Bosnia and Herzegovina
Ministry of Foreign Trade and Economic Relations

STATE OF THE ENVIRONMENT REPORT OF BOSNIA AND HERZEGOVINA 2012

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Foreword

This is the first State of the Environment Report for Bosnia and Herzegovina prepared with support from the Millennium Development Goals Fund and the United Nations Environment Programme. The team in charge of its development faced a challenging task: collect all available data on the state of environmental media, analyze it, research the current society response and offer adequate solutions that will help in preservation of natural treasure of this country. Bosnia and Herzegovina, as all other countries, wants to harmonize its obligations with the needs of society, and to be represented in a realistic and correct manner during international information exchange, so that it couldenter into the realization of defined priorities. Understanding the state of the environment thereby presents a solid base for all future activities. This is the first report which comprehensively analyzes the state of the environment nationwide based on a significant number of data gathered from key institutions in charge of monitoring and environmental protection at all levels. A considerable number of experts across BiH were involved in its development as well as the academic community and non-governmental sector which verifies the effort put in producing a document that will summarize all available knowledge and offer the best solutions. The Report introduces a systematic approach to addressing environmental issues though policy planning that will respond to the needs of society and provides a valuable contribution in establishing regular systems of environmental data monitoring and appropriate environmental improvement system based on facts. The goal of this Report is: to ensure relevant, reliable and useful data and to raise public awareness about environmental issues among decision makers and the general public, to fully support inclusion of environmental considerations into general economic and sector decision-making processes that lead to a more sustainable and effective preservation of our natural resources and to identify issues that need to be addressed through environmental policies. Ensuring reliable information on the current state of the environment will be of help to state and entity authorities and ministries, policy makers and other decision makers when setting priorities in decision-making processes which will enhance the existing state of the environment in Bosnia and Herzegovina. All of this is a significant step forward for Bosnia and Herzegovina in its efforts to harmonize and approach European practices in environmental management and as such to accelerate the accession process to the EU.

I also wish for this Report to serve its purpose, to be incorporated within all other sector policies, plans, programs and projects, and as such to become the main driving force in reaching green economy goals and sustainable development of our society.

MINISTER
Mirko Šarović

Acronyms and Abbreviations

BD - Brčko District

BiH – Bosnia and Herzegovina

BOD_5 - Biochemical Oxygen Demand

CARDS - Community Assistance, Development and Stabilization

CBD - Convention on Biological Diversity

CDM - Clean Development Mechanism

CFC - Chlorofluorocarbons

CORINAIR - Core Inventory of Air Emissions

CORINE - Coordination of Information on the Environment

CPI - Consumer Price Index

CSD - Commission on Sustainable Development

CSI – Core Set Indicators

CTC - Carbon tetrachloride

DCF - Donors Coordination Forum

DDE - Dichlorodiphenyldichloroethylene

DDT - Dichlorodiphenyltrichloroethane

DIKTAS - Dinaric Karst Aquifer System

DNA - Designated National Authority

EBRD - European Bank for Reconstruction and Development

EC – European Commission

EEA - European Environment Agency

EIA - Environmental Impact Assessment

EIONET - European Environment Information and Observation Network

EPA - European Partnership Agreement

EPR - Environmental Performance Review

EQS – Environmental Quality Standards

ERDF - European Regional Development Fund

ESPOO - Convention on Environmental Impact Assessment in a Transboundary Context

EU – European Union

EUR - Euro

FAO - Food and Agriculture Organization

FBiH –Federation of Bosnia and Herzegovina

FC - Faecal Coliforms

FHMI BiH– Federal Hydrometeorological Institute of BiH

FLIS - Forward-Looking Information and Services

FMEMI – Federal Ministry of Energy, Mining and Industry

FMET –Federal Ministry of Environment and Tourism

FMPP - Federal Ministry of Spatial Planning

FMPPE – Federal Ministry of Spatial Planning and Environment[1]

FMAWMF - Federal Ministry of Agriculture, Water Management and Forestry

FS - Faecal Streptococci

GAINS - Greenhouse Gas-Air pollution Interactions and Synergies

GDP - Gross Domestic Product

GEF - Global Environment Facility

GHG - Greenhouse Gas

GIS - Geographic Information System

GMO - Genetically modified organisms

HCFC - Hydrochlorofluorocarbons

HFC - Hydrofluorocarbons

HPI - Human Poverty Index

IA - Interim Agreement

ICT - Information and communication technology

IDA - International Development Association

IESCE - Inter-Entity Steering Committee for the Environment

IFC - International Finance Corporation

IFI – International Financial Institution

IMF - International Monetary Fund

INC - Initial National Communication

IPA - Instrument for Pre-Accession Assistance

IPCC - International Panel on Climate Change

IPPC - Integrated Pollution Prevention and Control

ISO - International Standards Organization

IUCN - International Union for Conservation of Nature and Natural Resources

JICA – Japan International Cooperation Agency

KFW - Kreditanstalt Für Wiederaufbau (German Development Bank)

KM - Convertible mark

MAC - Mine Action Center

1 Ministry of Spatial Planning and Environment is now divided into two ministries: Federal Ministry of Spatial Planning and Federal Ministry of Environment and Tourism

MBO - Mechanical-biological processing

MCSD - Mediterranean Commission on Sustainable Development

MDG - Millennium Development Goals

MEA - Millennium Ecosystem Assessment

MEA - Multilateral Environmental Agreement

MFC - Methil chromform

MHRR BiH - Ministry for Human Rights and Refugees of Bosnia and Herzegovina

MIEM RS - Ministry of Industry, Energy and Mining of Republika Srpska

MIFF - Multi-annual Indicative Financial Framework

MIPD - Multi-annual Indicative Planning Document

MKB - International disease classification

MLF - Multilateral Fund

MAFWM RS - Ministry of Agriculture, Forestry and Water Management of Republika Srpska

MSPCEE RS - Ministry of Spatial Planning, Civil Engineering and Ecology of Republika Srpska

MOFTER BiH- Ministry of Foreign Trade and Economic Relations of of Bosnia and Herzegovina

NAP - National Action Programme for Combating Desertification/Degradation of Soil

NBSAP - National Biodiversity Strategy and Action Plan

NCB - National Committee Board

NEAP BiH- National Environmental Action Plan of Bosnia and Herzegovina

NFP - National Focal Point

NMVOC - Non-Methane Volatile Organic Compounds

NSCESD - National Steering Committee for Environment and Sustainable Development

NTFP - Non-timber Forest Products

NGO - Non-governmental organization

OA - Official Aid

OCP - Organochlorine Pesticides

ODP - Ozone Depleting Potential

OECD - Organisation for Economic Co-operation and Development

PCB - Polychlorinated Biphenyls

PFC - Perfluorocarbons

PHARE - Poland and Hungarian Assistance for Economic Reconstruction Program (Pologne Hongarie Assistance à la Reconstruction des Economies)

PM – Particulate matter

POP - Persistent Organic Pollutants

PRTR - Pollutant Release and Transfer Register

RAPPAM - Rapid Assessment and Prioritization of Protected Areas Management

RDB – Red Data Book

REC BiH - Regional Environmental Centre for of Bosnia and Herzegovina

RHMS RS – Republic Hydrometeorological Service of RS

RS - Republika Srpska

SAA -Stabilization and Association Agreement

SDC – Swiss Agency for Development and Cooperation

SEA – Strategic Environmental Assessment

SEE - South East Europe

SEIS - Shared Environmental Information System

SIDA - Swedish Development Agency

SIS - Soil/Land Information System

SOOO - Ozone Depleting Substances

TC - Total Coliforms

TP - Thermal plant

UN – Organization of United Nations

UNCCD - United Nations Convention to Combat Desertification

UNDAF - United Nations Development Assistance Framework

UNDP – United Nations Development Programme

UNECE - United Nations Economic Commission for Europe

UNEP - United Nations Environment Programme

UNESCO - United Nations Education, Science and Culture Organization

UNFCCC - United Nations Framework Convention on Climate Change

UNICEF – United Nations Children's Fund

UNV – United Nations Volunteers

UNWTO – United Nations World Tourism Organization

USAID – United States Agency for International Development

USEPA – US Environmental Protection Agency

WB - World Bank

WFD - Water Framework Directive

WHO - World Health Organization

WQM - Water Quality Monitoring

WTO - World Trade Organization

WWF - World Wide Fund for Nature

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Central Bank of Bosnia and Herzegovina
Construction Institute of Sarajevo Canton
Environmental Protection Fund of Federation of Bosnia and Herzegovina
Environmental Protection Fund of Republika Srpska
Federal Administration for Inspection Issues
Federal Bureau for Geodetic and Property Relations
Federal Hydrometeorological Institute of BiH
Federal Institute for Agropedology
Federal Institute of Agriculture
Federal Ministry of Agriculture, Water Management and Forestry
Federal Ministry of Energy, Mining and Industry
Federal Ministry of Environment and Tourism
Federal Ministry of Spatial Planning
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Ministry of Economic Relations and Regional Cooperation of Republika Srpska
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About the State of Environment Report of Bosnia and Herzegovina 2012

Environment is a complex natural and social term for the area of the Earth, which was shaped by complex and substantially fulfilled by complex natural and social processes. The environment constitutes of natural environment, soil, air, water, biosphere and built (artificial) environment that has emerged as a result of human activities.

Laws on Environmental Protection of the Federation of Bosnia and Herzegovina (FBiH), the Republika Srpska (RS) and the Brčko District[2] (BD) of Bosnia and Herzegovina, as well as Laws on Waters[3] , are the founding legal acts that define and set out goals, principles, measures, responsibilities, documents, financing and supervision of environmental protection in Bosnia and Herzegovina (BiH), and that also regulate the obligation of the competent Ministries to establish a system of providing information on the environment and enable monitoring of the state of the environment.

The State of the Environment Report of BiH 2012 (Report) is the first report on the state of the environment of the country of BiH and it presents one of the founding documents on environmental protection in BiH. Having in mind that, as BiH gets closer to the European Union and to accessing to it, the environment will become one of its priority areas, the Report will certainly be a significant foundation for the assessment of the state of the environment in future negotiations of BiH for access to the EU membership.

Purpose of the State of Environment Report

The purpose of this Report is to give an overview of key data on the state of theenvironment of BiH. The Report presents a comprehensive overview of the state of the environment and trends, pressures and their effect on the environment, initiators of those pressures, as well as existing initiatives for resolution of environmental issues. In addition to evaluation of the complete state of the environment, the Report gives an evaluation of efficiency of the applied environmental protection measures, and identifies key issues for protection and improvement of the state of the environment. As it contains an evidential basis for development of a strategic approach to protection and improvement of the environment in BiH, the Report includes the area of interest for policy and decision makers.

Using the results of the analysis, assessments and calculations of environmental indicators implemented in the previous period, the Report provides an overview of the environmental situation up to 2011 and it provides a basis for evaluation of the situation in the future period.

Objective of the Report is to:

- Ensure relevant, reliable and useful information about environmental issues to decision makers and the wider public;
- Raise awareness about environmental issues amongst decision makers and the public;
- Support as complete inclusion of environmental considerations as possible into general economic and sectoral decision making processes that lead to more sustainable use and more efficient preservation of our natural resources;
- Identify problems that are to be addressed through environmental policies with the aim to increase the effectiveness of policies and better define the priorities, measures and activities.

Provision of reliable information about the current state of the environment will assist the state and entity governments and ministries, policy makers and other decision makers to determine priorities, formulate policies and adopt managementdecisions that will contribute to improving the current state of the environment in BiH.

2 Law on Environmental Protection (Official Gazette of FBiH, Nos. 33/03 and 38/09), Law on Environmental Protection (Official Gazette of RS, Nos. 28/07, 41/08, 29/10), Law on Environmental Protection (Official Gazette of BD, Nos. 24/04, 1/05, 19/07, 9/09)

3 Law on Waters (Official Gazette of FBiH, No. 70/06), Law on Waters (Official Gazette of RS, No. 50/06, 92/09), Law on Water Protection in BD (Official Gazette of BD, No.25/04, 1/05, 19/07)

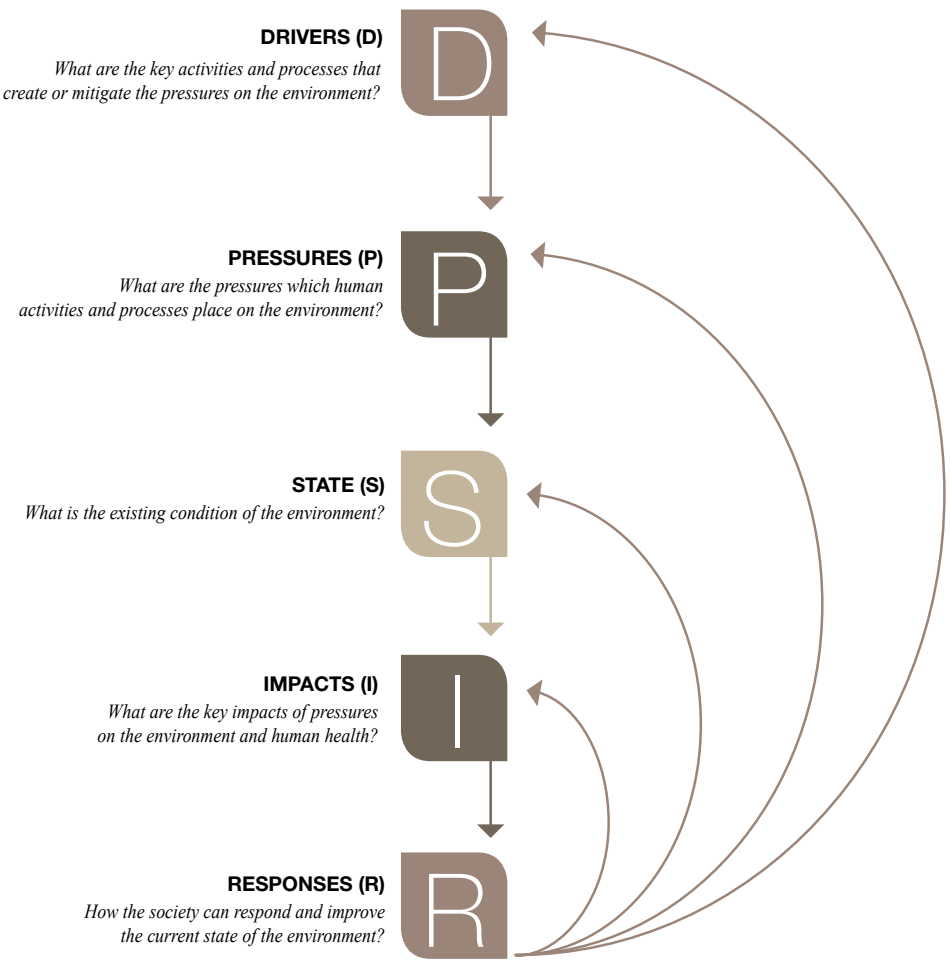
The community has a very significant role in supporting and initiating changes in the environment. This is why the Report ensures clear and accessible information on the state of the environment to the wider public, including business directors, employees, students, etc. The purpose of raising awareness, i.e. information sharing, is to reach a better understanding of environmental problems within the context of sustainable development, to contribute to forming opinions on environmental issues, to change the behavior of the society that would lead towards sustainability and to increase participation of the public in activities related to the environment and decision making.

Methodology and Availability of Data

The methodology used for developing the Report is primarily defined by the characteristics of the topic it deals with – environmental protection, as well as by the level of establishment of the environmental protection system in BiH. The approach to developing the Report was based on an internationally accepted framework for reporting on the state of environment – DPSIR methodology. This framework assumes causal links between mutually related components of social, economic and environmental systems. It recognizes the chain of linksstarting fromdriving forces behindspecific pressures on the environment, consequences of those pressures, i.e. the state of environment, which has a direct effect on theecosystem, and causes a number of direct impacts. All these negative effects, as a consequence, have a response in the society, which by a number of measures further affects all the links in the chain (Figure 1).

According tothe DPSIR methodology, indicators that quantify information about the environment and facilitate a better understanding of complex environmental problems, belong to one of the following categories:

Figure 1:
DPSIR methodology



- Driving forces (D) –basic driving forces behind negative impacts (e.g. demography, economic development, agriculture, energy, industry, transport, tourism, etc.);
- Pressures (P) –consequences of driving forces (e.g. urban planning, waste generation, excessive utilization of resources, emissions into the air, water and soil, etc.);
- State (S) –current state of the environment as a consequence of pressure; presents a combination of physical, chemical and biological conditions (e.g. the state of quality of air, water and soil, state of ecosystems, etc.);
- Impact (I) –changes of states may have anenvironmental or economic impacton the functioning of ecosystems, human health, as well as on economic and social effectiveness of the society;
- Response (R) –measures and instruments that the society/country implements or plans to implement with the aim to improve the state of the environment (policy, legislation, economic measures, technical measures, etc.).

The Report is structured in such a manner that it, on one side, provides an insight into causes, pressures and consequences of pollution and, on the other side, it gives an overview of policy responses that have been drafted with the aim to decrease negative impacts of human activities on the environment as well as an overview of the efficiency of their implementation.

The Report is based on available data from different sources, calculations made on the basis of collected data and professional analyses. The quality of this Report is in direct relation with the quality of available data and information. There is a great disproportion in availability of data between different areas. On one side, environmental data are better monitored in some areas than in others, measuring is systematically performed and data are collected over a number of years. On the other side, a part of the necessary data has not been recognized as important for environmental protection issuesuntil now, thus in some areas data are partly or completely missing. Basic problems related to the evaluation of data used in this Report are a lack of systematic measuring,a lack of legal obligations to collect data, some data being scattered all around different sources (agencies, institutions, administrations, and companies) anda lack of all necessary data.

In certain cases, the problem was alack of harmonization between the official data of BiH with data from other sources (studies, plans, or data collected from the “owners” of data); however, in such cases, the data used in the Report are those that are official. Lacking official data, data available in literatureand in relevant strategic, planning and study documents were used for some areas.

Significance of Environmental Indicators and Strategy of Selection

With the aim of simpler exchange of information and its use in the overall process of planning and developing the environment sector, the state of the environment presented in this Report is determined by way of the indicator approach. Environmental indicators make very useful tools for quantification of physical indicators of the state of the environment, as well as for monitoring the status and changes in the environment. Properly selected indicators may show key development trends, be useful when describing causes and effects of environmental conditions, as well as be used to monitor and implement environmental policies and strategies. Indicators are used to turn complex data into information that is used for analyzing existing data and trends, formal adoption of adequate solutions and decisions for evidence-based management as well as for the needs of research and the wider public.

Indicators in this Report were selected on the basis of availability, their significance for evaluating the state of the relevant area and on the basis of whether they are on the list of the basic indicators of the European Environment Agency (EEA), that is, the so-called CSI[4] list. Selected indicators are currently the available indicators important for basic environmental problems and their primary task is to assist in future comparison of indicator values from different cycles of environment sector development processes and in taking measurements in our changing environment.

4 CSI – Core Set of Indicators

Bearing in mind that this is the first report on the state of the environment in BiH, it presents the “baseline” which will be the ground for monitoring and evaluation of progress in the area of environmental protection in future periods.

Report Development Process

The Report development processis part of a three-year program of the Millennium Development Goals Fund – MDG-F under the name “Mainstreaming Environmental Governance: Linking Local and National Action in Bosnia and Herzegovina”, which has been jointly implemented by five UN agencies (UNDP, UNEP, UNESCO, FAO, UNV).

The Report was developed on the basis of a detailed analysis using the methodology recommended by the European Environment Agency (DPSIR), the framework of which ensures monitoring and planning of the environment sector on a cycle basis. The Report is developed in such a manner that it includes each of the cycles with the aim to assess the state of environment for the given cycle, which, at the same time, presents reference values of environmental indicators for the following cycle which, in the process of the environment sectordevelopment, has the aim to improve reference values of the indicators from the previous cycle. The best available information are, to the extent possible, used with the aim to select components of the assessment, as well as to determine the state and trends as precisely as possible. Data were used from a wide spectre of data sources (as stated in the Report) and in extensive consultations with experts from different scientific disciplines.

In addition to this, the Report development process was implemented adhering to the principles of participatory planning, that is, the principle of participation of all stakeholders in the environment sector. In this manner, by participation of representatives of relevant institutions from all segments of the environment, as well as by applying the inter-sectoral approach, the use of the current available environmental data was ensured.

As there is no uniform information system for environmental monitoring at the level of BiH, in some segments the data needed to be obtained by analysisand application of assumptions and assessments. Ensuring availability and quality of data necessary for systematic monitoring of the state of the environment depends on establishing a comprehensive monitoring system, which is a very demanding task, but also one of the priority tasks in the following period. Drafting and adoptinga list of environmental indicators at the level of BiH is one of the pre-conditions for defining the implementation of monitoring, establishing a network of measuring stations, as well as an information system for monitoring the state of the environment. The second significant segment of providing information about the environmentis the process of data exchange; therefore one of the primary tasks is to establish a system of obligations and responsibilities for exchanging environmental data between the authorities of the entities and the BD competent for certain components of the environment.

Form of the Report and its Contents

When developing the Report, the usual approachof mostEU countriesto developing similar reports was used. Having in mind that this Report is a “baseline” on the grounds of which monitoring and evaluation of progress in the area of environmental protection will be carried out, its scope is somewhat wider, so as to show and process as many data as possiblein one place.

The structure of Chapters 2, 3 and partly Chapter 4 is the same and it encompasses a short introduction into the area, evaluation of the state shown on the basis of indicators, conclusions and recommendations for improving the monitoring and reporting process, as well as the state of the environment in general.

CONTENTS OF THE REPORT

The Report consists of six main Chapters:

1. INTRODUCTORY INFORMATION about BiH provides an overview of geographic and climate characteristics, historical and political background as well as cultural heritage.

2. SOCIO-ECONOMIC DRIVERS AND PRESSURES the Chapter deals with driving forces and pressures of socio-economic activities that affect the environment.

3. STATE AND TREND IN THE ENVIRONMENT –the Chapter gives an assessment of the state and trends that are a result of pressures on the environment for seven areas: forest resources, land and soil resources, resources of groundwaters and surface waters, mineral resources, biological and landscape diversity, air pollution and damages to the ozone layer, as well as climate changes.

4. ENVIRONMENTAL SAFETY AND HUMAN HEALTH this Chapter gives an overview of natural and man made disasters, it deals with post-conflict issues and transboundary environmental impacts, and analyzes the impacts of the environment to human health.

5. POLICY RESPONSES are related to environmental management, environmental policy, education about the environment, raising awareness of the public about the environment, as well as to the participation of the public in Bosnia and Herzegovina.

6.CONCLUSIONS AND THE WAY FORWARD the Chapter gives main conclusions of the Report in terms of the state in the field of environment, availability of data and reporting procedures and it also provides future recommendations regarding environmental reporting.

Executive Summary

The level of social and economic environmental pressures in BiH in the last two decades has been predetermined by the country's development characterized by war-time aftermaths, transition process and introduction of European standards necessary for accession of BiH to the European Union (EU).

As a transition country, BiH faces a significant number of social, economic and other issues in the post-war period, among which the issue of environmental protection stands out as a key issue, the solution of which presents a major challenge. Being the centre of heavy industry, resource and energy base of the former Yugoslavia, BiH was exposed to serious pollution of its basic natural resources – water, air and soil in the pre-war period. During the conflict 1992 – 1996, BiH faced a decrease in economic activities in all sectors, and the country emerged with an utterly ruined infrastructure and industry and devastated economy. As a consequence of the war, vast areas of land were left covered with landmines; significant quantities of different types of waste were left behind as well as thousands of hectares of cut or destroyed forests and etc.

Even though the post-war period, directed towards revival of economic activities, was not prioritized by environmental protection, the BiH accession process to EU has contributed to development of environmental protection policies. Having in mind the significance of the environment for economic development, human health and social balance, BiH has undertaken a series of activities in order to address key environmental issues in the previous decade. Within the National Environmental Action Plan for BiH (NEAP BiH) of 2003, priority areas, main goals of the environmental protection policy have been defined and a series of measures for achieving the set goals has been developed, and goals met so far differ in certain sectors.

BRIEF SUMMARY OF THE STATE OF ENVIRONMENT

Population and Urbanization

BiH is characterized by exceptional natural, landscape and architectural diversity. Spatial diversity and its processes have been influenced by a series of historical circumstances. At the crossroad between East and West, BiH has always been the meeting place of different cultures, nations and civilizations. Currently, there are approximately 3.9 million people living in BiH. An official census has not been conducted since 1991, and this presents a setback in many other spheres. All the "per-capita" information are estimates instead of actual measured data. BiH has an ageing population. Fertility rates are low and the unemployment rate of the working age population is 27.2%, which can have negative implications on the future economic stability. Increased urban sprawl and high rates of poverty are also an important driving force of environmental degradation. Urban areas are constantly developing, so, despite the decrease of total population, these areas and their transport corridors have a continuing trend of population concentration. Regarding spatial planning, BiH is still missing a major number of its spatial and urban plans. The RS has adopted a spatial plan (Spatial Plan of RS 2008 – 2015), while the Draft Spatial Plan of FBiH 2008 – 2028 is still in the adoption procedure. Illegal construction is a major issue in the whole of BiH, which is a result of missing planning mechanisms, insufficient implementation and control and significant socio-economic factors and population displacement during the war.

Energy Sector, Mining and Industry

The energy sector is one of the key sectors of BiH economy. Main domestic sources of energy are coal and hydro-potential, while natural gas and oil are imported. In the period between 1995 and 2008, BiH registered an increase in energy consumption, at an annual rate of 3.14%. Final energy consumption per capita in 2008 was 0.62 ktoe, which is lower than the

EU average (2.23ktoe/per capita). Energy consumption from renewable sources in the same year amounted to 575 ktoe which is 9.59% of the total energy consumption, with the largest share of fossil fuels (coal 64.47%, oil 22.42%, gas 5.89%). Most renewable sources are based on hydro-potential and biomass, while sun, wind and geothermal potential are insufficiently researched and are not used to a satisfactory extent. It must be stressed however that, in the period 1995 – 2008, the annual increase in energy consumption from renewable sources amounted to 1.32%. This growth trend is an encouraging sign, since this is a key area in which additional effort must be invested in order to decrease fossil fuel consumption and improve environmental protection.

The industrial sector in BiH is characterized by low productivity and weak competition. Such situation in BiH industry is caused by, on one side, war destruction and loss of pre-war markets, while on the other hand, consequences of previous economic development models based on natural resource exploitation cannot be disregarded.

The energy and industry sectors have major impacts on the environment. One of the globally adopted indicators of negative impacts these sectors have on the environment are greenhouse gas emissions, especially CO_2 which is the most widespread. In 1990, GHG emissions in BiH amounted to 34 million tones, but there is no recent data on GHG emissions at BiH level.

Coal mines are an important part of the energy sector; however, BiH mining is faced with significant environmental issues due to exceptionally modest attention which is paid to this sector and a lack of financial means. Coal is exploited at an area of 18,000 ha, while waste materials are disposed of at an area of almost 6,000 ha. These locations mostly consist of meadows, arable areas and forests which have been degraded. Even though at the majority of mine sites technological waste waters are processed in settling tanks, at a certain number of these sites they are not processed before being discharged into water flows; on the contrary, theyare released directly into sewers or septic tanks. Only one mine has a wastewater treatment plant.

Agriculture, Fisheries and Aquaculture

Compared to the total area of agricultural land in BiH, arable areas are decreasing, while the area of unused and uncultivated land has increased by 45 – 49% compared to total arable land. Only 1% of arable land is irrigated, which is insignificant in comparison to most EU countries. Production of cereals, vegetables, industrial crops and fodder has significantly decreased compared to the pre-war period. Even though organic production is not widespread, it is constantly increasing every year. Impact of agriculture on the environment is reflected in soil and water pollution and it contributes to global warming due to GHG emissions. GHG emissions originating from the agricultural sector had a slight growth trend in the period 2005 – 2010, but are still far from the emission levels in 1990. Since BIH agriculture is characterized by small and fragmented estates, inadequate equipment on estates and poor use of agricultural inputs, it is estimated that the current impacts of this sector on the environment are not significant in comparison to certain other sectors.

Fish fauna has been relatively well researched in BiH. Aquaculture in BiH mostly comprises of freshwater species culturing: Salmonoid species (rainbow trout, brown trout and brook trout) and Cyprinid species (common carp, grass carp, silver carp and wells catfish). The most common marine species are European sea bass, Gilthead sea bream and Mollusks (Mediterranean mussel and European flat oyster). Even though many pre-war fish processing facilities are not in operation, production of fish (mostly freshwater) is increasing in BiH.

Transport and Infrastructure

Freight and passenger transport in BiH is constantly increasing. Major forms of transport in BiH are road and rail. Passenger transport is mainly oriented to road traffic, while a significant part of freight transport is conducted by rail. Water transport is poorly developed and does not pose a significant impact on the overall transport of goods and passengers. Air transport

is also insufficiently developed, even though progress is being achieved slowly. Negative impacts of transport on the environment are mirrored in a constant increase of adverse air emissions, which is a consequence of a constant increase in the number of motor vehicles, i.e., consumption of motor fuels and accidents during transport. Motor vehicles are one of the main air polluters in major urban centers, with vast numbers of old vehicles greatly contributing. The majority of registered road motor vehicles in BiH (74%) are over 10 years old. Even though the construction ofthe highway in Corridor Vc, which will be intensified in the following period, is expected to significantly improve road transport conditions within the country and ensure an enhanced connection of BiH to other European countries, these activities will necessarily lead to a decrease in and intersection of natural habitats. On the other hand, improvement of road conditions will decrease the number of traffic accidents and their impact on human life and health as well as the number of minor and major material damages. Even though an increasing trend in traffic accidents was recorded in the period 2006 – 2008, a constant decline in the number of accidents, especially those resulting in death, has been recorded since 2008, despite a constant increase in traffic intensity.

Tourism

Tourism is one of the fastest growing activities in the world, and is an important development determinant in BiH. Despite that, systematic evaluation and protection of all touristic potential has not been realized. Increase in tourist flow and construction of new accommodation capacities not followed by adequate infrastructure are the cause of rising environmental pressures. Many tourist visits are not recorded, and the registry system for visits is very complicated and unadjusted for tourists staying for short periods and in private accommodation. Because of this, available statistical data does not reflect the actual situation in BiH tourism and it is estimated that the number of tourists is much higher than presented in official data. As a tourist destination, BiH recorded an annual increase of 4-6% in the number of foreign tourist visits in the past years. Still, the number of tourists in the mountains during winter has significantly decreased in the last years due to high temperatures and a lack of snow.

Waste Management

Waste is generally one of the most significant environmental issues in BiH. Since 2003, generated municipal waste in BiH has been constantly increasing, and in 2010 it amounted to 332 kg per capita. The level of service coverage is 68%. Waste collection is generally performed by municipal utility companies entirely or partially state-owned or in some cases, by private companies contracted by municipalities. Reliable statistical data on generation of packaging waste in BiH is nonexistent, but estimates indicate that annual quantities of packaging waste amount to approximately 240,000 tones. Except for scrap ferrous and non-ferrous metals, the current level of recycling in BiH is low compared to developed countries. From the total mass of municipal waste, less than 5% of recyclables are separated, while 95% of mixed municipal waste is disposed at disposal sites.

In BiH 91 municipal disposal sites were registered in 2010. There is not a single operating incinerator or MBT plant in BiH, so landfilling is still the main option for disposal of municipal waste. However, due to limited disposal capacities and low public awareness on adequate waste management, a significant number of illegal dumpsites are present in BiH. Besides a few established regional landfills, waste is mainly disposed of in an inadequate manner and is a risk to human health and the environment. Strategic documents and plans in the area of waste management require establishment of regional sanitary landfills as well as remediation and closure of existing municipal disposal sites; however, in many regions of BiH this issue has not been addressed yet.

Due to a lack of adequate treatment and disposal facilities, non-hazardous and hazardous waste from production activities and medical waste often end up at existing municipal waste disposal sites. Therefore, a major part of hazardous production waste and other special categories of waste are exported. The quantity of exported hazardous waste in 2009 amounted to 4,870 tones, and the main export destinations are Austria, France and Slovenia. According

to legislation which regulates the area of waste management, import of hazardous waste in BiH for disposal purposes is forbidden.

Forest Resources

Forests are a very significant natural resource in BiH and 80% of forests, or 2.80 million hectares, is state-owned. The forest cover extends to 50% of total BiH territory and is equally distributed between the two entities. Most forest areas are classified as high forests. The first forest inventory in BiH was implemented in the period between 1964 and 1968. A new forest inventory was commenced in 2006 and is in its final stage. It is expected that data arising from the new inventory will serve as a solid basis for monitoring forest status in the following period. BiH has a very long tradition of utilizing its wood resources. Before the conflict, the amount of timber harvested annually was 5.5 to 6.5 million m^3/year; that figure today is around 4.5 million m^3/year. Besides wildfires, which pose the greatest hazard to forests and biodiversity in general, a negative impact on forest resource management is the presence of landmines. Due to inaccessibility of certain areas, forest treatment and rehabilitation options within these areas for the purpose of forest health management or fire hazard protection are limited.

Land and Soil Resources

Soil degradation is increasing, and land use changes and loss of agricultural land are caused by sudden urbanization, industrialization and changes to commercial development. Opencast mining or opencast exploitation of mineral ores has resulted in approximately 15,000 ha of damaged land in BiH, while disposals of fly ash and slag occupy an area of approximately 250 ha. Waste is dumped on large areas of fertile agricultural land, thus precluding the possibility of agricultural production. The main characteristics of soils in BiH are: low content of humus and fertilizer nutrients, soils are generally shallow and approximately 14% of the territory contains excess water. Acid soils occupy more than 1/3 of the land in BiH. As more than 80% of the country consists of terrain with slopes exceeding 13%, water induced erosion is an increasingly present problem.

Since there is no specific legislation directly regulating this area, BiH does not have systematic soil quality monitoring. One of the most important issues is the attitude of society towards land, i.e., low awareness of the significance of soil resulting in an insufficient number of quality policies for soil protection. Development of appropriate legislation is one of the basic prerequisites for meeting goals which would mitigate the mentioned negative trends, but this is a slow process.

Water Resources

BiH ranks among the better-watered and largely spring-fed countries, with a dense river network in the Sava River Basin, and with a less developed network of surface waters in the Adriatic Basin, with significant karstic ground watercourses. BiH is a country rich in waters but with unequal temporal and spatial distribution of total water quantities. Regarding surface water quality, the state of BiH rivers is generally good considering the content of oxygen in water, even though the Bosna River is significantly more polluted than other rivers. According to average values, nitrate concentrations in BiH rivers in the period 2000 – 2008 were not significant which was mostlya result of slow agricultural and industrial development. However, rivers located in regions with highly developed industry, as for example Spreča River, have reported high concentrations of nitrates.

Total annual water abstraction for public water supply amounts to around 1% of annual renewable water. Groundwater and springs are of special significance as they are mainly used for water supply (89%), while 10.2% comes from rivers and 0.8% from natural lakes and artificial reservoirs. The percentage of population in BiH covered by public water supply services is 58. Losses in the water supply network are estimated between 30% and 50%, and the uncharged water level is between 25 and 75%. According to estimates from strategic

documents, only 33% of the population is connected to public sewage systems, while only some municipalities in the FBiH and one in the RS have functioning wastewater treatment plants. The rest is directly discharged into receiving water bodies.

Monitoring of inland and coastal bathing water quality is not carried out systematically, but according to immediate needs and availablefunds, while systematic monitoring of groundwater quality is not performed in a satisfactory manner.

Mineral Resources

The majority of significant coal basins has been known for over a century and is mostly well explored. Some of them have been in exploitation for more than 100 years. Total geological reserves of coal in BiH are estimated at 5,647 billion tons. The most important reserves of brown coal are located in central BiH, Banovići, Ugljevik, Miljevina and Kamengrad, and of lignite in Kreka, Gacko, Stanari, Bugojno, Livno and Duvno (Tomislavgrad). These basins are existing and future potential for thermal energy generation. There are significant lead ore deposits in BiH, with estimated reserves of 450 million tons. The explored salt reserves amount to 370 million tons, while exploitable reserves amount to an estimated 54.72 million tons. Besides these deposits, other types of metal ores (lead, zinc, silver, manganese, antimony, copper, mercury) and non-metallic ores (magnesite, barite, bauxite) are present in BiH. There are numerous stone deposits with good prospects for significant increase in existing production and processing. Geothermal sources in BiH have not been explored sufficiently yet, and estimated possible total installed capacity of geothermal sources at 44 locations is 9.25 MWt for heating purposes only, or 90.2 MWt of geothermal energy for heating, recreational and spa purposes.

Biodiversity and Landscape Diversity

The richness of the living world in BiH is a result of spatial ecological heterogeneity, geomorphologic and hydrological diversity, specific geological past and climate diversity. The living world of BiH is characterized by a high degree of endemic and relict forms of living organisms. More than 5,000 species and sub-species of vascular plants, more than 100 species of fish, over 320 species of birds and other components of biological diversity have been identified in BiH. However, data on biodiversity in BiH is scarce, and BiH has still not established a central or coordination body for monitoring biodiversity status. There is also no data for the majority of generally accepted indicators for monitoring biodiversity status. Territories covering protected areas in BiH are relatively small, and the percentage of this territory compared to the total BiH territory is extremely low and far below the European standard.

Air Quality

Hydrometeorological institutes of FBiH (Sarajevo) and RS (Banja Luka) regularly monitor air quality. The institutes determine qualitative and quantitative air properties within the basic network of meteorological stations (Sarajevo, Ivan Sedlo, Tuzla, Zenica, Mostar and Banja Luka), even though this is insufficient for obtaining a real image of air quality for the whole of BiH. Even though the previous period shows a significant progress in air quality monitoring and reporting (instalment of on-line monitoring stations and regular reporting to the EIONET Network within the European Environment Agency), in order to obtain a more complete image of air quality in BiH, it is necessary to collect and analyze more data from several different stations within the country.

Air pollution in BiH generally arises from industrial activities and traffic. Industrial process emissions have decreased compared to the pre-war period and as pre-war production levels have not yet been reached, air quality status in BiH is better than it was prior to the 90's. However, a constant increase of traffic leads to rising traffic emissions which mostly affect major urban centers in BiH. Due to specific climate conditions and temperature inversions, air pollution is significantly pronounced in the winter months in larger urban areas in BiH, and

especially in cities located in valleys where emissions become "trapped" for longer periods of time. Significant progress was achieved in decrease and prohibition of ozone depleting substance (ODS) use. Ozone depleting potential in BiH has decreased by over 90% between 2002 and 2008 due to implementation of the Montreal Protocol.

Climate Change

Climate change is reflected in rising average annual temperatures on one hand and concurrent precipitation decrease on the other. Climate data for BiH presented in the "Initial National Communication for Climate Change for BiH" indicates changes observed around the Mediterranean Sea and the Balkans. The model used in this report indicates that BiH will continue to be affected by global warming with an average increase of 0.7 to 1.6 per degrees Celsius of global increase, and that the region will suffer from reduced precipitation especially in the summer period, thus leading to increasing droughts. Due to overall low productivity and energy consumption as well as to low per capita energy production and consumption, BiH remains a small GHG emitter with a total of 24.14 Mt CO_2 eq in 2005. Despite this, the country needs to find a way to decrease emissions and to adapt to current climate change and its consequences in key sectors: agriculture, forestry, industry, transport and energetics.

Environmental Security and Human Health

A healthy environment is the basic precondition for quality of living and human health preservation. The percentage of population covered by public water supply is high (88.8% of households in BiH have in-house access to potable water) and the percentage of non-compliant potable water samples in terms of physical-chemical aspect varied from 10 to 18% in the period from 2009 to 2011, and from 8 to 12% in terms of microbiological conformity. Diseases transmitted via potable water are limited and occur mainly in smaller water supply systems which are not monitored regularly by public health institutes. Foodstuff safety in production and trade in BiH is continually monitored and there are sporadic occurrences of limited cases of infection. The total number of infected patients with food confirmed as the cause/pathway in 2009 amounted to 1,169, and in 2011 there was an increase to 1,472. Public health from the environmental aspect is still an insufficiently explored area in BiH. Public health institutes report on epidemiological data, but no data directly linking environmental factors and human health (air pollution, summer heat waves, etc.) exist. A lack of targeted research regarding specific environmental pollution and its consequences on human health is evident.

Even though there is still no systematic reporting on toxic chemicals and substances in all segments of the environment, there are information sources which clearly state that water, soil and food in BiH contain certain concentrations of harmful substances. The main sources of eco-toxic substances are inadequate disposal of municipal, medical and industrial waste, quarrying waste and a lack of wastewater treatment plants as well as sewage directly discharged into open receiving water bodies. Concentrations of toxic substances are being measured, but reporting on findings in most cases is not unified. Usually, food samples are taken and analyzed for toxic substance content, but not many studies on eco-toxicology are conducted. In BiH, systematic reporting of contaminants in food, which is fully compliant with the regulations on food safety, is carried out by the Food Safety Agency of BiH towards the Council of Ministers of BiH,

From the aspect of environmental and human safety, landslides, wildfires and floods represent a significant issue in BiH. Aside from this, it is estimated that 1,443 km^2 remain covered by landmines as a consequence of warfare, which is 2.8% of the total territory of BiH. Post-conflict political and economic issues still largely affect recovery which directly affects the environment sector.

Policy Responses

Environmental governance in BiH has a fragmented series of environmental institutions at four administrative levels: state, entity, cantonal and municipal. According to the Constitution, environmental policies and natural resource use are the responsibility of entity and BD governments which regulate environmental matters through laws, regulations and standards. However, when the Law on Ministries and Other Bodies of Administration of BiH was adopted in March 2003, the Ministry of Foreign Trade and Economic Relations was given the power to define policies and basic principles, coordinate activities and harmonize plans of entity bodies, government and institutions in accordance with international obligations in the areas of agriculture, energetics, environmental protection, development and use of natural resources and tourism.

Even though such a complex administrative structure suffers from a lack of vertical (entity/canton/municipality) and horizontal (inter-entity/inter-ministerial/inter-municipality) cooperation, a shift forward in the environment sector reform implementation is evident. The BiH accession process to EU is one of the main driving forces in the environment sector reform, which, for the most part, applies to harmonization of domestic legislation with the acquis communautaire. In that sense, in the period between 2002 and 2004, the FBiH, the RS and the BD adopted a set of environmental laws that are a basis for drafting subordinate legislation at all levels. Despite the accomplishments reached so far, certain areas are still unregulated by legislation which is definitively a particular challenge for the following period and in existing circumstances. Besides the adopted legislation, by-laws, regulations and procedures and ratification of numerous international agreements, during the period 2000 – 2012 a significant number of strategic documents were drafted, showing continuing efforts of BiH in achieving reform in the environment sector.

Aside from governmental institutions, an important role in environmental protection is played by national and entity agencies and institutes, scientific-research institutions, occupational and/or professional associations, civic associations or non-governmental organizations. In the last decade, an upward trend in institution and organization numbers is evident, both governmental and non-governmental, as a consequence of increased public awareness about the significance of environmental conservation.

Despite the success so far achieved in certain areas, BiH faces major challenges in fulfilling set goals in the field of environmental protection. Nonexistence of a coordination mechanism with clear authorizations and distinct delineation of responsibilities and obligations between state, entities, cantons and municipalities, nonexistence of unified data collection and processing methodology and domestic standards in accordance with EU norms, a lack of subordinate legislation and funds for certain significant measures to implement environmental policy may be recognized as basic obstacles which might impede the implementation of environmental reform.

ENVIRONMENTAL INDICATORS PARTIALLY OR COMPLETELY MISSING

State of the Environment Report BiH 2012 was developed based on existing available data on sector pressures and state of the environment collected from all relevant existing sources. A special challenge for the development of this Report was a lack of a significant number of data and indicators to create an overall image on the state of the environment in BiH. An overview of data and indicators by sectors or areas that were partially or completely missing during the development of this Report is given in the document. In the following period, it is necessary to pay attention to capacity strengthening for state of the environment data collection which is currently missing so that an overall image of the state of the environment in BiH may be obtained.

RECOMMENDATIONS FOR IMPROVING THE STATE OF THE ENVIRONMENT AND KEY TASKS

Establishment of the coordination mechanism with clear authorizations and distinct delineation of responsibilities and obligations between the state, entities, cantons and municipalities is the basic precondition for an efficient functioning of environmental information systems in FBiH, RS and BD, based on reliable and current data and information. Aside from this, it is paramount to establish functioning horizontal and vertical links at all levels of state and entity administration which will enhance its efficiency and timely and coordinated activities in environmental protection. Long-term environmental protection at the state level will ensure inclusion of requirements, needs and goals of environmental protection into planning and development documents of all sectors which are sources of pressure on the environment.

Some general recommendations that will serve as guidance in creation of qualitative process for future State of the Environment Report drafting are the following:

Environment Report drafting are the following:

- **Recommendation 1**– Strenghten existing legal and institutional framework allowing Entities and the state to improve access to information, form the basis for sound decision making process andfulfill its reporting obligations;
- **Recommendation 2** – Strengthening environmental monitoring. State and entity authorities should establish a phase program for environmental monitoring which would be closely linked to the Environmental Information System enabling better control over the environment;
- **Recommendation 3** – Strengthening and promoting environmental statistics to permanent activity within operation of statistical authorities at the state and entity level;
- **Recommendation 4** – Strengthening the Environmental Information Management System defined through EU CARDS RANSMO project;
- **Recommendation 5** – Developing environmental indicators set in compliance with international methodologies and its adoption by the Parliament of BiH;
- **Recommendation 6** - Strengthening the Pollution Release and Transfer Register – PRTR;
- **Recommendation 7** – Strengthening the EIONET European Environment Information and Observation Network reporting;
- **Recommendation 8**– Beginning of a knowledge base establishment for Forward-Looking Information and Services - FLIS and Shared Environmental Information System – SEIS;
- **Recommendation 9** – Strengthening environmental education - planned, formal and informal education at different levels and in different sectors.

1 GENERAL INFORMATION

1.1 GEOGRAPHY
1.2 CLIMATE
1.3 HISTORICAL AND POLITICAL BACKGROUND
1.4 CULTURAL HERITAGE

The state of Bosnia and Herzegovina (BiH) was established by the Dayton Agreement (signed on 14th December 1995) and it consists of three separate administrative units: Federation of Bosnia and Herzegovina (FBiH), Republika Srpska (RS) and Brčko District (BD) of Bosnia and Herzegovina. The official languages are Bosnian, Serbian and Croatian.

According to the 1991 census, BiH had a population size of 4.4 million, while the current population size, according to the BiH Agency for Statistics, is estimated at 3.8 million.

1.1 GEOGRAPHY

BiH is located on the Balkan Peninsula, bordering with the Republic of Croatia (931 km) in the north, north-west and south, the Republic of Serbia (375 km) and the Republic of Montenegro (249 km) in the east. The surface area of BiH amounts to 51,209.2 km^2, out of which 51,197 $km_2$is the land area and 12.2 km^2 the sea area. In the north, BiH has access to the Sava River, whereas in the south, in Neum, it has access to the Adriatic Sea. According to its geographical position, BiH belongs to the Adriatic and Black Sea Basin.

Figure 2:
Topographic map of BiH

BiH is primarily a mountainous country covered in forests (Figure 2). The average altitude is 500 meters, with the highest peak being the Maglić Mountain (2,387 m). Out of its total surface area, 42% consists of mountains, 24% of hills, 29% of karst areas and 5% of lowlands. BiH owns a high value in water resources in the Balkan Peninsula, as there are many surface and groundwater flows. There are seven main river basins in BiH (the Una, the Vrbas, the Drina, the Bosna, the Sava, the Neretva, the Trebišnjica and the Cetina rivers), out of which 75.5% belong to the Black Sea Basin and 24.5% to the Adriatic Sea Basin. BiH also has an abundance of thermal, mineral and thermal and thermo-mineral springs, out of which only a smaller percentage is used for medical and recreational purposes (Initial National Communication of BiH under the United Nations Framework Convention on Climate Changes, 2009).

1.2 CLIMATE

Though a relatively small country, BiH has a lot of variations of the three main climates thanks to its diversified topography, flora and geographic location. Moderate continental climate with cold winters and hot summers prevails in the north of the country. The average temperature in January varies between +1 and -2 °C, while in July the average temperatures are between 18.7 °C and 22.6°C. The average annual temperature is between 9 °C and 12 °C, even though these values vary from year to year. The annual quantity of rainfall is between 700 mm ineastern parts and 1300 mm inwestern parts of the country.

Central parts of BiH are characterized by the mountain and continental climate, as well as Alpine climate at altitudes higher than 1,700 m (Figure 3). The main characteristics of this climate are strong and cold winters with mild and short summers. The average temperature varies from -3.5 °C to 6.8°C in January and 14.8°C and 16.9°C in July. Valleys of this area are also characterized by thermal inversions with frequent fogs. Regions with this climate have relatively abundant rainfall and snowfall. In the south-west part of the country, the Mediterranean climate (river mouth of the Neretva River) prevails and it is influenced by the mountain climate. Because of the Adriatic Sea, winters in these areas are moderate (the average temperature in January amounts to 4°C), while summers are hot. The average annual temperature varies between 13°C and 16°C. These areas have abundant rainfall during winters, while summers are very dry.

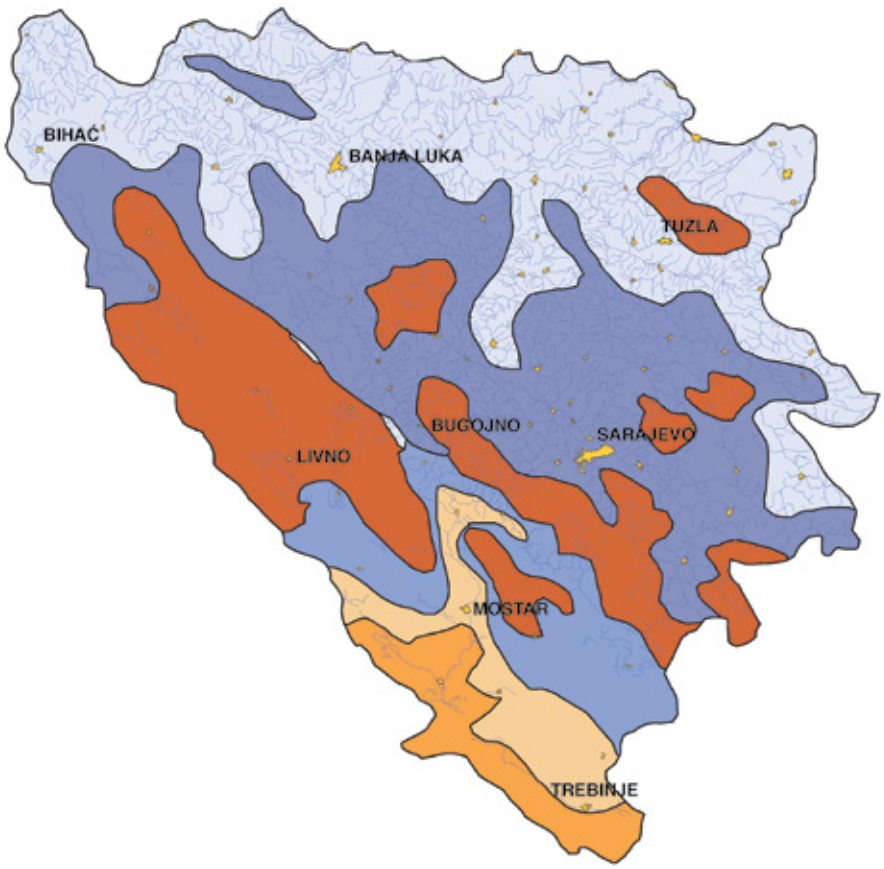


Figure 3: Climate ofBiH (Source: Federal Hydrometeorological Institute of BiH)

1.3 HISTORICAL AND POLITICAL BACKGROUND

The political and legal evolution of BiH can be traced, without interruptions, toover a thousand years back, from the early European and medieval South Slavic period until the present day. The main characteristics of this continuity are seen in the duration and permanence of the territory and the name of Bosnia and Herzegovina, as well as its administrative and political unity.

For centuries, different social and political systems have succeeded one another in BiH, starting from the feudal state, through the Ottoman, Austro-Hungarian and Yugoslavian administrations, all the way to the Socialist Republic of BiH. All these systems, and each in their own way, established their own administrative and political structures, but BiH maintained and kept its territorial integrity in every one of them.

The Constitution of BiHis an Annex to the General Framework Agreement for Peace in BiH (Dayton Peace Accords) which was initialed on 21st November 1995 in Dayton and signed on 14th December 1995 in Paris. This is a unique case, because the Constitution was never published in the official languages of the country, but was negotiated and published in a foreign language, i.e., in the English language.

The Constitution confirmed the continuation of the legal existence of BiH as a country, while its internal structure was changed. In accordance with the Constitution, BiH consists of two entities: the Federation of Bosnia and Herzegovina and theRepublika Srpska. The Dayton Peace Accords has not managed to resolve the issue of the inter-entity boundary line in the area around Brčko, hence the parties agreed to have a mandatory arbitration on this issue (Annex 2, Article 5 of the Dayton Peace Accords). On the basis ofan arbitral awardpassed on 5th March 1999, the Brčko District of Bosnia and Herzegovina was formed under exclusive sovereignty of the State.

Figure 4: Administrative organization of BiH according to the Dayton Peace Accords

In the Preamble of the Constitution, the Bosniacs, Croats and Serbs are described as the "constitutive peoples". At the state level, power sharing agreements were introduced, which is why it is not possible to adopt any decision against the will of the representatives of any "constituent people", including the right of veto in case that the vital national interest is violated, entity veto, abicameral system (House of Peoples, consisting of five Bosniacs and the same number of Croats from the FBiH, and five Serbs from the RS), as well as collective Presidency consisting of three members, where the Bosniac and Croat members come from the FBiH, while the Serb member comes from the RS.

BiH has a complex administrative structure. The central government at the level of BiH received limited powers in accordance with the Dayton Peace Accords of 1995, as all governmental functions and authorities that are not expressly assigned to the institutions of BiHin the Constitution, are those of the entities. However, the influence and authority of the state government are limited and restricted to coordination of international cooperation and similar obligations, thus currently the most significant policy-making activities in BiH belong to the entities.

BiH also has complex governance at the local level. The FBiH consists of 10 (ten) cantons and each has its own government and adopts its own laws (which are in accordance with legislation of the FBiH). Municipalities in the FBiH and the RS usually exercise their authorities through various municipal departments. The FBiH is divided into 79 municipalities, the RS into 62 and the City of Brčko is a separate administrative unit – a District.

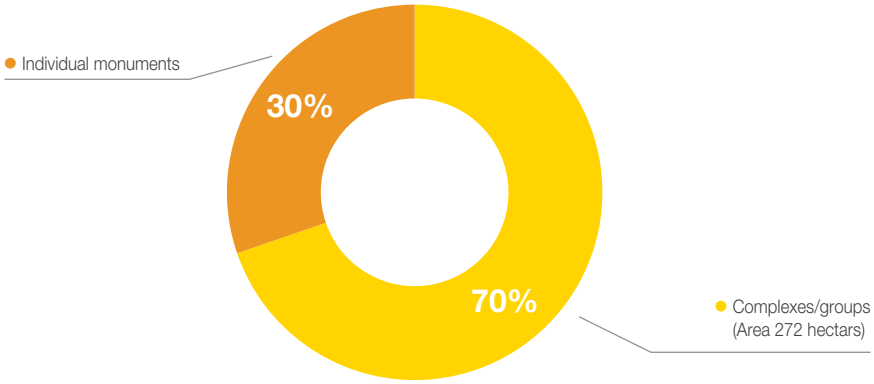
Even though proper functioning of the system is important for the implementation of national and international policies, there is a lack of vertical (Federation / cantons / municipalities) and horizontal (between entities / between ministries / between communities) cooperation amongst the aforementioned institutions.

1.4 CULTURAL HERITAGE

At the crossroads between the East and the West, BiH has always been the meeting place of different cultures, nations and civilizations. Starting from unique medieval standing tombstones – the so-called 'stećci', Roman buildings and mosaics, to Ottoman and Austro-Hungarian architecture, and ancient Catholic and Orthodox ornaments, the cultural heritage of this country is characterized by richness and diversity.

Figure 5: Examples of cultural heritage in BiH

Figure 6: State of architectural heritage before the war (Source: Commission to Preserve National Monuments in BiH, 2010)



BiHhas a rich architectural and archeological heritage, inherited from various empires ever since the Paleolithic period. The historical periods of BiH are: Paleolithic, Mesolithic, Neolithicand Eneolithic periods, the period of Ostrogoths, the Slav migrations, Medieval Bosnia, the rule of the Ottoman Empire, the rule of Austro-Hungary, the Kingdom of the Serbs, Croats and Slovenes, SFR of Yugoslavia and the period of the internationally recognized country of BiH.

Architectural heritage of BiHwas systematically destroyed during the war that took place from 1992 to 1995. Annex 8 of the General Framework Agreement for Peace in Bosnia and Herzegovina marked a new era of continuous protection of the country's heritage.

Table 1:
Classification of building heritage in BiH by chronology and style (Source: Commission to Preserve National Monuments in BiH, 2010)

Historical periods	Total number of monuments
Historical rural ensembles	814
Paleolithic and Mesolithic period	30
Neolithic period	13
Chalcolithic and Eneolithic Age	16
Metal Age –Bronze and Iron Age (forts)	161
Roman Era 284-480 A.D.	18
Early Mediaeval period / Ostrogothic state, 490-535 A.D. (23 basiliks and 5 necropolises)	28
Early Slav period from 7th to 9th century	10
Mediaeval period, from 13th to 15th century (172 forts, 95 necropolises with 58457 stećak necropolises	267
Ottoman period, 1463 – 1878 (60 urban and rural areas, 58 mosques and tekkes, 40 churches and monasteries, 2 synagogues, 44 necropolises and turbes (mausoleums), 14 public buildings, 24 educational buildings, 3 towers, 11 clock towers, 20 bridges, 19 residential properties, 4 public edifices in the eclectic manner)	299
Austro-Hungarian period (27 urban heritage ensembles, 47 individual monuments)	74

Figure 7shows a number of historical monuments either damaged or destroyed since November 1995.

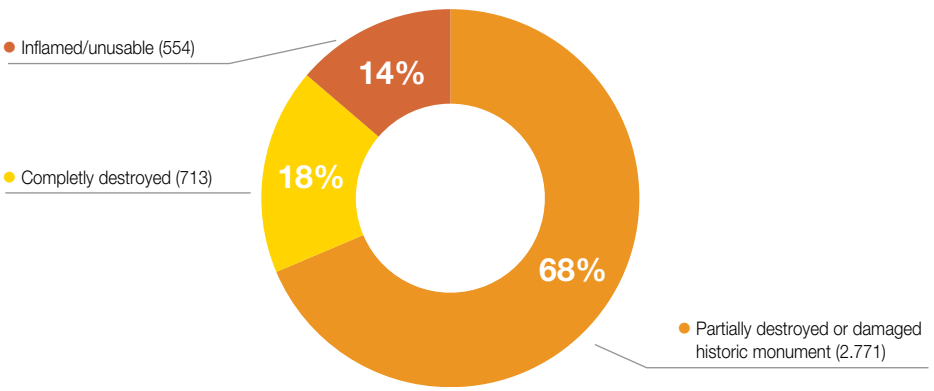


Figure 7:
Number of destroyed historical monuments (Source: Commission to Preserve National Monuments in BiH, 2010.)

In accordance with the authorities awarded to it by Annex 8, the Commission to Preserve National Monuments in BiH (hereinafter: Commission) declared a total of 569 assets as national monuments of BiHtill the end of December 2009.

In addition to a rich architectural and archeological heritage, BiH has a very beautiful and rich selection of traditional and cultural art and crafts which, historically speaking, have developed depending on different natural environments where people in BiH lived. For example, many communities that inhabited mountainous areas and mainly lived on cattle breeding developed unique art and crafts using wool and leather. The beauty of these handmade items lies in the perpetual variation of patterns and colors. Today, traditional patterns are used, but there is also a tendency of coming up with new ones (Heyl and Gregorin, 2003).

Owing to the richness of local mines, craftsmen in BiH have always been renowned for themanufacture of and work with metal items. According to Marian Wenzel, who was one of the most significant scientists for art and handicrafts in BiH, stylish scenes of hunting, horsemen and dancers or symbols of nature that are portrayed on well known medieval monuments – stećci, originate from patterns carved or engraved on vessels made of silver or other noble metals or semi-noble metals that used to be a part of funerary artifacts. BiH is rich in beautiful cultural artifacts made of different fabrics, leather, metal, wood, then pottery, carved stone items, religious art and other items, some of which are shown onFigure 8.

Figure 8: Diversity of traditional arts and crafts of BiH (Source: Heyl and Gregorin, 2003)

2 SOCIO-ECONOMIC DRIVERS AND PRESSURES

2.1 DEMOGRAPHY AND POPULATION TRENDS

2.2 POVERTY AS A DRIVING FORCE OF ENVIRONMENTAL DEGRADATION

2.3 ECONOMIC OVERVIEW AND RECENT TRENDS

2.4 DRIVERS AND PRESSURES BY SECTORS

2.5 WASTE MANAGEMENT

Human activities are the main driver of changes in the environment. By using natural resources and space, as well as by satisfying one's personal, economic and social needs, man affects the environment and the availability of natural resources, causes changesto the state of the environment and specific ecosystems, affecting sometimes directly the safety and health of people. Some economic activities, such as transport, industry, mining and energy are easily recognized as drivers of pressures on the environment. However, even though some branches of industry, such as agriculture, forestry, aquaculture or tourism create pressures on the environment, they depend on that very environment. Waste, as one of the pressures on the environment, occurs as a consequence of all human activities and in all industries, so it may be said that waste is a consequence of human existence. The need to consider influences of specific sectors on the environment is a result of the need to plan and prepare strategic development documents, which are based on sustainable development. Sustainable development presents the basis of economic and environmentally acceptable development, the greatest benefit of which is to the society.

2.1 DEMOGRAPHY AND POPULATION TRENDS

The last population census in BiH was carried out in 1991; hence, there are no accurate data on the population size and demographic statistics. However, there are assessments of statistical offices in BiH that were obtained on the basis of research and demographic calculations.

In the past, data on population and households were collected as a part of the census process every 10 years on the basis of auniform methodology applied in BiH. In the last population census, 4,377,000 persons were enumerated as resident population in places where their families lived, while according toestimates of 2010, the resident population was around 3,843,000, which clearly shows that BiH suffered tremendous changes from 1991 to 2012 (Figure 9).

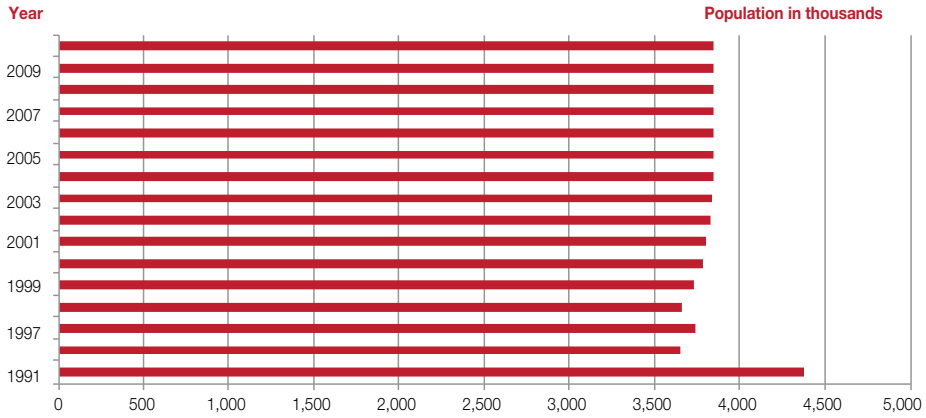


Figure 9:
Population size of BiH according to the 1991 population census and estimates made between 1996 and 2010 [5]
(Source: Agency for Statistics of BiH, Demography 2010, Thematic Bulletin TB, 022011)

BiH, one of the six republics of the former Yugoslavia, became an independent state in 1992 and soon thereafter a war, which lasted until 1995 and caused mass destruction and loss of lives, broke out. The war had significant consequences for the country and caused changes in the population structure. In addition to physical destruction and loss of lives, it has also lead to significant social unrest and decline in living standard.

The period between 1992 and 1995 is characterized by war migrations. In addition to those who left during the war, it is estimated that approximately another 110,000 citizens of BiHemigrated after the war, out of which around 43,000 have permanently changed their citizenship.

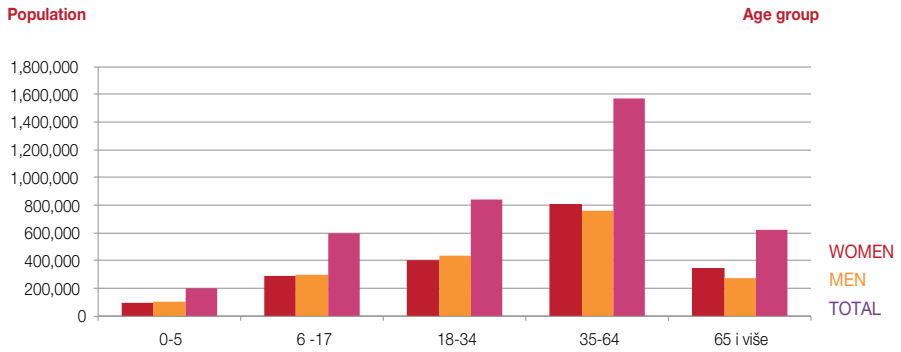
The lack of reliable and comprehensive demographic data presents one of the challenges, not only for the envisaged development of the country, but also for any calculations per capita, which is why most environmental data are just estimates.

The House of People of the Parliamentary Assembly of BiH adopted the Law on Census of

5 Agency for Statistics of BiH does not have data for the war period

Population, Households and Housing in BiH for 2013. The census of population should be conducted from 1st to 15th April 2013, according to the state on 31st March of that year, which is considered the reference date of the census. The aim of the census is to establish the total population of the whole country and at all territorial levels: settlements, municipalities, cities and cantons. In addition to the population size and its spatial distribution, a census provides data on the demographic, ethnic, educational, economic, migratory and other characteristics of citizens, the number of households, families and their characteristics as well as data on the housing stock and its characteristics.

Figure 10: Population in BiH according to age groups for 2009 (Source: Agency for Statistics of BiH, BiH in Figures 2011)

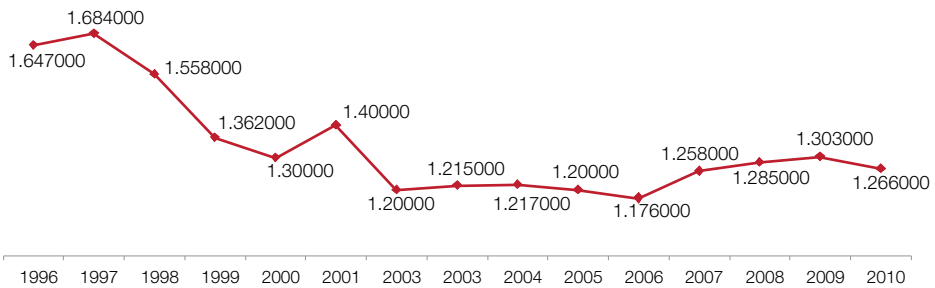


BiH has a high percentage of ageing population with a low fertility rate, which might have serious consequences for the future of economic sustainability. The average population age in BiH is 38.3 years. On average, men are younger than women (37.2 years). The difference between sexes increases when median age is taken into account: 50% of men are younger than 37 years compared to 40 years for women. The largest population in BiH is in the age group between 35 and 64 (39.5%). The younger population (17 years) accounts for21.6% of the total population. Older adults (persons who are 65 or older) account for 15.1% of the total population, and out of 100 elderly people, 57 are women. The percentage of women older than 65 is 16.8%, while the same percentage for men amounts to 13.3%.

The dependency ration, i.e. the percentage of the inactive (persons younger than 15 and older than 65) and active population (between 15 and 64) is 48.3% in BiH, meaning that there are 48 inactive persons per 100 active ones.

BiH has a low rate of fertility. For every 100 women between the ages of 15 and 49, there are about 18 children younger than 5.

Figure 11: Total fertility rate in BiH (Source: Agency for statistics of BiH, Demography 2010, Thematic Bulletin, TB 02,2011)



Life expectancy at birth is 74 years (72.1 for men and 77.3 for women). Child mortality (0-5) is 15% per 1000 live births. The working age population consists of all persons age 15 or older. According to official estimates for 2010, 2,597,000 persons of the total population (3,843,126) fall under the category of working age population, while 1,158,000 personsfall under the labor force category. Out of the total number of labor force, only 843,000 persons are employed.

According to the standards of the International Labor Organization – ILO, the working age population consists of all persons age 15 and older and it is divided into two categories: labor force (economically active) and population that is economically (in terms of labor) inactive. Labor

force or active population consists of employed and unemployed persons. Inactive working-age population consists of all persons, age 15 and older, who are neither employed nor are taking stepsto find employment. According to the aforementioned ILO standard classification, the unemployment rate of working- age population was 27.2% in 2010, while 41% of the population was inactive. In total, 1,439,000 inactive working-age persons are registered in BiH.

Another demographic issue that affects the environment is unbalanced development of urban and rural areas. In BiH, as a country in transition, the population is abandoning less developed parts of the country and is moving to urban areas. Bigger urban centers (Sarajevo, Tuzla, Banja Luka, etc.), which are also the most developed areas, are dominant in terms of population size. Having in mind the global urbanization process present in BiH, spatial plans of BiH foresee further increase in the urbanization rate, though, there is no information that would be a ground for forecasts of detailed urban and rural structures in BiH.

2.2 POVERTY AS A DRIVING FORCE OF ENVIRONMENTAL DEGRADATION

Poverty is reflected in different manners, which includea lack of income and funds necessary to ensure sustainable existence; hunger and undernourishment, poor health, unavailability or limited availability of education and other basic services; increased death incidence, including death from illnesses, homelessness and inadequate housing conditions; insecure environment, social discrimination and isolation. A significant characteristic of denial of human rights is also non-participation in decision-making and in the civil, social and cultural life of the community. The multidimensionality of poverty is reflected in a state marked by a long-term or permanent deprivation of resources, abilities, possibility of choices, safety and power that are necessary for an appropriate living standard and realization of other civil, economic, political, cultural and social rights (Bejaković, 2005.)

Poverty is usually divided into income-related – without the possibility tosatisfy basic necessities of live, and income - unrelated – which encompasses other characteristics significant to living, most frequently related to the level of education, health, etc. Consideration of income-unrelated poverty incorporates health condition, indicators of the diet and literacy of the population. Still, in general, more attention is paid to absolute and relative income-related poverty. The World Bank defines that a person is poor if his/her income is insufficient to satisfy the level of primary necessities. The level of those necessities changes over time and across different societies, in accordance with the level of development, social norms and values.

According to the EUROSTAT methodology, poverty is defined in a relative sense and it is based on the calculation of the so-called relative poverty line. It is defined as an amount of 60% of median expenditure per household member, with the size of the family being adjusted according to the OECD - Organization for Economic Cooperation and Development scale, while according to the methods of the World Bank, poverty is defined as absolute poverty and it is calculated based on the absolute poverty line. Within this methodology, two lines of poverty are differed: food poverty line and general poverty line. In order to determine these lines, the necessary minimal calorie contents of food is determined first, while expenditure costs are calculated accordingly.

The environment affects poverty in three different manners: it ensures sources of sustenance for the poor; it affects their health and influences their vulnerability. On the other side, poverty also affects the environment in different ways: it forces the poor to destroy the environment, it encourages countries to promote economic growth at the expense of the environment, it encourages poor societies to decrease the importance of environmental issues and it also leads to unsuccessful resource allocation for solving such problems. In rural areas, the poor have a stronger influence on and control over natural resources. Access to a clean environment is very important for the poor living in urban areas and it presents a priority. Prioritization of

environmental issues may vary in relation to different social groups, as well as in relation to gender. For example, poor women, whose primary role is to run the household, may consider a safe supply of clean water, sewage and an unlimited service of electricity supply to be key aspects of welfare.

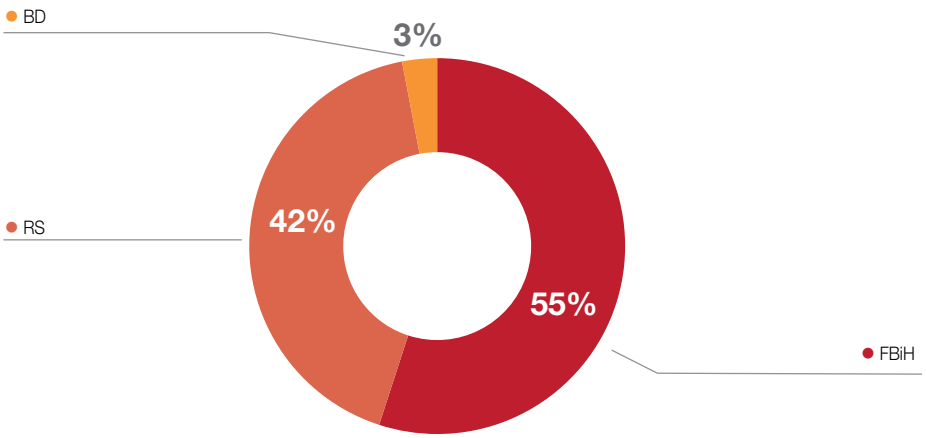
Calculations based on data that were collected during the Living Standards Measurement Study (LSMS) of 2001, 2005 and 2007 show that poverty defined as a lack of expenditures is quite widespread and affects every fifth citizen of BiH.

On average, the total annual expenditure per household in 2007 amounted to KM 18,497.14. The best part was spent on food and housing costs (31.92% and 22.15% respectively). The average net salary per capita in BiH amounts to KM 798.00. The annual income per capita was calculated according to net salary per capita and it amounts to KM 9,576.00. It can be concluded based on these data that the rest of the salary is spent on 'other' costs (clothing, education, housing and utility costs, transport, etc.).

In 2007, 60% of the median monthly expenditure in BiH amounted to KM 385.71. This figure presents a relative poverty line (or standard poverty line) for asingle adult household, which is used for calculating the poverty rate for the entities and for the country as a whole.

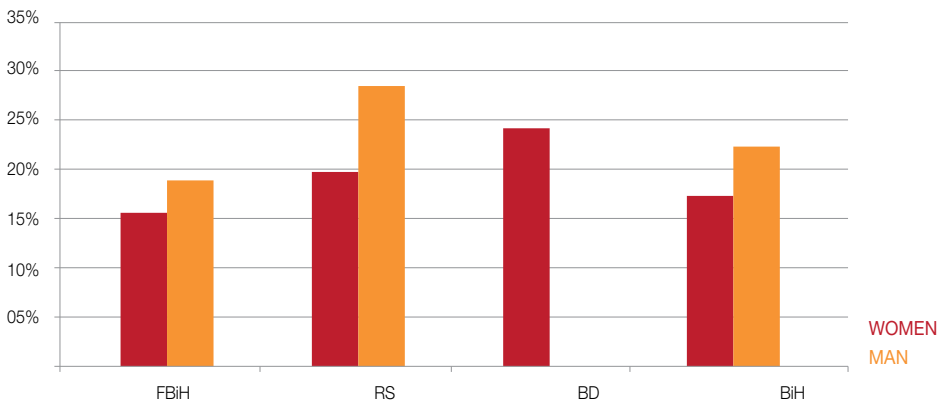
In 2007, 193,692 households (18.4% of the total number of households) or 627,903 citizens in BiH (18.2% of the total population) lived in relative poverty. This data is a result of different living conditions in three geographic areas in the country. Out of 100 poor households, 55.4% live in the FBiH where almost every sixth household lives in poverty, while in the RS almost every fifth child is poor, while in the BD almost every forth household is poor (Agency for Statistics of BiH, Household Expenditure Survey, 2007).

Figure 12: Poor households in BiH per geographic areas in 2007 (Source: Agency for Statistics of BiH, Household Expenditure Survey in BiH – Poverty and Living Conditions, 2007)



The gender of the household head has a certain influence on relative poverty. At the level of BiH, the rate of household poverty with a female head is 22.4% as opposed to 17.3% with male heads of households. The difference is most pronounced in the RS, where these rates amount to 28.6% and 19.8% respectively, while in other geographic areas, these differences are lesspronounced.

Figure 13: Extent of poverty in BiH per genderhousehold head in 2007 (Source: Agency for Statistics of BiH, Household Expenditure Survey of BiH 2007)



The rate of poverty according to the general poverty line is around 21%. Poverty is more widespread in rural areas (17.8%) than in urban areas (8.7%) (Agency for Statistics of BiH, Household Expenditure Survey, 2007).

In BiH, despite the post-conflict situationand a low officialGDP measurement, there are no cases of extreme poverty. Cases of poverty without a recorded income were not registered to an extreme extent.

At the same time, an analysis on the basis of LSMS data has shown significant deprivation in aspects of poverty not related to income:

- 27% of adults in BiH can be considered as “educationally poor”;
- 16% of the population is affected by health poverty;
- Housing conditions of 11% of population are below the poverty standard;
- 29% of the population can be characterized as “deprived of rights”, since they live in households without a defined right of ownership of the accommodation they live in. Deprivation of other human rights regarding physical protection from violence and crime is also a significant problem.

As different dimensions of poverty affect different people, 72% of all adults in BiH are poor from at least one of the key aspects of welfare, i.e. in terms of material expenditure, education, health, housing, employment and right to ownership.

The link between poverty and a poor economic state and degradation of the environment in BiH is primarily reflected in an inadequate discharge and treatment of waste waters, inadequate waste management (inadequate disposal of municipal waste and waste from industrial plants), influences of old abandoned industrial waste disposal sites from earlier periods that have not been remediated, pollution of air by emissions from traffic and industrial plants with old technological processes, deforestation caused by commercial exploitation and cutting firewood, etc.

2.3 ECONOMIC OVERVIEW AND RECENT TRENDS

For the past twenty years, the economy in BiH has been marked by the post-war period and the period of transition from socialism to market economy. The economy of BiHis based on natural resources and, as such, it has often been environmentally unsustainable. Pollution of water, air and land, cutting of forests and unsustainable mining are the results of such an economy and use of unclean technologies. The main challenges which BiH faces and which inevitably affect sustainable production and consumption, are: a high level of unemployment, underdeveloped private sector, unstable institutions and non-existence of institutions, underdeveloped infrastructure – particularly transport infrastructure, insufficient investment into research and development, an educational system not adjusted to market needs, as well as irrational use of energy. Even though progress has been made in some areas, it is necessary to invest additional efforts in the process that leads towards European Union membership.

Over the last few years, developed countries are increasingly turning towards green economy. Green economy is defined as an economy that efficiently uses natural resources and ecosystem services, it is socially inclusive, energy efficient and it significantly decreases environmental risks. The desire behind such a transition is to ensure a fair market competition for green products by gradually canceling adverse subsidies, reforming policies and incentives, strengthening market infrastructure, introducing new market mechanisms, reallocating public investments and “greening” public procurements (UN Environmental Protection Program, 2010). The European Environment Agency (EEA) prepared a summary of environmental assessment in

BiH; however, there is still no transition to green economy in BiH.

Recovery from negative economic trends was recorded in 2010 in the sense of an increase in industrial production, export growth, somewhat increased profit from retail, stabilization of the levels of foreign current reserves.

However, recovery is still slow and changes in the labor market have not been achieved. The external imbalance was much lower in 2010 than in previous years, mainly because of a favorable balance of external trade, though the influx of money was much lower (excluding financial aid). With the help of the current stand-by arrangement, control over state finances was much better, thus it could have been expected that the fiscal deficit would be lower than in 2009, while, on the other side, a serious fiscal consolidation is to be conducted in the coming period. The nominal gross domestic product (GDP) per capita amounted to KM 24,004,000in 2009 at current prices, which is by 3% lower than in 2008. In 2010, the nominal GDP per capita amounted to KM 24,486,000 (Agency for Statistics of BiH, BiH in Numbers 2011).

Figure 14: GDP for BiH for the period of 2005 – 2010 at current prices, expressed in KM 1,000 (Source: Agency for Statistics of BiH, BiH in Figures 2011)

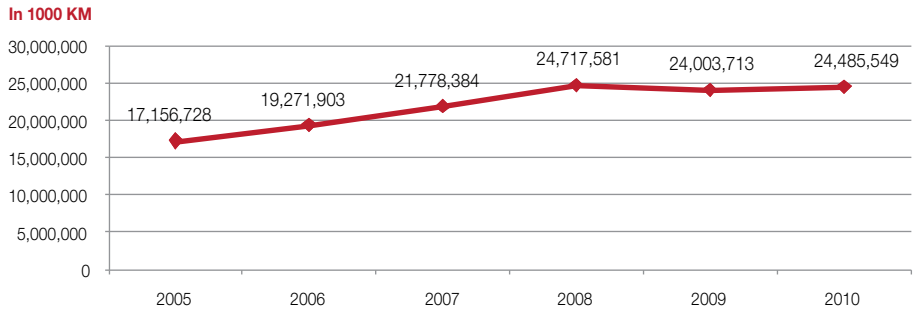
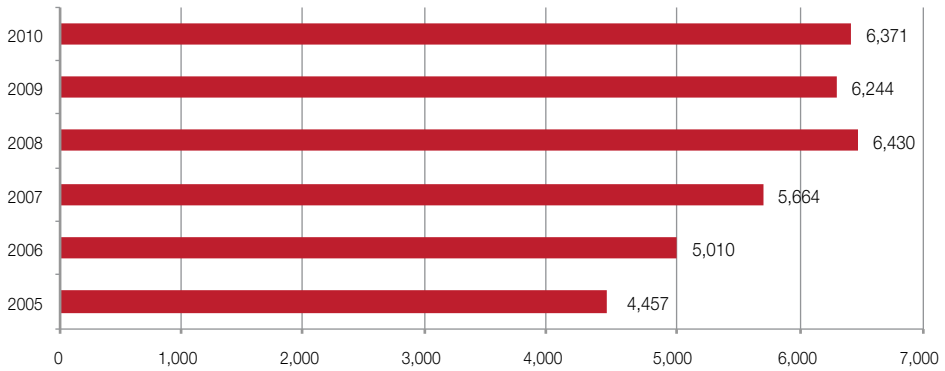


Figure 15: GDP per capita in BiH for the period of 2005-2010, in KM (Source: Agency for Statistics of BiH, BiH in Figures 2011)



According to the production method, gross domestic product is the final result of continuous activities that are performed by resident production units. According to current prices, GDP is a sum of gross added value of all resident units at basic prices plus net taxes on products and services.

Table 2: Added value to basic prices per branch, 2005-2010, in % (Source: Agency for Statistics of BiH, BiH in Figures 2011)

Industry Branch	2005	2006	2007	2008	2009	2010
Agriculture, hunting, forestry, fishery (A+B)	10,12	10,26	9,75	8,90	8,59	8,36
Industrial activities in the strict sense (C+D+E)	20,41	20,12	20,40	20,98	20,16	20,89
Construction (F)	5,23	5,26	5,92	6,44	6,16	5,20
Services (from G to O)	64,24	64,35	63,92	63,68	65,09	65,55
Added value	100,00	100,00	100,00	100,00	100,00	100,00

The composition of the Consumer Price Index showed that prices in December 2010, at the annual level, were determined by an increase in prices of goods and services. Namely, the price of goods increased by 3.5%, while prices of services increased by 2.6%. On a monthly level, prices in BiHwere by around 0.8% higher in December 2010 than in the previous month of that year and by 3.1% higher when compared to December 2009. The average annual inflation amounted to 2.1% in BiHin 2010. The increase in prices amounted to 2.0% in the fourth quarter compared to the third quarter of 2010.

COICOP DIVISIONS	Ø2010/ Ø2005	Ø2010/ Ø2009
Total	117,7	102,1
Food and non-alcoholic beverages	122,8	99,3
Alcoholic beverages and tobacco products	133,9	120,2
Clothing and shoe ware	86,3	95,4
Housing, water, electricity, gas and other fuels	134,6	103,1
Furniture, household goods and regular maintenance	104,7	100,1
Health care	113,5	101,8
Transport	113,1	107,1
Communications	131,6	106,9
Recreation and culture	115,0	100,7
Education	111,6	102,6
Restaurants and hotels	121,3	101,1
Other goods and services	108,0	100,7

Table 3:
Consumer Price Index according to COICOP divisions in BiH (Source: Agency for Statistics in BiH, Consumer Price Index, Thematic Bulletin, TB 09, 2010)

The Consumer Price Index in BiH is calculated on the basis of the main list of products (620 products in 2010). Every month, 21,000 prices are collected at pre-determined centers for collection of samples at 12 geographic locations (5 cities in the FBiH, 6 cities in the RS and in the Brčko District). The average level of prices in BiH for 2010 was higher by 2.1% compared to the average in 2009, which was a result of an increase in average prices of alcoholic beverages and tobacco products (20.2%), transport (7.1%), communications (6.9%), housing, water, electricity, gas and other fuels (3.1%), education (2.6%) and hotel and restaurant services (1.1%).

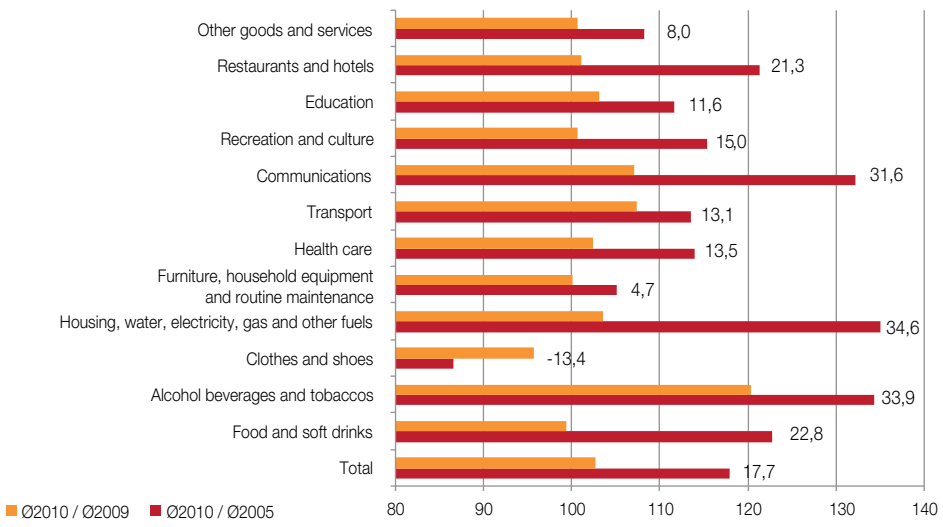


Figure 16:
Consumer Price Index of BiH according to the COICOP divisions in 2010 (Source: Agency for Statistics of BiH, Bosna i Herzegovina in Figures 2011)

According to administrative data, distribution of employees by sector showed that the production industry employed 19.3% employees in December 2010, while the wholesale and retail sectors, the motor vehicles and motorcycles repair sector and sector of personal and household products employed 18.4%. The total share of the production industry in the number of employed persons remained unchanged compared to the state in September 2010, while the share of the trade sector increased by 24 baseline points. The public administration and defense sectors followas well as the mandatory social insurance sectorwith 10.5% and then the education sectorwith 8.7% of the total number of employed persons. These sectors employ 57% of employed persons in BiH. Other sectors employ 0.1% (fisheries) to 7.2% (transport, warehousing and communications).

