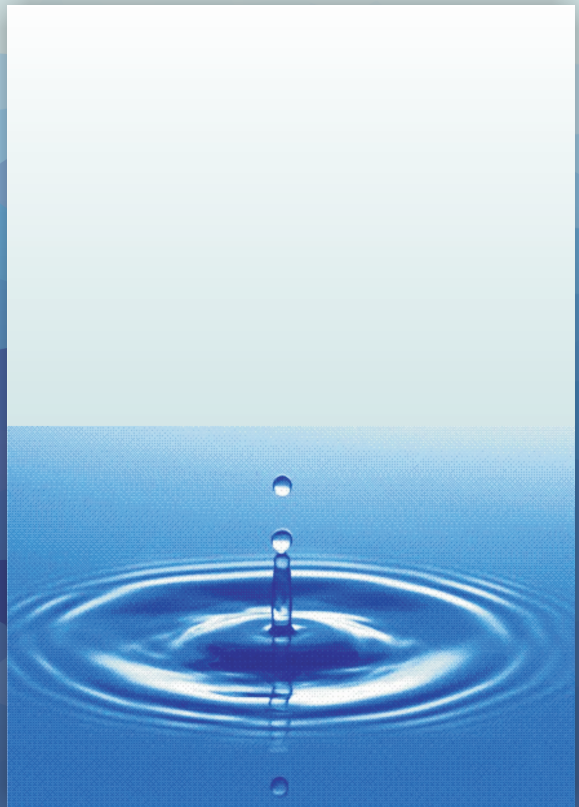# WATER

MK - NI 018
USE OF FRESHWATER RESOURCES

Period of indicator assessment

- September 2007 – April 2008

Explanation

- ### Justification for indicator selection

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

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

Definition

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

Units

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

Policy relevance of the indicator

List of relevant policy documents:

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

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

Legal grounds

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

treatment.

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

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

Targets

No specific targets.

Key policy issue

Is water resources approximation based on water resources sustainability?

Key message

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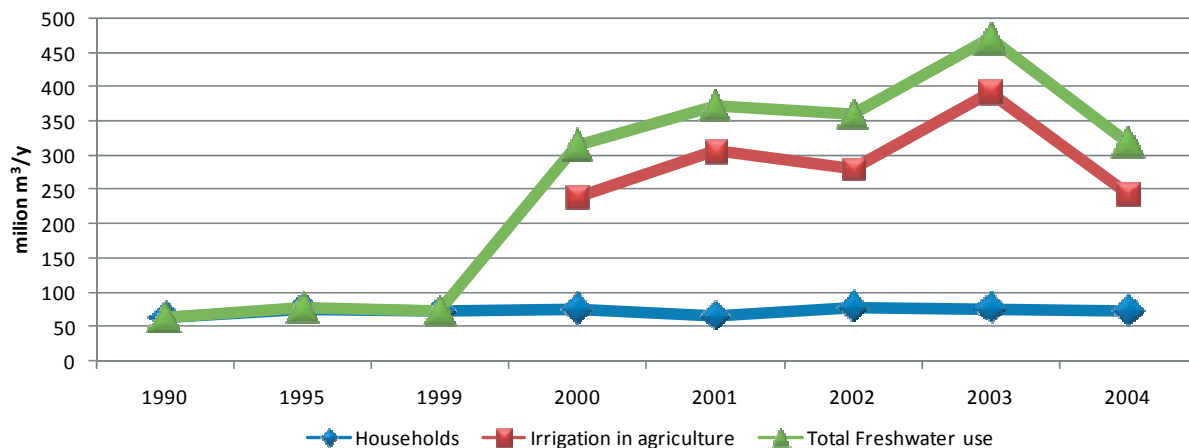

Freshwater resources use
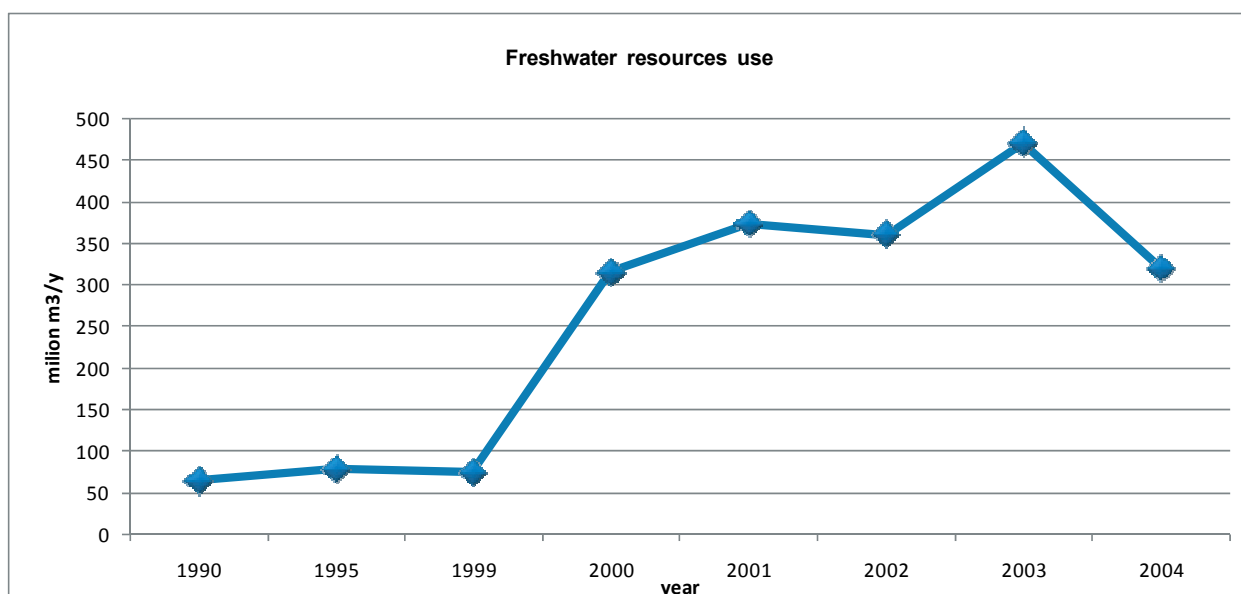
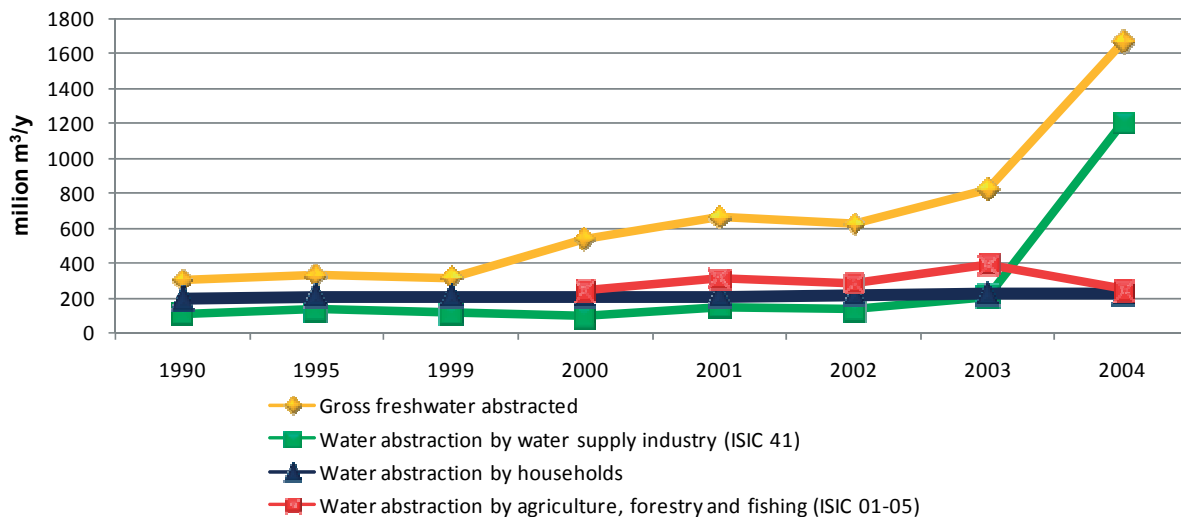Data is not part of the regular statistics published in the country.

Use of freshwater resources by sectors

Gross abstracted freshwater

Gross abstracted fresh surface water

Gross abstracted fresh groundwater

Legend:
- Gross fresh groundwater abstracted
- Groundwater abstraction by water supply industry (ISIC 41)
- Direct groundwater abstraction by households
- Direct groundwater abstraction by agriculture, forestry and fishing (ISIC 01-05)

Gross distributed freshwater for industry supply

Legend:
- Freshwater losses during transport - Losses by leakage
- Net freshwater delivered by water supply industry (ISIC 41)
- Households
- Agriculture, forestry and fishing (ISIC 01-05)
- Other economic activities

Assessment

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

Methodology

■   Methodology for the indicator calculation

–   Data is collected and processed by sectors and types of industry.

