European Environment Agency

Identification and implementation of the EEA Core Set of Indicators in Republic of Macedonia

Annex II: Fact Sheets

November 2006

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1. AIR POLLUTION AND OZONE DEPLETION

1.1. CSI 001 Emissions of acidifying substances in the Republic of Macedonia

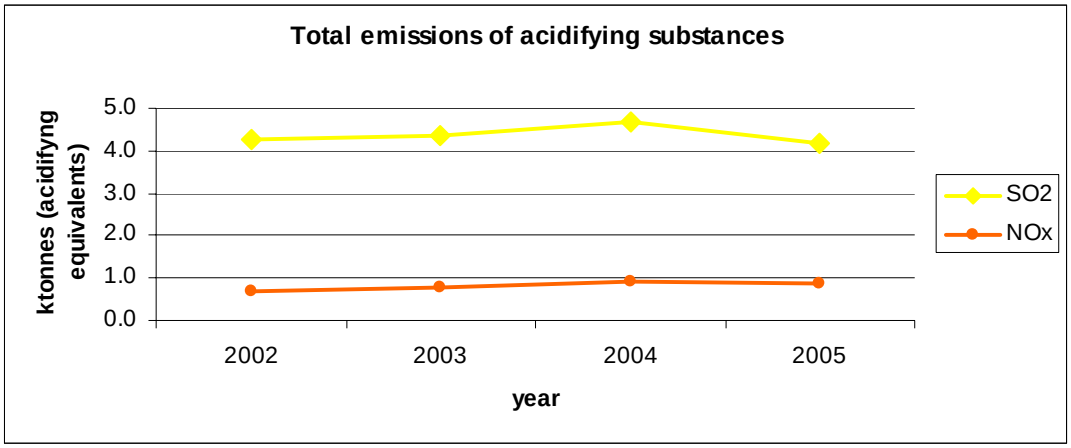
Key message

In the scope of the CORINAIR Program in the country a special Inventory of the emission substances had been established in 2005 and the estimation was done for the period 2002-2005, which means a proper trend is not possible.

There is a slight decreasing trend of some acidifying substance emission in Republic of Macedonia in the period 2002-2005, especially SO_2 (decreasing of some 20%), but rather manly due to the fact of decreasing of the number or ceased production process (in the metallurgy) of the existing pollution sources than to some special anti pollution measures and programs.

The production of electrical power is still the main polluter with SO_2, (over 90 % of the emission) mainly because of the bad quality (low calories) of the fuels with high percentage of sulphur. These processes together with the transport are the main generators of NO_x (around 70 %of the emission.) Data for NH_3 emission are available only for 2005 (the agriculture is the main generator with over 80% of the emission).

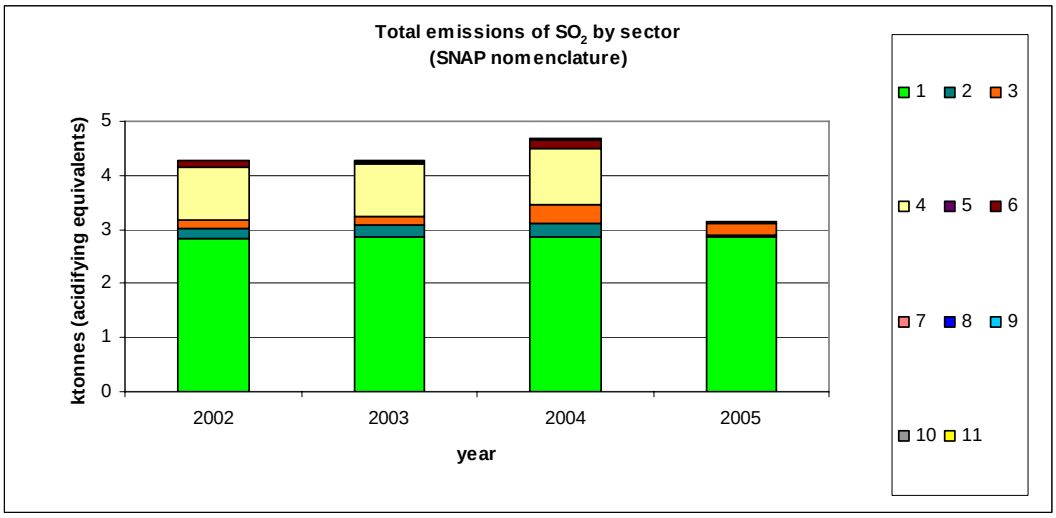
At present there is no integrated program or action plans on any level for reducing the emissions of pollutants into the atmosphere in the country.



Title: Total emissions of acidifying substances

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

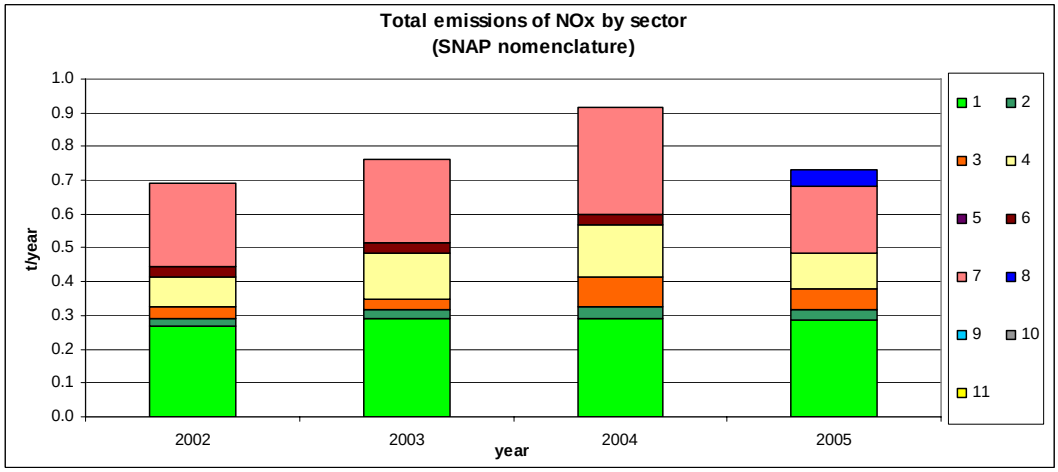
Note: no data for the period before 2002



Title: Total emissions of SO_2 by sector

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

Note: no data for the period before 2002



Title: Total emissions of NO_x by sector

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

Note: no data for the period before 2002

Results and assessment

Policy relevance

Legal bases

Law on Environment (2005), Law on Ambient Air Quality (2004), Law on Road Traffic Safety, Law on Standardization (including Rulebook on the quality of liquid fuels with national standards for liquid fuels) National Methodology on emissions—CORINAIR

UNECE LRTP Convention – (ratified - including EMEP Protocol)

In the Law on Ambient Air Quality there is an obligation for an adoption of a National Plan for Ambient Air Protection and a Program for pollution reduction and quality improvement. These documents will be prepared under the EU Beside the emissions limits; The Law on Ambient Air Quality establishes a legal ground for the technical inspection and registration of mobile sources of pollution to include the compulsory regular control of the compliance of the emission levels with the legal standards.

Assessment - Analyse the trend of the indicator and linkages between relevant indicators and sectors

With the completion of the Cadastre of Air Polluters and Pollutants in the Republic of Macedonia, most of the possible air polluters, as well as individual air pollutants, will be identified. Data have been collected from business entities and the following pollutants are measured: sulphur dioxide, nitrogen oxides, carbon monoxide, dust, quantity of exhaust gas-flow from outlets into the air, and heavy metals, where possible. By the application of the CORINAIR (Core Inventory for Air Pollution) methodology and the SNAP (Selected Nomenclature for Air Pollution), the data measured by the Laboratory under the MEPP, the data obtained from individual major companies that monitor only air emissions and pollution, as well as data in the Statistical Year Book have been compiled for around 220 polluters in the Republic of Macedonia. Introduction of unique methodology of air pollution inventory at the national level is of high importance with regard to individual pollutants, recommended under the CORINAIR (Core Inventory for Air Pollution). The Republic of Macedonia has ratified the Convention on Long-range Transboundary Air Pollution and the EMEP Protocol (European Monitoring of Environment Programme). The methodology will enable the data for Republic of Macedonia to be compatible to and comparable with the relevant EU data. Introduction of unique methodology of air pollution inventory (CORINAIR) and distribution of quantities of pollutants according to all 11 sectors in line with the SNAP, at the national level is planned for 2005 and 2006, through CARDS Regional Programme and European Environmental Agency (EEA).

Emissions of SO_2 by sector

Based upon the new (CORINAIR) methodology introduced and data collected the series of SO_2 emissions have been estimated for the period 2002-2005.

Despite the slightly decreasing trend of SO_2 emission which can be linked with the reduction in the heavy industrial processes in the country, the production of the electrical power is the major source of emission (over 91 % in 2005). The south-west region where the biggest Electrical Plant is located is most heavily polluted. The quality of the solid and liquid fuel is low (high percentage of sulphur) and there is no evidence for a proper emission reduction policy on local or national level.

Emissions of NO_x by sector

The series of NO_x emissions have been estimated for the period 2002-2005. With the CORINAIR methodology of estimation applied, the main source of NO_x emission in the country are the production of electrical energy (38%) again because of the bad fuel quality, transport (27%) and the other industrial production processes (No. 4 of the SNAP nomenclature-with more than 14% of the estimated emission).

Emissions of NH_3 – have been initially calculated for 2005. The agricultural sector is the main source of emission (84 % of the emission) CARDS projects.

Data coverage (by years):

Table 1: Total emissions of acidifying substances

Substances (ktonnes)	2002	2003	2004	2005
SO_2	4,3	4,3	4,7	3,1
NO_x	0,7	0,8	0,9	0,7

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

Table 2: Total emissions of SO_2 by sector

SNAP		2002	2003	2004	2005
1	Public power, cogeneration and district heating plants	2.8211	2.8714	2.8714	2.8707
2	Commercial, institutional and residential combustion plants	0.1968	0.1968	0.2320	0.0332
3	Industrial combustion	0.1688	0.1688	0.3656	0.2016
4	Production processes	0.9581	0.9650	1.0369	0.0111
5	Extraction and distribution of fossil fuels				
6	Solvent use	0.1244	0.0444	0.1383	
7	Road transport	0.0161	0.0161	0.0308	0.0242
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

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

Table 3: Total emissions of NO_x by sector

SNAP		2002	2003	2004	2005
1	Public power, cogeneration and district heating plants	0.2667	0.2923	0.2923	0.2848
2	Commercial, institutional and residential combustion plants	0.0246	0.0246	0.0333	0.0326
3	Industrial combustion	0.0328	0.0328	0.0885	0.0596
4	Production processes	0.0906	0.1352	0.1541	0.1072
5	Extraction and distribution of fossil fuels				
6	Solvent use	0.0309	0.0309	0.0309	
7	Road transport	0.2475	0.2467	0.3167	0.2000
8	Other mobile sources and machinery				0.0450
9	Waste treatment and disposal				0.0005
10	Agriculture				
11	Nature.				0.0037
total		0.6922	0.7619	0.9157	0.7334

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

Metadata

Legal bases for the indicator:

Law on Environment (2005), Law on Ambient Air Quality (2004), National Methodology on emissions — CORINAIR

LRTP Convention – (ratified - including EMEP Protocol)

Data source(s):

State Statistical Bureau, Energy Balance of the country – Governmental Report; Cadastre of Air Polluters and Pollutants, Data from the measurements of the companies main polluters, Motor Cars Database of the Ministry for Interior, CORINAIR project of the Ministry for Environment and Physical Planning, National Spatial Plan.

Geographical coverage: Republic of Macedonia

Temporal coverage: 2002 - 2005

Methodology and frequency of data collection:

CORINAIR Atmospheric Emission Inventory Guidebook, Second Edition, 1999, SNAP nomenclature of the sectors annual processing of the data.

Methodology of data manipulation (measurements):

The data are collected on regional basis and are presented as national data.

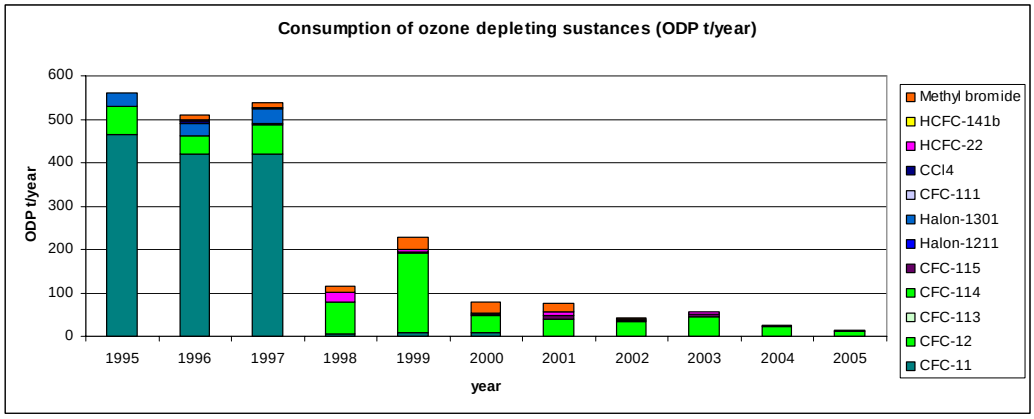
Quality information (at data level):

Strength and weakness (at data level) there is no data for the period before 2002, proper trend is not possible.

1.2. CSI 006 Production and consumption of ozone depleting substances

Key message

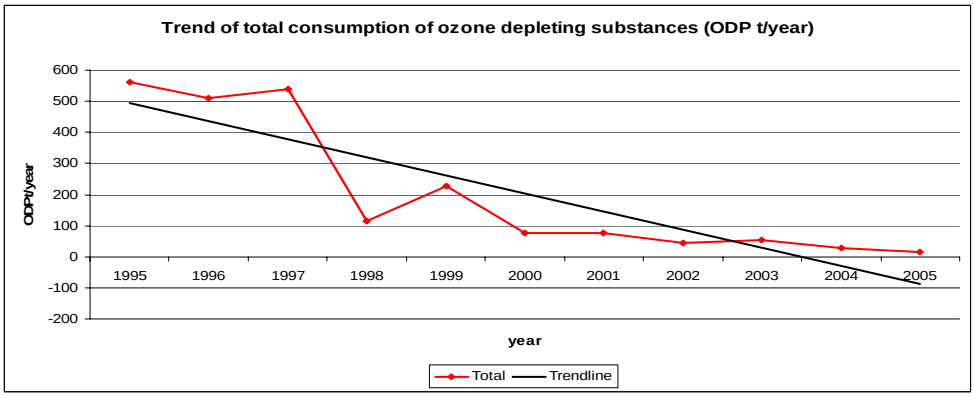
Republic of Macedonia ratified the Vienna Convention and Montreal Protocol in 1994. After the preparation of the Country Programme for Phasing out of ozone depleting substances (ODSs) in 1996 and establishment of the National Ozone Unit under the Ministry of Environment and Physical Planning in 1997 the national action on inventory, reduction and elimination of ODSs had started. In the period from 1997 to 2005 more than 97% of the ODS consumption was eliminated.



Title: Consumption of ozone depleting substances (ODP t/year)

Source: Ministry of Environment and Physical Planning, Ozone Unit

Note: Only data for consumption, there is no production of ODSs in the Republic of Macedonia



Title: Trend of total consumption of ozone depleting substances (ODP t/year)

Source: Ministry of Environment and Physical Planning, Ozone Unit

Note: Only data for consumption, there is no production of ODSs in the Republic of Macedonia

Results and assessment

It is important to be stressed that there is no ODS production in Republic of Macedonia. The country was only a consumer of around 560 tonnes chemicals classified in the Annex of the Montreal Protocol in 1995 before starting of the national action on reduction and elimination of ODSs. The Ozone Unit under the Ministry of Environment and Physical Planning using the special software controls the import, export and consumption of ODSs in the country. The total consumption of ODS in 1996 was 560 T and 75% out of the total consumption is in the sectors of foams and refrigerators. Everyday monitoring shows the decreasing trend of ODS consumption: the basic average consumption between 1995-1997 was approximately 527 T. After implementation of the activities defined in Country Programme for Phasing out of ODSs and conducting an intensive national action on ODS reduction and elimination the results were 66.72 tonnes - total ODS consumption in 2005 or 97% less that the quantity registered in 1995. This was in line with the Montreal Protocol obligation and are well ahead in comparison with the time frame defined in the treaty.

Policy relevance

Legal bases

- Law on Ratification of the Vienna Convention

- Law on Ratification of the Montreal Protocol

- Law on Ratification of the London Amendment to the MP

- Law on Ratification of the Copenhagen Amendment to the MP

- Law on Ratification of the Montreal Amendment to the MP

- Law on Ratification of the Beijing Amendment to the MP

- As of 01.03.1997 the import of ODSs is allowed only with permit issued by the Ministry of Environment and Physical Planning

- As of 12.06.1998 the import of equipment (new and used refrigerators, freezers, cooling equipment, heat pumps etc.) containing ODS is allowed only with permit issued by the Ministry of Environment and Physical Planning

The Country Program for Phasing-out Substances that Deplete the Ozone Layer was prepared in 1996.

Several projects have been proposed in the Country Program for accelerated phase-out of ODS. All projects are technically and financially supported by the Multilateral Fund of the Montreal Protocol, through UNIDO, as an implementing Agency.

Currently, a project on terminal CFCs phasing-out is running and foresees to enable complete elimination of CFCs classified in Annex A Group I of the Montreal Protocol till 1 January 2009.

Assessment

The Ministry of Environment and Physical Planning/Ozone Unit conducts permanent monitoring of the import, export and consumption of the ODSs in the country. The Ozone Unit prepares yearly reports which are based on real data processed by the special software for this purpose. The reports presented a reduction of the ODSs for more than 97%. The projects on elimination of the ODS usage implemented in almost all economic sectors applying ODSs (refrigerator production and servicing, rigid and flexible foam production, fire fighting equipment, agriculture, etc) made the consumption of these hazardous chemicals to be phased-out. The financial assessment provided by the Multilateral Fund of the Montreal Protocol enables the Republic of Macedonia to fulfil obligations under the Montreal Protocol and promoted Best Available Techniques in the sectors using ODSs in the processes.

Data coverage (by years):

Table 1: Consumption of ozone depleting substances in Republic of Macedonia (ODP t/year)

Substances	ODP t/year										
	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
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
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
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**

Source: Ministry of Environment and Physical Planning, Ozone Unit

Metadata

Legal bases for the indicator: Law on Ratification of the Montreal Protocol (1987)

Data source(s): Ministry of Environment and Physical Planning/Ozone Unit

Geographical coverage: Republic of Macedonia

Temporal coverage: 1995 - 2005

Methodology and frequency of data collection: Annual data processed by the Ministry of Environment and Physical Planning/Ozone Unit.

Methodology of data manipulation (measurements): The MoEPP/Ozone Unit performs permanent monitoring of the imported/exported and consumed ODS quantities.

Quality information (at data level):

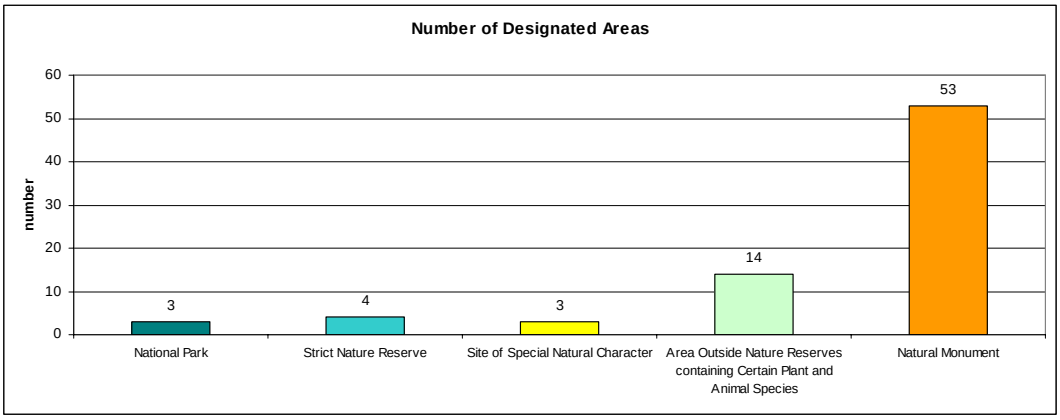
Data meets obligations defined by the Montreal Protocol.