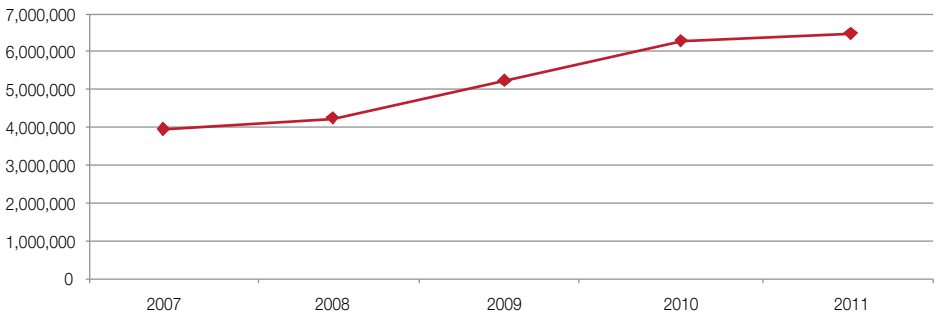
During the first six months of 2011, the net direct foreign investments in BiH amounted to KM 181 million. According to activities in 2011, the following branches of economyrecorded the largestinflow of direct foreign investments: wholesale (KM 70 million), real estates (KM 50 million), financial mediation, excluding insurance and pension funds (KM 37 million), and production of food and drinks (KM 12 million). A considerable outflow of direct foreign investments was recorded in the production of base metals (KM 67 million), while a smaller outflow was recorded in the production of motor vehicles (KM 7 million) and chemical products (KM 2 million). When it comes to direct foreign investments of investors in 2011, Russia invested most direct foreign investments in the value of KM 77 million, while Switzerland recorded the largest outflow in the amount of KM 40 million.

External debt is the sum of all debts of BiH and legal entities to foreign creditors. Theexternal debt is often related to moneyborrowed from international organizations, such as: the International Monetary Fund and the World Bank. Countries decide to get into external debt to obtain fresh capital for new investments or to repay a previous debt with interest payments or toreduce a budget deficit. However, this becomes a problem, when money is spent inefficiently andfor purposes other than specified.

At the end of the third quarter of 2011, the total balance of the external debt amounted to KM 6.49 billion, which is by KM 199.4 million or 3.2% more than at the end of 2010. Out of the total external debt, the debt to the World Bank – IDA amounted to KM 1.75 billion or 26.9%, which is the largest share of the external debt. In addition to this, the debt to the Paris Club (debt incurred prior to 1992) amounts to KM 825.1 million or 12.7% and the debt to the International Monetary Fund amounts to KM 765.0 or 11.8%.

The total balance of the external debt does not include an amount of KM 1.85 billion related to committed but undisbursed funds of which the largest part, 30.3%, relates to the European Bank for Reconstruction and Development and 26.6% to the European Investment Bank. Funds also to be excluded from the total balance of external debt pertain to the guarantee of the state of BiH for a loan to public companies in an amount of KM 11.3 million. In 2011, KM 367.8 million were allocated for external debt servicing, of which KM 256.6, that is, 69.8% were intended for the principal and KM 111.3 million or 30.2% for interest payments. In the first nine months of 2011, the external debt was serviced with KM 211.1 million, of which the principal amounted to 68% and the interest to 32%.

Figure 17: External debt of the government sector – expressed in KM 1000 (Source: Central Bank of BiH, 2011)



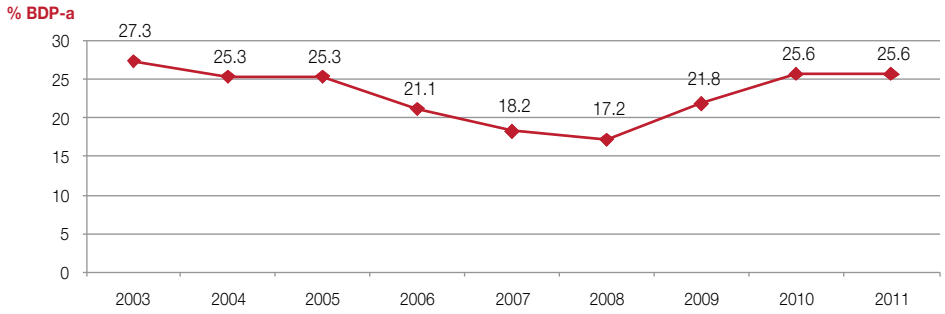


Figure 18:
External debt of the government sector as a percentage of GDP (Source: Central Bank of BiH, 2011)

According to the Ministry of Finance and Treasury, BiH is considered a country with moderate external indebtedness.

2.4 DRIVERS AND PRESSURES BY SECTORS

2.4.1 AGRICULTURE

Agriculture may both have a positive and negative impacton the environment. Sustainable agriculture helps in soil conservation, protection from floods and absorption of carbon-dioxide from the atmosphere. Unsustainable agriculture leads to soil degradation, loss of biodiversity and contamination of air and water. Agriculture is one of the largest water consumers. Penetrations of nutrients, pesticides and cattle waste, as well as soil runoff, all lead to pollution of groundwaters. Contamination by nitrates from agriculture is among the most serious problems affecting groundwater, which the member countries of the Organization for Economic Cooperation and Development (OECD) are faced with (Organization for Economic Cooperation and Development, 2001).

Soil degradation (soil erosion by water, compaction, soil salinization, acidification and loss of organic substances) caused by unsustainable agriculture (monocultures, excessive grazing, rare or short rotations, deep soil cultivation) is additionally accelerated by climate and technology (suppression of soil using heavy machinery). Soil compaction also leads to loss of land fertility, as it limits water flow and leads to retention of water and nutrients. The loss of natural habitats, monocultures and use of chemicals cause a decrease in biodiversity. Crops and cattle release ammonia that pollutes the air (UN Environment Program / GRID Arendal, 2002).

Although agriculture is one of the most significant branches of economy inBiH, this sector has been recovering very slowly in the post-conflict period.

2.4.1.1 Percentage of land area under agricultural land

BiH covers an area of 5,112,879 hectares, of which 2,607,579 hectares are the territory of the FBiH and 2,505,300 hectares of the RS. Around 52% (2,600,000) of the total land area is suitable for agricultural activities, while the rest is covered with forests (Table 4). Out of the total agricultural land, 40% is at 500 m.a.s.l, 35% is at altitudes between 500 and 1000 m.a.s.l., while 25% is located at altitudes higher than 1,000 m.a.s.l. Out of the total agricultural land in BiH, 68% is arable land and 32% are meadows. Fertile lowlands constitute 16% of the total agricultural land of BiH, 62% constitute less fertile hilly and mountain areas, while the Mediterranean area accounts for 22% (MOFTER[6] BiH, 2002).

6 Ministry of Foreign Trade and Economic Relations

Table 4: Land use in BiH (Source: The First National Report on the Implementation of the UN Convention to Combat Desertification /Land Degradation (UNCCD) in BiH, 2007)

Type of land surface	BIH	FBiH (ha)	RS(ha)	FBiH (%)	RS (%)
Total surface	5,112,879	2,607,579	2,505,300	51.0	49,0
Agricultural land	2,557,415	1,258,796	1,298,619	49.2	50,8
Agricultural cultures	1,077,908	461,360	616,548	42.8	57,2
Orchards	95,753	41,395	54,358	43.2	56,8
Vineyards	6,000	5,307	693	88.5	11,5
Meadows	485.213	248.291	236.922	51.2	48,8
Pastures	861,177	502,442	358,734	58.3	41,7

2.4.1.2 Agriculture and animal production

Percentage of crops

Agricultural production in BiH is not intensive and it is characterized byquite a low productivity. Despite favorable conditions for development of agricultural production, data available to the Agency for Statistics of BiH show that every year 45% of arable land is not utilized.

According to the Statistical Report of the Agency for Statistics of BiH for 2010, cultivated land by type of cultivation amounted to 1,007,000 ha, of which sown landaccounted for 512,000 ha, fallow land and uncultivated land for 492,000 ha, nurseries and other arable land for 3,000 ha.

Figure 19: Cultivated land by type of cultivationin BiH (Source: BiH MOFTER, Report in the area of agriculture for BiH 2007; FOCUS, National Report per states on organic production on the basis of reference books and collected data, 2010)

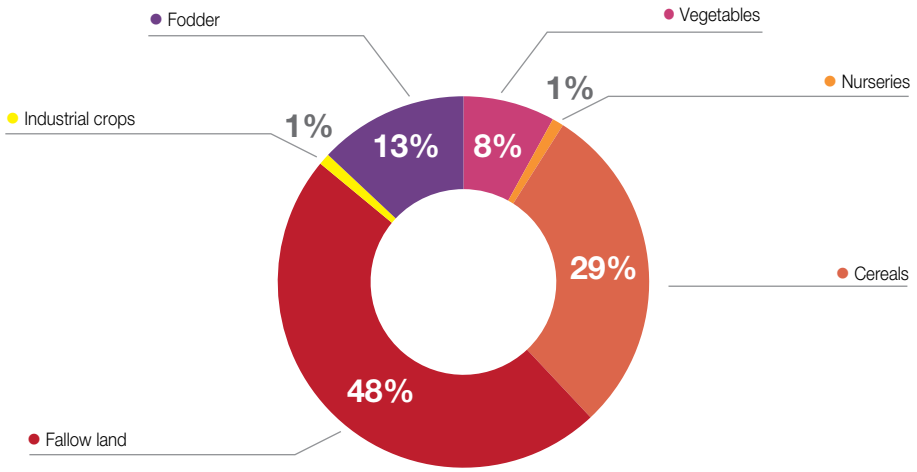


Figure 19clearly shows that the largest percentage of crops includes cereals, followed by fodder, then vegetables and finally industrial crops. Also, the percentage share of nurseriesis very small, butthey could be a basis for greater investments into this area.

Areas under cereal cultivation in 2010 amounted to 293,000 ha, fodder covered 133,107 ha, vegetables 71,642 ha and industrial crops 7,000 ha. These results clearly show that the largest percentage of land is still not used – fallow land and uncultivated and abandoned land (around 48% of the total arable land).

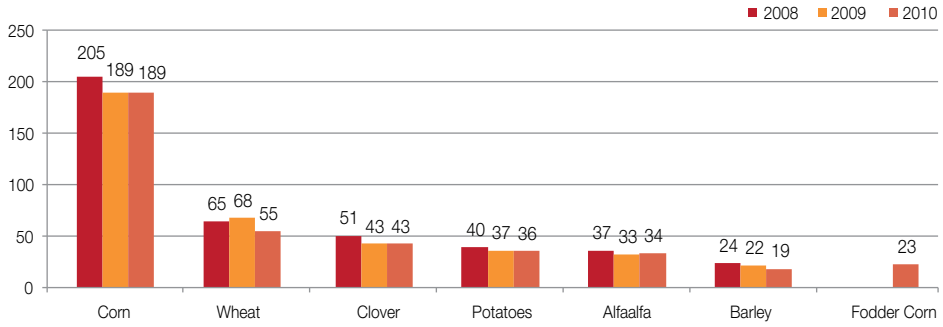


Figure 20:
Harvested surface for the period of 2008-2010, expressed in 1000 ha (Source: Agency for Statistics of BiH, BiH in Numbers, 2009, 2010, 2011)

Import of cereals, small plots ofsown land, a small number of farms and poor production technology are reasons as to why present production is much lower than pre-war production. As Figure 20 shows, the production of corn, wheat, potatoes and barleyexperienced a slightly declining trend from 2008 to 2010.

A significant decrease incultivated land as well as increased import of cereals, maize, vegetables, industrial crops and fodder, a lack of production plants and technologies and the fact that a large number of people is abandoning rural areas are some indicators of the present decrease in agricultural production in BiH, compared to the pre-war period (1990). After the war, the structure of land use changed leaving more areas unused. Further, large areas have been destroyed, arable land has been abandoned, mine fields are still present and fires have destroyed thousands of hectares of agricultural land and forests over recent years (UNECE[7] , 2004.).

Organic production

Organic agricultural land in BiH covers 262 ha (2009). According to the latest data, organic production land increased by 17% in 2009. Despite the sudden increase, the organic sector is still very small and it covers only 0.02% of arable land. The average size of organic farms in BiH is small; there is only 1.2 ha of cultivated land per farm. In the period of 2003 – 2007, the field of organic production recorded a sudden growth (MOFTER BiH, 2010).

Development of organic agriculture in BiH began in 2000. The organic market in BiH has an annual growth between 10% and 20%. The share of organic products in the EU market in 2007 amounted to 5%, which is close to Euro 1.5 million. Wild aromatic medicinal plants have a share of 80% in export. A wide spectrum of products is grown on such lots: buckwheat, maize, wheat, barley, rye, oat, potatoes, carrots, lettuce, onions, beetroots, peppers, cucumbers, strawberries, raspberries, sweat cherries, grapes, figs and apricots. There arearound 600 producers of organic food. In BiH there are 14 farms registered as organic food producers, i.e. producers of milk and meat products (BiH MOFTER, 2007).

Types of livestock and poultry

Animal breeding can have a negative impact on the environment because of nutrient runoff from animal wastedisposal areas or because of some other improper use of animal waste (point and non-point sources of pollution). The share of livestock in the total agricultural production is estimated at 50%. The total number of livestock in BiH is mainly much lower than earlier and it could be brought to the pre-war level if preconditions for livestock production are put in focus. Only porkand poultry production has increased. Before the war, there were 873,605 head of cattle in BiH owned by the government and these were kept on state farms. Table 5 shows the total livestock population in BiH in 2010 and 2011.

7 United Nations Economic Commission for Europe

Table 5: Total livestock population (domestic animals) in BiH 1990, 2010 and 2011 (Source: Agency for Statistics of BiH, Release, Agriculture, Totallivestock and poultry population and animal production in 2010 and 2011)

Livetsock and poultry	Numbers (1990)	Numbers (2010)	Numbers (2011)
Swine	499,460	590,431	577,000
Cattle	873,605	462,368	455,000
Sheep	1,319,000	1,046,035	1,021,000
Rabbits	21,654	18,941	
Horses	99,803	19,261	19,000
Beehives	74,901	366,571	382,000
Poultry	8,544,000	21,802.235	18,703,000

Figure 21(left): Total livestock population (domestic animals)

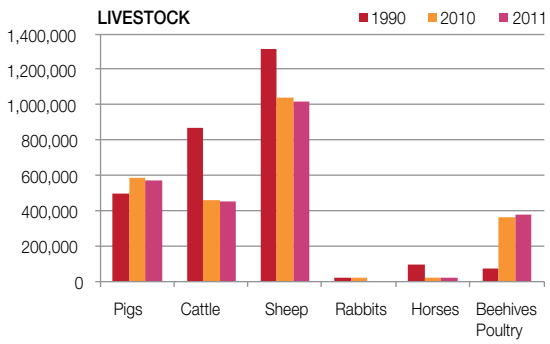
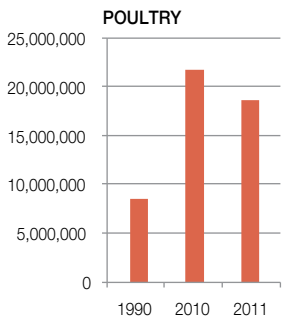


Figure 22(right): Total poultry population in BiH (Source: Agency for Statistics of BiH, Release, Agriculture, Totallivestock and poultry population and animal production in 2010 and 2011 , BiH MOFTER)



The number of head of cattle is constantly on the decline. In 2010, the number of head of cattle decreased by 411,237 compared to 1990 and by 418,605 head of cattlein 2011. This occurred because of a major decrease inpopulation in rural and mountainous areas during and after the war. The decrease directly affected the production of milk and meat. In order to stop this negative trend, it is necessary to offer better subsidies and improve support measures to dairy farmers

The number of horses has drastically declined when compared to 1990, which was caused by the fact that horses were not used any longer as a means of transport or for agricultural needs, as was the case before the war. Due to population growth and a higher consumption of meat and because the price of white meat is lower than the price of red meat, a significant increase in production of poultry was recorded in 2010 compared to 1990.

Because of a decrease inlivestock production, which directly causes lower production of organic waste and fertilizers, environmental risks are currently not sohigh in BiH. Production iscurrently not an issue, asthe average number of animals per farm (or area) is very low. However, if this sector continues to develop and if the number of animals increases, it could become a longer-term threat that should be regulated by agricultural and environmental legislation.

2.4.1.3 Greenhouse gas emissions

Greenhouse gasses (GHG) are all atmospheric gases that contribute to the greenhouse effect byabsorbing infrared radiation producing solar heating of the Earth's surface. They include carbondioxide (CO_2), methane (CH_4), nitrous oxide (NO_2) and water vapour.

Table 6 shows greenhouse gas emissions from the agriculture sector. It is evident that in the period 2005-2010 the total GHG emissions were slowly increasing; however, they are still not close to the level of emissions in 1990.

		1990*	2005	2006	2007	2008	2009	2010
Enteric fermentation	CH_4	1.548	1.069	1.098	1.075	1.056	1.062	1.057
Manure management	CH_4	285	140	143	135	131	134	136
	N_2O	397	228	235	234	231	235	236
Agriculture soil	N_2O	2.378	1.578	1.643	2.043	1.876	1.771	1.913
Field burning of agriculture residues	CH_4	0	13	13	11	13	13	11
	N_2O	0	5	5	4	5	5	4
Total GHG emission		**4.608**	**3.033**	**3.137**	**3.502**	**3.312**	**3.220**	**3.357**

Table 6: Greenhouse gas emissions from the agriculture sector (Source: Agency for Statistics of BiH, Environment, Energy, Transport 2011, TB13)

** Source: Initial national communication of BiH under the UNFCCC*

2.4.1.4 Consumption of water for irrigation

Agricultural activities require large amounts of water. In developed countries, irrigated land has been increasing; however, practices of sustainable irrigation are rare. Almosthalf of the waterproduced worldwide is lost through irrigation systems due to damaged pipes and inefficient irrigation systems (OECD[8], 2001).

Lack of water during the vegetation season is a key limiting factor for the development of agriculture, particularly in the southern parts of BiH, in the region gravitating toward the Adriatic Sea. Considering climate change, this area will be most severely impacted by droughts, and it is necessary to start reconstructing the irrigation system and water reservoirs. Only 4,630 ha in this area are irrigated and the potential area that could be irrigated expands to 74,000 hectares (REC[9] , 2000).

In BiH, 11,660 ha were irrigated in 1990. Today, only some areas have functionalirrigation systems. Irrigation systems were partly destroyed through warfare and poor maintenance in the post-war period. It is necessary to ensure significant funds for reconstructing existing systems and building new and modern irrigation systems.

Around 15% of arable land in the world is irrigated and only about 1% in BiH (without an agricultural census, it is only possible to make an estimate of the percentage of irrigated area and use data from some studies and reports). At present some agricultural producers use water from freshwater sources without any water quality and quantity control system. Inadequate irrigation can cause significant environmental damage. A good legislative system needs to be established, which would ensure the implementation of control mechanisms and field inspections (UNECE, 2004).

Current agricultural data indicate that agriculture has not had a major negative impact on the environment as a result of mostly non-intensive production, but this could change quickly with the development of the sector and production-oriented agriculture infuture years. Since there is no established environmentalmonitoring system for agriculture, every analysis of the situation is based on estimates.

In the main productive areas and river valleys, excessive use of mineral fertilizers and pesticides poses a threat. Nitrates from fertilizers are soluble and could easily penetrate into soil and directly pollute aquifers. Surface run-off could contaminate rivers and other freshwaters. Agricultural inputs are not tested to check whether they contain some potentially toxic substances (The First National Report on the Implementation of the UN Convention to Combat Desertification /Land Degradation in BiH, Banja Luka, 2007).

8 Organization for Economic Cooperation and Development

9 Regional Environmental Center

2.4.1.5 Conclusions and recommendations

Agriculture in BiH still presents a very important segment of the economy, providing food for a significant part of the rural and urban population. A significant part of the labor marketin rural areas is related to agriculture and, as such, it plays a very significant role in the lives of people from these areas. In comparison with other sectors, agriculture has been recovering slowly after the end of the war. In general, agriculture in BiH is characterized by small and divided properties, poor technical equipment is used on farms (old pre-war technologies are mainly used), agricultural inputs are rarely used, and considering the aforementioned, it is estimated that current impacts on the environment are not particularly adverse. However, the sum of agricultural and environmental data in the country is very poor. There are no official data on consumption and composition of fertilizers, pesticides, ratio of nitrogen, eco-efficiency and use of energy, or other environmental data related to agriculture, which is why it is difficult to assess the actual impact of agriculture on the environment.

A positive observed trend is the growth of organic production, even though the percentage of landthat is under organic production is still very low when compared to the rest of agricultural land, and that is due to very small farmsizes (0.5 – 1.2 ha). It is important to note that BiH has a good potential for organic agriculture and a transition from conventional to organic production would decrease adverse impacts on the environment while ensuring asustainable food source. Hence, decision-makers should focus on providing better subsidies to organic food producers.

Agricultural data is published sporadically by various institutions, thus they are not always based on actual measurements, but rather on estimates.

Relevant data and indicators unavailable at present:

- Annual average of conversion of landinto agricultural land
- Consumption and composition of fertilizers / pesticides
- Ratio of nitrogen
- Eco-efficiency
- Emissions caused by agricultural activities
- Primary types of energy consumption in agriculture

Establishing of an Agricultural Information and Monitoring System and conducting an Agricultural Census are crucial for obtaining good quality data, based on which further management choices for development can be made properly.

Additional recommendations in the area of agriculture in BiH:

- Strengthening sustainable agricultural production, in particular:
  - Encouraging resource-use efficiency ;
  - Rewarding farmers through subsidies for providing environmental services, which willencourage farmers to engage in environmentally beneficial practices, such as organic farming;
- Empowering poor farmers that contribute most agricultural products;
- Establishment of a new agricultural advisory service to promote Good Agricultural Practice Principles such as: proper use of fertilizers, pesticides and irrigation water as well as disposal of animal waste;
- Strengthening agricultural research institutions for the purpose of monitoring the environmental impacts of agriculture;
- Improvement of existing and adoption of new agriculture and environmental legislation as well as harmonization with relevant EU directives.

2.4.2 ENERGY

The energy sector is one of the key sectors in terms of its potential to impact the environment. The development of the energy sector and an increase in energy consumption result in a growth of greenhouse gas emissions and other pollutants. Developing countries and countries that possess significant energy resources, such as BiH, need to pay particular attention to rational use of energy and selection of future energy sources in order to minimize damage to the environment. Selection of high-efficiency technologies in power plant and fuel type available can significantly affect the level of emissions, as utilization of gas instead of coal may decrease emissions. Therefore, it is a challenge to ensure a long-term development of energy and to minimize unwanted impacts on the environment, thus it is necessary to strive to use renewable energy sources, that is, sources which can reduce the total emission of greenhouse gases.

The main domestic sources of energy in BiH are coal and hydro potential, while natural gas and oil are imported. The assessed hydro-potential is close to 6,800 MW, however, 35% of capacities are used, which is the lowest rate of exploitation in Europe. Coal reserve balances amount to 4.0 billion tons. Consumption of energy and impact of the energy sector on the environment in BiH have been increasing, even though the level of 1990 has not been reached yet. Total primary energy supply – TPES amounted to around 7.8 Mtoe in 1990 (million tons of oil equivalent), while it was 5.1 Mtoe in 2005 (FMEMI[10] , 2009).

The process of transition and warfare havelead to a decrease in the physical growth of the industrial production volume, reduced export of electricity, thus decreasing energy consumption. In 2009, the total primary energy supply (TPES) amounted to 1.49 toe (ton of oil equivalent) per capita. Global TPES per capita amounts to 1.82 tons and in the OECD member countries it is 4.64 toe per capita. Due to poor conditions in industry, consumption of natural gas is significantly lower than in 1990. An unfavorable combination of consumption (a relatively high percentage spent on heating and consumption in households) and consumption dynamics (higher consumption during the winter period) have resulted in high prices of natural gas. In addition to this, only one gas pipeline is used for transporting natural gas and there is only one importeron the market, which additionally jeopardizes the stability of the supply. Additional gas pipelines and an accelerated expansion of the gas distribution network in BiH would enable a wider use of gas in households and generation of electricity and thermal energy. This could result in a reduction of the CO_2 emission growth rate (Initial National Communication of BiH under the UN Framework Convention on Climate Changes, 2009).

Utilization of firewood for heating prevails in BiH, particularly with groups of population that are economically disadvantaged. Most households are connected to the electricity distribution network and the highest percentage of electricity is consumed by households, mainly for heating purposes (hot water, cooking), lighting and appliances (Study of the Energy Sector in BiH, 2008). The main energy indicators in BiH are based on core set indicators of the European Environment Agency, which are:

- CSI 027 Final energy consumption by sector,
- CSI 028 Total energy intensity,
- CSI 029 Primary energy consumption by fuel,
- CSI 030 Renewable primary energy consumption,
- CSI 031 Renewable electricity consumption.

These indicators were developed by the European Environment Agency and they are taken as estimates. In 2008, the Agency for Statistics of BiH started processing statistical data on energy in accordance with the EU regulations.

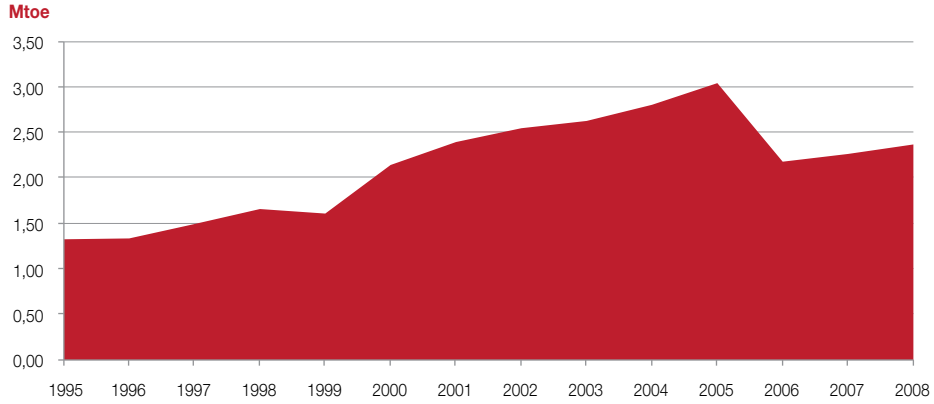
10 Federal Ministry of Energy, Mining and Industry

2.4.2.1 Final energy consumption by sector

Final energy consumption is an algebraic sum of energy consumptionin all sectors: industry, traffic, households, agriculture and other consumers.

After a drastic drop in energy consumption in the early nineties, due to warfare in BiH, in the period from 1995 to 2008, an increase in energy consumption at an annual rate of 3.14% (Figure 23) was recorded. In 2008, final energyconsumption in BiH amounted to 2.37 Mtoe and was increased by 2.20% compared to 2007.

Figure 23: Final energy consumption in BiH (Source: European Environment Agency, Final Consumption of Energy by Sector, 2010.)



In 2008, final energy consumption in BiH amounted to 0.62 toe/capita, while final energy consumption in the Western Balkan countries amounted to 1.10 toe/capita, as follows: Albania 0.56 toe/capita, Croatia 1.64 toe/capita, Macedonia 0.87 toe/capita and Serbia 1.31 toe/capita. In European Union member countries, final energyconsumption, in 2008, was 2.23 toe/capita (European Environment Agency, Final Energy Consumption by Sector, 2010).

Having in mind that the Agency for Statistics of BiH and the European Environment Agency do not possess data on final energyconsumption by sector, data of the Agency for Statistics of BiH on final consumption of electricity and thermal energy by sector will be presented in the document.

Final consumption of electricity by sector

In 2010, final electricity consumption amounted to 10.347 GWh, of which households had a share of 43.9%, industry of 35.7% and other consumers, including construction, traffic and agriculture had 20.4%. In 2010, the largest consumer of electricity in industry was the metal production industry (except iron) with a share of 51%, while the industry of iron and steelkept a share of16%. Between 2008 and 2010, consumption of electricity increased by 1.17% on an annual basis. The highest growth in this period was recorded in the sector of agriculture (13.48%), then traffic (10.29%), construction (8.66%), households (1.52%) and industry (0.37%) (Agency for Statistics of BiH, Environment and Energy, 2010).

Final thermal energy consumption by sector

In 2010, final thermal energyconsumption amounted to 5,396 TJ. Households had the largest share of consumption with 74.6%, followed by the industry and other consumers with 25.4%. In the period between 2008 and 2010, consumption of thermal energy grew at an annual rate of 2.91%. The highest annual growth in this period was recorded in the category of other consumers with 11.41%, while households accounted for 1.97% (Agency for Statistics of BiH, Environment and Energy, 2010).

2.4.2.2 Total energy intensity

Total energy intensity represents the ratio between the total energy consumption (primary energy) and gross domestic product (GDP) that is calculated every calendar year.

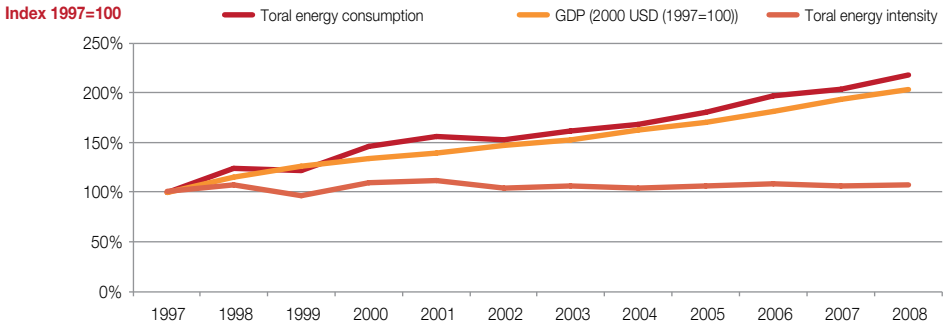


Figure 24: Total energy intensity in BiH for the period of 1997-2008 (Index 1997=100) (Source: European Environment Agency, Total Energy Intensity, 2010)

In the observed period, from 1997 to 2008, the total primary energy consumption grew at an average annual rate of 4.52%, while the GDP grew at an annual rate of 4.24%. However, the total energy intensity in BiH had an annual growth rate of 0.56%, as shown inFigure 24. Economic growth was followed by the growth of total primary energy consumption; hence there was no decoupling between the function of total primary energy consumption and the function of GDP, meaning that a growth in total energy intensity was recorded. Figure 24 shows that the energy intensity between 2002 and 2008 was constant, while the GDP grew linearly in the period from 1997 to 2008, but insufficiently to cause decoupling between GDP and total primary energy consumption, whereby energy intensity would be reduced. A comparison between energy intensity in BiH and other Western Balkan countries shows the following results: total primary energy consumption in Western Balkan countries grew at an average annual rate of 1.02% in the period between 1997 and 2008, while this growth rate in BiH was 4.52%, which is by 4.43 times higher than in other Western Balkan countries (European Environment Agency, Total Energy Intensity 2010).

It should be pointed out that in 1991, energyconsumption per unit of GDP in BiH was 2.5 times higher than in some other countries of the Western Balkans, such as Croatia and Macedonia. One of the causes of such high energy intensity was the export of electricity at low prices to other regional republics (BiH MOFTER, 2002).

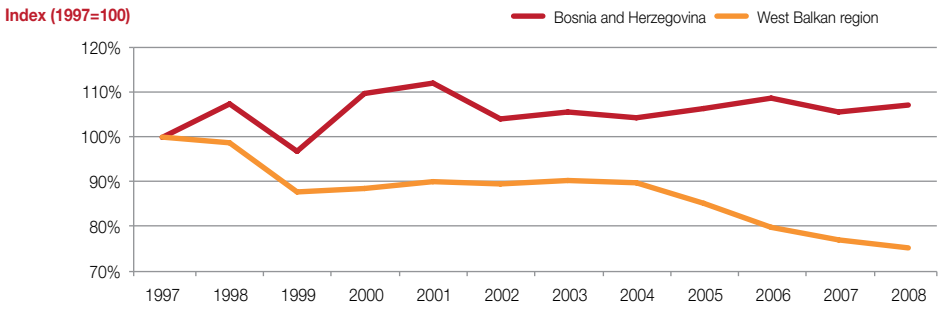


Figure 25: Energy intensity in BiH and Western Balkan countries (1997=100) (Source: European Environment Agency, Total Energy Intensity, 2010)

BiH records a high energy intensity, therefore the first task for sustainable development of the energy sector in BiH should be reducing energy intensity in the entire cycle, starting from primary energy and processing of raw materials to production. This includes the use of thermal energy resulting from waste in industrial plants and in agriculture. Also, a gradual transition to non-conventional energy sources (use of biomass, cogeneration and trigeneration, use of solar energy, better utilization of hydro-potential, e.g. utilization of small-size HPP, etc.) (MOFTER BiH, 2002).

Table 7: Total energy intensity in BiH, 1997-2008 (Index 1997=100) (Source: European Environment Agency, Total Energy Intensity, 2010)

State	/	1997	1998	1999	2000
BiH	Total primary energy supply (ktoe)	2744	3402	3367	4018
	GDP (constant 2000 USD) (mil)	3993	4616	5059	5338
	Energy intensity	0.687	0.737	0.665	0.753
	Total primary energy supply (1997=100)	100%	124%	123%	146%
	GDP (constant 2000 USD (1997=100)	100%	116%	127%	134%
	Energy intensity (1997=100)	100%	107%	97%	110%

Table 8: Comparison of energy intensity of BiH with the Western Balkans countries, 1997-2008, (Index 1997=100) (Source: European Environment Agency, Total energy intensity, 2010)

Country	1997	1998	1999	2000	2001	2002	2003	2004
Albania	100%	99%	120%	76%	72%	78%	77%	71%
BiH	100%	107%	97%	110%	112%	104%	106%	104%
Croatia	100%	101%	101%	95%	94%	92%	94%	90%
Macedonia	100%	99%	90%	85%	85%	84%	84%	82%
Serbia	100%	97%	85%	88%	92%	94%	96%	96%
Western Balkans region	100%	99%	88%	88%	90%	89%	90%	90%

Table 7 shows the trend of total energy intensity in BiH in the period between 1997 and 2008, while Table 8 provides a comparison between the energy intensity in BiH and energy intensity in the Western Balkans countries.

2.4.2.3 Primary energy consumption by fuel

Primary energy consumption by fuel (CSI 029) is the quantity of energynecessary to satisfy energy consumption needs in the country. In the period from 1995 to 2008, the following fuels were used in BiH: oil, gas, coal, electricity and renewable energy, including wood biomass.

The period between 1995 and 2008 is characterized by increasedtotal energy consumption (Table 9). Between 1995 and 2008, primary energy consumption by fuel grewat an average rate of 5.30%. A significant increase in energy consumption (10.84% annually) occurred in the period between 1995 and 2005, which is related to post-war recovery. Between 2001 and 2008, the annual growth rate was 3.66%.

Fuel	1995	1996	1997	1998	1999	2000
Renewable energy sources	469	603	565	562	651	618
Electrical energy	10	-132	-154	-80	-147	-92
Coal	348	506	1581	2014	1964	2318
Gas	123	206	124	141	144	232
Oil	592	610	628	764	756	942
TOTAL	1542	1793	2744	3401	3368	4018

2001	2002	2003	2004	2005	2006	2007	2008
4291	4191	4426	4635	4963	5395	5598	5990
5572	5868	6102	6475	6798	7220	7714	8132
0.770	0.714	0.725	0.716	0.730	0.747	0.726	0.737
156%	153%	161%	169%	181%	197%	204%	218%
140%	147%	153%	162%	170%	181%	193%	204%
112%	104%	106%	104%	106%	109%	106%	107%

2005	2006	2007	2008	Changes in annual average, 1995-2008 (%)	Energy intensity in 2008 (toe/cap)
77%	66%	63%	57%	-5.39	0.66
106%	109%	106%	107%	0.56%	1.56
87%	84%	83%	79%	-1.93%	2.05
80%	81%	80%	78%	-2.00%	1.52
86%	76%	71%	72%	-2.83%	2.19
85%	80%	77%	75%	-2.35%	1.74

Primary energy consumption by fuel increased by 3.27%in 2008 compared to the previous year. In the structure of primary energy consumption in 2008, fossil fuels came first with 92.77% (coal 64.47%, oil 22.42%, gas 5.89%), while renewable sources had a share of 9.59%. Having in mind that BiH exports electricity, the total consumption in 2008 was decreased by 2.31%, that is, by 142 ktoe. In the period from 1995 to 2008, an increase in the export of electricityby 7.60% was recorded. Compared to Western Balkans countries, BiH is the only country in which export of electricity was recorded. The share of coal in total energy consumption in 2008 amounted to 64.47% and it increased by 4.53% compared to 2007, while in the period from 1995 to 2008, the annual growth of coal amounted to 6.50%. In 2008, the share of gas in total energy consumption was 5.89%, thus when compared to 2007, it increased by 2.41%. Between 1995 and 2008, the annual increase in gas consumption was 4.65%. In 2008, the share of oil was 22.41%, which was by 2.53% higher than in 2007. Between 1995 and 2008, consumption of oil increased by 3.99% (European Environment Agency, PrimaryEnergy Consumption by Fuel, 2010).

2001	2002	2003	2004	2005	2006	2007	2008
628	636	648	690	652	688	528	575
-94	-96	-99	-179	-121	-181	-52	-142
2534	2363	2527	2622	2747	3364	3512	3862
242	255	266	311	366	318	336	353
981	1033	1084	1192	1319	1206	1274	1342
4291	**4191**	**4426**	**4636**	**4963**	**5395**	**5598**	**5990**

Table 9:
Primary energy consumption by fuel in BiH (ktoe) in the period of 1995-2008
(Source: European Environment Agency, Primary EnergyConsumption by Fuel, 2010)

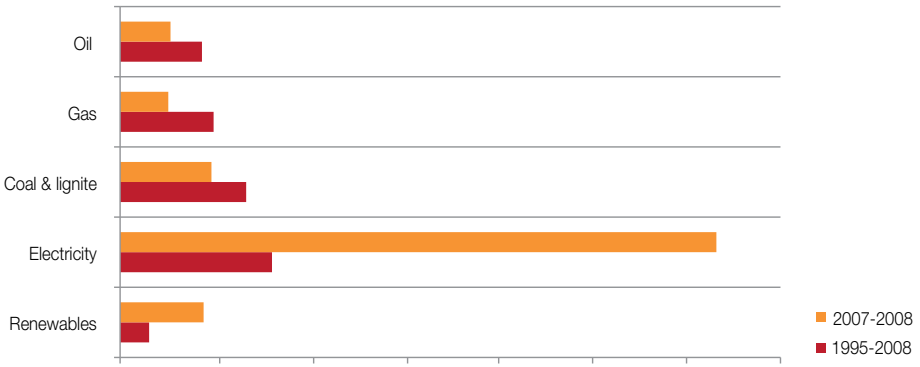


Figure 26: Average annual growth rate for different fuels in BiH (Source: European Environment Agency, Primary EnergyConsumption by Fuel, 2010)

In 2008, the share of renewable energy in consumption was 9.59%, which is by 4.09% higher compared to the previous year. In the period from 1995 to 2008, the annual growth was 1.32%. An increase in energy consumption from renewable energy sources is encouraging, having in mind that this is the key area in which additional efforts must be invested, in order to decrease the consumption of fossil fuels and improve environmental protection.

2.4.2.4 Renewable energy consumption

Renewable energy consumption (CSI 030) is consumption of energy generated using renewable energy sources in relation to total primary energy consumption.

In accordance with the Law on Electricity of FBiH (Official Gazette of FBiH, No. 41/02) and Law on Electricity of RS (Official Gazette of RS, No. 08/08), renewable energy sources are sources of energy that permanently exist in nature and are renewed fully or partly, especially the energy of water flows, wind, biomass, biogas, geothermal and non-accumulated solar energy.

Energy consumption from renewable energy sources in 2008 amounted to 575 ktoe or 9.59% of the total energy consumption and compared to the previous year, in which consumption amounted to 528 ktoe or 9.42% of the total energy consumption, an increase of 4.09% in energy consumption from renewable energy sources was recorded (European Environment Agency, Consumption of Energy from Renewable Energy Sources, 2010). Consumption of renewable energy increased in this period, because of, among other things, better hydrological conditions and reduced consumption of energy from fossil fuels (coal, oil and gas). Reduced exploitation of coal and closure of some coal mines, as well as the high price of oil, contributed to reduced consumption of fossil fuels in 2008.

Energy consumption from renewable energy sources in relation to the total consumption of energy in BiH between 1995 and 2008 is shown in Figure 27, where a drop in consumption of renewable energy is clearly seen as compared to the total energy consumption. Consumption of renewable energy in 1995 amounted to 30.40% of the total energy consumption in BiH (the methodology used does not include firewood), that is, 468.52 ktoe of 1541 ktoe, while this percentage dropped to 9.59% in 2008, that is, 575 ktoe of 5990 ktoe.

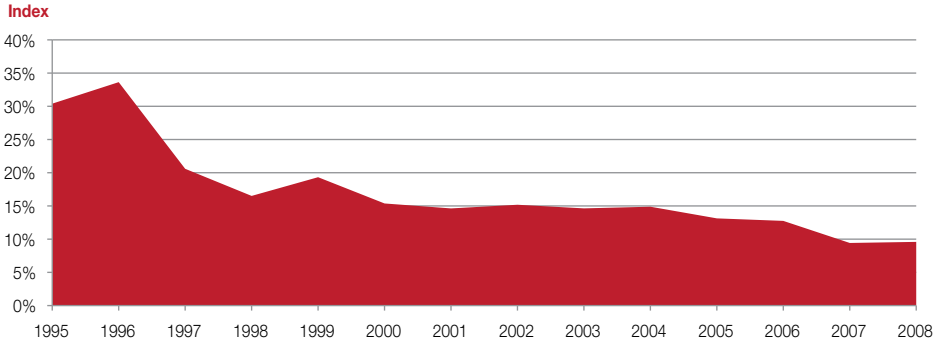


Figure 27: Renewable energy consumption in relation to total energy consumption in BiH, period of1995-2008 (Source: European Environment Agency, Renewable Energy Consumption, 2010)

A decrease in the consumption of renewable energy as compared to the total energy consumption affected the growth of energy consumption from other sources (thermal power plants) that were destroyed or damaged during the war. In the post-war period, significant investments were implemented. Among the most significant ones are the repair and modernization of block 3, 100 MW and block 4, 200 MW TPP in Tuzla and reconstruction and modernization of block 5, 110 MW TPP Kakanj.

If consumption of energy from renewable energy sources in BiH is not observed in relation to the total consumption of energy in the period 1995 – 2008, it is obvious that renewable energy consumptionrecords an annual growth rate of 1.32%. It is important to mention that BiH has recorded the highest increase in consumption of renewable energy of 1.32% when compared to the other Western Balkan countries in theperiod 1995 – 2008. Croatia follows BiH with a recorded annual growth of 0.6%. Other countries of the Western Balkan have recorded a drop in consumption of renewable energy (Albania -1.68%, Macedonia -0.45% and Serbia -0.26 at an annual basis) (European Environment Agency, Renewable Energy Consumption, 2010).

The percentage of renewable energy sources in BiH is shown in Figure 28, which clearly shows that the share of hydro energy is 51.8%, while the consumption of energy from biomass is 48.1%. Consumption of geothermal energy in 2008 had a small share – 0.04% of the total energy consumption from renewable energy sources (SYNENERGY Project, CRES, 2010).

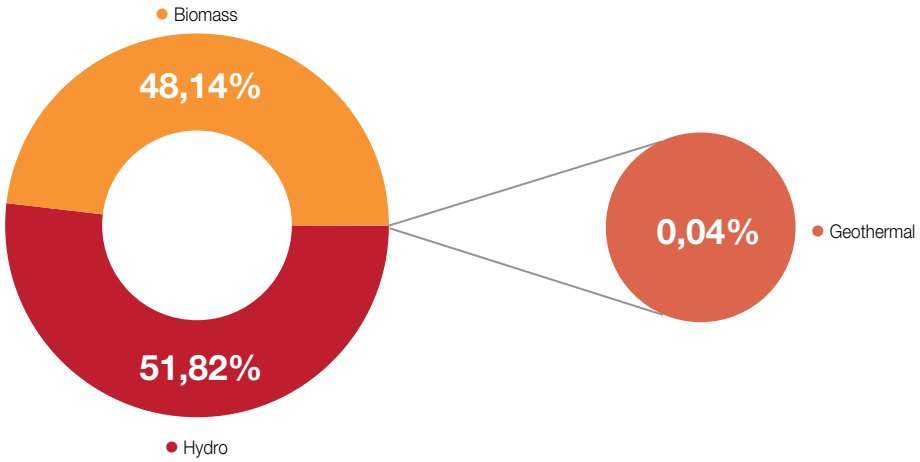


Figure 28:
Consumption of renewable energy sources by energy sources in BiH, in percentages for 2008 (Source: SYNENERGY Project, CRES, 2010)

The sustainability of a region or community is achieved by preserving economic, environmental and social values, and precisely the development and use of renewable energy sources offers a potential for economic growth, reduction of emissions, protection of the environment, use of eco-friendly sources, development of tourism and rural areas in the sense of employingthe local population, building roads and access roads, a safer supply of energy as well as additional tourist offer in the area surrounding power plants.

The potential of the market for projects related to renewable energy sources in BiH is considerable and is constantly growing. In the future, the renewable energy sector needs to be one of the key sectors that support the continuous development of the country.

2.4.2.5 Renewable electricity consumption

Renewable electricity consumption (CSI 031) represents renewable electricity consumption compared to total electricity consumption.

HPP present the main source of renewable energy in BiH;this primarily pertains to large-scale HPP (with an installed capacity of above 10 MW according to theDecree on Use of Renewables and Cogeneration), which are also considered renewable energy sources.

The share of renewable electricity in the total consumption of electricity in BiH amounted to 46.90%in 2010, while in the period of 2008-2010, electricityconsumption increased at an

annual rate of 4.48%, while consumption of electricity from renewable energy sources grew at an annual rate of 13.12%. The reason for such an increase in electricity from renewable energy sources lies in favorable hydrological conditions, as well as in the construction of a new HPP called Mostarsko Blato, which produced 41 GWh of electricity in the test period in 2010 (Agency for Statistics of BiH, Statistics of Energy for 2008, 2009 and 2010, Independent System Operator in BiH, 2010).

It is important to emphasize that large-scale HPP, in accordance to their flooding surface must be environmentally acceptable and meet the criteria of sustainability because of their impact on the ecology of rivers, hydro-geology and micro-climate. The total installed capacity of small-scale HPP in FBiH amounts to 23.7 MW (Energy and Environment in BiH, 2011), and 22.1 MW in RS in 2012 (MIEM RS). Besides large-scale HPP, small scale HPP can also have a negative impact on the local flora and fauna (migrations and negative impact on fish, downstream water quality etc.). However, in comparison with TPP and large-scale HPP, these damages are significantly smaller (Uščuplić, 2007).

BiH possesses significant resources for generating energy from renewable sources. The theoretical hydro potential in BiH amounts to approx. 99,256 GWh/yr and the technical to approx. 23,395 GWh/yr. The energy potential of small-scale HPP in BiH amounts to 3,520 GWh annually. Biomass originating from forestry (firewood, forestry waste and wood waste from the timber industry) and agriculture has the largest economic potential, offering the best opportunity for employment and decreasing greenhouse gas emissions. The total technical potential of biomass energy in BiH amounts aprox. 33.518 PJ. BiH has a significant solar radiation that ranges from 1,240 kWh/m^2 in the north to 1,600 kWh/m^2 in the south and it has an annual average of 1,840.9 sunny hours. The theoretical potential of solar energy in BiH amounts to 67.2 PWh which exceeds the total consumption of energy in the country. Currently, there are no wind power plants that are connected to the high voltage network. However, between 1999 and 2012, potential locations were identified for building wind power plants in BiH. At present, there are 16 macro-locations in the FBiH with a total power of approx. 1400 MW and 13 macro-locations in the RS witha total power of 640 MW that have been designated as desirable for building wind power plants (Strategic Plan and Program of Energy Sector Development of FBiH, 2009; Energy Development Strategy of RS, 2012), which is technically possible exploitable potential. Decree on the Production and Consumption of Energy from Renewable Sources and CogenerationRS defines 100 MW of usable capacity until 2020 to encourage electricity production from wind power plants.

According to recommendations of the European Community on obligatory targets for BiH, based on data established for the base year 2009, the starting share of renewable energy sources is defined as follows: fixed rate of 5.5%, additional increase of the base GDP per capita 1.6% and target share of renewable energy sources by 2020 of 40% (the methodology does not include firewood). The Indicative Plan of Production Development 2011-2020 determines the total plan of energy production from renewable sources for BiH until 2020 (Figure 29),

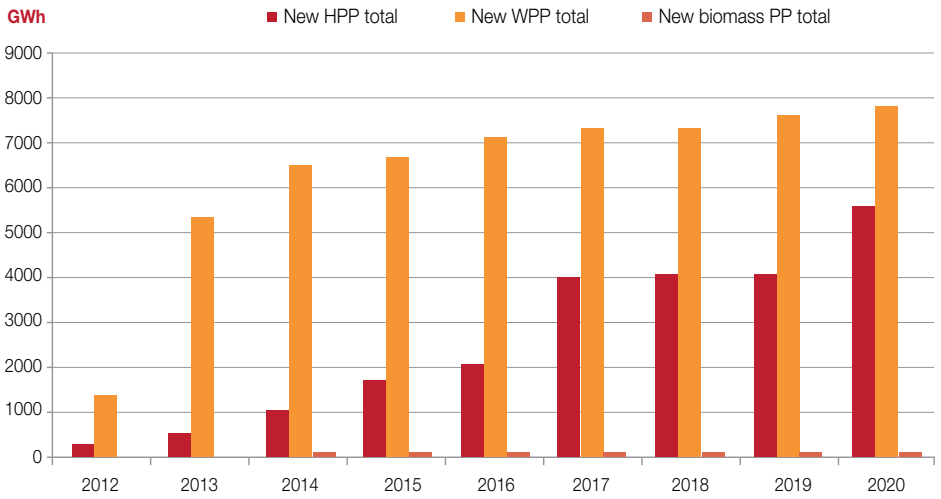


Figure 29: Total electricity production in BiH of new renewable energy sources for the period 2012 - 2020 (Source: Independent System Operator in BiH, Indicative Plan of Production Development 2011 – 2020, June, 2010)

With the aim to incentivize the use of renewable energy sources, decisions on the methodology for determining the level of purchase prices of electricity from renewable energy sources in the FBiH and the RS were adopted and this has triggered the process of investments, thus larger investments can be expected in the future.

2.4.2.6 Conclusions and recommendations

As in other sectors, in the energy sector, it is necessary to have a set of indicators for reporting in order to monitor the energy sector and undertake adequate measures. At the moment, only reporting on electricity consumption and thermal energy is done in BiH and it is of utmost importance that the aforementioned CSI indicators of the European Environment Agency are included into the report of the Agency for Statistics of BiH.

Data that are missing for monitoring of the energy sector are:

- There are no timely reports on CSI indicators (CSI 027 Final energy consumption by sector, CSI 028 Total energy intensity, CSI 029 Primary energy consumption by fuel, CSI 030 Renewable primary energy consumption, CSI 031Renewable electricity);
- Net energy import dependency (ENER 012);
- Energy efficiency and consumption in the transport sector (ENER 023);
- Energy efficiency and consumption in the household sector (ENER 022);
- Energy intensity in the service sector;
- Energy-related emissions of particulate matter (ENER 007);
- Energy-related emissions of acidifying substances (ENER 006);
- Energy-related emissions of ozone precursors (EN 05);
- CO_2 emissions from electricity generation;
- Absolute and relative energy consumption in relation to GDP;
- Monitoring of waste generation from power plants.

The most significant way forward in this sector is: development of energy strategies, reduction of energy intensity and use of renewable energy sources and application of best available techniques (BAT).

In order to achieve decrease of energy intensity, it is necessary to:

- Take action in cooperation with the Chambers of Commerce of FBiH and RS to support the economy;
- Establish energy consulting centers;
- Introducean energy efficiency labeling systemfor technical products;
- Adopt regulations for energy efficiency in buildings and to introduce an energy efficiency labeling system for buildings;
- Introduce a system of incentives and disincentives to increase energy efficiency in households and industry, and
- Introduce a system of energy audit in industry (voluntary mechanism).

In order to encourage the use of renewable energy sources, it is necessary to:

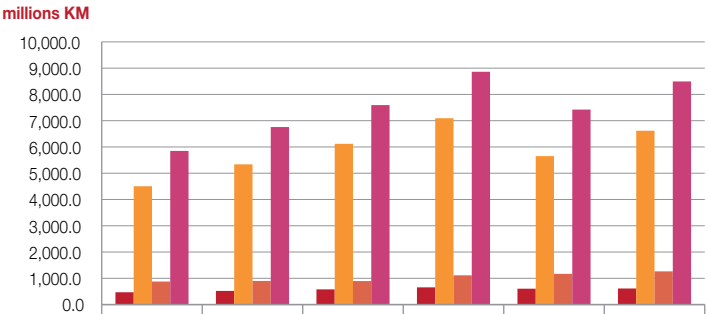
- Use and prefer Clean Development Mechanism (CDM) projects and use flexible mechanisms of foreign support to implement Clean Development Mechanisms in BiH, and
- Develop apolicy for incentivizing theproduction and use of energy from renewable energy sources, with international support,
- Introduce incentives for thermal power in order to bring the existing thermo blocks to legal framework as regulated in EU legislation.

2.4.3. INDUSTRY

The industry sector in BiH is presently characterized by low productivity and poor competition. The main problem lies in the area of infrastructure and financial markets, which are, also, insufficiently developed and inefficient. A low level of technological development and lagging in the field of business strategy and quality management also contribute to a low level of productivity. Trends of low productivity and competitiveness are reflected in the high state current account deficit. Low competitiveness and productivity are insufficient to enable the financial sector to provide greater support to the industry (Initial National Communication of BiH under the United Nations Framework Convention on Climate Change (UNFCCC), 2009).

This difficult situation that the BiH industry faceswas caused by destruction during the war and loss of pre-war markets, though consequences of the former development model should not be disregarded. Industrial development in BiH in the 1970s brought short-term prosperity; however, the industry depended on tremendous investments into the military defense industry during the period after the end of World War II. Prior to the disintegration of the SFRY, more than 55% of the defense industry was based in BiH. After the end of the war, the main pre-war industrial companies have not recovered.

Figure 30: Regular industrial production in BiH in the period 2005-2010 (Source: Agency for Statistics of BiH, Industrial production 2010, Thematic Bulletin TB 05)



	2005	2006	2007	2008	2009	2010
C - Mining and quarrying	468.5	520.0	578.2	655.0	604.0	611.9
D - Manufacturing	4,504.6	5,338.4	6,120.2	7,093.5	5,650.6	6,618.0
E**- Electricity, gas and water supply	876.2	899.8	895.2	1,113.8	1,168.5	1,263.9
Total	5,849.3	6,758.2	7,593.6	8,862.3	7,423.1	8,493.8

*** Excluding data for distribution and sale of electrical energy*

2.4.3.1 Emissions of CO_2, CH_4 and N_2O from the industry

Data on economic activities, i.e., production or consumption of certain industrial process are taken from annual reports of the Institute for Statistics of the Socialist Republic of BiH for 1990, since,at the state level, there are no data on emissions by sector (Initial National Communication of BiH under the United Nations Framework Convention on Climate Change (UNFCCC), 2009).

As Figure 31 shows, the total emission of CO_2 equivalent in BiH in 1990 amounted to 34 million tons. The highestpercentage of the emission was attributable to the energy sector (74%), then agriculture with 12%, industrial processes with 11% and the waste sector with 3%.

In BiH, the main source of methane is agriculture (87 thousand tons), uncontrolled emissions from coal mines (75 thousand tons) and waste disposal (47 thousand tons). Methane is formed as a direct product of metabolism in herbivorous animals (internal fermentation) and as a result of organic decomposition of animal waste (utilization of fertilizers). The most important source of N_2O in BiH is also agriculture. Fertilizers and other agricultural products use large amounts of nitrogen, which has an impact on N_2O emissions (Initial National Communication of BiH under the United Nations Framework Convention on Climate Change (UNFCCC), 2009).

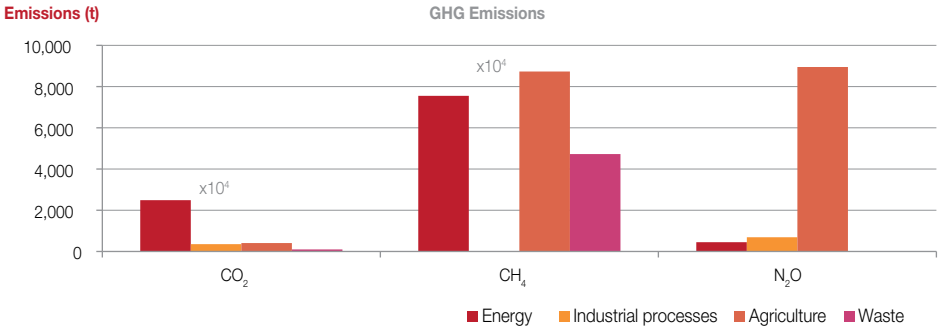


Figure 31: Summarized Report on CO_2 equivalent, CH_4 and N_2O for BiH for 1990 (Source: Initial National Communication of BiH under the United Nations Framework Convention on Climate Change (UNFCCC), 2009)

2.4.3.2 Energy consumption of industry

There are no accurate data on energy consumption in the secondary sector. Figure 32 shows energy consumption in various sectors in 2009.

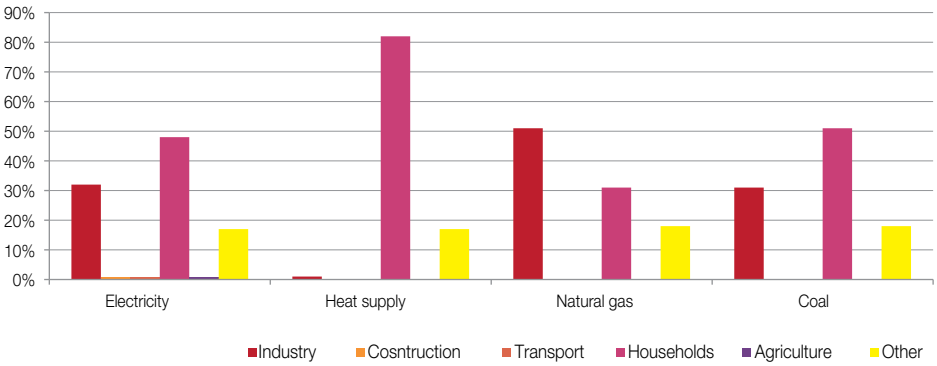


Figure 32: Share of electricity, heat supply, natural gas and coal consumption of industry in BiH in 2009 (Source: Agency for Statistics of BiH, Energy Statistics 2010)

In 2009, electricity consumed by industry was 3033 GWh, which is 32% of the total electricity consumption in BiH. The said quantity of electricity consumed by industry is lower than in previous years. This was probably caused by the economic crisis that affected domestic production with an indirect effect on energyconsumption in industry.

Thermal energy consumption in industry is low, only 59 TJ, while in 2009 the total thermal energy consumption in BiH was 5015 TJ. Most thermal energy is consumed by households, while the share of industryin the consumption of this type of energy is only 1%.

Other significant sources of energy that are used in industry are natural gas and coal. In 2009, the secondary sector spent 82,138,000 m^3 of natural gas, which is 51% of the total consumption of this fuel. In 2009, the share ofcoal consumption in industry in BiH was lower than the share of natural gas consumption. The share ofcoal consumption in industry is 31%, while most of coal (51%) is used in households (Figure 32).

Figure 33 shows consumption of coal and coke for industrial purposes in BiH.

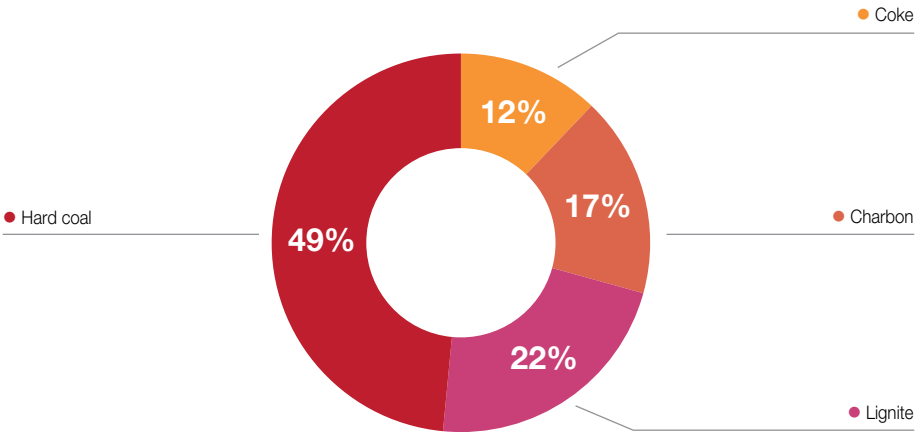


Figure 33: Consumption of coal and coke in the industry of BiH in 2009 (Source: Agency for Statistics of BiH, Release, Energy Statistics: Coal, Coke, No. 1 of 22nd December 2010)

2.4.3.3 Number of industrial companies engaged in Environment Management System

In BiH, there are 82 companies (Institute for Standardization of BiH, 2010) with ISO 14001 Certificates and none is part of EMAS – Eco-Management and Audit Scheme, since the EMAS regulationapplies to 27 EU member states, three member countries of the European Economic Area and EU accession countries.

2.4.3.4 Conclusions and recommendations

Indicators and missing data for regular reporting and monitoring of emissions from industrial plants in BiH:

- Atmospheric emissions from industry
- Energy consumption in industry
- Total material requirements
- Number of industrial companies engaged in the EnvironmentManagement System
- Eco-efficiency in industry
- Progress in management and remediation of contaminated location

Old technologies result in air pollution and other forms of environmental degradation and this is a major issue in the industry sector of BiH. BiH has recorded a significant progress in implementing EU Directive 2008/1/EC on Integrated Pollution Prevention and Control (IPPC), especially when it comes to the issuance of environmental permits in industry. The Pollutant Release and Transfer Register (PRTR) has been introduced in BiH, but it is still in its initial phase, and one of the important ways forward isfor the industry sector to adequately and properly complete the pollutant registry every year.

2.4.4 FISHERIES AND AQUACULTURE

Fish fauna is relatively well researched in BiH. In total, there are 119 fish species. The most common freshwater fish species cultured in BiH are Salmonidae (rainbow trout, brown trout and brook trout) and the species Cyprinidae (carp, grass carp, silver carp and European catfish), while the most frequent sea fish are: European sea bass, gilthead and seashells (mussel and oyster). During the war of 1992 - 1995, most fish farms and fish processing plants were completely destroyed. Even though problems still exist, fish breeding (mostly of freshwater fish) has been increasingconstantly. Fish processing improved significantly between 1999 and 2003, thanks to the availability of high-quality feed, new technologies and expansion of producers' associations (BiHForth Report to the Convention on Biological Diversity, 2010).

Similar to other sectors, most problems in this sector are related to the way in which the country is organized, which makes collection of reliable data on fish breeding more difficult.

2.4.4.1 Production of consumed fish

Data on production of consumed fish in 2010 and 2011 are incomparable to previous years because of changes to the Data Collection Methodology. For the purpose of satisfying the requirements of EU Regulation No. 762/2008, the definition according to which aquaculture production presents the output from aquaculture at first sale was amended. Fish, fish progeny, fish roe and shells that are transferred into the following year are not considered as production for the reference year.

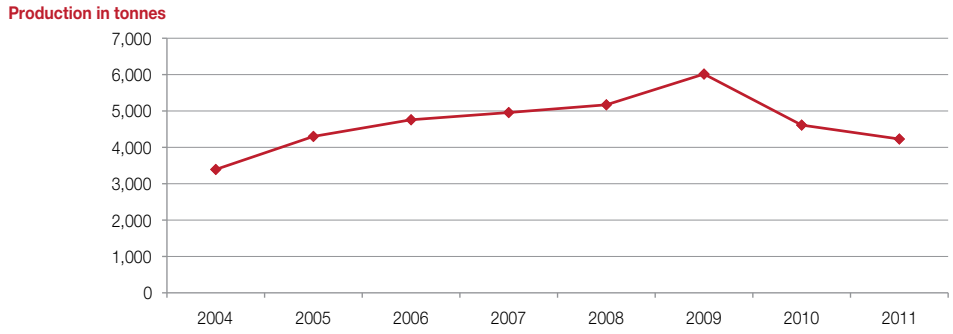


Figure 34:
Production of consumed fish in BiH (Source: Agency for Statistics of BiH, Release, Aquaculture, Annual Report on Aquaculture, 2011)

Data on production of consumed fish and shells, fish progeny and roe were obtained by aggregating data of the annual statistical surveys of the FBiH, theRS and the BD statistics. The total production of consumed fish in 2011 was lower by 8.3% compared to 2010. Production of carp is lower by 32%, while the production of trout is higher by 5% when compared to 2010. Out of the total quantity of produced consumed fish, carp accounts for 21.9%, trout for 72.2% and other fish species for 5.9%. Other fish species include: grass carp, silver carp, European catfish, pike-perch, tench, sea bass, gilthead sea bream, etc.

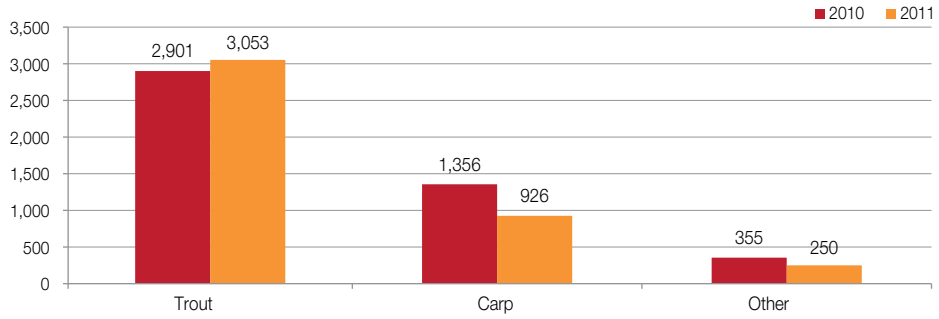


Figure 35:
Production of consumed fish in BiH by types (Source: Agency for Statistics of BiH, Release, Aquaculture, Annual Report on Aquaculture 2011)

2.4.4.2 Number and structure of fish farms

In BiH, fish farms are generally distributed in three main regions. In the northern Bosnia, in the RS, there are currently six Cyprinidae fish farms. In the Neretva and Vrbas River basins, there are around 40 concrete Salmonidae fish farms and cages (floating cages) (Report on Fishery, FAO[11] , 2005). There are, also, two sea fish farms in Neum, where European sea bass and gilthead sea bream are farmed (Agency for Statistics of BiH, 2011).

Table 10:
Structure of operating facilities in BiH in 2011 (Source: Agency for Statistics of BiH, Release, Aquaculture, Annual Report on Aquaculture 2011)

Type of facility	Facility size	
	2010	2011
Trout fishponds, m^2	92,901.0	91,026.0
Carp fish ponds, ha	2,458.7	2,278.0
Cages, m^3	127,106.0	117,581.0

In BiH, there are four facilities for processing fish: Tropik in Banja Luka, Laks and Norfish in Mostar and Žuvela in Stolac (Agency for Statistics of BiH, 2011). Most fish farms have neither installed filters nor some other wastewater treatment devices nor have they designated locations for disposal of dead fish. Due to these failures, fish farms can potentially have negative impacts on the quality of surface and groundwaters.

11 Food and Agriculture Organization

Table 11: Useful water surface area of marine fish farms in Neum (Source: Capacity Building in Integrated Pollution Prevention and Control in. BiH, 2008)

Name of fish farm	Useful surface, m ^{2}
„Karaka maricultura“ Neum	1,500
„Ancor comerc“ Neum	2,100
Total	3,600

2.4.4.3 Conclusions and recommendations

As BiH is extremely rich in high-quality freshwater resources, aquaculture has an enormous potential for development. However, there are several obstacles that must be overcome first, such as: organization offreshwater aquaculture production and sales, adoption of adequate laws and regulations for the sector, cooperation between the scientific and applied research sectors, establishment of a long-term development plan for the aquaculture and fresh water fisheries sectors and incorporation of aquaculture and freshwater fisheriesactivities into the socio-economic and political systems of the country.

Prior to meeting the requirements for implementing some of the aforementioned activities, a good data processing and collection system must be developed. This includes improveddata collection and exchange of data between Ministers and statistical authorities in the country.

Indicators and data missing for the fisheries sector in BiH are the following:

- CSI 033 – Aquaculture production (total and by types) in the whole state,
- CSI 034 – Fishing fleet capacity
- Status of marine fish stocks – important for Neum for the purpose of planning sustainable fishery. It should also been taken into account for freshwater fish.
- Aquaculture caught in adjacent waters
- Eco-efficiency in fishing
- Impact of production on freshwater and marine ecosystems
- Amount of fish food used
- Consumption of imported vs. domestic products.

2.4.5 MINING

Mining in BiH faces serious environmental problems. Unfortunately, most of these problems are related to a chronic lack of funds that should be provided for a gradual and systematic resolution of environmental issues. Very fewstudies on the impact of mining on the environment have been carried out. Major issues concern damages resulting from mining and the effects of mining areas on some habitats. Therefore, there are no comprehensive measures for protection and adequate monitoring of possible impacts on the environment. Processes of land reclamation and remediation of mined out areashave generally not been implemented in accordance with legislation. Currently there is a market demand in BiH for coal used as fuel in electricity generation.

2.4.5.1 Disposal and treatment of waste materials and environmental aspects of mining activities

Coal mines are a very significant part of the energy sector in BiH, where there are 12 active mines, of which 9 are located in the FBiH and 3 in the RS. Opencast and underground mining methods are used in mines. Brown coal and lignite are exploited. Laws on mining in the FBiH and the RS prescribe mandatory remediation of degraded land and a land reclamation plan must be incorporated in mining projects.

In BiH, coal is exploited at an area of 18,000 ha, while the disposal area for waste materials occupies almost 6,000 ha (Energy Sector Study in BiH, 2008). According to available data, the most degraded areas are meadows, then arable land and forests.

Some operating mines have still not prepared land reclamation plans and they plan to prepare themafter the completion of mining activities. In most cases, land reclamation is implemented by applying technical and biological measures, after which mined out areas can be used for agriculture or forestry.

A standardized system of environmental protection, ISO 14001:2004 was introduced in only one mine (coal mine Stanari – Doboj), whilepreparations for implementing a quality management system are ongoing in another mine.

Several mines monitor pollutant emissions and they generally focus on air emissions and control of waste waters. On the basis of available data, reporting to responsible institutions about environmental issues is obligatory for only some mines, while the same obligation has not been imposed on other mines, i.e., they are not obliged to implement environmental monitoring.

Waste management varies among mines. In most mines, waste materials are categorized as technological and municipal waste. Most mines have not been identified as a source of dangerous waste, which isnot fully in accordance with the Rulebook on Waste Categories with Lists (Official Gazette of FBiH, No. 9/05) or with the Rulebook on Waste Categories Catalogues (Official Gazette of RS, No. 39/05), because it is likely that mines produce certain quantities of waste oils and lubricants categorized as hazardous waste in the aforementioned Rulebooks.

On the majority of mine sites, technological waste waters are processed in settling tanks prior to being discharged into nearby water flows,while in some mines technological waste waters are not treated prior to being discharged into water flows; on the contrary, they are directly released into sewage and septic tanks. A waste water treatment plant exists only in one mine. Onlya few mines implement constant waste water quality control, while other mines implement the control several times or once a year and some do not have waste water control at all.

According to the Law on Environmental Protection in the FBiH and the RS, i.e., Rulebook on Plants and Facilities that can only be built and commissioned upon obtaining an environmental permit, only mines producing more than 50,000 tons annually or those covering an arealarger than 5 hectares are obliged to obtain an environmental permit. Apart from obtaining environmental permits for specific facilities, regularmonitoring of emissions and reporting to relevant institutions must be carried out (Energy Sector Study in BiH, 2008).

Environmental aspects of mining activities

Laws on Environmental Protection in the FBiH and the RS prescribe an obligation to implement strategy assessments of the environmental impact for the purpose of urban planning and to develop an assessment of the environmental impact at the project level. The procedure for assessing environmental impacts and the contents of the Environmental Impact Study are defined by the Rulebook on plants and facilities which require an environmental impact assessment and on plants and facilities that can only be built and commissioned if an environmental permit has been issued (Official Gazette of FBiH, No. 19/04) and by theDecree on projects that must undergo an environmental impact assessment and on the criteria for deciding on the obligation of implementingthe environmental impact assessment and the scope thereof (Official Gazette of RS, No. 7/06).

The Law on Environmental Protection defines an environmental impact assessment as an obligatory precondition for obtaining an environmental permit and consequently a planning permit, together with other permits that are necessary for building new energy plants and mines.

Further, it is prescribed by law that existing mines shall prepare activity plans containing measures and requirements for a complete reduction of emissions, i.e., pollution, and that they shall synchronize with the Best Available Techniques – BAT, which include obligatory plans for

waste management, which is one of the preconditions for obtaining an environmental permit. Waste management plans must also be prepared for new plants and facilities.

If the aforementioned is taken into account, it is clear that all mines in BiH will soon be obliged to implement certain measures for reducing environmental impacts, therebytaking into consideration the aspect of waste management together with obligatory monitoring of emissions that pollute the environment; and they will report to responsible institutions on monitoring results.

2.4.5.2 Coal mines in BiH

Coal is one of the most important energy sources in BiH. Major reserves of brown coal and lignite are distributed in the whole of the FBiH and the RS. Most existing coal mines supply TPP in both entities. Coal mines located in northwestern and central BiH supply TPP Kakanj and TPP Tuzla, which are managed by Public Company "Elektroprivreda" of BiH (JP EP BiH), while mines Ugljevik and Gacko supply TPP Ugljevik and TPP Gacko, which are under the management of "Elektroprivreda" of RS (ERS),(Figure 36).

Figure 36: Locations of coal mines and thermal power plants in BiH (Source: Energy Sector Study in BiH, 2008)

Coal mines in the FBiH	Coal mines in the RS
■ Banovići (brown coal) – opencast mine Čubrić, Turija and Grivice; underground mine Omazići ■ Đurđevik (brown coal) –opencastmine Višća II and underground mine Đurđevik ■ Kakanj (brown coal) – opencast mine Vrtlište and underground mine Haljinici ■ Zenica (brown coal) – underground mines Stara jama, Raspotočje and Stranjani ■ Breza (brown coal) – underground mines Sretno and Kamenice ■ Bila (brown coal) – underground and opencast mine Grahovčići ■ Kreka (lignite) – opencast mines Šikulje and Dubrave; underground mines Mramor and Bukinje ■ Sanski Most (brown coal) - Kamengrad opencast mine ■ Livno (lignite) - Tušnica opencast mine ■ Gračanica, G.Vakuf/Uskoplje (lignite) - Dimnjače opencast mine	■ Ugljevik (brown coal) - opencast mines Bogutovo Selo and TPP Ugljevik ■ Miljevina (brown coal) – opencast mine and underground mine ■ Gacko (lignite) – deep-pit mines Gračanica and TPP Gacko ■ Stanari (lignite) – deep-pit mine Raškovac
Potential deposits of coal in the FBiH	**Potential deposits of coal in the RS**
■ Opencast mine Kanogra for supplying fuelto thermal power plant Duvno, ■ Opencast mine Kotezi for supplying fuelto thermal power plant Bugojno.	■ Opencast mine Ugljevik East for supplying fuel to existing and new units of thermal power plant Ugljevik, ■ Opencast mine Gacko for supplying fuelto existing and new units of thermal power plant Gacko.

2.4.5.3 Production in coal mines in BiH

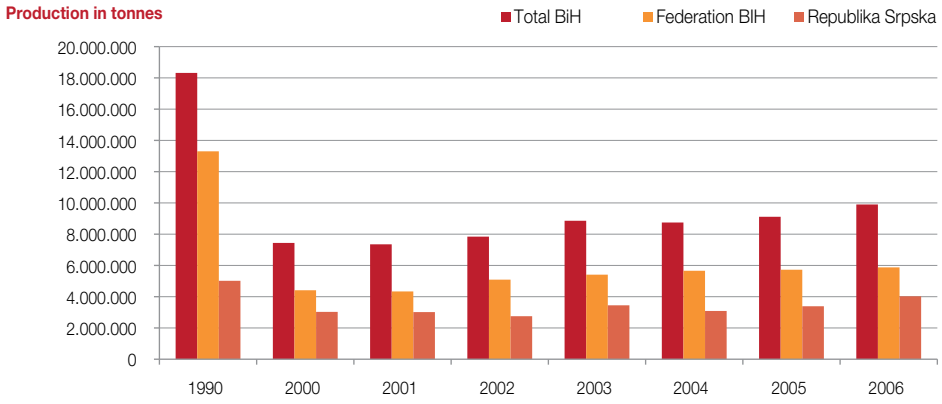
Improvement of operations and modernization of coal mines are crucial for generatingelectricity at low prices, i.e., for ensuring sustainable and cost-effective growth.

There are significant differences between coal mines in BiH, but they are similar in terms of geological and technological conditions. In the FBiH there are opencast mines and underground mines, which exploit brown coal and lignite, while in the RS, only opencast mining is carried out. Opencast mines are located on different types of land, from flat to hilly areas, and coal is excavated from slightly to steeply dipped deposits utilizing technology for continuous exploitation (bucket-wheel excavator) or discontinuous exploitation (excavators and trucks) of lignite and brown coal, as well as for removal of overburden.

There are two main markets for BiH coal. Coal is partly needed for the operation of four TPP within in the systems of JP EP BiH and ERS, and it is also partly used in various industries, as well as for heating and household needs in BiH and in the neighboring countries. Hence, planned capacities are based on the needs of these markets.

However, data on production mainly depend on the most significant segment – electricity generation. The future growth of commercial demand for coal will, among other things, depend on operational plans of specific mines that are scattered across a number of locations. Due to the complexity of amalgamating hundreds of separate plans, it is impossible to foresee anything except for the future trend of coal demand. However, future forecasts will, without doubt, depend on future plans of large industrial producers.

Figure 37: Production of coal in BiH (Source: Energy Sector Study in BiH, 2008.)



YEAR				
MINES	1990	2000	2001	2002
BiH				
TOTAL BIH	**18,317,755**	**7,440,139**	**7,350,720**	**7,842,859**
FBiH				
Kreka (L*)	4,892,509	1,499,917	1,488,743	1,701,464
Banovići (BC**)	2,280,027	1,002,430	1,001,154	1,234,370
Đurđevik (BC)	1,483,291	231,529	323,302	382,582
Kakanj (BC)	2,017,717	766,567	747,465	942,544
Breza (BC)	490,867	391,468	253,119	291,255
Zenica (BC)	920,214	353,197	344,027	318,960
Bila (BC)	116,195	50,752	46,652	59,631
Gračanica (L)	683,981	80,050	94,942	128,687
Livno (L i BC)	81,400	35,941	36,310	31,845
Kamengrad (BC)	134,600	0	0	0
Mostar (BC)	200,000	0	0	0
TOTAL FBIH	**13,300,801**	**4.411.851**	**4.335.714**	**5.091.338**
RS				
Gacko (L)	2,382,555	1,763,472	1,797,825	1,420,970
Ugljevik (BC)	1,826,890	1,186,549	1,168,486	1,226,378
Stanari (L)	641,223	51,795	48,695	104,173
Miljevina (BC)	166,286	26,472	0	0
TOTAL RS	**5,016,954**	**3.028.288**	**3.015.006**	**2.751.521**

* *L – lignite;* ** *BC - brown coal*

2003	2004	2005	2006
8,858,271	**8,746,424**	**9,113,373**	**9,900,177**
1,979,369	2,087,266	2,000,282	2,021,038
1,327,596	1,328,169	1,445,668	1,383,302
438,428	461,555	503,334	486,913
903,012	967,850	996,735	1,114,746
308,237	282,545	171,733	221,951
221,039	278,357	289,657	280,903
61,093	69,190	71,842	76,941
139,142	153,695	196,272	230,346
31,703	30,432	49,808	58,859
0	0	0	0
0	0	0	0
5.409.619	**5.659.059**	**5.725.331**	**5.874.999**
1,982,563	1,743,216	2,044,445	1,979,575
1,313,281	1,145,929	1,073,702	1,533,488
152,808	198,220	269,895	512,115
0	0	0	0
3.448.652	**3.087.365**	**3.388.042**	**4.025.178**

Table 12:
Production of coal by mines in BiH in tons (Source: Energy Institute Hrvoje Požar et al, Energy Sector Study in BiH, 2008)

Table 12 presents data on coal production by mines in BiH in tons for the period 2000-2006. Review of the planned and the achieved production in the FBiH coal minesin the period January - December 2010, and the achieved production in the period January - December 2009 is shown in Table 13.2000-2006. Pregled planirane i ostvarene proizvodnje u rudnicima uglja u FBiH i prodaje u razdoblju I-XII. 2010. godine, te ostvarene proizvodnje u razdoblju I –XII. 2009. godine prikazuje Tabela 13.

Table 13: Review of planned and achieved production in FBiH coal mines in the period I – XII 2010 and achieved production in the period I - XII 2009 (Source: Federal Ministry of Energy, Mining and Industry)

COAL MINE	Production plan		Achieved production (t)	Contracted coal supplies forTPPs (t)	ForTPP (t)
	Achieved production I-XII 2009.	By energy bilance			
Kakanj	1,173,893	1,100,000	1,074,826	1,010,000	1,040,553
Zenica	307,810	290,000	198,166	195,000	41,859
Breza	400,064	403,763	429,213	385,000	387,698
"A.L." Bila	92,405	95,000	95,657	80,000	82,052
Gračanica	268,132	240,000	253,219	175,000	185,820
Kreka	2,507,172	2,600,000	2,317,219	2,260,000	2,079,998
Đurđevik	445,705	558,328	523,003	436,800	420,944
Banovići	1,450,622	1,500,000	1,460,963	1,000,000	927,696
Tušnica	0	63,900	0	30,000	0
Kamengrad	0	160,000	0	0	0
Total	**6,645,803**	**7,010,991**	**6,352,266**	**5,571,800**	**5,166,620**

Overburden/mine waste in coal mines

Opencast mines have a defined coefficient of overburden, or to be more precise, a ratio between the quantity of excavated coal and removed overburden (waste rock), which is expressed in cubic meters (m^3) per ton of coal. For example, Banovići Mine operates with 9 m^3/t, Đurđevik Mine has up to 10 m^3/t, Kreka up to 4,942 m^3/t and Ugljevik up to 7,14 m^3/t. Waste rock from underground mines originates primarilyfrom interburdens between coal seams, which are separated in the process of separation in coal processing plants (Energy Sector Study of BiH, 2008, Documentation of JP EP BiH, TPP Tuzla , cola mines: Ugljevik, Gacko, Kreka, Banovići, Kakanj, Bugojno, Stanari, etc. Mining Institute Tuzla, Pre-Feasibility Study on Building Thermal Power Plants Stanari, Kongora and Bugojno).

Table 14: Production, quality of coal, labor force and productivity – total future estimates for coal mines in BiH.

INDICATOR		2005	2010	2015	2020
Annual production (000 tons)	Lignite	4,532.8	5,570.0	10,820.0	11,550.0
	Brown coal	4,621.4	6,166.0	7,148.0	7,311.0
Coal quality (kJ/kg)	Lignite	9,129.0	9,263.0	9,195.0	9,242.0
	Brown coal	13,677.0	13,798.0	13,799.0	13,806.0
Labor force	Lignite	33,965.2	36,807.0	42,977.0	43,929.0
	Brown coal	67,930.4	73,614.0	85,954.0	87,858.0
Productivity (ton per capita annually)	Lignite	842.0	1,232.0	2,626.0	2,803.0
	Brown coal	464.0	712.0	850.0	874.0

Coal sales							
Industry and broad consumption (t)	Export (t)	% 4 : 2	% 4 : 3	% 6 :4	% 6 : 5	% 7 : 4	% 8 : 4
34,273	0	91.56	97.11	96.81	103.02	31.89	0.00
156,527	0	64.37	68.33	21.23	21.46	78.99	0.00
54,937	0	107.29	106.30	90.33	100.70	12.80	0.00
11,268	0	103.52	100.69	85.78	102.56	11.78	0.00
62,426	75	94.43	105.50	73.30	106.06	24.65	2.96
237,220	0	92.42	89.12	89.76	92.04	10.23	0.00
65,800	41,060	117.34	93.67	80.49	96.36	12.58	7.85
385,675	147,591	100.71	97.40	63.49	92.77	26.42	10.10
0	0	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0,00	0.00	0.00	0.00	0.00	0.00
1,008,126	**188,726**	**95.58**	**90.60**	**81.34**	**92.73**	**15.87**	**2.97**

2.4.5.4 Metal and non-metal mines

Currently in BiH there are 9 metal and non-metal mines, such as:

1. Veovača – Mine of lead, zinc, barite

This mine is located in the Municipality of Vareš and it was in operation from 1981 to 1988, when it was closed as the ore excavated contained large quantities of mercury.

The planned capacity in opencast mine Veovača was 400,000 tons of run-of-mine ore that was removed by way of the discontinuous technology for opencast mining and by drilling and blasting processes. An outer waste rock disposal area close to the mine was used for disposal of waste rock and it was located in a valley close to the Jeglenac spring. Flotation was used for ore processing which was carried out in a flotation plant that was located in the village of Tisovac, 4-5 kilometers west of the opencast mine. Flotation sludge, that is, flotation waste material was deposited in a sedimentation basin, which was constructed in the valley of the Jeglenac spring and which had an earth dam and an impervious layer of clay. An edge ditch was constructed to prevent penetration of surface waters. Many reagents were used to obtain a heavy and liquid substance necessary for the floatation process, such as: Na_2CO_3, $CuSO_4$, boron oil, amyl xanthate, etc.

A sudden closure of the mine caused majorenvironmental problems. The entire plant and all equipment in flotation plant Tisovac was abandoned without reclamation, cleaning and protection. Also, a certain quantity of ore was left in the warehouse (concentrates of lead, zinc and barite). The total area that was destroyed and affected by operations in the opencast mine is estimated at 515,500 m^2.

