AIR POLLUTION

MK-NI 001

EMISSIONS OF ACIDIFYING SUBSTANCES

Definition

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

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

Units

- kt (acidifying equivalent)

Key policy issue

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

Key message

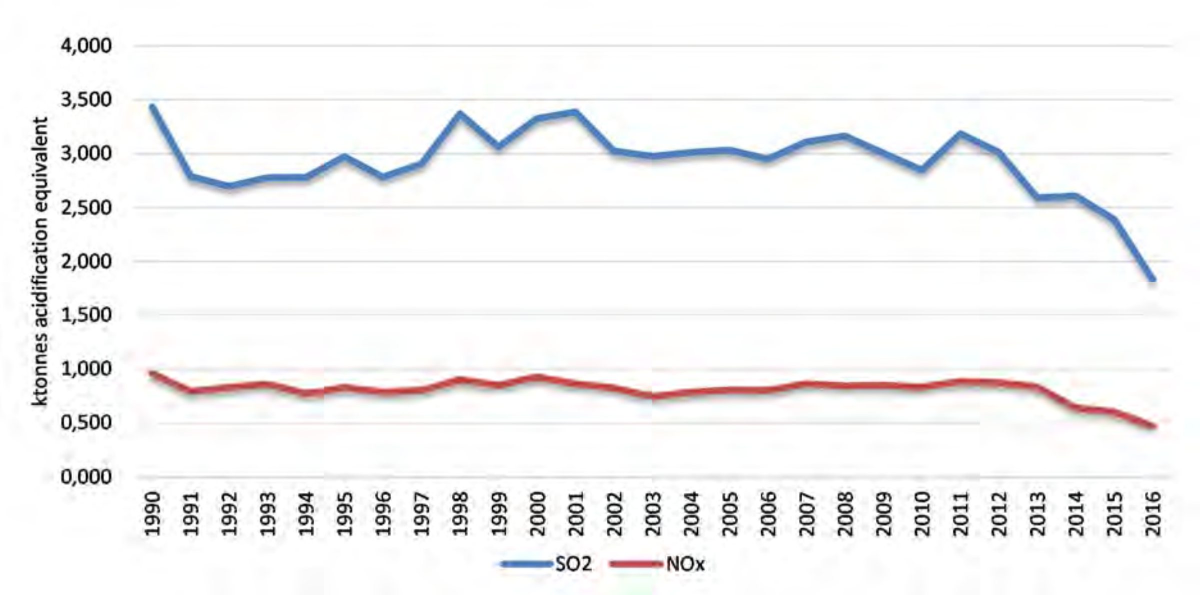
Sulfur dioxide (SO_2)

The key sector of this polluting substance is energy production and distribution. Compared to the trend in 1990, emissions of sulfur dioxide changed in 2016 (reduction by 47% compared to 1990), but the trend was variable due to changes in the consumption of coal in energy sector. In the period from 2012 until today the trend of decline of SOx starts due to the reduced consumption of coal and heavy oil in the thermal power plants. . Nevertheless, there was no significant reduction compared to other European countries, due to the fact that the best available techniques were not applied in the energy producing installations for reduction of sulfur oxides as substances originating from the use of coal with high content of sulfur. On the other side, SO_2 emissions from fuels combustion in industry and administrative facilities owing to use of crude oil with sulfur content up to 1%. Yet, this reduction did not contribute to significant reduction in overall emissions considering that the share of emissions from electricity producing installations in 2016 was around 86%. Significant reduction in this polluting substance is expected upon the introduction of a desulfurization process in the largest electricity producing plant REK Bitola, planned to be implemented in accordance with the time dynamics, set out in the National Plan for reduction of emissions from large combustion plants. .

Nitrogen oxide (NOx)

The key sectors for this pollutant are energy production and distribution, and road transport. Total national emissions of NOx in 2016 are 21,6 kt.The trend of emissions during the reporting period was not stable and depended mainly on the consumption of fuels in the energy sector. The reasons for the reduction during the last several years are related to significantly reduced emissions from the industry for electricity production, owing to reduced scope of operation in REK Oslomej and modernization of boilers in REK Bitola as well as lower fuel consumption in the sector. As a result of the old vehicle fleet (around 79% of cars belong to EURO classes 0-2), there was no significant reduction in the emission of this pollutant from road transport. At the same time, due to the availability of detailed data for the fleet, for the last few years for the period 2014-2016, a methodology for calculation of emissions at level 2 is applied, while for the previous years the calculations were performed in the application of the methodology at level 1. Greater progress in the reduction of NOx emissions is expected with renewal of the fleet and with the increasing of the share of renewable sources in electricity production.

Diagram 1. Emission trends for nitrogen oxides and sulfur dioxide



Assessment

Under the CARDS Programme, the Inventory of air emissions of the main pollutants in the country was established in 2005, in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 an Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

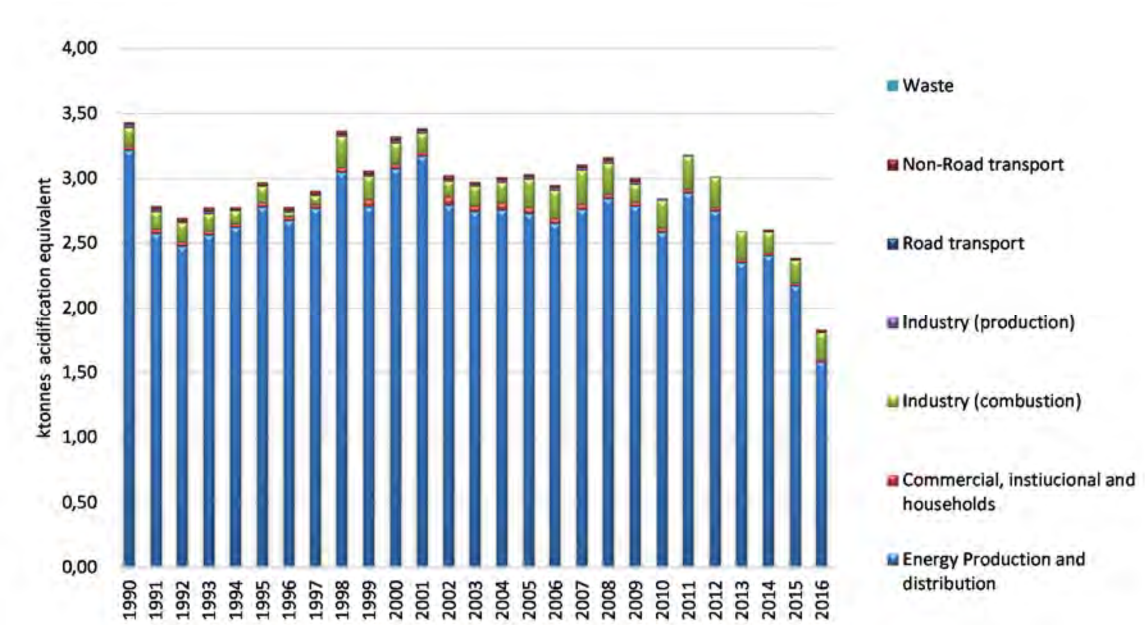
For ozone precursors, nitrogen oxides, the main sources of emissions in 2016 were the following SNAP categories of sources: Road transport with a share of 31% (22% in 1990) and Energy production and distribution with a share of 41% in the overall national emissions of NOx.

As far as sulfur dioxide is considered, almost all emissions of SO_2 originate from Energy production and distribution (86%). Around 11% of overall national emissions of SO_2 originate from combustion processis in manufacturing industry.

Policy specific issue

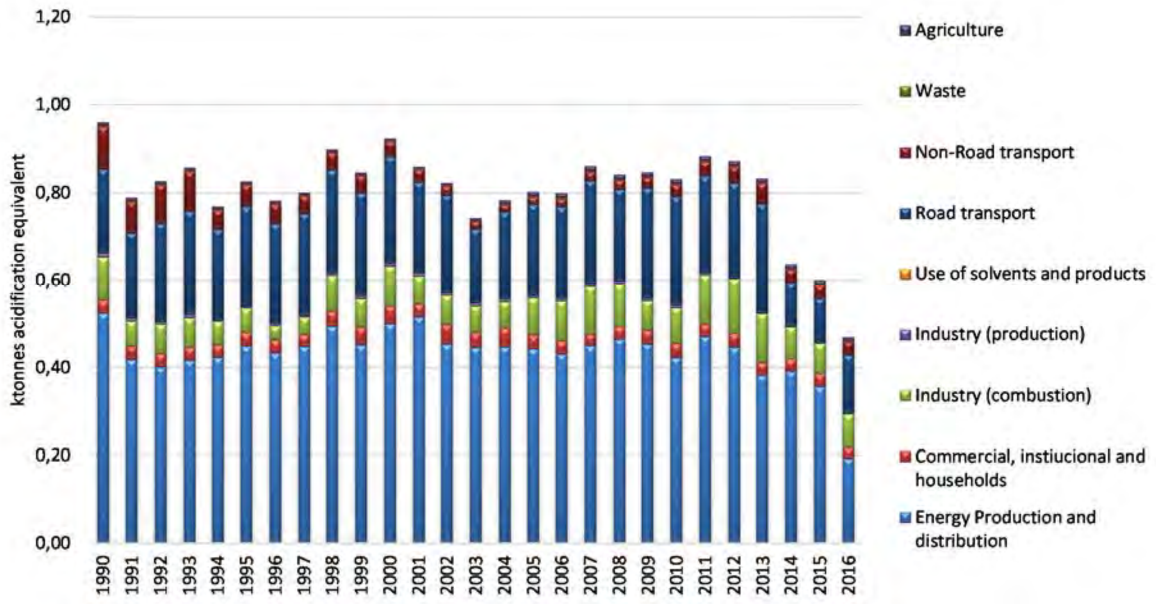
Which different sectors and processes contribute to acidifying substances emissions?

Diagram 2. Total SOx emissions by sectors on annual level



The sector is the key sector in sulfur oxides emission. In 2013 and 2014, approximately the same emissions of sulfur oxides were recorded which were lower than in 2011 and 2012 due to the lower capacity of operation of the thermal power plant REK Oslomej. In general, it may be concluded that in the entire reporting period. A key source is the sector of Energy production and distribution, on average, with share of 80-90% in the entire reporting period.

Diagram 3. Total NOx emissions by sectors on annual level



Data coverage: excel

Source of data: The data used refers to overall national emissions and emissions categorized by NFR delivered to "Eionet Central Data Repository" by EEA member and collaborating states to EEA and Parties to CLRTAP. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/

Methodology

- Methodology for the indicator calculation

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

Calculations are in line with the Guidelines of UNECE/EMEP Convention on Long-Range Transboundary Air Pollution (LRTAP Convention), as well as application of the SNAP – selective nomenclature of air pollution. With regard to this specific indicator, factors have been used in order to express the acidifying property potential. These factors are for NO_x 0,02174 and for SO_2 0,03125. The results are expressed in kilotonnes equivalent acidity.

Uncertainty

- **Methodological and data uncertainty**

Use of factors of the acidifying property potential leads to some uncertainty. Furthermore, national emission factors obtained by measurements in the Republic of Macedonia are used only in energy sector. For other sectors, standard emission factors from the EMEP/EEA Guideline are used for the inventory of air pollutants. It has been assumed that the factors are representative for Europe as a whole; different factors may be estimated at local level. Comprehensive discussion on uncertainty of these factors can be found in deLeeuw (2002). As far as activity installment is concerned, uncertainty arises from data taken from Statistical Yearbook and other sources. Definition of activity installment which is not required form, expert estimations containing uncertainty are made.

- **Reference of used methodology**

EMEP/EEA Guideline for inventory of air pollutant emissions 2013, Technical Report no. 09/2009, EEA.

EMEP/EEA Guideline for inventory of air pollutant emissions 2013, Technical Report no. 12/2013, EEA.

EMEP/EEA Guideline for inventory of air pollutant emissions 2013, Technical Report no. 21/2016, EEA.

Policy relevance of the indicator

List of relevant policy documents

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared has been adopted.

The National Environmental Action Plan (NEAP II) has been adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level concerning introduction of renewable energy sources, application of the code of good agricultural practice, technical control of vehicles at registration, application of the best available techniques in industrial facilities, etc. At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs), all 8 Protocols to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) were ratified in 2010. With regard to the last three Protocols, i.e. Protocol on heavy metals, Protocol on POPs and Gothenburg Protocol, National Action Plan for Ratification and Implementation was adopted at their request. Due to the requirement for modifications of national totals related to emissions in baseline year (1990) and national emission ceilings for 2010, the Gothenburg Protocol and Protocol on sulfur of 1995 entered into force for the Republic of Macedonia in 2014, upon the adoption of the values specified in Annex II to these Protocols.

In order to fulfill one of the basic requirements under the Protocols to CLRTAP, Inventory of Air Pollution is prepared on regular annual level by EMEP/EEAMethodology and the prepared inventory is reported to UNECE and CLRTAP and European Environmental Agency. With regard to fulfillment of the requirements of the Stockholm Convention covering the same pollutants specified in the Protocol on POPs, the National Implementation Plan for old and new organic pollutants was updated and Inventory of old and new POPs chemicals was prepared.

Legal basis

The Law on Ambient Air Quality was adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) as framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

With reference to air standards transposed in part of the mentioned rulebooks, all ISO and CEN standards and their amendments in the area of air emissions and air quality were adopted by means of endorsement method.

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

Targets

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

National documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that the transposition of Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC into the national laws and bylaws ranges between 90-100%, while activities towards their implementation are in progress.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on the CORINAIR Programme has been introduced; setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Also, in accordance with Directive 2001/81/EC, as well as Gothenburg Protocol, the ceilings of the amounts of emissions have been set at the level of the Republic of Macedonia for 2010 that shall not be exceeded at annual level. The Executive Body of the Convention on Long-Range Transboundary Air Pollution, upon submission of the values of national ceilings in order to enrol the Republic of Macedonia in Annex II of the Gothenburg Protocolrequested correction of the values considering the reported data on air emissions of the pollutants sulfur dioxide and ammonia at national level. Changes in the values of these pollutants were incorporated in the Rulebook amending the Rulebook on upper limits – emission ceilings of pollutants for the purpose of setting projections for certain period concerning reduction of the quantities of pollutant emissions at annual level published in July 2014. In 2016, national emissions ceilings for SO_2 and NO_x were not exceeded.

	Upper limit - ceiling	Total emissions-2016
SO_2	110 Gg	58.7 Gg
NO_x	39 Gg	21.6 Gg

With regard to targets – emission projections for NO_x for 2020, they amount 23.8 Gg, and this target has been achieved in 2016.

As far as achievement of targets – projections for SOx by application of model, this target (under the applied GAINS model) for 2020 is 15 kilotons. This projection would be achieved is the National Emission Reduction Plan (NERP) is implemented in accordance with the Decision of the Ministerial Council of the Energy Community (D/2013/05/MC-S-end) concerning restriction of emissions of certain air pollutants from large combustion plants (LCP) which is currently under review to be adopted by the Energy Community in September this year. The plan defines national borders - the ceilings for large combustion plants for 2018, 2023 and 2027 which was approved by the Energy

Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017. Starting from January 2019, Republic of Macedonia should report on the quantities of total emissions resulting from large combustion plants in order to determine the compliance with the defined ceilings in the NERP.

Achievement of the targets for reduction of acidifying pollutants emissions which at the same time cause degradation of environment, materials and negative effect on human health is dependent on the adoption and implementation of all planned documents under the National Programme for Approximation with the EU Acquis.

Reporting obligation

- Reporting obligations under multilateral agreements – UNECE/CLRTAP and towards EEA
- Annual report of processed data on environment

General metadata

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

MK - NI 002
EMISSIONS OF OZONE PRECURSORS

Definition

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

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

Units

- kt (NMVOC - equivalent)

Key policy issue

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

- Emissions of ozone precursors in 2016 compared to 1990, have been reduced for nitrogen oxides (NO_X) by 51%, they have decreased for non-methane volatile organic compounds (NMVOC) by 43%, for carbon monoxide (CO) by 44%, and an increase was recorded for methane (CH_4), compared to 2014 (for which it has the latest available data) by 67%.

- With regards to nitrogen oxides, the decline in emissions since 2012 is a result of the reduced consumption of coal and fuel oil at thermal power plants for electricity production. In the last several years, the reduction of emissions is also a consequence of the reduced operation of REK Oslomej (namely, this installation starting from 2014 works only for one month in one calendar year). During 2016, the emissions of this pollutant were reduced as a result of the reduced consumption of coal in installations for electricity production, and because of the application of a national emission factor instead of the emission factor that was applied in the last few years.

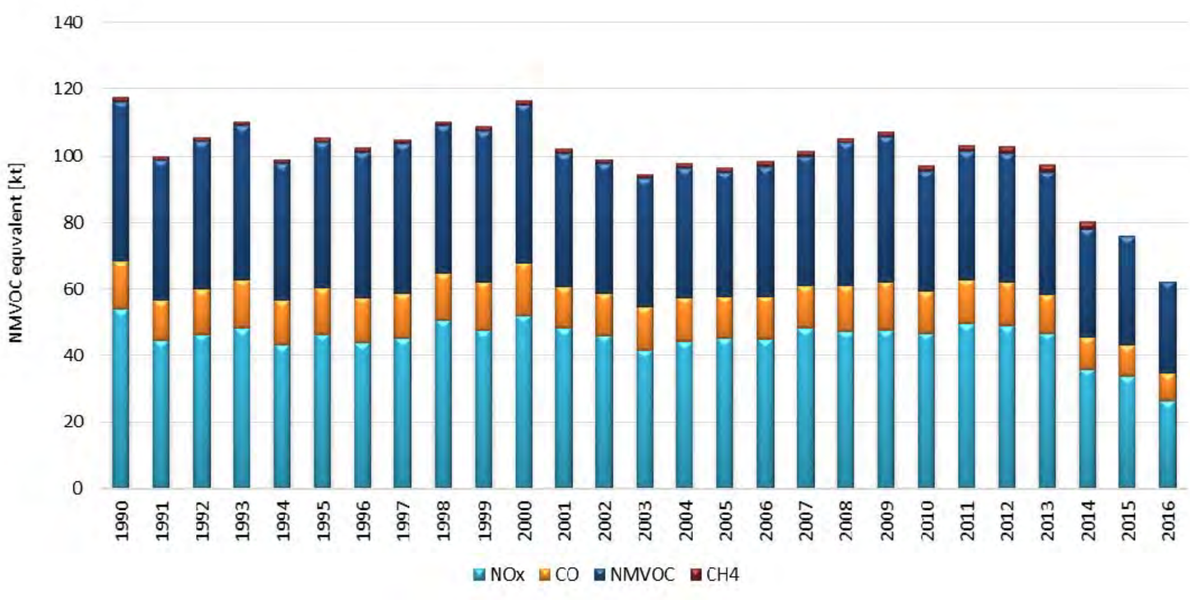
- With regards to volatile organic pollutants, in 2016 for comparison, the emissions of these pollutants are reduced to around 43%. The reasons for the decrease lie mainly in lower emissions from transport and the use of solvents. At the same time, the change in methodology from Level 1 to Level 2 for the last three years has led to a reduction in the emissions of this pollutant. From 2015 to 2016, emissions were reduced by 16%, due to the reduced use of solvents, and also due to slightly lower emissions from the household sector.

- In 2016, CO emissions are reduced by 15% compared to 2015 and amounted to 74 kt. The reduction of CO emissions in 2016 is also noticeable, compared to 2015, as well as a continuous decline in emissions starting from 2012, especially in the sector od household heating and administrative buildings, due to reduced consumption of wood at the expense of increasing consumption of natural gas and pellets.

- CH_4 was the only pollutant among ozone precursors where increase in emission was recorded in the followup years as a result of increased emissions from the waste sector resulting from increased population and slow implementation of the waste strategy.

The Diagram below shows annual trend of carbon monoxide, methane, non-methane organic compounds and nitrogen oxides emissions presented as ozone precursors.

Diagram 1. Total ozone precursors emissions



The Diagram indicates that decrease in overall ozone precursors can be noted as of 2011, with the trend being almost unvariable in the preceding period.

Assessment

Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 an Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

Data used in the calculation of ozone precursors was taken from the Inventory of air pollutant emissions by sectors or activities prepared in 2016 when recalculation of emissions for the whole period of 1990-2014 was made.

Inventory of methane as one of ozone precursors is made by IPPC methodology. In the frames of the Third National Communication on Climate Change, the GHG Inventory was made for the period 1990-2014 and data on methane emissions by sectors ws taken from there.

Completed inventory of ozone precursors indicates dropping trend during the analyzed period.

Changes in the quantities of NOx and CO emissions in transport sector resulted from the change in consumed quantities of diesel fuels and petrols by passenger cars. In this sector, vehicle fleet keeps renewing from year to year, though the number of used cars increases thus resulting in absence of significant emissions reduction from the traffic. At the same time, it should be emphasized that the methodology for calculation of emissions at level 2 has been applied in the last three years, which also leads to reduction of the emissions of all pollutants. It is necessary to use a higher level of calculation for the whole period, which would make a more realistic assessment of the trend of emissions from the traffic sector. As far as reduction in NOx emissions from the energy sector is concerned, the implementation of IPPC Directive and introduction of the best available techniques in heat production installations, as well as modernization of electricity production plants in 2013, reduction in emissions of this pollutant from energy sector was recorded upon 2013. Also, the reduced consumption of coal and heavy oil and the reduced production of electric energy with existing energy production capacities leads to a reduction in the emissions of pollutants emanating from this sector.The amount of CO emissions from non-combustion facilities like households, depends mainly from the use of wood for heating. These emissions have been decreasing in recent years due to the reduced consumption of wood and increased consumption of pellets and natural gas. In the future, it is expected that there would be further reduction of emissions from this sector due to the expansion of the national gasification network. It is expected that CO emissions would be reduced in future through the introduction of a nation-wide gasification system.

Directive 1999/13/EC regarding NMVOC emissions from solvents use in installations and certain activities has been partially transposed (only for limit values) in the national legislation, and reduction schemes for these pollutants have not been introduced. Full transposition of this Directive is planned by the end of this year. On the other side, transposition of Directives 1994/63/EC and 2009/126/EC concerning emissions from petrol filling and distribution to petrol stations is in final stage and implementation of the Law on Control of Volatile Organic Compound Emissions at petrol use has commenced. Namely, registration of installations for storage, installations for filling and emptying of mobile containers and petrol stations in accordance with the adopted rulebook is underway.

Yet, reduction in NMVOC emissions from the implementation of the adopted and planned legislation is expected to be achieved in the coming years.

With regard to greenhouse gas methane, overall emissions have increased due to emission increase in waste sector owing to the trend of growth in the quantity of solid waste. Emission of methane from the agriculture sector has showed a declining trend. Reduction in the emission of this pollutant is expected upon the implementation of the waste legislation.

Specific policy issue

Which different sectors and processes contribute to ozone precursors emissions?

Diagram 2. Total NOx emissions by sectors/year

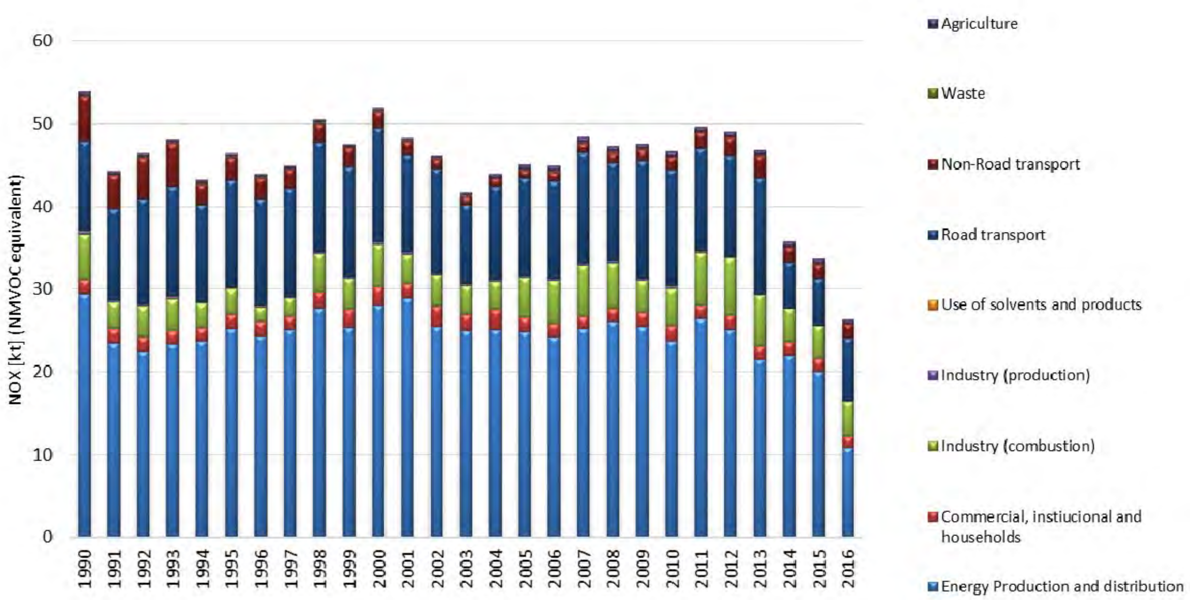


Diagram 3. Total CO emissions by sectors/year

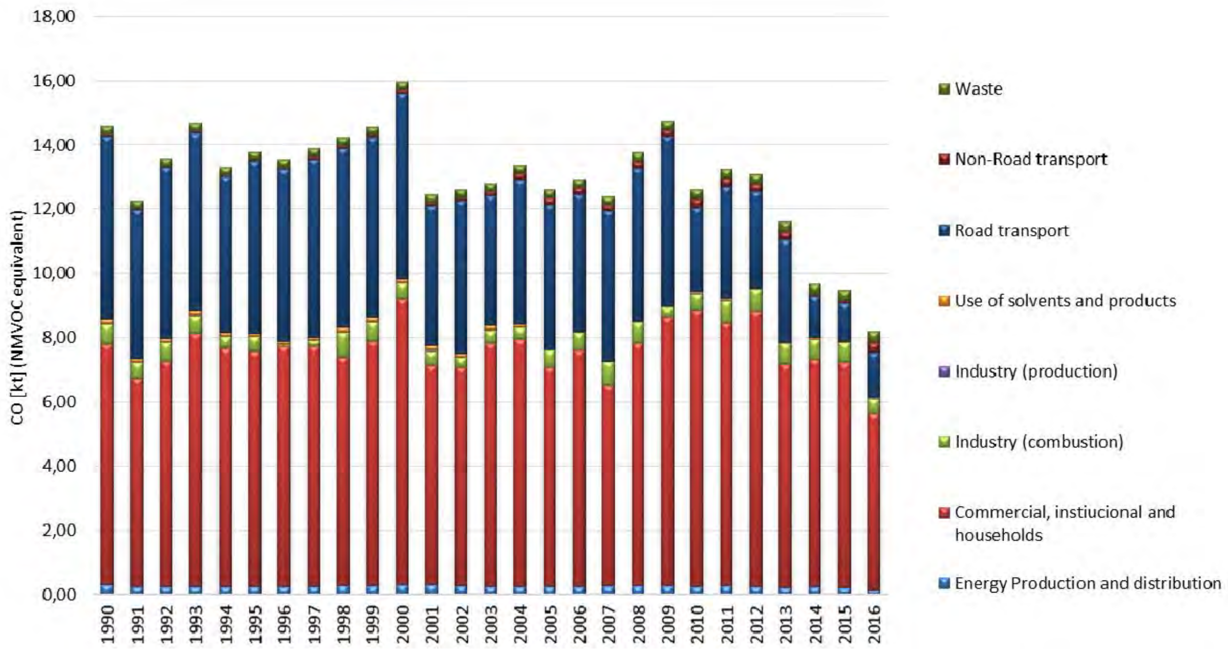


Diagram 4. Total NMVOC emissions by sectors/year

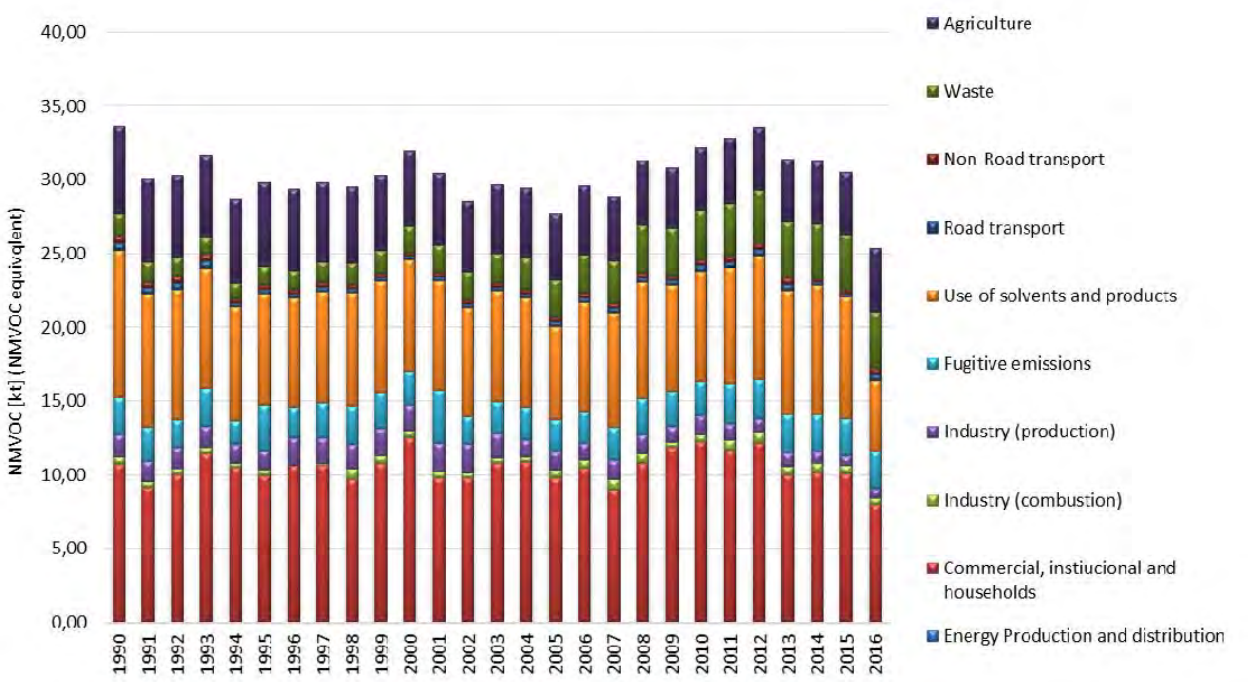
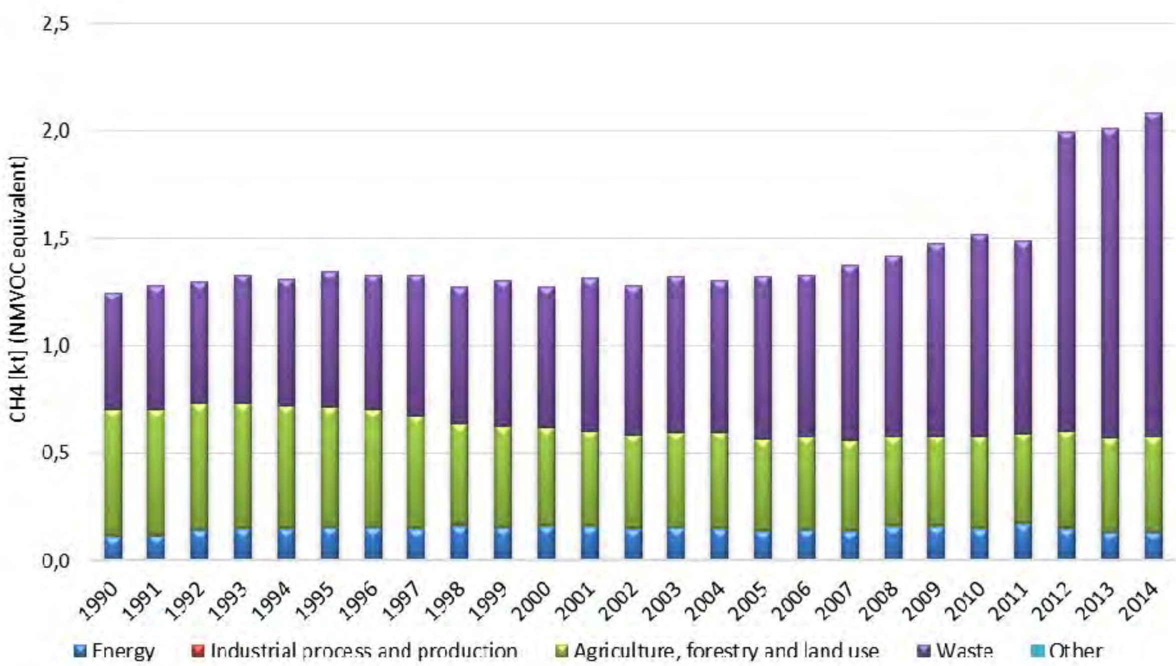


Diagram 5. Total CH4 emissions by sectors/year



Data coverage: **excel**

Source of data: The data on NMVOC, CO and NOx as overall national emissions and emissions

categorized by NFR was taken from the following web site:
http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/ , posted in February 2018. Data on CH_4 emissions was taken from the Inventory of GHG accessible at the following web site: http://cdr.eionet.europa.eu/mk/un/unfccc/envwo3zfg/.

Nitrogen oxides (NOx)
The main sources of emissions of this polluting substance in 2016 were the following sectors of sources: Road transport with a share of 31% (22% in 1990) and Energy production and distribution with a share of 41% (55% in 1990) in the overall national NOx emissions.

Carbon monoxide (CO)
Almost all emissions of CO originate from Commercial, institutional and households sector with a share of 67%, road transport with share of 17%, and less from the sector Industry (Combustion) with a share of 9%. The reason for the reduction in the emissions in the period 1990 to 2016 is related to the reduced emissions from the Road transport sector. From 2015 to 2016, emissions have declined by 14%, mainly due to lower consumption of fuel wood.

Nonmethane volatile organic compounds (NMVOCs)
The main sources of NMVOCs emissions in 2016 were the sectors Commercial, institutional and households, Industry (production) and Road transport. Reduction of emissions of these pollutants (NMVOCs) is recorded in all sectors, with exception of the waste sector, from which the emissions are increasing.

Methane (CH_4)
With regard to methane emissions, categorization was made in several sectors: waste, industry, agriculture, energy and other. Throughout the reporting period, emissions from the sector waste were the highest and increasing for the last several years. The sector Agriculture, forestry and land use is the second key sector with significant share in methane emission, followed by energy sector.

Methodology

- ## Methodology for the indicator calculation

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

Calculations are in line with EMEP/EEA Guidelines and methodology for inventory and application of the SNAP – selective nomenclature of air pollution.

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

- ## Reference of used methodology

Methodology applied in the calculation and presentation of this indicator has been taken from the EMEP/EEA Guideline on air pollutant emission inventory 2013, Technical Report no. 12/2013, EEA. and de Leeuw, F. (2002). Set of emission indicators of long-range transboundary air pollution, Environmental science and policy.

Policy relevance of the indicator

The European Partnership Action Plan has been adopted, as well as the National plan for approximation of the national legislation with the European regulations stating the bylaws that need to be prepared.

NEAP II has been prepared, specifying the measures that need to be taken to improve the overall status of air and in that sense to reduce emissions leading to acidification. The National Ambient Air Protection Plan 2012-2017 has been adopted, and it contains measures for air protection on national level and the National program for gradual reduction of emissions until 2020 in order to define and implement measures on national level concerning introduction of renewable sources, application of the code of good agricultural practice, technical control of vehicles at registration, application of the best available techniques in industrial facilities, etc., as well as technical control and on road checks. At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, an air quality improvement program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project “Further strengthening of the capacities for effective implementation of the acquis in the field of air quality”, which were adopted by the councils of the municipalities. Additionally the municipality of Veles also has prepared and adopted an Air Quality Plan in November 2017.

A National Plan for the reduction of emissions (NERP) of sulfur dioxide (SO_2), nitrogen oxides (NOx) and dust from the existing large combustion plants in Republic of Macedonia has been prepared. The plan was approved by the Energy Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017. Starting from January 2019, Republic of Macedonia should report on the quantities of total emissions resulting from large combustion installations in order to determine the compliance with the defined ceilings in NERP.

All 8 Protocols to the Convention on Long-Range Transboundary Air Pollution (CLRTAP) were ratified in 2010. With regard to the last three Protocols, i.e. Protocol on heavy metals, Protocol on POPs and Gothenburg Protocol, National Action Plan for Ratification and Implementation was adopted at their request. Due to the requirement for modifications in contributions related to emissions in baseline year (1990) and national emission ceilings for 2010, the Gothenburg Protocol and Protocol on sulfur of 1995 entered into force for the Republic of Macedonia in 2014, upon the adoption of the values specified in Annex II to these Protocols.

In order to fulfill one of the basic requirements under the Protocols to CLRTAP, Inventory of Air Pollution is prepared on regular level by EMEP/EEA Methodology and the prepared inventory is reported to UNECE and CLRTAP and European Environmental Agency.

With regard to fulfillment of the requirements of the Stockholm Convention covering the same pollutants specified in the Protocol on POPs, the National Implementation Plan for old and new organic pollutants was updated and Inventory of old and new POPs chemicals was prepared.

Legal basis

The Law on Ambient Air Quality was adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) as framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions for NMVOC, CO and NOx, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

With reference to air standards transposed in part of the mentioned rulebooks, all ISO and CEN standards and their amendments in the area of air emissions and air quality were adopted by means of endorsement method.

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

In 2010, all 8 Protocols to the Convention on Long-Range Transboundary Air Pollution – CLRTAP were ratified.

In relation to the obligations for calculation of emissions of non-methane volatile organic compounds (NMVOCs), the following protocols or international ratified agreements are of relevance:

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning concerning control of emissions of non-methane volatile organic compounds or their transboundary transfer. The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 24/2010);

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning reduction of acidification, eutrophication and ground ozone. The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 135/2010).

The latter Protocol is also relevant for nitrogen oxides, and the older Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning concerning control of nitrogen oxides releases or their transboudary transfers (Official Gazette of RM no. 24/2010).

Targets

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

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that the new regulations in the area of air emissions have been adopted transposing the following Directives into the national legislation: 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC and the level of transposition is 90-100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory taking was introduced based on the EMEP/EEA Guideline on air pollutant emission inventory aimed at regular inventory of pollutants in tonnes per year following n-2 principle where n is the current year.

Also in accordance with Directive 2001/81/EC and Gothenburg Protocol, the upper limits-ceilings of the amounts of emissions have been set at the level of the Republic of Macedonia for 2010 that shall not be exceeded at 2010 annual level. The Executive Body of the Convention on Long-Range Transboundary Air Pollution, upon submission of the values of national ceilings in order to enroll the Republic of Macedonia in Annex II of the Gothenburg Protocol requested correction of the values considering the reported data on air emissions of the pollutants sulfur dioxide and ammonia at national level. Changes in the values of these pollutants were incorporated in the Rulebook amending the Rulebook on upper limits – emission ceilings of pollutants for the purpose of setting projections for certain period concerning reduction of the quantities of pollutant emissions at annual level published in July 2014. In 2016, national upper limits – ceilings for NO_x and NMVOCs were not exceeded.

	Upper limit - ceiling	Total emissions-2016
NMVOC	30 Gg	27,5
NO_x	39 Gg	21,6

With regard to targets – emission projections for NO_x for the year 2020, under the scenario with measures, are estimated to be 23,8 Gg, and this emission level has already been achieved in 2016. With regard to targets – emission projections for NMVOC for 2020 set in the Programme for gradual reduction of emissions of certain polluting substances at the level of the Republic of Macedonia, with reduction projections from 2010 to 2020, it should be pointed out that those have not been taken into account because of recalculations of the emissions made during the last years for this polluting substance. Therefore, revision of the projections for 2020 has been envisaged and those are not included in this report.

Also, the targets set under the older protocols (emissions in 1987 for NOx and emissions of NMVOCs for 1988) have not been exceeded in 2016, the year of reporting (according the rule n-2, where n is the current year).

These documents set the basis for achievement of the targets for reduction of emissions of ozone precursors thus resulting in reduced degradation of environment and negative effect on human health.

Reporting obligation

- Reporting obligations under multilateral agreements – UNECE transboundary air pollution transfer, as well as to EEA
- Annual report of processed data on air emissions

General meta-data

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

MK - NI 004

EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS - NO_2

Definition

The indicator shows the portion of urban population potentially exposed at ambient air concentrations of pollutants in excess of the limit value set for human health protection.

Urban population taken into account is actually the total number of inhabitants living in cities with at least one monitoring station. These cities include the capital and other major cities of the Republic of Macedonia. The number of inhabitants is based on the last census carried out by the State Statistical Office in 2002.

Exceedance of air quality limit values occurs when the concentration of air pollutants exceeds the limit values for SO_2, PM_{10}, NO_2 and the target values for O_3 as specified in the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013), wherein the requirements of the Directive on Ambient Air Quality and Cleaner Air in Europe 2008/50 EC and Heavy Metals Directive 2004/107/EC have been transposed. Where there are multiple limit values (see section on Policy Targets), the indicator uses the most stringent case:

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

Units

The percentage of urban population potentially exposed at ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) above limit values set for human health protection. Ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) are expressed in microgram/m^3(µg/m^3).

Key policy issue

What progress has been achieved in reducing the concentrations of pollutants in urban areas in order to achieve the limit values, NO_2 set in the Decree?

Key message

In the period from 2004 to 2017, the portion of the population exposed at concentrations of nitrogen dioxide above the limit values set for human health protection ranged between 0 and 69%. The highest percentage of population exposure of 69% was recorded in 2011.

Diagram 1: Percentage of urban population exposed at air pollution in areas where concentrations of pollutants are in excess of limit/target values

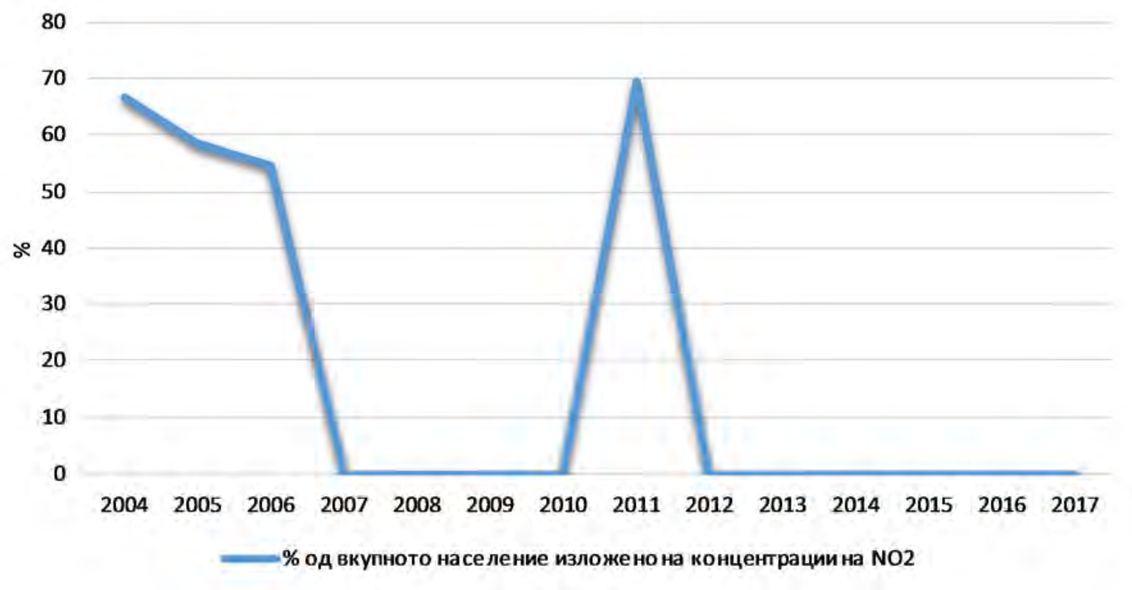


Diagram 2: Percentage of population exposed at NO_2 annual concentrations in urban areas

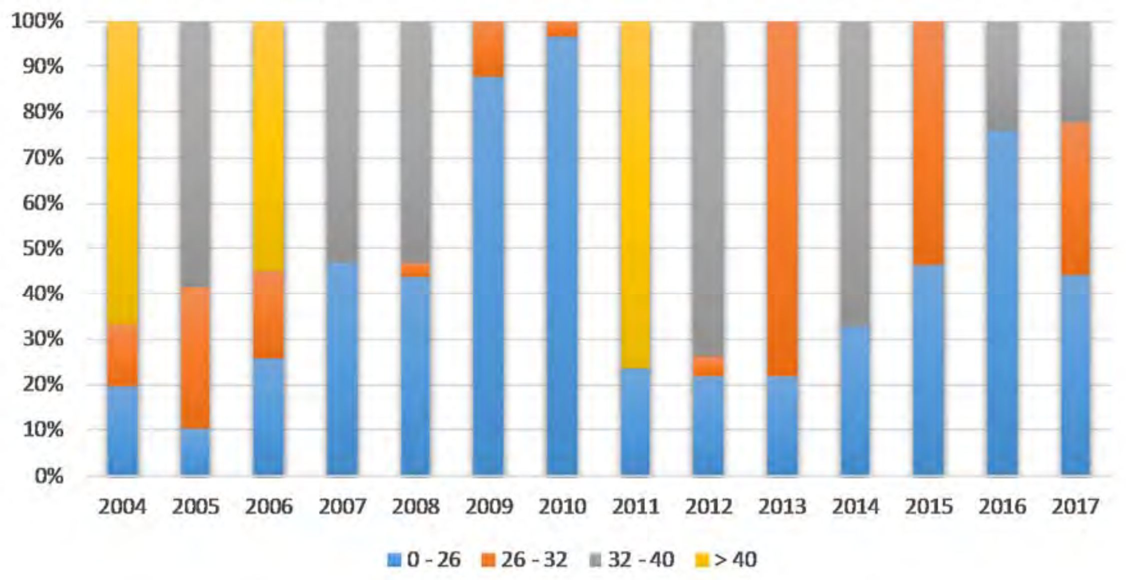
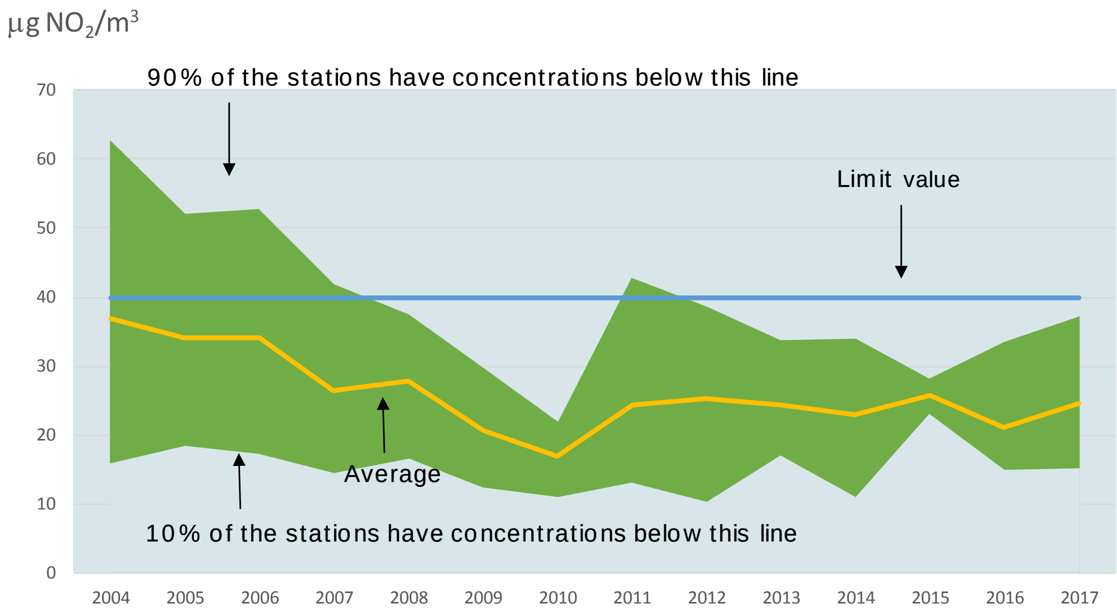


Diagram 3: Average annual concentration of NO_2



Data coverage: **excel**

Source: Ministry of Environment and Physical Planning

Assessment

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

In the period 2004 to 2017, the portion of population exposed at nitrogen dioxide concentrations above the limit value for human health protection (40 µg/m^{3}mean annual limit value) ranged from 0 to 69%. The highest percentage of 69% population exposure was recorded in 2011.

In 2004, 2006 and 2011, significant portion of the population (55-67%) of the population was exposed at concentrations above 40 µg/m^3.

Methodology

- Methodology for the indicator calculation

The mean annual concentration in a city is calculatedas an average of the mean annual value measured in all monitoring stations located in urban areas. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and urban background stations.

Uncertainty

- Methodological uncertainty and data uncertainty

In general, data is not representative for all urban environments in the Republic of Macedonia. Compared to the methodology of the European Environmental Agency, where the calculation of the indicator is based only on data produced by the urban background stations, in our calculations we used data from all measuring stations located in urban environments. Also, due to the minimum number of monitoring stations, the calculation of the indicator also took into account the stations where data coverage is below 75% per calendar year. We can also point out as uncertainty in the indicator calculation the fact that the number of inhabitants in cities is based on the census of the population conducted by the State Statistical Office in 2002, instead of estimated number of population for each year.

Policy relevance of the indicator

List of relevant policy documents

The National Plan for Air Protection presents the state of air quality, defines the measures for ambient air quality protection and improvement in the Republic of Macedonia and all relevant institutions responsible for their implementation within 5 year period, namely from 2013 to 2018 (Official Gazette of the Republic of Macedonia no.170/2012).

Legal grounds

The Law on Ambient Air Quality was adopted in August 2004 and later amended on several occasions in line with the requirements of the relevant EU legislation (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007, 83/2009, 35/2010, 47/2011, 59/2012, 163/13, 10/15 and 146/15) and it is framework law in the area of air. The main goals of this Law are: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollution resulting in climate change, as well as provision of the relevant information on the quality of ambient air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant *Acquis Communitaire.* So far, 12 bylaws have been adopted. Calculations for this indicator are based on the provisions of the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013 and 183/2017).

Targets

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

Limit values for concentrations of nitrogen dioxide in ambient air

In accordance with the said Decree, two limit values are specified for nitrogen dioxide for the purpose of human health protection.

- Hourly mean concentration of nitrogen dioxide shall not exceed the limit value of 200 $\mu g/m^3$ by more than 18 times during one calendar year.
- The mean annual concentration shall not exceed 40 $\mu g/m^3$.

Reporting obligation

European Environmental Agency

- Air quality data exchange in accordance with implementing Decision containing the rules of Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council concerning reciprocal exchange of information I reporting on ambient air quality (Decision 2011/850/EC).

General metadata

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

MK - NI 004

EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS - O_3

Definition

The indicator shows the portion of urban population potentially exposed at ambient air concentrations of pollutants in excess of the limit value set for human health protection.

Urban population taken into account is actually the total number of inhabitants living in cities with at least one monitoring station. These cities include the capital and other major cities of the Republic of Macedonia. The number of inhabitants is based on the last census carried out by the State Statistical Office in 2002.

Exceedance of air quality limit values occurs when the concentration of air pollutants exceeds the limit values for SO_2, PM_{10}, NO_2 and the target values for O_3 as specified in the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013), wherein the requirements of the Directive on Ambient Air Quality and Cleaner Air in Europe 2008/50 EC and Heavy Metals Directive 2004/107/EC have been transposed. Where there are multiple limit values (see section on Policy Targets), the indicator uses the most stringent case:

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

Units

The percentage of urban population potentially exposed at ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) above limit values set for human health protection. Ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) are expressed in microgram/m^3(µg/m^3).

Key policy issue

What progress has been achieved in reducing the concentrations of pollutants in urban areas in order to achieve the target values for O_3 set in the Decree?

Key message

In the period from 2004 to 2017, the portion of the population exposed at concentrations of ozone higher than the target value set for human health protection ranged from 12 to 43%. The highest percentage of population exposure of 43% was recorded in 2007.

Diagram 1: Percentage of urban population exposed at air pollution in areas where concentrations of pollutants are in excess of limit/target values

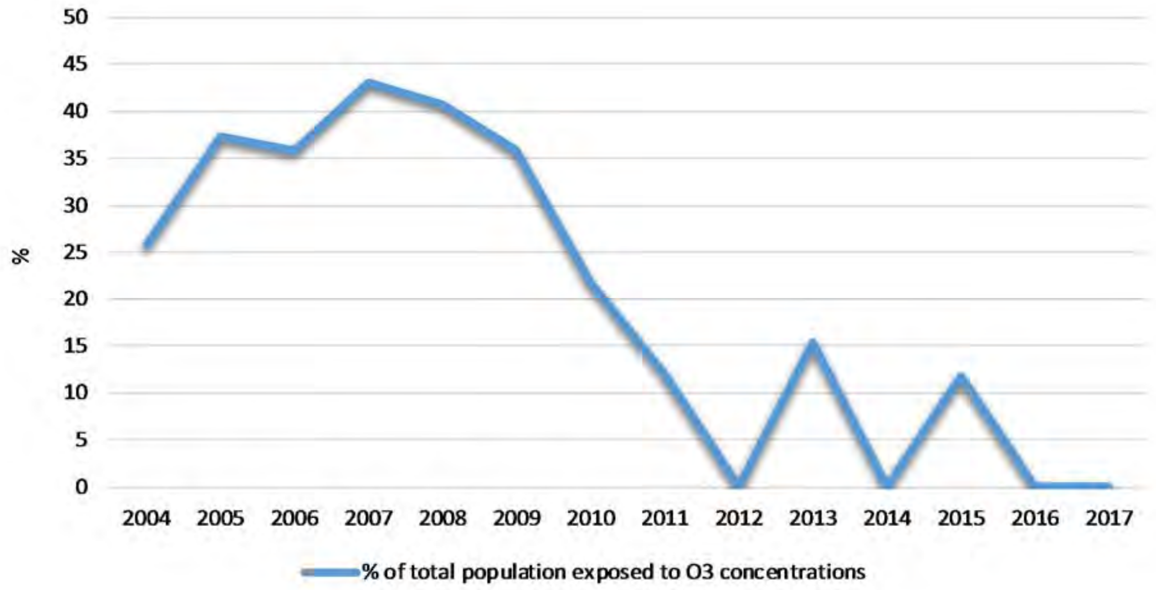


Diagram 2: Percentage of urban population exposed at concentrations ofO3above the long-term target value for human health protection, expressed as number of days in the course of a calendar year

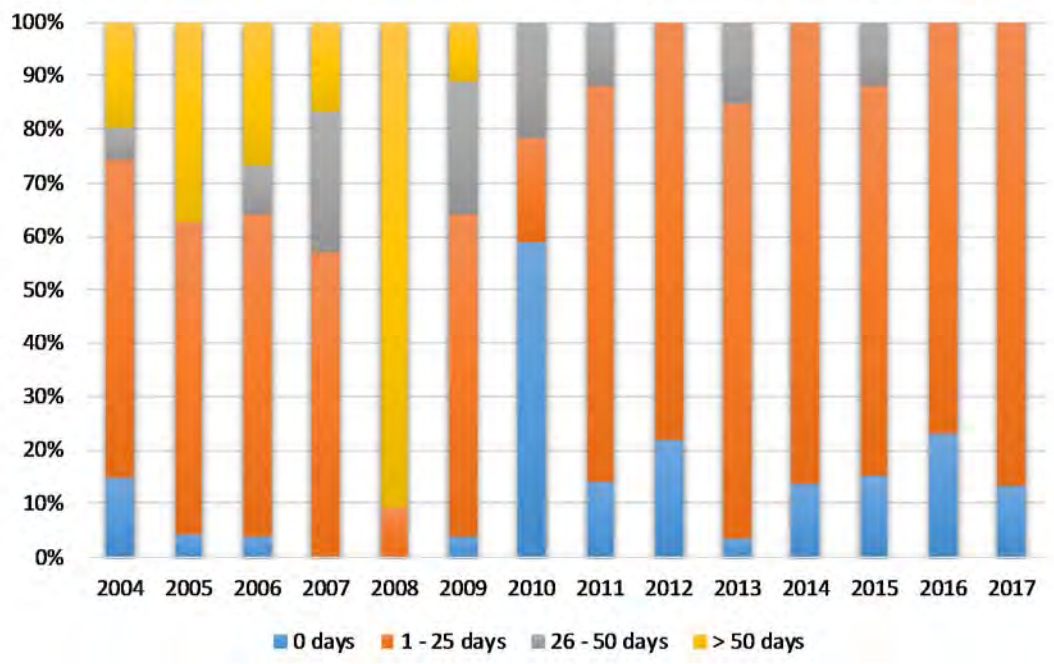
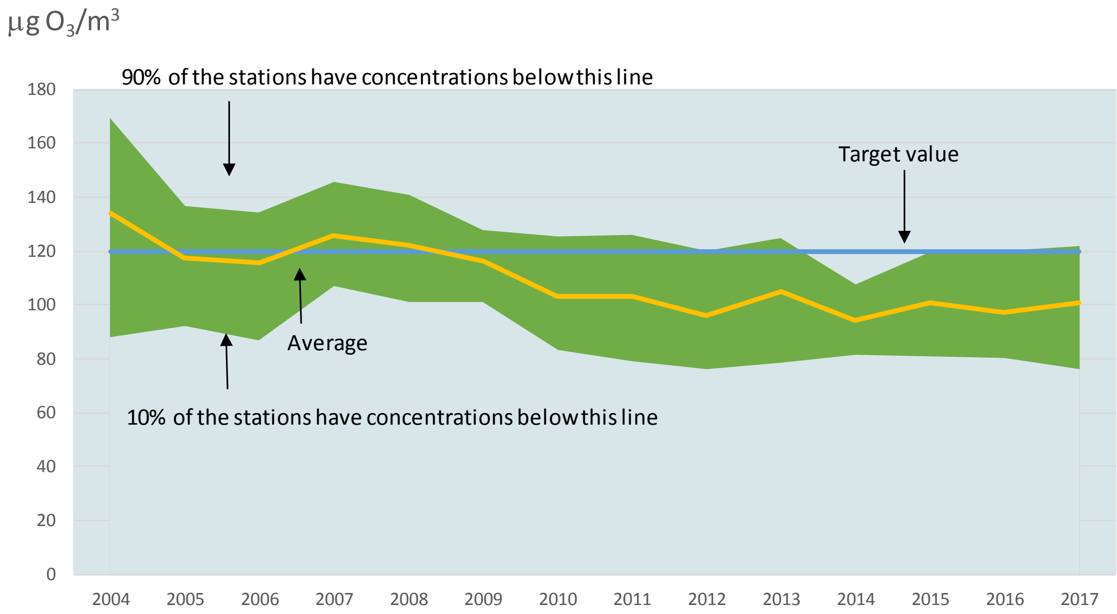


Diagram 3: 26th highest maximum 8-hourly mean concentration of O_3



Data coverage: excel

Source: Ministry of Environment and Physical Planning

Assessment

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

Automatic monitoring stations measure the ground-level ozone formed as a result of photochemical reactions involving nitrogen oxides, volatile organic compounds (most frequently hydrocarbons), etc. However, its content is also dependent on solar radiation and annual seasons. Thus, higher ozone concentrations are observed in warmer days, especially during summer.

In In the period 2004 to 2015, the portion of population exposed at ozone concentrations above the target value for human health protection ranged from 0 to 43%. The highest percentage of 43% population exposure was recorded in 2007, followed by falling trend to reach 0% in 2012, while the percentage of exposure in 2013 was 15%. Then, in 2014, there was decrease in the portion of population exposure at 0% again and the portion of the population increased in 2015 by 12%.

In the period 2004 to 2009, population was exposed at concentrations above the target value of 120 µg/m^{3}in more than 25 to 50 days in a calendar year. Percentage of exposure at concentrations above the target value of 120 µg/m^{3}in more than 25 to 50 days in a calendar year was recorded during the entire reporting period, except in 2005, 2012 and 2014. In 2016 and 2017 population exposed to ozone concentrations is again 0%.

Methodology

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

Uncertainty

- Methodological uncertainty and data uncertainty

In general, data is not representative for all urban environments in the Republic of Macedonia. Compared to the methodology of the European Environmental Agency, where the calculation of the indicator is based only on data produced by the urban background stations, in our calculations we used data from all measuring stations located in urban environments. Also, due to the minimum number of monitoring stations, the calculation of the indicator also took into account the stations where data coverage is below 75% per calendar year. We can also point out as uncertainty in the indicator calculation the fact that the number of inhabitants in cities is based on the census of the population conducted by the State Statistical Office in 2002, instead of estimated number of population for each year.

Policy relevance of the indicator

List of relevant policy documents

The National Plan for Air Protection presents the state of air quality, defines the measures for ambient air quality protection and improvement in the Republic of Macedonia and all relevant institutions responsible for their implementation within 5 year period, namely from 2013 to 2018 (Official Gazette of the Republic of Macedonia no.170/2012).

Legal grounds

The Law on Ambient Air Quality was adopted in August 2004 and later amended on several occasions in line with the requirements of the relevant EU legislation (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007, 83/2009, 35/2010, 47/2011, 59/2012, 163/13, 10/15 and 146/15) and it is framework law in the area of air. The main goals of this Law are: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollution resulting in climate change, as well as provision of the relevant information on the quality of ambient air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant *Acquis Communitaire.* So far, 16 bylaws have been adopted. Calculations for this indicator are based on the provisions of the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013 and 183/2017).

Targets

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

Target values for ozone concentrations in ambient air

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

- The target value for ozone, for the purpose of human health protection, is specified so that 8-hourly mean value is calculated from the hourly concentrations in each day. The maximum daily 8-hourly mean value of ozone shall not exceed the value of 120 μg/m^3 in more than 25 days in the course of the year (calculated as an average value for three years). This target value should be achieved by 2010.

- The Decree also defines long-term target for the purpose of human health protection, set at 120 µg/m^3, as maximum daily 8-hourly mean value during a calendar year.

Reporting obligation

European Environmental Agency

- Air quality data exchange in accordance with implementing Decision containing the rules of Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council concerning reciprocal exchange of information I reporting on ambient air quality (Decision 2011/850/EC).

General metadata

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

MK - NI 004

EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS - PM_{10}

Definition

The indicator shows the portion of urban population potentially exposed at ambient air concentrations of pollutants in excess of the limit value set for human health protection.

Urban population taken into account is actually the total number of inhabitants living in cities with at least one monitoring station. These cities include the capital and other major cities of the Republic of Macedonia. The number of inhabitants is based on the last census carried out by the State Statistical Office in 2002.

Exceedance of air quality limit values occurs when the concentration of air pollutants exceeds the limit values for SO_2, PM_{10}, NO_2 and the target values for O_3 as specified in the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013), wherein the requirements of the Directive on Ambient Air Quality and Cleaner Air in Europe 2008/50 EC and Heavy Metals Directive 2004/107/EC have been transposed. Where there are multiple limit values (see section on Policy Targets), the indicator uses the most stringent case:

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

Units

The percentage of urban population potentially exposed at ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) above limit values set for human health protection. Ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) are expressed in microgram/m^3($\mu g/m^3$).

Key policy issue

What progress has been achieved in reducing the concentrations of pollutants in urban areas in order to achieve the limit values for PM_{10} set in the Decree?

Key message

In the period from 2004 to 2017, 100% of the population has been exposed at concentrations of suspended particulate matter in excess of the limit values specified in the Decree. Significantly higher concentrations of PM_{10} are measured during winter period.

Diagram 1: Percentage of urban population exposed at air pollution in areas where concentrations of pollutants are in excess of limit/target values

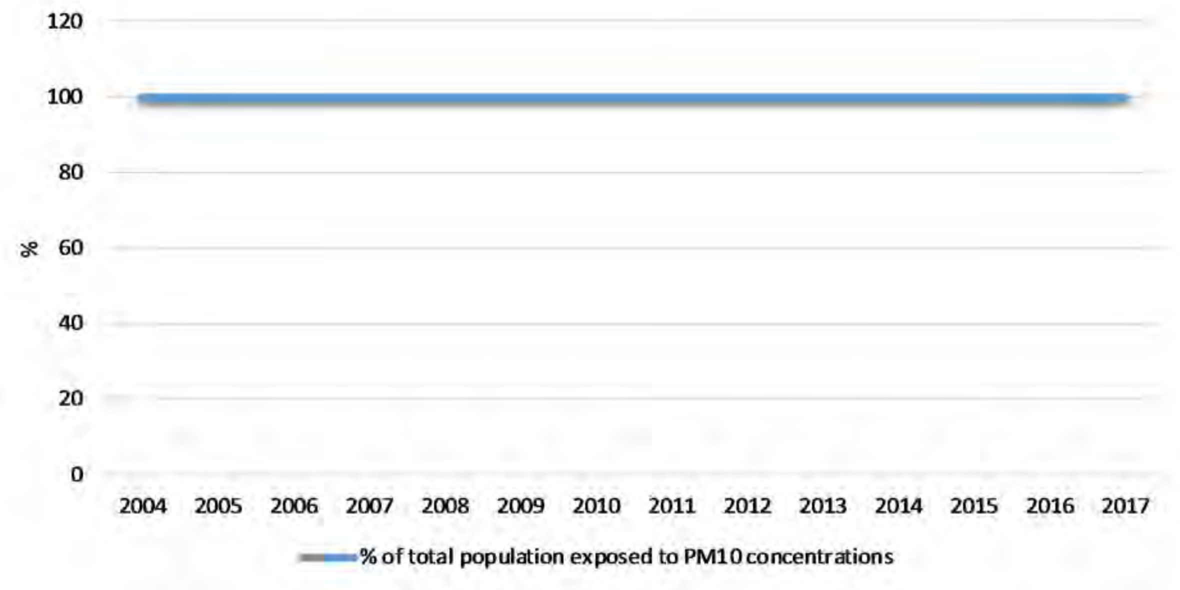


Diagram 2: Percentage of urban population exposed at concentrations of PM10 above the daily mean limit value, expressed as number of days in the course of a calendar year

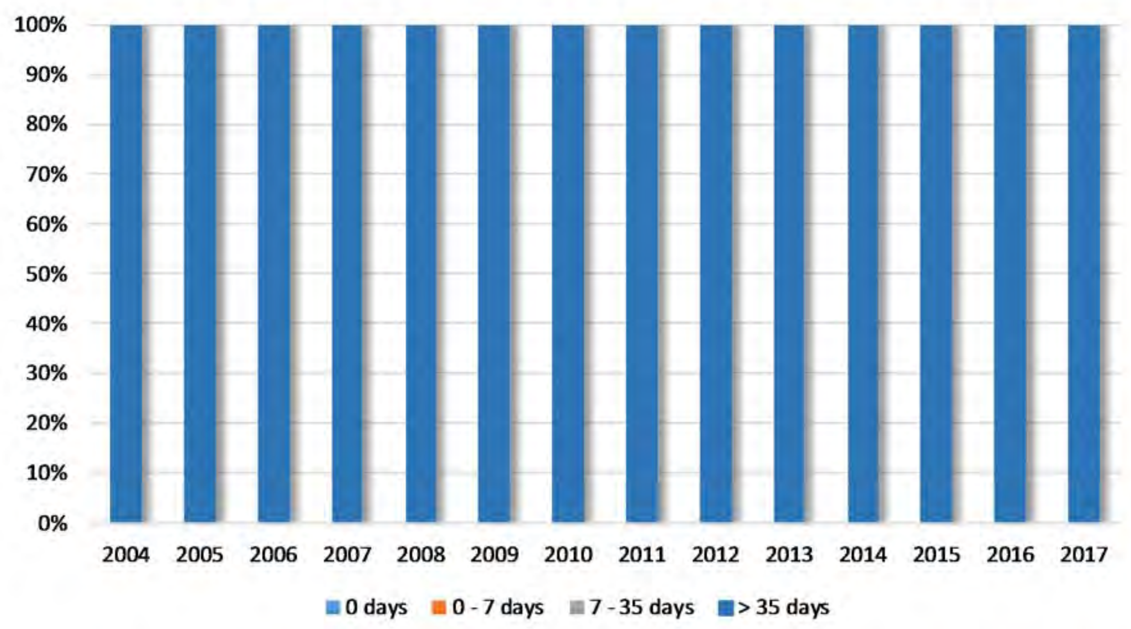
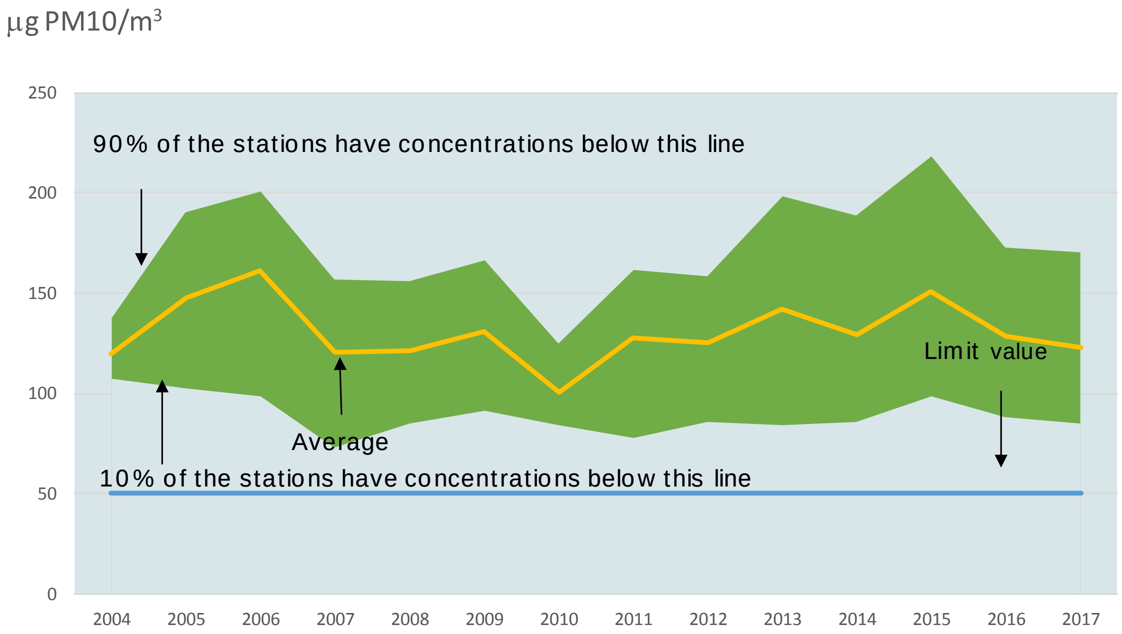


Diagram 3: 36th highest mean daily concentration of PM10



Data coverage: **excel**

Source: Ministry of Environment and Physical Planning

Assessment

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

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

The processed data for the period 2004 to 2017 show that during the entire period, 100% of the population was exposed at concentrations of suspended particulate matters are in excess of the limit value (mean daily limit value of 50 µg/m^3 that shall not be exceeded in more than 35 days in the course of a calendar year). 100% of the population was exposed at concentrations above the limit value in more than 35 days in a calendar year.

Methodology

- ### Methodology for the indicator calculation

For each urban measuring station, the number of days with daily mean concentration above the limit value (daily mean limit value is 50 µg/m^3) is calculated from the available hourly data. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and urban background stations. The number of days with exceedance in a city is obtained by averaging the mean values of the results from all stations located in that city.

Uncertainty

- Methodological uncertainty and data uncertainty

In general, data is not representative for all urban environments in the Republic of Macedonia. Compared to the methodology of the European Environmental Agency, where the calculation of the indicator is based only on data produced by the urban background stations, in our calculations we used data from all measuring stations located in urban environments. Also, due to the minimum number of monitoring stations, the calculation of the indicator also took into account the stations where data coverage is below 75% per calendar year. We can also point out as uncertainty in the indicator calculation the fact that the number of inhabitants in cities is based on the census of the population conducted by the State Statistical Office in 2002, instead of estimated number of population for each year.

Policy relevance of the indicator

List of relevant policy documents

The National Plan for Air Protection presents the state of air quality, defines the measures for ambient air quality protection and improvement in the Republic of Macedonia and all relevant institutions responsible for their implementation within 5 year period, namely from 2013 to 2018 (Official Gazette of the Republic of Macedonia no.170/2012).

Legal grounds

The Law on Ambient Air Quality was adopted in August 2004 and later amended on several occasions in line with the requirements of the relevant EU legislation (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007, 83/2009, 35/2010, 47/2011, 59/2012, 163/13, 10/15 and 146/15) and it is framework law in the area of air. The main goals of this Law are: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollution resulting in climate change, as well as provision of the relevant information on the quality of ambient air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant *Acquis Communitaire.* So far, 12 bylaws have been adopted. Calculations for this indicator are based on the provisions of the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013 and 183/2017).

Targets

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

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

The said Decree specifies two limit values for suspended particulate matter of size up to 10 micrometers, for the purpose of human health protection.

- 24-hourly limit value is 50 μg/m^3,and it shall not be exceeded by more than 35 times during one calendar year
- The mean annual concentration shall not exceed 40 μg/m^3.

Reporting obligation

European Environmental Agency

- Air quality data exchange in accordance with implementing Decision containing the rules of Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council concerning reciprocal exchange of information I reporting on ambient air quality (Decision 2011/850/EC).

General metadata

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

MK - NI 004

EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS - SO_2

Definition

The indicator shows the portion of urban population potentially exposed at ambient air concentrations of pollutants in excess of the limit value set for human health protection.

Urban population taken into account is actually the total number of inhabitants living in cities with at least one monitoring station. These cities include the capital and other major cities of the Republic of Macedonia. The number of inhabitants is based on the last census carried out by the State Statistical Office in 2002.

Exceedance of air quality limit values occurs when the concentration of air pollutants exceeds the limit values for SO_2, PM_{10}, NO_2 and the target values for O_3 as specified in the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013), wherein the requirements of the Directive on Ambient Air Quality and Cleaner Air in Europe 2008/50 EC and Heavy Metals Directive 2004/107/EC have been transposed. Where there are multiple limit values (see section on Policy Targets), the indicator uses the most stringent case:

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

Units

The percentage of urban population potentially exposed at ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) above limit values set for human health protection. Ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) are expressed in microgram/m^3(µg/m^3).

Key policy issue

What progress has been achieved in reducing the concentrations of pollutants in urban areas in order to achieve the limit values for SO_2 in the Decree?

Key message

No excess of mean daily concentrations of sulphur dioxide was recorded in the period from 2004 to 2017, i.e. the population was not exposed at sulphur dioxide concentrations above limit value, except in 2006 when out of the allowed 3 days, exceedance of the limit value was recorded in the course of 8 days in Skopje, which was not seen as significant problem.

Diagram 1: Percentage of urban population exposed at air pollution in areas where concentrations of pollutants are in excess of limit/target values

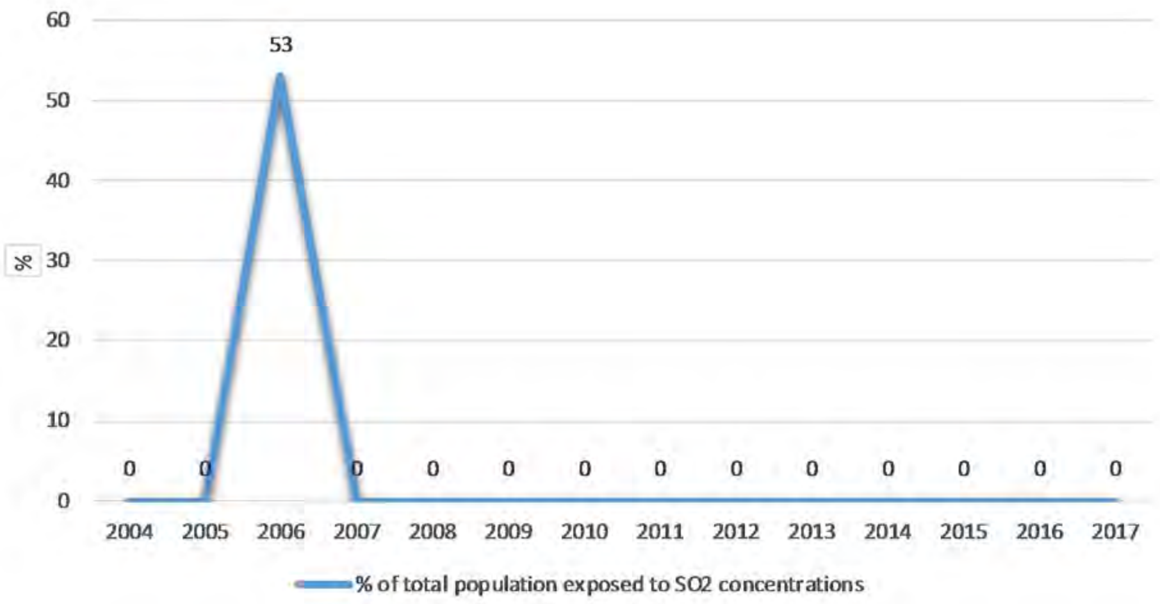


Diagram 2: Percentage of urban population exposed at concentrations of SO2 above the daily mean limit value expressed as number of days in the course of a calendar year

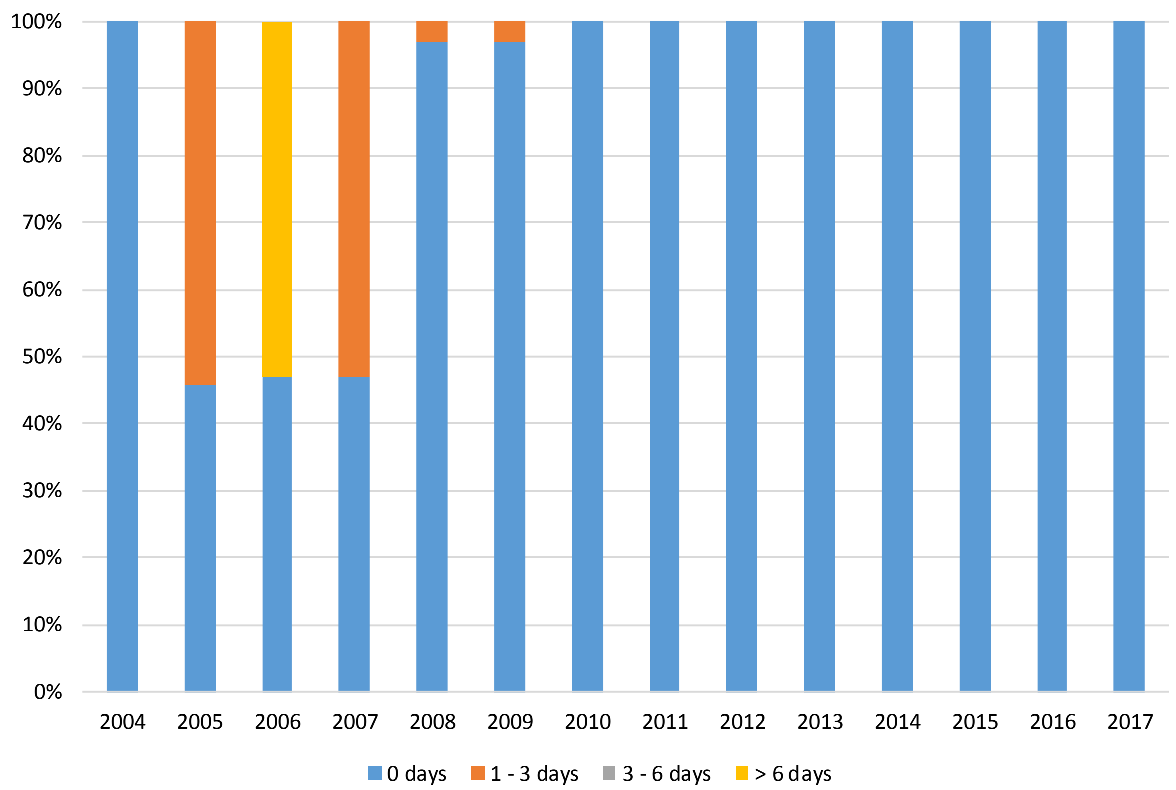
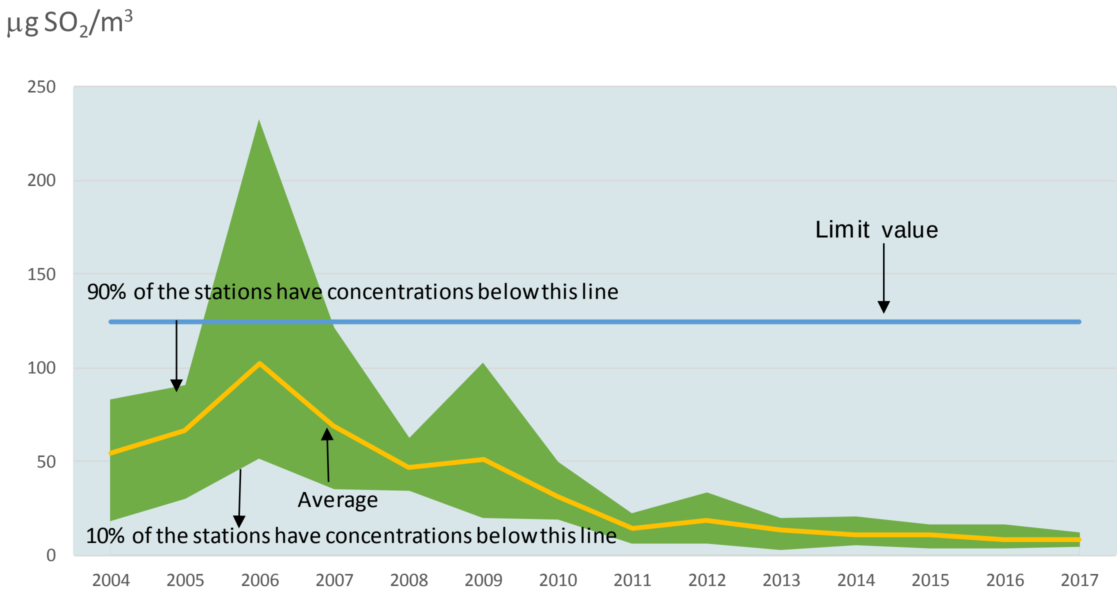


Diagram 3: 4th highest average mean daily concentration of SO2



Data coverage: **excel**

Source: Ministry of Environment and Physical Planning

Assessment

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

In the period 2004 to 2017, there have been no concentrations above the daily mean limit value for sulphur dioxide, i.e. population was not exposed at sulphur dioxide concentrations above the limit value, except in 2006 when out of the allowed 3 days, exceedance of the limit value was recorded in the course of 8 days in Skopje, which was not seen as significant problem.

In 2006, 53% of the population was exposed at sulphur dioxide concentration above 125 µg/m^{3}for more than 6 days in the course of the year. In 2005 and 2007, there was higher percentage (around 50%) of the population exposed at sulphur dioxide concentration above 125 µg/m^3 for 1 to 3 days in the course of the year, while in 2008 and 2009, this percentage of population exposure was very low (3%).

Methodology

- Methodology for the indicator calculation

For each measuring station located in urban environment, the number of days with mean daily concentration higher than the limit value (daily mean value of 125 µg/m^3) is calculated from the available hourly data. Selected urban stations include stations of the following types: stations measuring traffic pollution, stations measuring industrial pollution and urban background stations. The number of days with excess in a city is obtained by averaging the results of all stations located in that city.

Uncertainty

- Methodological uncertainty and data uncertainty

In general, data is not representative for all urban environments in the Republic of Macedonia. Compared to the methodology of the European Environmental Agency, where the calculation of the indicator is based only on data produced by the urban background stations, in our calculations we used data from all measuring stations located in urban environments. Also, due to the minimum number of monitoring stations, the calculation of the indicator also took into account the stations where data coverage is below 75% per calendar year. We can also point out as uncertainty in the indicator calculation the fact that the number of inhabitants in cities is based on the census of the population conducted by the State Statistical Office in 2002, instead of estimated number of population for each year.

Policy relevance of the indicator

List of relevant policy documents

The National Plan for Air Protection presents the state of air quality, defines the measures for ambient air quality protection and improvement in the Republic of Macedonia and all relevant institutions responsible for their implementation within 5 year period, namely from 2013 to 2018 (Official Gazette of the Republic of Macedonia no.170/2012).

Legal grounds

The Law on Ambient Air Quality was adopted in August 2004 and later amended on several occasions in line with the requirements of the relevant EU legislation (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007, 83/2009, 35/2010, 47/2011, 59/2012, 163/13, 10/15 and 146/15) and it is framework law in the area of air. The main goals of this Law are: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollution resulting in climate change, as well as provision of the relevant information on the quality of ambient air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant *Acquis Communitaire.* So far, 12 bylaws have been adopted. Calculations for this indicator are based on the provisions of the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013 and 183/2017).

Targets

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

Limit values for concentrations of sulphur dioxide in ambient air

In accordance with the said Decree, two limit values are specified for sulphur dioxide for the purpose of human health protection.

- Mean daily limit value of 125 μg/m^3 which shall not be exceeded by more than three times during one calendar year
- Hourly limit value of 350 μg/m^3, which shall not be exceeded by more than 24 times during one calendar year.

Reporting obligation

European Environmental Agency

- Air quality data exchange in accordance with implementing Decision containing the rules of Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council concerning reciprocal exchange of information I reporting on ambient air quality (Decision 2011/850/EC).

General metadata

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

MK - NI 004

EXCEEDANCE OF AIR QUALITY LIMIT VALUES IN URBAN AREAS – By monitoring station

Definition

This indicator shows:

- Number of days during year when the level of air pollution (for the pollutants: suspended particulate matters sized up to 10 micrometers (PM_{10}), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and ground ozone (O_3)) exceeds the prescribed limit values (maximum permissible annual and short-term concentrations in urban areas where regular observation of air quality is performed).
- Portion of urban population living in urban areas with at least one monitoring station) in the country exposed at air pollution above the set limit values.
- Absolute values of the concentration of pollutants in the air.

Units

Number of days

Ambient air concentrations of sulphur dioxide (SO_2), particulate matter sized up to 10 micrometer (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) are expressed in microgram/m^3 ($\mu g/m^3$).

Key policy issue

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

Key message

Suspended particulate matters sized up to 10 micrometers (PM10)
Concentrations of suspended particulate matters sized up to 10 micrometers exceed limit values specified in the Decree at the analyzed measuring points. High concentrations of suspended particulate matters sized up to 10 micrometers occur frequently, especially during winter period. Highest concentrations of PM10 have been measured in Skopje.

Nitrogen dioxide (NO_2)
In the period 2004 to 2017, decreasing trend was observed for the concentrations of nitrogen dioxide. Measured concentrations of this pollutant exceed specified limit value only in Skopje.

Sulphur dioxide (SO_2)
In the period 2004 to 2017, decreasing trend was observed for the mean annual concentration at all measuring points. Also, the mean daily limit value for sulphur dioxide was not exceeded, i.e. population was not exposed at concentrations of sulphur dioxide above the limit value at all analyzed measuring points.

Ozone (O_3)
In the period 2004 to 2017, the highest concentrations of ozone were recorded in Bitola, due to the fact that the city is situated in southwestern part of the country with higher number of sunny days during the year. Ozone concentrations measured in Skopje throughout the analyzed period were significantly lower compared to ozone concentrations measured in Bitola and Veles.

Diagram 1: Mean annual concentration of PM10

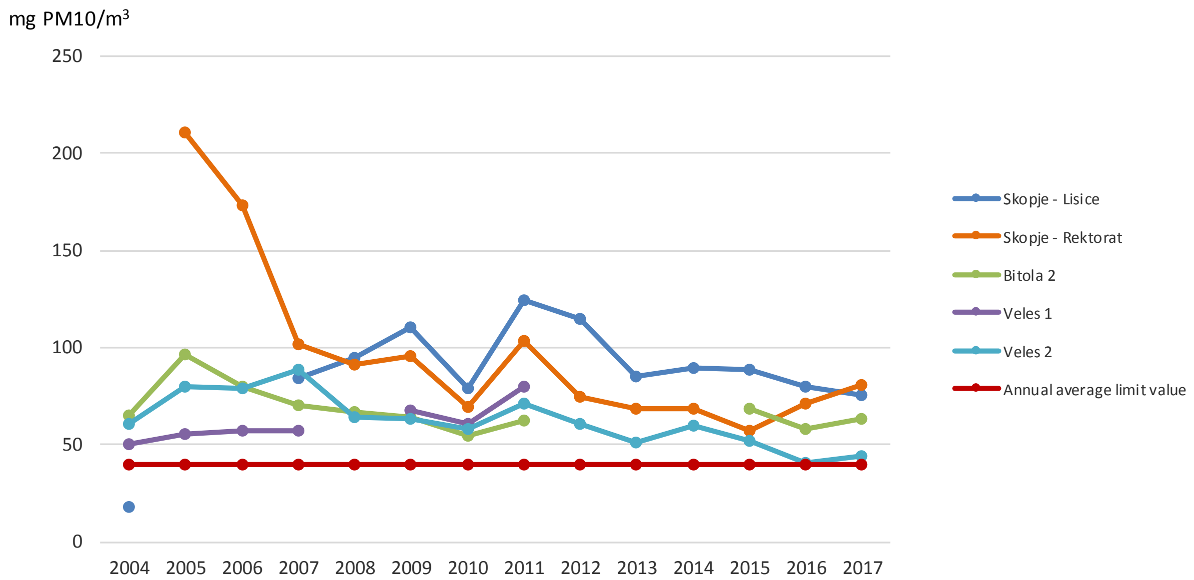


Diagram 2: Mean annual concentration of NO_2

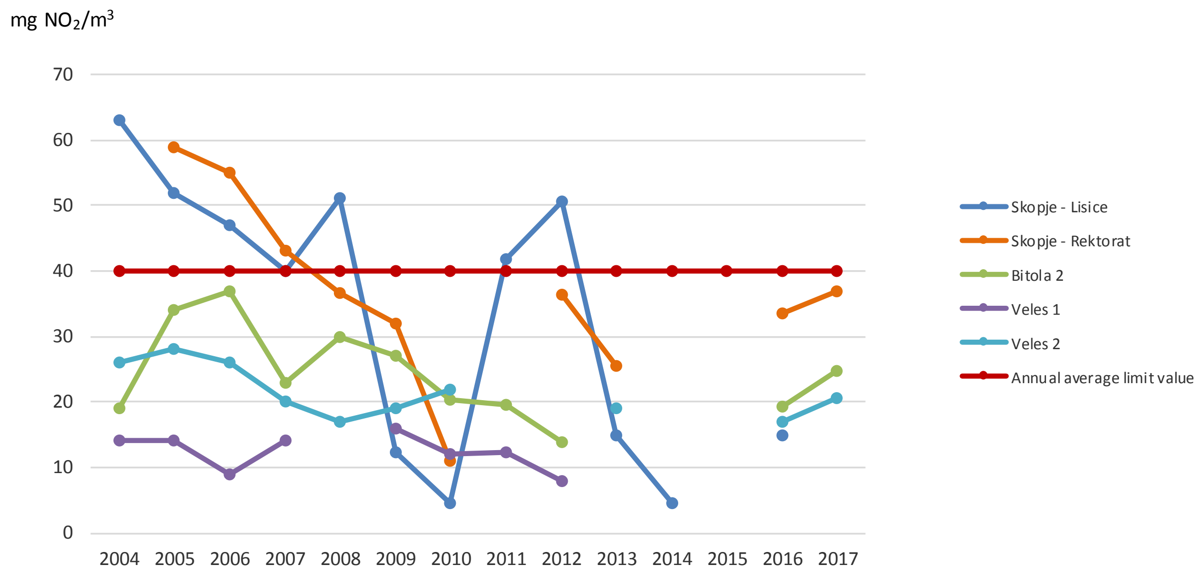


Diagram 3: Mean annual concentration of SO_2

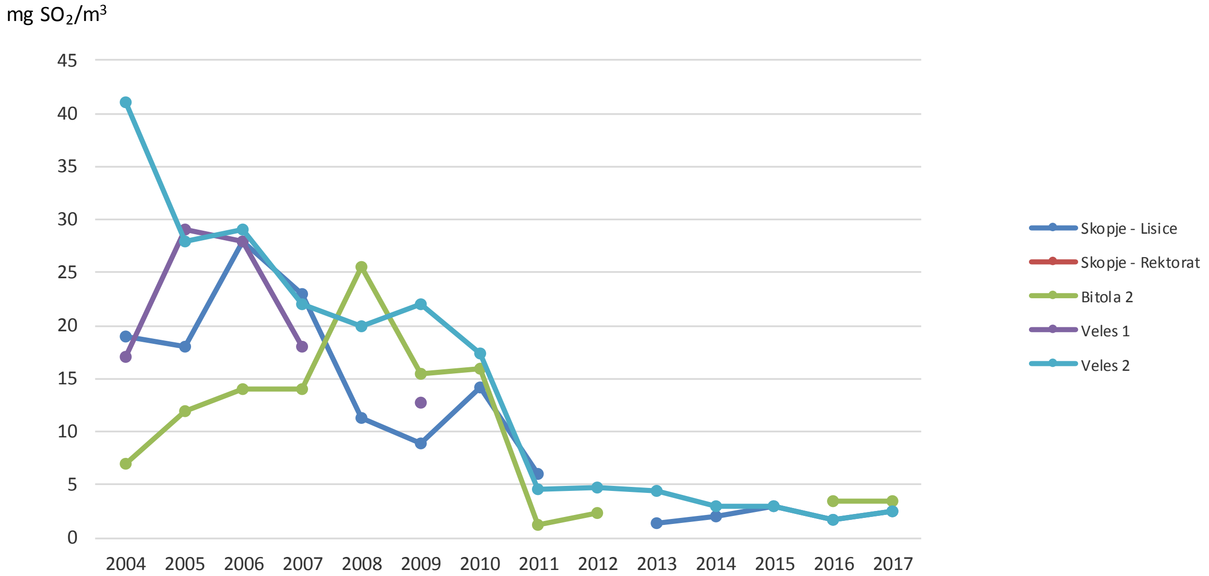
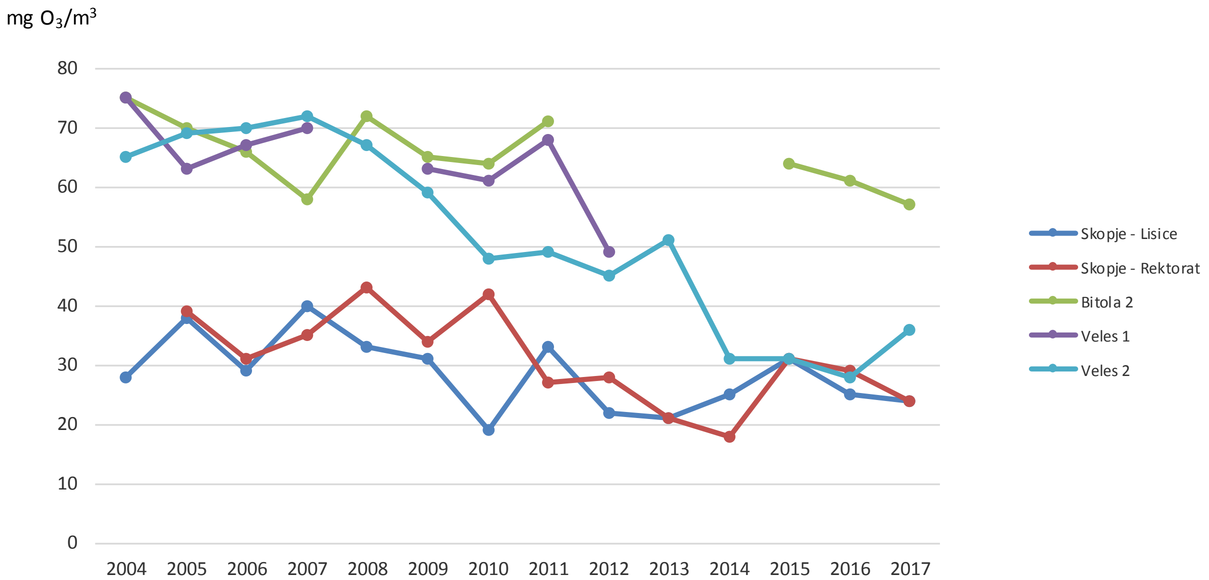


Diagram 4: Mean annual concentration of O_3



Data coverage: excel

Source: Ministry of Environment and Physical Planning

Assessment

Suspended particulate matters (PM_{10})

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

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

Based on data processed for the period 2004-2017, we may conclude that throughout the period, the population was exposed at concentrations of suspended particulate matters exceeding limit values (mean limit value of 50 $\mu g/m^3$ which should not be exceeded in more than 35 days during a calendar year and annual limit value of 40 $\mu g/m^3$). Highest concentrations of this pollutant were recorded in Skopje, which was most probably due to human lifestyle, dense population, intensive use of solid fuel for households heating during winter, as well as impacts of industry.

Nitrogen dioxide (NO2)

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

Data processed indicate that the mean annual concentration of nitrogen dioxide was exceeded only in Skopje, which was most probably due to high frequency of traffic and operation of industrial facilities.

Sulphur dioxide (SO2)

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

In the period 2004 to 2017, there was no exceeding of the mean daily limit value for sulphur dioxide, i.e. population was not exceeded at concentrations of sulphur dioxide above the limit value at all analyzed measuring points.

Ozone - O3

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

Automatic monitoring stations measure the ground-level ozone formed as a result of photochemical reactions involving nitrogen oxides, volatile organic compounds (most frequently hydrocarbons), etc. However, its content is also dependent on solar radiation and annual seasons. Thus, higher ozone concentrations are observed in warmer days, especially during summer.

In the period 2004 to 2017, the highest concentrations of ozone were recorded in Bitola, due to the fact that the city is situated in southwestern part of the country with higher number of sunny days during the year. Ozone concentrations measured in Skopje throughout the analyzed period were significantly lower compared to ozone concentrations measured in Bitola and Veles.

Methodology

- ## Methodology for the indicator calculation

Calculation of the indicator takes into account data from conducted measurements of the quality of the air in the following three cities: Skopje, Bitola and Veles, as the most representative sites reflecting the state of air quality in the Republic of Macedonia. Skopje was selected as capitol and the largest urban area in the country and big industrial centre. Bitola is second in size city and the largest thermal power plant REK Bitola is located in its vicinity and Veles as city with great historical industrial pollution.

For each selected urban station, the type of station is specified (urban background, station measuring air pollution from traffic, station measuring air pollution from industry). Then, the following is calculated for each pollutant from the available hourly data: mean annual concentration, highest mean daily concentration and number of days with exceeded mean daily limit value.

Uncertainty

- ## Methodological uncertainty and data uncertainty

Calculations of the indicator have also taken into consideration stations where data coverage is below 75% per calendar year.

Policy relevance of the indicator

List of relevant policy documents

The National Plan for Air Protection presents the state of air quality, defines the measures for ambient air quality protection and improvement in the Republic of Macedonia and all relevant institutions responsible for their implementation within 5 year period, namely from 2013 to 2018 (Official Gazette of the Republic of Macedonia no.170/2012).

Legal grounds

The Law on Ambient Air Quality was adopted in August 2004 and later amended on several occasions in line with the requirements of the relevant EU legislation (Official Gazette of the Republic of Macedonia Nos. 67/2004, 92/2007, 83/2009, 35/2010, 47/2011 and 59/2012, 163/13, 10/15 and 146/15) and it is framework law in the area of air. The main goals of this Law are: avoidance, prevention and reduction of harmful effects on human health and environment as a whole, prevention and reduction of pollution resulting in climate change, as well as provision of the relevant information on the quality of ambient air. This Law establishes the legal grounds for adoption of a number of bylaws in line with the requirements of the relevant *Acquis Communitaire.* So far, 12 bylaws have been adopted. Calculations for this indicator are based on the provisions of the Decree on the limit values of levels and types of polluting substances in ambient air and on the alert thresholds, deadlines for the limit values achievement, margins of limit value tolerance, target values and long-term ozone targets (Official Gazette of the Republic of Macedonia No. 50/05, 4/2013 and 183/2017).

Targets

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

Limit values for concentrations of sulphur dioxide in ambient air

In accordance with the said Decree, two limit values are specified for sulphur dioxide for the purpose of human health protection.

- Mean daily limit value of 125 µg/m^3 which shall not be exceeded by more than three times during one calendar year
- Hourly limit value of 350 µg/m^3, which shall not be exceeded by more than 24 times during one calendar year.

Limit values for concentrations of nitrogen dioxide in ambient air

In accordance with the said Decree, two limit values are specified for nitrogen dioxide for the purpose of human health protection.

- Hourly mean concentration of nitrogen dioxide shall not exceed the limit value of 200 µg/m^3 by more than 18 times during one calendar year.
- The mean annual concentration shall not exceed 40 µg/m^3.

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

The said Decree specifies two limit values for suspended particulate matter of size up to 10 micrometers, for the purpose of human health protection.

- 24-hourly limit value is 50 µg/m^3,and it shall not be exceeded by more than 35 times during one calendar year
- The mean annual concentration shall not exceed 40 µg/m^3.

Target values for ozone concentrations in ambient air

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

- The target value for ozone, for the purpose of human health protection, is specified so that 8-hourly mean value is calculated from the hourly concentrations in each day. The maximum daily 8-hourly mean value of ozone shall not exceed the value of 120 µg/m^3 in more than 25 days in the course of the year (calculated as an average value for three years). This target value should be achieved by 2010.
- The Decree also defines long-term target for the purpose of human health protection, set at 120 µg/m^3, as maximum daily 8-hourly mean value during a calendar year.

Reporting obligation

European Environmental Agency

- Air quality data exchange in accordance with implementing Decision containing the rules of Directives 2004/107/EC and 2008/50/EC of the European Parliament and of the Council concerning reciprocal exchange of information I reporting on ambient air quality (Decision 2011/850/EC).

General metadata

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

MK - NI 006

CONSUMPTION OF OZONE DEPELTING SUBSTANCES

Definition

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

This indicator quantifies the consumption of ozone-depleting substances (ODSs) in the Republic of Macedonia.

Units

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

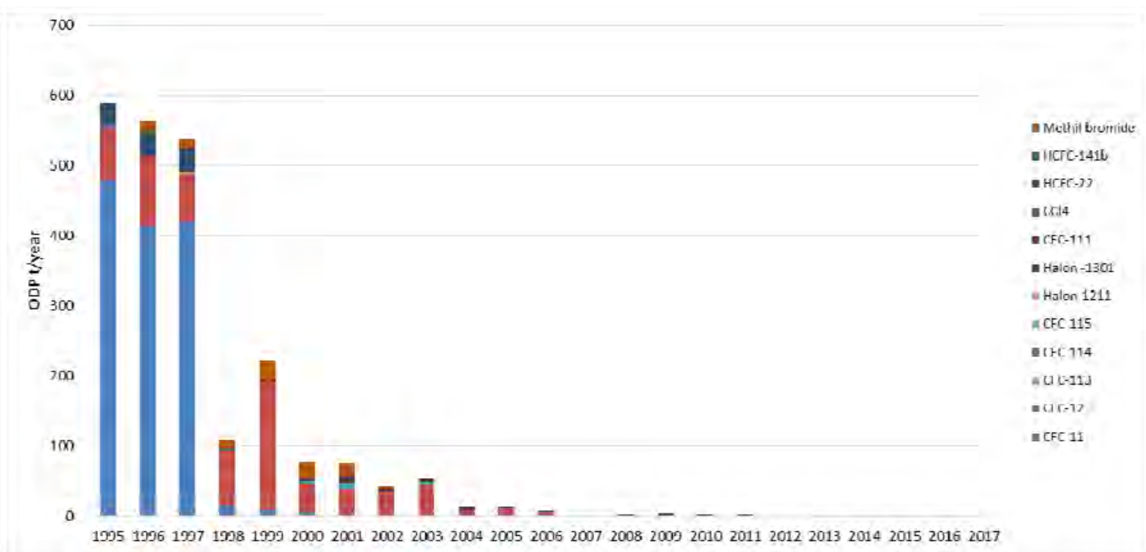
Key policy question

Does Macedonia fulfil the targets specified under the Montreal Protocol concerning ODSs reduction and elimination?

Key message

Considering the extent of ODSs elimination in the Republic of Macedonia, it may be concluded that the percentage of more than 99.87% of ODSs phased-out in the observed period reflects the fact that our country has not only fulfilled its obligations under the Montreal Protocol, but reached beyond the requirements specified in the Protocol.