Data specification

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

Data coverage (by years):

Table 1: Use of freshwater resources

Unit in mio 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

Table 2: Use of freshwater resources by sectors

Unit in mio m³/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross freshwater abstracted	302	333,8	315,5	539,3	660,9	627,1	816,3	1663
Freshwater abstracted by industry water supply	105,4	129,8	113,6	95,4	148,5	133,5	202,7	1199
Freshwater abstracted by households	196,6	204	201,9	204,7	205,7	212,2	220,3	219,2
Freshwater abstracted by agriculture, forestry and fishery				239,2	306,7	281,4	393,3	244,8

Table 3: Gross freshwater abstracted

Unit in mio m³/y	1990	1995	1999	2000	2001	2002	2003	2004
Households	64	78	73,3	76,3	66,3	79,3	78	74,8
Irrigation in agriculture				239,2	306,7	281,4	393,3	244,8
Total freshwater use	64	78	73,3	315,5	373	360,7	471,3	319,6

Table 4: Gross fresh surface water abstracted

Unit in mio m³/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross fresh surface water abstracted	**208,1**	**268,6**	**269,9**	**482,8**	**598,6**	**579,1**	**691,3**	**1415,9**
Gross fresh surface water abstracted by industry water supply	60,9	97,2	93,1	81,2	136,3	125	118,7	1006,1
Direct fresh surface water abstracted by households	147,2	171,4	176,8	169,1	167,6	176,5	184,2	184,4
Direct fresh surface water abstracted by agriculture, forestry and fishery				232,5	294,7	277,6	388,4	225,4

Table 5: Gross fresh ground water abstracted

Unit in mio m³/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross fresh groundwater abstracted	**93,9**	**65,2**	**45,6**	**56,5**	**62,3**	**48**	**125**	**247,1**
Gross fresh groundwater abstracted by industry water supply	44,5	32,6	20,5	14,2	12,2	8,5	84	192,9
Direct fresh groundwater abstracted by households	49,4	32,6	25,1	35,6	38,1	35,7	36,1	34,8
Direct fresh groundwater abstracted by agriculture, forestry and fishery				6,7	12	3,8	4,9	19,4

Table 6: Gross distributed fresh water for industries supply

Unit in mio m³/y	1990	1995	1999	2000	2001	2002	2003	2004
Gross freshwater distributed for industries water supply	76,8	51,9	63,3	78,1	49,4	86,3	100,3	99,9
Water loss during transport	**119,8**	**99,7**	**138,6**	**366**	**421,1**	**407,3**	**515,7**	**363,4**
Net freshwater distributed for industries water supply	64	78	73,3	76,3	66,3	79,3	78	74,8
Households				239,2	306,7	281,4	393,3	244,8
Agriculture, forestry and fishery	55,8	21,7	65,3	50,5	48,1	46,6	44,4	43,8

General metadata

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

Geographical coverage: Republic of Macedonia

Temporal coverage: 1990 - 2004

Frequency of data collection: collection of annual data.

Note: Data is available only for certain sectors.

Future activities

- Short-term activities
   a. Description of the activity
   – Regular updating of indicator
   b. Required resources
   – Involvement of national experts from governmental institutions in the area of water resources
   c. Status
   – Continuous

   Deadline: one year

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

MK - NI 019

OXYGEN CONSUMING SUBSTANCES IN RIVERS

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

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

Definition

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

Units

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

Policy relevance of the indicator

List of relevant policy documents:

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

Legal grounds

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

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

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

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

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

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

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

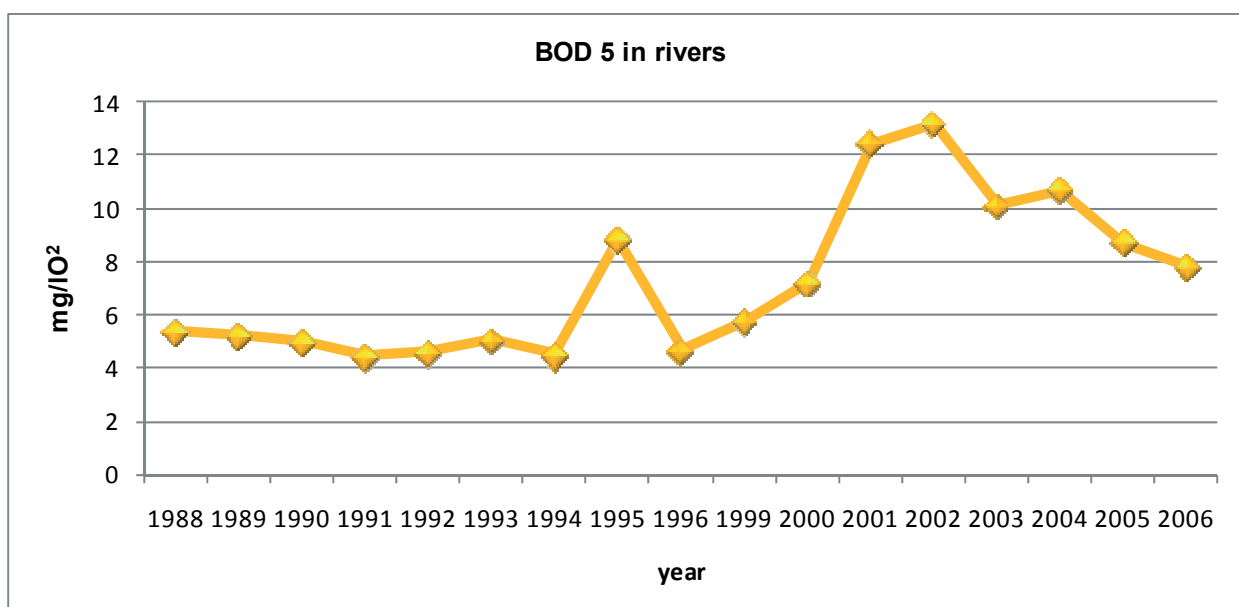against harmful impacts of waters. The Strategy should be adopted by the Assembly of the Republic of Macedonia.
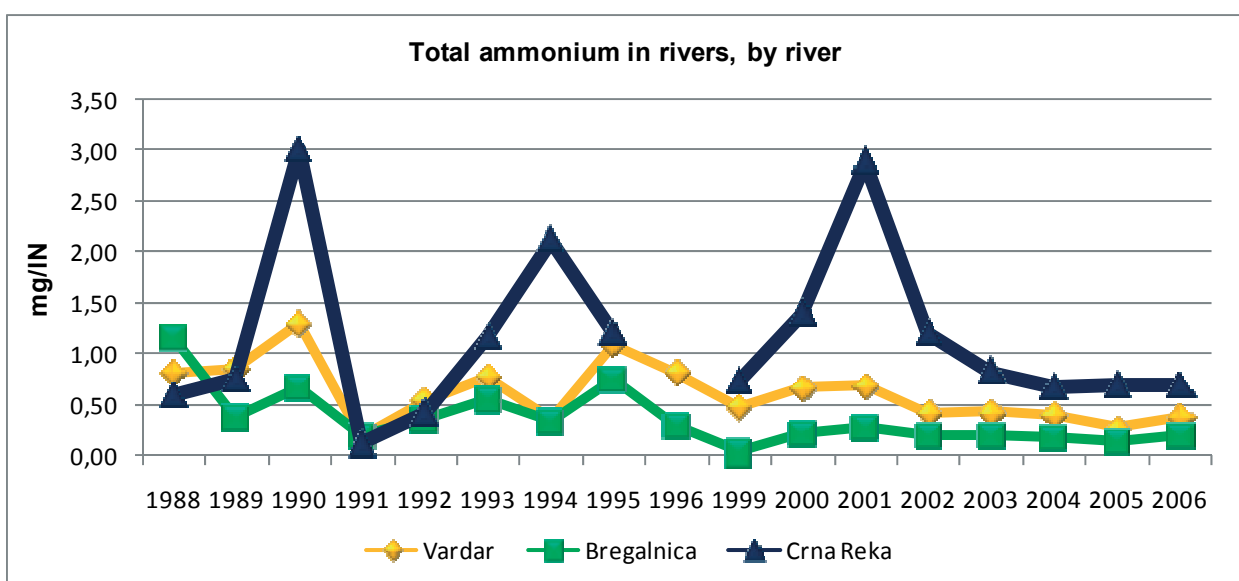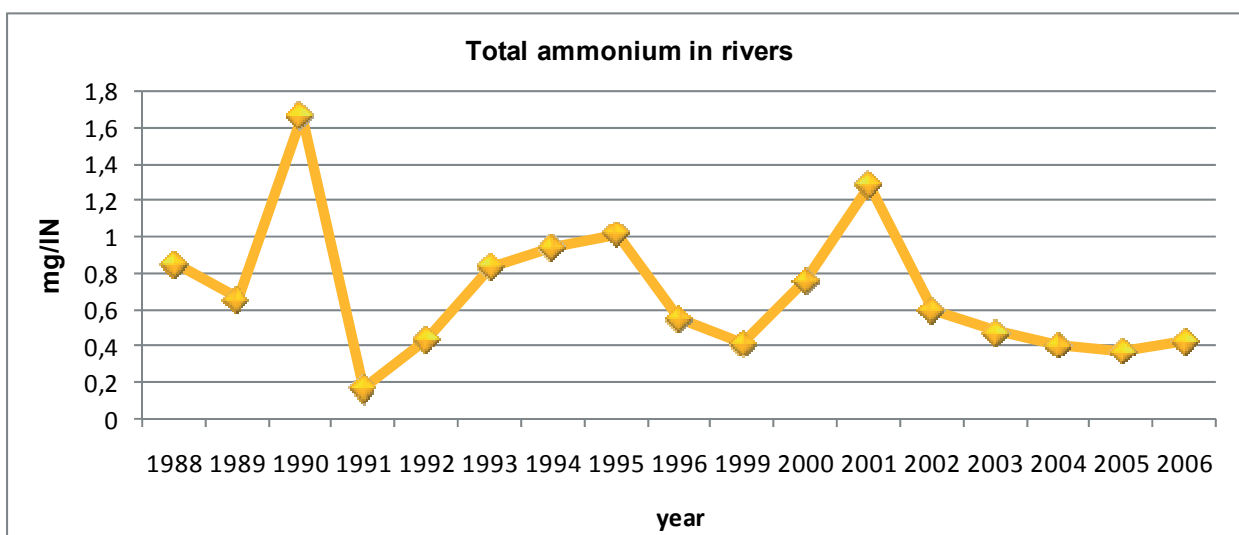
Targets

