ENVIRONMENTAL INDICATORS
Republic of Macedonia
2008

Ministry of Environment and Physical Planning
Macedonian Environmental Information Center

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CONTENT

The Ministry of Environment and Physical Planning as a body of the state administration responsible for the affairs of the environment, has proposed set of environmental indicators of the Republic of Macedonia on the basis of which the relevant report will be created as specified in Article 45 paragraph 1 of the Law on Environment (Official Gazette of the Republic of Macedonia No. 53/05, 81/05 and 24/07), Articles 44 and 45 of the Rulebook on the content of the State of the Environment Report (Official Gazette of the Republic of Macedonia No. 35/06), conclusions of the Government of the Republic of Macedonia adopted at the Fifth Session held on 15 May 2007, as well as in the requirements of the EU legislation and international organizations.

FOREWORD

The management of the environment in all areas and at all levels is equally complex and important process. Namely, the quality of all environmental media - water, air and soil - adequate management of areas like waste and wastewater, abundance and accessibility of natural resources, determine directly human health and welfare. The manner in which the environment is managed today becomes even more important given the fact it makes (positive or negative) impact on the quality of living of future generations, depending on the decisions we make and measures we take. In the context of this perception, the responsibility of those entrusted to manage this area through adoption of relevant decisions at all levels both in public and private, as well as civil sectors, becomes even greater.

Decisions adopted may from their side be proper and effective if they rely on accurate information of relevance for the specific decision. This notion is of particular importance in the process of environmental management. It is especially important to establish the current state of the environment by applying modern technologies, techniques and methodologies for its qualitative and quantitative assessment. Further on, the causes of certain (negative) developments should be identified, the resulting consequences with regard to human health above all, as well as living and developed environment, social welfare, economic growth or briefly the future sustainable development of the society.

Establishing of the above relations is not an easy task at all. Thus, for example, the increased rate of certain acute disease could be due to some negative environmental impacts, like polluted air, contaminated waters and soils. The source of such impacts could be natural or anthropogenic. Such increased rate of the disease could from its side result in significant social impacts reflected through higher costs for the health care and lower profits due to the reduced productivity of affected population. In addition to this, low quality of the environment could have significant impact on the economic growth of an area or the country as a whole - marketing of agricultural products originating from environmentally polluted area is difficult and at low prices, while tourism could burst in an area promoted as environmentally clean.

Nevertheless, all above mentioned relations, i.e. causes, consequences and trends, can not be analyzed as data to serve as basis for adoption of relevant, well founded decisions for taking appropriate measures while they are at the level of suspicions and assumptions. They should be confirmed and evidenced, which is an exceptionally complex task. Almost equally complex task is the follow-up need to present them in a rational, easy to understand, concise and usable form.

Environmental reporting via **indicators** is exactly such ambitious undertaking - to produce a report, a picture of the environment presented through as much as possible quantitative data acquired through scientifically based measurements and analysis, indicating the sources, causes, consequences and trends of specific conditions. We believe that this Report, developed by contributions of experts from all relevant areas, besides of fulfilling one of the obligations deriving from the Law on Environment, will establish the basis necessary for appropriate decision making in the process of environmental management, and thus make the expected contribution to the sustainable development of our country.

Dr. Nexhati Jakupi
MINISTER OF ENVIRONMENT AND PHYSICAL PLANNING

EXPLANATION

Monitoring and reporting of the state of the environment is an obligation prescribed by the national legislation. Motivated by its aspiration to get closer to the practices of the European Union in this area, the country endeavors to fulfill this obligation in a manner also prescribed by the European law by delivering environmental data and information to the European Environmental Agency (EEA) and shaping the recording according to the requirements of the relevant EU Directives and other regulations. The task to fulfill this obligation has been delegated to the Macedonian Environmental Information Centre of the Ministry of Environment and Physical Planning на Република Македонија.

Experiences gained through data delivery to the European Environmental Agency has resulted in significant increase in environmental data flow, both in quantitative and qualitative terms between the Republic of Macedonia and international organizations. Such experiences have enabled comparisons to be made between databases and thus their improvement through reorganization of reporting processes at national level, intensified exchange of information among experts and better public access to environmental information and data.

WHY ENVIRONMENTAL INDICATORS?

The European Environmental Agency with its member states initiated the development of the Core Set of Indicators (CSI) in 2000. It was approved and adopted by all relevant bodies and the set reached 37 indicators in 2004. The main purpose of the process was to prepare environmental indicators based on numerical data which, presenting the environment, the specific characteristic or the trend in certain phenomenon, may warn us of the incurred problems and thus they are a useful tools in the process of environmental reporting. Reasonably selected indicators based on properly selected temporal series present the key trends and facilitate prompt and adequate action by all stakeholders involved in the process of environment protection. This is of particular importance in the context of environment protection policy creation.

The establishment and development of environmental indicators was driven by the need to identify indicators of relevance for the environmental state monitoring and policy creation, in line with the EEA Core Set of Indicators (CSI), including indicators in six themes (Air pollution and ozone depletion, Climate Change, Waste, Water, Biological Diversity and Land) and four sectors (agriculture, energy, transport and fishery). These indicators should respond to the key environmental policy issues on national level.

The Government of the Republic of Macedonia, at its Fifth Session held on 15 May 2007 adopted the Draft Environmental Indicators developed by the Macedonian Environmental Information Centre thus initiating the process of identification of the national set of indicators.

Based on the conclusions adopted by the Government of the Republic of Macedonia and Decision no. 10-2323/29 of 14 September 2007 signed by the Minister of Environment and Physical Planning, 12 working groups were established each for a chapter and they verified and supplemented the proposed environmental indicators of the Republic of Macedonia, including country specific indicators. The members of the working groups have proposed the indicators presented in the Table to be adopted as Environmental Indicators of the Republic of Macedonia:

LIST OF INDICATORS

NO	Title of the indicator	Code	Compliance with other indicators			DPSIR	Trend
			EEA CSI	SDI	Thematics		
1 AIR POLLUTION AND OZONE DEPLETION							
1	EMISSIONS OF ACIDIFYING SUBSTANCES	MK NI 001	001		AP1	P	
2	EMISSIONS OF OZONE PRECURSORS	MK NI 002	002		AP19	P	
3	EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS	MK NI 004	004		AP14	S	
4	CONSUMPTION OF OZONE DEPELTING SUBSTANCES	MK NI 006	006		OD3	P	
2 NATURE AND BIODIVERSITY							
5	THREATENED AND PROTECTED SPECIES	MK NI 007	007		BDIV20	S/I	
6	DESIGNATED AREAS	MK NI 008	008		SEBI 2010 - 7	P	
7	SPECIES DIVERSITY	MK NI 009	009		BDIV9	S	

NO	Title of the indicator	Code	Compliance with other indicators			DPSIR	Trend
			EEA CSI	SDI	Thematics		
3 CLIMATE CHANGE							
8	GREENHOUSE GAS EMISSIONS AND REMOVALS	MK NI 010	010	SDI	CC5	P	
9	PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS	MK NI 011	011	SDI	CC14	P	
4 SOIL							
10	LAND TAKE	MK NI 014	014		TE090 TE091	P	
11	PROGRESS IN MANAGEMENT OF CONTAMINATED SITES	MK NI 015	015		TE117	P	
12	FOREST FIRES	MK NI 038			TE065	P	
5 WASTE							
13	MUNICIPAL WASTE GENERATION	MK NI 016	016		WMF8	P	

NO	Title of the indicator	Code	Compliance with other indicators			DPSIR	Trend
			EEA CSI	SDI	Thematics		
6 WATER							
14	USE OF FRESHWATER RESOURCES	MK NI 018	018	SDI	WQ3	P	
15	OXYGEN CONSUMING SUBSTANCES IN RIVERS	MK NI 019	019		WEU5	S	
16	NUTRIENTS IN FRESHWATER	MK NI 020	020		WEU2 WEU3	S	
17	BATHING WATER QUALITY	MK NI 022	022		WEU15	S	
18	URBAN WASTE WATER TREATMENT	MK NI 024	024	SDI	WEU21	P	
19	DRINKING WATER QUALITY	MK NI 039			WEU13	S	
20	IRRIGATED LAND	MK NI 040		SDI	WQ4	D	

NO	Title of the indicator	Code	Compliance with other indicators			DPSIR		Trend
			EEA CSI	SDI	Thematics			
7 AGRICULTURE								
21	GROSS NUTRIENT BALANCE	MK NI 025	025		Agri02	P		
22	AREA UNDER ORGANIC FARMING	MK NI 026	026		IRENA 07 Agri22	P		
23	MINERAL FERTILISER CONSUMPTION	MK NI 08			IRENA 08	D		
24	CONSUMPTION OF PESTICIDES	MK NI 09			IRENA 09 Agri24	D		
8 ENERGY								
25	FINAL ENERGY CONSUMPTION BY SECTOR	MK NI 027	027	SDI	EE18	D		
26	TOTAL ENERGY INTENSITY	MK NI 028	028	SDI	EE23	P		
27	TOTAL ENERGY CONSUMPTION BY FUEL	MK NI 029	029	SDI	EE24	D		
28	RENEWABLE ENERGY CONSUMPTION	MK NI 030	030	SDI	EE26	P		
29	RENEWABLE ELECTRICITY	MK NI 031	031	SDI	EE27	P		

NO	Title of the indicator	Code	Compliance with other indicators			DPSIR	Trend
			EEA CSI	SDI	Thematics		
9 FISHERY							
30	FISH STOCK CHARACTERISTICS	MK NI 041			FISH 3	S	
10 TRANSPORT							
31	PASSENGER TRANSPORT DEMAND	MK NI 035	035		TERM12	D	
32	FREIGHT TRANSPORT DEMAND	MK NI 036	036		TERM13	D	
11 HEALTH							
33	AIR POLLUTION AND LEAD IN BLOOD - LEVEL OF LEAD IN CHILDREN'S BLOOD	MK NI 042			AP14, ENHIS RPG4_Chem_Ex2	S	
34	MORTALITY DUE TO RESPIRATORY DISEASES (J00 - J99) - INFANTS	MK NI 043			ENHIS Air_E2	S	
35	INCIDENCE OF CHILDHOOD LEUKAEMIA	MK NI 044			ENHIS RPG4_Rad_E1	S	
36	INCIDENCE OF MELANOMA IN PEOPLE AGED UNDER 55 YEARS	MK NI 045		SDI	ENHIS RPG4_Uvrd_E1	S	
37	MORTALITY FROM TRAFFIC ACCIDENTS - CHILDREN AND YOUNG PEOPLE	MK NI 046		SDI	ENHIS Traf_E1	S	

NO	Title of the indicator	Code	Compliance with other indicators			DPSIR	Trend
			EEA CSI	SDI	Thematics		
12 TOURISM							
38	TOURIST TRURB-OVER IN THE REPUBLIC OF MACEDONIA 1 International tourist visits 2 Foreign tourists stay 3 Domestic tourist visits	MK NI 047		SDI	TOUR12 TOUR 33	P D	
39	TOURISM SCALE AND FACILITIES INTENSITY	MK NI 048			TOUR 14	I	
40	ROLE OF TOURISM IN ECONOMY	MK NI 049		SDI	TOUR 35	D	

CLASSIFICATION OF ENVIRONMENTAL INDICATORS

All indicators in a set have been classified in accordance with the framework known by its abbreviation DPSIR, comprising the following concepts: **D**riving forces – **P**ressures - **S**tate – **I**mpacts – **R**esponses, where each phase transmits its own meaning (Figure 1). This framework is particularly important and clear with regard to environmental policy creation.

- **Driving forces** are a social and economic factors and activities that cause either the increase or mitigation of pressures on the environment. They may, for example, include the scope of economic, transport or tourist operations.
- **Pressures** are represented by direct anthropogenic pressures and impacts on the environment, such as pollutant emissions or the consumption of natural resources.
- **State** relates to the current state and trends of the environment that determine the level of air, water body and soil pollution, the biodiversity of species within individual geographical regions, the availability of natural resources, such as timber and fresh water.
- **Impacts** are the effects that the environmental changes have on human and non-human health status.
- **Responses** are society's reactions to environmental issues. They may include specific State measures, such as taxes on the consumption of natural resources. Decisions made by companies and individuals, such as corporate investments into pollution control or purchase of recycled goods by households are also important.

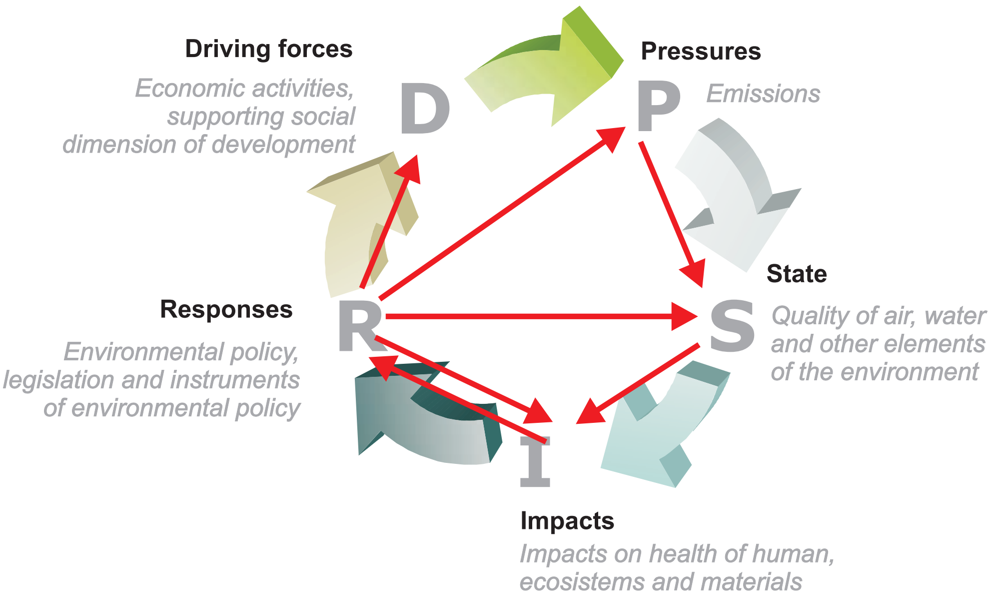


Figure 1

Indicators are also classified by their type into five categories, namely:

A = descriptive indicator (answering the question **What is happening to the environment and to humans?;** in other words, it describes the current state)

B = performance indicator (answering the question **What is the distance between the current environmental situation and the desired situation (target)?,** or it compares the current state of the environment with the specified environmental protection targets and they serve the monitoring of the progress towards such targets).

C = efficiency indicator (answering the question **Does the environment improve?,** or it states if the socity has improved the quality of products and processes relative to resources, emissions and waste per unit waste)

D = Policy-effectiveness indicator (answering the question **How effectively has the official country's environmental policy been implemented?** Or if and to what extent the official national policy has been implemented)

E = Total Welfare indicators (answering the question **Has the overall state improved?,** or it describes if and to what extent has the country practiced sustainable development, i.e. economic development providing social welfare for the citizens and protection for the environment).

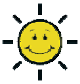
PRESENTATION OF ENVIRONMENTAL INDICATORS

In order to present indicators in a comprehensive manner, their information and data are presented by brief description of the indicator, prepared in accordance with the template established by the European Environmental Agency in the following order:

Period of the indicator assessment
Explanation
Justification for the indicator selection
Definition
Units
Policy relevance
List of relevant policy documents
Legal grounds
Key and specific policy issue
Key message
Assessment
Targets
Methodology for the indicator calculation
Data specification
Data coverage by years
General metadata
Methodological uncertainty
Future activities
Short-term activities
Long-term activities

Quantitative values of a given indicator are expressed mostly as annual values for a given period, and presented by means of **diagrams, tables** and **maps.** They are then followed by explanations interpreting the trend and the possible causes, as well as the measures undertaken and planned to improve or preserve the current status of the environment. Each indicator is accompanied by a symbol making assessment of individual indicators and showing the trend of presented data and specified targets.

Symbols indicating trends assessment

	Positive development indicating the achievement of a qualitatively or quantitatively defined target
	Undefined course of development, insufficient for achieving qualitative or quantitative targets; it may also be a changeable trend within a given indicator
	Unfavourable course of development

All segments of this concept of presentation are interlinked and support the response to the policy relevant issues. Environmental indicators rely on internationally recognized methodologies, and thus they are by definition internationally comparable. During their elaboration, EEA methodological information on environmental indicators was used.

Separate parts define the indicator, provide basic information on methodology of measurements conducted and manner of the subject indicator presentation. In the assessment of certain phenomenon, it is of vital importance to identify the expected trend and intensity of development. Quantitative values of a given indicator are expressed mainly in annual values for the specified period, and presented through diagrams, maps and tables containing the data.

High amount of data, including data possessed by the MEIC, as well as other sources of data administered by other relevant institutions and organizations, was collected for the purpose of preparation of the Draft Environmental Indicators.

The problems faced with by the working groups in the preparation of environmental indicators are mostly related to environmental data itself, namely:

- lack of data, especially lack of historical data to be compared with the present state, to conduct analysis of phenomena course and development and estimate the trends of the future development;
- lack of relevant data to serve the goals of reporting through environmental indicators;
- quality, i.e. format of data which in most cases required detailed analysis, checking and reprocessing;
- non-continuous data collection by the relevant institutions and organizations resulting in lack of data for certain periods/years and impossibility to track the trend of the given phenomenon;
- existing data is owned by different institutions and regular data/information flow has not been established yet, although the legal grounds to that end has been provided.

FUTURE ACTIVITIES

Indicators development is a dynamic process which is subject to continuous updating and improvement. According to the experiences from other countries and international institutions, we are convinced that environmental indicators are effective and useful tool in environmental reporting and efficiency in the implementation of environmental policies.

According to the Law on Environment, the proposed environmental indicators will serve as reporting basis at annual level, and the working groups are obliged to update and improve the respective environmental indicators on continuous basis.

Working groups may propose indicators under additional chapters not elaborated as yet, but deemed to be relevant for the observation of the state of the environment in the Republic of Macedonia (e.g.: noise, chemicals, etc.).

Macedonian Environmental Information Center

LIST OF ABBREVIATIONS

CSI	Core Set of Indicators
EC	European Community
EEA	European Environment Agency
ENHIS	European Environment and Health Information System
EUROSTAT	Statistical Office of the European Communities
ISO	International Standardization Organization
NEAP	National Environmental Action Plan
WHO	World Health Organisation
GDP	Gross Domestic Product
DPSIR	Driving forces - Pressure - State - Impact - Response
LSGUs	Local Self-Government Units
EU	European Union
EC	European Commission
IHP	Institute for Health Protection
PHI	Public Health Institution
MEPP	Ministry of Environment and Physical Planning
UN	United Nations
OUN	Organization of United Nations
RIHP	Republic Institute for Health Protection
HMA	Hydrometeorological Administration
HBI	Hydrobiological Institute

Air pollution and ozone depletion	
CLRTAP	Convention for Lon Range Transboundary Air Pollution
NECD	National Emission Ceilings Directive
POPs	Persistent Organic Pollutants
UNECE	United Nations Economic Commission for Europe
CORINAIR	CoR Inventory Air Polution
IPPC, EIA/SEA	Integrated Pollutant Prevention Control, Environmental Impact Assessment/ Strategic Environmental Assessment
CEN	Comite Europeen de Normalisation
SNAP	Selected Nomenclature for Air Pollution
CARDS	Community Assistance for Reconstruction, Development and Stabilization
UNFCCC	United Nations Framework Convention on Climate Change
EMEP	European Monitoring and Evaluation Program Note: The EMEP has been established in the framework of the UN/ECE Convention on Long-Range Transboundary Air Pollution
EEA/ETC-ACC	European Environment Agency/European Topic Center – Air and Climate Change
GHG (CRF).	Green house gases (Common reporting format)
TOFP	Tropospheric Ozone Formation Potential
NMVOCs	Non-Methane Volatile Organic Compounds
CH_4	Methane
CSI	Core Set of Indicators
PM	Particulate Matters
SO_2	Sulphur dioxide
PM_{10}	Particulate Matters up to 10 micrometers in size
$PM_{2.5}$	Particulate Matters up to 2.5 micrometers in size
NO_2	Nitrogen oxide
O_3	Ozone
NO	Nitrogen monoxide
NOx	Nitrogen oxides
UV	Ultraviolet
CFC	Chlorofluorocarbons
HCFC	Hydrochlorofluorocarbons
CCl4	Chloroform

ODS	Ozone Depleting Substances
HBFC	Hydrobromofluorocarbons
MT	Metric tonnes
ODP	Ozone Depletion Potential
UNEP	United Nation Environmental Programme
UNIDO	United Nation Industrial Development Organisation
DGENV	European Commission, Environment Directorate-General
Biological Diversity	
IUCN	International Union for Conservation of Nature
NCSA	National Capacity Self-Assessment
UNESCO	United Nations Educational, Scientific and Cultural Organization
SNR	Strict Natural Reserve
NP	National Park
MN	Monument of Nature
ASNC	Area of Special Natural Characteristics
AONRFFS	Area Outside Natural Reserve Containing Certain Flora and Fauna Species
ASCI	Areas of Special Conservation Interest
CDDA	Common Database on Designated Areas
FAO	Food and Agriculture Organisation
SEBI 2010	Streamlining of European Biodiversity Indicators by 2010
CBD	Convention on Biodiversity
PEBLDS	Pan-European Biological and Landscape Diversity Strategy
Climate Change	
IPCC	Inter-Governmental Panel for Climate Change
GHG	Green House Gases
LUCF	Land Use Change and Forestry
UNFCCC	United Nations Climate Change Convention
CDM	Clean Development Mechanism
EE	Energy Efficiency
RES	Renewable Energy Sources
TPP	Thermal Power Plant
WASP	Energy system planning tool
GACMO	Green House Gases Costing Model

Soil	
CORINE Land Cover	Coordination of Information on the Environment
JRC	Joint Research Centre
Waste	
ERM	Environmental Resources Management
Water	
WEI	Water exploitation Index
PE	Public Enterprise
OECD/ EUROSTAT	Organisation for Economic Co-operation and Development / Statistical Office of the European Communities
BOD	Biological Oxigen Demand
NH4+	Ammonium ion
FWD	Framework Water Directive
EEC	European Economic Community
IPPC	Integrated Pollution Prevention and Control
pH	Measure of solution acidity or alkalinity
NO_3	Nitrates
ХПК	Chemical Oxygen Demand
Agriculture	
OECD	Organisation for Economic Co-operation and Development
Energy	
ECE/UN	Economic Commission for Europe/ United Nations
IEA/OECD	Institute of European Affairs/ Organisation for Economic Co-operation and Development
NAC	National Activities Classification
PARE	Price Adjusted Rate Exchange
Fishering	
FAO	Food and Agriculture Organisation
Transport	
ECMT	European Conference of the Ministers of Transport
UNECE	United Nations Economic Commission
UIC	L'Union Internationale des Chemins

DG TREN	Directorate-General for Transport and Energy
ECMT/UNECE	European Conference of the Ministers of Transport/ United Nations Economic Commission for Europe
ROD	Report Obligation Database
Health	
IQ	Intelligence Quotient
Pb	Lead
IPPC	Integrated Pollution Prevention and Control
EIA/SEA	Environmental Impact Assessment/ Strategic Environmental Assessment
PM	Particulate Matters
HIV/AIDS	Human Immunodeficiency virus/ Acquired Immune Deficiency Syndrome
ALL	Acute Lymphoblastic Leukaemia
ELF	Extremely Low Frequency
AML	Acute Myeloid Leukaemia
COMARE	Committee of Medical Aspects of Radiation in the Environment
ACCIS	Automated Childhood Cancer Information System
REACH	Registration, Evaluation, Authorisation and Restriction of CHemicals
UV	Ultraviolet
Tourism	
WTO	World Tourism Organization

AIR POLLUTION

MK-NI 001

EMISSIONS OF ACIDIFYING SUBSTANCES

Period of indicator assessment

- September 2007— April 2008

Explanation

- Justification for indicator selection

Emissions of acidifying substances cause damage to human health, ecosystems, buildings and materials, through processes like corrosion. The effects associated with emissions of pollutants included in this type of indicators depend on their acidifying potential and on the properties of ecosystems and materials. The deposition of acidifying substances still frequently exceeds the critical levels in ecosystems throughout Europe.

The indicator supports assessment of the progress towards implementation of the Gothenburg Protocol under the 1979 Convention on Long-Range Transboundary Air Pollution (CLRTAP) and the EU Directive on National Emissions Ceilings (NECD) (2001/81/EC).

Definition

The indicator tracks the trends in anthropogenic emissions of acidifying substances, i.e. acidifying processes in the air. These substances include nitrogen oxides, ammonia, and sulfur dioxide, and their acidifying power is weighted by their acidifying potential.

The indicator also provides information on emissions by sectors: energy generation and transformation, road and other transport, industry (processes and energy), fugitive emissions, waste, agriculture and other.

Units

- Ktonnes (acidifying equivalent)

Policy relevance of the indicator

List of relevant policy documents

The National Environmental Action Plan (NEAP II) provides directions for the measures (presented below) that need to be taken to improve the overall status of air, including the reduction of emissions of acidifying substances:

- Development of National Plan for Ambient Air Protection;
- Development of Programmes for air emissions reduction and air quality improvement in certain local self-government units (LSGUs) with action plans (pilot: City of Skopje);
- Establishment of lists of air quality zones and agglomerations;

- Capacity building in vehicles technical control at vehicles registration, annual technical inspections and control on roads.

According to the Stabilization and Association Agreement between the EU and the Republic of Macedonia, Action Plan for European Partnership, National Programme for Approximation with the Acquis, the following activities should be implemented:

- Preparation of bylaws in the area of air in accordance with the National Approximation Programme with priorities
- Establishment of national emission ceilings for certain atmospheric pollutants (2001/81/EC)
- National Implementation Plan for POPs emissions reduction
- Inventory of Air Pollution by CORINAIR Methodology and reporting to UNECE/ CLRTAP.

Legal grounds

The Law on Environment (adopted in 2005) regulates areas of relevance for the air quality and air emissions, especially in the segments of environmental monitoring, environmental impact assessment (EIA) and Integrated Pollution Prevention and Control (IPPC). Consistent implementation of certain Articles regulating IPPC, EIA/SEA will contribute to air emissions reduction, adoption of Local Environmental Action Plans (LEAPs) and climate change mitigation. The Law on Ambient Air Quality (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007) establishes the legal grounds for adoption of several bylaws and the following have been adopted so far:

- Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term targets (Official Gazette of the Republic of Macedonia No. 50/05)
- Rulebook on criteria, methods and procedures for ambient air quality assessment (Official Gazette of the Republic of Macedonia No. 82/06)
- Rulebook on the methodology for inventory and determination of the levels of polluting substances in the atmosphere in tons per year for all types of activities, as well as other data to be reported to the European Monitoring and Evaluation Programme (EMEP) (Official Gazette of the Republic of Macedonia No. 142/2007).

Two additional bylaws are in adoption procedure.

It has been envisaged to prepare National Plan for Ambient Air Protection and Programme for Air Pollution Reduction and Quality Improvement. These documents will be prepared in accordance with the requirements of the following EU Directives: 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC. The Law on Ambient Air Quality establishes the legal grounds for the technical check-ups of mobile sources of pollution, performed for the purpose of vehicles registration to include regular compulsory control and demonstrate compliance with legal standards on emission levels.

The Rulebook on air emissions inventory in accordance with the CORINAIR (CoR Inventory Air Pollution) Programme has been adopted and introduced as a national methodology for air emissions inventory.

The UNECE Convention on Long-Range Transboundary Air pollution has been ratified and steps towards ratification of its eight Protocols have been taken.

Unite Nations Framework Convention on Climate Change – UNFCCC.

By means of endorsement method, 19 ISO and CEN standards in the area of air emissions and quality have been adopted.

Other legislation related to the regulation of air quality and air emissions includes the Law on Road Transport Safety, Law on Standardization, Rulebook on liquid fuels quality with national standards for liquid fuels quality, etc.

Key policy issue

What progress has been made in reducing acidifying substances emissions in the air?

At present, activities are carried out in relation to the implementation of the system of Integrated Pollution Prevention and Control based on the Law on Environment and in accordance with Directive 96/61/EC. In this context, Decree and Rulebook for their implementation have been prepared. These acts define the business entities, i.e. production facilities obliged to acquire A and B integrated environmental permits, which specify the conditions for air pollution control and the limit values of emissions they will be allowed to release in the air. The introduction of this system will enable control of air emissions and quality, as well as possibility to reduce the emissions of acidifying pollutants in the air.

Specific policy issue

Which different sectors and processes contribute to acidifying substances emissions?

Кey message

In 2005, in the frames of the CORINAIR Programme, the Inventory of Air Emissions was established in the country, presenting emissions by individual sectors or activities, and assessment was made for the period 2002-2006, which means that the trend presented has some uncertainty.

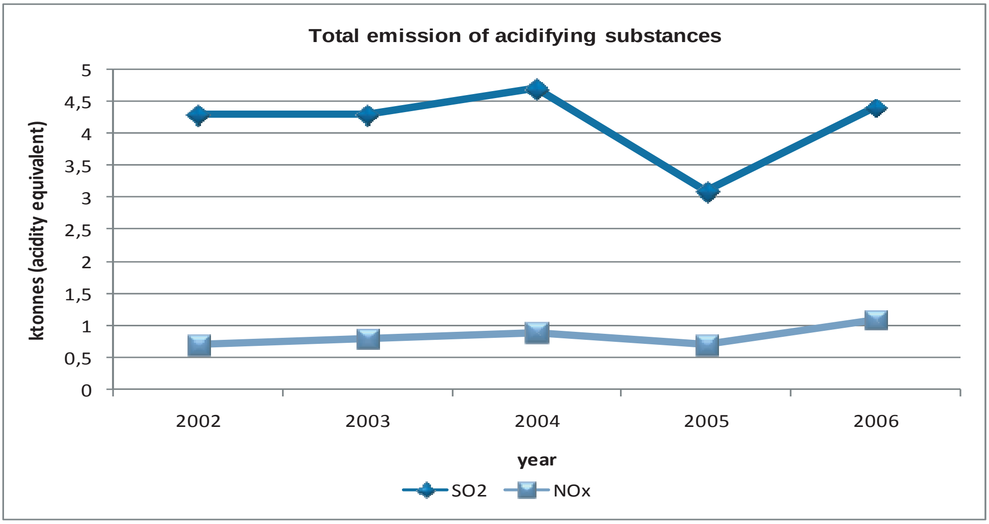
Sectors based on the CORINAIR Methodology and SNAP – selective nomenclature are given in the table below:

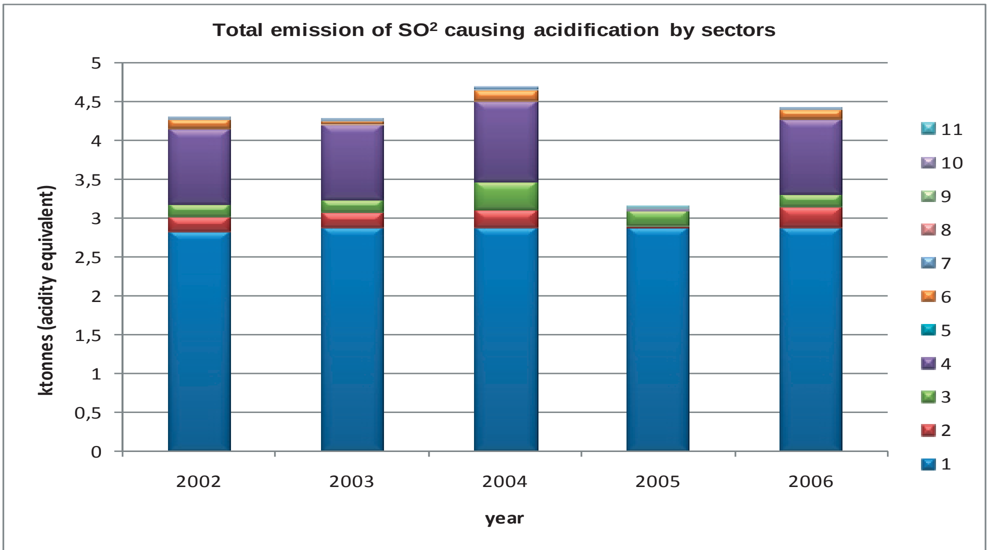
SNAP	
1	CoropCombustion in energy and transformation industries (stationary sources)
2	Non-industrial combustion plants (stationary sources)
3	Combustion in manufacturing industry (stationary sources)
4	Production processes (stationary sources)
5	Extraction and distribution of fossil fuels and geothermal energy
6	Solvent and other product use
7	Road transport
8	Other mobile sources and machinery
9	Waste treatment and disposal
10	Agriculture
11	Nature

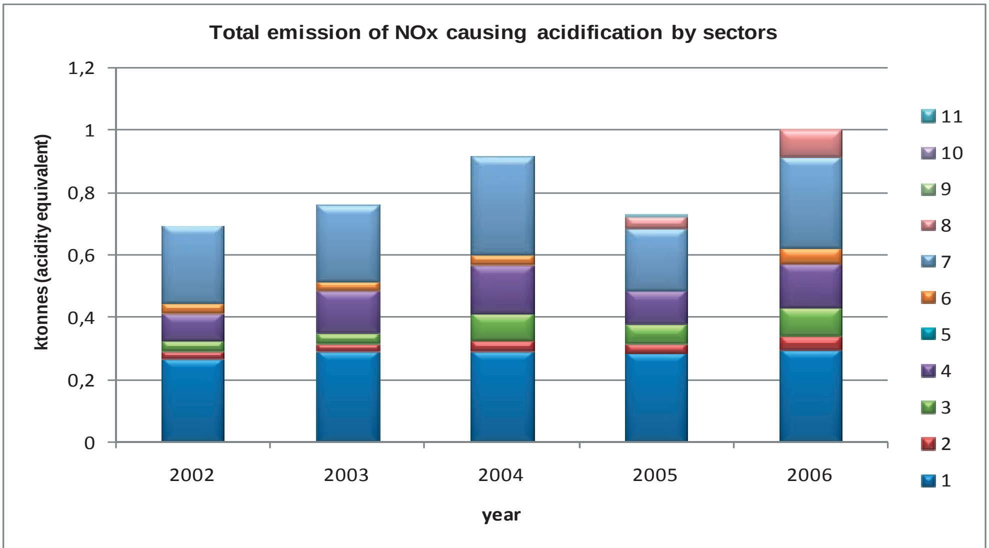
In the period 2002 – 2006, a varying trend in the emissions of certain acidifying substances was observed in the Republic of Macedonia, ranging from mild falling especially for SO_2 (decrease by around 20%) in 2005, to increase to almost stable level in other years. The falling trend in 2005 was due mainly to the decreased number or/and closed production processes in metallurgy which used to be sources of pollution. Taking into account the unstable transition period in the country, the increase in the amounts of emission in 2006 is not surprising. Actually, this is an indication that no continuously falling trend in the quantities of emissions can be achieved at annual level, as well as in longer term, in absence of specific measures and programmes for pollutants emission reduction.

Electricity production remains the main source of pollution with SO_2,, mainly as a result of the poor quality (low calorific value) of fuels with high content of sulfur. These processes, together with the transport, are also the main sources of NO_x emissions. Data on NH_3 is available only for 2005 (the main source being the agriculture).

At this moment, there are no integrated programmes or action plans aimed at reducing the emissions of polluting substances in the atmosphere, at any level in the country.







Assessment

In order to identify the amounts of air emissions of the main polluting substances, the Cadastre of Air Polluters and Pollutants in the Republic of Macedonia was developed.

The development of the Cadastre relied on data (2004 - 2005) obtained from business facilities, as well as data obtained by measurement of sulfur dioxide, nitrogen oxides, carbon monoxide and dust, where no data was available. Through this process, data of around 1000 combined air emission sources and around 660 point air emission sources was processed. It should be noted that the Cadastre of Air Polluters and Pollutants in the Republic of Macedonia requires review, considering the date of its production (2004 – 2005) and the changes taking place meantime.

The Cadastre identified the polluting substances at the level of facility. However, in an observation of the requirements of the relevant international agreements, such as UNECE/CLRTAP, the CORINAIR Methodology and SNAP nomenclature were introduced in order to obtain compatible and comparable data on the given polluting substances.

The introduction of the uniform methodology for air pollution inventory on national level based on CORINAIR (Core Inventory for Air Pollution) is of great importance in terms of the identification of amounts of individual pollutants. The Republic of Macedonia ratified the UNECE Convention on Long-Range Transboundary Air Pollution, but eight Protocols to this Convention remain to be ratified.

The introduction of the uniform methodology for air pollution inventory (CORINAIR) and the distribution of amounts of polluting substances to all 11 sectors in accordance with the SNAP-selective nomenclature of air pollution on national level, has enabled the Republic of Macedonia to report data which is compatible with the relevant data at the EU level.

SO_2 emissions by sectors

By application of the CORINAIR methodology, estimates of series of SO_2 emissions were made for the period 2002 - 2006.

Despite of the mildly falling trend in SO_2 emissions by 2005, which may be attributed to the decreased number of active industrial processes in the country (closure of certain major industrial facilities), there was a rising trend in the amounts of SO_2 emissions in 2006.

The above shows that no persistent falling trend in the quantities of air emissions can be achieved at annual level, as well as in longer term, unless specific measures and programmes for pollutant emissions reduction are introduced.

Electricity production is the main source of this type of emissions. Namely, in 2006, more than 66 % of sulphur dioxide emissions originated from electricity production and use of poor quality and low calorific value lignite.

Major proportion of these emissions is located in the southwestern part of the country, where the biggest thermal power plant for electricity production is located. The quality of both solid and liquid fuels is low (with high content of sulfur), and no data is available on any relevant policy for emission reduction, both on local and national levels.

NO_x emissions by sectors

The series of NO_x emissions have been estimated for the period 2002 - 2005.

By application of the CORINAIR methodology in nitrogen oxides emission inventory, it can be concluded that the main sources of NO_x emission in the country include electricity production (28%), again owing to the poor quality of fuel, transport (37%) and other industrial production processes (no. 4 of the SNAP nomenclature, contributing more than 14% to the estimated emission).

NH_3 emissions– initially calculated for 2005. Agricultural sector is the main source of these emissions (84% of the emission), (data taken from CARDS projects). It should be noted that no data is available on NH_3 emissions in 2006.

Targets

Does any of the national documents set targets or targets set under international documents should be achieved?

National documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that the development of new regulations in the area of air emissions is in progress, and they will transpose the following Directives into the national legislation: 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on the CORINAIR Programme has been introduced, setting the target of regular inventory of pollutants in tonnes per year.

Inventory of pollutants by main sectors of relevance for climate change is also performed in accordance with the United Nations Framework Convention on Climate Change (UNFCCC).

In order to achieve the targets for reduction of acidifying substances emission, causing degradation of environment and materials, as well as negative effects on human health, it is necessary to adopt all documents planned under the National Programme for Approximation with the Acquis.

Methodology

- ### Methodology for the indicator calculation

The methodology for this indicator calculation is based on aggregation and calculation of data on SO_2, NH_3 and NO_x emissions at annual basis, on national level, as overall and distributed to sectors, i.e. activities.

Calculations are in line with the Guidelines of UNECE/EMEP Convention on Long-Range Transboundary Air Pollution, and CORINAIR methodology for inventory and application of the SNAP – selective nomenclature of air pollution. With regard to this specific indicator, factors have been used in order to express the acidifying property potential. These factors are specific to each pollutant, namely NO_x 0.02174, SO_2 0.03125 and NH_3 0.05882. The results are expressed in kilotonness equivalent acidity.

- ### Methodology for deficiencies overcoming

In order to enable analysis of the trend where the countries have not reported data for a period of one or more years, data is interpolated to derive emissions for the missing year or years. If data is missing at the beginning or at the end of the period, it is assumed that the value of the emission is equal to the first or the last reported value. Application of tools for gaps filling may create artificial trends, but they are taken as unavoidable if comprehensive and comparable data set is required on European countries for the purposes of policy analysis. The list of data sets with filled in gaps plus information with reference of data used to fill in the gaps can be found on EEA Data Service at: http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=818

- Reference of used methodology

EEA/ETC-ACC Technical Report outlining the methodologies for gap filling, applied for 2004. EEA/ETC-ACC CLRTAP and information on GHG air emissions (CRF).

Data specification

Title of the indicator	Source	Reporting obligation
Emissions of acidifying substances	– State Statistical Office, Energy balance of the country – Report by the Government; – Cadastre of Air polluters and Pollutants; – Data from measurements in companies – major polluters: – Database on motor vehicles of the Ministry of Interior; – Project: Introduction of CORINAIR Inventory Methodology of the Ministry of Environment and Physical Planning, – Spatial Plan of the Republic of Macedonia.	– Reporting obligations under multilateral agreements – UNECE/ CLRTAP and EEA – Annual report of processed data on air emissions

Data coverage (by years):

Table 1: Total emission of acidifying substances

Substances (k-tons)	2002	2003	2004	2005	2006
SO_2	4,3	4,3	4,7	3,1	4,4
NO_x	0,7	0,8	0,9	0,7	1,1

Table 2: Total emission of SO_2 by sectors presented relative to acidification coefficients

SNAP		2002	2003	2004	2005	2006
1	Combustion in energy and transformation industries (stationary sources)	2,8211	2,8714	2,8714	2,8707	2,8811
2	Non-industrial combustion plants (stationary sources)	0,1968	0,1968	0,2320	0,0332	0,2588
3	Combustion in manufacturing industry (stationary sources)	0,1688	0,1688	0,3656	0,2016	0,1688
4	Production processes (stationary sources) и	0,9581	0,9650	1,0369	0,0111	0,9581
5	Extraction and distribution of fossil fuels and geothermal energy					
6	Solvent and other product use	0,1244	0,0444	0,1383		0,1244
7	Road transport	0,0161	0,0161	0,0308	0,0242	0,0161
8	Other mobile sources and machinery				0,0078	
9	Waste treatment and disposal				0,0001	
10	Agriculture					
11	Nature				0,0012	
total		4,2852	4,3429	4,6750	3,1499	4,4

Table 3: Total emission of NO_x by sectors presented relative to acidification coefficients

SNAP		2002	2003	2004	2005	2006
1	Combustion in energy and transformation industries (stationary sources)	0,2667	0,2923	0,2923	0,2848	0,2967
2	Non-industrial combustion plants (stationary sources)	0,0246	0,0246	0,0333	0,0326	0,0446
3	Combustion in manufacturing industry (stationary sources)	0,0328	0,0328	0,0885	0,0596	0,0885
4	Production processes (stationary sources)	0,0906	0,1352	0,1541	0,1072	0,1411
5	Extraction and distribution of fossil fuels and geothermal energy					
6	Solvent and other product use	0,0309	0,0309	0,0309		0,0512
7	Road transport	0,2475	0,2467	0,3167	0,2000	0,2914
8	Other mobile sources and machinery				0,0450	0,0871
9	Waste treatment and disposal				0,0005	
10	Agriculture					
11	Nature				0,0037	
total		0,6922	0,7619	0,9157	0,7334	1,0006

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 001	**Emissions of acidifying substances**	CSI 001 AP1	Emissions of acidifying substances	**P**	**B**	acidification air	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2002 – 2006

Frequency of data collection:

Guidelines by EMEP/CORINAIR – Manual on Atmospheric Emissions Inventory, Third edition and SNAP – nomenclature of sectors, annual data processing.

In line with the guidelines, the frequency of data collection and processing is set on annual basis.

Note: There is no data available before 2002 to identify the quantity of emissions of acidifying substances.

Uncertainty

- Methodological uncertainty and data uncertainty

Use of factors of acidification potential leads to some uncertainty. It has been assumed that factors are representative for Europe as a whole; at local level, different factors may be assessed. Detailed discussion of uncertainty of these factors can be found with de Leeuw (2002).

EEA uses data reported officially by EU Member States and by other EEA Member States, which observe general instructions on emission data calculation and reporting (EMEP/EEA 2001) with regard to NOx, SO_2 and NH3.

Future activities

- Short-term activities

Indicator update by supplementing annual data from the inventory of emissions of acidifying substances from the preceding year.

a. Description of the activity

Calculation of the indicator and approval of updated and supplemented indicator by the Working Group on the national set of air quality indicators.

b. Required resources

Engagement of national experts in the area of air quality from governmental institutions.

c. Status

In progress

Dead line: 1 year

- Long-term activities

– Transposition of Directives of relevance for the air emissions area, namely Directives 2000/81/EC, 2001/81/EC, 96/61/EC, as well as preparation of bylaws in this regard.

– Preparation of National Plan for Air Protection,

– Preparation of Plan for Air Emissions Reduction.

a. Description of the activity

Upon the completion of the above described activities, conditions should be established to enable the implementation of the listed documents, e.g. establishment of ceiling values of annual emissions and their reduction projection in line with the NEC Directive 2001/81/EC.

Introduction of the system of Integrated Pollution Prevention and Control.

b. Required resources

No resources needs have been established.

c. Status

In progress.

Dead line: 01.01.2099

a. Description of the activity

Improvement of the quality of national data reported to the UNECE/CLRTAP/EMEP.

b. Required resources

The Gothenburg Protocol enters into force. Ratification has not reached the required number of 16 countries.

c. Status

In progress

Dead line: 01.01.2099

MK - NI 002

EMISSIONS OF OZONE PRECURSORS

Period of indicator assessment

- September 2007—April 2008

Explanation

- Justification of indicator selection

Emissions of non-methane volatile organic compounds (NMVOCs), nitrogen oxides, carbon monoxide and methane contribute to the formation of ground-level (tropospheric) ozone. Their relative contributions can be assessed on the basis of their tropospheric ozone-forming potential (TOFP) (de Leeuw 2002).

Ozone is a powerful oxidant and tropospheric ozone can have adverse effects on human health and ecosystems. It is a problem mainly during the summer months. High concentrations of ground-level ozone adversely affect the human respiratory system and there is evidence that long-term exposure accelerates the decline in lung function with age and may impair the development of lung function. Some people are more vulnerable to high concentrations than others, with the worst effects generally being seen in children, asthmatics and the elderly. High concentrations in the environment are harmful to crops and forests, decreasing yields, causing leaf damage and reducing disease resistance.

Definition

This indicator tracks trends in emissions of ozone precursors: nitrogen oxides, carbon monoxide, methane and non methane volatile organic compounds, caused by anthropogenic activities, and each weighted by their tropospheric ozone-forming potential.

The indicator also provides information on emissions by sectors: energy industries; road and other transport; industry (processes and energy); other (energy); fugitive emissions; waste; agriculture and other (non energy).

Units

- Ktonnes (NMVOC - equivalent)

Policy relevance of the indicator

List of relevant political documents

The National Environmental Action Plan (NEAP II) provides directions for the measures (presented below) that need to be taken to improve the overall status of air, including the reduction of of emissions of ozone precursors:

- Development of National Plan for Ambient Air Protection;

- Development of Programmes for air emissions reduction and air quality improvement in certain local self-government units (LSGUs), including the City of Skopje;
- Establishment of lists of air quality zones and agglomerations;
- Capacity building in vehicles technical control at vehicles registration.

According to the Stabilization and Association Agreement between the EU and the Republic of Macedonia, Action Plan for European Partnership, National Programme for Approximation with the Acquis, the following activities should be implemented:

- Preparation of bylaws in the area of air in accordance with the National Approximation Programme with priorities
- Establishment of national emission ceilings for certain atmospheric pollutants (2001/81/EC)
- National Implementation Plan for POPs emissions reduction
- Inventory of Air Pollution by CORINAIR Methodology and reporting to UNECE/CLRTAP.

Legal grounds

The Law on Environment (adopted in 2005) regulates areas which make direct impact on air quality and air emissions. Thus, the Law regulates issues related to IPPC, EIA/SEA, Local Environmental Action Plans (LEAPs) and climate change.

The Law on Ambient Air Quality was adopted in 2004 (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007) as framework law in the area of air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant *Acquis Communitaire*.

The following regulations have been adopted so far:

- Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05)
- Rulebook on criteria, methods and procedures for ambient air quality assessment (Official Gazette of the Republic of Macedonia No. 82/06)
- Rulebook on the methodology for inventory and determination of the levels of polluting substances in the atmosphere in tons per year for all types of activities, as well as other data to be reported to the European Monitoring and Evaluation Programme (EMEP) (Official Gazette of the Republic of Macedonia No. 142/2007).

The requirements of the relevant EU Directives have been transposed in the above listed regulations, and two additional bylaws are in adoption procedure.

It has been envisaged to prepare National Plan for Ambient Air Protection and Programme for Air Pollution Reduction and Quality Improvement. These documents will be prepared in accordance with the requirements of the following EU Directives: 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC. The Law on Ambient Air Quality establishes the legal grounds for the technical checkups of mobile sources of pollution, performed for the purpose of vehicles registration to include regular compulsory control and demonstrate compliance with legal standards on emission levels.

The Rulebook on air emissions inventory in accordance with the CORINAIR (CoR Inventory Air Pollution) Programme has been adopted and introduced as a national methodology for air emissions inventory.

The UNECE Convention on Long-Range Transboundary Air pollution has been ratified and steps towards ratification of its eight Protocols have been taken.

Unite Nations Framework Convention on Climate Change – UNFCCC.

By means of endorsement method, 19 ISO and CEN standards in the area of air emissions and quality have been adopted.

Other legislation related to the regulation of air quality and air emissions includes the Law on Road Transport Safety, Law on Standardization, Rulebook on liquid fuels quality with national standards for liquid fuels quality, etc

Key policy issue

What progress has been made in ozone precursors emissions reduction in Europe?

At present, activities are carried out in relation to the implementation of the system of Integrated Pollution Prevention and Control based on the Law on Environment and in accordance with Directive 96/61/EC. In this context, Decree and Rulebook for their implementation have been prepared. These acts define the business entities, i.e. production facilities obliged to acquire A and B integrated environmental permits, which specify the conditions for air pollution control and the limit values of emissions they will be allowed to release in the air. The introduction of this system will enable control of air emissions, thus providing possibility to reduce the emissions of pollutants identified as ozone precursors.

Specific policy issue

Which different sectors and processes contribute to ozone precursors emissions?

Key message

In 2005, in the frames of the CORINAIR Programme, the Inventory of Air Emissions was established in the country, presenting emissions by individual sectors, i.e. activities, and assessment was made for the period 2002-2005. Application of this manner of data processing, especially due to the lack of data in real time, the trend presented cannot be determined precisely.

Sectors based on the above stated Methodology and SNAP – selective nomenclature are given in the table below:

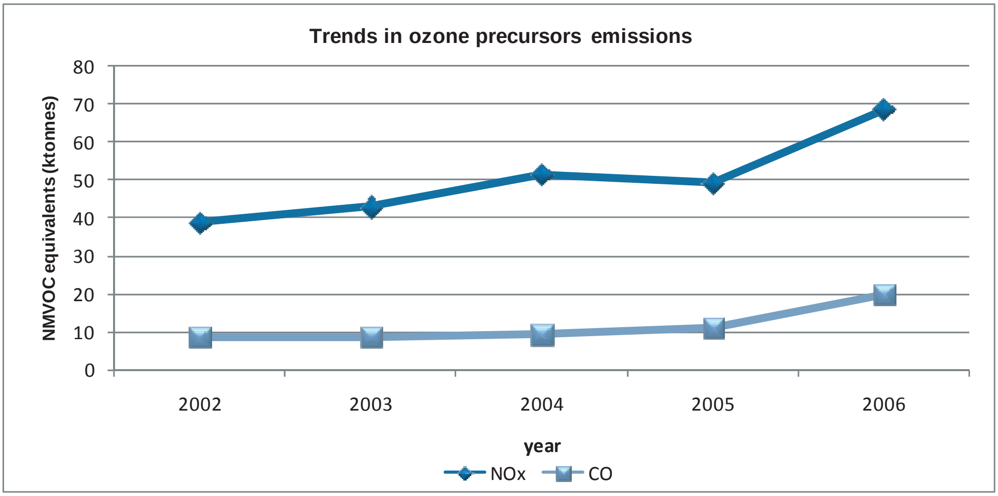
SNAP	
1	Combustion in energy and transformation industries (stationary sources)
2	Non-industrial combustion plants (stationary sources)
3	Combustion in manufacturing industry (stationary sources)
4	Production processes (stationary sources)
5	Extraction and distribution of fossil fuels and geothermal energy
6	Solvent and other product use
7	Road transport
8	Other mobile sources and machinery
9	Waste treatment and disposal
10	Agriculture
11	Nature

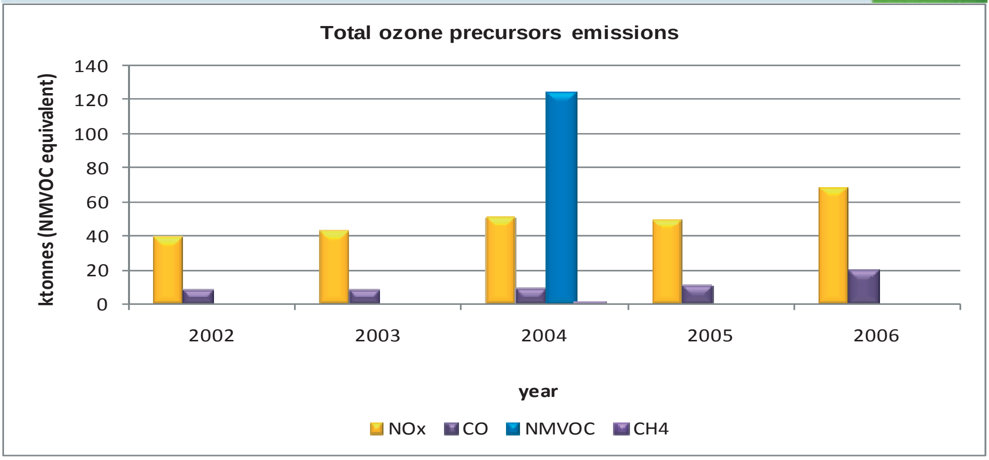
In the period 2002 – 2006, a rising trend has been tracked in the emissions of ozone precursors in the Republic of Macedonia, with an exception of NMVOC and CH_4 presented only for 2004 as major contributors to air emissions in that year.

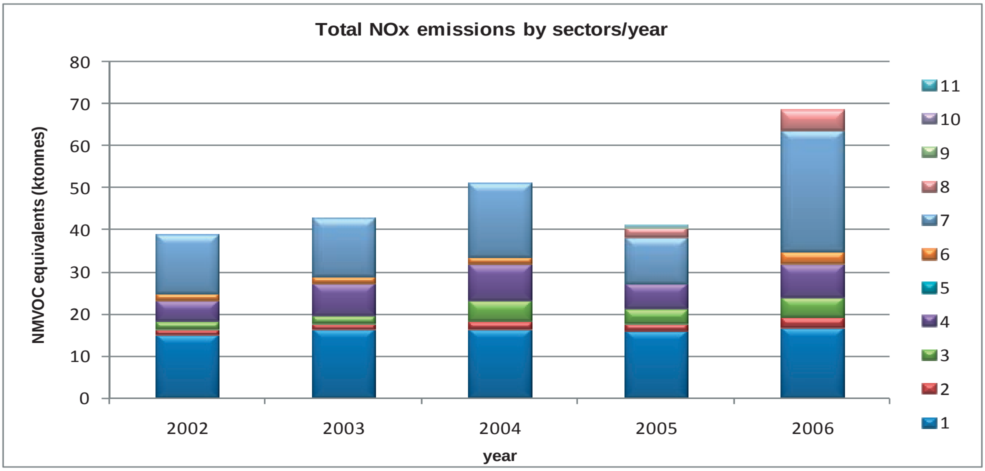
Electricity production - sector 1, road transport - sector 7, and nature - sector 11 are the main sources of ozone precursors emission.

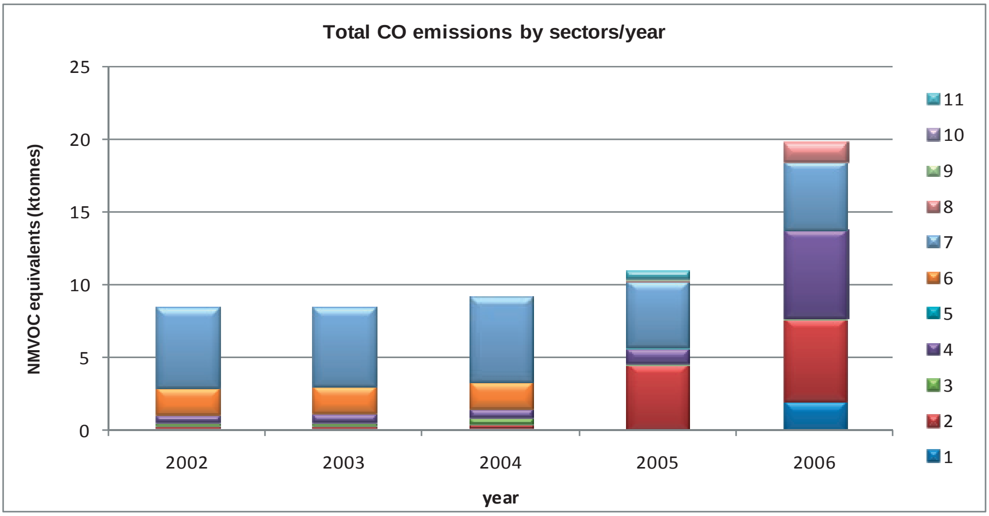
At this moment, there are no integrated programmes or action plans aimed at reducing the emissions of polluting substances in the atmosphere, at any level in the country.

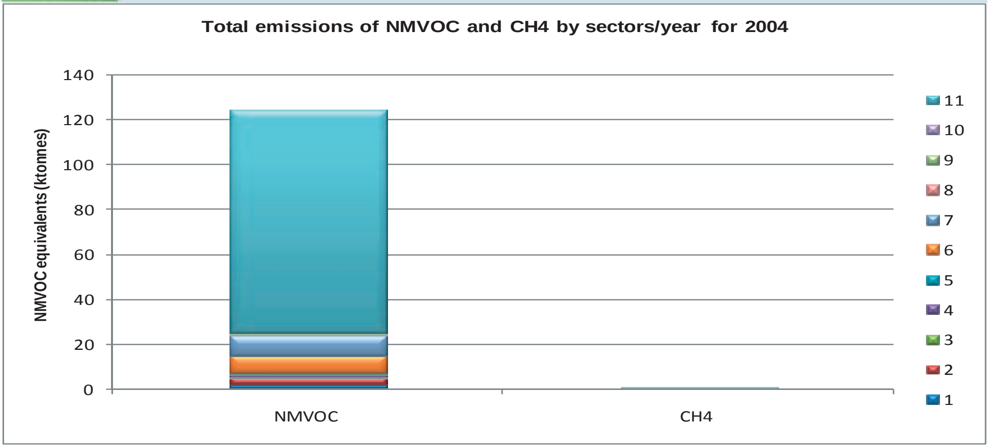
The Diagram below shows the annual trend in the emissions of CO (carbon monoxide) and nitrogen oxides presented as ozone precursors:




Total ozone precursors emissions
ktonnes (NMVOC equivalent)
140
120
100
80
60
40
20
0
2002
2003
2004
2005
2006
year
NOx
CO
NMVOC
CH4


Total NOx emissions by sectors/year
NMVOC equivalents (ktonnes)
80
70
60
50
40
30
20
10
0
2002
2003
2004
2005
2006
year
11
10
9
8
7
6
5
4
3
2
1


Total CO emissions by sectors/year
NMVOC equivalents (ktonnes)
25
20
15
10
5
0
2002
2003
2004
2005
2006
year
11
10
9
8
7
6
5
4
3
2
1



Assessment

For the purpose of identifying the amounts of air emissions of the main polluting substances, the Cadastre of Air Polluters and Pollutants in the Republic of Macedonia was developed in 2004-2005.

The development of the Cadastre was based on data obtained from business facilities, as well on measurements of sulfur dioxide, nitrogen oxides, carbon monoxide and dust.

This Inventory was based on polluting substances at the level of facility. However, in an observation of the requirements of the relevant international agreements, such as UNECE/CLRTAP, the CORINAIR Methodology and SNAP nomenclature were introduced in order to obtain compatible and comparable data on the given polluting substances.

The introduction of the uniform methodology for air pollution inventory on national level as recommended by CORINAIR (Core Inventory for Air Pollution) is of great importance in terms of the identification of amounts of individual pollutants. This methodology made the data of the Republic of Macedonia compatible with the relevant data in the European Union. methodology of air pollution inventory (CORINAIR) presents the quantities of air pollutants emissions distributed to all 11 sectors in accordance with the SNAP – selective nomenclature of air pollution on national level.

Total emission of ozone precursors

Series of emissions of ozone precursors were assessed for the period 2002 - 2006.

Although there are no major temporal annual series of data on ozone precursors, it is possible to conclude the following with regard to total emission of ozone precursors on annual level in the analyzed years from 2002 to 2006: NO_x and CO remained with rising trend, while quantities of NMVOC and CH_4 emissions could be presented for 2004 only. Namely, these two pollutants were covered in the inventory and their identification was conducted in the process of development of the Cadastre of air emissions, by application of the CORINAIR methodology for 2004. Most of the quantities of NMVOC and CH_4 emissions derive from the sector 11, sector 7 and sector 6 under SNAP.

Emissions of NO_x as ozone precursor by sector

Series of NO_x emissions were assessed for the period 2002 - 2005..

Through application of the CORINAIR methodology in the inventory of nitrogen oxides emission, it was found out that the main sources of NO_x in the country include electricity production, again due to the poor quality of fuel, transport and other industrial production processes.

Emissions of CO as ozone precursor by sectors

Series of CO emissions were assessed for the period 2002 - 2005.

Emissions of CO as ozone precursor show mild increase in the total quantity in the given years. If presented by SNAP sectors, sector 7, i.e. transport is prevailing in this regard. Also, CO emission results from combustion processes in heat producing plants (sector 2).

Emissions of NMVOC and CH_4 as ozone precursor by sectors

Series of NMVOC and CH_4 were not available for the period 2002 - 2006. Data available covers only 2004.

The application of the CORINAIR methodology in the inventory of NMVOC and CH_4 emissions leads to the conclusion that the main sources of this emission in the country originate from the SNAP 11 sector.

Targets

Does any of the national documents set targets or targets set under international documents should be achieved?

National documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that the development of new regulations in the area of air emissions is in progress, and they will transpose the following Directives into the national legislation: 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on the CORINAIR Programme has been introduced, setting the target of regular inventory of pollutants in tons per year.

Inventory of pollutants by main sectors of relevance for developments caused by climate change is also performed in accordance with the Uited Nations Framework Convention on Climate Change (UNFCCC).

The above documents provide basis for achievement of the targets for reduction of ozone precursors emission, causing degradation of environment and materials, as well as negative effects on human health.

Methodology

- Methodology for the indicator calculation

The methodology for this indicator calculation is based on aggregation and calculation of data on CO, NMVOC, CH_4 and NO_x emissions at annual basis, on national level, as overall and distributed to sectors, i.e. activities.

Calculations are in line with the Guidelines of UNECE/EMEP Convention on Long-Range Transboundary Air Pollution, and CORINAIR methodology for inventory and application of the SNAP – selective nomenclature of air pollution.

With regard to this specific indicator, factors have been used in order to express the property of ozone precursors. These factors are specific to each pollutant, namely for NO_x it is 1.22, for NMVOC it is 1, for CO it is 0.11 and for CH_4 this value is 0.014. The results are expressed in kilotons NMVOC equivalent**.**

- ### Methodology for deficiencies overcoming

In order to enable analysis of the trend where the countries have not reported data for a period of one or more years, data is interpolated to derive emissions for year or years for which such data is missing. If data is missing at the beginning or at the end of the period, it is assumed that the value of the emission is equal to the first or the last reported value. Application of tools for gaps filling may create artificial trends, but they are taken as unavoidable if comprehensive and comparable data set is required on European countries for the purposes of policy analysis. The list of data sets with filled in gaps plus information with reference of data used to fill in the gaps can be found on EEA Data Service at: http://dataservice.eea.europa.eu/dataservice/metadetails.asp?id=818

- ### Reference of used methodology

Methodology applied in the calculation and presentation of this indicator has been taken fro the Guidelines under CLRTAP and de Leeuw, F. (2002), Set of emission indicators of long-range transboundary air pollution, Environmental science and policy.

Data specification

Title of the indicator	Source	Reporting obligation
Emissions of ozone precursors	– State Statistical Office, Energy balance of the country – Report by the Government; Cadastre of Air polluters and Pollutants; – Data from measurements in companies – major polluters: – Database on motor vehicles of the Ministry of Interior; Project: – Introduction of CORINAIR Inventory Methodology of the Ministry of Environment and Physical Planning, – Spatial Plan of the Republic of Macedonia.	– Reporting obligations under multilateral agreements – UNECE/CLRTAP, as well as to EEA – Annual report of processed data on air emissions.

Data coverage (by years):

Table 1: Total emission of ozone precursors

NMVOC equivalent (k-tonnes)	2002	2003	2004	2005	2006
NOx	38,8	42,8	51,4	49,1	68,517
CO	8,4	8,4	9,2	10,9	19,768
NMVOC			124,1		
CH_4			0,8		

Table 2: Total emission of NOx by sectors

SNAP		2002	2003	2004	2005	2006
1	Combustion in energy and transformation industries (stationary sources)	14,965	16,405	16,405	15,981	16,649
2	Non-industrial combustion plants (stationary sources)	1,379	1,379	1,867	1,831	2,501
3	Combustion in manufacturing industry (stationary sources)	1,842	1,842	4,965	3,347	4,965
4	Production processes (stationary sources)	5,084	7,590	8,647	6,018	7,917
5	Extraction and distribution of fossil fuels and geothermal energy					
6	Solvent and other product use	1,732	1,732	1,732		2,873
7	Road transport	13,888	13,845	17,773	11,224	28,731
8	Other mobile sources and machinery				2,524	4,88
9	Waste treatment and disposal				0,025	
10	Agriculture					
11	Nature				0,205	
total		38,847	42,756	51,387	41,158	68,516

Table 3: Total emission of CO by sectors/year

SNAP		2002	2003	2004	2005	2006
1	Combustion in energy and transformation industries (stationary sources)	0,181	0,181	0,181	0,042	2,037
2	Non-industrial combustion plants (stationary sources)	0,203	0,203	0,241	4,559	5,621
3	Combustion in manufacturing industry (stationary sources)	0,214	0,214	0,428	0,061	0,054
4	Production processes (stationary sources)	0,520	0,579	0,601	0,990	6,062
5	Extraction and distribution of fossil fuels and geothermal energy				0,061	
6	Solvent and other product use	1,825	1,825	1,825		
7	Road transport	5,424	5,424	5,963	4,502	4,759
8	Other mobile sources and machinery				0,223	1,235
9	Waste treatment and disposal				0,001	
10	Agriculture					
11	Nature				0,533	
total		8,366	8,426	9,238	10,971	19,768

Table 4: Total emission of NMVOC and CH_4 by sectors/year, for 2004

SNAP		NMVOC	CH_4
1	Combustion in energy and transformation industries (stationary sources)	1,6901	0,0007
2	Non-industrial combustion plants (stationary sources)	3,5088	0,0306
3	Combustion in manufacturing industry (stationary sources)	0,2105	0,0020
4	Production processes (stationary sources)	1,1078	0,0002
5	Extraction and distribution of fossil fuels and geothermal energy	0,4249	0,1626
6	Solvent and other product use	8,4847	0,0000
7	Road transport	8,8241	0,0026
8	Other mobile sources and machinery	0,9692	0,0002
9	ТретиWaste treatment and disposal рање на отпад	0,0010	0,2023
10	Agriculture	0,0000	0,3877
11	Nature	98,8666	0,0119
total		124,0877	0,8008

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 002	**Emissions of ozone precursors**	CSI 002 AP19	Emissions of ozone precursors	**P**	**A**	air air quality	Annually

Geographical coverage: Territory of the Republic of Macedonia

Temporal coverage: 2002 – 2006

Frequency of data collection

Data is collected throughout the year, but data processing, presentation and reporting takes place once a year. In this context, Guidelines by EMEP/CORINAIR – Manual on Atmospheric Emissions Inventory, Third edition and SNAP – nomenclature of sectors, annual data processing, are used.

Note: There is no data available before 2002 to identify the quantity of ozone precursors emissions.

Uncertainty

- ### Methodological uncertainty and data uncertainty

Use of factors of the potential for ozone production by precursors leads to some uncertainty. It has been assumed that factors are representative for Europe as a whole; at local level, different factors may be assessed. Detailed discussion of uncertainty of these factors can be found with de Leeuw (2002).

EEA develops this indicator of ozone precursors emissions once a year and it uses it in the reporting on the state of the environment. The uncertainty involved in the calculations and in data sets should be clearly stated in the assessment, in order to prevent misleading messages to impact the policy actions or processes.

Future activities

- ### Short-term activities

Indicator update by supplementing annual data from the inventory of emissions of ozone precursors from the preceding year.

a. Description of the activity

Calculation of the indicator and approval of updated and supplemented indicator by the Working Group on the national set of air quality indicators.

b. Required resources

Engagement of national experts in the area of air quality from governmental institutions.

c. Status

Continuous activity

Deadline: 1 year

- ### Long-term activities

1. Medium and long-term activities include transposition of Directives of relevance for the air emissions area, namely Directives 2000/81/EC, 2001/81/EC, 96/61/EC, as well as preparation of bylaws in this regard.
2. Preparation of National Plan for Air Protection.
3. Preparation of Plan for Air Emissions Reduction.

a. Description of the activity

Upon the completion of the above described activities, conditions should be established to enable the implementation of the listed documents, e.g. establishment of ceiling values of annual emissions and their reduction projection in line with the NEC Directive 2001/81/EC.

Introduction of the system of Integrated Pollution Prevention and Control.

MK - NI 004

EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification of indicator selection

Urban populations are exposed to air pollution with sulphur dioxide, particulate matter (PM), nitrogen oxides and ground-level ozone. Sulphur dioxide (SO_2) is directly toxic to humans, its main action being on the respiratory functions. Indirectly, it can affect human health as it is converted to sulphuric acid and sulphate in the form of fine particulate matter.

Epidemiological studies have reported statistical significant associations between short-term, and especially long-term exposure to increased ambient PM concentrations and increased morbidity and (premature) mortality. PM levels that may be relevant to human health are commonly expressed in terms of the mass concentration of inhalable particles with an equivalent aerodynamic diameter equal to or less than 10 micrometer (PM_{10}). Health effect associations for the $PM_{2.5}$ fraction are even more clearly evident. Although the body of evidence concerning the health effects of PM is increasing rapidly, it is not yet possible to identify a concentration threshold below which health effects are not detectable. There is therefore no recommended WHO Air Quality Guideline for PM.