Figure 1: Consumption of Ozone Depleting Substances (ODP t/year)



Note: Given the fact that the Republic of Macedonia has never produced any ODS, the diagram includes data only on ODSs consumption

Data coverage: excel

Source: MEPP/Ozone Unit

Assessment

According to data contained in the Country Programme for Phasing-out Substances that Deplete the Ozone Layer (1996), the average consumption of ODSs in the observed period amounted 527 tons. According to the provisions of the Montreal Protocol, the said average has been taken as a base level in determining the extent of reduction to be achieved within the restrictions provided for by the Protocol. Table 1 shows the trend of decline in ODSs consumption in the period of the last ten years (2004 – 2013). Apart from ODSs elimination in industry (production of refrigerators and production of rigid and flexible foams), where technologies using ozone depleting substances before 1997 were replaced by non-ODSs solutions, interventions were also made in agriculture through substitution of methyl bromide with alternative solutions that did not involve application of ODSs, in cooling devices servicing and maintenance through establishment of the system for ODS collection and recycling. In the context of the latter, equipment for collection and recycling of cooling devices have been delivered to services and service technicians were trained in good cooling devices servicing practice. For the same purpose, training was organized for custom officers to control import-export of ozone depleting substances at border-crossings of the Republic of Macedonia.

The national action for ozone layer protection during the observed period has resulted in the complete elimination of the consumption of ODSs in the Republic of Macedonia.

Methodology

- ### Methodology for the indicator calculation

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

ODSs	CFC-11	CFC-12	CFC-113	CFC-114	CFC-115	CFC-111	CCl_4	Halon 1211	Halon 1301	HCFC-22	HCFC-141b	Methyl bromide
Value of ODP	1	1	0.8	1	0.6	1	1.1	3	10	0.055	0.11	0.7

Policy relevance of the indicator

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

List of relevant policy documents

National Environmental Action Plan (NEAP II, 2006)

Country Programme for Phasing-out Substances that Deplete the Ozone Layer (1996) – strategic document establishing the main directions in the domain of management and elimination of ODSs in the Republic of Macedonia. It was adopted in 1996. Based on the recommendations of the Country Programme, ODSs elimination has been completed in industry (production of refrigerators, flexible and rigid foams), agriculture, private sector. By 2011, more than 99% of ODSs consumption defined in the National Programme was eliminated. Projects have been implemented by means of the financial support provided by the Multilateral Fund of the Montreal Protocol through the Ministry of Environment and Physical Planning/ Ozone Unit.

Legal grounds

- Law on the Ratification of the Vienna Convention for the Protection of the Ozone Layer was adopted by the Republic of Macedonia by means of succession in 1994.
- Law on the Ratification of the Montreal Protocol on Substances that Deplete the Ozone Layer was adopted by the Republic of Macedonia by means of succession in 1994.
- Law on the Ratification of London Amendment to the Montreal Protocol.
- Law on the Ratification of Copenhagen Amendment to the Montreal Protocol.
- Law on the Ratification of Montreal Amendment to the Montreal Protocol.
- Law on the Ratification of Beijing Amendment to the Montreal Protocol.
- Law on Environment.
- Order banning the import of air-conditioning devices that contain HCFCs.
- Order restricting the import of ozone depleting substances.
- Order banning production of and trade in ozone depleting substances, as well as production of and trade in products containing ozone depleting substances.
- Order banning import and export of HCFC containing products.
- Rulebook on ozone depleting substances, as well as products containing ozone depleting substances.
- Rulebook on the manner of collection, recovery and recycling of ozone depleting substances.
- Order banning the trade in cooling products in disposable cylinders.
- Rulebook on the format and the content of the programme for training in proper handling, servicing, collection, recovery and recycling of cooling devices and/or cooling devices containing products, detailed requirements to be fulfilled by legal persons perfoming training in proper handling, servicing, collection, recovery and recycling of cooling devices and/or cooling devices containing products, as well as the manner of authorization for performance of training proper

handling, servicing, collection, recovery and recycling of cooling devices and/or cooling devices containing products

- Rulebook on the format, content and manner of reporting on the types and quantities of collected, recovered and recycled cooling devices
- Rulebook on the format and content of the certificate for complteted training cooling devices and/or cooling devices containing products handling.

Targets

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

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

Reporting obligation

- UNEP- Secretariat for Ozone Layer Protection
- Multilateral Fund of the Montreal Protocol

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 006	**Consumption of ozone depleting substances**	CSI 006	Consumption of ozone depleting substances	**P**	**G**	▪ Climate change	annually

MK – NI 050

EMMISSION OF THE MAIN POLLUTING SUBSTANCES - EMISSION OF SULPHUR OXIDES

Definition

The indicator tracks the trends in sulphur oxides expressed as sulphur dioxide.

Units

kt (kilotons per year)

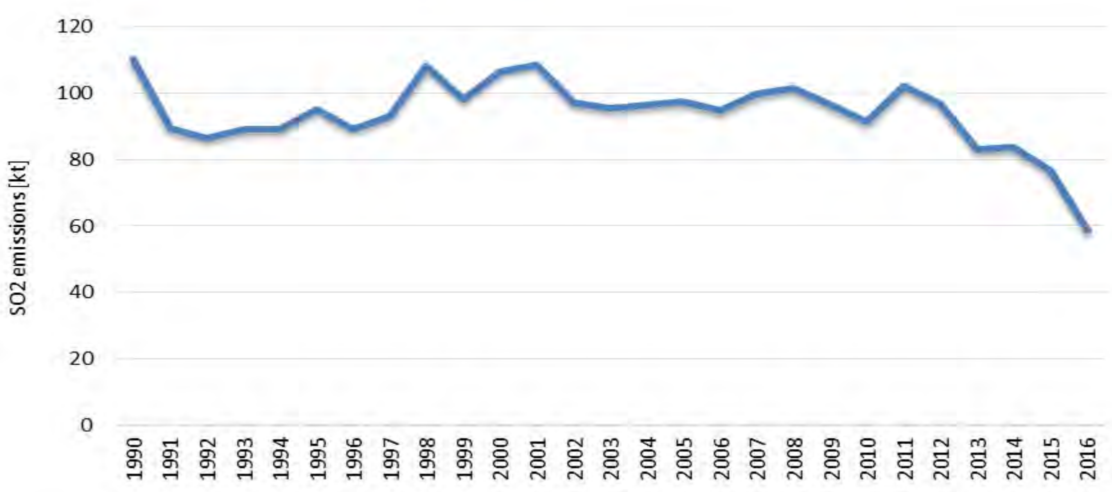
Key policy issue

What progress has been made in overall reduction of emissions of sulphur oxides expressed as sulphur dioxide in the Republic of Macedonia?

In 1990, the overall national emissions of SO_2 amounted to 110 kt. In 2016, emissions dropped by 47% compared to 1990 and amounted to 58,7 kt. The reasons for the dropping trend of this polluting substance are related mainly to the reduced emissions of sulphur oxides from public energy and heating plants. The reduction of emissions, especially in 2016, is due to the reduced amount of burnt coal in REK Bitola and the reduced operation of REK Oslomej. It is also important to mention the significant difference in SO_2 emissions in 2015 compared to 2016 of 23% due to the aforementioned reasons. The peaks (highest values) of emissions in 2009 and 2011 were caused by increased consumption of coal in the biggest thermal power plant REK Bitola, compared to 2010 when the consumption was lower. In the period 2012-2013, reduction in the emission was due to the reduced time of operation of the second in size power plant REK Oslomej, from 12 to 5 months and reduced consumption of coal by as much as 60%. Lower emissions of SO_2 in 2013 compared to 2012 were also a result of the boilers modernization in the biggest thermal power plant REK Bitola. During 2013 and 2014, emissions were relatively stable (-1%).

The Diagram below shows annual trend in the emissions of sulphur oxides expressed as sulphur dioxide for the period 1990 to 2016.

Diagram 1.Trend in emissions of sulphur oxides expressed as sulphur dioxide



Assessment

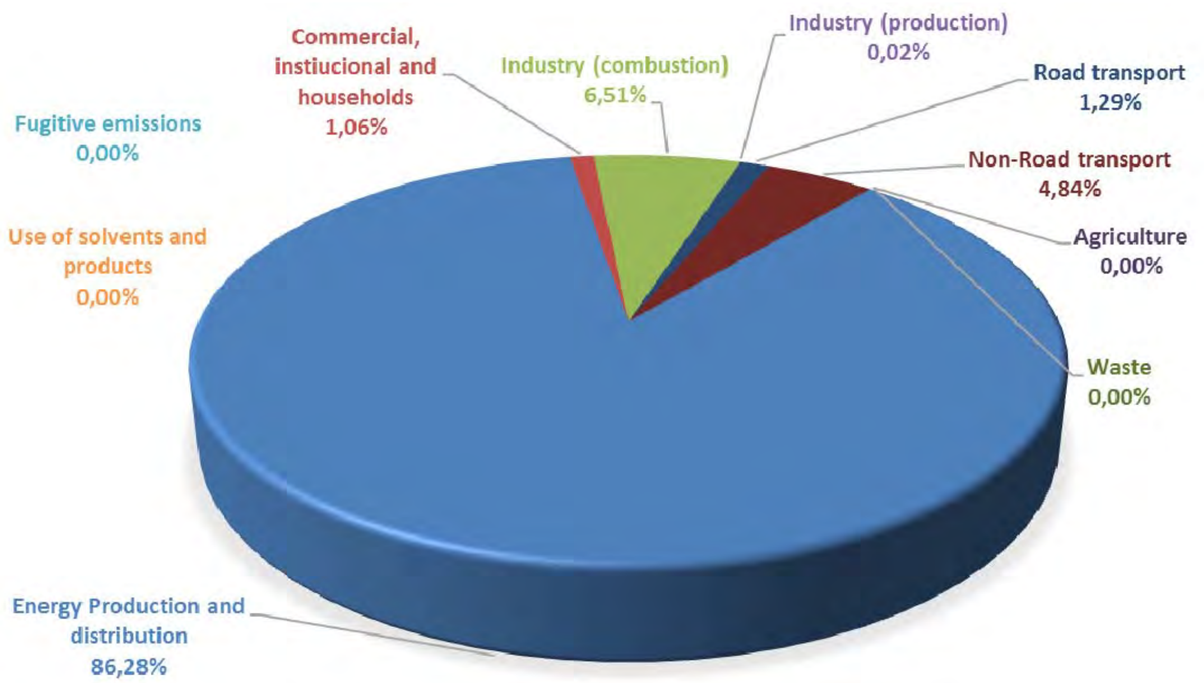
Under the CARDS Programme, the Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014, the Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

Almost all emissions of SO_2 originate from the sector Energy Production and distribution. Thus, the main sources of emissions in 2016 included the following NFR categories of sources: 1A1 Energy industries (Public energy and heating plants), with a share of 86,3% in the total national emission of SO_2. Around 6,5% of the total national emission of SO_2 originated from the sector - Industry (combustion) as well as 4,8% from the sector Non-Road transport. Other sectors are minor sources of SO_2 emissions.

Diagram 2. Emissions of SOx by sectors in 2016

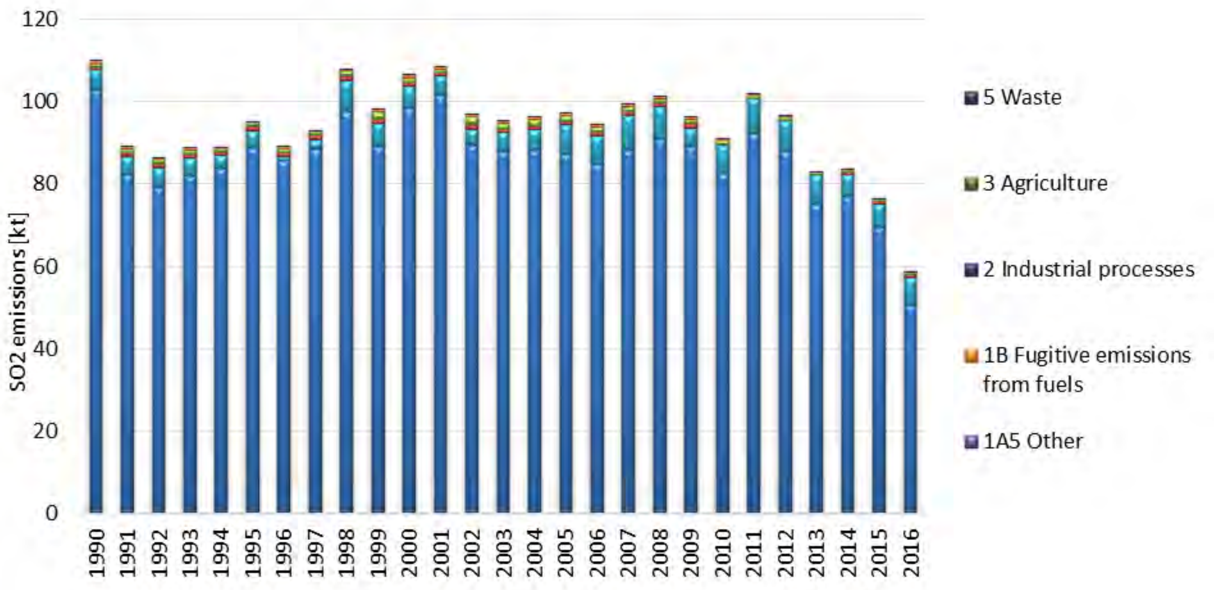


Policy specific issue

Which different NFR categories contribute to sulphur oxides emissions?

NFR category 1A1 Energy industries (Public energy and heating plants) is the key source for sulphur oxides emissions. In 2013 and 2014, almost equal emissions of sulphur oxides were recorded, which were lower compared to 2011 and 2012, due to reduced capacity of REK Oslomej. In 2016, there is a decrease in the emissions of SO_2 from NFR category 1A1 due to the non-operation of REK Oslomej and the reduction of the mass of burnt coal in REK Bitola. In general, the same trend of percentage representation of NFR caterories participating in sulfur oxides emissions is noted, with the exception of the above-mentioned reduction in emissions from NFR category 1A1.

Diagram 3. Emissions of sulphur oxides expressed as SO_2 by NFR categories per year



Data coverage: **excel**

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR sectors of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by SNAP.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016. The Guidebook contains emission factors which have been used in the calculations, except for the energy sector where calculations were made by use of country specific factors or use of data from the measurements completed in the period 2008-2016 for this polluting substance and for the sector 1A1a concerning electricity and heat producing plants.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction from 2012 to 2020 have been adopted in order to define and implement measures on national level concerning reduction of sulphur oxides emissions and achievement of projected values for the total emission of this polluting substance on national level. At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, a program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo were prepared in the Twining project "Further strengthening of the capacities for effective implementation of the acquis in the field of air quality", which were adopted by the councils of the municipalities. National plan for reduction of pollution for sulphur dioxide (SO_2), nitrogen oxides (NOx) and dust (TSP) for existing Large Combustion Plant (LCP) has been prepared. The plan was approved by the Energy Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017.

Targets

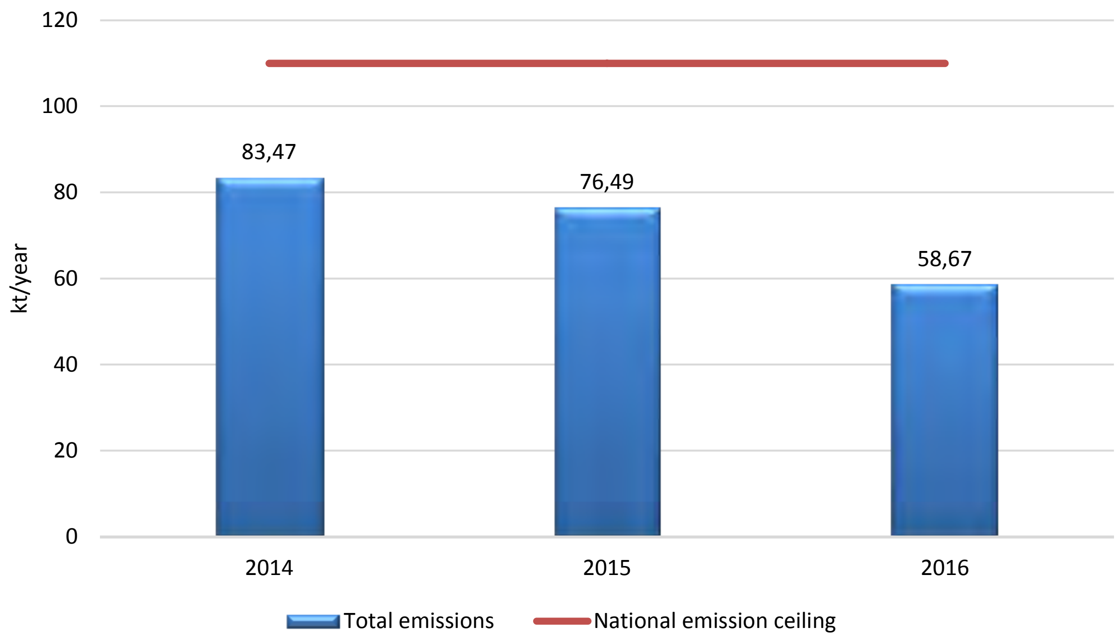
Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.
Also, in accordance with Directive 2001/81/EC, as well as Gothenburg Protocol, the ceilings of the amounts of emissions have been set at the level of the Republic of Macedonia for 2010 that shall not be exceeded at the annual level of 2010. The Executive Body of the Convention on Long-Range Transboundary Air Pollution, upon submission of the values of national ceilings in order to enrol the Republic of Macedonia in Annex II of the Gothenburg Protocol requested correction of the values considering the reported data on air emissions of the pollutants sulfur dioxide and ammonia at national level. Changes in the values of these pollutants were incorporated in the Rulebook amending the

Rulebook on upper limits – emission ceilings of pollutants for the purpose of setting projections for certain period concerning reduction of the quantities of pollutant emissions at annual level published in July 2014. This Rulebook also sets the national upper limit – ceiling for the emissions of sulphur oxides expressed as sulphur dioxide of 110 kilotons. The national upper limit-ceiling for SOx has not been exceeded for the last three years.

Diagram 4. Comparison of the national emissions of SO_2 in the period 2014-2016 with the upper limit-ceiling for 2010



According to the presented annual calculated emissions, the Republic of Macedonia is in compliance with the Gothenburg Protocol for this polluting substance. Older date protocols on sulfur also set targets for this polluting substance, namely: Protocol on reduction of sulphur oxides emission or their transboundary transfer by at least 30%, under which the national emissions of sulphur oxides expressed as sulphur dioxide should be reduced by 30% relative to 1980 (this target was not achieved in 2014) and Protocol regarding further reduction of sulphur oxides emission, under which emissions in n-2 year (where n is the current year) should not exceed the emissions of 1990 and the country is compliant with this Protocol.

With reference to sulphur oxides, based on the Decision of the Ministerial Council of the Energy Community (D / 2013/05 / MC-S-end), for the purpose of reducing the emissions of certain pollutants in the air from large combustion plants (LCP), as already mentioned, a National Emission Reduction Plan (NERP) has been prepared and adopted. The Plan sets the national upper limits-ceilings for sulphur dioxide from large combustion plants for 2018, 2023 and 2027. REK Bitola is already undertaking activities for finding financing for the start of the desulphurization process, which would significantly reduce the emissions of sulfur dioxide.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In 2010, all 8 Protocols to the Convention on Long-Range Transboundary Air Pollution – CLRTAP were ratified. Owing to the requirement for amendment of the annexes with regard to emissions in the baseline year (1990) and national emission ceilings for 2010, the Gothenburg Protocol and 1995 Protocol on sulphur entered into force for the Republic of Macedonia in 2014 upon adoption of the values set in Annex II of these Protocols. In relation to the obligations for calculation of emissions of sulphur and its oxides, the following protocols or international ratified agreements are of relevance:

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning further reduction in sulphur emissions. The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 24/2010);

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning reduction of sulphur oxides emission or their transboundary transfer by at least 30%. The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 24/2010);

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning reduction of acidification, eutrophication and ground ozone (Gothenburg, 1999). The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 135/2010), while Republic of Macedonia became an equal member of the protocol in 2014.

Reporting obligation

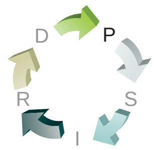
- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 050	**Emissions of the main polluting substances – sulphur oxides (SOx)**	EEA UNECE	CSI 040, APE 010 A1/1	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 050

EMMISSION OF THE MAIN POLLUTING SUBSTANCES - EMISSION OF NITROGEN OXIDES EXPRESSED AS NITROGEN DIOXIDE



Definition

The indicator tracks the trends in nitrogen oxides expressed as nitrogen dioxide.

Units

kt (kilotons per year)

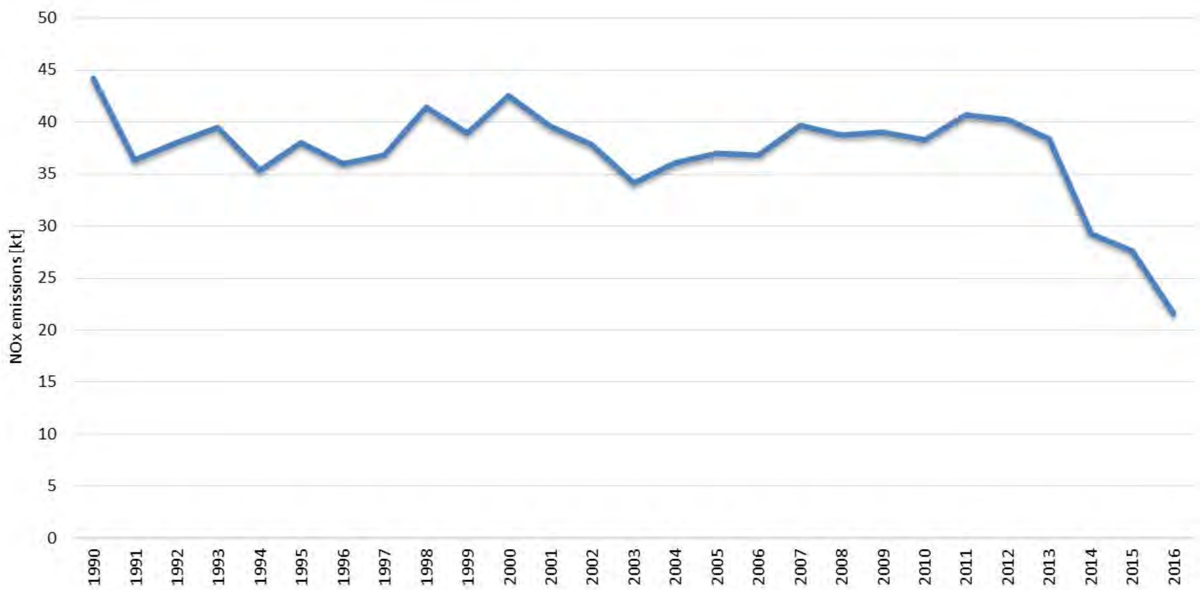
Key policy issue

What progress has been made in overall reduction of emissions of nitrogen oxides expressed as nitrogen dioxide in the Republic of Macedonia?

In 1990, the overall national emissions of NOx amounted to 44 kt. Since then, emissions have been reduced so that in 2016 emissions are at around 21.6 kt, ie 51% of emissions in 1990. The reasons for the reduction are due to the significantly reduced emissions from the energy production industry (Public Energy and Power Plants) due to the reduced quantity of coal use in REK Bitola and the use of national emission factors, in order to comply with the inventory for greenhouse gases, which were used in 2016 and which are about 30% smaller compared to the emission factors that were used for emissions in 2015. For these reasons, a difference of 46% was observed in relation to NOx emissions in 2016 compared to 2015 with a declining trend. Also, in 2015 and 2016, REK Oslomej worked only one month in each year. An increase of emissions in 2006 and 2007 was caused by increased consumption of crude oil in the NFR category 1A1a, while sharp drop of emissions between 2011 and 2012 resulted from reduced consumption of coal in large thermal power plants. In the period 2012-2013, reduction in the emission was due to the reduced time of operation of the second in size power plant - REK Oslomej, from 12 to 5 months and reduced consumption of coal by as much as 60%. Lower emissions of NOx in 2013 compared to 2012 were also result of the boilers modernization in the biggest thermal power plant REK Bitola.

The Diagram below shows annual trend in the emissions of nitrogen oxides expressed as nitrogen dioxide for the period 1990 to 2016.

Diagram 1.Trend in emissions of nitrogen oxides expressed as nitrogen dioxide



Assessment

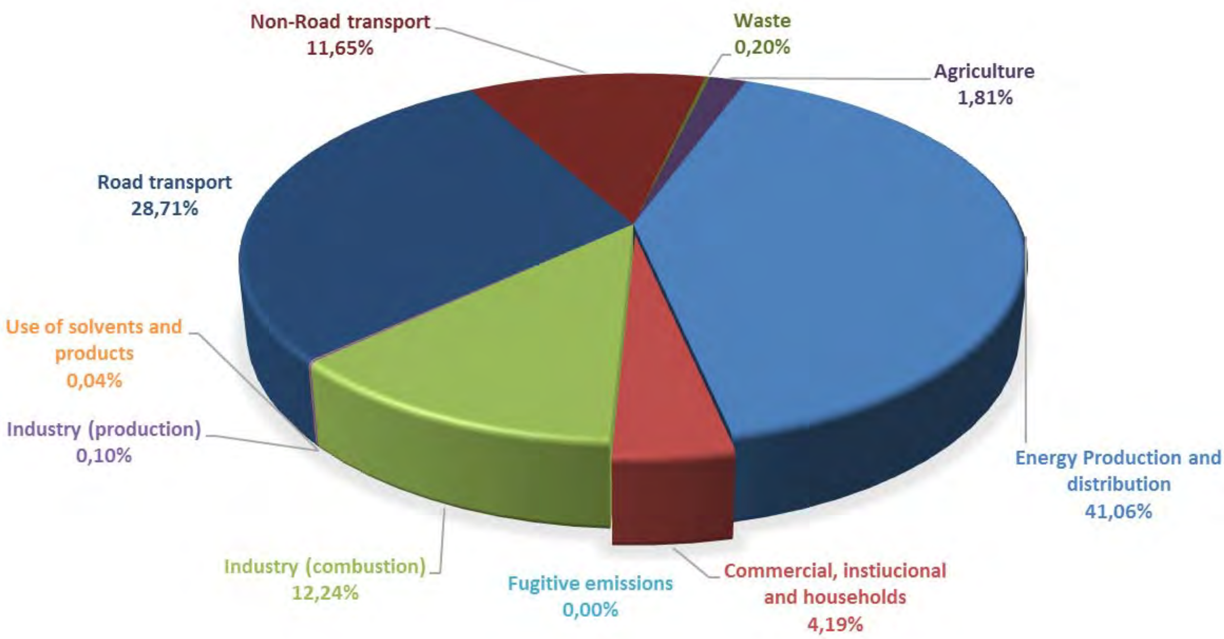
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main source of emissions in 2016 is the sector Energy production and distribution with a share of 41,1%. The sector Road transport, contributes with a share of 28,7%, followed by the sectors Industry (Combustion) with a share of 12,2% and Non-Road transport with a share of 11,7%.

Diagram 2. Emissions of NOx by sectors per year in 2016

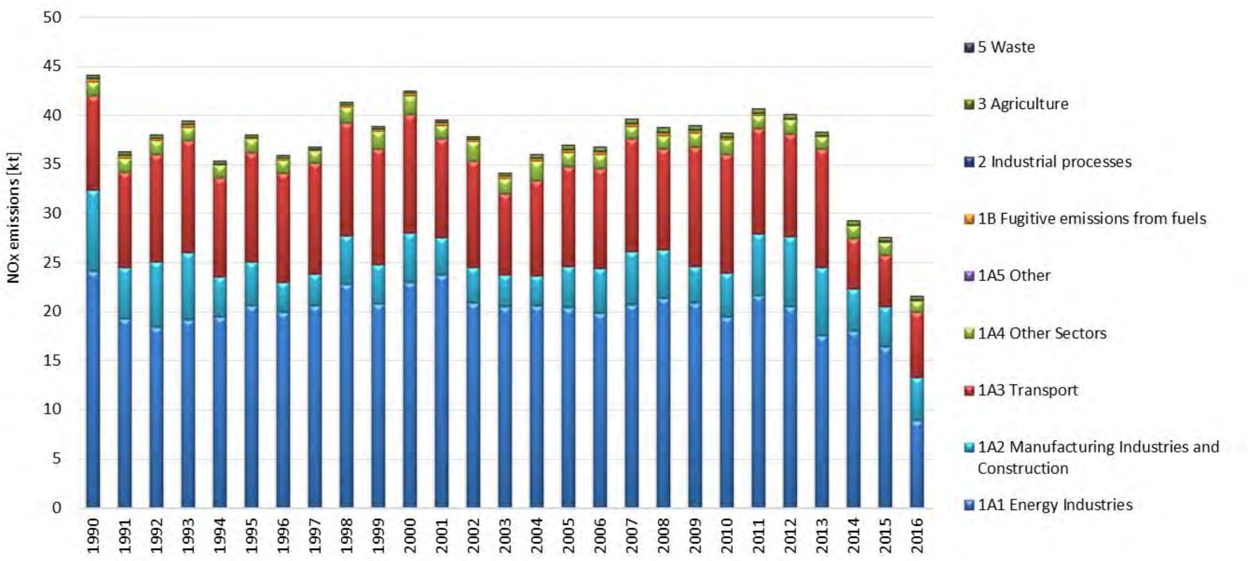


Policy specific issue

Which different NFR categories contribute to nitrogen oxides emissions?

NFR category 1A1a is the key sector in nitrogen oxide emissions. There is a decrease in emissions in 2014 compared to emissions in previous years, due to the reduction of emissions of nitrogen oxides from transport and combustion from production installations and construction. In 2015, the reduction of NOx emissions is insignificant compared to 2014 while a significant decrease is observed in 2016 due to the reduced amount of coal used in REK Bitola and the use of national emission factors, in order to comply with the GHG inventory, which were used in 2016 and which are about 30% smaller compared to the emission factors that were used till 2015. In 2013 and 2014, roughly equal emissions of nitrogen oxides are recorded, which, compared to 2011 and 2012, are lower due to the reduced capacity of REK Oslomej. The lower emissions of NOx from NFR category 1A1 in 2013 and 2014 compared to 2012, are also a result of the modernization of the boilers in the largest thermal power plant REK Bitola.

Diagram 3. Emissions of NOx by NFR categories per year



Data coverage: **excel**

Sources of data:

The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/..

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR sectors of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016. The Guidebook contains emission factors which have been used in the calculations, except for the energy sector where calculations were made by use of country specific factors or use of data from the measurements completed in the period 2008-2016, for this polluting substance for the NFR category 1A1a, concerning electricity and heat producing plants.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-20136).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction from 2012 to 2020 have been adopted in order to define and implement measures on national level concerning reduction of nitrogen oxides emissions and achievement of projected values for the total emission of this polluting substance on national level. At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo were prepared in the Twining project “Further strengthening of the capacities for effective implementation of the acquis in the field of air quality”, which were adopted by the coouncils of the municipalities. A National plan for reduction pollution for sulphur dioxide (SO2), nitrogen oxides (NOx) and dust (TSP) for existing Large Combustion Plant (LCP) was prepared. The plan was approved by the Energy Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017.

Targets

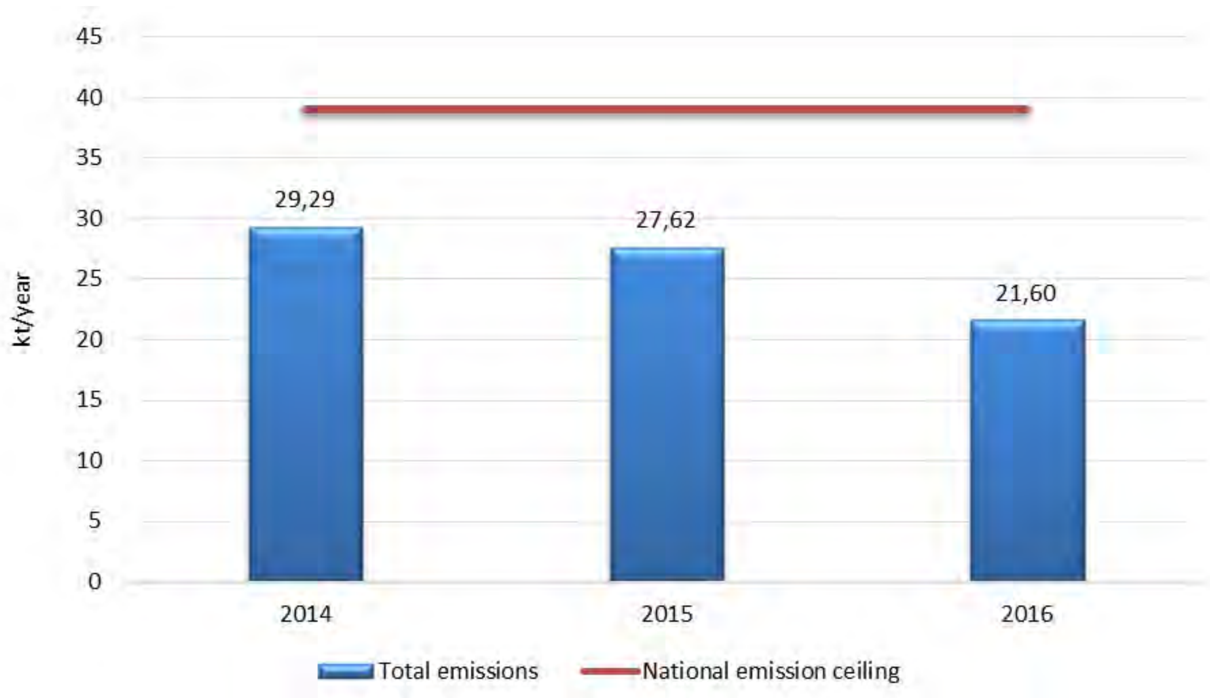
Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Also, in accordance with Directive 2001/81/EC, as well as Gothenburg Protocol, the ceilings of the amounts of emissions have been set at the level of the Republic of Macedonia for 2010 that shall not be exceeded at the annual level of 2010. The Executive Body of the Convention on Long-Range Transboundary Air Pollution, upon submission of the values of national ceilings in order to enrol the Republic of Macedonia in Annex II of the Gothenburg Protocol requested correction of the values considering the reported data on air emissions of the pollutants sulfur dioxide and ammonia at national level. Changes in the values of these pollutants were incorporated in the Rulebook amending the Rulebook on upper limits – emission ceilings of pollutants for the purpose of setting projections for certain period concerning reduction of the quantities of pollutant emissions at annual level published in July 2014. This Rulebook also sets the national upper limit – ceiling for the emissions of nitrogen oxides expressed as nitrogen dioxide of 39 kilotons. The national upper limit-ceiling for NOx has not been exceeded for the last three years.

Diagram 4. Comparison of the emissions of NOx in the period 2012-2014 with the upper limit-ceiling for 2010



According to the results presented in Diagram 4, it may be concluded that the Republic of Macedonia is in compliance with the Gothenburg Protocol for this polluting substance. For this polluting substances, targets are also set in the Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning control of nitrogen oxides releases or their transboundary transfers, under which the emissions in n-2 year (where n is the current year) should not exceed the emissions in the baseline year (being 1987 for our country) and the country is compliant with this Protocol in relation to emissions calculated for 2016.

With reference to the targets – projections for NOx for 2015 (33.7 kilotons) scenario with measures set in the Programme for gradual reduction of emissions of certain polluting substances at the level of the Republic of Macedonia with projections for the reductions in the period between 2012 and 2020, were achieved in 2014.

REK Bitola is already undertaking activities for finding finances for the start of the desulphurization process, which would result in reduction in the emissions of nitrogen oxides.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In 2010, all 8 Protocols to the Convention on Long-Range Transboundary Air Pollution – CLRTAP were ratified. Owing to the requirement for amendment of the annexes with regard to emissions in the baseline year (1990) and national emission ceilings for 2010, the Gothenburg Protocol and 1995 Protocol on sulphur entered into force for the Republic of Macedonia in 2014 upon adoption of the values set in Annex II of these Protocols. In relation to the obligations for calculation of emissions of nitrogen oxides, the following protocols or international ratified agreements are of relevance:

- Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning control of nitrogen oxides releases or their transboundary transfers. The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 24/2010);
- Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning reduction of acidification, eutrophication and ground ozone (Gothenburg, 1999). The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 135/2010), while Republic of Macedonia became an equal member of the protocol in 2014.

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 050	**Emissions of the main polluting substances – nitrogen oxides (NOx)**	EEA UNECE	CSI 040, APE 010 A1/2	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 050

EMMISSION OF THE MAIN POLLUTING SUBSTANCES - EMISSION OF NON-METHANE VOLATILE ORGANIC COMPOUNDS (NMVOC)

Definition

The indicator tracks the trends in non-methane volatile organic compounds (NMVOC).

Units

kt (kilotons per year)

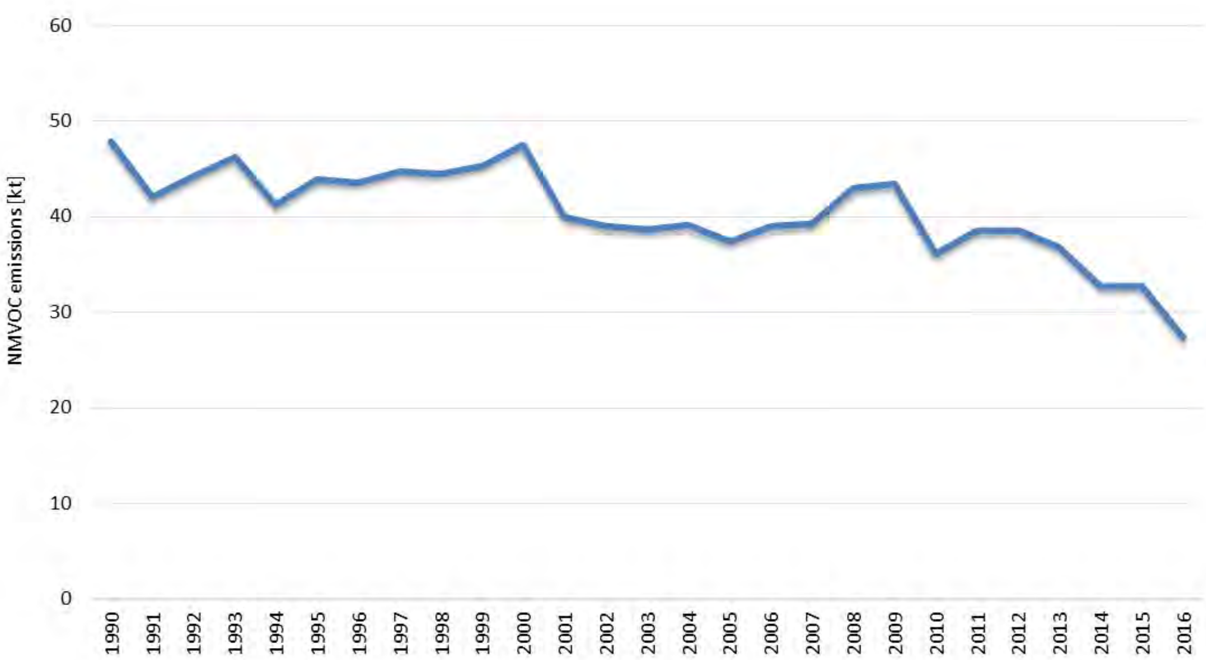
Key policy issue

What progress has been made in overall reduction of emissions of non-methane volatile organic compounds in the Republic of Macedonia?

In 1990, the total national emissions of NMVOC amounted to about 44 kt. In 2016 for comparison, the emissions are reduced to around 27,3 kt, which is a decrease of 43%. The reasons for the decline are mainly in lower emissions from transport, the use of solvents and industrial processes. From 2015 to 2016 emissions were reduced by 16%, due to reduced emissions from other sectors (use of solvents, households) by 21% and industrial processes by 39%.

The Diagram below shows the annual trend in the emissions of non-methane volatile organic compounds for the period 1990 to 2016.

Diagram 1.Trend in emissions of non-methane volatile organic compounds



Assessment

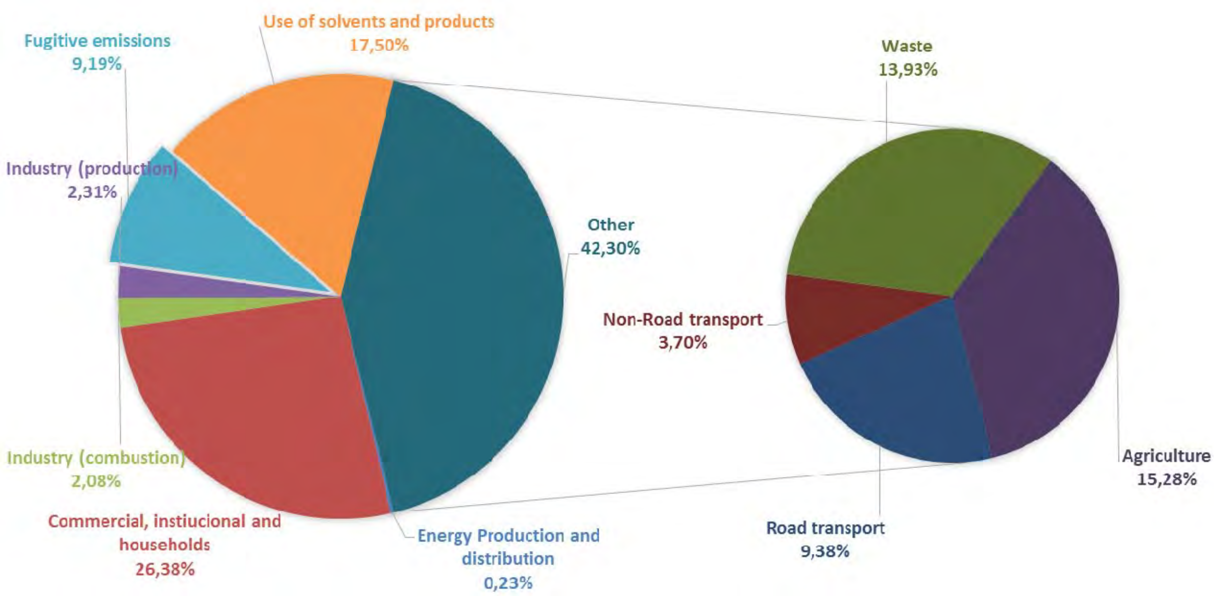
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014, the Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, institutional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main sources of emissions in 2016 for NMVOCs are the following sectors: Commercial, institutional and households (mainly household heating) and use of solvents and products that have a share of 26,4% and 17.5%, respectively, in the total national emissions of NMVOC. The emissions of NMVOC from the sector agriculture, mainly derived from agricultural land, have a share of 15,3% in total national emissions. Contribution to the total emissions of NMVOC results also from Waste, with a share of 13,9%, 9,4% of the total emissions of NMVOC derive from Road transport, while Fugitive emissions participates with a share of 9,2%.

Diagram 2. Emissions of NMVOCs by sectors in 2016

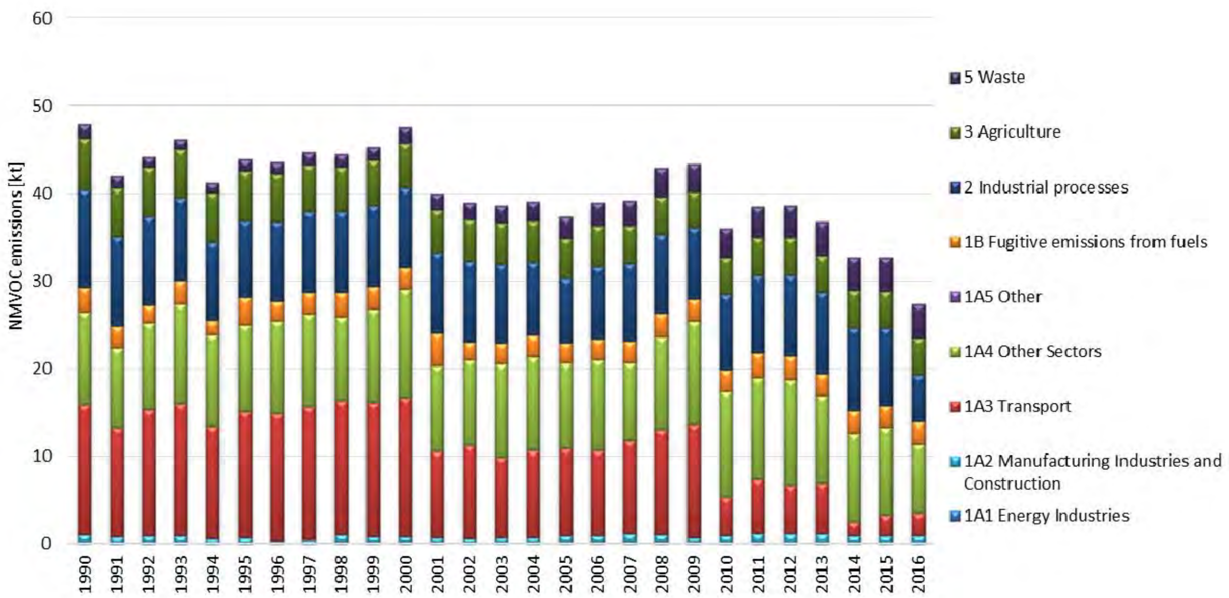


Policy specific issue

Which different NFR categories contribute to non-methane volatile organic compounds emissions?

The main sources of emissions in 2016 of NMVOCs are NFR categories of sources 1A4 - Other sectors (mainly household heating), 2 - Industrial processes and use of products (mainly solvent use), 3 - Agriculture, 5 - Waste, 1A3 - Transport and 1B - Fugitive emissions (mainly from extraction and distribution fossil fuels and geothermal energy) with shares of 29%, 20%, 15%, 14% and 9% respectively. In the period 2011-2013, the annual emissions of NMVOC by sectors are approximately the same, so that in 2014 and 2015 their emission reduction is registered due to the reduction of NMVOC emissions from the NFR categories 2 - Industrial processes and 1A4 - Other sectors (mainly household heating). Another significant reduction in NMVOC emissions is in 2016, primarily due to the further reduction of emissions from the NFR categories 2 - Industrial processes and 1A4 - Other sectors.

Diagram 3. Emissions of NMVOCs by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/..

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR sectors of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking, published in 2009, 2013 and 2016. The Guidebook contains emission factors which have been used in the calculations, except for the energy sector where calculations were made by use of country specific factors or use of data from the measurements completed in the period 2008-2016, for this polluting substance and for the NFR category 1A1a, concerning electricity and heat producing plants.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level. At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, a program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo were prepared in the Twining project “Further strengthening of the capacities for effective implementation of the acquis in the field of air quality”, which were adopted by the councils of the municipalities.

Targets

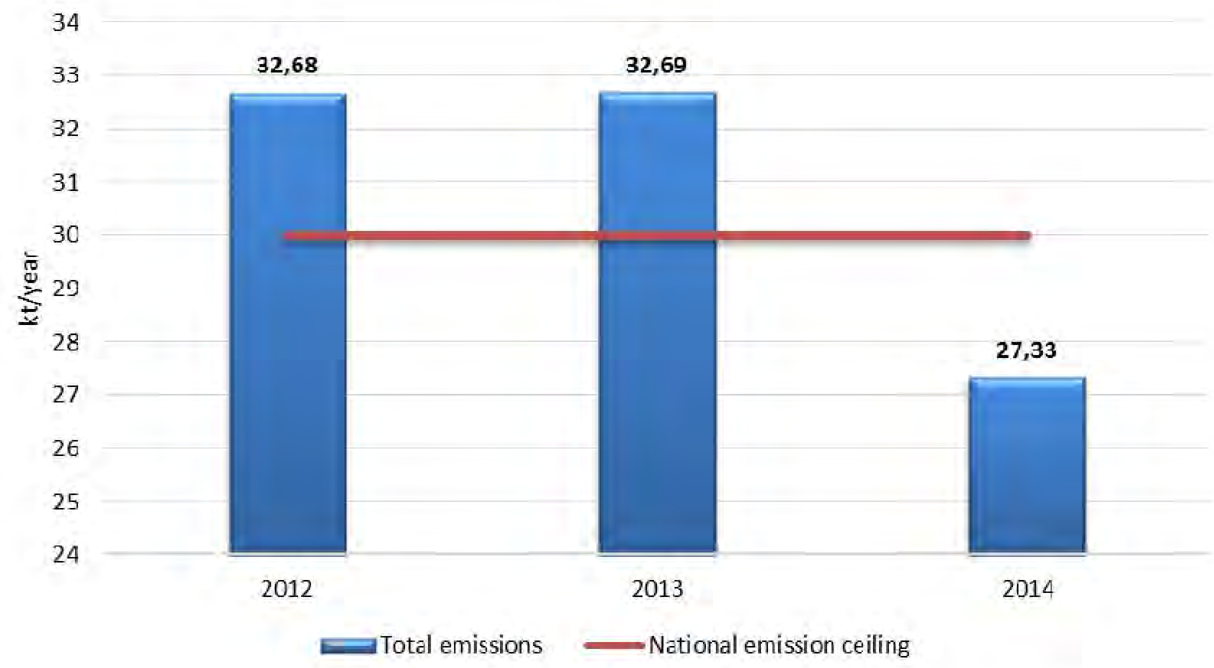
Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Also, in accordance with Directive 2001/81/EC, as well as Gothenburg Protocol, the ceilings of the amounts of emissions have been set at the level of the Republic of Macedonia for 2010 that shall not be exceeded at the annual level of 2010. The Executive Body of the Convention on Long-Range Transboundary Air Pollution, upon submission of the values of national ceilings in order to enrol the Republic of Macedonia in Annex II of the Gothenburg Protocol requested correction of the values considering the reported data on air emissions of the pollutants sulfur dioxide and ammonia at national level. Changes in the values of these pollutants were incorporated in the Rulebook amending the Rulebook on upper limits – emission ceilings of pollutants for the purpose of setting projections for certain period concerning reduction of the quantities of pollutant emissions at annual level published in July 2014. In the last three years the national upper limit-ceiling for NMVOCs was exceeded in 2014 and 2015.

Diagram 4. Comparison of the national emissions of NMVOCs in the period 2014-2016 with the upper limit-ceiling for 2010



Older date protocol on non-methane volatile organic compounds also sets targets for this polluting substance, namely: Protocol to 1979 UNECE Convention on Long-Range Transboundary Air Pollution, concerning control of emissions of non-methane volatile organic compounds or their transboundary transfer, under which the national emissions of non-methane volatile organic compounds should be reduced by 30% relative to 1988 (this target was not achieved in 2014) which means that the country is compliant with this Protocol.

With reference to the targets-projections of NMVOCs for 2020 set in the Programme for gradual reduction of emissions of certain polluting substances at the level of the Republic of Macedonia, with reduction projections from 2010 to 2020, we should point out that those do not take into account recalculations for the emissions made for this polluting substance in the follow-up years and therefore review of projections for 2020 has been envisaged and those have not been taken into account in this report.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In 2010, all 8 Protocols to the Convention on Long-Range Transboundary Air Pollution – CLRTAP were ratified. Owing to the requirement for amendment of the annexes with regard to emissions in the baseline year (1990) and national emission ceilings for 2010, the Gothenburg Protocol and 1995 Protocol on sulphur entered into force for the Republic of Macedonia in 2014 upon adoption of the values set in Annex II of these Protocols. In relation to the obligations for calculation of emissions of non-methane volatile organic compounds (NMVOCs), the following protocols or international ratified agreements are of relevance:

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning concerning control of emissions of non-methane volatile organic compounds or their transboundary transfer. The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 24/2010);

Protocol to 1979 Convention on Long-Range Transboundary Air Pollution concerning reduction of acidification, eutrophication and ground ozone (Gothenburg, 1999). The Protocol was ratified by the Law on Ratification (Official Gazette of RM no. 135/2010), while Republic of Macedonia became an equal member of the protocol in 2014

Reporting obligation

- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 050	**Emissions of the main polluting substances – non-methane volatile organic compounds (NMVOCs)**	EEA UNECE	CSI 040, APE 010 A1/3	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 050

EMMISSION OF THE MAIN POLLUTING SUBSTANCES - EMISSION OF AMMONIA

Definition

The indicator tracks the trends in ammonia.

The indicator also provides information on emissions by subsectors in the key sector - agriculture.

Units

kt (kilotons per year)

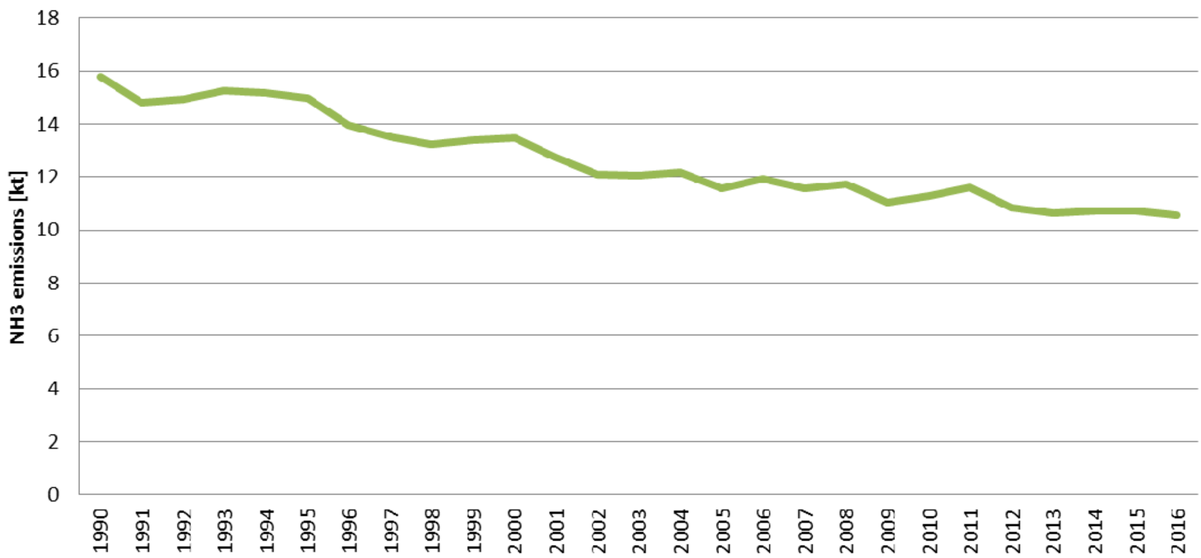
Key policy issue

What progress has been made in overall reduction of emissions of polluting substance ammonia in the Republic of Macedonia?

In 1990, the total national emissions of NH_3 amounted to 15,8 kt. For comparison in 2016, emissions are reduced by 39% and they are about 10,5 kt. The reasons for the declining trend of emissions of this pollutant lie mainly in the reduction of emissions from agriculture (management of fertilizers), which is associated with the cultivation of smaller number of livestock. From 2015 to 2016, emissions are reduced by 9%.

The Diagram below shows the annual trend in ammonia emissions for the period 1990 to 2016.

Diagram 1. Trend in ammonia emissions



Assessment

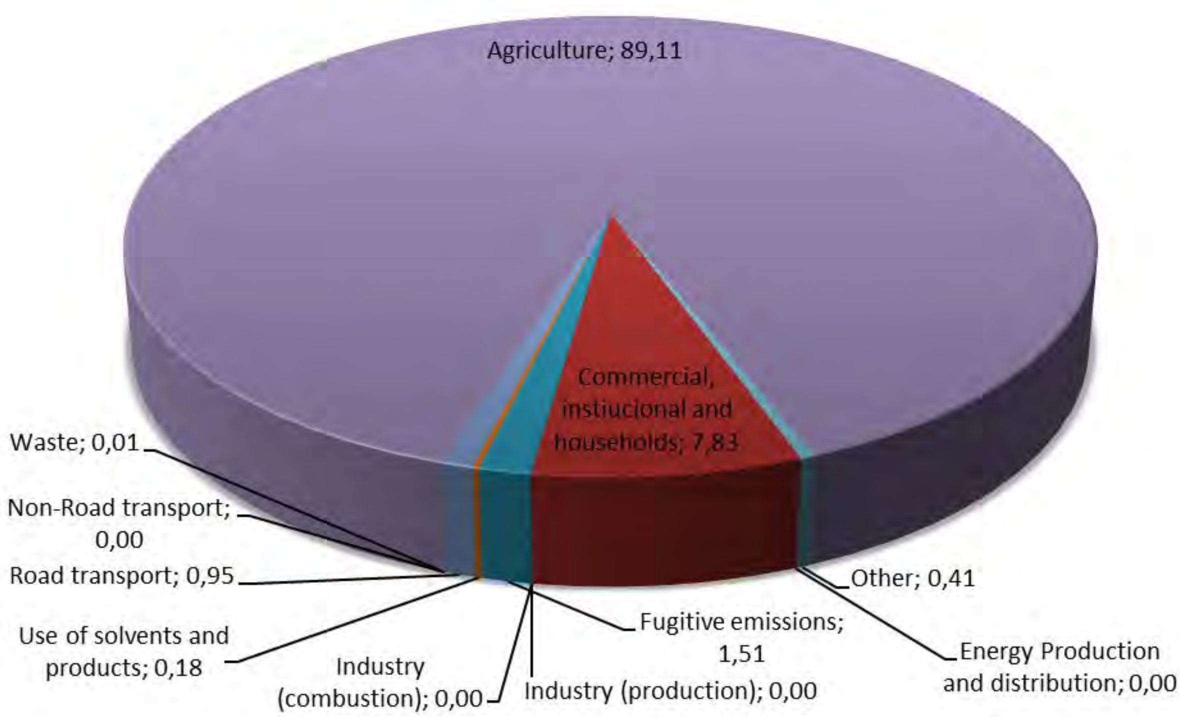
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 an Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

In the total emissions of ammonia in 2016, the sector Agriculture contributes with share of 89%, followed by the sector Commercial, institutional and households with 7,8% and the sector Fugitive emissions with share of 1,5% .

Diagram 2. Emissions of NH_3 by sectors in 2016



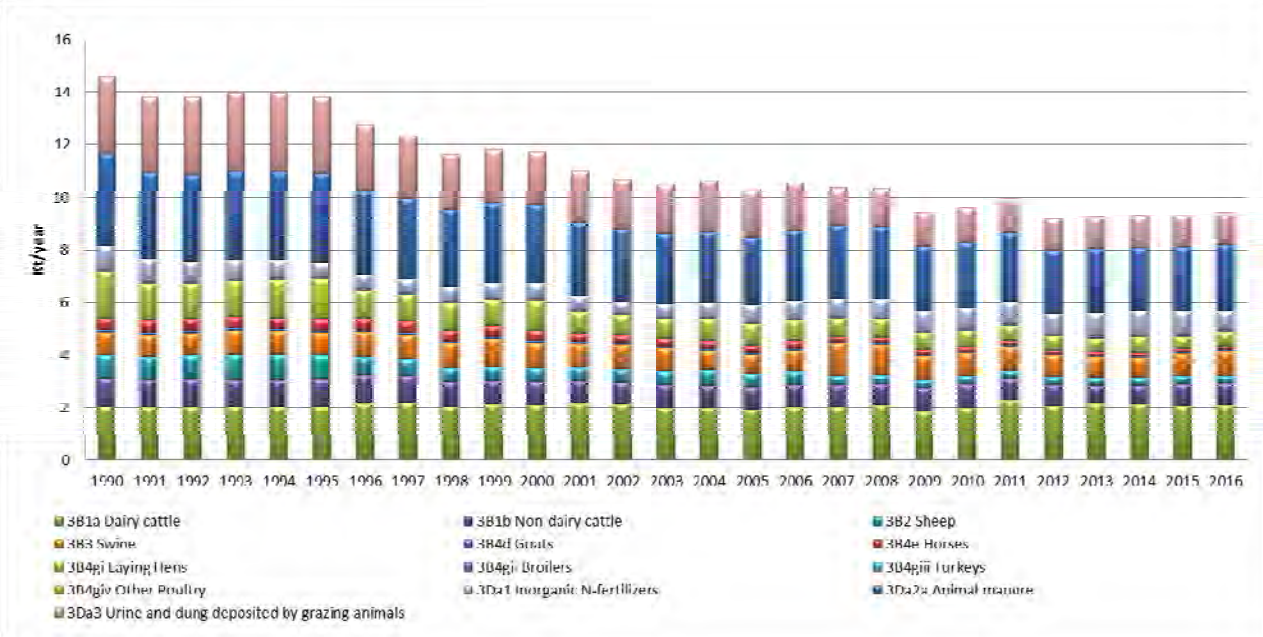
Policy specific issue

Which different NFR categories contribute to ammonia emissions?

Agriculture is the key NFR category for ammonia emissions. Therefore, Diagram 3 shows emissions from the agricultural category by subcategories.

Emissions from livestock breeding originate from urea decomposition in the feces of animals and decomposition of urea in poultry. Ammonia emissions depend on the species of animals, their age, manner of breeding, and waste management and disposal. The main reason for emission reduction is the reduction in the number of bred animals, especially manifested among poultry, sheep, goats and horses owing to declined interest in dealing with livestock breeding activity and increased internal village to town migration of the population.

Diagram 3. Emissions of NH_3 from NFR category agriculture by subcategories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations of the emission of this pollutant are in line with the Guidebooks of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016. The Guidebook contains emission factors which have been used in the calculations, except for the energy sector where calculations were made by the use of country specific factors or use of data from the measurements completed in the period 2008-2016 for this polluting substance and for the sector 1A1a concerning electricity and heat producing plants.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared has been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level concerning reduction of emissions from the agricultural sector, which has the highest share in ammonia emissions.

In 2007, the Government of the Republic of Macedonia adopted the National Strategy for Agriculture and Rural Development, establishing the principles of the policies for support and measures adapted to expected changes in legislation, institutions and control systems. The Strategy defines strategic goal as basis for development of agricultural and rural sector in the Republic of Macedonia in the period from 2007 to 2013 reading: "to strengthen agriculture to be competitive on integrated regional markets of the European Union and Southeastern Europe through measures aimed at enhancing the efficiency of agricultural production, processing and placement and building of relevant effective public and private institutions; to improve revenues on farm; ensure that consumers have access to safe, healthy food; to optimize the benefit of limited soil, forest and water resources in environmentally favourable manner; and build vital rural communities through sustainable rural development". In 2007, the Government of the Republic of Macedonia adopted the National Strategy for Organic Agricultural Production (2008 - 2011) setting the grounds for introduction and development of organic agricultural production. This Strategy is accompanied with Action Plan of measures and activities for strategy implementation, which have been to a great extent implemented.

National Plan for Organic Production 2013-2020 was adopted. The purpose of the National Plan for Organic Production for the period 2013-2020 is the instrument providing basis for further development of the organic production in the Republic of Macedonia. This National Plan also sets the directions, activities and measures, namely policies to be implemented by MAFWE during the period 2013 -2020 concerning future development of organic production in the Republic of Macedonia and also provides basis for planning and implementation of financial support in this sector.

National Strategy for Agriculture and Rural Development for the period 2014-2020 was adopted. It reflects the state in the Republic of Macedonia and the interest of the country in agriculture and rural areas development through improvement of current policies and enhancement in their efficiency.

The Law on Agricultural Land stipulates measures for agricultural land fertility improvement through undertaking agritechnical measures, and one of these measures is application of mineral fertilizers. It is stated that protection of agricultural land against pollution and infection is carried out by prohibition, restriction and prevention of direct inlet of harmful matters in soil, water and air and undertaking of other measures to maintain and improve productivity. It is specified that protection of agricultural land from contamination and infection are subject of application of regulations for environment and nature protection and improvement.

The Law on Fertilizers regulates the manner of fertilizers use. This is especially important for ammonia emissions reduction from the use of nitrogen artificial; fertilizers.

As far as ammonia emissions from traffic are concerned, in accordance with the Strategy for Energy, renewal of vehicle fleet has been envisaged with expectation for use of vehicles with secondary catalysts with lower NH_3 emission levels in future.

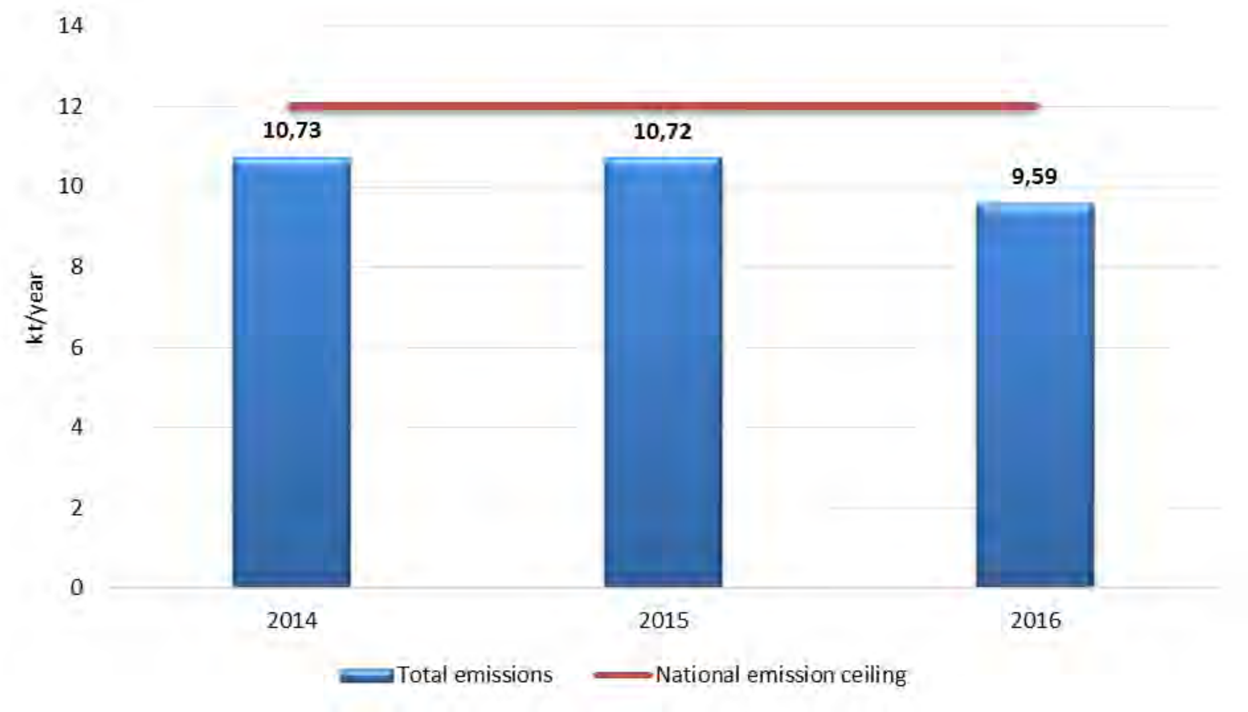
Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guideline for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.
Also, in accordance with Directive 2001/81/EC, as well as Gothenburg Protocol, the ceilings of the amounts of emissions have been set at the level of the Republic of Macedonia for 2010 that shall not be exceeded at the annual level of 2010. The Executive Body of the Convention on Long-Range Transboundary Air Pollution, upon submission of the values of national ceilings in order to enrol the Republic of Macedonia in Annex II of the Gothenburg Protocol requested correction of the values considering the reported data on air emissions of the pollutants sulfur dioxide and ammonia at national level. Changes in the values of these pollutants were incorporated in the Rulebook amending the Rulebook on upper limits – emission ceilings of pollutants for the purpose of setting projections for certain period concerning reduction of the quantities of pollutant emissions at annual level published in July 2014. The national upper limits – ceiling for NH_3 of 12 kt has not been exceeded for the last three years.

Diagram 4. National NH_3 emissions for the period 2014-2016 compare to the national emission ceiling



Regarding the ammonia-targeted 2020 projections set out in the Program for the gradual reduction of emissions of certain pollutants in the Republic of Macedonia, with projections for the reduction from 2010 to 2020, it should be noted that the emissions have not been taken into account from the use of N-fertilizers, due to which a revision of the projections is anticipated and according to the improvement and completion of the inventory for this pollutant.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

With reference to air standards transposed in part of the mentioned rulebooks, all ISO and CEN standards in the area of air emissions and air quality were adopted by means of endorsement method.

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

In 2007, the Law on Agriculture and Rural Development was adopted as basic horizontal act regulating areas of planning and implementation of agricultural and rural development policy, as well as other aspects of agricultural and rural development policy.

Amendments of the Law on Agriculture and Rural Development in 2010 further harmonized and integrated the principles of programming, monitoring and implementation of the policy of the Republic of Macedonia for agriculture and rural development with the European Common Agricultural Policy.

The Law includes provisions for programming and implementing the policy of state aid, as well as provisions for application of the measures for rural development.

The framework of organic agricultural production is defined in the Law on Organic Agricultural Production. A number of bylaws were adopted under this Law in 2010, regulating the areas of production, processing, labeling of organic products, authorization and certification, as well as control systems. Also, the Law on Agriculture Development Fostering, the Law on Environment and the Law on Nature Protection are of relevance.

The above documents provide basis for achievement of the targets for emission reduction of pollutants that are ozone precursors, accompanied with reduced degradation of environment and negative effects on human health.

Reporting obligation

- Reporting obligation towards UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 050	**Emissions of the main polluting substances – ammonia (NH_3)**	APE 003	Ammonia (NH_3) emissions	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 050

EMMISSION OF THE MAIN POLLUTING SUBSTANCES - CARBON MONOXIDE (CO)

Definition

The indicator tracks the trends in carbon monoxide (CO).

Units

kt (kilotons per year)

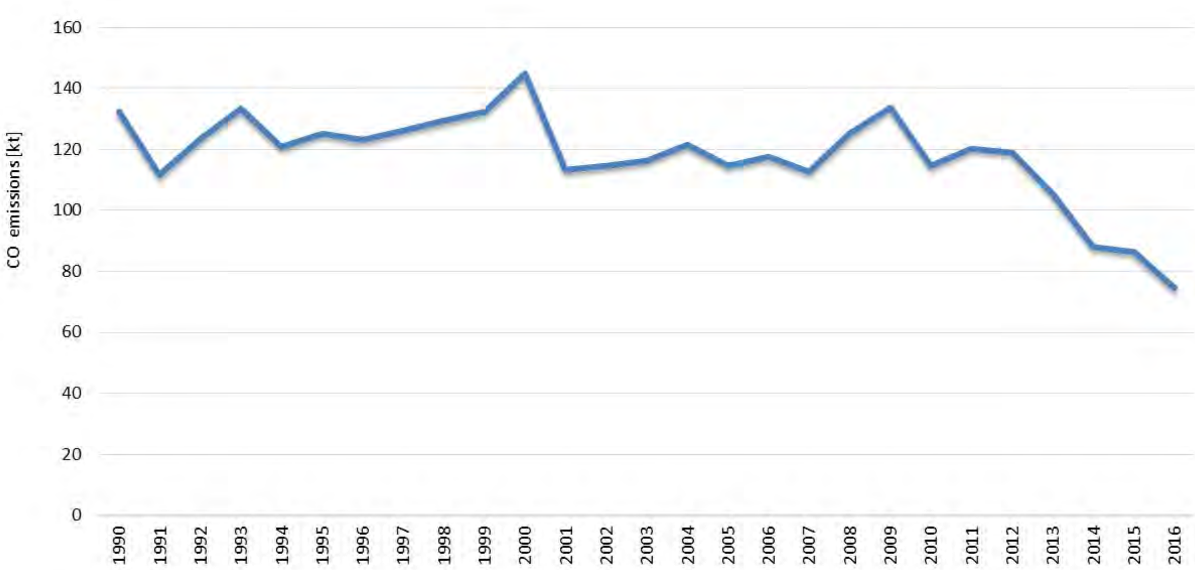
Key policy issue

What progress has been made in overall reduction of emissions of carbon monoxide in the Republic of Macedonia?

In 1990, the total national emissions of CO amounted to 132,4 kt. For comparison, in 2016 emissions are reduced by 44% to amount 74 kt. The reduction of CO emissions in 2001 is also noticeable compared to 2000. From 2001 to 2012 the trend does not show significant changes except certain smaller fluctuations. Significant reduction of CO emissions is recorded in 2013 and a further reduction in 2014 and 2015. Compared to 2015, a further significant downward trend is observed in 2016 by 14%.

The Diagram below shows annual trend in the emissions of carbon monoxide for the period 1990 to 2016.

Diagram 1.Trend in emissions of carbon monoxide (CO)



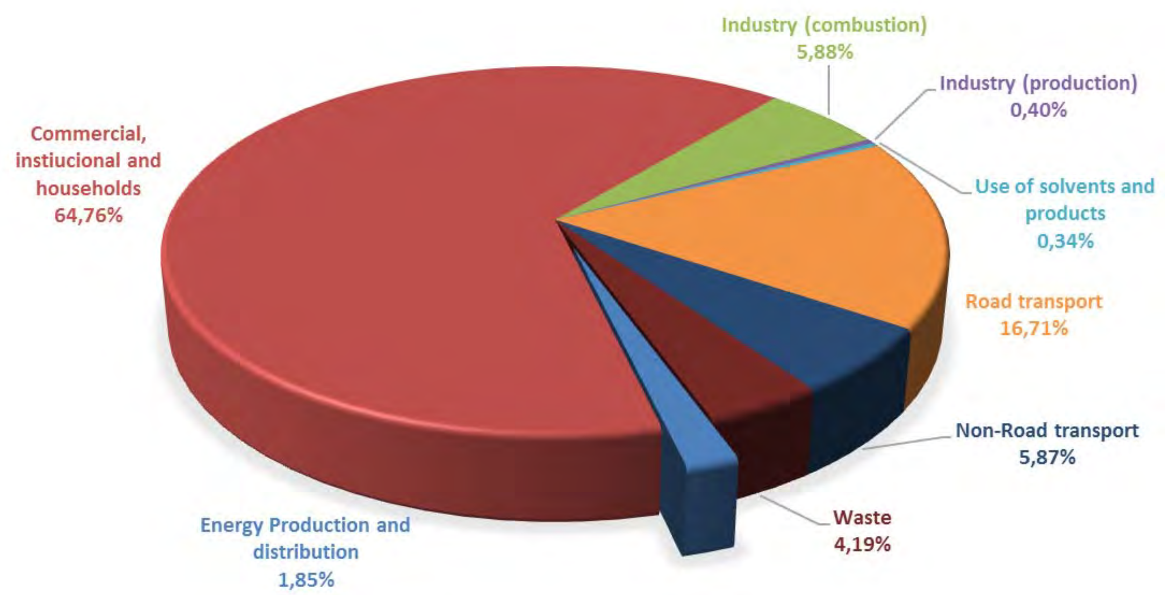
Assessment

Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 an Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants. The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The largest source of emissions of CO is the sector Commercial, institutional and household with a share of 64.8%. Then follows the sector Road transport with a share of 16.7%, while the sectors Industry (Combustion), Non-road traffic and Waste participate with share of 5.9%, 5.9% and 4.2%, respectively, in the total CO emissions . The remaining sectors are insignificant sources of carbon monoxide.

Diagram 2. Emissions of CO by sectors in 2016

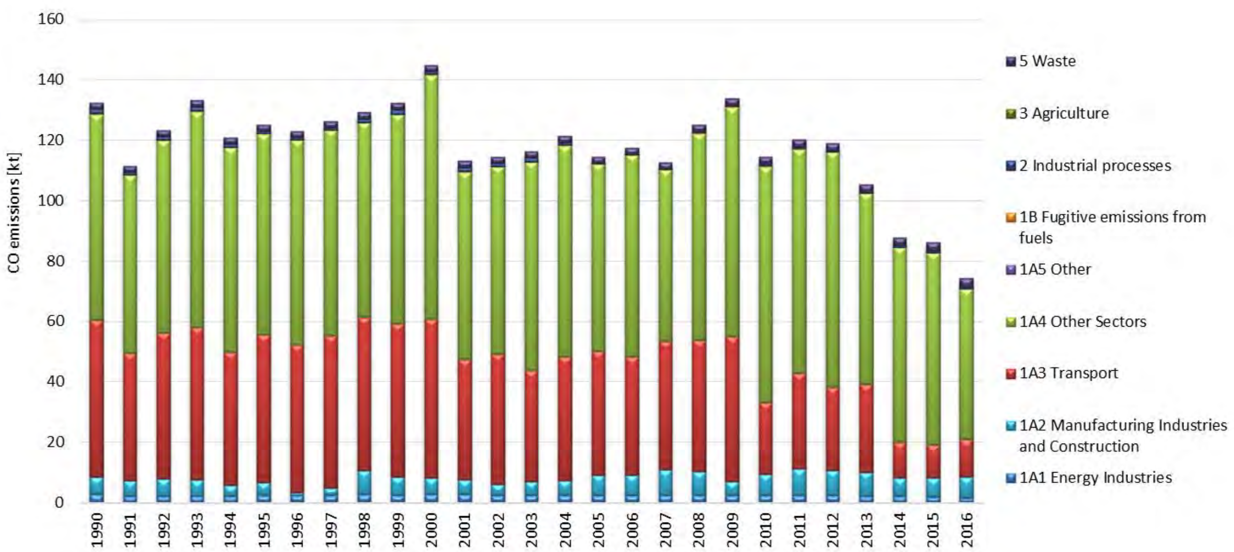


Policy specific issue

Which different NFR categories contribute to carbon monoxide emissions?

A significant proportion (part) of all CO emissions come mainly from the NFR category 1A4 - Other sectors (primarily household heating) with a share of 67%, while the NFR categories 1A3 - Transport (road transport) and 1A2 - Combustion in manufacturing industries and construction are participating with share of 17% and 9%, respectively, in total CO. The graph below shows a reduction in total CO emissions in 2001 compared to 2000, attributable to the lower fuel consumption in the NFR category 1A4 - Other sectors (primarily household heating). The reason for emission reduction in the period 2010-2013 compared to the previous years, is mainly found in the reduced emissions from the sector 1A3 - Transport (road transport). From 2014 to 2016, there is further reduction of total CO emissions, mainly due to reduction of emissions from NFR categories 1A4 - Other sectors (primarily household heating) and 1A3 - Transport (road transport).

Diagram 3. Emissions of CO by NFR categories per year



Data coverage: **excel**

Sources of data:

The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/..

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR sectors of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by SNAP.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in

2009, 2013 and 2016. The Guidebook contains emission factors which have been used in the calculations, except for the energy sector where calculations were made by use of country specific factors or use of data from the measurements completed in the period 2008-2016 for this polluting substance, for the sector 1A1a concerning electricity and heat producing plants.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-20136).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

In relation to this polluting substance, the limit values for air quality are set in a bylaw in compliance with the Framework Air Directive 2008/50/EC, while limit values for air emissions are set in a bylaw in compliance with Directives 2001/80/EC, 1999/13/EC and 2000/76/EC.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to this polluting substance, the limit values and thresholds of assessment compliance with the Framework Air Directive 2008/50/EC are prescribed in the following bylaws: Decree on the limit values for the levels and types of polluting substances in the ambient air and alert thresholds, deadlines for limit values achievement, margines of tolerance for the limit value, target value ands and long-term objectives and Rulebook on criteria, methods and procedures for ambient air quality assessment.

The limit values for air emissions for certain technological processes are set in the Rulebook on the limit values of permissible levels of emissions and types of polluting substances in waste gases and steams released from stationary sources in the air.

Reporting obligation

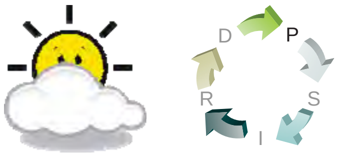
- Reporting obligations towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 050	**Emissions of the main polluting substances – carbon monoxide (CO)**	UNECE	A1/5 (Carbon monoxide emissions (total stationary and mobile sources)) A1/2	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 050

EMMISSION OF PARTICULATE MATTER – TOTAL SUSPENDED PARTICLES (TSP)



Definition

The indicator tracks the trends in total suspended particles (TSP).

Units

kt (kilotons per year)

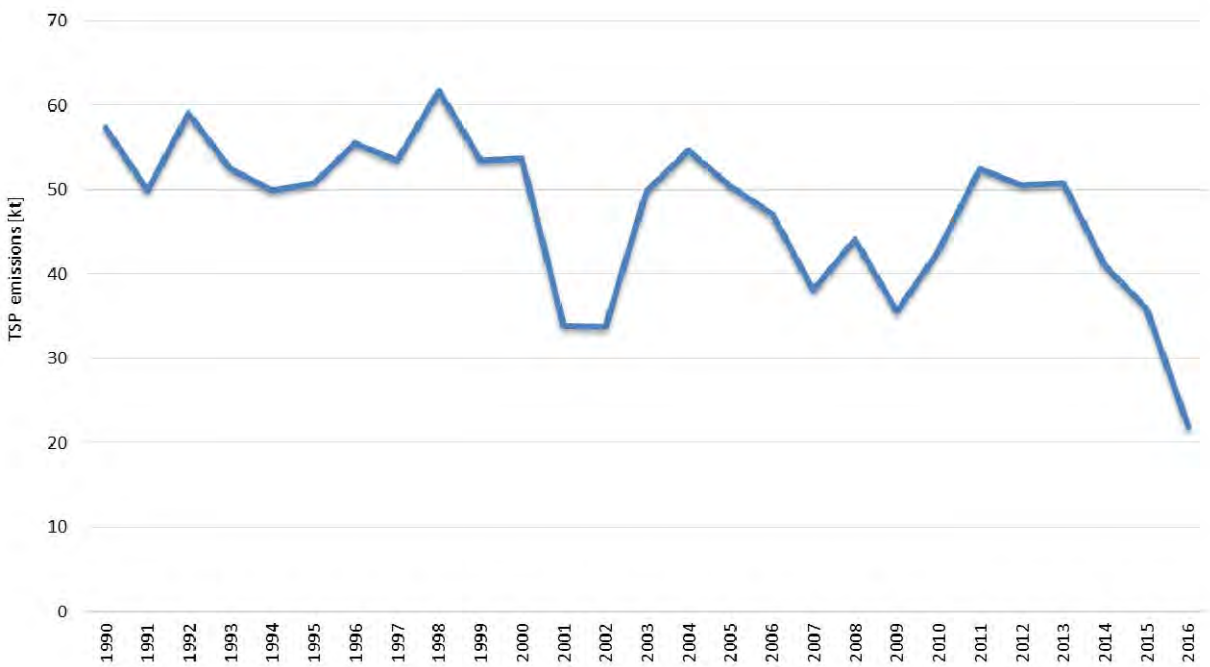
Key policy issue

What progress has been made in overall reduction of emissions of total suspended particles in the Republic of Macedonia?

In 1990 total national emissions of TSP were 57.4 kt. By comparison, in 2016 emissions are reduced by 62% and amount to 22 kt. A big difference in TSP emissions is in 2016 in relation to 2015 where the reduction is 39%. The main reason for this decrease (2016 in relation to 2015) was due to lower emissions from industrial processes (ferroalloy production), 54%, and from energy production 64%. .

The Diagram below shows annual trend in the emissions of total suspended particles (TSP) for the period 1990 to 2016.

Diagram 1.Trend in emissions of total suspended particles (TSP)



Assessment

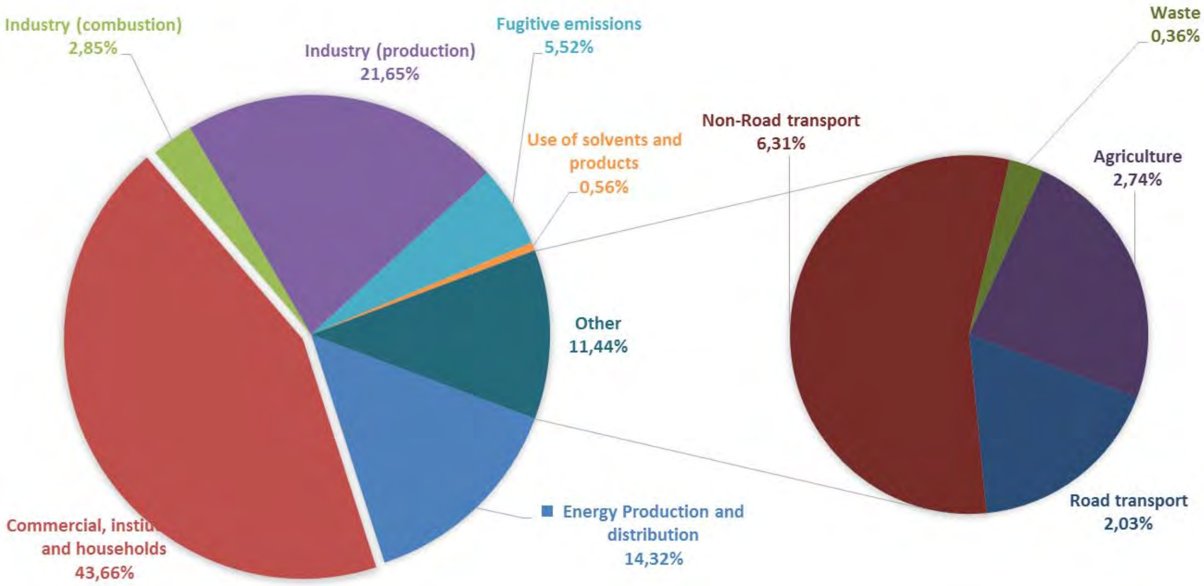
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main sources of emissions of TSP in 2016 are sectors 2 – Commercial, Institutional and household, 4 – Industry (production) (mainly 2C2 Ferroalloy production) and 1 – Energy production and distribution with shares of 43,7%, 21,7% and 14,3%, respectively.

Diagram 2. Emissions of total suspended particles (TSP) by SNAP per year in 2016



Policy specific issue

Which different NFR categories contribute to TSP emissions?

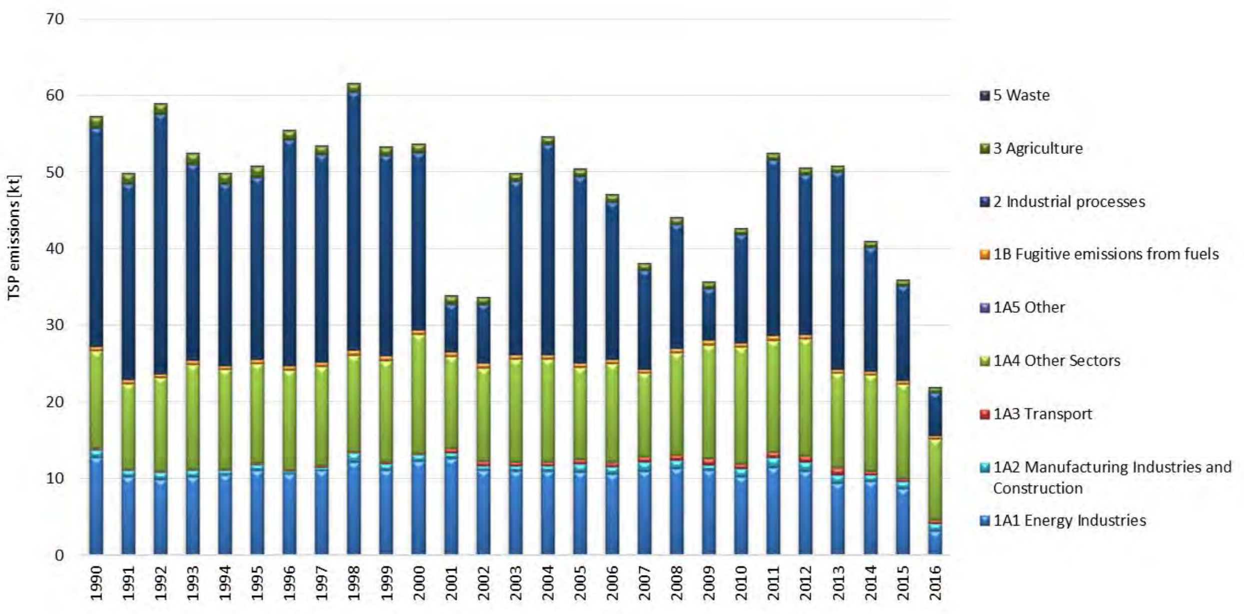
Main sources of TSP emissions in 2016 are the NFR categories 1A4 - Other sectors (primarily household heating), 2 - Industrial processes (mainly 2C2 Ferroalloy production) and 1A1 Energy industries with shares of 48%, 26% and 14%, respectively, in the total emissions of TSP.

NFR sectors of categories 1B - Fugitive emissions from fuels, 3 - Agriculture and 5 - Waste are insignificant sources of emissions of TSP.

For the years 2001, 2002 and 2009, emissions are very low, compared to other years. The reasons for this are that emissions from the production of ferroalloys are very low due to the fact that in these years the ferrosilicon production company has worked with limited capacity and the quantities of ferrosilicon produced are 80-90% lower compared to the production in 2014.

From 2013 to 2014, emissions again decreased by 23%, due to lower emissions from ferroalloy production, as well as reduced household heating emissions. A significant reduction in emissions in 2016 compared to 2015 occurs mainly due to the large reduction of TSP emissions from NFR categories 2 - Industrial processes (mainly 2C2 Ferroalloys production), due to the reduced capacity in the operation of the ferrosilicon production plant, and 1A1 - Energy industries.

Diagram 3. Emissions of total suspended particles (TSP) by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, Guidebook of 2013 and Guidebook of 2016. The Guidebook contains emission factors which have been used in the calculations, except for the energy sector where calculations were made by use of country specific factors or use of data from the measurements completed in the period 2008-2016 for this polluting substance for the NFR category 1A1a concerning electricity and heat producing plants.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola,. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project “Further strengthening the capacities for effective implementation of the acquis in the field of air quality”, which were adopted by the councils of the municipalitieswhich should be finalized at the end of 2016. Additionally, the municipality of Veles also has prepared and adopted air quality plan in November 2017. National plan for reduction pollution for sulphur dioxide (SO_2), nitrogen oxides (NOx) and dust (TSP) for existing Large Combustion Plant (LCP) has been prepared. The plan was approved by the Energy Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year. With regard to this polluting substance, air emission limit values are set in the bylaw compliant with the following Directives: 2001/80/EC, 1999/13/EC and 2000/76/EC.
As already mentioned, a National Emission Reduction Plan (NERP) has been adopted.
REK Bitola is already undertaking activities for finding funds to start the desulfurization process, which would also reduce the TSP emissions.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc. The most relevant bylaw for this polluting substance is the Rulebook on the limit values for permissible levels of emission and types of polluting substances in waste gases and steams released from stationary sources in the air, which sets the limit values of air emissions from different technological processes.

Reporting obligation

- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 061	**Emissions of particulate matter – total suspended particles (TSP)**	UNECE	A1/12	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 061

EMMISSION OF PARTICULATE MATTER – PARTICULATE MATTER (PM10) HAVING DIAMETER OF 10 MICROMETERS OR LESS

Definition

The indicator tracks the trends in emissions of particulate matter having diameter of 10 μm or less (PM_{10}).

Units

kt (kilotons per year)

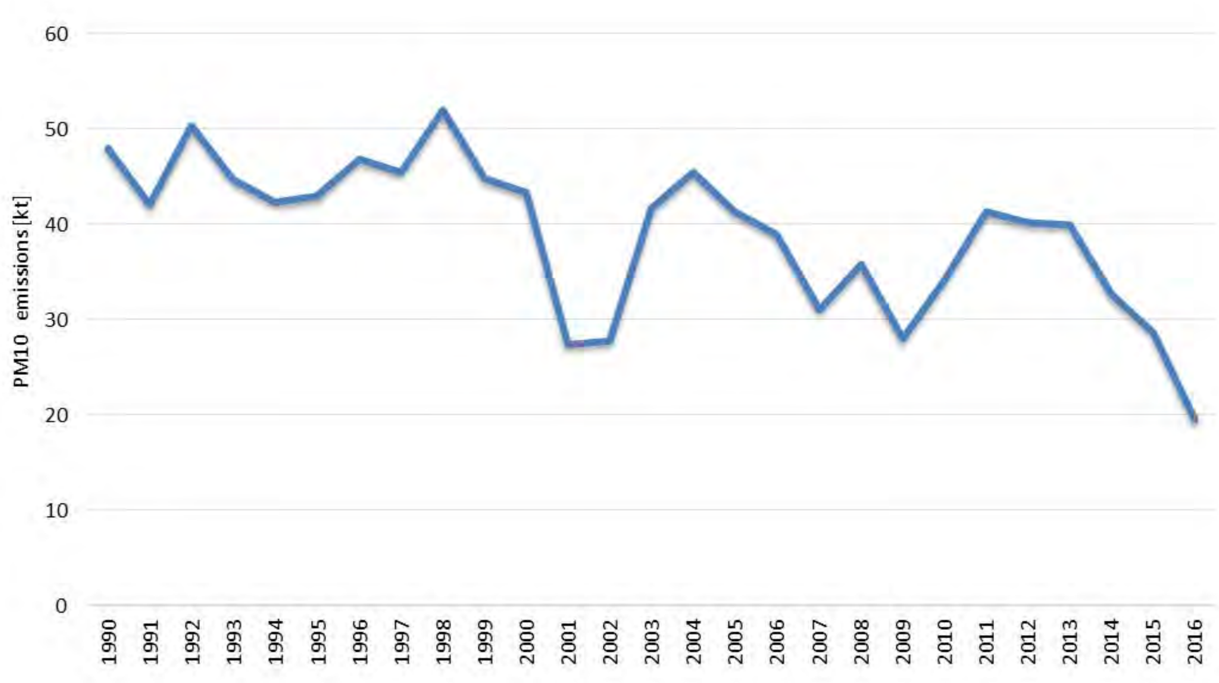
Key policy issue

What progress has been made in overall reduction of emissions of particulate matter having diameter of 10 μm or less (PM10) in the Republic of Macedonia?

In 1990 total national emissions of PM10 amounted to 48 kt. For comparison, the emissions in 2016 are significantly reduced by 59% at the level of 19,5 kt. The main reason for the decrease is due to lower emissions from industrial processes (ferroalloy production), Energy industry and Other sectors, where the emission reduction is with a share of 81%, 75% and 25%, respectively, compared to 1990.

The Diagram below shows annual trend in PM10 emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of particulate matters having diameter of 10 μm or less (PM10)



Assessment

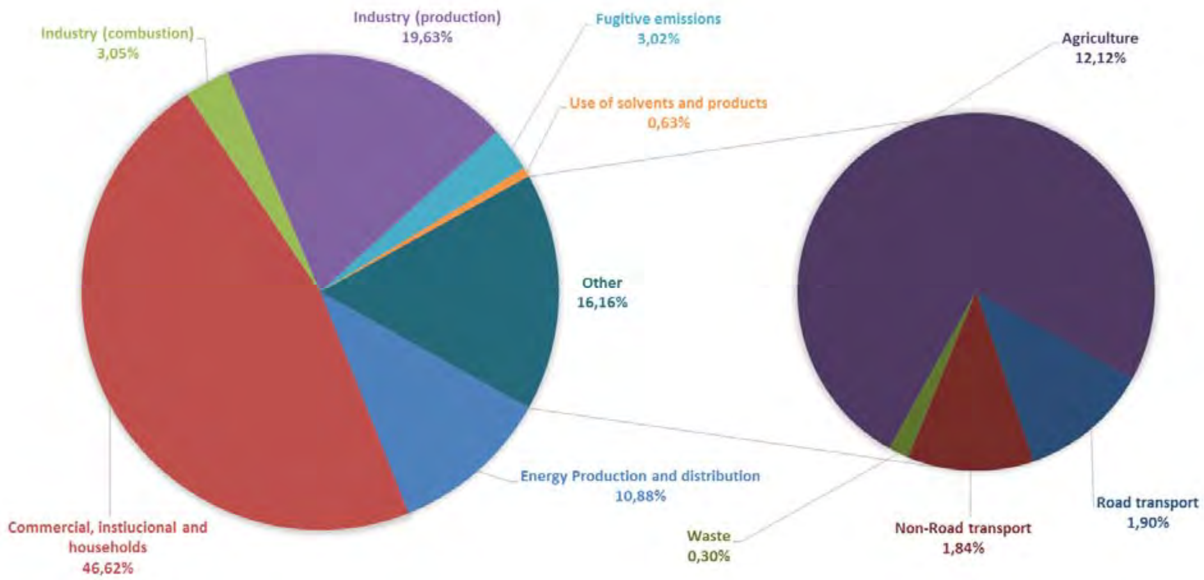
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main sources of emissions of particles up to 10 micrometers PM10 in 2016 are the sectors 2 – Commercial, institutional and household (mainly household heating), 4 - Industry (production) (mainly 2C2 Ferroalloy production), 10 - Agriculture and 1 – Energy production and distribution with shares of 46.6%, 19.6%, 12.1% and 10.9%, respectively.

Diagram 2. Emissions of PM10 by sectors in 2014



Policy specific issue

Which different NFR categories contribute to PM10 emissions?

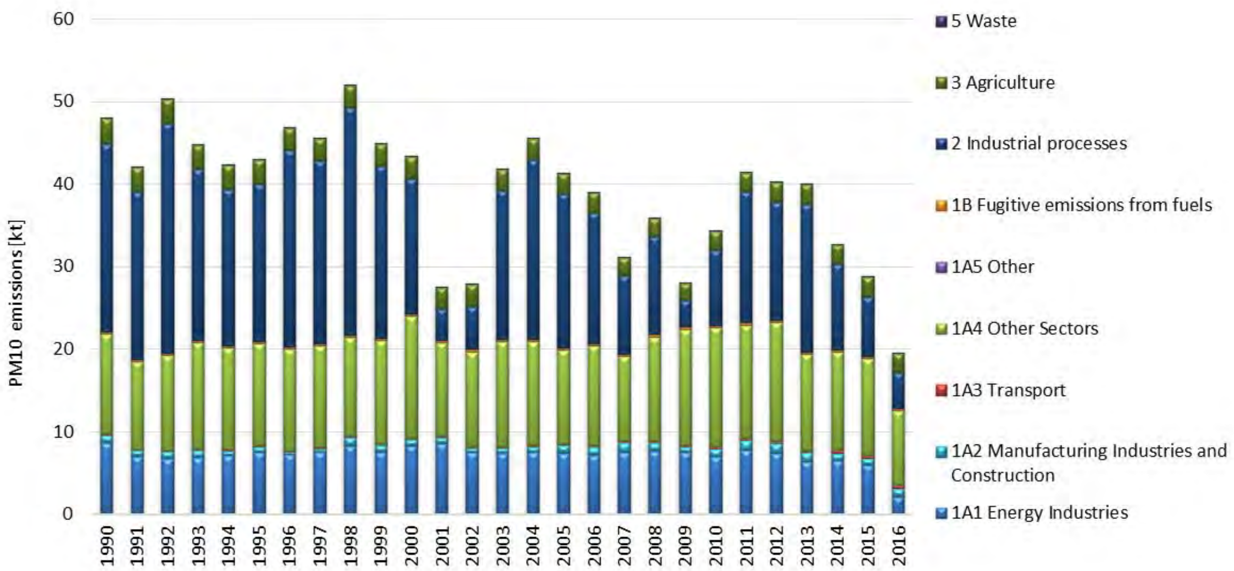
The main sources of PM10 emissions in 2016 are the NFR categories 1A4 - Other sectors (mainly heating in households), 2 - Industrial processes (mostly 2C2 Production of ferroalloys) 3 - Agriculture and 1A1 Energy industries with share of 47%, 22%, 12% and 11%, respectively.

NFR categories 1B - Fugitive emissions and 5 - Waste are insignificant sources of PM10 emission.

Emissions in 2001, 2002 and 2009 were very low compared to other years. The reasons for this are that emissions originating from ferroalloys production were very low owing to the fact that the during these years the ferrosilicon producing company operated with limited capacity and produced quantities of ferrosilicon were by 80-90% lower compared to production in 2014.

From 2013 to 2014, PM10 emissions dropped again by 24% due to reduced emissions from ferroalloys production, as well as reduced emissions from household heating. There is a significant reduction in emissions in 2016 compared to 2015 occurs mainly due to the large reduction of PM10 emissions from the NFR categories 2 - Industrial processes (mainly 2C2 Ferroalloy production) due to the reduced capacity in the operation of the ferrosilicon production plant, and 1A1 - Energy industries.

Diagram 3. Emissions of PM10 by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project "Further strengthening the capacities for effective implementation of the acquis in the field of air quality", ", which were adopted by the councils of the municipalities. National plan for reduction pollution for sulphur dioxide (SO_2), nitrogen oxides (NOx) and dust (TSP) for existing Large Combustion Plant (LCP) has been prepared. The plan was approved by the Energy Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

As already mentioned, a National Emission Reduction Plan (NERP) has been adopted.
REK Bitola is already undertaking activities for finding funds to start the desulfurization process, which would also reduce the PM10 emissions.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc. For this polluting substance, the limit values and thresholds for assessment in accordance with the Framework Air Quality Directive 2008/50EC are specified in the following bylaws: Decree on limit values of the levels and types of polluting substances in ambient air and alert thresholds, deadlines for achievement of limit values, margines of tolerance for limit value,m target values and long-term objectives and Rulebook on the criteria, methods and procedures for ambient air quality assessment.

Reporting obligation

- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 061	**Emissions of particulate matter having diameter of 10 μm or less (PM10)**	UNECE	A1/13	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 061

EMMISION OF PARTICULATE MATTER – PARTICULATE MATTER (PM2.5) HAVING DIAMETER OF 2.5 MICROMETERS OR LESS

Definition

The indicator tracks the trends in emissions of particulate matter having diameter of 2.5 micrometers or less (PM2.5).

Units

kt (kilotons per year)

Key policy issue

What progress has been made in overall reduction of emissions of particulate matters having diameter of 2.5 micrometers or less (PM2.5) in the Republic of Macedonia?

In 1990 total national emissions of PM2.5 amounted to 32,5 kt. For comparison, in 2016 emissions are significantly reduced by 57% and amount to 14 kt. The main reason for the decline is due to lower emissions from Industrial processes (ferroalloy production), Energy industry and Other sectors, where emissions reduction is 82%, 75% and 25%, respectively, compared to 1990.

The Diagram below shows annual trend in PM2.5 emissions for the period 1990 to 2016.

Diagram 1.Trend in PM2.5 emissions

Assessment

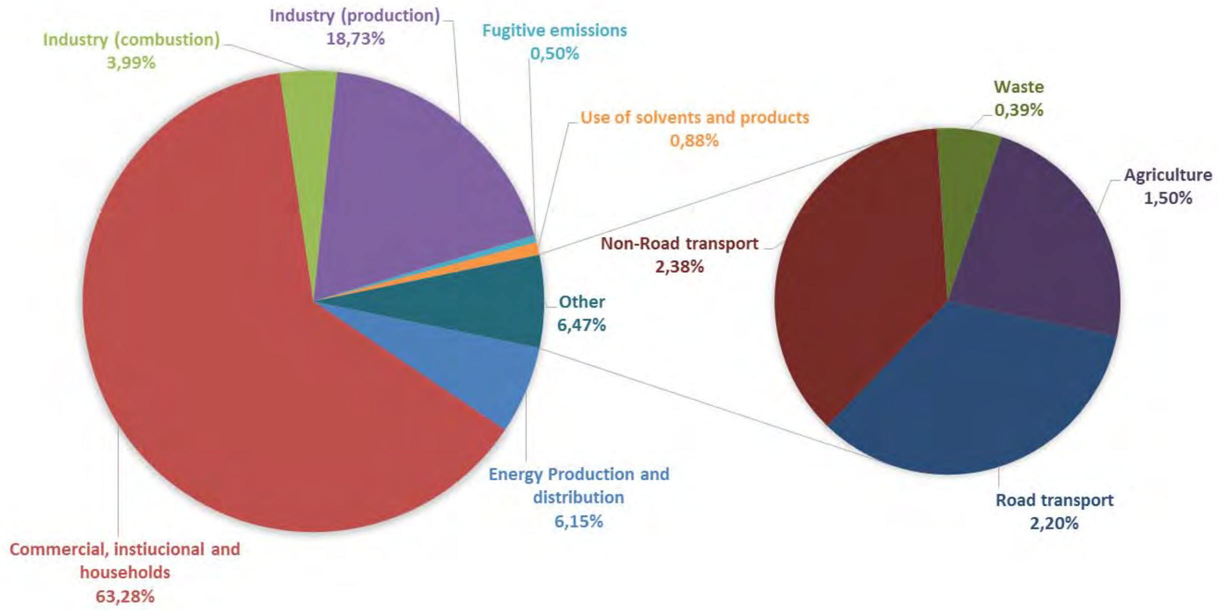
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main sources of emissions of solid particles up to 2,5 micrometers PM2,5 in 2016 are sectors: Commercial, institutional and households (mainly household heating), Industry (production) (mainly 2C2 Ferroalloy production), and Energy production and distribution with shares of 63,3%, 18,7% and 6,1%, respectively.