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

Key message

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

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

BOD 5 in rivers

ENVIRONMENTAL INDICATORS OF THE REPUBLIC OF MACEDONIA

BOD 5 in rivers, by river

Total ammonium in rivers

Total ammonium in rivers, by river

ENVIRONMENTAL INDICATORS OF THE REPUBLIC OF MACEDONIA
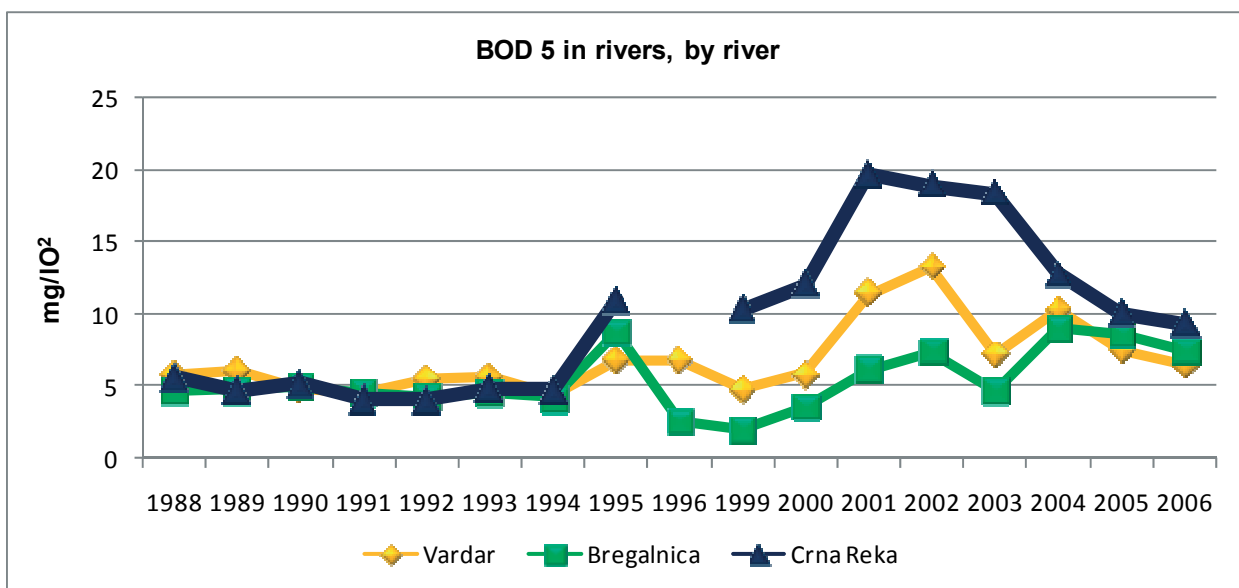
Assessment

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

Methodology

- Methodology for the indicator calculation

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

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

Data specification

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

Data coverage (by years):

Table 1: BOD 5 in the rivers

mg/lO₂	1988	1989	1990	1991	1992	1993	1994	1995	1996	1999	2000	2001	2002	2003	2004	2005	2006
BOD 5	5,39	5,22	4,98	4,44	4,62	5,06	4,48	8,82	4,67	5,75	7,21	12,41	13,19	10,11	10,69	8,69	7,79

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

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

Table 3: Total ammonium in the rivers

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

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

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

General metadata

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

Geographical coverage: Republic of Macedonia

Temporal coverage: 1988 – 2006

Frequency of data collection: Monthly data is processed

Future activities

■ Short-term activities

– Definition of national set of water indicators

a. Description of the activity

– Regular updating of the indicator

b. Required resources

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

c. Status

– Continuous

Deadline: in one year

■ Long-term activities

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

MK - NI 020

NUTRIENTS IN FRESHWATER

Period of indicator assessment

■   September 2007 – April 2008

Explanation

■   Justification for indicator selection

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

Definition

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

Units

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

Policy relevance of the indicator

List of relevant policy documents:

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

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

Legal grounds

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

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

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

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

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

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

Targets

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

− Directive on drinking water (98/83/EC) – maximum permissible concentration of nitrates is 50 mg/l;

− Directive on abstraction of surface water intended for drinking (75/440/EEC) requires nitrates concentration of 25 mg/l.

− Directive on nitrates (91/676/EEC) requires identification of groundwater bodies where the annual concentration exceeds or may exceed 50 mg/l nitrates.

− Directive on urban wastewater treatment (91/71/EEC) specifies reduction of the pollution caused by organic matter as its objective.

Key policy issue

Has the nutrients concentration in water courses shown rising trend?