PM_{10} in the atmosphere can result from direct emissions (primary PM_{10}) or emissions of particulate precursors (nitrogen oxides, sulphur dioxide, ammonia and organic compounds) which are partly transformed into particles by chemical reactions in the atmosphere (secondary PM_{10}).

Short-term exposure to nitrogen dioxide may result in airway and lung damage, decline in lung function, and increased responsiveness to allergens following acute exposure. Toxicology studies show that long-term exposure to nitrogen dioxide can induce irreversible changes in lung structure and function.

Exposure to high ozone concentration for periods of a few days can have adverse health effects, in particular inflammatory responses and reduction in lung function. Exposure to moderate ozone concentrations for longer periods may lead to a reduction in lung function in young children.

Definition

The indicator shows ambient air concentrations of pollutants in excess of the limit value set for the quality of air in urban environments.

Exceedance of air quality limit values occurs when the concentration of air pollutants exceeds the limit values for SO_2, PM_{10}, NO_2 and the target values for O_3 as specified in the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05), wherein the requirements of the Daughter Directives 1999/30/EC, 2000/69/EC and 2002/3/EC have been transposed.

Where there are multiple limit values (see section on Policy Targets), the indicator uses the most stringent case:

- Sulphur dioxide (SO_2): the daily limit value
- Nitrogen dioxide (NO_2): the annual limit value
- Particulate matter of a size up to 10 micrometer (PM_{10}): the annual limit value
- Ozone (O_3): the short term objective

Units

Concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) in the ambient air are expressed in microgramme/m^3 (µg/m^3).

Policy relevance of the indicator

List of relevant policy documents

The National Environmental Action Plan II (2006) specifies the improvement of the quality of the air through measures intended to reduce the emissions of the main pollutants as one of its priority objectives. The same document indicates two basic measures that need to be taken, namely: preparation of National Plan for Ambient Air Protection and strengthening the monitoring process and air quality assessment.

Legal grounds

The Law on Environment regulates areas which make direct impact on air quality and thus may contribute to air emissions reduction. Thus, the Law regulates issues related to IPPC, EIA/SEA, Local Environmental Action Plans (LEAPs) and climate change.

The Law on Ambient Air Quality was adopted in August 2004 (Official Gazette of the Republic of Macedonia Nos. 67/2004). It was later amended (Official Gazette of the Republic of Macedonia No. 92/2007), and it is framework law in the area of air. The main goals of this Law are: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollution resulting in climate change, as well as provision of the relevant information on the quality of ambient air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant Acquis Communitaire.

The following regulations have been adopted so far:

- Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05)

– Rulebook on criteria, methods and procedures for ambient air quality assessment (Official Gazette of the Republic of Macedonia No. 82/06)

Targets

The Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term targets, defines the limit values for SO_2, PM_{10}, NO_2 and target values for O_3.

Limit values for concentrations of sulfur dioxide in ambient air

In accordance with the said Decree, two limit values are specified for **sulfur** dioxide for the purpose of human health protection. Both limit values should be achieved by 1 January 2012:

– Daily limit value of 125 μg/m^3 which shall not be exceeded by more than three times during one calendar year

– Hourly limit value of 350 μg/m^3, which shall not be exceeded by more than 24 times during one calendar year.

Limit values for concentrations of nitrogen dioxide in ambient air

In accordance with the said Decree, two limit values are specified for nitrogen dioxide for the purpose of human health protection. Both limit values should be achieved by 1 January 2012:

– Hourly mean concentration of nitrogen dioxide shall not exceed the limit value of 200 μg/m^3 by more than 18 times during one calendar year.

– The mean annual concentration shall not exceed 40 μg/m^3.

Limit values for concentrations of suspended particulate matter of size up to 10 micrometers in the ambient air

The said Decree specifies two limit values for suspended particulate matter of size up to 10 micrometers, for the purpose of human health protection. The achievement of limit values has been planned in two phases. In the first phase, both limit values should be achieved by 1 January 2010, where:

– 24-hourly limit value is 50 μg/m^3, and it shall not be exceeded by more than 35 times during one calendar year

– The mean annual concentration shall not exceed 40 μg/m^3 .

In the second phase, both limit values should be achieved by 1 January 2012, where:

– 24-hourly limit value is 50 μg/m^3, shall not be exceeded by more than seven times during one calendar year

– The mean annual concentration shall not exceed 20 μg/m^3 .

Target values for ozone concentrations in ambient air

The said Decree, with regard to ozone, specifies target value for the purpose of human health protection and long-term target for the purpose of human health protection.

- The target value for ozone, for the purpose of human health protection, is specified so that 8-hourly value is calculated from the hourly concentrations in each day. The maximum daily 8-hourly value of ozone shall nor exceed the value of 120 μg/m^3 in more than 25 days in the course of the year (calculated as an average value for three years). This target value should be achieved by 2010.
- The Decree also defines long-term target for the purpose of human health protection, set at 120 μg/m^3, as maximum daily 8-hourly value during a calendar year.

Key policy issue

What progress has been achieved in reducing the concentrations of pollutants in urban areas in order to achieve the limit values (for SO_2, PM_{10}, NO_2) and target values (for O_3) set in the Decree?

Key message

Sulphur dioxide - SO_2

Excess of mean daily concentrations of **sulfur** dioxide above limit values has been recorded in Skopje, but not in other cities in the Republic of Macedonia.

Suspended particulate matter of size up to 10 micrometers

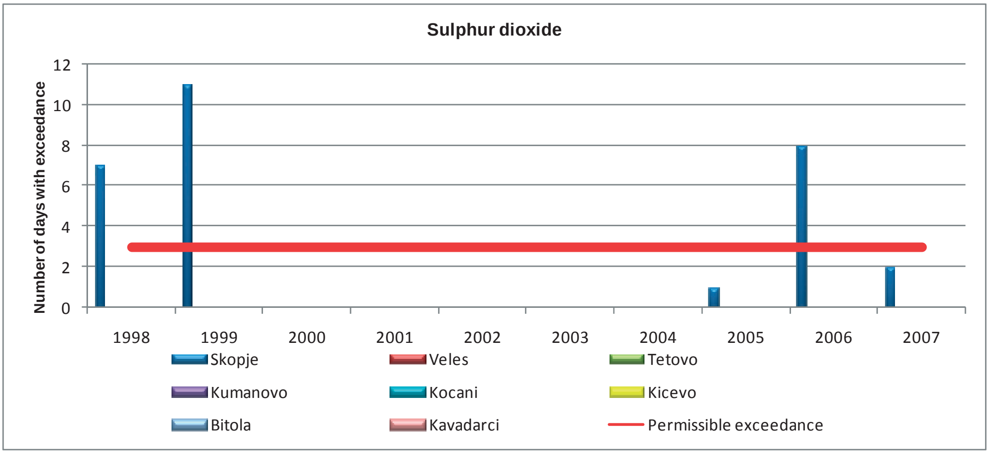
Concentrations of suspended particulate matter of size up to 10 micrometers exceed the limit values specified in the Decree in all urban areas where measurements take place. There frequent events of very high concentrations of suspended particulate matter of size up to 10 micrometers.

Nitrogen dioxide

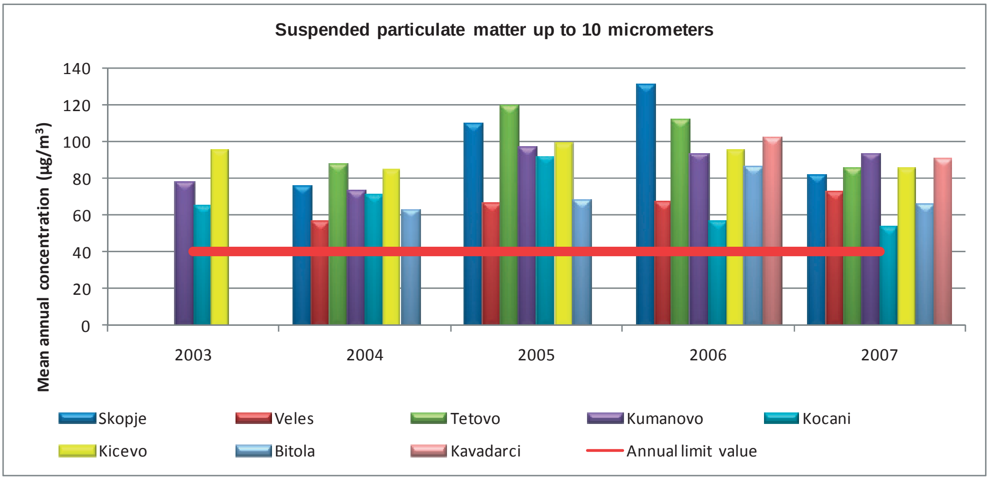
The measured concentrations of nitrogen dioxide are bellow limit values specified in the Decree, at all measuring points, with an exception of Skopje and Kumanovo in the course of 2004 and Kicevo in the course of 2005.

Ozone

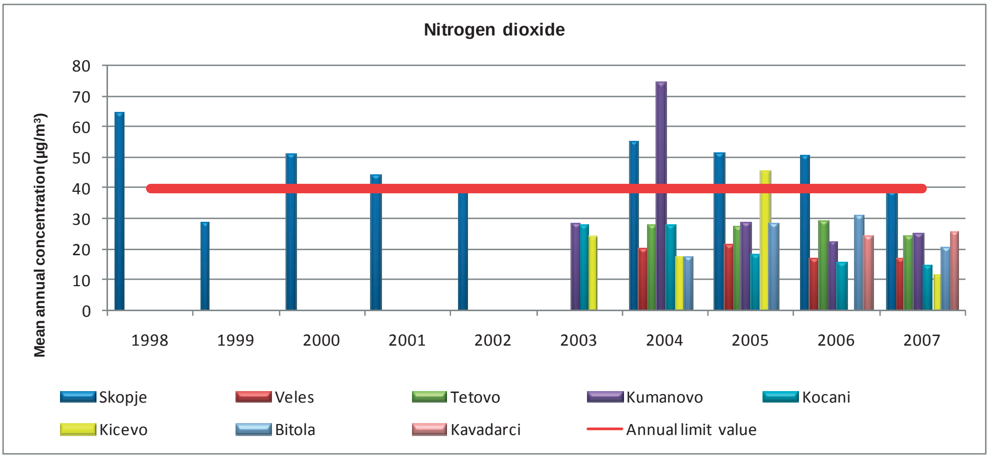
The Decree does not specify limit values for ozone, but it sets target value to be applied until 2010. The target value for ozone is in excess in all cities in the Republic of Macedonia where measurements of this pollutant are conducted.



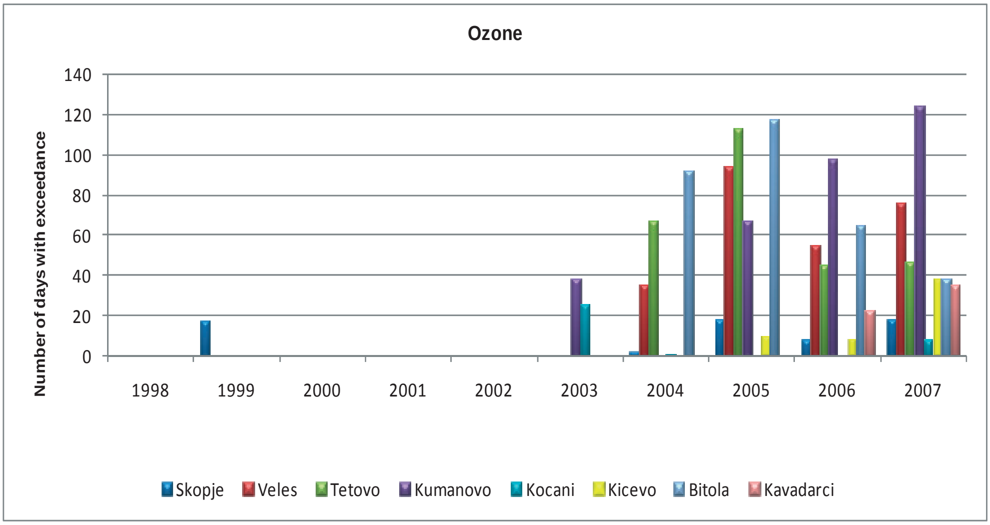
Sulphur dioxide
Number of days with exceedance
12
10
8
6
4
2
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Skopje
Veles
Tetovo
Kumanovo
Kocani
Kicevo
Bitola
Kavadarci
Permissible exceedance



Suspended particulate matter up to 10 micrometers
Mean annual concentration (µg/m³)
140
120
100
80
60
40
20
0
2003
2004
2005
2006
2007
Skopje
Veles
Tetovo
Kumanovo
Kocani
Kicevo
Bitola
Kavadarci
Annual limit value



Nitrogen dioxide
Mean annual concentration (µg/m³)
80
70
60
50
40
30
20
10
0
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Skopje
Veles
Tetovo
Kumanovo
Kocani
Kicevo
Bitola
Kavadarci
Annual limit value



Assessment

Sulphur dioxide - SO_2

Sulfur dioxide in the air most frequently originates from major thermal power plants, as well as from small and medium size boilers for coal combustion in urban environments. The main anthropogenic sources include coal and oil combustion. This pollutant is also released in the air from industrial processes (production of cellulose and paper, sulfuric acid, lead and zinc ores smelting).

According to the available data, the mean daily concentrations of sulfur dioxide have been in excess only in the City of Skopje, in 998, 1999 and 2006. The occurrence of this excess of concentrations above the limit values is due to the higher frequency in traffic, i.e. fuels combustion in transportation means.

PM_{10}

Suspended particulate matters of size up to 10 micrometers are particles able to pass through an opening conducting selection by size, with 50% loss in efficiency at aerodynamic diameter of size less than ten micrometers (10 µm). These particles of size not exceeding 10 micrometers are the so called fine particles or aerosols. Their retention time in the air is long and they originate from natural and anthropogenic sources. Among natural sources, the more prominent include yellow rains, present also with us, forest fires and chemical reactions. Combustion of coal, wood and oil, industrial processes, transport and waste burning are the most significant anthropogenic sources.

Increased concentrations of suspended particulate matters can be recorded in urban areas, especially in autumn-winter seasons, which is most probably due to increased frequency in traffic, fossil fuels combustion and meteorological conditions.

The processed data show that concentrations of suspended particulate matter up to 10 micrometers are in excess of the mean annual concentration of 40 µm/m^3, in all cities where measurements of this pollutant take place. The highest mean annual concentration of this pollutant was recorded in Skopje, in 2006, which is most probably due to the living style, density of population, high level of solid fuels in use for households heating in winter period, as well as to sources from industry.

Nitrogen dioxide - NO_2

Investigations have testified the presence of several nitrogen oxides in the air, but the most significant among them are nitrogen dioxide and nitrogen monoxide. These pollutants most often originate from natural sources. However, in urban environments, the main source is the traffic, and industry is minor source. The most toxic of all nitrogen oxides is the nitrogen dioxide, the concentrations of which are dependent on season and meteorological conditions. Namely, in concentration of NO is higher in morning hours when the traffic is more frequent, while the intensification of solar radiation during the day leads to transformation of NO into NO_2 resulting in increased concentration of NO_2. Nitrogen oxides influence the content of ozone and other photochemical oxidants in the air. During the spring-summer period, the concentration of NO_2 is higher, while in autumn-winter period, the concentration of NO is higher. The quantity of NO_x increases in winter period due to the higher frequency of traffic.

Processed data showed that excess in the mean annual concentration of nitrogen dioxide was recorded in 1998, 2000, 2001, 2004, 2005 and 2006, in Skopje. However, in the period from 2004 to 2007, a decreasing trend was tracked in the concentration of this pollutant.

Among other cities, excess in the mean annual concentration of nitrogen dioxide was recorded in Kumanovo, in 2004 and in Kicevo in 2005. This was most probably due to the high frequency of traffic and operation of industrial facilities in these cities.

In 2007, no excess in the mean annual concentration of nitrogen dioxide was recorded in any of the measuring points in the Republic of Macedonia.

Ozone- O_3

Ozone layer is positioned at height of 10 km to 15 km from Earth and it plays the role of a filter for UV radiation and climate stabilizer.

Automatic monitoring stations measure the ground-level ozone formed as a result of photochemical reactions involving nitrogen oxides, volatile organic compounds (most frequently hydrocarbons), etc. However, its content is also dependent on the course of the day (intensity of solar radiation), as well as annual seasons.

The diagram above shows the number of days with excess in target value set for ozone in Macedonian urban environments. As presented, a number of days with excess in ozone target value is tracked in all cities where measurements of this pollutant take place. In the period from 2004 to 2006, the highest number of days with excess in ozone target value was recorded in Bitola, and in 2007 in Veles.

Methodology

- Methodology for the indicator calculation

Sulphur dioxide - SO_2

For each measuring station located in urban environment, the number of days with mean daily concentration higher than the limit value (daily mean value of125 µg/m^3) is calculated from the available hourly data. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and so called urban background stations. The number of days with excess in a city is obtained by averaging the results of all stations located in that city.

Suspended particulate matter up to 10 micrometers – PM_{10}

For each measuring station located in urban environment, the mean annual concentration (annual limit value is 40 µg/m^3) is calculated from the available hourly data. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and so called urban background stations. The mean annual concentration in a city is obtained by averaging the mean annual concentration of all stations located in that city.

Nitrogen dioxide - NO_2

For each measuring station located in urban environment, the mean annual concentration (annual limit value is 40 µg/m^3) is calculated from the available hourly data. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and so called urban background stations. The mean annual concentration in a city is obtained by averaging the mean annual concentration of all stations located in that city

Ozone – O_3

For each measuring station located in urban environment, the number of days in which the maximum daily 8-hourly concentration of ozone is in excess of ozone target value for human health protection - 120 µg/m^3 is calculated. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and so called urban background stations. The number of days with excess in a city is obtained by averaging the results of all stations located in that city.

Data specification

Title of the indicator	Source	Reporting obligation
Exceedance of air quality limit values in urban areas	MOEPP	– European environmental agency – Exchange of data on air quality, based on the Council Decision on the establishment of reciprocal exchange of information and data among all networks and individual ambient air quality measuring stations (97/101/EC). – Exceedance in ozone concentrations during April, May, June, July, August and September, under the requirements of Ozone Directive 2002/3/EC. – Exceedance in ozone concentrations during summer period, under Ozone Directive 2002/3/EC.

Data coverage (by years):

Table 1: Number of days with SO_2 concentrations in excess of mean daily limit value - 125 μg/m^3 in urban environments in Macedonia.

City	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Skopje	Number of days	7	11					0	1	8	2
Veles	Number of days							0	0	0	0
Tetovo	Number of days							0	0	0	0
Kumanovo	Number of days						0	0	0	0	0
Kocani	Number of days						0	0	0	0	0
Kicevo	Number of days						0	0	0	0	0
Bitola	Number of days							0	0	0	0
Kavadarci	Number of days									0	0

Source: Ministry of Environment and Physical Planning, Macedonian Environmental Information Centre

Table 2: Mean annual concentration of PM_{10} (annual limit value is 40 μg/m^3)

City	Unit	2003	2004	2005	2006	2007
Skopje	μg/m^3		75,69	110,1	131,5	82,25
Veles	μg/m^3		56,76	67,4	68	73
Tetovo	μg/m^3		87,76	119,7	112	86
Kumanovo	μg/m^3	78	74,03	97,34	94	94
Kocani	μg/m^3	65,46	71,97	92,2	57	54
Kicevo	μg/m^3	95,47	84,91	99,65	96	85
Bitola	μg/m^3		63,41	68,68	86,5	66,5
Kavadarci	μg/m^3				103	91

Source: Ministry of Environment and Physical Planning, Macedonian Environmental Information Centre

Table 3: Mean annual concentration of NO_2 (annual limit value is 40 μg/m^3)

City	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Skopje	Number of days	0	17,5					2	18,5	8,33	18
Veles	Number of days							35,5	94	55,5	76,5
Tetovo	Number of days							67	113	45	47
Kumanovo	Number of days						38	0	67	98	124
Kocani	Number of days						26	1	0	0	8
Kicevo	Number of days						0	0	10	9	38
Bitola	Number of days							92	118	64,5	38,5
Kavadarci	Number of days									23	35

Source: Ministry of Environment and Physical Planning, Macedonian Environmental Information Centre

Table 4: Number of days with excess in ozone target value in Macedonian urban environments (highest mean 8-hourly value > 120 μg/m^3)

City	Unit	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Skopje	μg/m^3	64,83	29	51,26	44,3	39,9		55	51,6	50,67	38,52
Veles	μg/m^3							20,1	21,4	17,27	17
Tetovo	μg/m^3							28	27,7	29,42	24,67
Kumanovo	μg/m^3						28,5	74,5	28,9	23,01	25,5
Kocani	μg/m^3						28,3	28	18,5	15,8	15,07
Kicevo	μg/m^3						24,2	17,7	45,4		12,21
Bitola	μg/m^3							17,5	28,6	31,12	20,63
Kavadarci	μg/m^3									24,56	25,87

Source: Ministry of Environment and Physical Planning, Macedonian Environmental Information Centre

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 004	**Exceedance of air quality limit values in urban areas**	CSI 004	Exceedance of air quality limit values in urban areas	**S**	**A**	air air quality	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1998 – 2007

Frequency of data collection: Data from automatic air quality monitoring system is obtained on hourly basis, by modem support through telephone line, collected in the central station located in the Macedonian Environmental Information Centre, MEPP.

Uncertainty

- Methodological uncertainty

In general, data is not representative for all urban environments in the Republic of Macedonia. The indicator is subject to changes from year to year depending on meteorological conditions. Compared to the methodology of the European Environmental Agency, where the calculation of the indicator is based only on data produced by the so called urban background stations, in our calculations we used data from all measuring stations located in urban environments, because there is only one urban background station, located in the Municipality of Gazi Baba, Skopje.

- Data uncertainty

In general, data is not representative for all urban environments in the Republic of Macedonia. According to the methodology adopted by the European Environmental Agency, only series of data produced by monitoring stations with at least 75% during one year are taken into account in the indicator calculation (in other words, more than 274 valid daily data in the course of one calendar year). In our case, this was not taken into account in using data from monitoring stations. Representativeness of selection is different for different cities and this decreases the possibility for comparisons between cities. At this stage, it is not possible to select sufficient number of monitoring stations covering the whole temporal period, due to the fact that stations with available data change from year to year.

Future activities

- Short-term activities

Indicator update by supplementing new data (Data from the State Automatic Air Quality Monitoring System for 2008).

a. **Description of the activity**

Calculation of the indicator and approval of updated and supplemented indicator by the Working Group on the national set of air quality indicators.

b. Reqiuered resources

Engagement of national experts in the area of air quality from governmental institutions.

c. Status

Continuous activity.

Deadline: 1 year.

■ Long-term activities

1. Calculation of data uncertainty

a. Description of the activity

Application of ISO and CEN standards in the area of air quality.

Proper development of the State Automatic Ambient Air Quality Monitoring System, including regular maintenance, servicing and calibration of instruments in the monitoring stations should result in more valid data in the course of one year. The goal is to apply the defined methodology of the European Environmental Agency in indicator calculation, i.e. to use only these series of data from monitoring stations with a coverage of at least 75% during one year (i.e. more than 274 valid daily data in the course of one calendar year).

b. Required resources

Allocated budget for regular maintenance of the State Automatic Ambient Air Quality Monitoring System, in accordance with the prepared Operational Programme.

c. Condition

Continuous activity.

Revision of the classification of monitoring stations in order to use only series of data from urban background stations in indicator calculation.

Establishment of new monitoring stations based on Strategic Planning of the MEPP.

MK - NI 006

CONSUMPTION OF OZONE DEPELTING SUBSTANCES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification of indicator selection

In the middle of 1970s, the world scientific community detected the phenomenon of ozone layer depletion positioned at 25-40th km above the Earth surface in the upper layers of the atmosphere, i.e. stratosphere. The identified cause of ozone molecules destruction is related to organic compounds (hydrocarbons) the molecule of which contains atoms of halogen elements (chlorine or bromine). One molecule of the chemicals as CFCs, HCFCs, CCl_4, halons, methyl chloroform, and methyl bromide released in the atmosphere during ozone molecules reaction in stratosphere is able of destroying 100.000 molecules of ozone and result in ozone layer depletion. Recognizing the issue of the ozone layer depletion, the international community has adopted two key documents, namely the 1985 Vienna Convention for the Protection of the Ozone Layer and 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, which initiate aggressive action aimed at reduction and full elimination of substances that deplete the ozone layer at global level.

Vienna Convention is a framework document establishing the basis for introduction of rigorous measures for restriction of the use of ozone depleting substances (ODSs), while the Montreal Protocol establishes precise rules and time frames within which the reduction and the elimination of ODSs by means of prohibition and restriction of their production, import and export shall take place. ODSs emissions are not addressed either by the Convention, nor by the Protocol.

In 1994, the Republic of Macedonia ratified both the Vienna Convention and the Montreal Protocol, and in the period 1998 - 2002, the four Amendments to the Protocol (London Amendment, Copenhagen Amendment, Montreal Amendment, and Beijing Amendment) were ratified, too.

The national action towards ODSs elimination has been carried out since 1997, when the Ozone Unit was established within the Ministry of Environment and Physical Planning. Under the financial support provided by the Multilateral Fund of the Montreal Protocol, as much as more than 97% of the total consumption in the country has been eliminated, through substitution of ODSs in all economic branches of their application.

Considering the fact that the Republic of Macedonia has never been producing ODSs, the Ministry of Environment and Physical Planning/Ozone Unit carries out permanent of ODSs import in, export from and consumption in the Republic of Macedonia. Consequently, the indicator will track the ODSs consumption.

Definition

Substances that deplete the ozone layer (ODSs) are the compounds which cause depletion of the ozone layer. This group includes CFCs, HCFCs, HBFCs CCl_4, halons, methyl chloroform, methyl bromide. In general, these compounds are very stable in troposphere and they decompose only under the influence of ultra-violet radiation emitted by the Sun. While decomposing, they release chlorine or bromine atoms which destroy the molecules of stratospheric ozone.

This indicator quantifies the consumption of ozone-depleting substances (ODSs) in the Republic of Macedonia in the period between 1995 and 2005.

Units

- ODSs consumption is expressed in ODP tons which means quantity of each substance in metric tonnes (MT) multiplied by its Ozone Depletion Potential (ODP).

Policy relevance of the indicator

Upon the ratification of the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer, series of policy measures aimed at steady reduction and elimination of ODSs consumption were undertaken in the Republic of Macedonia in the period between 1997 and 2007.

List of relevant policy documents

National Environmental Action Plan (NEAP II, 2006)

Country Programme for Phasing-out Substances that Deplete the Ozone Layer (1996) – strategic document establishing the main directions in the domain of management and elimination of ODSs in the Republic of Macedonia. It was adopted in 1996. Based on the recommendations of the Country Programme, ODSs elimination has been completed in industry (production of refrigerators, flexible and rigid foams), agriculture, private sector. By 2006, more than 97% of ODSs consumption defined in the National Programme was eliminated. Projects have been implemented by means of the financial support provided by the Multilateral Fund of the Montreal Protocol through the Ministry of Environment and Physical Planning/ Ozone Unit.

Legal grounds

- Law on the Ratification of the Vienna Convention for the Protection of the Ozone Layer (Official Journal of SFRY No. 1/90), adopted by the Republic of Macedonia by means of succession in 1994.
- Law on the Ratification of the Montreal Protocol on Substances that Deplete the Ozone Layer (Official Journal of SFRY No. 16/90), adopted by the Republic of Macedonia by means of succession in 1994.
- Law on the Ratification of London Amendment to the Montreal Protocol (Official Gazette of the Republic of Macedonia No. 25/98)
- Law on the Ratification of Copenhagen Amendment to the Montreal Protocol (Official Gazette of the Republic of Macedonia No. 25/98)

– Law on the Ratification of Montreal Amendment to the Montreal Protocol (Official Gazette of the Republic of Macedonia No. 51/99)

– Law on the Ratification of Beijing Amendment to the Montreal Protocol (Official Gazette of the Republic of Macedonia No. 13/02)

– As of 1 March 1997, the import of ozone depleting substances is allowed only upon permit issued by the Ministry of Environment and Physical Planning.

– As of 12 June 1998, equipment containing ozone depleting substances (used refrigerators, freezers, cooling devices, heat pumps, etc.) may be imported only upon permit issued by the Ministry of Environment and Physical Planning.

– Law on Environment (Official Gazette of the Republic of Macedonia Nos. 53/2005 and 81/2005)

– Order banning the import of used refrigerators, freezers and other cooling or freezing devices and import of ozone depleting substances (Official Gazette of the Republic of Macedonia No. 87/2006)

– As of 1 January 2008, equipment (new refrigerators, freezers, cooling devices, heat pumps, air-conditioners) may be imported only upon permit issued by the Ministry of Environment and Physical Planning.

Targets

By the act of ratification of the Montreal Protocol, the Republic of Macedonia has undertaken all obligations deriving from this document. According to the obligations specified in the Protocol, the schedule for the ODSs elimination is as follows:

<table>
<tr><th colspan="2">Montreal Protocol</th><th rowspan="2">Controlled substances applied in the Republic of Macedonia</th><th rowspan="2">Obligations of the Republic of Macedonia (as Article 5 country under the Montreal Protocol)</th></tr>
<tr><th>Annex</th><th>Group</th></tr>
<tr><td rowspan="2">A</td><td>I</td><td>CFC-11
CFC-12
CFC-115</td><td>Base level: Mean of the consumption in 1995-1997
Freeze : 1 July 1999
50% reduction : 1 January 2005
85% reduction : 1 January 2007
100% reduction : 1 January 2010</td></tr>
<tr><td>II</td><td>Halon-1211
Halon-1301
Halon-2402</td><td>Base level: Mean of the consumption in 1995-1997
Freeze : 1 January 2002
50% reduction : 1 January 2005</td></tr>
<tr><td>C</td><td>I</td><td>HCFC-22
HCFC-141b</td><td>Base level: Consumption in 2009-2010
Freeze : 1 January 2013
10% reduction : 1 January 2015
35% reduction : 1 January 2020
67,5% reduction : 1 January 2025
97,5% reduction : 1 January 2030
100% reduction : 1 January 2040</td></tr>
<tr><td>E</td><td>I</td><td>Methyl bromide</td><td>Base level: Mean of the consumption in 1995-1998
Freeze : 1 January 2005
100% reduction : 1 January 2015</td></tr>
</table>

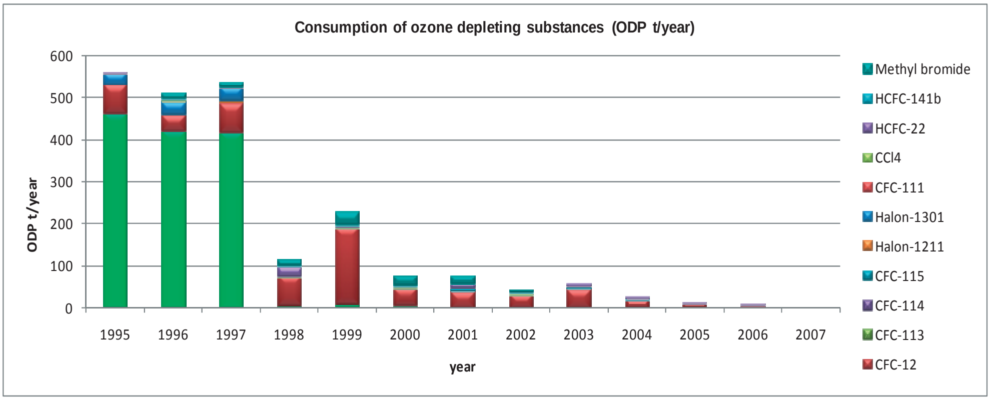
Taking into account the extent of ODSs elimination in the Republic of Macedonia, it may be concluded that the percentage of elimination of more than 97% reflects the fact that our country has achieved much more advanced level of compliance that the one required under the Protocol.

Key policy issue

During the last ten years (1997 - 2007), the Republic of Macedonia has phased-out more than 97% of ODSs consumption, which means that it has not only fulfilled its obligations under the Montreal Protocol, but reached beyond the requirements specified in the Protocol.

Key message

The act of ratification of the Montreal Protocol (1994) and the establishment of the Ozone Unit under the Ministry of Environment and Physical Planning (1997) was immediately followed by national action to protect the ozone layer, through ODSs reduction and elimination. The main task of MEPP/Ozone Unit is to coordinate the activities related to ODSs phasing-out at national level. Thus, in the period between 1997 and 2007, under the coordination of this Unit, the implemented projects for ODSs phasing-out achieved removal of more than 97% of the total consumption of ODSs in the country. Apart from this, the MEPP/Ozone Unit conducts permanent monitoring of the import, export and consumption of the ODSs in the Republic of Macedonia, monitoring of collected and recycled amounts of ODSs [through the projects “Plan for Management and handling of Cooling Substances and Devices” (2000 - 2005) and “Final CFCs elimination” (2006 - 2010), the services for cooling devices were supplied with equipment for collection, treatment and recycling of ODSs and three ODSs recycling centres were established in the country], works on the awareness of directly affected stakeholders, as well as of the public in general.



Note: Given the fact that the Republic of Macedonia has never produced any ODS, the diagram includes data only on ODSs consumption in the period 1995 - 2007.

Assessment

With the establishment of the Ozone Unit under the Ministry of Environment and Physical Planning in 1997, the country has joined actively the global action for ODSs reduction and phasing-out. During the last ten years (1997 - 2007), under the coordination of the Ozone Unit, application of ODSs has been phased-out in all industrial installations where such application has been identified in the Republic of Macedonia. All activities involving substitution of ODSs in industry, as well as in other economic sectors (agriculture, private sector) where ODSs found their application, have been implemented by means of financial support provided by the Multilateral Fund of the Montreal Protocol, amounting to US$ 5.000.000.

Reports of the UNEP's Secretariat for the Protection of the Ozone Layer certify that in the ten year period, through specific investment projects and technical assistance provided by UNIDO, as much as more than 97% of ODSs consumption in the Republic of Macedonia has been phased-out.

According to data contained in the Country Programme for Phasing-out Substances that Deplete the Ozone Layer (1996), the average consumption of ODSs in the period 1995 - 1997 amounted 527 tons. According to the provisions of the Montreal Protocol, the said average has been taken as a base level in determining the extent of reduction to be achieved within the restrictions provided for by the Protocol. Table 1 shows the trend of decline in ODSs consumption, especially in the period of the last ten years (1995 – 2005). Apart from ODSs elimination in industry (production of refrigerators and production of rigid and flexible foams), where technologies using ozone depleting substances before 1997 were replaced by non-ODSs solutions; interventions were also made in agriculture through substitution of methyl bromide with alternative solutions that did not involve application of ODSs, in cooling devices servicing and maintenance through establishment of the system for ODS collection and recycling. In the context of the latter, 109 sets of equipment for cooling fluids and 20 sets of equipment for collection, treatment and recycling of cooling devices have been delivered so far to services dealing with cooling devices and three centres for cooling fluids recycling were established (in Skopje, Ohrid and Strumica). In parallel with the above, in the period 2000 – 2007, more than 220 service technicians were trained in proper handling and management of cooling substances and devices, and 366 customs officers were trained in ODSs control and detection at all border-crossings in the country.

The national action for ozone layer protection has resulted in elimination of more than 97% of the total consumption of ODSs in the Republic of Macedonia

Methodology

- ## Methodology for the indicator calculation

The Indicator shows the quantity of consumed ODSs. The value presented has been obtained by multiplying the value of the consumed quantity expressed in metric tons by the Ozone Depletion Potential (ODP). The Table below presents the values of ODP for substances identified to be applied in the Republic of Macedonia and the consumption of which is subject of reduction or control. The Ministry of Environment and Physical Planning/Ozone Unit has data on ODSs consumption in both metric and ODP tons.

ODSs	ODP value
CFC-11	1.0
CFC-12	1.0
CFC-113	0.8
CFC-114	1.0
CFC-115	0.6
CFC-111	1.0
CCl_4	1.1
Halon 1211	3.0
Halon 1301	10.0
HCFC-22	0.055
HCFC-141b	0.11
Methyl Bromide	0.7

Data specification

Title of indicator	Source	Reporting obligation
Consumption of ODSs	MEPP/Ozone Unit	– UNIDO – UNEP - Secretariat for Ozone Layer Protection – Multilateral Fund of the Montreal Protocol

Data coverage (by years):

Table 1: Consumption of ODSs in the period 1995-2007

Substances	ODP t*/year											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CFC-11	464,8	420	418,41	7	8,8	7,12						
CFC-12	64,74	41	69,1	70,84	183,07	39,6	39,58	34,07	44,53	21,35	11,83	6,99
CFC-113						0,02						
CFC-114												
CFC-115					0,02	2,72	7,1	0,04	4,8	0,5		
Halon-1211			3,87									
Halon -1301	30	30	32,4									
CFC-111					1,36							
CCl4		4,4	0,02	0,1	0,06	0,04		0,01			0,012	
HCFC-22	1,5	2,31	1,83	22,16	6,57	4,93	10,36	3,81	5,96	4,76	1,86	2,36
HCFC-141b		0,11		2,31	0,11	0,05		0,11				
Methyl bromide		12	12	12,9	27,24	23,37	19,92	5,32				
Total	**561,04**	**509,82**	**537,63**	**115,31**	**227,23**	**77,85**	**76,96**	**43,36**	**55,29**	**26,61**	**13,7**	**9,35**

***** ODP (Ozone Depletion Potential): integrated change in the total amount of ozone per unit mass emission of specific compound relative to integrated change in the total amount of ozone per unit mass emission of CFC-11, Source: Environmental Assessment Report No. 2, EEA, 1999.

ODP tons: consumption in metric tons multiplied by the value of Ozone Depletion Potential.

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 006	**Consumption of ozone depleting substances**	CSI 006 OD3	Consumption of ozone depleting substances	**P**	**B**	DG ENV EEA Eurostat	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 - 2007

Methodology and frequency of data collection: data is collected and processed by the Ministry of Environment and Physical Planning/Ozone Unit at annual basis.

Information on quality (at data level):

Based on the feedback received every year upon delivery of the annual report to international bodies responsible for the implementation of the Montreal Protocol, data meets all international criteria in this field.

Future activities

■ Short-term activities

Implementation of the project for final elimination of CFCs in the Republic of Macedonia

a. Description of the activity

Project "Plan for full elimination of CFCs in the Republic of Macedonia"

The Project "Plan for full elimination of CFCs in the Republic of Macedonia" is another step forward made by the Republic of Macedonia, but this time the final one after several years of efforts towards full elimination of substances characterized by their highest value of ozone depletion potential, i.e. the well-known chlorofluorocarbons or CFCs.

The main goal of the Project is to ensure timely, sustainable and intensified phasing-out of CFCs through improvement of the current legislation, stakeholders training, use of existing stockpiles, active participation of affected stakeholders and support by decision-makers.

The project will be implemented through the following phases:

- Review of existing and drafting of new legislation (compliant with EU Directives in this area) in relation to import, export and consumption of ozone depleting substances;
- Provision of additional equipment for collection, treatment and recycling of freons for cooling equipment service technicians;
- Establishment of sustainable system for education in acceptable management of CFC-cooling fluids in vocational secondary schools for service technicians of cooling devices and incorporation of CFC-fluids collection and recycling as topics in their curriculum;
- Updating of existing system for continuous monitoring of collected and recycled amounts of CFC-cooling substances;
- Organization of intensive campaign by involvement of public information media and non-governmental sector in activities aimed at informing the general public of undertaken activities.

The Project is actually an advanced phase of the previous Plan for Management of Cooling Substances and Devices. The new activity envisages new, more sophisticated scheme of collection, treatment and re-use of CFCs in cooling systems:

- recording the service providers in need for equipment for CFC-freons collection;
- training in introduction of the procedure for freons collection - recycling (treatment) - refilling;
- delivery of equipment for freons collection - recycling (treatment) - refilling;
- practical application of the equipment;
- reporting to the Ozone Unit on collected/recycled amounts of CFC-freons.
- In addition to the above, the Project has included training of customs officers in CFCs identification and control at border-crossings and granting of detection equipment.

The new approach in the process enables implementation of the entire cycle (collection-recycling-refilling) on the spot, thus making the procedure economically more cost-effective, both for the service provider and for the client. In addition to this, the possibility for refilling fluids that have not been treated to the level which will not damage the system is minimized.

Activities for application of new methods of CFC-cooling media collection and reuse enable strict restrictions of the import of ozone depleting substances, within the following frames:

- 15.000 kg in the period between 1 January 2006 and 31 December 2006;
- 10.000 kg in the period between 1 January 2007 and 31 December 2007;
- 5.000 kg in the period between 1 January 2008 and 31 December 2008;
- substances listed in Annex A, Group I of the Montreal Protocol on the Substances that Deplete the Ozone Layer shall not be imported after 31 December 2009.

All the above indicates that the Project “Plan for full elimination of CFCs in the Republic of Macedonia” will enable finalization of activities for full elimination of CFCs in the Republic of Macedonia and thus fulfillment of the obligations deriving from the Montreal Protocol: 100% reduction by 1 January 2010.

Demonstration project for substitution of ODSs containing centrifugal chillers

The goal of the Project is to demonstrate the reduction in the consumption of ozone depleting substances through substitution of centrifugal chillers that contain these chemicals in the National Bank of the Republic of Macedonia and OHIS.

Specifically, the Project will enable:

- meeting the obligations arising from the Montreal Protocol,
- enhancing the energy efficiency through energy saving, as well as reduction of GHG emissions in the cooling sector and air-conditioning,
- facilitation of the substitution of ODS containing chillers with environment friendly devices of high energy saving performance.

b. Required resources

The funds required for the project implementation have been provided by the Multilateral Fund of the Montreal Protocol.

c. Status

Project “Plan for full elimination of CFCs in the Republic of Macedonia”

In the course of one year from the project initiation (2006), the following activities have been implemented:

- Teaching personnel was trained in nine vocational secondary schools, regarding good practices in cooling substances and devices management and handling,
- Ten vocational secondary schools have been furnished with demonstration equipment for collection, treatment and recycling of cooling substances,
- 216 service technicians of cooling devices have been trained and certified in proper management and handling of cooling substances and devices,
- Provision of collection, treatment and recycling equipment for 22 services for cooling devices,

- 99 customs officers have been trained in ODSs detection and control on border-crossings
- Manual for service technicians of cooling appliances and Manual for service technicians of small commercial equipment, have been prepared.

Demonstration project for substitution of ODSs containing centrifugal chillers

The Demonstration project for substitution of ODSs containing centrifugal chillers is implemented in the National Bank of the Republic of Macedonia and OHIS, Skopje. This Project has enabled substitution of ODS containing cooling equipment with equipment using cooling fluid with ozone depletion potential equal to zero. Premises envisaged for installation of the new equipment have been adjusted to the new system, the equipment has been installed in both the National Bank of the Republic of Macedonia and OHIS, and final preparations for putting the new chillers into operation are in progress.

Deadline: 1 January 2010

- Long-term activities

Institutional support – Ozone Unit

The Ozone Unit has operated under the Ministry of Environment and Physical Planning since February 1997. All activities of the Ozone Unit have been financed by the Multilateral Fund of the Montreal Protocol, while the role of implementing agency has been given to UNIDO. The main task of the Unit is to coordinate the implementation of the Country Programme for ODSs Phasing-out, i.e. implementation of the activities aimed at ODSs reduction and phasing-out in the Republic of Macedonia. In this context, during the last ten years, the Unit has implemented several projects in industry, agriculture, private sector, etc., thus phasing-out more than 97% of the total consumption of ODSs in the country.

In parallel to the above, the Unit is active in the field of awareness rising of the issue of ozone layer depletion with persons that are professionally engaged in economic branches which apply ODSs and with the general public. To that end, high number of thematic brochures, documentary films, posters, picture book etc., has been produced.

The Unit attributes particular priority to the activity of permanent monitoring of ODSs import, export and consumption in the Republic of Macedonia. For this purpose, in 1997, a special software (database) was developed, which makes it possible to have a clear picture of the status of ODSs in the country at any moment. Software was developed for records keeping of collected and recycled amounts of ODSs. The two databases facilitate timely meeting of the reporting obligations towards international bodies responsible for the implementation of the Montreal Protocol, as well as of the binding provisions of the Montreal Protocol in general.

b. Required resources

During the last ten years (1997 - 2007), the activities of the Ozone Unit under the Ministry of Environment and Physical Planning, as responsible office for the coordination of the activities for ODSs reduction and phasing-out at national level, have been financed by the Multilateral Fund of the Montreal Protocol.

c. Status

In the frames of the Ozone Unit under the Ministry of Environment and Physical Planning, database containing detailed data on the import, export and consumption of ODSs in the country has been established. The database is exceptionally useful tool in the preparation of annual reports towards international bodies responsible for the implementation of the Montreal Protocol. According to data in the database, in the period between 1995 and 2005, more than 97% of the total consumption of ODSs in the Republic of Macedonia was phased-out.

Deadline: underway.

NATURE AND BIODIVERSITY

MK – NI 007

THREATENED AND PROTECTED SPECIES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

There are a number of ways of assessing progress towards the target of halting the loss of biodiversity in Europe by 2010. This indicator tracks changes in the status of species at national level that are threatened at the global level and can thus contribute to assessing progress towards the target by acting as a proxy indicator for the impacts of national policies on European biological diversity.

For many years, the International Union for Conservation of Nature (IUCN) has monitored the extent and rate of biological diversity degradation by assigning species to red list categories through detailed assessment of information against a set of objective, standard, quantitative criteria. This assessment is made at the global level. For species present in European territories and only, and evaluated as globally threatened, this indicator shows the impacts of European and national policies on European biodiversity.

For globally threatened species present in and also outside Europe, some of the species may not be classified as threatened at European or national levels. Nevertheless, Europe has a strong responsibility for the care of these species even though they are not yet threatened. How far European policies on nature and biodiversity take this responsibility into consideration is shown by the information that the indicator provides on the number of globally threatened species that are protected at the European level.

Definition

This indicator shows the number of species present in the Republic of Macedonia and assessed as globally threatened and/or protected by European instruments (such as EU Directives and the Bern Convention) protected at national level.

At present, the indicator shows the status of the number of endemic and threatened species at national level, identified in accordance with the relevant international documents and with the national legislation:

- Number of endemic and threatened wild species of plants
- Number of endemic and threatened wild species of fungi
- Number of endemic and threatened wild species of vertebrate animals

Units

- Number of spieces

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan, in its Chapter on Nature, emphasizes the goal of the establishment of integrated system for nature and biological diversity protection, in line with the EU standards and multilateral agreements, through the measure for application of mechanisms for further implementation of the National Strategy for Biological Diversity Protection with Action Plan and the National Capacity Self-Assessment (NCSA), the Law on Nature Protection and creation of appropriate conditions for Natura 2000 network establishment. It envisages action towards development of National Red Lists and Red Book.

The National Strategy for Biological Diversity Protection with Action Plan defines integrated approach to the protection and sustainable use of components of biological diversity. The Action Plan outlines the specific actions to be taken to achieve the goals. One of the measures is the document Protection of Species, through several actions concerning elaboration of National Red Lists and Red Book, vultures protection, protection of endemic and relict species *Thymus oehmianus*, etc.

Legal grounds

The Law on Nature Protection provides for elaboration of Red Lists and Red Book, as well as proclamation of strictly protected wild species and protected wild species, by which they shall acquire the status of natural heritage.

Targets

Identification of the extent of threat for certain species of plants, fungi and animals found in the Republic of Macedonia, which are of European or global significance and definition of measures for their protection and management.

Key policy issue

How many species of European/global significance are protected by national instruments?

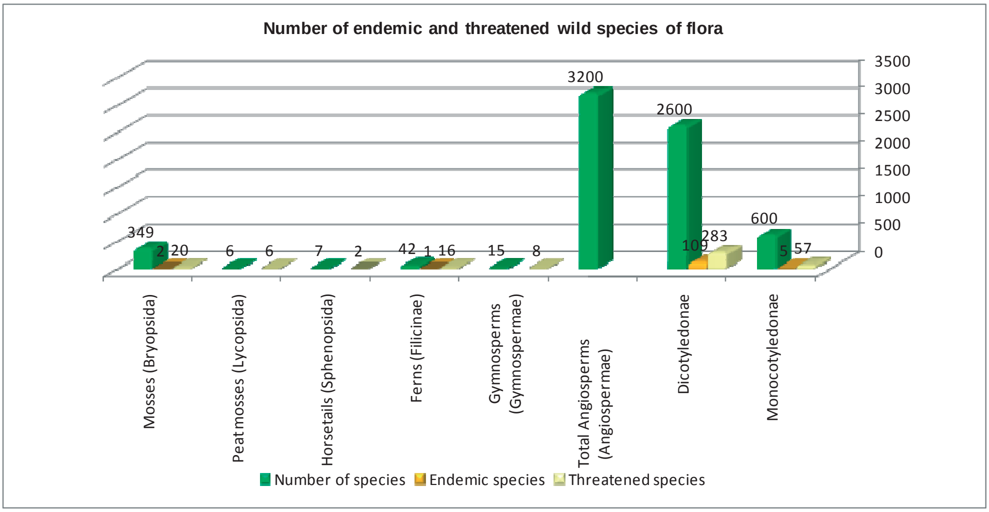
Key message

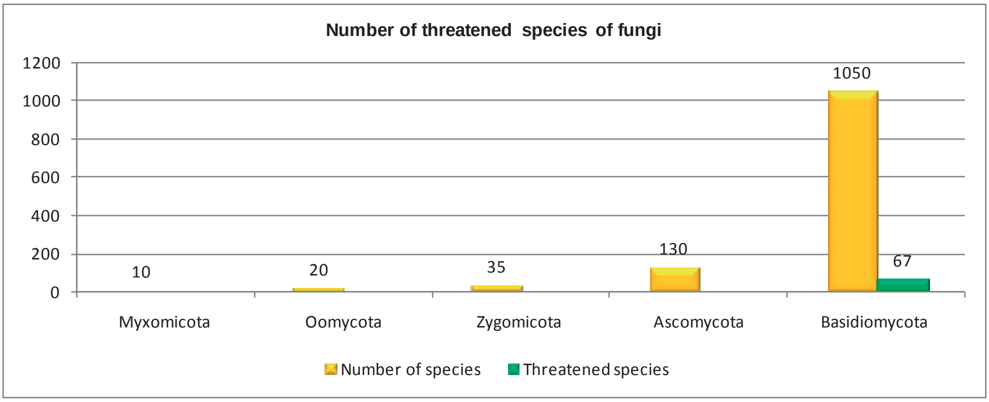
Abundance and variety of species and ecosystems are the main features of biological diversity in the Republic of Macedonia. According to the available information, this wealth comprises the imposing number of around 18.000 taxa, out of which more than 900 taxa are Macedonian endemic taxa.

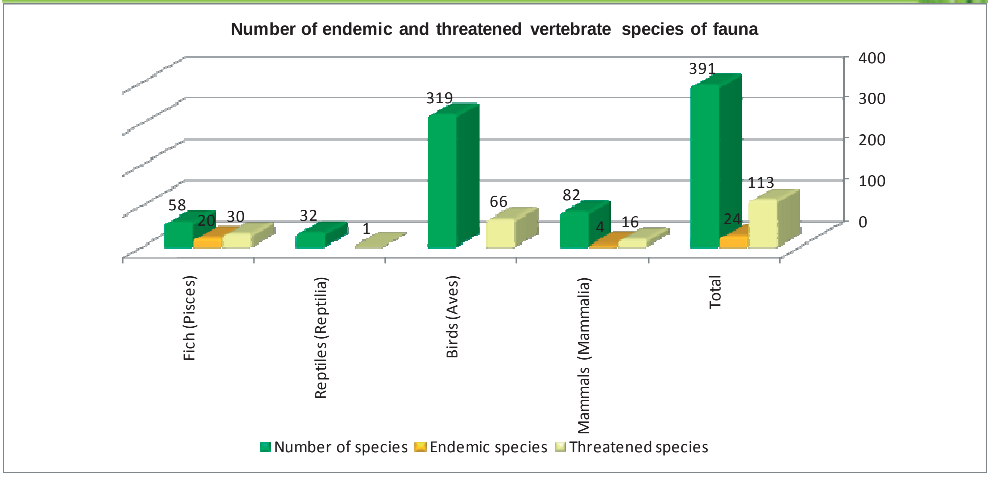
Considering the fact that national Red Lists of plants, fungi and animals have not been established yet, the analysis of affected / threatened species has been made in accordance with international criteria contained in a number of multilateral documents (conventions, agreements, Global Red List, European Red List, EU Directives), etc.

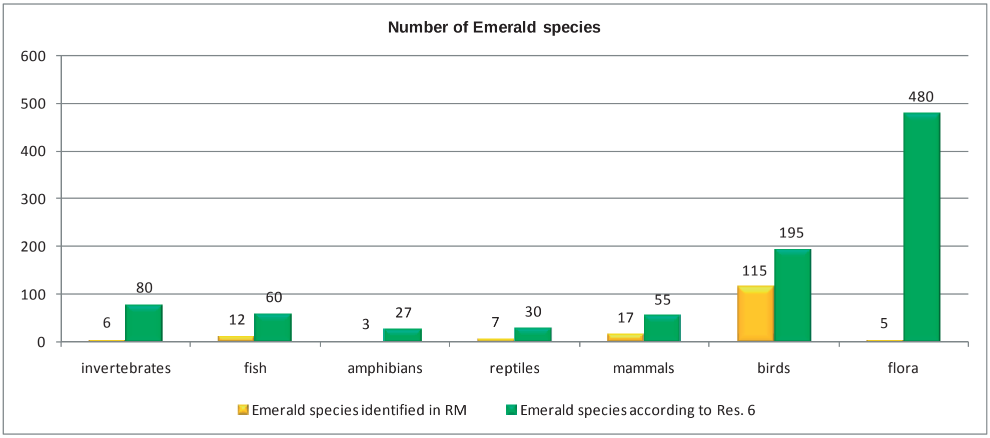
Thus, the IUCN World Red List contains 72 taxa of higher plants from the Republic of Macedonia, 19 of which are local endemic taxa. The Annexes of the Bern Convention include 12 species of higher plants.

The European List of vertebrate animals includes 113 species, of which: 30 fish species, 66 bird species16 mammals and 1 reptile species. Out of the total of 20 endemic fish species from the Republic of Macedonia, 17 have been enrolled in the category of globally threatened species. The total number of identified "Emerald" species (under Resolution No.6 to the Bern Convention) on the territory of the Republic of Macedonia is 165 species.









Assessment

The flora of higher plants in the Republic of Macedonia is very rich and diverse, represented by around 3700 species. Recent flora of higher plants is represented by a mosaic of various plant elements (Tertiary relict, Mediterranean, Greek-Asia Minor, Illyric, Caucasian, Middle European, Eurasian, Arctic-Alpine, cosmopolitan); there is high number of endemic species among higher plants, too (Balkan, South Balkan, Macedonian, etc.). The highest number of endemic plant species (114) has been recorded with *Angiosperms*.

The National Red List of threatened wild flora species has not been developed yet. The affected species shown in the Table have been included in accordance with international criteria contained in several international documents (conventions, agreements, Global Red List, European Red List, EU Directives). The IUCN Global Red List contains 72 taxa from the Republic of Macedonia, 19 of which are local endemic taxa. The Annexes of the Bern Convention list 12 species having their area of spreading on the territory of the Republic of Macedonia.

Fungi compose exceptionally heterogeneous group of organisms; however, studies so far have focused on the orders of *Ascomycota* and *Basidiomycota*, while other orders are poorly studies. Out of the total number of recorded growing wild fungi on the territory of the Republic of Macedonia (around 1250 species), most belong to the orders *Myxomicota* (10), *Oomycota* (20), *Zygomicota* (35), *Ascomycota* (130) and *Basidiomycota* (1050).

The Preliminary National Red List of threatened fungi species includes 67 species belonging to the order of *Basidiomycota*.

The main feature of the fauna is its high extent of taxonomic diversity, represented by as many as 9339 species and 228 subspecies or 9567 taxa in total.

Among vertebrate fauna, the highest endemism has been tracked with fish class the share amounting 34.5%, while from among other four classes, four endemic taxa have been recorded with mammals only. Out of the total of 20 endemic fish species, 17 have been included in the category of globally threatened species.

From among vertebrate animals, 113 recorded species have been enrolled on the European Red List, namely: 30 species of fish, 66 birds, 16 mammals and 1 reptile species. The National Red List of threatened fauna species has not been completed yet.

Within the species diversity, particular significance is attributed to the identified “Emerald” species. Namely, total of 165 species have been identified, as follows: 6 species of invertebrate animals, 12 species of fish, 3 species of amphibians, 7 species of reptiles, 115 species of birds, 17 species of mammals and 5 species of plants.

Data specification

Title of the indicator	Source	Reporting obligation
Threatened and protected species	– Study on the Status of Biological Diversity in the Republic of Macedonia – Strategy and Action Plan for Bilogical Diversity Protection in the Republic of Macedonia	

Data coverage (by years):

Table 1: Number of endemic and threatened wild species of flora

	Number of species	Endemic species	Threatened species
Mosses (*Bryopsida*)	349	2	20
Peat mosses (*Lycopsida*)	6		6
Horsetails (*Sphenopsida*)	7		2
Ferns (*Filicinae*)	42	1	16
Gymnosperms (*Gymnospermae*)	15		8
Total Angiosperms (Angiospermae)	3200		
Dicotyledonae	2600	109	283
Monocotyledonae	600	5	57
Total	3700	117	392

Table 2: Number of threatened fungi species

	Total number of species	Threatened species
Myxomicota	10	
Oomycota	20	
Zygomicota	35	
Ascomycota	130	
Basidiomycota	1050	67
Total	1245	67

Table 3: Number of endemic and threatened vertebrate fauna species

	Total number of species	Endemic species	Threatened species
Fish (*Pisces*)	58	20	30
Reptiles (*Reptilia*)	32		1
Birds (*Aves*)	319		66
Mammals (*Mammalia*)	82	4	16
Total	391	24	113

Table 4: Number of Emerald species identified in the Republic of Macedonia

	invertebrates	fish	amphibians	reptiles	mammals	birds	flora
Emeralds pecies identified in the Republic of Macedonia	6	12	3	7	17	115	5
Emerald species according to Res. 6	80	60	27	30	55	195	480

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 007	**Threatened and protected species**	CSI 007	Threatened and protected species	**S/I**		Biological diversity	5 - annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2003 - 2004

Future activities

- Short-term activities

a. Description of the activity

- Development of national Red Lists of plants, fungi and animals.
- Definition of national indicator of threatened and protected species.

b. Required resources

- Establishment of work group to establish the national indicator of threatened and protected species.

c. Status

- Activities are underway.

Deadline: 2008

- Long-term activities

- Development of national Red Books of plants, fungi and animals.
- Elaboration of monitoring programme for species to be identified as threatened.

MK – NI 008

DESIGNATED AREAS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Measures to conserve or restore biodiversity are taken at different geographical and policy levels (international, European and national). These measures may have different criteria and objectives but should be complementary. Thus the indicator concentrates on the trends of designated areas according to different policy instruments (ratified multilateral agreements, EC Birds and Habitats Directives and national instruments) and how effective they are in reaching objectives (sufficiency index).

The Sufficiency Index answers to the specific policy question "Are these measures effective in reaching the objectives?" by telling us if species and habitats listed by the EU Birds and Habitats Directives, and Bern Convention, are sufficiently represented in the protected areas.

Definition

The indicator shows the proportion of a country designated total area that is protected under national instruments, or under the EU Birds and/or Habitats Directives (Natura 2000 sites), or under the Bern Convention (Emerald sites) and other multilateral agreements.

- Total (cumulative) designated area of sites protected under national instruments, or under the EU Birds and/or Habitats Directives and under multilateral agreements over the time.

The indicator is also broken down to show the different trends of surface area in km2 designated under international conventions and initiatives, under EU Directives and under national legislation:

- Number of protected areas under the national categorization
- Percentile representation of individual national categories of protected areas out of the total protected area
- Changes over time in the number of areas designated under the national legislation
- Changes over time in cumulative surface area of nationally protected sites
- Changes over time in cumulative surface area of Emerald sites (designated under the Bern Convention).

Units

- Number of sites, km^2 and %.

Policy relevance of the indicator

List of relevant policy documents

The Spatial Plan of the Republic of Macedonia for the period 2002 - 2020 envisages extension of the total area of protected areas from the current 7.34% to 11.6 % of the national territory in future.

The Second National Environmental Action Plan, in its Chapter on Nature, emphasizes the goal of the establishment of integrated system for nature and biological diversity protection, in line with the EU standards and multilateral agreements, through the measure for application of mechanisms for further implementation of the National Strategy for Biological Diversity Protection with Action Plan and the National Capacity Self-Assessment (NCSA), the Law on Nature Protection and creation of appropriate conditions for Natura 2000 network establishment.

The National Strategy for Biological Diversity Protection with Action Plan, adopted by the Government in 2004, defines integrated approach to the protection and sustainable use of components of biological diversity. The Action Plan outlines the specific actions to be taken to achieve the goals. One of the measures is the expansion of the system of designated areas, as well as elaboration of proposals for nomination of new designated sites, as well as proposals for nomination of new areas for the Global Ramsar List and the List of the World Heritage under the UNESCO.

Legal grounds

The Law on Nature Protection provides for introduction of a system of designated areas aimed at protecting biological diversity in natural environments, natural processes, as well as abiotic characteristics and biological diversity of the area. Protection of nature is carried out through protection of biological and landscape diversity and protection of natural heritage within and outside designated areas.

Targets

Expansion of the network of national designated areas up to around 12% under the Spatial Plan and National Strategy for Biological Diversity Protection, and by areas designated under international conventions and initiatives.

Identification of all areas in the National Emerald network and Natura 2000.

Key policy issue

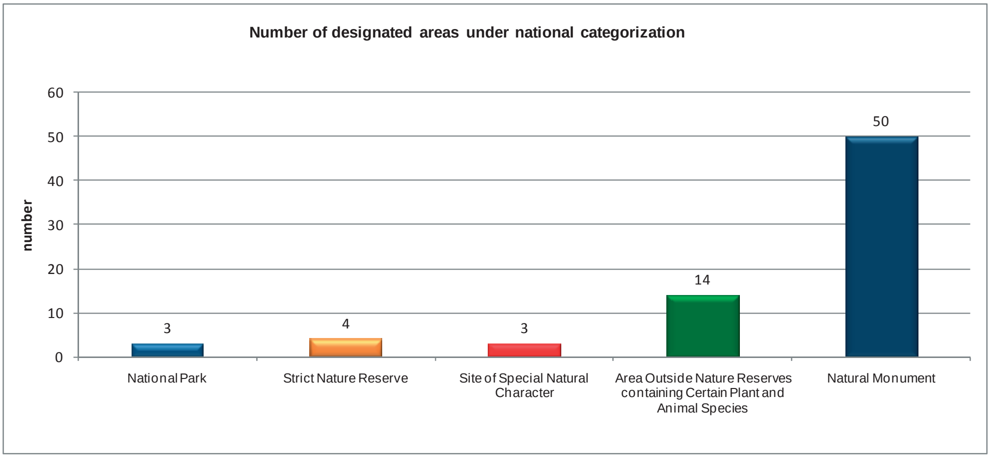
What is the progress in designation of areas (km^2, %) under the national legislation, EU Directives and multilateral agreements?

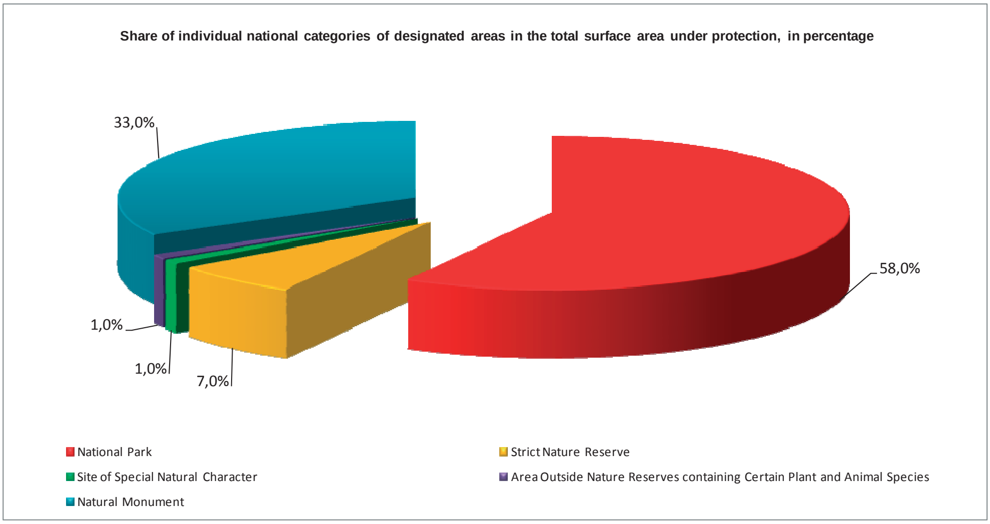
Key message

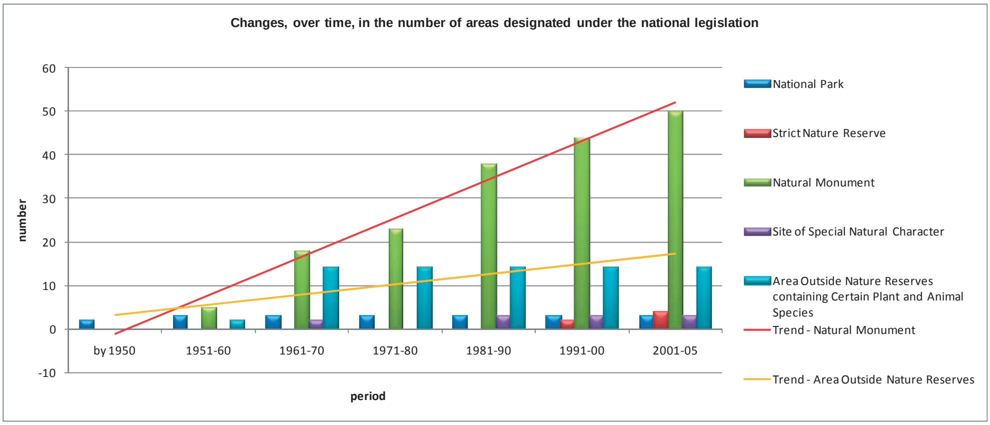
As of 1948, when the First National Park “Pelister” was designated in the country, the number and the total surface area of different categories of protected areas have noted permanent growth on national level. Most of those areas are National Parks (58 %) and Monuments of Nature (33 %).

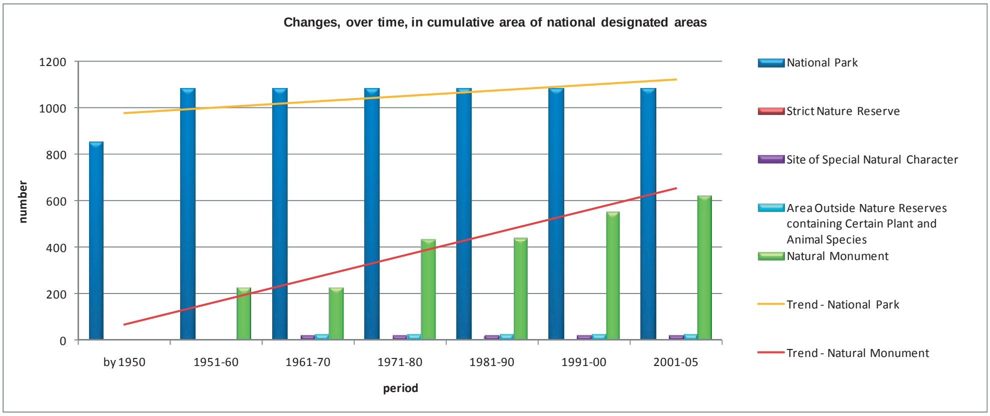
Under the new Law on Nature Protection, new categorization of designated areas has been adopted in accordance with the model of the International Union for Conservation of Nature (IUCN) (six categories of designated areas).

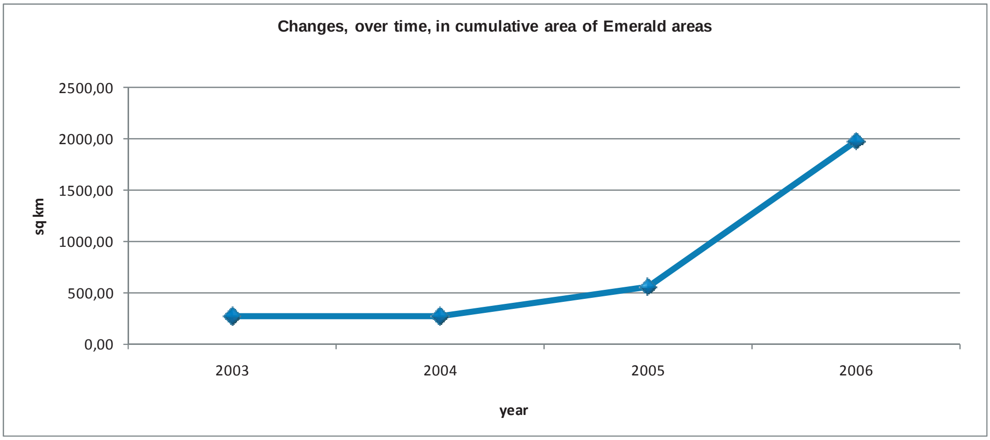
The National Emerald network of areas of special conservation interest, initiated in 2002, comprises 16 areas which cover a total area of 198.145 ha, or around 7.7% of the total national territory. Activities towards identification of new Emerald areas will continue until its full establishment. Emerald areas will be included in the Natura 2000 network when the Republic of Macedonia becomes a EU Member State.