Diagram 2. Emissions of $PM_{2.5}$ by sectors in 2016



Policy specific issue

Which different NFR categories contribute to PM2.5 emissions?

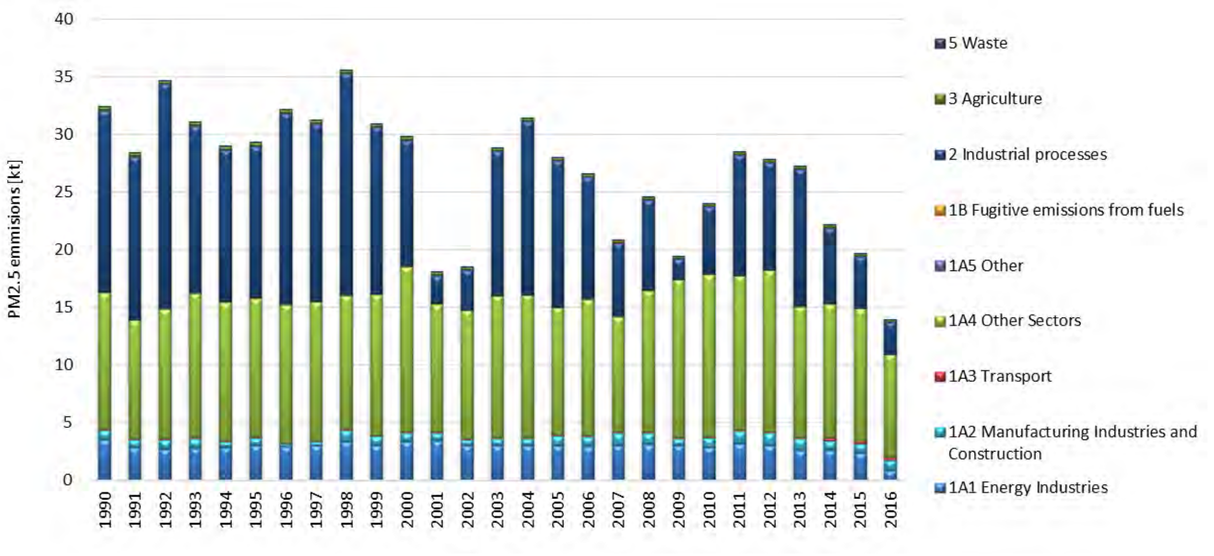
The main sources of PM2.5 emissions are the NFR categories 1A4 - Other sectors (mainly heating in households), 2 - Industrial processes (mostly 2C2 Production of ferroalloys) with shares of 63% and 20% respectively. Smaller sources of PM2.5 emissions are the NFR categories for 2016 1A1 Energy industries and 1A2 Manufacturing Industries and Construction with shares of 6% both.

NFR categories 1B - Fugitive emissions, 3 - Agriculture and 5 - Waste are insignificant sources of PM2.5 emission.

Emissions of PM2.5 in 2001, 2002 and 2009 were very low compared to other years. The reasons for this are that emissions originating from ferroalloys production were very low owing to the fact that the during these years the ferrosilicon producing company operated with limited capacity and produced quantities of ferrosilicon were by 80-90% lower compared to production in 2014.

From 2013 to 2014, emissions dropped again by 25% due to reduced emissions from ferroalloys production, as well as reduced emissions from household heating. There is a significant reduction in emissions in 2016 compared to 2015 with 29% and occurs primarily due to the large reduction of PM2.5 emissions from NFR categories: 2 - Industrial processes and use of products (mainly 2C2 Ferroalloy production), due to the reduced capacity in the operation of the ferrosilicon production plant, 1A1 - Energy industries and 1A4 - Other sectors.

Diagram 3. Emissions of PM2.5 by NFR categories per year



Data coverage: **excel**

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory published in 2009, 2013 and 2016.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project "Further strengthening the capacities for effective implementation of the acquis in the field of air quality", which were adopted by the councils of the municipalitie. National plan for reduction pollution for sulphur dioxide (SO2), nitrogen oxides (NOx) and dust (TSP) for existing Large Combustion Plant (LCP) has been prepared. The plan was approved by the Energy Community and the revised plan was adopted by the Government of the Republic of Macedonia in December 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

This pollutant has not been included in the current National Programme for gradual reduction of emissions by 2020 and it is planned to include it in the forthcoming period in accordance with amendments of Directive 2001/81/EC and amendments of the Gothenburg Protocol.
As already mentioned, a National Emission Reduction Plan (NERP) has been adopted.
REK Bitola is already undertaking activities for finding funds to start the desulfurization process, which would also reduce the PM2.5 emissions.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc. For this polluting substance, the limit values and thresholds for assessment in accordance with the Framework Air Quality Directive 2008/50/EC are specified in the following bylaws: Decree on limit values of the levels and types of polluting substances in ambient air and alert thresholds, deadlines for achievement of limit values, margines of tolerance for limit value, target values and long-term objectives and Rulebook on the criteria, methods and procedures for ambient air quality assessment.

Reporting obligation

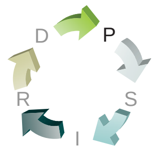
- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 061	**Emissions of particulate matter having diameter of 2.5 micrometers or less ($PM_{2.5}$)**	EEA UNECE	CSI 040, APE 010 A1/14	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 062

EMMISSION OF PERSISTENT ORGANIC POLLUTANTS - Polycyclic aromatic hydrocarbons (PAHs)



Definition

The indicator tracks the trends in Polycyclic aromatic hydrocarbons (PAHs).

Units

t (tons per year)

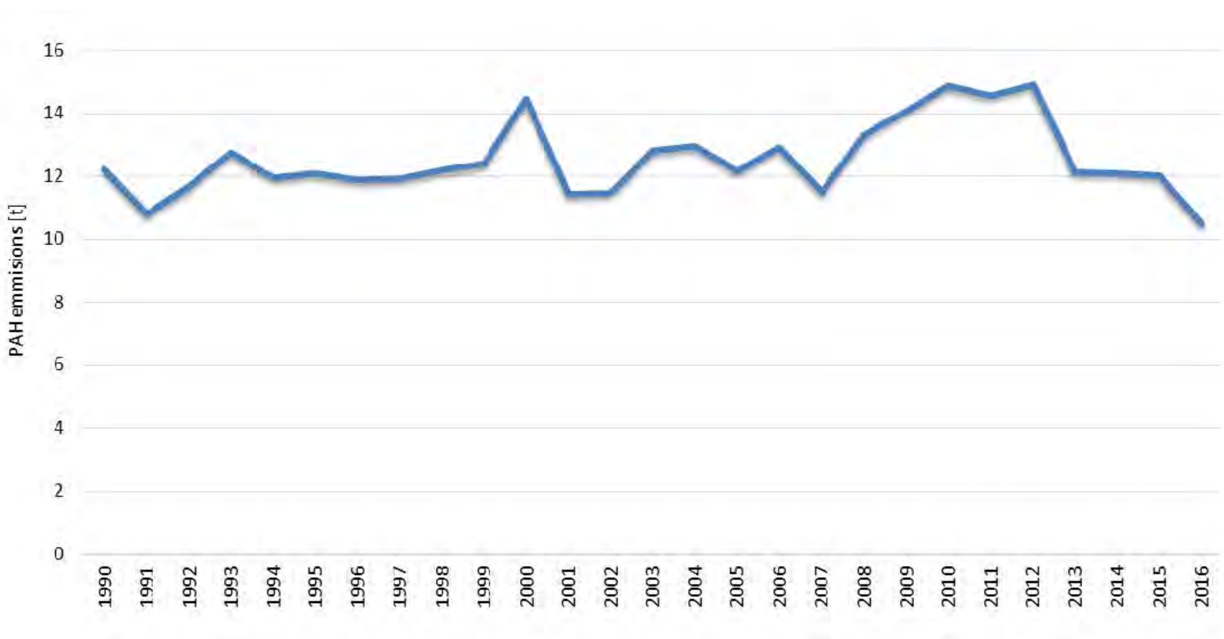
Key policy issue

What progress has been made in overall reduction of emissions of polycyclic aromatic hydrocarbons (PAHs) in the Republic of Macedonia?

The total national emissions of PAHs were 12,2 t in 1990. Since then, emissions have been relatively stable, yet in 2016, there is a certain decrease in emissions relative to the level of 1990, ie 10,5 t due to reduction of emissions from 1A4 Other sectors.

The Diagram below shows annual trend in PAHs emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of polycyclic aromatic hydrocarbons (PAHs)



Assessment

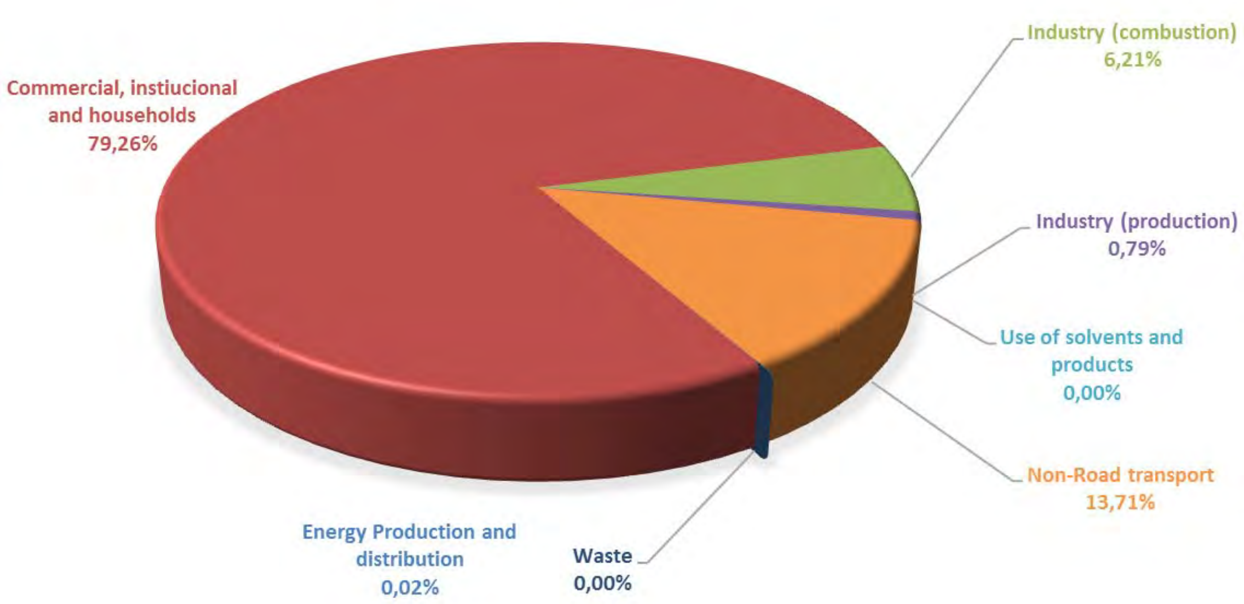
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main source of PAHs emissions in 2016 was the sectors Commercial, institutional and households with a share of 79,3%. Within this sector, the main source contributing to overall national emissions of PAHs in 2016 was the subsector 1A4bi related to household heating, with the highest emissions originating from wood. The sector Non-Road transport contributes with 13,7%, while the sector Industry (combustion) contributes with 6,2% to the overall national emission of PAHs.

Diagram 2. Emissions of PAHs by sectors in 2016



Policy specific issue

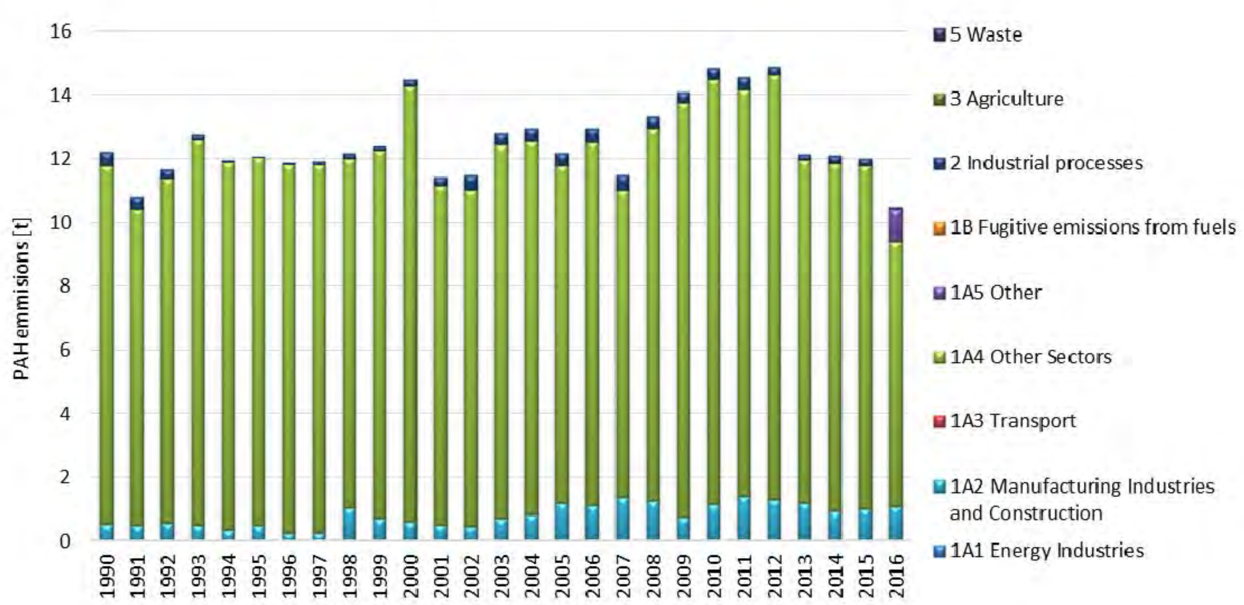
Which different NFR categories contribute to emissions of polycyclic aromatic hydrocarbons (PAHs)?

The main source of PAH emissions in the period 1990-2016 is NFR category 1A4 – Other sectors with a share of 79,2% (92% in 1990). NFR category manufacturing Industries and Construction contributed with 10,4% (4% in 1990) while NFR category 1A5 Other contributes with 9,5% (0% in 1990), to the overall national emissions.

NFR categories 1B - Fugitive emissions and 2 - Industrial processes are insignificant sources of PAHs.

The most significant reductions have been observed in the sector household heating. In the period from 2013 to 2014, overall emissions of PAHs dropped by 13% due to reduced emissions from household heating as a result of the warmer weather and lesser consumption of fuel wood. Also significant reduction of PAHs emissions in 2016 compared to 2015 is recorded in the NFR sector 1A4 - Other sectors of 23%, but also the occurrence of emissions from 1A5 Other.

Diagram 3. Emissions of polycyclic aromatic hydrocarbons (PAHs) by NFR categories per year



Data coverage: **excel**

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP

(United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year. For this polluting substance, limit values of air emissions are set in the bylaw which is compliant with the following directives: 2001/80/EC, 1999/13/EC and 2000/76/EC.

Also, targets – basic obligations for this polluting substance are also set in the Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning persistent organic pollutants, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Under the Protocol, national overall emissions of PAHs in n-2 year (where n is the current year) should not exceed the overall emission calculated for 1990 (taken as baseline year). The Republic of Macedonia is in compliance with this Protocol considering the emissions presented here for 2016. Compared to 1990, emissions of this pollutant have dropped by 14%.

The current National Programme for graduall reduction of emissions by 2020 does not include this polluting substance, but it has been planned to include it in the coming years in parallel with the amendments of Directive 2001/81/EC and amendments to the current Gothenburg Protocol.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

For this polluting substance, the most relevant bylaw is the Rulebook on the limit values for permissible levels of emission and types of polluting substances in waste gases and steams released from stationary sources in the air, which sets the limit values of air emissions from different technological processes.

In relation to the obligations for calculation of the emissions of polycyclic aromatic hydrocarbons (PAHs), the following convention and protocol as international ratified agreement are of relevance:

Stockholm Convention on Persistent Organic Pollutants ratified by the Law on Ratification (Official Gazette of RM no. 17/2004).

Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning persistent organic pollutants, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Reporting obligation

- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 062	**Emissions of persistent organic pollutants – polycyclic aromatic hydrocarbons (PAHs)**	EEA UNECE	APE 006 A1/9	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 062

EMMISSION OF PERSISTENT ORGANIC POLLUTANTS – Polychlorinated biphenyls (PCBs)

Definition

The indicator tracks the trends in polychlorinated biphenyls (PCBs).

Units

kg (kilograms per year)

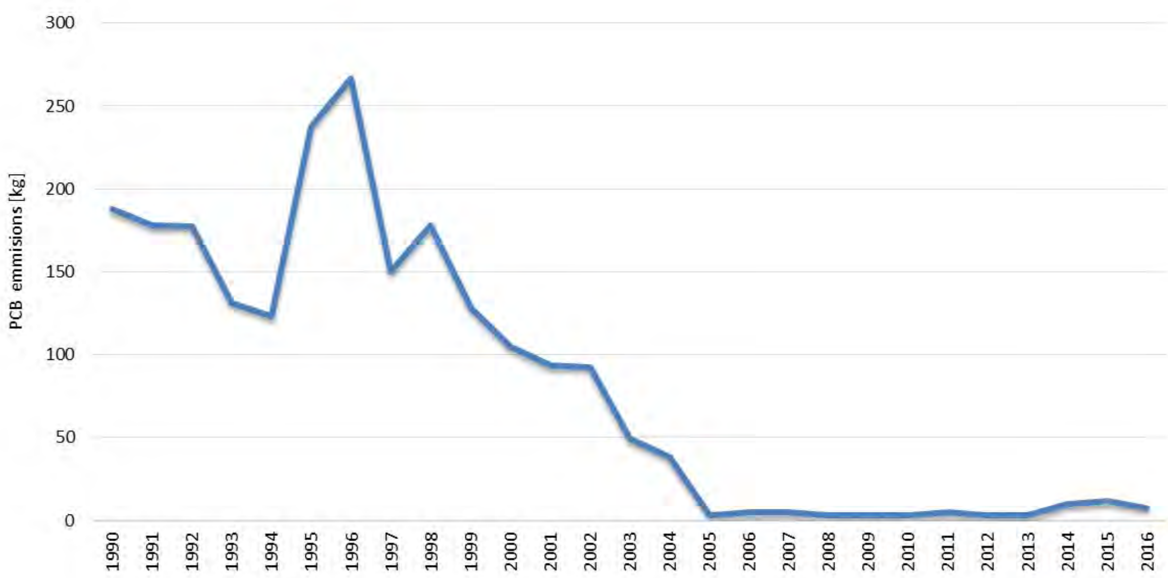
Key policy issue

What progress has been made in overall reduction of emissions of polychlorinated biphenyls in the Republic of Macedonia?

In 1990, the overall national emissions of PCBs amounted to 187,5 kg. Since then, emissions have been reduced significantly to drop by 96% in 2016 or at a level of 7,5 kg.

The Diagram below shows annual trend in PCBs emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of polychlorinated biphenyls (PCBs)



Assessment

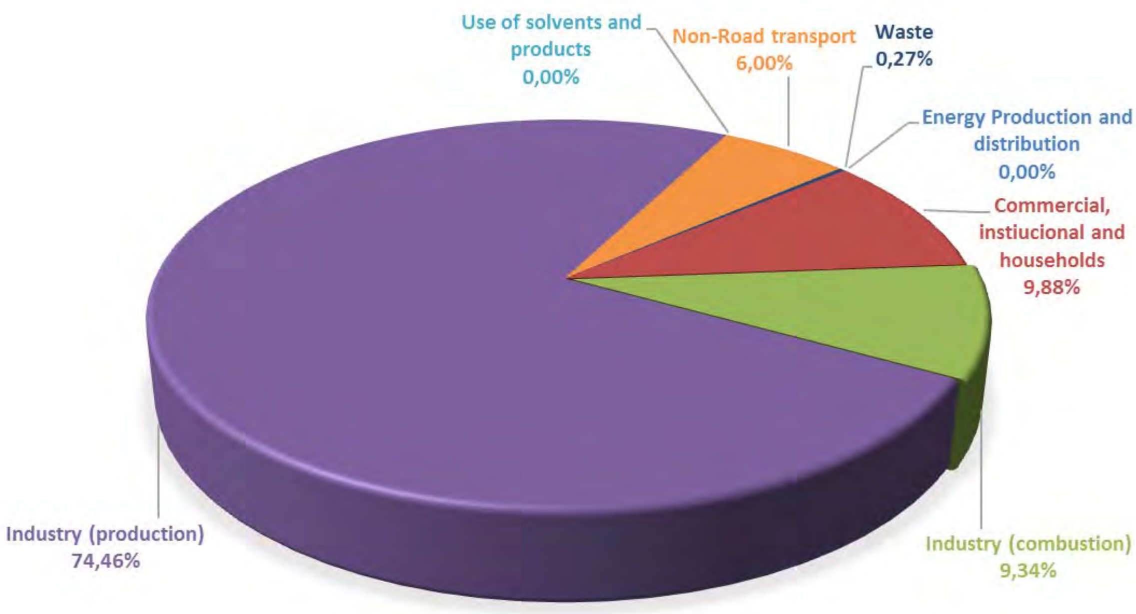
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main source of PCBs emissions in 2016 was the sector Industry (combustion) with a share of 74,5%. Other sectors that contribute in PCBs emissions, in 2016, are: Commercial, institutional and households and Industry (combustion), related to combustion of fuels in non-industrial buildings and combustion plants in industrial facilities, with shares of 9,9% and 9,3%, respectively. The sector Non-Road transport contributes with share of 6% in the total PCBs emissions. Others sectors are insignificant sources of PCBs.

Diagram 2. Emissions of polychlorinated biphenyls PCBs by sectors in 2016



Policy specific issue

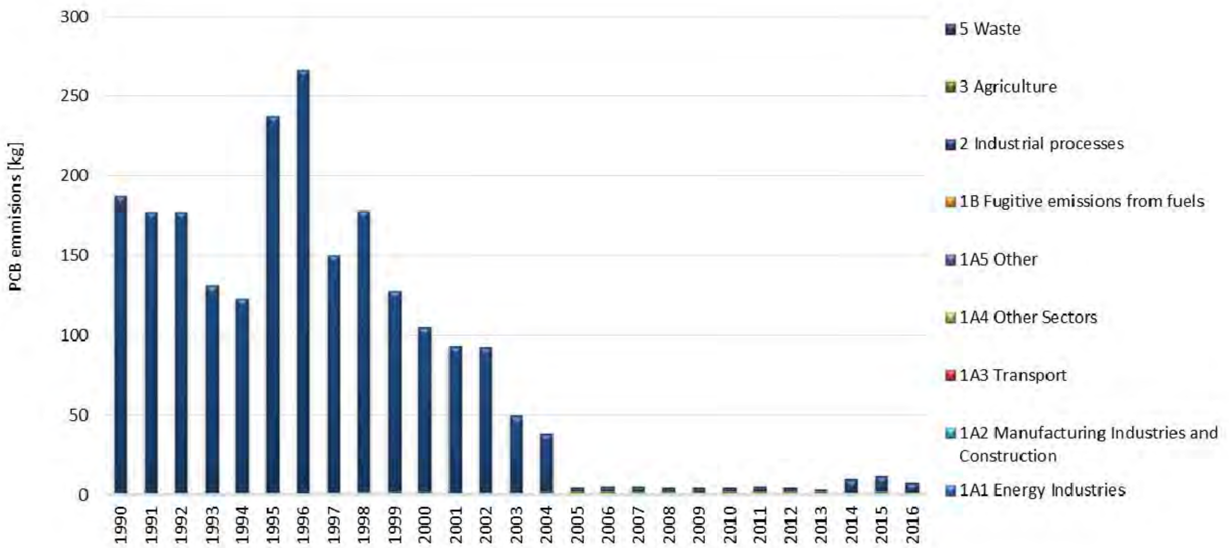
Which different NFR categories contribute to emissions of polychlorinated biphenyls (PCBs)?

The main source of PCBs emissions in the period 1990-2016 was the NFR category 2 - Industrial processes with share of 74% in 2016 (99% in 1990). Within this sector, the highest contribution to overall national emissions of PCBs originated from subcategory 2C5 Production of lead. The main source was the smeltery in Veles which terminated its operation in 2003 contributing to significant reduction in overall national emissions of PCBs as of 2005 onwards. Other sources of emission in 2016 were NFR categories 1A2 – Manufacturing industries and Construction (Iron and steel production) with share of 15% and 1A4 - Other sectors (mainly household heating) with share of 10%.

NFR categories 3 – Agriculture and 5 - Waste were insignificant source of PCBs in 2016.

In 2016, compared to 2015, the total PCBs emissions are significant decresing (by 35%) mainly because of decresing of emissions of PCBs from NFR category 2 - Industrial processes

Diagram 3. Emissions of polychlorinated biphenyls (PCBs) by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year. For this polluting substance, limit values of air emissions are set in the bylaw which is compliant with the following directives: 2001/80/EC, 1999/13/EC and 2000/76/EC.

Also, targets – basic obligations for this polluting substance are also set in the Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning persistent organic pollutants, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Under the Protocol, national overall emissions of PCBs in n-2 year (where n is the current year) should not exceed the overall emission calculated for 1990 (taken as baseline year). The Republic of Macedonia is in compliance with this Protocol considering the emissions presented here for 2016. Compared to 1990, emissions of this pollutant have been reduced by 96%.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to the obligations for calculation of the emissions of polychlorinated biphenyls (PCBs), the following convention and protocol as international ratified agreements are of relevance:

Stockholm Convention on Persistent Organic Pollutants ratified by the Law on Ratification (Official Gazette of RM no. 17/2004).

Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning persistent organic pollutants, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Reporting obligation

- Reporting obligations are set on annual level towards international agreements - UNECE-CLRTAP and EEA
- Annual Report of Processed Data on Air Emissions

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 062	**Emissions of persistent organic pollutants – polychlorinated biphenyls (PCBs)**	EEA UNECE	APE 006 A1/9	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 062

EMMISSION OF PERSISTENT ORGANIC POLLUTANTS – Dioxins and furans (PCDD/PCDF)

Definition

The indicator tracks the trends in dioxins and furans (Polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDF)).

Units

g I-TEQ (grams per toxic equivalent)

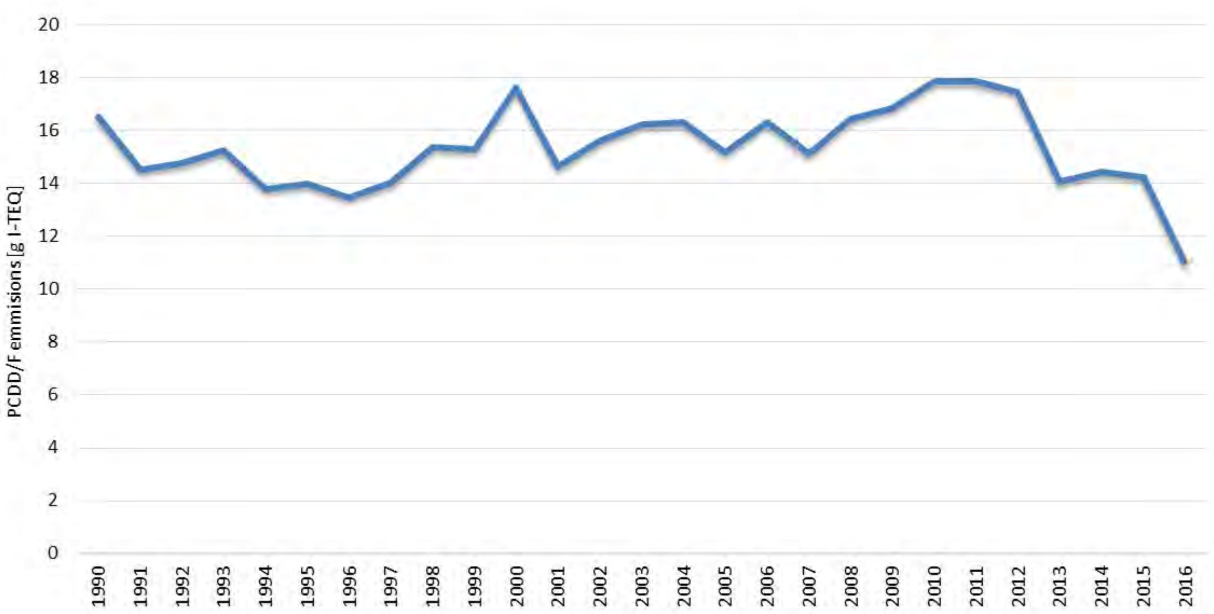
Key policy issue

What progress has been made in overall reduction of emissions of dioxins and furans in the Republic of Macedonia?

In 1990, the overall national emissions of PCDD/PCDF (dioxins/furans) amounted to 16,5 g I-TEQ. Since then, emissions have been reduced to drop at 11 g I-TEQ in 2016 or by 33% compared with 1990.

The Diagram below shows annual trend in dioxins and furans (PCDD/PCDF) emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of dioxins and furans (PCDD/PCDF)



Assessment

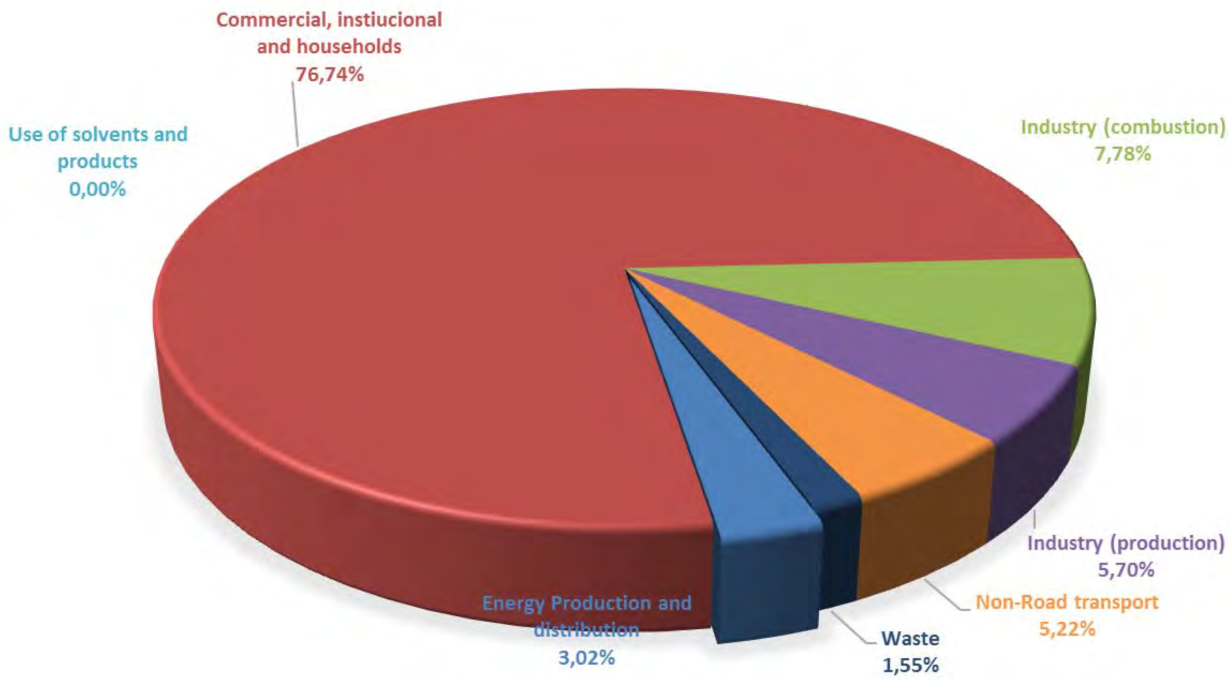
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The main source of PCDD/PCDF emissions in 2016 was the sector Commercial, institutional and households with a share of 76,7% (in the overall national emissions). Also, sectors Industry (combustion), Industry (production), Non-Road transport and Energy production and distribution contribute in o the overall national emissions of PCDD/PCDF with shares of 7,8%, 5,7%, 5,2% and 3%, respectively.

Diagram 2. Emissions of dioxins and furans (PCDD/PCDF) by sectors in 2016



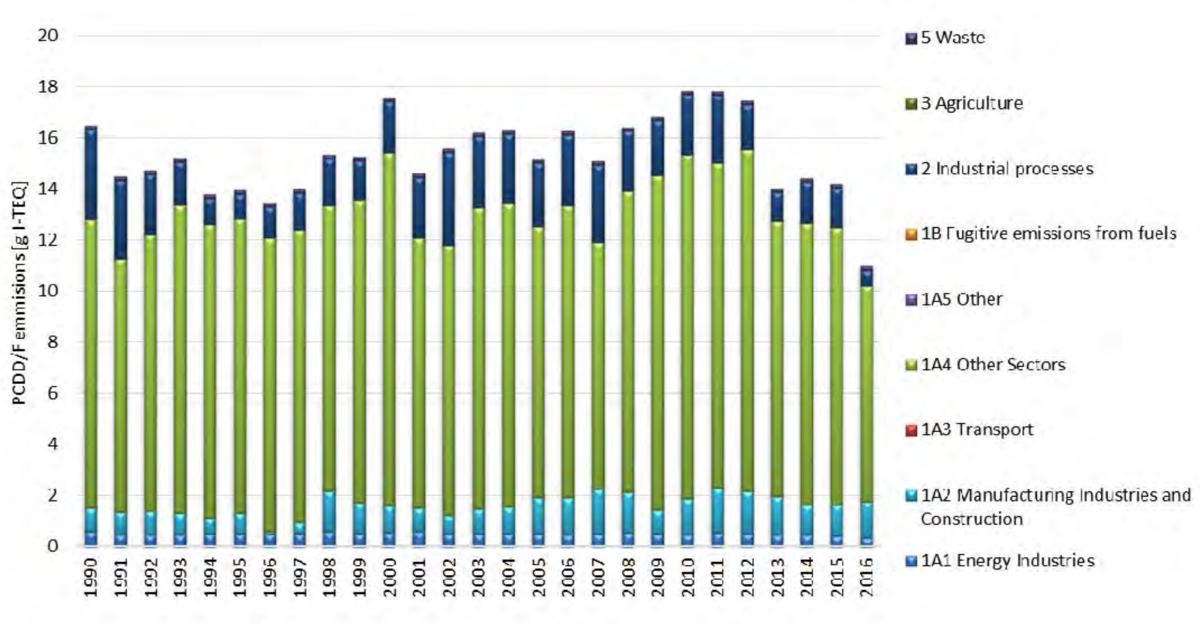
Policy specific issue

Which different NFR categories contribute to emissions of dioxins and furans (PCDD/PCDF)?

The main source of PCDD/PCDF emissions in the period 1990-2016 was the NFR category 1A4 - Other sectors (mainly household heating) and then 2 – Industrial processes and 1A2 Combustion from manufacturing industries and construction. In 2016 PCDD/PCDF emissions from NFR category 2 – Industrial processes are significant reduced compared to 2015 (by 59%) due to the change in the methodology of the emission calculation from subcategory Metal production (Production of iron and steel). Also, there is significant reducing in PCDD/PCDF emissions in 2016 compared to 2015 (by 22%) from NFR category 1A4 – Other sectors (mainly household heating).

NFR sectors 1B - Fugitive emissions, 3 - Agriculture and 5 - Waste were insignificant sources of PCDD/PCDF.

Diagram 3. Emissions of dioxins and furans (PCDD/PCDF) by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation

for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by SNAP.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, 2013 and 2016.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year. For this polluting substance, limit values of air emissions are set in the bylaw which is compliant with the following directives: 2001/80/EC, 1999/13/EC and 2000/76/EC.

Also, targets – basic obligations for this polluting substance are also set in the Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning persistent organic pollutants, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Under the Protocol, national overall emissions of PCDD/PCDF in n-2 year (where n is the current year) should not exceed the overall emission calculated for 1990 (taken as baseline year). The Republic of Macedonia is in compliance with this Protocol considering the emissions presented here for 2016. Compared to 1990, emissions of this pollutant have been reduced by 33%.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to the obligations for calculation of the emissions of dioxins and furans (PCDD/PCDF), the following convention and protocol as international ratified agreements are of relevance:

Stockholm Convention on Persistent Organic Pollutants ratified by the Law on Ratification (Official Gazette of RM no. 17/2004).

Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning persistent organic pollutants, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and towards EEA
- Annual Report of Processed Data on Air Emissions

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 062	**Emissions of persistent organic pollutants – dioxins and furans (PCDD/PCDF)**	EEA UNECE	APE 006 A1/11	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 063
EMMISSION OF HEAVY METALS – LEAD (Pb)

Definition

The indicator tracks the trends in lead (Pb).

Units

t (tons per year)

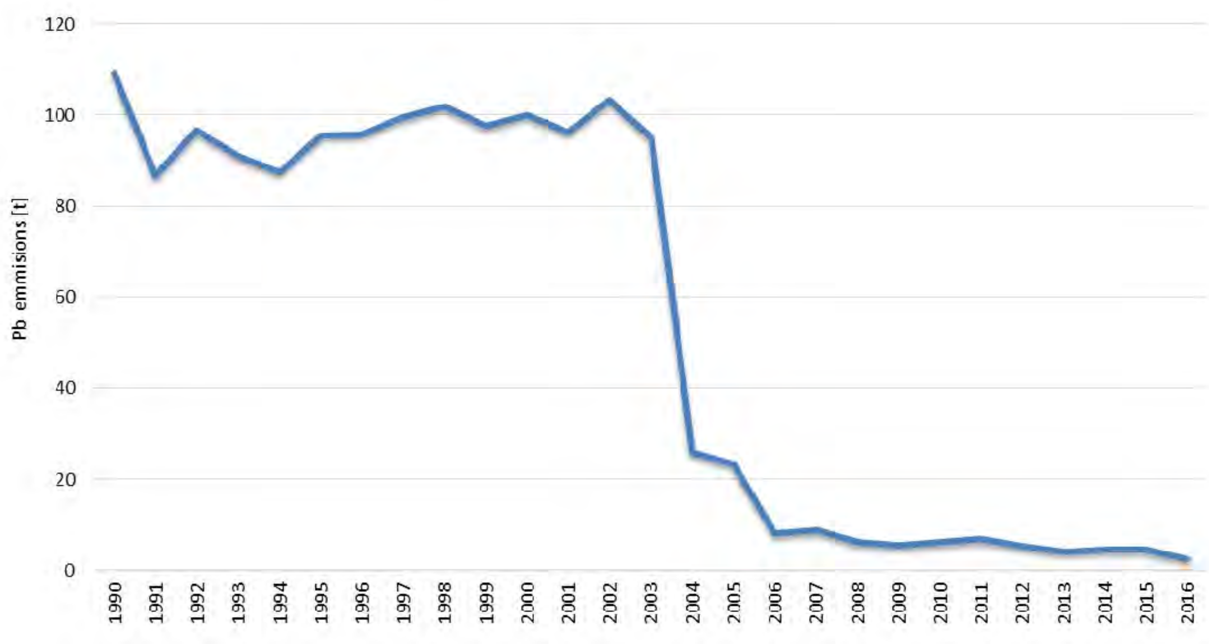
Key policy issue

What progress has been made in overall reduction of emissions of lead in the Republic of Macedonia?

Total national emissions of Pb in 1990 amounted to 109,4 t, with emissions steadily decreasing since 2006 to about 8 t, and till 2016 are reduced by 98%, to 2.5 t, compared to 1990. The most important reductions occur in the sectors Road transport and Industry (production). In 2016 compared to 2015 the reduction of Pb emissions are due to a significant reduction in industrial processes.

The Diagram below shows annual trend in lead (Pb) emissions for the period 1990 to 2016.

Diagram 1. Trend in emissions of lead (Pb)



Assessment

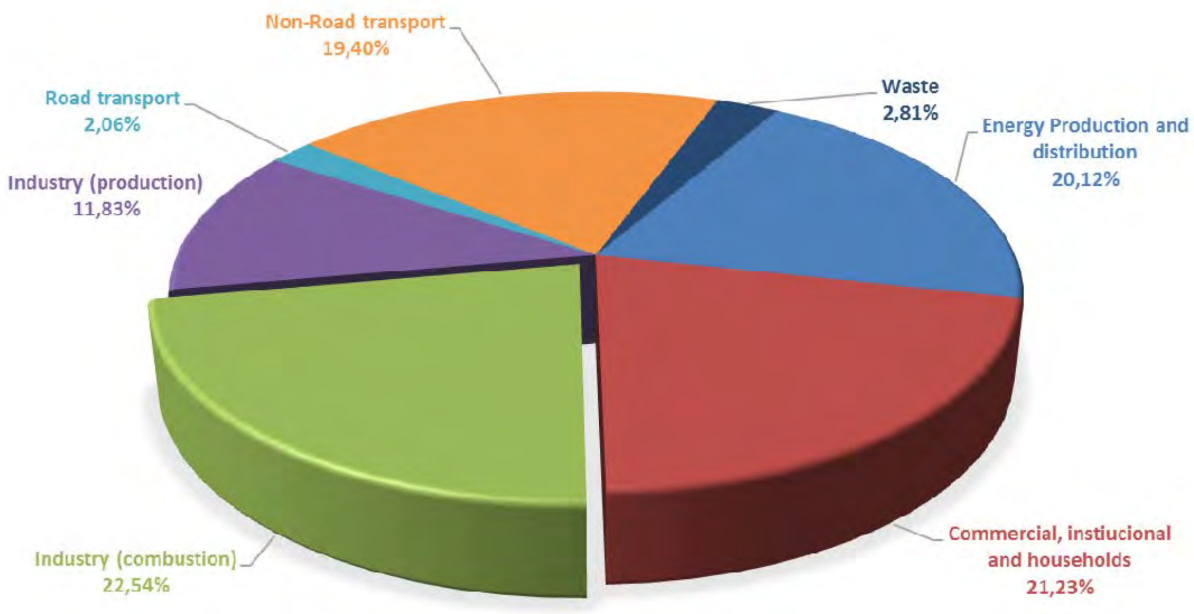
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

In total national Pb emissions in 2016 4 sectors participate practicly equally: Industry (combustion), Commercial, institutional and households, Energy production and distribution and Non-Road transport with shares of 22.5%, 21.2%, 20.1% and 19.4%, respectively. Smaller participation in emissions comes from the sector Industry (production) with share of 11.8%.

Diagram 2. Emissions of lead (Pb) by sectors per year in 2016



Policy specific issue

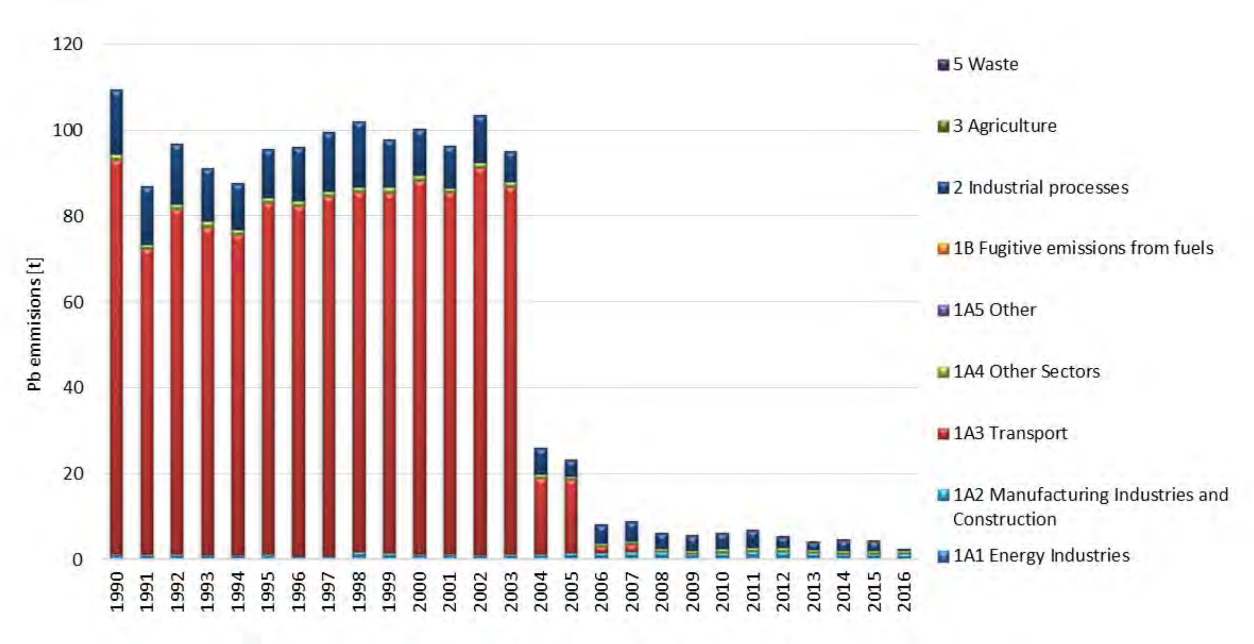
Which different NFR categories contribute to emissions of lead (Pb)?

Main sources of Pb emissions in 2016 represent NFR categories 1A2 – Manufacturing industries and Construction, 1A4 – Othe sectors and 1A1 - 1 Energy industries witth shares of 38% (only 1% in 1990), 26% (only 1% in 1990) and 20% (only 1% in 1990), respectively. NFR category 2 – Industrial processes participate with share of 12% in total Pb emissions in 2016 (14% in 1990) with a note that there is a significant reduction in Pb emissions in 2016 compared to 2015 by 87% due to a change in the methodology of calculating the emissions from the subcategory 2C1 Manufacture of iron and steel.

It should be noted that in 1990 the largest share in the Pb emissions came from the NFR category 1A3 - Transport with a share of 84%, while in 2016 the share of this category is only 2%.

NFR categories 5 - Waste, 1B - Fugitive emissions and 3 - Agriculture are insignificant sources of Pb emissions.

Diagram 3. Emissions of lead (Pb) by NFR categories per year



Data coverage: **excel**
Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation

for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Calculations are in line with the Guidebook of EMEP/EEA on air emissions inventory taking published in 2009, Guidebook of 2013 and Guidebook of 2016. The Guidebook contains emission factors which have been used in the calculations.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009 and Guidebook of 2013 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola,. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project “Further strengthening the capacities for effective implementation of the acquis in the field of air quality”, which were adopted by the councils of the municipalities. Additionally the municipality of Veles also has prepared and adopted air quality plan in November 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Also, targets – basic obligations for this polluting substance are also set in the Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning heavy metals, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Under the Protocol, national overall emissions of Pb in n-2 year (where n is the current year) should not exceed the overall emission calculated for 1990 (taken as baseline year). The Republic of Macedonia is in compliance with this Protocol considering the emissions presented here for 2014. Compared to 1990, emissions of this pollutant have been reduced by 96%.

Legal grounds

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/15 и 146/15) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions leading to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to this polluting substance, the limit values and thresholds for assessment in accordance with the Framework Air Directive 2008/50/EC are prescribed in the following bylaws: Decree on the limit values for the levels and types of polluting substances in the ambient air and alert thresholds, deadlines for limit values achievement, margines of tolerance for the limit value, target value ands and long-term objectives and Rulebook on criteria, methods and procedures for ambient air quality assessment.

With regard to obligations for calculation of the emissions of lead (Pb), the following protocol as international ratified agreement is of relevance:

Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning heavy metals, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and towards EEA
- Annual Report of Processed Data on Air Emissions

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 063	**Emissions of heavy metals – lead (Pb)**	EEA UNECE	APE 005 A1/6	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 063

EMMISSION OF HEAVY METALS – CADMIUM (Cd)

Definition

The indicator tracks the trends in cadmium (Cd).

Units

t (tons per year)

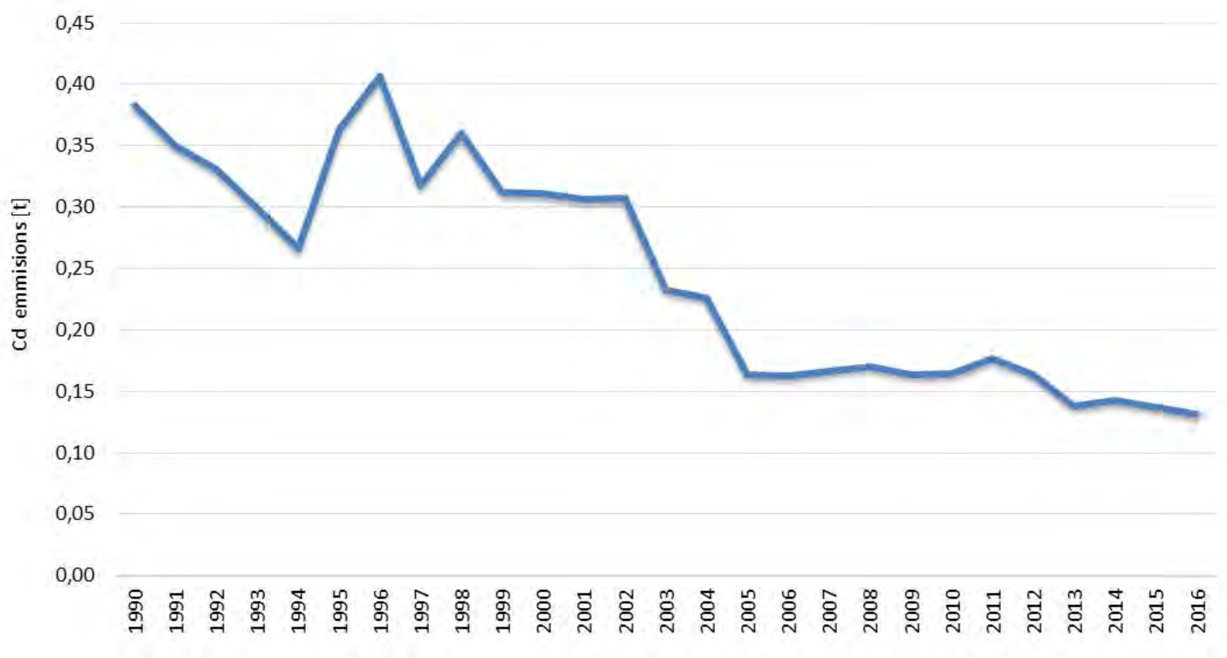
Key policy issue

What progress has been made in overall reduction of emissions of cadmium in the Republic of Macedonia?

In 1990, the overall national emissions of Cd amounted to 0.38 t, followed by constant reduction in emissions to reach 0.131 t or reduction by 66% in 2016 compared to 1990 and 4% compared to 2015.

The Diagram below shows annual trend in cadmium (Cd) emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of cadmium (Cd)



Assessment

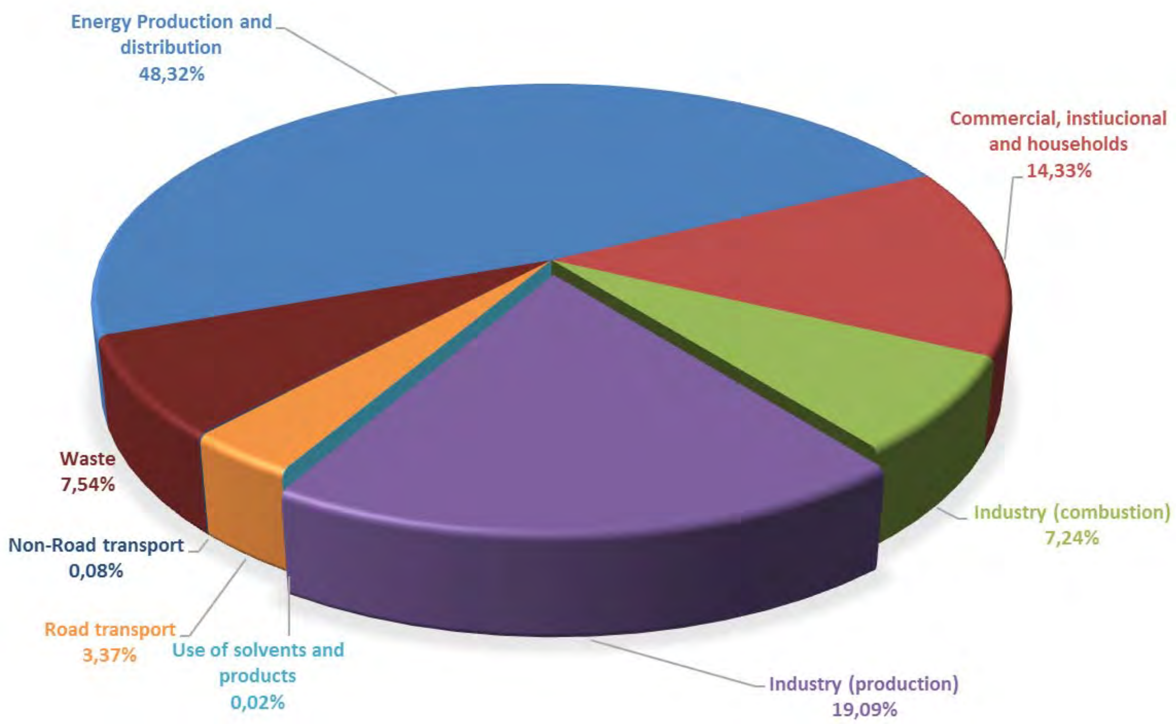
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The most important source of emissions of Cd in 2016 is the sector 1 Energy production and distribution with a share of 48.3%, followed by sectors Industry (production) and 2 Commercial, institutional and households with 19.1% and 14.3% respectively. Sectors Industry (combustion) and Waste contribute with 7.2% and 7.5% respectively. The remaining sectors have a lower share of emissions of this pollutant.

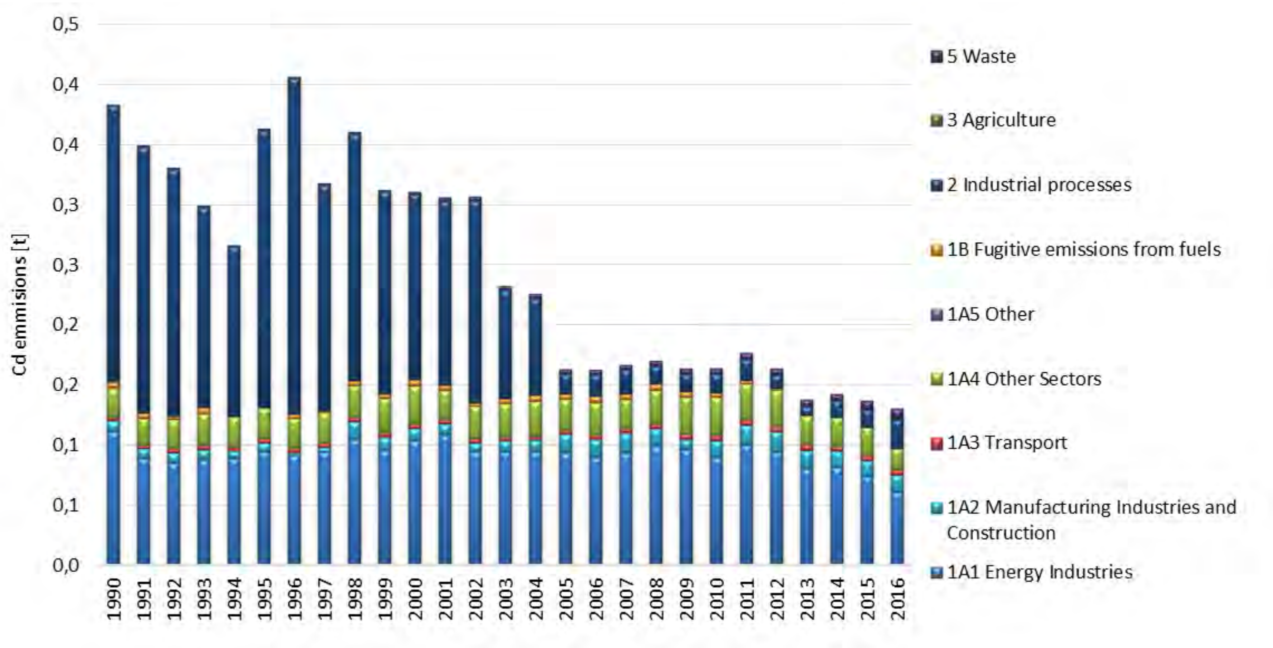
Diagram 2. Emissions of cadmium (Cd) by sectors in 2016



Policy specific issue

Which different NFR categories contribute to emissions of cadmium (Cd)?

The main sources of Cd emissions in the period 1990-2016 were the NFR category 2 Industrial processes (till 2004), and NFR category Energy industries. , The most significant reductions were observed in 2 - Industrial processes (production of metals), as lead and zinc smeltery in Veles terminated the operation in 2003. Emissions from the NFR category 1A1 - Energy industries show a relatively constant trend, although in the last years of 2013-2016 there is a reduction in emissions. Since 2005 this NFR category is the largest source of cadmium emissions.Diagram 3. Emissions of cadmium (Cd) by NFR categories per year



Data coverage: **excel**

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project "Further strengthening the capacities for effective implementation of the acquis in the field of air quality", which were adopted by the councils of the municipalities. Additionally, the municipality of Veles also has prepared and adopted air quality plan in November 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Also, targets – basic obligations for this polluting substance are also set in the Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning heavy metals, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Under the Protocol, national overall emissions of Cd in n-2 year (where n is the current year) should not exceed the overall emission calculated for 1990 (taken as baseline year). The Republic of Macedonia is in compliance with this Protocol considering the emissions presented here for 2016. Compared to 1990, emissions of this pollutant have been reduced by 66%.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions cadmiuming to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to this polluting substance, the limit values and thresholds for assessment in accordance with the Framework Air Directive 2004/107/EC are prescribed in the following bylaws: Decree on the limit values for the levels and types of polluting substances in the ambient air and alert thresholds, deadlines for limit values achievement, margines of tolerance for the limit value, target value ands and long-term objectives and Rulebook on criteria, methods and procedures for ambient air quality assessment.

With regard to obligations for calculation of the emissions of cadmium (Cd), the following protocol as international ratified agreement is of relevance:

Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning heavy metals, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and towards EEA
- Annual Report of Processed Data on Air Emissions

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 063	**Emissions of heavy metals – cadmium (Cd)**	EEA UNECE	APE 005 A1/7 (Emissions of cadmium (total, stationary and mobile sources))	**P**	**B**	▪ air ▪ quality of air	annually

MK – NI 063

EMMISSION OF HEAVY METALS – MERCURY (Hg)

Definition

The indicator tracks the trends in mercury (Hg).

Units

t (tons per year)

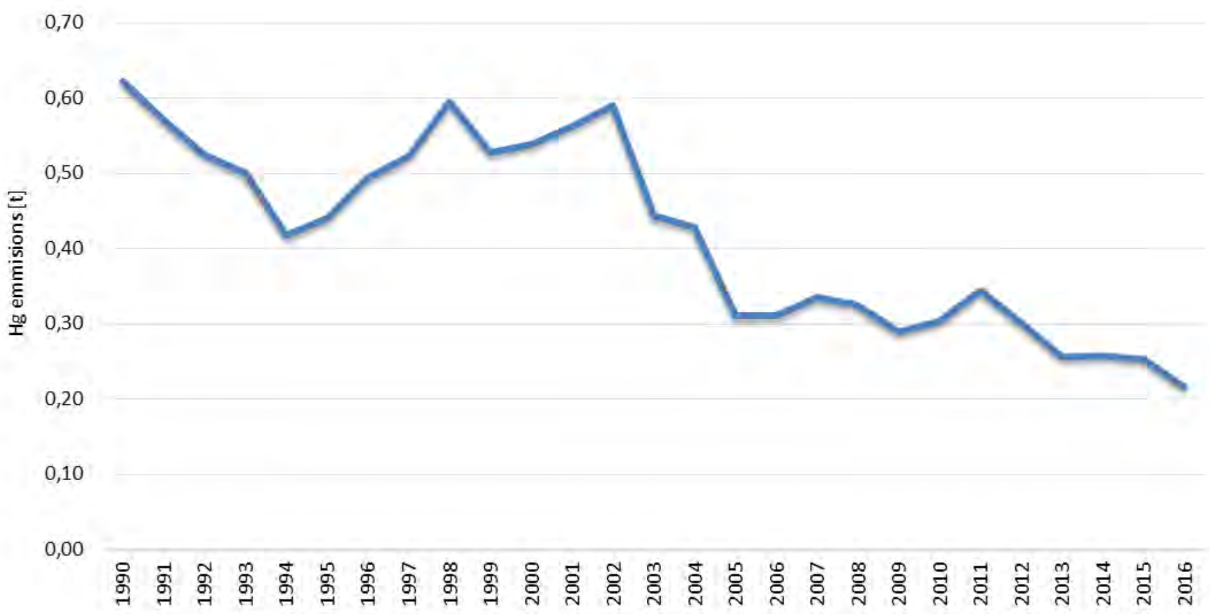
Key policy issue

What progress has been made in overall reduction of emissions of mercury in the Republic of Macedonia?

In 1990, the overall national emissions of Hg amounted to 0.62 t, followed by constant reduction in emissions to reach 0.22 t or reduction by 65% in 2016 compared to 1990. The most significant reductions in Hg emissions occurred in NFR category 2 - Industrial processes (production of metals), due to the termination of the operation of the lead and zinc smeltery in Veles in 2003. .

The Diagram below shows annual trend in mercury (Hg) emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of mercury (Hg)



Assessment

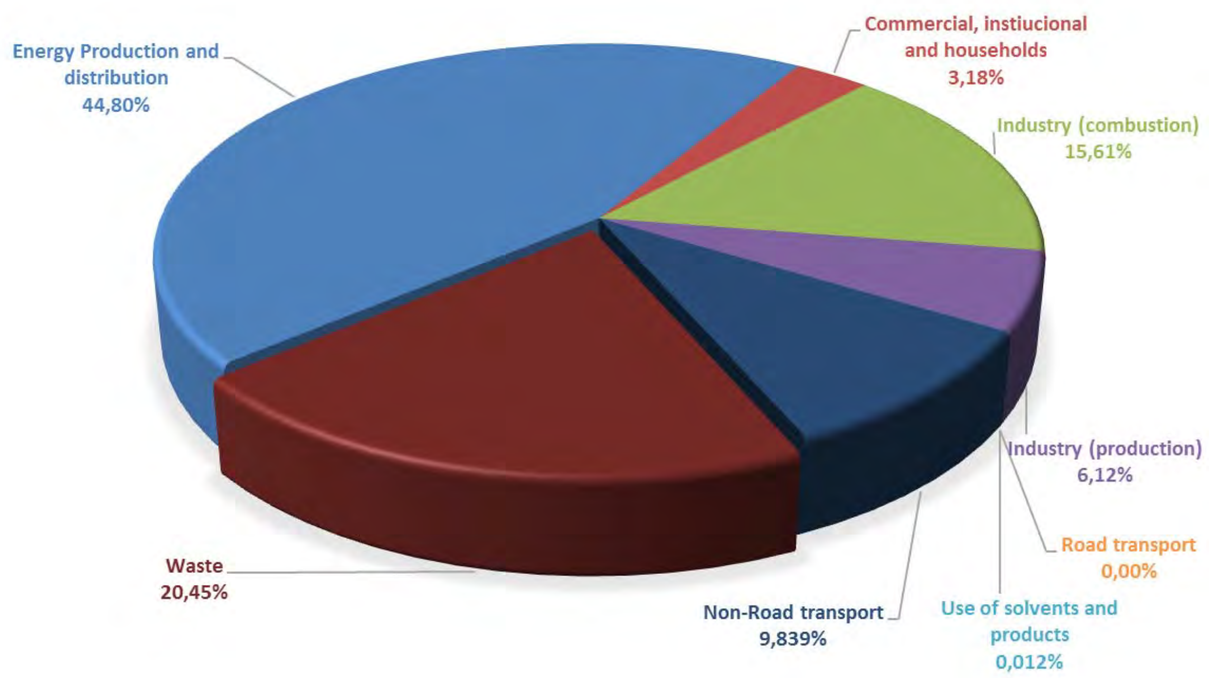
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The most important source of Hg emissions in 2016 was the sector Energy production and distribution with a share of 44,8% in the overall mercury emissions. Second sector with a share of 20,5% is the sector Waste followed by sectors Industry (combustion) and Industry (production) with a share of 15,6% and 9,8% in the overall mercury emissions, respectively.

Diagram 2. Emissions of mercury (Hg) by sectors r in 2016

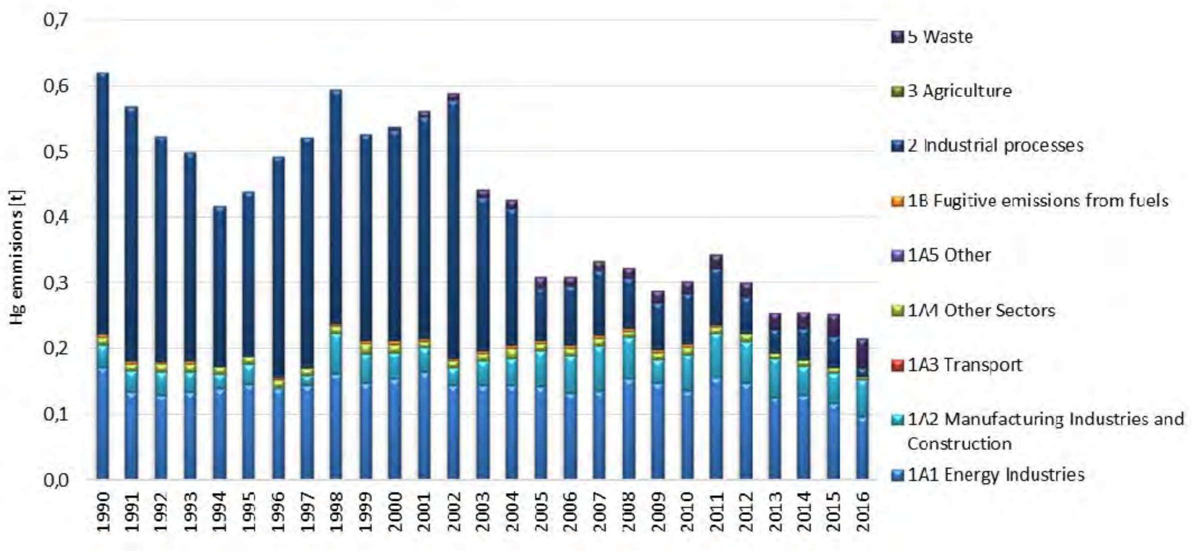


Policy specific issue

Which different NFR categories contribute to emissions of mercury (Hg)?

The main sources of Hg emissions in the period 1990-2016 were: the NFR category 2 - Industrial processes (till 2004) with share of 64% in 1990, and since 2005 there is a significant decrease in mercury emissions from this source and in 2016 participates only with 6% in total emissions of Hg and NFR category 1A1 Energyindustries with share of 28% in 1990, whereas although the quantitative values of Hg emissions from this category are reduced in 2016, this category accounts with the highest share of 45%. . Total emissions of mercury in 2016 were reduced by 65% compared to 1990, while compared to 2015 they were reduced by 15%. The most significant reductions were observed in 2 - Industrial processes (production of metals), as lead and zinc smeltery in Veles terminated the operation in 2003. Emissions from this NFR category in 2016 were reduced by 97% compared to 1990, while compared to 2015 were reduced by 72% primarily due to the change in the methodology for calculating the emissions from the production of metals (iron and steel production). For the NFR category 1A1 mercury emissions in 2016 are decreased by 44% compared to 1990, while compared to 2015 the reduction is 17%.

Diagram 3. Emissions of mercury (Hg) by NFR categories per year



Data coverage: **excel**

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation

for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2013 and Guidebooko of 2016 (http://www.eea.europa.eu/publications/emep-eea-guidebook-2013, Technical report no. 12/2013, EEA. and de Leeuw, F. (2002) and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016). Set of emission indicators of long-range transboundary air pollution, Environmental science and policy.

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola, Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project "Further strengthening the capacities for effective implementation of the acquis in the field of air quality", which were adopted by the councils of the municipalities. The municipality of Veles also has prepared and adopted air quality plan in November 2017.

With regards to other international agreements referring to mercury the Republic of Macedonia, through the Ministry of Environment and Physical Planning, in consultation with UNEP, submitted a draft project to the GEF in order to make a synthesis and review of the current situation with the presence and management of mercury in the country.

By signing the Minatom Convention, the Republic of Macedonia was granted the right to access funds intended for the preparation of such a project. The project was approved in 2015, and was carried out in the period April 2016-April 2018.

With this project, the Republic of Macedonia managed to prepare the first inventory of emissions and releases of mercury in the environment, an institutional and legal framework for the management of mercury in the Republic of Macedonia and other relevant data.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air

Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Also, targets – basic obligations for this polluting substance are also set in the Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning heavy metals, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

Under the Protocol, national overall emissions of Hg in n-2 year (where n is the current year) should not exceed the overall emission calculated for 1990 (taken as baseline year). The Republic of Macedonia is in compliance with this Protocol considering the emissions presented here for 2016. Compared to 1990, emissions of this pollutant have been reduced by 65%.

Furthermore the reduction of mercury is accordance with requirements set down in Minamata convention for reduction of mercury in the environment which has been signed by our country.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions mercurying to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

With regard to obligations for calculation of the emissions of mercury (Hg), the following protocol and convention as international ratified agreements are of relevance:

- Protocol to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution concerning heavy metals, ratified in our country in 2010 (Official Gazette of RM no.135/2010).

- Minamata Convention on Mercury, which was signed on 25 July 2014.

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and towards EEA
- Annual Report of Processed Data on Air Emissions

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 063	**Emissions of heavy metals – mercury (Hg)**	EEA UNECE	APE 005 A1/8	**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 063

EMMISSION OF HEAVY METALS – ARSENIC (As)

Definition

The indicator tracks the trends in arsenic (As).

Units

t (tons per year)

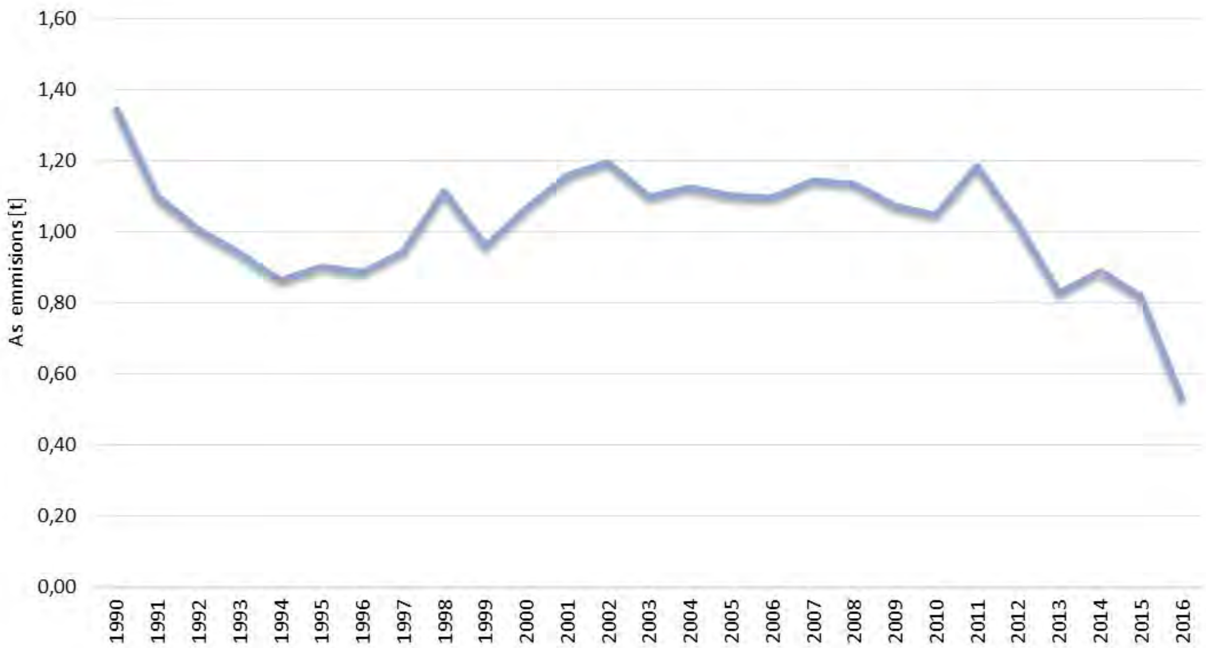
Key policy issue

What progress has been made in overall reduction of emissions of arsenic in the Republic of Macedonia?

In 1990, the overall national emissions of As amounted to 1.34 t, followed by reduction in emissions up to 1996 and then they are increasing with a constant trend by 2012. In 2013 there is a reduction of arsenic emissions with a constant trend till 2015, and then in 2016 there is a significant reduction in emissions by 61% compared to 1990 and 35% compared to 2015. The most important reduction in As emissions is in sector 2 - Industrial processes and the use of other products (metal production). The most significant reductions in As emissions in 2016 occurred in NFR category 2 - Industrial processes (production of metals) due to the reduced production of ferroalloys.

The Diagram below shows annual trend in arsenic (As) emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of arsenic (As)



Assessment

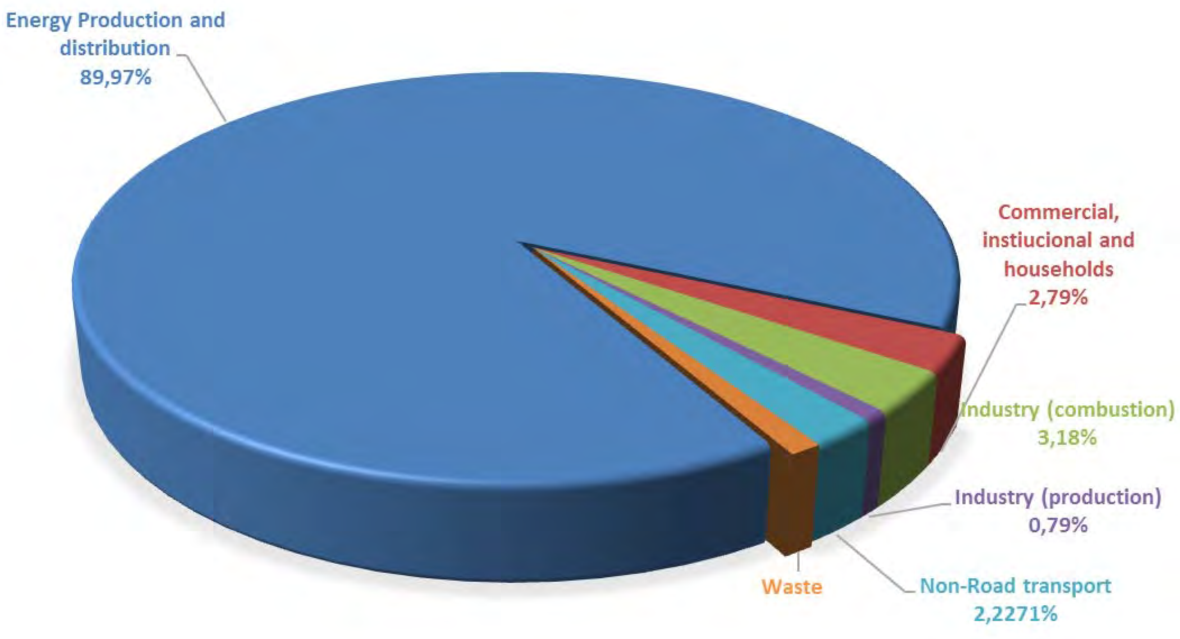
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The most important source of As emissions in 2016 is the sector Energy production and distribution with share of 90%. The other sectors have a significantly lower share in total arsenic emissions.

Diagram 2. Emissions of Arsenic (As) by sectors in 2016

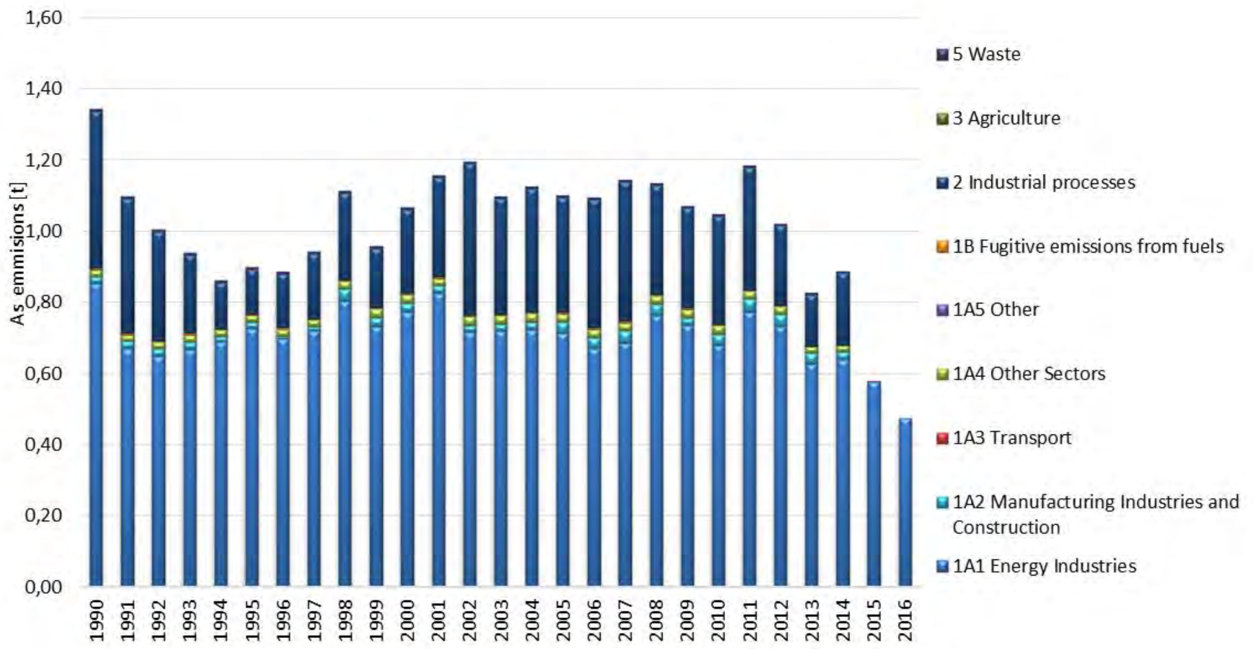


Policy specific issue

Which different NFR categories contribute to emissions of Arsenic (As)?

The main sources of As emissions in the period 1990-2016 were the NFR category 1A1 Energy industries (where reduced emission of As has been observed during the last years), as well as NFR category 2 Industrial processes. In 2016 there is a significant reduction in arsenic emissions from NFR category 2 - Industrial processes, with this category accounting for only 1% in total emissions and compared to 1990 is down by 99% and compared to 2015 by 98%. In 2016 even 90% of the total arsenic emissions are from the NFR category 1A1 Energy production, although in this NFR category in 2016 there is a decrease in arsenic emissions by 44% compared to 1990, and by 17% compared to 2015.

Diagram 3. Emissions of Arsenic (As) by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address:
http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant as reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project "Further strengthening the capacities for effective implementation of the acquis in the field of air quality", which were adopted by the councils of the municipalities. Addtionally the municipality of Veles also has prepared and adopted air quality plan in November 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions Arsenicing to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to this polluting substance, the limit values and thresholds for assessment in accordance with the Framework Air Directive 2004/107/EC are prescribed in the following bylaws: Decree on the limit values for the levels and types of polluting substances in the ambient air and alert thresholds, deadlines for limit values achievement, margines of tolerance for the limit value, target value ands and long-term objectives and Rulebook on criteria, methods and procedures for ambient air quality assessment.

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and towards EEA
- Annual Report of Processed Data on Air Emissions

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 063	**Emissions of heavy metals – Arsenic (As)**			**P**	**A**	▪ air ▪ quality of air	annually

MK – NI 063

EMMISSION OF HEAVY METALS – NICKEL (Ni)

Definition

The indicator tracks the trends in nickel (Ni).

Units

t (tons per year)

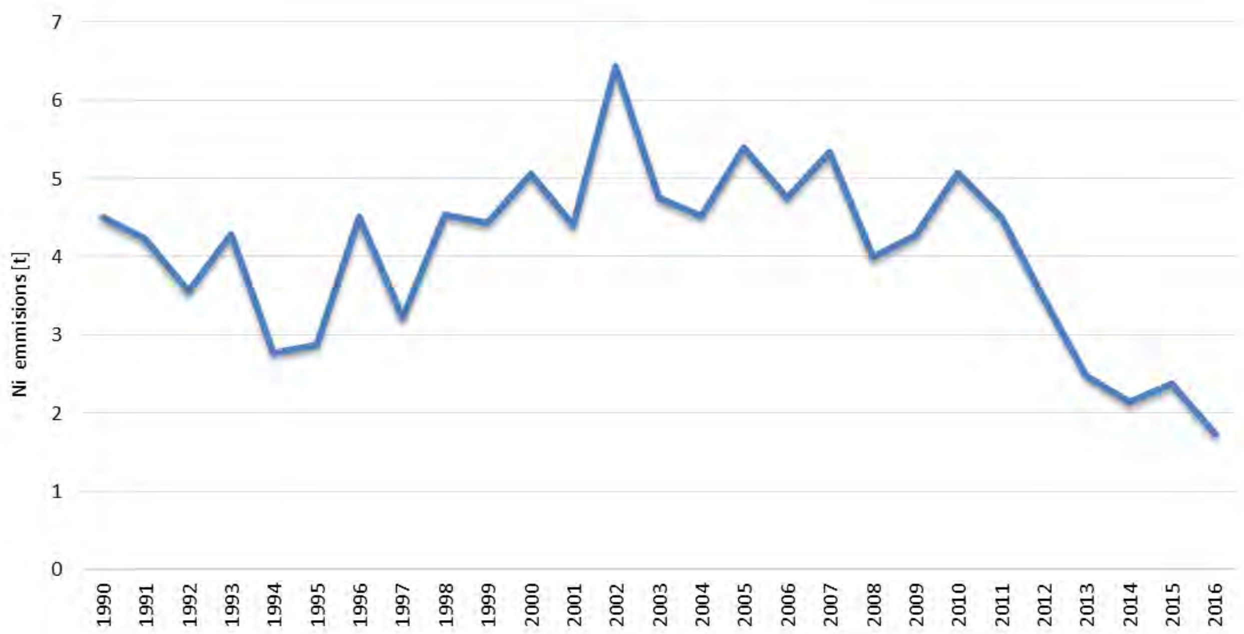
Key policy issue

What progress has been made in overall reduction of emissions of nickel in the Republic of Macedonia?

In 1990, the overall national emissions of Ni amounted to 4.5 t, with emissions manifesting variable trend with a jump in 2002, followed again by variable trend and continuous reduction since 2010 (small exception is 2015 where there is a slight increase in emissions compared to 2014). Emissions in 2016 were reduced by 61% compared to 1990, and 27% compared to 2015.

The Diagram below shows annual trend in nickel (Ni) emissions for the period 1990 to 2016.

Diagram 1.Trend in emissions of nickel (Ni)



Assessment

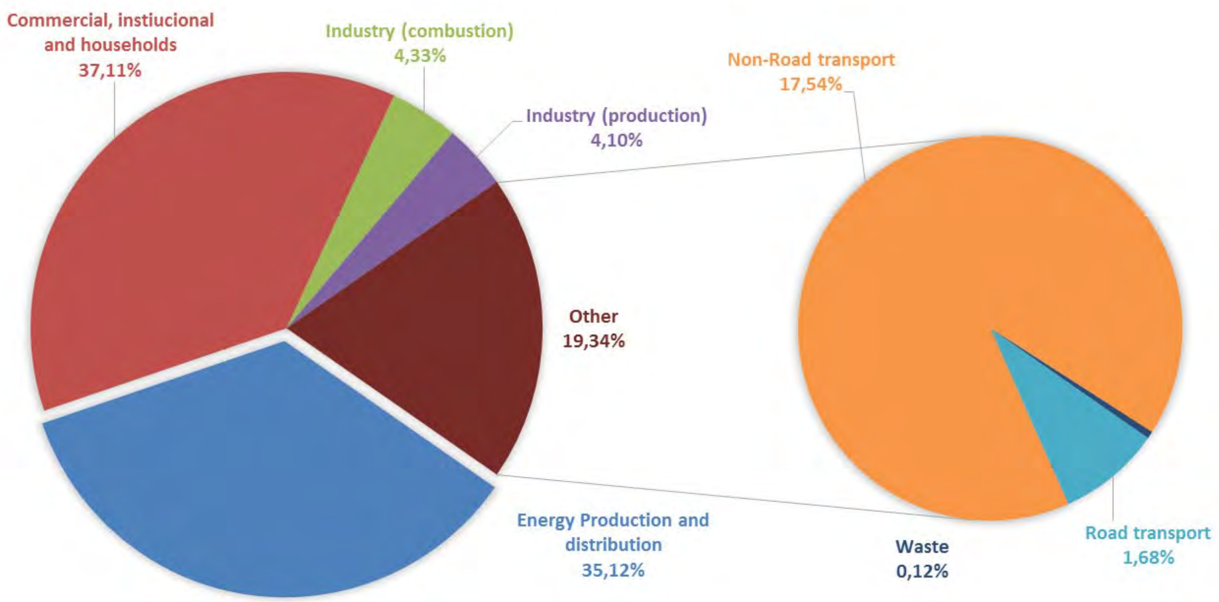
Under the CARDS Programme, Inventory of air emissions of the main pollutants in the country was established in 2005 in accordance with the EMEP methodology by individual sectors, i.e. activities, and in 2014 Inventory including all pollutants was prepared. Starting from 2014, the Republic of Macedonia carries out calculations of national emissions for all pollutants.

The emission sources, within this national indicator, are made according to the following categorization:

Sector
Energy Production and distribution
Commercial, instiucional and households
Industry (combustion)
Industry (production)
Fugitive emissions
Use of solvents and products
Road transport
Non-Road transport
Waste
Agriculture
Other

The most important sources of Ni emissions in 2016 represent sectors Commercial, institutional and households and Energy production and distribution with shares of 37.1% and 35.1%, respectively, followed by the sector Non-Road transport with a share of 17.5%. Sectors Industry (Combustion) and Industry (production) account with share of 4.3% and 4.1%, respectively, in the total emissions of nickel.

Diagram 2. Emissions of nickel (Ni) by sectors in 2016

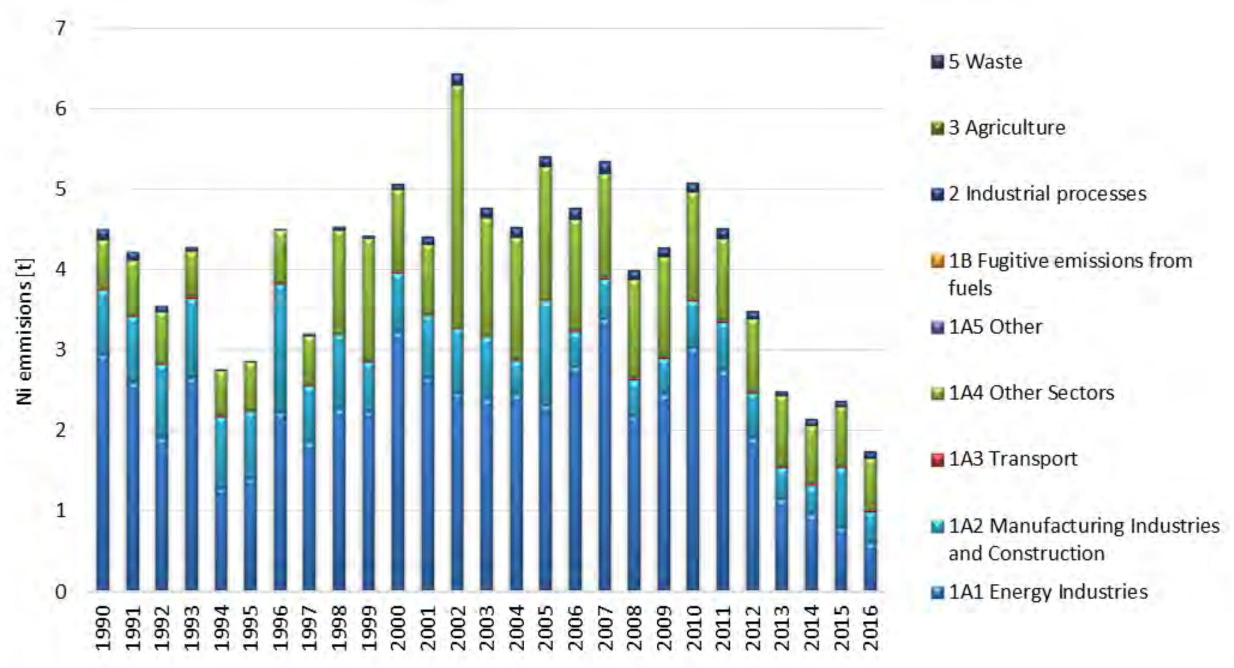


Policy specific issue

Which different NFR categories contribute to emissions of nickel (Ni)?

Main sources of Ni emissions in the period 1990 - 2016 are NFR categories 1A1 - Energy industries, 1A2 - Combustion in manufacturing and construction and 1A4 - Other sectors with share in total emissions of nickel in 2016 of 35% (65% in 1990), 22% (18% in 1990) and 37% (14% in 1990) respectively. In terms of 2015, the emissions from the above NFR categories registered in 2016 are decreased by 23%, 49% and 12% respectively.

Diagram 3. Emissions of nickel (Ni) by NFR categories per year



Data coverage: excel

Sources of data:
The data used refers to overall national emissions and emissions categorized by NFR delivered by EEA member and collaborating states to EEA and Secretariat of the United Nations. Data is accessible per country on the following web address: http://cdr.eionet.europa.eu/mk/un/clrtap/inventories/envwovm7g/.

Methodology

- Methodology for indicator calculation

The methodology for this indicator calculation is based on calculated national emissions and emissions by NFR categories of this pollutant Ni reported to EEA (European Environmental Agency) and UNECE/EMEP (United Nations Economic Commission for Europe/Cooperative programme for monitoring and evaluation for transboundary air pollution transfer under the Convention on Transboundary Air Pollution Transfer) in February 2016. Data used in this report is in accordance with the data submitted, the difference being that additional allocation of national emissions has been made apart from NFR (as sent to international organizations) also by sectors.

Reference of used methodology

Methodology used for calculation and presentation of this indicator is given in EMEP/EEA Guidebook for inventory of air pollutant emissions of 2009, Guidebook of 2013 and Guidebook of 2016 which may be accessed at the following links (http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2009, http://www.eea.europa.eu/publications/emep-eea-emission-inventory-guidebook-2013 and http://www.eea.europa.eu/publications/emep-eea-guidebook-2016).

Policy relevance of the indicator

Action Plan for European Partnership, as well as National Plan for approximation of the national legislation with European regulations specifying bylaws that need to be prepared have been adopted.

The National Environmental Action Plan (NEAP II) was adopted. It contains the measures that need to be taken to improve the overall status of air quality, including the reduction of emissions of acidifying substances. The National Plan for Ambient Air Protection for the period 2012 to 2017 specifying the measures for air protection on national level and the National Programme for gradual air emissions reduction by 2020 have been adopted in order to define and implement measures on national level.

At the same time, for the purpose of air quality improvement in certain local self-government units (LSGUs) with action plans, program was prepared for the City of Bitola. Air quality plans and short term action plans for city of Skopje and city of Tetovo are prepared in the Twining project "Further strengthening the capacities for effective implementation of the acquis in the field of air quality", which were adopted by the councils of the municipalities. Additionally the municipality of Veles also has prepared and adopted air quality plan in November 2017.

Targets

Does any of the national documents set target or target should be achieved in accordance with other international documents?

National strategic documents listed as references in the above text provide guidelines and specify actions that should be undertaken as a matter of priority. It is important to mention that bylaws have been prepared in the area of air emissions transposing Directives 96/61/EC, 2000/81/EC, 2000/76/EC, 99/13/EC and 2001/81/EC, ranging between 90 and 100%.

In accordance with the requirements of the UNECE Convention on Long-Range Transboundary Air Pollution, inventory based on EMEP/EEA Guidebook for inventory of polluting substances into the air, setting the target of regular inventory of pollutants in tons per year following the n-2 principle, where n is the current year.

Legal basis

The Law on Ambient Air Quality adopted in August 2004 and amended several times afterwards (Official Gazette of RM no. 67/2004, 92/2007, 83/2009, 35/10, 47/11, 100/12, 163/2013, 10/2015 и 146/2015) is framework law in the area of air. The goals of this Law include avoiding, prevention and reduction of harmful effects on human health and environment as a whole, prevention and abatement of pollutions cadmiuming to climate change, as well as provision of appropriate information on the quality of ambient air.

On the basis of the Law on Ambient Air Quality, 16 bylaws were prepared and adopted to introduce limit values for air quality and air emissions, methodology of air quality and air emissions monitoring, manner of preparation of planning documents for air protection against pollution, manner of informing the citizens and international organizations, etc.

In relation to this polluting substance, the limit values and thresholds for assessment in accordance with the Framework Air Directive 2004/107/EC are prescribed in the following bylaws: Decree on the limit values for the levels and types of polluting substances in the ambient air and alert thresholds, deadlines for limit values achievement, margines of tolerance for the limit value, target value ands and long-term objectives and Rulebook on criteria, methods and procedures for ambient air quality assessment.

Reporting obligation

- Reporting obligations towards international agreements - UNECE-CLRTAP and towards EEA
- Annual Report of Processed Data on Air Emissions

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		ClNisification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 063	**Emissions of heavy metals – nickel (Ni)**			**P**	**A**	▪ air ▪ quality of air	annually

NATURE AND BIODIVERSITY

MK – NI 007

THREATENED AND PROTECTED SPECIES

Definition

This indicator shows the number of species present in the Republic of Macedonia and assessed as globally threatened and/or protected by European instruments, such as: Rio Convention on Biological Diversity, Bonn Convention on the Conservation of Migratory Species of Wild Animals, Hague Agreement on the Conservation of Migratory Waterbirds, London Agreement on Bats Protection, EU Directives on habitats and wild birds and Bern Convention on the Conservation of European Wildlife and Natural Habitats, protected at national level.

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

- Number of endemic and threatened wild species of plants (flora)
- Number of endemic and threatened wild species of native fungi
- Number of endemic and threatened wild species of animals (fauna)

Units

- Number of species

Key policy issue

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

Key message

Abundance and variety of ecosystems, types of natural habitats and wild species, as well as genetic resources, are the main features of biological diversity in the Republic of Macedonia. According to the available information, this wealth comprises the imposing number of around 17.604 species, out of which 976 species are endemic species.

Considering the fact that national Red Lists of animals, plants and fungi are under establishment, the analysis of threatened and protected wild species has been made in accordance with international criteria contained in a number of multilateral documents (conventions, agreements, Global Red List, European Red List, EU Directives).

Thus, the IUCN World Red List contains 72 taxa of higher plants from the Republic of Macedonia, 19 of which are local endemic taxa.

The Annexes of the Bern Convention include 12 species of higher plants.

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

Figure 1. Number of protected species of animals

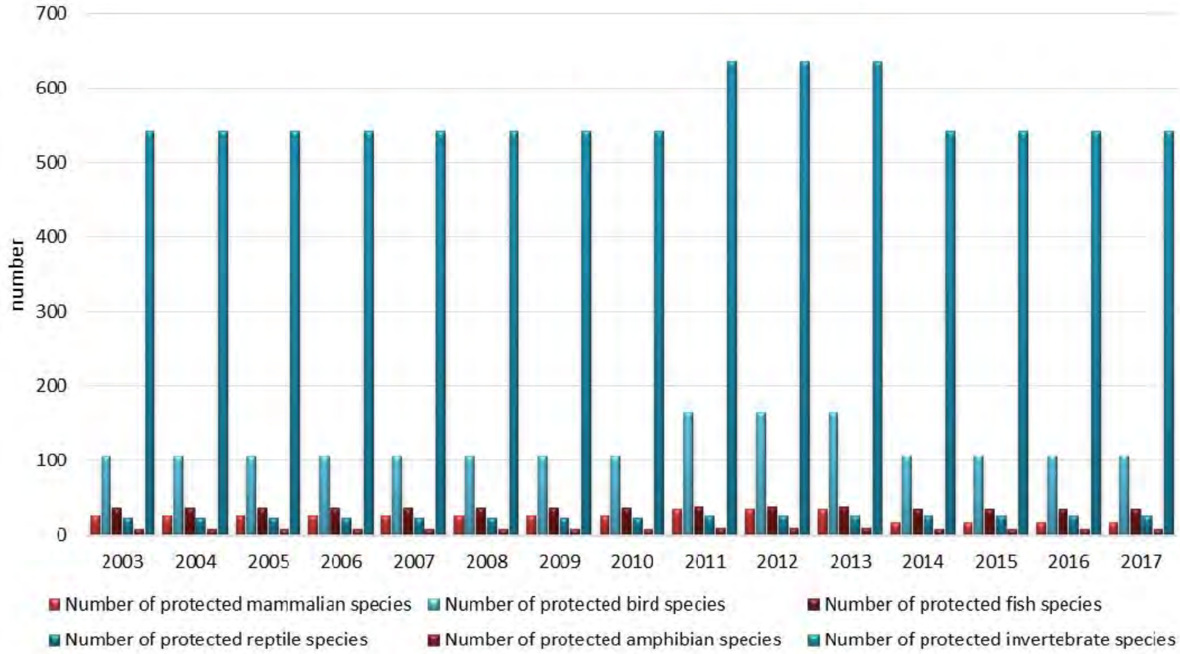


Figure 2. Number of endemic species of animals

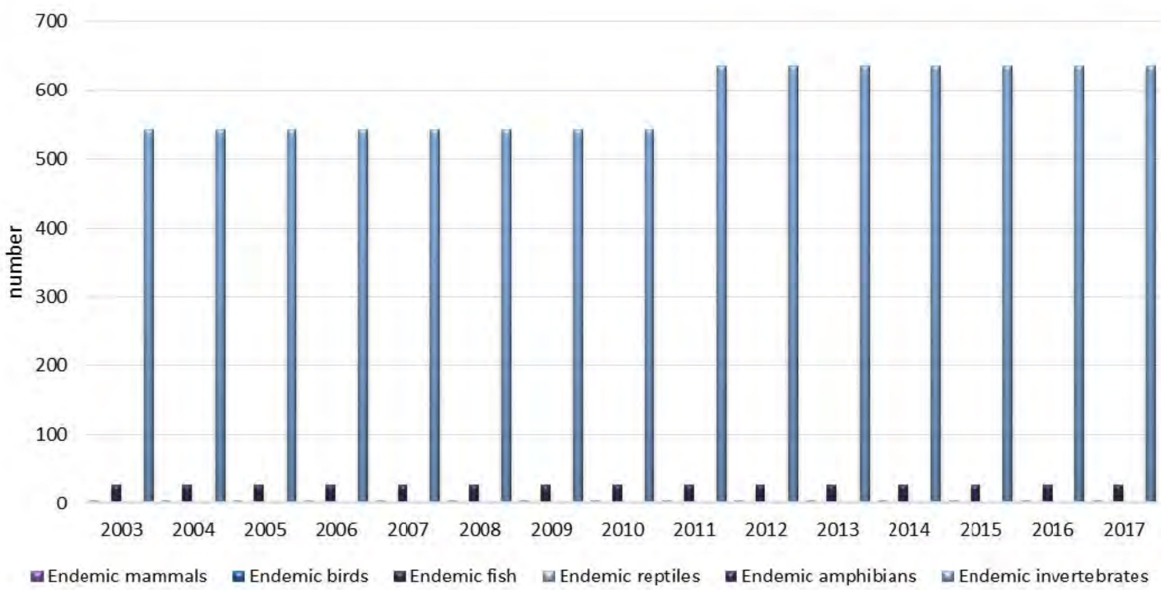


Figure 3. Number of threatened species of animals

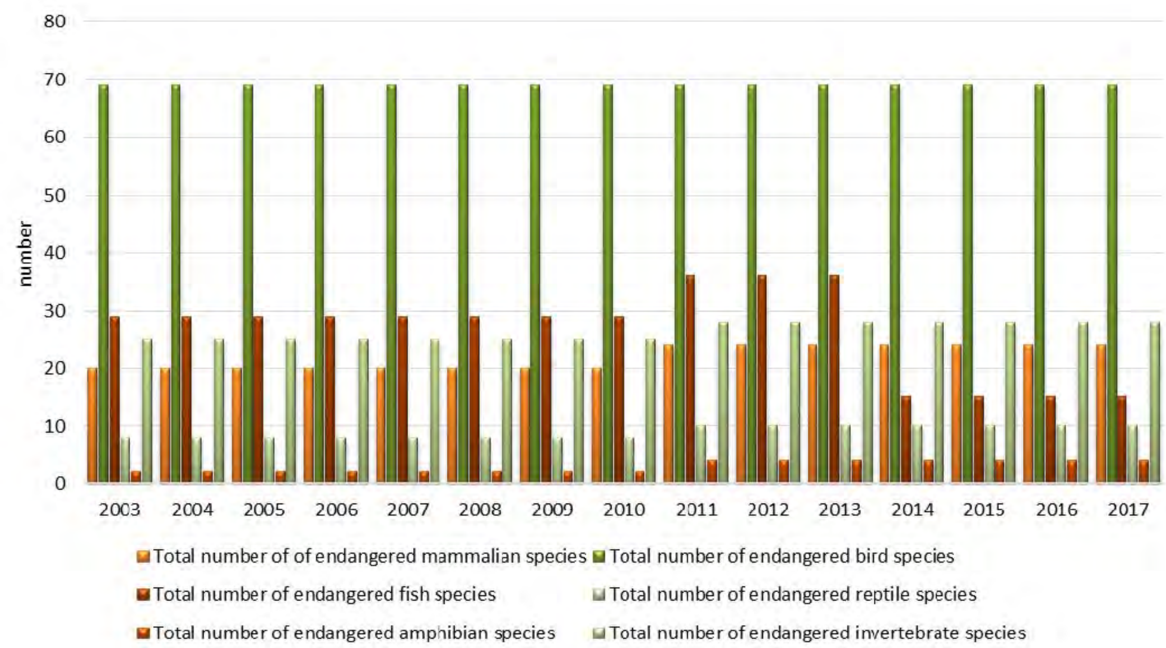


Figure 4. Number of protected species of plants

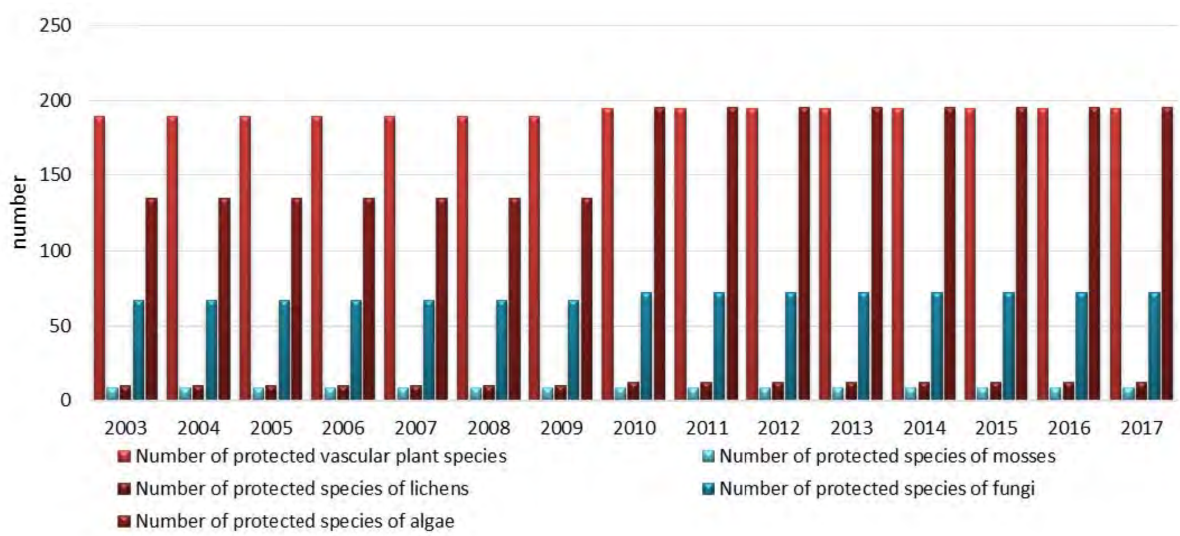


Figure 5. Number of endemic species of plants

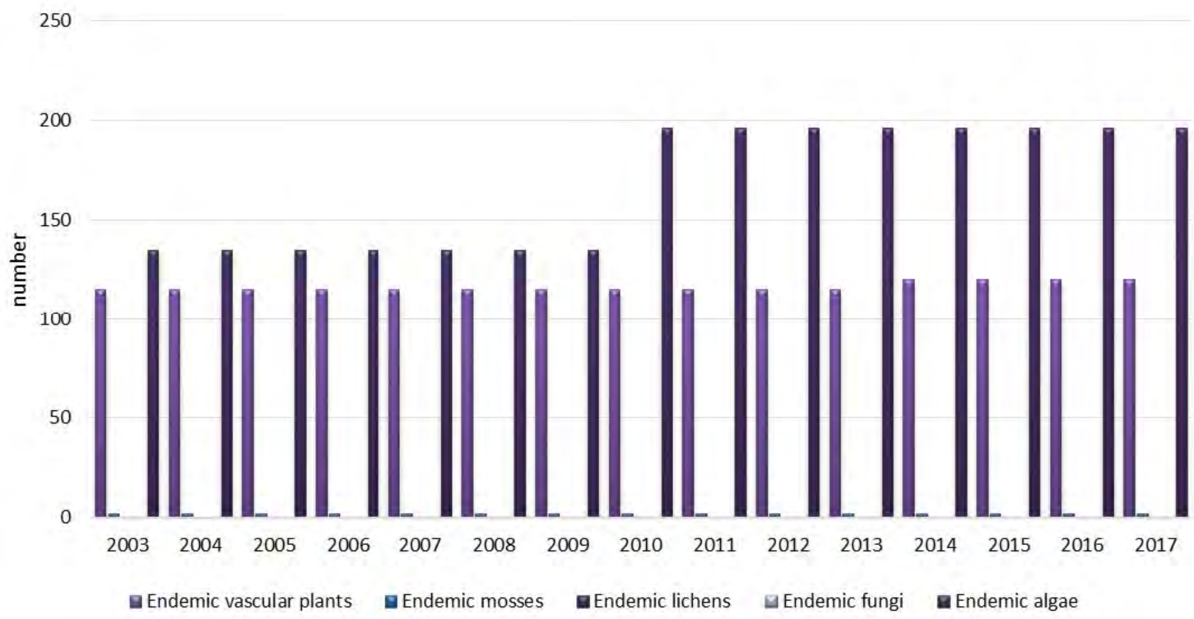


Figure 6. Number of threatened species of plants

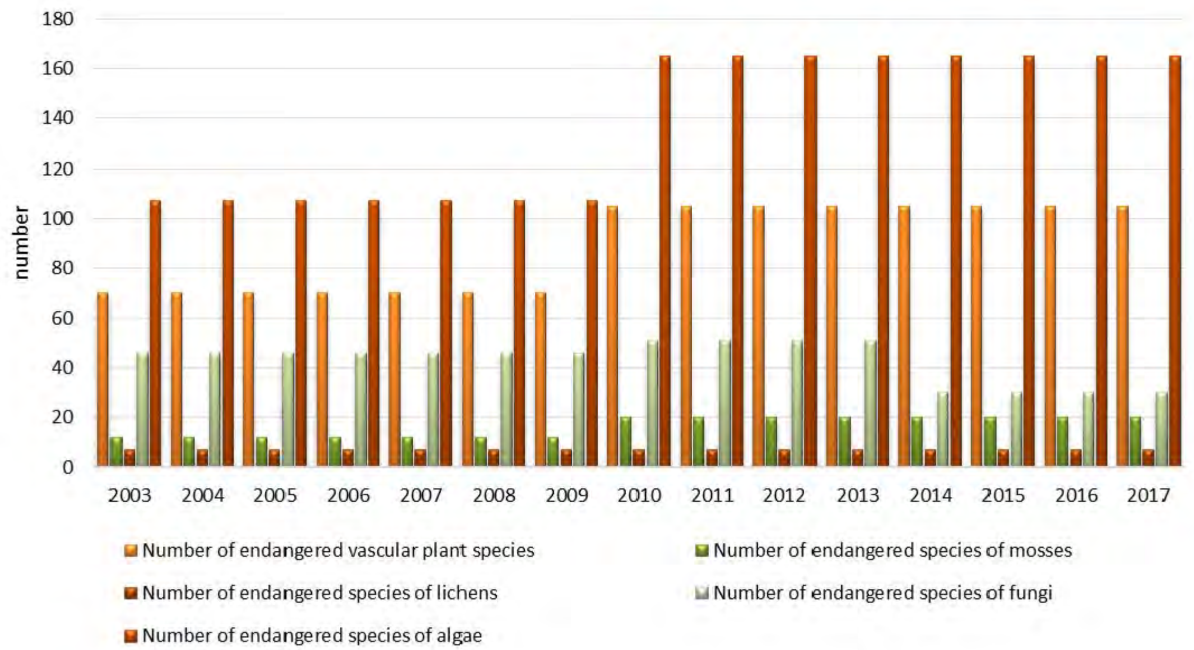
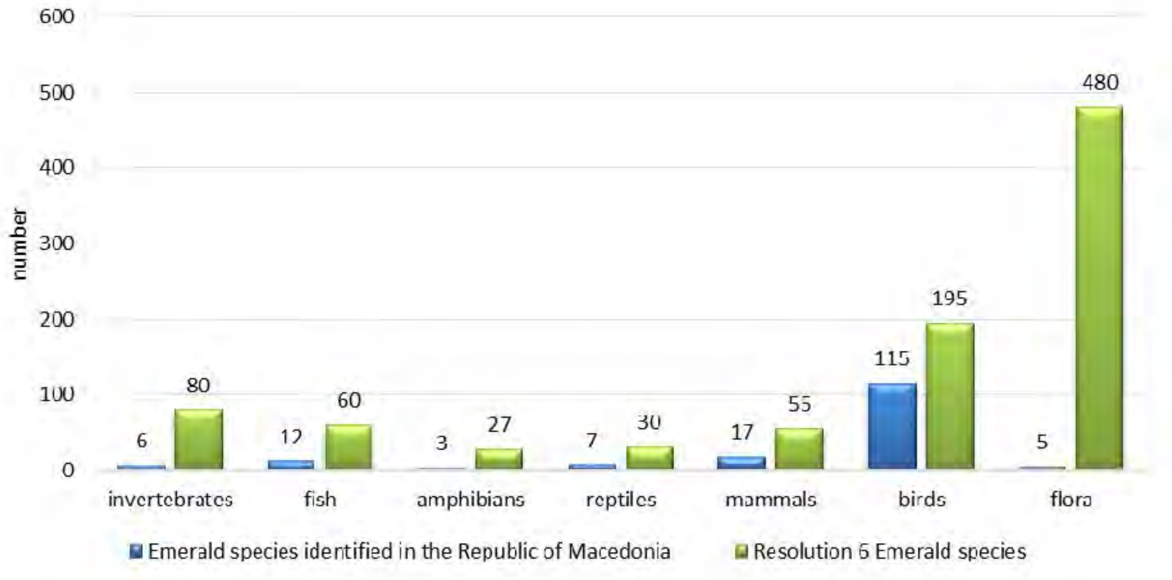


Figure 7. Number of Emerald species in Europe and in the Republic of Macedonia



Data coverage: excel

Sources of data: Study on the state of biodiversity in the Republic of Macedonia (2003), Strategy and Action Plan for the Protection of Biodiversity in the Republic of Macedonia (2004), Report on the Establishment of National Emerald Network in the Republic of Macedonia (2009), Analysis and Valorization of Species Diversity in the Republic of Macedonia Macedonia (2010), Fifth National Report of the Republic of Macedonia to the Rio Convention on Biological Diversity (2016), Final Report on the creation of ecological network NATURA 2000 in MK, section on distribution of populations and status of endangered species flora and fauna (MEPP, 2017).