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

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

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

Nitrates and orthophosphates in rivers

Nitrates in rivers by river

Legend: Vardar, Bregalnica, Crna Reka

Orthophosphates in rivers by river

Legend: Vardar, Bregalnica, Crna Reka

Total phosphorus in lakes

Legend: Ohrid Lake, Prespa Lake

Total nitrate in lakes
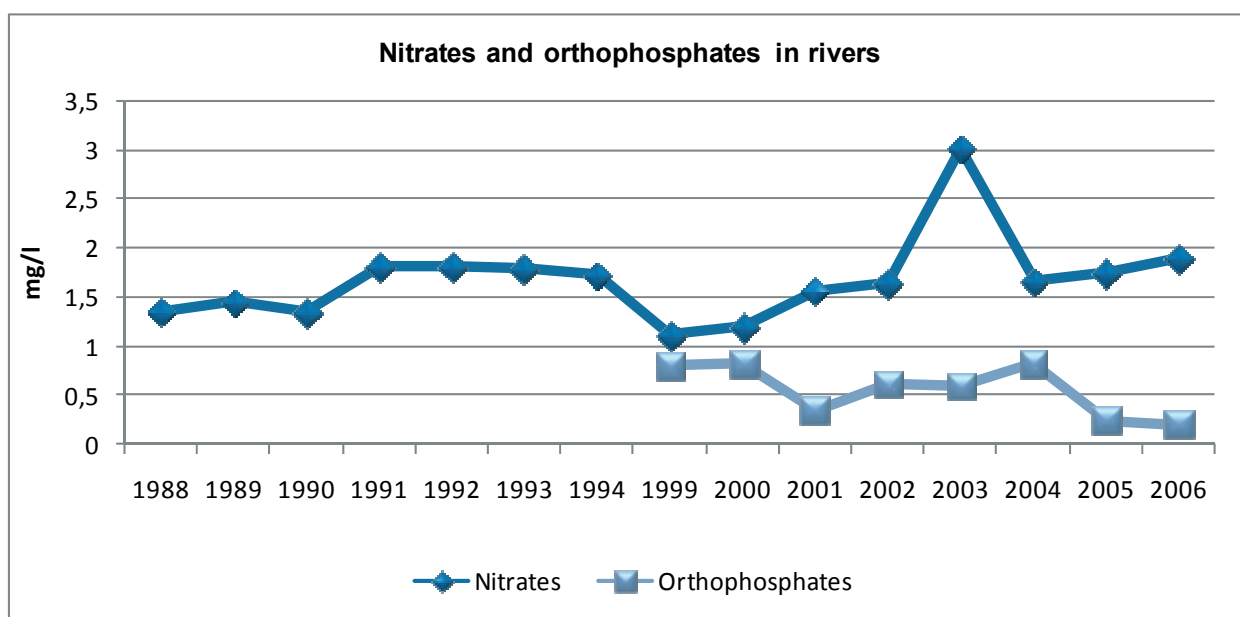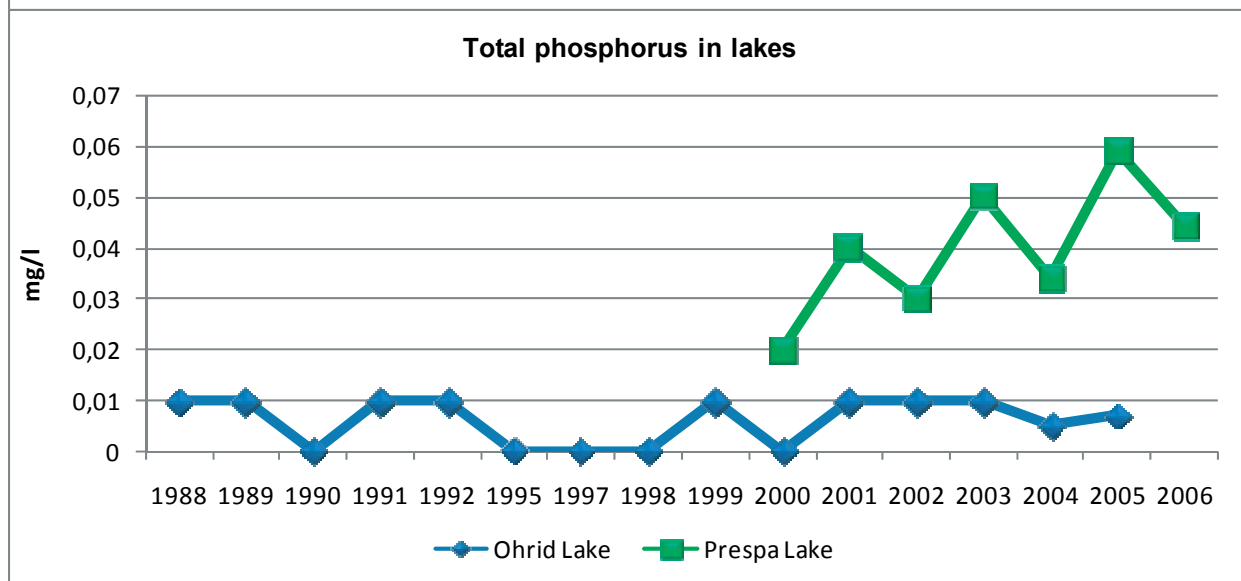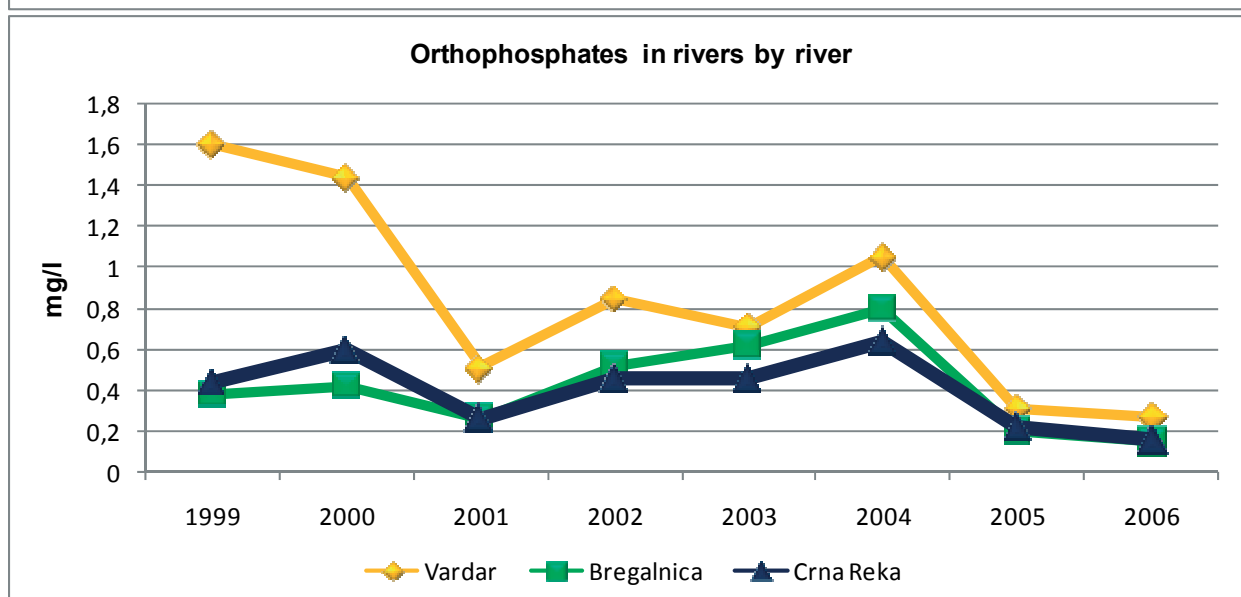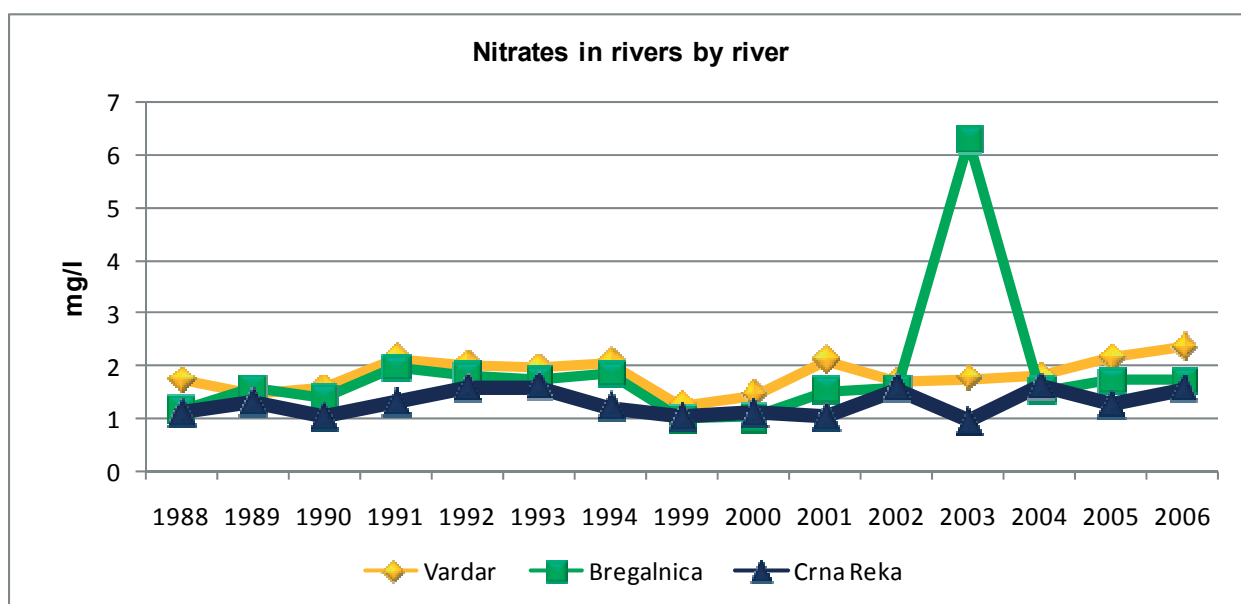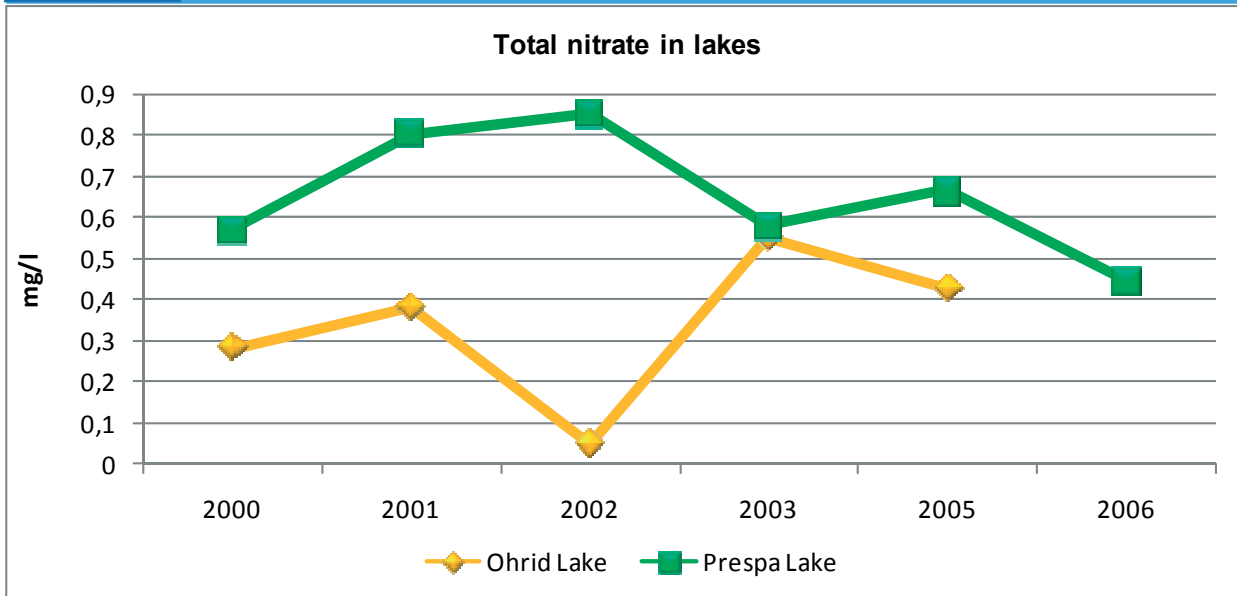
Note: No data is available before 2000

Assessment

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

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

Methodology

- Methodology for the indicator calculation

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

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

Data specification

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

Data coverage (by years):