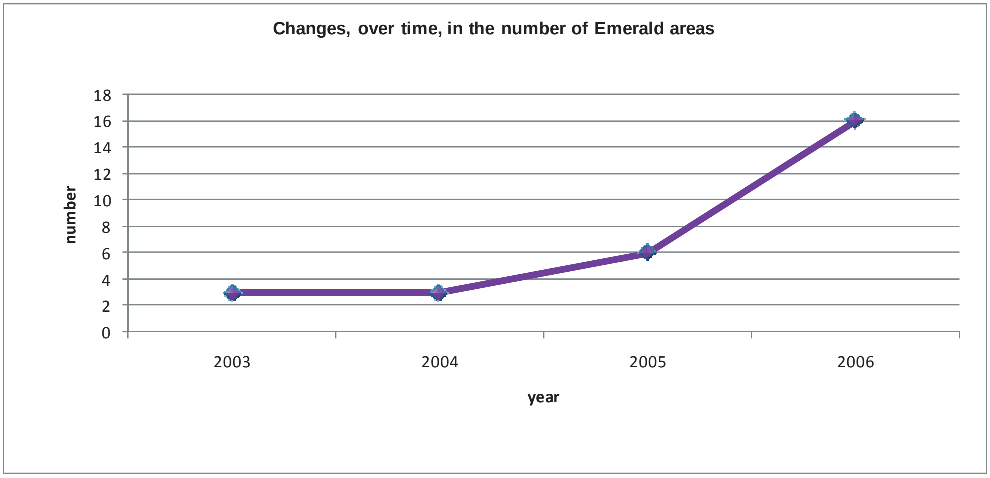





Changes, over time, in the number of areas designated under the national legislation
60
50
40
30
20
10
0
-10
number
by 1950
1951-60
1961-70
1971-80
1981-90
1991-00
2001-05
period
National Park
Strict Nature Reserve
Natural Monument
Site of Special Natural Character
Area Outside Nature Reserves containing Certain Plant and Animal Species
Trend - Natural Monument
Trend - Area Outside Nature Reserves


Changes, over time, in cumulative area of national designated areas
1200
1000
800
600
400
200
0
number
by 1950
1951-60
1961-70
1971-80
1981-90
1991-00
2001-05
period
National Park
Strict Nature Reserve
Site of Special Natural Character
Area Outside Nature Reserves containing Certain Plant and Animal Species
Natural Monument
Trend - National Park
Trend - Natural Monument


Changes, over time, in cumulative area of Emerald areas
2500,00
2000,00
1500,00
1000,00
500,00
0,00
sq km
2003
2004
2005
2006
year



Assessment

Since 1948, when the first National Park was designated, there has been constant rise in the total area of different national categories of protected areas. Today, the network of designated areas in the Republic of Macedonia comprises 74 Items of Nature, occupying a total surface area of 188.734 hectares or 7.34% of the national territory. The structure is arranged under the old categorization, as follows: Strictly Protected Natural Reserve (SNR), National Park (NP), Monument of Nature (MN), Site of Special Natural Characteristics (ASNC) and area outside natural reserves containing certain plant and animal species (CPAS). Most of the currently designated protected areas are National Parks (58%) and Monuments of Nature (33%).

Under the new Law on Nature Protection, new categorization is in course of introduction, upon its alignment with the IUCN method: Strictly Protected Natural Reserve, National Park, Monument of Nature, Nature Park, Protected Landscape and Multi-purpose Area. The Law allows for a transitional period of six years from its entry into force, when the revalorization of protected areas designated prior to its adoption will be completed.

According to the Spatial Plan of the Republic of Macedonia, for the period 2002-2020, expansion of the total surface `area of designated areas has been envisaged, to rise from the current 7.34% to 11.6 % of the national territory. For the sake of comparison, the percentage of designated areas in most of the European countries ranges between 10 and 15 % of the total national territory.

Designated areas with internationally recognized status include:

- Monument of Nature “Ohrid Lake” – World Natural Heritage (UNESCO);
- Monument of Nature “Prespa Lake” – Ramsar Site;
- Monument of Nature “Markovi Kuli” (*King Mrko’s Towers*) - World Natural Heritage (UNESCO’s Tentative List); and
- Monument of Nature “Slatinski izvor” (*The Springs of Slatino*) - World Natural Heritage (UNESCO’s Tentative List).

In 2002, the Republic of Macedonia commenced the process of establishment of the Emerald network of areas of special conservation interest (ASCI), established on the territories of the countries Parties to the Bern Convention and important part in the preparation of candidate countries for EU membership.

By means of the implementation of a pilot-project (2002 - 2003), 3 ASCIs were identified and proposed, accounting for around 10% of the total National Emerald Network. Activities aimed at establishing the Emerald network have continued in the following years, to result in 16 areas proposed for inclusion in the National Emerald Network so far. This corresponds with around 80% of the total Emerald Network of the Republic of Macedonia. The total surface area of the so far proposed areas is 198.145 ha, where the smallest area occupies a surface area of 810 ha (The Springs of Smolare), and the largest one is Mariovo with a surface area of 73.088 ha. Part of the proposed areas have already been protected at national level under different categories, as follows: NP Galicica, SNR Ezerani, MN Dojran Lake, NP Pelister, SNR Tikves, MN Demir Kapija, NP Mavrovo, MN Matka, MN Smolarski Vodopad and MN Markovi Kuli.

The Emerald network is an efficient tool in the preparation for the implementation of Birds and Habitat Directives, for the countries moving towards EU membership.

Methodology

- Methodology for the indicator calculation

The procedure for identification and designation of different categories of protected areas derives from the Law on Nature Protection, EU Directives and provisions of multilateral agreements.

Data specification

Title of the indicator	Source	Reporting obligation
Designated areas	CDDA Emrald database	– Annually, to the European Environmental Agency – Annually, to the Secretariat of the Bern Convention with the Council of Europe

Data coverage (by years):

Table 1: Number of designated areas under the national categorization

Category	DESIGNATED AREA	**Number**	Total Area in sq km
A	National Park	3	1083.38
A	Strict Nature Reserve	4	128.55
A	Site of Special Natural Character	3	23.38
A	Area Outside Nature Reserves containing Certain Plant and Animal Species	14	26.45
A	Monument of Nature	50	625.58
	Total	**74**	**1887.34**

Table 2: Share of individual national categories in the total area under protection, in percentage

Designated area	Number	Total Area in sq km	%
National Park	3	1083,38	58%
Strict Nature Reserve	4	128,55	7%
Site of Special Natural Character	3	23,38	1%
Area Outside Nature Reserves containing Certain Plant and Animal Species	14	26,45	1%
Monument of Nature	50	625,58	33%
Total	**74**	**1887,34**	**100%**

Table 3: Changes, over time, in the number of areas protected under the national legislation

Designated area	by 1950	1951-60	1961-70	1971-80	1981- 90	1991-00	2001-05
National Park	2	3	3	3	3	3	3
Strict Nature Reserve	0	0	0	0	0	2	4
Natural monument	0	5	18	23	38	44	50
Site of Special Natural Character	0	0	2	0	3	3	3
Area Outside Nature Reserve containing Certain Plant and Animal Species	0	2	14	14	14	14	14

Table 4: Changes, over time, in the cumulative surface area of national designated areas

Designated area	by 1950	1951-60	1961-70	1971-80	1981-90	1991-00	2001-05
National Park	855.88	1083.38	1083.38	1083.38	1083.38	1083.38	1083.38
Strict Nature Reserve	0	0	0	0	0	127.3	128.55
Site of Special Natural Character	0	0	22.53	22.53	23.38	23.38	23.38
Area Outside Nature Reserves containing Certain Plant and Animal Species	0	0.06	26.45	26.45	26.45	26.45	26.45
Monument of Nature	0	232.67	232.85	439.58	444.17	554.28	625.58

Table 5: Changes, over time, in the number and area of Emerald sites

	2003	2004	2005	2006
Number	3	3	6	16
Total area in sq km	275,83	275,83	559,38	1981,45

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 008	**Designated areas**	CSI 008	Designated areas	**R**	A	Biological diversity nature policies	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1948 - 2006

Frequency of data collection: annual

Information on the quality (at data level): The process of revalorization of the currently protected areas and their re-designation in line with the new categorization, new, accurate data/information on designated areas will be collected.

Note: The CDDA database contains data under the old categorization.

Future activities

- Short-term activities

a. Description of the activity

– Definition of national set of indicators for designated areas.

b. Required resources

– Establishment of Working Group to elaborate the national set of indicators for designated areas.

c. Status

– Activities are underway

Deadline: 2008

- Long-term activities

Redesignation of the currently protected areas by accurate definition of boundaries and surface area and production of digital boundaries.

Valorization and designation of new areas to be protected under the new categorization. Identification of new areas to be included in the National Emerald Network.

MK – NI 009

SPECIES DIVERSITY

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The objective of this indicator is to produce a generic indicator that will show the state and trends of biological diversity in Macedonia. At present the trend information for species at national level is very limited, so for the purpose of this indicator it is split into trend assessments for different species groups. It is possible to develop a methodology for trends establishment for more species and species groups, but for now there are initial activities only for birds.

The trends for all species are linked to different habitat types. An assessment of the trend for a group of species linked to a particular habitat type, can give a good indication of the quality of that habitat type.

Selection of the species and species groups is based primarily on the availability of data and the need to show trends for various species groups. Future development of the indicator will involve extending the concept to include other species and species groups, while also defining common criteria for inclusion or deletion of species.

Definition

The indicator will show the trend in the number and distribution of selected species or species groups at national level, as relative assessment compared to the baseline of the monitoring commencement.

At the moment, species groups considered are the birds.

The indicator will show the trend of common birds species (developing) and the trend of certain selected species of birds of pray.

Units

- Number of species, estimated number of individuals for certain species.

Policy relevance of the indicator

List of relevant policy documents

The Second National Environmental Action Plan, in its Chapter on Nature, emphasizes the goal of the establishment of integrated system for nature and biological diversity protection, in line with the EU standards and multilateral agreements. One of the actions envisaged for the goal achievement is development of national monitoring programme for biological diversity components and elaboration of national biodiversity indicators.

The National Strategy for Biological Diversity Protection with Action Plan defines integrated approach to the protection and sustainable use of components of biological diversity. The Action Plan outlines the specific actions to be taken to achieve the goals. The strategic commitment “Research and monitoring” includes action for national biodiversity indicators development.

Legal grounds

The Law on Nature Protection provides for monitoring of the state of the nature. The monitoring methodology needs to be specified in a regulation. The monitoring over the state of nature is carried out through: measurement, observation, assessment and control of the state of species, their habitats, habitat types, environmentally significant areas, ecosystems, landscape types, monitoring and assessment of geological values and monitoring of the state of natural heritage.

Targets

Identification of the trend in populations for selected bird species and establishment of the reasons leading to reduction in their number and development and implementation of measures for the negative trend halting (contribution to the achievement of the Target 2010 for biodiversity loss prevention/reduction by 2010).

Assessment

Abundance and variety of species and ecosystems are the main features of biological diversity in the Republic of Macedonia. According to the available information, this wealth comprises the imposing number of around 18.000 taxa, out of which more than 900 taxa are Macedonian endemic taxa. According to the analysis of the richness of biodiversity in the countries of the European continent, the Republic of Macedonia is positioned at the very top of the list of states known as “European Hotspot".

The total number of registered bird taxa is 338 (319 species and 19 subspecies). 69 bird species found in the Republic of Macedonia have been included in the European Red List. From among “Emerald” species identified in the Republic of Macedonia (under the Resolution No. 6 of the Bern Convention), 115 species are birds.

In the period from 2003 until present, within the Project for vultures conservation, monitoring of the populations of Griffon Vulture and Egyptian Vulture has been carried out, accompanied also by monitoring of the Imperial Eagle. There is also older data on the said species, as well as on the Golden Eagle, Mediterranean Falcon, *Buteo rufunnus G.,* etc. However, this data should be analyzed again prior to use.

The implementation of the Project for common bird species monitoring was initiated in 2007 and, based on the below described methodology, preliminary data on the trend in certain bird species will be obtained in the course of the next several (three at minimum) years.

Data specification

Title of the indicator	Source	Reporting obligation
Species diversity	– Grubac, B. & VELEVSKI, M. (2004): Survey and monitoring of the status, breeding success and threats to the Egyptian Vulture in Macedonia- 2004. MES. 28 pp. Report to BVCF/FZS.Емералд база на податоци – Grubac, B. & VELEVSKI, M. (2005): Survey and monitoring of the status, breeding success and threats to the Egyptian Vulture in Macedonia- 2005.	

Data coverage:

Species	Number
Griffon Vulture	
Year	couples
2004	21-25 couples
2005	14 couples
2006	9 couples
Egyptian Vulture	
year	couples
2004	35 couples
2005	31 couples
2006	30 couples

General metadata

Code	Title of indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 009	**Species diversity**	CSI 009	Species diversity	**C**		biological diversity	

Geographical coverage: Republic of Macedonia

Temporal coverage:

- for common bird species: since 2007
- for selected birds of pray: since 2004

Frequency of data collection: annually

Methodology

■ Methodology for the indicator calculation

Sample quadrants (10 – 15) with a surface area of 1 km^2 will be selected at random and common bird species will be counted there by applying the method of linear transect. The counting will take place in the breeding period (15 April - 15 June), with intensity of two counts per year. Data will be statistically processed to show the rend in species at national level, for which minimum of three years research will be required.

With regard to birds of pray, full census has been envisaged, to cover breeding couples and identify their breeding success.

■ Source of applied methodology

The methodology used by the British Trust for Ornithology in their census of breeding birds in the United Kingdom will be used.

Uncertainty

■ Methodological uncertainty

Uncertainty derives from the level of expertise of researchers.

Future activities

■ Short-term activities

- Definition of indicators
- Selection of sample sites for common bird species
- Training of researchers in monitoring of selected species

a. Description of activity

Depending on the number of researchers and their experience, sample sites will be selected by random and birds will be counted within them. The total number of these areas is expected to range between 10 and 15 quadrants.

Training of the researchers is required, to include workshops and practical field work (birds identification, data collection and compilation)

b. Required resources

- Organization of two workshops for training in birds identification, data collection and compilation.
- Organization of workshops to increase the number of participants in the observers' network.
- Development of practical tools (interactive CD Rom) on birds identification.
- Procurement of optical equipment (binoculars).
- Preparation of birds identifier in Macedonian.

c. Status

Activities are in initial stage.

Deadline: 2010

- Long-term activities

a. Description of the activity

- Permanent training of researchers and increase in the number of sample sites.
- Selection of other indicator sets and development of methods for their monitoring.

Deadline: 2010 - 2012

LIST OF ADITIONAL INDICATORS

The Work Group on biodiversity, nature and fishery indicators held three meetings, during which discussions focused on the definition of the national list of biodiversity, nature and fishery indicators, as well as supplementing and verifying the three proposed indicators submitted to the Government of the Republic of Macedonia.

The Work Group made an attempt to propose final list of indicators and experts extended several proposals to that end: three proposal indicators of live stock breeding as specific segment of agriculture related to the indicator under the SEBI 2010 and FAO; four proposal indicators of plant production, three proposal indicators of forests: it was also proposed to include the indicator of fires in this list, as well as one indicator of veterinary health measures. There was another proposal to develop a sub-indicator of fish under the indicator of genetic resources, while under the fishery – fish catch and production.

In order to simplify the work, it was proposed to group the indicators (e.g. wild species/habitats, forestry, agriculture, genetic resources, anthropogenic activity, fishery, etc.) and appropriate subgroups composed by the Work Group members to be formed accordingly. Where needed, additional experts should be invited. The final national list has not been developed yet. This certainly requires additional time, as well as financial resources.

Biodiversity indicators are informative tools summarizing data on complex environmental issues in order to present the state and the trend in biodiversity. They provide indication of how close we have reached to the achievement of certain defined goals, such as the global/ European Target 2010 – to reduce/prevent biodiversity loss by 2010.

Biodiversity indicators, regardless of whether assessed at national or global level, build bridges between policy creators and science. Policy creators set the targets and the measurable objectives, while scientists determine certain variables of biodiversity, monitor the current status and develop model to project the future status of biodiversity. A good monitoring programme should identify the biodiversity trend and provide guidelines for undertaking of adequate measures, i.e. interventions by policy makers.

Convention on Biological Diversity (CBD) has set indicators at global level in order to measure the progress towards the achievement of Target 2010, allocated to seven focal areas:

- protection of biodiversity components,
- promotion of sustainable use,
- analysis of threats to biodiversity,
- maintenance of goods and services to support human welfare,
- protection of traditional knowledge, innovation and practice,
- provision of equitable and balanced distribution of benefits resulting from the use of genetic resources, and
- enabling resource transfer.

Based on the above focal areas under the CBD and EU headline indicators and Pan-European Biological and Landscape Diversity Strategy (PEBLDS) at European level under the Project “Streamlining of European Biodiversity Indicators by 2010 (SEBI 2010), the first set of

European biodiversity indicators has been developed, as follows:

26 indicators have been proposed within the SEBI 2010 process:

1. Abundance and distribution of selected species
2. Red List Index for European species
3. Species of European interest
4. Ecosystem coverage
5. Habitats of European interest
6. Livestock genetic diversity
7. Nationally designated protected areas
8. Sites designated under the EU Habitats and Birds Directives
9. Critical load exceedance for nitrogen
10. Invasive alien species in Europe
11. Occurrence of temperature-sensitive species
12. Marine Trophic Index of European seas
13. Fragmentation of natural and seminatural areas
14. Fragmentation of river systems
15. Nutrients in transitional, coastal and marine waters
16. Freshwater quality
17. Forest: growing stock, increment and fellings
18. Forest: deadwood
19. Agriculture: nitrogen balance
20. Agriculture: area under management practices potentially supporting biodiversity
21. Fisheries: European commercial fish stocks
22. Aquaculture: effluent water quality from finfish farms
23. Ecological Footprint of European countries
24. Patent applications based on genetic resources
25. Financing biodiversity management
26. Public awareness

Considering the fact that the reporting obligation towards EEA and EU will be based on the above indicators, experts should focus their next activities on the elaboration of these indicators. Most of the indicators are complex/aggregate and thus several indicators can be proposed oriented towards the complex indicator and then to remove indicators that are not relevant for the Republic of Macedonia (e.g. Marine Trophic Index of European seas), etc.

In addition to the above, the issue of lack of data has to be settled, namely adequate monitoring programme should be prepared, relevant institutions and organizations for monitoring performing should be accredited as required, to monitor certain biodiversity components and continuous monitoring system should be established at national level.

CLIMATE CHANGE

MK - NI 010

GREENHOUSE GAS EMISSIONS AND REMOVALS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Potential impacts of climate change at global level include rising sea levels, increased frequency and intensity of floods and droughts, changes in biotes and food productivity and increase in diseases. There has been constantly growing evidence that greenhouse gas emissions cause increase in global and European surface air temperatures, resulting in climate change (IPCC, 2001, 2007). Efforts to reduce or limit the effects of climate change have been focused on the reduction of the emissions of greenhouse gases covered by the Kyoto Protocol.

At the level of EU Member States, this indicator supports the Commission's annual assessment of the progress in the emission reduction in EU and in individual Member States towards the achievement of the targets specified in the Kyoto Protocol, based on the mechanism for GHG monitoring (Council Decision No. 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. This indicator illustrates the current trends in mand-induced GHG emissions in relation to targets set by the Kyoto Protocol.

In the case of the Republic of Macedonia, the indicator is based on data contained in the National Grenhouse Gases Inventory produced within the process of developing the National Communications towards the United Nations Framework Convention on Climate Change.

Definition

The indicator shows the quantities of greenhouse gas emissions on national level. The emissions are presented by greenhouse gas type. The indicator provides information on emissions in the following sectors: energy, industrial processes, agriculture, land use change and forestry and waste.

Units

– Tonnes CO_2-equivalent

Policy relevance

The Grenhouse Gases Inventory establishes the basis for the analysis of the GHG reduction.

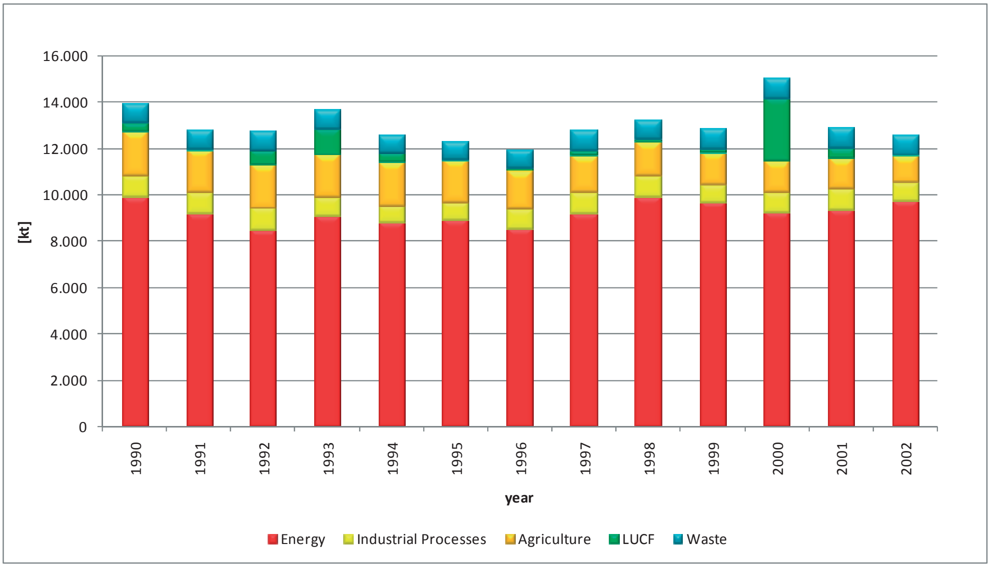
Legal grounds

Republic of Macedonia is a Party to the United Nations Framework Convention on Climate Change and to the Kyoto Protocol. Climate change issues have been incorporated in the Law on Environment, including the requirements for preparation of GHG emission inventories and GHG removal via sinks, as well as development of action plan with measures and activities aimed at GHG emissions abatement and climate change impacts mitigation. In addition to this, by means of amendment of the Law on Environment, provision has been made for Designated National Authority (DNA) to approve the projects under the Kyoto Protocol Clean Development Mechanism (CDM).

Key message

This indicator provides information on the trends in total GHG emissions, which is in direct correlation with energy intensity of the economy in the country, as well as with the quality of fuels. The establishment of national system for regular development and updating of GHG inventories is vital.

The diagrams below present the contribution of individual sectors and pollutants that are also greenhouse gases, in kilotons per year and in percentage.




year
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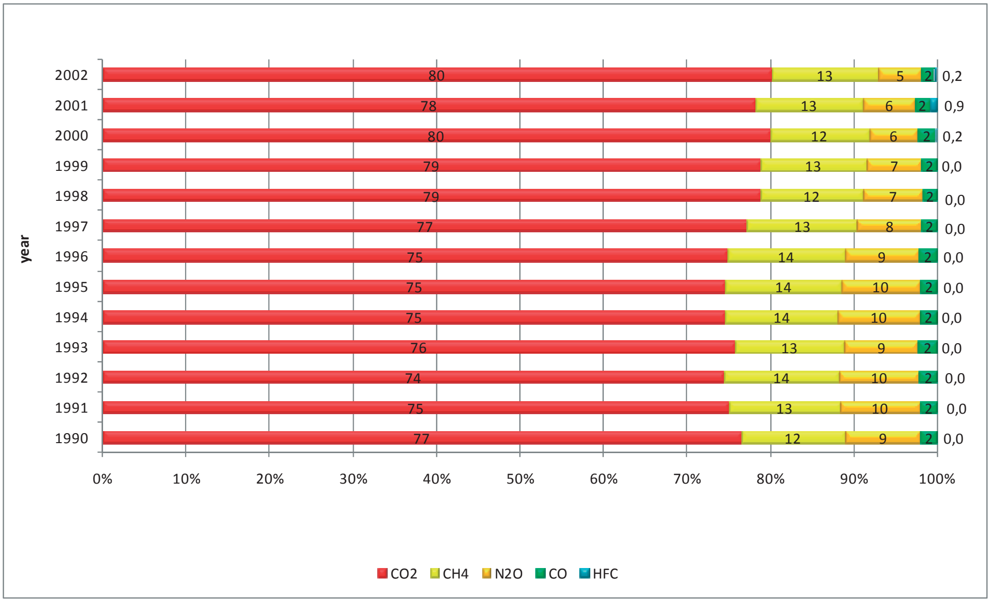
Energy
Industrial Processes
Agriculture
LUCF
Waste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20%
30%
40%
50%
60%
70%
80%
90%
100%
CO2
CH4
N2O
CO
HFC

Assessment

Subject of analysis are the following gases: CO_2, CH_4 и N_2O, CO and HFC, and the total emission is expressed in CO_2-eq. This indicator provides information on GHG emissions from the following sectors: energy, industrial processes, agriculture, land use change and forestry (LUCF) and waste.

The Inventory of Greenhouse Gases prepared under the Second National Communication on Climate Change (scheduled for adoption in September 2008) is summarized in Table 1. The first part of the table presents the amounts of GHG emissions by sectors, as well as total emissions for the period 1990 – 2002 (*). The second part of the table shows absolute and percentile values of CO_2-equivalent for all sectors. Detailed analysis of individual sectors and of each GHG separately shows that GHG emissions note certain decrease, namely in the sectors of industrial processes (by 35%) and agriculture (by 22%), while the trend in the LUCF sector is varying and the emissions show no change in the waste sector. Rise in GHG emissions has been observed only in the energy sector (by 6%). Comparatively, the share of the energy sector in total GHG emissions is very high (almost 3/4), followed by agriculture, waste and industrial processes sectors (the share being 10, 8 and 7%, respectively), while the share of the LUCF is below 2%. The falling trend of GHG emissions from industrial processes and agriculture sectors is due to their declining activities within the national economy in the assessed period.

Methodology

- Methodology for the indicator calculation

GHG emissions are calculated as aggregate of input data and the relevant emission factors. No measurements are required. The 1996 IPPC Methodology for GHG Inventories development was used, in line with the guidelines under the United Nations Framework Convention on Climate Change (UNFCCC).

Data specification

Title of the indicator	Source	Reporting obligation
Greenhouse gases emissions and removals	– Greenhouse Gas Emissions Inventory in: the First National Communication of Macedonia under the United Nations Framework Convention on Climate Change (UNFCCC), Ministry of Environment and Physical Planning, p. 29-46, 2003; – Second National Communication of Macedonia under the United Nations Framework Convention on Climate Change (UNFCCC), Ministry of Environment and Physical Planning; www.unfccc.org.mk	– UNFCCC

Data coverage (by years): 1990 – 2002

Table 1: GHG Inventory in the Second National Communication (*)

CO_2-eq emissions by sectors

	Sector	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
[kt]	Energy	9.939,83	9.190,47	8.484,18	9.068,37	8.839,56	8.925,02	8.578,29	9.198,29	9.939,13	9.716,39	9.226,90	9.355,70	9.755,52
	Industry	889,29	908,89	957,78	831,36	716,56	793,28	819,71	910,30	891,78	742,43	885,70	929,02	784,05
	Agriculture	1.908,27	1.866,08	1.881,62	1.858,08	1.888,54	1.825,04	1.682,11	1.571,02	1.462,96	1.377,56	1.379,52	1.313,29	1.073,39
	LUCF	283,66	24,07	424,06	758,82	273,29	5,67	51,49	177,63	89,16	99,57	1.973,70	336,53	36,49
	Waste	786,29	794,97	806,08	808,37	753,66	778,67	785,13	822,21	827,12	828,38	844,23	836,38	840,59
	Total	**13.807,34**	**12.784,47**	**12.553,72**	**13.324,99**	**12.471,61**	**12.327,68**	**11.916,72**	**12.679,45**	**13.210,15**	**12.764,34**	**14.310,05**	**12.770,92**	**12.490,04**
[%]	Energy	71,99	71,89	67,58	68,06	70,88	72,40	71,99	72,54	75,24	76,12	64,48	73,26	78,11
	Industry	6,44	7,11	7,63	6,24	5,75	6,43	6,88	7,18	6,75	5,82	6,19	7,27	6,28
	Agriculture	13,82	14,60	14,99	13,94	15,14	14,80	14,12	12,39	11,07	10,79	9,64	10,28	8,59
	LUCF	2,05	0,19	3,38	5,69	2,19	0,05	0,43	1,40	0,67	0,78	13,79	2,64	0,29
	Waste	5,69	6,22	6,42	6,07	6,04	6,32	6,59	6,48	6,26	6,49	5,90	6,55	6,73
	Total	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**

Contribution of CO_2, CH_4, N_2O and HFC in the total CO_2-eq emissions from all sectors

	Gas	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
[kt]	CO_2	10.545,33	9.598,08	9.321,21	10.048,55	9.290,20	9.213,08	8.928,41	9.793,79	10.408,98	10.055,09	11.283,60	9.959,41	10.059,08
	CH_4	1.732,78	1.703,43	1.747,30	1.775,03	1.697,21	1.695,97	1.666,20	1.675,40	1.630,70	1.628,35	1.741,23	1.656,67	1.621,23
	N_2O	1.253,22	1.218,64	1.221,40	1.199,10	1.224,80	1.173,38	1.057,27	970,94	936,79	845,36	959,99	813,94	570,40
	CO	276,01	264,33	263,80	302,31	259,40	245,25	264,85	239,32	233,68	235,54	300,03	220,44	208,62
	HFC	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	25,20	120,47	30,71
	Total	**13.807,34**	**12.784,47**	**12.553,72**	**13.324,99**	**12.471,61**	**12.327,68**	**11.916,72**	**12.679,45**	**13.210,15**	**12.764,34**	**14.310,05**	**12.770,92**	**12.490,04**
[%]	CO_2	76,37	75,08	74,25	75,41	74,49	74,73	74,92	77,24	78,80	78,77	78,85	77,99	80,54
	CH_4	12,55	13,32	13,92	13,32	13,61	13,76	13,98	13,21	12,34	12,76	12,17	12,97	12,98
	N_2O	9,08	9,53	9,73	9,00	9,82	9,52	8,87	7,66	7,09	6,62	6,71	6,37	4,57
	CO	2,00	2,07	2,10	2,27	2,08	1,99	2,22	1,89	1,77	1,85	2,10	1,73	1,67
	HFC	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,18	0,94	0,25
	Total	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**

*- The adoption of the Second National Communication on Climate Change has been scheduled for September 2008

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 010	**Greenhouse gases emissions and removals**	CSI 010 CC5	Greenhouse gas emissions and removals	**P**	B	Greenhouse gases emissions and removals	Annually

Data source(s): Input data: Yearbooks of the State Statistical Office; other publications/ projects of Ministries (environment, agriculture, forestry, etc.), Emission factors: 1996 IPCC – Emission factors base

Geographical coverage: Republic of Macedonia

Temporal coverage: 1990 – 2002

Frequency of data collection: The Inventories have been prepared every three years, in accordance with the specified frequency of national reports development.

Uncertainty

■ Uncertainty of data

Lack of adequate data to apply more sophisticated method in the framework of the methodology, inconsistency of data, lack of national emission factors

Activities

■ Short-term activities

– Strengthening of capacity for inventories development

a. Description of the activity

– Finalizing activities of preparation of the Second National Communication on Climate Change.

b. Required resources

– Training of staff in the MEPP to be capable of updating the inventory by themselves, including on annual basis if required. Possible employment of additional technical expert to maintain the GHG Inventory.

– Updating and upgrading of existing databases.

Deadline: end of 2008

■ Long-term activities

Regular production of GHG Inventories on annual basis.

MK - NI 011

PROJECTIONS OF GREENHOUSE GAS EMISSIONS AND REMOVALS

Period of the indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Potential impacts of climate change at global level include rising sea levels, increased frequency and intensity of floods and droughts, changes in biotes and food productivity and increase in diseases. There has been constantly growing evidence that greenhouse gas emissions cause increase in global and European surface air temperatures, resulting in climate change (IPCC, 2001, 2007). Efforts to reduce or mitigate the effects of climate change have been focused on the reduction of the emissions of all greenhouse gases covered by the Kyoto Protocol.

At the level of EU Member States, this indicator supports the Commission's annual assessment of the progress in the emission reduction in EU and in individual Member States towards the achievement of the targets specified in the Kyoto Protocol, based on the mechanism for GHG monitoring (Council Decision No. 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol).

In the case of the Republic of Macedonia, the indicator is based on data contained in the Report on Climate Change Mitigation in the Republic of Macedonia, produced in the process of development of National Communications towards the United Nations Framework Convention on Climate Change.

Definition

The indicator illustrates projected trends in anthropogenic greenhouse gas (GHG) emissions by means of application of the existing policies and measures and/or additional policies and measures. Projected trends are presented by sector types: energy, industrial processes, agriculture, land use change and forestry and waste.

Units

- Tons CO_2-equivalent.

Policy relevance

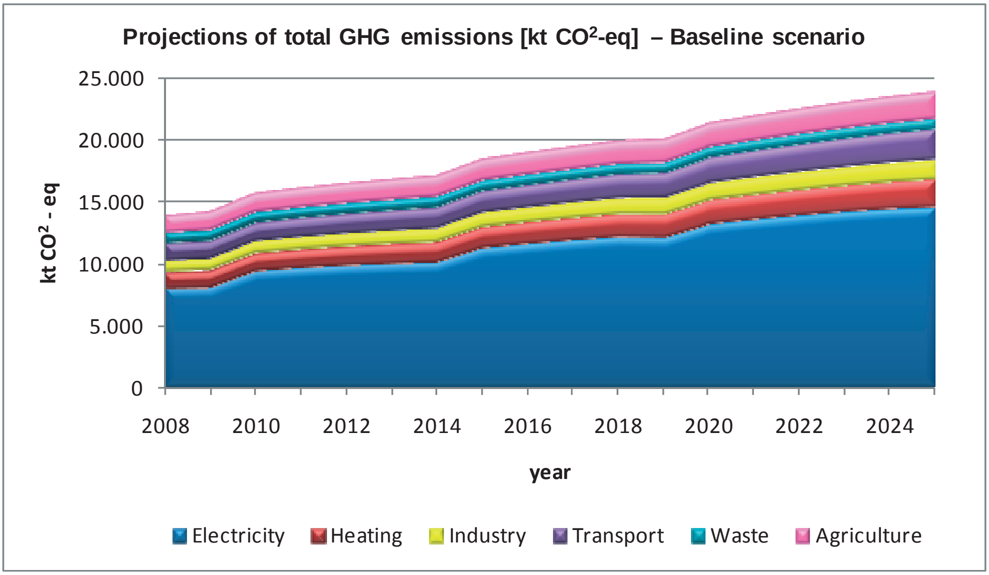
This indicator is of vital importance for the national climate change mitigation policy. It is also related to future implementation of projects based on the Clean Development Mechanism (CDM) of the Kyoto Protocol.

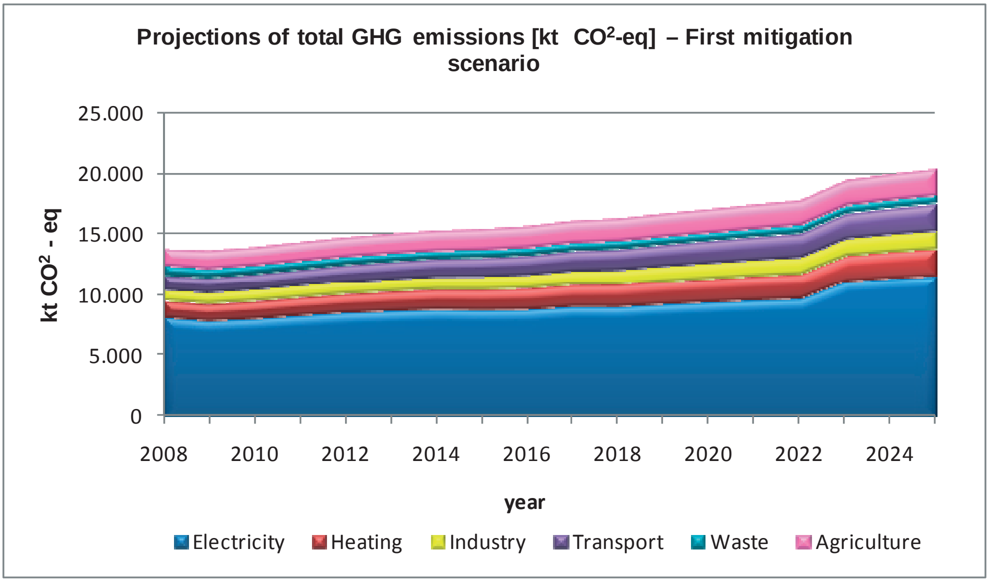
Legal grounds

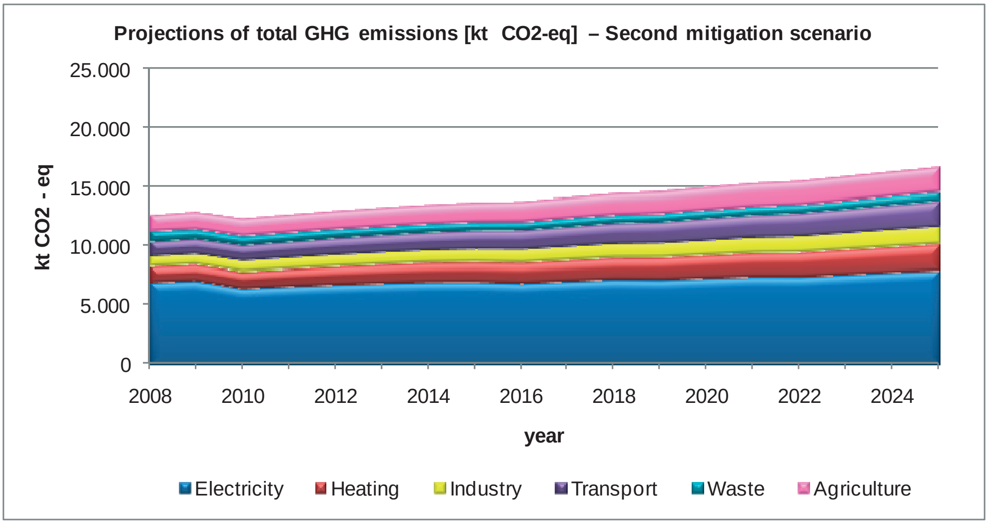
Republic of Macedonia is a Party to the United Nations Framework Convention on Climate Change and to the Kyoto Protocol. Climate change issues have been incorporated in the Law on Environment, including the requirements for preparation of GHG emission inventories and GHG removal via sinks, as well as development of action plan with measures and activities aimed at GHG emissions abatement and climate change impacts mitigation. In addition to this, by means of amendment of the Law on Environment, provision has been made for Designated National Authority (DNA) to approve the projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol.

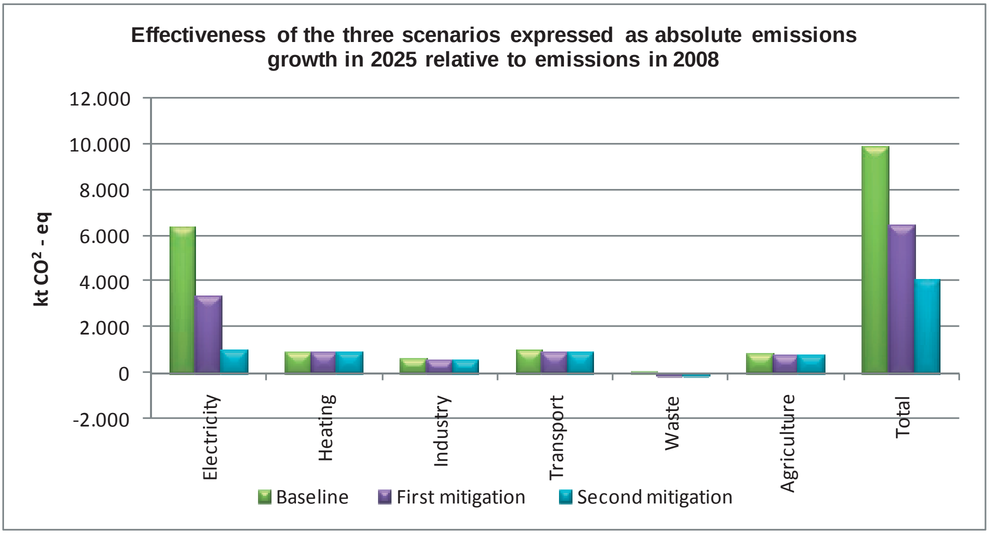
Key message

According to specific emissions (кt CO_2-eq per capita), Macedonia remains among countries with relatively high emissions per capita, mainly due to the use of fossil fuels in electricity production. Compared to the baseline scenario, this parameter notes gradual decline along with the introduction of gas in mitigation scenarios. Considering the close interaction between GHG emissions and the manner of energy production and consumption, the national policy for energy efficiency (EE) and renewable energy sources (RES) will by itself contribute to the climate change mitigation, as achievement of the objectives set in these policies will at the same time reduce the GHG emissions.

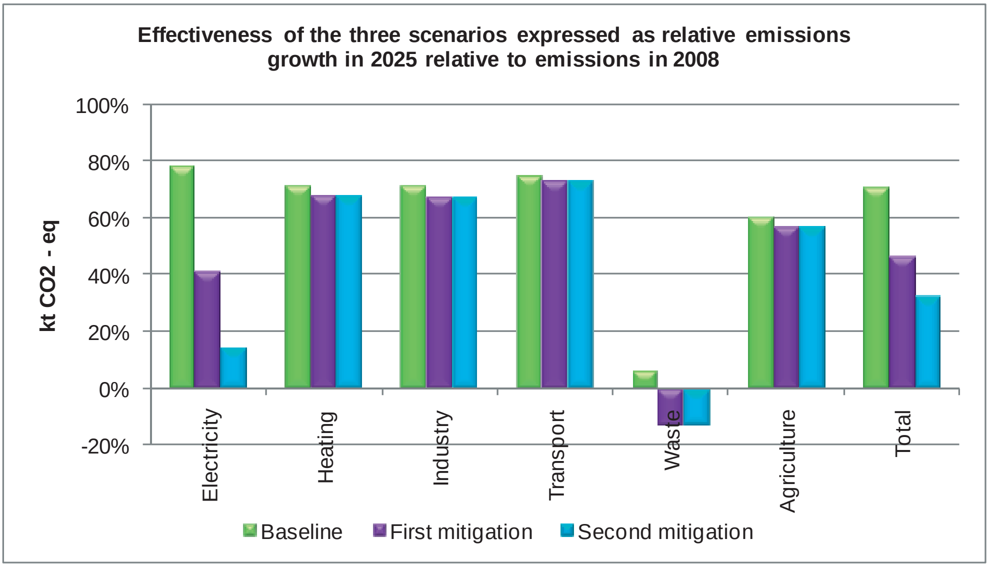



Projections of total GHG emissions [kt CO2-eq] – First mitigation scenario
25.000
20.000
15.000
10.000
5.000
0
kt CO2 - eq
2008
2010
2012
2014
2016
2018
2020
2022
2024
year
Electricity
Heating
Industry
Transport
Waste
Agriculture

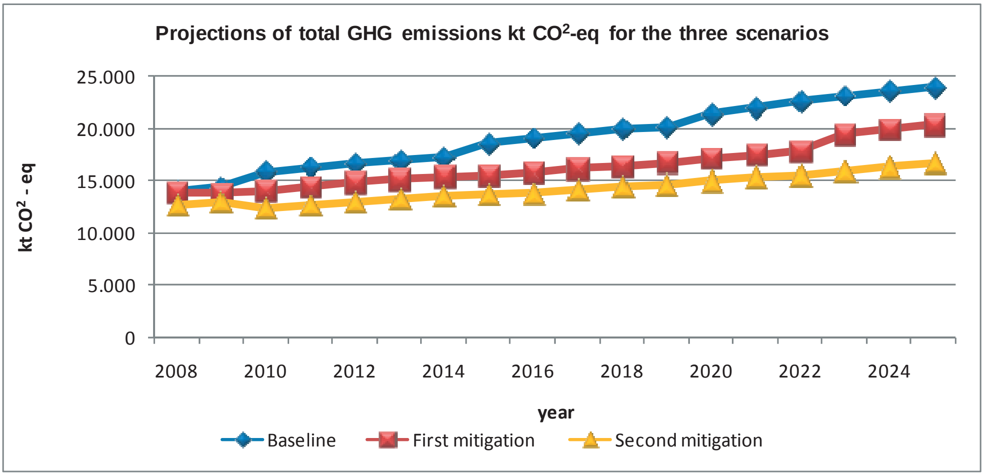

Projections of total GHG emissions [kt CO2-eq] – Second mitigation scenario
25.000
20.000
15.000
10.000
5.000
0
kt CO2 - eq
2008
2010
2012
2014
2016
2018
2020
2022
2024
year
Electricity
Heating
Industry
Transport
Waste
Agriculture



Effectiveness of the three scenarios expressed as absolute emissions growth in 2025 relative to emissions in 2008
12.000
10.000
8.000
6.000
4.000
2.000
0
-2.000
kt CO² - eq
Electricity
Heating
Industry
Transport
Waste
Agriculture
Total
Baseline
First mitigation
Second mitigation



Effectiveness of the three scenarios expressed as relative emissions growth in 2025 relative to emissions in 2008
100%
80%
60%
40%
20%
0%
-20%
kt CO2 - eq
Electricity
Heating
Industry
Transport
Waste
Agriculture
Total
Baseline
First mitigation
Second mitigation



Assessment

This Chapter integrates sectoral emissions in order to project total GHG emissions for the period 2008 - 2025 based on adopted scenarios: baseline, first and second mitigation scenarios. It should be noted that the first and the second mitigations scenarios differ only in electric power sector, where the second mitigation scenario includes additional measures for emission abatement, which will, as shown below, contribute significantly to the overall emission abatement. Total emissions at the beginning and at the end of the period by all scenarios are summarized on Table 1. Further on, Table 2 (and Figure 1), Table 3 (and Figure 2) and Table 4 (and Figure 3) present sectoral and total GHG emissions by years, for each scenario, respectively.

Analysis of the baseline scenario: According to projections presented in Table 2 and on Figure 1, there will be significant increase of GHG emissions by 2025 compared to values estimated for 2008 (around 9.900 kt CO_2-eq in absolute value, or around 71% in relative terms), provided that business-as-usual is preserved (Figure 4 and Figure 5, the last group of columns). This increase is mainly connected to the growth in electric power sector (absolute difference of 6.400 kt CO_2-eq and 78% relative growth of the value in 2008), which reflects the so called dark scenario, i.e. development scenario of the national energy sector based on lignite (Figure 4 and Figure 5, first group of columns). Other sectors also show significant growth in GHG emissions, so that values in 2025 compared to values in 2008 are higher by 75% - transport, 71% - heating and industry, 60% - agriculture and 6% - waste (Figure 4 and Figure 5).

Analysis of scenarios of emission abatement: The state could improve if development paths include activities/measures leading to GHG emissions reduction. As a result, the first mitigation scenario (as defined in the analysis by sectors) will lead to increase in total emissions of 46% of the values in 2025 compared to the value in 2008 or absolute difference of around 6.400 kt CO_2-eq. (Table 3 and Figure 2; also Figure 4 and Figure 5, last group of columns). This increase in total emissions decreases further by 32% (absolute difference of around 4.000 kt CO_2-eq) if development paths observe the second mitigation scenario (Table 4 and Figure 3; also Figure 4 and Figure 5, last group of columns).

With regard to emission projections by sectors for the three scenarios, comparison of emissions in 2025 with those in 2008 shows highest rise of emissions in electric energy sector. Namely, the relative increase of 78% in the baseline scenario falls at 41% in the first mitigation scenario due to the introduction of two plants on natural gas for combined electricity and heat production (the first one in 2009 and the second in 2015). The relative increase drops at 14% under the second mitigation scenario, as a result of reduced consumption by major consumers, introduction of renewable energy sources and termination of the thermal power plant (TPP) in Negotino upon the establishment of the new gas power plant (Figure 4 and Figure 5, last group of columns). As far as the sectors are concerned, there is a notable result in the waste sector, where the relative increase of 6% in the baseline scenario reaches negative relative increase (-13%) under both mitigation scenarios. This means that, under the mitigation scenario, the values of emissions in 2025 will be by 13 % lower compared to their values in 2008 (Figure 4 and Figure 5, fifth group of columns), owing to the introduction of technology for landfill gas combustion at several landfills in the country. Other sectors note minor contribution to the reduction of overall emissions, considering the fact that the relative difference between baseline and mitigation scenarios ranges within 2 - 4%. (Figure 5).

Summary of the projections of total GHG emissions by years, in line with the adopted scenarios, is presented in Table 5 and on Figure 6.

According to its country specific emissions (kt CO_2-eq/capita), Macedonia remains among countries with relatively high emissions per capita, owing mainly to the use of fossil fuels in electricity production. Compared to the baseline scenario, this parameter notes gradual decrease with the introduction of gas under mitigation scenarios. The calculated specific emissions for the three scenarios are presented in Table 6.

Table 1 Determining values for the three scenarios

	Total GHG emissions in 2008 [кt CO_2-eq]	Total GHG emissions in 2025 [кt CO_2-eq]
Baseline scenario	14.040	23.947
First miigation scenario	13.904	20.348
Second mitigation scenario	12.645	16.713

Table 2 Projections of total GHG emissions [кt CO_2-eq]- Baseline scenario

	Electricity	Heating	Industry.	Transport	Waste	Agriculture	Total
2008	8.196	1.328	906	1.390	844	1.376	**14.040**
2009	8.268	1.375	937	1.432	847	1.517	**14.376**
2010	9.584	1.423	970	1.475	850	1.553	**15.855**
2011	9.836	1.472	1.004	1.520	853	1.595	**16.280**
2012	10.025	1.524	1.039	1.566	856	1.637	**16.647**
2013	10.154	1.577	1.076	1.614	859	1.679	**16.959**
2014	10.246	1.632	1.113	1.664	862	1.722	**17.239**
2015	11.388	1.690	1.152	1.715	865	1.764	**18.574**
2016	11.719	1.740	1.187	1.775	868	1.807	**19.096**
2017	12.006	1.792	1.222	1.838	871	1.851	**19.580**
2018	12.261	1.846	1.259	1.902	875	1.894	**20.037**
2019	12.199	1.902	1.297	1.970	878	1.937	**20.183**
2020	13.260	1.959	1.336	2.039	881	1.981	**21.456**
2021	13.628	2.017	1.376	2.112	884	2.025	**22.042**
2022	13.954	2.078	1.417	2.186	887	2.070	**22.592**
2023	14.241	2.140	1.459	2.264	891	2.114	**23.109**
2024	14.463	2.205	1.503	2.344	894	2.159	**23.568**
2025	14.600	2.271	1.548	2.427	897	2.204	**23.947**

Table 3 Projections of total GHG emissions [кt CO_2-eq]- First mitigation scenario

	Electricity	Heating	Industry	Transport	Waste	Agriculture	Total
2008	8.196	1.328	902	1.258	844	1.376	13.904
2009	7.922	1.353	931	1.296	769	1.517	13.788
2010	8.093	1.401	961	1.335	757	1.512	14.059
2011	8.354	1.451	993	1.375	741	1.546	14.460
2012	8.575	1.502	1.025	1.416	729	1.588	14.835
2013	8.719	1.556	1.059	1.458	720	1.630	15.142
2014	8.831	1.611	1.094	1.502	700	1.673	15.411
2015	8.784	1.647	1.130	1.547	703	1.715	15.526
2016	8.827	1.697	1.163	1.601	706	1.757	15.751
2017	9.071	1.749	1.196	1.656	709	1.800	16.181
2018	9.055	1.803	1.231	1.714	712	1.844	16.359
2019	9.262	1.859	1.267	1.773	715	1.887	16.763
2020	9.428	1.916	1.304	1.834	718	1.930	17.130
2021	9.580	1.975	1.342	1.897	722	1.974	17.490
2022	9.700	2.035	1.381	1.963	725	2.018	17.822
2023	11.131	2.097	1.422	2.031	728	2.063	19.472
2024	11.367	2.162	1.463	2.101	731	2.107	19.931
2025	11.553	2.228	1.506	2.174	735	2.152	20.348

Table 4 Projections of total GHG emissions [кt CO_2-eq]- Second mitigation scenario

	Electricity	Heating	Industry	Transport	Waste	Agriculture	Total
2008	6.937	1.328	902	1.258	844	1.376	12.645
2009	7.082	1.353	931	1.296	769	1.517	12.948
2010	6.430	1.401	961	1.335	757	1.512	12.396
2011	6.613	1.451	993	1.375	741	1.546	12.719
2012	6.765	1.502	1.025	1.416	729	1.588	13.025
2013	6.881	1.556	1.059	1.458	720	1.630	13.304
2014	6.973	1.611	1.094	1.502	700	1.673	13.553
2015	6.990	1.647	1.130	1.547	703	1.715	13.732
2016	6.878	1.697	1.163	1.601	706	1.757	13.802
2017	7.042	1.749	1.196	1.656	709	1.800	14.152
2018	7.180	1.803	1.231	1.714	712	1.844	14.484
2019	7.143	1.859	1.267	1.773	715	1.887	14.644
2020	7.290	1.916	1.304	1.834	718	1.930	14.992
2021	7.415	1.975	1.342	1.897	722	1.974	15.325
2022	7.398	2.035	1.381	1.963	725	2.018	15.520
2023	7.586	2.097	1.422	2.031	728	2.063	15.927
2024	7.756	2.162	1.463	2.101	731	2.107	16.320
2025	7.918	2.228	1.506	2.174	735	2.152	16.713

Table 5 Projections of total GHG emissions for the three scenarios [кt CO_2-eq]

Year	Baseline scenario	First mitigation scenario	Second mitigation scenario
2008	14.040	13.904	12.645
2009	14.376	13.788	12.948
2010	15.855	14.059	12.396
2011	16.280	14.460	12.719
2012	16.647	14.835	13.025
2013	16.959	15.142	13.304
2014	17.239	15.411	13.553
2015	18.574	15.526	13.732
2016	19.096	15.751	13.802
2017	19.580	16.181	14.152
2018	20.037	16.359	14.484
2019	20.183	16.763	14.644
2020	21.456	17.130	14.992
2021	22.042	17.490	15.325
2022	22.592	17.822	15.520
2023	23.109	19.472	15.927
2024	23.568	19.931	16.320
2025	23.947	20.348	16.713

Table 6 Country Specific GHG emissions in Macedonia kt CO_2-eq/capita

Year	Population projections (1000 inhabitants)	Baseline scenario	First mitigation scenario	Second mitigation scenario
2008	2.055	6,83	6,76	6,15
2009	2.062	6,97	6,69	6,28
2010	2.068	7,67	6,80	5,99
2011	2.074	7,85	6,97	6,13
2012	2.080	8,00	7,13	6,26
2013	2.086	8,13	7,26	6,38
2014	2.093	8,24	7,36	6,48
2015	2.099	8,85	7,40	6,54
2016	2.105	9,07	7,48	6,56
2017	2.112	9,27	7,66	6,70
2018	2.118	9,46	7,72	6,84
2019	2.124	9,50	7,89	6,89
2020	2.131	10,07	8,04	7,04
2021	2.137	10,31	8,18	7,17
2022	2.143	10,54	8,31	7,24
2023	2.150	10,75	9,06	7,41
2024	2.156	10,93	9,24	7,57
2025	2.163	11,07	9,41	7,73

Methodology

- Methodology for the indicator calculation

The electric energy production sector (which contributes more than 50% to the total GHG emissions) has been modeled by application of the WASP software (a tool used in the energy sector development planning), while emissions estimates for other sectors have been made by using the software tool GACMO and expert judgments. Projections of GHG emissions have been made by downscaling analysis made under the national reports.

Data specification

Title of the indicator	Source	Reporting obligation
Projections of GHG emissions and removals	– Analysis for GHG emissions reduction in: the First National Communication on Climate Change to UNFCCC, MEPP, UNDP, p. 47-84, 2003 – Second National Communication on Climate Change to UNFCCC, MEPP, www.unfccc.org.mk	– UNFCCC

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 011	**Projections of GHG emissions and removals**	CSI 011	Projections of greenhouse gas emissions and removals	**P**	A	air air quality Climate change	Annually

Data source(s): Yearbooks and other publications of the State Statistical Office, relevant national strategies/programmes/plans

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000 - 2025

Uncertainty

- ### Uncertainty of data

Lack of national sectoral strategies (especially in energy sector).

Activities

- ### Short-term activities

- Adoption of the Second National Communication on Climate Change, with incorporated Report on Climate Change Mitigation. .

a. Description of the activity

- Based on the data available on the development of energy, industrial and agricultural sectors, the baseline scenario and additional mitigation scenarios including measures for GHG emissions reduction in the relevant sectors, have been developed.

Deadline: mid of 2008

- ### Long-term activities

- Based on adopted national strategies in individual sectors, to create climate change mitigation scenarios with lower uncertainty.

SOIL

MK – NI 014

LAND TAKE

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Land take by urban and related infrastructure results in major environmental impacts due to the soil take, as well as disruptions caused by transport, noise, resource exploitation, waste disposal and fragmentation and degradation of natural landscapes. Intensity and models of urbanization derive from three main factors: economic development, demand for housing and expansion of transport networks. Despite the fact that, under the legislation, most of the land and urban planning responsibilities have been delegated to local level (Municipalities), national policies have direct or indirect effects on urban development.

Definition

Changes in and current status of agriculture, forest and other semi-natural land taken by urban and other artificial land development. It includes areas sealed by construction and urban infrastructure as well as urban green areas and sport and leisure facilities. The main drivers of land take are grouped in processes resulting in the extension of:

- housing, services and recreation,,
- industrial and commercial sites,
- transport networks & infrastructures,
- mines, quarries and waste dumpsites.

Units

Units of measurement for changes and current status recording and mapping are hectares. For data presentation, the unit in km^2 can be used as well.

Results are presented as:

- current status of land cover based on the nomenclature adopted at European level, at five-year intervals;
- changes in land cover, at five-year intervals, presented in % of the total area of the country and % of the various land cover types.

Note: Particular attention is payed to areas changing as a result of urban systems extension leading to negative impact on the environment.

Policy relevance of the indicator

Legal grounds

Under the Law on Environment, every citizen is entitled to have an access to environmental state information. This indicator provides not only data on the state of the environment (land cover), but it also facilitates uniform access thereto, both at national and European levels.

Based on the Law on Land Survey and Registration, by means of regular land survey information is provided on the types of land cover. Although these parameters do not correspond with the CORINE land cover nomenclature, there is a possibility for unique integration of land cover elements.

Law on Urban and Spatial Planning.

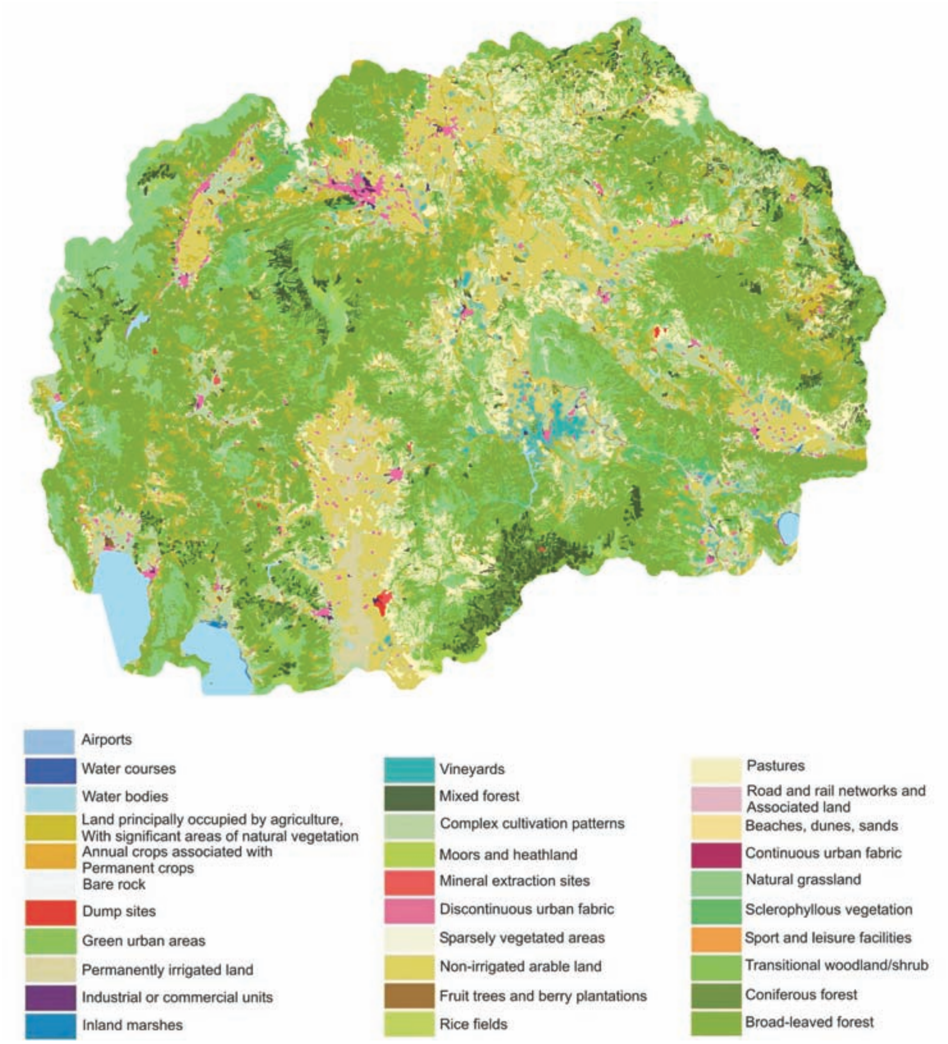
Targets

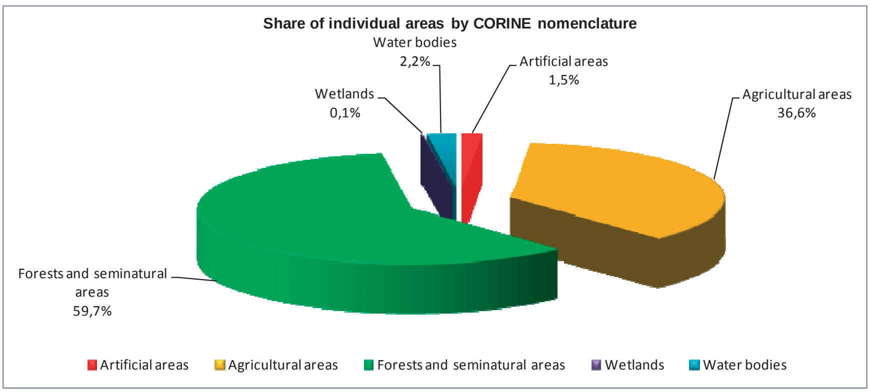
Tracking the changes in land cover and mapping of current status. Changes are monitored over five-year intervals. Methodology and nomenclature have been additionally harmonized at European level, thus enabling integrated monitoring of changes at regional and European levels.

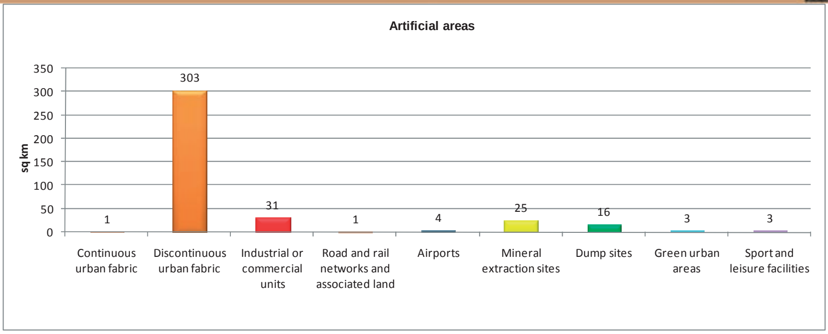
Key message

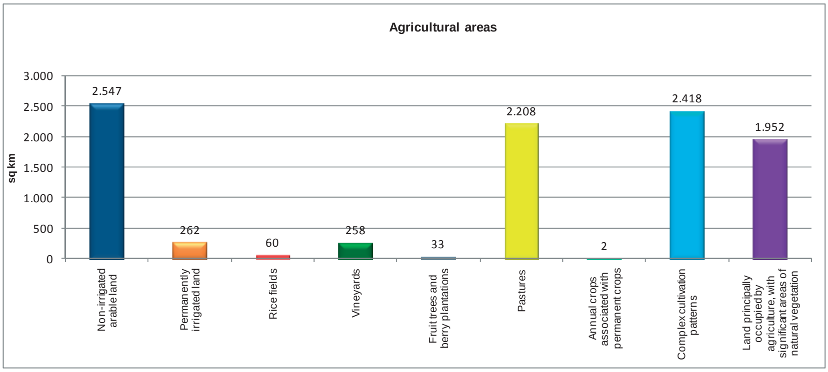
Based on the CORINE Land COVER methodology applied in the first phase of the project, it has been established that the surface area belonging to the category of forest and semi-natural areas is the largest one in the Republic of Macedonia, covering 15 879 km^2 or 61.8 % of the total area. Agricultural area is still significant by size (around 38 % of the total area).

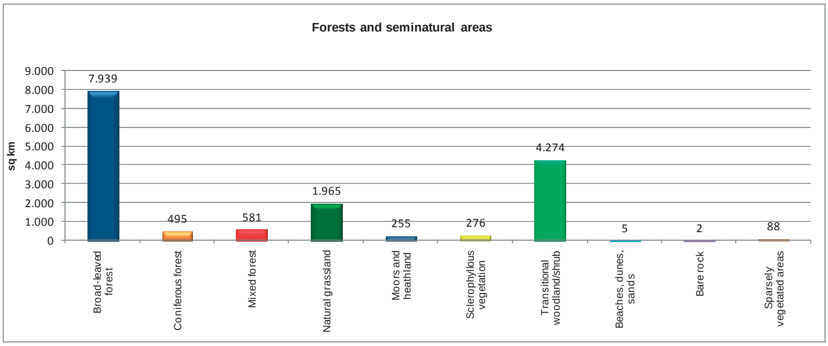
CORINE Land COVER 2000 (data of 1996)

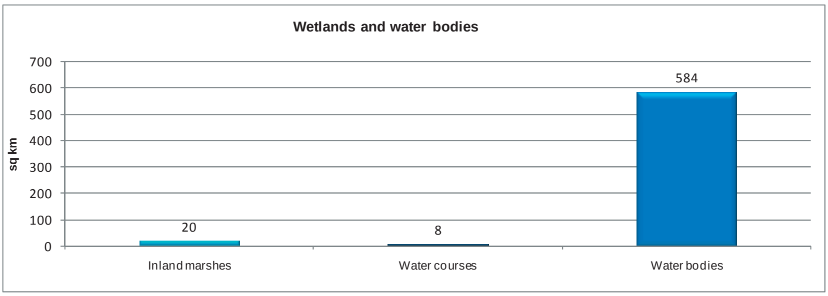





Artificial areas
sq km
350
300
250
200
150
100
50
0
1
303
31
1
4
25
16
3
3
Continuous urban fabric
Discontinuous urban fabric
Industrial or commercial units
Road and rail networks and associated land
Airports
Mineral extraction sites
Dump sites
Green urban areas
Sport and leisure facilities


Agricultural areas
sq km
3.000
2.500
2.000
1.500
1.000
500
0
2.547
262
60
258
33
2.208
2
2.418
1.952
Non-irrigated arable land
Permanently irrigated land
Rice fields
Vineyards
Fruit trees and berry plantations
Pastures
Annual crops associated with permanent crops
Complex cultivation patterns
Land principally occupied by agriculture, with significant areas of natural vegetation


Forests and seminatural areas
sq km
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0
7.939
495
581
1.965
255
276
4.274
5
2
88
Broad-leaved forest
Coniferous forest
Mixed forest
Natural grassland
Moors and heathland
Sclerophyllous vegetation
Transitional woodland/shrub
Beaches, dunes, sands
Bare rock
Sparsely vegetated areas


Wetlands and water bodies
sq km
700
600
500
400
300
200
100
0
20
8
584
Inland marshes
Water courses
Water bodies

Assessment

Data under CORINE Land Cover was published in 2000 година, and the source of information (satellite Landsat images) was from 1996.

Republic of Macedonia was not actively involved in the Project "Image2000 and CLC2000“ as a joint project of the European Environmental Agency (EEA) and Joint Research Centre (JRC) for the purposes of updating the CORINE Land COVER database.

Preparatory activities for implementation of the Project CORINE Land COVER 2006 (satellite images from 2006) are underway, while mapping of changes and current state is expected by the end of 2008.

In order to enable efficient use of this database at national level, i.e. within the Republic of Macedonia, additional data on Land COVER is needed, concerning area units and additional elements of the basic nomenclature, i.e. addition of the 4^{th} level in the nomenclature.

According to CORINE Land COVER, the highest proportion of the land is covered by forests and semi-natural areas covering 15 879 km^2 which corresponds to 61.8 % of the total area. The category of agricultural land takes 9 739 km^2 or 37,9 % of the total area, the category of artificial areas covers 389 km^2 or 1.5 % of the total area, etc.

Methodology

- Methodology for the indicator calculation

The assessment of CORINE Land Cover in 2000 was based on data from satellite images.

Owing to characteristics of the land cover of the Republic of Macedonia, out of the possible 44 classifications, 31 were identified. In addition to this and for the same reason, the minimum spatial unit treated within the project was reduced at 20 hectares instead of 25 hectares.

The substance of the process is photo-interpretation of satellite images consisting of:

- Delineation of boundaries of areas representing unique land area units at images with "false" colours;
- Application of interpretation keys, supporting documentation and satellite/aeroplane images for marking with identification number - class in nomenclature;
- Extrapolation of this marking and identification of all segments of the image exhibiting similar characteristics: colour, structure and composition.

Technical Guideline for CORINE Land Cover development was prepared by the European Environmental Agency.