2. BIODIVERSITY

2.1. CSI 008 Designated areas

Key message

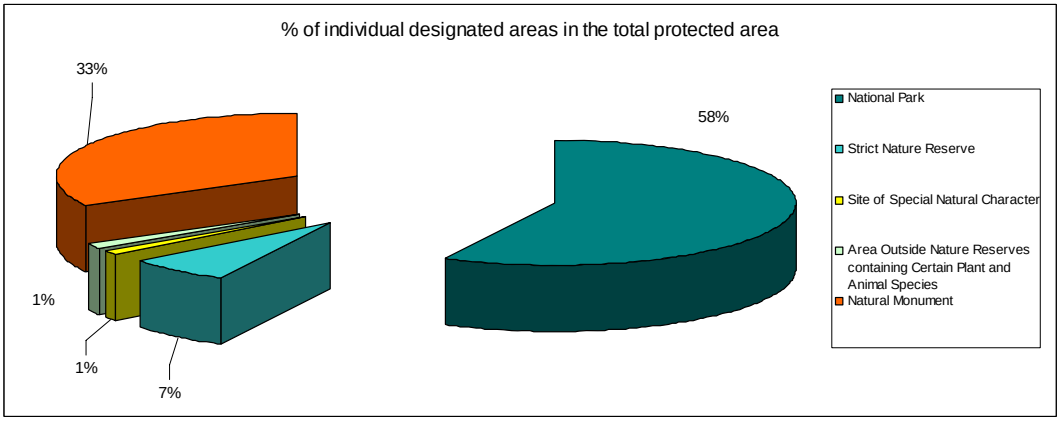
Starting from 1948 when the First National Park in the country had been announced, the number and the total area of different national categories of protected areas started to have an increasing trend. With the new Law on Nature Protection a new categorization of the protected areas had been adopted in accordance with the IUCN model (six categories of protected areas). The majority are National Parks (58 %) and Monuments of Nature (33 %).



Title: Number of Designated areas (CDDA data base)

Source: Ministry of Environment and Physical Planning, Office for Environment

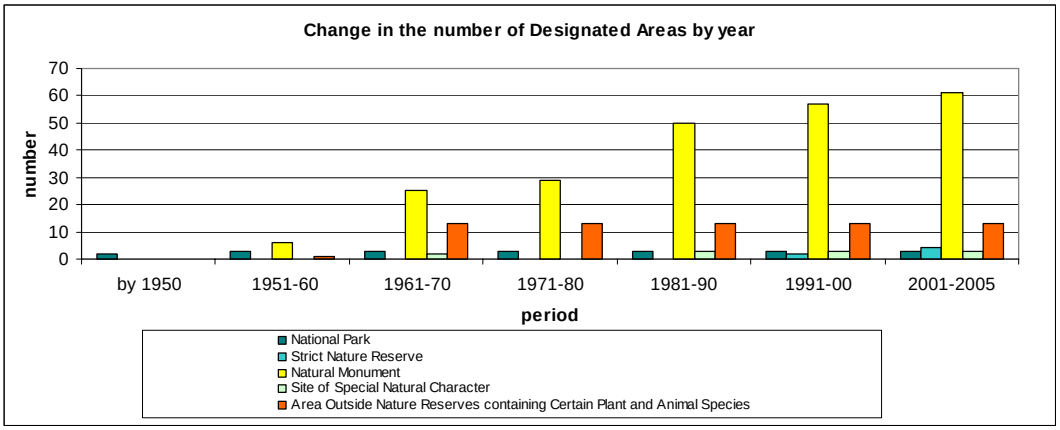
Note: The CDDA database contains data according to the old categorization.



Title: % of individual categories of designated areas in the total protected area (CDDA data base)

Source: Ministry of Environment and Physical Planning, Office for Environment

Note: The CDDA database contains data according to the old categorization.



Title: Change in the number of Designated Areas by year (CDDA data base)

Source: Ministry of Environment and Physical Planning, Office for Environment

Note: The CDDA database contains data according to the old categorization.

Results and assessment

Policy relevance

Legal bases

Spatial Plan of Republic of Macedonia for 2002-2020 (2004), envisages an increasing of the total surface of protected areas from the current 7.30 % (187.770 hectares) to future 11.6 % of the country surface. As a comparison in most of the European countries the total surface of protected areas is between 10-15 % of the country area.

Law on Nature Protection (2004) predicts an introduction of a system of protected areas aiming to protect the biodiversity in the frame for the natural environment, the processes in the nature as well as abiotic characteristics and area's biodiversity. The protection of the nature is carried out through biological and landscape diversity protection and natural heritage protection in and outside protected areas**.**

National Environmental Action Plan – 2 (2006) also emphasizes the aim of introduction of an integral system on nature protection and sustainable biodiversity in accordance to the EU standards and international regulations, agreements and conventions.

National Strategy for Biological Diversity and an Action Plan adopted by the Government in 2004 defines integrated approach towards protection and sustainable use of the components of biological diversity. The Action Plan presents the specific actions to be implemented for the purpose of achieving the goals. One of the actions emphasized in the documents is the enlarging of the

protected areas surface with declaring different categories new protected areas, as well as a preparation of proposals for new areas on the Ramsar and UNESCO lists.

Assessment

Since 1948 when the First National Park had been declared, there is an increasing trend of the number and the total surface of the different national categories of protected areas. Currently the network of protected areas in the Republic of Macedonia comprises 74 items of nature, covering a total area of 187.770 hectares or 7.30 % of the national territory. The structure has been made in accordance to the old categorization on national parks, strict natural reserve, site of special natural characteristics, natural monuments and areas outsides natural reserves containing certain plants and animal species. In accordance to the new Law on Nature Protection in 2004, new categorization had been introduced harmonized with the IUCN method: Strictly Protected Natural Reserve, National Park, Monument of Nature, Nature Park, Protected Landscape and Multi-Purpose Area. The Law stipulates a transitional period of three years after its entry into force when the re-evaluation of protected areas designated prior to its adoption will be completed.

Protected areas of internationally recognised status includes

- Monument of nature “Ohrid Lake” – World natural heritage (UNESCO);

- Monument of nature “Prespa Lake” – Ramsar Site;

- Monument of nature “Markovi Kuli” (*King Marco’s Towers*) – World natural heritage (UNESCO’s Preliminary List); and

- Monument of nature “Slatinski Izvor” (*Slatino Springs)* - World natural heritage (UNESCO’s Preliminary List).

In 2002, the Republic of Macedonia initiated the establishment of the Emerald Network of areas of special conservation interest. So far six areas have been proposed to be included in the national Emerald Network. In 2004, activities towards the development of indicative map of the Pan-European Environmental Network for South Eastern Europe, involving the Republic of Macedonia, commenced.

At present, the management of the protected areas is partial and in certain cases does not exist. The exceptions are the National parks.

The majority of the current designated protected areas are National Parks (58 %) and Monuments of Nature (33 %).

Data coverage (by years):

Table 1: Number of Designated areas

Category	Designated areas	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	Natural Monument	53	619,78
	Total	**77**	

Source: Ministry of Environment and Physical Planning, Office for Environment

Table 2: Percent of individual categories of designated areas in the total protected area

Designated areas	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%
Natural Monument	53	619,78	33%
Total	77	1881,54	

Source: Ministry of Environment and Physical Planning, Office for Environment

Table 3: Change in the number of designated areas by year

	by 1950	1951-60	1961-70	1971-80	1981-90	1991-00	2001-2005
National Park	2	3	3	3	3	3	3
Strict Nature Reserve	0	0	0	0	0	2	4
Natural Monument	0	6	25	29	50	57	61
Site of Special Natural Character	0	0	2	0	3	3	3
Area Outside Nature Reserves containing Certain Plant and Animal Species	0	1	13	13	13	13	13

Source: Ministry of Environment and Physical Planning, Office for Environment

Metadata

Legal bases for the indicator:
Spatial Plan of the Republic of Macedonia (2004), The Law on Nature Protection (2004)

Data source(s):

Ministry of Environment and Physical Planning, CDDA MK 2004, www.moepp.gov.mk

Spatial Plan of the Republic of Macedonia

Country study for biodiversity of the Republic of Macedonia

National Strategy for Biological Diversity and Action plan of the Republic of Macedonia

State Statistical Office, Statistical Yearbook of the Republic of Macedonia, www.stat.gov.mk

Geographical coverage: Republic of Macedonia

Temporal coverage: 1948 - 2005

Methodology and frequency of data collection: yearly

Methodology of data manipulation (measurements):

The procedure of designating different categories of protected areas is in accordance to the law on Nature Protection.

Quality information (at data level):

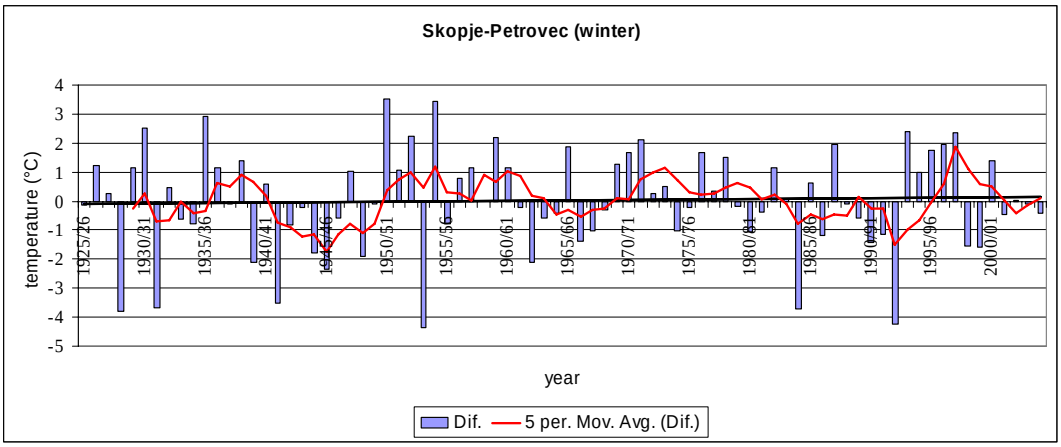
With the process of re-valorisation and re-categorization of the current protected areas in the defined period, new more accurate data/information's will be available for all the designated areas.

3. CLIMATE CHANGE

3.1. CSI 012 Global and European temperature

Key message

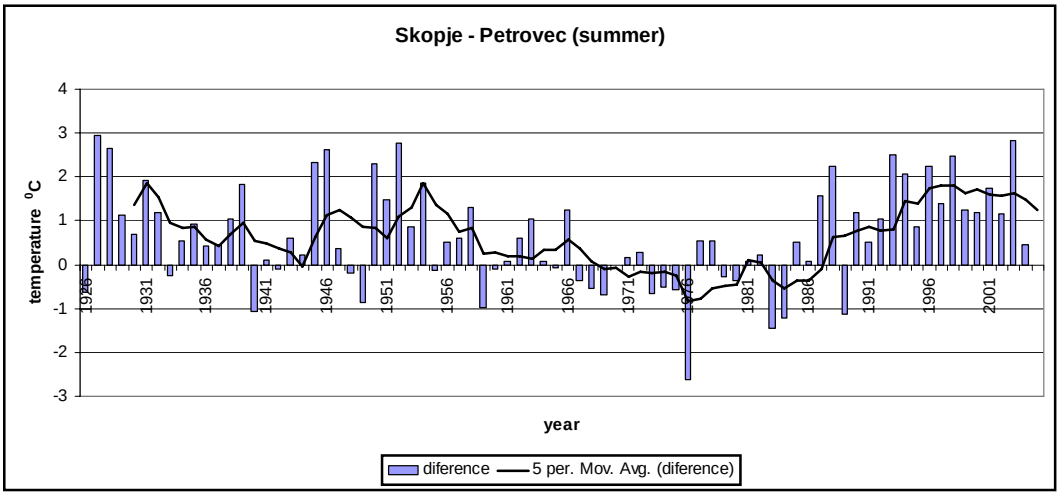
The increase in global average temperature on the five climate stations in the country is in the frame of the policy targets defined in EU (not more than 2 degrees Celsius (C) above pre-industrial levels). This deviation is 0.6 degrees for the summer period. However the rate of increase in global average temperature per decade presents more concerning results. In four stations the rate of increase in the summer periods of the last decade (1996-2005) is between 1.3 and 1.5, far above the proposed target of not more than 0.2 degree C. The increasing in the average temperature of the winter period in the last decade was between 0.3 and 0.4 degrees Celsius.



Title: Deviation of the average winter temperature per year in the period 1926 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

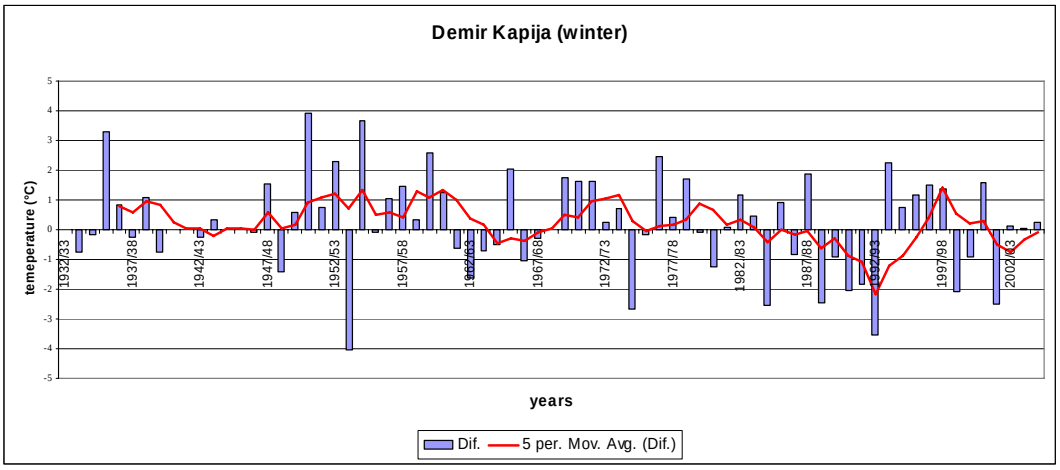
Note: No data before 1926



Title: Deviation of the average summer temperature, per year in the period 1926 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

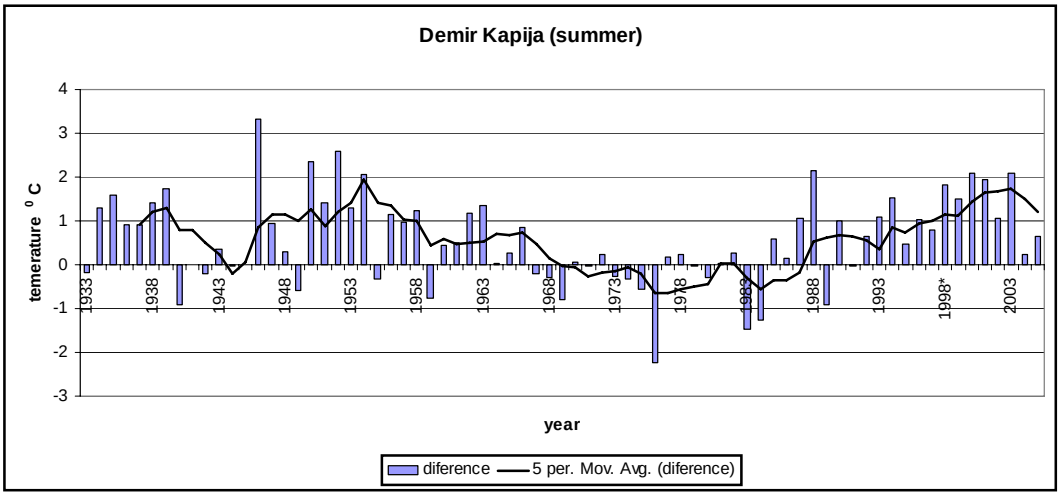
Note: No data before 1926



Title: Deviation of the average winter temperature, per year in the period 1933 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

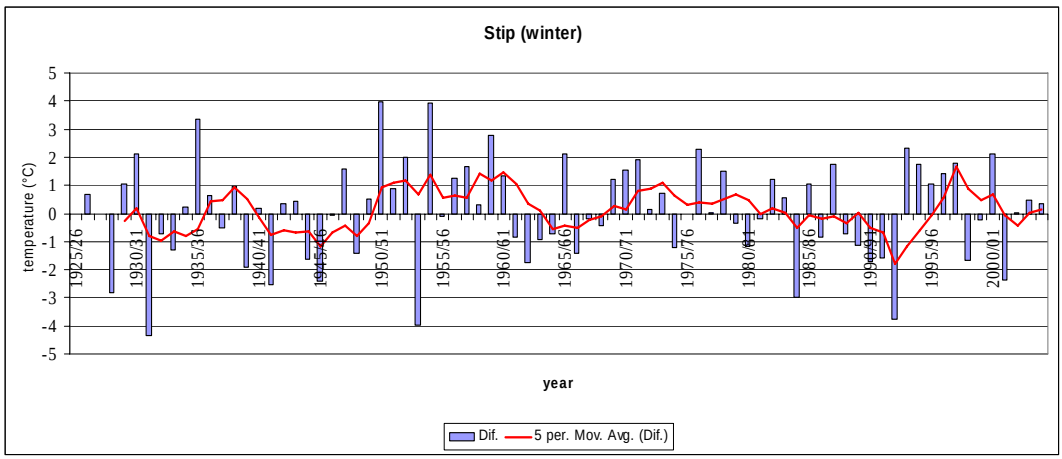
Note: No data before 1933



Title: Deviation of the average summer temperature, per year in the period 1933 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

Note: No data before 1933



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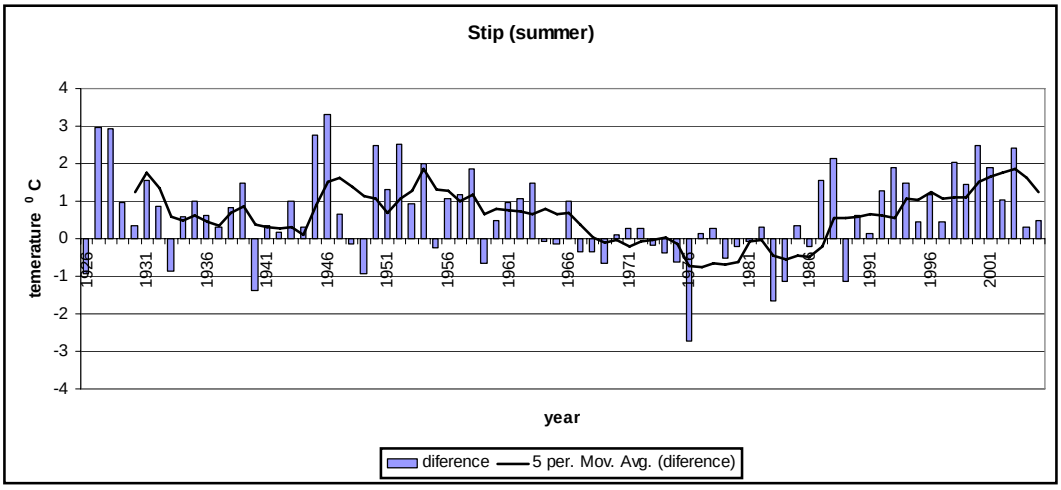

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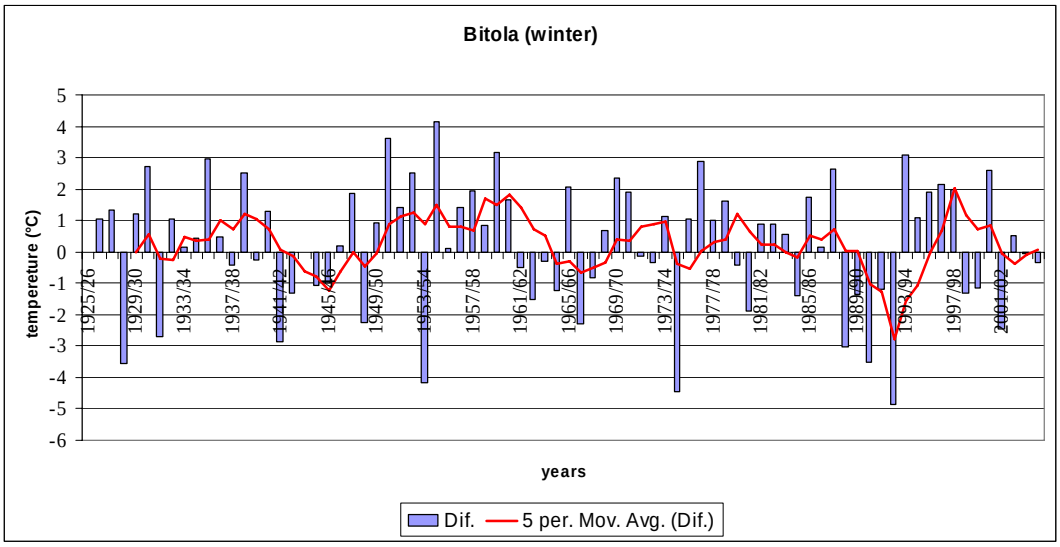