Table 1: Nitrates and orthophosphate in rivers

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

Table 2: Nitrate in rivers by river

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

Table 3: Orthophosphates in rivers by river

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

Table 4: Total phosphorus in lakes

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

Table 5: Total nitrate in lakes

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

General metadata

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

Geographical coverage: Republic of Macedonia

Temporal coverage: 1998 – 2006

Frequency of data collection: Monthly data is processed

Future activities

- **Short-term activities**

  – Definition of the National Set of water indicators

  a. Description of the activity

  – Regular updating of indicator

  b. Required resources

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

  c. Status

  – continuous

  Deadline: within one year

- **Long-term activities**

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

MK - NI 022

BATHING WATER QUALITY

Period of indicator assessment

■   September 2007 – April 2008

Explanation

■   Justification for indicator selection

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

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

Definition

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

Units

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

Policy relevance of the indicator

List of relevant policy documents

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

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

Legal grounds

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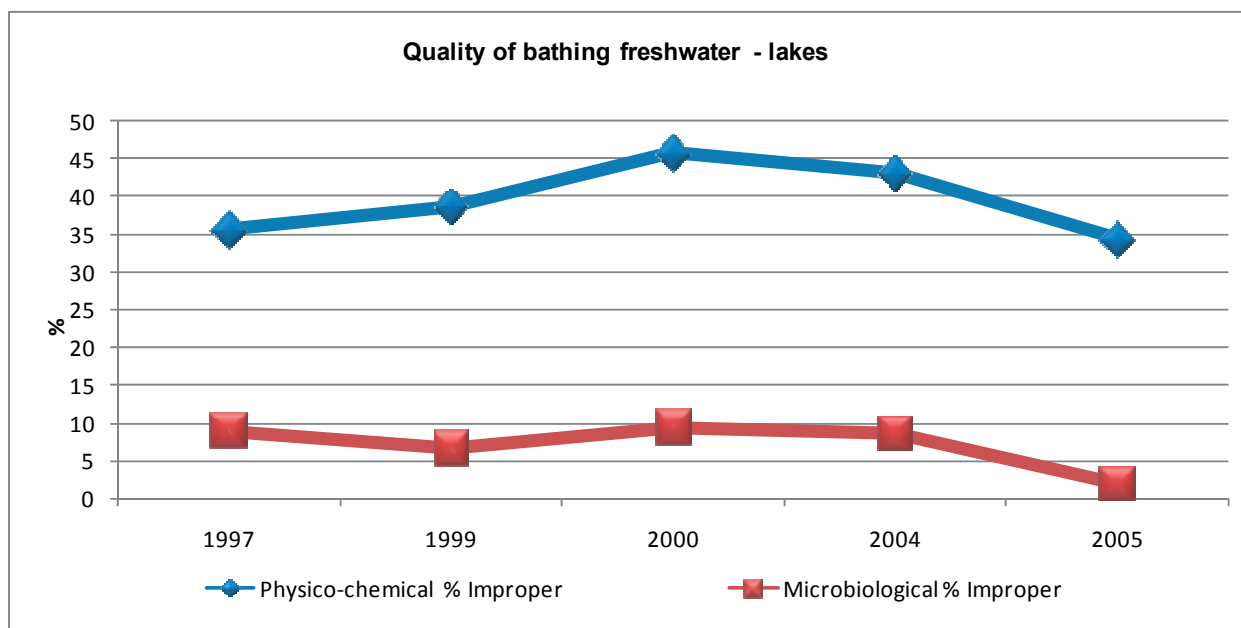
Targets

It is necessary that all water bodies designated for bathing comply with mandatory values of water quality specified in Bathing Water Directive.
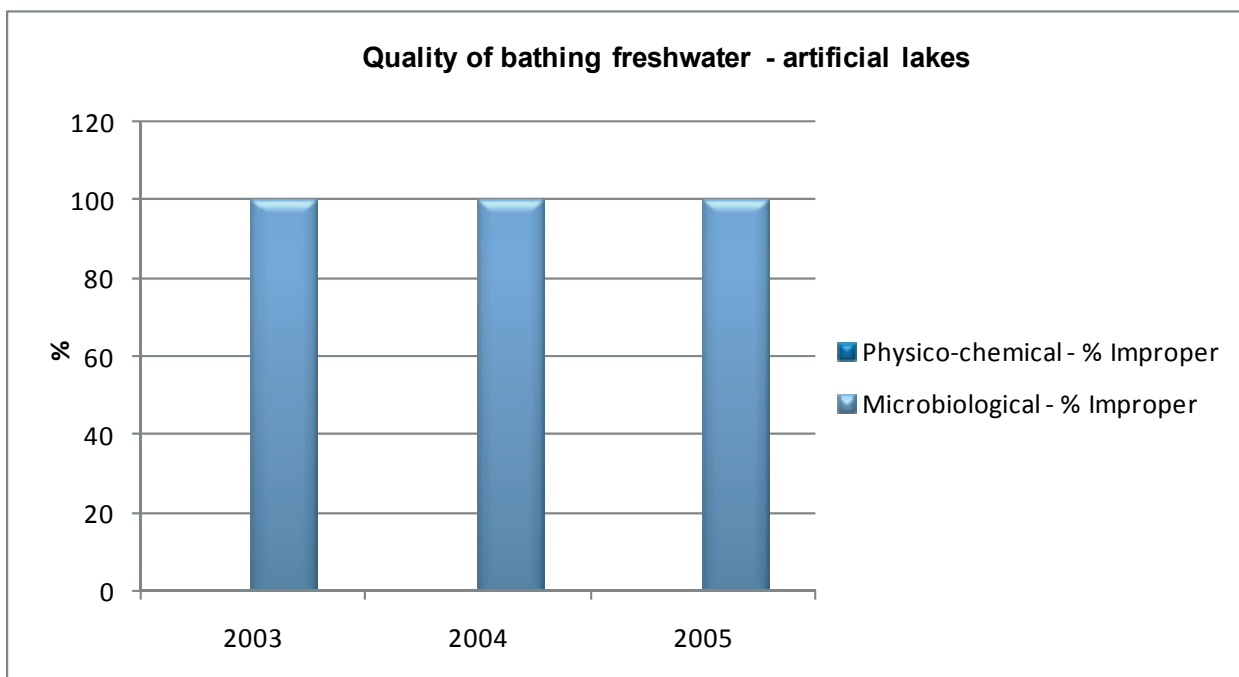
Law on Waters transposing the requirements of EU in relation to bathing should be adopted, thus enabling reduction and prevention of water pollution, as well as achievement of hygienic and sanitary safety of bathing water.

Key message

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

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

Quality of bathing freshwater - lakes

ENVIRONMENTAL INDICATORS OF THE REPUBLIC OF MACEDONIA

Quality of bathing freshwater - artificial lakes

Legend:
- Physico-chemical - % Improper
- Microbiological - % Improper

Assessment

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

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

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

Methodology

■   Methodology for the indicator calculation

Standard methodology for sampling - annual data.

Data specification

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

Data coverage (by years):

Table 1: Bathing water quality – lakes

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

Table 2: Bathing water quality – artificial lakes

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

General metadata

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

Geographical coverage: Republic of Macedonia

Temporal coverage: 1997 - 2005

Data presentation: Annual reports

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

Future activities

- ■ Short-term activities

– Definition of the national set of water indicators

  a. **Description of the activity**

– Regular updating of the indicator

  b. **Required resources**

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

  c. **Status**

– continuous

   Deadline: within one year.

- ■ Long-term activities

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

MK - NI 024

URBAN WASTE WATER TREATMENT

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

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

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

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

Definition

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

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

Units

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

Policy relevance of the indicator

List of relevant policy documents

The National Environmental Action Plan (NEAP) 2.