Data specification

Title of the indicator	Source	Reporting obligation
Land take	CORINE Land Cover	

Data coverage (by years):

Table 1: Percentage of individual areas by CORINE Nomenclature

	Area in km^2	% of total area
Artificial areas	389	1,5
Agricultural areas	9739	37,9
Forests and semi-natural areas	15879	61,8
Wetlands	20	0,1
Water bodies	591	2,3

Table 2: Artificial areas

	CORINE LandCOVER code	CORINE Nomenclature	km^2
Artificial areas	111	*Continuous urban fabric*	1
	112	*Discontinuous urban fabric*	303
	121	*Industrial or commercial units*	31
	122	*Road and rail networks and associated land*	1
	124	*Airports*	4
	131	*Mineral extraction sites*	25
	132	*Dump sites*	16
	141	*Green urban areas*	3
	142	*Sport and leisure facilities*	3

Table 3: Agricultural areas

	CORINE Land COVER code	CORINE Nomenclature	km^2
Agricultural areas	211	*Non-irrigated arable land*	2.547
	212	*Permanently irrigated land*	262
	213	*Rice fields*	60
	221	*Vineyards*	258
	222	*Fruit trees and berry plantations*	33
	231	*Pastures*	2.208
	241	*Annual crops associated with permanent crops*	2
	242	*Complex cultivation patterns*	2.418
	243	*Land principally occupied by agriculture, with significant areas of natural vegetation*	1.952

Table 4: Forests and seminatural areas

	CORINE LandCOVER code	CORINE Nomenclature	km^2
Forests and seminatural areas	311	*Broad-leaved forest*	7.939
	312	*Coniferous forest*	495
	313	*Mixed forest*	581
	321	*Natural grassland*	1.965
	322	*Moors and heathland*	255
	323	*Sclerophyllous vegetation*	276
	324	*Transitional woodland/shrub*	4.274
	331	*Beaches, dunes, sands*	5
	332	*Bare rock*	2
	333	*Sparsely vegetated areas*	88

Table 5: Wetlands and water bodies

	CORINE LandCOVER code	CORINE Nomenclature	km^2
Wetlands	411	*Inland marshes*	20
Water bodies	511	*Water courses*	8
	512	*Water bodies*	584

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 014	**Land take**	CSI 014	Land take	**P**	A	– management – nature – other – population – soil – tourism – transport – urbanization	10 - annually

Geographical coverage: Republic of Macedonia

Temporal coverage: Data set on land cover was finalized in 2000, based on satellite images taken in 1996.

Uncertainty

- Methodological uncertainty

No systematic methodological uncertainty or data uncertainty have been found. Certain digression in the identification of changes and actual state can occur for small size spatial elements that can not be identified uniformly, but have no significant impact on the quality of the indicator.

Future activities

■ Short-term activities

Active participation of the Republic of Macedonia in CORINE Land Cover 2006. Preparatory activities towards implementation of the Project CORINE Land COVER 2006 (satellite images from 2006) are underway, while mapping of changes and actual state is expected by the end of 2008.

a. Description of the activity

- All activities are in accordance with the technical specification of the European Environmental Agency, ETC "Land Use and Spatial Information" and under their direct supervision.

b. Required resources

- In accordance with the recommendations of the European Environmental Agency, the implementation of the Project will rely on the persons that have worked in the previous phase of the Project who will make the core team, and new persons will be included to establish the basis for the next phases.

c. Status

- Commencement of the activities for project implementation.

Deadline: End of 2008.

■ Long-term activities

- Participation in all follow-up phases of the Project, as well as data processing to generate the fourth level of the nomenclature.

MK - NI 015

PROGRESS IN MANAGEMENT OF CONTAMINATED SITES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Emission of hazardous substances from industry, as well as from municipal and industrial waste, may have impacts on the quality of soil and water, and especially groundwater. Management of contaminated sites assumes assessment of harmful effects that cause contamination and undertaking measures to comply with environmental standards required by the relevant legislation. Unfortunately, no standards for the soil quality or defined targets for remediation of the sites with exceeded standards have been put in place in our country. On the other side, numerous activities causing soil contamination have been identified. This concerns especially industrial activities and waste disposal by municipalities and industrial facilities.

The implementation of the existing legislation, especially the Law on Environment which incorporates the Integrated Pollution Prevention and Control Directive, the Law on Nature Protection, the Law on Agricultural Land, the Law on Waste Management with transposed Landfill Directive, as well as legislation pending adoption, such as Law on Waters with transposed Water Framework Directive would result in specific activities that shall be undertaken to reduce soil contamination. However, major efforts are needed to settle the issue of historical contaminations.

This indicator tracks the progress in the management of contaminated sites, as well as the level of financial resources (public and private) that should be allocated for remediation.

Definition

The term 'contaminated site' refers to a well-delimited area where the presence of soil contamination has been confirmed and the severity of possible impacts to ecosystems and human health are such that remediation is needed, specifically in relation to the current or planned use of the site. The remediation or clean-up of contaminated sites can result in a full elimination or in a reduction of these impacts.

The term 'potentially contaminated site' includes any site where soil contamination is suspected but not verified and investigations need to be carried out to verify whether relevant impacts exist.

The progress in the management of contaminated sites has been designed to mitigate possible negative effects in case of suspected or confirmed environment degradation and there is a need to reduce potential threats to human health, biological diversity, water bodies, soil, habitats, foodstuffs, etc.

The management of contaminated sites starts with investigation that can further lead to rehabilitation or treatment of contaminated site, measures for its conservation and maintenance and revitalization of contaminated sites.

1. The indicator shows progress in five main steps:
2. site identification/ preliminary study;
3. preliminary investigation;
4. main site investigation;
5. implementation of remediation measures;
6. measure completed.

In future, this indicator would also show the costs to the society for contaminated sites remediation, the main activities contributing to soil contamination and achievements in the management of contaminated sites.

Units

- Share of economic activities in soil contamination as percentage of sites where the activity is present compared to the total number of processed sites.
- Number of sites managed to a certain step out of the five main steps of the indicator.
- Number of sites for which each of the five steps within contaminated sites management has been completed as a percentage of the total number of sites to be processed.
- Expenditures for remediation expressed in EUR per capita per year.

Policy relevance of the indicator

Our country lacks legally prescribed standards on soil. Generally, the existing legislation is intended to prevent new contaminations. Implementation of the actual legislation and the adoption of the Law on Waters would result in reduced soil contamination and improved control of contamination caused by natural and other developments.

Legal grounds

Soil protection is regulated by several laws, including the Law on Environment, the Law on Nature Protection, the Law on Agricultural Land, etc., but there is no soil specific law, with clearly defined institutional responsibilities.

According to Article 2 of the Law on Environment, improvement of the state and quality of the environment includes the protection of soil. The same Law, in its Article 9, prescribes the polluter pays principle, while Article 13 introduces the principle of precaution which should assist in avoiding the local soil contamination in future. Article 36 envisages internal monitoring for legal and natural persons possessing emissions and making impacts by their activities on one or more environmental media.

The Law on Nature Protection, in its Article 11 concerning restriction in land use change and in correlation with Article 12 prohibition of nature use in a manner causing degradation of soil and its fertility loss.

The Law on agricultural land, Article 31, prescribes protection of agricultural land against pollution and contamination for the purpose of production of health safe food, protection of human health, flora and fauna and uninterrupted use and protection of the environment.

The same Article specifies that the Ministry of Agriculture, Forestry and Water Economy determines the matters which are harmful for agricultural land, their maximum permissible concentrations in soils and measures that have to be undertaken with regard to agricultural land with concentrations of harmful matters above permissible ones.

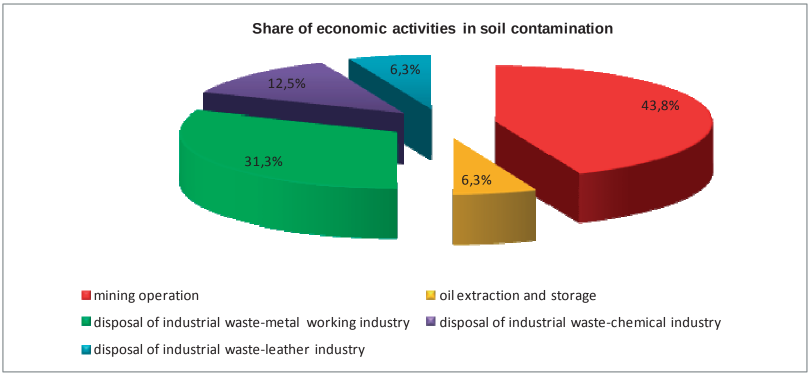
Targets

Implementation of the Operational Programme for pre-accession assistance of the European Union. Implementation of infrastructure projects (wastewater treatment, waste management and industrial hot-spots). Implementation of the National Waste Management Plan, development of local programmes and plans for solid municipal and other waste types management, closure and revitalization of illegal landfills.

Remediation of tailings, stabilization and recultivation of industrial landfills.

Key policy issue

What is the share of economic activities contributing to soil contamination in the Republic of Macedonia?



The main contaminants contributing to soil and groundwater contamination should be identified. In order to answer the above question, it is necessary to carry out additional investigations of contaminated sites, as well as inspection of the activities of industrial companies producing contaminants as by-products.

Key message

In the Republic of Macedonia, 16 sites have been identified as areas of potential soil contamination, characterized as hot-spots. Preliminary investigations have been carried out with 16 sites, while with two sites main investigations have been carried out and certain remediation measures implemented. Completion of measures has not been recorded with none of the identified hot-spots. With regard to economic activities contributing to soil contamination expressed in percentage, the highest share belongs to mining with 43.75%, followed by metallurgy with 31.25%, organic chemical industry with 12.5% and refinery and leather manufacturing industry with 6.25%.

Specific policy issue

What progress has been made in local soil contamination management and control?

Five main steps in the progress in contaminated sites management	Identified sites
Site identification/preliminary study	16
Preliminary investigation	16
Main site investigation	2
Implementation of remediation measures	1
Measure completed	0

What are the costs for soil contamination remediation and what is the contribution from the public budget and contribution from private budget?

According to the National Waste Management Plan of the Republic of Macedonia, calculations have led to the conclusion that around 77 million EUR or 38 EUR per capita will be needed.

Methodology

- Methodology for the indicator calculation

Data for the indicator calculation was taken from the National Waste Management Plan of the Republic of Macedonia or Special Study E.

The shares of economic activities contributing to soil contamination are calculated e.g. [number of mines contributing to soil contamination]/[total number of sites or sites where soil contamination has been confirmed] x 100.

- Source of applied methodology

According to European Environmental Agency, European Topic Centre for soils

Data specification

Title of the indicator	Source	Reporting obligation
Progress in the management of contaminated sites	– Ministry of Environment and Physical Planning	– Soil contamination (TE-2)

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 015	**Progress in the management of contaminated sites**	CSI 015	Progress in management of contaminated sites	**P**	A	chemicals industry management nature soil transport urbanization waste water	annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2005

Frequency of data collection: at annual basis

Uncertainty

- ### Methodological uncertainty

Although there is a definition of contaminated site, because of the lack of limit values for the concentration of certain toxic chemicals in the soil, it is difficult to determine the exact number of sites where soil contamination has been confirmed.

The assessment of contaminated site depends to a great extent on the individual expert assessment.

- ### Uncertainty of data set

All sites where certain industrial/economic activity is performed have not been accounted as sites with determined contamination, although such activities generate chemical substances. Lack of data on chemical substances from various industrial facilities causing soil contamination. Estimates of the costs related to remediation processes are approximative and based on expert judgments.

Future activities

- ### Short-term activities

Establishment of work groups for the purpose of elaboration, final definition and full development of the indicator.

a. Description of the activity

Elaboration, final definition and full development of the indicator.

b. Required resources

Experts in the area of environment, economy, organic and chemical industry, metallurgy, etc.

c. Status

In progress.

Deadline: June 2008

- ### Long-term activities

Long-term activities will be defined by the Work Group.

MK - NI 038

FOREST FIRES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Forests are valuable resource and play significant role in the process of air, water, land and biodiversity protection. Forests are global store of carbon and biodiversity. Forests in the Republic of Macedonia cover 950.594 ha representing 37% of the national territory. High trunk forests constitute 30% of the overall forest cover, while low trunk forests makes up the remained 70%. Around 89% of the forests in the Republic of Macedonia are state owned and only around 11% are privately owned. Macedonian dendroflora consists of 319 tree species and shrubs are represented by more than 80 subspecies and varieties. They assemble 81 forest associations. There are 49 endemic and subendemic species. Deciduous trees take 56.10%, conifers 8.46%, mixed deciduous forests 28.70%, mixed conifers 0.79% and mixed deciduous and coniferous trees take 5.95%. Major causes of unfavorable conditions in forestry are forest fires, plant pests and diseases, inadequate individual wood felling, specific natural conditions and insufficient public awareness on the importance of forests. All mentioned pressures result in degradation of forests and land erosion. The statement can be illustrated by the fact that there is a semi-desert area in the central part of the Republic of Macedonia, on the eastern side of Vardar River, as a consequence of wood fellings around Vardar and Crna rivers in the period between 16 and 19 century. In addition to this, in the course of the last 10 years, around 100.000 ha have suffered forest fires, while annual amount of fuel wood acquired by illegal wood cutting has been estimated at 30% of the amount of fuel wood cut in a legal manner. Reduction of the rate of forests degradation and destruction is one of the greatest challenges in forestry.

Definition

The indicator provides information on the number of forest fires on the territory of the Republic of Macedonia. It also provides information on the magnitude of forest fires presenting the area subjected to fire and the type of wood mass seized by fire, as well as the total damage caused by fire.

Units

The area seized by fire is expressed in ha (hectares), while wood mass seized by fire is expressed in m^3. The total damage from forest fires is expressed in denars, as well as number of forest fires.

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) defines measures for improved protection against forest fires through establishment of indicators as:

- Number of forest fires per year, and
- Area destructed by forest fires each year.

Under the NEAP 2 measures and activities, the following is specified:

- Development of National Strategy for Sustainable Development of Forests,
- Strengthening of capacity for sustainable forests management, and
- Development of Strategy for Forest Fire Prevention.

Legal grounds

- Law on Forests (Official Gazette of the Republic of Macedonia No. 47/97 and amendments no. 7/00) which regulates forests and forest resources management and protection. Protection of forests is integrated and indivisible part of the overall forest management. In the context of forests protection against fires and regulation of measures in this area, we should also mention the 2001 Rulebook on specific measures for forest protection against fires.
- Law on Natural Rarities Protection (Official Gazette of the Republic of Macedonia No. 41/73 and amendments no. 42/76, 10/90, 62/93)
- Around 7.34% of the territory of the Republic of Macedonia is under protection. Protection regimes cover national parks, strict natural reserves, three areas with specific natural characteristics, 14 special plant and animal reserves and 50 monuments of nature.
- Law on national parks Protection (Official Gazette of the Republic of Macedonia No. 33/80 and amendments no. 10/90 and 62/93)
- Law on Designation of Forest Area of Pelister Mountain as National Park (Official Gazette of the Republic of Macedonia No. 38/48 and 16/65)
- Law on Designation of Forest Area around Mavrovo lakes National Park (Official Gazette of the Republic of Macedonia No. 10/49, 23/52 and 16/65)
- Law on Designation of Forest Area of Galicica Mountain as National Park (Official Gazette of the Republic of Macedonia No. 31/58 and 16/65)
- Law on Fire Prevention (Official Gazette of the Republic of Macedonia No. 43/86 and amendments in no. 37/87, 51/88, 36/90, 12/93)

Targets

Compliance with the legislation concerning forests and forest resources protection. Reduction of forest fires number, reduction of wood mass and forest area affected by forest fires. Reduction of costs and damages resulting from forest fires. Increase of the public awareness in relation to fire prevention and undertaking all possible measures to reduce human factor as forest fires cause.

Key policy issue

What is the number of forest fires, what is the area and wood mass affected by fire?

Diagram 1: Number of forest fires in the Republic of Macedonia

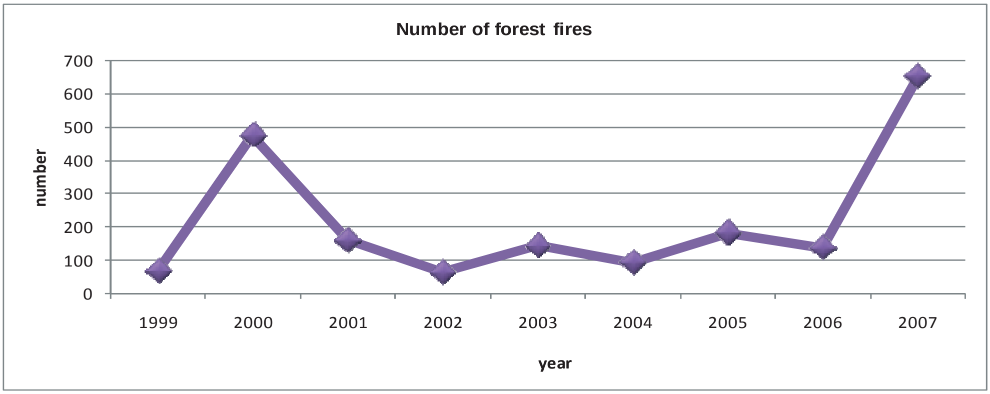


Diagram 2: Area affected by forest fires in the Republic of Macedonia

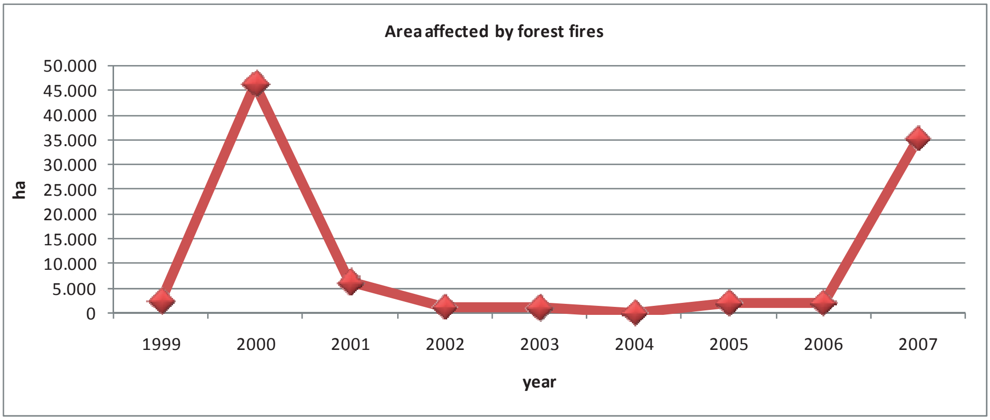
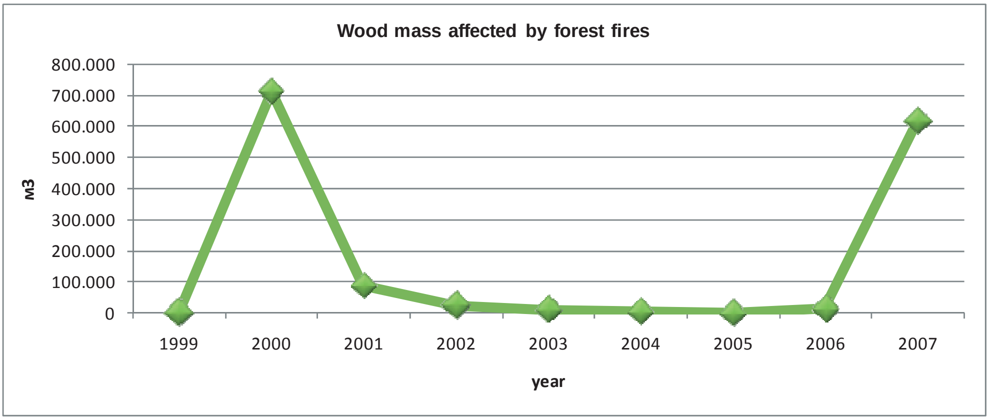


Diagram 3: Wood mass affected by forest fires in the Republic of Macedonia



Key message

In the period between 1999 and 2007, rapid increase in the number of fires, area and mass affected by fire in the Republic of Macedonia was tracked in 2000. Then, there was fall in 2001 and 2002, retaining relatively stable level up to 2006.

In 2007, there was rapid rise in the above mentioned measured parameters, where the number of fires reached the maximum, while area and wood mass affected by fire is slightly lower compared to the peak reached in 2000.

Specific policy issue

What is the status of forest fires in the Republic of Macedonia?

Forest fires constitute one of the biggest problems in forestry, as well as in the environment of the Republic of Macedonia as a whole. Huge amounts of wood mass are destroyed by forest fires and this is thus an economic problem. Forest fires cause air, soil and water pollution. Burn trunks are source of pathogens and pests. There is also an increase in erosion processes in burnt areas, water regime disbalancing, loss of vegetation and desertification. Almost 95% of forest fires is caused by man. Forest fires destroy as much as 2 200 ha forest each year. The mean number of fires is 120 per year. In 2000, due to extreme draughts and human factor, there were 476 fires and around 46 000 ha affected, while in 2007, an area of around 35 000 ha was affected by 652 fires.

Table 1: Number of fires, area affected by fires in ha, wood mass affected by fires in m^3 in the Republic of Macedonia

Year	Number of fires	Area affected by fire in ha	Wood mass affected by fire in m^3
1999	69	2.414,80	1.905,00
2000	476	46.235,73	711.782,00
2001	161	6.263,30	88.260,00
2002	65	1.186,30	24.661,28
2003	144	1.068,88	10.987,00
2004	94	892.05	4.322,30
2005	182	2.084,10	1.063,00
2006	138	2.085,95	12.978,00
2007	652	35.248,06	617.678,67

What is the total damage resulting from forest fires in the Republic of Macedonia?

Table 2: Total damage resulting from forest fires in 2007 presented in denars in the Republic of Macedonia

Year	Total damage from fires in denars
1999	105.837.151,00
2000	969.852.057,00
2001	610.814.677,00
2002	18.531.939,00
2003	15.594.691,00
2004	91.083.591,00
2005	25.287.638,00
2006	148.712.782,00
2007	1.311.167.721,95

Methodology

- Methodology for the indicator calculation

Data and the indicator calculation was processed by the Public Enterprise for Forests Management of the Republic of Macedonia - "Macedonian Forests".

Data specification

Title of the indicator	Source	Reporting obligation
Forest fires	– Public Enterprise for Forests Management - "Macedonian Forests"	

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 038	**Forest fires**	TE065	Forest fires	**P**		Soil Forestry Agriculture Nature Urbanization	annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1999 to 2007

Frequency of data collection: At annual basis

Uncertainty

■ Methodological uncertainty and data uncertainty

There is certain extent of uncertainty in determining the amount of wood mass in m^3, as well as in the determining of area affected by fires in ha, deriving from some methodological uncertainty in parameters calculation.

Future activities

■ Short-term activities

– Establishment of work groups to elaborate, finalize definition and develop the indicator.

a. Description of the activity

– Elaboration, finalization of definition and development of the indicator.

b. Required resources

– Experts in the area of forestry, environment, agriculture, economy, etc.

c. Status

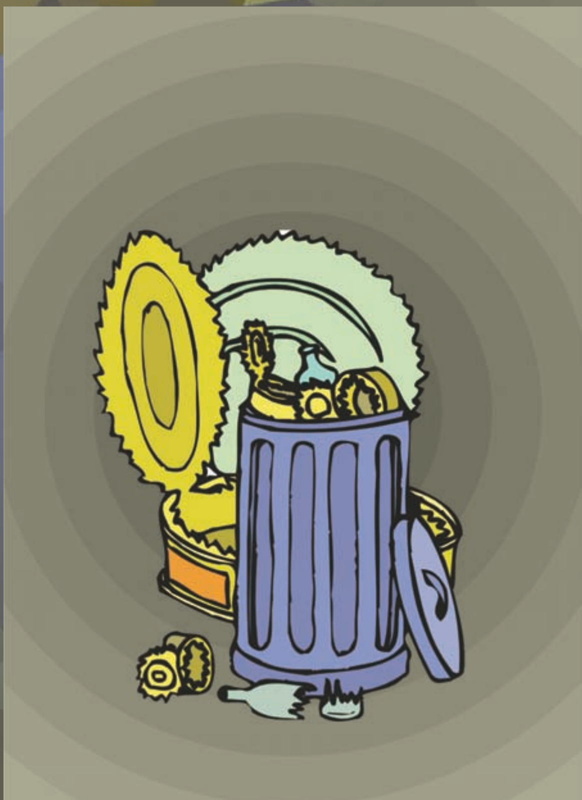
– In progress

Deadline: June 2008

■ Long-term activities

– Long-term activities will be defined by the Work Group.

WASTE



MK - NI 016

MUNICIPAL WASTE GENERATION

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Waste represents an enormous loss of resources in the form of both materials and energy. The amount of waste produced can be seen as an indicator of how efficient we are as a society, particularly in relation to our use of natural resources and waste treatment operations.

Municipal waste is currently the best indicator available for describing the general development of waste generation and treatment in European countries. This is because all countries collect data on municipal waste; data coverage for other wastes, for example total waste or household waste, is more limited.

Municipal waste constitutes only around 15 % of total waste generated, but because of its complex character and its distribution among many waste generators, environmentally sound management of this waste is complicated. Municipal waste contains many materials for which recycling is environmentally beneficial.

Despite its limited share of total waste generation, the political focus on municipal waste is very high.

Definition

The indicator presents municipal waste generation, expressed in kg per person, and the method of treatment (recycling, composting, landfill and incineration), expressed as a percentage of total municipal waste treatment. Municipal waste refers to waste collected by or on behalf of municipalities; the main part originates from households, but waste from commerce and trade, office buildings, institutions and small businesses is also included.

Units

– kilogramme per person per year, percentage.

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) defines the approach to waste management through incorporation of the basic objectives into the legislation harmonized with the relevant EU law. It establishes monitoring mechanisms, as well as economic instruments for the waste management implementation. In addition, it identifies the relevant stakeholders in the area of waste management (especially in the context of overlapping competences among sectors). The process of decentralization and the need to build institutional capacity have been taken into account, as well as establishment of conditions for adequate financing of waste management in the Republic of Macedonia.

The National Waste Management Plan includes the following activities:

- Analysis of waste at national level: municipal waste, hazardous waste, medical waste and agricultural waste;
- Construction of pilot waste composting plant: analysis of alternatives for composting, designing and implementation of alternatives and recommendations for waste composting;
- Analysis of the market with regard to most demanded recyclable materials: current status, potential opportunities for recovery and recycling, extension of the recycling system coverage and waste treatment system coverage; proposals of legal, economic and financial instruments coordinated by the project NEAP 2; analysis of EU Directives of relevance for waste recovery and recycling;
- Assessment of alternative economic and financial instruments through financial support from municipalities or from other financing sources.

Legal grounds

The basic legal framework for the waste management has been established by the Law on Waste Management. The main characteristics of the waste related legislation include:

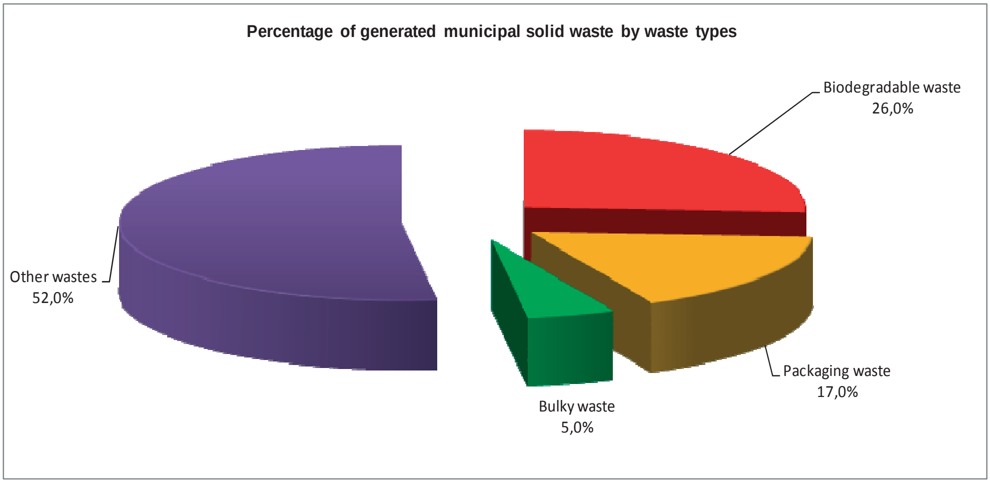
- Full approximation with the relevant EU Directives transposed in the Law on Waste Management, taking into account the local conditions;
- The Law on Waste Management incorporates the main principles in waste management (principle of environmental protection in waste management, principle of waste minimization, precaution principle, proximity, universality of service, polluter pays principle, deposit system, etc.),
- The waste management, as public service, is based on the principle of universality of service (non-discrimination, sustainability, quality and efficiency, transparency, affordability and full coverage of the territory).

Key message

Data resulting from the Project on waste management show that 73% of collected waste is households waste. Taking into account that 73% of the waste originates from households, the total amount of waste generated has been estimated at 0.86 kg/capita/day or 313 kg/ capita/ year. The analysis of waste composition reflects that dominant fractions in the waste are organic matters with 26.2% and small size wastes with 30.9% or more than 50% of the generated waste in total. Paper and cupboard contribute 11.6%, followed by plastics with 9.6%. All other waste fractions, i.e. wood, glass, textile, metals, hazardous wastes from households and other categories contribute all together less than 25% to the waste generated.

Primary market investigation has shown that there is certain recycling chain established on the Macedonian market.

There is a need to improve regular reporting and statistics of waste generation, disposal and treatment.



Assessment

The amounts of generated waste are assessed on the basis of data provided by the State Statistical Office and on the basis of the analysis performed in the frameworks of the Study on Waste Management in Southeastern Part of Macedonia, prepared by ERM Lahmaeyer International GmbH (2002-2004).

The Study on Waste Management in Southeastern Part of Macedonia presents indicators of municipal waste generation in the subject region. According to the analysis made by the Ministry of Environment and Physical Planning (MEPP) on the amounts of generated municipal waste in other parts of the country, it may be concluded that such amounts are comparable to the results contained in the said Study and are thus fully applicable for the whole national territory.

Data from the survey carried out in the framework of the mentioned Study show that 73% of the collected waste is household waste. Taking this into account, it has been estimated that the total amount of generated waste is 0.86 kg/capita/day or 313 kg/capita/year.

The analysis of waste composition shows that the main fractions in the waste are organic matters with 26.2%, packaging waste with 17 %, bulky waste with 5% and other waste types with 52%.

Disposal

There is only one legal landfill in the Republic of Macedonia – “Drisla” in the vicinity of Skopje,

where no ground protection has been provided. This landfill is not fully compliant with modern technical standards. The capacity of the landfill is 16.000.000 tonnes, and by 2002, only 4 % of the designed capacity was utilized.

There are 32 municipal landfills, most of which are not fenced and secured, and their construction and operational performance is inadequate. There are also around 1.000 small illegal waste dumping sites in rural municipalities and settlements.

Methodology

- Methodology for the indicator calculation

Estimates and annual reports by municipalities.

Data specification

Title of the indicator	Source	Reporting obligation
Municipal waste generation	– National Waste Management Plan, MEPP	– EUROSTAT

Data coverage:

Table 1: Generated municipal solid waste by types

Waste stream	Amounts (ton/year)	(%)
Household waste	417,838	73
Commercial waste	154,543	27
Type of wastes		
Biodegradable waste	148,819	26
Packaging waste	97,305	17
Bulky waste	28,619	5
Other wastes	297,638	52
Total MSW	**572,381**	**100**

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 016	**Municipal waste generation**	CSI 016 WMF8	Municipal waste generation	**P**	A	households population urbanization waste	2 - annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2004 – 2005

Frequency of data collection: annually

Future activities

- **Short-term activities**

– Definition of the national set of waste indicators.

a. Description of the activity

– Establishment of Work Group for the national set of waste indicators.

b. Required resources

– Involvement of national experts from governmental institutions in the area of waste.

c. Status

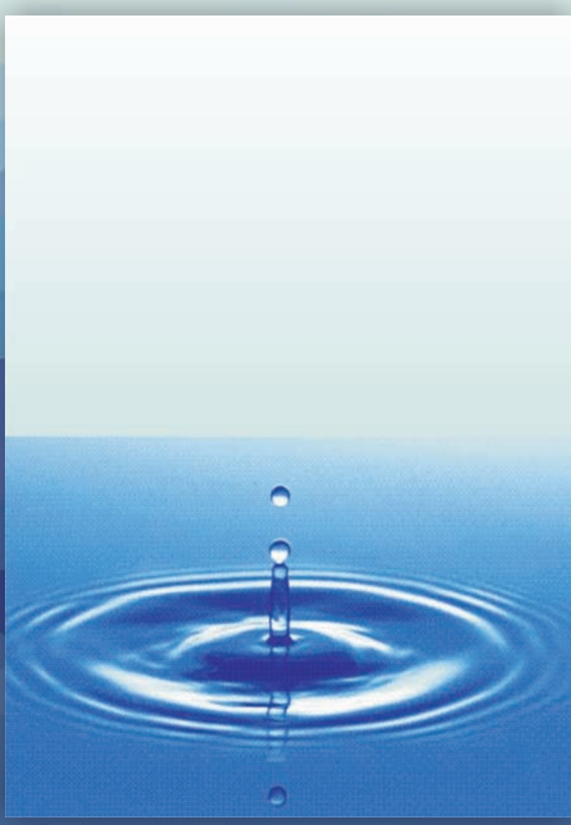
– Early initiative

Deadline: 2008

- **Long-term activities**

– Long-term activities are to be defined by the Work Group.

WATER



MK - NI 018

USE OF FRESHWATER RESOURCES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Monitoring the efficiency of freshwater use by different economic sectors at the national and local level is an important factor in determining the rates of extraction, which are sustainable over the long term an policy objective under the EU's Sixth Environment Action Programme (2001-2010).

The indicator shows how total water abstraction puts pressure on freshwater resources. Changes in the WEI (water exploitation index) help to analyse how changes in abstraction impact on freshwater resources by increasing pressure on them.

Definition

The water exploitation index (WEI) is the mean annual total abstraction of freshwater divided by the mean annual total renewable freshwater resource at the country level, expressed in percentage terms.

Units

– Water exploitation index - WEI (%); water abstraction for irrigation, public water supply, manufacturing industry and energy cooling (mio. m^3 per year).

Policy relevance of the indicator

List of relevant policy documents:

The National Environmental Action Plan - 2 and Environmental Monitoring Strategy and Data Management Strategy.

The policy for sustainable use of water resources based on the Sixth Environmental Action Programme and Framework Water Directive requirements.

Legal grounds

The Law on Waters prescribes maintenance and improvement of water regime and sustainable use of available water quantities in accordance with the Water Master Plan of the Macedonia. The Water Master Plan is implemented by issuance of permits for water management or awarding of concessions for water use, which specify the manner and the conditions for water use, the operation regime while managing the water resources or other facilities and plants making impact on water regime, the manner and the conditions for discharging water, waste water and waste substances and the required degree of waste water treatment.

The Law specifies that the maintenance and improvement of water regime is carried out on the basis of River Basins Management Plans. Such Plans contain the environmental protection goals, good status of surface water bodies (good quantitative status and chemical status). River Basins Management Plans will be implemented through issuance of permits for water use, permits for extraction of sand, gravel and stone and permits for water discharges specifying quantitative and qualitative requirements in each case individually.

Use of water for different purposes is specified under the Decree on Water Classification, according to which water is divided into five different classes based on the level of pollution, while water characteristics are determined on the basis of classes and purposes for which water can be used.

Targets

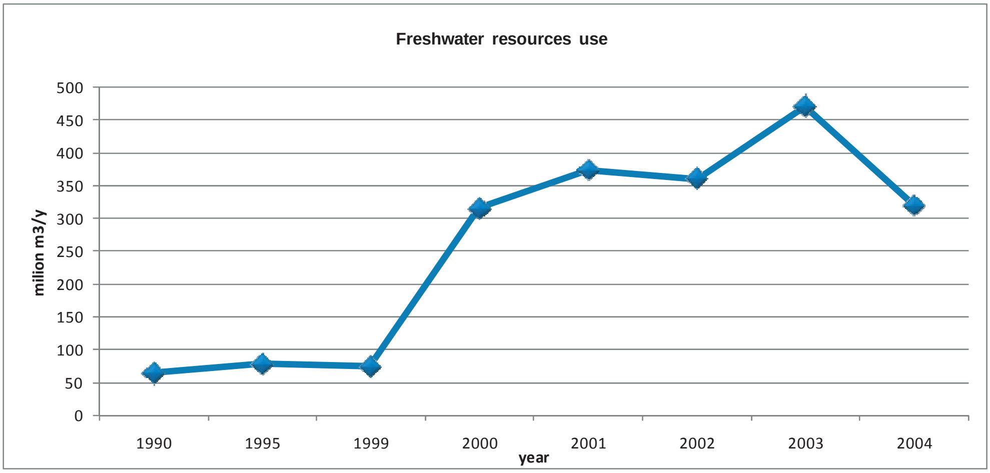
No specific targets.

Key policy issue

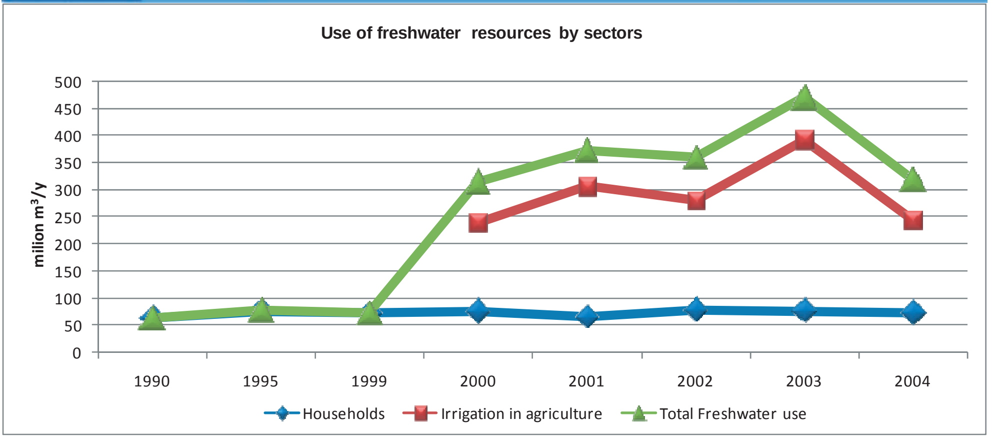
Is water resources approximation based on water resources sustainability?

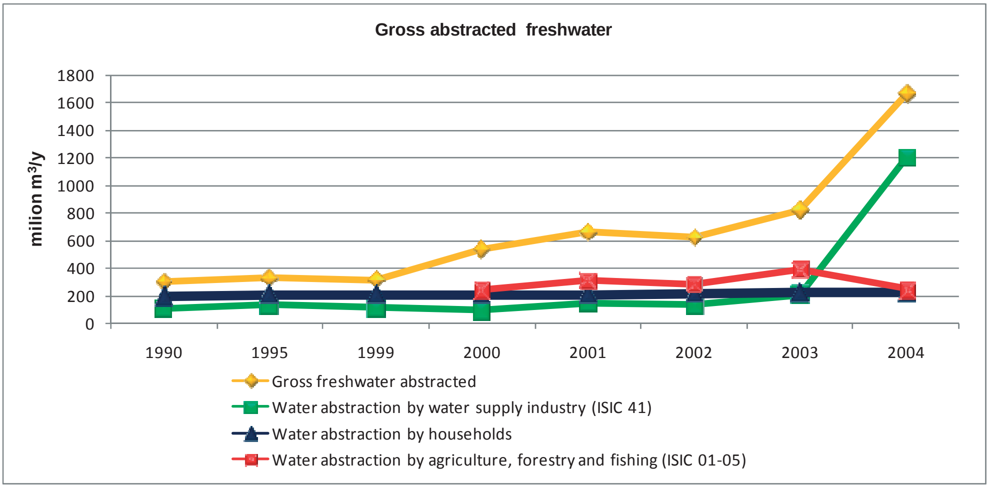
Key message

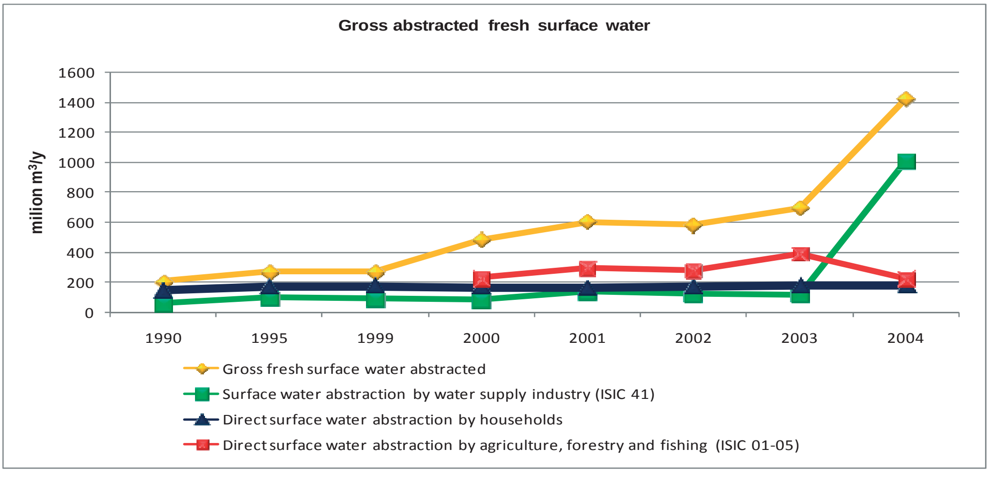
In the period 1990 – 2004, rising trend was tracked in freshwater resources use. Particular rise was recorded in 2000. Public water supply is the main user of abstracted surface and ground freshwaters, covering more than 94% of the population. Variability of data could be conditioned by discontinuity of industrial processes.

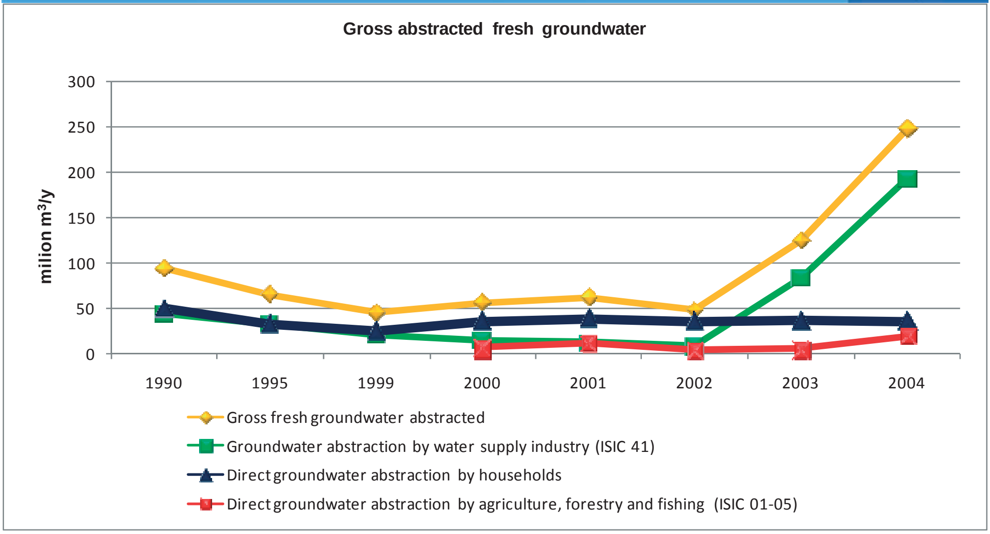


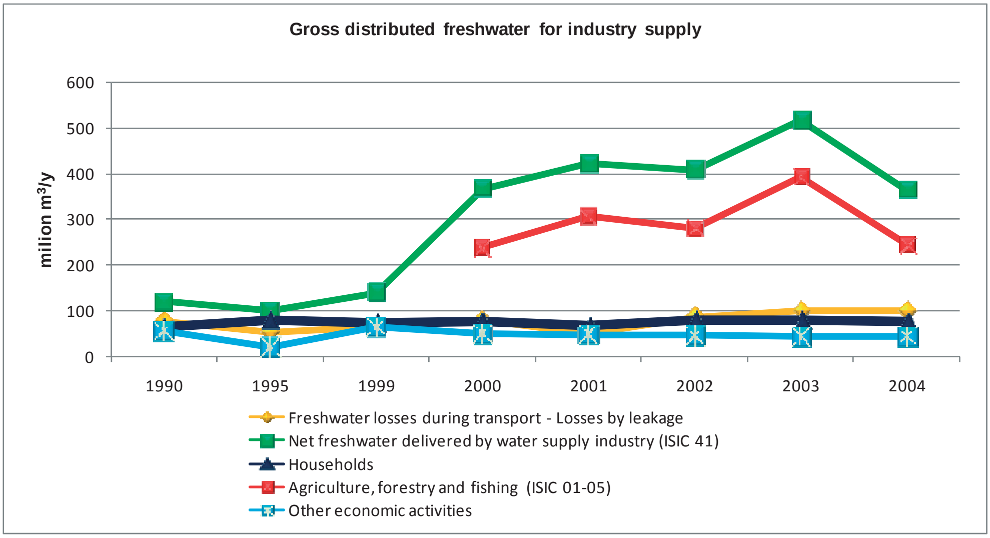
Data is not part of the regular statistics published in the country.


Use of freshwater resources by sectors
500
450
400
350
300
250
200
150
100
50
0
milion m³/y
1990
1995
1999
2000
2001
2002
2003
2004
Households
Irrigation in agriculture
Total Freshwater use


Gross abstracted freshwater
1800
1600
1400
1200
1000
800
600
400
200
0
milion m³/y
1990
1995
1999
2000
2001
2002
2003
2004
Gross freshwater abstracted
Water abstraction by water supply industry (ISIC 41)
Water abstraction by households
Water abstraction by agriculture, forestry and fishing (ISIC 01-05)


Gross abstracted fresh surface water
1600
1400
1200
1000
800
600
400
200
0
milion m³/y
1990
1995
1999
2000
2001
2002
2003
2004
Gross fresh surface water abstracted
Surface water abstraction by water supply industry (ISIC 41)
Direct surface water abstraction by households
Direct surface water abstraction by agriculture, forestry and fishing (ISIC 01-05)





Assessment

In the period 1990 – 2004, rising trend was tracked in freshwater resources use in the country. Particular rise was recorded in 2000. Public water supply is the main user of abstracted fresh surface and ground waters, especially in 2004. There has been discontinuity of industrial processes, reflected in water abstraction.

Methodology

- Methodology for the indicator calculation
  - Data is collected and processed by sectors and types of industry.

Data specification

Title of the indicator	Source	Reporting obligation
Use of freshwater resources	– State Statistical Office – Water Management Administration – Public Water Supply and Sewerage Enterprise	– OECD/EUROSTAT

Data coverage (by years):

Table 1: Use of freshwater resources

Unit in mio m^3/y	1990	1995	1999	2000	2001	2002	2003	2004
Freshwater use	64	78	73,3	315,5	373	360,7	471,3	319,6

Table 2: Use of freshwater resources by sectors

Unit in mio m^3/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross freshwater abstracted	302	333,8	315,5	539,3	660,9	627,1	816,3	1663
Freshwater abstracted by industry water supply	105,4	129,8	113,6	95,4	148,5	133,5	202,7	1199
Freshwater abstracted by households	196,6	204	201,9	204,7	205,7	212,2	220,3	219,2
Freshwater abstracted by agriculture, forestry and fishery				239,2	306,7	281,4	393,3	244,8

Table 3: Gross freshwater abstracted

Unit in mio m^3/y	1990	1995	1999	2000	2001	2002	2003	2004
Households	64	78	73,3	76,3	66,3	79,3	78	74,8
Irrigation in agriculture				239,2	306,7	281,4	393,3	244,8
Total freshwater use	64	78	73,3	315,5	373	360,7	471,3	319,6

Table 4: Gross fresh surface water abstracted

Unit in mio m^3/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross fresh surface water abstracted	**208,1**	**268,6**	**269,9**	**482,8**	**598,6**	**579,1**	**691,3**	**1415,9**
Gross fresh surface water abstracted by industry water supply	60,9	97,2	93,1	81,2	136,3	125	118,7	1006,1
Direct fresh surface water abstracted by households	147,2	171,4	176,8	169,1	167,6	176,5	184,2	184,4
Direct fresh surface water abstracted by agriculture, forestry and fishery				232,5	294,7	277,6	388,4	225,4

Table 5: Gross fresh ground water abstracted

Unit in mio m^3/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross fresh groundwater abstracted	**93,9**	**65,2**	**45,6**	**56,5**	**62,3**	**48**	**125**	**247,1**
Gross fresh groundwater abstracted by industry water supply	44,5	32,6	20,5	14,2	12,2	8,5	84	192,9
Direct fresh groundwater abstracted by households	49,4	32,6	25,1	35,6	38,1	35,7	36,1	34,8
Direct fresh groundwater abstracted by agriculture, forestry and fishery				6,7	12	3,8	4,9	19,4

Table 6: Gross distributed fresh water for industries supply

Unit in mio m^3/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross freshwater distributed for industries water supply	76,8	51,9	63,3	78,1	49,4	86,3	100,3	99,9
Water loss during transport	**119,8**	**99,7**	**138,6**	**366**	**421,1**	**407,3**	**515,7**	**363,4**
Net freshwater distributed for industries water supply	64	78	73,3	76,3	66,3	79,3	78	74,8
Households				239,2	306,7	281,4	393,3	244,8
Agriculture, forestry and fishery	55,8	21,7	65,3	50,5	48,1	46,6	44,4	43,8

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 018	**Use of freshwater resources**	CSI 018	Use of freshwater resources	**P**	A	water	annual

Geographical coverage: Republic of Macedonia

Temporal coverage: 1990 - 2004

Frequency of data collection: collection of annual data.

Note: Data is available only for certain sectors.

Future activities

- Short-term activities

a. Description of the activity

– Regular updating of indicator

b. Required resources

– Involvement of national experts from governmental institutions in the area of water resources

c. Status

– Continuous

Deadline: one year

- Long-term activities

– Long-term activities are to be defined by the Work Group.

MK - NI 019

OXYGEN CONSUMING SUBSTANCES IN RIVERS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Large quantities of organic matter (microbes and decaying organic waste) can result in reduced chemical and biological quality of river water, impaired biodiversity of aquatic communities, and microbiological contamination that can affect the quality of drinking and bathing water. Sources of organic matter are discharges from wastewater treatment plants, industrial effluents and agricultural run-off. Organic pollution leads to higher rates of metabolic processes that demand oxygen. This could result in the development of water zones without oxygen (anaerobic conditions). The transformation of nitrogen to reduced forms under anaerobic conditions in turn leads to increased concentrations of ammonium, which is toxic to aquatic life above certain concentrations, depending on water temperature, salinity and pH.

Definition

The key indicator for the oxygenation status of water bodies is the biochemical oxygen demand (BOD) which is the demand for oxygen resulting from organisms in water that consume oxidisable organic matter. The indicator illustrates the current situation and trends regarding BOD and concentrations of ammonium (NH_4) in rivers.

Units

– Annual average BOD after 5 or 7 days incubation (BOD_5/BOD_7) is expressed in mg O_2/l and annual average total ammonium concentrations in micrograms N/l.

Policy relevance of the indicator

List of relevant policy documents:

The National Environmental Action Plan - 2, the Environmental Monitoring Strategy and Environmental Data Management Strategy, as well as EU Directives aimed at achieving and improving the quality of water and reducing discharges and impacts of organic matter. The most important is the Framework Water Directive (FWD) 2000/60/EEC, according to which, by the year of 2015, rivers in EU should achieve good ecological status or good ecological potential. The goal of the Directive on nitrates (91/676/EEC) is to reduce nitrates and pollution by organic matter originating from agricultural lands, as well as the requirements of the Directive on urban wastewater treatment (91/271/EEC) aimed at reducing the pollution from sewerage and industrial wastewater treatment plants. Directive on Industrial Pollution Prevention and Control (IPPC) 96/61/EEC is aimed at control and prevention of water resources pollution by industry

Legal grounds

The Law on Waters prescribes maintenance and improvement of water regime to be implemented on the basis of river basins management plans. Such plans contain environmental protection objectives aimed at achieving good status of surface water bodies (good quantitative and chemical status, including good ecological potential) and of ground water resources (good quantitative and chemical status).

For the purpose of maintenance and improvement of the quality of water and establishment of the adequacy of water for use for different purposes, the Law on Waters specifies classification of waters and categorization of water bodies, as well as specification of deadline for achievement of the water quality goals for each water category and specification of the minimum standards for water quality and environmental protection goals for all water bodies. According to the Law, Programme with measures for environmental protection goals shall be adopted for each river basin.

Use of water for different purposes is specified under the Decree on Water Classification, according to which water is divided into five different classes based on the level of pollution, while water characteristics are determined on the basis of classes and purposes for which water can be used.

The Decree on categorization of water courses, lakes, accumulations and water resources (1999) specifies the quality of water by specific classes of water in water bodies, lakes, accumulations and groundwater resources. This Decree also establishes five categories of water courses. In order to maintain the quantity and the quality of the water (water regime), the competent authority issues water management consent in relation to construction, reconstruction, connection or extension of facilities that make impact on waters and water management permit for use of water as resource or as recipient. In circumstances of absence of emission standards for individual polluters and pollutants, the said documents are issued on the basis of specific expert assessment by the competent authority, for each case separately, taking into account the principle of sustainable use of water resources and providing care for the quality of wastewater discharged, in order to prevent the water to exceede the quality standards applied for the recipient.

The Law on Public Health Protection specifies that the Regional Institutes for Health Protection, coordinated by the Republic Institute for Health Protection, are obliged to monitor environmental-health and other conditions of relevance for the protection of drinking water and to undertake measures for active protection of the population against communicable and other diseases of high health and social relevance. These Institutes perform microbiological, parasitological, hygiene, toxicological and biochemical analyses within the scope of their activity.

Monitoring of the surface waters quality at all points of health relevance is performed under the Programme for Preventive Public Health Protection, in order to enable undertaking of timely measures for public health protection. Waters used as drinking water sources, for sports and recreation, as well as for primary agriculture production, are of highest interest.

The National Strategy for Waters is adopted for 30 years time horizon. It should provide sustainable development of waters, through meeting the demands of all users, protecting waters against pollution, protecting and improving aquatic ecosystems and providing protection against harmful impacts of waters. The Strategy should be adopted by the Assembly of the Republic of Macedonia.

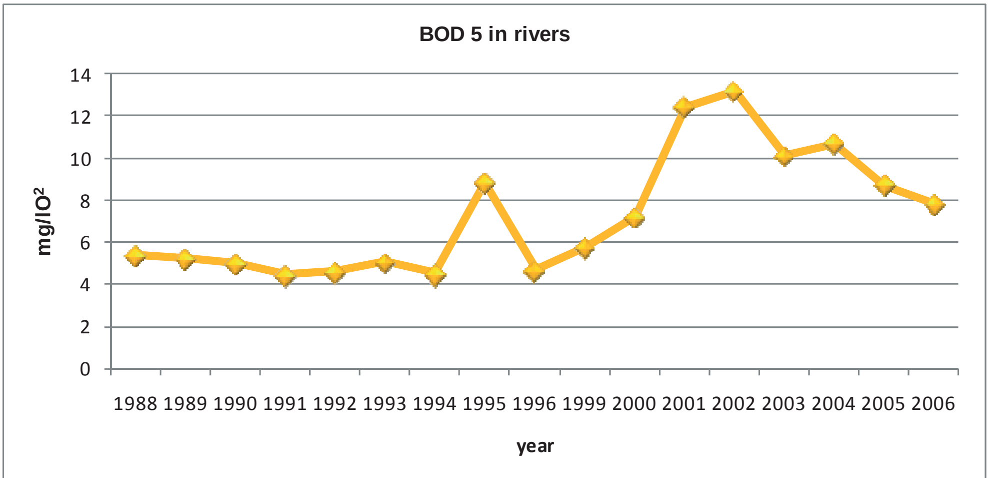
Targets

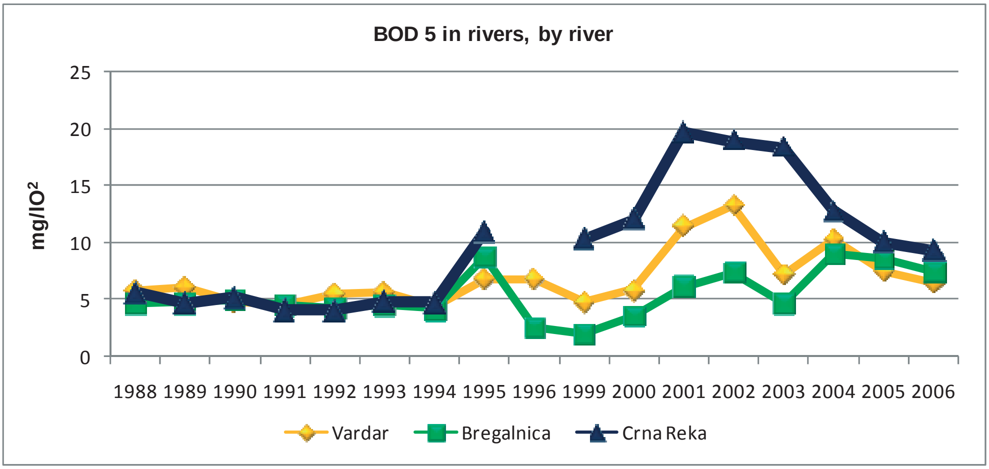
Reduction and prevention of water pollution and thus achievement of good ecological status or potential of waters. Requirements of the relevant EU Directives, namely FWD, on urban wastewater treatment, on nitrates, on hazardous substances, as well as Directives on drinking and bathing waters, have been transposed in the Law on Waters).

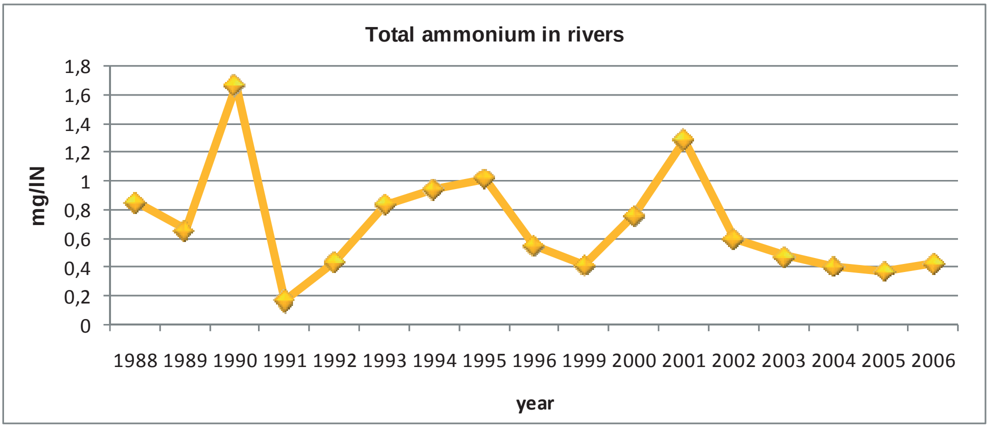
Key message

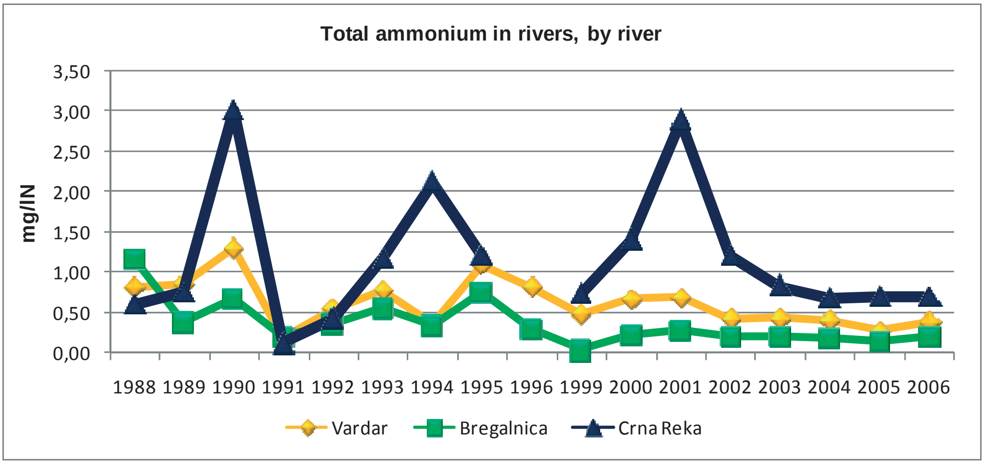
During the assessed period from 1988 to 2006, no reduction in BOD 5 and concentrations of ammonium in rivers was tracked in the Republic of Macedonia. At some monitoring stations, located on the rivers Crna Reka and Vardar, eutrophic water status with high BOD value was recorded. These results could reflect the status of inefficient treatment of urban and industrial wastewaters in the country, as well as the inadequate protection of river basins.

Adequate protection of rivers, and especially the introduction of regular wastewater treatment in the country, is the top priority of the policy at both national and local levels.




BOD 5 in rivers, by river
mg/lO2
25
20
15
10
5
0
1988 1989 1990 1991 1992 1993 1994 1995 1996 1999 2000 2001 2002 2003 2004 2005 2006
Vardar
Bregalnica
Crna Reka


Total ammonium in rivers
mg/lN
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
1988 1989 1990 1991 1992 1993 1994 1995 1996 1999 2000 2001 2002 2003 2004 2005 2006
year


Total ammonium in rivers, by river
mg/lN
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
1988 1989 1990 1991 1992 1993 1994 1995 1996 1999 2000 2001 2002 2003 2004 2005 2006
Vardar
Bregalnica
Crna Reka

Assessment

A trend of rising BOD 5 and ammonium concentrations was tracked in the rivers in the Republic of Macedonia at certain measuring points in the period 1988 - 2006. Eutrophic status with high BOD was particularly recorded in two rivers: Crna Reka and Vardar. These results could reflect the status of inefficient treatment of urban and industrial wastewaters in the country, as well as the inadequate protection of river basins.

Methodology

- Methodology for the indicator calculation

Indicators calculation is based on the methodology established by Eurowaternet, determined by the European Topic Centre for water under the European Environmental Agency.

This process defines the manner of selection of the monitoring stations, the types of parameters to be monitored, as well as the frequency of their collection.

Data specification

Title of the indicator	Source	Reporting obligation
Oxygen consuming substances in rivers	– MEPP – HMA – HBI	– EEA

Data coverage (by years):

Table 1: BOD 5 in the rivers

mg/lO_2	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004	2005	2006
BOD 5	5,39	5,22	4,98	4,44	4,62	5,06	4,48	8,82	4,67	5,75	7,21	12,41	13,19	10,11	10,69	8,69	7,79

Table 2: BOD 5 in the rivers, by individual river

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004	2005	2006
Vardar	5,78	6,11	4,74	4,52	5,46	5,69	4,36	6,74	6,73	4,82	5,85	11,35	13,3	7,18	10,3	7,46	6,52
Bregalnica	4,67	4,78	4,95	4,55	4,22	4,60	4,21	8,7	2,62	2,04	3,61	6,1	7,35	4,71	8,99	8,55	7,44
Crna Reka	5,72	4,76	5,25	4,25	4,18	4,9	4,88	11,02		10,41	12,1	19,76	18,94	18,4	12,82	10,08	9,41

Table 3: Total ammonium in the rivers

mg/lN	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004	2005	2006
Total ammonium	0,85	0,66	1,66	0,17	0,44	0,83	0,94	1,01	0,55	0,42	0,76	1,28	0,6	0,48	0,41	0,37	0,43

Table 4: Total ammonium in the rivers, by individual river

River	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004	2005	2006
Vardar	0,81	0,85	1,3	0,18	0,54	0,77	0,35	1,09	0,81	0,48	0,67	0,69	0,42	0,43	0,4	0,27	0,38
Bregalnica	1,17	0,38	0,67	0,2	0,36	0,56	0,34	0,75	0,29	0,04	0,22	0,27	0,19	0,2	0,17	0,14	0,2
Crna Reka	0,59	0,75	3,02	0,12	0,41	1,16	2,12	1,2		0,73	1,39	2,89	1,2	0,82	0,67	0,7	0,7

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 019	**Oxygen consuming substances in rivers**	CSI 019	Oxygen consuming substances in rivers	**S**	A	water	annual

Geographical coverage: Republic of Macedonia

Temporal coverage: 1988 – 2006

Frequency of data collection: Monthly data is processed

Future activities

- Short-term activities

– Definition of national set of water indicators

a. Description of the activity

– Regular updating of the indicator

b. Required resources

– Involvement of national experts from governmental institutions in the area of waters

c. Status

– Continuous

Deadline: in one year

- Long-term activities

– Long-term activities will be defined by the Work Group.

MK - NI 020

NUTRIENTS IN FRESHWATER

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Large inputs of organic matter (microbe and decaying organic waste) in river waters can lead to decreased chemical and biological quality, unbalanced biodiversity in aquatic communities and microbiological contamination making impact on the quality of drinking and bathing waters. Sources of organic matter include discharges from wastewater treatment plants, industrial effluents and agricultural run-offs. Organic pollution leads to higher rates of metabolitical processes which demand oxygen. This can result in formation of oxygen free aquatic zones (anaerobic conditions). Transformation of nitrogen in lower forms under anaerobic conditions causes higher concentrations of ammonium, which is toxic to the aquatic living organisms if found above certain concentration, depending on the water temperature, salinity and pH value.

Definition

Concentrations of orthophosphate and nitrate in rivers, total phosphorus and nitrate in groundwater bodies. The indicator can be used to illustrate geographical variations in current nutrient concentrations and temporal trends.

Units

– Concentration of nitrate is expressed as mg nitrate (NO_3)/l, and orthophosphate and total phosphorus as microgram P/l.

Policy relevance of the indicator

List of relevant policy documents:

The National Environmental Action Plan - 2 and the Environmental Monitoring Strategy and Environmental Data Management Strategy.

EU Directives aimed at achieving and improving the quality of water and reducing discharges and impacts of organic matter. The most important is the Framework Water Directive (FWD) 2000/60/EEC, according to which, by the year of 2015, rivers in EU should achieve good ecological status or good ecological potential. The goal of the Directive on nitrates (91/676/EEC) is to reduce nitrates and pollution by organic matter originating from agricultural lands, as well as the requirements of the Directive on urban wastewater treatment (91/271/EEC) aimed at reducing the pollution from sewerage and industrial wastewater treatment plants. Directive on Industrial Pollution Prevention and Control (IPPC) 96/61/EEC is aimed at control and prevention of water resources pollution by industry.

Legal grounds

The Law on Waters prescribes maintenance and improvement of water regime to be implemented on the basis of river basins management plans. Such plans contain environmental protection objectives aimed at achieving good status of surface water bodies (good quantitative and chemical status, including good ecological potential) and of groundwater resources (good quantitative and chemical status).

For the purpose of maintenance and improvement of the quality of water and establishment of the adequacy of water for use for different purposes, the Law on Waters specifies classification of waters and categorization of water bodies, as well as specification of deadline for achievement of the water quality goals for each water category and specification of the minimum standards for water quality and environmental protection goals for all water bodies. According to the Law, Programme with measures for environmental protection goals shall be adopted for each river basin.

The Decree on categorization of water courses, lakes, accumulations and water resources specifies the quality of water by specific classes of water in water bodies, lakes, accumulations and groundwater resources. This Decree also establishes five categories of water courses. In order to maintain the quantity and the quality of the water (water regime), the competent authority issues water management consent in relation to construction, reconstruction, connection or extension of facilities that make impact on waters and water management permit for use of water as resource or as recipient. In circumstances of absence of emission standards for individual polluters and pollutants, the said documents are issued on the basis of specific expert assessment by the competent authority, for each case separately, taking into account the principle of sustainable use of water resources and providing care for the quality of wastewater discharged, in order to prevent the water to exceede the quality standards applied for the recipient.

The Law on Public Health Protection specifies that the Regional Institutes for Health Protection, coordinated by the Republic Institute for Health Protection, are obliged to monitor environmental-health and other conditions of relevance for the protection of drinking water and to undertake measures for active protection of the population against communicable and other diseases of high health and social relevance. These Institutes perform microbiological, parasitological, hygiene, toxicological and biochemical analyses within the scope of their activity.

Monitoring of the surface waters quality at all points of health relevance is performed under the Programme for Preventive Public Health Protection, in order to enable undertaking of timely measures for public health protection. Waters used as drinking water sources, for sports and recreation, as well as for primary agriculture production, are of highest interest.

The National Strategy for Waters is adopted for 30 years time horison. It should provide sustainable development of waters, through meeting the demands of all users, protecting waters against pollution, protecting and improving aquatic ecosystems and providing protection against harmful impacts of waters. The Strategy should be adopted by the Assembly of the Republic of Macedonia.

Targets

The indicator is not related directly to the requirements of a single Directive. Ecological quality of surface water requiring reduction of eutrophication and nutrient concentrations is a target specified in several Directives, namely:

- Directive on drinking water (98/83/EC) – maximum permissible concentration of nitrates is 50 mg/l;
- Directive on abstraction of surface water intended for drinking (75/440/EEC) requires nitrates concentration of 25 mg/l.
- Directive on nitrates (91/676/EEC) requires identification of groundwater bodies where the annual concentration exceeds or may exceed 50 mg/l nitrates.
- Directive on urban wastewater treatment (91/71/EEC) specifies reduction of the pollution caused by organic matter as its objective.

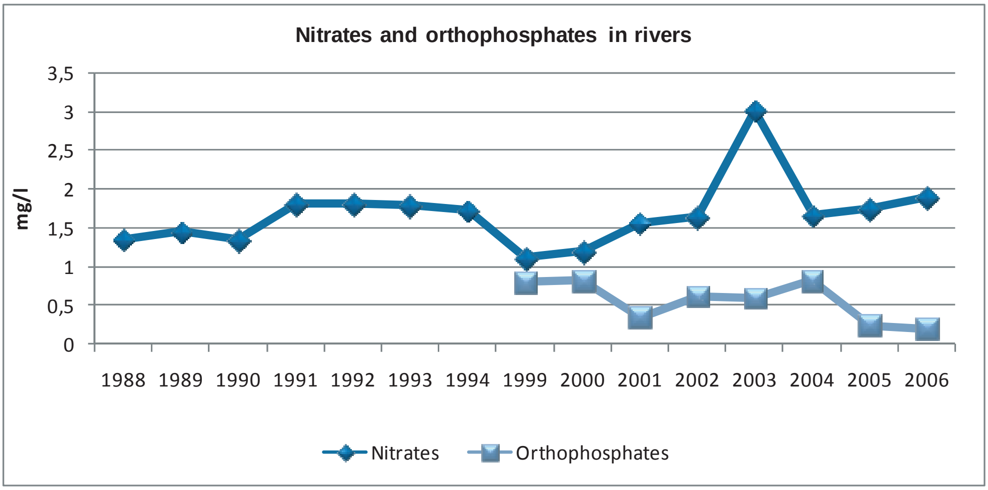
Key policy issue

Has the nutrients concentration in water courses shown rising trend?