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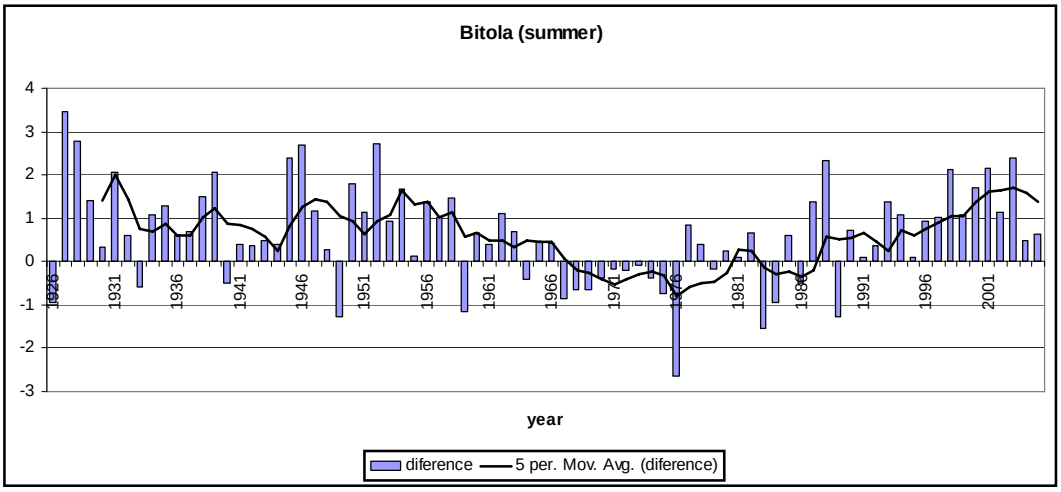
Source: Administration of Hydro meteorological Matters

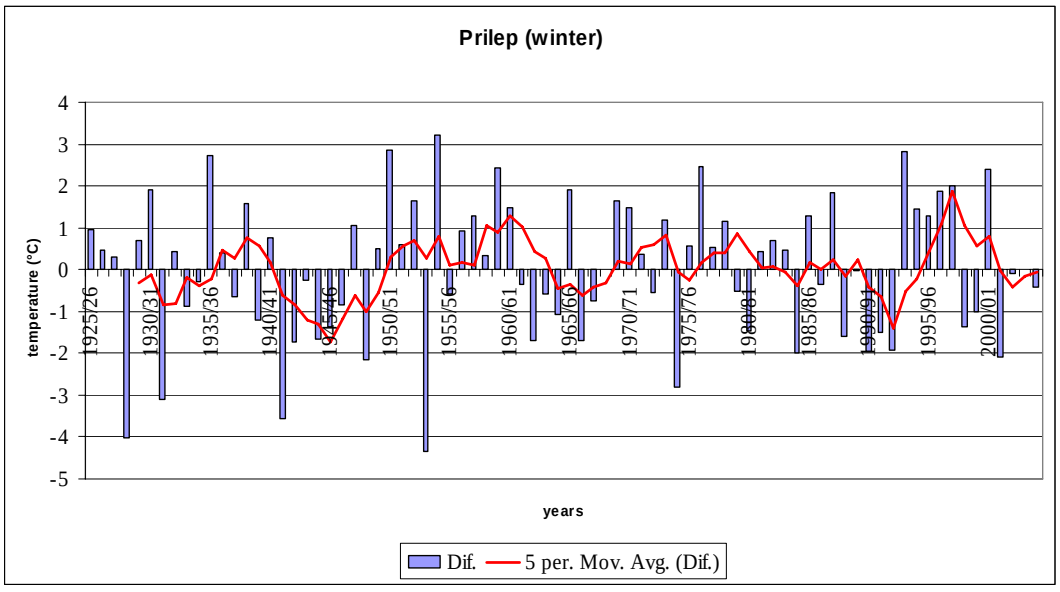
Note: No data before 1926



Title: Deviation of the average summer temperature, per year in the period 1926 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

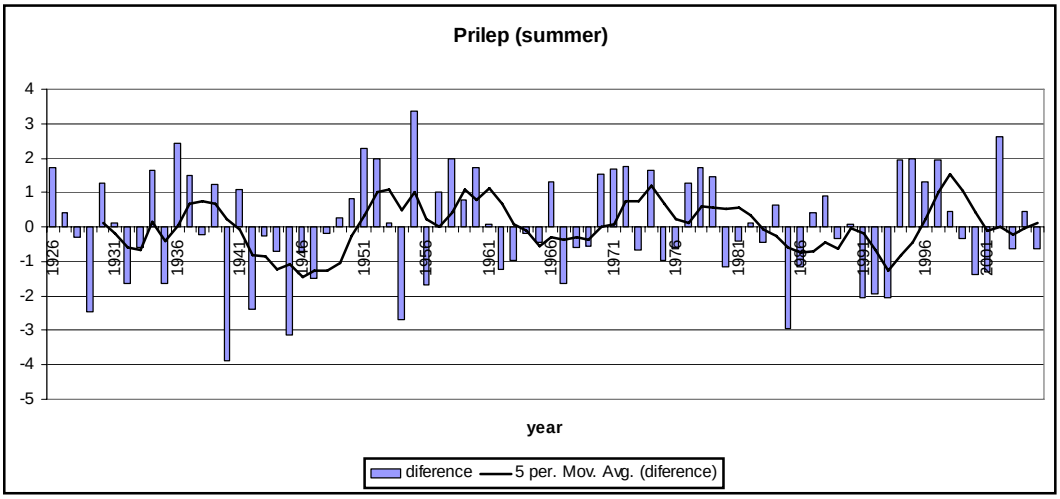
Note: No data before 1926



Title: Deviation of the average winter temperature, per year in the period 1926 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

Note: No data before 1926



Title: Deviation of the average summer temperature, per year in the period 1926 – 2005, compared to the 1961 – 1990 average

Source: Administration of Hydro meteorological Matters

Note: No data before 1926

Results and assessment

Policy relevance

Legal base

The Ministry of Environment and Physical Planning is the national focal point for climate change issues and the body responsible for policy making with regard to the implementation of the provisions of the United Nations Framework Convention on Climate Change. In January 2000, the first project office was set up within the Ministry of Environment and Physical Planning, when the work on the First National Communication on Climate Change began with the financial support provided by the Global Environment Facility (GEF). The Office was established with the aim of strengthening the national capacities in the implementation of the obligations taken over with the ratification of the United Nations Framework Convention on Climate Change. The Office is strengthening the system for development and periodical upgrading of national inventories of anthropogenic emissions, as well as the system for formulation, implementation, publishing and regular upgrading of the national programme containing the measures of climate change mitigation and adaptation.

Law on hydro meteorological matters (1992) - This law regulates hydrological and meteorological matters and authorize (designate) the responsible institution – Administration of Hydro meteorological Matters for fulfilling the tasks comprising: development and maintenance of hydrological and meteorological (weather) observation; research of atmosphere, soil and water resources; and application of hydrology and meteorology.

Some duties regarding the development and maintenance of the hydrological and meteorological (weather) observation (Article 4) are: meteorological measurements and observations for weather forecasting, climatology, processing the registered data; provision of reports and forecasts of weather etc.

Research of the atmosphere, soil and water resources (Article 5), among other include: research of the physical basis of climate, monitoring the climate change and variability, and development of methods for climate prediction etc.

Administration of Hydro meteorological Matters represents a national Hydro meteorological informative centre as part of national system for information distribution. It also carries out international exchange of meteorological and hydrological data and information.

The measurements of the air temperature at the main meteorological stations Skopje (Hs=234m ϕ=41°57' λ=21° 38'), Prilep (Hs=673m ϕ=41° 20' λ=21° 34'), Bitola (Hs=586m ϕ=41° 03' λ=21° 20'), Demir Kapija (Hs=126m ϕ=41° 25' λ=22° 15') and Stip (Hs=326m ϕ=41° 25' λ=22° 11') (hat represent different climate regions in the Republic of Macedonia) are used to calculate the average monthly air temperatures.

The Republic of Macedonia has prepared the First National Communication on Climate Change, according to the United Nations Framework Convention for Climate Change (UNFCCC**)** which was adopted by the Government of the Republic of Macedonia in 2003. The Communication was submitted to the Secretariat of the Convention on 25.03.2003. The First National Communication on Climate Change incorporates the Action Plan, which includes recommendations and measures for greenhouse gas (GHG) effects abatement, as well as measures for adoptation to future climate change in the most sensitive sectors.

Assessment

The increase in global average temperature on the five climate stations in the country is in the frame of the policy targets defined in EU (not more than 2 degrees Celsius (C) above pre-industrial levels). This deviation is 0.6 degrees for the summer period. The increase in the winter period is significantly lower in the range of 0.0 - 0.1 ^{0}C in 4 of five stations. However the rate of increase in global average temperature per decade presents more concerning results. In four stations the rate of increase in the summer periods of the last decade (1996-2005) is between 1.3 and 1.5 far above the proposed target of not more than 0.2 degree C. The increasing in the average temperature of the winter period in the last decade was between 0.3 and 0.4 degrees Celsius.

Results in each of the stations

Skopje - Petrovec (winter)

Deviation of the average winter temperature in Skopje (for the period 1926-2005) from the average winter temperature of a standard climate period (1961-90) show the average value of 0,0 ^{0}C. For the last decade (1996-2005), this value is 0,3 ^{0}C.

Skopje - Petrovec (summer)

Deviation of the average summer temperature in Skopje (for the period 1926-2005) from the average summer temperature of a standard climate period (1961-90) show the average value of 0,6 ^{0}C. For the last decade (1996-2005), this value is 1,5 ^{0}C.

Demir Kapija (winter)

Deviation of the average winter temperature in Demir Kapija (for the period 1926-2005) from the average winter temperature of a standard climate period (1961-90) show the average value of 0,2 ^{0}C. For the last decade (1996-2005), this value is -0,1 ^{0}C.

Demir Kapija (summer)

Deviation of the average summer temperature in Demir Kapija (for the period 1926-2005) from the average summer temperature of a standard climate period (1961-90) show the average value of 0,6 ^{0}C. For the last decade (1996-2005), this value is 1,3 ^{0}C.

Stip (winter)

Deviation of the average winter temperature in Stip (for the period 1926-2005) from the average winter temperature of a standard climate period (1961-90) show the average value of 0,1 ^{0}C. For the last decade (1996-2005), this value is 0,3 ^{0}C.

Stip (summer)

Deviation of the average summer temperature in Stip (for the period 1926-2005) from the average summer temperature of a standard climate period (1961-90) show the average value of 0,6 ^{0}C. For the last decade (1996-2005), this value is 1,4 ^{0}C.

Bitola (winter)

Deviation of the average winter temperature in Bitola (for the period 1926-2005) from the average winter temperature of a standard climate period (1961-90) show the average value of 0,2 ^{0}C. For the last decade (1996-2005), this value is 0,4 ^{0}C.

Bitola (summer)

Deviation of the average summer temperature in Bitola (for the period 1926-2005) from the average summer temperature of a standard climate period

(1961-90) show the average value of 0,6 ^{0}C. For the last decade (1996-2005), this value is 1,4 ^{0}C.

Prilep (winter)

Deviation of the average winter temperature in Prilep (for the period 1926-2005) from the average winter temperature of a standard climate period (1961-90) show the average value of 0,0 ^{0}C. For the last decade (1996-2005), this value is 0,3 ^{0}C.

Prilep (summer)

Deviation of the average summer temperature in Prilep (for the period 1926-2005) from the average summer temperature of a standard climate period (1961-90) show the average value of 0,0 ^{0}C. For the last decade (1996-2005), this value is 0,3 ^{0}C.

Data coverage (by years):

Table 1: Deviation of the summer average temperature

	Skopje - Petrovec	Demir Kapija	Stip	Bitola	Prilep
1926	-0,6		-0,9	-0,9	1,7
1927	2,9		3,0	3,5	0,4
1928	2,7		2,9	2,8	-0,3
1929	1,1		1,0	1,4	-2,5
1930	0,7		0,3	0,3	1,3
1931	1,9		1,6	2,1	0,1
1932	1,2		0,9	0,6	-1,6
1933	-0,2	-0,2	-0,9	-0,6	-0,6
1934	0,5	1,3	0,6	1,1	1,6
1935	0,9	1,6	1,0	1,3	-1,6
1936	0,4	0,9	0,6	0,6	2,4
1937	0,5	0,9	0,3	0,7	1,5
1938	1,0	1,4	0,8	1,5	-0,2
1939	1,8	1,7	1,5	2,1	1,2
1940	-1,1	-0,9	-1,4	-0,5	-3,9
1941	0,1		0,3	0,4	1,1
1942	-0,1	-0,2	0,2	0,4	-2,4
1943	0,6	0,4	1,0	0,5	-0,3
1944	0,2	0,0	0,3	0,4	-0,7
1945	2,3		2,8	2,4	-3,1
1946	2,6	3,3	3,3	2,7	-0,7
1947	0,4	0,9	0,7	1,2	-1,5
1948	-0,2	0,3	-0,1	0,3	-0,2
1949	-0,9	-0,6	-0,9	-1,3	0,3
1950	2,3	2,4	2,5	1,8	0,8
1951	1,5	1,4	1,3	1,1	2,3
1952	2,8	2,6	2,5	2,7	2,0
1953	0,9	1,3	0,9	0,9	0,1
1954	1,9	2,1	2,0	1,7	-2,7
1955	-0,1	-0,3	-0,2	0,1	3,4
1956	0,5	1,1	1,1	1,4	-1,7
1957	0,6	1,0	1,2	1,0	1,0
1958	1,3	1,2	1,9	1,5	2,0
1959	-1,0	-0,8	-0,7	-1,2	0,8
1960	-0,1	0,4	0,5	0,7	1,7
1961	0,1	0,5	1,0	0,4	0,1
1962	0,6	1,2	1,1	1,1	-1,2
1963	1,0	1,4	1,5	0,7	-1,0
1964	0,1	0,0	-0,1	-0,4	-0,2
1965	-0,1	0,3	-0,1	0,5	-0,4
1966	1,2	0,9	1,0	0,4	1,3
1967	-0,4	-0,2	-0,3	-0,9	-1,6
1968	-0,5	-0,3	-0,3	-0,6	-0,6
1969	-0,7	-0,8	-0,7	-0,6	-0,6
1970	0,0	0,1	0,1	-0,4	1,5
1971	0,2	0,0	0,3	-0,2	1,7
1972	0,3	0,2	0,3	-0,2	1,8
1973	-0,7	-0,3	-0,2	-0,1	-0,7
1974	-0,5	-0,3	-0,4	-0,4	1,6
1975	-0,6	-0,6	-0,6	-0,7	-1,0
1976	-2,6	-2,2	-2,7	-2,6	-0,6
1977	0,5	0,2	0,1	0,8	1,3
1978	0,5	0,2	0,3	0,4	1,7
1979	-0,3	0,0	-0,5	-0,2	1,5
1980	-0,4	-0,3	-0,2	0,2	-1,2
1981	0,1	0,0	-0,1	0,1	-0,4
1982	0,2	0,3	0,3	0,7	0,1
1983	-1,4	-1,5	-1,7	-1,5	-0,4
1984	-1,2	-1,3	-1,1	-0,9	0,6
1985	0,5	0,6	0,3	0,6	-2,9
1986	0,1	0,1	-0,2	-0,5	-1,2

	Skopje - Petrovec	Demir Kapija	Stip	Bitola	Prilep
1987	1,6	1,1	1,6	1,4	0,4
1988	2,2	2,1	2,1	2,3	0,9
1989	-1,1	-0,9	-1,1	-1,3	-0,3
1990	1,2	1,0	0,6	0,7	0,1
1991	0,5	0,0	0,1	0,1	-2,0
1992	1,0	0,6	1,3	0,4	-1,9
1993	2,5	1,1	1,9	1,4	-2,1
1994	2,1	1,5	1,5	1,1	1,9
1995	0,9	0,5	0,4	0,1	2,0
1996	2,2	1,0	1,2	0,9	1,3
1997	1,4	0,8	0,4	1,0	1,9
1998	2,5	1,8	2,0	2,1	0,5
1999	1,2	1,5	1,4	1,1	-0,3
2000	1,2	2,1	2,5	1,7	-1,4
2001	1,7	1,9	1,9	2,2	-1,3
2002	1,2	1,1	1,0	1,1	2,6
2003	2,8	2,1	2,4	2,4	-0,6
2004	0,5	0,2	0,3	0,5	0,5
2005	0,0	0,6	0,5	0,6	-0,6

Table 2: Deviation of the winter average temperature

	Skopje - Petrovec	Demir Kapija	Stip	Bitola	Prilep
1925/26	-0,1				1,0
1926/27	1,2		0,7	1,0	0,5
1927/28	0,3		0,0	1,3	0,3
1928/29	-3,8		-2,8	-3,6	-4,0
1929/30	1,2		1,0	1,2	0,7
1930/31	2,5		2,1	2,7	1,9
1931/32	-3,7		-4,3	-2,7	-3,1
1932/33	0,5	-0,8	-0,7	1,1	0,4
1933/34	-0,6	-0,2	-1,3	0,2	-0,9
1934/35	-0,8	3,3	0,2	0,4	-0,3
1935/36	2,9	0,8	3,3	3,0	2,7
1936/37	1,2	-0,2	0,6	0,5	0,4
1937/38	-0,1	1,1	-0,5	-0,4	-0,6
1938/39	1,4	-0,7	1,0	2,5	1,6
1939/40	-2,1		-1,9	-0,3	-1,2
1940/41	0,6		0,2	1,3	0,8
1941/42	-3,5	-0,3	-2,5	-2,9	-3,6
1942/43	-0,8	0,3	0,4	-1,3	-1,7
1943/44	-0,2		0,4	0,0	-0,3
1944/45	-1,8		-1,6	-1,1	-1,7
1945/46	-2,4	-0,1	-2,4	-1,0	-1,4
1946/47	-0,6	1,5	-0,1	0,2	-0,8
1947/48	1,0	-1,4	1,6	1,9	1,1
1948/49	-1,9	0,6	-1,4	-2,2	-2,2
1949/50	-0,1	3,9	0,5	0,9	0,5
1950/51	3,5	0,7	4,0	3,6	2,9
1951/52	1,1	2,3	0,9	1,4	0,6
1952/53	2,2	-4,0	2,0	2,5	1,6
1953/54	-4,4	3,7	-4,0	-4,2	-4,3
1954/55	3,4	-0,1	3,9	4,1	3,2
1955/56	-0,8	1,0	-0,1	0,1	-0,6
1956/57	0,8	1,5	1,3	1,4	0,9
1957/58	1,1	0,3	1,7	1,9	1,3
1958/59	0,0	2,6	0,3	0,8	0,3
1959/60	2,2	1,3	2,8	3,2	2,4
1960/61	1,1	-0,6	1,3	1,7	1,5
1961/62	-0,2	-1,6	-0,8	-0,5	-0,4
1962/63	-2,1	-0,7	-1,7	-1,5	-1,7
1963/64	-0,6	-0,5	-0,9	-0,3	-0,6
1964/65	-0,4	2,0	-0,7	-1,2	-1,1
1965/66	1,9	-1,0	2,1	2,1	1,9

1966/67	-1,4	-0,3	-1,4	-2,3	-1,7
1967/68	-1,0	0,0	-0,2	-0,8	-0,7
1968/69	-0,3	1,7	-0,4	0,7	0,0
1969/70	1,3	1,6	1,2	2,4	1,6
1970/71	1,7	1,6	1,5	1,9	1,5
1971/72	2,1	0,2	1,9	-0,1	0,4
1972/73	0,3	0,7	0,1	-0,3	-0,5
1973/74	0,5	-2,7	0,7	1,1	1,2
1974/75	-1,0	-0,2	-1,2	-4,5	-2,8
1975/76	-0,2	2,5	0,0	1,0	0,6
1976/77	1,7	0,4	2,3	2,9	2,5
1977/78	0,3	1,7	0,0	1,0	0,5
1978/79	1,5	-0,1	1,5	1,6	1,2
1979/80	-0,2	-1,3	-0,4	-0,4	-0,5
1980/81	-1,1	0,1	-1,2	-1,9	-1,5
1981/82	-0,4	1,2	-0,2	0,9	0,4
1982./83	1,1	0,5	1,2	0,9	0,7
1983/84	0,1	-2,5	0,6	0,6	0,5
1984/85	-3,7	0,9	-3,0	-1,4	-2,0
1985/86	0,6	-0,8	1,0	1,7	1,3
1986/87	-1,2	1,9	-0,8	0,2	-0,4
1987/88	1,9	-2,5	1,8	2,6	1,8
1988/89	-0,1	-0,9	-0,7	-3,0	-1,6
1989/90	-0,6	-2,0	-1,1	-1,4	0,0
1990/91	-1,4	-1,8	-1,7	-3,5	-2,0
1991/92	-1,1	-3,5	-1,6	-1,2	-1,5
1992/93	-4,2	2,2	-3,8	-4,9	-1,9
1993/94	2,4	0,7	2,3	3,1	2,8
1994/95	1,0	1,2	1,7	1,1	1,4
1995/96	1,8	1,5	1,1	1,9	1,3
1996/97	1,9	1,4	1,4	2,1	1,9
1997/98	2,3	-2,1	1,8	2,0	2,0
1998/99	-1,5	-0,9	-1,7	-1,3	-1,4
1999/00	-1,6	1,6	-0,2	-1,1	-1,0
2000/01	1,4	-2,5	2,1	2,6	2,4
2001/02	-0,5	0,1	-2,4	-2,5	-2,1
2002/03	0,0	0,0	0,0	0,5	-0,1
2003/04	-0,1	0,3	0,5	0,0	0,0
2004/05	-0,4		0,4	-0,3	-0,4

Metadata

Legal bases for the indicator: The Law on Hydro Meteorological Matters (1992)

Data source(s): Administration of Hydro Meteorological Matters, www.meteo.gov.mk

Geographical coverage: Republic of Macedonia

Temporal coverage: 1926 - 2005

Methodology and frequency of data collection: Daily data collection

Methodology of data manipulation (measurements):

Data on five climate regions. Calculations are carried out for the differences of the seasonal (winter and summer) and annual average air temperature for the existing long term records relative to the average air temperature for the standard climate period 1961-1990 and used as climate change indicator.