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

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

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

Legal grounds

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

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

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

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

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

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

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

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

Targets

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

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

Key message

The requirements of the Directive concerning municipal wastewater treatment have not been implemented in the current Law on Waters.
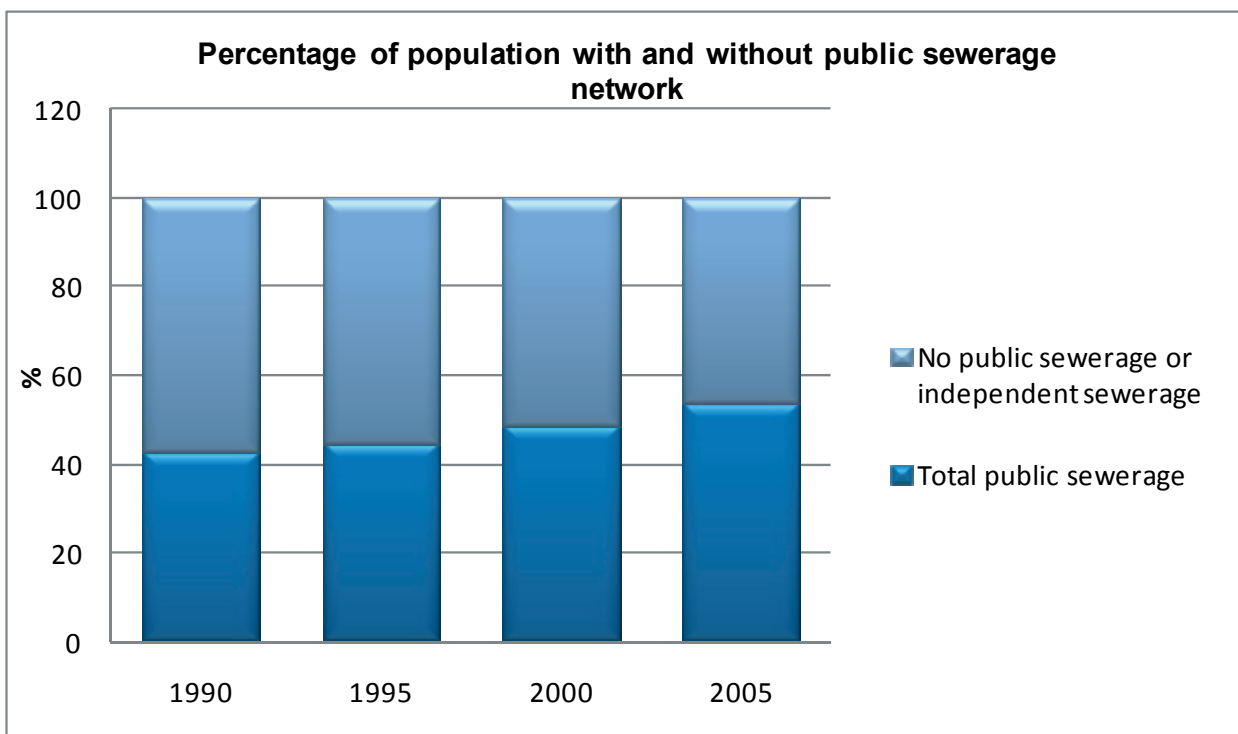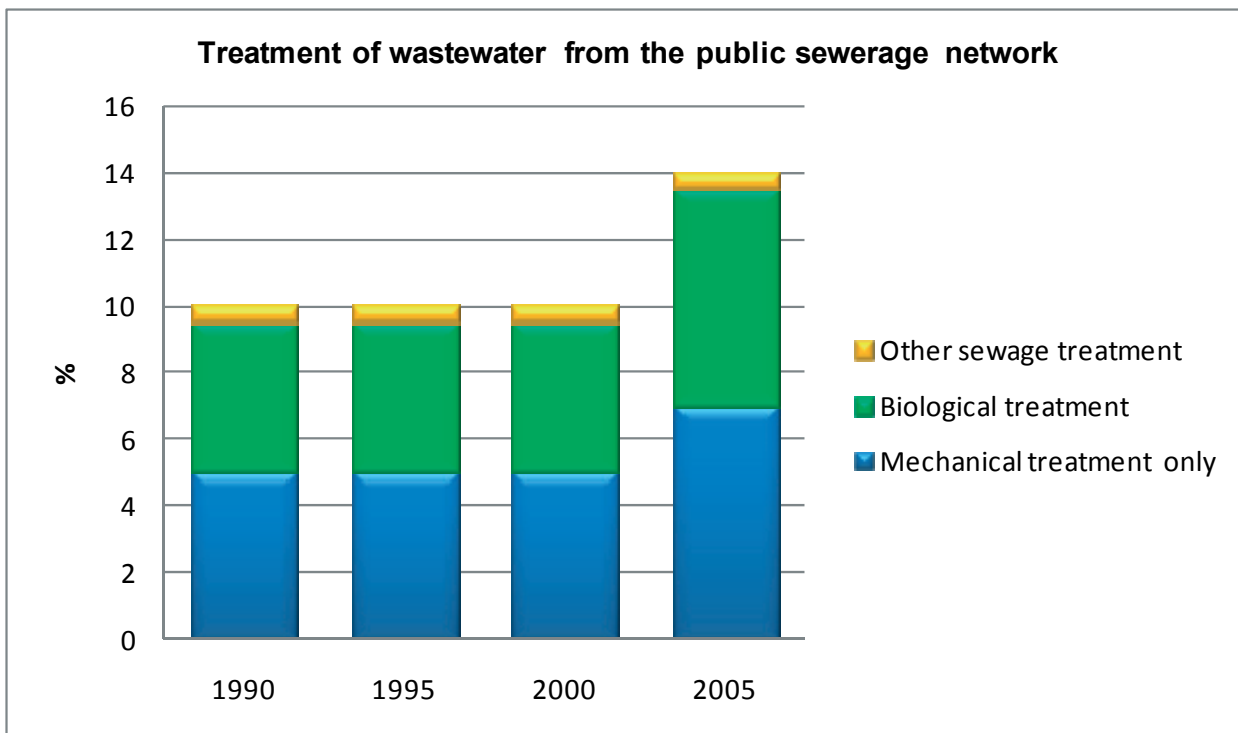
According to the results on the distribution of the population in the Republic of Macedonia in relation to treated municipal wastewaters involving only mechanical treatment, biological treatment and latest treatment technology, it can be concluded that there is no conformity with the Urban Wastewater Treatment Directive. The percentage of the population covered by municipal wastewater treatment with included biological treatment is very low. Therefore, the introduction of regular treatment of wastewaters in the country is top priority, both at local and national levels.

In the past period, no reduction in BOD 5 and in concentrations of ammonium in rivers (MK NI 019) has been observed in the Republic of Macedonia. At some monitoring stations, located

on the rivers Crna Reka and Vardar, eutrophic water status with high BOD value was recorded. These results could reflect the status of inefficient treatment of urban and industrial wastewaters in the country, as well as the inadequate protection of river basins.

Treatment of wastewater from the public sewerage network

Percentage of population with and without public sewerage network

Assessment

According to the results on the distribution of the population in the Republic of Macedonia in relation to treated municipal wastewaters involving only mechanical treatment, biological

treatment and application of latest treatment technology, and in relation to public sewerage, it can be concluded that the percentage of such population is very low. Despite of the rising trend, the current state is unsatisfactory with regard to EU requirements.

Methodology

■ Methodology for the indicator calculation

In accordance with the requirements of EUROSTAT

Data specification

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

Data coverage (by years):

Table 1: Percentage of public sewerage with and without treatment

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

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

Table 2: Percentage of population with and without public sewerage

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

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

General metadata

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

Geographical coverage: Republic of Macedonia

Temporal coverage: 1990 - 2006

Frequency of data collection: annual

Uncertainty

■   Methodological uncertainty and data uncertainty

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

Future activities

■   Short-term activities

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

a.   Description of the activity

–   Regular updating of the indicator.

b.   Required resources

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

c.   Status

–   continuous.

Deadline: within one year.

■   Long-term activities

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

MK NI 039

DRINKING WATER QUALITY

Period of indicator assessment

- September 2007 – April 2008

Explanation

- Justification for indicator selection

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

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

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

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

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

Definition

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

guideline values set for the quality of drinking water by the World Health Organization (WHO, 2004 and 2006).

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

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

Units

– Number of aerobic mesophilic bacteria in 1 ml,

– Number of coliform bacteria in 100 ml,

– Number of thermo-tolerant coliform bacteria in 100 ml, concentration of physico-chemical pollutants in mg/l,

– Parameters for radiological safety of drinking water in bekerels/l and total indicative dose in mSV/l.

Policy relevance of the indicator

List of relevant policy documents:

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

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

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

– Reduction of exposure to toxic chemicals through water originating from agriculture and industry.

The NEHAP also sets the following priorities:

– approximation of the legislation on the quality of ambient and drinking waters with the recommendations of the EU (approximation completed in 2004) and with the WHO Guidelines (approximation with the 2006 Guidelines is in progress 2006);

– introduction of disincentive process for non-earmarked consumption of drinking water by commercial and non-commercial users and restrictive prices for the population in circumstances of draught for the purpose of consumption streamlining (implemented under the Law on Drinking Water Supply and Urban Wastewater Collection (Official Gazette of the Republic of Macedonia No.68/04 and 28/06));

– establishment of sanitary protection zones around water supply sources in order to prevent contamination of anthropogenic origin (permanent process performed and most of the public utilities have established zones in line with the Elaborates for sanitary protection zones developed by the Public Health Institution RIHP and other authorised vocational institutions);

- construction of municipal and industrial wastewater treatment systems (constructed and operational in Struga including Ohrid, in Resen, Dojran, Makedonski Brod, Kumanovo and Sveti Nikole, the last one currently out of operation);

- monitoring of the quality of surface and groundwaters, especially at drinking water abstraction, places intended for sports and recreation and points for abstraction of water for irrigation, monitoring of discharged untreated and treated municipal and industrial wastewaters in accordance with EU and WHO Guidelines (monitoring is performed regularly and continuously by the Public Health Institution Republic Institute for Health Protection (PHI RIHP) - Skopje and the 10 Regional PHI IHPs with their local units);

- introduction of drinking water fluoridation as the most efficient, the least costly and socially and medically most fair means for massive caries prophylaxis (delivered Project proposal for drinking water fluoridation, with Bitola as pilot Municipality, through the Ministry of Health).

