MINISTRY OF THE ENVIRONMENT

NATIONAL ENVIRONMENTAL PROTECTION AGENCY

REPORT OF INDICATORS YEAR 2017

Bucharest- 2018

INTRODUCTION

We thank the collaborators of the National Environmental Protection Agency and the institutions that provided the data and information needed to prepare this report. We also point out that indicators not found in the report could not be processed due to lack of data.

Environmental indicators are among the most simple tools to use in environmental reporting, being a generally quantitative measure, used to illustrate and communicate complex environmental phenomena, including trends and evolution over time, producing a picture of the state of the environment (Source: EEA, 2015. European Environment and Situation 2015: Synthesis Report. Web: eea.europa.eu.

For the elaboration of the Environmental Status Report in Romania, the set of 37 Core Set Indicators (CSI) established by the European Environment Agency (EEA) was taken over and adapted by O.M.M.A.P. No.618 / 30.03.2015, for a characterization of the thematic areas, as accurate as possible.

Thus, by this order, besides the 37 basic indicators, 34 other specific indicators were selected, among the European indicators of the European Environment Agency (EEA), resulting a total of 71 environmental indicators used in the field of environmental protection in Romania.

The 37 CIS indicators cover the following areas:

- ***Air pollution:*** *Emissions of acidifying substances; Emissions of ozone precursors; Emissions of primary particles and secondary precursors of particles; Exceeding limit values for air quality in urban areas; Exposure of ecosystems to acidification, eutrophication and ozone;*
- ***Biodiversity:*** *Species of European interest; Designated protected areas; Diversity of Species;*
- ***Climate change:*** *The production and consumption of ozone-depleting substances; Greenhouse gas emission trend; Projections of greenhouse gas emissions; Global, European and national temperature; Atmospheric greenhouse gas concentrations*
- ***Land and soil:*** *Land occupation; Progress in the management of contaminated sites;*
- ***Waste:*** *Generating municipal waste; Generating and recycling of packaging waste;*
- ***Water:*** *the use of fresh water resources; Oxygen consuming substances from rivers; Nutrients in water; Nutrients in transient, coastal and marine waters; Bathing water quality; Chlorophyll from transient, coastal and marine waters; Urban wastewater treatment;*
- ***Agriculture:*** *Gross Balance of Nutrients; Area designated for organic farming;*
- ***Energy:*** *Final energy consumption by sector type; Primary energy intensity; Primary energy consumption by fuel type; Primary energy consumption produced from renewable energy sources; The consumption of electricity produced from renewable energy sources;*
- ***Pisciculture:*** *The state of marine fish stocks; Aquaculture production; Fishing fleet capacity;*
- ***Transport:*** *The demand for passenger transport; Demand for freight transport; Use of alternative and cleaner fuels*

and the 34 specific indicators selected refer to the following areas:

- ***Air pollution:*** *heavy metal emissions; Emissions of persistent organic pollutants;*
- ***Biodiversity:*** *Habitats of European interest in Romania; Protected natural areas designated at national level; Protected areas of community interest designated under the Habitats and Birds Directives; Invasive allogeneic species; Fragmentation of natural and semi-natural areas; Forest: forest fund, growing and harvesting of wood; Forest: dead wood (dry);*
- ***Climate change:*** *Rainfall average; Extreme precipitation; Degree of snow cover; Increasing sea level at global, European and national levels; Increased sea water temperature; Flows of watercourses; Floods; Hydrological drought; Organic carbon in soil; Crop growing season; Productivity of agricultural crops due to lack of water resources; Areas occupied by forests; The*

risk of forest fires; Extreme temperatures and health; Floods and health; Number of degrees-days for heating;

- ***Waste:*** *waste from electrical and electronic equipment;*
- ***Water:*** *Pesticides in groundwater; Dangerous substances in watercourses; Dangerous substances from lakes; Water courses classification schemes;*
- ***Transport:*** *Land occupation through transport infrastructure; End-of-life vehicles;*
- ***Sustainable consumption and production:*** *Number of organizations certified EMAS and ISO 14001; Number of products and services labeled with the European Ecolabel.*

(Source: European Environment Agency and O.M.M.A.P. Guidelines No.618 / 30.03.2015)

I.AIR QUALITY AND POLLUTION

I.1.AIR QUALITY: STATE AND CONSEQUENCES

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Chapter I. AIR QUALITY AND POLLUTION

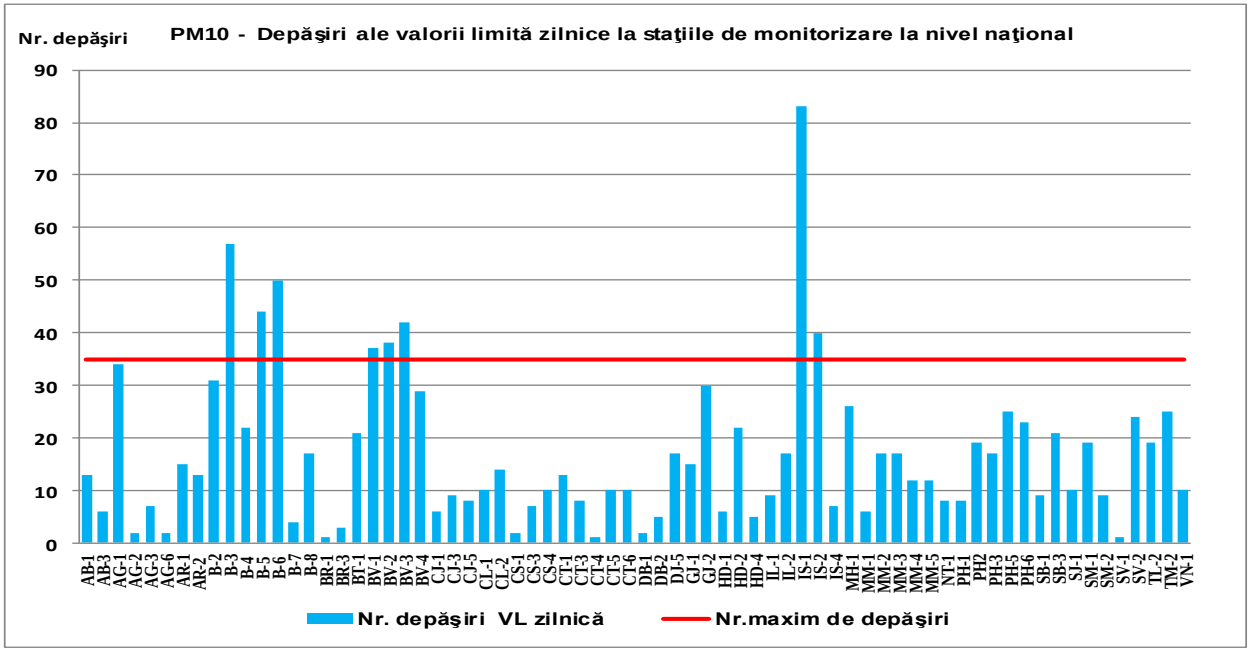
I.1. AIR QUALITY: STATE AND CONSEQUENCES

RO 04	Indicator code Romania: RO 04 AEM indicator code: CSI 04

TITLE: LOSS OF LIMIT VALUES CONCERNING AIR QUALITY IN URBAN AREAS
DEFINITION: Percentage of urban population potentially exposed to pollutant concentrations in ambient air that exceed the limit value for human health protection.

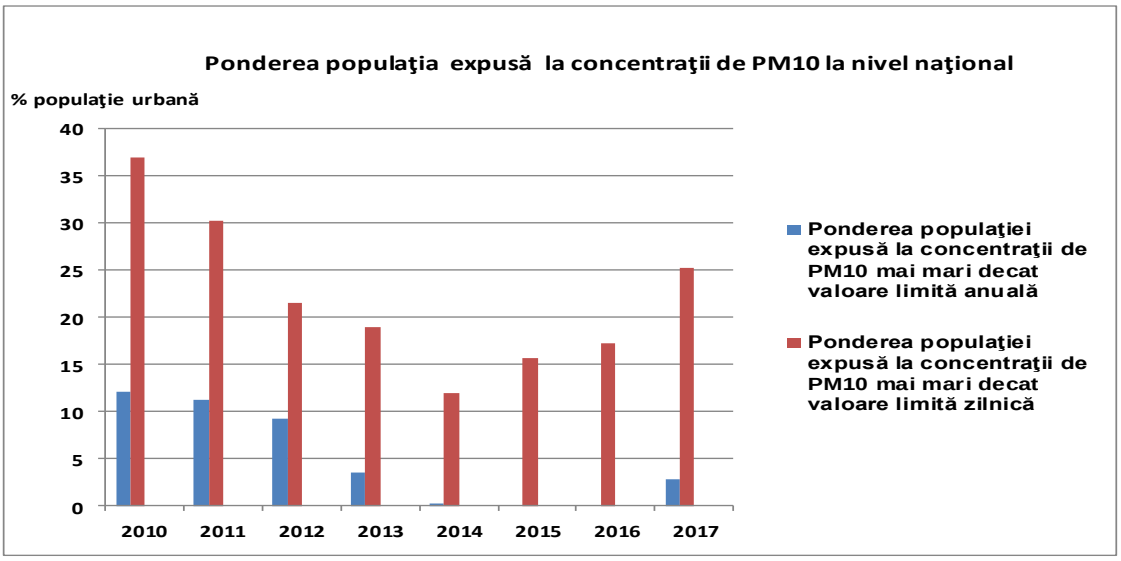
Life quality is strictly correlated and dependent on air quality. The pace of economic, demographic and institutional development requires that well-thought-out and documented measures are taken, in order to control the dangerous air pollution phenomena, to direct the socio-economic-financial development mechanisms for the benefit of man and humanity. Loading the body of the population exposed to certain pollutants, known to have storage qualities in certain organs, is another important aspect of the influence of environmental pollution on health, which can be analyzed considering the percentage of the urban population potentially exposed to pollutant concentrations in the ambient air which exceed the limit value for the protection of human health.

Figure no. I.1. Number of exceedances of the daily limit value for particulate matter in PM10 suspensions at national monitoring stations in 2017



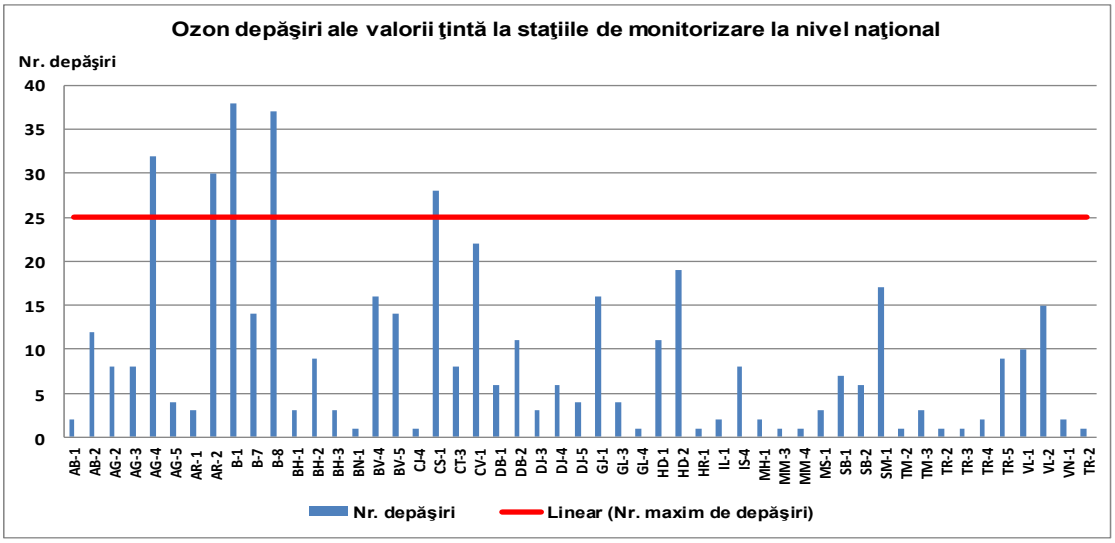
Source: NEPA

Figure no. I.2. Share of population at national level potentially exposed to concentrations of PM10 exceeding the limit value set for human protection



Source: NEPA

Figure no. I.3. The number of exceedances of the targeted value of ozone at national monitoring stations in 2017



Source: NEPA

The acknowledgement of these effects of environmental pollution on health has led to the need for environmental measures, which also take into account the number of exceedances of the target limit value / value recorded at national level.

RO 05	Indicator code Romania: RO 05 AEM indicator code: CSI 05

TITLE: EXPOSURE OF ECOSYSTEMS TO ACIDIFICATION, EUTROFIZATION AND OZON

DEFINITION: The indicator shows ecosystems or cultivated areas that are subject to deposition or atmospheric concentrations of pollutants exceeding the so-called "critical thresholds" or concentration for a particular ecosystem or cultivated area. At the same time, this indicator shows the state of change in levels of acidification, eutrophication and ozone for the environment. The risk for each location is estimated by reference to the "critical level," which represents a quantitative estimation of exposure to pollutants below which, no significant long-term harmful effects arise, given the current knowledge.

Pollution of ambient air affects ecosystems by adversely affecting the development of fauna and flora, which are sometimes more sensitive than the human body to the action of various pollutants. The effects of atmospheric pollutants vary according to their nature:

- Acid gases (carbon monoxide, sulfur dioxide, nitrogen oxides) in combination with precipitation water produce acid rains that affects vegetation;
- nitrogen and sulfur compounds contribute to smog formation, which prevents normal photosynthesis and breeding of animals;
- halogen derivatives cause burns in plants and the disease called fluorosis in animals (bone deformation and tooth decay);
- particles reduce atmospheric transparency, affecting photosynthesis and also the animals, causing respiratory illness similar to humans;

Exposure of ecosystems to ozone

Exposure of agricultural crops, forest areas and vegetation areas to ozone, to a target value AOT40 and long-term objective AOT40.

AOT40*: is the sum of the differences between hourly concentrations higher than 80 µg / m3 (40 ppb) and 80 µg / m3 accumulated in all hourly values measured between 8.00 and 20.00 hours of Central Europe (9.00-21.00 Romanian time). For crops, accumulation is from May 1 to July 30. For forests, accumulation is during the summer (April 1, 30 September).*

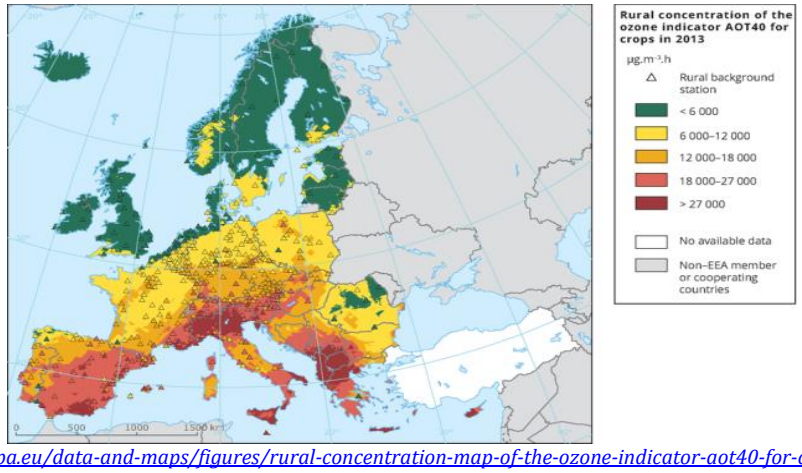
AOT40 is expressed in (µg / m3) x hour.

Target value AOT40 *is 18000 (µg / m3) x h average for 5 years.*

The long-term objective AOT40 *(calculated with hourly values) is 6000 (µg / m3) x h.*

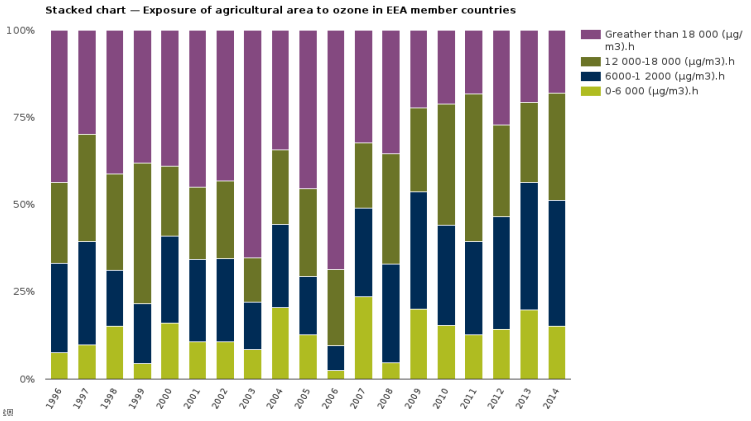
Figure no. I.4. Exposure of agricultural cropland and forests to ozone concentrations AOT40 in some European countries

Agricultural crops



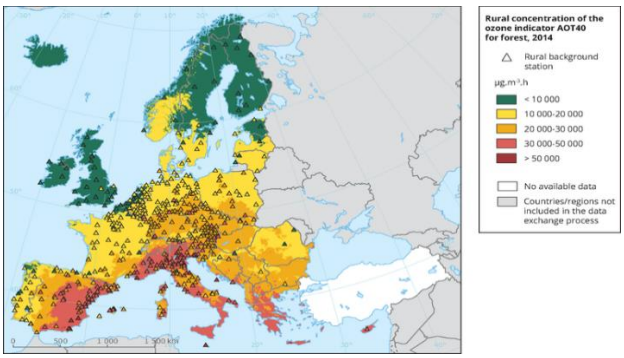
https://www.eea.europa.eu/data-and-maps/figures/rural-concentration-map-of-the-ozone-indicator-aot40-for-crops-year-7/map11-1-csi005-fig05-86672.eps/image_large

Evolution over the years



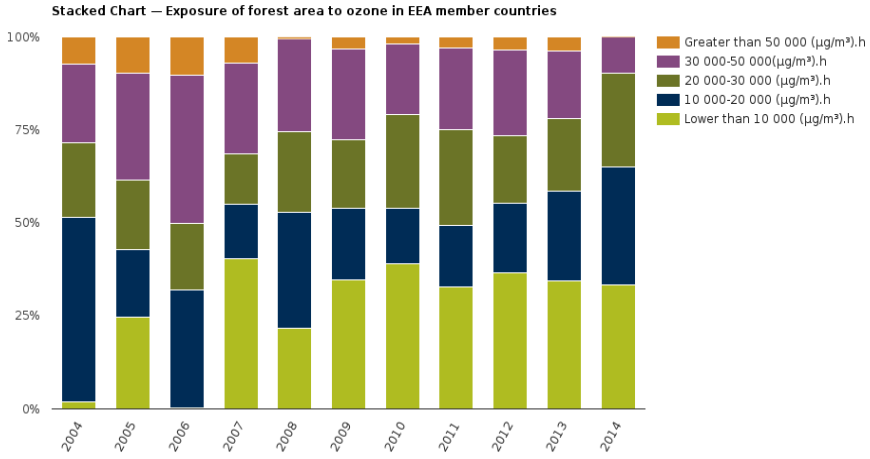
https://www.eea.europa.eu/data-and-maps/daviz/exposure-of-agricultural-area-to-4#tab-chart_10

Forests



https://www.eea.europa.eu/data-and-maps/figures/rural-concentration-of-the-ozone-1/map11-2-csi005-fig06-86673.eps/image_large

Evolution over the years

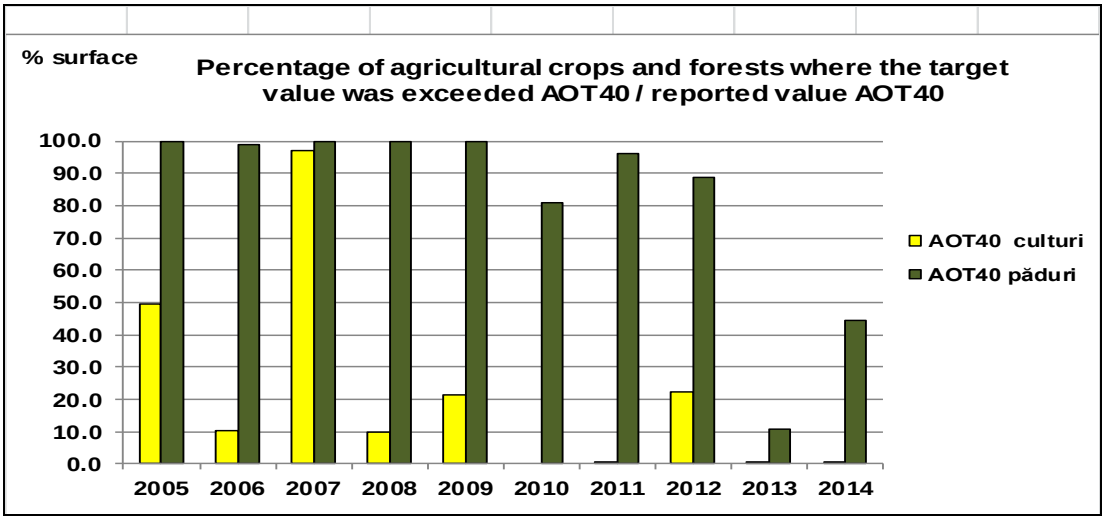


Source: https://www.eea.europa.eu/data-and-maps/daviz/exposure-of-forest-area-to-4#tab-chart_2

Analyzing the graphs above, it is found that most crops are exposed to ozone concentrations that exceed the long-term AOT40 target set by the Air Quality Directive 2008/50 / EC. Also, a significant part is exposed to levels that exceed the target value of AOT40 set by the Directive for 2010. For forest-covered areas, the situation is more unfavorable, both in overcoming the long-term AOT40 target and in overcoming the target value of AOT40.

As far as Romania is concerned, it is situated in an intermediate field in comparison with other EU countries, both in agricultural crops and forests, especially in recent years, as can be seen in Figures no. I.4 and no. I.5.

Figure no. I.5. Evolution of the percentage of exposed areas at ozone concentrations above the target value for agricultural and forest ecosystems (AOT40) in Romania



Source: http://acm.eionet.europa.eu/download/spat_interp_aqmaps_shapesets/2014-aq-data/Supplementary_material_to_ETCACM_TP_2016_6.pdf

The graphical representation shows the evolution of the percentage of exposed areas at ozone concentrations above the target value for agricultural crops and forest ecosystems (AOT40). It is noticed that until 2012, the forest areas exposed to ozone concentrations above the AOT40 target value were maintained at approximately the same interval over the whole analyzed period, but in 2013 the percentage of them decreased considerably (<50%). For agricultural crops, in 2010, 2011, 2013, 2014, the percentage of exposed areas at ozone concentrations higher than the target value of AOT40 was insignificant.

I.2. DETERMINANT FACTORS AND PRESSURES AFFECTING AIR QUALITY STATE

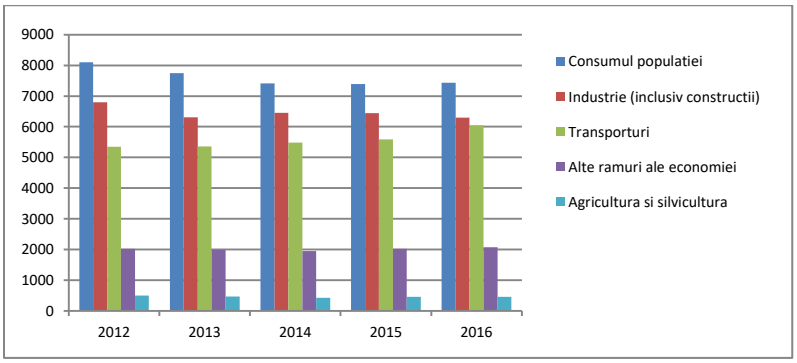
RO 27	Indicator code Romania: RO 27 AEM indicator code: CSI 27

TITLE: FINAL ENERGY CONSUMPTION BY SECTOR

DEFINITION: Final energy consumption covers the amounts of energy supplied to the final consumer for the most diverse energy purposes. It is calculated as the sum of the final energy consumption in all sectors of activity. They are structured to include industry, transport, households, services and agriculture.

The assessment of the energy level dependence at a sector level is done by summing up the amounts of energy used in branches of activity according to the energy balance. Quantities used to produce other fuels, energy consumption and transport and distribution losses are not included. In 2016, primary energy production decreased by 6.0% compared to 2015 and imports of energy products increased by 15.7%; the gross domestic energy consumption decreased by 0.6% compared to the previous year; final energy consumption increased by 1.9% compared to 2015, according to data published by the National Institute of Statistics (NIS).

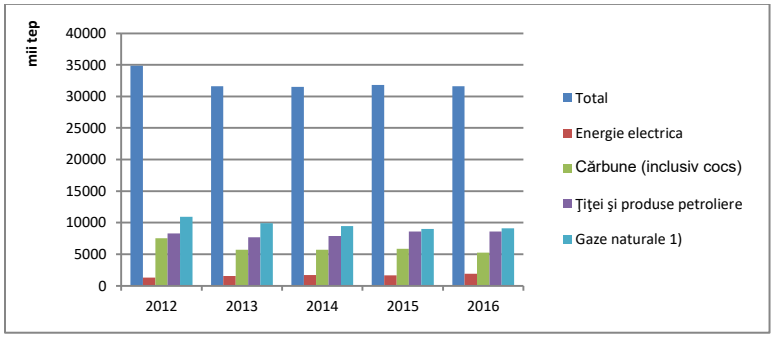
Figure no. I.6. Energy consumption by types of sectors of activity for the period 2012 - 2016 (thousand tep)



Source:http://www.insse.ro

In figure no. I.6 concerning energy consumption by types of sectors of activity, in the period 2012-2016, it is noticed that the largest share of the energy consumption is in the residential sector, followed by the activities in the industry and the transport activities. Final energy consumption in 2016 increased by 421 thousand tep (+ 1.9%) compared to 2015, and final consumption in industry (including construction) decreased by 137 thousand tep (-2.1%). Transport and the tertiary sector recorded increases in consumption compared to the previous year (+ 8.2% and 2.7% respectively) and with a cumulative weight of 36.4% in total, final energy consumption compensated for the final energy consumption decreases in industry and agriculture.

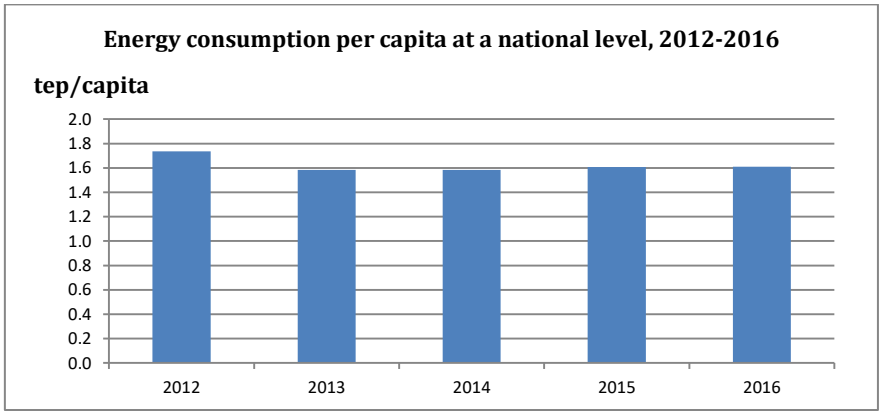
Figure no. I.7. Energy consumption by fuel type for 2012-2016 (thousand tep)



Source: http://www.insse.ro

In figure no. I.7 concerning the energy consumption by fuel type, it is noticed that the largest share corresponds to the natural gas values for the whole analyzed period, and the values corresponding to the types of coal and crude oil fuel have an approximately similar average evolution. The downward trend in energy consumption remains in 2016.

Figure no. I.8. Energy consumption per capita, expressed in tonnes of petroleum equivalent (tep)



Source: http://www.insse.ro

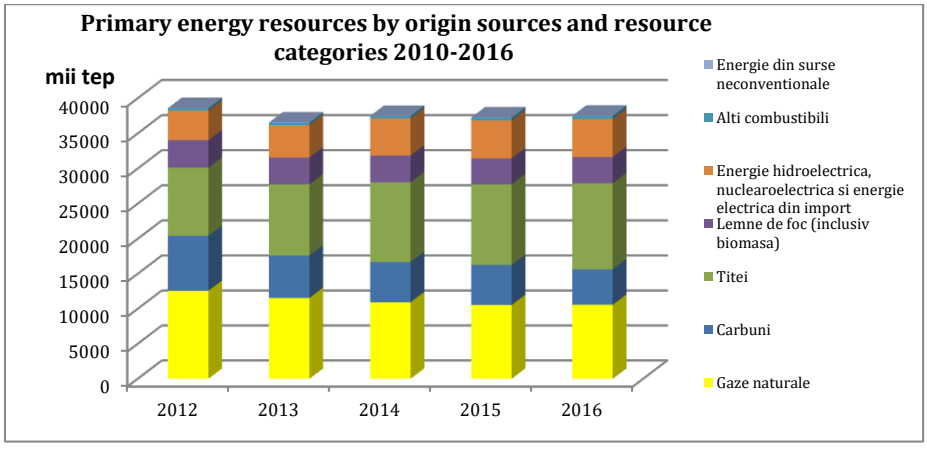
From the analysis of the data presented in figure no. I.8 it is observed a peak consumption of 1.74 tep in 2012, a decrease to 1.58 tep in the years 2013-2014, followed by a slight increase to 1.61 tep in 2015 and 2016. Compared to 2012, in 2016, per capita energy consumption decreased by7.4%.

RO 29	Indicator code Romania: RO 29 AEM indicator code: CSI 29

TITLE: PRIMARY ENERGY CONSUMPTION BY FUEL TYPE
DEFINITION: The amount of energy required to meet the gross domestic energy consumption of solid fuels, crude oil, natural gas, firewood, nuclear and renewable sources and a smaller component of "other" sources (industrial waste and net imports of electricity) of a country.

Primary energy resources in 2016 were 40910 thousand tons of oil equivalent, rising by 245 thousands tep (+0,6%) in comparison with the previous year.

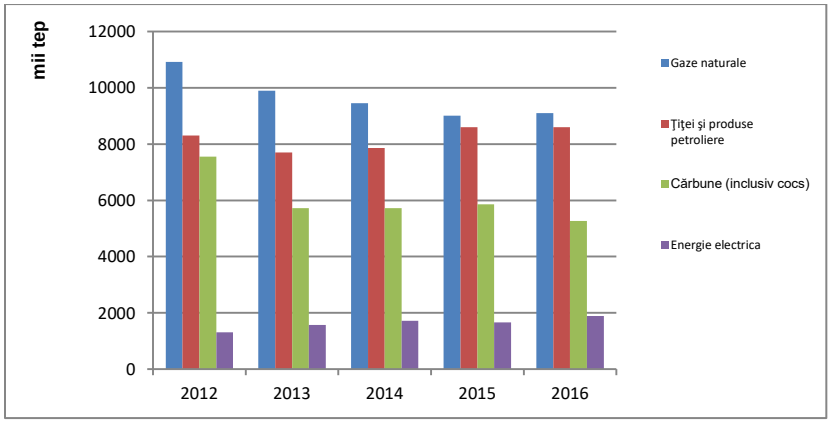
Figure no. I.9. Primary energy production from primary energy resources in Romania



Source: http://www.insse.ro (TEMPO_IND107A_14_8_2018)

Primary energy production in the year 2016, of 24798 thousand tep, fell by 1589 thousand to 2015 (26,387 thousand tep), but continued to retain its significant share of total energy resources, accounting for 58.8% of (down from 3.8% in comparison with 2015).

Figure no. I.10. The evolution of primary energy consumption in Romania during the period 2012-2016



Source: http://www.insse.ro

Consumption of natural gas is the largest share of all constituent factors of domestic consumption of primary energy, increasing by 1% compared to 2015, but decreasing by 16.7% compared to 2012 (figure no.10).

Under the current challenge of securing energy resources and the need to reduce CO2 emissions while protecting the environment, investing in energy efficiency and renewable energy, recovering secondary energy resources, and combating energy poverty, is a strategic priority for Romania.

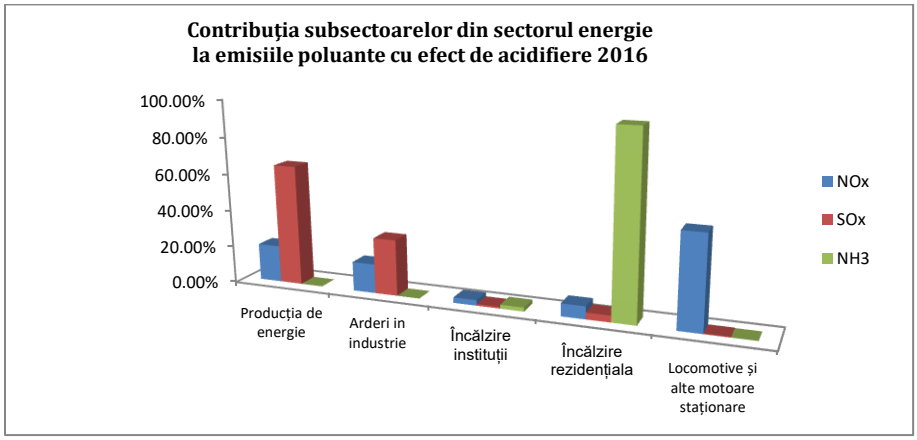
RO 01	Indicator code Romania: RO 01 AEM indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES

DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), taking into account its acidifying potential for each of them**.** The indicator also provides information on changes in emissions from major source sectors: generation and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

Acidification is the process of modifying the natural chemical nature of an environmental component due to the presence of some chemical compounds in the atmosphere, which causes a series of chemical reactions in the atmosphere, leading to changes in air, precipitation and even soil pH, with the formation of the corresponding acids. Gases with an acidifying effect on the atmosphere are: sulfur dioxide, nitrogen dioxide and ammonia. These pollutants come mainly from anthropogenic activities: burning fossil fuels (coal, oil, natural gas), metallurgy, agriculture, road traffic. Manure management and enteric fermentation from livestock breeding are significant sources of ammonia, and the use of nitrogen fertilizers in agriculture is an important source of ammonia. Depending on the acidifying potential of anthropogenic emissions, the contribution of energy sector subsectors to the pollutant emissions of nitrogen oxides (NOX), ammonia (NH3) and sulfur oxides (SOX, SO2) is graphically plotted.

Figure no. I.11. Contributions of activity subsectors, in energy sector, in 2016 to emissions of acidifying pollutants (NOx, SOx, and HN3)



Source : Romania's Informative Inventory Report 2018

From the analysis of data on the contribution of the energy sector to the polluting emissions with an acidifying effect at national level for the reporting period, a significant share of ammonia from the institutional heating activity is observed, and a high SO2 and NOx value in the generating energy activity (Figure No. I.11).

RO 02	Indicator code Romania: RO 02 AEM indicator code: CSI 02

TITLE: OZONE PRECURSOR EMISSIONS

DEFINITION: The indicator follows trends in the anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and non-methane volatile organic compounds (NMVOCs) from the sectors: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

Particular attention should be paid to the control of pollution sources emitting Volatile Organic Compounds (VOCs) mainly from the organic chemical synthesis industry because, together with the suspended particles, the main components of smog and nitrogen oxides, in the presence of light, contributes to the formation of tropospheric ozone. *Tropospheric ozone* is a very oxidizing, highly reactive, smelling, gas-inducing gas that causes respiratory problems, focuses on the stratosphere and provides protection against life-threatening UV radiation.

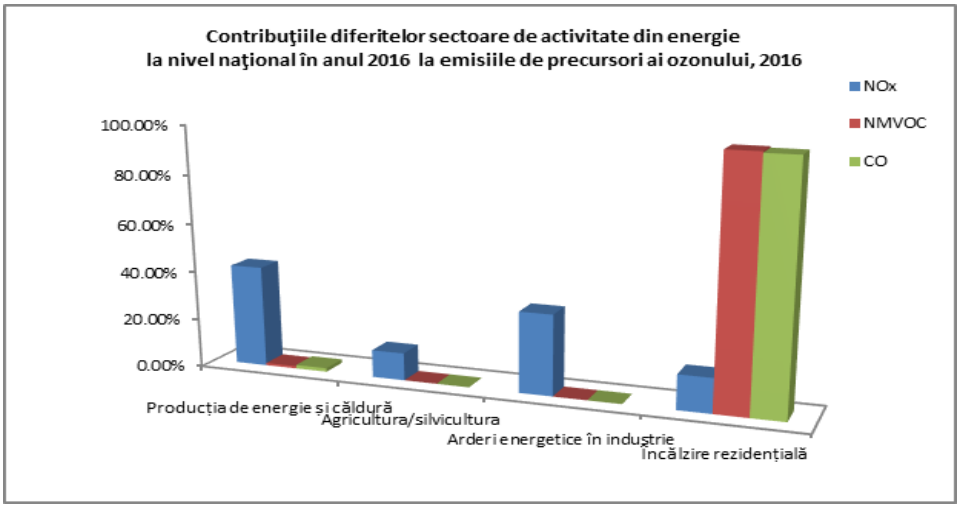
Ozone present at ground level acts as a component of "photochemical smog". It is formed by a reaction involving in particular volatile organic compounds and nitrogen oxides.

It is responsible for damage to vegetation by atrophy of some tree species in urban areas. During spring and summer, when the daylight range is high, atmospheric photochemical reactions are accelerated, resulting in increased ozone concentrations, especially during very hot days (temperatures above 30 ° C). In addition, increased concentrations of tropospheric ozone can have an impact on crops and buildings.

Volatile organic compounds are one of the main precursors to ozone, which is a natural constituent of the atmosphere. In the context where other pollutants exist, such as nitrogen oxides, sulfur oxides, ozone becomes a generating source of smog and produces a number of negative effects on the climate system as well as on the productivity of ecosystems and human health.

As such, the areas most affected by tropospheric ozone pollution are urban, precursor pollutants being generated in particular by industrial activities and road traffic. VOC pollution is widespread in many industrial plants in the chemical and metallurgical industries, but also in fossil fuel burners or waste incinerators.
Nitrogen oxides are formed in the combustion process when fuels are burned at high temperatures, but most often they are the result of road traffic, industrial activities, electricity generation. Nitrous oxides are responsible for smog formation, acid rain, deterioration of water quality, greenhouse effect, and reduced visibility in urban areas.
It is graphically represented the trend of anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO) and non-methane volatile organic compounds (NMVOCs) from different sectors of activity.

Figure no. I.12. Contributions of subsectors in the energy sector, in 2016, to emissions of pollutants discharged into the atmosphere and considered ozone precursors



Source : Romania's Informative Inventory Report 2018

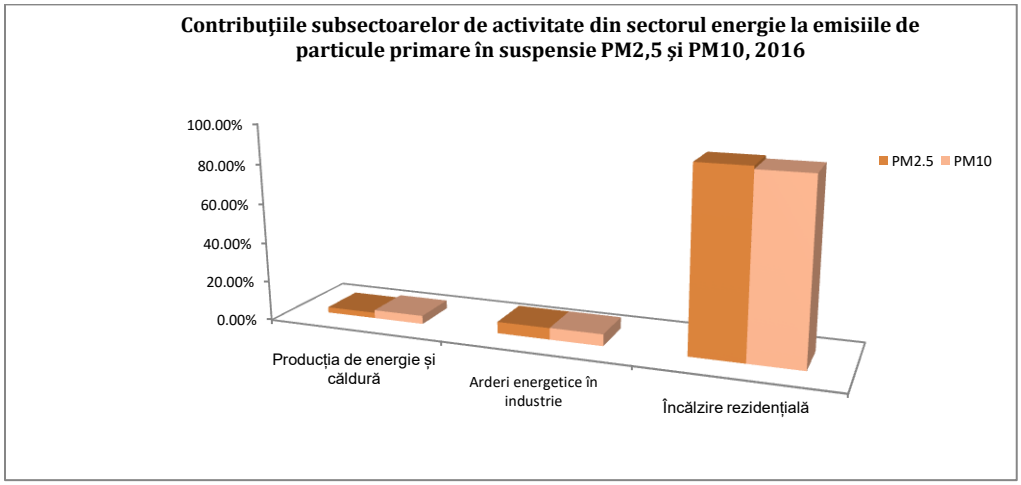
Analyzing the situation regarding the contribution of the energy sector to pollutant emissions with ozone precursors for the reporting period, it is observed that there is a majority of the NOx, SOx and NNVOC pollutants from the energy and heat production activity.

RO 03	Indicator code Romania: RO 03 AEM indicator code: CSI 03

TITLE: EMISSIONS OF PRIMARY PARTICLES AND SECONDARY PRECURSORS OF PARTICLES
DEFINITION: This indicator shows the primary particle emission (PM2,5) and 10 μm (PM10) and secondary particle precursors (NOx, ammonia (NH3) and Sulfur dioxide (SO2), derived from anthropogenic sources, by source sectors: energy production and distribution, energy use in industry, industrial processes, road transport, non-commercial transport, institutional and residential transport, use of solvents and other products, waste, other sources.

The trend of the emission of primary particles with a diameter of less than 2.5 μm is shown graphically (PM2.5) and 10μm (PM10), respectively, from anthropogenic sources, by types of activity sectors.

Figure no. I.13. Contributions of activity sub-sectors, in the energy sector, in 2016 to emissions of primary particles in suspention PM2,5 and PM10



Source: Romania's Informative Inventory Report 2018

From the analysis of the above graph we find that the main share in the energy sector in primary particles emissions in suspension PM2,5 and PM10 is occupied by residential heating (Figure I.13).

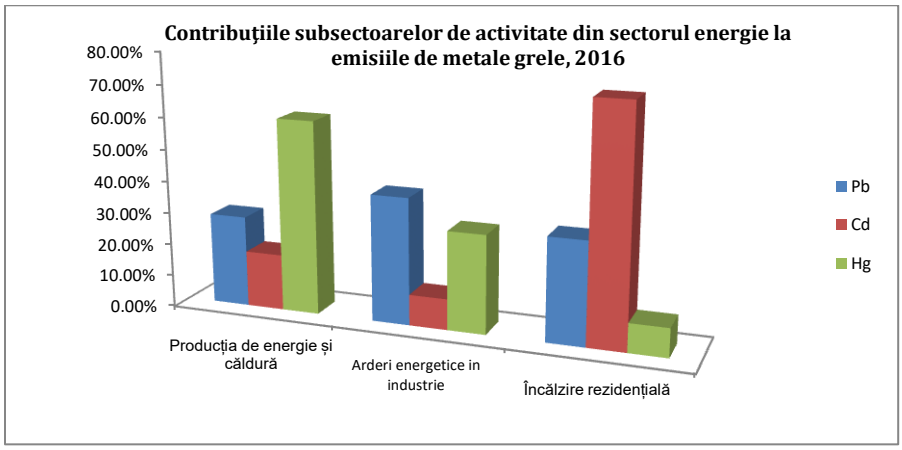
RO 38	Indicator code Romania: RO 38 AEM indicator code: APE 05

TITLE: HEAVY METAL EMISSIONS

DEFINITION: Trends of heavy metal anthropic emissions by industry: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

Heavy metals (mercury, lead, cadmium, etc.) are compounds that can not be degraded naturally, have a long retention time in the environment and are dangerous in the long run because they can accumulate in the food chain. Heavy metals can come from stationary and mobile sources: combustion and waste combustion processes, technological processes in heavy metal non-ferrous metallurgy and road traffic. Heavy metals can cause affections such as muscular, nerve, digestive disorders, general apathy; can affect the process of plant growth, preventing the normal development of photosynthesis, breathing or sweating. From statistical data, heavy metal emissions show a decrease compared to those recorded in recent years. From the distribution of emissions by sectors of activity, it is noticed that the highest share of mercury emissions, in excess of 60%, comes from combustion in the production of energy and heat. These include sectors such as: production processes, waste treatment and disposal and, in a very small proportion, other activities, namely non-industrial combustion plants and road transport. The trend of anthropogenic emissions of heavy metals on different sectors of activity is shown graphically (Figure I.14).

Figure no. I.14. Contributions of the activity subsectors from the sectors of energy in 2016 to heavy metal emissions



Source : Romania's Informative Inventory Report 2018

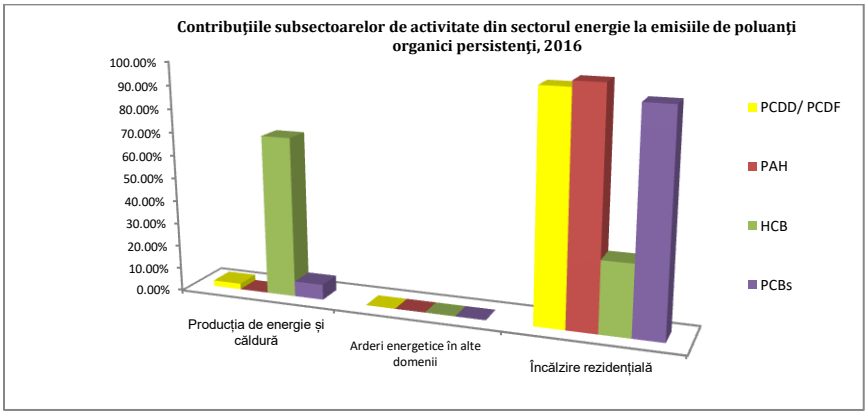
From the analysis of the situation regarding the contribution of the energy sector to the heavy metals emissions, the reporting period shows a significant increase in mercury emissions from the energy sub-sectors for iron and steel production and cadmium emissions from the residential heating subsector.

RO 39	Indicator code Romania: RO 39 AEM indicator code: APE 06

TITLE: EMISSIONS OF PERSISTENT ORGANIC POLLUTANTS
DEFINITION: Trends in anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by sectors of activity: production and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

Graphistically, the trend of anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by sectors of activity (figure I.15).

Figure no. I.15. Contributions of energy sector subsectors, in 2016 to emissions of persistent organic pollutants



Source : Romania's Informative Inventory Report 2018

From the analysis of the data presented regarding the contribution of the energy sector to the persistent organic pollutant emissions it is noticed that the highest share in the emission of these pollutants has the residential heating subsector.

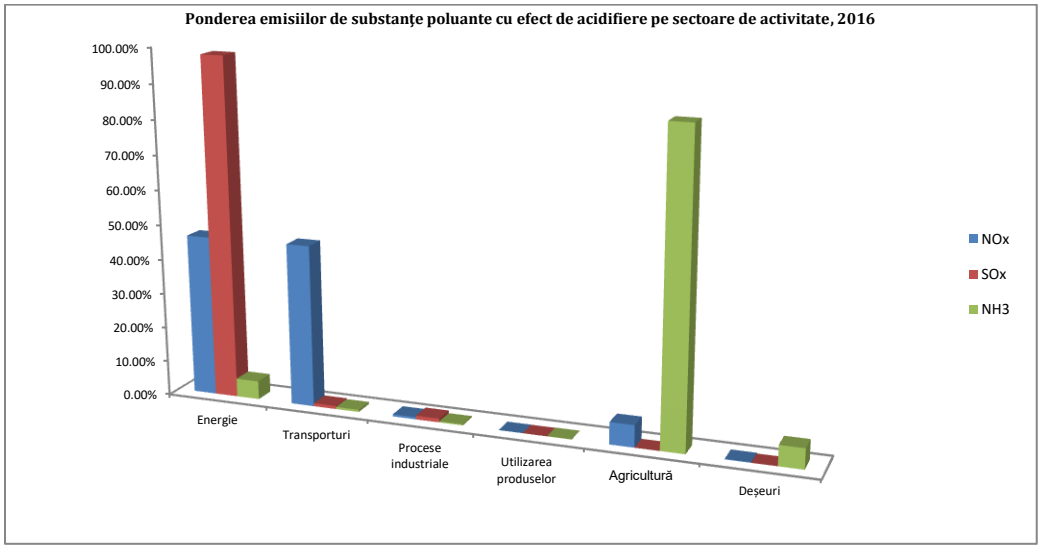
RO 01	Indicator code Romania: RO 01 AEM indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES

DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), for each of these taking into account its acidifying potential. The indicator also provides information on changes in emissions from major source sectors: generation and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

Depending on the acidification potential, graphically represented the trend of the anthropogenic emissions of nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), by sectors of activity at national level: energy, transport, industrial processes, use products, agriculture, waste (Figure I.16).

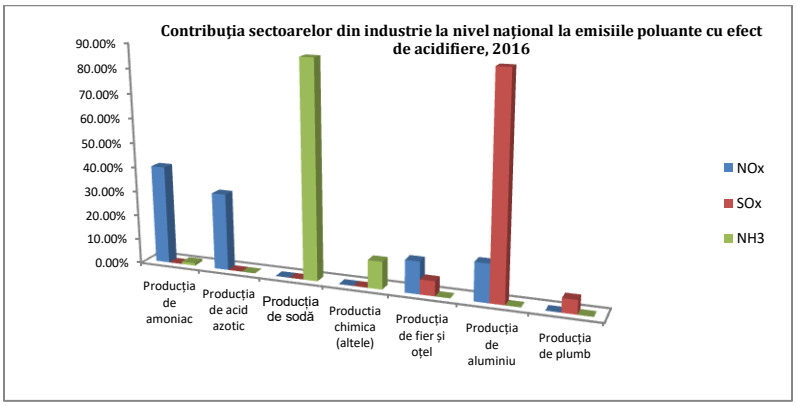
Figure no. I.16. Share of emissions of polluting substances with acidifying effect by sectors of activity at national level in 2016



Source: Romania's Informative Inventory Report 2018

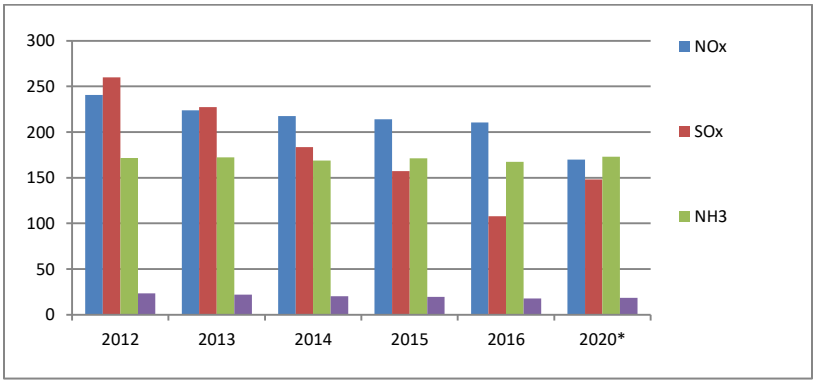
At national level, the acidification effect is predominantly from the energy sector for sulfur oxides, energy and transport for nitrogen oxides and ammonia agriculture (Figure No.1.17).

Figure no. I.17. Contribution of industry sectors in 2016 to acidifying pollutants (NOx, SOx, and NH3)



Source: Romania's Informative Inventory Report 2018

Figure no. I.18. Evolution of emissions of pollutants with an acidifying effect at national level in the period 2012-2016 and target for 2020



*Note: * Emission ceilings according to the revised Gothenburg Protocol 2010*

From the data analysis of acidifying substances, the high-activity industry subsectors are aluminum production with significant sulfur dioxide values, followed by soda production with high ammonia pollutants and ammonia production, where high values are recorded for pollutants of nitrogen oxides.

Taking into account the 2010 ceilings and the provisions of the revised Gothenburg Protocol on the reduction of air pollutant emissions, commitments to be fulfilled by 2020, it is observed that the evolution of acidifying pollutant emissions at national level over the entire analyzed period follows a downward trend.

RO 02	Indicator code Romania: RO 02 AEM indicator code: CSI 02

TITLE: OZONE PRECURSORS EMISSIONS

DEFINITION: The indicator follows trends in the anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and non-methane volatile organic compounds (NMVOCs) from the sectors: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

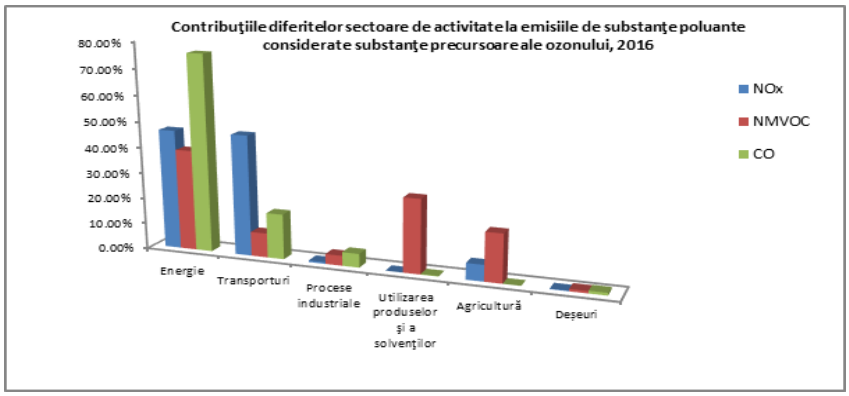
Ozone is the allotropic form of oxygen. In the atmosphere, it can form naturally as a result of electrical discharges and under the action of solar rays, and artificially, as a result of the reactions of harmful substances from sources of ground pollution.

Ozone formed at the bottom of the troposphere is the main pollutant in industrialized cities. Tropospheric ozone is formed from nitrogen oxides (especially nitrogen dioxide), volatile organic compounds (VOC), carbon monoxide in the presence of solar radiation as the source of chemical reaction energy.

Toxic fog is produced by the chemical interaction between pollutant emissions and solar radiation. The most common product of this reaction is ozone. During peak hours in urban areas, the atmospheric concentration of nitrogen and hydrocarbon oxides increases rapidly due to intense traffic. At the same time, the amount of nitrogen dioxide in the atmosphere decreases due to the fact that solar light leads to its decomposition into nitrogen oxide and oxygen atoms. Oxygen atoms combined with molecular oxygen form ozone. Hydrocarbons are oxidized and reacted with nitrogen oxide to produce nitrogen dioxide.

The share of emissions of pollutants discharged into the atmosphere and considered ozone precursors (NMVOC, NOX and CO) at national level by sectors of activity in 2016 are presented graphically in figure no. I.19.

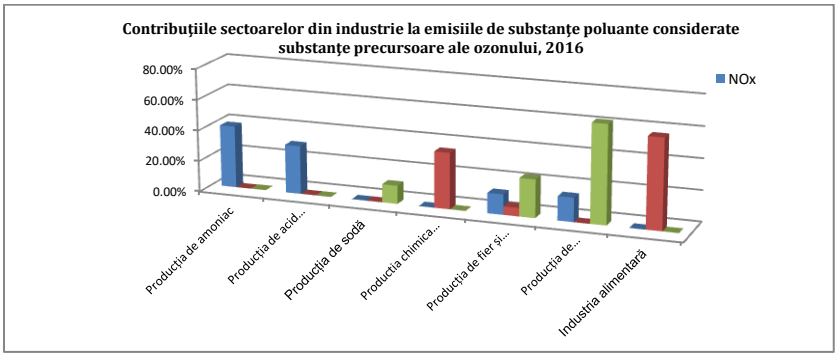
Figure no. I.19. Contributions of the sectors of activity to emissions of pollutants emitted into the atmosphere and considered as precursors of ozone at national level in 2016



Source: Romania's Informative Inventory Report 2018

The data presented graphically highlights the fact that the energy sector contributes significantly to emissions of ozone precursor pollutants at national level.

Figure no. I.20. Contribution of industry subsectors to emissions of air pollutants considered ozone precursors (NOx, NMVOC, CO) in 2016



Source: Romania's Informative Inventory Report 2018

From the analysis of the data presented on the contribution of different sectors of activity to the ozone precursor pollutant emissions in the industrial sector, there is a significant share of the subsectors of activity such as the production of high CO value aluminum, the production of nitric acid and ammonia with values significant emissions of nitrogen oxides and the food industry with the highest values of NMVOC emissions.

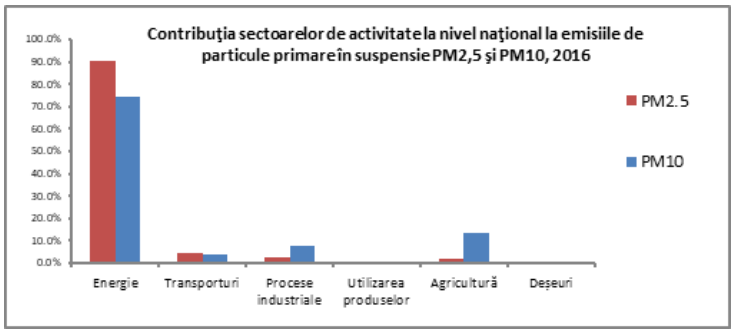
RO 03	Indicator code Romania: RO 03 AEM indicator code: CSI 03

EMISSIONS OF PRIMARY PARTICLES AND SECONDARY PRECURSORS OF PARTICLES

DEFINITION: This indicator shows trends in the primary particle emission (PM2,5) and 10 μm (PM10) and secondary precursors of particle (NOx, ammonia (NH3) and Sulfur dioxide (SO2), derived from anthropogenic sources, by source sectors: energy production and distribution, energy use in industry, industrial processes, road transport, non-commercial transport, institutional and residential transport, use of solvents and other products, waste, other sources.

In figure no. I.21 are shown graphically the contributions from the sectors of activity to PM2,5 and PM10 primary particulate emissions at national level in 2016.

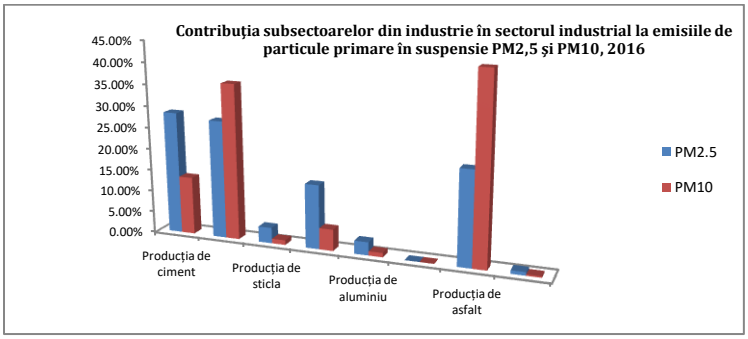
Figure no. I.21. Contribution of sectors of activity at national level in 2016 to primary particles in suspenstion PM2,5 and PM10 emissions



Source : LRTAP-RO- 2016

By comparing the values presented for different sectors of activity at national level it is noted that the share of the energy sector is the highest in emissions of primary particles in suspention.

Figure no. I.22. Contribution of industry subsectors in industry in 2016 to primary particles in suspention PM2,5 and PM10 emissions



Source: LRTAP-RO- 2018

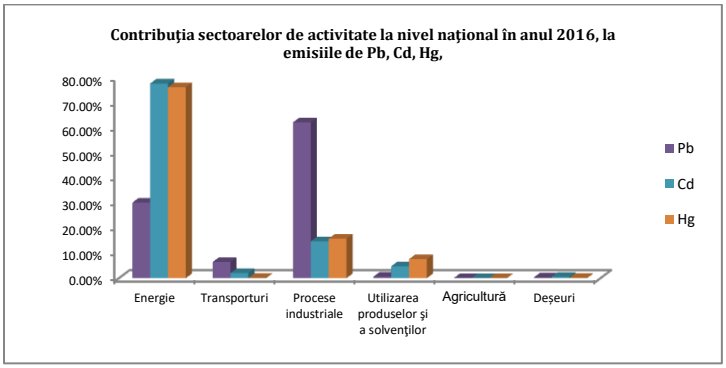
From the analysis of the data presented on the contribution of the industrial activity sub-sectors to primary particles in suspention PM2.5 and PM10 emissions, it is noted that the subsectors asphalt production, lime and cement production have the highest weights compared to other activities.

RO 38	Indicator code Romania: RO 38 AEM indicator code: APE 05

TITLE: HEAVY METAL EMISSIONS
DEFINITION: Trends of heavy metal anthropic emissions by industry: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

Contributions of the sectors of activity to the heavy metals (Cd, Hg, Pb) emissions at national level in 2016 are presented graphically (Figure I.23).

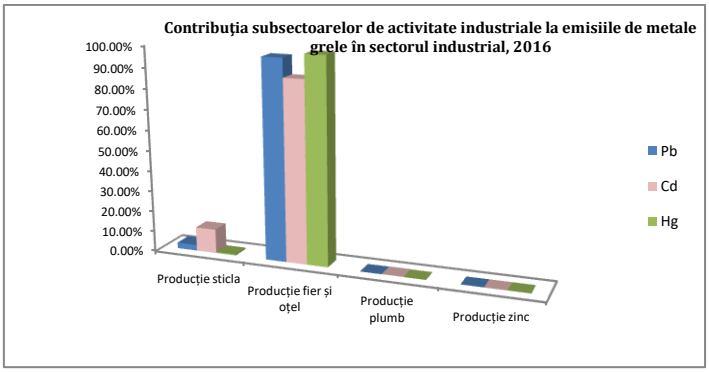
Figure no. I.23. Contribution of sectors of activity at national level in 2016 to emissions of heavy metals Pb, Cd, Hg



Source: LRTAP-RO- 2018

From the analysis of the data presented, it is observed that the industry and energy sectors have the largest national shares, compared to the other activities, to the emissions of heavy metals Pb, Cd, Hg.

Figure no. I.24. Contribution of industry sub-sectors to heavy metals emissions Pb, Cd, Hg, at national level in 2016



Source: LRTAP-RO- 2018

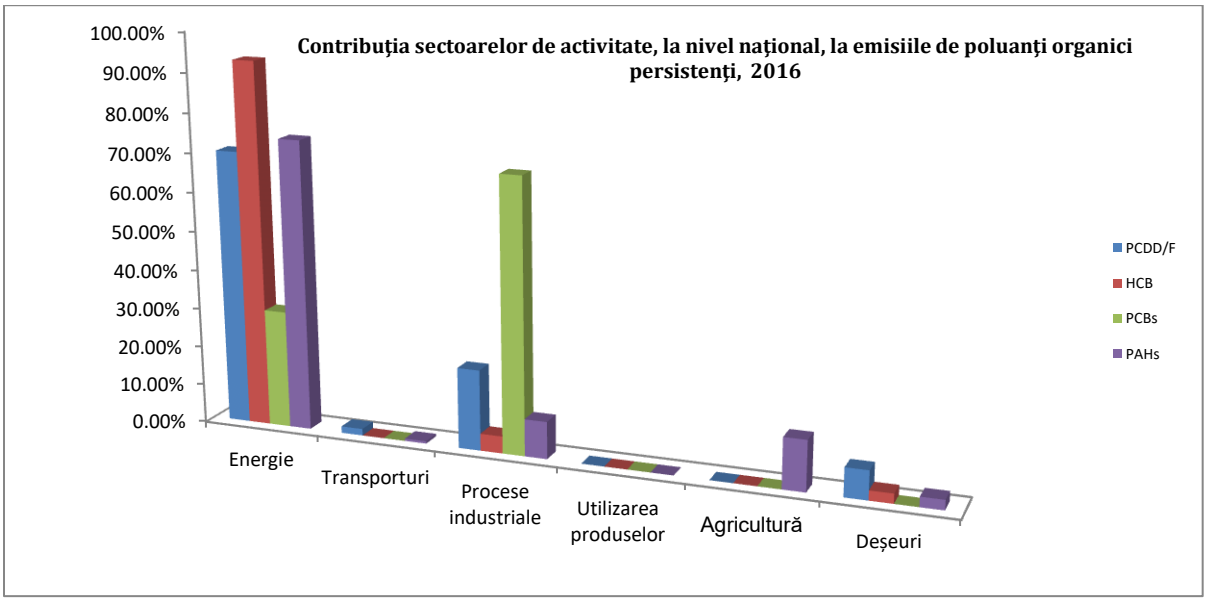
From the analysis of the data presented graphically on the contribution of the activity subsectors to the heavy metals emissions in the industrial sector, it is noticed that the share of iron and steel production activities in the heavy metals Pb, Cd, Hg emissions is predominant and represents a significant source of pollution at the national level.

RO 39	Indicator code Romania: RO 39 AEM indicator code: APE 06

TITLE: EMISSIONS OF PERSISTENT ORGANIC POLLUTANTS
DEFINITION: Trends in anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by sectors of activity: production and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

Contributions of POPs (hexachlorobenzene-HCB, hexachlorocyclohexane-HCH, polychlorinated biphenyls-PCBs, dioxin-PCDDs, furans-PCDFs and polyaromatic hydrocarbons - HPAs) by sectors of activity at national level in 2016 are presented graphically Figure no. I.25.

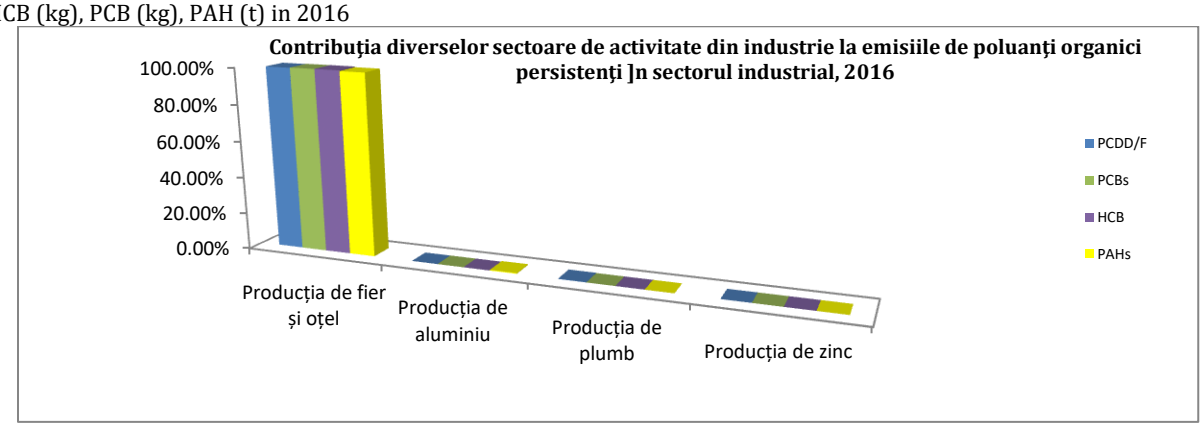
Figure no. I.25. Contribution of sectors of activity at national level in 2016 to emissions of persistent organic pollutants PCDD / PCDF (g I-TEQ), HCB (kg), PCB (kg), PAH (t)



Source: LRTAP-RO- 2018

It is noted that two sectors of activity at national level contribute decisively to emissions of persistent organic pollutants, these being the energy sector with aromatic polycyclic aromatic hydrocarbons, dioxins and furans, and the industrial sector with polyfluorinated biphenyls, in particular. The waste sector contributes much lower dioxin and furane emissions compared to the two major sectors.

Figure no. I.26. Contribution of industry subsectors to persistent organic pollutant emissions, PCDD / PCDF (g I-TEQ), HCB (kg), PCB (kg), PAH (t) in 2016



Source: LRTAP-RO- 2018

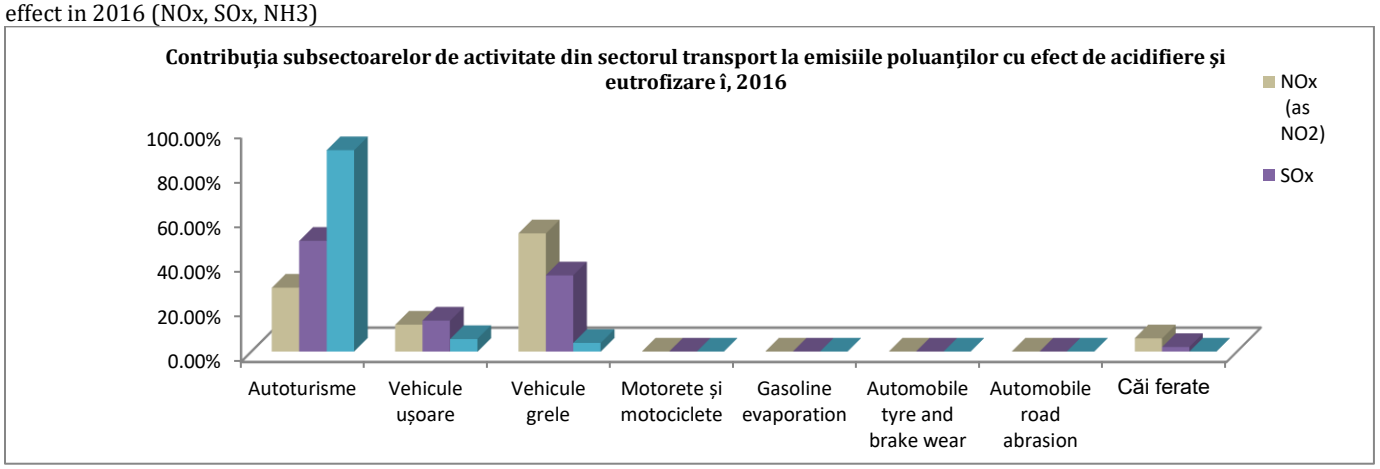
From the above graph we can see that the activity with the highest share for all pollutants is the production of iron and steel.

RO 01	Indicator code Romania: RO 01 AEM indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES
DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), taking into account for each of them, its acidifying potential. The indicator also provides information on changes in emissions from major source sectors: generation and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

Depending on the acidification potential of anthropogenic emissions: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), the graphs below show the respective trends in the transport sector subsectors (no aviation).

Figure no. I.27. Contribution of transport sector subsectors to pollutant emissions with acidifying and eutrophication effect in 2016 (NOx, SOx, NH3)



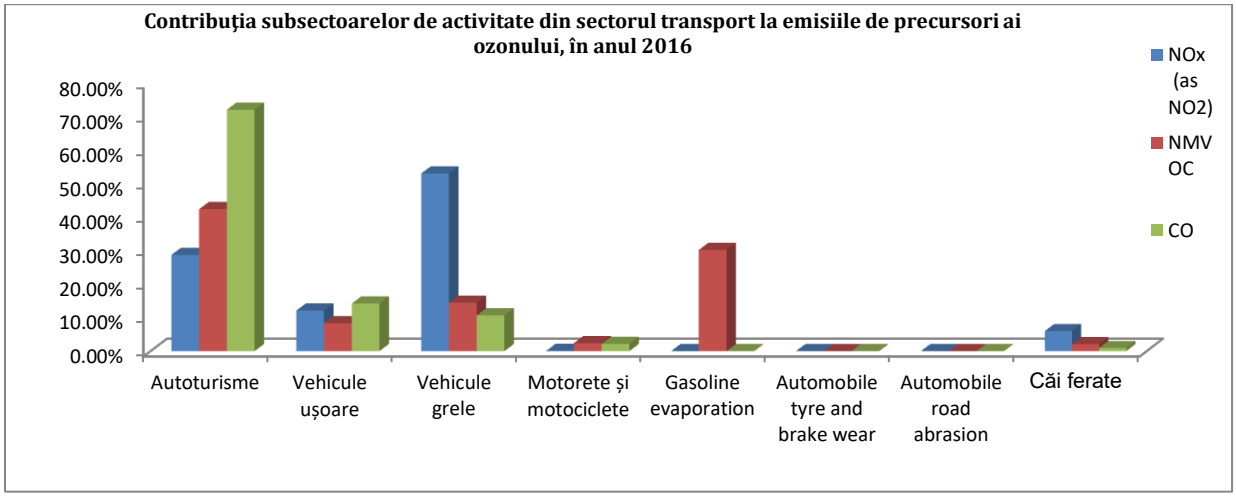
Source: Romania's Informative Inventory Report 2018

From the analysis of the data on the acidifying potential of the anthropogenic emissions of nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), it is found that the sub-sectors of activity of cars and heavy vehicles have the largest share, followed by light vehicles and emissions from rail traffic.

RO 02	Indicator code Romania: RO 02 AEM indicator code: CSI 02

TITLE: OZONE PRECURSOR EMISSIONS
DEFINITION: The indicator follows trends in the anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and non-methane volatile organic compounds (NMVOCs) from the sectors: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

Figure no. I.28. Contribution of the transport sector subsectors to the ozone precursor emissions in 2016 (NOx, NMVOC, CO)



Source: Romania's Informative Inventory Report 2018

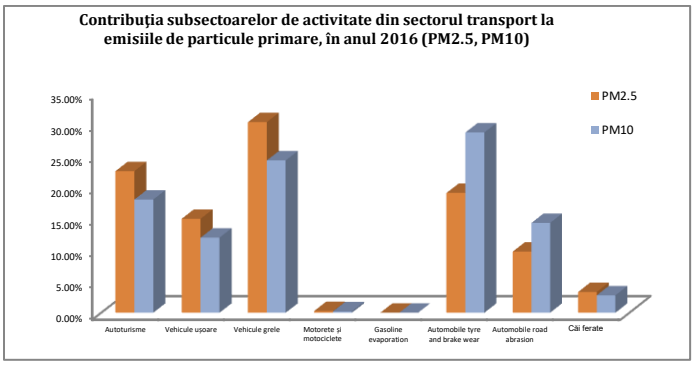
From the analysis of data on the contribution of transport subsectors in 2016 to the emissions of ozone precursors in the transport sector, the highest values for CO and NMVOC pollutants in the category of passenger cars and petrol vapor are observed, followed closely by the category of heavy duty vehicles the highest value for nitrogen oxides pollutants.

RO 03	Indicator code Romania: RO 03 AEM indicator code: CSI 03

TITLE: EMISSIONS OF PRIMARY PARTICLES AND SECONDARY PRECURSORS OF PARTICLES
DEFINITION: This indicator shows the primary particle emission (PM2,5) and 10 μm (PM10) and secondary particle precursors (NOx, ammonia (NH3) and Sulfur dioxide (SO2), derived from anthropogenic sources, by source sectors: energy production and distribution, energy use in industry, industrial processes, road transport, non-commercial transport, institutional and residential transport, use of solvents and other products, waste, other sources.

The graph of the emission of primary particles with a diameter of less than 2.5µm (PM2.5) and 10µm (PM10), respectively.

Figure no. I.29. Contribution of transport sub-sectors to primary particulate emissions in 2016 (PM2.5, PM10)



Source: LRTAP-RO-2018

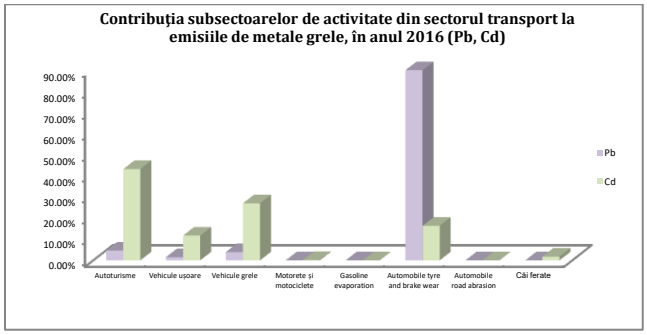
From the analysis of data on the contribution of transport activity sub-sectors in 2016 to primary particles emissions and secondary particle precursors, it is found that activities with the largest share come from the category of cars, heavy duty vehicles and tires and brakes.

RO 38	Indicator code Romania: RO 38 AEM indicator code: APE 05

TITLE: HEAVY METAL EMISSIONS
DEFINITION: Trends of heavy metal anthropic emissions by industry: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

The trend of anthropogenic heavy metals emissions in the transport sub-sectors in the year 2016 is presented graphically (figure no. I.30).

Figure no. I.30. Contribution of transport sector sub-sectors to heavy metal emissions in 2016 (Pb, Cd)



Source: LRTAP-RO- 2018

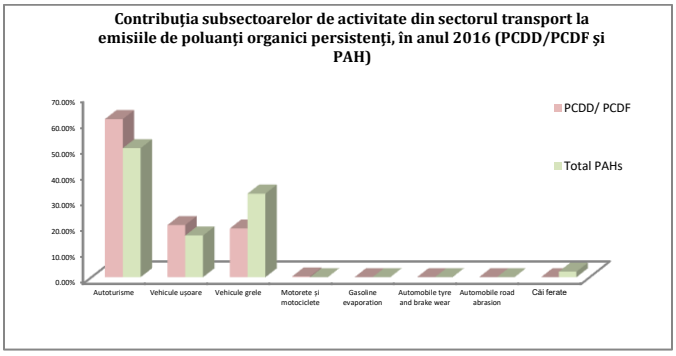
From the analysis of data on national transport sector contributions to heavy metal emissions, it is noted that the largest share come from the same activities such as passenger transport and heavy goods vehicles for Cd and wear activity brake pads for Pb.

RO 39	Indicator code Romania: RO 39 AEM indicator code: APE 06

TITLE: EMISSIONS OF PERSISTENT ORGANIC POLLUTANTS
DEFINITION: Trends in anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by sectors of activity: production and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

The trend of anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by transport activity sub-sectors to 2016 is shown graphically (Figure no I.31).

