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COMMITTEE ON ENVIRONMENTAL POLICY
CONFERENCE OF EUROPEAN STATISTICIANS

Joint Intersectoral Task Force on Environmental Indicators

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Item 3 of the provisional agenda

REVIEW OF THE GUIDELINES ON THE APPLICATION OF ENVIRONMENTAL INDICATORS

Informal note by the secretariat[1]

Introduction

As a part of basic activities of the Joint Task Force on Environmental Indicators, the Review of the Guidelines on the Application of Environmental Indicators continues. At the 5th session the following Guidelines indicators are being reviewed:

- Emissions of pollutants into the atmospheric air,
- Greenhouse gas emissions,
- Household water use per capita,
- Water losses,
- Land uptake,
- Fertilizer consumption.

This report provides the analysis of replies to the questionnaire on indicators submitted by the following countries:

- Armenia,
- Azerbaijan,
- Belarus,
- Bosnia and Herzegovina,
- Former Yugoslav Republic of Macedonia,
- Georgia,
- Kazakhstan,
- Kyrgyzstan,
- Montenegro,
- Republic of Moldova,

[1] Prepared with the assistance of Mr. Vladislav Bizek and Mr. Alexander Shekhovtsov, consultants to the secretariat, with the financial support from the European Union project on the Shared Environment Information System. It has not been formally edited.

- Russian Federation,
- Tajikistan
- Serbia,
- Ukraine,
- Uzbekistan.

Review and basic analysis of the data reported by countries for each indicator is presented below.

I. SUMMARY OF COUNTRY REPORTS ON THE QUESTIONNAIRE ON 6 INDICATORS FROM THE GUIDELINES

1. Emissions of pollutants into the atmospheric air

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Armenia														
Azerbaijan														
Belarus														
Bosnia and Herzegovina														
Georgia														
Kazakhstan														
Kyrgyzstan														
Serbia														
Montenegro														
Republic of Moldova														
Russian Federation														
Tajikistan														
Former Yugoslav Republic of Macedonia														
Ukraine														
Uzbekistan														

Note: Green colour means that the country has reported at least some data related to this indicator.

Thirteen countries have filled the questionnaire on this indicator however with different levels of details.

Data on emissions of certain pollutants into the atmospheric air are collected: In Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Montenegro, the Republic of Moldova, Russian Federation, Tajikistan, Ukraine and Uzbekistan since1990, in Georgia and Serbia - since 2000 and in the former Yugoslav Republic of Macedonia - since 2001. Bosnia and Herzegovina has not reported data on this indicator.

The highest data coverage for the development of indicator "Emissions of pollutants into the atmospheric air" can be seen in the case of Belarus, Serbia, Montenegro and Ukraine (Table 1).

Table 1: Information reported by countries for the development of indicator "Emissions of pollutants into the atmospheric air".

	SO_2	NOx	NMVOC	NH_3	CO	CxHy	TSP	PM10	PM2,5	PAH	PCB	PCDD/F	Pb	Cd	Hg
Azerbaijan	■	■	■	■	■	■									
Armenia	■	■	■	■	■	■	■						■		
Belarus	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Bosnia and Herzegovina															
Georgia	■	■	■		■		■			■					
Kazakhstan	■	■	■	■	■	■	■						■	■	■
Kyrgyzstan	■	■	■	■	■	■									
Serbia	■	■	■	■	■			■	■	■	■	■	■	■	■
Montenegro	■	■	■	■	■			■	■	■	■	■	■	■	■
Republic of Moldova	■	■	■	■	■	■				■			■	■	
Russian Federation	■	■	■	■	■	■							■	■	■
Tajikistan	■	■	■		■	■									
Former Yugoslav Republic of Macedonia	■	■	■	■	■		■								
Ukraine	■	■	■	■	■	■	■	■	■	■			■	■	■
Uzbekistan	■	■	■	■	■	■									

Kyrgyzstan and Uzbekistan have not reported data on emissions from the mobile sources. In addition, Kazakhstan has the data on emissions of sulphur dioxide and nitrogen oxides for 2005 and 2006 only. Tajikistan has the data on emissions of nitrogen oxides, carbon monoxide and hydrocarbons from mobile sources for the last 5 years.

Data on emissions of the following pollutants have not been reported:

- TSP: Azerbaijan, Kyrgyzstan, Serbia, Montenegro, the Republic of Moldova, Russian Federation, Tajikistan, Uzbekistan;
- PM_{10} and $PM_{2.5}$: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia, Uzbekistan;
- Ammonia: Georgia, Tajikistan;
- Hydrocarbons: Georgia, Serbia, Montenegro, the former Yugoslav Republic of Macedonia;
- PAH: Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia, Uzbekistan;

- PCB: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia, Ukraine, Uzbekistan;
- PCDD/F: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia, Ukraine, Uzbekistan;
- Lead: Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, the former Yugoslav Republic of Macedonia, Uzbekistan;
- Cadmium: Armenia, Azerbaijan, Georgia, Kyrgyzstan, the former Yugoslav Republic of Macedonia, Uzbekistan;
- Mercury: Armenia, Azerbaijan, Georgia, Kyrgyzstan, Tajikistan, the Republic of Moldova, Tajikistan, the former Yugoslav Republic of Macedonia, Uzbekistan.

Kazakhstan, instead of data on emissions of TSP, has presented data on the sum of three substances (soot, shale ash and coal ash), explaining that the formation rates of TSP and its breakdown to PM_{10} and $PM_{2.5}$ is stipulated as from 2013. At the same time, Kazakhstan has reported the data on the absolute values of emissions of seven additional pollutants, not covered by the questionnaire. These include such toxic substances like benzo(a)pyrene or arsenic.

Belarus, which has presented the most complete data on emissions of all substances requested by questionnaire (plus arsenic) from various sources, applied internationally recognized methodology CORINAIR for the calculation of emissions from mobile sources till 2009; afterwards COPERT IV methodology has been introduced. The application of this methodology is confirmed by Montenegro as well while Georgia has reported that the data quality control in this country is carried out in accordance with the EMEP/EEA Air Pollutant Emission Inventory Guidebook.

In most countries that provided such information, the emissions of carbon monoxide from mobile sources are much higher than those from stationary sources. In Serbia, Montenegro and the Former Yugoslav Republic of Macedonia, on the contrary, emissions from stationary sources exceed those from mobile sources. The total amount of emissions from stationary and mobile sources in Azerbaijan has increased 1.6 times (15 years), in Georgia 2.2 times (10 years) in Serbia 1.4 times (10 years), remained stable in the Russian Federation (10 years) and Ukraine (20 years) and decreased 3 times in Armenia (20 years), 2.5 times in Belarus (20 years) and Montenegro (20 years) and 4.5 times in the Republic of Moldova (20 years).

Emissions of sulphur dioxide from stationary sources are much higher than those from mobile sources in all countries except Georgia where these emissions are approximately at the same level. Emissions of this pollutant from mobile sources are not being calculated in Azerbaijan.

Nitrogen oxides emissions from mobile sources, compared to those from stationary sources, prevail in Belarus (especially in recent years), Georgia, Armenia, Azerbaijan, Serbia and Montenegro (in recent years) and in the Republic of Moldova. In the Russian Federation, Tajikistan and Ukraine (in recent years) emissions from these sources are comparable with each other while the former Yugoslav Republic of Macedonia is dominated by the emissions from stationary sources.

Emissions of NMVOC from stationary sources exceed those from mobile sources in Serbia, Montenegro and the former Yugoslav Republic of Macedonia. In Georgia (recently) and the Russian Federation, the emissions from both types of sources are at a similar level while Belarus and Ukraine is are dominated by emissions from mobile sources.

The information submitted by Azerbaijan for the reporting period shows that sulphur dioxide emissions decreased 33 times and hydrocarbon emissions 3.5 times. However, emissions of nitrogen oxides and carbon monoxide increased 1.5 times. The explanation for such considerable decrease in emissions of sulphur dioxide has not been reported but might be related to the close down of the most polluting installations during the post-Soviet times.

For the last 20 years, Armenia has reported the following reduction of emissions: TSP 9times, nitrogen oxides 3 times and sulphur dioxide, NMVOC and carbon monoxide 2.5 – 2.7 times. During the same period of time, emissions of hydrocarbons increased 37 times and those of ammonia 4 times. This considerable reduction of sulphur dioxide is probably related to the decline of industrial activity in the last decade of the 20th century as well as to the introduction of cleaner technologies in the first decade of the 21st century.

During the last 20 years, emissions of almost all pollutants have decreased in Belarus; 13.5 times for sulphur dioxide or 1.7 times for nitrogen oxides (Figure 1). However, emissions of hydrocarbons have increased almost 4 times over the same period of time.

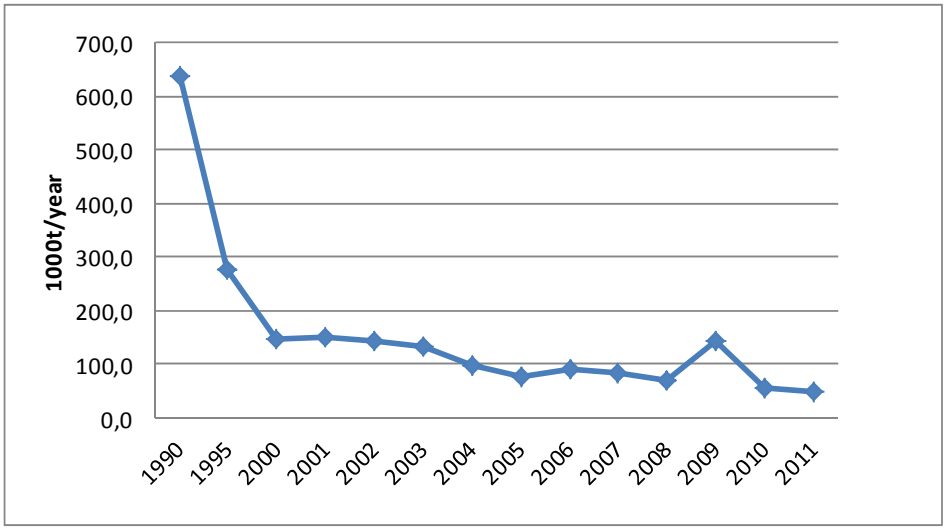


Figure 1: Emissions of sulphur dioxide in Belarus from 1990 to 2011

For the 10-years period, Georgia has shown an increase of emissions of controlled substances from 1.5 times for TSP to 40 times for PAHs.

From 1990 to 2011 there was a reduction of emissions of most pollutants in Kazakhstan; from 1.5 times for nitrogen oxides and benzo(a)pyrene to 10 times for the arsenic compounds. Emissions of hydrocarbons and mercury compounds remained at the same level while those of organic compounds (acetone, toluene, etc.) increased.

For the last 20 years, Kyrgyzstan has shown a decrease of all controlled emissions from 1.5 times decrease in the case of hydrocarbons to 6.5 times decrease in the case of sulphur dioxide and carbon monoxide.

It can be seen from the data obtained from Serbia that almost all emissions of controlled substances tend to increase during the 10-years period. Most significant increase is shown for PCBs - 26 times, lead compounds - 3,5 times or PAH - 2,5 times (Figure 2, 3 and 4).

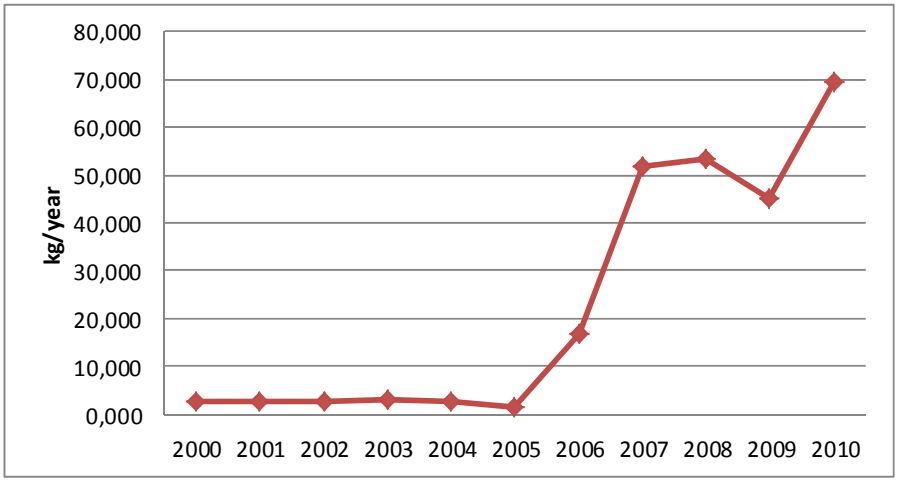


Figure 2: Emissions of PCB in Serbia from 2000 to 2010

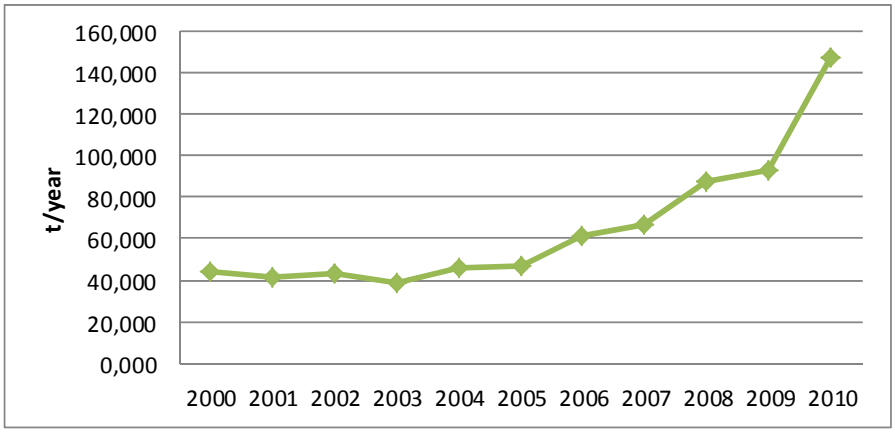


Figure 3: Emissions of lead compounds in Serbia from 2000 to 2010

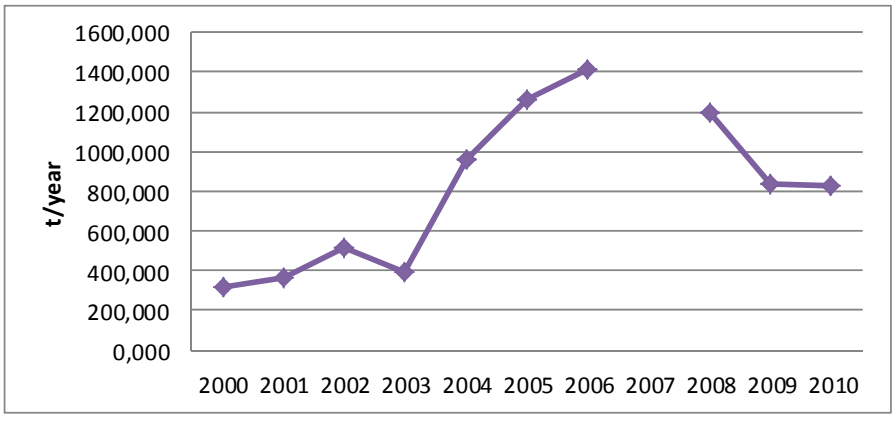


Figure 4: Emissions of PAH in Serbia from 2000 to 2010

In Montenegro, for the 20 years reporting period, the following emissions reduction can be seen: Sulphur dioxide 1.5 times, ammonia, carbon monoxide and PCBs - 2 times and lead compounds - 7 times. Emissions of other pollutants varied from year to year, in average remaining at the same level (Figures 5, 6 and 7).