In order to properly close a mine, the following steps should be taken:

- Inspection of the whole zone
- Plan for alternative use of the remaining building and plants

- Cleaning and reclamation of the affected area
- Technical and biological land reclamation focusing on water protection

2. Olovo – Lead Mine

Production of cerrusite – iron ore $PbCO_3$ was completed in 1992. As the mine had no processing plant, there were no environmental risks in terms of deposited waste rock. Production has never beenresumed, as there are no strategic partners.

3. Bužim –manganese mine was closed in 1992 and production has not beenresumed.

4. Vareš – production of iron

Production was terminated in 1992. After production was resumed, the Ministry of Energy, Mining and Industry of the FBiH made a decision in 1999 to terminate production once again. Large areas of the mine are yet to undergo a recultivation process.

5. Mines of boxite operating:

- Mine Jajce - Jajce
- Mine Čitluk - Čitluk
- Mine Posušje - Posušje
- Mine Široki Brijeg - Široki Brijeg
- Mine Bosanska Krupa - Bosanska Krupa

2.4.5.5 Conclusions and recommendations

There is a significant lack of knowledge in the field of prevention and minimization of effects of mining on the environment which is very complex and requires a serious approach. Missing data on the mining sector in BiH are:

- Information on metal and non-metal mines in the RS including mineral resources (Ministry of Industry, Energy and Mining of RS)
- Information on inspections in the RS (Ministry of Industry, Energy and Mining of RS)
- Environmental data on the mines

Metal mines, which were primarily destroyed during the war, are not a subject of interest for domestic and foreign investors, which is why most of them are non-operating. Many mines were not adequately closed, thus it is necessary to prepare inventory listsfor abandoned metal mines in order to define hot spots, environmental threats and risks, as well as a set of priorities concerning remediation. Also, there are only seven inspectors for mining, geology and electrical engineering in the FBiH, while this information is unknown for the RS. It is necessary to involve, not just successors of mining properties, but also representatives of the authorities, local community and other interest groups.

According to obligations stated in the Laws on Environmental Protection and Waste Management of the FBiH and the RS and with the aim to protect the environment, mines should undertake the following measures:

- Identify all locations at which waste is generated, then make detailed lists with types and quantities of generated wasteaccording to the waste catalogue and waste codes;
- Evaluate reusing waste and recycling possibilities;
- Develop a waste management plan containing: methods of waste collection, methods of disposal, defined waste collection locations and responsible persons in charge of keeping a waste management cadastre;
- Ensure adequate infrastructure for temporary waste disposal, particularly of dangerous waste, which would ensure that waste is disposed of in accordance with legal regulations and requirements;

- Provide training to responsible persons about all legal obligations concerning waste management and implementation of a waste management plan;
- Provide training to all employees on implementing a waste management plan, thereby putting special emphasis on educating employees in charge of maintaining and overhauling plants;
- Assess environmental and human risks and accidents related to mining;
- Define measures for minimizing risk levels;
- Develop internal intervention plans for environmental accidents and inform and train employees accordingly, and nominate persons responsible for implementing these plans.

2.4.6 TRANSPORT AND INFRASTRUCTURE

Transport of goods and passengers in BiH is constantly increasing, enabling private and business contacts and economic development of the country. Corridor VC is under construction, which will significantly improveroad transport conditions in the country and provide a better connection with European countries.

The most significant forms of transport in BiH are road and railroad transport. Passenger transport is mainly focused on roads, though a significant part of freight transport is done by railroads. The existing road infrastructure is constantly being renewed through road reconstruction and rehabilitation projects. The construction of the highway in Corridor VC is being acclerated and the highway Banja Luka – Bosanskaof 35 km has been opened for traffic.. The plan is to build the highway Tuzla – Orašje, an expressway from Sarajevo to Donji Vakuf, highway Neum – Stolac, and other roads. Railroad traffic has significantly decreased. Reconstruction of the railroad infrastructure is progressing very slowly and the main railroad lines are: Vrpolje – Doboj – Zenica – Sarajevo – Mostar – Ploče; Doboj – Banja Luka – Bosanski Novi, Doboj – Tuzla – Zvornik and the Una Railroad. Water transport is poorly developed in BiH and has a minor importance in the overall transport of people and goods.Air transport is also underdeveloped, although gradually progressing.

Transport and transport infrastructure have a positive effect on connecting people and on the total development of the country, but they can negativelyaffect the environment. By building road and railroad infrastructure land is occupied and divided into two parts, natural habitats are separated, noise emissions are increased and water flows, air, soil, flora and fauna are polluted. Road transport pollutes the air with by-products of combustion of fossil fuels, petroleum and petroleum products, which makes it both a local and global polluter. An important effect of this type of transporton the environment is the increase of greenhouse gas emissions.

Transport of dangerous substances also presents an environmental risk. Despite all safety measures, accidents happen occasionally and certain quantities of hazardous substances get released into the environment, which can have very detrimental consequences. FBiH Government has formed a working group to prepare a draft Law on Transport of Hazardous Substances. In the RS, Law on Transport of Hazardous Substances (Official Gazette of RS, no. 1/08) is in force, and the draft of the amendments to this Act, which is partially aligned withthe acquis, has been prepared. Transport of hazardous substances in BD is regulated by the Law on Transport of Explosive Materials and Flammable Liquids and Gases (Official Gazette of BD, no. 27/07) and the Law on Transport on Roads of BD (Official Gazette of BD, no. 10/06, 19/07, 23/08 and 04/11), and there is ongoing development of the remaining regulations under this Act. At the state level, Workinggroup was established to ensure that during development of legislation on transport of hazardous substances at the lower levels, the same standards are applied, all three types of transport (road, rail and water) and all EU regulations governing subject area are considered, and regulations and EU standards are transposed and implemented. The Working group consists of representatives of the relevant institutions at the state level, and representatives of the competent authorities of FBiH, RS and BD.

Having in mind the significance and growing influence of transport and transport infrastructure on the socio-economic development of the country and the environment, these issues are given all the more importance, particularly because of the construction of the highway in Corridor VC and the strategy for development of road infrastructure in the FBiH and the RS.

2.4.6.1 Road and railroad traffic

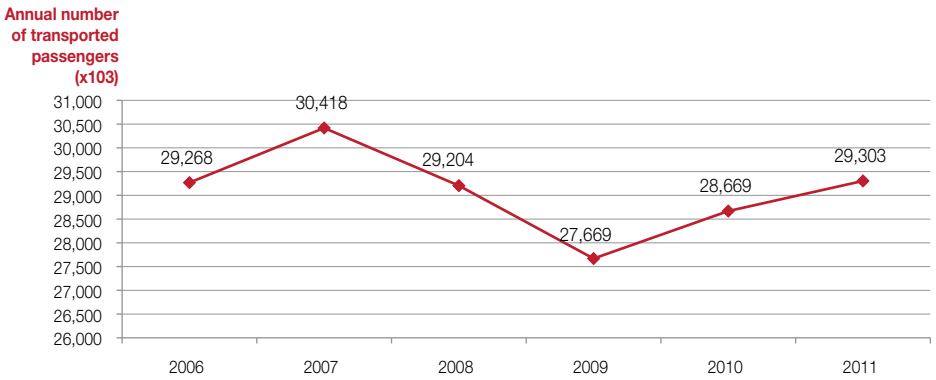
Transport of passengers in road and railroad

In the period from 2006 to 2011, transport of passengers was rather balanced. A significant portion of road transport was carried out by personal means of transportation that are not part of the statistical analysis. Passenger transport by railroad had a share of 1.7%in 2005 and in 2009 it increased to 2.2%. Generally speaking, passenger transport by railroad does not have aconsiderable effect on the environment.

Table 15: Data on road traffic (Source: Agency for Statistics of BiH, Release: Transport, No.1, 2010; Transport Statistics No.5, 2011; Transport: Road, Railrway, Air and Postal Transport, No. 1, 2012)

Year Transport of passengers and goods	2006	2007	2008	2009	2010	2011
Annual number of transported passengers (x10³)	29,268	30,418	29,204	27,669	28,669	29,303
Passenger kilometers (x10³)	1,873,598	2,043,895	2,113,943	1,959,227	1,864,471	1,926,212
Transported goods in tonnes (x10³)	3,302	4,943	5,714	5,068	4,837	4,857
Ton –kilometer (tkm) (x10³)	1,283,892	1,763,827	1,873,598	1,711,575	2,038,731	2,308,690

Figure 38: Annual number of transported passengers in the period of2006-2011 (Source: Agency for Statistics of BiH, Release: Transport, No. 1, 2010; Transport Statistics No. 5, 2011; Transport: Road, Railway, Air and Postal Transport, No.1, 2012)

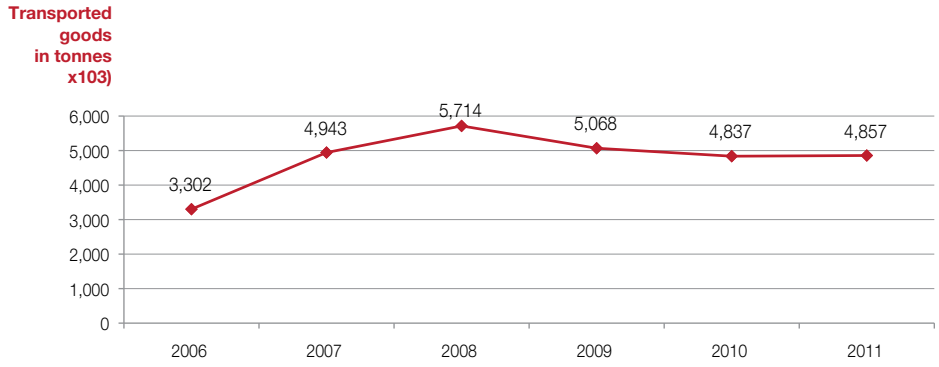


Freight transport by road and railroad

Freight transport by road is constantly increasing. A significant growth was seen in 2008. From 2009, a slight decline in road freight transport was recorded (Figure 39). Railroad freight transport is still very significant, especially because of transport of ore, coal, petroleum and petroleum products, etc. After a slight decline in 2009, a small increase in the quantity of transported goods was recorded, thus in 2011 this quantity amounted to 14.2 million tons. A significant portion of transported goods, around 40%, is related to international transport.

From an environmental point-of-view, road freight transport has the largest impact, because of accident and fossil fuels spill risks. Increase of road freight transport leads to greater emission of exhaust gases and pollution of the environment, while transport of hazardous substances also presents a negative environmental impact.

Figure 39: Quantity of transported goods (in tons) on roads in the period of2006-2011 (Source: Agency for Statistics of BiH, Release: Transport, No. 1, 2010; Transport Statistics No. 5, 2011; Transport: Road, Railway, Air and Postal Transport, No.1, 2012)



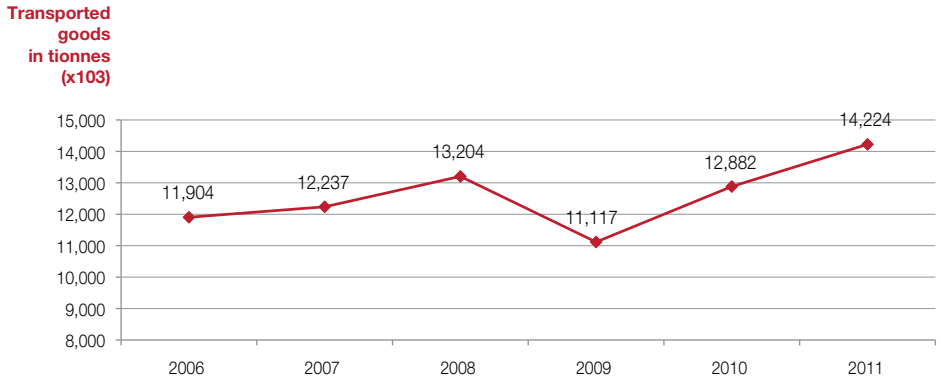


Figure 40:
Quantity of transported goods by railroad in the period of 2006-2011 (Source: Agency for Statistics of BiH, Release: Transport, No.1, 2010, Traffic Statistics, No. 5, 2011, Traffic: Road, Railroad, Air and Postal Traffic, No.1, 2012)

Fuel Consumption

According to data for BiH, for the period of 2000 – 2005, gas and diesel fuelconsumption was quite balanced. Pollution of the environment with lead from gas has significantly decreased after the BAS EN 228 Standard was introduced as well as the Decision on Quality of Liquid Fuels. Unfortunately, in BiH it was permitted to use leaded gas produced in BiH until 30th August 2010. Registered passenger vehiclesaccording to fuel type in 2011 and their environmental characteristics are shown in Figure 41 and Figure 42.

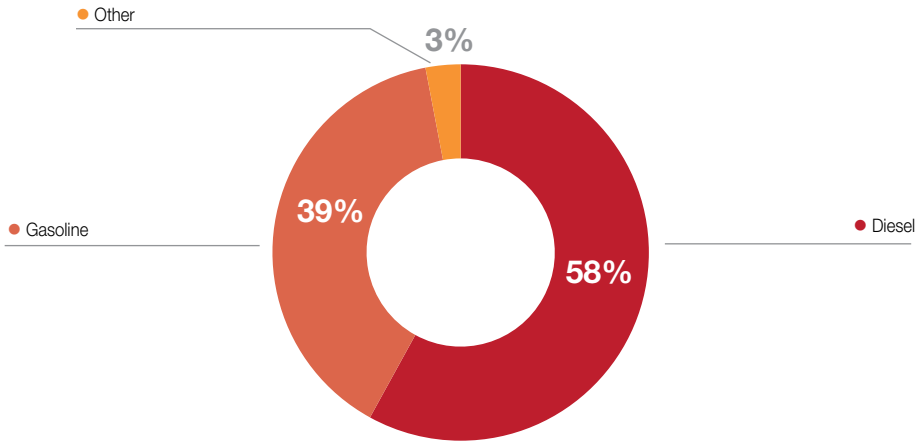


Figure 41:
Passengervehicles by fuel type in 2011 (Source: Agency for Statistics of BiH, Release, Transport: Registered Road Motor Vehicles for 2011)

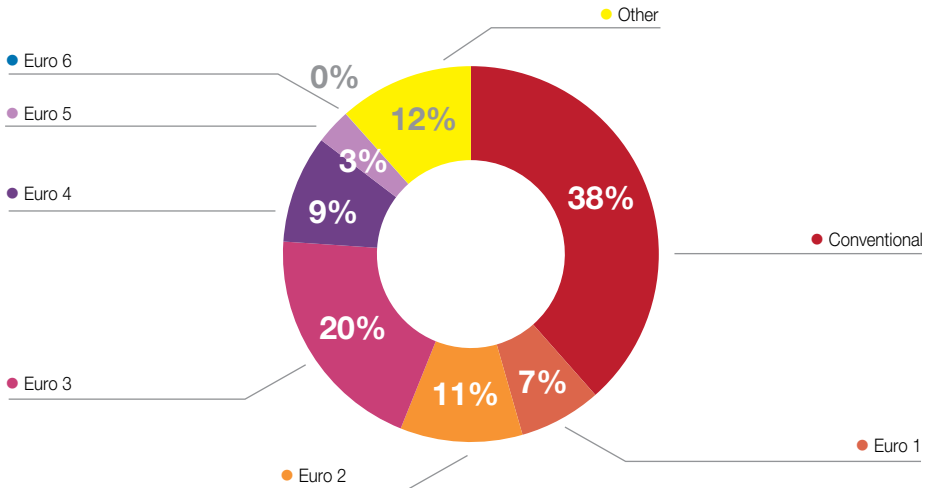
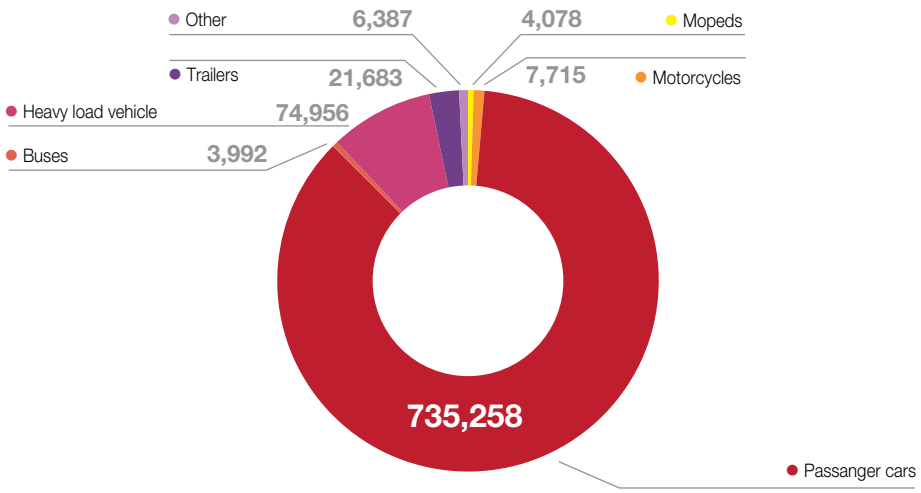


Figure 42:
Environmental characteristics of registered motor vehicles in 2011 (Source: Agency for Statistics of BiH, Release, Transport: Registered Road Motor Vehicles for 2011)

Registered motor vehicles and their structure

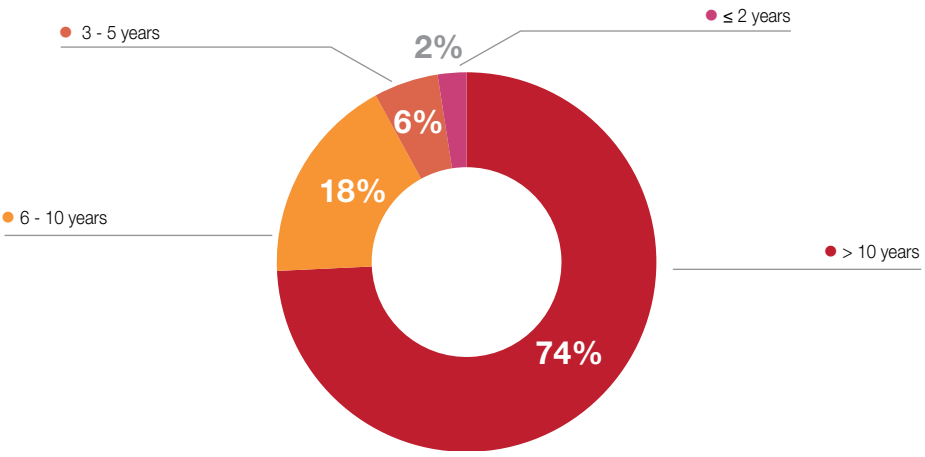
Data on the total number of vehicles in BiH in the period between 2003 and 2011show a growth of registered motor vehicles. In 2003, there were 646,658 registered vehicles, in 2004 this figure amounted to 695,828, in 2005 there were 705,828 vehicles and in 2011 the number of registered vehicles increased to 854,078. The number of registered vehicles is constantly growing. The structure of registered motor vehicles for 2011 is shown inFigure 43. Passenger vehicles account for the highest percentage of registered vehicles.

Figure 43: Structure of registered vehicles in BiH in 2011 (Source: Agency for Statistics of BiH, Release, Traffic: Registered road motor vehicles for 2011)



Old vehicles are one of the main polluters of air in major urban areas. Most registered vehicles (74%) are older than 10 years (Figure 44).

Figure 44: Registered passenger vehicles according to age in 2011 (Source: Agency for Statistics of BiH, Release, Transport: Registered Road Motor Vehicles for 2011)



Capacity of traffic infrastructure

In 2010, BiH had 40.7 km of highway, 3,801 km of main roads and 4,685 km of regional roads. Total length of railroad network amounted to 1,027 km.

The busiest roads are those that lead to major urban centers. The average annual daily traffic on these roads varies between 10,000 and 15,000. Such roads with heavy traffic are dangerous from the aspect of safety and environmental protection, having in mind that more traffic means more pollution of the environment.

Length of infrastructure network	2006	2007	2008	2009	2010
Railroad length	1,024	1,017	1,017	1,017	1,027
Electrified lines	771	771	771	771	771
Other lines	253	253	246	246	256
Road length	8,656	8,646	8,592	8,521	8,527
Main	3,771	3,808	3,801	3,801	3,801
Regional	4,865	4,810	4,763	4,685	4,685
Highway	20	28	28	35	41

Table 16: Railroad and road infrastructure in BiH, in km (Source: Agency for Statistics of BiH, Environment, Energy, Transport 2011, Thematic Bulletin TB 13)

Traffic accidents

Increased traffic intensity leads to an increased number of traffic accidents and their effectson human life and health, as well as to an increased number of minor and major material damages. The annual number of road traffic accidents and the number of road traffic injuries and deathsare shown in Figure 45. On average, 110 traffic accidents happen every day. Interestingly enough, despite an increased number of vehicles, the number of traffic accidents is decreasing.

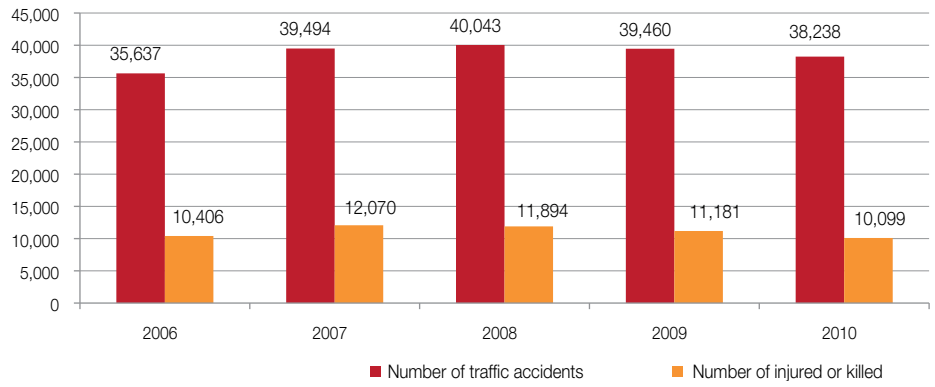


Figure 45: Annual number of road traffic accidents and number of road traffic injuries and deaths (Source: Agency for Statistics of BiH, Environment, Energy, Transport2011, Thematic Bulletin TB 13)

2.4.6.2 Air traffic

Considering that BiH is a potential candidate for the EU membership, air traffic is insufficiently developed and small steps of progress have been made. The annual number of passengers travelling by air in period 2006 – 2011 is shown inFigure 46. It is obvious that the number of passengers is increasing yearly, which testifies to the fact that this type of traffic needs to be developed. The BiH Directorate for Civil Aviation – BH DCA, which operates under the BiH Ministry of Communications and Transport as an umbrella institution competent for all aspects of aviation in BiH, adopts positive reports year after year, which is evidence of progress in this type of transport.

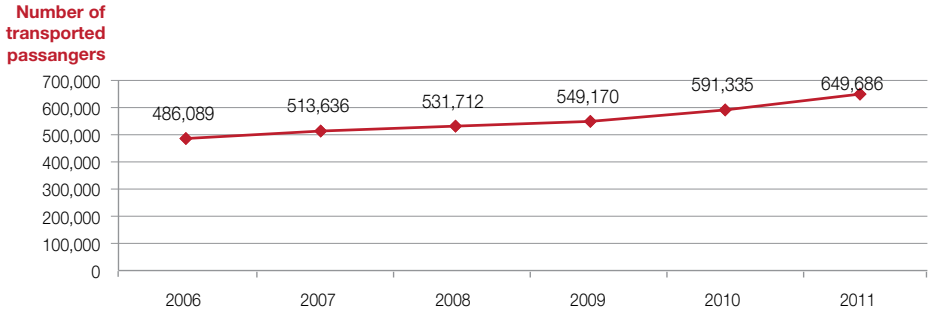


Figure 46: Number of passengers travelling by air in period of 2006-2011 (Source: Agency for Statistics of BiH, Release: Transport, No. 1, 2010; Transport Statistics No. 5, 2011; Transport: Road, Railroad, Air and Postal Transport, No.1, 2012)

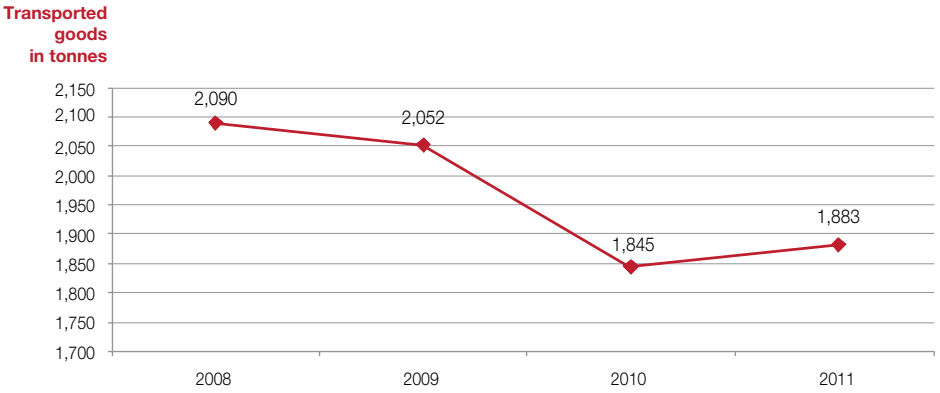


Figure 47: Quantity of transported goods by air in the period of 2008-2011 in tons (Source: Agency for Statistics of BiH, Release: Transport, No. 1, 2010; Transport Statistics No. 5, 2011; Transport: Road, Railroad, Air and Postal Transport, No.1, 2012)

Figure 47shows the quantity of goods transported by air in the period between 2008 and 2011. A slight yet slow decline in the quantity of transported goods is evident.

There are four airports open for international commercial traffic in BiH, in Banja Luka, Mostar, Sarajevo and Tuzla. Sarajevo International Airport was declared one of the best European airports in its category (up to 1 million passengers) by the ACI Council in Munich in 2005. A total of 9 companies operate the most significant connections withEuropean capitals, such as, Vienna, Munich, Istanbul, Belgrade, Zagreb, Ljubljana, Zurich, etc. thus connecting Sarajevo with the rest of the world. The number of connection points is constantly increasing, ever since the airport was opened. Sarajevo Airport is and will remain the main point of entry for international visitors to BiH. However, it is necessary to develop the other airports in BiH, as well as Sarajevo Airport, in order to increase the capacity and number of direct flights, as well as the number of present airline companies.

2.4.6.3 Water transport and infrastructure[12]

In BiH, the Sava River is a navigable river and it also functions as the border between BiH on one side and Croatia and Serbia on the other. As the Sava River is a tributary of the Danube, water transport on the Sava is connected to the Danube – which is treated as the VII Pan-European Transport Corridor. In this manner, BiH is connected to the network of the European waterways and the traffic geo-position of BiH is evaluated for this form of transport. The Sava Riveris part of the Danube transport network of internal navigable routes with its 594 km of navigable route from Belgrade to Sisak and approx. 333 km along the border of BiH, which offer numerous opportunities for developing different types of transport, tourism and recreation along the whole water flow.

In the pre-war period, two ports on the Sava River were operational: Brčko and Bosanski Šamac / Šamac. BiH does not have any marine ports; however, Croatian ports on the Adriatic Sea are used.

The disintegration of the former country and the economic decline of the 1980s and 1990s of the previous century resulted in a major decline of transport and sailing on the Sava River. Since then, the Sava River has hardly been used for river transport, because of considerable damages, as well as poor maintenance and a lack of investments. Navigation conditions are unfavorable, because of a limited draft depthover long periods, limited width of navigable route and clearance under bridges, as well as insufficient markings. Transport on the Sava River is limited to only certain sections of the river and it is at a very low level, while before 1990 the level of transport was around 15 million tons of freight annually. During previous years, which were characterized by poor maintenance, the width and depth of the navigable route of the Sava River decreased, while sailinghas become unsafedue to limited dimensions. This has resulted in shorter navigation periods during the year and a very limited interest in transport.

On the other side, in other parts of Europe, transport by internal navigable routes has proven to be a competitive form of transport, which is environmentally acceptable and reduces road traffic congestions.

12 Source of data: Ministry of Communications and Transport of BiH.

The four countries of the Sava River Basin – BiH, the Federal Republic of Yugoslavia (later know as Serbia and Montenegro, and then the Republic of Serbia), the Republic of Croatia and the Republic of Slovenia, have all entered into negotiations with a primary view to establish an appropriate framework for transboundary cooperation and to provide sustainable use, protection and management of water resources in the Sava River Basin, thereby enabling better living conditions and an increase in the living standard of the population in the region. As a key turning point in negotiations, the Framework Agreement on the Sava River Basin (Framework Agreement) was executed, as a unique international agreement integrating all aspects of water resource management, whereby the InternationalSava River Basin Commission was established with the legal status of an international organization (the Sava Commission), seated in Zagreb, all for the purpose of implementing the Framework Agreement.

Within the implementation of the Framework Agreement and Protocol on the Navigation Regimeto the Framework Agreement, efforts were made to ensure the necessary conditions for the Sava River to become a significant, environmentally acceptable connection that is safe for sailing in terms of transport by internal water routes; and the undertaken activities have resulted in a number of achievements:

- The administrative and legal framework has been strengthened by developing a set of rules and other documents related to technical issues and safety of navigation, which have been harmonized with the relevant regulations of the European Union (EU) and the Economic Commission of the United Nations for Europe (UNECE);
- Activities regarding the reconstruction and establishment of a marking system were implemented; hence the marking system for navigable routes was fully reinstated after 20 years.

On the basis of the existing and/or planned construction of traffic infrastructure connecting the Sava River with several ports on the Adriatic Sea, as well as on the basis of port infrastructure on the Sava River and connections to the Danube, the Sava River offers several advantages for intensifying the further development of water traffic and it is clear that reinstatement of transport by the water route of the Sava River is extremely important, as it presents an environmentally favorable and sustainable form of transport with anexceptional potential. This has become especially pronounced after signing and ratifying the Framework Agreement and adopting the Protocol on the Navigation Regime to the Framework Agreement, which stipulates freedom of navigation for boats ofthe said countries.

2.4.6.4 Conclusions and recommendations

Development of the global market requires a large increase in passenger and freight transport, which in turn increases the pressure on the environment. Statistical monitoring of transport (number of vehicles, quantity of transported goods and other aforementioned indicators) shows that the negative effect on the environment is increasing. Poor infrastructure in BiH is a major cause of traffic congestion that leads to air pollution, especially in major urban areas. In the transport sector of BiH, there is no statistical monitoring of the state of the environment, such as air, water and soil pollution attributable to transport, which is why data on environmental impactsare only approximate estimates.

Recommendations for improving the monitoring of the impact of transport on the environmentas well as forreducing negative impacts of the transport sector on the environment are the following:

- Installation ofstations for air quality monitoring and measurement of noise levels at roads with average annual daily traffic above 8000 vehicles;
- Improved and more frequent fuel quality controls;
- Development of a set of special traffic measures for periods when air pollution exceeds limit values;
- Establishment and application of energy efficiency criteria for purchasing vehicles and for bodies of the wider public sector providing transportation services
- Provision of training and education for improving the efficiency of transport in terms of energy consumption;

- Implementation of energy audits in companiesdealing with public transportation;
- Soft loans for improvingtransport efficiency in terms of energy consumption;
- Promotion of cleaner forms of transport, such as use of public transportation, walking, cycling, etc.
- Promotion of greater use of railways for inter-city journeys;
- Rulebook with detailed specifications for meeting the requirements of the Law on Spatial Planning and Construction for the purpose of developing an energy efficiency study as a part of technical documents for all structures, including transport;
- Construction of bypasses for the purpose of avoiding city centers;
- Investments intosuitable urban infrastructure projects, such as bicycle zones, parking lots, better programming of traffic lights, public transportation and stops, etc.
- Improvement of the quality of existing infrastructure.

2.4.7 TOURISM

BiH is, without doubt, an interesting tourist destination. This country has a long and rich history and a cultural heritage which is a mix of different influences. BiH is attractive because of its geographic position, incredible beauty, cultural and historical heritage, as well as favorable climate conditions. For centuries, BiH has been a meeting place for different cultures, religions and traditions. Owing to all these characteristics, BiH has numerous possibilities to develop different kinds of tourism.

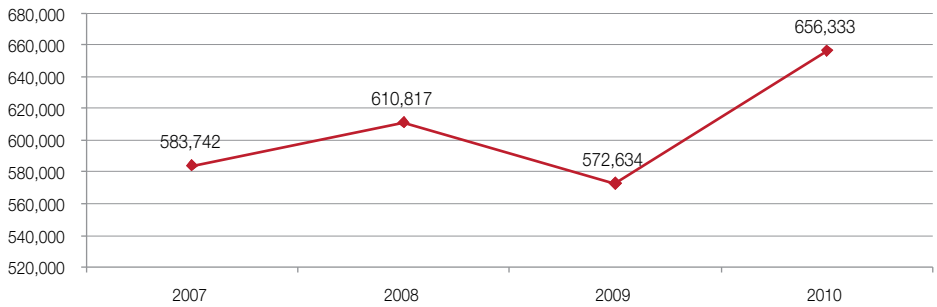
Tourism plays a very important role in incentivizing development and combating poverty. The latest trends show that travelling to developing counties and less developed countries is becoming increasingly popular in the developed world. Tourism is one of the most significant economy sectors for developing countries and it is a primary source of foreign income in most of these countries (UN World Tourism Organization, 2010).

2.4.7.1 Number of tourist visits

Available official statistical data do not reflect the actual state of tourism in BiH. It is considered that the number of tourists is much higher than presented in official data. Many visits are not reported and the system for registration of visits is very complicated and is not adjusted to people who stay in the country, in a city, for a few days in private accommodation.

As a tourist destination, BiH has recorded an annual increase of 4-6% in the number of foreign tourist visitsover past years.

Figure 48: Number of tourist visits (Source: Agency for Statistics, Tourism Statistics 2009)



The number of tourists visiting mountains during winter has reduced significantly, because of high temperatures and lack of snow. There are no assessments of the effect of climate change on tourism activities in BiH, which is why there are no available data on the decline in winter tourism.

Over the last few years, temperature changes on the global level have led to a number of snowfall regime disruptions. It cannot be precisely forecasted whether precipitation will be decreased or redistributed in the future.

Because of rising temperatures, the total quantity of the snow cover has dropped in our region as well as the number of days with snowfall. Figure 49 shows the total amount of snow for the winter season (December, Januaryand February) measured at meteorological station Sokolac. Still, greater deviations occur at extreme heights with snow cover as well as in the distribution of snowfall. There is a trend of reduced snowfall in December and January and of frequent snowfall in February. Also, low-snow years are not uncommon, but neither arehigh-snow years (such as, for example 2012). Tourism should adjust to the trend of increasing snow cover toward winter end and use the advantages of years with extreme snowfall, i.e., extend the skiing season to the end of winter and beginning of spring in case of large snowfall.

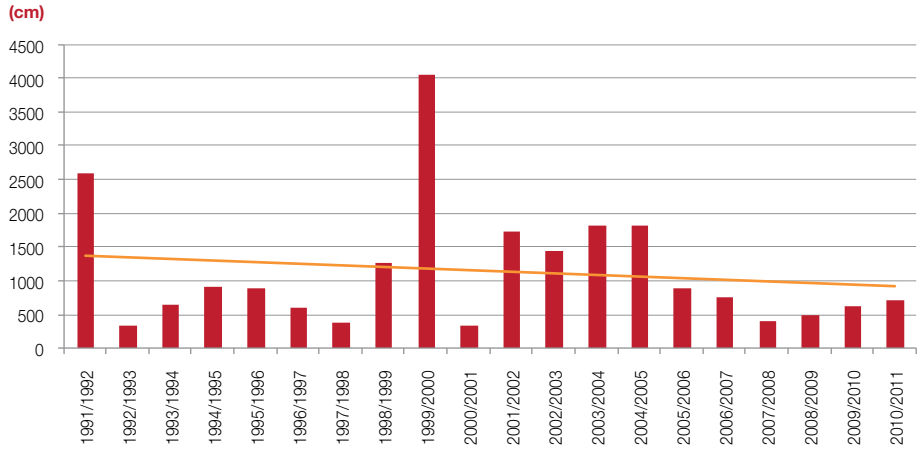


Figure 49:
Total amount of snow for the winter season (December-February) – meteorological station Sokolac
(Source: Republic Hydrometeorological Service of RS –RHMS RS)

2.4.7.2 Number of tourist overnight stays

The number of tourist overnight stays in December 2011 was 88,749, which is by 7.2% lower than in November 2011 and by 10. 8% higher compared to December 2010. The actual number of visits was probably higher than recorded by official statistics. In 2011, average overnight stays of domestic tourists amounted to 2.3 nights and of foreign to 2.1 nights (Agency for Statistics of BiH, Tourism 2011).

In 2007, the ratio of tourist consumption in BiH to the GDPwas 5.3%, to export it was 18.8%, while the ratio to export of services was 59.9% (Turkish Development Bank, 2010).Tourism is recognized as a sector with an incredible potential for improving the country's economy, since there are unused tourist potentials in the country. According to forecasts of the World Tourist Organization[13] , BiH is one of the leading countries in the world in terms of expected growth of tourism to 2015.

There are no official data on the total number of employees in thetourism sector or on profit made through tourism. There is only available data on profits in hotels and restaurants. In 2008, profit from accommodation and restaurant servicesin BiH amountedto 69.4 million, of which 62% is profit from hotels and motels, 21% is profit from restaurant services and 17% is profit made through other services (cafes, bars). In the hotel and restaurant sector, there is a total of 4.7% employees.

BiH attracts a large number of tourists because of the activities it has to offer, such as rafting, kayaking, hiking, skiing, paragliding, riding and mountain biking. Protected areasgenerally offer numerous advantages for the development of tourism. Tourist activities in protected areas are not recommended because protected areas are not suited to such activities. According to the sustainability principle, development of tourism in protected areas should be a priority.

In the period from January to December 2011, the number of tourists increased by 4.5% compared to the same time period in 2010. The number of overnight stays increased by 6.2% and a total number of 1,504,205 overnight stays (Figure 50) was recorded.

13 UNWTO - United Nations World Tourism Organization

Figure 50: Number of tourist overnight stays (Source: Agency for Statistics of BiH, Release, Tourism 2011: Tourism Statistics for December 2011)

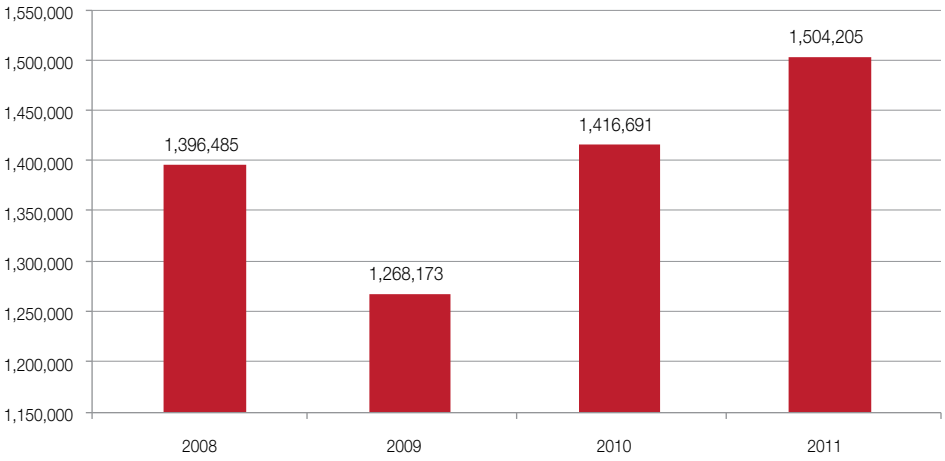
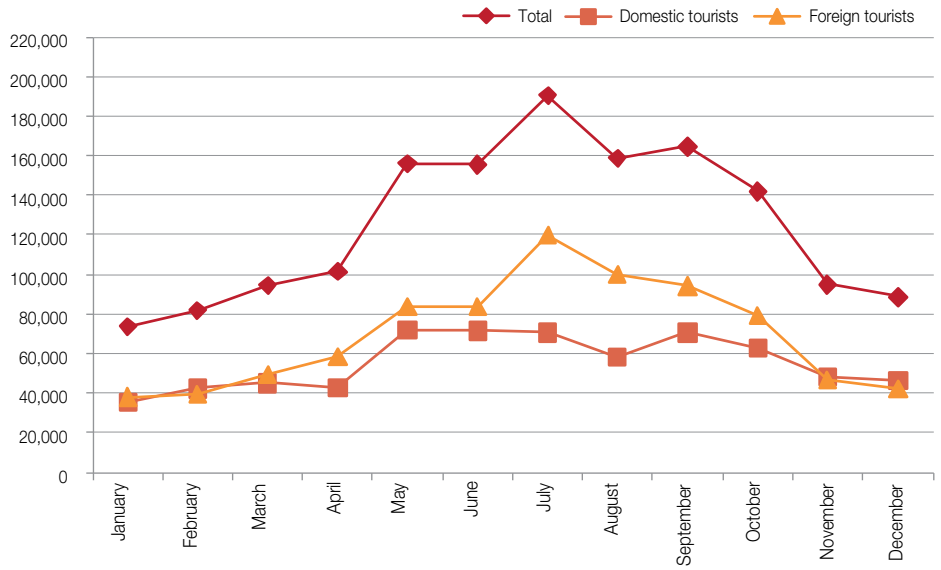
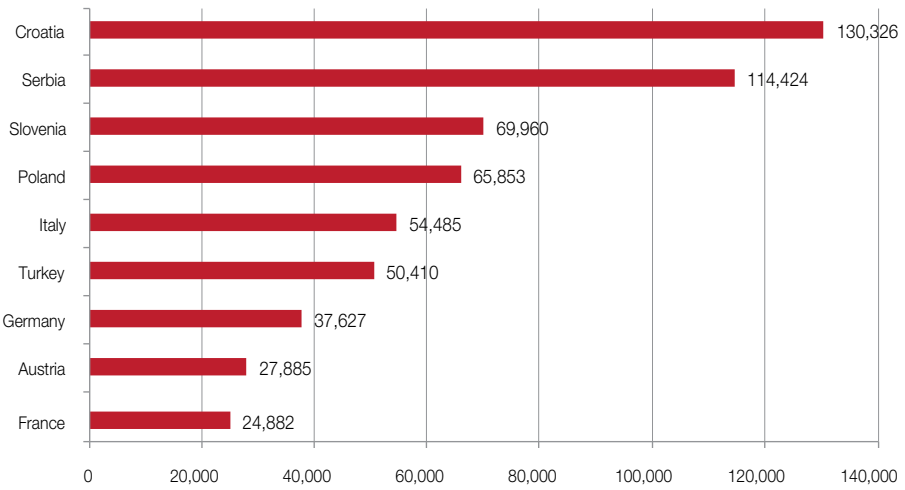


Figure 51: Number of tourist overnight stays by months (Source: Agency for Statistics of BiH, Release, Tourism 2011: Tourism Statistics for December 2011)



In terms of the share of foreign tourists in overnight stays, out of 79.40%, 19.87% came from Serbia, 22.63% from Croatia, 12.15% from Slovenia, 6.53% from Germany, 9.46% from Italy and 8.75% from Turkey. The rest of tourists (20.6%) came from other countries (Figure 52).

Figure 52: Number of overnight stays of tourists by country of residence (Source: Agency for Statistics of BiH, Release, Tourism 2011: Tourism Statistics for December 2011



2.4.7.3 Conclusions and recommendations

Globalization of the tourist industry increases the number ofdirectly and indirectly employed people, but it also has a negative effect on the environment. BiH does not have statistical indicators of tourist activities in the country. It is believed that the number of tourists is higher than what is shown in available official data.

Official institutions in charge of tourist activities must invest enormous efforts with the aim to improve and update statistical data on tourism in line with international procedures and standards. Most data are missing because no records are keptby institutions that are directly or indirectly related to tourism.

Missing data for the sector of tourism and recreation in BiH are:

- Amount of waste generateddue to tourism;
- Number of visitors in protected areas;
- Urban waste generation due to tourism;
- Ecological efficiency of tourism;
- Tourist visits and electricity consumption in accommodation facilities;
- Total number of employees in the tourism sector or revenues generated from tourism;
- Effect of climate change on tourism in BiH.

Eco-tourism is a part of the BiH tourism sector with a large development potential. Eco-tourism is a type of tourism based on natural wealth, which has lately gained importance. However, without statistical indicators about the number of visitors in protected areas, eco-villages etc. it is hard to determine trends in eco-tourism development, needs for these kind of services and set long-term development goals. Responsible tourist waste disposal is still an open issue. Waste produced by touristic activities is similar to communal waste. Assessment of tourist waste quantities is important for an efficient planning of its disposal. It is necessary to improve registers of touristic visits and overnight stays in order to enable precise estimates of tourist waste. With the aim to improve the state of the tourism sector and reduce negative effects onthe environment that this sector can have, it is necessary to take certain steps. Some of the recommendations related to the environmental aspect of tourism are:

- Record keepingby institutions that are directly or indirectly related to tourism;
- Keeping records on visits to protected areas;
- Keeping records on the number of motor vehicles in protected zones in order to calculate the level of air pollution;
- Calculation of the capacity of protected areas – maximum number of visitors that can access protected areas, without endangering them;
- Updating all information in cooperation with statistical institutes;
- Promotion of alternative forms of tourism (eco-tourism, rural tourism, health tourism) that are available to the average citizen;
- Regular training of tourism employees regarding environmentally-acceptable tourism practices, as well as keeping tourist informed about protecting the environment, especially concerning forest fires.
- Investing into upright signs for pedestrians and bikers in natural areas;
- Strengthening of the role of non-governmental organizations and civil societies in the management and development of eco-tourism in protected areas through projects and programs.

2.4.8 SPATIAL AND URBAN PLANNING

There is no responsible body for spatial planning at the level of BiH. However, the FBiH, the RS and the BD have authorities for developing and implementing legal regulations in this sector, as well as adopted laws that regulate the issues of spatial and urban planning in these territories[14] . Types of plans set out in these laws are:

14 Law on Spatial Planning and Land Use in the FBiH (Official Gazette of FBiH 02/06), Law on Spatial Planning and

Table 17: Overview of spatial and urban development plans prescribed by the laws of the FBiH, the RS and the BD

FBiH ***** Spatial plans are adopted for a period of 20 years	**Spatial Plan** ▪ Spatial Plan of FBiH – sets out long-term goals in accordance with planned development; it is the last adoption phase now, ▪ Cantonal Spatial Plan – prepared on the basis of the Spatial Plan of the FBiH, establishes the basic rules, goals of spatial planning for all the areas of the Canton (urban and rural), designated land use, environmental protection measures and construction use of buildings, ▪ Spatial Plan for Significant Areas for FBiH – it is prepared for an "area of significance for the FBiH", first of all for: spaces for construction of large hydro-energy facilities, areas for water supply, international traffic routes, etc. ▪ Cantonal Spatial Plan for Significant Areas – it is done for the area with protected natural resources, thermal, mineral and other sources of water, forest and agricultural land and areas for recreation ▪ Municipal Spatial Plans (except for the Municipalities in Sarajevo and Mostar to which urban plans are related to) – it is prepared on the basis and in accordance with Cantonal Spatial Plan)
	Urban Plan It is prepared on the basis of Cantonal and Municipal Spatial Plans. It defines the use of land and purpose, protection of cultural heritage, environmental protection measures, protective zones, etc.
	Detailed Regulation Plan It defines detailed land use, requirements for construction, manner of preparation of construction land (provisions for infrastructure, such as roads, telecommunication, water, sewage, etc.) Detailed plans are: ▪ Regulation Plans – which are prepared on the basis of Urban Plans and are used to regulate city area planning, at which intensive construction is envisaged ▪ Urban Planning Projects – these are prepared for construction works that are performed in parts of city areas that are built as a one part or are only partly built
RS * Strategies are adopted for 10 years, while Spatial Planning and Urban Planning documents are adopted for 20 years	**Strategy of Spatial Development of the RS and Strategy of Spatial Development of the Area with Specific Use** Strategic and development documents that define goals and principles of spatial development: ▪ Spatial Plan of RS – defines long-term goals and spatial development measures. It also defines policies of land use and development of all functions and activities in its territory (instructions for development of agriculture, forestry, usage of natural resources, etc.) ▪ Spatial Plan for an Area with Specific Use– main spatial organization of an area, measurements for use, regulation and protection of an area, environmental protection, etc. ▪ Municipal Spatial Plan – main land use, city and village system of settlements and their connection, expansion of city areas, infrastructure, public bulidings, environmental protection, etc.
	Urban Plan It regulates in detail instructions given in the Municipal Spatial Plans, first of all: detailed land use, it sets out construction, agricultural and forest spaces, construction requirements, land and protected areas, transport, water, energy and utility infrastructure, etc.
	Zoning Plan It defines specific land use and designing and building of new, as well as reconstruction of old, buildings
	Regulation Plan This plan defines use of lots, purpose and size of buildings, population density in the cities and regulation, construction borders, dimensions of goods, infrastructure, etc.
	Urban Planning Projects Urban Planning Projects describe in detail usage of areas, size and use of buildings, design of buildings, plan of development and leveling, spatial planning requirements, concept solution for transport, utility and energy infrastructure, concept solutions for planned buildings.
	Parceling Plan This Plan contains a plan of spatial organization, plan of transport, infrastructural plan for energy, water and communications, size, shape and location of lots, access to them, etc.
BD * Spatial Development Strategy is adopted for the period of 20 years; Spatial and Urban Plans are adopted for the period of 10 to 15 years.	**Spatial Development Strategy** It defines long-term spatial planning goals. It consists of two principles and goals of development of space and areas, organization of the area, use and protection of the area, etc.
	Spatial Plan The same purpose and application as in the FBiH and the RS. .
	Urban Plan The same purpose and application as in the FBiH and the RS.
	Detailed Implementation Plan ▪ Zoning Plan – it defines the area use and requirements for construction, as well as reconstruction of the existing buildings. ▪ Regulation Plan – the same purpose and application as in the FBiH and the RS. ▪ Urban Planning Projects - the same purpose and application as in the FBiH and the RS. ▪ Parceling Plan – the plan is adopted for city areas, where new construction may be approved. It establishes: use of the area, regulation and construction borders, city and technical requirements for project preparation, dimensions of the land lots for construction, data on the status of ownership over the land and such.

The RS has adopted a Spatial Plan (Spatial Plan of RS 2008-2015), while adoption of the same document in the FBiH is still ongoing. Having in mind that these strategic documents govern the use and protection of land, the lack of such a plan in the FBiH is a major problem. Four, out of ten cantons, in the FBiH have prepared and adopted spatial plans.

Data on the number of spatial and urban development plans in the FBiH are not available. In late 2000, 22 municipalities in the RS had no spatial or urban development plan, 32 municipalities had no spatial plan, and 30 municipalities had no urban development plan. The situation has not improved significantly since 2000, judging by new data showing that almost 80% of municipalities in the RS have no planning documents or have outdated planning documents that are not in line with the existing Spatial Plan.

Illegal construction is still a major problem in the whole of BiH, which is a result of the lack of planning and implementation mechanismas well as of significant socio-economic factors and displacement of people during the war. Official statistics concerning these matters is scarce and sporadic. However, existing information confirm the strength and importance of the pressures that this phenomenon puts on land use and other resources.

The role and function of spatial and urban development plans is to provide development guidelines and environmental protection is a significant part of this process. Environmental protection is achieved by defining principles and goals for development and use of land and by defining construction rules in planning documents. The lack of planning documents seriously affects the environment, as locations and types of development are not selected through a planning process, but randomly. The lack of planning documents at all levels of government in BiH creates additional pressure on natural resources and enables illegal construction and uncontrolled development. Further, there is neither control over areas of polluting activities nor over activities that use natural resources, generate waste and disturb wildlife nor over activities in areas sensitive to pollution.

The number of illegally constructed buildings in the area of the Sarajevo Canton is estimated at 26,000, according to data of the Sarajevo Canton Ministry of Spatial Planning and Environmental Protection. It is estimated that there arearound 3,000 illegally constructed buildings in the Herzegovina-Neretva Canton, whereof most are located in the City of Mostar. Data for the RS show that there are between 74,000 and 86,000 illegally constructed buildings (Nezavisne Novine, 2011). Illegal construction causes many problems, most of which primarily affect the environment such as: inadequate land use, landslides,forest harvesting, inadequate waste disposal, etc.

2.4.8.1 Urban development

The FBiH is administratively divided into 10 cantons that are further divided into municipalities. In the FBiH, there are 79 municipalities, while the RS is administratively divided into 62 municipalities. The City of Brčko is a separate administrative unit – a District. The largest cities in BiH are: Sarajevo, Banja Luka, Tuzla, Zenica and Mostar. Population density in BiH was 73.69% citizen/ km^2in 2008. The urban population for the same year was estimated at 1,789,958 or 47.44%, while the annual urban population growth was 1.09%. The rural population in BiH, in 2008, was estimated at 1.983,141, i.e. 52.56%. In 2008, therural population growth amounted to -1.24 (World Bank, 2011).

There are no available accurate data on the number of households in BiH, only estimates on the basis of theSurvey of Household Expenditure and the Household Living Standard Survey that were conducted by the Agency for Statistics of BiH. According to this source of data, it is estimated that there was close to 1,504,613 households in BiH in 2007 (Table 18), with an average household size of 3.27 members.

Table 18: Households in BiH (Source: Agency for Statistics of BiH, Household expenditure Survey, 2007)

	BiH	FBiH	RS	BD
Number of households in BiH	1,504,613	657,984	374,715	21,914
Number of households in BiH (%)	100%	62.4%	35.5%	2.1%

Some other indicators significant for urban development, according to the World Bank (2011) data, are:

- 52.3% of roads are paved
- 34.7 per 100 people have internet access, butonly 4.99 per 100 people have fixed subscription to broadband internet
- 84 per 100 people have subscription to mobile telephones
- 27.3per 100 people have a telephone line

2.4.8.2 Housing conditions

Out of around 1.1 million housing units registered in BiH in the 1991 census, close to 453,000 housing units or 42% of the pre-war housing stock were destroyed or damaged during the 1992-1995 war, according to data of the Ministry for Human Rights and Refugees in BiH. Up tonow, 317,000 housing units, i.e., 68% have been reconstructed. According to data gathered from the field, around 150,000 housing units in BiH have not been renewed, which is actually 32% of total damaged or destroyed housing stock. Most of these housing units have suffered massive destruction, almost to the point of complete devastation (Ministry for Human Rights and Refugees, 2010).

In order to complete the return process of displaced people, another 45,000 housing units must be renewed, which is close to one third of the remaining destroyed or damaged housing units in BiH. However, data show that the total number of destroyed and damaged housing units includes 450 apartment buildings in 64 municipalities with close to 2,500 apartments that have not been fully renewed or do not satisfy basic living conditions.

Housing standard is estimated by comparing the housing stock structure in terms of the number of rooms with the number of household members. Almost ¾ of households in BiH live in separate houses and less than 1/5 in apartment buildings The percentage of "other" types of buildings ("skyscrapers/block house/duplex apartment", "pre-fabricated houses", "other") is low and only 2.0% of households live in such buildings, while 7.4% households live in one part of the house. In terms of geographic areas, it is evident that the highest percentage of households lives in separate houses (Agency for Statistics of BiH, Household Expenditure Survey, 2007).

Table 19: Main housing units by type of building and geographic area, 2007 (values in thousands and structure in percentages) (Source: Agency for Statistics of BiH, Household Spending Survey 2007)

Geographic areas	Type of construction of housing unit (in thousands)				
	Apartment Building	Separate house	Part of house	Other	Total (=100%)
FBiH	22.4	66.0	9.7	2.0	658
RS	15.2	79.1	3.6	2.0	375
BD	(8.8)	86.7	:	:	22
BiH	19.6	71.1	7.4	2.0	1,055
Geographic area	**Apartment building**	**Separate house**	**Part of house**	**Other**	**Total**
FBiH	71.4	57.9	81.5	62.3	62.4
RS	27.7	39.5	17.5	36.8	35.5
BD	(0.9)	2.5	:	:	2.1
BiH (=100%)	206	750	78	21	1,055

Most households (41.7%) live in a housing unit with three rooms, followed by households living in housing units with four rooms (23.5%). There is a low percentage of households living in oneroom or in a housing unit with more than five rooms.

The average surface area of the main housing unit in BiH is 73 m^2. This indicator, according to the 1991 Census, was 60.45 m^2. Apart from single households, single parents and couples without children live in relatively small housing units. Extended family households or couples with three or more children live in the largest housing units.

Number of rooms	Geographic area							
	FBiH		RS		BD BiH		BiH	
	Structure %	Average surface m^2	Structure %	Average surface m^2	Structure %	Average surface m^2	Structure %	Average surface m^2
1	1.8	37.94	1.9	28.2	:	:	1.8	34.57
2	15.8	49.65	19.0	46.48	31.0	52.76	17.3	48.51
3	40.4	63.96	44.1	63.15	38.5	81.97	41.7	64.0
4	24.0	83.98	23.1	84.31	15.7	97.71	23.5	84.29
5	10.9	101.48	7.0	102.16	7.2	116.7	9.5	101.90
6 and more	7.1	123.15	5.0	130.29	:	:	6.3	125.49
Total (=100%)	**657**	**74.32**	**374**	**70.25**	**22**	**79.44**	**1053**	**72.98**

Table 20: The number of rooms and average surface of the main housing units (values in thousands and structure in percentages) (Source: Agency for Statistics of BiH, Household ExpenditureSurvey 2007)

Though more than ten years have passed since the war ended,displaced persons in BiH still live in various types of accommodation. These temporary solutions are mostly collective accommodations and vary from collective centers, adapted former schools, culture centers, military barracks, etc. to rentedbuildings for collective accommodation such as hotels or company warehouses. The housing standard of refugees and displaced persons in those buildings is low. It is estimated that around 3,000 families, that is, 8,500 persons still live in various types of collective accommodations (Ministry for Human Rights and Refugees, 2010).

2.4.8.3 Conclusions and recommendations

Agency for Statistics of BiH, Federal Office of Statistics and Republika Srpska Institute of Statistics are the most relevant sources of data. Having in mind that BiH is yet to conduct the population census, the existing data from these sources are outdated, particularly those related to demography, households and housing stock. FBiH and RS ministries in charge of spatial planning and urban planning must make sure that data on the number and type of plans, as well as data on illegal construction are available. For the purpose of developing this State of Environment Report of BiH, data for this Chapter are taken from secondary, more updated sources. However, after the census is conducted, the state and entity statistics will be the most relevant source of data.

2.5 WASTE MANAGEMENT

Waste is generated as a consequence of human activities and it represents the loss of materials and energy. Increase of waste generation is connected to economic growth and increase of consumption. Waste and the manner in which it is managed cause emissions into water, air and soil, which can impact human health and the environment. The extent of that impact depends on the quantity and characteristics of waste, as well as on the manner in which it is handled. In order to decrease pressures on the environment, the society should provide adequate collection, transport and recycling, which requires extensive funding.

2.5.1 MUNICIPAL WASTE

Municipal solid waste includes household waste as well as other similar types of waste generated by industry and service activities. Municipal waste is usually disposed ofat landfills and dumping sites. In most areas covered with waste collection services, there is no organized separation of waste at source, as capacities for separation and recycling are still insufficient in BiH.

Data collection, monitoring and reporting in the waste sector lags behind other sectors such as the air and water sectors. Transboundary reporting activitiesare mainly based on obligations from several international conventions and agreements. Available data on industrial and municipal waste, including hazardous waste, are based on estimates that are either incomplete or unreliable. It is expected that legislation developed in line with related EU Directives will facilitatethe collection of comprehensive waste data over the next few years

The most recent efforts in collecting data on industrial and municipal waste were undertaken by the Agency for Statistics of BiH in 2008. The Agency introduced waste statistics in accordance with the Law on Statistics and EU requirements, laws on waste management in the FBiH, the RS and the BD and the waste catalogue. The Agency processes data obtainedthrough statistical surveysentitled “Annual Report on Collected Municipal Waste” and “Annual Report on Disposed Waste” (KOM 6aS i KOM 6aD). These Reports are to be submitted by public utility companies and other companies dealing with collection and disposal of waste as well as by operators of landfills and waste disposal sites.

Data on waste statistics for the period 2003 – 2007 is based on the results of relevant studies and estimates.

2.5.1.1 Municipal waste generation

The quantity of municipal waste generated per capita in BiH is increasing. This trend is expected to continue, bearing in mind the foreseen development of tourism and economy, and due to changes inconsumption patterns. The share of population covered with organized waste collection and disposal to landfills amounts to 68%. There is no waste incineration or MBT plant (mechanical and biological treatment) operating in BiH, hence landfilling is still the main option for municipal waste management.

In recent years, the legislation of developed countries follows an intensive development of the integrated waste management concept, with an emphasis on reducing the amounts of disposed waste. EU directives on waste require from the member states to decrease waste generation, while increasing recycling and waste treatment practices. Municipal waste generation data (indicator CSI 016) is essential information for adequate waste managementplanning. In BiH, it is necessary to define more precisely the quantities of generated municipal waste, in order to avoid potential problems in developing waste management systems at all levels.

Table 21: Quantity of generated and disposed municipal waste in BiH in 2010 (Source: Agency for Statistics of BiH, First Release, Environment Statistics – Public MunicipalTransportation and Disposal of Waste in 2010)

Waste data	Waste amount(t/ year)
Generated municipal waste	1,275,918
Quantity of waste collected by utility companies	1,057,768
Disposed waste	1,102,032

Available data on municipal waste generation in BiH in the period from 2008 to 2010 is shown in Table 22 and Figure 53.

Year	Generated municipal waste (t/year)	Annual waste generation per capita (kg/capita/year)	Daily waste generation per capita (kg/capita/day)
2008	1,367,097	356	0.98
2009	1,493,060	389	1.08
2010	1,275,918	332	0.9

Table 22: Generation of municipal waste in BiH in the period of 2008 - 2010 (Source: Agency for Statistics of BiH, First Release, Environment Statistics – Public Municipal Transportation and Disposal of Waste in 2008, 2009 and 2010)

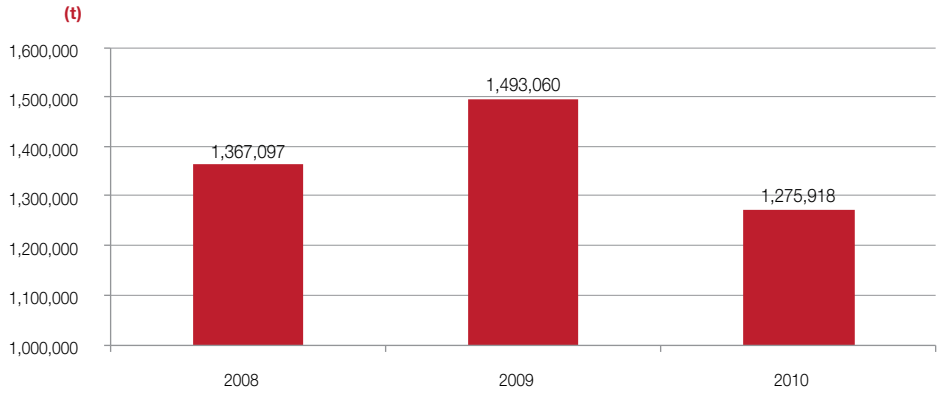


Figure 53: Municipal waste generation in BiH (Source: Agency for Statistics of BiH, Release, Environment Statistics – Public MunicipalTransportation and Disposal of Waste in 2008, 2009 and 2010)

According to the estimate of the Agency for Statistics of BiH from 2011, the average generated quantity of municipal waste in the country amounted to 396 kg per capita 2010 (which is 1,521,898 tons). However, in January 2013 the Agency published corrected data, which were significantly lower than the ones previously published. According to these data, the estimated waste generation in 2010 amounted to 1,275,918 tons (332 kg per capita). The correction of the release by the Agency of Statistics of BiH is a result of the correction by the Federal Agency for Statistics. The indicator of average municipal waste generation was determined based on the total amount of generated municipal waste and the total population sizefor the reference year(Figure54 – period2008-2010). However, other available indicative information on generated municipal waste provides different figures. The Federal Environmental Protection Strategy 2008 – 2018 estimated an average of 269 kg per capita in 2007 (this data is accepted in the State of the Environment Report of FBiH for 2010), while the Federal Waste Management Plan 2012 – 2017 provided an estimate of 316 kg in 2009.

Figure 54 shows the average municipal waste generation per capita for the period 2003 – 2010. Data for the period of 2003 – 2008 arebased on the results of relevant studies and estimates.

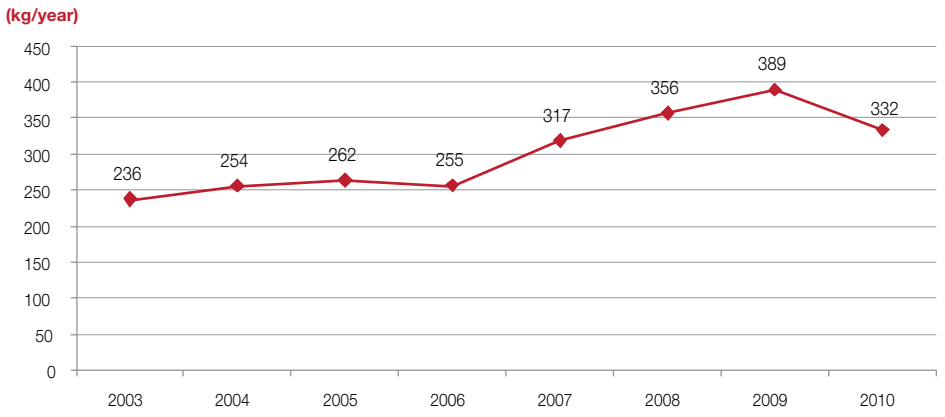


Figure 54: Estimated average quantity of produced municipal waste per capita in BIH (Source: (i) For the period of 2003-2007 – European Environment Agency, CSI 016 Municipal waste generation „Fact sheet – West Balkan region/waste theme" 2010, (ii) for the period of 2008 – 2010 – Agency for Statistics of BiH, First Release, Environment Statistics – Public Municipal Transportation and Disposal of Waste in 2008, 2009 and 2010).

Release, Environment Statistics – Public Municipal Transportation and Disposal of Waste in 2008, 2009 and 2010).

Municipal waste generation in BiH has been increasing since 2003. Considering that the average municipal waste generation per capita in the Western Balkans (Albania, Croatia, Serbia) ranges between 334 and 367 kg, the initally estimated annual quantity in BiH, in the amount of 396 kg per capita, was above average. In 2010, Albania reported that the annual waste generation per capita amounted to 334 kg (Albanian Agency of Environment and Forestry), Serbia reported 360 kg per capita (Serbian Environmental protection Agency), while Croatia reported 367 kg per capita (Croatian Environment Agency). If the GDP and consumption patterns in the Western Balkans countries are compared, the corrected data on annual quantity of generated municipal waste in BiH of 332 kg per capita is more realistic. On the other side, when compared to the EU 27 average that amounts to more than 522 kg (EEA, September 2010), the figures for BiH are significantly lower, which is mainly a result of lower GDP and distinct consumption patterns

Quality of data

According to data of the Agency for Statistics, only a few business entities submitted data on waste quantities obtained by measurement. Most estimates have not been verified by systematicweighing, since only a limited number of landfills in BiHhave weighing equipment. As fordatacollection, waste utility companies have not started applying a uniform methodology or definition of waste. Lack of precision in determining the quantity of municipal waste could cause difficulties when planning the waste management system at lower levels.

Improvement of accuracy of municipal waste data and establishing a reliable data collection and reporting system are some of the key challenges. The first precondition for achieving this goal is installation of weighing equipment at a larger number of landfills. The second precondition is full implementation of uniform practices fordatacollection. Data on municipal waste can only be improved if these two preconditions are fulfilled

2.5.1.2 Collection of municipal waste and service coverage

Municipal waste collection systems in BiH, in urban and partly in rural areas, are based on weekly house-to-house collection of household waste. In general, there is no waste pre-selection by households. Waste collection is mainly carried out by utility companies (which are fully or partly state-owned) and, to a lesser extent, by private companies contracted by municipalities. Waste collection charges are, in some cases, included in a joint bill together with water and sewage charges, while in other cases they are separate. In specificmunicipalities, waste collection and transport is organized by the same company that operates the landfill.

In many municipalities, collection of bulky waste is completely unregulated and such waste is usually disposed of at local dump sites on the basis of individual agreements, as well as at many other inadequate locations such as fields, along roads and river banks. Consequently, a large quantity of discarded furniture, car parts, old refrigerators and many other types of waste is found across the country. Waste disposal charges vary between cities, but generally they are insufficient. Municipal utility companies also collect medical waste and certain other types of industrial waste, which they then dispose of at local landfills.

The Mediterranean Commission for Sustainable Development (MCDS) has defined an indicator of waste collection service coverage (MCSD-109-R). Due to a significant problem of illegal disposal in developing countries, as well as in underdeveloped regions of Europe, monitoring of this indicator has been introduced, as it is considered that coverage with collection and waste disposal service is a basic civilization feature, just like access to water supply and sewage systems (FMOIT, 2010). In BiH, coverage by these services varies significantly. According to the latest data of the Agency for Statistics of BiH (2011), the average level of coverage with waste collection and disposal services amounted to 68% in 2010.

2.5.1.3 Municipal waste treatment

There is no operating waste incineration or MBT (mechanical and biological treatment of waste) plant in BiH. Recyclables separated from the mixed municipal waste amount to less than 5% of the total municipal waste mass, while at least 95% of the collected mixed municipal waste is disposed of mostly at non-sanitary disposal sites (an estimate from the Environmental Protection Strategy of FBiH 2008-2018).

The main option for disposal of municipal waste is still landfilling(Table 21), which is inadequate in most cases.

2.5.1.4 Number of registered municipal waste landfills

Municipal waste landfills are mainly of an open type and located in areas that are not regulated by the principles of sanitary landfilling, i.e., there are no protection systems forsoil, water and air preservation. At a great majority of municipal waste landfills, there is no control ofleakage waters and gases. Waste is occasionally covered with inert materials using excavators.Figure 55 shows the number of waste landfills that operated in 2010.

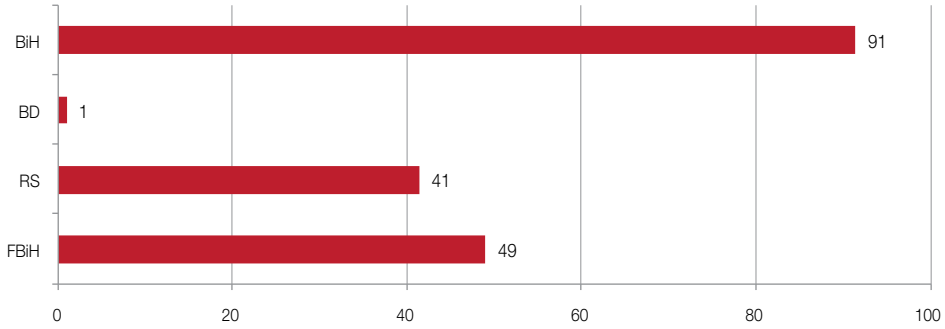


Figure 55:
Number of registered waste disposal sites in 2010 (Source: (i) Federal Office of Statistics, First Release, Collected and Disposed Municipal Solid Waste in 2010, (ii) RS Institute of Statistics, Annual Release, Environment Statistics – Generated, Collected and Disposed Waste in 2010, and (iii) Development Strategy of BD 2008-2017)

A certain number of previously used municipal waste disposal sites are not operating now, and given thatabandoned disposal sites have not been rehabilitated and closed properly, they can be considered as illegal dumpsites.

Only some landfills can be categorized as controlled landfills, of whichthe followingare located in the FBiH: Uborak in Mostar, Tešanj, Krupa (Krivodol). These waste disposal sites partly use multi-barrier isolation systems and systems for collection and drainage of leakage waters. These sites are fenced, supervised and have a management. Only Sarajevo, Zenica and Tuzla in the FBiH and Banja Luka and Bijeljina in the RS have constructed sanitary landfills. In Smiljevići landfill (Sarajevo Canton), a wastewater treatment facility has beenunder trial and testing for a while now.

Most existing waste disposal sites (excluding the previously mentioned sanitary landfills) receive different types of hazardous and non-hazardous waste from households, including bulky waste, medical waste, industrial waste, etc. There is no primary waste selection by type and origin and no separation of biodegradable waste. Waste of animal origin is disposed of at existing waste disposal sites, but also at illegal dumpsites. It is necessary to urgently continue with the construction of regional sanitary landfills in order to initiate the rehabilitation and closure of existing municipal waste disposal sites.

2.5.1.5 Number of illegal municipal waste landfills

Recently, 10 to 15 % of illegal ('wild') dumpsites have been closed throughout BiH, though it is estimated that around 1,100dumpsites are still in use. These figures are often emphasized in government documents. There is no uniformregister of illegal dumpsites. According to data from the Environmental Protection Fund of RS, there are250 registered illegal dumpsites in theRS. In the FBiH, there are approximately 340 illegal dumpsites (Federal Waste Management

Plan 2012 – 2017). However, this number could actually be much higher; given that many such sites have not been registered. Sometimes, waste utility companies remove smalldumpsites, but, after that, other dumpsites “appear” at other locations

2.5.1.6 Degree of regional sanitary landfills establishment

In the Waste Management Strategy, prepared within the EU PHARE Project (AEA Technology, 2000), which has not been officially adopted in the FBiH, the proposed concept of regional municipal waste management foresees, as a form of final waste management, construction of regional sanitary landfills. The World Bank has supported this concept through its loan for regional landfillsconstruction. The proposed regional concept is accepted in the Environmental Protection Strategy of FBiH 2008 – 2018. However, practice until now has shown that the concept of regional waste management is primarily focused on construction of regional landfills, instead of perceiving the broad concept of waste handling.

Until now, regional landfills have been constructed only in Sarajevo (Smiljevići landfill) and Zenica (Mošćanica landfill) in the FBiH, as well as in Banja Luka (Ramići landfill) and Bijeljina (Brijesnica landfill) in the RS. Even though significant funds of the World Bank were used in the previous period intended for establishment of a regional landfill in the Tuzla Canton, it was not constructed due to the obvious NIMBY syndrome (“Not in my back yard”). The same scenario occurred with the proposed sites in Bihać and Grude. For the purpose of waste disposal in the Municipality of Tuzla, the old landfill “Desetine” was only adapted and now meets all the requirements of sanitary disposal. This landfill is a municipal and not a regional site. In September 2010, a recycling plant was opened at this landfill. At the location near the old landfill “Uborak” in Mostar, a new regional sanitary landfill is being constructed. Construction of the landfill, which has entered the final phase, was financed by the World Bank funds. It is expected to be operational by the end of 2012.

Municipalities of Kupres, Tomislavgrad and Prozor – Rama have signed an agreement and are currently in the phase of site selection and feasibility study preparation for a regional sanitary landfill. Three municipalities in Canton 10 (Glamoč, Livno and Bosansko Grahovo) have also signed an agreement on establishing a public waste management company. Activities related to theselection of a site and feasibility study preparation are underway now. Municipalities in the Una-Sana Canton have signed an inter-municipal agreement for continuation of activities on establishing a regional sanitary landfill in region Grabež-Drenovo Tijesno, but so far, none of these further activities have been undertaken. Four municipalities in the region of Gornji Vrbas (Gornji and Donji Vakuf, Jajce and Bugojno) have signed an agreement on waste management in the region, with site selection and feasibility study preparation being underway.

Even though, in the last two years, there was an initiative tobuild a common regional landfill for the region of Gornje Podrinje (in the RS), including three municipalities in the FBiH (Goražde, Foča – Ustikolina and Pale-Prača), and a principle agreement was reached, representatives of the RS Ministry excluded this possibility. This is why the three aforementioned municipalities in the FBiH decided to independently undertake further activities to establish a sanitary landfill.

Preparation for the regional sanitary landfill construction in Zvornik has reached the final phase. Municipalities of Zvornik, Osmaci, Milići, Srebrenica, Bratunac, Vlasenica, Šekovići (RS), as well as Kalesija and Sapna (FBiH) will dispose of municipal waste at this landfill. In 2005, negotiations relating to the regional landfill construction in Doboj were initiated, but, so far, results have not been achieved. The regional landfill in Doboj would benefit the following municipalities: Doboj, Modriča, Derventa, Brod, Petrovo, Teslić, Vukosavlje (RS) as well as Doboj South, Doboj East, Tešanj, Usora, Odžak and Maglaj (FBiH). A new process of site selection and feasibility study preparation is expected to start in 2012. Municipalities of Šamac, Orašje, Gradačac, Srebrenik, Gračanica, Donji Žabar and Pelagićevo have started negotiations on establishing a regional landfill; however, this has not progressed any further. Representatives of the town of East Sarajevo and six urban municipalities have achieved an agreement on preparation ofstudy for selection of the best potential site for a regional sanitary landfill in this area.

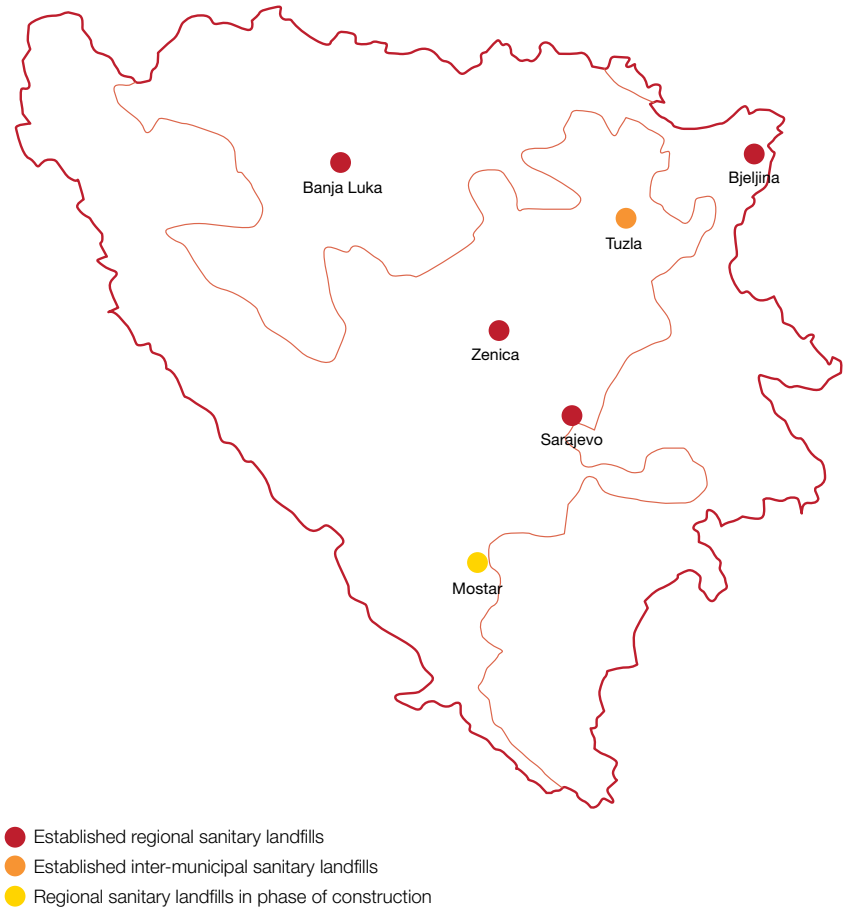


Figure 56:
Establishment of regional sanitary landfills in BiH

In the second phase of the World Bank project (which started in November 2008 and is currently underway), US$ 40 million of loan to BiH will be ensured for the improvement of infrastructure and waste management services in the country. This project is expected to end in February 2014.

The biggest challenge in addressing this issue is selection of regional landfill sites and obtaining consents from the local population, as the NIMBY effect is still very much present

2.5.1.7 Generation and recycling of packaging waste

There are no reliable statistical data on the generation of packaging waste in BiH. This is mainly caused by the lack of regular and accurate statistics for this indicator. One of the reasons is the lack of primary legislation on packaging and packaging waste. The system of packaging and packaging waste management has not been introduced yet in BiH; the preconditions will be provided by implementation of identical functional regulations in the FBiH and the RS.

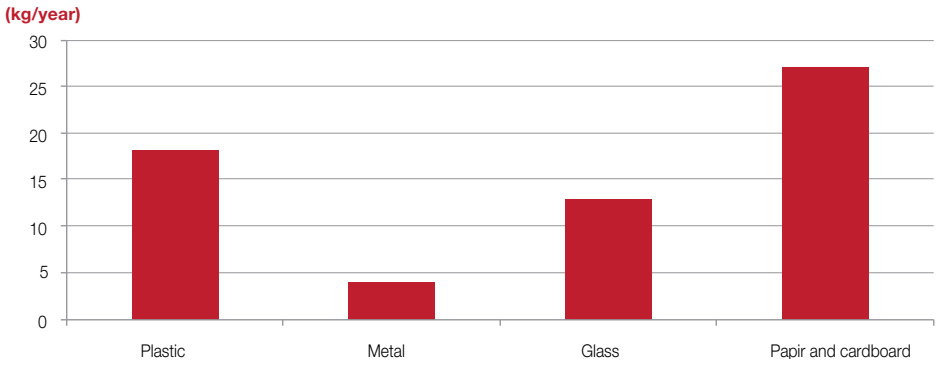
However, rough estimates may be given regarding packaging waste generation. Based on the analysis results of morphological composition of waste disposed at regional landfill “Moščanica” (Zenica, 2010), landfill “Uborak” (Mostar, 2007), landfills in the Sarajevo Canton and Municipality of Tuzla, and taking into account the overall estimated annual quantities of municipal waste in BiH, the estimated annual generated quantity of packaging waste at the level of BiH(Table 23).

Table 23: Estimated generation of packaging waste in BiH, 2010

Packaging waste types	Generatedquantity (t/year)
Plastic packaging (PET and plastic of high-density level)	70,127
Metal packaging (aluminum and other)	15,420
Glass packaging	49,878
Paper and cardboard	104,548
Total:	**239,972**

Based on the aforementioned analysis, annual packaging waste quantity amounts to 239.972 tons, which is equal to the annual quantity of 62 kg per capita.Figure 57shows estimated average annual quantity of generated packaging waste in BiH per capita, by packaging type.

Figure 57: Estimated annual generation of packaging waste in BiH per capita



When compared with developed countries, the present scope of recycling in BiH is low. Reasons for this are high transportation costs, lack of separation at source, lack of collection systems and adequate nation-wide recycling market, lack of subsidies and incentives, and poorly developed public awareness.

Separate collecting and processing of packaging waste in BiH is not widely established. There is experience, but it is based on projects of limited territorial scope. Out of the total quantity of generated packaging waste, quantities obtained by the system of separate collection are very small. Some cities have introduced separate collection containers in city centers, though waste selection at source is performed only through implementation of pilot projects in certain areas

2.5.2 NON-HAZARDOUS PRODUCTION WASTE

Due to high share of waste dross and ash from large industrial furnaces and boilers, mining waste, technological waste from the soda industry, but also other materials such as waste sand from metal casting, waste metal, etc. that are in accordance with the Rulebook on Waste Categories with Lists (Official Gazette of FBiH, No. 19/05, Official Gazette of RS, No. 39/05) categorized as non-hazardous waste, the largest share (around 97%) in total production waste in the present conditions represents non-hazardous waste.

According to data from the Agency for Statistics of BiH, the total quantity of generated non-hazardous production waste amounted to 54,405,793 tons in 2009. The consolidated data is based on reports from companies with 10 or more employees, which are registered in the following sectors (according to the NACE Rev. 1.1. Classification of Production Activities): C-Mining and Quarrying, D-Manufacturing and E-Electricity, Gas and Water Supply. The Agency for Statistics of BiH announced for the first time, in 2008, data on quantities, types and flow of waste generated from production activities. Figure 58 shows the generation of non-hazardous waste from production activities.

15 Estimates are based on estimated generation of packaging waste and total number of population for the reference year

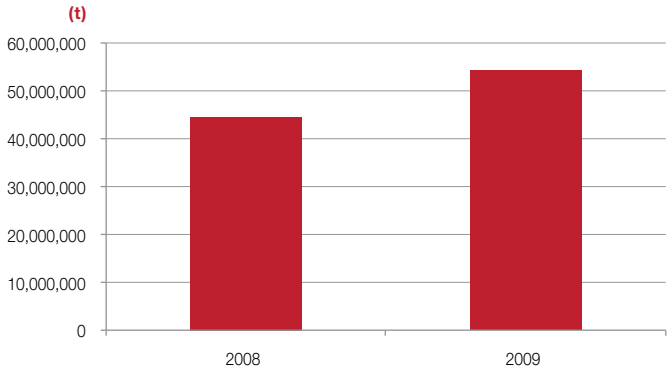


Figure 58:
Total generation of non-hazardous production waste in BiH
(Source: Agency for Statistics of BiH, First Release, Environment – Waste from Production Activities 2008 and 2009)

Most non-hazardous waste (50,767,510 tons in 2009) comes from mining and quarryingactivities. When compared with this, production and energyrelatedactivities, gas, steam and water supply generate lower quantities of non-hazardous waste (manufacturing industry – 3,011,982 tons; energy, gas and water supply – 626,301 tons).Figure 59 shows the share of non-hazardous waste generated from each production activity.