Assessment

The **flora** of the Republic of Macedonia is very rich and diverse and represented by 5.843 species, of which 2.169 algae and 3.674 species of plants. Recent flora of higher plants is a mosaic of various floral elements: Tertiary relicts, Mediterranean, Greek-Asia Minor, Illyric, Caucasian, Middle European, Skardo-Pindian, Eurasian, Arctic-Alpine, cosmopolitan, among which 228 species are endemic (Balkan, South Balkan, Macedonian, local, etc.). The highest number of endemic plant species (114) has been recorded with *Angiosperms*.

The National Red List of threatened wild plant species is under establishment. The number of threatened wild plant species is shown in Table 1. The assessment of threat of species by taxonomic groups has been carried out in accordance with international criteria contained in several international documents (conventions, agreements, Global Red List, European Red List, EU Directives).

The IUCN Global Red List contains 72 taxa from the Republic of Macedonia, 19 of which are local endemic species. The Annexes of the Bern Convention list 12 plant species having their area of spreading on the territory of the Republic of Macedonia.

Lichens are represented by 450 species. Considering lichens studied in the Republic of Macedonia, no lichen species have been included in Annexes I and II of EU Habitat Directive. On national level, 12 lichen species have been identified to have status of being threatened.

Fungi compose exceptionally heterogeneous group of organisms and explorations so far have focused on the phyla of *Ascomycota* and *Basidiomycota*, while others are poorly studied. The total number of studied and recorded native fungi on the territory of the Republic of Macedonia is 2000 species. Most of those belong to the phyla *Myxomicota* (10), *Oomycota* (20), *Zygomicota* (35), *Ascomycota* (130) and *Basidiomycota* (1050).

From among studied native fungi in the Republic of Macedonia, no species has been included in Annexes II and IV of the Habitat Directive. The Preliminary National Red List of threatened fungi species includes 67 species belonging to the phylum of *Basidiomycota*. There are 72 protected species, with 4 endangered fungi with endangered status.

Fauna diversity is characterized with high extent of taxonomic diversity, represented by 13.320 species and 229 subspecies or 13.549 taxa in total.

Invertebrate animals (Invertebrata) are represented by 13.000 species, 635 of which are endemic. There are 43 species protected, and 28 species are endangered.

Vertebrate wild animals (Vertebrata) are represented by 549 species of which 34 species are endemic. The class of fish covers 85 species of which 27 species are endemic (34.5%). The class of amphibians includes 15 species of which 4 endemic species. The class of reptiles includes 32 species, no endemics, as well as in birds involving 333 species, but no endemic species are registered. In the class of mammals there are 84 species and 3 endemic species are registered. Also in terms of the degree of endangerment of the populations of vertebrate animals in the class of fish, 15 species are included, which are included in the category of globally endangered species.

It is of particular importance to point out that the fauna of vertebrate animals includes 113 species that have been enrolled on the European Red List, namely: 30 species of fish, 66 birds, 16 mammals and 1 reptile species. The National Red List of threatened fauna species is under development.

Within the species diversity, particular significance is attributed to the identified “Emerald” species. Namely, total of 165 species have been identified, as follows: 6 species of invertebrate animals, 154 vertebrate animals (12 species of fish, 3 species of amphibians, 7 species of reptiles, 115 species of birds, 17 species of mammals and 5 species of plants).

Two lists of strictly protected and protected species were adopted on national level (2011).

List 1: Strictly protected wild species in the Republic of Macedonia includes: 9 species of native fungi, 51 plant species, 36 invertebrate species and 98 vertebrate species.

List 2: Protected wild species in the Republic of Macedonia includes: 63 species of native fungi, 12 species of lichen, 151 plant species, 507 invertebrate species and 87 vertebrate species.

Policy relevance of the indicator

List of relevant policy documents:

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

The National Strategy for Biological Diversity Protection with Action Plan (NSBAP) defines integrated approach to the protection and sustainable use of components of biological diversity. The Strategic Action Plan (SAP) outlines the specific actions to be taken to achieve the targets. One of the measures in this document is the Protection of Species, through several actions concerning elaboration of National Red Lists and Red Book of the Republic of Macedonia, and protection of globally endangered wild species. Particularly important conservation activities concern protection of butterflies, Pelister, Pelagonia and Lokven dragonfly, Macedonian crayfish, From among vertebrate animals, critically endangered and endangered endemic and other fish species (lamprey, trout, eel), amphibians (sand-hoppers, frogs), reptiles (turtles, lizards, snakes), birds of prey (vultures, eagles, falcons, wild species of migratory waterbirds, other wild bird species, small size mammals (rodents, bats), wild carnivores: bear, lynx, wolf, golden jackal, otter, marten, badger, souslik, Balkan snow vole, Balkan chamois, red deer, deer, etc.

From among plants, the following have been identified: endemic and relict species Ema's *Thymus oehmianus*, Alshar's *Thymus alcharensis*, Macedonian ramonda (Ramonda macedonica), Balkan ramonda (Ramonda serbica), Mariana's tulip (Tulipa marianae), Sharplanina tulip (Tulipa scardica), Mayer's nepeta (Nepeta ernesti-mayeri), Alshar's violet (Viola allchariensis), Arsen's violet (Viola arsenica), Koshaninova violet (Viola kosaninii), spring Adonis flower (Adonis vernalis), orchids (Orchidaceae), Macedonian dwarf pine (Pinus mugo macedonicus), Macedonian oak (Quercus macedonicus), etc.

Legal grounds

The Law on Nature Protection provides for elaboration of National Red Lists and Red Book of the Republic of Macedonia, as well as proclamation of strictly protected wild species and protected wild species, by which they shall acquire the status of natural heritage. It is also legal obligation to establish Cadastre of protected areas and Registry of natural heritage including also strictly protected and protected wild species in the Republic of Macedonia.

Targets

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

Reporting obligation

- UNEP/CBD Secretariat
- Secretariat of UNEP/CMS, AEWA, EUROBATS
- Secretariat of BC/CE

General metadata

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

MK – NI 008

DESIGNATED AREAS

Definition

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

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

The indicator is also broken down to show the different trends of surface area in km^2 designated under international conventions and initiatives, under EU Directives and under national legislation:

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

Units

- Number of sites, ha, km2 and %.

Key policy issue

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

Key message

As of 1948, when the First National Park "Pelister" was designated in the Republic of Macedonia, the number and the total surface area of different categories of protected areas have noted permanent growth on national level.

At this moment, due to the new categorization of designated areas established under the new Law on Nature Protection, in accordance with the IUCN categorization, the designated area system is in transition and includes designated areas under the old and under the new categorization. The analysis (in relation to the number and the area) includes all designated areas in the Republic of Macedonia designated under the old and also under the new categorization. In doing so, the areas designated in accordance with the old categorization have been processed according to the appropriate/corresponding IUCN category. The analysis of the area of the designated areas has been made by rendering the borders of the areas in GIS.

Presently, the network of protected areas includes 86 areas in total and these occupy area of 229.900 ha or 8.94% of the territory of the Republic of Macedonia. The largest portion is occupied by national parks and nature monuments.

Total of 35 sites have been identified in the National Emerald network of areas of special conservation interest. They occupy an area of 752.223 ha or 29% of its territory.

Figure 1. Total area of designated areas

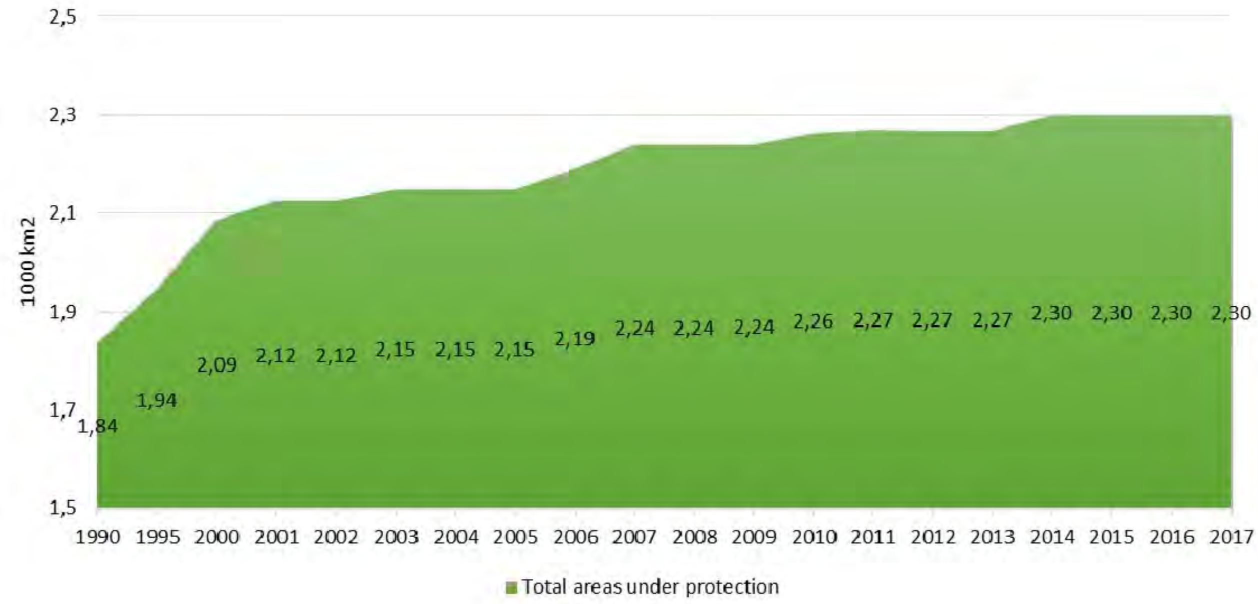


Figure 2. Area of designated areas by category of conservation

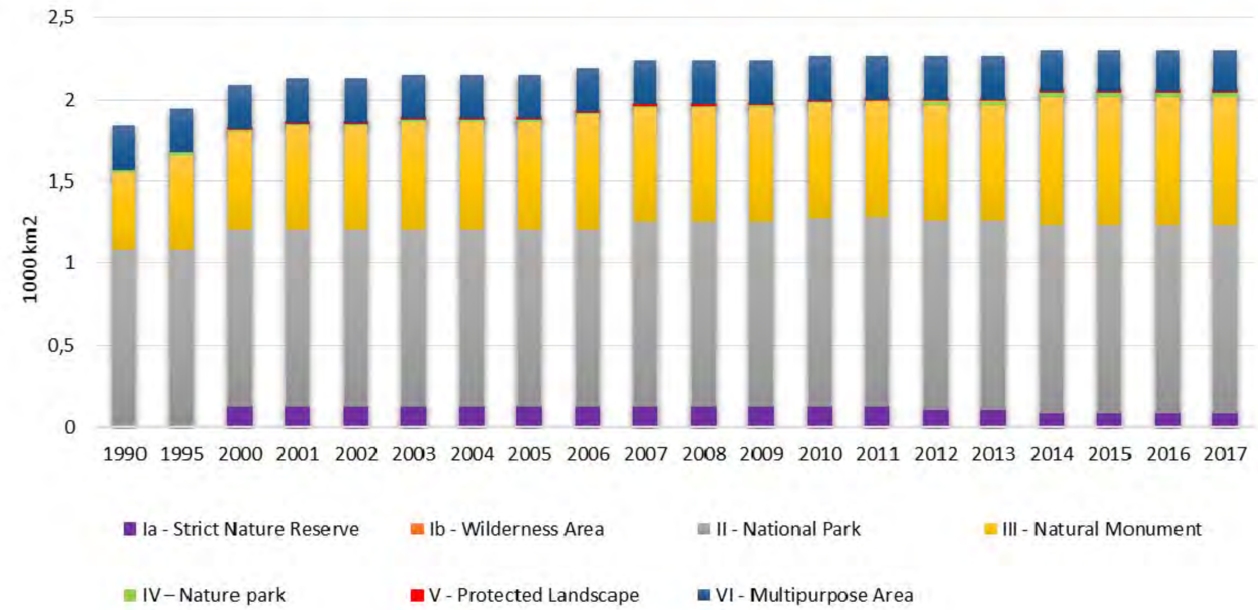


Figure 3. Share of individual national categories of designated areas in the overall territory of the Republic of Macedonia

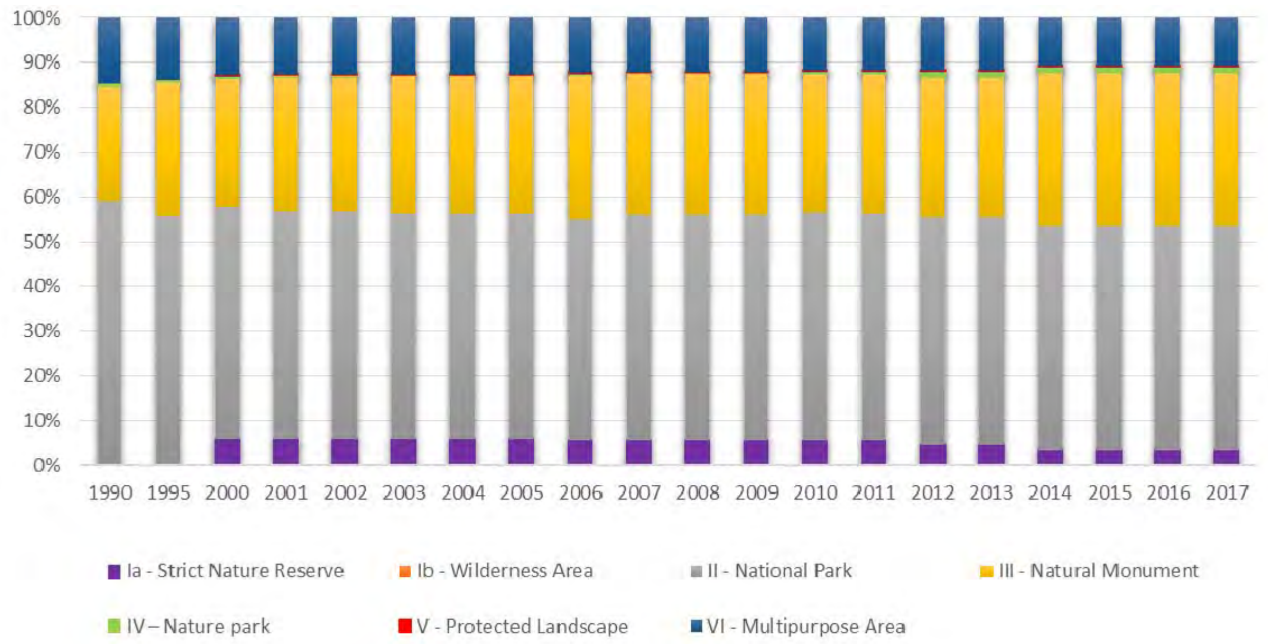


Figure 4.Total number of designated areas

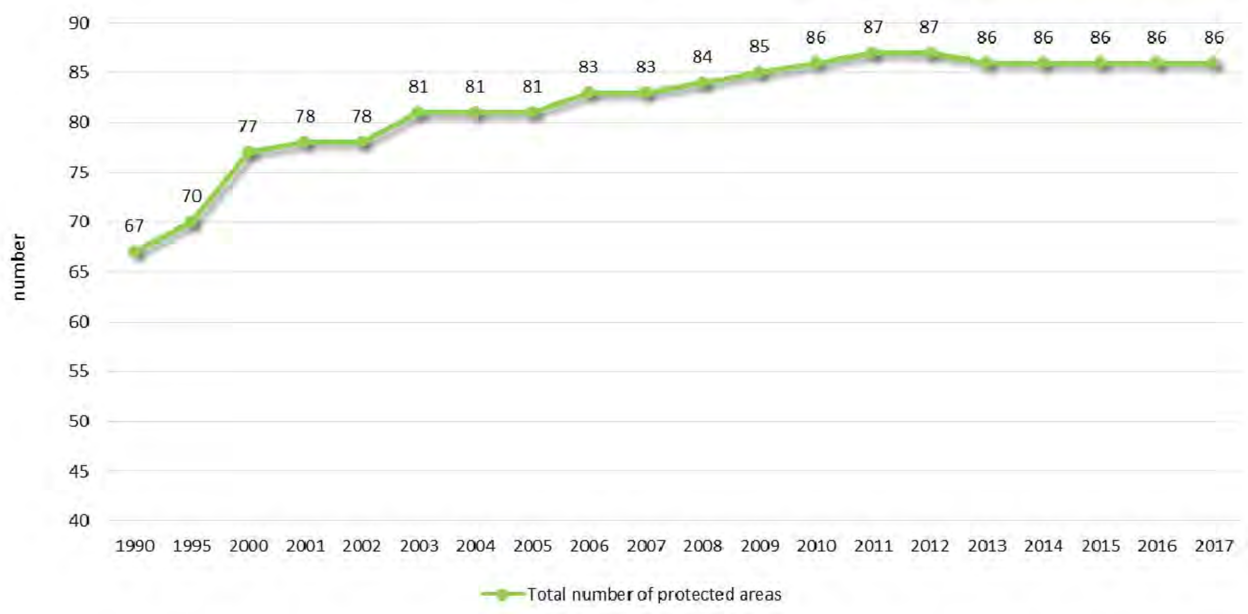
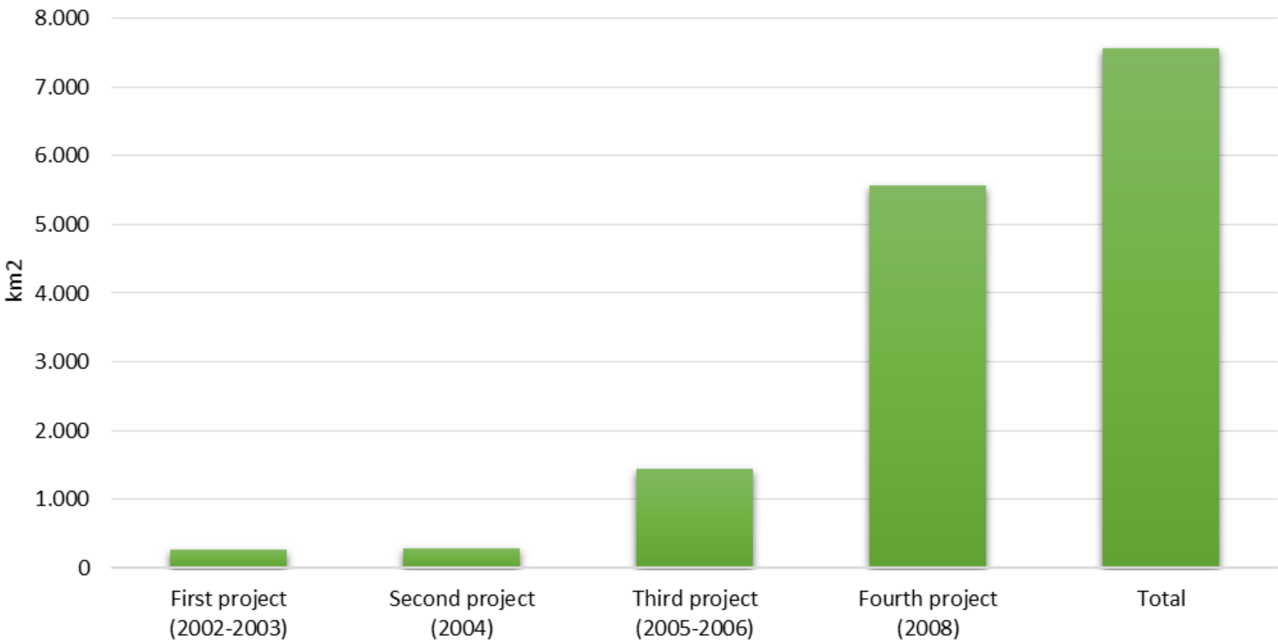


Figure 5. Area of identified Emerald areas



Data coverage: excel

Source: MoEPP - CDDA, Emerald database

Assessment

1. Designated areas at national level

Under the 2004 Law on Nature Protection, new categorization of designated area is introduced, aligned with the International Union for Conservation of Nature (IUCN), enabling inclusion of the national designated areas in the world network of designated areas. The Law stipulates a responsibility that, within 6 years, all designated areas (nominated before 2004) to be re-evaluated and designated accordance with the new categorization. Because of the current transitional period, the network of designated areas (areas designated according to the new categorization redesignated areas) the analysis (regarding the number and area they occupy) includes all designated areas in the Republic of Macedonia, designated under the old and also the new categorization. In doing so, the areas designated in accordance with the old categorization have been processed according to the appropriate/corresponding IUCN category. The analysis of the area of the designated areas has been made by rendering the borders of the areas in GIS (according to the data from the acts of designation or redesignation of areas, the Spatial Plan of the Republic of Macedonia, and where precise data in the Spatial Plan were missing, the area of the designated areas was rendered in accordance with the experts opinion).[1]

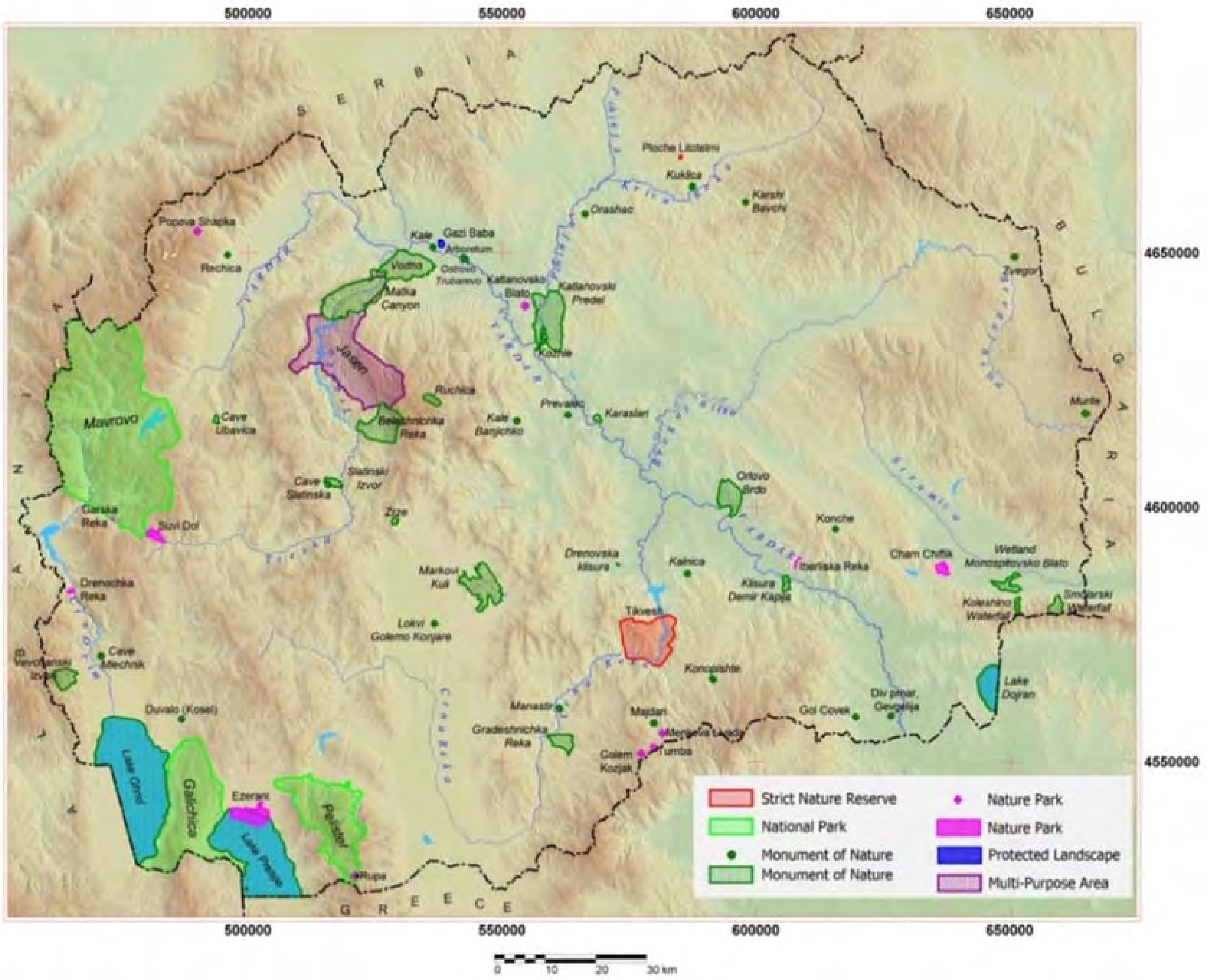
In the analyzed period, the area of designated areas has grown, i.e. the share of designated areas in the overall area of Macedonia in 1990 was 7.14% and in 2017 it grew to 8.94%. Also, the number of designated areas recorded increase from 67 in 1990 to 86 areas in 2017, most of which – 67 areas – belong to natural monuments, followed by nature park with 12 areas.

Thus, currently the designated area network comprises 86 areas, with total area of 229.900 ha or 8.94% of the territory of Macedonia.

Most of it falls into the category national parks with around 4.47%, then natural monuments with 3.07% and the multipurpose area Jasen with 0,97% of the national territory.

[1] The analysis of the number and area of designated areas, i.e. the rendering of the borders in GIS has been done during 2010-2011, within the UNDP and GEF project „Strenghtening the environmental, institutional and financial sustainability of the system of designated areas in the Republic of Macedonia ".

Map 1. Distribution of protected areas (without individual stems) in the Republic of Macedonia, (MOEPP, 2015)



2. Designated areas with internationally recognized status

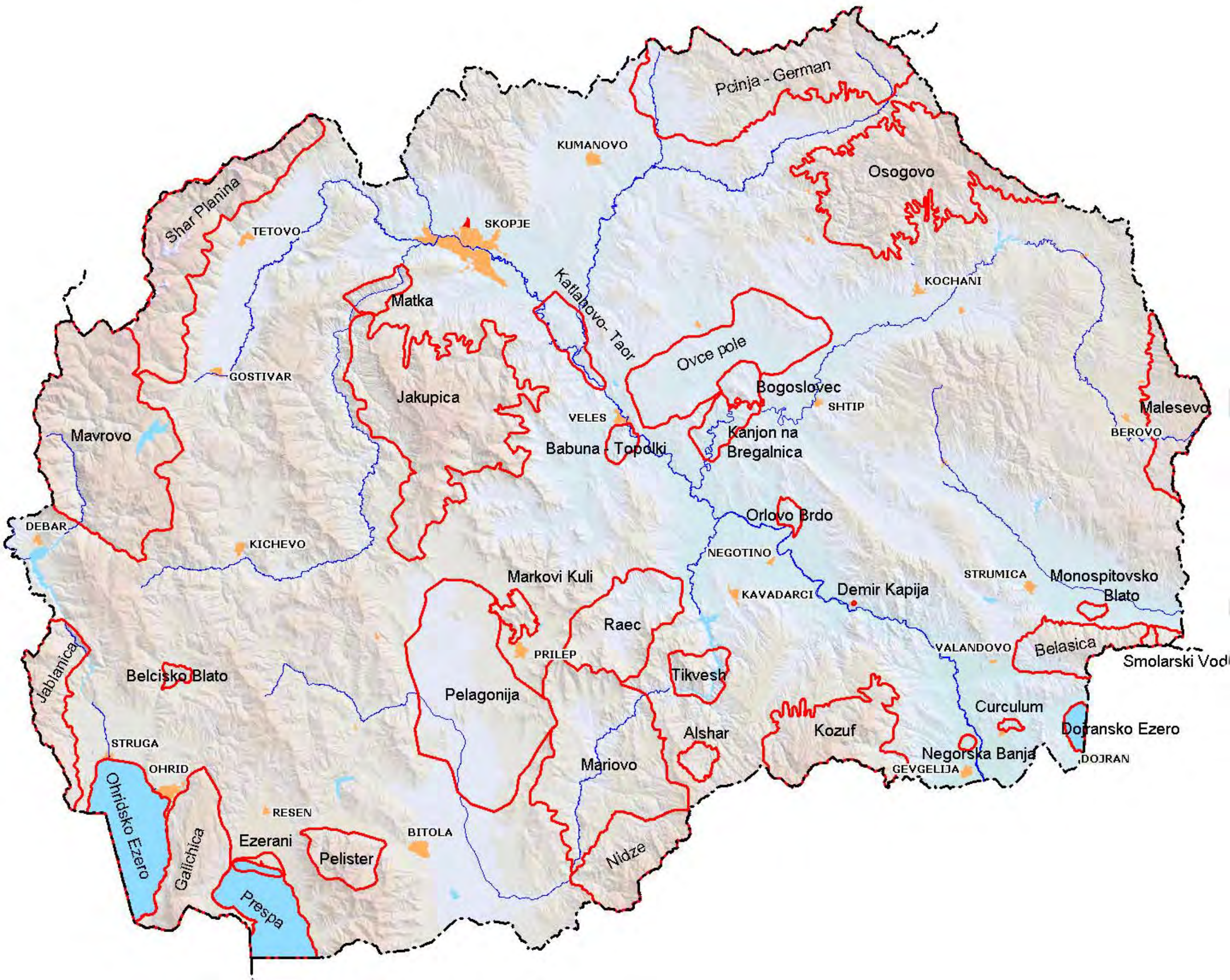
- Monument of Nature “Ohrid Lake” – World Natural Heritage (UNESCO);
- Monument of Nature “Prespa Lake” – Ramsar Site (1995);
- Monument of Nature “Dojran Lake” – Ramsar Site (2008);
- Monument of Nature “Markovi Kuli” (*King Marko’s Towers*) - World Natural Heritage (UNESCO’s Tentative List); and
- Monument of Nature “Slatinski izvor” (*The Springs of Slatino*) - World Natural Heritage (UNESCO’s Tentative List).
- Biosphere Ohrid-Prespa Reserve – World Natural Heritage (UNESCO) (2014).

3. Emerald network

4 phase process was implemented in the Republic of Macedonia from 2002 to 2008 to identify the areas of special conservation interest (ASCI) and establish the Emerald Network. This network is established on the territory of the countries Parties to the Bern Convention and important part in the preparation of candidate countries for EU membership for the implementation of the EU Birds and/or Habitats Directives, or an additional tool in the process of establishing the coherent European Environmental Network Natura 2000.

35 locations have been identified in the National Emerald network. Under the first project, implemented in 2002-2003, 3 areas have been identified: SNR Ezerani, NP Galicica and SR Dojran Lake, with a total area of 27.660 ha (3,6%). In 2004 a second project was implemented, identifying another 3 areas: SNR Tikves, NP Pelister, SR Demir Kapija, with a total area of 28.000 ha (3,8%). Under the third project implemented in 2005-2006, ten areas with a total area of 144.783 ha (19,1%) were identified, while with the fourth project (implemented in 2008), another 19 areas were identified with a total area of 556.447 ha (73,5%). The National Emerald Network of the Republic of Macedonia identifies 35 areas covering and area of 752.223 ha or around 29% of its territory.

Map 2. National Emerald network of the Republic of Macedonia



4. Natura 2000 ecological network

The Natura 2000 ecological network has been established in the territories of EU member states with the aim to secure the biodiversity by means of conservation of the natural habitats and wild flora and fauna.
The obligation to establish Natura 2000 comes from the Article 3 of the Directive of the conservation of natural habitats and wild flora and fauna (92/43/EEC). Measures taken under this Directive are intended to maintain/or restore to a favourable conservation status of natural habitats and wild plant and animal species which are of EU interest.
The Natura 2000 environmental network includes "Specially Protected Areas" (SPA's) – defined in accordance with the Wild Bird Conservation Directive and Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (Habitat Directive).
Article 52 of the Law on Nature Protection, provides a legal basis for the establishment of the Natura 2000 ecological network.

The MoEPP is currently implementing activities for further harmonization of the national legislation on nature protection with the EU legislation, as well as the Directives on habitats and birds. In this direction, identification of habitats and species of European importance on the national level, has been carried out and nine (9) areas have been identified as potential areas for Natura 2000 and two (2) areas with high natural potential. Three (3) of them are proposed as potential Special Protection Areas (SPA) under the Birds Directive, and six (6) areas as Site of Community Importance (SCI) in accordance with the Habitats Directive:

1. Dojran Lake (SPA)
2. Ohrid Lake (SPA)
3. Prespa Lake (SPA)
4. Mavrovo (SCI)
5. Shar Planina area with high natural potential
6. Jakupica (SCI)
7. Ovche Pole (SCI)
8. Cave Ubavica (SCI)
9. Galicica (SCI)
10. Pelister (SCI)
11. Mariovo and Kozuf areas with high natural potential

5. Natural rarities

The Law on Nature Protection under Article 90-a, provides a legal basis for the protection of certain parts of nature, like natural rarities. Certain rare, endangered and endemic, plants and animal species, their parts and communities, landscape forms, geological profiles, paleontological and speleological objects, can be declared as natural rarity, if their area is less than 100 hectares.
Pursuant to the Law on Nature Protection, the Dona Duka Cave (Official Gazette of the Republic of Macedonia No. 182/2011) and the Platanus orientalis in Morodvis (Official Gazette of the Republic of Macedonia No. 65/2016) were declared as natural rarities.
There are ongoing activities for the valorization and proclamation of ten localities/individual stems as natural rarities in the East Planning Region and the Ohrid region.

Methodology

- Methodology for the indicator calculation

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

Policy relevance of the indicator

List of relevant policy documents

Spatial Plan of the Republic of Macedonia

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

A Draft-National Biodiversity Strategy with Action Plan (2018-2023) and Draft-National Strategy for Nature Protection (2017-2027) have been finalized. There is currently a procedure for their adoption by the

Government of the Republic of Macedonia.

Legal grounds

The Law on Nature Protection provides for introduction of a system of designated areas aimed at protecting biological diversity in natural environments, natural processes, as well as abiotic characteristics and biological diversity of the area. The Law adopts new categorization of the designated areas which is in accordance with the International Union for Conservation of Nature (IUCN) model, establishing 6 categories of protected natural heritage.

Targets

Expansion of the network of national designated areas up to around 12% in relation to the territory of the Republic of Macedonia is foreseen under the Spatial Plan of the Republic of Macedonia, the Spatial Plans of the Regions and the National Strategy for Biological Diversity Protection

The 35 areas identified by the National Emerald network will be used to form the Natura 2000 network; therefore it is necessary to strengthen the capacities at national and local level to start the process of identification of all areas in accordance with Natura 2000 and the EU Birds and Habitats Directive.

Reporting obligation

- Annually, to the European Environmental Agency
- Annually, to the Secretariat of the Bern Convention with the Council of Europe

General metadata

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

MK – NI 009

SPECIES DIVERSITY

Definition

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

Currently, groups of species that are taken into account are fish, birds and mammals from fauna, and higher plants of the flora.

The indicator shows the trend of several selected wild species: endemic fish (Pelister trout), predatory birds (eagles, vultures, falcons), water birds (black stork), then mammal-big beasts (brown bear) and conifers (Molikapine).

Units

Number of species, estimated number of individuals for certain species, or diversity (ha).

Key policy issue

What is the trend of the populations of selected plant species (Molikapine), fish, birds and mammals, what are the reasons that lead to a reduction in the number of them?

Key message

According to the available data, there is a decreasing trend in the number of populations in all observed species, except for the molybdenum, which in the considered period is spread to 1174 ha.

It is noted that with the ban on hunting and the implementation of several projects and programs focused on the protection of the brown bear, which belongs to group of Keystone species, in the period from 2012 to 2017, the number of population is stable.

Figure 1. Trend in number and distribution of Keystone species

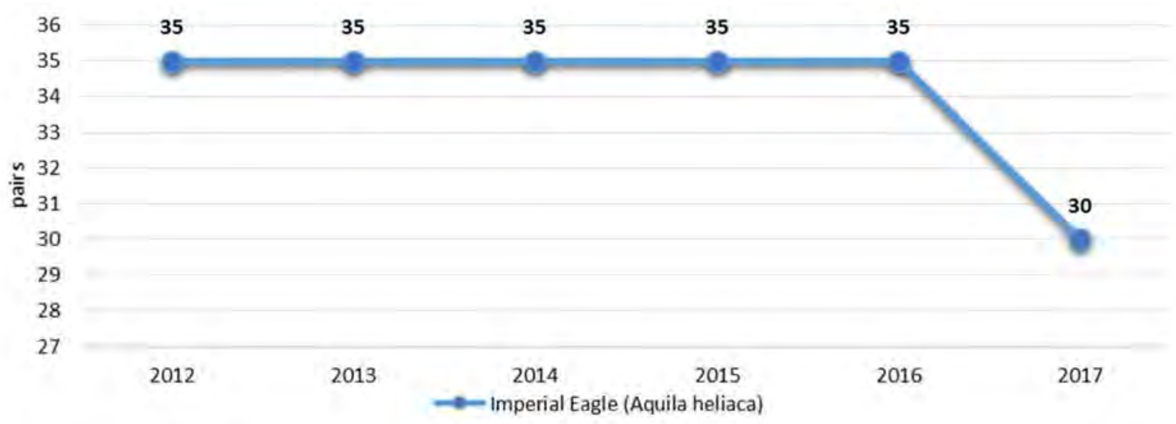


Figure 2. Trend in number and distribution of Flagship species

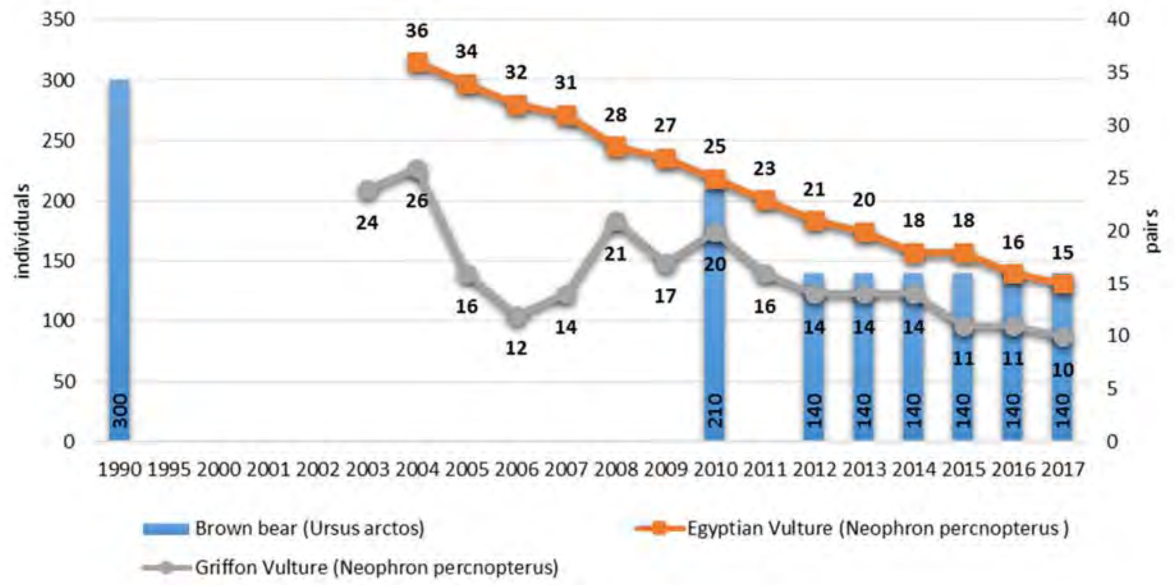


Figure 3. Trend in number and distribution of endemic species

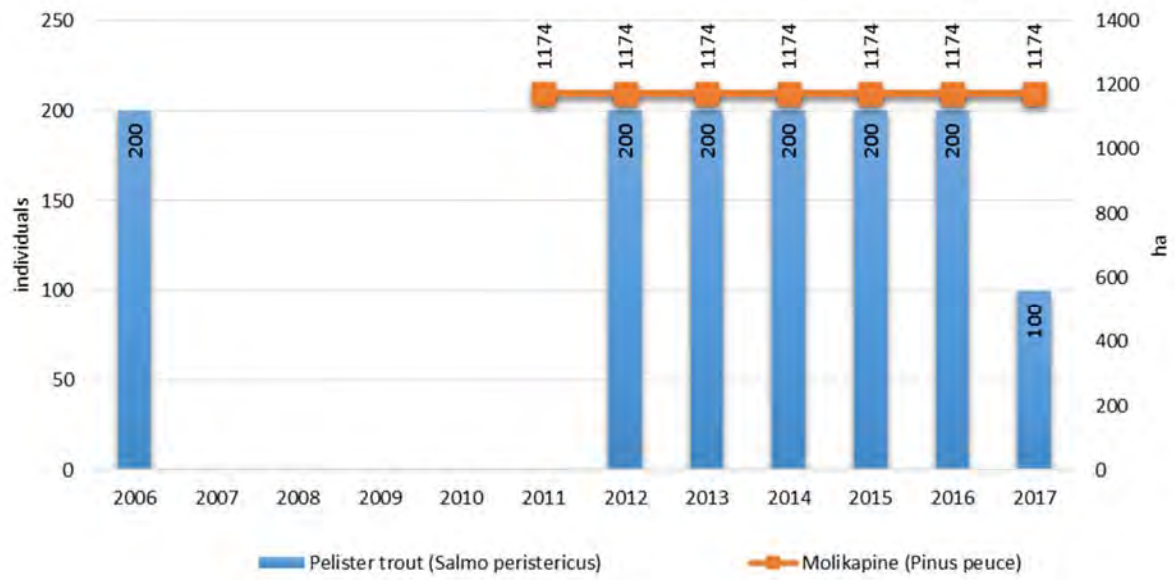
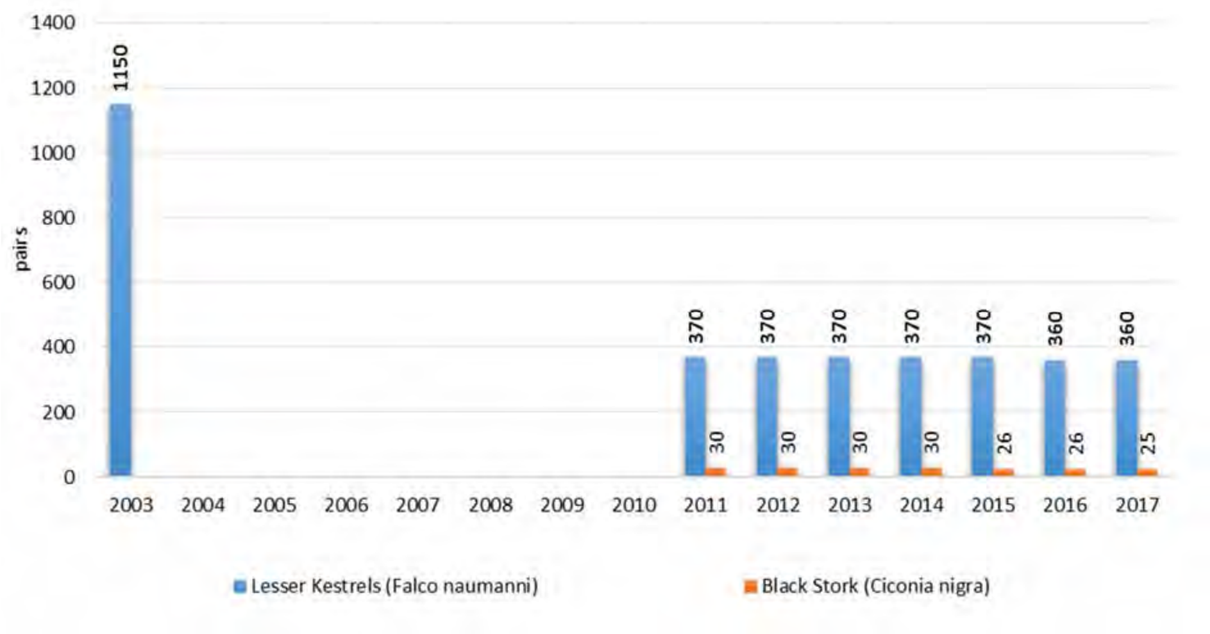


Figure 4. Trend in number and distribution of other species



Data coverage: **excel**

Source: Micevski, B. (1998): Ornithofauna of Lake Prespa, Vest. Micevski, B. (2000): Ornithofauna of tree natural lakes in Macedonia (Lake PRespa, Ohrid and Doiran), Final Report, FNSM. Micevski B.& Nastov.A. (2002): Conservationa of migratory birds in Macedonia, National Report to CMS and AEWA, UNEP, Bonn. Grubac, B. & Velevski, M. (2004 -2010): Survey and monitoring of the status, breeding success and threats to the Egyptian Vulture in Macedonia- Report to BVCF/FZS; 2. Grubac B., Velevski M., Lisicanec T., Lisicanec E., Rolevski, D.& Andevski, J. (2007): Decrease of population size of the Griffon vulture Gyps fulvus in Macedonia and assessment of conservation measures. III Congress of Ecologists of Republic of Macedonia, 06-09.10.2007, Struga. Abstract Book, 101-102. Macedonian Ecological Society; 3. Македонско еколошко друштво и Фонд за дивата флора и фауна. Velevski, M & all. (2012): State of Birds of Macedonia- Report of BL International and MES,MK, Velevski.M. & all.(2013): Vulture conservation in Macedonia, in Balkan Peninsula and Adjacent Region, Vulture Conservation Fondation and Frankfurt Zoological Society. MEPP&Scientific Project Team: Fift National Report for Biodiversity in Macedonia, UNEP/CBD, 2015. Nastov, A. & Micevski,B. (2017): Tematic Report of conservation status of selected migratory fauna species: birds and mammals in MK (UNEP/CMS). MEPP&Project Team (2017): Final Report of distribution of population and conservation status of key selected flora and fauna species , EU IPA Project for NATURA 2000 in Macedonia (2017). Nastov, A&Micevski, B (2018): National Riport for implementation of Ramsar Convention in MK.

Assessment

The richness and heterogeneity of species and ecosystems are the basic features of biodiversity in the Republic of Macedonia. According to available information, this treasure includes an impressive figure of 17,604 species of which over 976 species are endemic. According to the analysis of the richness of the biodiversity of countries in the European continent, the Republic of Macedonia is at the very top of the list of countries known as "European Hotspot".

The Ornithofauna of the Republic of Macedonia is represented by 338 taxa (309 species and 19 subspecies) of birds.

The European Red List includes 66 bird species that are found in Macedonia. Also, 115 Emerald species of birds have been identified (in accordance with Resolution No. 6 of the Berne Convention) that are present in Macedonia.

According to the available data in the category of Keystone species (Figure 1), the population of the eagle (Aquila heliaca) was monitored. It is noted that in the period from 2011 to 2017 the trend is negative so that the number of reproductive couples has dropped to 30 couples, which is a decline of 14.3%.

When monitoring the trend of number and distribution of Flagship species (Figure 2), one species of mammals (brown bear) and two species of predatory birds (white-headed and Egyptian vulture) were examined.

From the data it can be noticed that the number of Ursus arctos individuals decreased by 30% from 1990 to 2010, but in the period from 2012 to 2017 it is stable and amounts to 140 individuals.

For the white-headed vulture (Gyps fulvus) there is a trend of decreasing the number of populations, so in the period from 2003 to 2017 the number of reproductive couples decreased from 24 to 10 couples, which is a drop of 58.3%. Also, the number of Egyptian vulture population (Neophron percnopterus) decreased from 36 to 14 couples in the period from 2004 to 2017, a 61% drop.

When monitoring the trend of the number and distribution of endemic species (Figure 3), one plant and one animal species is considered. From the floral diversity as an endemic plant species, the fifth-pinus pine (Pinus peuce), which has been analyzed for 7 years (2011-2017), is singled out. Its status has not changed, more precisely it is spread to 1174 ha.

From the faunal diversity, the trend in the populations of a type of endemic freshwater fish Pelister trout (Salmo peristericus) was analyzed. For this species, there is a decrease in the number of populations in Brajcinska Reka (NP Pelister) from 200 to 100 reproductive indices, which is a decrease of 50%.

For the other species (Figure 4), on the basis of the available data, two species were examined: the Lesser Kestrels and the Black Stork.

In the Lesser Kestrels (Falco naumanni), the highest number of couples (1150) was recorded in 2003, after which there was a declining trend and in 2011 it amounted to 370 couples. This number of reproductive couples is constant by 2015, and then reduced in 2016 and 2017 to 360 couples.

For the Black Stork (Ciconia nigra), the number of couples shows a declining trend, with 30 reproductive couples in 2011 dropping to 25 couples in 2017 and a fall of 16.7%.

Methodology

Methodology for indicator calculation

Sampling quadrants (10 – 15) with an area of 1 km2 are taken by random and common bird species were counted there by the method of linear transect. Counting took place in the period of nesting (from 15 April to 15 June) with the intensity of two searches per year. Data was statistically processed resulting in the established trend in the populations of species at national level.

With reference to birds of prey, full census of couples in nest and determination of their success in nest have been envisaged.

Source of used methodology

We applied methodology used by the organization British Trust for Ornithology in carrying out the census of birds in nests on the territory of the United Kingdom.

Policy relevance of the indicator

List of relevant policy documents

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

The National Strategy for Biological Diversity Protection with Action Plan defines integrated approach to the protection and sustainable use of components of biological diversity. The Action Plan outlines the specific actions to be taken to achieve the goals. The strategic commitment “Research and monitoring” includes action for national biodiversity indicators development. (D.1.11).

Legal grounds

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

Targets

Identification of the trend in populations for selected bird species and establishment of the reasons leading to reduction in their number and development and implementation of measures for the negative trend halting (contribution to the achievement of the Target 2020 for biodiversity loss prevention/reduction by 2020).

Reporting obligation

UNEP/CBD Secretariat, UNEP/CMS Secretariat, AEWA, EUROBATS, BC/CE Secretariat

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Typ e	Linkage with area	Frequency of publication
MK NI 009	**Species diversity**	CSI 009	Species diversity	**S**		▪ Biological diversity	**MK NI 009**

MK – NI 052

FORESTS AND OTHER WOODED LAND

Definition

The indicator shows the overall forest and other wooded land area, the share of this area in country area, as well as share of forest landscapes naturally recovered and planted forests, share of production forest area and forests intended for soil, water, ecosystem and biodiversity protection.

The term *forest* means forest ecosystem on wooded land grown over with forest tree species and shrubs, bareland adjacent to forest, as well as other barelands and meadows within forest, forest nurseries, forest roads, seeds plantations, fire prevention passes in forest, wind protection belts on areas exceeding two ares in size, as well as forest within protected areas.

Wooded land is land under forest or which due to its natural properties is the most suitable for forest production, as well as land with facilities intended for forest production.

Production forests are primarily intended for permanent production of wood assortments and other wood products and services.

Forests within protected areas are designated under the Law on Nature Protection.

Units

– km^2, ha and %.

Key policy issue

What is the trend of overall forest and other woodland area?

Key message

The share of total forest area in overall country area ranges between 35.5% and 44,6%, forest area was the largest in 2016, and the smallest in 1990. In 2016, there was increase in the overall forest area by 9.8% compared to 1990 when the forest area was the smallest.

With regard to share of wooded land areas in country area, data is available only for the period 2010 to 2016 and ranges between 3.8% and 5.4%, reflecting increase by 44.1%.

The share of planted forest area has variable trend of decrease and increase in area.

Figure 1. Share of forests and other wooded land in country area

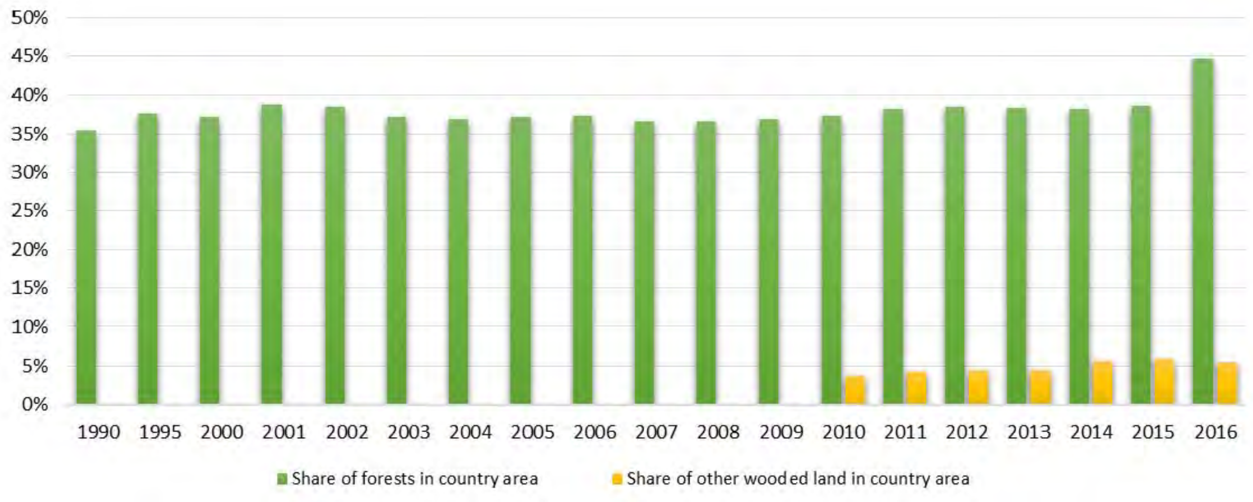


Figure 2. Share of planted forest in country area

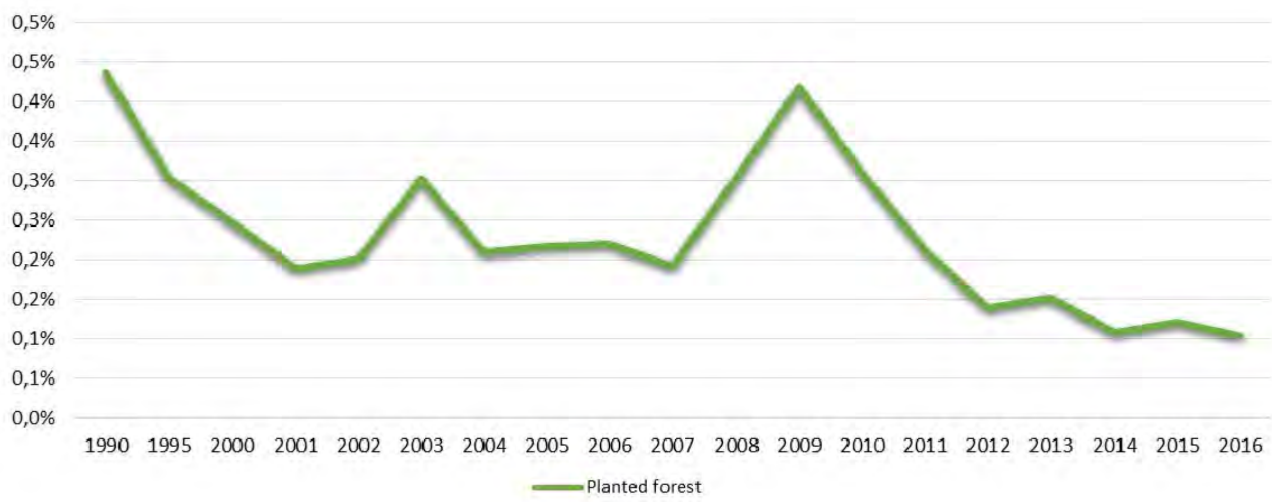
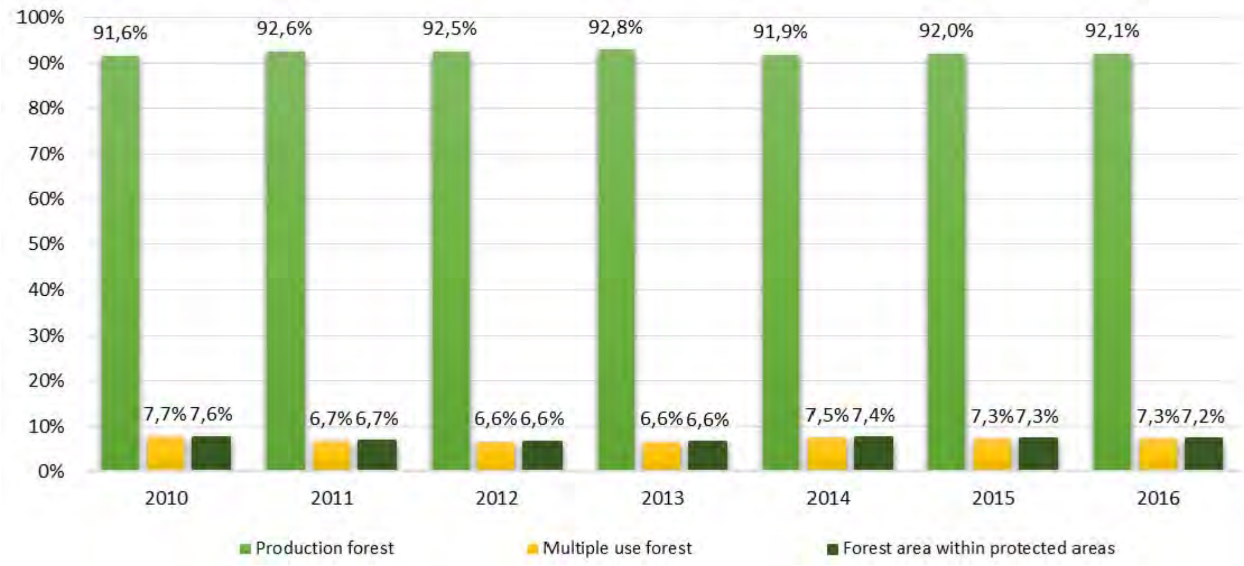


Figure 3. Share of production, multiple use forest and forest area within protected areas in country area



Data coverage: excel

Source of data: State Statistical Office

Assessment

Besides production, forests also have role of nature protection through protection of biodiversity and protection against erosion. They are of great importance for sustainable development owing to influence they make on climate, water regime, oxygen production and quality of environment.

During the reporting period, the share of overall forest area in the total country area ranges between 35.5% and 44.6%, forest area was the largest in 2016, and the smallest in 1990. In 2016, there was increase in the overall forest area by 9.8% compared to 1990. In 2016 there was increase by 0.7% compared to 2015. The increase of the forest area is due to new measurements of forest.

With regard to share of other wooded land areas in country area, data is available only for the period 2010 to 2016 and ranges between 3.8% 5.9%, reflecting increase by 44.1%.

The share of planted forest area with new forest has variable trend of decrease and increase in area. Significant decline by 52.8% was recorded in the period 1990 to 2001, followed by increase of 53.2% by 2003, and then decrease again of 37.3% by 2007. The greatest increase was recorded from 2007 to 2009 reaching 120.2%, to be followed by the greatest decline of 73.7% by 2016.

The share of production forests in total forest area, in the period 2010 to 2016 recorded increase by 4.8%, the share of multiuse forests noted decrease by 1.3%, and the share of forest areas within protected areas noted drop by 1.1% in total forest area.

Methodology

- Methodology for the indicator calculation

Parameters are obtained from reporting units delivered with regular statistical reports, book-keeping records, based on specific forest management plans.

Policy relevance of the indicator

Legal grounds

- Law on Nature Protection (Official Gazette of RM no. 67/04, 14/06, 84/07, 35/10, 47/11, 148/11, 52/12, 13/13, 163/13 and 41/14)
- Law on Forests (Official Gazette of RM no.64/09, 24/11, 53/11, 25/13, 79/13, 147/13, 43/14 and 160/14)
- Law on State Statistics (Official Gazette of RM no.54/97, 21/07, 51/11, 104/13, 42/14 ,192/15 and 27/16) and Programme for statistical survey for the period 2013-2017 (Official Gazette of RM no.20/13, 24/14, 13/15 and 07/16)

Targets

The Spatial Plan of the Republic of Macedonia specifies enlargement of forest and wooded land areas, namely by 2020 the share in country area should be 48.8%.

Reporting obligation

- UNECE/FAO
- FOREST EUROPE Report on "State of Forests and Sustainable Forest Management in Europe"
- FAO Global Forest Resources Assessments (FRA)

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 052	**Forests and wooded land**			**S**	A	▪ Biodiversity	Annually

CLIMATE CHANGE

MK - NI 010

GREENHOUSE GAS EMISSIONS

Definition

The indicator shows the quantities of greenhouse gas emissions and sinks into/from atmosphere on national level. The emissions are presented by greenhouse gas type. The indicator provides information on emissions in the following sectors: energy, industrial processes and products use, agriculture, forestry and other land use (AFOLU) and waste.

Units

- Kilotons CO_2-equivalent

Key message

The aggregate GHG emissions and removals (net emissions) are estimated 9,023 Gg CO_2-eq in 2014 (including the FOLU sector). The Figure 1 shows the time series of the emissions (emissions reduced for the removals), in CO_2-eq, from 1990 to 2014. Significant fluctuations in the net emissions can be seen in 2000, 2007, 2008 and 2012, where increased CO_2 emissions can be noticed in FOLU sector (instead removals) as a result of the intensified forest fires/wildfires. If the emissions and removals from FOLU sector are not accounted for, then the total GHG emissions are 12,204 Gg CO_2-eq in 2014 (Figure 2). The dominant share of emissions from the Energy sector is evident throughout the whole time series.

According to the level assessment for 2014, the top categories with the highest values of emissions (in kt CO_2-eq) are: Energy Industries – Solid Fuels (22.8%, CO_2 emissions), Solid Waste Disposal (11.4%, CH_4 emissions), Road Transportation (8.2%, CO_2 emissions), and Manufacturing Industries and Construction – Liquid Fuels (3.4%, CO_2 emissions), while the category Forest Land Remaining Forest Land has the highest values of removals (35.1%, CO_2 sinks).

Figure 1. Total net GHG emissions in kilotons CO2-equivalent (baseline 2000)

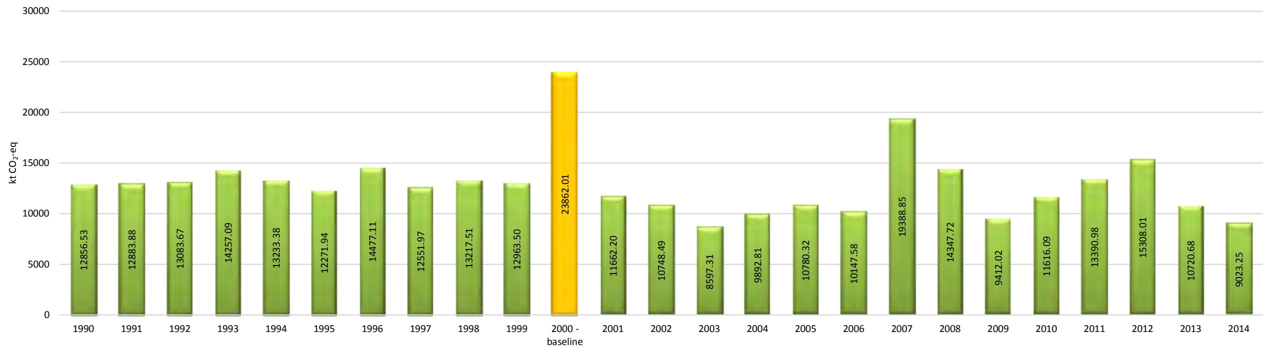


Figure 2. GHG emissions by sector in kilotons per year

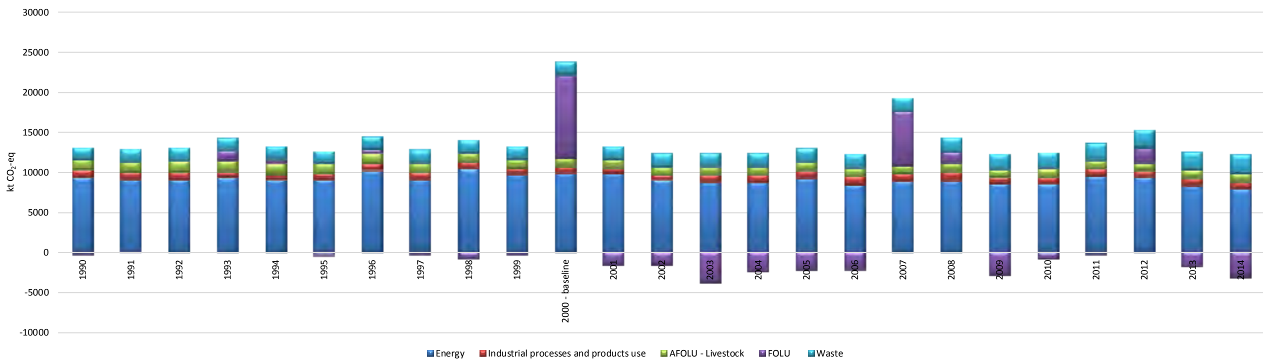


Figure 3. Share by sector of GHG emissions in % per year

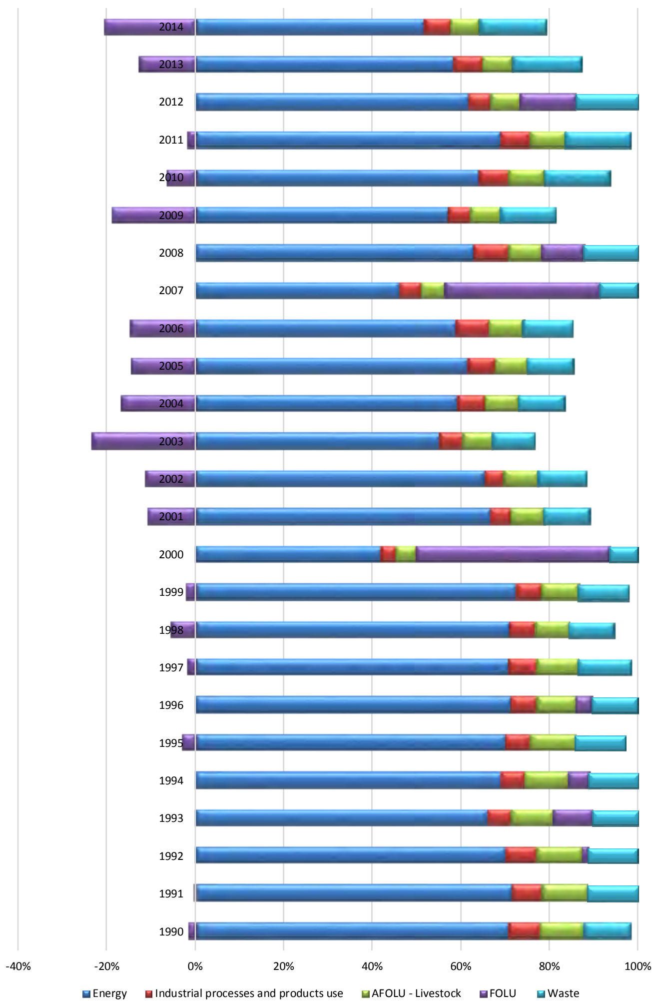
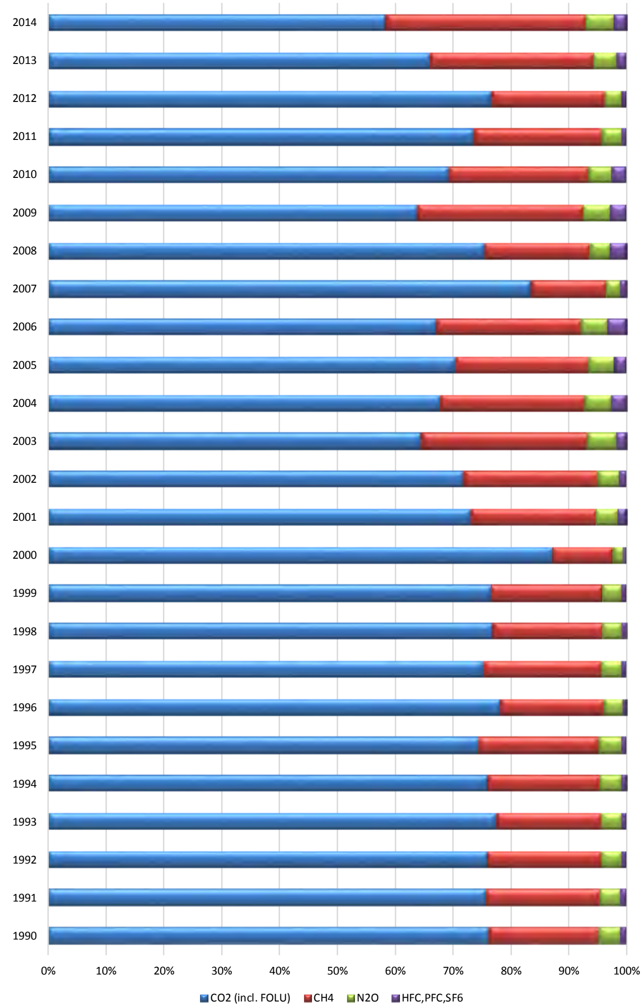


Figure 4. Share of individual pollutants in the total GHG emissions in % per year



Data coverage: excel

Source: Second Biennial Update Report (SBUR) on Climate Change to UNFCCC (National Inventory Report (NIR) - RCESD - MASA), MoEPP, UNDP, 2017, www.unfccc.org.mk

Assessment

In general, the greatest share in the total emissions (excluding the removals from Forestry and other land use sector) have the emissions from the Energy sector, accounting for 65.2% in 2014, followed by the Waste sector with 19% share, Agriculture (only emissions from manure management and enteric fermentation) with 8.2% and IPPU sector with 7.6%.

Considering the net emission (where the removals from Forestry and other land use sector are accounted for), again the Energy sector has the greatest contribution to the emissions, with of 88% in 2014, followed by the Waste sector with share of 26%, then emissions from Agriculture (only from manure management and enteric fermentation) with share of 11% and the emissions from Industrial processes and product use with 10%. The Forestry and other land use sector contirubutes to the removal of the GHG with -35% share (Figure 3).

The GHG inventory in the Energy sector accounts for the emissions released as a result of fuel combustion activities in in the following categories: Energy Industries, Manufacturing Industries and Construction, Transport, Other sectors (Commercial/Institutional, Residential and Agriculture/Forestry/Fishing) and Non-Specified. In addition, the Fugitive emissions from extraction of lignite, oil refining and transmission of natural gas have been calculated. Therefore, the overall GHG emissions in Energy sector are 7,957.5 kt CO_2-eq in 2014. Most of the GHG emissions in 2014 come from the category Energy Industries (59.7%), then from the Transport (20.5%) and Manufacturing Industries and Construction (14.2%). The other two categories together account for 3.8% of the total emissions in 2014 and the remaining 1.8% are Fugitive emissions.

The GHG emissions in the IPPU sector in Macedonia come either from the manufacturing industries or the usage of ozone-depleting substances (ODS) substitutes for refrigeration and air-conditioning. The metal industry is the main contributor with dominant level of emissions from the ferroalloy production. This category is followed by the mineral industry where most of the emissions come from cement production. The rest of the emissions are a result of ODS substitutes usage in the country. Only small portion of emissions come from the chemical industry sector as there are no significant factories that produce chemicals. The level of the overall greenhouse emissions from this sector is consistent throughout the entire period of 1990-2014, where the emissions from manufacturing industries follow generally decreasing trend, while emissions from product use follow increasing trend over the observed years. The emissions in in 2014 it amount to 921.6 kt CO_2-eq.

The GHG emissions from the AFOLU sector include emissions associated with Livestock, Forestry and Land Use. Activities related to Livestock production emit CH_4 and N_2O. The CH_4 emission is caused by enteric fermentation during herbal digestion in ruminants but also N_2O emission occurs during the metabolic processes. Additionally N_2O is emitted as a result of manure storage and processing (management). The emissions due to livestock activity in 2014 were 673.7 kt CO_2-eq. Emissions of land use were evaluated throughout forest land, cropland, grassland, wetland, settlements and other land. Forestry sector is the major contributor of GHG sinks in Macedonia, with exception of several years (2000, 2007, 2008 and 2012) when the amounts of forest fires (burned areas) were significantly above the annual average. The average GHG sinks in this sector for 2014 is estimated on 3,471.2 kt CO_2-eq. The Land category, despite the CO_2 emissions and/or sinks, is characterized with non-CO_2 emissions, particularly as a result of biomass burning, N_2O emissions from managed soils, including indirect N_2O emissions from additions of N to land due to deposition and leaching, and emissions of CO_2 following additions of liming materials and urea-containing fertilizer. These emissions are estimated to be 328.2 kt CO_2-eq in 2014.

The GHG emissions from the Waste sector cover the following categories: Solid Waste Disposal, Biological Treatment of Solid Waste, Incineration and Open Burning of Waste and Waste Water Treatment and Discharge. The overall emissions from this sector are estimated to 2,323.5 kt CO_2-eq in 2014. The Solid Waste Disposal emissions are most significant accounting for 94.4% of the total waste emissions in 2014. The emissions from Incineration and Open Burning of Waste represent 1.4% of the total Waste emissions. The remaining 4.2% of Waste emissions come from Wastewater Treatment and Discharge (domestic and industrial).

Analyzing the net GHG emissions by gas (including the removals from FOLU sector), it is evident that across the series the most dominant are the CO_2 emissions (Figure 4). Their share accounts for 58% in 2014, followed by the CH_4 emissions with 35%, then N_2O emissions with 5% and all F-gasses with 1.5%.

Methodology

▪ Methodology for the indicator calculation

To calculate GHG emissions as well as GHG inventories, the methodology provided by UNFCCC/IPCC is used.

Methodology is based on the calculation of GHGs as a product from the activity data for individual sectors and emission factors.

In the preparation of Macedonia's National Inventory under the Second Biennial Update Report, the Tier 2 method was applied for CO_2 emission factors for lignite, residual fuel oil and natural gas for Fuel combustion activities in Energy sector. Tier 2 was also used in IPPU sector for emission factors in Mineral industry, for cement production and in Metal industry, for Iron and steel production and Ferroalloys production. The Waste sector is another sector with Tier 2 application, through IPCC FOD method and taking into account the country-specific activity data on waste disposal at solid waste disposal sites (SWDS) and the historical data on GDP and population. For the other sectors the default method, Tier 1, was used.

The analysis of key categories that contribute the most to the absolute level of national emissions and removals (level assessment) and to the trend of emissions and removals (trend assessment), was conducted using the Approach 1. According to this approach, key categories are those that, when summed together in descending order of magnitude, add up to 95% of the total level/trend.

In the SBUR, the uncertainty analysis for the first time was conducted using both methods, Approach 1 (Error Propagation method) and Approach 2 (which is actually an implementation of the Monte Carlo method), for all sectors of the inventory for 2012, 2013 and 2014.

Policy relevance

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

Legal grounds

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

Reporting obligation

UNFCCC

General metadata

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

MK - NI 011

PROJECTIONS OF GREENHOUSE GAS EMISSIONS

Definition

The indicator illustrates projected trends in anthropogenic greenhouse gas (GHG) emissions by means of application of the existing policies and measures (Mitigation scenario, with existing measures - WEM) and/or additional policies and measures (Higher ambition mitigation scenario, with additional measures - WAM). Projected trends are presented by sector types: energy, industrial processes, agriculture, forestry and other land use and waste.

Units

- Tons CO_2-equivalent.

Key message

According to specific emissions (кt CO_2-eq per capita), Macedonia will have an upward trend in each of the three scenarios and in the mitigation scenarios it would grow at a lower rate than in the Reference Scenario. Thus, the value of this indicator in the WAM scenario increases by 16% in 2035. That means that every citizen of Macedonia in 2035 will create 7.5 t CO_2-eq, and in 2012 it created 6.5 t CO_2-eq. According to these forecasts, in 2035, Macedonia will be somewhere between the EU (28) (8.75 t CO_2-eq/capita) and Hungary (6.25 t CO2-eq/capita) in 2015.

Figure 1: Projections of total GHG emissions [кt CO2-eq] – Reference scenario (Without Measures – WOM)

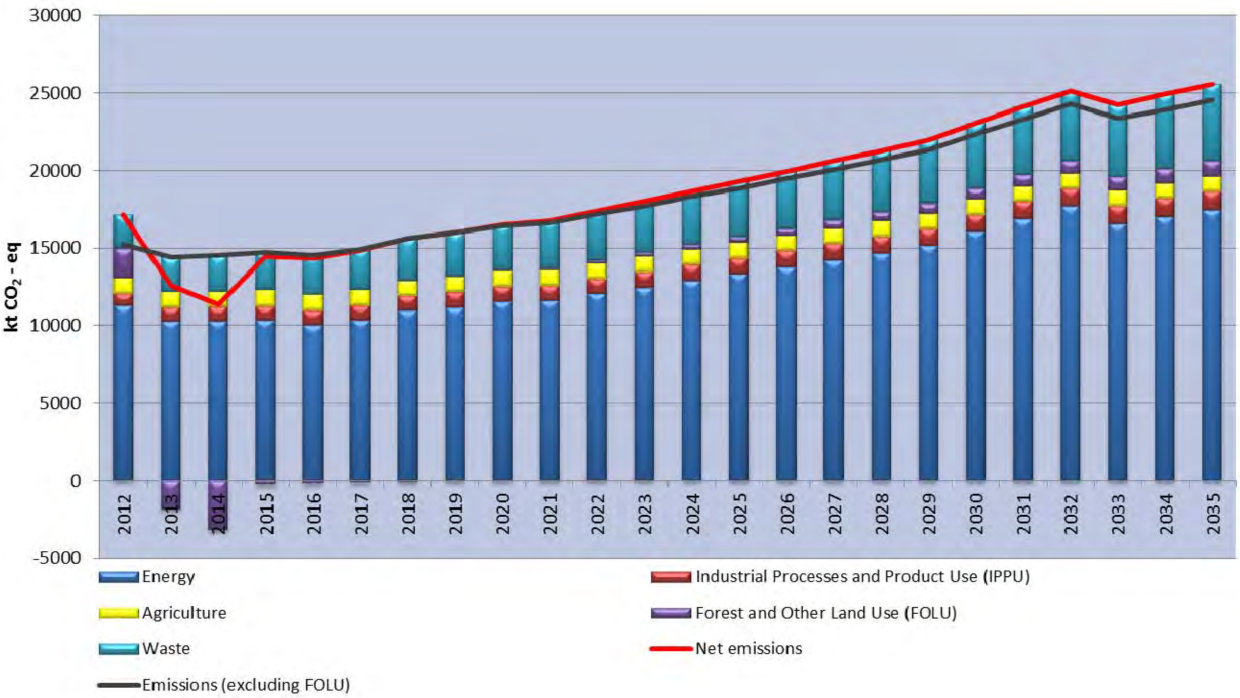


Figure 2: Projections of total GHG emissions [кт CO2-eq] - Mitigation scenario (With Existing Measures - WEM)

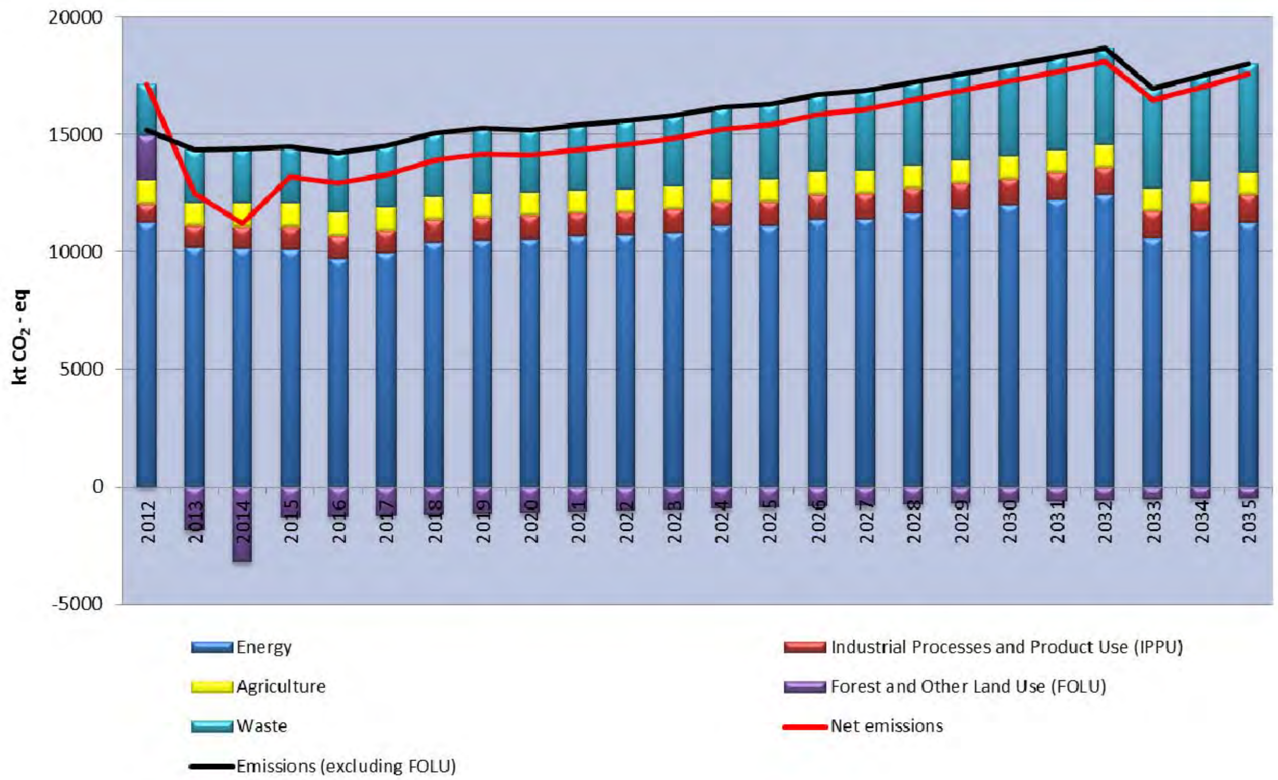


Figure 3: Projections of total GHG emissions [кт CO2-eq] - Higher ambition mitigation scenario (With Additional Measures - WAM)

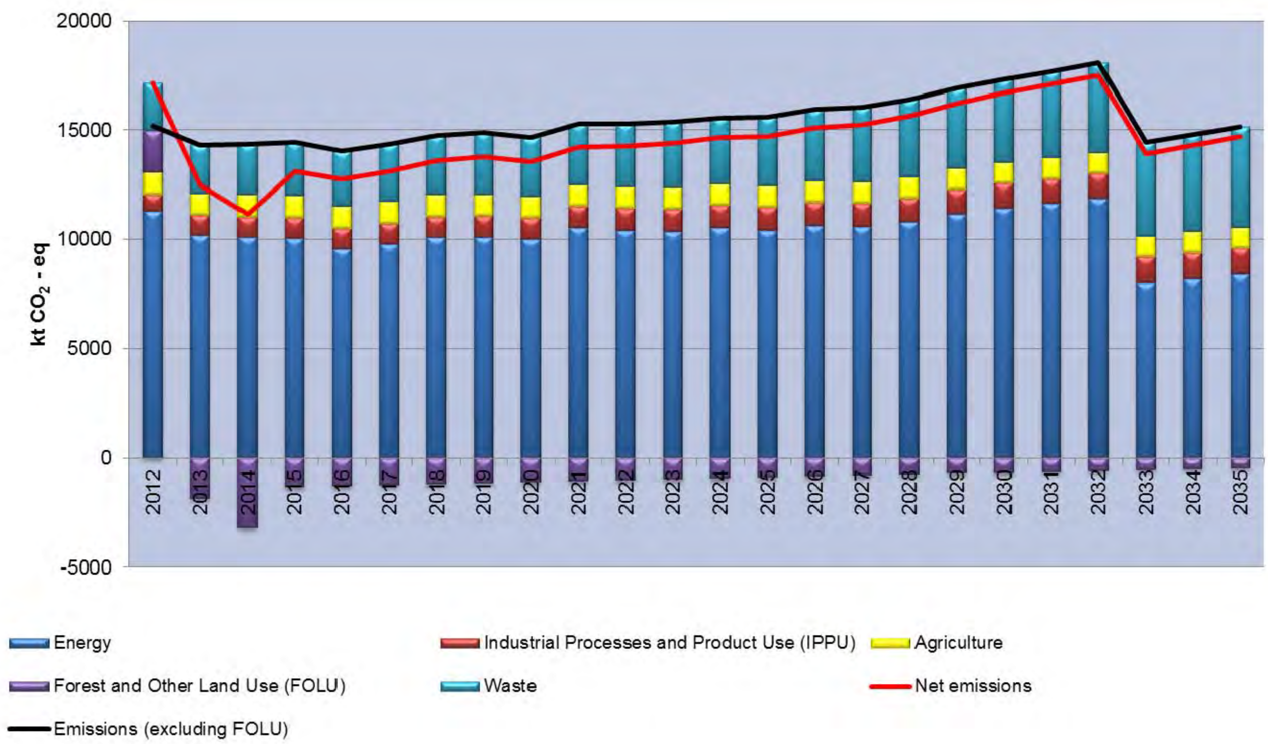


Figure 4: Effectiveness of the three scenarios expressed as absolute emissions growth in 2035 relative to emissions in 2012

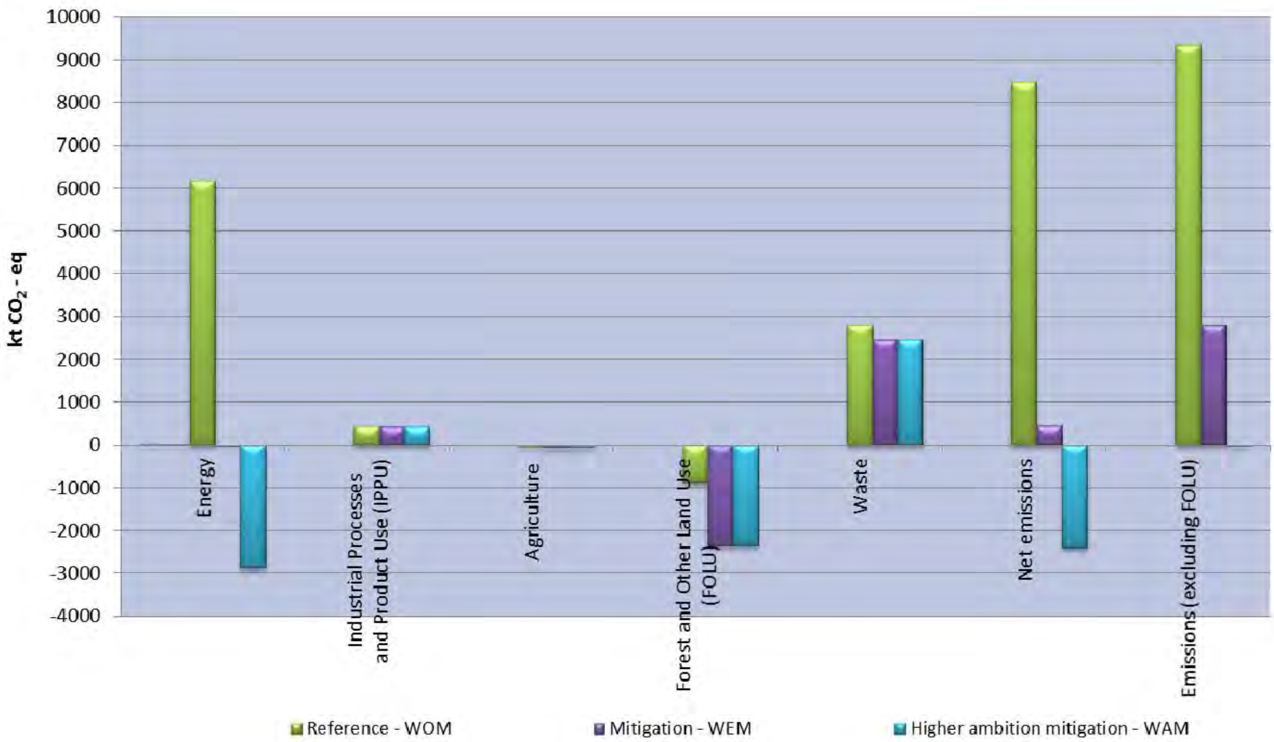


Figure 5: Effectiveness of the three scenarios expressed as relative emissions growth in 2035 relative to emissions in 2012

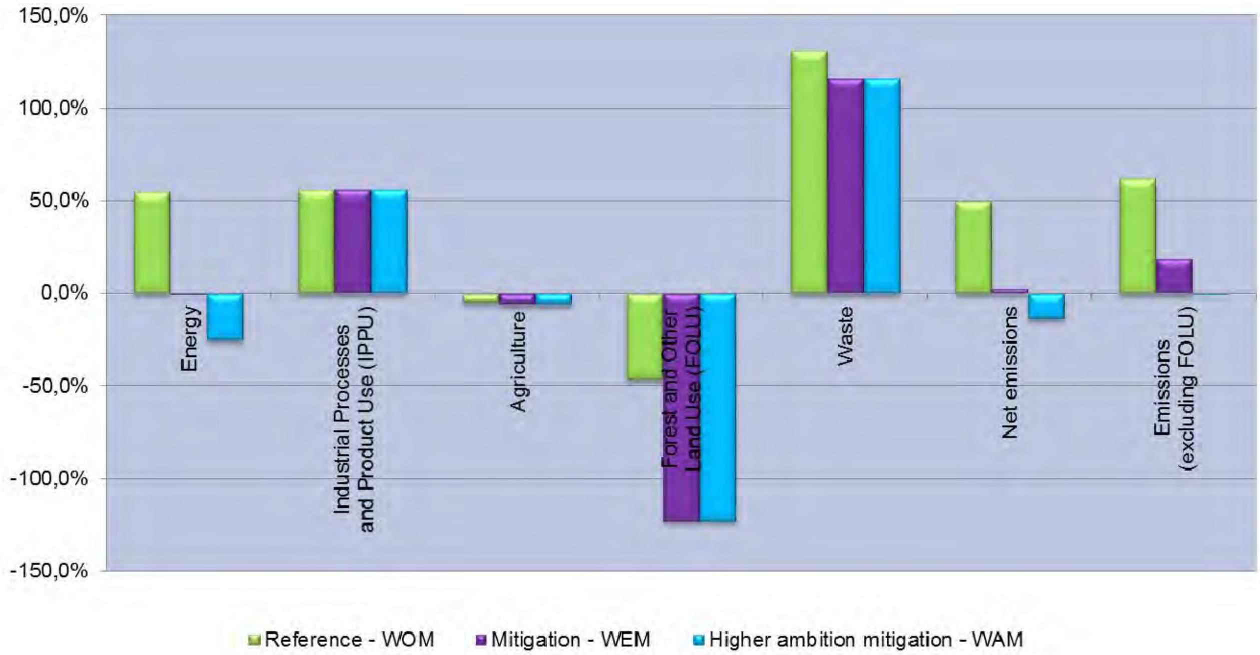
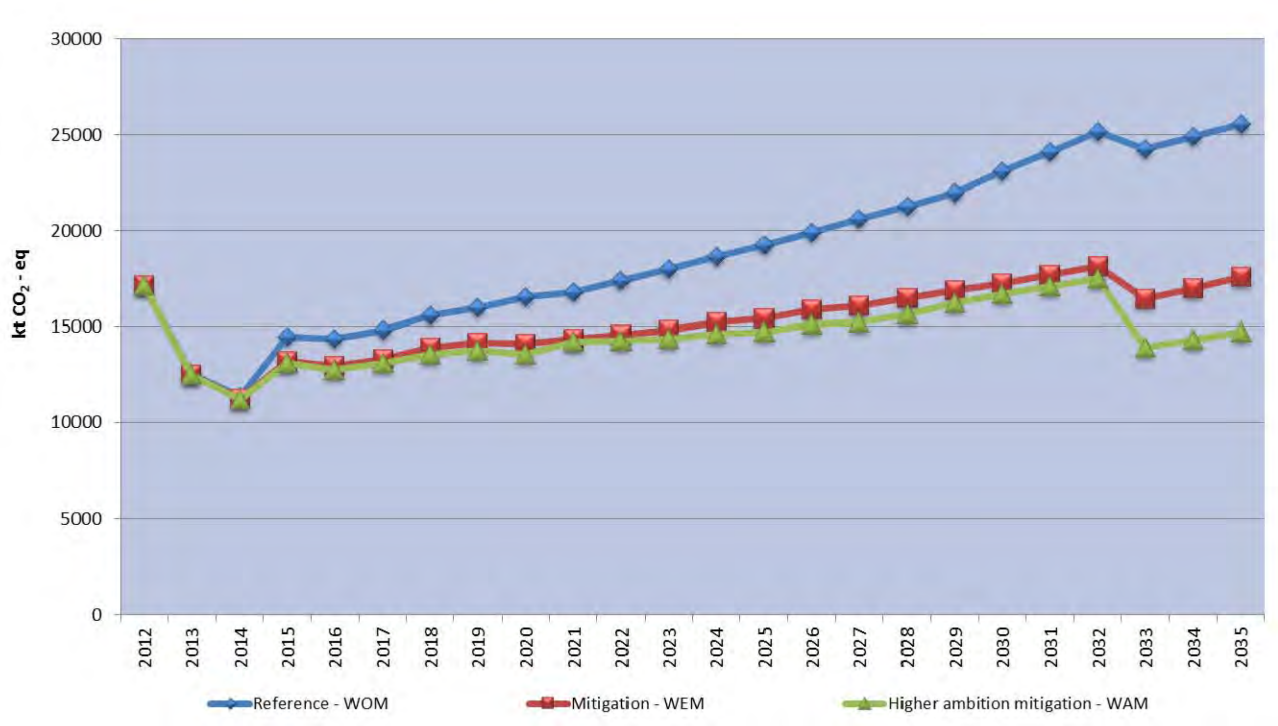


Figure 6: Projections of total net GHG emissions for the three scenarios [кt CO2-eq]



Data coverage: **excel**

Source: Second Biennial Update Report on Climate Change to UNFCCC (Report on Mitigation of Climate Change - RCESD - MASA), MoEPP, UNDP, 2017, www.unfccc.org.mk

Assessment

The climate change mitigation analysis conducted in the Second Biennial Update Report (SBUR) builds upon and continues the analyses of previous studies: Third National Communication (TNC), First Biennial Update Report (FBUR) and the Intended Nationally Determined Contributions (INDC)[1].

In order to assess the mitigation potential of certain measures and policies, all sectors recognized by the Intergovernmental Panel on Climate Change (IPCC) methodology (Energy, Industrial Processes and Product Use, Agriculture, Forestry and Other Land Use and Waste) have been modelled in the SBUR. The modelling has been conducted for the period from 2012 to 2035.

Taking into account the changes in development which occurred in the meantime, the Reference scenario, reflecting a case with no implemented mitigation measures is firstly revised as a **Scenario Without Measures** (**WOM scenario**). This scenario has **no likelihood of occurrence** because it implies, for instance, that the efficiencies of devises used in households in 2035 would be same as the efficiencies of the devises used in 2012. Nevertheless, creating such a scenario **is of crucial importance** because it allows all measures to be compared to one referent option and it allows for the comparison of the effects (financial, environmental, energy related) of a certain measure or policy to take place. When the yearly total emissions in the WOM scenario are calculated (Table 2 and Figure 1, a gradual rise from 2012 until 2035 is evident; the emissions in 2035 amount to 25,585 Gg CO_2-eq which is a 49% increase compared to the emissions from 2012. The Energy sector continuously has the biggest share in the total net emissions, a share which in 2035 is estimated to be 68%, while the Waste sector has the biggest increase in emissions (around 130%).

[1] All documents are available on this link: http://klimatskipromeni.mk/Default.aspx?LCID=213

Taking into consideration all national strategic and planning documents, over 50 mitigation measures were recognized out of which, with the participation of key actors, 46 measured were selected for modelling – 35 measures in the Energy sector, 8 measures in Agriculture, Forestry and Other Land Use (AFOLU) and 3 measures in the Waste sector. Each of these measures is represented with a separate table in the Mitigation report, containing all necessary information, progress of implementation (timeframe, expected results and costs, implementing entity) and progress indicators.

From the list of measures, in collaboration with all relevant stakeholders, **35 measures/policies** were marked as measures/policies with high realization probability because they deal with projects that have been started/are going to start in near future, are prioritized projects/policies in sectoral strategic and planning documents or have resulted from already passed laws or laws that will be passed in near future. These measures are included in the **Mitigation Scenario** which is also called the **Scenario with Existing Measures (WEM)**. Another **Higher ambition mitigation scenario** has been created, which along with the existing measures contains additional measures/policies, thus obtaining the name **Scenario with Additional Measures (WAM)**.

As a result of the proposed measures in the Scenario with Existing Measures (WEM) and the Scenario with Additional Measures (WAM), the total GHG emissions in 2035 drop by 25.2% (Table 3 and Figure 2) and 27.8% (Table 4 and Figure 3) respectively, when compared to the Reference scenario (WOM). The GHG emissions occurring in WEM in 2035 are only 2.6% higher than in 2012, while the 2035 emissions in WAM decrease by 14% when compared to 2012 (Table 7, Figure 4 and Figure 5). Both scenarios' peaking year occurs in 2032 when the emissions are 18,130 CO_2-eq according to the WEM scenario and 17,510 CO_2-eq according to the WAM scenario (Table 5 and Figure 6). The Energy sector still dominates with its share in the total emissions (60.9% in WEM and 53.8% in WAM in 2035), but compared to the Reference scenario, the emissions of the WEM scenario decrease by 25% and the emissions in the WAM scenario decrease by 29% in 2030. Hence, the majority of the suggested mitigation measures and policies are related to the Energy sector.

Another important indicator is **CO_2 emissions per capita**, according to which Macedonia falls in the same category as Romania and Hungary, as a country with relatively low emissions per capita. In the Reference Scenario this indicator will have an increasing trend, while in the mitigation scenarios it would grow at a lower rate than in the Reference Scenario (Table 6). In the calculation of this indicator, emissions from Forestry and other land use are excluded from the total emissions of each scenario (in order to make a comparison of the development of Macedonia with the EU (28) and the countries of Southeast Europe) and then are divided by the forecasted population.