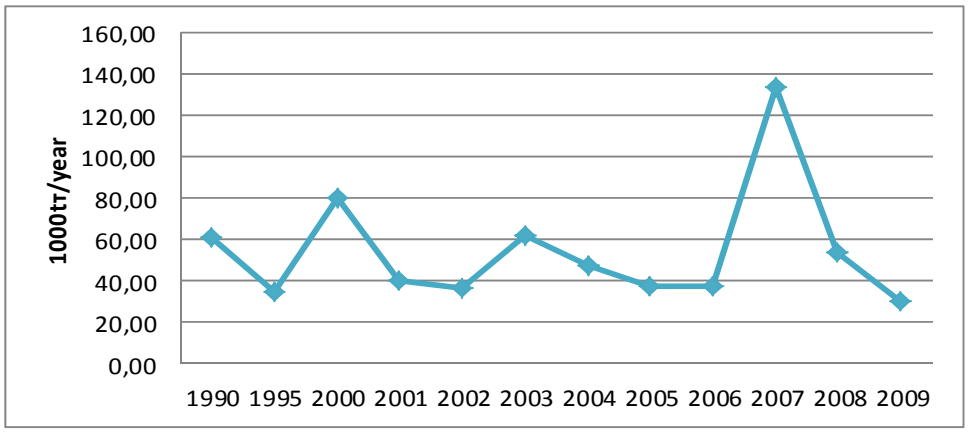


Figure 5: Emissions of carbon monoxide in Montenegro from 1990 to 2009

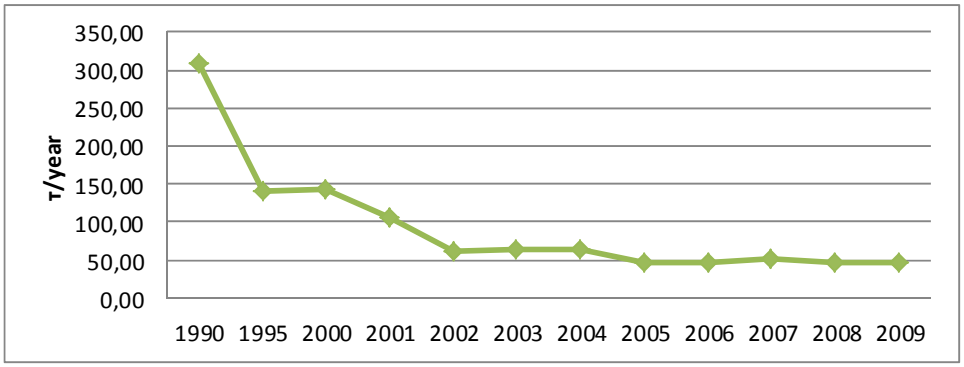


Figure 6: Emissions of lead compounds in Montenegro from 1990 to 2009

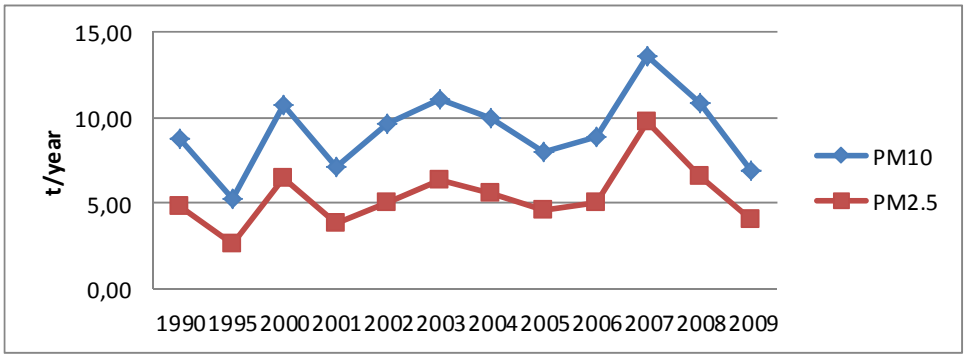


Figure 7: Emissions of PM_{10} and $PM_{2.5}$ in Montenegro from 1990 to 2009

For the last 12 years, the Republic of Moldova has reported the following reduction of emissions: Sulphur dioxide 3-times, lead compounds 2.5 times, carbon monoxide 4.5 times (20 years). During the last 10 years, the following increase of emissions has been observed: nitrogen oxides 1.3 times, NMVOC 5 times and PAH more than 10 times. Emissions of ammonia are negligible.

From 1990 to 2011, emissions of sulphur dioxide, cadmium and mercury have decreased 2 times and those of lead compounds 6.5 times (Figure 8) in the Russian Federation. However, 1.5 times increase of NMVOCs and ammonia emissions can be seen.

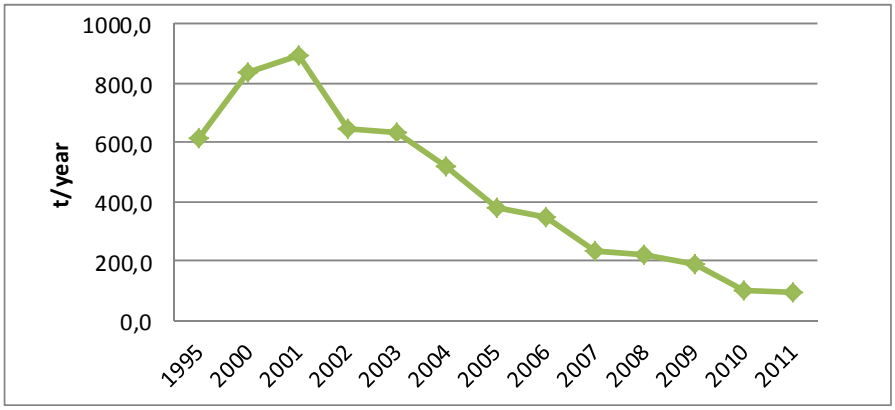


Figure 8: Emissions of lead compounds in the Russian Federation from 1995 to 2011

In Tajikistan, emissions of sulphur dioxide decreased 6-times during last 20 years. In parallel, emissions of nitrogen oxides increased 3.5 times, emissions of carbon monoxide 6 times and emissions of hydrocarbons 40 times. Sharp increase in emissions of the last three pollutants occurred in 2007 when emissions from mobile sources which represent more than 90 % of national totals have started to be included into emission inventories.

In the former Yugoslav Republic of Macedonia, the amount of emissions of various pollutants has changed a little in the 6 - 9 years reporting period.

Ukraine has shown in their data for a 20 years reporting period the following decrease of emissions: Sulphur dioxide 2 times and TSP 2.5 times and, for the last 8 years, $PM_{2.5}$ 2 times and PAHs 7 times. Emission levels of nitrogen oxides, carbon monoxide and PM_{10} have not changed. However, for the last 8 years, emissions of NMVOC increased 3.5 times, those of lead compounds 3 times and those of mercury compounds 20 times (Figures 9 and 10).

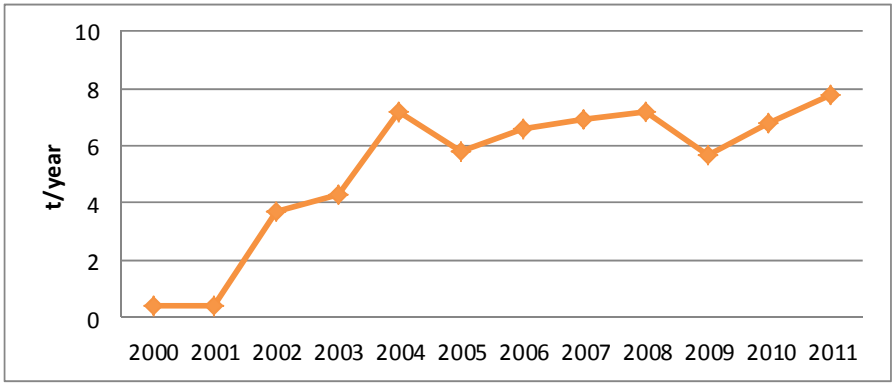


Figure 9: Emissions of mercury compounds in Ukraine from 2000 to 2011

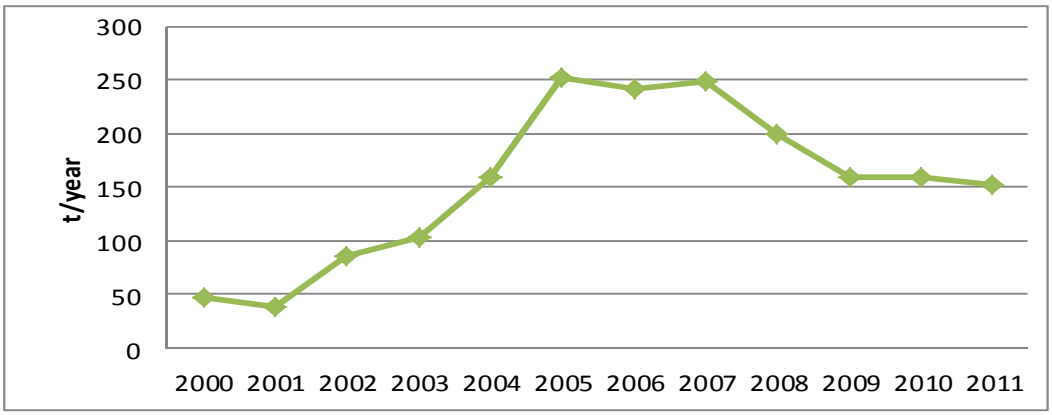


Figure 10: Emissions of lead compounds in Ukraine from 2000 to 2011

For a 20 years reporting period, reduction in emissions of almost all pollutants can be seen in Uzbekistan; from 1.5 times in the case of nitrogen oxides to 9 times in the case of NMVOC. Only emissions of ammonia and hydrocarbons increased slightly.

Specific emissions of pollutants per capita or per unit area in almost all cases correlate with absolute values of emissions, increasing or decreasing depending on the change of the absolute values. The former Yugoslav Republic of Macedonia has not reported on specific emissions.

The highest amounts of emissions per capita have been noted in the following countries:

- Sulphur dioxide - 99.5 kg in Kazakhstan in 2004(Figure 11);

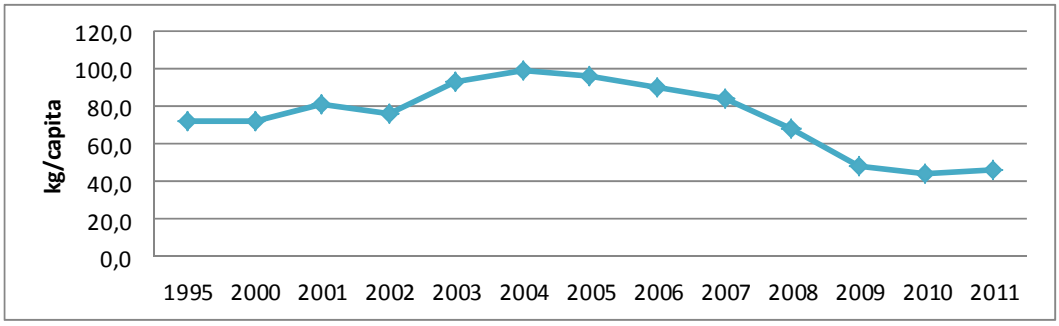


Figure 11: Per capita emissions of sulphur dioxide in Kazakhstan

- Nitrogen oxides - 28.0 kg in Belarus in 1990 (Figure 12);

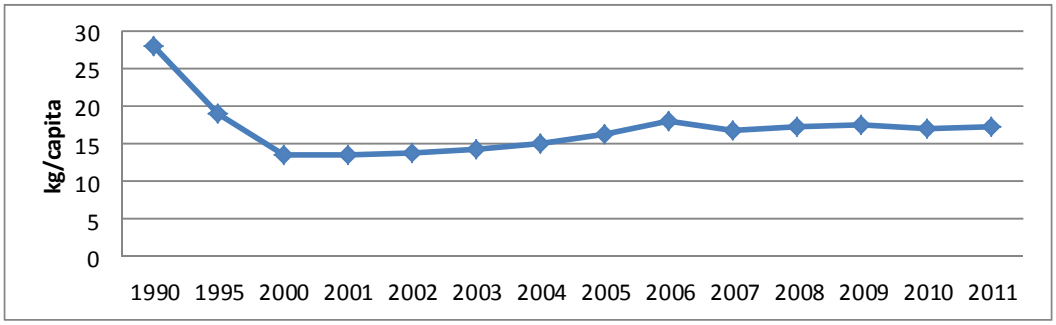


Figure 12: Per capita emissions of nitrogen oxides in Belarus

- NMVOC - 52.2 kg in Belarus in 1990 (Figure 13);