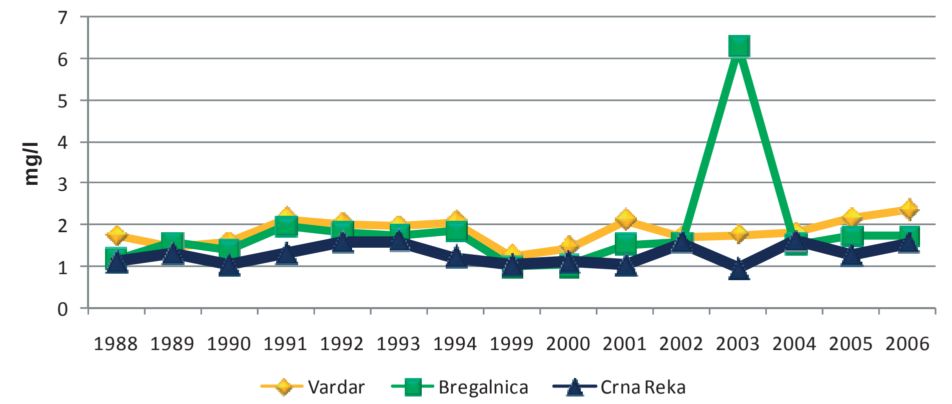
Despite of the absence of continuous monitoring of the status of groundwaters quality in the Republic of Macedonia during the last years, it can be stated that the concentration of nitrates in drinking water has been in a stable environmental health status.

With regard to rivers, increased annual mean value of nitrates and orthophosphates has been recorded at certain points in the River of Vardar.

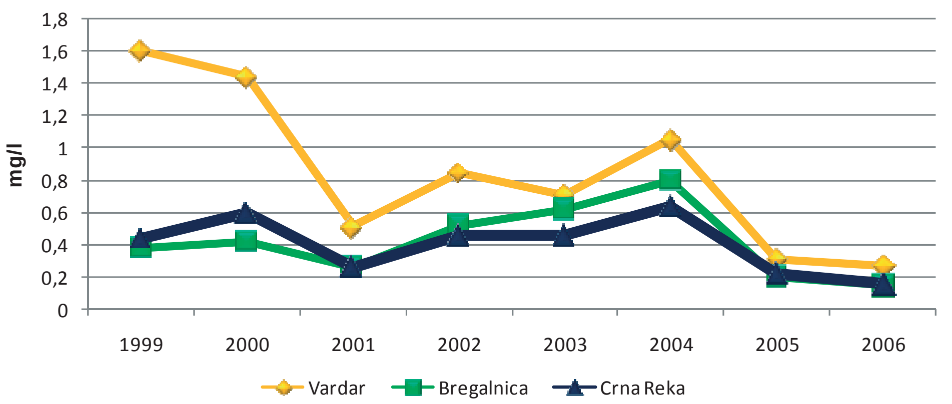
Throughout the investigation period, the Lake of Ohrid has sustained its oligotrophic nature as shown on the Table on the concentrations of phosphorus and nitrates. Significantly higher concentration was found in the waters of the Lake of Prespa, where the content of organic matter has reached high level, thus increasing the risk of Lake's water eutrophication



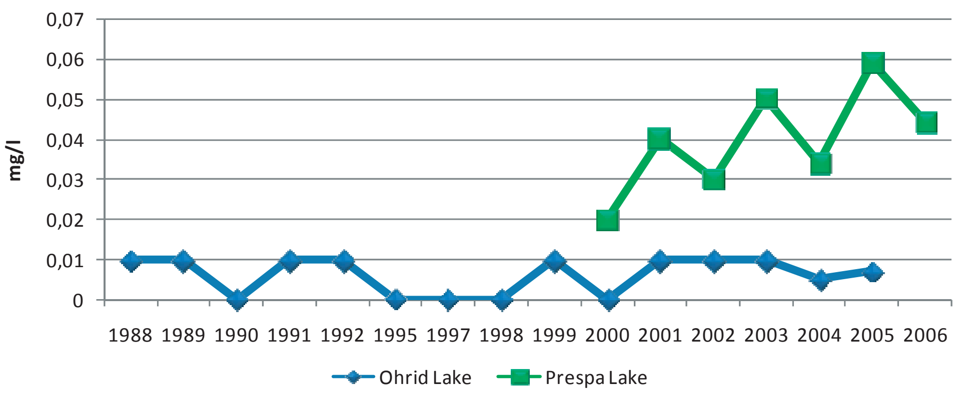
Nitrates in rivers by river

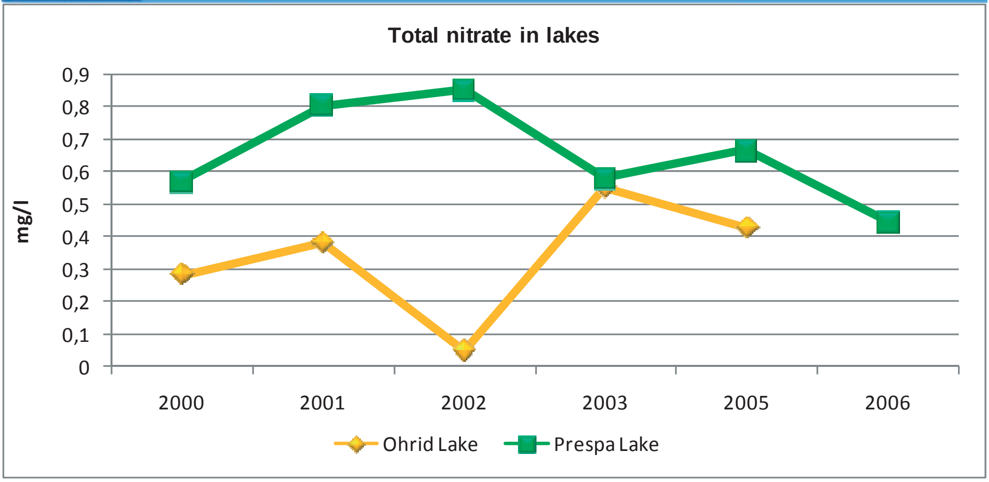


Orthophosphates in rivers by river



Total phosphorus in lakes





Note: No data is available before 2000

Assessment

Annual mean concentrations of nitrates and orthophosphates have remained relatively stable since the beginning of 1990's. It has been found out that the concentration of these parameters is higher at certain measuring points of Vardar River.

Analysis of the results from the measurements in the plagial parts of Ohrid Lake throughout the period has confirmed the oligotrophic nature with relatively stable concentrations of phosphorus (below 0.015 mg./l) and nitrates (mean annual concentrations below 0.55 mg/l). Concentrations are significantly higher in Prespa Lake, where organic compounds are found at high levels, thus increasing the risk of Lake's water eutrophication.

Methodology

- ### Methodology for the indicator calculation

The calculation of the indicator is based on the methodology established under Eurowaternet, established by the European Topic Centre for waters of the European Environmental Agency.

Under this process, the manner of selection of monitoring stations is defined and the type of monitoring parameters and the frequency of their collection are specified.

Data specification

Title of the indicator	Source	Reporting obligation
Nutrients in freshwater	– MEPP – HMA – HBI	– EEA

Data coverage (by years):

Table 1: Nitrates and orthophosphate in rivers

	1988	1989	1990	1991	1992	1993	1994	1999	2000	2001	2002	2003	2004	2005	2006
nitrate (mg/lN)	1,35	1,45	1,34	1,81	1,81	1,78	1,72	1,11	1,20	1,56	1,63	3,00	1,66	1,73	1,89
orthophos-phate (mg/lP)								0,81	0,82	0,34	0,61	0,59	0,83	0,24	0,19

Table 2: Nitrate in rivers by river

River	1988	1989	1990	1991	1992	1993	1994	1999	2000	2001	2002	2003	2004	2005	2006
Vardar	1,74	1,48	1,59	2,14	2,03	1,98	2,07	1,26	1,46	2,12	1,73	1,76	1,82	2,17	2,37
Bregalnica	1,19	1,59	1,4	1,98	1,85	1,77	1,87	1,02	1,05	1,54	1,6	6,28	1,53	1,76	1,74
Crna Reka	1,12	1,31	1,03	1,32	1,58	1,61	1,21	1,04	1,11	1,05	1,57	0,97	1,63	1,27	1,57

Table 3: Orthophosphates in rivers by river

River	1999	2000	2001	2002	2003	2004	2005	2006
Vardar	1,6	1,438	0,514	0,85	0,71	1,05	0,31	0,27
Bregalnica	0,38	0,42	0,26	0,52	0,62	0,8	0,2	0,15
Crna Reka	0,44	0,6	0,26	0,46	0,46	0,64	0,22	0,16

Table 4: Total phosphorus in lakes

Lake	1988	1989	1990	1991	1992	1995	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Ohrid	0,01	0,01	0	0,01	0,01	0	0	0	0,01	0	0,01	0,01	0,01	0,005	0,007	
Prespa										0,02	0,04	0,03	0,05	0,034	0,059	0,044

Table 5: Total nitrate in lakes

Lake	2000	2001	2002	2003	2005	2006
Ohrid Lake	0,28	0,38	0,05	0,551	0,428	
Prespa Lake	0,57	0,8	0,85	0,58	0,665	0,449

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 020	**Nutrients in freshwaters**	CSI 020	Nutrients in freshwater	**S**	A	Water	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1998 – 2006

Frequency of data collection: Monthly data is processed

Future activities

- **Short-term activities**

– Definition of the National Set of water indicators

a. Description of the activity

– Regular updating of indicator

b. Required resources

– Involvement of national experts from governmental institutions in the area of waters

c. Status

– continuous

Deadline: within one year

- **Long-term activities**

– Long-term activities will be defined by the work group.

MK - NI 022

BATHING WATER QUALITY

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The Bathing Water Directive (76/160/EEC) was designed to protect the public from accidental and chronic pollution incidents, which could cause illness from recreational water use. Examining compliance with the Directive therefore indicates the status of bathing water quality in terms of public health and also the effectiveness of the Directive.

The Bathing Water Directive is one of the oldest pieces of environmental legislation in Europe and data on compliance goes back to the 1970s. Under the Directive, Member States are required to designate coastal and inland bathing waters and to monitor the quality of the water throughout the bathing season.

Definition

The indicator describes the changes over time in the quality of designated bathing waters in terms of compliance with standards for microbiological parameters (total coliforms and faecal coliforms) and physicochemical parameters (mineral oils, surface-active substances and phenols) introduced by the EU Bathing Water Directive (76/160/EEC).

Units

– The data is expressed in a form of percentage of inland bathing waters with mandatory standards and levels specified in guidelines for microbiological and physicochemical

Policy relevance of the indicator

List of relevant policy documents

The National Environmental Action Plan - 2 and the Environmental Monitoring Strategy and Environmental Data Management Strategy.

Bathing Water Directive (76/160/EEC) requires the countries to designate water bodies intended for bathing and carry out monitoring of their quality during the bathing period. Water bodies designated for bathing are those water bodies designated by the competent authorities and those where bathing has been practiced traditionally by high number of swimmers. The bathing period is determined in accordance with the period during which the highest number of swimmers is present. Qualitative monitoring takes place on daily basis during the bathing season, as well as two weeks before the commencement of the bathing season. 95% of the samples have to comply with mandatory standards.

Legal grounds

Law on Waters, Decree on categorization of water courses, lakes, accumulations and water resources.

Targets

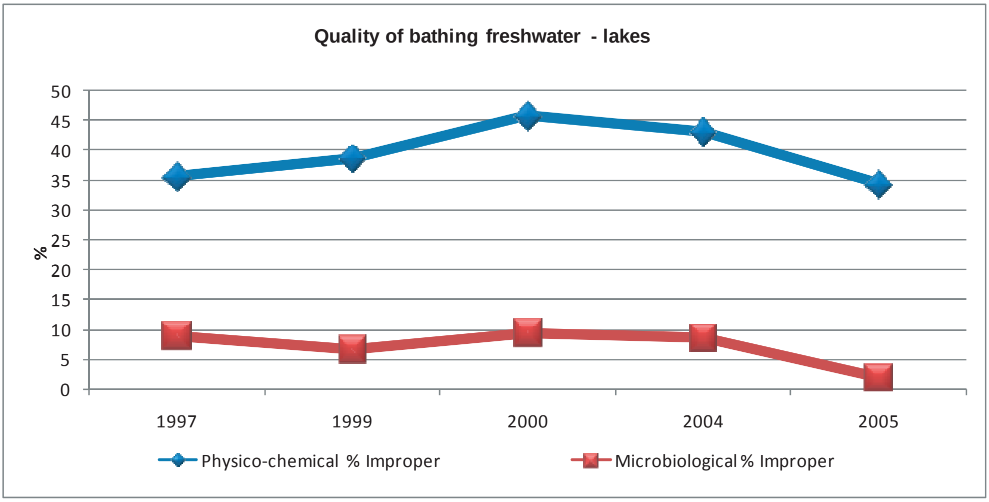
It is necessary that all water bodies designated for bathing comply with mandatory values of water quality specified in Bathing Water Directive.

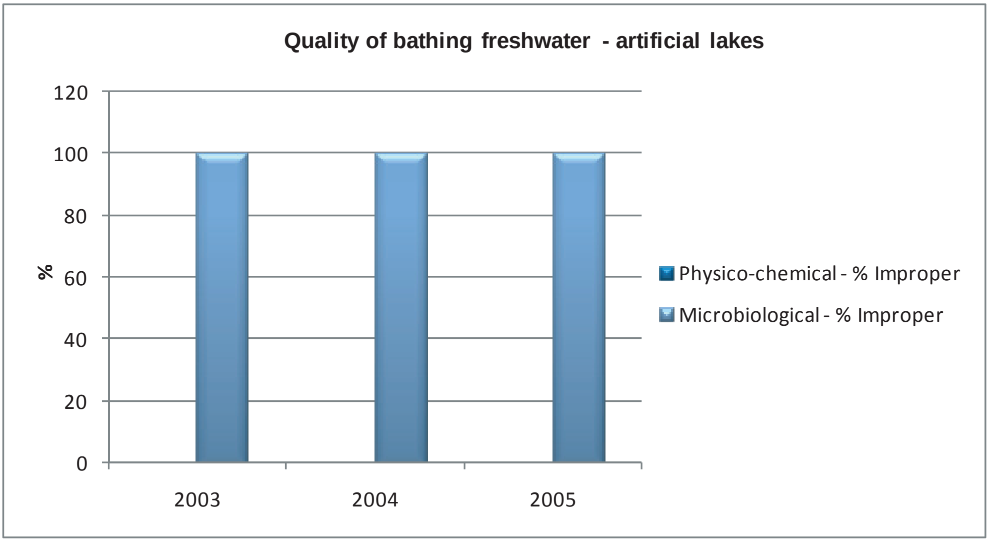
Law on Waters transposing the requirements of EU in relation to bathing should be adopted, thus enabling reduction and prevention of water pollution, as well as achievement of hygienic and sanitary safety of bathing water.

Key message

Natural and some of the artificial lakes comply with the relevant standards for bathing waters quality and thus the quality of lake water is at constantly satisfactory level. It has been noted that the water in the biggest natural lake – Ohrid Lake – has been improving as a result of the construction of appropriate wastewater system in the region. However, there are still parts at which rivers entering the Lake contribute to deterioration of the status of water quality of the Lake. The percentage of samples with inadequate quality is still high (especially for physicochemical parameters). Settlements around the three natural lakes are among the rare ones with wastewater treatment plants available in the country.

National legislation and standards in this area should be harmonized with the EU Bathing Water Directive.





Assessment

The greatest proportion of water areas in the country belongs to natural lakes, the shores of which are used for recreation purposes. The quality of water in these lakes is threatened by uncontrolled discharges of wastewater, uncontrolled use of lake waters for agricultural and tourism purposes, as well as by weather conditions. Apart from natural lakes, there are artificial lakes - water accumulations in the Republic of Macedonia, used for both recreation and economic purposes.

The problems of bathing water quality protection in the lakes are closely related to the implementation of one of the highest priorities in the country's environment protection - construction of adequate wastewater treatment facilities.

As international waters, the waters of the biggest natural lakes, i.e. Ohrid and Prespa, are also subject of bilateral and trilateral agreements between the Republic of Macedonia, Republic of Albania and Republic of Greece, respectively.

Methodology

- Methodology for the indicator calculation

Standard methodology for sampling - annual data.

Data specification

Title of the indicator	Source	Reporting obligation
Bathing water quality	– RIHP	– WHO

Data coverage (by years):

Table 1: Bathing water quality – lakes

	Physico-chemical		Microbiological	
	Number of samples	% Improper	Number of samples	% Improper
1997	77	35,60	77	9,00
1999	80	38,67	80	6,67
2000	73	45,80	73	9,47
2004	59	43,13	59	8,63
2005	65	34,37	63	1,93

Table 2: Bathing water quality – artificial lakes

	Number of samples	% Improper	% Proper
2003	18	0	100
2004	20	0	100
2005	16	0	100

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 022	**Bathing water quality**	CSI 022	Bathing water quality	**S**	B	shore water	annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997 - 2005

Data presentation: Annual reports

Weaknesses: There is a difference between national and international standards for bathing water and they need to be harmonized with the EU Bathing Water Directive (76/160/EC).

Future activities

- ## Short-term activities

– Definition of the national set of water indicators

a. Description of the activity

– Regular updating of the indicator

b. Required resources

– Involvement of national expert from governmental institutions in the area of waters.

c. Status

– continuous

Deadline: within one year.

- ## Long-term activities

– Long-term activities will be defined by the work group.

МК - NI 024

URBAN WASTE WATER TREATMENT

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Wastewater from households and industry represents a significant pressure on the water environment because of the loads of organic matter and nutrients as well as hazardous substances. With high levels of the population in EU Member States living in urban agglomerations, a significant fraction of wastewater is collected by sewers connected to public wastewater treatment plants and then discharged into recipients. The level of treatment before discharge and the sensitivity of the receiving waters determine the scale of impacts on aquatic ecosystems. The types of treatments and conformity with the Directive are seen as proxy indicators for the level of purification and the potential improvement of the water environment.

Primary (mechanical) treatment removes part of the suspended solids, while secondary (biological) treatment uses aerobic or anaerobic micro-organisms to decompose most of the organic matter and retain some of the nutrients (around 20 - 30 %). Tertiary (advanced) treatment removes the organic matter even more efficiently. It generally includes phosphorus retention and in some cases nitrogen removal. Primary treatment alone removes no ammonium whereas secondary (biological) treatment removes around 75 %.

The indicator tracks the success of policies to reduce pollution from wastewater by describing the trends in the percentage of the population connected to public wastewater treatment plants with different levels of purification.

Definition

Percentage of population connected to primary, secondary and tertiary wastewater treatment plants. The indicator illustrates:

1. changes in wastewater treatment;
2. conformity in terms of providing primary, secondary and tertiary treatment;
3. levels of urban wastewater treatment in large cities (agglomerations >150 000 p.e.).

Units

- Percentages of population connected to primary, secondary and tertiary wastewater treatment.

Policy relevance of the indicator

List of relevant policy documents

The National Environmental Action Plan (NEAP) 2.

Environmental Monitoring Strategy and Environmental Data Management Under the Urban Wastewater Treatment Directive, the EU Member States are required to provide connection to wastewater collection systems in all agglomerations exceeding 2 000 population equivalent. Secondary (biological) treatment must be provided in all agglomerations exceeding 2 000 population equivalent and discharging wastewater directly into receiving freshwater resources. It provides for specific requirements for different deadlines for compliance achievement depending on the sensitivity of receiving waters with regard to agglomerations exceeding 10 000 population equivalent.

The performance of wastewater treatment is monitored for five different parameters: BOD, COD, total suspended matter, total nitrates and total phosphorous.

In the case of smaller agglomerations and those connected to wastewater collection systems, the treated wastewater at the outlet has to comply with quality targets of the recipient.

Legal grounds

The Law on Waters prescribes maintenance and improvement of water regime carried out on the basis of river basin management plans. Such Plans contain environmental protection objectives, good ecological status of surface water bodies (good quantitative and chemical status, including good ecological potential) and groundwater resources (good quantitative status and good chemical status).

River Basins Management Plans will be implemented through issuance of permits for water use, permits for extraction of sand, gravel and stone and permits for water discharges specifying quantitative and qualitative requirements in each case individually.

For the purpose of maintenance and improvement of the quality of water and establishment of the adequacy of water for use for different purposes, the Law on Waters specifies classification of waters and categorization of water bodies, as well as specification of deadline for achievement of the water quality goals for each water category and specification of the minimum standards for water quality and environmental protection goals for all water bodies. According to the Law, Programme with measures for environmental protection goals shall be adopted for each river basin.

The Decree on categorization of water courses, lakes, accumulations and water resources specifies the quality of water by specific classes of water in water bodies, lakes, accumulations and groundwater resources. This Decree also establishes five categories of water courses with regard to water quality goals specified therein. In order to maintain the quantity and the quality of the water (water regime), the competent authority issues water management consent in relation to construction, reconstruction, connection or extension of facilities that make impact on waters and water management permit for use of water as resource or as recipient. In circumstances of absence of emission standards for individual polluters and pollutants, the said documents are issued on the basis of specific expert assessment by the competent authority, for each case separately, taking into account the principle of sustainable use of water resources and providing care for the quality of wastewater discharged, in order to prevent the water to exceed the quality standards applied for the recipient

The Law on Public Health Protection specifies that the Regional Institutes for Health

Protection, coordinated by the Republic Institute for Health Protection, are obliged to monitor environmental-health and other conditions of relevance for the protection of drinking water and to undertake measures for active protection of the population against communicable and other diseases of high health and social relevance. These Institutes perform microbiological, parasitological, hygiene, toxicological and biochemical analyses within the scope of their activity.

Monitoring of the surface waters quantity is performed under the Programme for Preventive Public Health Protection, adopted at annual basis and published in the Official Gazette of the Republic of Macedonia. Monitoring of the surface waters quality at all points of health relevance is performed under the Programme for Preventive Public Health Protection, in order to enable undertaking of timely measures for public health protection. Waters used as drinking water sources, for sports and recreation, as well as for primary agriculture production, are of highest interest

The National Strategy for Waters is adopted to cover 30 period. It should provide sustainable development of waters, through meeting the demands of all users, protecting waters against pollution, protecting and improving aquatic ecosystems and providing protection against harmful impacts of waters. The Strategy should be adopted by the Assembly of the Republic of Macedonia.

Targets

Requirements of the relevant EU Directives, (FWD, on urban wastewater treatment, on nitrates, on hazardous substances, as well as Directives on drinking and bathing waters) have been transposed in the Law on Waters, thus enabling reduction and prevention of water pollution and achievement of good ecological status or potential of waters.

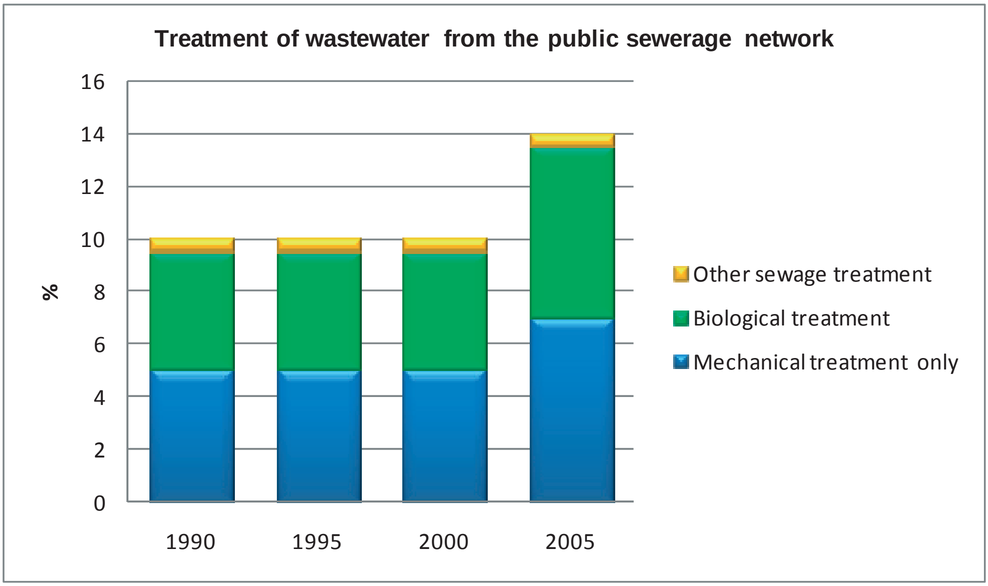
The Urban Wastewater Treatment Directive, aimed at protecting the environment against impacts caused by urban wastewater discharges. In addition to this, compliance with the requirements specified in the Urban Wastewater Treatment Directive and Directive on Integrated Pollution Prevention and Control is incorporated in the goals of the Framework Water Directive, the main goal of which is the achievement of good chemical and biological status of all waters by 2015.

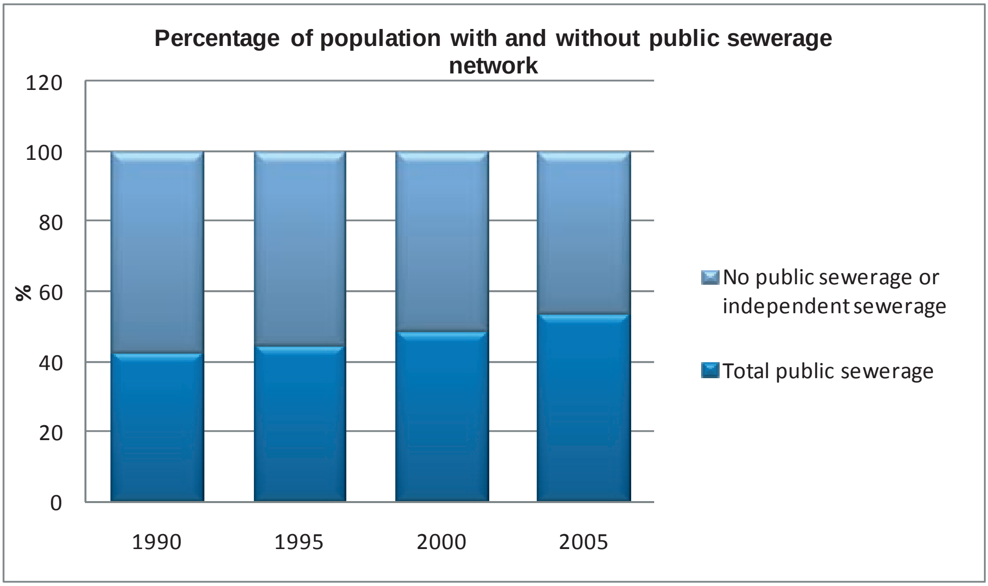
Key message

The requirements of the Directive concerning municipal wastewater treatment have not been implemented in the current Law on Waters.

According to the results on the distribution of the population in the Republic of Macedonia in relation to treated municipal wastewaters involving only mechanical treatment, biological treatment and latest treatment technology, it can be concluded that there is no conformity with the Urban Wastewater Treatment Directive. The percentage of the population covered by municipal wastewater treatment with included biological treatment is very low. Therefore, the introduction of regular treatment of wastewaters in the country is top priority, both at local and national levels.

In the past period, no reduction in BOD 5 and in concentrations of ammonium in rivers (MK NI 019) has been observed in the Republic of Macedonia. At some monitoring stations, located on the rivers Crna Reka and Vardar, eutrophic water status with high BOD value was recorded. These results could reflect the status of inefficient treatment of urban and industrial wastewaters in the country, as well as the inadequate protection of river basins.





Assessment

According to the results on the distribution of the population in the Republic of Macedonia in relation to treated municipal wastewaters involving only mechanical treatment, biological treatment and application of latest treatment technology, and in relation to public sewerage, it can be concluded that the percentage of such population is very low. Despite of the rising trend, the current state is unsatisfactory with regard to EU requirements.

Methodology

- Methodology for the indicator calculation

In accordance with the requirements of EUROSTAT

Data specification

Title of the indicator	Source	Reporting obligation
Urban wastewater treatment	– Republic Institute for Health Protection, Ministry of Health	– EUROSTAT

Data coverage (by years):

Table 1: Percentage of public sewerage with and without treatment

		1990	1991	1992	1993	1994	1995	1996	1997	1998
Number of population connected to public sewerage	*1000's*	1.945.000	1.955.000	1.965.000	1.970.000	1.972.000	1.975.000	1.978.000	1.980.000	1.990.000
Total public sewerage with treatment	*%*	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0
Public sewerage without treatment	*%*	95,0	95,0	95,0	95,0	95,0	95,0	95,0	95,0	95,0

		1999	2000	2001	2002	2003	2004	2005	2006
Number of population connected to public sewerage	*1000's*	2.025.000	2.050.000	2.038.651	2.022.547	2.029.892	2.035.196	2.038.514	2.043.000
Total public sewerage with treatment	*%*	5,0	5,0	6,0	6,0	6,0	6,0	6,5	7,0
Public sewerage without treatment	*%*	95,0	95,0	94,0	94,0	94,0	94,0	93,5	93,0

Table 2: Percentage of population with and without public sewerage

		1990	1991	1992	1993	1994	1995	1996	1997	1998
Total public sewerage	*% of pop.*	43,0	44,0	44,0	44,0	44,0	45,0	45,0	45,0	46,0
Mechanical treatment only	*% of pop.*	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0	5,0
Biological treatment	*% of pop.*	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5	4,5
Other sewage treatment	*% of pop.*	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Public sewerage without treatment	*% of pop.*	33,0	34,0	34,0	34,0	34,0	35,0	35,0	35,0	36,0
No public sewerage or independent sewerage	*% of pop.*	57,0	56,0	56,0	56,0	56,0	55,0	55,0	55,0	54,0
of which with independent treatment	*% of pop.*									

		1999	2000	2001	2002	2003	2004	2005	2006
Total public sewerage	*% of pop.*	49,0	49,0	50,0	51,0	52,0	53,0	54,0	55,0
Mechanical treatment only	*% of pop.*	5,0	5,0	5,5	5,5	5,5	6,5	7,0	8,0
Biological treatment	*% of pop.*	4,5	4,5	6,0	6,0	6,0	6,0	6,5	7,0
Other sewage treatment	*% of pop.*	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
Public sewerage without treatment	*% of pop.*	39,0	39,0	38,0	39,0	40,0	40,0	40,0	39,5
No public sewerage or independent sewerage	*% of pop.*	51,0	51,0	50,0	49,0	48,0	47,0	46,0	45,0
Of which with independent treatment	*% of pop.*			25,0	24,0	23,0	22,0	21,0	20,0

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 024	**Urban wastewater treatment**	CSI 024	Urban waste water treatment	**P**	A	water waste	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1990 - 2006

Frequency of data collection: annual

Uncertainty

- Methodological uncertainty and data uncertainty

Data is collected by means of survey and there is uncertainty of data resulting from the methodology itself.

Future activities

- Short-term activities

– Definition of the national set of water indicators, including urban wastewater treatment.

a. Description of the activity

– Regular updating of the indicator.

b. Required resources

– Involvement of national expert from governmental institutions in the area of waters.

c. Status

– continuous.

Deadline: within one year.

- Long-term activities

– Long-term activities will be defined by the work group.

MK NI 039

DRINKING WATER QUALITY

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Drinking Water Directive (80/778/EEC) and its amendment (98/83/EC which entered into force in 2003) aim to ensure that the water intended for human consumption is safe. It has to be free of any microorganism, parasite or substance that could potentially threaten human health. The Directive sets the minimum requirements for certain parameters. Member States are obliged to establish standards for such parameters which may not be more tolerant than those specified in the Directive and to perform monitoring of the quality of drinking water in accordance with such standards.

With reference to non-EU countries, like the Republic of Macedonia which is a candidate country for EU membership, the World Health Organization has set the priority that "all people, regardless of the level of their development and their social and economic conditions, shall have the right to an access to adequate supply of safe drinking water". In order to assist in the achievement of this goal, the WHO published the "Guidelines for Drinking Water Quality" (the last edition is the 3rd one) and the countries are obliged to achieve them in order to ensure health for their populations.

The monitoring of drinking water quality varies throughout Europe, candidate countries and newly independent states, so that some countries perform water monitoring at the points of its consumption (e.g. tap), others monitor the water at the source (the point of water extraction) or where the water leaves the distribution network.

In the Republic of Macedonia, the quality of the drinking water is performed at the point of water abstraction, at filtering stations, at different measuring points in the water supply network (start, middle and end) and at the most frequent points of water consumption for drinking purposes.

Consumption of contaminated drinking water containing thermo-tolerant coliform bacteria may cause water borne diseases, water associated diseases (leichmaniasis, schistosomiasis), water related diseases (malaria), diseases of dirty hands (faecal and oral diseases - hepatitis A) and diseases induced by inhalation (legionaries disease). Water may give rise to diseases involving contaminants from physico-chemical point of view and radiological pollutants.

Definition

This indicator shows the exceedance of limit values set in Drinking Water Directive (80/778/EEC) and its amendment (98/83/EC which entered into force in 2003) and in the Rulebook on drinking water safety (Official Gazette of the Republic of Macedonia No.57/04), as well as the guideline values set for the quality of drinking water by the World Health Organization (WHO, 2004 and 2006).

Exceedance of drinking water quality limit values occurs when the concentration/dose of the pollutant exceeds the limit values specified in the above listed regulations.

Where more than one limit values exist (see the section on Policy goals), the indicator shall adopt the most strict case.

Units

- Number of aerobic mesophilic bacteria in 1 ml,
- Number of coliform bacteria in 100 ml,
- Number of thermo-tolerant coliform bacteria in 100 ml, concentration of physico-chemical pollutants in mg/l,
- Parameters for radiological safety of drinking water in bekerels/l and total indicative dose in mSV/l.

Policy relevance of the indicator

List of relevant policy documents:

The National Environmental Action Plan - 2 (2006) sets the improvement of the quality of drinking water through reduction of emissions of the main pollutants into surface and groundwaters as its main objective. The same document specifies the primary measure to be applied: to strengthen the processes of drinking water quality monitoring and assessment.

The 1999 National Environmental Health Action Plan (NEHAP) sets two main objectives:

- Reduction and minimization of health risks for the population through provision of drinking water for every citizen, which is safe from health point of view, sufficient in quantity, with guaranteed microbiological, organoleptical and physico-chemical composition, compliant with national standards and WHO Guidelines, as well as waters intended for sports and recreation and healthy food production;
- Reduction of exposure to toxic chemicals through water originating from agriculture and industry.

The NEHAP also sets the following priorities:

- approximation of the legislation on the quality of ambient and drinking waters with the recommendations of the EU (approximation completed in 2004) and with the WHO Guidelines (approximation with the 2006 Guidelines is in progress 2006);
- introduction of disincentive process for non-earmarked consumption of drinking water by commercial and non-commercial users and restrictive prices for the population in circumstances of draught for the purpose of consumption streamlining (implemented under the Law on Drinking Water Supply and Urban Wastewater Collection (Official Gazette of the Republic of Macedonia No.68/04 and 28/06));
- establishment of sanitary protection zones around water supply sources in order to prevent contamination of anthropogenic origin (permanent process performed and most of the public utilities have established zones in line with the Elaborates for sanitary protection zones developed by the Public Health Institution RIHP and other authorised vocational institutions);

- construction of municipal and industrial wastewater treatment systems (constructed and operational in Struga including Ohrid, in Resen, Dojran, Makedonski Brod, Kumanovo and Sveti Nikole, the last one currently out of operation);
- monitoring of the quality of surface and groundwaters, especially at drinking water abstraction, places intended for sports and recreation and points for abstraction of water for irrigation, monitoring of discharged untreated and treated municipal and industrial wastewaters in accordance with EU and WHO Guidelines (monitoring is performed regularly and continuously by the Public Health Institution Republic Institute for Health Protection (PHI RIHP) - Skopje and the 10 Regional PHI IHPs with their local units);
- introduction of drinking water fluoridation as the most efficient, the least costly and socially and medically most fair means for massive caries prophylaxis (delivered Project proposal for drinking water fluoridation, with Bitola as pilot Municipality, through the Ministry of Health).

Legal grounds

Under the Law on Health Protection (Official Gazette of the Republic of Macedonia No.38/91, 73/92, 46/93, 55/95, 17/97, 21/98, 9/00), Article 2, paragraph 1, health protection consists of measures, activities and procedures for health and environment preservation and improvement, the rights and the obligations exercised within the health insurance, as well as measures, activities and procedures undertaken by organizations in the area of health for the purpose of human health preservation and improvement, diseases prevention and control, injuries and other health related issues, early detection of diseases and health state, timely and efficient treatment and rehabilitation by application of expert medical measures, activities and procedures. The Law on Waters (Official Gazette of the Republic of Macedonia No. 4/98), in its Article 1, regulates the conditions and the manner of water use, protection against harmful effects of water, protection of waters against over-abstraction and pollution, water resources management, water sources management and financing of water management activity, awarding the water for use upon approval, concession, transboundary waters and other issues of relevance for the provision of unique water regime in the Republic of Macedonia.

The Programme for preventive health protection in the Republic of Macedonia for 2006 (Official Gazette of the Republic of Macedonia No.31/06) specifies: the measures, tasks and activities envisaged in the Programme for implementation of the Institutes for Health Protection in cooperation with the Republic Institute for Health Protection, also provide for application of provisions contained in a number of laws regulating issues of monitoring, research and study of the health status of the population, the reasons for appearance and spread of communicable and other diseases of social and health relevance, as well as impacts of environmental factors on human health, proposal and undertaking measures for the purpose of protection and improvement of human health.

The Law on Drinking Water Supply and Urban Wastewater Collection (Official Gazette of the Republic of Macedonia No.68/04 and 28/06), in its Article 1, regulates the conditions and the manner of drinking water supply, termination of drinking water supply and urban waste water discharges into recipient through sewerage and water supply systems, respectively, construction, maintenance, protection and connection to water supply and sewerage systems, relationships between service provider and user, as well as supervision over the implementation Decree on Water Classification (Official Gazette of the Republic of Macedonia No.18/99), in its Article 2, specifies five classes of surface watercourses, lakes and accumulations and ground water resources. The Law on Food and Foodstuffs and Materials in Contact with Food (Official Gazette of the Republic of Macedonia No.54/02), in its Article 1 specifies that the Law regulates the conditions for provision of safe food and safe foodstuffs and materials in contact with food, production and trade, rights and obligations of natural and legal persons processing food or performing trade in food in order to protect human health, to protect consumers from misleading and to enable free trade in the internal and external markets. Article 2, item 1 specifies that food is any substance intended for human use through nutrition and drinking, as well as any ingredient used for production, processing and preparation of food. Food also includes **drinking water** from public water supply systems, intended for the market, and water intended for food

The control over the drinking water safety and the frequency of monitoring are prescribed by the Rulebook on drinking water safety (Official Gazette of the Republic of Macedonia No. 57/04).

In the Law on Nature Protection (Official Gazette of the Republic of Macedonia No.67/04), one of the main goals defined in Article 4, item 6 of the Law is the securing of the right of citizens to a healthy environment.

For the purpose of protecting the sources of drinking water, the National Council for Health and Social Policy adopted the Rulebook on the manner of establishment and maintenance of protection zones around drinking water sources (Official Gazette of SRM No.17/83).

The following EU Directives have been transposed in the new Rulebook:

Drinking Water Directive (80/778/EEC) and its amendment (98/83/EC which entered into force in 2003).

Targets

The Rulebook on drinking water safety (Official Gazette of the Republic of Macedonia No 57/04), specifies the limit values for the parameters monitored in drinking water in terms of human health protection.

Limit values of concentrations of certain parameters in drinking water

- According to the said Rulebook, limit values have been specified for the purpose of human health protection, harmonized with the EU Directive and WHO Guidelines on the quality of drinking water (2004).

Key policy issue

What progress has been made in reducing the concentrations of pollutants in urban and rural environments in order to reach drinking water limit values specified in the Rulebook

Key message

Bacteriological contamination of drinking water in rural environments, where no regular disinfection of drinking water is carried out in local water supply systems.

Drinking water quality

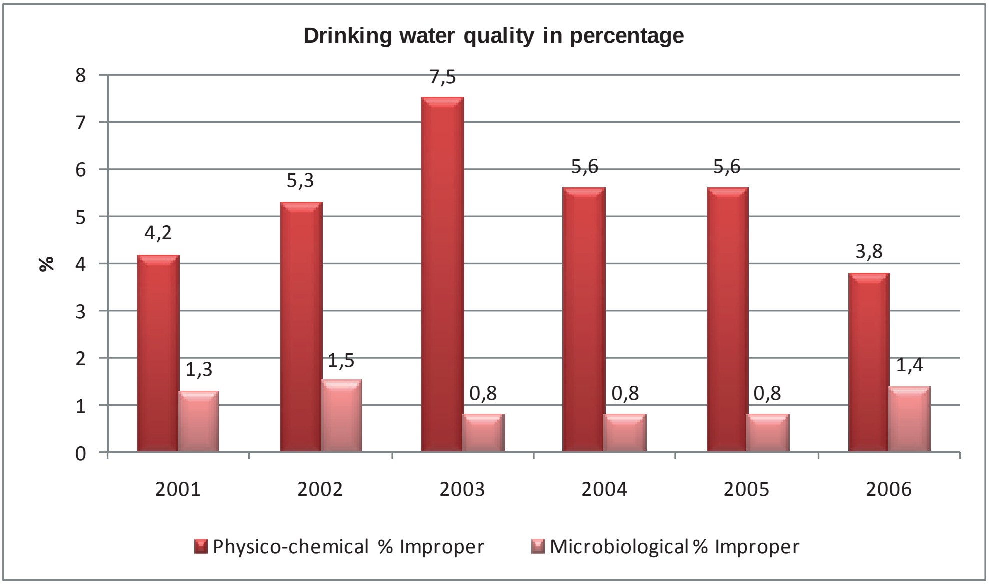
Analysis of data from water supply in rural settlements shows that sanitary and hygienic safety of analyzed samples of drinking water are generally satisfactory, i.e. within the expected results, compared to the previous years. The most frequent reason for unsafe findings in physico-chemical analysis is the absence of residual chlorine or increased content of iron in raw water, but not in the water supply network. The water in the water supply system in Sveti Nikole was banned for consumption due to increased content of aluminium and trihalomethanes (ban issued in 2003, still in effect).

Analysis of the results on health safety of drinking water in the period 2001 - 2006 shows that the percentage of unsafe samples according to physico-chemical analysis is in the range between 4.2 and 7.5%, and the percentage of unsafe samples according to microbiological analysis is in the range between 0.8 and 1.5%.

Analysis of data from water supply in rural settlements in 2006 showed that sanitary and hygienic state of facilities and health safety of analyzed drinking water samples was satisfactory in general, i.e. within the limits of expected results, compared to previous years. The most frequent reason for unsafe findings in physico-chemical analysis is the absence of residual chlorine or increased content of iron in raw water and in very low percentage it is the increased content of nitrites from digged or drilled wells of individual users.

The evaluation of data contained in the reports of the Institutes for Health Protection on rural populated places leads to the conclusion of the following state:

- Around 218.995 inhabitants are connected to urban water supply systems, and thus the state of maintenance of the water supply facilities and drinking water quality corresponds with the status of cities where those are connected. With reference to physico-chemical analysis, 9.53% unsafe samples have been found, while 3% have been unsafe in bacteriological analysis.
- 476.059 inhabitants are supplied with drinking water from water supply systems in rural settlements using their own springs and managing the facilities by themselves. 21% of the analyzed samples have been unsafe with regard to physico-chemical parameters, mostly due to the lack of residual chlorium, while 25% of analyzed data have been bacteriologically unsafe.
- Local water supply facilities (wells, pumps, rural taps, springs) are still used as main source of drinking water for around 128.102 inhabitants. 32.9% of the analyzed samples have been unsafe with regard to physico-chemical parameters, mostly due to the lack of residual chlorium, while 34% of analyzed data have been bacteriologically unsafe.



Assessment

Quality of drinking water

The current control measures, frequency of monitoring and standards applicable to drinking water quality and safety in urban areas in the Republic of Macedonia are in accordance with EU regulations and with the WHO Guidelines on drinking water quality. Almost entire carstic and surface water, as well as significant quantities of well water, is of low fluoride content (which is a caries protective factor and therefore fluoridation of water intended for drinking has been proposed), with an average of 0.1 mg/l. Some wells of raw drinking water in Veles, Stip and Kocani have relatively high content of iron and manganese and therefore water filtering stations have been built and thus treated water is absolutely meeting the legal standards. Toxic parameters are also compliant with legal standards.

In the segment of health safe drinking water supply in rural populated places, the deficiencies in terms of undefined sanitary protection zones around drinking water sources, lack of adequate equipment fro drinking water filtering and disinfection and inappropriate technical maintenance, have been constantly present. Therefore, there is high percentage of bacteriologically unsafe samples from local water supply facilities (25%).

The access to safe drinking water in the Republic of Macedonia has reached 93% (period 2003 - 2006), with a remark that the access to safe drinking water for urban population is 99%, and in rural settlements 78% of the population consumes health safe drinking water, while the rest are exposed to occasional risk of bacteriological contamination of drinking water.

Methodology

- Methodology for the indicator calculation

Drinking water quality

The 10 Regional Institutes for Health Protection in Skopje, Kumanovo, Veles, Stip, Kocani, Strumica, Prilep, Bitola, Ohrid and Tetovo, through their hygiene-epidemiological stations in cooperation with the PHI Republic Institute for Health Protection – Skopje, carry out regular and continuous monitoring of drinking water quality in line with the number of monitoring points and frequency defined in the Rulebook on drinking water safety (Official Gazette of the Republic of Macedonia No.57/04). The Institutes perform basic physico-chemical and bacteriological analysis of drinking water samples, while the PHI Republic Institute for Health Protection carries out surveillance over periodical physico-chemical analysis, analysis of pesticide residues, analysis of contaminants, parasitological and radiological analysis.

Data specification

Title of the indicator	Source	Reporting obligation
Drinking water quality	– HP – 10 Regional – RIHP	– European Environmental Agency – Exchange of data on drinking water quality, based on the Council decision on the establishment of reciprocal exchange of information and data on drinking water quality (98/83/EC). – World Health Organization - ENHIS – Drinking water quality, in line with the WHO Guidelines on drinking water quality of 1987 and 2004, respectively. .

Data coverage (by years):

Table 1: Drinking water quality in percentage

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 039	**Drinking water quality**	WEU13	Drinking water quality	**S**	**A**	Water quality	Annually

Temporal coverage: 2001 – 2006

	Physico-chemically % unsafe	Microbiologically % unsafe
2001	4,2	1,3
2002	5,30	1,50
2003	7,50	0,80
2004	5,60	0,80
2005	5,60	0,80
2006	3,80	1,40

Frequency of data collection: Data from PHI Institutes for Health Protection in Skopje, Kumanovo, Veles, Stip, Kocani, Strumica, Prilep, Bitola, Ohrid and Tetovo, on drinking water quality, is received once per year, via mail, in the PHI Republic Institute for Health Protection - Skopje.

Uncertainty

- Methodological uncertainty

Generally, data is representative for the entire urban environment in the Republic of Macedonia. The indicator is subject of changes from year to year, depending on the introduction of new stations for drinking water filtering and in line with the rising trend of connection of rural population to safe drinking water supply.

- Data uncertainty

Generally, data is representative for the entire urban environment in the Republic of Macedonia. The representation by choice of monitoring is in accordance with the requirements of the EU Directive 98/83/EC.

Future activities

- Short-term activities

– Finalized definition of the national set of water indicators.

a. Description of the activity

– Establishment of Work Group for the national set of drinking water quality indicators to comply with the ISO standards.

b. Required resources

– Engagement of national experts from governmental institutions in the area of drinking water quality.

c. Status

– Early initiative

Deadline: one year.

MK - NI 040

IRRIGATED LAND

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Monitoring of the efficiency of the use of water for irrigation of agricultural land at national and local levels is an important factor in the establishment of the water abstraction rate, which is an objective for sustainable and long-term policy under the policy objective under the EU's Sixth Environment Action Programme (2001-2010).

The indicator shows how the overall water abstraction makes pressure

Definition

The indicator tracks the trend in irrigated areas in a given time interval on the whole territory of the Republic of Macedonia, as well as total quantities of consumed water on the entire territory and proportion of irrigated land compared to the total cultivable land area.

Units

- Area of irrigated land (expressed in hectares), quantity of water used for irrigation expressed in cubic meters consumed at annual level, % of irrigated land in the total cultivable land area.

List of relevant policy documents:

The National Environmental Action Plan - 2 and Environmental Monitoring Strategy and Data Management Strategy.

The policy for sustainable use of water resources based on the Sixth Environmental Action Programme and Framework Water Directive requirements.

Legal grounds

The Law on Waters prescribes maintenance and improvement of water regime and sustainable use of available water quantities in accordance with the Water Master Plan of the Macedonia. The Water Master Plan is implemented by issuance of permits for water management or awarding of concessions for water use, which specify the manner and the conditions for water use, the operation regime while managing the water resources or other facilities and plants making impact on water regime, the manner and the conditions for discharging water, waste water and waste substances and the required degree of waste water treatment.

The Law specifies that the maintenance and improvement of water regime is carried out on the basis of River Basins Management Plans. Such Plans contain the environmental protection goals, good status of surface water bodies (good quantitative status and chemical status). River Basins Management Plans will be implemented through issuance of permits for water use, permits for extraction of sand, gravel and stone and permits for water discharges specifying quantitative and qualitative requirements in each case individually.

Use of water for different purposes is specified under the Decree on Water Classification, according to which water is divided into five different classes based on the level of pollution, while water characteristics are determined on the basis of classes and purposes for which water can be used.

Targets

No specific targets.

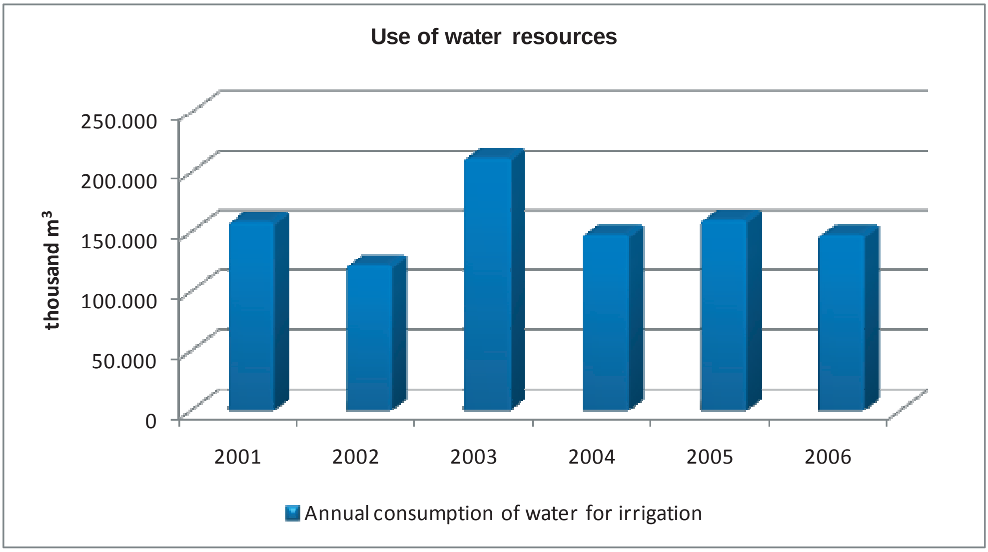
Key policy issue

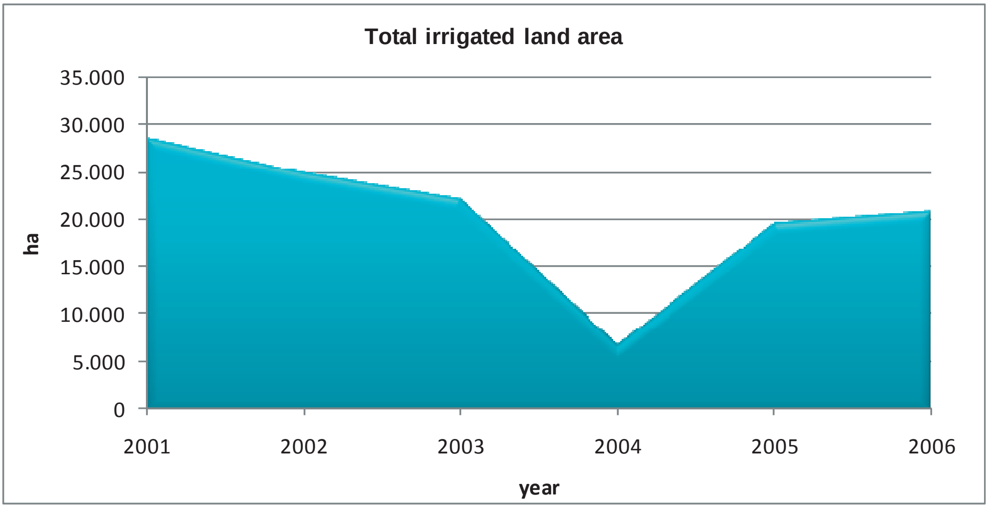
Is the water abstraction based on water sustainability?

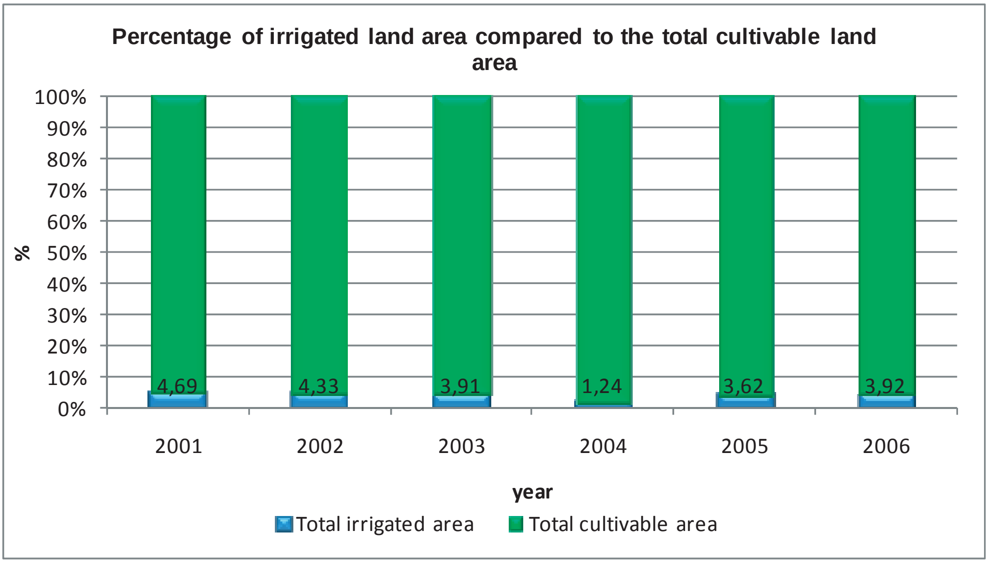
Key message

An uneven trend in water use for land irrigation was observed in the period between 2001 – 2006, due to weather conditions in the given year, as well as to organizational restructuring of the sector. Particular increase was recorded in 2003.

Data is not part of the official statistics published in the country.




Total irrigated land area
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0
ha
2001
2002
2003
2004
2005
2006
year


Percentage of irrigated land area compared to the total cultivable land area
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
%
4,69
4,33
3,91
1,24
3,62
3,92
2001
2002
2003
2004
2005
2006
year
Total irrigated area
Total cultivable area

Assessment

An uneven trend in water use for land irrigation was observed in the period between 2001 – 2006. There is an interesting data that the quantity of water consumed by this sector in 2004 was significantly lower compared to the entire successive interval. This is due to the favorable weather conditions in 2004, when increased number of precipitation and increased water masses were noted. Table 4 presents the percentage of irrigated land area compared to the entire cultivable land area in the Republic of Macedonia, showing that the percentage is really low with the average being below 5% for the entire time interval.

Methodology

- Methodology for the indicator calculation

Data is collected and processed by years.

Data specification

Title of the indicator	Source	Reporting obligation
Irrigated land	– State Statistical Office	– OECD/EUROSTAT

Data coverage (by years):

Table 1: Use of water resources

	2001	2002	2003	2004	2005	2006
Annual consumption of water for irrigation (thousand m^3)	157 847	121 186	211 569	147 500	159 494	147 294

Table 2: Area of irrigated land

h/y	2001	2002	2003	2004	2005	2006
Total irrigated land area, hectares	28 722	25 019	22 267	6 967	19 787	21 038

Table 3: Total cultivable land

h/y	2001	2002	2003	2004	2005	2006
Total cultivable land area, hectares	612 000	577 000	569 000	560 000	546 000	537 000

Table 4: Percentage of irrigated area compared to total cultivable area

	2001	2002	2003	2004	2005	2006
%	**4,69**	**4,33**	**3,91**	**1,244**	**3,62**	**3,92**

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 040	**Irrigated land**	WQ4	Irrigated land	**D**	A	Water	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2001 - 2006

Frequency of data collection: Collection of annual data.

Note: Data is available for some sectors only.

Future activities

- Short-term activities

– Definition of the national set of water indicators

a. Description of the activity

– Regular updating of the indicator

b. Required resources

– Involvement of national expert from governmental institutions in the area of waters

c. Status

– continuous

Deadline: one year

- Long-term activities

– Long-term activities will be defined by the work group.

AGRICULTURE

MK - NI 025

GROSS NUTRIENT BALANCES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The balance of mineral matters enables to understand the links between nutrients used in agriculture, changes in the environment and sustainable use of soil nutrient resources. Constant surplus in mineral matters indicates potential environmental problem, while constant deficit indicates potential problem in sustainable agriculture, i.e. poses the risk of reducing the nutrients in the soil. The main determinant is the absolute value of mineral suficit/deficit related to local practice of mineral matters management in agriculture and agroecological conditions, such as soil types and weather events (rain falls, vegetation periods, etc.).

Gross nitrogen balance provides indication of the possible water contamination and identifies agricultural systems, i.e. areas loaded with excessive amounts of nitrogen.

Definition

The nutrient balance or nitrogen balance establishes the link between nutrients used in agriculture and changes in the quality of the environment, in order to achieve sustainable use of soil nutrients in terms of their input and output.

The indicator estimates the potential surplus of nitrogen on agricultural land. This is done by calculating the balance between nitrogen added to a hectare agricultural land. The indicator accounts for all inputs to and outputs from the farm. The inputs consist of the amount of nitrogen applied via mineral fertilisers and animal manure as well as nitrogen fixation by legumes, deposition from the air, and some other minor sources. Nitrogen output is contained in the harvested crops, or grass and crops eaten by livestock. Uncontrolled escape of nitrogen to the atmosphere, e.g. as N_2O from agriculture is difficult to estimate and therefore not taken into account.

Units

- The gross nitrogen balance is expressed in (kgN/year) per hectare (ha).

Policy relevance of the indicator

The gross nitrogen balance is an issue regulated by the Framework Law on Waters, which is in a phase of adoption in our country, incorporating the requirements of Nitrates Directive (91/676/EC) and Framework Water Directive (2000/60/EC). The Nitrates Directive is aimed at reducing and preventing in future the water pollution by nitrates from agricultural sources. This Directive restricts the application of manure at 170 kg N/ha/year. The goal of the Framework Water Directive is the achievement of good ecological status of surface and ground waters in terms of quality of biological communities, hydrological characteristics and chemical characteristics.

List of relevant policy documents

The National Environmental Action Plan 2 (NEAP 2) specifies the measures for ratinal use of natural resources, as well as controlled use of pesticides, i.e. plant protection products, as well as the measure for establishment of soil monitoring and information system to monitor the status of pesticides consumption.

Legal grounds

The Law on Agricultural Land, in its Articles 9 and 10, specifies the measures for improved agricultural land fertility through application of agro-technical measures, hydro-amelioration, agramelioration and anti-errosion measures. Article 36 of the Law specifies that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.

The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

The Law on Environment, in its Article 8, promotes the principle of sustainable development, meaning that, when undertaking or performing any activity, rationale and sustainable use of natural resources shall be taken into account, thus meeting the needs for healthy environment, as well as social and economic needs of present generations, without jeopardizing the rights of future generations to meet their own needs.

Targets

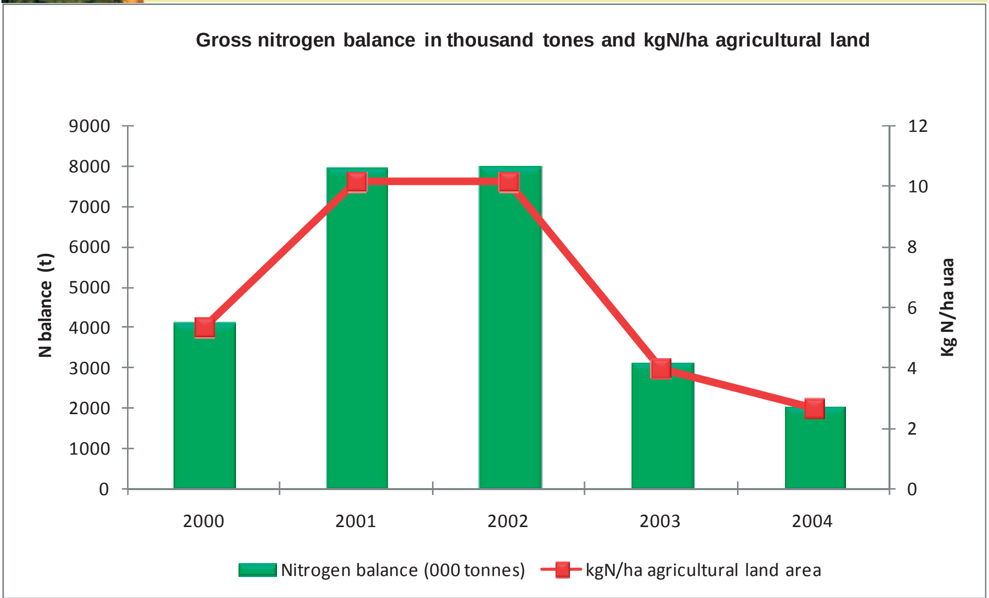
No specific targets.

Key policy issue

Has the impact of agriculture on the environment improved?

Key message

In the period from 2000 to 2001, significant rise in gross nitrogen balance was tracked, followed by a period of stagnation, to note rapid drop in the period from 2002 to 2003 and further slight fall in the gross nitrogen balance expressed both in thousand tonnes and kilograms nitrogen per hectare agricultural land (kgN/ha). Constant suficit in nitrogen balance indicates potential environmental problems, while constant deficit indicates potential risk of reduced nutrients in the soil.



Methodology

- Methodology for the indicator calculation

Methodology for the indicator calculation has been taken from OECD/Eurostat national nutrient balances, which takes into account all input and output matters in the farm.

Input nitrogen matters consist of:

1. Total amount of applied fertilizers
   - Inorganic fertilizers
   - Organic fertilizers (manure excluded)
2. Manure
3. Nitrogen fixation by legumes
4. Deposition from the air
5. Other minor sources (semen and other reproductive material)

Output nitrogen matters include:

1. Harvested crops placed on the market, including also forage crops
2. Grass and crops eaten by livestock

Uncontrolled escape of nitrogen to the atmosphere in a form of N_2O from agriculture is difficult to estimate and therefore not taken into account.

- Source of applied methodology

OECD/Eurostat Gross Nitrogen Balances Handbook (12/2003)

Data specification

Title of the indicator	Source	Reporting obligation
Gross nutrient balance	– Statistical Yearbook 2005, State Statistical Office – Calculation of the gross nitrogen balance was made by the Faculty of Agricultural Science and Food, University of “St. Cyril and Methodius”, Skopje	

Data coverage (by years):

Table 1: Gross nitrogen balance expressed in thousands tones and kgN/ha agricultural land in the period 2000 - 2004

	2000	2001	2002	2003	2004
Nitrogen balance (000 tonnes)	4117	7956	7978	3111	2053
kgN/ha agricultural land area	5,33	10,12	10,11	3,96	2,66

Table 2: Nitrogen input in agriculture, 2000 - 2004

Nitrogen input in thousands tones	2000	2001	2002	2003	2004
Via mineral fertilizers	11798	17289	18716	12999	15072
Via manure	13846	13385	13117	13097	13234
Biologically fixated nitrogen	2094	2160	1783	2232	2214
Total	27738	32834	33616	28328	30520

Table 3: Nitrogen output from agriculture, 2000 - 2004

Nitrogen output in thousands tones	2000	2001	2002	2003	2004
Contribution by market non-forage and forage crops	8571	7381	7894	7124	9916
Contribution by non-market forage crops and pastures (harvested- grazed)	15050	17498	17745	18103	18551
Total	23621	24878	25638	25217	28467

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 025	**Gross nutrient balance**	CSI 025	Gross nutrient balance	**P**	A	agriculture water	3 - annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000 - 2004

Frequency of data collection: annually

Uncertainty

- Methodological uncertainty

Data used in the calculation of this indicator has been partially based on estimates by experts, using harmonized methodology which might not always reflect specific circumstances in our country, Certain coefficients used in calculations differ significantly from country to country. Data on nitrogen input is considered more adequate and more comprehensive than on the output. Uncertainty is present with regard to harvested forage crops, as well as grass crops eaten by livestock.

Based on the above, data on gross nitrogen balance in our country should be taken with certain extent of precaution.

- Uncertainty of data sets

Data on the amounts of applied manure are accompanied by certain extent of uncertainty, and statistical data on semen and other reproductive material, as well as data on grass crops eaten by livestock, i.e. those that are not placed on the market, should be taken by certain extent of uncertainty, too.

Future activities

- Short-term activities

– Establishment of Work Group with a task to define, elaborate and develop the indicator in full..

a. Description of the activity

– Definition, elaboration and full development of the indicator..

b. Required resources

– Experts in the area of environment, agriculture and other relevant fields.

c. Status

– In progress

Deadline: June 2008

- Long-term activities

Long-term activities are to be defined by the Work Group.

MK - NI 026

AREAS UNDER ORGANIC FARMING

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The need to select this indicator is related to the specific nature of organic farming which is distinct from other manners of farming in the application of certain standards, production rules, certification procedures, specific labeling, as well as products placement on specific market. Farming is considered organic if it complies with the Law on Organic Farming and regulations that are in a process of adoption. The provisions of this Law have been harmonized with international and European ones, especially with EU Regulation No.2092/91, because of the future development of trade exchange of organic products with European countries. Organic farming has been developed in order to be sustainable from environmental point of view, while observing clearly verified rules.

Definition

Organic agriculture is a production system reducing or eliminating the use of GMOs and input of synthetic chemicals such as synthetic chemical fertilizers, pesticides, hormones and growth regulators in agriculture. Instead, the use of good practices in the agro-ecosystem management for crop and livestock production is promoted. Organic farming differs from conventional in the application of production rules, labelling schemes and certificates.

The indicator is calculated as share (percentage) of area under organic farming (sum of existing areas under organic farming and areas in a process of conversion for organic farming) in the total area or total cultivable land area.

Units

The indicator is presented as sum of area under organic farming and area being converted for organic farming, measured in ha. Share of organic farming is given as a percentage of total utilized agricultural area.

Policy relevance of the indicator

Legal grounds

The framework for the organic farming is established by the Law on Organic Farming and regulations which are in a process of adoption. The provisions of this Law have been harmonized with international and European ones, especially with EU Regulation No.2092/91, which is of particular importance in the context of future development of trade exchange in organic products with European countries. Officially, the organic (ecological or biological) farming started in 2005 under the Programme for encouraging and development of organic agricultural production for 2005.

Targets

No specific targets have been set.

Key policy issue

Which are the key trends in agricultural production systems from environmental point of view?

Key message

In 2005, the share of the area under organic farming in the Republic of Macedonia amounted 0.049% and 0.060% area under conversion in the total cultivable land. Out of the total agricultural land area, 0.127% of the area was used for organic farming, including also forest areas, pastures and uncultivated land and 0.027% area under conversion.

	total in ha	**as % of total utilized agricultural area**
Total utilized agricultural area	545.514,00	100%
Utilized organic area	266,00	0,049%
Area in a process of conversion	326,54	0,060%
	total in ha	**as % of total utilized agricultural area**
Agricultural area	1.229.150,00	100%
Utilized agricultural area + Forest organic area, pastures, uncultivated land	1.566,00	0,127%
Area in a process of conversion	326,54	0,027%

Methodology

- Methodology for the indicator calculation

The indicator is presented as sum of area under organic farming and area being converted for organic farming, divided by the total cultivable land area or total agricultural area. This value is multiplied by 100 in order to present the value in percentage.

- Source of applied methodology

The method of the European Environmental Agency.

Data specification

Title of the indicator	Source	Reporting obligation
Areas under organic farming	– State Statistical Office – Ministry of Agriculture, Forestry and Water Economy, Division of Organic farming.	

Data coverage (by years):

Table 1: Total utilized agricultural area and total agricultural area in 2005

Utilized agricultural area in ha	Total agricultural area in ha
545 514	1 229 150

Table 2: Areas under organic farming in 2005

Production areas under organic farming in ha	Forest land areas, pastures, uncultivated organic land in ha	Area under conversion in ha
266	1 300	326,54

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 026	**Area under organic farming**	CSI 026 IRENA 07	Area under organic farming	**R**	A	agriculture biological diversity	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2005

Frequency of data collection: annually

Uncertainty

- Methodological uncertainty

Impossibility to observe the trend due to the lack of data for several years.

Future activities

- Short-term activities

– Establishment of Work Group with a task to define, elaborate and develop the indicator in full..

a. Description of the activity

– Definition, elaboration and full development of the indicator..

b. Required resources

– Experts in the area of environment, agriculture and other relevant fields.

c. Status

– In progress

Deadline: June 2008

■ Long-term activities

– Long-term activities are to be defined by the Work Group.

MK - NI 08

MINERAL FERTILIZER CONSUMPTION

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of mineral fertilizers.

Definition

Mineral fertilizers are substances containing chemical elements required for plants growth, especially nitrogen, phosphorus and potassium.

This indicator shows the consumption of mineral fertilizers in the Republic of Macedonia, by presenting total amounts in tonnes consumed substances, and their application per hectare cultivated land area.

Units

- Total amounts in tonnes consumed mineral fertilizers, and their application per hectare cultivated land area (kg/ha).

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of mineral fertilizers. The same document also specifies the measure for establishment of monitoring and information system for soil, to monitor the mineral fertilizers consumption.

Legal grounds

The Law on Agricultural Land in its Articles 9 and 10 specifies the measures for improved agricultural land fertility through undertaking of agrotechnical measures, one of them being fertilizers application. Article 31 concerning agricultural land protection against pollution and contamination specifies that the protection of agricultural land against pollution and contamination is performed by prohibition, restriction and prevention of direct input of harmful matters in soil, input of harmful matters through water and air and undertaking of other measures for its productivity maintenance and improvement. Article 36 of the Law specifies that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.