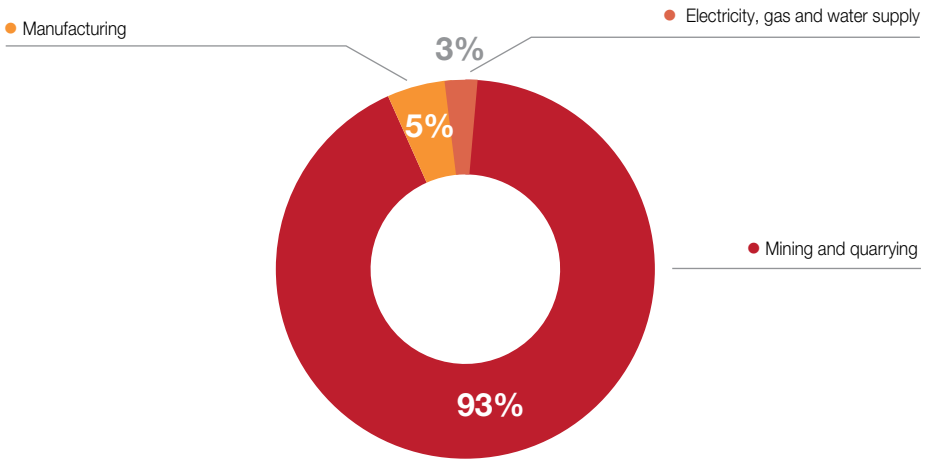
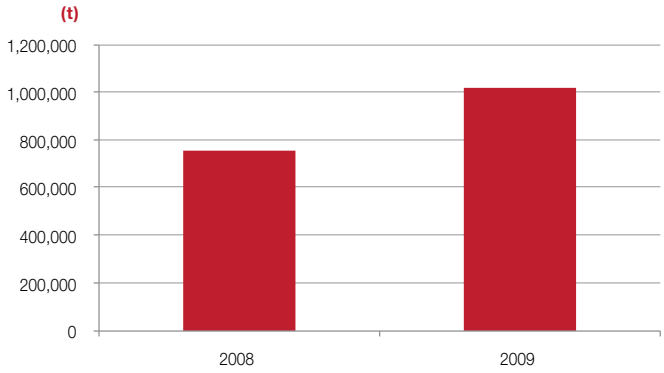


Figure 59:
hare of generated non-hazardous production waste in 2009 by type of production activity
(Source: Agency for Statistics of BiH, First Release, Environment –Waste from Production Activities in 2009)

2.5.3 HAZARDOUS PRODUCTION WASTE

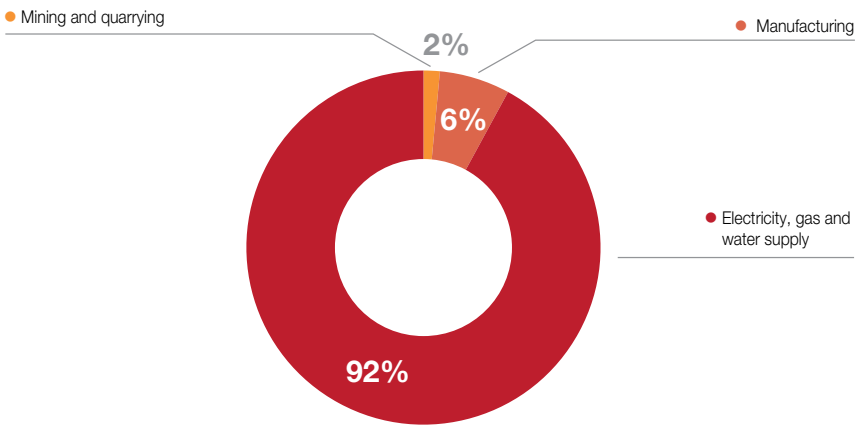
With an exception of waste oils, old batteries and electronic waste from industrial use, in the press releases of the Agency for Statistics of BiH, it is stated that the quantity of generated hazardous waste in 2009 amounted to 1,018,035 tons. Compiled data are also based on reports of companies with 10 or more employees, which are registered in the following sectors (according to NACE Rev.1.1. Classification of Production Activities): C-Mining and Quarrying, D-Manufacturing and E-Electricity, Gas, and Water Supply.

Figure 60: Generation of hazardous production waste in BiH (Source: Agency for Statistics of BiH, First Release, Environment – Waste from Production Activities in 2008 and 2009)



Even though the quantity of hazardous waste is significantly lower than the quantity of non-hazardous waste (around 1.8%), precisely this type of waste may causemost negative effects to the environment, unless disposed of properly. Most of hazardous waste comes from activities related to production and supply of electricity, gas, water supply (937,313 tons in 2009), as well as from manufacturing industry (specifically from production of basic metals and manufactured metal products which amounted to 59,032 tons in 2009).

Figure 61: Share of generated hazardous production waste in 2009 by type of production activity (Source: Agency for Statistics of BIH, First Release, Environment – Waste from Production Activities in 2009)



2.5.4 MEDICAL WASTE

There are no reliable statistical data on medical wasteproduction, as the FBiH and the RS do not have a registry system for generated medical waste. Based on average waste production from health facilities (Cheng et al, 2009), which ranges between 2.41 and 3.26 kg/bed/day (out of which between 0.19 and 0.88 kg/bed/day accounts for produced infectious waste), and based on the number of hospitalization days, the quantity of annual generation of medical waste can be estimated. Taking into account the number of hospitalization days in 2009 (3,259,977), and the previously mentioned average waste production, the estimated quantity of waste from health facilities in 2009 amounted 8,150 tons, out of which 650 tons was infectious waste.

Regulation on Medical Waste Management in the FBiH and the RS (Official Gazette of FBiH, No. 77/09 and Official Gazette of RS, No. 9/06) obliged medical facilities to appoint a responsible body for treatment of medical waste, development of medical waste management plans, segregation of waste, treating infectious waste with thermal or chemical sterilization on site (UNECE, 2011). The implementation of these regulations is still in slow progress.

Research conducted within the preparation of the Federal Waste Management Plan 2012-2017 indicated that medical waste in the FBiH is being partly sterilized, melted and burned,

as well as sold to companies authorized for disposal of hazardous waste or in the worst case scenario, it is collected by public utility companies. Non-hazardous waste is mainly handed over to public utility companies along with mixed municipal waste, while a minor part is sterilized or autoclaved.

A certain number of health care institutions in BiH perform incineration of medical waste. Even though the main clinics in Sarajevo and Banja Luka have achieved progress towards safer medical waste management, there is still a significant risk to public health at the state level.

Statistical agencies in BiH annually publish data on waste generated in human or animal health care and/or related research (as a part of total waste generated in production activities (C, D and E) by the European List of Waste); however, data is not representative. The Agency for Statistics of BiH reported that a total of 14 tons of waste generated in the health sector contained no hazardous waste. The lack of statistical data is mainly due to the lack of a registry system of generated medical waste.

2.5.5 SPECIAL CATEGORIES OF WASTE

Waste of animal origin and animal by-products

In BiH, there isno statistical data on animal waste generation, as the statistical agencies have not started monitoring this type of data yet. However, rough estimates may be made based on statistical data on the total number of cattlehead in BiH and on slaughtering cattle and poultry in slaughterhouses.

The total estimated quantity of waste/animal origin by-products amounted to 34,400 t in BiH in 2011.

In 2011, animal waste amounted to approximately 14,237 t. This quantity was estimated based on available data on the total number of cattle head in BiH (Agency for Statistics of BiH, First Release, Agriculture – Livestock and Poultry Population and livestock production in 2011), and based on average mortality for healthy livestock as well as death caused by various illnesses.

Animal by-products are whole animal carcasses or carcass parts or animal products not intended for human consumption, including egg cells, embryos and semen for artificial insemination of animals (Decision on Animal By-Products and Derived Products Not Intended for Human Consumption, Official Gazette of BiH, No. 19/11). Based on data on slaughtering of livestock and poultry in slaughterhouses (Source: Agency for Statistics of BiH, First Release, Agriculture – Slaughter of Livestock and Poultry in Abattoirs in 2011), as well as data on generated waste in production and meat processing plants (based on Reference document on Best Available Techniques in Food, Drink and Milk Industries, August 2006), the estimated quantity of generated animal by-products amounted to around 20,162 tons in 2011.

In BiH, no organized system for animal waste/by-product management exists– there are no plants for harmless disposal of animal waste, except one privately owned, or collection centers with refrigerators for collection of this type of waste. There are several smaller animal waste incinerators, which perform sporadic incineration of animal waste. Some of these have been installed as parts of industrial plants and they perform incineration only for their needs.

Animal by-products/waste handling in BiH is defined by the following regulations:

- Decision on Animal By-Products and Derived Products not Intended for Human Consumption (Official Gazette of BiH (Official Gazette of BiH, No. 19/11) – subject to harmonization with the European Union– Directive No. 1069/2009/EC of the European Parliament and Council of 21October 2009, laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Directive No. 1774/2002/EC.
- Regulation on Determining veterinary and health safety requirements for disposal, use, collection, transportation, identification and traceability, registration and approval of facilities, product placement on the market, import, transit and export of animal by-products and derived products not intended for human consumption (Official Gazette of BiH, No. 30/12) – subject to harmonization with the Commission Regulation (EU) No. 142/2011 of 25 February 2011 implementing Regulation (EC) No. 1069/2009 of the European Parliament

and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at the border under that Directive

Proposal drafting for animal origin waste disposal is currently ongoing as part of IPA 2012-2013 state assistance program (Veterinary Office of BiH, competent FBiH and RS veterinary offices).

Waste oils (from industry and transport)

Annual consumption of lubricants in BiH amounts to around 22,000 – 23,000 (FMPPE[16] , 2006). This data includes consumption in all types of industrial application and in the transport sector. Out of this quantity, around 50% or 11,000 – 11,500 t/yr may be collected after utilization, while the rest is released into the environment due to evaporation of light fractions, leaks, dripping, etc.

Unusable old vehicles

There is no precise data about the number of vehicles put out of use in BiH. In many open locations throughout BiH there are temporary dump yards for such vehicles, but it is impossible to determine their current number. In BiH, there is no operational facility for treatment of old vehicles by cutting or separation of certain materials. According to experience-based data, old vehicles contain: 64% of iron, 6% of aluminum, 9% of plastic, 2.9% of rubber and the rest is made up of various other materials. Unusable old vehicles are treated as non-hazardous waste, provided that any oils, liquids, oil filters, batteries, air bags, mercury and elements containing PCB (polychlorinated biphenyls) and braking plates containing asbestos are removed.

Old vehicle tires (from industry and transport)

The estimated quantity of old tires in BiH ranges between 5,000 and 12,000 tons/yr (World Bank, 2006), most of which are disposed of in an adequate manner, by incineration or long-term storing. Old tires are treated as non-hazardous waste. A certain number is recycled by the so-called recapping, though according to rough estimates, this is the case only with up to 5% of the total quantity of old tires.

Waste batteries (from industry and transport)

Currently, there are no reliable numbers or statistical data on the quantity of waste batteries. However, based on the report “CARDS Waste Recycling Pilot Project, 2004-2006” (World Bank, 2006), it is estimated that the annual quantity of old car batteries amounts to 6,500 tons. Due to a lack of adequate local capacities, collected batteries have been mainly exported in the last few years abroad, primarily to Slovenia, for recycling. Batteries contain heavy metals (lead, nickel, cadmium) and electrolytes (acids, basis), and are therefore considered hazardous waste.

Electrical and electronic waste (EEW)

Initial Report on the Implementation of Directive on Waste Electrical and Electronic Equipment -WEEE (IFC, 2008) indicated that EU27 countries annually generate from 5 kg of WEEE per capita (Bulgaria) to 30 kg of WEEE per capita (G. Britain). In BiH, generation of this type of waste is about 5-6 kg/person per year that amounts to 23,000 tons/yrat the state level, with approximately:

- 6,000 tons of home and office devices (TV, computers, office equipment, mobile telephones, etc.),
- 17,000 tons of home appliances.

It is assumed that managementof this waste is reduced to rare individual initiatives, which

16 Federal Ministry of Spatial Planning and Environment (this ministry is now transformed into two new ministries)

include less than 5% of generated waste. Electronic waste containing PCB, HCFC, HFC, heavy metals (cadmium, chromium, mercury, nickel, etc.), free asbestos or other hazardous substances, is considered hazardous.

2.5.6 TRANSBOUNDARY MOVEMENT OF HAZARDOUS WASTE

The Agency for Statistics of BiH publishes data on transboundary movement of hazardous waste. Quantity of hazardous waste during 2009 was higher by 55% compared to the previous year and has reached the 2007 level. Regardless of increased export of hazardous waste in 2009, compared to 2008, transboundary movement of hazardous waste in the period of 2001-2009 decreased slightly.

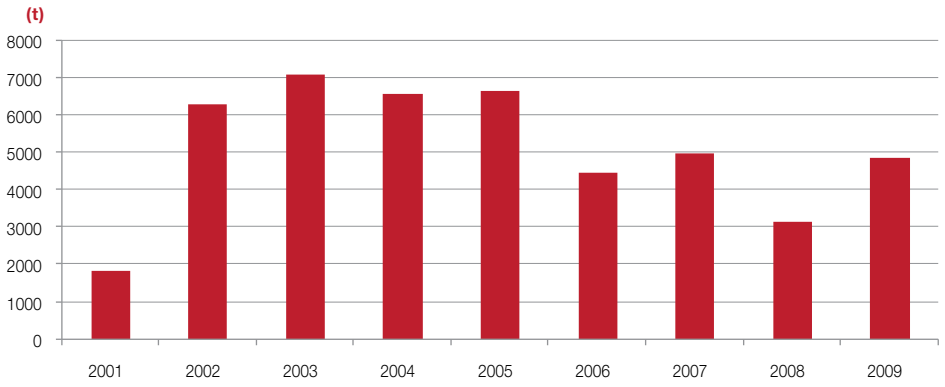


Figure 62: Export of hazardous waste, 2001-2009 in tons (Source: Agency for Statistics of BiH, Environment, Energy, Transport 2011, Thematic Bulletin TB 13)

In the period from 2001 to 2009 there were no significant changes in the number of companies engaged in export of hazardous waste. There are approximately ten companies that possess permits for export of hazardous waste issued by the competent FBiH and RS Ministries. Some of these companies have never undertaken any export activities.

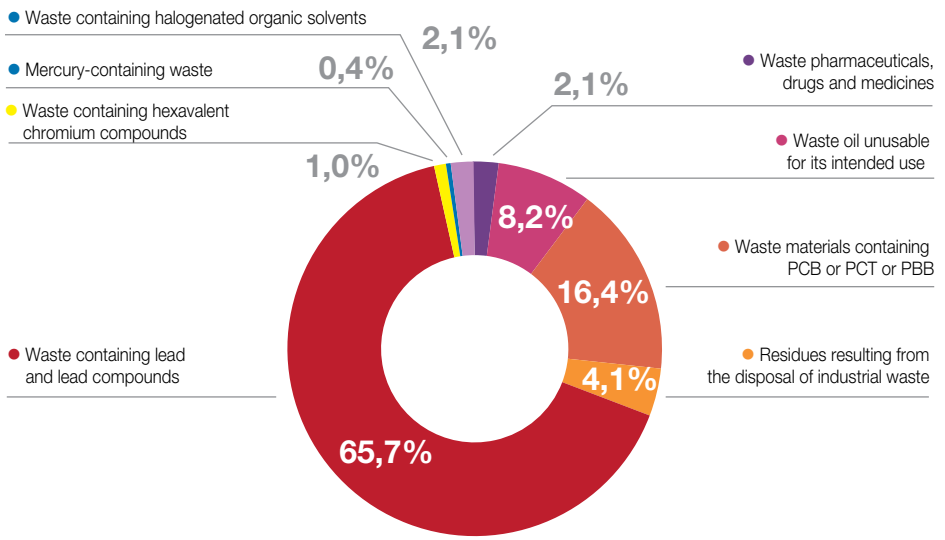


Figure 63: Structure of exported hazardous waste in 2009 (Source: Agency for Statistics of BiH, Environment, Energy, Transport 2011, Thematic Bulletin TB 13)

Main export destinations are Austria, France and Slovenia (Figure 64). Waste batteries and car batteries are mainly sent to Slovenia for treatment, as well as waste containing lead alloys. Waste containing environmentally toxic substances, as well as construction material containing asbestos,is exported to France, for disposal. Other types of waste are exported to Austria for processing and disposal.

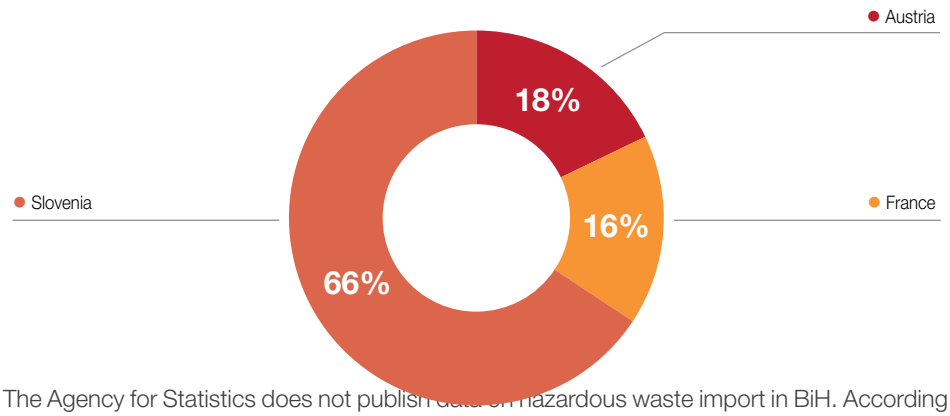


Figure 64: Countries importers of hazardous waste from BiH in 2009 (Source: Agency for Statistics of BiH, Environment, Energy, Transport 2011, Thematic Bulletin TB 13)

The Agency for Statistics does not publish data on hazardous waste import in BiH. According to legislation which regulates the area of waste management in the FBiH, the RS and the BD, import of hazardous waste in BiH for disposal purposes is forbidden.

2.5.7 CONCLUSIONS AND RECOMMENDATIONS

After a long gap in data collection on the environment, the Agency for Statistics of BiH started, in cooperation with the Federal Office of Statistics and the Republika Srpska Institute of Statisticsto collect nationwide municipal and production waste database, in 2008. Even though progress was only recently made, there is still room for improvement in the scope, quality and validity of prepared databases, as well as improvement in cooperation between all bodies receiving data on waste from municipal utility companies, firms and other. This is particularly related to the state and entity statistical agencies, relevant entity and cantonal ministries and bodies, as well as the Government of the BD.

A large number of illegal dumpsites exist in BiH, mainly due to limited waste disposal capacities and low level of public awareness about adequate waste management. The problem of a large number of illegal dumpsites has to be addressed systematically. The best approach to addressing this issue is to plan and implement measures to prevent their re-emergence, such as: installation of prominent signs prohibiting waste disposal on endangered sites, enhanced monitoring, introduction of supervisory services, increased sanctions, etc. However, apart from the repressive measures, in certain regions it is necessary to improve the level of service coverage related to waste collection and disposal. To address this issue systematically, direct co-operation between waste management utility companies, municipal institutions, environmental officers and inspections is required. In addition, a key action to prevent illegal dumping is education and implementation of public awareness raising campaigns on proper waste management, separate waste collection and recycling and the negative impact of illegal dumping on human health and the environment.

In order to improve monitoring and the overall status of waste management, it is necessary to undertake certain steps as soon as possible. The Agency for Statistics of BiH, Federal Office of Statistics, Republika Srpska Institute of Statistics, the Federal Ministry of Environment and Tourism, the Ministry of Spatial Planning, Construction and Ecology of RS, the Government of BD and the relevant cantonal ministries need to improve data collection on all types of waste, in terms of their content, quality and validity, in order to provide the relevant basic information on waste generation and waste management practices, as well as to ensure the accuracy and consistency of collected data.

The Federal Ministry of Environment and Tourism, the Ministry of Spatial Planning, Construction and Ecology of RS, the Government of BD and the relevant cantonal ministries, together with municipalities and waste management utility companies need to accelerate the establishment of regional sanitary landfills. The first precondition to achieve this is to speed up the selection of adequate landfill sites and to find a way for these sites to be accepted by local communities. Cantons and municipalities need to draft their waste management plans and set guidelines for establishment of environmentally sound and socially and financially sustainable waste

management services. Therefore, besides the regional landfills, it is necessary to consider setting up additional facilities in the waste management system, such as transfer stations, to reduce transport costs and to provide such services to distant municipalities.

In order to reduce the negative environmental impact of municipal waste disposal, along with the establishment of regional sanitary landfills, the entity, cantonal and municipal governments need to invest additional efforts to ensure better implementation of existing waste management legislation and to close existing uncontrolled waste disposal sites and illegal dumpsites. In order to minimize illegal dumping and accelerate the establishment of regional landfills, the relevant entity and cantonal ministries, together with municipalities and other various partners need to raise public awareness and promote environmentally sound waste management practices (including waste separation, recycling and reuse).

The Federal Ministry of Environment and Tourism, the Ministry of Spatial Planning, Construction and Ecology of RS, the Brčko Dictrict Government need to adopt subordinate legislation necessary for establishment of waste management system for special waste categories (car batteries, waste oils, used cars, WEEE, etc.). Apart from the development of legislation, relevant entity and cantonal ministries should increase awareness among industries regarding the reuse and recycling opportunities and promote materials and energy recovery from waste.

The relevant entity and cantonal ministries need to undertake feasibility studies for examining economic aspects and potential market for organizing separate collection of municipal waste and construction of recycling facilities. A nationwide recycling program in partnership with municipal/cantonal waste management companies (containers for waste paper, trucks etc.) can significantly improve material recovery.

3 STATES AND TRENDS IN THE ENVIRONMENT

3.1 FOREST RESOURCES

3.2 LAND AND SOIL RESOURCES

3.3 SURFACE AND GROUNDWATER RESOURCES

3.4 MINERAL RESOURCES

3.5 BIOLOGICAL AND LANDSCAPE DIVERSITY

3.6 AIR POLLUTION AND OZONE DEPLETION

3.7 CLIMATE CHANGE

The state of the environment that presents a combination of physical, chemical and biological conditions is affected by pressures exerted by social and economic activities. Neglecting environmental issues for the benefit of economic and social development has led to poor state of the environment in some areas. Climate changes, loss of biological diversity, changes in land use, damagesto the ozone layer, water, air and soil pollution, as well as other problems and situations that we face clearly show the direction we are heading. At present, it has become clear that such a trend cannot continue, which is why human activity turns more towards sustainable development. Sustainable development is a process of change of values starting from each individual and it continues bytransferring those changes to all other areas of human activity. The sustainable development concept is based on: economic and efficient development, social justice and environmental sustainability. Such a development is possible only if all environmental components are taken care of, as well as if their protection is implemented in a continuous and coordinated manner. .

3.1 FOREST RESOURCES

Forests are a very significant natural resource of BiH. Forest cover is extended to 50% of the total territory of BiH and it almost equally covers the FBiH and the RS. Currently, no statistical data are collected on the state of forest resources at the state level.

The first forest inventory in BiH was implemented in the period between 1964 and 1968. After this, no new forest inventory was performed until the new state inventory that was initiated in 2006 and it is now in its final phase. It is expected that published data, the result of a new forest inventory, will ensure relevant information on the state of forest resources forstakeholders at the state and entity level. Data collected during the inventory will also serve as a basis for monitoring the state of forests and forest land, and all other forest related resources. Also, these data will be of tremendous importance for the preparation of the forest management strategy (e.g. National Forest Program and Forest Strategy) and for defining priorities for forest resources research and development. It should be emphasized that the condition of forests can be presented not only based on state forest inventory, but also based on forest management plans that are being prepared for forest management units in FBiH and RS.

A significant problem in the forest sector is a widespread distribution of landmines in forests, as a result of warfare in the nineties.

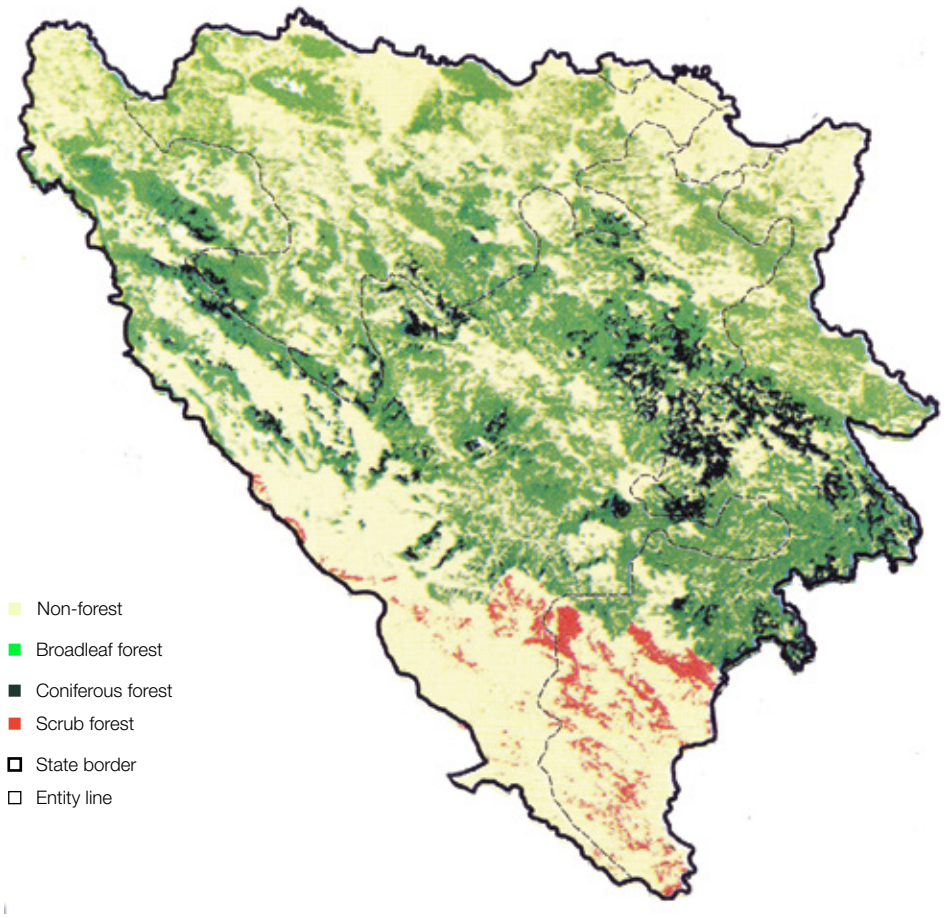
3.1.1 THE MOST REPRESENTED TYPES OF TREES

Forests in BiH may generally be classified as high andcoppice coniferous and deciduous forests. Most forest areas are classified as high forests in which deciduous trees prevail. The most widespread type of deciduous trees is beech (Fagus spp.), which makes almost 40% compared to the distribution of all types, while oak (Quercus spp.) covers around 20%. Spruce and fir, which may be found at higher altitudes and that grow on steep surfaces, make an additional 20% of the forest cover in BiH.

3.1.2 FOREST COVER SURFACE AND OWNERSHIP

In BiH, 80% of forests, covering 2.80 million hectares, are in public ownership. Forests in the FBiH cover the surface of 1.52 million hectares, out of which 1.24 million hectares, that is, 81.8% are in public ownership. In the FBiH, 0.28 million hectares are in private ownership, out of which half of these are coppice forests. In the RS, total forest cover amounts to 1.28 million hectares out of which 0.99 million hectares is in public ownership and 0.28 hectares is in private ownership.

Figure 65:
Map of forest cover in BiH (Source: National Environmental Action Plan in BiH (NEAP BiH), 2003)



3.1.3 GROWING STOCK

Having in mind that the data from the new forest inventoryis not available yet, data on estimated annual growth and growing stock ranges depending on the used sources. Forests and forestlands in the FBiH (according to the area structure described in the current forest management plans for public and private forests) have the total area of 1,521,400 ha or 48% of the total FBiH area. The total growing stock of the state-owned forests in the FBiH is 161,842,588 m^3 or 197.37 m^3/ha. The total annual growth is 4,396,944 m^3/yr in and 5.7 m^3/ha/yr (Federal Ministry of Agriculture, Water and Forestry (2012): Information on management of forests in the Federation in 2009 and forest management plans for 2010). According to data from the Cadastre of forests and forest land in RS (state 31 December 2011), the total growing stock in the RS amounted to 228,171,218 m^3, that is, 230 m^3/ha. Annual growth amounts to 5,182,187 m^3/yr of publicly owned forests and 1,272,524 m^3/yr of private forests (that is, 7.17 m^3/ha/yr of state forests and 4.71 m^3/ha/yr of private forests).

3.1.4 WOOD HARVESTING

BiH has a long tradition of wood resource utilization. Before the war, the annual quantity of timber harvested amounted to between 5.5 and 6.5 million m^3 (USAID,[17], 2006). Today, this quantity has dropped to 4.5 million m^3/yr and is almost equally distributed between the FBiH and the RS. On average, wood is used for heating and also as material for different purposes in the timber industry. The estimated use of forest resources in the RS is 1.4% compared to the total growingstock. The average available annual cutting volume for all forest categories is 4.5 m^3/ha (around 65% of annual increment). The average intensity of use in the RS ranges between 49% and 58% in state forests and 30% to 35% in private ones. The annual allowable cut of 2,932,369 m^3 in the FBiH is lower than the estimated annual increment and it presents

17 USAID - United States Agency for International Development

69.8 % of the annual increment. The total volume ofloggingin the FBiH in 2011 amounted to 2,291,852 m³, out of which 1,112,226 m³ accounted for coniferous trees and 1,179,626 m³ for deciduous trees. In the FBiH, the allowable annual cut has not been fully used. Available data shows that forests are in a solid state (Table 24).

Group, type	BiH	FBiH	RS
		m³	
All high forrests	8.666.008	3.568.223	5.097.785
Coppice	1.989.718	632.792	1.356.926
Total	10.655.726	4.201.015	6.454.711

Table 24: Estimated annual growth of the state-owned forests in BiH (Source: Federal Ministry of Agriculture, Water and Forestry (2012): Information on management of forests in the Federation in 2009 and forest management plans for 2010; PC " Šume Republike Srpske", Cadastre of forests and forest land in RS, 2011)

Information on forest assortment production is collected at the level of forest management units and are forwarded, for further processing and presentation, to the entities, cantons and private companies in the timber sector. This information is sent, in the form of a report, to the statistical authorities in the FBiH and the RS and tothe Agency for Statistics of BiH.

Production of forest assortments in BiH was increased by 5.4% in 2010, compared to 2009. Production of coniferous assortment increased by 13.05%, while production of deciduous assortments increased by only 0.19%. The total production of assortment in BiH in 2010 reached 3,614,899 m³, out of which 1,577,825 m³ were coniferous and 2,037,074% deciduous assortment. The most significant increase was recorded in production of coniferous roundwood in 61.77%, deciduous roundwood in 33.98%, other long deciduous trees in 24.85% and mining coniferous trees in 22.00% (Agency for Statistics of BiH (2010): Release: Production, sale and stocks of forest products in BiH by assortment in 2010).

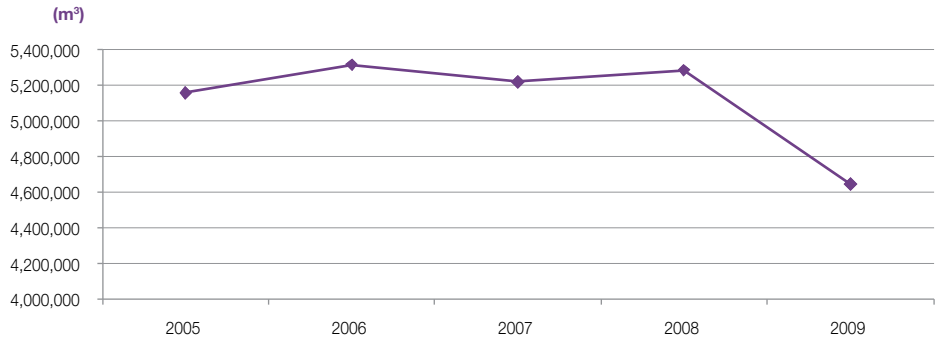


Figure 66: Exploitation of forests in BiH (Source: (i) Republika Srpska Institute of Statistics, Statistical Yearbook 2010; (ii) Federal Ministry of Agriculture, Water and Forestry (2010): Information on management of forests in the Federation in 2009 and forest management plans for 2010)

In the FBiH, the exploitation of forests decreased in 2009 compared to 2008 for approximately 16% and amounted to 1,965,238 m³. Timber industry had a decline in production and export to domestic and foreign markets by 25% (FMAWMF , 2010). The total forest exploitation in the RS amounted to 2,543 m³ of forest in 2009, including private (218,000 m³) and state (2,325,000 m³) forests..

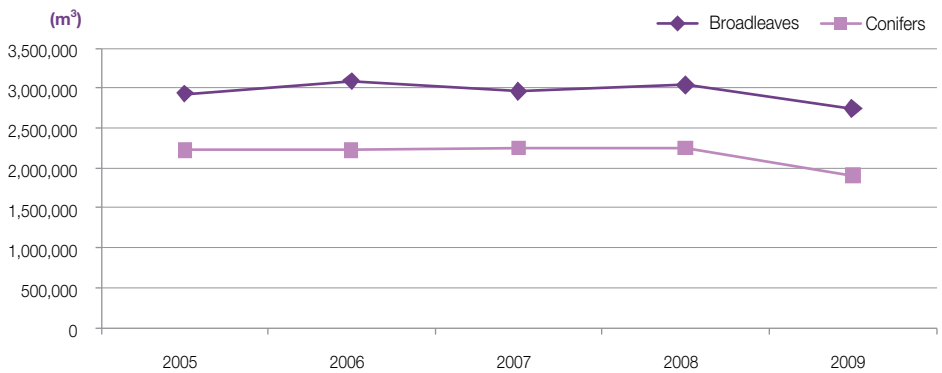
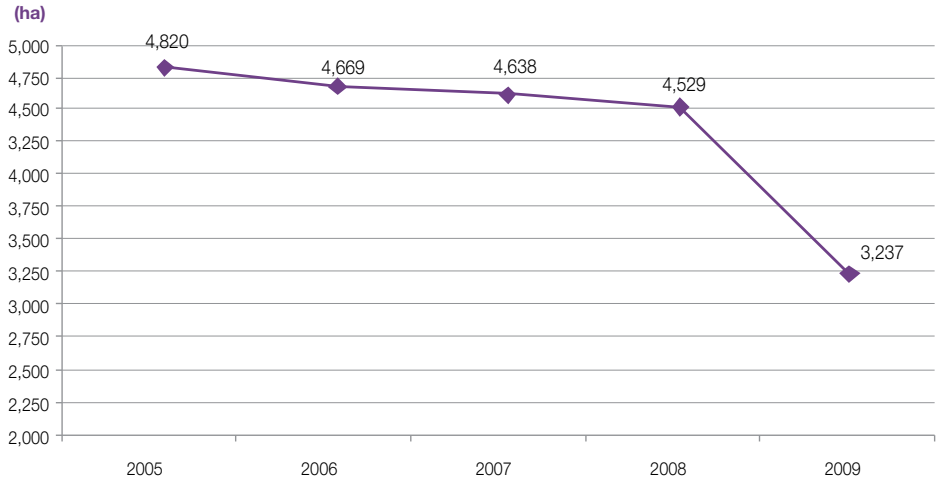


Figure 67: Felling by main types of trees between 2005 and 2009 in BiH (Source: (i) Republika Srpska Institute of Statistics, Statistical Yearbook 2010; (ii) Federal Ministry of Agriculture, Water and Forestry (2010): Information on forest management in the Federation in 2009 and forest management plans for 2010).

3.1.5 AFFORESTATION

In the FBiH, afforestation/reforestation was performed on 1,835,9 ha in 2009. In the RS, 1,401 ha of land were afforested/reforestated in 2009. Also in the RS, 9,344 ha of land were afforested/reforestated in the period from 2005 to 2009. This measure is mainly appliedto forests and state-owned land, while forests and land in private ownership have not been subject to significant afforestation/reforestation.

Figure 68: Afforestation in BiH (Source: (i) Federal Ministry of Agriculture, Water and Forestry (2010): Information on forest management in the Federation in 2009 and forest management plans for 2010; (ii) Republika Srpska Institute of Statistics, Statistical Yearbook 2010)



3.1.6 FOREST HEALTH

There are several reports on general forest health. There is no available data regarding forest health based on defoliation indicators of main tree species. According to available data, forest diseases and damages caused by insects are within acceptable limits. A high risk for future forest health state in the FBiH and the RS is caused by landmine presence. As these areas in minefields are not accessible, possibilities of curing illnesses or putting insect outbreaks under control are very small.

3.1.7 LANDMINE PRESENCE

According to expert estimates, almost 10% of forests in the RS and the FBiH are covered with landmines. The Mine Action Center (MAC) is competent for landmine data collection and continuous updating. Removal of landmines is a long and a very expensive process. Forest areas are often not a priority for mine removal (inhabited and town areas are a higher priority), thus very little has been done in relation to this issue. Hence, it is expected that mines will remain a long-term and relevant problem of forest management in BiH.

3.1.8 CONCLUSIONS AND RECOMMENDATIONS

Data obtained from the conducted forest inventory at a state level will give a precise and realistic perspective of the state of forest resources in BiH. Currently, there is a high number of data on the state and use of forest resources at entity level. Agreeing on methodology for data collection in the FBiH and the RS would, to a great extent, facilitate compiling and presenting data at the state level, which is, in most cases, a requirement of international conventions and of the EU in terms of monitoring and reporting.

Potential threat to BiH forests is in the presence of landmines, causing certain areas to become unavailable for treatment and recovery of forests aimed at preserving the health of trees (e.g. protection from bark beetle). Even though there are no data on illegal logging, it is safe to assume that instances thereof exist, raising a need to monitor the state and implementation of activities with the aim to prevent them.

3.2 LAND AND SOIL RESOURCES

Land and soil resources are among the most significant natural resources in BiH, the primary function of which is the production of food and raw materials. With the future use of resources, as well as population growth and development, society will need greater quantities of food – more intensive agriculture, construction of new settlements and industries, roads and transportation, exploitation of different raw materials, etc. which will potentially increase pressures on the soil.

One of the most important issues is low awareness of the significance of soil - where people do not understand the importance of soil resulting in weak policies for soil protection.

It is necessary to emphasize that absolute measures for soil protection do not currently exist. However, it is possible to apply such measures and care, by which the loss of good quality soils may be reduced.

3.2.1 LAND AREA BY LAND USE CATEGORIES

BiH covers an area of 5,112,879 hectares and close to 52% (2,600,000 ha) of the total land area is suitable for agriculture and the remainder is considered forestland. Even though the total agricultural land area in the FBiH and the RS is similar, when the population of each entity is considered (2,250,000 in the FBiH and 1,450,000 in the RS), the division of agricultural land per capita is 0.56 ha in the FBiH and 0.90 ha in the RS. Furthermore, when fertile land and gardens are considered, the state in the FBiH declines further, to 0.23 ha per capita, which is half the size compared to the RS (0.46 ha)as shown in the First National Report on the Implementation of the UN Convention to Combat Desertification/Land Degradation[18] in BiH of 2007.

Table 25:
Summary of land use in BiH
(Source: Spatial basis for the Spatial Plan of the FBIH for 2008 – 2028, Spatial Plan of the RS until 2015, First National Report on Implementation of the UN Convention to Combat Desertification/ Land Degradation in BiH, 2007, The RS Land Management Plan, 2009)

Total surface			
FBiH [ha]	RS [ha]	BD [ha]	BiH [ha]
2.608.587	2.466.746	49.300	5.124.633
FBIH		**RS**	
Soil classification	**Surface [ha]**	**Soil classification**	**Surface [ha]**
Forest and bare land	1.452.631	Forest and bare land	1.372.003
Agricultural land	1.285.172	Agricultural land	1.047.899
Fertile land and gardens	469.518	Total fertile land	472.013
Orchards	42.701		
Vineyards	5.009		
Meadows	294.931	Meadows	251.099
Pastures	460.409	Pastures	324.787
Ponds, marshes	2.638		
Agricultural land per capita	0,56	Agricultural land per capita	0,72
Fertile land and gardens per capita	0,23	Fertile land and gardens per capita	0,32

3.2.2 ANTHROPOGENIC AND SPECIAL SOIL DEGRADATION

Soil degradation has been increasing, both in BiH and worldwide. The numerous causes of soil degradation are present in BiH, such as: surface exploitation of different raw materials, building of settlements on arable areas, landfills, water accumulations, construction of infrastructure (roads, railroads, etc.), industrial facilities, occurrence of water erosion and landslides, presence of landmines and drought.

18 UNCCD - United Nation Convention to Combat Desertification/Land Degradation

Physical loss of soil

There are no official data regarding the distribution of land area permanently withdrawn from agricultural cultivation as well as from forestry due to physical soil losses. It is evident that the latest published data in BiH (1983) show that the annual loss of soil to agricultural land in BiH is 3,000 ha (Resulović, 1983). The most frequent causes of soil loss which decrease available agricultural land in BiH, are stated in Table 26.

Table 26: Most frequent loss of agricultural land in BiH (Source: Resulović, 1983)

Cause of agricultural soil loss	Lost area (ha/ annually)	Lost area (%)
Opencast mining (opencast pits)	900	30
Landfills	300	10
Residential zones	600	20
Water accumulations	300	10
Roads	300	10
Industrial facilities	300	10
Erosions, landslides, etc.	300	10
Total	**3,000**	**100**

Destruction of soil due to exploitation of raw materials

Opencast mining or surface exploitation of mineral ores (coal, iron ore, bauxite and clay) has left around 15,000 ha of damaged land in BiH. The main consequence of such exploitation is not only a direct loss of soil due to mining, but also additional land loss caused by disposal of waste material at mining areas. The main mining areas are located in the following municipalities: Tuzla, Ugljevik, Gacko, Kakanj, Stanari and Prijedor.

Landfills

Waste is disposed of at large areas of fertile agricultural land, thus excluding a possibility of agricultural production on that land. According to data from the First National Report on Implementation of the UN Convention to Combat Desertification/Land Degradation in BiH, industrial wastes are of particular concern and these include:

- Sand and ash from thermal power plants (4 landfills in Lukavac, Kakanj, Ugljevik and Gacko), covering a surface area of more than 500 ha;
- Red mud from alumina processing plant (Mostar, Zvornik);
- Landfills around mines.

Amelioration of soil degraded due to opencast mining

The total area of soil degraded due to opencast mining amounts to approximately 15,000 ha. These damages are present in the area of some towns (Tuzla, Ugljevik Kakanj, Gacko) which are excluded from the use of a large area of cultivated land. Re-cultivation (reclamation) measures have been introduced over an area of about 1,500 ha, covered in orchards, field crops, pastures and forests. Some re-cultivated areas are more than 50 yearsold. Overburden materials are mostly marl (loamy and clayey). These surfaces are concentrated in the region where opencast mining of coal (lignite) was carried out. On one part, changes in soil properties have been investigated, along with physical and chemical properties of the soil. In these areas,

complete re-cultivation was carried out during which technical, agro-technical and biological measures were used (Čustović, 2005).

Re-cultivation of fly ash disposals

Disposalsites of fly ash and slag occupy an area of around 250 ha. On one part of this area re-cultivation has been carried out (over about 5 ha) at which 20 cm of soil was layered in order to grow crops such as maize and other cereals.

Recultivation of municipal wastes

Even though re-cultivation of land is present in BiH to a certain degree, there is no official database on these activities.

Also, there is no accurate data on soil acidity, although it is assumed that in the last couple of decades, soil acidity has significantly increased. Acidification (both natural and due to emissions) has also degraded other soil characteristics, thus having an adverse effect on the plant cover (reduced production of agricultural crops and destruction of forest cover). This is mostlypresented in areas close to thermal power plants (Tuzla, Kakanj, Ugljevik, Gacko) and in industrially developed centers (particularly those associated with thechemical industry) where there are large scale emissions of SO_2,CO_2, NO_x and other gases that cause acid rains and soil acidification.

Erosions, landslides and deforestation of forests

The hilly terrain and a relatively high percipitation level in BiH indicate that a major part of the country is exposed to water-induced erosion. This occurrence is mostlypresented in the central and southern parts of the country, where the annual quantity of rainfall reaches up to 2,000 mm. Considering that more than 80% of BiH consists of areas with slopes steeper than 13%, water-induced erosion is becoming an issue, particularly when land cover is removed due to uncontrolled exploitation of timber (First National Report on Implementation of the UN Convention to Combat Desertification/Land Degradation in BiH, 2007).

3.2.3 LAND STRUCTURE

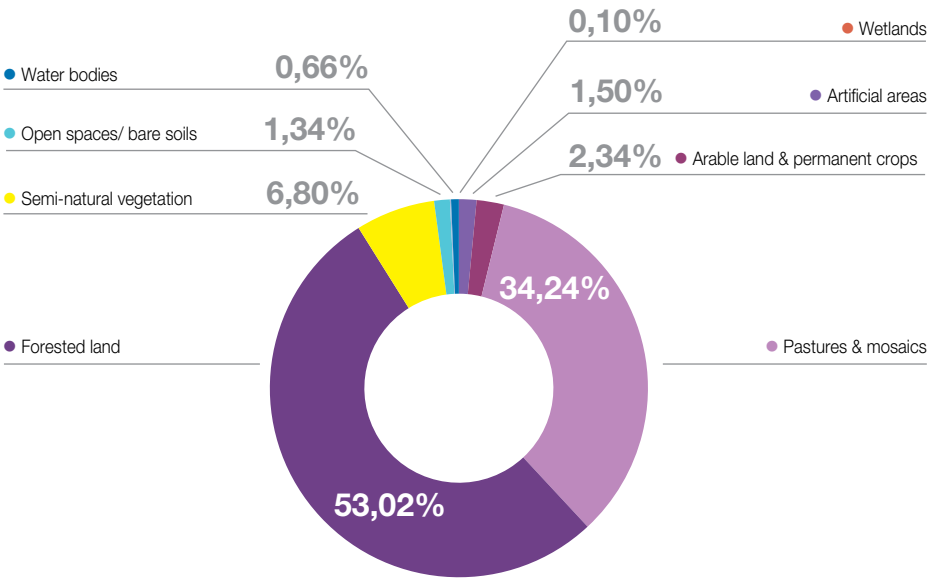
Total land structure

Having in mind that BiH does not have an agricultural census, there has been no official data on artificial areas, arable land and permanent crops, pastures and mosaics, forested land, semi-natural vegetation, open areas and bare rocky areas, swamps and water bodies since 1990. For 2006, there are relevant data from the project CORINE Land Cover (2006) shown inTable 27 and Figure 69.

Table 27: Land cover 2006 (Source: European Environment Agency, CORINE Land Cover- BiH, 2006)

Area	Surface (ha)
Artificial areas	76,865
Arable land and permanent crops	120,006
Pastures and mosaics	1,755,116
Forested land	2,717,931
Semi-natural vegetation	349,210
Open spaces and bare soils	68,824
Wetlands	5,030
Water bodies	33,095

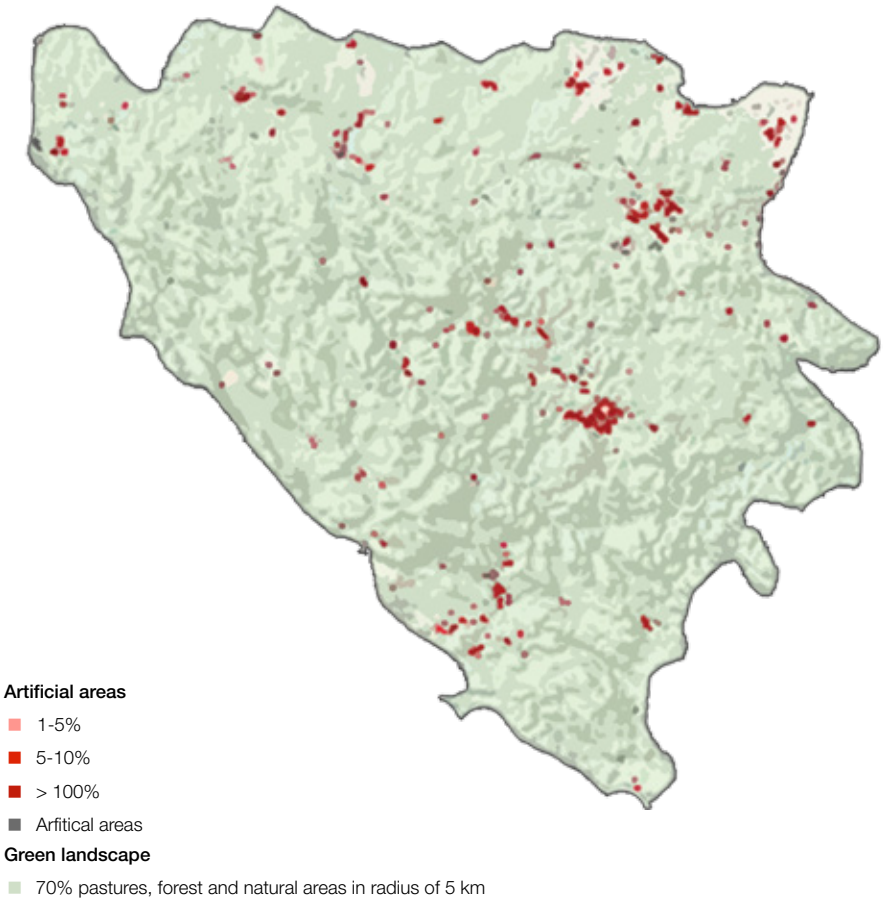
Figure 69: Land cover in 2006 [% of the total forest] (Source: European Environment Agency, CORINE Land Cover- BiH, 2006)



There are no official data on the structure of the total land cover. Data from CLC2006 (Corine Land Cover) were used here, although this data also needs review and updating through new CLC2010 and other helpful techniques. Observing CLC2006 it can be noticed that a very high percentage of the BiH territory is covered with forests and semi-natural vegetation, while a small percentage of the territory with arable land and permanent crops. Trends are not available as there are no data for the period 1990-2010.

Structure of urbanized land

Figure 70: Map of artificial areas in BiH (Source: European Environment Agency, CORINE Land Cover - BiH, 2006)



Land use changes and losses of agricultural land are results of sudden urbanization, industrialization and changes to commercial developments, including the introduction of new technologies. Figure 70 shows artificial areas that are generated by expansion of urban areas.

High diffusion of residential sprawl is one of the main features of the artificial areas in BiH. Artificial land in BiH is formed from ¾ by residential settlements with quite a significant share of mines, quarries and landfills (14%). Artificial land take, which is concentrated mostly around major cities, is driven predominantly by urban diffusion of residential sprawl (about 75%). Besides the urban sprawl, sprawl of mines and quarrying areas has a significant share (13%) in the total up-take area. The land consumed by artificial sprawl during this period is mostly composed of agricultural areas with a predominant share of pastures and mosaics (70%), arable land (18%) and 9% of forested land turned into artificial.

During the construction of residential, industrial and other facilities and due to irresponsible decision-making, most infrastructures (settlements, roads, airports, water reservoirs) have been built on fertile agricultural land, resulting in permanent consequences to the environment in BiH.

Table 28 and Figure 71 show the most important and most frequent causes of the reduction in available agricultural land.

Artificial surfaces	Land cover 2006 [ha]
Housing, services, recreation	57,676
Industrial and commercial units, construction	6,869
Transport networks, infrastructure	1,283
Mines, quarries, landfills	11,037

Table 28: Artificial surfaces 2006 (Source: European Environment Agency, CORINE Land Cover - BiH, 2006)

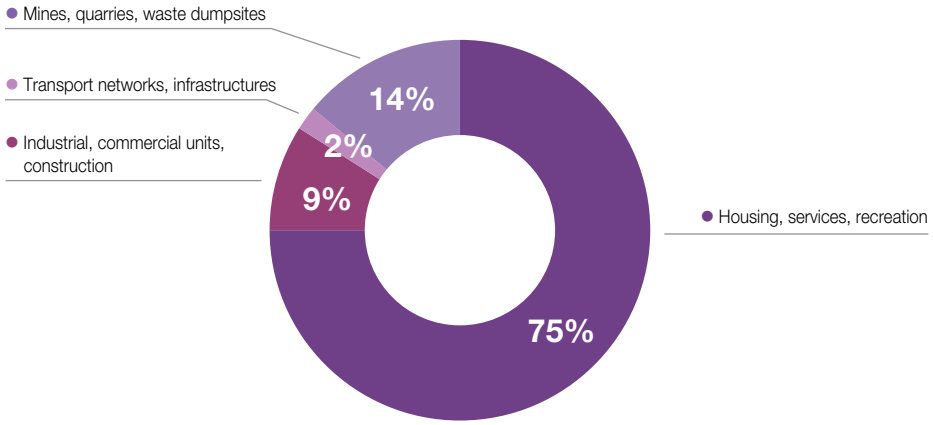


Figure 71: Artificial surfaces 2006 [% of the total area] (Sources: European Agency for Environment, CORINE Land Cover - BiH, 2006)

3.2.4 CHANGE OF LAND USE

Land use in BiH suffers from inadequate and irrational planning of resources. Loss of agricultural land, in most cases, is a result of unplanned construction of residential and industrial facilities and infrastructure, irrational exploitation of mineral raw materials and excessive erosion caused by deforestation and irregular treatment of slopes.

Since BiH does not have official data on land use change, the only source of data is, therefore, CORINE Land Cover. In the period between 2000 and 2006, 48,226 ha of land changed its class, which corresponds to 0.94% of the total territory of the country (Table 30).

Table 29: CORINE Level 1 changes 2000 – 2006 (ha) (Source: European Environment Agency, CORINE Land Cover - BiH, 2006.)

CORINE Land Cover class	CLC2006	CLC2000	Changes
Artificial surfaces	75,887	68,989	6,898
Agricultural surfaces	1,879,384	1,884,906	-5,522
Forest vegetation and other natural areas	3,126,317	3,127,456	-1,139
Swamp areas	5,023	5,301	-278
Water surfaces	34,712	34,671	41
Total	**5,121,323**	**5,121,323**	**0**

In accordance with the CLC2006, artificial annual land take in BiH amounts to 1,021 ha (Table 29), which is significantly lesscompared to the old above mentioned data from publications (Table 26).

The development of artificial land in BiH during this period is characterized by a relatively high percentage of artificial formation (1.4%) with respect to the total initial artificial area (Table 29 and Table 30).

Table 30: Artificial land take [ha/ year, % of initial state] (Source: European Environment Agency, CORINE Land Cover - BiH, 2006)

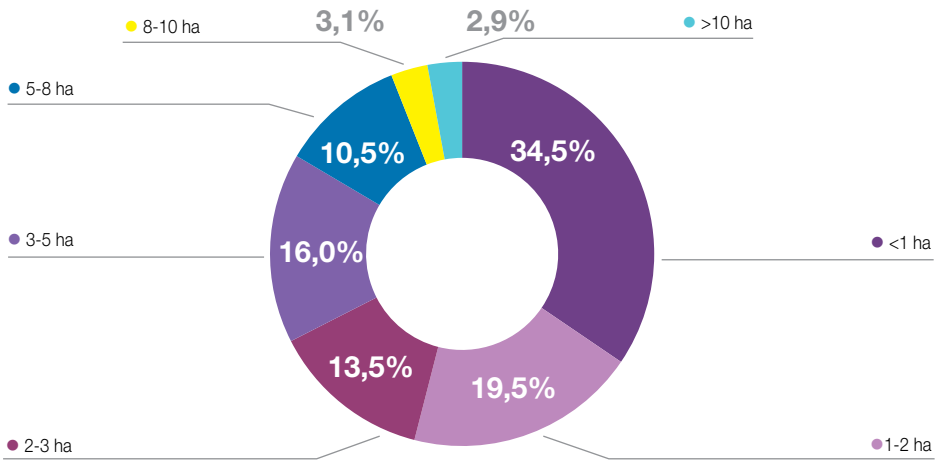
Artificial land take in period 2000-2006	
Artificial land take	1,021 ha/annually
Artificial land take % from the initial year	1.48 %

According to the obtained data, it can be concluded that artificial surfaces have significantly increased, while areas under agriculture and forest vegetation and other natural surfaces have decreased (Taletović et al, 2011).

3.2.5 LAND OWNERSHIP STRUCTURE

According to estimates, in 1990 around 95% of land was private and 5% public. Even though there is no official data on privatization, it was evident that the process of public land privatization has been occurring to a great extent, meaning that the amount of private land has significantly increased when compared to the year of 1990. It is important to emphasize the size of individual land holdings, which are very small in BiH, with 54% of properties occupying an area less than 2 ha (Figure 72). The average household income increases with the increase in land holding size.

Figure 72: Size of land holdings in BiH (NEAP BiH, 2003)



Sufficient food supply, a principle livelihood outcome and one of the indicators of household well-being level, especially of poor communities that depend on farming, is mainly determined by the size of cultivated land. The implications of land size can clearly be seen in household income too. The sizes of holding and household income have a positive correlation.

3.2.6 LAND TYPES AND SOIL QUALITY

Analysis of the soil classes shows that the soil in BiH is very heterogeneous. Automorphous soils cover 86% of the total surface area, while the hydromorphous soils cover the other 14% (Figure 73).Composition of humus in agricultural soils is around 50% lower than in soils covered by forest vegetation. Due to farming and treatment methods applied, the content of humus in agricultural soils shows a tendency of further decline.

Semberija, Posavina and Krajina, in the north of BiH, have somewhat better conditions for agricultural production, with predominately hydromorphous soils on flat and moderately undulating terrain in the valleys of the Sava River and its tributaries. The central part of BiH is a mainly hilly and mountainous region with a large portion of steep or sloping terrain. This area has mainly been covered with dystric cambisols, humus that overlies limestone and dolomites, as well as luvisols and diluvial soils, which are mainly covered by forests and pastures. Only a small percentage of this area is suitable for farming and results in subdivisions into very small fields. Southern parts of BiH are dominated by shallow layers of soil on lime/dolomite substrata and with scarce covering of vegetation and rock outcrops (Figure 73).[19]

Figure 73:
Soil map (Inventory of the Post-War Situation of Land Resources in BiH) (Source: Food and Agriculture Organization - FAO CGP/BIH/002/ITA)

19 FAO Project entitled „Inventory of the Post-War Situation of Land Resources in Bosnia and Herzegovina" was prepared in cooperation with the Federal Institute for Agro-Pedology from Sarajevo, Agricultural Institute of RS from Banja Luka and Federal Agro-Mediterranean Institute from Mostar.

In brief, the main characteristics of soils in BiH are: acid soils cover 1/3 of the land, humus content is low, content of the most important fertilizers is low, soils are mainly shallow, excess water on about 14% of the territory, inadequate care for soil fertilityimprovement, individual land holdings are small and fragmented, erosion is an issue, particularly on sloping land (Čustović, 2005).

According to land capability classification (Class I to Class VIII), the four main zones (A, B, C and D) have been defined in BiH (Table 31).

Table 31: Land capability classification in BiH (Source: First National Report on Implementation of the UN Convention to Combat Desertification/ Land Degradation in BiH, 2007)

Zones and land capability classes	ha	%
A – High quality soils of I, II and III class which are adequate for intensive agricultural production	774,907	15.16
B – Moderate quality soils of IVa and IVb class which canbe used for other purposes	1,126,520	22.03
C – Low quality soils of V and VI class that can be used for extensive agricultural farming and out of the agriculture and forestry sectors	1,654,616	32.36
D – Very poor quality soils of VII and VIII class which canbe used for several purposes, but with very strong restriction	1,556,857	30.45
TOTAL	**5,112,900**	**100.00**

3.2.7 CONCLUSIONS AND RECOMMENDATIONS

The main problems that negatively affect land resources in BiH are: the lack of systematic soil monitoring, lack of Soil/Land Information System - SIS, lack of a National Action Plan - NAP to combat desertification/land degradation, lack of detailed information on soil/land contamination to ensure healthy food production, lack of an adequate system of land assessment (land capability classification), lack of a unified land inventory (a separate registry and excerpt from the land registry books), lack of implementation of rehabilitation and remediation measures (rehabilitation of contaminated soil), low level of awareness regarding the significance of soil and land for sustainable development and mankind survival, low level of land use planning, and lack of land (pedological) large-scale maps that could serve better land use planning.

It is necessary to establish a land and soil monitoring system from all soil quality aspects in accordance with the EU standards and procedures, as well as a soil information system (SIS) at the level of the FBiH, the RS and the state level that would be available to the public.

Data that is currently not available in the sphere of Land Resources in BiH:

- Soil re-cultivation
- Soil affected by desertification/degradation
- Changes of land use
- Soil sensitivity
- Soil acidity
- Gross soil nutrient balance
- Nitrogen balance (e.g. kg of nitrogen to one hectare of land)
- Contamination of soil by heavy metals and other chemical agents
- Soil compaction
- Healthy state of soil

In order to resolve problems that negatively affect land and soil resources in BiH, it is necessary, to undertake certain steps. Development of a National Action Plan (NAP) to combat desertification/ land degradation, establishment of an adequate system of land assessment (land capability classification), improvement of existing and adoption of new soil - environmental legislation, as well as harmonization with relevant EU directives, preparation of an agricultural inventory, are only some of the important recommendations for improving the state of land and soil resources.

3.3 SURFACE AND GROUNDWATER RESOURCES

The total annual water resources from precipitation in BiH amount to 63.9 km^3/yr[20] , while internal renewable water resources amount to 36.4 km^3/yr. If we take into account the quantity of water flowing in from other countries (through the Sava and the Drina rivers), the total annual renewable water resources amount to 64.5 km^3/yr. The total internal renewable water resources per capita in BiH are 9,279 m^3/capita per year (the population of BiH is estimated at 3,839,737[21]). According to the aforementioned data, BiH ranks among the better-watered and largely spring-fed countries, with a dense river network in the Sava River Basin, a less developed network of surface waters in the Adriatic Sea Basin and significant karstic underground flows.

Due to various geological characteristics, topography and climate, the total quantity of water is not equally distributed either spatially or temporally. Great differences in the quantity of precipitation between areas in the west and those in the east of the country cause regular and frequent floods in some places, while other areas are faced with a lack of water and droughts.

Figure 74: Main water basins in BiH (Source: Federal Hydrometeorological Institute of BiH (FHMI BIH), 2010)

20 Calculations are based on the average rainfall in the area of BiH P=1250 L/m^3)

21 Agency for Statistics of BIH: Annual indicators – estimate of 30 June 2011

3.3.1 QUANTITY OF SURFACE WATER

3.3.1.1 Use of freshwater resources

BiH is a country rich in waters, but an unbalanced spatial and temporal availability of water presents a problem. In the water supply system for households, the percentage of uncharged water ranges from 25% to 75% for different public water utility companies. Due to the old infrastructure, physical losses of water in the central systems for public water supply are estimated at 30% to 50%.. Water losses are higher in the post-war period and they have a trend of slow growth (Figure 76), which is affected by the percentage of uncharged water. During the period 2003 to 2009, a trend of increase in household water supply from the public water supply system was noted.

Central municipal water supply systems in BiH are managed by more than 120 water utility companies, which are usually organized as public companies owned by the municipalities, cantons or cities. Central municipal water supply systems which are managed by municipal utility companies cover 58% of the population in BiH (60% in the FBiH, 57% in the RS, and 37% in the BD). The population not covered by central municipal water supply system relies on the water supply system in their local communities or on individual wells. In general, the condition of the water supply infrastructure in BiH is unsatisfactory, primarily in terms of the public water systems coverage, the amount of losses, the state of water supply facilities, and in particular in terms of high tariffs and the collection rate which can barely cover regular operation and maintenance[22].

The total annual water abstraction for public water supply amounts to around 1% of the annual renewable water resources. Water supply is mainly based on the use of groundwaters and springs (89%), while 10.2% of water comes from rivers and 0.8% from lakes and artificial accumulations. Between 2003 and 2010, the average annual abstraction of ground and surfaces waters for the needs of public water supply in BiH was between 320 and 330 million m^3, while the quantity of water delivered to households, the agricultural sector, the industrial sector and for the needs of other activities and water supply systems, amounted to between 157 and 165 million m^3, while the rest is statistically recognized under “water losses” (Agency for Statistics BiH, First Release, Environment and Energy: Collection and Distribution of Water 2006, 2008, 2009, 2010).Enormous losses were partly a result of the failure to implement measuring of supplied water, insufficient capacity of water sources or inadequate facilities for water transport, storage and distribution with high technical losses, or, in most cases, the combination of all the said reasons (Water Policy in BiH, 2011).

The total quantity of abstracted water in 1990, almost 390 million m^3 (Water Management Framework of BiH 1994) is slightly larger than the total annual quantity of abstracted water in the period from 2003 to 2009. This can be explained by a decrease of water abstraction for industrial needs in the postwar period, as many industrial water consumers have ceased their operations.

Figure 75: Water abstraction for public water supply systems (total quantity and quantities taken from groundwaters, from springs, rivers, accumulations and lakes, as well as quantities of water from other water supply systems (1000 m^3/ annually) in the period 1990-2009 (Source: Agency for Statistics of BiH, First Release, Environment and Energy: Collection and Distribution of Water 2006, 2008, 2009, 2010)

22 Water policy of BiH, 2011 -The document is still in the adoption procedure (May 2012)

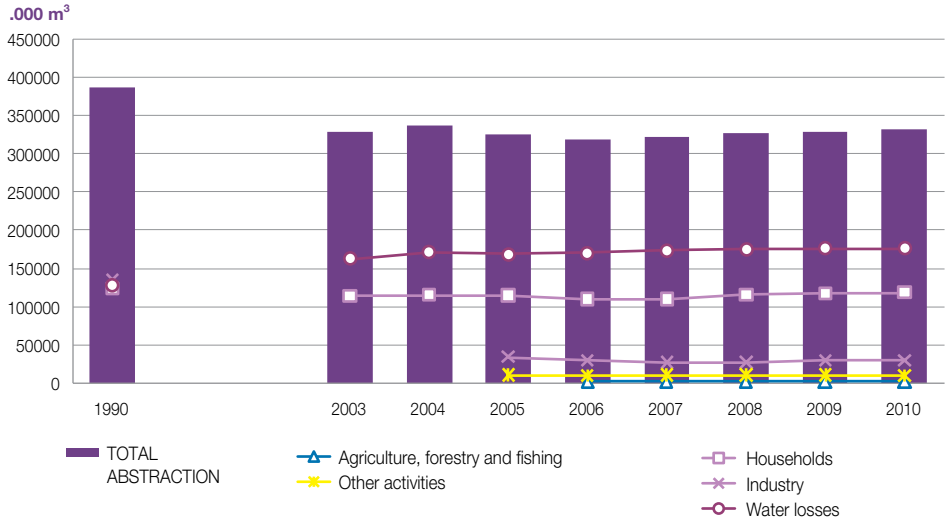


Figure 76: Water abstraction for public water supply system, supply by type of users and losses (1000 m³/annually) in the period of 1990-2009 (Source: Agency for Statistics of BiH, First Release, Environment and Energy: Release, Environment and Energy: Collection and Distribution of Water 2006, 2008, 2009, 2010)

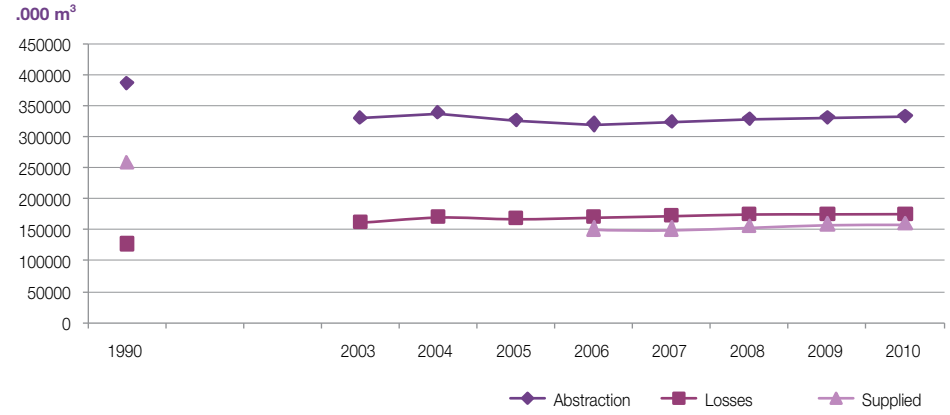


Figure 77: Water abstraction for public water supply system, delivered quantities and losses (1000 m³/annually) in the period of 1990-2009 (Source: Agency for Statistics of BiH, First Release Environment and Energy: Collection and Distribution of Water, 2006, 2008, 2009, 2010)

As already noted, all the aforementioned data are related to the public water supply system. However, total quantities of abstracted water are certainly higher, particularly for large industrial consumers. Since 2009, data on the total quantity of water spent in the industry are available at the Agency for Statistics of BiH[23] . In 2009, the total quantity of water supplied to companies amounted to 14,826,948,000 m³, out of which 0.1% to mining and quarrying, 0.4% to the manufacturing industry, while 99.5% to companies for production and supply of electricity, gas and water. According to the origin of water supplied to industry, 0.3% of the total quantity was taken from rivers, 99.5% from reservoirs, and the remaining 0.2% from the public water supply system, other systems, groundwaters, springs (Table 32). In 2010, the total quantity of water supplied to companies amounted to 18,482,680,000 m³, and the ratio of the origin of water supplied to industry was mainly the same.

Year	Quantity of water utilized in industry in 1000 m³						
	Total	From public water supply	From other systems	From own water stocks			
				From groundwaters	From wells	From rivers	From reservoirs
2009	14,826,948	25,177	3,337	9,312	2,054	38,064	14,749,004
2010	18,482,680	23,581	2,997	10,649	1,326	39,504	18,404,623

Table 32: Use of water in BiH industry (Source: Agency for Statistics of BiH, Release, Environment and Energy: Utilization and Protection of Water Against Pollution in Industry in 2009 and 2010)

23 Annual report on utilization and protection of waters against pollution in industry. This report includes enterprises whose main activities, according to the Classification of Activities, are grouped in the following sectors: mining and quarrying, manufacturing and electricity, gas and water supply, and those which utilize and discharge waters, irrespective of water capture and waste waters recipient. Industrial units of non-industrial enterprises are also included.

If the total quantity of water utilized in industry is taken into account, as shown in Table 32, the total annual water abstraction amounts to more than 40% of annual renewable water resources. If the quantity of abstracted water from accumulations is not taken into account (quantity of water mainly used for hydroelectricity), the total annual abstraction from other systems and from own water supplies in BiH, together with the public water supply and industry (except for hydroelectricity) amounts to 1.1% of annual renewable energy sources.

3.3.2 SURFACE WATER QUALITY

Surface water quality monitoring in BiH was established in the sixties of the last century, but it was interrupted and completely stopped during the nineties.

Re-establishment of regular quality monitoring started in 2000, but not on all BiH rivers and not according to the same schedule. On a larger part of the Sava River Basin in BiH, in parts where the river network is highly developed, regular monitoring was re-established in 2007 (Table 33). Monitoring is under the competence of the Water Agency:[24]

- Sava River Basin District Agency, Sarajevo (FBiH)
- Adriatic Sea River Basin District Agency, Mostar (FBiH)
- Water Agency for Sava River District – Bijeljina (RS)
- Water Agency for Trebišnjica River District – Trebinje (RS)

Table 33: Number of monitored profiles/water bodies for water flows (Source: Water Agenciesfrom the FBiH andthe RS)

Basin /Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
RS –Sava River Disctict and Trebišnjica River District	21	21	21	23	23	23	26	69	32	64	64
FBiH – Save River Basin								121	73	47	43
FBiH – Adriatic Sea Basin	13	18	19	18	18	18	20	19	26	21	24
BIH TOTAL	**34**	**39**	**40**	**41**	**41**	**41**	**46**	**209**	**131**	**132**	**131**

Generally, it can be said that water monitoring in BiH has made a significant progress over the last ten years and it continues to develop and adjust. Since 2001, regular reporting is performed to the European Environment Agency, but there are still certain difficulties with collection of data for the whole of BiH.

For the purpose of a better comparability of data for the period 2000-2009, six measuring profiles for six large rivers in BiH were selected in order to analyze trends using the same criteria[25] . All gauging stations are located in the lower part of the river flow, downstream from large polluters: Kozarska Dubica (the Una River), Delibašino Selo downstream from Banja Luka (the Vrbas River), measuring profile Doboj downstream - the town (the Bosna River), measuring profile Badovinci (the Drina River), downstream from Mostar (the Neretva River) and Trebinje (the Trebišnjica River). Annual average trends and mean values were analyzed.

3.3.2.1 Oxygen consuming substances in rivers

TDuring the period 2000-2009, no major changes in the concentration of organic substances in rivers were recorded, as indicated by BOD_5 and ammonium (NH_4) levels. These values show that the state of rivers in BiH is generally good, considering the content of oxygen in water

24 The existing water management system in BiH is explained in detail in Section 5

25 As the series of data for the period after 2006 is insufficient in length for trend analysis and also having in mind that data on the upper and medium flow of the River Bosnia are missing (the largest basin in BiH), there was a dilemma about the selection of stations for trend analysis for this Report: use all the available data for unequally distributed stations or select a certain number of stations by the same criteria.

and saturation of water with oxygen. However, the Bosnia River is significantly more polluted than the other rivers.

Biochemical Oxygen Demand – BOD_5 is a five-day biochemical consumption of oxygen necessary for biological disintegration of organic matter. A high level of BOD_5 is indicative of organic pollution which leads to a decreased concentration of oxygen and harmful impacts on water ecosystems. In general, the main causes of organic pollution generation are untreated municipal and industrial waste waters.

From 2000 to 2009, arithmetic mean values point to a small increase of the BOD_5 and ammonium level with fluctuations, while the median shows a slight trend of increase. The median of average annual values of the BOD_5 concentration measured in the rivers falls between 1.5 and 2.8 mg O2/L (Figure 78), while the median of the average annual ammonium concentration values ranges between 0.03 and 0.09 mg N/L (Figure 80). Average annual values of parameters for each major river are shown separately (Figure 79 and Figure 81.). It is obvious that the Bosna River is significantly more polluted than the other rivers. Figure 82 shows the average annual ammonium and BOD_5 concentration in the Spreča River at the mouth of the Bosna River, as well as the average values of the same parameters for the aforementioned six profiles of the six major rivers in BiH.

Figure 78:
Value of BOD_5(Source: Results of monitoring of surface waters carried out by Water Agencies in BiH [27])

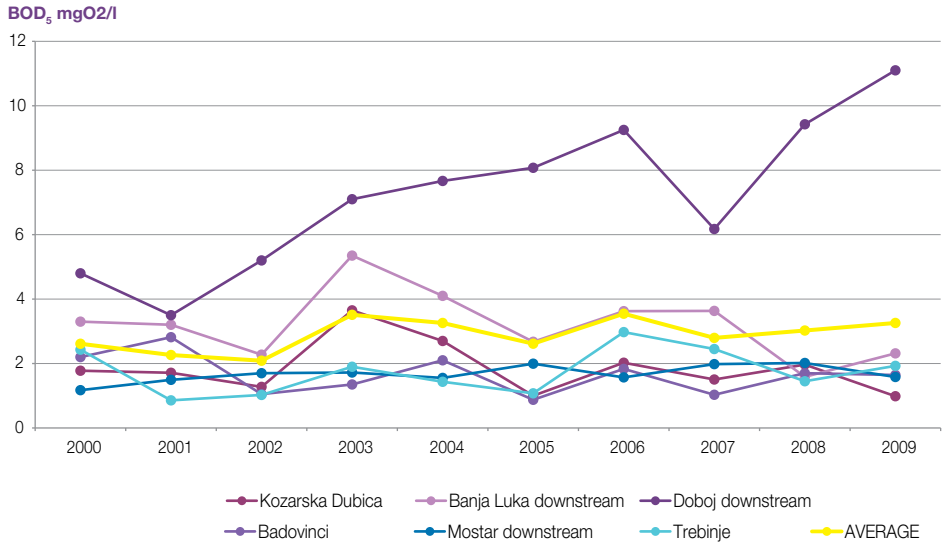


Figure 79:
Average values of BOD_5 (mg O2/l) in the rivers of BiH – separately (Source: Results of monitoring of surface waters carried out by Water Agencies in BiH)

26 Sava River Basin District Agency – Sarajevo (FBiH)
Adriatic Sea River Basin District Agency – Mostar (FBiH)
Water Agency for Sava River District – Bijeljina (RS)
Water Agency for Trebišnjica River District – Trebinje (RS)
Trebinje (RS).

Figure 80: Values of ammonium (mg NH_4+-N/l) in the rivers of BiH (Source: Results of monitoring of surface waters carried out by Water Agencies in BiH)

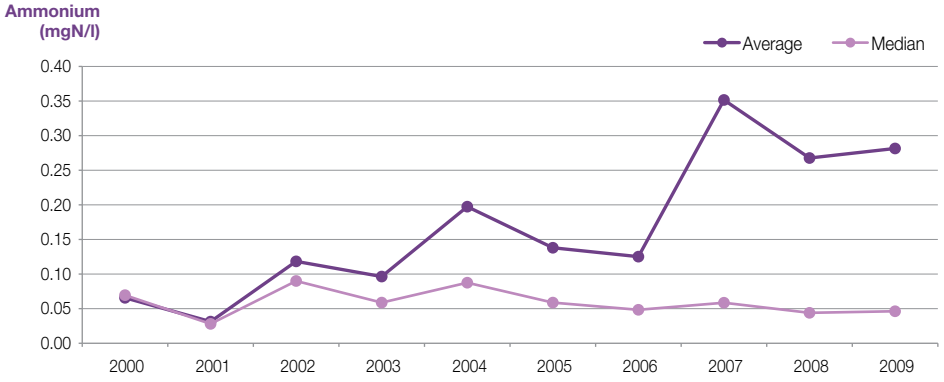


Figure 81: Average values of ammonium (mg NH_4+-N/l) in the rivers of BiH – separately (Source: Results of monitoring of surface waters carried out by Water Agencies in BiH)

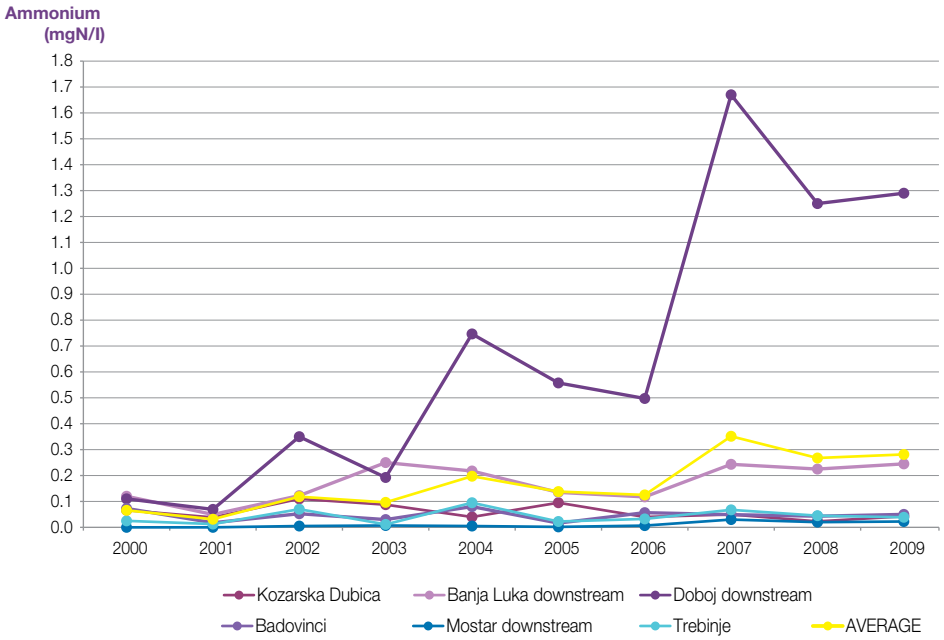
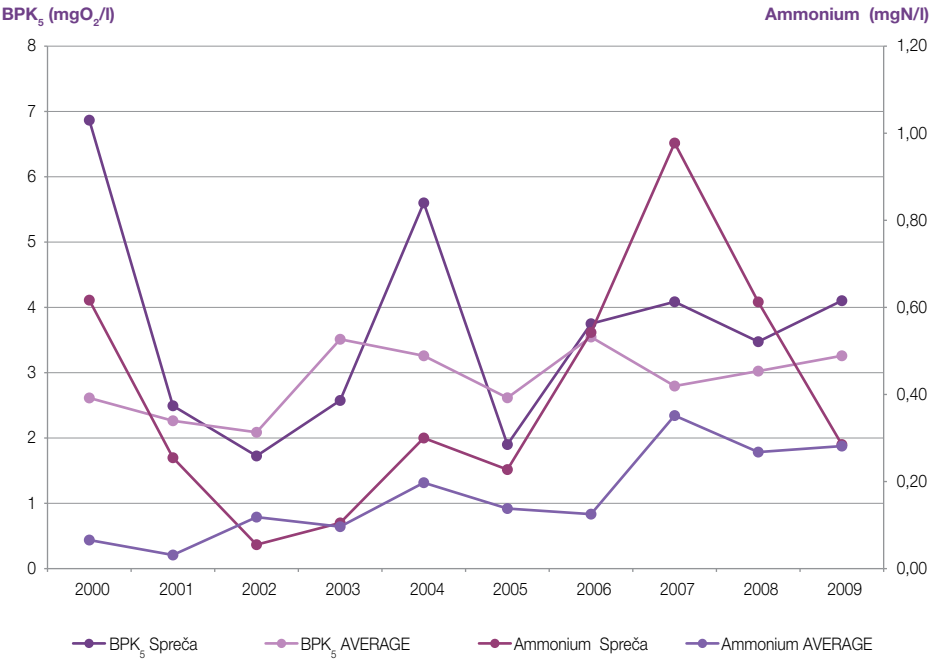


Figure 82: Ammonium and BOD_5 at the mouth of the Spreča River flowing into the Bosna River, as well as average ammonium values and BOD_5 in the rivers of BiH (Source: Results of monitoring of surface waters carried out by Water Agencies in BiH)



3.3.2.2. Nutrients in freshwaters

With certain oscillations, a linear trend shows a small increase in concentrations of nitrates in the rivers of BiH during the period of 2000 – 2009. These values indicate that the state of the rivers of BiH is good considering the content of nitrates in water. Based on water quality monitoring in accumulations, it can be concluded that accumulations are sensitive to increased phosphorus concentration and subject to the process of eutrophication, while trends cannot be determined due to a short series of data.

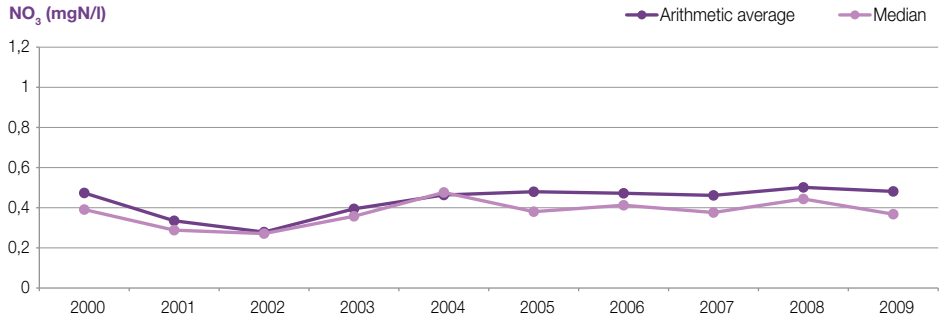


Figure 83: Value of nitrates ($mgNO_3$-- N/l) in the rivers of BiH (Source: Results of monitoring of surface waters carried out by Water Agencies in BiH)

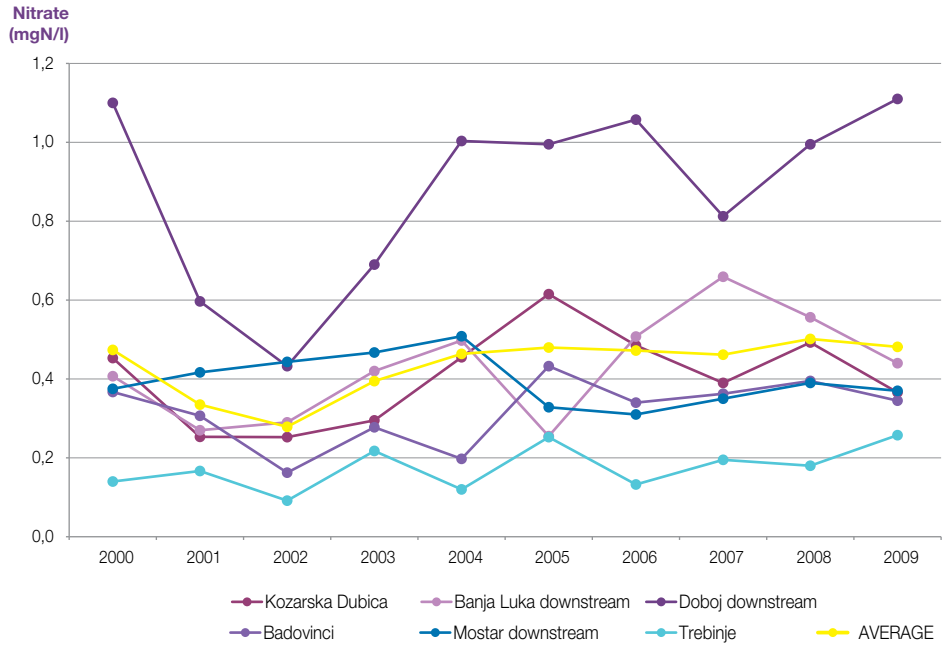


Figure 84: Average values of nitrates ($mgNO_3$-- N/l) in the rivers of BiH – separately (Source: Results of monitoring of surface waters carried out by Water Agencies in BiH)

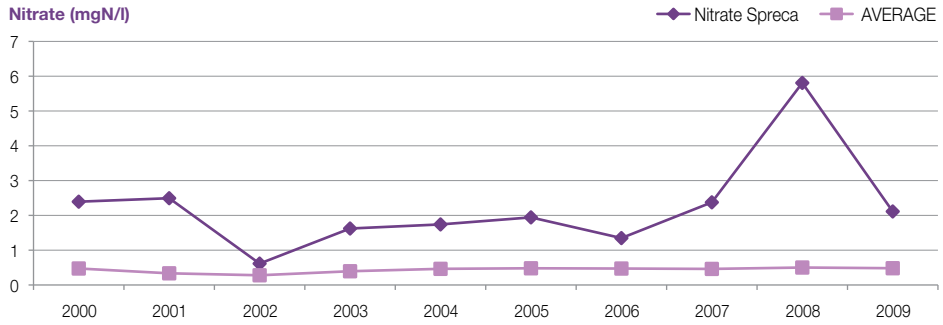


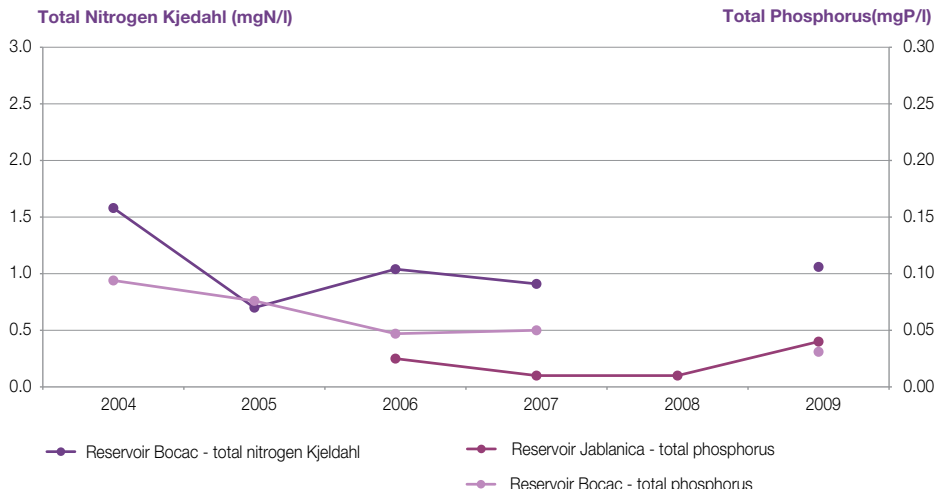
Figure 85: Nitrates at the mouth of Spreča River flowing into Bosna River, as well as the average value of nitrates in the rivers of BiH (Source: Results of monitoring of surface waters carried out by the Water Agency for Sava River District – Bijeljina)

According to the average values for the period of 2000 – 2008, the concentration of nitrates in the rivers of BiH is not high, which is mainly due to a slow development of agriculture and industry. The median of average annual values of nitrate concentration in the rivers of BiH was between 0.27 and 0.48 mg NO3--/l.