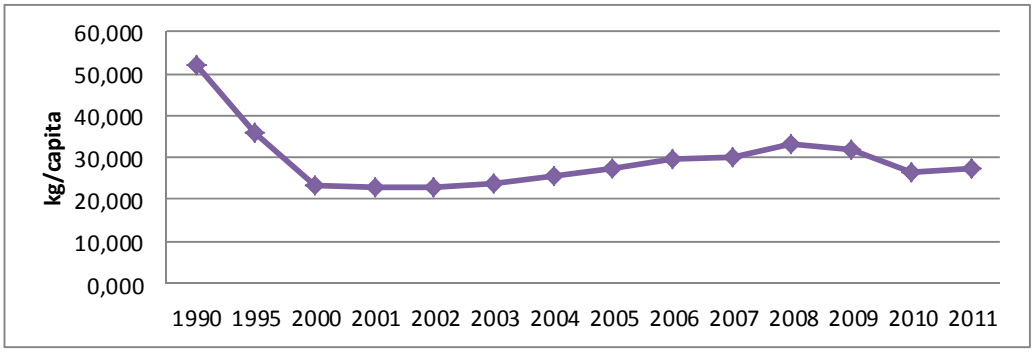


Figure 13: Per capita emissions of NMVOC Belarus

- Ammonia - 21.1 kg in Belarus in 1990 (Figure 14);

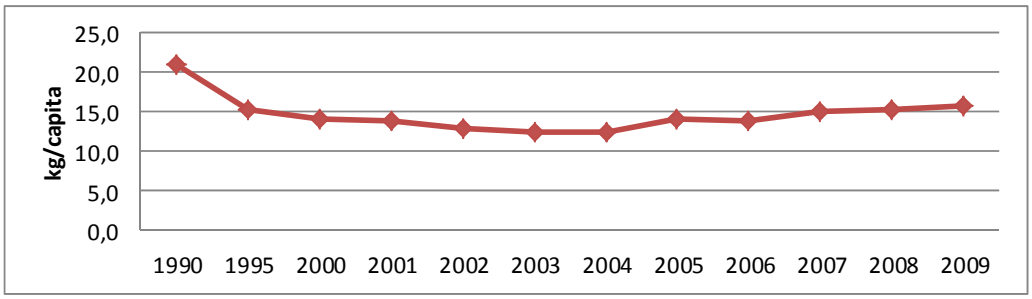


Figure 14: Per capita emissions of ammonia in Belarus

- Carbon monoxide - 214 kg in Montenegro in 2007 (Figure 15);

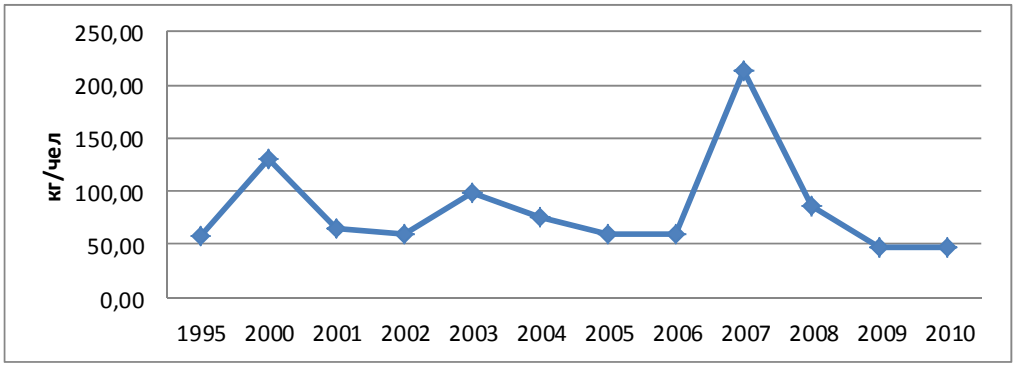


Figure 15: Per capita emissions of carbon monoxide in Montenegro

- Hydrocarbons – 19.1 kg in Armenia in 2010 (Figure 16);

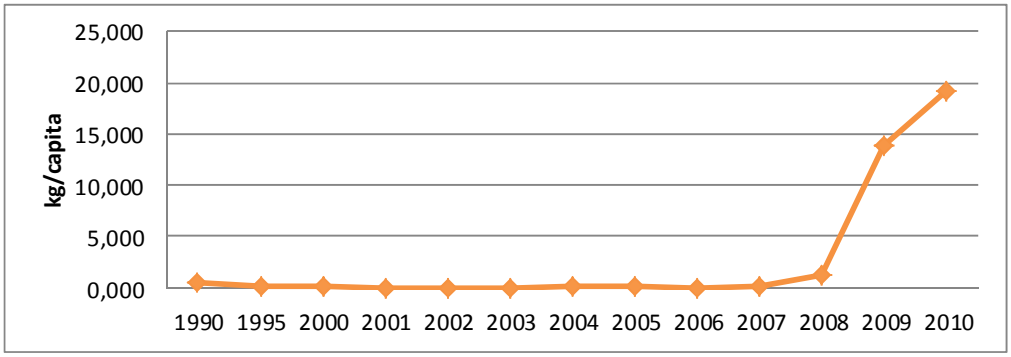


Figure 16: Per capita emissions of hydrocarbons in Armenia

- TSP - 50.2 kg in Kazakhstan in 2004 (Figure 17);

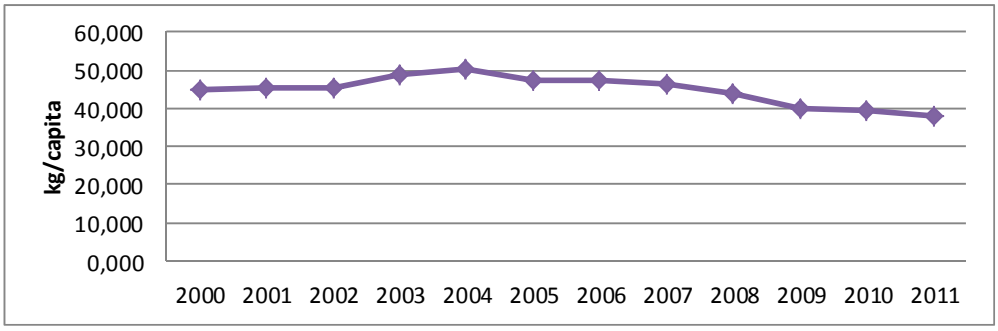


Figure 17: Per capita emissions of TSP in Kazakhstan

- For PM_{10} - 21.8 kg in Montenegro in 2007 (Figure 18);

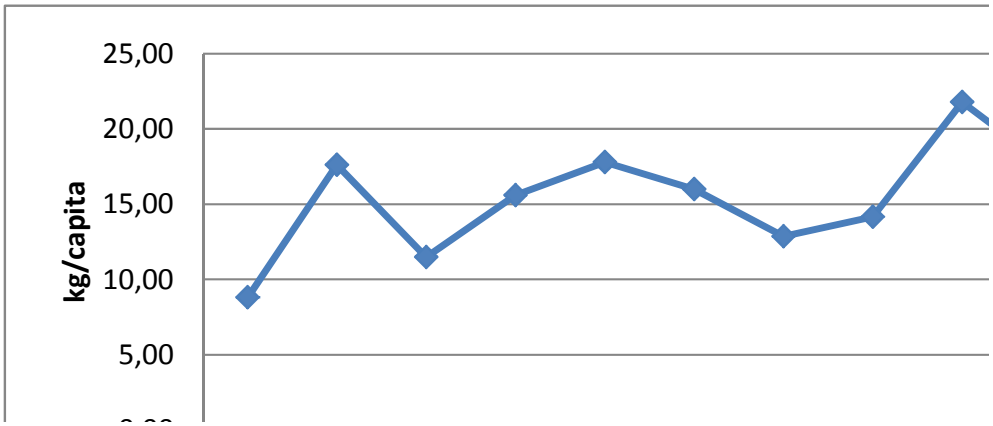


Figure 18: Per capita emissions of PM_{10} in Montenegro

- For $PM_{2.5}$ - 15.5 kg in Montenegro in 2007 (Figure 19).

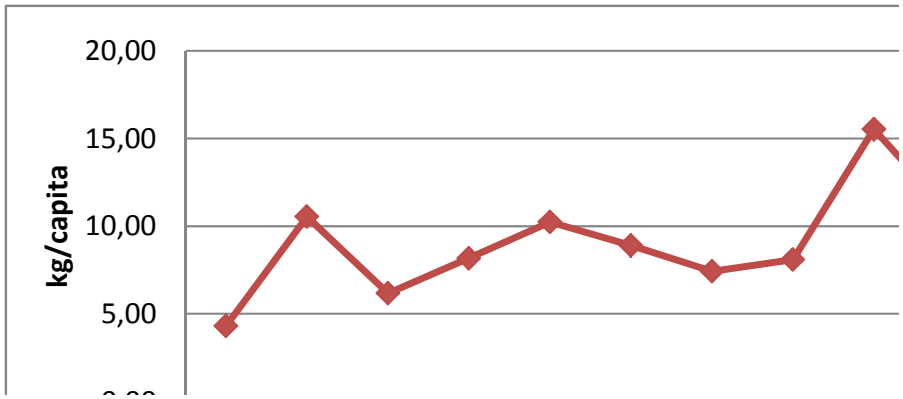


Figure 19: Per capita emissions of PM2.5 in Montenegro

Per capita emissions of pollutants into the atmosphere for several countries are presented in the following diagrams (Figures 20, 21, 22 and 23).

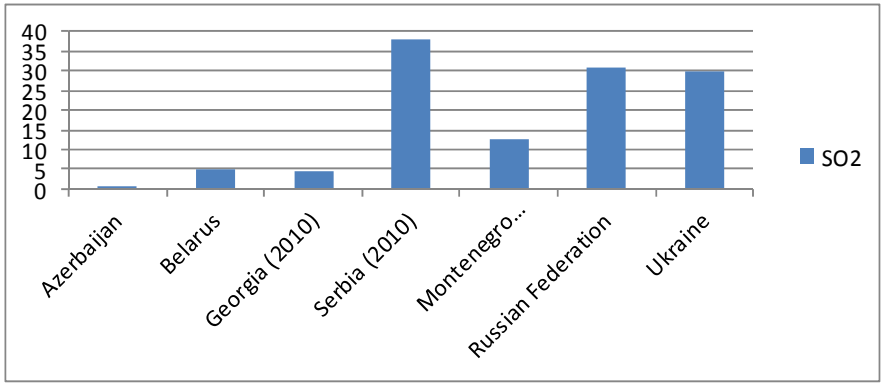


Figure 20: Per capita emissions of sulphur dioxide

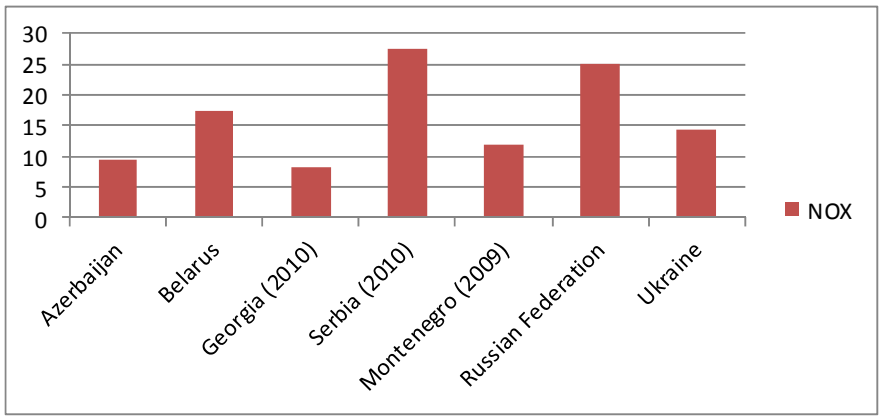


Figure 21: Per capita emissions of nitrogen oxides

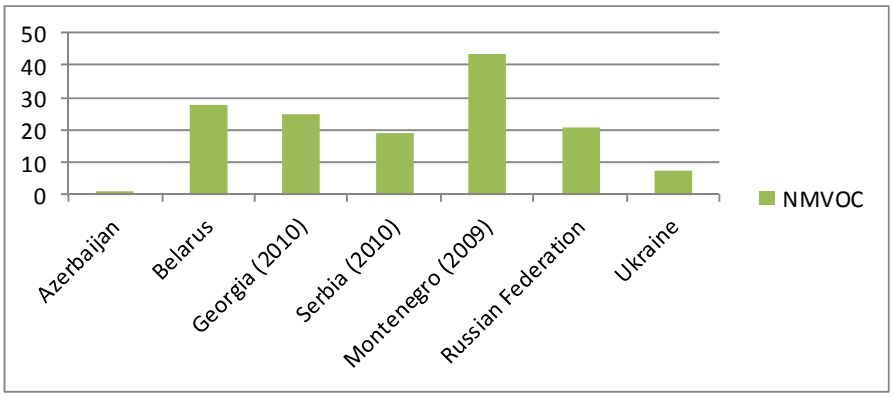


Figure 22: Per capita emissions of NMVOC

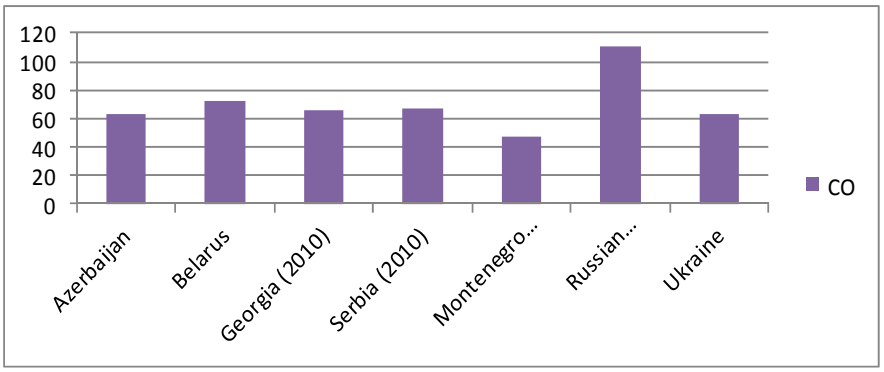


Figure 23: Per capita emissions of carbon monoxide

Information on emissions of major pollutants per unit of GDP at constant prices has not been submitted by Kyrgyzstan, the former Yugoslav Republic of Macedonia and Uzbekistan. The Russian Federation presented this information in terms of GDP in current prices.

In Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, the Republic of Moldova, Russian Federation (emissions from stationary sources), Ukraine and Uzbekistan, emission data are collected using forms of statistical reporting.

In most countries, information on emissions is being published in the statistical and environmental publications However, Kyrgyzstan, the Republic of Moldova, the former Yugoslav Republic of Macedonia and Uzbekistan did not specify the titles of those publications, and Serbia did not provide information about the publication of emissions data at all.

Conclusions:

1. The most complete data for the development of indicator "Emissions of pollutants into the atmospheric air" are available in Belarus, Serbia, Montenegro and Ukraine.
2. Data on emissions from mobile sources are not available in Kyrgyzstan and Uzbekistan.
3. All reporting countries assess the emissions of sulphur dioxide, nitrogen oxides, NMVOC (except Tajikistan), carbon monoxide and ammonia (except Georgia and Tajikistan).
4. Only four countries (Belarus, Serbia, Montenegro and Ukraine) assess the emissions of fine particulate matter.

5. Information on emissions of heavy metals has been received from Belarus, Kazakhstan, Serbia, Montenegro, the Republic of Moldova, Russian Federation and Ukraine.
6. Data on emissions of additional substances not covered by the questionnaire have been received from Belarus and Kazakhstan.
7. Dynamics of changes in pollutant emissions in the reporting periods are different in particular countries. The trend of reducing emissions of most pollutants was observed in Belarus, Kazakhstan, Kyrgyzstan, Montenegro, and Uzbekistan. In the former Yugoslav Republic of Macedonia, the amount of emissions during the reporting period has changed slightly. However, in Georgia and Serbia the data indicate the growth of emissions in these countries for almost all pollutants.
8. Sharp increase in emissions of nitrogen oxides, carbon monoxide and hydrocarbons during the last five years in Tajikistan starting 2007 is related to the fact that emissions from mobile sources which represent more than 90 % of national totals have started to be included into emission inventories.
9. Specific emissions of pollutants per capita or per unit area correlate in almost all cases associated with the absolute values of emissions, increasing or decreasing depending on their changes.
10. Belarus, Georgia and Montenegro control the quality of data on this indicator in accordance with international methodologies and standards.
11. Information on emissions of pollutants into the air is being published regularly in Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Montenegro, Russian Federation Tajikistan and Ukraine.

Recommendations:

1. It is recommended to Belarus, Montenegro and Ukraine to use available data to develop the indicator "Emissions of pollutants into the atmospheric air." Serbia is also recommended to develop this indicator based on the reported data, taking into account the need to publish information on emissions in the statistical publications and reports on the state of the environment.
2. It is suggested to Kazakhstan, Kyrgyzstan and Uzbekistan to develop a methodology for determining emissions from mobile sources and to carry out the necessary calculations of emissions.
3. It is recommended to the countries which have not reported data on emissions into the ambient air of all pollutants, listed in the questionnaire, to introduce assessment of such emissions into the practice of relevant authorities.
4. Bosnia and Herzegovina which has filled the questionnaires on other indicators, should be requested to collect data on emissions of pollutants into the atmospheric air and send them for assessment.
5. Kyrgyzstan, the former Yugoslav Republic of Macedonia and Uzbekistan should be requested to carry out the calculations of emissions of major pollutants per unit of GDP.
6. The former Yugoslav Republic of Macedonia and Uzbekistan are recommended to publish information on emissions of pollutants into the atmospheric air in the statistical and environmental publications.
7. It is recommended to the countries participation in the SEIS project to use the following emission data obtained during the development of indicator “Emissions of pollutants into the atmospheric air” in the documents of the European Environment Agency: Sulphur dioxide, nitrogen oxides, carbon monoxide, NMVOC, ammonia (except Georgia) and hydrocarbons (except Georgia).

2. Greenhouse gas emissions

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Armenia														
Azerbaijan														
Belarus														
Bosnia and Herzegovina														
Georgia														
Kazakhstan														
Kyrgyzstan														
Serbia														
Montenegro														
Republic of Moldova														
Russian Federation														
Tajikistan														
Former Yugoslav Republic of Macedonia														
Ukraine														
Uzbekistan														

Note: Green colour means that the country has reported at least some data related to this indicator.

Thirteen countries have filled the questionnaire on this indicator however with different levels of details.

Azerbaijan, Belarus, Kazakhstan, Russian Federation and Ukraine have reported data up to 2010 (including), Montenegro up to 2009. In the reports by Armenia, Georgia, the Republic of Moldova, the former Yugoslav Republic of Macedonia and Uzbekistan, the time series are presented starting from 1990, however ending in the middle 2000s only. The time series of Kyrgyzstan cover the period 2000 – 2005. Tajikistan has information on total GHG emissions in CO_2 equivalent available for the period 1990 - 2003 only. Bosnia and Herzegovina and Serbia have not reported data on this indicator.

Several countries have filled absolute emissions of all GHGs in CO_2 equivalents directly but aggregated emissions are calculated correctly.

The highest data coverage for this indicator can be seen in the case of the Russian Federation, Kazakhstan and Ukraine.

Azerbaijan does not have available data on emissions of hydrofluorocarbons (HFC) and perfluorocarbons (PFC), Armenia, Georgia and Montenegro do not have available data on emissions of HFC, PFC and sulphur hexafluoride and Kyrgyzstan, the former Yugoslav Republic of Macedonia and Uzbekistan have not reported data on emissions of PFC and sulphur hexafluoride. Belarus has aggregated data on emissions of HFC and sulphur hexafluoride.

The absence of carbon dioxide emissions in Armenia seems to be illogic considering the fact that the country is dominated by the emissions from energy sector.

Belarus has not presented the emissions of particular greenhouse gases for certain years, however aggregated emissions in terms of CO_2 equivalent are presented for all reporting years.

Having data on emissions of main greenhouse gases available, Uzbekistan has not presented aggregated emissions in terms of CO_2 equivalent which were to be calculated using the respective formula; however has reported the data on aggregated emissions including trends in land use, land use change and forestry (LULUCF).

Calculations of changes caused by LULUCF have not been reported by Armenia, Georgia, Kyrgyzstan and Montenegro.

The highest amount of greenhouse gases (in CO_2 equivalents) in 2010 was emitted by the Russian Federation (2.2 billion tons) followed by Ukraine (383 million tons). The lowest value of emissions can be seen in Montenegro – around 4 million tons. Rather low levels of emissions – between 10.5 and 12.5 million tons per year can be seen in the case of Georgia, Kyrgyzstan, the Republic of Moldova and the former Yugoslav Republic of Macedonia.

As a part of the total inventory in terms of absolute values of greenhouse gases emissions, the emissions of CO_2 exceed those of other gases considerably in all countries except Armenia. However, taking into account recalculation of absolute emissions to CO_2 equivalents according to the formula "emissions of CO_2 (Mt) + 21 x emissions of CH_4 (Mt) + 310 x emissions of N_2O (Mt) + 0.01 x sum of emissions of F-gases (kt) multiplied by respective GWPs, the highest impact on climate can be attributed to methane emissions in the case of Azerbaijan and Kyrgyzstan and to nitrous oxide emissions in the case of Montenegro, the Republic of Moldova and the former Yugoslav Republic of Macedonia.

With the exception of Kyrgyzstan, the aggregated emissions in CO_2 equivalent decreased in the last reported year in all countries. The highest decrease can be seen in Georgia and the Republic of Moldova – 4 times – and in Ukraine – 2.5 times (Figures 24, 25 and 26). Kyrgyzstan has reported slight increase in emissions for the period of 6 years, however aggregated emissions with the impact of land use, land use change and forestry are not calculated correctly.

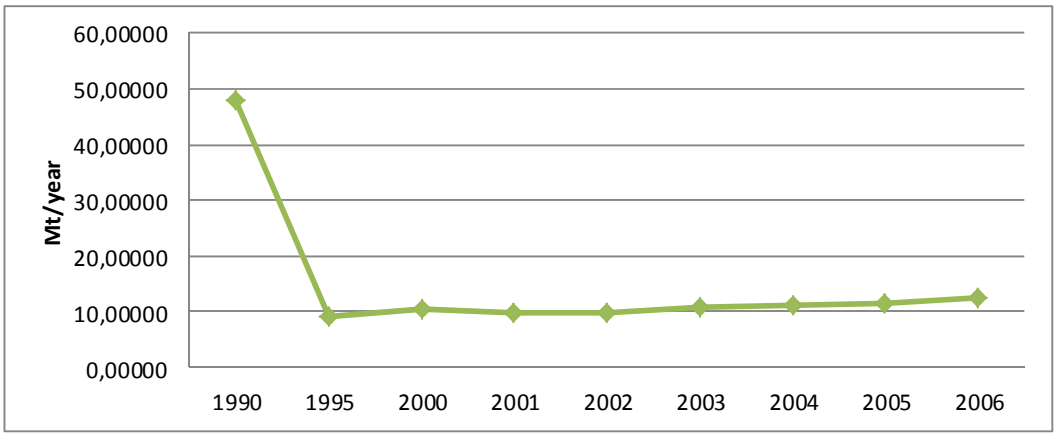


Figure 24: Aggregated emissions in CO_2 equivalent in Georgia

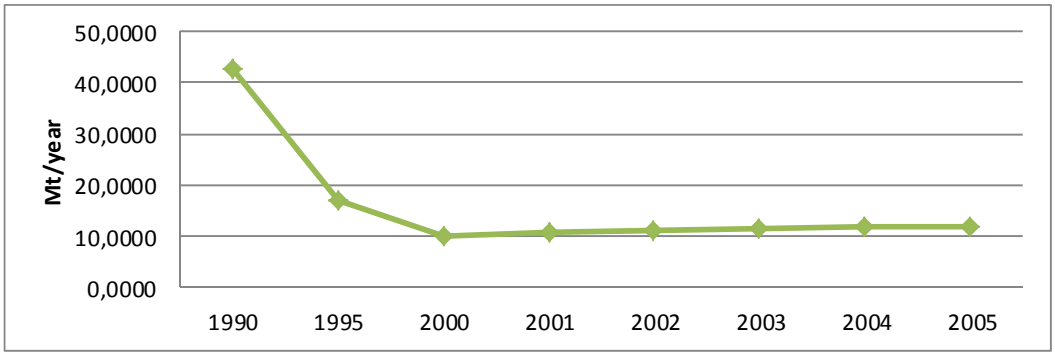


Figure 25: Aggregated emissions in CO_2 equivalent in the Republic of Moldova

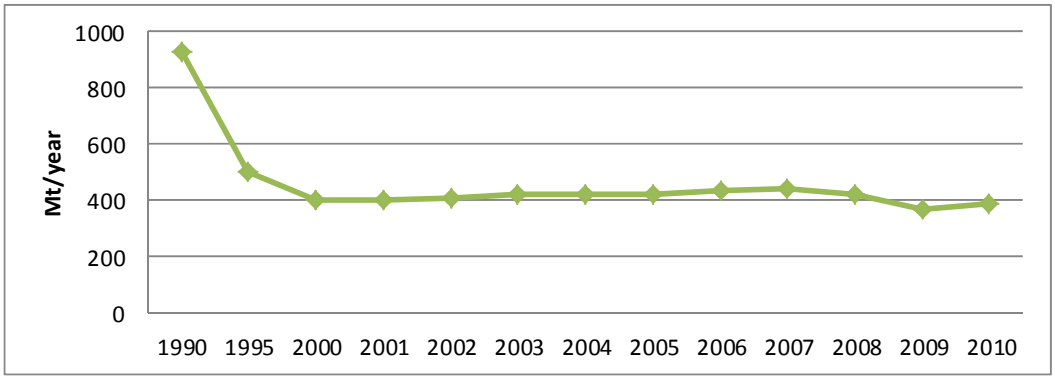


Figure 26: Aggregated emissions in CO_2 equivalent in Ukraine

In all countries, the predominant greenhouse gas emissions are those from energy utilities originated from fuel combustion in stationary sources.

All countries except Kyrgyzstan and Montenegro showed a decrease of the specific emission of greenhouse gases per capita in their time series (Figure 27). Kyrgyzstan differs form other countries as reported increased emissions per km^2 of the country.