4. ENERGY

4.1. CSI 031 Renewable electricity

Key message

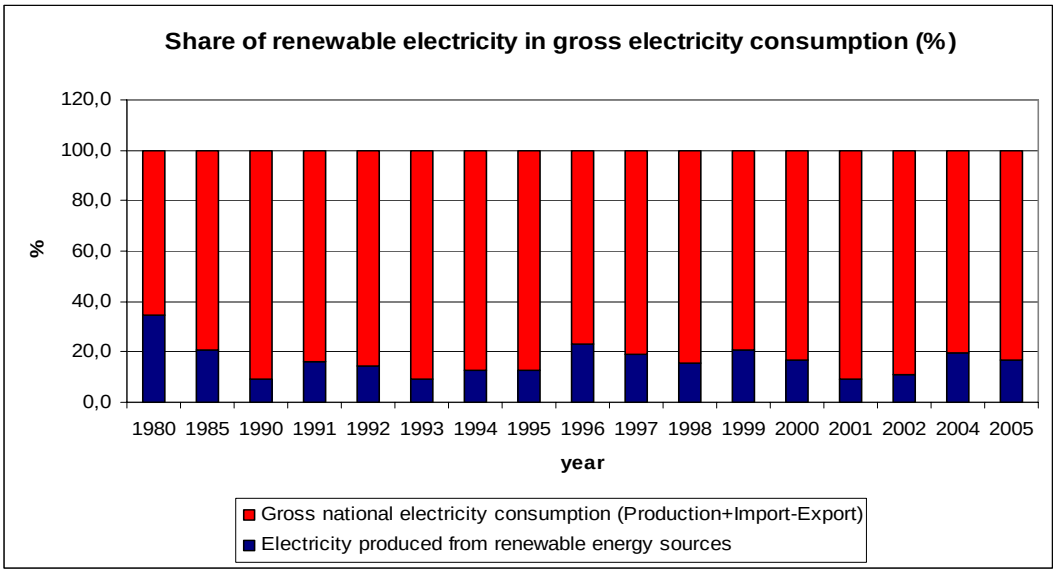
Installed power generation capacity in Macedonia is 1450 MW, comprising approximately 60 percent thermal and 40 percent hydro plant.

Regardless of the indicative target of 21% of gross EU-25 electricity consumption from renewable sources by 2010 as set by EU in its Directive 2001/77/EC, the need for increased exploitation of the renewable sources in the Republic of Macedonia conforms to the practices in the developed countries and their efforts to reduce pollutant emissions and support sustainable development.

The share of renewable electricity in gross electricity consumption in the Republic of Macedonia is rather low. It has a rather high annual fluctuation between 9.2 % and 34.4 % since 1980 depending on hydrological conditions.

In the year 2004, in Macedonia 19.9 % of total consumption was renewable electricity produced by hydro-electric power plants.

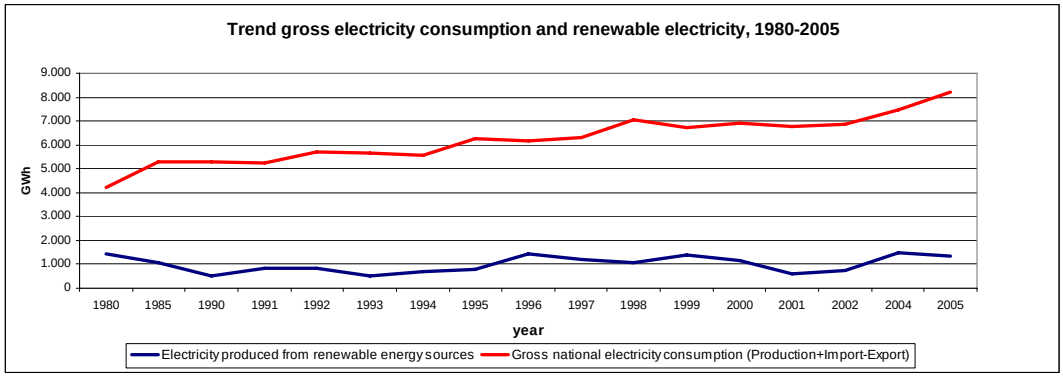
Further growth will be needed to meet the EU indicative target of a 21 % share by 2010.



Title: Share of renewable electricity in gross electricity consumption (%)

Source: State Statistical Office, "Energy balances of The Republic of Macedonia" – Ministry of Economy

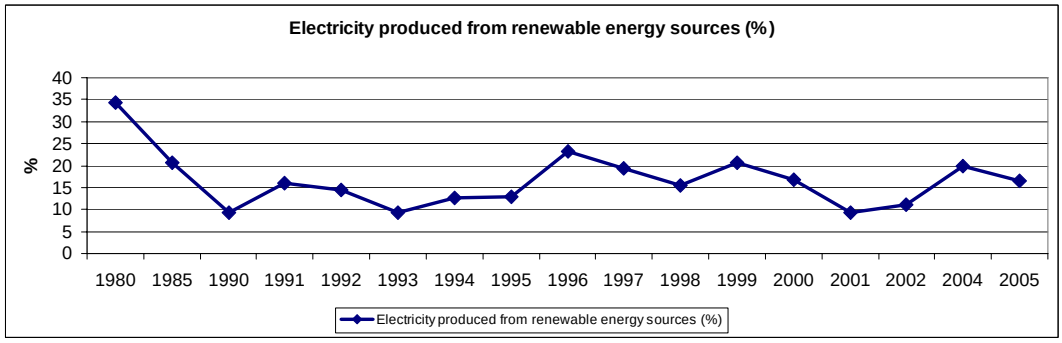
Note: There are missing data for 2003. The 2005 data are made based upon an assumption.



Title: Trend gross electricity consumption and renewable electricity, 1980-2005

Source: State Statistical Office, "Energy balances of The Republic of Macedonia" – Ministry of Economy

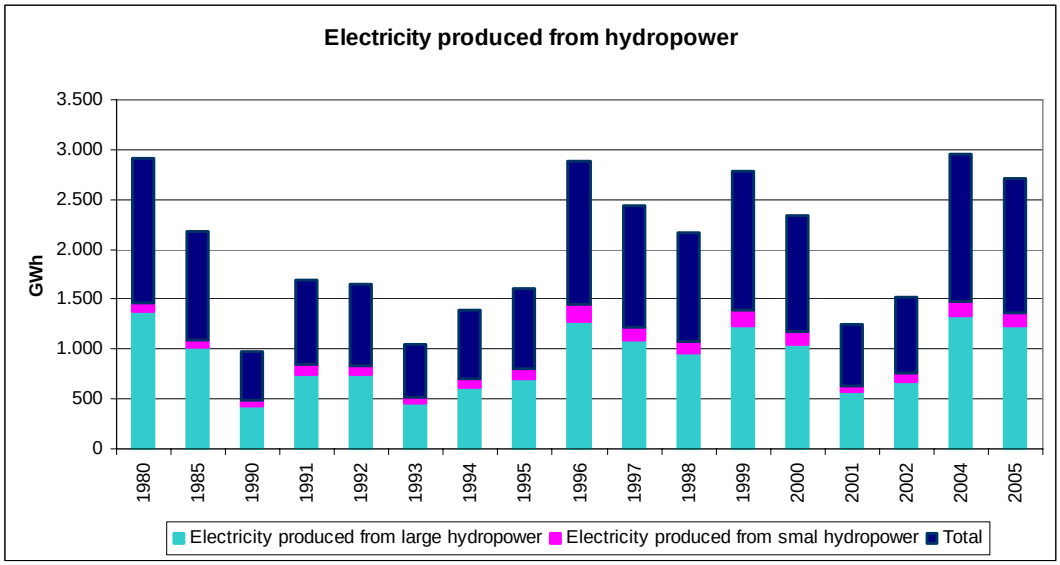
Note: There are missing data for 2003. The 2005 data are made based upon an assumption.



Title: Electricity produced from renewable energy sources (%)

Source: State Statistical Office, "Energy balances of The Republic of Macedonia" – Ministry of Economy

Note: There are missing data for 2003. The 2005 data are made based upon an assumption.



Title: Electricity produced from hydropower

Source: State Statistical Office, "Energy balances of The Republic of Macedonia" – Ministry of Economy

Note: There are missing data for 2003. The 2005 data are made based upon an assumption.

Results and assessment

Policy relevance

Legal base

The Energy Law (1997), “Energy balances of The Republic of Macedonia”, Strategy on Development of the Energy Sector of Macedonia (2000), Study on least-cost development until 2020, Energy Policy Paper of the Republic of Macedonia (2004).

Assessment

Macedonia has promising indigenous resources of renewable energy. These include hydropower, geothermal energy, biomass energy, and in the longer term wind energy.

However, even though a pipeline of financially viable renewable energy projects has been identified by different project developers, these are not being implemented because of institutional and financial constraints.

The GEF Mini Hydro project that will be completed by the end of June, 2004, has demonstrated that financially viable opportunities exist for tapping of small hydropower resources, e.g. by adding small turbine plants to existing water supply pipelines. For the purpose of following up on this project, the Ministry of Economy has developed a "pipeline" of 4 similar projects (each in the rage of 0.5 to 5.0 MW) proposed by public sector entities and 11 mini-hydro projects (each in the range of 0.1 to 1.0 MW) proposed by private investors. These projects have all been screened for technical and financial viability, but they mostly still face institutional constraints (e.g. the solving of water rights issues) and all suffer from limited access to finance.

The Macedonian Geothermal Association has prepared a list of eight projects for expansion and rehabilitation of the existing geothermal schemes in Macedonia, mainly for use of geothermal heat in greenhouses and for space heating. The projects appear to be financially viable (pay-back time less than seven years) but many face substantial institutional problems (e.g. public ownership of the near-bankrupt spas that own the existing boreholes).

The government is also interested in developing a measurement program to determine the potential for wind energy in Macedonia. Such a program would need to be put in place before it would be possible to estimate the financial viability of wind power in Macedonia.

In Kavadarci, center for the wine production in Macedonia, there is interest in projects to prepare fuel briquettes from vineyard waste. The project sponsors have calculated that at current energy prices such a project would have a pay-back time of five to six years. Several other options for biomass use exist.

Removing barriers for use of these renewable energy supply options would increase the supply from indigenous energy sources, create local employment options and mitigate the adverse environmental impact of energy production.

Currently, the share of renewable energy in electricity consumption is very prominent and depends on hydrological conditions during the year. Compared with 1980, the share of renewable energy in gross electricity consumption declined in 1990 (9.3%), 1993 (9.2%) and 2001 (9.2%), due to less production from hydropower, as a result of lower rainfall.

The structure of renewable energy sources in the Republic of Macedonia comprises only hydropower plants, mainly the large ones. The average annual share of small power plants in renewable energy is about 9 %. The history of using hydropower in Macedonia goes back to 1957 with the first hydroelectric power plant on river Vardar, HE Vrutok. Nowadays, a number of 7 large and 15 small hydropower stations are in function in the Republic of Macedonia.

During the period of observation 1980 - 2005, according to the available data, the trend is not well-balanced. The greatest share of renewable energy is in 1980, 1985 and 1996 (34.4%, 20.7% and 23.3% respectively).

The gross electricity consumption increase of 35% over the period from 1985 to 2005, was much faster than the increase in renewable electricity production (19.7 %).

The average annual share of electricity produced from renewable energy sources, only from hydropower plants, in gross national electricity consumption is 16.6 % and it is almost equal whit values in 2005 (16.5%). 90 % of the renewable energy is produced by the 6-th largest with combined capacity 480 MW out of 22 hydropower plants.

The setting of the national renewable electricity 2010 indicative target of 21% is under way. There is a plan for 7 new hydropower plants to be constructed in the country

Enlarged and permanent promotion of the RES (Renewable Energy Sources): hydro, solar, geothermal, wind and biomass are recommended. According to the intensity and durability of solar radiation, there is a great potential in Macedonia for using solar energy, especially for hot water. There are some technical and economic experiences of using geothermal energy in agriculture for greenhouse heating. There is also a good potential to widen its exploitation in district heating too. A study for techno-economic potentials of biomass and biogas is necessary to be prepared.

Data coverage (by years):

Table 1: Share of renewable electricity in gross electricity consumption (%)

	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2004	2005
Electricity produced from renewable energy sources (hydro power plants)	34,4	20,7	9,3	16,1	14,4	9,2	12,5	12,8	23,3	19,3	15,4	20,6	16,9	9,2	11,0	19,9	16,5
Gross national electricity consumption (Production+Import-Export)	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: State Statistical Office, Ministry of Economy

Table 2: Trend gross electricity consumption and renewable electricity, 1995 - 2005

	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2004	2005
Electricity produced from renewable energy sources	1.457	1.090	490	845	827	522	696	801	1.442	1.222	1.083	1.388	1.170	626	757	1.481	1.358
Gross national electricity consumption (Production+Import-Export)	4.233	5.268	5.269	5.250	5.725	5.657	5.552	6.249	6.177	6.329	7.046	6.733	6.923	6.792	6.881	7.456	8.231

Source: State Statistical Office, Ministry of Economy

Table 3: Electricity produced from hydropower

	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2004	2005
Electricity produced from large hydropower	94,3	93,0	87,9	89,1	91,0	88,9	87,9	87,4	89,0	89,2	88,7	89,0	89,5	91,0	90,9	90,8	90,6
Electricity produced from small hydropower	5,7	7,0	12,1	10,9	9,0	11,1	12,1	12,6	11,0	10,8	11,3	11,0	10,5	9,0	9,1*	9,2*	9,4

Source: State Statistical Office, Ministry of Economy

* Estimated values

Metadata:

Legal bases for the indicator:

The Energy Law (1997)

Data source(s):

State Statistical Office, the annual publications “Energy balances of The Republic of Macedonia”, Strategy on Development of the Energy Sector of Macedonia (2000), Study on least-cost development until 2020, World Bank Energy Policy Paper of the Republic of Macedonia (2004), EUROSTAT

Geographical coverage: Republic of Macedonia

Temporal coverage: 1980, 1995, 1990 – 2002, 2004, 2005

Methodology and frequency of data collection:

Energy Statistics Methodology Eurostat F4, 1998; Annual;

Methodology of data manipulation (measurements):

Electricity generated from renewable energy sources and gross national electricity consumption are measured in GWh (gigawatt hour) and TJ (terajoule). The share of renewable electricity in gross electricity consumption is given in percentage.

Strength and weakness (at data level):

The percentage of renewable electricity in total electricity production was calculated on the basis of electricity production only in hydropower plants. Data include all hydropower plants.

5. TERESTRIAL

5.1. CSI 014 Land Take

Key message

The basic strategic goal of the Spatial Plan of the Republic of Macedonia is to realize a higher degree of the entire functional integration of the territory of the country, as well as provide conditions for considerably larger infrastructural and economic integration with neighbouring and European countries in the process of globalization of economic flows. The task of achieving higher degree of space integration of the Republic of Macedonia implies a decrease of regional disproportions, i.e. qualitative changes in the urban, economic, and social structure, especially in the areas that have emphatic social and economic development dysfunctions.

The Plan anticipates that within the frameworks of productive usage of the land, in 2020 the agrarian land will consume the largest part or 46.5% (1,196,000 ha) of the territory of the Republic of Macedonia, i.e. 51.2% of the productive land. Forests and forest land will spread over an area of 1,140,000 ha, i.e. it will consume 48.8% of the productive land. The total amount of unproductive land in year 2020 is anticipated to equal 236,000 ha, i.e. 9.2% of the territory of the Republic of Macedonia. Areas occupied by settlements, constructive and industrial objects are going to occupy 65,000 ha, i.e. 27.5% of the entire unproductive land, i.e. 2.5% of the Macedonian territory.

Based on CORINE Land COVER methodology applied in 2000, the largest highest land area in the country belong to the category of forest and semi-natural areas, with 15 879 sq km or 61,8 % of total. The agricultural area is still a significant one (around 38 % of total). This data must be updated.