However, rivers located in regions with developed industry reported high nitrate concentrations, for example the Spreča River (area around the Sava River), where the average nitrate concentration in 2008 was 5.81 mg NO_3--N/l (based on 8 samples in one year). Figure 84shows average annual values of nitrates for the main rivers of BiH.

Natural lakes in BiH are important for recreation and tourism, though they do not have other significant use. Flooding of karst areas causes occasional lakes/wetlands in the Adriatic Sea Basin in the total quantity of around 2.5 billion m^3. In BiH, there are 28 artificial accumulations of water with a total volume of around 3.9 billion m^3. Accumulations are primarily used for electricity generation, but they are also important for water flow regime regulation. Regular monitoring of water quality has been established only for some of them.

Figure 86: Total nitrogen and phosphorus in Lakes Bočac and Jablaničko, 2004-2009 (Source: Results of monitoring of surface waters carried out by the Water Agency for Sava River District – Bijeljina and the Adriatic Sea River Basin District Agency – Mostar)



3.3.2.3 Bathing water quality

Having in mind the lack of an adequate legal framework, quality control of inland and coastal bathing waters is not performed systematically, but according to current needs and available funds. According to the data of water quality monitoring of the Adriatic Sea at the coastal area in Neum, which has been conducted during summer months since 2001, the state of bathing water was "satisfactory". Monitoring of the bathing water quality is the responsibility of the public health sector and Ministries of Health in the FBiH and the RS.

According to the Law on Waters[27] , surface water bodies intended for recreation and areas designated for bathing, present a type of protected areas. These areas need to be protected by the provisions of the public health sector. According to the Law, a swimming area, as an area for public recreational water activities, is defined by a municipal body responsible for waters. However, bathing areas, in practice, have not yet been defined or registered as public baths; they represent areas where bathing is traditionally done. Analysis and quality control of bathing water is done when necessary and according to available funds. It is implemented by the water agencies within their annual monitoring and Institutes of Public Health at the request of the municipal health and sanitation inspections. In the absence of adequate regulations, the old state standards from 1980 related to recreational waters are still in force (Official Gazette of SRBiH, No. 19/80). In line with these standards – the only microbiological criteria is based on the upper limits of 500 total coliforms per 100 ml (500 TC/100 ml) for coastal waters and 2000 total coliforms per 100 ml (2000 TC/100 ml) for inland waters. Although the transposition of the Water Framework Directive is not fully completed in the BiH legislation, Article 26 of the Decree on Water Classification and Categorization of Watercourses in the RS (Official Gazette of RS, No. 42/01) stipulates that a second class of water can be used for bathing, and Article 14 stipulates the sanitary microbiological parameters for the second class of water.

27 Law on Waters (Official Gazette of FBiH, No. 70/06), Law on Waters (Official Gazette of RS, Nos. 50/06, 92/09), Law on Water Protection in BD (Official Gazette of BD, Nos. 25/04, 1/05, 19/07)

Since 2001, the Adriatic Sea River Basin District Agency has been conducting analysis of the quality of coastal bathing water at the Adriatic Sea during the summer tourist season at the beach in Neum. Total Coliforms – TC, Faecal Coliforms – FC and Faecal Streptococci – FS are being controlled.

Compliance with the EU bathing water directives is still based on the subgroup of parameters that are determined by the EU directive on bathing water quality 76/160/EEC . The parameters also include TC, FC and FS and it is possible to analyze compliance with the EU requirements for bathing water in relation to the Bathing Water Directive 76/160/EEC[28]. The rate of compliance with guide values for FS (100 FS/100 ml)[29] varied from 8.3% in 2004 to 83.3% in 2002, while compliance with mandatory values for Faecal coliforms was 100% (2000 FC/100 ml), except for 2001, when the compliance rate was 75% (Figure 87). Based on the presented data, it can be concluded that there is compliance with mandatory values, but not with recommended values.

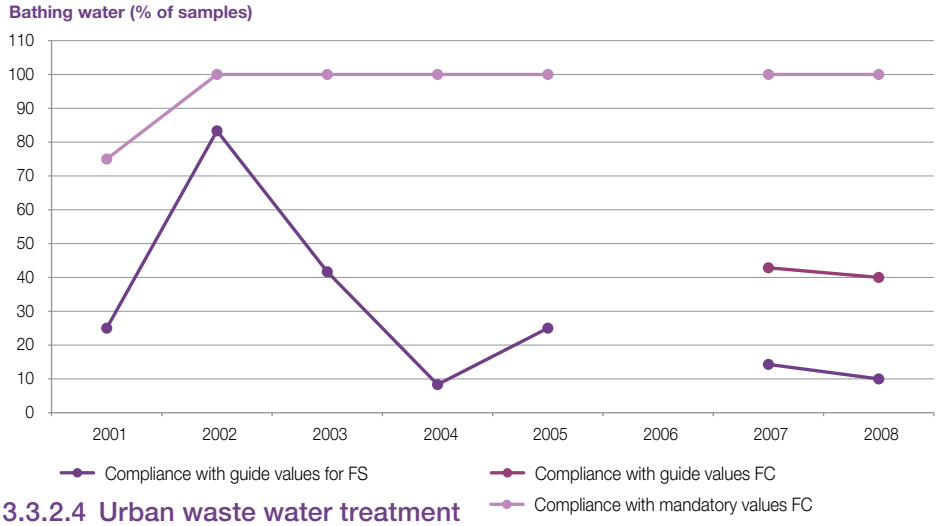


Figure 87:
Quality of coastal bathing water, compliance rate with recommended and obligatory values, for the period of 2001-2008 (Source: Adriatic Sea River Basin District Agency – Mostar)

3.3.2.4 Urban waste water treatment

Even though the general state of drainage and treatment of waste waters from the public drainage system in BiH is at an unsatisfactory level, little progress has been made in increasing the number of connections to public sewage and very little progress in terms of the ratio between the annual quantity of treated water and the total quantity of waste water.

In 1991, 38% of the total population in BiH was connected to the public sewage system (Water Management Framework of BiH, 1994). According to estimates from strategic documents of the FBiH (Water Management Strategy FBiH, 2010-2022) and the RS (Development Framework for Water Management of RS, 2006), this percentage is lower and it amounts to 33% in the FBiH and 32% in the RS.

Waste waters from households account for the highest percentage of total waste waters (Figure 89). The number of people connected to the sewage system is higher in urban areas. The percentage of population living in agglomerations (>2000 PE) that are connected to the sewage system is estimated to be 46% at the state level (Water Policy in BiH, 2011 [30]).

Estimations indicate that 45% of the population from the Sava River Basin lives in the Bosna River Sub-Basin. Having in mind that the average annual runoff from the Bosna River Sub-Basin amounts to 163 163 m^3/s, this leads to a conclusion that the average runoff in the Bosna River Sub-Basin amounts to 0.1 L/s/capita, indirectly indicating that the numerous water supply problems in the Bosna River Sub-Basin are also the most prominent ones in BiH. When these

28 A new Bathing Water Directive (Directive 2006/7/EC) establishes microbiological standards for two new parameters, Intestinal Enterococci and Escherichiacoli, which will be used to classify bathing water quality as "poor", "sufficient", "good" and "excellent". However, data on parameters forIntestinal Enterococci and Escherichia coli must be converted in order to be assessed under the rules of Directive 76/160/EEC (EEA/ADS/06/001 – Water: Methodology for bathing water quality transitional assessment -2008)

29 Litsky method. Colony counting according the most probable number or membrane filtration. Growing on appropriate media.

30 The document is still in the adoption procedure (May 2012).

quantitative indicators are combined with the fact that the greatest industrial users in BiH are located in the Bosna River Sub-Basin, then it can be argued with certainty that the Bosna Tiver is the most vulnerable in terms of urban and industrial waste waters discharge (Water Policy of BiH, 2011[31]).

Since 2003, a slight increase has been recorded in the total length of the sewage network and the number of connections, as shown in Figure 88.

Figure 88: Total length of the sewage system and number of sewage connections, for the period of 2003-2010 (Source: Agency for Statistics of BiH, First Release, Environment and Energy: Public sewage system2006, 2008, 2009, 2010)

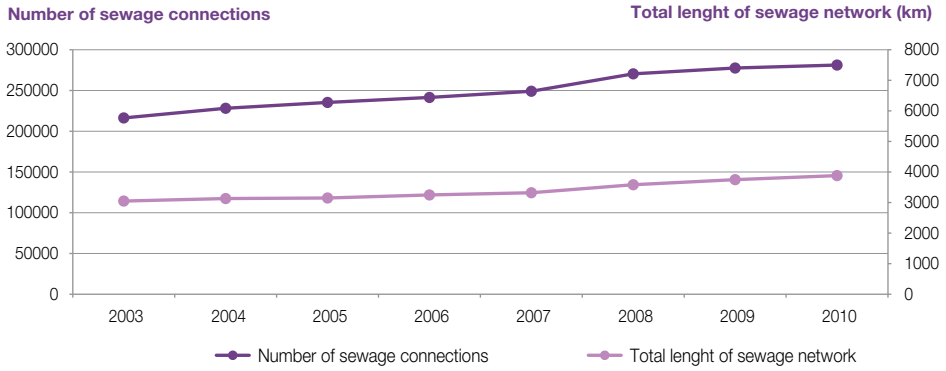
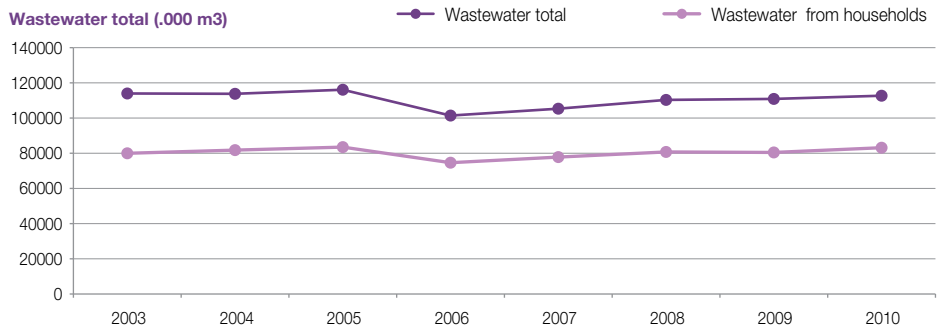


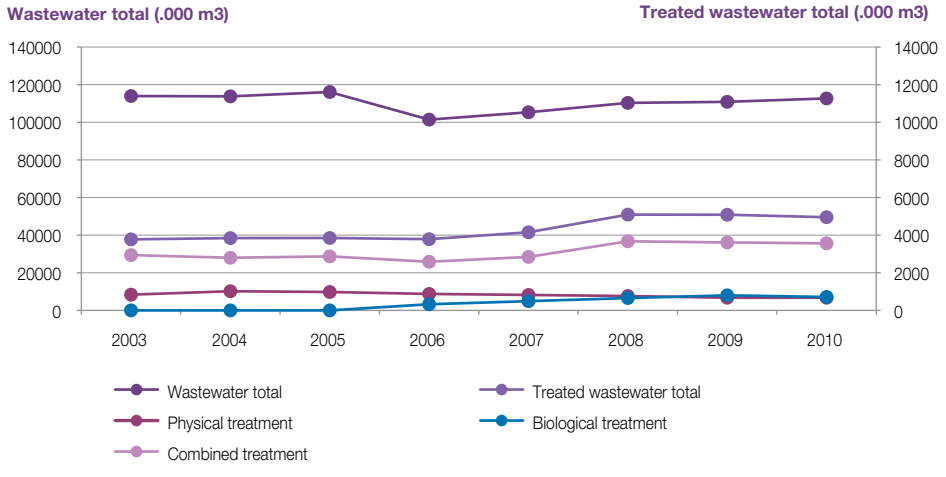
Figure 89: Waste water quantities in the period of 2003-2010 (Source: Agency for Statistics of BiH, First Release, Environment and Energy: Public sewage system 2006, 2008, 2009, 2010)



In BiH, there is a clear problem of inadequate waste water discharge. Only some municipalities in the Federation (Gradačac, Žepče, Odžak, Trnovo and Srebrenik in the Sava River Basin; Ljubuški, Čitluk, Grude and Neum in the Adriatic Sea Basin) and two in the RS (Trebinje and Bileća in the Adriatic Sea Basin) have functioning facilities for sewage water treatment. Table 34shows the status of existing and planned urban waste waters treatment plants in BiH.

Some progress was made in the analyzed period (2003-2009) if we take into account the quantity of water treated annually in comparison to total waste waters. In 2009, a positive trend of increasing treatment quality continued, as evidenced by an increase in the share of biological treatment methods (Figure 90), while in 2010 there was a slight decrease.

Figure 90: Quantity of waste waters: total and treated, the period of 2003-2010 (Source: Agency for Statistics of BiH, First Release, Environment and Energy: Public sewage system 2006, 2008, 2009, 2010)



31 The document is still in the adoption procedure (May 2012).

Table 34:
Status of constructed and planned facilities for urban waste water treatment in BiH

No.	Municipality/Canton	ES/PE	Treatment degree	Status / Note
A/ Built / Reconstructed facilities				
1	Sarajevo	600,000	II (III degree planned in the next phase	Not operational, a tender for reconstruction of the facility for II degree treatment is being prepared
2	Gradačac	30,000	II	Operational
3	Srebrenik	12,000	II	Operational
4	Trnovo	5,000	II	Operational
5	Žepče	10,000	II	Operational, reduced capacity
6	Odžak	10,000	II	Operational
7	Neum	5,000 *	I	* Operational, a regional system is planned for a part of BiH and the Republic of Croatia in the capacity of 30,000 ES
8	Čitluk (+Međugorje)	7,000+7,000	III	Operational, negotiating the inclusion of Međugorje
9	Grude	2,500	II	Operational
10	Ljubuški	5,000 + 1,000*	II	Operational, *negotiating to increase 6,000
11	Široki Brijeg	5,000	II	Not operational, equipment missing
12	Bosansko Grahovo	3,000	II	Not operational, the facility destroyed
13	Trebinje	30,000	II	60% of equipment is operational
14	Bileća	15,000	II/III	I phase of 5,000 ES is operational
B/ Under construction / contracted				
1	Živinice	25,000	III	I degree under construction, and a tender - completion of II/III treatment degree is expected -
2	Mostar	100,000	III	Construction of facility (in part or full) - contracted
3	Bihać	60,000	III	Contracting in progress
B/ Ongoing (a loan or a grant signed)				
1	Konjic (GEF)	15,000	III	The first phase for 5,000 ES in preparation
2	Cazin (EBRD)	14-45,000	II	Tender procedure in progress, EBS in line with the location from the current FS, according to the availability of funds from the FS, the location and the available budget for the sewer system and treatment plant
3	Velika Kladuša (EIB)	15,000	II	Preparation of tender documents ongoing
4	Bosanski Petrovac (EIB)	6,000	II	Preparation of tender documents ongoing
5	Tomislavgrad (EIB)	8,000	II	Preparation of tender documents ongoing
6	Orašje (EIB)	10,000	II	Preparation of tender documents ongoing
7	Approval and signing of loan contracts with the EIB is ongoing, for the purpose of the facility Phase I construction in Tešanj, Doboj Jug, Jajce (right bank, downstream from the city), Prozor-Rama, Stolac, Kupres and 4 populated areas around Konjic (compact equipment)			
8	Bijeljina	80,000	II	I phase – project documentation and negotiations for 60,000 ES ongoing
9	Višegrad	10,000	II	The first phase of project documentation for 5,000 ES ongoing
10	Vlasenica	15,000	II	Conceptual design for the first phase of 5,000 ES

LEGEND: *I (primary treatment): physical and/or chemical pre-treatment/sedimentation up to 50% of substance suspension;*
II (secondary treatment): biological treatment and sedimentation;
III (tertiary treatment): additional removal „N“ and „P“.

3.3.3 GROUNDWATER

Systematic monitoring of groundwater quality is not performed in a satisfactory manner, except for the sources for public water supply, when the raw water is controlled in accordance with the regulations on the hygienic control of potable water during the annual monitoring conducted in relation to the population equivalent (PE). Monitoring is conducted in the north-east part of BiH and in the Adriatic Sea basin. Currently, preparatory activities for development of studies are carried out, which will be a basis for the establishment of systematic groundwater monitoring in accordance with the EU Water Framework Directive (WFD). Information on the quality of groundwater resources can be drawn from the data on groundwater quality used for public water supply. According to these data, it can be concluded that the groundwater quality is still mostly good. Waters used for public water supply generally do not require treatment, except for mandatory disinfection. In line with the quality of groundwater, the corresponding technological procedures for preparing and processing of raw water into potable water are applied. These waters can sometimes contain higher concentrations of manganese, iron or other contaminants requiring conventional treatment processes to be supplemented based on aeration, sedimentation, filtration and disinfection. The available data show only few cases of groundwater contamination. However, the lack of reliable data on the quality of groundwater resources in BiH is striking, thus it is possible that groundwater contamination is more widespread. If measures are not promptly implemented, the quality of groundwater might deteriorate (Water Management Strategy of FBiH2010-2022; Development Framework for Water Management of RS, 2006).

3.3.4 CONCLUSIONS AND RECOMMENDATIONS

The presented indicators point to more than forty topics/issues that are currently most prominent in the water sector in BiH (Water Policy of BiH, 2011). Technical problems can certainly include drainage and treatment of waste water from the public drainage system and industry, pollution of rivers downstream of urban agglomerations and industrial areas, tremendous losses of water in public water supply systems, unsatisfactory monitoring of groundwater and coastal marine water, etc. Identified administration problems include: the lack of and/or insufficient performance of the competent bodies at the state level in coordinating activities related to water resource management, inadequate tariff policies for utility companies imposed by the local government, direct dependency of the utility companies management on the local level of political authority, weakness of inspections for the protection of surface water and groundwater, lack of accuracy in the management of coastal, marine and other areas.

Data are missing partially or completely for some indicators of state of water resources in BiH. Some data are not measured or collected,while some data such as certain indicators in the field of water supply to the population, water protection, use of waters and protection from floods are not unique for the whole country. Due to the foregoing reasons, usually because of a lack of uniform organization of data for the entire country, data and indicators in the sphere of water resources that were not available during the development of this Report are:

- Water supply to the population:
  - Consumption of water in households per capita
  - Water fee collection rate
- Protection of water quality
  - Number and frequency of combined sewage systems in urban areas
  - Utilization of recycled water
  - Level of sedimentation in water flows
  - Contaminated sediments
- Use of waters -
  - Irrigation for the needs of agriculture
- Protection from floods

- Estimates of economic losses due to floods and droughts
- Public investments into protection from floods

- Nutrients in transitional, coastal and sea waters (CSI 021), trends in concentrations of nitrates and phosphorus in winter months and N/P ratio in the Adriatic Sea in BiH
- Chlorophyll in transitional, coastal and sea waters (CSI 023) – mean surface concentration of chlorophyll during summer months (mg/L) in the Adriatic Sea in BiH
- Gross balance of nutrients (CSI 025) – (a) quantity of nitrogen that is taken in through mineral fertilizers and manure, as well as nitrogen fixation of leguminosaes, deposition from the air and other smaller sources; (b) production of nitrogen from crops, grass or crops eaten by cattle.

In order to provide the necessary pre-conditions for an efficient implementation of EU directives related to the water sector, it is necessary that the government undertakes the following activities in a short period of time (1-3 years) [32]:

- Prepare general plans for water supply, sewage and waste water treatment in BiH;
- Prepare the classification of river basins, as a first step in development of plans for river basin management;
- Improve fiscal discipline of water resource users in order to achieve effective collection of consumers' debts, which have been defined by the existing regulations;
- Improve coordination and harmonization at the state level, including improvement of statistics in the area of environment as a permanent activity within the scope of entity and state bodies in charge of statistics.

3.4 MINERAL RESOURCES

3.4.1 COAL DEPOSITS

BiH is rich in coal deposits. Coal was formed in different eras of historical and geological development of the Earth and in numerous locations in BiH (more than 100). This includes stone coal reserves, which do not have an immense economic significance, and are contained in sedimentary complexes of Late Paleozoic (close to Vlasenica), in Triassic and Jurassic formations (close to Bosansko Grahovo), in Eocene formations in Herzegovina (Lastva), as well as in the Mountains of Majevica and Kozara in BiH.

Recently, economically cost-effective reserves of stone coal were found in some parts of the central and eastern Majevica Mountain (Veselinovac, Gnjica and Rožanj).

Economically significant coal deposits were mainly formed during the Neogene period. Most deposits of brown coal were generated in the Early and Middle Miocene, while lignite deposits were formed in the Late Miocene and Early Pliocene. Brown coal deposits are of tectonically disturbed and unbalanced quality. Lignite deposits are most frequently found in marine (Kreka, Stanari) and lake sediments (Gacko, Bugojno, Livno, Duvno).

More important coal basins in BiH were discovered over 100 years ago and are generally well explored geologically. In some of them, the process of coal exploitation has been performed for more than one hundred years.

Total geological reserves of coal in BiH are estimated to be 5.647 billion tons, out of which 2.540 are balance reserves (1.438 billion tons of lignite and 1.103 billion tons of brown coal). Only 45% are balance reserves, while 11% accounts for out-of-balance reserves and 44% are potential reserves. Considerable funds are necessary to convert potential reserves into balance reserves through additional geological research.

The most important reserves of brown coal are found in the following basins: central BiH (Kakanj, Zenica, Breza and Bila), Banovići (Seona, central basin, Djurdjevik), Ugljevik (Bogutovo Selo, Ugljevik Istok, Glinje, Mezgraja, Tobut-Peljave), Miljevina and Kamengrad. Lignite basins:

32 Water Policy of BiH, 2011

Kreka, Gacko, Stanari, Bugojno, Livno and Duvno (Tomislavgrad). These basins present the existing and future potentials for thermal energy production.

Other coal basins (Mostar, Tušnica, Kotor Varoš, Lješljanski, Teslić, Žepče-Šeher, Mesići, Drvar, Cazin and other) stand for only 5% of balance reserves, that is, 6.3% of the total coal reserves. There are 52.6% of lignite balance reserves in the Kreka basin and 19.7% in the Gacko basin, etc.

Table 35: Coal reserves in BiH (Source: Energy Institute Hrvoje Požar et al, Study of Energy Sector inBiH, 2008)

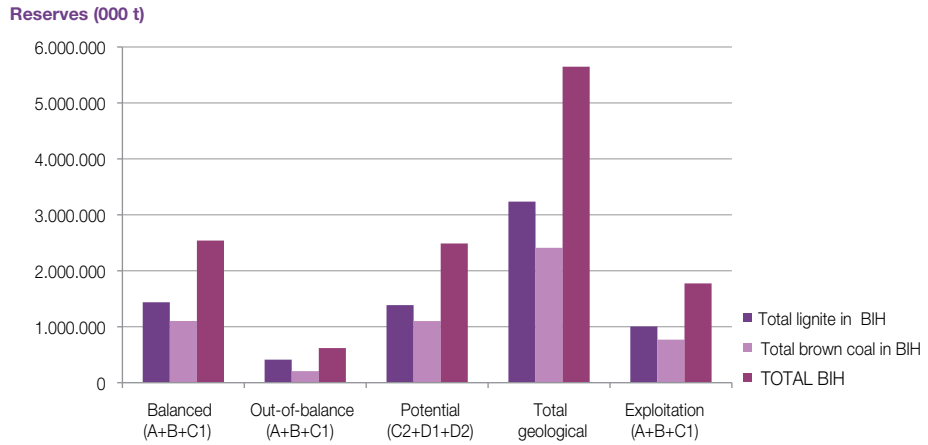
No.	NAME OF MINE AND TYPE OF COAL	RESERVES (000 t)		
		Balanced (A+B+C1)	Out-of-balance (A+B+C1)	Potential (C2+D1+D2)
BiH				
Total lignite in BiH		1,437,635	412,103	1,386,653
Total brown coal in BIH		1,102,718	206,834	1,101,689
TOTAL IN BIH		**2,540,353**	**618,937**	**2,488,342**
FBiH				
1	Kreka (L)	743,954	322,833	59,407
2	Banovići (BC)	194,085	13,935	0
3	Đurđevik (BC)	60,183	4,963	0
4	Kakanj (BC)	256,536	56,525	127,604
5	Breza (BC)	49,244	23,928	0
6	Zenica (BC)	179,843	59,931	721,369
7	Bila (BC)	26,808	10,373	25,354
8	Gračanica (L)	10,657	0	0
9	Tušnica 76,201	1,111	0	77,312
	Tušnica 16,274	0	1,865	18,139
10	Kamengrad (BC)	112,001	3,722	120,000
11	Bugojno (L)*	14,651	0	1,280,105
12	Kongora (L)*	206,411	0	0
Total lignite in BiH		1,051,874	1,051,874	323,944
Total brown coal in BIH		894,974	894,974	173,377
TOTAL IN FBIH		**1.946.848**	**1,946,848**	**497,321**
RS				
1	Ugljevik (BC)	186,544	17,657	65,397
2	Stanari (L)	107,221	31,842	9,761
3	Gacko (L)	278,540	56,317	37,380
4	Miljevina(BC)	21,200	15,800	40,100
Total lignite in RS		385,761	385,761	88,159
Total brown coal in RS		207,744	207,744	33,457
TOTAl IN RS		**593,505**	**593,505**	**121,616**

Potential reserves are distributed in several basins and have not been sufficiently researched. Significant potential reserves of brown coal are registered in the Ugljevik and Kamengrad basin. It must be emphasized that potential coal deposits in the Bugojno, Livno and Duvno basins, are very interesting in terms of thermal energy production (documentation JP EP BiH, TE Tuzla, coal mines: Ugljevik, Gacko, Kreka, Banovići, Kakanj, Bugojno, Livno, Stanari, 2011).

Total geological	Exploitation (A+B+C1)	Hd (GJ/t)	Humidity (%)	Ash (%)	Total sulfur (%)
3,236,391	1,004,593				
2,411,241	769,839				
5,647,632	**1,774,432**				
1,126,194	456,008	11.31	38.70	13.06	0.61
208,020	162,429	16.18	16.09	24.14	1.74
65,146	54,524	17.95	9.42	25.77	2.30
440,665	204,839	12.5-16.07	5.7-9.16	35.49-42.75	1.4-3.85
73,172	28,098	14.43	6.61	30.99	2.54
961,143	131,800	17.62	12.58	22.32	3.65
62,535	16,091	14.50	15.84	24.65	4.69
10,657	10,657	10.75	32.43	17.06	2.95
68,528	11.00	39.00	13.00	2.23	2.23
11,433	15.00	16.50	18.00	4.00	4.00
235,723	68,671	13.00	22.60	24.19	4.08
1,294,756	12,893	11.36	32.88	19.43	
206,411	129,765	7.38	35.06	27.50	1.25
1,339,512	2,715,330	677,851			
996,192	2,064,543	677,885			
2,335,704	**4,779,873**	**1,355,736**			
269,598	72,874	12,287	32.1	18.07	4.08
148,824	73,271	9,646	50.75	5.74	0.17
372,237	253,471	10,174	37.97	15.68	1.55
77,100	19,080	11.7-14.8	24.9	24.83	2.2
47,141	521,061	326,742			
105,497	346,698	91,954			
152,638	**867,759**	**418,696**			

** Potential coal deposits; L – ligniet, BC–brown coal; Exploitation reserves – Balance of reserves minus exploitation losses*

Figure 91: Coal reserves in BiH (Source: Energy Sector Study in BiH, 2008)



3.4.2 METALLIC ORE DEPOSITS

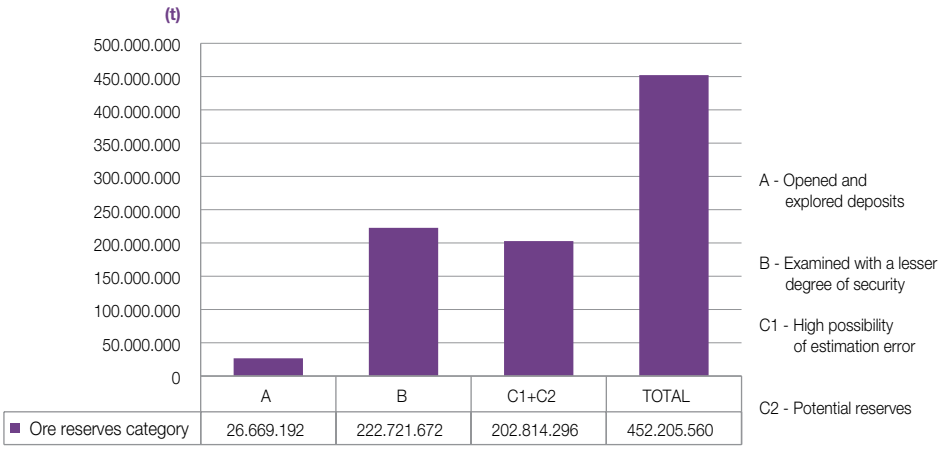
Deposits of lead, zinc and silver

Lead and zinc are usually found together in the same deposits, and often with silver ore. These ores have been mined since the Ancient Roman period and many places have been named after them (for example – Argentaria – area of eastern BiH – Tomaschek, 1895). Austrian–Hungarian geologists made an invaluable contribution to the research of these ore deposits (E. Mojsisovics et.al. 1879/80; B.Walter 1887, F.Katzer, 1900-1910). Major lead and zinc deposits in BiH are located in the area of Vareš, Olovo, Ljubija and Srebrenica (Kurtanović, 2000)

Iron

In the region of the former Yugoslavia, BiH was the leader in terms of abundant iron ore deposits with a share of 89% (over 2 million tons/yr) in the total production of Yugoslavia in the 1960s. Iron ore has been exploited since the Ancient Roman period until nowadays. At the beginning of the 20th century, Austrian researchers led by Fridrich Katzer carried out the first significant research in this field. Iron ore deposits are found in the following areas: Vareš, Konjic-Jablanica-Prozor, Raduša Mountain-Jajce-Mrkonjić Grad, Central Bosnia, Sana-Una, eastern and southeastern Bosnia and in the area of Zavidovići-Teslić. The total reserves of the said ore deposits are given in Figure 92..

Figure 92 Iron ore reserves in BiH, in tons (Source: Kurtanović, 2000.)



Based on the conducted research (Radomir Jovanović), there are around 100 deposits of iron ore of different composition in BiH. Many are well researched, but there are still

Manganese

Volcanogenic-sedimentary manganese deposits are the most important and widespread. The entire production of manganese is based on such deposits. One of the most important manganese deposit in BiH, with explored reserves amounting to hundreds of tons, is situated in the area of Varoška Rijeka near the town of Bužim. The ore was extracted by way of opencast exploitation. Waste rocks were deposited at an outer dump site near the open cast mine.

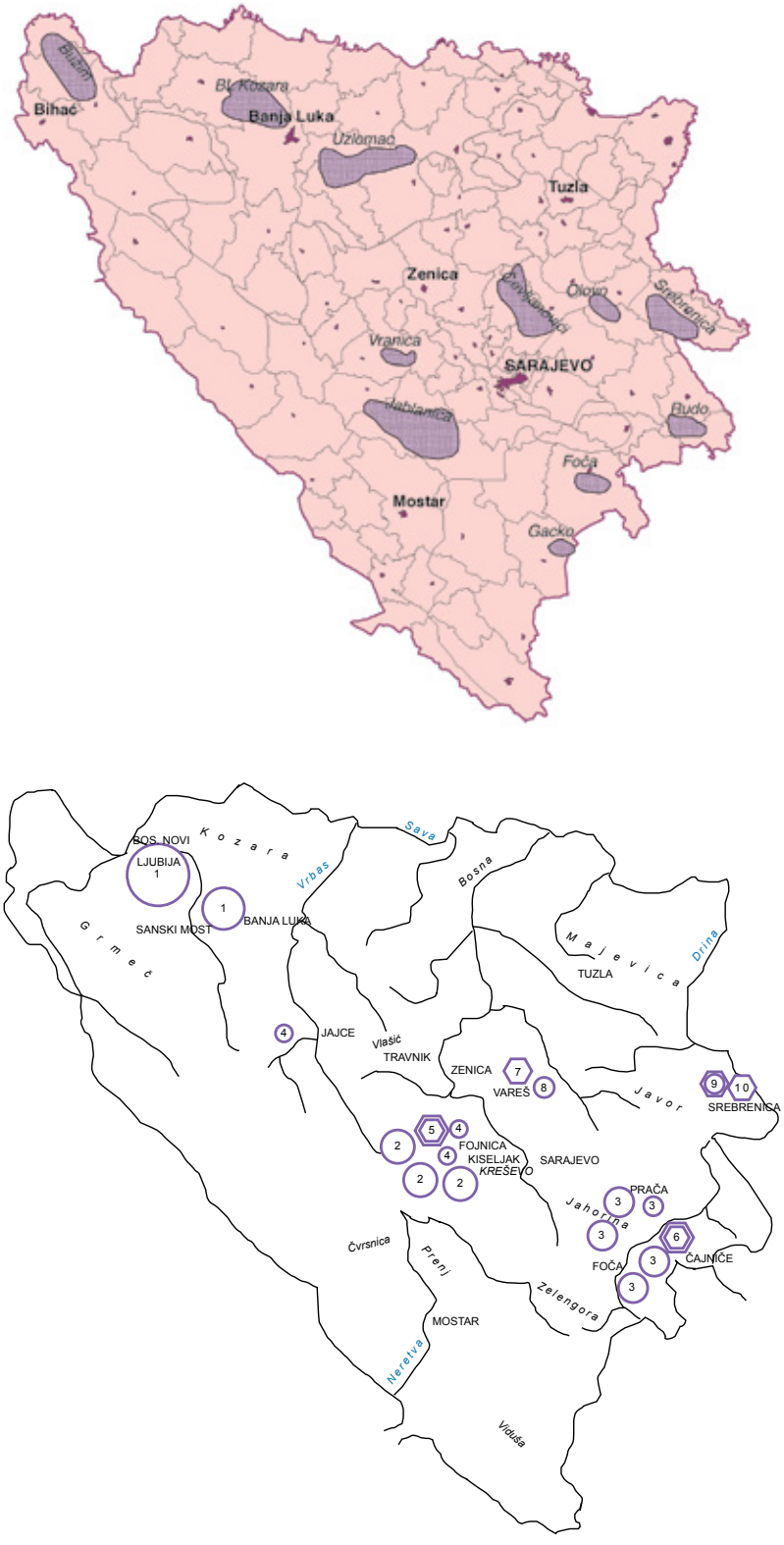


Figure 93:
Deposits of manganese (top) and antimony (bottom) in BiH (Source: Kurtanović, 2000.)

Antimony

Three types of antimony ore have been identified in BiH: quartz-antimony, baryte–antimony and polymetal ore of antimony. By the end of the 18th century, antimony was exploited in Čemernica, near Fojnica. During the 1960s, antimony ore was intensely explored and exploited from deposit Rudište near the Goražde – Čajniče highway. The content of antimony in Čemernica deposits varied from 3-15%, zinc content from 2-10%, while the silver content varied from 50-100 grams per ton. Research was completed in 1963, when 200,000 tons of antimony ore were identified, out of which several tens of thousands tons contained 3-4% antimony.

Copper

The research carried out in BiH indicated the presence of several hundred copper ore deposits. In addition to the monometallic ore, several forms of oxide ores exist (cuprite, tenorite), sulphides (chalcopyrite, covelline and chalcocite), sulphates (tetrahedrite, bournonite, enargite, stannite, cubanite), and often carbonates (malachite and azurite). There are around 20 different types or forms of copper ore deposits. Analysis of the present state of genetic, morphological and economic types of copper ore deposits in BiH leads to the following conclusion: the main reserves are connected with the Triassic area near Vareš and Prozor, diabase-porphyry and volcanogenic-sedimentary areas in the zone of Kozara-Ozren-Konjuh mountains. Furthermore, metalogenetic area of Konjuh-Krivaja-Teslić-Čavka should not be disregarded..

Mercury

There are several hundreds of mercury ore deposits in BiH, mainly cinnabar and tetrahedrite, and rarely metacinnabar. Mercury was mined from Ancient Roman period until 1960s in different locations (Figure 94)

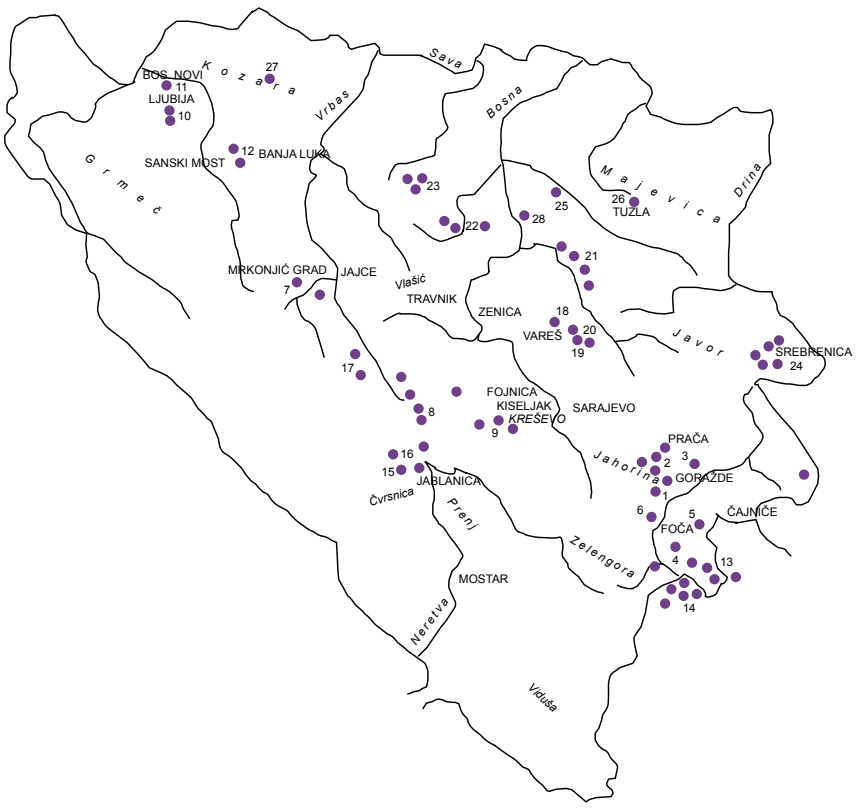


Figure 94: ocations of deposits of copper (left) and mercury (right) in BiH (Source: Kurtanović, 2000.)

2.4.3 NON-METALLIC ORE DEPOSITS

Rock salt

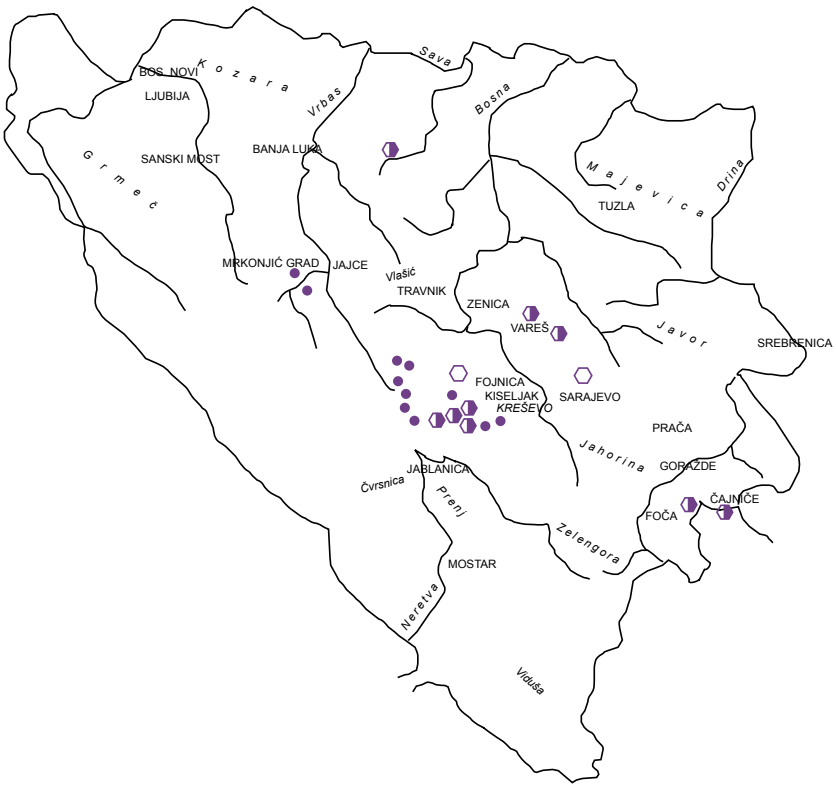
"Tetima" deposit of rock salt on the Mountain Majevica is the replacement capacity for salt mining in Tuzla, and it was activated in order to reduce the significant impact that salt mining in Tuzla had on the environment. Salt water, as the main product of salt mining, can pollute the soil and water flows and there is a possibility of H2S occurrence, as recorded in the research phase. Drilling fluids are highly toxic and potentially dangerous for the environment. Salt water pipelines that carry salt water from the mine to the plant in Tuzla are 20 km long and there is a potential risk of pipeline bursts and salt water release. Contents of gases: CO_2, H_2S, NH_3, methane, ethane, ethylene, n-propane, propylene, n-buthane and penthana in an amount not exceeding 20.68 cm^3/kg salt; this is, therefore, a gaseous deposit (Hrustić, 2009.). The mine has been operational since 2002.

Researched salt reserves are as follows:

- Salt reserves - 375 million tons
- Excess reserves - 342 million tons
- Exploiting factor - 0,16
- Usable reserves - 54,72 million tons

Magnezit

Magnesite ore was extracted in the Kladanj area. It is connected to the Krivaja-Konjuh ultramafic massif that stretches from the Bosna River Basin in the west to the Sarajevo-Tuzla highway in the east (to the north of Olovo). It borders with the Zvijezda Mountain (north of Vareš) in the south and with Ribnica and Banovići in the north.



The River Krivaja divides the deposits in two plateaus, the plateau west of Krivaja and the plateau east of Konjuh. Based on Study on Classification, Categorization and Reserves Calculation, status on 31 December 1985, the estimated balance geological reserves amounted to 1,678,000 t (sector Miljevica 801,000 t and sector Zeničica 877,000 t) (Mining Institute Tuzla, 2009).

Barite

Numerous barite deposits are scattered throughout BiH. These are mono-mineral and complex barite deposits. The quality of mono-mineral barite deposits in BiH was researched and the ore was mined near Kreševo and Velika Kladuša, but mining was stopped in 1991. Opencast and underground mining methods were used in barite mining. Underground mining was performed in the primary deposits, while the other deposits were mined using opencast mining methods. Baryte reserves in the Kolivoji deposits (5 km from Kreševo) are estimated to several tens of tons. Other deposits in that area are classified as insufficiently explored.

Bauxite (white bauxite as nonmetal ore and red bauxite as metal ore)

White bauxite is found in different areas rich in bauxite deposits in the top layer of sediment in red bauxite deposits. This ore is used in the fire protection industry for the production of high quality bricks and bauxite powder, given its high content of iron. White bauxite with Fe_2O_3 content over 5% is used in the production of rapid-hardening cement and special cements. Red bauxite with high percentage of Al_2O_3 is used in aluminum production.

Former mines of bauxite are situated in triangle Bosanska Krupa - Lušci Palanka - Bosanski Petrovac. Both opencast and underground mining methods were used in bauxite mining. The ore was transported by trucks to the railroad in Bosanska Krupa and then to consumers. Enrichment and processing plants were not part of these activities. Opencast mining caused soil erosion, therefore technical and biological land reclamation is necessary.

Bauxite opencast mining was also performed in the Stolac area. As in previous cases, the processing plant was not installed at the location. Technical and biological soil re-cultivation must be performed at this location, while the facilities and plants in the mine compound have to be restored and potentially used for other purposes.

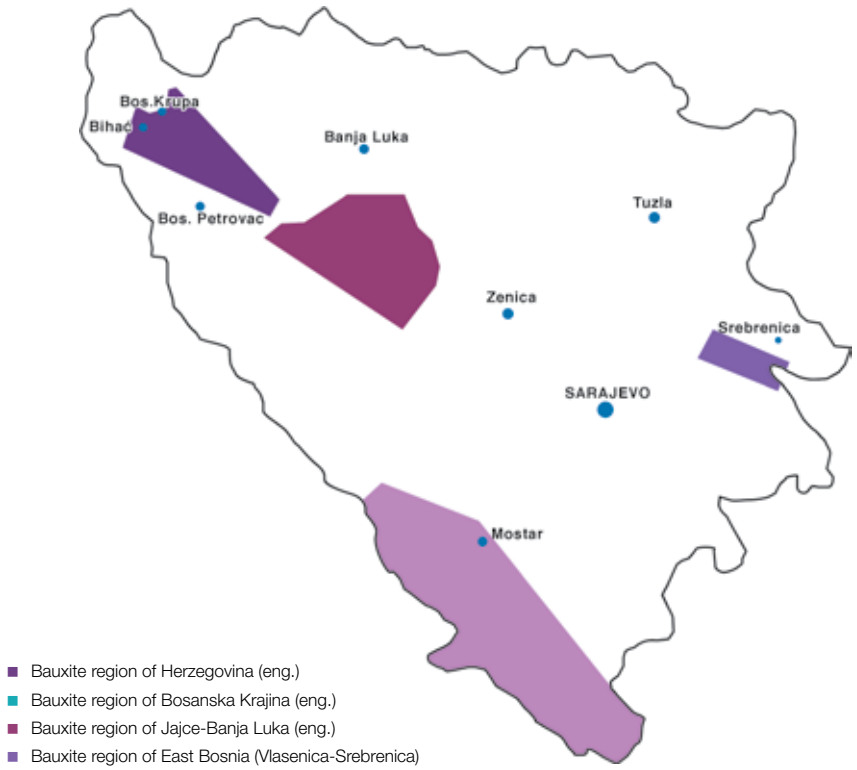


Figure 95: Bauxite deposits in BiH (Source: Kurtanović, 2000.)

3.4.4 Stone deposits

In the geological area of BiH there are practically limitless reserves of igneous rock, with good prospects for future exploitation and processing to meet both local and export deamnds. Separate deposits of architectural stone are also taken into consideration in terms of future mining and processing.

The following quarries are currently operational in the FBiH:

- Architectural stone: in Jablanica (gabbro), Novi Travnik (gabbro-diorite and amphibolites in Vareš);
- Technical stone: in Ribnica (diabase), Vareš (spilite), Fojnica (quartz keratophyre and diabase in Podgradci).

Dolomite and limestone deposits are scattered throughout BiH. Herzegovina is rich in other stone deposits such as gabbro, diabase, sinter, technical stone etc.

3.4.5 Previous assessment of geothermal potential

Geothermal energy potential in BiH has not been sufficiently researched. Seventy four locations of geothermal sources with total potential thermal power have been defined. The total of 30 deep wells were drilled in the country, and thermal fluid parameters were explored in few cases only, while the thermal characteristics of rocks have not been explored anywhere (Study of Energy Sector in BiH, 2008). Geothermal energy utilization assessment in BiH is possible in several fields:

- Agriculture for food production,
- Municipal heating sector,
- Health and cosmetic industry - balneotherapy,

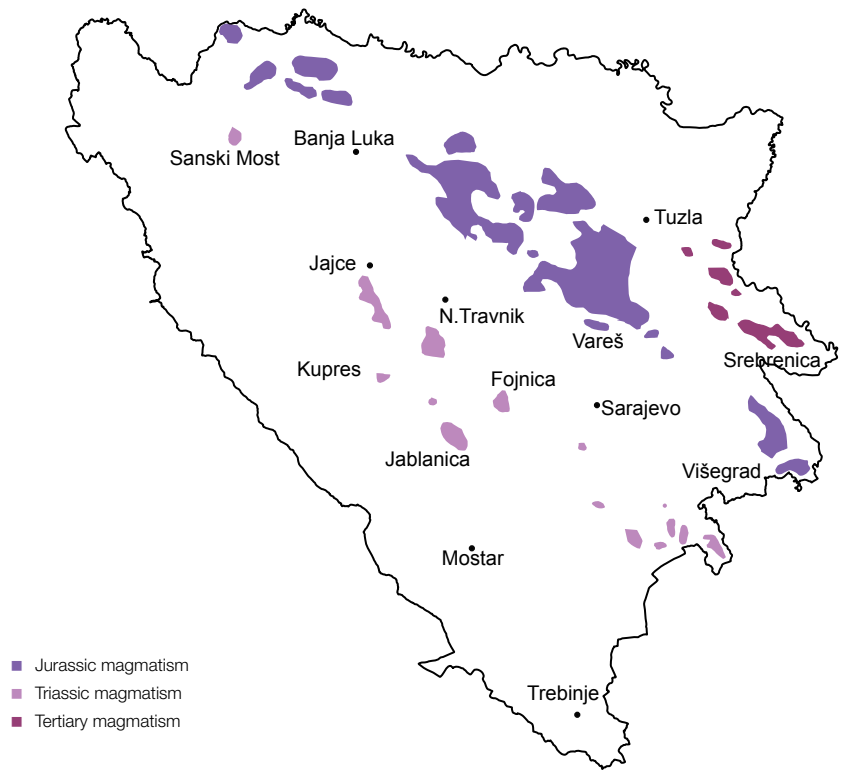
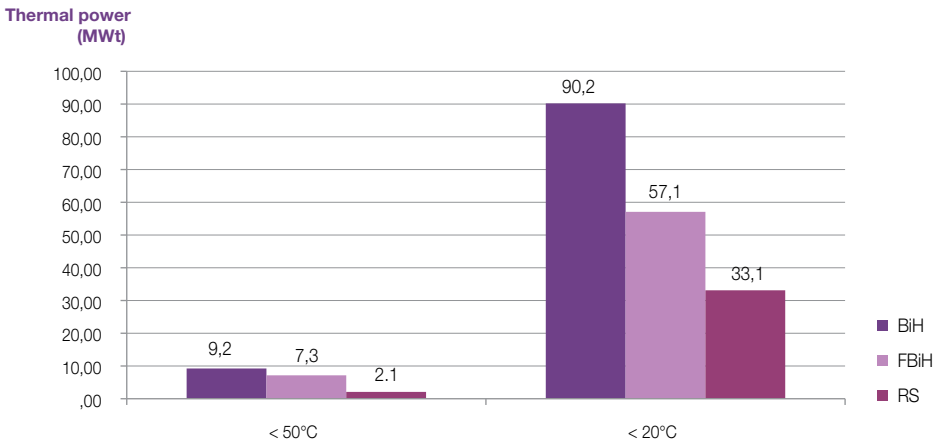


Figure 96:
Ultrabasic rock deposits in BiH
(Source: Trubelja and Hrvatović, 2004)

- Tourism purposes
- Electricity generation in small-scale power plants.

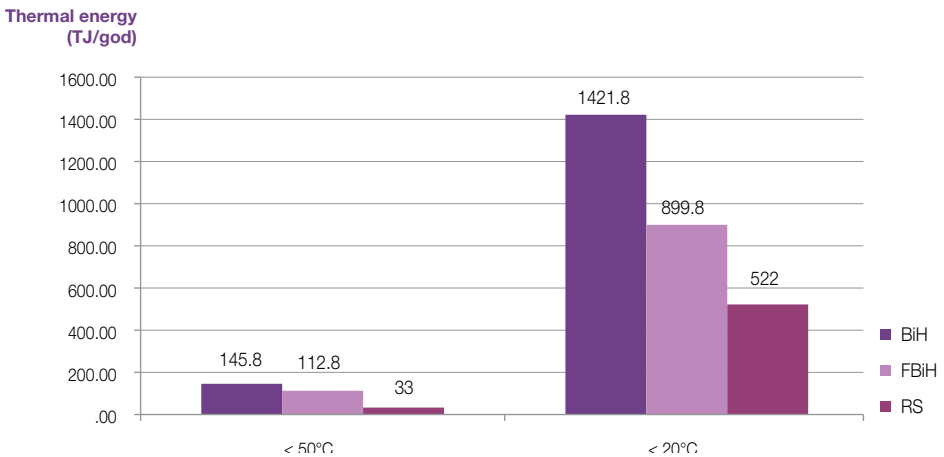
At 44 locations where thermal exploitation in Bosnia and Herzegovina is possible in line with the set criteria, the total potential installed capacity at geothermal sources is 9.24 MWt, if only heating of spaces is considered (temperature reduction up to 50ºC), that is, 90.2 MWt if geothermal energy for space heating and recreational and balneological needs (bathing) is considered (temperature reduction up to 20 ºC). Total installed capacity of thermal power of geothermal sources in the FBiH at 28 locations and at 16 locations in the RS is shown in Figure 97.

Figure 97: Potential of geothermal power in BiH, given in MWt (Source: Study of Energy Sector in BiH, 2008)



If the utilization factor of the mentioned sources is 0.5, then BiH can produce around 145.75 TJ of energy for space heating, i.e. a total of 1,421.75 TJ of energy for heating and spa (Figure 98).

Figure 98: Potential of geothermal power in BiH, given in TJ/year (Source: Study of Energy Sector in BiH, 2008)



The obtained results are promising, but without adequate representative parameters that can be obtained only by deep drilling, it is impossible to speak realistically about geothermal sources. Bearing in mind that significant investments are required for explorative drilling, as well as the degree of uncertainty that accompanies such explorations, it is not realistic to expect investments into this sector without the support of state and entity governments or the international community (Study of Energy Sector in BiH, 2008).

3.4.5 CONCLUSIONS AND RECOMMENDATIONS

Coal basins in BiH are well known for at least a century. They are mainly geologically well explored. Total geological reserves of coal are estimated at 5.647 billion of tons, of which 2.540 billion tons are balanced reserves (1.438 billion tons of lignite and 1.103 billion tons of brown coal). Balance reserves stand for only 45 %, out-of-balance 11 % and 44 % are potential reserves. Therefore, it is necessary to pay special attention to the environment when using this resource. Enormous funds are necessary to carry out proper exploration of potential reserves in order to convert them into balance reserves

Environmental issues related to operating coal mines are discussed in the chapter titled "Mining". As previously mentioned, only a few research papers address mining impacts on the environment. The research papers mainly considered damages caused by mining and impact of mining on populated areas. Therefore, comprehensive protective measures and monitoring of possible environmental impacts have not been defined. Processes of soil re-cultivation and land recovery at open cast mines have not been carried out in accordance with the legislation.

Data and indicators for metal and non-metal mines in the RS, including mineral resources, were not available during the development of this Report. These data were partly collected from other sources.

Metal mines, mainly destroyed in the war, were not in the focus of local and foreign investors, and the majority of them are out of operation. Many were not properly shut down, and it is necessary to put together an inventory of abandoned metal mines in order to identify critical spots, hazards and environmental risks, and set rehabilitation priorities. This requires engagement of not only legal successors of mines, but also representatives of the government, local community and all other stakeholders.

3.5 BIOLOGICAL AND LANDSCAPE DIVERSITY

Biological diversity (biodiversity) underlines the existence and importance of diversity of all living forms and their habitats on Earth. Biological diversity means the variability among living organisms from terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part (UN Convention on Biological Diversity[33] , 1992). Landscape diversity means the variability of a group of geological formations and of vegetation types with different space use. Therefore, a group of different ecosystems can be referred to as a landscape.

BiH is considered to be rich in species and habitats. The variability of wildlife in BiH is the result of ecological heterogeneity of space, geomorphologic and hydrological diversity, specific geological past and climate diversity. BiH wildlife is characterized by a high degree of endemic and relict life forms. More than 5,000 species and subspecies of vascular plants, more than 100 species of fish and more than 320 species of birds and other elements of biological diversity have been identified in BiH (BiH Fourth National Report to UN Convention on Biological Diversity, 2010).

BiH wildlife is poorly researched at the moment. Current data on the total number of species of flora, fauna and fungi are contained in BiH Fourth National Report to the UN Convention on Biological Diversity. However, data on biological diversity in BiH are scarce and BiH still has no institution responsible for biological diversity state monitoring. Data on the majority of generally accepted indicators for the monitoring of biological diversity state do not exist in BiH (see the table with indicators at the end of the chapter).

33 CBD - Convention on Biological Diversity

3.5.1 STATE OF BIOLOGICAL AND LANDSCAPE DIVERSITY

At present, BiH has a low capacity for collecting and publishing reliable statistical data in accordance with European standards. The collection of statistical data on the environment and biological diversity is still not a part of entity/state statistical data collection systems. Due to this, the majority of data on biological diversity is found in research papers and publications developed by different institutions. As previously mentioned, there is no central or coordinating body responsible for collecting, recording and analyzing data on biological diversity at the entity and state level.

The last BiH National Report to the Convention on Biological Diversity contains detailed information on diversity of species, ecosystems and landscapes. Several strategic documents with information on the state of biological diversity were prepared at BiH level and the level of the FBiH and the RS (Table 36).

Table 36: Relevant strategic documents that are the source of information on biological diversity in BiH

2003	National Environmental Action Plan BiH (NEAP BiH)
2004	Environmental Performance Review published by United Nations
2007	Strategije za zaštitu prirode i okoliša u FBiH i RS
2008	Strategies for protection of nature and environment in the FBiH and the RS
2010	The Fourth Report of BiH to the UN Convention on Biological Diversity
2010	UNECE Report on Environmental Performance Review
2010	FBiH Environmental Performance Report
2011	National Biodiversity Strategy with Action Plan 2008-2015

At present, the Red Book and a List for BiH prepared in accordance with IUCN[34] methodology do not exist. However, data in research papers that contain information on species are available and may serve as a starting point for Red Book preparation. The document "Taxonomic and Geographic Assessments of Species as a Basis of Development of Red List" required for developing the Red List was prepared for the RS and finalized in April 2012. Currently, the development of the Red List for the FBiH is underway

Flora

The fact that 5,134 different plant species have been identified in BiH points to a considerable plant species diversity. A large number of those species (1,859) belongs to the class Cyanophyta and algae, while the rest belong to the class of mosses (Bryophyta), ferns (Pteridophyta) and seed plants (Spermatophyta).

Fauna

Fish fauna is relatively well researched and 199 fish species are identified. The diversity of aquatic animals is characterized by 7 orders, 21 species and 22 sub-species. Reptiles inhabit fresh water ecosystems, swamps, wetlands and almost all land ecosystems (especially habitats with extreme living conditions like rocky meadows) and are classified into 40 species and 45 sub-species that belong to 12 families. The greatest reptile diversity is identified in the Mediterranean region and supra-Mediterranean belt. Bird fauna includes 326 species that belong to 60 families. The majority of these species are hibernators, while migratory birds appear only in certain seasons and usually in wetlands (e.g. Busko Blato, Bardača, Hutovo Blato) and river flows (e.g. downstream of the Drina River). Eighty five mammal species have been identified and the majority live in land habitats

34 International Union for Conservation of Nature and Natural Resources

Fungi

Fungi inhabit land and marine ecosystems. It is estimated that 15,000-20,000 fungi species can be currently found in BiH. However, only 552 species in the higher order of fungi have been identified.

Table 37: Vertebrates fauna in BiH (Source: BiH Fourth National Report to UN Convention on Biological Diversity, 2010)

Animal group	No. of families	Total number of species	Endangered species in BiH	Endemic species
Fish	27	119	?	12
Water animals	7	20	3	6
Reptiles	12	38	11	12
Birds	60	326	97	-
Mammals	19	85 (+2?)	24	9
Total	**125**	**588 (2?)**	**135**	**39**

Table 38: Taxonomic diversity of higher plants (Source: BiH Fourth National Report to UN Convention on Biological Diversity, 2010)

	Family	Order	Species	Sub-species	Total
Bryophyta	52	187	565	0	565
Pteridophyta	14	26	61	8	71
Spermatophyta	161	858	3,256	1,078	4,498
Total	**227**	**1,071**	**3,882**	**1,086**	**5,134**

Habitats and landscapes

Landscape diversity of BiH is the result of its geographic position, climate, geological, geomorphologic, ecological, hydrological, anthropogenic and other factors. The Dinarides mountain system stretches from Posavina in the north with slightly hilly landscapes to the Adriatic Basin in the south, and its direction is from northwest to southeast. Apart from orogenic wedges, the Dinarides are dominated by high plateaus. Tectonic movements formed valleys and karst fields. Great river valleys are Sarajevo-Zenica in the River Bosna valley, Uskoplje and Banja Luka in the River Vrbas valley, Bihać in the River Una valley, Tuzla in the River Spreča valley, Mostar in the River Neretva valley, and many others.

Many factors influenced the formation of karst fields. The bottom of karst field is covered with quartz sediment, while the sides are framed by carbonate mass. Fresh water sources are usually found along the edges of karst fields, and their water runs into karst sinkholes and karst underground. The landscape of BiH is made of underground karst forms in carbonate rocks, which classify it as one of the richest holokarst regions in the world. BiH is rich in many discovered and undiscovered caves and pits, and the most famous are: cave Vjetrenica in Popovo Polje, Glavačanska cave near Foča, Mračna cave in the Prača valley, Bijambarska cave in Nišići and Orlovača near Sumbulovca.

Richness of landscape diversity in BiH can be best explained by geographic zones, which provide prerequisites for different ecosystems and landscapes. Predominant landscapes from the south to the north are as follows (BiH Fourth National Report to UN Convention on Biological Diversity, 2010):

- Mediterranean landscapes;
- Supra-Mediterranean landscapes;
- Mediterranean-mountainous landscapes;
- Mountain landscapes;
- Hilly landscapes;
- Peripannonian landscapes;
- Pannonian landscapes..

Figure 99:
Canyon of the river Una, Štrbački Buk

Figure 100:
Mountain Prenj – high-mountain landscape

3.5.2 PRESSURES ON AND THREATS TO BIOLOGICAL DIVERSITY

In the Fourth National Report to the UN Convention on Biological Diversity the state of biological diversity is assessed based on trends analyses and intensities of indentified pressures on biological diversity. The results showed that habitat conversion, overexploitation of resources and pollution caused the most intense pressures on biological diversity. A group of ecosystems subject to the highest pressure due to an intensive process of habitat conversion is precisely the one containing ecosystems typical for BiH. Pollution represents a typical pressure on the environment near and around urban areas and settlements. Invasive species also pose significant pressure on biological diversity.

Results available in the UNECE Environmental Performance Review present a synthesis of conclusions from key reports and strategies prepared for BiH to date. They reflect the main problems and threats to biological diversity. Threats to biological diversity are as follows:

- Habitat conversion, followed by excessive exploitation of natural resources;
- Development of the energy sector, based on hydropower plants, with a number of impacts (e.g. destruction of river canyon with a high level of biological diversity and endemism, destruction of habitats due to a change in hydrological regime, eutrophication etc.);
- Pollution;
- Invasive alien species;
- Uncontrolled game hunting and trade.

The main pressures on all types of landscapes and in all ecosystems are:

- Uncontrolled urbanization, construction of roads and other infrastructure that lead to habitat degradation and fragmentation;
- Habitat conversion (especially karst habitats) into agricultural land, as well as a general expansion of agricultural areas (predominantly, the expansion of monocultures);
- Diverting water flows for construction of hydro accumulation facilities combined with poor water management;
- Water contamination with different industrial and agricultural pollutants;
- Global climate change and acidification of habitats;
- Forest fires caused by inattention and negligence;
- Uncontrolled waste disposal;
- Inadequate forest management;
- Overexploitation of medicinal herbs and fungi;
- Intense conversion and fragmentation of forest habitats by open cast quarries and construction areas;
- Unbalanced hunting and fishing;
- Invasion of invasive species and genetically modified organism

3.5.3 ENDANGERED AND PROTECTED SPECIES

As mentioned before, by the end of 2012 there were no red lists or lists containing IUCN methodologies for species conservation available. The list of plants that can serve as a basis for preparation of the National Red List can be found in the National Museum Sarajevo Gazette (Šilić, 1992-1995; 1996).

3.5.4 INVASIVE SPECIES

Based on the available information and data on invasive species, there are tens of such species registered in BiH (BiH Fourth National Report to UN Convention on Biological Diversity, 2010). The category of horticultural plants that are out of human control in BiH contains: Ailanthus altissima (tree of haven), Helianthus tuberosus L. (sunroot), Solidago gigantea (giant goldenrod), Amorpha fruticosa L. (false indigo), Robinia pseudacacia L. (Black locust), Phytolacca americana L. (American pokeweed), Reynoutria japonica Houtt. (Japanese knotweed), Impatiens glandulifera (Himalayan balsam), etc. The most invasive are: Ambrosia artemisiifolia (common ragweed), Bidens bipinnata L. (Spanish needles), Bidens frondosus L. (Devil's beggarticks), Bidens subalternans DC. AndEchinocystis lobata (Michx.) Torr. & A. Gray (wild cucumber). Alien sea species are the most frequent fish species that arrive to free fish farm waters or swim in spontaneously from neighboring lakes and rivers. Gudgeon (Gobio gobio) is one of the most invasive fish species in our country. The data on the number and distribution of invasive species are still missing.

3.5.5 PROTECTED AREAS

The territory of protected areas in BiH is relatively small, and the percentage share as compared to the total BiH territory is very low and significantly below the European average. In 2011, the percentage of protected areas in BiH was 2% (Table 39).The percentage of protected areas has increased over the past 9 years with the establishment of the National Park "Una" in 2008 and similar activities. However, that percentage is still below the level of protection envisaged in numerous strategic documents[35] .

At present, there are three National Parks in BiH: National Park "Kozara", National Park "Sutjeska" in the RS and National Park "Una" in the FBiH. Establishment and management of these national parks is in accordance with 2nd category IUCN, but it ought to be emphasized that National Park "Una" was declared a national park in accordance with the IUCN categorization, while national parks "Sutjeska" and "Kozara" were declared in the former Yugoslavia. The adoption of the Law on National Park "Kozara" and the Law on National Park "Sutjeska" was completed in December 2012. These legal acts are also in line with the IUCN categorization. Existing national parks cover 39,759.9 ha. Ten areas are designated as Natural Monument (3rd category IUCN), four of which are located in the FBiH, and six in the RS. These are: Skakavac, Prokoško Lake, Vrelo Bosne and Tajan in the FBiH, and Ljubačevo cave, Žuta Bukva, Orlovača cave, Rastuša cave, Dedana pit and Vagan cave in the RS. Apart from these, two protected areas are designated parks of nature (Blidinje and Hutovo Blato), but this category is not envisaged in the Law on Nature Protection in the FBiH.

153 areas in BiH have some degree of protection since 1954. These are usually protected landscapes, natural monuments, or protected habitats (e.g. forest seed stands). However, classification and registration of these areas is still not harmonized with the new legislation. The status of decisions made according to the Law on Natural, Cultural and Historic Heritage of SRBiH[36] is still not clear, and those areas cannot be regarded as officially protected. After the new law on nature protection in the FBiH is adopted, the revision of protected areas declared before 2003 is foreseen.

35 NEAP foresees protection of 15% - 20% territory in Bosnia and Herzegovina

36 Official Gazette of SRBiH No. 4/1965

Table 39:
Areas that were officially protected in BiH before December, 2012

Category according to the Law on Nature Protection in RS and FBiH	IUCN category	Name of the protected area	Area (ha)	Entity	Total number of locations
Protected natural areas	I.a i I.b	Special Nature Reserve Lisina	560.6	RS	3
		Special Nature Reserve Gromiželj	831.3	RS	
		Strict Nature Reserve Janj Primeval Forest	295.0	RS	
National Park	II.	NP Sutjeska	16,052.34	RS	3
		NP Kozara	3,907.54	RS	
		NP Una	19,800.0	FBiH	
NaturePark (only cantonal regulations)		Nature Park Blidinje	35,800.0	FBiH	2
		Nature Park Hutovo Blato	7,411.0	FBiH	
Natural Monument	III.	NM Ljubačevo cave	45.45	RS	10
		NM Skakavac	1,430.7	FBiH	
		NM Prokoško lake	2,225.0	FBiH	
		NM Vrelo Bosne	603.0	FBiH	
		NM Tajan	3,510.0	FBiH	
		NM Žuta Bukva	0.5	RS	
		NM Orlovača cave	27.01	RS	
		NM Rastuša cave	11.39	RS	
		NM Dedana pit	28.26	RS	
		NM Vagan cave	12.0	RS	
Habitat Management Area (in RS only)	IV.	-	-	-	-
Protected landscape	V.	Protected Landcape Bijambare	497.0	FBiH	2
		Protected Landcape Konjuh	8,016.61	FBiH	
Protected area for resource management (in RS only)	IV.	Area for Resource Management "University City"	27.38	RS	1
	TOTAL		**101,092.08**		**21**

Note: Data on the size of protected areas are obtained from legislation proclaiming these areas as protected, publications available on the FMET website or data from the Republic Institute for Protection of Cultural, Historical and Natural Heritage of RS.

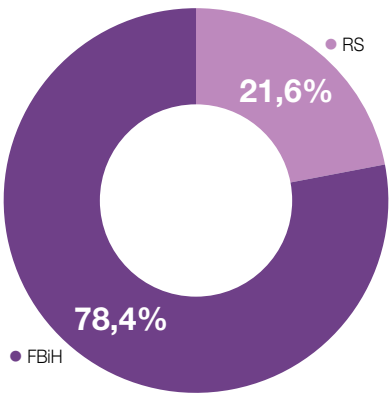


Figure 101:
Protected areas in BiH by entity

Figure 102: Protected areas in BiH by protection category

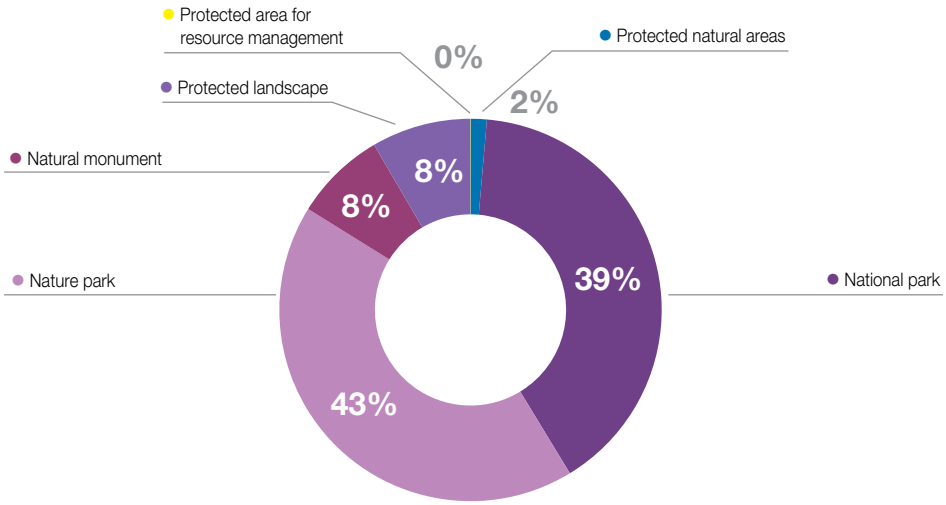
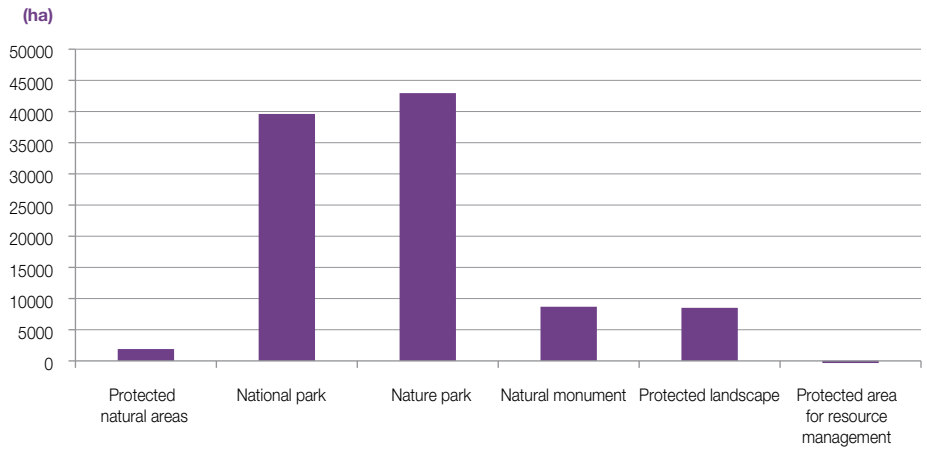


Figure 103: Protected areas in BiH in ha



3.5.6 RAMSAR SITES

There are three Ramsar sites in BiH: Hutovo Blato, Bardača and Livanjsko polje. Hutovo Blato was declared a natural park in 1995. Due to its significance for migration of large number of wetland birds, it was enlisted in the Specially Protected Areas of Mediterranean Importance in accordance with the Barcelona Convention. The International Council for Bird Protection (ICPB) included Hutovo Blato on the list of internationally recognized areas of importance for birds (1998.). Since 2002, Hutovo Blato has been on the list of wetland habitats of international importance according to the Ramsar Convention. Bardača, another Ramsar site in BiH (identified in 2007), is situated in the north of the country on the alluvial plain of the Sava River. The third internationally recognized site of importance for birds is Livanjsko polje, which was declared a Ramsar site in 2008. At present, several other locations are in the designation process (USAID, 2011).

3.5.7 DIVERSITY CHANGE CAUSED BY CLIMATE CHANGE

In line with the global EH50M model, it is projected that the temperature will rise from 0.7 to 1.6°C for every 1°C of global rise, from 2031 to 2060 (Initial National Communication of BiH under the UN Framework Convention on Climate Change, 2009). Available data and analyses indicate that climate change will jeopardize all three macro areas in BiH. Regarding threats to

biological diversity, the most affected areas are the Alpine-Nordic and Mediterranean regions. The Dinarides region, an extremely important area in the Balkans and rich in endemic species, will be particularly affected. This mountain range has special biological and geomorphologic values. Rivers in karst areas and ecosystems that developed along rivers could also be at risk.

It is expected that climate change will greatly influence plants in mountain habitats of BiH. It is expected that herbaceous plants of narrow ecological valence will reduce in number in the highest mountain areas, since they will not be able to adapt quickly enough to new habitats.

Climate change and vegetation movements may significantly disturb future animal distribution, number and survival. The speed of change combined with urban and agricultural barriers may influence the ability of many animals to move towards zones that are more appropriate for them in terms of climate and ecology (Initial National Communication of BiH under the UN Framework Convention on Climate Change, 2009).

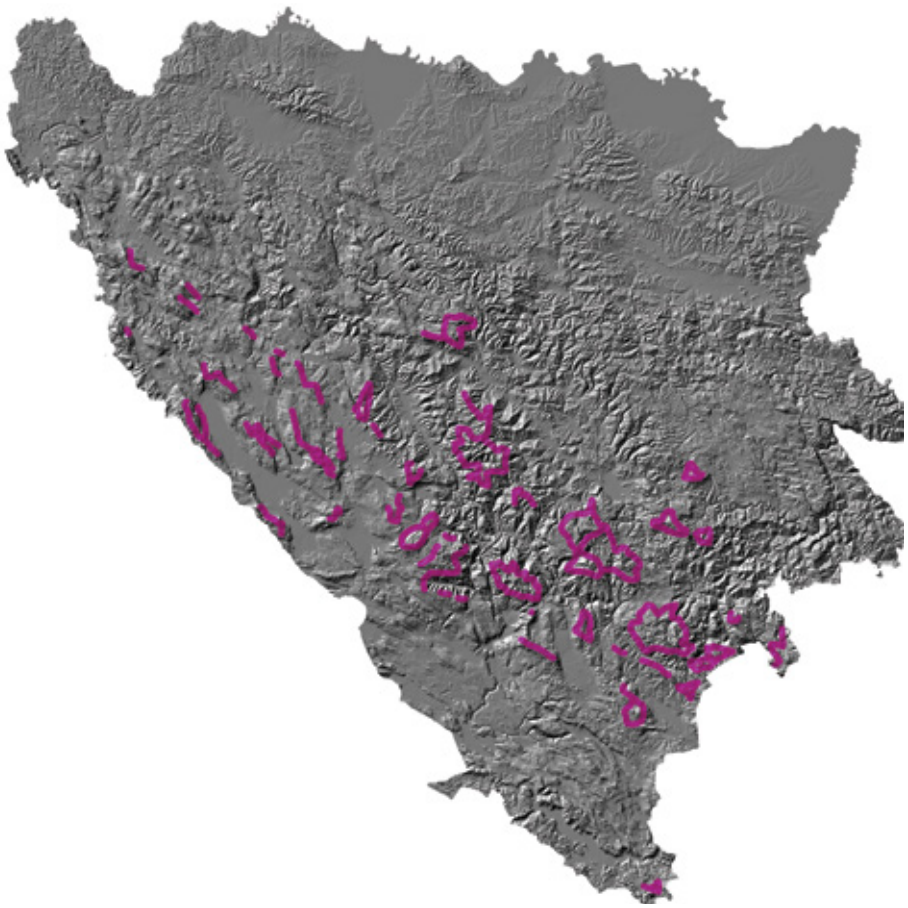


Figure 104:
High mountain zones in BiH that are most sensitive to climate change (Source: Initial National Communication of BiH under the UN Framework Convention on Climate Change, 2009)

3.5.8 CONCLUSIONS AND RECOMMENDATIONS

Biological diversity monitoring. Data on the majority of identified indicators for monitoring the biological diversity state are not available in BiH. Systematic collection and analysis of biological diversity data are almost non-existent. Expert institutions responsible for the collection of biological diversity data do not exist at the state level or at the level of the FBiH, the RS and the BD, and neither do databases.

Table 40: The list of biological diversity indicators and their status

Indicator	Explanation	Status
CSI 007	Endangered and protected species – number of species	Data not available/incomplete data
CSI 008	Areas with some sort of protection – different trends depending on the change of the area size	Some data are available, but they are not compatible due to the use of different methodologies upon data collection and indicators calculation. Data presented in the text.
CSI 009	Species diversity – trends of change in division of certain species groups	Data not available
SEBI 004	Ecosystem coverage – change in soil category in relation to ecosystem types in Europe	Data not available
SEBI 013	Fragmentation of natural and semi-natural areas	Data not available
SEBI 025	Financing biodiversity management	Data not available
SEBI 026	Public awareness – public opinion on certain aspects of biological diversity	Data not available
CLIM 021	Freshwater biodiversity and water quality	Data not available
CLIM 022	Distribution of plant species – impact of climate change	Data not available /incomplete data
CLIM 024	Distribution of animal species - impact of climate change	Data not available

Data collection and monitoring of biodiversity trends are necessary for efficient management of natural biological resources, which requires a quick and adequate response.

Status of protected areas. Before the Law on Nature Protection was implemented in the FBiH, the RS and the BD, protected areas were completely neglected in terms of their status as areas of special interest. However, adoption of these laws did not significantly influence the situation of previously declared protected areas because the law did not stipulate the revision and transformation into new categories, and many areas remained outside the legal framework.

Area use/urbanism. The lack or inconsistent application of spatial and planning documentation enabled the use of protected areas for different purposes like dam construction for hydropower plants, construction of small-scale hydropower plants, opening of quarries, construction of road infrastructure, forest logging and other activities that contribute to conversion of primary habitats. This resulted in a loss of biological diversity and especially in the loss of forms unique to BiH.

Harmonization of legislation. Discrepancies in legislation at the cantonal and federal levels present one of the problems of nature protection on the territory of the FBiH. Regulations in some cantons are completely independent of federal regulations, which is reflected in discrepancies related to protected categories. This prevents the full implementation of the FBiH Law on Nature Protection, which is, in this case, the umbrella law.

Additional problems are related to discrepancies between the FBiH, the RS and the BD legislations. This results in an inability to establish an operative database at BiH level. This situation led to an inadequate reporting to the European Environmental Agency, and prevented the planning of joint protection of biological diversity at the state level.

Natura 2000. The gravity of existing problems encountered in designation of protected areas or in protection of biological diversity at the state level represents an unfavorable basis for the launch of Natura 2000, although it is important for European integrations. Regulation on Natura 2000 was adopted in the FBiH, and the introduction of Natura 2000 for the purpose of site protection is nitiated..

Road construction. Construction of Corridor 5C may have a significant impact on biological diversity. Corridor 5C is a part of the trans-European network and it connects the central part of the Adriatic Sea with Budapest. The main goal of the highway construction is to connect BiH with the main traffic centers. It requires the construction of 330 km of roads in BiH. It is considered that some protected areas may be particularly affected by the construction of the Corridor. This especially pertains to Nature Park Hutovo Blato and area Prenj-Čvrsnica-Čabulja-Vran that will possibly become protected areas. The measures to mitigate the negative effects of the Corridor construction are defined in the Environmental Impact Assessment (EBRD, 2007). Application of these measures would contribute to a decrease of pressure on biological diversity in that area.

3.6 AIR POLLUTION AND OZONE DEPLETION

3.6.1 AIR POLLUTION

Air pollution can affect human health in many ways. Numerous scientific research linked air pollution with different health conditions, including: aggravation of respiratory and cardiovascular disease, decreased lung function, increased frequency and intensity of respiratory symptoms such as breathing difficulties and cough, increased susceptibility to respiratory infections, impact on the nervous system, including the brain, such as IQ loss and impacts on learning, memory and behavior, cancer and early death. It seems that more sensitive individuals are at greater risk of polluted air impact on health, for example, persons with pre-existing lung and heart disease (e.g. heart failure/ischemic heart disease, asthma, emphysema and chronic bronchitis), diabetes, the elderly and children. In 2008, around 127 million people lived in countries that exceeded national air quality standards.

Air pollution is also harmful for the environment. Ozone can damage vegetation and harm plants and trees growth. Those effects can reduce the ability of plants to absorb CO_2 from the atmosphere, and indirectly impact entire ecosystems. Particles in the air that scatter and absorb light reduce visibility - a common issue in cities in BiH located in valleys. Annex II contains simplified demonstrations of negative effects of air pollution on human health and environment.

The majority of air pollutants in BiH comes from industrial activities, but a significant amount also comes from traffic. Before the war, the industry was the most significant polluter, such as the steel industry in Zenica, thermal plants in Kakanj, Tuzla, Ugljevik and Gacko, cement factories in Kakanj and Tuzla, wood processing industry in Doboj and Maglaj, acetylene, chlorine and hydrochloric acid production in Jajce, the chemical industry, detergent and fertilizer industry in Tuzla and many other. However, there were 122 industrial waste water treatment plants before the war, out of which 40% operated properly. At present, none of these are operational. During the war many industrial production facilities were damaged and destroyed, and the pre-war level of production has not been reached yet. Due to this, pollution is much lower now than before the war. At present, some of the pollution is the consequence of long-range transfer of pollutants via air masses coming from abroad. Most of the pollution comes from fossil fuels combustion in energy generation and transportation.

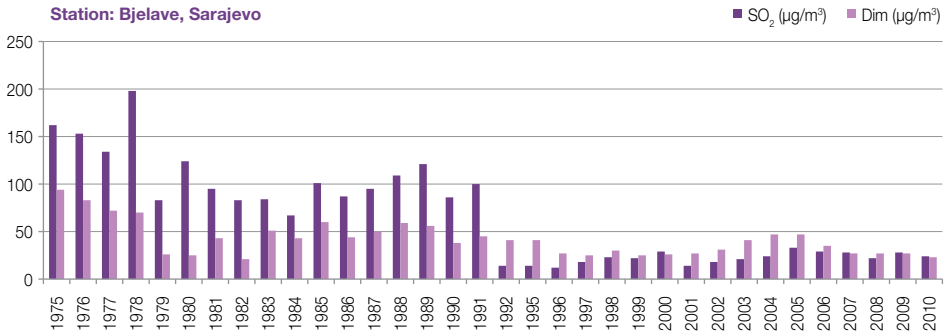
In accordance with European conventions, BiH hydro-meteorological institutes use European software DEM for emissions in order to analyze statistical data on air pollution. In this way the European Environmental Agency obtains the data that are available on their website.

The Federal Hydro-Meteorological Institute BiH (FHMI BiH) uses the CORINAIR methodology, while the Republic Hydro-Meteorological Institute (RHMI RS) uses the IPCC methodology for reporting and data compatibility verification. The following software is used: Collector, Reporter, Importer, Copert and Selma GIS. Stations in Sarajevo, Tuzla and Banja Luka monitor air quality.

Air quality in Sarajevo

The Federal Hydro-Meteorological Institute of BiH (former BiH Institute) has been continuously monitoring air quality since 1967. In the first decades since measuring started, average annual values obtained by analyzing 24 hour data from 1975 to 1991 show a significantly higher pollution level compared to the last 17 years (Figure 105). This trend can be explained by reduced industry activities due to warfare, but also by thermal fuel conversion of coal into gas in Sarajevo thermal plants after the war. From 1995 to 2011 (after the war) there was a gradual increase in concentrations of SO_2 and smoke. In 2001, there was a decrease in concentrations due to favorable meteorological conditions (long periods without temperature inversion, higher average temperatures, causing a decreased energy demand and lower emissions into the atmosphere).

Figure 105: Average annual concentrations of SO2 and smoke in Sarajevo in the period 1975-2010 (Source: FHMI BIH, 2011)



Data from meteorological station Bjelave show that concentration of SO_2, NO, NO_2, NO_x, CO and O_3 are lower than limiting values defined in the Guidelines for Limit Values of Air Quality Parameters in the FBiH (Official Gazette of FBiH, No. 12/05) (Figure 106).

Figure 106: Average annual concentrations of SO2, NO, NO2, NOX, O3 in Sarajevo (1-hour values) in the period 2002-2010 (Source: FHMI BIH, 2010)

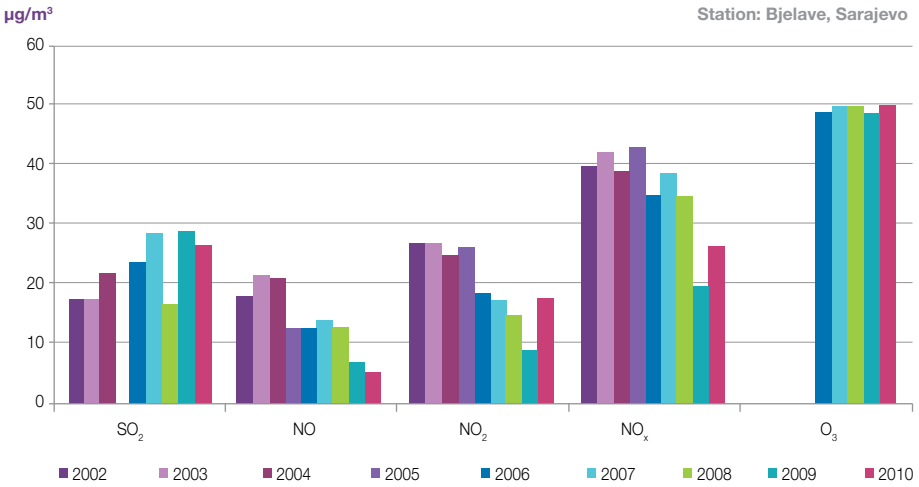


Figure 107 shows the data from two meteorological stations (Bjelave – 100 m above the city and Alipašina Street – town center). The most obvious differences are found in emissions of NO, NO_2 and NO_x. Concentrations measured by the automatic station in Alipašina Street are several times higher than concentrations measured at Bjelave station, which is mainly due to emissions from traffic (Alipašina Street is one of the busiest street in terms of traffic).