Figure no. I.31. Contribution of subsectors of transport sector to emissions of persistent organic pollutants in 2016 (PCDD / PCDFs and PAHs)



Source: LRTAP-RO-2018

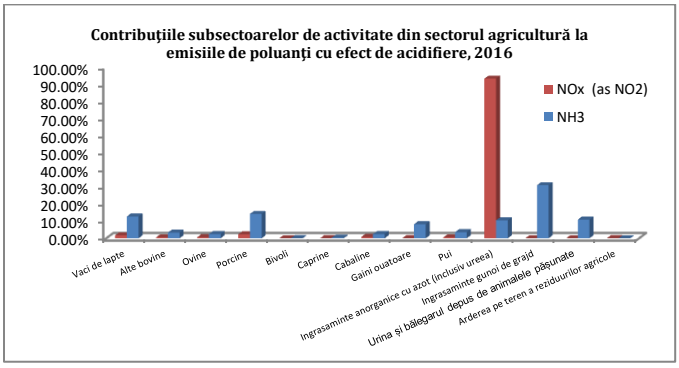
From the analysis of data on transport sector contributions to persistent organic pollutant emissions, it is clear that these pollutants also have the largest share of cars, passenger transport and heavy goods vehicles, followed by light vehicles.

RO 01	Indicator code Romania: RO 01 AEM indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES I
DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), taking into account for each of them, its acidifying potential. The indicator also provides information on changes in emissions from major source sectors: generation and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

The trend of the anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and changes in emissions from the main subsectors in the agriculture sector to 2016 is shown graphically. Contributions from agricultural activity sub-sectors to polluting emissions of acidifying pollutants in the agriculture sector (NOx, NH3) are presented graphically (Figure I.32).

Figure no. I.32. Contributions of sub-sectors of agriculture sector to acidifying pollutants (NOx and NH3) in 2016



Sursa: Romania's Informative Inventory Report 2018

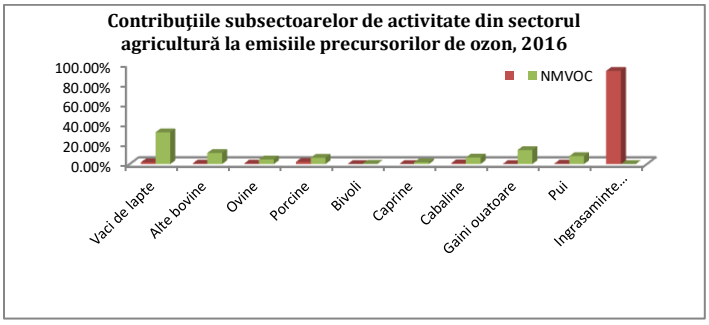
From the analysis of the data presented on the contribution of the activity of the agricultural sub-sectors to the polluting emissions with acidifying effect it is found that the activities with an impact on acidifying pollutant emissions are livestock breeding (dairy cows, pigs, laying hens) followed by application of fertilizers synthetic and natural crops. The sub-sector of application of inorganic nitrogen fertilizers (including urea) to the soil is the main contributor (93.4%) to NOx emissions from agriculture.

RO 02	Indicator code Romania: RO 02 AEM indicator code: CSI 02

TITLE: OZONE PRECURSOR EMISSIONS
DEFINITION: The indicator follows trends in the anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and non-methane volatile organic compounds (NMVOCs) from the sectors: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

Data on the trend of anthropogenic emissions of ground-level ozone pollutants (tropospheric) pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and nonmetallic volatile organic compounds (NMVOCs) are processed and presented in graphic form. Contributions of agriculture sub-sectors to ozone precursor emissions (CH4, NMVOC, NOx and CO) in 2016 are presented graphically in Figure no. I.33.

Figure no. I.33. Contributions of sub-sectors of activity in the agricultural sector to ozone precursor emissions (NMVOC and NOx) in 2016



Source: Romania's Informative Inventory Report 2018

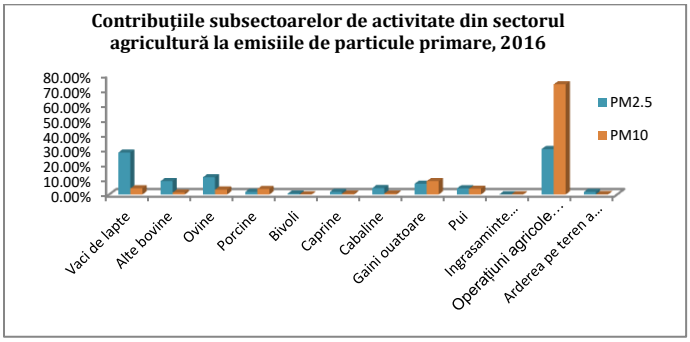
From the analysis of the data on the contribution of the activity of the agricultural sectors to the ozone precursor emissions at the national level, it is observed that the activities related to the breeding of animals (dairy cows, laying hens, other cattle and broilers) have the highest share of the NMVOC pollutant , and for NOx emissions, the main issuer is the sub-sector of application of inorganic nitrogen fertilizers (including urea).

RO 03	Indicator code Romania: RO 53 AEM indicator code: CSI 03

TITLE: EMISSIONS OF PRIMARY PARTICLES AND SECONDARY PRECURSORS OF PARTICLES
DEFINITION: This indicator shows the primary particle emission (PM2,5) and 10 μm (PM10) and secondary particle precursors (NOx, ammonia (NH3) and Sulfur dioxide (SO2), derived from anthropogenic sources, by source sectors: energy production and distribution, energy use in industry, industrial processes, road transport, non-commercial transport, institutional and residential transport, use of solvents and other products, waste, other sources.

Contributions of agricultural sector sub-sectors to emissions of PM2,5 and PM10 primary particulates in 2016 are presented graphically (Figure I.34).

Figure no. I.34. Contributions of sub-sectors of activity in the agricultural sector to PM2,5 and PM10 primary particles emissions 2016



Source: LRTAP-RO-2018

From the analysis of the data on the contribution of the activity of the agricultural sectors to the PM2.5 and PM10 emissions in the agricultural sector, the agricultural activity in farms, transport and storage is significant, followed by the activity of dairy cows.

RO 39	Indicator code Romania: RO 39 AEM indicator code: APE 06

TITLE: EMISSIONS OF PERSISTENT ORGANIC POLLUTANTS
DEFINITION: Trends in anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by sectors of activity: production and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

The agricultural sector contributed about 13% to the emissions of polycyclic aromatic hydrocarbons (PAHs) in 2016, resulting from the field burning of agricultural residues.

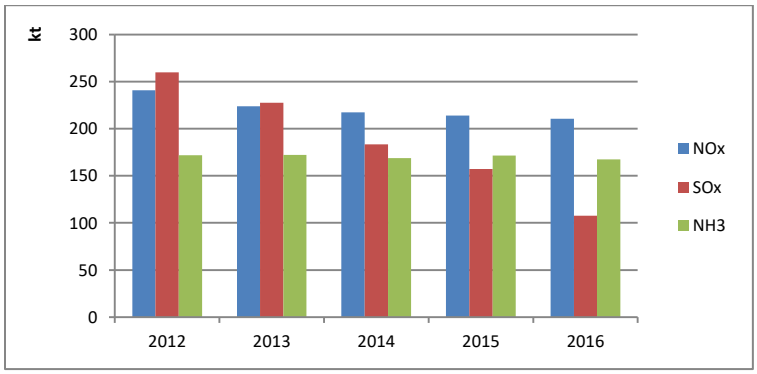
I.3. TRENDS AND FORECASTS FOR AIR POLLUTION

RO 01	Indicator code Romania: RO 01 AEM indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES
DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), taking into account for each of them its acidifying potential. The indicator also provides information on changes in emissions from major source sectors: generation and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; more.

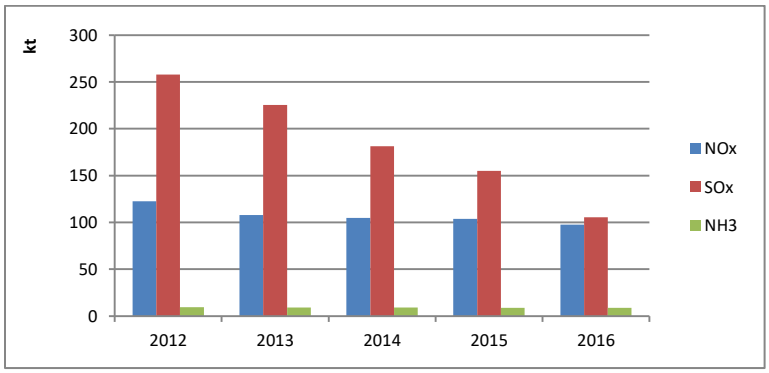
The trend of emissions of air pollutants by sectors of activity (energy, industry, transport, agriculture, waste) at national level during 2010-2016 is presented. The trend of pollutant emissions with acidifying and eutrophication (NOX, SOX and NH3) pollutants at a national level, during the period 2010-2016, is graphically presented in (Figures I.34 - I.38).

Figure no. I.34. The trend of emissions of atmospheric pollutants with acidifying and eutrophication effects at national level 2012-2016 (total energy, industry, transport, agriculture, waste)



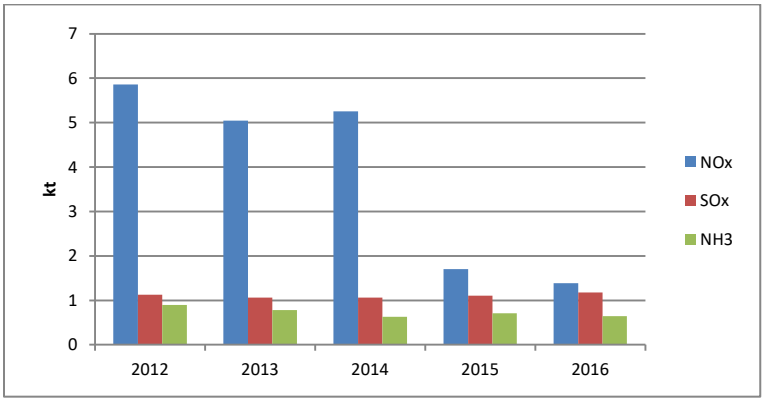
Source: LRTAP-RO 2018

Figure no. I.35Tendency of acidifying pollutants (NOx, SOx and NH3) from the energy sector at national level in 2012-2016



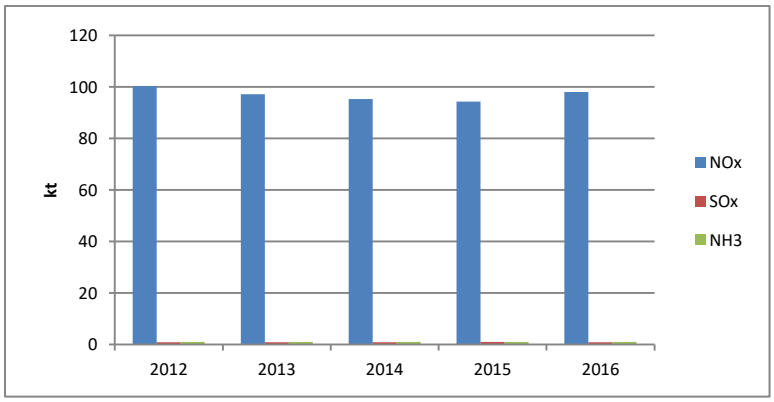
Source: LRTAP-RO-2018

Figure no. I.36. Tendency of acidifying pollutants (NOx, SOx and NH3) in the industry sector at national level in 2012-2016



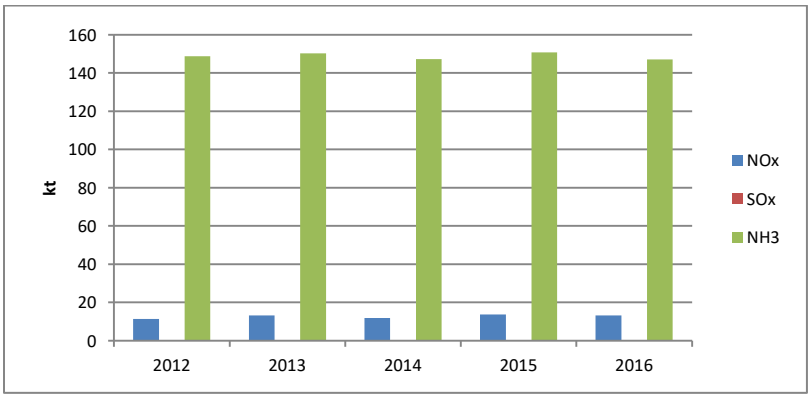
Source: LRTAP-RO-2018

Figure no. I.37. Tendency of emissions of pollutants with acidifying effect (NOx, SOx and NH3) from the transport sector at national level during 2012-2016



Source: LRTAP-RO-2018

Figure no. I.38. Tendency of acidifying pollutants (NOx, SOx and NH3) in the agriculture sector at national level in 2012-2016



Source: LRTAP-RO-2018

Target emissions of sulfur dioxide and nitrogen oxides have a downward trend as a result of progressive implementation by the activity holders of compliance measures with emission limit values. The study of the interaction of the pollutant with the environment in which the dispersion takes place is made taking into account all factors that greatly influence its evolution in time and space. From the analysis of data on the pollutant emissions trend in the sectors of activity, it can be noticed that the reduction of air pollutant emissions in order to comply with the air quality norms for certain areas can be anticipated as an effect of their impact depending on the form of data input (data complexity, organization, etc.), but also output (tables, graphs, etc.).

From the data analysis, a slight tendency to decrease pollutant emissions with acidifying effect at national level over the analyzed period can be observed. By sector, the decrease is mainly in the energy and industry sectors, with the agriculture and transport sectors showing increasing or decreasing variations from year to year.

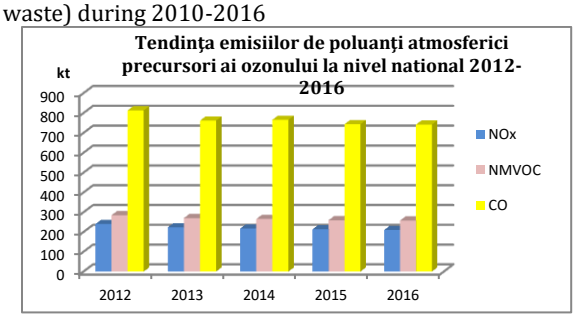
RO 02	Indicator code Romania: RO 02 AEM indicator code: CSI 02

TITLE: OZONE PRECURSOR EMISSIONS

DEFINITION: The indicator follows trends in the anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and non-methane volatile organic compounds (NMVOCs) from the sectors: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; others.

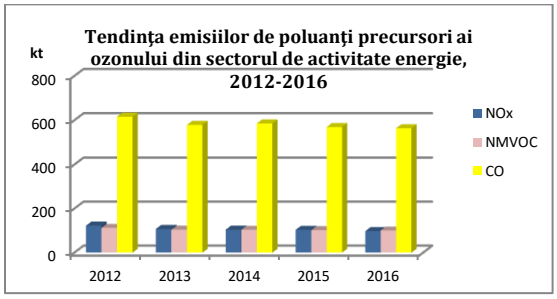
In graphical form, it is presented the trend of emissions of ozone precursors (NOx, NMVOC, CO) at the national level during 2010-2016 (Figures I.39 - I.43).

Figure no. I.39. The trend of emissions of atmospheric pollutants, precursors of ozone at national level (total energy, industry, transport, agriculture, waste) during 2010-2016



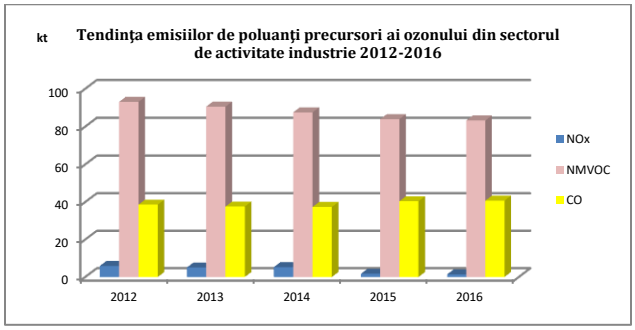
Source: LRTAP-RO-2018

Figure no. I.40. The trend of ozone precursor Pollutants (NOx, NMVOC and CO) from the energy sector at national level in 2012-2016



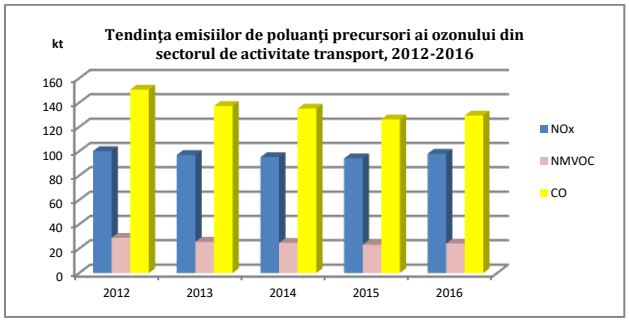
Source: LRTAP-RO-2018

Figure no. I.41. The trend of ozone precursor (NOx, NMVOC and CO) emissions from the industry sector at national level in 2012-2016



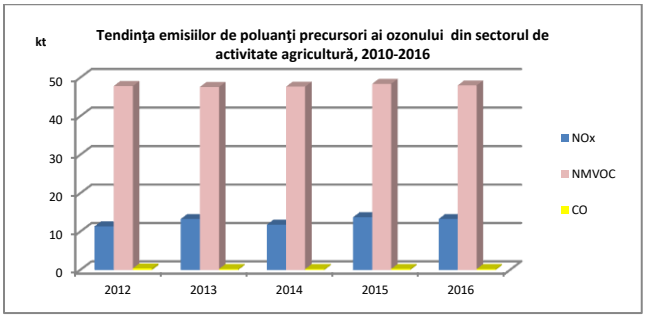
Source: LRTAP-RO-2018

Figure no. I.42. The trend of emissions of ozone precursor pollutants (NOx, NMVOC and CO) from the transport sector at national level in 2012-2016



Source: LRTAP-RO-2018

Figure no. I.43. The trend of emissions of ozone precursor pollutants (NOx, NMVOC and CO) from the agriculture sector at national level in 2012-2016



Source: LRTAP-RO-2018

From the analysis of the data sets presented on the trend of pollutant emissions of ozone precursors at national level, it is also observed a slight decrease during the analyzed period. Emisiile de substanţe poluante evacuate în atmosferă au o tendinţă descendentă ca urmare a implementării principiilor dezvoltării durabile şi adoptării unor politici de mediu, precum:

- production of electricity by partial replacement of fossil fuels with alternative sources: nuclear energy (commissioning of reactors 3 and 4 at Cernavoda NPP), wind energy, energy produced in photovoltaic panels, etc
- reducing the sulfur content of fuels and partially replacing diesel with biodiesel;
- replacing heating in rural areas (traditional wood-burning stoves) with upgraded stoves that use pellets as fuel and have high combustion yields and low pollutant emissions;

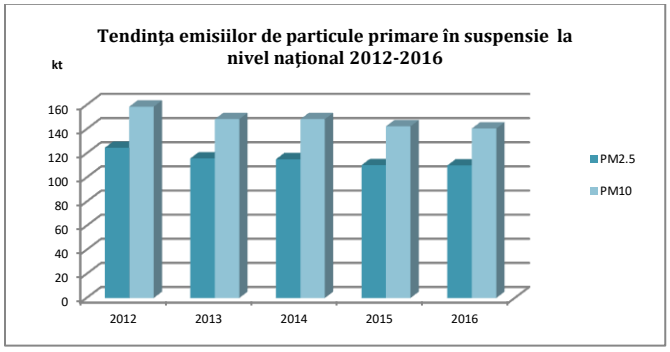
- putting into service of vehicles equipped with hybrid and electric motors;
- provision of economic and financial mechanisms for replacing installations with significant pollutant effect on the environment with other less polluting ones;
- provision of containment, capture, storage of polluting substances (eg carbon capture and storage at IMA-large combustion plants, electrostatic filters, low NOx burners, scrubbers, etc.).

RO 03	Indicator code Romania: RO 03 AEM indicator code: CSI 03

TITLE: EMISSIONS OF PRIMARY PARTICLES AND SECONDARY PRECURSORS OF PARTICLES
DEFINITION: This indicator shows the primary particle emission (PM2,5) and 10 μm (PM10) and secondary precursors of particles (NOx, ammonia (NH3) and Sulfur dioxide (SO2), derived from anthropogenic sources, by source sectors: energy production and distribution, energy use in industry, industrial processes, road transport, non-commercial transport, institutional and residential transport, use of solvents and other products, waste, other sources.

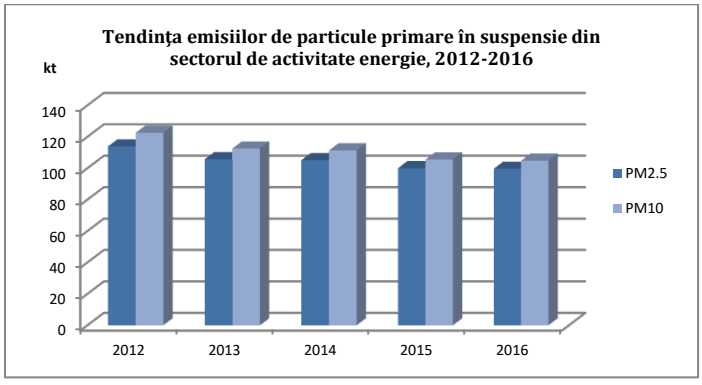
The trend of emissions of primary particles with a diameter of less than 2.5μm (PM2.5) and 10μm (PM10) in suspension, expressed in kt, at national level during the period 2010-2016, is presented graphically (Figures I.44 - I.46).

Figure no. I.44. Primary particulate matter emission trend at national level (total energy, industry, transport, agriculture, waste) 2010-2016



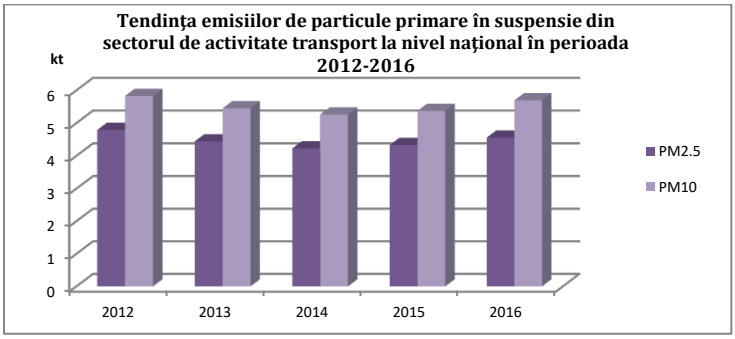
Source: LRTAP-RO-2018

Figure no. I.45. The trend of emissions of primary particulate in suspention, in the energy sector at national level in 2012-2016



Source: LRTAP-RO-2018

Figure no. I.46. The trend of emissions of primary particulate in suspention, in the transport sector at national level in 2012-2016



Source: LRTAP-RO-2018

The analysis of the data sets on PM2,5 and PM10 primary particles emissions at national level reveals that the main sectors with major contributions to primary particles emissions: the energy sector and the transport sector.

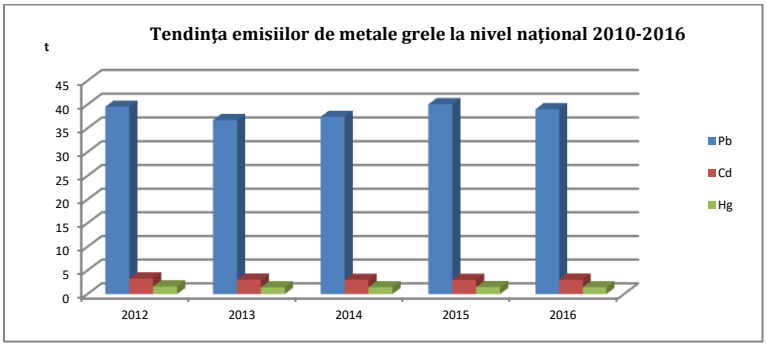
RO 38	Indicator code Romania: RO 38 AEM indicator code: APE 05

TITLE: HEAVY METAL EMISSIONS

DEFINITION: Trends of heavy metal anthropic emissions by industry: energy production and distribution; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

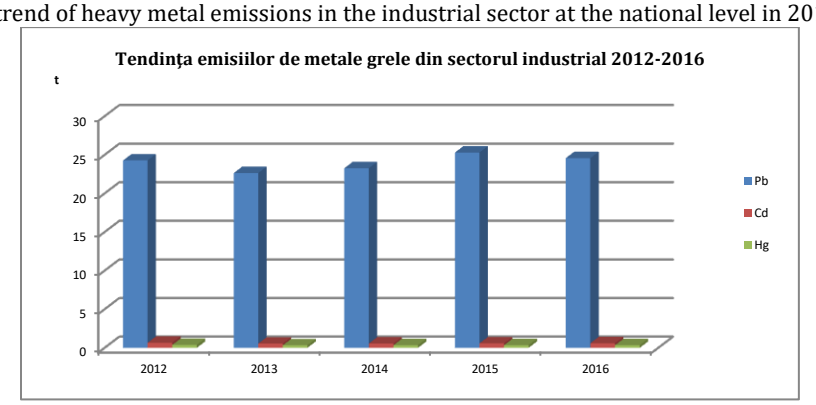
The trend of emissions of heavy metals cadmium (Cd), mercury (Hg) and lead (Pb) at national level in the period 2012-2016 is presented graphically (Figures I.47 - I.49).

Figure no. I.47. The trend of emissions of heavy metals (Cd, Hg and Pb) at national level (total energy, industry, transport, agriculture, waste) 2012-2016



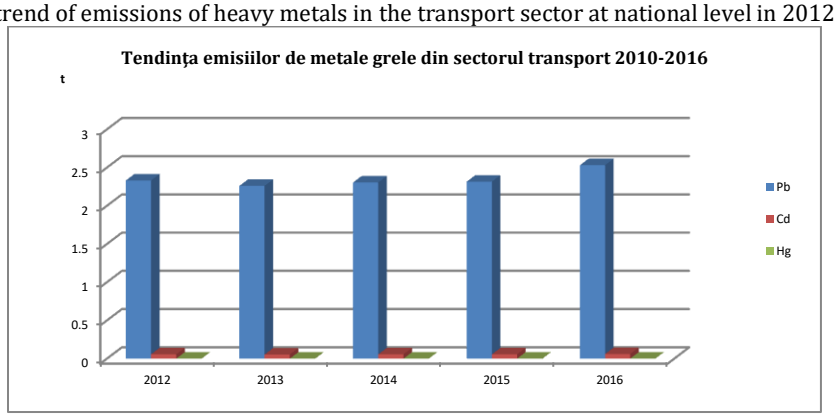
Source: LRTAP-RO-2018

Figure no. I.48. The trend of heavy metal emissions in the industrial sector at the national level in 2012-2016



Source: LRTAP-RO-2018

Figure no. I.49. The trend of emissions of heavy metals in the transport sector at national level in 2012-2016



Source: LRTAP-RO-2018

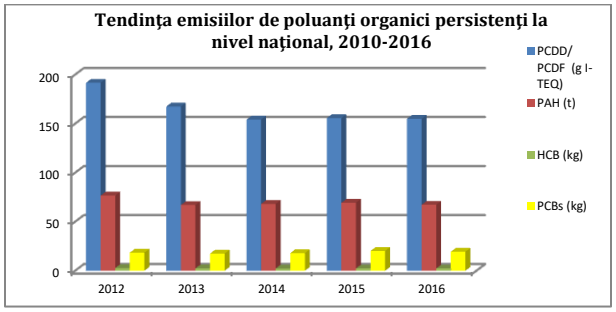
At national level, the analysis of the data on the heavy metal emission trend shows an increase in the 2014-2015 period, the trends revealing the periods of economic crisis 2010-2013 when the activities were reduced, and the recovery from the crisis between 2013-2015 when the activities were increased based on recovery and economical growth. The transport sector shows a year-on-year growth trend with an average of 9.9% for the Pb indicator, mainly due to the increase in the number of cars at national level, both civil and industrial, in 2016 Pb emissions by 9.3% higher than in 2015.

RO 39	Indicator code Romania: RO 39 AEM indicator code: APE 06

TITLE: EMISSIONS OF PERSISTENT ORGANIC POLLUTANTS
DEFINITION: Trends in anthropogenic emissions of persistent organic pollutants, polycyclic aromatic hydrocarbons (PAHs), by sectors of activity: production and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; commercial, institutional and residential; use of solvents and other products; agriculture; waste; other sources.

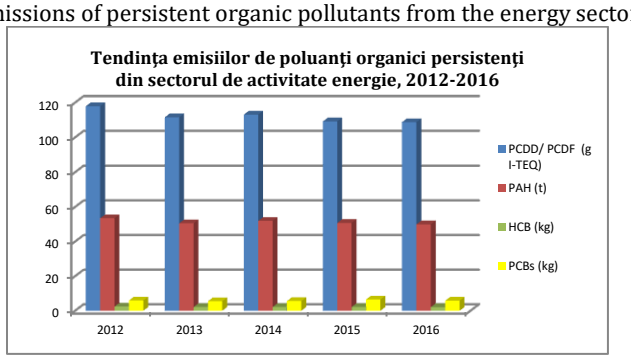
The trend of emissions of persistent organic pollutants (hexachlorobenzene-HCB, hexachlorocyclohexane-HCH, polychlorinated biphenyls - PCBs, dioxin-PCDDs, furans-PCDFs and polyaromatic hydrocarbons-HPAs) at national level in 2012-2016 is shown in figures no. I.50 - I.53.

Figure no. I.50. The trend of emissions of persistent organic pollutants (hexachlorobenzene HCB, hexachlorocyclohexane HCH, polychlorinated biphenyls PCBs, dioxin PCDDs, furans PCDFs and HPA polyaromatic hydrocarbons) at national level in 2012-2016



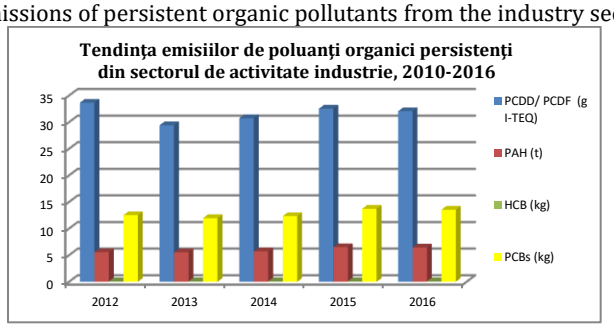
Source: LRTAP-RO-2018

Figure no. I.51. The trend of emissions of persistent organic pollutants from the energy sector during 2012-2016



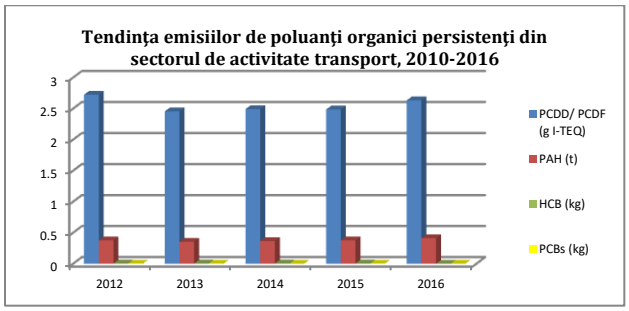
Source: LRTAP-RO-2018

Figure no. I.52. The trend of emissions of persistent organic pollutants from the industry sector in 2012-2016



Source: LRTAP-RO-2018

Figure no. I.53. The trend of emissions of persistent organic pollutants from the transport sector during the period 2012-2016



Source: LRTAP-RO-2018

The socio-economic, financial and political measures that create the legislative framework, as well as the objectives of national, European and national plans, projects and programs, have been highlighted as instruments for controlling and preventing emissions of air pollutants according to the requirements of the directives on quality of life and the environment.

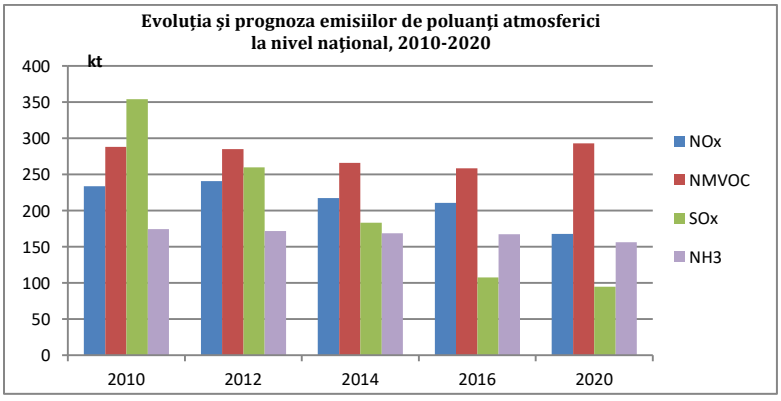
Forecasts on emissions of the main atmospheric pollutants

Emissions of pollutants released into the atmosphere have a downward trend as a result of the implementation of the principles of sustainable development and the adoption of environmental policies such as:

- the production of electricity by partial replacement of fossil fuels with alternative sources: nuclear energy (commissioning of reactors 3 and 4 from Cernavoda NPP), wind energy, energy produced in photovoltaic panels, etc.;
- reduction of sulfur content of fuels and partial replacement of diesel fuels with biodiesel;
- replacement of heating of rural households (traditional wood-burning stoves) with upgraded stoves which use pellets as fuel and have high combustion yields and low pollutant emissions;
- putting into service of vehicles fitted with power-driven engines;
- provision of economic and financial mechanisms to allow the replacement of installations with significant pollutant effect on the environment with other less polluting;
- provision of containment, capture, storage of polluting substances (eg carbon capture and storage in large combustion plants - IMA, electrostatic filters, low NOx burners, scrubbers etc.).

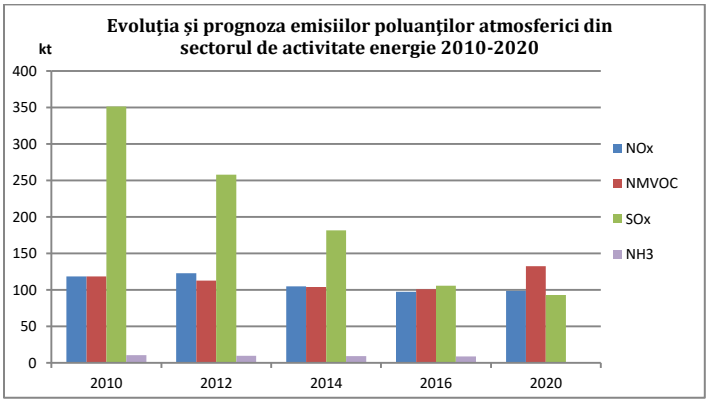
The evolution and forecast of emissions of air pollutants by sectors of activity (energy, industry, transport, agriculture, waste) at the national level for the years 2010, 2012, 2014, 2016 and 2020 are presented graphically (figures no. 54 - I.58).

Figure no. I.54. Evolution of air pollutant emissions by sectors of activity (energy, industry, transport, agriculture, waste) at national level for the period 2010-2016 and projected target for 2020.



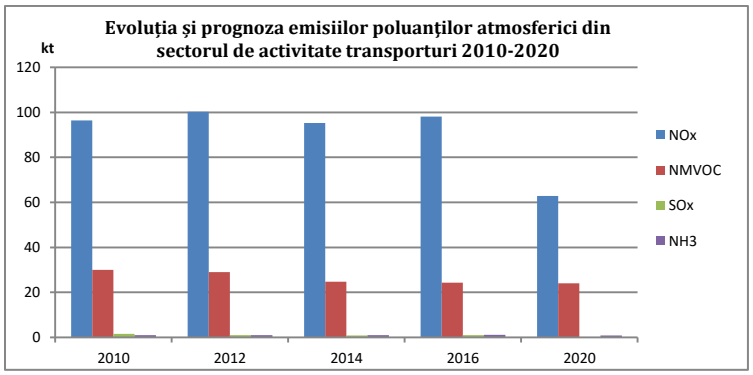
Source: National_emission_projections_2030_Annex_IV

Figure no. I.55. Evolution and forecast of emissions of air pollutants (NOx, NMVOC, SOx and NH3) from the energy sector at national level for 2010-2020



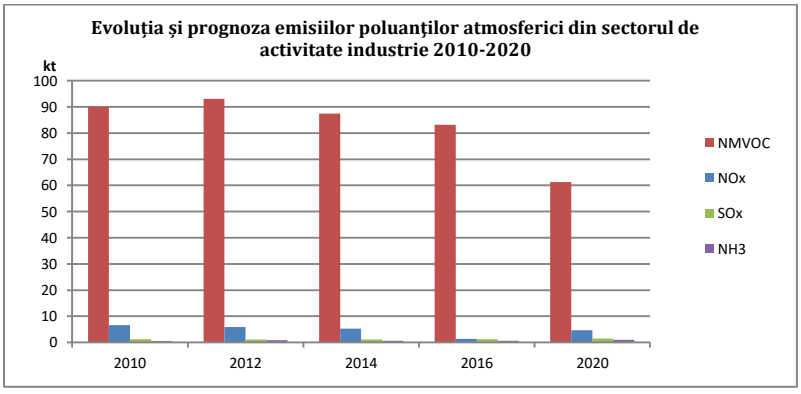
Source: National_emission_projections_2030_Annex_IV

Figure no. I.56. Evolution and forecast of emissions of air pollutants (NOx, NMVOC, SOx and NH3) from the transport sector at national level for 2010-2020



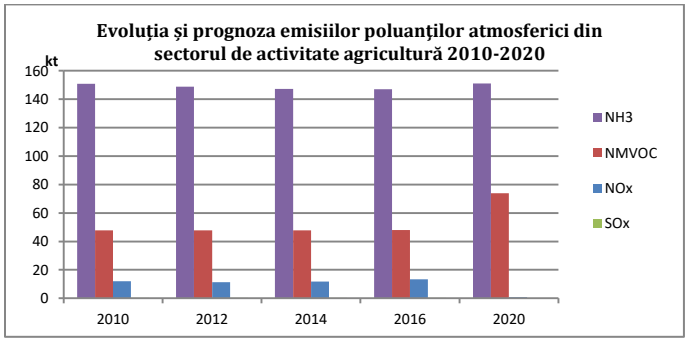
Source: National_emission_projections_2030_Annex_IV

Figure no. I.57. Evolution and forecast of emissions of air pollutants (NOx, NMVOC, SOx and NH3) from the industry sector at national level for 2010-2020



Source: National_emission_projections_2030_Annex_IV

Figure no. I.58. Evolution and forecast of emissions of atmospheric pollutants (NOx, NMVOC, SOx and NH3) from the agriculture sector at national level for 2010-2020



Source: National_emission_projections_2030_Annex_IV

The analysis of the data on the ***evolution of atmospheric pollutant emissions at national level shows a decrease in all the activity sectors.***

Preliminary forecasts include a number of different estimates (scenarios) that include combinations of support elements related to changes in activity levels (eg economic growth or decline) as well as the impact of new technologies, techniques and practices that correspond to local, national efforts or regional ("policies and measures"). These are intended to reduce emissions, ranging from emissions controls for motor vehicles and industrial plants and fuel incentives and cleaner technologies or changes in economic factors (eg fuel prices), measures which have as a purpose fuel exchanges and behavioral changes (for example raising awareness).

These approaches include measures such as: applying complex techniques and technologies to reduce and control or encourage new technologies. Assumptions about preliminary forecasts are based on a range of data sets, including forecasts of industrial development, population growth, changes in agro-technical models and demand for transport. Medium and long-term emission factors reflect technological advances, environmental regulations, improved operating conditions for plant and machinery, and any expected change in fuel formulations. The speeds of penetration of new technologies are important in the development of sectoral emission factors for any target year of forecast.

II.WATER

II.1.WATER RESOURCES: QUANTITY AND FLOWS

II.2.WATER QUALITY

II.3.MARINE AND COSTIER ENVIRONMENT

Chapter II. WATER

II.1. WATER RESOURCES: QUANTITY AND FLOWS

II.1.1. STATES, PRESSURES AND CONSEQUENCES

II.1.1.1. Potentially and technically usable water resources

RO 52	Indicator code Romania: RO 18 AEM indicator: CSI 18

TITLE: USE OF WATER RESOURCES

DEFINITION: The Water Exploitation Index (WEI) is the total annual average freshwater abstraction reported to total annual average of renewable water resources at national level, expressed as a percentage and calculated according to the following formula.

$$WEI = \frac{C}{RT} T * 100$$

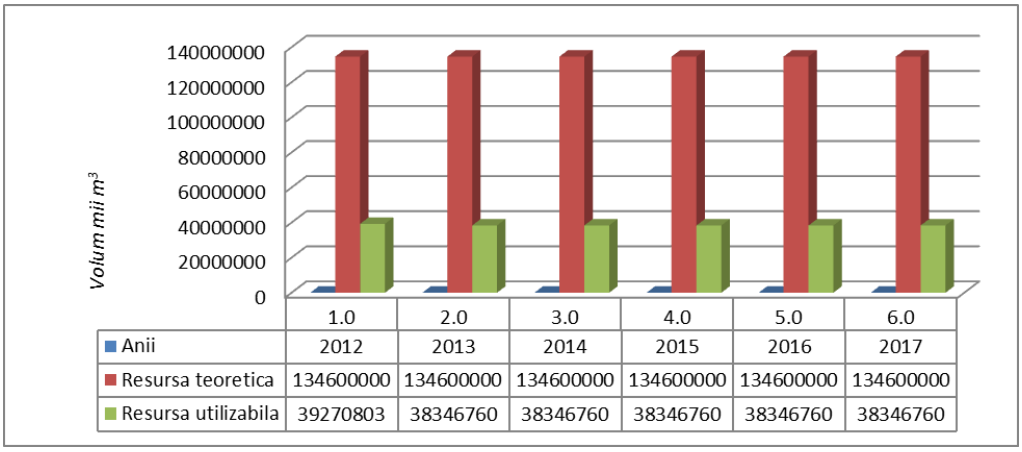
where: WEI is the water exploitation index, expressed in%;
CT - average annual total freshwater abstraction, expressed in billions of m3 / year;
RT - the total annual average national renewable water resources, expressed in million m3 / year.

Table no. II.1. Evolution of the theoretical and usable water resource in thousands of m³

Years	Theoretical resource	Usable resource
2012	134600000	39270803
2013	134600000	38346760
2014	134600000	38346760
2015	134600000	38346760
2016	134600000	38346760
2017	134600000	38346760

Source: ANAR

Figure no. II.1. Evolution of the theoretical and usable water resource in thousands of m³



Source: ANAR

II.1.1.2. Use of water resources

II.1.1.3. Extreme events caused by water flows

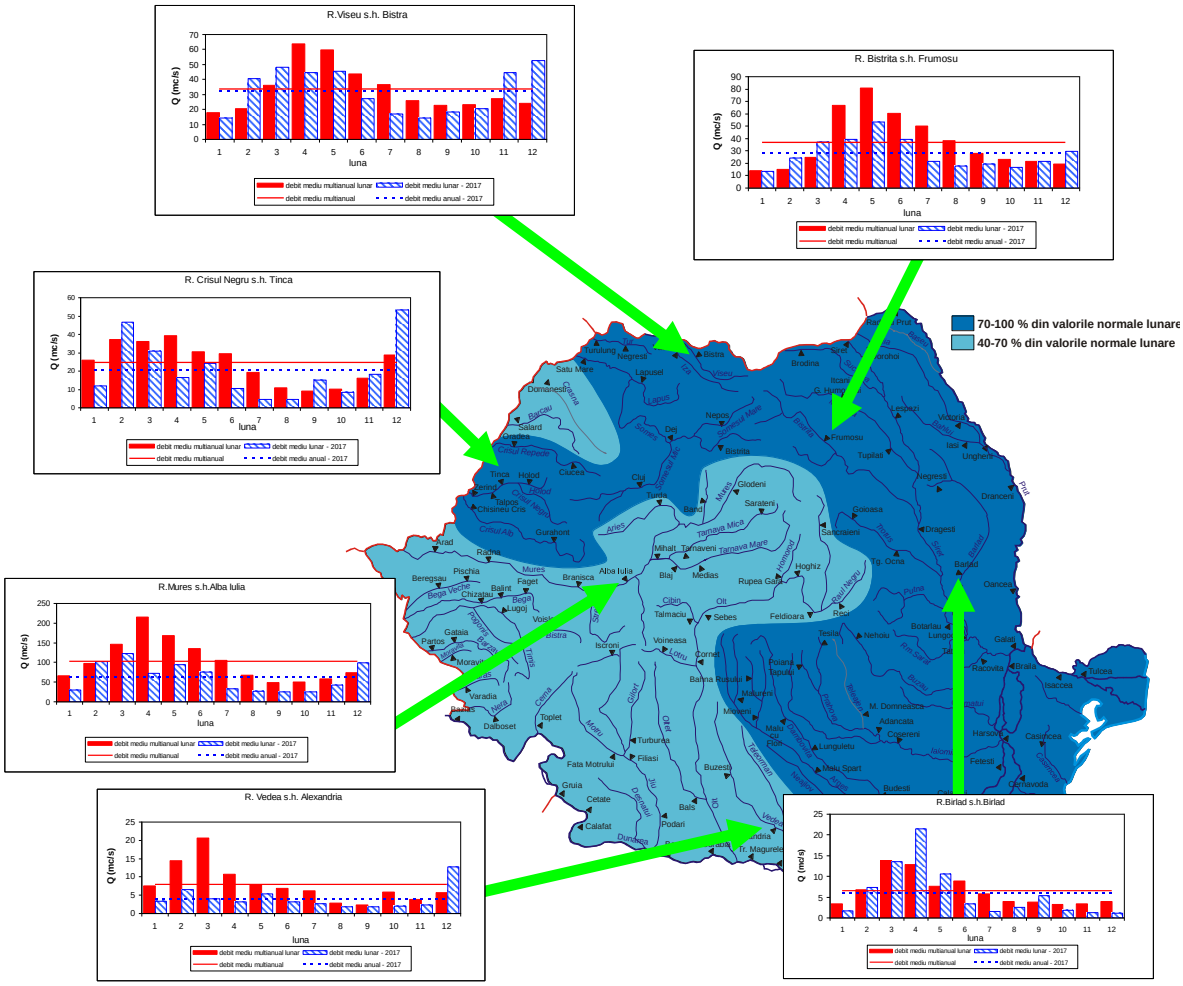
RO 52	Indicator code Romania: RO 52 AEM indicator code: CLIM 16

TITLE: WATER COURSES DEBT
DEFINITION: The indicator defines the estimated changes in daily, monthly, seasonal and annual average flows of watercourses.

HYDROLOGICAL CHARACTERIZATION OF THE YEAR 2017

I) RIVERS

In 2017 the hydrological regime ranged between 70-100% of the multi-annual averages on rivers in the river basins: Vişeu, Iza, Tur, Somes, Crişul Negru, Crisul Alb, Argeş, Ialomiţa, Siret, Prut and rivers in Dobrogea and between 40-70% on rivers in river basins: Crasna, Barcau, Crişul Repede, Mureş, Bega Veche, Bega, Timiş, Bârzava, Moraviţa, Caraş, Nera, Cerna, Jiu, Olt and Vedea.



Source: ANAR/INHGA

A map with the distribution of the annual module coefficients (the ratio of the annual average flow and the multiannual average flow) for the year 2017, the monthly average flow rate graph (——) versus the monthly average values (– – -), the average annual flow 2017 ( ), the average multiannual flow 2017 ( ) hydrometers representative of the main areas of the country

During 2017, the most important meteorological and hydrological hazardous events, with significant deflections of DEPARTMENTS in some hydrographic basins, were registered in February, April and May 2017. In February the most affected river basins were the rivers in the basin Viseul, Iza, Turul, Someşul, Criss and Barladul, in April the rivers in the Barlad basin and in May, Barladul, Trotusul superior and, in isolation, the rivers in the Jiu, Argeş basins and Oltul inferior.

Also, between May and September 2017, as a result of some significant and torrential rainfall events, there have been frequent dangerous hydrological phenomena represented by significant leaks on the slopes, torrents, streams, rapid floods on small unmonitored rivers in hydrological point of view, which have often produced local floods.

From June 2017 on the rivers in the basin of Bârlad, on the tributaries of the Prut River and on the upper course of the Siret there was installed a deficient hydrological regime, which was maintained in July and August.

In the year 2017, based on the hydrological situation and meteorological forecasts, prior to the occurrence of dangerous phenomena, were issued at national level **7 HYDROLOGICAL WARNINGS - ORANGE CODE, 37 WARNINGS - YELLOW CODE, respectively 31 warnings for immediate phenomena (of which 1 RED CODE) and 194 warnings for immediate phenomena.**

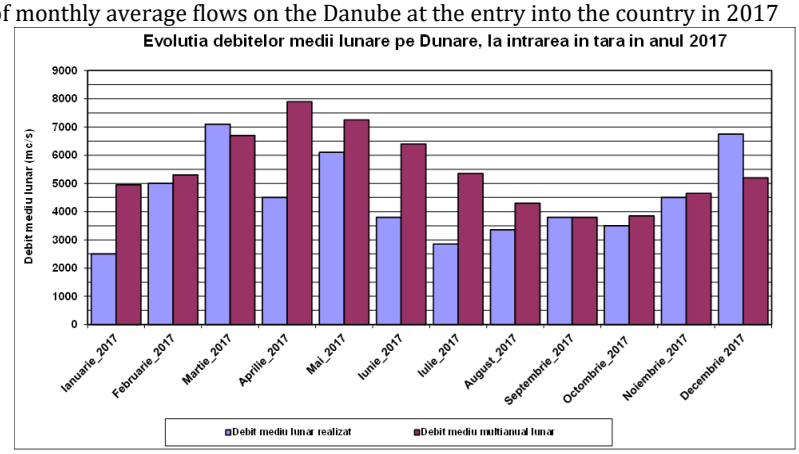
THE DANUBE RIVER

In 2017, the average monthly flows recorded on the Danube at the entry into the country (Baziaş section) were above the monthly multiannual monthly averages in March and December 2017, and in the rest of the months below the monthly norms, with values ranging from 50-94% of multiannual monthly environments between January-February 2017 and April-November 2017 and at a value equal to the monthly multiannual average in September 2017. The lowest average monthly flow rate was recorded in January at 50% of the monthly multiannual average.

Figures II.2 and II.3 show the evolution of average, monthly and maximum monthly flows on the Danube at entry into the country. The maximum Danube flow rate at the entrance of the country was 8600 m3 / s on 21 December 2017 and the minimum value was 2200 m3 / s recorded between January 14-18, 2017.

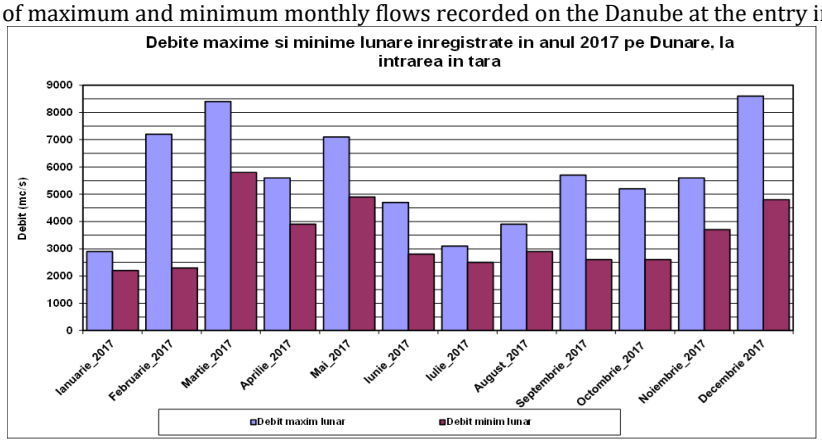
Analyzing the evolution of the minimum debits in this interval, there is an increasing trend in February-March, November-December, in May and August and decreasing in June-July, September-October and in April. As far as the maximum flows are concerned, they showed an increasing trend in February-March, August-September, November-December and May and one decreasing between June - July 2017 and in April and October.

Figure no. II.2. Evolution of monthly average flows on the Danube at the entry into the country in 2017



Source: ANAR/INHGA

Figure no. II.3. Evolution of maximum and minimum monthly flows recorded on the Danube at the entry into the country in 2017



Source: ANAR/INHGA

II.1.2. FORECASTS

II.1.2.1. Availability, demand and water scarcity

II.1.2.2. Risks and pressures of floods

RO 53	Indicator code Romania: RO 53 AEM indicator code: CLIM 17

TITLE: FLOODS
DEFINITION: The indicator highlights the trend of major floods at national level, as well as the expected changes in flood variation with a 100-year return period**.**

Table no. II.2. Synthetic chart on floods in Romania

No. crt.	Year	No. of events	No. of significative events	Affected urban areas
1	2010	94	3	117
2	2011	45	1	19
3	2012	39	2	39
4	2013	74	3	47
5	2014	151	5	72
6	2015	49	5	20
7	2016	171	4	93
8	2017	137	3	68

Source: ANAR/INHGA

II.1.3. Use and efficient management of water resources

II.2.WATER QUALITY

II.2.1. WATER QUALITY: STATE AND CONSEQUENCES

II.2.1.1. Water quality of the watercourses

RO 65	Indicator code Romania: RO 65 AEM indicator code: VHS 02

TITLE: HAZARDOUS SUBSTANCES FROM WATER COURSES
DEFINITION: The indicator quantifies the concentrations (annual averages) of hazardous substances present in the watercourses. The hazardous substances required for reporting are those listed in H.G. no. 351/2005 approving the Program for the phasing out of discharges, emissions and losses of priority hazardous substances, modified and completed by H.G. no. 1038/2010.

For this indicator, we considered the reporting of priority substances in H.G. no. 570/2016 underlying the assessment of the chemical status of surface waters (WFD investigation environment). Also, overtaking of the SCM means both the exceedances of the SCM-MA and of the SCM-MAC (according to H.G. No. 570/2016).

The distribution of the number of priority substances monitored in the watercourses on hydrographic areas/basins in 2017 is presented in table no. II.3 and figure no. II.4.

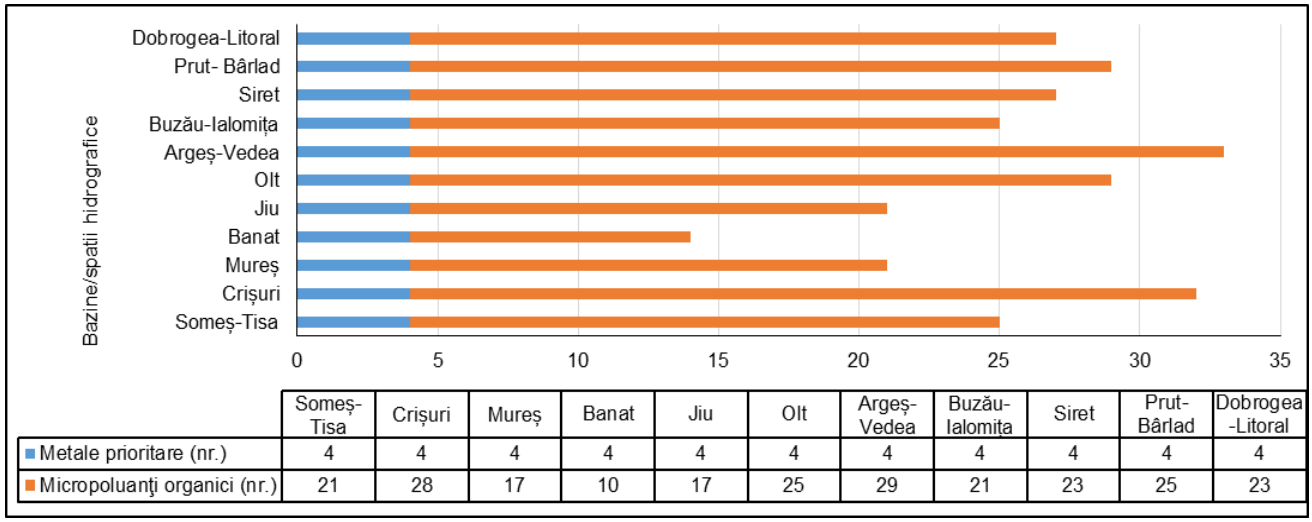
Table no. II.3. Priority substances monitored in watercourses on river basins / basins in 2017 (no.) - WB Investigation Environment

Space / River basin	Monitored Length (Km)	Monitored sections (no.)	Monitored primary substances	
			Priority metals (no.)	Organic microporbents (no.)
Someş - Tisa	3525,87	61	4	21
Crişuri	1088,02	40	4	28
Mureş	3066,68	61	4	17
Banat	1888,39	35	4	10
Jiu	1994	32	4	17
Olt	1496	51	4	25

Argeș - Vedea	502,46	15	4	29
Buzău - Ialomița	798	18	4	21
Siret	1861,22	23	4	23
Prut - Bârlad	2462,59	38	4	25
Dobrogea - Litoral	742,31	11	4	23
Total	**19425,54**	**385**	**4**	**29**

Source: Data transmitted by the National Administration "Apele Române"

Figure no. II.4. Priority substances monitored in watercourses on river basins/basins in 2017 - WB Investigation Environment



	Someș-Tisa	Crișuri	Mureș	Banat	Jiu	Olt	Argeș-Vedea	Buzău-Ialomița	Siret	Prut-Bârlad	Dobrogea-Litoral
Metale prioritare (nr.)	4	4	4	4	4	4	4	4	4	4	4
Micropoluanţi organici (nr.)	21	28	17	10	17	25	29	21	23	25	23

Source: Data transmitted by the National Administration "Apele Române"

Table *no. II.4* shows the share of monitoring sections with a higher concentration than the SCM (%) in 2011-2017.

Table no. II.4. Share of monitoring sections with a higher concentration than the SCM (%) between 2011 and 2017

Year	2011	2012	2013	2014	2015	2016	2017
Monitored priority substances (number)	34	37	37	37	36	42	33
Monitoring sections (number)	430	510	498	418	435	392	385
Share of sections with higher concentration than SCM (%)	11,39	20,19	37,95	5,49	3,44	3,82	5,71

Source: Data transmitted by the National Administration "Apele Române "

RO 67

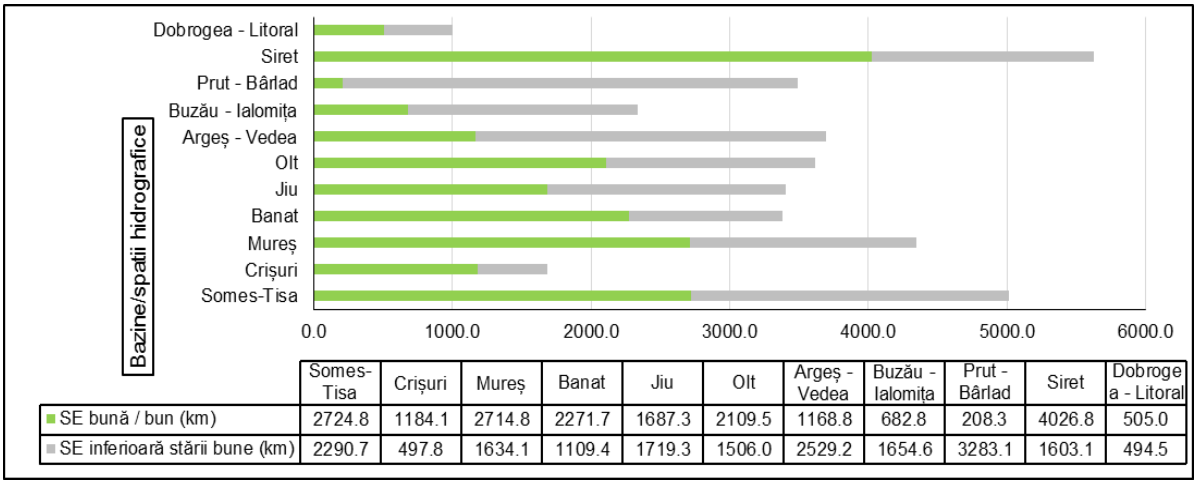
Indicator code Romania: RO 67
AEM indicator code: WEC 04

TITLE: CLASSIFICATION SCHEMES FOR WATER COURSES
DEFINITION: The watercourse classification schemes are designed to provide an indication of the degree of pollution

ECOLOGICAL STATE / ECOLOGICAL POTENTIAL OF MONITORED WATER COURSES (heavily modified, artificial water bodies - rivers) ON HYDROGRAPHIC SPACES / BASES AND NATIONAL LEVEL

The assessment of the ecological status / ecological potential of water courses monitored (natural water bodies, heavily modified, artificial water bodies - rivers) on hydrographic areas / basins in 2017 (km) is presented in figure no.II.5.

Figure no. II.5. Ecological status / ecological potential of water courses monitored (natural water bodies, heavily modified, artificial - rivers) on hydrographic areas / basins in 2017 (km)



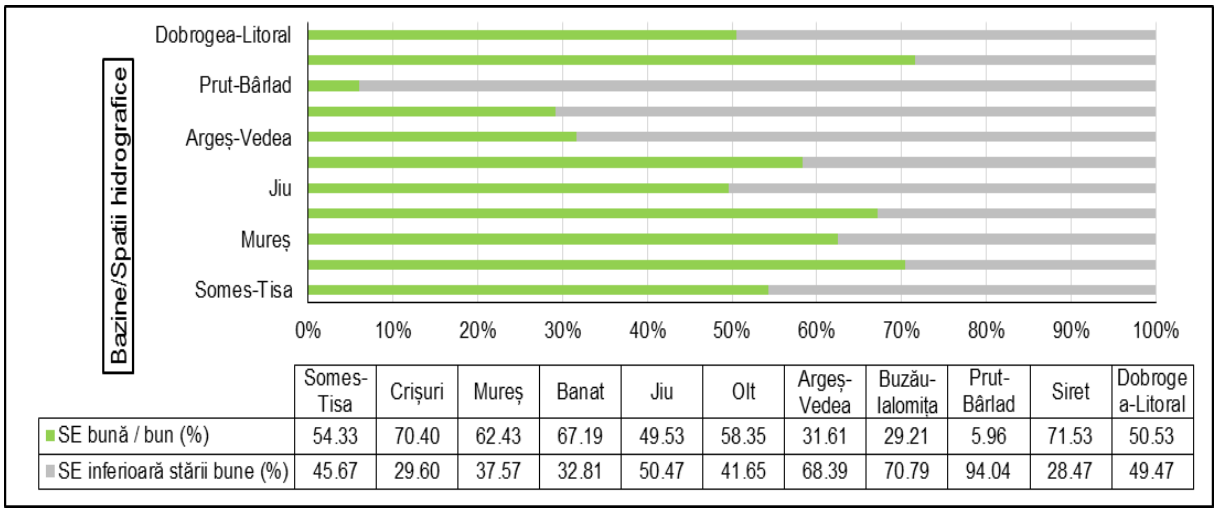
	Somes-Tisa	Crișuri	Mureș	Banat	Jiu	Olt	Argeș - Vedea	Buzău - Ialomița	Prut - Bârlad	Siret	Dobrogea - Litoral
SE bună / bun (km)	2724.8	1184.1	2714.8	2271.7	1687.3	2109.5	1168.8	682.8	208.3	4026.8	505.0
SE inferioară stării bune (km)	2290.7	497.8	1634.1	1109.4	1719.3	1506.0	2529.2	1654.6	3283.1	1603.1	494.5

*** SE - ecological status / ecological potential**

Source: Data transmitted by the National Administration "Apele Române "

The assessment of the ecological status / ecological potential of water courses monitored (natural, heavily modified, artificial water bodies - rivers) on hydrographic areas / basins in 2017 (%) is presented in figure no. *II.6*.

Figure no. II.6. Ecological status / ecological potential of monitored water courses (natural, heavily modified, artificial water bodies - rivers) on river basins / basins in 2017 (%)

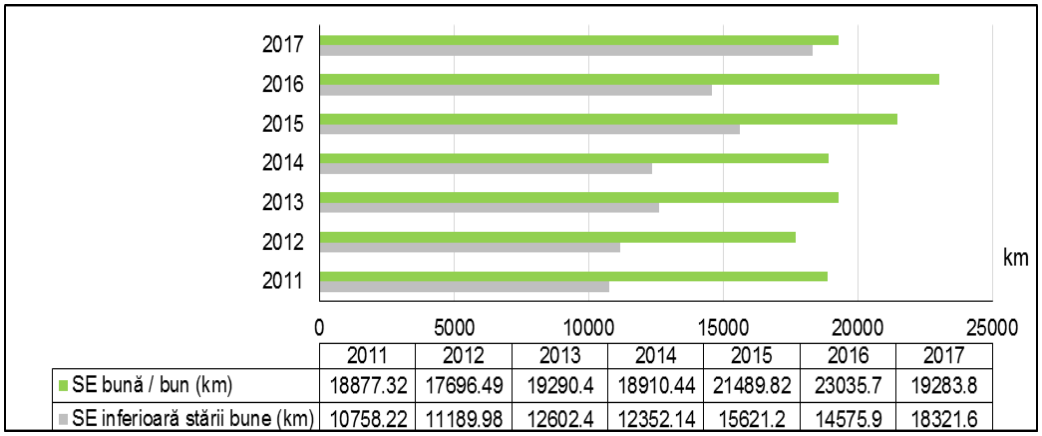


	Somes-Tisa	Crișuri	Mureș	Banat	Jiu	Olt	Argeș-Vedea	Buzău-Ialomița	Prut-Bârlad	Siret	Dobrogea-Litoral
SE bună / bun (%)	54.33	70.40	62.43	67.19	49.53	58.35	31.61	29.21	5.96	71.53	50.53
SE inferioară stării bune (%)	45.67	29.60	37.57	32.81	50.47	41.65	68.39	70.79	94.04	28.47	49.47

Source: Data transmitted by the National Administration "Apele Române"

The evolution of the ecological status / ecological potential of the water courses monitored (natural water bodies, strongly modified, artificial - rivers) at national level during the period 2011 - 2017 (km) is presented in figure no. II.7.

Figure no. II.7. Evolution of the ecological status / ecological potential of monitored water courses (natural, heavily modified, artificial water bodies - rivers) at national level in 2011-2017 (km)

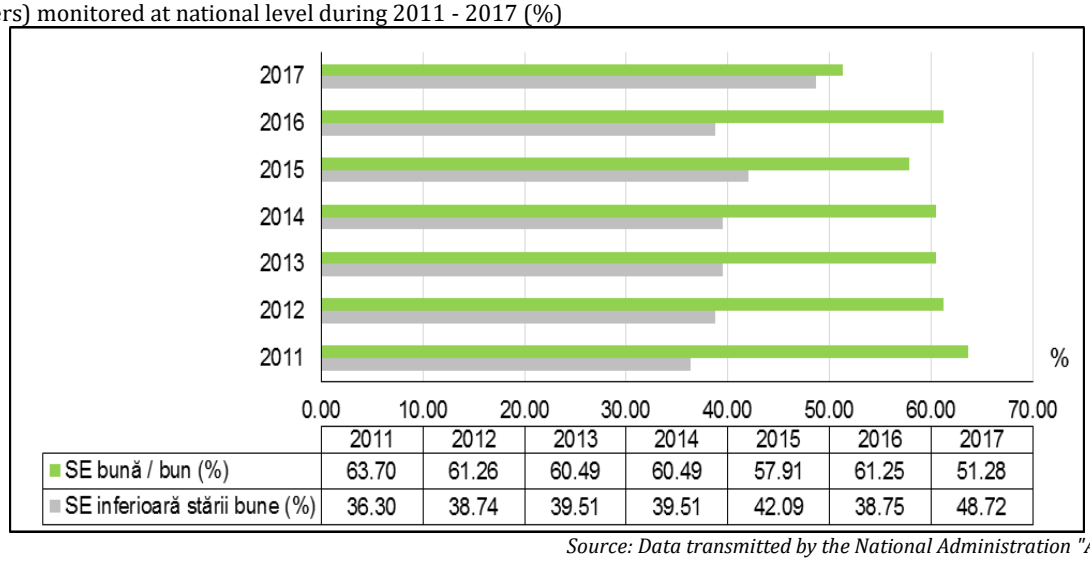


	2011	2012	2013	2014	2015	2016	2017
SE bună / bun (km)	18877.32	17696.49	19290.4	18910.44	21489.82	23035.7	19283.8
SE inferioară stării bune (km)	10758.22	11189.98	12602.4	12352.14	15621.2	14575.9	18321.6

Source: Data transmitted by the National Administration "Apele Române"

The evolution of the ecological status / ecological potential of the water courses (natural, heavily modified, artificial water bodies - rivers) monitored at national level during 2011-2017 (%) is presented in figure no. II.8.

Figure no. II.8. Evolution of ecological status / ecological potential of water courses (natural, heavily modified, artificial water bodies - rivers) monitored at national level during 2011 - 2017 (%)



	2011	2012	2013	2014	2015	2016	2017
SE bună / bun (%)	63.70	61.26	60.49	60.49	57.91	61.25	51.28
SE inferioară stării bune (%)	36.30	38.74	39.51	39.51	42.09	38.75	48.72

Source: Data transmitted by the National Administration "Apele Române"

The evolution of the ecological status / ecological potential of monitored water courses (bodies of natural, heavily modified, artificial water bodies - rivers) at national level during 2011-2017 is presented in table no. II.5.

Table no. II.5. Evolution of ecological status / ecological potential of monitored water courses (natural, heavily modified, artificial water bodies - rivers) at national level during 2011 - 2017

Ecological status / Ecological potential	2011	2012	2013	2014	2015	2016	2017
Very Good and Good (%) / Maximum and Good (%)	63,7	61,26	61,43	60,49	57,87	61,26	51,28
Moderate (%) / Moderate (%)	35,88	38,55	37,99	38,11	39,91	36,68	44,33
Poor (%)	0,28	0,04	0,26	1,22	1,7	1,45	2,82
Bad (%)	0,15	0,15	0,32	0,18	0,52	0,59	1,57
SE inferior to good condition (%)	36,3	38,73	38,57	39,5	42,13	38,72	48,72
Monitorized river network length (km)	29635,54	28886,47	31892,8	31262,58	37111,02	38128,85	37605,38
Number of monitoring sections	1384	1407	1409	1332	1465	1464	1498

Source: Data transmitted by the National Administration "Apele Române"

II.2.1.2. Water quality of lakes

RO 66

Indicator code Romania: RO 66
AEM indicator code: VHS 03

DATE: HAZARDOUS SUBSTANCES FROM LAKES
DEFINITION: The indicator quantifies the concentrations (annual averages) of hazardous substances present in lakes. The hazardous substances required for reporting are those listed in H.G. no. 351/2005 approving the Program for the phasing out of discharges, emissions and losses of priority hazardous substances, modified and completed by H.G. no. 1038/2010.

For this indicator, we considered the reporting of priority substances in H.G. no. 570/2016 underlying the assessment of the chemical status of surface water (the WFD investigation environment). Also, by overtaking over the SCM, it is understood both the exceedances of the SCM-MA and the SCM-MAC (according to H.G. no.570 / 2016). The distribution of the number of priority substances monitored in lakes (natural, heavily modified and artificial lakes) on hydrographic areas / basins in 2017 is presented in table no. II.6 and figure no. II.9.

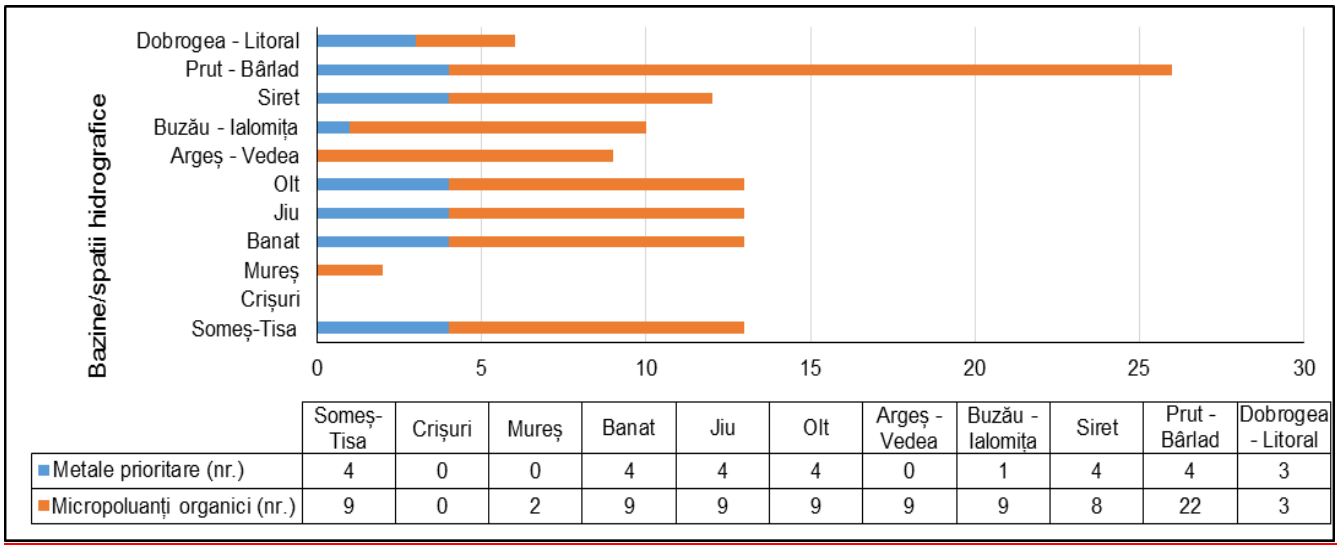
Table no. II.6. Distribution of priority substances monitored in lakes (natural, heavily modified and artificial lakes) on hydrographic areas / basins in 2017 - WAT investigation environment

Space / River basin	Water bodies (no.)	Monitored priority substances Monitored		Monitored sections (no.)
		Priority metals (no.)	Organic microporbents (no.)	
Someş - Tisa	12	4	9	10
Crişuri	8	0	0	0
Mureş	8	0	2	2
Banat	9	4	9	4
Jiu	16	4	9	3
Olt	11	4	9	7
Argeş - Vedea	18	0	9	2
Buzău - Ialomiţa	29	1	9	3

Siret	10	4	8	3
Prut - Bârlad	26	4	22	11
Dobrogea - Litoral	22	3	3	10
Total	**169**	**4**	**22**	**55**

Source: Data transmitted by the National Administration "Apele Române"

Figure no. II.9. Distribution of priority substances monitored in lakes (natural, heavily modified and artificial lakes) on hydrographic areas / basins in 2017 - WAT investigation environment



	Someș-Tisa	Crișuri	Mureș	Banat	Jiu	Olt	Argeș - Vedea	Buzău - Ialomița	Siret	Prut - Bârlad	Dobrogea - Litoral
Metale prioritare (nr.)	4	0	0	4	4	4	0	1	4	4	3
Micropoluanți organici (nr.)	9	0	2	9	9	9	9	9	8	22	3

Source: Data transmitted by the National Administration "Apele Române"

Table no. II.7. Share of monitoring sections of priority substances with concentrations higher than SCM (%) for 2017 per hydrographic area / basin - WAT investigation environment

Space / River basin	Monitoring sections (no.)	Monitoring sections with concentrations higher than SCM (nr.)	Share of monitoring sections with concentrations higher than SCM (%)
Someș - Tisa	10	0	0
Crișuri	0	0	0
Mureș	2	0	0
Banat	4	0	0
Jiu	3	0	0
Olt	7	0	0
Argeș - Vedea	2	0	0
Buzău - Ialomița	3	0	0
Siret	3	0	0
Prut - Bârlad	11	0	0
Dobrogea - Litoral	10	1	10
Total	**55**	**1**	**1,82**

Source: Data transmitted by the National Administration "Apele Române"

Evolution of concentration monitoring sections higher than the EQS is presented in table no. II.8.

Table no. II.8. Share of monitoring sections with a higher concentration than the SCM (%) between 2011 and 2017

Year	2011	2012	2013	2014	2015	2016	2017
Monitored priority substances (no.)	34	37	37	37	31	37	26
Monitoring sections (no.)	110	109	98	92	71	95	55
Share of sections with a higher concentration than the SCM (%)	13,64	24,77	53,06	11,96	2,81	3,15	1,82

Source: Data transmitted by the National Administration "Apele Române"

II.2.1.3. Groundwater quality

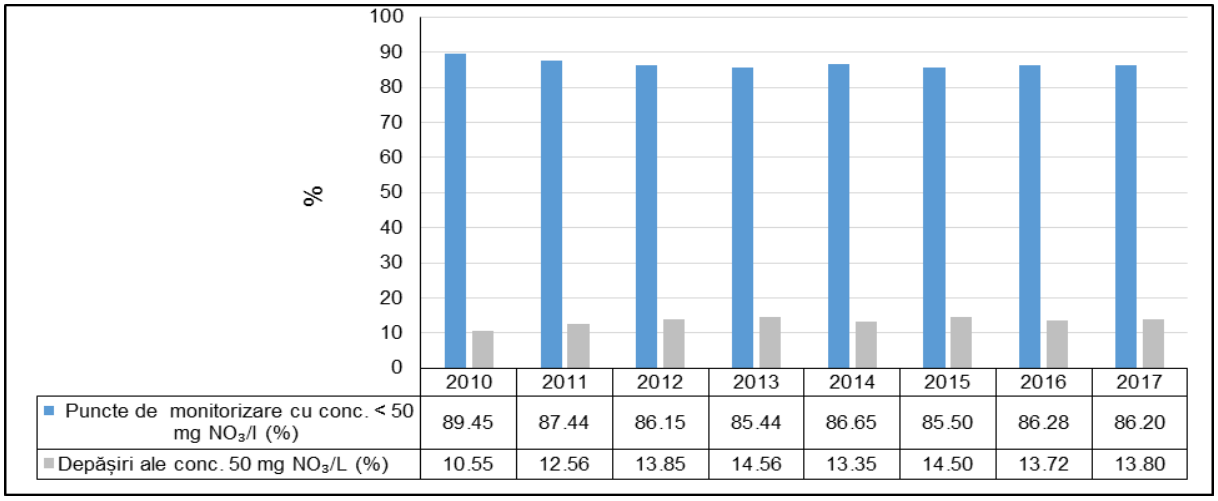
RO 20

Indicator code Romania: RO 20
AEM indicator code: CSI 20

TITLE: NUTRIENTS IN WATER
DEFINITION: The indicator quantifies nitrogen present in groundwater and is used to highlight geographic variations in concentrations and their evolution over time.