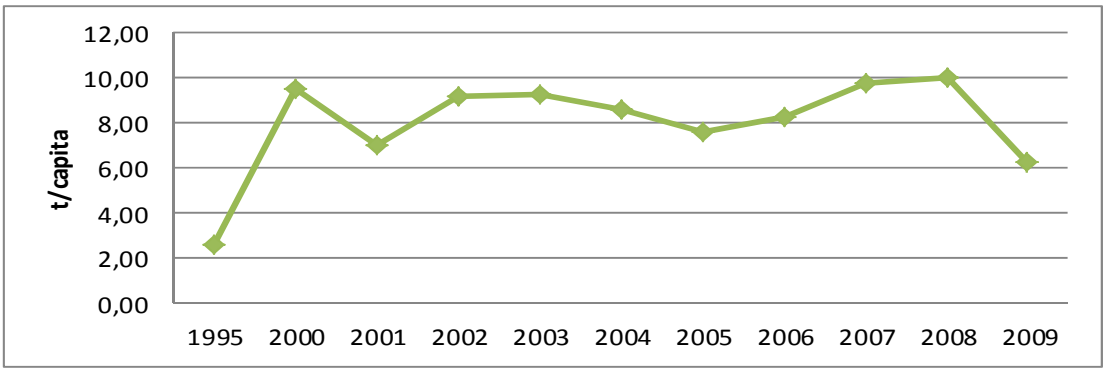


Figure 27: Per capita GHG emissions in Montenegro from 1995 to 2009

Aggregated emissions per unit of GDP in the reporting countries vary between 0.5 - 1.5 thousand tons per 1000 U.S. dollars with the exception of Kyrgyzstan and Tajikistan, where these values reach 7 – 8 thousand tons per USD 1000 in the years for which data is available.

Montenegro has reported that an inventory of greenhouse gas emissions in the country and quality control of the results is carried out in accordance with the methodology CORINAIR. In Azerbaijan, Belarus, Georgia, Russian Federation and Tajikistan, both internal and external control procedures related to the preparation of the indicator are carried out in accordance with the methodological guidelines of the Intergovernmental Panel on Climate Change.

Belarus and Russian Federation have prepared five national communications to meet the obligations of participation in the UN Framework Convention on Climate Change (UN FCCC), Armenia, Azerbaijan, Georgia, the Republic of Moldova and Uzbekistan - two national communications and Montenegro - one national communication.

In Kyrgyzstan, despite the reported data, the development of this indicator is not conducted. Data collection and calculation is being carried out periodically in the framework of international projects for the preparation of national communications to meet the obligations of the UN FCCC.

At the national level, the regular publication of greenhouse gas emissions is carried out in Armenia, Georgia, Kazakhstan, Montenegro, the Republic of Moldova and the Russian Federation.

Azerbaijan, Belarus, Kyrgyzstan and Ukraine have reported on placing of their national communications on the site of the UN FCCC. However, these communications are not periodic and not available to the general public. The former Yugoslav Republic of Macedonia and Uzbekistan have not reported information on publication of greenhouse gas emissions.

No one of countries has reported on developed target values for future reduction of greenhouse gas emissions.

Conclusions:

1. The highest amount of greenhouse gases is emitted by the Russian Federation followed by Ukraine and Kazakhstan. These countries have the highest data coverage and the most full time series on greenhouse gas emissions

2. Data reported by Azerbaijan and Belarus could be used for the development of this indicator only partially.
3. Assessment of emission changes due to LULUCF is not being carried out in Armenia, Georgia, Kyrgyzstan and Montenegro.
4. In Belarus, Georgia, Kazakhstan, Russian Federation, Ukraine and Uzbekistan, the CO_2 emissions exceed those of other greenhouse gases considerably. In Azerbaijan and Kyrgyzstan, the highest impact on climate can be attributed to methane emissions and in Montenegro, the Republic of Moldova and the former Yugoslav Republic of Macedonia to nitrous oxide emissions.
5. Armenia has not reported on the emissions of carbon dioxide.
6. With the exception of Kyrgyzstan, all countries have achieved reduction of aggregated emissions in terms of CO_2 equivalent in the last reporting year comparing to the first reporting years.
7. Emissions of greenhouse gases from energy sector originated in combustion of fuel in stationary installations represent the major source of emissions in all countries.
8. With the exception of Kyrgyzstan and Montenegro, all countries have shown the decrease in specific emissions of greenhouse gases per capita during the whole reporting period.
9. Majority of countries is preparing national communications on UN FCCC.
10. Azerbaijan, Belarus, Georgia, Russian Federation and Tajikistan carry out both internal and external control procedures related to the preparation of the indicator in accordance with the requirements of the methodological guidelines of the Intergovernmental Panel on Climate Change and Montenegro in accordance with the CORINAIR methodology.
11. Information on greenhouse gas emissions is being published regularly in Armenia, Georgia, Kazakhstan, Montenegro, the Republic of Moldova and the Russian Federation.

Recommendations:

1. It is recommended to the Russian Federation, Kazakhstan and Ukraine to use their data for the development of indicator „Greenhouse gas emissions“ taking into account the development of target values for emission reduction in the future.
2. It is recommended to Uzbekistan to carry out calculations of aggregated emissions in terms of CO_2 equivalent using available data.
3. Armenia should be requested to check availability of the data on carbon dioxide emissions.
4. It is recommended to Armenia, Georgia, Kyrgyzstan and Montenegro to include the changes of emissions due to LULUCF into their national emission inventories.
5. It is recommended to Kyrgyzstan to introduce greenhouse gas emission inventory system at the national level.
6. I tis necessary for Azerbaijan, Belarus, Kyrgyzstan and Ukraine to present their national communications not only at the UN FCCC website but also at national level to inform general public. It is recommended to the former Yugoslav Republic of Macedonia to publish information on greenhouse gas emissions in statistical and environmental publications.
7. Taking into account the above mentioned comments, it is recommended to the countries participating in the SEIS project to use the data of indicator „Greenhouse gas emissions“ in the documents of the European Environment Agency.

3. Household water use per capita

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Armenia														
Azerbaijan														
Belarus														
Bosnia and Herzegovina														
Georgia														
Kazakhstan														
Kyrgyzstan														
Serbia														
Montenegro														
Republic of Moldova														
Russian Federation														
Tajikistan														
Former Yugoslav Republic of Macedonia														
Ukraine														
Uzbekistan														

Note: Green colour means that the country has reported at least some data related to this indicator.

Twelve countries have filled the questionnaire on this indicator however with different levels of details.

In most countries, data are collected since 1990, in Tajikistan since 1992, in Serbia – since 1999, in Armenia, Bosnia and Herzegovina, Kazakhstan and the Russian Federation – since 2000. Montenegro, the Republic of Moldova and Uzbekistan have reported only general information on water consumption in the municipal sector, which cannot be the basis for the development of the indicator.

The most complete data in terms of fairly long periods of observation have been reported by Azerbaijan, Armenia, Belarus, Bosnia and Herzegovina, Kazakhstan, Serbia and Tajikistan, which showed the consumption of water both through the centralized systems and through self-supply. Georgia also has reported this data, but they only apply to the period 2010-2011. In other countries, calculations of water consumption bypassing the centralized systems was not conducted.

The Russian Federation, instead of water consumption in the municipal sector, showed overall data on the supply of water to the population and organizations financed from the budget, and

- instead of the annual water consumption per capita - the average daily supply of water per inhabitant. Such data cannot be used in comparison with the data obtained in other countries.

Of the countries having complete data on this indicator available, in Tajikistan more than half of the population is not connected to centralized water supply; in Azerbaijan – 48 %, in Georgia - 40% and in Belarus, Kazakhstan and Serbia - less than 20% and in Armenia – less than 3%. In Bosnia and Herzegovina, 63% of the population was not connected to centralized water supply in 2000, whereas by 2010 this figure dropped to 46% (Figure 28).

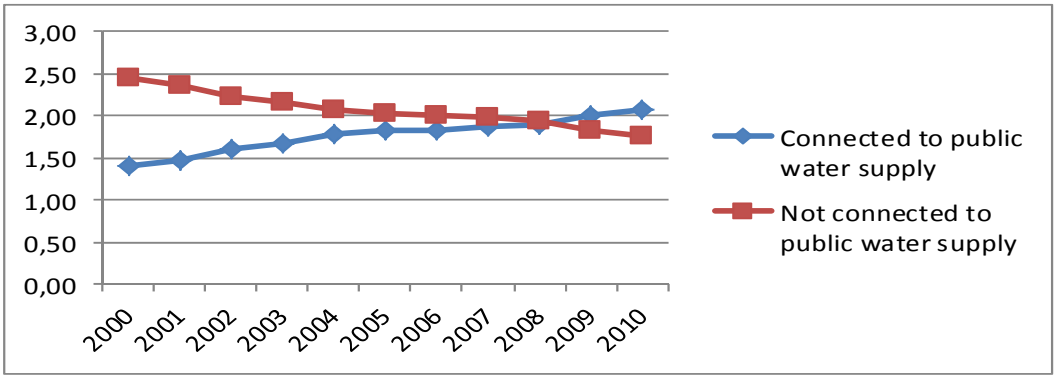


Figure 28: Connection to public water supply in Bosnia and Herzegovina (million persons)

In Armenia, Azerbaijan, Belarus (last 5 years), Serbia and Ukraine, the trend to reduce total water consumption and water consumption per capita per annum can be seen. In Bosnia and Herzegovina and the former Yugoslav Republic of Macedonia, on the contrary, the volume of total water consumption and water consumption per capita was increasing from year to year. In Kazakhstan, there is a small increase in total water consumption and saving in water consumption per capita at the same level.

Of all reporting countries, the highest amount of water per capita per year, even without taking into account the population not connected to public water supply, is at present consumed in Georgia - 106 m^3, the lowest in Kyrgyzstan - 12.6 m^3(Figure 29).

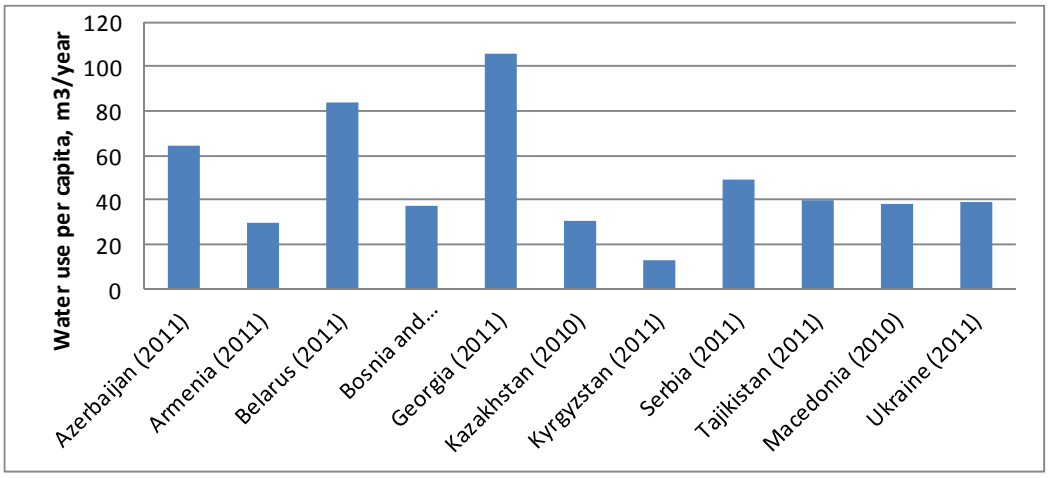


Figure 29: Household water use per capita

In Kyrgyzstan, both total water use and water use per capita oscillates from year to year with changes up to 5 – 6 times (Figures 30 and 31).

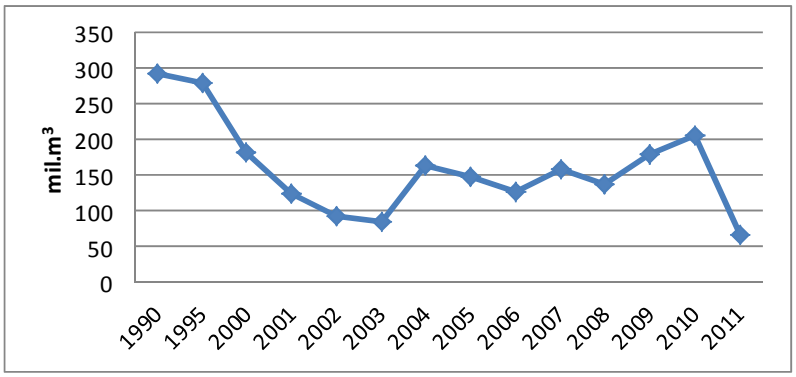


Figure 30: Total water use in Kyrgyzstan

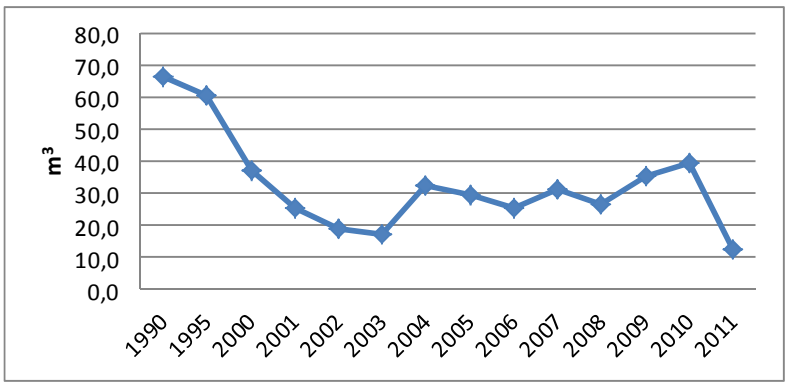


Figure 31: Water use per capita in Kyrgyzstan

In most countries the statistical authorities are responsible for the collection of data on this indicator. In Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyzstan, Russian Federation, the Republic of Moldova and Ukraine, the data is being collected using national statistical reporting forms.

In Serbia, the methodology of data collection and calculations is partly harmonized with the international recommendations of the OECD/Eurostat and the UNSD/UNEP. Georgia has stated that the quality control of data acquisition, conducted in the country, is inefficient. The rest of the countries carry out quality of control data acquisition using national methods of control.