Methotodolgy

- Methodology for the indicator calculation

In comparison to the previous studies, **significant improvements and upgrades** can be attributed to the modeling in the SBUR, among which are: harmonization of all sectors and categories with the IPCC methodology (the sectors are identical as in the Greenhouse Gases (GHG) inventory) so that trends can more easily be followed; use of a single methodology for GHG emission calculations in all sectors (IPCC methodology); integration of the separate models of all sectors[2] by introducing intersectoral connections on the basis of key drivers which are common for all sectors; use of a unified methodology when creating mitigation policies/measures which allows an integrated preview of the results through two scenarios (Mitigation scenario – Scenario with Existing Measures and a Higher ambition mitigation scenario – Scenario with Additional Measures) etc. In addition to these improvements and upgrades in the modelling, the private sector and the public administration were actively included in the process of preparing and choosing the measures and policies. In that regard, a number of meetings were organized in order to ensure

[2] In previous national reports on climate change, the analysis of some sectors were conducted with MARKAL, some with GACMO, others according to other methodologies and all of them used different input data.

acquaintance and alignment of the attitudes of different actors towards the suggested measures and policies.

Policy relevance

This indicator is of vital importance for the national climate change mitigation policy. It is also related to future implementation of projects based on the National Intended Determined Contributions and the Paris Agreement.

Legal grounds

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

Reporting obligation

- UNFCCC

General metadata

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

MK - NI 012
AIR TEMPERATURE

Definition

The indicator shows the annual average air temperature over a given period of time, and deviations from the mean average air temperature in the country and in particular regions.

Units

- Degrees Celsius (°C)

Key question

What is the trend in annual average air temperature and its deviation from the mean average temperature?

Key message

During the reporting period, the positive deviation from the mean average air temperature is recorded and increase in annual average air temperature in all four observed populated places. The deviation from the mean average air temperature for the period 1961 to 1990 ranged between -0.3° and 1.8°C in Bitola, between 0.5° and 2.2°C in Gevgelija and between -0.2° and 1.4°C in Lazaropole. In Skopje, the deviation from the mean average air temperature for the period 1981-1990 ranged between -0.4° and 1.3°C.

Figure 1. Annual average air temperature trend at the selected stations

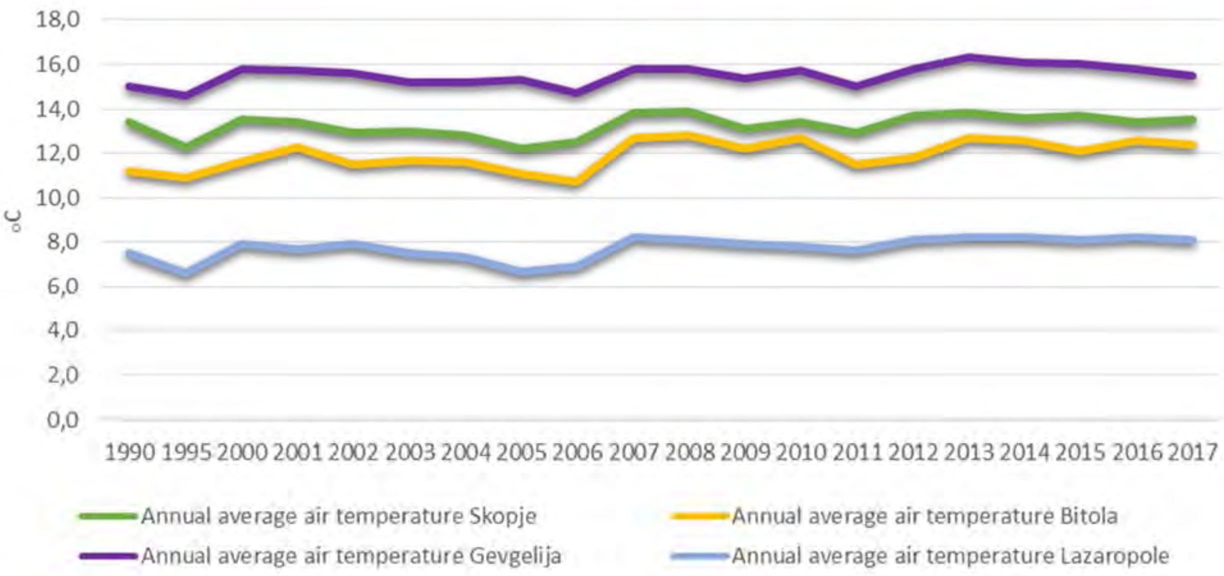
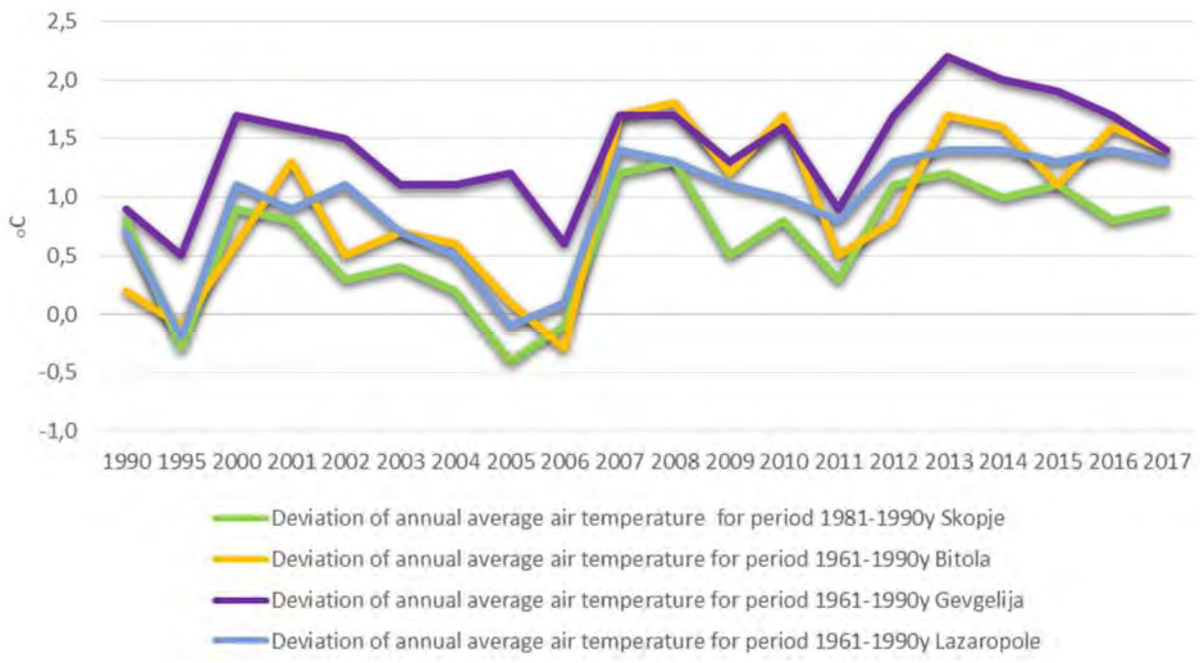


Figure 2. Deviation from the mean average air temperature at the selected stations



Data coverage: excel

Source: Hydrometeorological Service

Assessment

The indicator takes into account data of annual average air temperature from 1990 until 2017, mean average air temperature for the period 1961 to 1990 and the deviation of the annual average air temperature. The data sets which are taken are from Bitola, the second major city, than Gevgelija, site with the highest and Lazaropole, site with the lowest mean average temperature. For Skopje, the mean average air temperature was taken for the period 1981 to 1990.

In Skopje, the annual average air temperature in 2017 recorded increase by 0.9°C compared to mean average air temperature for the period 1981-1990. Warmest year with average annual air temperature of 13.9°C was 2008, with highest deviation of 1.3°C from the mean average air temperature in the period 1981 to 1990. In Bitola, the average air temperature in 2017 was increased by 1.4°C compared to mean average air temperature for the period 1961-1990y. The warmest year with average annual air temperature of 12.8°C was 2008 with highest deviation of 1.8°C from the mean average air temperature for the period 1961 to 1990.

In Gevgelija, the average air temperature in 2017 was increased by 1.4°C compared to the mean average air temperature for the period 1961-1990. The warmest year with average annual air temperature of 16.3°C was 2013y with highest deviation of 2.2°C from the mean average air temperature for the period 1961 to 1990. In Lazaropole, the average air temperature in 2017 was increased by 1.3°C compared to the mean average air temperature for the period 1961-1990y. The warmest years with average annual air temperature of 8.2°C were 2007, 2013, 2014 and 2016, with highest deviation of 1.4°C from the mean average air temperature in the period 1961 to 1990.

Methodology

- Methodology for the indicator calculation

Air temperature means temperature of ambient air measured in shade (inside meteorological house) at a height of 2 meters. It is measured conventional by standard glass thermometer (mercury or alcohol), specially constructed maximum and minimum thermometers and/or electronic sensor incorporated in the automated weather stations. The main parameters of air temperature for a given location are: daily average temperature, maximum daily and minimum daily temperature.
Data processing of the measured values is consisted of calculating the average air temperatures for a given time period (day, month, year) and/or recording the highest or the lowest values.
Daily average temperature is obtained by air temperatures measured at 07, 14 and 21 hours (local time) using the formula: Tavg = (T7+T14+2*T21)/4
The monthly average air temperature is calculated as sum of the daily average air temperature divided by the number of days in a given month.
The annual average air temperature is calculated as a sum of the monthly average air temperature divided by 12months.
The highest monthly average air temperature is the highest value of the monthly average air temperature during the given year.
The lowest monthly average air temperature is the lowest value of the monthly average air temperature during the given year.

In the past, meteorological measurements in Skopje were characterized by frequent changes in location. The first meteorological measurements date back in 1924 (precipitation station) and measurements as climatological station started in 1944 in old Aerodrom (present location at Jane Sandanski Boulevard) and then the station was relocated at airport Petrovec then and now Alexander the Great. Meteorological station at Zajchev Rid was established in 1978 and has been operating with permanent measurements of meteorological elements and phenomena since then.
According to the surveys carried out in the sector for meteorology so far and results obtained, the Main meteorological station Skopje is more representative for Skopje Valley and wider urban area of the City of Skopje than the station at Alexander the Great airport the main purpose of which are the meteorological measurements for the aviation.
For the above reasons, we propose data from Skopje (Zajchev Rid) as the most relevant coming from a modern meteorological observatory. Based on the aforementioned, the mean average air temperature for the City of Skopje was taken for the period 1981 to 1990.

Policy relevance

Legal grounds

Law on Hydrometeorological Activity (Official Gazette of RM no.103/08, 53/11 and 51/15).

Target

In its climate policy, the European Union proposed that the global average temperature increase should be limited to not more than 2°C above pre-industrial levels

Reporting obligation

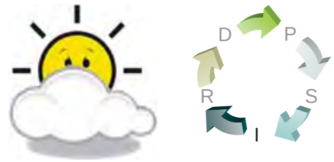
World Meteorological Organization

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 012	**Air temperature**	CSI 012 CLIM 001	**Global and European temperature**	**S**	B	▪ air ▪ air quality ▪ climate change	Annually

MK - NI 051

PRECIPITATIONS



Definition

Indicator shows annual precipitation quantity fallen on a given area for a given period of time, in liquid or solid state and deviations of the annual precipitation sum from mean average precipitation over selected period of time on the whole national territory or in certain parts.

Units

- millimeters (mm), percentage %, liter per square meter

Key policy issue

What is the precipitation trend?

Key message

During the reporting period, variable trend was recorded in all four populated places. The annual deviations from the mean average precipitation for the period 1961 - 1990 ranged between 63% and 143% in Bitola, between 62% and 169% in Shtip and between 72% and 124% in Lazaropole. In Skopje, annual deviation from the mean average precipitation for the period 1981 to 1990 ranged between 67% and 176%.

Diagram 1: Annual precipitation sum from 1990 till 2017 in selected populated places

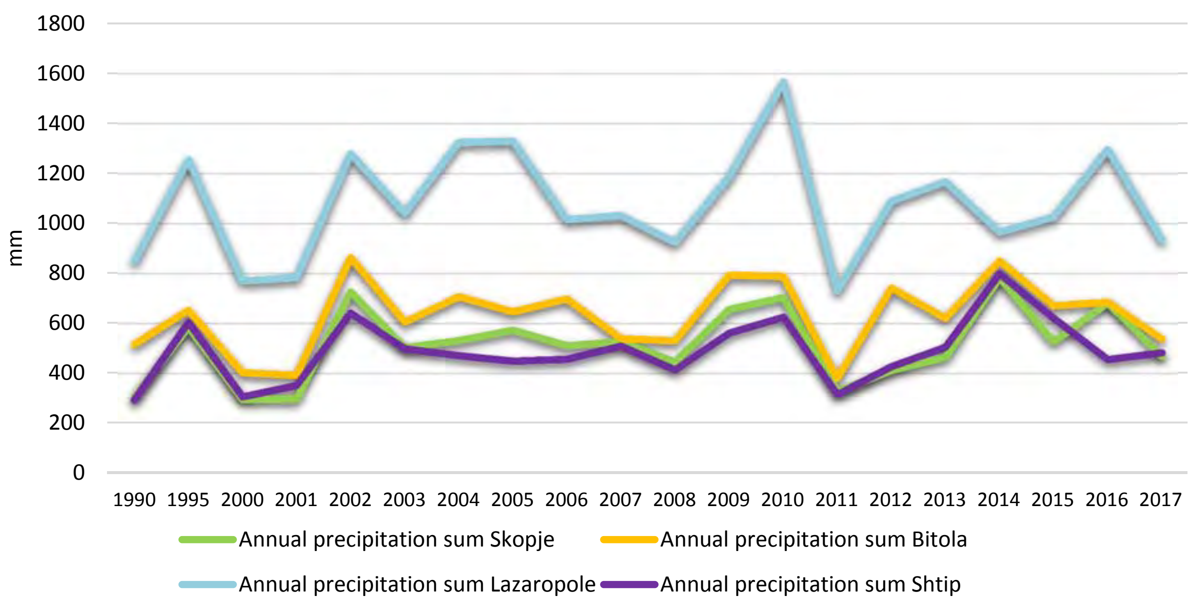
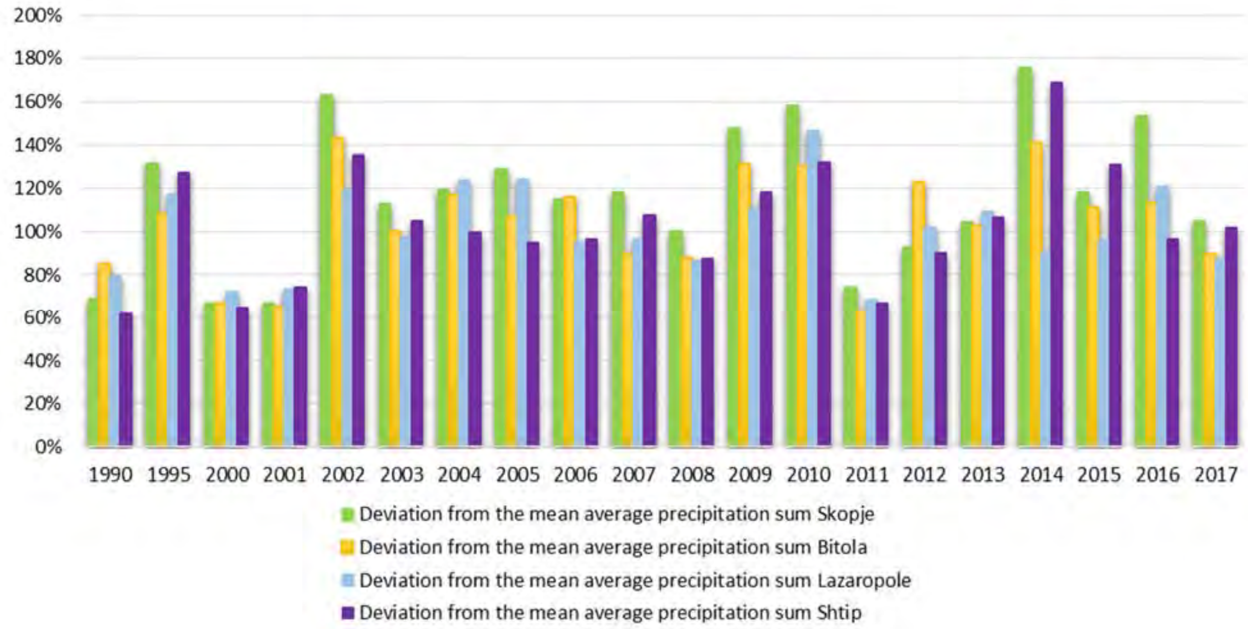


Diagram 2: Annual deviation from the mean average precipitation sums in selected populated places



Data coverage: excel

Source of data: Hydrometeorological Service

Assessment

The indicator takes into account data for annual precipitation sums from 1990 till 2017, mean average precipitation for the period 1961 to 1990 and deviation of the annual average precipitation sums.

The data processing was made for Bitola, the second major city, Lazaropole, place with the highest and Shtip with the lowest mean average precipitation sums for the period 1961-1990. For Skopje, the mean average precipitation was taken for the period 1981 to 1990.

In Skopje, the annual precipitation sum in 2017 was slightly increased by 5% compared to the mean average precipitation for the period 1981-1990. The wettest year was 2014 with annual precipitation of 782.9 mm and highest deviation from the mean average precipitation in the period 1981 – 1990 was also recorded this year reaching 76%.

In Bitola, the annual precipitation in 2017 was decreased by 11.1% compared to the mean average precipitation sums for the period 1961-1990. The wettest year was 2002 with annual precipitation of 863.8 mm. The highest deviation from the mean average precipitation in the period from 1961 to 1990 was also recorded this year, reaching 43%.

In Shtip, the annual precipitation in 2017 was slightly increased by 2% compared to the mean average precipitation sum for the period 1961-1990. The wettest year was 2014 with measured annual precipitation 799.4 mm. The highest deviation from the mean average precipitation in the period 1961-1990y was also recorded this year, reaching 69%.

In Lazaropole, the annual precipitation in 2017 was decreased by 13% compared to the mean average precipitation sum for the period 1961-1990. The wettest year was 2010 with measured annual precipitation 1566.5mm. The highest deviation from the mean average precipitation in the period 1961-1990 was also recorded this year, reaching 46%.

According to this indicator and the analyzed measuring sites it can be concluded that on the territory of Republic of Macedonia precipitation pattern is variable in space and time.

Methodology

- ## Methodology for the indicator calculation

Precipitations are measured with: rain gauge, ombrometer (pluviometer) and with automatic precipitation sensor (at automatic meteorological stations). Instruments are positioned outdoors at 1 meter height. Rain gauge measures the overall precipitations accumulated during certain period of time. Time resolution can be 6 hours, 12 hours and 24 hours. In practice, daily sum of precipitations is usually operated with. Daily sum of precipitation means the quantity fallen during the period from 07 o'clock yesterday till 07 o'clock today.

Ombrometer is mechanical registration instrument recording the precipitation in time. Its minimum time resolution is between 1 and 10 minutes, depending on the type of the instrument.

Automatic sensor for precipitation is electronic sensor. It has alternating time resolution, starting from 1 minute.

Based on daily sum of precipitation, monthly, annual and mean average sums are calculated.

Data from ombrometer and automatic sensor enable calculation of precipitation intensity (precipitation quantity fallen in unit of time).

In the past, meteorological measurements in Skopje were characterized by frequent changes in location. The first meteorological measurements date back in 1924 (rainfall measuring station) and measurements as climatological stations started in 1944 in old Aerodrom (present location at Jane Sandanski Boulevard) and then the station was dislocated at the then airport Petrovec and now Alexander the Great. Meteorological station at Zajchev Rid was established in 1978 and has been operating with permanent measurements of meteorological elements and phenomena since then.

According to the surveys carried out in the sector for meteorology so far and results obtained, the Main meteorological station Skopje is more representative for Skopje Valley and wider urban area of the City of Skopje than the station at Alexander the Great airport the main purpose of which are the meteorological measurements for the aviation.

For the above reasons, we propose data from Skopje (Zajchev Rid) as the most relevant coming from a modern meteorological observatory. Based on the aforementioned, data on the long-term average precipitations for the City of Skopje was taken for the period 1981 to 1990.

Policy relevance of the indicator

Legal grounds

Law on Hydrometeorological Activity (Official Gazette of RM no.103/08, 53/11 and 51/15)

Targets

There are no targets defined

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 051	**Precipitations**	CLIM 002	**Mean precipitation**	**I**	A	▪ water ▪ climate change	Annually

SOIL

MK – NI 014

LAND TAKE

Definition

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

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

Units

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

Results are presented as:

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

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

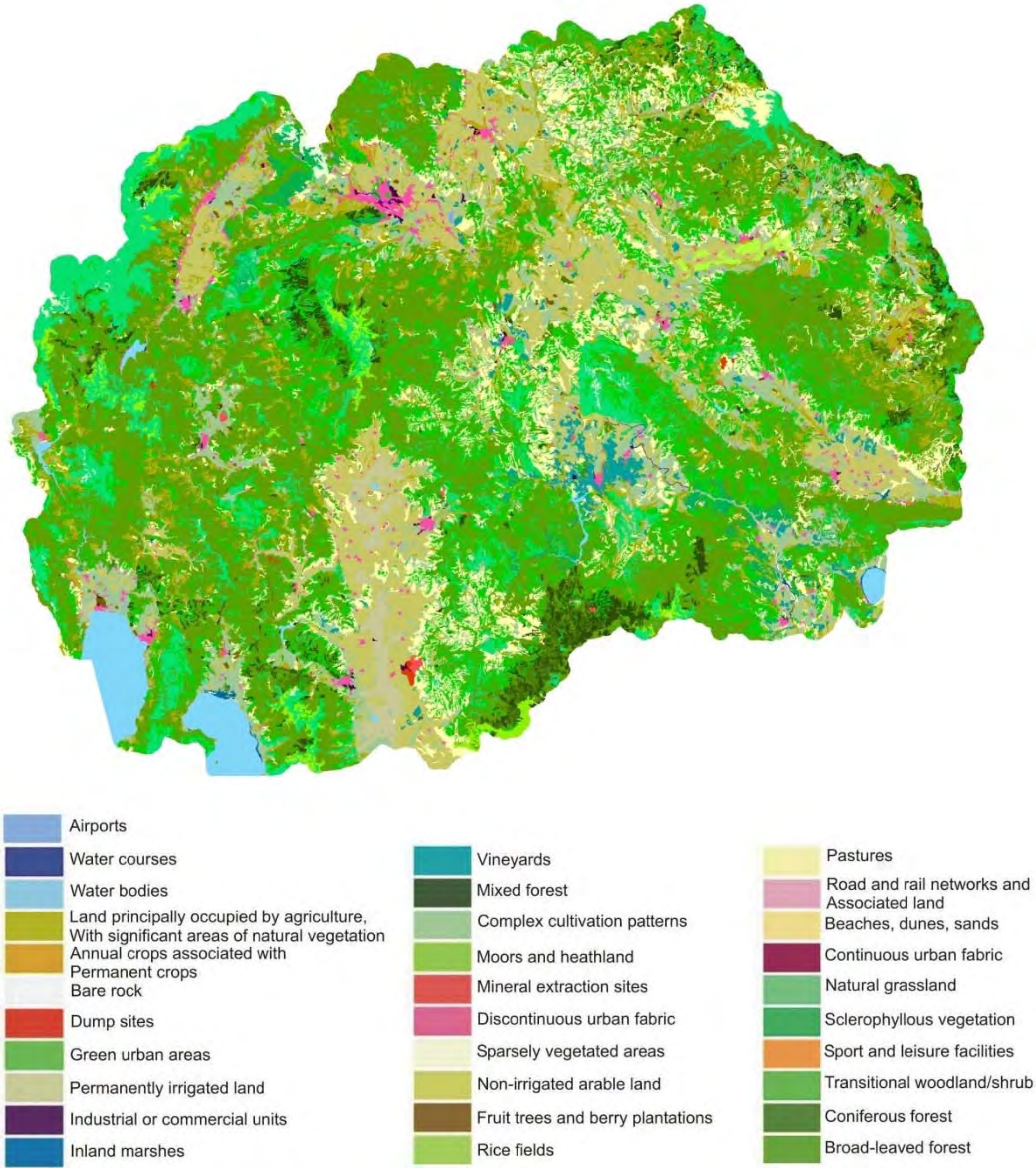
Key policy question

How much and in what proportions is agricultural, forest and other semi-natural and natural land being taken for urban and other artificial land development?

Key message

Based on the CORINE Land COVER methodology, the largest portion of the land in the Republic of Macedonia is under forest and semi-natural areas, covering 1. 564.488 ha or 60,5% of the total area. The category of agricultural land area covers 927.976 ha or 36.1% of the total area, the category of water bodies covers 55.856 ha or 2.2% of the total area, the category of artificial areas covers 43.000ha or 1.7% of the total area, and the smallest area of 2.000 ha or 0.1% of the total area is wetlands (Figure 1).

Map 1. CORINE Land COVER 2000 (data of 1996)



Map 2. CORINE LandCover overall changes 2006-2012

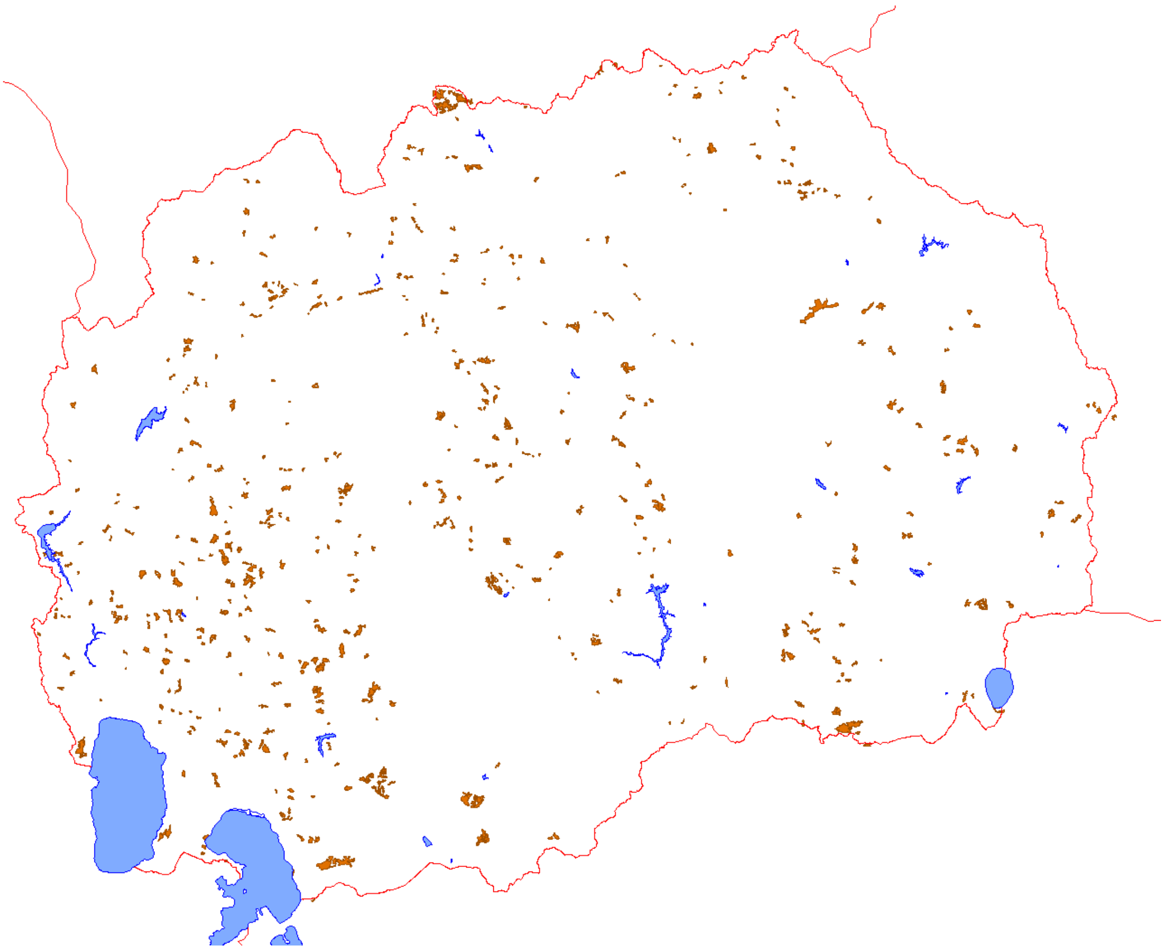


Figure 1. Area of individual areas by CORINE nomenclature and share in the total territory of the country

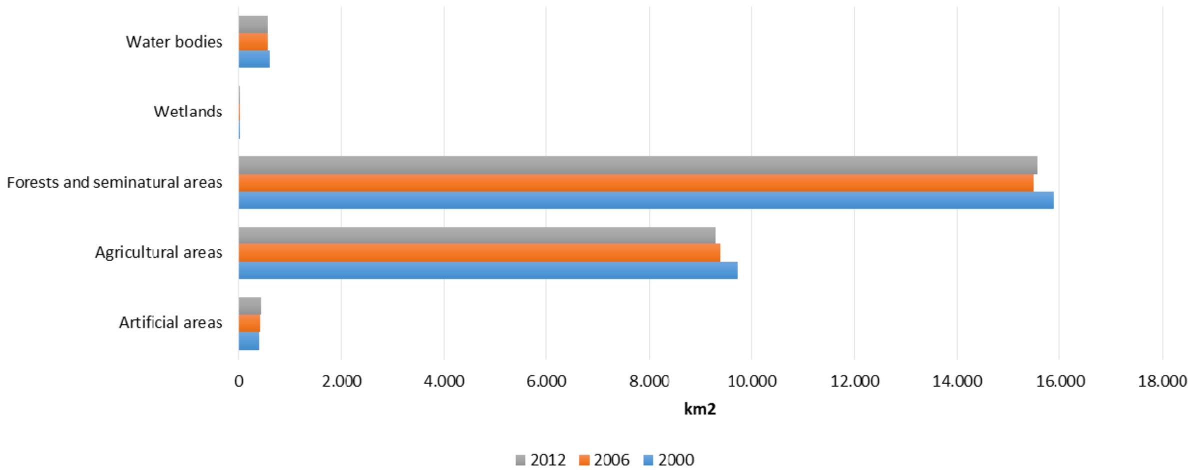


Figure 2. CORINE level 1 total changes (in hectares)

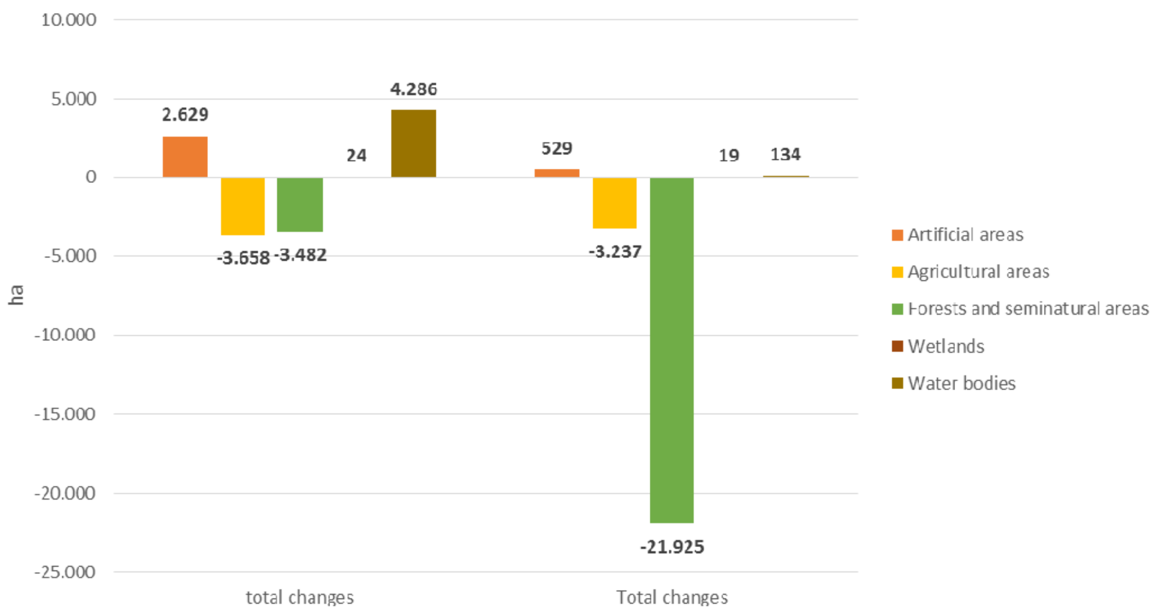


Figure 3. Relative contribution of land-cover categories to uptake by urban and other artificial land development (2006-2012)

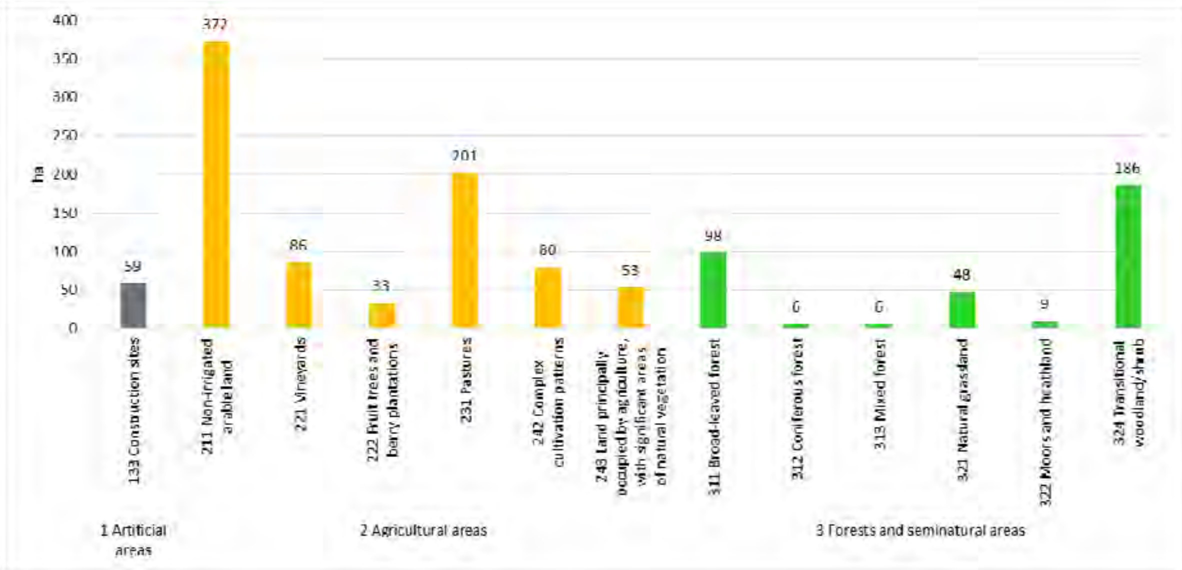
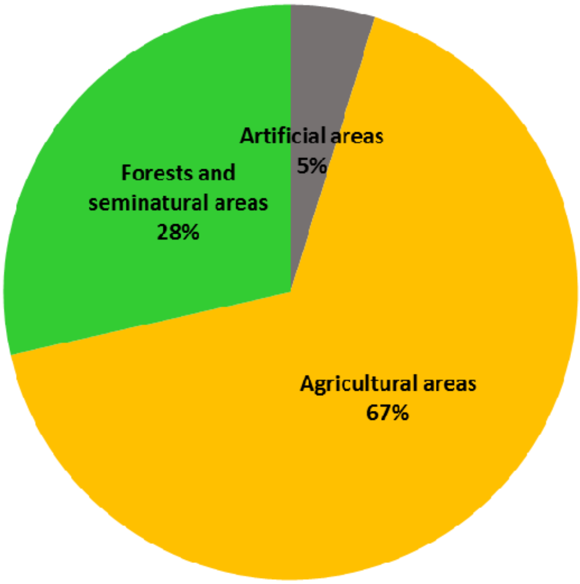


Figure 4. Relative contribution of level 1 categories transformed into urban and other artificial land development (2006-2012)



Data coverage: excel

Source: CORINE Land Cover

Assessment

Owing to characteristics of land cover of the territory of the Republic of Macedonia, out of 44 possible classifications under the CORINELandCoverNomenclature, 31 classifications have been identified up to the third level of the Nomenclature.

As a result of CORINELandCOVER Project, as illustrated on Figure 2, the greatest overall changes in the period 2006 to 2012, were recorded for the growth of artificial land area and reduction in agricultural land area and forest and semi-natural areas.

CORINELandCOVER changes between 2006 and 2012 cover territory of around 26.873 ha which is around 1.04% of the total territory of the country. The overall number of changes is smaller compared to the period 2000-2006 amounting 1.9% or 50.657 ha.

Concerns rising fact is that the biggest change occurs in the area of class 311 (broad-leaved forest) into class 324 (transitional woodland with shrubs) and class 323 (Sclerophyllous vegetation) covering total area of 18.171 ha or 44.57% of the total changes. This change is most probably due to wood cut and forest fires.

Opposite process of changes from class 324 (transitional woodland with shrubs) into class 311 (broad-leaved forest) concerns total area of 8.099ha or 14.13% of the total changes is due to new forest growth.

Land take on the account of expansion of residential areas and construction sites is the main reason for the increase in urban and other artificial land development cover.
In the period 2006-2012, the greatest change occurred in the class of agricultural land in favour of the growth of artificial land area amounting 67% of the total change. The greatest contribution of

30.1% occurred in the land class of non-irrigated arable land followed by the class of pastures with 16.3%.

The change in the class of forest and semi-natural areas amounted 28% of the total changes with the greatest change occurring in transitional woodland with shrubs with 15%, followed by the change in broad-leaved forest with 7.9%. These changes lead to changes in biological diversity, as they cause reduction in the habitats of high number of flora and fauna species.

Methodology

- Methodology for the indicator calculation

The assessment of CORINELandCoverin 2000 and 2006 was based on data from satellite images.

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

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

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

TechnicalGuidelineforCORINELandCoverdevelopment was prepared by the European Environmental Agency.

Policy relevance of the indicator

Legal grounds

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

BasedontheLawonLandSurveyandRegistration, bymeansofregularlandsurveyinformationisprovidedonthetypesoflandcover. AlthoughtheseparametersdonotcorrespondwiththeCORINEland cover nomenclature, there is a possibility for unique integration of land cover elements.

LawonUrbanandSpatialPlanning.

Targets

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

Reporting obligation

- EEA

General metadata

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

MK - NI 015

PROGRESS IN MANAGEMENT OF CONTAMINATED SITES

Definition

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

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

The progress in the management of contaminated sites has been designed to show reduction and elimination of negative effects to ecosystems and human health where environment degradation has been confirmed.

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

The indicator shows progress in five main steps:

1) site identification/ preliminary study;

2) preliminary investigation;

3) main site investigation;

4) implementation of remediation measures;

5) measure completed.

Units

- Number of sites managed up to a certain step out of the five main steps of the indicator.
- Share of economic activities in soil contamination as percentage of sites where the activity is present compared to the total number of sites.

Key policy issue

What progress has been made in contaminated sites management and what is the share of economic activities contributing to soil contamination?

Key message

The management of contaminated sites in the period from 2005 to 2011 showed progress with regard to the main site investigation, as well as implementation of remediation measures. With regard to completion of remediation measures, no progress has been recorded, i.e. completion of remediation measures has not been recorded in none of the identified hot-spots.

With regard to economic activities contributing to soil contamination expressed in percentage, the highest share belongs to mining and metallurgy with 31.25%, and oil refining and leather manufacturing industry with 6.25%.

Figure 1. Progress in contaminated sites management

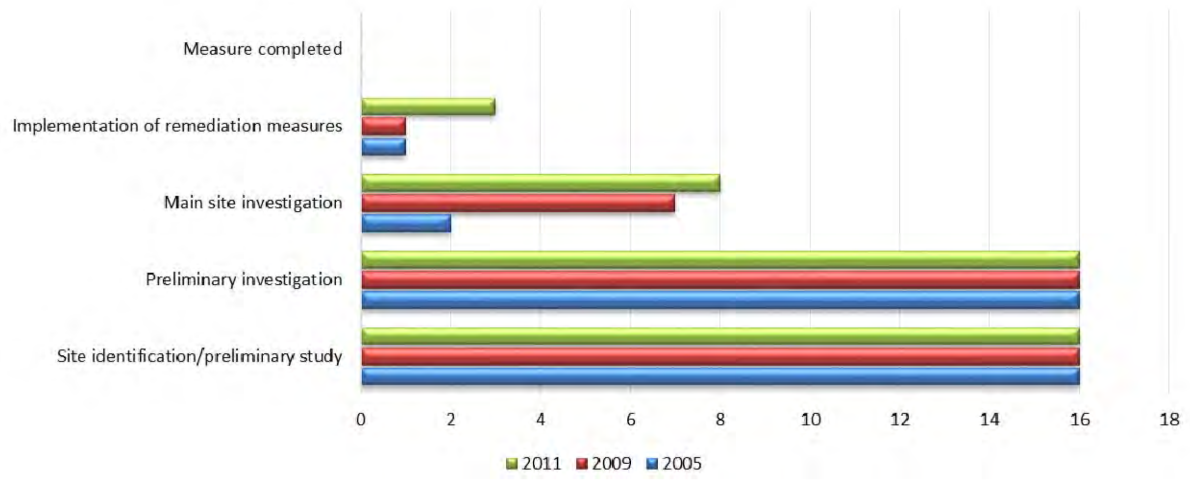
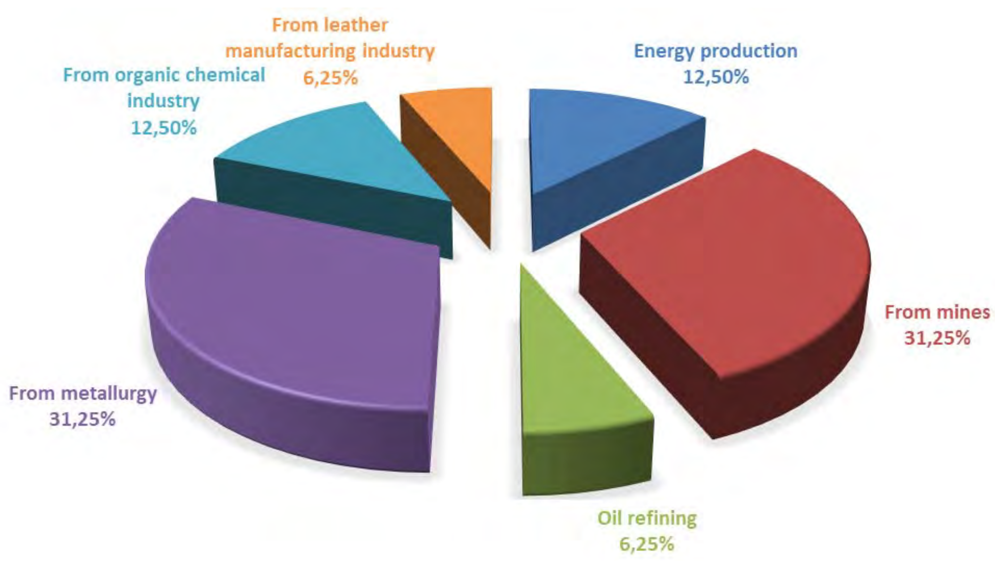


Figure 2. Share of economic activities in soil contamination



Data coverage: excel

Data source: Ministry of Environment and Physical Planning

Assessment

In the Republic of Macedonia, identification and preliminary investigations have been carried out with 16 sites, where soil contamination has been detected and those sites have been marked as hot-spots. Main investigations have been carried out with eight sites. Remediation measures have been implemented with three sites, while completion of measures has not been recorded with none of the sites.

With regard to economic activities contributing to soil contamination expressed in percentage, the highest share belongs to mining and metallurgy with 31.25%, followed by organic chemical industry with 12.5% and oil refining and leather manufacturing industry with 6.25%.

Reporting obligation

Soil contamination (TE-2)

Methodology

- ### Methodology for the indicator calculation

Data for the indicator calculation was taken from the National Waste Management Plan of the Republic of Macedonia or Special Study E, and from CARDS 2006 Project concerning development of remediation plans with financial requirements for elimination of industrial hot-spots, as well as Feasibility assessment and development of main technical design for water protection measures in the mine Buchim – UNDP Macedonia.

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

- ### Source of applied methodology

According to European Environmental Agency.

Uncertainty

- ### Methodological uncertainty

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

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

- ### Uncertainty of data set

All sites where certain industrial/economic activity is performed have not been accounted as sites with determined contamination, although such activities generate chemical substances.

Policy relevance of the indicator

List of relevant policy documents

The Second National Environmental Action Plan of the Republic of Macedonia.

Legal grounds

Our country lacks legally prescribed limit values for concentrations of certain contaminating substances in soil and standards for their detection in soil. Generally, the existing legislation is intended to prevent new contaminations.

Soil protection is regulated by several laws, including those concerning environment, nature protection, agricultural land, etc., but there is no soil specific law, with clearly defined institutional responsibilities.

Targets

Remediation of tailings, stabilization and re-cultivation of industrial landfills.

General metadata

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

MK - NI 038

FOREST FIRES

Definition

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

Units

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

Key policy issue

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

Key message

In the Republic of Macedonia, rapid increase in the number of fires, area and mass affected by fire was tracked during the analyzed period, reaching the maximum of 652 fires in 2007. Then, there was a trend of gradual fall by 2009 with 61 fire events, and then the number of fires started to rise again in the following years.

The number of fires in 2016 compared to the number of fires in 2009 noted rise approximately 2.4 times.

Figure 1. Number of forest fires

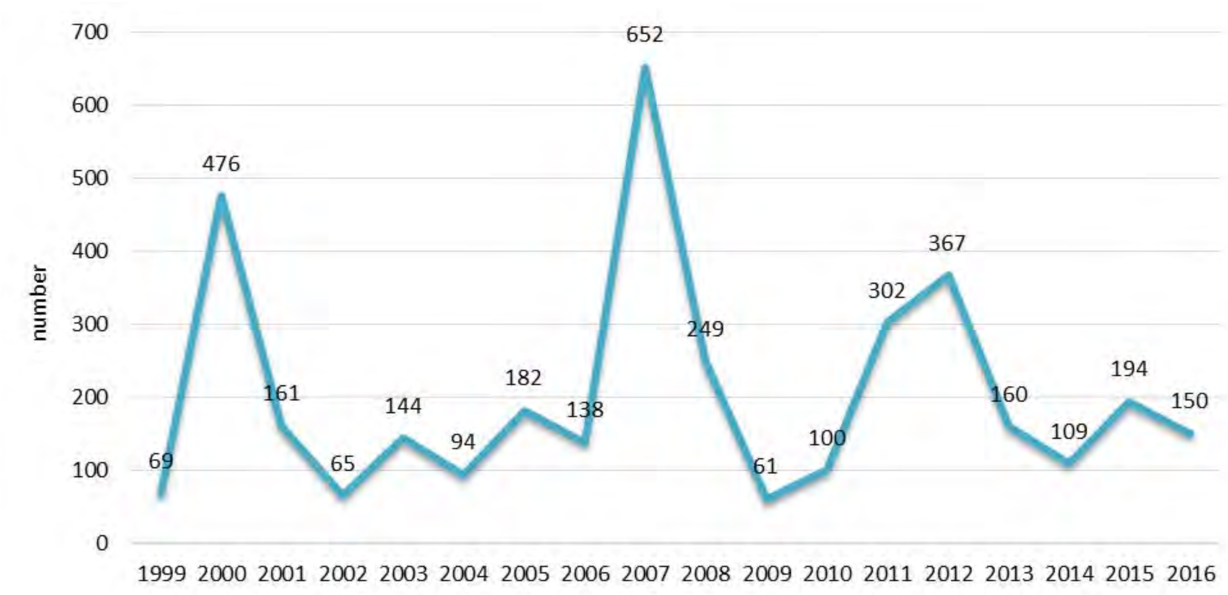


Figure 2. Area under fire

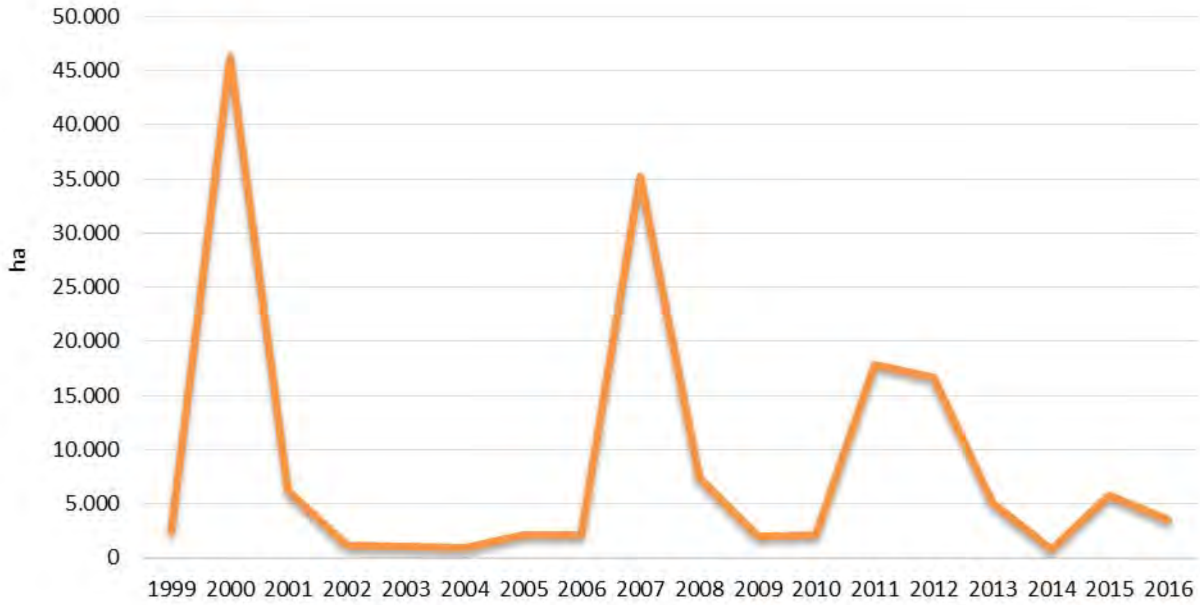


Figure 3. Wood mass subjected to fire

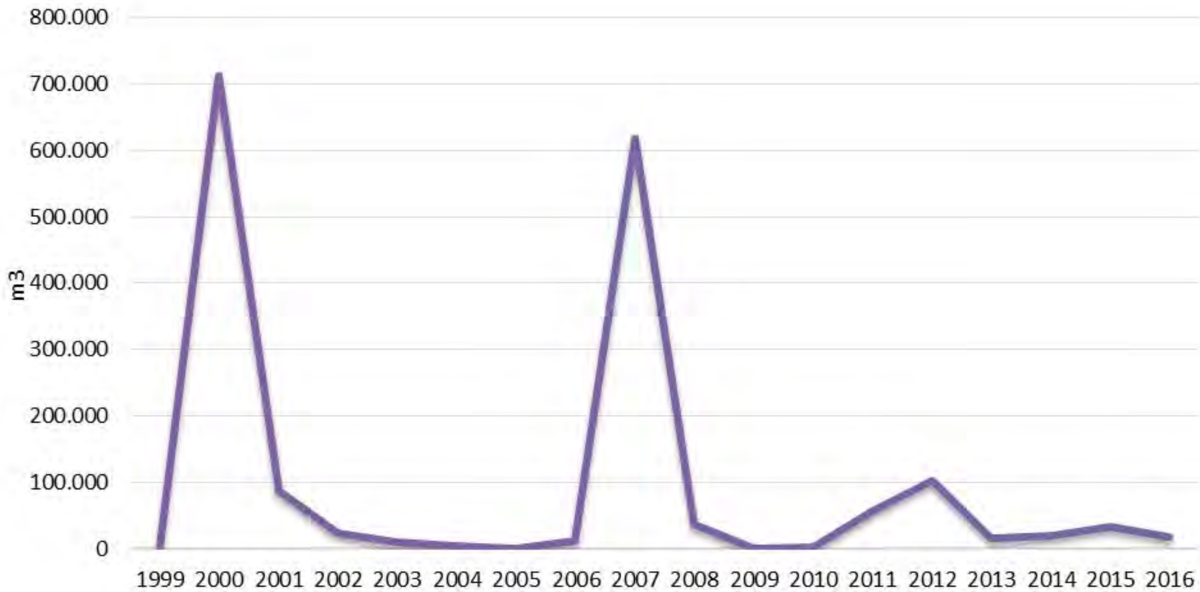
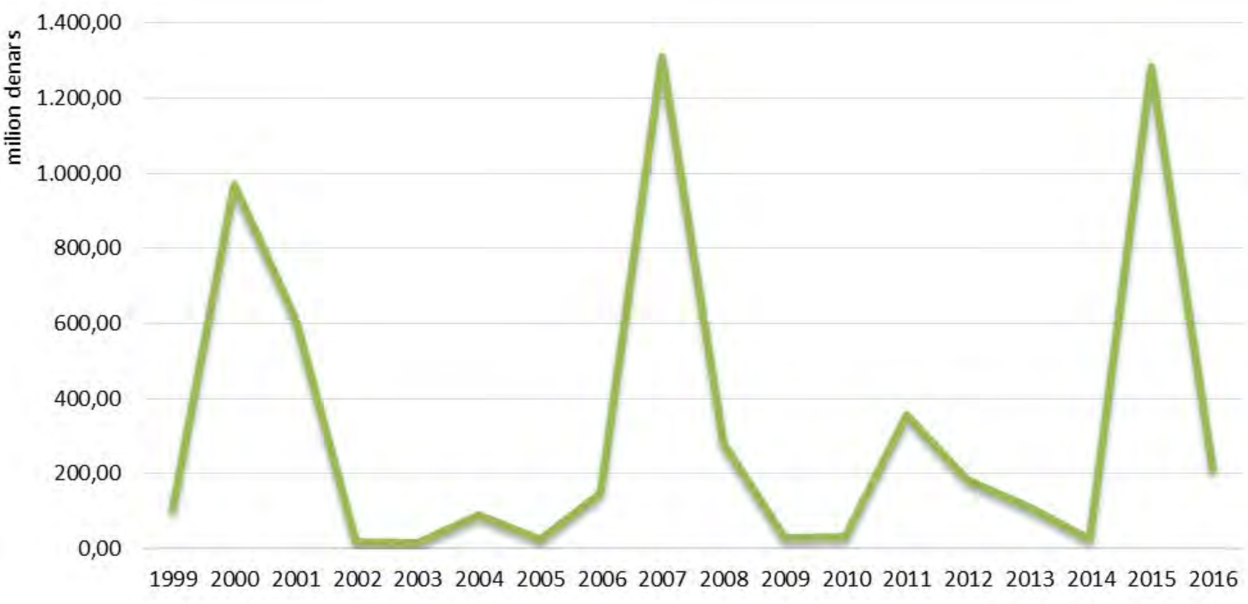


Figure 4. Total damage from fires expressed in denars



Data coverage: excel

Source: Public Enterprise for Forests Management - "Macedonian Forests"

Assessment

Forest fires are among the most severe problems in forestry, as well as environment as a whole in the Republic of Macedonia. Great quantity of wood mass is destroyed by forest fires and this is an economic problem. Forest fires cause pollution of air, soil and water. Burnt woods are source of pathogens and pests. There is also increase in erosive processes in burnt areas, disturbed balance of water regime, loss of vegetation and desertification. Almost 95% of forest fires are caused by man. At an average, forest fires destroyed around 8,821.79 ha forest per year during the analyzed period. In the period from 1999 to 2016, the average number of forests per year was 204. In 2007, due to extreme draughts and human factor, the number of forest fires reached 652 fires at an area of around 35.000 ha.

In proportion with the parameters discussed above, the overall damage from fires by year expressed in denars was highest in 2007 reaching the value of 1,311,167,721.95 denars. In 2016, this value was 211,363,850denars. The overall average damage from fires in the period from 1999 to 2016 amounted 322,364,897 denars per year.

Methodology

- Methodology for the indicator calculation

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

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) defines measures for improved protection against forest fires, instructions on the need for capacity strengthening for sustainable forest management, as well as development of strategy for forest protection against fires.

Strategy for Sustainable Development of Forestry in the Republic of Macedonia.

Legal grounds

- Law on Forests, which regulates forests and forest resources management and protection. Protection of forests is integrated and indivisible part of the overall forest management. In the context of forests protection against fires and regulation of measures in this area, we should also mention the 2001 Rulebook on specific measures for forest protection against fires.
- Law on Natural Rarities Protection
- Law on National Parks Protection
- Law on Fire Prevention.

Targets

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

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 038	**Forest fires**	CLIM 035	**Forest fires**	**P**	A	▪ Soil ▪ Forestry ▪ Agriculture ▪ Nature ▪ Urbanization	annually

MK – NI 053

SOIL EROSION

Definition

The indicator shows soil erosion which is natural process and is important for soil formation from geological point of view. With reference to soil erosion, particular attention is paid to accelerated erosion where natural speed of erosion is intensified due to anthropogenic factor, through application of inadequate agricultural practices, forest decrease, forest fires, construction activities, etc. Physical factors like climate, topography and soil properties are also relevant for soil erosion. Erosion of soil under the force of water is the most frequent and most severe problem both in Europe and our country. The indicator shows values for soil erosion, based on which we may identify regions affected by certain degree of erosion and develop measures for problem control.

Units

– km^2 and %.

Key policy issue

To what extent is the soil in Macedonia affected by erosion?

Key message

Macedonia is one of erosion most affected territories on the Balkans. Water erosion is dominant in our country including erosion caused by rainfalls and running waters.

According to the Report of the European Environment Agency (Europe's Environment the Dobris Assessment, 1995), Macedonia belongs to the so called red zone of water erosion in Europe.

According to the Map of Erosion of Macedonia, 96.5% of the total area is under erosion process and 3.5% of the total national territory is not affected by erosion.

Diagram 1. Distribution of soil erosion

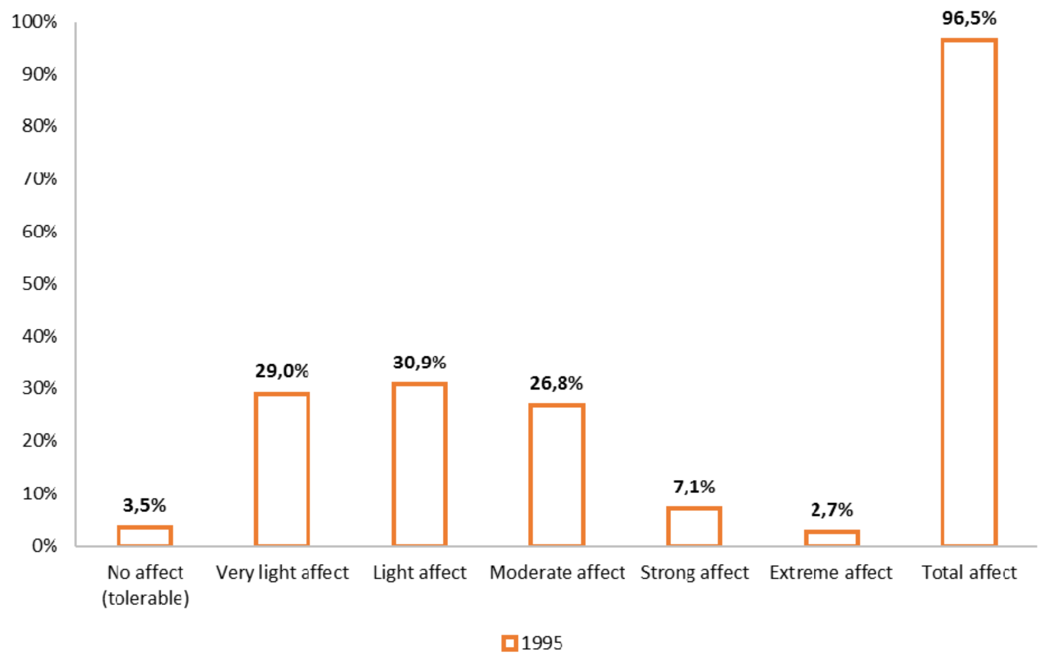
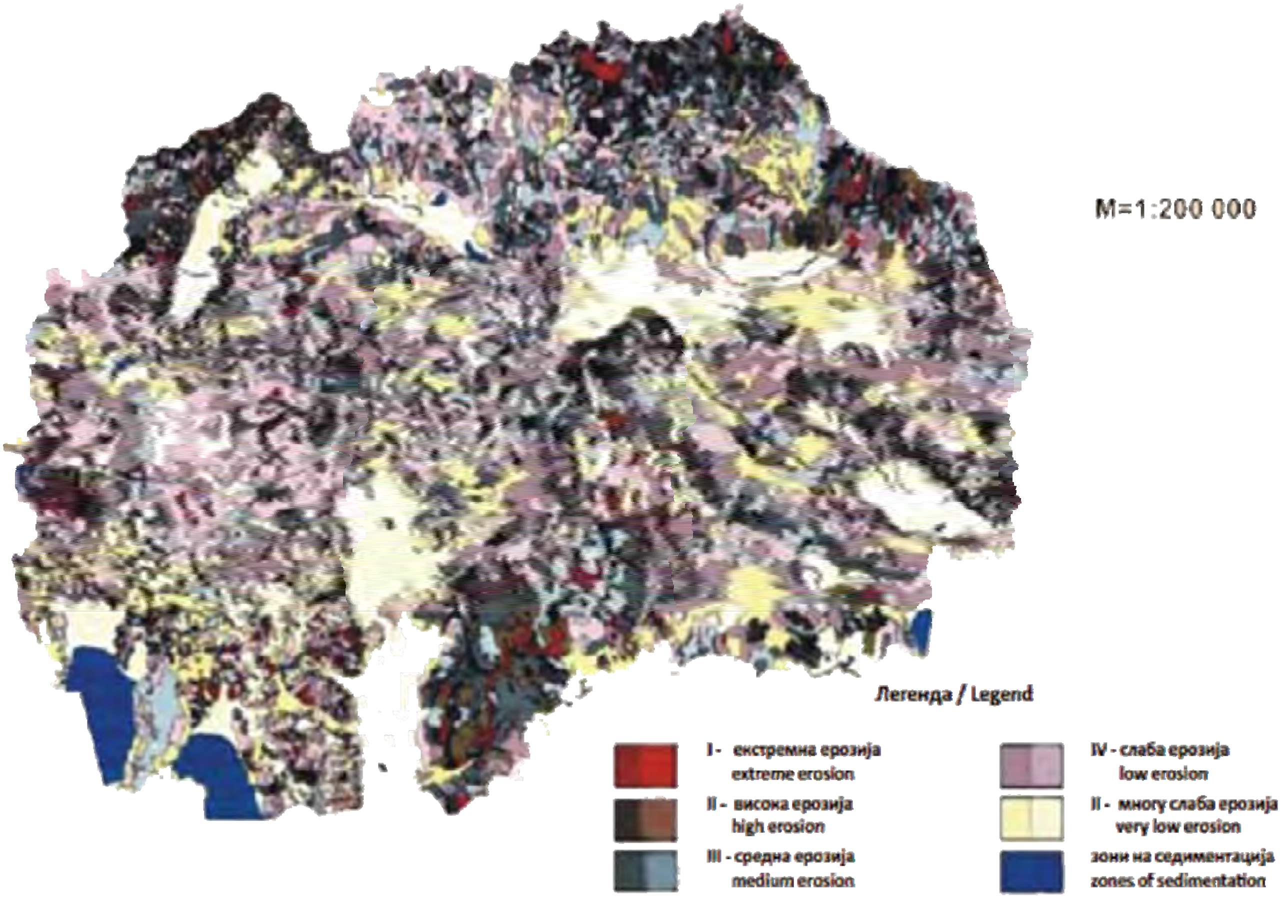


Figure 1. Map of Soil Erosion



Data coverage: excel

Source of data: Ministry of Environment and Physical Planning

Assessment

Water erosion is dominant in our country including erosion caused by rainfalls and running waters. Aeolian erosion is represented on high mountain peaks, but damages resulting from it are negligible compared to water erosion. This is also the case of abrasive erosion which is actually caused by lake water waves in our country.

Macedonia is one of erosion most affected territories on the Balkans. There are several reasons for this, such as: long-term destructive impact by man (destruction of natural vegetation, absence of measures for agricultural soil conservation, inadequate processing resulting in deterioration of physical soil properties); relief in which mounatains alternate with valleys with occurrence of steep and long inclination; erodibility of certain sediments, rocks and soils; climate conditions as torrent nature of precipitations, aridity of climate due to which natural vegetation cover on soil is weaker, and destroyed vegetation is harder to recover.

According to the Report of the European Environment Agency (Europe's Environment the Dobris Assessment, 1995), Macedonia belongs to the so called red zone of water erosion in Europe.

According to the Map of Erosion of Macedonia, 96.5% of the total area is under erosion process. 36.65% of the national area is affected by the first three categories of erosion (extreme – 2.7%, high – 7.1% and medium – 26.8%). 59.9% of the national area is affected by low and very low erosion.

Annual loss of soil is average annual loss of arable soil layer of 20 cm in thickness over an area of 8.500 ha, which is loss of 17.000.000 m^3 soi, every year.

The Map of Erosion of Macedonia was completed in 1992, but it was digitalized and published in 2002. It was prepared by emphirical model of Gavrilovich, according to whom there are five categories and 12 sub-categories of erosion intensity.

Methodology

- Methodology for the indicator calculation

Different methods can be used to assess erosion risk, divided mainly in expertise based assessments and model based assessments.

1. Example for expertise based assessment is Global Assessment of Soil Degradation–GLASOD). This methodology is based on obtaining answers by certain experts in all countries and its main deficiency is the issue of control of objectivity of answers given and application of different standards by different experts in different regions. This methods identifies subjectively the regions with similar intensity of soil erosion, while not taking conditions leading to that into account
2. Example for model based assessment is the Pan-European Soil Erosion Risk Assessment (PESERA). This model is appropriate for anticipation of soil erosion degree, which takes into account precipitations and eroded sediments, daily precipitations accumulated during month, monthly vegetation cover, certain climate information, etc.

Homogenous and comprehendible data on soil erosion degree, including soils in our country, is obtained through the process of calculation and modeling, which use:

- Pedological maps
- Land cover maps (Corine Land Cover 2000)
- Topographic maps
- Climate maps with temperature data

Under the recommendation of the European Commission, soil erosion may be determined through appropriate recommended methods of modeling and on the basis of methods using expert assessment.

Policy relevance of the indicator

Legal grounds

- Law on Environment (Official Gazette of RM no. 53/05, 81/05, 24/07, 159/08, 83/09, 48/10, 124/10, 51/11, 123/12, 93/13, 187/13 and 42/14)
- Law on Agricultural Land (Official Gazette of RM no. 135/07, 18/11, 42/11, 148/11, 95/12, 87/13 , 106/13, 164/13 and 39/14)
- Second National Environmental Action Plan 2006
- Thematic Soil Strategy (COM (2006)231)
- Draft Framework Directive on Soils (COM (2006)232)
- To Thematic Strategy for Soil Protection (CEC, 2002)

Targets

According to the Spatial Plan of the Republic of Macedonia, counter-erosion protection of space should be conducted by combined measures, such as:

- Targeted use of areas susceptible to erosion;
- Terracing, intensive afforestation of erosion active areas and forests tending;
- Regulation of torrent watercourses with structural facilities;
- Special measures for protection against ruining, rock falls and land slides on steep slopes and river banks.

Regulation of torrent watercourses of I and II category of destructiveness which include 10.15 % of overall areas affected by erosive processes will contribute to remediation of erosive areas and regulation of torrent watercourses.

Reporting obligation

- JRS (Joint Research Centre)/EEA (European Environment Agency)/EIONET

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 053	**Soil erosion**	CLIM 028	Soil erosion	**P**	A	▪ Soil ▪ Climate change	Every ten years

WASTE

MK - NI 016

MUNICIPAL WASTE GENERATION

Definition

The indicator presents generation of municipal waste expressed in kg per capita. Municipal waste is non-hazardous waste generated by natural persons in households and commercial waste and is collected by municipalities or on their behalf.

Units

Kilograms per capita per year, thousand tons, percentage.

Key question

Is the amount of generated municipal waste decreasing?

Key message

With reference to municipal waste, we may say that generation of municipal waste went hand in hand with the economic growth by 2011, while 2012 was marked by fall in the economic growth, but increase in generated municipal waste, the same as 2016, while in 2014 the generation of municipal waste went down, but economic growth increase. This situation might be a result of improved process of collection of data and information on municipal waste, namely receipt of comprehensive and precise data on the quantity of generated municipal waste. Generation of municipal waste parallels economic growth and it cannot be decoupled from it yet.

Figure 1. Generated municipal waste in tons

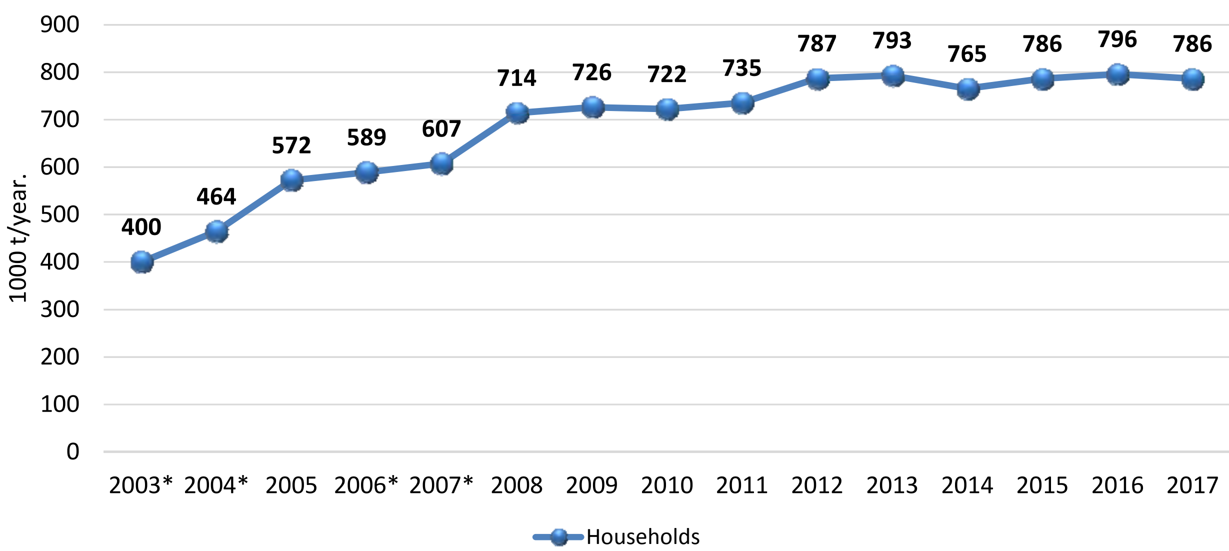
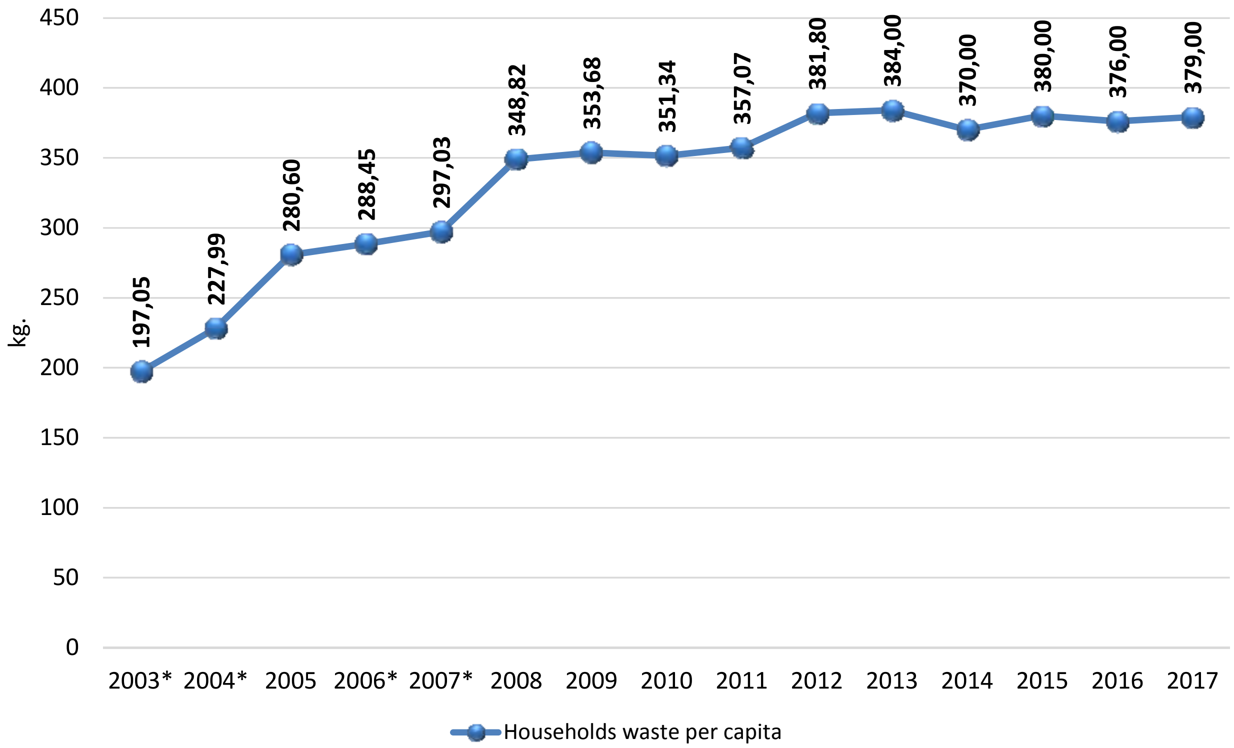


Figure 2. Generation of municipal waste in kg per capita per year



Data coverage: excel

Source of data: Releases of the State Statistical Office, Strategy for Waste Management in the Republic of Macedonia (2008-2020), MEPP, National Waste Management Plan (2009-2015) of the Republic of Macedonia, MEPP, World Bank

Assessment

The amount of generated municipal waste as indicator may show direction of movement of the use and the consumption of products and goods and it indirectly reflects the potential environmental burden if municipal waste fails to be recognized as potential resource. Increased generation of municipal waste indicates increased use and consumption of products and goods. Given the fact that nearly 100% of the collected municipal waste is disposed of at landfills, increased generation of municipal waste will potentially increase negative impact on environment.

Methodology

Types of wastes are determined by the 2005 List of waste types. Collection of data is performed mainly through surveys, estimates, administrative data. Reports are in a form of Relases of the State Statistical Office, Annual reports on municipal waste management by the Mayors of the Municipalities.

Policy relevance

List of relevant policy documents:

Second National Environmental Action Plan of the Republic of Macedonia (2006)

Strategy for Waste Management in the Republic of Macedonia (2008-2020)

National Waste Management Plan (2009-2015) of the Republic of Macedonia

Legal grounds

Law on Waste Management (2004)

National Classification of Activities NCA Rev.2 2006)

Reporting obligation

- EUROSTAT

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 016	**Municipal waste generation**	EEA CSI 016	**Municipal waste generation**	**P**	A	▪ Households ▪ Economy ▪ Population ▪ Urbanization ▪ Waste	2-yearly
		UNECE I-1	**Waste generation**				

MK - NI 056

MANAGEMENT OF HAZARDOUS WASTE

Definition

This indicator shows the amounts of generated hazardous waste, amounts of imported and exported hazardous waste, amount of temporarily stored hazardous waste, as well as treated hazardous waste as a whole.

Units

- The amounts of hazardous waste are presented in tons, cubic meters and share of waste (%).

Key question

What is the manner of hazardous waste management, i.e. what is the trend of hazardous waste generation, import and export and the manner of its treatment?

Key message

Prevailing manner of hazardous waste management is its disposal by commercial entities that generate it themselves, followed by waste disposal, and then by hazardous waste recovery. As of 2011, the amount of generated hazardous waste has been decreasing gradually, with certain increase noted in 2013 compared to 2012. In 2016 there are huge decrease in the amount of generated hazardous waste as a lack of the annual report of generation of hazardous waste from REK Bitola which generate more than 90% of the hazardous waste in the Republic of Macedonia.

Figure 1. Overview of the total generated hazardous waste presented in tons and cubic meters in the period 2011-2015

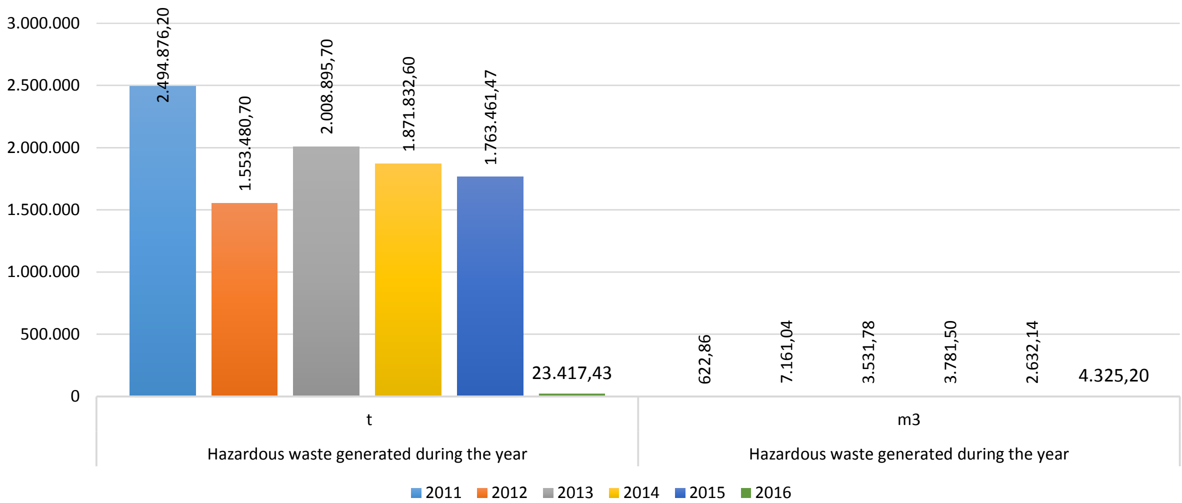


Figure 2. Share of the amount of imported and treated hazardous waste presented in tons

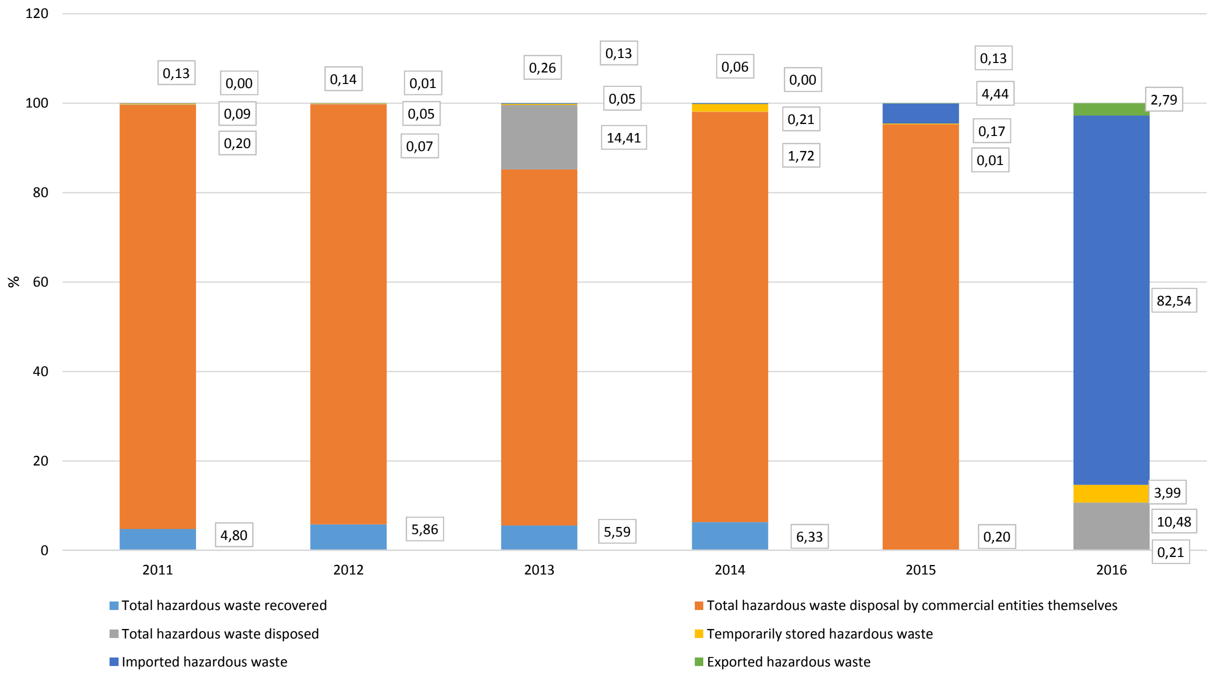
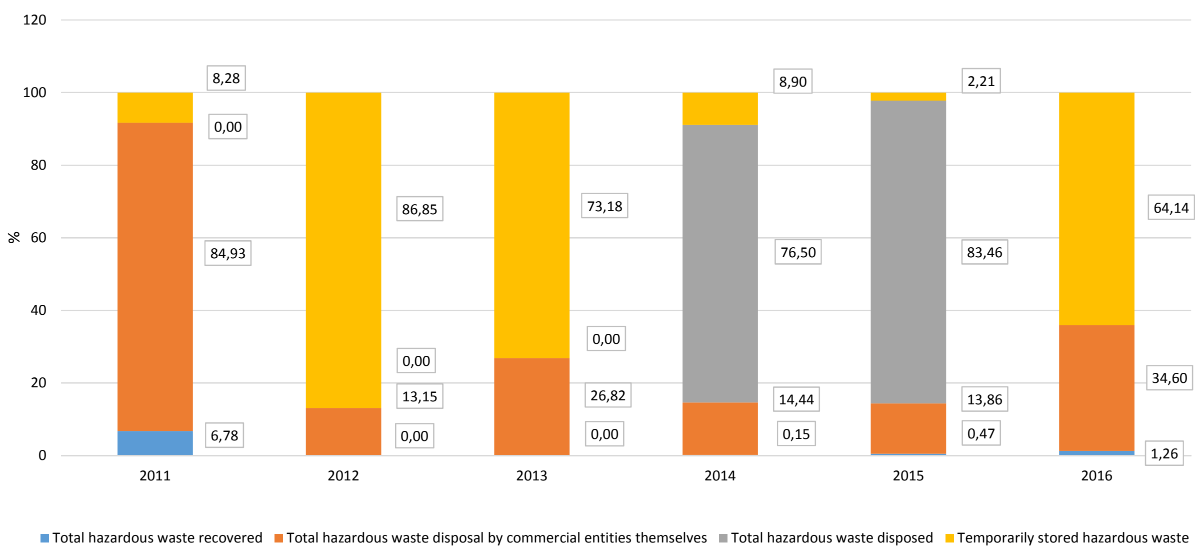


Figure 3. Share of the amount of imported and treated hazardous waste presented in m^3



Data coverage: **excel**

Source of data: Ministry of Environment and Physical Planning

Assessment

Prevailing manner of hazardous waste management in the period from 2011 to 2015 was its disposal by commercial entities that generated it themselves and it ranged from 94.92% in 2015 to 79.434% in 2013 as the least favourable manner of waste management with regard to consequences on environment and human health. The rate of hazardous waste recovery was 4.79 % in 2011, 6.31% in 2014, and there was great drop in hazardous waste recovery in 2015 and 2016 amounting 0.2%.

The waste that cannot be treated or disposed appropriately is temporarily stored. Temporarily stored hazardous waste is the waste pending disposal or treatment. Treatment can be carried out in the country of generation or in another country. Uncontrolled transboundary movement of hazardous waste and its disposal or inappropriate handling may cause heavy health problems in people and may contaminate water and soil. Recycling, appropriate incineration and appropriate disposal of hazardous waste in the country of its disposal reduces the demand for hazardous waste transboundary movement and thus reduces the risk for human health and environment. In certain cases, international transport of hazardous waste is necessary and justified in terms of the waste proper disposal and treatment with no consequences for human health and environment, and such is its reuse as secondary raw material or for energy production.

Import of hazardous waste in the Republic of Macedonia increased as of 2012 up to 2015 and 2016 ranging from 0.052% to 4.43% for 2015 and 82.54%. Export of hazardous waste ranged from 0.0025% for 2014 to 0.125% for 2015 and 2.79 for 2016. Data on generated, imported, exported and disposed hazardous waste helps to control and monitor its movement and removal.

Methodology

Certain types of hazardous waste are grouped according the main economic activities based on the National Classification of Activities NCA Rev. 2 harmonized with the International Standards for Industrial Classification of All economic activities (ISIC). Types of hazardous waste are determined by the List of waste types. Appropriate treatment and disposal of waste are in accordance with definitions and conditions set in the Law on Waste Management. Collection of data is acquired mainly through submission of annual reports on hazardous waste management by commercial entities that generate hazardous waste from 2011 to 2016.

Policy relevance

List of relevant policy documents:

Second National Environmental Action Plan of the Republic of Macedonia (2006)

Strategy for Waste Management in the Republic of Macedonia (2008-2020)

National Waste Management Plan (2009-2015) of the Republic of Macedonia

Legal grounds

- Law on Waste Management (2004)
- National Classification of Activities NCA Rev.2 2006)
- List of waste types (2005)
- Ratified Basel Convention

Targets

Establishment of integrated waste management and financially self-sustainable waste management system.

Reporting obligation

- EUROSTAT

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 056	**Management of hazardous waste**	UNECE I-2	Management of hazardous waste	P R	A	▪ economy ▪ population ▪ urbanization ▪ waste	2 - year

MK - NI 057

FINAL MUNICIPAL WASTE MANAGEMENT

Definition

This indicator shows the final management of the overall amount of municipal waste through the processes of:

- Incineration (with and without energy recovery)
- Landfilling (controlled or uncontrolled landfills)
- Composting
- Reuse or recycling
- Other manner of management.

Units

- Tons/year, percentage (%).

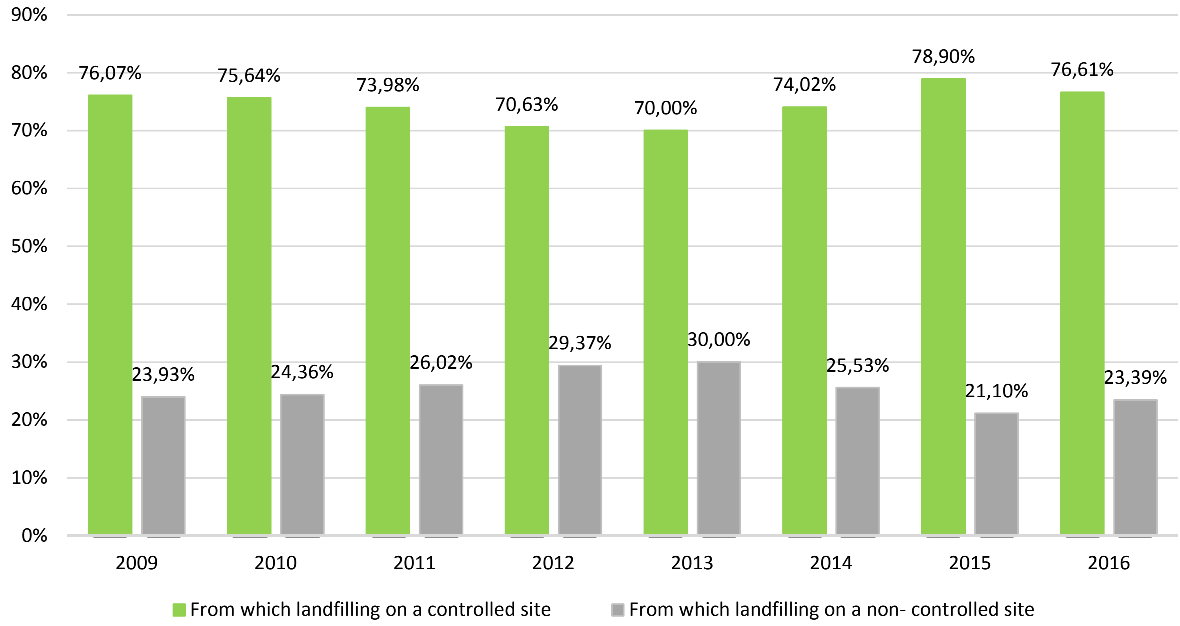
Key question

In which way or through which processes the final waste management is performed?

Key message

Waste landfilling on controlled landfills is the prevailing process in the final waste management in the Republic of Macedonia, followed by waste disposal on uncontrolled landfills. The processes of composting, reuse, recycling of municipal waste, as well as waste incineration with energy recovery are almost not represented in the country.

Figure 1. Overview of % of municipal waste landfilling on controlled and uncontrolled landfills



Data coverage: excel

Source of data: State Statistical Office

Assessment

The way in which the waste is managed in the country has great impact on environment, economy and human health and wellbeing. Adequate waste management assumes that the Government is aware if the risks of waste for human health and environment and it supports and promotes appropriate measures to prevent waste generation or reduce it, as well as to manage it properly. Reduction in the amount of generated waste, as well as reuse and recycling of generated waste are ecologically the most favourable processes of waste management, as it also accomplishes reduction in raw materials and resources extraction. Another option of management of the waste that cannot be reused or recycled is incineration with energy recovery. The last option in waste management is its disposal in landfills and technically appropriately managed and controlled landfills are recommended for this purpose.

The two most represented processes of waste management, namely disposal of waste on controlled and uncontrolled landfills, are rather unfavourable for the environment, health of people and animals, as well as economy. Waste disposal on controlled landfills in the period 2009 to 2016 ranged from 70.0% to 78.9%, while disposal of waste on uncontrolled landfills was in the range between 21.1% in 2015 and 30.0% in 2013. All this indicates pollution of the environment and loss of natural resources. Absence of the processes of reuse, recycling, composting and incineration of waste with energy recovery reflects lack of recognition of the waste as resource and lack recovery of energy and matter contained in the waste.

Methodology

Types of hazardous waste are determined by the List of waste types. Appropriate treatment and disposal of waste are in accordance with definitions and conditions set in the Law on Waste Management. Collection of data is acquired mainly through surveys, estimates, and administrative data. Reports are in a form of releases of the State Statistical Office (2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016).

Policy relevance

List of relevant policy documents:

Second National Environmental Action Plan of the Republic of Macedonia (2006)

Strategy for Waste Management in the Republic of Macedonia (2008-2020)

National Waste Management Plan (2009-2015) of the Republic of Macedonia

Legal grounds

- Law on Waste Management (2004)
- List of waste types (2005)

Targets

Establishment of integrated waste management and financially self-sustainable waste management system.

Reporting obligation

- EUROSTAT

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 057	**Final municipal waste management**	UNECE I4a	Final waste disposal: Management of municipal waste	I	A	▪ households ▪ economy ▪ population ▪ urbanization ▪ waste	2 - years

MK - NI 064

QUANTITY OF GENERATED WASTE BATTERIES AND ACCUMULATORS

Definition

This indicator tracks the quantity of generated waste batteries and accumulators (WBA) by types; it also tracks the achievement of targets through avoiding and reducing the waste generated, achievement of high rate of waste batteries and accumulators collection, recycling and other types of waste batteries and accumulators recovery.

Units

Kilogram/year, percentage

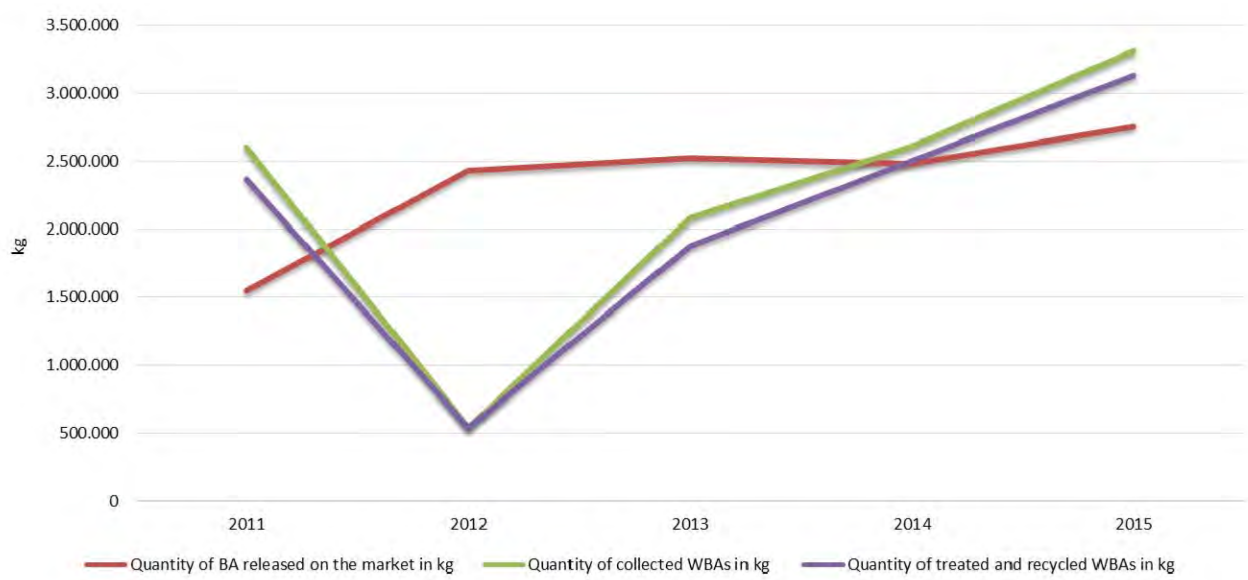
Key policy question

What is the status of the quantity of batteries and accumulators released on the market in the Republic of Macedonia? What is the quantity of collected, treated, recycled and exported WBAs?

Key message

During the reporting period, from 2011 to 2015, gradual increase in the quantity of BAs released on the market in the Republic of Macedonia, quantity of collected waste batteries and accumulators, as well as quantity of treated and recycled waste batteries and accumulators was recorded. This means that the rate of WBAs collection aiming at achievement of the national targets is increasing.

Figure 1. Total quantity of batteries and accumulators



Data coverage: excel

Source of data: Ministry of Environment and Physical Planning

Assessment

The Law on the Management of Batteries and Accumulators and Waste Batteries and Accumulators sets the requirements for environment protection that have to be fulfilled by batteries and accumulators at their production and release on the market in the Republic of Macedonia. It also regulates the handling of waste batteries and accumulators including the obligations and responsibilities of economic operators and other entities involved in the process of production and release on the market batteries and accumulators that contain hazardous substances, the rules for collection, recovery, recycling and disposal of waste batteries and accumulators, as well as other conditions for waste batteries and accumulators handling, reporting and economic instruments for achievement of the national targets for waste batteries and accumulators collection and recovery.

The analyzed data for the period 2011 to 2015 shows increase in the quantity of batteries and accumulators released on the market by 78%.

The quantity of collected WBAs from 2011 to 2012 was reduced by 79.22%, but in the followup period from 2012 to 2015 it noted a positive trend increasing by six times. The quantity of treated and recycled WBAs from 2011 to 2012 manifested decrease by 77%, while from 2012 to 2015 it increased by five times.

The above indicates that the handling of waste batteries and accumulators has positive trend of increase in the quantities of collected waste batteries and accumulators by which the set national targets would be achieved gradually.

The quantity of exported WBAs for treatment and recycling for 2015 amounted 112.725 kg.

Methodology

- Methodology for the indicator calculation

Data and calculation for the indicator were made by the Ministry of Environment and Physical Planning using information and data obtained under the Rulebook on the format and the content of the form of the annual report on waste batteries and accumulators handling and the manner of its submission, as well as the format and the content of the form for records keeping of the quantities and types of batteries and accumulators released on the market in the Republic of Macedonia.

Policy relevance of the indicator

List of relevant policy documents:

Strategy for Waste Management of the Republic of Macedonia (2008 -2020)
National Waste Management Plan of the Republic of Macedonia (2009 – 2015)
Assessment of the state of waste batteries and accumulators management of the Republic of Macedonia

Legal grounds

- Law on Waste Management
- Law on the Management of Batteries and Accumulators and Waste Batteries and Accumulators
- Rulebook on the format and the content of the form of the annual report on waste batteries and accumulators handling and the manner of its submission, as well as the format and the content of the form for records keeping of the quantities and types of batteries and accumulators released on the market in the Republic of Macedonia

- Rulebook on the manner of monitoring and calculating the achievement of the rates of waste batteries and accumulators collection, as well as the format and the content of the form for monitoring and calculation

EU and other international regulations:

Directive on batteries and accumulators and waste batteries and accumulators 2006/66/EC and amendments 2008/12/EC, 2008/103/EC

Targets

Under the principle of sustainable development of the Law on the Management of Batteries and Accumulators and Waste Batteries and Accumulators, the following general objectives should be achieved:

- Reduction in the quantity of waste batteries and accumulators disposed of at landfill,
- Achievement of high level of waste batteries and accumulators collection,
- Achievement of high level of waste batteries and accumulators recycling and other forms of recovery,
- Provision of conditions for establishment of handling system (return, collection, recovery and recycling) for waste batteries and accumulators,
- Provision of conditions for establishment and development of market for waste batteries and accumulators recovery and recycling, and
- Provision of equal position on the market between domestic and foreign legal and natural persons and avoidance and elimination of trade barriers that may disrupt the market.

Also, the following targets should be achieved:

a) 25% at minimum of the weight of the portable batteries and accumulators released on the market in the Republic of Macedonia should be collected by the end of 2016, and

b) 45% at minimum of the weight of the portable batteries and accumulators released on the market in the Republic of Macedonia should be collected by the end of 2020.

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 064	Quantity of generated waste batteries and accumulators			**P**	B	waste	annually

MK - NI 065

QUANTITY OF GENERATED PACKAGING WASTE

Definition

This indicator tracks the quantity of generated packaging waste. The purpose of this indicator is to prevent generation of packaging waste, reduce the quantity of packaging waste, achieve high rate of packaging reuse, recycling and other types of packaging waste recovery.

Units

Tons/year, %

Key policy question

What is the status of the quantity of packaging released on the market in the Republic of Macedonia? What is the quantity of generated, recycled and recovered packaging waste?

Key message

During the period from 2011 to 2015, increase was recorded in the quantity of packaging waste released on the market and consequentlyincrease in the quantity of collected, recycled and recovered individual materials of the packaging aiming at achievement of the national targets for packaging waste handling.

Figure 1. Trend of the overall quantities of packaging released on the market

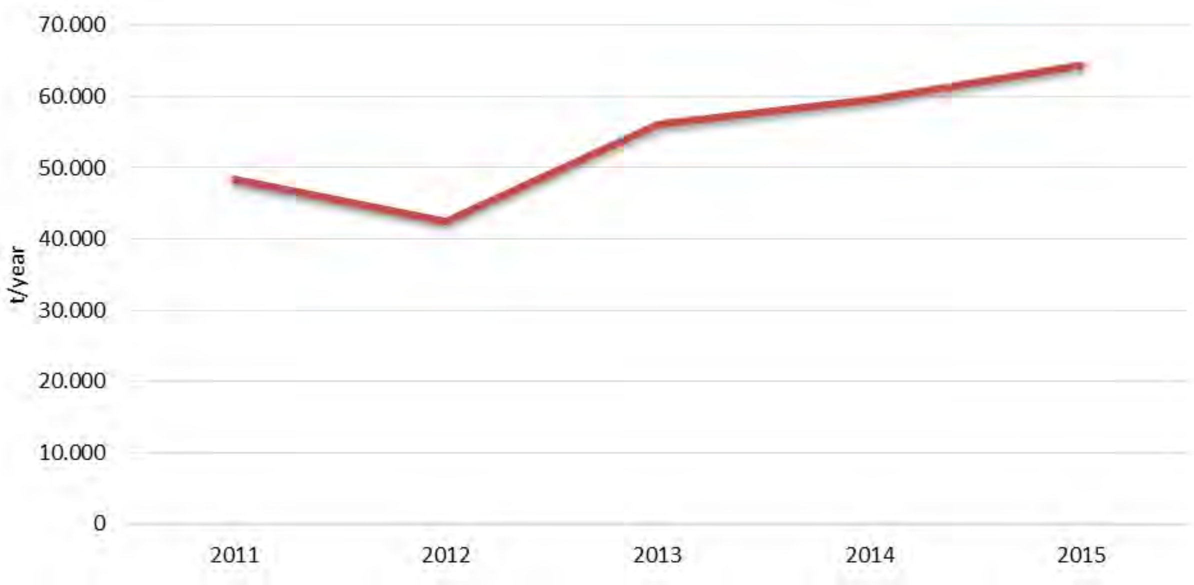


Figure 2. Trend of the overall quantities of collected packaging waste

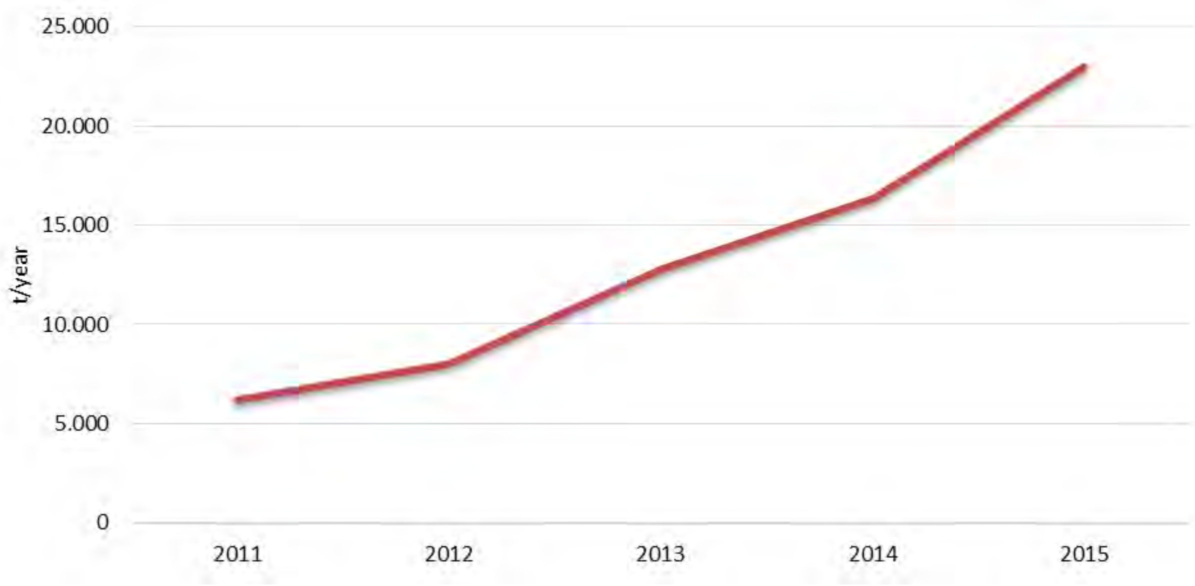
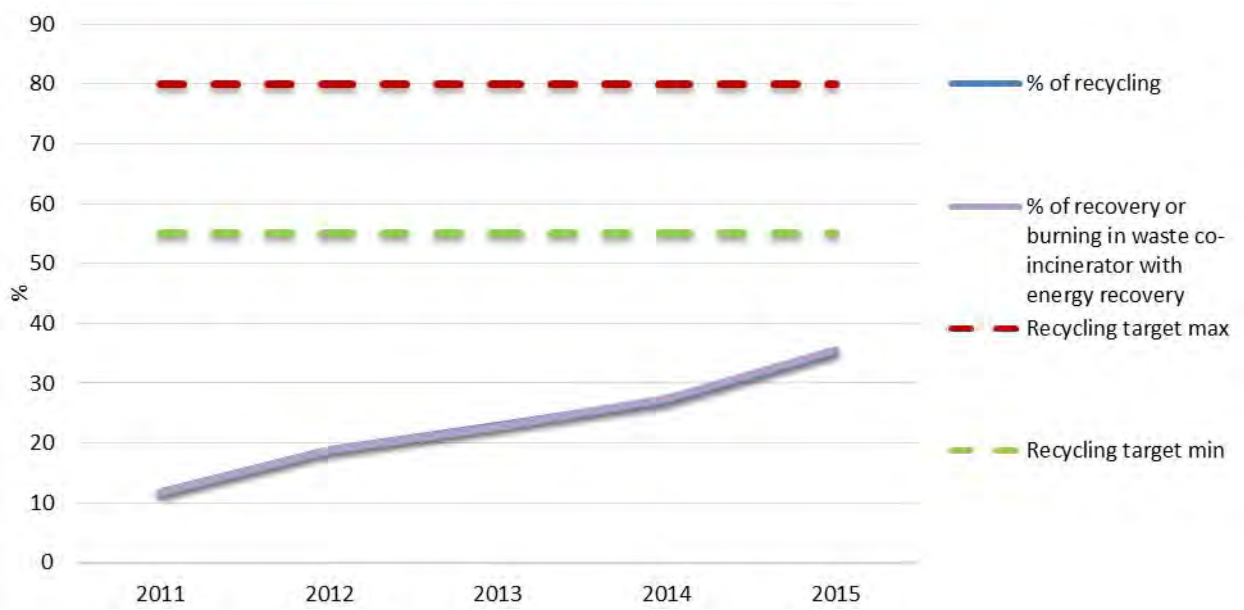


Figure 3. Trend of recycling and recovery by year compared to targets



Data coverage: excel

Source of data: Ministry of Environment and Physical Planning

Assessment

The Law on the Management of Packaging and Packaging Waste sets the requirements for environment protection that have to be fulfilled by the packaging at production, release on the market and introducing for use. It also regulates the handling of the packaging waste including the obligations and responsibilities of economic operators and other entities involved in the process of production, release on the market and introducing for use of the packaging, the rules for collection, reuse,

recovery and disposal, as well as other conditions for packaging waste handling, reporting and economic instruments for achievement of the national targets for packaging waste collection and recovery.
The quantity of the packaging waste released on the market in 2015was 64.369,48 tons. This quantity compared to the one in 2011 reflects increase by 33%. Further more, the total quantity of collected packaging waste in 2015 increased by 3,5 times compared to 2011 and amounted 22.992,25 tons. The percentage of packaging waste recycling for 2015 was 35,3%, while the percentage of recovery or burning in waste co-incinerators with energy recovery was 35,6%.
The above indicates that the handling of packaging waste has positive trend of increase in the quantities of recycling of the material and other forms of recovery by which the set national targets would be achieved gradually.