THE DEVELOPMENT OF NUMBER OF MONITORING POINTS WITH EXCEEDANCES TO THE NITRATION CONTENT IN THE PERIOD 2011-2017 (%)

Figure no. II.10. Evolution of monitoring points with exceedances of nitrate concentrations between 2011 and 2017 (%)



	2010	2011	2012	2013	2014	2015	2016	2017
Puncte de monitorizare cu conc. < 50 mg NO_3/l (%)	89.45	87.44	86.15	85.44	86.65	85.50	86.28	86.20
Depășiri ale conc. 50 mg NO_3/L (%)	10.55	12.56	13.85	14.56	13.35	14.50	13.72	13.80

Source: Data transmitted by the National Administration "Apele Române"

RO 64

Indicator code Romania: RO 64
AEM indicator code: VHS 01

TITLE: GROUNDWATER PESTICIDES
DEFINITION: The indicator shows the concentration of an active substance or sum of the concentrations of active substances in the class of pesticides determined in groundwater. The pesticides required for reporting are those listed in the list of priority substances in H.G. no. 351/2005 approving the Program for the phasing out of discharges, emissions and losses of priority hazardous substances, modified and completed by H.G. no. 1038/2010.

Distribution of the number of pesticide monitoring points per river basin / basin in 2017

Table no. II.9. Pesticides monitored in 2017 (number)

Space / River basin	Water bodies monitored (number)	Monitoring points (total number)	Points in which pesticides are monitored (number)	Pesticides monitored (number)
Someș - Tisa	15	131	1	2
Crișuri	9	130	1	3
Mureș	23	122	6	16
Banat	20	215	0	0
Jiu	8	93	76	2
Olt	14	143	45	15
Argeș - Vedea	11	168	162	21
Buzău - Ialomița	18	192	191	21
Siret	6	111	12	18
Prut- Bârlad	7	113	49	12
Dobrogea - Litoral	10	118	7	11
Total	**141**	**1536**	**550**	**21**

Source: Data transmitted by the National Administration "Apele Române"

Share of monitoring points with a concentration greater than 0,1 µg / L of the number of drillings in which pesticides are monitored for 2017

Table no. II.10. Share of monitoring points with a concentration greater than 0,1 µg / L of the number of drillings in which pesticides are monitored for 2017 (%)

Space / River basin	Points in which pesticides are monitored (no.)	Monitoring points with conc. > 0,1 µg / L(no.)	Monitoring points with conc. > 0,1 µg / L (%)
Someș - Tisa	1	1	100
Crișuri	1	0	0
Mureș	6	0	0
Banat	0	0	0
Jiu	76	0	0
Olt	45	0	0
Argeș - Vedea	162	7	4,32
Buzău - Ialomița	191	3	1,57
Siret	12	0	0
Prut- Bârlad	49	0	0
Dobrogea - Litoral	7	0	0
Total	**550**	**11**	**2,0**

Source: Data transmitted by the National Administration "Apele Române"

Evolution of monitoring points with a concentration greater than 0,1 µg / L for the period 2011-2017 (%)

Table no. II.11. Evolution of monitoring points with a concentration greater than 0,1 µg / L for the period 2011-2017 (%)

Year	2011	2012	2013	2014	2015	2016	2017
Number of pesticides monitored	20	20	19	19	19	20	21
Total number of monitored points	1314	1300	1271	1318	1310	1523	1536
Number of points where pesticides are monitored	278	368	333	284	365	574	550
The share of monitoring points with a concentration greater than 0.1µg / L from the no. points in which pesticides are monitored (%)	6,12	2,99	2,7	0	6,3	3,31	2,0

Source: Data transmitted by the National Administration "Apele Române"

Table no. II.12. Number of monitored points in which pesticides are monitored and no. points with a concentration greater than 0.1µg / L in 2017

Pesticides	No. of points where pesticides are being monitored	No.of monitoring points with conc. greater than 0.1 µg / L
Alaclor	462	2
Atrazin	457	9
Clorfenvinfos	141	-
Clorpirifos	140	-
DDT-Total	457	-
Diuron	164	-
gama HCH - Lindan	461	-
Izoproturon	164	-
p,p-DDT	459	-
p,p-DDE	5	-
Aldrin	460	-
Dieldrin	460	-
Endrin	463	-
Isodrin	460	-
Simazin	460	-
Trifluralin	103	-
delta-Hexaclorciclohexan	1	-
Diclorvos	9	-
Mevinfos	89	-
beta-Endosulfan	487	-
Endosulfan	547	-

Source: Data transmitted by the National Administration "Apele Române"

II.2.1.4. The quality of bathing water

RO 22	Indicator code Romania: RO 22 AEM indicator code: CSI 22

TITLE: The quality of bathing water
DEFINITION: The indicator expresses percentages of coastal and indoor bathing areas complying with mandatory standards and recommended levels for microbiological and physic-chemical parameters**.**

In the 2017 bathing season (June 1 - September 15), 50 natural bathing areas were set up in Romania for which the Territorial Public Health Directorates set up a monitoring calendar. The list of these areas and the monitoring calendar were posted on the Ministry of Health website. In 49 of these areas the bathing water is marine type and one area is on a freshwater lake.
Romania as a member of the European Union monitored and reported to the European Commission in a standardized and uniform form the bathing water quality for the 2017 season. Thus, the purpose of protecting the health of the population in relation to the bathing waters in the areas arranged in Romania has been met.

Water quality assessment of the total of 50 natural bathing areas identified and reported by Romania to the European Commission (EIONET Platform - European Union Platform created by the EEA) in 2017 was performed for continuously monitored areas over the last 4 years and evaluation was applied through classification using the current season database (2017) and the previous 3 seasons; this assessment was carried out in accordance with Directive 2006/7 / EC and the provisions of H.G. no. 546/2008, art. 18-24, and the provisions of annex no. 2.

- excellent 36,00% (18),
- good 58,00% (29),
- satisfying 6,00% (3) şi
- unsatisfying 0,00% (0).

Following the classification of bathing water, the possibility of grouping bathing areas was created. Thus, two groups of adjacent zones of 3 zones could be formed if the analysis of the potential risks revealed by the profiles would be positive and the quality of the areas would be maintained with the same rating for several years in a row. The rest of the areas remain independent as the evolution of water quality is fluctuating.

During the bathing season 2017, overall, bathing water quality decreased and no short-term pollution was reported and no abnormal situation was signaled.

Under the DSP Constanta and Tulcea there was no need for special management measures in their bathing areas as there were no changes in the quality of the water bathing during monitoring and there was no identified risk of adverse effects on users' health.

Besides bathing areas reported to the European Commission for the 2017 bathing season, 11 DSPs territorial reported the presence of 22 natural bathing areas, arranged and not arranged.

Even though the quality of the water for the set-up areas ranged from guide values and / or mandatory values, none was monitored at a frequency complying with the legislation in order to prove the stability of water quality and could register it for reporting to the European Commission.

Regarding the 15 undefined bathing areas, few samples were collected for monitoring the microbiological indicators, only DSP Constanta carrying 9 determinations for the two areas.

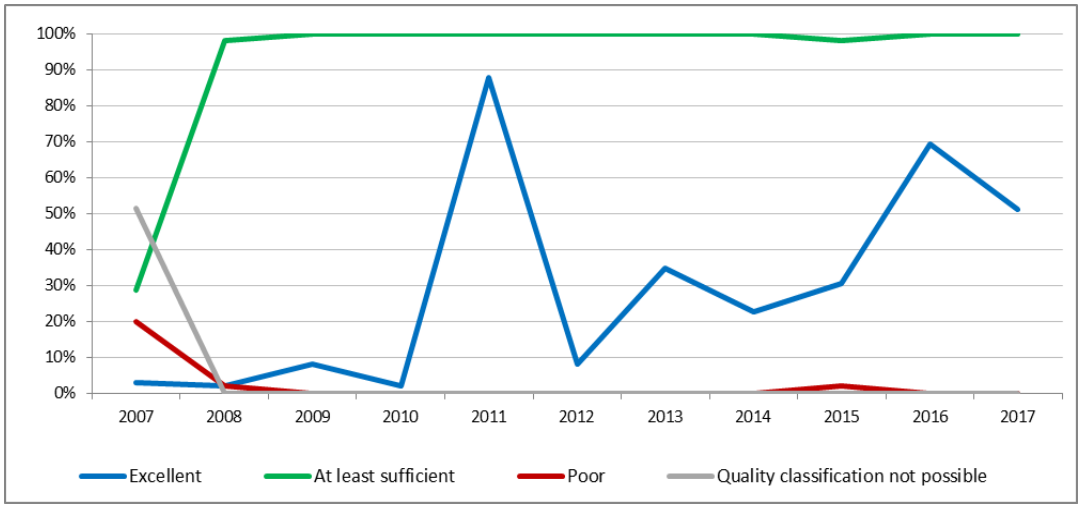
The microbiological indicators fall within the guide values in 2 zones, the mandatory values for 3 zones and the other values were non-compliant or not monitored (and bathing prohibited). The health assessment and inspection of bathing areas by DSPs of counties that have identified bathing areas on their territory has led to a better knowledge of the bathing area to prevent the emergence of potential health hazards of the population that frequent those areas.

In order to achieve water protection objectives for all bodies of surface water, especially for protected areas such as those for bathing water, it is necessary to identify anthropogenic pressures and assess their impact on water quality. To meet this goal, local ABAs need to consider the areas where a bathing location is actually created and then cooperate with local DSPs.

With regard to the establishment of fast and adequate management agents in the event of short-term pollution (PTS) and abnormal situations, it is necessary that ANPM - ABA together with the territorial DSPs develop / re-evaluate the profiles of the surface water on which they are located natural bathing areas (arranged and not arranged) according to the HG no. 546/2008 (Annex 3) and the Water Law no. 107/1996, with subsequent amendments and completions.

As far as the bathing water quality evolution is concerned, from 2007 to 2017, it is presented in EEA's "BWD Report For the Bathing Season 2017 Romania" - figure no. *II.11*.

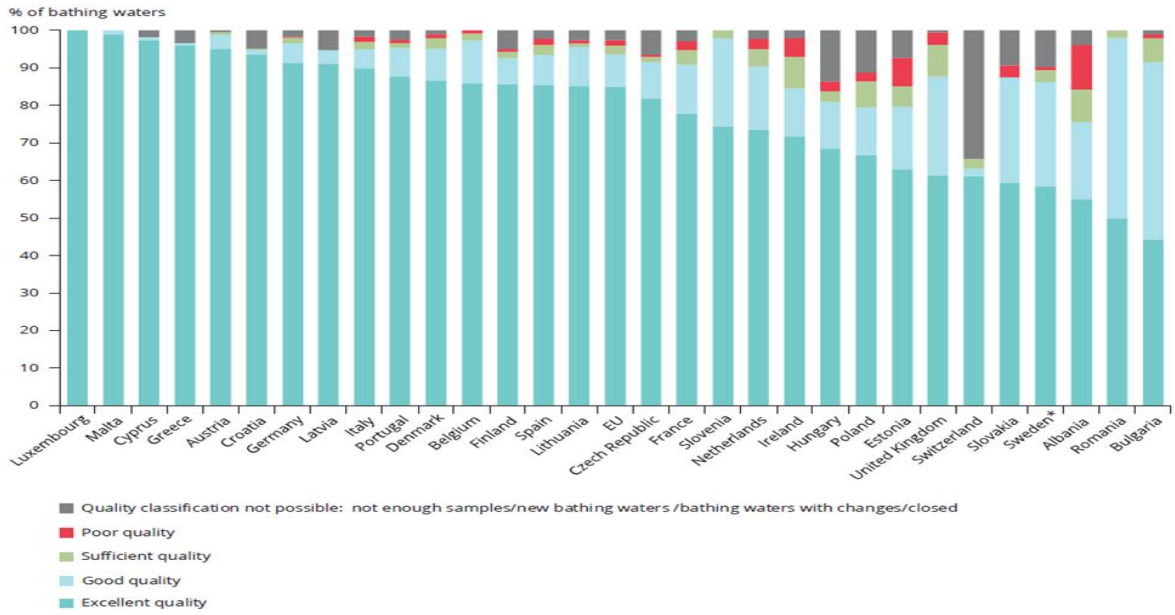
Figure no. II.11. The trend of bathing water quality in Romania for the period 2007-2017



Source: National Institute of Public Health

Although in Romania, for the period 2007-2016, there is an increasing trend of the percentage for excellent water quality bathing areas, in 2017 there is a decrease in the percentage. The quality of bathing water is predominantly consistent only with the values in the mandatory rules and not with the reference values to which it is intended. From the annual reports of the Member States of the European Union it was found that Romania does not have bathing areas that are not in compliance with the 2017 classification.

Figure no. II.12. Results of bathing water quality in 2017 for 28 EU Member States, Albania and Switzerland (EEA source)



Source: WISE bathing water quality database (data from annual reports by EU Member States).
https://www.eea.europa.eu/publications/european-bathing-water-quality-in-2017

Consideration should be given to the objective of continually improving surface water quality, as EC waterbath specialists / colleagues want to eliminate the "satisfactory" water quality in the near future (complying only with mandatory standards).

Source: Data provided by the National Institute of Public Health

II.2.2. DETERMINANT FACTORS AND PRESSURES AFFECTING WATER QUALITY STATUS

II.2.2.1. Significant pressures on water resources in Romania

RO 25	Indicator code Romania: RO 25 AEM indicator code: CSI 25

TITLE: GROSS BALANCE OF NUTRIENTS

DEFINITION: The indicator estimates the nitrogen surplus on agricultural land**.** This is done by calculating the balance between the total amount of nitrogen entering the agricultural system and the total amount of nitrogen exiting the agricultural system, per unit area of agricultural land. The indicator shows all inputs and outputs of nitrogen from agricultural land. Inputs consist of the amount of nitrogen applied by mineral and natural fertilizers, nitrogen fixed by plants and emissions into the air. Output nitrogen is contained in crops, grass and crops consumed by animals. Nitrogen emissions in the form of NO2 are difficult to estimate and are not taken into account.

The gross balance of nutrients provides an indication of the risk of pollution of bodies of surface water and groundwater as a result of leakage of surplus nutrients from agricultural areas.

According to the Water Framework Directive 2000/60 / EC, basin / river basin management plans have been considered as significant pressures that result in the failure to meet environmental objectives for the body of water. Depending on how the water body system is operating, you can know if a pressure can cause an impact.

This approach, correlated with the list of all pressures and the particular characteristics of the receiving basin, leads to the identification of significant pressures.

An alternative is that conceptual understanding must be synthesized in a simple set of rules that directly indicate whether a pressure is significant. An approach of this type is to compare the magnitude of the pressure with a relevant criterion or limit value for the body of water. In this respect, the European Directives present the limits over which pressures can be called significant and the substances and groups of substances which need to be considered. Establishing significant pressures lies at the heart of further identifying the link between all categories of pressure - objectives - measures. Consideration was given to pressure and impact analysis based on the use of the DPSIR concept (Driver - Pressure - State - Impact - Response - Anthropic activity- Pressure- State- Impact- Response).

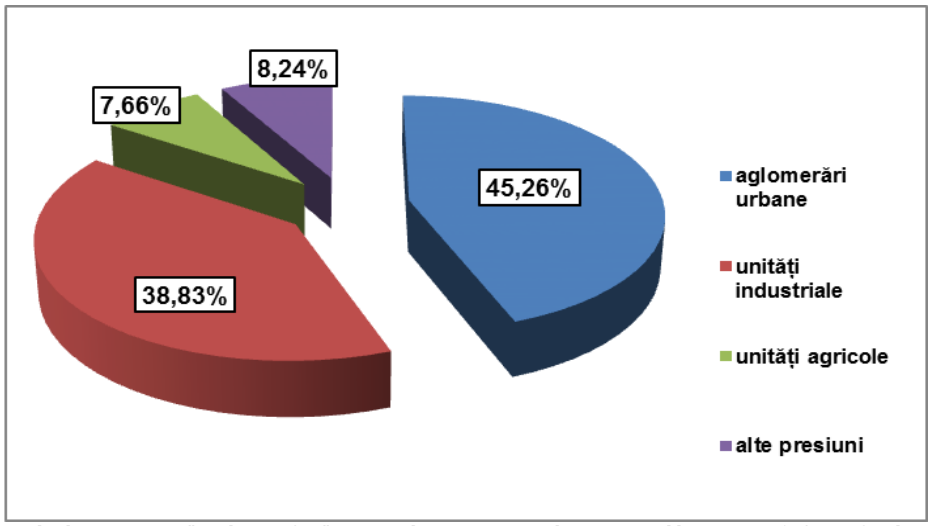
Applying the set of criteria has led to the identification of significant point pressures, taking into account the discharges of treated or unpurified waters into surface water resources:

- ***human agglomerations*** *(*identified in accordance with the requirements of the Urban Waste Water Treatment Directive - Directive 91/271 / EEC) with more than 2000 equivalent inhabitants (I.e.) with wastewater collection systems with or without sewage treatment plants and discharging into water resources; also the agglomerations <2000 l. are considered significant point sources if they have a centralized sewerage system; also are considered significant sources of pollution, human agglomerations with unitary sewerage systems that do not have the capacity to collect and purify the mixture of wastewater and rainwater during periods of intense rainfall;

- ***industry:***
  - installation covered by the Industrial Emissions Inventory Directive 2010/75 / EEC (IED Directive), including those units that are listed in the Emission and Transfer Pollutant Register (E-PRTR), which are relevant to the environmental factor;
  - establishments evacuating dangerous substances (List I and II) and / or priority substances beyond the limits of the legislation in force (in accordance with the requirements of Directive 2006/11 / EC replacing Directive 76/464 / EEC on pollution caused by dangerous substances discharged into the environment aquatic environment of the Community;
  - other units that evacuate in water resources and do not comply with the applicable water environment factor.
- ***agriculture:***
  - livestock farms covered by the Industrial Emissions Directive 2010/75 / EEC (IED Directive) - including establishments that are listed in the E-PRTR that are relevant to the environmental factor;
  - farms evacuating hazardous substances (List I and II) and / or priority substances beyond the limits of the legislation in force (in accordance with the requirements of Directive 2006/11 / EC replacing Directive 76/464 / EEC on pollution caused by dangerous substances discharged into the environment aquatic environment of the Community:
  - other agricultural units with punctual discharges and which do not comply with the applicable water environment factor.

In the National River Basin Management Plan of Romania, updated and approved by H.G. no. 859/2016, a total of 2970 water users using surface water resources as a receiver of discharged water were inventoried nationwide, of which, taking into account the criteria mentioned above, a **total of 1409 sources potentially significant points (626 urban, 563 industrial, 106 agricultural and 114 other pressures such as forestry, aquaculture, etc.).**

Figure no. II.13. Share of potentially significant point pressures



Source of data: National Administration "Apele Române", National Management Plan approved by GD no. 859/2016 for the approval of the updated National Management Plan for the portion of the Danube river basin which is included in the territory of Romania

It is noted that the greatest percentage of the point pressures are represented by human agglomerations, with approx. 45%, respectively waste water discharged from urban agglomeration collection and treatment systems.

Concerning diffuse sources of significant pollution, identified by the use of the land, it can be mentioned:

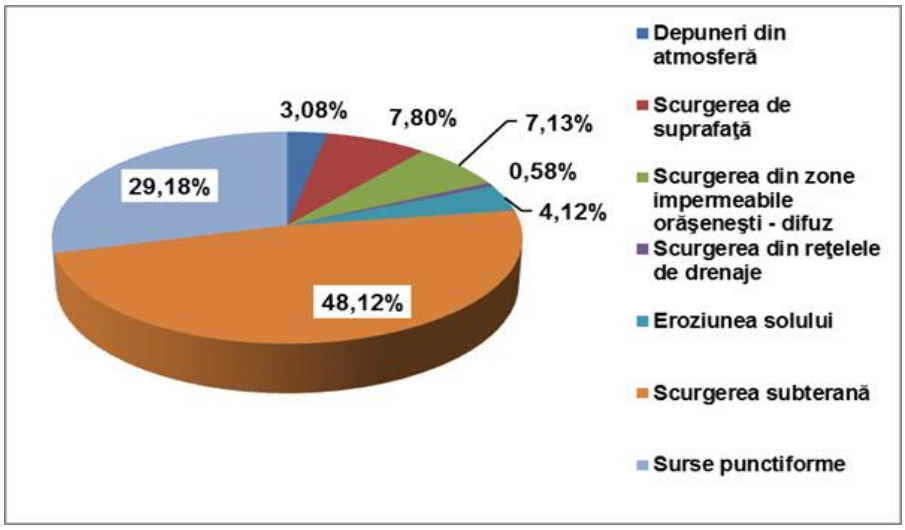
- human agglomerations / localities that do not have wastewater collection systems or adequate sludge collection and disposal systems in sewage treatment plants as well as localities with non-compliant household waste dumps;
- agro -livestock farms that do not have adequate manure storage / utilization systems, localities identified as vulnerable to nitrate pollution from agricultural sources, pesticide units that do not comply with current legislation, other agricultural units / activities that can lead to significant diffuse emissions;
- deposits of raw materials, finished products, auxiliary products, non-compliant waste storage, units producing diffuse accidental pollution, abandoned industrial sites.

Diffuse pressures from agricultural activities are difficult to quantify. However, the amounts of pollutants emitted from diffuse pollution sources can be estimated by applying mathematical models. For example, the Modelling Nutrient Emissions in River Systems (MONERIS) model, which allows estimating nutrient emissions (nitrogen and phosphorus) taking into account six ways of producing diffuse pollution: surface leakage, drainage, underground drainage, leakage urban impermeable areas, atmospheric deposits and soil erosion.

The MONERIS model applies to the development of each management plan, the latest information being available at the 2012 level. It is specified that these data have been updated for the second management plan with values in 2012, based on the completion of the MONERIS model at national level (within the Danube International District) and at the level of international sub-basins (Tisa).

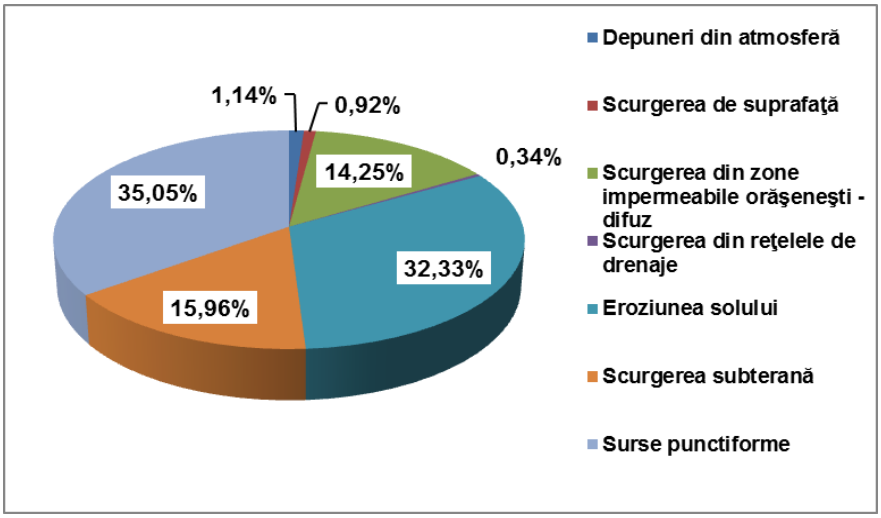
In figures no. II.14 and II.15 it is shown the contribution of the diffuse nitrogen and phosphorus pollution modes for 2012, taking into account the ways presented above.

Figure no. II.14. Modes (pathways) for the production of diffuse nitrogen pollution



Data source: National Administration "Romanian Waters", National Management Plan approved by H.G. no. 859/2016 for the approval of the updated National Management Plan for the portion of the Danube river basin which is included in the territory of Romania

Figure no. II.15. Modes (pathways) for producing diffuse pollution with phosphorus



Data source: National Administration "Romanian Waters", National Management Plan approved by H.G. no. 859/2016 for the approval of the updated National Management Plan for the portion of the Danube river basin which is included in the territory of Romania

The MONERIS model also quantifies the contribution of different sources of pollution to total nutrient emission. Thus, for diffuse sources of pollution, these categories of sources are represented by agriculture, localities (human settlements), other sources (e.g. atmospheric nitrogen oxides deposition) as well as natural resources. It should be emphasized that the MONERIS model takes into account all sources of pollution, not only those identified as significant.

Table no II.13 presents the emissions of nitrogen and phosphorus from diffuse sources of pollution, taking into account the contribution of each category of sources of pollution; about 22% of the amount of nitrogen emitted by diffuse sources is due to agricultural activities and about 19% of total diffuse phosphorus emission is due to human settlements / agglomerations.

Table II.13. Emissions of nitrogen and phosphorus from different diffuse sources for 2012

Diffuse pollution sources	Nitrogen emissions		Emissions of phosphorus	
	tone	%	tone	%
Agriculture	16295	22,47	2.943,097	55,18
Human agglomerations	5035	6,94	1.014,474	19,02
Other sources	37148	51,21	566,124	10,61
Natural background	14056	19,38	810,124	15,19
Total diffuse sources	72.533	100	5.334	100
Specific average diffusion on the total area	3,05 kg N/ha		0,22 kg P/ha	
Specific average diffuse emissions from agriculture on agricultural land	1,18 kg N/ha		0,21 kg P/ha	

Data source: National Administration "Romanian Waters", National Management Plan approved by H.G. no. 859/2016 for the approval of the updated National Management Plan for the portion of the Danube river basin which is included in the territory of Romania

Diffuse pollution contributes a total of 5431 potentially significant diffuse pressures to water bodies that do not achieve environmental objectives, of which:

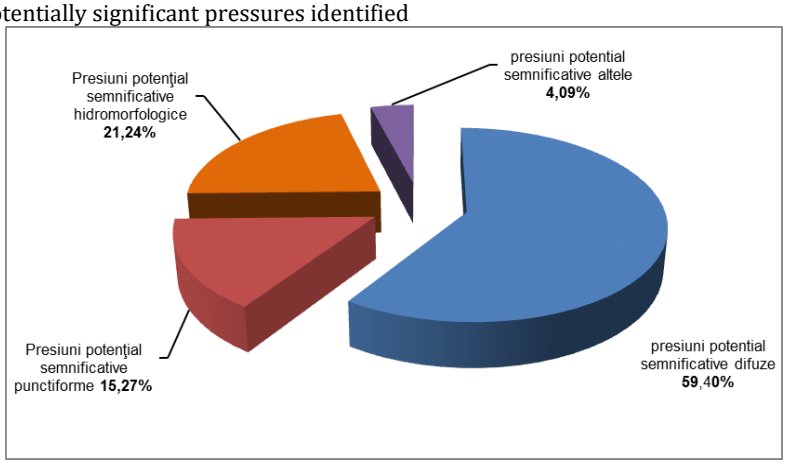
- 1298 agglomerations of more than 2000 l. which are not equipped with waste water collection systems (including agglomerations where for 75 collecting / purification systems there are phenomena of rainwater overflows in rainy weather);
- 3.678 agglomerations of less than 2000 l. without collection systems;
- 263 significant diffuse agricultural pressures;
- 61 industrial units and
- 57 others (fishing activities, etc.).

Following the application of the process of validation of potentially significant diffuse pressures - agricultural activities with the achievement of environmental objectives (ecological status / potential and chemical status of water bodies), 2048 significant diffuse pressures were identified (1776 urban, 263 agricultural, 9 industrial).

Another significant category of significant pressures is related to significant hydro morphological pressures. Changes in the hydro morphological characteristics of watercourses (changes in natural courses, changes in the hydrological regime, deterioration of aquatic biodiversity, etc.) cause an impact on the aquatic environment, which may contribute to the lack of environmental objectives of water bodies.

Figure II.16 shows the type and weight of the 8800 potentially significant total pressures. The greatest share of potentially significant pressures is represented by diffuse pressures - human agglomerations without collection and farming systems, as well as by the hydro morphological pressures

Figure no. II.16. Share of potentially significant pressures identified



Data source: National Administration "Romanian Waters", National Management Plan approved by H.G. no. 859/2016 for the approval of the updated National Management Plan for the portion of the Danube river basin which is included in the territory of Romania

In 2017 there were 70 accidental pollutions of the surface water courses, mainly on the inland rivers: 19 with oil and other hydrocarbons, 28 with unpurified waste water, two pollution with mine waters, 6 pollution with oxygenation conditions low, 4 with unidentified substances, 5 with other substances and 6 with semi-solid waste. The phenomena had a local / basinal impact, and due to the reduced duration, the nature of the pollutant, the length of the affected section and the inertia of the communities in the aquatic biocenosis structure, the effects of the phenomena in question were reduced only to the local change in the values of the physicochemical indicators, without causing them a significant change in aquatic biodiversity in the long run. The production of accidental pollution is mainly due to the negligence shown by some economic operators during the technological processes or the non-observance of the legal provisions regarding the discharge of waste water into the water resources.

With regard to the type and magnitude of the anthropogenic pressures that can affect the bodies of groundwater (according to the Framework Directive 2000/60 / EC - Annex II - 2.1), it is envisaged:

- sources of point and diffuse pollution:

- pollution sources due to human agglomerations without wastewater collection and treatment systems (domestic, industrial, agricultural, etc.) or without proper waste collection systems;
- diffuse pollution sources caused by agricultural activities (agro-technical farms that do not have adequate manure storage systems, etc.) and industrial activities through non-compliant landfills (industrial, domestic, construction, etc.);
-other potentially polluting anthropogenic activities.

From the point of view of the impact on the quantitative status of groundwater bodies, quantitative pressures are considered significant water abstractions, which may exceed the natural rate of recharge of the aquifer.

- water sampling and recharging of underground water bodies:

According to the provisions of the WFD, Annex II - 2.3, the criteria for the selection of water abstraction are considered those considering water samplings> 10 m3 / day. In Romania, underground water is generally used for water supply to the population, but also for industrial, agricultural purpose, etc.

The recharge of aquifers in Romania is achieved by infiltration of surface and meteoric waters.

With regard to the sampling / recharging balance, which leads to quantitative assessment of the body of groundwater, no special problems are reported, the sampling being lower than the natural refuelling rate.

In the first National Management Plan, 19 underground water bodies were identified which did not achieve good chemical status due to the following parameters: nitrogen and ammonium, for which exceptions were set to achieve targets by 2027. Due to the measures taken in the first implementation cycle and following the current assessment of the chemical status, 128 underground water bodies are in good chemical status and 15 are in poor chemical status.

II.2.2.2. Waste water and sewerage networks

RO 24	Indicator code Romania: RO 24 AEM indicator code: CSI 24

TITLE: PURGING URBAN WASTE WATER

DEFINIȚIE: The indicator quantifies the population's level of connection to wastewater collection and purging systems. The indicator also illustrates the efficiency of national wastewater purging programs, the effectiveness of policies to reduce nutrient and organic waste discharges and the state of implementation of the Directive 91/271 / EEC and 98/15 / EC on wastewater purging requirements at national level.

Justification for selecting the indicator

Domestic and industrial wastewater exerts significant pressure on the aquatic environment due to organic material, nutrients and hazardous substances. Considering the high percentage of the population living in urban agglomerations, a significant part of the wastewater is collected through sewage systems and transported to sewage treatment plants.

Pre-evacuation treatment level and status of receiving waters determine the impact intensity on aquatic ecosystems.

The provisions of Directive 91/271 / EEC on Urban Wastewater Treatment, as amended and supplemented by Commission Directive 98/15 / EC of 27 February 1998 and the types of sewage treatment processes applied, are considered to be representative for removal level of pollutants from water also for the potential improvement of the aquatic environment.
Primary (mechanical) purification removes part of suspended solids (about 40-70%), while secondary (biological) purification uses aerobic and / or anaerobic microorganisms to decompose a large proportion of organic substances (approx. 50-80%), remove ammonium (about 75%) and retain some nutrients (about 20-30%). Tertiary (advanced) purification effectively removes organic matter, phosphorus compounds and nitrogen compounds.
The indicator records the progress of policies implemented to reduce the pollution of the aquatic environment caused by wastewater discharges. The indicator also describes trends and percentage of population connected to sewage treatment plants (primary, secondary and tertiary) urban wastewater.

Definition and description

The indicator quantifies the population's level of connection to wastewater collection and treatment systems. It also illustrates the effectiveness of national waste water treatment programs, the effectiveness of existing policies to reduce nutrient and organic waste discharges and the state of implementation of the requirements of the Waste Water Treatment Directives (91/271 / EEC and 98/15 / EC) national level.
The data sets underlying this indicator's estimation are as follows: National population connected to urban wastewater treatment plants; the volume of industrial and domestic waste water and the quantities of pollutants generated; the volume of industrial and domestic waste water and the amounts of pollutants collected in sewer systems; the volume of waste water and the amounts of pollutants discharged into the natural receptors without purification; the volume of waste water to be treated and the amounts of pollutants present in effluent effluents; municipal and industrial wastewater treatment plants; the volume of sludge resulting from the types of processing; ș.a.
Similar or identical indicators are provided by the following international organizations:

- Eurostat ETE: *Population connected to urban waste water treatment plants*;
- EU TEPI WP-5: *Purified water - collected water*;
- ESS SDI: *Population connected to wastewater treatment systems*;
- OECD KEI: *Degree of connection to sewage treatment plants*;
- OECD CEI: *Population connected to sewage treatment plants*;
- CSD 1996: *Sewage treatment*;
- WHOEH: *Coverage of wastewater treatment*.

In fact, regardless of the way of expression adopted, international organizations refer to indicators that quantify the level of connection of the population to wastewater collection and treatment systems.

Context of Relevant Environmental Policies and Targets / Objectives

As a member of the European Union, Romania is obliged to improve the quality of its environmental factors and to meet the requirements of the European AcquisTo this end, Romania has adopted a series of Action Plans and Programs at both national and local level, all in line with Romania's Accession Treaty, Chapter 22, the most important being: the National Development Plan, National Reference Framework for the 2007-2013 programming period, National Implementation Plan of Directive 91/271 / EEC on Urban Wastewater Treatment, amended by Directive 98/15 / EC and the Sectoral Operational Program Environment. Environmental Protection Plans have also been developed at the regional level, and at the local level all economic agents have been obliged to develop and implement compliance plans.
The Wastewater Treatment Directives (91/271 / EEC and 98/15 / EC) aim to protect the environment against adverse effects of urban waste water discharges and provide standards / treatment levels to be achieved before discharging such waters into the receivers. In this respect, the directives require Member States to ensure:

- Secondary collection and treatment systems for all agglomerations with more than 2000 equivalent inhabitants (I.e.) with direct discharges into water resources;

- Collection and tertiary treatment systems for all agglomerations with more than 10000 l.E. which have evacuation in the water resources considered sensitive areas;
- For for large agglomerations with more than 150000 l.E., treatment systems more advanced than the secondary stage when evacuated to sensitive areas, and at least secondary treatment stages when discharged into "normal" water resources".

Taking into account both the positioning of Romania in the Danube river basin and the Black Sea Basin, and the need to protect the environment in these areas, Romania declared its entire territory as a sensitive area. This decision is reflected in the fact that all agglomerations with more than 10000 equivalent inhabitants have to provide an urban waste water treatment infrastructure to allow advanced treatment, especially with regard to nutrients (total nitrogen and total phosphorus). As for secondary treatment (biological step), its application is a general rule for agglomerations of less than 10,000 equivalent inhabitants.
The reduction of pollution generated by various point and diffuse sources (mainly urban, industrial and agricultural) resulting from the implementation of the Urban Waste Water Treatment Directives and the IPPC / IED Directive must be considered an integral part of the programs of measures to achieve the environmental objectives Water Framework Directive 2000/60 / EC, which aims to achieve good chemical and ecological status by 2015 for all bodies of water.
The Waste Water Treatment Directives have been fully transposed into Romanian legislation by H.G. no. 352/2005 regarding the modification and completion of H.G. no. 188/2002 approving some norms regarding the discharge conditions in the aquatic environment of the waste waters. Thus, the requirements of compliance with the negotiated transition periods for the collection and treatment systems assumed by Romania through the Accession Treaty, Chapter 22 - Environment, Water quality, as well as the sensitive area status for the whole territory of the Romania. H.G. no. 352/2005 includes three technical norms concerning the collection, treatment and disposal of urban waste water (NTPA 011), wastewater discharge conditions in localities and directly in treatment plants (NTPA 002) and pollutant loading limits of industrial and urban waste water to evacuate to natural receptors (NTPA 001).

Short - term strategic objectives - Horizon 2015
Improvement of waste water infrastructure by providing sewage and treatment services in most urban areas by 2015 and setting up regional structures for efficient wastewater management.
Given the state of the existing water management infrastructure in accordance with the Accession Treaty, Romania has achieved transition periods for complying with the acquis for the collection, discharging and treatment of municipal wastewater by 2015 for 263 agglomerations of more than 10000 l. and by 2018 for 2346 agglomerations between 2000 l. and 10,000 l.e.
The proposed targets under Directives 91/271 / EEC, 98/15 / EC and 2000/60 / EC are:

- Increasing the degree of connection of human agglomerations by more than 2000 l.e. to sewerage systems by extending sewerage networks from 69.1% of equivalent inhabitants connected in 2013 to 80.2% in 2015 and 100% in 2018;
- Increasing the degree of connection of human agglomerations by more than 2,000 l.E. to sewage systems by building new waste water treatment plants and by rehabilitating and upgrading existing ones to achieve a 60.6% e.e. in 2013, 76.7% l.e. in 2015 and 100% l.e. in 2018.

Taking into account the provisions of the Water Framework Directive 2000/60 / EC, which also refers to agglomerations as significant sources of pollution, the implementation of the measures related to Directives 91/271 / EEC and 98/15 / EC and of additional measures other than those required by them, contribute to achieving ecological status / environmental potential and chemical status of water bodies by 2015. If these measures are not technically feasible, they are disproportionate in terms of costs or the agglomerations have a transition period negotiated after 2015, derogations from reaching the status / potential of water bodies until 2021.
Also, one of the objectives of the 2007-2013 Operational Program Environment is to increase the volume of waste water treated to 60% in 2015.

***Medium-term strategic objectives - Horizon 2020*:**

According to the objectives of the Treaty of Accession to the European Union, agglomerations with more than 2,000 inhabitants will comply with the requirements of Directives 91/271 / EEC and 98/15 / EC in 100% since 2018. The process of improving services sewage and wastewater treatment will continue in small rural agglomerations.

Key and specific aspects related to environmental policy:

How effective are existing policies to reduce the quantities of nutrients and spilled organic substances (discharged)?

Protection of human health and waste water treatment are the main challenges for a healthy environment in both urban and rural areas.

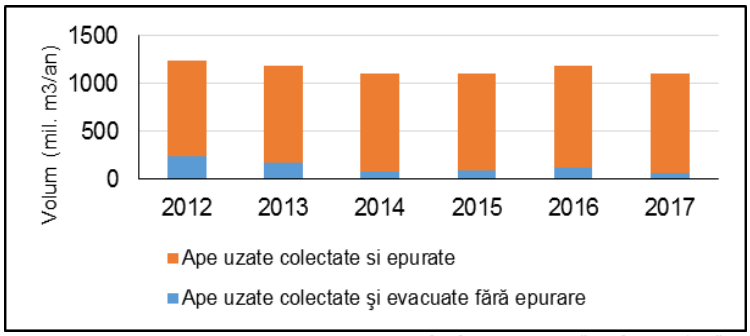
Uncontrolled wastewater spills create a danger to both the health of the population and the environment. Vulnerable groups (children and elders) among the population are particularly affected by waterborne diseases, but adults also suffer later, which can greatly influence the economic development of the region. The surface water quality is directly influenced by wastewater discharges, unpainted or insufficiently treated, from point sources, urban, industrial and agricultural sources. The impact of these sources of pollution on natural receptors depends on the flow of water and its loading with pollutants. The statistics compiled and presented annually in the "Water quality synthesis in Romania" prove that the biggest impact is the waste water from the urban agglomerations. In 2017, the polluted wastewater use followed a decreasing trend, with urban waste water discharges continuing to have the greatest impact on the quality of surface water, particularly with regard to organic pollution (75.26% CBO5 and 74.41% CCO-Cr) and nutrients (95.75% total nitrogen and 96.70% total phosphorus).

Table no. II.14. Total volume of urban wastewater discharged into natural receptors during 2007-2017

Year	Volume of urban wastewater discharged into natural receptors (mil.m3 / year)				
	Total	No need for purification	Sufficiently purified	Insufficiently purified	Not purified
2007	1361,351	7,348	257,066	564,250	532,687
2008	1319,290	12,698	293,780	487,756	525,054
2009	1296,890	8,609	300,991	458,340	528,950
2010	1302,577	3,525	457,332	304,880	536,840
2011	1325.570	0,650	342,930	445,830	536,180
2012	1248,129	1,483	524,769	484,921	236,956
2013	1194,423	3,024	744,003	275,164	172,232
2014	1115,475	3,144	605,266	426,280	80,785
2015	1111,187	0,486	757,153	260,196	93,352
2016	1182,080	0,471	431,128	630,170	120,310
2017	1111,128	0,479	496,515	545,421	68,711

Source: National Administration "Apele Române", Water Quality Synthesis in Romania

Figure no. II.17. Evolution of collection and purification of urban wastewater volumes discharged into natural receptors during 2012-2017



Source: National Administration "Apele Române", Water Quality Synthesis in Romania

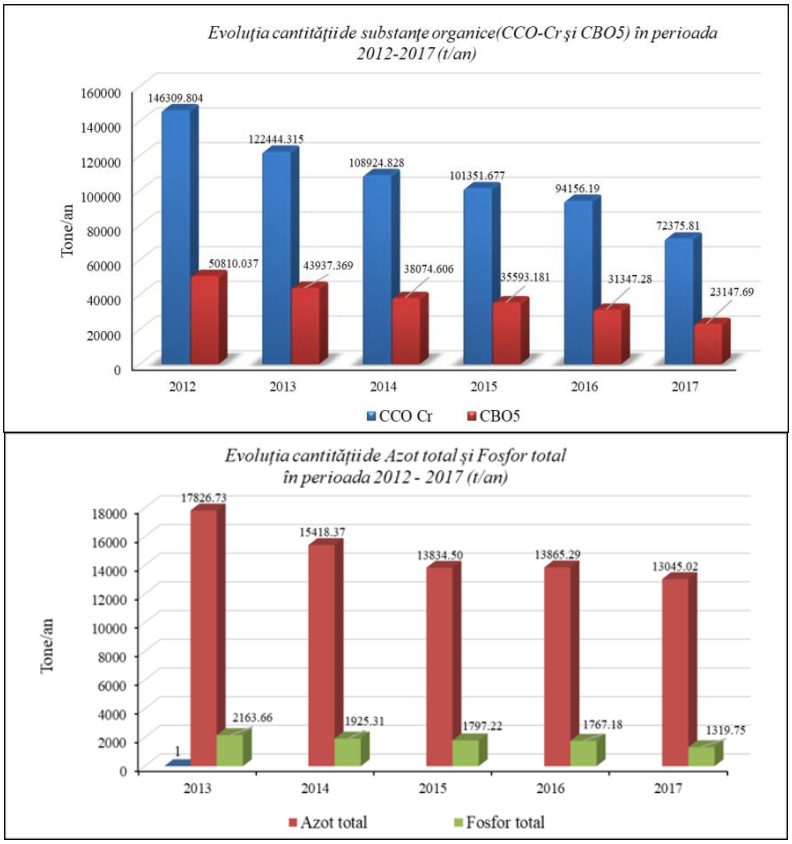
Table no. II.15. Pollutant loading of effluents discharged from human agglomerations into natural receptors during 2007-2017

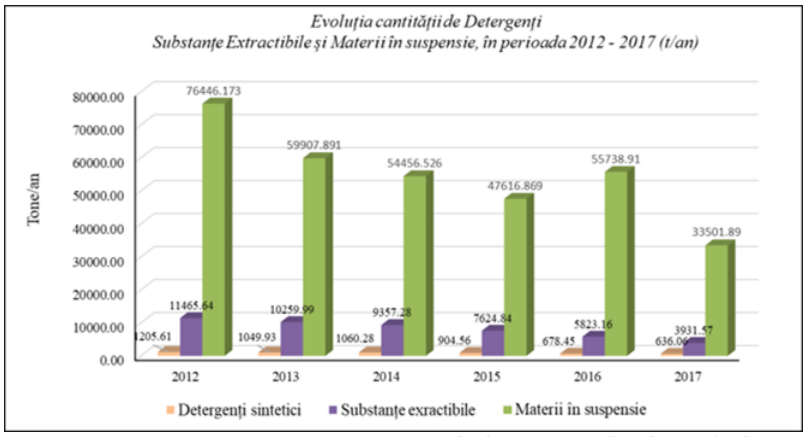
Pollutant	Amount of pollutants (tonnes / year)					
	2007	2008	2009	2010	2011	2012
CBO_5	128067,22	116776,59	118991,57	105535,69	100463,75	50810,03
CCO Cr	390282,24	356216,55	349636,03	308232,09	264896,67	146309,80
Total nitrogen	28991,17	27195,58	28520,30	28712,32	21787,77	19712,16
Total phosphorus	5691,97	4449,46	3729,61	3634.,97	3820,40	2613,18
Matters in suspention	336936,66	283430,35	266218,51	326020,49	232891,39	76446,17
Synthetic detergents	8126,14	1839,98	4639,24	2290,03	1946,26	1205,61
Extractable substances	28478,83	24090,57	30362,57	28819,89	27283,00	11465,63

Pollutant	Amount of pollutants (tonnes / year)				
	2013	2014	2015	2016	2017
CBO_5	43937.36	38074.60	35593,18	31347.28	23147.69
CCO-Cr	122444.31	108924.82	101351,67	94156.19	72375.81
Total nitrogen	17826.73	15418.36	13834,49	13865.29	13045.02
Total phosphorus	2163.65	1925.31	1797,22	1767.18	1319.76
Matters in suspention	59907,89	54456.52	47616,87	55738.90	33501.89
Synthetic detergents	1049.92	1060.28	904,56	678.45	636.07
Extractable substances	10259.99	9357.28	7624,83	5823.16	3931.57

Source: National Administration "Apele Române", Water Quality Synthesis in Romania

Figure no. II.18. Evolution of Pollutant Loading of Wastewater Discharged into Water Resources in the Period 2012-2017





Source: National Administration "Apele Române", Water Quality Synthesis in Romania

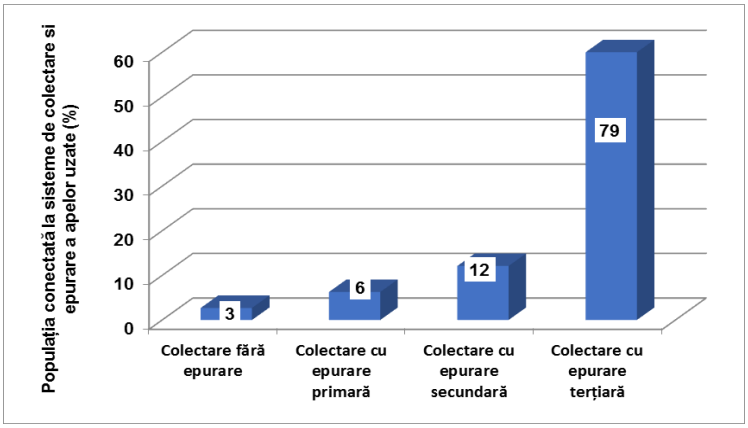
The progress of policies applied to reduce the pollution of the aquatic environment caused by waste water evacuation can be highlighted by the tendencies and the percentage of the population connected to the wastewater treatment plants (primary, secondary and tertiary) of urban waste water.

According to the latest data of the National Institute of Statistics, 9,702,739 inhabitants had dwellings connected to the sewage systems, which represent 49.1% of Romania's population. Regarding the treatment of waste water, the population with dwellings connected to the sewerage systems provided with sewage treatment plants was 9,415,524 persons, representing 47.7% of the country's population.

Also, the degree of connection of the population to wastewater collection and treatment systems differentiated by treatment levels is presented in Figure II.19.

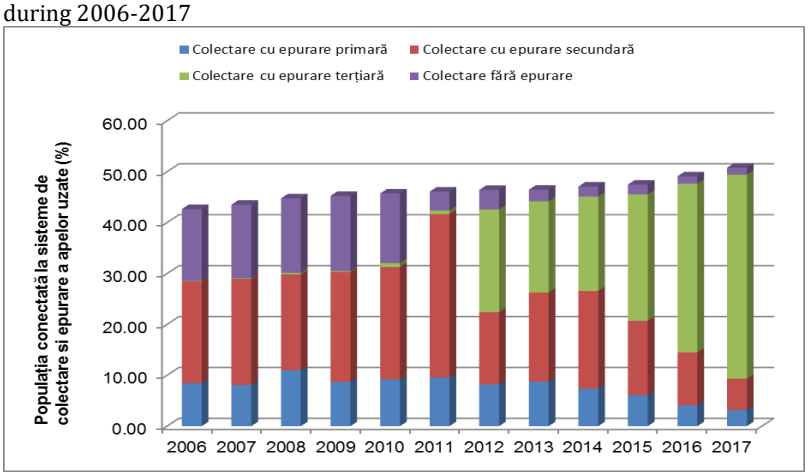
The evolution of the population's degree of connection to waste water collection and treatment systems according to the type of sewage treatment (Figure II.20) shows a steady increase in the number of the population benefiting from sewage services as a consequence of the extension and infrastructure. It is noted that the proportion of tertiary treatment collection systems has increased especially lately. Primary (mechanical) purification removes part of suspended solids (about 40-70%), while secondary (biological) scrubbing uses aerobic and / or anaerobic microorganisms to decompose a large proportion of organic substances (approx. 50-80%), remove ammonium (about 75%) and retain some of the nutrients (about 20-30%). Tertiary (advanced) purification effectively removes organic matter, phosphorus compounds and nitrogen compounds.

Figure no. II.19. The degree of connection of population to wastewater collection and treatment systems in 2017



Source: National Institute of Statistics, www.insse.ro

Figure no. II.20. The degree of connection of the population to sewage collection and treatment systems, depending on the type of sewage treatment applied during 2006-2017



Source: National Institute of Statistics, www.insse.ro

In 2017 in Romania, 1904 agglomerations of more than 2,000 inhabitants were identified, of which 1119 agglomerations were equipped with sewage systems and only 31 of them complied with the requirements of Directive 91/271 / EEC. According to the Implementation Plan of Directive 91/271 / EC on Urban Wastewater Treatment, as amended by Directive 98/15 / EC, at the end of the implementation period (31 December 2018) the planned situation for compliance of agglomerations is presented in Table no. II.16.

Table no. II.16. Predicted situation of human agglomerations at the compliance deadline

Size of agglomerations (l.e.)	Number of agglomerations	% of the total number of agglomerations	Total load (l.e.)	% of total l.e.
> 150000	22	0,85	9562512	35,7
15000 - 150000	131	5,02	5686925	21,2
10000 – 15000	111	4,26	1349507	5,1
2000-10000	2341	89,87	10177236	38,0
Total	**2 605**	**100**	**26 776 180**	**100**

Source: The Romanian Waters Administration, Brochure for the Public on the Situation in Romania of Urban Wastewater and Sludge from the WWTPs 2012 and the report "The stage of the implementation of the urban wastewater treatment and execution capacities and put into operation for human agglomerations"

Conformance terms for connecting human agglomerations to water collection systems used are shown in table no. II.17.

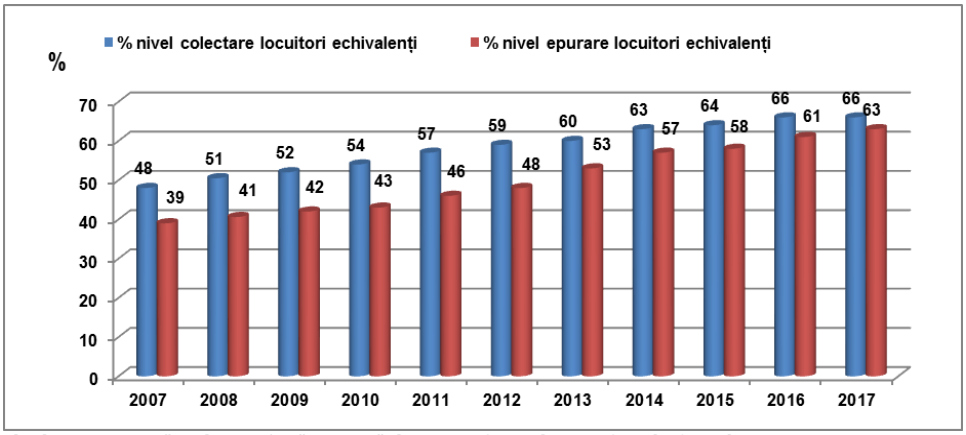
Table no. II.17. The foreseeable situation for sewerage systems by the end of the implementation period of the Directive

Year	Surface water		Coastal waters		Total	
	No. of agglomerations	Total l.e.	No. of agglomerations	Total l.e.	No. of agglomerations	Total l.e.
2010	359	15437048	8	826211	367	16263259
2013	196	2181777	1	32390	197	2214167
2015	497	2993491	1	4828	498	2998319
2018	1542	5296926	1	3509	1543	5300435
Total	**2594**	**25909242**	**11**	**866938**	**2605**	**26776180**

Source: The Romanian Waters Administration, Brochure for the Public on the Situation in Romania of Urban Waste Water and Sludge from the WWTPs 2012 and the Report on the "Stage of Implementation of Urban Waste Water Treatment and Execution Capacities and Operations for Human Agglomerations 2011"

According to the report made by the National Administration "Apele Române", in the agglomerations with 2000-10,000 l.e, the degree of connection to the collection system registered an increase of approx. 18.5% at the end of 2017 as compared to 2007. As regards the degree of connection to the urban waste water treatment plants, it increased by approx. 24% between 2007 and 2017.

Figure no. II.21. Evolution of the degree of collection and treatment (%) of biodegradable organic (I.e.) water waste at national level



Source: National Administration "Apele Române", report "The state of completion of works for urban waste water treatment and the capacities in execution and put into operation for human agglomerations"

Compliance terms for the connection of human agglomerations to waste water treatment systems are presented in table no. II.18. According to the report made by the National Administration "Apele Române", in agglomerations with 2000-10000 l.e. the degree of connection to urban waste water treatment plants increased from 39.5% in 2007 to 66.33% in 2017. In 2017, approximately 63.73% of the equivalent population of Romania is connected to the sewage treatment plants.

The targets to be achieved for the transition period - 2015 - are approx. 80.2% for wastewater collection and approx. 76.7% for sewage treatment, ensuring compliance of human agglomerations with more than 10,000 l.E. with regard to wastewater collection.

The targets to be achieved in Romania for the transition period, 2013, are approx. 69% for wastewater collection and approx. 61% for sewage treatment. **Considering the collection and purification levels achieved in 2017, which is more than 95% of the target value, it can be said that the indicator is "near target".**

As far as the targets for the transition period, 2015, is 80.2% for collection and 76.7% for treatment, they are made in a proportion of approx. 83%, reflecting the fact that the situation is still "far from target".

Table no. II.18. Romania's compliance deadlines with the requirements of Directive 91/271 / EEC on Urban Wastewater Treatment

Type of agglomeration	Number of agglomerations	Number of equivalent inhabitants	Degree of connection to treatment plants (%)	Agreed compliance deadline for agglomerations
2.000-10.000 l.e.	2.346	10.192.131	38,08	31.12.2018
10.000-150.000 l.e.	241	7.012.655	26,20	31.12.2015
> 150.000 l.e.	22	9.562.512	35,72	31.12.2015
Inventory Total	**2.609**	**26.767.398**	**100**	**31.12.2018**

Source: "Apele Române" National Administration, Brochure for the Public on the Situation of Urban Wastewater and Sludge from Wastewater Treatment Stations in Romania

According to the provisions of the Directive, the level of urban wastewater treatment is determined according to the polluted load of the raw waste water and the condition of the body of the receiving water. The performance of waste water treatment plants is assessed on the basis of five parameters: biochemical oxygen demand (CBO5), chemical oxygen demand (CCO-Cr), total suspended matter (MTS) and total nitrogen (NT) and total phosphorus (PT). According to the "Water Quality Synthesis in Romania" report, conducted by the National Administration „Apele Romane", of 2174 wastewater treatment plants investigated in 2014, 603 were urban waste water treatment plants, of which only 230 (38.14%) operated correspondingly, the waste water discharged according to the quality standards provided by the HG no. 352/2005 (the limits established by NTPA 001/2005).

As a member of the European Union, Romania is obliged to improve the quality of its environmental factors and to meet the requirements of the European Acquis. To this end, Romania has adopted a series of Action Plans and Programs at both national and local level, all in line with the Romania's Position Paper on the Accession Treaty, 22, the most important being the National Reform Program 2017, the National Development Plan, the Regional Development Plan, the National Strategic Reference Framework for the 2007-2013 programming period, the National Implementation Plan of Directive 91/271 / EEC on Water Treatment Urban Waste, amended by Directive 98/15/EC, National Rural Development Program 2007-2013 and 2014-2020, Sectoral Operational Program Environment 2007-2013, Large Infrastructure Operational Program 2014-2020 (POI 2014-2020). Environmental Protection Plans have also been developed at the regional level, and at the local level all economic agents have been obliged to develop and implement compliance plans.

Ways to present the indicator

The implementation of the requirements of the Urban Waste Water Treatment Directives will also implicitly lead to a significant increase in the volume of sludge from urban waste water treatment plants.

From the situation provided by the National Institute of Statistics on the management of sludge from the urban wastewater treatment plants in the year 2016 (Table II.19) it can be noticed that from the total amount of sludge generated in the treatment plants approx. 16.51% was used in agriculture.

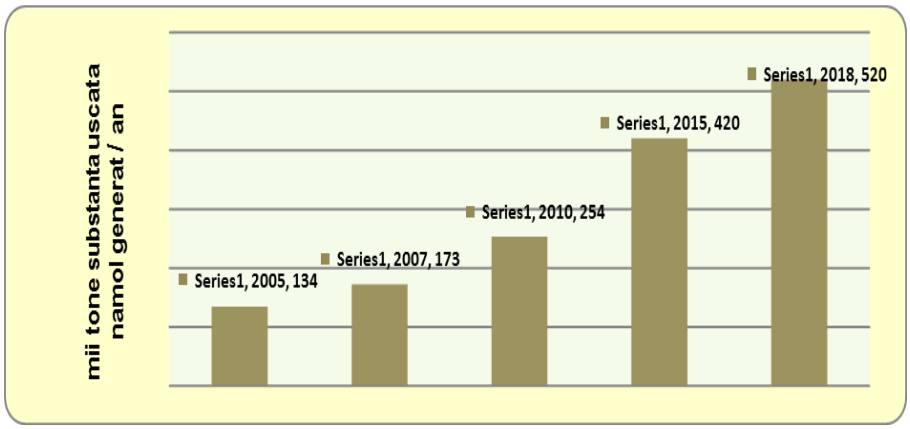
Table no. II.19. National use of sludge from urban waste water treatment plants in 2016

Uses of sludge	Amount of sludge (million tonnes s.u./an)
Total amount produced	**169,36**
Total quantity removed, out of which:	**169,36**
Use in agriculture	16,51
Composting and other applications	0
Storage on arranged platforms	107,96
Exit in the sea	0
Incineration	0,39
Others	44,5

Data source: National Institute of Statistics, TEMPO online database, www.insse.ro

According to the first National River Basin Management Plan (developed in 2009), it was estimated that at the end of the compliance period (2018) an amount of sludge of approx. 520850 tonnes dry substance / year over approx. 172529 tonnes dry substance / year obtained in 2007.

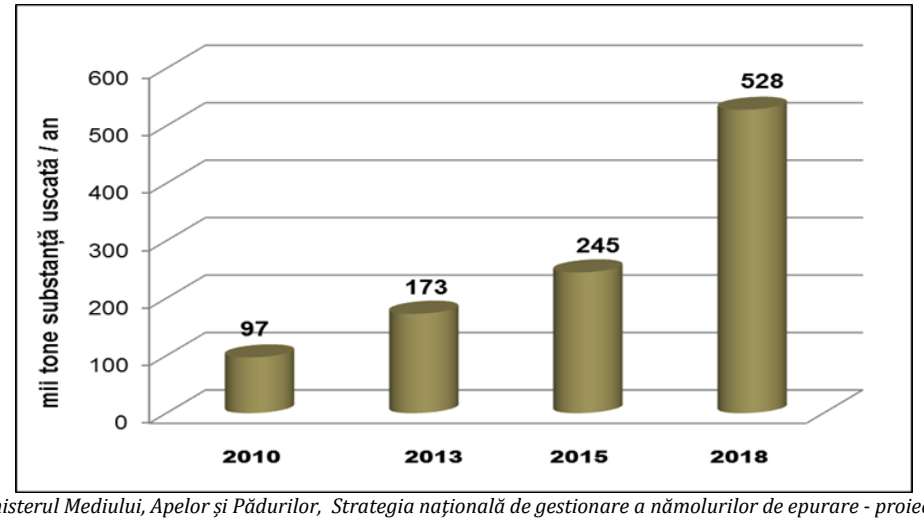
Figure no. II.22. Evolution of sludge generated by sewage treatment plants in Romania



Source: Administrația Națională "Apele Române", Planul Național de Management al bazinelor/spațiilor hidrografice din România aprobat prin HG nr. 80/2011) 4

The National Sewage Sludge Management Strategy, developed within a European project and currently under approval, provides a framework for planning and implementing measures to manage the growing sludge volumes from existing, rehabilitated urban wastewater treatment plants, rehabilitated and new from Romania. The expected future quantities of sludge produced were evaluated according to figure no. II.23.

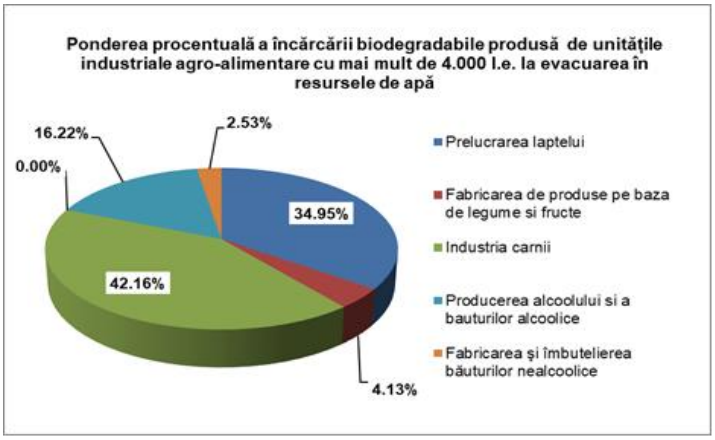
Figure no. II.23. The expected future amounts of sludge produced



Source: Ministerul Mediului, Apelor și Pădurilor, Strategia națională de gestionare a nămolurilor de epurare - proiect POSM/6/AT/I.1.2010, "Elaborarea politicii naționale de gestionare a nămolului de epurare"

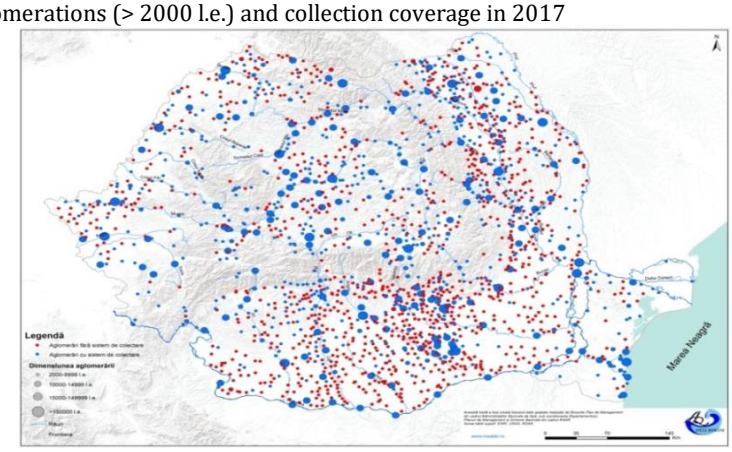
Directive 91/271 / EEC on Urban Waste Water Treatment also addresses sewage from the agro-food industry (meat, beverages, dairy, etc.) with a biologic biodegradable load of more than 4000 l. In this respect, provisions apply to companies in the agri-food industry that directly discharges waste water into surface water. They are required to clean the wastewater prior to evacuation to natural emissaries.

Figure no. II.24. Percentage share of biodegradable load produced by agrifood industrial units by more than 4000 l.E. to evacuation to water resources



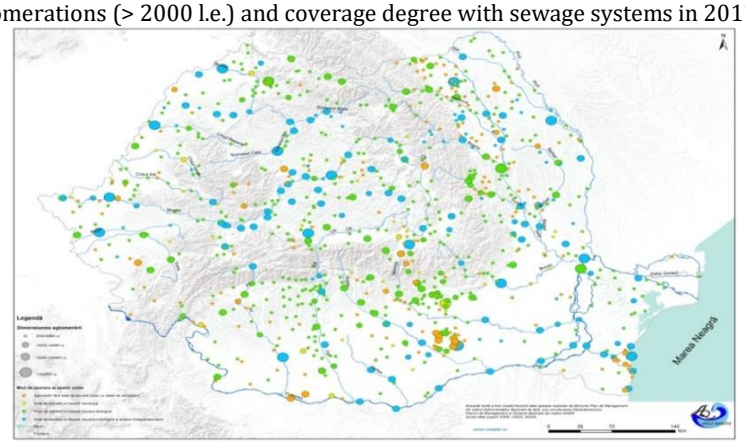
Source: Administraţia Naţională "Apele Române", raport „Stadiul realizării lucrărilor pentru epurarea apelor uzate urbane şi a capacităţilor în execuţie şi puse în funcţiune pentru aglomerări umane" în anul 2017

Figure no. II.25. Human agglomerations (> 2000 l.e.) and collection coverage in 2017



Source: Administraţia Naţională "Apele Române", raport „Stadiul realizării lucrărilor pentru epurarea apelor uzate urbane şi a capacităţilor în execuţie şi puse în funcţiune pentru aglomerări umane" în anul 2017

Figure no. II.26. Human agglomerations (> 2000 l.e.) and coverage degree with sewage systems in 2017



Source: Administraţia Naţională "Apele Române", raport „Stadiul realizării lucrărilor pentru epurarea apelor uzate urbane şi a capacităţilor în execuţie şi puse în funcţiune pentru aglomerări umane" în anul 2017

How to determine the indicator:
- formula:

$$PCWW = \sum_{i=1}^{n} Loc\_Ep_i$$

where: PCWW represents the degree of connection of equivalent inhabitants to urban wastewater collection and treatment systems;
Loc_Ep is the equivalent number of inhabitants connected to the sewage treatment plants:

- units of measure: number of equivalent inhabitants or%
-geographical coverage: locality, human agglomeration, cluster, county, region, national
-periodicity of data: monthly, quarterly, semester, yearly
- data availability: National Administration "Apele Române"
National Institute of Statistics
- aggregation of data: at the level of human, county and national agglomeration

Ways to analyze and interpret data

The data obtained as a result of monitoring, qualitative and quantitative monitoring, of urban wastewater collection and treatment systems is centralized at the level of each agglomeration, county and subsequently at national level, following:

- purifying the entire volume of wastewater from human agglomerations before discharging them into natural receptors;
- achieving adequate waste water treatment efficiencies in urban stations in order to comply with the requirements of the Urban Waste Water Treatment Directives and the provisions of H.G. no. 352/2005;
- assigning values for pollutant loads associated with agglomerations in order to achieve the environmental objectives of water bodies as required by the Water Framework Directive 2000/60 / EC;
- variaţia the spatial and temporal variation of the equivalent population / inhabitants connected to wastewater collection and treatment systems in order to characterize the trends and assess the effectiveness of the measures applied to reduce the pollution of the aquatic environment caused by waste water evacuation.

When there is a clearly quantifiable objective associated with a target, the evolution of the indicator is evaluated against the direction leading theoretically to the target. The evaluation is based on the deviation from the current trend of the indicator from the theoretical direction to the target. Thus, if the average annual growth rate, in percentage terms, between the base year and the most recent year for which data is available and which is calculated as a percentage of the average annual growth rate, thereafter would be necessary to meet the goal in the target year is: 100% or greater, the indicator is rated "to target" (clearly favorable); between 80% and 100%, the indicator is rated "near target" (moderately favorable), below 80%, the indicator is rated "off target" (moderately unfavorable).

Sources of data and information

"Apele Române" National Administration: manages and exploits the infrastructure of the National Water Management System; monitorises the status and the qualitative evolution of water resources; builds the database on the quality of surface water and groundwater resources in order to establish the national data base on the quality of water resources; elaborates the annual synthesis of the water quality protection and reports on the status of the quality of the water resources at national level; processes and makes available to the central public water authority, NIS and other competent institutions the data and information required for its field of activity, implements and reports the state of fulfillment of the requirements of the European Water Directives, including the Water Framework Directive 2000 / 60 / EC and Urban Wastewater Treatment Directives 91/271 / EEC and 98/15 / EC.
National Institute of Statistics: manages and operates the Database of Sustainable Development Indicators in Romania; the TEMPO online database.

Methods of Use

Reporting obligations to national, European and international bodies:

- the preparation of annual national reports;
- annual reports at the level of the European Environment Agency (data and information on the main set of CSI indicators);
- annual reports to EUROSTAT (Joint Inquiry on Inland Waters);
- reports to the European Commission on the state of implementation of the requirements of art. 15, 16 and 17 of the Urban Waste Water Treatment Directives 91/271 / EEC and 98/15 / EC.

Monitoring the implementation of environmental policies by regularly evaluating compliance with the Water Framework Directive (once every six years) and the Urban Wastewater Treatment Directives 91/271 / EEC and 98/15 / EC (once every 2 years).

Population connected to sewage treatment plants (share of population connected to sewage systems and sewage treatment plants) is a sustainable development indicator for Romania of Level 2 - a complementary indicator that is usable for monitoring and reviewing sustainable development programs.

II.2.3. TRENDS AND FORECASTS ON WATER QUALITY

II.2.4. POLICIES, ACTIONS AND MEASURES TO IMPROVE WATER QUALITY STATUS

II.3. MARINE AND COSTIER ENVIRONMENT

Source: **National Institute for Marine Research and Development "Grigore Antipa"**

II.3.1. THE STATUS OF MARINE AND COASTAL ECOSYSTEMS AND CONSEQUENCES

II.3.1.1. Status of protected marine areas

RO 41	Indicator code Romania: RO 41 AEM indicator code: SEBI 07

TITLE: PROTECTED NATURAL AREAS OF NATIONAL INTEREST
DEFINITION: Protected marine areas. The indicator shall describe the evolution of the protected marine areas and the areas covered by them.

Marine sites in the Natura 2000 network

According to international and European Union directives, the Protected Marine Network must have a suitable surface to fulfill the assigned protection role and consist of protected areas linked through "green corridors" that provide natural conditions for movement, reproduction and refuge for species of marine flora and fauna. Specific legislative directives are represented by:

1.Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora;

2. Council Directive 79/409 / EEC of 2 April 1979 on the conservation of wild birds;

3. Common Fisheries Policy - Regulation no. No 1967/2006 of the European Council of 21 December 2006;

4.Directive 2000/60 / EC establishing a framework for Community action in the field of water policy;

5.Directive 2014/89 / EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for the development of the maritime space;

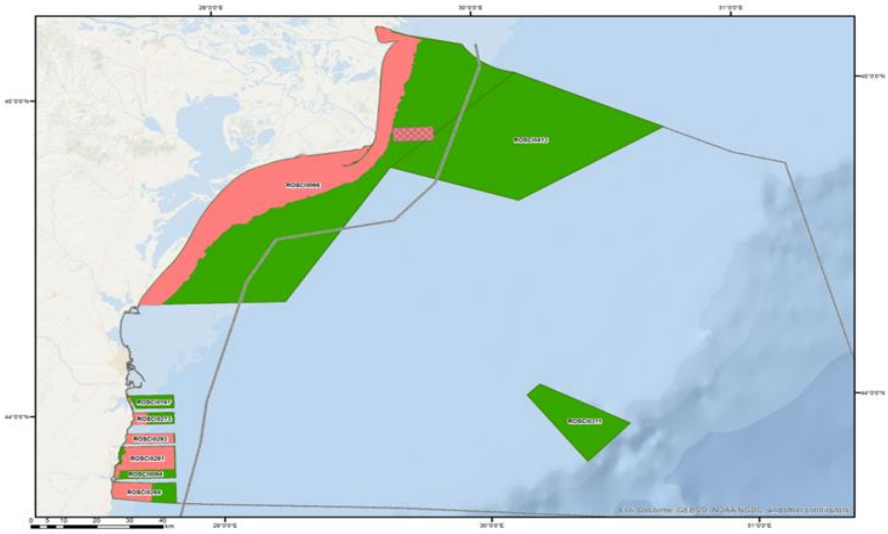
6. United Nations Convention on the Law of the Sea;

7. Convention on Biological Diversity;

8. Regional maritime conventions: OSPAR (North-East Atlantic Ocean), HELCOM (Baltic Sea), Barcelona Convention (Mediterranean) and the Bucharest Convention (Black Sea).

In accordance with Order no. 46/2016 on the establishment of the protected natural habitat regime and the declaration of sites of Community importance as an integral part of the Natura 2000 European ecological network in Romania, published in the Official Gazette no. 114 / 15.02.2016 the Romanian Protected Areas Network (Figure no.2.27) consists of the following sites of Community Importance:
1.ROSCI0066 Rezervaţia Biosferei Delta Dunării - zona marină
2.ROSCI0413 Lobul sudic al Câmpului de Phyllophora al lui Zernov
3.ROSCI0197 Plaja submersă Eforie Nord - Eforie Sud
4.ROSCI0273 Zona marină de la Capul Tuzla
5.ROSCI0281 Cap Aurora ROSCI0094
6.ROSCI0293 Costineşti - 23 August
7.ROSCI0311 Canionul Viteaz
8.Izvoarele sulfuroase submarine de la Mangalia
9.ROSCI0269 Vama Veche - 2 Mai.

Figure no. II.27Map of sites of Community importance (under the Habitats Directive) in the Romanian Black Sea sector. Green = site boundaries in 2016, Red = site boundaries 2011-2015



Source: INCD "Grigore Antipa" Constanța

In table no. II.20. the areas of sites of community importance in the Romanian Black Sea sector are presented.

Table no. II.20. The areas of sites of community importance in the Romanian Black Sea sector

No. crt.	Site	Surface in 2017 (km²)
1.	ROSCI0066 DD-ZM	3.362,91
2.	ROSCI0094 Mangalia	57,85
3.	ROSCI0197 Eforie	57,17
4.	ROSCI0269 Vama Veche	123,11
5.	ROSCI0273 Cap Tuzla	49,47
6.	ROSCI0281 Cap Aurora	135,92
7.	ROSCI0293 Costineşti	48,84
8.	ROSCI0311 Canionul Viteaz	353,77
9.	ROSCI0413 ZPF-SL	1.868,15
	TOTAL	**6.057,19**

Source:INCD "Grigore Antipa" Constanța

The share of marine sites of Community importance in the Romanian Black Sea sector is shown in table no. II.20.

Table nr. II.21. Share of sites of community importance (SCI) in the Romanian Black Sea sector

Area	Surface SCI (km²)	Surface SCI (%)
Territorial waters (0-12 nautical miles)	3.529,09	84,95
Contiguous Zone and the Exclusive Economic Zone	2.528,10	10,38

Source:INCD "Grigore Antipa" Constanța

Natural reserve „Acvatoriul Litoral Marin Vama Veche - 2 Mai" (ROSCI0269)

Custodian: National Research and Development Institute "Grigore Antipa" Constanta
Natural protected area: Natural reserve „Acvatoriul Litoral Marin Vama Veche - 2 Mai", which overlaps the Natura 2000 site ROSCI0269

Custody Convention no. 306 of 13.12.2011, extended by the Addendum no. 2 of 13.12.2016.