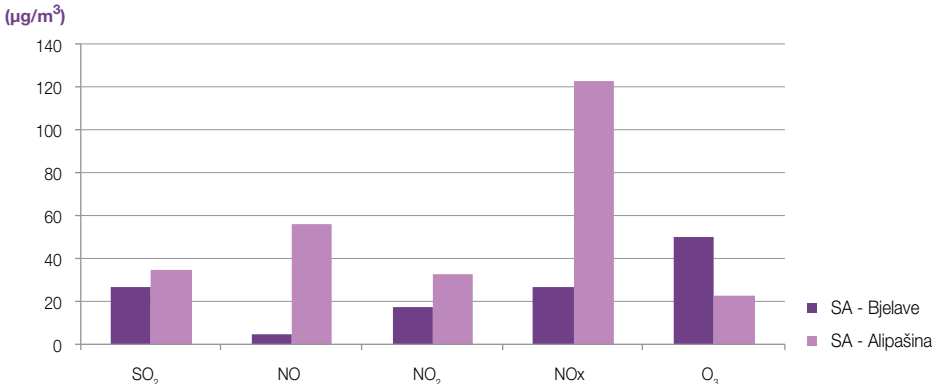


Figure 107: Average annual concentrations of SO_2, NO, NO_2, NO_x, O_3 in stations in Sarajevo: Bjelave and Alipašinain 2010 (Source: FHMI BIH, 2011)

Air quality in Tuzla

Monitoring of air sulfur dioxide and smoke concentrations in Tuzla was not performed during the first decade after the war and was started again in 2002. Comparing the measuring results of 24-hour samples in the period 2002-2011 with the measurements from the period 1990-1991, it is evident that the concentration of sulfur dioxide is slightly lower, while the concentration of smoke is higher and exceeds the limit (Figure 108).

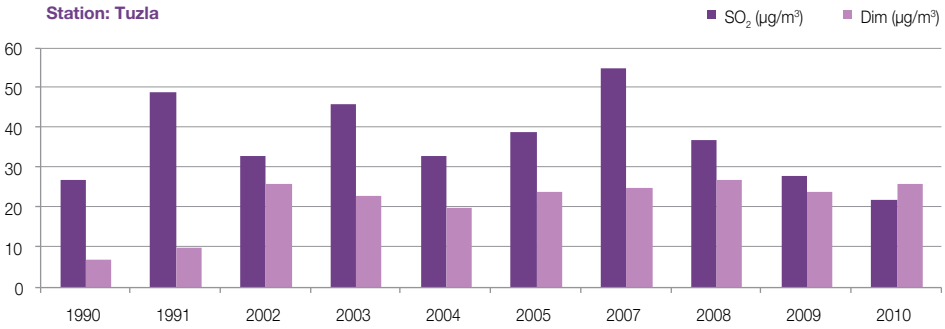


Figure 108: Average annual concentrations of SO_2 and smoke in the period 1990-1991 and 2002-2010 (Source: FHMI BIH, 2011)

Air quality in Banja Luka

Similar to Sarajevo, the air quality in Banja Luka deteriorates during winter due to emissions from stationary sources (small furnaces) and mobile sources (vehicles, traffic), but the pollutant levels do not exceed limits defined by the regulations. It is safe to say that pollutants like PM10 come close to limit values (100 µg/m^3 in 24 hours). This is caused by inadequate heating fuel or low quality motor fuel.

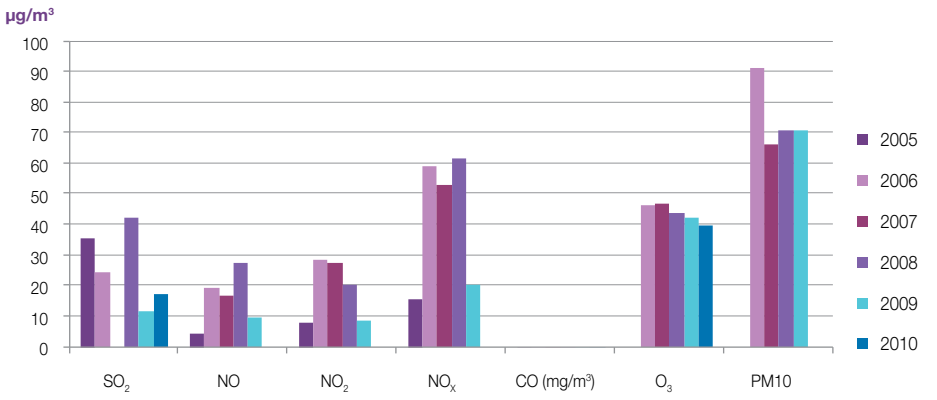


Figure 109: Average annual concentrations of SO_2, NO, NO_2, NO_x, CO, O_3 and PM10 in Banja Luka in the period 2005-2010 (Source: RHMI RS, 2011)

Apart from this, the results of air quality measurements are based on the data from one station only, which is situated in a very busy street surrounded by numerous boiler rooms; therefore, the results are "worst case scenario" and the data are not representative of air quality in the entire city.

Exceedance of air quality limit values in urban areas (Mostar, Banja Luka and Sarajevo)

The highest SO_2 emission comes from the combustion of fossil fuels with high concentrations of sulfur. Since many towns in BiH are situated in valleys, smog and air pollution have become common environmental issues during winter, when emissions from boiler rooms, traffic and industry become "trapped" in valleys. The following figures show the exposure of town inhabitants to SO_2 and NO_2.

Figure 110: Exposure of town inhabitants to SO_2 in BiH (Source: FHMI BIH)

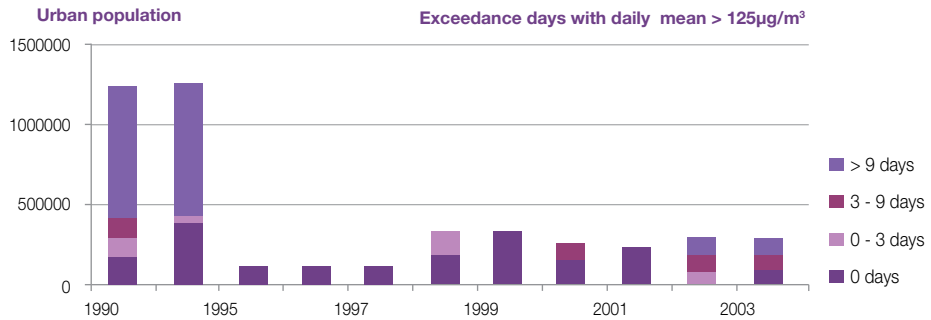


Figure 111: Exposure of town inhabitants to NO_2 in BiH in 2004 (Source: FHMI BIH)

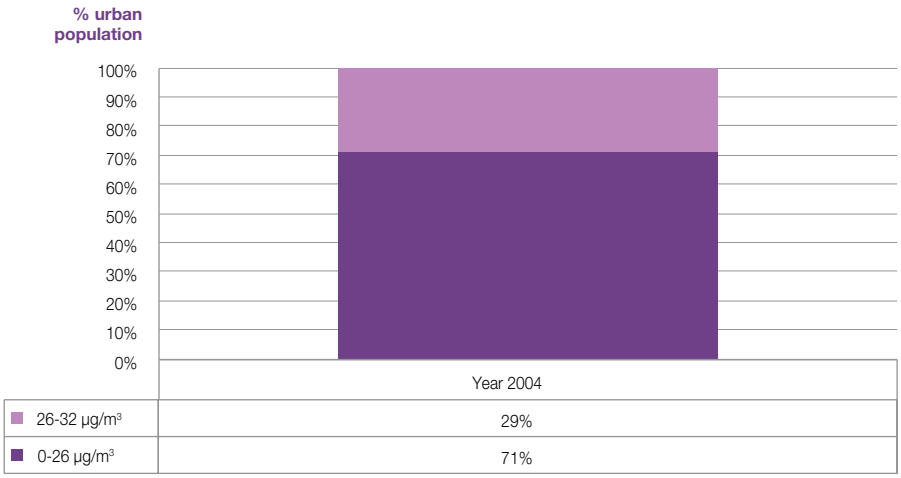


Figure 111 shows that out of 100% of the urban population in 2004 (Sarajevo, Tuzla, Mostar and Banja Luka), approximately 75% was exposed to 0-26µg/m³ NO_2, and the rest of population (around 25%) was exposed to NO_2 concentrations between 26–32 µg/m³. Since the limit for NO_2 is 300 µg/m³, the population was not exposed to significant concentration of NO_2.

3.6.2 ACID RAIN

Pollution in the form of acids and acid forming compounds (like sulfur dioxide and nitrogen oxides) can precipitate from atmosphere onto the Earth's surface. These acidic deposits can be dry or wet. Wet deposits are known as acid rain. Acid rains can occur anywhere, and in some areas rain can contain 100 times more acidity than natural precipitation. Acidic deposits can present a serious regional problem, especially in areas that are downwind from the source of high SO_2 and NO_x emissions (e.g. coal burning facilities, melting furnaces and

factories). Acidic deposits can harm the ecology of land and water systems in many ways. Although acidic deposits can harm foliage directly, they also change chemical and physical soil characteristics and thus harm trees. In lakes, acidic deposits can cause death of fish and other aquatic animals.

Environment sectors within the Federal Hydro-Meteorological Institute of BiH in Sarajevo and the Republic Hydro-Meteorological Institute of RS in Banja Luka regularly analyze acidity of precipitation. Acid rains occur throughout the year, but are more intense in winter months.

As shown in Figure 112, the percentage of acid rains in Sarajevo continuously increased from 1996 to 2006, after which it decreased until 2009, then it started increasing again until 2010. High percentage of acid rains can be attributed to winds coming from north and north-west. This is logical, because Kakanj and Zenica, towns that heavily produce pollution, are situated north and north-west of Sarajevo. In addition to local cities, a part of pollutants that cause acid rains comes from north-west Europe.

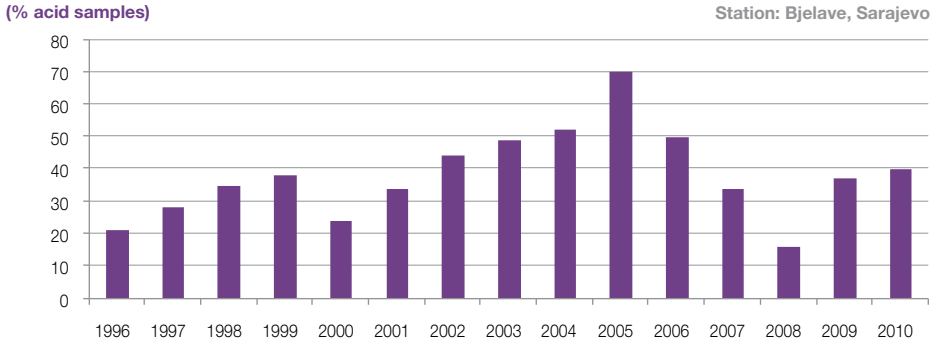


Figure 112:
Frequency of acid rains in Sarajevo in the period 1996 - 2010
(Source: FHMI BIH, 2011)

Figure 113 shows the frequency of acid rains in Banja Luka. Compared to Sarajevo, Banja Luka has a significantly smaller percentage of acid rains.

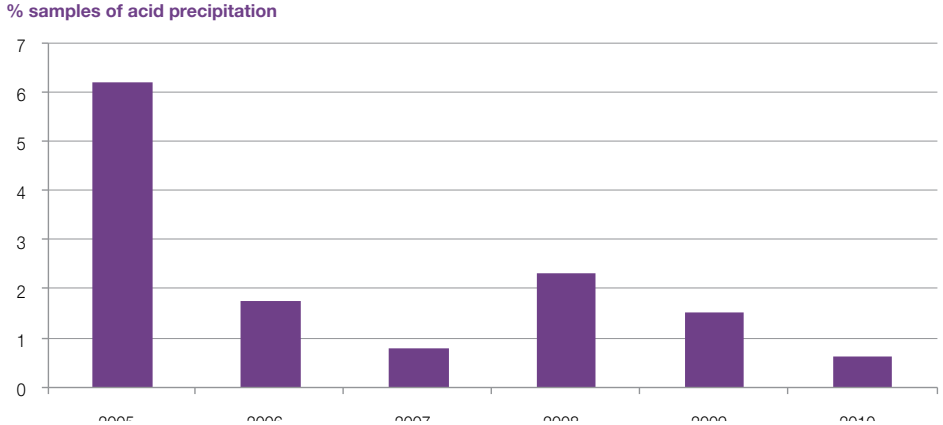


Figure 113:
Frequency of acid rains in Banja Luka from 2005 to 2010
(Source: RHMI RS, 2010)

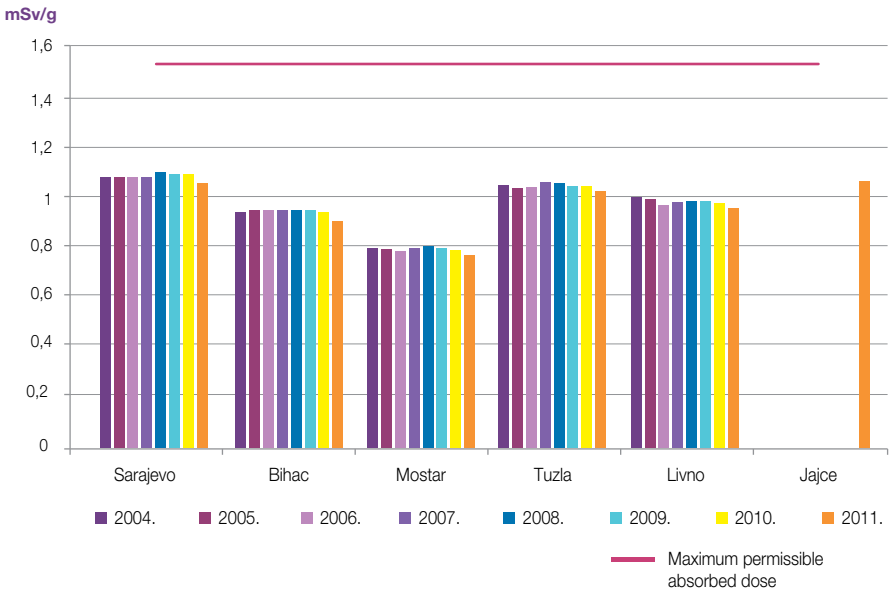
3.6.3 ATMOSPHERE RADIOACTIVITY

Thanks to the IAEA[37] in Vienna, there are 5 automatic stations in BiH in each entity which perform continuous measurement of ionizing radiation in the ambient air. Reporting is done on an annual basis by the Federal Hydro-Meteorological Institute of BiH and the Institute of Public Health of RS. Those institutions measure the absorbed dose of ionizing radiation on a daily basis. According to available data on continuous long-term measurements and test measurements in the region of central BiH, the absorbed dose of ionizing radiation is 0.8 to 1.1 mSv/y.

37 International Atomic Energy Agency

The measured values are below standard world norms (having in mind that natural Earth radiation is 1.2 mSv/y, and that natural cosmic radiation is 0.3 mSv/y, so the total natural radiation is 1.5 mSv/y)..

Figure 114: Annual absorbed dose of ionizing radiation for the period 2004-2011 (Source: FHMI BIH, 2011)



3.6.4 EMISSIONS OF OZONE PRECURSORS

BiH currently has data on only one indicator, CSI 002 – emissions of ozone precursors for 1990 and 2004, so it is very difficult to draw conclusions and show real trends. This indicator implies the anthropogenic emissions of ozone precursors: nitrogen oxides, carbon monoxide, methane and non-methane volatile organic compounds (NMVOC), each measured by their potential to form ozone in the troposphere. Results for all mentioned compounds are given as NMVOC equivalents (ketones). Figure 115 shows the trend of decrease of ozone precursor emission in BiH in an amount of 63% from 1990 to 2004, and the emissions are indexed to 1990 values (1990 = 100). The decrease is the result of the war and very slow recovery of all industrial facilities after the war.

Figure 115: Emissions of precursors in 1990 and 2004 (Source: European Environment Agency, 2005.)

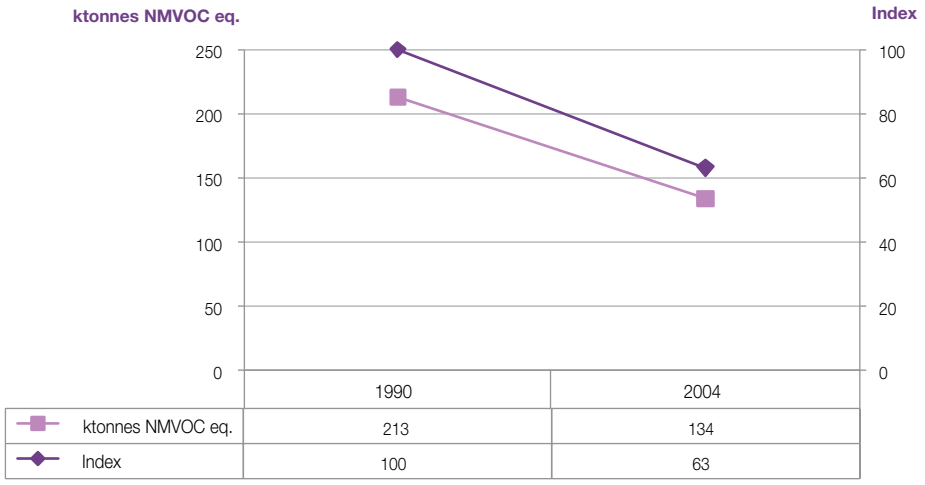


Figure 116 shows precursor emission for 1990 and 2004 by different sectors. It is noticeable that in 1990 more than half of ozone precursor emissions originated from energy industries

(mainly thermal plants). Although there was a decrease by 8% in 2004, the energy industry remained the main ozone precursor emitter. It is important to note that transportation emissions increased significantly from 24 % in 1990 to 40% in 2004, which is in accordance with the data from section 2.4.6.1 that shows an increased number of registered vehicles and with the stated data on city air pollution. All this indicates a need to devote more attention to the control of motor vehicle emissions, quality of imported vehicles and fuel quality standards, for they significantly influence the general air pollution in BiH.

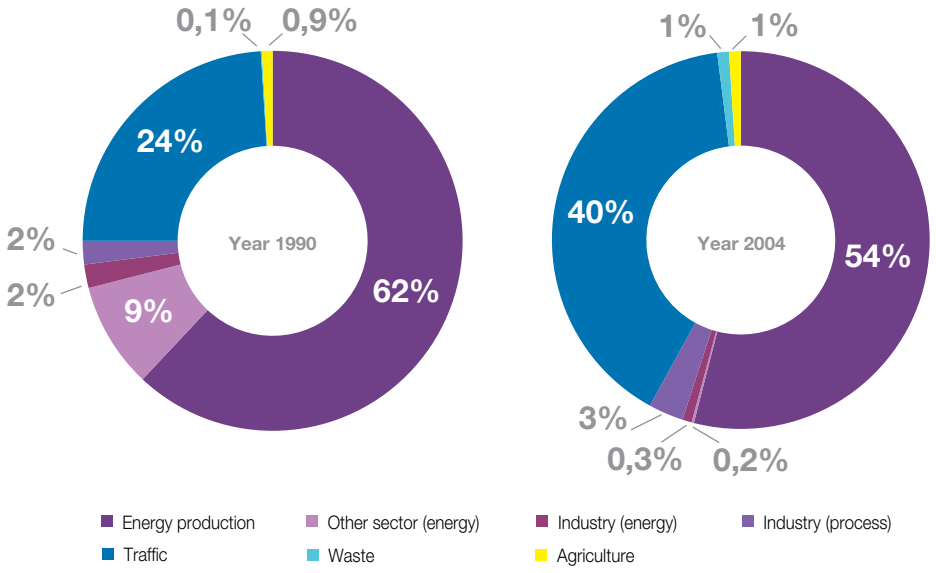


Figure 116: Emissions of ozone precursors for 1990 and 2004 by sectors (Source: FMET, 2010)

3.6.5 PRODUCTION OF OZONE DEPLETING SUBSTANCES

The use of ozone depleting substances (ODS), mainly chlorofluorocarbons (CFCs) was widespread in the 1960s in refrigerators, refrigerants, sprays, solvents, foams, etc. due to their chemical stability. Twenty years later it was discovered that CFCs remain in the atmosphere for a long time, which depletes the ozone layer and affects human health and the environment. The Vienna Convention (1985) and the Montreal Protocol (1987) were established as an international response to this threat, and their main goal was gradual phase out of CFCs, halons, carbon tetrachloride (CTC) and methyl chromform (MCF). In the meantime, the first generation of substitutes was introduced. i.e. hydrochlorofluorocarbons (HCFCs), which are much less harmful than CFCs. However, it was noticed that HCFCs are also greenhouse gases, linking ozone depletion with climate change. The Montreal Protocol introduced phasing out measures for the first generation of substitutes. As a consequence, the second generation of substitutes entered the market, such as hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs). Although they are 100% ozone safe, HFCs and PFCs are powerful GHGs and are controlled substances in accordance with the Kyoto Protocol on Climate Change (1997). Other alternative substances like hydrocarbon (HC), ammonia and carbon dioxide were considered as suitable substitutes and have been in use for a long time, especially in refrigerating equipment. They are safe for the environment and climate, but are still not adequate for all applications due to their toxic and inflammable characteristics.

It is important to note that the ozone depleting potential (ODP) in BiH decreased by more than 90% from 2002 - 2008 due to implementation of the Montreal Protocol, and there has been no production of ozone depleting substances in BiH since.

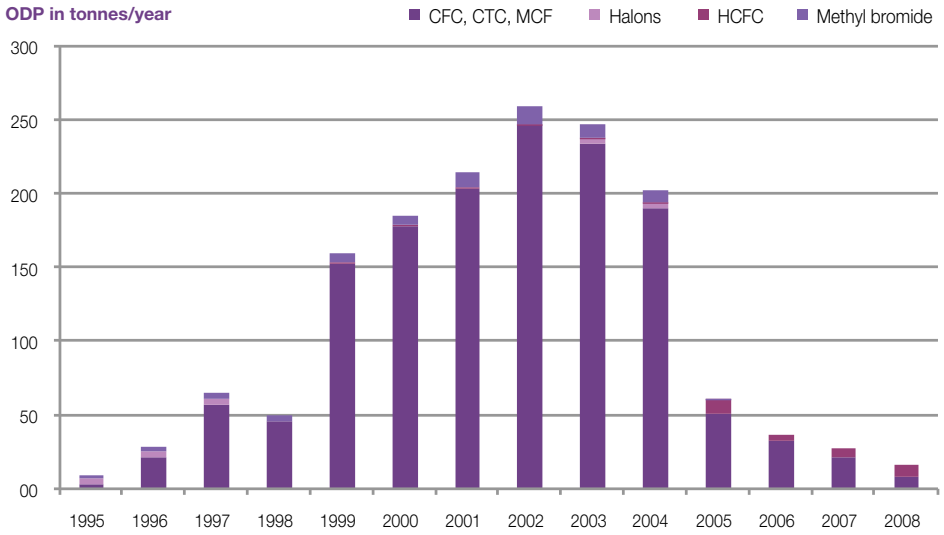


Figure 117: Consumption of ozone depleting substances in BiH in the period of 1995 - 2008 (ODP in tons/years) (Source: MOFTER BiH - Ozone Unit)

3.6.6 CONCLUSIONS AND RECOMMENDATIONS

Monitoring of air quality in BiH is done in only some cities and according to different methods. Until 2007, the responsibility for the air quality monitoring network was not given to anyone. Because of this, and due to a small number of monitoring stations in BiH, the data shown for air quality do not represent the state of air quality in the entire country. Measuring of air quality in BiH is done by the Federal Hydrometeorological Institute and responsible cantonal bodies in the FBiH, the Republic Hydrometeorological Institute in the RS, a responsible department in the BD Government, and in certain cases even the municipalities.

Missing data and indicators for monitoring of air quality are:

- CSI 001 – Emission of acidifying substances
- CSI 003 - Emission of primary particulate matter and secondary particulate matter precursors
- CSI 004– Exceedance of air quality limit values in urban areas
- CSI 005 - Exposure of ecosystems to acidification, eutrophication and ozone
- Heavy metals (Cd, Pb, Zn)
- Toxic air pollutants (e.g. chlorinated and volatile organic compounds)
- Trends and projections for air quality data

Conclusions that can be drawn based on parameters and air quality monitoring in BiH are the following:

- Due to specific climate conditions and temperature inversions, air pollution is significantly higher in winter months in the majority of city centers in BiH, especially in cities situated in valleys, where pollution gets “trapped” for a longer period;
- Air pollution in city areas is mainly caused by emissions from stationary sources caused by fuel combustion, then by emissions from traffic and industry. Although emissions from industrial processes decreased after the conflict, emissions from traffic increased. Fuel oil and coal used for heating are mostly of poor quality, which causes significant air pollution;
- The use of monitoring results for air quality planning is not developed;
- There is no reporting on the impacts of air pollution on human health and the environment - this segment needs to be under the jurisdiction of public health institutes in order to link air quality with the health status of the population
- Although parameters of some pollutants like smoke and SO_2 perhaps do not exceed the limits, the chemical “cocktail” of polluted air usually has more harmful impacts on human health and the environment, which is not considered in reports.

There has been a significant improvement in monitoring and reporting on air quality such

as the installation of online monitoring stations and regular reporting to the EIONET in the European Environment Agency. Laws on Environmental Protection in the FBiH, RS and BD and new regulations on air quality monitoring and defining kinds of air pollutants in both entities adopted in 2012 defined methodology and procedures for air quality monitoring according to the EU directives. However, in order to have a more complete general state of air quality in BiH, it is necessary to collect and analyze more data from different stations in the country. One fact is very obvious from the data on air quality: poor quality fuels like coal, fuel oil and gas contribute to low air quality

It is imperative for BiH to start introducing clean energy sources like biomass. So far biomass has mainly been exported, while poor quality coal and fuel oil were used for heating in BiH households. Apart from this, gasoline control should be increased, as well as the control of technical compliance of cars and industrial emitters monitoring. There are recommendations to introduce thermal co-generation in cities such as Kakanj and Zenica, and to "accelerate" the traffic in Sarajevo. There are several environmental studies and feasibility studies for the construction of a highway that would connect one part of Sarajevo with the other. This idea must be implemented, because the majority of air pollution in Sarajevo is caused by slow traffic.

3.7 CLIMATE CHANGE

Global warming bears consequences on regional climate patterns and climate factor distribution, and on human economic and social activities and political decisions. As clearly stated and explained in the Fourth Assessment Report of the International Panel on Climate Change (IPCC), released in 2007, for the first time in history, human activities have been declared the cause of the global climate change. The report has, with a high degree of confidence, showed that the global atmospheric temperature increase was caused by increased emissions of anthropogenic greenhouse gases. These gases are mainly carbon dioxide (CO_2), released in the atmosphere through fossil fuels combustion, methane (CH_4), nitrogen oxides (NO_X) and other strong anthropogenic GHGs like PFCs and SF6. Through the greenhouse effect, the heat of daily solar radiation is naturally stored and the Earth's temperature is kept on a level suitable for life. But since the industrial revolution, people have started burning fossil fuels increasingly to produce energy, which leads to an increase in the greenhouse effect.

When considering climate and the environment, at the end of the 1970s and during the 1980s, it was shown that emissions of halogens like chlorofluorocarbons, produced for different purposes, have a harmful impact on the ozone layer at higher altitudes in the stratosphere, creating an ozone hole mainly over Antarctic. Numerous UNEP reports state, and it is widely recognized, that the ozone hole has various significant impacts on the environment and climate. After the Montreal Protocol in 1987, the production and utilization of ozone depleting substances was banned, which is now resulting in a slight trend of ozone hole stabilization.

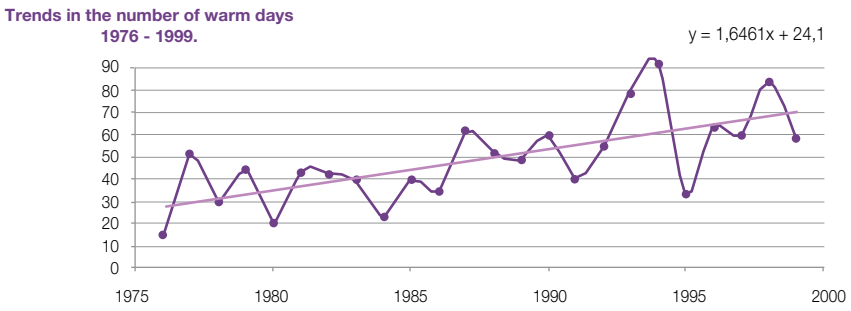


Figure 118:
Trends in number of summer days (>25°C) and occurrence of heat and cold waves
(Source: European Climate Assessment Program, 2010.)

The average global temperature of the Earth's surface increased by 0.6ºC in the 20th century. This change may seem insignificant, but its consequences are great disturbances in regional and local climate patterns. Some regions become warmer and dryer, while others become more humid. Other consequences are sea level rising and ice polar cap and glaciers melting,

reducing the amount of fresh water on Earth. Apart from the stated, the frequency and intensity of extreme weather conditions, like extreme droughts, major floods, hurricanes with devastating winds and rain torrents is alarming, and all that contributes to increasing the range of important economic, social and political influences at local, regional and international levels (Intergovernmental Panel on Climate Change, 2007). At the European level, the measurements showed a trend of an average increase in number of warm days in the period 1976-2000. In addition to this, the trend of prolonged heat waves in Europe between 1976 and 1999 was observed.

3.7.1 CLIMATE CHANGE OBSERVATIONS IN BIH

Climate data for BiH presented in the Initial National Communication on Climate Change in BiH, show the changes observed in the Mediterranean and the Balkans. Even though projections need additional adjustments, which shall be performed in the Second National Communication under the UNFCC, general trends can still be predicted (IPPC, 2007). Predicted regional changes are in accordance with the global scenario of 2ºC increase (Initial National Communication of BiH under the UN Framework Convention on Climate Change, Banja Luka, 2009). According to this climate model, BiH will continue to be affected by global warming with an average increase of 0.7ºC to 1.6ºC for 1ºC of global increase. The same model predicts a reduced amount of precipitation in the region, especially in summer, which will lead to prolonged droughts. Spatial variation predictions for temperature and precipitation show significant variations due to topographic and microclimate conditions in BiH. Consequently, the general trend in BiH shows an average temperature increase and an average precipitation decrease, leading to dryer summers and less snowfall in winters.

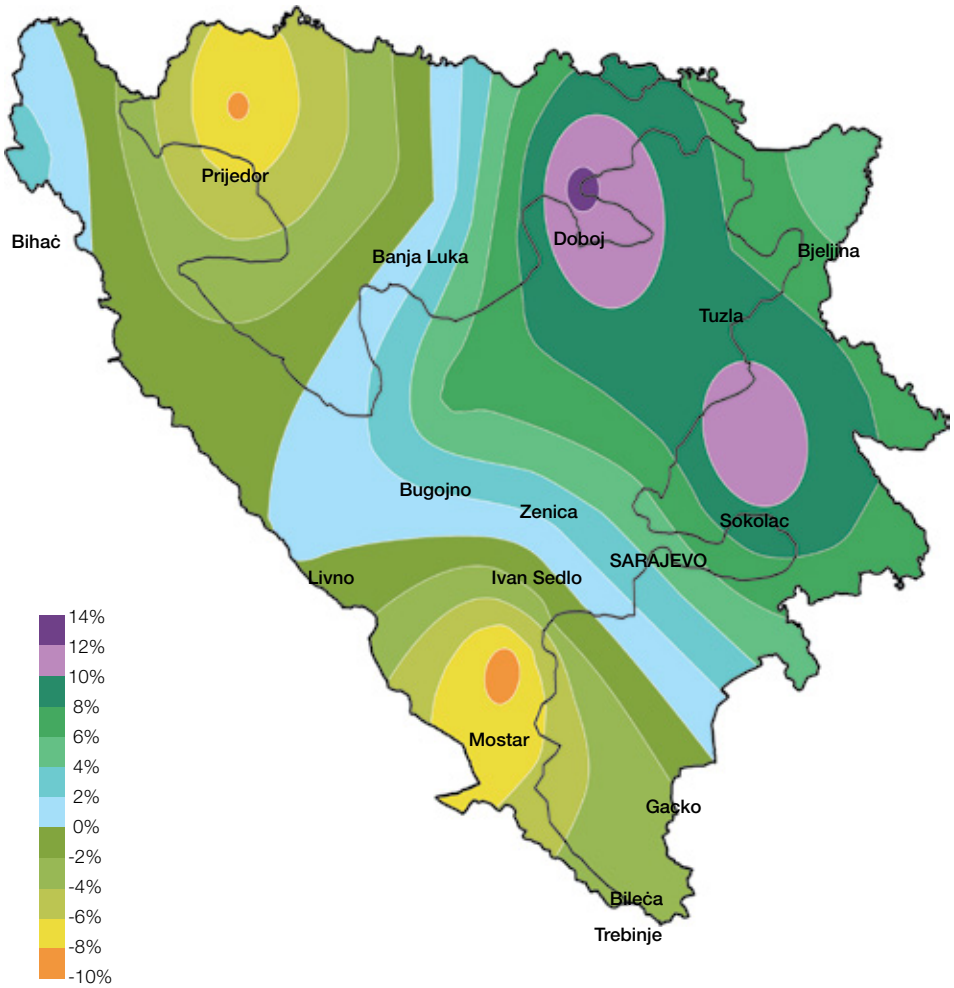


Figure 119: Spatial distribution of annual decrease/increase in precipitation in the last decade (1999 – 2008) compared to reference period 1961-1990. (Source: Initial National Communication of BiH under the UN Framework Convention on Climate Change, 2009.)

3.7.2 PRECIPITATION TRENDS

Decrease in precipitation has a greater impact on areas closer to the Adriatic Sea, especially in summer months (Figure 119). According to the same source, summers in Mostar were dryer from 1982 to 2007 than from 1956 to 1981, while significant differences for this time frame were not observed in Sarajevo.

3.7.3 TEMPERATURE TRENDS

It is recorded that the average temperature in BiH increased by approximately 0.6ºC in the last century, which follows the European trend (Majstorović, 2008). Regular measuring of temperatures in Sarajevo and Banja Luka confirm the said trend of an average annual temperature increase. Average temperatures in both cities have increased gradually in the last century. Figure 120 and Figure 121 show warming trends of 0.85ºC in Sarajevo and of 2.3ºC in Banja Luka.

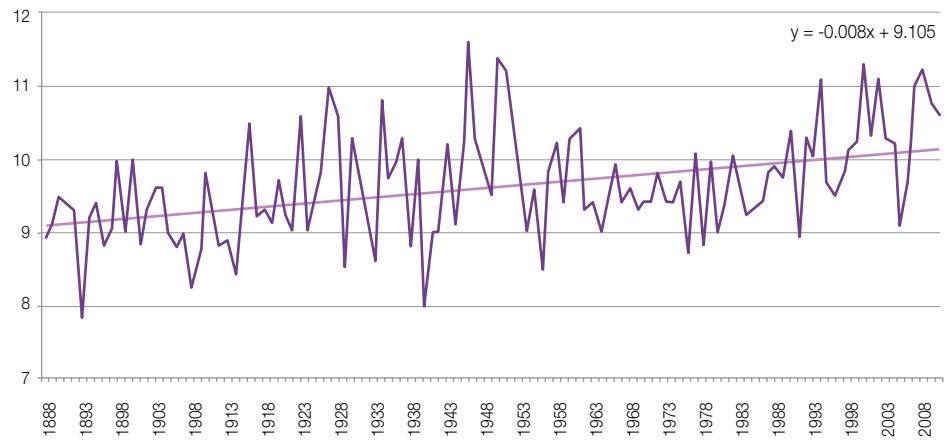


Figure 120: Average annual temperature in Sarajevo from 1888 to 2010 in ºC (Source: FHMI BIH)

According to the presented data (Figure 120), the average annual temperature in Sarajevo in the last century shows a trend of increase by 0.85ºC. Analysis of the whole measuring period in Sarajevo (123 years) shows that the average air temperature in Sarajevo was 9.0ºC from 1888 to 1897, and 10.4ºC from 2001 to 2010, which is an increase of 1.4ºC.

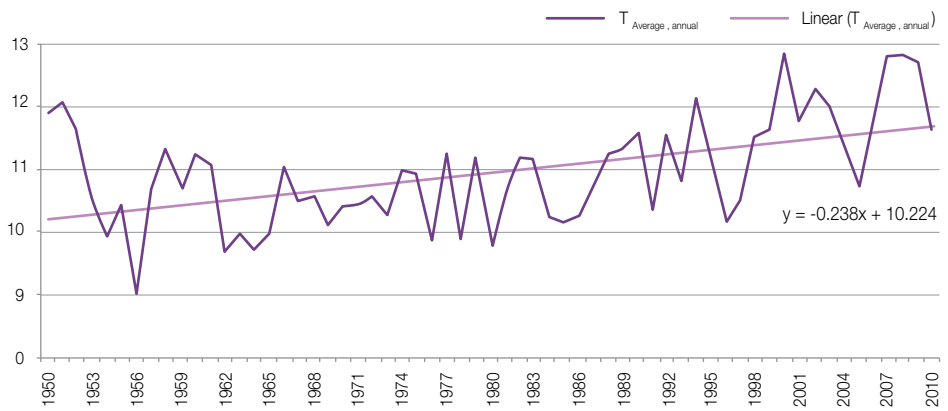


Figure 121: Average annual temperature in Banja Luka in the period 1949 – 2010 in ºC (Source: RHMI RS)

Data on air temperature in Banja Luka have been collected since 1892, but the first continuous data set for a period of 10 years refers to the period 1900-1909, with an average annual temperature of 10.7oC. As shown in Figure 121, from 1950 to 2010, the average annual temperature increased by 2.3oC over 100 years, indicating that by mid 21st century, should the present trend continue, the average annual temperature in Banja Luka may reach 13oC. During the first decade of the observed period, from 1950 to 1959, the average annual

temperature was 10.8oC, while in the last decade, from 2001 to 2010, the average annual temperature was 12.0oC, corresponding to an increase of 1.2oC. The data were regularly collected from 1950 to 1991, but data collection from 1992-1997 was irregular, resulting in the use of approximate values. From 1998, data collection has been continuous. Therefore, the trend of air temperature increase in Sarajevo and Banja Luka is evident, with a slightly faster increase in Banja Luka.

There are other available data confirming the trend of temperature increase in Sarajevo, which are based on the number of days with temperature below 5, 10 and 15oC thresholds and number of days with temperatures above 5, 10 and 15oC thresholds (Figure 122 and Figure 123).

Figure 122: Temperature thresholds below 5, 10 and 15°C, comparison of periods 1961 - 1990 and 2001 - 2010 (Source: FHMI BIH)

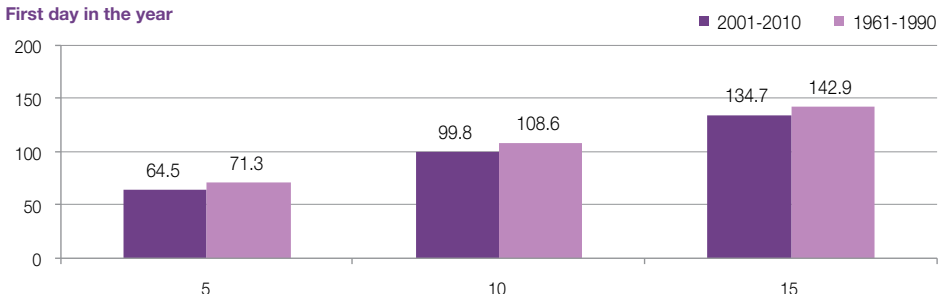
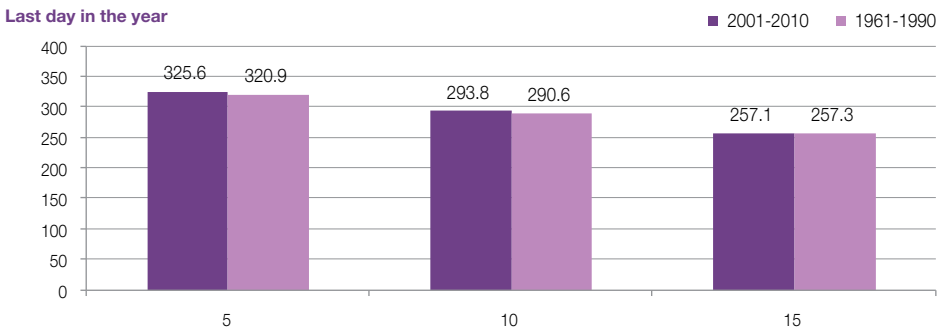
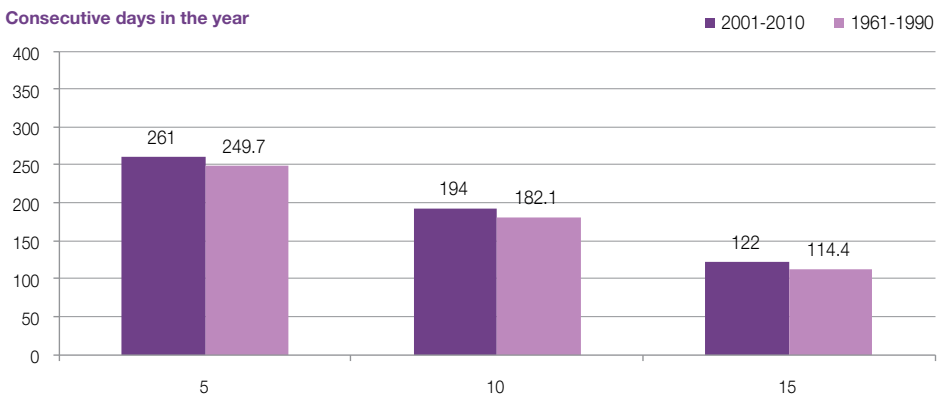


Figure 123: Temperature thresholds above 5, 10 and 15°C, comparison of periods 1961 - 1990 and 2001 - 2010 (Source: FHMI BIH)



The data presented confirms the general warming trend in BiH with a decrease in the number of cold days (shorter cold periods) and increase in the number of warm days. The warming trend causes a longer growing period. The length of the growing season is one of the warming trend indicators, causing earlier start of spring and later start of winter. Exceeding of temperature thresholds shown in Figure 122 and Figure 123 indicates that the growing season in BiH increased in the period 2001 - 2010 compared to the period 1961 - 1990, as shown in Figure 124.

Figure 124: Average length of vegetation period for 5, 10 and 15°C, comparison of the period 1961 - 1990 with 2001 - 2010. (Source: FHMI BIH)



Data on agrophenology indicators (timing cycle of agricultural crops - CLIM 031), used by the European Environment Agency (EEA) are not available for BiH. This indicator is not only important for the display of climate change, but can also contribute to a better adjustment of

agricultural practices to climate change. Data (Figure 124) shows that sowing can on average be done earlier as well as harvesting. If the season is prolonged, additional crops may be produced, which significantly affects agricultural production. Figure 124is just an indication, as data on possible change of sowing and harvesting dates are not available.

The effect of high temperatures can be noticed in the state of surface waters during the period of low waters when expansion of biomass and algal blooms occur, leading to potential toxic contamination of cyanobacteria that are nephrotoxic, neurotoxic and hepatotoxic or other algae that significantly impair the quality of water intended for water supply or recreation.

3.7.4 GREENHOUSE GAS EMISSIONS

Due to relatively low total energy generation and consumption, as well as low energy generation and consumption per capita, BiH remains a small emitter of GHGs with a total of 24.14 Mt CO_2 equivalents in 2005. Taking into account the presented total emission (Table 41) and an estimated population size of 3.85 million, as well as calculation of GAINS model (Greenhouse Gas-Air pollution Interactions and Synergies), emission per capita in BiH for 2005 was 6.36 tons of CO_2 equivalent (UN Economic Commission for Europe, 2011). Projections show that there will be a slight increase until 2030, as shown in Table 41.

Table 41: Projection of greenhouse gases emission in BiH (Source: UNECE, 2011)

Year	2005	2010	2015	2020	2025	2030
Total GHGs (Mt eq. CO_2)	24.14	25.24	25.75	26.87	28.32	31.27
CO_2 (Mt)	19.51	20.32	21.14	22.00	23.51	26.41
CH_4 (Mt)	0.11	0.12	0.10	0.11	0.11	0.10

In fact, even if a slight growing trend is expected, anthropogenic emissions of GHGs in BiH decreased in 2004 compared to pre-war levels, as shown in Figure 125. A lower emission of GHGs is the result of reduced industrial activities in primarily the energy sector, in which coal-based electricity generation is lower compared to the pre-war level. Due to a lack of data on GHGs emissions (data exists for 1990 and 2004 only), the annual trend is not shown, but it is clear that GHGs emissions decreased because of destruction of industry during the war, and a slow recovery after the war (Figure 125). As indicated above, present GHGs emissions of around 25 Mt CO_2 equivalents are higher than in 2004, but still lower than in the pre-war period (around 30 Mt CO_2 equivalents)..

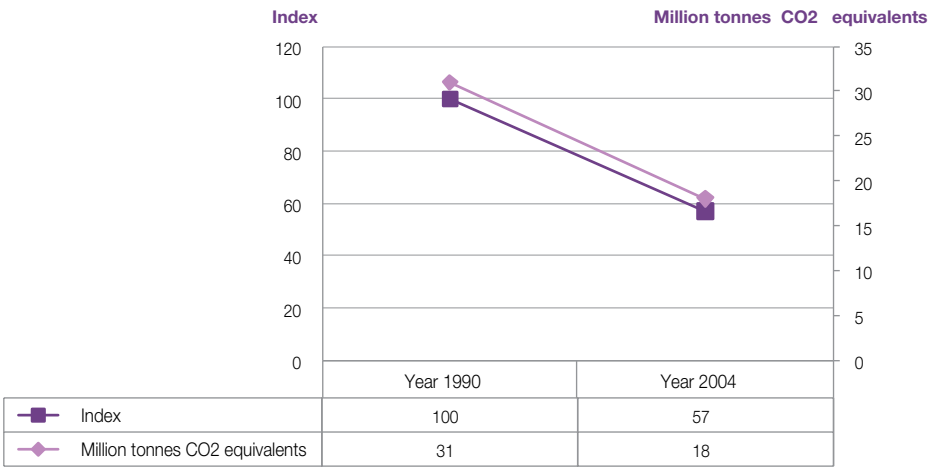


Figure 125: Anthropogenic emissions in BiH (Source: FHMI BIH)

Emissions of GHGs in BiH are mainly a result of electricity generation, non-industrial energy generation and transportation, but it seems that emissions stabilized in 2000, as is evident from Table 40.

Table 42: GHGs emissions breakdown, including the energy sector in BiH (Source: UNECE, 2011.)

1,000 ton equivalents CO_2					
Sector	2000		2001		2002
	FBiH	RS	FBiH	RS	FBiH
Total	**8,469**	**4,705**	**9,154**	**4,405**	**9,701**
Electricity generation	4,058	2,760	4,686	2,805	5,136
Energy transformation	196	299	217	206	210
Non-industrial energy generation	1,401	239	1,419	240	1,495
Industry and agriculture	715	482	781	231	782
Coal mining	549	55	505	53	521
Transportation	1,283	745	1,301	743	1,319
Other mobile sources	267	125	245	127	238

GHG emission breakdown in BiH shows that the main source of GHG emission is electricity generation, the trend of which was stable from 2000 to 2007. Electricity is mainly generated by coal burning in thermal plants, where coal combustion is the heaviest emitter of GHGs per quantity of energy released. In 2004, total GHG emissions from the BiH energy sector amounted to 14 Mt equivalents CO_2, representing the best part (almost 80%) of the total 18Mt CO_2 equivalents emitted in BiH in 2004. The rest of GHG emissions come from transport, industry, agriculture, coal mining, etc.

3.7.5 CLIMATE CHANGE IMPACTS ON ECOSYSTEMS

Climate change has an impact on the country's various ecosystems which include alpine, coniferous mountain forests, continental forests, and Mediterranean ecosystems that are related to sub-climate conditions. Ecosystems are characterized by very tightly balanced and specific interactions between plant and animal communities, the soil and the climate. Biodiversity of these ecosystems is the result of millions of years of evolution where species became highly inter-dependent and dependent on local climate conditions such as temperature and precipitations. In return a rich biodiversity provides some climate stability (Convention on Biological Diversity, 2007) by contributing to regulating the water cycle but also the carbon cycle. It is being increasingly recognized that biodiversity and their ecosystems provide services to humanity that should now be measured for their economic value (IPPC 2007, European Commission 2011, Millennium Ecosystem Assessment 2005, Mesbah 2009), as well as that climate change greatly affects its stability (IPPC 2007, Millennium Ecosystem Assessment 2005, USEPA 2011). It turned out that climate change presents a serious threat to the biological diversity of plants in Europe (Thuiller et al. 2004). Some species are more sensitive to changes or are already endangered, and endemic species in particular can become endangered as a result of climate change. For example some plant and animals species can be forced to move to higher altitudes to meet the same conditions of temperature and humidity. Some plant species can send their progenies to other locations with their light seed transported by wind or birds over long distances, but other species including many plants are not necessarily able to move to new habitats, especially to higher altitudes. As noted in the 2010 FAO report on forest and climate change that includes a chapter on BiH:

"If we take into account the forecast temperature changes, most pressure would be on the oak forests, both cork oak and English oak. The sessile oak forests are the lowest forests in BiH, and their altitudinal range is from 280 to 860 m (altitude amplitude is very low, at 580 m). Migration of the sessile oak and English oak to areas of higher altitude is disabled due to

	2003		2004		2005	
RS	FBiH	RS	FBiH	RS	FBiH	RS
4,194	**9,043**	**4,773**	**9,795**	**4,750**	**10,135**	**4,957**
2,600	4,831	3,159	5,178	2,791	4,979	3,022
233	217	180	396	264	528	157
259	1,305	270	1,389	282	1,597	278
188	562	228	636	477	841	562
48	550	61	577	54	561	60
742	1,338	740	1,357	738	1,376	737
124	240	135	262	144	253	141

their heavy seed. In addition, any increase in temperature is accompanied by an increase in dryness, resulting in slower decay of forest litter."

If the annual rainfall is reduced, surface water reserves may decrease and groundwater flows may reduce. Access to water may become reduced and economic as well as social activities may suffer from it. Temperature changes and change in precipitation patterns affect forestry and agriculture. Dryer summer seasons can result in an increase of insect born diseases among some tree species, thus affecting forestry. Agriculture and forestry are most directly affected by climate change as their production is essentially dependent on the climate, mainly precipitation and temperature range. An increase in the growing season length seems to take place in BiH as indicated earlier. An increasing growing season length can affect biodiversity in different ecosystems. The extent of the impact of an increasing growing season length will vary depending on ecosystems and species. Some species will adapt and thrive under these changing conditions and other will suffer if they cannot migrate.

The lack of availability of water will also have a direct effect on hydroelectricity. Water scarcity could additionally burden decision-makers at local and regional levels in terms of determining priorities related to access to water in situations when decisions must be made for the agricultural, energy and industrial sectors, and households. Most economic sectors are directly or indirectly affected by access to water as explained above, but the economy is especially affected by extreme weather events which could occur at an increasing rate in the near future such as extreme droughts, and extreme floods.

The tourist industry might also be affected by a decrease of snow cover for winter sports in sky resorts. Figure 126 and Figure 127 show the annual number of days in Sarajevo with snow cover of 10 cm and more. The trend of decrease in number of days with more than 10 cm of snow cover is obvious for the period 1951-2010. That decrease is emphasized in Figure 127 that shows the annual number of days with more than 10 cm of snow by season (autumn, winter and spring). Both diagrams confirm a warming trend as the number of days with more than 10 cm of snow is a relevant indicator of temperature. A decreasing number of days (between 10 and 13 days less) with snow cover is another indication that air temperature has been increasing in Sarajevo over the last 60 years. In addition, a lower snow cover in the mountains reduces the amount of stored water that can be melted and released in spring and summer into river basins and that fills groundwater reserves.

Figure 126: Annual number of days with snow cover of 10 cm and more in Sarajevo in the period 1951 - 2010 (Source: FHMI BIH)

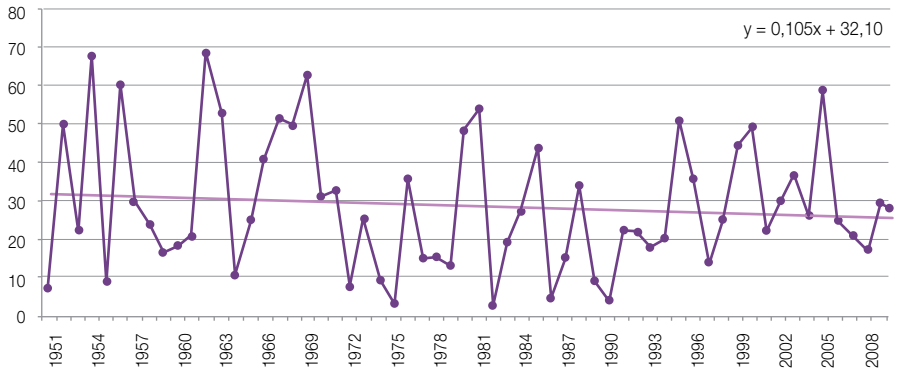


Figure 127: Number of days per season with snow cover of 10 cm and more in Sarajevo in period 1951/1952 - 2010/2011 (Source: FHMI BIH)

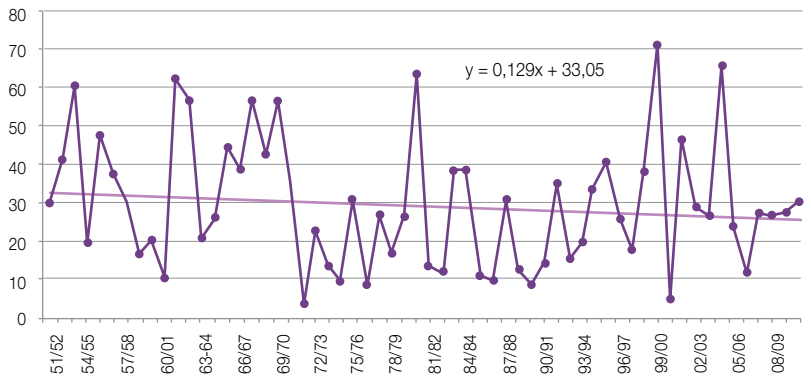
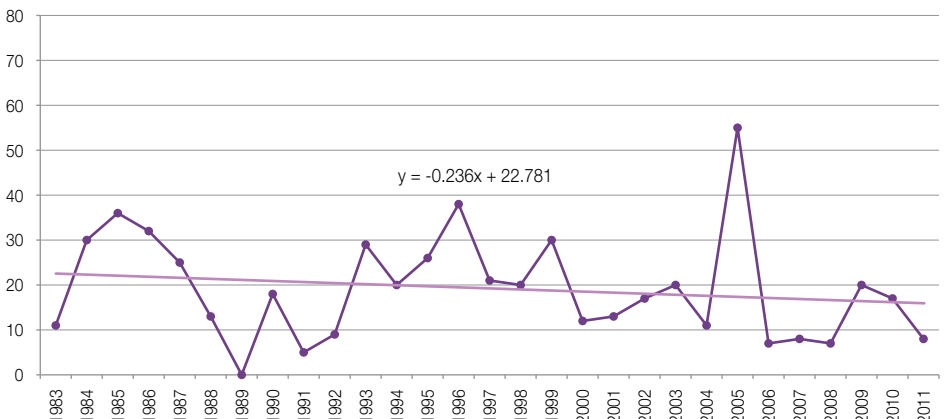


Figure 128 shows the number of days with snow cover of 10 cm or more in Banja Luka. The Figure shows that the occurrence of this amount of snow cover is very uneven, variable and uncertain.

Figure 128: Annual number of days with snow cover of 10 cm and more in Banja Luka in the period 1983-2011 (Source: RHMS RS)



3.7.6 MITIGATION MEASURES AND ADAPTATION TO CLIMATE CHANGE

In the IPCC Fourth Assessment Report, it is recommended to all stakeholders, i.e., governments, industry and consumers to find means to reduce GHG emission or to mitigate the present trend of climate change and adapt to upcoming changes taking place. It is in the interest of every country to prepare as best as possible for adaptation to indirect and direct consequences of climate change. BiH is included in the regional Southeast European Climate Change Framework Action Plan, which was an important milestone. Such an action plan at the state level would be highly necessary, especially in the context of a complex, fragmented and bureaucratic structure of the government in which institutions are not equally equipped for adjustment to changes. Climate change scenarios provide important elements of information that may guide decision-makers in defining long-term state strategies. Mitigation measures and adaptation to climate change in BiH include: water conservation and saving, energy saving and more extended use of renewable energy sources, sustainable forestry and agricultural practices.

Water saving

A significant amount of water in BiH is lost in the water supply system (Agency for Statistics of BiH, Environment and Energy 2011). The majority of waste water in urban areas is not treated, but directly discharged into rivers, thus polluting the water that otherwise could have been supplied to other consumers (UN Economic Commission for Europe, 2011) [38]. As water becomes increasingly scarce, demand will increase, especially since water for agricultural use comes mainly from precipitations which are, as shown above, decreasing every year in some regions. Alternative approaches to securing water for food production will be further developed, for example through irrigation. Scarcity of water will push for increased efficiency in water use with a decrease in water waste. Mountain forest ecosystems play an important role in water conservation in BiH and should be maintained as important natural water reservoirs (FAO, 2010).

Adaptation to increasing drought and heat in recent years

The last two summers of 2011 and 2012 were characterized by increased droughts and temperatures in the Balkans, with temperatures up to 47°C in Herzegovina[39] , with one billion USD loss in BiH in agriculture production during the last summer of 2012.The lack of available water due to the dryer weather in 40 years will also result in a lower capacity to generate hydroelectricity [40]. BiH is a member of the UN Convention to Combat Desertification and produced its First National Report on the Implementation of the UNCCD in 2007. The report includes measures recommended for the rehabilitation of degraded lands and for early warning systems for mitigating the effects of drought. At the regional level, under the framework of the Regional Cooperation Council a Joint Statement was made in November 2008 by the Ministers responsible for environment of the Republic of Albania, Bosnia and Herzegovina, the Former Yugoslav Republic of Macedonia, Montenegro and the Republic of Serbia on combating climate change in Southeast Europe. The recent summers of 2011 and 2012 with extreme droughts should serve as reminders of the importance of implementing adaptation and mitigation measures to combat climate change in BiH and the Balkans.

Adaptation and mitigation measures in agriculture and forestry

Agricultural practices need to be modified in order to adapt to change. Some factors could positively affect agriculture such as the increasing growing season length; however given that other important factors are not limited, such as water availability and soil quality, climate change is expected to have a negative effect on agricultural production. Crops production in BiH currently depends mainly on precipitation to maintain sufficient moisture in the soil. Irrigation practice need to be developed and water reservoirs have to be made available (currently less

38 Stated in the documents of the project "Support to BiH Water Policy", and entities' strategic and planning documents in the field of water management

39 Reuter Agency http://www.reuters.com/article/2012/08/21/us-balkans-drought-idUSBRE87J0MX20120821

40 Reuter Agency :http://www.reuters.com/article/2012/09/07/us-balkans-drought-energy-idUSBRE8860F020120907

than 2 % of arable land is irrigated). Other options include changing crop varieties with the introduction of new winter crops or other perennial crops because soil cover is essential for water conservation. Organic farming practices generally provide stronger resilience to climate change in addition to being cleaner for the environment and safer for human health. Organic farming maintains long-term soil fertility and moisture, prevents erosions and flooding, maintains biodiversity including crop biodiversity. Organic farming is also energy efficient and reduces GHG emissions; it is therefore being increasingly recommended for both developed and developing countries. Traditional agricultural practices in BiH should be combined with modern scientific knowledge and technologies, with the aim of integrated and sustainable agriculture.

A large area of BiH is covered with forests, which are very important for local climate conditions, water cycle, absorption of GHGs and oxygen release, temperature change mitigation and soil humidity preservation (FAO, 2010). It is therefore essential for BiH to ensure that the current forest cover is maintained and possibly even expanded. These goals can be reached through sustainable forest management, and wood and non-wood products could be supplied for economic activities, while the tourist industry could offer recreational activities (Intergovernmental Panel on Climate Change 2007, European Commission 2011, Millennium Ecosystem Assessment 2005, Mesbah 2009).

Energy efficiency improvement and renewable energy sources development

Energy efficiency improvement enables decreased energy consumption and GHG emission per capita. Examples of energy efficiency include better construction insulation, but also co-generation, i.e., simultaneous production of electricity and thermal energy for district heating plants. Development of renewable energy sources decreases dependence on fossil fuels, as well as GHG emissions. Hydroenergy is well developed in BiH, with electricity production accounting for 40% of the total energy production or 7183 GWh annually. There is still a good potential for further development, especially in terms of small-scale power plants, but the danger for biological diversity is significant. The use of wind energy in BiH is still marginalized, with the exemption of the plan for wind power plants construction in Podveležje and Livanjsko Polje and detail research at 5 sites in eastern Herzegovina in the RS is in progress. Geothermal energy with identified thermal sources at temperatures from 20 to 100 degrees has significant potential that is not developed. Some estimates of solar energy potential indicate that the electricity generating capacity is 33 GWh, while the present biomass level corresponds to an amount of 4,200 GWh (Initial National Communication of BiH under the UN Framework Convention on Climate Change, 2009).

3.7.7 INTERNATIONAL LEGAL FRAME FOR CLIMATE CHANGE FROM BIH PERSPECTIVE

BiH ratified the UN Framework Convention on Climate Change in 2000 and the Kyoto Protocol in 2007. BiH is one of the countries that are not members of Annex 1 of the Convention. There are no restrictions in GHG emissions for countries that are not members of Annex 1, for they are not considered to be great emitters per capita. The Ministry of Spatial Planning, Construction and Ecology of RS is the focal point for the Convention on behalf of BiH. In accordance with the UNFCCC, BiH, being a country that is not a member of Annex 1, is entitled to a transfer of numerous financial mechanisms, knowledge and technologies. In 2009, BiH developed the Initial National Communication under the United Nations Framework Convention on Climate Change. The preparation of the Second National Communication is ongoing with UNDP's assistance. The Clean Development Mechanism (CDM [41]) according to the Kyoto Protocol of the Convention on Climate Change allowed co-financing of certain projects in BiH through carbon trading, after the process of Designated National Authority appointing (DNA) was completed in BiH (UN Economic Commission for Europe, 2011.) at the first DNA Executive Board meeting (29 September 2011, Ministry of Foreign Trade and Economic Relations). These projects include energy efficiency, use of renewable energy or projects related to sustainable

41 CDM - Clean Development Mechanism

agriculture or sustainable forest management. Three projects are being developed, related to the decrease of NO_2 (coke industry), CH_4 (mining), SF6 (thermal plants) and CO_2 (small-scale hydropower plants) (Initial National Communication of BiH under the United Nations Framework Convention on Climate Change, 2009). DNA Executive Board emphasized at the meeting that BiH and other projects may benefit from the Clean Development Mechanism through:

- Further development of the energy efficiency market and renewable energy sources;
- Access to modern technologies;
- Attracting direct foreign investments through a series of projects that are harmless for the environment of all stakeholders;
- Ensuring infrastructure development, increase of GDP and employment;
- Improvement of air quality and the environment and offering different energy sources in order to decrease dependence on fossil fuel procurement.

Through development of potential projects of the Clean Development Mechanisms and by presenting them to stakeholders, BiH is in a position to decrease GHG emissions at the global level, and by engaging in such activities fulfill one of the priorities of the Stabilization and Association Agreement, for example, the implementation of the Kyoto Protocol. Some of the potentials for decreasing GHG emissions in BiH are:

- Increasing energy efficiency, since BiH has greater energy intensity than neighboring countries
- Biomass use, annual logging around 5 million m^3
- Obtaining energy by waste gasification (e.g. at Sarajevo landfill)
- Wind energy use
- Thermal water energy use.

3.7.8 CONCLUSIONS AND RECOMMENDATIONS

There is no doubt that global climate change is caused by anthropogenic greenhouse gases emission. Although BiH is not a major GHG emitter, it has to find ways to contribute and mitigate emissions and to adapt to present climate change and its consequences. Medium-term and long-term state strategies must include mitigation and adaptation measures in key sectors, including agriculture, forestry, industry, transportation and energy. Climate change must be included as an element in the existing strategic documents, like the National Environmental Action Plan or the future Energy Strategy.

BiH needs to make full use of various opportunities under international mechanisms such as those determined by the Kyoto protocol under the UNFCCC. These opportunities include foreign investments and technology transfers in the field of renewable energy, energy efficiency, agriculture, forestry, and biodiversity conservation. Climate change represents a threat to local economies, including BiH, but also gives it an excellent opportunity to accelerate the transition towards sustainable economy (Green Economy Report, UNEP 2011), which increases the use of renewable energy and reduces pollution including emission of greenhouse gases.

Data collection and analysis needs to be further developed in BiH, especially for climate change. Besides the data presented in this Report, many data are still missing, due to poor environmental data collecting and processing.

For some climate change indicators in BiH data are missing partially or completely. One problem is the fact that some data are not measured or collected, and the other problem is that data are not properly processed, distributed or published. Climate change indicators in BiH for which data is completely or partially missing are:

- Water temperature (CLIM 019)
- Water retention (CLIM 029)
- Water requirement (CLIM 033)
- Timing of the cycle of agricultural crops (agrophenology) (CLIM 031)
- Species-ecosystem relationship (CLIM 026)
- Soil erosion by water (CLIM 028)
- River flow (CLIM 016)
- River floods (CLIM 017)
- River flow drought (CLIM 018)
- Plant phenology (CLIM 023)
- Normalized losses from river flow disasters (CLIM 040)
- Heat and health (CLIM 036)
- Growing season for agricultural crops (CLIM 030)
- Freshwater biodiversity and water quality (CLIM 021)
- Forest growth (CLIM 034)
- Forest fire danger (CLIM 035)
- Distribution of plant species (CLIM 022)
- Distribution of animal species (CLIM 024)
- Direct losses from weather disasters (CLIM 039)
- Crop-yield variability (CLIM 032)
- Animal phenology (CLIM 025)
- Agriculture and forestry (CLIM 042)

Indicators relevant to climate change are related to many other environmental indicators. For proper collection of climate change data, coordination between relevant agencies is very important, such as hydro-meteorological institutes, forestry and agricultural institutes, as well as air and water quality measuring. These measurements should be collected and processed by relevant agencies.

Having in mind that the BiH government is very fragmented, a pragmatic approach would be to strengthen capacities of existing agencies for collecting, approving and compiling the data on environmental indicators and climate change.

Priority should be given to environmental indicators that are part of the core set indicators (CSI) presented in this Report. The initiative to raise public and political awareness of these indicators is important. This Report on the State of the Environment in BiH, will be a valuable tool in achieving that goal.

Besides, universities and their faculties are, in some cases, in a position to create and/or collect data for a number of those indicators. These data are usually a part of scientific publications, but could also be systematically submitted to statistical authorities in the FBiH and the RS or to the Agency for Statistics of BiH. According to the definition, environmental science is a multidisciplinary science. Required data must come from different sources, related to different ministries and different agencies. Diversity of information sources once again emphasizes the need to coordinate within and between entities in order to obtain data at the state level.

Some environmental data are social or economic in nature, like data on public opinion or market trends. These data are typically obtained through surveys and research, most often performed

by public or private agencies or media. Some data are also gathered from the private sector. Relevant data from private companies are directly presented to the public or submitted to public institutions that release the data and make it publicly available. BiH is a member of the UNECE Aarhus Convention, and the report on implementation of the mentioned Convention was developed in 2010 (Aarhus Convention). In the focus of this Convention, held in 1998 in Aarhus in Denmark, is access to information, public participation in decision-making and access to justice in environmental matters. Similar to the Freedom of Information Act, which refers to public information in general, the public is entitled to requesting environmentally relevant information for their own benefit, under the said Convention. After implementation of an EU/CARD project in 2007, the FBiH and the RS adopted Rulebooks on Registration of Installations and Pollutants, and since 2008 companies are obliged to report data, while environmental inspectors are authorized to fine companies that do not comply with the regulations. Data reporting includes atmosphere emissions, waste water release, solid waste disposal, installation characteristics and details on permits. A Social and Environment Impact Study must be carried out for any large-scale infrastructure project (NEAP BiH, 2003).

4 ENVIRONMENTAL SAFETY AND HUMAN HEALTH

4.1 CHEMICALS AND HARMFUL SUBSTANCES

4.2 NATURAL AND HUMAN-MADE DISASTERS

4.3 POST-CONFLICT ISSUES

4.4 TRANSBOUNDARY ISSUES AND THEIR ENVIRONMENTAL IMPACT

4.5 IMPACTS ON HUMAN HEALTH

Changes in physical, chemical or biological state of the environment determine the ecosystem quality and human well-being. State changes can have an environmental or economic impact on the functioning of ecosystems, on human health and safety, and on economic and social efficiency of the society. The environment is a specific medium that reflects the consequences of all human activities. Environmental safety, and human safety, can be jeopardized by natural and human activities (e.g. landslides, forest fires, mined areas, etc.). Physical environmental influences may cause different health conditions in humans, in the form of various diseases. Although there is a series of indications of possible environmental impacts on human health, it is very difficult to demonstrate, and especially prove, their direct connection.

4.1 CHEMICALS AND HARMFUL SUBSTANCES

According to the EU White Paper – Strategy for a Future Chemicals Policy, world production of artificial chemicals increased from 1 million to 400 million between 1930 and 2000. Between 1930 and 2000, world production of artificial chemicals increased from 1 million to 400 million tons each year. Although the social benefit of certain chemicals cannot be denied, for instance their use in healthcare, some chemicals unfortunately have harmful effects on wildlife and people, and their long-term impacts are still unknown. Increasing number of scientific research on chemical contamination of the environment has a sobering effect. Regardless of the region scientists focus on, tropical areas, ocean systems, industrial areas or Arctic, they find traces of toxic chemicals.

The mandate for chemicals management in BiH is given to the Federal Ministry of Health in the FBiH, the Ministry of Health and Social Protection in the RS, and the Department for Health and Other Services of the BD Government. These institutions work closely with environmental ministries when it comes to issues of chemicals and environmental protection.

Monitoring and reporting bodies

Federal Ministry of Agriculture, Water Management and Forestry analyses the amount of imported pesticides each year. According to the Law on Chemicals (Official Gazette of the RS, no. 25/09), Ministry of Health and Social Protection of the RS manages an Integral Inventory of Chemicals.

According to the Law on Food (Official Gazette of BiH, no. 50/04), the Food Safety Agency of BiH regularly collects, processes and analyzes data and results of food laboratory analyses submitted by food control laboratories in BiH, which are related to the presence of physical, chemical and microbiological hazards in food, in line with the existing regulations in BiH. The Agency has established cooperation with all laboratories for food control in BiH, and at present it is in the final stage of preparation for the process of licensing an official food control laboratory, in accordance with the existing regulations in BiH. The Agency regularly submits data on food safety for the BiH area to the relevant institutions in BiH for review and consideration, and from 2009 it has been submitting "Information on Risk Assessment" containing all data on food safety for BiH to the Council of Ministers for adoption. So far the Council of Ministers has considered and adopted five reports. Table 43 shows the data on food laboratory analyses results for the period 2009-2011, submitted by food control laboratories in BiH.

Type of contaminant	2009		2010		2011	
	Number of analyses	Number and % of non-samples not satisfying	Number of analyses	Number and % of samples not satisfying	Number of analyses	Number and % of samples not satisfying
Heavy metals	13,525	366 (2.71%)	6934	5 (0.07%)	6280	36 (0.57%)
Mycotoxins	786	6 (0.76%)	64	0	136	2 (1.47%)
Pesticide residue	2,594	2 (0.08%)	1180	9 (0.76%)	1514	10 (0.66%)

Table 43: Results of laboratory analyses of food in BiH in the period 2009-2011 (Source: Food Safety Agency of BiH, 2012.)

The Ministry of Foreign Trade and Economic Relations - Veterinary Office BiH regularly monitors harmful chemicals in residues of veterinary pharmaceuticals, pesticides and contaminants in living animals and animal products (meat, milk, eggs, honey), and in animal feed. The Annual Residues Monitoring Plan is adopted in accordance with the Decision on Monitoring of Certain Substances in the Residue of Live Animals, and Animal Products (Official Gazette of BiH, Nos. 01/04, 40/09, and 44/11) and the Decision on Adopting the Monitoring Plan and Control of Residues for 2011 (Official Gazette of BiH, No.25/11).

Different samples are examined depending on the chemical being measured. Usually, these are samples of urine, blood, muscles, kidney, liver or eggs. Inspectors take samples in the FBiH, the RS and the BD, which are then analyzed in authorized laboratories. In 2010, presence of different dangerous substances was tested in 1022 samples, out of which two were positive (two samples were positive for two different types of antibiotics).

There are four main agencies for monitoring the state of surface waters in BiH, two in the FBiH and two in the RS. All agencies monitor water quality, but there is no systematic reporting at the state level (except for the EIONET, for which a National Focal Point has been established). Agencies use different reporting forms, so it is complicated to review the state of toxic pollutants in surface waters in BiH.

Kemal Kapetanović Institute in Zenica monitors the content of heavy metals in air. It is unknown if there are reports on polluted air impact, especially air polluted with heavy metals, on human health and the environment.

Different institutions, like the Federal Institute for Agropedology, the Federal Institute of Agriculture and the Agricultural Institute of the RS monitor contents of toxic soil pollutants. All three institutions measure toxic pollutants, but the data is not public and reports are not consistently published.

The Institute for Public Health of FBiH, as well as the RS Public Health Institute, publish annual reports on the state of public health in the FBiH and the RS. These reports include a section entitled Environment and Health, in which the quality of air, soil and water, as well as the effects of noise on health are reported. Although these reports do not contain data or measurements, they do express the following concerns: air pollution in some towns that regularly exceeds limits (especially in winter months), potential water pollutants that reach the water supply system and problems with waste management. Reports stress the problem of illegal landfills as the leading issue affecting environmental health. This is especially the case with industrial and medical waste which is not adequately disposed of, i.e., that is discarded at illegal landfills or together with municipal waste. The Institute for Public Health of FBiH reports that 60% of infectious medical waste is collected together with municipal waste. The Institute for Public Health of FBiH, and the RS Public Health Institutealso state that such a situation with waste in the country presents even a greater risk for groundwater quality, which is not monitored regularly.

The Institute for Accreditation of BiH regularly publishes and updates the list of all accredited laboratories dealing with chemical testing and other activities linked to the environmental protection. Laboratories from this list undertake chemical testing of soil, water, animal and agricultural products and food.

The Ministry of Foreign Trade and Economic Relations of BiH is the national focal point [42] (executive body) for all conventions on environmental protection signed and ratified by the state. BiH is a signatory of the Stockholm Convention on Persistent Organic Pollutants which was ratified on 30 March 2010.

The launch of project “Enabling Activities for Implementation of Stockholm Convention on Persistent Organic Pollutants in BiH” in May 2011 gives the hope that some aspects of POP state in the country will be clarified, since the development of a POP inventory in BiH is one of the project activities. The main goal of the project is to strengthen national capacity and enable preparations for the National Implementation Plan for POP Management, as well as its specific strategy and action plans.

42 NFP – National Focal Point

Independent research

Within Sarajevo University there are several researchers at the Faculty of Pharmacy, Faculty of Medicine and Faculty of Science who have published their researches on POP concentration in the Neretva River, polychlorinated biphenyls (PCB) concentration in the soil of Sarajevo Canton and atmospheric concentration of mercury in Tuzla.

During the last war in BiH a number of transformer stations were destroyed, which caused significant spills of transformer oil containing PCB. A couple of those stations are located in the vicinity of Sarajevo, near the water supply source. Analytic samples of soil from that area showed that only 9 out of a total of 42 individual samples had total PCB concentration higher than 0,5 ppb (immunochemical method detection limit), and the highest concentration found was 1.53 ppb. It is 3 - 4 orders of magnitude lower than concentrations found in similar circumstances, so it is safe to claim that concentrations found do not pose a risk of water contamination. What is worrying is that even deeper soil layers (50 cm) contained the same PCB concentration as the surface layer (5 cm), which implies continuous contamination (Marjanović et al, 2007).

Another publication considered POP levels in the Neretva River (Đeđibegović et al, 2010). This publication claims that POP examination results show that the Neretva River is not contaminated. In Table 2 of this publication it is shown that DDT concentration is below the quantification limit and only its metabolite DDE was quantifiable. Considering the set mean annual concentrations in environmental quality standards for priority and other substances, and in line with the existing local and EU legislation (Directive 2008/105/EC), the threshold of permitted mean annual surface water concentration of total DDT is 0,025 µg/L and the measured concentration was p.p - DDE 14 pg/L which is approximately 1800 times less than the permitted concentration values. As stated in the publication, the total measured concentration of organochloride pesticides (OCP) is 140 pg/l, which can be considered as background concentration. The study concludes that DDT and its main metabolite levels show recent use of that insecticide. Since DDT has not been imported to BiH in the last 15 years, recent use indicates the existence of stock that should be investigated. The paper also states the presence of contaminants like PBDE which should be monitored.

The Adriatic Sea River Basin District Agency Mostar conducts regular analyses of organochloride pesticides in the Neretva River (measuring profile Dračevo and Žitomislići) and so far there has been no values exceeding the EQS standard according to Directive 2008/105/EC, and values given in Attachment 1 of the Rulebook on Requirements for Waste Water Discharge into Natural Recipients and Public Sewage System (Official Gazette of FBiH No. 4/12).

Tuzla is one of the most polluted towns in BiH. A publication entitled "Distribution of Mercury in the Air in the Area of the Town of Tuzla" shows that in the town, due to the chloralkali factory, there is a significant concentration of mercury in the air (1 – 251 ng/m^3), and the highest concentrations are found near the factory (Huremovic et al, 2008).

Concentration of atmospheric mercury (ng/m^3)			
	Unpolluted areas in the world	Polluted areas in the world	Concentration of atmospheric mercury in Tuzla and surrounding area
Average	≤0.04/2	-	26.7
Minimum	0.01	≤0.09	1
Maximum	0.06 (3.4)	39	251

Table 44: Comparison of Tuzla region with average concentrations of atmospheric mercury in polluted areas and unpolluted areas in the world (Source: Huremović et al, 2008.)

Although there is still no systematic reporting on hazardous chemicals and substances in all segments of the environment, there are information sources that clearly state that water, soil and food in BiH contain certain concentrations of hazardous chemicals and substances. The main sources of eco-toxic chemicals and substances are similar throughout the world,

and BiH is no exception - inadequate disposal of municipal waste and waste from industry, mines and hospitals, lack of waste water treatment plants, and sewage systems that directly discharge into open water bodies.

In BiH, concentrations of toxic substances are being measured, but in most cases there is no coherent reporting on the findings. The content of toxic substances is mainly determined in food samples, but there are not many eco-toxicology studies. The first step in developing a report on the state of hazardous chemicals in BiH is establishment of better cooperation and information exchange between relevant institutions. Apart from that, it is necessary to improve, harmonize and strengthen legal, institutional, technical and financial bases, as well as mechanisms and measures for safe chemical management and monitoring of their environmental impacts.

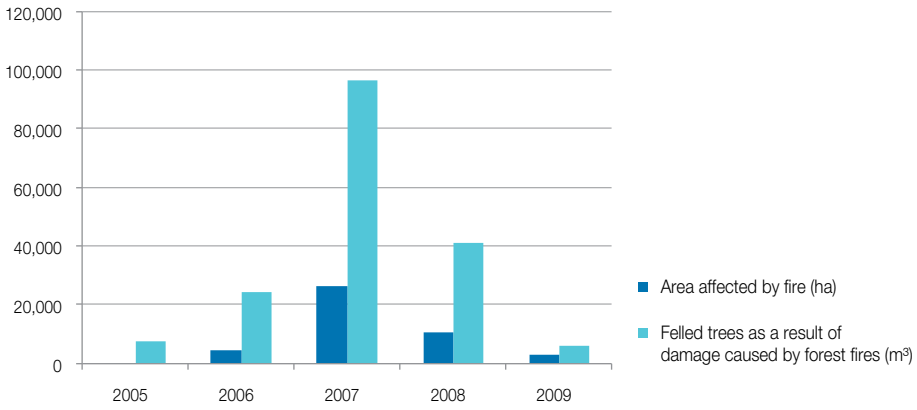
4.2 NATURAL AND HUMAN-MADE DISASTERS

4.2.1 FOREST FIRES

Forest fires pose the greatest threat to forests and biological diversity in general. They destroy ecosystems and affect survival of animals and plants. They even increase erosion risks by destroying vegetation. Most often they start in karst regions of Herzegovina due to its geographic position and climate characterized by high temperatures and dry land in summer. Generally, low levels of humidity and high temperatures are considered factors that significantly increase the risk of forest fire.

According to the information of the Agency for Statistics of BiH, data on the causes of forest fires are not being collected, but the figure below shows the available data on burnt surface areas and felled timber as a result of forest fires.

Figure 129: Area of forest fires and amount of felled timber presenting the damage of forest fires in BiH (Source: Agency for Statistics of BiH, 2011.)



4.2.2 FLOODS

Floods in the wider area of BiH are caused by the imbalance of many natural factors (water regime, climate, geological, topographical and human activities). In BiH, there are no accurate data on flooded areas and damages at the annual level, since the Agency for Statistics of BiH does not collect such data.

Four water agencies (two in the FBiH and two in the RS) monitor surface water flows and analyze data on floodplains, each within its water district, and prepare plans to prevent and reduce harmful effects of floods.

An overview of the basic territorial (planning) units for water management, and hence flood

risk, gives a better insight into the hydrographic network in BiH. Under the provisions of the entity Laws on Waters in BiH, the basic territorial (planning) unit for water management is a water basin:

1. Sava River Basin
2. Adriatic Sea River Basin.

Sava River Basin includes parts of the international Danube River Basin and part of the international sub-basin of the Sava River on the territory of BiH, which belongs to the Black Sea Basin. The Adriatic Basin covers parts of the international river basins of the Neretva River with Trebišnjica, as well as Cetina and Krka on the BiH territory.

From the aspect of flood risk, these two watersheds are effectively independent, but at the same time, the parts that belong to the same water basin in both entities have strong interdependence. In addition, the Sava River Basin in BiH, directly "leans" on interstate waterways: Una, Korana, Sava and Drina, while the Adriatic Basin is in the most direct connection with parts of the interstate rivers Neretva and Cetina (and some minor), which are on the territory of Republic of Croatia.

The following areas are most exposed to floods:

- In the upper reaches of the Sava River tributaries: Drvar (Unac River), Tuzla (the Jala River), Olovo (the Krivaja River), river valleys of rivers Spreča, Usora, Miljacka, Željeznica etc.;
- In the middle and lower courses of the Sava River tributaries: Kulen Vakuf, Bihać, Bosanka Krupa (the Una River), Novi Grad, Prijedor, Sanski Most (Sana River), Gornji Vakuf Bugojno, Donji Vakuf (Vrbas River), Čelinac (the Vrbanja River) Sarajevo field, Zenica, Maglaj, Doboj (the Bosna River), Foča, Goražde, Zvornik, Janja (the Drina River);
- In the valley of the Sava River, settlements: Dubica, Gradiška, Srbac, Brod, Derventa (Ukrina), Šamac, Brčko and Orašje;
- In the Neretva River valley: Čapljina valley, Gabela valley, Višići, Svitava, Hutovo Blato, Brotnjo plateau, Rastok Jezerac, Neretva valley (area Čapljina-Buna), Vir-Posušje, Ljubuški-Vitina valley (the Trebižat River), Bijelo and Bišće valley (the Buna River);
- In karst areas: Imotski-Bekija valley, Mostarsko blato, Livno valley, Kupres valley, Duvno valley with Šuica valley, the area around Bosnansko Grahovo, Gatačko valley, Nevesinje valley, Dabarsko valley, Fatničko valley, Bileća valley, Trebinje (Mokro) valley, Ljubomir valley, Ljubinje valley and Popovo valley.

Floods in BiH pose a threat to an area of 250,000 ha, which is 4% of the total territory (UN Economic Commission for Europe, 2004).

Construction of protective structures greatly decreases the risk of flooding, but there is still no sufficient protection. Flooding consequences have a significant impact on population health due to pollution of potable water resources. Floods pose the greatest threat to groundwater resources in areas of intergranular soil structure (33% of water resources used for water supply), because they are situated in river alluvial deposits. A particular problem is environmental pollution caused by floods and possible toxic contamination. Floods cause enormous damages to crops, private property and infrastructure, and lead to the erosion of arable land.

In recent years, uncontrolled settlement additionally complicated the implementation of protective measures in flooding areas such as river valleys and areas close to river banks. In line with the EU legislation and state legislation, the FBiH began to develop a risk assessment in order to establish the Flood Risk Management Plan. Also, the Civil Protection Authority of RS has initiated the development of natural and other disasters risk assessment of the RS, which is the first stage in the process of developing the Civil Protection Plan of RS. For the purpose of environmental reporting, it is necessary that the Agency for Statistics of BiH collects data on flooded areas and damages at an annual level.

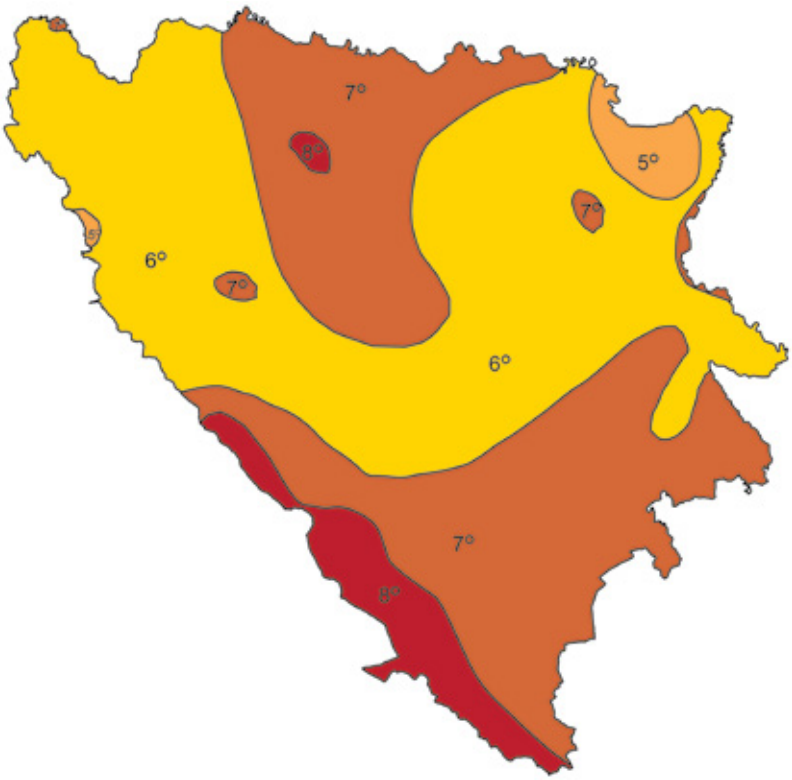
4.2.3 EARTHQUAKES

As a part of the Mediterranean zone of Alpine-Himalayan seismic belt, the regional tectonic position of BiH covers several individual geotectonic units: Pannonian basin, Eastern Alps, the Dinarides and the zone between the Dinarides and the Adriatic platform. Seismicity is mainly influenced by the collision of the Adriatic platform and the Dinarides. The Pannonian basin is characterized by rare occurrence of major events, which is typical of intraplate seismicity. Regional seismic activity in BiH is characterized by the occurrence of earthquakes within well-known epicenter areas, as can be seen on the map of epicenters (Figure 130).