CORINE Land COVER 2000 (1996 data)

ARTIFICIAL AREAS

- 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

- 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

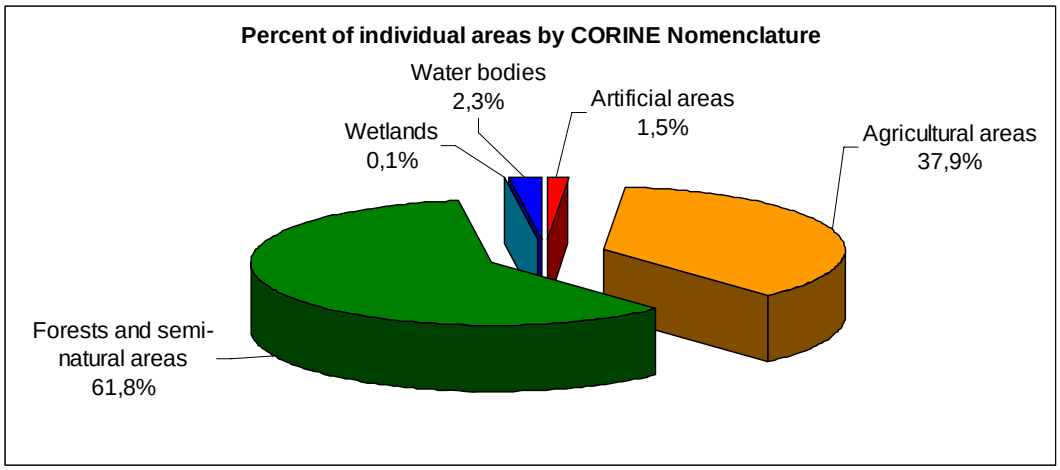
FORESTS AND SEMI-NATURAL AREAS

- 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

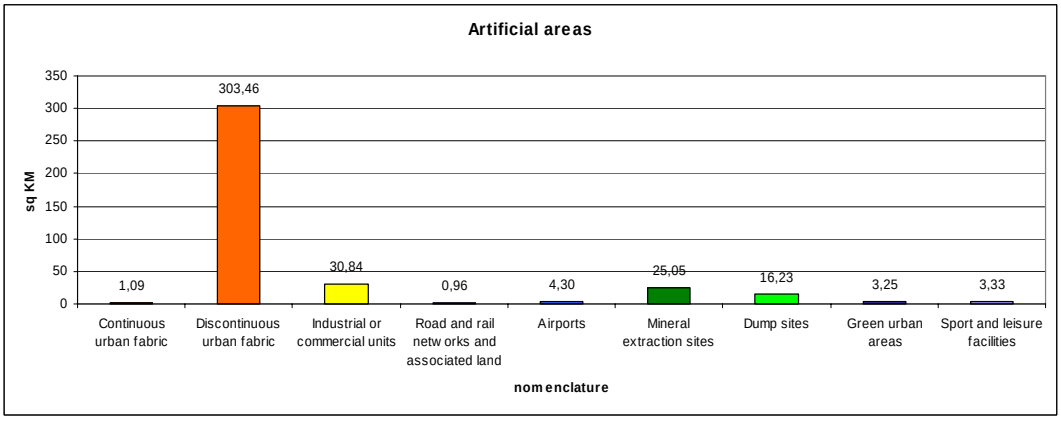
- Inland marshes
- Water courses
- Water bodies

1. Data based on CORINE Land COVER 2000



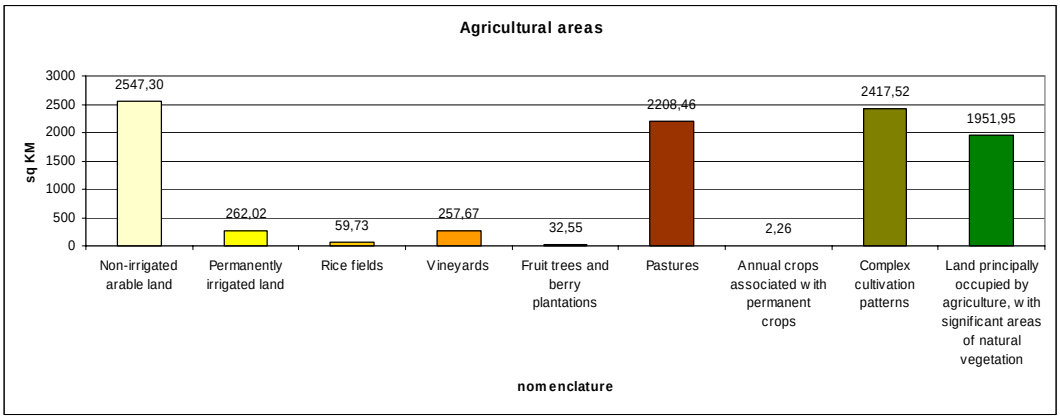
Title: Percent of individual areas by CORINE Nomenclature

Source: CORINE Land COVER 2000



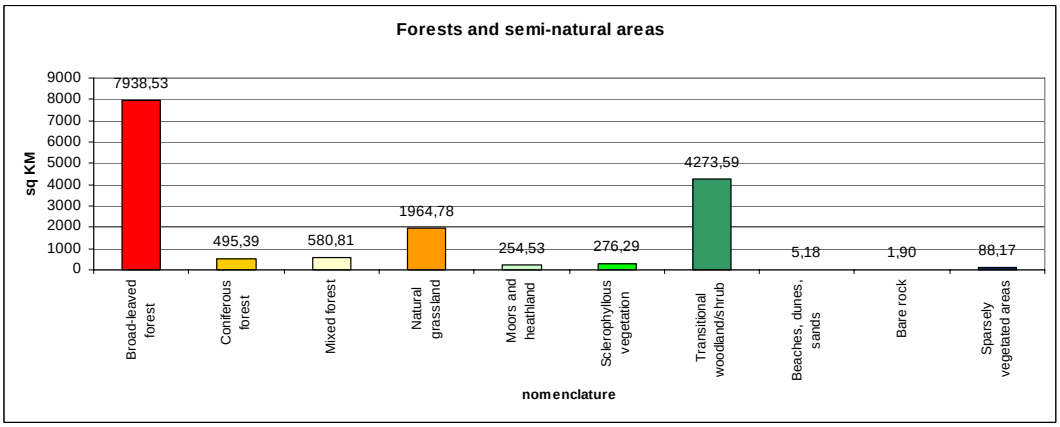
Title: Artificial areas

Source: CORINE Land COVER 2000



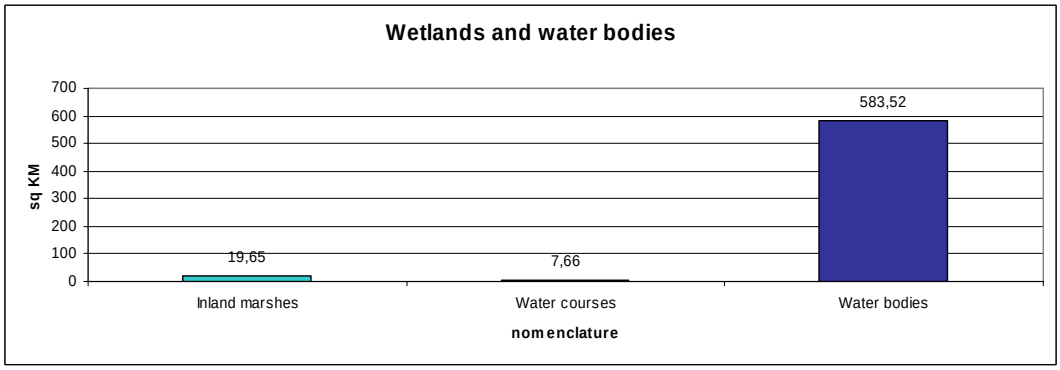
Title: Agricultural areas

Source: CORINE Land COVER 2000



Title: Forests and semi-natural areas

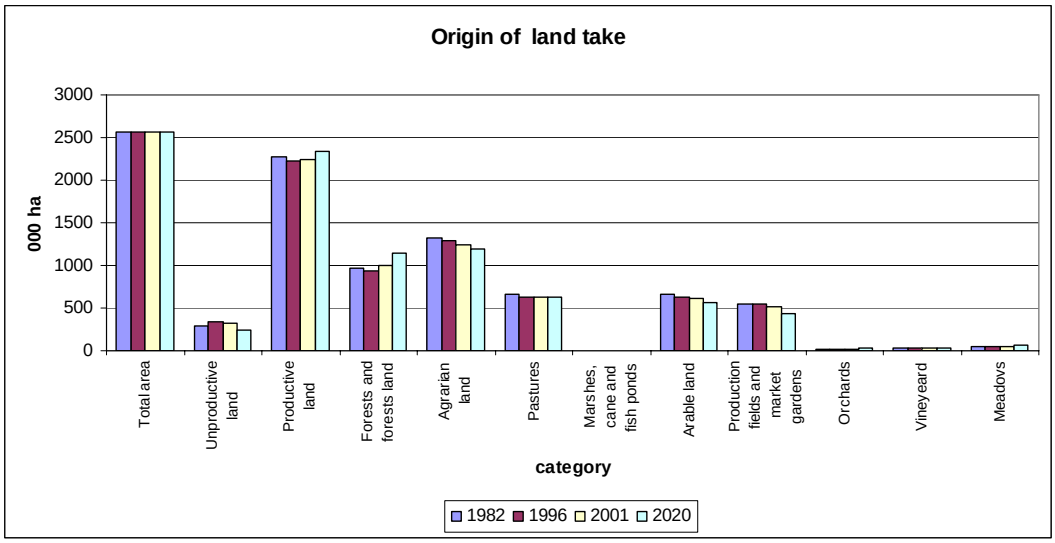
Source: CORINE Land COVER 2000



Title: Wetlands and water bodies

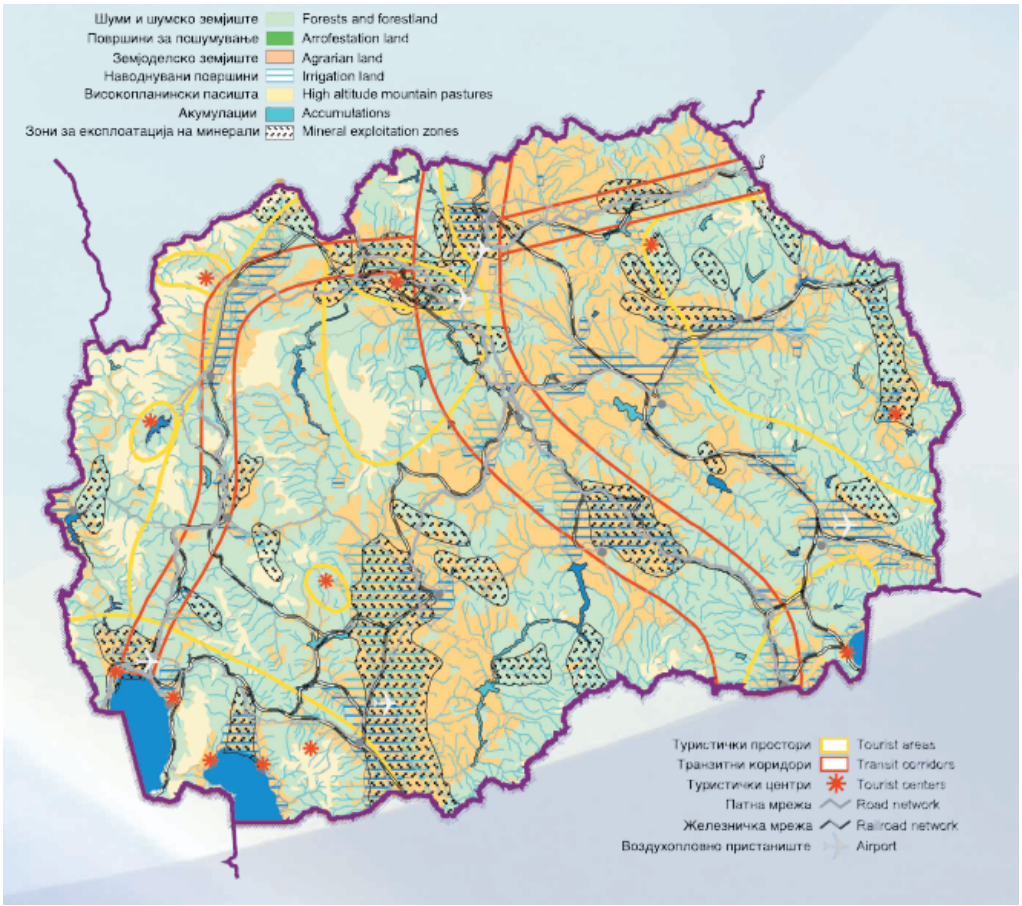
Source: CORINE Land COVER 2000

2. Data based on Spatial Plan of the Republic of Macedonia



Title: Origin of land take by year

Source: Spatial Plan of the Republic of Macedonia



Results and assessment

Policy relevance

Legal base

On the basis of the Law on Land Survey and Cadastre (1984), the regular procedure of land survey provides information on the type of the land cover, too. Although these parameters do not correspond with the Land Cover nomenclature, there is a possibility for unique association of Land Cover elements.

The Spatial Plan of the Republic of Macedonia is a long-term integral document of highest rank and lasting values. The Spatial Plan was brought by the Macedonian Assembly in June 2004.

Assessment

1. CORINE Land Cover

CORINE Land Cover data is not updated, there is no possibility for Land take changes to be identified due to the lack of land cover datasets from different periods.

The 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 purpose of CORINE Land COVER database updating.

In order to use this database efficiently on national level, i.e. within the Republic of Macedonia, additional detailing of data in the Land COVER data are required, both in terms of unit of area treated and in terms of additional elements in the basic nomenclature, i.e. adding of the 4th level to the nomenclature.

Based on CORINE Land COVER, the highest percentage of land take is from category forest and semi-natural areas, where 15 879 sq km was taken what gives 61,8 % of total. From category agricultural areas 9 739 sq km was taken what gives 37,9 % of total, from category artificial areas 389 sq km was taken what gives 1,5 % of total etc.

2. The Spatial Plan of the Republic of Macedonia (2004)

The changes in balance of allocation of areas result from the structural changes of productive land, which are made in order to harmonize the usage of the land with the natural conditions, protect the pedological foundation from intensive erosion, and obstruct area devastation. The basic transformation by year 2020 is anticipated to be executed by re-allocating 96,000 ha agrarian land, which is at present composed of uncultivated land and deserted arable land and market gardens of 6.7 and 8th class, with a relatively expressed erosion of forest land. The Plan anticipates that areas, which are productively allocated (used by the primary sector), should spread over 2,335,000 ha by year 2020. This presents an increase in relation to the present situation by 94.000 (4%). Within the

frameworks of productive usage of the land, agrarian land will consume the largest part or 46.5% (1,196,000 ha) of the territory of the Republic of Macedonia, i.e. 51.2% of the productive land. Forests and forest land will spread over an area of 1,140,000 ha, i.e. it will consume 48.8% of the productive land. The total amount of unproductive land in year 2020 is anticipated to equal 236,000 ha, i.e. 9.2% of the territory of the Republic of Macedonia. Areas occupied by settlements, constructive and industrial objects are going to occupy 65,000 ha, i.e. 27.5% of the entire unproductive land, i.e. 2.5% of the Macedonian territory. The 30,000 ha increase, as opposed to the present 35,000 ha, is a result of the actions of harmonization and legalization of illegally constructed objects in the vicinity of larger towns (over 100,000 objects) and expansion of certain inhabited areas, headquarters of newly formed municipalities above all. The development and construction of urban centres will focus on exploitation of land within the limits of existing scopes. Industry and small economy will also develop within the frames of existing industrial zones or areas reserved for the purpose by means of existing spatial and urban planning documentation.

The total area of land that falls on forests, forest crops, and intensive plantations on the territory of the Republic of Macedonia (year 2001) equals 997,374 ha (according the State Statistical Bureau), i.e. 38.8% of the entire territory of the country, or 0.49 ha/per inhabitant. This degree of woodland is not low within European frameworks (29.3%). But, taking into consideration the fact that 71% of the areas are occupied by low-growing trees and degraded forests, which comprise only 37% of the wood mass reserves, it is clear that the figure of 82.1 m3/ha makes the country poor with quality forests and falling behind European countries (Switzerland 257 m3/ha, Austria 162 m3/ha, Germany 126 m3/ha, Slovenia 186 m3/ha).

The Republic of Macedonia possesses a total quantity of 9,573 km categorized road network. 879 km fall on highways, 3,438 km to regional, and 5,256 km to local roads. The greater percentage of the highways (573 km) in the country is part of the E-road European road network system.

The development concept of the railroad system is based on the necessity for modernization and expansion of the railroad in general, and the need to connect the Macedonian railroad network to the suitable networks of the Republics of Bulgaria and Albania.

Data coverage (by years):

1. CORINE Land Cover

Table 1: Percentage of individual areas by CORINE Nomenclature

	Area in sq KM	% 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

Source: CORINE Land Cover

Table 2: Artificial areas

	CORINE Land COVER code	CORINE Nomenclature	sq KM
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

Source: CORINE Land Cover

Table 3: Agricultural areas

	CORINE Land COVER code	CORINE Nomenclature	sq KM
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

Source: CORINE Land Cover

Table 4: Forests and seminatural areas

	CORINE Land COVER code	CORINE Nomenclature	sq KM
Forests and semi-natural 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

Source: CORINE Land Cover

Table 5: Wetlands and water bodies

	CORINE Land COVER code	CORINE Nomenclature	sq KM
Wetlands	411	*Inland marshes*	20
Water bodies	511	*Water courses*	8
	512	*Water bodies*	584

Source: CORINE Land Cover

2. The Spatial Plan of the Republic of Macedonia

Table 6: Origin of land take by year

	Total area	Unproductive land		Productive land		Forests and forests land		Agrarian land		Pastures		Marshes, cane and fish ponds		Arable land		Production fields and market gardens		Orchards		Vineyard		Meadows	
	000 ha	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%	000 ha	%
1982	2571	292	11,36	2279	88,64	962	37,42	1317	51,23	663	25,79	2	0,08	654	25,44	549	21,35	23	0,89	36	1,40	52	2,02
1996	2571	346	13,46	2225	86.54	934	36,33	1291	50,51	632	24,28	2	0,08	634	24,26	554	21,55	20	0,78	29	1,13	55	2,14
2001	2571	330	12,84	2241	87,20	997	38,80	1244	48,50	630	24,50	2	0,10	612	23,80	512	19,90	17	0,70	28	1,1	55	2,1
2020	2571	236	9,18	2335	90,80	1140	44,30	1196	46,50	625	24,30	1	0,00	570	22,20	440	17,10	30	1,20	40	1,6	60	2,3

Source: The Spatial Plan of the Republic of Macedonia

Metadata

Legal basis for the indicator:

Law on Land Survey and Cadastre (1984), Law on Urban and Spatial Planning (2005)

Data source(s):

CORINE Land Cover, Spatial Plan of the Republic of Macedonia.

Geographical coverage: Republic of Macedonia

Temporal coverage:

Land cover dataset was finished in 2000 year, based on satellite imagery dated 1996. The Spatial Plan data are from 1982 and 2001 Spatial Plans with a mid term data from 1996 and anticipation for 2020.

Methodology and frequency of data collection:

CORINE Land Cover assessment in 2000 used the satellite imagery data. The Spatial Plan preparation used the standard spatial and urban planning methodology**.**

Quality information (at data level):

Due to the characteristics of the land cover in the Republic of Macedonia, out of the total of 44 possible classifications, 31 have been identified. In addition to this, for the same reasons, the minimum spatial unit treated under the project was reduced to 20 hectares, instead of 25 hectares.

Strength and weakness (at data level):

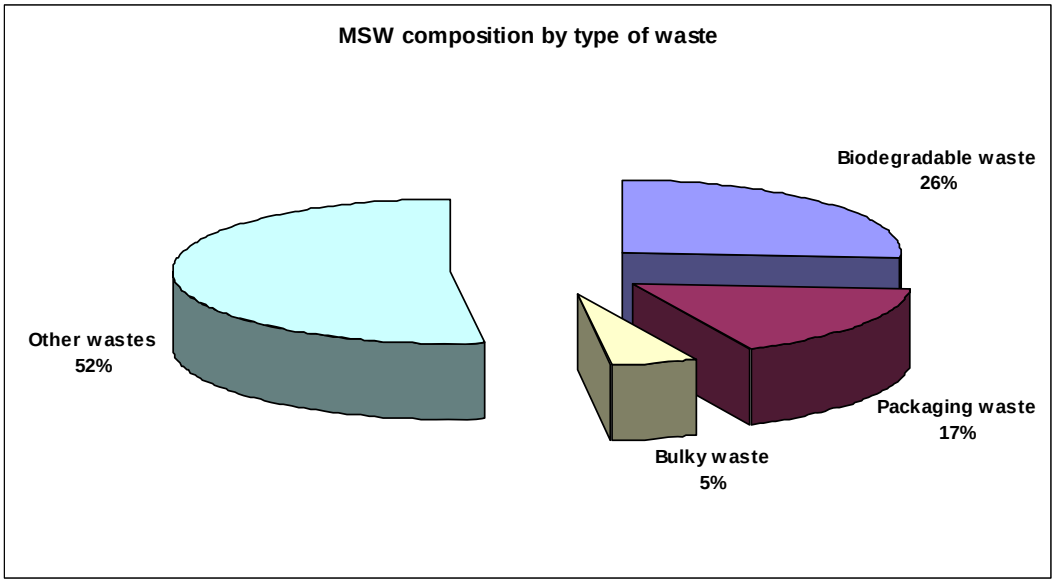
- CORINE Land Cover data as most appropriate for this indicator are not updated. For the practical use on national level it is important the 4th level in the CORINE Land Cover nomenclature to be identified and database to be produced
- There is no possibility Land take change to be identified due to the lack of land cover datasets from different periods.
- There is no proper updating of the data in the institutions in charge.