The protected area „Acvatoriul Litoral Marin Vama Veche - 2 Mai" was established in 1980, by Decision no. 31/1980 of the Constanta County Council and confirmed as a protected area by Law no. 5/2000 regarding the approval of the National Spatial Establishment Plan, having the code 2345. By Order no. 1964 of 13 December 2007 and Order no. 2387 of 29 September 2011 amending the Order of the Minister of Environment and Sustainable Development no. 1964/2007 on establishing the protected natural habitat regime of sites of Community importance as an integral part of the Natura 2000 European ecological network in Romania, the protected area was declared a site of Community Importance (SCI) as an integral part of the Natura 2000 European ecological network in Romania. „Acvatoriul Litoral Marin Vama Veche - 2 Mai" is part of the Habitat / Species Management Area category of "Natural Reserve" (corresponding to IUCN category IV), aiming to protect and conserve marine habitats and important marine flora and fauna.
The priority conservation objectives for the ROSCI0269 Vama Veche - 2 Mai site are the achievement of good conservation status for habitats 1170-10 with Pholas dactylus, 1170-8 with Cystoseira barbata and 1170-2 with Mytilus galloprovincialis, all of which are in a mild state including the conservation of the representative species C. barbata, P. dactylus and C. officinalis. The mammalian and fish species listed in Annex II of the Habitats Directive, which are present on the site: Tursiops truncatus ponticus, Phocoena phocoena relicta, Alosa immaculata and Alosa tanaica, must also be protected.
The status and trends of the marine and coastal environment of „Acvatoriul Litoral Marin Vama Veche - 2 Mai" were also monitored in 2017.

Number of favorable / unfavorable notifications issued by the custodian

The main purpose for which the protected area was established is the conservation of biodiversity and marine habitats. It also aims at eliminating and preventing the exploitation or use of resources that contradict the conservation object, as well as ensuring the conditions for the scientific, educational and recreational research activities. In certain sub-areas, the Regulation only allows traditional fishing activities.

Any type of activities that could modify habitats and influence the species present in the site are strictly forbidden (eg construction, extraction of mineral resources, aquaculture, etc.)

In 2017, the custodian issued 6 (six) permits for various activities inside or near the protected area. All the documentation submitted by the applicants was thoroughly studied and found to be subject to the legislation in force and not to be contrary to the Natura 2000 principles. The documentation is also archived and kept for further consultation at the custodian's office.

Controls of environmental authorities (number of controls, control body, established aspects, imposed measures and stage of implementation)

During 2017, the National Environmental Guard, through the Constanta County Commissariat, carried out 2 (two) inspections at INCDM "Grigore Antipa", as custodian of the Marine Reserve „Acvatoriului litoral marin Vama Veche - 2 Mai“ (ROSCI0269). The observed aspects were recorded in the Inspection Reports no. 2361 / 30.05.2017 and 5256 / 29.11.2017, respectively.

Monitoring the conservation status

In 2017 there were researches dedicated to the monitoring of species and habitats in ROSCI0269 Vama Veche – 2 Mai under the monitoring program of INCDM.

In August 2017, the Mobile Monitoring Point, represented by the trailer in the Grigore Antipa National Marine Research and Development Institute (Figure No. II.28), was located in the area Vama Veche, in the vicinity of Restaurant "Corsarul”.

Figure no. II.28. The mobile monitoring point of the Vama Veche Reserve (INCDM trailer)

Source: INCD “Grigore Antipa” Constanța

Researchers and technicians at the Institute ensured their permanence during this peak season of the summer season, exercising both research and monitoring activities on the status of the protected marine area as well as education and public awareness, by distributing brochures, leaflets and flyers to tourists Vama Veche-2 Mai Marine Reservation - and the marine environment in general. The main goals of the detached staff were:

- Ensuring permanence at the Mobile Information Point of INCDM;
- Surveillance of the activities carried out in the area, from the point of view of compliance with the Regulation of the Reservation;
- Informing tourists and sharing information about the Reservation;
- Recording the environmental factors and the abundance of tourists in the area;
- Observations on catches at the fishery points in the area.

During the period of continuity assurance, the custody teams also participated in the volunteer with the fishermen working at the fishery point of 2 Mai and Vama Veche. Qualitative and quantitative assessments have been made on fish catches. As a result of the observations, it was revealed that dominant were the anchovies, the horsehead, the barbell.

In order to draw attention to the delimitation of the area, INCDM installed nine warning beacons in the perimeter of the protected area (figure no.2.29). It measures 1 meter in height and 60 cm in diameter, and carries placards with easily visible information from craft passing through the area.

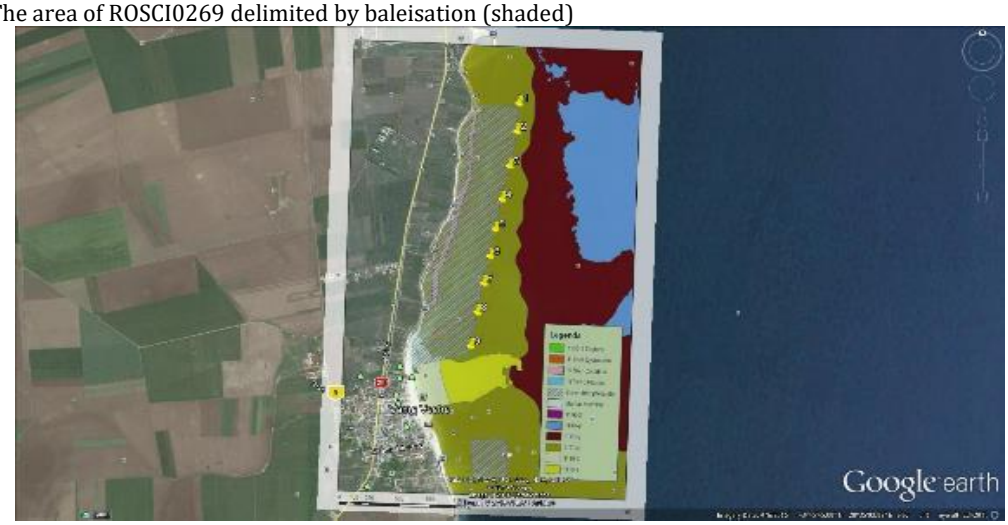
Each of the nine beacons was tested using a galvanized chain, doubled using lenghts of about 275 kg each (railway sleepers). The depth at which the eight collar beaks are in each case is about 6 - 6.5 meters.

Figure no. II.29. Built-in beacon for delimitation ROSCI0269

Source: INCD "Grigore Antipa" Constanța

In conclusion, the protected area from the shore of the Vama Veche -2 Mai Reservation, figurine hatched in the picture below (figure no. II.30), is currently delimited by a total of nine identical beacons, placed in the hills between 6 and 6.5 meters, and between them about 200 meters.

Figure no. 30. The area of ROSCI0269 delimited by baleisation (shaded)



Source: INCD "Grigore Antipa" Constanța

Ecological education

In the year 2017, awareness raising and education among pupils took place. In this respect, lectures were held during the week "Scoala Altfel" and films were played regarding the Marine Reservation Vama Veche - 2 Mai. More than 200 students from Constanta County learned of the existence of this protected marine area. Also members of the Junior Ranger Club at the Secondary School of 2 Mai were invited to celebrate the International Black Sea Day, which took place on 27 October at INCDM headquarters. Students from the Junior Ranger Club of 2 Mai have presented to a broad audience the club that has been doing 10 years of action to protect the Black Sea. Two of the more experienced members, Laurenţiu Cristian Ştefan and Adrian Ciobotaru, spoke to the participants about the activity of the club, stating that they make every effort to protect the marine reservation from Vama Veche - 2 Mai, which is in the custody of INCDM.

Children highlighted the fact that they are always discussing with the tourists on the beaches of the protected area, whom they teach not to throw more waste on the beach and in the Black Sea waters.

Figure no, II.31. Presentation of Junior Ranger Club activities at the International Black Sea Day (October 2017)

Source:INCD "Grigore Antipa" Constanța

Conclusions

In conclusion, the status of the marine environment at the site ROSCI0269 (Vama Veche-2 Mai Marine Aquarium) shows a slight improvement trend, constant in recent years, confirmed by the presence of a remarkable variety of species. In 2017, the only problems identified were waste on beaches and seaweed deposits on the Marine Reservation. In the area related to the protected marine area Vama Veche-2 Mai Marine Aquarium (ROSCI0269) no major pollution sources have been identified, which is confirmed by the parameters of the quality of the marine environment, which did not significantly exceed the admitted limits.

No other special events have been recorded within the Marine Reservation Vama Veche - 2 Mai vineyards to modify / alter marine habitats. The monitoring of the quality of the marine environment did not reveal alarming parameters regarding the state of the species and habitats in the Reservation. The custodians also did not encounter any problems with the tourists present in the beach area of the Vama Veche - 2 Mai Marine Reservation, nor with the local authorities who have always supported the actions in the area.

II.3.1.2. Status of marine ecosystems and living resources

RO 09	Indicator code Romania: RO09 AEM indicator code: CSI 09

TITLE: DIVERSITY OF SPECIES

DEFINITION: The indicator describes the status and trends of biodiversity, namely the variation of biodiversity over time. In the context of relevant environmental policies, in particular the European Biodiversity Strategy, sustainable fisheries are pursued by 2015 (establishing maximum yields to ensure the sustainable use of fish resources).

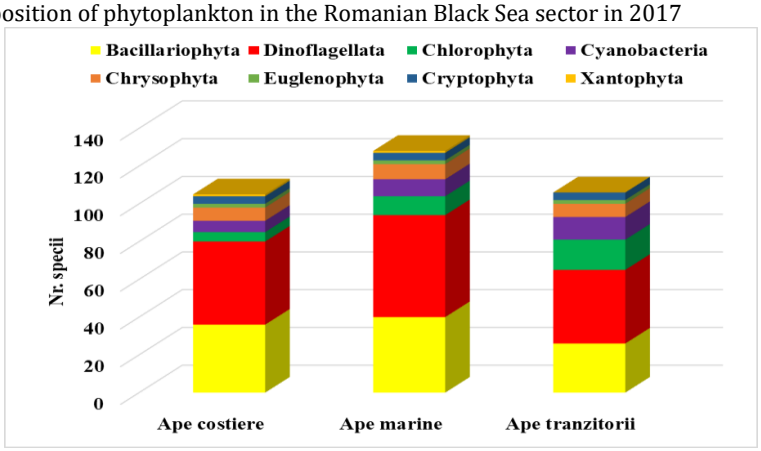
PHYTOPLANKTON

The identification of the qualitative and quantitative structure of the phytoplankton as a status indicator of the eutrophication was done by analyzing the samples collected in March, July and November 2017 on the Portiţa, Est Constanţa and Mangalia profiles.

In the composition of the phytoplankton there were identified 149 species with varieties and forms, belonging to 8 taxonomic groups (Bacillariophyta, Dinoflagellata, Chlorophyta, Cyanobacteria, Chrysophyta, Euglenophyta, Cryptophyta and Xantophyta).

The greatest diversity was encountered in marine waters (128 species), where dinoflageata were dominant with 54 species, followed by diatoms (with 40 species). In the coastal and transitional waters the dominance of the dinoflageata is maintained, being represented by 44 and 39 species respectively. Of the other groups, there are the chlorophylites, 5-16 species and cyanobacteria with 6-12 species, most of them occurring in transitional waters, favoring the development of these species. Crisopites were represented by 7-8 species, and cryptophytes, euglenophytes and xantopites of 1-4 species (figure no. II.32).

Figure no. II.32. Taxonomic composition of phytoplankton in the Romanian Black Sea sector in 2017



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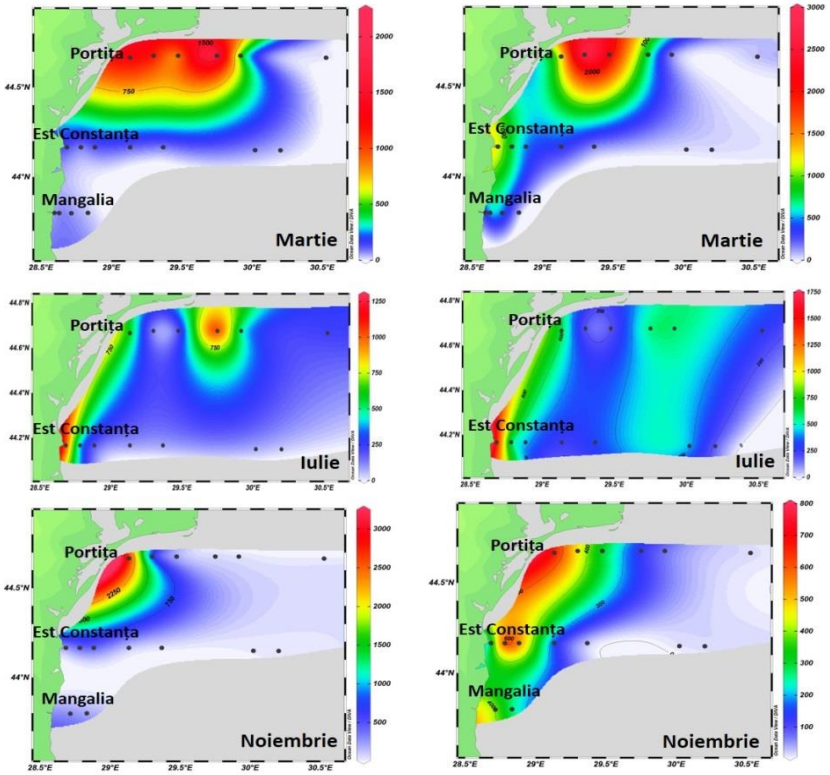
Source: INCD "Grigore Antipa" Constanța

Figure no. II.33. Density distribution (103 cells / L, left) and biomass (mg / m3, right) phytoplankton in 2017



Phytoplankton is one of the basic biological elements in the Water Framework Directive (WFD)/(DCA) and is also taken into account in 4 descriptors of the Marine Strategy Framework Directive (DCSMM): Biodiversity (D1), non-indigenous species (D2), trophic network (D4) and eutrophication (D5).
The phytoplankton biomass indicator shows the level and trends of the summer biomass (mg / m3) in the Romanian seas. The ecological status assessment was done for coastal, transitional and marine waters for the summer season 2017 by calculating the percentile 90 for the biomass values corresponding to the surface layer (0-10m) of each profile. Thus, it can be noticed that the average biomass values obtained for the transient and marine waters of the summer of 2017 fit these bodies of water into good ecological status. With regards to coastal waters, the value obtained (2603,06 mg / m3) exceeds the target value set for this water body (950 mg / m3) being in bad ecological status (Tableno. II.22).

Table no. II.22. Assessment of the ecological status of bodies of water based on the biomass element (mg / m3) in 2017

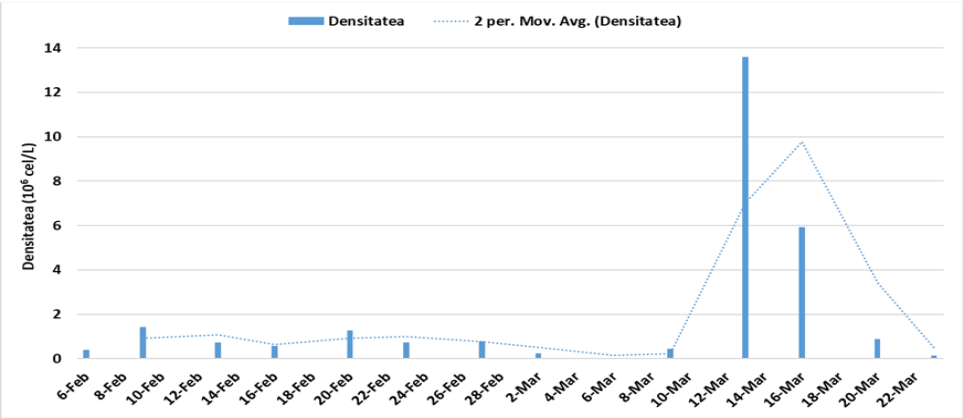
Water Body	Profile	Target value (mg/m^3)	Obtained value 2017	Ecological status
Transitional waters				
Sulina - Periboina	Portiţa	3000	584.67	
Costal waters				
Periboina - Cap Singol	Est Constanţa	950	2603.06	
Marine waters				
Sulina – Vama Veche	Portiţa	800	581.44	
	Est Constanţa	800	461.07	

Sursa:INCD "Grigore Antipa" Constanţa

Algal bloom

During 2017, in the continental and shallow waters of Mamaia, three species of microalgae have been found to have developed over one million cells per liter, decreasing compared to the 6 species in 2016.
It was noted the large scale development of the diatomee species Skeletonema costatum, a phenomenon that started at the beginning of February with a value of 400 · 103 cel / L and peaked in mid March (13.6 · 106 cel / L) , in the shallow waters of Mamaia (figure no II.34).

Figure no. II.34. Variation of the density of the species Skeletonema costatum in the shallow waters of Mamaia during the peak development period



Source:INCD "Grigore Antipa" Constanţa

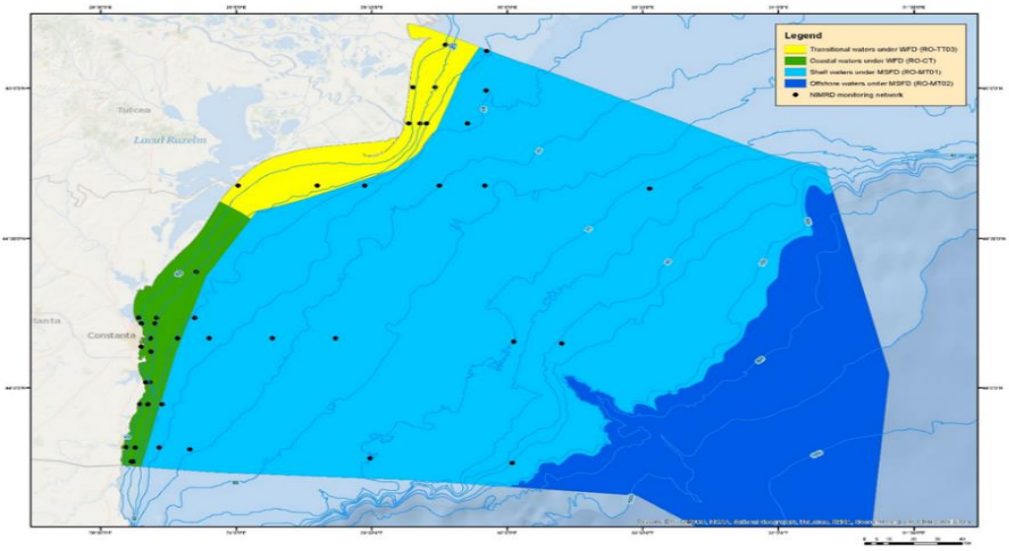
The following two flowering phenomena were of small magnitude. The first one took place in July with the development of the cocolitophore species, Emiliania huxleyi, which reached the maximum value of 1.06 · 106 cel / L at the Portiţa 4. The second phenomenon of flowering took place in November, near the shore, on Portiţa 1 station due to Planktolyngbya circumcreta cyanobacteria (2,2 · 106 cel / L).

ZOOPLANKTON

In order to identify the ecological status of the zooplanktonic populations on the Romanian seaside, during the year 2017 three sets of samples were collected, collected within the Marine Environment Monitoring Program, in order to report the state of the marine environment in accordance with the provisions of the Water Framework Directive (WFD)/(DCA)and the Marine Environment Strategy Framework Directive (DCSMM).

Zooplankton samples were collected within the national monitoring network (Figure II.35), a network covering three types of water: transient, coastal and marine. The three expeditions covered the cold season (two expeditions in March and November) and the warm season (an expedition in July).

Figure no. II.35. National monitoring network



Source: INCD "Grigore Antipa" Constanța

Conclusions

From a qualitative point of view, zooplankton in 2017 was represented by a total of 20 species, dominating the copepods and meroplankton.

The zooplanktonic community has experienced variations in density and biomass. March is characterized by the dominance of the trophic component of the zooplanktonic community, unlike in July and November, when the non -trophic component recorded the highest values.

Within the zooplanktonic trophic component, the copepods dominated from a qualitative point of view, followed by the meroplanktonic component.

Analyzing the ecological status of water bodies, it is noted that in the cold season, good ecological status is recorded in over 90% of the stations for all three indicators analyzed, with the only exception being in November for Noctilluca scintillans Biomass where bad ecological status dominated in over 95%.

In the warm season, the non-GES state prevailed for the indicators analyzed, except for the "Noctiluca scintillans species biomass", where 100% GES status was achieved in coastal waters.

Microzooplankton

For qualitative and quantitative analysis both hollow and tantalum lorica were considered because it was demonstrated that the mechanical and chemical disturbances associated with the collection and fixation procedures can cause the detachment of the cell from the cell (Thompson & Alder, 2005). Densitatea organismelor s-a exprimat în indivizi specie/litru (indivizi/l). The volume of the Lorica was calculated according to the total length and aboral diameter of the Lorica with the geometric shape assumed for each species. Biomass was expressed in carbon biomass (µgC / l) using the specific biolumum conversion formula for formalin conserved material (Verity & Langdon, 1984).

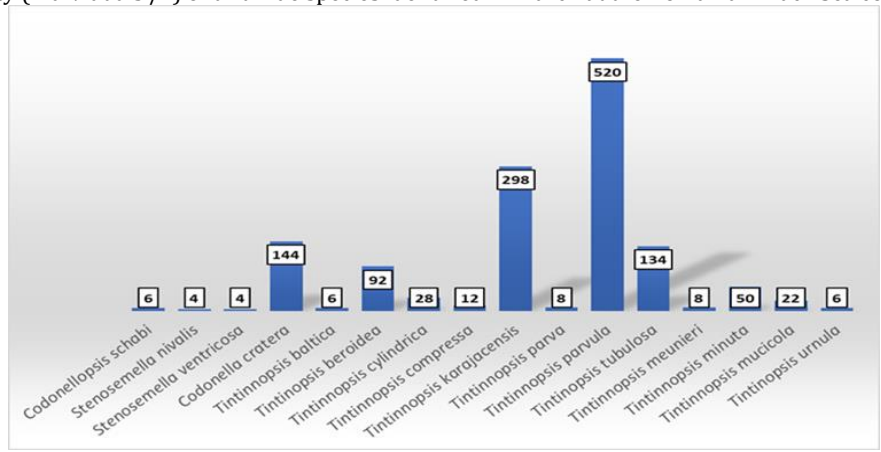
A number of 16 tintinide species belonging to Codonella, Codonellopsis, Stenosemella and Tintinnopsis genus were identified in the spring season, the latter being best represented as both species diversity and density (Table no. II.23). Tintinnopsis parvula was the species with the highest density this month, with values of 520 (individuals / l) followed by Tintinnopsis karajacensis (298 ind. / L) and Codonella cratera (144 individuals / l) (Figure no. II. 36).

Table no. II.23. List of tintinide species identified in March 2017 at the Romanian Black Sea coast

Order	Family	Gender	Species
Choreotrichida	Codonellopsidae	*Codonellopsis*	*Codonellopsis schabi*
		Stenosemella	*Stenosemella nivalis*
			Stenosemella ventricosa
	Codonellidae	*Codonella*	*Codonella cratera*
		Tintinnopsis	*Tintinnopsis baltica*
			Tintinopsis beroidea
			Tintinnopsis cylindrica
			Tintinnopsis compressa
			Tintinnopsis karajacensis
			Tintinnopsis parva
			Tintinnopsis meunieri
			Tintinnopsis minuta
			Tintinnopsis mucicola
			Tintinnopsis parvula
			Tintinopsis tubulosa
			Tintinnopsis urnula

Source: INCD "Grigore Antipa" Constanța

Figure no. II.36. Density (individuals / l) of tintinide species identified in March at the Romanian Black Sea coast



Source: INCD "Grigore Antipa" Constanța

Analyzing the distribution of the micro zooplanktonic component along the Romanian seaside, during this period a decrease of the respective biomass densities was observed from north to south . On the Portiţa profile, the density and biomass values were 4.5 or 3 times higher than on the Mangalia and Est-Constanţa profiles (Figures II.37 and II.38). The highest species diversity (14 species) is recorded on the East-Constanta profile.

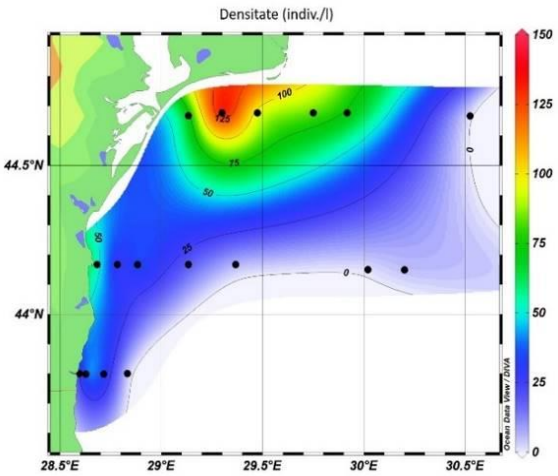


Figure no. II.37. Density (ind./l) of the microzooplankton community in March 2017

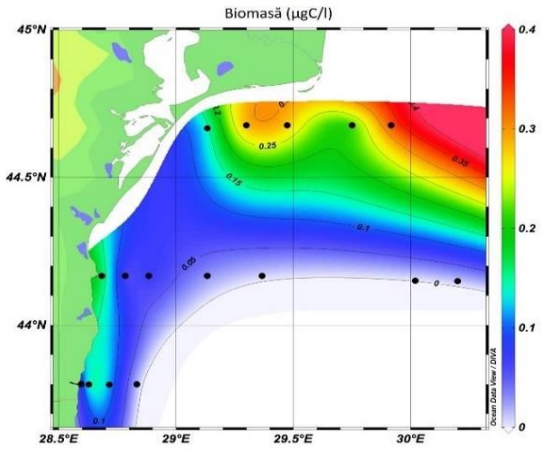


Figure no. II.38. Biomass (µgC/l) of the microzooplankton community in March 2017

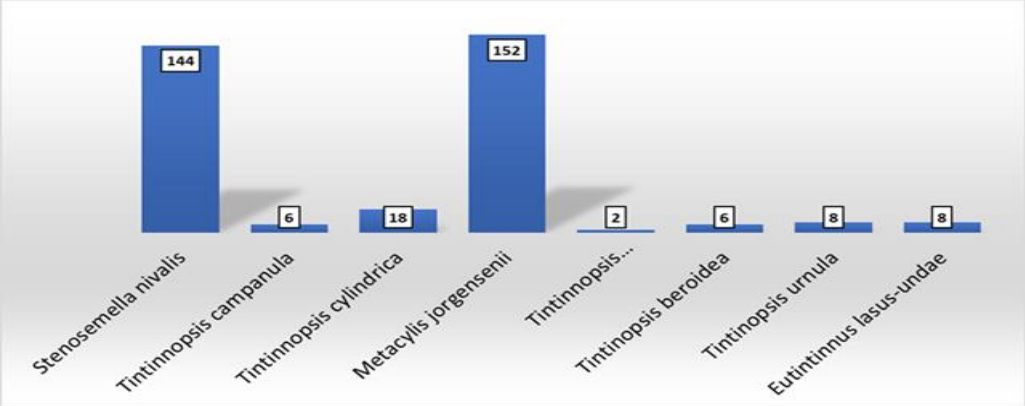
In the summer season, the microzooplankton component recorded changes over the period mentioned above, identifying 8 species belonging to the genus - Metacylis, Stenosemella Tintinnopsis and Eutintinnus (Table II.24). The genus Tintinnopsis recorded the smallest value in terms of quantity, although the number of species was best represented during this period. The species that dominated the component in terms of density (152 individuals / liter) is Metacylis mediterranea (Figure No. II.39).

Table no. II.24. List of tintinide species identified in July 2017 at the Romanian Black Sea coast

Order	Family	Gendre	Species
Choreotrichida	Codonellopsidae	*Stenosemella*	*Stenosemella nivalis*
	Codonellidae	*Tintinnopsis*	*Tintinopsis beroidea*
			Tintinnopsis campanula
			Tintinnopsis cylindrica
			Tintinnopsis karajacensis
			Tintinopsis urnula
	Metacylididae	*Metacylis*	*Metacylis mediterranea*
	Tintinnidae	*Eutintinnus*	*Eutintinnus lasus-undae*

Source: INCD "Grigore Antipa" Constanţa

Figure no. II.39. Density (ind./l) of the tintinide species identified in July at the Romanian Black Sea coast



During this period, the analysis of the microzooplankton community along the Romanian seas indicates an increase of the density and biomass values from north to south. The highest densities were recorded in coastal waters, on the profile of the Portita being the species Metacylis mediterranea (152 indiv. / L) and on the Est-Constanta profile of the species Stenosemella nivalis (144 individuals / l).

Figure no. II.40. Density(ind./l) of the microzooplankton community in July 2017

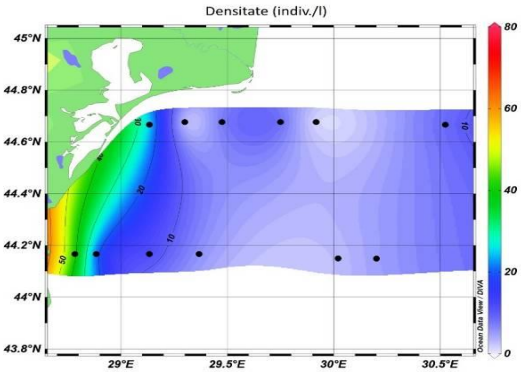
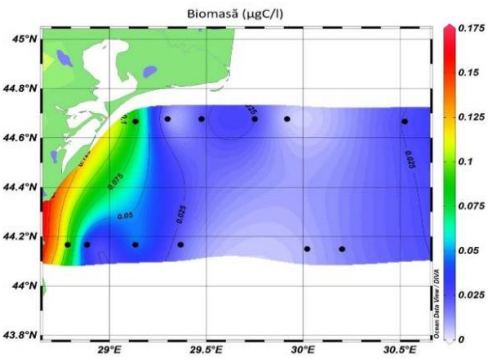


Figure no. II.41. Biomass (µgC / l) of the microzooplankton community in July 2017



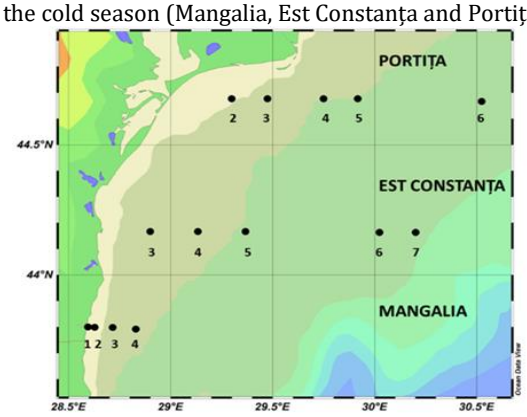
In 2017 a total of 19 tintinidae species were reported, including T. beroidea, T. cylindrica, T. karajacensis, T. urnula and Stenosemella nivalis, which were common in both analyzed periods. From the analysis of the two seasons we can see a qualitative differentiation of the identified species. In the spring season the dominance of the species Tintinnopsis parvula was revealed and in the summer season of the species Metacylis mediterranea. From the point of view of species diversity, the Tintinnopsis genus dominated both analyzed periods. From a quantitative point of view, the spring season was marked by 4 times higher biomass compared to the summer season. Spatial distribution was also different in the two seasons. In the spring, the densities and microzooplankton biomass fell from the north to the south of the Romanian seaside, the situation being the opposite in the summer season. In both seasons, densities and biomass were raised in coastal waters, reducing to marine waters.

ZOOPLANCTON GELATINOS

To determine the state of zoo planktonic gelatin populations in 2017, 24 samples were collected and analyzed in the cold and hot season.

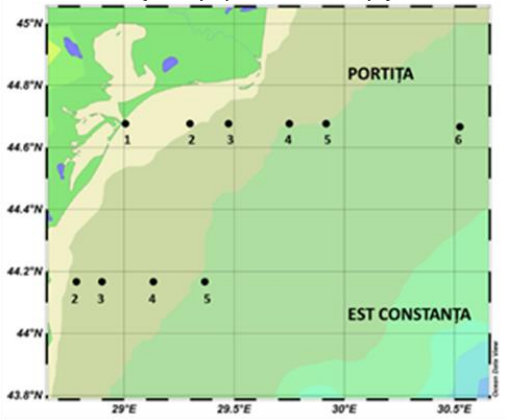
The samples were taken from three profiles (Mangalia, East Constanţa and Portiţa), presented in Figures no. II.42 and II.43.

Figure no. II.42. The station network in the cold season (Mangalia, Est Constanța and Portița)



Source: INCD "Grigore Antipa" Constanța

Figure no. II.43. The station network in the hot season (Portița și Est Constanța)



Source: INCD "Grigore Antipa" Constanța

Conclusions

The zooplankton community was represented in 2017 by 3 species: the sciphosor Aurelia Aurita, the ctenophorus Pleurobrachia pileus and Mnemiopsis leidyi, these being observed in both seasons.

The golden Aurelia sciphosor dominated both the warm season (4.72ex / m3) and the cold season (1.63ex / m3), followed by the Pleurobrachia pileus, which recorded average values of 4.29 ex /. M3 in the warm season, this being a species that prefers higher water temperatures.

Mnemiopsis leidyi recorded the lowest values in both the warm season (7,12 ex / m3) and the cold season (0,0024 ex / m3).

From the qualitative point of view in 2017 the species Beroe ovata was present at the Romanian seaside, which was not identified in the analyzed quantitative samples because they were collected before the peak development season (autumn season).

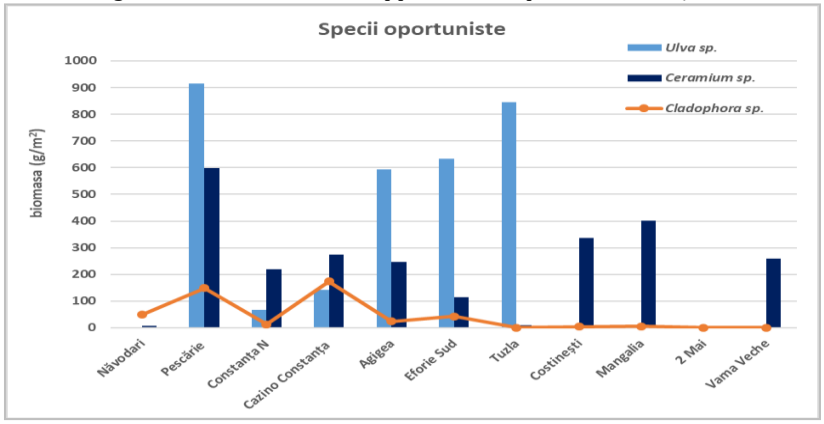
During the expeditions made in 2017, visual observations were also made on the species Rhizostoma pulmo, but it was too large to be analyzed on board.

FITOBENTOS

The phytobenthic component (including macroalgae and marine phanerogams) is monitored annually at the Romanian seaside by observation and sampling, in order to permanently update the information and to capture the possible changes in the qualitative and quantitative structure of the phytobenthic associations. The station network has remained constant from 2009 until now, with sampling from Năvodari to Vama Veche, from depths between 0-3 m, during the summer season.

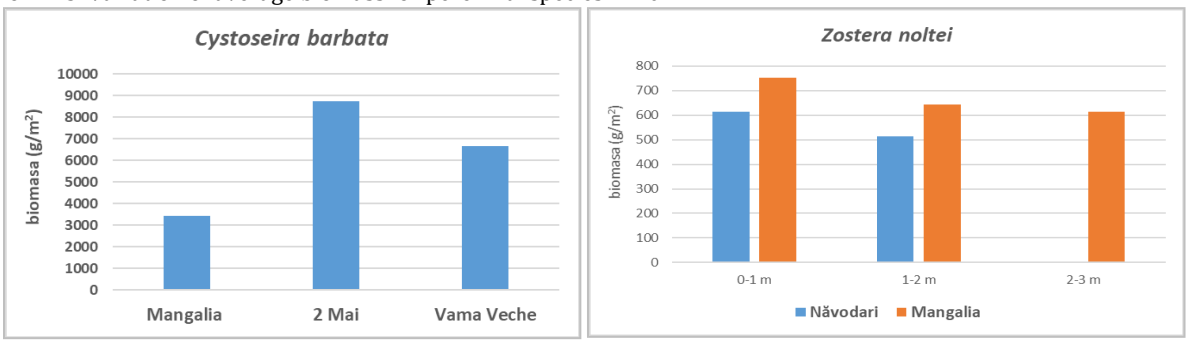
This depth range is considered optimal for the development of phytobenthic associations at the Romanian shore, being also an area permanently influenced by the anthropogenic factors.
With regard to the communities formed exclusively from opportunistic species, they were dominated in terms of quantity of green algae in most monitored stations. Of the Ulva species, dominant, like the previous years, was the rigid Ulva chlorophyll. Ulva species had a constant presence at the Romanian seaside, with high values of fresh biomass in Pescărie (914 g / m2) and Tuzla (850 g / m2) (figure no. II.44). After the abundant development in the summer of 2010 and 2011, due to the high sea water temperatures, Cladophora species, although constant presence on the Black Sea coast, did not show significant biomass in 2017, with a maximum of 180g/m^2 at the Cazino Constanta. Among the rodophytes, as in previous years, the Ceramium species (C. virgatum and C. diaphanum var. Elegans) dominated the shallow substrate with a maximum biomass value of 600g/m2 in fish (Figure II .44).

Figure no. II.44. Variation of average biomass for dominant opportunistic species in 2017 *(Source: INCD "Grigore Antipa" Constanța)*



Perennial species are an important component of phytopathogen, represented at the Romanian seaside by a small number of species belonging to the genus Cystoseira, Phyllophora and Zostera. Cystoseira male-size fields of varying sizes were identified at Mangalia, Jupiter-Saturn, May 2, and Vama Veche. The species developed high average biomass ranging from 3400 to 8800g / m2, with a maximum recorded in the 2 Mai - Vama Veche reservation area (Figure II.45.a). With regard to the Zostera noltei marigold, this species was reported in Năvodari (0.5 - 2m deep) and Mangalia (between 0.5 - 3m). Fresh biomass for Zostera nolte ranged from 615 to 750 g / m2 (depending on depth) at Mangalia, and in Năvodari between 500 and 615 g/ m^2 (depending on depth) (figure no. II.45. b).

Figure no. II.45. Variation of average biomass for perennial species in 2017



a) *Cystoseira barbata* b) *Zostera noltei*

Source: INCD "Grigore Antipa" Constanța

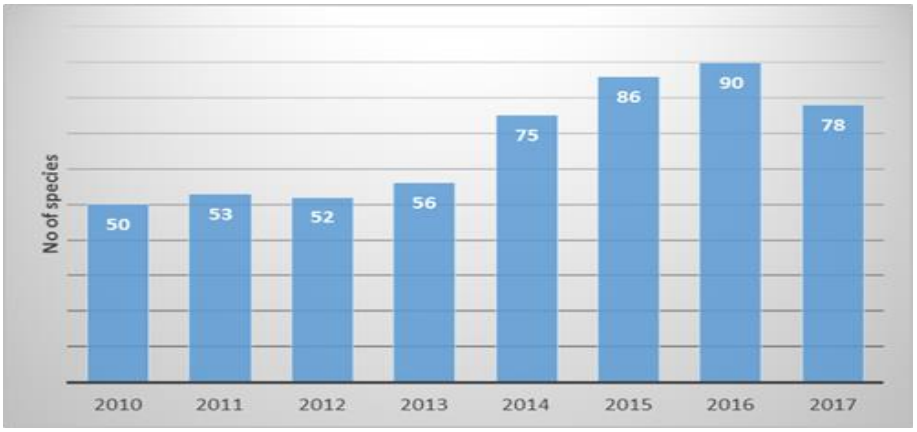
For the year 2017, the main conclusions regarding the phytobenthic component refer to the clear domination of the species of Ulva of the opportunistic macroalgae during the summer season and to the maintenance of the regeneration process of the perennial species at the Romanian seaside, with direct references to Cystoseira barbata, Coccotylus truncatus and Zostera noltei. These species have a special ecological value and have suffered a continuous decline on the Romanian shores over the decades, so they require very careful monitoring.

ZOOBENTOS

Macrozoobenthos condition in 2017

In 2017 samples of macrozoobenthos were collected from the mobile substrate from 16 stations located on three profiles: Portiţa, East Constanţa and Mangalia. Although the profiles on which the samples were collected do not cover the entire Romanian platform, however, they cover the main water bodies and the major circular habitats for which the reference conditions were elaborated, as well as the threshold values for the good status of the marine environment (GES). In the researched area, 78 species of benthic invertebrates were identified in 2017. The number of smaller species in 2017 compared to 2016 is correlated with the smaller number of samples collected in 2017 compared to 2016, when the network of stations covered the whole Romanian platform (figure no. II.46). Therefore, given the situation, in this case it can not be said that the specific diversity of macrozoobenthos was lower than in the last five years.

Figure no. II.46. Diversity of benthic species in Romanian Black Sea waters in the period 2010-2017



Source: INCD "Grigore Antipa" Constanța

Conclusions

- In 2017, only 16 zooobenthos samples were collected from three perpendicular shorelines and based on which the status of benthos was assessed both in the bodies of water under DCA and in the major circular habitats under DCSMM.
- Specific diversity was lower in YEAR 2017 (78 species) compared to YEAR 2016 (90 species), due to the lower number of samples collected.
- By applying the M-AMBI * (n) index, macrozoobenthos in the marine transient water body has been assessed to be in poor ecological status (Poor) and the one in the coastal water bodies has been assesed to be in an ecological good status (Good)
- Based on the same index, the major circulatoric habitats (Mixed Moths and Sediments dominated by Mytilus galloprovincialis and Modiolula phaseolina mites) were assessed as being in good ecological state (GES), although, due to the lower number of stations from which samples were taken the results of the assessment are not comparable, also valid for coastal and marine transients.

LIVING MARINE RESOURCES

The diversity of the Romanian ichthyofaunal in the seaside area has undergone permanent changes both qualitatively and quantitatively. These changes have occurred as a result of the deterioration of environmental conditions but also due to inadequate management of fisheries. Some of these changes have had a major impact on both pelagic and benthic fish populations, affecting common and rare species, juveniles and adults, fish populations of commercial or non-commercial value, thus generating the disappearance of fish populations and very rarely introducing new species.

In 2017, in terms of quality and quantity were analyzed fish samples collected from fishing tackle placed along the Romanian coast from Vadu to Vama Veche and from the two expeditions with the net on the beach. Samples collected from fishing tackle were taken from May to October, twice a month, analyzed in the isthiology laboratory. The fishing net expeditions were made in August in the northern part of the Romanian coast (Edighiol area) and Baia Mamaia in October, with six tunnels being taken during each expedition at depths between 0.5 - 5 m.
From a qualitative point of view, the following families and species of fish appeared frequently at the Romanian seaside (Table no. II.25):

Table no. II.25. - Qualitative structure of the biodiversity of ihtiofauna at the Romanian seaside

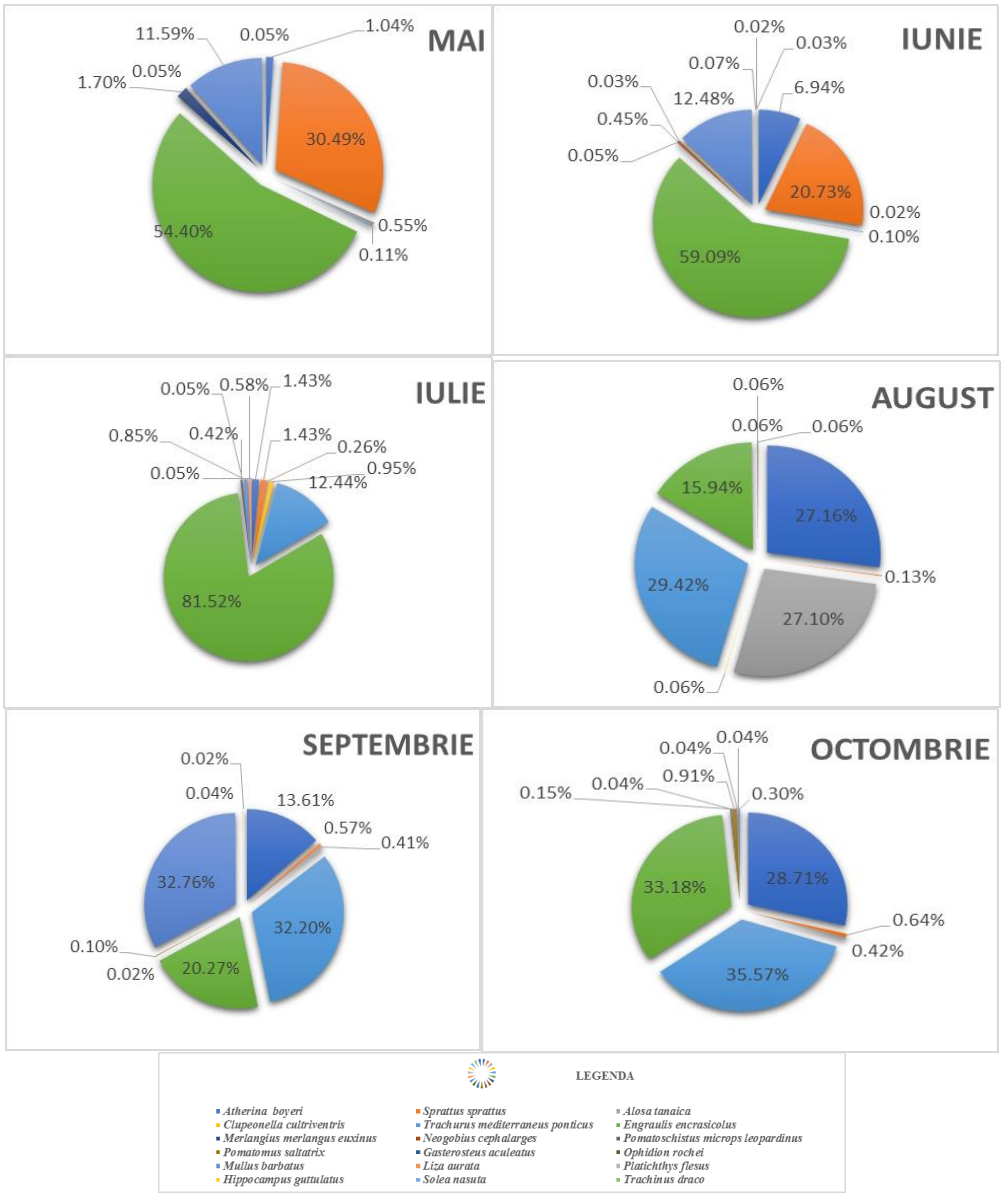
Family	Species	Popular name
Atherinidae	*Atherina hepsetus*	aterina
Blenniidae	*Coryphoblennius galerita*	cocoşel de mare
Belonidae	*Belone belone euxini*	zargan
Callionymidae	*Calliumymus pusillus*	şoricel de mare
Clupeidae	*Sprattus sprattus*	şprot
	Alosa immaculata	scrumbia de Dunăre
	Alosa tanaica	rizeafcă
	Clupeonella cultriventris	gingirica
Carangidae	*Trachurus mediterraneus ponticus*	stavrid
Engraulidae	*Engraulis encrasicolus*	hamsia
Gadidae	*Merlangius merlangus euxinus*	bacaliar
	Gaidropsarus mediterraneus	galea
Gobiidae	*Neogobius melanostomus*	strunghil
	Mesogobius batrachocephalus	hanus
	Gobius niger	guvid negru
	Neogobius fluviatilis	guvid de baltă
	Pomatoschistus microps leopardinus	guvid de nisip
Gasterosteidae	*Gasterosteus aculeatus*	ghidrin
Ophididae	*Ophidion rochei*	cordeluţă
Mullidae	*Mullus barbatus*	barbun roşu
Mugilidae	*Mugil cephalus*	laban
Pleuronectidae	*Platichthys flesus*	cambulă
Rajidae	*Raja clavata*	vulpea de mare
	Dasyatis pastinaca	pisica de mare
Sciaenidae	*Sciaena umbra*	corb de mare
	Umbrina cirrosa	milacop
Sciaenidae	*Sarda sarda*	pălămidă
Scophthalmidae	*Psetta maxima*	calcan
Serranidae	*Serranus cabrilla*	biban de mare
Syngnathinae	*Syngnathus variegaus*	ac de mare
	Syngnathus typhle	ac de mare
	Hippocampus guttulatus	căluţ de mare
Squalidae	*Squalus acanthias*	rechin
Trachinidae	*Trachinus draco*	drac de mare
Triglidae	*Trigla lucerna*	rândunica de mare

Source: INCD "Grigore Antipa" Constanţa

May was dominated by anchovy and sprat fish populations, followed by barn and bacalli. In June, the dominant species was anchovy (Engraulis encrasicolus), followed by sprat and barb, the other non-commercial species being present in 1-10 specimens. The quantitative dominant species of July was also anchovy, followed by horse mackerel, with non-commercial species being present in 1-30 specimens.

Species such as atherosclerosis, horse mite, and rhesus had the highest quantitative value in August, followed by anchovy. Barbun had the highest numerical value in September, followed by horse mackerel, anchovies and atheros. In October, the dominant species were: horse mackerel, anchovies and aterine, followed by sprat and rifle (Figure no. II.47).

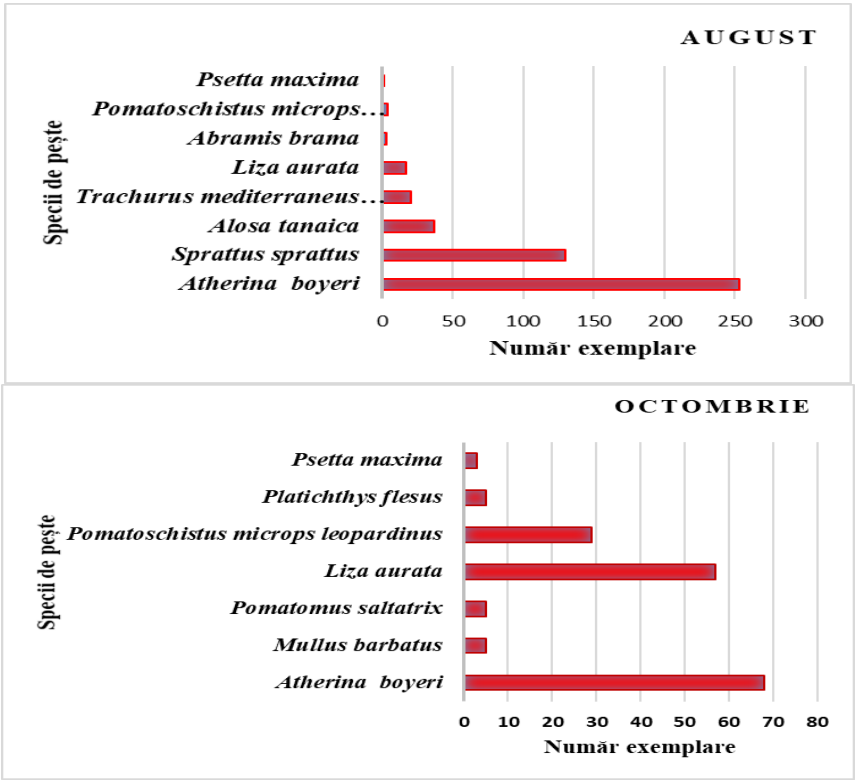
Figure no. II.47. – Graphic representation of the biodiversity of the ichthyofauna in May - October 2017



Source: INCD "Grigore Antipa" Constanța

The analysis of the samples resulted from the expeditions with the net revealed the presence of the dominant atheritic and sprat species in August and of the athenaeum and chefalus populations in October (figure no. II.48).

Figure no. II.48. – Graphic representation of expedition with the net on the beach



Source: INCD "Grigore Antipa" Constanța

The disappearance or numerical reduction of fish species is the cause of the oscillations of ecological factors in the marine ecosystem, overfishing, inappropriate gear and anthropogenic impact.
The exploitation and sustainable management of the ichthyofauna in the Romanian Marine Area should take into account the maintenance of the quality, diversity and availability of fishery resources in sufficient quantities for present and future generations, in the context of food security and sustainable development.

II. 3.1.3. Situation on pollution of the marine and coastal environment

RO 21	Indicator code Romania: RO 21 AEM indicator code: CSI 21

TITLE: NUTRIENTS IN TRANSITIONAL, COASTAL AND MARINE WATER
DEFINITION: The indicator shows the annual trends in concentrations of soluble nitrates and orthophosphates (in winter, expressed in micrograms / L) and the N / P ratio in the sea, the concentration levels (low, moderate, high) winter (nitrate + nitrite) and the concentration of soluble orthophosphates (expressed in micromol / L) in the Black Sea water.

Pollution is the process of altering the living environment - biotic and abiotic - and goods created by man, a process triggered mainly by waste from human activity (domestic, agricultural or industrial) and various natural phenomena (floods, eruptions, storms, etc.). The pollutant is any product - solid, liquid or gaseous - resulting from human activity, dispersed in environmental factors (air, water, soil) and potentially affecting the health of living organisms and the state of the environment.

Thus, environmental protection aims at preserving the ecological balance, maintaining and improving the natural factors, preventing and combating pollution, ensuring and improving working and living conditions, using all the means, actions and measures specific to achieving these objectives.

Particularly, marine pollution refers to the introduction, directly or indirectly, into the marine environment of substances or energy with potential for altering natural equilibrium, endangering human health and biological resources and hampering legitimate uses of the sea (e.g. fishing, sailing or recreation). In maritime port systems such as Constanta, a major concern is aquatic pollution, a phenomenon defined by all the ways in which pollutants of domestic, agricultural or industrial origin affect aquatic ecosystems.

In the Black Sea port system of our country, the major threat to the health, productivity and biodiversity of the marine environment is the effects of human activities carried out in the coastal area. The statistical data reveal the very high share of the pollutant load, leakages and discharges from economic activities (80%), knowing that coastal areas are economic zones (production or tourism). It is appreciated that the value of goods and services created in marine ecosystems areas is substantially higher than those obtained in inland terrestrial ecosystems.

Unequivocally, this way results the negative effect of marine pollution on various habitats (physically altered and destroyed), on the sustainable use of the seas, and on human health (through direct contact with polluted water or the consumption of contaminated marine nutrients) through the action of multiple categories of polluting sources, including: wastewater from sewage systems, pesticides, radioactive substances, heavy metals, hydrocarbons, alluvium and household waste.

From an institutional point of view, national actors with environmental competencies are working on the basis of collaboration with international bodies in line with strategies focused on monitoring the marine and coastal environment, preserving the marine ecosystem, protecting and developing living marine resources , the use for these purposes of the techniques of radioactivity and marine radioecology, the achievement of the organizational and legislative support of the fight against pollution (as a phenomenon and as a manifestation of its effects).

Concerning the pollution sources of Constanta port, the territorial structures of the National Environmental Guard (NEG) identified, in time, the most important such phenomena affecting environmental factors: naval accidents at port and in its vicinity, the silos of the port, those produced as a result of the activity of operators located in the port or its adjacent areas. The relative contribution of each source of pollution varies according to the characteristics of each marine area in the zone: industrialization degree, population density and port system activities, and the possibility of pollutant emissions.

The most important such source, hydrocarbon pollution, has acquired a chronic character, accentuated by the deliberate or accidental mode in which naval transport causes pollution. Deliberately, illegal, for example, the discharge into the sea of waste water or hydrocarbons resulting from the cleaning of oil tankers occurs, while accidental pollution of sea water is based on deficiencies in the operation of onboard installations. In order to create a picture of the scale of the phenomenon, it is recalled that more than 50000 ships cross the Black Sea annually.

Other sources of pollution of the system - and Constanta port basin - are the exploitation of mineral resources (oil and gas) in the continental shelf, as well as activities specific to the chemical and petrochemical industry or heavy industry (shipbuilding and ship repair).

In view of the fragile balance of the marine ecosystem and its vulnerability to environmental accidents and the effects of global climate change, a set of appropriate measures to reduce the level of pollution in the area is proposed:

- tightening sanctions applied in case of deliberate pollution;
- the establishment of an obligation to keep on board sufficient anti-pollution materials, as well as the effective control of its fulfillment, namely the drastic sanctioning of those who do not respect it;

- regulate the submission of permits for the proper operation of installations for the loading and unloading of oil products at port docks, and severely penalize cases of breach of this obligation, including those with faulty dock access;
- close monitoring of operators carrying out port activity;
- the upgrading of pollutant take-off systems in the coastal zone;
- the presence of large-scale marine disaster units for intervention in large-scale pollution situations in the port and coastal areas.

From a technical point of view, limiting the effects of pollution, especially those related to the spread of hydrocarbon films to the sea surface, involves the use of dams (pneumatic and rigid), including improvised ones, locally available at the time of the event. Less recommended, due to high pricing and / or demanding exploitation technologies are special dams (fire, filter or recuperator).

In addition to the use of floating dams, the limitation of hydrocarbon film expansion can be achieved by physic-chemical processes (gelling of the marginal portion of the film by polymerization, dissemination of products capable of altering the water-petrol contact surface tension). Firefighting dams are intended for the protection of oil-covered film under controlled conditions, those with a semi-permeable absorbent / filter structure that retain the film, are used in low-pollution areas, and remediation combines the advantages of classic floating dams with those of collecting devices film In this respect, it is stated that by collecting the pollutant on the surface of the water and significantly reducing its harmfulness over the environment, it responds optimally to the pollution with hydrocarbons.

On the other hand, at least partial recovery of hydrocarbons through passive / static methods (fixed arrangement of recovery equipment near the shore and directing of the film to them by floating deflector dams) and active / dynamic (collection of special sailboats and driving hydrocarbons to recovery facilities on board) can lead to important economic benefits.

Particularly to the general aspects outlined above and using the data provided by the competent territorial structures of GNM, inserted in table no. II.26, the trend of increasing the number (and the magnitude) of the analyzed events in the first part of the period under investigation, with a maximum in its mid-point (2013 and 2014), followed by the significant reduction of the polluting phenomena towards the end of the period, so that in the last year of the interval (2016) the situation will be similar to the first one (2011).

It is also observed that the share of the phenomenological typology is held by hydrocarbon pollution, while the influence of the other causal factors is reduced (that of fires remains relatively important). It is also noted the similarity of the evolution over time of the number of events, whether it is their cumulative nuance or their distribution by influence factors.

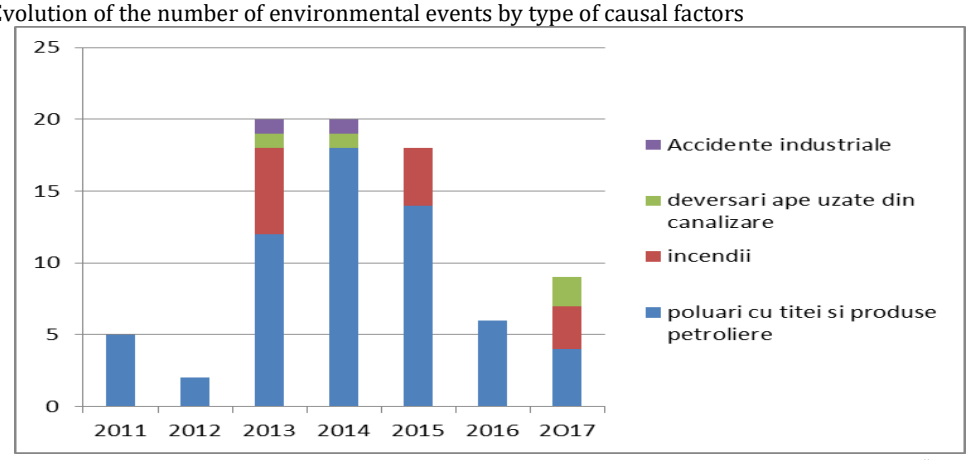
During 2017, the total number of marine and coastal environment pollution events slightly exceeded that recorded in 2016 and 9 against 7 but was well below the average in the succession of the years considered (below the level of 2013, 2014 and 2015). It can also be noticed that the year 2017 meant a relative uniformization of the distribution of the analyzed events by type of causal factors (with the mention that the industrial accidents did not significantly affect the statistics), unlike the situation of the previous years, where the share obviously belonged to the first two factors studied. From the point of view of the phenomenological etymology, one can distinguish between the most common causes of the analyzed events: the technical and technological failures, the deficiencies during the operation of the vessels and the attempts (concretized or not) to evade the products / substances (for oil pollution), short-circuiting of electrical networks, non-observance of the rules of the labor safety technique and errors of the human factor in the passage of technological processes (for fires), uncontrolled discharge of wastewater / household waste, evacuation of substances through the pluvial / sewerage network and losses of substances related components of the plant.

Table no. 26. Situation of accidental pollutants that caused the impact of environmental factors (air, water, soil) in the coastal zone between 2011 and 2016

Year	No. total events	Nature and cause of environmental accident / Total number			
		Pollution of crude oil and petroleum products	Fires	Drainage of sewage waters from sewage	Industrial accidents
2011	5	5	-	-	-
2012	2	2	-	-	-
2013	20	12	6	1	1
2014	20	18	-	1	1
2015	18	14	4	-	-
2016	7	6	-	-	-
2017	9	4	3	2	-

Source: INCD "Grigore Antipa" Constanța

Figure no. II. 49. Evolution of the number of environmental events by type of causal factors



Source: INCD "Grigore Antipa" Constanța

In the Black Sea coastal area administered by the Danube Delta Biosphere Reserve Administration, inspections and controls were carried out regarding the observance of the regulatory works for the sinking of previously sunk marine vessels (e.g. Fortuna S, under the Moldovan flag), respectively the monitoring of the the state of some wrecks (for example, the Turgut S ship under the Georgian flag and the Panamanian ship owner) and the storage of recovered parts, knowing that even in the absence of oil pollution by a wreck a ship can affect the environmental factors (through its structural components). Particular attention is paid to plant and animal species, the conservation of which requires the designation of special areas of conservation and special aquifunctional protection.

Eutrophication indicators

Nutrients

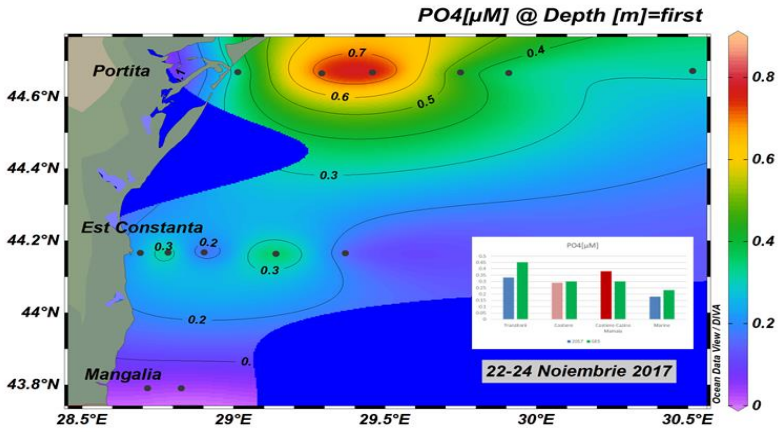
RO 21	Indicator code Romania: RO 21 AEM indicator code: CSI 21

TITLE: NUTRIENTS IN TRANSITIONAL, COASTAL AND MARINE WATER

DEFINITION: The indicator shows the annual trends in concentrations of soluble nitrates and orthophosphates (in winter, expressed in micrograms / L) and the N / P ratio in the sea, the concentration levels (low, moderate, high) winter (nitrate + nitrite) and the concentration of soluble orthophosphates (expressed in micromol / L) in the Black Sea water.

Nutrients, the main cause of eutrophication, were investigated in 2017 by analyzing the samples (N = 181) taken from the water column (0-90m) in three oceanographic expeditions carried out in April, July and November on the network of Portița (6 stations), East Constanta (7 stations) and Mangalia (6 stations). The network of stations covers all the typologies included in the Water Framework Directive (WFD) and the Marine Environment Strategy (DCSMM) - Transitional, Coastal and Marine Waters.
Evolution tendencies were obtained by statistical analysis of historical data (1959/1976/1980 - 2016) and daily samples collected in 2017 at Cazino - Mamaia station 0m (N = 215).
Phosphate concentrations (PO4) 3- recorded in the water column between 0.02 - 1.04 µM (mean 0.16 µM, mean 0.11 µM, standard deviation of 0.16 µM). The maximum values were found at the sediment water interface in the wide area (Est Constanța 6 and 7 stations with depths between 65-85m) at the beginning of the cold season, between November 23-24. Throughout the year, there is a potential risk of non-compliance with good ecological status in coastal waters (Figure II.50).

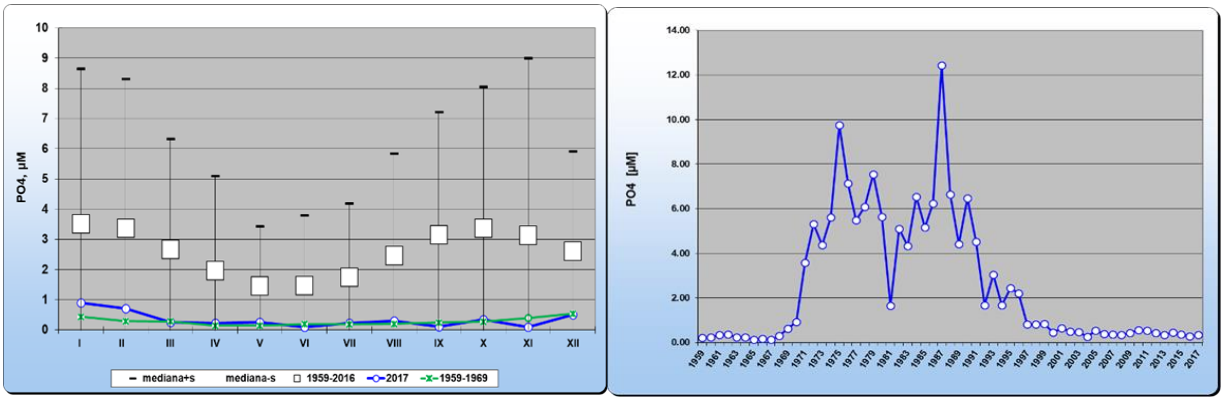
Figure no. II.50. Spatial variability of phosphate concentrations in the waters of the Romanian Black Sea seaside and the comparative situation with the target values for good ecological status, 2017



Source: INCD "Grigore Antipa" Constanța

In the long run, the monthly averages of 2017 differ significantly (t test, confidence interval 95%, p <0.0001, t = 9.7270, df = 22, Dev.St., difference = 0.230) 1959-2016, due to the low values recorded in 2017, comparable to the averages of the period 1959-1969 (figure no.II.51.a).

Figure no. II.51. The comparative situation of multiannual (a) and annual (b) monthly concentrations of phosphates in sea water in Constanta between 1959-2016 and 2017



a b

Sursa:INCD "Grigore Antipa" Constanța

Between 1959 and 2016, annual mean concentrations of phosphate concentrations fluctuated between 0.13 µM (1967) and 12.44 µM (1987), with a decrease from 1987. The average value in 2017, 0.34 µM, falls within the characteristic range of the reference period of the 1960s (multi-annual average 1959-1969 0.28µM ± 0.14µM).

Inorganic forms of nitrogen (nitrates, nitrates and ammonia) recorded heterogeneous values along the entire Romanian Black Sea seashore, amounting to slight exceedances of the value proposed as a target for assessing good ecological status in coastal and marine waters (Table no. II.27).

Table no. II.27. Descriptive statistics of concentrations of inorganic forms of nitrogen in surface waters of the Black Sea - 2017

N=45	Transient (N=6)				Costal (N=8)				Marine (N=31)			
	Min.	Max.	Media	75%	Min.	Max.	Media	75%	Min.	Max.	Media	75%
NO_3, µM	2,46	17,68	9,41	15,19	3,38	13,36	6,64	8,39	1,36	21,20	5,11	7,01
NO_2, µM	0,03	8,18	1,94	2,04	0,04	0,46	0,26	0,34	0,05	0,90	0,23	0,25
NH_4, µM	0,36	12,05	4,89	5,87	0,31	11,63	5,30	7,99	0,21	21,14	3,83	5,21
$\sum N_{anorganic}$ (DIN), µM	8,73	27,63	16,33	19,08	8,51	16,97	12,21	13,60*	2,77	24,09	9,17	10,97*
Targeted value GES, DIN µM				37,50				13,50				10,50

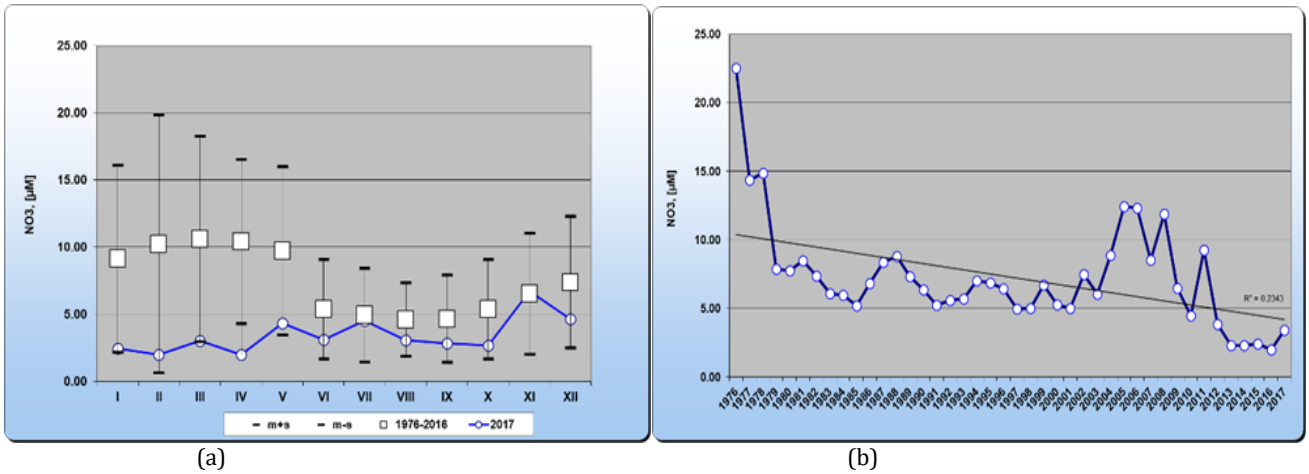
** Values exceed the proposed target value to achieve good environmental status*

Source: INCD "Grigore Antipa" Constanța

Trends of evolution

Azotation - Monthly multi-year averages 1976-2016 and monthly averages from 2017 differ significantly (t test, confidence interval 95%, p <0.0001, t = 4.8775, df = 22, Dev.St. of difference = 0.812) as a result of the low concentrations measured in 2017 (figure no II.52 a). In the long run (annual averages 1976-2016), the annual average of 3,45µM is observed in 2017 (Figure no.52b).

Figure no. II.52. Comparative situation of multiannual (a) and annual (a) monthly (b) concentrations of seawater nitrogen in Constanta between 1976-2016 and 2017

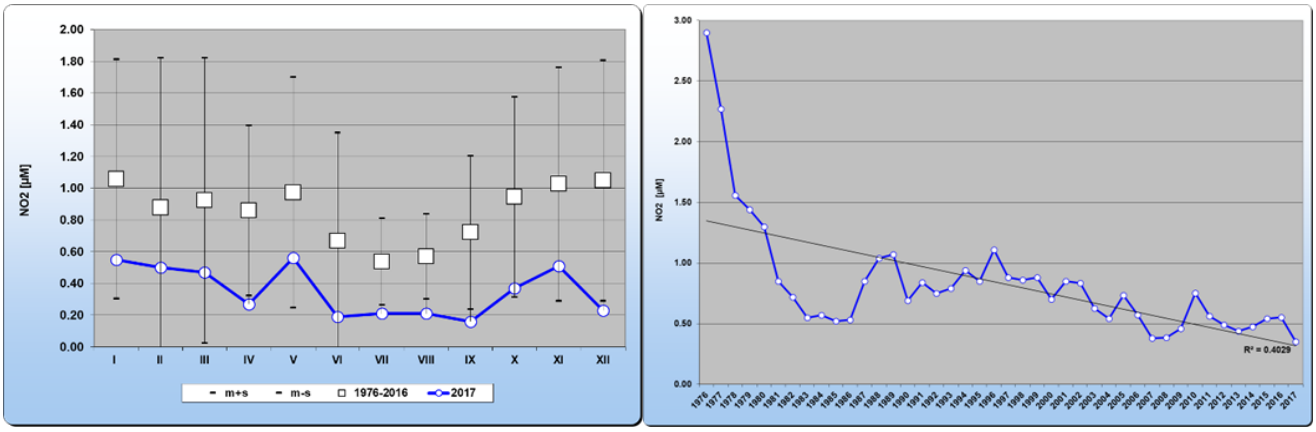


(a) (b)

Source: INCD "Grigore Antipa" Constanța

Azotites - Monthly multi-year averages 1976-2016 and monthly averages from 2017 differ significantly (t test, confidence interval 95%, p <0.0001, t = 7.1733, df = 22, Dev.St. of difference = 0.070) as a result of lower concentrations in 2017 (Figure No II.53 a). In the long run (1976-2016), the minimum historical average, 0,35µM (figure no. II.53 b).

Figure no. II.53. The comparative situation of multiannual (a) and annual (a) monthly (b) concentrations of seawater nitrogen in Constanta between 1976-2016 and 2017

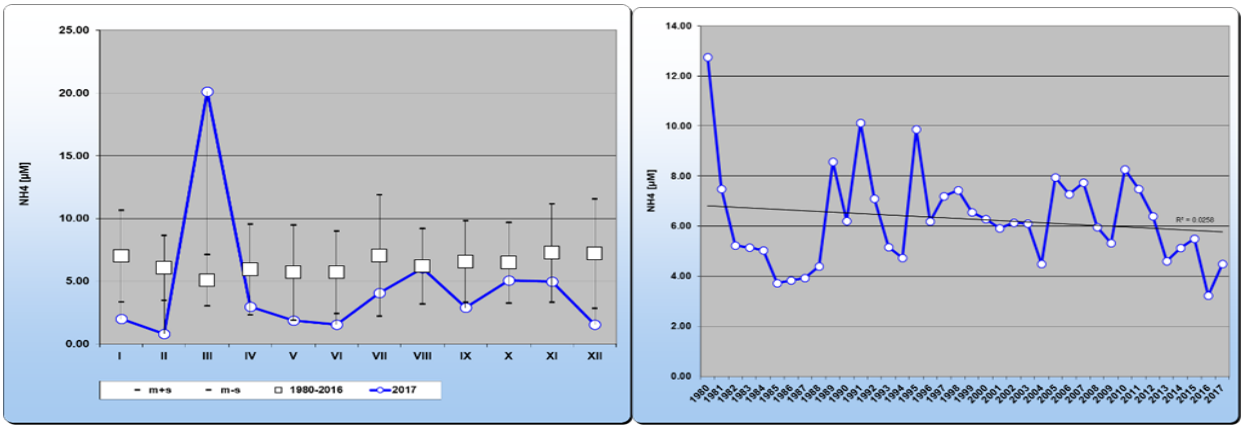


(a) (b)

Source: INCD "Grigore Antipa" Constanța

Ammonium - Multi-yearly monthly averages 1980-2016 and monthly averages of 2017 (excluding March) differ significantly (t test, confidence interval 95%, p <0.0001, t = 6.1140, df = 22, Dev.St. of the difference = 0,538) as a result of lower concentrations in 2017 (figure no II.54 a). In the long-term (1980-2017), the average annual concentration of 4.49 µM is observed in 2017 (figure no.II.54 b).

Figure no. II.54. The comparative situation of the multiannual monthly averages (a) and December (b) of sea water ammonia concentrations in Constanta between 1976-2016 and 2017

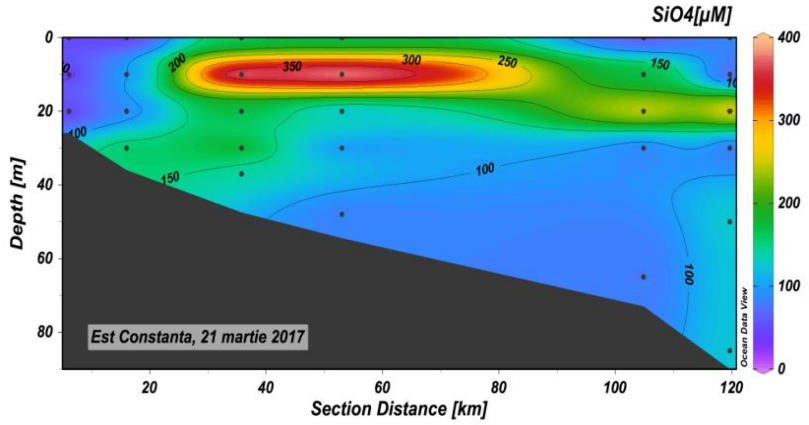


(a) (b)

Source :INCD "Grigore Antipa" Constanța

The extreme values measured in March (March 16 - 93.34 µM) are due to the mineralization of the organic substance produced as a result of algal blooms during the same period.Silica, (SiO4) 4, had concentrations ranging from 1.5 - 395.2 µM (mean 31.7 µM, median 8.8 µM, standard deviation 59.9 µM). The increased variability of the concentration range is due to the extreme values measured in the water column (10-20m) at stations 3, 4, 5, 6 of the Est Constanţa profile, March 2017 (figure no.II.55).