Methodology

- Methodology for the indicator calculation

The indicator was developed on the basis of the Rulebook on the format and the content of the form of the annual report on the type and the quantity of packaging released on the market or imported in the Republic of Macedonia during the preceding calendar year and such packaging waste handling, the format and the content of the form for records keeping of the overall packaging released on the market or imported in the Republic of Macedonia, as well as the manner of records keeping.

Rulebook on the manner of keeping, the format and the detailed content of the database and informations system of packaging and packaging waste.

Policy relevance of the indicator

List of relevant policy documents:

Strategy for Waste Management of the Republic of Macedonia (2008 -2020)
National Waste Management Plan of the Republic of Macedonia (2009 – 2015)
Programme for packaging waste management

Legal grounds

- Law on Waste Management
- Law on the Management of Packaging and Packaging Waste
- List of illustrative examples of packaging
- Rulebook on the manner of numbering and abbreviations on which the system of identification is based and marking of the materials of which the packaging was made, as well as the format and the content of the label for packaging waste handling
- Rulebook on the format and the content of the form of the annual report on the type and the quantity of packaging released on the market or imported in the Republic of Macedonia during the preceding calendar year and such packaging waste handling, the format and the content of the form for records keeping of the overall packaging released on the market or imported in the Republic of Macedonia, as well as the manner of records keeping
- Rulebook on the manner of keeping, the format and the detailed content of the database and informations system of packaging and packaging waste
- Rulebook on the conditions for durable packaging and types of packaging serving as parameters that the packaging is durable

EU and other international regulations:

Directive on packaging and packaging waste 94/62/EC and amendments 2004/12/EC

Targets

Under the principle of sustainable development of the Law on the Management of Packaging and Packaging Waste, the following general objectives should be achieved:

- to prevent generation of packaging waste,
- to reduce the quantity of packaging waste,
- to reduce and restrict the use of harmful metals and matters in packaging and thus reduce the toxicity of the packaging waste,
- to prevent or reduce negative impact of packaging waste on environment and provide high level of environment protection,
- to provide conditions for establishment of system for return, selection, collection, reuse, recovery and recycling of packaging waste,
- to provide conditions for establishment and development of market of packaging waste recovery and recycling, and
- to provide equal position between domestic and foreign legal and natural persons and avoide and eliminate trade barriers that may disrupt the market.

National targets for packaging waste handling require that the following quantities of packaging and packaging waste should be and recovered on the territory of the Republic of Macedonia within the following deadlines:
a) by the end of 2020, at least 60% of the weight of the packaging waste generated on the territory of the Republic of Macedonia should be recovered by recovery operations or energy recovery operations;
b) by the end of 2020, at least 55% and 80% at maximum of the weight of the packaging waste generated on the territory of the Republic of Macedonia should be recycled;
c) by the end of 2020, the following quantities of materials of which the packaging is produced should be recycled:

- 60% glass,
- 60% paper and cardboard,
- 50% metals, and
- 15% wood; and

d) by the end of 2018, 22.5% plastics, taking into account only the recyclable materials in the plastic.

The exported quantities of packaging waste will be taken into account in the fulfillment of the obligations and achievement of the targets set under the law only if there is evidence that those have been recovered in a manner not harmful for the environment and equivalent with the manner defined in the regulations for environment protection and waste management in the Republic of Macedonia.

General metadata

Code	Title of the indicator	Compliance with CSI/EEAor other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 065	Quantity of generated packaging	CSI 052	Waste recycling	**P**	B	waste	annually

MK - NI 066

QUANTITY OF GENERATED MEDICAL WASTE

Definition

This indicator tracks the quantity of generated medical waste by types. This indicator monitors the achievement of strategic objectives, namely avoidance to the maximum extent possible, reduction of the quantity of generated hazardous waste, prevention of negative impacts of waste on environment, human life and health, as well as high level of environment and human life and health protection.

Units

Kilogram/Ton/year

Key policy question

What is the status of the quantity of medical waste in the Republic of Macedonia? Data on the types and the wuantities of medical waste and quantity for handling?

Key message

In the period between 2010 and 2016, gradual increase in the quantity of generated medical waste was recorded in the Republic of Macedonia. This leads to the conclusion that the number of hazardous medical waste generators increased as well and those are obliged to report once in a year on the waste handling in accordance with the legislation in the area of medical waste management.

Figure 1. Total quantity of generated medical waste in the period 2010 to 2016

Data coverage: excel

Source of data: Ministry of Environment and Physical Planning

Assessment

The quantity of generated medical waste in the period from 2010 to 2016 increased gradually. Based on the data submitted, the quantity of reported generated medical waste for 2016 amounted 712,24 tons compared to 2010 when the quantity of generated medical waste was 195.6 tons. The quantity of generated medical waste increased by 3.5 times.

According to reports submitted for 2016 for further handling of medical waste, the quantity of the medical waste handed over to other persons was 698,60 tons. Quantity of 13,64 tons of liquid waste was treated automatically. The biggest portion of the reported quantity belongs to infective waste (18 01 03*) with 648,35 tons.

We may conclude that the medical waste handed over to third persons in the Republic of Macedonia is treated adequately and neutralized and does not pose any direct hazard to environment and people.

We should also point out that the presented quantities of medical waste do not show total quantities of generated medical waste at the level of the Republic of Macedonia.

Methodology

- Methodology for the indicator calculation

The indicator is developed on the basis of data and information obtained in accordance with the provisions of the Rulebook on the format and the content of the journal for waste handling records keeping, the format and the content of the forms for the waste identification and transport and the format and the content of the forms of the annual reports for waste handling. The type of the waste is determined by the List of waste types.

Legal ground

- Law on Environment
- Law on Waste Management
- Rulebook on the manner of medical waste handling, as well as the manner of medical waste packaging and marking
- Rulebook on the format and the content of the journal for waste handling records keeping, the format and the content of the forms for the waste identification and transport and the format and the content of the forms of the annual reports for waste handling
- List of waste types
- National classification of activities
- Law on State Statistics
- Programme for statistical surveys

Targets

Avoidance and reduction to the maximum possible extent of the quantity of generated waste;
Disposal of waste in environmentally acceptable manner; and
High level of environment and human life and health protection.

General metadata

Code	Title of the indicator	Compliance with CSI/EEAor other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 066	Quantity of generated medical waste			**P**	B	waste	annually

WATER

MK - NI 018
USE OF FRESHWATER RESOURCES

Definition

The indicator observes the exploitation of freshwater resources according to their use in individual sectors, such as: public water supply, irrigation and electricity production (cooling), losses of water in water supply systems of legal persons registered for water abstraction for manufacturing or distribution of water, as well as the water exploitation index (WEI).

Units

- Water exploitation index - WEI expressed in %;
- Quantity of freshwater resources used is expressed in million m^3 per year.

Key policy issue

Is water resources approximation based on water resources sustainability?

Key message

In the period 1990 – 2014, oscillatory trend was tracked in water resources use. Particular rise was recorded in 2012 where the biggest quantities of freshwater resources were used for irrigation. This is due to the fact that 2012 was dry year and distribution of precipitations was such that enabled filling of water accumulations with the required quantities of water for irrigation.

Figure1. Water exploitation index

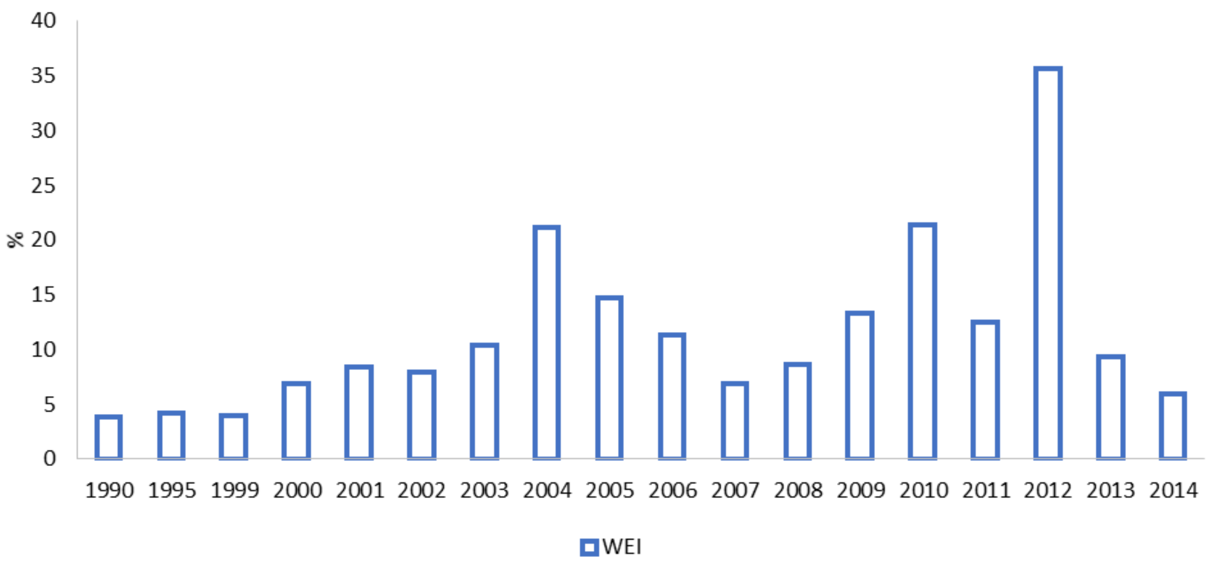


Figure 2. Water resources use by sectors

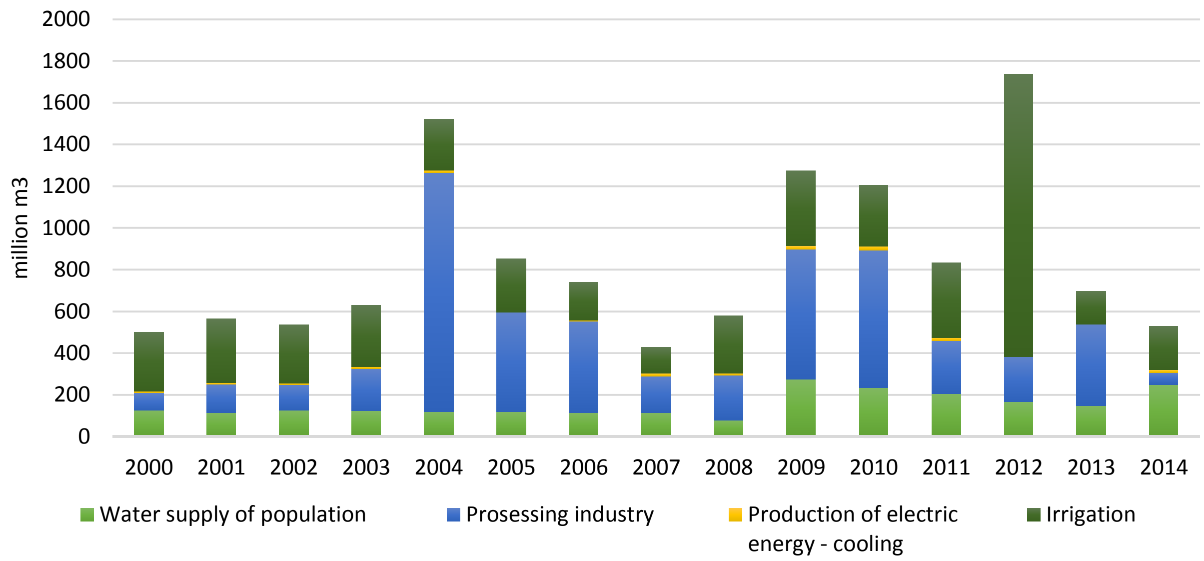


Figure 3. Abstracted water

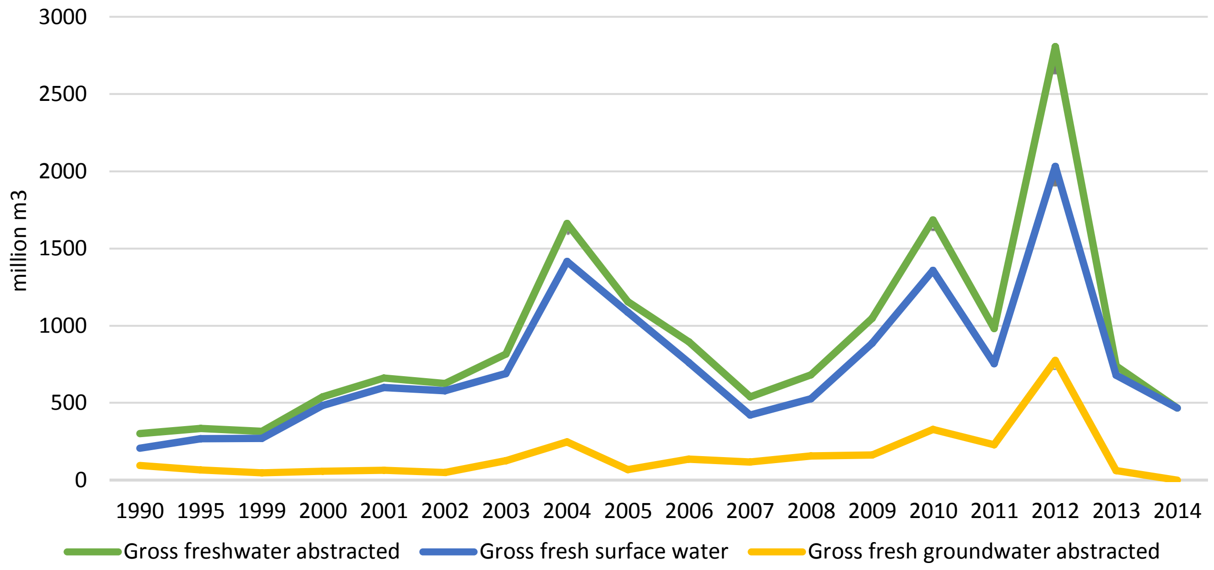


Figure 4. Gross abstracted surface freshwater

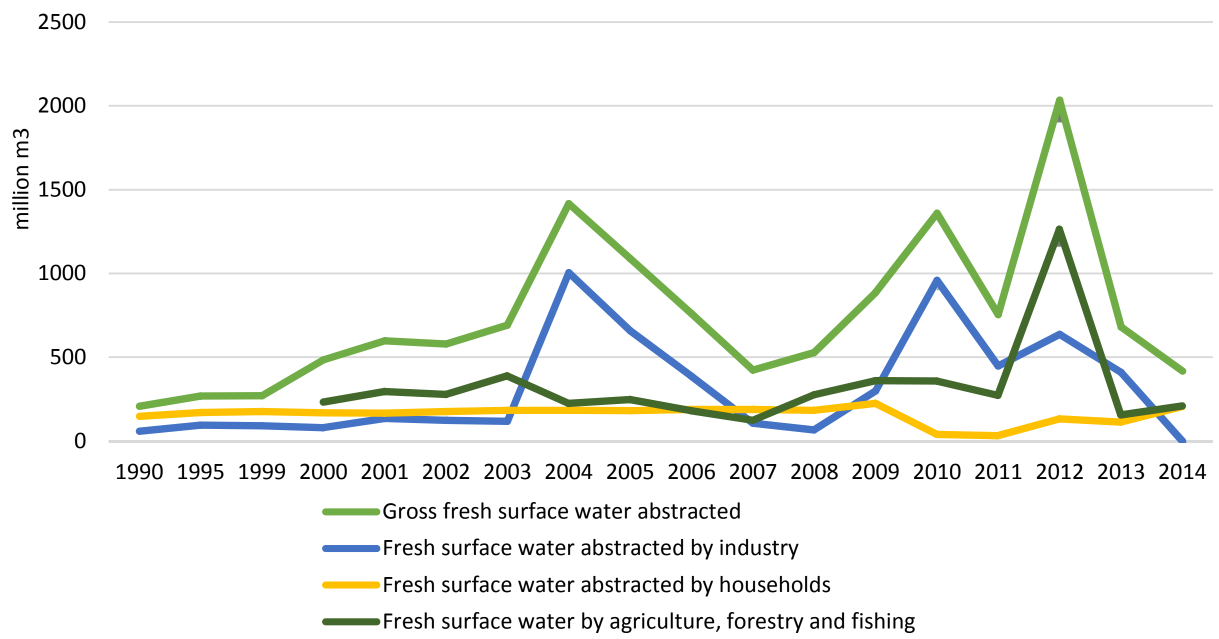


Figure 5. Gross abstracted ground freshwater

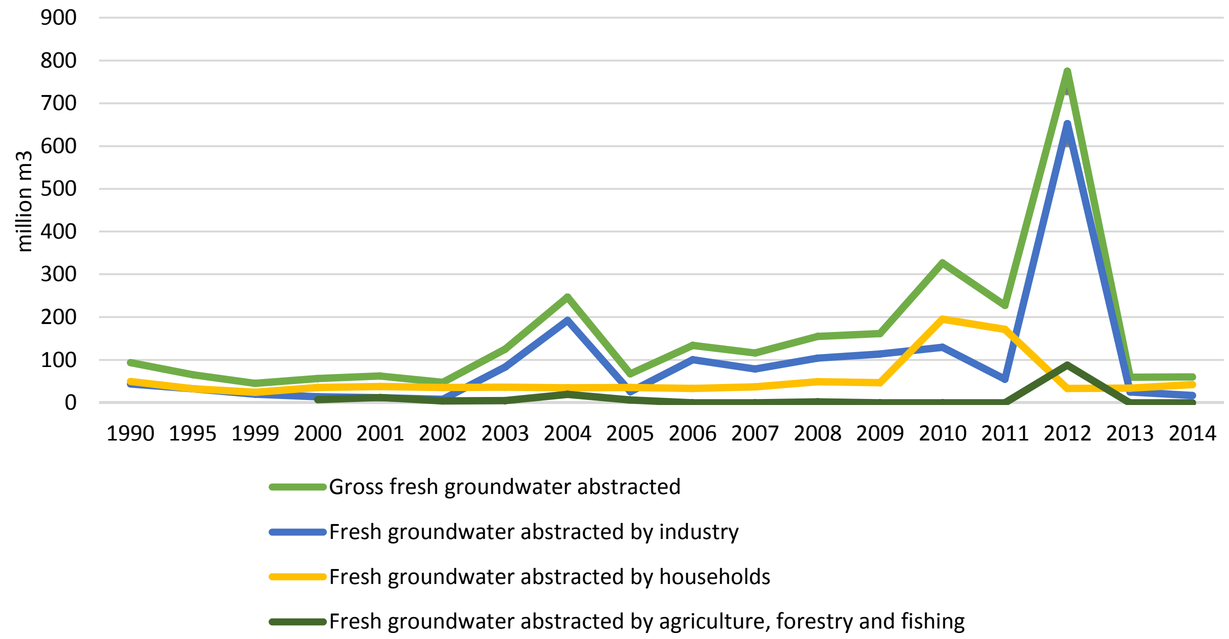


Figure 6. Freshwater loss in transport

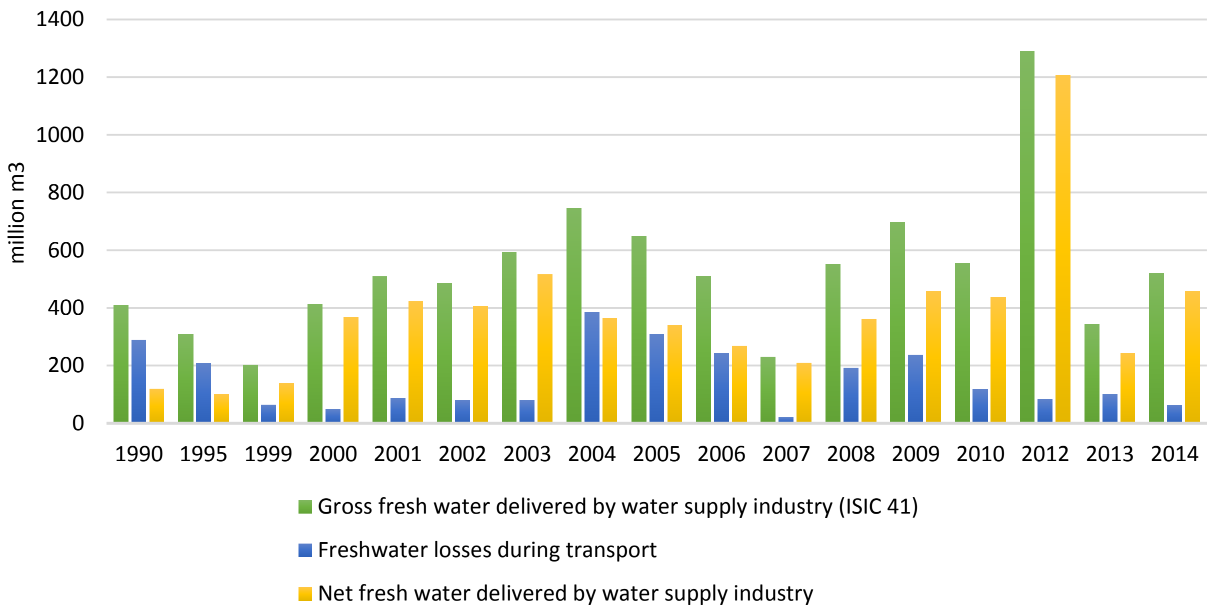
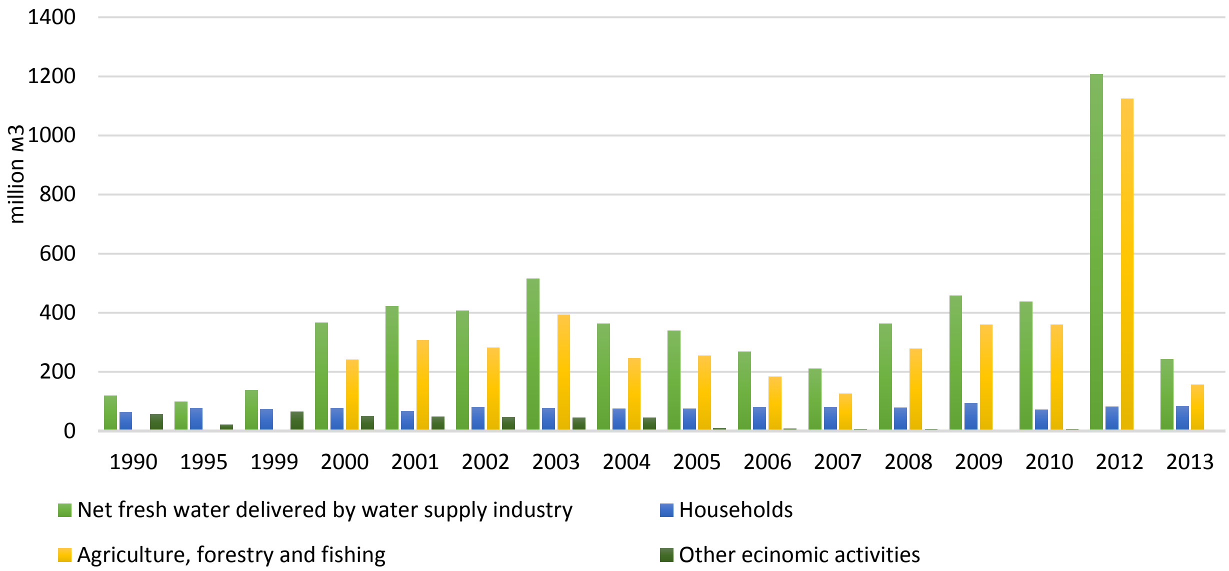


Figure 7. Net distributed freshwater



Data coverage: **excel**

Source: State Statistical Office, Water Management Administration, Public Water Supply and Sewerage Enterprise, Water communities

Assessment

In the period 1990 – 2014, variable trend was tracked in freshwater resources use in the country. Particular rise was recorded in freshwater consumption in 2004 and 2012. Processing industry and irrigation are the main users of fresh surface and ground freshwaters during the analyzed period. In the years from 2000 to 2003, as well as in 2008, 2011 and 2012, the quantities of abstracted freshwater for irrigation exceeded the quantities for processing industry. Throughout the analyzed period, freshwater consumption for electricity production, i.e. power plants cooling, was the lowest.

As far as freshwater abstraction is considered, Figure 3 shows that surface freshwaters recorded the biggest quantities of freshwater were abstracted in 2012. During the analyzed period, abstraction of ground freshwater resources was without major oscillations except in 2012 when rise was recorded. In the same year (2012) the values of abstracted surface freshwater were the highest, too.

Abstraction of ground freshwater resources is mainly for freshwater supply for households and part of industry, while the share of agriculture, forestry and fishery is negligible.

Diagram number 6 shows that the biggest loss of freshwater in transport occurred in 2004 and 2005, while the lowest losses were recorded in 2007 and years from 1999 to 2003. Contrary to this, in abstraction of ground freshwaters at net distributed freshwater, most of the freshwater is consumed for agriculture, forestry and fishery.

Methodology

- Methodology for the indicator calculation

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

Water Exploitation Index (wei) is calculated by the mean annual total abstraction of freshwater divided by the mean annual total renewable freshwater resource at the country level.

WEI = (totABS/LTAA) *100

Where: totABS = mean annual value of total freshwater abstraction for all purposes; LTAA = long term annual mean value of freshwater resources, where data is expressed in average for a period of at least 20 consecutive years. Unit =%

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.

National Strategy for Waters.

Legal grounds

The Law on Waters prescribes the basic planning documents for protection, maintenance and constant improvement of the disposable water resources and rational use of the available water quantities.

Basic planning and water management development documents in the Republic of Macedonia are:

- The National Water Strategy
- Water Master Plan of the Republic of Macedonia and
- River Basin Management Plans.

The Law specifies that the maintenance and improvement of water regime is carried out on the basis of River Basin Management Plans. Such Plans contain the environmental protection goals, good status of surface water bodies (good quantitative status and chemical status, including good ecological potential) and of the groundwater resources (good quantitative status and chemical status).

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.

Reporting obligation

- OECD/EUROSTAT

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

MK - NI 019

OXYGEN CONSUMING SUBSTANCES IN RIVERS

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.

Key policy issue

Has pollution of rivers by biochemical oxygen demand (BOD_5) and ammonium not noted increase?

Key message

In the Republic of Macedonia, there is a variable trend in the concentrations of BOD5 and the concentrations of ammonium in the rivers, during the period under review. The largest drop in concentrations of BOD5 is observed from 2008 to 2010. Then we observe a period of slight increase in concentrations. Ammonium concentrations in the rivers decline, starting from 2001 until 2016, when the lowest concentration was registered.

Moderate eutrophic status in relation to the level of BOD5 is registered in the river Vardar. These results can reflect the state of inefficient treatment of urban and industrial wastewater, as well as the inadequate protection of river basins.

Figure 1. Biochemical oxygen demand (BOD_5) in rivers

Figure 2. Biochemical oxygen demand (BOD_5) in rivers by river

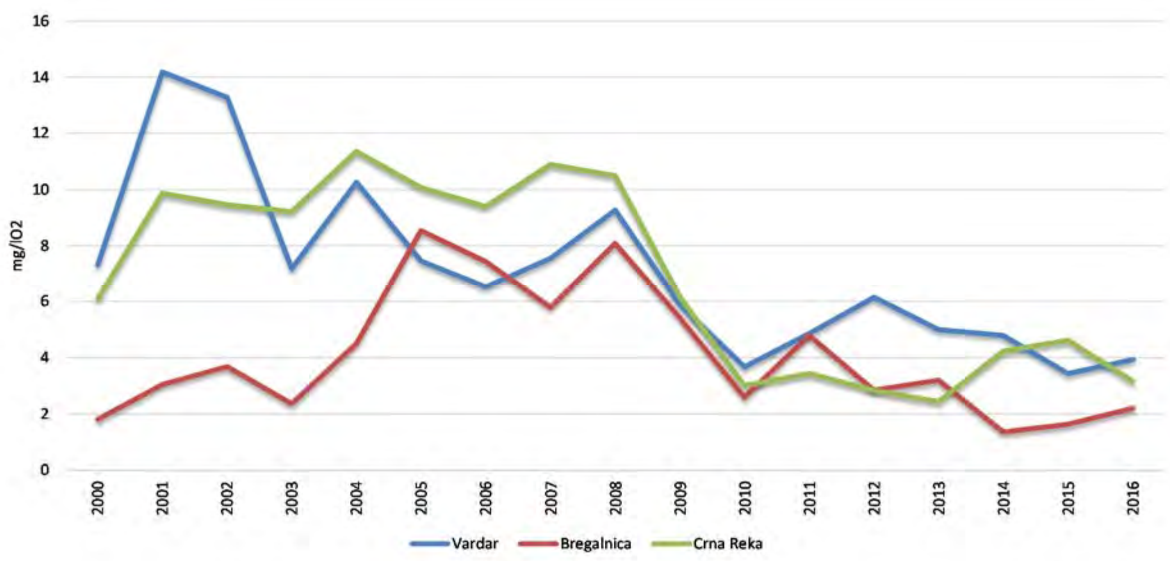
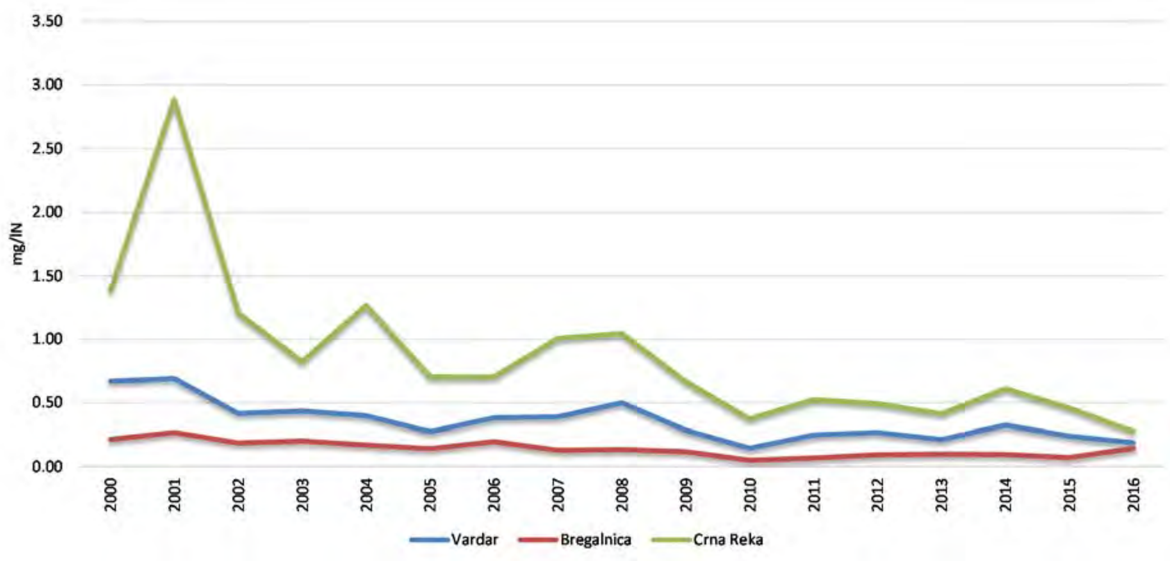


Figure 3. Total ammonium in rivers

Figure 4. Total ammonium in rivers by river



Data coverage: excel

Source: MEPP, HMA

Assessment

In the Republic of Macedonia, during the analyzed period, there was a changing trend in the concentrations of BOD5 and the concentrations of ammonium. In the period from 2000 to 2008, the concentration of BOD5 has a relatively stable trend, after which from 2008 to 2010 the lowest concentrations of BOD5 were registered. In the rest of the period, there is a slightly growing trend in the concentrations of BOD5.

Concerning ammonium concentrations in rivers, each year there are significant variations. The highest concentration of ammonium was recorded in 2001, followed by a decrease in concentrations. The lowest concentration was registered in 2016.

Some monitoring stations located on Crna Reka and the river Vardar, recorded moderate eutrophic status of waters, in relation to the level of BOD5. These results can reflect the state of inefficient treatment or urban and industrial wastewater in the country, as well as the inadequate protection of river basins.

Proper protection of rivers and, in particular, the introduction or regular wastewater treatment in the country is the highest political priority at the local and national level.

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 thefrequency of their collection.

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,

Strategy for Waters has been developed in order to establish long-term policy that will secure sustainable development of waters by meeting the demands of all water users, protecting waters against pollution and pollution control.

The Law on Waters transposing the following EU Directives into the national legislation:

- 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.
- Directive on nitrates (91/676/EEC), the goal of which is to reduce nitrates and pollution by organic matter originating from agricultural lands.
- Directive on urban wastewater treatment (91/271/EEC) aimed at reducing the pollution from sewerage and industrial wastewater treatment plants

The Law on Environment has transposed the 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 the main planning documents for water protection, maintenance and permanent improvement of available water resources and sustainable use of available water quantities.

The main planning documents for water management planning and development include:

- The National Strategy for Waters
- Water Management Master Plan of the Republic of Macedonia, and
- River basin management plans.

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, management plan will be adopted for each river basin, in order to achieve the environmental protection objectives.

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.

Targets

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

Reporting obligation

- EEA

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

MK - NI 020

NUTRIENTS IN FRESHWATER

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 mgP/l.

Key policy question

Has the nutrients concentration in water courses shown rising trend?

Key message

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

In the analyzed period, slight drop was recorded in the mean annual concentrations of nitrates and orthophosphates in all three rivers. An exception was recorded in the period from 2013 to 2016, when insignificant increase in orthophosphates concentrations was recorded in all three rivers.

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, thus increasing the risk of Lake's water eutrophication.

Figure 1. Nitrates and orthophosphatesin rivers

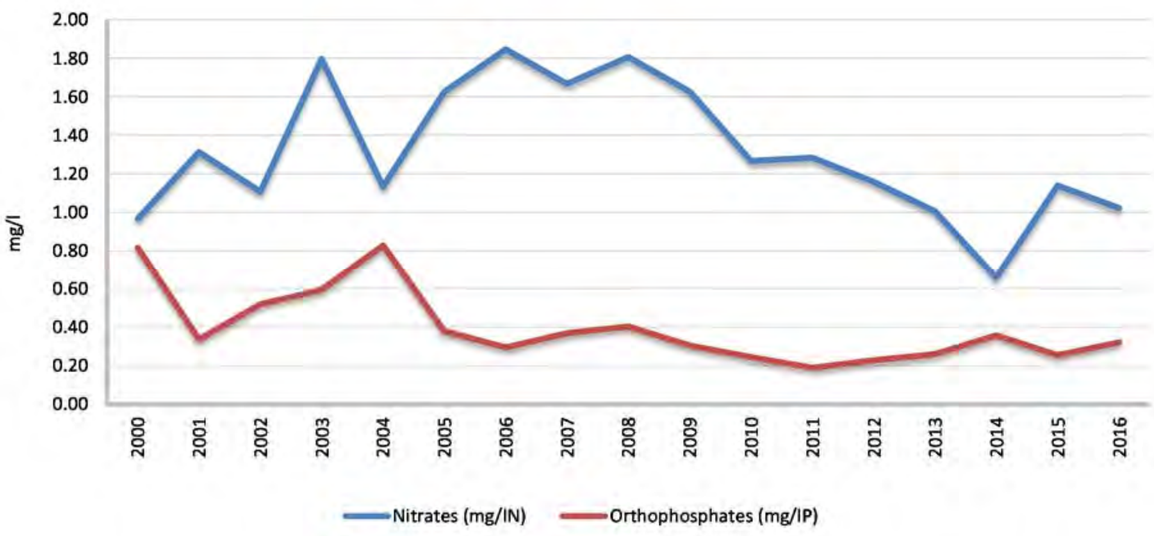


Figure 2. Nitrates in rivers by river

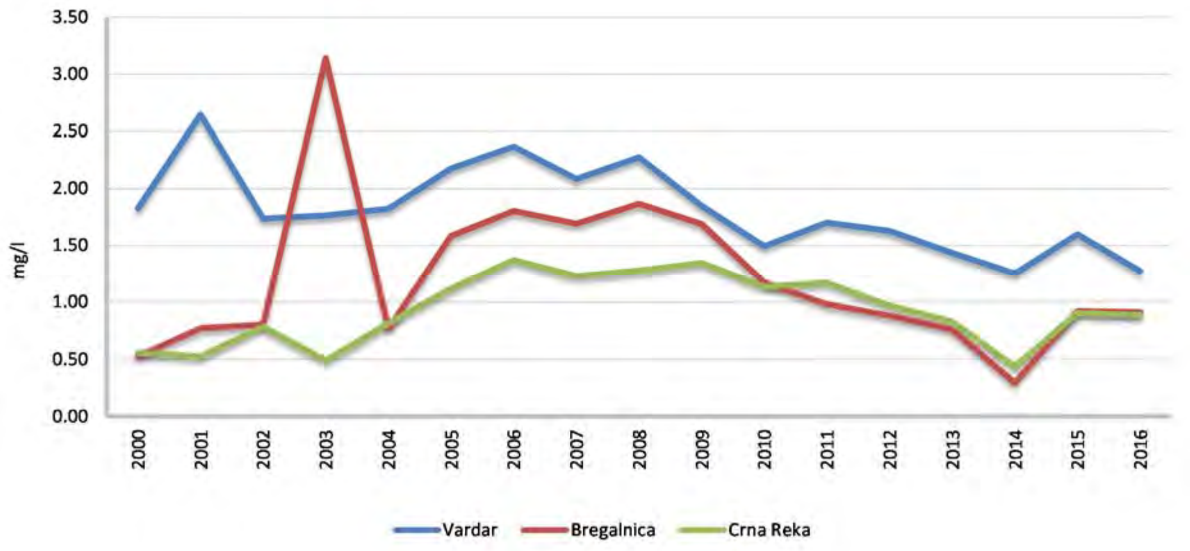


Figure 3. Orthophosphatesin riversby river

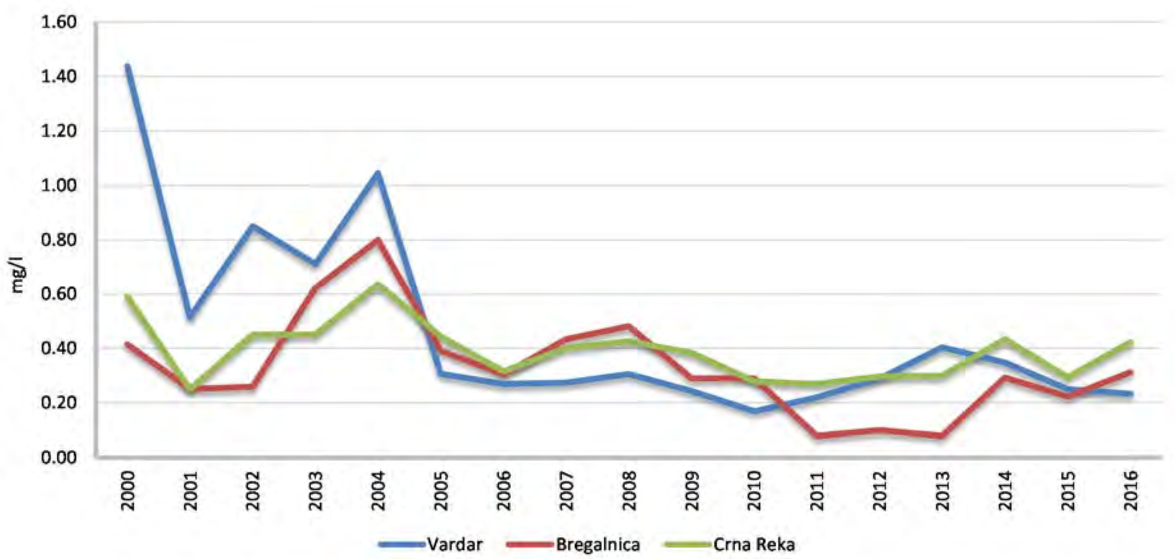


Figure 4. Total phosphorous in lakes

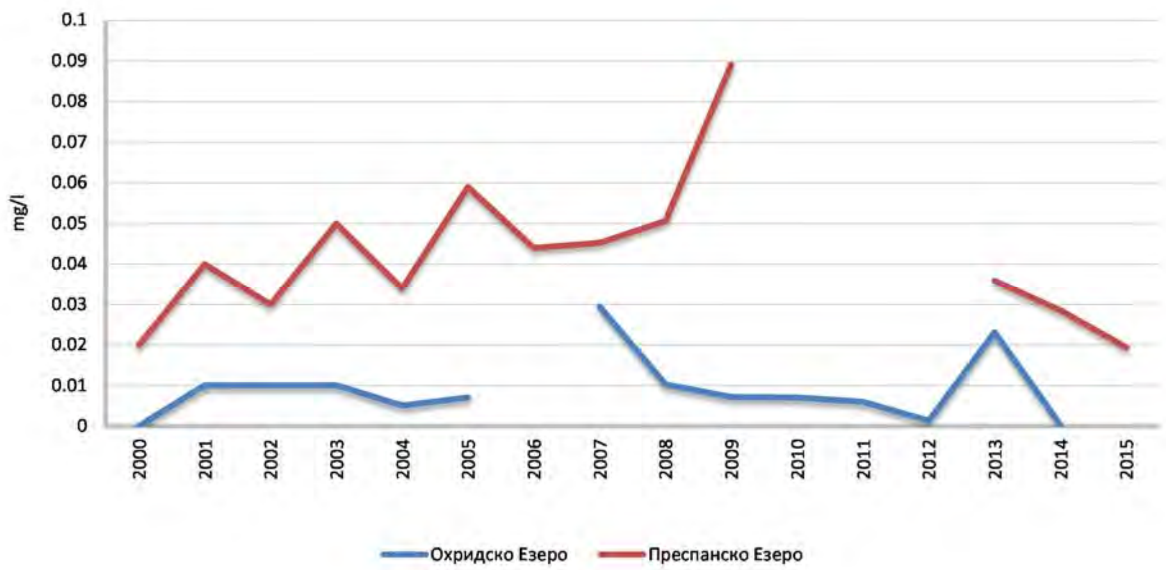
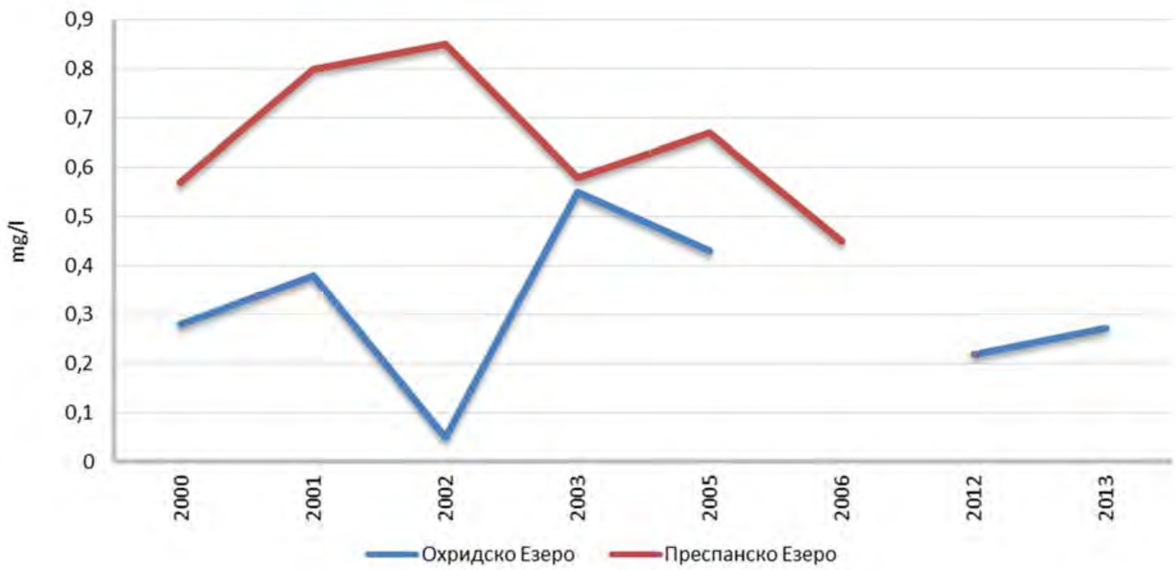


Figure 5. Total nitrate in lakes



Data coverage: excel

Source: MEPP, HMA, HBI

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 VardarRiver.

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), with higher concentrations of phosphorous (0.030 mg/l)recorded in 2007 in Ohrid Lake and nitrates concentrations within permissible limits (mean annual concentrations below 0.55 mg/l). From 2013 until 2016, investigations were carried out in Prespa Lake's litoral and pelagial zones, where the concentrations of nitrates and total phosphorous were noted as declining. It is important to note that in the period from 2014 until 2016, there is no available data on nitrates and total phosphorous in the Ohrid Lake. Concentrations are significantly higher in Prespa Lake, where organic compounds are found at high levels, thus increasing the risk of the 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.

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.

Strategy for Waters has been developed in order to establish long-term policy that will secure sustainable development of waters by meeting the demands of all water users, protecting waters against pollution and providing pollution control.

The Law on Waters transposing the following EU Directives into the national legislation:

- 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.
- Directive on nitrates (91/676/EEC), the goal of which is to reduce nitrates and pollution by organic matter originating from agricultural lands.
- Directive on urban wastewater treatment (91/271/EEC) aimed at reducing the pollution from sewerage and industrial wastewater treatment plants

The Law on Environment has transposed the 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 the main planning documents for water protection, maintenance and permanent improvement of available water resources and sustainable use of available water quantities.

The main planning documents for water management planning and development include:

- The National Strategy for Waters
- Water Management Master Plan of the Republic of Macedonia, and
- River basin management plans.

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. Such plans contain environmental protection objectives in order to achieve good status of surface water bodies (good quantitative and chemical status, including also good ecological potential) and ground water resources (good quantitative status and chemical status).

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

Under the Law on Waters, authorities responsible for health protection are obliged to carry out monitoring of waters intended for human consumption and bathing waters, and for undertaking measures for active protection of the population against communicable diseases of high social and health relevance. The competent institutes perform microbiological parasitological, hygienic, toxicological and biochemical analyses within the scope of their activity.

Programme for preventive health protection performs monitoring over the quality of surface waters at all points of health interest, in order to enable timely undertaking of measures for population protection. Waters used as drinking water sources, sports and recreation and primary agricultural production are of highest interest.

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.

Reporting obligation

- EEA

General metadata

Code	Title of the indicator	Compliance with CSI/EEAor other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MKNI 020	**Nutrients in freshwaters**	CSI 020	Nutrients in freshwater	**S**	A	water	annually

MK - NI 022

BATHING WATER QUALITY

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 parameters.

Key policy issue

Has the quality of bathing water improved?

Key message

The quality of lake water is at mainly satisfactory level. However, there are rivers which with their entry into the lakes contribute to deterioration of the quality of lake water. The percentage of samples with non-compliant quality is still very high (especially for physical and chemical parameters) Settlements around the three natural lakes are among the rare ones with wastewater treatment plants available in the country.

Approximation of the national legislation and standards in this area with the EU Bathing Water Directive should continue.

Figure 1. Quality of bathing freshwater - lakes

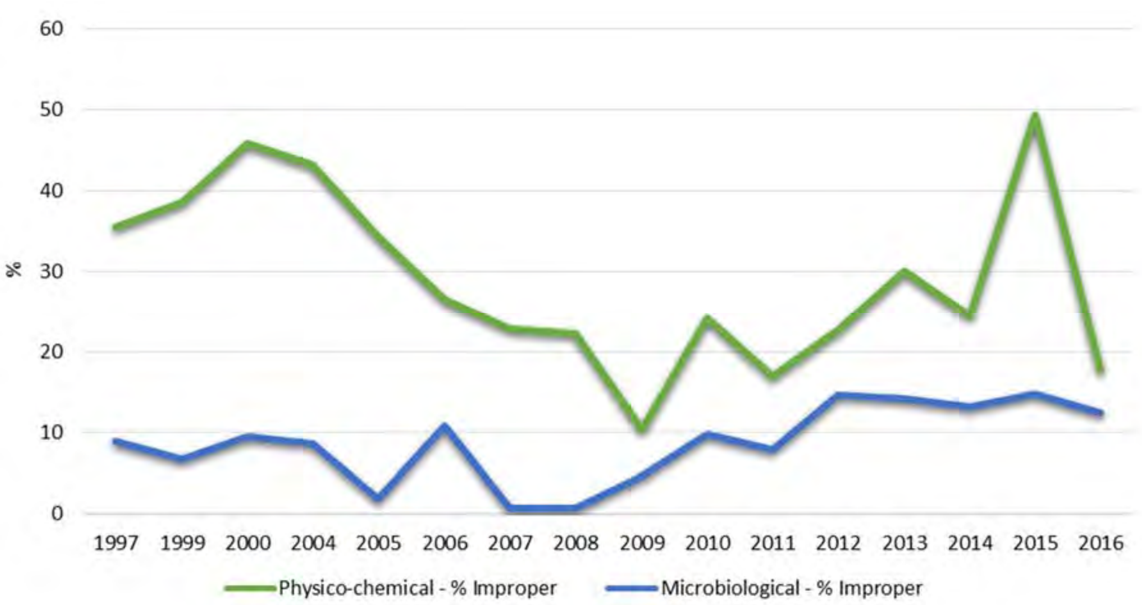
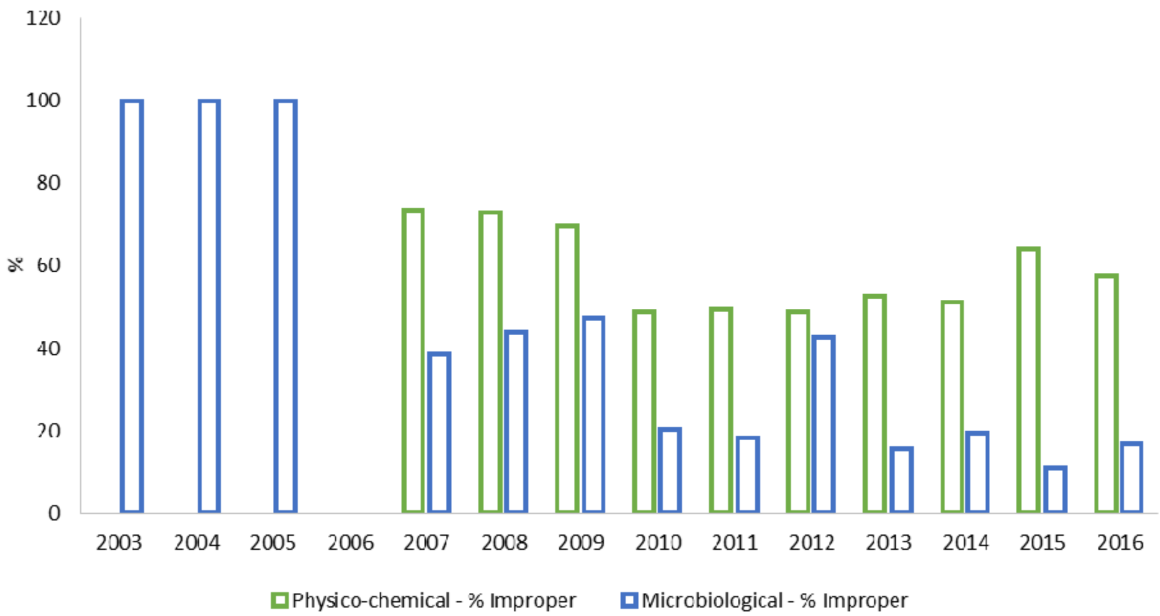


Figure 2. Quality of bathing freshwater – artificial lakes



Data coverage: excel

Source: Public Health Institute of the Republic of Macedonia

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 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.

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 identify water bodies intended for bathing and carry out monitoring of their quality during the bathing period. Water bodies identified 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 identified for bathing comply with mandatory values of water quality specified in Bathing Water Directive and the provisions of the Law on Waters.

Reporting obligation

- WHO

General metadata

Code	Title of the indicator	Compliance with CSI/EEAor 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

MK - NI 024

URBAN WASTE WATER TREATMENT

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.

Key policy issue

To what extent will the system of urban waste waters collection, removal and treatment improve the status of freshwaters in the Republic of Macedonia?

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.

Figure 1. Treatment of wastewater from the public sewerage network

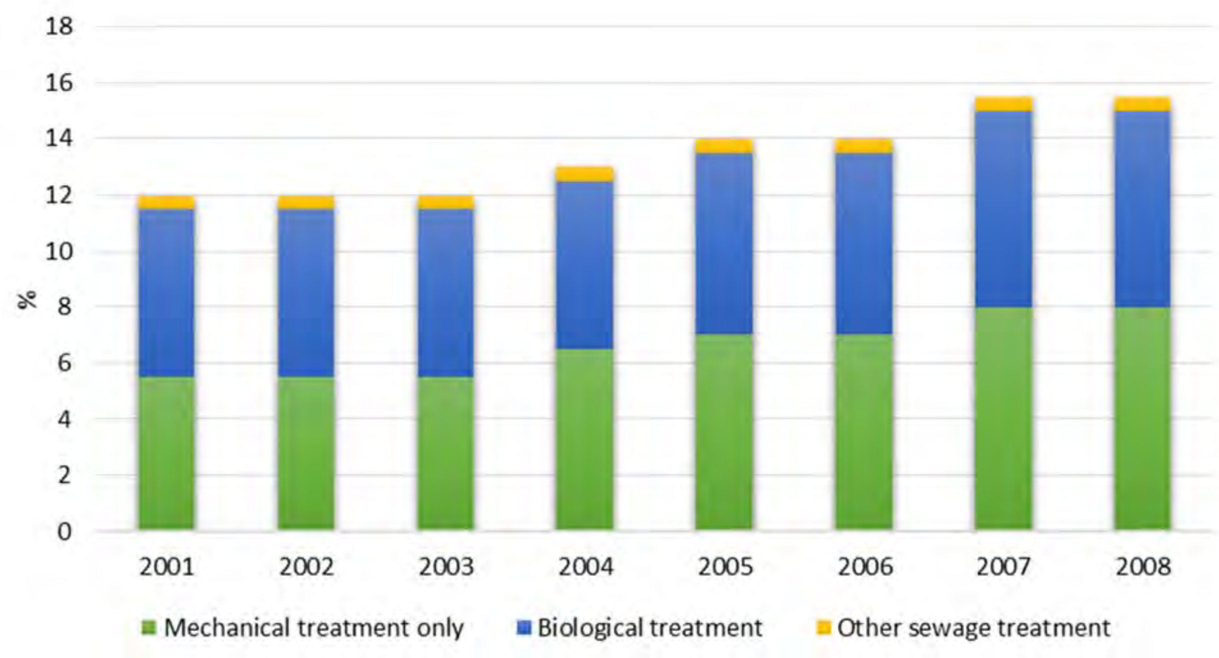
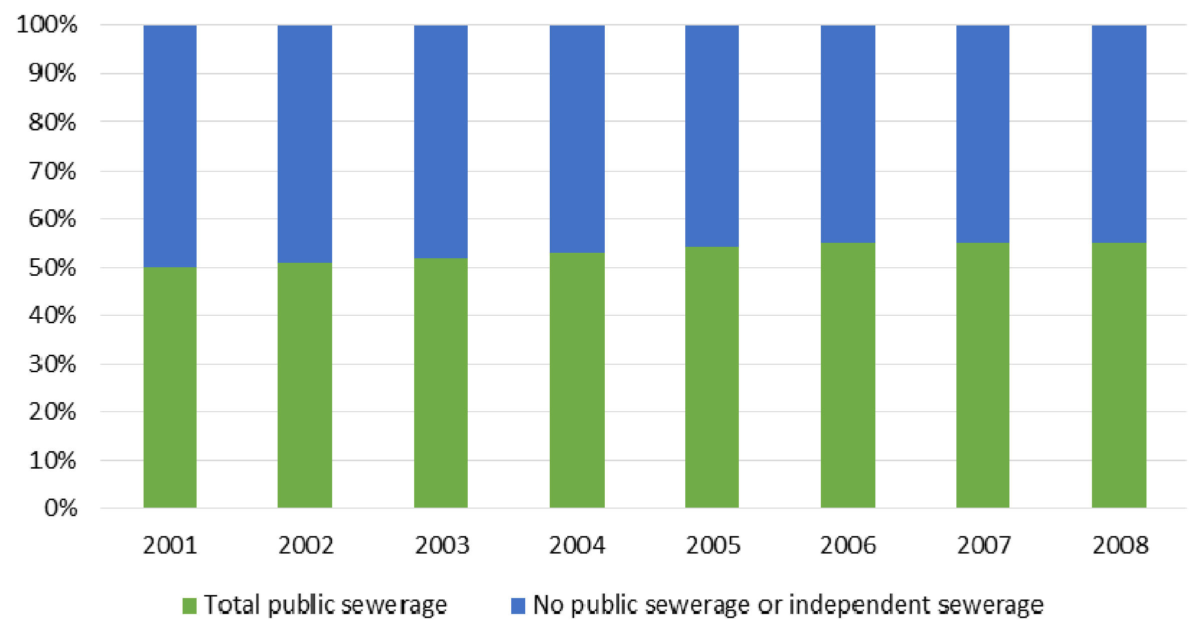


Figure 2. Percentage of population with and without public sewerage network



Data coverage: excel

Source: Republic Institute for Health Protection

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

Policy relevance of the indicator

List of relevant policy documents

The National Environmental Action Plan (NEAP) 2.

Environmental Monitoring Strategy and Environmental Data Management Strategy.

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 (biologicxal) 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 њитх регард то њатер љуалитъ гоалс специфиед тхереин. 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 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.

Reporting obligation

- EUROSTAT

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

MK - NI 039

DRINKING WATER QUALITY

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.

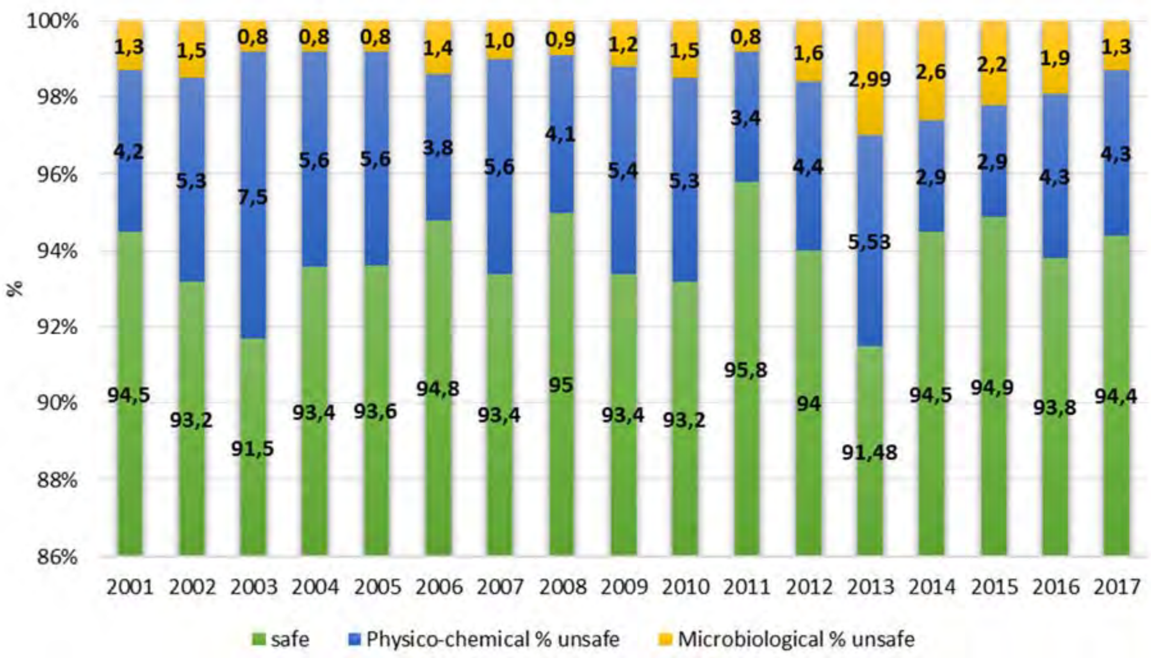
Key policy issue

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

Access to safe drinking water in the Republic of Macedonia amounts 95% (period from 2001 to 2017) with a note that population in urban areas has 99% access to safe drinking water and 78% of rural population has access to health safe drinking water, while the rest is exposed at occasional risk of bacteriological pollution of drinking water.

Figure 1.Drinking water quality in percentage



Data coverage: **excel**

Source: Public Health Institute of the Republic of Macedonia, PHI – 10 Regional

Assessment

Sanitary and hygienic condition of facilities and health safety of analyzed water samples are, generally, satisfactory, i.e. within the expected limits compared to previous years. In the period 2001-2017, the percentage of unsafe samples based on physical and chemical analysis ranged between 2.9 and 7.5 %, while the percentage of unsafe samples based on microbiological analysis ranged between 0.8 and 2.99%. The most frequent causes of unsafe findings in the physical and chemical include absence of residual chlorine or increased content of iron in raw water and in very few samples it is due to increased content of nitrites from dag or drilled wells of individual users.

With bacteriologically positive findings, the cause is mostly increased number of aerobic mesophile bacteria. Toxic parameters are within the prescribed legal norms.

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 for drinking water filtering and disinfection and inappropriate technical maintenance, have been constantly present. Therefore, there is high percentage of bacteriologically unsafe (9-25%).

Methodology

- Methodology for the indicator calculation

The 10 regional Public Health Institutes – Skopje, Kumanovo, Veles, Shtip, Kochani, Strumica, Prilep, Bitola, Ohrid and Tetovo with their hygiene-epidemiological stations, in cooperation with the Public Health Institute – Skopje, carry out regular and continuous monitoring of drinking water corresponding with the number of measuring points and schedule specified in the Rulebook on drinking water safety (Official Gazette of the Republic of Macedonia No.57/04). Institutes perform basic physic-chemical and bacteriological analyses of drinking water samples, while the Public Health

Institute of the Republic of Macedonia performs monitoring of periodical physic-chemical analysis, analysis of pesticide residues, analyses of contaminants, parasitological and radiological analysis.

Uncertainty

- Methodological uncertainty

Data is, generally, representative for the whole urban area in the Republic of Macedonia. The indicator is subject to modifications from year to year, depending on the introduction of new drinking water treatment plants and in line with the enhanced trend of rural population coverage with safe drinking water supply.

- Data uncertainty

Data is, generally, representative for the whole urban area in the Republic of Macedonia. Representativeness of monitoring selection is in accordance with the requirements of Directive 98/83/EC.

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;
- introduction of disincentive prices 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);
- 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);
- completion of the process of construction of municipal and industrial wastewater treatment systems;

- 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 Institute - Skopje and the 10 Regional public health centers with their local units);
- although the pilot project for fluoridation of milk consumed by pre-school children has been initiated, introduction of drinking water fluoridation as the most efficient, the least costly and socially and medically most fair means for massive caries prophylaxis has remained as public health option.

Legal grounds

Law on Health Protection, Law on Waters, Programme for preventive health protection in the Republic of Macedonia, Law on Drinking Water Supply and Urban Wastewater Collection, Decree on Water Classification, which 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, in its Article 4 includes drinking water as food.

Rulebook on drinking water safety (sets frequency of drinking water safety control).

In the Law on Nature Protection, 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.

The following EU Directives have been transposed in the new legal acts:

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

Targets

The Rulebook on drinking water safetyspecifies 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).

Reporting obligation

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.

General metadata

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

MK - NI 040

IRRIGATED LAND

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.

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 and 2014, due to weather conditions in the given year, as well as to organizational restructuring of the sector. Particular growth in water use for land irrigation was recorded in 2012.

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

Figure 1.Use of water resources

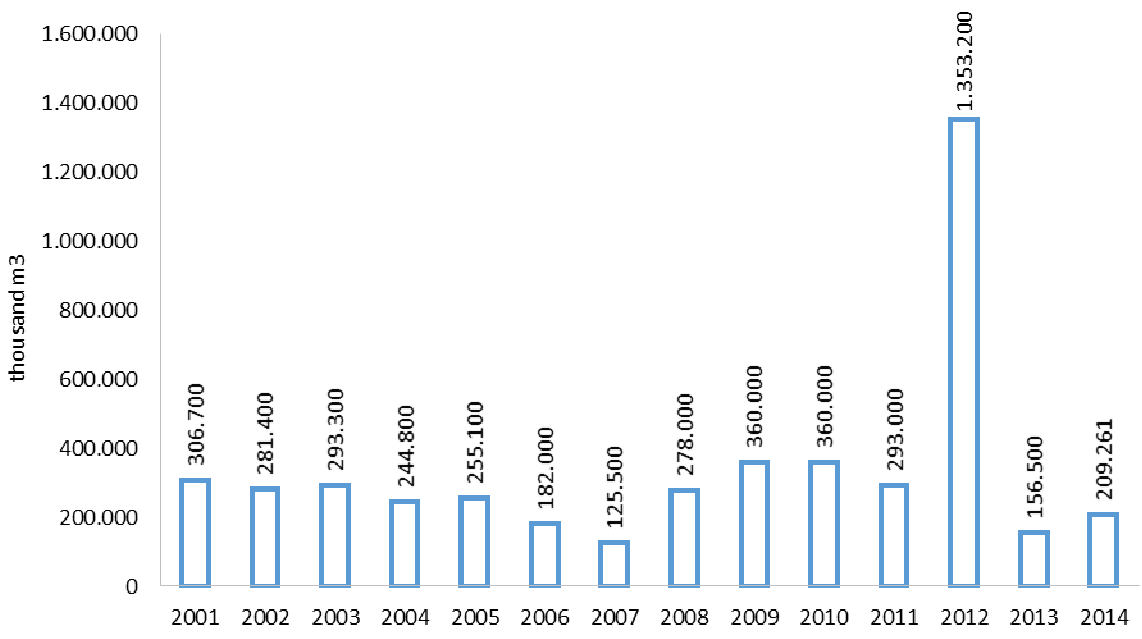


Figure 2.Total area irrigated

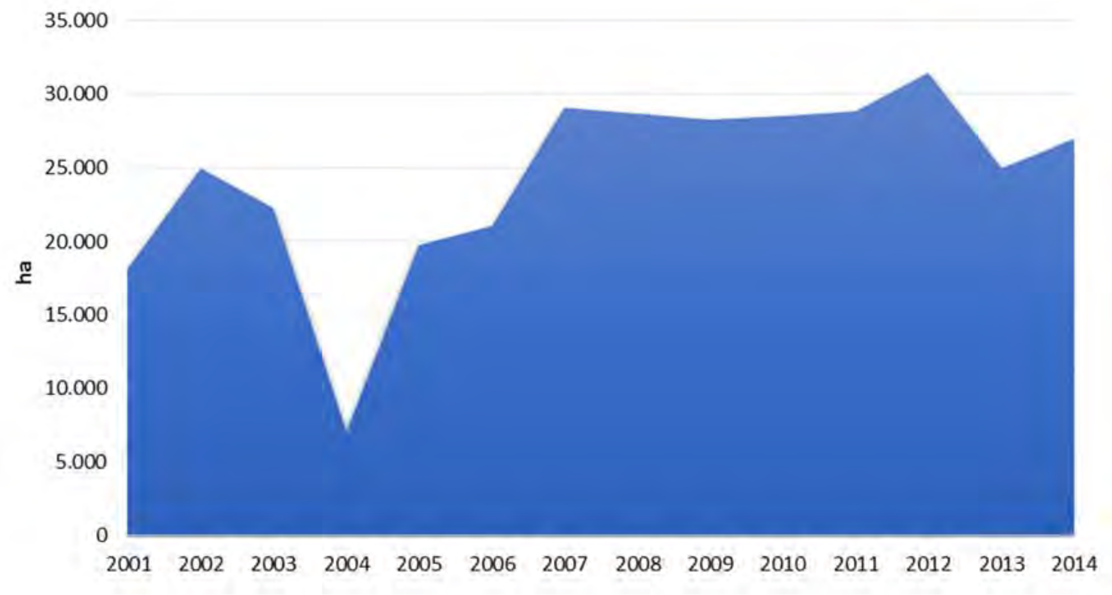
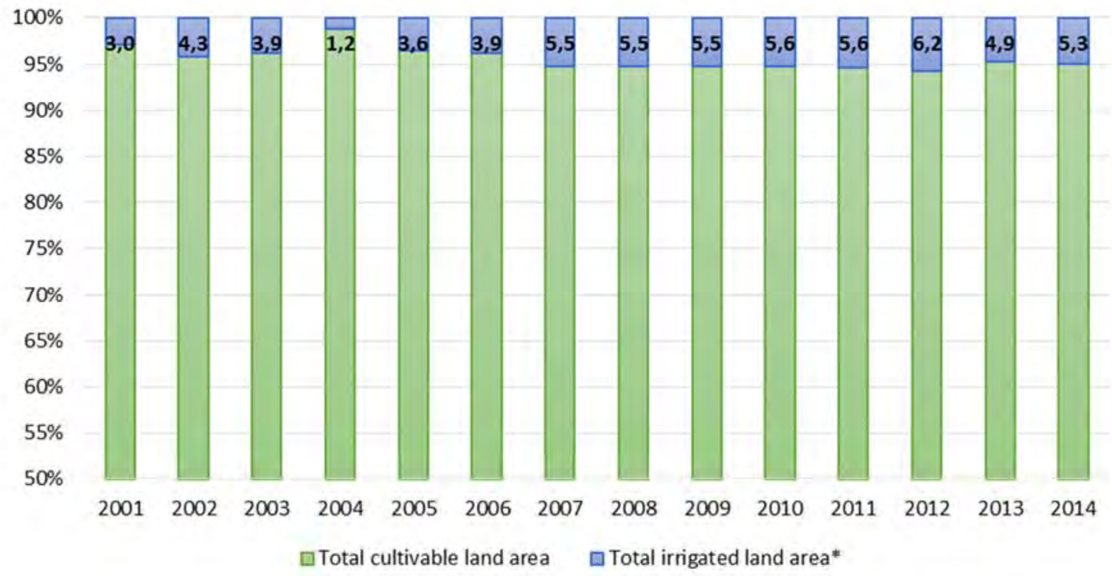


Figure 3. Percentage of irrigated area relative to total cultivated land area



Data coverage: **excel**

Source: State Statistical Office

Assessment

Figure 2 shows the whole irrigated land area for the period 2001-2014, reflecting an uneven trend in water use for land irrigation. There is an evident data that the quantity of water consumed by this sector in 2012 was significantly bigger compared to the entire successive interval. This is due to the fact that 2012 was a dry year, but precipitations were distributed in such a way that enables filling of accumulations with sufficient quantities of water. Figure 3 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, except in 2012 when higher percentage was recorded, reaching 6.2%.

Methodology

- Methodology for the indicator calculation

Data is collected and processed by years.

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 as transposed in the national Law on Waters.

Legal grounds

The Law on Waters provides for integrated approach, specifying the conditions and the manner of waters use and allocation, protection against harmful impacts of water, as well as standards and values for water quality and control of pollution, while taking into account integration of measures and activities for water protection in all development, strategic, planning and programme documents.

The main planning documents for water management planning and development include:

- The National Strategy for Waters
- Water Management Master Plan of the Republic of Macedonia, and
- River basin management plans.

The National Strategy for Waters is aimed at establishing long-term policy to ensure sustainable use of water by meeting the demands of all users with adequate quality water in sufficient quantities, rational and cost-effective consumption of waters, water protection against contamination and contamination control.

The Water Master Plan of the Republic of Macedonia provides for integrated planning and implementation of programmes and measures, technical and economic solutions for rational water use, protection of waters against contamination and protection against harmful impacts of water, based on the principles of sustainable development and the timeframe for their implementation.

The River Basins Management Plans enable maintenance and improvement of water regime. Such Planscontainthe environmental protection goals, good status of surface water bodies (good quantitative status and chemical status, including good ecological potential) and ground water resources (good quantitative status and chemical status).

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.

Reporting obligation

OECD/EUROSTAT

General metadata

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

AGRICULTURE

MK - NI 08

MINERAL FERTILIZER CONSUMPTION

Definition

Mineral fertilizers are substances containing chemical elements required for plants growth, especially nitrogen, phosphorus and potassium.

This indicator shows the consumption of mineral fertilizers in the Republic of Macedonia, by presenting total amounts in tonnes consumed substances, and their application per hectare cultivated land area.

Units

- Tones,kg/ha.

Key policy issue

What is the trend in the amount of used mineral fertilizers in agriculture?

Key message

Mineral fertilizer consumption in agriculture noted a falling trend in the period from 2000 to 2012. The overall mineral fertilizers consumption reduced by 64.61%. Consumption of nitrogen mineral fertilizers dropped by 63.77%. Consumption of phosphorous fertilizers dropped by 77.01%. Consumption of combined mineral fertilizers dropped by 93.26% between 2000 and 2009, while in the period from 2009 to 2012 there was gradual increase by 11.82%. Consumption of potassium fertilizers showed periodical trends of reduction and increase, so that consumption in 2012 increased by 100% compared to 2011. Consumption of mineral fertilizers on cultivated land area (kg/ha) by agricultural companies and agricultural cooperatives during the observed period showed periodical trends of reduction and increase.

Figure 1. Consumption of mineral fertilizers

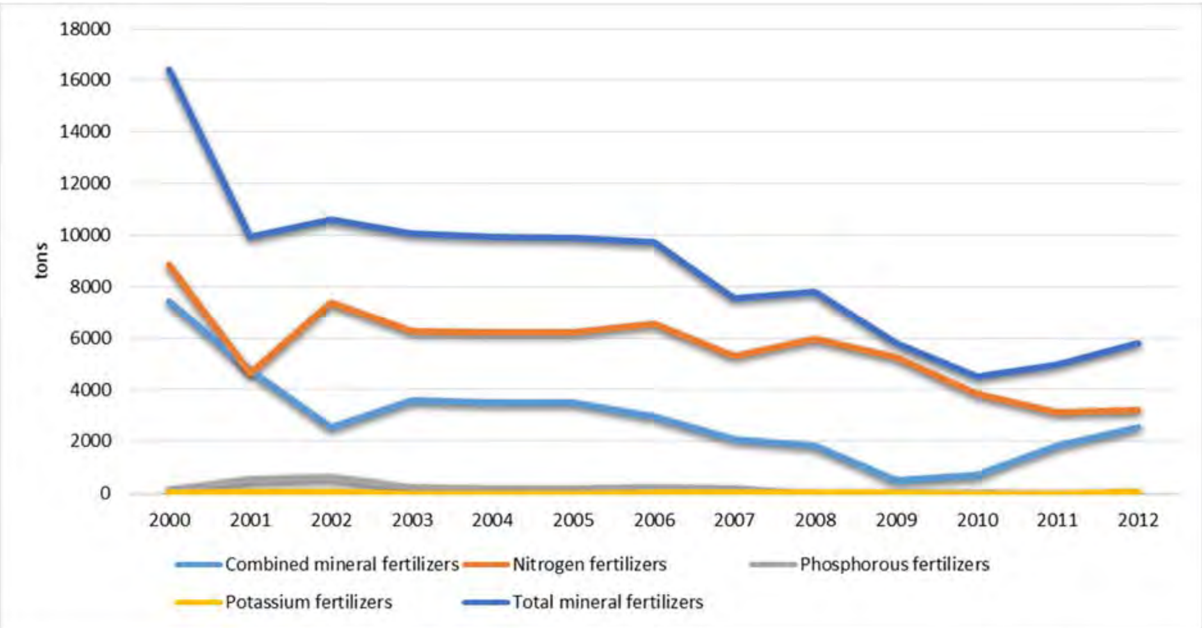
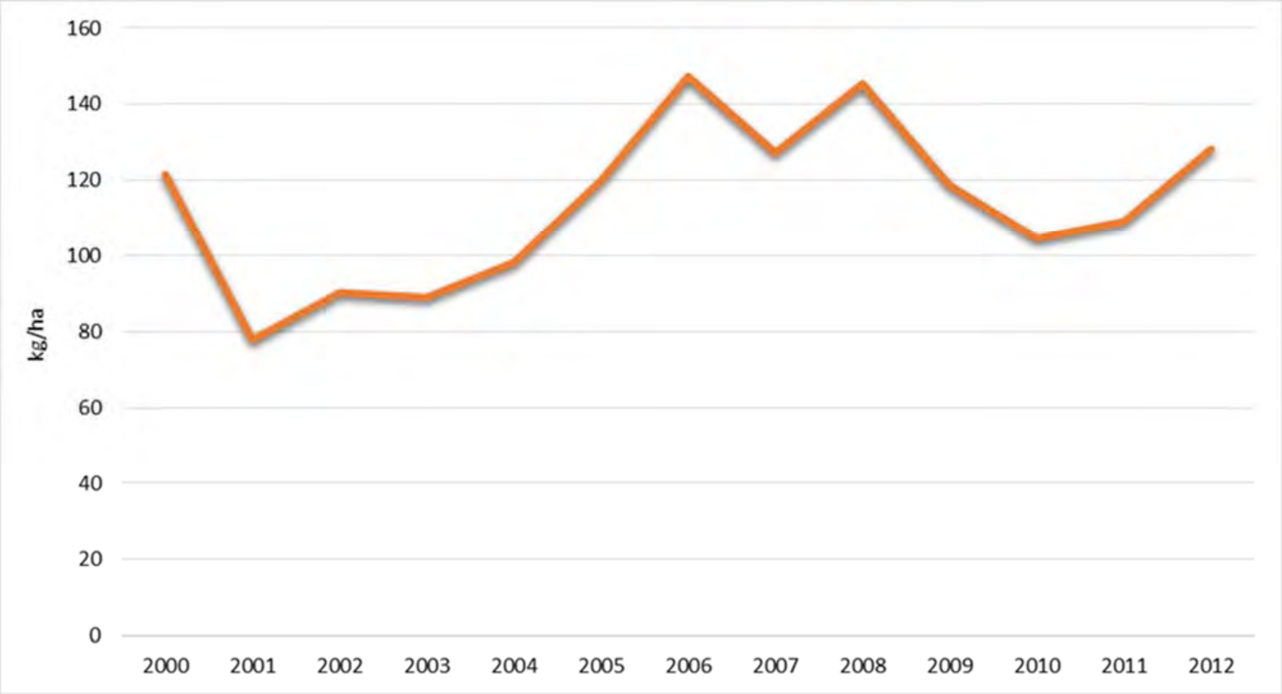


Figure 2. Use of mineral fertilizers on cultivated land area (kg/ha)by agricultural cooperatives and agricultural companies)



Data coverage: excel

Source: Statistical Yearbooks, State Statistical Office

Assessment

In the observed period, consumption of mineral fertilizers in agriculture dropped from 16.16 tons to 5.809 tons of fertilizers. The quantity of mineral fertilizers used on cultivated land area (of agricultural companies and cooperatives) expressed in kilograms per hectare, during the observed period showed periodical trends of increase and decrease. In 2004, with 77.74 kg/ha, consumption of mineral fertilizers was the lowest, while in 2006 with 147.24 kg/ha it was the highest.

It is difficult to connect the trend in reduction in mineral fertilizers consumption directly with the impact on the quality of the environment. The ultimate effect on the quality of environment depends to a great extent on other factors, such as use of organic fertilizer, yield from crops, soil types, management of agricultural farms, etc.

Methodology

- Methodology for the indicator calculation

Consumption of individual groups of mineral fertilizers as combined mineral fertilizers, nitrogen fertilizers, phosphorous fertilizers, potassium fertilizers, as well as total mineral fertilizers per hectare utilized agricultural area is obtained by dividing the total quantity of consumed group of mineral fertilizers in kg by the total utilized agricultural area presented in ha.

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of mineral fertilizers. The same document also specifies the measure for establishment of monitoring and information system for soil, to monitor the mineral fertilizers consumption.

Legal grounds

The Law on Agricultural Landspecifies the measures for improved agricultural land fertility through undertaking of agrotechnical measures, one of them being fertilizers application, i.e. use of mineral fertilizers. It is specified that agriculturallandprotection against pollution and contamination is performed by prohibition, restriction and prevention of direct input of harmful matters in soil, input of harmful matters through water and air and undertaking of other measures for its productivity maintenance and improvement. It is also specified that, for the purpose of agricultural land protection against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.

The Law on Fertilizers Use regulates the manner of fertilizers use.

The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

Targets

No specific targets.

Reporting obligation

No reporting obligation

General metadata

Code	Title of the indicator	Compliancewith CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MKNI 08	**Mineral fertilizer consumption**	IRENA 08	Mineral fertilizer consumption	**D**		Agriculture Soil Water	Annually

MK - NI 09

CONSUMPTION OF PESTICIDES

Definition

Plants protection products or pesticides are chemical substances which restrain diseases and pests in plants. This indicator shows the quantities of pesticides used for plants protection, such as fungicides, herbicides, insecticides and category of total including, apart from the mentioned ones, other plant protection products.

Units

- Total quantities of used substances in tones, share of different groups of pesticides, as well as their application per hectare utilized agricultural area (kg/ha).

Key policy issue

Has the use of pesticides in agriculture increased in quantity?

Key message

Application of pesticides in agriculture, including all plant protection products, like fungicides, herbicides, insecticides and total quantity showed a trend of reduction in quantity consumed in the period between 2000 and 2005, sharp increase in 2006 and then decrease again by 2012.

The application of fungicides from 2000 to 2006 showed trend of variation of reductions and increases, in the period from 2006 to 2012 it reduced by 77.66%. Application of herbicides also showed a trend of reduction from 2000 to 2006, while from 2006 to 2012 the overall use of pesticides in agriculture reduced by 71.72%.

Figure 1. Use of plant protection products

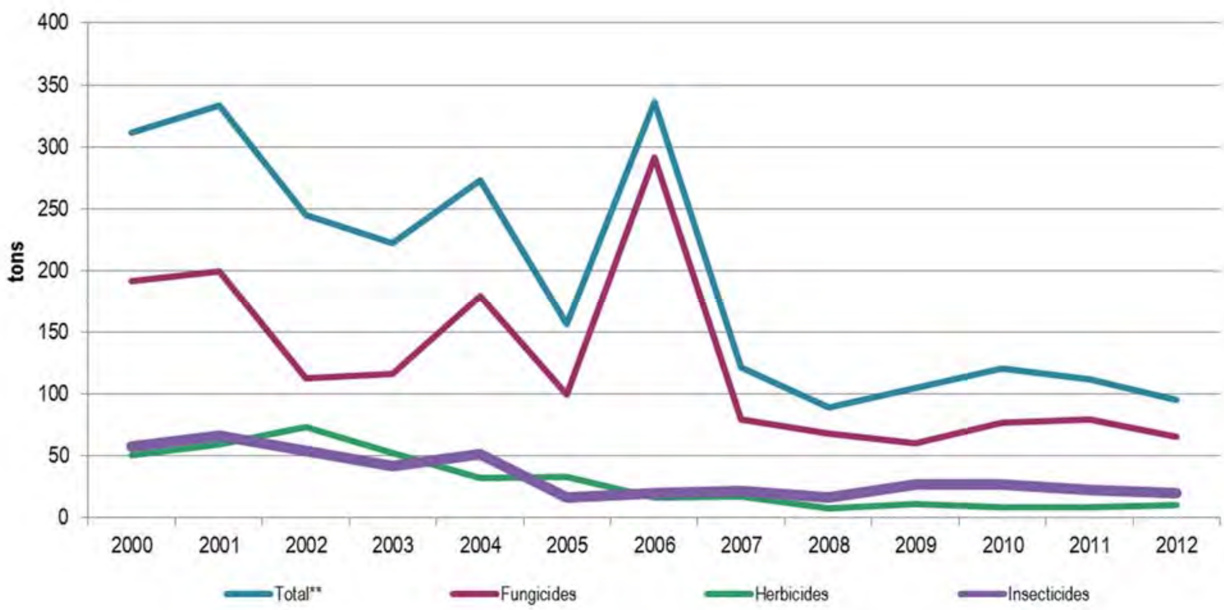


Figure 2. Share of plant protection products in percentage

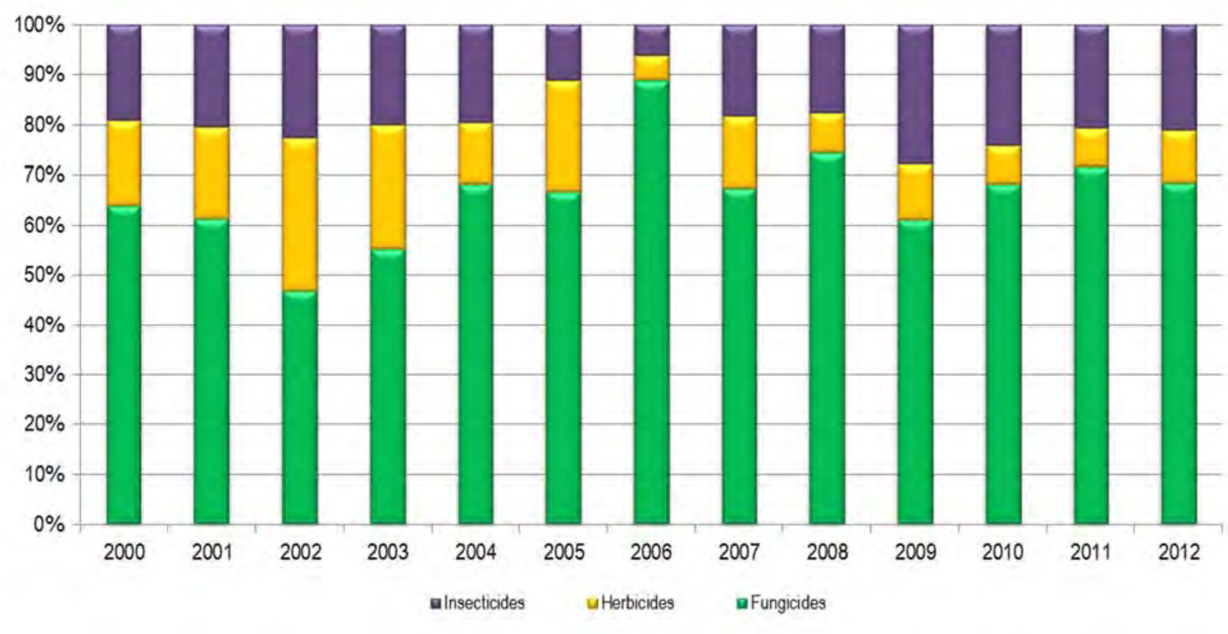
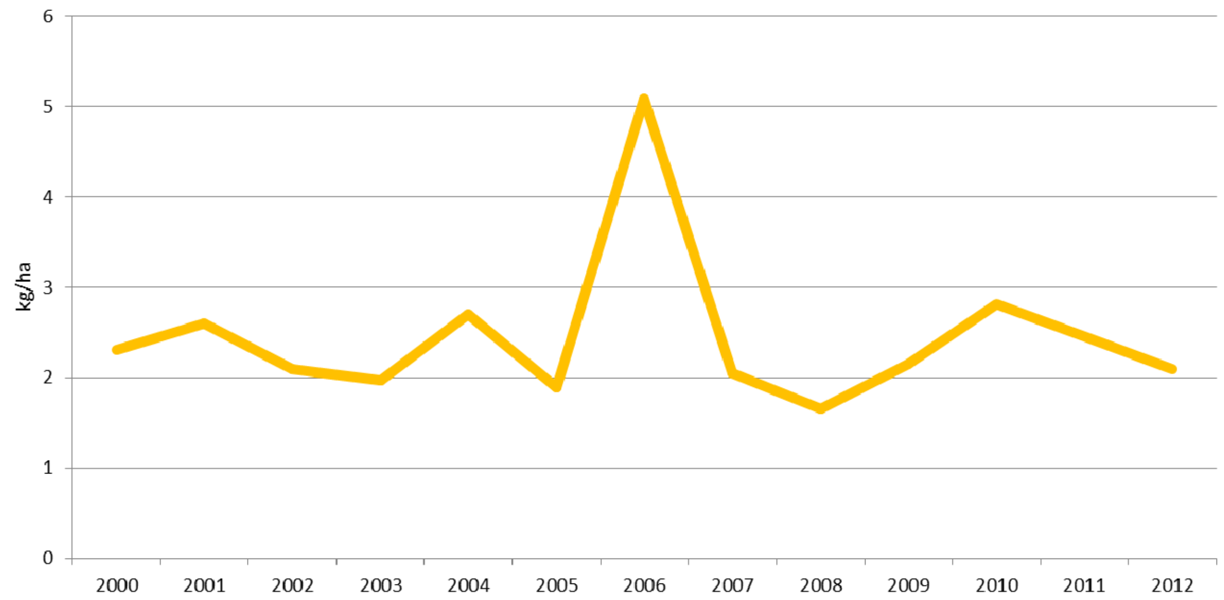


Figure 3. Total plant protection products used on the total cultivable land (kg/ha) (from agricultural companies and agricultural cooperatives)



Data coverage: excel

Source: Statistical Yearbooks, State Statistical Office

Assessment

In the period 2000 to 2006, use of pesticides in agriculture showed variations of reduction and increase in the period from 2006 to 2012 it dropped from 336 to 95 tons. With regard to the share of plant protection products, in the period 2000 to 2012, fungicides noted highest share. In 2012, fungicides were the most used with 68.42%, then insecticides with 21% and herbicides with

10.52%.

The total amount of plant protection products used on the total cultivable land in agricultural companies and agricultural cooperatives expressed in kg/ha, from 2006 when consumption was the highest, to 2012 reduced from 5.08 to 2.09 kg/ha, which is a reduction by 58.85 %.

Methodology

- Methodology for the indicator calculation

The share of different pesticide groups as fungicides, herbicides and insecticides is obtained when the quantity of each group is divided by the total quantity of consumed pesticides, and then the value obtained is multiplied by 100. The application of individual group per hectare utilized agricultural area is obtained when the total quantity of consumed pesticides expressed in kg is divided by the total utilized agricultural area (agricultural companies and agricultural cooperatives) in the Republic of Macedonia expressed in ha.

Policy relevance of the indicator

List of relevant policy documents:

The Second National Environmental Action Plan (NEAP 2) specifies the measure for rationale use of natural resources, as well as controlled use of pesticides, i.e. plant protection products. The same document also specifies the measure for establishment of monitoring and information system for soil, to monitor the pesticides consumption.

Legal grounds

The Law on Agricultural Land specifies the measures for improved agricultural land fertility through undertaking of agro-technical measures, hydro-amelioration, agramelioration and anti-errosion measures.

The Law on Nature Protection specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

The Law on Plants Protection regulates the protection of plants against diseases, pests and weeds, as well as use of plant protection products.

The Law on Plant Protection Products regulates approval, placement on the market, use and control of active substances that are products; maximum level of residues, equipment for products application; exchange of information related to products, products production, records keeping of legal and natural persons involved in production and placement of products on the market, conditions for authorization by authorities responsible for implementation, monitoring and control of this law.

The Law on Plant Health regulates the health of plants, measures and obligations concerning occurrence of harmful organisms in plants, plant products and other articles and objects, prevention of their inlet and spread, measures for control, biological measures for plant protection, access to and exchange of information and information system, costs and compensations, responsibilities of competent authorities, authorized services, authorities and bodies in the area of plants health and it also regulates other issues in the area of plants health.

Targets

No specific targets.

Reporting obligation

None

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MKNI 09	**Consumption of pesticides**	IRENA 09	Consumption of pesticides	**D**		Agriculture	Annually

MK - NI 025

GROSS NUTRIENT BALANCES

Definition

The nutrient balance or nitrogen balance establishes the link between nutrients used in agriculture and changes in the quality of the environment, in order to achieve sustainable use of soil nutrients in terms of their input and output.

The indicator estimates the potential surplus of nitrogen on agricultural land. This is done by calculating the balance between nitrogen added to a hectare agricultural land. The indicator accounts for all inputs to and outputs from the farm. The inputs consist of the amount of nitrogen applied via mineral fertilisers and animal manure as well as nitrogen fixation by legumes, deposition from the air, and some other minor sources. Nitrogen output is contained in the harvested crops, or grass and crops eaten by livestock. Uncontrolled escape of nitrogen to the atmosphere, e.g. as N_2O from agriculture is difficult to estimate and therefore not taken into account.

Units

- The gross nitrogen balance is expressed in (kgN/year) per hectare (ha).

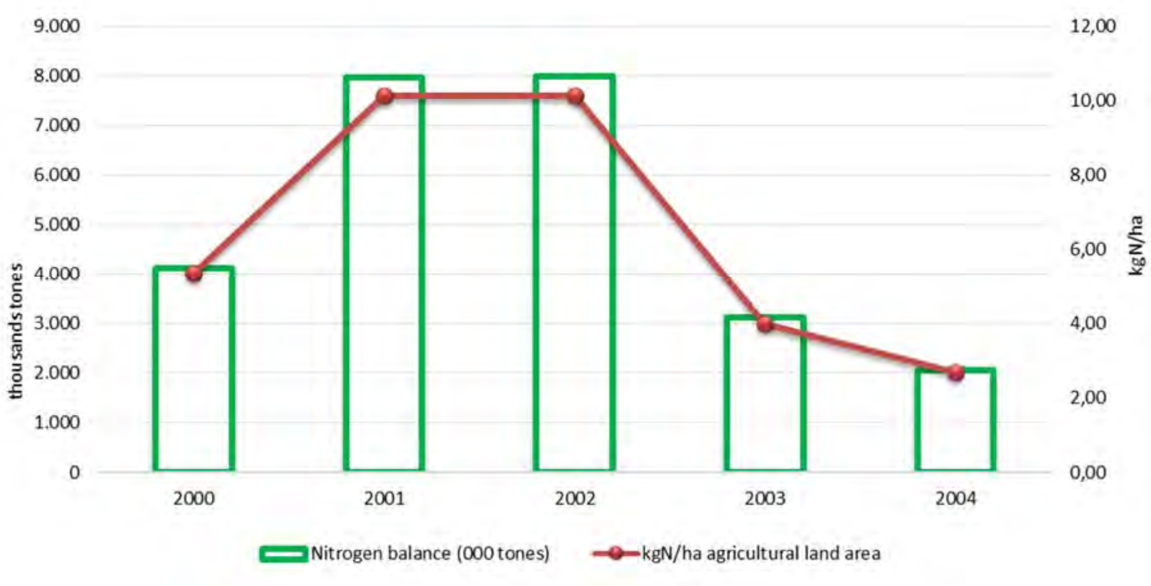
Key policy issue

Has the impact of agriculture on the environment improved?

Key message

In the period from 2000 to 2001, significant rise in gross nitrogen balance was tracked, followed by a period of stagnation, to note rapid drop in the period from 2002 to 2003 and further slight fall in the gross nitrogen balance expressed both in thousand tones and kilograms nitrogen per hectare agricultural land (kgN/ha). Constant suficit in nitrogen balance indicates potential environmental problems, while constant deficit indicates potential risk of reduced nutrients in the soil.

Figure 1 Gross nitrogen balance expressed in thousand tones and kgN/ha agricultural land area



Data coverage: **excel**

Source: Statistical Yearbook, State Statistical Office, Calculation of the gross nitrogen balance was made by the Faculty of Agricultural Science and Food, University of "St. Cyril and Methodius", Skopje

Methodology

- Methodology for the indicator calculation

Methodology for the indicator calculation has been taken from OECD/Eurostat national nutrient balances, which takes into account all input and output matters in the farm.

Input nitrogen matters consist of:

1. Total amount of applied fertilizers
   - Inorganic fertilizers
   - Organic fertilizers (manure excluded)
2. Manure
3. Nitrogen fixation by legumes
4. Deposition from the air
5. Other minor sources (semen and other reproductive material)

Output nitrogen matters include:

1. Harvested crops placed on the market, including also forage crops
2. Grass and crops eaten by livestock

Uncontrolled escape of nitrogen to the atmosphere in a form of N_2O from agriculture is difficult to estimate and therefore not taken into account.

- Source of applied methodology

OECD/Eurostat Gross Nitrogen Balances Handbook (12/2003)

Uncertainty

- Methodological uncertainty

Data used in the calculation of this indicator has been partially based on estimates by experts, using harmonized methodology which might not always reflect specific circumstances in our country. Certain coefficients used in calculations differ significantly from country to country. Data on nitrogen input is considered more adequate and more comprehensive than on the output. Uncertainty is present with regard to harvested forage crops, as well as grass crops eaten by livestock.

Based on the above, data on gross nitrogen balance in our country should be taken with certain extent of precaution.

- Uncertainty of data sets

Data on the amounts of applied manure are accompanied by certain extent of uncertainty, and statistical data on semen and other reproductive material, as well as data on grass crops eaten by livestock, i.e. those that are not placed on the market, should be taken by certain extent of uncertainty, too.

Policy relevance of the indicator

The gross nitrogen balance is an issue regulated by the Framework Law on Waters, incorporating the requirements of Nitrates Directive (91/676/EC) and Framework Water

Directive (2000/60/EC). The Nitrates Directive is aimed at reducing and preventing in future the water pollution by nitrates from agricultural sources. This Directive restricts the application of manure at 170 kg N/ha/year. The goal of the Framework Water Directive is the achievement of good ecological status of surface and ground waters in terms of quality of biological communities, hydrological characteristics and chemical characteristics.

List of relevant policy documents

The National Environmental Action Plan 2 (NEAP 2) specifies the measures for ratinal use of natural resources, as well as controlled use of pesticides, i.e. plant protection products, as well as the measure for establishment of soil monitoring and information system to monitor the status of pesticides consumption.

Legal grounds

The Law on Agricultural Land specifies the measures for improved agricultural land fertility through undertaking of agro-technical measures, hydro-amelioration, agramelioration and anti-errosion measures. It also prescribes that for the purpose of protection of agricultural land against pollution and contamination, the provisions contained in the regulations on environment and nature protection and improvement shall apply accordingly.

The Law on Nature Protection, in its Article 4, specifies the goals of protection, including preservation and recovery of existing biological and landscape diversity in a state of natural balance and prevention of harmful activities and nature disruption.

The Law on Environment, in its Article 8, promotes the principle of sustainable development, meaning that, when undertaking or performing any activity, rationale and sustainable use of natural resources shall be taken into account, thus meeting the needs for healthy environment, as well as social and economic needs of present generations, without jeopardizing the rights of future generations to meet their own needs.

Targets

No specific targets.

Reporting obligation

EEA

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 025	**Gross nitrogen balance**	CSI 025	Gross nutrient balance	**P**	A	▪ agriculture ▪ water	3 - annually

MK - NI 026

AREAS UNDER ORGANIC FARMING

Definition

The indicator is calculated as share (percentage) of area under organic farming (sum of existing areas under organic farming and areas in a process of conversion for organic farming) in the total area or total cultivable land area.

Units

The indicator is presented as sum of area under organic farming and area being converted for organic farming, measured in ha. Share of organic farming is given as a percentage of total utilized agricultural area.

Key policy issue

Whether the share of organic cultivable area in the total cultivable area is in increase?

Key message

In the period under review, the production areas and areas under organic production have a variable trend of growth and decline. Production areas with organic production have a positive trend with increase of 7.8 times, from 266 hectares in 2005 to 2.073,37 hectares in 2016. The areas under conversion have the largest increase, by 17 times in the period from 2005 to 2011, and the largest decline in the period from 2011 to 2014. A positive trend in increase of the areas under conversion occurs again in 2015 and 2016, and thus compared to 2014 there is a 28 % growth noted in 2016.

The dynamics of the total certified production area with organic agricultural production, follows the above stated dynamics of increase and decrease in the number of organic operators, over the years.

In relation to the target of 4% set for 2020, we could note that the share of organic production in relation to the total arable agricultural area, is still minor with only 0.26%.

Figure1. Area under organic agricultural production

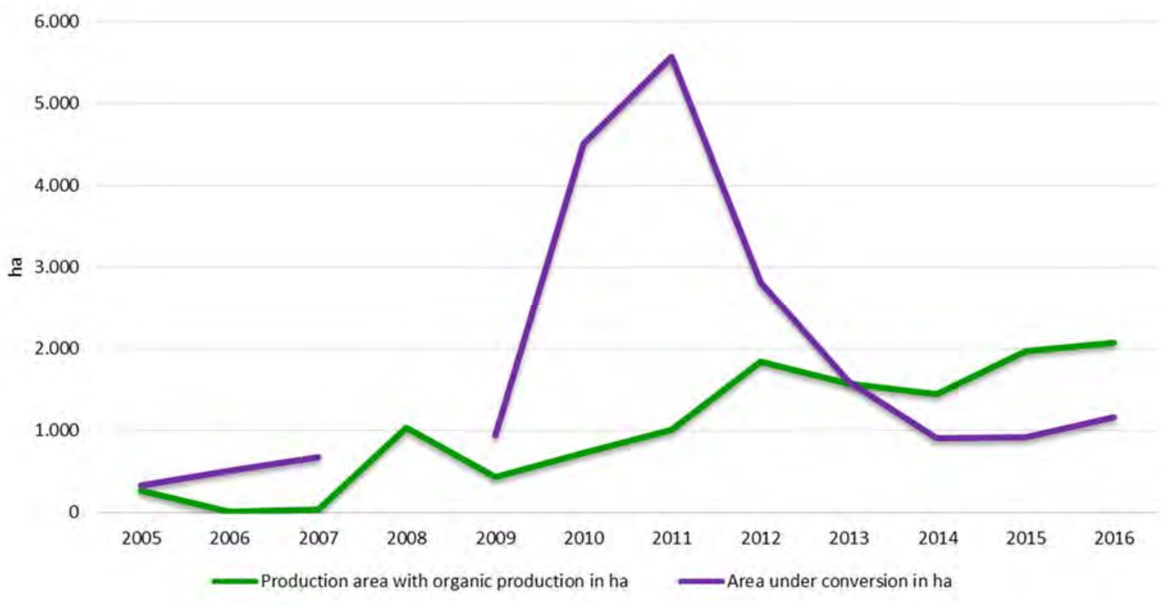


Figure 2. Share of area under organic agricultural production in cultivable and total agricultural area.