6. WASTE

6.1. CSI 016 Municipal waste generation

Key message

The data from the Waste Management Project shows that 73% of the collected waste is household waste. Taking into account that 73% of the waste is household waste, the total waste generation is estimated at 0.86 kg/cap/day or 313 kg/cap/year. The analysis of the waste composition shows that the dominant waste fractions are organics and fines, with participation of 26.2% and 30.9% respectively, or in total, more then 50% of the generated waste. Paper and cardboard participate with 11.6%, followed by plastics with 9.6%. All other waste fractions, i.e. wood, glass, textiles, metals, hazardous household waste and other categories participate in total less than 25% of the generated waste.
Primary research of the market showed that there is certain recycling chain established on the Macedonian market.
There is a need of improvement of the regular reporting and statistics of the waste generation, disposal and treatment.



Title: Municipal Solid Waste (MSW) composition by type of waste

Source: National Waste Management Plan 2004-2005, Ministry of Environment and Physical Planning

Results and assessment

Policy relevance

Legal base

On the national level, the Government of the Republic of Macedonia, as stipulated in Article 16 of the Law on Waste Management (2004), adopts Strategy for Waste Management and determines the strategic goals and main directions in the area of waste management.

The Ministry of Environment and Physical Planning, in accordance with Articles 17 and 19 of the Law on Waste Management, provides for the implementation of the determinants of the Strategy through the adoption of the Waste Management Plan of the Republic of Macedonia and Annual Programmes for its implementation.

The Ministry of Environment and Physical Planning carries out supervision over the implementation of the Law on Waste Management and of regulations adopted thereof, issues waste management permits, establishes conditions for permanent monitoring of waste management, as well as monitoring of the environment and impacts on persons, and establishes and manages waste management information system.

The basic legal framework for waste management has been established by the **Law on Waste Management (2004).** The main features of the legislation concerning waste management are as follows:

- Full harmonisation with the relevant EU Directives, which have been transposed in the Law on Waste Management (hereinafter: LWM), taking also into consideration the local conditions;
- LWM incorporates the basic principles of waste management (principle of environmental protection in waste management - waste minimization, principle of precaution, closeness, service universality, polluter pays principle, system of deposit, etc.),
- Waste management, as a public service, is based on the principle of service universality (nondiscrimination, sustainability, quality and efficiency, transparency, affordable price and full coverage of the territory).

NEAP 2 – National Environmental Action Plan (2004-2005) - CARDS 2001

The NEAP 2 (adopted in 2006) defines the approach towards waste management through the incorporation of the main goals of legislation harmonized with the EU legislation. It establish monitoring mechanisms, as well as economic instruments, for waste management implementation. It also identifies the relevant stakeholders in the area of waste management (especially in the context of overlapping responsibilities among the sectors). The process of decentralization and the need for institutional capacity building

shall be taken into account, as well as the creation of conditions for appropriate financing of waste management in the Republic of Macedonia.

NATIONAL WASTE MANAGEMENT PLAN (2004-2005) – CARDS 2001

The Plan is adopted in 2005. It includes the following activities:

- Analysis of waste at national level: municipal waste, hazardous waste, industrial waste, medical waste and agricultural waste;
- Construction of a pilot waste composting plant: analysis of composting alternatives, design and implementation of alternatives and recommendations concerning waste composting;
- Analysis of the market in terms of the most frequently demanded materials for recycling: current status, potential possibilities for processing and recycling; extension of the coverage of the waste recycling system and waste treatment system; proposals of legal, economic and financial instruments coordinated with the NEAP 2 Project; analysis of EU Directives relevant to waste processing and recycling.;
- Assessment of alternative economic and financial instruments through municipal financial support or other financial sources.

The Project consists of two components:

- First component: the development of the National Waste Management Plan that shall further play the role of a basic document.
- Second component: the development of a Feasibility Study on waste management in eastern and north-eastern parts of the Republic of Macedonia, covering the areas of Stip, Kocani, Sveti Nikole, Probistip, Malesevo and Pijan area, through Makedonska Kamenica and areas of Kriva Palanka, Kratovo, Kumanovo, and Lipkovo.

The Law on Waste Management stipulates the obligation for the development of National Waste Management Strategy, as well as waste management plans.

The Strategy shall cover a period of 12 years, whereas National plans will be developed for a period of six years. The local self-government units are obliged to develop waste management plans for their respective territories, to cover a period between three and six years. For the purpose of the plans, annual waste management programmes shall be developed, including national programmes and programmes at the level of the local self-government units. Legal entities and natural persons generating waste above the quantity specified in the National waste management plan shall be obliged to develop waste management programmes and to report on the implementation of such programmes.

Assessment

Quantities of generated waste have been assessed on the basis of data provided by the State Statistical Office and on the basis of the analysis carried out under the Study on Waste Management in South-western part of Macedonia, developed by the ERM Lahmaeyer International GmbH (2002-2004).

The Study on Waste Management in the South-western part of Macedonia presents indicators on municipal waste generation in the region concerned. According to the analysis carried out in the Ministry of Environment and Physical Planning (MEPP) on the quantities of generated municipal waste in other parts of the country, it can be concluded that the quantities are compatible with the results from the above stated Study and fully applicable to the whole territory of the country.

The data in the questionnaire conducted in the Study above shows that 73% of the collected waste is household waste. Taking this into account the total waste generation is estimated at 0.86 kg/cap/day or 313 kg/cap/year.

The analysis of the waste composition shows that the dominant waste fractions are organics and fines, with participation of 26.2% and 30.9% respectively, or in total, more then 50% of the generated waste. Paper and cardboard participate with 11.6%, followed by plastics with 9.6%. All other waste fractions, i.e. wood, glass, textiles, metals, hazardous household waste and other categories participate in total less than 25% of the generated waste.

During the analysis the density of the waste in the containers was roughly estimated. The results vary between 58 kg/m^3 and 286 kg/m^3. One of the reasons for the high specific weight is the higher construction and demolition content in those analyses, although it is not believed this is the only explanation. For single houses the average waste density is 127 kg/m^3, for multi storey buildings 113 kg/m^3 and for commercial waste 97 kg/m^3.

Sorting analysis showed that 17.65% of the generated mixed waste is packaging material, resulting in approximately 51 kg packaging per person per year. This is very low compared to the European-15 average of 158 kg/person in 1997, however in agreement with data reported for some CEE countries.

It is recommended to institutionalise waste analysis method and to execute them every two years, independent on the improvement of the weighing at landfills.

Disposal

There is only one legal landfill in the Republic of Macedonia – “Drisla”, in the vicinity of Skopje, at which no ground protection has been applied. This landfill does not comply with contemporary technical standards. The capacity of the landfill is16.000.000 tons, and only 4 % of its designed capacity was used by 2002.

There are 32 municipal landfills, most of which are not fenced and guarded, and their constructive and operational performance is inappropriate. There are around 1.000 smaller illegal dumping sites in rural municipalities and settlements.

Recycling waste

Primary research of the market showed that there is a recycling chain established on the Macedonian market. The commodities are mainly collected by the informal sector and then sold to the legal entities the so called scrap yards, usually members of the Association 'Makedonska Surovina' that today has over 70 members.

Based on current Macedonian market conditions and having in mind the requirements of EU directives on recovery – recycling of municipal wastes (94/62/EC, EU Packaging Waste Directive) as well as 99/31/EC EU Landfill Directive) the following commodities were analysed in more details:

- Paper/Cardboard
- PET
- Used Tires

Data is collected for seven commodities: paper and cardboard, plastic (PET, hard plastic, film), metal (ferrous and non-ferrous), tires, car batteries and glass, as well as textile

Data coverage (by years):

Table 1: Waste generation data

Waste generation/capita	313 kg/capita	Sampling results
Fraction of household waste	73%	% of total solid wastes collected
Specific weight:		
Single houses	127 kg/m^3	
High rise buildings	112 kg/m^3	
Commercial sector	96 kg/m^3	
Packaging waste	13%	Of household waste
	30%	Of commercial waste
Biodegradable (organic) waste	26%	148,819 ton total annual generation
(Greenery waste)		(61.765 ton annual generation)
Bulky waste	5%	28,619 ton total annual generation

Source: National Waste Management Plan 2004-2005,, Ministry of Environment and Physical Planning

Table 2: Total MSW generation and composition

Waste stream	Quantities (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**

Source: National Waste Management Plan 2004-2005,, Ministry of Environment and Physical Planning

Table 3: Recycling waste in Republic of Macedonia - Overview

	Paper / Cardboard	PET	Used Tires	Car batteries	Glass	Metal
Recycled (t)	14,844	0,2	170	2.983	0	385,452
Import	n/a	0	n/a	n/a	0	285,664
Export	3,600	0	0	2,983	0	0
Land filled (Disposed)	71,655	10,748	n/a	n/a	13,972	9,912
Total quantity (Generated)	86,499	10,748	n/a	n/a	13,972	395,364
Recycling rate	21,1%	0,01%	n/a	n/a	0%	97,5%

Source: National Waste Management Plan 2004-2005,, Ministry of Environment and Physical Planning

Metadata

Legal bases for the indicator: The Law on waste management (2004)

Data source(s): National Waste Management Plan, Ministry of Environment and Physical Planning - Annual Report

Geographical coverage: Republic of Macedonia

Temporal coverage: 2004 - 2005

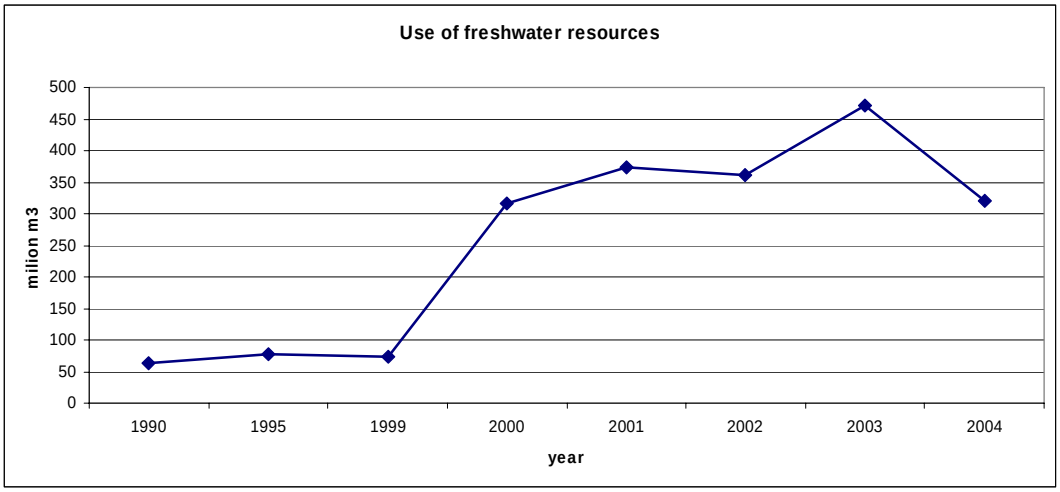
Methodology and frequency of data collection: Estimations, annual reporting from the municipalities

7. WATER

7.1. CSI 018 Use of freshwater resources

Key message

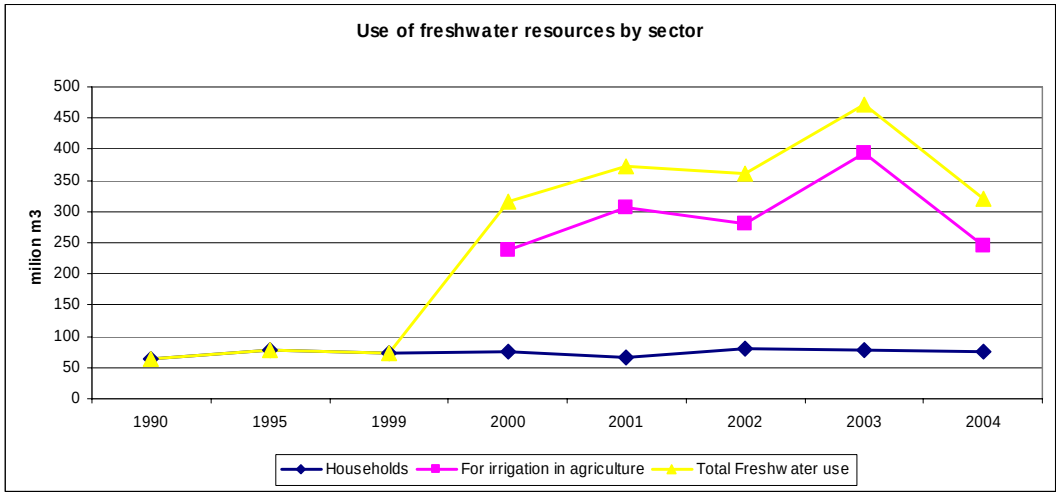
In the period 1990 – 2004 there is an increasing trend of fresh water use in the country. A special increase has been noticed in 2000. The Water Supply Industry (public water supply) is the main user of the surface and ground water abstracted, supplying more than 94% of the population. The variability of the data could be a result of the discontinuity of the industrial processes.
The data are not part of the regular statistics published in the country.



Title: Use of freshwater resources

Source: State Statistical Office 2005

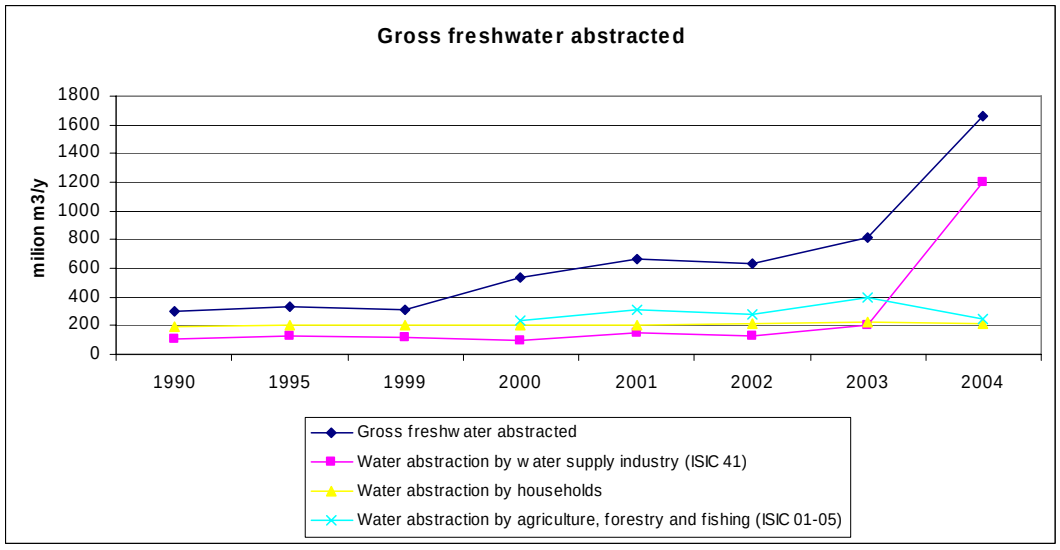
Note: Data available only for some sectors



Title: Use of freshwater resources by sector

Source: State Statistical Office 2005

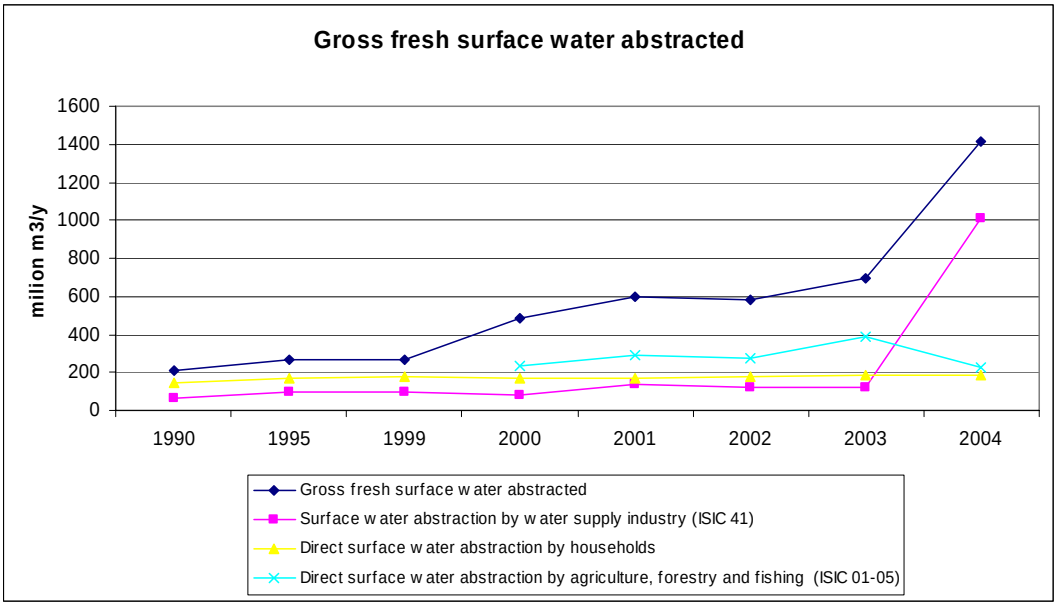
Note: Data available only for some sectors



Title: Gross freshwater abstracted

Source: State Statistical Office 2005

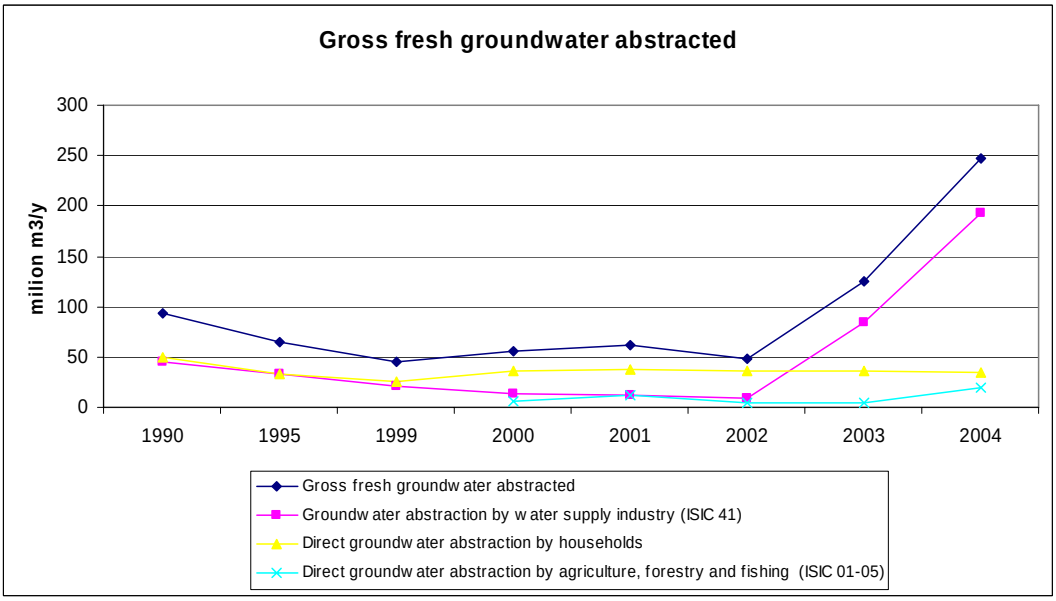
Note: Data available only for some sectors



Title: Gross fresh surface water abstracted

Source: State Statistical Office 2005

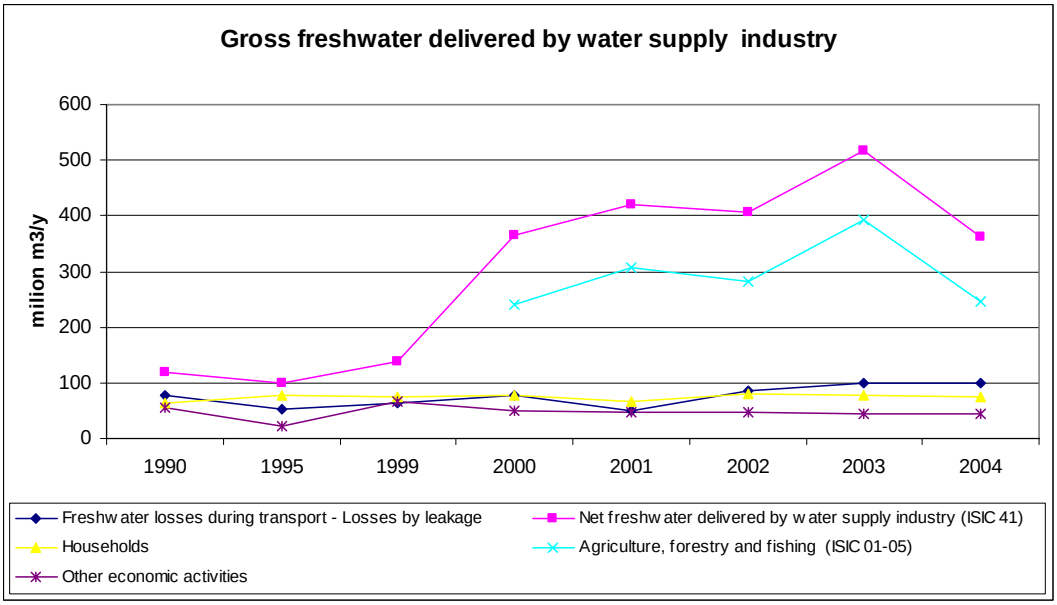
Note: Data available only for some sectors



Title: Gross fresh groundwater abstracted

Source: State Statistical Office 2005

Note: Data available only for some sectors



Title: Gross freshwater delivered by water supply industry

Source: State Statistical Office 2005

Results and assessment

Policy relevance

Legal base

The **Law on Waters (1998**) stipulates the maintenance and improvement of water regime and rational utilization of available quantities of water in accordance with the **Water Management Master Plan of the Republic of Macedonia**. The Water Management Master Plan is implemented through the issuance of water management permits or awarding water use concessions, specifying the manner of and the conditions for water use; the operation regime of water management and other facilities and plants having impact on water regime; the manner of and conditions for water discharge; wastewater and waste substances discharge, and the degree of wastewater purification.