Figure no. II.55. Vertical distribution of silicate concentrations Est Constanta, March 2017

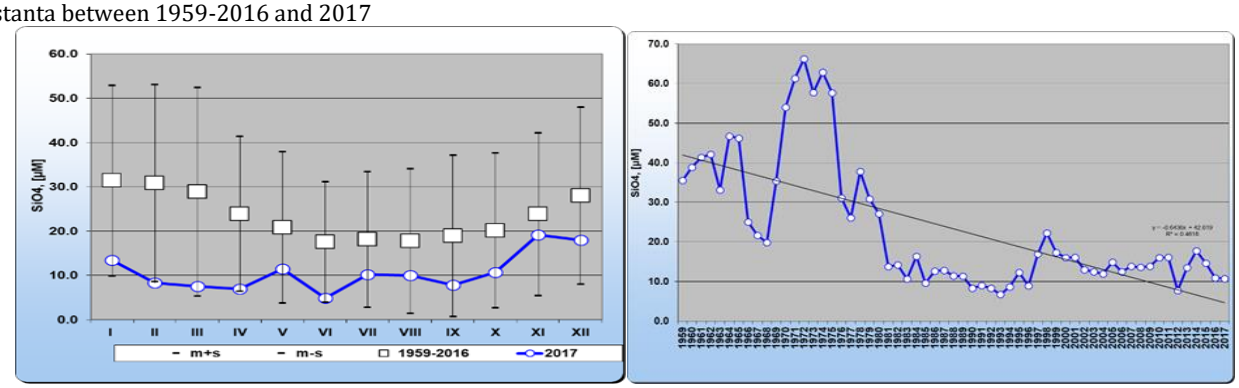


Source: INCD "Grigore Antipa" Constanța

In Constanta, the monthly multi-year averages 1959-2016 and the monthly averages of 2017 differed statistically (t test, confidence interval 95%, p <0.0001, t = 6.4536, df = 22, Dev.St. of difference = 1,959) due to lower levels of concentrations (figure no.II.56 a).

The annual average concentrations of silicates in the sea water in Constanta range from 6.7 µM (1993) to 66.3 µM (1972) and recorded an average of 10.7 µM in 2017 (Figure No.II.56 b).

Figure no. II.56. The comparative situation of the multiannual (a) and annual (b) monthly concentrations of sea silicates in Constanta between 1959-2016 and 2017



(a) (b)

Source :INCD "Grigore Antipa" Constanța

Chlorophyll

RO 23	Indicator code Romania: RO 23 AEM indicator code: CSI 23

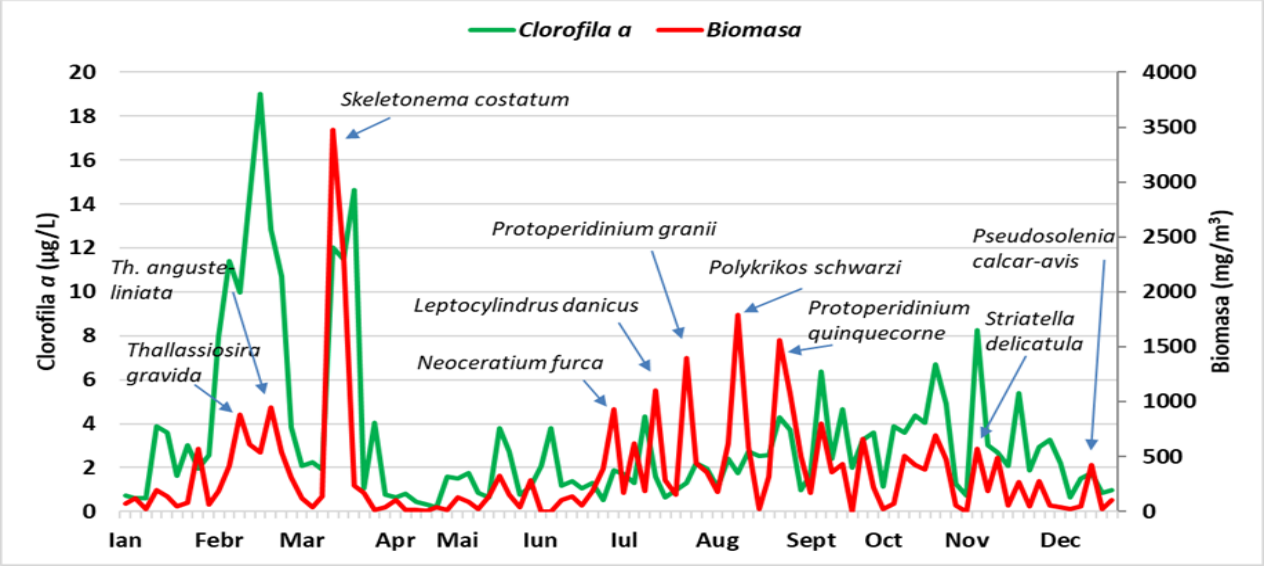
TITLE: CHLOROPHYLL a IN TRANSITIONAL,COASTAL AND MARINE WATERS

DEFINITION: The indicator describes: average annual summer concentrations (expressed in micrograms / L), classification of concentration levels (low, moderate, and high), and summer average concentrations of chlorophyll (expressed in micrograms / L). Chlorophyll a is the biochemical parameter most commonly determined in oceanography, being a unique indicator of plant biomass and marine productivity. In summer, when primary production is limited only by nutrients, the concentration of chlorophyll a is related to the nutrient stock.

Chlorophyll a is one of the most commonly determined biochemical parameters, being an indicator of plant biomass and primary productivity. Due to its importance in the marine ecosystem and the fact that it is easier to measure than phytoplankton biomass, chlorophyll has been included in the list of indicators for the "Eutrophication" field of the EU Water Framework Directive, which is one of the parameters of impact monitored.

The content of chlorophyll determined in 2017 in the shallow waters of Mamaia varied between 0.19 and 19.03µg/L. The seasonal distribution of chlorophyll showed high values at the end of the winter season (values between 10 and 19,03µg/L), corresponding to the development of the species of diatomee Skeletonema costatum, a species characteristic of the cold season (Figure II.57). The peak summer value was recorded in July (4.35µg/L) with the development of the flakes of the Neoceratium forca, Protoperidinium granii, Polykrikos schwarzi. Both the spring and summer end times are generally characterized by reduced concentrations of chlorophyll a (maximum values of 2-3µg/L). In the autumn of 2017 there were higher chlorophyll a values of up to 8.25 µg/L.

Figure no. II.57. Seasonal variation of chlorophyll a (µg / L) in Romanian coastal waters in 2017



Source: INCD "Grigore Antipa" Constanța

II.3.1.4. Impact of climate change on the marine and coastal environment

RO 51	Indicator code Romania: RO 51 AEM indicator code: CLIM 13

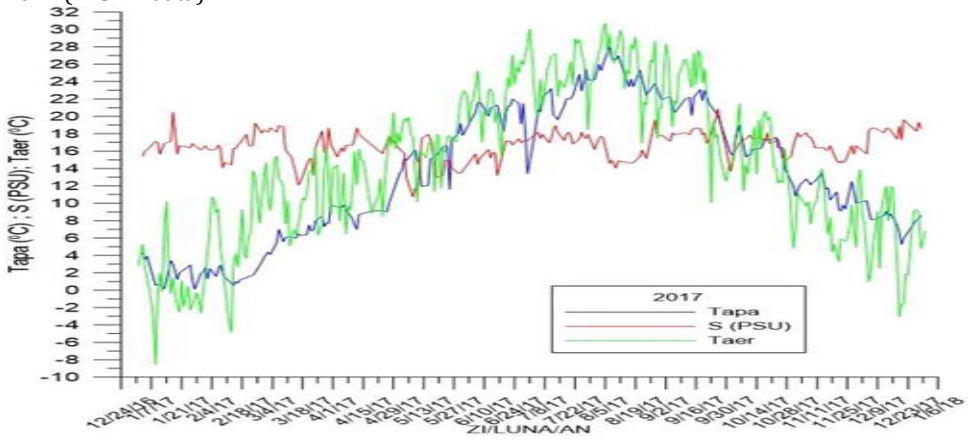
TITLE: SEA WATER TEMPERATURE INCREASE

DEFINITION: This indicator can be defined by: annual average of sea surface water surface temperature anomalies; the annual average of the sea surface water temperature.

Temperature

The evolution of the temperature in the active layer is determined by the periodic changes of the thermal balance and of the air masses dynamics from the air-water interface (Figure II.58), while in the deep layers the vertical distribution is maintained by the geothermal flow.

Figure no. II.58. Daily Air Temperature Evolution (https://giovanni.gsfc.nasa.gov/giovanni/), water temperature and salinity in Constanta, 01 - 12.2017 (INCDM data)

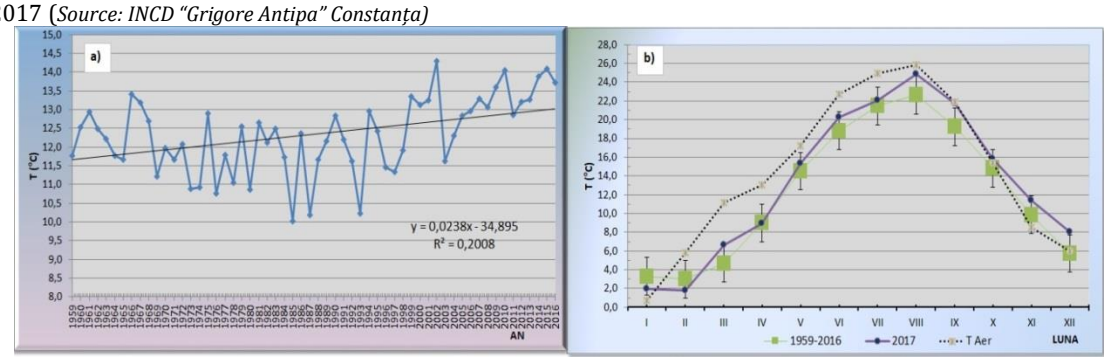


Source: INCD "Grigore Antipa" Constanța

The sea water temperature in Constanta at the 12-month period of the analyzed period was 2.2°C higher than the reference water temperature (1959-2016). The maximum daily temperature measured at 28.03°C was measured on August 6, not at all surprising, given the evolution of air temperature. Compared to the multi-annual situation, the averages in Constanta exceeded them almost throughout the year 2017. The exception is January and February, with a monthly average lower than 1.3°C or 1.1°C compared to the reference period (Figure II.59 a).

Compared with the reference period, 2017 may be characterized as a thermally atypical year with significantly positive differences. Thus, the maximum difference of 2.5° C was determined in September (19.2°C between 1971 and 2016 compared to 21.7° C in 2017) (Figure II. 59b).

Figure no. II.59. Comparison of multiannual (a) and monthly averages (b) of sea water temperature in Constanta between 1959 - 2016 and 2017 (*Source: INCD "Grigore Antipa" Constanța)*



The temperature trend of surface water for the period 1959-2016 is slightly increased by about 0.02° C/year.

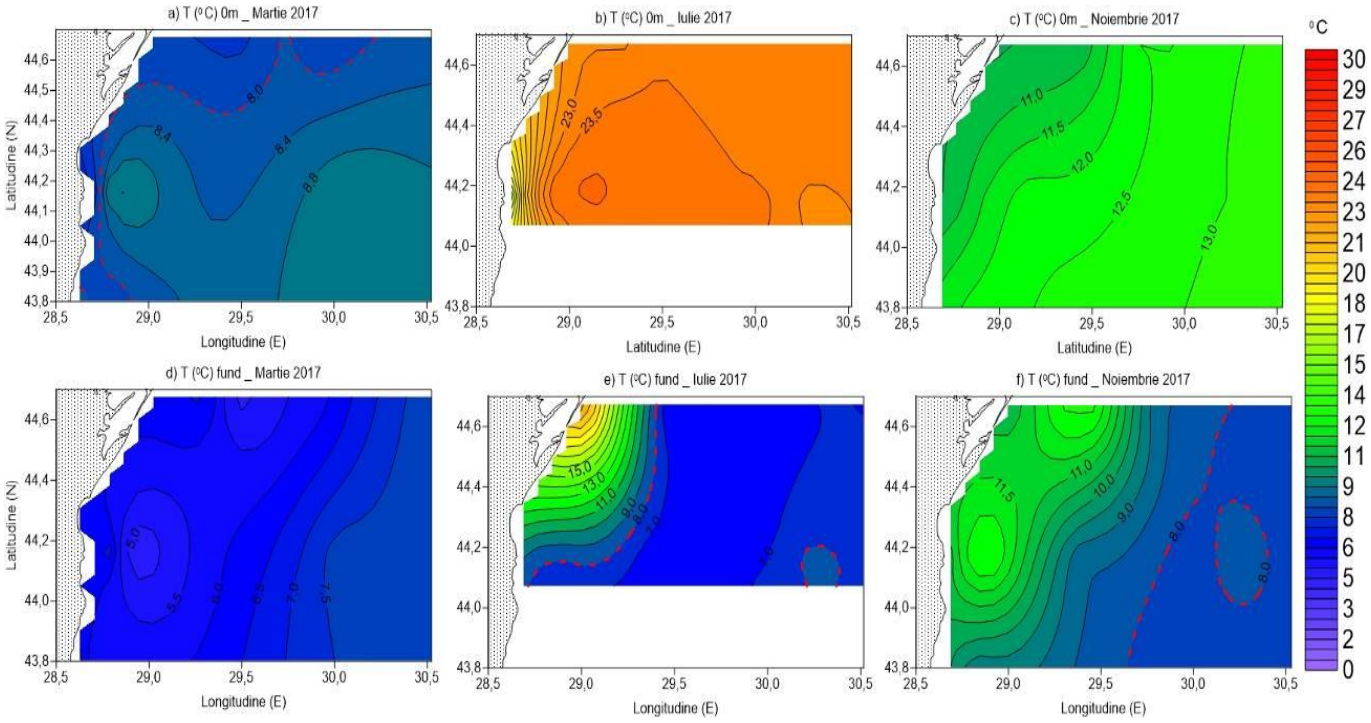
Along the western continental shelf of the Black Sea, throughout the water column, the water temperature recorded values between 4.4°C and 24.0°C. The minimum values belong to the Cold Interlayer (SIR ≤ 8°C) corresponding to the Est-Constanţa 3 station (March) at a depth of about 30m.

In the spring, the temperature distribution is homogeneous from the surface to the bottom layer (figure no. II.60 a and d) with values between 4.4 - 9.2°C. The maximum values were recorded at Constanţa 20m and Constanţa 30m in the surface layer (figure no. II.60 a). In the central part of the Romanian continental plateau, the distribution of surface temperature follows the direction of movement of the anti-cyclonic currents formed due to the strong winds specific to the season.

In the warm season, the temperature is homogeneous from the surface to the bottom (Figure II. 60b), with temperatures in the season-specific values (between 16.6 and 24.0°C). Due to the strong influence between the atmosphere - sea - shore, the minimum temperature of 16.6°C was recorded at the shallow water station, Constanta 5m. Strong stratification is observed from a depth of 30 m deep to the bottom (Figure II. 60 e).

During autumn, the temperature distribution is homogeneous at the surface (figure II. 60c) with values between 10.4 - 13.2°C. The maximum values were recorded at the Portiţa 6 station in the surface layer.

Figure no. II.60. The horizontal distribution of the temperature (a, b, c) at the surface (0m) and (d, e, f) bottom along the Romanian continental shelf - March (a, d) (c, f) 2017 *(Source: INCD "Grigore Antipa" Constanţa)*



RO 50	Indicator code Romania: RO 50 AEM indicator code: CLIM 12

TITLE: GROWTH OF THE SEA AT GLOBAL, EUROPEAN AND NATIONAL LEVEL

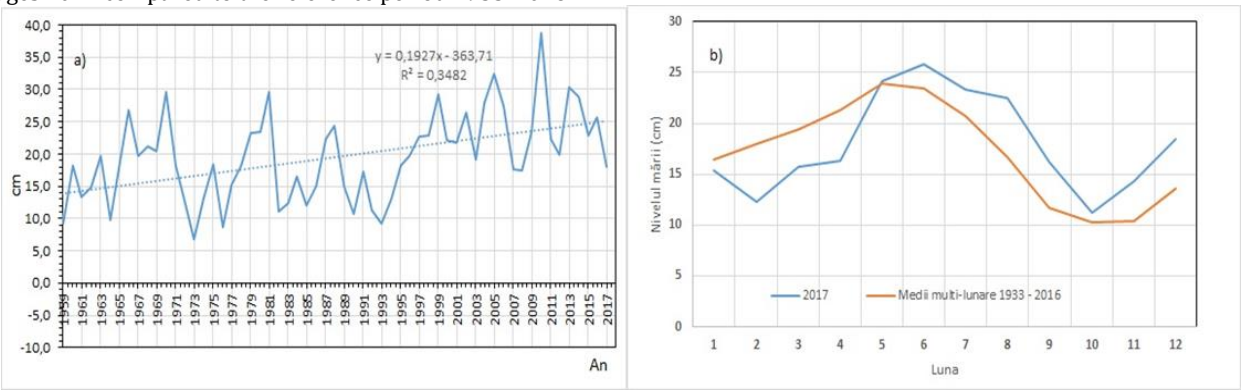
DEFINITION: The indicator reflects the change in the average sea level, the absolute evolution of sea level using satellite data.

Physical indicators of marine water

The sea level, as one of the status indicators of the coastal zone, presented in 2017 three distinct oscillation stages. Compared to the reference period (multiannual monthly averages over the period 1933 - 2016), it was characterized by a constant exceedance of the average monthly values starting with the warm season. A maximum of 25.81cm (2.3cm above the multi-monthly value of the reference period) was recorded in June 2017 and a minimum of 11.28cm in October (1cm above the multi-month value of the reference period).

Regarding the evolution of sea level at the Romanian seaside, we specify that in the long run, the trend is increasing, with a rhythm of approx. 0.19cm/year (Figure no II.61 a).

Figure no. II.61. The oscillations of the Black Sea level at the Romanian seaside: a) annual averages 1933 - 2016, b) monthly averages 2017 compared to the reference period 1933-2016



Source: INCD "Grigore Antipa" Constanța

II.3.2. SITUATION CONCERNING THE MARINE FISHERY FUND

RO 32	Indicator code Romania: RO32 AEM indicator code: CSI 32

TITLE: STATUS OF FISH SEA STOCKS DIVERSITY OF SPECIES

DEFINITION: The indicator refers to the estimated quantity of fish for the main fish species in the Romanian Black Sea sector. The indicator monitors the proportion of overfished stocks in the total number of commercial stocks by fisheries in the Romanian Black Sea sector.

The Romanian fishing area is between Sulina and Vama Veche; the shoreline stretches over a distance of 243km and can be divided into two main geographic and geomorphologic sectors:

- ***the northern sector*** (approximately 158 km in length) stretches between the secondary delta of the Chilia branch and Constanta, composed mainly of alluvial sediment;
- ***the southern sector*** (approximately 85 km in length) stretches between Constanta and Vama Veche, characterized by high cliffs, active cliffs, separated by large beaches with accumulation beaches, often sheltering seaside lakes.

The distance from the shore to the continental shelf (depth 200 m) ranges from 100 to 200 km in the northern sector, 50 km in the southern. The submarine slope of the continental shelf is very low in the north, with a depth of 10 m at the Danube Mouths, while in the southern sector the depth of 10 m is reached at 1.5 km from the shore. The shallow waters below 20 m from the northern part are included in the Danube Delta Biosphere Reservation.

The industrial fishing activity in the Romanian marine sector since 2017 has been done in two ways: active fishing with coastal trawler vessels at depths exceeding 20 m and fishing with fixed gear along the coast in the 12 fishery points, situated between Sulina-Vama Veche, shallow, 3 to 11 m tall, but also at depths of 20 - 60 m / gullies and longs.

The following trends have been reported:

► Evolution of status indicators

- **the stock biomass** for the main fish species (Chart no. II.28) indicates for the year of 2017:

- the sprat population biomass was estimated at about 23,269 tonnes, the smallest value achieved over the last five years (2012-2016), but generally has a natural fluctuation almost normal;
- biomass population of bacalli, was estimated at 20,911 tons, much higher than the estimated values, between 2014 - 2016 (about 300%) and almost equal to the estimates for 2013;
- the biomass of the turbot population was estimated at 1,523 tons, lower than the estimates of 2016 (28%), but higher than the estimates for the 2012-2015 period;
- shark population biomass was estimated at 1,223 tonnes, slightly lower than in previous years (2014-2016).

Table no. II.28. Value of stocks (tonnes) for the main fish species in the Romanian Black Sea sector

Species	2012	2013	2014	2015	2016	2017
Sprat	68.887	56.429	60.000	48.903	114.653	23.269
Bacalli	5.650	19.797	5.550	7.112	6.928	20.911
Gobies	450	300	300	300	300	300
Turbot	628	554	298	999	2.117	1.523
Sharks	1.550	4.483	1.520	1.657	1,550	1.223
Rapana	-	-	13.000	13.000	14.000	17.500

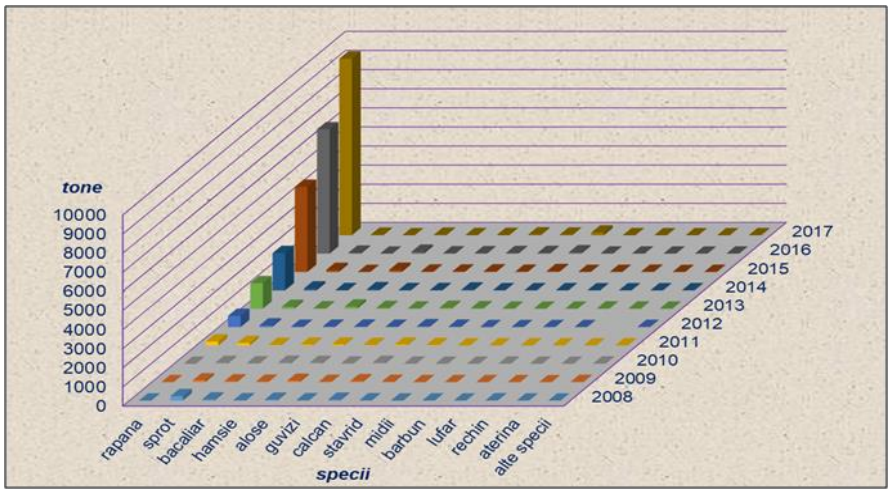
Source: INCD "Grigore Antipa" Constanța

The legalization of trawl fishing in July 2013 led to the development of specialized fishing of the species, with a substantial increase in landings from one year to another (a maximum of 9.244 tonnes in 2017), which led to a decrease pressure on stocks of turbot and sprat, regulated and monitored species, closely followed by the European Commission. The fall in pressure on the two stocks was reflected in the assessments made in 2017.

- **the population structure** shows, as in previous years, the presence of a larger number of species (over 20), of which both the small species (sprat, anchovies, bacalaria, horse mackerel, gobies) and the bigger waist (turbot and scrub of Danube). If the dominance in catches was mainly in Sprattus sprattus / sprats (62,29 - 78,85%) in the period 2000 to 2013, followed by the traditional species: Engraulis encrasicolus / anchovies (1,6-10,42%), Merlangius merlangus euxinus / bacaliar (2.86-6.4%), Gobiidae / gobies (3.5-4.6%), Psetta maxima maeotica / turbot (1.8-12.9%), Trachurus mediterraneus ponticus /horse mackerel (0.6-1.73%), Squalus acanthias / shark (0.1-2.08%), Mugidae / bluefish (0.1-1.2%), Alose / alose (0.9-2% , 72%) and other species (0.55-3.0%) over the last six years, catches of molluscs increase commercial value by catching large amounts of rapana (Rapana venosa). The main species in the catches of 2017 were: rapana - 9,244.3 t; mussels (67 t); anchovy (102 t), sprat (28,738 t); horse mackerel (34,569 t); turbot (42,616) t; alose (9.208 t) and mullet (4 t) (figure no II.125.). In addition to these species, other species also appeared in the catches: atheros (0.085 t), blue fish (0.647 t), grey mullet (1.212 t), gobies (18.853 t), knout goby (1.695 t) Black Sea shad (5,457 t), pontic shad(8,342 t), blue fish (8,042 t), needlefish (2,486 t), thornback ray (0,312 t), sarda (0,295 t) and dasyatis (0,509 t).

Figure no. II.62. Structure of catches (t) of the main species fished in the Romanian marine sector in 2008 - 2017

Source: INCD "Grigore Antipa" Constanța

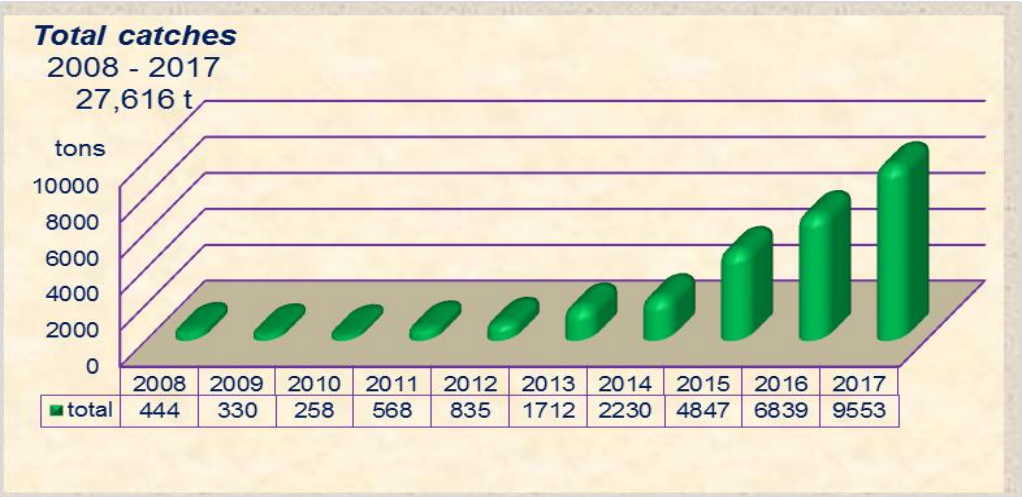


► **Evolution of pressure indicators**

- **the fishing effort** continues the reduction trend reported since 2000. Thus, in 2017, active fishing activated 4 vessels (24-40 m), using in fishing: 2 pelagic trawl, 8 beam trawls, 300 gillnets for turbot, 1 vessel (18-24 m), using: 2 trawls and 19 vessels (12-18 m), using: 38 beam trawls, 1,403 gillnets for turbot, 20 gillnets for Black Sea shad and 3 gillnets for sharks. In fixed-line fishing practiced along the Romanian seaside, a number of 111 boats, respectively 12 boats (under 6 m) and 99 boats (6-12 m), were used: 27 taliens, 12 beams trawls, 978 gillnets for turbot, 392 gillnets for Black Sea shad, 84 gillnets for gobies, 55 gillnets for sharks, 2 beach nets, 24 longlines for gobies, 24 mounts and 94 volts;
- **total catches**: on the Romanian seabed, catch levels and fishing efficiency have fluctuated from one year to the next, mainly due to the reduction in fishing effort (decrease in coastal trawlers and, implicitly, of fishing personnel) and the impact of hydroclimatic conditions on fish populations as well as increased production costs and lack of market outlets. The total level of catches made between 2000 and 2014, with the exception of 2001 and 2002, when over 2,000 tonnes (2431 tonnes or 2116 tonnes), was quite low, ranging between 1390 tonnes / 2006 and 1940 tonnes / 2005, then dropped sharply to 435tone / 2007, 177t / 2008, 331t / 2009 and 258tone / 2010. In the last five years, catches increased by 1711t / 2013, 2231t / 2014, 4847t / 2015 (double compared to 2014), 6,839tone in 2016 (higher than in the previous year by 41.1%) and 9553 tones, in 2017, by 71.59%, higher than in 2016 (figure no. II. 63). The tendency to increase catch levels over the past six years was not due to the ichthyofauna, but to the interest of economic agents in the manual and beam harvesting of rapana gastropods (Rapana venosa), which increased from year to year, from about 65% / 2012, at 98.6% / 2017, of the total catch taken at the Romanian Black Sea coast.

Figure no. II.63. The total catch (t), made in the Romanian Black Sea sector, during 2008 - 2017

Source: INCD "Grigore Antipa" Constanța



► **Evolution of Impact Indicators**

- ***the percentage of species whose stocks are outside safety margins*** has been close to that of previous years, accounting for nearly 90%. Exceeding the safety limits is not only due to exploitation in the Romanian marine sector, most of the fish species having a cross-border distribution, which requires a regional management;

- ***the percentage of complementary species in Romanian catches*** continues to remain at a level
- ***changes in the structure by size classes (age, length)*** compared to the period 2010 - 2016, with the exception of the sprat at which there is a rejuvenation of the group due to a very good addition to the other species in the catches, the biological parameters have been maintained close to the same values;

- ***CPUFE*** (catch per unit of fishing effort), resulting in fishing in the Romanian seaside area:

- with fixed tools:

a. boats < 6 m:

- talien: 1,060.16 kg / talien: 289.13 kg / month, 56.79 kg / day and 19.393 kg / h, at a fishing effort of 3 taliens, 11 months, 56 days, 164 hours and one capture of 3,180.5 kg;
- gillnet for turbot: 1.617 kg / boat, 20.21 kg / gillnet; 323.4 kg / month; 134.75 kg / day; 31.70 kg / hr at a boat effort, 80 gillnets, 5 months, 12 days, 51 hours and a catch of 1.617 kg;
- gillnet for Black Sea shad: 288.14 kg / boat, 29.66 kg / gillnet; 155,153 kg / month; 59.32 kg / day; 22.66 kg / hour; at an effort of 7 boats, 68 gillnets, 13 months, 34 days, 89 hours and a 2.017 kg catch;
- gillnet for gobies: 131.25 kg / boat, 15.44 kg / gillnet; 131.25 kg / month; 24.2 kg / day; 9.55 kg / hr at an effort of: 4 boats, 34 gillnets, 4 months, 14 days, 38 hours and a 525 kg catch;
- longlines: 363 kg / boat, 72.6 kg / longline; 72.6 kg / month; 49.56 kg / day; 21.43 kg / hr, at a boat effort, 5 longlines, 5 months, 15 days, 34 hours and a 363 kg catch;
- manual rapana harvesting: 4,761.8 kg / boat, 2,645.44 kg / diver; 2.164.45 kg / month; 384.02 kg / day; 87.53 kg / hr, at an effort of 5 boats, 9 people, 11 months, 61 days, 272 hours and a catch of 23.809 kg;

a. *boats 6 - 12 m:*

- talien: 667.71 kg / boat, 790.66 kg / talien: 167.94 kg / month, respectively 23.085 kg / day, 6.15 kg / hr at a fishing effort of 28 boats, 24 taliens, 113 months , 882 days, 3,083 hours and a catch of 18,976 kg;
- gillnets for turbot: 1.120,94 kg / boat; 22.47 kg / gillnet; 296.72 kg / month; 164.04 kg / day; 45.34 kg / hr, at an effort of 18 boats, 898 gillnets, 68 months, 123 days, 445 hours and a catch of 20.711 kg;
- gillnet for Black Sea shad: 157.06 kg / boat; 15.51 kg / gillnet; 102.57 kg / month; 41.54 kg / day; 17.88 kg / hr; at an effort of 32 boats, 324 gillnets, 49 months, 121 days, 281 hours and a catch of 5,026 kg;

similar to that of recent years, accounting for 20%;

- gillnet for gobies: 288.33 kg / boat; 37.61 kg / gillnet; 55.81 kg / month; 29.83 kg / day; 10.57 kg / hr; at an effort of 6 boats, 46 gillnets, 14 months, 58 days, 162 hours and a 1,730 kg catch;
- gillnet for shark: 365.0 kg / boat; 26.54 kg / gillnet; 243.33 kg / month; 162.22 kg / day; 38.42 kg / hr; at an effort of 4 boats, 55 gillnets, 6 months, 9 days, 38 hours and a catch of 1,460 kg;
- gobies longlines: 114.6 kg / boat, 30.16 kg / longline; 63.66 kg / month; 27.28 kg / day; 9.55 kg / hr at an effort of 5 boats, 19 longlines, 9 months, 21 days, 60 hours and a catch of 573 kg;
- beach fishing net: 55.0 kg / boat; 55.0 kg / fishing net; 27.5 kg / month; 18.33 kg / day; 4.58 kg / hour at an effort of 2 boats, 2 nets, 4 months, 6 days, 24 hours and a 110 kg catch;
- beam trawl: 100,833.5 kg / boat; 50.416,75 kg / beam trawl; 19.516,16 kg / month; 2,200.0 kg / day; 458.68 kg / trawl, 372.31 kg / hr; at an effort of: 6 boats, 12 beam trawls, 31 months, 275 days, 1,319 trawls, 1,625 hours and a catch of 605.001 kg;
- manual rapana harvesting: 69,970.46 kg / boat; 11.891,12 kg / man; 21,404.02 kg / month; 2.667.66 kg / day; 463.61 kg / h; at an effort of 26 boats, 153 people, 85 months, 682 days, 3.926 hours and a catch of 1,819,232 kg;
- volts: 212.38 kg / boat; 47.44 kg / volt; 40.93 kg / month; 11.96 kg / day; 2.90 kg / hr at an effort of 21 boats, 94 volts, 109 months, 373 days, 1537 hours and a 4.460 kg catch;
- mounts: 58.75 kg / boat; 32.5 kg / mount; 22.94 kg / month; 7.65 kg / day; 2.18 kg / hr at an effort of 16 boats, 24 mounts, 34 months, 102 days, 357 hours and a 780 kg catch;

- **with active tools**:

a. *boats12 - 18 m:*

- gillnet for turbot: 1,629.09 kg / ship, 12.77 kg / gillnet; 471.58 kg / month; 308.97 kg / day; 50.55 kg / hr, at an effort of 11 ships, 1403 gillnets, 38 months, 58 days, 358 hours and a catch of 17,920 kg;
- gillnet for shark: 140.0 kg / ship; 46.66 kg / gillnet; 70 kg / month; 70 kg / day; 28.0 kg / hr; to an effort of 1 ship, 3 gillnets, 2 months, 2 days, 5 hours and a 140 kg catch;
- gillnet for Black Sea shad: 116.0 kg / boat; 5.8 kg /gillnet; 116.0 kg / month; 29.0 kg / day; 3.14 kg / hr; at an effort of 1 ship, 20 gillnets, 1 month, 4 days, 37 hours and a 116 kg catch;

- beam trawl: 253,496.64 kg / ship; 126.748,42 kg / beam trawl; 40,137.0 kg / month; 5140,277 kg / day; 468,161 kg / trawler, 412,477 kg / hr, at an effort of:

b. *boats 18 - 24 m:*

- beam trawl: 382,233 kg / ship, 191,166.5 kg / beam trawl; 47,791.63 kg / month; 3.748.36 kg / day; 170.138,18 kg / trawl, 378,137.34 kg / hr, at a ship effort, 2 beam trawl, 8 months, 102 days, 445 trawls, 989 hours and a catch of 382,333 kg;

c. *boats 24 - 40 m:*

- pelagic trawl: 8.930 kg / ship; 2.551.43 kg / month; 1,050.59 kg / day, 241.351 kg / trawl, 223.25 kg / h, at a fishing effort of 2 vessels, 7 months, 17 days of 19 vessels, 38 trawl beams, 120 months, 937 days, 10,288 trawls, 11,677 hours and a catch of 4,816,440 kg.

fishing, 74 trawls and 80 trawling hours and a catch of 17.860 kg;

- gillnets for turbot: 1,264.5 kg / ship; 8.43 kg / gillnet; 361.28 kg / month; 229.90 kg / day; 41.46 kg / hr, at an effort of 2 vessels, 300 gillnets, 9 months, 11 days, 61 hours and a catch of 2.529 kg;
- beam trawl: 399,360.75 kg / ship; 199.680,37 kg / beam trawl; 55.084,44 kg / month; 4.248,52 kg / day; 464,508 kg / trawl, 372,451 kg / h, at an effort of: 4 vessels, 8 trawls, 29 months, 376 days, 3,439 trawlings, 4,289 hours and a catch of 1,597,443 t.

Measures in order to solve critical issues

► at a national level

- preserving the biological diversity of marine ecosystems and protecting species threatened with extinction;
- the use of selective, non-destructive, cost-effective fishing gear and techniques that respect the environment and protect marine living resources;
- the development of mariculture and the diversification of mariculture products.

► at a regional level

- developing programs / projects for assessing the status of fish stocks and monitoring the environmental conditions and biological factors that influence them;
- the development of a regional fisheries database;
- taking rigorous action to combat illegal fishing.

II.3.3. ANTHROPICAL PRESSURES ON THE MARINE AND COASTAL ENVIRONMENT

RO 33	Indicator code Romania: RO33 AEM indicator code: CSI 33

TITLE: PRODUCTION OF AQUACULTURE

DEFINITION: The indicator monitors aquaculture production as well as nutrient discharges, thus measuring aquaculture pressure on the marine environment. It is a simple and easily accessible indicator but used alone is of limited importance and relevance due to varied production practices and due to local conditions.

In 2017, no marine aquaculture farm operated at the Romanian seaside, so the pressure exerted by this activity was null.

RO 34	Indicator code Romania: RO 34 AEM indicator code: CSI 34

TITLE: FISHING FLEET CAPACITY

DEFINITION: Fishing capacity, defined in terms of tonnage and engine power, and sometimes the number of boats, is one of the key factors determining the fishing mortality caused by the fleet. The average size of vessels is an important parameter for assessing the pressure exerted by fishing activity. Larger vessels generally lead to greater fishing pressure than small sized ones, mainly due to the fishing gear used, the level of activity and the geographical coverage that these vessels can reach.

Table no. II.29. Total boats / active vessels in 2017

Length classes boats/ ships	Total active boats/ships	Fishing technique	Medium length	Medium age	Total GT	Total kW	No of people
< 6 m	12	PG*	5,25	15,2	9,21	189,78	29
6-12 m	65	PG	7,68	21,74	101,64	583,66	154
6-12 m	34	PMP*	8,07	15,97	104,13	540,54	117
12 - 18 m	19	PMP	14,69	7,6	616,41	3.300,41	74
18-24 m	1	PMP	20,2	18	70	272,06	5
> 24 m	4	PMP	25,75	25,8	476	1.217,25	25
TOTAL	**135**		**81,64**	**104,31**	**1377,39**	**6103,7**	**404**
PG* - Ships / boats fishing only with stationary gear (gillnets, taliens, cages, longlines, etc.)							
PMP* - ships / boats fishing both with stationary and towed gear (trawl, net, drag, etc.)							

Source: INCD "Grigore Antipa" Constanța

II.3.4. INTEGRATED COASTAL MANAGEMENT AND MARITIME SPATIAL PLANNING

II.3.4.1. Integrated Coastal Zone Management

II.3.4.2. Maritime Spatial Planning (MSP)

III.SOIL

III.1.SOIL QUALITY: STATE AND TRENDS

III.2.CRITICAL ZONES IN THE CONTEXT OF SOIL DETERIORATION

III.3.PRESSURES ON SOIL QUALITY STATUS

III.4.PROJECTS AND ACTIONS TAKEN FOR THE IMPROVEMENT OF SOIL QUALITY STATE

Chapter III. SOIL

III.1. SOIL QUALITY: STATE AND TRENDS

RO 55	Indicator code Romania: RO 55 AEM indicator code: CLIM 27

TITLE: ORGANIC CARBON FROM SOIL
DEFINITION: Variation of organic carbon content in fertile soil**.**

Water erosion is present in different degrees at 6.3 million hectares, of which about 2.3 million are equipped with anti-erosion works, currently severely degraded; this, along with landslides (about 0.7 million ha), causes soil losses of up to 41.5 t / ha per year. Wind erosion is manifested on nearly 0.4 million hectares, with the danger of expansion, knowing that in recent years some forests and protective curtains have been cleared from areas with sandy soils susceptible to this degradation process. These soils have a small edaphic volume, low water retention capacity and suffer from drought, with low fertility. Excessive skeleton content at the top of the soil affects about 0.3 million ha.

Table no. III.1. The area of agricultural land affected by various productive capacity limiting factors

Factor's name	Affected area thousands ha	
	Total	Arable
Drought	7100	-
Periodic excess of soil moisture	3781	-
Water erosion of soil	6300	2100
Landslides	702	-
Erosion of the soil through the wind	378	273
Excessive skeleton from the surface of the soil	300	52
Soil salinization	614	-
of which with high alkalinity	223	135
Secondary compaction of soil due to improper work ("talpa plugului")	6500	6500
Primary compaction of soil	2060	2060
Formation of crust	2300	2300
Small reserve - extremely low humus in the soil	7485	4525
Strong and moderate acidity	3424	1867
Providing low and very low mobile phosphorus	6330	3401
Providing low and very low mobile potassium	787	312
Providing low nitrogen	5110	3061
Mine trace elements (zinc)	1500	1500
Physical-chemical and chemical soil pollution, of which:	900	-
- pollution with substances carried by the wind	363	-
- soil damage through various excavations / input of anthropogenic filler material	24	-
Land cover with waste and solid residues	18	-

[1] Source: I.C.P.A. The same surface may be affected by one or more restrictive factors

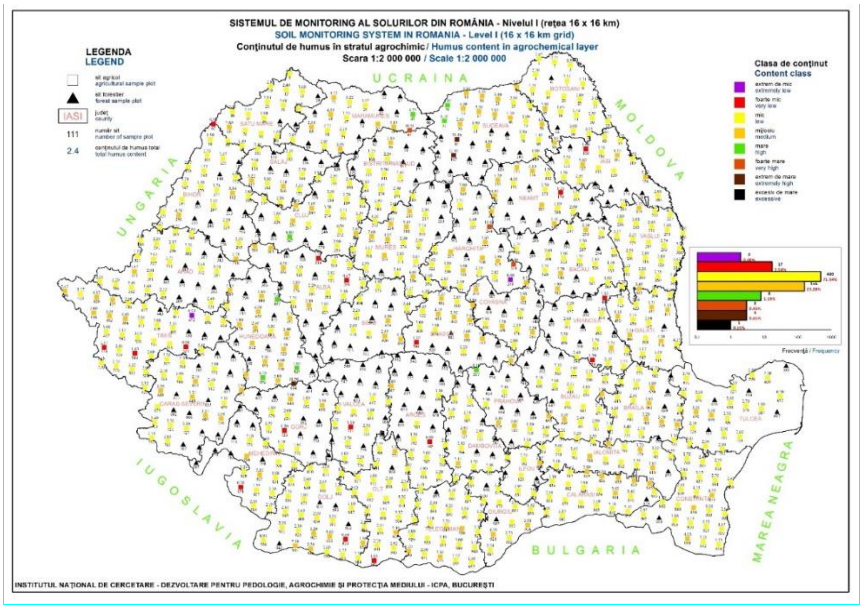
Soil salinization is on about 0.6 million ha, with a tendency of worsening in the irrigated or drained and inappropriately operated areas, or in other areas with potential secondary salinization, which still amount to 0.6 million. Ha. Structure damage and secondary soil compaction ("talpa plugului") is about 6.5 million ha; the primary compaction is present on about 2 million hectares of arable land, and the tendency to form the crust at the surface of the soil, on about 2.3 million hectares. The agrochemical status, analyzed on 66% of the agricultural fund, has the following characteristics:

- strong and moderate acidity of the soil on about 3.4 million ha of agricultural land and medium-strong alkalinity on about 0.2 million ha of agricultural land;
- poor to very poor assurance of soil with mobile phosphorus, about 6.3 million ha of agricultural land;
- poor soil assurance with mobile potassium, on about 0.8 million ha of agricultural land;
- the poor soil assurance with nitrogen on about 5.1 million ha of agricultural land;
- providing extremely low to low soil humus on nearly 7.5 million ha of agricultural land;
- deficiencies of microelements on significant surfaces, especially zinc deficiencies, strongly felt in corn culture on about 1.5 million hectares.

The humus content (H,%) determined in the agrochemical layer of agricultural monitoring sites in the 16x16 km network at country level showed values in the extremely small area - excessively high, with the largest share of soils with low humus content (71.6%), followed by medium soils (23%) (Figure III.1):

Physical-chemical and chemical soil pollution affects about 0.9 million ha; the particularly strong aggressive effects on the soil produce heavy metal pollution (especially Cu, Pb, Zn, Cd) and sulfur dioxide, identified mainly in the critical areas Baia Mare, Zlatna, Copsa Mică. Overall, wind-borne pollution affects 0.363 million ha. Although in recent years a number of industrial units have been closed and others have reduced their activity, soil pollution remains high in areas heavily affected. Oil and salt water pollution from oil, refining and transport is present on about 50,000 ha.

Figure no. III.1. The spatial distribution of the humus content values in the agrochemical layer of the monitoring networks of the 16x16 km.



Source: I.C.P.A.

Soil damage through various excavation works affects about 24,000 ha, constituting the most serious form of soil deterioration encountered in mining operations up to date, such as in the Oltenia mining basin. The quality of land affected by this type of pollution has decreased by 1-3 classes, so some of these areas have become practically unproductive.

Covering the soil with waste and solid residues has led to the removal of about 18,000 ha of agricultural land.

These data are also evidenced by the results of the reinventing of the lands affected by different processes presented in the synthesis in Table no. III.2.

Table no. III.2. General situation of soils in Romania affected by different processes

General Process Name		Code	Area (ha) and degree of damage					
			poor	moderate	strong	very strong	excessive	Total
I	Processes of diverse soil pollution caused by industrial and agricultural activities	**1.** Pollution by day - to - day excavation (mining, quarrying, etc.)	2	16	255	519	23640	**24432**
		2. Deposits, waste dumps, tailings ponds, flood tailings, garbage dumps, etc..	247	63	236	320	5773	**6639**
		3. Inorganic wastes and residues (minerals, inorganic materials including metals, salts, acids, bases) from industry (including mining and quarrying)	10	217	207	50	360	**844**
		4. Airborne substances	215737	99494	29436	18030	1615	**364348**
		5. Radioactive matters		500			66	**566**
		6. Organic waste and residues from the light food industries and other industries	13	19	12	17	287	**348**
		7. Wastes, agricultural and forestry residues	37	65	90	642	306	**1140**
		8. Animal manure	2883	993	363	265	469	**4973**
		9. Human manure		689	11		33	**733**
		17. Pesticides	1058	650	224	77	67	**2076**
		18. Contaminants pathogens		505			117	**617**
		19. Saltwater (from oil extraction)	952	497	408	205	592	**2654**
		20. Petroleum products		473	248	5	25	**751**
		TOTAL I	**220939**	**104176**	**31490**	**20130**	**33350**	**410121**

II	Soils affected by slope processes and other processes	**10.** Surface erosion, deep, slides	944.763	1.013.854	749420	454150	210729	**3372916**
		15. Primary and / or secondary compaction	543371	544556	251268	125555	88526	**1553276**
		16. Pollution by sediment produced by erosion (clogging)	4088	2389	4808	1178	836	**13299**
		TOTAL II	**1492222**	**1560799**	**1005496**	**580883**	**300091**	**4939491**
III	Natural and / or anthropogenic affected soils	**11.** High salinity soils (salt and / or alkaline)	264163	80639	52488	36867	50678	**484835**
		12. Acidic soils	1766295	1926886	716794	186023	18132	**4614130**
		13. Excess water	640738	1075063	420208	199479	185785	**2521273**
		14. Excess or shortage of nutrients and organic matter	8358147	11604450	7549319	3306533	1373196	**3219164 5**
		TOTAL III	**11029343**	**14687038**	**8738809**	**3728902**	**1627791**	**3981183**
General total			**12742504**	**16352013**	**9775795**	**4329915**	**1961232**	**4516149 5[2)]**

Source : Institutul Național de Cercetare - Dezvoltare pentru Pedologie, Agrochimie și Protecția Mediului (I.C.P.A.) și Oficiile Județene de Studii Pedologice și Agrochimice (O.J.S.P.A.)

[2)] Aceeași suprafață poate fi afectată de mai multe procese

III.2. CRITICAL AREAS FOR SOIL DEGRADATION

RO 15	Indicator code Romania: RO 15 AEM indicator code: CSI 15

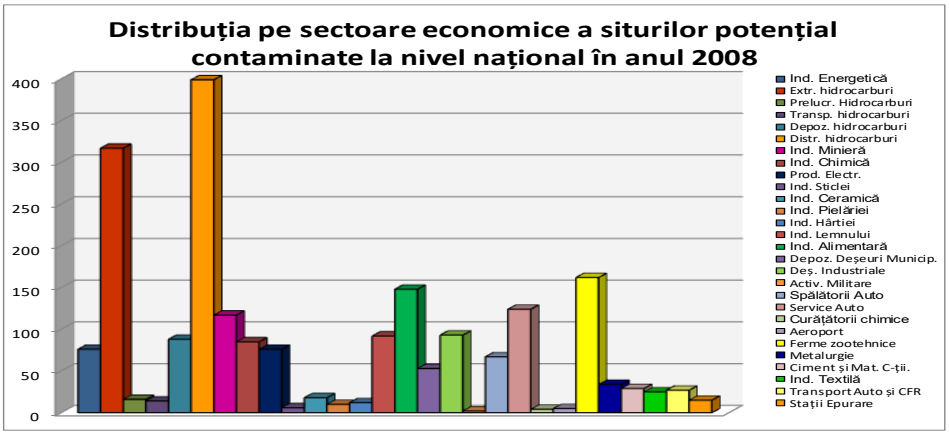
TITLE: Progress in the management of contaminated sites

DEFINITION: The management of contaminated sites shows the progress achieved in five main steps: preliminary study, preliminary investigation, detailed site investigation, implementation of risk mitigation measures, decontamination costs.

A preliminary national inventory of potentially contaminated sites was drawn up in 2008 (Figure III.2) based on the answers to the questionnaires set out in Annexes 1 and 2 of the H.G. no. 1408/2007. According to this inventory, there are 1628 potentially contaminated sites in Romania, broken down by economic sectors as follows:

- 151 sites potentially contaminated by mining and metallurgy;
- 834 potentially contaminated sites by the oil industry;
- 85 potentially contaminated sites in the chemical industry;
- 558 sites potentially contaminated from other activities (activities specific to the industries: energy, electrical and electronics, glass, ceramics, textiles and leather, pulp and paper, wood, cement, machinery, food, military activities, specific land transport activities, airports, specific agricultural and zootechnical activities).

Figure no. III.2. The distribution by economic sectors of potentially contaminated sites at national level in 2008



Sursa: ANPM

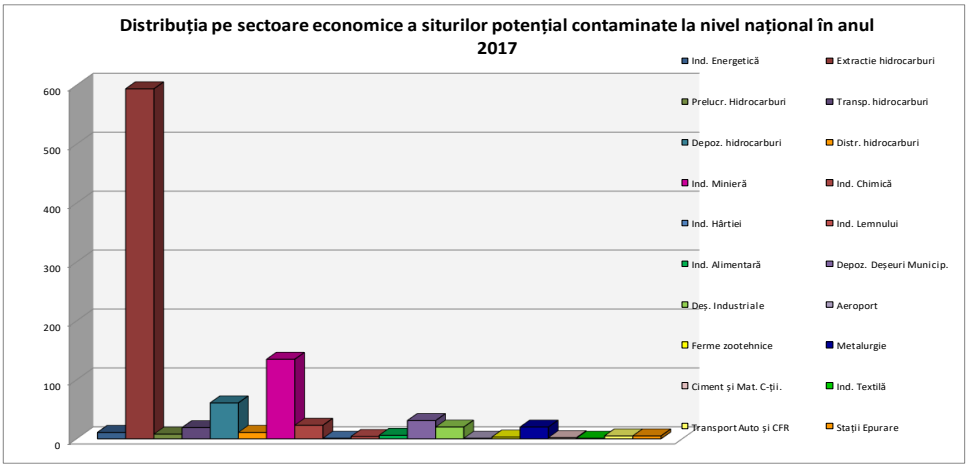
In 2015 it was published in the Official Gazette, H.G. no. 683/2015, respectively the National Strategy and the National Action Plan for the Management of Contaminated Sites in Romania, based on the national inventory updated by the National Environmental Protection Agency and submitted to the Ministry of Environment in 2014 for interministerial approval.

Synthetic situation in 2017, resulting from the January-February 2018 reinventation of sites where anthropogenic activities have been carried out / are being carried out with impact on soil environmental factors, based on information communicated by subordinated and centralized institutions at national level is graphically represented in figures no. III.3 and no. III.4.

According to this reinvention, there were identified 961 potentially contaminated sites broken down by economic sectors as follows:

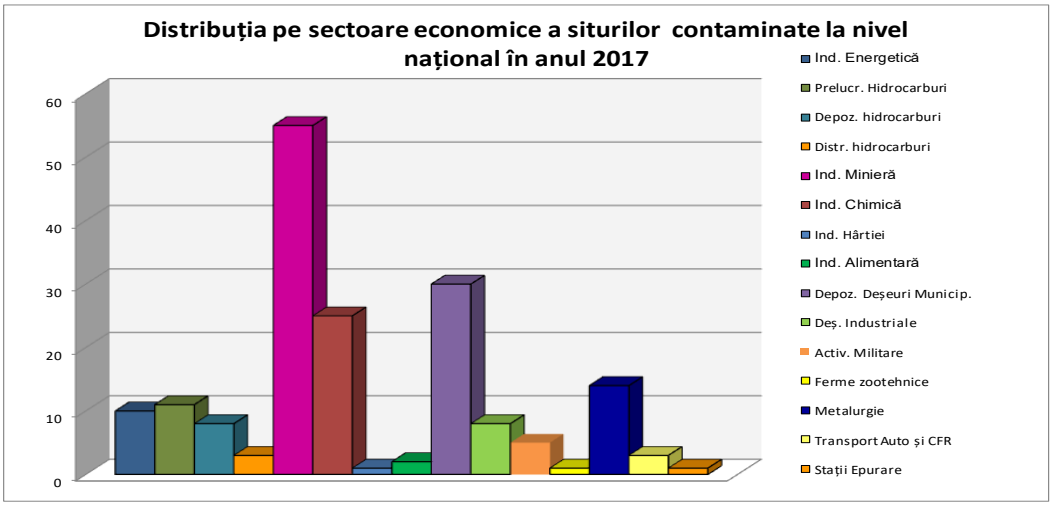
- 155 potentially contaminated sites from mining and metallurgy;
- 693 potentially contaminated sites from the oil industry;
- 23 potentially contaminated sites from the chemical industry;
- 90 potentially contaminated sites from other activities (activities specific to the industries: energy, textiles, machine building, food, specific land transport activities, agricultural and zootechnical activities, etc.).

Figure no. III.3. The distribution by economic sectors of sites potentially contaminated at national level in 2017



Source: NEPA

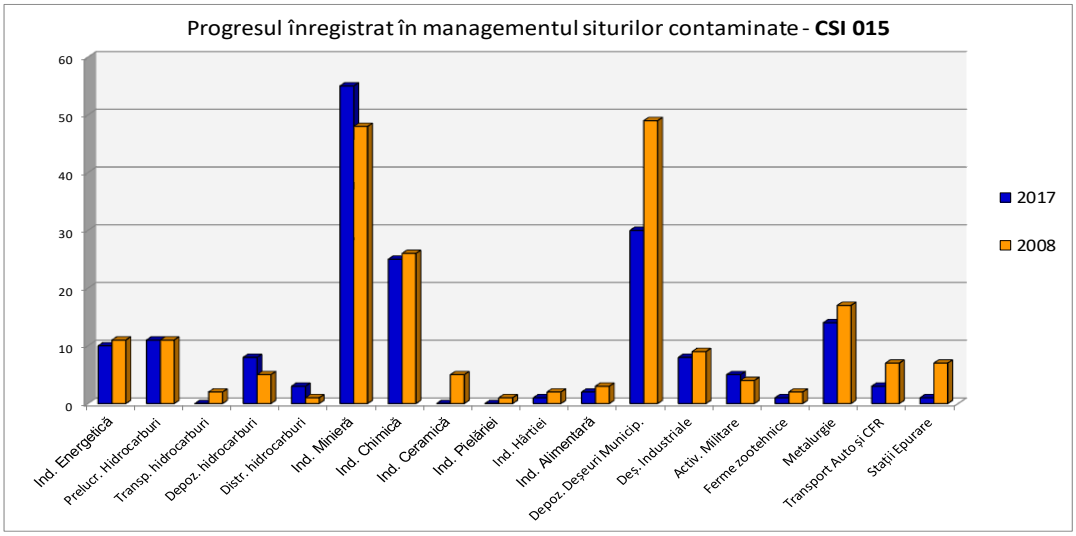
Figure no. III.4. The distribution by economic sectors of the sites contaminated at national level in 2017



Source: NEPA

National Inventory of Contaminated / Potentially Contaminated Sites underlying H.G. no. 683/2015 is in continuous numerical dynamics, so that the total number of sites for some fields of activity is expected to increase following the investigation of the former industrial platforms, the areas where agricultural activities were carried out, the hazardous waste landfills , transport, etc., and for other areas of activity, by implementing measures to minimize the impact on the environment, the number of sites may decrease as shown in Figure no. III.5, according to the AEM indicator: CSI 015 - Progress in the management of contaminated sites. Thus, there is a decrease in the number of contaminated sites as a result of the remediation works mainly carried out in the oil and metallurgical industry, e.g. the Giurgiu, Calarasi, Prahova and Vaslui counties.

Figure no. III.5. Progress in the management of contaminated sites – CSI 015



Source: NEPA

The National Strategy and the National Action Plan for the Management of Contaminated Sites in Romania determine the investment needs and funding priorities for the contaminated sites sector for the 2014-2020 funding period.

The National Strategy takes into account the provisions of the current EU directives related to the protection of the environment and human health, such as Directive 2000/60 / EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy, Directive 98 / 83 / EEC) on the quality of water intended for human consumption, European Council Directive 80/68 / EEC on the protection of groundwater against pollution caused by certain dangerous substances, Directive 79/409 / EEC on the protection of wild birds, Council Directive 92/43 / EEC on the conservation of natural habitats and of wild fauna and flora. An EU directive on soil and subsoil protection is not in place, but there is a common general approach to soil and subsoil contamination issues. This approach is based on risk assessment and management associated with soil and subsoil pollutants, the concept being called "Risk-Based Land Management" (RBLM).

With regard to the estimated cost of risk assessment and remediation of the 961 potentially contaminated sites (Figure III.4), compared to the figure of EUR 7,145 billion reported in 2015 for the 1183 sites potentially contaminated at that level time, we believe that the value will decrease significantly, similar to the 177 contaminated sites (Figure III.5). The sources of funding will be provided by accessing EU structural funds, through state funding, but also through external financing and private sector investment.

Soil pollution following industrial activity (mining, steel, energy, etc.)

The quality of soils is affected to varying degrees by the pollution caused by different industrial activities, as it results from the data obtained from the partial inventory carried out (Chart III.3).

In general, by pollution, in the field of soil protection is meant any disruption that affects soil quality both qualitatively and quantitatively.

The types of soil pollution are those set out in the Methodology for the elaboration of soil studies vol. III (1987) and in the Romanian Soil Taxonomy System (2003) (types of pollution-indicator 28). The degree of pollution was assessed on 5 classes, either according to the percentage reduction of the crop in terms of quantity and / or qualitatively to the production obtained on the unpolluted soil, or by exceeding in different proportions the thresholds established by the Order no. 756/1997.

Code 01. Pollution (degradation) of soils by daily mining, ballast, quarries

Among the forms of pollution of this type, the most serious is the destruction of the soil on large surfaces produced by the mining "up to date" for the extraction of coal (lignite). As a result, the fertile soil layer is lost, various agricultural and forestry uses disappear. According to preliminary data, 24,432 ha are affected at the country level, out of which 23,640 are excessively affected. The largest areas are in Gorj county (12.093 ha), Cluj (3.915 ha) and Mehedinti (2.315 ha).

At the region's level the most affected are the South-West Oltenia region (over 60% of the affected area) and the North-West region (19%).

In Gorj county 3,333 ha this way destroyed, were recultivated, and an area of 12,093.5 ha affected is going to be re-arranged, and in the counties of Vâlcea and Mehedinţi 318 ha and 94 ha respectively are being re-arranged, 1,074 ha and 466 ha respectively, are going to be recultivated.

Important areas are affected by ballasts (about 1,500 ha), which deepen the waterbeds, producing a decrease in the level of ground water and consequently the reduction of the water reserves in the neighboring areas, as well as the soil disturbance through the deposition of extracted materials.

Code 02. Pollution with depots, waste dumps, tailings ponds, flood tailings, garbage dumps, etc.

Increasing the volume of industrial and household wastes poses particular problems, both by occupying important land areas and for human and animal health. Tailings in operation may affect the surrounding lands in the case of the breakage of the dams, the contamination with heavy metals, cyanides from flotation, with other excess elements (as was the case in the previous years in Baia Mare).

The same effect has the preservation tailings ponds (for example, at Bălan Mine - the Fagul Cetății pond in Harghita county - where it is grazing in conditions of pollution of soils with heavy metals).

From the preliminary inventory data it results that this type of pollution affects 6,639 ha in 35 counties of which 5,773 ha excessive. The largest areas are recorded in the West (23.2%), North-East (20.5%), North-West (19.7%), Center (12.3%), South West Oltenia (12,2%).

Code 03. Inorganic wastes pollution (minerals, inorganic materials including metals, salts, acids, bases) from industry (including mining and quarrying)

It is estimated that this type of pollution affects 844 ha, of which 360 ha are excessively affected, most of them in counties with mining activity, steel industry and non-ferrous metallurgy. At the regional level, the largest areas are in the region (South-West Oltenia (30%), South-East (27.4%), North West (13.6%) West (12.9%)).

Code 04. Pollution by airborne substances (hydrocarbons, ethylene, ammonia, sulfur dioxide, chlorides, fluorides, nitrogen oxides, lead compounds etc.)

Also, large areas are affected by emissions from the the fertilizer, pesticides, oil refining, as in Bacau, where the affected low-moderate 104 755 ha of agricultural land, as well as the plants of binders and asbestos. In the case of non-ferrous metallurgy (Baia Mare, Copşa Mică, Zlatna), the content of heavy metals and sulfur dioxide, 198,624 ha, were affected in various degrees, causing diseases of humans and animals in neighboring areas within a radius of 20 -30 km.

Air pollution with substances that produce acid rain (SO2, NOx etc.), such as chemical fertilizer plants, thermal power stations, etc., affects air quality, especially in the case of non-ferrous metallurgy; they contribute to the acidification of soils to varying degrees, causing ground bases to leach to depth and drastically reducing the content of nutrients, especially mobile phosphorus.

Another type of pollution with airborne substances is that produced by the binder and asbestos plants, which, besides air pollution, cover the calcium-containing powdered plants which, in the presence of water, form calcium hydroxide, causing disruptions to the foliar apparatus.

Dismantling of ashes from coal-fired power plants dumps the air, depositing them on soils "enriching" them in alkaline and alkaline earth metals, which can get into groundwater if they are placed on low-level land.

In total, they are affected by air pollution with airborne substances, 364,348 ha, of which 49,081 ha and moderately 99,494 ha. Over 87.3% of the affected areas are located in the Center regions (43%), the North-East region (28.8%), the South-West Oltenia region (15.5%).

Code 05. Radioactive matter pollution is reported in 5 counties (Arad, Bacau, Brasov, Harghita and Suceava)

According to preliminary data, this type of pollution affects 566 ha, out of which 66 ha excessively. This type of pollution occurs in the counties of Arad, Bacău, Braşov, Harghita, Suceava. The largest areas are located in Brasov county (500 ha).

Code 06. Waste and organic waste pollution from the light food industry and other industries

348 hectares are affected, of which 287 ha excessively. The largest areas are in Caraş-Severin (150 ha) and Galaţi (101 ha).

Code 07. Pollution by agricultural and forestry waste.

It is reported on 1.140 ha of which very strong and excessive on 948 ha, and the largest areas are in Bacau County, 626 ha.

Code 08. Pollution by animal manure.

This consists in disrupting soil chemical composition by enriching with nitrates, which can also have toxic effects on groundwater. Are affected in various degrees 4,973 ha, of which moderately high-excess 1,097 ha.

Code 09. Pollution with human manure.

It is probed only in 4 counties and affects 733 ha, of which 33 ha are excessively polluted, but it is present in all localities, especially where there is no sewerage network.

Code 17. Pollution of pesticides

It is reported only in a few counties and amounts to 2.076 ha, of which 1.986 ha in Bacau County, around the Chimcomplex Complex; in general, pollution is poor and moderate.

Code 18. Pollution by contaminating pathogens

It is reported only in four counties, 617 ha, of which moderate on 505 ha and excessive on 117 ha.

Code 19. Saltwater pollution (from oil extraction) or associated with oil pollution

By this type of pollution, the ecological equilibrium of soil and groundwater is deregulated on 2,654 ha, of which 1,205 ha are strongly and excessively. High salt water content in the case of "eruptions" drastically changes soil chemistry in the sense of penetration of sodium into the adsorbent complex, with toxic effects for plants, defending the salt-specific flora, and contaminating the groundwater. Slopes of land appear in the slope lands. Also, the composition of the groundwater, which feeds the wells of the households of the inhabitants of the neighboring territory, may be distorted. The most important reported areas are located in South-Muntenia (30.3%), South-West Oltenia (29.1%) and North-East (27.9%).

Code 20. Oil pollution from extraction, transport and processing

The physical processes that occur due to the oil extraction activity consist in disturbing the fertile soil layer in the exploitation parks (excavated surfaces, road transport network, electricity network, pressure pipes and buried cables or the soil surface, etc.). All of this has the effect of soil compaction, changes in the soil configuration due to excavation, and finally, the reduction of agricultural or forest productive areas.

Chemical processes are determined by the type of pollution:

- petroleum or petroleum and salted water (mixed);
- upward, downward and overlapping pollution.

At national level, the upward pollution is predominant, due in general to the breakage of pressure pipes, the leaks from which can reach the pedophagal canvas. The ability to retain oil in the soil depends on the clay content, which can generally be infiltrated to 70-80 cm and even more, hampering the depollution process. An important indicator illustrating the retention of these products in soil is the carbon / nitrogen ratio (C / N).In the five counties counted (Bacau, Covasna, Gorj, Prahova and Timiş) 751 ha are affected, of which 278 ha strongly-excessively.

Accidental pollution

In the year 2017, 197 environmental incidents were reported at the level of the whole country (Figure III.6).

For the period 2011-2017, their distribution on the main environmental factors is shown in table no. III.3.

Table no. III.3. The distribution of accidental pollution on the main environmental factors of environmental incidents

Environmental factors / Years	2011	2012	2013	2014	2015	2016	2017
Air	12	115	27	24	34	24	38
Water	46	46	53	49	58	53	73
Water/Soil	14	3	3	5	10	3	5
Air/Soil	0	0	0	0	0	5	4
Air/Water	0	0	0	0	0	2	0
Soil	122	343	359	345	297	82	73
Water/Air/Soil	0	0	0	0	0	4	4

Source: NEPA - Centralized Situation of Environmental Events Produced at National Level in 2017

At the level of the economic development regions, the situation is the following:

REGION 1 NORD-EST - Bacău 11, Botoşani 1, Iaşi 7, Neamţ 0, Suceava 3, Vaslui 0 - a total of 22 incidents, mainly due to leakage from the oil pipelines due to the advanced degree of corrosion of pipelines, spills / spills domestic and industrial waste water, deliberate cutting of pumped pipelines, fire / self-ignition at landfills, etc. The environmental factors affected were soil, water and air. There were no environmental incidents in 2017 in Neamţ and Vaslui counties.

REGION 2 SOUTH-EAST - Brăila 7, Buzău 2, Constanţa 33, Galaţi 7, Tulcea 2, Vrancea 2 - a total of 53 incidents - mainly caused by spills of oil and oil products from corroded or cracked pipes, ecology of the golf course Dana 79, waste water

REGION 3 SOUTH MUNTENIA - Argeş 16, Călăraşi 0, Dâmboviţa 8, Giurgiu 4, Ialomiţa 11, Prahova 16, Teleorman 5 - total 60 incidents, caused by oil spills due to pipe failures or their corrosion, pollutant discharges water, non-functioning oil pipelines, fire at the production halls, tank wagon overturns, oil tanker cracks, etc. The environmental factors affected were water, soil and air. No environmental events were recorded in Calarasi County in 2017.

REGION 4 SOUTH-WEST OLTENIA - Dolj 1, Gorj 0, Mehedinţi 2, Olt 2, Vâlcea 3 - a total of 8 incidents, mainly caused by: Domestic waste fires/ Domogled National Park / in a production hall, corroded crude oil transport pipelines. The environmental factors affected were water, soil and air. There were no environmental events in Gorj County.

REGION 5 WEST - Arad 2, Caraş-Severin 4, Hunedoara 3, Timiş 3 - a total of 12 incidents caused by: uncontrolled discharges of technological waters and animal manure, vegetative putrefaction phenomena, tailings management on tailings ponds, fires at installations or self-ignition of waste, accidental wastewater discharges, road accidents to chemical means of transport. The environmental factors affected were water, soil and air.

spills, erroneous barge loading operations, oil field ex-filtration, fire at the production site, gas leakage in transport wagons, liquid manure, vegetation fires / self-ignition at landfills, etc. The environmental factors affected were water, soil and air.

REGION 6 NORTHWEST - Bihor 0, Bistrita-Nasaud 1, Cluj 4, Maramures 1, Satu-Mare 1, Salaj 0 - total 7 incidents caused mainly by: discharges of wastewater or mine water into natural receivers, fires at temporary waste landfills and a well. The environmental factors affected were water, soil and air. In Bihor and Salaj counties no environmental events were recorded in 2017.

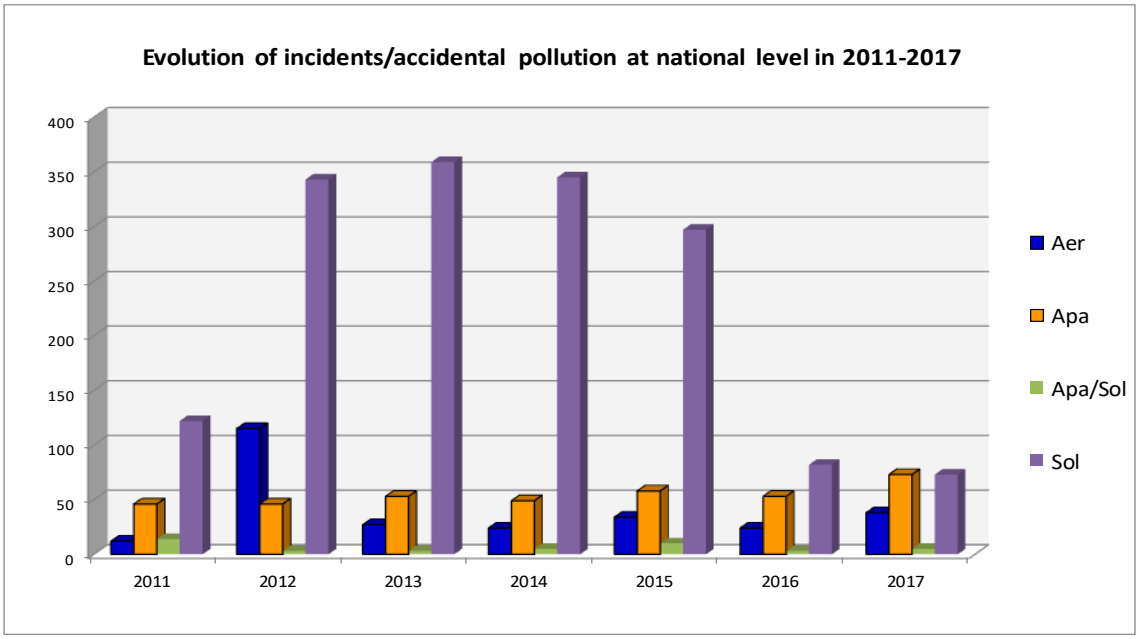
REGION 7 CENTER - Alba 8, Braşov 6, Covasna 0, Harghita 7, Mureş 8, Sibiu 0 - total 29 incidents, mainly caused by: insufficiently treated / tailings wastewater discharges / storage in natural receptors / oils in the rainwater network, household / industrial waste / industrial waste incidents, road accidents to means of transport dangerous chemicals, self-ignition hydrogen leaks at an installation. The environmental factors affected were water, soil and air. In the Covasna and Sibiu counties no environmental events were recorded in 2017.

REGION 8 BUCHAREST-ILFOV - Bucharest 2, Ilfov 4 - total 6 incidents caused by repeated fires at Glina garbage dump, self-ignition of household waste, fire at a furniture store, accidental oil spills from corroded pipelines for transporting petroleum products. The environmental factors affected were water, soil and air.

CONCLUSIONS:

- There is a 12.18% increase in events registered in 2017 (197 events) compared to those reported in 2016 (173 events) and a decrease of 50.25% compared to 2015 (396 events) (Figure III. 6).
- More than 50% of the national environmental events recorded in 2017 are due to the extraction / exploitation of oil fields and the transport of petroleum products, the causes being the same as in the previous year: age, degradation, pipe fracture, attempts theft of oil pipelines and oil products.
- No major impact on environmental or human health factors was reported for environmental events registered in 2017.
- The evolution of national environmental incidents for the year 2017 and the period 2011-2017 as well as the evolution of the pollutants according to the affected environmental factors is shown graphically in figure no.III.6.

Figure no. III.6. Evolution of incidents / accidental pollution at national level in 2011-2017



Sursa: ANPM

III.3. PRESSURES ON SOIL QUALITY STATUS

RO 25	Indicator code Romania: RO 25 AEM indicator code: CSI 25

TITLE: Gross balance of nutrients

DEFINITION: The indicator estimates the nitrogen surplus on agricultural land. This is done by calculating the balance between the total amount of nitrogen entering the agricultural system and the total amount of nitrogen leaving the system per hectare of agricultural land.

The quantity of natural fertilizers (Table no. III.4 and Figure no.III.7) applied in 2017 compared to that used in 1999 is by 24% lower and the area applied decreased compared to the previous years (2014-2016), the average quantity being 17.8 t / ha.

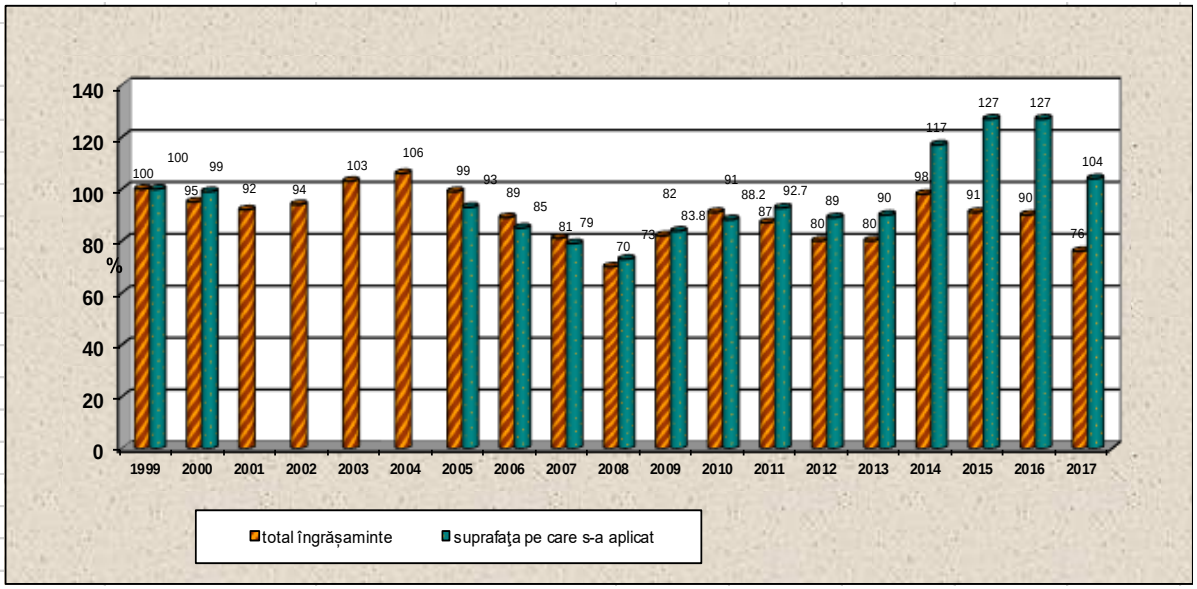
In 2017, only 8.53% of the cultivated land is fertilized with natural fertilizers, which, corroborated with the mineral fertilization data, indicates that it is necessary to balance the nutritional balance of these lands in order to achieve safe and stable crops.