The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

Targets

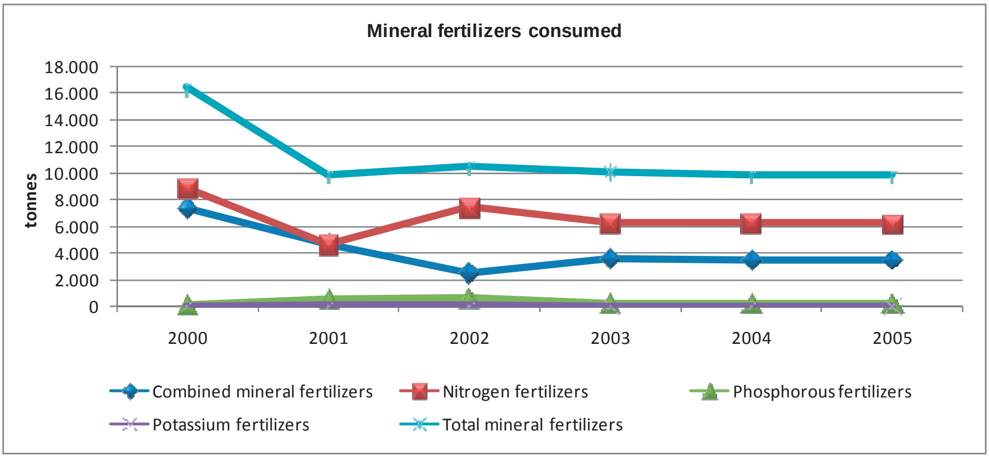
No specific targets.

Key policy issue

Has the impact of agriculture on the environment improved?

Key message

Mineral fertilizer consumption in agriculture noted a falling trend in the period from 2000 to 2005. Consumption of nitrogen mineral fertilizers dropped by 29.8%. Consumption of potassium fertilizers dropped by 92.3%. Consumption of combined mineral fertilizers dropped by 53%, while the total consumption of mineral fertilizers dropped by 39.7%. Consumption of phosphorus fertilizers only increased by 31%.



Assessment

It is difficult to connect the reduction in mineral fertilizers consumption directly with the impact on the quality of the environment. The ultimate effect on the quality of environment depends to a great extent on other factors, such as use of organic fertilizer, yield from crops, soil types, management of agricultural farms, etc.

Methodology

- Methodology for the indicator calculation

Consumption of individual groups of mineral fertilizers as combined mineral fertilizers, nitrogen fertilizers, phosphorous fertilizers, potassium fertilizers, as well as total mineral fertilizers per

hectare utilized agricultural area is obtained by dividing the total quantity of consumed group of mineral fertilizers in kg by the total utilized agricultural area presented in ha.

Data specification

Title of the indicator	Source	Reporting obligation
Mineral fertilizer consumption	– Statistical Yearbook, 2006, State Statistical Office	

Data coverage (by years):

Table 1: Mineral fertilizers consumption, 2000 - 2005 (in tonnes)

Year	Combined mineral fertilizers	Nitrogen fertilizers	Phosphorous fertilizers	Potassium fertilizers	Total mineral fertilizers
2000	7409	8833	161	13	16416
2001	4732	4625	515	81	9953
2002	2536	7386	618	53	10593
2003	3588	6250	234	2	10074
2004	3498	6217	213	3	9931
2005	3488	6200	211	1	9900

Table 2: Total utilized agricultural area in thousand hectares (ha), 2000 - 2005

	2000	2001	2002	2003	2004	2005
Total utilized agricultural area in thousand ha	598	612	577	569	560	546

Table 3: Mineral fertilizers consumed per utilized agricultural area (kg/ha)

	2000	2001	2002	2003	2004	2005
Mineral fertilizers consumed per utilized agricultural area (kg/ha)	27,45	16,26	18,35	17,7	17,73	18,13

General meta data

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 08	**Mineral fertilizer consumption**	IRENA 08	Mineral fertilizer consumption	**D**		Agriculture	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000-2005

Frequency of data collection: annually

Uncertainty

- Uncertainty of data

Data on the quantity of consumed mineral fertilizers contains certain extent of uncertainty, especially when originating from private sector. Some of the values have been obtained by estimation.

Future activities

- Short-term activities

– Establishment of Work Group with a task to define, elaborate and develop the indicator in full.

a. Description of the activity

– Definition, elaboration and full development of the indicator.

b. Required resources

– Experts in the area of environment, agriculture and other relevant fields.

c. Status

– In progress.

Deadline: June 2008

- Long-term activities

– Long-term activities are to be defined by the Work Group

MK - NI 09

CONSUMPTION OF PESTICIDES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

In order to preserve and revive the existing biological diversity in a state of natural balance and prevent harmful activities in agriculture that may result in disruption in nature, it is necessary to monitor the application of plants protection products.

Definition

Plants protection products or pesticides are chemical substances which restrain diseases and pests in plants. This indicator shows the quantities of pesticides used for plants protection, such as fungicides, herbicides, insecticides and category of total including, apart from the mentioned ones, other plant protection products.

Units

- Total quantities of used substances in tones, share of different groups of pesticides, as well as their application per hectare utilized agricultural area (kg/ha).

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of pesticides, i.e. plant protection products. The same document also specifies the measure for establishment of monitoring and information system for soil, to monitor the pesticides consumption.

Legal grounds

The Law on Agricultural Land in its Articles 9 and 10 specifies the measures for improved agricultural land fertility through undertaking of agro-technical measures, hydro-amelioration, agramelioration and anti-errosion measures. One of the agrotechnical measures is control of weeds, diseases and pests. Article 31 concerning agricultural land protection against pollution and contamination specifies that the protection of agricultural land against pollution and contamination is performed by prohibition, restriction and prevention of direct input of harmful matters in soil, input of harmful matters through water and air and undertaking of other measures for its productivity maintenance and improvement. Article 36 of the Law specifies that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.

The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

The Law on Plants Protection, in its Article 1, regulates the protection of plants against diseases, pests and weeds, as well as use of plant protection products. Article 38 specifies that producers of plant protection products are obliged to keep records of quantities of products produced and released for trade, while legal persons importing such products from foreign producers are obliged to keep records of quantities of products imported and released for trade in the Republic of Macedonia.

Targets

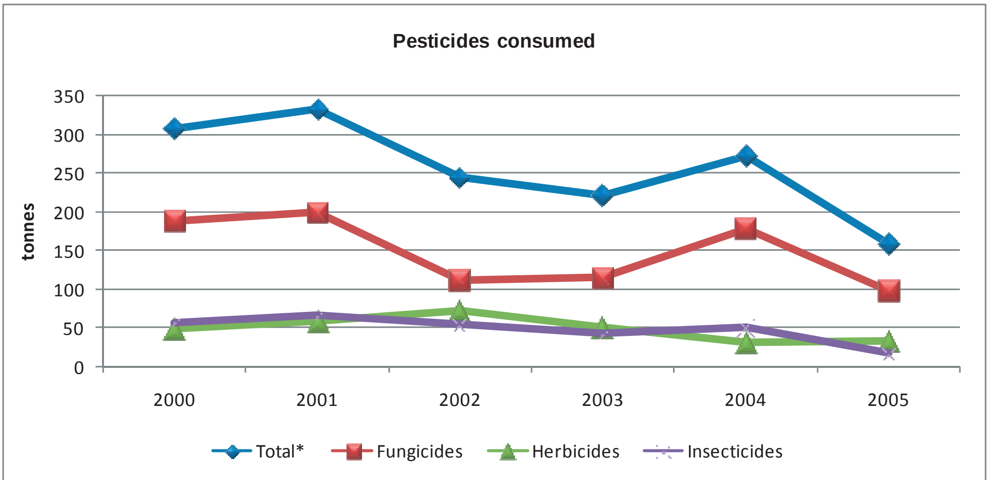
No specific targets.

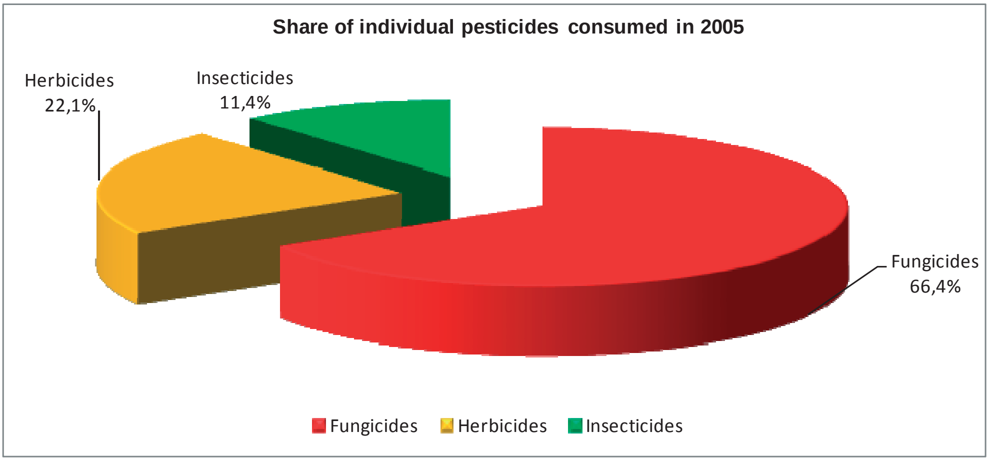
Key policy issue

Has the impact of agriculture on the environment improved?

Key message

Application of pesticides in agriculture, including all plant protection products, like fungicides, herbicides, insecticides and total quantity shows a trend of slight reduction in quantity consumed in the Republic of Macedonia in the period between 2000 and 2005, with an exception of 2001 when increase in quantities consumed was recorded. In terms of share of pesticides in 2005, the highest quantity consumed was of fungicides by 67%, followed by insecticides with 11% and herbicides with 22%.





Methodology

- Methodology for the indicator calculation

The share of different pesticide groups as fungicides, herbicides and insecticides is obtained when the quantity of each group is divided by the total quantity of consumed pesticides, and then the value obtained is multiplied by 100. The application of individual group per hectare utilized agricultural area is obtained when the total quantity of consumed pesticides expressed in kg is divided by the total utilized agricultural area in the Republic of Macedonia expressed in ha.

Data specification

Title of the indicator	Source	Reporting obligation
Consumption of pesticides	– Statistical Yearbook, 2006, State Statistical Office	

Data coverage (by years):

Table 1: Total utilized agricultural area in thousand hectares (ha), 2000 - 2005

	2000	2001	2002	2003	2004	2005
Total utilized agricultural area in thousand ha	598	612	577	569	560	546

Table 2: Consumed pesticides, 2000 - 2005

Year	Total* (tonnes)	Fungicides (tonnes)	Herbicides (tonnes)	Insecticides (tonnes)
2000	308	189	50	57
2001	333	200	59	66
2002	245	113	73	54
2003	222	116	52	42
2004	273	179	32	51
2005	159	99	33	17

*The category “total”, apart from recorded fungicides, herbicides and insecticides, covers other pesticides as well

Table 3: Total pesticides consumed per total utilized agricultural area (kg/ha)

	2000	2001	2002	2003	2004	2005
Total pesticides consumed per total utilized agricultural area (kg/ha)	0,51	0,54	0,42	0,39	0,48	0,29

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 09	**Consumption of pesticides**	IRENA 09	Consumption of pesticides	**D**		agriculture	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2000 - 2005

Frequency of data collection: annually

Uncertainty

- ### Uncertainty of basic data

Data on the quantity of consumed pesticides contains certain extent of uncertainty, especially when originating from private sector. Some of the values have been obtained by estimation.

Future activities

- ### Short-term activities

– Establishment of Work Group with a task to define, elaborate and develop the indicator in full

a. Description of the activity

– Definition, elaboration and full development of the indicator..

b. Required resources

– Experts in the area of environment, agriculture and other relevant fields.

c. Status

– In progress

Deadline: June 2008

■ Long-term activities

– Long-term activities are to be defined by the Work Group.

ENERGY

МК - NI 027

FINAL ENERGY CONSUMPTION BY SECTOR

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The trend in final energy consumption by sector provides a broad indication of progress made in reducing energy consumption and associated environmental impacts by the different end-use sectors (transport, industry, services and households). It can be used to help monitor the success of key policies that attempt to influence energy consumption and energy efficiency.

Data on final energy consumption help estimating the environmental impacts of energy use. The type and extent of energy-related pressures on the environment depend both on the sources of energy (and how they are used) and on the total amount of energy consumed. One way of reducing energy-related pressures on the environment is thus to use less energy. This may result from reducing the energy consumption for energy-related activities (e.g. for warmth, personal mobility or freight transport), or by using energy in a more efficient way (thereby using less energy per unit of demand), or from a combination of the two.

Definition

Final energy consumption is energy supplied to meet the demand of the final consumers and is calculated as the sum of final energy consumption from all sectors, namely industry, transport, agriculture, households, etc.

The indicator "Final energy consumption by sector" can be expressed in presented in thousand tonnes of oil equivalent (ktoe) and in percentage as a ratio between final energy consumption by each sector and final energy consumption by all sectors.

Units

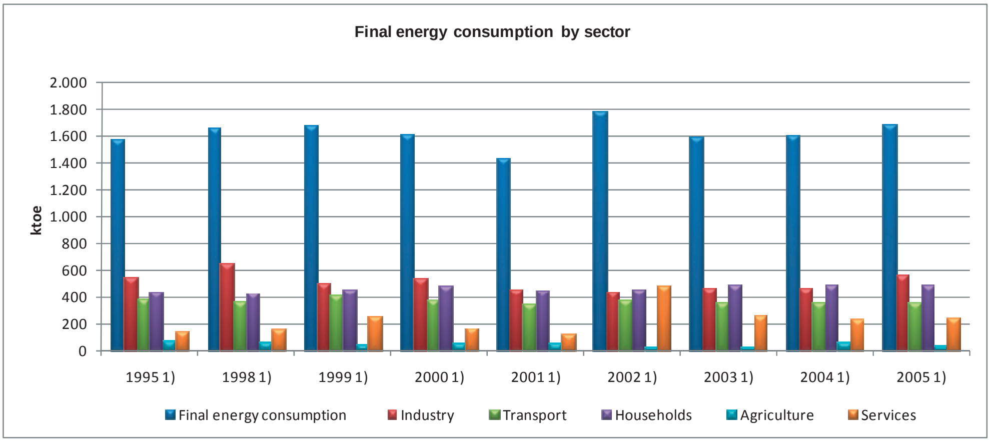
- thousand tonnes of oil equivalent (ktoe)
- percentage (%)

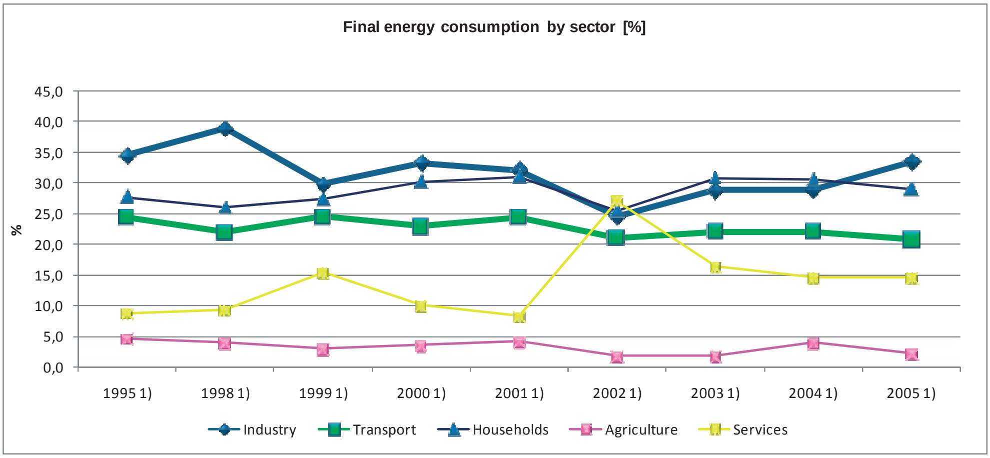
Policy relevance of the indicator

Legal grounds

Law on Energy (Official Gazette of the Republic of Macedonia No. 63/2006, 36/2007);

Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).





Key message

Policies in energy sector should favour measures aimed at rational and efficient energy consumption, especially by households and industry.

Assessment

Given the fact that sectoral shares depend on the country's economic circumstances, country comparisons of the shares are meaningless unless accompanied by a relevant measure of the importance of the sector in the economy. As the interest is focused on the reduction of final energy consumption and not on the sectoral redistribution of such consumption, the absolute values should be preferred as a more meaningful indicator of progress.

Depending on the characteristics of economies and the extent of efficiency in final energy consumption, diverse structure of energy consumption can be found in individual sectors. In

2001, major share in the total energy consumption in the Republic of Macedonia belonged to the industry (31.7%), followed by households and road transport (30.6% and 21.9%, respectively).

Final energy consumption in the Republic of Macedonia correlates closely with the dynamics of industrial production, due to the high share of industry in the total final energy consumption. Thus, the reduced industrial activity in 2004 resulted in final energy consumption fall thus reducing its share in the total final energy consumption (28.9%). During the second half of 2004, industrial facilities being also major energy consumers were restarted, leading to intensified economic activity in the country and increased final energy consumption in 2005 (33.5%), indicating higher share of industry in the total final energy consumption.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Common surveys on: coal, oil, natural gas, electricity and heat, renewable energy for 2005, by Eurostat, ECE/UN and IEA/OECD
- Energy Statistics Methodology Eurostat F4, 1998"
- National Classification of Activities (NCA) (Official Gazette of the Republic of Macedonia No. 09/2006)

Data specification

Title of the indicator	Source	Reporting obligation
Final energy consumption by sector	– State Statistical Office	– Eurostat, ECE/UN and IEA/OECD.

Data coverage (by years):

Table 1: Final energy consumption by sector

ktoe	1995 1)	1998 1)	1999 1)	2000 1)	2001 1)	2002 1)	2003 1)	2004 1)	2005 1)
Final energy consumption	1.572	1.652	1.670	1.606	1.423	1.780	1593	1600	
Industry	543	643	499	535	458	438	460	462	562
Transport	385	364	411	368	349	376	353	353	350
Households	435	429	456	485	442	452	493	490	487
Agriculture	71	65	48	56	58	32	29	63	36
Other sectors	137	152	256	161	118	482	260	232	244

Source: State Statistical Office

1) Previous data

Table 2: Final energy consumption by sector (%)

(%)	1995 [1)]	1998 [1)]	1999 [1)]	2000 [1)]	2001 [1)]	2002 [1)]	2003 [1)]	2004 [1)]	2005 [1)]
Final energy consumption	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0
Industry	34,5	38,9	29,9	33,3	32,2	24,6	28,9	28,9	33,5
Transport	24,5	22,0	24,6	22,9	24,5	21,1	22,1	22,1	20,9
Households	27,7	26,0	27,3	30,2	31,0	25,4	30,9	30,6	29,0
Agriculture	4,5	3,9	2,9	3,5	4,1	1,8	1,8	3,9	2,2
Other sectors	8,7	9,2	15,3	10,0	8,3	27,1	16,3	14,5	14,5

Source: State Statistical Office

[1)] Previous data

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 027	**Total energy consumption by sector**	CSI 027 EE 18	Final energy consumption by sector	**D**	A	energy	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 - 2005

Frequency of data collection: At annual basis.

Future activities

- Short-term activities

Adoption of the national set of energy indicators.

a. Description of the activity

The national set of energy indicators verified by the established Work Group will be delivered for adoption to the Government of the Republic of Macedonia as part of the Environmental Indicators.

b. Required resources

Possible engagement of technical expert who would handle the data obtained by the State statistical office.

c. Status

Energy indicators elaborated up to 2005.

Deadline:

- Long-term activities

Updating of the adopted national set of energy indicators.

MK - NI 028

TOTAL ENERGY INTENSITY

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The type and extent of energy-related pressures on the environment depends on the sources of energy and in which quantities they are used. One way of reducing energy-related pressures on the environment is to use less energy. This may result from reducing the consumption in energy-related activities (e.g. for warmth, personal mobility or freight transport), or by using energy in a more efficient way (thereby using less energy per unit of demand), or from a combination of the two.

The indicator identifies to what extent there is a decoupling between energy consumption and economic growth, but it does not show any of the underlying reasons that affect the trends. A reduction in total energy intensity can be the result of positive improvements in energy efficiency or changes in energy demand resulting from other factors including structural, societal, behavioural or technical change.

Definition

Total energy intensity is the ratio between the total energy demand (or total energy consumption) and the Gross Domestic Product.

The total energy consumption as the sum of the total energy demand from solid fuels, oil, natural gas and renewable sources.

The Gross Domestic Product (GDP) is converted by the Price Adjusted Rate of Exchange (PARE) method, applying the OUN Methodology (2000 database).

The total energy demanded (or total energy consumption) is expressed in thousand tonnes oil equivalent, and Gross Domestic Product in million US$.

The indicator "Total energy intensity" is expressed in kilograms oil equivalent per 1000 US$ (kgoe/1000 US$).

The indicator is also calculated in indexes with 2000 as base year (2000=100).

Units

- million US$
- thousand tonnes oil equivalent (ktoe)
- kilograms oil equivalent (kgoe)
- indexes (2000=100)

Policy relevance of the indicator

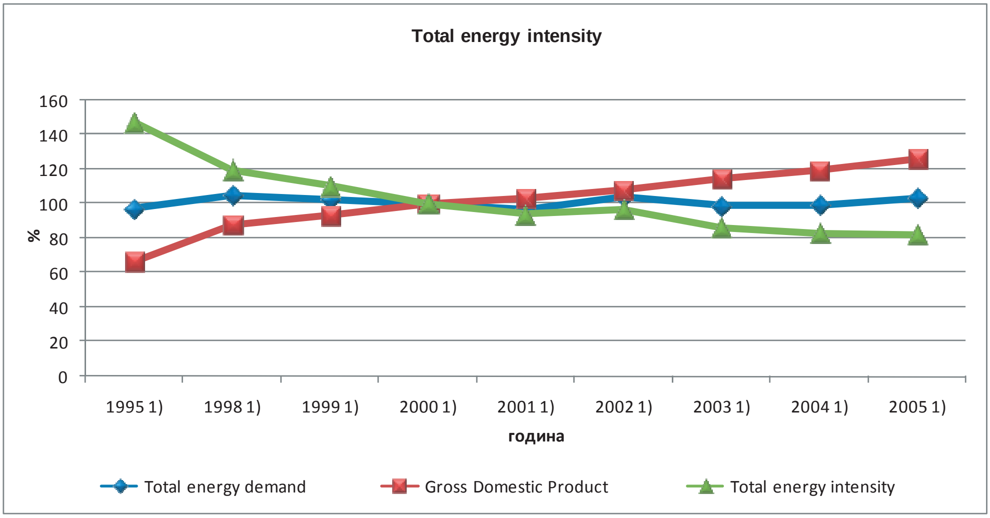
Legal grounds

Law on Energy (Official Gazette of the Republic of Macedonia No. 63/2006, 36/2007);

Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy);

Key message

- Structural changes in industry by favoring less energy intensive industries
- Introduction of market based energy proces (energy prices rationing), thus improving the performance of domestic energy producers and providing significant incentives for energy saving. Adoption of the secondary legislation to support projects in the area of energy efficiency. It is also needed to harmonize the laws and regulations in different sectors linked with energy efficiency
- Improvement of energy efficiency on the side of production, but also on the side of the demand through targeted programmes, trainings and public awareness improvement.



Assessment

Comparative analysis of energy consumption relative do GDP, so called indicator of energy intensity, has shown that the Republic of Macedonia belongs to the group of countries with relatively high energy consumption levels, due to the high energy intensity of the facilities that lead the economic growth. Almost one third of the electricity consumption comes of high energy intensive industries. The greatest energy consumers consume more electricity at annual level than the total electricity generated by hydro-power plants. In addition to this, due to the long-lasting treatment of the electricity price as a social category, the residential sector uses significant quantities of electricity for heating.

Methodology

■ Methodology for the indicator calculation

Statistical methodology for calculation:

- common surveys for coal, oil, natural gas, electricity and heat, renewable energy for 2005 by Eurostat, ECE/UN and IEA/OECD
- Energy Statistics Methodology Eurostat F4, 1998"
- Price Adjusted Rate of Exchange (PARE) method, applying the OUN Methodology (2000 database).

Data specification

Title of the indicator	Source	Reporting obligation
Total energy intensity	State Statistical Office	– Eurostat – ECE/UN – IEA/OECD

Data coverage (by years):

Table 1: Total energy intensity

	1995 1)	1998 1)	1999 1)	**2000 1)**	2001 1)	2002 1)	2003 1)	2004 1)	2005 1)
Total energy demand (ktoe)	2694	2904	2837	**2765**	2677	2892	2740	2749	2863
Gross Domestic Product (mio US$)	2377	3157	3340	**3588**	3706	3872	4119	4298	4534
Total energy intensity (kgoe/1000 CUS$)	1133,3	920,0	849,5	**770,6**	722,5	746,9	665,2	639,5	631,5

	index 2000=100								
Total energy demand	97,4	105,0	102,6	**100,0**	96,8	104,6	99,1	99,4	103,5
Gross Domestic Product	66,2	88,0	93,1	**100,0**	103,3	107,9	114,8	119,8	126,4
Total energy intensity	147,1	119,4	110,2	**100,0**	93,8	96,9	86,3	83,0	81,9

Source: State Statistical Office

1) Previous data

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 028	**Total energy intensity**	CSI 028 EE 23	Total energy intensity	**R**	B	energy	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 - 2005

Frequency of data collection: Data is collected at annual basis.

Future activities

- ### Short-term activities

Adoption of the national set of energy indicators.

a. Description of the activity

The national set of energy indicators verified by the established Work Group will be delivered for adoption to the Government of the Republic of Macedonia as part of the Environmental Indicators.

b. Required resources

Need to engage technical expert who would handle the data obtained by the State statistical office.

c. Status

Energy indicators have been elaborated by 2005.

Deadline:

- ### Long-term activities

Updating of the adopted national set of energy indicators.

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MK - NI 029

TOTAL ENERGY CONSUMPTION BY FUEL

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Total energy consumption disaggregated by fuel type is a leading indicator describing the development of energy sources and the corresponding levels of consumption. The environmental impact of each fuel is very specific.

The consumption of fossil fuels (such as crude oil, oil products, hard coal, lignite and natural and derived gas) provides a proxy indicator of resource depletion, CO_2 and other greenhouse gas emissions and air pollution levels (e.g. SO_2 and NOx). The degree of the environmental impact depends on the relative share of different fossil fuels and the extent to which pollution abatement measures are used. Natural gas, for instance, has approximately 40 % less carbon content than coal and 25 % less carbon content than oil and contains only marginal quantities of sulphur.

Renewable energy consumption is a measure of the contribution from technologies that are more environmentally benign, as they produce no (or very little) net CO_2 and usually significantly lower levels of other pollutants. Renewable energy can, however, have impacts on landscapes and ecosystems. The incineration of municipal waste is generally made up of both renewable and non-renewable material and may also generate local air pollution. However, emissions from the incineration of waste are subject to stringent regulations including tight controls on quantities of cadmium, mercury and other such substances. Similarly, the inclusion of both large and small-scale hydropower provides only a broad indicator of environmentally benign energy supply. While small-scale hydro schemes generally have little environmental impact, large-scale hydro-power facilities can have major adverse impacts (flooding, impact on ecosystems, water levels, requirements for population resettlement).

Definition

Total energy consumption or gross inland consumption represents the total quantity of energy necessary to satisfy the total national needs for energy for energy transformations, all types of consumption by energy sector and final energy and non-energy consumption.

The total energy consumption is calculated as sum of the total energy consumption originating from solid fuels, oil, natural gas and renewable sources.

The indicator "Total energy consumption by fuel" is expressed in thousand tonnes of oil equivalent (ktoe) and in percentage as ratio between the total energy consumption per fuel and the total energy consumption of all fuels.

Units

- thousand tonnes of oil equivalent (ktoe)
- percentage (%)

Policy relevance of the indicator

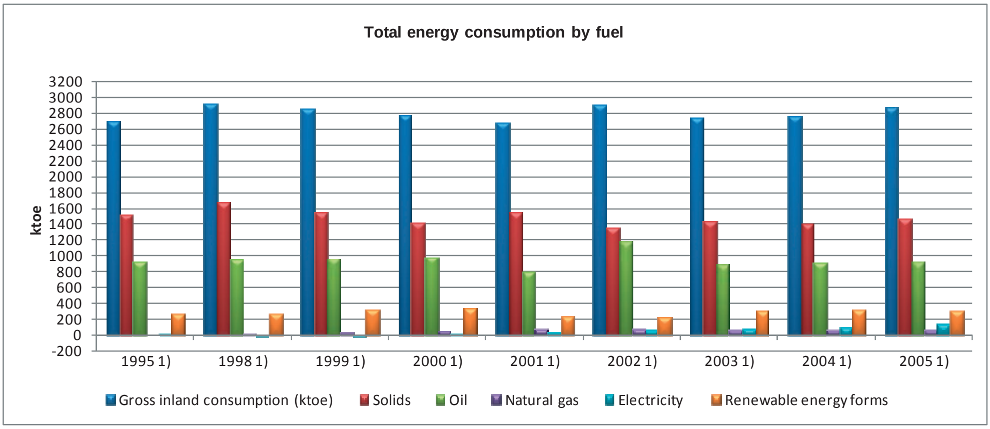
Legal grounds

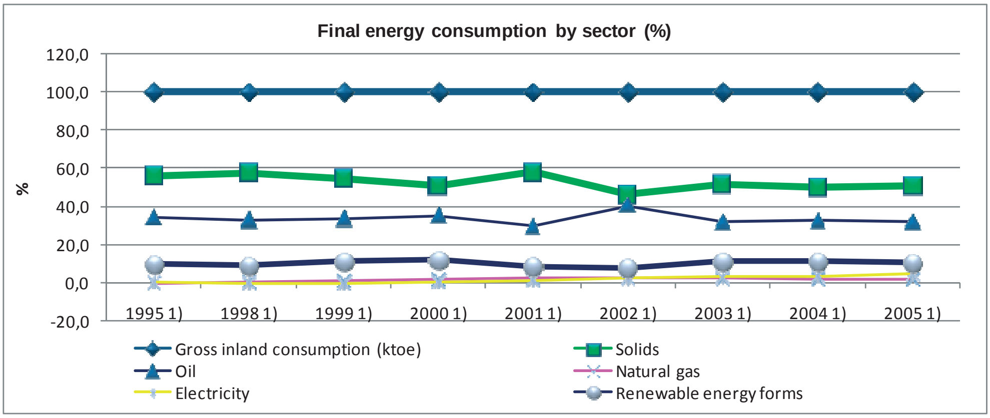
Law on Energy (Official Gazette of the Republic of Macedonia No. 63/2006, 36/2007);

Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Key message

Policies in energy sector should favour measures aimed at change in the mix of fuels in favour of the natural gas and renewable energy sources. This is a very useful indicator reflecting depletion of resources, emissions of CO_2 and other GHGs and levels of air pollution (e.g.: SO_2 and NO_x).





Assessment

In 2001, dominant energy sources in the Republic of Macedonia were coal and oil and oil derivatives (with a share of 56.7% and 30.5%, respectively), while from among other energy types the fuel wood is represented in significant quantity (5.7%). In 2004, dominant energy sources in the Republic of Macedonia were coal and oil (with a share of 50.3% and 30.8%, respectively), and from among other fuels, fuel wood is represented as well (share of 6.2%).

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Common surveys for coal, oil, natural gas, electricity and heat, renewable energy for 2005 by Eurostat, ECE/UN and IEA/OECD.
- Energy Statistics Methodology Eurostat F4, 1998"

Data specification

Title of the indicator	Source	Reporting obligation
Total energy consumption by fuel	State Statistical Office	– Eurostat – ECE/UN – IEA/OECD

Data coverage (by years):

Table 1: Total energy consumption by fuel

	1995 1)	1998 1)	1999 1)	2000 1)	2001 1)	2002 1)	2003 1)	2004 1)	2005 1)
Gross inland consumption (ktoe)	2694	2904	2837	2765	2677	2892	2740	2749	2863
- Solids	1513	1672	1543	1406	1553	1352	1415	1385	1459
- Oil	914	951	955	967	790	1173	876	895	912
- Natural gas	0	18	33	54	71	74	65	57	62
- Electricity (import-export)	10	0	-9	10	37	68	82	101	137
Renewable energy sources	258	264	315	329	226	225	302	310	293

Source: State Statistical Office

1) Previous data

Table 2: Percentage of the total energy consumption by fuel

	1995 1)	1998 1)	1999 1)	2000 1)	2001 1)	2002 1)	2003 1)	2004 1)	2005 1)
Gross inland consumption **(%)**	100,0	100,0	100,0	100,0	100,0	100,0	100	100	100
- Solids	56,2	57,6	54,4	50,8	58,0	46,8	51,6	50,4	51,0
- Oil	33,9	32,8	33,7	35,0	29,5	40,6	32,0	32,6	31,8
- Natural gas	0,0	0,6	1,2	1,9	2,7	2,6	2,4	2,1	2,2
- Electricity (import-export)	0,4	0,0	-0,3	0,3	1,4	2,4	3,0	3,7	4,8
- Renewable energy sources	9,6	9,1	11,1	11,9	8,4	7,8	11,0	11,3	10,2

Source: State Statistical Office

1) Previous data

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 029	**Total energy consumption by fuel**	CSI 029 EE 24	Total energy consumption by fuel	**D**	A	energy	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 – 2005

Frequency of data collection: Data is collected at annual basis

Future activities

- Short-term activities

Adoption of the national set of energy indicators.

a. Description of the activity

The national set of energy indicators verified by the established Work Group will be delivered for adoption to the Government of the Republic of Macedonia as part of the Environmental Indicators.

b. Required resources

Need to engage technical expert who would handle the data obtained by the State statistical office.

c. Status

Energy indicators have been elaborated by 2005.

Deadline:

- Long-term activities

Updating of the adopted national set of energy indicators.

MK - NI 030

RENEWABLE ENERGY CONSUMPTION

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The share of renewable energy consumption in the total energy consumption in the Republic of Macedonia provides a broad indication of progress towards reducing the environmental impact of energy consumption, although its overall impact has to be seen within the context of the total fuel mix, potential impacts on biological diversity and the extent to which pollution abatement equipment is fitted.

Renewable energy sources are generally considered environmentally benign, with very low net emissions of CO_2 per unit of energy produced, even allowing for emissions associated with the construction of the plant. Emissions of other pollutants are also often lower for renewable energy production than for fossil fuel energy production. The exception to this is municipal and solid waste (MSW) incineration which, due to the cost associated with separation, usually involves the combustion of some mixed wastes including materials contaminated with heavy metals.

Most renewable (and non-renewable) energy sources have some impact on landscape, habitats and ecosystems, although many of these impacts can be minimised through careful site selection. Large hydropower schemes in particular, can have adverse impacts including flooding, disruption of ecosystems and hydrology, and socio-economic impacts if resettlement is required. Some solar photovoltaic schemes require relatively large quantities of heavy metals in their construction and geothermal energy can release pollutant gases carried by its hot fluid if not properly controlled. Wind turbines may have visual and noise impacts in the areas of their location. Some types of biomass and biofuel crops also have considerable land, water and agricultural input requirements such as fertilisers and pesticides.

Definition

Renewable energy sources are defined as renewable non-fossil energy sources: hydropower, geothermal, solar and wind power; solid biomass; biogas, liquid biofuels, etc.

The indicator "Renewable energy consumption" is expressed as ratio of total renewable energy consumption and the total energy consumption originating from all fuels (in percentage).

Renewable energy consumption is expressed in thousand tonnes of oil equivalent (ktoe).

Units

– thousand tonnes of oil equivalent (ktoe)
– percentage (%)

Policy relevance of the indicator

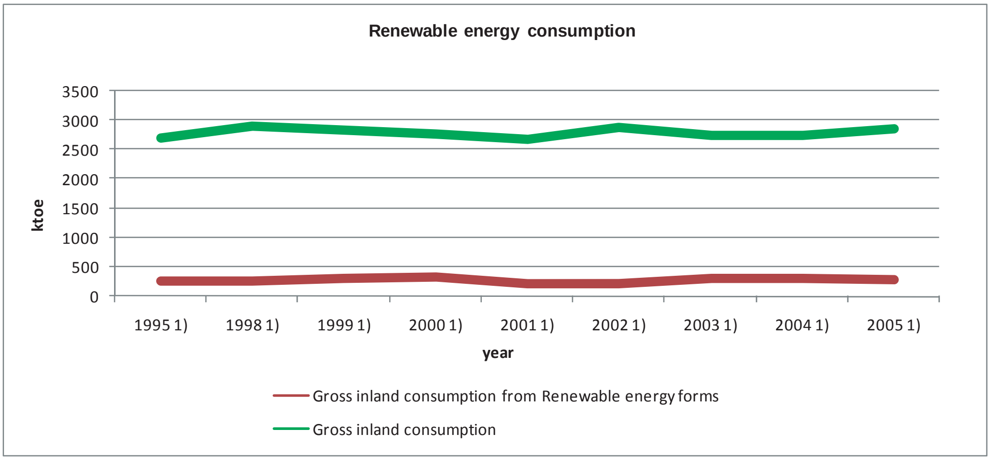
Legal grounds

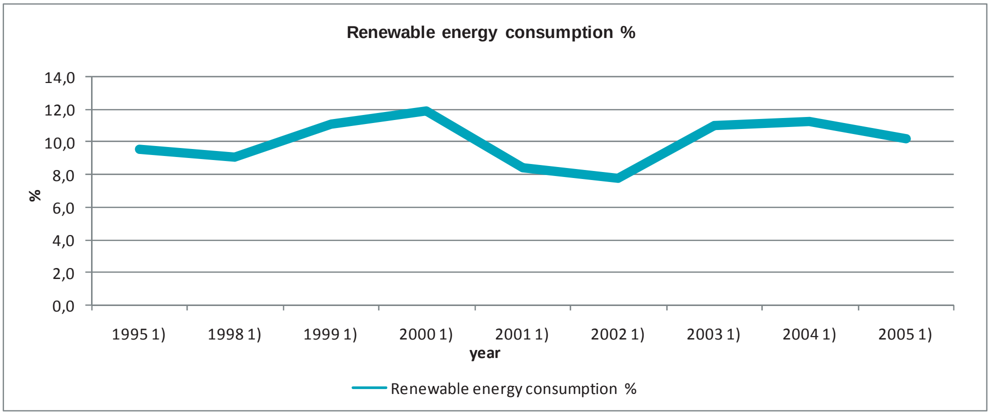
Law on Energy (Official Gazette of the Republic of Macedonia No. 63/2006, 36/2007);

Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Key message

The policies in the sector should favour measures towards greater utilization of renewable energy sources.





Assessment

Relatively low share of renewable energy in the total energy consumption (10% at an average) indicates the dominant use of fissile fuels which is unfavorable in terms of both energy resources depletion and environment pollution.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- common surveys for coal, oil, natural gas, electricity and heat, renewable energy for 2005 by Eurostat, ECE/UN and IEA/OECD.
- Energy Statistics Methodology Eurostat F4, 1998"

Data specification

Title of the indicator	Source	Reporting obligation
Renewable energy consumption	State Statistical Office	– Eurostat – ECE/UN – IEA/OECD

Data coverage (by years):

Table 1: Renewable energy consumption

	1995 1)	1998 1)	1999 1)	2000 1)	2001 1)	2002 1)	2003 1)	2004 1)	2005 1)
Renewable energy consumption	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe
- Gross inland consumption from Renewable energy sources	258	264	315	329	226	225	302	310	293
- Gross inland consumption	2694	2904	2837	2765	2677	2892	2740	2749	2863

	%	%	%	%	%	%	%	%	%
Renewable energy consumption	9,6	9,1	11,1	11,9	8,4	7,8	11,0	11,3	10,2

Source: State Statistical Office

1) Previous data

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 030	**Renewable energy consumption**	CSI 030 EE 26	Renewable energy consumption	**R**	B	energy	annual

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 - 2005

Frequency of data collection: Data is collected at annual level

Future activities

- Short-term activities

Adoption of the national set of energy indicators.

a. Description of the activity

The national set of energy indicators verified by the established Work Group will be delivered for adoption to the Government of the Republic of Macedonia as part of the Environmental Indicators.

b. Required resources

Need to engage technical expert who would handle the data obtained by the State statistical office.

c. Status

Energy indicators have been elaborated by 2005.

Deadline:

- Long-term activities

Updating of the adopted national set of energy indicators.

MK - NI 031

RENEWABLE ELECTRICITY

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Renewable electricity is generally considered environmentally benign, with very low net emissions of CO2 per unit of electricity produced, even allowing for emissions associated with the construction of the electricity production facilities. Emissions of other pollutants are also generally lower for renewable electricity production than for electricity produced from fossil fuels. The exception to this is the incineration of Municipal and Solid Waste (MSW), which due to high costs of separation, usually involves the combustion of some mixed wastes including materials contaminated with heavy metals.

Definition

Renewable electricity sources are defined as renewable non-fossil sources of energy, such as: hydropower, geothermal, solar and wind power; solid biomass; biogas, liquid biofuels, etc.

The indicator "Renewable electricity " measures the share of electricity produced from renewable sources in gross national electricity production (in percentage).

The gross national electricity consumption is a sum of the total gross production and import of electricity minus electricity exported.

The gross national electricity consumption is expressed in GWh.

Units

- GWh
- percentage

Policy relevance of the indicator

Legal grounds

Law on Energy (Official Gazette of the Republic of Macedonia No. 63/2006, 36/2007);

Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

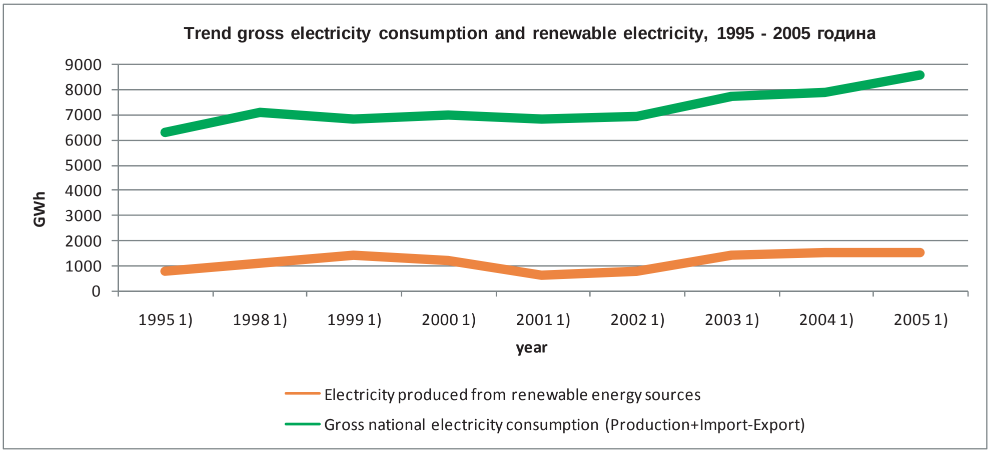
Key message

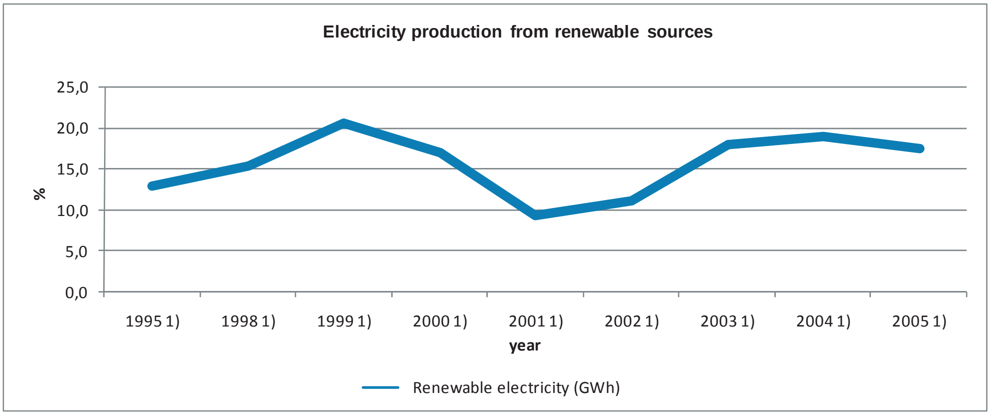
In the context of the indicative goal of 21% of gross consumption of electricity originating from renewable energy sources in EU-25, as specified by the EU in its Directive No. 2001/77/EC, the need for greater utilization of renewable energy sources in the Republic of Macedonia is in line with the practices in developed countries and their efforts to reduce pollutants emission and support the sustainable development. Republic of Macedonia needs to set the national goal for renewable energy share in line with the potential of the available renewable energy sources.

The share of electrcity originating from renewable sources in the gross electricity consumption in the Republic of Macedonia is rather low. It makes relatively high annual fluctuation depending on hydrological conditions.

In 2004, 19.9 % of the total consumption in Macedonia was renewable electricity originating from hydropower plants.

Further increase is required to reach the EU's indicative goal of 21% share by 2010. (Law on Energy).





Assessment

The production of electricity from renewable sources in the Republic of Macedonia is based on the hydropower. Production in large hydropower plants is predominant.

At present, the share of renewable electricity in the overall electricity consumption is very important and depends on hydrological conditions during the year. Compared to 1995, the share of renewable electricity in the gross electricity consumption has increased the most in 1999 (20.5%), followed by significant drop in 2001 (9.2%), as a result of lower production of hydropower due to reduced precipitations.

During the observed period 1995 - 2005, and according to available data, the trend was even. The highest share of renewable electricity was recorded in 1999 and 2004 (20.5% and 18.9%, respectively).

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- common surveys for coal, oil, natural gas, electricity and heat, renewable energy for 2005 by Eurostat, ECE/UN and IEA/OECD.
- Energy Statistics Methodology Eurostat F4, 1998"

Data specification

Title of the indicator	Source	Reporting obligation
Renewable electricity	State Statistical Office	– Eurostat – ECE/UN – IEA/OECD

Data coverage (by years):

Table 1: Trend in gross electricity consumption and renewable electricity consumption, 1995 - 2005

	1995 [1)]	1998 [1)]	1999 [1)]	2000 [1)]	2001 [1)]	2002 [1)]	2003 [1)]	2004 [1)]	2005 [1)]
	GWh	GWh	GWh	GWh	GWh	GWh	GWh	GWh	GWh
- Electricity produced from renewable energy sources	801	1083	1388	1170	626	757	1374	1482	1492
- Gross national electricity consumption (Total gross production+Import-Export)	6249	7046	6760	6923	6792	6881	7690	7841	8541

Source: State Statistical Office

[1)] Previous data

Table 2: Renewable electricity production in %, 1995 - 2005

	1995 1)	1998 1)	1999 1)	2000 1)	2001 1)	2002 1)	2003 1)	2004 1)	2005 1)
Renewable electricity %	12,8	15,4	20,5	16,9	9,2	11,0	17,9	18,9	17,5

Source: State Statistical Office

1) Previous data

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 031	**Renewable electricity**	CSI 031 EE 27	Renewable electricity	**R**	B	energy	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 - 2005

Frequency of data collection: Data is collected at annual basis

Future activities

- Short-term activities

Adoption of the national set of energy indicators.

a. Description of the activity

The national set of energy indicators verified by the established Work Group will be delivered for adoption to the Government of the Republic of Macedonia as part of the Environmental Indicators.

b. Required resources

Need to engage technical expert who would handle the data obtained by the State statistical office.

c. Status

Energy indicators have been elaborated by 2005.

Deadline:

- Long-term activities

Updating of the adopted national set of energy indicators.

FISHERY

MK - NI 041

FISH STOCK CHARACTERISTICS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

There is diverse fish fauna at relatively small area in the Republic of Macedonia. Characterization of the fish stock will have great practical significance in terms of various fish species distribution, fish stocks management and their sports, fishing, scientific and other meaning. This will create the possibility for sustainable exploitation of fish stocks, their qualitative and timely protection and implementation of adequate interventions aimed at increased fish populations density in fishing waters.

Definition

The indicator shows the number of freshwater species living in waters and lakes in the Republic of Macedonia and the fish species represented in fishponds that are subject to aquicultural production.

At present, the indicator shows the status of:

- catch of two economically significant fish species in fishing waters;
- total catch of other fish species in fishing waters;
- total aquicultural fish production in fishponds.

Units

Number of fish species, kilograms (tones) fish catch.

Policy relevance of the indicator

List of relevant policy documents

The Study on the State of Biological Diversity in the Republic of Macedonia and the National Strategy for Biological Diversity Protection with Action Plan establish integrated approach to the protection and sustainable use of biological diversity components including fishery.

Legal grounds

The Law on Fishery and Aquiculture (Official Gazette of the Republic of Macedonia No. 62/2008) regulates the management, planning, commercial management and aquicultureof fish in fishing waters, fish ponds, semi fish ponds, cages and other fish breeding resources.

Targets

The main goal of this indicator is to define the number and abundance of fish species in freshwater basins and fishponds. This will enable sustainable fish management and exploitation through fishing, as well as implementation of certain interventions, especially in the domain of fish population reproduction and protection.

Key policy issue

How sustainable is the fish catch in the Republic of Macedonia?

Key message

Fishing and fish stock exploitation in fishponds and artificial water accumulations in the Republic of Macedonia is under permanent supervision, with constant care for the fish stocks and regular stocking with economically important fish species. In this way, sustainable development and exploitation of fish as an important economic resource is provided, as well as for sports fishing. Exploitation of fish stocks from natural lakes has been coping with permanent problems for a longer period, including over-fishing and uncontrolled fish catch in those aquatic ecosystems. These activities affect particularly the endemic fish species, such as Ohrid trout (Salmo letnica Kar.), as well as other endemic species represented by small populations in certain aquatic ecosystems. Scientific institutions in the Republic of Macedonia, in the frames of their annual programmes and their primary activity of freshwater ecosystems monitoring and protection, carry out regular monitoring of the fish stock status, within the limits of their possibilities.

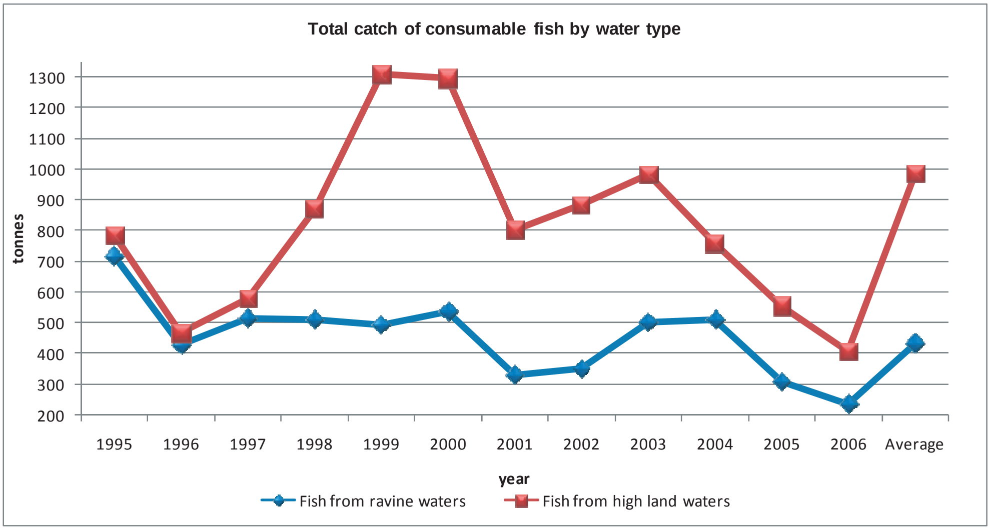


Diagram 1

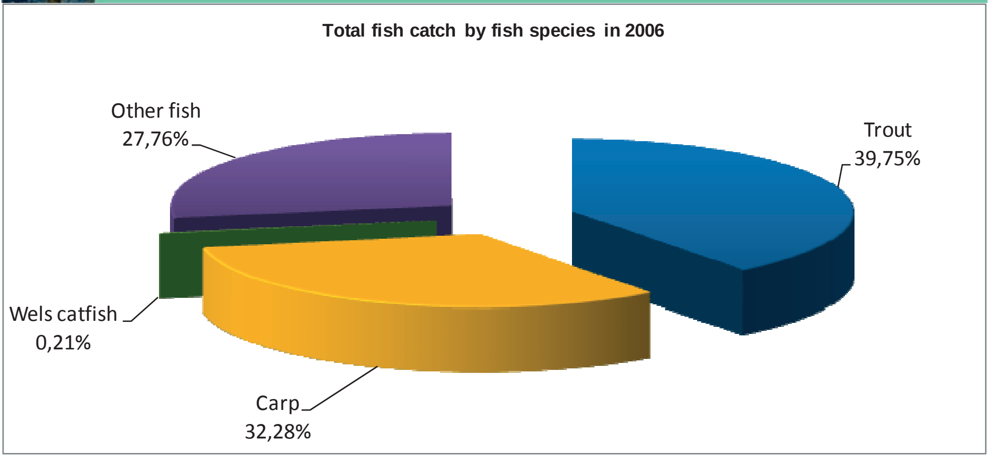


Diagram 2

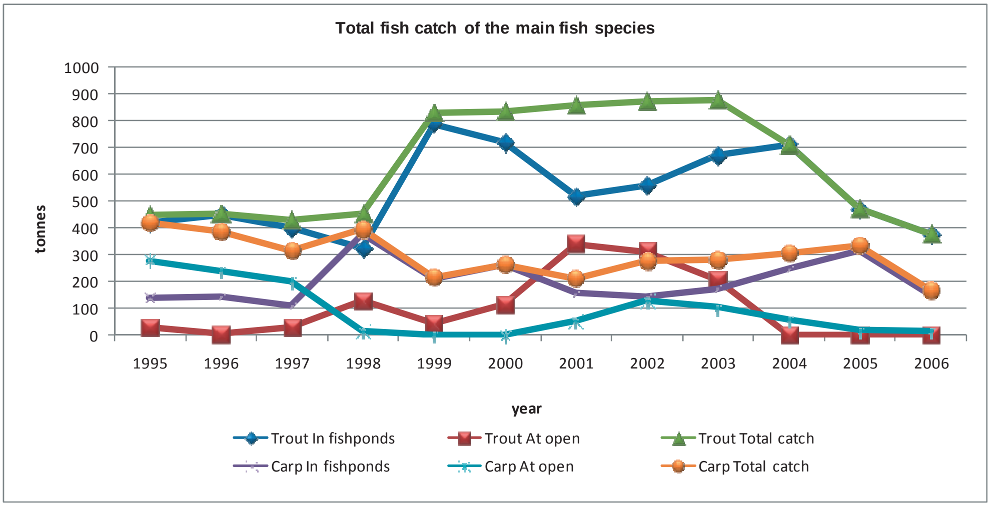


Diagram 3

Assessment

National literature contains numerous works dealing with certain aspects (systematic, biological, economic, sports and fishing aspects). Several authors, like Stanko Karaman in his work „Pisces Macedoniae” of 1924, Mirce Naumoski in „Fish in Macedonia. Systematic association, biology and importance” of 1995 and Simo Georgiev in „The key in identification of *Osteichthyes* and *Cephalaspidomorpha* in the Republic of Macedonia” of 1998, focus on ihtiofauna in our country.

The State Statistical Office of the Republic of Macedonia collects data, on annual basis, on fish

catch in fishing areas, as well as on fish production in fish ponds, which is further processed as total fish catch by species, from ravine and high land waters, fish balance and by fish ponds types.

Table 1, with regard to total catch (production of commercial fish and fishing by sports fishermen), shows that the average fish catch in the Republic of Macedonia is 1 285 tonnes of different fish species, noting that the yield has decreased during the last several years because some fishing companies, business entities and concessionaires have lost their licenses for fishing activities in certain water basins, and significant number of sports fishing clubs have been terminated. In the total commercial fish catch, the contribution of catch from high land waters is 2/3, but it has to be noted that this value also incorporates the production of commercial fish in fish ponds.

Diagram 1 shows that the carp is predominant fish species in the total fish catch from both water types, while trout is leading in high land waters.

Methodology

- Methodology for the indicator calculation

Source of data and methodology for the indicator calculation

The source of data on the characteristics of fish stocks in the Rerpublic of Macedonia is the State Statistical Office and their methods are used for data processing.

Uncertainty

Uncertainty derives from the assumed incomplete data on fish catch in rivers and lakes. The uncertainty increases further because of the limitted number of literature data on genetic structure of fish populations in natural aquatic ecosystems.

Data specification

Title of the indicator	Source	Reporting obligation
Fish stock characteristics	– State statistical office	– FAO – Fisheries and Aquaculture Department

Data coverage (by years):

Table 1: Total fish catch in the Republic of Macedonia in tonnes

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average
Total catch	1505	898	1099	1388	1804	1834	1135	1238	1486	1271	868	646	1285
At open	*945*	*428*	*588*	*686*	*930*	*852*	*458*	*533*	*326*	*312*	*61*	*89*	*445*
In fishponds	*560*	*470*	*511*	*702*	*874*	*982*	*677*	*705*	*1160*	*959*	*787*	*557*	*838*
Sturgeons			2	6									
Zander				29	7	7	4	5	5	0	0	0	4
Wels catfish	3		3	3	3	3	3	2	2	15	2	4	4
Carp	420	251	316	94	215	263	163	178	280	307	187	167	220
Pike				2	3		3	3	1	4	0	2	2
Tench	4		3	2	1	1			1	58	57	7	21
Mixed fish 1	3		3	3	4	19	12	15	15	53	26	10	19
Mixed fish 2	19		8	35	18	28	17	20	23	25	10	10	19
White fish			4	18	22	20	12	15	16	27	26	12	19
Bleak	200	179	120	236	130	110	68	74	89	23	4	12	64
Eel	70		60	72	60	50	50	40	40		0	3	35
Alosa talax												0	0
Grey mullet												2	2
Other fish - bought out				15	32	38			31			9	28
Fish from ravine waters	*719*	*430*	*519*	*515*	*495*	*539*	*332*	*352*	*503*	*512*	*312*	*238*	*436*
Trout	450	268	429	433	832	836	23	28	880	712	442	378	516
Huchen	161	96	151	214	244	173	517	564	25			3	254
Thymallus thymallus							107	117				9	78
Other fish	175	104		226	233	286	156	177	78	47	114	18	139
Fish from high land waters	*786*	*468*	*580*	*873*	*1309*	*1295*	*803*	*886*	*983*	*759*	*556*	*408*	*987*

Table 2: Total fish catch in the Republic of Macedonia in tonnes

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average
Fish from ravine waters	*719*	*430*	*519*	*515*	*495*	*539*	*332*	*352*	*503*	*512*	*312*	*238*	*436*
Fish from high land waters	*786*	*468*	*580*	*873*	*1309*	*1295*	*803*	*886*	*983*	*759*	*556*	*408*	*987*

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 041	**Characteristic of the fish fund**	**FISH 3**	Fish stock characteristics	**C**		Water Biodiversity Tourism	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997 - 2007

Frequency of data collection: The database of the State Statistical Office of the Republic of Macedonia contains major temporal series on the total catch of freshwater fish species existing in our natural and artificial water basins and that temporal series is divided into two parts – data before 1987 and data on the total fish catch after 1987. Data is collected from two sources: commercial entities registered under the national classification of activities, as commercial fish producers – fish ponds and different forms of fishing associations – sports fishermen. There are two main types of commercial fish production in fish ponds the Republic of Macedonia: fish ponds for trout production, dominated by Californian trout and fish ponds for carp production, where one could also rarely find the species of wels catfish, carp, etc.

Future activities

- Short-term activities

– Definition of autochthonous fish species in rivers and lakes;

– Taking of measures for protection of introduced alien species not specific for the relevant aquatic ecosystems in the past;

– Population and genetic investigation of fish populations, especially endemic and threatened species.

c. Status

– Activities are underway

Deadline: Activity is permanent

- Long-term activities

– Undertaking of comprehensive population and genetic study of several fish species, especially endemic and threatened species.

TRANSPORT

MK - NI 035

PASSENGER TRANSPORT DEMAND

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Transport is one of the main sources of greenhouse gases and pollutants that give rise to significant air pollution, which can seriously damage human health and ecosystems. The indicator helps to understand the impact of pollution from the transport on the environment.

The environmental impact of passenger transport arises from resources transfer, fuels consumption, greenhouse gas emissions, pollutant and noise emissions, land consumption (conversion), accidents etc. Due to the different types of origin of pollution from the transport and modal shifting (types of means of transportation), determination of the overall environmental effects becomes difficult. The total environmental effect of modal shifting can in fact only be determined on a case-by-case basis, where local circumstances and specific local environmental effects must be taken into account (e.g. transport in urban areas or over long distances, etc.).

Definition

The indicator **"passenger transport demand"** will be presented in two different ways:

1) To measure decoupling of passenger transport demand from economic growth, the volume of passenger transport relative to GDP will be used, including separate trends for its two components. Both passenger transport demand and real GDP growth will be indexed on 1995 as baseline determined by EEA. The decoupling indicator is defined as the ratio between passenger-km (inland modes) and GDP (Gross Domestic Product in constant 1995 EUR). It will be indexed on year t-1 in order to be able to observe changes in the intensity of passenger transport demand relative to economic growth. In the presentation of this indicator in the Republic of Macedonia, the index 2001=100 is taken as baseline year for comparison.

2) Modal split share of passenger transport: This indicator is defined as the percentage share of transport by passenger car in total inland transport. The unit used is the passenger-kilometre (pkm), which represents one passenger traveling a distance of one kilometre. It is based on transport by passenger cars, buses and coaches, trains and air.

All data should be based on movements on national territory, regardless of the nationality of the vehicle. However, data collection methodology should be harmonised at the EU level.

Units

The unit used is the passenger-kilometre (pkm), which represents one passenger travelling a

distance of one kilometre. It is based on transport by passenger cars, buses and coaches, and trains. Passenger transport demand and GDP are shown as an index (2001=100). The ratio of the former to the latter is indexed on year t-1 (i.e. annual decoupling/intensity changes).

Policy relevance of the indicator

List of relevant policy documents

The **National Strategy for Transport** has been prepared and adopted by the Government of the Republic of Macedonia. It determines the main directions of the transport policy development in the Republic of Macedonia through identification of goals and development strategy for road, rail and air transport sectors.

Legal grounds

The road transport is regulated by the Law on Road Transport (Official Gazette of the Republic of Macedonia No. 68/04 and 127/06). It regulates the conditions and the manner of performing transport of passengers and goods in internal and international road transport.

The Law has implemented the requirements of several relevant EU Directives and Regulations, namely: Directive 96/26EC, Directive 84/647EEC, Regulation 56/83EEC, Regulation 684/92EEC, Regulation 881/92 EEC, Regulation 3118/93EEC, Regulation 792/94EC, Regulation 3315/94EC, Regulation 12/98EC and Regulation 2121/98EC.

Transportation of dangerous goods is regulated by the Law on Dangerous Goods Transportation in Road and Railroad Transport (Official Gazette of the Republic of Macedonia No. 92/07), regulating the conditions under which transport of dangerous goods shall be performed (preparation of matter, loading, transport, on road procedures, unloading, safety in transportation, vehicles equipment and staff training). The following EU legal measures have been implemented in the Law: Directive 94/55/EC, Directive 2000/61/EC, Directive 2001/7/EC, Directive 95/50/EC, Directive 2001/26/EC, Directive 2004/112/EC, Directive 1996/35/EC, Directive 2000/18/EC, Directive 98/91/EC, Directive 96/49/EC and Directive 2006/90/EC.

Railroad transportation is regulated by the Law on Railroads (Official Gazette of the Republic of Macedonia No. 64/05 and 24/07), Law on Agreements on Transportation in Railroad Traffic (Official Gazette of the Republic of Macedonia No. 55/07), Law on Agency Regulating Railroad Transport Services Market (Official Gazette of the Republic of Macedonia No. 07/08) and Law on Railroad Transport Safety (Official Gazette of the Republic of Macedonia No. 40/07).

Air transportation is regulated by the Law on Rail Transport (Official Gazette of the Republic of Macedonia No. 14/06 and 24/07)

Waterway transportation is regulated by the Law on Inland Waterway Transport (Official Gazette of the Republic of Macedonia No. 55/07).

Targets

The indicator is targeted at presenting information to be used in the preparation of documents and actions aimed at reducing the negative effects on the environment and people.

One of the actions is to substitute the road by railroad, waterway and public passenger transport, to reach share of road transport in 2010 not to be higher than the one in 1998.

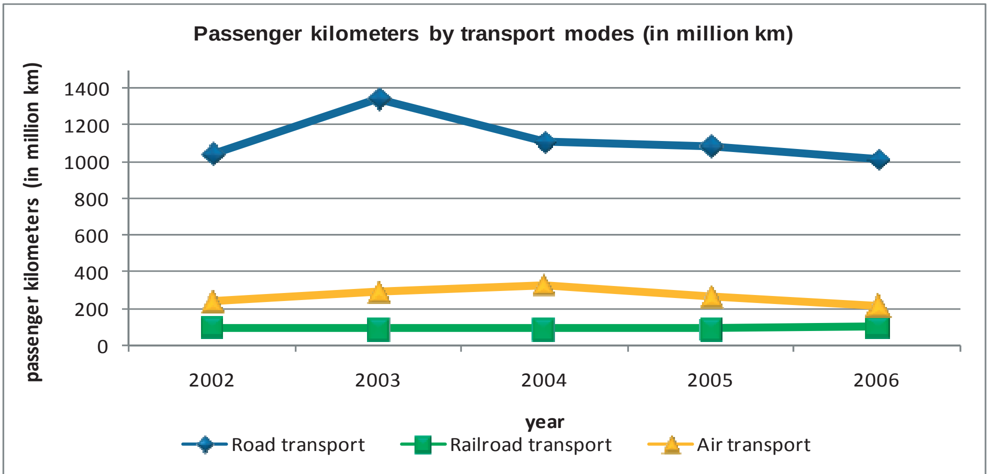
Key message

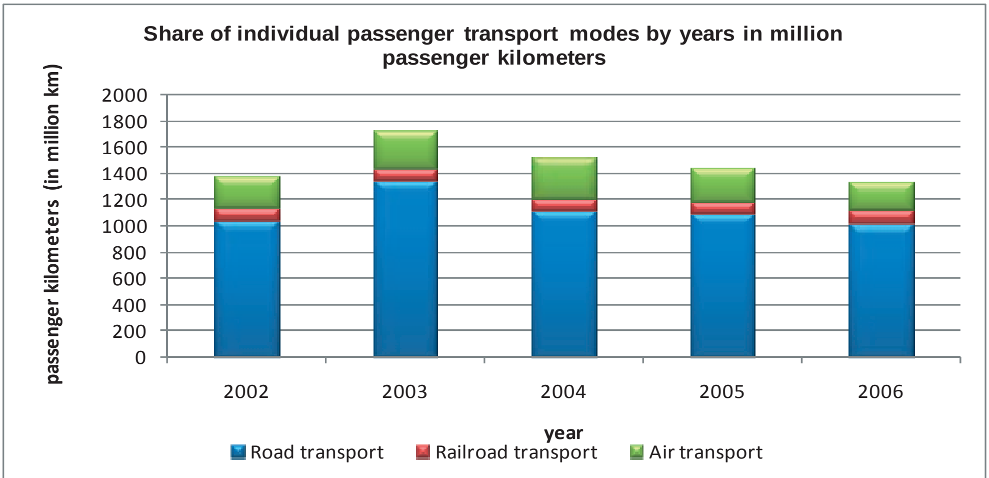
Is the passenger transport demand decoupled from economic growth?

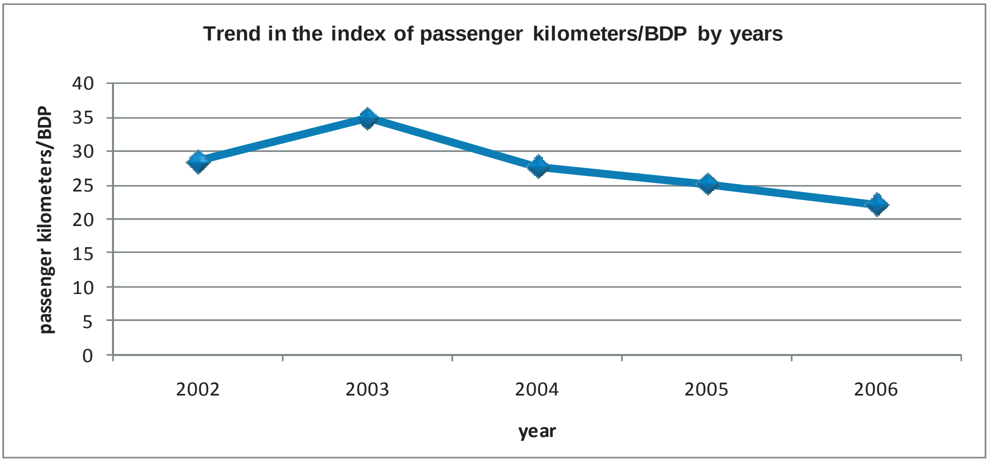
Decoupling of passenger transport demand from economic growth is difficult given the fact that in doing this we use the volume of passenger transport relative to BDP. This depends on the conditions of transport performance, availability of the relevant legislation, appropriate presentation of BDP.

Specific policy issue

Is the passenger transport in road transport reduced compared to other transport modes?







Assessment

The trend in the course of the last three years, in comparative terms, in road and air passenger transport has noted slight decrease. This actually means that there was a slight drop in the index of passenger per kilometres from 2003 to 2006. This is not the case with railroad passenger transport which remained constant during the same years.

Diagram 1 shows the trend in road, railroad and air transport between 2002 and 2006 expressed in passenger-km (passenger kilometres).

Diagram 2 shows that the road transport takes up the highest percentage of the passenger transport ranging between 72.64 % and 77.9 %, while the share of railroad transport ranges from 5.3 % to 7.9 % and air transport from 16 to 21.2%. This indicates that the reduction of environmental pollution requires reduction in the share of road transport in the share of passenger transport in favour of other transport mode. This would also result in avoided costs for the expensive liquid fuel which while combusting pollutes the environment.

Diagram 3 shows the falling trend in passenger kilometres/BDP ratio by given years.

This ratio is indexed for the year 2001=100 in order to monitor the changes in the intensity of passenger transport demand relative to economic growth presented through BDP.