All countries except the former Yugoslav Republic of Macedonia, confirmed the publication of the data on this indicator in the statistical and environmental publications and in some countries also the sanitary-epidemiological publications and websites. However, Kyrgyzstan, Montenegro and the Republic of Moldova did not specify the titles of these publications.

Conclusions:

1. The most complete data on household water use over a sufficiently long time periods are available in Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan and Serbia and Tajikistan, which showed water consumption both through public water supply and through self-supply.

2. Information on the consumption of water by the households not secured by municipal water supply is not available in Belarus, Kyrgyzstan, the Russian Federation, the former Yugoslav Republic of Macedonia and Ukraine.
3. The Russian Federation has provided information that does not correspond with the questionnaire and which cannot be used to develop this indicator.
4. In Azerbaijan, Bosnia and Herzegovina, Georgia and Tajikistan, significant part of population has no access to centralized water supply.
5. Downward trend in both the total water consumption and water consumption per capita can be observed in Armenia, Azerbaijan, Belarus, Kyrgyzstan, Serbia, Tajikistan and Ukraine. In Bosnia and Herzegovina and the former Yugoslav Republic of Macedonia, the figures were growing from year to year.
6. The highest amount of water per capita in the last reporting year was consumed in Georgia - 106 m^3, the lowest - in Kyrgyzstan – 12.6 m^3.
7. All countries except the former Yugoslav Republic of Macedonia, publish information on the consumption of water in national publications.

Recommendations:

1. It is recommended to Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Kazakhstan, Serbia and Tajikistan to use available data to develop indicator "Household water use per capita."
2. It is recommended to the Republic of Moldova and Uzbekistan to establish data collection and calculation mechanisms for the formation of the indicator.
3. It is recommended to Kyrgyzstan, the former Yugoslav Republic of Macedonia and Ukraine to develop a method of calculation of consumption of water by population and households not connected to centralized water supply systems.
4. The Russian Federation should be requested to consider the possibility of adapting its existing data associated with the consumption of water in terms of the indicator "Household water use per capita."
5. It is recommended to Georgia to improve quality control of data for this indicator through consultation with the competent international organizations.

4. Water losses

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Armenia														
Azerbaijan														
Belarus														
Bosnia and Herzegovina														
Georgia														
Kazakhstan														
Kyrgyzstan														
Serbia														
Montenegro														

Republic of Moldova														
Russian Federation														
Tajikistan														
Former Yugoslav Republic of Macedonia														
Ukraine														
Uzbekistan														

Note: Green colour means that the country has reported at least some data related to this indicator.

Fifteen countries have filled the questionnaire on this indicator however with different levels of details.

Six of them (Azerbaijan, Armenia, Belarus, Georgia, Kyrgyzstan, Ukraine) have shown calculations of water losses for the period 1990 - 2011. In Serbia, until the year 2000 estimates of water loss were carried out per every three years in 1990, 1993, 1996 and 1999, but in the period 2000 - 2003 such calculations have not been conducted. Montenegro showed the results of calculations made in 2002, 2005 and 2008, i.e. as a three-year cycle.

None of the countries has filled in the questionnaire completely. None of them has shown the water losses resulting from accidents in the networks, evaporation and the errors in the measurements. Only Azerbaijan, Armenia, Kazakhstan and the former Yugoslav Republic of Macedonia account for water lost through leakage. At the same time Armenia relates 100% of water losses to leakages. The rest of the countries, except the Russian Federation, have shown total losses of water in absolute terms and as a percentage of the amount of abstracted water.

The Russian Federation includes the abstraction of both fresh and sea water while the reported losses only cover water lost during transportation, evidently including leakage and evaporation.

Most countries have reduced the abstraction of water during their reporting periods. However, the abstraction of water in Bosnia and Herzegovina has increased 1.5 times in 10 years, in Georgia 1.3 times in 22 years, in Montenegro1.1 times in 7 years and in the former Yugoslav Republic of Macedonia 2.3 times in 21 years.

Strong annual variation in both water abstraction and water losses is characteristic for the former Yugoslav Republic of Macedonia (Figure 32).

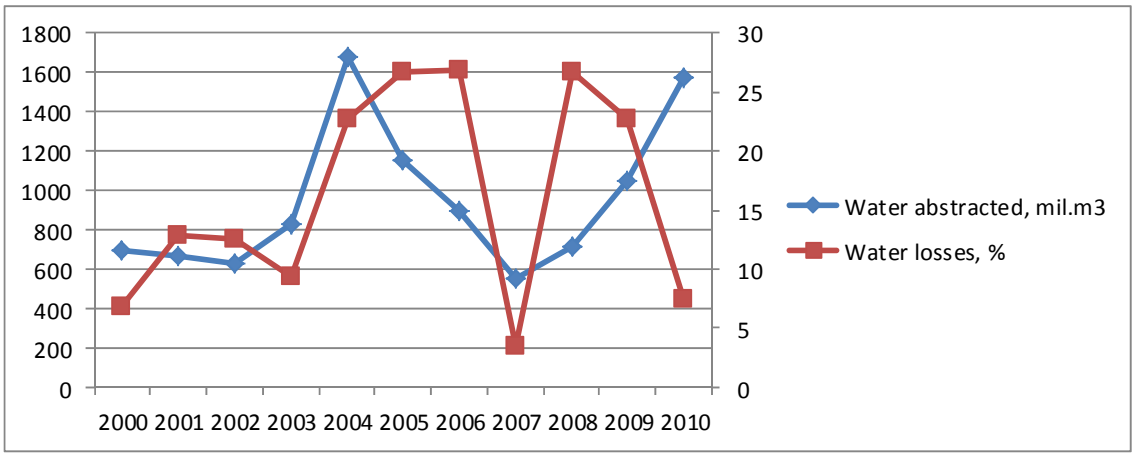


Figure 32: Annual variation in water abstraction and water losses in the former Yugoslav Republic of Macedonia

The highest total losses of water in the absolute values are recorded in the Russian Federation, where the number varies from year to year around 8 km^3. However, the abstraction of water in the Russian Federation exceeds the abstraction in majority of other countries by 1-2 orders.

The lowest water abstraction can be seen in Montenegro (about 100 million m^3 per year), but the losses in this country in 2008 amounted to more than half of the abstracted water. In Georgia in 2006 and 2007, water losses amounted to well over half of the total amount abstracted.

The catastrophic increase in water losses from 7.5% in 1990 to more than 80% in the period 2006-2011 can be seen in Armenia (Figure 33). During the reporting period, water losses have increased 5 times in Tajikistan.

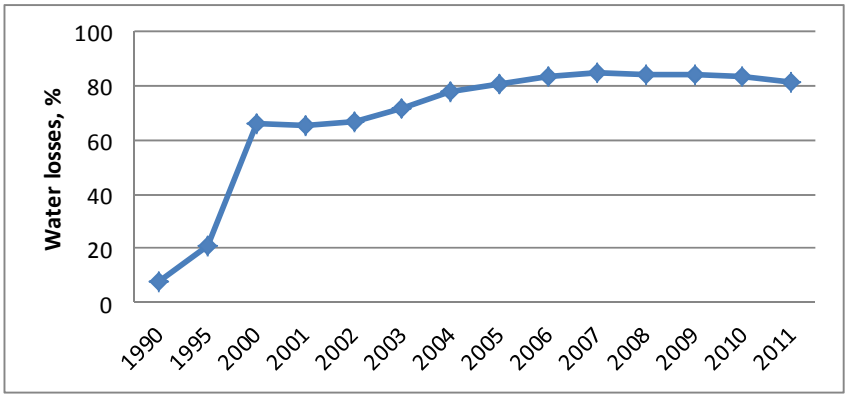


Figure 33: Water losses in Armenia

In Kyrgyzstan, the data on water losses do not correspond to the balance calculations between the water abstraction and its delivery to end users, which has lead to incorrect estimates of water losses in percentage terms. In addition, water transfers to other countries are not taken into account.

In accordance with the data from Uzbekistan, less than a half of abstracted water is delivered to the end users and the percentage of water losses is calculated based on the quantity supplied to the network, which is not correct for the calculation of this indicator.

The lowest losses of water, around 8%, can be seen in the Republic of Moldova.

The following growth trends of water losses for the reporting periods of time are observed:
- In Azerbaijan from 24.0% in 1990 to 33.3% in 2011 (in 2001 - 36.2%);
- In Armenia from 7.5% in 1990 to 81.3% in 2011 (in 2007 - 84.6%);
- In Bosnia and Herzegovina from 49.6 % in 2000 to 51.6 % in 2010;
- In Belarus from 3.2% in 1990 to 11.7% in 2011 (in 2010 -15%);
- In Georgia, from 12% in 1990 to 37% in 2011 (in 2000 - 56%);
- In the former Yugoslav Republic of Macedonia from 6.8% in 2000 to 7.4% in 2010 (in 2006 - 26.9%);
- In the Russian Federation from 7.3% in 1990 to 9.5% in 2010 (in 2003 - 10.2%);
- In Tajikistan from 11.7 % in 1992 to 52.8 % in 2011 ((in 2010 – 57 %);
- In Montenegro, from 30.9% in 2002 to 53.2% in 2008;
- In Serbia, with 12.8% in 1990 to 32.2% in 2011,
- In Ukraine - from 15.7% in 1990 to 33.3% in 2011 (in 2008 - 36.9%) – Figure 34.

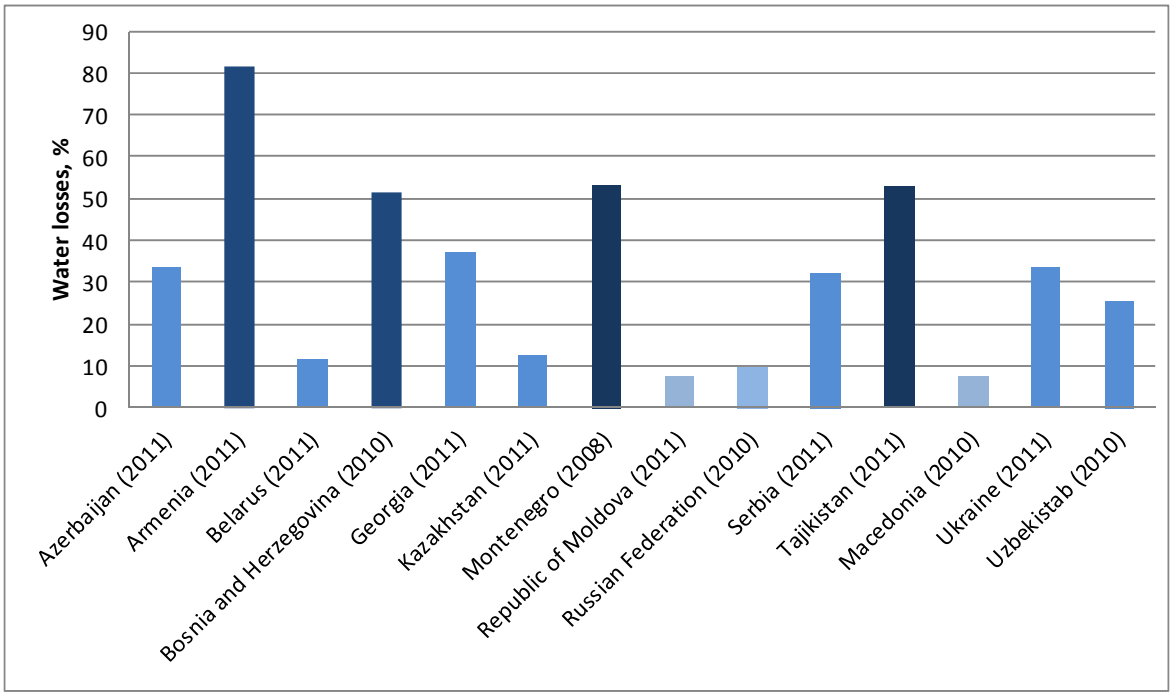


Figure 34: Water losses in by countries

The trend of reduction of water losses from 22.8% in 1995 to 12.4% in 2011(with slight variations in water abstraction) has only been reported by Kazakhstan. However, in the period 2000 - 2003 the water losses had been fixed at 29 -33%, then a sharp decrease in losses occurred (Figure 35).

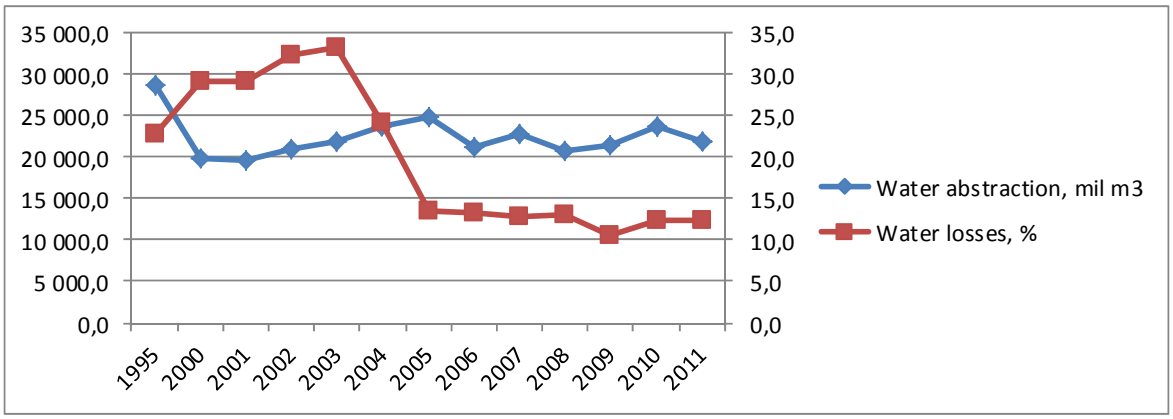


Figure 35: Relation between water abstraction and water losses in Kazakhstan

In Serbia, the methodology of data collection and calculations is partly harmonized with the international recommendations of OECD/Eurostat and the UNSD/UNEP. Georgia states that the quality control of data acquisition, conducted in the country, is inefficient. The rest of the countries carry out the quality control of data acquisition using national methods of control.