Table no. III.4. The quantity of natural fertilizers applied during the period 1999-2017

Year	Total fertilizer		The surface on which it was applied		Share of application area to cultivated area	Medium quiatity on ha			
						to the applied surface		to the agricultural area	
	t	%	ha	%	%	t/ha	%	t/ha	%
1999	16.685.312	100	680.016	100	6,90	24.537	100	1,129	100
2000	15.812.625	95	674.200	99	6,80	23.454	96	1,068	95
2001	15.327.000	92	-	-	-	-	-	1,032	91
2002	15.746.000	94	-	-	-	-	-	1,061	94
2003	17.262.000	103	-	-	-	-	-	1,173	104
2004	17.749.000	106	-	-	-	-	-	1,200	106
2005	16.570.000	99	632.947	93	6,78	26.179	107	1,124	100
2006	14.900.000	89	575.790	85	6,10	25.877	105	1.011	90
2007	13.498.000	81	536929	79	5,69	25.139	102	0,916	81
2008	11.725.220	70	494.412	73	5,25	23.715	97	0,797	71
2009	13.748.307	82	569.531	83,8	6,05	24,140	98	0,935	83
2010	15.231.715	91	600.052	88,2	6,37	25,38	103	1,04	92
2011	14.510.194	87	630293	92.7	6.70	23.02	94	0.99	88
2012	13.292.617	80	605694	89	6.48	21.95	89.5	0,91	81
2013	13.282.877	80	613563	90	6.53	21.65	88.2	0,91	81
2014	16.261.702	98	795031	117	8.47	20.45	83.3	1.11	98
2015	15.212.325	91	864218	127	9.20	17.60	71.7	1.04	92
2016	14.927.000	90	862330	127	9.18	17.31	70.5	1.02	90
2017	12.625.073	76	708.364	104	8.53	17.8	72.5	0.86	76

Source: Ministry of Agriculture and Rural Development

Figure no. III.7. The quantity of natural fertilizers applied during the period 1999-2017



Source: Ministry of Agriculture and Rural Development

III.4. FORECASTS AND ACTIONS TAKEN FOR THE IMPROVEMENT OF SOIL QUALITY STATE

RO 26	Indicator code Romania: RO 26 AEM indicator code: CSI 26

TITLE: Area for organic farming
DEFINITION: The indicator quantifies the share of the area earmarked for organic farming (the sum of the current areas of organic farming and the areas undergoing conversion) as a proportion of the total agricultural area.

Organic farming is a production system that attaches great importance to protecting the environment and animals by reducing or eliminating genetically modified organisms and synthetic chemicals such as fertilizers, pesticides and promoters of growth regulators (Table no. III.5, Figure no. III.8 and Table no.III.6).

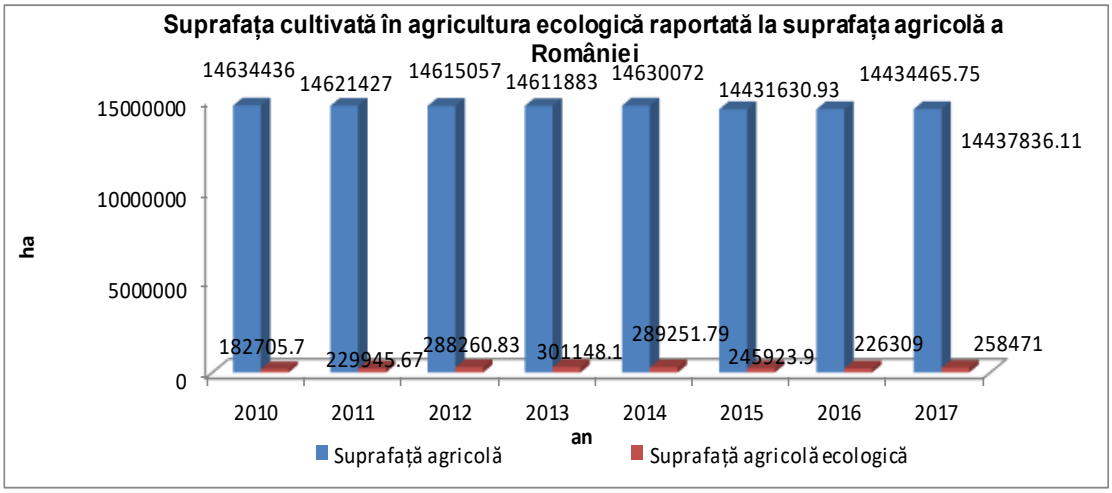
Table no. III.5. Dynamics of operators and areas in organic farming

Indicator	2010	2011	2012	2013	2014	2015	2016	2017
Number of certified operators in organic farming	3155	9703	15544	15194	14470	12231	10562	8434
Total area in organic farming (ha)	182706	229946	288261	301148	289251.79	245923.9	226309	258470.927
Cereals (ha)	72297.8	79167	105149	109105	102531.47	81439.5	75198.3	84925.51

Dried and proteinaceous pulses for the production of grain (including grains and leguminous seeds and mixtures) (ha)	5560.22	3147.36	2764.04	2397.34	2314.43	1834.352	2203.78	499466
Tuberculous and root plants total (ha)	504.36	1074.98	1124.92	740.75	626.99	667,554	707.026	665.54
Industrial crops (ha)	47815.1	47879.7	44788.7	51770.8	54145.17	52583.11	53396.9	72388.33
Green harvested plants (ha)	10325.4	4788.49	11082.9	13184.1	13493.53	13636.48	14280.5	20350.75
Other crops on arable land (ha)	579.61	851.44	27.77	263.95	29.87	356.22	258.47	88.25
Vegetables (ha)	734.32	914.08	896.32	1067.67	1928.36	1210.08	1175.33	1458.78
Permanent crops (ha) vineyards, cultivated fruit bushes	3093.04	4166.62	7781.33	9400.31	9438.53	11117.26	12019.8	13165.41
Permanent crops (ha) pastures and meadows	31579.1	78197.5	105836	103702	95684.78	75853.57	57611.7	50685.74
Uncultivated land (ha)	10216.8	9758.55	8810.73	9516.33	9058.66	7,225,852	9457.2	9747.94

Source: Inspection and certification bodies; MADR ** Eurostat classification*

Figure no. III.8. The area cultivated in organic farming relative to the agricultural surface of Romania



Source: MADR

Table no. III.6. Evolution of certified livestock population[1)]

Indicator	U.M	2010	2011	2012	2013	2014	2015	2016
Livestock cattle (total)	**heads**	**5358**	**6894**	**7044**	**20113**	**33782**	**29313**	**20093**
Cattle for slaughter	heads	0	314	745	1101	244	491	478
Milk cows	heads	3026	3599	2643	10088	23906	21667	15171
Other cattle	heads	2332	2981	3656	8924	9632	7155	4444
Porcine total	**heads**	**320**	**414**	**344**	**258**	**126**	**-**	20
Pigs for fattening	heads	0	201	212	125	18	43	13
Breeding sows	heads	30	89	42	77	33	14	7

Other pigs	heads	290	124	90	56	75	29	0
Ovine total	**heads**	**18883**	**27389**	**51722**	**72193**	**114843**	**85419**	**66401**
Sheep, breeding females	heads	11285	21945	-	47472	96737	-	**-**
Other sheep	heads	7598	5444		24721	18106	-	**-**
Caprine (total)	**heads**	**1093**	**801**	**1212**	**3032**	**6440**	**5816**	**218**
Goats, breeding females	heads	966	596	-	-	5637	-	**-**
Other goats	heads	127	205			803	-	**-**
Birds total	**heads**	**21580**	**46506**	**60121**	**74220**	**57797**	**107639**	**63254**
Chickens of meat	heads	0	150	37	-	-	-	**-**
Laying hens	**heads**	**21580**	**46356**	**60064**	**-**	**57797**	**-**	**-**
Breeding birds	heads	-	-	-	-	-	-	**-**
Other birds	heads	-	-	20	-	-	--	**-**
Turkeys	heads	-	-	20	-	-	-	**-**
Ducks	heads	-	-	-	-	-	-	**-**
Geese	heads	-	-	-	-	-	-	**-**
Others	heads	-	-	-	-	-	-	**-**
Equine	**heads**	**284**	**282**	**142**	**200**	**626**	**485**	**-**
Bees (in number of hives)	**bee families**	**64836**	**77994**	**85225**	**81772**	**81583**	**-**	**86195**
Other animals	**heads**	**0**	**0**	**5217**	**4878**	**2667**	**79654**	**-**

Souce: MADR [1)] dota of 2017 are missing

IV.LAND USE

IV.1.STATE AND TRENDS

IV.2.THE ENVIRONMENTAL IMPACT OF CHANGING LAND USE

IV.3.DETERMINANT FACTORS OF CHANGING LAND USE

IV.4.PROJECTS AND ACTIONS CONCERNING THE LAND USE

Chapter IV. LAND USE

IV.1. STATE AND TRENDS

IV.2. IMPACT OF THE LAND USE CHANGE ON THE ENVIRONMENT

RO 44	Indicator code Romania: RO 44 AEM indicator code: SEBI 13

TITLE: FRAGMENTATION OF NATURAL AND SEMI-NATURAL AREAS
DEFINITION: The indicator shows differences in the average of natural and semi-natural surfaces, relying on land cover maps made by interpreting satellite images.
The indicator is intended to address the issue of integrity of ecosystems by providing a "measure" of land disintegration across the whole of Romania.

Changing land use may cause habitat fragmentation and may affect the distribution of species that occupy a particular area.
Conversion of land to urban expansion, transport infrastructure development, industrial, agricultural and tourism development is the main cause of the fragmentation of natural and semi-natural habitats. At present, it is estimated that about 6.5% of the country's surface is intended for housing construction. Chaotic building, without respecting a coherent and consistent urbanism strategy, leads to the unusual use of areas for construction and their expansion to the detriment of natural ones.
Uncontrolled urban development and the transfer of rural population accompanied by the destruction of urban ecosystems (green areas, green spaces, tree felling, nesting, etc.) and insufficient measures for the proper collection and treatment of waste and water waste have a significant negative impact on biodiversity.

IV.3. DETERMINANT FACTORS OF CHANGE OF LAND USE

RO 14	Indicator code Romania: RO 14 AEM indicator code: CSI 14

TITLE: LAND OCCUPANCY
DEFINITION: The indicator shows the quantitative change in the occupation of agricultural, woodland, semi-natural and natural land by the expansion of urban and artificial land. Includes waterproofed construction and urban infrastructure areas as well as urban green spaces, sports and recreation complexes.

In the year 2014 the surface of the land fund was covered with the following categories of land use according to Table no. IV.1 and Fig. IV.1.

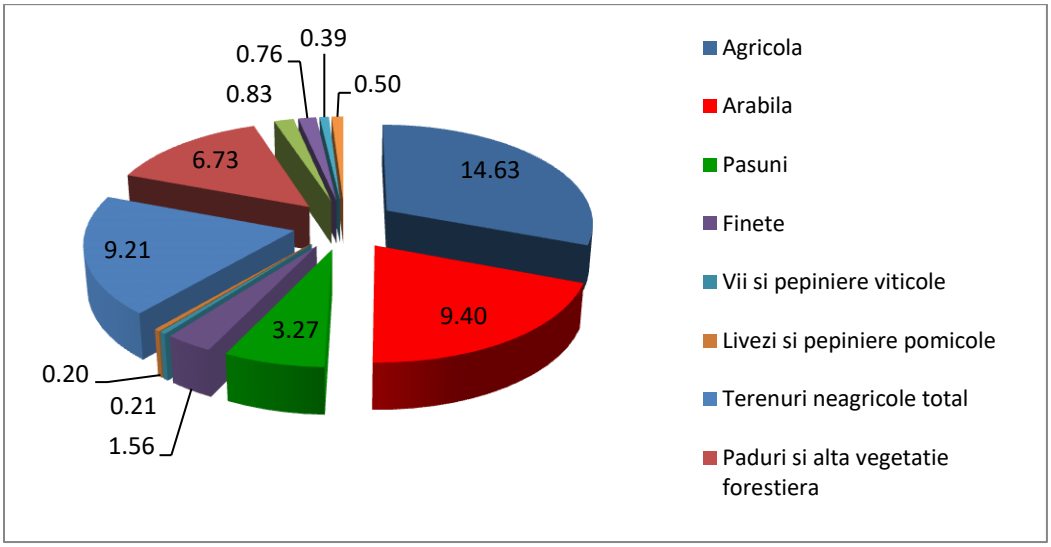
Table no. IV.1. Land use allocation in 2014 by use categories

Land surface area by mode of use	Hectare
Agricultural	14630072
Arable	9395303
Psture	3272165

Meadows	1556246
Wine vineyards and vineyard nurseries	209417
Orchards and nurseries	196941
Non-agricultural land, total	9208999
Forests and other forest vegetation	6734003
Covered with waters, puddles	831495
Covered with construction	758285
Communication routes and railways	389795
Degraded and unproductive lands	495421

Source: NIS, TEMPO-Online Database http://statistici.insse.ro/shop/index.jsp?page=tempo3&lang=ro&ind=AGR101A

Figure no. IV.1. Distribution of the land fund in 2014 by usage categories (data expressed in mil. ha)



Source: NIS

RO 68	Indicator code Romania: RO 68 AEM indicator code: TERM 08

TITLE: OCCUPANCY OF THE LAND BY TRANSPORT INFRASTRUCTURE
DEFINITION: The indicator shows the land occupied by the transport infrastructure.

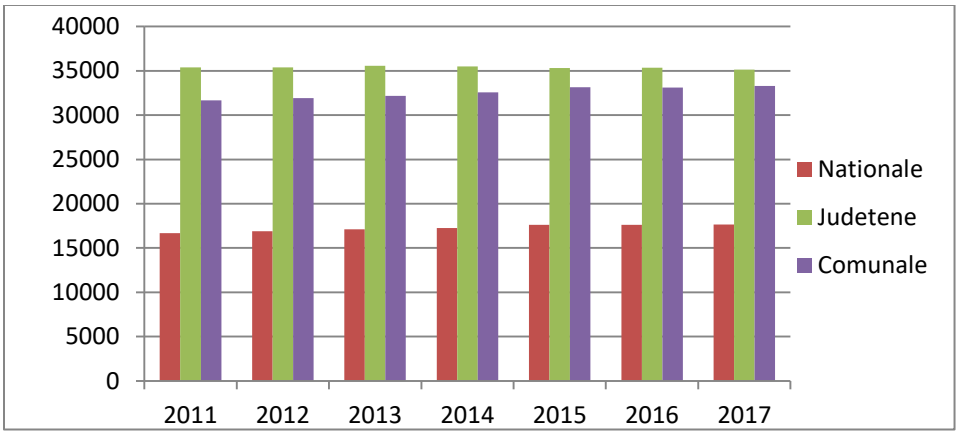
The transport infrastructure in Romania in the period 2011-2017, according to the available national statistical data, shows an insignificant increase (Table IV.2, Table IV.3, Figure IV.2, Figure IV.3).

Table no. IV.2. Road transport infrastructure in Romania between 2011 and 2017

Categories of roads	Lengths of kilometers per year						
	2011	2012	2013	2014	2015	2016	2017
National	16690	16887	17110	17272	17606	17612	17612
County	35374	35380	35587	35505	35316	35361	35361
Municipal	31674	31918	32190	32585	33158	33107	33107

Source: NIS, TEMPO-Online Database

Figure no. IV.2. Road transport infrastructure in Romania between 2011 and 2017



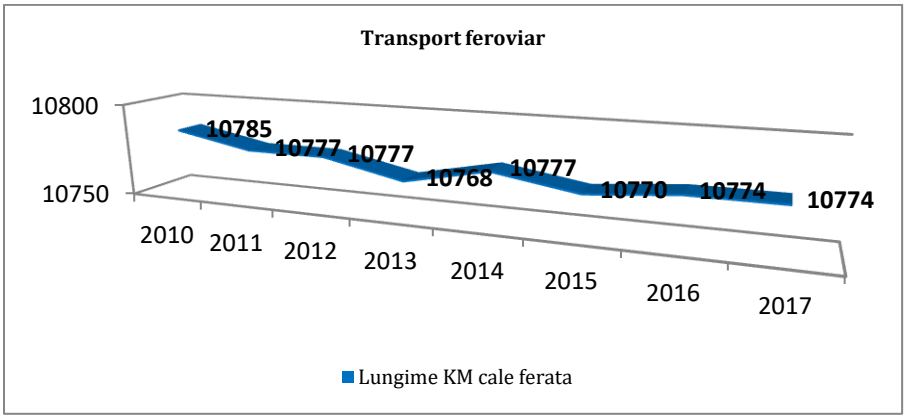
Source: NIS, TEMPO-Online Database

Table no. IV.3. Railway Infrastructure in Romania in 2011-2017

Rail transport	Year						
	2011	2012	2013	2014	2015	2016	2017
Railway length (km)	10777	10777	10768	10777	10770	10774	10774

Source: NIS, TEMPO-Online Database

Figure no. IV.3. Railway Infrastructure in Romania in 2011-2017



Source: NIS, TEMPO-OnlineDatabase

IV.4. FORECASTS AND ACTIONS CONCERNING THE USE OF LANDS

Territorial cohesion implies the appropriateness of natural and anthropogenic resources to the needs of socio-economic development in order to eliminate disparities and disfunctions between different spatial units while preserving the natural and cultural diversity of the regions.

Territorial settlement has a predominantly strategic character, establishing spatial development directions, which are determined on the basis of multidisciplinary analyzes and interdisciplinary syntheses. The documents resulting from this process are both technical in spatial coordination on the principle of maximizing the potential synergies of sectoral and legal sectoral development, since, once the documentation has been approved, they become rules of spatial development for that territory.

Territorial planning plans are the technical foundation and the political and legal assumption of strategies for access to funding for programs and projects from national and European funds, in particular through the Regional Operational Program and Sectorial Operational Programs. As part of the implementation of the National Spatial Planning Plan, by September 2008, five sections were approved by law: transport networks, water, protected areas, the network of localities, natural risk areas, tourist areas.

Under the specific conditions of Romania, the clarification of the legal regime of ownership of land - either intravilan (buildable) or extravilan (mainly agricultural, forestry or protected natural perimeters) - through an appropriate cadastral system, is the main object of territorial development and precedes the establishment the technical and economic regime through urban planning documentation. So far, several programs and strategies have been adopted with relevance to the fight against drought, land degradation and desertification, of which the most important are:

- National Strategy for Sustainable Development;
- National Program for Environmental Protection;
- National Strategy for Risk Management of Flood Production;
- National Program for Rehabilitation of Pastures;
- Forestry Development Strategy;
- National Rural Development Program;
- National Development Plan.

The National Strategy and Plan for Climate Change (Combat and Adaptation), promoted by H.G. no. 529/2013. Starting with November 2007, farmers in Romania benefit from the provisions of a "Code of Attitudes for Adaptation of Agricultural Technologies to Climate Change", elaborated in the framework of a European Union project involving Romania.

V. NATURAL PROTECTION AND BIODIVERSITY

V.1.STATE OF CONSERVATION AND TRENDS OF BIODIVERSITY COMPONENTS

V.2.THREADS ON BIODIVERSITY AND BIODIVERSITY PRESSURES

V.3.NATURAL PROTECTION AND BIODIVERSITY: FORECASTS AND ACTIONS

Chapter V. NATURAL PROTECTION AND BIODIVERSITY

V.1. STATE OF CONSERVATION AND TRENDS OF BIODIVERSITY COMPONENTS

V.1.1. TRENDS ON THE CONSERVATION OF ECOSYSTEMS AND HABITATS

RO 40	Indicator code Romania: RO 40 AEM indicator code: SEBI 005

TITLE: HABITATS OF EUROPEAN INTEREST IN ROMANIA
DEFINITION: The indicator shows the changes in the conservation status of the habitats of European interest.

The indicator shows the evolution of the conservation status of European interest habitats (listed in Annex I of the Habitats Directive) and is based on the data collected / monitored in accordance with the reporting obligations under Article 17 of the Habitats Directive. The conservation status of species and habitats of community interest is assessed nationally and biogeographically, on a 3-tier scale, known as the "traffic light", as follows:

- **Favorable conservation status: green indicator -** any pressure or threat that influences the habitat is not significant and the habitat is viable in the long run;
- **Inappropriate unfavorable conservation status: orange indicator -** used for situations where a change in existing administration or policy is required, but the danger of disappearance is not so great;

Totally inadequate unfavorable conservation status: red indicator - serious threats and pressures affecting habitat maintenance.

The "unfavorable" category was divided into two classes to allow reporting of further improvement or deterioration:

- U1 - Unfavorably inadequate
- U2 - Unfavorably bad.

For defining this indicator at national level, relevant are the information reported by Romania in the country report in accordance with Article 17 of the Habitats Directive for the reporting period 2007-2012. Romania has prepared and submitted to the European Commission in 2013 the first report on the status of the conservation of habitats of community interest.

The number of habitats in Annex I of the Habitats Directive for biogeographical regions for which reports were submitted to the Commission in accordance with Article 17 is presented in table no. V.1:

Table no. V.1 - Number of habitats reported according to Annex I of the Habitats Directive

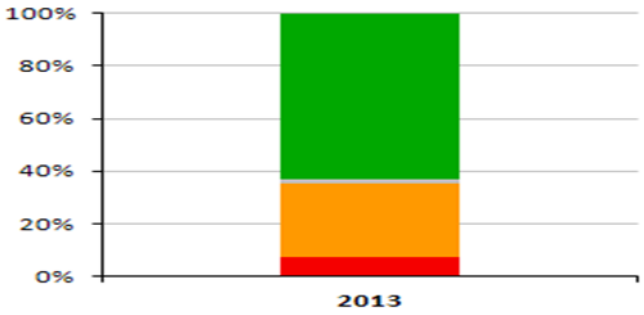
Bioregion	**HABITATS**	
	Annex I	
	Non-priority	**Priority**
Number of habitats in Romania	**60**	**25**
	85	
Alpine (ALP)	37	11
Black Sea Pontic (BLS)	18	3
Continental (CON)	34	17
Pannonian (PAN)	11	5
Stepic (STE)	18	6
Black Sea (MBLS)	6	

Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

For the RO40 indicator, the following charts on global habitat conservation status, bio-geographical regions or habitat classes are relevant.

The global assessment of habitats of community interest in Romania is represented by percentage in figure no.V.1.

Figure no. V.1- Overall assessment of habitats conservation status



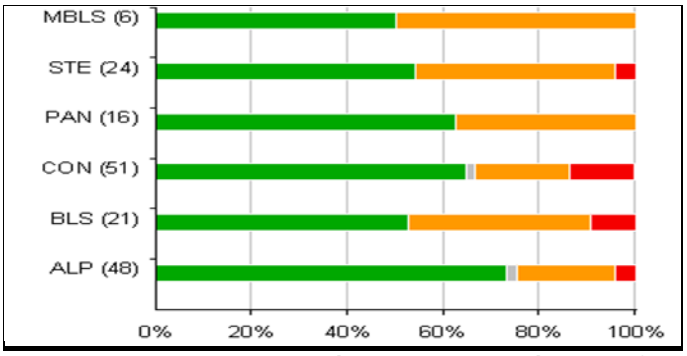
Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

FV - Favorable
NA - Unreported
XX - Unknown
U1 - Unfavorably inadequate
U2 - Unfavorably bad

It can be seen that the assessed and reported habitats in Romania as a whole are over 60% in a favorable conservation status and about 7% of them have been assessed as "unfavorable overall status".

The distribution by bio-geographical regions of the conservation status of the habitats of European interest in Romania is highlighted in figure no.V.2.

Figure no. V.2 - Status of conservation of habitats of European interest in Romania by bio-geographical regions, reporting period 2007-2012 (%)

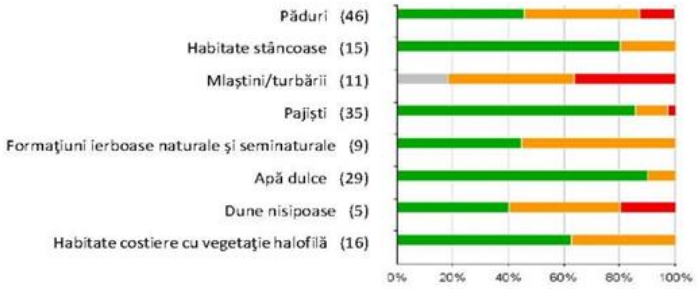


Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 EC

Note: The number in each bracket corresponds to the number of assessments for each bio-geographical region for the reporting period 2007-2012.

According to the data reported to the Commission, it is noted that most of the habitats whose conservation status is favorable are found in the Alpine region, followed by bio-geographical regions: continental, pannonian, steppe and pontic.

Figure no. V.3- Conservation Status on Habitat Classes of European Interest in Romania, 2007-2012 (%)



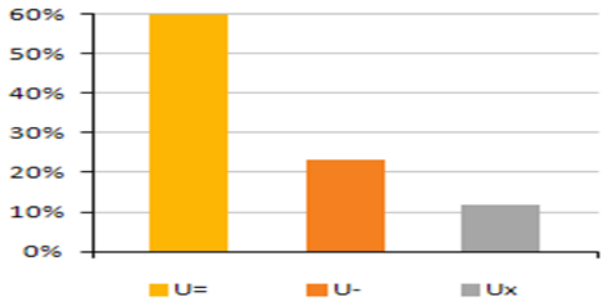
Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

Note: The number in each bracket corresponds to the number of evaluations for the 2007-2012 period.

Another worrying aspect is the habitats of marshes and peatlands, assessed in a very high percentage with unfavorable conservation status (over 80%).

Improvement/deterioration trends for habitats with an unfavorable conservation status (U1 and U2) are presented in percentage in figure no.V. 4.

Figure no. V.4 - Habitats - the general trend of conservation status (%)



Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

Note:
(U +) = unfavorable (inadequate or bad) with an improvement trend
(U=) = unfavorably stable
(U-) = unfavorable with a tendency to worsen
(Ux) = unfavorable with unknown tendency

V.1.2. TRENDS IN THE SITUATION OF PRIORITY SPECIES

RO 07

Indicator code Romania: RO 07

AEM indicator code: CSI 007 / SEBI 003

TITLE: SPECIES OF EUROPEAN INTEREST
DEFINITION: The indicator shows changes in the conservation status of species of European interest. It is based on data collected through monitoring obligations in accordance with Art. 11 of the Habitats Directive (92/43 / EEC).

Species conservation status is assessed nationally and biogeographically and reported on a three-tier scale coded differently by color as indicated for RO40 indicator in section V.1.1.
This indicator shows how the Habitats Directive is implemented and progressed and is extremely relevant to Member States and to the nature conservation policy. The results are representative of the EU Member States and can be integrated at European level. Also, it is estimated, the total conservation status over the reporting period and the general trends of the conservation status (grades:improved "+", in decline"-", stable "=", unknown "x").
With the exception of large agricultural areas and terrestrial and aquatic ecosystems, which are under the negative impact of pollution sources where changes in the structure and dynamics of biological diversity occur, the rest of the natural environment is preserved in the natural quality parameters.
Due to its geographical position, Romania has and contributes to Europe with a rich and unique biodiversity, both at the ecosystems and species level, as well as at the genetic level, distributed in the 5 biogeographical regions.
The number of species in each Annex of the Habitats Directive by biogeographical regions for which reports have been submitted to the Commission pursuant to Article 17 of the Habitats Directive is presented in table No V.2:

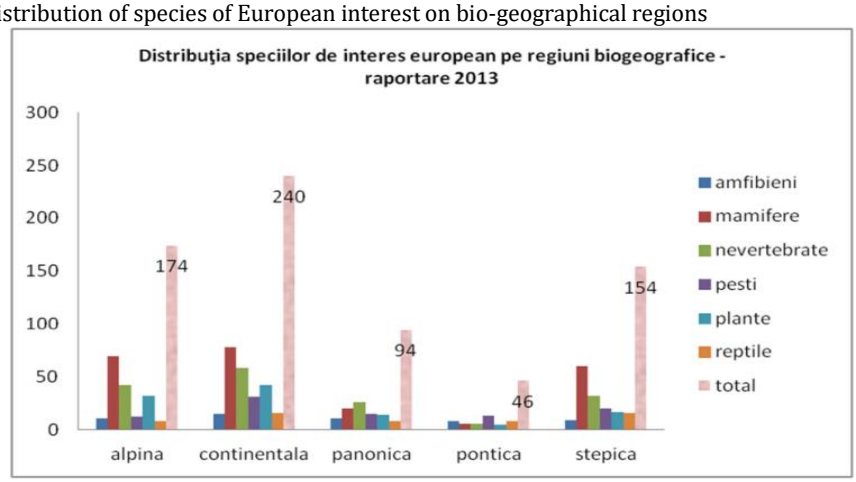
Table no. V.2 - The number of species in the Annexes of the Habitats Directive

Bioregion	SPECIES					
	Annex II		Annex IV		Annex V	
	Non-priority	Priority	Including those from Annex II	Without those from Annex II	Including those from Annex II	Without those from Annex II
Number of species in Romania	147	15	174	50	35	26
	162		**174**		**35**	
Alpină (ALP)	74	7	94	33	20	18

Marea Neagră Pontică (BLS)	25	1	24	11	15	9
Continentală (CON)	114	12	140	44	29	21
Panonică (PAN)	49	2	55	20	14	10
Stepică (STE)	64	3	87	39	19	13
Marea Neagră (MBLS)	2		3	1		

Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

Figure no. V.5 - Distribution of species of European interest on bio-geographical regions

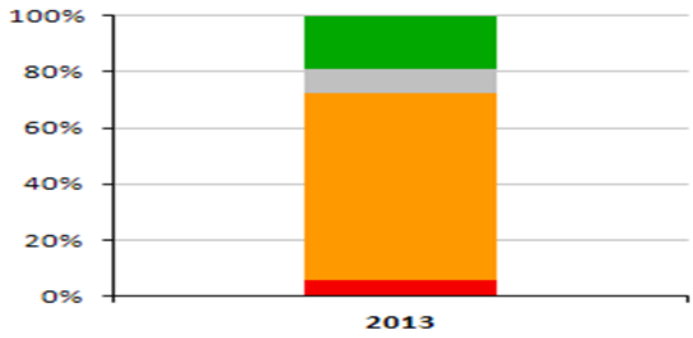


Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

As it can be seen, the bio-geographical regions with the greatest wealth of species of European interest are: continental, alpine and steppe.

At national level, the global assessment of species of community interest is presented in percentage in the figure below:

Figure no. V.6 - Overall assessment of species conservation status, reporting period 2007-2012 (%)



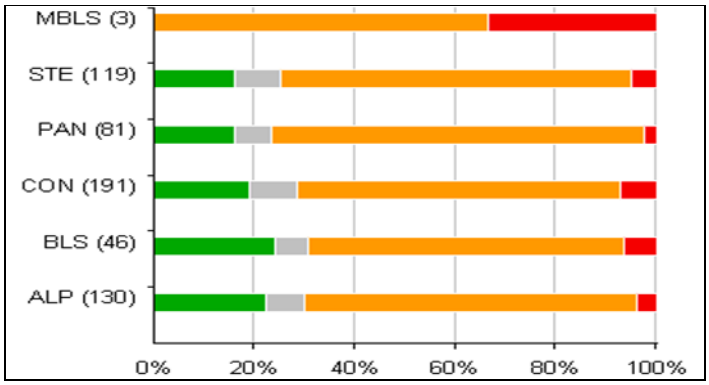
Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

Legend:

- *FV - Favorable*
- *NA - Unreported*
- *XX - Unknown*
- *U1 - Unfavorably inadequate*
- *U2 – Unfavorably bad*

According to reported data, it is estimated that a large percentage (67%) of all evaluated species have an unfavorable conservation status, while 5% have a totally unfavorable status. Thus, with a global 72% conservation status for species of community interest, Romania is well above the European average (54% in EU-25 - SOER 2010). A favorable status has 18% of the evaluated species (compared to 17% of the EU average) and the percentage of non-evaluated species in Romania is lower compared to the EU average.

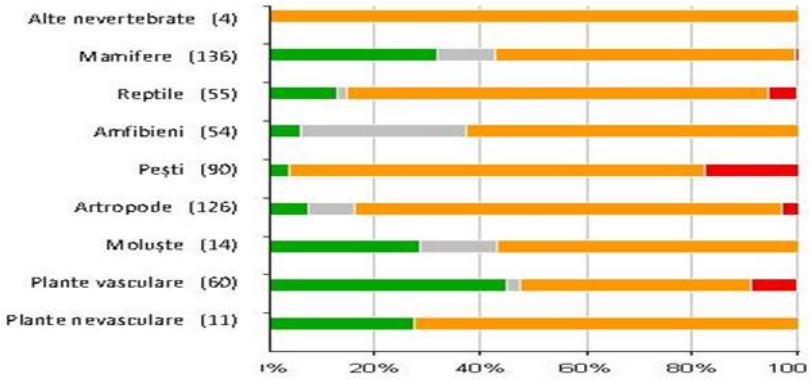
Figure no. V.7 - Status of conservation of species of European interest in Romania by bio-geographical regions, reporting period 2007-2012 (%)



Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

According to the data reported to the Commission, the situation in the Black Sea region is alarming, as there is no favorable assessment for any of the species assessed and reported.

Figure no. V.8 - Status of conservation of species of European interest in Romania by taxonomic groups, for the period 2007-2012 (%)



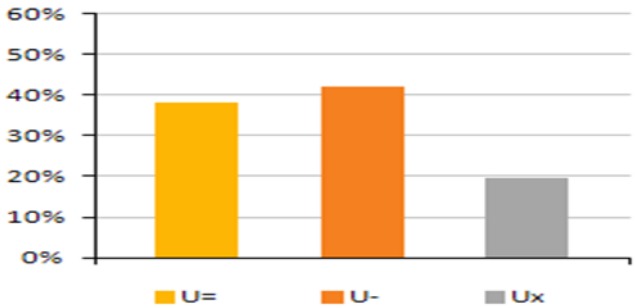
Source: ibis.anpm.ro şi National Summaryfor Article 17 Romania – 2007-2012 by EC

Notes: The number in brackets is the number of bioregional assessments corresponding to the reporting period 2007-2012

From the reported data it is found that among the species evaluated, the fish have the lowest favorable conservation status, followed by amphibians and arthropods, then by reptiles, molluscs, mammals and plants.

According to the reported data, the improvement or deterioration trends for the species with an unfavorable conservation status (U1 and U2) are presented percentually on the graph below.

Figure no. V.9 - Species - General trend of conservation status of species of community interest (%)



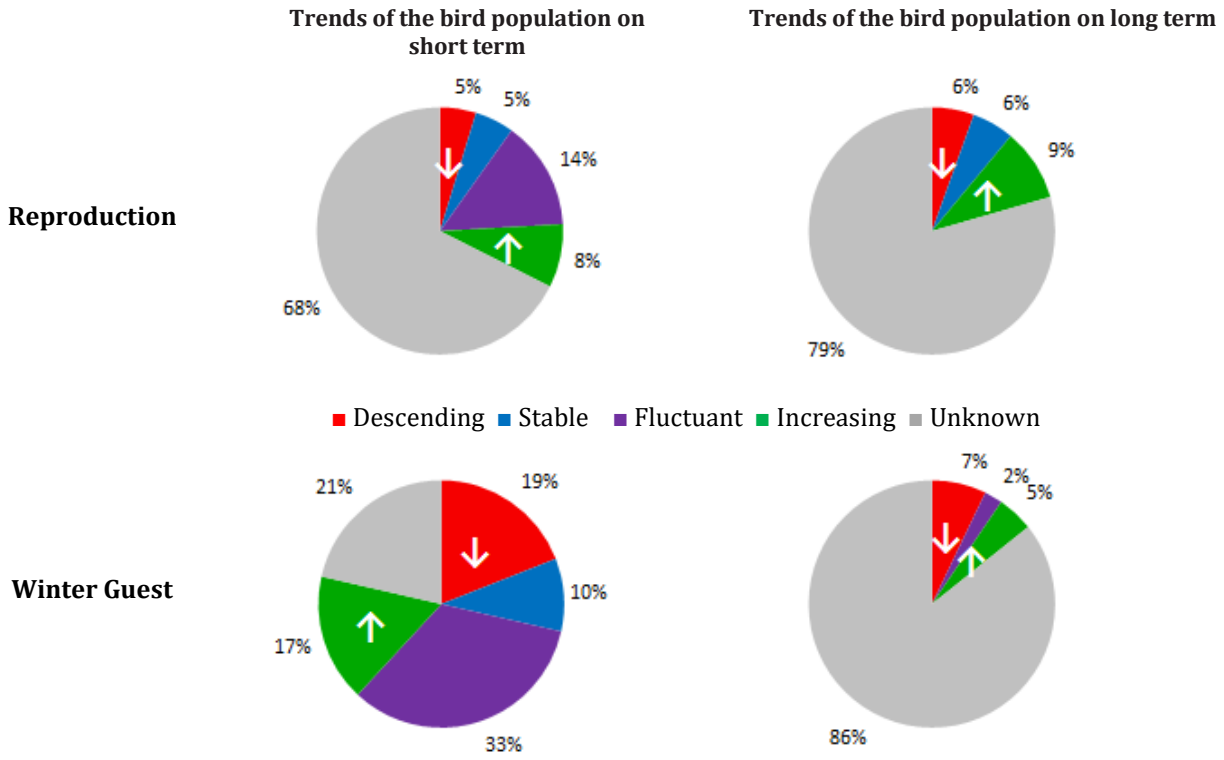
Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

***Note**:*

(U+) = unfavorable (inadequate or bad) with an improvement trend
(U=) = unfavorably stable
(U-) = unfavorable with a tendency to worsen
(Ux)= unfavorable with unknown tendency

Trends of bird populations at national level, evaluated according to the data reported in 2014, are presented in the graphs below, showing the trend categories: decreasing, stable, fluctuating, ascending or unknown. Both short-term and long-term trends are included. The taxonomic categories Reproduction and Winter Guest are clearly distinguished.

Figure no. V.10 - Trends of the bird population



Source: National Summary for Article 12 by EC, perioada 2008-2012

V.2. THREATS ON BIODIVERSITY AND PRESSURES OVER BIODIVERSITY

V.2.1. Invasive species

RO 43	Indicator code Romania: RO 43 AEM indicator code: SEBI 010

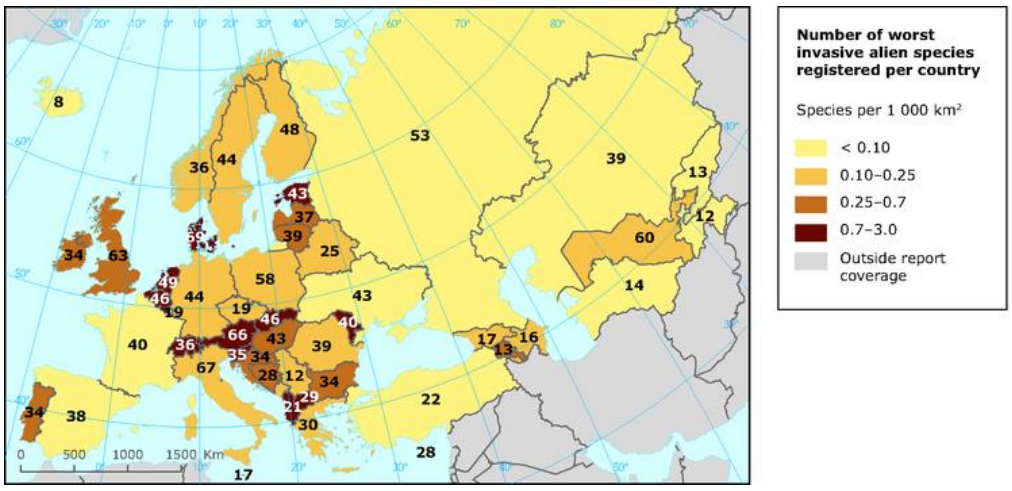
TITLE: INVASIVE ALIEN SPECIES
DEFINITION: The indicator comprises two elements: "The total number of 1970 alien species in Europe", showing the evolution of species that have the potential to become invasive alien species, and "the most harmful invasive alien species threatening biodiversity in Europe" a list of invasive species with negative impact demonstrated.

According to the European Biodiversity Strategy, it is foreseen that by 2020 the invasive species and their ways of spreading will be identified and proritized and the introduction of new invasive species. The National Strategy and Action Plan for Biodiversity Conservation 2010 - 2020 state that at national level there is no clear evidence of the number of alien, invasive species, the only centralization of the data and related information being made in the European database DAISIE, by the researchers, on a voluntary basis.

While for most alien species registered in Europe (according to the project DAISIE - Delivering Alien Invasive Species Inventories for Europe) no major impacts have been identified yet, some are extremely invasive. Since 1950, at least one such species appears in each year and there are no signs that the rate would fall.

The DAISIE inventory presents 10822 species at European level in 2009, of which 163 are extremely damaging, and in Romania there were 39 such extremely damaging species (Figure no. V.11 and Figure no. V.12.).

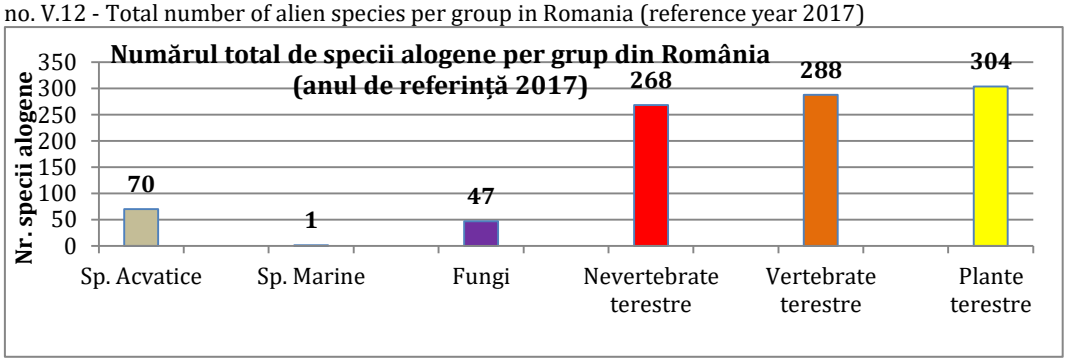
Figure no. V.11 - Number of the most dangerous invasive species per country



Source: DAISIE

In Romania, according to the data voluntarily registered by many experts in the DAISIE application and the information reported by some local environmental protection agencies, we find approximately 977 non-native species, of which 70 aquatic species, 1 marine species, 268 non-terrestrial invertebrates , 47 fungi, terrestrial vertebrates 288, terrestrial plants 304.

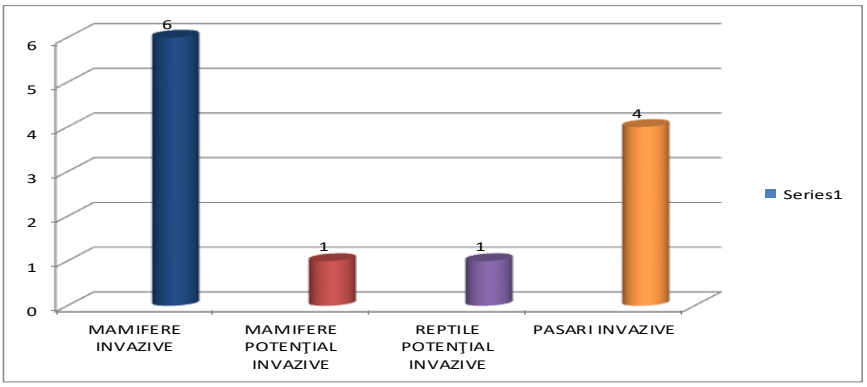
Figure no. V.12 - Total number of alien species per group in Romania (reference year 2017)



Source: DAISIE

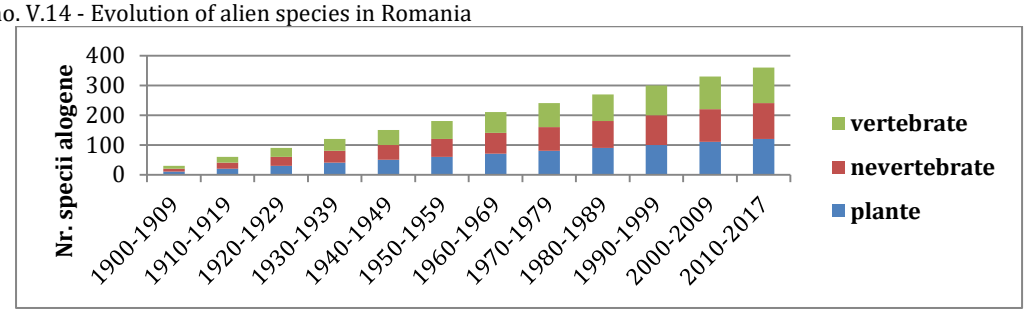
The list of the most damaging invasive alien species that threaten biodiversity in Romania makes a distinction between the most damaging invasive alien species in the country, on ecosystems and taxonomic groups, on their impact on national biodiversity and the change in abundance or spread. List of the most damaging invasive alien species threatening biodiversity in Romania according to the DAISIE project (Figure No. V.13*).*

Figure no. V.13 - List of the most damaging invasive alien species in Romania



Source: DAISIE

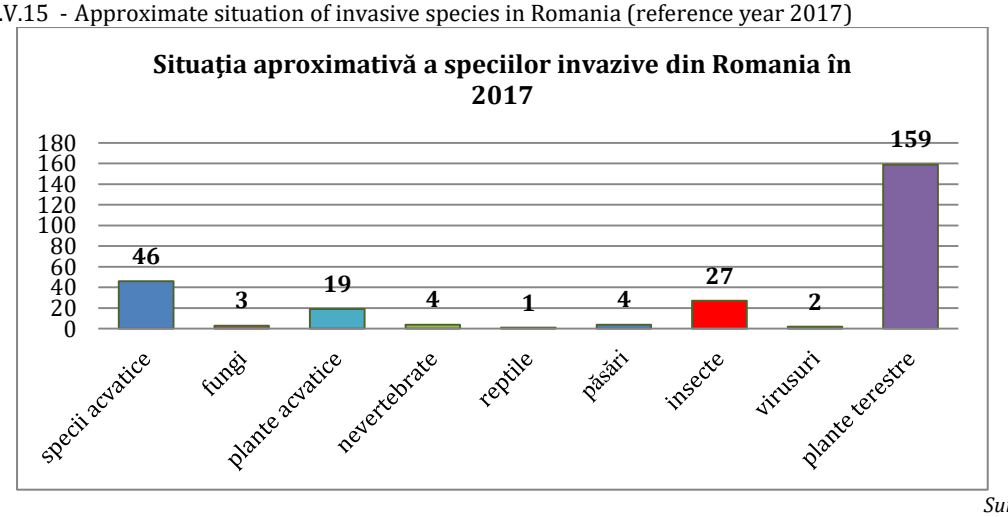
Figure no. V.14 - Evolution of alien species in Romania



Source: DAISIE

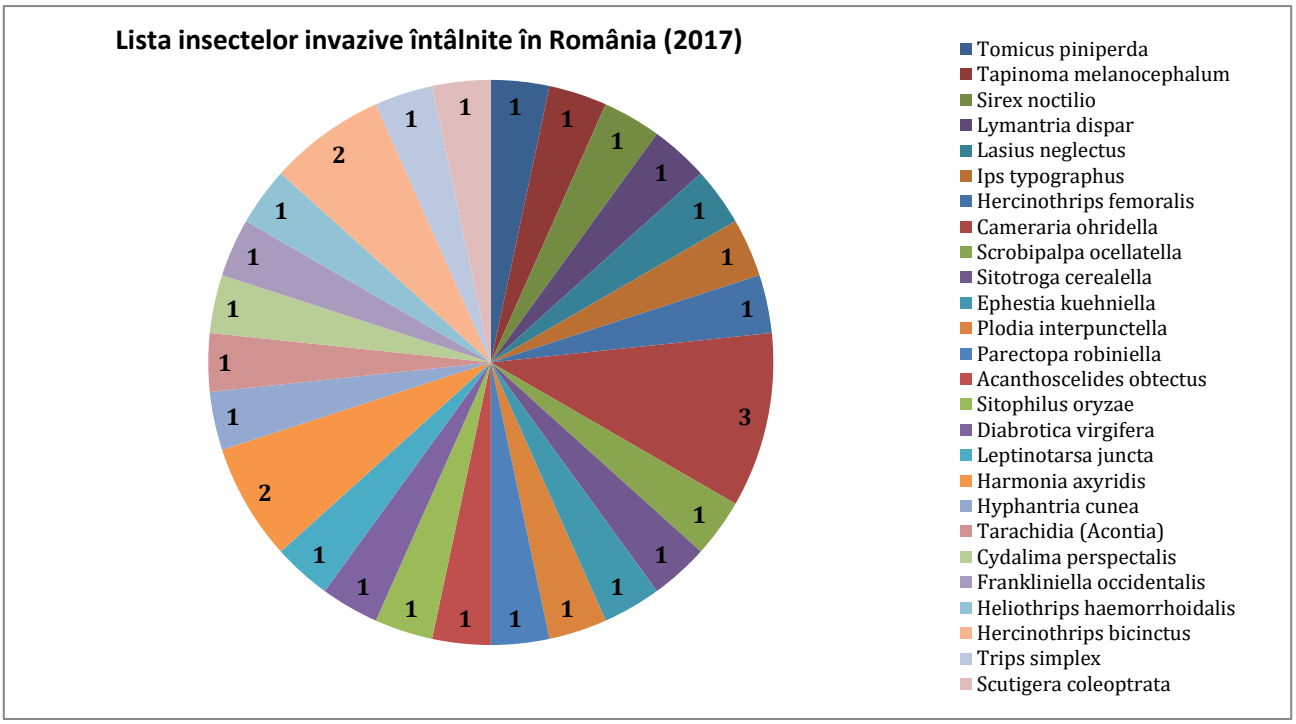
Some 265 invasive species (aquatic species 46, fungi 3, aquatic plants 19, invertebrates 4, reptiles 1, birds 4, insects 27, viruses 2, terrestrial plants) have been established according to data submitted by some of the Environmental Protection Agencies 159) (Figure No. V.15)

Figure no.V.15 - Approximate situation of invasive species in Romania (reference year 2017)



Sursa: DAISIE

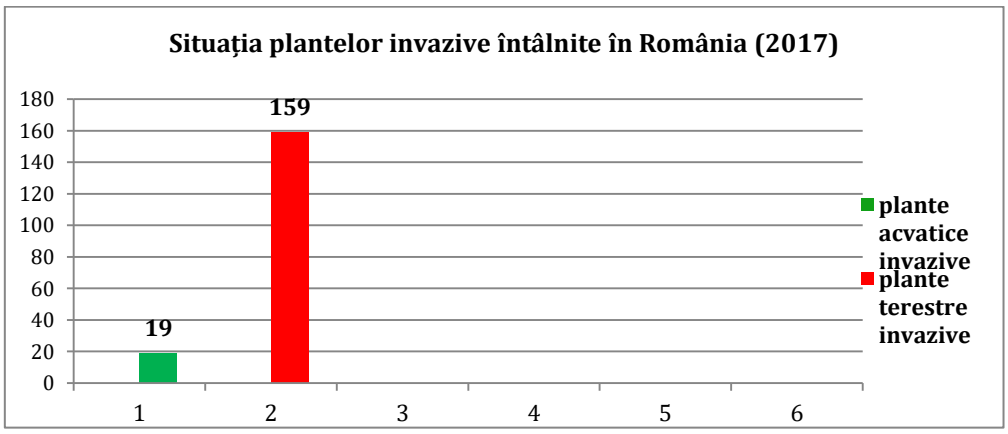
Figure no. V.16 - List of invasive insects encountered in Romania (2017)



Source: DAISIE

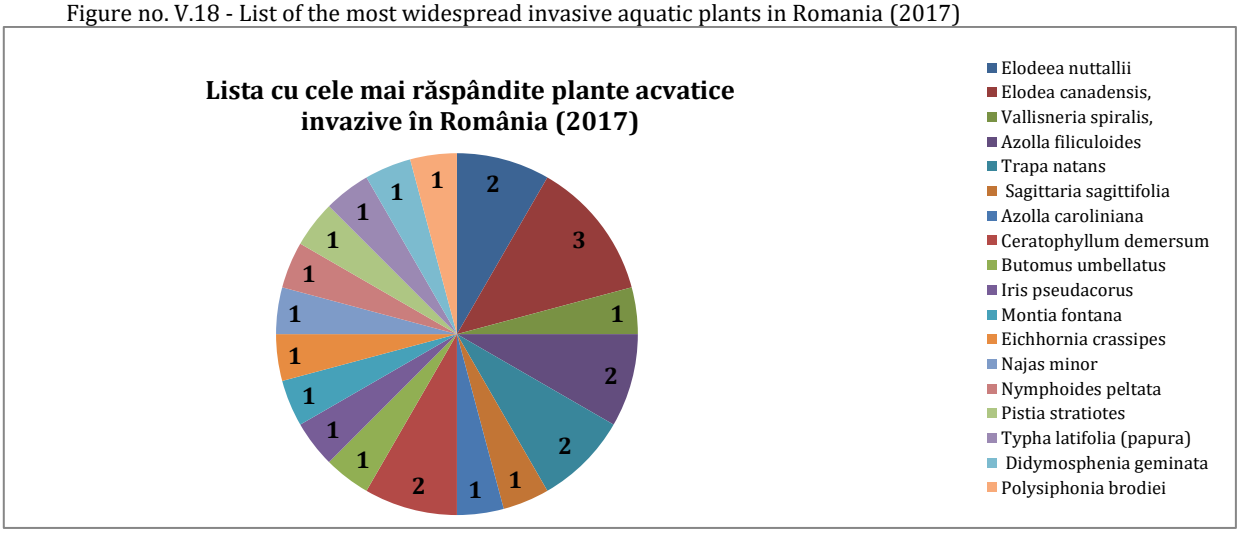
Invasive plant species lead over time to the elimination of native plant species (characteristic of that area), thus to the decline in biodiversity (loss of biodiversity). Thus, these invasive plants, gradually eliminate the valuable species - rare protected, or the good fodder plants (used for domestic animal feed - Figure no. V.17*)*.

Figure no. V.17 - Situation of invasive plants encountered in Romania (2017)



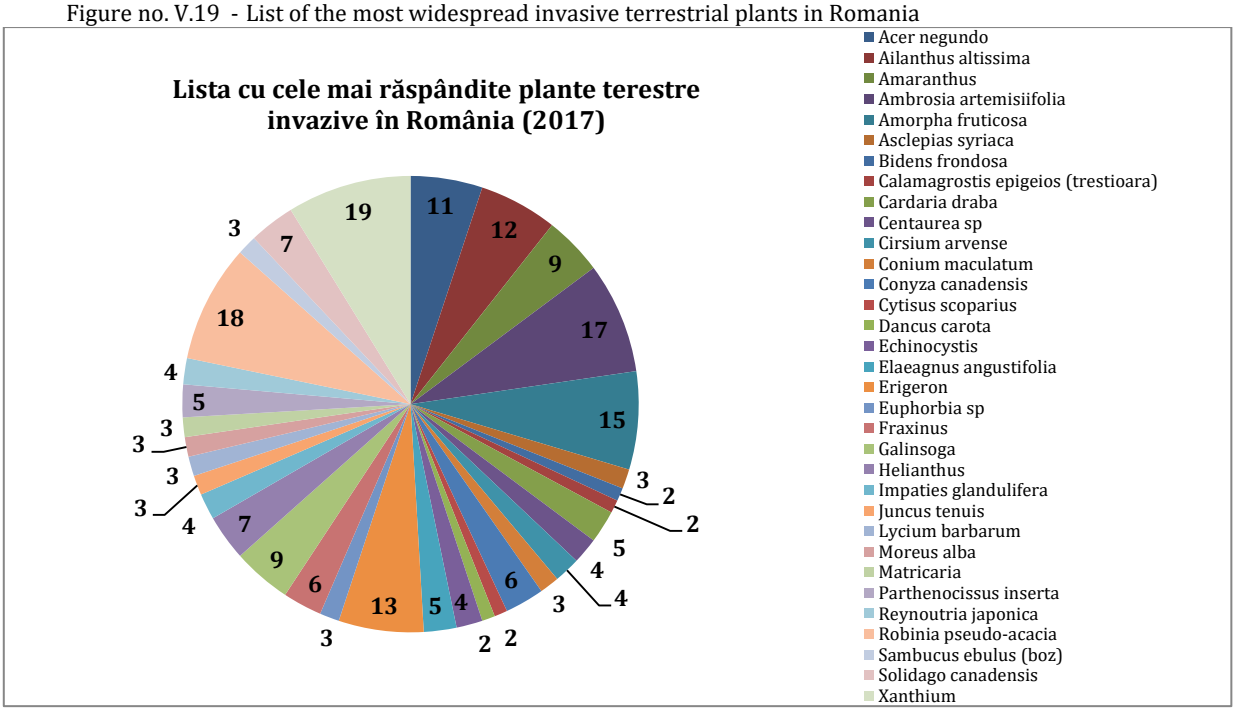
Source: DAISIE

Figure no. V.18 - List of the most widespread invasive aquatic plants in Romania (2017)



Source: DAISIE

Figure no. V.19 - List of the most widespread invasive terrestrial plants in Romania



Source: DAISIE

The current situation in Romania can be characterized by:

- ✓ a low degree of public awareness and, consequently, an opposition of civil society to government administration interventions;
- ✓ extremely low accessibility of scientific information, especially in relation to species identification, risk analysis, etc.;
- ✓ the absence of a prioritized approach to invasive species control;
- ✓ unhindered introduction of invasive species - often by mail - as inadequate inspection and quarantine measures;
- ✓ inadequate monitoring capacity;
- ✓ lack of effective emergency measures;
- ✓ poor coordination between government agencies, local authorities and local communities.

V.2.4.1. Fragmentation of ecosystems

RO 44	Indicator code Romania: RO 44 AEM indicator code: SEBI 013

TITLE: FRAGMENTATION OF NATURAL AND SEMI-NATURAL AREAS
DEFINITION: The indicator shows differences in the average of natural and semi-natural surfaces, relying on land cover maps made by interpreting satellite images.
The indicator is intended to address the issue of integrity of ecosystems by providing a "measure" of land disintegration across the whole of Romania.

In terms of biodiversity, the indicator is relevant to providing information on the evolution of natural and semi-natural areas for any ecosystem. If the area of the site falls significantly, it will have a negative impact on habitat types and species dependent on these habitat types.
Besides the phenomenon of complete destruction of habitats, there is also the spraying through roads, agricultural lands, urban environments or damaged buildings.
There is no data on the fragmentation of habitats on the territory of Romania, necessary to calculate this indicator.

Between 2016 and 2017, the Ministry of Environment, in partnership with the National Institute for Economic Research "Costin C. Kiriţescu", implemented the project "Developing the administrative capacity of the Ministry of Environment, Waters and Forests to implement biodiversity policy" (SIPOCA 4 code) financed by the European Social Fund (ESF) through the Operational Capacity Administrative Program (OCAP). Among the objectives of the project were the development of studies to base public policies on degraded ecosystems in line with the objectives of the EU Biodiversity Strategy for 2020 and to set up investment programs for the restoration of degraded ecosystems outside protected natural areas.

V.2.4.2. Reducing natural and semi - natural habitats

RO 14	Indicator code Romania: RO 14 AEM indicator code: CSI 014

TITLE: LAND OCCUPANCY
DEFINITION: The indicator shows the quantitative change in the occupation of agricultural, woodland, semi-natural and natural land by the expansion of urban and artificial land. Includes building areas and urban infrastructure, as well as urban green spaces, sports and recreation complexes.

Anthropogenic pressures are largely due to the expansion of urbanization, agricultural activities, uncontrolled tourism, poaching and hunting, excessive grazing, fishing, all of which lead to the reduction of natural and semi-natural habitats, with negative repercussions on the number of species of wild fauna and flora.
Land is a finite resource and the way it is exploited is one of the main determinants of environmental change, with a significant impact on the quality of life and ecosystems, as well as on the management of infrastructure.

At national level, reducing pressures due to land use change and leading to the loss of natural and semi-natural habitats is one of the objectives set out in the National Strategy and Action Plan for Biodiversity Conservation 2013-2020.

V.2.5.1. Forest exploitation

RO 45	Indicator code Romania: RO 45 AEM indicator code: SEBI 017

TITLE: FOREST:FOREST FUND, GROWTH AND CUTTING TIMBER
DEFINITION: The indicator shows the evolution of the forest fund, net annual growth and annual cuttings, as well as the utilization rates of forests (fraction of annual cuts in annual growth).

According to the National Statistics Institute's "Statistics of Forestry Activities in 2017" published on the NIS website on July 31, 2018, at the end of 2017, the area of the forest fund remained at approximately the same level as compared to 2016, with a slight increase mainly due to reforestation of wooded pastures and due to the introduction of degraded land into the forest fund, in accordance with Law no. 133/2015 for amending and completing the Law no. 46/2008 - Forest Code.

The national forest fund occupied an area of 6565 thousand hectares at the end of 2017, which represents 27.5% of the country's surface.
In 2017, the total area of the forests was 6406 thousand hectares, of which the area occupied by deciduous trees was 70.0% and the rest was occupied by resinous, according to INS data mentioned in table no. V.3 (according to the above paper cited).

Table no. V.3. - The forest fund, by category of use, 2013 - 2017 thousand hectares

Categories of use	*2013*	*2014*	*2015*	*2016*	*2017*
Forest fund – total	**6539**	**6545**	**6555**	**6559**	**6565**
The surface of the forests	**6381**	**6387**	**6399**	**6404**	**6406**
– Resinous	1937	1930	1931	1929	1924
– Decidous	4444	4457	4468	4475	4482
Other lans (from the forest fund)	**158**	**158**	**156**	**155**	**159**

Source: INS/ http://www.insse.ro/cms/ro/publicatii-statistice-in-format-electronic

Physical-geographical conditions and economic and social development influence the distribution of the national forestry fund by development regions and counties.

The distribution of the forestry fund at the level of the counties is represented in the figure below, the highest concentration being in the development center with 19.3% of the total forest fund

Figure V.20- Area of the forest fund, by counties at the end of 2017

Source: INS/ http://www.insse.ro/cms/ro/publicatii-statistice-in-format-electronic

According to the above-mentioned source, in Romania in 2017 18316 thousand cubic meters of raw wood volume were harvested, 1118 thousand cubic meters more than in 2016.

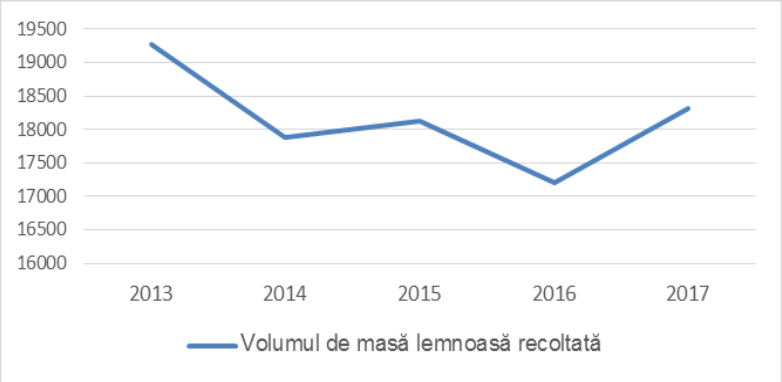
The main danger to forests in Romania is the phenomenon of uncontrolled cuttings.
In 2017, the volume of harvested wood was 5.0% lower than in 2013.

Table no. V.4 - Volume of harvested mass, by main species, between 2013 - 2017 - thousand cubic meters - gross volume

The main species	***2013***	***2014***	***2015***	***2016***	***2017***
The volume of timber harvested - total	**19282**	**17889**	**18133**	**17198**	**18316**
Resinous	7922	7225	6782	6268	6531
Beech	6226	5836	6215	5799	6212
Oak	1742	1664	1769	1688	1788
Various hardwoods species	1969	1876	1951	2008	2228
Various softwoods species	1423	1288	1416	1435	1557

Source: INS/ http://www.insse.ro/cms/ro/publicatii-statistice-in-format-electronic

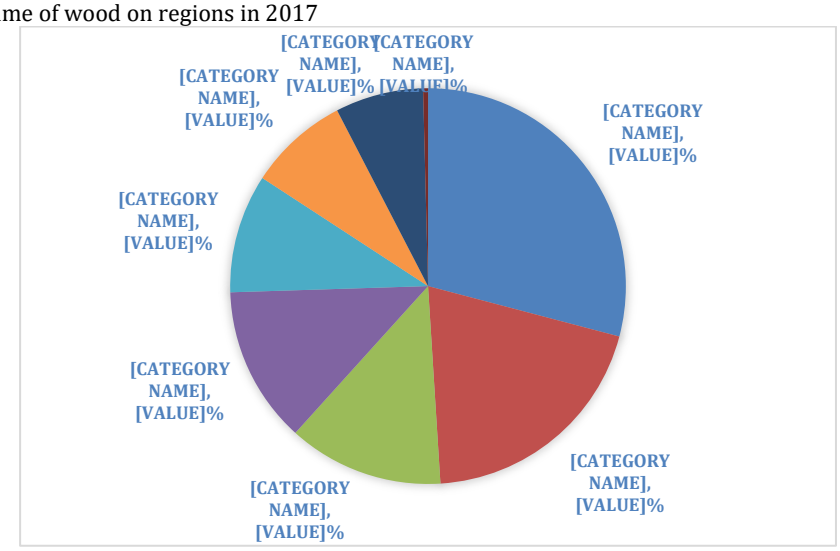
Figure no. V.21 - The dynamics of wood mass harvesting in the period 2013-2017



Source: INS/ http://www.insse.ro/cms/ro/publicatii-statistice-in-format-electronic

At the level of the development regions, 29.1% of the total volume of the wood was harvested from the North-East region, 19.9% from the Center region, 12.7% from the North-West region, 12.8% from the West region, 9.7% from the South-Muntenia region, 8.2% from the South-West Oltenia region, 7.2% from the South-East region and 0.4% from the Bucharest-Ilfov region, as shown in Figure. no. V.22.

Figure no. V.22 - Volume of wood on regions in 2017



Source: INS/ http://www.insse.ro/cms/ro/publicatii-statistice-in-format-electronic

In 2017, from the total cutting area of 177296 ha to 39.7%, regeneration cuts were made, 58.1%, preservation cuts, 1.8% regeneration cuts in and 0 , 4% substitution cuts-restoration of poor productive and degraded stands.

Table no. V.5 - Area covered by cuts, by types of treatments, between 2013 and 2017 hectares

Types of cuts	*2013*	*2014*	*2015*	*2016*	*2017*
Area covered with cuts - total	**109738**	**100981**	**98453**	**137218**	**177296**
Cuts forest regeneration	**78618**	**71914**	**69791**	**65127**	**70321**
– Successive cuts	3657	3568	2920	2405	2542
– Progressive cuts	64421	57371	56792	54905	60620
– Gardening cuts	5648	6035	5137	3733	3446
– Complete cuts	4892	4940	4942	4084	3713
Cuts for regeneration in the bark	**4054**	**3642**	**3665**	**3229**	**3212**
Cuts for substitution-recovery of the degraded and low productive stands	**1133**	**1002**	**776**	**755**	**728**
Conservation cuts	**25933**	**24423**	**24221**	**68107**	**103035**

Source: INS/ http://www.insse.ro/cms/ro/publicatii-statistice-in-format-electronic

V.3.1. NETWORK OF NATURAL PROTECTED AREAS

RO 41

Indicator code Romania: RO 41

AEM indicator code: SEBI 007

TITLE: NATURAL PROTECTED AREAS DESIGNATED AT NATIONAL LEVEL

DEFINITION: The indicator illustrates the rate of increase in the number and total area of protected areas of national interest over time. The indicator can be characterized by: IUCN categories, bio-geographic region and country.

In 2017, the number of protected natural areas is maintained at the same level as at the end of 2016. The data for the total number and areas of each category of protected natural area for 2017 are presented in the tables below.

Changes in data on protected natural areas occurred in 2015 following the implementation by the Ministry of Environment of the project "***Realizing spatial data sets according to INSPIRE technical specifications for protected natural areas, including Natura 2000 sites, with a view to optimizing their management facilities*** ", which analyzed the boundaries of the protected natural areas, following the collection of field data based on the existing documentation.

Also, in 2016 several natural protected areas were designated, namely 1 natural park - Văcărești Natural Park, 23 special avifaunistic protection areas (SPAs) and 54 sites of Community importance (SCI), and areas of many existing SCIs were extended.

Thus, in Romania, in the year 2016, the number of 945 protected areas of national interest including the Danube Delta was reached, a number that remained in 2017.

In table no. V.6 the data regarding the categories of natural protected areas in the year 2017 are included.

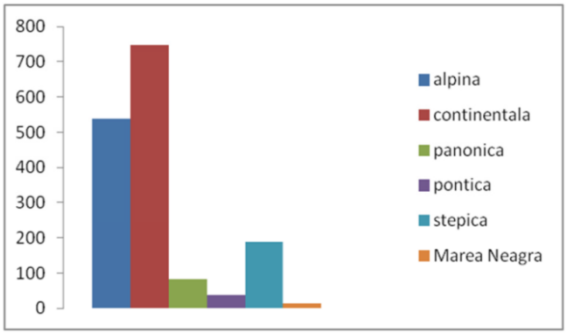
Table no. V.6 - Categories of protected natural areas in Romania at the level of 2017

Categories of protected natural areas	Number	Surface (ha)
Scientific reserves, natural monuments, nature reserves	916	307973.06
National parks	13	317419.19
Natural parks	16	770026.529
Areas of special avifauna protection (SPA)	171	3875297.58
Sites of community importance (SCI)	435	4650970.00
Reservations of the biosphere	3	661939.33
Wetlands of international importance (situri RAMSAR)	19	1096640.01
Natural sites of the universal natural heritage	1	311915.88

Source: MM

At present more than 1500 protected natural areas are designated, of which about 2/3 are of national interest, and their distribution by counties and biogeographical regions is presented in the graphs, tables and maps below:

Figure no. V.23 - Distribution of protected areas of national interest on biogeographical regions



Source: ibis.anpm.ro

Figure no. V.24 - National distribution of protected areas of national interest: nature reserves and monuments, natural and national parks

Source: MM

Table no. V.7-National parks in Romania in 2017

Name	County	Surface (ha)
Total		**317419.19**
Domogled-Valea Cernei	Caraş - Severin, Mehedinţi, Gorj	61661.28
Munţii Rodnei	Bistriţa - Năsăud, Maramureş,	47202.31
Retezat	Hunedoara, Caraş - Severin, Gorj	38315.95
Cheile Nerei-Beuşniţa	Caraş - Severin	36811.52
Semenic-Cheile Caraşului	Caraş - Severin	36100.29
Călimani	Bistriţa - Năsăud, Harghita, Mureş, Suceava	24435.47
Cozia	Vâlcea	16725.23
Piatra Craiului	Argeş, Braşov	14789.21
Munţii Măcinului	Tulcea	11247.02
Defileul Jiului	Gorj, Hunedoara	10976.39
Ceahlău	Neamţ	7763
Cheile Bicazului-Hăşmaş	Harghita, Neamţ	6912.82
Buila-Vânturariţa	Vâlcea	4478.7

Source: MM

Table no. V.8- Natural parks in Romania

Name	County	Surface (ha)
Total		**769841.81**
Apuseni	Alba, Bihor, Cluj	76054.97
Munţii Maramureşului	Maramureş	133450.43
Porţile de Fier	Caraş-Severin, Mehedinţi	128101.71
Geoparcul Platoul Mehedinţi	Mehedinţi	106376.34
Geoparcul Dinozaurilor–Ţara Haţegului	Hunedoara	100049.66
Grădiştea Muncelului-Cioclovina	Hunedoara	38106.85
Putna-Vrancea	Vrancea	38060.18
Bucegi	Prahova, Braşov, Dâmboviţa	32519.7
Vânători-Neamţ	Neamţ	30705.62
Comana	Giurgiu	25107
Balta Mică a Brăilei	Brăila	20665.48
Lunca Mureşului	Arad, Timiş	17397.39
Defileul Mureşului Superior	Mureş	10158.58
Lunca Joasă a Prutului Inferior	Galaţi	8109.96
Cefa	Bihor	4977.94
Văcăreşti	Bucureşti-sector 4	184.719

Source: MM

RO 42

Indicator code Romania: RO 42

AEM indicator code: SEBI 008

TITLE: PROTECTED AREAS OF COMMUNITY INTEREST DESIGNATED IN ACCORDANCE WITH THE HABITAT AND BIRDS DIRECTIVES

DEFINITION: The indicator shows the current state of implementation of the Habitats Directive (92/43 / EEC) and Birds (79/409 / EEC) by the Member States through two sub-indicators:
(a) highlighting spatial coverage trends with Natura 2000 site proposals;
(b) calculating an index of sufficiency based on these proposals.

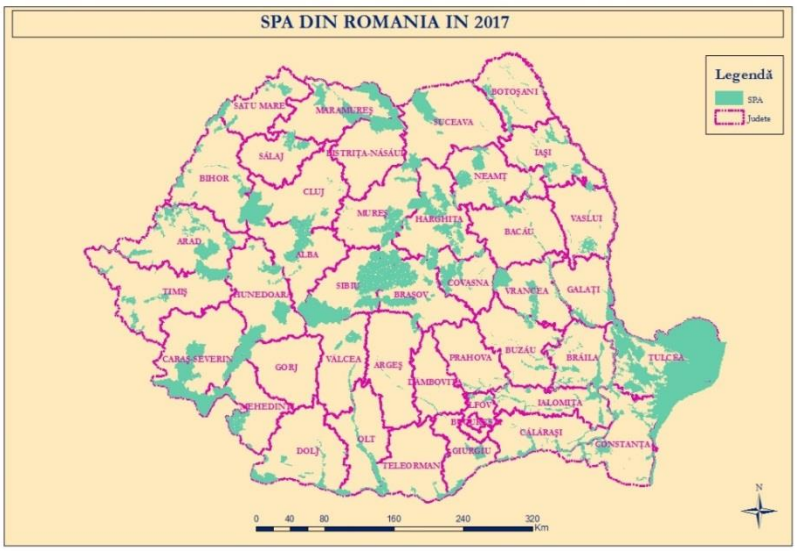
As a member state of the European Union, Romania contributes to ensuring biodiversity at European level by preserving natural habitats, as well as wild fauna and flora. In this respect, the Natura 2000 Ecological Network was set up in Romania to preserve the species and habitats considered to be of Community importance by designating sites of community interest. SCI - Sites of Community Importance and SPAs - Areas of special avifaunistic protection.

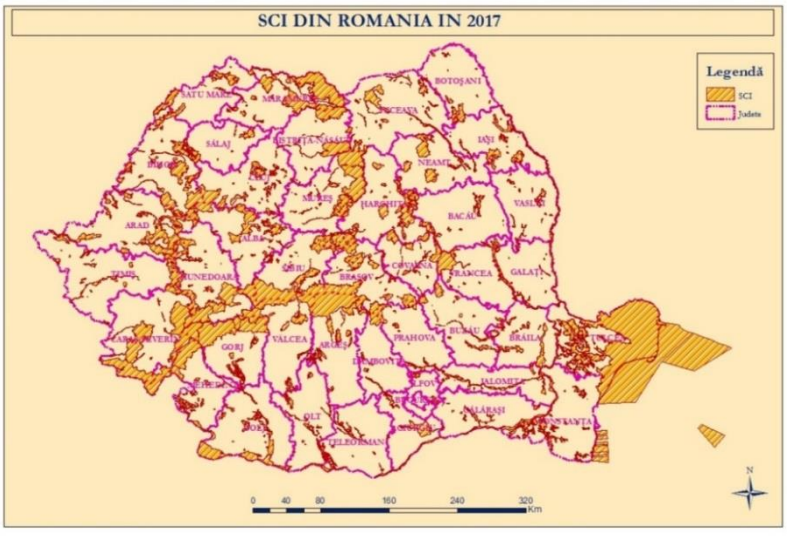
At the end of 2016, a number of 606 Natura 2000 sites was reached in Romania: 435 SCIs and 148 SPAs, a number that remained until the end of 2017.

By designating new sites, the area covered by Natura 2000 sites increased from about 18% in 2007 to about 23% of the country's surface.

The maps below show the distribution of SCIs and SPAs at the national level in the year 2017.

Figure no. V.25 - National distribution of Natura 2000 sites

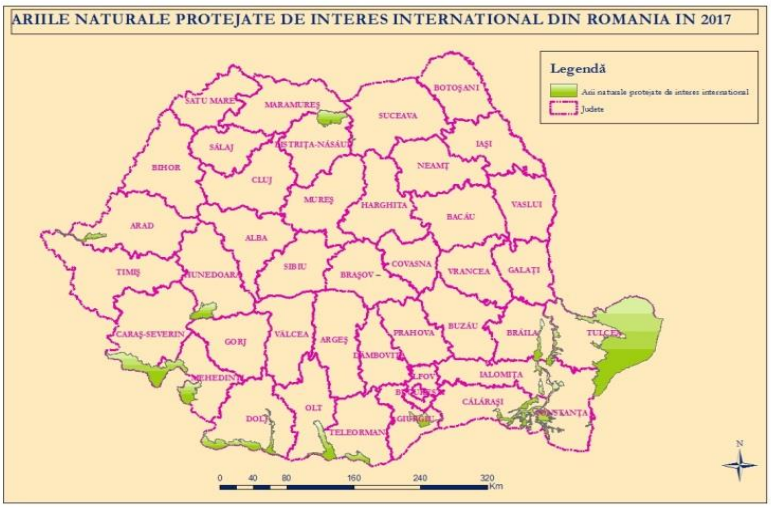




Source: MM

Another category of protected natural areas are the areas of international interest, namely biosphere reserves, known wetlands of international importance and RAMSAR sites and natural sites of universal natural heritage. The map below highlights the national distribution of these protected natural areas.