Methodology

- ### Methodology for the indicator calculation

In order to measure the decoupling of passenger transport demand from economic growth, the volume (i.e. intensity) of passenger transport relative to BDP is calculated. Relative decoupling occurs when the passenger transport demand rises at rate lower than the one of the BDP. Absolute decoupling occurs when the passenger transport demand falls while BDP rises or remains constant.

The unit used is the passenger-kilometre (pkm), which represents one passenger travelling a distance of one kilometre. It is based on passenger transport by buses and coaches and trains.

With regard to EU Member States, according to Regulation on road transport and Regulation (EC) No 91/2003 on railroad transport statistics, data is based on all movements of passenger transport on national territory.

Source of used methodology

Structural indicators of Eurostat on transport

State Statistical Office.

■ Methodological uncertainty and data uncertainty

All data is based on the movements on the national territory, regardless of the nationality of the vehicle. The methodology of data collection has been harmonised at EU level, but there is still not data provided on the transport by passenger car. Sources include EUROSTAT, National statistical offices, ECMT, UNECE, UIC, DG TREN.

In order to answer the question whether the passenger transport demand is decoupling from economic growth, the intensity of passenger transport relative to changes in real BDP is considered.

■ Uncertainty of data sets

The unit used to measure the volume or intensity of passenger transport, as defined in the indicator, is the passenger-kilometre (pkm). It represents one passenger travelling a distance of one kilometre. Data on the transport by passenger car (i.e. average number of passengers per car) is not compulsory variable as there is no legal ground in place. All data on the passenger transport is collected through the Common Survey on transport statistics of EUROSTAT/ECMT/UNECE.

The loading of the vehicle is the key factor which plays a vital role in the assessment of whether there is decoupling of passenger transport demand from BDP growth. In order to obtain full picture of passenger transport demand and corresponding problems in the environment, it would be very useful to supplement data with data on the number of passenger -kilometres by vehicle-kilometres.

Uncertainty of grounds

In the context of environment protection, it is important not to overlook the trends in the total passenger transport volume. Real absolute values are of key importance for the understanding of the pressures on the environment originating from increased passenger transport demand.

Data specification

Title of the indicator	Source	Reporting obligation
Passenger transport demand	– State Statistical Office	

Data coverage (by years):

Table 1. Passenger kilometres by years (in million km)

	2002	2003	2004	2005	2006
Road transport	1042	1344	1110	1087	1016
Railroad transport	98	92	94	94	105
Air transport	236	289	324	263	214

Table 2 Share of passenger kilometres (in million kilometres) of individual passenger transport modes

%	2002	2003	2004	2005	2006
Road transport	75,7	77,9	72,64	75,3	76,1
Railroad transport	7	5,3	6,1	6,5	7,9
Air transport	17,1	16,7	21,2	18,21	16

Table 3 Ratio between passenger kilometre and BDP

year	pkm	BDP	pkm/BDP
2002	1140	4005	28,46
2003	1436	4129	34,78
2004	1204	4355	27,65
2005	1181	4705	25,10
2006	1121	5069	22,11

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 035	**Passenger transport demand**	CSI 035	Passenger transport demand	**P**	**B**	-Passenger transport per kilometre -BDP	Monthly, periodically, annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2002 to 2006

Frequency of data collection: Data is collected at monthly basis from regional departments, and processed and presented on annual basis, periodically and annually.

Data is prepared and processed in accordance with the methodology set in the Guide on transport statistics of EUROSTAT and regulations applicable for each transport mode.

Future activities

- Short-term activities

– Identification and definition of indicators in the area of transport that may show the state of the passenger transport demand in passenger- kilometre and ton- kilometre in the indicator of the freight transport demand.

a. Description of the activity

– The indicator of passenger transport demand is calculated and presented based on data collected and processed by the State Statistical Office in the adequate format by specified methodology.

b. Required resources

– Engagement of national experts from governmental institutions with knowledge of the passenger transport demand to take part in the indicator development.

c. Status

– Continuous

Deadline: 1 year

- Long-term activities

a. Description of the activity

– Activities concerning transposition of Directives of relevance for the transport, strategy for transport, plan for improvement of the transport performance.

b. Required resources

– No required resources have been identified.

c. Status

– In progress

Deadline: 1 January 2099

МК - NI 036

FREIGHT TRANSPORT DEMAND

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Transport is one of the main sources of air pollution through emissions of greenhouse gases and other pollutants. This is the reason why transport can affect and harm human seriously health and ecosystems.

Reduction in the freight transport demand will result in reduced environmental damages and lower impact on human health from freight transport. Therefore, the need for decoupling the freight transport related to BDP is also related to environmental impacts.

The environmental impact of freight transport arises from resources transfer, fuels consumption, greenhouse gas emissions, pollutant and noise emissions, land consumption (conversion), accidents etc. Due to the different types of origin of pollution from the transport and modal shifting, determination of the overall environmental effects becomes difficult. The total environmental effect of modal shifting can in fact only be determined on a case-by-case basis, where local circumstances and specific local environmental effects must be taken into account (e.g. transport in urban areas or over long distances, etc.).

Definition

The indicator **"freight transport demand"** will be presented in two different ways:

1) To measure decoupling of freight transport demand from economic growth, the volume of freight transport relative to GDP will be used, including separate trends for its components. Both real GDP growth and freight transport demand will be indexed on 1995 as baseline at the level of EUROSTAT. The decoupling indicator is defined as the ratio between tonne-km (inland transport) and GDP (Gross Domestic Product in constant 1995 EUR). It will be indexed on year t-1 in order to be able to observe changes in the annual intensity of freight transport demand relative to economic growth.

2) Modal split share of freight transport: This indicator is defined as the percentage share of freight transport in total inland transport. The unit used is tonne-kilometre (tkm), which represents movement of one tonne over a distance of one kilometre. It includes road and railroad inland transport. Railroad transport is based on movements on national territory, regardless of the nationality of the vehicle. Road freight transport is based on all movements of vehicles registered in the reporting country.

Units

The unit used is the tonne-kilometre (tkm), which represents the movement of one tonne over a distance of one kilometre. It includes transport by road and rail. Rail transport is based on movements on national territory, regardless of the nationality of the vehicle. Road transport is based on all movements of vehicles registered in the reporting country. Freight transport demand and GDP are shown in EUROSTAT as an index (1995=100). The ratio of the former to the latter is indexed on year t-1 (i.e. annual decoupling/intensity changes).

Policy relevance of the indicator

List of relevant policy documents

The **National Strategy for Transport** has been prepared and adopted by the Government of the Republic of Macedonia. It determines the main directions of the transport policy development in the Republic of Macedonia through identification of goals and development strategy for road, rail and air transport sectors.

Legal grounds

The road transport is regulated by the Law on Road Transport (Official Gazette of the Republic of Macedonia No. 68/04 and 127/06). It regulates the conditions and the manner of performing transport of passengers and goods in internal and international road transport.

The Law has implemented the requirements of several relevant EU Directives and Regulations, namely: Directive 96/26EC, Directive 84/647EEC, Regulation 56/83EEC, Regulation 684/92EEC, Regulation 881/92 EEC, Regulation 3118/93EEC, Regulation 792/94EC, Regulation 3315/94EC, Regulation 12/98EC and Regulation 2121/98EC.

Transportation of dangerous goods is regulated by the Law on Dangerous Goods Transportation in Road and Railroad Transport (Official Gazette of the Republic of Macedonia No. 92/07), regulating the conditions under which transport of dangerous goods shall be performed (preparation of matter, loading, transport, on road procedures, unloading, safety in transportation, vehicles equipment and staff training). The following EU legal measures have been implemented in the Law: Directive 94/55/EC, Directive 2000/61/EC, Directive 2001/7/EC, Directive 95/50/EC, Directive 2001/26/EC, Directive 2004/112/EC, Directive 1996/35/EC, Directive 2000/18/EC, Directive 98/91/EC, Directive 96/49/EC and Directive 2006/90/EC.

Railroad transportation is regulated by the Law on Railroads (Official Gazette of the Republic of Macedonia No. 64/05 and 24/07), Law on Agreements on Transportation in Railroad Traffic (Official Gazette of the Republic of Macedonia No. 55/07), Law on Agency Regulating Railroad Transport Services Market (Official Gazette of the Republic of Macedonia No. 07/08) and Law on Railroad Transport Safety (Official Gazette of the Republic of Macedonia No. 40/07).

Air transportation is regulated by the Law on Rail Transport (Official Gazette of the Republic of Macedonia No. 14/06 and 24/07)

Waterway transportation is regulated by the Law on Inland Waterway Transport (Official Gazette of the Republic of Macedonia No. 55/07).

Targets

The indicator is targeted at presenting information to be used in the preparation of documents and actions aimed at reducing the negative effects on the environment and people.

One of the actions is to substitute the use of road freight transport by railroad and waterway transport, to reach share of road freight transport in 2010 not to be higher than the one in 1998.

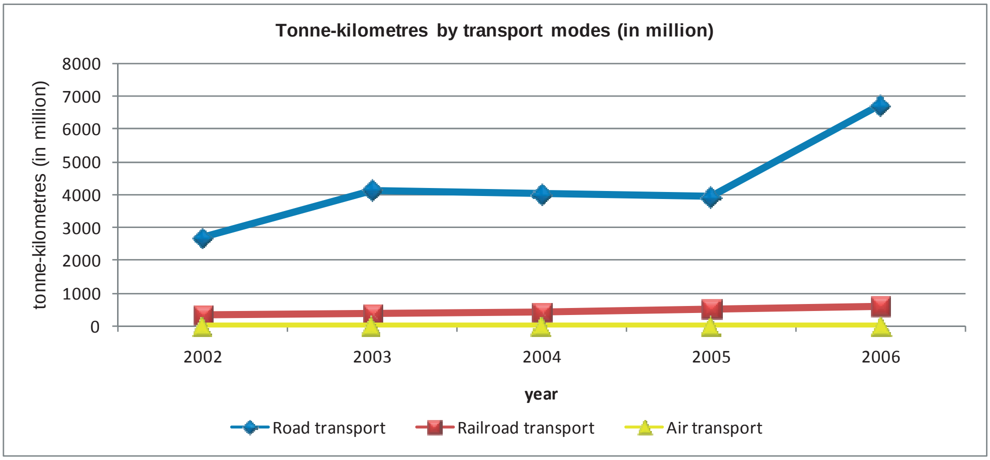
Key message

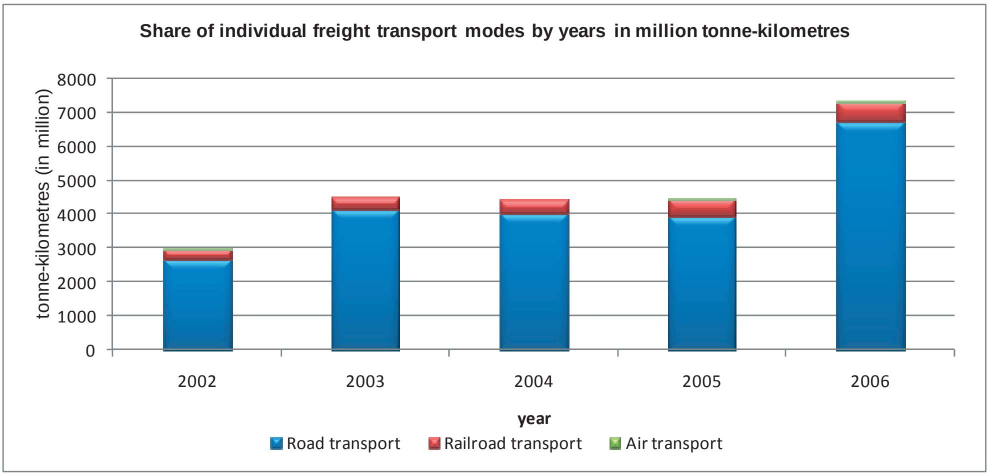
Is the freight transport demand decoupled from economic growth?

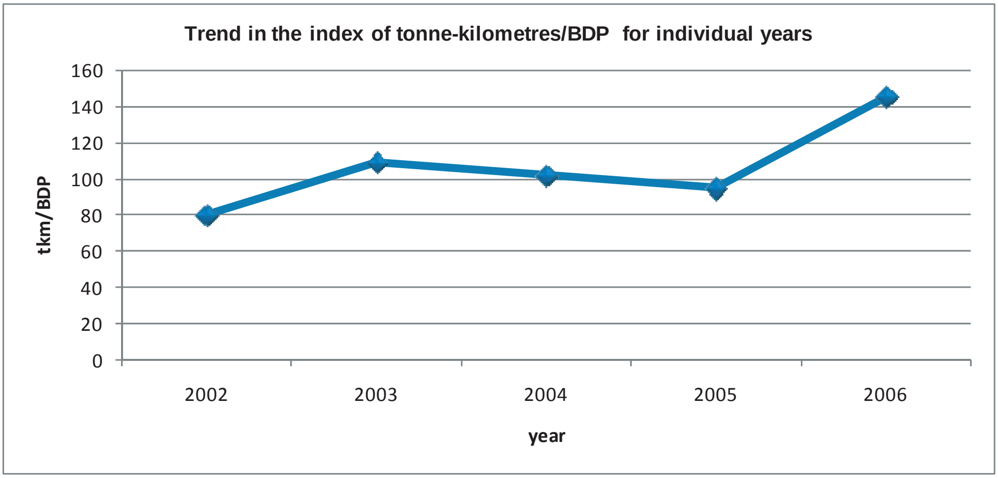
To measure decoupling of freight transport demand from economic growth, the volume of freight transport relative to GDP is used, including separate trends for its components. The decoupling indicator is defined as the ratio between tonne-km (inland transport) and GDP (in relation to EUROSTAT Gross Domestic Product in constant 1995 EUR). It will be indexed on year t-1 in order to be able to observe changes in the annual intensity of freight transport demand relative to economic growth.

Specific policy issue

Is the percentage of freight transport in road transport reduced compared to other transport modes?







Assessment

The trend in freight transport demand in tonne-kilometres by transport modes presented in Diagram 1, in the period from 2002 to 2006, noted continuous increase for the road freight transport almost identical at annual basis up to 2005, followed by rapid increase between 2005 and 2006. In the domain of railroad and air freight transport, there was almost no change in data at annual level and the trend remained constant without major notable variations.

Diagram 2 shows clearly that the freight transport was dominated by road transport ranging between 88.11 and 91.7 % presented by all analyzed years. Freight transport by railroad was in the range between 8.4 and 11.3 % of the total freight transport. This is sufficient indication that the indicator should attend to reduce the road transport in favour of other freight transport modes. The reason for this lies in the fact that the road freight transport consumes costly liquid fuels which during combustion on road cause significant pollution of environment, air, soil, biodiversity, etc.

Diagram 3 shows that the trend in the index of tonne-kilometres relative to BDP was rising from 2002 to 2003, followed by a period of falling up to 2005, and then noted rapid rise between 2005 and 2006.

The ratio is indexed for the year 2001=100 in order to monitor the changes in the intensity of freight transport demand relative to economic growth presented through BDP.

Methodology

- ### Methodology for the indicator calculation

In order to measure the decoupling of freight transport demand from economic growth, the volume (i.e. intensity) of freight transport relative to BDP is calculated. Relative decoupling occurs when the freight transport demand rises at rate lower than the one of the BDP. Absolute decoupling occurs when the freight transport demand falls while BDP rises or remains constant.

The unit used is the tonne-kilometre (tkm), which represents movement of one tonne over a distance of one kilometre. It is based on passenger transport by buses and coaches and trains. It includes road and railroad inland transport. Railroad inland transport is based on movements on national territory, regardless of the nationality of the vehicle. Road freight transport is based on all movements of vehicles registered in the country.

According to Regulation (EC) No 1172/98, data on road transport is based on all movements of vehicles registered in the reporting country. All other data on transport refer mainly to movements on national territory, regardless of the nationality of the vehicle.

- ### Sources of used methodology

Structural indicators of EUROSTAT on transport

State Statistical Office.

- ### Methodological uncertainty and data uncertainty

All data is based on movements on national territory, regardless of the nationality of the vehicle. Methodology of data collection has been harmonized at EU level, but there is still not data provided on the freight transport by road. Sources include EUROSTAT, National statistical offices, ECMT, UNECE, UIC, DG TREN.

In order to answer the question whether the freight transport demand is decoupling from economic growth, the intensity of freight transport relative to changes in real BDP is considered.

Uncertainty of data sets

The unit used to measure the volume or intensity of freight transport, as defined in the indicator, is the tonne-kilometre (tkm). It represents movement of one tonne over a distance of one kilometre. Data on the freight transport is collected through the Common Survey on transport statistics of EUROSTAT/ECMT/UNECE.

The loading of the vehicle is the key factor which plays a vital role in the assessment of whether there is decoupling of freight transport demand from BDP growth. In order to obtain full picture of transport demand and corresponding problems in the environment, it would be very useful to supplement data with data on the number of tonne-kilometers by vehicle-kilometre.

- Uncertainty of grounds

In the context of environment protection, it is important not to overlook the trends in the total freight transport volume. Real absolute values are of key importance for the understanding of the pressures on the environment originating from increased freight transport demand.

Data specification

Title of the indicator	Source	Reporting obligation
Freight transport demand	– State Statistical Office	

Data coverage (by years):

Table 1 Freight transport by modes in tonne-kilometers (in million km)

	2002	2003	2004	2005	2006
Road transport	2693	4130	4004	3930	6732
Railroad transport	334	373	426	530	614
Air transport	0,331	0	0	0,45	0,44

Table 2 Share in percentage of tonne-kilometres (in million km) of individual freight transport modes

%	2002	2003	2004	2005	2006
Road transport	88,95	91,7	90,4	88,11	91,6
Railroad transport	11,3	8,3	9,6	8,4	8,4
Air transport	1,05	0	0	0	0

Table 3 Ratio between tonne-kilometres and BDP

year	tkm	BDP	tkm/BDP
2002	3207	4005	80,07
2003	4503	4129	109,07
2004	4430	4355	101,73
2005	4460	4705	94,79
2006	7346	5069	144,92

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 036	**Freight transport demand**	CSI 036	Freight transport demand	**P**	**B**	Freight transport per kilometre BDP	Monthly Periodically Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2002 to 2006

Frequency of data collection:

Data is collected at monthly basis from regional departments, and processed and presented on annual basis, periodically and annually.

Data is prepared and processed in accordance with the methodology set in the Guide on transport statistics of EUROSTAT and regulations applicable for each transport mode.

Future activities

- Short-term activities

– Identification and definition of indicators in the area of transport that may show the state of transport demand in tonne-kilometre in the indicator of the freight transport demand.

a. Description of the activity

– The indicator of freight transport demand is calculated and presented based on data collected and processed by the State Statistical Office in the adequate format by specified methodology.

b. Required resources

– Engagement of national experts from governmental institutions with knowledge of the freight transport demand to take part in the indicator development.

c. Status

– Continuous activity -Deadline: 1 year

- Long-term activities

a. Description of the activity

– Activities concerning transposition of Directives of relevance for the transport, strategy for transport, plan for improvement of the transport performance.

b. Required resources

– No required resources have been identified.

c. Status

– In progress.

Deadline: 1 January 2099


HEALTH

MK - NI 042

AIR POLLUTION AND LEAD IN BLODD – LEAD LEVEL IN CHILDREN'S BLOOD

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Urban population is exposed at air pollution with lead. Lead is toxic to living beings, including humans. Contact with lead and its compounds and thus exposure to its harmful effect in a form of acute, sub acute and chronic poisoning is possible under various conditions. Non-occupational poisoning occurs under every day living conditions, through emissions released from lead smelters, motor traffic where engines use ethyl containing fuel or from other industrial facilities and craftsman workshops, as well as through transmission from soil in the nutrition chain or drinking water by intake in the organism usually by inhalation and ingestion. In the case of lead intake through food and water children are more sensitive than adults because the lead with them is resorbed up to 59%, while with adults this extent is 10%. In lead intake by inhalation, there is a difference due to respiratory volume amounting 20 m^3/day with adults and only 5 m^3/day with children, and absorption is around 40% with both population groups.

Behavioural and mental retardation problems have been evidenced with children exposed continuously to low concentrations of lead. As a result of the use of lead in water supply pipes, wide use of lead containing dyes, extensive use of petrol with tetraethyl lead and lead particles emissions from zinc and lead smelteries, the lead has become a common pollutant of the environment. When the level of lead in the blood of exposed population is above 15 mg/dl, certain measures for exposure reduction should be undertaken. Children exposed to lead have been proven to suffer from hemoglobin falling at lead level in the blood of 40 mg/dl. Examination of children aged 4 and older with lead levels in the blood below 25 mg/dl showed deficit by 2-3 points for IQ (intelligence coefficient), and at each further increase in lead level in the blood by 10 mg/dl, IQ falling by 2-3 points could be estimated. According to such estimates, the average IQ with lead non-exposed population is 100, while the average IQ with comparable population with 25 mg/dl lead in the blood is only 95.5.

Definition

This indicator tracks the exceedances of guideline values of lead level in children's blood in urban areas. The level of lead in the blood of children in the municipality, region or country is expressed as average value of individual concentrations of lead in the blood in micrograms/deciliters (μg/dl).

Excess in air quality limit values occurs when the concentration of pollutant exceeds the limit values specified for lead in the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term targets (Official Gazette of the Republic of Macedonia No. 50/20005).

Where there are several limit values (see the section on Policy goals), the indicator uses the most stringent case:

- Lead (Pb): annual limit value in ambient air
- Lead (Pb): level of lead in blood

Units

- Lead (Pb) concentrations in ambient air are expressed in micrograms/m^3.
- Lead level in the blood is expressed in micrograms/dl.

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan – NEAP 2 (2006) sets the improvement of air quality through reduction of basic pollutants emission as its main priority. The same document specifies two basic measures that need to be taken: to prepare national plan for ambient air protection and strengthen the ambient air quality monitoring and assessment process.

The 1999 National Environmental Health Action Plan identifies the goal of implementation of targeted epidemiological investigations of the health status primarily with vulnerable population groups in health risky areas (Lead and Zinc Smelter - Veles) in terms of air pollution (non-ferrous metallurgy).

Legal grounds

The Law on Environment regulates areas that have direct impact on the quality of air, i.e. should contribute to air emissions reduction. Thus, the Law regulates the issues of IPPC, EIA/ SEA, local environmental action plans and climate change.

The Law on Ambient Air Quality was adopted in August 2004 (Official Gazette of the Republic of Macedonia No. 67/2004) It was amended (Official Gazette of the Republic of Macedonia No. 92/2007) and represents framework law in the area of air. The goals of this Law include: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollutions leading to climate change, as well as provision of adequate information on the ambient air quality. This Law stipulates adoption of high number of bylaws in accordance with the requirements of the *Acquis Communitaire*.

The same Law, together with the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term targets (Official Gazette of the Republic of Macedonia No. 50/05) transposes the requirements of the relevant EU Directives.

To be more precise, the following EU Directives have been transposed in the Law and the Decree:

– Framework Air Quality Directive 96/62/EC on ambient air quality assessment and management
– Directive 1999/30/EC on limit values for sulfur dioxide, nitrogen dioxide and nitrogen oxides, suspended particulate matters and lead in ambient air.

The level of lead in ambient air and lead in the blood of exposed population are defined in the WHO Air Quality Guidelines of 1987 and 2000.

Targets

The Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term targets specifies the limit values for lead. The WHO Air Quality Guidelines define the guideline values for the lead concentration in ambient air and lead level in the blood of exposed population.

Limit values for the lead concentrations in ambient air and lead level in children's blood

According to the said Decree, with regard to lead the limit value for human health protection has been defined. The limit value should be achieved by 1 January 2012 in the vicinity of specific industrial sources located at places polluted by industrial activities.

– Annual limit value of 0.5 µg/m3 in ambient air.
– Lead level in children’s blood below 10 µg/dl.

Key policy issue

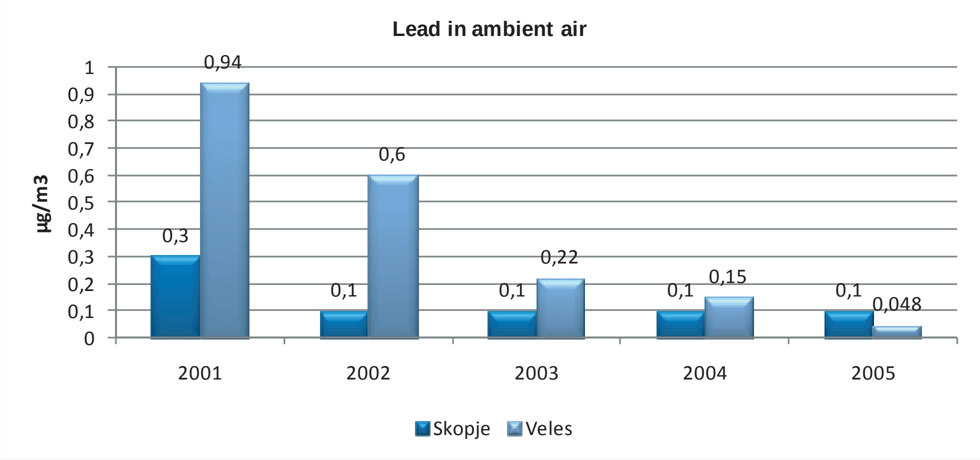
What progress has been made towards reduction of pollutants concentrations in urban environments in order to achieve the limit values for ambient air in urban environments defined in the Decree?

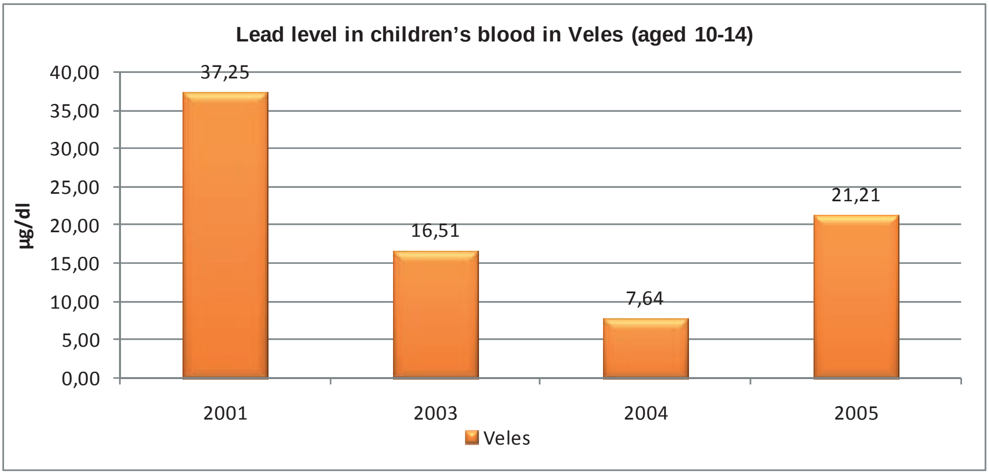
What progress has been made towards reduction of lead level in blood of vulnerable segment of the population, such as children in urban environments defined in the WHO Guidelines?

Key message

Lead - Pb

The lead concentrations have generally reduced since 2001 and excess in limit values of 0.5 µg/m3 in ambient air specified in the Decree has been recorded only in Veles; however, this has not been the case in Skopje with continuously low concentrations significantly below the limit values set for the lead in ambient air.





Assessment

Lead

The lead in the air most frequently originates from lead and zinc ores smelting. The occurrence of high lead concentrations in the ambient air in Veles in the period before 2003 resulted from the emissions released by Lead and Zinc Smelter in Veles.

High difference in lead concentrations in Veles measured in the period 2001-2002 was due to the emissions released by Lead and Zinc Smelter, while lead concentrations in ambient air decreased between 2003 and 2005 as a result of the terminated operation of the Smelter.

The level of lead in the blood of school aged children between 10 and 14 has been falling along with the improvement of the ambient air quality with regard to lead as air pollutant. In the period from 2001 to 2003, the level of blood with children in Veles was in excess of the levels recommended by the WHO. In 2004, when the Lead and Zinc Smelter was out of operation, the recorded levels of lead in school aged children's blood was below the guideline value of

WHO. In 2005, there was another increase in the level of lead in children's blood.

The graphical presentation shows the falling trend in lead concentrations in the ambient air in the period between 2001 and 2005.

The graphical presentation shows the falling trend in the levels of lead in children's blood in the period between 2001 and 2005.

Methodology

- Methodology for the indicator calculation

Lead in ambient air – Pb μg/m^3

For each station located in urban environment, annual lead concentration in ambient air annual limit value of 0,5 μg/m^3) is calculated using available 24 hourly data during entire year. Selected urban stations include stations of the following type: stations measuring the pollution from the traffic, stations measuring pollution from industry and so called urban background stations. The average concentration is obtained by averaging the results from all stations located in Veles. In Skopje, there is only one monitoring station with discontinued monitoring.

Lead in children's blood – Pb/blood μg/dl

Analysis is made on vein blood taken from school aged children between 10 and 14 in Veles and the individual levels of blood recorded have provided the average level of lead in the blood (Guideline value of WHO is below 10 μg/dl). Analysis is made to estimate the level of current exposure of children to lead in urban environment resulting from historical pollution (up to 2003) and pollution caused by traffic.

Data specification

Title of the indicator	Source	Reporting obligation
Excess in air quality limit values in urban areas	IHP Veles	– European Environmental Agency – Exchange of air quality data based on the Council Decision on the establishment of reciprocal exchange of information and data from all networks and individual ambient air quality measuring stations (97/101/EC).
Level of lead in children's blood	RIHP	– World Health Organization - ENHIS – Levels of lead in children's blood, according to WHO Air Quality Guidelines, 1987 and 2000.

Data coverage (by years):

Table 1: Average annual concentration of lead in ambient air (average annual value – 0.5 μg/m^3 in Macedonian urban environments

City	Unit	2001	2002	2003	2004	2005
Skopje	μg/m^3	0,3	0,1	0,1	0,1	0,1
Veles	μg/m^3	0,94	0,6	0,22	0,15	0,048

Source: PHI Republic Institute for Health Protection

Table 2: Level of lead in children's blood (Guideline value by WHO is 10 µg/dl)

City	Unit	2001	2003	2004	2005
Veles	µg/dl	37.25	16.51	7.64	21.21

Source: PHI Republic Institute for Health Protection

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 004	**Excess in air quality limit values in urban areas**	CSI 004 AP14	Exceedance of air quality limit values in urban areas	**S**	**A**	Air quality	Annually
MK NI 042	**Level of lead in children's blood**	ENHIS RP G4_Chem_ Ex1	Blood levels in children	**S**		Health	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2001 – 2005

Frequency of data collection: Data collection by the Public Health Institution (PHI) Institute for Health Protection – Skopje and Veles on ambient air quality with regard to lead concentration is performed on annual basis, sent via mail to the PHI Republic Institute for Health Protection – Skopje.

Data on the level of lead in children's blood is obtained on the basis of examinations conducted by the PHI Republic Institute for Health Protection – Skopje in cooperation with the Institute for Health Protection - Veles. Data on the level of lead in the blood is reported to ENHIS (European Environment and Health Information System).

Uncertainty

- Methodological uncertainty

Generally, data is not representative for the whole urban environment in the Republic of Macedonia. The indicator is subject to changes from year to year, conditioned by the operation of the Lead and Zinc Smelter in Veles. Compared to the defined methodology of the European Environmental Agency, where the indicator is calculated using data only from the so called urban background stations, in our indicator calculation we have used data on ambient air quality with regard to lead content produced by one measuring station in the Municipality of Centre in the City of Skopje, with monitoring of discontinuous type. Such monitoring has not been established in other cities of our country.

- Uncertainty of data

Data is generally not representative for the whole urban environment in the Republic of Macedonia. According to the defined methodology of the European Environmental Agency, only data series from monitoring stations with at least 75% coverage in the course of one year

shall be taken into account in the indicator calculation (or more than 274 valid daily data during one calendar year). In our case, this was not observed in the use of data from the monitoring station in Skopje. Representativeness of choice in the case of monitoring stations in Veles on ambient air quality with regard to lead content complies with the requirements of the EU Directive 1999/30/EC.

Future activities

- ### Short-term activities

– Definition of the national set of indicators of air quality and lead level in children's blood.

a. Description of the activity

– Establishment of work group concerning the indicators of air quality and lead level in children's blood.

b. Required resources

– Engagement of national experts from governmental institutions in the area of air quality and health assessment of the level of lead in children's blood.

c. Status

– Early initiative

Deadline: 1 year.

- ### Long-term activities

– Long-term activities will be defined by the work group.

MK – NI 043

MORTALITY DUE TO RESPIRATORY DISEASES (J00 - J99) WITH INFANTS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Environmental pollution, especially the presence of PM, ozone, nitrogen oxides and sulphur oxides in ambient air of indoor and outdoor environment is a proven factor of adverse impact on human health, specifically on bronchial tubes and respiratory pathways and organs. In this context, children are particularly vulnerable group and morbidity in correlation with air quality has been proven exactly with this population. According to the WHO Review of effects of air pollution on children's health and development (2005), there is a strong causal relationship between air pollution and mortality of respiratory diseases in neonatal period. Although infant mortality caused by respiratory diseases can be also linked with other pathological conditions or factors with infants, it is still used as indicator of environmental burden, i.e. air pollution.

Definition

The indicator shows mortality rate of respiratory diseases (J00 - J99) with infants. In this contents, infants are alive born children aged 1 to 12 months, respiratory diseases are acute or chronic condition of respiratory systems, including acute respiratory infections, bronchitis, pneumonia or influenza (J00—J99). According to data available from epidemiological studies, infants' mortality could be in correlation with the level of air pollution in the environment, along with series of other factors that can influence respiratory diseases mortality and morbidity. Therefore, the indicator is considered useful in the assessment of the load of diseases attributed to ambient air quality.

Units

– Number of deaths per 1000 alive born infants aged between 1 and 12 months.

Policy relevance of the indicator

List of relevant policy documents

The Second National Environmental Action Plan – NEAP 2 (2006) sets the improvement of air quality through reduction of basic pollutants emission as its main priority. The same document specifies two basic measures that need to be taken: to prepare national plan for ambient air protection and strengthen the ambient air quality monitoring and assessment process.

The 1999 National Environmental Health Action Plan identifies the goal of implementation of targeted epidemiological investigations of the health status primarily with vulnerable

population groups in health risky areas (Lead and Zinc Smelter - Veles) in terms of air pollution (non-ferrous metallurgy).

The National Children's Environment and Health Action Plan in which the current children's health profile in the country is presented, identifies the current environmental health risks to children from air pollution, indoors primarily passive tobacco smoking and outdoors, including the lead.

The Handbook – Planning to protect Children against hazards – The Regional Priority Goal III reads: We aim to prevent and reduce respiratory diseases due to outdoor and indoor air pollution thereby contributing to a reduction in the frequency of asthmatic attacks in order to ensure that children can live in an environment with clean air. We aim to achieve a substantial reduction in the morbidity and mortality from acute and chronic and respiratory disorders in children and adolescents."

Legal grounds

The Law on Environment regulates areas that have direct impact on the quality of air, i.e. should contribute to air emissions reduction. Thus, the Law regulates the issues of IPPC, EIA/SEA, local environmental action plans and climate change.

The Law on Ambient Air Quality – the principle of precautionary and accountable behaviour stipulates that: In the course of activities that may affect the quality of ambient air, everyone shall be obliged to behave in a careful and responsible manner in order to avoid and prevent ambient air pollution and harmful effects on human health and environment as a whole.

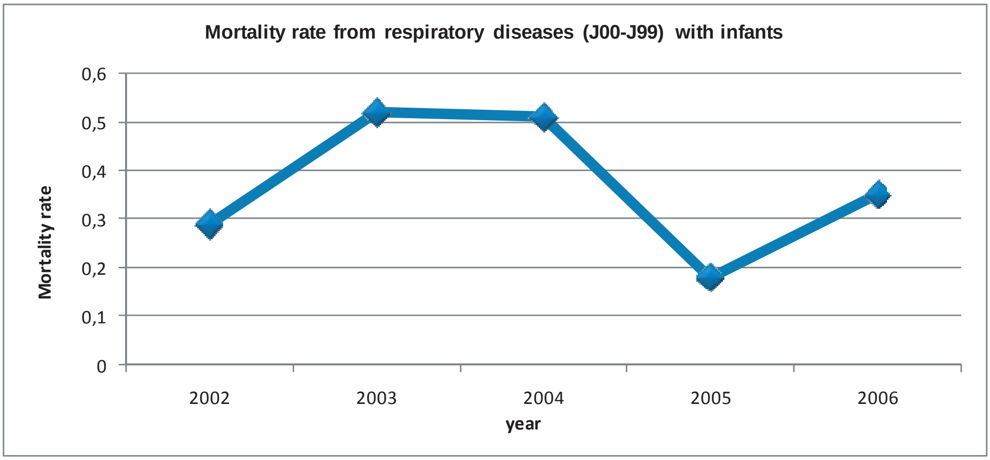
Targets

To reduce the mortality rate from respiratory diseases (J00 - J99) with infants. Or prevent the mortality rate increase.

Key policy issue

What steps have been taken to reduce or prevent the increase in the mortality rate from respiratory diseases (J00 - J99) with infants?

What cross-sectoral policies have been implemented so far in order to reduce respiratory morbidity and mortality with the general population and with infants in particular?



Key message

The mortality rate from **respiratory diseases (J00 - J99)** with infants, in the period 2002 – 2006, ranged between 0.18 and 0.52. The analysis of the trend indicates a variable state in the said period with an evident drop in 2005 which increased again the next year. The increased mortality rate with infants from respiratory diseases can be attributed to exposure at pollutants in the ambient air both indoors and outdoors, while the falling of the rate results from improved conditions and air quality. However, such significant changes in the levels of air pollution were not observed. Different criteria in diagnosis setting and reporting of death and causes leading to it may have had influence on this variable trend. Respiratory diseases with infants are not attributable only to air pollution, but also to biological and genetic factors of infants, presence of allergens, infective agents, nutrition, socio-economic factors and parents' educational background. In some developing countries, other congenital or gained diseases play an important role, such as HIV/AIDS and malaria – all these can have impact on the mortality rate.

The mortality rate is also dependent on the effectiveness of the health care system and availability of health services. Mortality rates from respiratory diseases in developed countries have remained stable for decades, and even reduction in mortality has been tracked despite of the rising morbidity rate.

The analysis of the causes for death with the general population for the period 2003 - 2005 concluded that respiratory diseases as cause for death with the general population held the fifth position with a rate between 3.9 and 3.4, while the rate of conditions appearing in the prenatal period was 1.0.

On the other hand, mortality rate with infants was 11.3 in 2003, 13.2 in 2004 and 12,8 in 2005,meaning that respiratory diseases in infancy had very low contribution to the total mortality of this population.

Methodology

- Methodology for the indicator calculation

The indicator of mortality from respiratory diseases (J00 - J99) with infants is calculated as a rate of infants died from respiratory diseases (J00 - J99) per 1000 infants aged from 1 to 12 months.

Data specification

Title of the indicator	Source	Reporting obligation
Mortality due to respiratory diseases (J00 - J99) with infants	– State Statistical Office	– Every doctor stating death is obliged to fill in the reporting list on the death event, stating the causes for the death and then such data is collected in the national database of the State Statistical Office

Data coverage (by years): 2002-2006

Table 1: Mortality rate due to respiratory diseases (J00 - J99) with infants

Year	2002	2003	2004	2005	2006
Mortality rate	0,29	0,52	0,51	0,18	0,35

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 043	**Mortality due to respiratory diseases (J00—J99) with infants**	ENHIS Air_E2	Mortality due to respiratory diseases	**C**		Air Health Traffic Local self-government	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2002 – 2006

Frequency of data collection: annually.

Future activities

■ Short-term activities

a. Description of the activity

– Comparable methods of information collection, classification, description and recording are important in order to facilitate comparisons of mortality. Rising quality and coverage of population by European registers of mortality establish solid basis for the future monitoring activities. National databases with comprehensive data on the overall mortality and specific mortality rates are of vital importance. An important co-indicator is the concentration of individual pollutants in the air, children living in humid homes, children exposed at tobacco smoke, accessibility of health care services, socio-economic data on the family.

b. Required resources

– Multi-sector team composed of national experts in the area of traffic, transport, education, medicine, building with regard to adequate planning solutions of the space, urban and rural development in the context of the public awareness rising and capacity building in relation to this issue.

c. Status

– Activities are underway.

Deadline: June 2008

MK – NI 044

ИINCIDENCE OF CHILDHOOD LEUKAEMIA

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

The causes of childhood leukaemia remain unknown in most of the cases. Certain number of causes and highly suspected risk factors has been identified, but reviews underline that they are responsible only for low number of cases. The known and highly suspected causes include genetic factors (2 – 3% of the cases are connected with Dawn syndrome), exposure to Epstein Barr virus (for certain types of childhood Hodgkin's lymphoma), intrauterine and after birth exposure to ionizing radiation. Infectious diseases may play a role in the aetiology of childhood leukaemia, especially acute lymphoblastic leukaemia (ALL). Delayed exposure to infection in early childhood could result in abnormal reaction leading to leukaemia development. Leukaemia could also be a rare reaction to specific, although not identified infectious agents.

Other risk factors, including environmental factors, have been less clearly identified. International Agency for Research on Cancer has concluded that extremely low frequency (ELF) magnetic fields are possibly carcinogenic to humans, based on consistent statistical associations of high-level residential magnetic fields with a doubling of risk of childhood leukaemia. Several studies have indicated that children exposed to certain dangerous chemicals (benzene, hazardous air pollutants) are at higher risk of childhood leukaemia, where benzene could be possible causal agent. Several works have demonstrated statistical relationship between the risk of childhood leukaemia and exposure to insecticides used in households on plants and green areas and in the lice shampoos.

There are different leukaemia types with different patterns of geographical distribution. Among children aged between 0 and 14 years app. 75% of leukaemia is classified as ALL; in developed countries, this includes 70% of pre B-cell type representing peak occurrence in early phases of life and explains the difference observed in the global standardized incidence of leukaemia between countries. Actually, ALL shows an incidence up to 40 cases per million in Western countries among white population, from 20 to 30 cases per million in Eastern European countries, but below 15 to 20 cases per million in sub-Saharan countries. Second most frequent type of childhood leukaemia is the acute myeloid leukaemia (AML), accounting for 20% of all cases of leukaemia and shows a remarkably stable worldwide incidence of 4-10 cases per million.

The Committee on the Medical Aspects of Radiation in the Environment (COMARE) has reported that the rates of many childhood cancers, including those of leukaemia, are slightly higher in areas with high socioeconomic status compared to more deprived areas. The reason for this is not known. The correlation could be relevant for the differences observed in the results between Eastern and Western countries obtained by ACCIS. Due to the insufficiently clear causal factors of leukaemia, policies for incidence reduction are difficult to formulate.

Definition

Incidence of leukaemia is the rate of new diagnosed cases of leukaemia defined by ICD-10 codes C90-95 in children aged 0 to 14 years.

Units

- Number of diagnosed cases of leukaemia per 100 000 persons aged 0 to 14 years.

Policy relevance of the indicator

List of relevant policy documents

Leukaemia is often discussed when environmental issues and childhood diseases are considered. The causes of the majority of cases are, however, unknown. As a result, there is a lack both of policies aiming directly at reducing the incidence of leukaemia and of major programmes fostering research into the potential risk factors for leukaemia in Europe.

The new Regulation of the European Parliament and the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) is of relevance. It considers that the carcinogenicity, mutagenic and reproductive toxicity of chemical industrial substances are priority criteria when they are submitted to security constraints and declarations authorizing their use. The target of REACH is to substitute progressively substances that are known to be safer for most carcinogenic, mutagenic and toxic industrial substances. Of further relevance is Council Directive 97/43/EURATOM, which aims to protect patients from excessive exposure to radiation for medical use and ensure that there is minimum exposure during pregnancy and early childhood.

The Second National Environmental Action Plan - NEAP 2 (2006), as its main goal, sets the achievement of environmental quality by which concentrations of pollutants will not lead to significant impacts or risks to human health, establishment of effective system of prevention, control and assessment of health risks in accordance with the requirements of the national and EU legislation, as well as with WHO recommendations, through taking the specific measure of NEHAP review and further implementation, with particular accent on the risks to children's health.

The 1999 National Environmental Health Action Plan, in its section on ionising and non-ionising radiation, specifies the priorities and specific activities that need to be undertaken to reduce negative impacts from these radiations on human health.

Legal grounds

The provisions of Article 89 of the **Law on Chemicals**, section on Overall human health and environment protection, provide legal grounds for the Minister of Health and the Minister of Environment and Physical Planning to order temporary prohibition or restriction of production, distribution or use of hazardous chemicals in case of suspicion that they are harmful for human health and environment.

The Law on Ionising Radiation incorporates provisions concerning the protection of the population against ionising radiation. The legal person causing ionising radiation, in case of caused release of radioactive substances in the environment, and consequently adverse impacts on human health, shall compensate the damage.

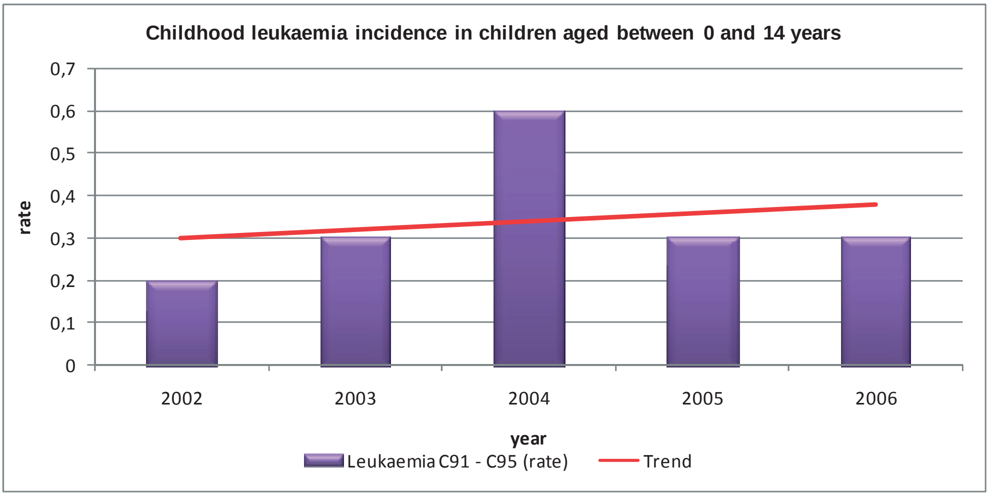
The Law on Non-Ionising Radiation is under drafting and it has been scheduled for adoption by the end of 2008. The draft of this law incorporates provisions concerning particularly the protection of children population against non-ionising radiation during their stay at school, pre-school institutions and hospitals.

Targets

To reduce leukaemia incidence in children aged 0 to 14.

Key policy issue

What progress has been made to reduce the incidence of childhood leukaemia?



Key message

The incidence of childhood leukaemia shows a stable trend in the reporting period 2001-2005, with a peak of the incidence in 2004. During the past several years, environmental management capacity in the Republic of Macedonia has been strengthened in order to reduce exposure to certain agents and thus improve the health of the population.

Assessment

The indicator uses data from the national register of malignant diseases for the period 2001 - 2005. The indicator is based on data on children aged 0 - 14 years.

Considering the fact that causal factors of leukaemia are not clear, policies to reduce incidence are difficult to formulate or have limited effects. For example, policies to reduce exposure to

ionising or electromagnetic radiation potentially prevent only a small portion of leukaemia cases. Therefore, it is necessary to undertake further coordinated research into environmental impacts on leukaemia and environmental/genetic interactions. It is particularly important to monitor childhood leukaemia. National registers with continual follow-up that employ standardized or comparable methods should be universal.

In the context of public health, leukaemia related mortality is an important co-indicator for assessment of the quality of health care system.

Methodology

- Methodology for the indicator calculation

National estimates of incidence rates are standardized to world standard population aged 0 – 14 years: number of new cases per 100 000 person-years.

Data specification

Title of the indicator	Source	Reporting obligation
Incidence of childhood leukaemia in children aged 0 - 14 years	– National Register of malignant diseases	– Every doctor establishing diagnosis of leukaemia is obliged to fill in the reporting list on the malignant disease, and then such data is delivered to Regional Institutes for Health Protection, further delivered to the Republic Institute for Health Protection

Data coverage (by years):

Table 1: Childhood leukaemia incidence in children aged 0-14 years

	2002	2003	2004	2005	2006
Leukaemia C91 - C95 (rate)	0,2	0,3	0,6	0,3	0,3

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 044	Incidence of childhood leukaemia	ENHIS RPG4_Rad_E1	Incidence of childhood leukaemia	**S**		Health Waste Consumption of radioactive preparations	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2001 - 2005

Frequency of data collection: annual

Future activities

- Short-term activities

a. Description of the activity

– Comparable methods for information collection, classification, description and registration are important in order to enable comparisons of leukaemia incidence and mortality. Rising quality and coverage of the population by European cancer registers establish solid basis for the future monitoring activities. National registers with comprehensive data on leukaemia are of vital importance.

b. Required resources

– Improvement of human and technical resources for leukaemia diagnostics and treatment. Introduction of measures to reduce exposure to ionising and non-ionising radiations, adequate waste disposal to reduce environmental burden and population exposure accordingly.

c. Status

– Activities are in progress.

Deadline: June 2008.

MK – NI 045

INCIDENCE OF MELANOMA IN PEOPLE AGED UNDER 55 YEARS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Melanoma is a malignant transformation of pigment cells (melanocites) in the skin. Most of the melanomas seem to be caused by acute, irregular and excessive exposure to the sun, mainly during childhood, although exposure in adult age also contributes to increased risk factor for melanoma. The light skin prototype (types I and II), high number of birthmarks or atypical and family history of skin cancer are the most frequent predictors of risk for melanoma.

Melanomas occurring in those aged under 55 years seem to be strongly linked to exposure to UV radiation in childhood. These melanomas are often localized on the body trunk (males) and on the legs (females). The fact that melanoma in the elderly occur on the most chronically exposed parts of the body illustrates that chronic exposure is more important for melanomas occurring among elderly people. Melanoma is more frequent among people in the higher socioeconomic layers and among northern European populations. This is probably due to their higher excessive intermittent exposure to UV radiation in combination with a light skin prototype.

The main way to prevent melanoma is to advise people to limit their exposure to the sun by avoiding such exposure during the hours of the day when UV radiation is most intense (approximately two hours each side of the solar noon) and to wear appropriate clothes, hats and sun-glasses. Special attention needs to be paid to children. The use of sunscreen preparations may help to prevent sunburn and skin cancer but may also lead to increased exposure to the sun. Survival is strongly linked to the stage of the disease at diagnosis, which provides a rationale for considering organized screening programmes for melanoma. Since the incidence of melanoma is expected to keep increasing in the future, early detection remains an important strategy to combat the disease. Prevention campaigns carried out in north-western European countries since the 1980s have probably resulted in a decrease in the average thickness of melanomas and stabilization in melanoma mortality in young people.

Definition

The incidence of melanoma in people aged under 55 years is the number of detected cases during one year expressed per 100 000 residents of selected population.

The incidence is obtained by calculating the number of cases on the mean population size during the period considered. The age-standardized rate is calculated using the age groups. The age group considered here are those aged 0–54 years.

Units

– number of cases per 100 000 person-years.

Policy relevance of the indicator

List of relevant policy documents

Melanoma is strongly linked with exposure to UV radiation during childhood and is therefore largely preventable. WHO has launched the INTERSUN Global UV Project to stress the importance of increasing awareness and knowledge about the potential negative health effects of exposure to UV radiation, especially during childhood. This information should be readily available through various channels such as television, radio, campaigns, meteorological websites and in schools. Representatives of the tourism industry can also play a crucial role in minimizing the risks associated with exposure to the sun by disseminating information to their customers and by taking essential measures in tourism facilities and services. A UV radiation index can help to identify appropriate action based on the measured UV radiation levels. Furthermore, the use of sunbeds by children should be strongly discouraged, if not forbidden. The INTERSUN Project recommendations can serve as a framework for an action plan to reduce exposure to UV radiation.

Nevertheless, there are at present few official regulations in most European countries on policies to reduce excessive exposure of children to UV radiation. There are thus major opportunities for developing policy as well as for harmonizing and strengthening efforts to reduce such exposure. National policies to reduce exposure to artificial UV radiation, including regulations for the use of sunbeds by children and teenagers should be implemented in more countries in the WHO European Region.

Excessive exposure to solar UV radiation can best be prevented by regional and local awareness-raising and information campaigns, especially in educational institutions. The aim is to encourage schoolchildren to take measures to protect themselves against the sun.

The Second National Environmental Action Plan - NEAP 2 (2006), in its part on non-ionising radiation, specifies the main targets and measures towards the establishment of effective system of environment protection and control against harmful effects of non-ionising radiation in the Republic of Macedonia.

The 1999 National Environmental Health Action Plan, in its section on non-ionising radiation, specifies the priorities and specific activities that need to be undertaken to reduce negative impacts from this radiation on human health.

The National Strategy for Climate Change, in its part 6.6. Health, provides an overview of climate change impacts on human health.

Targets

To reduce the incidence of melanoma through implementation of cross-sectoral policies aimed at public awareness increase and improved education of the population.

Key policy issue

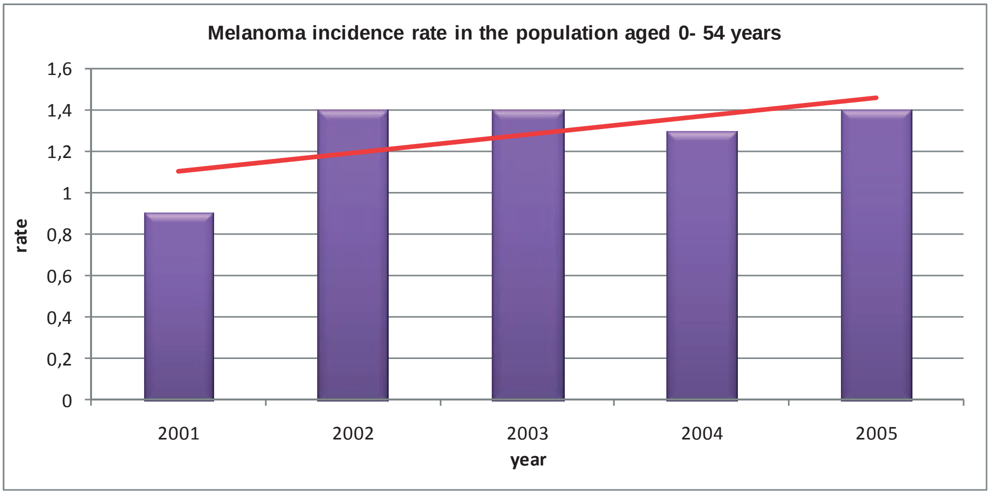
What steps have been taken to prevent the rising trend of melanoma?

What cross-sectoral policies have been implemented so far to reduce the exposure of the general population and especially children, as it seems that the latter population is the most sensitive and exposure during this period of life leads to consequences in later age?

Key message

The analysis of the incidence of melanoma over five year period shows significant rising trend in the 2001-2002 period, which is then retained, but with increased incidence rate. The rising trend is an alarm for taking preventive measures, i.e. protecting the population against UV radiation.

The incidence of melanoma skin cancer in people aged under the age of 55 years in Europe varies considerably between countries. The highest incidence rates are found in northern and western countries and the lowest in southern countries, with rates from three to eight times lower for men and women, respectively. In eastern European countries the incidence rates are low to intermediate. These variations are likely to be linked to specific behaviour (winter holidays, sun-seeking behaviour) as well as to improved diagnoses resulting from better detection of melanoma.



Assessment

The incidence of melanoma ranges between rates of 0.9 in 2001, retained at 1.4 during the follow-up years, which means that it tracks an increasing trend.

Melanoma is one of the cancers with the fastest rates of increase among people in Europe, and this trend has been observed in our country, too. Trends in rates differ between regions: in northern Europe where the rates are high, they appear to have levelled off since the 1990s, particularly among people aged less than 55 years. This seems to be the result of a change in sun-seeking and protective behaviour against UV radiation among the younger generations. In

contrast, in southern and eastern

Europe, as a Region where the Republic of Macedonia belongs, the rates are generally still increasing steeply in all age groups.

The main way to prevent melanoma is to advise people to limit their exposure to the sun. Thus, the national policy should pay greater attention to the prevention of over-exposure to UV radiation during childhood, in observation of recommendations of expert literature and scientific research evidence. This policy approach is supported by the experiences from western European countries. The stagnation, as of 1990s, in previously rising trends in northern Europe among people aged under 55 years supports the conclusion that specific protective activities against UV radiation in these countries have proven effective.

Methodology

- Methodology for the indicator calculation

The incidence of melanoma in people aged under 55 years is calculated as the number of new diagnosed cases of melanoma during one year per 100 000 residents.

Data specification

Title of the indicator	Source	Reporting obligation
Incidence of melanoma in people aged under 55 years	– National Register of malignant diseases	– Every doctor establishing diagnosis of melanoma is obliged to fill in the reporting list on the malignant disease, and then such data is delivered to Regional Institutes for Health Protection, further delivered to the

Data coverage (by years):

Table 1 Incidence rate of melanoma in population aged 0 - 54 years, 2001 - 2005

Year	2001	2002	2003	2004	2005
rate	0,9	1,4	1,4	1,3	1,4

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 045	Incidence of melanoma in people aged under 55 years	ENHIS RPG4_U vrd_E1	Incidence of melanoma in people aged under 55 years	**S**		Health Climate change Tourism	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2001 - 2005

Frequency of data collection: annual.

Future activities

■ Short-term activities

a. Description of the activity

– Comparable methods of collection, classification, description and registration of information are important to allow comparisons of melanoma incidence and mortality. The increasing quality and population coverage of European cancer registries are good bases for future monitoring efforts. Complete national data registries for melanoma are of crucial importance. Estimates of mortality from melanoma are an important co-indicator, since melanoma prognosis is strongly correlated with the type of the tumour at diagnosis.

b. Required resources

– Multi-sectoral team composed of national experts in the fields of medicine, environmental health, education, tourism, finance, etc., in order to develop a long-term project aimed at public awareness increase and capacity building with regard to this issue.

c. Status

– Activities concerning diagnosis, recording, data delivery and strengthening the national register of malignant diseases are in progress, as this risk presents a challenge to public health.

– With regard to public education aimed at awareness increase, activities have been undertaking starting in primary education, through daily information via media. Republic of Macedonia, as southern European country, has many sunny days during the year and hot waves during summer season. Thus, HMA informs the citizens on daily basis via the media on the value of UV index. At days with exceptionally high values of UV Index, the RIHP and Ministry of Health address population with information including recommendations for the behaviour in such conditions.

Deadline: June 2008

■ Long-term activities

a. Description of the activity

– Preparation of Strategy for protection against UV radiation and reduction of melanoma incidence, to elaborate in detail all long-term activities and stakeholders to take part in its implementation. Multidisciplinary approach should be the ground for the development and implementation of this strategy.

– Targets to be established in this strategy should take a prominent place in the development of future NEHAPs.

– Capacity building and promotion campaigns on the meaning of UV radiation and its UV Index value, the impact of UV radiation on ecosystems, effects on human health and especially adverse health effects. Protection and prevention measures with regard to adverse health effects.

b. Required resources

– Multi-sector team composed of national experts in the area of traffic, transport, education, medicine, building with regard to adequate planning solutions of the space, urban and rural development in the context of the public awareness rising and capacity building in relation to this issue.

Deadline: December 2010.

MK – NI 046

MORTALITY FROM TRAFFIC ACCIDSENTS WITH CHILDREN AND YOUNG PEOPLE

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Traffic injuries are leading cause of death for children and young people in the European Region and mortality rates are unacceptably high, recording differences which in certain areas reach as much as eight times. On the other side, intervention measures in certain countries indicate however that injuries attributable to traffic accidents and deaths related to them are preventable, i.e. their rate can be easily be reduced. All this indicates that there is an urgent need to implement safety policies in transport and strategies for injuries prevention. Children and young people constitute a vulnerable group with regard to traffic accidents due to their different psychological and physical features compared to adults. Children under the age of 10 years have limited ability to get along with traffic and thus they are exposed at higher risk in conditions of dense overcrowded traffic, restricted and lower visibility, reduced prediction of the outcome of situations, etc. The risk is further increased when drivers fail to focus on cyclists or pedestrians. In case of accident, children are particularly vulnerable, as their head/torso proportion increases the risk of head injury, and their tallness increases the probability that vital bodily organs are injured in accidents. Traffic accidents lead to post-trauma stress with almost 33% of children, and all this in combination with their risky behaviour, limited experience in traffic and higher sensitivity at alcohol increase their vulnerability.

Environmental conditions contribute significantly to traffic accidents, with attributive fraction being assessed at 25% in European Region. It has been assessed that as much as 35% of traffic accidents is due to environmental conditions, especially to urban planning policies and practice, roads design, traffic congestion and density of population, as well as number of motor vehicles.

Definition

The indicator shows the mortality rate from traffic accidents for children aged 0 - 14 years and young people aged 15 - 24, the trend in a given period and comparison of data on European Region and policy relevance related thereto.

Units

– Number of deaths per 100 000 children aged 0 - 14 years or per 100 000 young people aged 15 - 24 years, respectively.

Policy relevance of the indicator

List of relevant policy documents

The National Children and Environment Protection Action Plan which presents the current health profile of children in the country defines the existing environmental health risks for children for the purpose of their protection against accidents and trauma.

The Guidebook - Planning of Children's Protection against Hazards – Regional Priority Goal II reads: "We aim to prevent and significantly reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure, and supportive human settlements for all children".

Legal grounds

The Law on Traffic Safety at Roads - This Law regulates the safety and protection on roads; obligations in case of traffic accident; conditions for acquiring the right to drive a vehicle; candidates training for drivers; driving examination taking and checking of driver's ability; checking of vehicles, devices and equipment that are compulsory for the vehicles; dimensions, total mass; axial loading of vehicles and conditions that shall be met by vehicles in traffic; technical check-ups of vehicles; special safety measures; organization and tasks of the safety at roads councils, as well as misdemeanour sanctions and misdemeanour procedure administered with regard to misdemeanours in the field of traffic at road.

Targets

To reduce the mortality rate from traffic accidents with children and young people populations through appropriate intervention programmes, i.e. to prevent the mortality rate increase.

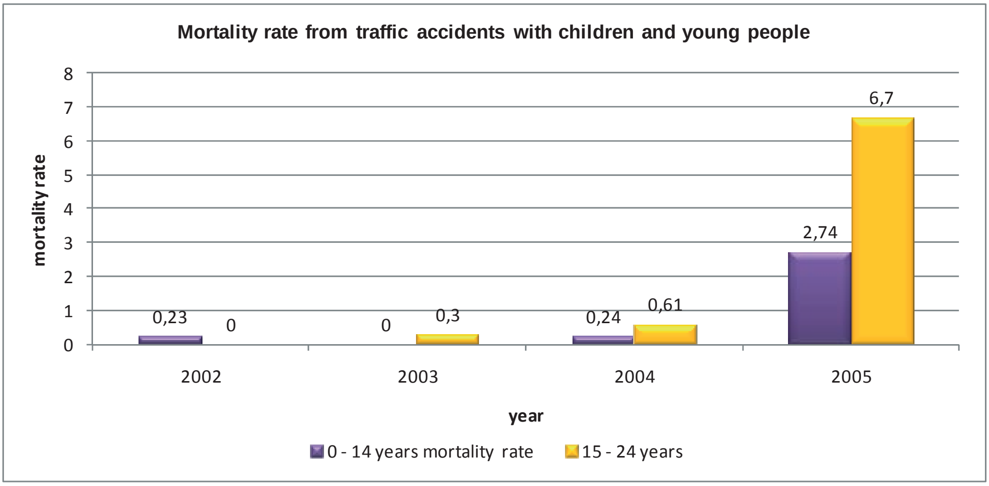
Key policy issue

What steps have been taken to reduce the mortality rate from traffic accidents with vulnerable groups like children and young people or prevent its increase?

What cross-sectoral policies have been implemented to reduce the number of traffic accidents for the general population and especially children population, as it appears that this population is the most sensitive and exposure in childhood results in consequences at later age?

Key message

The mortality rate for children aged 0 - 14 years and young people aged 15 - 24 years was low during 2002 - 2004, ranging between 0 and 0.24 for children and 0 to 0.61 for young people. The rate is relatively low compared to specific mortality rates in other European countries like Greece, Spain, France, Germany. However, there was a rapid increase in 2005, tracking as high as 10 times higher rate, namely 2.74 for children aged 0 - 14 years and 6.7 for young people aged 15 - 24 years. The rapid increase in 2005 could reflect the improved system of reporting of causes of death. Nevertheless, this growth could be a fact indicating the need for introduction of intervention programmes as part of cross-sectoral policies.



Methodology

- Methodology for the indicator calculation

The indicator mortality from traffic accidents (800 and 848) is calculated as rate of deaths attributable to traffic accidents involving persons aged 0 - 14 years and aged 15 - 24 years per 100 000 residents from among the said age groups.

Data specification

Title of the indicator	Source	Reporting obligation
Mortality from traffic accidents in children and young people	– State Statistical Office	– Every doctor stating death is obliged to fill in the reporting list on the death event, stating the causes for the death and then such data is collected in the national database of the State Statistical Office

Data coverage (by years):

Table 1 Mortality from traffic accidents in children aged 0 - 14 years and young people aged 15 - 24 years

	0 - 14 years	15 - 24 years
	Mortality rate	
2002	0,23	0
2003	0	0,30
2004	0,24	0,61
2005	2,74	6,70

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 046	Mortality from traffic accidents in children and young people	ENHIS Traf_E1	Mortality from traffic accidents	**S**	A	Health Transport Local self-government Physical planning	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2001 - 2005

Frequency of data collection: annual.

Future activities

- Short-term activities

a. Description of the activity

– Comparable methods of information collection, classification, description and recording are important in order to facilitate comparisons of mortality. Rising quality and coverage of population by European registers of mortality establish solid basis for the future monitoring activities. National databases with comprehensive data on the overall mortality and specific mortality rates are of vital importance. An important co-indicator is the rate of injuries caused by traffic accidents, considering the fact that the mortality rate is in close correlation with the injuries rate.

b. Required resources

– Multi-sector team composed of national experts in the area of traffic, transport, education, medicine, building with regard to adequate planning solutions of the space, urban and rural development in the context of the public awareness rising and capacity building in relation to this issue.

c. Status

– Activities are underway.

Deadline: June 2008

TOURISM

MK – NI 047

TOURISM INTENSITY IN THE REPUBLIC OF MACEDONIA

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

Justification for the selection of tourism indicators should be seen in the fact that tourism is social, economic and significant spatial phenomenon. This means that tourism is in close correlation with the environment.

The above correlation can be identified in its incentive interdependence on the environment. Cases of environmental degradation and devastation, absence of innate environmental elements in the place of permanent residence and contradiction between emitting and attractive environment are among the main reasons for involvement of the local population in tourist activity.

The attractiveness of the environment is the leading reason for tourists visit and stay. The extent of visits and stays appears as indicator of environment attractiveness. Attractiveness without tourists interest would remain only potential value of the environment.

Development of tourism assumes sustainable use of environmental elements. This means that the basis of tourism development should also constitute environment protection. However, tourism development often leads to threats to stability of ecosystems and authentic characteristics of the space due to enormous and inadequate building of reception facilities and improper attitudes of visitors towards the environment.

Tourist indicators as tourist visits and stay through the intensity, structure and dynamics of development are suitable for monitoring as data is available and official.

1.1 International tourist intensity

Justification for the selection of the indicator of international tourist visits is based on the fact that higher extent of international visits reflects the environment as an environment of international importance. Advanced experience of foreign tourists implies greater attractiveness for visits. The intensity of visits should be analyzed by registered tourists in catering establishments, through transport, registration by interview and data on regional distribution.

1.2 Foreign tourist stay

Foreign tourists with their stay indicate the level to which the environment has been adapted to their demands. In this way, the trend of attractiveness at international level will be assessed.

1.3 National tourist intensity

This indicator shows the level of interest demonstrated by national tourists for visits and stay in

tourist areas. In this way it also indicates the ratio between stay and visits in terms of length of stay, reflecting the achievement of environment adaptation to the demands of tourists.

Definition

The indicator shows:

1.1 International tourist intensity

The total number of foreign tourists by years shows the development dimension. Using the growth rate, the extent to which the attractiveness of the environment as receptive environment will be utilized may be estimated, the needs for expansion of accommodation and other reception establishments may be defined. In this context, the expansion of attractive substance in receptive environment can be defined in terms of foreign tourist visits.

The number of foreign tourists by month determines the seasonal concentration. This indicator supports the determination of activities and measures by which appropriate supply should be offered in the period of seasonal concentration in order to prevent disruption of environmental balance while satisfying tourist demands of foreign visitors.

The structure of visitors by country of origin determines the emitting spatial zones. Monitoring of the trends in the level of visits provides the opportunity for regional adaptation of the elements of environment as tourist supply of the receptive space to tourist consumption.

1.2 Overnights of foreign tourists

The total number of overnights of foreign tourists in the Republic of Macedonia by years has had a varying trend, marking growing or dropping of overnights by years for certain temporal period.

The total number of overnights of foreign tourists by years reflects the attractiveness and satisfaction of tourists with the stay in receptive environment as development dimension. This is the way by which both positive and obstructive undertakings in this context can be observed by years.

The stay acquired by months enables to assess the stay in seasonal terms and determine the activities in that regard.

The structure of realized overnights by country of origin enables to assess the acceptability of attractive properties of environmental elements in certain emitting environments and monitor the development in that context.

The average stay of foreign tourists expresses the ratio between the realized overnights and the number of tourists. Monitoring of these indicators enables the progress in the satisfaction of tourists in the receptive country with the visit to be observed, which facilitates justified approach to tourist supply improvement with reference to foreign tourist market.

1.3 National tourists intensity

National tourist intensity reflects the aspiration of domestic tourists towards the environment and its properties. The growth in the number of national visitors assumes that the receptive and attractive resources are affordable to national tourists.

Regional distribution within national tourist industry shows the level of attractiveness and receptiveness of individual tourist regional target areas as distinct environments.

The indicated stay of national tourists expresses the ratio between realized overnights and number of tourists. Monitoring of this data enables to determine the progress in the satisfaction of tourists with the visit in receptive environment, which facilitates justified approach to tourist supply improvement with reference to national tourist market.