Legal grounds

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

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

The Law on Drinking Water Supply and Urban Wastewater Collection (Official Gazette of the Republic of Macedonia No.68/04 and 28/06), in its Article 1, regulates the conditions and the manner of drinking water supply, termination of drinking water supply and urban waste water discharges into recipient through sewerage and water supply systems, respectively, construction, maintenance, protection and connection to water supply and sewerage systems, relationships between service provider and user, as well as supervision over the implementation Decree on Water Classification (Official Gazette of the Republic of Macedonia No.18/99), in its Article 2, specifies five classes of surface watercourses, lakes and

accumulations and ground water resources. The Law on Food and Foodstuffs and Materials in Contact with Food (Official Gazette of the Republic of Macedonia No.54/02), in its Article 1 specifies that the Law regulates the conditions for provision of safe food and safe foodstuffs and materials in contact with food, production and trade, rights and obligations of natural and legal persons processing food or performing trade in food in order to protect human health, to protect consumers from misleading and to enable free trade in the internal and external markets. Article 2, item 1 specifies that food is any substance intended for human use through nutrition and drinking, as well as any ingredient used for production, processing and preparation of food. Food also includes **drinking water** from public water supply systems, intended for the market, and water intended for food

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

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

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

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

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

Targets

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

Limit values of concentrations of certain parameters in drinking water

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

Key policy issue

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

Key message

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

Drinking water quality

Analysis of data from water supply in rural settlements shows that sanitary and hygienic safety of analyzed samples of drinking water are generally satisfactory, i.e. within the expected results, compared to the previous years. The most frequent reason for unsafe findings in physico-chemical analysis is the absence of residual chlorine or increased content of iron in raw water, but not in the water supply network. The water in the water supply system in Sveti Nikole was banned for consumption due to increased content of aluminium and trihalomethanes (ban issued in 2003, still in effect).
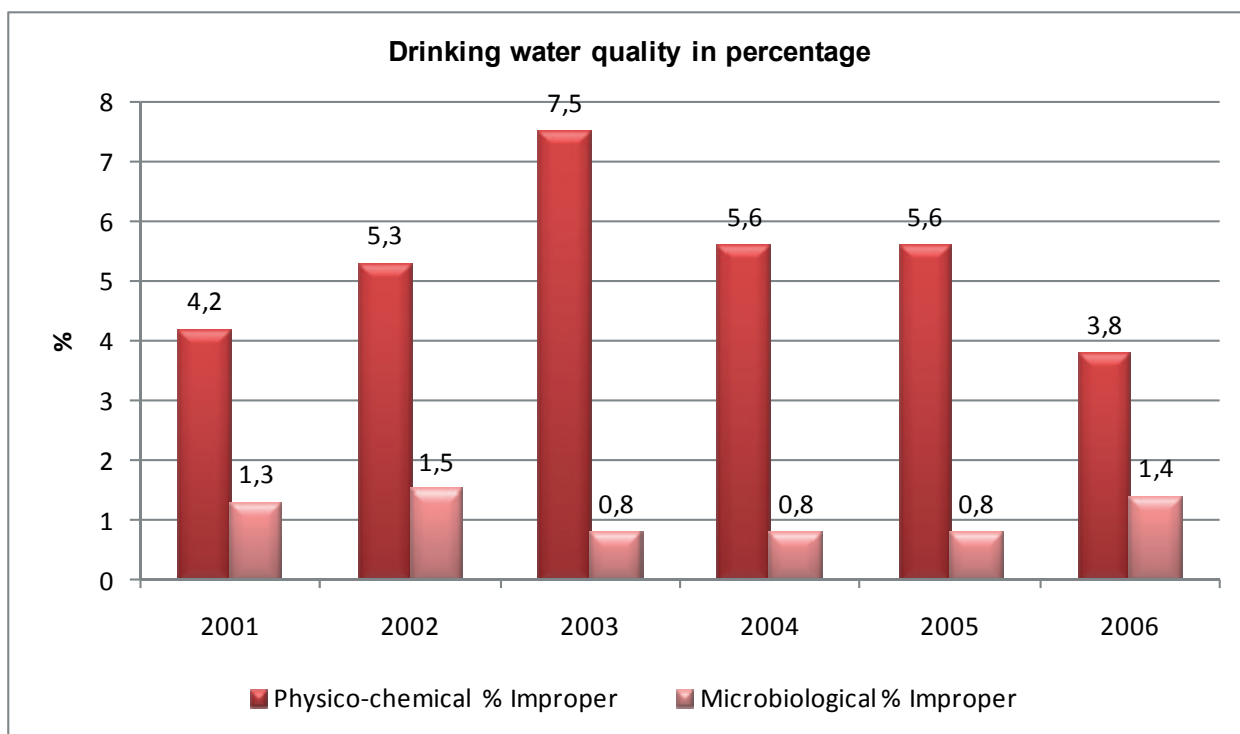
Analysis of the results on health safety of drinking water in the period 2001 - 2006 shows that the percentage of unsafe samples according to physico-chemical analysis is in the range between 4.2 and 7.5%, and the percentage of unsafe samples according to microbiological analysis is in the range between 0.8 and 1.5%.

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

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

- Around 218.995 inhabitants are connected to urban water supply systems, and thus the state of maintenance of the water supply facilities and drinking water quality corresponds with the status of cities where those are connected. With reference to physico-chemical analysis, 9.53% unsafe samples have been found, while 3% have been unsafe in bacteriological analysis.

- 476.059 inhabitants are supplied with drinking water from water supply systems in rural settlements using their own springs and managing the facilities by themselves. 21% of the analyzed samples have been unsafe with regard to physico-chemical parameters, mostly due to the lack of residual chlorium, while 25% of analyzed data have been bacteriologically unsafe.

- Local water supply facilities (wells, pumps, rural taps, springs) are still used as main source of drinking water for around 128.102 inhabitants. 32.9% of the analyzed samples have been unsafe with regard to physico-chemical parameters, mostly due to the lack of residual chlorium, while 34% of analyzed data have been bacteriologically unsafe.

Drinking water quality in percentage

A bar chart showing physico-chemical and microbiological improper percentages by year:

Year	Physico-chemical % Improper	Microbiological % Improper
2001	4,2	1,3
2002	5,3	1,5
2003	7,5	0,8
2004	5,6	0,8
2005	5,6	0,8
2006	3,8	1,4

Assessment

Quality of drinking water

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

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

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

Methodology

■   Methodology for the indicator calculation

Drinking water quality

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

Data specification

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

Data coverage (by years):

Table 1: Drinking water quality in percentage

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

Temporal coverage: 2001 – 2006

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

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

Uncertainty

- ■ Methodological uncertainty

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

- ■ Data uncertainty

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

Future activities

- ■ Short-term activities
- – Finalized definition of the national set of water indicators.
  - **a. Description of the activity**
- – Establishment of Work Group for the national set of drinking water quality indicators to comply with the ISO standards.
  - **b. Required resources**
- – Engagement of national experts from governmental institutions in the area of drinking water quality.
  - **c. Status**
- – Early initiative

    Deadline: one year.

MK - NI 040

IRRIGATED LAND

Period of indicator assessment

■   September 2007 – April 2008

Explanation

■   Justification for indicator selection

Monitoring of the efficiency of the use of water for irrigation of agricultural land at national and local levels is an important factor in the establishment of the water abstraction rate, which is an objective for sustainable and long-term policy under the policy objective under the EU's Sixth Environment Action Programme (2001-2010).

The indicator shows how the overall water abstraction makes pressure

Definition

The indicator tracks the trend in irrigated areas in a given time interval on the whole territory of the Republic of Macedonia, as well as total quantities of consumed water on the entire territory and proportion of irrigated land compared to the total cultivable land area.

Units

–   Area of irrigated land (expressed in hectares), quantity of water used for irrigation expressed in cubic meters consumed at annual level, % of irrigated land in the total cultivable land area.

List of relevant policy documents:

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

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

Legal grounds

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

The Law specifies that the maintenance and improvement of water regime is carried out on the