Figure no. V.26 - National distribution of protected areas of international interest



Source: MM

Biosphere Reserves

Three Biosphere Reserves have been declared in Romania

- Delta Dunării (1991),
- Pietrosul Rodnei (1979),
- Retezat (1979).

In accordance with the results of the project implemented by the Ministry of the Environment regarding the natural protected area limits mentioned above, Table V.9 presents information on their areas and the national distribution of these protected natural areas.

Table no. V.9 – Biosphere Reserves in 2017

Name	County	Surface (ha)
Total		**661939.33**
Delta Dunării	Tulcea, Constanța	576421.07
Pietrosul Rodnei	Maramureș, Bistrița-Năsăud,	47202.31
Retezat	Caraș-Severin, Hunedoara, Gorj	38315.95

Source MM

Ramsar sites

At the level of 2017, Romania had 19 Ramsar sites listed in table no. V.10, their surfaces being determined to a better degree by the project "*Creating spatial data sets according to INSPIRE technical specifications for protected natural areas, including of Natura 2000 sites, given the optimization of their management facilities"*:

Table no. V.10 – Ramsar sites in Romania in 2017

Name	County	Surface (ha)
Total		**1096640.01**
Delta Dunării	Tulcea, Constanţa	576517.86
Parcul Natural Porţile de Fier	Caraş-Severin, Mehedinţi	128101.71
Ostroavele Dunării-Bugeac-Iortmac	Călăraşi, Constanţa, Ialomiţa	81407.92
Blahniţa	Mehedinţi	46028.43
Confluenţa Olt-Dunăre	Olt, Teleorman	45541.16
Calafat-Ciuperceni-Dunăre	Dolj	29379.25
Bistreţ	Dolj	27241.59
Parcul Natural Comana	Giurgiu	25107
Dunărea Veche - Braţul Măcin	Brăila, Tulcea, Constanţa	24069.34
Braţul Borcea	Călăraşi, Ialomiţa	21529.98
Insula Mică a Brăilei	Brăila	20665.48
Suhaia	Teleorman	19707.1
Confluenţa Jiu-Dunăre	Dolj	19257.46
Parcul Natural Lunca Mureşului	Arad, Timiş	17397.39
Canaralele de la Hârşova	Ialomiţa, Constanţa	7304.79
Iezerul Călăraşi	Călăraşi	5008.69
Lacul Techirghiol	Constanţa	1272.26
Tinovul Poiana Stampei	Suceava	695.93
Coplexul Piscicol Dumbrăviţa	Braşov	406.67

Source: MM

Natural sites of the universal natural heritage

Since 1991 the Danube Delta has been included on the UNESCO World Heritage List as a recognition of the value of the universal natural heritage of this territory.

VI.FORESTS

VI.1.NATIONAL FOREST FUND: STATE AND CONSEQUENCES

IV.2.THREADS AND PRESSURES ON FORESTS

IV.3.TRENDS, FORECASTS AND ACTIONS FOR SUSTAINABLE MANAGEMENT OF FORESTS

Chapter VI. FORESTS

VI.1. NATIONAL FOREST FUND: STATE AND CONSEQUENCES

VI.1.1. THE FORESTRY FUND SURFACE EVOLUTION

RO 45	Indicator code Romania: RO 45 AEM indicator code: SEBI 17

TITLE: FOREST: forest fund, growing and harvesting of timber
DEFINITION: The indicator shows the evolution of the forest fund, net annual growth and annual cuts, as well as the utilization rate of the forests (the annual cut of the annual increase).

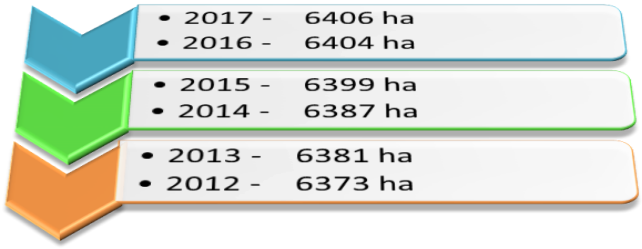
Romania's national forest fund occupies at the end of 2017 an area of 6565 thousand hectares, which represents 27.5% of the country's surface. The surface of the forestry fund on December 31, 2017, compared to the same date of 2015, registered a slight increase of 6,000 hectares due mainly to the redevelopment of the wooded pastures and the introduction of degraded land into the forest fund under Law no. 46/2008 on the Forest Code, as subsequently amended and supplemented.

Table no. VI.1. The evolution of the area of the forest fund, by categories of use and species, between 2013 and 2017

Categories of use	2013	2014	2015	2016	2017
	(thousands of hectares)				
Total forest fund	6539	6545	6555	6559	6565
The surface of forests *, of which:	6381	6387	6399	6404	6406
- resinous	1937	1930	1931	1929	1924
- deciduous	4444	4457	4468	4475	4482
Other land in the forest fund	158	158	156	155	159

Source: MAP

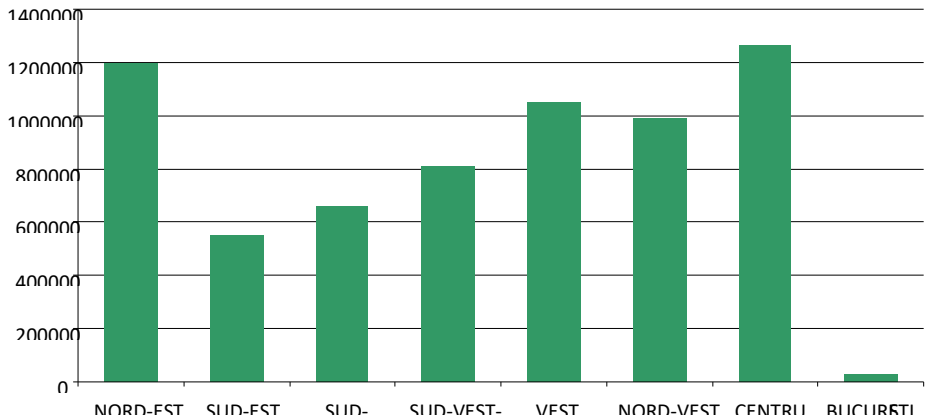
Figure no. VI.1. Evolution of the forest area * during 2012-2017 (ha)



Source: MAP

The distribution of the forestry fund by development region indicates a significant concentration of it in the CENTRAL development regions (19.3% of the total forest fund) and NORTH-EAST (18.2%), followed by the WEST development regions 16.0%), NORTH-WEST (15.1%), SOUTH-WEST-OLTENIA (12.4%), SOUTH-MUNTENIA (10.1%), SOUTH- EAST (8.4%) and BUCHAREST- ILFOV (0.4%).
The counties with the largest share of forest, amounting to about 1/3 of the surface of the forest fund are Suceava (6,5%), Caraș-Severin (6,3%), Bacău (4,1%), Harghita (4%) , Neamt (4%), Maramures (4%) and Gorj (3.8%),

Figure no. VI.2. Forest Fund Distribution, by Development Region, at the end of 2017 (ha)



Sursa: MAP

The forest area per inhabitant is 0,32 ha / place (on January 1, 2017 the population of Romania was 19,644,350 inhabitants - resident population[1]), close to the European one 0,31 ha / place.

[1] *The population of Romania resident on 1 January 2017 www.insse.ro*

The average annual growth in the year 2017 was 7.8 m3 / year / ha (according to the data provided by the Forest Fund Inventory), above the European average of 4.4 m3 / year / ha.

Table no. VI.2. The wood mass harvesting index (m3 / year / ha) for the period 2013-2017

Anul	2013	2014	2015	2016	2017
Wood mass harvesting index – m^3/an/ha	2.9	2.7	2.8	2,7	2,8

Source: MAP

VI.1.2. DISTRIBUTION OF FORESTS BY THE MAIN FORMS OF RELIEF

VI.1.3. HEALTH STATUS OF FORESTS

RO 46	Indicator code Romania: RO 46 AEM indicator code: SEBI 18

TITLE: FORESTRY: dead wood (dry)
DEFINITION: The indicator shows the volume of dead wood in the form of dried or demolished trees, by type of forest (m3 / ha).

1.3.1. Evolution of the phenomenon of abnormal drying of trees

One of the major reasons that caused the emergence and evolution of the phenomenon of premature drying of the trees, according to observations and results from the specialty studies, is represented by the climatic changes, which caused the occurrence of extreme meteorological phenomena such as: excessive temperature with frequency and long duration, successive and long-lasting droughts, precipitations (rainfall, snowfall), quantitatively significant in terms of time and surface unit, early and late frost, etc.

From the meteorological point of view, 2017 was characterized by the existence of two antagonistic periods: the January-June period of rainfall and the July-December period with rainfall and temperatures over the multi-annual averages specific for these months. Also, the occurrence of early and late frosts that caused the frost of young tree lobsters.

Although the 2013-2017 period was more balanced in precipitation, the excessive drought that occurred between 2006 and 2012 continued to affect the physiological state of some tree species with claims to the soil moisture regime.

Due to the physiological debilitation of the trees, due to the effects of drought, favorable conditions were created for the development of insects and cryptogamic agents, which

infested the trees and accentuated the state of decline until their drying.
Compared to the previous years, the drying percentage of the fir tree has been maintained at a relatively constant level, about 7% of the area of the state-owned forest fund of the state occupied by this species (compared to 10% in 2015 and 8% in 2016) the main cause of this phenomenon being the prolonged drought. Spruce, although a less demanding species for water in the soil, compared with the fir tree, is very sensitive to the action of the wind and to the pressure exerted by the weight of the snow layer.
The resinous trees damaged by abiotic factors are an environment favorable to the development of bark beetles, which rapidly infest these trees and cause their mass drying. The most affected by drying were resinous stands located outside their natural area, especially those in the eastern part of the country, where the water deficit in the soil was very pronounced.
Of the deciduous species, the cvercines face drying phenomena on larger surfaces, respectively 16,159 ha (3% of the surface area of the forest fund owned by the state being occupied by these species). Of the cvercinee, more sensitive proved to be the Quercus pedunculata (pedunculate oak), but also the Quercus pedunculiflora (the Brown oak), Quercus petraea (the sessile oak) Quercus cerris (the Turkey oak) and Quercus frainetto (the Hungarian oak) showed drying phenomena.
One of the deciduous species that is in an obvious state of decline is Fraxinus (ash). This species exhibits a high sensitivity to the action of biotic and abiotic factors. The hydric stress in which the Fraxinus (ash) has been subjected in the last decade, characterized by the existence of particularly dry periods alternating with periods characterized by excess moisture, caused its debilitation. Due to the debilitation of the species, aggressive attacks from pests (especially Stereonichus fraxini) and cryptogamic agents (Hymenoscyphus fraxineus) took place. Studies conducted at European level indicate that Hymenoscyphus fraxineus has a high potential for multiplication and spread, and the trees infested with this fungus are predestined for drying. At present no methods have been identified to prevent the emergence and control of the disease caused by Hymenoscyphus fraxineus.
Over the last decades, in several forest areas, pollution has increased, affecting the health of trees and their regeneration capacity. Industrial pollution, both domestic and cross-border, generates the occurrence of acid rain. The harmful effect of the powders resulting from the activity of the units producing the building materials (cement, lime, ballast etc) acts and it is perceived on extensive areas. The evolution of the volume of wood mass affected by abnormal drying during 2010-2017 is presented in table no. VI. 3.

Table no. VI.3. Evolution of the volume of wood affected by abnormal drying during 2010-2017

No. crt.	Year	Volume of wood mass affected by abnormal drying (thousand m3)		
		Total	Resinous	Deciduous
1	2010	244,2	38,1	206,1
2	2011	151,9	45,9	106,0
3	2012	152,3	82,4	69,9
4	2013	496,5	327,5	169,0
5	2014	360,9	245,1	115,8
6	2015	247,2	115,8	131,4
7	2016	284,0	118,0	166,0
8	2017	221,1	107,7	113,4

Source: MAP

VI.1.4. RENEWED FORESTS SURFACES

VI.1.5. FORESTRY VEGETATION DEFICIT AREAS AND AFFORESTATION AVAILABILITY

VI.2 THREATS AND PRESSURES ON THE FORESTS

VI.2.1. CUT FOREST SURFACES

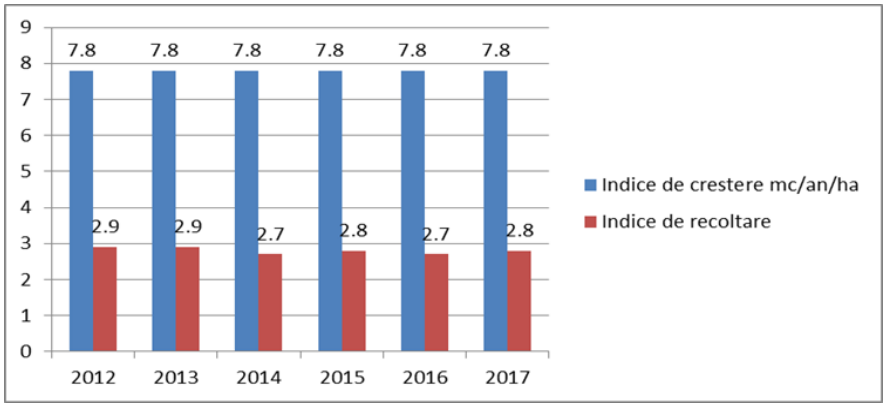
RO 45	Indicator code Romania: RO 45 AEM indicator code: SEBI 17

TITLE: FOREST: forest fund, growing and harvesting of timber
DEFINITION: The indicator shows the evolution of the forest fund, net annual growth and annual cuts, as well as the utilization rate of the forests (the annual cut of the annual increase).

The evolution of society brought with it the appearance of some types of products to meet the growing needs of different industries, namely the appearance of the various wood substitutes, but the pressure on forest ecosystems is still very high due to the large demand for wood varieties and does not provide for a reduction of these claims.

Forest-based ecosystems are driven by climate change, expanding economies and a society that wants to meet consumption needs and profitability as quickly as possible (forest owners want a maximum profit as soon as they enter contradiction with the availability and capacity to regenerate forest ecosystems).

Figure no. VI.3. Evolution of wood cuttings m3 / year / ha, period 2012-2017



Sursa: MAP

Table no. VI.4. Evolution of cut forest surfaces, period 2013-2017

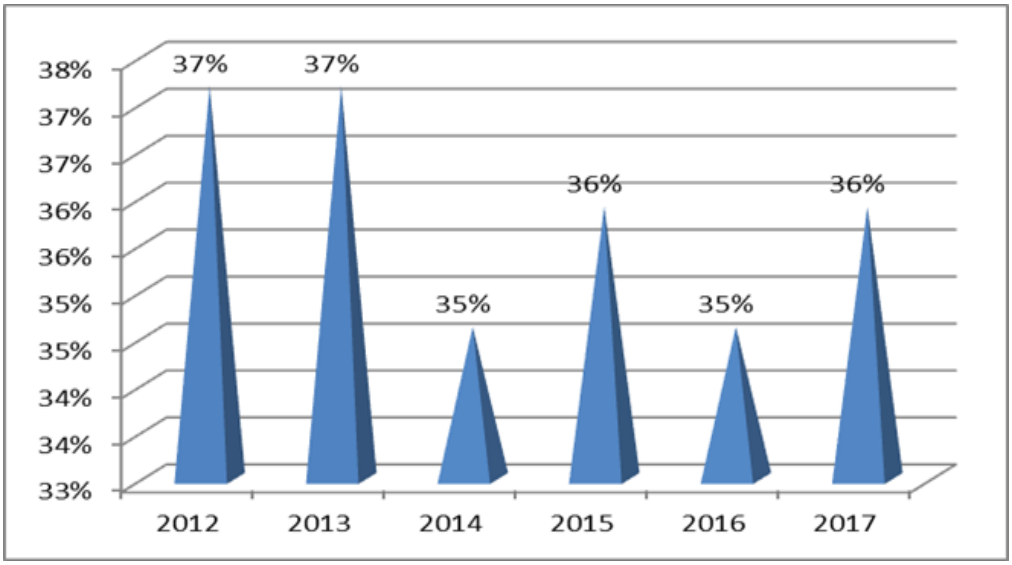
Type of cuttings		Year				
		2013	**2014**	**2015**	**2016**	**2017**
Regeneration cuttings, of which:	regeneration cuttings in forest-ha	78618	71914	67791	65127	70321
	Regeneration cuttings in grove-ha	4054	3642	3665	3229	3212
	substitution cuttings-ha	1133	1002	776	755	755
	Conservation cuttings-ha	25933	24423	24221	68107	103035
Total		**109738**	**100981**	**98453**	**137218**	**177296**

Source: MAP

The evolution of forest fund growth and wood harvesting in Romania is illustrated

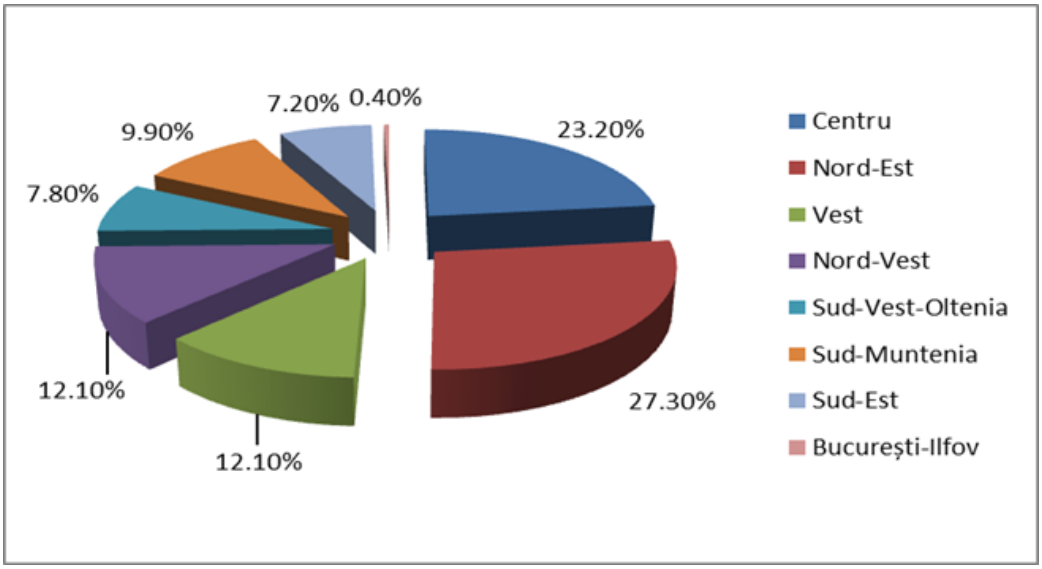
by the rate of use of forests (the ratio between tree cutting and tree growth).

Figure no. 4. Forest use rate in 2012-2017



Source: MAP

Figure no. VI.5. Wood mass harvested (%) by development regions in 2016

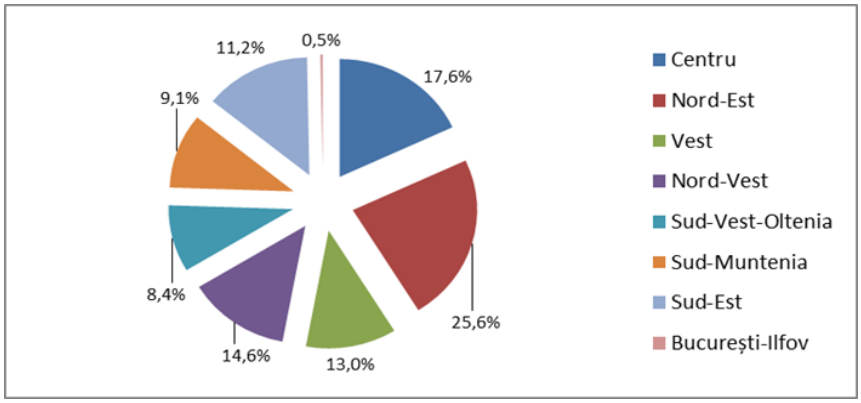


Source: MAP

The largest volume of wood was harvested in the NORTH-EAST development region 29.1% of the total volume of harvested wood, followed by the CENTRAL development area by 19.9% and a smaller share was registered in the development regions WEST with 12, 8%, NORTH-WEST with 12.7%, SOUTH-MUNTENIA with 9.7%, SOUTH-WEST OLTENIA with 8.2%, SOUTH-EAST with 7.2% and BUCHAREST-ILFOV with 0 ,4%.

Source: www.insse.ro

Figure no. VI.6. Forest regeneration works (%), by region of development, in 2016



Source: www.insse.ro

VI.2.2. CHANGING LAND USE

RO 44	Indicator code Romania: RO 44 AEM indicator code: SEBI 013

TITLE: FRAGMENTATION OF NATURAL AND SEMI-NATURAL AREAS
DEFINITION: The indicator shows differences in the average of natural and semi-natural surfaces, relying on land cover maps made by interpreting satellite images. It is based on a simple methodology, including mathematical calculations and GIS analysis, based on Corine Land Cover data (CLC).

VI.2.2.1. Fragmentation of ecosystems

Over the past two centuries, under the impact of anthropogenic activities in conjunction with those induced by natural disturbing factors, land use and land cover has undergone a continuous transformation through the local reduction of forest areas and the increase in land area of agricultural or land plots transport and/or construction. The local reduction of the surface of forest ecosystems has led to fragmentation of ecosystems, sometimes with irreversible consequences on biological diversity. For this reason, in recent years, a particular focus has been placed on protecting and conserving forest ecosystems in order to increase the reforestation percentage and reduce fragmentation.

The main cause of the fragmentation of forest ecosystems is the radical change of ownership of forest land. Thus, from state ownership over the entire forest fund, after 1990, by applying the land fund laws, the forest land is in different forms of ownership (public of the territorial-administrative, private entities of private individuals or of legal persons). In applying the forestry regime, forest holders have specific obligations and responsibilities. With respect to privately owned forests of individuals, it should be noted that at present there are estimated to be around 900000 owners. If this number adds to the fact that a large number of seemingly individual properties are, in fact, until the debate of successions, small collective property, we have a picture of the major difficulties encountered by the central public authority responsible for forestry in the elaboration of forestry policies of unitary management of the entire national forest fund, as well as in the control of the observance of the forest regime. Also, the fragmentation of the forest fund frequently occurs also in the case of the construction of isolated dwellings which subsequently require access ways and utilities.

VI.2.3. CLIMATE CHANGE

VI.3. TRENDS, FORECASTS AND ACTIONS ON SUSTAINABLE MANAGEMENT OF FORESTS

VII.MATERIAL RESOURCES AND WASTE

VII.1.USE OF MATERIAL RESOURCES: STATE AND TRENDS

VII.2.GENERATION AND WASTE MANAGEMENT: TRENDS, IMPACTS AND FORECASTS

VII.3.POLICIES AND ACTIONS ON THE USE OF MATERIAL RESOURCES AND WASTE

Chapter VII. MATERIAL RESOURCES AND WASTE

VIII.2.1. GENERATION AND MANAGEMENT OF MUNICIPAL WASTE

RO 16	Indicator code Romania: RO 16 AEM indicator: CSI 16

NAME: GENERATION OF MUNICIPAL WASTE
DEFINITION: The indicator expresses the total amount of municipal waste generated per capita (kg per capita and year.)

In accordance with National Waste Management Strategy 2014-2020, "*municipal waste is represented by all domestic and similar waste generated in urban and rural areas in households, institutions, commercial units and from economic operators, street waste collected from premises of public buildings, streets, parks, green spaces, plus building and demolition waste resulting from the interior design of dwellings collected by sanitation operators"*.

The collection of municipal waste is the responsibility of the municipalities, which can carry out these tasks either directly (through specialized services within the Local Councils) or indirectly (by delegating this responsibility on a contractual basis to specialized and authorized companies for the performance of sanitation services).

In 2016, the amount of municipal waste collected through the specialized services of the mayoralties or the sanitation companies was 5260 thousand tons.

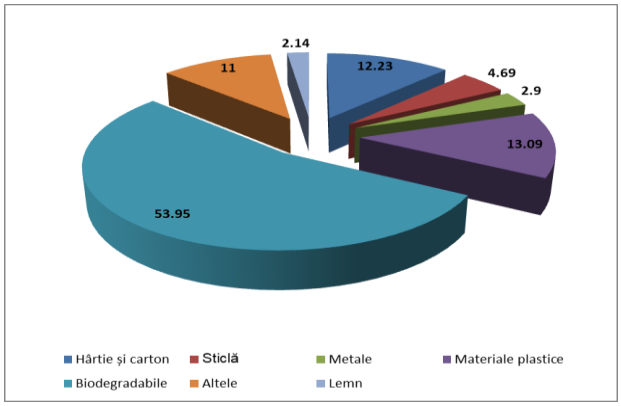
Of the total amount of municipal waste collected by sanitation operators, 79% is household waste and assimilable waste.

Table no. VII.1 - Waste collected by municipalities in 2016

Waste collected	Quantity collected - thousands of tons	Percent %
domestic and similar waste	4301	82
waste from municipal services	691	13
construction / demolition waste	268	5
TOTAL	**5260**	**100**

Source: National Environment Protection Agency

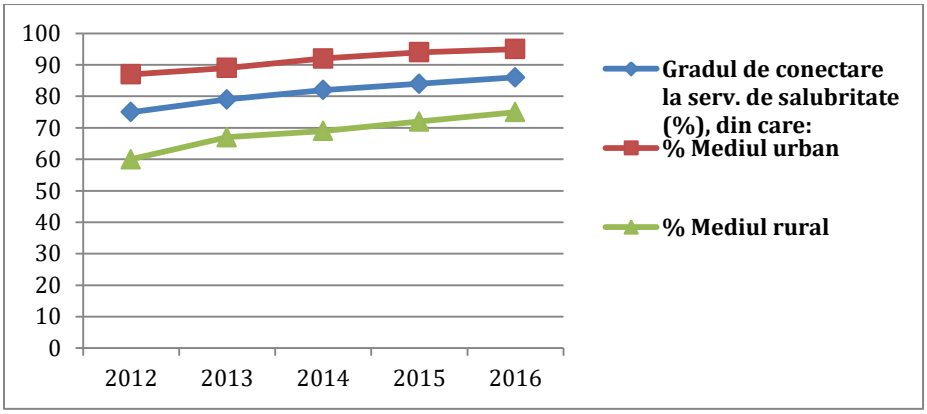
Figure no. VII.1 - Percentage composition of household and similar waste collected in 2016



Source: National Environment Protection Agency

It should be noted that collection of municipal waste is not generalized at national level. Figure no.VII.2 shows the evolution of the connection to the sanitation service during 2012-2016.

Figure no. VII.2 - The degree of connection to the sanitation service during 2012-2016



Source: National Environment Protection Agency

From the above information we can see a year-on-year increase in the connection to the sanitation service.

The amount of waste generated by the population not served by sanitation is calculated using the following generation indices: 0.9 kg / place / day for the urban area and 0.4 kg / place / day for the rural area.

Municipal waste management involves the collection, transport, recovery and disposal of waste, including the monitoring of landfills after closure.

Responsibility for municipal waste management rests with local government, which, through its own means or through the concession of the sanitation service to an authorized operator, must ensure collection (including separate collection), transport, treatment, recovery and final disposal of such waste.

Some of the collected municipal waste is sent directly for final (material or energy) recovery or disposal, while another part is sent to intermediate treatment plants (sorting stations, composting plants).

The disposal of municipal waste is done exclusively by storage. Until now, municipal waste incineration plants have not been put into operation in Romania. At the end of 2017, 40 compliant landfills were authorized to operate.

Sustainable development indicators on municipal waste

In accordance with EUROSTAT (Municipal Waste Data Collection Guidelines) recommendations, municipal waste is domestic and assimilable waste generated by households, institutions, business units and economic operators.

Included are bulky waste (including WEEE from the population) and waste coming from parks, gardens and street cleaning, including the contents of street bins.

By collection mode, municipal waste is:

- Collected by or on behalf of the municipalities;
- Collected directly by private economic operators - valid for WEEE and other types of recyclable waste;
- Generated and uncollected by a sanitation operator, but managed directly by the generator.

Are excluded:

- Sewage sludge from urban wastewater treatment;
- Construction and demolition waste.

Sustainable development indicators on municipal waste refers to:

- Municipal waste generated;
- Municipal waste treated by: energy recovery, storage, recycling (excluding composting and anaerobic digestion), composting.

The EUROSTAT Guideline also recommends that recyclable waste streams (paper, plastic, metal, etc.) resulting from sorting facilities and subsequently sent to recycling facilities, to be considered as recycled.

Considering all the above, the following municipal waste indicators have been calculated at national level:

- *Municipal waste generated - 5136029 tonnes in 2016*

The value was calculated by summing the quantities generated for the following types of waste:

- ✓ household and similar waste and from municipal services collected by sanitation operators;
- ✓ household waste generated and uncollected by sanitation operators;
- ✓ recyclable waste from the population, collected through authorized economic operators other than sanitation operators (paper and cardboard, metals, plastics, glass, wood, biodegradable, textile, WEEE, waste batteries and accumulators).

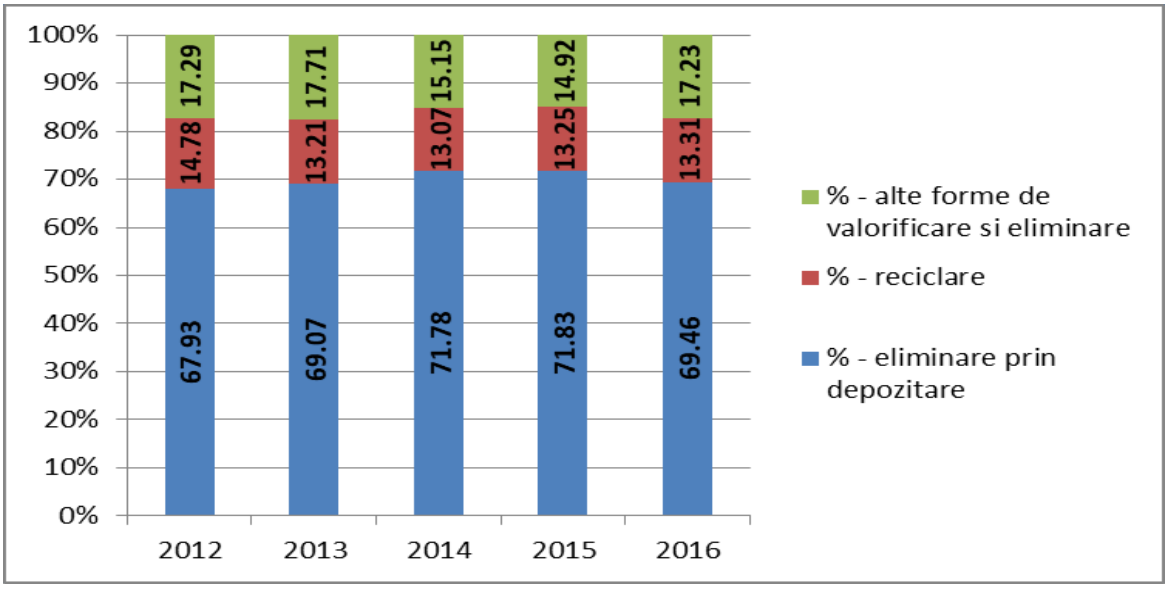
- *Municipal recycled waste (including composting) - 683771 tonnes in 2016*

The value was calculated by summing up the recycled quantities for the following types of waste:

- ✓ household and similar waste and from municipal services collected by sanitation operators;
- ✓ household waste generated and uncollected by sanitation operators;
- ✓ recyclable waste from the population, collected through authorized economic operators, other than sanitation operators (paper and cardboard, metals, plastic, glass, wood, biodegradable, textile, WEEE, battery and accumulator waste).

- *The recycling rate achieved for municipal waste in 2016 - 13.31%.*

Figure no. VII.3 - The share of the main municipal waste management activities in 2012-2016



Source: National Environment Protection Agency

VII.2.3. SPECIAL WASTE FLOWS

VII.2.3.1. WASTE OF ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

RO 63	Indicator code Romania: RO 63 AEM indicator code: WASTE 003

TITLE: ELECTRICAL AND ELECTRONIC EQUIPMENT WASTE
DEFINITION: The indicator shows the quantities of electrical and electronic equipment (EEE) that are placed on the market and the quantities of waste from electrical and electronic equipment (WEEE) collected in total, from households and reused or recycled, expressed in kg / capita. The figures are related to the collection target of 4 kg / site / year set at the level of the Member States of the European Union.

Only electrical and electronic equipment can be placed on the market by the producers registered in the Register of Producers and Importers of EEE, conceived at NEPA.
At the beginning of 2006, the procedure for registration of the electrical and electronic equipment producers was started in the Register of producers and importers of electrical and electronic equipment, according to the requirements of the legislation in force. By the end of 2017, there were 3005 manufacturers of electrical and electronic equipment (EEE).
The evolution of the quantities of EEE placed on the market during the period 2012-2016 is presented in Table VII.2.

Table no. VII.2 - EEE placed on the market

Category	Quantities of EEE (tonnes)				
	2012	2013	2014	2015	2016
1 - Large household appliances	74755.61	81810.67	84995.17	105692.21	129548.53
2 - Small household appliances	14641.71	13655.46	10466.12	15075.62	16224.62
3 - IT and telecommunication equipment	12423.31	13759.41	13400.46	13934.16	13231.54
4 - Consumer goods	12267.52	11704.91	14832.53	15759.25	17594.37
5 - Lighting equipment	6052.09	6363.55	5350.9	6063.35	7042.15
6 - Electrical and electronic tools	7556.19	7339.87	7727.25	9654.61	11068.44
7 - Toys, sports and leisure equipment	812.9	654.42	999.47	1613.55	2150.54
8 - Medical devices (except for all implanted and infected products)	423.57	416.79	394.51	674.21	565.36
9 - Surveillance and control instruments	1245.3	750.14	938.16	2566.29	2126.21
10 - Automatic dispensers	369.85	348.97	482.54	808.83	1093.56
TOTAL	**130548.1**	**136804.2**	**139587.1**	**171842.1**	**200645.32**

Source: National Environment Protection Agency

In order to achieve the annual targets for the collection, reuse, recycling and recovery of WEEE, manufacturers can act:

- individually, using their own resources;
- by transferring these responsibilities, on a contractual basis, to a legally established and authorized economic operator.

The operating licenses and contact details of authorized collective organizations are published on the website of the Ministry of Environment, in the chapter on Waste Management - DEEE Commission.

Between 2008 and 2015, an annual WEEE collection target was set of at least 4 kg of waste per inhabitant. Despite the efforts made by the responsible authorities and operators, the annual collection target of 4 kg / inhabitant / year was not achieved.

Evolution of the quantities of WEEE collected during the period 2012-2016 is presented in table no. VII.3.

Table no. VII.3 - WEEE collected

Category	Quantities of EEE (tonnes)				
	2012	2013	2014	2015	2016 (preliminary data)
1 - Large household appliances	11398.81	20315.61	20465.24	24122.43	29592.16
2 - Small household appliances	864.21	977.49	1021.16	1218.32	1320.07
3 - IT and telecommunication equipment	4976.01	4886.16	4803.3	6837.5	5645.37
4 - Consumer goods	3513.5	4671.74	3513.27	5385.22	7063.19
5 - Lighting equipment	776.99	837.26	1140.05	1783.84	1292.11
6 - Electrical and electronic tools	691.64	702.87	815.37	796.01	891.33
7 - Toys, sports and leisure equipment	59.84	89.82	65.6	107.26	115.51
8 - Medical devices (except for all implanted and infected products)	58.19	28.44	34.07	48.43	83.24
9 - Surveillance and control instruments	686.63	505.58	236.42	3836.15	411.01
10 - Automatic dispensers	56.94	149.78	64.51	94.84	239.79
TOTAL	**23082.76**	**33164.75**	**32158.99**	**40777**	**46653.79**

Source: National Environment Protection Agency

WEEE collected are treated both in Romania and in other EU member states. The recovery targets set by the legislation, respectively achieved, are presented in table no. VII.4.

Table no. VII.4 - Objectives of recovery for WEEE

Category	Objective of recovery envisaged by legislation (%)	Realized recovery targets (%)				
		2012	2013	2014	2015	2016
1 - Large household appliances	80	89	93	93	83	Data is being processed
2 - Small household appliances	70	88	89	88	93	
3 - IT and telecommunication equipment	75	86	85	87	80	
4 - Consumer goods	75	87	88	88	85	
5 - Lighting equipment	80	84	92	93	86	
6 - Electrical and electronic tools	70	89	88	91	95	
7 - Toys, sports and leisure equipment	70	83	84	84	70	
8 - Medical devices (except for all implanted and infected products)	Not applicable	Not applicable	Not applicable	Not applicable	70	
9 - Surveillance and control instruments	70	86	86	88	76	
10 - Automatic dispensers	80	90	92	93	83	

Source: National Environment Protection Agency

VII.2.3.2. PACKAGING WASTES

RO 17	Indicator code Romania: RO 17 AEM indicator: CSI 17

TITLE: GENERATION AND RECYCLING OF PACKAGING WASTE
DEFINITION: The indicator is the total quantity of packaging used in Romania, expressed in kg per capita and year.

Based on the legislation in force, economic operators with responsibilities report the data on packaging and packaging waste. The analysis and interpretation of the data was carried out in NEPA. The results are presented and analyzed below.

Table no. VII.5 - Packaging placed on the market (tonnes) by type of material, 2011-2015

Tip materiale	2011	2012	2013	2014	2015
	tone	tone	tone	tone	tone
Sticlă	139730	160259	149205	164521	194347
Plastic	278810	298042	290279	336818	359036
Hârtie/carton	293100	303108	311578	388017	441764
Metal	55230	58333	54406	65666	66830
Lemn	225540	239774	248660	289691	334573
Altele	100	41	11	24	11
TOTAL	992510	1059557	1054139	1244737	1396562

Source: National Environment Protection Agency

Table no. VII.6 -. Recovered packaging waste by type of material, 2011-2015

Tip materiale	2011		2012		2013		2014		2015	
	tone	%	tone	%	tone	%	tone	%	tone	%
Sticlă	83790	59.97	106192	66.26	73467	49.24	89103	54.16	79874	41.10
Plastic	120370	43.17	154778	51.93	158218	54.51	155353	46.12	170595	47.50
Hârtie şi carton	199340	68.01	212648	70.16	239745	76.95	325024	83.77	395861	89.60
Metal	34410	62.30	32398	55.54	28732	52.81	42147	64.18	42845	64.10
Lemn	101950	45.20	102696	42.83	73886	29.71	90680	31.30	105520	31.50
Altele	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	539860	**54.39**	608712	**57.45**	574048	**54.46**	702307	**56.42**	794696	**56.90**

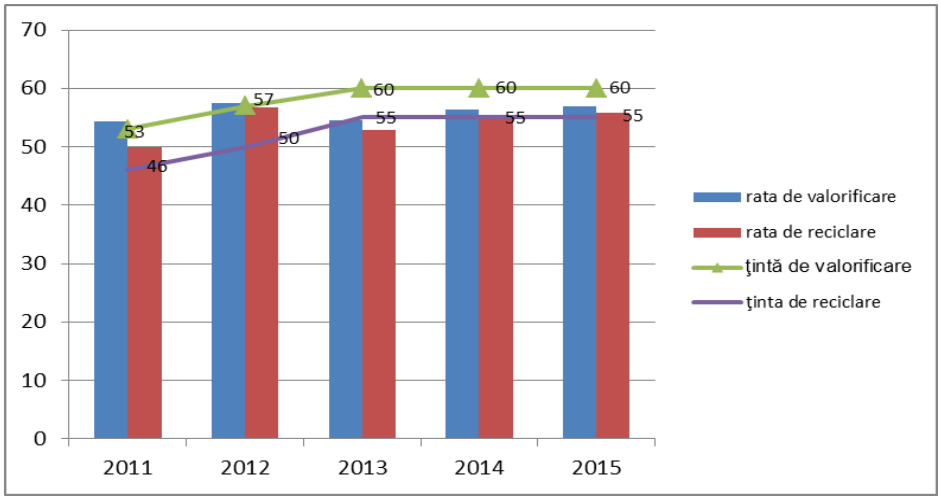
Source: National Environment Protection Agency

Table no. VII.7 - Recycled packaging waste by type of material, 2011-2015

Tip materiale	2011		2012		2013		2014		2015	
	tone	%	tone	%	tone	%	tone	%	tone	%
Sticlă	83790	59.97	106192	66.26	73467	49.24	89103	54.16	79874	41.10
Plastic	112460	40.34	152852	51.29	149940	51.65	149769	44.47	167554	46.70
Hârtie şi carton	191990	65.50	211698	69.84	232580	74.65	323556	83.39	394300	89.30
Metal	34410	62.30	32398	55.54	28732	52.81	42147	64.18	42845	64.10
Lemn	73390	32.54	98660	41.15	71902	28.92	77071	26.60	96203	28.80
Altele	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
TOTAL	496040	**49.98**	601800	**56.80**	556621	**52.80**	681646	**54.76**	780776	**55.91**

Source: National Environment Protection Agency

Figure no. VII.4 - Trend of recovery and recycling rates of packaging waste



Source: National Environment Protection Agency

VII.2.3.3. END OF LIFE VEHICLES

RO 69	Indicator code Romania: RO 69 AEM indicator code: TERM 11

TITLE: END OF LIFE VEHICLES
DEFINITION: The indicator shows the number of end-of-life vehicles and monitors whether the targets for recovering used tires have been met. The indicator is expressed in units of collection per year and percentage.

In the period 2007 - 2014, economic operators are obliged to ensure the following objectives, taking into account the average mass at the empty:

- ✓ reuse and recovery of at least 75% of the average mass per vehicle and year of vehicles manufactured before 1 January 1980;
- ✓ reuse and recover at least 85% of the average mass per vehicle and year of vehicles manufactured after 1 January 1980;
- ✓ reuse and recycling of 70% of the average mass per vehicle and year of vehicles manufactured before 1 January 1980;
- ✓ reuse and recycling of 80% of the average mass per vehicle and year of vehicles manufactured from 1 January 1980.

Starting January 1, 2015, economic operators are required to ensure that the following goals are met, taking into account the average mass at the empty:

- ✓ reuse and recover at least 95% of the average mass per vehicle and year for all end-of-life vehicles;
- ✓ reuse and recycling of at least 85% of the average mass per vehicle and year for all end-of-life vehicles.

In order to monitor the achievement of the objectives set out above, economic operators performing collection and treatment of end-of-life vehicles are required to report specific information. Centralized national data is presented below.

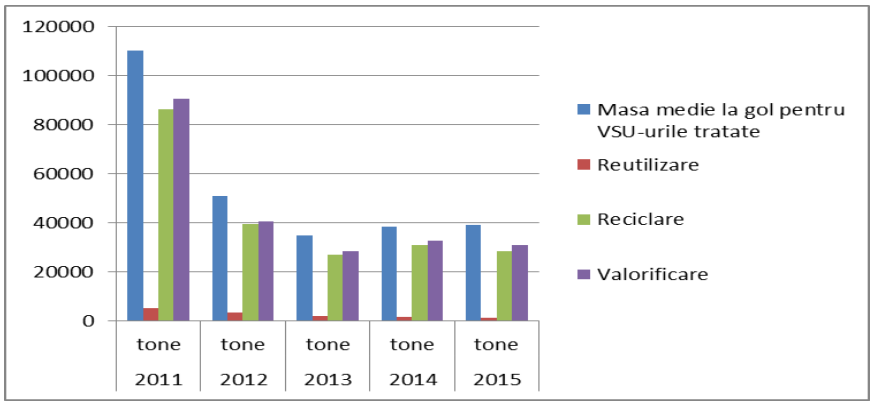
Table no. VII.8 - ELV collected and handled between 2011 and 2015

	2011	2012	2013	2014	2015
VSU colectate	124299	55374	37340	43351	43228
VSU tratate	128839	57950	37989	42138	41886

*Diferența dintre numărul de vehicule scoase din uz colectate și numărul de vehicule scoase din uz tratate se datorează vehiculelor scoase din uz în anii anteriori și rămase în stoc

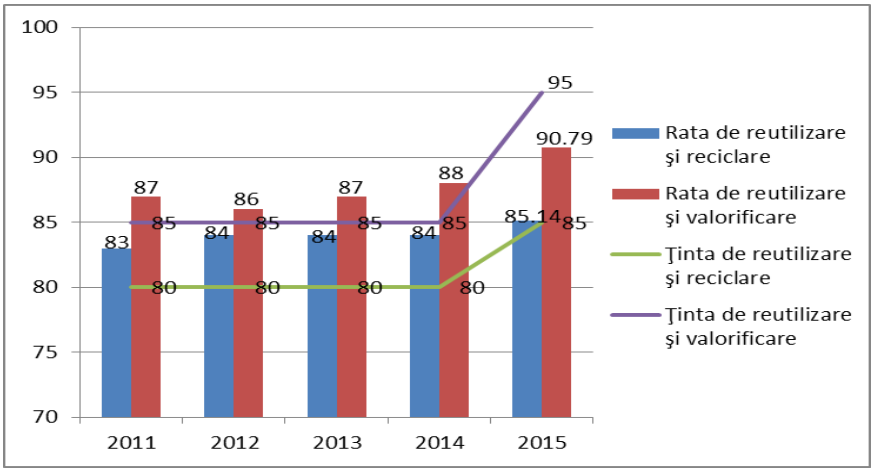
Source: National Environment Protection Agency

Figure no. VII.5 - Evolution of reuse / recycling / recovery



Source: National Environment Protection Agency

Figure no. VII.6 - Trend of reuse / recycling / recovery



Source: National Environment Protection Agency

VIII.CLIMATE CHANGE

VIII.1.IMPACT OF CLIMATE CHANGE ON NATURAL AND ANTROPIC SYSTEMS

VIII.2.DETERMINANT FACTORS AND PRESSURES ON CLIMATE CHANGE

VIII.3.TRENDS OF GREENHOUSE GAS EMISSIONS

VIII.4.SCENARIOS AND FORECASTS ON CLIMATE CHANGE

VIII.5.ACTIONS FOR ATTENUATING AND ADAPTING TO CLIMATE CHANGE

Chapter VIII. CLIMATE CHANGE

VIII.1. IMPACT OF CLIMATE CHANGE ON NATURAL AND ANTROPIC SYSTEMS

VIII.1.1. CHANGES RELEVANT TO THE CLIMATE FRAMEWORK IN ROMANIA

RO 12	Indicator code Romania: RO 12 AEM indicator code: CSI 12

TITLE: TEMPERATURE AT NATIONAL LEVEL
DEFINITION: This indicator shows absolute changes and average temperature changes at national level.

Climate characterization of 2017

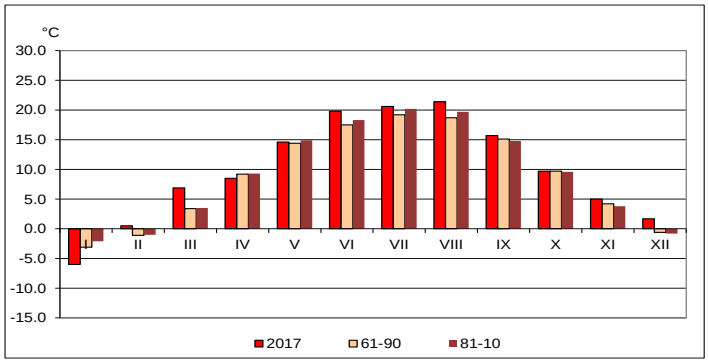
In 2017, the country average annual temperature (9.9 ° C) was 0.7°C higher than the normal climatological one (reference interval 1981 to 2010). The highest annual average temperatures, above 12ºC, were registered in the southern and southwestern part of the country, the highest value, 13.5ºC, recorded at Dr. Tr. Severin. Negative deviations of monthly average temperature from normal climatic conditions, corresponding to each month, were recorded in 3 of the 12 months of the year and were between 0.3ºC (May) and 3.9ºC (January). In 9 months, the average monthly temperature in the country was higher than normal climatological values between 0.1ºC (October) and 3.4ºC (March) (Figure No. VIII.1). The distribution of the annual average temperature in the country in 2017 is shown in figure no. VIII.2.

Table no. VIII.1 - Annual average temperatures and annual rainfall averages in Romania over the last 5 years

Year	2013	2014	2015	2016	2017
Temperature iîn ºC)	10,0	10,2	10,5	10,4	9,9
Rainfall (in mm)	683,5	807,8	630,1	791,5	673,5

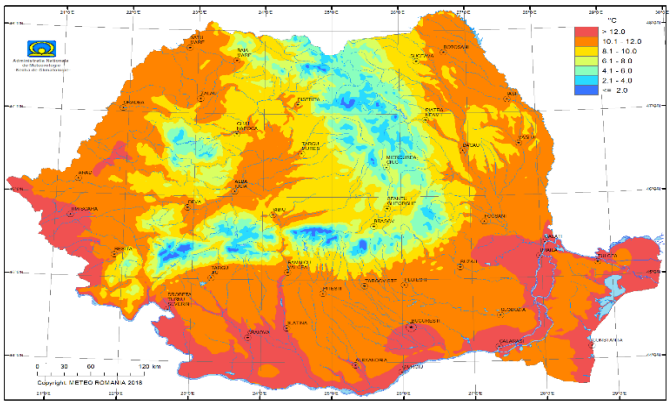
Source: National Meteorological Administration

Figure no. VIII.1 - The average monthly temperature in Romania in 2017, compared to normal climatology (1961-1990, 1981-2010)



Source: National Meteorological Administration

Figure no. VIII.2 - Average annual temperatures in 2017 (în ºC)



Source: National Meteorological Administration

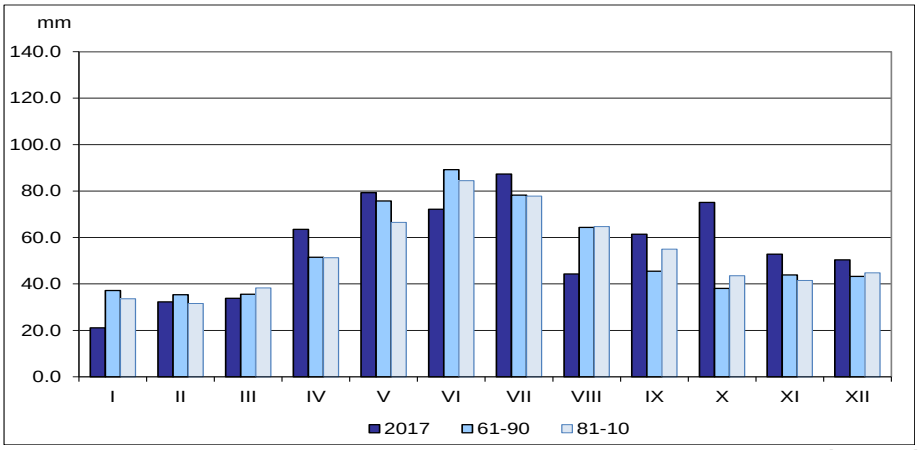
RO 47	Indicator code Romania: RO 47 AEM indicator code: CLIM 02

TITLE: RAINFALLS AVERAGE

DEFINITION: This indicator is defined by:

- Annual rainfall trends at national level
- The projected changes in annual rainfall and summer season at national level

Figure no. VIII.3 - The average monthly precipitation rate in Romania in 2017 compared to the normal, climatological one (1961-1990, 1981-2010)



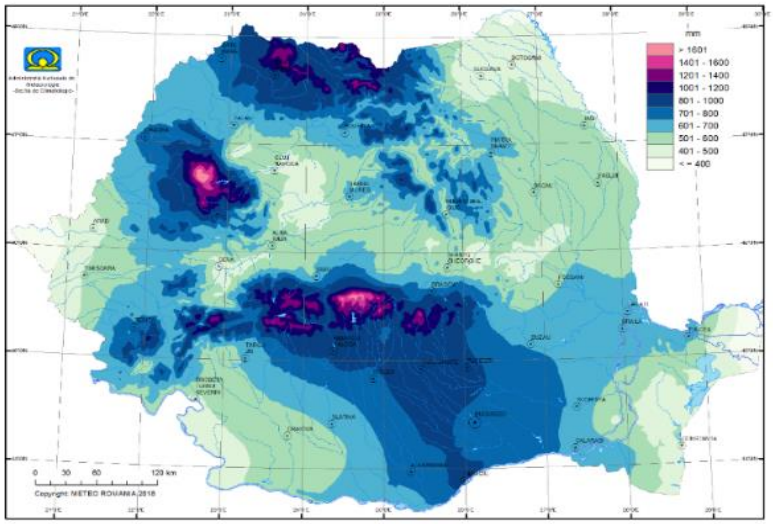
Source: National Meteorological Administration

The annual rainfall, country average (673.5 mm), was only 6% higher than the normal climatological one (1981-2010). Thus, the deviations were positive in eight of the 12 months, fluctuating between 2% (February) and 73% (October), and negative deviations were in the remaining four months, January, March, June and August, oscillating between 12% in March and 37% in January.

Large annual precipitation, over 800-1000 mm, accumulated mainly in Maramures, in important areas of Muntenia and Crişana, but also in the mountain area (figure no.VIII.4) .

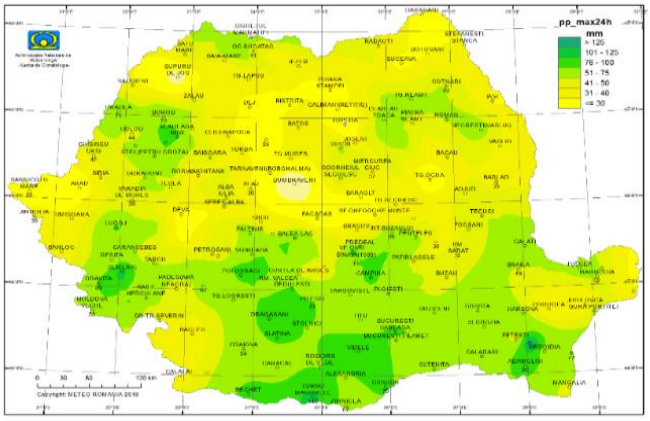
In 2017, higher values of the maximum amount of rainfall accumulated in 24 hours were recorded isolated on areas in Banat, Oltenia, Western Carpathians and southern Dobrogea (Figure no. VIII.5).

Figure no. VIII.4- Annual rainfall rates in 2017 (in mm)



Source: National Meteorological Administration

Figure no. VIII.5 - The maximum amount of rainfall accumulated in 24 hours, registered in 2017, at meteorological stations covering the territory of Romania (in mm)

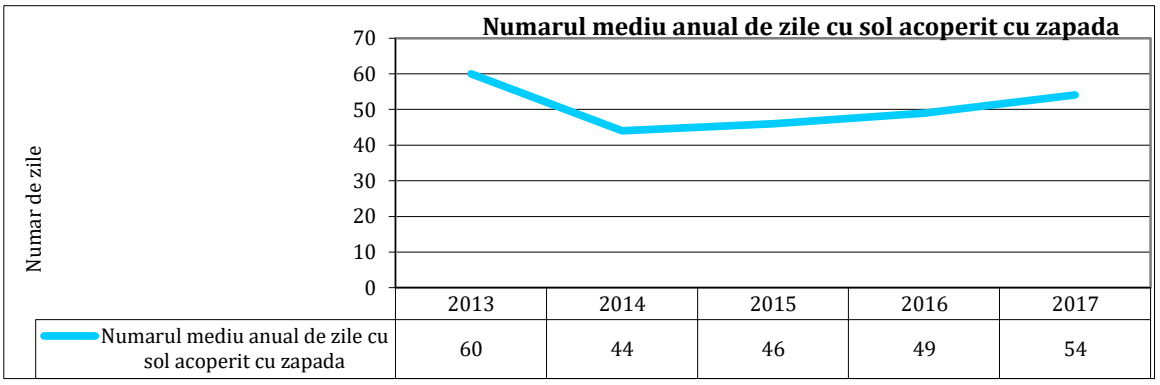


Source: National Meteorological Administration

RO 49	Indicator code Romania: RO 49 AEM indicator code: CLIM 08

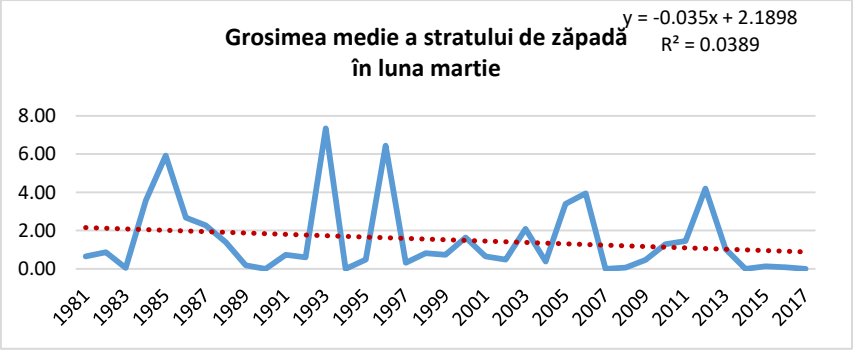
TITLE: THE DEGREE OF SNOW COVERING
DEFINITION: This indicator is defined by:
- Evolution of snow cover at national level
- Trend of snow recorded in March (excluding mountain areas)
- Forecast changes concerning the annual number of days with snow

Figure no. VIII.6 - The average annual number of days with soil covered in snow in Romania in the last 5 days



Source: National Meteorological Administration

Figure no. VIII.7 - Evolution of the mean snow thickness (in cm) in Romania (excluding mountain stations) in March, between 1981 and 2017, and the associated linear trend



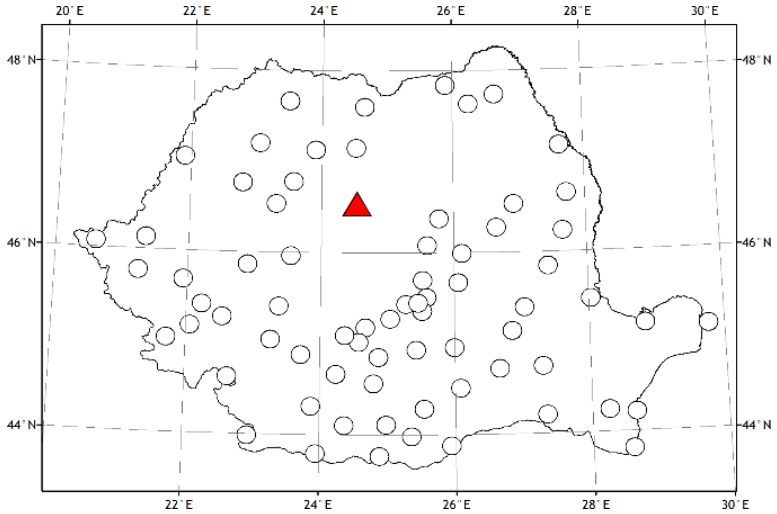
Source: National Meteorological Administration

The average annual number of days with soil covered in snow in Romania is illustrated in Figure no. VIII.6. In 2017 there was a slight increase in the number of snow-covered days compared to 2016. The trend of the thickness of the snow layer (except mountain stations), highlighted in March (figure no. VIII.7) for the period 1981-2017, is a significant reduction, consistent with the developments in Europe and Asia and in agreement with the global warming signal.

RO 48	Indicator code Romania: RO 48 AEM indicator code: CLIM 04

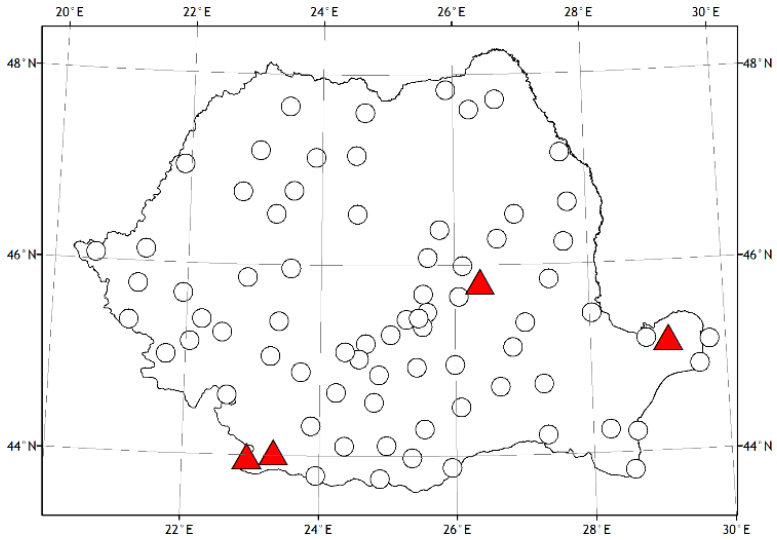
TITLE: EXTREME RAINFALL
DEFINITION: This indicator is defined by:
• Evolution of the number of consecutive days with rainfall (wet periods), or no precipitation (dry periods)
• The projected changes for the next 20 years on maximum rainfall during summer and winter

Figure no. VIII.8 -Trends in the duration of the maximum annual consecutive days with precipitation (%) over the period 1961-2017. Significant elevations (decreases) at the 90% threshold (two-dimensional) are represented by red triangles



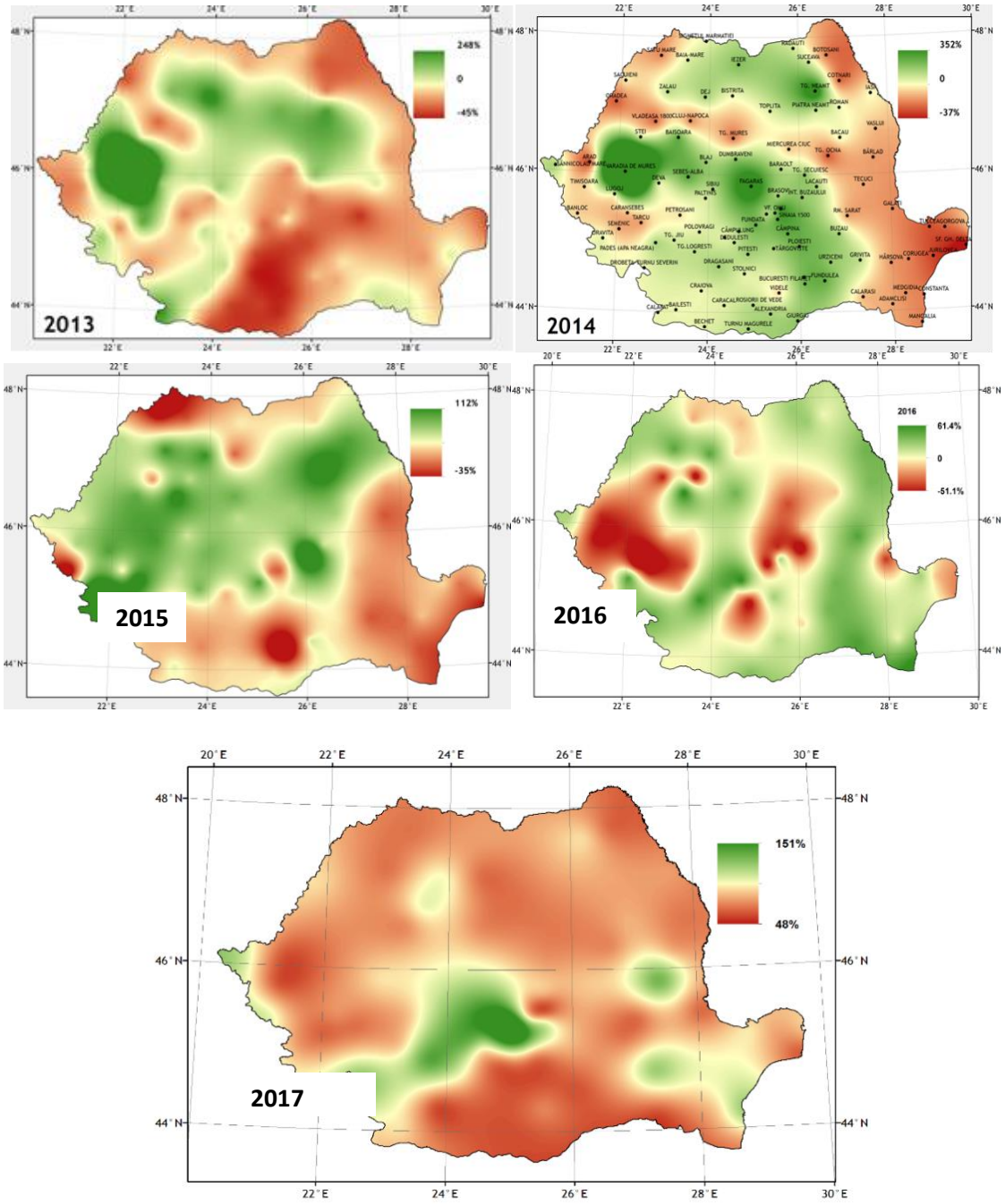
Source: National Meteorological Administration

Figure no. VIII.9 - Trends in the maximum annual period of consecutive days without precipitation (%) over the period 1961-2017. Significant elevations (decreases) at the 90% threshold (two-dimensional) are represented by red triangles



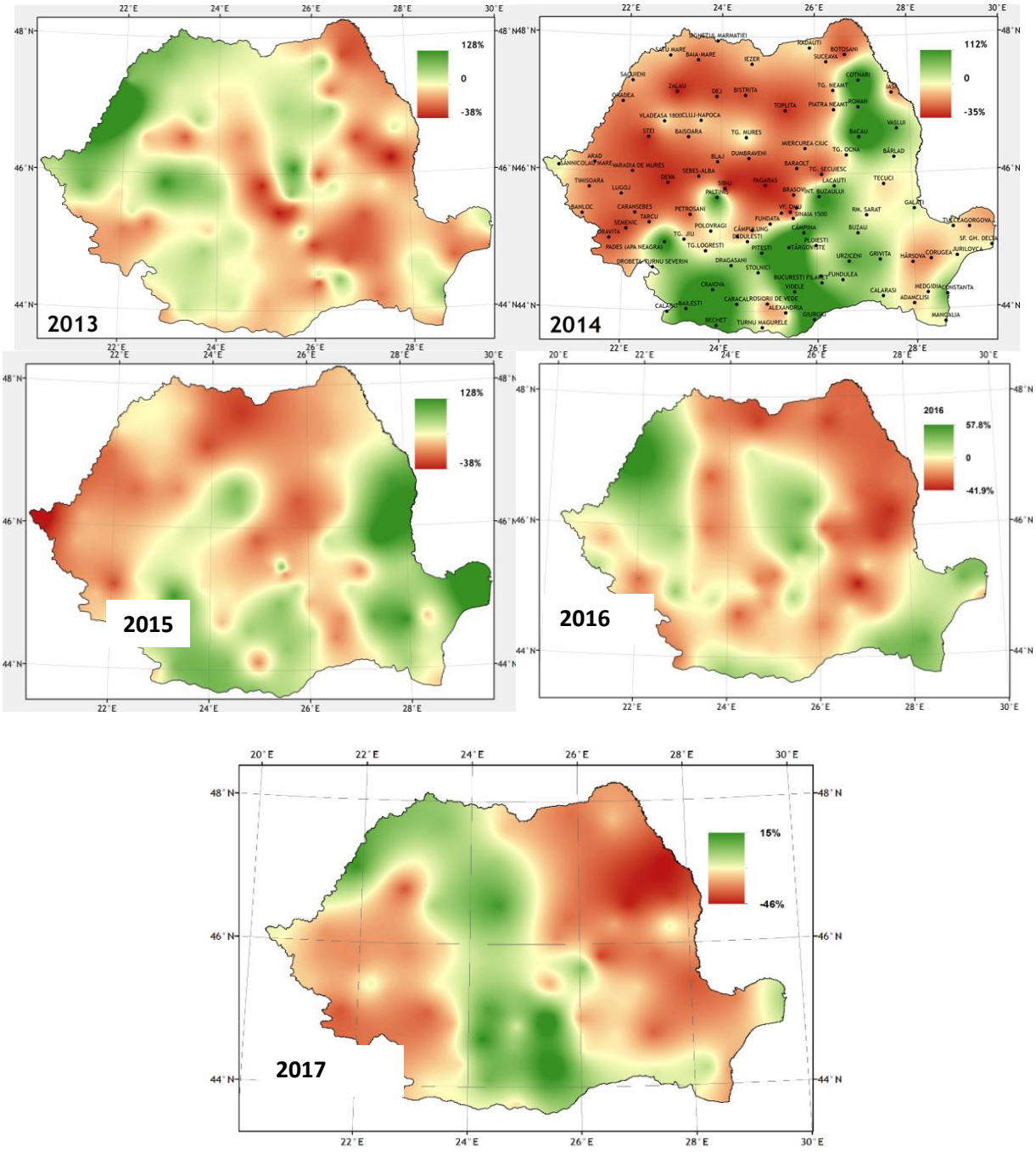
Source: National Meteorological Administration

Figure no. VIII.10 - Decrease of the maximum number of consecutive days without rainfall (%) in the last 5 years compared to the multi-annual average of 1981-2010 (current climatological norm)



Source: National Meteorological Administration

Figure no. VIII.11 - Decrease of the maximum number of consecutive days with rainfall (%) in the last 5 years compared to the multi-annual average of 1981-2010 (the climatological norm in force)



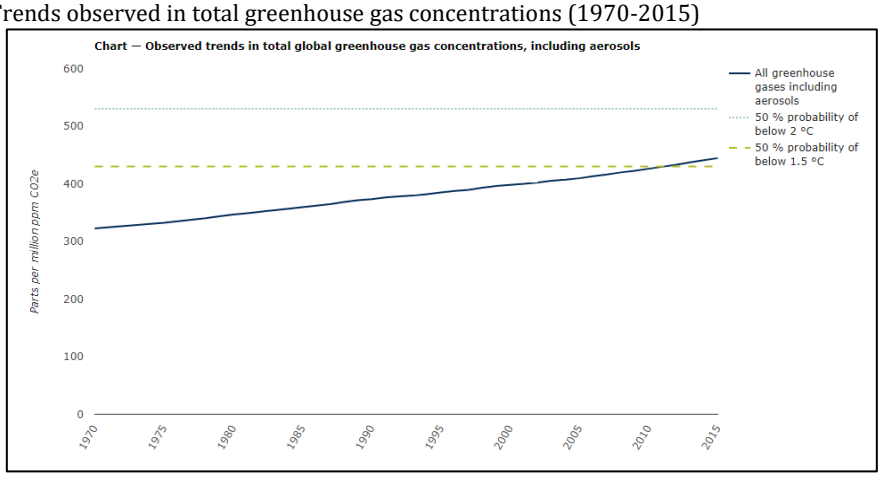
Source: National Meteorological Administration

VIII.1.2. CONCENTRATION OF ATMOSPHERE GREENHOUSE GASES

RO 13	Indicator code Romania: RO 13 AEM indicator code: CSI 013

TITLE: ATMOSPHERIC CONCENTRATIONS OF GREENHOUSE GASES
DEFINITION: The indicator shows the measured trends and forecasts for greenhouse gas (GHG) concentrations. Included are GHG concentrations in the Kyoto Protocol (CO2, CH4, N2O, SF6, HFCs, PFCs and NF3).

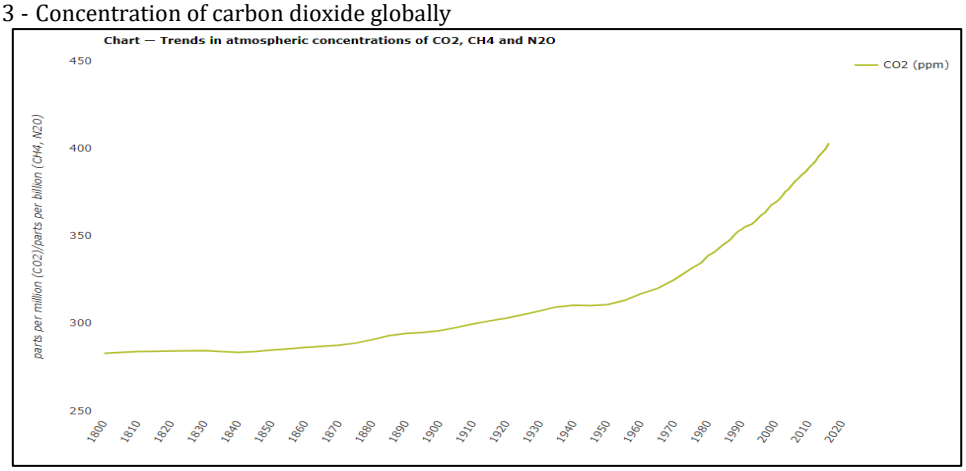
Figure no. VIII.12 - Trends observed in total greenhouse gas concentrations (1970-2015)



Source:: https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-10/assessment

The annual average CO2 concentration reached 400 and 403 ppm in 2015 and 2016 respectively (Figure VIII.12). This represents an increase of over 119 ppm (+ 43%) compared to pre-industrial levels (before 1800) (NOAA, 2015). Generally, CO2 concentrations in the atmosphere exceed the concentration range recorded in ice cores over the last 800,000 years (IPCC, 2013) (Figure No. VIII.13).

Figure no. VIII.13 - Concentration of carbon dioxide globally



Source: https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-10/assessment

VIII.1.4 IMPACT OF CLIMATE CHANGE ON SOCIO-ECONOMIC SECTORS AND SYSTEMS

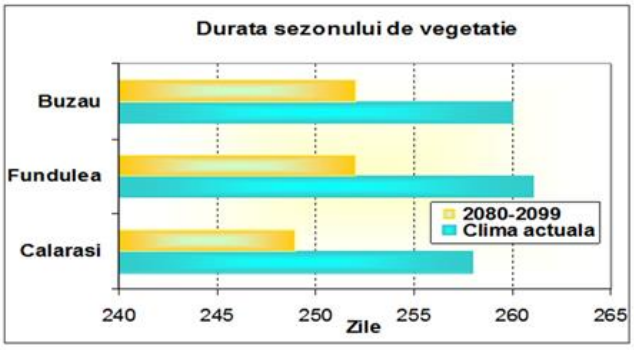
VIII.1.4.1. Agriculture

RO 52	Indicator code Romania: RO 52 AEM indicator code: CLIM 030

TITLE: THE AGRICULTURAL GROWTH SEASON
DEFINITION: This indicator is defined by the number of days with positive temperatures in a year.

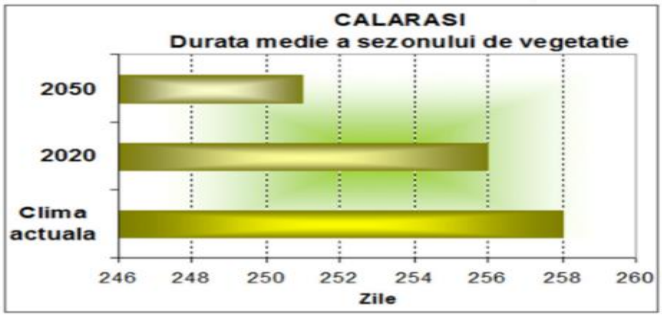
The vegetation season is that period of the year, also called the no freeze season, where the most favorable conditions of plant growth are registered. In figure no. VIII.14 is presented the duration of the growing season for wheat crops both for the present period and for the period 2080-2099. Projections were conducted using the RegCM3 climate model, developed at ICTP, Trieste, under IPCC emission scenarios, A1B. For all three analyzed stations, significant decreases (number of days) of the vegetation season are observed. For example, in Călăraşi (figure no. VIII.15), one can notice a decrease of the vegetation season by 2-14 days due to the increase of the temperature. For the average duration of the vegetation season, the HadCM3 climate model simulations were used for the 2020-2050 timeframe under the IPCC A2 emission scenario.