Units

- Number, intensity and structure.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2008 - 2012**
- **National Environmental Action Plan - 2** - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
- **Spatial Plan of the Republic of Macedonia** – in its Chapter 5.4. "Tourism development and organization of tourist areas", defines the objectives and planning determinations for tourism development.
- **National Strategy for Sustainable Development of the Republic of Macedonia** – in the section on tourism, presents the directions for sustainable development of tourism, within short, medium, and long-term frames, up to 2030.
- **Strategy for Biological Diversity Protection in the Republic of Macedonia with Action Plan** – under measure C.5 "Stimulation of traditional use of biological diversity and eco-tourism", defines the action for identification of sites suitable for eco -tourism.

Legal grounds

The Law on Tourist Activity ("Official Gazette of the Republic of Macedonia" No. 62/2004) specifies the conditions and the manner of performing tourist activity (Chapter 15 Services in rural, ethno and eco-tourism, Article 51).

The Law on Environment, the Law on Nature Protection, the Law on Waste Management, the Law on Ambient Air Quality and the aw on Waters regulate partially the requirements for environmental protection in tourist activity.

Targets

- Integration of the principles of sustainable development and environmental considerations in tourist sector
- Identification of areas of priority importance for tourism development
- Encouragement of exchange of best practices between public and private tourist interests
- Protection of natural heritage and biological diversity in tourist destinations

- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environment
- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.
- Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

Key policy issue

1. What is the impact of tourism on the environment?

Tourism is a development factor with regard to phenomena and interactions in the environment, both in economic and non-economic activities. Tourism is not a product of natural and anthropogenic impact of environmental elements, but it is a significant transformer of the environment. The impacts of tourism on the environment may be systematized in all domains of tourist industry. In the domain of emitting environment, tourism appears as environment transformer in a form of numerous billboards, illuminated advertisements, and shop windows. In the communication domain, transportation means for tourist purposes are employed, such as railways, cable railways, abandoned trains and cars, even trunks, advertisements on by-road billboards and transportation means. New properties are introduced in the attractive-reception environment. Mountains obtain skiing terrains and view platforms, hunting is related to drinking and feeding places and observatories, shores contain well arranged beaches, parter and horticultural substances, interior and exterior developments are present, rural areas are adapted to receive tourists, the space is planned for infrastructure and communal services, and commercial network undergoes evolution and turns into tourist merchandise profile through sales of souvenirs and articles for tourist activities.

2. Does the increased number of tourists make enhanced pressure on the environment?

Increased number of tourists should not by itself imply enhanced pressure on the environment. Such pressure occurs in conditions of weak organization. In such conditions, the increased number of tourists may cause confrontations and misunderstandings among stakeholders involved in tourist industry, insufficient observation of traffic regulations, lack of care for public hygiene, non-observation of the code of conduct in tourist resort, robberies and destruction of nature and artifacts and sociofacts, criminogene conduct in terms of dealings with drugs, alcohol, prostitution, violations and other types of crime.

Development of tourism and increased number of tourists are accompanied by building activities that are not in accordance with the regulations and in harmony with authentic features of natural values.

Specific policy issue

What is the contribution of tourism in pollutants emission?

Increased number of tourists in communication and receptive-attractive environment, the length of stay and activities they perform can contribute significantly to the emission of pollutants resulting in pollution. Pollution can take the following forms:

- exhaust gases of transportation means to move through the space;

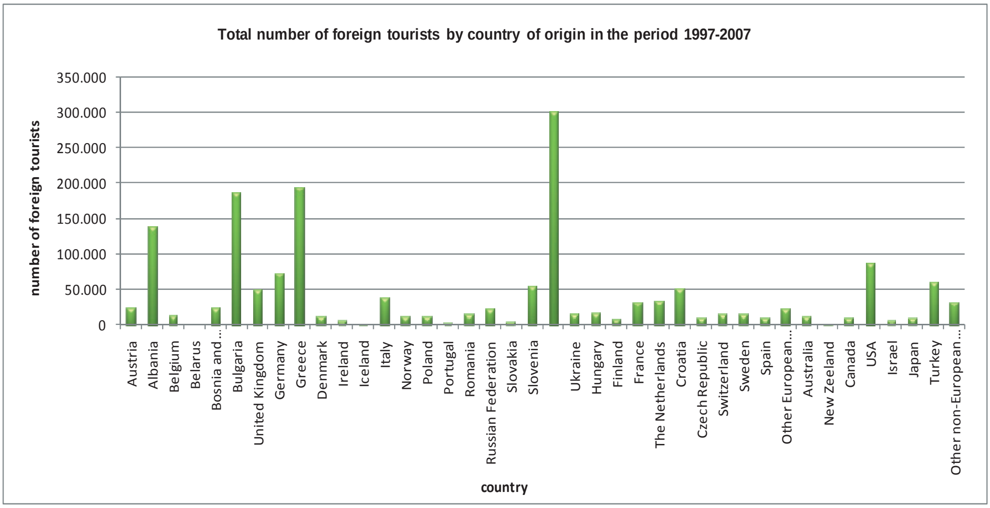
- enhanced intensity and inadequate structure of accommodation establishments, as well as increased number of visitors and overnights lead to increased amounts of:
  - wastewater;
  - solid waste;
  - dust and
  - smoke
- use of water resources for bathing assumes modification of the chemical composition and introduction of biological agents;
- increased use of freon containing appliances causes not only change in atmospheric relations in the local environment, but also global change.
- use of water resources by motor driven vessels leads not only to higher exhaust gases emission, but also higher discharge of fuel and maintenance products;
- enhanced intensity and inadequate structure of accommodation establishments and overnights result in increased level of smoke in the air;
- increased level of smoke can also come from barbeques and certain tourist animation activities.

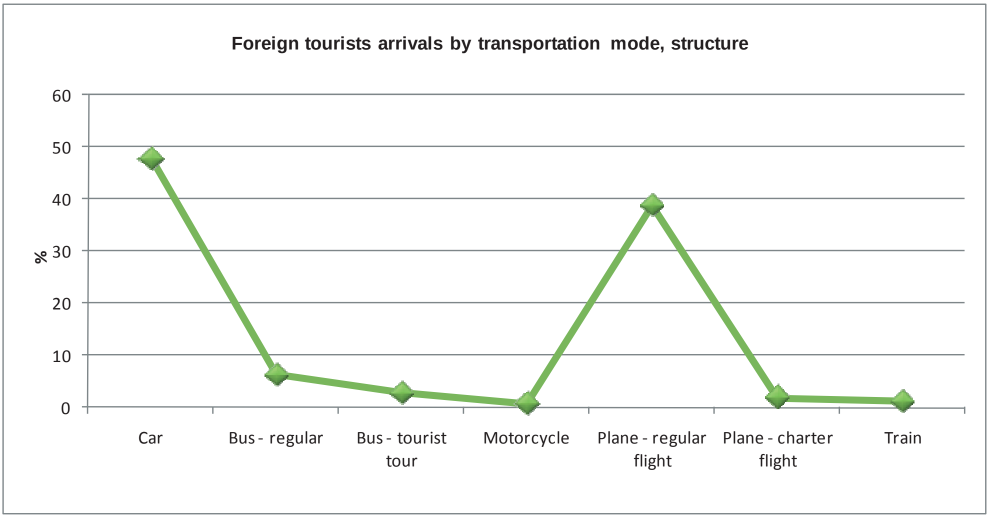
Key message

Data and information provided by this indicator show that there have been no significant achievements in development. Stagnation in terms of tourist visits, stay, intensity and quality of accommodation establishments has been evident throughout the period from the independence of the Republic of Macedonia to the last analyzed year. During this period, the levels of 1999 and 2000 have not been reached. Nevertheless, the problems of pollution have not been settled.

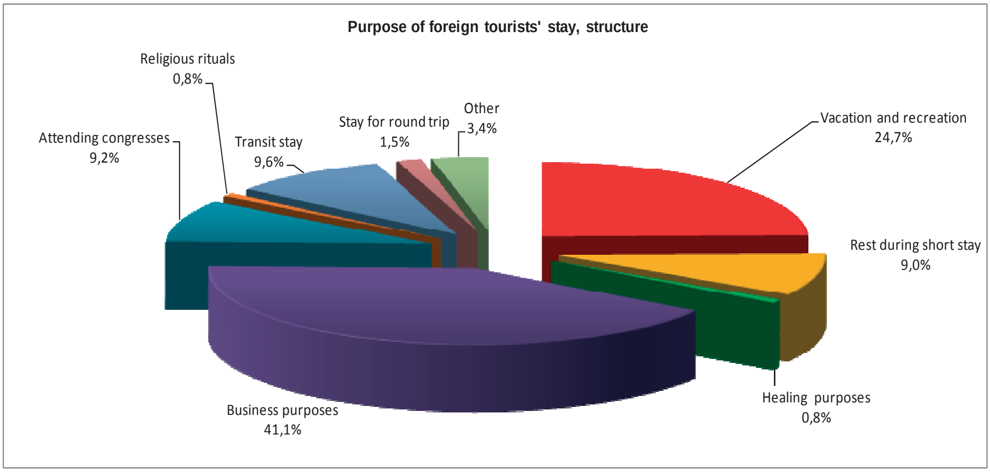
Considering the fact that tourism is organized activity, monitoring of these indicators is necessary and so are the actions of all stakeholders for the purpose of environment protection and improvement through timely interventions and planned activities.

1.1 International tourist intensity

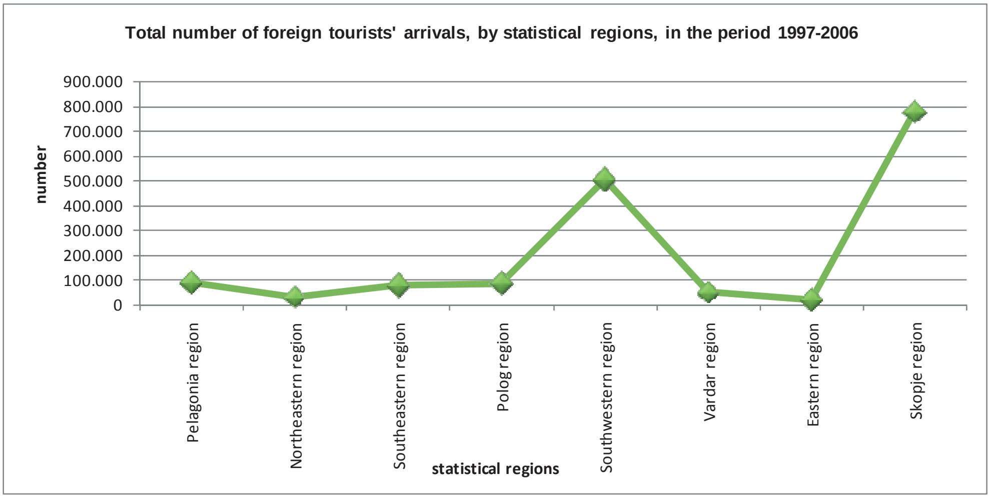




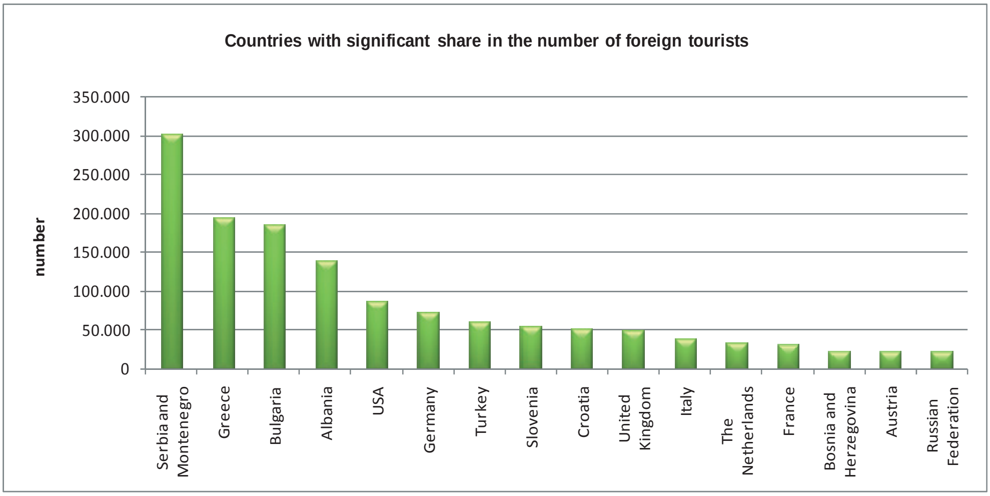
Note: Foreign tourists arrivals by transportation mode, structure, according to interview conducted in 2004



Note: Foreign tourists arrivals by transportation mode, structure, according to interview conducted in 2004

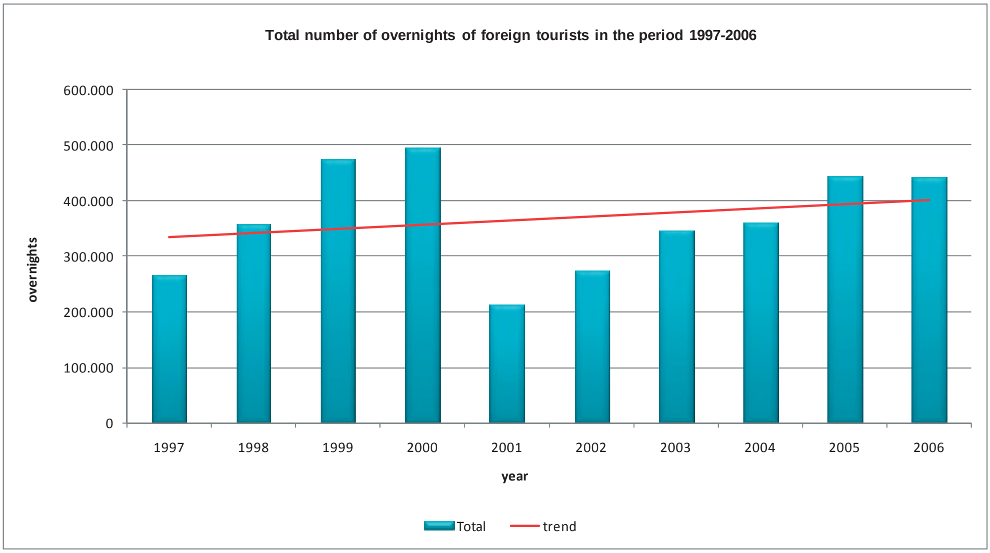


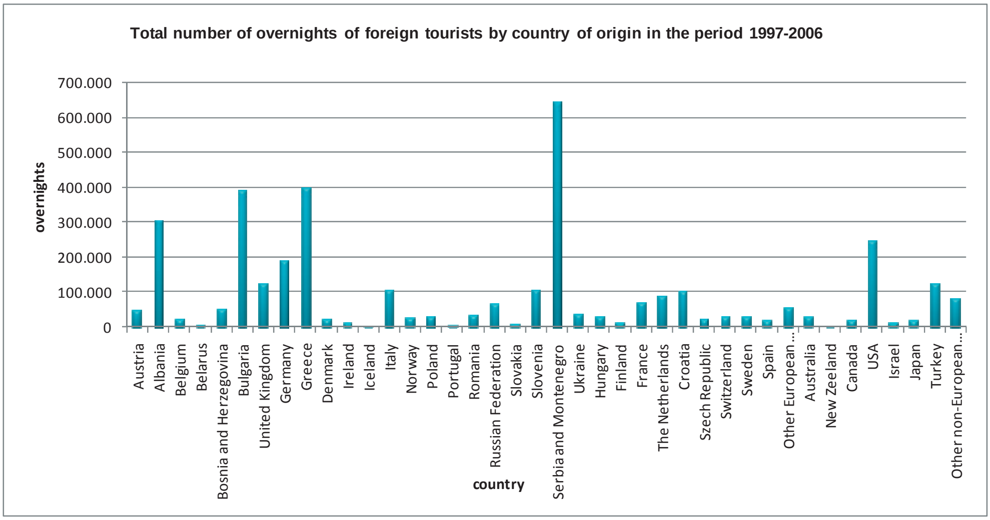
Total number of foreign tourists' arrivals, by statistical regions, in the period 1997-2006
number
900.000
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0
Pelagonia region
Northeastern region
Southeastern region
Polog region
Southwestern region
Vardar region
Eastern region
Skopje region
statistical regions

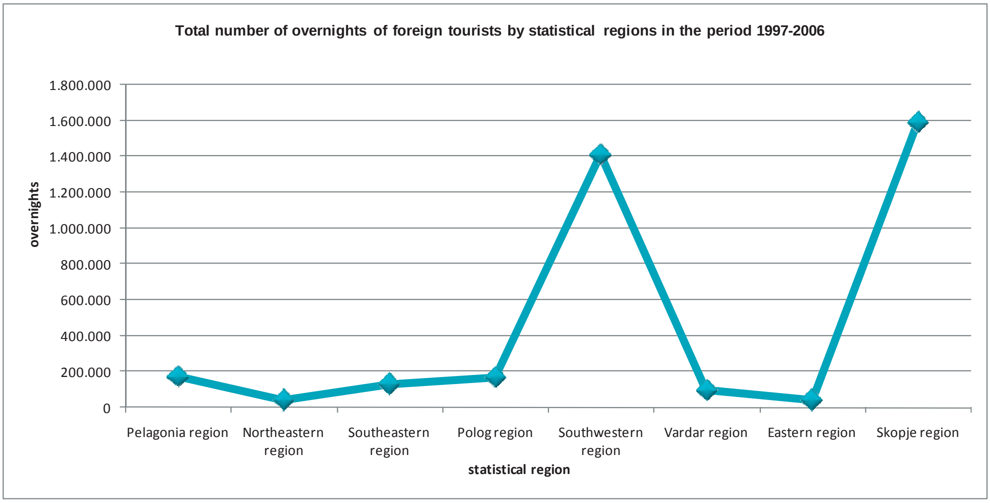


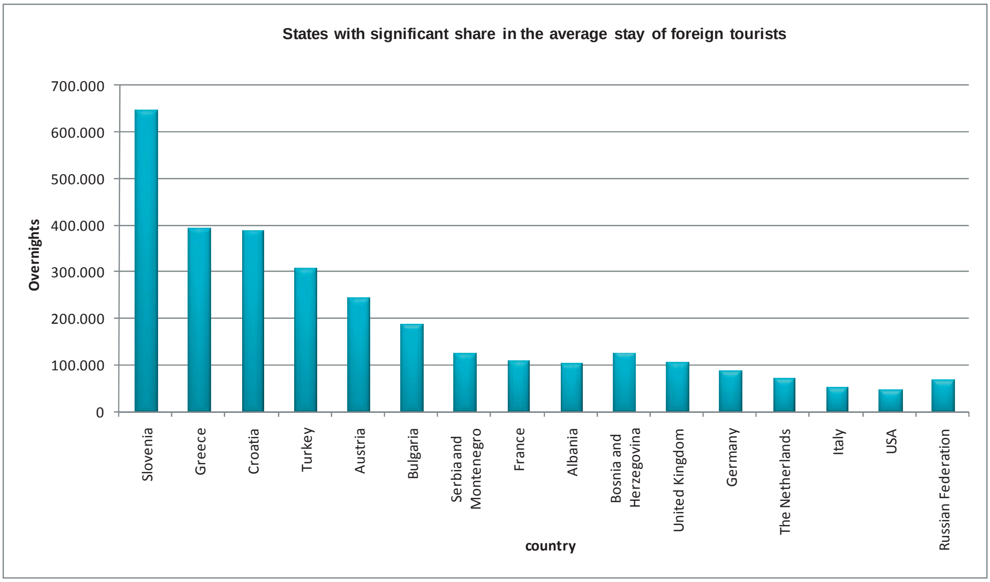
Countries with significant share in the number of foreign tourists
number
350.000
300.000
250.000
200.000
150.000
100.000
50.000
0
Serbia and Montenegro
Greece
Bulgaria
Albania
USA
Germany
Turkey
Slovenia
Croatia
United Kingdom
Italy
The Netherlands
France
Bosnia and Herzegovina
Austria
Russian Federation

1.2 Overnights of foreign tourists

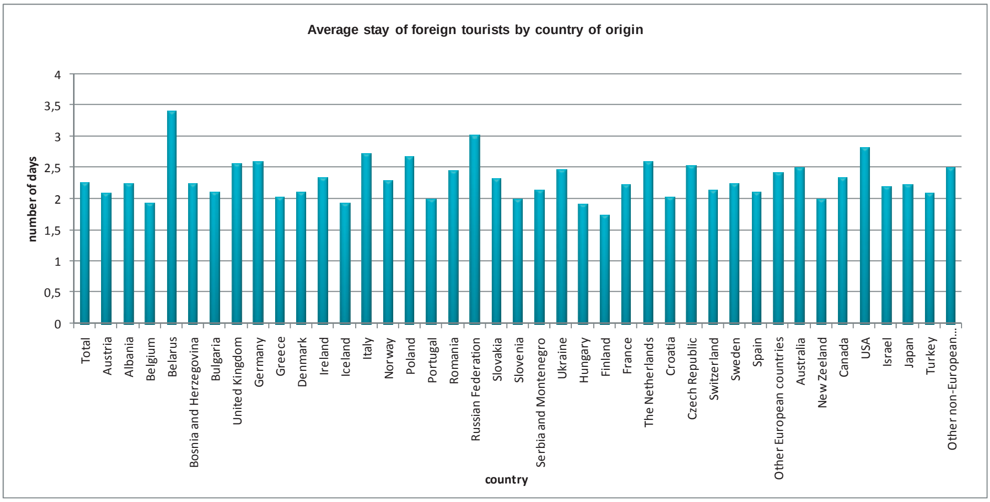


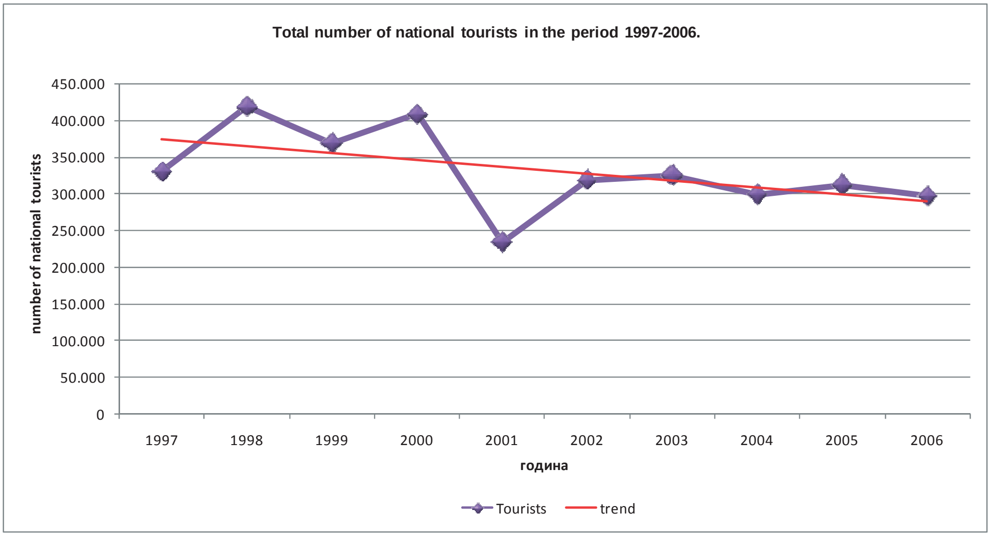


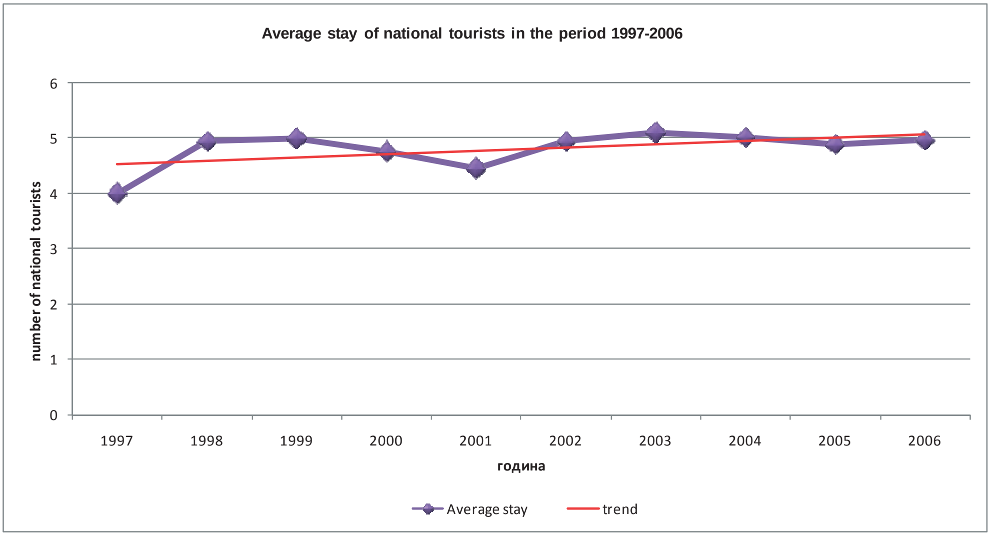

Total number of overnights of foreign tourists by statistical regions in the period 1997-2006
overnights
1.800.000
1.600.000
1.400.000
1.200.000
1.000.000
800.000
600.000
400.000
200.000
0
Pelagonia region
Northeastern region
Southeastern region
Polog region
Southwestern region
Vardar region
Eastern region
Skopje region
statistical region


States with significant share in the average stay of foreign tourists
Overnights
700.000
600.000
500.000
400.000
300.000
200.000
100.000
0
Slovenia
Greece
Croatia
Turkey
Austria
Bulgaria
Serbia and Montenegro
France
Albania
Bosnia and Herzegovina
United Kingdom
Germany
The Netherlands
Italy
USA
Russian Federation
country

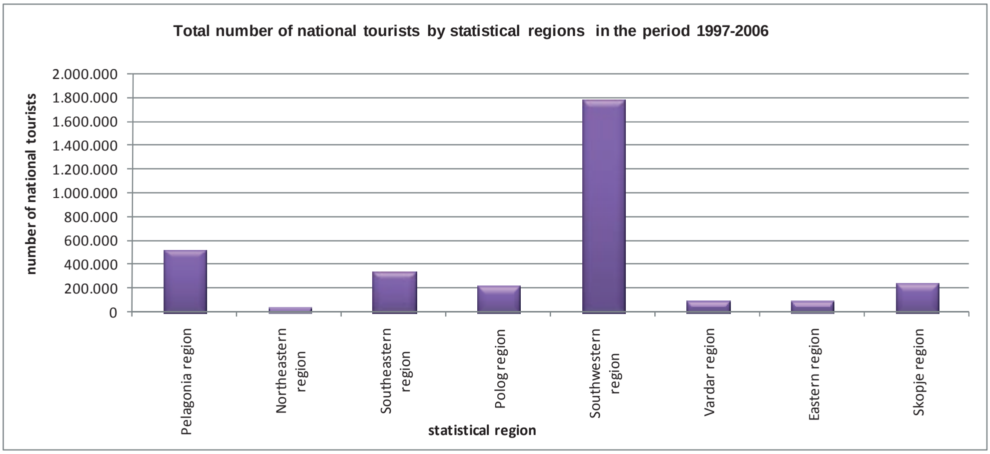
1.3 National tourist intensity



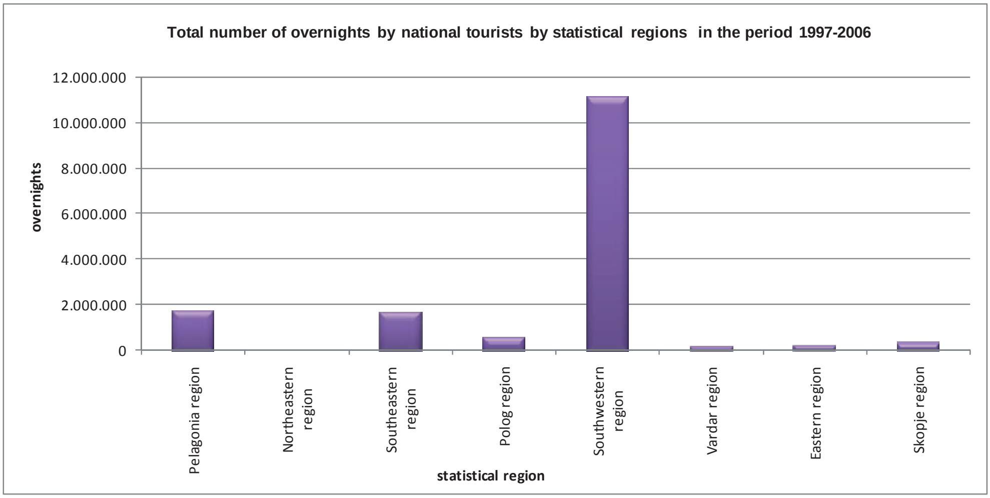




Average stay of national tourists in the period 1997-2006
number of national tourists
6
5
4
3
2
1
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
година
Average stay
trend



Total number of national tourists by statistical regions in the period 1997-2006
number of national tourists
2.000.000
1.800.000
1.600.000
1.400.000
1.200.000
1.000.000
800.000
600.000
400.000
200.000
0
Pelagonia region
Northeastern region
Southeastern region
Polog region
Southwestern region
Vardar region
Eastern region
Skopje region
statistical region



Assessment

1.1 International tourist intensity

Data presented in Table 1 and diagrams show that the Republic of Macedonia has been visited by tourists from many countries in the world. Tourists from Europe, Asia, Australia and North America dominate. During the ten year reporting period, the structure of visits is dominated by tourists from the neighborhood of the Republic of Macedonia. Table 5 indicates that the leading position is occupied by tourists from Serbia and Montenegro, followed by Greece, Bulgaria and Albania. Development of attractive and receptive base in the Republic of Macedonia should provide grater presence of tourists from Western European countries with longer tourism tradition, and thus higher tourism and culture level.

Data in Table 2 and the Diagram show that most of the foreign tourists arrive by car. This indicator is in the context of the use of this type of transport mode in other state destinations, too. However, tracking the mode of foreign tourists arrival will help us identify the use of more rationale transport modes, such as railway, bus and plain, because they make lower negative impact on the environment.

Table 3 presents the purposes for tourists' visits. Data reflect that the business purposes are predominant, which is by itself a negative feature, as such foreign tourists do not use the attractions of the environment, but urban possibilities instead. Observation of this aspect will enable an insight in the extent to which foreign tourist intensity will increase in terms of vacation and recreation as reflection of the properties of the environment.

Regional distribution presented in Table 4 and the Diagram shows that leading regional centers are Skopje and Southwestern regions, indicating two differentiated regions with different characteristics. Namely. the Southwestern region is predominated by the attractiveness of the resources, while Skopje region offers possibilities for business activities. Other regions incorporate alternative opportunities based on different environments, and therefore it is important to monitor the scale of foreign tourists visits for the purpose of redistribution of visits.

1.2 Overnights of foreign tourists

Table 6 indicates that overnights follow the visits of foreign tourists in the Republic of Macedonia. The summary results presented in Table 9 lead to the conclusion that the highest number of overnights was realized by tourists from neighboring countries to the Republic of Macedonia, while such results in relation to tourists from Western European and other countries with recognized tourist tradition lag behind in the stay. Observation of this trend can help us assess the rate at which the attractiveness of the environment has adapted to the demands of these visitors.

Regional distribution of accomplished foreign overnights presented in Table 7 shows that the highest number of such overnights was done in Skopje region, which is an unfavorable circumstance in the context of foreign tourism intensity, because they relate to visitors in mainly urban environment. Observation of the relations in the regional distribution of overnights accomplished by foreign tourists will enable the assessment of measures undertaken to redistribute overnights to other regions with specific values.

The average stay of foreign tourists, presented in Table 8, enables us to observe the level of domination of environmental characteristics. The Table indicates that the length of stay of foreign tourists in the Republic of Macedonia is relatively short. Such length was around 2.26 in the analyzed period, reflecting significant lagging behind relative to the average length of stay of national tourists. The observation will help us realize the extent to which the length of stay of foreign tourists in the Republic of Macedonia has improved.

1.3 National tourism intensity

Table 10 indicates that the number of national tourists has stagnation characteristics. Namely, during this ten year period, the level of intensity tracked in 1997 was not reached. This by its side means that no significant improvement in the offer was made. The overnights acquired by national tourists track similar characteristics. Highest number of overnights was recorded in 1998, reflecting evident stagnation. The results of average length of stay reflect similar relations. Observation of the intensity and dynamics of national tourists' visits shows the extent to which tourist supply has been adapted to the demands of national tourists. Elements of the environment, as attractions for national tourists, should be observed by applying the approach of average stay length in the coming period, too.

Data in Table 11 show that the dominant region in the context of distribution of national tourists is Ohrid and Prespa region, which could be assessed as advantage, but also as unbalanced distribution. Observation of these indicators should facilitate the estimate of the extent to which the number of national tourists will increase in other regions as a result from the promotion of the elements of the environment in tourist supply at the national tourist market.

Table 12 indicates that the number of overnights is comparable to tourist visits as reflection of the attractiveness of the environment, and thus the highest number of overnights has been recorded in Ohrid and Prespa region. Observation of overnights will enable to assess the extent to which regions will improve the attractive basis as a factor of acquiring higher number of overnights.

Methodology

- ## Methodology for the indicator calculation

The trend in tourism development through dynamics and intensity of tourist industry.

The scale and the intensity, as well as the share of individual countries in the total number of foreign tourists arrivals and overnights, national tourists arrivals and overnights, regional distribution and average number of days of stay.

- ## Methodology for data manipulation (measurements):

Number and percentage.

Data specification

Title of the indicator	Source	Reporting obligation
1. Tourism intensity in the Republic of Macedonia 1.1 International tourism intensity 1.2 Overnights of foreign tourists 1.3 National tourism intensity	– State Statistical Office	– Yearly to EUROSTAT – World Tourist Organization (WTO) – Annual tourist review of tourism and other services – Five-year interview of foreign tourists in accommodation establishments

Data coverage (by years):

1.1 International tourism intensity

Table 1: Foreign tourists arrivals by country of origin

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Total	**121.337**	**156.670**	**180.788**	**224.016**	**98.946**	**122.861**	**157.692**	**165.306**	**197.216**	**202.357**	**1.627.189**
Austria	1.713	2.062	2.098	2.559	1.300	1.919	2.564	2.503	2.736	3.490	22.944
Albania	5.489	12.266	21.248	24.747	6.419	9.086	12.088	13.452	16.868	16.188	137.851
Belgium	668	857	2.961	1.759	814	970	1.243	996	1.157	1.414	12.839
Belarus	152	185	562	452	166	154	157	197	188	127	2.340
Bosnia and Herzegovina	1.210	1.278	1.258	1.841	1.377	1.885	2.687	3.648	4.021	4.240	23.445
Bulgaria	20.425	37.566	18.770	27.623	8.484	11.703	14.147	12.156	17.462	17.421	185.757
United Kingdom	2.379	3.792	9.126	6.693	4.357	3.916	4.517	4.049	5.099	5.318	49.246
Germany	5.147	6.071	12.370	10.349	4.860	6.084	6.317	6.522	6.995	7.659	72.374
Greece	9.256	8.148	10.152	21.304	10.637	14.677	27.042	29.901	33.080	30.835	195.032
Denmark	477	662	2.207	2.468	704	786	1.048	1.379	1.165	1.018	11.914
Ireland	556	288	879	672	389	525	482	522	659	991	5.963
Iceland	57	50	128	134	119	153	159	118	125	137	1.180
Italy	3.062	3.727	6.259	4.410	2.511	3.076	3.626	3.618	4.259	4.651	39.199
Norway	421	818	1.921	2.304	885	1.059	1.108	962	1.051	1.277	11.806
Poland	1.116	1.980	779	1.134	725	1.095	1.029	1.233	1.254	1.332	11.677
Portugal	93	161	423	487	226	308	432	331	365	511	3.337
Romania	1.790	1.285	910	1.759	1.101	1.255	1.330	1.144	1.733	1.662	13.969
Russian Federation	2.846	2.887	3.366	3.078	1.647	1.246	1.352	1.487	2.092	1.998	21.999
Slovakia	299	331	514	445	311	481	559	554	554	636	4.684
Slovenia	5.383	5.882	4.606	5.288	2.658	3.837	4.579	5.444	7.514	9.228	54.419
Serbia and Montenegro	30.079	31.112	29.346	35.522	16.429	23.239	27.325	30.771	39.147	38.208	301.178
Ukraine	618	832	622	6.347	3.405	908	706	724	617	641	15.420
Hungary	903	1.261	803	2.372	2.130	1.985	2.173	1.320	1.582	1.835	16.364
Finland	583	730	859	1.278	711	683	768	782	835	885	8.114
France	1.763	2.636	4.735	4.768	2.313	2.542	3.513	2.845	3.017	3.133	31.265
The Netherlands	1.782	2.620	5.953	6.809	1.564	2.016	2.470	2.652	4.218	3.809	33.893
Croatia	4.194	3.199	3.260	4.651	2.609	4.097	5.467	6.828	7.667	8.817	50.789
Czech Republic	744	743	715	1.032	560	927	1.155	905	1.290	2.108	10.179
Switzerland	1.163	1.384	1.723	1.868	934	965	1.485	1.598	1.845	1.924	14.889
Sweden	687	920	1.505	2.033	962	1.082	1.503	1.596	1.854	1.937	14.079
Spain	417	350	1.215	1.286	879	842	1.386	895	1.213	1.154	9.637
Other European countries	1.035	1.222	2.101	3.531	1.734	1.767	2.689	2.911	2.286	2.961	22.237
Australia	981	1.103	967	1.578	586	844	1.187	1.116	1.563	2.014	11.939
New Zeeland	55	83	172	200	77	128	99	96	143	264	1.317
Canada	463	831	1.626	1.711	747	776	970	704	851	906	9.585
USA	4.961	7.957	13.900	15.312	7.099	6.997	7.403	7.658	7.588	8.275	87.150
Israel	326	390	342	595	375	430	526	676	1.207	1.170	6.037
Japan	608	1.094	1.301	1.025	419	594	1.076	931	1.041	1.212	9.301
Turkey	5.919	6.135	5.038	6.700	3.101	5.180	5.755	6.496	7.379	7.804	59.507
Other non-European countries	1.517	1.772	4.068	5.892	2.622	2.644	3.570	3.586	3.496	3.167	32.334

Table 2: Arrivals of foreign tourists by transport mode, structure*

Transportation means of arrival	%
Car	47,85
Bus - regular	6,39
Bus - tourist tour	2,88
Motorcycle	0,81
Plane - regular flight	38,83
Plane - charter flight	1,97
Train	1,26

* Based on data from the Interview of foreign tourists, 2004

Table 3: Purpose of stay of foreign tourists, structure *

Purpose of stay in the Republic of Macedonia	%
Vacation and recreation	24,72
Rest during short stay	8,95
Healing purposes	0,75
Business purposes	41,08
Attending congresses	9,17
Religious rituals	0,76
Transit stay	9,6
Stay for round trip	1,54
Other	3,42

* Based on data from the Interview of foreign tourists, 2004

Table 4: Foreign tourists arrivals by 8 statistical regions

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Total	**121.337**	**156.670**	**180.788**	**224.016**	**98.946**	**122.861**	**157.692**	**165.306**	**197.216**	**202.357**	**1.627.189**
Pelagonia region	8.027	7.392	6.760	9.435	4.695	6.464	9.225	11.238	12.550	12.472	88.258
Northeastern region	3.974	5.667	6.624	5.455	845	1.325	985	1.739	2.011	1.580	30.205
Southeastern region	4.966	4.225	4.784	5.268	6.927	5.006	7.792	9.559	16.518	12.696	77.741
Polog region	5.412	7.126	13.959	16.765	6.236	5.013	4.898	7.529	8.506	9.185	84.629
Southwestern region	28.039	55.393	48.893	77.500	15.501	34.234	51.551	53.497	66.226	72.258	503.092
Vardar region	5.392	4.421	3.145	13.141	5.364	3.624	3.323	3.208	3.332	3.894	48.844
Eastern region	1.543	1.682	1.054	1.240	1.075	1.714	1.995	2.330	2.302	3.079	18.014
Skopje region	63.984	70.764	95.569	95.212	58.303	65.481	77.923	76.206	85.771	87.193	776.406

Table 5: Countries with significant share in the number of foreign tourists in the period 1996 – 2006

Country	Tourists
Serbia and Montenegro	301.178
Greece	195.032
Bulgaria	185.757
Albania	137.851
USA	87.150
Germany	72.374
Turkey	59.507
Slovenia	54.419
Croatia	50.789
United Kingdom	49.246
Italy	39.199
The Netherlands	33.893
France	31.265
Bosnia and Herzegovina	23.445
Austria	22.944
Russian Federation	21.999

1.2 Overnights of foreign tourists

Table 6: Overnights of foreign tourists by country of origin

	Total tourists 1997-2006	Total overnights 1997-2006	Average stay of foreign tourists
Total	**1.627.189**	**3.673.416**	**2,26**
Austria	22.944	48.253	2,1
Albania	137.851	308.279	2,24
Belgium	12.839	24.931	1,94
Belarus	2.340	7.951	3,4
Bosnia and Herzegovina	23.445	52.575	2,24
Bulgaria	185.757	391.148	2,11
United Kingdom	49.246	126.480	2,57
Germany	72.374	188.062	2,6
Greece	195.032	396.171	2,03
Denmark	11.914	25.185	2,11
Ireland	5.963	13.959	2,34
Iceland	1.180	2.273	1,93
Italy	39.199	107.414	2,74
Norway	11.806	27.109	2,3
Poland	11.677	31.345	2,68
Portugal	3.337	6.687	2
Romania	13.969	34.340	2,46
Russian Federation	21.999	66.519	3,02
Slovakia	4.684	10.922	2,33
Slovenia	54.419	108.189	1,99
Serbia and Montenegro	301.178	644.882	2,14
Ukraine	15.420	38.077	2,47
Hungary	16.364	31.449	1,92
Finland	8.114	14.138	1,74
France	31.265	69.769	2,23
The Netherlands	33.893	88.598	2,61
Croatia	50.789	103.205	2,03
Szech Republic	10.179	25.852	2,54
Switzerland	14.889	32.004	2,15
Sweden	14.079	31.701	2,25
Spain	9.637	20.363	2,11
Other European countries	22.237	54.130	2,43
Australia	11.939	29.794	2,5
New Zeeland	1.317	2.621	1,99
Canada	9.585	22.444	2,34
USA	87.150	246.401	2,83
Israel	6.037	13.297	2,2
Japan	9.301	20.724	2,23
Turkey	59.507	125.160	2,1
Other non-European countries	32.334	81.015	2,51

Table 7: Overnights of foreign tourists by 8 statistical regions

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
TOTAL	**265.524**	**359.538**	**474.394**	**493.867**	**212.751**	**274.720**	**346.200**	**360.589**	**442.988**	**442.845**	**3.673.416**
Pelagonia region	17.262	13.225	10.630	19.653	7.172	11.435	14.708	22.974	31.589	26.676	175.324
Northeastern region	5.264	8.720	7.785	7.600	1.326	2.134	1.661	3.045	3.446	2.939	43.920
Southeastern region	7.377	7.824	7.704	8.994	10.050	8.593	12.143	15.957	27.998	26.107	132.747
Polog region	12.609	17.417	30.006	34.378	11.714	8.335	8.358	14.320	16.824	18.525	172.486
Southwestern region	87.636	154.410	147.493	233.204	40.347	96.323	135.213	141.684	184.048	192.216	1.412.574
Vardar region	8.515	8.861	6.567	20.063	18.592	8.855	7.599	6.514	6.865	7.417	99.848
Eastern region	3.388	3.466	2.232	2.458	2.731	4.343	5.053	6.998	5.579	7.657	43.905
Skopje region	123.473	145.615	261.977	167.517	120.819	134.702	161.465	149.097	166.639	161.308	1.592.612

Table 8: Average stay of foreign tourists

	Total tourists 1997-2006	Total overnights 1997 -2006	Average stay of foreign tourists
Total	**1.627.189**	**3.673.416**	**2,26**
Austria	22.944	48.253	2,1
Albania	137.851	308.279	2,24
Belgium	12.839	24.931	1,94
Belarus	2.340	7.951	3,4
Bosnia and Herzegovina	23.445	52.575	2,24
Bulgaria	185.757	391.148	2,11
United Kingdom	49.246	126.480	2,57
Germany	72.374	188.062	2,6
Greece	195.032	396.171	2,03
Denmark	11.914	25.185	2,11
Ireland	5.963	13.959	2,34
Iceland	1.180	2.273	1,93
Italy	39.199	107.414	2,74
Norway	11.806	27.109	2,3
Poland	11.677	31.345	2,68
Portugal	3.337	6.687	2
Romania	13.969	34.340	2,46
Russian Federation	21.999	66.519	3,02
Slovakia	4.684	10.922	2,33
Slovenia	54.419	108.189	1,99
Serbia and Montenegro	301.178	644.882	2,14
Ukraine	15.420	38.077	2,47
Hungary	16.364	31.449	1,92
Finland	8.114	14.138	1,74
France	31.265	69.769	2,23
The Netherlands	33.893	88.598	2,61
Croatia	50.789	103.205	2,03
Czech Republic	10.179	25.852	2,54
Switzerland	14.889	32.004	2,15
Sweden	14.079	31.701	2,25
Spain	9.637	20.363	2,11
Other European countries	22.237	54.130	2,43
Australia	11.939	29.794	2,5
New Zeeland	1.317	2.621	1,99
Canada	9.585	22.444	2,34
USA	87.150	246.401	2,83
Israel	6.037	13.297	2,2
Japan	9.301	20.724	2,23
Turkey	59.507	125.160	2,1
Other non-European countries	32.334	81.015	2,51

Table 9: Countries with significant share in ten-year period

	Tourists	Overnights	Average stay by foreign tourists
Serbia and Montenegro	301.178	644.882	2,14
Greece	195.032	396.171	2,03
Bulgaria	185.757	391.148	2,11
Albania	137.851	308.279	2,24
USA	87.150	246.401	2,83
Germany	72.374	188.062	2,6
Turkey	59.507	125.160	2,1
Slovenia	54.419	108.189	1,99
Croatia	50.789	103.205	2,03
United Kingdom	49.246	126.480	2,57
Italy	39.199	107.414	2,74
The Netherlands	33.893	88.598	2,61
France	31.265	69.769	2,23
Bosnia and Herzegovina	23.445	52.575	2,24
Austria	22.944	48.253	2,1
Russian Federation	21.999	66.519	3,02

1.3 National tourism intensity

Table 10: Arrivals and overnights of national tourists

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
Tourists	330.534	418.410	368.842	408.507	234.362	318.851	325.459	299.709	312.490	297.116	3.314.280
Overnights	1.321.622	2.066.923	1.838.748	1.940.772	1.041.831	1.575.664	1.660.667	1.504.845	1.527.053	1.474.550	15.952.675
Average stay	4	4,94	4,99	4,75	4,45	4,94	5,1	5,02	4,89	4,96	4,81

Table 11: Arrivals of national tourists by 8 statistical regions

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
TOTAL	**330.534**	**418.410**	**368.842**	**408.507**	**234.362**	**318.851**	**325.459**	**299.709**	**312.490**	**297.116**	**3.314.280**
Pelagonia region	52.200	56.894	59.559	63.679	45.062	56.118	54.464	45.472	46.003	39.498	518.949
Northeastern region	6.150	5.536	4.571	6.299	3.827	3.709	3.555	1.634	1.661	853	37.795
Southeastern region	40.221	23.620	38.120	32.687	26.884	26.613	27.521	34.535	45.333	45.881	341.415
Polog region	31.636	44.992	36.065	36.151	10.579	7.414	11.357	15.150	12.049	12.705	218.098
Southwestern region	144.315	238.926	198.021	219.039	107.808	183.790	189.829	169.453	170.208	160.960	1.782.349
Vardar region	14.881	11.326	7.904	13.803	9.196	10.139	9.429	5.145	4.246	4.327	90.396
Eastern region	7.117	8.233	5.787	7.349	11.687	12.803	6.553	7.516	7.061	8.942	83.048
Skopje region	34.014	28.883	18.815	29.500	19.319	18.265	22.751	20.804	25.929	23.950	242.230

Table 12: Overnights of national tourists by 8 statistical regions

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
TOTAL	**1.321.622**	**2.066.923**	**1.838.748**	**1.940.772**	**1.041.831**	**1.575.664**	**1.660.667**	**1.504.845**	**1.527.053**	**1.474.550**	**15.952.675**
Pelagonia region	176.788	199.679	204.705	215.011	120.325	187.393	187.716	153.956	147.225	128.785	1.721.583
Northeastern region	11.723	12.348	9.536	11.954	9.535	4.305	4.704	2.639	2.620	1.064	70.428
Southeastern region	211.107	104.520	224.406	152.621	115.686	100.202	156.957	217.781	180.860	191.970	1.656.110
Polog region	76.438	113.409	105.108	99.193	35.503	14.549	31.178	39.130	33.652	35.299	583.459
Southwestern region	750.950	1.554.501	1.238.887	1.378.770	663.758	1.164.009	1.203.809	1.028.797	1.104.087	1.052.271	11.139.839
Vardar region	26.533	21.191	15.528	24.887	28.966	31.802	23.338	11.310	8.985	9.518	202.058
Eastern region	24.558	23.906	15.241	19.301	37.354	42.753	17.040	19.356	14.283	21.277	235.069
Skopje region	43.525	37.369	25.337	39.035	30.704	30.651	35.925	31.876	35.341	34.366	344.129

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 047	Tourism intensity in the Republic of Macedonia	TOUR 12 TOUR 33	Tourism intensity Overnights spent in tourism accommodations	**D, P**	A	Biological diversity Nature Policies Waste Water Air Transport Soil	Yearly Every five years

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997 - 2006

Frequency of data collection: yearly – every five years

Future activities

- Short-term activities

a. Description of the activity

– Continuous work of the working group which should include members from tourist association, culture and economy to define the national set of tourism indicators, monitoring of indicators and reporting therewith.

b. Required resources

– Human resources are required in the State Statistical Office.

c. Status

– Activities are in progress.

Deadline: Activities are continuous.

MK – NI 048

TOURISM INTENSITY AND FACILITIES DYNAMICS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

This indicator includes the number of accommodation units, number of rooms and beds and structure of facilities. The selection of this indicator is justified by the fact that it can track the level of development and receptive development. The number of such establishments should reflect the utilization of the space for tourist purposes, and the number of rooms in accommodation establishments is an indicator of the trend in accommodation intensity. The structure reflects the quality and its trend in accommodation units and establishments.

Definition

Accommodation establishments are supra-structural facilities facilitating visits and stay of tourists in a given environment. Their observation enables the assessment of regional development.

Units

- Number of facilities, number of rooms and number of beds.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2008 - 2012**
- **National Environmental Action Plan - 2** - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
- **Spatial Plan of the Republic of Macedonia** – in its Chapter 5.4. "Tourism development and organization of tourist areas", defines the objectives and planning determinations for tourism development.
- **National Strategy for Sustainable Development of the Republic of Macedonia** – in the section on tourism, presents the directions for sustainable development of tourism, within short, medium, and long-term frames, up to 2030.
- **Strategy for Biological Diversity Protection in the Republic of Macedonia with Action Plan** – under measure C.5 "Stimulation of traditional use of biological diversity and eco-tourism", defines the action for identification of sites suitable for eco -tourism.

Legal grounds

The Law on Tourist Activity ("Official Gazette of the Republic of Macedonia" No. 62/2004) specifies the conditions and the manner of performing tourist activity (Chapter 15 Services in rural, ethno and eco-tourism, Article 51).

The Law on Environment, the Law on Nature Protection, the Law on Waste Management, the Law on Ambient Air Quality and the **aw on Waters** regulate partially the requirements for environmental protection in tourist activity.

Targets

- Integration of the principles of sustainable development and environmental considerations in tourist sector
- Identification of areas of priority importance for tourism development
- Encouragement of exchange of best practices between public and private tourist interests
- Protection of natural heritage and biological diversity in tourist destinations
- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environment
- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.
- Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

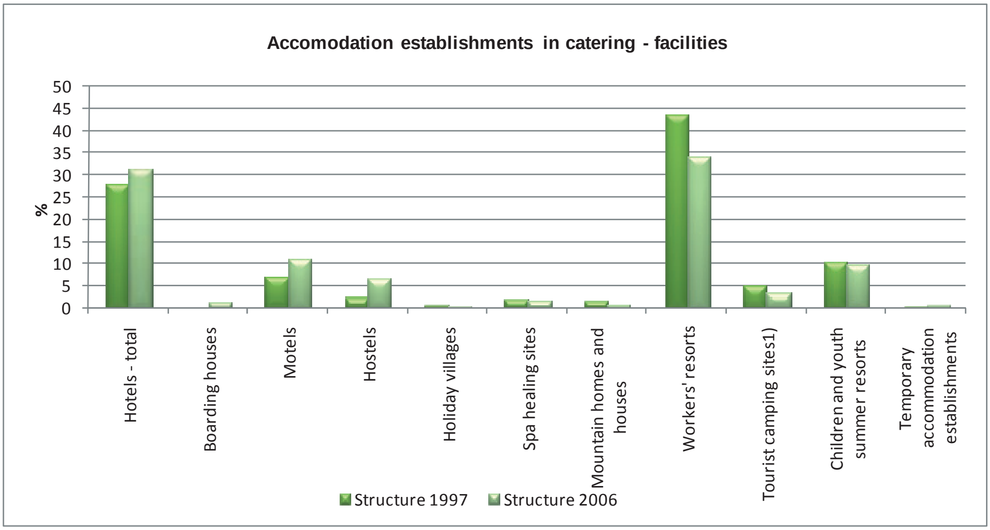
Key policy issue

What is the impact of accommodation establishments on the environment?

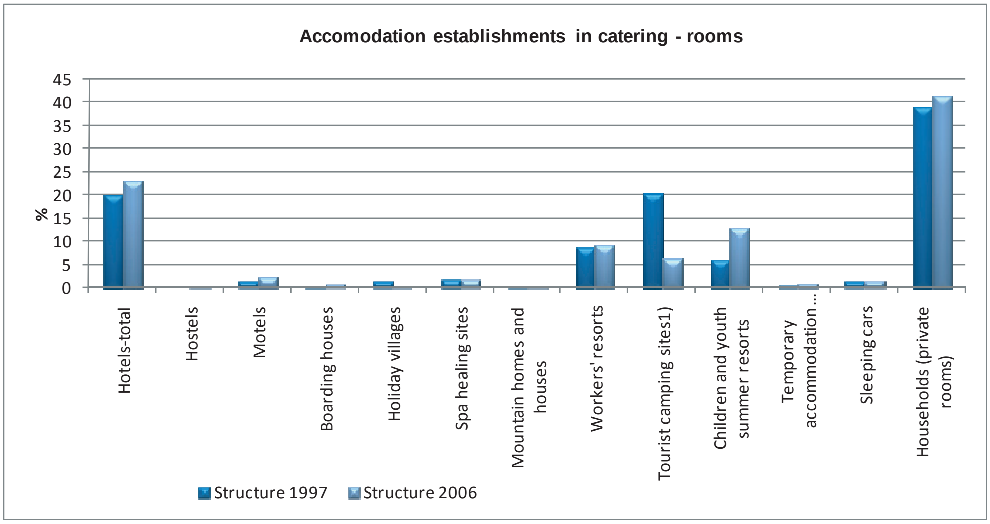
The number of accommodation units may have both positive and negative impacts. Positive impacts are related to proper utilization of the space, and negative impacts are made when the space is occupied by accommodation establishments in inadequate manner.

Key message

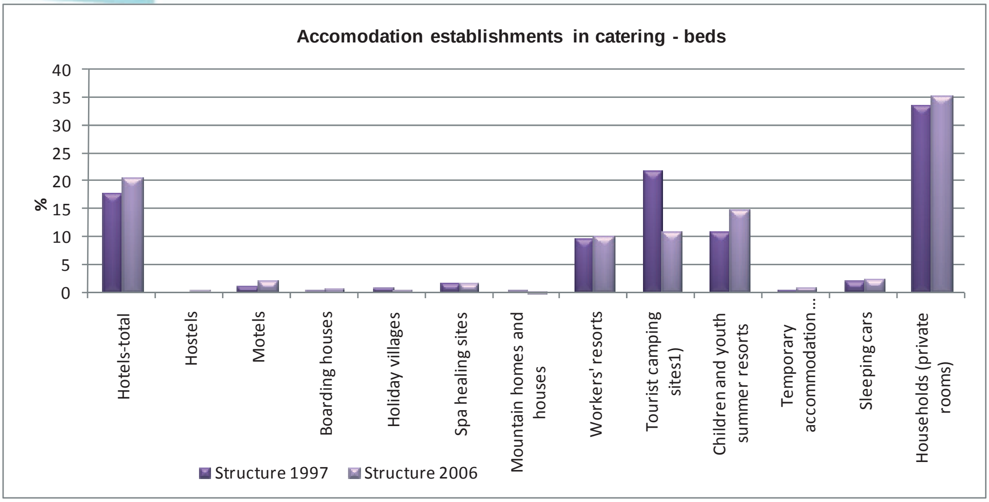
To pay attention to the intensity and dynamics of accommodation establishments and the manner of their utilization in the environment. It is particularly important to undertake preventive measures against pollution of waters, air and soil caused by accommodation establishments.



Accomodation establishments in catering - facilities
50
45
40
35
30
25
20
15
10
5
0
%
Hotels - total
Boarding houses
Motels
Hostels
Holiday villages
Spa healing sites
Mountain homes and houses
Workers' resorts
Tourist camping sites1)
Children and youth summer resorts
Temporary accommodation establishments
Structure 1997
Structure 2006



Accomodation establishments in catering - rooms
45
40
35
30
25
20
15
10
5
0
%
Hotels-total
Hostels
Motels
Boarding houses
Holiday villages
Spa healing sites
Mountain homes and houses
Workers' resorts
Tourist camping sites1)
Children and youth summer resorts
Temporary accommodation...
Sleeping cars
Households (private rooms)
Structure 1997
Structure 2006



Assessment

Table 1 indicates that the intensity of accommodation establishments as facilities in the analyzed period tracks an increase of around 20%, reflecting an increase that has to be observed. In this context, it is of particular importance to underline that increases have been noted with facilities of hotel nature, while decrease have been observed in the area of workers' resorts. This can be assessed as positive trend because it is a result of the transformation of non-commercial into commercial sector which will have to be more observant of environmental protection standards.

Tables 2 and 3 indicate falling trend in the number of rooms and beds resulting from decreased number of rooms in camping sites. In environmental terms, this is a positive aspect.

Methodology

- ### Methodology for the indicator calculation

Development trend of accommodation units.

Share of individual types of accommodation establishments in the total number.

- ### Methodology of data manipulation (measurement):

Number and percentage.

Data specification

Title of the indicator	Source	Reporting obligation
Tourism density and facilities dynamics	– State Statistical Office	– Statistical Yearbook – WTO – EUROSTAT

Data coverage (by years):

Table 1: Accommodation establishments in catering industry – number of facilities – status on 31 August

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Structure 1997	Structure 2006
TOTAL	**308**	**320**	**332**	**323**	**327**	**334**	**333**	**352**	**347**	**359**	**100,0**	**100,0**
Hotels - total	86	90	91	94	98	98	98	107	107	112	27,9	31,2
A category	10	10	11	12	13	12	12	13	14	14	3,2	3,9
B category	60	63	65	68	71	72	73	79	78	83	19,5	23,1
C category	7	7	7	6	6	6	6	7	7	7	2,3	1,9
D category	9	10	8	8	8	8	7	8	8	8	2,9	2,2
Boarding houses	-	-	-	1	2	5	5	5	5	5	0,0	1,4
Motels	21	24	27	29	28	29	30	36	35	39	6,8	10,9
Hostels	7	7	8	11	12	16	17	18	20	23	2,3	6,4
Holiday villages	2	2	2	2	2	2	2	2	1	1	0,6	0,3
Spa healing sites	6	6	6	5	5	5	5	5	6	6	1,9	1,7
Mountain homes and houses	5	5	7	4	4	4	4	4	2	3	1,6	0,8
Workers' resorts	134	137	141	127	126	126	122	125	122	122	43,5	34,0
Tourist camping sites[1)]	15	15	15	14	14	13	13	13	12	11	4,9	3,1
Children and youth summer resorts	31	33	34	35	35	35	35	35	35	35	10,1	9,7
Temporary accommodation establishments	1	1	1	1	1	1	2	2	2	2	0,3	0,6

Table 2: Accommodation establishments in catering industry – number of rooms – status on 31 August

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Structure 1997	Structure 2006
TOTAL	**28.077**	**28.476**	**29.066**	**27.143**	**27.242**	**26.877**	**27.017**	**27.222**	**26.925**	**26.503**	**100**	**100**
Hotels-total	5.593	5.677	5.916	5.895	5.961	5.983	5.935	5.989	6.024	6.086	19,90	23,00
A category	1.497	1.497	1.632	1.598	1.616	1.618	1.635	1.661	1.675	1.706	5,30	6,40
B category	3.652	3.711	3.830	3.900	3.948	3.968	3.912	3.914	3.921	3.968	13,00	15,00
C category	204	224	224	176	176	176	174	179	181	178	0,70	0,70
D category	240	245	230	221	221	221	214	235	247	234	0,90	0,90
Hostels	-	-	-	20	33	57	57	64	64	64	0,00	0,20
Motels	352	425	423	435	434	443	491	498	558	627	1,30	2,40
Boarding houses	51	52	59	74	86	118	130	155	151	180	0,20	0,70
Holiday villages	360	360	360	212	212	212	212	212	86	86	1,30	0,30
Spa healing sites	472	472	472	432	432	432	420	423	421	422	1,70	1,60
Mountain homes and houses	29	35	54	33	33	33	33	33	11	17	0,10	0,10
Workers' resorts	2.431	2.484	2.527	2.446	2.455	2.462	2.452	2.544	2.452	2.446	8,70	9,20
Tourist camping sites[1)]	5.663	5.603	6.006	3.756	3.756	1.715	1.703	1.720	1.700	1.678	20,20	6,30
Children and youth summer resorts	1.699	1.941	1.922	1.739	1.739	3.739	3.779	3.779	3.690	3.343	6,10	12,60
Temporary accommodation establishments	168	168	168	168	168	168	252	252	250	250	0,60	0,90
Sleeping cars	364	364	364	376	376	376	376	376	372	372	1,30	1,40
Households (private rooms)	10.895	10.895	10.795	11.557	11.557	11.139	11.177	11.177	11.146	10.932	38,80	41,20

Table 3: Accommodation establishments in catering industry – number of beds – status on 31 August

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Structure 1997	Structure 2006
TOTAL	**78.425**	**78.974**	**79.203**	**73.759**	**74.130**	**73.985**	**72.059**	**72.276**	**72.637**	**71.021**	**100**	**100**
Hotels-total	13.882	14.125	14.564	14.468	14.626	14.629	14.434	14.536	14.369	14.539	17,70	20,50
A category	4.027	4.027	4.297	4.251	4.276	4.249	4.203	4.269	4.229	4.242	5,10	6,00
B category	8.675	8.840	9.043	9.269	9.402	9.432	9.323	9.289	9.132	9.327	11,10	13,10
C category	637	706	706	422	422	422	411	421	423	416	0,80	0,60
D category	543	552	518	526	526	526	497	557	585	554	0,70	0,80
Hostels	-	-	-	46	63	110	110	110	127	109	0,00	0,20
Motels	895	1.035	1.042	1.018	1.013	1.035	1.053	1.089	1.371	1.512	1,10	2,10
Boarding houses	125	121	138	159	184	258	264	308	347	420	0,20	0,60
Holiday villages	574	674	674	456	456	456	436	436	193	193	0,70	0,30
Spa healing sites	1.329	1.329	1.329	1.225	1.225	1.225	1.142	1.142	1.096	1.090	1,70	1,50
Mountain homes and houses	170	177	309	204	204	204	204	204	47	77	0,20	0,10
Workers' resorts	7.612	7.886	7.995	7.561	7.598	7.640	7.336	7.669	7.347	7.221	9,70	10,20
Tourist camping sites[1)]	17.006	16.632	16.606	12.608	12.608	8.088	7.845	7.797	7.717	7.773	21,70	10,90
Children and youth summer resorts	8.484	8.647	8.398	7.976	8.115	12.582	11.158	10.908	11.991	10.685	10,80	15,00
Temporary accommodation establishments	304	304	304	304	304	304	528	528	534	534	0,40	0,80
Sleeping cars	1.604	1.604	1.604	1.596	1.596	1.596	1.596	1.596	1.680	1.680	2,00	2,40
Households (private rooms)	26.440	26.440	26.240	26.138	26.138	25.858	25.953	25.953	25.818	25.188	33,70	35,50

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 048	Tourism density and facilities dynamics	TOUR 14	Tourism density	**S, P**	A	Biodiversity Nature Policies Waste Water Air Transport	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997 - 2006

Frequency of data collection: yearly - August

Information on quality (at data level): August in the current year is taken as critical.

Future activities

- Short-term activities

a. Description of the activity

– Continuous monitoring of the state is necessary.

b. Required resources

– Human resources are required in the State Statistical Office.

c. Status

Activities are in progress.

Deadline: Activities are continuous

MK – NI 049

ECONOMIC VALUE OF TOURISM INDUSTRY

- September 2007 – April 2008

Explanation

- Justification for indicator selection

This indicator should show what are the effects of tourism development, in economic terms, on the environment, and through its share in GDP it will be placed in the context of the overall economic development.

Definition

Share in BDP is the share of the gross value added, in percentage, in the area of tourism in the total Gross Domestic Product on national level.

Units

– %.

Policy relevance

List of relevant policy documents

– National Strategy for Tourism Development 2008 - 2012

– National Environmental Action Plan - 2 - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.

– Spatial Plan of the Republic of Macedonia – in its Chapter 5.4. "Tourism development and organization of tourist areas", defines the objectives and planning determinations for tourism development.

– National Strategy for Sustainable Development of the Republic of Macedonia – in the section on tourism, presents the directions for sustainable development of tourism, within short, medium, and long-term frames, up to 2030.

– Strategy for Biological Diversity Protection in the Republic of Macedonia with Action Plan – under measure C.5 "Stimulation of traditional use of biological diversity and eco-tourism", defines the action for identification of sites suitable for eco-tourism.

Legal ground

The Law on Tourist Activity ("Official Gazette of the Republic of Macedonia" No. 62/2004) specifies the conditions and the manner of performing tourist activity (Chapter 15 Services in rural, ethno and eco-tourism, Article 51).

The Law on Environment, the Law on Nature Protection, the Law on Waste Management, the Law on Ambient Air Quality and the **aw on Waters** regulate partially the requirements for environmental protection in tourist activity.

Targets

- Integration of the principles of sustainable development and environmental considerations in tourist sector
- Identification of areas of priority importance for tourism development
- Encouragement of exchange of best practices between public and private tourist interests
- Protection of natural heritage and biological diversity in tourist destinations
- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environment
- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.
- Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

Key policy issue

What is the impact of tourism relying on the characteristics of the environment on the economic development of the Republic of Macedonia?

Specific policy issue

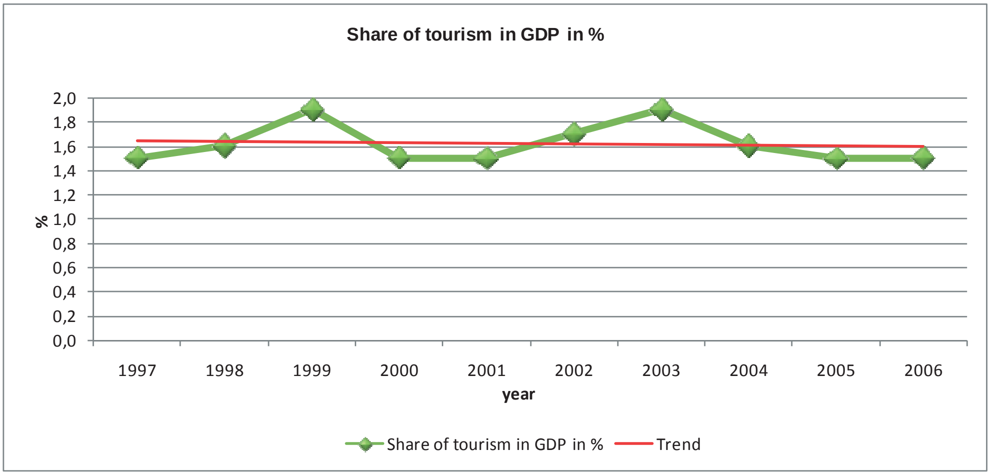
What is the possibility to invest financial resources in attractive areas of the Republic of Macedonia’s environment?

The revenues acquired through tourist charges and taxes will enable environment management and protection, and such revenues will also provide possibilities for legal and natural persons to improve the living conditions and the working performance.

Key message

Tourism is an important economic activity accelerating economic and non-economic activities, while in functional terms it is expressed as multiplicator of economic achievements, induces activities, possesses conversive character by attributing market nature to phenomena and relations that have no economic meaning; it balances the payment balance of the country, balances development relations in different environments and contributes to the employment.

Increased charges for municipal development will result in humanization of the environment and its protection and promotion.



Assessment

The Table shows that the share of tourism in GDP is relatively low with falling trend. I.e. with no improvement. Observation should enable insight in the extent in which effects from tourist development on the environment improve.

Methodology

- Methodology for the indicator calculation

Share of value added from tourism in GDP.

Data specification

Title of the indicator	Source	Reporting obligation
Economic value of tourism industry	– State Statistical Office	– Yearly publication on GDP – Statistical Yearbook

Data coverage (by years):

Table 1: Share of the sector "Catering and tourism" or "Hotels and restaurants in Gross Domestic Products (production method).

	Share of tourism in GDP in %
1997	1,5
1998	1,6
1999	1,9
2000	1,5
2001	1,5
2002	1,7
2003	1,9
2004	1,6
2005	1,5
2006	1,5

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 049	**Economic value of tourism industry**	TOUR 35	Economic value of tourism industry	**D**	B	Biodiversity Nature Policies Waste Water Air Transport	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997 - 2006

Frequency of data collection: annual

Future activities

- Short-term activities

a. Description of the activity

– Continuous monitoring of the status is necessary.

b. Required resources

– Human resources required in the State Statistical Office.

c. Status

– Activities are in progress.

` **Deadline:** Activities are continuous.

List of Members in the Work Groups elaborating the Environmental Indicators of the Republic of Macedonia

Established under Decision no..10-2323/29 of 14 September 2007, signed by the Minister of Environment and Physical Planning.

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