All countries, except the former Yugoslav Republic of Macedonia and Uzbekistan, confirmed the publication of information about the losses of water in statistical and environmental publications and on websites. However, Kyrgyzstan, Montenegro and Tajikistan did not specify the titles of publications.

Conclusions:

1. Losses of water between the sites of abstraction and the places of use represent an indicator of the efficiency of water use, including the state of water systems and impact on the formation of water prices.
2. None of the countries has submitted complete data on this indicator in accordance with the questionnaire. None of them has reported water losses resulting from accidents in the networks, evaporation, and the errors in the measurements.
3. Most countries, except Bosnia and Herzegovina, Georgia, Montenegro and the former Yugoslav Republic of Macedonia have reported tendency to reduce the annual water abstraction.
4. Despite the overall decrease in the amount of abstracted water, the losses increased in all countries, except Kazakhstan and the Republic of Moldova, which lose less water than any other country.
5. In Bosnia and Herzegovina, Georgia, Montenegro and Tajikistan, water losses for many years exceed 50% of the total abstracted water; and in Armenia more than 80% of the total abstracted water was lost in recent years as a result of leakages.
6. Data on water losses in Kyrgyzstan and Uzbekistan require revision.
7. All countries except the former Yugoslav Republic of Macedonia, publish information on the losses of water in national publications

Recommendations:

1. It is recommended to all countries to consider not only the total losses of water, but also to break them down by the type of loss (leakages. accidents, evaporation).
2. It is recommended to Kyrgyzstan to adjust balance calculations of water losses between the site of abstraction and the place of delivery to end users in order to obtain reliable results.

3. Uzbekistan should be requested to provide clarification regarding the significant difference between the amount of abstracted water and its feeding into the utility grid.
4. It is recommended to Georgia to improve quality control of data for this indicator through consultations with the competent international organizations.

5. Land uptake

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Armenia														
Azerbaijan														
Belarus														
Bosnia and Herzegovina														
Georgia														
Kazakhstan														
Kyrgyzstan														
Serbia														
Montenegro														
Republic of Moldova														
Russian Federation														
Tajikistan														
Former Yugoslav Republic of Macedonia														
Ukraine														
Uzbekistan														

Note: Green colour means that the country has reported at least some data related to this indicator.

Ten countries have filled the questionnaire on this indicator with different levels of detail.

Data which can be used for the formulation of this indicator have been sent by Armenia, Azerbaijan, Belarus and Kazakhstan only.

The Republic of Moldova has some data on the indicator available over the period 1995 - 2011. Azerbaijan, Kazakhstan and Uzbekistan have reported the data since 2000 and Armenia since 2006. Bosnia and Herzegovina has presented data for 2000 and 2006 and Montenegro for 2006 only. Georgia, Kyrgyzstan, Serbia, the Russian Federation and the former Yugoslav Republic of Macedonia have not presented data for the formulation of this indicator.

Kyrgyzstan has reported in accordance with the classification adopted in the country, which is not the same as that proposed in the questionnaire. Nevertheless, information on land taken out of productive function can be indirectly obtained from the data, as they contain information about the land settlements, industry, transport, communication or defence. However, this analysis was not done.

Information by the Republic of Moldova and Uzbekistan contain only the areas of land taken out of productive function, but the figures are questionable because of their small size and large fluctuations from year to year.

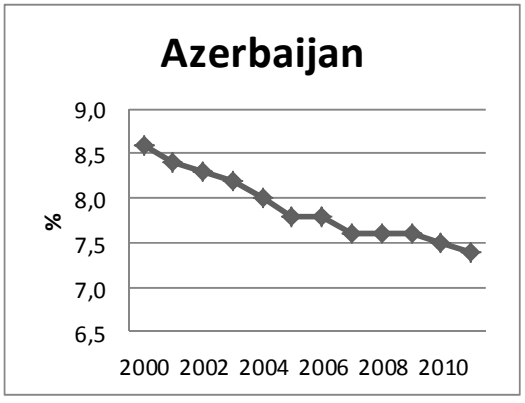
Azerbaijan has reported about the areas of land taken out of productive function, the lands occupied by mining companies, mineral deposits, grids, pipelines, transportation structures, communication and security systems, border strips, residential areas, the various agencies and organizations or areas designated for recreation. It is noted that the set of indicators presented in the questionnaire does not correspond to the positions in the balance of the land in the country, from which the data were obtained.

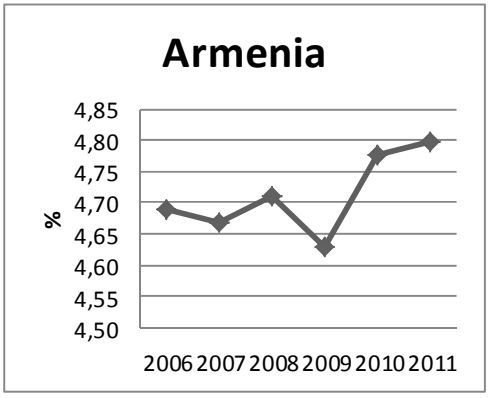
Belarus has included to the land taken out of productive function the areas set aside for technical and transport infrastructure and residential areas. At the same time, Belarus, along with Bosnia and Herzegovina, Montenegro and Tajikistan, presented information on the areas of land used for landfills, waste dumps and tailings.

The Russian Federation which has not reported data, informed that the development of information in the proposed structure of the questionnaire is not being carried out. The country has developed information on land acquisition for the state and public needs, including the construction and expansion of industrial, transport, communication and other structures, the construction of hydro-technical and other water related structures or expansion and construction of settlements.

The most complete information on this indicator has been presented by Kazakhstan, in which only the information on areas occupied by different structures, areas designated for recreation or waste management utilities is missing.

Analysis of the reported information showed that the amount of land taken out of productive function in Azerbaijan varies from year to year from 7.4 % to 8.6%, in Kazakhstan - from 8.4% to 11.5%. In Belarus such lands so far amounted to 1.4% with the trend of annual growth (Figure 36), in Bosnia and Herzegovina to about 1% (2006), in Armenia to 4.8% or to 1.5% in Montenegro (2006).





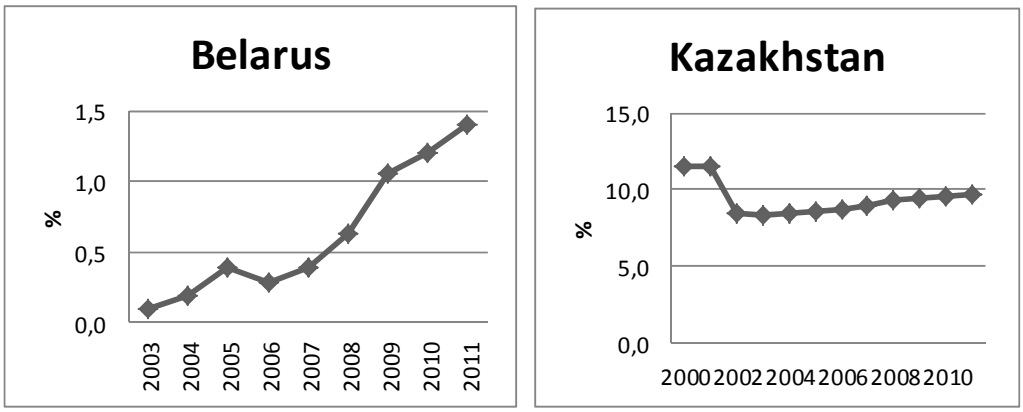


Figure 36: Dynamics of land taken out of productive function by countries

Comparative characteristics of the share of land taken out of productive function are presented in Figure 37 below.

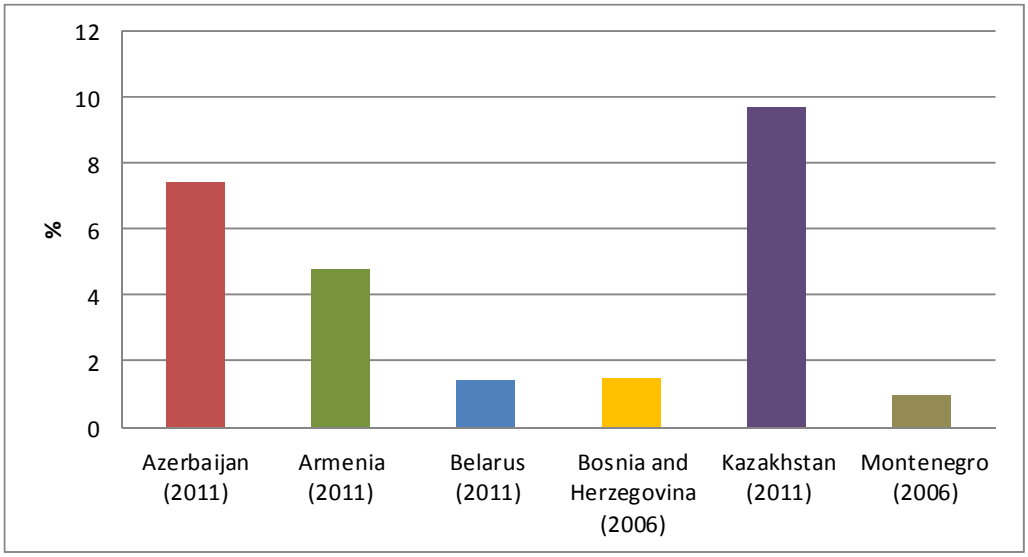


Figure 37: Comparative characteristics of the share of land taken out of productive function

In Armenia, Belarus, and Kazakhstan, the major part of the land taken out of productive function is occupied by residential areas, in Azerbaijan by industrial installation and in Tajikistan by landfills and other waste deposit sites.
Currently, Kazakhstan is working to expand the parameters recommended in the context of the UNECE categories of land.

Data on the indicator are being published in Azerbaijan, Bosnia and Herzegovina, Kazakhstan, the Republic of Moldova and Tajikistan, mainly in the statistical yearbooks and land inventories. Armenia has also announced the publication of the data but without specifying their titles.

Conclusions:

1. None of the countries has reported full data for the development of this indicator in accordance with the questionnaire.

2. Information which can be used to develop this indicator has only been received from Armenia, Azerbaijan, Belarus, and Kazakhstan.
3. A number of countries (Azerbaijan, Kyrgyzstan, Russian Federation) use to determine land taken out of productive function their own national classifications, which do not coincide with the international ones.
4. Only Kazakhstan, which has presented the most complete information on the indicator, is working on adapting the national data system to the international one.
5. Territories taken out of productive function in Kazakhstan may exceed 10% of the total country area.
6. In Armenia, Belarus, and Kazakhstan, the major part of the land taken out of productive function is occupied by residential areas, in Azerbaijan by industrial installation and in Tajikistan by landfills and other waste deposit sites.
7. The data on these indicators is being published in Azerbaijan, Bosnia and Herzegovina, Kazakhstan, the Republic of Moldova and Tajikistan.

Recommendations:

1. It is recommended to Kyrgyzstan to select data related to the land taken out of productive function from the massive bulk of data available.
2. It is recommended to the Republic of Moldova and Uzbekistan to verify the reported data on the uptake of land of productive function and break these down by categories.
3. It is recommended to the countries whose national land use classification is not compatible with the international standards to initiate mutual consultations to achieve the convergence of the categories of land use classification.

6. Fertilizer consumption

Country	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Armenia														
Azerbaijan														
Belarus														
Bosnia and Herzegovina														
Georgia														
Kazakhstan														
Kyrgyzstan														
Serbia														
Montenegro														
Republic of Moldova														
Russian Federation														
Tajikistan														

Former Yugoslav Republic of Macedonia														
Ukraine														
Uzbekistan														

Note: Green colour means that the country has reported at least some data related to this indicator.

Thirteen countries have filled the questionnaire on this indicator however with different levels of details.

Complete data sets on the consumption of different types of fertilizers from 1990 to 2011 are available in Kyrgyzstan, the Republic of Moldova and the Russian Federation and from 1992 to 2011 in Tajikistan.. Data for the period 2000-2011 years have been presented by Belarus, Kazakhstan, Ukraine and Uzbekistan. Data for the last 4-6 years were collected in Armenia, Azerbaijan, Bosnia and Herzegovina, Georgia and Serbia. The former Yugoslav Republic of Macedonia has not presented data suitable for the development of this indicator (the area treated with organic fertilizers has been presented for one year only). Montenegro has not filled the questionnaire replying that the country does not collect data on consumption of organic fertilizers.

The most complete data on this indicator for the 12-year period is available in Kazakhstan. However, the data on fertilizers sales data were presented in national currency and not in metric tons which makes it difficult to estimate the amount of fertilizers sold.

Complete data for more than 20 years are also available in the Russian Federation, however without taking into account the consumption of complex mineral fertilizers (containing nitrogen, phosphates and potash). The same applies to the Republic of Moldova, which has not presented both the data on consumption of complex mineral fertilizers and those on the volume of their sales.

Information on the application of complex fertilizers has only been included in the reports by Bosnia and Herzegovina (for the last two years), Kazakhstan and Ukraine. Azerbaijan has reported that complex fertilizers are not being applied in the country.

Bosnia and Herzegovina and Serbia have not reported data on the areas treated with fertilizers as well as data on the application of organic fertilizers.

In all countries, except Armenia, the areas under mineral fertilizers exceed the areas under organic fertilizers considerably.

Nitrogen fertilizers dominate the balances of fertilizer consumption in all countries except Belarus. Georgia and Tajikistan have reported that only this type of fertilizer is applied in the country. In Belarus, potash fertilizers are consumed more frequently than the nitrogen and phosphate ones.