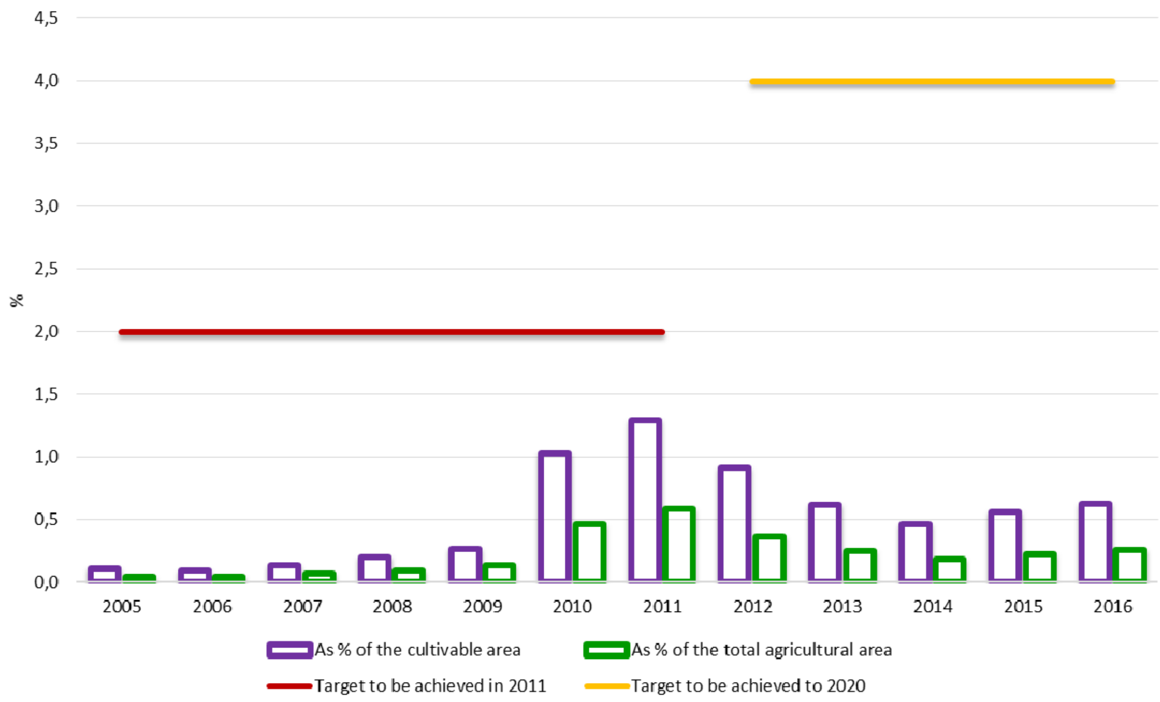


Figure 3.Organic vegetable production in ha by type of culture

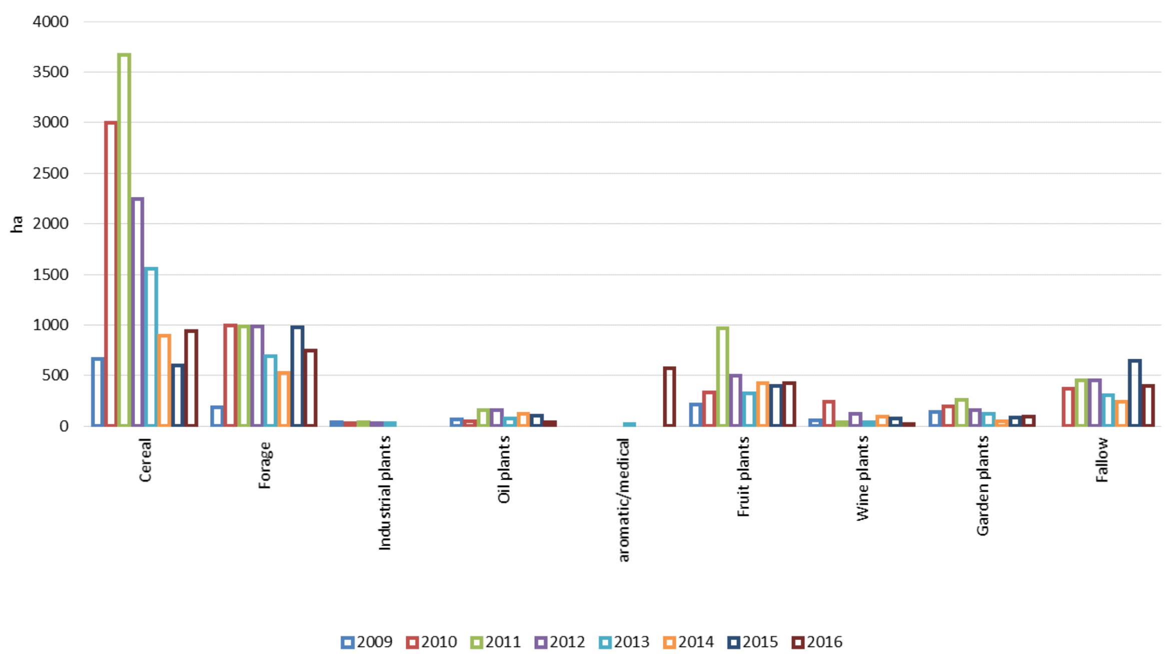
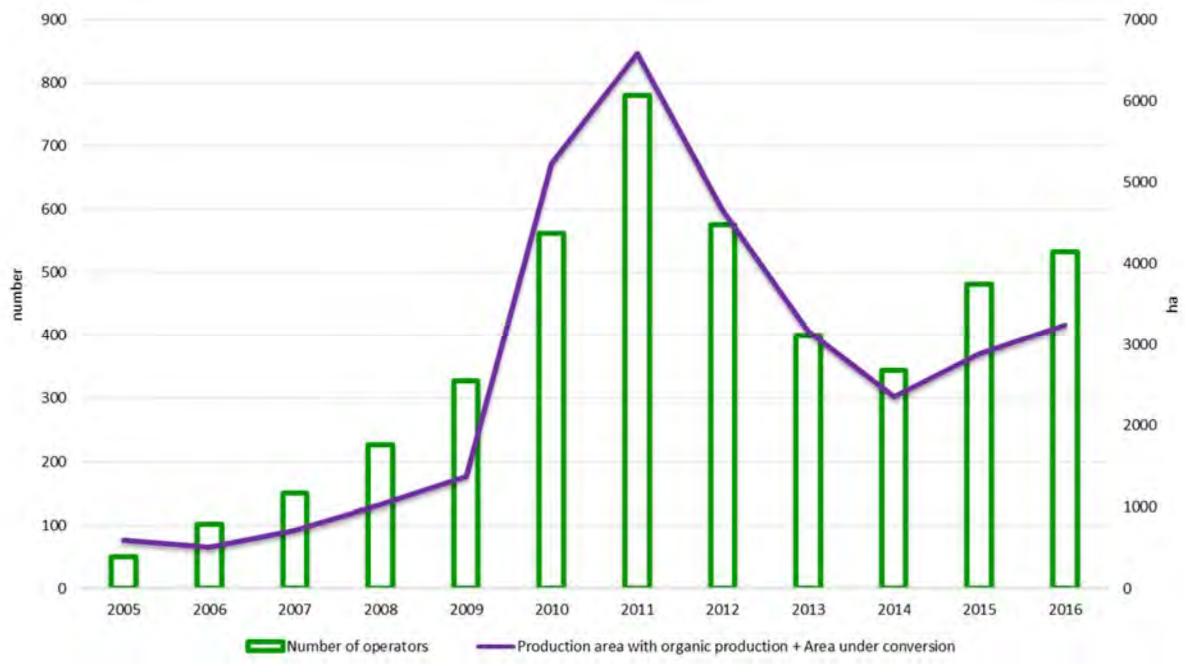


Figure 4. Ratio between the number of operators and the area under organic agricultural production



Data coverage: excel

Source: Statistical Yearbook, State Statistical Office, Ministry of Agriculture, Forestry and Water Economy, Division of Organic farming.

Assessment

During the period under review, the production areas and areas under organic conversion have a variable trend of growth and decline. Production areas with organic production have a positive trend with increase of 7.8 times, from 266 hectares in 2005 to 2.073,37 hectares in 2016.

The areas under conversion have the largest increase in the period from 2005 to 2011, from 326,54 hectares in 2005 to 5.573,66 hectares in 2011, meaning a 17 times increase. But then, in the period from 2011 to 2014, there is a huge decline in the areas under conversion, from 5.573,66 hectares to 910.88 hectares, which points to the fact that during this period the areas under conversion have been significantly reduced. A positive trend of increase of the areas under conversion is noted again in 2015 and 2016. Compared to 2014, in 2016 the areas under conversion increased by 28%.

The share of total area under organic agricultural production (production + conversion) in the total arable land, increased from 0.109% in 2005 to 1.288% in 2011, while in 2012 the share decreased and it was 0.914%, whereas the negative trend continued until 2014. From 2014 to 2016, we would note a further increase in the area of organic agricultural production, in the total arable land. In 2016, compared to 2014, the share increased to 0.63%, but unfortunately, compared to 2011 when it had the largest share, the share in 2016 declined by 51%.

The share of organic agricultural production areas in the total arable land is insignificant, taking into account the National Plan for organic production 2013-2020, in which until 2020, the objective is for organic arable land to be 4% in the total arable land in Republic of Macedonia, which in 2016 is only 0.26%.

Figure 3 shows that grain cultures are the leading organic cultures in Republic of Macedonia in 2016, with a share of 28.96%, followed by forage crops with 23.12%, while the vineyards are with participation of 0.54% in the total certified areas.

The number of certified organic operators in the period from 2005 to 2011 increased in proportion with the growth of areas under organic agricultural production (figure 4), yet it declined from 2012 to 2014, and again having an increase of 54.9% in the period from 2014 until 2016.

Methodology

The method of the European Environmental Agency.

The indicator is presented as sum of area under organic farming and area being converted for organic farming, divided by the total cultivable land area or total agricultural area. This value is multiplied by 100 in order to present the value in percentage.

Policy relevance of the indicator

List of relevant political documents

- National strategy with action plan for development of organic farming in the Republic of Macedonia 2008-2011
- Strategy for agriculture and rural development – condition and need to establish agro-environmental policy.
- The Strategy for compliance of the Macedonian agricultural and food sector with the EU Common agricultural policy – indicates the need to identify the regions suitable for organic farming and to comply with the European regulations.
- The Treaty with the World Trade Organization – improvement of the international food safety standards
- The Second National Environmental Action Plan – strives to include environmental issues directly in the agricultural development policy and to maintain the natural resources needed for sustainable development on high level. In accordance with this, a control and certification body for organic agricultural production, recognized by the EU has been defined and established.
- National strategy for biodiversity with Action Plan
- National strategy for sustainable development

Legal grounds

The framework for the organic farming is established by the Law on Organic Farming and regulations which are in a process of adoption; the Law on Stimulating Agriculture Development, Law on Environment and Law on Nature Protection.

The provisions of this Law have been harmonized with international and European ones, especially with EU Regulation No.2092/91, which is of particular importance in the context of future development of trade exchange in organic products with European countries.

Targets

In 2011, the organic cultivable land has a 2% share in the total cultivable land in Macedonia.
In 2011, while the wild collection area has a share of 5% in the total cultivable area in Macedonia.

Reporting responsibilities

- Annual report for quality of the environment in the Republic of Macedonia
- Environmental statistics
- European Environment Agency

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MKNI 026	**Area under organic farming**	CSI 026 IRENA 07	Area under organic farming	**R**	A	agriculture biological diversity	Annually

ENERGY

MK - NI 027

FINAL ENERGY CONSUMPTION BY SECTOR

Definition

Final energy consumption is energy supplied to meet the demand of the final consumers and is calculated as the sum of final energy consumption from all sectors, namely industry, transport, agriculture, households, and other sectors.

The indicator "Final energy consumption by sector" is expressed in thousand tonnes of oil equivalent (ktoe) and in percentage as a ratio between final energy consumption by each sector and final energy consumption by all sectors.

Units

- thousand tonnes of oil equivalent (ktoe)
- percentage (%)

Key question

Is final energy consumption increasing and in which sector it is the highest?

Key message

Policies in energy sector should favour measures aimed at rational and efficient energy consumption, especially by households and industry.

During the period between 2000 and 2016, final energy consumption in the Republic of Macedonia increased by 15.5%, with an annual average rate of 6.26%.. If we compare the energy consumption in 2016 with respect to 2000, it is noted that the increase in the final energy consumption is the highest in the transport sector by 89%, while in the industry it is decreased by 20.3%, and in the households there is an increase of 1.7%. In 2016, the largest share in the final energy consumption is noted for the transport sector with 34.9%, the households with 24.7% and the industry with 24.7%.

Figure 1. Final energy consumption by sector

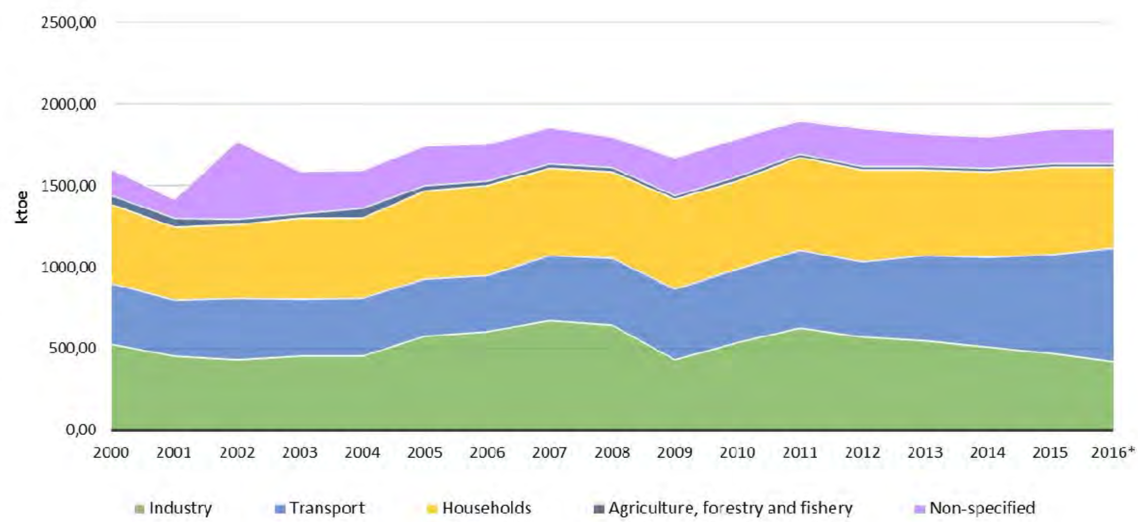
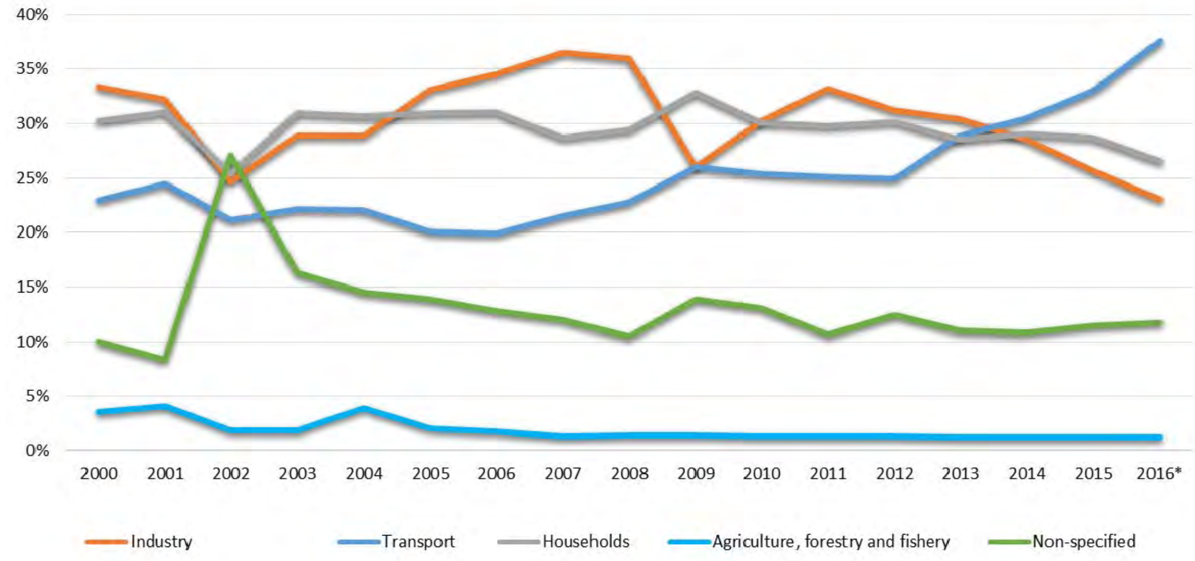


Figure 2. Share of individual sectors in final energy consumption



Data coverage: excel

Source: State Statistical Office

Assessment

In the period from 2000 to 2016, the final energy consumption in the Republic of Macedonia increased by 15.5%.

By analyzing data on final energy consumption, it can be noted that the largest drop in final energy consumption in he sector industry is in 2016, and the highest increase in consumption in the sector industry is noted in 2007.

Comparing 2016 with the year 2000, it can be noted that the final energy consumption in transport has a steady increase with a rise in 89%, while in the households sector there is increase by 1.7%.

The largest share in the final energy consumption in 2016 is from the transport sector with 34.9%, households with 24.7% and the industry with 24.7.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Regulation on Energy Statistics of the European Parliament and of the Council (Regulation no.1099/2008).
- “Energy Statistics Methodology Eurostat F4, 1998"
- National classification of activities, Rev.2 (Official Gazette of the Republic of Macedonia no. 147/2008)

Policy relevance of the indicator

- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[1]
- Strategy for Energy Development in the Republic of Maceodnia by 2030.[2]

[1] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[2] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply .

Reporting obligation

- Eurostat
- ECE/UN
- IEA/OECD

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 027	**Final energy consumption by sector**	CSI 027 ENER 016	Final energy consumption by sector and fuel	**D**	A	Energy	annualy

MK - NI 028
TOTAL ENERGY INTENSITY

Definition

Total energy intensity is the ratio between the total energy demand (or total energy consumption) and the Gross Domestic Product.

The total energy consumption is calculated as the sum of the total energy demand from solid fuels, oil, natural gas and renewable sources.

The Gross Domestic Product (GDP) is converted by the Price Adjusted Rate of Exchange (PARE) method, applying the OUN Methodology (2000 database).

The total energy demanded (or total energy consumption) is expressed in thousand tonnes oil equivalent, and Gross Domestic Product in million EUR.

The indicator "Total energy intensity" is expressed in kilograms oil equivalent per 1000 EUR (kgoe/1000 EUR).

The indicator is also calculated in indexes with 2000 as base year (2000=100).

Units

- million EUR
- thousand tonnes oil equivalent (ktoe)
- kilograms oil equivalent (kgoe)
- indexes (2000=100)

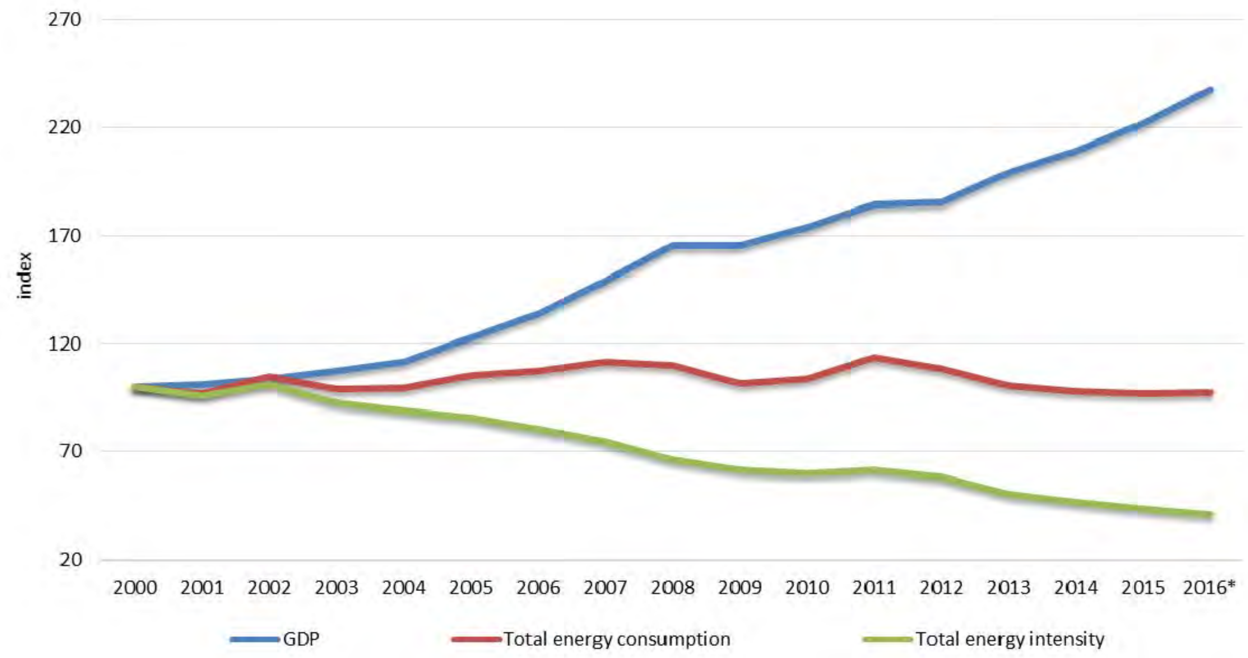
Key question

What will be the dynamics of strategic targets implementation and achievement?

Key message

The trend in Energy intensity in the Republic of Macedonia recorded a decline by 59.1% in 2016 compared to 2000, mainly due to the trend of GDP growth of 137.4% in the same year. The largest drop in the energy intensity, compared to the previous year, from 13.68%, was registered in 2013 in comparison to 2012, and the largest increase by 5.51% in 2002 compared to 2001.

Figure 1. Total energy intensity



Data coverage: excel

Source: State Statistical Office

Assessment

There is a constant change in the trend of total energy intensity from 2000 to 2016, with an average rate of decline of 5.3%. In 2016, compared to 2000, a decline in energy intensity of 59.1% was noted as a result of a 137.4% increase of GDP in the same year. The larest drop in the energy intensity compared to the previous year, from 68%, is noted in 2013 compared to 2012, and the highest increase of 5.5% in 2002 compared to 2001.
A favorable trend of a decrease in energy intensity can be noted from the time series.
A comparative analysis of energy consumption in relation to GDP, a so called indicator of energy intensity, shows that the Republic of Macedonia belongs to the group of countries with relatively high energy consumption, due to the high energy intensification of the capacities that carry the economic growth. Also, due to the long term treatment of the price of electricity as a social category, the residential sector uses a considerable amount of electricity for heating.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Regulation on Energy Statistics of the European Parliament and of the Council (Regulation no.1099/2008),
- „Energy Statistics Methodology Eurostat F4, 1998"
- National classification of activities NCA Rev.2 (Official Gazette of the Republic of Macedonia no. 147/2008).

Policy relevance of the indicator

List of relevant policy documents:

- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[1]
- Strategy for Energy Development in the Republic of Maceodnia by 2030[2]

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Targets

Target to be achieved in EU is spending tonnes oil equivalent per 1.000 US$ GDP, while the target in the Republic of Macedonia is 0,75 tonnes oil equivalent. The implementation of measures under the Strategy for Energy Efficiency Promotion, this should drop down to 0,45 to 0,49 into 2020.

Reporting obligation

- Eurostat
- ECE/UN
- IEA/OECD

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 028	**Total energy intensity**	CSI 028 ENER 017	Energy intensity	**R**	B	▪ energy	annualy

[1] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[2] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf

MK - NI 029

PRIMARY ENERGY CONSUMPTION BY FUEL (GROSS INLAND CONSUMPTION)

Definition

Primary energy consumption or gross inland consumption represents the total quantity of energy necessary to satisfy the total national needs for energy for energy transformations, all types of consumption by energy sector and final energy and non-energy consumption.

The total energy consumption is calculated as sum of the total energy consumption originating from solid fuels, oil, natural gas, electricityand renewable sources.

The indicator "Primary energy consumption by fuel" is expressed in thousand tonnes of oil equivalent (ktoe) and in percentage as ratio between the total energy consumption per fuel and the total energy consumption of all fuels.

Units

- thousand tonnes of oil equivalent (ktoe)
- percentage (%)

Key question

What are the trends conserning the share of fuels in the total energy consumption?

Key message

The total energy demand in 2016 compared to 2000 has decreased by 2.9%. The highest share in the total energy demand in 2016 belongs to oil products and their share is40.4%.For the period 2000 to 2016, the share of natural gas was increased from 1.9% to 6.6% in the total energy demand.

In the period from 2000 to 2016, the use of solid fuels has decreased from 50.8% to 32.4%.

Figure 1. Total energy consumption by fuel

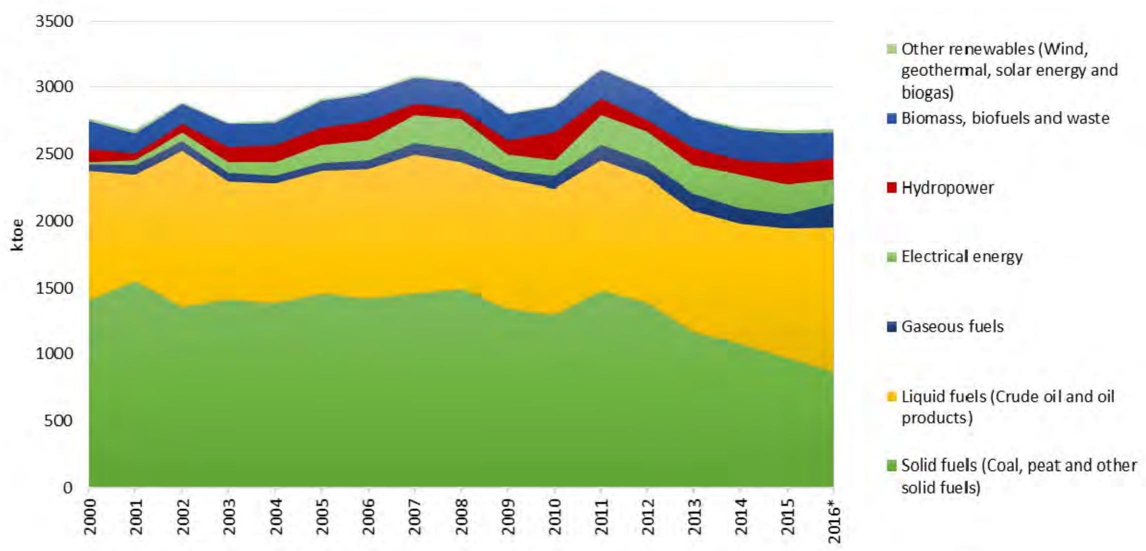
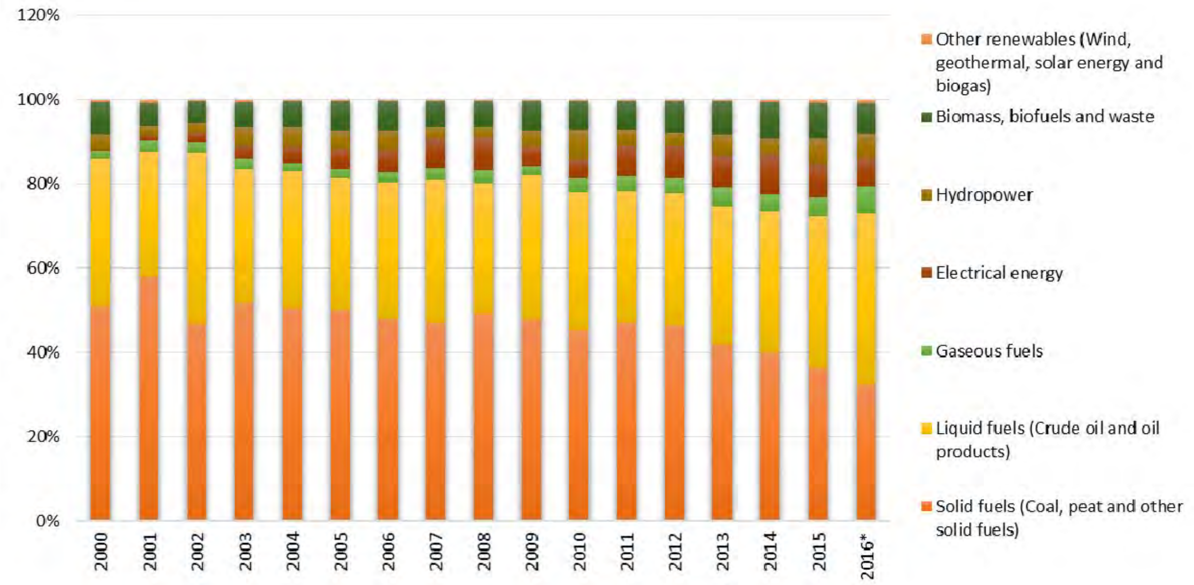


Figure 2. Share by fuel in the total energy consumption



Data coverage: **excel**

Source: State Statistical Office

Assessment

In tha past period, dominant energy sources in the Republic of Macedonia included solid fuels, oil and oil derivatives. The share of solid fuels in the total energy consumption for the period between 2000 and 2014 was significantly higher compared to other energy sources ranging from 40.9% to 58%. Also, the share of liquid fuels in the total energy consumption was rather significant and ranged between 29.5% and 40.6%. Reduction of ecological footprint of electricity production in thermal power plants fueld by low calorific coal – lignite is among the greatest challenges in the attempt to reduce the effects of gas emissions in the production process.

Renewable energy sources have negligible share in the total energy consumption ranging from 7.8% to 14.6%, except for wood which is mostly used in individual households without adequate filters for combustion gas emissions.

Increase in the share of renewable energy sources in total energy consumption would be at the same time a possibility for economy restructuring in several sectors, energy efficiency in households and industry, as well as jobs creation.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Regulation on Energy Statistics of the European Parliament and of the Council (Regulation no.1099/2008),
- "Energy Statistics Methodology Eurostat F4, 1998"

Policy relevance of the indicator

- National Strategy for Sustainable Development in the Republic of Macedonia 2009 – 2030[1]
- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[2]

[1] http://www.moepp.gov.mk/wp-content/uploads/2014/12/Nacionalna-Strategija-za-Odrzliv-Razvoj-vo-RM-NSSD-Del-1.pdf

- Strategy for Energy Development in the Republic of Maceodnia by 2030[3]

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Targets

- Reduction in the dependence on imported fuels and reduction in inefficient energy consumption;
- Modernization of energy infrastructure and diversification of energy supply (extension of the network for natural gas is an important essential element for the implementation of all measures envisaged towards energy efficiency);
- Participation in of regional cooperation and compliance with the legislation of the Energy Community.

Reporting obligation

- Eurostat
- ECE/UN
- IEA/OECD

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 029	**Primary energy consumption by fuel**	CSI 029 ENER 026	Primary energy consumption by fuel	**D**	A	energy	annualy

[2] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[3] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf

MK - NI 030
RENEWABLE ENERGY CONSUMPTION

Definition

Renewable energy sources are defined as renewable non-fossil energy sources: hydropower, geothermal, solar and wind power; solid biomass; biogas, liquid biofuels, etc.

The indicator "Renewable energy consumption" is expressed as ratio of total renewable energy consumption and the total energy consumption originating from all fuels (in percentage).

Units

- thousand tonnes of oil equivalent (ktoe)
- percentage (%)

Key question

How fast is the share of renewable energy in the total energy consumption?

Key message

Policies in energy sector should favour measures for greater use of renewable energy sources.

Relatively low share of renewable energy in the total energy consumption (11.5% at an average) indicates dominant use of fossile fuels which is unfavourable in terms of both depletion of energy resources and environmental pollution.

Biomass has the highest share of renewable energy in the total energy consumption and ranges from 5.1% to 8.7%, while the lowest share belongs to solar electric energy. Hydro electricity has a share in the range between 2 and 7.3%.

Figure 1. Share of renewable energy in the total energy consumption by energy source (%)

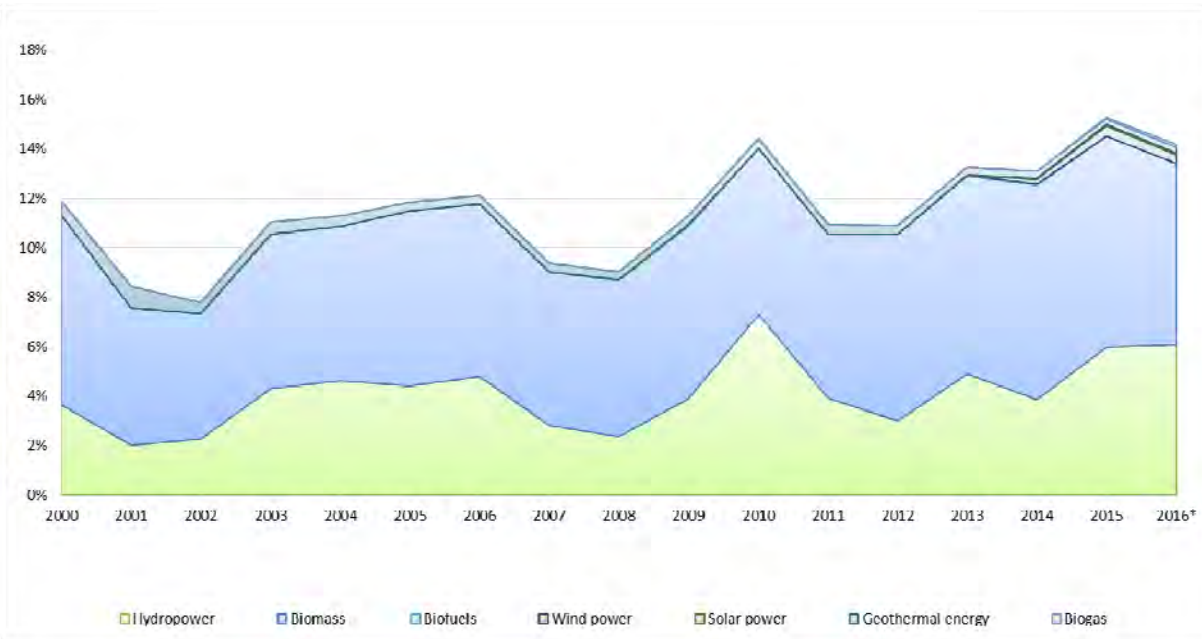
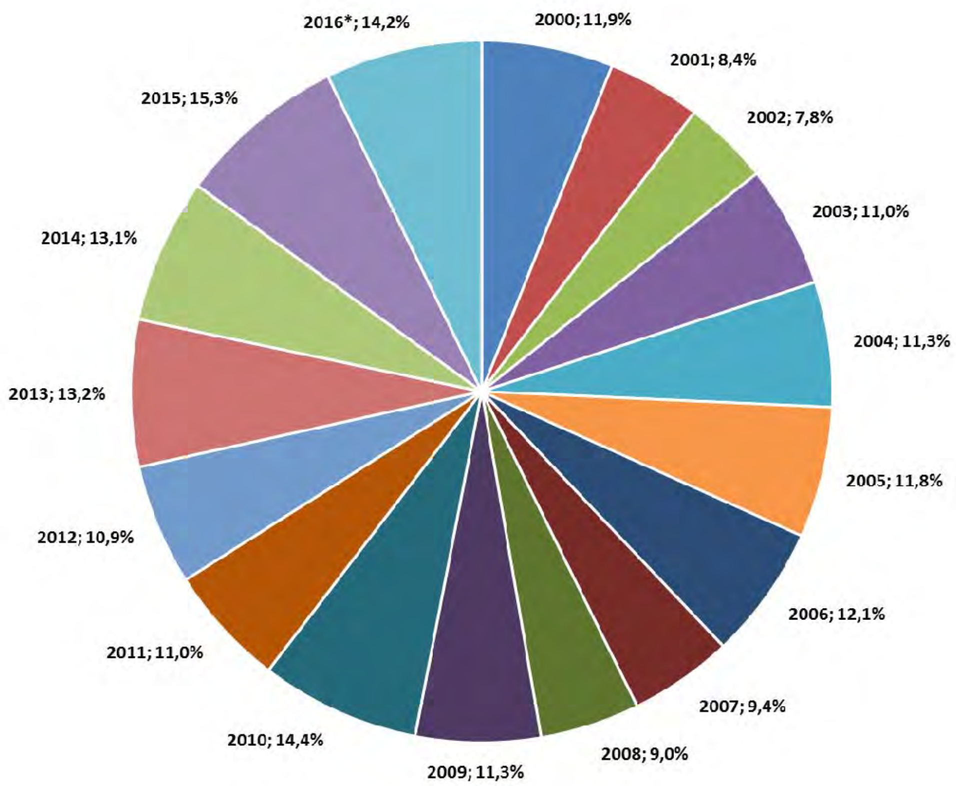


Figure 2. Total share of renewable energy in the total energy consumption (%)



Data coverage: excel

Source: State Statistical Office

Assessment

Relatively low share of renewable energy in the total energy consumption (11.45% at an average) indicates the dominant use of fossile fuels which is unfavorable in terms of both energy resources depletion and environment pollution. The highest share of renewable energy in the total energy consumption was recorded in 2015 with 15.3%, and the lowest one of 7.8% in 2002.

During the reporting period, the trend of renewable energy share in the total energy consumption was variable. In the period from 2000 to 2002, there was a drop by 34.6%, and from 2002 to 2006 there was a growth by 39.6% in the share of renewable energy in the total energy consumption, followed by decline in 2007 by 28%, and then growth again in the period from 2008 to 2010 of 73.5%, and significant decline in the period from 2011 to 2014 amounting 24.6%.

Biomass has the highest share of renewable energy share in the total energy consumption and ranges from 5.1% to 8.7%, while the lowest share belongs to solar electric energy. Hydro electricity has a share in the range between 2% and 7.3%.

The minimal share of renewable energy sources in the share of the total energy production and consumption in the Republic of Macedonia indicates that the available resources (e.g.geothermal, hydro, solar power and other) are insufficiently utilized, but also the aspects of energy security, in terms of all steps that need to be undertaken by the state to prevent threats in relation to planned demands for energy by the national economy. Energy security or threat to economy and social welfare the factors of which are minimized with reduction of dependence on energy and energy resources import, indicate the importance of social resources streamlining towards maximum utilization of natural renewable sources.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Regulation on Energy Statistics of the European Parliament and of the Council (Regulation no.1099/2008),
- “Energy Statistics Methodology Eurostat F4, 1998"

Policy relevance of the indicator

- Strategy for Energy Efficiency in the Republic of Macedonia by 2020[1]
- Strategy for Energy Development in the Republic of Maceodnia by 2030[2]
- Strategy for Utilization of Renewable Energy Sources (RES) in the Republic of Macedonia by 2020[3]

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy)**.**

Targets

Reduction in the dependence on imported fuels and reduction in inefficient energy consumption;
Modernization of energy infrastructure and diversification of energy supply;
Participation in of regional cooperation and compliance with the legislation of the Energy Community.

Reporting obligation

- Eurostat
- ECE/UN
- IEA/OECD

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 030	**Renewable energy consumption**	CSI 030 ENER 029	Renewable energy in gross inland energy consumption	**R**	B	energy	annualy

[1] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[2] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf
[3] http://www.economy.gov.mk/dokumenti/strategii/3102.html

MK - NI 031

RENEWABLE ELECTRICITY

Definition

Renewable electricity sources are defined as renewable non-fossil sources of energy, such as: hydropower, geothermal, solar and wind power; solid biomass; biogas, liquid biofuels, etc.

The indicator "Renewable electricity" measures the share of electricity produced from renewable sources in gross national electricity production (in percentage).

The gross national electricity consumption is a sum of the total gross production and import of electricity minus electricity exported.

Units

- GWh
- percentage

Key question

What is the share of electrcity originating from renewable sources in the gross electricity consumption in the Republic of Macedonia?

Key message

The share of electrcity originating from renewable sources in the gross electricity consumption in the Republic of Macedonia is rather low. It makes relatively high annual fluctuation depending on hydrological conditions, considering that so far only hydro and solar power from among renewable sources contribute to electricity production from renewable sources. Efforts should be made to utilize other renewable sources for electricity production.

There was a variable trend in the rate of renewably energy sources utilization during the analyzed period. In 2010, resulting from favourable hydrological conditions, the share of renewable electricity in the total gross electricity consumption was the highest amounting 28%, while the lowest share was recorded in 2001 amounting 9.2%. Figure 1. Share of renewable electricity in gross domestic electricity consumption

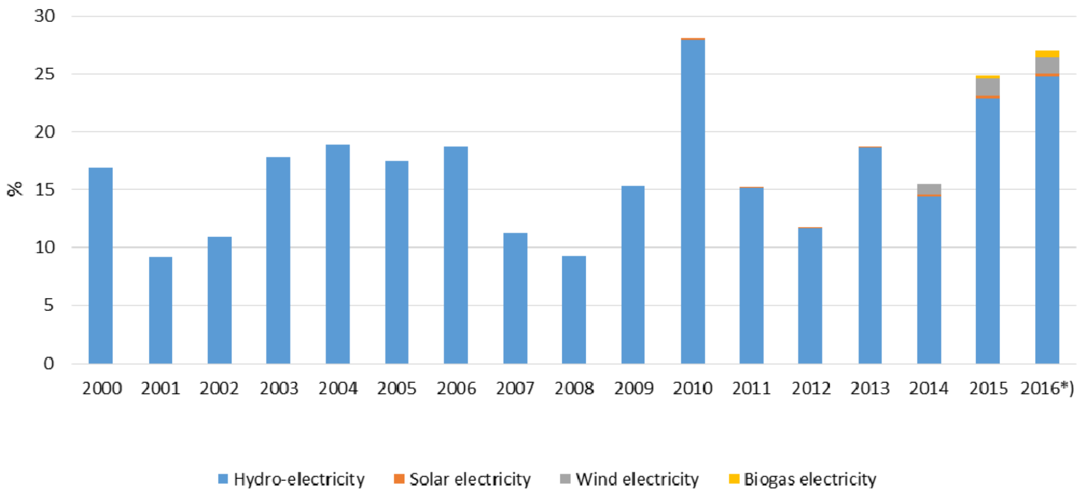
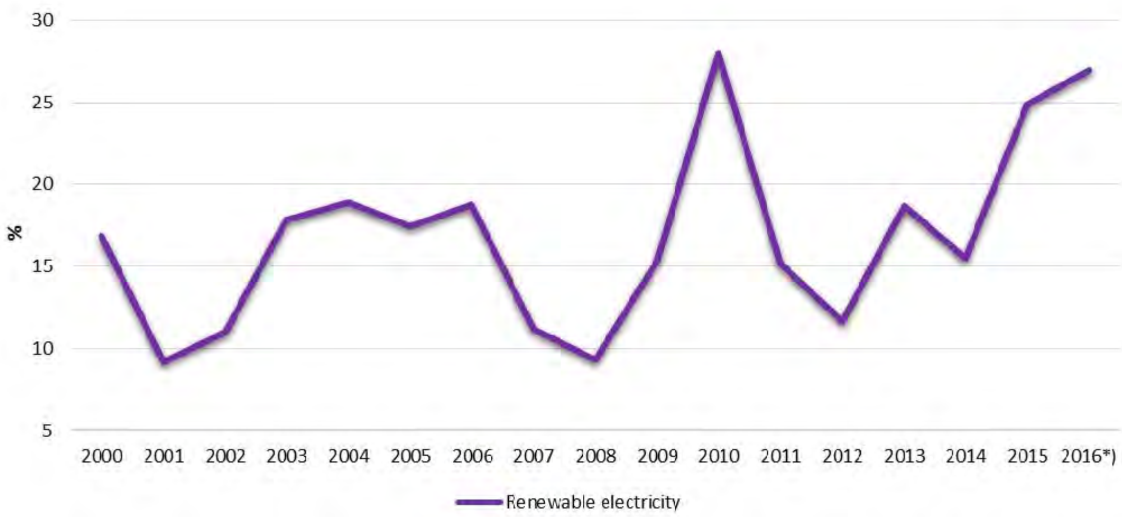


Figure 2. Trend in electricity production from renewable sources (%)



Data coverage: excel

Source: State Statistical Office

Assessment

The production of electricity from renewable sources in the Republic of Macedonia is based on the hydropower, but in the last years, a contribution has been noted by new renewable sources (solar electricity plants, windmills and biogas plants, as well as an increase in the share from small hydropower plants). Production in large hydropower plants is predominant.

At present, the share of renewable electricity in the overall electricity consumption is very important and depends on hydrological conditions during the year. Variable hydrological conditions result in variations in the production of hydro energy due to lower quantities of precipitation. This indicates the fact that there is a need for larger investments in energy production capacities to enable an increase of the utilization of other renewable energy sources as well, such as solar,wind power and biogas.

During the observed period, there was a variable trend of utilization of energy from renewable sources. In 2010, resulting from favourable hydrological conditions, the share of renewable electricity in the total gross electricity consumption was the highest amounting 28%, while the lowest share was recorded in 2001 amounting 9.2%.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Common surveys for coal, oil, natural gas, electricity and heat, renewable energy for 2005 by Eurostat, ECE/UN and IEA/OECD.
- “Energy Statistics Methodology Eurostat F4, 1998"

Policy relevance of the indicator

- Strategy for Renewable Energy Sources Utilization in the Republic of Macedonia by 2020[1]
- National Strategy for Sustainable Development in the Republic of Macedonia 2009 – 2030[2]
- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[3]
- Strategy for Energy Development in the Republic of Maceodnia by 2030[4]

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Targets

To achieve the required increase in order to reach the EU indicative target of 25% share by 2020, and 30% by 2030.

Reporting obligation

- Eurostat
- ECE/UN
- IEA/OECD

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 031	**Renewable electricity**	CSI 031 ENER 030	Renewable electricity consumption	**R**	B	energy	annualy

[1] http://www.gec.mk/EE%20vo%20Makedonija/Strategija%20za%20OIE.28juni2010.pdf
[2] http://www.moepp.gov.mk/wp-content/uploads/2014/12/Nacionalna-Strategija-za-Odrzliv-Razvoj-vo-RM-NSSD-Del-1.pdf
[3] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[4] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf

MK - NI 058

ENERGY DEPENDENCE FOR ALL FUELS

Definition

Energy dependence is calculated as ratio between net import of energy and the total energy consumption

Units

- percentage

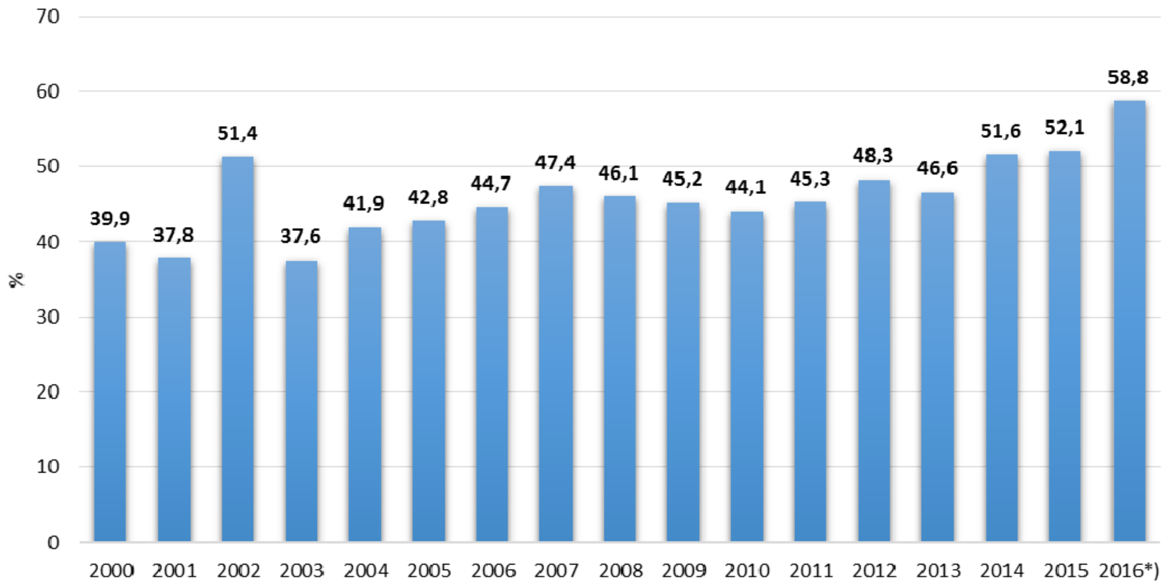
Key question

What is the rate of energy dependence of the Republic of Macedonia?

Key message

During the reporting period, variable trend of growth and fall in energy dependence could be noted. Data indicated increase in energy dependence on import in 2016 compared to previous yearThe highest energy dependence during the reporting period was recorded in 2016 or 58,8% of energy consumption in the country was covered by import. The lowest energy dependence of 37.6% was recorded in 2003.

Figure 1. Energy dependence for all fuels (%)



Data coverage: **excel**

Source of data: State Statistical Office

Assessment

Energy dependence measures the rate of country dependence on import in order to meet its energy demand. The goal of every country's energy policy is to reduce its dependence on imported energy.

During the analyzed period, variable trend of growth and fall in energy dependence could be noted. The trend of increase in energy dependence on import in order to meet energy demand in the country continued in 2016, too. Data showed increase in energy dependence on import in 2016 compared to previous year , which was the highest energy dependence during the analyzed period. The lowest energy dependence of 37.6% was recorded in 2003.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Common surveys for coal, oil, natural gas, electricity and heat, renewable energy by Eurostat, ECE/UN and IEA/OECD
- "Energy Statistics Methodology Eurostat F4, 1998"

Policy relevance of the indicator

- Strategy for Renewable Energy Sources Utilization in the Republic of Macedonia by 2020[1]
- National Strategy for Sustainable Development in the Republic of Macedonia 2009 – 2030[2]
- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[3]
- Strategy for Energy Development in the Republic of Maceodnia by 2030[4]

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Targets

Reduction of dependence on import through investments in research and generation of new energy sources (with focus on the utilization of solar, geothermal energy and biomass from waste in rural areas) and other energy infrastructures.[3]

Reporting obligation

- Eurostat

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 058	**Energy dependence for all fuels**	tsdcc310/ SDI	Energy dependance	**D**	A	Energy	annually

[1] http://www.economy.gov.mk/dokumenti/strategii/3102.html
[2] http://www.moepp.gov.mk/wp-content/uploads/2014/12/Nacionalna-Strategija-za-Odrzliv-Razvoj-vo-RM-NSSD-Del-1.pdf
[3] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[4] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf

MK - NI 059

TOTAL ENERGY CONSUMPTION PER CAPITA

Definition

Total energy consumption is the sum of domestic primary production, net import and balance of reserves. The total energy consumption per capita is obtained as a ratio between total energy consumption and total number of population in the reference year.

Units

- thousand tons of oil equivalent (ktoe) per capita

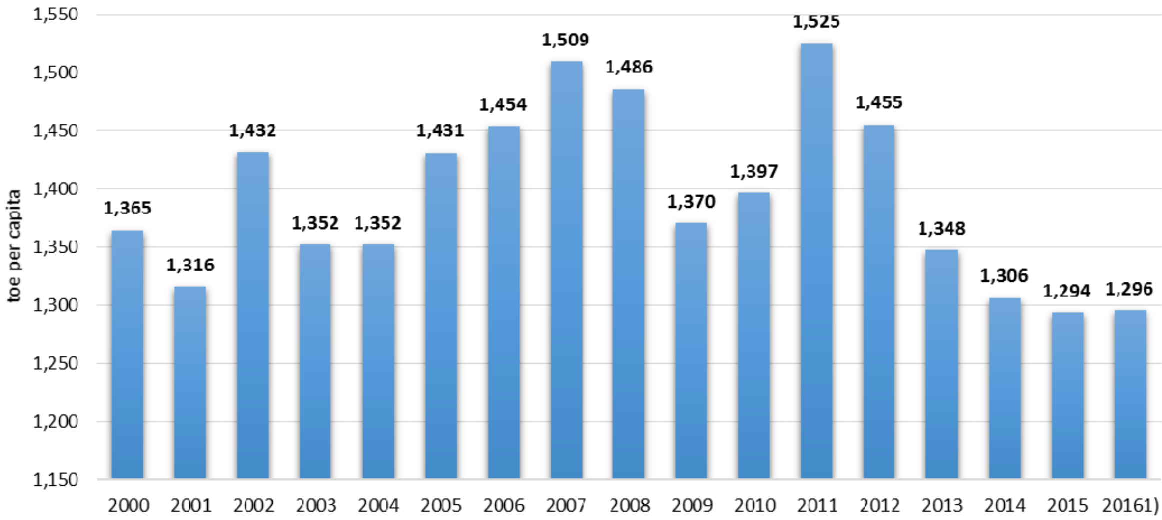
Key question

What is the total energy consumption per capita in the Republic of Macedonia?

Key message

During the reporting period, this indicator had variable trend of growth and fall in energy consumption per capita. The highest consumption of the total energy consumption during the analyzed period was recorded in 2011 reaching 1.525 toe/capita, and the lowest one in 2015 amounting 1.294 toe/capita reflecting a fall by 15.2%.

Figure 1. Total energy consumption per capita (toe/capita)



Data coverage: excel

Source of data: State Statistical Office

Assessment

Consumption of the total energy consumption is notably dependent on the development of the main consumption sectors, including electricity production. This indicator reflects to a significant rate the level of living standard, demands for heating and structure of industry or economy in the country.

During the reporting period, this indicator had variable trend of growth and fall in energy consumption per capita.

The total energy consumption dependes on the demand, i.e. consumption of fuels. If demand in industry and other sectors increases or decreases, the total energy consumption will increase/decrease accordingly.

The highest consumption of the total energy consumption during the analyzed period was recorded in 2011 reaching 1.525 toe/capita, and the lowest one in 2015 amounting 1.294 toe/capita reflecting a fall by 15.2%

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Common surveys for coal, oil, natural gas, electricity and heat, renewable energy by Eurostat, ECE/UN and IEA/OECD
- “Energy Statistics Methodology Eurostat F4, 1998"

Policy relevance of the indicator

- Strategy for Renewable Energy Sources Utilization in the Republic of Macedonia by 2020[1]
- National Strategy for Sustainable Development in the Republic of Macedonia 2009 – 2030[2]
- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[3]
- Strategy for Energy Development in the Republic of Maceodnia by 2030[4]

Legal grounds

Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply (Article 16 of the Law on Energy).

Reporting obligation

- Eurostat

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 059	**Total energy consumption per capita**			**D**	A	Energy	annually

[1] http://www.economy.gov.mk/dokumenti/strategii/3102.html
[2] http://www.moepp.gov.mk/wp-content/uploads/2014/12/Nacionalna-Strategija-za-Odrzliv-Razvoj-vo-RM-NSSD-Del-1.pdf
[3] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[4] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf

MK - NI 060

SHARE OF RENEWABLE ENERGY IN GROSS FINAL ENERGY CONSUMPTION

Definition

The share of renewable energy in the gross final energy consumption is the ratio between gross final energy consumption from renewable energy sources and the gross final energy consumption from all types of fuels.

The gross final energy consumption from all types of fuels is the sum of the final energy consumption, electricity and heat consumption in the process of production in electricity and heat production sectors, as well as losses of heat and electricity in transmission and distribution.

Calculations of the indicator with normalized values in the gross final electricity consumption use pondered values of electricity generated in hydro power plants in order to balance the effects of climate change.

Units

- percentage

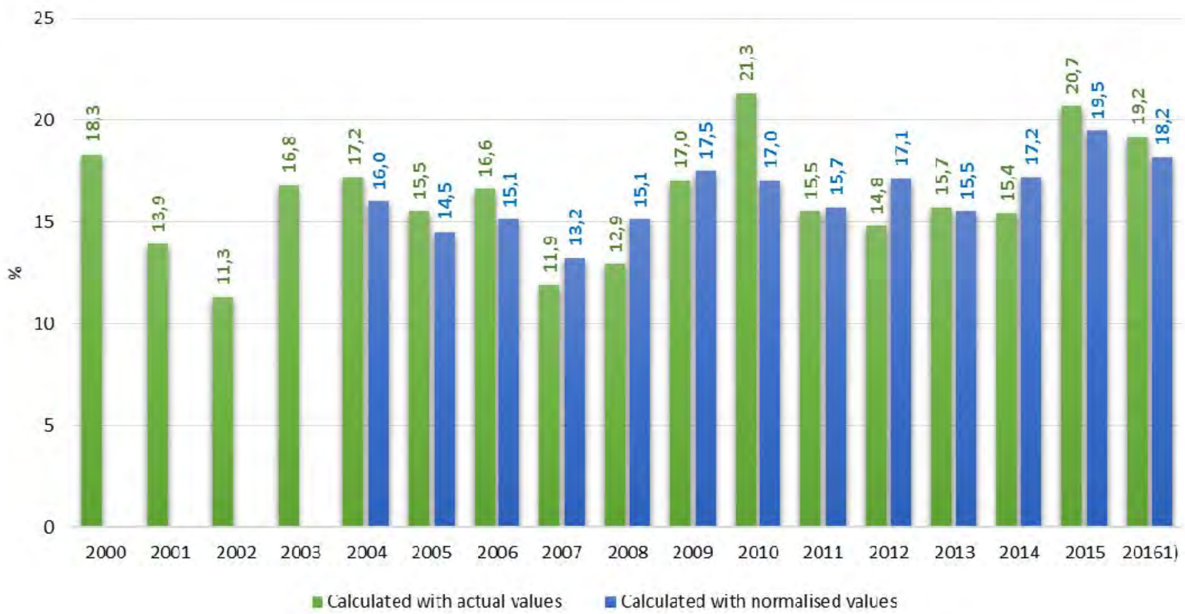
Key question

Has the share of reneable energy in the gross final energy consumption been growing and what is the progress towards the share targets of 23.9% by 2020?

Key message

Calculated by normalized values, the share of reneable energy in the gross final energy consumption in 2016 was 18.2% and approaching the set target of 23.9% in 2020. In 2016 compared to 2009 which was taken as baseline year for target monitoring, there was significant increase of 2.9%.

Figure 1. Share of renewable energy in gross final energy consumption (%)



Data coverage: **excel**

Source of data: State Statistical Office

Assessment

The share of reneable energy in the gross final energy consumption during the analyzed period had variable trend of growth and fall. Calculated by normalized values, the share in 2014 was 19.6% and noting a trend of constant growth in the share of reneable energy.
The increase in the share of reneable energy in the gross final energy consumption has resulted from the newly constructed facilities for energy generation from renewable energy sources (construction of wind farm, photovoltaic plants, small hydro power plants, etc.) owing to the favourable national energy policy.

Methodology

- Methodology for the indicator calculation

Statistical methodology for calculation:

- Regulation on energy statistics of the European Parliament and of the Council (Regulation no.1099/2008).
- “Energy Statistics Methodology Eurostat F4, 1998"

Policy relevance of the indicator

- Strategy for Energy Efficiency Promotion in the Republic of Macedonia by 2020[1]
- Strategy for Energy Development in the Republic of Maceodnia by 2030[2]
- Strategy for Renewable Energy Sources Utilization in the Republic of Macedonia by 2020[3]

Legal grounds

- Law on Energy; Energy Balance of the Republic of Macedonia - annual planning document defining the demands for energy and the possibility for their supply.

Targets

Increased share of renewable energy sources to a level higher than 20% of the total final energy consumption by 2020 compared to 2006.[2]

Reporting obligation

- Eurostat, ECE/UN and IEA/OECD.

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 060	Share of renewable energy in gross final energy consumption	CSI 048 ENER 028	Share of renewable energy in gross final energy consumption	**D**	A	Energy	annually

[1] http://www.konkurentnost.mk/StrateskiDokumenti/StrategijazaunapreduvanjenaEERMdo2020godina.pdf
[2] http://www.build.mk/docs/users/cloverstack/Strategija%20za%20razvoj%20na%20energetikata%202008-2020%20so%20vizija%20do%202030.pdf
[3] http://www.gec.mk/EE%20vo%20Makedonija/Strategija%20za%20OIE.28juni2010.pdf

FISHERY

MK - NI 041

FISH STOCKS CHARACTERISTICS

Definition

The indicator shows the number of freshwater species living in rivers and lakes in the Republic of Macedonia and the fish species represented in fishponds that are subject to aquicultural production.

At present, the indicator shows the status of:

- catch of two economically significant fish species in fishing waters;
- total catch of other fish species in fishing waters;
- total aquicultural fish production in fishponds.

Units

Number of fish species, kilograms (tones) fish catch.

Key policy issue

How sustainable is the fish catch in the Republic of Macedonia?

Key message

The average fish catch in the Republic of Macedonia is 1. 370 tons of different fish species. The overall fish catch had periodical trend of reduction and increase, from 2003 to 2006 the catch reduced because individual fishing companies, business entities and concessionaires lost their permits for fishing activities in individual aquatic basins and high number of sports fishing clubs were terminated.

The greatest fish cat was noted in 2000 amounting 1834, and the lowest one was in 2006 and amounted 813 tons. Carp is the leading species in lowland waters with a catch of 220 tons in 2016, and trout in highland waters with a catch of 973 tons in 2016. Trout had the highest share in the total fish catch in 2016 with 75.3%, followed by carp with 17.03%, other fish with 4.41% and catfish had lowest share with 3.25%.

Figure 1. Total fish catch

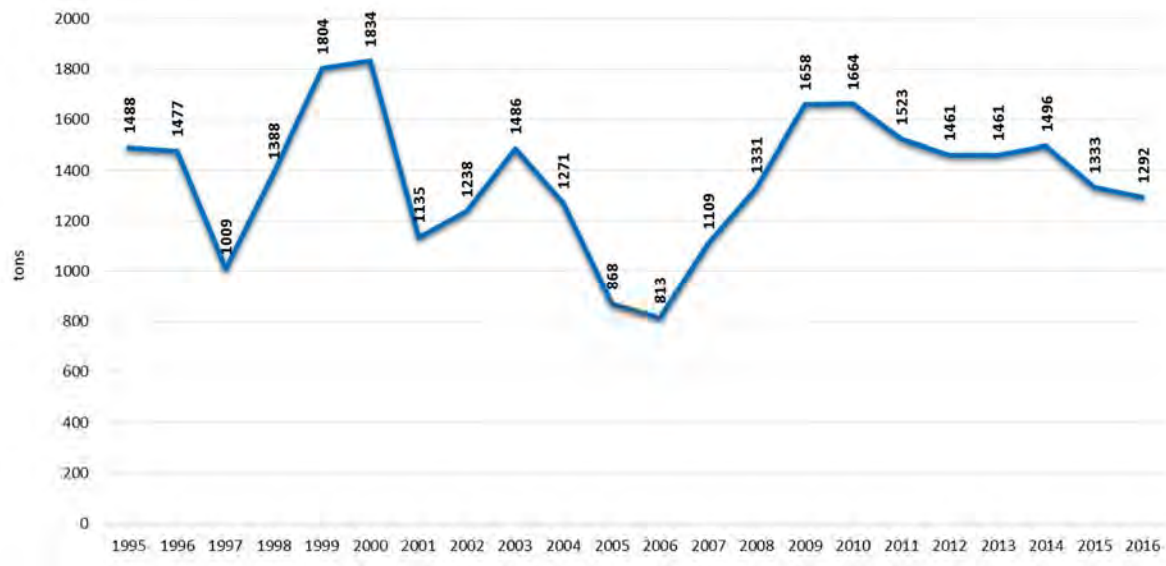


Figure2. Catch of the main fish species

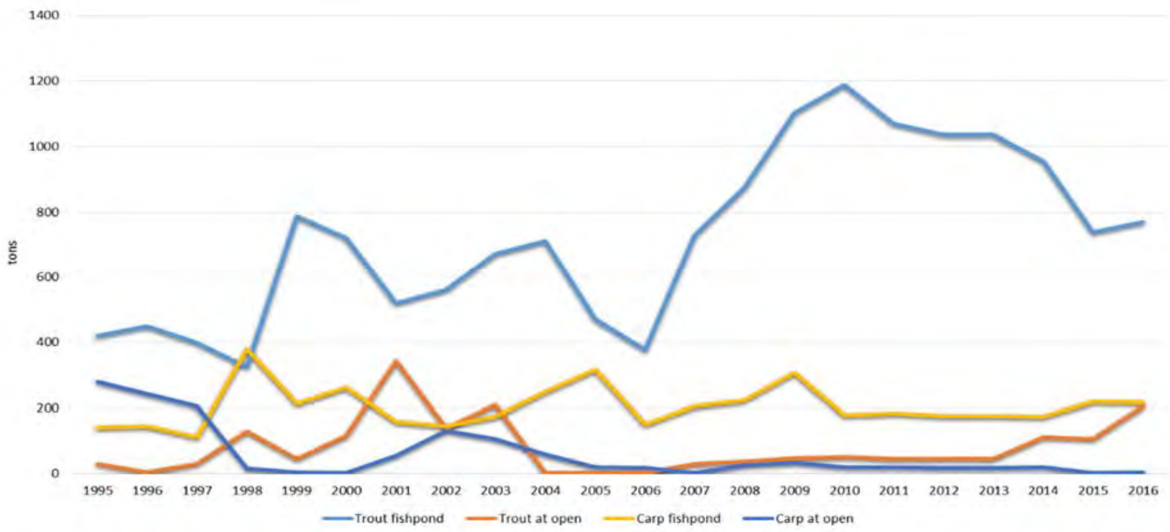
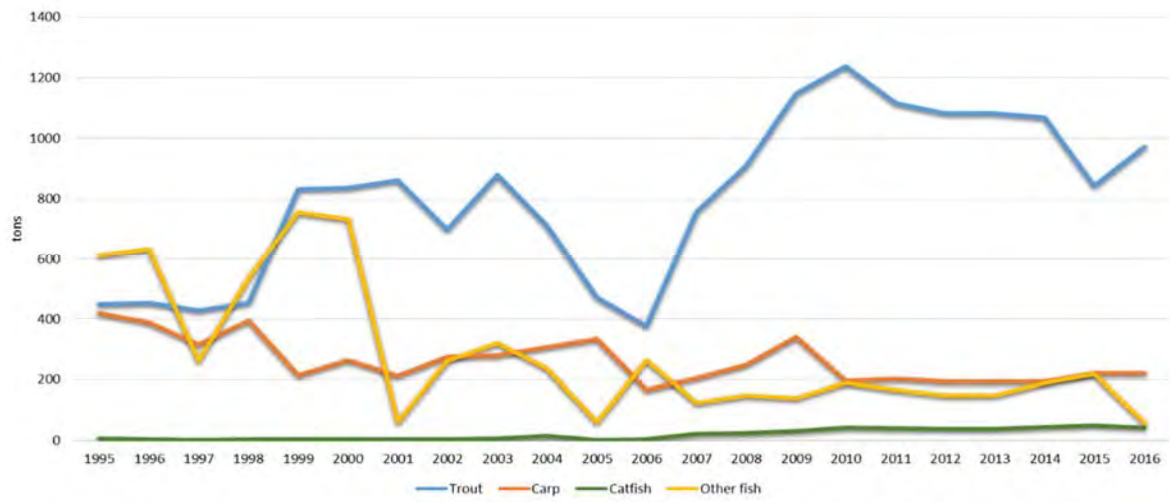


Figure 3. Total fish catch by fish species



Data coverage: excel

Source: State Statistical Office

Assessment

During the observed period, with regard to total fish catch (production of commercial fish and fishing by sports fishermen) in the Republic of Macedonia, the average catch is 1.370 tons of different fish species. In the period from 1995 to 2003, the overall fish catch had periodical trend of reduction and increase, from 2003 to 2006 the catch decreased because some fishing companies, business entities and concessionaireslost their licenses for fishing activities in certain water basins, and significant number of sports fishing clubs were terminated.

Trend of increase by 104.6% in the total fish catch was noted in the period 2006 to 2010 compared to 2006, i.e. it increased from 813 to 1664 tons of fish. Then, in the period 2011 to 2016, there was drop in fish catch again compared to 2010 by 22.39%.

Figure 3 shows that the carp is pre dominant fish species in lowland waters with a catch of 220 tons in 2016, while trout is leading in highland waters with a catch of 973 tons in 2016. In the total fish catch in 2016, trout had the highest share with 75.3%, followed by carp with 17.03%, other fish species with 4.41% and catfish with 3.25% noted lowest share.

Fishing and fish stock exploitation in fishponds and artificial water accumulations in the Republic of Macedonia is under permanent supervision, with constant care for the fish stocks and regular stocking with economically important fish species. In this way, sustainable development and exploitation of fish as an important economic resource is provided, as well as for sports fishing. Exploitation of fish stocks from natural lakes has been coping with permanent problems for a longer period, including over-fishing and uncontrolled fish catch in those aquatic ecosystems. These activities affect particularly the endemic fish species, such as Ohrid trout (Salmo letnica Kar.), as well as other endemic species represented by small populations in certain aquatic ecosystems.

Methodology

Methodology for the indicator calculation

The source of data on the characteristics of fish stocks in the Rerpublic of Macedonia is the State Statistical Office and their methods are used for data processing.

Uncertainty

Uncertainty derives from the assumed incomplete data on fish catch in rivers and lakes. The uncertainty increases further because of the limitted number of literature data on genetic structure of fish populations in natural aquatic ecosystems.

Policy relevance of the indicator

List of relevant policy documents

The Study on the State of Biological Diversity in the Republic of Macedonia and the National Strategy for Biological Diversity Protection with Action Plan establish integrated approach to the protection and sustainable use of biological diversity components including fishery.

Spatial Plan of the Republic of Macedonia.

Legal grounds

The Law on Fishery and Aquiculture regulates the management, planning, commercial management and aquiculture of fish in fishing waters, fish ponds, semi fish ponds, cages and other fish breeding resources.

Targets

The overall fish production in the Republic of Macedonia has been envisaged to grow by 2.300 tons by 2020. The main mass in this grow will consist of trout fish (1.435 tons or 62% of the total catch) mostly from fishponds.[1]

Reporting obligation

- FAO – Fisheries and Aquaculture Department

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MKNI 041	**Fish stock characteristics**	**FISH 3**	Fish stock characteristics	**S**	**A**	Water Biodiversity Tourism	annual

[1]Spatial Plan of the Republic of Macedonia

TRANSPORT

MK - NI 035

PASSENGER TRANSPORT DEMAND

Definition

The indicator **"passenger transport demand"** will be presented in two different ways:

1) To measure decoupling of passenger transport demand from economic growth, the volume of passenger transport relative to GDP will be used. The decoupling indicator is defined as the ratio between pkm (inland modes) and GDP (Gross Domestic Product in constant 2000 EUR). In the presentation of this indicator in the Republic of Macedonia, the index 2000=100 is taken as baseline year.

2) Share of passenger transport: This indicator is defined as the percentage share of each mode of transport in the total inland transport. The unit used is the passenger-kilometre (pkm), which represents one passenger traveling a distance of one kilometre. It is based on transport by passenger cars, buses and coaches and trains.

All data should be based on movements on national territory, regardless of the nationality of the vehicle. However, data collection methodology should be harmonised at the EU level.

Units

The unit used is the passenger-kilometre (pkm), which represents one passenger travelling a distance of one kilometre. It is based on transport by passenger cars, buses and coaches, and trains.

Passenger transport demand and GDP are shown as an index 2000=100.

Key policy question

Is the passenger transport in road transport reduced compared to other transport modes?

Is the passenger transport demand decoupled from economic growth?

Key message

The overall passenger transport demand has grown by 38.43% during the analyzed period.

The share of road transport in the total passenger transport was 99.1% in 2016, reflecting an increase by 44.82 % compared to 1990, for railroad transport it was 0.9% in 2016 or decline by 4.28 times relative to 1990.

The share of the private cars in the total passenger transport is the highest. The share in 2016 was 77.7%, being at the same time the highest share during the analyzed period. Increased demand for cars has direct reflection on the structure of passenger inland transport, negative impacts on environment and health, especially for the fact that high number of vehicles transports low number of passengers. Data on the share of private vehicles and public road transport in cities has been estimated.

Demand for passenger transport per capita was the lowest in 2006 – 2690 km, and the highest in 2015 with 4558 km.

Figure 1 Passenger kilometers of individual modes of passenger transport in the total passenger transport

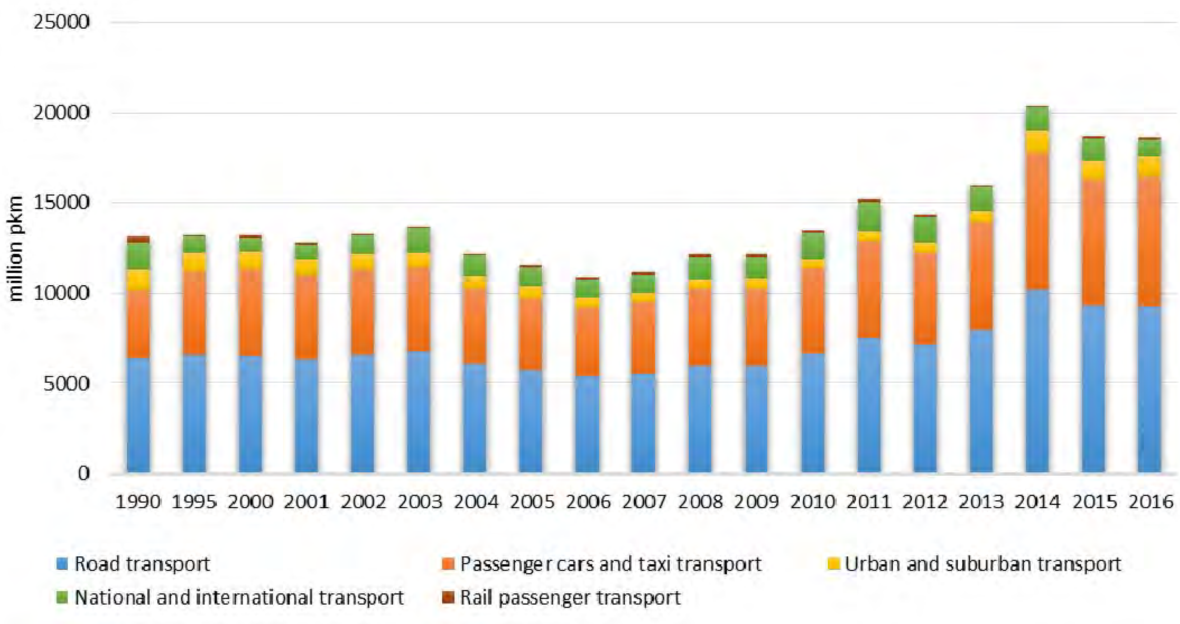


Figure 2 Share of individual modes of passenger transport in the total passenger transport

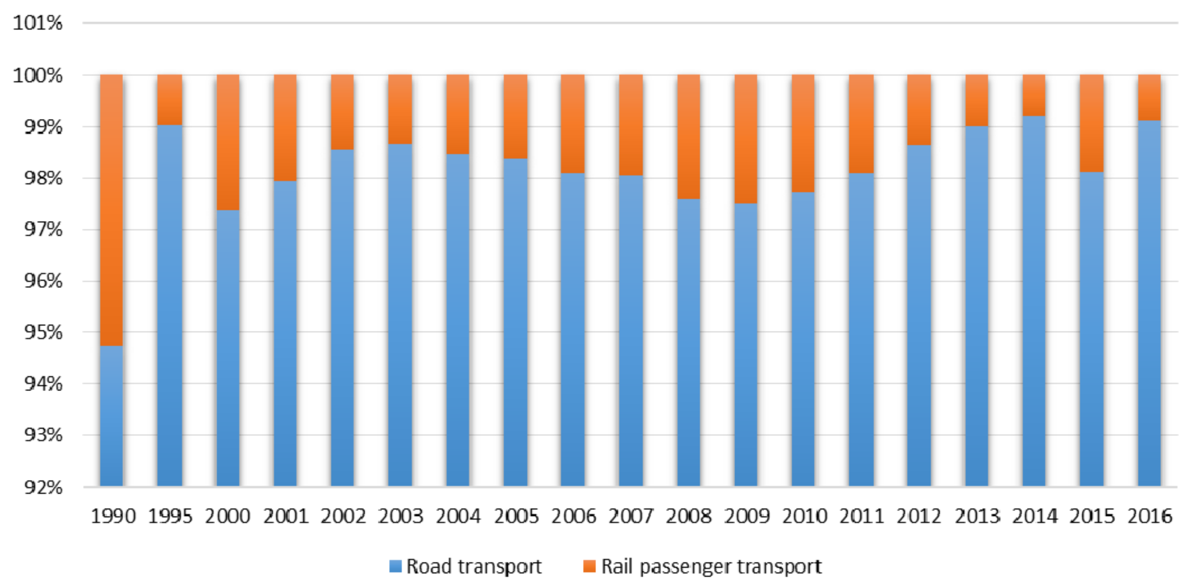


Figure 3: Demand for passenger transport per capita

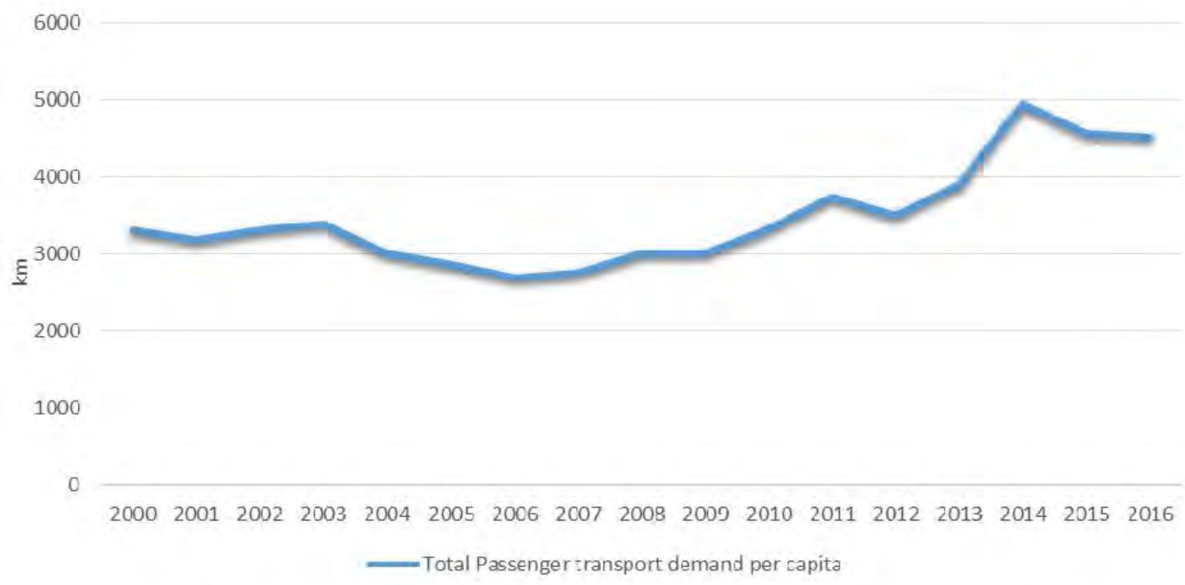
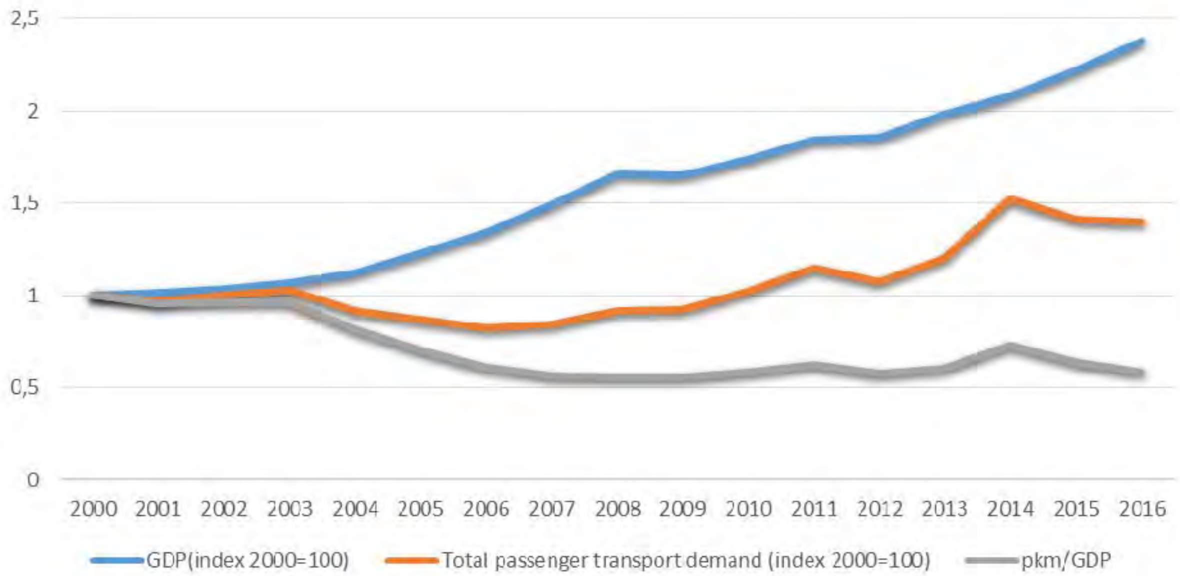


Figure 4: Total passenger transport demand/GDP ratio



Data coverage: excel

Data source: State Statistical Office

Assessment

The total passenger transport demand during the analyzed period ranged between 5492 and 9441 passenger kilometers, noting increase by 38.43%. The share of road transport in the total passenger transport was 99.1% in 2016 reflecting increase by 44.82% compared to 1990, and it was 0.9% in railroad transport in 2016 or decrease by 4.28 times compared to 1990.

The share of passenger cars and taxi transport in the total passenger transport was the highest. In 2016, it had share of 77.7% representing also the highest share during the analyzed period. The lowest share of 57.7% was recorded in 1990. In the period from 2000 to 2006, there was a falling trend by 25.9%, followed by growing trend up to 2016 by 70.1%. This indicates that the reduction of environmental pollution requires reduction in the share of road transport in the share of passenger transport in favour of other transport modes. This would also result in avoided costs for the expensive liquid fuel which while combusting pollutes the environment.

The urban and suburban transport in cities throughout the analyzed period noted trend of reduction amounting 9.08%.

National and international transport during the analyzed period noted variable trend with the biggest reduction in 2016 of 4.28 times compared to 1990 recorded for railway transport meaning that this transport mode was used at very low rate.

Data on the share of passenger cars and taxi transport in cities was estimated and data on the share of urban and suburban transport in cities was estimated in the period from 1990 to 2013.

The passenger transport demand per capita was the lowest in 2006 with 2690 km per capita, and the highest in 2015 with 4558 km per capita.

The trend of the passenger kilometer/GDP ratio from 2000 to 2016 was mainly in decrease. It is indexed for the year 2000=100 in order to monitor the changes in the intensity of passenger transport demand relative to economic growth presented through GDP.

Methodology

Methodology for the indicator calculation

In order to measure the decoupling of passenger transport demand from economic growth, the volume (i.e. intensity) of passenger transport relative to GDP is calculated. Relative decoupling occurs when the passenger transport demand rises at rate lower than the one of the GDP. Absolute decoupling occurs when the passenger transport demand falls while GDP rises or remains constant.

The unit used is passenger-kilometre (pkm), which represents one passenger traveling a distance of one kilometre.

With regard to EU Member States, according to Regulation on road transport and Regulation (EC) No 91/2003 on railroad transport statistics, data is based on all movements of passenger transport on the national territory.

Source of used methodology

Structural indicators of Eurostat on transport

State Statistical Office

Methodological uncertainty and data uncertainty

All data is based on the movements on the national territory, regardless of the nationality of the vehicle. The methodology of data collection has been harmonised at EU level, but estimated data has been used for the purposes of data calculation on the transport by passenger car. Sources include EUROSTAT, National statistical offices, ECMT, UNECE, UIC, DG TREN.

In order to answer the question whether the passenger transport demand is decoupling from economic growth, the intensity of passenger transport relative to changes in real GDP is considered.

Uncertainty of data sets

In order to obtain full picture of passenger transport demand and corresponding problems in the environment, it would be very useful to supplement data with data on the number of vehicle-kilometers.

Policy relevance of the indicator

List of relevant policy documents

The National Strategy for Transport prepared and adopted by the Government of the Republic of Macedonia determines the main directions of the transport policy development in the Republic of Macedonia through identification of goals and development strategy for road, rail and air transport sectors.

Legal grounds

The road transport is regulated by the Law on Road Transport. It regulates the conditions and the manner of performing transport of passengers and goods in internal and international road transport.

Transportation of dangerous goods is regulated by the Law on Dangerous Goods Transportation in Road and Railroad Transport, regulating the conditions under which transport of dangerous goods shall be performed (preparation of matter, loading, transport, on road procedures, unloading, safety in transportation, vehicles equipment and staff training).

Railroad transportation is regulated by the Law on Railroads, Law on Agreements on Transportation in Railroad Traffic, Law on Agency Regulating Railroad Transport Services Market and Law on Railroad Transport Safety.

Reporting obligation

- EUROSTAT

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 035	**Passenger transport demand**	CSI 035	Passenger transport demand	**P**	**B**	▪ Ttransport ▪ GDP	Monthly Periodically Annualy

MK - NI 036

FREIGHT TRANSPORT DEMAND

Definition

The indicator **"freight transport demand"** will be presented in two different ways:

1) To measure decoupling of freight transport demand from economic growth, the volume of freight transport relative to GDP will be used. The decoupling indicator is defined as the ratio between tkm (inland transport) and GDP (Gross Domestic Product in constant 2000 EUR). Presentation of this indicator in the Republic of Macedonia will be based on the baseline year 2000=100.

2) Modal split share of freight transport: This indicator is defined as the percentage share of each mode of freight transport in total inland transport. The unit used is tonne-kilometre (tkm), which represents movement of one tonne of goods over a distance of one kilometre. It includes road and railroad inland transport. Railroad transport is based on movements on national territory, regardless of the nationality of the vehicle. Road freight transport is based on all movements of vehicles registered in the reporting country.

Units

The unit used is the tonne-kilometre (tkm), which represents the movement of one tonne of goods over a distance of one kilometre. It includes transport by road and rail.

Freight transport demand and GDP are shown as an index (2000=100).

Key policy question

Is the freight transport in road transport reduced compared to other transport modes?

Is the freight transport demand decoupled from economic growth?

Key message

The overall freight transport demand noted variable trend of increase and decrease during the analyzed period. The overall freight transport demand in 2016 increased by 53.9% compared to 1990 as a result of increase in road transport by 64.3%, while the railroad freight transport showed decline by 133% without positive impacts on environment.

Freight kilometers/GDP ratio in the period 2000 to 2016 followed the variable trend of the overall demand for freight transport.

Figure 1: Freight transport by modes in tone kilometers (in million km)

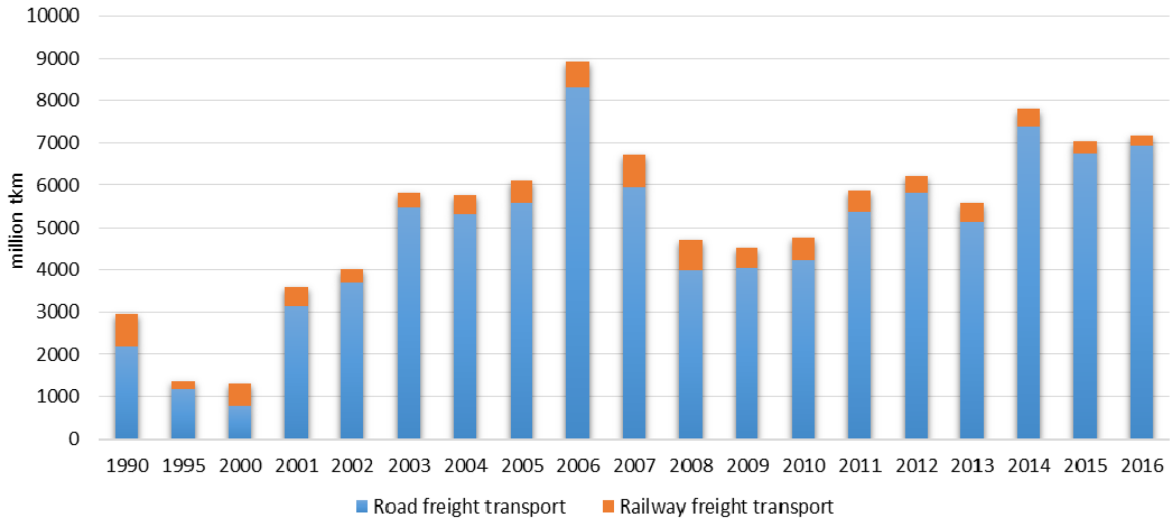


Figure 2: Share in percentages of tone kilometers of individual freight transport modes in the total freight transport

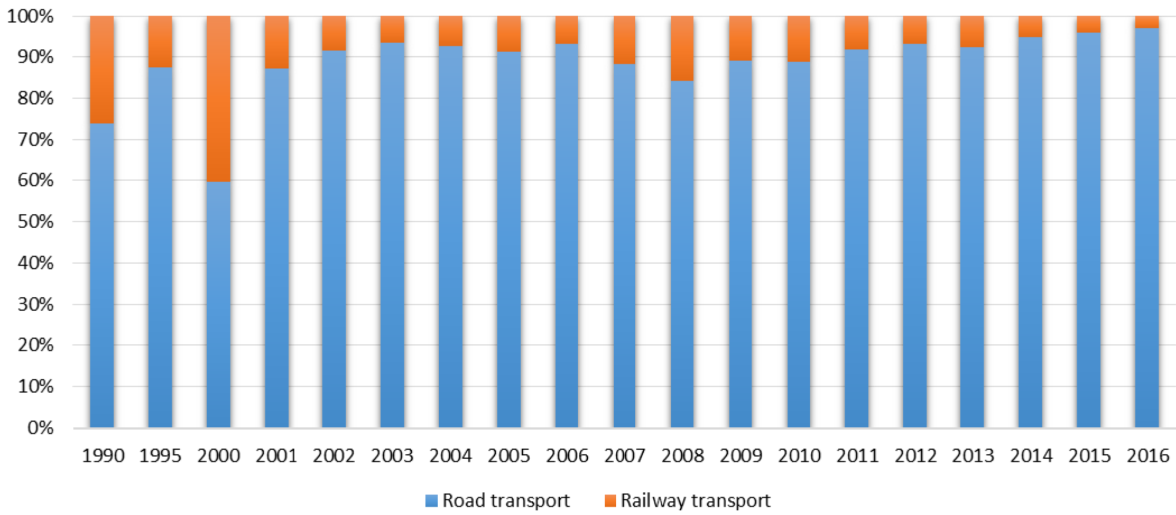
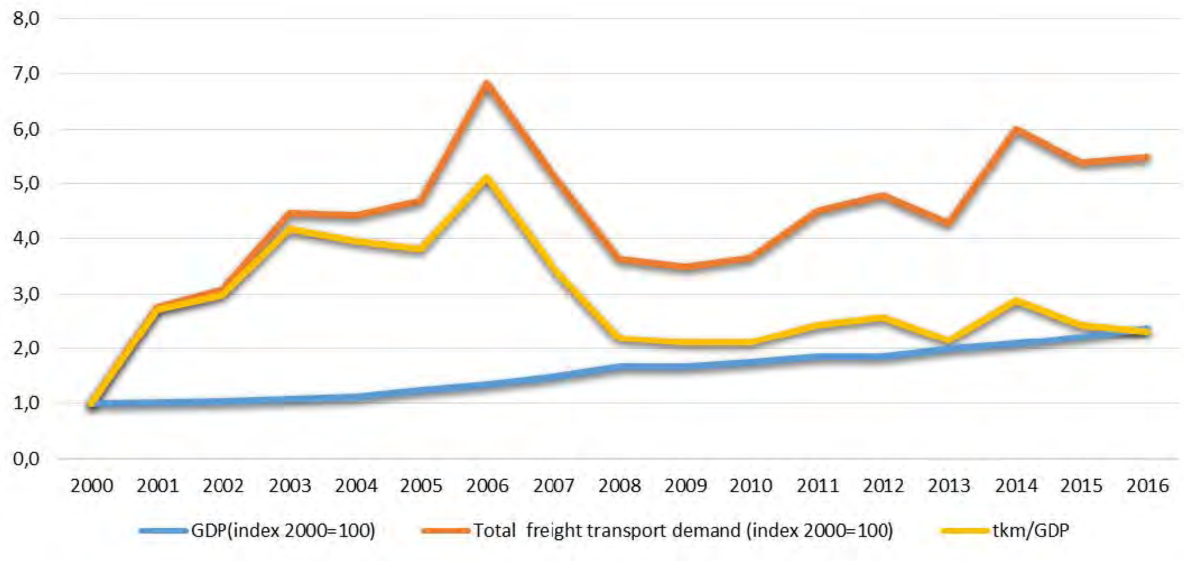


Figure 3: Total freight transport demand/GDP ratio



Data coverage: excel

Data source: State Statistical Office

Assessment

The freight transport demand noted variable trend of increase and decrease during the analyzed period. Figure 2 shows that the highest share in freight transport belongs to road transport ranging between 59.6% (2000) and 96.9% (2016), while railroad freight transport had a share between 3.1% (2016) and 40.4 % (2000) of the total freight transport demand. The share of railroad in the total freight transport, after the positive trend in 2013 reaching 7.6%, noted decline in 2016 with a share of 3.1% or reduction by 59.2% which will increase the negative impact of transport on the environment.

The above is sufficient indication that the indicator should endeavour towards reduction of road transport in favour of other freight transport modes. The reason for this is that the road freight transport uses costly liquid fuels which during combustion on roads cause significant pollution of the environment, air, soil, biodiversity, etc.

Figure 3 shows that the trend of the index of the total freight transport demand relative to GDP had variable trend of increase and decrease, with domination of growing trend in the period from 2000 to 2006, after which there is a changing trend of increase and decrease by 2016. It is indexed on baseline year 2000=100 in order to monitor the changes in the intensity of freight transport demand relative to economic growth expressed through GDP.

Methodology

- Methodology for the indicator calculation

In order to measure the decoupling of freight transport demand from economic growth, the volume (i.e. intensity) of freight transport relative to GDP is calculated. Relative decoupling occurs when the freight transport demand rises at rate lower than the one of the GDP. Absolute decoupling occurs when the freight transport demand falls while GDP rises or remains constant.

The unit used is the tonne-kilometre (tkm), which represents movement of one tonne over a distance of one kilometre.

With regard to EU Member States, according to Regulation on road transport and Regulation (EC) No 91/2003 on railroad transport statistics, data is based on all movements of passenger transport on the national territory.

According to Regulation (EC) No 1172/98, data on freight road transport is based on all movements of vehicles registered in the reporting country. All other data on transport refer mainly to movements on national territory, regardless of the nationality of the vehicle.

Sources of used methodology

Structural indicators of EUROSTAT on transport

State Statistical Office.

Methodological uncertainty and data uncertainty

All data is based on movements on national territory, regardless of the nationality of the vehicle. Methodology of data collection has been harmonized at EU level. Sources include EUROSTAT, National statistical offices, ECMT, UNECE, UIC, DG TREN.

In order to answer the question whether the freight transport demand is decoupling from economic growth, the intensity of freight transport relative to changes in real GDP is considered.

Uncertainty of data sets

In order to obtain full picture of transport demand and corresponding problems in the environment, it would be very useful to supplement data with data on the number of vehicle-kilometers.

Policy relevance of the indicator

List of relevant policy documents

The National Strategy for Transport prepared and adopted by the Government of the Republic of Macedonia determines the main directions of the transport policy development in the Republic of Macedonia through identification of goals and development strategy for road, rail and air transport sectors.

Legal grounds

The road transport is regulated by the Law on Road Transport. It regulates the conditions and the manner of performing transport of passengers and goods in internal and international road transport.

Transportation of dangerous goods is regulated by the Law on Dangerous Goods Transportation in Road and Railroad Transport, regulating the conditions under which transport of dangerous goods shall be performed (preparation of matter, loading, transport, on road procedures, unloading, safety in transportation, vehicles equipment and staff training).

Railroad transportation is regulated by the Law on Railroads, Law on Agreements on Transportation in Railroad Traffic, Law on Agency Regulating Railroad Transport Services Market and Law on Railroad Transport Safety.

Targets

The fourth goal of the National Strategy for Transport is securing sustainable protection of the environment.

Reporting obligation

- EUROSTAT

General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 036	**Freight transport demand**	CSI 036	Freight transport demand	**P**	**B**	▪ Transport ▪ GDP	Monthly Periodically Annualy

MK - NI 054
ROAD MOTOR VEHICLES BY FUEL TYPE

Definition

This indicator defines the number of motor vehicles broken down by road motor vehicle type (passenger cars, buses, good vehicles, work vehicles, motorcycles, road tractors and tractors) and fuel type (gasoline, diesel, mixture, gas oil, electricity) on national level.

Units

- percentage (%).

Key policy question

What is the share of road motor vehicles by fuel type in the total number of road motor vehicles by vehicle type?

Key message

Emissions of polluting substances originate from almost all economic and social activities, and especially emissions from transport, contribute greatly to overall air emissions. Utilization of alternative energy sources, renewable sources, biofuel and natural gas are all primary processes for air quality improvement.

Use of gasoline by cars is the highest, though with falling trend of 27.05% during the analyzed period. At the account of decline in the use of gasoline, use of diesel has recorded increasing trend from 2.3% in 1995 to 45.7% in 2016. Since air born particle emissions are higher in diesel combustion compared to petrol combustion, this trend of increased diesel consumption has negative impact to human health. Other types of fuel have very low share with growing trend and range from 0.5% in 1995 to 2.9% in 2016.

With other types of vehicles – buses, goods vehicles, work vehicles, road tractors and tractors - diesel is dominant type of fuel with growing trend, followed by gasoline, except for motorcycles where the dominant type of fuel is gasoline.. Other types of fuel have very low share with growing trend.

Figure 1. Share of passenger cars by fuel type in the total number of passenger cars

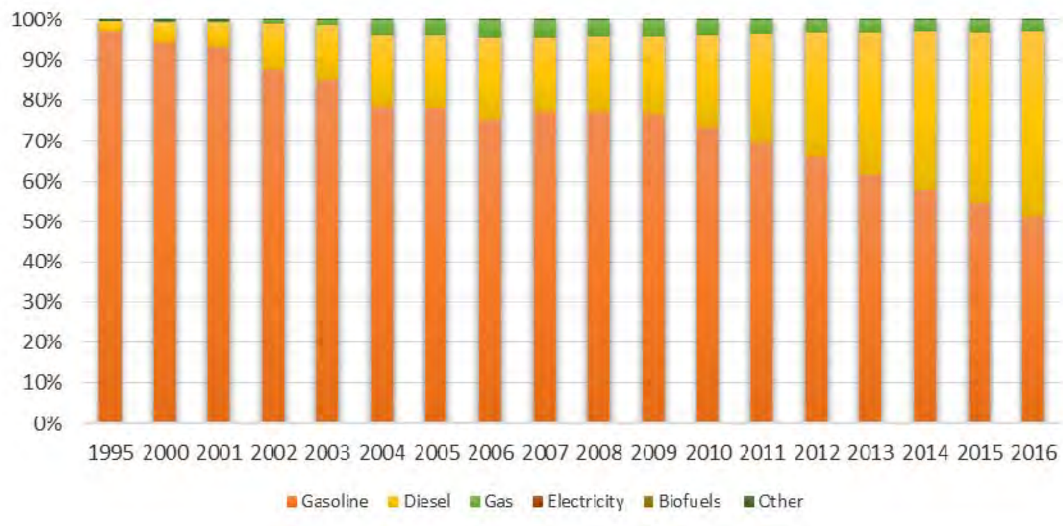


Figure 2. Share of buses by fuel type in the total number of buses

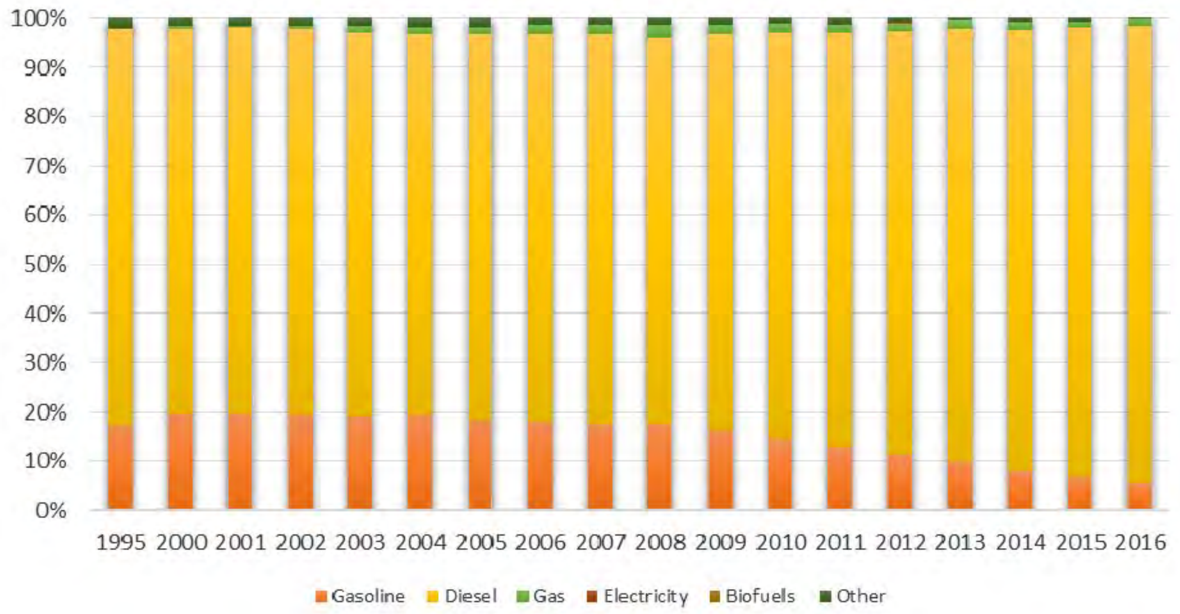


Figure 3. Share of goods vehicles by fuel type in the total number of goods vehicles

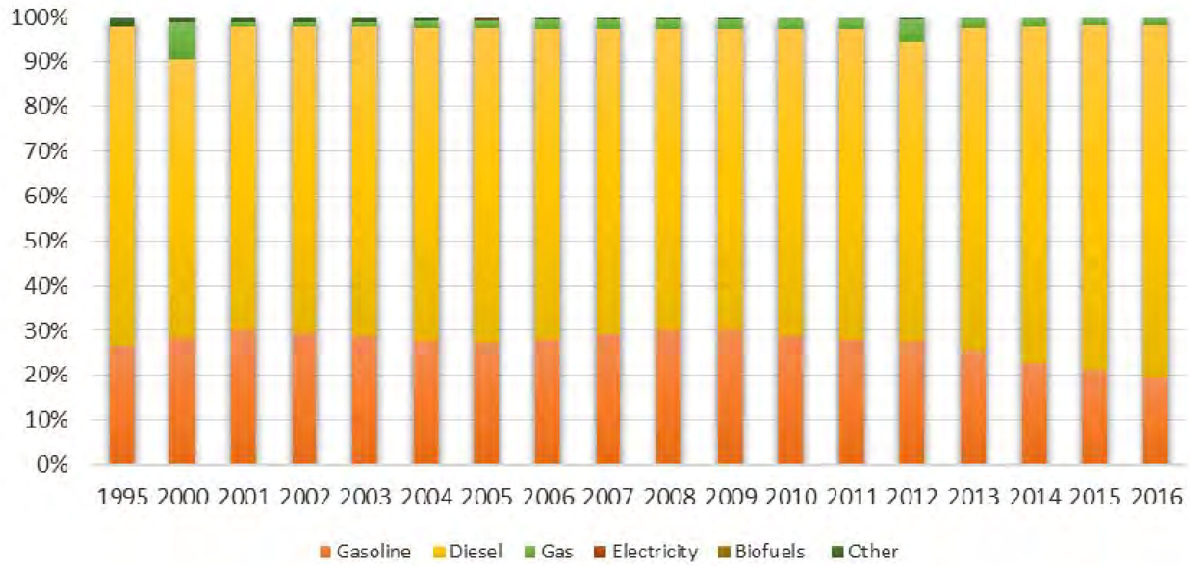


Figure 4. Share of work vehicles by fuel type in the total number of work vehicles

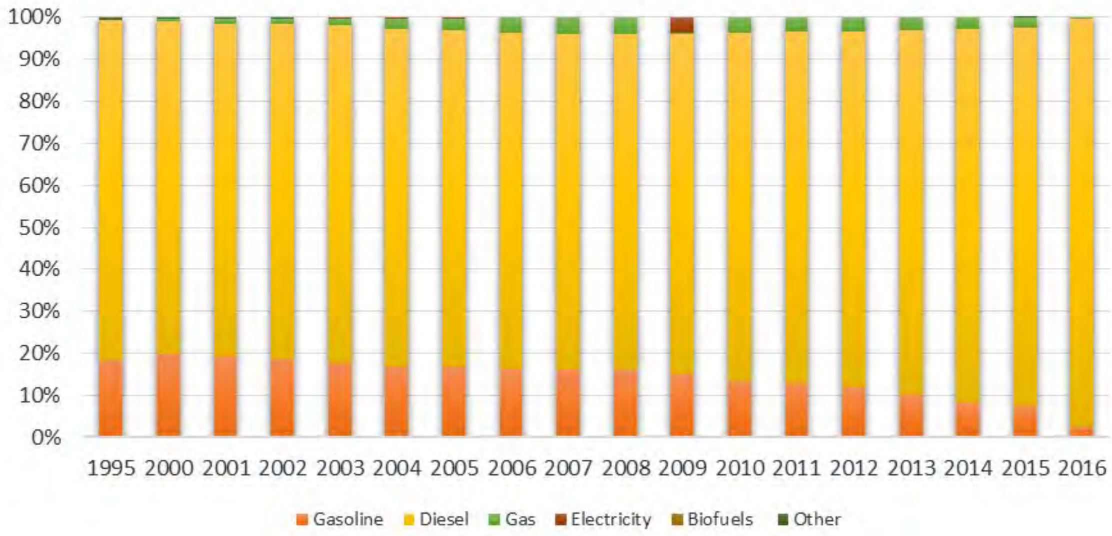


Figure 5. Share of motorcycles by fuel type in the total number of motorcycles

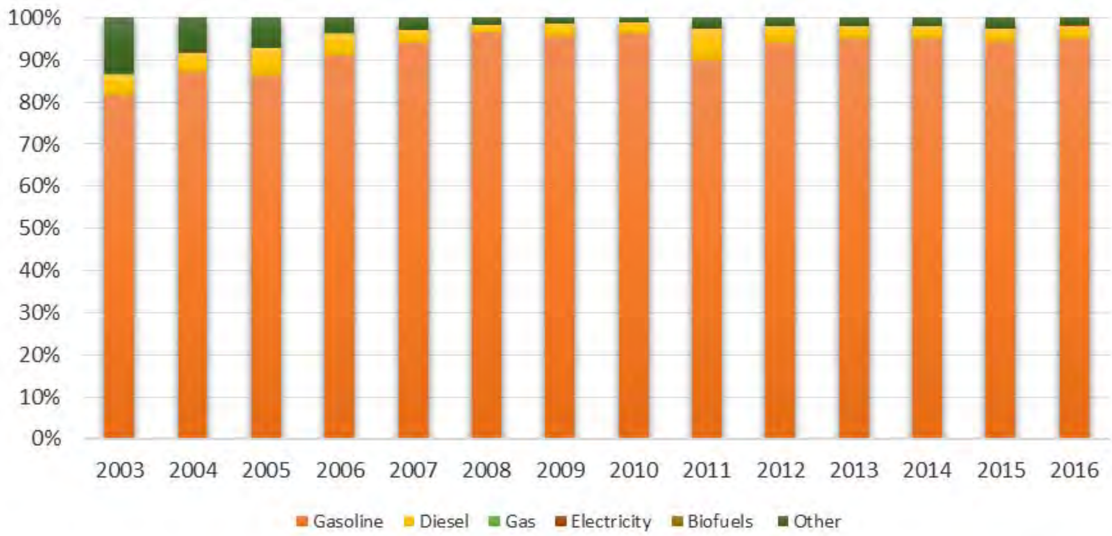


Figure 6. Share of road tractors by fuel type in the total number of road tractors

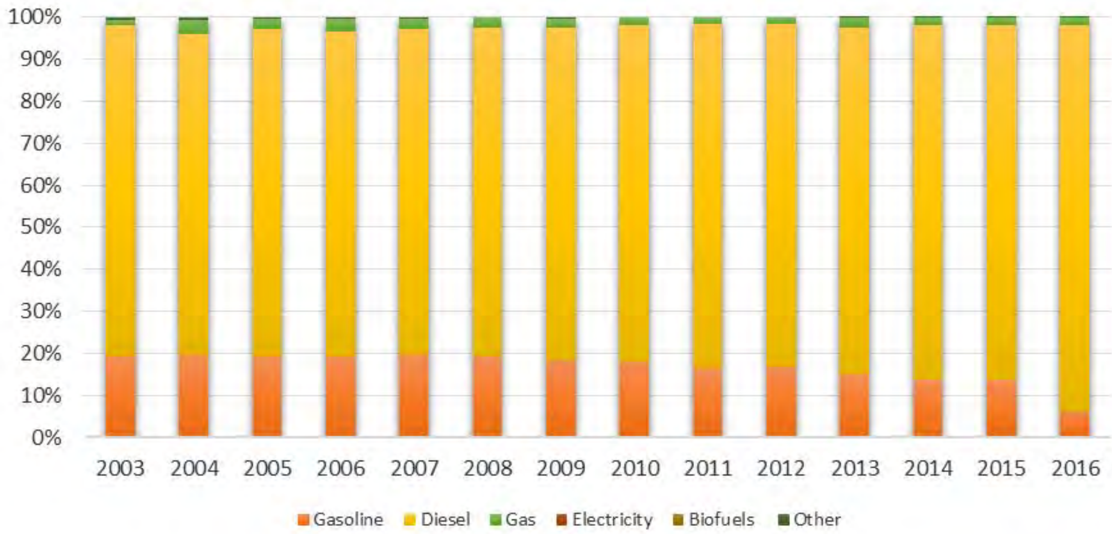
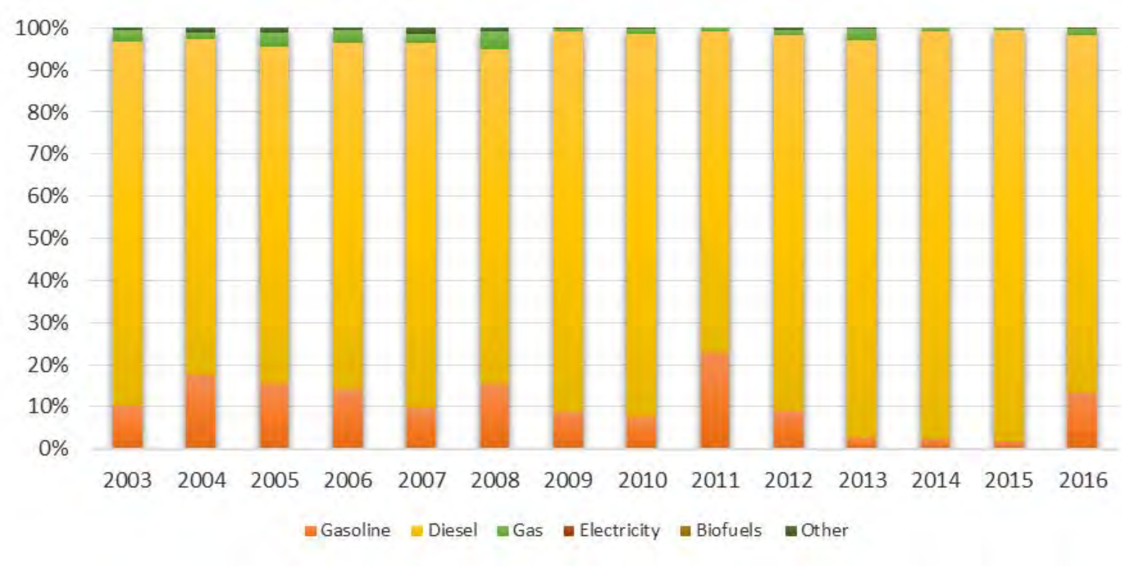


Figure 7. Share of tractors by fuel type in the total number of tractors



Data coverage: **excel**

Data source: State Statistical Office, Ministry of Interior

Assessment

Emissions of polluting substances originate from almost all economic and social activities, and especially emissions from transport, contribute greatly to overall air emissions. Policies and strategies for air pollution reduction are aimed primarily at reducing emissions from transport (combustion of fossil fuels in vehicles). Utilization of alternative energy sources, renewable sources, biofuel and natural gas are all primary processes for air quality improvement.