Figure 130: Epicenters of the strongest earthquakes and major seismotectonic faults on the territory of BiH (Source: FHMI BIH, Center for seismology, Sarajevo, 2010.)

What is important for BiH is that the present seismic activity is stronger in central and southeast parts of the country, and weaker in northwest regions.

Figure 131: Most active seismic areas in the next 100 years on the territory of BiH (Source: Balkan project, 1972)



Although it is very difficult to predict seismic events in any territory based on instrumental recordings (earthquake catalog), mathematical and physical models, it is still possible to predict some future seismic events. It is expected that in the next 50 years the earthquake intensity will not exceed VII by Mercalli-Cancani-Sieberg (MCS) scale. However, in the next 100 years stronger earthquakes are expected in southern and northwestern parts of the country (Figure 131).

Earthquakes can have a very negative impact on the environment and society. They can disturb the equilibrium of environmental factors and cause serious damage to ecosystems like forests, vegetation, rock formations, as well as to biological diversity of animals and plants, and they can start landslides and mudslides. Apart from this, a great threat to the environment, as a consequence of earthquakes, lies in spreading solid and liquid waste and industrial chemicals, water pollution, destruction of sewage collectors and water treatment plants.

BiH has a significant water potential with a large number of constructed dams that can trigger earthquakes by their own weight or the weight of water in the reservoir. This occurs when the reservoir is situated near two major fault lines, the stability of which can be disrupted by the change of water level, which can result in landslides, mudslides and cracks on the surface.

One of the main problems related to earthquakes is fresh water contamination with sea water, as well as waste water floods and formation of deposits on arable land. Earthquakes can cause death of plants and important soil microorganisms. In BiH, regulations and institutional measures are implemented by construction companies in order to reduce the risk of seismic activities; there are regulations on seismic insulation of buildings as prevention measures and citizens protection measures, which is under the competence of civil protection services. It is assumed that a strong earthquake can cause enormous economic, environmental and social damage; therefore, earthquake protection and consequence mitigation are an integral part of economic and social development plans.

4.2.4 LANDSLIDES

Landslides are a serious geological hazard. Many factors influence landslides, such as increased slope gradient, groundwater flow change, decrease in slope thickness, etc. These factors can be caused by natural or human activities. The slope gradient can be altered by: erosion, change in the river flow, presence of heavy materials on the slope (building), etc. One of the main causes of landslides is groundwater flow change caused by an increased water level, change of vegetation (forest felling, conversion to agricultural or urban area), heavy rains, prolonged drought periods, etc. A significant problem is illegal construction that additionally burdens slopes and initiates their movement. Among other human activities that have a negative impact on landslides it is important to mention excessive tree felling, decrease in vegetation cover, unsuitably constructed drainage systems and uncontrolled water drainage at the slope surface.

Terrain stability in BiH is multifarious with different types of geologic stratigrafy, and the existing units date back from the Paleozoic to the Quaternary period. There are sediments of various lithological characteristics, metamorphic and magmatic rocks in BiH, which provide a general insight into physico-mechanical properties and tectonic deformability. Due to different physico-mechanical properties listed in lithology articles, landslides appear in many different forms.

In 2009, the Federal Hydro-meteorological Institute of BiH created a map of vulnerable landslide areas in the FBiH (Figure 132) as a part of the Study of Vulnerable Areas in the FBiH. This map shows areas impacted by landslides at three different levels: stable, unstable and conditionally stable areas. In stable zones, the risk of landslide is less than 3.5%, in unstable it is greater than 10%, and in the conditionally stable areas the risk is between 3.5 and 10%. Due to the enormous economic and social consequences of landslides, it is necessary to systematically monitor and develop detailed maps, especially for unstable zones.

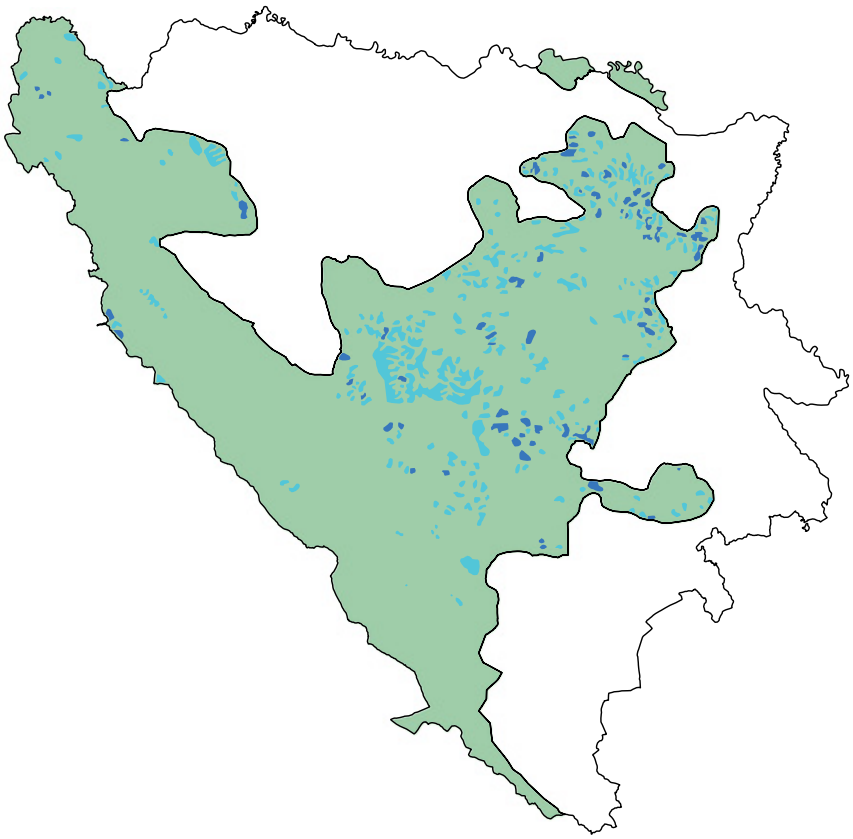


Figure 132:
Terrain stability map for FBiH
(Source: FHMI BIH)

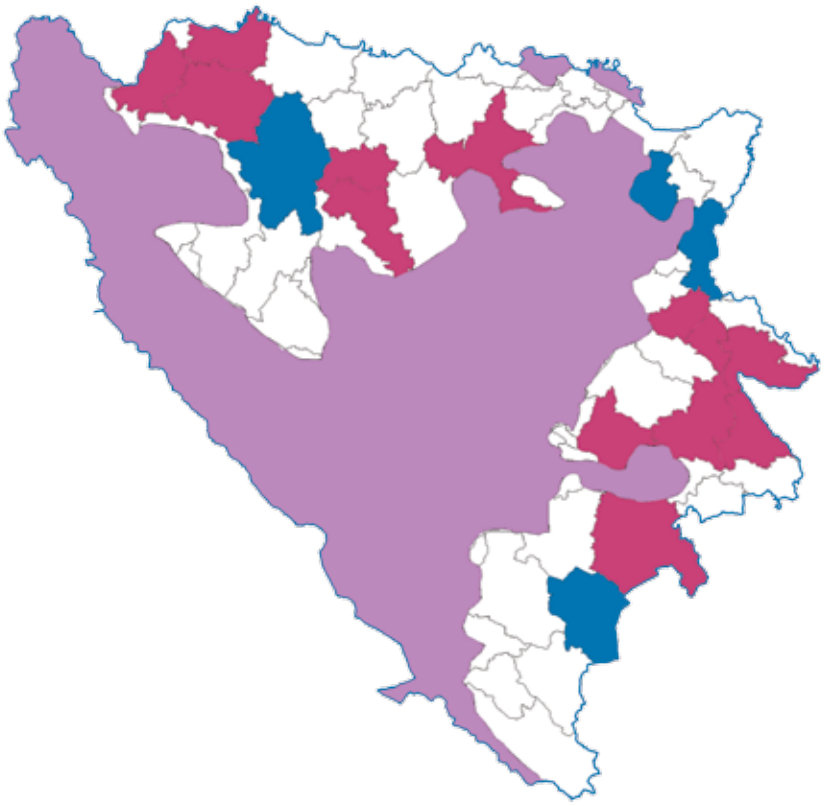


Figure 133:
Landslides map for RS
(Source: Geologic Survey of the RS, Zvornik, 2010)

Figure 133 shows landslides in the RS. The blue color indicates municipalities with the most active landslides, and areas in pink show municipalities with the greatest number of registered landslides.

The landslide registration and mapping process is still ongoing, which presents a problem, since the monitoring system cannot be installed until the entire area has been mapped.

According to currently available data there are approximately 1800 active landslides in BiH (Figure 134).

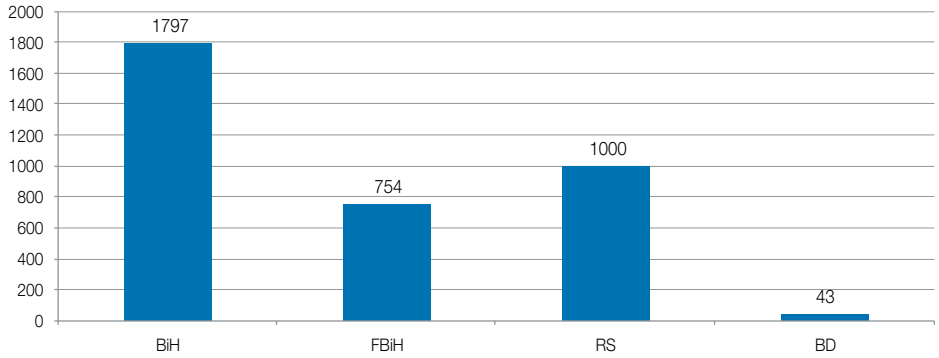


Figure 134: Number of active landslides in BiH (Source: Natural or Other Disasters Risk Assessments for BiH, 2011)

During the development of the Natural or Other Disasters Risk Assessment for BiH, the basic criteria for landslides vulnerability assessment was an estimate of already existing landslides, i.e., an analysis of consequences that the event in question had on people, property, infrastructure and the environment. In this way hazards were indentified and a list of representative landslides in BiH was created:

- Landslide Suljakovići - Maglaj
- Landslide Mala Broda - Zenica
- Landslide Bogatići Trnovo
- Landslide Čemerno - Gacko
- Landslide Lopare
- Landslide Zvornik
- Landslide Banja

Some examples of landslides and damage caused are shown below:

Figure 135: Landslide in Suljakovići (2010.) near Maglaj, that caused a total infrastructural destruction and environmental damage

Figure 135 shows the landslide near Maglaj (area of 70.000 m^2) which caused total environmental damage. The landslide was triggered by a long period of heavy rains.

Figure 136: Massive landslide in Bogatići (2010) which destroyed a hydropower plant and part of the forest

Figure 136 shows the landslide of 250,000 m^2 in Bogatići that caused enormous damage to the environment and buildings. The flow of the Željeznica River was changed, the hydropower plant completely destroyed, as well as some other buildings. In addition, a vast area of forest was also destroyed, which had a negative impact on animals that left their habitat. Although this issue was localized in 2010, nothing has been done to recover the area and prevent future damages.

Besides the direct impact of landslides on the environment and society, they also affect utility lines (gas, electricity, oil pipes, drainage pipes, sewage and water supply), and thus impact the environment directly. Asbestos from old buildings, smoke and particles can have an adverse impact on air quality. Hazardous materials and debris can contaminate water resources and surrounding landscapes.

Depending on climate conditions, BiH has more than 1000 landslides annually, some of them are old landslides that have reactivated, and some are new. These numbers have increased significantly in the last 20 years and it is should be emphasized that landslides represent one of the priority environmental issues in BiH. In 2010, 30 landslides appeared in Banja Luka, 41 in Lopare, 50 in Zvornik. Sarajevo Canton alone has 763 registered landslides, which is an enormous threat to human life and the environment. Geological properties of these areas are naturally suitable for landslides, and even the slightest human activity can cause great damages. Landslides can jeopardize lives, buildings and the environment, and landslide formation risk can be decreased through prevention, recovery and stabilization.

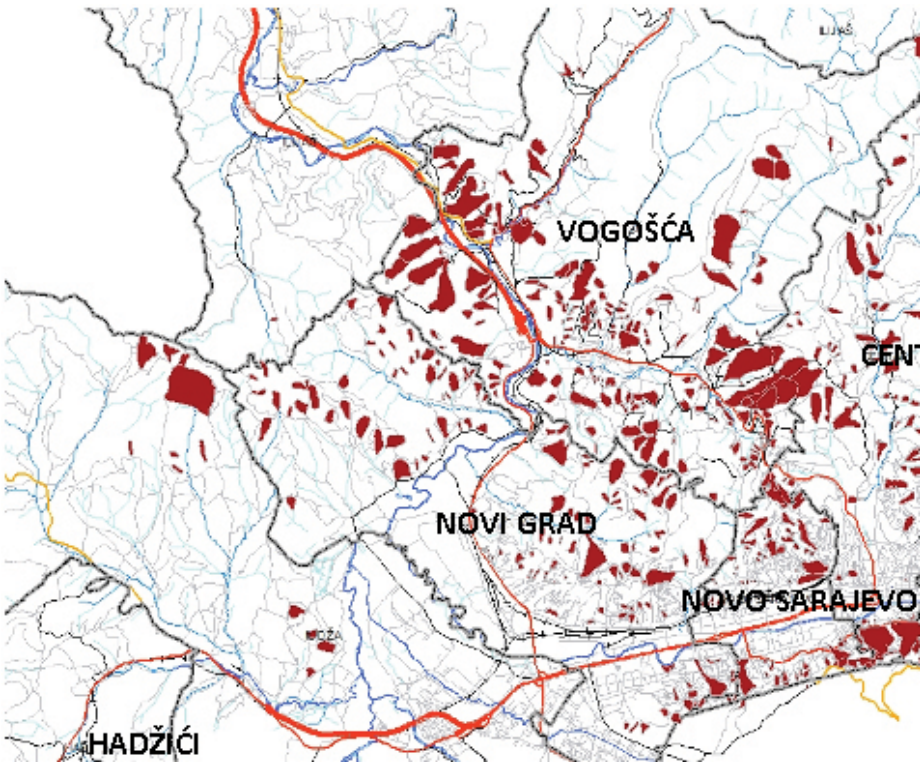


Figure 137: Landslides in Sarajevo Canton (marked in red) in database of ESRI ArcGIS 9.3. (Source: Institute for Construction of Sarajevo Canton, 2009)

Figure 137 shows the state of landslides in the Sarajevo Canton. Since there is no landslide map for the entire territory of BiH, it is necessary to develop detailed maps for the entire country. In this way certain areas would be defined as priority, and preconditions for recovery strategy development would be created.

4.3 POST-CONFLICT ISSUES

Environmental problems in post-conflict areas are, unfortunately, regarded as problems of secondary importance. The conflict has a contradictory impact on the environment in the region: while it caused great damages and left a corresponding legacy, it also allowed a brief respite from the harm that was being inflicted by a rapidly deregulated, in many respects deteriorating, industrial infrastructure which had little merit in terms of environmental impact assessment (Stoett, 2005). Ironically, a serious problem with hazardous waste emerged as a result of relief efforts during the conflict, since "at least 50,000 tons of expired pharmaceuticals left over from wartime donations are a particular waste problem" (Stoett, 2005). Munitions have littered many battlefields, but what is alarming is the presence of depleted uranium. This became a concern in BiH, since depleted uranium was used in the shelling at around 11 locations between 1994 and 1995. Uranium contamination is especially present at three sites: the Hadžići tank repair facility, the Hadžići ammunition storage area, and the Han Pijesak barracks. An extensive UNEP survey found the first-ever recorded instance of depleted uranium contamination of groundwater. However, the findings of the UNEP Balkans Task Force suggest that contamination is minimal, though precaution and greater public awareness are both strongly encouraged (UN Environmental Program, 2003).

The Hadžići tank repair facility was, according to the UNEP recommendations, decontaminated which decreased radioactivity on the endangered areas, while a significant amount of radioactive munitions and its parts were left deep in the soil. For this reason, the Institute for Public Health of FBiH implemented a three-year project entitled "Monitoring of Environmental Radioactivity in the Hadžići Area" with a special focus on depleted uranium (in the period 2007-2009). In this period the soil, water (surface water, potable water and technical water), grass, fruit and vegetables were sampled, and none of the samples showed the presence of depleted uranium. The mentioned project was replaced by a research project "Application of GIS tools to previously determined uranium isotopes in groundwaters and surface waters of the Hadžići region" which lasted from 2010 to 2011, and was implemented by the Institute for Public Health of FBiH as part of the scientific and technical cooperation with Institute "Jožef Stefan" from Slovenia (Natural or Other Disasters Risk Assessments in BiH, 2011).

One might argue that the real threat to environmental security comes not from war damage, but from the lack of regulatory laws and procedures in the post-war period. If one word could be used to describe BiH's current environmental predicament, that word would have to be "waste". This term applies to numerous aspects. Valuable agricultural land is being unused due to mine infestation. There is a crisis regarding solid and hazardous waste disposal, and this affects both human health and health of ecosystems, and usurps valuable policy development time. Many current issues are caused by infrastructure war damages, but even in the post-war period investments into infrastructure rehabilitation and maintenance were insufficient, and wasteful practices are a part of the issue (e.g. it is estimated that due to aged water supply system the loss amounts to astounding 70% of the total potable water). The situation is similar with air pollution, since standards remain unachievable in many urban areas, such as Kakanj, where the coal thermal plant is situated.

During the conflict in BiH, around 6,000 ha of land were destroyed in direct combat. Apart from this, BiH territory is covered with 15,000-20,000 landmines and more than 1 million of other explosive devices covering the area of 420,000 ha or 8% of total BiH territory. It is estimated that landmines are currently covering 1443 km^2, which is 2.8% of total BiH territory (Figure 138).

Figure 138: Landmine situation in BiH (Source: BHMAC, 2012.)

4.4 TRANSBOUNDARY ISSUES AND THEIR ENVIRONMENTAL IMPACT

BiH, like neighboring countries, is a signatory of the ESPO Convention. The obligation of ESPO Convention signatories is to develop an Environmental Impact Assessment for all projects that may cause transboundary environmental issues. Major activities or planned projects, in the recent period that have or could have a negative transboundary impact on the environment are given as follows:

„Rafinerija nafte“ a.d. Brod (Oil Refinery Brod) (former oil refinery “Bosanski Brod”) is situated in Brod, on the borderline with the Republic of Croatia. There is no environmental management system established in the refinery yet. According to the environmental legislation in BiH, the refinery is obliged to inform the competent ministry on environmental emissions, including emissions into air and water. However, in the previous period the refinery has not been operating continuously, and monitoring was not carried out regularly (Energy Sector Study in BiH, Module 13- Environment, 2008). For some time the refinery has been an issue and a subject of discussions between relevant representatives of BiH and the Republic of Croatia, aimed at preventing negative impacts of the Brod refinery on air quality in Slavonski Brod (Republic of Croatia).

Establishment of Waste Management Center (WMC) in Dubrovnik-Neretva County in the Republic of Croatia is planned at the location of Lučino Razdolje in proximity to the border with BiH. Construction of the main infrastructure component, the landfill, could endanger the Vjetrenica cave (in Popovo Polje Valley), that was nominated by BiH for addition to the UNESCO's World Heritage List. The planned location of the landfill site is east of the village (IPZ Uniprojekt, 2010), i.e. three kilometers of aerial distance from the border of Popovo Polje Valley and at approximately 150 m of altitude above Popovo Polje Valley. Due to extreme land permeability and abundant groundwaters that span from Popovo Polje Valley to the coastal zone just below the envisaged landfill location, there is a danger of negative impact to Popovo Polje valley ecosystem and its highly endangered and rich underground fauna.

Being the co-owner of nuclear plant "Krško", the Republic of Croatia has, in accordance with the agreement signed with the Republic of Slovenia in 2001, taken the responsibility to dispose of its nuclear waste share (50%), The Republic of Croatia still needs to determine whether to dispose of the nuclear waste at its own disposal site, at the Slovenian disposal site which is 13 km away, but very expensive, or to export the nuclear waste to third countries, which is always an issue. In case of the first option, the potential site for nuclear waste disposal from nuclear power plant "Krško" is Trgovska Gora, located only 10 km from the BiH border.

The Republic of Croatia has requested a loan from the European Bank for Reconstruction and Development for the construction of the first underground hydropower plant" Ombla". According to the project, the planned location is the river Ombla, two kilometers from Dubrovnik and on the border with BiH. Although an Environmental Impact Assessment was developed for the project, Croatian ecologists and hydrologists found numerous shortcomings. According to their estimates, the project might jeopardize the karst system and the abundant wildlife in that area, primarily the bat colonies in Vilina Cave, which is situated in the mountains above the River Ombla. On the other hand, the mouth of the River Ombla is only partly on Republic of Croatia's territory; its major part is in BiH. The authorities in BiH are not informed on project details, and due to possible negative environmental impact on BiH territory, additional research should be carried out. BiH ecologists emphasized the fact that the aquifer that will be converted into an underground reservoir is on BiH territory, so all the negative environmental impacts will be in BiH.

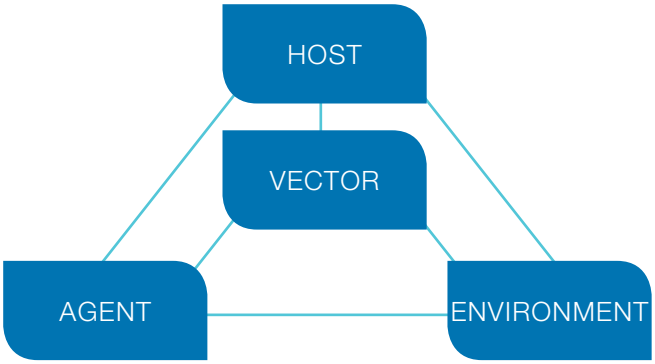
Project „Gornji horizonti" ("Upper Horizons") in eastern Herzegovina (RS) plans to divert waters from Gacko, Nevesinje, Dabar and Fatnik valleys through Bileća Lake and from hydropower plant "Trebišnjica" accumulation, towards hydropower plant "Dubrovnik" and along Popovo Polje Valley to underground hydropower plant Čapljina (Study of Vulnerability of Herzegovina-Neretva County/Canton, 2009.). Croatian and BiH ecologists warn that tremendous amounts of water that run through underground karst canals of smaller rivers flow naturally into the Neretva River would be diverted into the Trebišnjica Basin. In this manner, the Neretva River would lose a significant amount of its hydro potential. However, there are number of studies and expertise that analyzed the impact of water from the Upper Horizons from one basin to another. The studies concluded that water diversion has no effect on small waters of Buna, Bunica and Bregava. The Environmental Impact Study of the construction of hydropower plant Dabar passed the public hearing and it proved that the effect of water diversion from Nevesinjsko Polje Valley, which naturally drains towards Buna and Bunica, in Bileća accumulation and further to the accumulation of HPP Dubrovnik and underground HPP Čapljina, is insignificant, because it reduces the negative effects of high waters (floods) and overcomes the problems of low waters (drought), considering that low waters can be treated by accumulated water in reservoir Posćenje. However, this project is still a subject of debate of various stakeholders in BiH and Croatia.

4.5 IMPACTS ON HUMAN HEALTH

Disease is the result of interaction of three basic factors: host (person), agent (bacteria, virus, fungi, but also allergens, and under some circumstances food –high diet food, chemical agents - toxins, dust, physical agents - heat, radiation, cold and social and psycho-social stressors to some extent) and the environment. The latter influences the probability and circumstances of the host-agent contact in many ways. Many epidemiologists throughout the world also add vectors as the fourth factor and a link in many diseases.

The three aforementioned factors which describe the natural course of disease are known as epidemiological triad, as shown in Figure 139.

Figure 139: Epidemiological triad of disease – natural disease origin



Good knowledge of the natural course of disease is essential to determine preventive methods. While many infectious diseases are caused by human-to-human transmission, there are many other causes such as microorganisms living in the environment. Scientists from various fields, including medicine, must work together to address the challenges imposed by these environmental pathogens. Environmental pathogens are microorganisms that spend a significant part of their life cycle outside the host, but when transmitted to humans cause disease with measurable frequency. They can be transmitted by water, soil, air, food and other parts of the environment, and they can affect almost any individual on the planet. Environmental pathogens include Legionella pneumophila (a causative agent of Legionnaires 'disease, often found in air conditioning systems), West Nile virus (lat. Encephalitis Nili occidentalis) and Cryptosporidium parvum (parasite from food, potable water, and recreational water).

4.5.1 LINK BETWEEN HUMAN HEALTH AND THE ENVIRONMENT

In 2006, the World Health Organization (WHO) stated in their report "Preventing Disease through Healthy Environments" that as much as 24% of global diseases are caused by environmental exposures that can be averted. The Report stated that well targeted interventions could prevent risks coming from the environment. Further on, the Report estimates that more than 33% of diseases in children under the age of 5 are caused by influences from the environment. If environmental risk factors could be forestalled, the lives of 4 million children, mainly from developing countries, would be saved. The report estimates that more than 13 million deaths annually are caused by diseases that could have been prevented. Almost every third death and disease in the most undeveloped regions is caused by environmental influences. Over 40% of deaths caused by malaria and around 94% of deaths from diarrhea, two of the world's biggest childhood killers, could have been prevented through better environmental management.

WHO defines the environment as the sum of all physical, chemical and biological factors that are present in the outer surroundings, and all the related behaviors. This definition excludes behaviors not related to the environment, as well as behaviors related to the social and cultural sphere, and genetics.

Four main diseases that appear in poor regions are diarrhea, lower respiratory infections, malaria and various forms of unintentional injuries. Measures that can be immediately taken

in order to ease the burden of disease caused by environmental factors are promotion of safe water storage in households and hygiene, the use of clean and safer fuels, safe construction, more reasonable use and management of toxic substances in households and at work, and better management of water resources.

Diseases caused by environmental factors which on an annual scale present the largest health burden in terms of death, illness and disability or disability adjusted life years (DALYs) are: diarrhea, lower respiratory infections, malaria, traffic injury, unintentional injuries not caused by traffic accidents, chronic obstructive lung disease, and conditions in perinatal period.

The majority of diseases caused by environmental factors are at the same time the biggest killers, although they rank somewhat differently in order of lethality. Illnesses that cause the largest absolute number of deaths annually due to modifiable environmental factors (these are all parts of the environment subject to changes due to the use of available technologies, policies, prevention measures, and prevention and public health measures) are: cardiovascular disease, diarrhea, lower respiratory infections, cancer, chronic obstructive lung disease, traffic injuries, and unintentional injuries.

The WHO Report (2006) shows that the environment, in one way or another significantly affects more than 80% of the mentioned diseases. Moreover, it looks to quantify only those environmental hazards that are modifiable - that is, those that are readily amenable to change through policies or technologies that already exist. The report also states how many diseases, linked to the environment, can be prevented.

Millions of deaths could be prevented every year by determined actions and setting priorities in order to bring measures to control these diseases. Cooperation with energy, transport, agricultural and industrial sectors is of key importance in improvement of basic environmental factors that cause poor health conditions.

Climate change is a very important factor that contributes to environmental changes which cause diseases. Extreme weather events are becoming more intense and probably more frequent as the world climate changes (Albritton et al, 2001, Houghton et al 2001, Epstein, 2002, Woodrof et al, 2002). One of the important aspects of that trend for epidemiologists is the impact on infectious diseases. There is an increasing number of studies (McMichael et al, 2001) that dwell on the weather conditions impact on infectious diseases. Since the mid 1970's, there has been occurrence, reoccurrence and redistribution of infectious diseases (WHO, 1996) throughout the world. Although the causes of infectious disease spreading are numerous (Rothman, 1976), global climate change may also significantly contribute to this. Weather change and climate may influence host defenses, vectors, pathogens and habitat. It is necessary to integrate information from many sources in order to research the climate impact. For instance, by mapping multiple datasets through geographic information system (GIS), researchers can observe occurring patterns, and then spatial and temporal links may lead to new hypotheses regarding causality.

Climate change may influence the change in distribution and characteristics of vector infectious diseases – diseases whose causative agent is being transmitted through vector: tick, mosquito, etc. Apart from this, extreme weather conditions can be linked to "clusters" of diseases transmitted through vectors, rodents and food (Martens et al, 1997). Flash floods leave behind mosquito breeding grounds, drive the rodents from their burrows, contaminate water flows with toxic chemicals, microorganisms (like E. coli, Cryptosporidium and Vibrio cholerae) and nutrients, which can cause red tides. Sequential extremes can be particularly destabilizing. The number of predators decreases in droughts, while heavy rains increase the food for their opportunist prey.

Other increasingly worrying issues related to health deterioration due to climate impact, which should be further investigated, are: the role of increased variability in mortality caused by heat and cold, synergies with air pollution, including CO_2 fertilization, common ragweed pollen and asthma, travel hazards associated with unstable winter weather conditions, genetic shifts of arthropods induced by warming.

4.5.2 INFECTIOUS DISEASE REPORTING SYSTEM IN BIH

The infectious disease reporting system is regulated through the public health systems in the FBiH, RS and BD and is carried out in accordance with the 10th revision of the International Classification of Diseases (ICD 10). For tuberculosis only the case definition has been strictly applied (WHO) since the 1990s, and a system of monitoring and reporting has been applied. As for other diseases, they are monitored in BiH and information is released in accordance with clinical signs and symptoms. For some diseases, laboratory confirmation is needed in addition to the clinical signs, but this is not the case for all listed diseases.

Reporting for about 80 infectious diseases is mandatory – the numbers differ in entities because legislation at BiH level does not exist for this field.

For the purpose of this Report, diseases were divided into the following categories:

- Water and food borne diseases
- Vector borne diseases
- Diseases caused by climate change
- Tuberculosis
- Diseases caused by radiation or any other environmental risk factor

Based on the available official data that were collected in accordance with WHO recommendations by the Institute for Public Health of FBiH and Public Health Institute of RS, and based on our categorization, we have arrived at the following conclusions.

4.5.3 WATER AND FOOD BORNE DISEASES

The WHO (2006) states that 88% of all diarrhea cases in the world are caused by water, sanitation and hygiene. Determined risk factors are “potable water, sanitation and hygiene”, as well as aspects of food safety related to water, sanitation and hygiene (i.e. food contamination by unsafe potable water or insufficient household hygiene). In a limited number of cases the disease was transmitted by other routes not related to water, sanitation, hygiene or food (e.g. transmission by air), so around 94% of all diarrhea cases in the world are related to the environment, resulting in more than 1.5 million of deaths every year, mainly children. The estimate for developed countries (90%) is somewhat lower due to the lower number of infectious diarrhea cases, although non-infectious diarrhea formed a relatively high portion of total diarrhea cases. Water, sanitation and hygiene are very important factors impacting malnutrition (mentioned in the Report under “Malnutrition”). Cases of diarrhea, which can be assigned to water and sanitation, cause 5.3% of deaths and 3.5% of DALYs in European children under the age of 14.

Key climate variables, especially precipitation and temperature, affect diseases transmitted by potable water, food, and issues with coastal waters quality (there are no available data for this category of disease, although BiH has several kilometers of coast).

Supplying population with potable water is one of the main prerequisites for a high health level of any population. The World Health Organization included potable water quality monitoring among 12 important health indicators for countries, thus emphasizing its significance for population health. Due to this reason, WHO experts continuously work on standards and recommendations improvement for the purpose of solving issues. One of the priorities of every public health system is the prevention of gastroenteric diseases transmitted by water, which can be linked to an uninterrupted supply of potable water. Monitoring indicators recommended by WHO are: water borne diseases, potable water supply and potable water sources availability, and treatment of sewage waters.

Data on water supply in BiH are shown in the UNICEF-Multiple Indicator Cluster Survey from 2013 which was conducted as part of the project “Survey of the Social and Health Status of Children and Women in BiH “. Results concerning potable water availability are as follows:

- Almost entire population in BiH (99.6% in the FBiH, 99.5% in the RS and 99.4% in the BD) use improved potable water sources , with nearly equal percentages in urban and rural areas;
- According to the results, very few household members (5 %) use adequate methods for water treatment at home (boiling, chlorine addition, use of filters or solar disinfection)
- 94% of households in BiH, that is, 94.2% households in the FBiH, 96.5% in the RS and 46.1% in the BD, have potable water source on the premises . Water source on the premises is available in 94.7% of urban households and in 93.8% of rural households;

According to the same survey, majority of households has toilets, 99.7% in urban and 98.1% in rural areas. Around 99.0% of the FBiH population, 97.9% of the RS population and 100% of the BD population live in households with improved sanitary facilities. The difference between urban and rural areas is mainly related to the type of toilet. In urban areas of BiH, the most commonly used type is the toilet connected to sewage system (83.3%), and a septic tank in rural areas (58%).

Data on potable water safety in the FBiH is available at the Public Health Institute of FBiH and cantonal institutes for public health, in the RS at the Institute for Public Health of the RS, and in the BD at the Department for Health and Other Services of the BD Government. Apart from the public health institutes, data on water quality is available at the Food Safety Agency of BiH. Table 45presents data on potable water laboratory analysis results in the period of 2009-2011, submitted by relevant food control laboratories in BiH.

Table 45:
Results of laboratory analysis of potable water in BiH in the period 2009-2011
(Source: Food Safety Agency of BiH, 2012)

Type of analysis	2009.		2010.		2011.	
	Number of analyses	Number and % of satisfactory samples	Number of analyses	Number and % of unsatisfactory samples	Number of analyses	Number and % of unsatisfactory samples
Physical and chemical analysis	14.666	2.056 (14,02%)	12.997	2.318 (17,83%)	14.283	1.363 (9,54%)
Microbiological analysis	18.306	2.245 (12,26%)	22.324	2.433 (10,90%)	18.981	1.482 (7,81%)

The Food Safety Agency of BiH collects and analyzes the data on diseases caused/borne by food, based on the data regularly submitted by relevant public health institutions. Figure 140 shows data on diseases in BiH that were caused/borne by food, for the period 2009-2011.

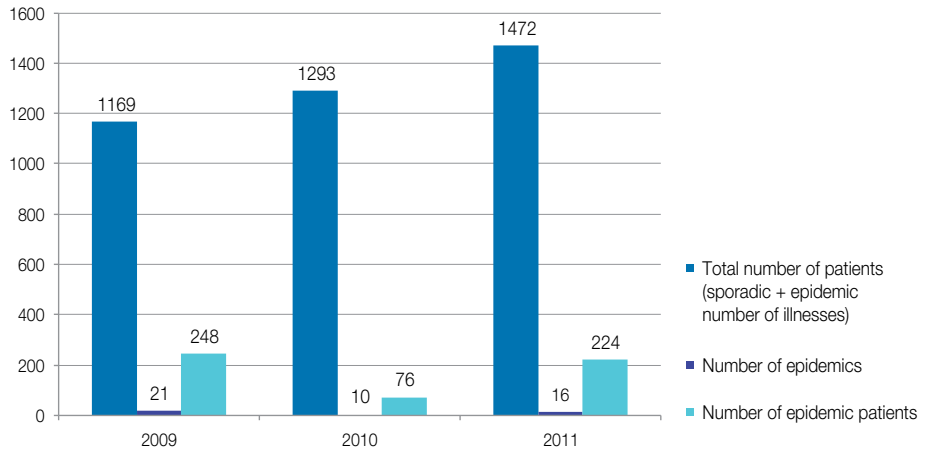


Figure 140:
*Epidemiological data on diseases caused/borne by food**
*(Source: Food Safety Agency of BiH, 2012 - *data related to diseases where food was confirmed as the source/route of transmission)*

The water-food link is obvious, as microbial agents from water (e.g. viruses, bacteria, protozoa) may contaminate food. There have been instances of fresh fruit and vegetables contamination by irrigation water.

Institutions within the health sectors of the FBiH, the RS and the BD do not analyze relations between water and food borne diseases and environmental risks and climate change.

Out of the typical water and food borne diseases which are related to the environment and climate, cholera is the most fatal one, but there have been no occurrences in BiH for almost a century. Giardiasis occurs sporadically – in the period 2006-2010 there were only 11 cases (2006 - 6; 2007 - 3; 2009 – 2; 2010 - 0). Within the health system of BiH, water and food borne diseases that cause various kinds of diarrhea such as cryptosporidiosis and the ones caused by cyclosporiasis (also not reported in the EU) are not diagnosed and reported, while schistosomiasis and trypanosomiasis are not present in the country.

There is no routine diagnostics for enteric viruses, so the majority of enteric diseases etiologically undetermined are classified in the reporting system according to ICD 10 as: other bacterial enteric infections (Infectiones intestinales bacteria aliae - A04), alimentary intoxications (Intoxicationes alimentaris bacteriae aliae - A05) and diarrhea and gastroenteritis whose infectious origin is assumed (Diarrhoea and gastroenterocolitis causa infectionis suspecta - A09). Figure 141 shows the total number of cases of all three diseases in the period 2006-2010, with distribution of cases by diagnosis for each year of reporting. Numbers of reported cases vary from year to year, but are in the range between 4,853 and 9,432.

Figure 141: Different types of diarrhea by year and by disease (Source: Data from bulletins of the Institute for Public Health of FBiH and Public Health Institute of RS, taken from EUFOR Communicable Diseases Bulletin)

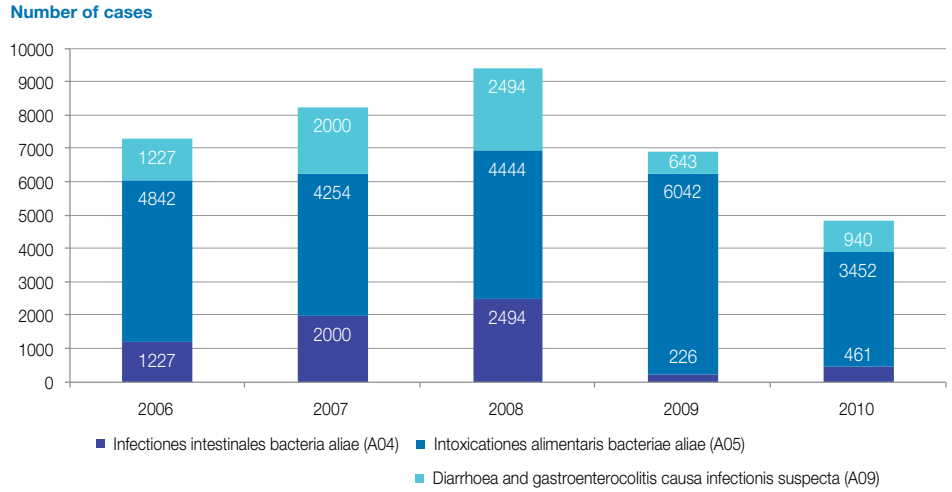
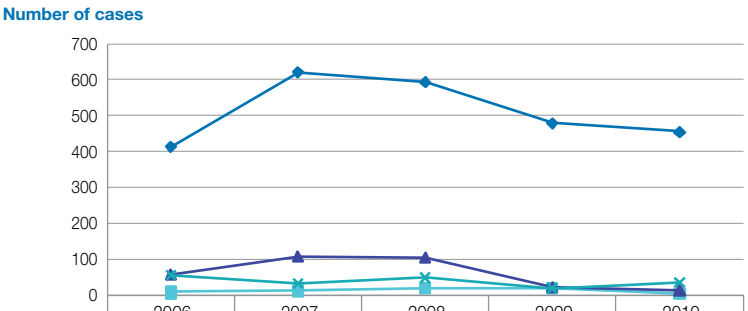


Figure 142 shows the number of reported cases of salmonelosis, dysentery, hepatitis A and leptospirosis: environment and climate change risk factors can affect all these diseases, due to their way of transmission – faecal-oral. There were no significant changes in the analyzed period.

Figure 142: Number of cases of Salmonella, Shigella, Hepatitis A and Leptospiroses in BiH by disease and by year from 2006 – 2010 (Source: Data from bulletins of Institute for Public Health of FBiH and Public Health Institute of RS, taken from EUFOR Communicable Diseases Bulletin)



	2006	2007	2008	2009	2010
Salmonelloses aliae (A02)	414	621	593	479	454
Shigelloses (A03)	9	12	20	19	5
Hepatitis A (B15)	56	108	104	21	14
Leptospiroses (A27)	56	32	48	19	34

4.5.4 VECTOR BORNE DISEASES

From the biological aspect, it is justifiable to expect that climate change might have a key role in determining factors which contribute to the spread of vector borne diseases.

The two most important vector borne diseases are malaria and dengue fever. Luckily, none of them are present in BiH. It is considered that malaria was eradicated in BiH by the end of the 1970s, since the last autochthonic case was reported in 1964, while in 1968 the reoccurrence of the disease was reported. However, having environmental conditions in mind, especially climate change, there is a probability of malaria reoccurrence. A dengue fever case has never been reported in BiH because its vector is not present in BiH, i.e., it cannot survive in present climate conditions, but similar to malaria, it could occur in case of significant climate change.

However, in the last decades there have been several cases of both diseases, the carriers of which were foreigners temporarily residing in BiH.

Cases of other vector borne diseases like tick-borne meningoencephalitis, yellow fever, chikungunya fever, Rift valley fever, Ross river fever, Murray valley encephalitis and St. Louis encephalitis have not been reported in BiH. This may be due to the geographic position of the country or undiagnosed cases, as physicians are not familiar with these diseases and laboratories do not test samples against them.

Lyme borreliosis is worth mentioning, because the number of reported cases has been increasing in recent years, as shown in Figure 143. This disease cannot be prevented by vaccination, but the treatment of the disease is highly efficient. Prevetion of this disease can be done through awareness raising and quick diagnostic and treatment measures.

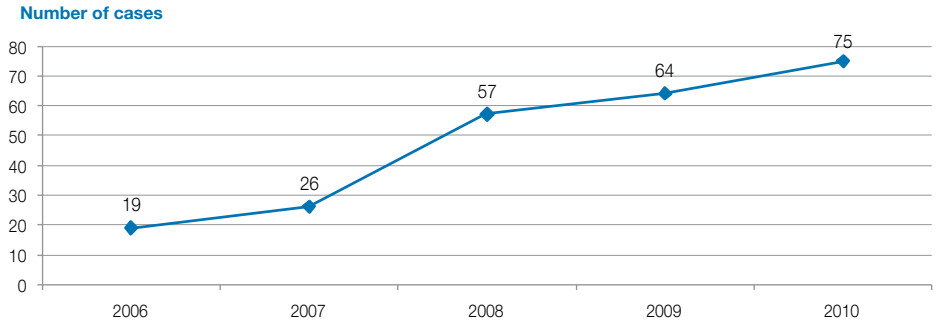
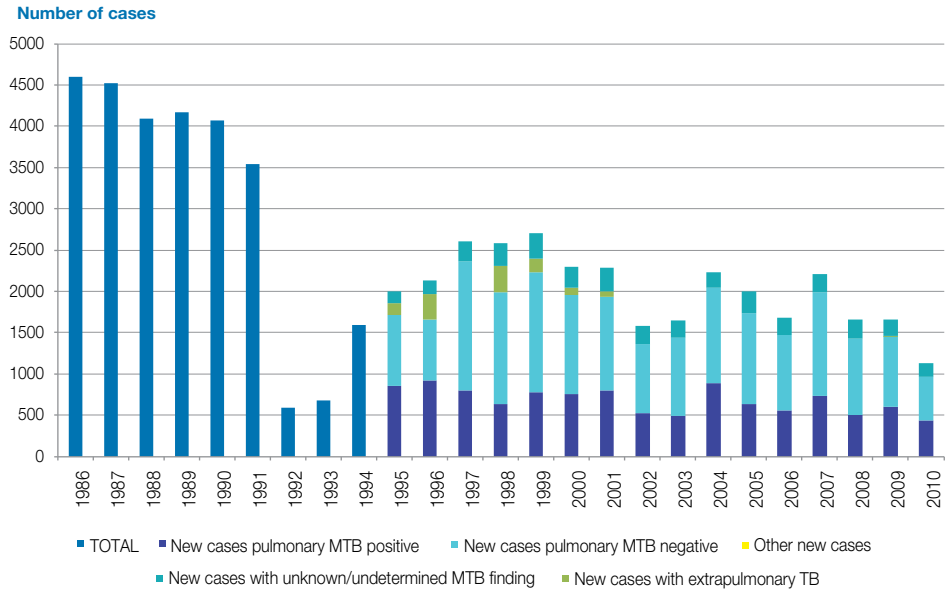


Figure 143: Number of cases of Lyme borreliosis in BiH from 2006 to 2010 (Source: Data from bulletins of Institute for Public Health of FBiH and Public Health Institute of RS, taken from EUFOR Communicable Diseases Bulletin)

4.5.5 TUBERCULOSIS

A disease that is being monitored in BiH according to WHO standards is tuberculosis. WHO provided case definition in 1995. Due to this detailed data for tuberculosis, it can be presented and analyzed over a longer period than any other infectious disease. Until 1991 there were 4,000 new cases every year in BiH. The number of cases significantly dropped in the period 1992-1996, as the result of underreporting during the war years 1992-1995. The same applies to other diseases, not exclusively to tuberculosis. Since 1995, reporting of new cases has been based on WHO standards and it took several years to establish this system. Although the total number of new cases after 2002 is around 2000, it is important to note that the number of MTB positive findings is continually decreasing. Besides, there are no unknown/undetermined cases. A high number of cases can be explained by the economic status of the population rather than by environmental factors.

Figure 144: Number of tuberculosis cases by year and by smear-positive status in BiH from 1985 – 2010 (Source: WHO, BiH Country data, 2012)



4.5.6 RESPIRATORY DISEASES CAUSED BY POLLUTED AIR

Although air pollution has been monitored for many years, correlation between any assumed increase in the number of affected people and increased pollution (increase in SO2, NO2 and smoke in the air, particularly in the three most polluted cities in BiH – Sarajevo, Tuzla and Zenica) was not calculated. The main reason is unreliable statistical data on the number of affected persons and on population at risk. Standard diagnostic classification of diseases that are being monitored is carried out in all three administrative units in BiH in line with the regulations on combating infectious diseases (common regulations at BiH level are missing), which means that all other diseases and conditions are monitored in public health reports. The network of public health data collection systems is not functional enough, so relevant data collecting is often difficult or data are not available for analysis to administrative units in the country. Only estimates can be given instead.

Because of that, air pollutants as causative agents cannot be linked with respiratory diseases, although many factors indicate that the number of such cases is high.

4.5.7 DISEASES CAUSED BY RADIATION OR ANY OTHER ENVIRONMENTAL RISK FACTOR

Unfortunately, the health system does not recognize the diseases and conditions which belong to this group. A register of malignant diseases exist only partially in the RS, while the FBiH has only just started establishing it. However, even if the register existed, proving the change in frequency compared to the pre-war period would be very complicated because of three main facts:

- International Classification of Disease was changed at the beginning of 1990s (ICD 10 replaced ICD 9), and 10th revision has been in use in BiH since 1995;
- Significant processes of migration occurred in BiH – immigration, internal displacement and emigration significantly changed all demographic categories;
- The last census in BiH was carried out in 1991, and there has not been one since.

4.5.8 CONCLUSIONS AND RECOMMENDATIONS

The FBiH, the RS and the BD laws on health protection identify the need for monitoring of the hygienic epidemiological situation in living and work surroundings as one of the tasks of public health institutions, as well as analisys of environmental impacts on health, dealing with health risk factors, environmental risks and activities for environmental protection and conservation. These provisions are not sufficiently harmonized with regulations and financial instruments, and disease registers for certain type of diseases are incomplete or nonexistent. Nevertheless, there are some types of diseases that are being monitored according to WHO standards (e.g. tuberculosis).

After considering all facts, i the identified need is to monitor environmental pathogens more efficiently in order to acquire a better understanding of pathogens occurrence and survival in areas considered risky in terms of disease occurrence due to environmental impact. In order to monitor diseases linked to the environment more efficiently, it is necessary to strengthen the public health network and health ecology, and work on establishing an information systems that will provide fast exchange of information and data on food health safety, potable water and general use items. Health systems of the FBiH, the RS and the BD need to be connected to the environmental information systems in order to better manage and analise both human health and environmental factors. Besides, multidisciplinary research must be encouraged in order to have better predictions on how the environment can impact the frequency of diseases caused by environmental impacts.

5 POLICY RESPONSES

5.1 ENVIRONMENTAL INSTITUTIONS, STATE ENVIRONMENTAL POLICY AND ENVIRONMENTAL MONITORING

5.2 ENVIRONMENTAL EDUCATION, ENVIRONMENTAL AWARENESS RAISING AND PUBLIC PARTICIPATION

Components of social, economic and environmental systems are interconnected by cause and effect relations, so the environment, being the media that reflects the consequences of all human activities, should be observed in a broader social context. The state of the environment and efficiency of applied environment protection measures can be analyzed only in the context of the entire political, economic and social situation in the country. Policy responses, created with the aim of reducing the negative impacts of human activities on the environment, are related to environmental management, environmental policies, monitoring, environmental education, environmental awareness raising and public participation in BiH. The synergy of all these instruments reflects the reactions of society with the aim to ensure a balanced development of the whole society.

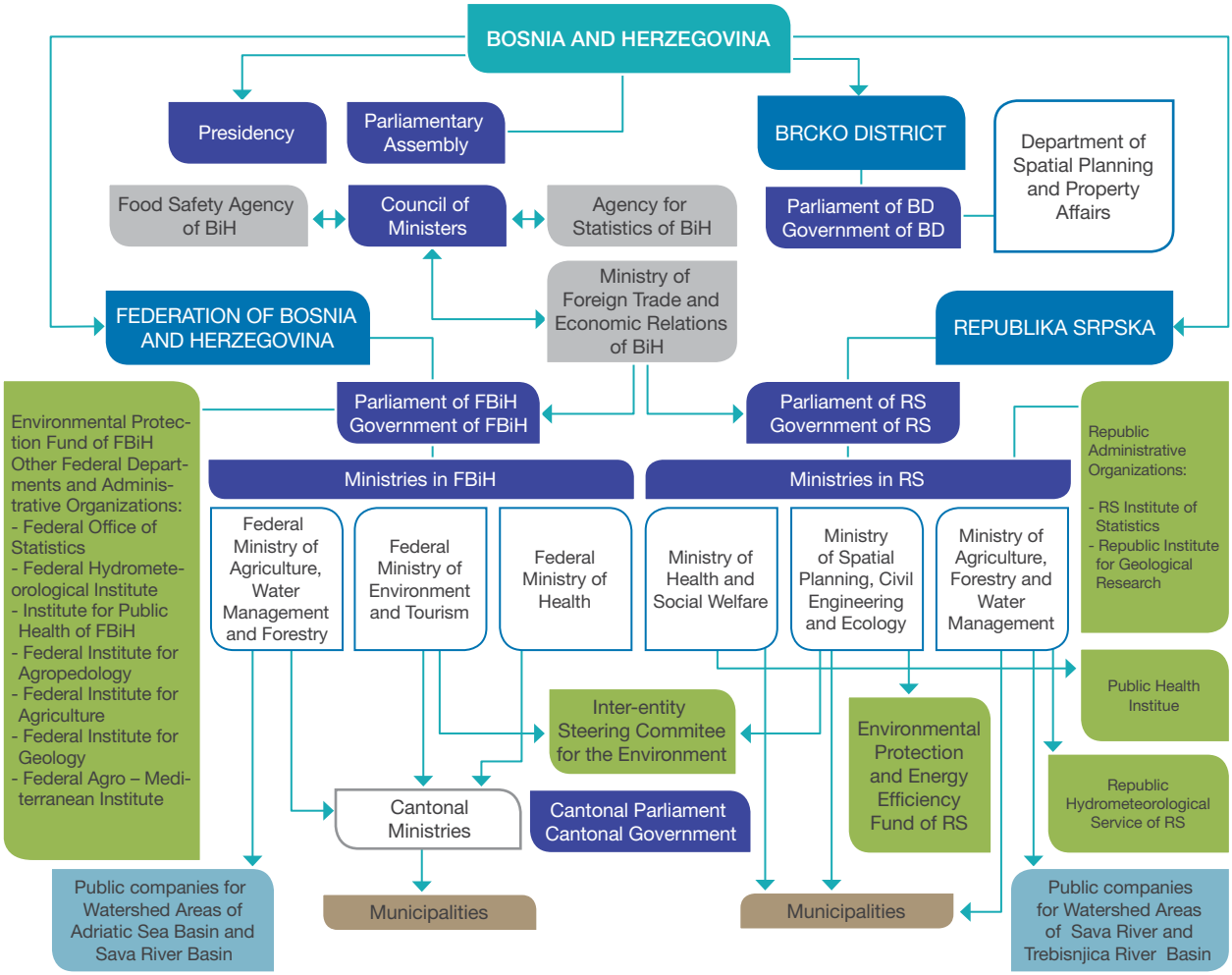
5.1 ENVIRONMENTAL INSTITUTIONS, STATE ENVIRONMENTAL POLICY AND ENVIRONMENTAL MONITORING

Reform efforts of the BiH environment sector have been spurred by the prospect of European Union (EU) membership and the adoption and transposition of the EU acquis communautaire. In this regard, adoption of the entire EU environmental acquiscommunautaire requires extensive changes to the existing environmental governance, policy, monitoring and activities.

5.1.1 INSTITUTIONAL STRUCTURE

Environmental governance in BiH has a fragmented series of environmental institutions at the four administrative levels: state, entity, cantonal and municipal (Figure 145).

Figure 145: Institutional structure in the field of environmental protection in BiH



Each of the said institutions has certain responsibilities at the state or entity level in the area of environmental protection (Table 46 to Table 49).

Table 46: Responsibilities of institutions in the field of environmental protection at the state level

Institution/sector/department	Responsibilities
Ministry of Foreign Trade and Economic Relations of BiH (Sector on natural resources, energy and environment protection)	Definition of policies, basic principles, coordination of activities and harmonization of plans of entities' bodies, government and institutions in accordance with international obligations in the areas of agriculture, energetics, environmental protection, development and use of natural resources and tourism[47]
Agency for Statistics of BiH (Federal Institute for Statistics and Institute for Statistics RS)	Development of statistical research, maintenance of statistical IT system, information exchange with other countries and international organizations related to bilateral contracts and other international agreements
Food Safety Agency of BiH	Provision of scientific advices, scientific and technical assistance to the BiH legal system and politics in the field of food safety and animal food safety, data collection and analysis, focal point for activities in Codex Alimentarius Commission and systems for rapid alert for food and food for animals (RASFF, INFOSAN), research, comparison, analysis and summary of scientific and technical data in the field of food safety
Inter-Entity Steering Committee for the Environment	Coordination and harmonization of Environmental Law and policies between the two entities, promoting the ratification of international conventions, implementation of EU projects

At the state level, there are constitutional provisions that define environmental aspects, Article IV a), and in the FBiH, the RS and the BD this field is constitutionally organized in the following way:

- According to the Constitution of FBiH [44], Chapter III, Article 2, para. c), the environmental protection policy is in the joint responsibility of the FBiH and cantons. In the Constitution of FBiH, there is no explicit provision which defines the responsibility for sustainable development, however, items d) and i) of Chapter III, Article I are relevant to this responsibility and therein it is specified the FBiH is exclusively responsible for defining the economic and energy policy;
- The Constitution of RS [45] defines that the RS organizes and provides environmental protection (Amendment XXXII, item 13), in other words, a system of protection and improvement of environment (Amendment 32 paragraph 1. item 13 of Article 68), protects and encourages rational use of natural resources with an aim to protect and improve quality of life, protect and restore the environment (Article 64), while an individual has the right to a healthy environment and everyone, in accordance with the Law, is obligated, if possible, to protect and improve the environment (Article 35). It is defined in the the Constitution that laws regulate the protection, use and management of resources of public interest, as well as payment of fees for use of assets of public interest and urban land;
- Responsibility of the BD for environmental protection is defined in Article 8 of Constitution of BD of BiH [46].

43 Article 9 of the Law on Ministries and Other Bodies of BiH (Official Gazette BiH, Nos. 5/03, 42/03, 26/04, 42/04, 45/06, 88/07, 35/09, 59/09 and 103/09)

44 Official Gazette of FBiH, Nos. 1/94, 13/97, 16/02, 22/02, 52/02, 63/03, 9/04, 20/04, 33/04, 71/05, 72/05 i 88/08

45 Official Gazette of RS, Nos. 21/92 – revised text, 28/94, 8/96, 13/96, 15/96,16/96, 21/96, 21/02, 26/02, 30/02, 31/02, 69/02, 31/03, 98/03, 115/05 and 117/05

46 Official Gazette of BD of BiH, Nos. 17/08 and 39/09

Table 47: Responsibilities of institutions in the field of environmental protection in the FBiH

Institution/sector/ department	Responsibilities
Ministry of Environment and Tourism	Administrative and professional tasks related to air, water and soil protection, monitoring and environmental standards, drafting environmental strategy and policy, tourism development
Ministry of Spatial Planning	Spatial planning and land use
Ministry of Agriculture, Water Management and Forestry	Administrative, professional and other tasks in the field of agriculture, water management, forestry and veterinary medicine, management of the two basins (Adriatic and Sava River Basins)
Ministry of Health	Administrative, professional and other tasks related to the responsibilities of the FBiH in the field of health care
Advisory Board for the Environment	Scientific and professional assistance to the Ministry and the FBiH Government, revises and gives comments on strategic and planning documents, establishes better co-ordination between the entity and cantonal levels
Inspection Services Authority	Implementation of regulations and control in the field of environmental protection
Environmental Protection Fund of FBiH	Collection and distribution of funds for environmental protection on FBiH territory, encouraging and funding for preparation, implementation and development of programs, projects and similar activities in the areas of conservation, sustainable use, protection and improvement of the state of the environment and use of renewable energy sources

Table 48: Responsibilities of institutions in the field of environmental protection in the RS

Institution/sector/department	Responsibilities
Ministry for Spatial Planning, Construction and Ecology	Environmental protection issues (land, air and water), waste management (solid and hazardous waste), legal affairs and biodiversity
Ministry of Agriculture, Forestry and Water Resources	Administrative, professional and other tasks in the field of agriculture, water management, forestry and veterinary, management the two basins (Sava River Basin and water district of the Trebišnjica River)
Ministry of Trade and Tourism	Administrative and other tasks related to trade, tourism and catering industry
Ministry of Health and Social Welfare	Administrative and other professional tasks related to the to the field of health and social welfare
RS Authority for Inspection Activities	Supervision of administrative acts implementation
Environmental Protection and Energy Efficiency Fund of RS	Collection of funds, funding for preparation, implementation and development of programs, projects and similar activities in the areas of conservation, sustainable use, protection and improvement of environment, energy efficiency and use of renewable energy sources

Table 49: Responsibilities of institutions in the field of environmental protection in the BD

Institution/sector/department	Responsibilities
Department for Urban Planning and Property Affairs	Environmental protection
Department of Agriculture, Forestry and Water Management	Tasks related to water management (issuing water licenses, water discharge, and flood protection infrastructure)
Department for Health and Other Services	Professional, administrative and other duties in the field of health and social welfare
Inspectorate	Implementation of regulations and controls in the field of environmental protection

Other institutions and public companies responsible for the fields of air, water, agriculture, etc. are listed in section “Environmental monitoring”.

There is a lack of vertical (entity/cantonal/municipal) and horizontal (inter-entity/inter-ministry-inter-municipal) cooperation between all mentioned institutions. Besides, governments are often unable to manage international obligations and numerous environmental regulations (e.g. fulfilling obligations related to reporting, appointing national focal points (executive bodies) and carrying out monitoring duties). Complex public administration leads to poor identification of responsibilities, tasks doubling and inefficiency.

5.1.2 STATE ENVIRONMENTAL POLICY

At the state level, aims and priorities related to environmental monitoring, information management and environmental training are presented in the National Environmental Action Plan (NEAP BiH) adopted in 2003 for the period 2003-2008 by the governments and parliaments of the FBiH and the RS.

The Poverty Reduction Strategy Paper, adopted in 2004 by the Council of Ministers of BiH, foresaw special measures to strengthen air, water, soil and land, forests, waste and biodiversity monitoring.

In the Mid-Term Development Strategy (MTDS) for the period 2004-2007, environmental priorities were not adequately addressed, nor effectively implemented. For example, only 0.6% of Official Development Assistance (ODA - amount of 2.7 million Euro) was used for environmental protection (BiH Ministry of Finance and Treasury, Donor Mapping Report, 2009-2010).

In 2008, the European Council adopted the new European Partnership Agreement (EPA) between the EU and BiH (2008/211/EC, Council Decision of 18 February 2008), that calls for the adoption of a state Law on Environmental Protection, and establishment of a State Environmental Agency.

UN Team in BiH, together with the Council of Ministers of BiH, completed the United Nations Development Assistance Framework - UNDAF for the period 2010-2014, with the aim to provide assistance in the said period. The Framework states that it is necessary to: strengthen the legal framework, improve the capacity for sustainable resource management and participatory sustainable development planning at the local level, and implementation of mechanisms for local environmental action plans.

At the entity level, environmental policies are developed under the scope of entity laws, but not all laws have been implemented effectively or fully prepared.

5.1.2.1 Environmental legislation

As stated in the European Partnership Agreement, the state Law on Environmental Protection has not been finalized and adopted. This process, that impacts the financial assistance provided by foreign organizations for environmental protection, has been ongoing since 2006.

At the FBiH and the RS level, there are laws related to the environment (adopted in 2002 in the RS, and in 2003 in the FBiH) - Law on the Environmental Protection, Law on Air Protection, Law on Waste Management, Law on Nature Protection and the Law on the Environmental Fund. In addition, in 2004 similar laws were adopted in the BD, except for the Law on the Environmental Fund. Water management and protection is covered by the Law on Waters (Official Gazette of FBiH, No. 70/06, Official Gazette of RS, Nos. 50/06, 92/09) and Law on Water Protection in BD (Official Gazette of BD, Nos. 25/04, 1/05, 19/07). Annex I contains a list of mentioned laws at all levels of government, as well as a list of important environmental decrees which have been adopted in the last 10 years.

Altogether, there is a lack of subordinate legislation prescribed by certain laws. In the FBiH, out of 23 subordinate laws called for under the Law on the Environmental Protection Fund, only six have been adopted so far, despite the fact that the deadlines for their adoption have expired. In the RS, a large number of regulations and subordinate laws have been adopted in accordance with framework laws, but their implementation continues to be a challenge. Apart from this, existing legislation is not harmonized vertically (due to multiple gaps between laws at the entity and cantonal levels - between cantons and the FBiH), and horizontally - environmental legislation varies in the FBiH and the RS and not all relevant laws are adopted in the FBiH, the RS and the BD (UNECE, 2011).

Multilateral Environmental Agreements

BiH became a party to several international conventions and agreements. International conventions and agreements ratified by BiH in accordance with the state Law on the Procedures

for the Conclusion and Implementation of International Agreements (BiH Official Gazette No. 29/00) are listed in Annex I.

5.1.2.2 Path to EU integration

The EU and BiH signed the Stabilization and Association Agreement (SAA) on 16 June 2008, and it will enter into force after the ratification process has been completed.

The Interim Agreement (IA) between the European Union and BiH entered into force on 1 July 2008. The Agreement successfully created a free trade area, while the BiH market is gradually being opened facilitating the economic and social development. On 16 June, the parties signed the Stabilization and Association Agreement and the Interim Agreement in Luxembourg. Until the ratification process is completed, the regulations of the Stabilization and Association Agreement related to trade provisions will be applied through the Interim Agreement.

The Stabilization and Association Agreement creates a framework for cooperation between the EU and BiH, and it is also crucial for political, economic, trade and human rights reform in the country. “Policies and other measures are designed to bring about sustainable economic and social development of BiH; these policies should ensure that environmental considerations are also fully incorporated from the outset and that they are linked to the requirements of harmonious social development” (Article 86, section 2 of SAA).

In 2009, the Council of Ministers of BiH established eight working groups for EU integration of BiH and harmonization of domestic laws with the EU acquis communautaire. One is the Working Group for Transport, Environment, Energy and Regional Development. It has 25 members appointed by different institutions at the state and entity levels. The progress made towards accession to the EU is shown in Annex I.

Overall, the EU Commission issues a detailed progress monitoring report on the process of adoptation and implementation of environmental acquis communautaire in BiH every year. Currently, the monitoring process is part of the Regional Network for Association project. Results show that advancement to the EU requirements is sometimes slow but steady in both entities.

5.1.2.3 Environmental Protection Funds

At the international level, there are numerous environmental financial mechanisms that assist BiH in tackling its environmental issues and improving environmental protection.

The Community Assistance for Reconstruction, Development and Stabilization (CARDS) program provided support to strengthen environment related capacity, but also infrastructural development, institution building and transboundary cooperation for the period 2001-2006.

For the period 2007-2013, the Instrument for Pre-Accession Assistance (IPA) provided assistance to BiH to go through the process of accession to the EU (e.g. transition and institution-building, transboundary cooperation, economic, social and regional development). Current projects financed by IPA instruments which are related to environmental protection are listed in Annex I.

The Multi-Annual Indicative Planning Document (MIPD) for the period 2007-2009 is a strategic planning document that assisted BiH within the framework of the IPA, whose overall financial scope amounted to 226 million Euro. The following period, 2009-2011, included several results and indicators on the environment such that a national environmental strategy is adopted and implemented; co-financing instruments for environmental infrastructure are generated and advanced; tools for environmental protection are initiated; various investments for environmental infrastructure are undertaken and the sector for the environmental acquis communautaire is advanced and aligned.

The Multi-Annual Indicative Financial Framework (MIFF) for the period 2009-2011 amounted to 303.2 million Euro for BiH.

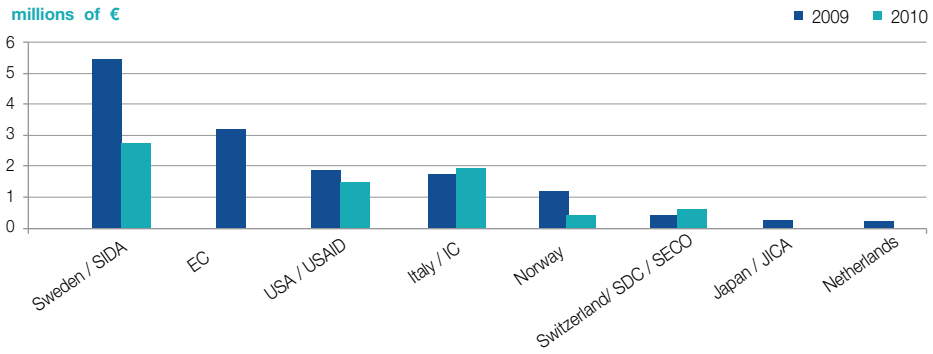
Foreign environmental Official Development Assistance (ODA) for BiH included diverse programs and activities during 2009-2010 for the agriculture and forestry sector and the environmental protection sector.

Agriculture and forestry sector

Assistance for the agriculture and forestry sector includes numerous projects ranging from the support of institutional development and improvement of efficiency and competitiveness of BiH agricultural producers to the application of new technologies and standards. Annex II contains the allocation of major projects, value of donors' assistance and project value for the sector.

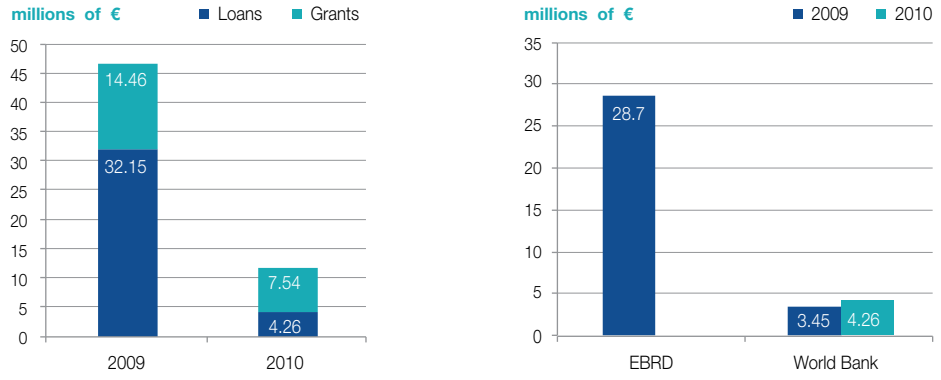
In 2009, active DFC (Donors Coordination Forum) members for the agriculture and forestry sector were Sweden/SIDA, EC, USA/USAID, Italy/IC, Norway, Switzerland/SDC/SECO, Japan/JICA, Netherlands, EBRD and World Bank. For 2010, Japan/JICA, Netherlands and EBRD did not allocate funds for this sector. Projects related to EC 2010 (worth 1.3 million Euro) have not been contracted yet (Figure 146).

Figure 146
Donor Aid Flows in the Agriculture and Forestry sector, 2009-2010, grants only (in million Euro) (Source: BiH Ministry of Finance and Treasury, Report on Donors List 2009-2010)



In 2009, the members of DCF allocated 46.61 million Euro to the agriculture and forestry sector, out of which 32.15 million Euro in loans (28.7 million Euro from EBRD and 3.45 million Euro from the World Bank) and 14.46 million Euro in grants. In 2010, donors contributed 13.10 million Euro, including 1.3 million Euro of EC projects for 2010 and 4.26 million Euro of World Bank loans (Figure 147).

Figure 147:
Allocation of grants-loans (left) and aid flow (right) in the agriculture and forestry sector in the period 2009-2010 (Source: BiH Ministry of Finance and Treasury, Report on Donors List 2009-2010)



Environmental protection sector

The assistance for environmental protection includes different projects listed in Annex I. Environmental programs are linked with other sectors such as infrastructure, energy, agriculture and forestry, return and reintegration, local governance and gender.

Main donors and financial institutions in the area of environmental protection are: EC, World Bank, Italy/IC, Norway, Netherlands, Sweden/SIDA, UNDP (through MDG and GEF) and Hungary. The leading donors for this sector in 2009 were the EC and the World Bank, then Norway, Netherlands and Italy/IC. Hungary became a new donor in 2010, while Japan/JICA expressed interest for this sector. The leading donors were the World Bank, the UNDP and Sweden/SIDA (Figure 148).

Figure 149 shows that donor contributions for this sector were significantly higher in 2009 (19.45 million Euro of grants) than in 2007 (4.29 million Euro) and in 2008 (3.50 million Euro). In 2010, donors contributed 11.40 million Euro, excluding EC 2010.

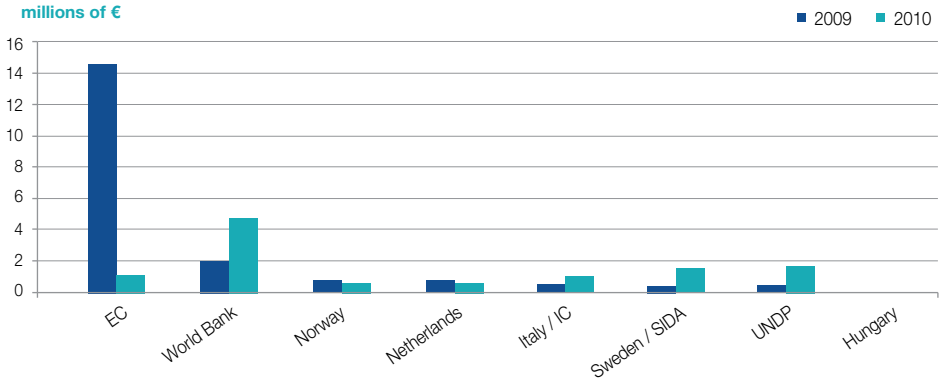


Figure 148:
Donor Aid Flow in the environmental protection sector 2009-2010 (in million Euro)
(Source: BiH Ministry of Finance and Treasury, Report on Donors List 2009-2010)

The FBiH and the RS have designated lower-level administrative units (cantons and municipalities) for certain environmental tasks, but their environmental expenditures do not appear in the entity budgets. For example, the RS spent 0.2% of its budget and 0.1 % of GDP on environmental protection, while the equivalent expenditure of the FBiH Ministry of Environment and Tourism was around 0.9% of the budget in 2009 (UNECE, 2011). Apart from this, the FBiH and the RS have their own environmental protection funds. Detailed description of funds is given below.

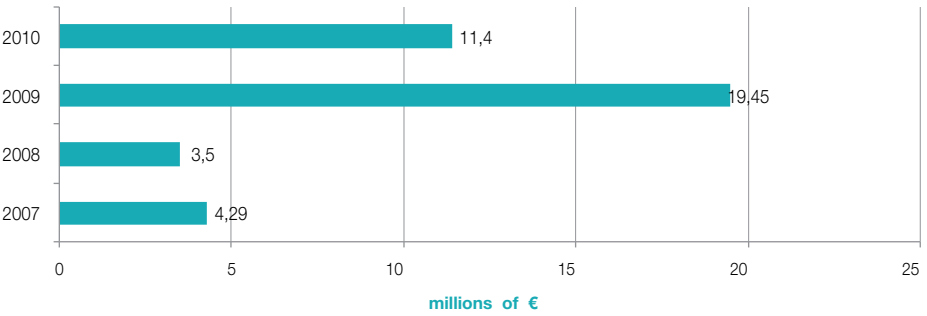


Figure 149:
Door/IFI Aid Flows to the environmental protection sector 2009-2010
(Source: BiH Ministry of Finance and Treasury, Report on Donors List 2009-2010)

Environmental Protection Fund of FBiH

The Fund is a legal entity with rights, obligations and responsibilities prescribed by the Law on the Environmental Fund of FBiH (Official Gazette of FBiH, No. 33/03) and its' Statute. It is a non-profit public institution. The founder of the Fund is the Federation of Bosnia and Herzegovina and the founding rights and duties are performed by the Government of FBiH on behalf of FBiH.

The Fund is managed by the Steering Committee which consists of seven members that are appointed or dismissed by the Government of FBiH. The Steering Committee consists of representatives of the competent administrative authorities, experts in the field of environment and economy, and representatives of academic institutions and NGOs. The Fund is supervised by the Supervisory Board which consists of three members that are appointed by the Government of FBiH at the proposal of the FBiH Minister of Environment and Tourism. The Supervisory Board members are appointed from members of scientific and professional institutions and non-governmental organizations. The Fund is managed by the director who represents the Fund. The director is appointed and dismissed by the Management Board with the approval of the Government of FBiH.

Activities of the Fund include collection and distribution of funds for environmental protection on FBiH territory, encouraging and funding preparation, implementation and development of programs, projects and similar activities in the field of conservation, sustainable use, protection

and improvement of the state of the environment and use of renewable energy sources, in particular:

- Professional and other activities related to acquisition, management and use of the Fund's finances;
- Mediation in connection to financing environmental protection by foreign countries, international monetary institutions and bodies and local and foreign legal entities and individuals;
- Providing professional services related to environmental protection funding;
- Maintaining a database of programs, projects and similar activities in the field of environmental protection and necessary and available funds for their achievement;
- Encouragement, establishment and maintenance of cooperation with international and local monetary institutions and other legal entities and individuals in order to fund environmental protection, environmental protection plans adopted under the Statute, international agreements of which BiH is a member and other programs and documents in the field of environmental protection;
- Performing other duties related to incentives and funding environmental protection defined by the Statute.

Financing sources of the Fund are:

- compensation from polluters
- compensation from natural resources users
- special environmental fees paid for each motor vehicle registration
- proceeds arising from international bilateral and multilateral cooperation and in-country cooperation on mutual programs, projects and similar activities in the field of environmental protection
- budget of the FBiH
- bank loans
- funds from loans by other legal entities and monetary institutions
- donor funds and other forms of support
- Fund operations (service fees, repayment of principal interest etc.), and
- other sources of funding defined by a special law, other regulations or contract.

For environmental projects in the FBiH, the Environmental Protection Fund of FBiH has so far invested around 40 million KM (cca 20 million Euro) from accumulated funds and funds that have been raised during its period of operation (2010-2012). Projects funded by the Environmental Protection Fund of FBiH are listed in details in Annex I.

Environmental Protection and Energy Efficiency Fund of RS

The Environmental Protection and Energy Efficiency Fund of RS was established as a legal entity with public authority whose rights, obligations and responsibilities are stipulated by the Law on the Environmental Protection Fund of RS and financing of environmental protection in RS, Fund Statute and other regulations. The founder of the Fund is Republika Srpska. The founding rights and duties are performed by the Government of RS and supervision over Fund operations is performed by the ministry responsible for environmental protection. The Fund is managed by the Steering Committee which consists of seven members that are appointed and dismissed by the Government of RS. The Steering Committee consists of one representative from the ministry responsible for the environment, the ministry responsible for energy affairs, the

ministry responsible for water management, the ministry responsible for finance, the Economic and Social Council of the RS, RS Chamber of Commerce, and a representative of academic and professional organizations at the proposal of the ministry responsible for science. The director of the Fund operations is the director appointed by the Government of RS on the basis of a public competition.

Fund activities include activities related to fund raising, financing preparation, implementation and development of programs, projects and similar activities in the field of environmental protection, sustainable use and improvement of the environment and in the field of energy efficiency and use of renewable sources of energy as defined by the law. The Fund, within the scope of its activities, uses its funds for securing financial support for the aims and principles of environmental protection and improvement of energy efficiency defined by strategic documents and local environmental action plans of local governments and rational use of natural sources and energy, as well as basic conditions of sustainable development and realization of human rights to a healthy environment.

Resources for financing the Environmental Protection and Energy Efficiency Fund of RS, in accordance with the Fund Law, are secured from designated sources, in particular:

- fees paid by polluters of the environment
- fees for waste disposal in the environment
- water protection fees paid by owners of motor vehicles that use oil or petroleum derivates in accordance with the Law on Waters (Official Gazette of RS Nos. 50/06 and 92/09)
- proceeds arising from international programs, projects and other activities in the area of environmental protection, energy efficiency and renewable energy sources
- contributions, donations, gifts and grants and
- from other sources in accordance with the law.

Sources for financing the Fund are currently provided only based on Article 194, paragraph 2 of the Law on Waters of RS (Official Gazette of RS, Nos. 50/06 and 92/09), that is, the Fund receives, by way of a separate account for environmental protection in RS, 15% of total revenues collected in the RS on behalf of the water protection fee (Article 189, paragraph 1, item v, Sub-Clause 1, 2 and 3 of the Law on Waters).

During the last 4 years, the Environmental Protection and Energy Efficiency Fund of RS streamlined around 5 million KM for environmental projects in the RS.

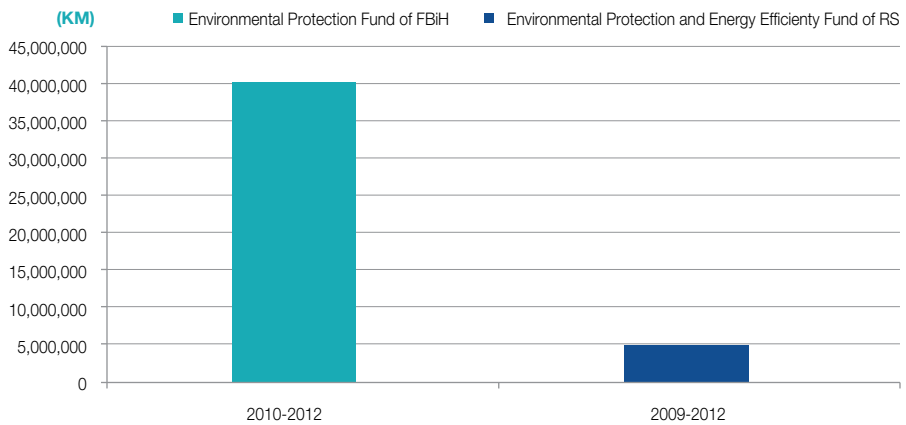


Figure 150: Financing sources of the FBiH and the RS Funds streamlined for environmental projects in BiH (Source: Environmental Protection Fund of FBiH, Environmental Protection and Energy Efficiency Fund of RS)

5.1.3 ENVIRONMENTAL MONITORING

Air quality

Two hydro-meteorological institutes (Federal Hydro-meteorological Institute of BiH and Republic Hydro-meteorological Institute of RS) are responsible for air quality monitoring. Both collect and manage data from numerous stations installed throughout the country. Based on the data, the historic trends in concentrations and their spatial distributions can be seen in several urban areas (e.g. in Sarajevo, Banja Luka, Mostar, Tuzla, Zenica, etc.). The network of air quality monitoring stations is shown in Annex I. Data required as input data are either interpolated from the pre-war situation or obtained from direct contacts with "known" polluters. Analysis is carried out following the CORINAIR (Core Inventory of Air Emissions) methodology and using designed tools for such purposes.

In accordance with the Convention on Long-range Transboundary Air Pollution and for the purposes of the Cooperative Program for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe, one automatic station has been operational at Ivan Sedlo since 2006.

Based on Laws on Environmental Protection in the FBiH, the RS and the BD, the competent environment ministries are obliged to keep a register of facilities/plants and polluters. The operators of facilities/plants with environmental permit have to regularly report the emission monitoring results to the competent ministry.

Water quality

The water quality of rivers in BiH has been systematically monitored since the second half of 1960s, when regular water quality monitoring was established at 58 stations. During 1990s, monitoring was interrupted due to the war. Pursuant to the provisions of the Dayton Peace Agreement, water management is the responsibility of the FBiH, the RS and the BD. Water management in BiH is under the competence of the Federal Ministry of Agriculture, Water Management and Forestry, the Ministry of Agriculture, Forestry and Water Management of RS and the Agriculture, Forestry and Water Management Department of the Government of BD. Also, monitoring of surface water is the responsibility of the two hydro-meterological institutes (Federal Hydro-meteorological Institute of BiH and Republic Hydro-meteorological Institute of RS). The Ministry of Foreign Trade and Economic Relations of BiH is responsible for the coordination of activities and harmonization of plans between entity government bodies.

In the organizational context, for managing waters, the following water agencies were established in accordance with the Law on Waters in the FBiH and the RS (Official Gazette of FBiH, No. 70/06, Official Gazette of RS, Nos. 50/06, 92/09): Sava River Basin District Agency (in Sarajevo), Adriatic Sea River Basin District Agency (in Mostar), Water Agency for Sava River District (in Bijeljina) and Water Agency for Trebišnjica River District (in Trebinje).

Relevant legislation for water management in BiH are two water laws, one for the FBiH and the other for RS, mainly harmonized with one another and with the EU Water Framework Directive. In line with the water laws, water monitoring is under the competence of water agencies. Monitoring systems are harmonized, but there are certain differences in the onset of observation, the choice of parameters and sampling frequency. The differences are often the consequence of the natural features diversity between two main basins as well as differences in the activity dynamics related to monitoring dynamics, e.g. identification of water bodies. After the interruption in observations during the 1990s, re-establishment of regular quality monitoring started in 2000, but not on rivers in all parts of BiH and not according to the same schedule. Only since 2006, river quality monitoring has been established on the entire BiH territory. Generally, it can be said that water monitoring in BiH has significantly improved over the last decade, but it is still being developed and harmonized. However, there are still some difficulties in unifying data for the whole of BiH.

The statistical system for water management in BiH, is set up through three competent institutions responsible for collection, organization, processing and publishing of water resources data: the Agency for Statistics of BiH at the state level, the Federal Office for Statistics and the RS Institute for Statistics at the entity level. Data collection and processing is almost completely harmonized between these three institutions. However, the problem of data validity (due to the mode of collection of certain data by statistics and agencies) and data exchange between different entity institutions is still present.

Soil quality

At present, there are no adequate laws on soil quality, soil protection or monitoring. Institutions in charge of soil resources are the Federal Institute for Agropedology in Sarajevo, the Agriculture Institute of RS Banja Luka and the Federal Agromediterranean Institute of Mostar, that have a limited performance in terms of projects, evaluations, studies and other activities. The inventory of the post-war situation of land resources in BiH was implemented under the project of the Food and Agriculture Organization (FAO) in 2007. The Agriculture Institute of RS carried out a pilot project in several RS municipalities with the aim to identify parameters, monitoring plots and pollutants for soil monitoring. Since all soil monitoring in the country is performed only on a contractual basis (road construction, etc.) and for study/project purposes, a complete or even partial database does not exist.

Biodiversity and forestry

Research institutions responsible for biodiversity are the Natural Science Faculties in Banja Luka and Sarajevo, the Agricultural Faculties in Banja Luka, Mostar and Sarajevo, the Forestry Faculties in Banja Luka and Sarajevo, the RS Institute for Protection of Cultural-Historical and Natural Heritage, and the National Museum of BiH in Sarajevo.

Following the initiative of the Food Safety Agency, the Council of Ministers founded the GMO Council, and authorized four laboratories for GMO in BiH. The Agency signed a protocol on cooperation with the reference GMO laboratory in Italy, and enabled equipping of two GMO laboratories in BiH through the World Bank project.

Based on Laws on Nature Protection in the FBiH and the RS (Official Gazette of FBiH No. 33/03, Official Gazette of RS No. 113/08), the responsibility of ministries in charge of environmental issues is to establish an environment information system and to provide institutional background for monitoring.

Four National Reports to the Convention on the Biodiversity (CBD), comprising detailed information on diversity of species, ecosystems and landscapes, have been developed. Individuals and research institutions carried out numerous studies and research in order to provide data for these Reports. The first forestry inventory in BiH was conducted in 1964 - 1968, while the second state forest inventory has been ongoing since 2006 covering all productive and non-productive forests, forest lands and other areas.

Even though different institutions (governing bodies, museums, research institutes, NGOs, etc.) possess a lot of data on biological diversity, there is no biodiversity monitoring system in BiH. Data are not available and verified. The list of recommended protected areas is still not harmonized and the categories are not revised. There is no agency or institution in charge of collecting, registering and analyzing data on biological diversity and protected areas at the entity or state levels.

Waste

The Laws on Waste Management in the FBiH, the RS and the BD contain general monitoring requirements for waste producers, waste facility operators and landfill operators. Waste producers and waste facility operators are obliged to carry out a control and monitoring program, to keep records of the state of permits and other relevant data, and report to the competent environmental authority once or several times a year, in accordance with the permit.