Consumption of both mineral and organic fertilizers, as well as the size of the areas to which are they applied, varies in all countries varies from year to year, showing significant fluctuations in some cases. For example, in Uzbekistan, the total amount of applied fertilizer per unit of agricultural land ranged from 24.0 kg / ha in 2006 to 202.7 kg / ha in 2010, in

Belarus - from 88.2 kg / ha in 2001 to 220. 0 kg / ha in 2010, in Kyrgyzstan - from 6.4 kg / ha in 1995 to 140.5 kg / ha in 1990 or in Tajikistan - from 37.5 kg / ha in 2001 to 157 kg / ha in 1990. In other countries the scale of these fluctuations is much smaller (Figure 38).

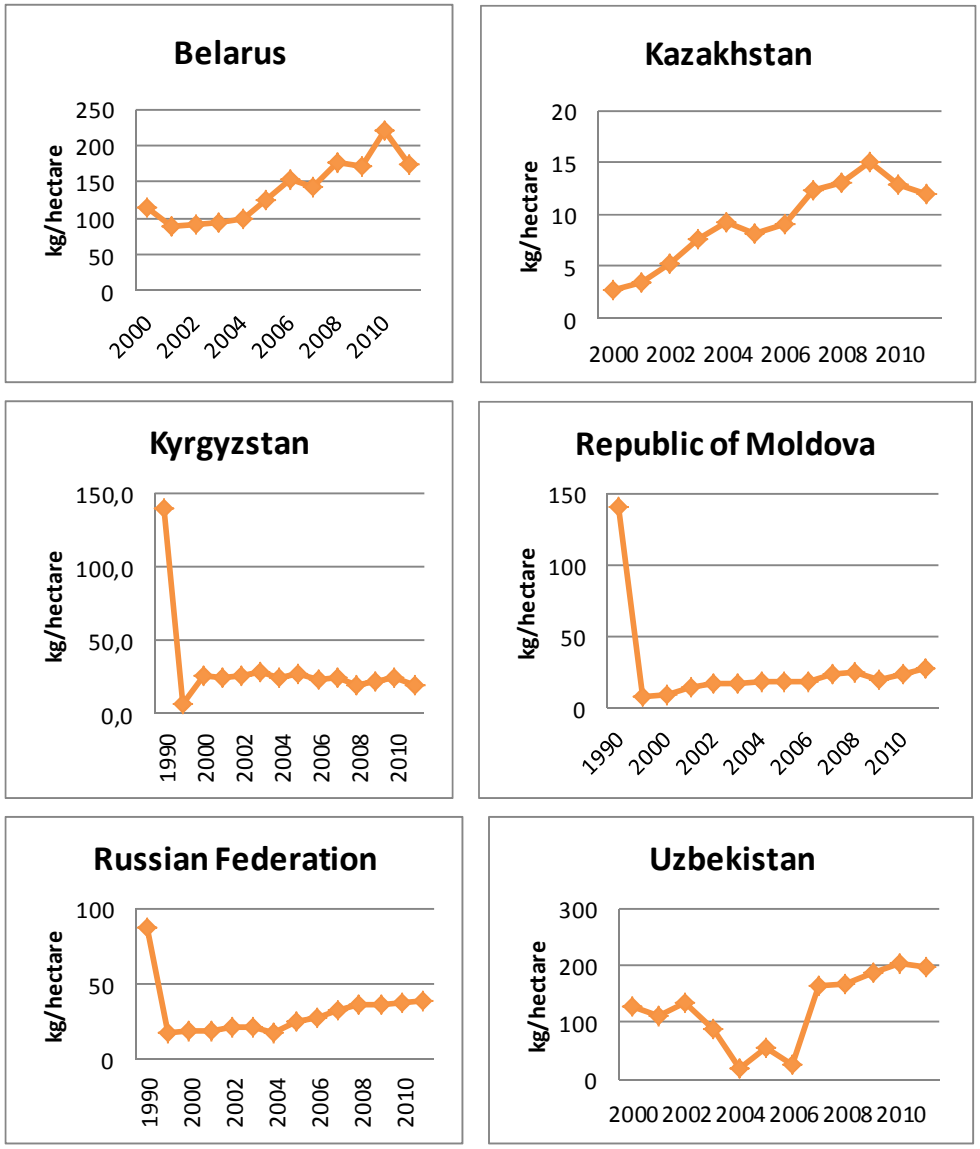


Figure 38: Consumption of mineral fertilizers per unit of agricultural land

Consumption of organic fertilizers can reach significant values in many countries, but they are usually applied to smaller area comparing to mineral fertilizers. In some years, Belarus has applied 8512 kg of organic fertilizers per hectare of agricultural land, the Republic of Moldova - 5916 kg / ha, Armenia – 5288 kg/hectare, Uzbekistan - 4169 kg / ha, the Russian Federation - 3500 kg / ha and Kyrgyzstan - 2500 kg / ha. At the same time, Kazakhstan has shown that it applies no more than 10.8 kg / ha of organic fertilizer, Armenia no more than 6.1 kg / ha and Ukraine no more than 1.5 kg / ha (Figure 39).

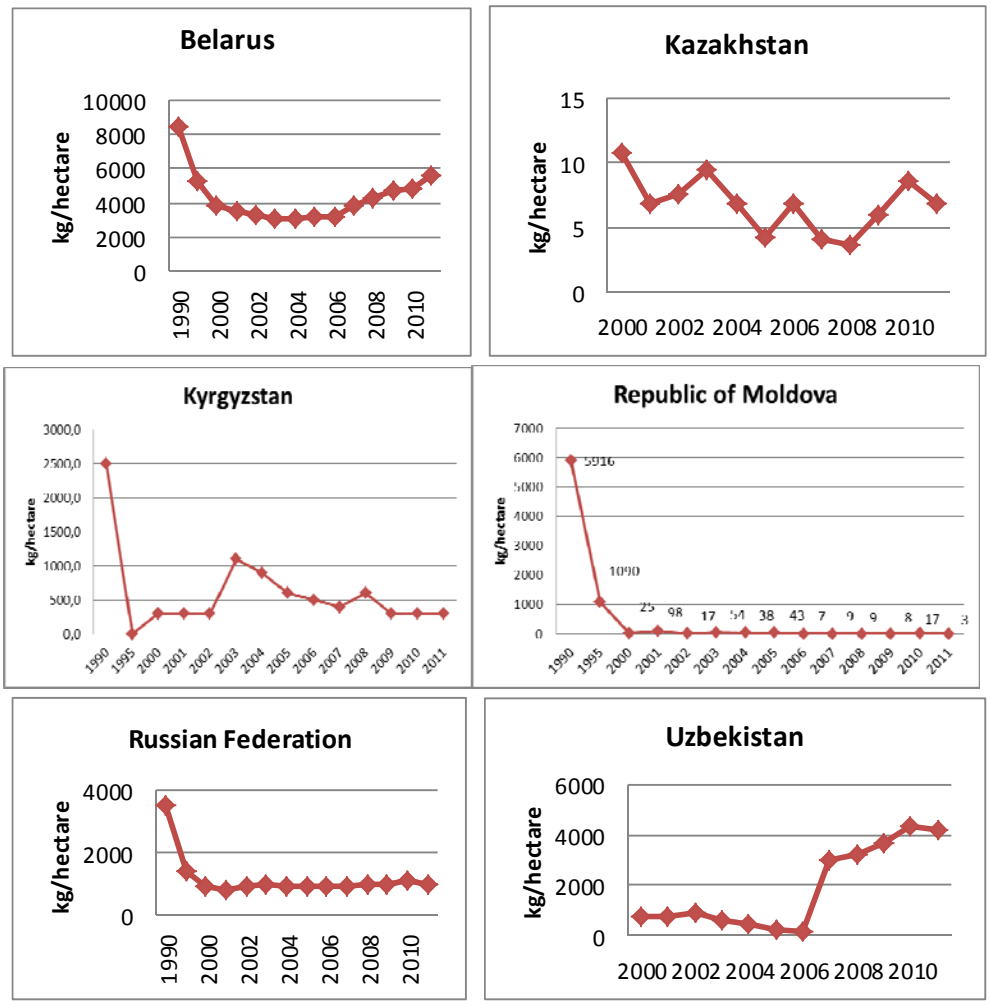


Figure 39: Consumption of organic fertilizers per unit of agricultural land in certain countries

In accordance with the questionnaire, all countries have calculated the consumption of mineral and organic fertilizers per unit area of total agricultural land. In addition, Armenia has calculated the consumption of fertilizers per unit of agricultural land treated by fertilizers.

Data on sales of fertilizers are only available in Armenia, Azerbaijan, Kazakhstan, the Russian Federation (including sales for export) and Uzbekistan.

Consumption of fertilizers for specific crops has been reported by Azerbaijan, Kazakhstan, the Republic of Moldova, Russian Federation, Ukraine and Uzbekistan.

In the report by Kyrgyzstan, there is no information on applying specific fertilizers in terms of substances but the consumption in terms of active ingredient is reported instead. Ukraine, on the contrary, has reported the amounts of introduced nitrogen, phosphate and potash fertilizers not showing the total amount of consumption, consumption per unit area or the share of area treated with organic fertilizers.

Kyrgyzstan has reported that it does not produce fertilizers and all the need is covered by exports from other countries.

No information on the publication of data on the application (consumption) of fertilizers is available from Serbia and Uzbekistan. Armenia and Kyrgyzstan have reported the publication of this information, but did not specify the titles of publications. Other countries publish information on the indicator and place it on the web.

Conclusions:

1. The most complete data for the development indicator "Fertilizer consumption," has been presented by Kazakhstan. The Republic of Moldova and the Russian Federation also submitted a fairly complete set of data except some items.
2. In most countries, except Belarus, the main type of fertilizers used are nitrogen fertilizers. In Belarus mainly potash fertilizers are used.
3. Consumption of both mineral and organic fertilizers as well as the size of the areas to which are they applied varies in all countries varies from year to year reaching large fluctuations in some cases.
4. Size of the areas on which mineral fertilizers are applied is significantly larger than the size of areas on which the organic fertilizers are applied in all countries except Armenia. The amount of applied introduced organic fertilizer per unit of area, on the contrary, may exceed the amount of applied mineral fertilizers by order of magnitude.
5. Most countries have not reported on the sales of fertilizers and fertilizer consumption for specific types of crops.
6. Kyrgyzstan has not reported information on applying specific fertilizers in terms of substances but the consumption in terms of active ingredient is reported instead. Ukraine, on the contrary, has reported the amounts of introduced nitrogen, phosphate and potash fertilizers not showing the total amount of consumption, consumption per unit area or the share of area treated with organic fertilizers.
7. Bosnia and Herzegovina and Serbia do not have available data on the areas treated with fertilizers as well as data on the application of organic fertilizers.
8. Data on this indicator are being published in Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Kazakhstan, Moldova. The Russian Federation and Ukraine. Armenia and Kyrgyzstan have also reported the publication of information on application of mineral and organic fertilizers, but without specifying the titles of publications.

Recommendations:

1. It is recommended to Kazakhstan to transpose the information on the sales of fertilizers from monetary units to mass units and to use such data for the development of this indicator.
2. It is recommended to the Republic of Moldova to provide information on the consumption of complex mineral fertilizers and on the sales of mineral fertilizers and to use the data for the development of this indicator afterwards.
3. Bosnia and Herzegovina and Serbia should be requested to complement the reported information by the data on the areas treated with fertilizers and on the application of organic fertilizers.
4. Ukraine should be requested to carry out calculations of the total consumption of mineral fertilizers, the consumption per unit of area and the share of areas treated with organic fertilizers.
5. It is recommended to Montenegro and the former Yugoslav Republic of Macedonia to establish in the country collection of data on fertilizers consumption.
6. It is recommended to Serbia and Uzbekistan to publish information about the application of mineral and organic fertilizers.

II. GENERAL CONCLUSIONS

The assessment of data reported by countries on particular indicators is presented in the table below. Following conclusions can be made from the point of view of indicator presentation:

- All countries except Bosnia and Herzegovina have reported various data on indicator „Emissions of pollutants into the atmospheric air". The best data coverage for different time period is available in Belarus, Montenegro, Serbia and Ukraine;
- Russian Federation and Ukraine are the only countries which full data on indicator „Emissions of greenhouse gases", complying with the requirements of UN Framework Convention on Climate Change. Many countries do not calculate absorption of greenhouse gases due to land use, land use change and forestry and do not have data on CFC, PFC and sulphur hexafluoride;
- Seven countries have sufficient data available to develop indicator "Household water use per capita". At the same time, a half of countries does not have data on water consumption by population not connected to public water supply systems;
- All countries have reported on indicator „Water losses". However, none of them has completed the questionnaire completely, not showing data on water losses due to accidents in pipelines, evaporation or errors in measurements which complicates development of this indicator;
- Only 10 countries have reported on indicator "Land uptake". However, this information cannot be considered sufficient for the development of this indicator namely due to the fact that many countries apply their own national classifications of lands taken of productive use which are not compliant with the international standards;
- Most countries have available data on the consumption of various types of mineral and organic fertilizers applied on agricultural land. However, most of them have not shown the whole complex of applied fertilizers.

None of countries has reported full data on all six indicators.

Assessment of data on indicators reported by countries

Indicators	Armenia	Azerbaijan	Belarus	Bosnia and Herzegovina	Georgia	Kazakhstan	Kyrgyzstan	Moldova	Montenegro	Russian Federation	Serbia	Tajikistan	FYROM	Ukraine	Uzbekistan
Emissions of pollutants into the atmospheric air						?	?					?	?		?
Emissions of greenhouse gases							?		?			?			
Household water use per capita								?	?	?			?	?	?
Water losses							?		?						?
Land uptake				?			?	?	?			?			?
Fertilizer consumption			?	?	?		?				?	?	?		?

	Information reported completely	All parameters for the development of indicator have been reported completely.
	Information reported partially	Parameters necessary for the development of indicator have been reported partially.
?	Reported information cannot be applied	Reported information cannot be used for the development of indicator.
	No information reported	