The usability of water for different purposes is determined according to the **The Decree on Water Classification** (1999) with regard to which water is divided into five various classes, depending on the level of pollution, and water characteristics are determined by classes and purposes for which water may be used.

The Law stipulates that the water regime maintenance and improvement are carried out on the basis of **River Basin Management Plans**. Such Plans

contain environmental goals, good status of surface water bodies (good quantitative and chemical status, including good ecological potential as well), and of ground water resources (good quantitative and chemical status). River Basin Management Plans will be implemented through the issuance of water use permits, sand, gravel and stone extraction permits, and permits for discharge into water, in which the quantitative and qualitative requirements will be specified on a case-by case basis.

Assessment

In the period 1990 – 2004 there is an increasing trend of fresh water use in the country. A special increase has been noticed in 2000. The Water Supply Industry is the main user of the surface and ground water abstracted, especially in 2004. There is a discontinuity in the industrial processes which have an influence on the abstraction of the water. The accuracy of the data should be checked on the sources.

Data coverage (by years):

Table 1: Use of freshwater resources

Unit mil m3/y	1990	1995	1999	2000	2001	2002	2003	2004
Freshwater use	64	78	73,3	315,5	373	360,7	471,3	319,6

Source: State Statistical Office 2005

Table 2: Use of freshwater resources by sector (mil 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
For 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

Source: State Statistical Office 2005

Table 3: Gross freshwater abstracted

	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**
Water abstraction by water supply industry (ISIC 41)	105,4	129,8	113,6	95,4	148,5	133,5	202,7	1199
Water abstraction by households	196,6	204	201,9	204,7	205,7	212,2	220,3	219,2
Water abstraction by agriculture, forestry and fishing (ISIC 01-05)				239,2	306,7	281,4	393,3	244,8

Source: State Statistical Office 2005

Table 4: Gross fresh surface water abstracted

	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**
Surface water abstraction by water supply industry (ISIC 41)	60,9	97,2	93,1	81,2	136,3	125	118,7	1006,1
Direct surface water abstraction by households	147,2	171,4	176,8	169,1	167,6	176,5	184,2	184,4
Direct surface water abstraction by agriculture, forestry and fishing (ISIC 01-05)				232,5	294,7	277,6	388,4	225,4

Source: State Statistical Office 2005

Table 5: Gross fresh groundwater abstracted

	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**
Groundwater abstraction by water supply industry (ISIC 41)	44,5	32,6	20,5	14,2	12,2	8,5	84	192,9
Direct groundwater abstraction by households	49,4	32,6	25,1	35,6	38,1	35,7	36,1	34,8
Direct groundwater abstraction by agriculture, forestry and fishing (ISIC 01-05)				6,7	12	3,8	4,9	19,4

Source: State Statistical Office 2005

Table 6: Gross freshwater delivered by water supply industry

	1990	1995	1999	2000	2001	2002	2003	2004
Freshwater losses during transport - Losses by leakage	76,8	51,9	63,3	78,1	49,4	86,3	100,3	99,9
Net freshwater delivered by water supply industry (ISIC 41)	**119,8**	**99,7**	**138,6**	**366**	**421,1**	**407,3**	**515,7**	**363,4**
Households	64	78	73,3	76,3	66,3	79,3	78	74,8
Agriculture, forestry and fishing (ISIC 01-05)				239,2	306,7	281,4	393,3	244,8
Other economic activities	55,8	21,7	65,3	50,5	48,1	46,6	44,4	43,8

Source: State Statistical Office 2005

Metadata
Legal bases for the indicator:

Law on waters (1998), Law on Drinking Water Supply and Urban Wastewater Drainage (2004)

Data source(s):

State Statistical Office, Statistical Yearbook of the Republic of Macedonia,

www.stat.gov.mk

Water Economy Administration, Public Enterprise for water supply and sewage system

Geographical coverage: Republic of Macedonia

Temporal coverage: 1990 - 2004

Methodology and frequency of data collection:

Annual data collection.

Methodology of data manipulation (measurements):

Data provided and processed by sectors and industries.

Quality information (at data level):

The accuracy should be checked at the source

Strength and weakness (at data level):

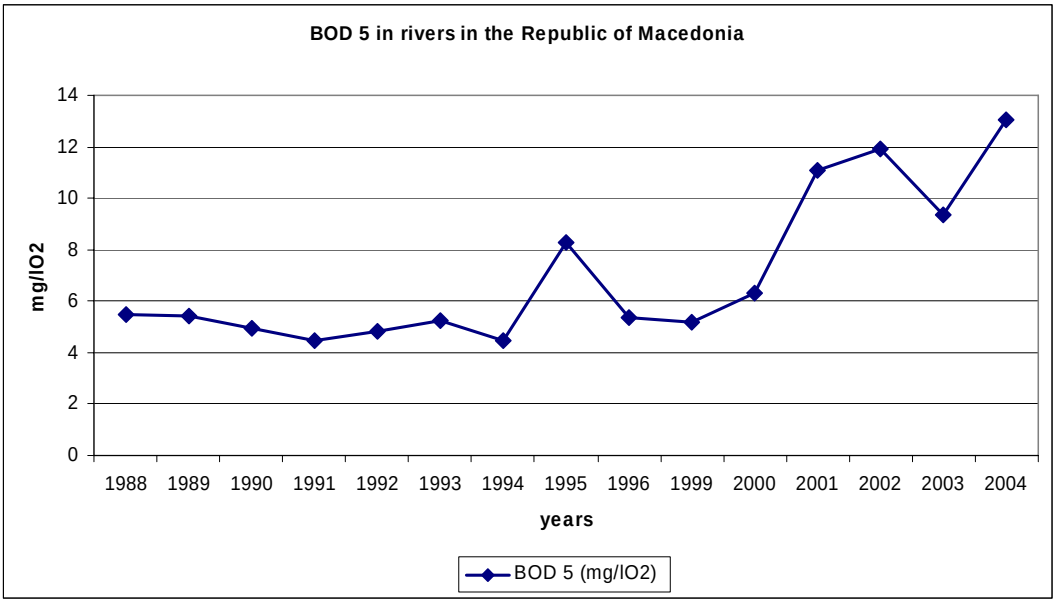
The accuracy of the data should be checked out at he sources

7.2. CSI 019 Oxygen consuming substances in rivers

Key message

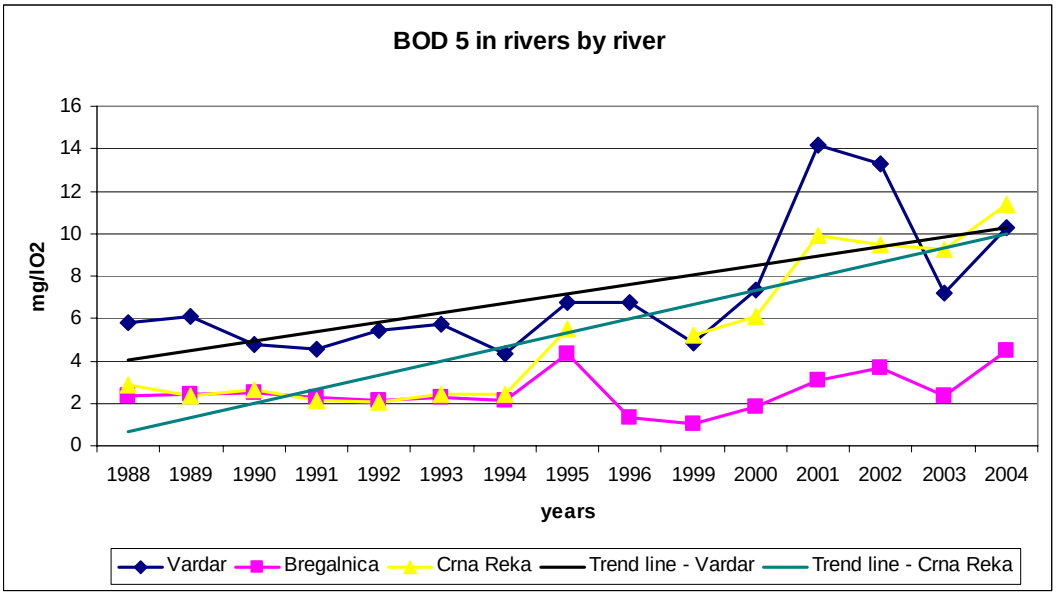
As opposite of many European countries, unfortunately in Republic of Macedonia there has not been a decrease in BOD 5 and ammonium concentrations in the rivers in the period 1988-2004. A non benefit eutrophic status with high BOD has been registered on some stations on two rivers: r. Crna (south-west) and the main river in the country r. Vardar (central part). These results can reflect the non beneficial status of the treatment of the urban and industrial wastewaters in the country, as well as un proper protection of the river basins.

The proper protection of the rivers and especially the introduction of a regular wastewaters treatment in the country is top policy priority on local and national level.



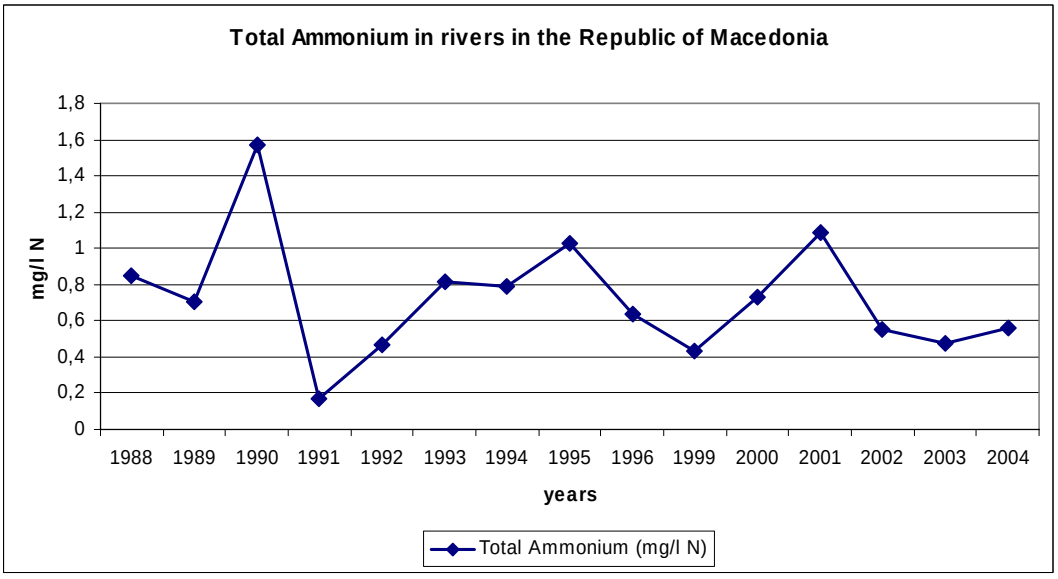
Title: BOD 5 in rivers in the Republic of Macedonia

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



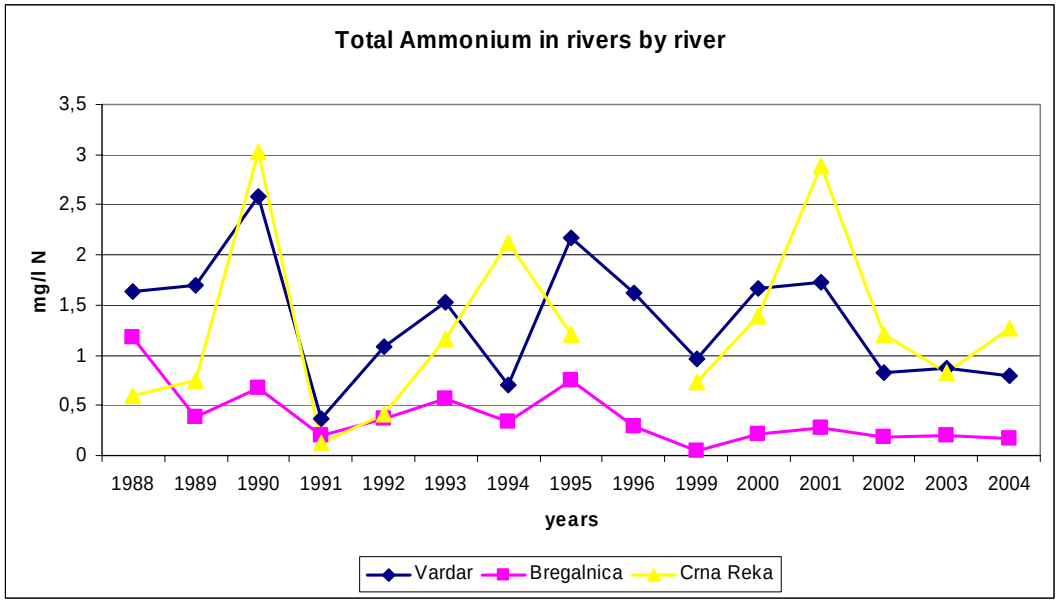
Title: BOD 5 in rivers by river

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



Title: Total Ammonium in rivers in the Republic of Macedonia

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



Title: Total Ammonium in rivers by river

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

Policy relevance

Legal base

The Law on Waters (1998)

The Draft Law on waters (in a stage of final adoption) stipulates that the water regime maintenance and improvement are carried out on the basis of River Basin Management Plans. Such Plans contain environmental goals, good status of surface water bodies (good quantitative and chemical status, including good ecological potential aswell), and of ground water resources (good quantitative and chemical status).

River Basin Management Plans will be implemented through the issuance of water use permits,sand, gravel and stone extraction permits, and permits for discharge into water, in which the quantitative and qualitative requirements will be specified on a case-by case basis.

For the purpose of water quality maintenance and improvement and determination of water appropriateness for use for certain purposes, the Draft Law stipulates water classification and water bodies categorisation, as well as the determination of a deadline for achieving water quality targets for each water category and the determination of minimum water quality standards and environmental goals for all water bodies. With regard to each river basin, the Draft Law stipulates the adoption of Programme of measures for achieving environmental goals.

The Decree on the Categorisation of Watercourses, Lakes, Accumulations and Ground Water Resources (1999) specifies water quality by specific classes of water in the watercourse, the lake, the accumulation and the ground water resource. This Degree also determines five categories of watercourses with regard to the targets set for the water therein . In order to secure the maintenance of the quantity and the quality of water (water regime), the competent body issues a water management consent for the construction, reconstruction, connection or extension of facilities having impacts on waters and a water management permit to use them as a resource or as a recipient. In circumstances of absence of emission norms on specific polluters and pollutants, the above mentioned documents are issued on the basis of specific expert assessments by the competent body, on a case-by-case basis, taking into account the principle of sustainable use of water resources and taking care of the quality of wastewater discharged, so that water does not exceed the quality standards applicable for the recipient.

The **Law on Health Care** (1991) stipulates that the Regional Institutes for Health Protection, coordinated by the Republic Institute for Health Protection are obliged to monitor and survey hygiene and other conditions related to drinking water protection, and to undertake measures for active protection of the population against communicable and other diseases of high social and health care relevance. These Institutes perform microbiological, parasitological,

hygiene, toxicological and biochemical analyses within the scope of their activity.

The quality of surface waters is monitored in accordance with the **Programme for Preventive Health Care** adopted on annual basis and published in the Official Gazette of the Republic of Macedonia. The surface water quality monitoring is carried out at points considered to be of health interest, in order to provide for the timely undertaking of measures to protect the population. Waters used as drinking water sources, for sports and recreation purposes and for primary agricultural production are of highest interest.

The National Strategy for Water is adopted for a period of 30 years. It will provide for sustainable development of waters, through meeting the demands of all users, protection of water against pollution, protection and improvement of water ecosystems and protection against harmful impacts of waters. The Strategy is adopted by the Assembly of the Republic of Macedonia.

Assessment

In Republic of Macedonia there is still a trend of increasing of BOD 5 and at some stations ammonium concentrations in the rivers in the period 1988-2004. Especially, an eutrophic status with high BOD has been registered on some stations on two rivers: r. Crna and the main river in the country r. Vardar. These results can reflect the non beneficial status of the treatment of the urban and industrial wastewaters in the country, as well as un proper protection of the river basins. The numerical data are present on tables 1-4.

Data coverage (by years):

Table 1: BOD 5 in rivers in the Republic of Macedonia

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004
BOD 5 (mg/lO_2)	5,49	5,44	4,92	4,46	4,83	5,22	4,45	8,3	5,36	5,19	6,32	11,11	11,93	9,38	13,07

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

Table 2: BOD 5 in rivers by river

River	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004
Vardar	5,78	6,11	4,74	4,52	5,46	5,69	4,36	6,74	6,73	4,82	7,32	14,2	13,3	7,18	10,3
Bregalnica	2,34	2,39	2,49	2,28	2,11	2,3	2,11	4,35	1,31	1,02	1,81	3,05	3,68	2,36	4,5
Crna Reka	2,86	2,38	2,63	2,13	2,09	2,45	2,44	5,51		5,21	6,09	9,88	9,47	9,22	11,4

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

Table 3: Total Ammonium in rivers in the Republic of Macedonia

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004
Total Ammonium (mg/l N)	0,85	0,71	1,57	0,17	0,46	0,81	0,79	1,03	0,64	0,43	0,73	1,08	0,56	0,47	0,56

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

Table 4: Total Ammonium in rivers by river

River	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004
Vardar	1,64	1,7	2,59	0,37	1,09	1,53	0,7	2,17	1,62	0,96	1,67	1,73	0,83	0,87	0,8
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
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	1,27

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

Metadata

Legal bases for the indicator:

Law on waters (1998), The Decree on the Categorisation of Watercourses, Lakes, Accumulations and Ground Water Resources (1999)

Data source(s) :

Administration of Hydro meteorological Matters and Hydro Biological Institute – Ohrid

Geographical coverage: Republic of Macedonia

Temporal coverage: 1988 – 2004

Methodology and frequency of data collection:

EUROWATERNET methodology for identification of the measurements points on the rivers and lakes have been applied

Monthly data have been processed

Methodology of data manipulation (measurements):

Data by four district river basins

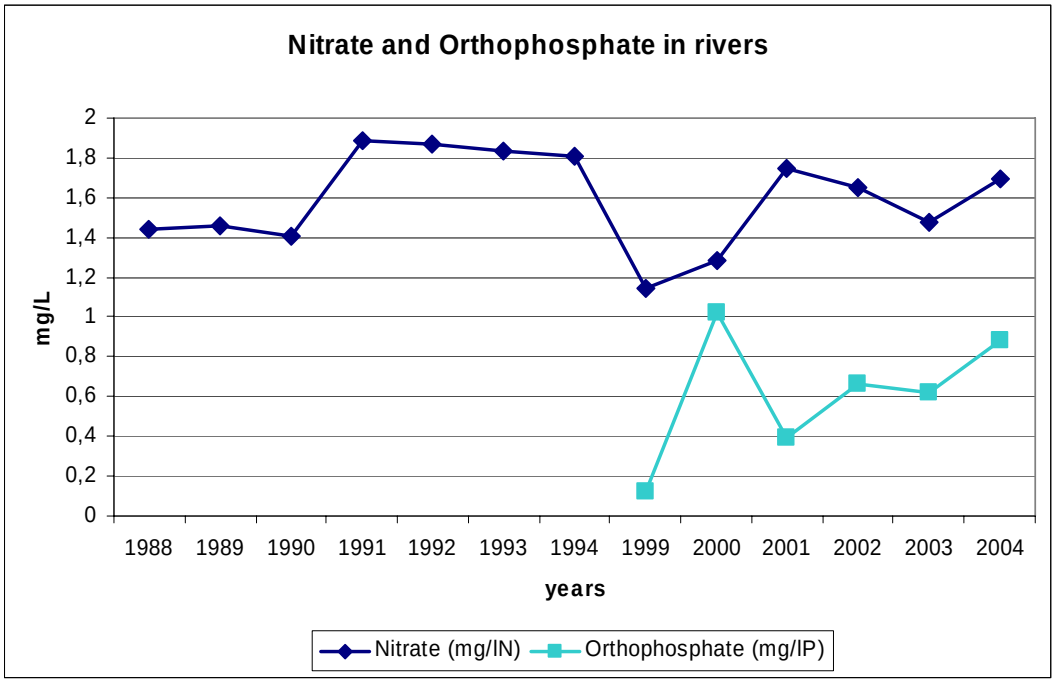
7.3. CSI 020 Nutrients in freshwater

Key message

Even though there is no a regular monitoring of the ground waters quality in the Republic of Macedonia, the nitrate concentrations in drinking waters are still not an environmental nor a health problem.