Waste monitoring and management, performed by the Agency for Statistics of BiH, the FBiH Office of Statistics, the Republika Srpska Institute of Statistics, are based on the statistical form completed by public utility companies. The data are predominantly estimates since waste monitoring is not performed frequently and waste quantification is usually done by visual assessment and not by measurement. As a result, the total volume of generated and disposed waste as reported is questionable. There has been very little progress in the recycling system (the majority of pilot projects were carried out in urban areas). Different types of waste (municipal, commercial, industrial, even animal and medical waste) are disposed of at landfills. There is still a high number of illegal dumpsites throughout the country.

Data on quantities, types and flows of waste generated in industries, crafts and other processes (processing industries, ore and stone mining, generation and supply of electricity, gas, steam and water supply) are published by the Agency for Statistics of BiH. Statistical data on generated medical waste in BiH do not exist.

Environmental information management and reporting

Currently, there is no centralized database on the environment at the state level, and there is no installed and implemented environmental information system. Different institutions monitor, collect and process data without adequate vertical or horizontal communication.

Pollutant Release and Transfer Registers (PRTRs) have been developed at the ministries responsible for the environment in the FBiH and the RS, and hardware and software were provided by the EU/CARDs project in 2007. The FBiH and the RS adopted the Regulations on Plants and Polluters Registration. Since 2008, companies are obliged to report data, while environmental inspectors have the authority to issue a fine to companies and their management for non-compliance. Several workshops have been organized for all stakeholders, including the NGO sector. Reports submitted by companies to the competent authorities usually contain significant gaps in data.

Even though the European Environment Agency (EEA) and its European Environment Information and Observation Network (EIONET) cooperate with BiH, there is still no body responsible for an integrated environmental information system. BiH submits about 65% of the required data to the European Environment Agency (UN Economic Commission for Europe, 2011).

In accordance with the laws on environmental protection in the FBiH, the RS and the BD, all regulatory bodies and public authorities are obliged to publish their information on environment in hard and soft copies, in formats that are easily accessible to the general public.

The first FBiH environmental assessment report was published in 2009 based on indicators. However, no environmental assessment reports or trends in the environmental indicators trends have been prepared in the RS.

The Agency for Statistics BiH has improved the environmental statistics that are published in the national statistical yearbooks. This institution currently works on developing a statistical form on environmental protection expenditures, revenue and investments.

5.2 ENVIRONMENTAL EDUCATION, ENVIRONMENTAL AWARENESS RAISING AND PUBLIC PARTICIPATION

5.2.1 ENVIRONMENTAL EDUCATION

In BiH, environmental education has made some progress in terms of including environmental elements in curricula and programs in pre-schools and schools based on several laws: the Framework Law on Primary and Secondary Education in BiH from 2003, Framework Law on Pre-Primary Education in BiH from 2007, Framework Law on Secondary Vocational Education and Training in BiH from 2008, Strategy for Educational Development in BiH adopted by the BiH Council of Ministers in 2008 for the period 2008-2015, Strategy for Vocational Education and Training Development in BiH for the period 2007-2013, and Strategy for Pre-Primary Educational Development in BiH from 2004.

Awareness development about the importance of environmental protection and conservation are aspects contained in the plans and programs of pre-primary educational institutions, as well as participation of children in activities relevant for environmental protection. In primary schools, first environmental topics are covered in the course „My Environment“, and later on in other courses (e.g. Nature, Biology, Physical and Health Education etc.) in which children have an opportunity to acquire knowledge about forming their own attitudes toward personal hygiene and environmental protection, nutrition hygiene, environmental issues, indicating their personal contribution to the environment, ecology, environmental awareness development, organizing initiatives for environmental protection etc.

On the other hand, topics relevant to ecology and environmental protection are covered in secondary vocational schools (different professions such as electrical engineering, economics, traffic, geodesy and civil engineering, catering and tourism, etc.) while in high schools they are part of the biology course.

At universities, there are different programs for ecology and environmental protection which provide academic titles in the following cities:

- Sarajevo – Faculty of Natural Sciences and Mathematics (Department of Biology – Program for Ecology; Department of Geography – Program for Tourism and Environmental Protection); Faculty of Mechanical Engineering (Department of Energetics, Processing Technology and Environmental Engineering – Program for Environmental Engineering);
- Banja Luka – University of Business Studies (Faculty of Ecology); Independent University (Faculty of Ecology); Faculty of Natural Sciences and Mathematics (Program for Ecology and Environmental Protection); Faculty of Technology (Program for Environmental Protection);
- Tuzla – Faculty of Technology (Department of Environmental Engineering);
- Travnik – International University (Faculty of Ecology);
- Zvornik – Faculty of Technology (Program for Environmental Engineering).

At public institutions, governments in the FBiH and the RS offer several professional training courses on environmental issues for their staff, officials and representatives of the business and NGO sectors and relevant personnel of companies.

The Regional Environmental Center for Middle and Eastern Europe is implementing the program „Education for Sustainable Development (ESD) in the Western Balkans“. The aim of that program is to provide assistance in implementing reforms in the educational sector and educational strategies for sustainable development in the Western Balkans through implementation and dissemination of ideas at the primary school level. Th comprehensive long-term goal of the program is for ESD to become a part of primary education in the Western Balkans as well as to efficientlyorganize schools in communities, in order to use potentials as much as possible for achieving sustainable development. The following fields are defined as priorities of the program:

- Education of teachers (Training on ESD prior to hiring and during employment);
- Development of curriculum, including extra curriculum activities and development of educational materials;
- Campaign for raising public awareness about environmental education/sustainability;
- Improvement of networking and cooperation, with the aim to exchange experiences and define good practice and access to environmental education/sustainability.

The aim of this program is to improve practices for sustainable development in schools and communities in area of the Drina River Basin (BiH, Montenegro and Serbia) and in the wider territory of the Western Balkans. The Regional Environmental Center for Middle and Eastern Europe in 2000 in cooperation with company Toyota, carried out a project on environmental education and education for sustainable development titled GREEN PACK for schools in BiH. Currently, the third phase of the project is in the initial stage.

Other stakeholders, such as environmental NGOs are also active in promoting environmental education in primary and secondary schools. However, very little media attention has been given to environmental education.

5.2.2 ENVIRONMENTAL AWARENESS RAISING AND PUBLIC PARTICIPATION

The Laws on Environmental Protection of the FBiH, the RS and the BD indicate that each individual and organization have an opportunity to participate in decision making processes. Regulatory bodies and governments are obliged to encourage public awareness and participation, facilitate access to information, judicial and administrative procedures, as well as to registers of installations and polluters in the future. This law also requires the creation of environmental advisory councils to assist in evaluation of strategic environmental assessments, environmental plans and programs for the environmental ministries and the entity governments. The councils are expected to be composed of different stakeholders (e.g. environmental associations, organizations and institutions). However, no progress has been made so far.

The UNECE Convention on Access to Information, Public Participation in Decision Making and Access to Justice in the Environmental Matters was signed in June 1998 in Aarhus, Denmark. BiH has recently (in 2008) acceded to the Aarhus Convention. In 2011, the First National Aarhus Convention Implementation Report in BiH was prepared with the participation of close to 30 government institutions, including three non-governmental organizations that ensured wide consultations on report drafts within the NGO community.

In 2012, the first Aarhus Center in BiH was opened, followed by the publication of the first comprehensive implementation manual on the Aarhus Convention in BiH, as well as the launch of a national online platform for the Convention www.aarhus.ba to provide up-to-date information and resources to environmental authorities and non-governmental organizations.

At the state, entity and canton levels, environmental authorities take action to raise public awareness of environmental issues and citizens' rights to environmental protection. This is, for example, related to the adoption of a program on celebrating important dates related to human rights in BiH for 2010 in line with the decision of BiH Council of Ministers of 20 April 2010 (05-07-01-1279-31/10). Authorities in charge of the environment published numerous promotional materials for the World Water Day, Earth Day, World Day for Environmental Protection and the Ozone Layer Protection Day.

Non-governmental organizations (NGOs) in the field of environment

NGO registration and activities are regulated in accordance with state and entity Laws on Associations and Foundations giving NGOs a wide range of rights: NGOs from one entity can operate in the other entity (e.g. locally or regionally); they are defined as organizations or

environmental experts associations; they have a legal status in terms of having opportunities to initiate court procedures. Numerous activities of NGOs include environmental awareness raising and education. Their joint participation in the formulation and implementation of environmental policy with governmental working groups is at a low level. They do not participate in meetings of the Inter-entity Steering Committee for the Environment or on the Supervisory Boards of environmental funds at the entity level. NGOs have access to financial support from entity environmental authorities (UN Economic Commission for Europe, 2011.).

In BiH, around 20 NGOs regularly participate in environmental impact assessments in the country (e.g. for construction of highways, hydropower plants, etc.) Ministries in charge of the environment together with investors organize public hearings. Summaries of environmental impact assessments are usually made available to the public (UN Economic Commission for Europe, 2011.)

According to the directory of environmental NGOs from 2006, there were 87 registered and 1 unregistered non-profit organization in the field of environment with the total of 54.628 members in BiH, out of which 222 members are full or part-time employees. The annual budget of environmental NGOs in BiH accounted for 1,761,000.00 Euro (BiH Regional Environmental Center, 2006). Financing sources and main activities carried out by these NGOs are shown in Annex I. A directory of environmental NGOs has not been updated since 2006.

A good indicator of raising public interest in natural and environmental protection is indicated by a growing number of and support to active NGOs (Figure 151). However, the environmental NGO movement is still at a relatively early stage of development, and therefore external support and assistance is of great importance. The majority of NGOs are still in need of basic support such as training on proposal writing, project and financial management, as well as support in terms of office and technical equipment. Above all, they need funds for carrying out their environmental projects.

Number of environmental NGOs

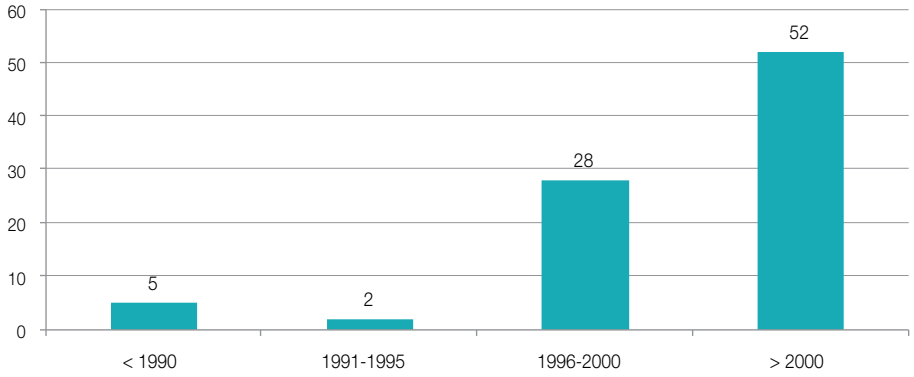


Figure 151: Number of environmental NGOs in BiH (Source: BiH Regional Environmental Center, 2006.)

Environmental issues in the media

Media sources give very little attention to and show insufficient interest for environmental protection. Whether the media is printed or electronic (daily or weekly), environmental information is limited and often pushed aside in favor of issues opposite to environmental interests (e.g. pollution, waste issues). Nevertheless, there are some good examples of radio and TV programs, thematic articles in written and electronic media, as well as efforts of some NGOs and individuals, who are the authors of respectable publications in local languages. Media are partly free, but journalists are pressured by political party structures to publish mostly political issues. Currently there are different media sources in BiH that occasionally publish information on environmental issues as shown in Annex I.

6 CONCLUSIONS AND THE WAY FORWARD

6.1 PRESENT EFFORTS IN REFORM IMPLEMENTATION IN THE ENVIRONMENT SECTOR
6.2 SYSTEM FUNCTIONING EFFICIENCY
6.3 DATA AVAILABILITY AND REPORTING PROCEDURES
6.4 THE WAY FORWARDI

State of the Environment Report for BiH 2012 presents the state of the environment in BiH based on the collected data available from different sources, analysis of the data, and, in case of insufficient quality data or data in general, on expert assumptions and estimates. The report portrays the state of certain environmental components (water, soil, air, biosphere, etc.), and deals with the main social and economic sectors with the aim to identify and assess their pressure on the environment.

The report was developed based on selected indicators that quantify information on the environment and facilitate a better understanding of complex environmental problems in BiH. The application of indicator approach enables quantifying and follow-up of physical environmental indicators, advancement and efficiency of applied measures in certain fields and ensures an efficient comparison of indicator values from different cycles of environment sector development. This approach was selected for reasons of information compatibility that will be exchanged internationally, mainly through the European Environmental Agency. The state of the environment overview is a method used by many other EU countries to track the state of the environment, so it enables a comparison of BiH state of the environment with other European countries.

6.1 PRESENT EFFORTS IN REFORM IMPLEMENTATION IN THE ENVIRONMENT SECTOR

The accession process of BiH to the EU is one of the main driving forces of environmental reforms. It is mainly related to the harmonization of local legislation with the EU acquis, since EU legislation is considered to be one of the most progressive with a tendency to achieve goals of environmental and resource protection; knowledge based economic development and social participation. In the period 2002-2004, a set of six basic environmental laws related to environmental protection, air protection, waste management, conservation of nature and environmental protection funds were adopted in the FBiH, the RS and the BD[47] . Water management and protection is covered by the Laws on Waters in the FBiH and the RS adopted in 2006, while in BD the Law on Water Protection in BD has been in force since 2004.

BiH has signed numerous multilateral agreements in the field of environmental protection. In the period 2000-2002, BiH ratified three main UN conventions: the Convention on Biological Diversity (ratified in 2002), the Framework Convention on Climate Change (ratified in 2000), and the Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification (ratified in 2002). Apart from these three main conventions and other international agreements, in 2001 the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was ratified, the Danube Convention in 2006 and the following were ratified during 2008: the Aarhus Convention, the Bern Convention, the CITES Convention, and the Cartagena and Kyoto Protocol. In 2009, the ESPO Convention was ratified, the Stockholm Convention on persistent organic pollutants at the beginning of 2010, while in 2011 the Beijing amendment to the Montreal Protocol of the Vienna Convention on the protection of ozone layer was ratified. In line with the Act of Succession, a series of international treaties, related to environment, were introduced into the legal system of BiH, including the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution. It is expected that several international conventions, protocols and agreements will be ratified in the upcoming period, since the ratification processes have already been initiated and BiH is, therefore, facing intense activity on implementation of the assumed international commitments in the future.

After the first environmental legislation in accordance with the EU legislation was adopted in the first half of the previous decade, there has been some improvement in terms of legislation. A

47 The similar set of laws was adopted in the Brčko District, excluding the law on the environmental protection fund.

certain number of new laws, ordinances and regulations were passed related to conservation of some environmental areas or to sectors which influence the quality of environmental components by their activities, but still a lot of effort has to be taken in order to bring BiH closer to the EU countries in terms of legislation. Despite the achievements, some areas have still not been covered by regulations, which is a specific challenge for the upcoming period and in the given circumstances.

Besides the legislation, enforcement regulations, rules and procedures, and international documents, a large number of strategic documents was drafted in the period 2000–2012, which present the basis of continuous BiH efforts to implement reforms in the environment sector: the Solid Waste Management Strategy (2002), the BiH National Environmental Action Plan – NEAP BiH (2003), the UNECE EPR1 – First Environmental Performance Review (2004), the First National Report on the Implementation of UN Convention to Combat Desertification/ Land Degradation in BiH (2007), the Initial National Communication to the UN Framework Convention on Climate Change (2009), I, II, III and IV BiH report to UN Convention on Biological Diversity (2005-2010), the Biological Diversity Strategy with Action Plan (2010), the UNECE EPR2 – Second Environmental Performance Review (2011), the NCSA Report (National Capacity Self-Assessment, 2012), "BiH in the Process Rio + 20" - BiH report for the UN Convention on Sustainable Development (UNSDC) which was held in Rio de Janeiro on 20-22 June, 2012, Water Policy in BiH (2011, pending for adoption) and the Second National Communication to the UN Framework Convention on Climate Change is being prepared. In the period 2000-2012, some of the most important environmental documents were developed in the FBiH and the RS: the Environmental Protection Strategy of FBiH 2008-2018 (2008), the Water Management Strategy of FBiH 2010-2022 (2011), the Federal Waste Management Plan 2012-2017 (2011), the Strategy of Nature Protection of RS (2011), the Draft Strategy of Integral Management of Waters in RS until 2024 (draft strategy, first iteration, 2012), the Framework Development Plan of Water Management of RS (2006), etc.

In light of this, the BiH State of the Environment Report 2012 is the founding document of environmental protection in BiH. Apart from the overview of environmental performance and assessment of the implemented protection measures efficiency, the Report identifies key questions for protection and improvement of the present environmental status. The preparation of the Report was based on a comprehensive process of data gathering that was carried out in BiH for the first time, and that included a large number of relevant institutions and other stakeholders. However, the work on this document showed extremely low human and technical capacities for the fulfillment of environmental obligations in BiH, and also towards the international community and the EU. Although lots of data are missing or are incomplete, intense work and cooperation of all stakeholders involved in the preparation of the Report resulted in gathering a significant part of environmental information and indicators that are now published and that can be the basis for further similar activities.

The Report on the State of the Environment in BiH is an important tool in environmental protection policy planning, but also an indicator of the need to include environmental protection obligations into all development and strategic documents of other sectors. Apart from being one of the main foundations of environmental performance assessment in the future negotiations of BiH for EU membership, the Report shall serve as a recommendation for decision making regarding sustainable environmental management in BiH and contribute to making decisions based on scientific methods. It is expected that this document will facilitate cooperation between different governing bodies and significantly improve future implementation of environmental policies.

6.2 SYSTEM FUNCTIONING EFFICIENCY

Despite successes in some areas, BiH is facing great challenges in achieving the planned goals of environmental protection. There are many shortcomings in environmental protection implementation that will have to be dealt with in the following period. One of the greatest deficiencies is a clear distinction of responsibilities and obligations of the state, entities, cantons and municipalities and non-existence of a coordinating mechanism with clear authorizations. Non-transparent obligations and responsibilities, disharmonized legislation, and the lack of funds are the main obstacles to an efficient implementation of strategic environmental documents. The distribution of competence over certain environmental components between institutions at entity, cantonal and municipal levels contributes neither to efficient environmental performance monitoring, nor to the planning of environmental protection. The lack of implementation regulations, inefficient monitoring of enforced regulations implementation and inadequate sanctions also present a great obstacle to reaching the earmarked aims.

6.3 DATA AVAILABILITY AND REPORTING PROCEDURES

Due to the unclear distribution of responsibilities and obligations between the state, entities, cantons and municipalities, there is no systematic environmental monitoring and no reporting system in BiH. The Agency for Statistics of BiH, the FBiH Office of Statistics and the Republika Srpska Institute of Statistics collect and process certain environmental data, according to the Statistical Program and Work Plan. Data are analyzed and published in accordance with the terms established by the Work Plan. However, the legislation that would oblige the state to prepare state of environment reports at the state level or to report to the European Environment Information and Observation Network (EIONET) in BiH is not yet fully established and harmonized.

According to the Law on Environmental Protection in the FBiH (Official Gazette of FBiH, Nos. 33/03, 38/09), the Federal Ministry of Environment and Tourism is obliged to establish an environmental information system and to instruct state of the environment monitoring, measuring, collection, analysis and data recording activities related to the use of and pressures on the environment. The information system is established and organized based on territorial population density and intensity of use of the environment as a periodic report on the state of the environment, with a view to establish qualitative and quantitative changes in the stateof the environment, which have occurred as a result of use of the environment and to enable comparison at an international level so as to evaluate them together with social and economic data and from the aspect of impacts on human health, to determine causes of environmental impacts with appropriate accuracy including detailed representations necessary for determining correlations relative to damage, to enable timely prediction of environmental hazards and undertake measures provided by regulations and other measures by competent authorities and to be used for planning purposes. FBiH authorities competent for water management, meteorology, pedology, geology, environmental protection, statistics and other administrative organizations are obliged to ensure, within their jurisdiction, the collection, analysis and recording of relevant data and information, especially on the use of and pressure on the environment and submit them to the ministry and other competent authorities at state level and to international institutions.

In July 2012 a new Law on Environmental Protection (Official Gazette of RS, no. 71/12) was adopted in the RS that envisages drafting of state of the environment reports at a biannual level. The report should contain data on state of the environment in the RS, data on the impacts of individual activities on the environment, data on adverse impacts on the environment, pressures on the environment, evaluation of implemented measures and their efficiency, overview of achievement of objectives of the strategy, evaluation of the use of funds for environmental

protection, assessment of the need to draft new or amend existing documentation and other significant data on environmental protection.

The Government of the BD is, according to the Law on Environmental Protection (Official Gazette of the BD, Nos. 24/04, 1/05, 19/07, 9/09) obliged to establish an environmental information system through subordinate legislation and enable state of the environment monitoring as well as measuring, collection, analysis and data recording activities on use of and pressures on the environment. As is the case in FBiH, the information system in BD is established based on territorial population density and so as to enable quantitative and qualitative changes in the state of the environment, to determine causes of environmental impacts with appropriate accuracy, to enable timely prediction of environmental hazards and undertake measures provided by regulations and to be used for planning purposes.

Environmental monitoring in BiH is not systematic, nor fully harmonized and coordinated. Some sectors perform better environmental data monitoring than others. For example, water agencies (two in the FBiH and two in the RS) regularly monitor different environmental parameters of surface waters and regularly prepare reports on surface water quality; however, this is not the case for groundwater. Hydro-meteorological institutes also regularly measure air pollution in Sarajevo and Banja Luka, and prepare annual reports, but there is an insufficient number of stations in BiH to determine the air quality status in the whole country. On the other hand, some environmental data are partly or completely missing, like data on biological diversity, climate change, land resources, and impact of economy driving forces (agriculture, industry, mining, tourism, spatial planning and urban planning) on the environment. This is caused by the lack of legislation in some of the mentioned areas, inadequate mechanisms of data transfer and coordination, and by the lack of official and institutionalized cooperation between sectors in charge of environmental issues.

In the majority of cases, data collection and processing is not performed in accordance with the EU guidelines and data are often inconsistent (the same data being collected in two entities often cannot be compared) or incomplete (emissions measured for only one year). Although Pollution Release and Transfer Registers (PRTRs) have been established in competent ministries in the FBiH and the RS, a poor improvement has been recorded in comprehensive monitoring system development, integral spatial information system or environmental information system, including a central database.

These mentioned problems were the main obstacle during the development of this report. These issue will have to be solved in the following period in order to enable performance monitoring of environmental trends in BiH and to report to the EU. Without data and environmental trends and a performance overview based on indicators, it is difficult to perform a complete state of the environment review, to make adequate and functional decisions on environmental management that would contribute to solving existing environmental issues.

6.4 THE WAY FORWARD

Proper management of environmental issues and risks requires decision making based on science. Reporting on the environment bridges the gap between scientific research and application of science in decision making in the field of environmental protection and management. However, in order to improve environmental data collection and application based on reliable and timely inputs and information as a prerequisite for complete environmental reports development, it is necessary to ensure an appropriate legal and institutional framework. Due to the current situation in BiH, the introduction of a regular reporting system on the environment needs to be focused on possible solutions within the existing legal and institutional frame.

Besides the establishment of a coordination mechanism with clear authorizations at state level, it is also very important to establish functioning horizontal and vertical coordination

mechanisms at all levels of entity and state administration, which will contribute to its higher efficiency as well as timely and coordinated environmental protection activities. Long-term state level environmental protection will be ensured by inclusion of environmental protection requirements, needs and objectives into planning and development documents of all sectors that are sources of environmental pressures.

6.4.1 DEVELOPMENT OF FUTURE STATE OF THE ENVIRONMENT REPORTS

With the present institutional setup, the most practical and most efficient solution for establishing regular environmental reporting could be the Ministry of Foreign Trade and Economic Relations of BiH that would assume activities related to periodical environmental reporting, with a strong support of the Agency for Statistics of BiH in collecting and processing data and parameters. However, the present organizational structure of the Ministry has insufficient capacity and support to implement these activities. Therefore, it is necessary that the Ministry of Foreign Trade and Economic Relations of BiH elevates the present Department for Environmental Protection into a new sector within the Ministry, which should comprise a separate department responsible for reporting on the state of the environment and other related tasks.

Relevant entity environmental ministries (FBiH Ministry of Environment and Tourism and RS Ministry of Spatial Planning, Construction and Ecology), relevant entity water management ministries (FBiH Ministry of Agriculture, Water Management and Forestry, Ministry of Agriculture, Forestry and Water Management of RS), the Government of BD (Department of Spatial Planning and Property Issues and Department for Agriculture, Forestry and Water Resources), statistical authorities and other administrative bodies in charge of environmental issues should ensure the necessary assistance in development of environmental reports through adequate and transparent information and data sharing. Figure 152 presents the development of State of the Environment Reports in BiH in accordance with the current institutional setup.

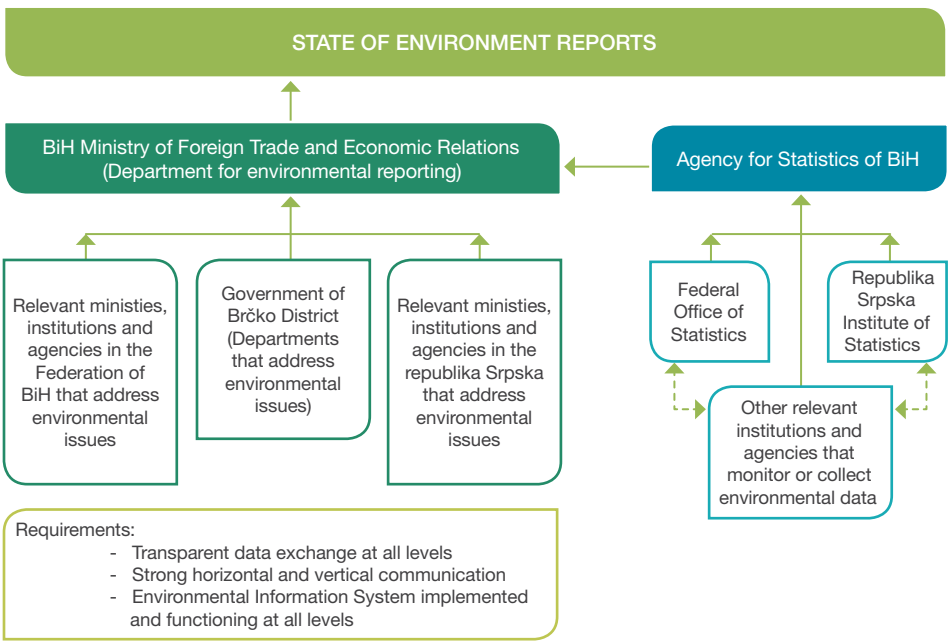


Figure 152:
Development of state of environment report within the present institutional organization

6.4.2 RECOMMENDATIONS FOR STATE IMPROVEMENT AND KEY TASKS

The following are general recommendations that can assist in development of a good and quality process for obtaining future State of the Environment Reports.

Recommendation 1 – Improve existing legal and institutional framework

In order to improve collection and application of environmental data that need to be reliable and timely, as a prerequisite for developing comprehensive state of the environment reports and further planning and implementation of environmental protection measures, it is necessary to strenghten the existing legal and institutional framework allowing the entities and the state to:

- Improve access to information;
- Form the basis for sound decision making process, and
- Fulfill its reporting obligations.

Recommendation 2 – Strengthening environmental monitoring

One of the main difficulties experienced during the creation of this document was the lack of data on the environment and lack of a presentation and transfer system of the said data. As mentioned earlier, there are some environmental data in certain sectors, and in other sectors data are completely lacking. State and entity authorities should establish program stages for environmental monitoring, that would be closely related to the Environmental Information Systems in the FBiH, the RS and the BD and that would ensure a better control of the environment. The greatest obstacle in environmental data gathering is an insufficient number of adequately equipped environmental laboratories, lack of trained personnel and means for regular monitoring.

There are two kinds of monitoring that must be strengthened: compliance monitoring and environmental impacts monitoring. The purpose of compliance monitoring is to check if the quality and quantity of an environmental component suffered changes due to human activities, and whether it is within the set standards of regulatory level. An example of compliance monitoring is a sampling program conducted by either industry or government to ensure that contaminant concentrations do not exceed a specified level in the environment. Environmental impacts monitoring is a repetitive and systematic measurement of environmental components characteristics aimed at testing certain hypotheses of human activity impacts on the environment. Environmental monitoring is primarily undertaken to determine effects of human activities on the environment, and to improve the comprehension of cause-effect relationship that exists between human activities and environmental changes.

Recommendation 3 – Strengthening the statistical sector in BiH

It is necessary to strengthen and promote statistics in the domain of environment as a permanent activity within the scope of work of the state and entity level authorities in charge of statistics. Statistical strengthening should include preparation of a set of indicators for the environment segment, in compliance with international methodologies and imprvement of Environmental Information Systems. The Agency for Statistics of BiH (Department of Transport, Environment and Energy), coordinates the work of the entity statistical institutions (FBiH Office of Statistics and the Republika Srpska Institute of Statistics), and actively provides environmental statistical data. However, the Agency for Statistics of BiH and entity statistical institutions are understaffed and need more human and financial resources in order to improve current data collecting, processing and reporting. It is very important that all three statistical institutions (Agency for Statistics of BiH, FBiH Office of Statistics and Republika Srpska Institute of Statistics) function adequately in order for BiH to produce good quality environmental reports.

Recommendation 4 – Strengthening the environmental information management system

Although each entity has its own Law on Environmental Protection and Law on Waters that oblige the regulatory and administrative bodies to make environmental data available, this, however, needs to be significantly improved. There is only a handful of formal mechanisms

for data and information transfer between institutions dealing with environmental issues in the country. Institutions that present a form of homogeneity in data collection and presentations are the entity authorities for statistics and the Agency for Statistics of BiH.

By virtue of the Memorandum of Understanding from 2004 (Memorandum of Understanding on the mutual cooperation and support to the establishment and functioning of the National Environmental Monitoring System between the Council of Ministers of BiH and the Government of FBiH and the Government of RS), steps towards the establishment of a functional information system for the environment are precisely defined. The BiH Ministry of Foreign Trade and Economic Relations, in cooperation with the Inter-entity Steering Committee for the Environment, the Inter-entity Commission for Water and relevant entity institutions and the BD are taking steps towards the creation of an integrated monitoring system in BiH. However, in the following period, it will be necessary to define coordination measures between the state, entities and the BD that would facilitate the process of system establishment defined by the EU CARDS RANSMO project (Project of National Environmental Monitoring System in BiH), conclusions which are referred to in the Memorandum. The RANSMO project serves as the basis for the development of the environmental monitoring system in BiH as a tool assisting in environmental decisions making, in accordance with the relevant EU directives and the European Environment Information and Observation Network (EIONET).

Recommendation 5 - Environmental indicators set to be developed and adopted by the Parliament of BiH

Environmental indicators are essential tools for tracking environmental progress, supporting policy evaluation and informing the public. Every State of the Environment Report should be based on precise environmental indicators. These indicators are regularly monitored and represent the basis for the current state and trends of the environment. Countries that do develop environmental reports regularly have a set of indicators that are usually adopted by the government of that country. The Ministry of Foreign Trade and Economic Relations of BiH, together with the entity ministries in charge of the environment (FBiH Ministry of Environment and Tourism, Ministry of Spatial Planning, Construction and Ecology of RS), relevant entity water management ministries (FBiH Ministry of Agriculture, Water Management and Forestry, Ministry of Agriculture, Forestry and Water Management of RS), Department of Spatial Planning and Property Issues and Department for Agriculture, Forestry and Water Resources of the BD Government and the Agency for Statistics of BiH (which coordinates the work of statistical institutions in the FBiH and the RS), need to draft the set of indicators that future SoERs will be based on. The list of indicators should include indicators from the CSI list used by the European Environment Agency and from the state list of indicators that would be specific to BiH. Also, the indicators should be compliant and harmonized at the state level. This State of the Environment Report for 2012, which is for the most part based on concrete environmental indicators, should serve as a strong basis for establishment of key environmental indicators, as well as future environmental reports. All indicators planned for adoption need to be officially addressed for endorsement to responsible institutions.

Recommendation 6 - Strengthening the Pollution Release and Transfer Register– PRTR

According to the provisions of the PRTR Regulation, facility operators to whom this regulation applies must submit reports on certain data to relevant authorities within ministries in charge of environmental issues at the entity level. Relevant authorities then transfer those data to the state level (Ministry of Foreign Trade and Economic Relations of BiH), and they have to ensure public access to data through the electronic database that is sent to EU/EEA. Although PRTRs have been installed in entity ministries, there has been little improvement in creating comprehensive monitoring system, including the database. Practical implementation of PRTR development is facing a series of challenges, especially insufficiently trained personnel in companies and environmental government bodies.

Recommendation 7 - EIONET – Reporting

The European Environment Information and Observation Network (EIONET) is a partner network of the European Environment Agency and its partners and cooperating countries. Besides the EEA and specialized European Topic Centers, this network includes experts from 39 countries and more than 350 national environmental agencies and other bodies that deal with environmental data and act as National Focal Points (NFP) and National Reference Centers (NRCs). BiH is also one of the cooperating countries.

The EIONET provides quality data and information, as well as expertise in environmental performance assessment in Europe, including BiH as a network member. After determining pressures, this information facilitates decision-making processes and policies regarding the environment, and monitors the efficiency of implemented policies and measures.

The EIONET priority is to ensure that data flow within this network is a set of determined, stable and defined goals which provide focus for countries that are in the process of establishing procedures of regular reporting. The main goal of this data flow is to encourage countries on their path to better efficiency through comparison with other countries, focusing on positive achievements recognition, and not only failures. BiH also contributes to this by being a member of the network.

Regarding environmental reporting to the EIONET, a positive trend was observed between 2000 and 2010. But, this year shows a slight decrease, which for BiH, as a country cooperating with the EAA, could be an encouragement to attain again the past positive development and to approach the average results of the majority of countries members of the EAA within the EU (65-70% until now), and to show engagement in approximation to the EU regarding environmental protection efforts.

Recommendation 8 - Forward-Looking Information and Services and Shared Environmental Information System

Forward-Looking Information and Services (FLIS)

The society is faced with unbelievably complex challenges and uncertainty. If BiH society wants to adapt and move towards sustainable development, then there is a clear need for a better understanding of these challenges and their long-term implications. Readiness and timely action require information on possible future pathways for BiH.

EEA's response to these challenges is the beginning of establishment of a knowledge base for Forward-Looking Information and Services (FLIS). The aim is to enable inclusion of long-term perspective and readiness in decision-making and creation of environmental policies**.**

Assessments of future perspectives for BiH may:

- Frame policies by identifying priority warning signals and emerging issues;
- Reflect on different options for the future;
- Identify driving forces and uncertainties;
- Check whether and how targets can be met;
- Develop robust measures and precautionary actions;
- Analyze cause-effect relationships;
- Anticipate possible surprises, discontinuities and shocks;
- Facilitate short- and long-term thinking in a structured way.

In order to facilitate the exchange of experiences in forward-looking assessments, it is necessary to:

1. Develop outlooks in BiH environmental reporting processes;
2. Adjust the data systems in order to capture forward-looking perspectives and new issues in BiH more regularly;

3. Increase expert knowledge on forward-looking assessments in the state;
4. Encourage cooperation of BiH with other countries and international organizations.

On behalf of the EEA, FLIS carries out these activities with six existing components: drivers and trends, indicators, scenarios, methods and tools, network and capacity building, as well as forward-looking assessments. In the future, new components may be added, as for example horizon scanning and early warning signaling.

Apart from additional forward-looking information in the future BiH national state of the environment reports, the reports should contain prepared and composed information on the environment for decision-makers in such a way that authentic short-term and long-term environmental policies may receive support. Such an advantage would justify stronger commitment of relevant stakeholders in BiH to this new policy tools.

Shared Environmental Information System (SEIS) – Future of reporting in the European Community

Tackling today's environmental challenges such as adjusting to climate change, sustainable management of ecosystems and natural resources, biological diversity conservation, preventing and managing natural accidents (floods, forest fires and lack of water) mainly depends on the assessment of data from different sectors and sources. That is why it is very important for the EU to have an information system based on the latest information and communication technology (ICT) that will provide the decision-makers at all levels (from local to European) with the access to the latest environmental data and in such a way help them make urgent life-saving decisions.

For the purpose of fully recognizing the efforts that BiH puts into informing the public on the state of the environment, and into successfully linking the Environment Information Systems of the FBiH, the RS and the BD with Pan-European Information, improving data collection, application and exchange is necessary for the purpose of partaking in the EEA Initiative on Shared Environment Information System. More intense participation in this initiative would ensure BiH an access to relevant achievements in present and future European reporting and environmental information systems.

Recommendation 9 - Strengthening environmental education

Environmental management requires appropriate organizational and professional capability. Education and schooling regarding environment is a long-term process that demands continuous work and support. The best results are achieved when educational policy and accompanying projects are united into joint plans which are implemented, monitored, evaluated and regularly harmonized. Having in mind the significant lack of environmentally educated staff in BiH, it is necessary to undertake planned, formal and informal education at different levels and in different sectors. Priority goals in this area are the following:

- Developing and raising public awareness on environment and sustainable development;
- Drafting and coordination of environmental education programs at different levels and sectors;
- Training of personnel for environmental management and environmental impacts control;
- Strengthening civil society.

Strategic orientation for fulfilling these goals includes implementing environmental and sustainable development education through school and university curriculae, development of environmental and sustainable development educational programs for various social groups, especially for decision makers, capacity strengthening of economic operators in the field of environmental management, encouraging all parts of the society, including governmental organizations, businesses, schools, associations and media to appropriate participation in environmental protection as well as encouraging development of joint environmental projects of different sectors (economy, scientific institutions, authorities, organizations, etc.).

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8 ANNEXES

ANNEX I
Environmental policy, agreements, non-governmental organizations

The list of cantonal ministries of environment in FBiH

No.	Canton	Ministry responsible for environment	Ministry responsible for environment
1	Una-Sana canton	Ministry of Construction, Spatial Planning and Environmental Protection	Ministry of Agriculture, Water Management and Forestry
2	Posavina canton	Ministry of Transport, Communication, Tourism and Environmental Protection	Ministry of Agriculture, Water Management and Forestry
3	Tuzla canton	Ministry of Spatial Planning and Environmental Protection	Ministry of Agriculture, Water Management and Forestry
4	Zenica-Doboj canton	Ministry of Spatial Planning, Transport and Communication and Environmental Protection	Ministry of Agriculture, Forestryand Water Management
5	Bosnian podrinje canton	Ministry of Urban Planning,Spatail Planning and Environmental Protection	Ministry of Economy
6	Central Bosnia canton	Ministry of Spatial Planning, Reconstruction and Return	Ministry of Forestry, Agriculture and Water Management
7	Herzegovina-Neretva canton	Ministry of Trade, Tourism and Environmental Protection	Ministry of Agriculture, Forestryand Water Management
8	West Herzegovina canton	Ministry of Spatial Planning, Construction and Environmental Protection	Ministry of Economy
9	Canton Sarajevo	Ministry of spatial Planning and Environmental Protection	Ministry of Economy
10	Canton 10	Ministry of Construction, Reconstruction, Spatial Planning and Environmental Protection	Ministry of Agriculture, Water Management and Forestry

Environmental Laws in BiH

BiH	
Name of the law	BiH Official Gazette No.
Law on Concessions	32/02
■ Law on Amendments to the Law on Concessions	56/04
Law on Veterinary Medicine in BiH	34/02
Law on Plant Protection	23/03
Law on Genetically Modified Organisms	23/09
Law on Animal Protection	25/09
Law on Agriculture, Food and Rural Development of BiH	50/08
Law on Radiation and Nuclear Safety	88/07
Law on Food	50/04

Environmental Laws in the FBiH

FBiH	
Name of the law	Official Gazette of FBiH No.
Law on Requirements for and Manner of Carrying Out Woodcutting	27/97
■ Law on Amendments and Supplements to the Law on Requirements for and Manner of Carrying Out Woodcutting	25/06
Law on Waters	70/06
Law on Protection against Ionizing Radiation and Radiation Safety	15/99
Law on Veterinary Medicine	46/00
Law on Forestry	20/02
■ Law on Amendments and Supplements to the Law on Forestry	32/03, 37/04
Law on Concessions	40/02
■ Law on Amendments to the Law on Concessions	61/06
Law on Waste Management	33/03
■ Law on Amendments and supplements to the Law on Waste Management	72/09
Law on Air Protection	33/03
■ Law on Amendments and Supplements to the Law on Air Protection	4/10
Law on Environmental Protection	33/03
■ Law on Amendments and Supplements to the Law on Environmental Protection	38/09
Law on Nature Protection	33/03
FbiH Law on the Environmental Protection Fund	33/03
Law on Freshwater Fisheries	64/04
FBiH Law on Inspections	69/05
FbiH Law on Spatial Planning and Land Use	2/06
■ Law on Amendments and Supplements to the FBiH Law on Spatial Planning and Land Use	72/07, 32/08, 4/10, 13/10
Law on Hunting	4/06
■ Law on Amendments and Supplements to the Law on Hunting	8/10
Law on Agriculture	88/07
■ Law on Amendments and Supplements to the Law on Agriculture	4/10
Law on Una National Park	44/08
Law on Agricultural Land	52/09
Law on Geological Research	9/10
Law on Mining	26/10
Law on Noise regulation	110/12

Environmental Laws in the RS

RS	
Name of the law	RS Official Gazette No.
Law on Environmental Protection	71/12
Law on Nature Protection	113/08
Law on Air Protection	124/11

RS	
Law on Waste Management	53/02
■ Law on Amendments and Supplements to the Law on Waste Management	65/08
Law on the Environmental Protection Fund	117/11
Law on Hunting	60/09
Law on Law on Amendments and Supplements to the Law on Concessions	25/02
	91/06, 92/09
Law on National Parks	75/10
Law on Organic Food Production	75/04
■ Law on Amendments and Supplements to the Law on Organic Food Production	71/09
Law on Geological Research	51/04
■ Law on Amendments and Supplements to the Law on Geological Research	75/10
Law on Mining	59/12
Law on Protection against Non-Ionizing Radiation	2/05
Law on Water	50/06
■ Law on Amendments and Supplements to the Law on Water	92/09
Law on Agriculture	70/06
■ Law on Supplements to the Law on Agriculture	20/07
■ Law on Amendments to the Law on Agriculture	86/07
■ Law on Amendments and Supplements to the Law on Agriculture	71/09
Law on Agricultural Land	93/06
■ Law on Supplements to the Law on Agricultural Land	86/07
■ Law on Amendments and Suplements to the Law on Agricultural Land	14/10
RS Law on Veterinary Medicine	42/08
Law on Forestry	75/08
Law on Genetically Modified Organisms	103/08
Law on Animal Protection	111/08
Law on Chemicals	25/09
RS Law on Plant Health protection	25/09
Law on Biocides	37/09
Law on Energy	49/09
Law on Fisheries	72/12
Law on Plant Protection Products	52/10
Law on Beeking	52/10
Law on Spatial Planning and Construction	55/10
Law on National Park “Sutjeska”	121/12
Law on National Park “Kozara”	121/12

Environmental Laws in the BD

BD	
The name of the law	BD Official Gazette No.
Law on Air Protection	25/04
■ Law on Amendments to the Law on Air Protection	19/07
■ Law on Amendments and Supplements to the Law on Air Protection	1/05, 9/09
Law on Nature Protection	24/04
■ Law on Amendments to the Law on Nature Protection	1/05, 19/07

BD	
■ Law on Amendments and Supplements to the Law on Nature Protection	1/05, 9/09
Law on Concessions	41/06
■ Law on Amendments and Supplements to the Law on Concessions	19/07, 2/08
Law on Water Protection in BD	25/04
■ Law on Amendments and Supplements of Law on Water Protection in BD	1/05, 19/07
Law on Spatial Planning and Construction	29/08
Law on Freshwater Fisheries	35/05
■ Law on Amendments and Supplements to the Law on Freshwater Fisheries	19/07
Law on Forestry in BD BiH	14/10
Law on Waste Management	25/04
■ Law on Amendments to the Law on Waste Management	19/07
■ Law on Amendments and Supplements to the Law on Waste Management	1/05, 2/08, 9/09
Law on Environmental Protection	24/04
■ Law on Amendments to the Law on Environmental Protection	19/07
■ Law on Amendments and Supplements to the Law on Environmental Protection	1/05, 9/09
Law on Agricultural Land	32/04
■ Law on Amendments to the Law on Agricultural Land	20/06, 19/07

Environmental Decrees in the FBiH

FBIH	
Decree on Classification of Water Flows	(Official gazette of SR BiH, no. 19/80)
Decree on Categorization of Water flows	(Official gazette of SR BiH, no. 42/67)
Decree on Single Methodology for Preparation of Documents Related to Spatial Planning	63/04
Decree on Hazardous and Harmful Substances in Water Flows	43/07
Decree on Selective Collection, Packaging and Labeling of waste	38/06
Decree on Building Structures and Interventions Important for FBiH and on Building Structures, Actions and Interventions that Can Largely Affect Environment, Life and Health of People in FBiH, for which the Urban Development Permit is Issued by the Federal Ministry of Spatial Planning	85/07
■ Decree on Modifications and Amendments to the Decree on Building Structures and Interventions Important for FBiH and on Building Structures, Actions and Interventions that Can Largely Affect Environment, Life and Health of People in FBiH, for which the Urban Development Permit is Issued by the Federal Ministry of Spatial Planning	29/08
Decree on Types, Composition and Quality of Bio-Fuel in Motor Vehicle Fuels	26/08
Decree on Forests	83/09
Decree on the Type and Contents of Plans for Protection against the Harmful Effects of Water	26/09
■ Decree on Modifications and Amendments to the Decree on Forests	26/10, 38/10
Decree on the Use of Renewable Energy and Cogeneration	36/10
Decree on the Requirements for Dischargin of Waste Water into the Natural Receiving Bodies and the Public Sewage System	4/12

Environmental Decrees in RS

RS	
Decree on Classification and Categorization of Water flows	42/01
Decree on Threshold Limit Values of Air Pollutants Emissions	39/05
Decree on Phasing-OutOzone Depleting Substances	94/05

Decree on Projects Subject to EIA and Criteria for Deciding on Obligatory Assessment and Extent of the EIA	7/06
Decree on Plants and Facilities the Construction and Operation of Requires a Valid Environmental Permit	7/06
Decree on Forest	83/09
■ Decree on Amendments and Supplements	26/10, 38/10
Decree on the Use of Renewable Energy and Cogeneration	36/10

Multilateral environmental contracts that BiH ratified upon succession

MULTILATERAL ENVIRONMENTAL CONTRACTS	PLACE AND DATE OF ADOPTION	RATIFICATION DATE (upon succession)
Convention on Wetlands of International Importance Especially as Waterfowl Habitat	Ramsar, 1971	March 1, 1992
Convention on Long-range Transboundary Air Pollution	Geneva, 1979	September 1, 1993
■ Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)	Geneva, 1984	September 1, 1993
Convention on International Maritime Organizations	Geneva, 1948	July 16, 1993
Convention on International Civil Aviation, annex 16 – aircraft noise	Chicago, 1944	January 13, 1993
Convention on Ozone Protection	Vienna, 1985	September 1, 1993
■ Protocol on Substances that Deplete the Ozone Layer	Montreal, 1987	September 1, 1993
■ Amendments to Montreal protocol agreed by the parties at the second meeting	London, 1990	August 11, 2003
■ Amendments to Montreal protocol agreed by the parties at the fourth meeting	Copenhagen, 1992	August 11, 2003
■ Amendments to Montreal protocol agreed by the parties at the ninth meeting	Montreal, 1997	August 11, 2003
■ Amendments to Montreal protocol agreed by the parties at the eleventh meeting	Beijing, 1999	Not adopted
UN Convention on the Law of the Sea	Montego Bay, 1982	January 12, 1994
Convention for the Protection of the Mediterranean Sea Against Pollution	Barcelona, 1976	March 1, 1992
■ Protocol for the prevention of pollution of the Mediterranean Sea by dumping from ships and aircraft.	Barcelona, 1976	March 1, 1992
■ Protocol concerning cooperation in combating pollution of the Mediterranean Sea by oil and other harmful substances in cases of emergency.	Kuwait, 1978	March 1, 1992
■ Protocol for the protection of the Mediterranean Sea against pollution from land-based sources. (LBS)	Athens, 1980	October 22, 1994
■ Protocol concerning Mediterranean specially protected areas.	Geneva, 1982	October 22, 1994
■ Protocol concerning specially protected areas and biological diversity in the Mediterranean	Barcelona, 1995	December 12, 1999
Convention onProtection of the World Cultural and Natural Heritage	Paris, 1972	July 12, 1993
Convention Concerning the Use of White Lead in Painting	Geneva, 1921	June 2, 1993
European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)	Geneva, 1957	September 1, 1993
■ Protocol Amending Article 14 of the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)	New York, 1975	September 1, 1993
Convention on the Physical Protection of Nuclear Material	Vienna, 1979	June 30, 1998
Convention on Fishing and Conservation of Living Resources of the High Seas	Geneva, 1958	January 12, 1994

MULTILATERAL ENVIRONMENTAL CONTRACTS	PLACE AND DATE OF ADOPTION	RATIFICATION DATE (upon succession)
Convention on the Territorial Sea and the Contiguous Zone	Geneva, 1958	September 1, 1993
Convention on Continental Shelf	Geneva, 1958	January 12, 1994
Convention on the High Seas	Geneva, 1958	September 1, 1993
Convention on Protection of Employees against Occupational Hazards in the Working Environment Due to Air Pollution, Noise and Vibration	Geneva, 1977	June 2, 1993
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.	London, Moscow, Washington D.C., 1971	August 15, 1994
Treaty on the Non-proliferation of Nuclear Weapons	New York, 1968	August 15, 1994
Convention on Early Notification of a Nuclear Accident	Vienna, 1986	June 30, 1998
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	Vienna, 1986	June 30, 1998
Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction	London, Moscow, Washington D.C., 1972	August 15, 1994

Source: *UN Environment Programme, Desk Review of the Legal and Institutional Framework of Environmental Protection in BiH, 2011*

Multilateral environmental contracts ratified in BiH

MULTILATERAL ENVIRONMENTAL CONTRACTS	PLACE AND DATE OF ADOPTION	RATIFICATION DATE IN BiH
UN Framework Convention on Climate Change	Rio de Janeiro, 1992	2000
■ Kyoto Protocol	Kyoto, 1997	2007
International Convention on Plant Protection	Rome, 1951	2003
Convention on Control of Transboundary Movements of Hazardous Wastes and Their Disposal	Basel, 1989	2001
UN Convention on Biological Diversity	Rio de Janeiro, 1992	2002
■ Cartagena Protocol on Biosafety	Cartagena, 2000	2009
UN Convention on Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	Paris, 1994	2002
Convention on co-operation for the protection and sustainable use of the Danube river	Sofia, 1994	2005
Convention for the Establishment of the European and Mediterranean Plant Protection Organization	Paris, 1955	2005
UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters	Aarhus, 1998	2008
■ Protocol on Pollutant Release and Transfer Registers (PRTR)	Kiev, 2003	2003
Convention on Persistent Organic Pollutants	Stockholm, 2001	2010
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Washington DC, 1973	2009
Convention on Environmental Impact Assessment in Transboundary Context	Espoo, 1991	2009
Protocol on Strategic Environmental Assessment	Kiev, 2003	2003
Convention on the Conservation of European Wildlife and Natural Habitats	Bern, 1979	2008
Framework Agreement on the Sava River Basin	Kranjska Gora, 2002	2003
Convention on the Protection and Use of Transboundary Watercourses and International Lakes	Helsinki, 1992	2009
■ Changes to Articles 25 and 26 of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes	Madrid, 2003	2010
Convention on the Transboundary Effects of Industrial Accidents	Helsinki, 1992	Not adopted

MULTILATERAL ENVIRONMENTAL CONTRACTS	PLACE AND DATE OF ADOPTION	RATIFICATION DATE IN BiH
■ Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and to the 1992 Convention on the Transboundary Effects of Industrial Accidents	Kiev, 2003	2003
Council of Europe Framework Convention on the Value of Cultural Heritage for Society	Faro, 2005	2009
Agreement on Energy Charter	Lisbon, 1994	2001
■ Energy Charter – Protocol on Energy Efficiency and Related Environmental Aspects	Lisbon, 1994	2001
Convention on Safety and Health in Mines	Geneva, 1995	2010
Convention on Safety and Health in Agriculture	Geneva, 2001	2010
Convention Concerning Work in the Fishing Sector	Geneva, 2007	2010
Convention Concerning the Prevention of Major Industrial Accidents	Geneva, 1993	2010
The European Landscape Convention	Florence, 2000	2010
Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction	Oslo, 1997	1998
Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Rotterdam, 1998	2007
Convention on International Trade in Endangered Species of Wild Fauna and Flora	Washington DC, 1973	2009
■ Amendment to Convention on International Trade in Endangered Species of Wild Fauna and Flora (Article XI)	Bonn, 1979	2009
European Framework Convention on Transboundary Cooperation between Territorial Communities or Authorities	Madrid, 1980	2008
Convention Concerning International Carriage of Goods by Rail	Bern, 1980	1996

***Source**: UN Environment Programme, Desk Review of the Legal and Institutional Framework of Environmental Protection in BiH, 2011*

Timeline of BiH integration into EU (Directorate for European Integration, 2011)

Improvement	Year
Relations between BiH and the European Union start developing through international recognition of BiH as an independent, sovereign state	1992
The Dayton/Paris Peace Agreement brought the war to an end.	1995
Regional Approach. The EU Council of Ministers establishes political and economic conditions for development of bilateral relations. BiH is granted autonomous trade preferences and from 1996, assistance under the Phare and Obnova programmes.	1997
EU Declaration. Establishment of the EU/BiH Consultative Task Force (CTF), a joint vehicle for technical and expert advice in the field of administration, the regulatory framework and policies.	1998
Stabilisation and Association Process (SAP). The SAP offers a clear prospect of integration into EU structures to BiH and another four countries of the region.	1999
Agreement reached on the Stability Pact, a political document with the strategic goal of stabilization in South-East Europe through bringing the countries in the region closer to Euro-Atlantic integration and through strengthening of regional cooperation.	1999
Publication of the EU Road Map. This document sets out 18 essential steps to be undertaken by BiH before work on a Feasibility Study for the opening of negotiations on a Stabilisation and Association Agreement could be started.	2000
The Council of Europe adopts Regulation 2666/2000, on Community Assistance for Reconstruction, Development and Stabilization (CARDS), designed for the SAP countries: Albania, BiH, Croatia, Macedonia, Serbia and Montenegro.	2000
Feira European Council stated that all the countries covered by the SAP are potential candidates for EU membership. Extension of duty-free access to EU market for products from BiH	2000
Adoption of the Country Strategy Paper for the period 2002 to 2006.	2001
The European Commission announces that most of the guidelines in the EU Road Map have been fulfilled.	2002
The European Commission adopts a proposition of the Report on the readiness of BiH for initiation of negotiations with the European Union on the Stabilization and Association Agreement.	2003
The first European Partnership for BiH.	2004

Improvement	Year
Negotiations on the Stabilization and Association Agreement have officially started in Sarajevo on November 25.	2005
First meeting of the Reform Process Monitoring (RPM), which replaced the Consultative Task Force	2006
Introduction of the Instrument for Pre-Accession Assistance (IPA), designed for all pre-accession activities and financed by the European Commission.	2007
Technical negotiations on the SAA finalized. SAA initialed on December 4.	2007
Framework Agreement on Rules of Cooperation in the Implementation of Financial Assistance from the European Commission to BiH within the IPA.	2008
Stabilization and Association Agreement signed on June 16. Interim Agreement comes into effect in July.	2008
2009-2011 Multi-Annual Indicative Planning Document (MIPD) for BiH was adopted	2009
The European Commission allocated to the country a total of € 89.1 million under the 2009 Instrument for Pre-accession Assistance (IPA) programme	2009
BiH joined its first Community programme - the 7th Framework Programme for research, technological development and demonstration activities (FP7).	2009
BiH undertakes the implementation of the Roadmap for the Visa Liberalisation	2010
Council decides on lifting short-stay visa for travel to Schengen countries	2010

Projects in the field of environment in BiH that are directly financed from IPA

Project title	Period	Million Euros
Support to BiH water policy	2008-2010	1.0
Support in implementation of IPPC directive	2008-2010	1.5
Construction of waste water treatment plant in Živinice	2008-2011	1.5
Strengthening of BiH environmental institutions and preparation for pre-accession funds and support to environmental infrastructure development	2008-2011	4.0
Rehabilitation and construction of water supply and sewage collection infrastructure in BiH	2008-2011	16.5
Rehabilitation and construction of water supply infrastructure, waste water treatment plant and solid waste disposal plant	2010-2014	40.0

Source: *BiH Ministry of Finance and Treasury: Report on donor list 2009-2010*

Main projects in the sector of agriculture and forestry in 2009-2010

Project title	Donor/financial institution	Project value (million Euros)
Konzum BiH (loan)	EBRD	25
Project in the field of agricultural and rural development	World Bank/Sweden/SIDA	19.07
Developmental interventions for fast improvement on the market – FIRMA (grant)	Sweden/SIDA, SAD/USAID	11.50
Project of market agriculture development – FARMA (grant)	Sweden/SIDA, SAD/USAID	10.01
Project of small commercial agriculture development (loan)	World Bank	9.22
Project of development and conservation of forests (loan)	World Bank	5.30
Combating brucellosis (loan)	Sweden/SIDA	2.50
Swiss project in the field of agriculture in Mostar region (SPPOM) (grant)	Switzerland/SDC/SECO	2.49
Bimal (loan)	EBRD	2.40
Development of agriculture (grant)	Norway	2.40
VF Komerc (loan)	EBRD	1.30
Strengthening and adjusting of information system of agricultural and rural sector in BiH (grant)	EC	1.28

Project of confidence building through development of agricultural and rural businesses in Srebrenica Municipality (grant)	Japan/JICA	1.13
Protection and valorization of high-quality traditional products from Herzegovina (grant)	Italy/Italian cooperation	1.10
Pilot activities in the field of integrated rural development and land revitalization in BiH (grant)	Italy/Italian cooperation	0.95
Reviving the valley: integrated activities in the field of organic food production, sustainable tourism and socio-economic participation in the valley of the river Una (grant)	Italy/Italian cooperation	0.55

Source: *BiH Ministry of Finance and Treasury: Report on donor list 2009-2010*

Main projects in environmental protection sector in 2009-2010

Project title	Donor/financial institutions	Project value (million Euros)
Rehabilitation and Construction of water supply and waste infrastructure in FBiH (grant)	EC	12.0
Program of solid communal waste management	Sweden/SIDA	10.0
Global Environmental Fund (GEF) – water quality protection	World Bank	6.32
Global Environmental Fund (GEF) – project of managing of the Neretva and the Trebišnjica waters	World Bank	4.24
Strengthening environmental management: connecting local and national activities in (pending)	UNDP	4.26
Ensuring access to water through institutional development (financed by MDG-F)	UNDP	3.05
Global Environmental Fund (GEF) – Protected forest and mountain areas	World Bank	2.40
Capacity strengthening in BiH in the field of environmental problem solving through solving of “crisis points”	Netherlands	1.57
Biological diversity and water management	Norway	1.32
Construction of waste water treatment plant in Živinice	EC	1.29
Support to creation and promotion of environmental and sustainable tourism plans in BiH	Italy/Italian cooperation	1.18
Support to implementation of EU Directive on integrated prevention and control of pollution (grant for technical assistance and equipment procurement)	EC	1.20
Support to implementation of work policy in the field of water management in BiH (grant for technical assistance)	EC	1.0
BiH Biomass Energy for Employment and Energy Security	GEF/UNDP	0.73
Mainstreaming Karst Peatlands Conservation Concerns into Key Economic Sectors	GEF/UNDP	0.73
Management system for industrial waste that is equal with communal waste	Italy/Italian cooperation	0.28

Source*: BiH Ministry of Finance and Treasury: Report on donor list 2009-2010*

Projects financed by the Environmental Protection Fund of FBiH in the period 2012-2012

Area	Total value of projects (in millions BAM)
Wastewater Management	18,182,400.00
Protection of water and water resources	11,091,847.55
Regulation of watercourses	3,276,864.25
Water supply projects	2,978,000.00
Reduction of emissions from traffic	250,000.00
Improvement, protection and monitoring of air quality	2,505,000.00
Scientific research and public awareness raising	1,449,000.00

Emergency funds	400,000.00
TOTAL	40,133,111.80

Network of stations for air quality monitoring in BiH

Institutions	Stations			Measured parameters
	Number	Type	Location	
Federal Hydro-Meteorological Institute BiH	2	Automatic	Sarajevo Ivan Sedlo	SO_2, CO, NO_x, O_3, PM_{10}
FBiH Environmental Protection Directorate of Tuzla canton	6	Automatic	Tuzla	SO_2, CO, NO_x particles, O_3, NMVOC and $PM_{2.5}$
FBiH Metallurgy Institute Zenica	1	Manual	Zenica	SO_2, particles, NO_x
FBiH Cantonal Public Health Institute Zenica	2	Automatic	Zenica	SO_2, CO, particles, NO_x
FBiH Cantonal Public Health Institute Sarajevo	8	5 manual 3 automatic (3 fixed and 1 mobile)	Sarajevo	SO_2, black smoke, CO, particles, NO_x
FBiH Cantonal Public Health Institute Mostar	1	Manual	Mostar	SO_2, black smoke
Republic Hydro-Meteorological Institute RS	1	Automatic	Banja Luka	SO_2, CO, NO_x, O_3, PM_{10}
Institute of Protection, Ecology and Informatics RS	14	Manual	Banja Luka, Gradiška and other municipalities	SO_2, black smoke
Government of BD	3	Automatic	BD	SO_2, CO, NO_x, particles, black smoke
Cement factory Kakanj	1	Automatic	Kakanj	SO_2, CO, NO_x, particles
Elektrodistribucija BiH	2	Automatic	Kakanj, Tuzla	SO_2, CO, NO_x, particles
Elektrodistribucija RS	2	Automatic	Ugljevik, Gacko	SO_2, CO, NO_x, particles
Pharmaceutical company “Bosnalijek” (through subcontracting with the company Dvokut)	1	Automatic	Sarajevo	SO_2, CO, NO_x, particles

Source: *UN Economic Commission for Europe: State of Environment Review in BiH Second Report, 2011*

Main environmental NGOs activities in 2006

Three main funding sources	**Quota (%)**
Grants or donations from local government/public sector	70%
Grants and donations from international institutions	52%
Membership	50%
Five priority areas that environmental NGOs work in	**Quota (%)**
Education in environmental protection	92%
Nature conservation	82%
Waste management	78%
Sustainable development	61%
Legal regulations on environmental protection	58%
Three main activities of environmental NGOs	**Quota (%)**

Raising public awareness of environment	93.2%
Conferences, meetings	73.9%
Public participation	72.7%

Source: REC BiH: NGO Directory –BiH,2006

Media in BiH

Media source	Press	Television	Radio	News agency
Title	Oslobođenje Dnevni avaz Nezavisne novine Glas Srpske Dnevni list Dani Slobodna Bosna Novi reporter Fondeko Svijet	TV BiH Federacija TV (FTV) RSTV (RTRS) Hayat mreža Plus OBN Pink BiH	Radio BiH Radio FBiH RS Radio (RTRS) Radio Herceg Bosna Bosanska Radio Mreža (BORAM) BM Radio - Radio Stari Grad (RSG)	Fena SRNA Onasa

ANNEX II
Effects of air pollution on the health, environment and climate

Effects of air pollution on health, environment and climate		
Pollutant	**Effects on health**	Effects on environment and climate
Ground ozone (O_3)	Decreases lung function and causes respiratory symptoms like cough and feeling of shortness of breath, worsens asthma and other respiratory conditions increasing the use of medications, hospitalizations, emergency room visits and early death.	Causes visible damage to vegetation, decreases photosynthesis, harmful to reproduction and growth, decreases the yield. Plant damage from the ground ozone may change ecosystem structure, decrease biological diversity and CO_2absorption capacity of plants.Ground ozone is a greenhouse gas that contributes to the heating of atmosphere.
Particulate matter (PM)	Short-term exposition may worsen heart or lung disease and cause symptoms, increase the use of medications, visits to the ER, and early death. Long-term exposition may cause heart and lung disease and early death.	Decreases visibility, harmful for processes in ecosystem, causes damage and/or dirtying of objects and property. Climate impacts are different depending on the particle type. Majority of particles are reflective and have net effect of cooling, while others (especially different forms of carbon, “dirty carbon”) absorb the energy and cause heating. Other effects include the change of time and location of typical raining patterns.
Lead (Pb)	Damages the nervous system in development, causing lower IQ and affects learning, memory and behavior in children. In adults affects heart and kidneys and causes anemia.	Harmful for plants and natural world, accumulates in the soil and contaminates land and water systems.
Sulfur oxides (SOx)	Worsens asthma, causes breathing difficulties, chest tightness and feeling of short breath, increases the use of medication, hospitalization, emergency room visits, and very high levels may cause respiratory symptoms in persons with no lung disease.	Contributes to soil and surface waters acidification, and to mercury methylation in wetlands. Causes damage to vegetation and the loss of local species in water and land systems. Contributes to formation of particles with other effects on environment. Sulphate particles cause cooling of the atmosphere.
Nitrogen oxides (NOx)	Worsens lung diseases and causes respiratory symptoms, hospitalizations, emergency room visits. Increases susceptibility to respiratory infections.	Contributes to soil acidification and enriching the soil and surface waters in nutrients (eutrophication, nitrogen saturation). Causes decrease in biological diversity. Affects levels of ozone, particles and methane, with consequences to environment and climate.
Carbon monoxide (CO)	Decreases the amount of oxygen that reaches organs and tissues; worsens heart disease, causes chest pain and other symptoms, thus increasing the number of hospitalizations and emergency room visits.	Contributes to formation of CO_2 and ozone, greenhouse gases that heat the atmosphere.
Ammonia (NH3)	Contributes to particle formation with all effects to health.	Contributes to eutrophication of surface waters and contamination of groundwater with nutrients. Contributes to formation of nitrogen and sulphate particles with all the effects on environment and climate.
Volatile organic compounds (VOCs)	Some toxic air pollutants cause cancer and serious health problems. Contributes to ozone forming with all the effects to health.	Contributes to ozone forming with all the effects to environment and climate. Contributes to forming of CO_2 and ozone, greenhouse gases that heat the atmosphere.
Mercury (Hg)	Causes the damage to liver, kidneys and brain, as well as neurological damage in development.	Precipitates in rivers, lakes and oceans where gets accumulated in fish and causes humans and animals exposing to it.
Other toxic air pollutants	Causes cancer, damage to immune system, neurological, reproductive, developmental, respiratory and other health problems. Some toxic pollutants contributes to pollution that is caused by ozone and particles with all the effects on health.	Harmful for natural world and cattle. Some toxic air pollutants accumulate in the food chain, some contribute to pollution caused by ozone and particles, with all effects on environment and climate.

ANNEX III
Availability and sources of indicators and data

Data/indicator type	Data source
Demography and population	
Number of citizens in BiH according to the 1991 census and according to estimates for the period 1996-2010 Population estimate in BiH in 2009 according to age groups and gender ratio Total fertility rate Work force	Agency for Statistics of BiH
Urban and rural areas	Grujić, L.: Okoliš u Bosni i Hercegovini 2002; Center for civil society promotion; Sarajevo; 2002
Poverty Consumption in household Consumption in household by months Poor households in BiH according to geographic areas Poverty extent in BiH according to the gender of household head Poverty rate according to general poverty line	Agency for Statistics of BiH (Federal Office of Statistics, Republika Srpska Institute of Statistics)
Economic review and the latest trends	
Nominal GDP per capita GDP in BiH for the period 2005-2010 according to current prices GDP per capita in BiH for the period 2005-2010 Value added to basic prices per branches, 2005 - 2010 Consumer price index according to COICOP classification in BiH Consumer price index in BiH according to COICOP classification in 2010 Employees by sectors	Agency for Statistics of BiH
External debt of Government sector External debt of Government sector as GDP percentage	Central Bank of BiH
Agriculture	
Percentage of state covered by agricultural land	MOFTER BiH - report on agriculture, see references References: The First National Report on the Implementation of the UN Convention to Combat Desertification /Land Degradation (UNCCD) in BiH, 2007
Crops Percentage of crops Cereals and vegetables Industrial crops and seedlings Organic production Livestock and poultry	Agency for Statistics of BiH BiH Ministry of Foreign Trade and Economic Relations - report on agriculture, see references
Greenhouse gas emissions from agriculture	Agency for Statistics of BiH
Water consumption for irrigation Irrigated land State of the irrigation systems Potential areas for irrigation	References: UN Economic Commission for Europe (2004) The First National Report on the Implementation of the UN Convention to Combat Desertification /Land Degradation (UNCCD) in BiH, 2007
Industry	
Regular industrial production in BiH from 2005 to 2009	Agency for Statistics of BiH
Data on pollution emission from industry at the state level from 1990	References: Initial National Communication of BiH under the UN Framework Convention on Climate Change (UNFCCC), 2009

Data/indicator type	Data source
Electricity consumption in industry in 2009 Heating consumption in industry in 2009 Industry share in consumption of natural gas in 2009 Industry share in consumption of coal in 2009	Agency for Statistics of BiH
Number of organizations holding ISO 14001 certificate	Institute of standards of BiH
Energy	
Assessment of hydro potential and coal reserves balance	References: Federal Ministry of Energy, Mining and Industry (2009)
Total primary consumption (TPES - Total Primary Energy Supply)	References: Initial National Communication of BiH within the UN Framework Convention on Climate Change (UNFCCC), 2009.
CSI 027 Final energy consumption by sectors	European Environmental Agency
Final consumption of electricity and thermal energy in 2008, 2009 and 2010	Agency for Statistics of BiH
Energy consumption by the unit of GDP in 1991	Ministry of Foreign Trade and Economic Relations of BiH
CSI 028 Total energy intensity CSI 029 Total energy consumption by energy-generating product CSI 030 Renewable energy consumption	European Environmental Agency
Energy consumption from renewable sources by energy source in BiH, 2006-2008 (%)	SYNENERGY project, CRES 2010
Gross production of electricity in BiH	Agency for Statistics of BiH
Production and consumption of electricity	Independent system operator in BiH, see the references
Total installed capacities of hydropower plants in BiH	References: Strategic plan and program of energy sector development in FBiH, Sarajevo, 2009.
Potential of renewable energy in BiH	References: Uščuplić M. (2007)
CSI 031 Electricity from renewable sources	Agency for Statistics of BiH
Fishery	
CSI 031 - Production in aquaculture Production of consumed fish Number and structure of fish farms	Agency for Statistics of BiH
Mining and production	
Coal mines – waste disposal and treatment Environmental aspect of mining activities	Federal Ministry of Energy, Mining and Industry
Coal production in BiH Production of waste in coal mines	References: Study of energy sector in BiH - Module 13 (Environment), Module 8 (Coal mines), 2008;
Metal and nonmetal mines of in FBiH	Mining Institute Tuzla, Prefeasibility study of construction of thermal power plants Stanari, Kongora and Bugojno
Coal production in FBiH	Federal Ministry of Energy, Mining and Industry
Transport and infrastructure	

Data/indicator type	Data source
Road traffic Annual number of passengers in road and railroad traffic Amount of goods transported in road and rail traffic Fuel consumption Number of registered motor vehicles Ecological characteristics of registered motor vehicles Registered motor vehicles and their structure The length of railway and road infrastructure Annual number of traffic accidents Annual number of passengers in air traffic	Agency for Statistics of BiH
Water transport and infrastructure	Ministry of Communications and Transport of BiH
Tourism and recreation	
Number of tourist arrivals	Agency for Statistics of BiH
Total amount of snow for the winter season (December-February) – meteorological station Sokolac	Republic Hydrometeorological Service of RS
Number of tourist nights Tourist nights by months Tourist nights by native country	Agency for Statistics of BiH
Spatial and town planning	
Demography (population density, rural vs. town population) Households in BiH	Agency for Statistics of BiH (Federal Office of Statistics, Republika Srpska Institute of Statistics)
Main housing units by building type and geographic area Number of rooms and average area of the main housing unit	Agency for Statistics of BiH
Forest resources	
Forest cover in BiH	References: National Environmental Action Plan (NEAP) BiH
Growing stock Wood harvesting Forest exploiting Cutting by the main types of trees Afforestation	Agency for Statistics of BiH; Federal Ministry of Environment and Tourism; Republika Srpska Institute of Statistics; FBiH Ministry of Agriculture, Water-management and Forestry References: US Agency for International Development (2006)
Soil and land resources	
Land area by land use categories Physical loss of soil Land destruction caused by exploatation of raw materials Landfills Soil reclamation Amelioration of soil that has been degraded by surface ore exploitation Recultivation of fly ash disposal area Recultivation of municipal waste	References: The First National Report on the Implementation of the UN Convention to Combat Desertification /Land Degradation (UNCCD) in BiH, 2007 Resulović, H. (1983) National Environmental Action Plan (NEAP) BiH Ćustović, H. (2005)
Land structure Structure of urbanized land Artificial surfaces Change in land use	European Environmental Agency: Corine land cover mapping 2006 (BiH), CLC2006 References: Taletović et al. (2011)
Land ownership structure	Agency for Statistics of BiH References: National Environmental Action Plan (NEAP) BiH

Data/indicator type	Data source
Erosion, landslides and deforestation Soil bonitation classification	References: The First National Report on the Implementation of the UN Convention to Combat Desertification /Land Degradation (UNCCD) in BiH, 2007
Land types and soil quality	References: Čustović, H. (2005) Inventory of post-war situation of land resources in BiH (FAO GCP/BIH/002/ITA)
Surface and groundwater resources	
Public water supply Abstracted water amount Total amount of water Sources and users of water Utilization of water in industry	Agency for Statistics of BiH; Federal Office of Statistics; Republika Srpska Institute of Statistics
Number of examined profiles/water bodies for waterflows	Water Agency
CSI 024 Urban waste water treatment Total length of sewage network and number of sewage connections Waste water quantities2003-2009 Waste water quantities: total and treated Status of constructed and planned facilities for treatment of urban waste water in BiH	Agency for Statistics of BiH; European Environmental Agency, Eionet – Wise database for BiH
CSI 019 –Oxygen consuming substances in rivers CSI 020 - Nutrients in freshwater	Sava River Basin District Agency – Sarajevo; Adriatic Sea River Basin District Agency - Mostar; Water Agency for Sava River District – Bijeljina; Water Agency for Trebišnjica River District – Trebinje; European Environmental Agency, Eionet –Wise database for BiH
CSI 022 Bathing water quality	Adriatic Sea River Basin District Agency - Mostar; European Environmental Agency, Eionet –Wise database for BiH
Mineral resources	
Coal deposits Coal reserves	References: Study of energy sector in BiH - Module 13 (Environment), Module 8 (Coal mines), 2008; Kurtanović (2000)
Metallic ore deposits	References: Mining Institute Tuzla (1980); Geoinžinjering Sarajevo (1979); Kurtanović (2000)
Non-metallic ore deposits	References: Kurtanović (2000); Hrustić (2009)
Stone deposits	References: Trubelja and Hrvatović (2004)

Data/indicator type	Data source
Assessment of geothermal potentials	References: Milivojević, Martinović (2005); Čićić and Miošić (1986); Study of energetic sector in BiH, Module 12 - Managing consumption, energy savings and renewable energy sources, 2008.
Biological and landscape diversity	
CSI 008 – Designation of protected areas	Official web pages of protected areas and parks References: Federal Ministry of Environment and Tourism, publications National Environmental Action Plan(NEAP) BiH
Diversity of flora and fauna (partial data) Landscape diversity Pressure and risks to biological and landscape diversity Endangered and protected species Protected areas Ramsar areas	References: UNECE: Review of the state of environment, 2004.and 2010; Entities' strategic documents on environmental protection; Fourth Report of BiH to UN Convention on Biological Diversity 2010; National assessment of biological diversity aims
Air pollution and ozone damage	
Average annual concentrations of SO_2 and smoke in Sarajevo Average annual concentrations of SO_2, NO, NO_2, NO_x, O_3 in Sarajevo. Average annual concentrations of SO_2 and smoke in Tuzla Percentage of acid precipitation in Sarajevo Annual absorbed dose of ionizing radiation	Federal Hydrometeorological Institute of BiH
Exposition of citizens to SO_2 and NO_2 in BiH	Federal Hydrometeorological Institute of BiH
Average annual concentrations of SO_2, NO, NO_2, NO_x, CO, O_3 and PM_{10} in Banja Luka Percentage of acid rains in Banja Luka	Republic Hydrometeorological Service of RS
CSI 002 - Emissions of ozone precursors in 1990 and 2004	European Environmental Agency
Emissions of ozone precursors in 1990 and 2004.	Federal Ministry of Environment and Tourism
CSI 006 - Consumption of ODS in BiH, 1995-2008	Ministry of Foreign Trade and Economic Relations BiH (Ozone unit)
Climate change	
Trends in number of summer days (>25 C) and cold and heat waves	European Climate Assessment Programme; Inter-governmental panel on climate change (IPCC), Fourth Report on Assessment, 2007.
Spatial distribution of annual increase/decrease in amount of rain in the last decade	References: Initial National Communication of BiH in accordance with the United Nations Framework Convention on Climate Change, 2009

Data/indicator type	Data source
Average annual temperature in Sarajevo 1888-2008 Average annual temperature in Banja Luka 1949-2010 Average annual temperatures Temperature thresholds Lasting of vegetative period	Federal Hydrometeorological Institute of BiH; Republic Hydrometeorological Service of RS ;
Emissions and removal of greenhouse gases - partly available (CSI 010) Trends of greenhouse gas emissions (CSI 010) Projections of greenhouse gas emissions, policies and measures (CSI 011) - partly available Anthropogenic emissions - concentrations of greenhouse gases in atmosphere in 1990 and 2004 (CSI 013)	Federal Hydrometeorological Institute of BiH; References: UNECE (2011)
Snow cover (CLIM 008) - Number of days annually with snow cover of 10cm and higher in Sarajevo	Federal Hydrometeorological Institute of BiH
Snow cover (CLIM 008) - Number of days annually with snow cover of 10cm and higher in Banja Luka	Republic Hydrometeorological Service of RS ;
Waste and waste management	
CSI 016 – Municipal waste generation	Agency for Statistics of BiH References: European Environmental Agency - CSI 016 Municipal Waste Generation, 2010
Collection of municipal waste and level of service coverage (MCSD- 109- R) P	Agency for Statistics of BiH
Municipal waste treatment	References: Federal Ministry of Environment and Tourism (2008)
Number of regional landfills	Federal Office of Statistics; Republika Srpska Institute of Statistics; References: Development strategy of BD 2008-2017
Number of illegal dumpsites	Environmental Protection Fund of RS References: Federal Ministry of Environment and Tourism (2011)
Degree of regional sanitary landfills establishment	Enova d.o.o. research
CSI 017 – Generation and recycling of packaging waste	Authors' estimates based on available data
Non-hazardous production waste	Agency for Statistics of BiH
Hazardous production waste	Agency for Statistics of BiH
Medical waste	Estimate based on average production of waste in health facilities References: Cheng et al. (2009) Federal Ministry of Environment and Tourism (2011)

Data/indicator type	Data source
Special categories of waste	Estimate based on available data Agency for Statistics of BiH; References: European Commission (2006) Federal Ministry of Spatial Planning and Environment (2006) World Bank (2006) International Finance Corporation (2008)
Transboundary movement of dangerous waste	Agency for Statistics of BiH
Environmental safety and human health	
Wildfires	Agency for Statistics of BiH
Floods Earthquakes	Federal Hydrometeorological Institute of BiH, Center for seismology References: UNECE (2004) Balkans project, 1972.
Landslides	Federal Institute for Geology; Federal Hydrometeorological Institute of BiH; Construction Institute of Canton Sarajevo References: BiH Council of Ministers (2011)
Mines	BHMAC, 2011
Diseases transmitted by water Diseases transmitted by vectors Tuberculosis	World Health Organization, Country data for BiH EUFOR Communicable diseases bulletin based on data from bulletins of Institute for Public Health of FBiH and Public Health Institute of RS
Contaminants in food Potable water safety Diseases transmitted by food	Food Safety Agency of BiH

ANNEX IV
Environmental indicators partially or completely missing

Area or Sector	Environmental Indicators
Energy	■ Timely reports on CSI indicators (CSI 027 Final consumption of energy by sector, CSI 028 Total energy intensity, CSI 029 Primary consumption of energy by fuels, CSI 030 Primary consumption of renewable energy, CSI 031 electricity from renewable sources) ■ Net energy import dependency (ENER 012) ■ Energy efficacy and consumption in the transport sector (ENER 023) ■ Energy efficacy and consumption in the household sector (ENER 022) ■ Energy intensity in the service sector ■ Energy-related emissions of particulate matter (ENER 007) ■ Energy-related emissions of acidifying substances (ENER 006) ■ Energy-related emissions of ozone precursors (EN 05) ■ CO_2 emissions in production of electricity ■ Absolute and relative consumption of energy according to the GDP
Industry	■ Atmospheric emissions from industry ■ Energy consumption of industry ■ Total material requirement ■ Number of industrial companies engaged in Environment Management System ■ Eco-efficiency in industry ■ Progress in management and remediation of contaminated locations
Mining	■ Information on metal and non-metal mines in the RS including mineral resources ■ Information on inspections in the RS ■ Environmental data on the mines
Agriculture	■ Annual average of conversion of land to agricultural land ■ Consumption and composition of fertilizers / pesticides ■ Ratio of nitrogen representation ■ Environmental efficiency ■ Emissions caused by agricultural activities ■ Primary types of energy consumption in agriculture
Fishery and aquaculture	■ CSI 033 – Aquaculture production (total and by types) in the whole state ■ CSI 034 – Fishing fleet capacity ■ Status of marine fish stocks – important for Neum for the purpose of planning sustainable fishery ■ Aquaculture caught in adjacent waters ■ Eco-Efficiency in fishing ■ Impact of production on freshwater and marine eco-systems ■ Amount of fish food used ■ Consumption of imported vs. domestic products
Transport and infrastructurea	There is no statistical monitoring of the state of the environment in the transport sector of BiH, as, for example, pollution of air, water and soil due to transport. Data on impacts of transport sector on the environment are only approximate assessments.
Tourism and recreation	■ Amount of waste generated due to tourism ■ Number of visitors in protected areas ■ Urban waste generation due to tourism ■ Environmental efficacy of tourism ■ Tourist arrivals and electricity consumption of public accommodations ■ Total number of employees in the tourism sector or revenues generated from tourism ■ Effect of climate changes on tourism in BiH
Spatial planning and urbanism	Given that BiH needs to conduct population census, the existing data from these sources are out-of-date, particularly those related to demography, households and housing fund.
Waste management	■ Generation of packaging waste (CSI 017) ■ Generation of medical waste ■ Generation of special waste categories – accurate data

Forest resources	Data on illegal logging Agreeing on methodology for collection of data in both entities would, to a great extent, make easier compiling and presentation of data at a state level, which is, in most cases, requirement of international conventions and of the EU in terms of monitoring and reporting.
Land and soil resources	■ Soil re-cultivation ■ Soil affected by desertification/degradation ■ Changes of land use ■ Soil sensitivity ■ Soil acidity ■ Gross soil nutrient balance ■ Nitrogen balance (e.g. kg of nitrogen to one hectare of land) ■ Contamination of soil by heavy metals and other chemical agents ■ Soil compaction ■ Healthy state of soil
Surface and groundwater resources	■ Consumption of water in households per capita ■ Water fee collection rate ■ Number and frequency of combined sewerage systems in city areas ■ Utilization of recycled water ■ Level of sedimentation in water streams ■ Contaminated sediments ■ Irrigation for the needs of agriculture ■ Estimates of economic losses due to floods and draughts ■ Public investments into protection from floods ■ Nutrients in transitional, coastal and sea waters (CSI 021), trends in concentrations of nitrates and phosphorus in winter months and N/P ratio in the Adriatic Sea in BiH ■ Chlorophyll in transitional, coastal and sea waters (CSI 023) – mean surface concentration of chlorophyll during summer months (mg/L) in the Adriatic Sea in BiH ■ Gross balance of nutrients (CSI 025) – (a) quantity of nitrogen that is taken in through mineral fertilizers and manure, as well as nitrogen fixation of leguminosaes, deposition from the air and other smaller sources; (b) production of nitrogen from crops, grass or crops eaten by cattle
Mineral resources	Data and indicators of metal and non-metal mines in the RS, including mineral resources, have not been available during the preparation of this Report. Those data were partly collected from other sources.
Biological and landscape diversity	■ CSI 009 Species diversity – trends of change in division of certain species groups ■ SEBI 004 Ecosystem coverage – change in soil category compared to ecosystem types in Europe ■ SEBI 013 Fragmentation of natural and semi-natural areas ■ SEBI 025 Financing biodiversity management ■ SEBI 026 Public awareness – public opinion on certain aspects of biological diversity ■ CLIM 021 Freshwater biodiversity and water quality ■ CLIM 022 Distribution of plant species – effects of climate change ■ CLIM 024 Distribution of animal species - effects of climate change ■ CSI 007 Endangered and protected species – number of species Some data are available, but they are not compatible due to different methodologies used when collecting data and calculating indicators: ■ CSI 008 Areas having some kind of protection – different trends depending on the change of the area size
Air quality	■ Emission of acidifying substances ■ CSI 003 - Emission of primary particulate matter and secondary particulate matter precursors ■ CSI 004 – Exceedance of air quality limit values in urban areas ■ CSI 005 - Exposure of ecosystems to acidification, eutrophication and ozone ■ Heavy metals (Cd, Pb, Zn) ■ Toxic air pollutants (e.g. chlorinated and volatile organic compounds) ■ Trends and projections for air quality data

Climate change	■ CLIM 019 Water temperature ■ CLIM 029 Water retention ■ CLIM 033 Water requirement ■ CLIM 031 Timing of the cycle of agricultural crops (agrophenology) ■ CLIM 026 Species-ecosystem relationship ■ CLIM 028 Soil erosion by water ■ CLIM 016 River flow ■ CLIM 017 River floods ■ CLIM 018 River flow drought ■ CLIM 023 Plant phenology ■ CLIM 040 Normalized losses from river flow disasters ■ CLIM 036 Heat and health ■ CLIM 030 Growing season for agricultural crops ■ CLIM 021 Freshwater biodiversity and water quality ■ CLIM 034 Forest growth ■ CLIM 035 Forest fire danger ■ CLIM 022 Distribution of plant species ■ CLIM 024 Distribution of animal species ■ CLIM 039 Direct losses from weather disasters ■ CLIM 032 Crop-yield variability ■ CLIM 025 Animal phenology ■ CLIM 042 Agriculture and forestry