Data during the reporting period indicate that use of gasoline in cars was the biggest, though with falling trend. In 1995, 97.2% of the cars used gasoline to fall at 51.3% of the cars in 2016. At the account of decline in the use of gasoline, use of diesel has recorded increasing trend from 2.3% in 1995 to 45.7% in 2016, which does not assume improvement in terms of environment protection and reduction of air emissions. Other types of fuel have very low share with growing trend and range from 0.5% in 1995 to 2.9% in 2016. The use of gas increased by 1160 times from 1995 to 2016.

With other types of vehicles – buses, good vehicles, work vehicles, road tractors and tractors - diesel is dominant type of fuel with growing trend, followed by gasoline, except for motorcycles where the dominant type of fuel is gasoline.

Use of diesel in motor coaches and buses recorded increase from 45.85% by 2016, and gasoline recorded drop from 59.1% during the analyzed period. Other types of fuel have very low share in the overall use of fuels ranging between 0.3% and 2.0%.

As far as trucks are concerned, use of diesel has almost constant share during the whole period, ranging between 67.2% and 78.2%; the same accounts for the use of gasoline with a range between 19.3% and 30.1%. Gas noted variable trend of use with the greatest share of 8.1% in 2005 followed by drop during the entire analyzed period, recording 1.6% in 2016. Other types of fuel have very low share and range between 2.0% and 0.1%.

With trailers, as with motor coaches and buses, use of diesel was the biggest with increase of 9.7% by 2016, while gasoline recorded decrease of 89.4% by 2016. Other types of fuel have very low share and range between 0.01% and 0.17%.

Methodology

- Methodology for the indicator calculation

Data for the indicator is obtained from the number of road motor vehicles by fuel type and total number of road motor vehicles by type of motor vehicles and is calculated as share of the number of road motor vehicles by fuel type in the total number of road motor vehicles by type of motor vehicles. The sum of the shares (%) of all types of road motor vehicles by fuel should amount 100 (%), relative to total number of road motor vehicles by type of motor vehicles.

Policy relevance of the indicator

List of relevant policy documents

National Strategy for Transport prepared and adopted by the Government of the Republic of Macedonia determines the main directions of transport policy development in the Republic of Macedonia through identification of targets and strategy for development of road, railroad and air transport sector.

Legal grounds

- Law on Road Transport (Official Gazette of RM no. 68/04, 127/06, 114/09, 83/10, 140/10, 17/11, 6/12, 23/13, 120/13, 163/13, 187/13, 42/14, 112/14, 166/14, 44/15, 97/15,124/15, 129/15, 193/15, 37/16 and 71/16)
- Law on Transport of Hazardous Matters in Road and Railroad Transport (Official Gazette of RM no. 92/07, 161/09, 17/11, 54/11, 13/13, 163/13, 38/14, 166/14, 116/15, 193/15 and 31/16)
- Law on State Statistics (Official Gazette of RM no. 54/97, 21/07 , 51/11 , 104/13, 42/14, 192/15 and 27/16)
- Law on Road Transport Safety (Official Gazette of RM no. 169/15, 226/15, 55/16 and 11/18)

Target

The fourth target of the National Strategy for Transport is securing of sustainable protection of the environment.

Reporting obligation

- EUROSTAT

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 054	**Road motor vehicles by fuel type**			**D**	**A**	Transport Energy	Monthly Periodically Annually

MK-NI 055
AVERAGE AGE OF ROAD MOTOR VEHICLES

Definition

This indicator classifies road motor vehicles by motor vehicle type (passenger car, buses, good wehicles and road tractors) and average age on country level.

Units

- percentage (%).

Key policy question

Has the vehicle fleet resulted in decreased average age of vehicles?

Key message

Data for the reporting period on all vehicle categories indicates that vehicles aged above 10 years have the highest share in the overall number of vehicles.

The average age of passenger cars has increasing trend ranging between 14.43 and 18.36 years, buses have variable trend of decrease and increase ranging between 20 and 15.3 years. The average age of good wehicles has decreasing trend by 2011, followed by increase by 2016 and ranges between 16 and 14.71 years. For road tractors, the average age has significant decreasing trend in the period from 2001 to 2016, ranging at 16,12 and 12.01 years.

Figure 1. Share of passenger cars by average vehicle age in the overall number of passenger cars

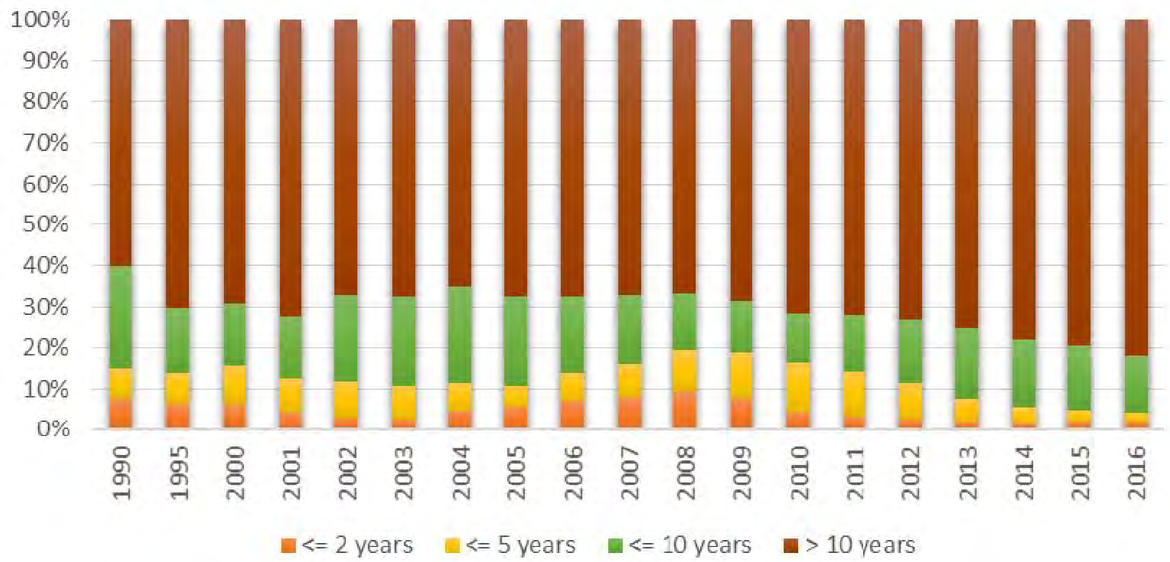


Figure 2. Share of buses by average vehicle age in the overall number of buses

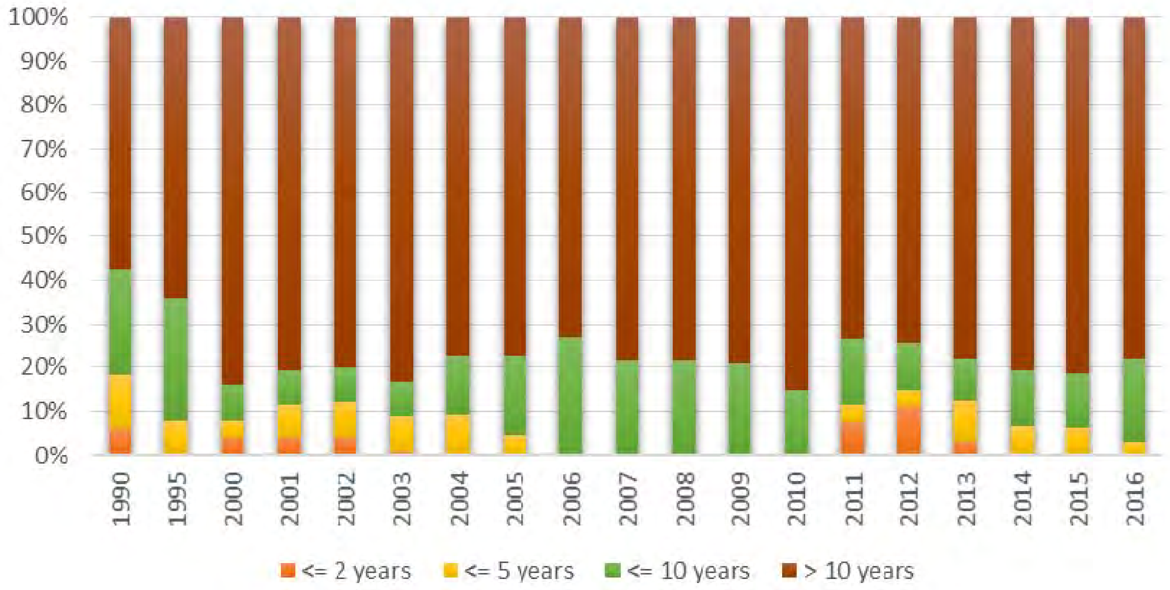


Figure 3. Share of good wehicles by average vehicle age in the overall number of good wehicles

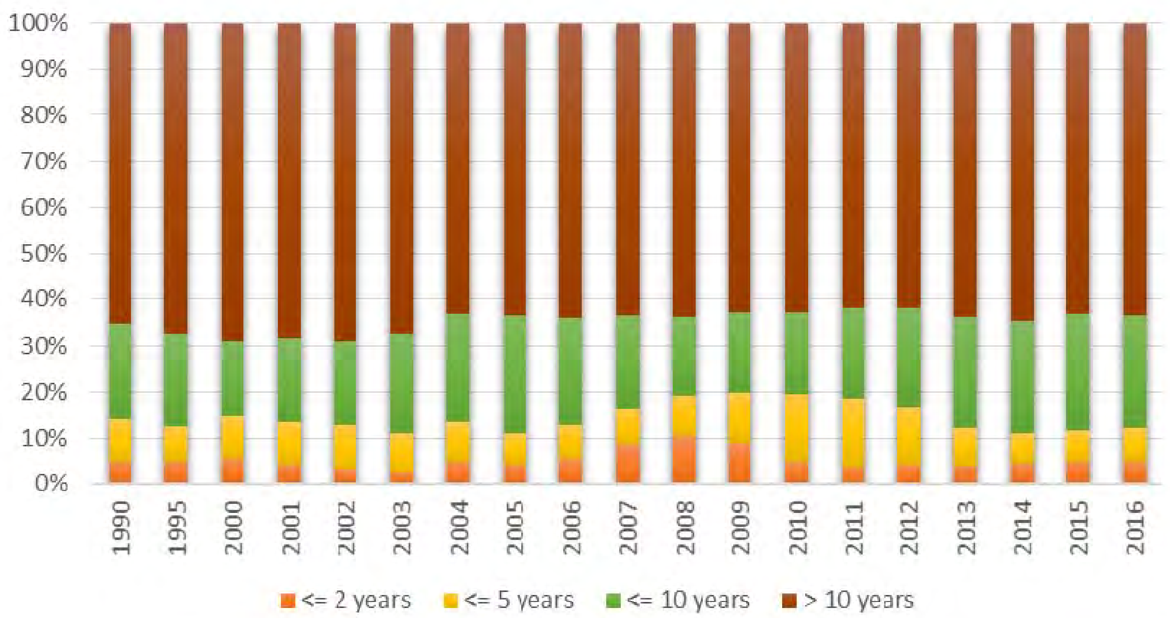


Figure 4. Share of road tractors by average vehicle age in the overall number of road tractors

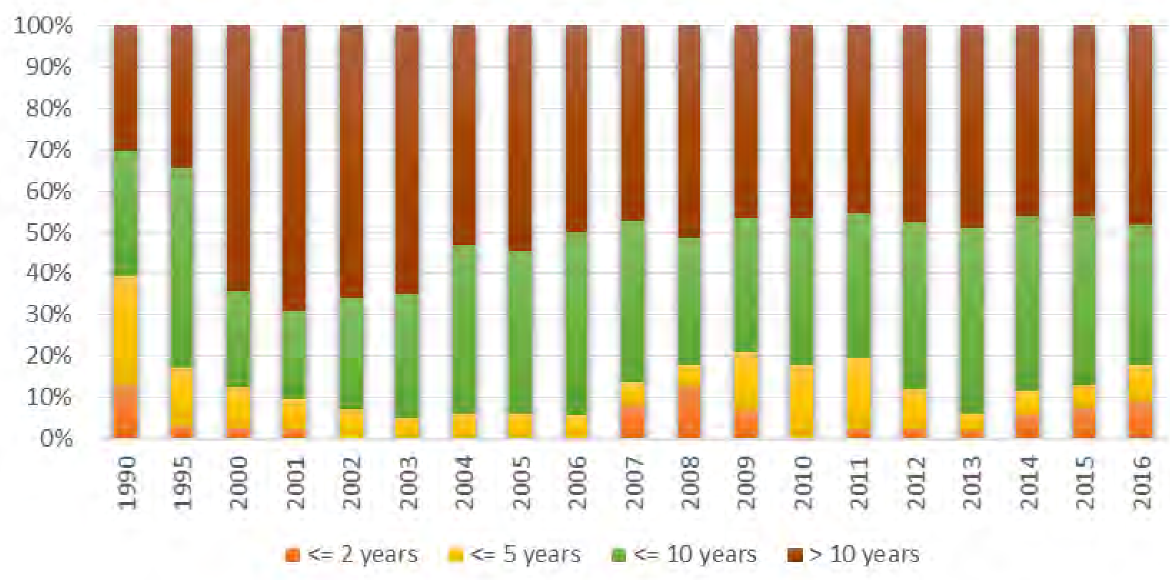
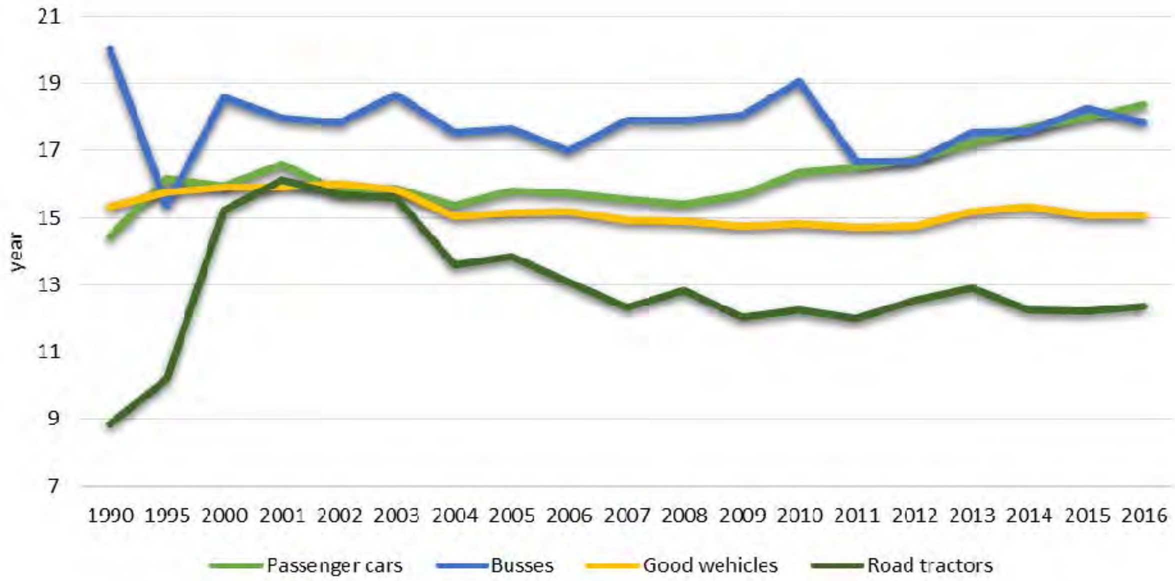


Figure 5. Average vehicle age



Data coverage: **excel**

Data source: State Statistical Office, Ministry of Interior

Assessment

Emissions of transport have great contribution to overall air emissions. Therefore, it is very important to renew vehicle fleet. Data for the reporting period on all vehicle categories indicates that the number of vehicles noted increase, but unfortunately vehicles aged above 10 years have the highest share in the overall number of vehicles which reflects old vehicle fleet with great influence of the total emissions of pollutants in the air.

The average age of passenger cars has increasing trend ranging between 14.43 and 18.36 years, buses have variable trend of decrease and increase ranging between 20 and 15.3 years. The average age of good wehicles had decreasing trend by 2011 followed with increase by 2016 and ranges between 16 and 14.71 years. For road tractors, the average age has significant decreasing trend in the period from 2001 to 2016 ranging between 16,12 and 12.01 years

With regard to passenger cars, the share in the overall number of vehicles in 2016, compared to 1990, aged above 10 years had increasing trend by 132.4%, vehicles aged from 5 to 10 years had decreasing trend by 3.51%, vehicles aged from 2 to 5 years were in decrease by 41.2% and vehicles aged up to 2 years had a trend of decrease by 61.1%.

The share in the overall number of buses in 2016 compared to 1990, of buses aged above 10 years had increasing trend by 31.6%, buses aged between 5 and 10 years had decreasing trend by 25%, buses aged between 2 and 5 years had variable trend ranging between 0% and 12.1% and vehicles aged up to 2 years had variable trend ranging between 0% and 11.1%.

With good wehicles during the reporting period, the share in the overall number of good wehicles aged above 10 years had increasing trend by 65.4%, good wehicles aged between 5 and 10 years had increasing trend by 100%, good wehicles aged between 2 and 5 years had increasing trend by 36.8% and good wehicles aged up to 2 years had increasing trend by 70%.

The share in the overall number of road tractors in 2016 compared to 1990, of road tractors aged above 10 years had increasing trend of 3.86 time, road tractors aged between 5 and 10 years had variable trend and ranged between 21.4% and 48.6%, road tractors aged between 2 and 5 years had decreasing trend by 16.67% and vehicles aged up to 2 years had variable trend ranging between 0% and 13%.

Methodology

- Methodology for the indicator calculation

Data for the indicator is obtained from the number of road motor vehicles by type and year of manufacturing, prepared by age groups and is calculated as share of the number of road motor vehicles by type. The sum of the shares (%) of all types of road motor vehicles by age groups should amount 100 (%), relative to total number of road motor vehicles by type of motor vehicles by age groups.

Policy relevance of the indicator

List of relevant policy documents

National Strategy for Transport prepared and adopted by the Government of the Republic of Macedonia determines the main directions of transport policy development in the Republic of Macedonia through identification of targets and strategy for development of road, railroad and air transport sector.

Legal grounds

- Law on Road Transport (Official Gazette of RM no. 68/04, 127/06, 114/09, 83/10, 140/10, 17/11, 6/12, 23/13, 120/13, 163/13, 187/13, 42/14, 112/14, 166/14, 44/15, 97/15,124/15, 129/15, 193/15, 37/16 and 71/16)
- Law on Transport of Hazardous Matters in Road and Railroad Transport (Official Gazette of RM no. 92/07, 161/09, 17/11, 54/11, 13/13, 163/13, 38/14, 166/14, 116/15, 193/15 and 31/16)
- Law on State Statistics (Official Gazette of RM no. 54/97, 21/07 , 51/11 , 104/13, 42/14, 192/15 and 27/16)
- Law on Road Transport Safety (Official Gazette of RM no. 169/15, 226/15, 55/16 and 11/18)

Target

The fourth target of the National Strategy for Transport is securing of sustainable protection of the environment.

Reporting obligation

- EUROSTAT

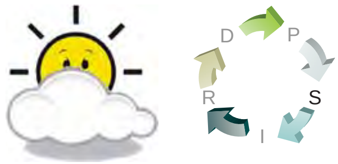
General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 055	**Average age of road motor vehicles**	TERM 033	Average age of the vehicle fleet	**D**	**A**	Transport	Monthly Periodically Annually


HEALTH

МК – НИ 046

MORTALITY FROM TRAFFIC ACCIDSENTS WITH CHILDREN AND YOUNG PEOPLE



Definition

The indicator shows the mortality rate from traffic accidents for children aged 0 - 14 years and young people aged 15 - 24, the trend in a given period and comparison of data on European Region and policy relevance related thereto.

Units

- Number of deaths per 100 000 children aged 0 - 14 years or per 100 000 young people aged 15 - 24 years, respectively.

Key policy issue

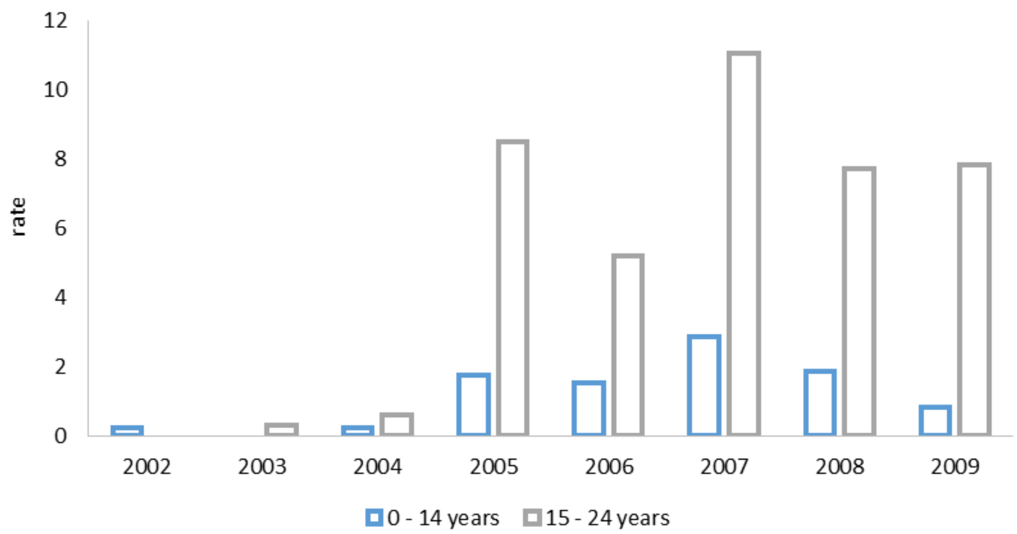
What steps have been taken to reduce or prevent the increase of the mortality rate from traffic accidents with vulnerable groups like children and young people?

What cross-sectoral policies have been implemented to reduce the number of traffic accidents for the general population and especially children population, as it appears that this population is the most sensitive and exposure in childhood results in consequences at later age?

Key message

The mortality rate for children and young people is lower in our country compared to specific mortality rates in other European countries like Greece, Spain, France, Germany. Nevertheless, this rate is sufficient to indicate the need for introduction of intervention programmes as part of cross-sectoral policies.

Figure 1. Mortality from traffic accidents, rate at 100 000, age 0-14 and 15-24 years



Data coverage: excel

Source: State Statistical Office

Assessment

The mortality rate for children aged 0-14 years and young peopleaged 15-24 has been relatively stable in the period 2002 to 2004, with significant rise in 2005. The rise in the rate in 2005 could as well reflect the improved system of causes of death reporting. The period 2005 to 2009 was characterized with variable trend of mortality rate reduction and increase.

Methodology

- Methodology for the indicator calculation

The indicator mortality from traffic accidents (800 and 848) is calculated as rate of deaths attributable to traffic accidents involving persons aged 0 - 14 years and aged 15 - 24 years per 100 000 residents from among the said age groups.

Policy relevance of the indicator

List of relevant policy documents

The National Children and Environment Protection Action Plan which presents the current health profile of children in the country defines the existing environmental health risks for children for the purpose of their protection against accidents and trauma.

The Gudiebook - Planning of Children's Protection against Hazards – Regional Priority Goal II reads: "We aim to prevent and significantly reduce health consequences from accidents and injuries and pursue a decrease in morbidity from lack of adequate physical activity, by promoting safe, secure, and supportive human settlements for all children".

Legal grounds

The Law on Traffic Safety at Roads - This Law regulates the safety and protection on roads; traffic rules on roads and the system of traffic signs and equipment; obligations in case of traffic accident; conditions for acquiring the right to drive a vehicle; candidates training for drivers; driving examination taking and checking of driver's ability; checking of vehicles, devices and equipment that are compulsory for the vehicles; dimensions, total mass; axial loading of vehicles and conditions that shall be met by vehicles in traffic; technical check-ups of vehicles; special safety measures; organization and tasks of the safety at roads councils, as well as misdemeanour sanctions and misdemeanour procedure administered with regard to misdemeanours in the field of traffic at road.

Targets

To reduce the mortality rate from traffic accidents with children and young people populations through appropriate intervention programmes.

Reporting obligation

- Every doctor stating death is obliged to fill in the reporting list on the death event, stating the causes for the death and then such data is collected in the national database of the

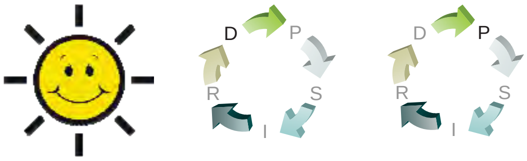
General metadata

Code	Title of the indicator	Compliance with CSI/EEA or other indicators		Classification by **DPSIR**	Type	Linkage with area	Frequency of publication
MK NI 046	Mortality from traffic accidents in children and young people	ENHIS Traf_E1	Mortality from traffic accidents	**S**	A	Health Transport Local self-government Physical planning	Annually

TOURISM

MK – NI 047-1

TOURISM INTENSITY IN THE REPUBLIC OF MACEDONIA



1 International tourist intensity

Definition

The indicator shows the total number of foreign tourists by years at country level and by statistical regions and structure of visitors by country of origin.

Units

- Number

Key policy issue

Does the number of tourists in the Republic of Macedonia have development dimension?

Key message

With regard to international tourist visits, the total number of foreign tourists during the analyzed period has had development nature or a rising trend of 5.2 times in 2017 compared to 1997.

Turkey contributes significantly to the number of tourists in Macedonia with 668.635 tourists during the observed period. By statistical regions, the highest number of foreign tourists was recorded in Skopje and Southwestern regions. With regard to foreign tourist arrivals by types of resorts, the highest number of tourists was recorded in Skopje amounting 1.991.328, and the lowest in spa resorts with 55.342 tourists.

Considering that tourism is organized activity, it is necessary to monitor these parameters and activate organizations structures in environment protection and improvement through timely interventions and planning activities.

Figure 1. Total number of foreign tourists

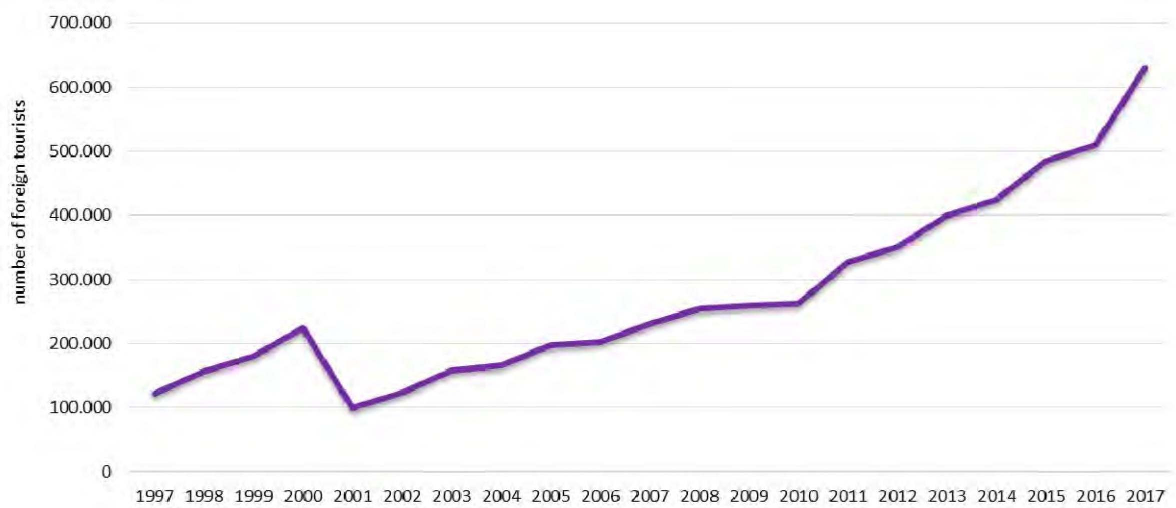


Figure 2. Total number of foreign tourists by country of origin in the reporting period

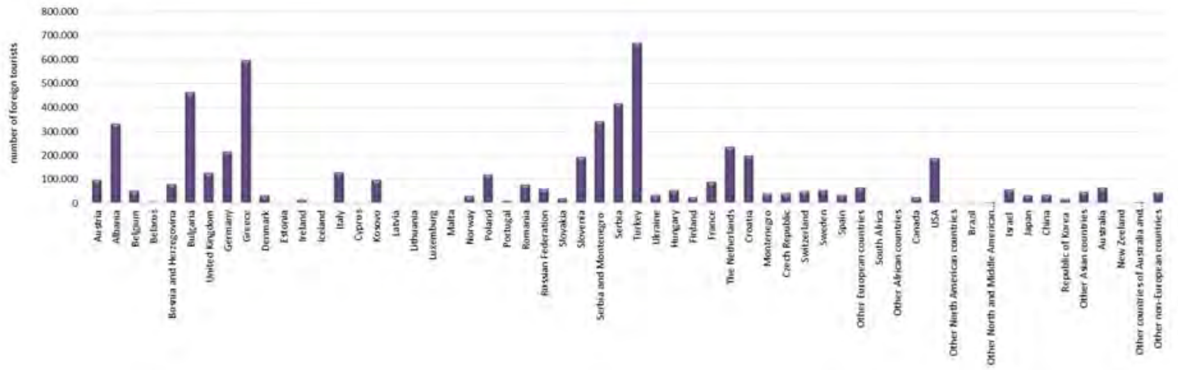


Figure 3. Countries with significant share in the number of foreign tourists

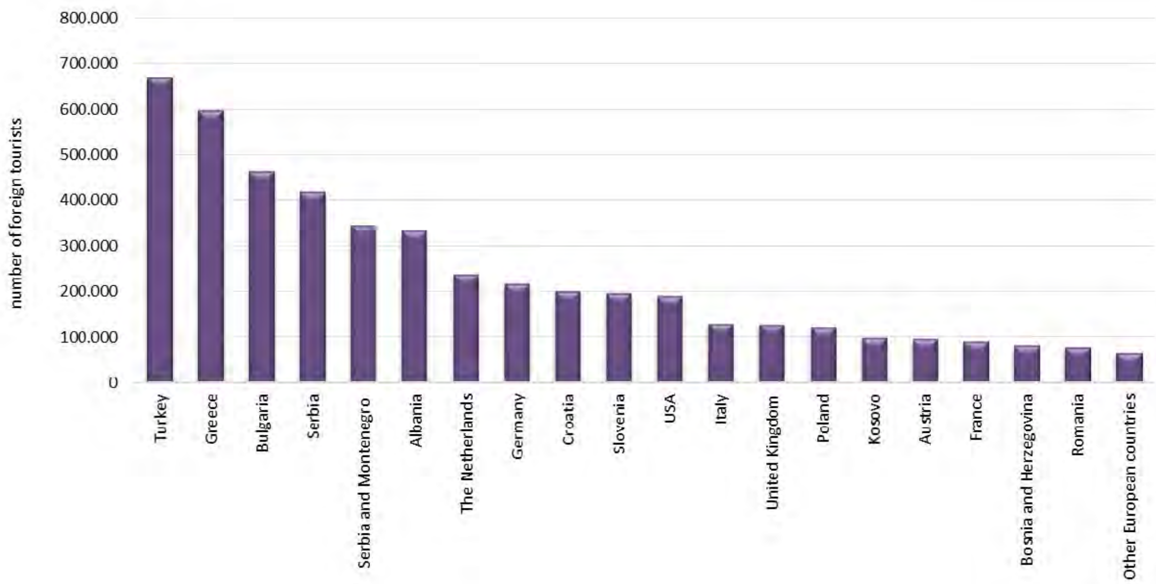


Figure 4. Foreign tourists arrivals by statistical regions

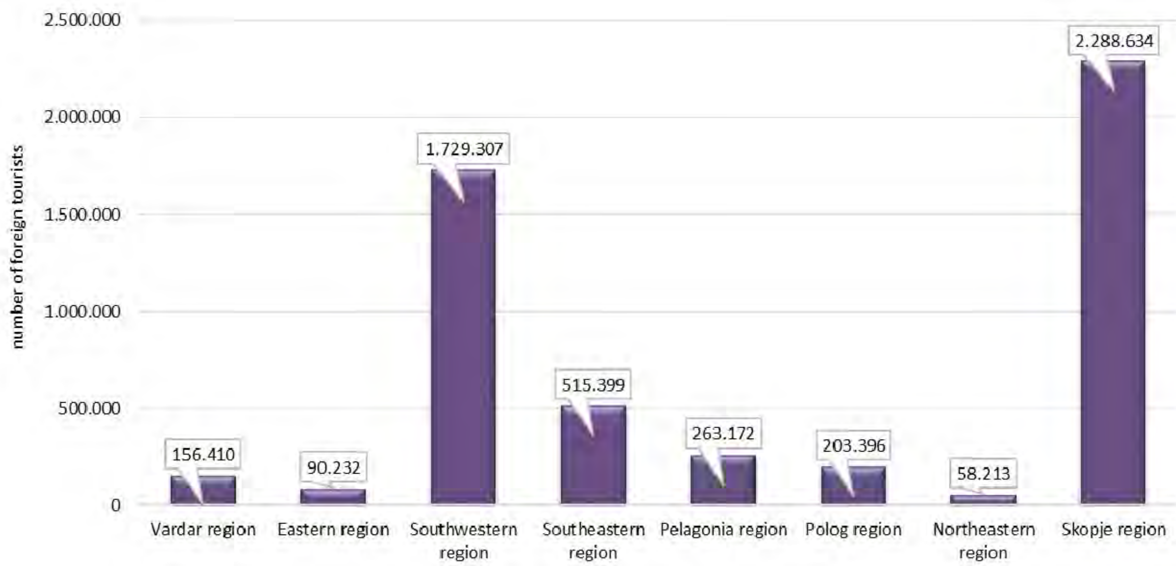
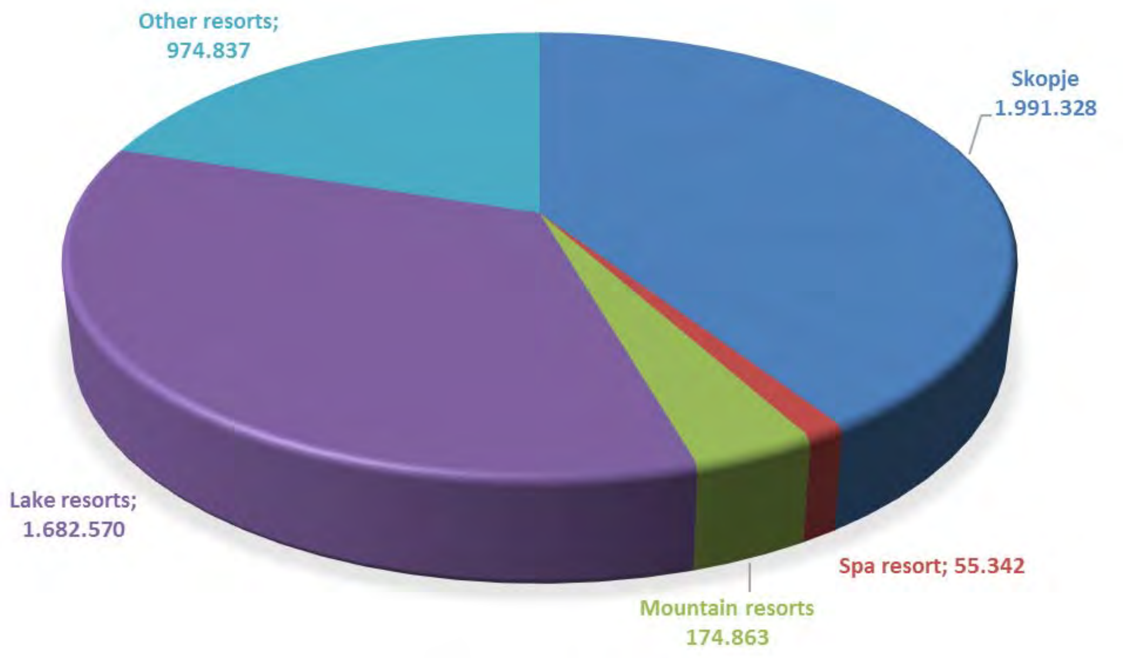


Figure 5. Foreign tourists arrivals by types of resorts in the period from 2003 to 2017



Data coverage: excel

Data source: State Statistical Office

Assessment

Data in the Figure indicates that the Republic of Macedonia is visited by a high number of countries. Tourists from Europe, Northern America, Asia and Australia prevail. The structure of visits during the observed period is dominated by tourists from the immediate neighborhood. Leading position among the first twenty counties making significant share in the overall number of foreign tourists belongs to tourists from Greece, Bulgaria, Serbia and Montenegro, Turkey, Albania and Serbia, while the highest number of tourists from among other continents comes from United States of America. Development of attractive and receptive base of the Republic of Macedonia should enable greater presence of tourists from Western European countries having longer tourism tradition and thus higher tourist culture level. Of the Western European countries, a significant rising trend of 23 times, in 2017, compared to 1997, has seen tourists from the Malta. The number of foreign tourists has notable rising trend from 121.337 tourists in 1997 to 630.594 tourists in 2017, which is an increase of 5.2 times. In the reporting period, Turkey has had the highest share with 11.6% or 668.635 tourists, while South Africa has had the lowest share with 0.014% or 851 tourist of the total number of foreign tourists in Macedonia.

According to regional distribution, Skopje region with 2.288.634 tourists and Southwestern region with 1.729.309 tourists area leading regional centers for tourists, representing two differentiated regions of different characteristics. Southwestern region is dominated by resource attractiveness, while Skopje region by business activity possibilities. Other regions possess alternative possibilities deriving from different environments and therefore it is important to monitor the intensity of foreign tourist visits with a view to redistribute the intensity of visits.

With reference to foreign tourists arrivals by types of resorts, Skopje has had the highest share in the total number of tourists with 40.81%, followed by lake resorts with 34,49%, other resorts with a share of 19.98%, mountain resorts with a share of 3.58% and the lowest share belongs to spa resorts with 1.13% of the total number of tourists.

Methodology

- Methodology for the indicator calculation

The data on tourists have been obtained on the basis of the regular monthly reports of catering and other business entities providing services of accommodation to tourists or act as intermediaries in the provision of these services. Guest books kept by business operators as a legal obligation are sources of data.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2009 – 2013 (revised in 2015)**
- **National Environmental Action Plan - 2** - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
- **Spatial Plan of the Republic of Macedonia** – in its Chapter 5.4. "Tourism development and organization of tourist areas", defines the status, objectives and planning determinations for tourism development.
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- **Strategy for Biological Diversity Protection in the Republic of Macedonia with Action Plan** – under measure C.5 "Stimulation of traditional use of biological diversity and eco-tourism", defines the action for identification of sites suitable for eco-tourism.

Legal grounds

The Law on Tourist Activity specifies the conditions and the manner of performing tourist activity (Chapter 15 Services in rural, ethno and eco-tourism), Law on Catering Activity.

The Law on Environment, the Law on Nature Protection, the Law on Waste Management, the Law on Ambient Air Quality and the **Law on Waters** regulate partially the requirements for environmental protection in tourist activity.

Targets

- Integration of the principles of sustainable development and environmental considerations in tourist sector
- Identification of areas of priority importance for tourism development
- Encouragement of exchange of best practices between public and private tourist interests
- Protection of natural heritage and biological diversity in tourist resorts

- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environmnet
- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.

Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

Reporting obligation

- Yearly to EUROSTAT
- World Tourist Organization (WTO)
- Annual tourist review of tourism and other services
- Five-year interview of foreign tourists in accommodation establishments

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 047 - 1	Tourism intensity in the Republic of Macedonia	TOUR 12	Tourism intensity	**D, P**	A	Biological diversity Nature Policies Waste Water Air Transport Soil	Yearly Every five years

MK – NI 047-2

TOURISM INTENSITY IN THE REPUBLIC OF MACEDONIA

2 Overnights of foreign tourists

Definition

The indicator shows the total number of overnights of foreign tourists by years at country level and by statistical regions. Also, it shows the structure of overnights and average stay of tourists by country of origin.

Units

- Number

Key policy issue

What is the trend of overnights of foreign tourists in the Republic of Macedonia?

Key message

With regard to international tourist visits, the overnights of foreign tourists during the analyzed period have had rising trend of 4.9 times in 2017 compared to 1997 year.

The Netherlands had significant share in the overnights of foreign tourists in Macedonia during the analyzed period with 4.59 days average stay of tourists. By statistical regions, the highest number of overnights was recorded in Southwestern and Skopje regions. With regard to overnights of foreign tourists by types of resorts, the highest number of overnights was recorded in lake resorts with 4.439.473 overnights, and the lowest number in spa resorts with 335.625 overnights.

Figure 1. Total number of overnights by foreign tourists

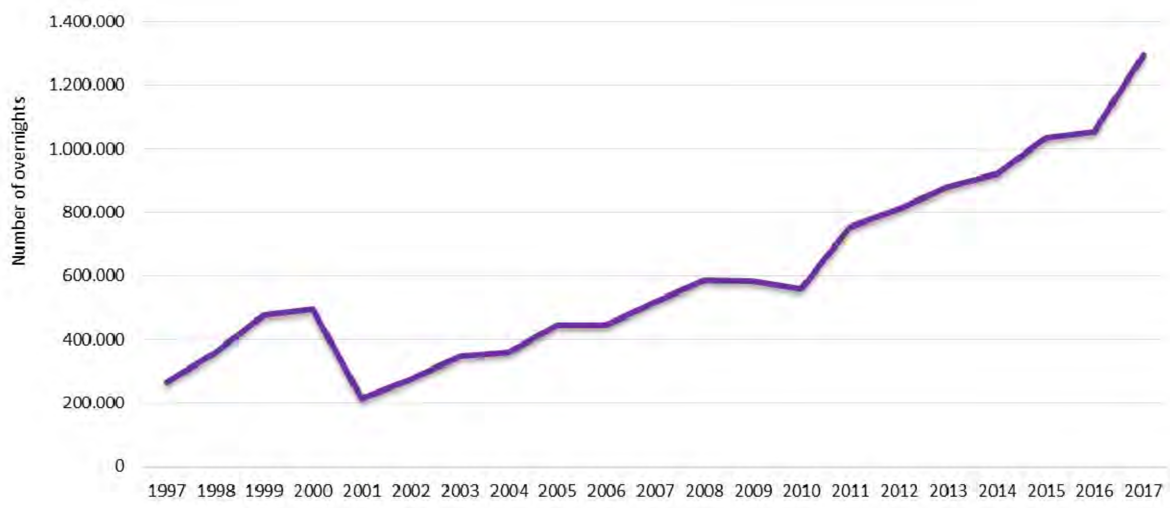


Figure 2. Total number of overnights and average stay by foreign tourists by country of origin

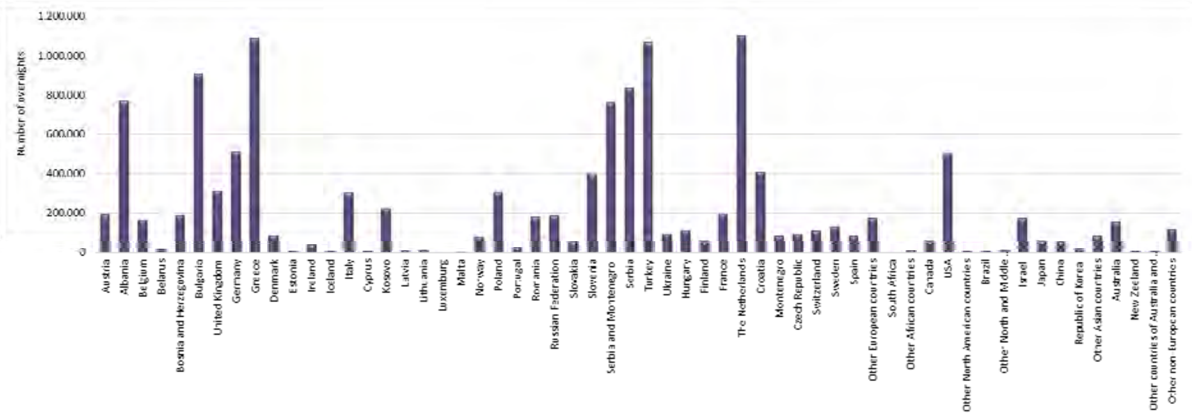


Figure 3. Countries with significant share in the average stay of foreign tourists

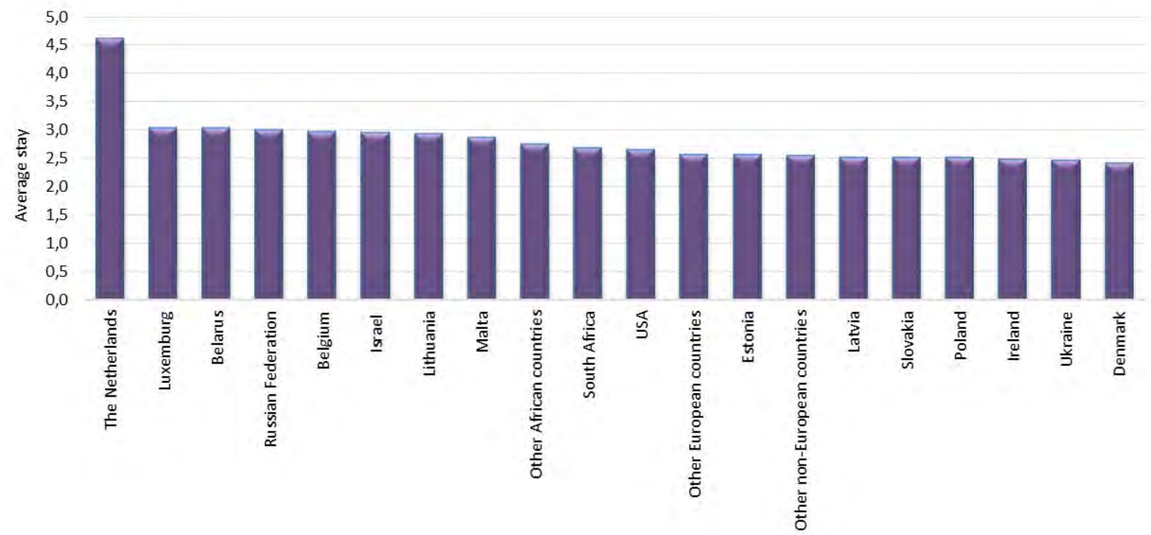


Figure 4. Overnights by foreign tourists by statistical regions

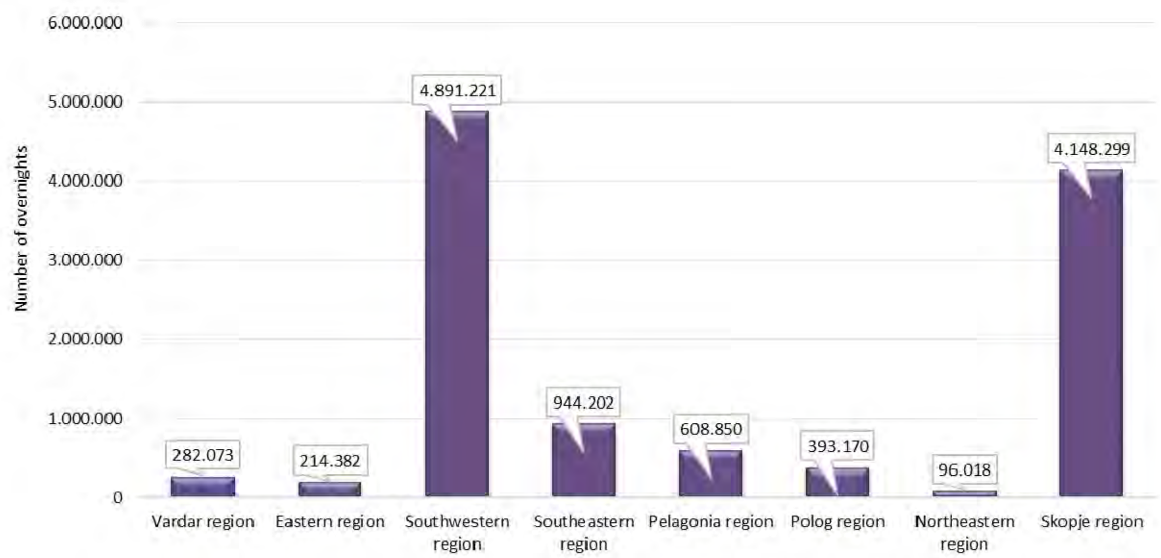
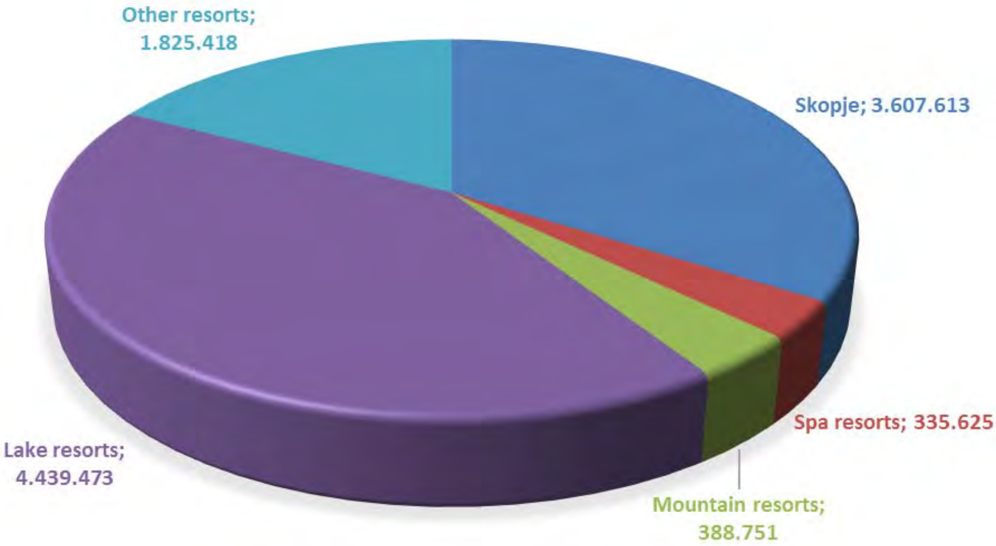


Figure 5. Overnights by foreign tourists by types of resorts in the period from 2003 to 2017



Data coverage: excel

Data source: State Statistical Office

Assessment

Overnights parallel the intensity of visits by foreign tourists in the Republic of Macedonia. Summarized results indicated that the highest number overnights was accomplished by tourists from European countries, with The Netherlands having the highest share in the average stay of tourists with 4.59 days. From among other continents, tourists from Other African countries had the longest average stay with 2.75 days. Observation of the trends enables us to follow the extent to which the attractiveness of the environment is adjusted to the demands of these visitors.

Regional distribution of accomplished foreign overnights indicates that tourists in Southwestern region have accomplished highest number of overnights, followed by Skopje region, which is unfavorable circumstance in the context of foreign tourist visits as the visits take place mainly in urban environments. Observation of relations within regional distribution of overnights accomplished by foreign tourists enables considerations of measures undertaken towards accomplishment of overnights in other regions with specific values.

The average number of foreign tourists provides the opportunity to monitor the level of prevalence of the characteristics of environment. The Figure indicates that foreign tourists stay for relatively short time in the Republic of Macedonia. This duration is around 2.20 days at an average during the analyzed period which reflects significant lagging behind the average stay by national tourists which is 4.56 days.

With regard to overnights of foreign tourists by types of resorts, the highest share in the overall number of overnights is recorded in lake resorts with 41.89%, followed by Skopje with 34.04%, other resorts with a share of 17.23%, mountain resorts with a share of 3.66% and the lowest share belongs to spa resorts with 3.16% in the total number of overnights.

Methodology

- Methodology for the indicator calculation

The data on tourists have been obtained on the basis of the regular monthly reports of catering and other business entities providing services of accommodation to tourists or act as intermediaries in the provision of these services. Guest books kept by business operators as a legal obligation are sources of data.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2009 – 2013 (revised in 2015).**
- **National Environmental Action Plan - 2** - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
- **Spatial Plan of the Republic of Macedonia** – in its Chapter 5.4. "Tourism development and organization of tourist areas", defines the status, objectives and planning determinations for tourism development.
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- **Strategy for Biological Diversity Protection in the Republic of Macedonia with Action Plan** – under measure C.5 "Stimulation of traditional use of biological diversity and eco-tourism", defines the action for identification of sites suitable for eco-tourism.

Legal grounds

The Law on Tourist Activity specifies the conditions and the manner of performing tourist activity (Chapter 15 Services in rural, ethno and eco-tourism), Law on Catering Activity.

The Law on Environment, the Law on Nature Protection, the Law on Waste Management, the Law on Ambient Air Quality and the **Law on Waters** regulate partially the requirements for environmental protection in tourist activity.

Targets

- Integration of the principles of sustainable development and environmental considerations in tourist sector
- Identification of areas of priority importance for tourism development
- Encouragement of exchange of best practices between public and private tourist interests
- Protection of natural heritage and biological diversity in tourist destinations
- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environmnet
- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.

Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

Reporting obligation

- Yearly to EUROSTAT
- World Tourist Organization (WTO)
- Annual tourist review of tourism and other services
- Five-year interview of foreign tourists in accommodation establishments

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 047 - 2	Tourism intensity in the Republic of Macedonia	TOUR 12 TOUR 33	Tourism Intensity Overnights spent in tourism accommodations	**D, P**	A	Biological diversity Nature Policies Waste Water Air Transport Soil	Yearly Every five years

MK – NI 047-3

TOURISM INTENSITY IN THE REPUBLIC OF MACEDONIA

3 National tourists intensity

Definition

The indicator shows the total number of overnights of national tourists by years at country level and by statistical regions and average stay of tourists.

Units

- Number

Key policy issue

Does the number of national tourists, overnights and average stay have development dimension?

Key message

With regard to national tourist visits, the overall number of tourists during the analyzed period has had falling trend of 9.9%. Furthermore, it is obvious that the accomplished overnights parallel tourist visits and have had falling trend of 23.7% during the analyzed period. The average stay of national tourists of 4.75 days in 2000 dropped to 4.02 days in 2017.

By statistical regions, the highest number and overnights of national tourists were recorded in Southwestern region and the lowest in Northeastern region.

With regard to national tourist arrivals by types of resorts, the highest number of national tourists was recorded in lake resorts with 2.887.029 tourists and the lowest in Skopje with 317.486 tourists. As for overnights of national tourists by types of resorts, the highest number of overnights was recorded in lake resorts with 16.409.074 overnights and the lowest number in Skopje with 484.776 overnights.

Figure 1. Total number of national tourists and number of overnights

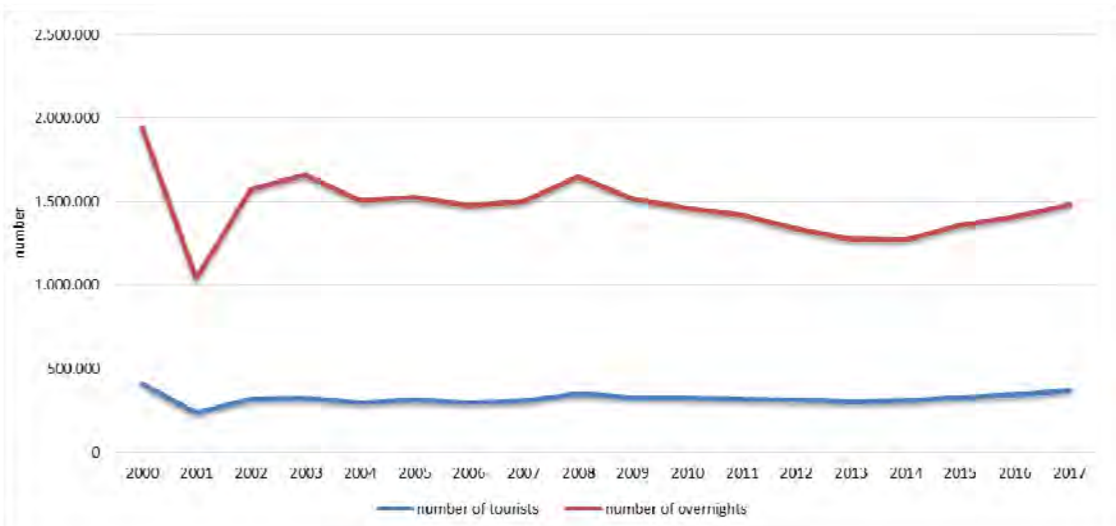


Figure 2. Average stay of national tourists

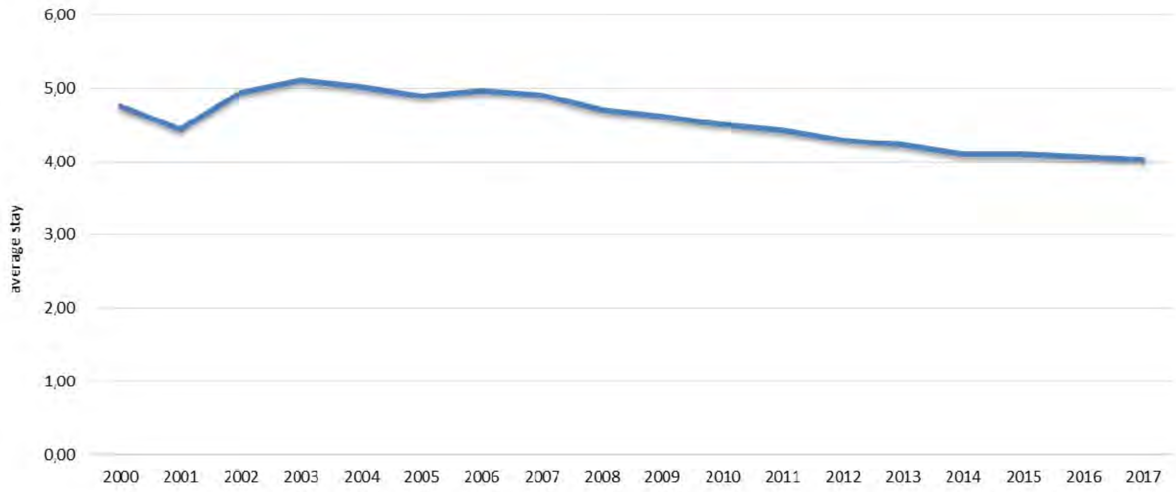


Figure 3. Number of national tourists and number of overnights by statistical regions

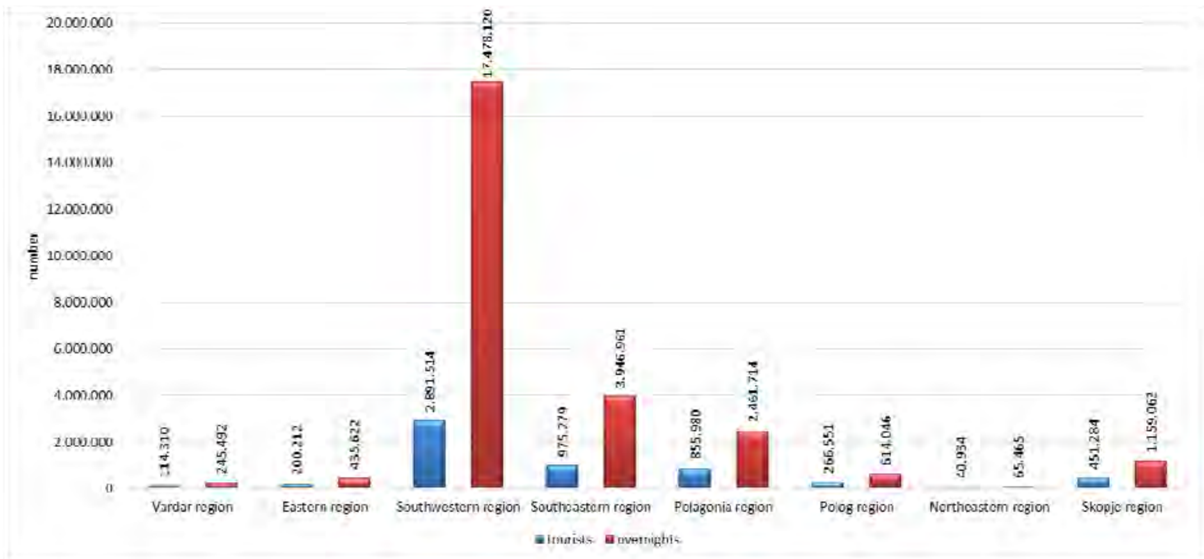


Figure 4. Arrivals of national tourists by types of resorts in the period 2003 to 2017

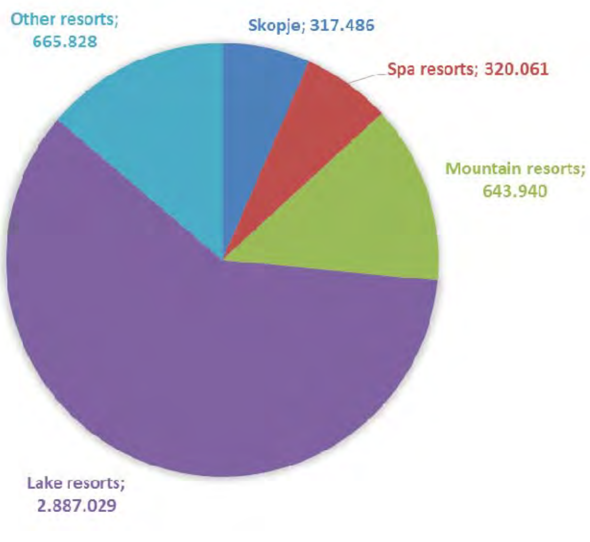
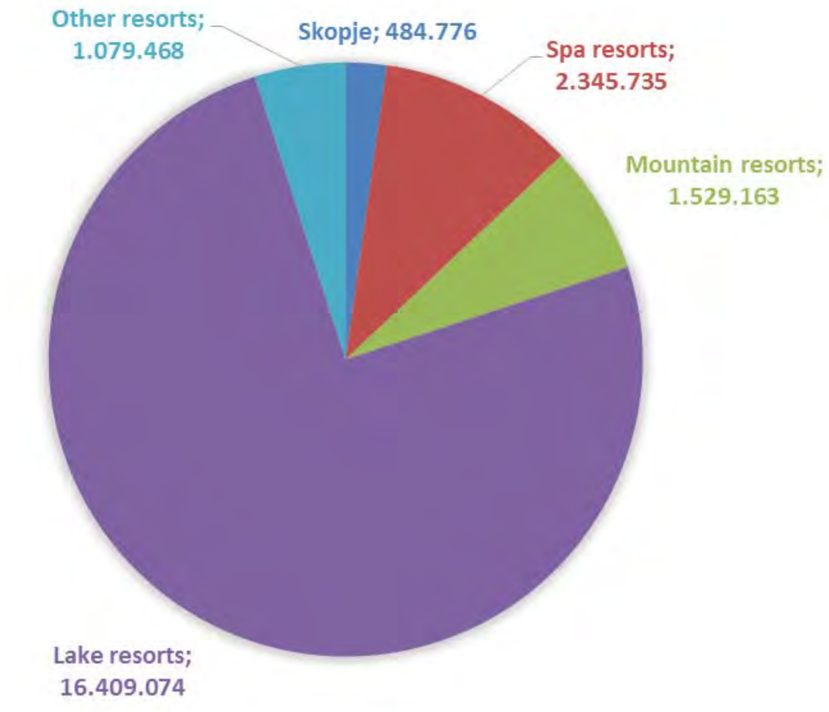


Figure 5. Overnights of national tourists by types of resorts in the period from 2003 to 2017



Data coverage: excel

Data source: State Statistical Office

Assessment

The number of national tourists has had falling trend of 9.9%; namely, the number of national tourists in 2000 was the highest, and it was the lowest in 2001. Similar characteristics have been observed with overnights accomplished by national tourists, i.e. the highest number of overnights was accomplished in 2000 and the lowest number of overnights in 2001. Also, the results reflect these relations with regard to average stay, showing significant fall in the number of overnights from 2007 to 2016. The shortest average stay of 4.02 days was recorded in 2017 and the longest one in 2003 amounting 5.1 days.

Southwestern region holds prevalence with regard to national tourists distribution, which can be assessed both as favourable aspect and uneven distribution. Observation of these indicators should indicate the extent to which the number of national tourists will increase in other regions as a result of the promotion of environmental elements in touristic offer on the national tourist market.

Furthermore, we may conclude that accomplished overnights follow tourist visits as a result of the attractiveness of the environment and thus the highest number of overnights is recorded in Southwestern region. Observation of overnights will show the extent to which regions will improve attractive base as factor in accomplishing higher number of overnights.

With regard to national tourist arrivals by types of arrivals, the highest share in the overall number of tourists was recorded in lake resorts with 59.75%, followed by other resorts with 13.77%, mountain resorts with a share of 13.32%, spa resorts with a share of 6.62% and the lowest share was recorded in Skopje with 6.57% in the total number of tourists.

With regard to overnights of national tourists by types of resorts, the highest share in the total number of overnights was recorded in lake resorts with 75%, followed by spa resorts with 10.74%, mountain resorts with a share of 7%, other resorts with share of 4.94% and Skopje noted the lowest share with 2.22% in the total number of overnights.

Methodology

- Methodology for the indicator calculation

The data on tourists have been obtained on the basis of the regular monthly reports of catering and other business entities providing services of accommodation to tourists or act as intermediaries in the provision of these services. Guest books kept by business operators as a legal obligation are sources of data.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2009 – 2013 (revised in 2015)**
- **National Environmental Action Plan - 2** - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
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- **Strategy for Biological Diversity Protection in the Republic of Macedonia with Action Plan** – under measure C.5 "Stimulation of traditional use of biological diversity and eco-tourism", defines the action for identification of sites suitable for eco-tourism.

Legal grounds

The Law on Tourist Activity specifies the conditions and the manner of performing tourist activity (Chapter 15 Services in rural, ethno and eco-tourism), Law on Catering Activity.

The Law on Environment, the Law on Nature Protection, the Law on Waste Management, the Law on Ambient Air Quality and the **Law on Waters** regulate partially the requirements for environmental protection in tourist activity.

Targets

- Integration of the principles of sustainable development and environmental considerations in tourist sector
- Identification of areas of priority importance for tourism development
- Encouragement of exchange of best practices between public and private tourist interests
- Protection of natural heritage and biological diversity in tourist destinations

- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environmnet
- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.

Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

Reporting obligation

- Yearly to EUROSTAT
- World Tourist Organization (WTO)
- Annual tourist review of tourism and other services
- Five-year interview of foreign tourists in accommodation establishments

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
MK NI 047 - 3	Tourism intensity in the Republic of Macedonia - National tourists intensity	TOUR 12 TOUR 33	Tourism Intensity Overnights spent in tourism accommodations	**D, P**	A	Biological diversity Nature Policies Waste Water Air Transport Soil	Yearly Every five years

МК – NI 048

TOURISM INTENSITY AND FACILITIES DYNAMICS

Definition

Accomodation establishments are supra-structural facilities facilitating visits and stay of tourists in a given environment. Their observation enables the assessment of regional development. The indicator shows the number of accommodation facilities, rooms and beds.

Units

- Number of facilities, number of rooms and number of beds.

Key policy issue

What is the impact of accomodation establishments on the environment?

Key message

The number of accomodation units may have both positive and negative impacts. Positive impacts are related to proper utilization of the space for facilities location, and negative impacts are made when the space is occupied iby accomodation establishments in inadequate manner.

The total number of accommodation establishments – facilities in the period 2008 to 2017 had a trend of increase by 30.26%. The number of rooms noted rising trend by 9.93%, and the number of beds noted rising trend by 6.71%, which is due to improved standard of accommodation facilities.

With regard to the structure of accommodation facilities, it is important to underline that increases occur for facilities of hotel nature, while decreases are primarily in the sphere of workers' resorts and uncategorized facilities for accommodation. The number of hotel facilities in 2017 compared to 2008 increased by 86.32%, number of holiday houses, apartments and rooms for rent and uncategorized accommodation facilities in the same period decreased by 33.33%, and number of boarding houses decreased by 50%.

Figure 1. Total number of accommodation establishments-facilities

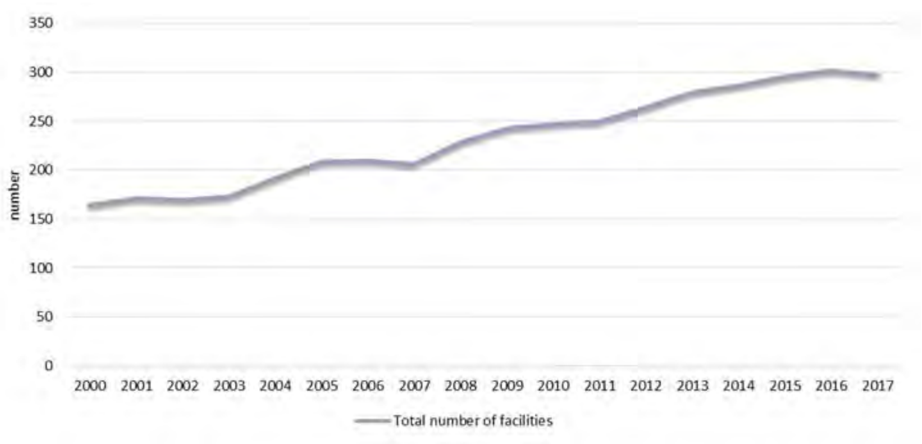


Figure 2. Total number of accommodation establishments – rooms and beds

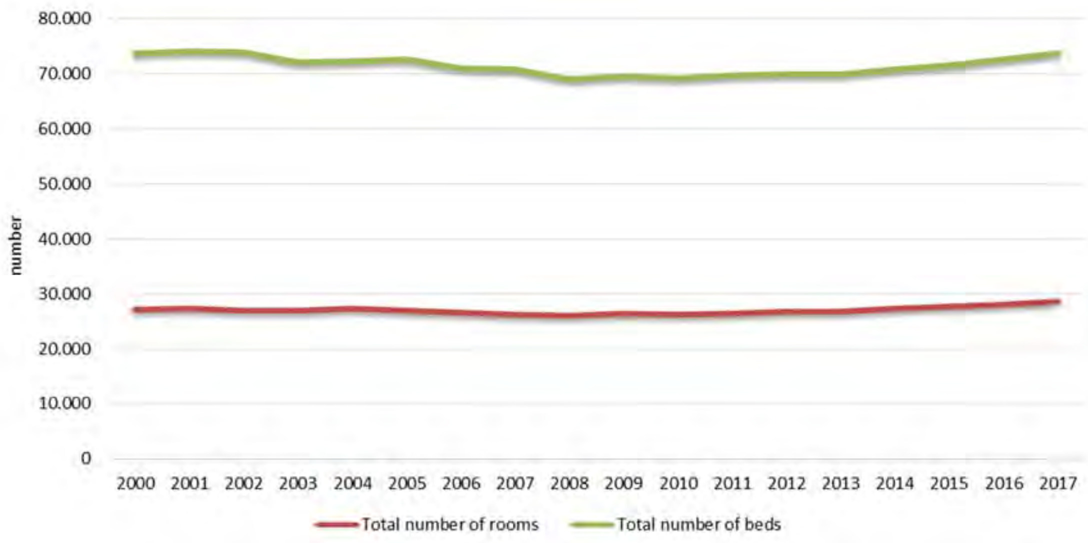


Figure 3. Accommodation establishments – structure of facilities

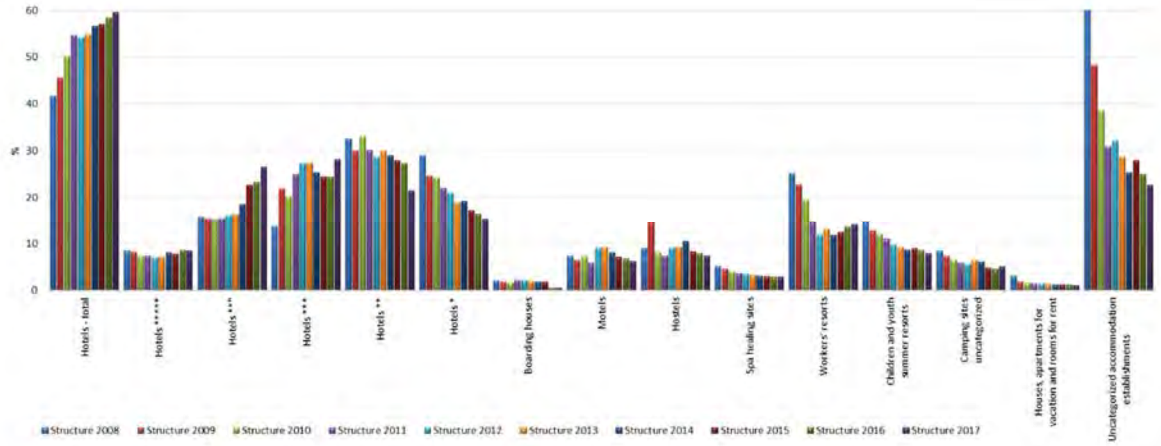


Figure 4. Accommodation establishments – rooms structure

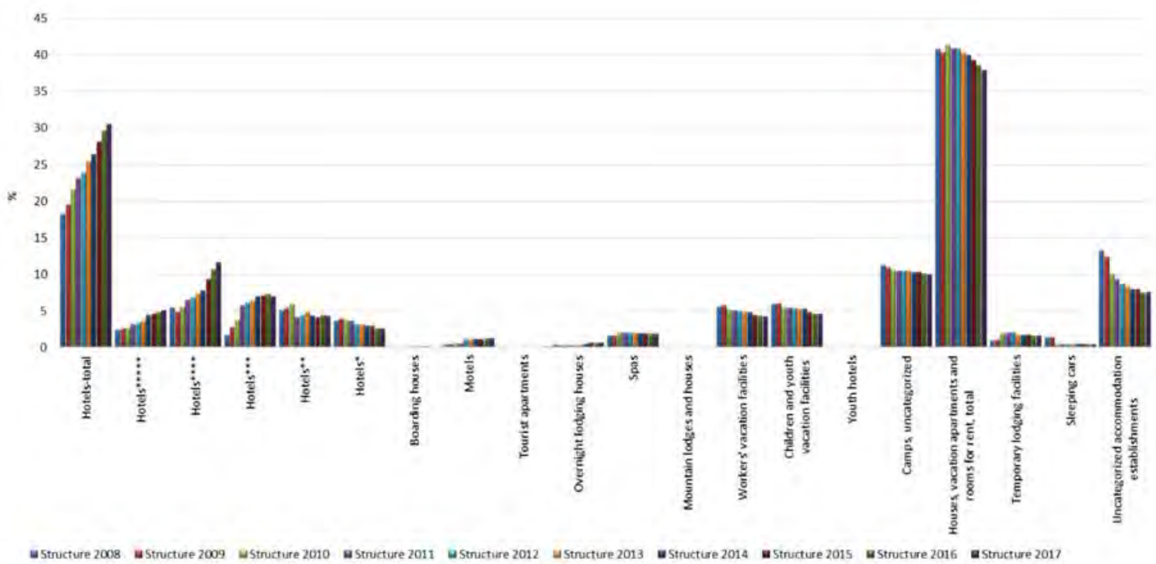
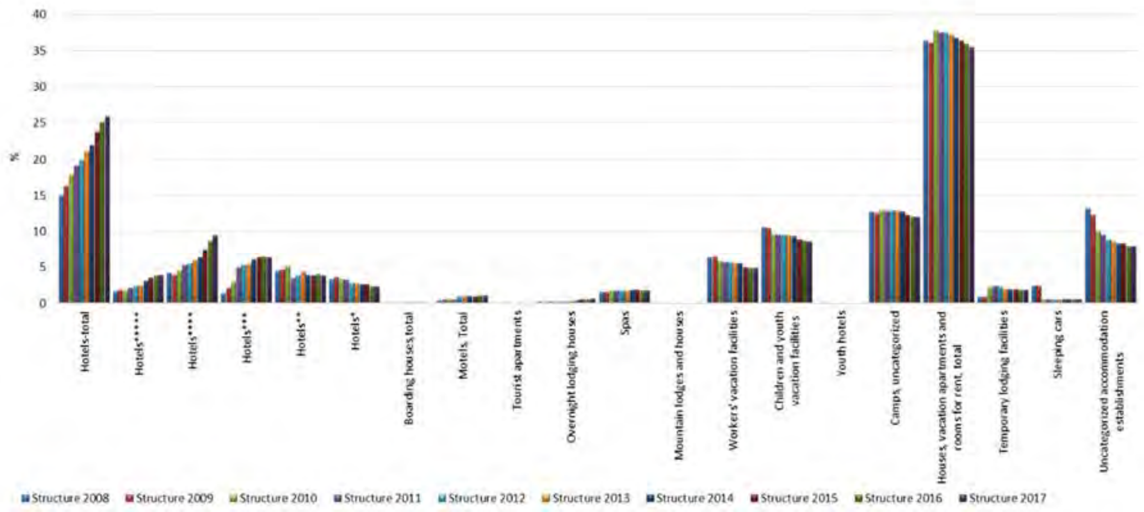


Figure 5. Accommodation establishments – beds structure



Data coverage: *excel*

Data source: State Statistical Office

Assessment

In 2008, statistical monitoring of accommodation establishments by stars was introduced for the first time. Categorization of establishments by stars cannot be automatically linked with the categorization by which establishments were monitored earlier and this caused interruption in annual data series.

The total number of accommodation establishments – facilities in the period 2008 to 2017 had a trend of increase by 30.26%. The number of rooms noted rising trend by 9.93%, and the number of beds noted rising trend by 6.71%, which is due to improved standard of accommodation facilities.

With regard to the structure of accommodation facilities, it is important to underline that increases occur for facilities of hotel nature, while decreases are primarily in the sphere of workers' resorts and uncategorized facilities for accommodation. The number of hotel facilities in 2017 compared to 2008 increased by 86.32%, number of holiday houses, apartments and rooms for rent and uncategorized accommodation facilities in the same period decreased by 33.33%, and number of boarding houses decreased by 50%. This can be assessed as positive trend because it is a result of the transformation of non-commercial into commercial sector which will have to be more observant of environmental protection standards.

In the category of motels, the number of rooms and beds had highest increase. The number of rooms increase of 3.34 times and number of beds increase of 2.67 times. In the category of sleeping cars, the number of rooms and beds recorded the greatest drop by 66.94% (rooms) and 77.14% (beds), respectively.

Methodology

- Methodology for the indicator calculation

Development trend of accomodation units.

Share of individual types of accomodation establishments in the total number.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2009 – 2013 (Revised in 2015).**
- **National Environmental Action Plan - 2** - in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
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Targets

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- Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

Reporting obligation

- Statistical Yearbook
- WTO

- EUROSTAT

General metadata

Code	Title of the indicator	Compliance with CSI EEA or other indicators		Classification by DPSIR	Type	Linkage with area	Frequency of publication
МК NI 048	Tourism density and facilities dynamics	TOUR 14	Tourism density	**S, P**	A	Biodiversity Nature Policies Waste Water Air Transport	Annually

MK – NI 049

ECONOMIC VALUE OF TOURISM INDUSTRY

Definition

Share in BDP is the share of the gross value added, in percentage, in the area of tourism in the total Gross Domestic Product on national level.

Units

- %.

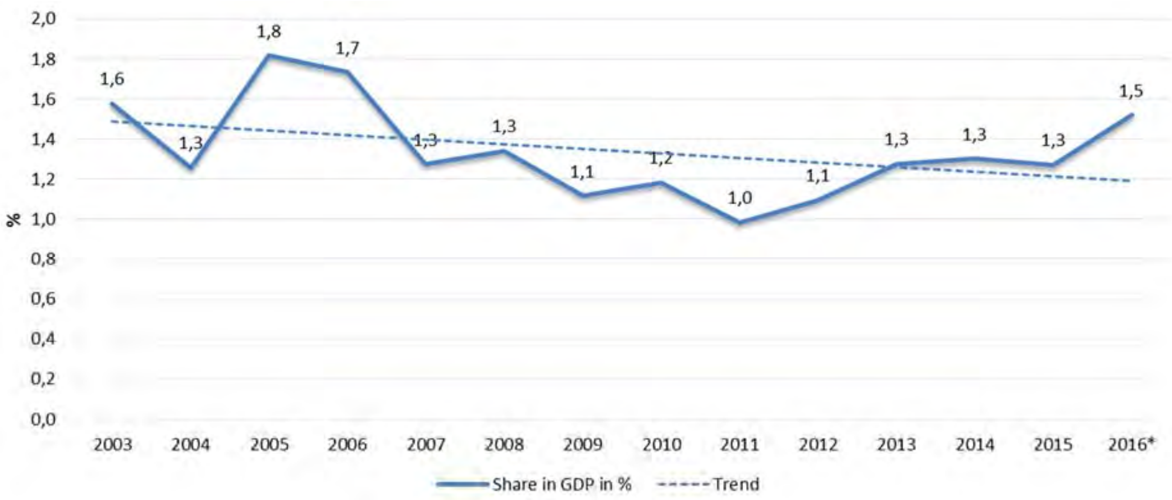
Key policy issue

What is the impact of tourism relying on the characteristics of the environment on the economic development of the Republic of Macedonia?

Key message

Share of tourism in gross domestic product has had constant decreasing trend. Drop by 3.68% was recorded in 2016 compared to 2003 and amounted 1.5%, reflecting very low contribution of tourism to the economic development of the Republic of Macedonia.

Figure 1. Share of tourism in GDP in %



Data coverage: excel

Data source: State Statistical Office

Assessment

The Figure shows that the share of tourism in GDP is relatively low with falling trend during the period 2003 to 2011, namely its share in 2011 recorded decrease by 37.6% compared to 2003. The share of tourism in GDP recording significant increase in the period 2011 to 2016 by 54.36%, which indicates a greater participation of tourism to the economic development of the Republic of

Macedonia. The share of the tourism was the highest in 2005 amounting 1.82%, and it was the lowest in 2011 with 0.98%. Observation should enable insight in the extent in which effects from tourist development on the environment improve.

Revenues acquired on the basis of tourist fee and taxes will enable environment planning and protection and also offer the opportunity to legal and natural persons to improve their living and working conditions.

Methodology

- **Methodology for the indicator calculation**

Share of value added from tourism in GDP.

Policy relevance

List of relevant policy documents

- **National Strategy for Tourism Development 2009 - 2013**
- **National Environmental Action Plan - 2 -** in Section 4.2.6. Tourism, describes the main challenge for sustainable tourism development, implementation of economic potential with minimum possible impact on the environment.
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Legal ground

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- Protection of natural heritage and biological diversity in tourist destinations
- Adoption and implementation of legislation in the area of tourism to regulate the protection of the environmnet

- Promotion of organic farming, healthy food production and especially traditional production of certain products (e.g. cheese, wine), production of honey, herbs growing, etc.
- Promotion of certain types of tourism such as wine tourism, hunting tourism, birds observation tourism, etc.

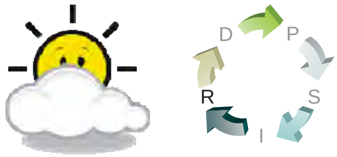
Reporting obligation

- Yearly publication on GDP
- Statistical Yearbook

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 NI049	**Economic value of tourism industry**	TOUR35	Economic value of tourism industry	**D**	B	Biodiversity Nature Policies Waste Water Air Transport	Annually

MK - NI 067
ENVIRONMENTAL PROTECTION EXPENDITURES



Definition

Environmental protection expenditures is an indicator composed of total investment and total current expenditures. Current expenditure is the sum of internal running costs plus compensations and other payments for environmental protection services.

Environmental protection expenditures track how much has been invested for reconstruction and procurement of technology and equipment for environment protection and how much has been spent for these technologies and equipment maintenance and operation. Environmental protection expenditures also include compensations and payments for environmental protection services (e.g. collection of waste, management of waste waters, environmental consultations).

Units

- Environmental protection investments (in thousand denars)
- Expenditures for environmental protection assets maintenance (in thousand denars)
- Investments and expenditures in industry and specialized producers (in thousand denars)

Key question

Can investments and expenditures for activities intended for protection, reduction and elimination of pollution or other degradation of environment contribute to society responding to environmental concerns and how are those financed?

Key message

In the period 2013 to 2015, investments for environmental protection noted decline. An increase is noted at 2016 and 2017. In 2017, the highest investment was made in the area of waste management. The highest expenditures for maintenance of the environmental protection assets were recorded in the same area. It is of key importance to increase both investment and expenditures for activities and assets of environmental protection in order to minimize the negative effects of processes and activities related to operations of business entities, especially industry and people's behaviour.

Figure 1. Total investments in environmental protection

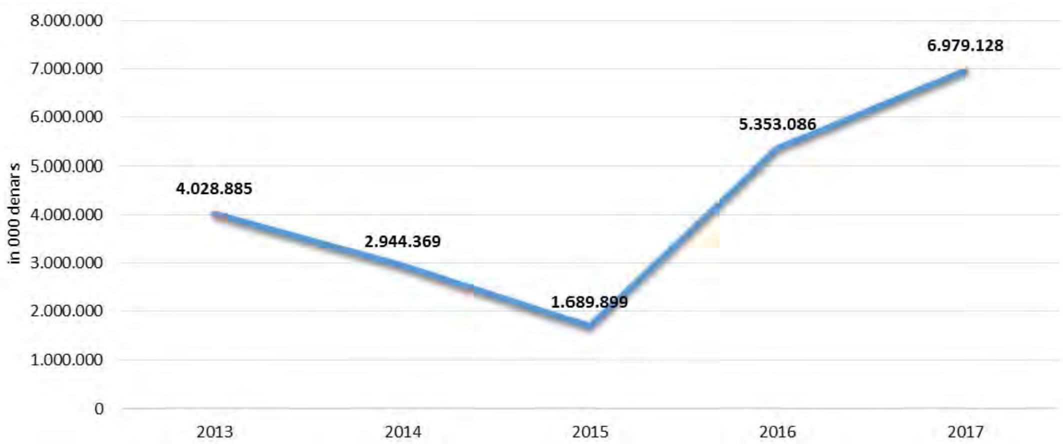


Figure 2. Investments in environmental protection by sector

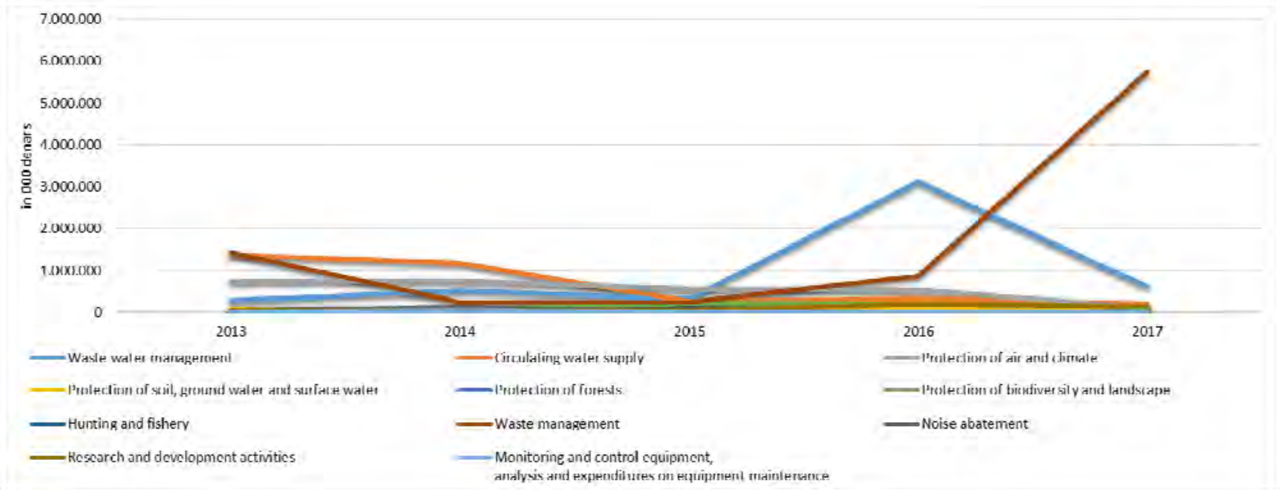


Figure 3. Total expenditures for environmental protection assets maintenance

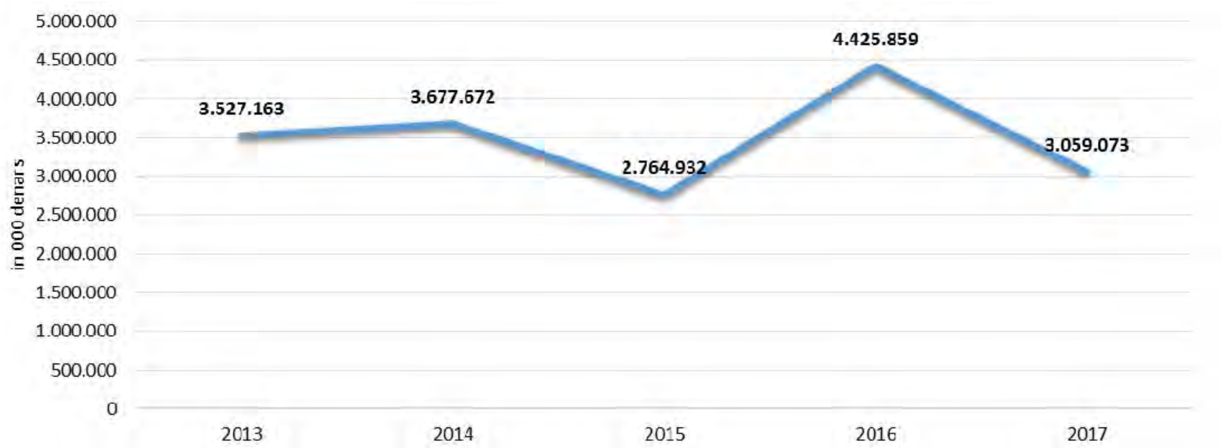


Figure 4. Total expenditures for environmental protection assets maintenance by sector

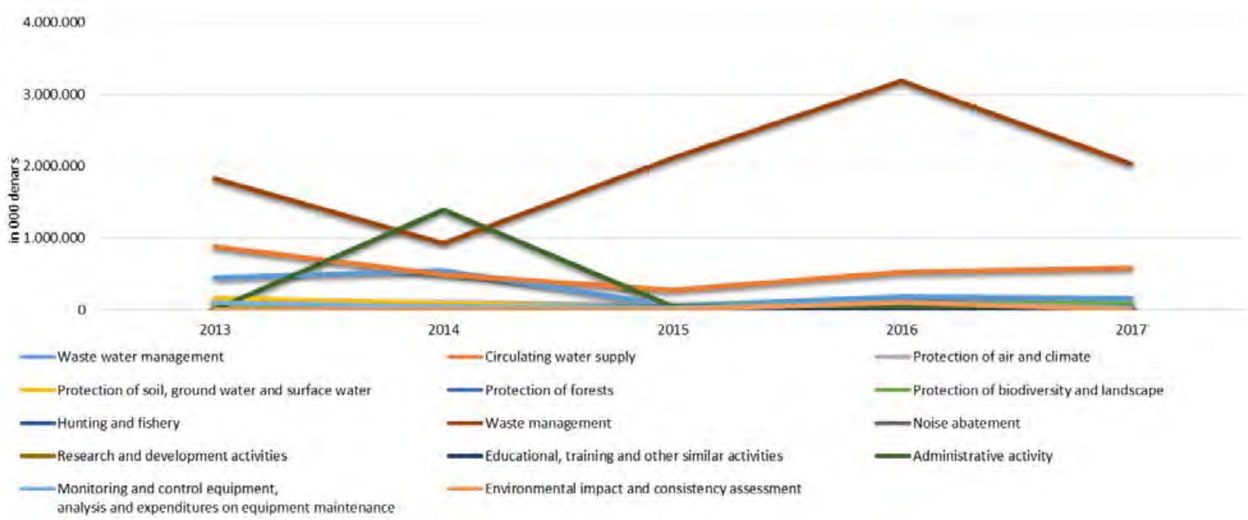
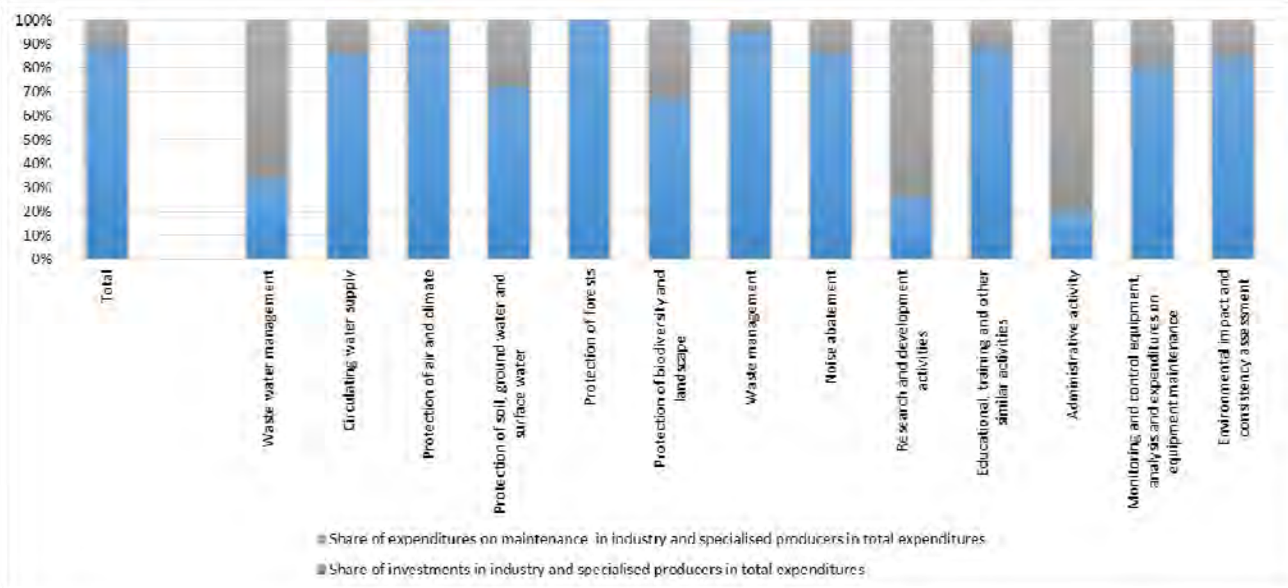


Figure 5. Share of environmental protection investments and expenditures in industry and specialized producers in overall expenditures, 2017



Data coverage: excel

Source: State Statistical Office

Assessment

The public is increasingly aware of the need for environment protection against pollution and waste. Today, the protection if the environment is integrated in all policy areas with an ultimate goal of achieving sustainable development. All activities inevitably affect the environment to a certain extent which means that all sectors in the economy play specific role in overall efforts to minimize negative effects: governmental agencies and local authorities, companies involved in industrial and other business activities, businesses producing environmental services (e.g. collection and handling of waste) and households as consumers.

The purpose of statistical survey of environmental protection expenditures is to answer the following three questions:

- How much is paid by residential units – producers or consumers – and in what form for environmental protection?
- To what level is this expenditure financed by various institutional sectors?
- What is the value of environmental protection services produced by various economic activities?

In the period 2013 to 2015, both investments in and expenditures for environmental protection showed declining trend. In 2016 and 2017 its increasing is noted. The largest area of investment and expenditure related to environment protection is the area of waste management – waste handling.

Comparative analysis of 2013 and 2014 data indicates that overall investments in and expenditures for environment protection in 2014 were lower by 12.3% than in 2013. The falling trend continued in 2015 as well; namely, the share of investments in the overall investments in and expenditures for environment protection in 2015 was 37.9% compared to 2014 when it was 44.5%, while the share of expenditures in 2015 recorded insignificant increased reaching 62.1% compared to 55.5% in 2014. In 2017 the share of investments is 87.45%, while the the share of expenditures is 12.55%.

In 2017, the highest amount of funds was invested in waste handling, while in 2015 and 2014 in water supply circulating systems. In relation to the expenditures for assets maintenance with regard to purpose, those were made for waste management in all years.

Observed by sectors of economic activity, the share of expenditures for environmental protection in industry and specialized producers in 2017 was 87.5% (2016-65.2%), while for other sectors it was 12.5 % (2016-34.8%). In industry and specialized producers, observed by purpose, the highest expenditures occurred for waste handling amounting 7.388.561 thousand denars. These expenditures were significantly increased compared to 2016 when they amounted 2.556.391 thousand denars. In other sectors, the highest expenditures in 2017 occurred for waste water management amounting 514.356 thousand denars, and the expenditures for hunting and fishery with the amount of 40 thousand denars were the lowest.

The ratio between the expenditures for environmental protection and gross domestic product is an important indicator of the protection of the environment relative to overall economic activity. In the period 2015-2016, the share of expenditures was around 1.6% of BDP and 1.6% in 2017.

Methodology

Data on the expenditures of environmental protection is gathered through regular statistical survey conducted on annual basis. It is carried out on the basis of sample designed within the statistical business register. Reporting units are business entities/local units (by NCA Rev.2) having funds of financial and non-financial fixed assets for environmental purposes (MFS-EN and NFS-EN).

Policy relevance of the indicator

List of relevant policy documents:

- Regulation 691/2011 of 6 July 2011 of the European Parliament and of the Council.
- Regulation 58/97 of 20 December 1997 for structural business statistics - SBS
- National Classification of Activities – NCA Rev.2
- Classification of environmental protection activities (CEPA 2000).

Legal grounds

- Law on State Statistics (Official Gazette of RM no. 54/97, 21/07, 51/11,104/13, 42/14, 192/15 and 27/16)
- Programme for statistical surveys for the period 2013-2017 (Official Gazette of RM no. 20/13, 24/14, 13.15 and 7/16

Targets

No specific targets.

Reporting obligation

- OECD/EUROSTAT

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 067	**Expenditures for environmental protection**			R	A	▪ Business entities	1 - year