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

Use of water for different purposes is specified under the Decree on Water Classification, according to which water is divided into five different classes based on the level of pollution, while water characteristics are determined on the basis of classes and purposes for which water can be used.
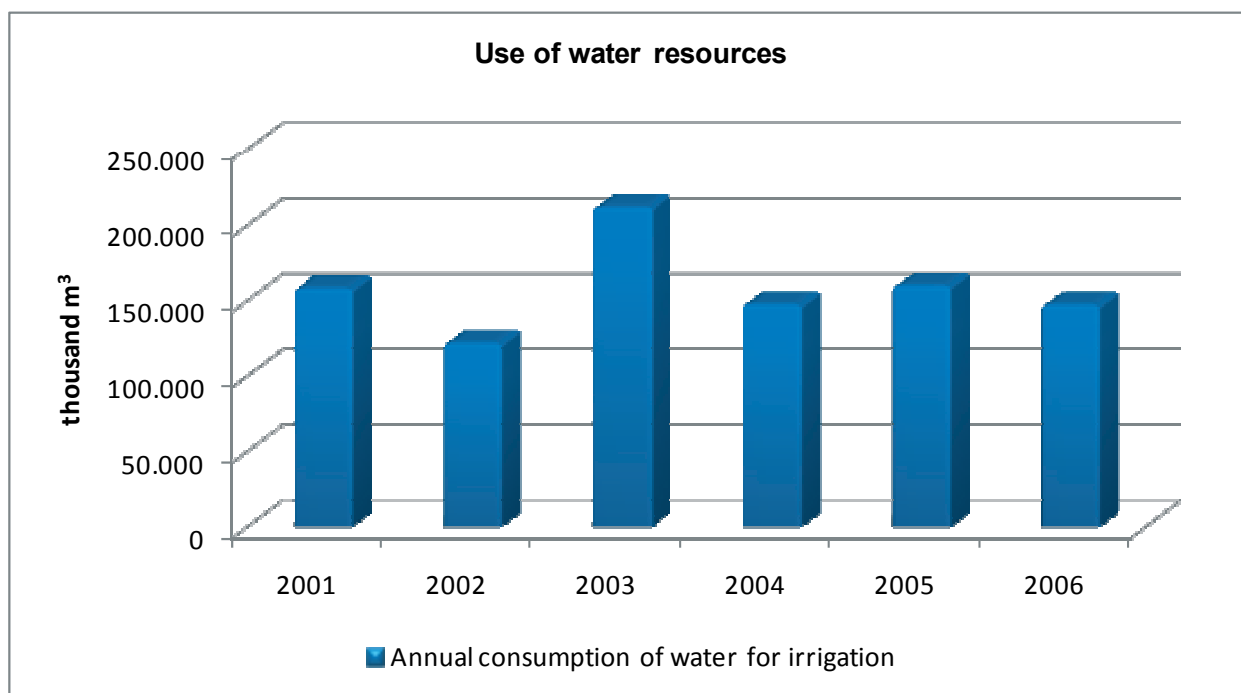
Targets
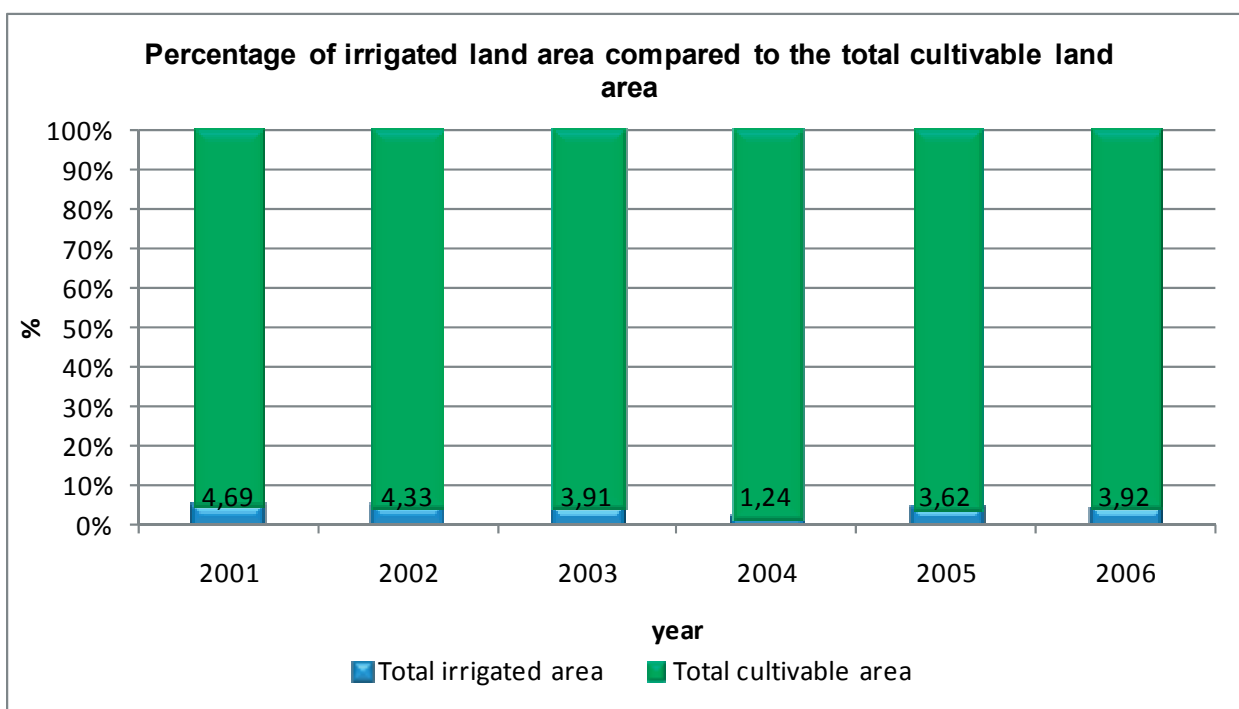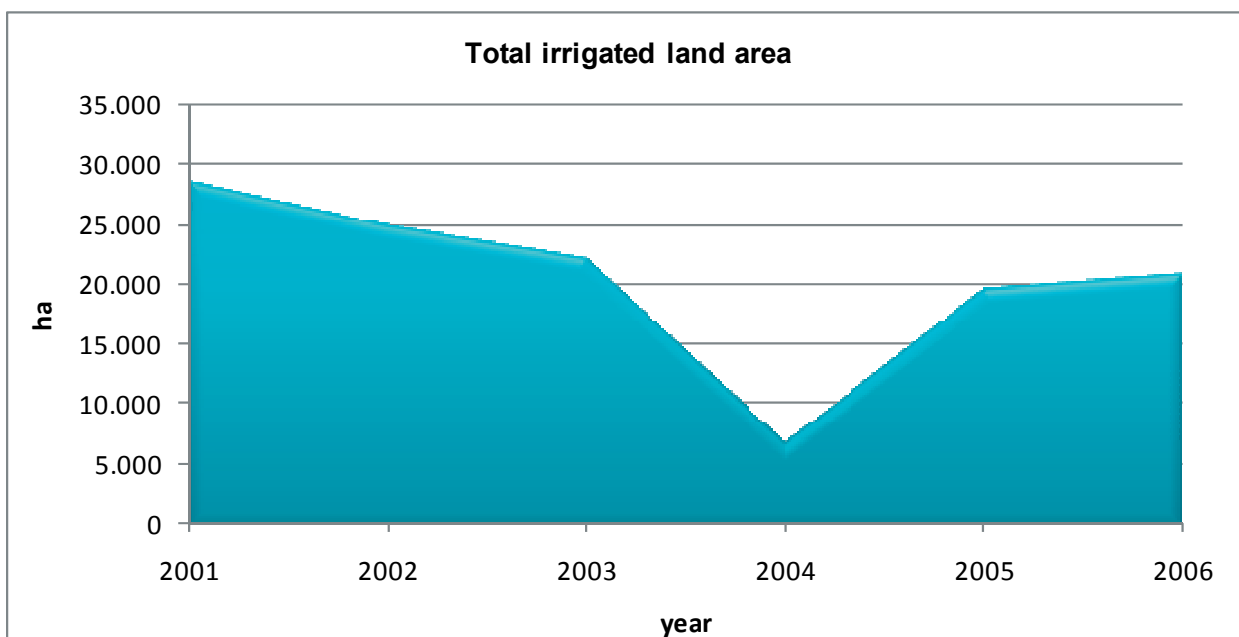
No specific targets.

Key policy issue

Is the water abstraction based on water sustainability?

Key message

An uneven trend in water use for land irrigation was observed in the period between 2001 – 2006, due to weather conditions in the given year, as well as to organizational restructuring of the sector. Particular increase was recorded in 2003.

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

Use of water resources

Annual consumption of water for irrigation

ENVIRONMENTAL INDICATORS OF THE REPUBLIC OF MACEDONIA

Total irrigated land area

Percentage of irrigated land area compared to the total cultivable land area

Assessment

An uneven trend in water use for land irrigation was observed in the period between 2001 – 2006. There is an interesting data that the quantity of water consumed by this sector in 2004 was significantly lower compared to the entire successive interval. This is due to the favorable weather conditions in 2004, when increased number of precipitation and increased water masses were noted. Table 4 presents the percentage of irrigated land area compared to the entire cultivable land area in the Republic of Macedonia, showing that the percentage is really low with the average being below 5% for the entire time interval.

Methodology

- Methodology for the indicator calculation

Data is collected and processed by years.

Data specification

Title of the indicator	Source	Reporting obligation
Irrigated land	– State Statistical Office	– OECD/EUROSTAT

Data coverage (by years):

Table 1: Use of water resources

	2001	2002	2003	2004	2005	2006
Annual consumption of water for irrigation (thousand m^3)	157 847	121 186	211 569	147 500	159 494	147 294

Table 2: Area of irrigated land

h/y	2001	2002	2003	2004	2005	2006
Total irrigated land area, hectares	28 722	25 019	22 267	6 967	19 787	21 038

Table 3: Total cultivable land

h/y	2001	2002	2003	2004	2005	2006
Total cultivable land area, hectares	612 000	577 000	569 000	560 000	546 000	537 000

Table 4: Percentage of irrigated area compared to total cultivable area

	2001	2002	2003	2004	2005	2006
%	4,69	4,33	3,91	1,244	3,62	3,92

General metadata

Code	Title of the indicator	Compliance with CSI/ EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 040	**Irrigated land**	WQ4	Irrigated land	**D**	A	Water	Annually

Geographical coverage: Republic of Macedonia

Temporal coverage: 2001 - 2006

Frequency of data collection: Collection of annual data.

Note: Data is available for some sectors only.

Future activities

■ Short-term activities

– Definition of the national set of water indicators

a. Description of the activity

– Regular updating of the indicator

b. Required resources

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

c. Status

– continuous

Deadline: one year

■ Long-term activities

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