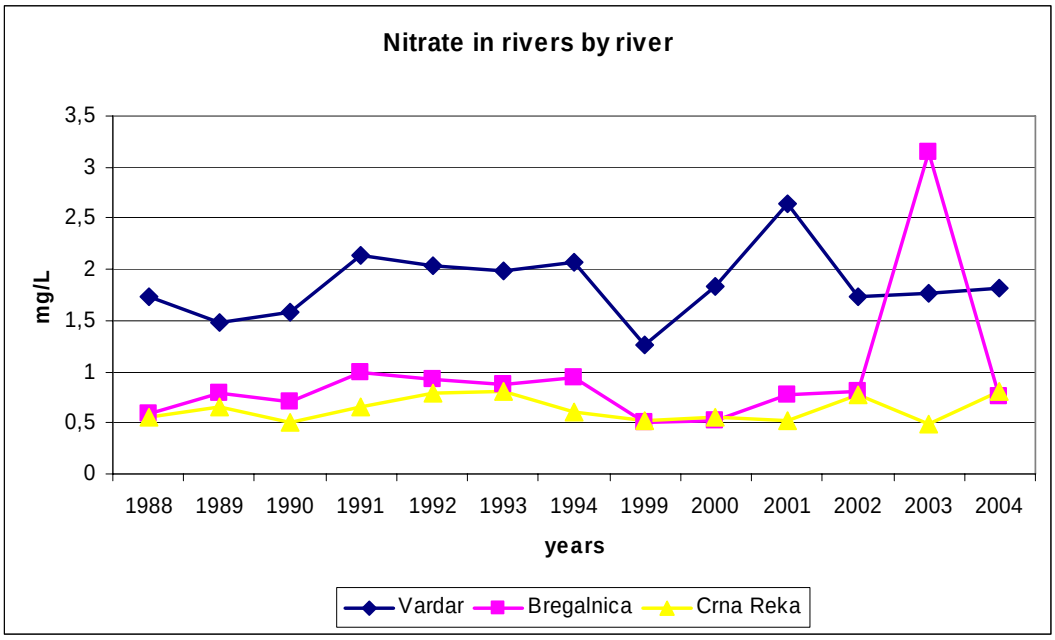
In regard to the rivers, the annual mean nitrate and orthophosphates concentrations have remained relatively stable since the early 1990s. The levels are higher in some parts of the main river in the country Vardar.

During the whole period the main natural lake - Ohrid Lake has kept the oligo trophic character with relatively stable concentrations of phosphor and nitrates. The concentrations are significantly higher in the other natural lake Prespa where the organic compounds are on a high level, increasing the risk of eutrophication of the lake water.



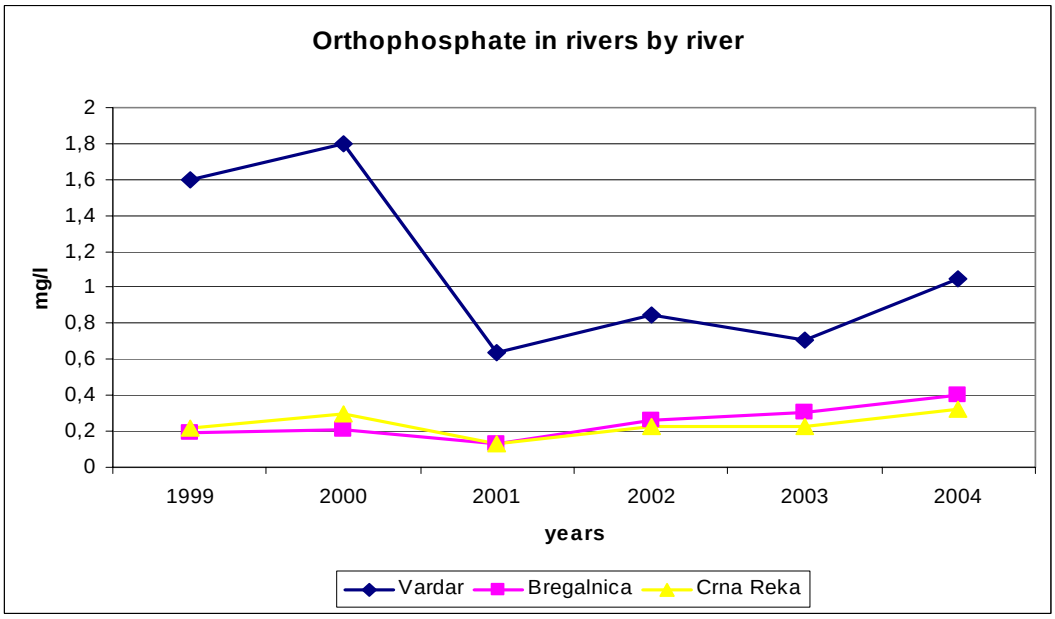
Title: Nitrate and Orthophosphate in rivers in the Republic of Macedonia

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



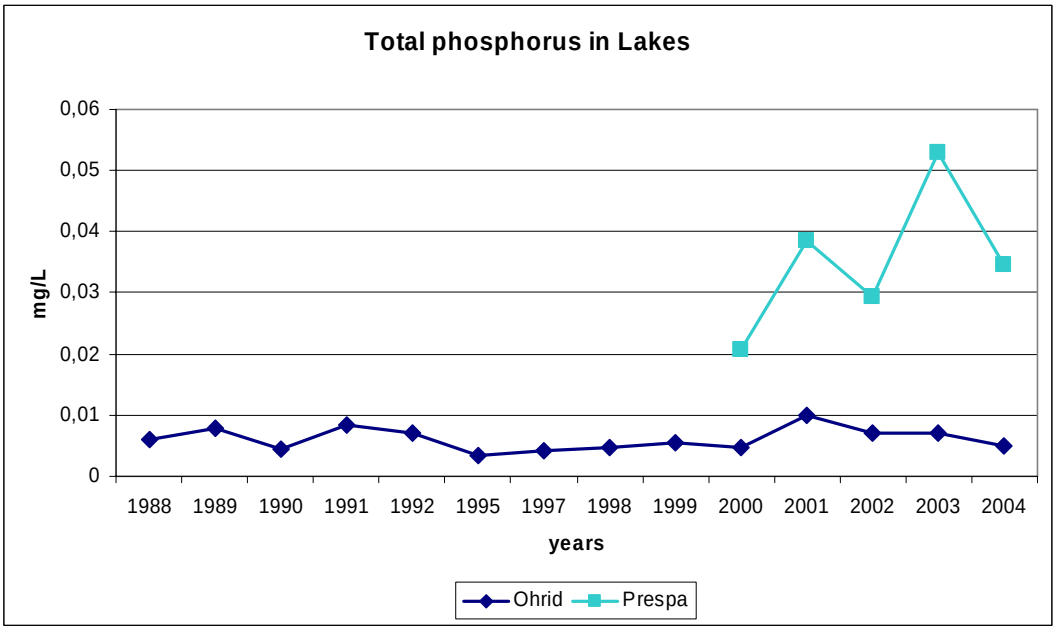
Title: Nitrate in rivers by river

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



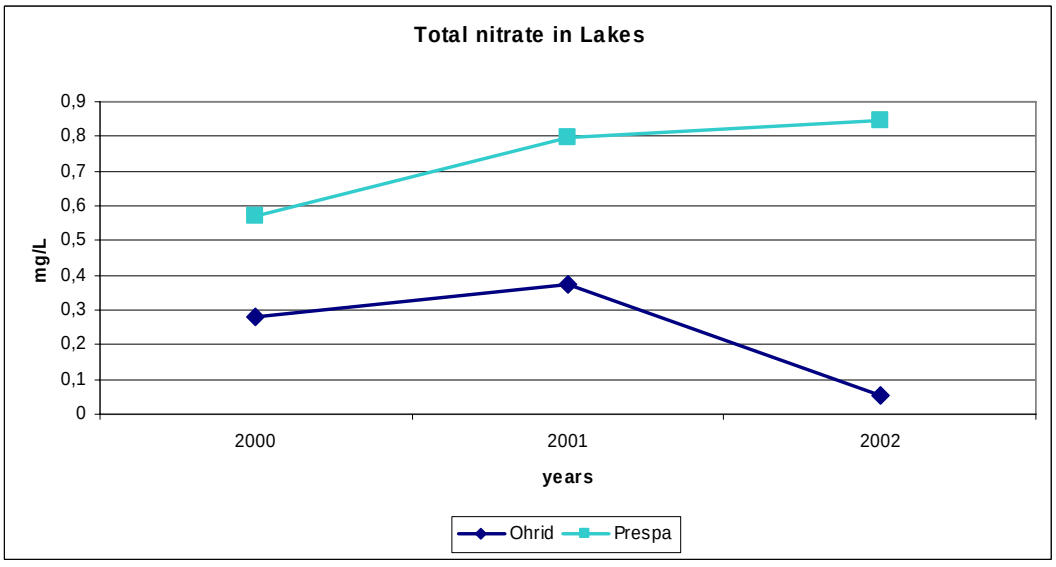
Title: Orthophosphate in rivers by river

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



Title: Total phosphorus in Lakes

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



Title: Total nitrate in Lakes

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

Note: No data before 2000

Policy relevance

Legal base

The Law on Waters (1998)

The Draft Law on waters (in a stage of final adoption) stipulates that the water regime maintenance and improvement are carried out on the basis of River Basin Management Plans. Such Plans contain environmental goals, good status of surface water bodies (good quantitative and chemical status, including good ecological potential aswell), and of ground water resources (good quantitative and chemical status).

River Basin Management Plans will be implemented through the issuance of water use permits,sand, gravel and stone extraction permits, and permits for discharge into water, in which the quantitative and qualitative requirements will be specified on a case-by case basis.

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of measures to protect the population. Waters used as drinking water sources, for sports and recreation purposes and for primary agricultural production are of highest interest.

The National Strategy for Water is adopted for a period of 30 years. It will provide for sustainable development of waters, through meeting the demands of all users, protection of water against pollution, protection and improvement of water ecosystems and protection against harmful impacts of waters. The Strategy is adopted by the Assembly of the Republic of Macedonia.

Assessment

The annual mean nitrate and orthophosphates concentrations have remained relatively stable since the early 1990s. The levels are higher in some parts of the main river in the country Vardar.

Following the results of the measurements in the pelagic parts of the lake waters surface, during the whole period the Ohrid Lake has kept the oligo trophic character with relatively stable concentrations of phosphor (under 0.015 mg./l) and nitrates (average annual concentrations under 0.55 mg/l). The concentrations are significantly higher in the other natural lake Prespa where the organic compounds are on a high level, increasing the risk of eutrophication of the lake water.

Data coverage (by years):

Table 1: Nitrate and Orthophosphate in rivers

	1988	1989	1990	1991	1992	1993	1994	1999	2000	2001	2002	2003	2004
Nitrate (mg/lN)	1,44	1,46	1,4	1,89	1,87	1,83	1,81	1,14	1,28	1,75	1,65	1,48	1,69
Orthophosphate (mg/lP)								0,13	1,02	0,4	0,67	0,62	0,88

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

Table 2: Nitrate in rivers by river

river	1988	1989	1990	1991	1992	1993	1994	1999	2000	2001	2002	2003	2004
Vardar	1,74	1,48	1,59	2,14	2,03	1,98	2,07	1,26	1,83	2,65	1,73	1,76	1,82
Bregalnica	0,59	0,79	0,7	0,99	0,92	0,88	0,94	0,51	0,52	0,77	0,8	3,14	0,76
Crna Reka	0,56	0,65	0,51	0,66	0,79	0,8	0,61	0,52	0,55	0,52	0,78	0,49	0,81

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

Table 3: Orthophosphate in rivers by river

river	1999	2000	2001	2002	2003	2004
Vardar	1,6	1,8	0,64	0,85	0,71	1,05
Bregalnica	0,19	0,21	0,13	0,26	0,31	0,4
Crna Reka	0,22	0,3	0,13	0,23	0,23	0,32

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

Table 4: Total phosphorus in Lakes

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

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

Table 5: Total nitrate in Lakes

	2000	2001	2002
Ohrid	0,28	0,38	0,05
Prespa	0,57	0,8	0,85

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

Metadata

Legal bases for the indicator:

Law on waters (1998), The Decree on the Categorisation of Watercourses, Lakes, Accumulations and Ground Water Resources (1999)

Data source(s): Administration of Hydro meteorological Matters and Hydro Biological Institute – Ohrid

Geographical coverage: Republic of Macedonia

Temporal coverage: 1998 – 2004

Methodology and frequency of data collection:

EUROWATERNET methodology for identification of the measurements points on the rivers and lakes have been applied

Monthly data have been processed

Methodology of data manipulation (measurements):

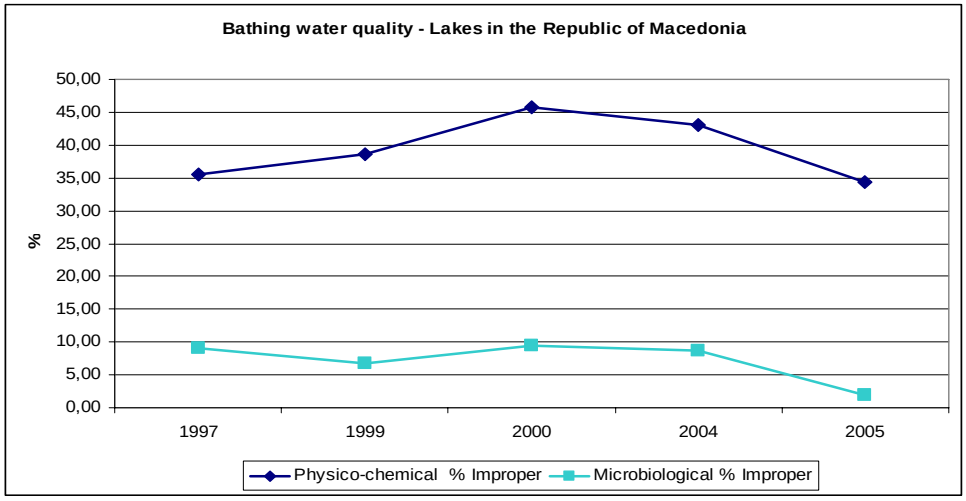
Data by four district river basins.

7.4. CSI 022 Bathing water quality

Key message

Due to the bad quality of the river waters in the country, only the natural and some artificial lakes water should be assessed in accordance to the bathing water quality. The quality of the lakes water in the country is in a constant – a satisfactory level of quality. The water in the main natural lake Ohrid is improving due to the fact of an establishment of a proper sewage treatment system in the region. However there are still parts where the rivers entering in the lake are contributing to the appearance of in proper quality data. The percentage of quality improper samples is still high (especially for the physico-chemical parameters). The settlements around the three natural lakes are the only ones who have some liquid waste treatment plants in the country**.**

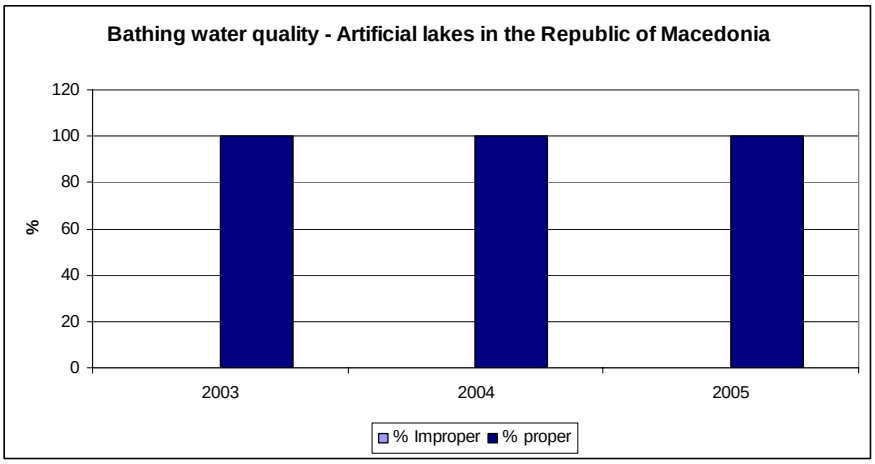
The national legislation and standards in this area should be harmonized with the EU Bathing water Directive.



Title: Bathing water quality – Lakes in the Republic of Macedonia

Source: Republic Institute for Health Protection, Ministry of Health

Note: Data for Ohrid, Prespa and Dojran Lake



Title: Bathing water quality – Artificial lakes in the Republic of Macedonia

Source: Republic Institute for Health Protection, Ministry of Health

Note: Data only for two artificial lakes (Mladost and Tikves Lake)

Policy relevance

Legal base

Law on waters (1998), The Decree on the Categorisation of Watercourses, Lakes, Accumulations and Ground Water Resources (1999)

Assessment

The highest percentage of the water area in the country belongs to the natural lakes whose coastal area has been used for recreational purposes. The water quality in these lakes has been endangered by the uncontrolled disposal of sewage waters as well as uncontrolled used of these waters for agricultural and tourist purposes, as well as bad weather conditions. The country has also 19 artificial lakes – water accumulations and some of them are also used for recreational purposes.

The problems of protection of the bathing water quality in the lakes are strictly connected with the resolution of one of the top environmental; priority in the country the introduction of proper sewage water treatment systems.

As international waters, the waters in the biggest natural lakes Ohrid and Prespa are also a subject of treatment of bilateral and three lateral agreements between Republic of Macedonia and republics of Albania and Greece.

Data coverage (by years):

Table 1: Bathing water quality – Lakes in the Republic of Macedonia

	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

Source: Republic Institute for Health Protection, Ministry of Health

Table 2: Bathing water quality – Artificial lakes in the Republic of Macedonia

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

Source: Republic Institute for Health Protection, Ministry of Health

Metadata

Legal bases for the indicator:

Law on waters (1998), The Decree on the Categorisation of Watercourses, Lakes, Accumulations and Ground Water Resources (1999)

Data source(s):

Hydro meteorological Administration, Republic Institute for Health Protection (RIHP)

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997-2005

Methodology and frequency of data collection:

Standard sampling methodology - annual data

Data presentation: Annual reports

Weaknesses:

There is a difference between the national and international bathing waters standards. They should be harmonized with the EU Directive for Bathing Waters (76 160 EC).