Figure no. VIII.14- The duration of the growing season for the wheat crop for the current climate and for the period 2080-2099



Source: National Meteorological Administration, Extreme Meteorological Phenomena in Romania - Implications on Agriculture, ICAR Forum Issue no V

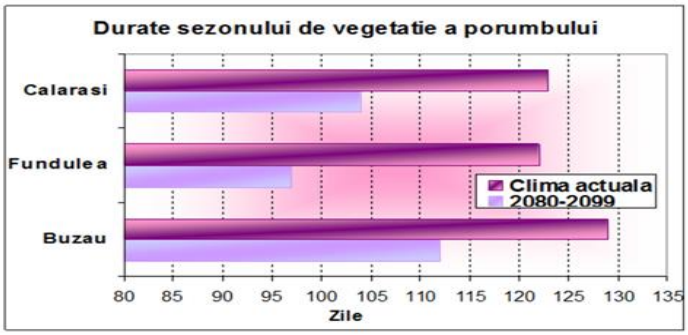
Figure no. VIII.15- The length of the growing season for the wheat culture at Calarasi station



Source: National Meteorological Administration, Extreme Meteorological Phenomena in Romania - Implications on Agriculture, ICAR Forum Issue

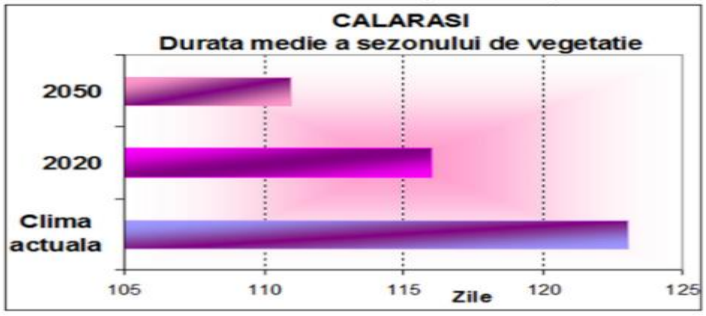
Regarding the maize culture (figure no. VIII.16), there is a decrease of the production as a result of the increase of water deficiencies in the soil, especially during the filling phase of the grain. For Calarasi station (figure no. VIII.17) the vegetation season is shortened by 7 days in 2020 and by 12 days in 2050, respectively, as a result of the increase of the air temperature.

Figure no. VIII.16 - The duration of the crop season for maize crop for the current climate and for the period 2080-2099



Source: National Meteorological Administration, Extreme Meteorological Phenomena in Romania - Implications on Agriculture, ICAR Forum Issue

Figure no. VIII.17 - The duration of the crop season for corn crop at Calarasi station



Source: National Meteorological Administration, Extreme Meteorological Phenomena in Romania - Implications on Agriculture, ICAR Forum Issue no V

RO 57	Indicator code Romania: RO 57 AEM indicator code: CLIM 16

TITLE: PRODUCTIVITY OF AGRICULTURAL CROPS DETERMINED BY THE LACK OF WATER RESOURCES
DEFINITION: This indicator can be mainly defined by the yield of agricultural crops due to the lack of water resources.

The forecasts of climate change (air temperature and rainfall) in Romania for the period 2001 - 2030 were constructed by applying two extrapolation methods (dynamic and static) recommended by the IPCC and applied to some global models (AOGCM) or regional models (RegCM) and applied to the A1B IPCC projection (small increases in GHG concentrations in the atmosphere in the 21st century).
The statistical outcomes of the forecasts for the period 2001-2030 as compared to the period 1960-1990 show the following:

- the air temperature will increase by 0.7 to 1.10C;
- average rainfall values in December and February will decrease, while in October and June will increase, and for the other months average values will not change.

The results of the dynamic modeling for the period 2001-2030 compared to the period 1960-1990 show:

- the average temperature will increase more in the eastern part of Romania;
- the winter air temperature outside the Carpathians is expected to drop by 1.5 ° C and in summer to rise by 0.2 ° C;
- spring - the temperature will increase by 1.8 ° C;
- autumn - the temperature is expected to rise;
- in the summer - precipitation will increase especially in the west;
- increasing precipitation in the autumn season;
- decreasing precipitation in the winter season.

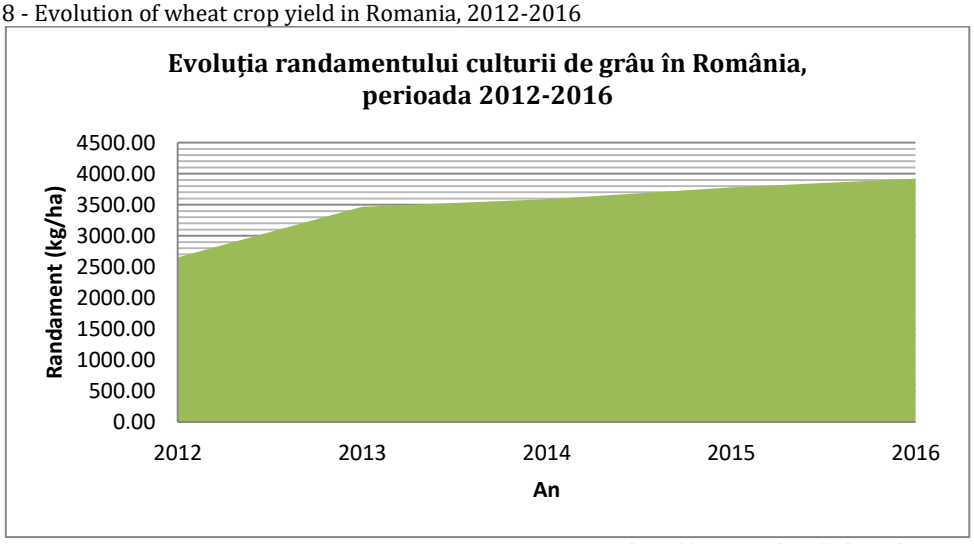
Source: 5th National Communication of Romania, Bucharest January 2010

Table no. VIII.2 - Cultivated area and wheat crop production in Romania, 2012-2016

Year	The cultivated area (thousands of hectares)	Production (thousands tons)	Yield (kg / ha)
2012	1997.6	5297.7	2652.03
2013	2104	7296.4	3467.87
2014	2112.9	7584.8	3589.76
2015	2106.6	7962.4	3779.74
2016	2112	8281	3920.93

Data source: http://www.madr.ro/culturi-de-camp/cereale/grau.html

Figure no. VIII.18 - Evolution of wheat crop yield in Romania, 2012-2016



Data source: http://www.madr.ro/culturi-de-camp/cereale/grau.html

VIII.1.4.2. Forests and forestry

RO 58	Indicator code Romania: RO 58 AEM indicator code: CLIM 034

TITLE: AREAS OCCUPIED BY FORESTS
DEFINITION: This indicator is defined by**:**

- The forest area**;**
- The volume of forest biomass.

As it is almost impossible to determine how much of the impacts on forests are related to recent anthropogenic climate change and how much is the effect provoked by the normal global climate cycle or other factors (natural climate change, past habitation, etc.) , evaluations must encompass the whole ensemble.

The consequences of climate change on Romania's forests are:

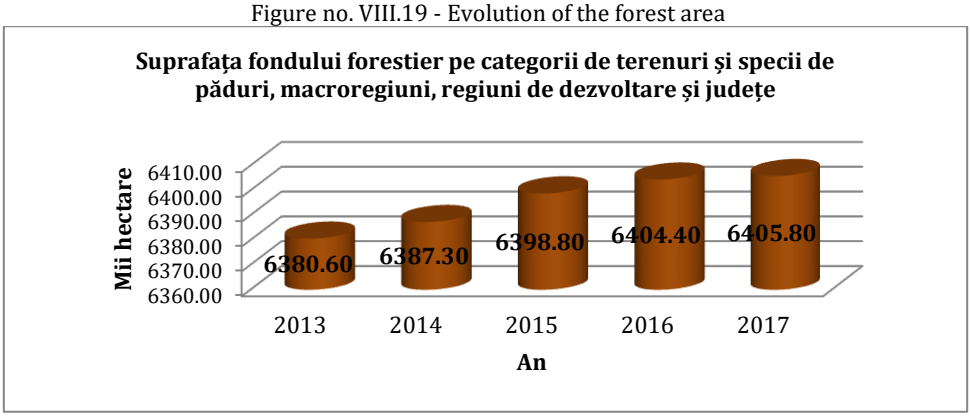
- Increasing the process of abnormal devitalization and drying of trees, especially in the dry areas of the country, steppe and silvosteppe;
- Translation of the natural zone from the Romanian geographic space, respectively the passage of the steppe in the semi-desert, of the the silvosteppe to steppe,of the forest area of the plain in silvosteppe, as well as a slight altitude translation of some species with upward trend of the upper limit of the forest vegetation;
- Reducing the current volume growth of plains and hillsides, partly offset by possible additional biomass accumulations in mountain ranges;
- Increase forest vulnerability to aggression of destabilizing factors: insect attacks, mass windfalls, forest fires;
- Qualitative depreciation of rapidly evolving soils for acidification, destruction, and adverse change of the organic layer.

In order to mitigate the consequences of climate change, we need to take some of the measures among which we mention:

- stopping deforestation while increasing the area of the forest fund;
- afforestation of non-regenerated surfaces;
- ecological reconstruction of destroyed forests;
- the correct application of the treatments;
- limiting the treatment of racing cuttings;
- the correct application of the silvicultural works;
- fight against illegal cuts

The evolution of the area of the forest fund in the period 2012-2016 by categories of land and forest species, macroregions, development regions and counties is represented in figure no. VIII.19.

Figure no. VIII.19 - Evolution of the forest area



(NIS data source, Tempo-online database)

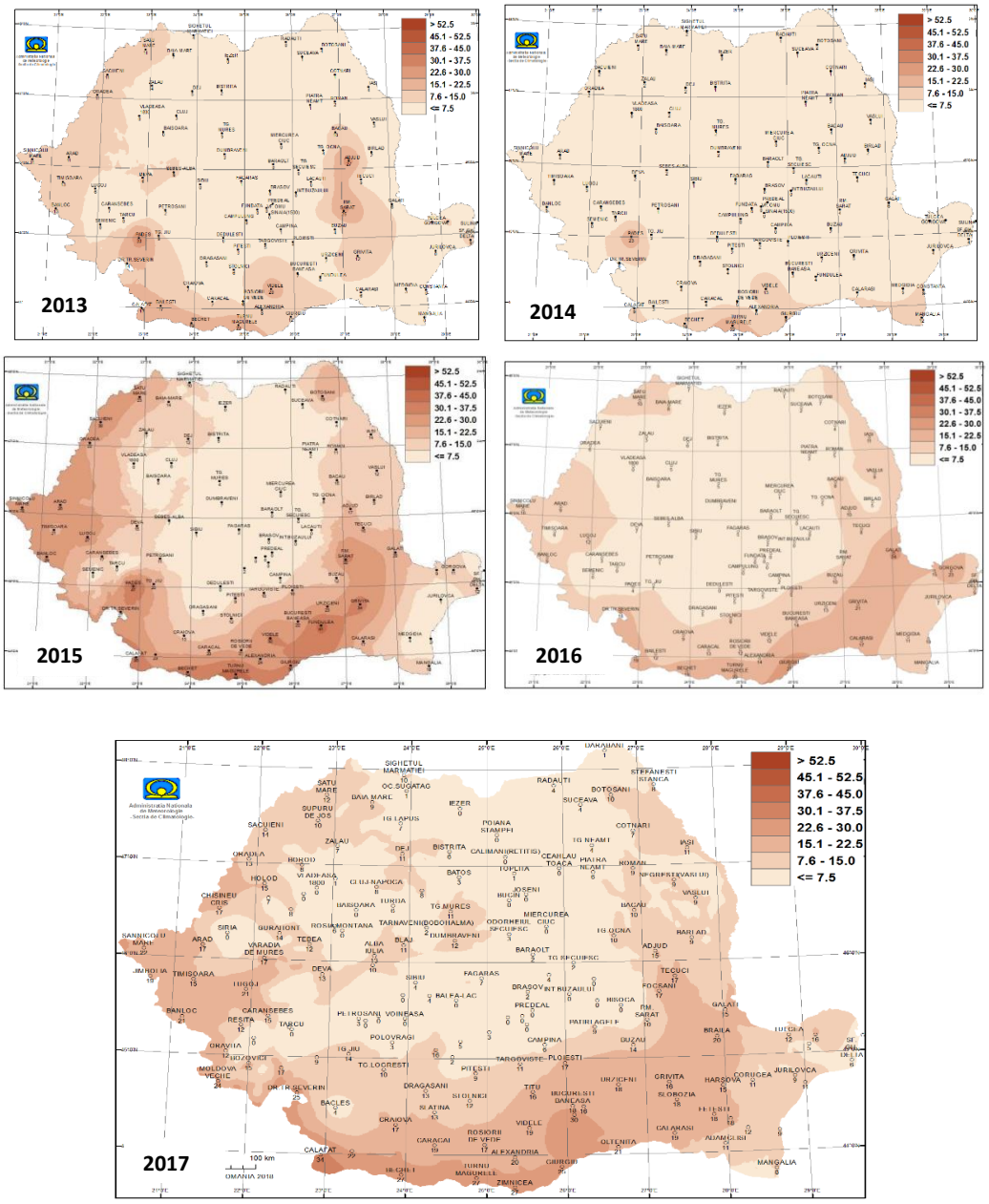
VIII.1.4.3. Human health

RO 60	Indicator code Romania: RO 60 AEM indicator code: CLIM 036

TITLE: EXTREME TEMPERATURES AND HEALTH
DEFINITION: This indicator is defined by the annual national mortality rate caused by extreme summer temperatures.

Figure no. VIII.20 shows a lower thermal stress for the summer of 2017 compared to the summer of 2015, when the number of days with heat discomfort was much higher, mostly on Romanian territory, but slightly increased compared to the summers of 2016 and 2014.

Figure no. VIII.20 The number of days over the last 5 years in which the ITU-temperature-humidity index exceeded the critical threshold of thermal discomfort (80 units)

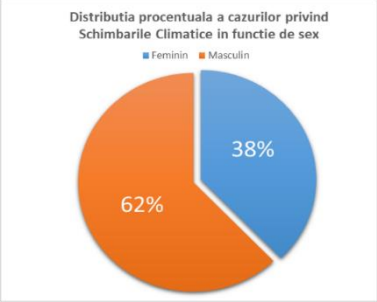


Source: National Meteorological Administration

The most vulnerable age groups are children and the age group> 65 years (especially by worsening / aggravation of cardiovascular disease. According to the information provided by the NATIONAL INSTITUTE FOR PUBLIC HEALTH, from the data registered in the RESANMED electronic platform corresponding to the "Climate Change" module, where there are cases of illness that can be caused by extreme climatic conditions: frostbite; sunburn; hypothermia; etc.) for the year 2017, results the the following:

- The distribution of cases of illness that can be determined by extreme phenomena depending on sex:
  - Male, with 62% (874 cases)
  - Female, with a percentage of 38% (533 cases)

Figure no. VIII.21 - The distribution of cases of disease that can be determined by extreme phenomena



Sursa INSP

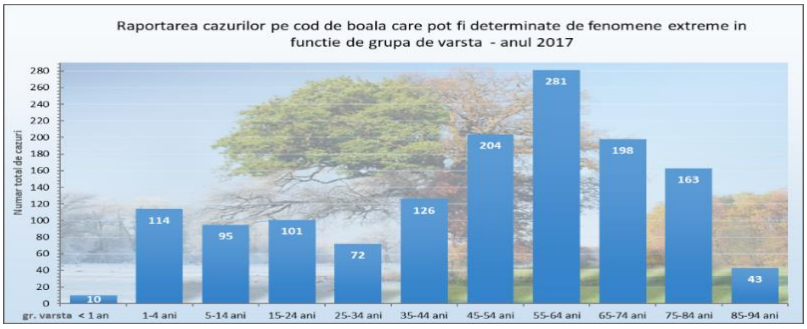
- Depending on the database records for the "Climate Change" module, 11 age groups have been structured for distribution of cases by age, thus distributed:

Table no. VIII.3 - Cases of disease reported by age groups

No.	Age group	Reported cases
1	< 1 an	10
2	1-4 ani	113
3	5-14 ani	95
4	15-24 ani	99
5	25-34 ani	73
6	35-44 ani	126
7	45-54 ani	201
8	55-64 ani	276
9	65-74 ani	200
10	75-84 ani	164
11	85-94 ani	43

Source: INSP

Figure no. VIII.22 - Reporting cases on disease code that can be caused by extreme phenomena depending on the age group - year 2017



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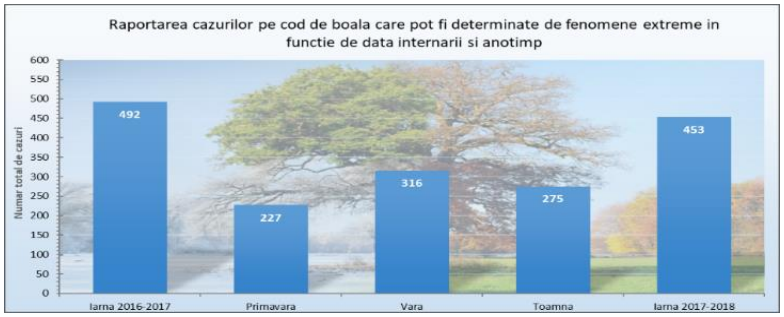
A percentage of 56% of cases is made up of people over 50 years of age. Thus, 786 cases refer to people aged between 50 and 94, the average age being 67 years. Depending on the date of admission and the year, the distribution of cases was the following:

Figure no. VIII.23 - Reporting cases on disease code that can be caused by extreme phenomena depending on the date of admission and season



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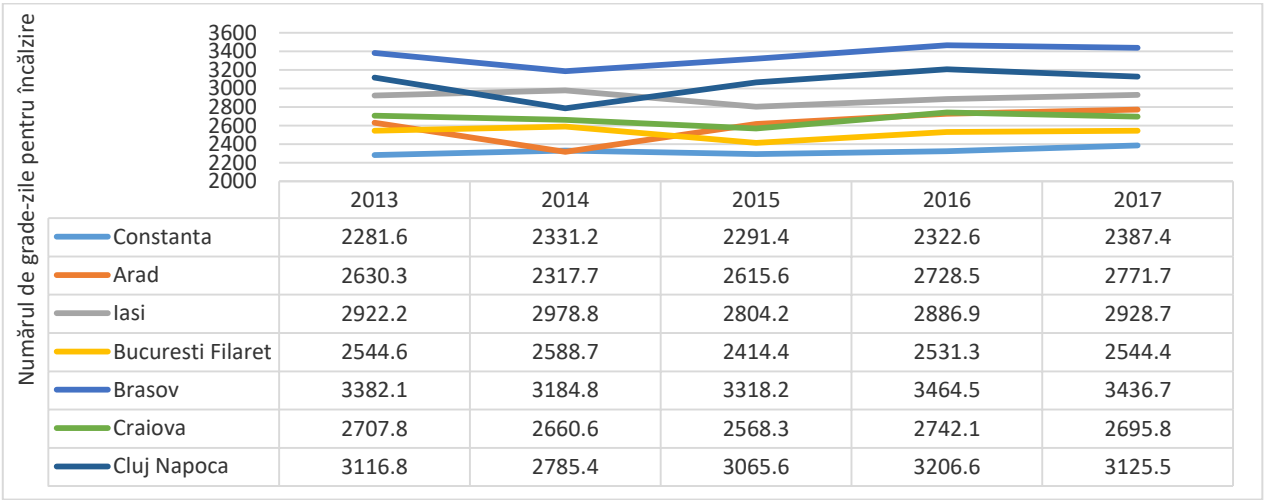
VIII.1.4.4. Energy

RO 62	Indicator code Romania: RO 62 AEM indicator code: CLIM 047

TITLE: NUMBER OF DEGREES-DAYS FOR HEATING
DEFINITION: This indicator shows the national trend of the number of degrees-days for heating.

Figure no. VIII.24 suggests a slight increase in the number of heating degrees for the Constanta, Arad, Iasi and Bucharest-Filaret cities and a slight decrease for the cities of Brașov, Craiova and Cluj-Napoca corresponding to the meteorological data from 7 cities covering the territory Romania in 2017 compared to 2016.

Figure no. VIII.24 - Number of heating degrees, corresponding to the meteorological data from 7 cities covering the territory of Romania, calculated for the period 2013-2017



	2013	2014	2015	2016	2017
Constanta	2281.6	2331.2	2291.4	2322.6	2387.4
Arad	2630.3	2317.7	2615.6	2728.5	2771.7
Iasi	2922.2	2978.8	2804.2	2886.9	2928.7
Bucuresti Filaret	2544.6	2588.7	2414.4	2531.3	2544.4
Brasov	3382.1	3184.8	3318.2	3464.5	3436.7
Craiova	2707.8	2660.6	2568.3	2742.1	2695.8
Cluj Napoca	3116.8	2785.4	3065.6	3206.6	3125.5

Source: National Meteorological Administration

VIII.2. DETERMINANTS AND PRESSURES FACTORS ON CLIMATE CHANGE

VIII.2.2. SUBSTANCES DIMINISHING THE OZONE STRUCTURE

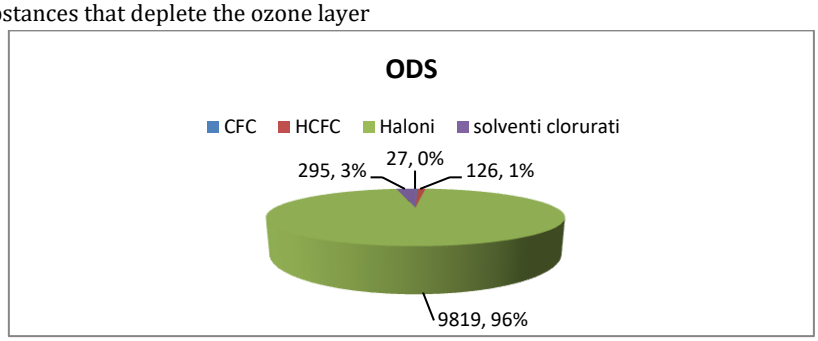
RO 06	Indicator code Romania: RO 06 AEM indicator code: CSI 06

TITLE: PRODUCTION AND CONSUMPTION OF SUBSTANCES LEADING TO OZONE DEPLETION
DEFINITION: This indicator quantifies the production and consumption of Ozone-Depleting Substances (ODS) in Romania. ODS are long-life chemicals containing chlorine and bromine and destroying the stratospheric ozone layer.

Consumption of substances that deplete the ozone layer according to Regulation 1005/2009 in 2017

- quantities of refrigerants by ODS types - 154,400 kg used from recovered substances - installed quantity;
- carbon tetrachloride - laboratory use as solvent - 295,200 kg;
- halons for fire fighting on airplanes, military land vehicles, military ships - 9819 kg - installed quantity.

Figure no. VIII.25 - Substances that deplete the ozone layer



Source: National Environmental Protection Agency

VIII.3. TRENDS OF GREENHOUSE GAS EMISSIONS

RO 10	Indicator code Romania: RO 10 AEM indicator code: CSI 010

TITLE: TRENDS OF GREENHOUSE GAS EMISSIONS
DEFINITION: This indicator shows the trends in greenhouse gas emissions. It analyzes the trends (total and sectoral) in relation to the obligations of the Member States to respect the Kyoto Protocol objectives.

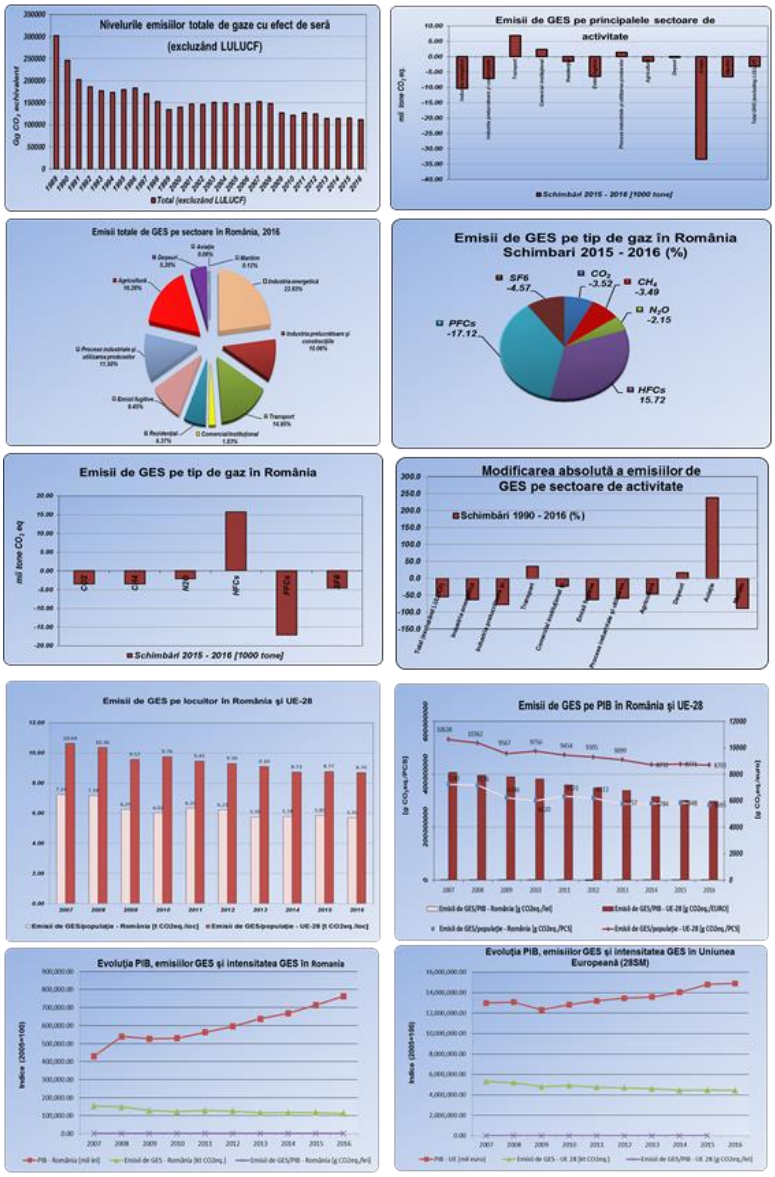
According to the national inventory of greenhouse gas emissions by our country in 2016, GHG emissions related to the Energy sector account for about 85% of the total, including LULUCF and 67% of the total, excluding LULUCF.

Table no. VIII.4 - Annual greenhouse gas emission levels over the period 2000 - 2016, thousands of tonnes of CO2 equivalent

Year	Total emissions (excluding LULUCF)	Total emissions (including LULUCF)
2000	140.733,62	117.874,98
2001	147.619,07	123.818,21
2002	146.501,24	124.891,01
2003	151.042,12	129.051,47
2004	150.225,38	128.491,31
2005	147.827,94	125.006,10
2006	149.598,21	127.334,60
2007	152.984,04	131.532,46
2008	148.078,36	126.179,68
2009	127.661,72	105.847,91
2010	122.182,25	99.170,01
2011	127.875,46	104.377,84
2012	124.847,08	99.615,38
2013	115.262,27	89.439,05
2014	115.371,21	89.886,43
2015	116.211,32	92.859,96
2016	112.542,36	88.250,05

Source: NEPA

Figure no. VIII.26 - Annual greenhouse gas emission levels over the period 2000 - 2016, thousands of tonnes of CO2 equivalent



Source: NEPA

In 2016, total greenhouse gas emissions (excluding land use, land use change and forestry - LULUCF) decreased by 62.81% compared to 1989 emissions, while net GHG emissions / removals (taking into account CO2 removals) decreased by 68.93%.

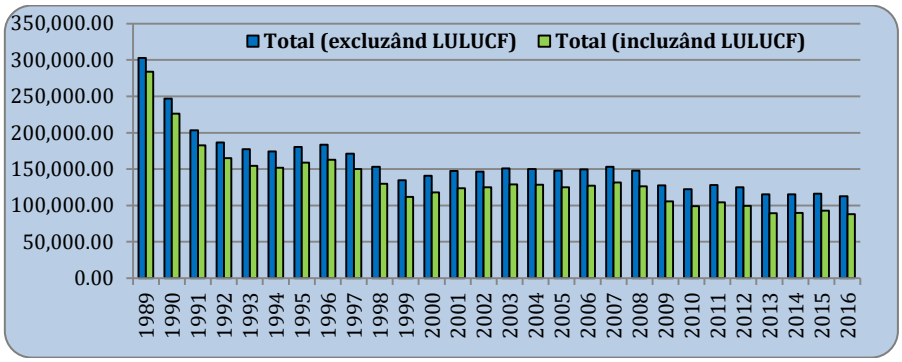
Total greenhouse gas emissions in 2016, excluding the removal by absorbers, amounted to 112,542.36 Kt of CO2 equivalent.

The decline in economic activity and energy consumption during the period 1989-1992 directly caused the reduction of total emissions during this period. Emissions began to rise until 1996, following the revival of the economy. Given the start of the first reactor at the Cernavoda nuclear power plant (1996), emissions fell again in 1997. Decrease continued until 1999.

The level of emissions has increased since 1999 and reflects economic development over the period 2000-2008. The limited decrease of GHG emissions in 2005, compared to 2004 and 2006 levels, was caused by the hydrological year, positively influencing the energy production in hydropower plants.

As a result of the economic crisis, emissions fell significantly in 2013 compared to 2008; subsequently, emissions increased relative to the rise in economic activity (Figure no. VIII.27).

Figure no. VIII.27 - The trend of total greenhouse gas emissions at national level (1989-2016)



Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

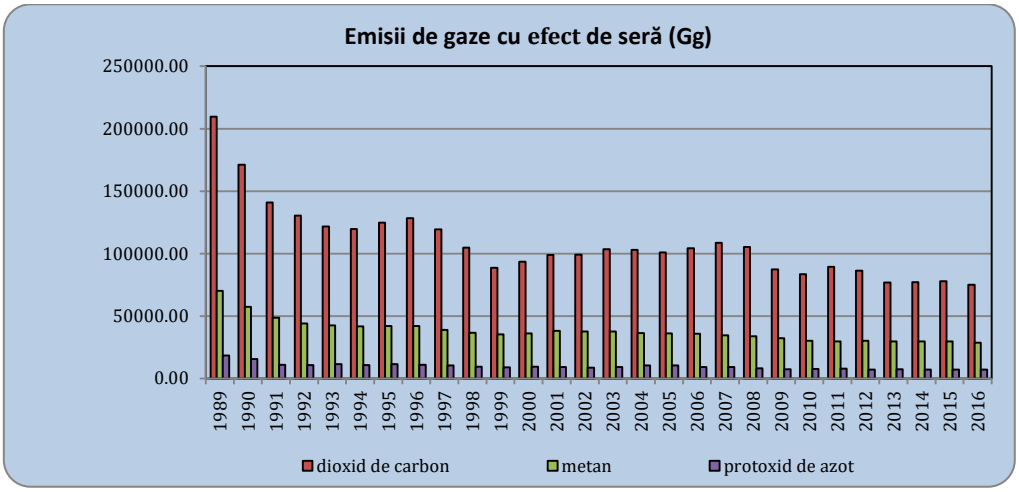
Of the nationally monitored greenhouse gases, carbon dioxide is the most significant pollutant, followed by methane and nitrous oxide (Figure VIII.28).

Carbon dioxide (CO2) is the most important anthropogenic greenhouse gas. The decrease in CO2 emissions (from 209,595.92 Gg in 1989 - 69.26% to 75,051.66 Gg in 2016 - 66.69%) is caused by the decrease of the amount of fossil fuels burnt in the energy sector (especially in the energy production electrical and thermal, and manufacturing and construction industries) as a result of declining activity.

Methane emissions (CH4), mainly related to fugitive emissions from the extraction and distribution of fossil fuels and livestock, declined by 59.32% in 2016 (from 70,186.63 Gg in 1989 to 28,551.60 Gg in 2016). The decrease in CH4 emissions in agriculture is due to a decrease in the level of livestock breeding.

N2O emissions are mainly generated in agricultural activities in agricultural soils and in chemical industry activities in the Industrial Processes sector. The decline in these activities (decline in animal husbandry, decrease in synthetic fertilizer N applied to soil quantities, decrease in crop yields) is reflected in the trend of N2O emissions and decreased in 62% (from 18,401.44 Gg in 1989 - to 6,989.67 Gg in 2016).

Figure no. VIII.28 - Trends in greenhouse gas emissions by type of pollutant at national level (1989-2016)



Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

Below are the trends of GHG emissions per sector in INEGES, excluding the LULUCF sector.

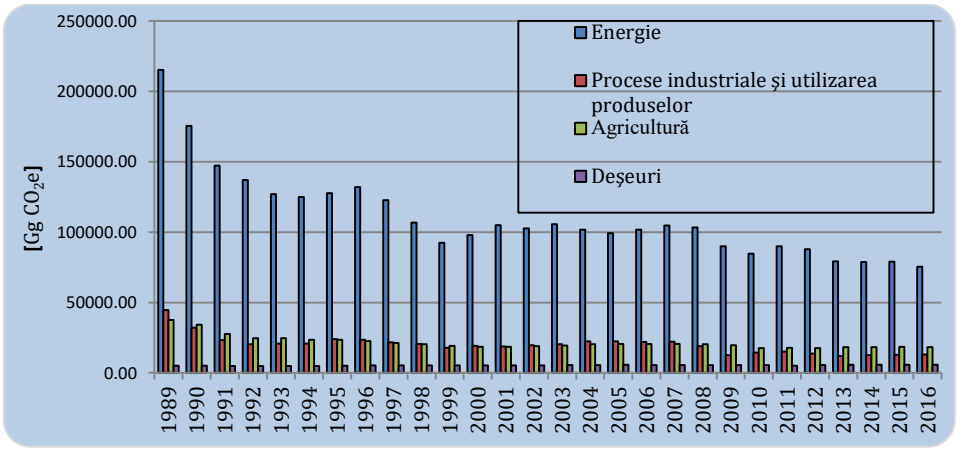
Emissions of GHGs from the energy sector decreased by 64.97% compared to the base year of 1989.

A significant 71.33% decrease in GHG emissions was recorded in the Industrial Processes and Product Use Sector in 2016 as compared to the 1989 level due to the decline or cessation of certain production activities.

GHG emissions from the Agriculture sector also declined by 51.16% in 2016 compared to 1989 emissions, due to the following causes: the decline in the livestock sector, the decline in crop production, the decrease in the quantities of fertilizers N-based synthetic compounds applied to the soil.

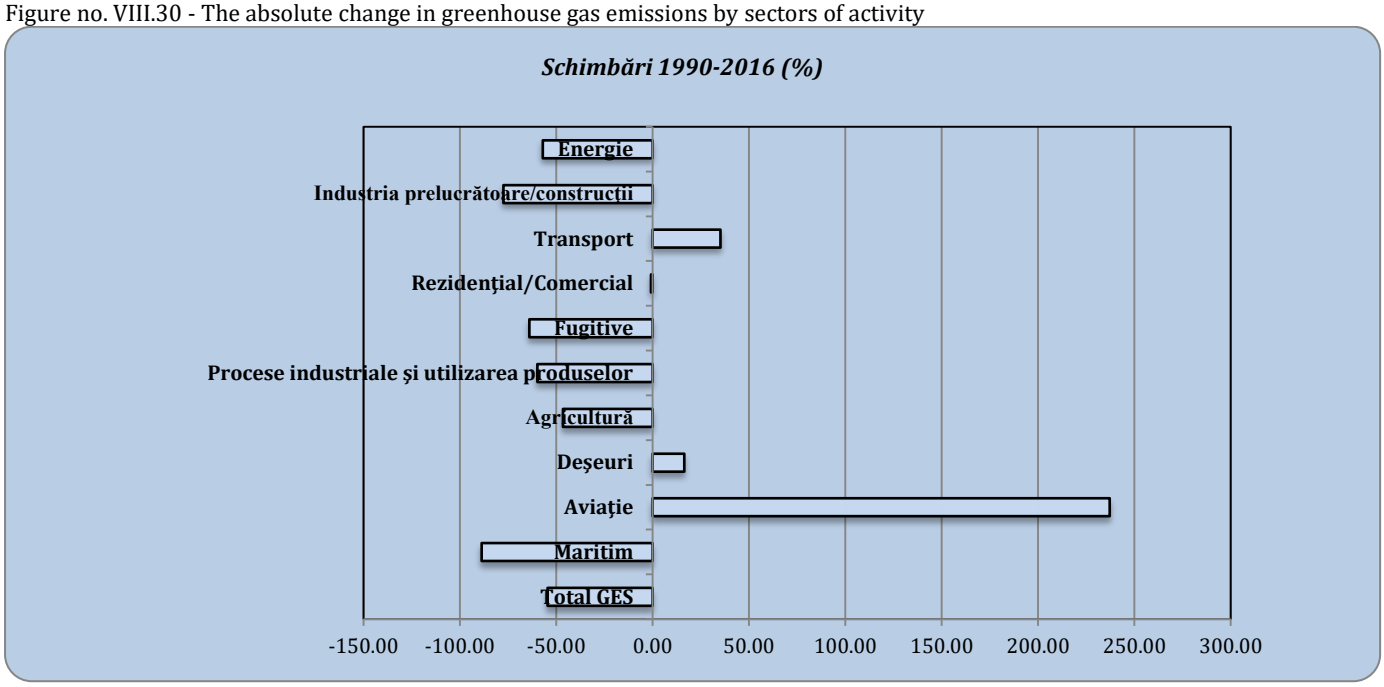
In the Waste sector, emissions increased by 13.87% in 2016 compared to 1989 levels.

Figure no. VIII.29 - Greenhouse gas emissions trends by sector type at national level (1989-2016)



Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

Figure no. VIII.30 - The absolute change in greenhouse gas emissions by sectors of activity



Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

VIII.4. SCENARIOS AND FORECASTS ON CLIMATE CHANGE

VIII.4.2. AGGREGATED DATA ON THE PROJECTIONS OF GHG EMISSIONS

RO 11	Indicator code Romania: RO 11 AEM indicator code: CSI 011

TITLE: PROJECTIONS OF GREENHOUSE GAS EMISSIONS
DEFINITION: This indicator illustrates the anticipated trends in anthropogenic emissions of greenhouse gases. The purpose of this indicator is to estimate the degree of achievement of the targets set by climate change policies. Estimated progress is calculated as the difference between the projected emissions and the targets set by the Kyoto Protocol. Greenhouse gases are those covered by the Kyoto Protocol (CO2, CH4, N2O, SF6, HFCs, PFCs and NF3).

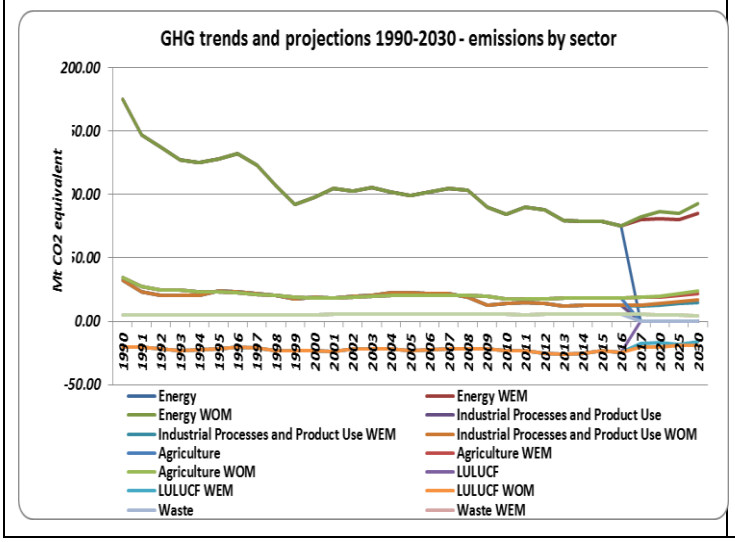
Table no. VIII.5 - The trend of GHG in Romania for the years 1990, 2008-2016

Key GHG data	1990	2008	2009	2010	2011	2012	2013	2014	2015	2016	1990–2016	2015–2016
Average 2008–2016 target under the Kyoto Protocol (Mt CO2-eq.)		256	256	256	256	256	256	256	256			
Total GHG emissions (Mt CO2-eq.)	246.7	148.1	127.7	122.2	127.9	124.8	115.3	115.4	116.2	112.5	-54.39%	-3.16%
GHG from international bunkers (Mt CO2-eq.)	0.8	0.6	0.5	0.5	0.5	0.4	0.6	0.9	0.8	1.0	22.96%	16.78%
GHG per capita (t CO2-eq. / capita)	10.6	7.2	6.2	6.0	6.3	6.2	5.8	5.8	5.8	5.7	-46.36%	-2.62%
GHG per GDP (constant prices) (g CO2-eq. / euro)	3,560.5	1,013.5	1,028.4	971.7	964.4	935.1	799.0	767.3	724.9	662.9	-81.38%	-8.55%
Share of GHG in total EU-28 emissions (%)	4.3%	2.9%	2.7%	2.5%	2.7%	2.7%	2.5%	2.6%	2.6%	2.5%	-41.26%	-2.73%
EU ETS allocated allowances (free + auctioning)		71.8	73.9	74.9	74.7	80.9	68.0	46.8	55.1	66.3		20.38%
EU ETS verified emissions - all installations (Mt CO2-eq.)		63.8	49.1	47.3	51.2	47.9	42.4	42.6	42.4	39.8		-6.17%
EU ETS verified emissions - constant scope (Mt CO2-eq.)		63.8	49.1	47.3	51.2	47.9	42.4	42.6	42.4	39.8		-6.17%
Share of EU ETS verified emissions (all install.) in total GHG (%)		43.1%	38.4%	38.7%	40.1%	38.3%	36.8%	36.9%	36.5%	35.3%		-3.12%
ETS verified emissions compared to annual allowances (%)		88.9%	66.4%	63.2%	68.5%	59.1%	62.4%	90.9%	77.0%	60.0%		-22.06%
GHG emissions in the non-ETS sectors		83.9	78.3	74.5	76.4	76.9	72.7	72.7	73.7	72.7		-1.37%
Equivalent annual target for non-ETS GHG emissions		184.2	182.1	181.1	181.3	175.1	75.6	77.5	79.3	81.1		2.30%

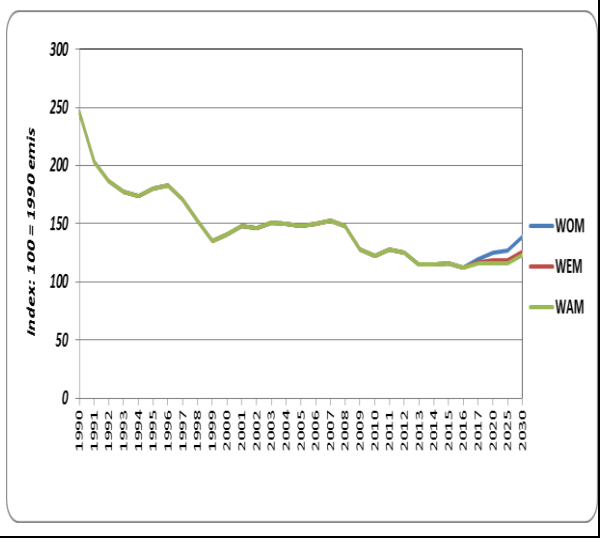
Source: NEPA

Figure no. VIII.31 - GHG Trend and Projections in Romania by Sector 1990-2020 and GHG Total GHG Forecast in Romania by 2030 for WEM, WOM and WAM scenarios

Trend and projections of GHG in Romania by sector, for the period 1990-2020



Total GHG emissions forecast in Romania by 2030 for WEM, WOM and WAM scenarios



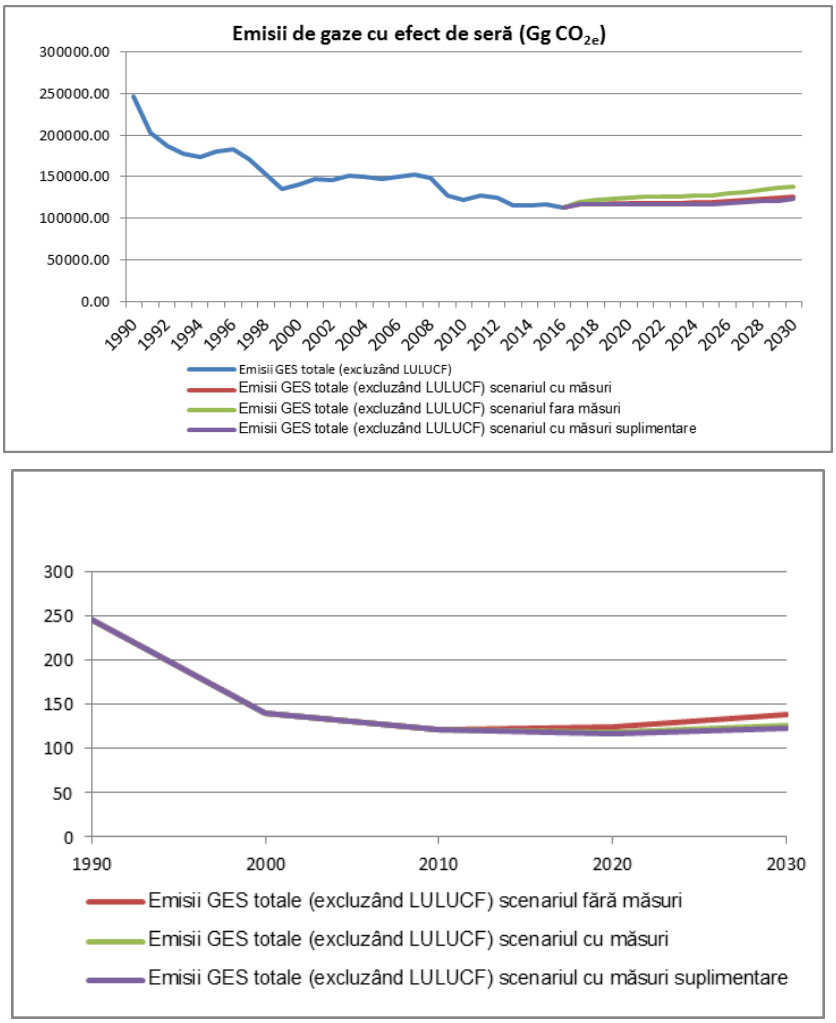
Source: NEPA

The greenhouse gas emissions forecasts were made for 3 scenarios:

1. The baseline scenario that does not include special greenhouse gas emission reduction activities ("scenario without measures");
2. The scenario similar to the benchmark in terms of the evolution of economic and social indicators but containing policies and programs to reduce greenhouse gas emissions ("scenario with measures");
3. The scenario with additional measures - similar to the reduction scenario but containing programs with additional measures to reduce greenhouse gas emissions ("scenario with additional measures").

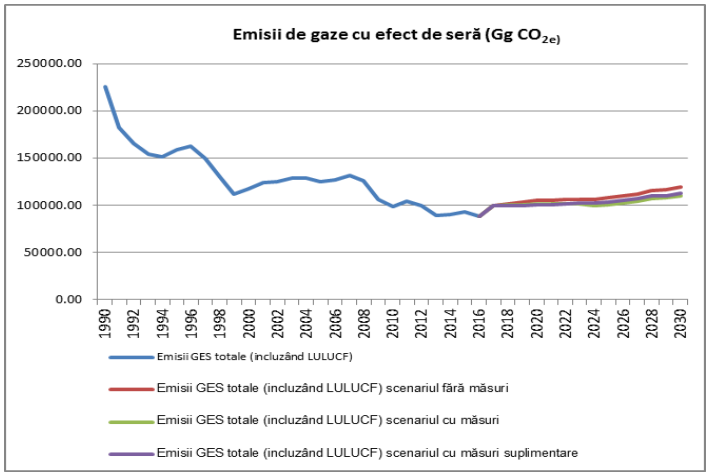
Projections of greenhouse gas emissions for the three scenarios show an upward trend over the period 2016-2030 (Figures VIII.32 to VIII.34).

Figure no. VIII.32 - Trends (1990-2016) and projections (2017-2030) of greenhouse gas emissions (excluding LULUCF) at national level



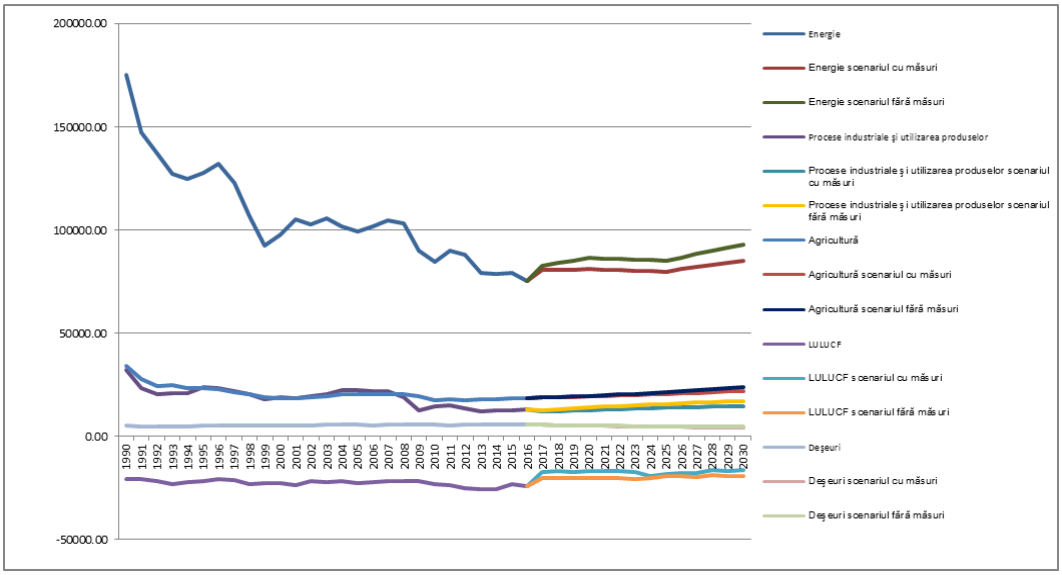
Data source: Ministry of Environment - Romania's 2017 Report for GHG projection referred în Regulation (EU) No. 525/2013

Figure no. VIII.33 - Trends (1990-2016) and projections (2017-2030) of greenhouse gas emissions (including LULUCF) at national level



Data source: Ministry of Environment - Romania's 2017 Report for GHG projection referred în Regulation (EU) No. 525/2013

Figure no. VIII.34 - Trends (1990-2016) and projections (2017-2030) of greenhouse gas emissions by sectors of activity at national level



Data source: Ministry of Environment - Romania's 2017 Report for GHG projection referred în Regulation (EU) No. 525/2013

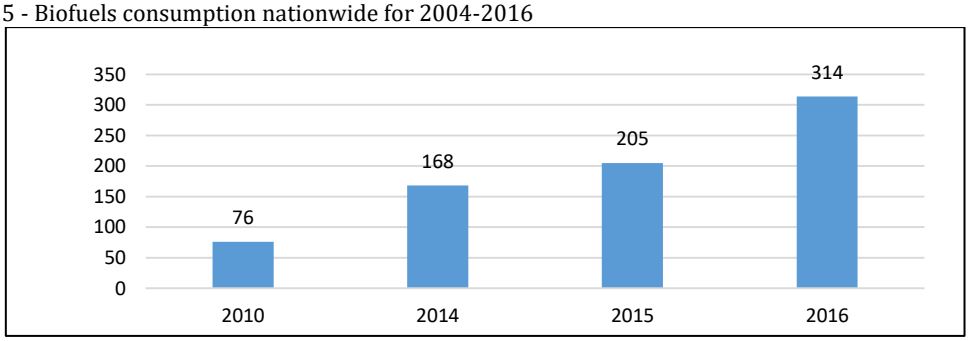
VIII.5. ACTIONS FOR MITIGATION AND ADAPTATION TO CLIMATE CHANGE

RO 37	Indicator code Romania: RO 37 AEM indicator code: CSI 037

TITLE: USING ALTERNATIVE AND MORE CLEAN FUELS
DEFINITION: Share of fuels with low or zero sulfur content and biofuels in total fuel consumption for road transport (% of fuels sold for transport purposes).

At national level, the data presented in Figure no. VIII.35 shows an increase in the use of biofuels in 2016 by 75.8% compared to 2010.

Figure no. VIII.35 - Biofuels consumption nationwide for 2004-2016



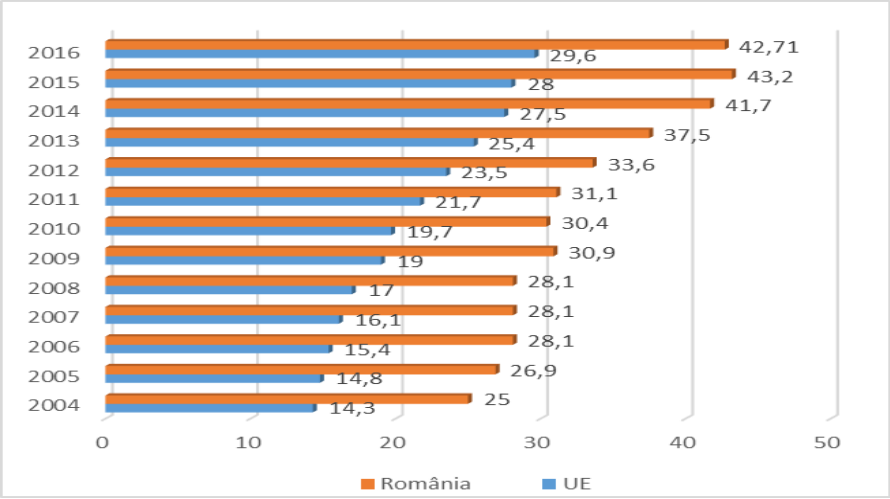
Source MM

RO 31	Indicator code Romania: RO 31 AEM indicator code: CSI 031

TITLE: ELECTRICITY CONSUMPTION FROM RENEWABLE ENERGY SOURCES
DEFINITION: The share of electricity produced from renewable energy sources is the ratio between the electricity produced from renewable energy sources and the gross domestic consumption of electricity, expressed as a percentage. It measures the contribution of electricity produced from renewable energy sources to gross domestic electricity consumption.

At national level over the period 2004-2016, more than 24% of the total value of the electricity was obtained by using the renewable energy sources (Figure VIII.36). Supporting green (environmentally-friendly) solutions for renewable energy production contributes to reducing greenhouse gas emissions from the energy sector.

Figure no. VIII.36 - Electricity produced from renewable energy sources at national level for the period 2004-2016



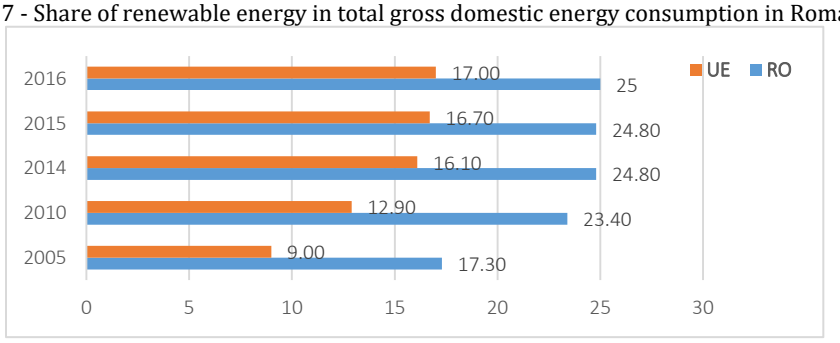
Source: Eurostat

RO 30	Indicator code Romania: RO 30 AEM indicator code: CSI 030 / ENER 029

TITLE: PRIMARY ENERGY CONSUMPTION FROM RENEWABLE ENERGY SOURCES
DEFINITION: The share of renewable energy consumption is the ratio between the gross domestic consumption of energy produced from renewable energy sources and the total gross domestic energy consumption, calculated over a calendar year, expressed as a percentage.

At European Union level, the share of renewable energy in total gross domestic energy consumption shows an upward trend for the period 2005-2016, from around 9% in 2005 to around 17% in the year 2016.
Also, at national level, the share of renewable energy in total gross domestic energy consumption shows an upward trend for the period 2005-2016, and in 2016 there was a decrease of about 1.76% compared to the value set in the previous year (figure no. VIII.37).

Figure no. VIII.37 - Share of renewable energy in total gross domestic energy consumption in Romania and EU-28



Source: Eurostat
Eurostat, statistical database, Gross domestic product at market prices, Millions of euro, chain-linked volumes, reference year 2005 (at 2005 exchange rates) nama_gdp_K (la 06.11.2013), http://appsso.eurostat.ec.europa.eu/nui/submit
ViewTableAction.do: Gross domestic product - market prices expressed in constant prices and Euro 2005 for Romania and the European Union

IX.URBAN ENVIRONMENT, HEALTH AND LIFE QUALITY

IX.1.THE URBAN ENVIRONMENT AND LIFE QUALITY: STATE AND CONSEQUENCES

IX.2.FORECASTS AND MEASURES TAKEN FOR A SUSTAINABLE URBAN DEVELOPMENT AND IMPROVEMENT OF THE HEALTH AND LIFE QUALITY IN URBAN AGGLOMERIES

Chapter IX. URBAN ENVIRONMENT, HEALTH AND QUALITY OF LIFE

IX. 1. THE URBAN ENVIRONMENT AND THE QUALITY OF LIFE: STATE AND CONSEQUENCES

IX.1.1. AIR QUALITY IN URBAN AGGLOMERATIONS AND EFFECTS ON HEALTH

IX.1.1.1. Exceedances of the annual average concentrations of PM10, NO2, SO2 and O3 in certain urban agglomerations

RO 04	Indicator code Romania: RO 04 AEM indicator code: CSI 04

TITLE: EXCEEDANCES OF LIMIT VALUES CONCERNING AIR QUALITY IN URBAN AREAS
DEFINITION: The indicator is the percentage of the urban population potentially exposed to atmospheric concentrations (in µg / m3) of sulfur dioxide (SO2), particulate matter (PM10), nitrogen dioxide (NO2) and ozone (O3) which exceed the limit value established for the protection of human health.

Exceeding air quality limit values in urban areas. Percentage of urban population potentially exposed to atmospheric concentrations (in µg / m3) of sulfur dioxide, PM10, nitrogen dioxide and ozone exceeding the limit value / target value established to protect human health.

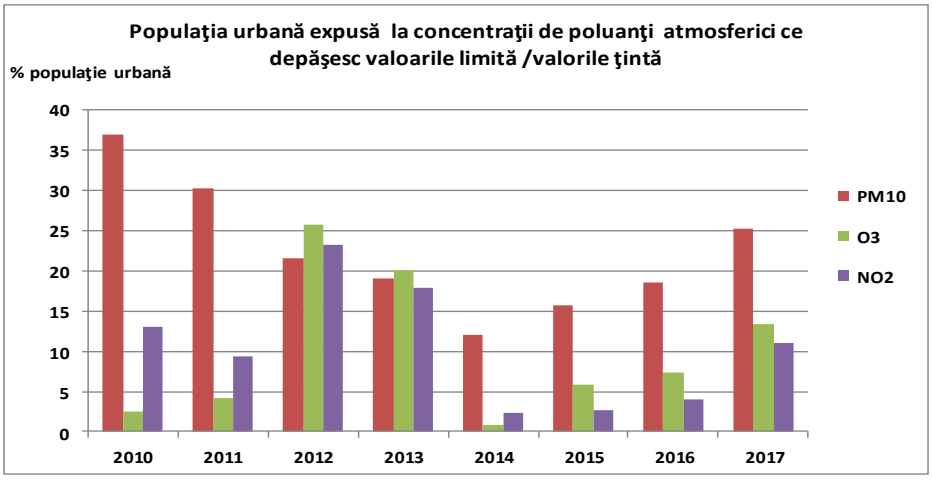
The air quality in human settlements is determined by measuring the average hourly, daily or monthly concentrations of the different pollutants and comparing them with the target limit values / values or, as the case may be, the maximum permissible concentrations stipulated in the normative acts in force.

The National Air Quality Monitoring Network (NAQMN) carries out continuous measurements for sulfur dioxide (SO2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O3), particulate matter (PM10 and PM2.5) , monocyclic aromatic hydrocarbons (benzene, toluene, o, m, p-xylene, ethylbenzene), polycyclic aromatic hydrocarbons and heavy metals. The air quality for each monitoring station is represented by quality indices, based on the measured concentrations of the main atmospheric pollutants.

The concentrations of pollutants in µg / m3 as well as the number of exceedences of the human health limit values are also reported for each individual station.

It is important to estimate and report the areas of exceeded areas and the population exposed to pollution for each of the urban agglomerations with air monitoring stations.

Figure no. IX.1 - Evolution of the percentage of the urban population exposed to concentrations of pollutants exceeding the limit values / target values set for the protection of human health (for NO2, O3, PM10)

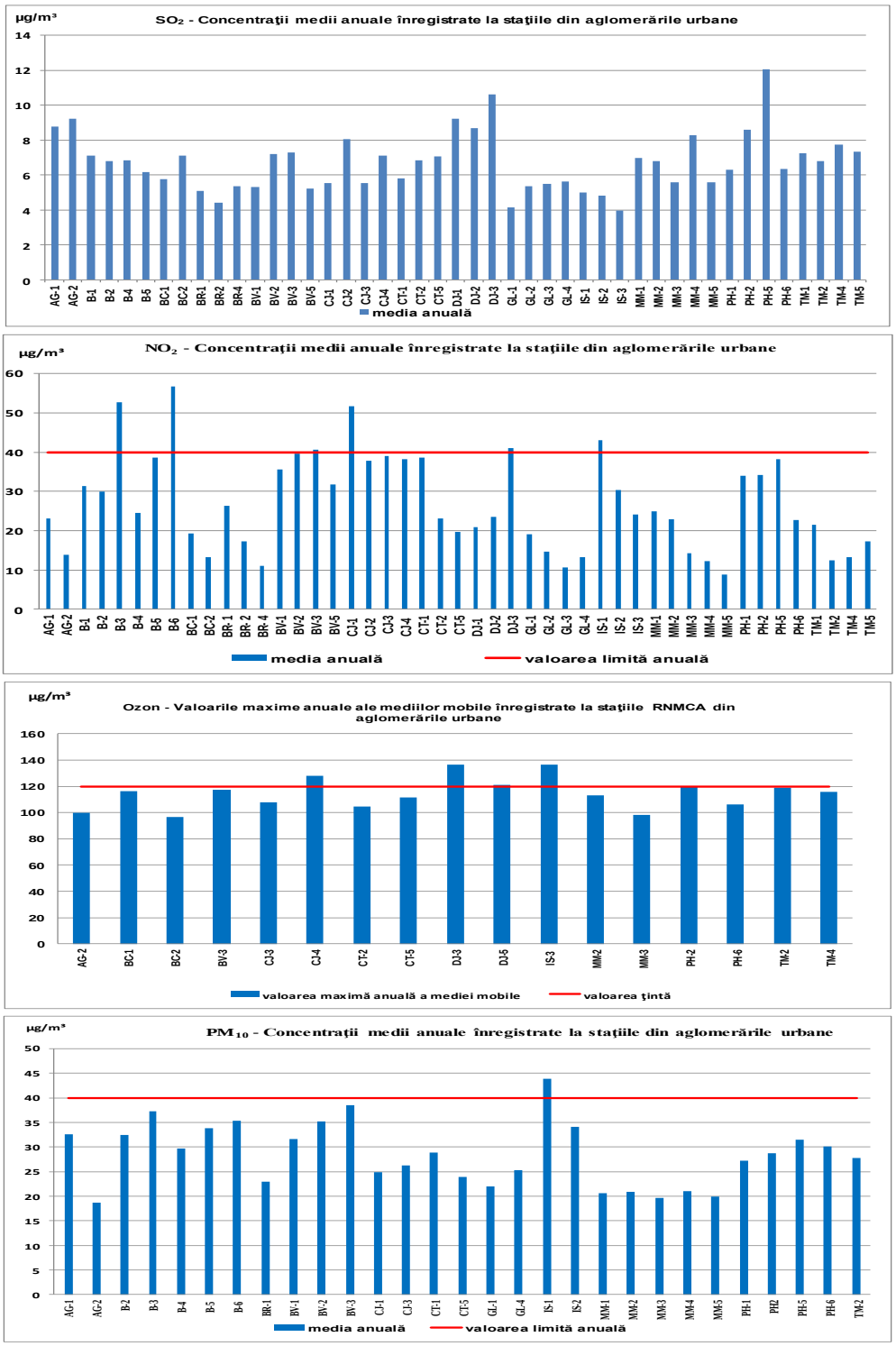


Source: NEPA

In accordance with the provisions of Law no. 104/2011 concerning the environmental air quality, in Romania, 13 urban agglomerations were established (Bacău, Baia Mare, Braşov, Braila, Bucharest, Cluj-Napoca, Constanţa, Craiova, Galati, Iasi, Piteşti, Ploieşti and Timişoara). In these agglomerations there are automatic monitoring stations with which the ambient air quality is monitored and assessed.

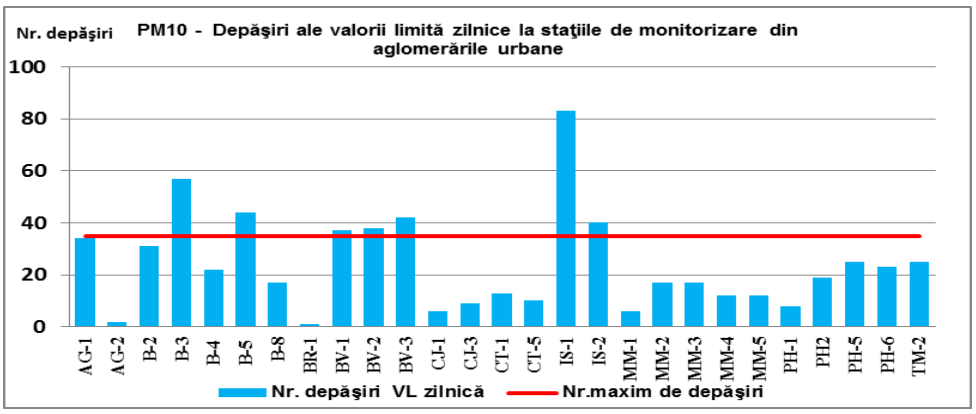
Next, the data obtained in 2017 from these stations are presented graphically for the most important pollutants: SO2, NO2, O3, PM10.

Figure no. IX.2 - Annual average concentrations of atmospheric pollutants recorded at monitoring stations in urban agglomerations in 2017



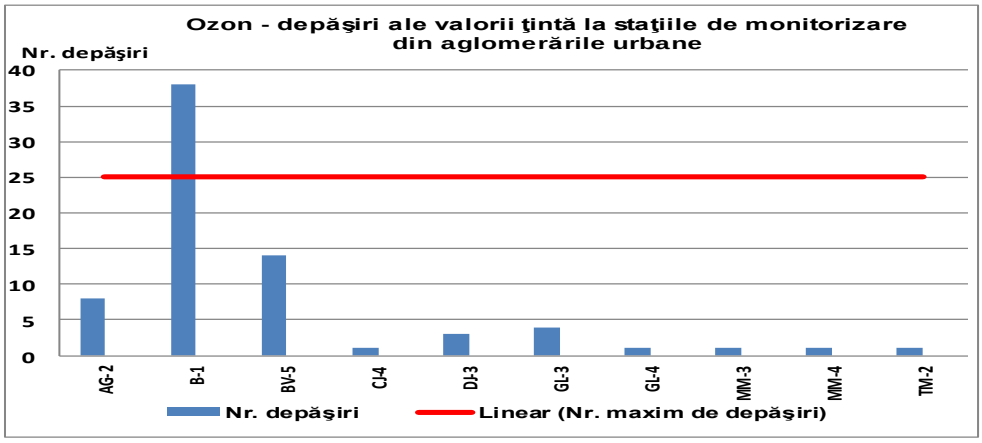
Source: NEPA

Figure no. IX.3 - Number of exceedences of the daily limit value for particulate matter PM10 in urban agglomeration monitoring stations in 2017



Sursa: ANPM

Figure no. IX.4 - Number of ozone target exceedances at monitoring stations in urban agglomerations in 2017



Sursa: ANPM

The data presented in the above figures highlights that in urban agglomerations in Romania the main and most important pollutants are particulate matter PM10 and nitrogen oxides, mainly generated by traffic and combustion processes in large thermal power plants or for district heating. The effects of these short-term or long-term pollutants on human health are multiple, affecting respiratory and cardiovascular systems and the provocation of lung diseases, diseases in the ENT sphere, allergic diseases, cardiovascular diseases, etc. The most affected groups are children, elderly people and people with chronic illness.

Source: NEPA

IX.1.2. FONIC POLLUTION AND EFFECTS ON HEALTH AND QUALITY OF LIFE

IX.1.3. WATER QUALITY AND EFFECTS ON HEALTH

IX.1.4. GREEN SPACES AND EFFECTS ON HEALTH AND QUALITY OF LIFE

IX.1.4.1. Area occupied by green spaces in urban agglomerations

IX.1.5. CLIMATE CHANGE AND EFFECTS ON URBAN ENVIRONMENT, HEALTH AND QUALITY OF LIFE

IX.1.5.1. MORTALITY RATE IN URBAN AGGLOMERATION AS FOLLOWING EXTREME TEMPERATURES IN SUMMER PERIOD

IX.1.5.2. Exposure of the population from urban agglomerations to flood risk - Floods and health

RO 61	Indicator code Romania: RO 61 AEM indicator code: CLIM 46

TITLE: FLOODS AND HEALTH
DEFINITION: This indicator is defined as the number of people affected by floods per million inhabitants. "Affected persons," as defined in the EM-DAT (The International Disaster Database), are those who need immediate assistance during an emergency period, including displaced or displaced persons.
The unit of measure is the number of people affected by the floods (deceased, injured, evacuated, destroyed homes, cases of illness due to contaminated water consumption) per million inhabitants.

Within the International Disaster Database (EM-DAT), Romania is included for the period 2011-2015 with 14 964 people affected by the floods:

Table nr. IX.1 - Natural disasters in Romania for the period 2011 - 2015 depending on the affected persons

The type of disasters	Date	Number of people affected
Extreme temperatures	23.01.2012	7 539
Flood	11.09.2013	5 400
Flood	19.04.2014	525
Flood	27.05.2015	1 500

Source: Natural Disasters in Romania, http://www.emdat.be/result-country-profile

Source: NEPA

In order for this natural disaster (flood) to be recorded in this EM-DAT database, it must meet at least one of the following criteria:

- the number of people reported deceased due to the flood: 10 or more;
- at least 100 affected people;
- state of emergency;
- requesting international aid.

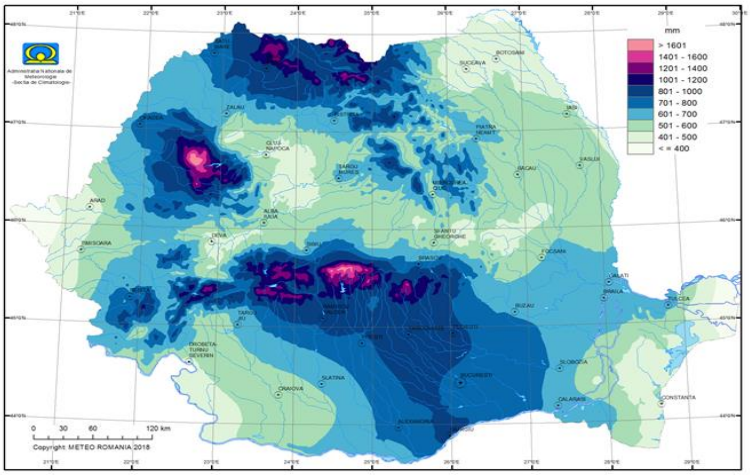
Following the statistical analysis according to Directive 2007/60 / EC on flood risk assessment and management, taking into account 6 selected national significant historical events, resulted in 39 casualties, with an average of about 13 casualties per event.
Reporting of the effects of floods in our country is done through the Synthesis Reports drawn up by County Emergency Committees and then approved by the President of the County / Municipal Emergency Committee and submitted to the Emergency Ministerial Committee and the General Inspectorate for Emergency Situations, within 30 days of cessation of the phenomenon.

Characterization of the year 2017 from the hydrological point of view

The annual rainfall, country average (673.5 mm), was only 6% higher than normal climatological (1981-2010). Thus, the deviations were positive in eight of the 12 months, fluctuating between 2% (February) and 73% (October), and negative deviations were in the remaining four months, January, March, June and August, oscillating between 12% March and 37% in January. Annual amounts of precipitation over 800 - 1000 mm accumulated mainly in Maramures, in important areas of Muntenia and Crişana, but also in the mountainous area.

In 2017, higher values of the maximum amount of precipitations accumulated in 24 hours, were recorded isolated on the areas of Banat, Oltenia, Western Carpathians and southern Dobrogea (Figure No. IX.5).

Figure no. IX.5 - Annual rainfall rates in 2017 (in mm)



Source: National Meteorological Agency

Climate change forecast on the urban environment

According to the National Climate Change Strategy 2013 - 2020, the changes in the Romanian climate regime are in the global context, taking into account the regional conditions: the temperature increase will be more pronounced during the summer, while in the northwest of Europe the growth the most pronounced one is expected in the winter.

According to the estimates presented in the IPCC AR4, in Romania there is an increase in the average annual temperature over the period 1980-1990 similar to the whole of Europe, there being little difference between the results of the models in the first decades of the 21st century and higher in terms of the end of the century:

- between 0.5 ° C and 1.5 ° C for the period 2020-2029;
- between 2.0 ° C and 5.0 ° C for the period 2090-2099, depending on the scenario (eg between 2.0 ° C and 2.5 ° C for the scenario that predicts the lowest increase in global average temperature and between 4.0 ° C and 5.0 ° C for the scenario with the most pronounced temperature increase).

From pluviometric point of view, more than 90% of the climatic models forecast for the period 2090-2099 droughts pronounced during the summer in Romania, especially in the south and south-east (with negative deviations from 1980-1990 over 20%).

As for winter precipitation, deviations are lower and uncertainty is greater.

The main impacts of climate change on urban areas, infrastructure and buildings are mainly related to the effects of extreme weather events such as heat waves, heavy snowfalls, storms, floods, increased slope instability.

Source: NEPA

X.ENVIRONMENT RADIOACTIVITY

X.1.MONITORING THE RADIOACTIVITY OF ENVIRONMENTAL FACTORS

X.1.1.AIR RADIOACTIVITY
X.1.2.WATER RADIOACTIVITY
X.1.3.SOIL RADIOACTIVITY
X.1.4.VEGETATION RADIOACTIVITY

Chapter X. RADIOACTIVITY OF THE ENVIRONMENT

Source: N.E.P.A

X.1. MONITORING OF RADIOACTIVITY OF ENVIRONMENTAL FACTORS

X.1.1. AIR RADIOACTIVITY

- **No indicators –**

❖ **RADIOACTIVITY OF ATMOSPHERIC AEROSOLS - No indicators –**
❖ **RADIOACTIVITY OF TOTAL ATMOSPHERIC DEPOSITS AND PRECIPITATIONS - No indicators –**

Immediate global beta analysis of total atmospheric deposition samples - No indicators –

X.1.2. WATER RADIOACTIVITY

- **No indicators –**

❖ **RADIOACTIVITY OF THE MAIN WATERS - No indicators -**

❖ **RADIOACTIVITY OF THE DANUBE - No indicators -**

❖ **RADIOACTIVITY OF THE BLACK SEA - No indicators -**

X.1.3. SOIL RADIOACTIVITY

- **No indicators –**

X.1.4. VEGETATION RADIOACTIVITY

- **No indicators –**

XI.CONSUMPTION AND ENVIRONMENT

XI.1.CONSUMPTION TRENDS

XI.2.FACTORS WHICH INFLUENCE CONSUMPTION

XI.3.PRESSURES ON THE ENVIRONMENT CAUSED BY CONSUMPTION

XI.4.GREEN ECONOMY

XI.5.FORECASTS POLICIES AND MEASURES ON CONSUMPTION AND ENVIRONMENT

Chapter XI. CONSUMPTION AND ENVIRONMENT

XI.1. CONSUMER TRENDS

XI.1.1. FOOD AND BEVERAGE
Annual average per capita consumption, main food and beverages

XI.1.2. HOUSING
Electricity consumption in dwellings
Average consumption per person

XI.1.3. MOBILITY

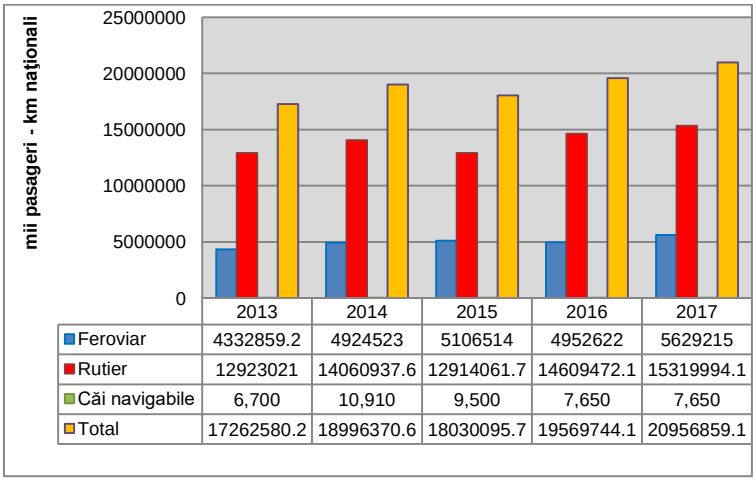
XI.1.3.1. Passenger transport

RO 35	Indicator code Romania: RO 35 AEM indicator code: CSI 35

TITLE: PASSENGER TRANSPORT DEMAND
DEFINITION: Passenger transport demand is defined as the amount of passenger-kilometers traveled each year. Domestic passenger transport includes car, bus and coach transport and trains.

The internal passenger transport section includes data referring only to national transport, irrespective of the nationality of the transport vehicle, for car, buses and coaches, respectively trains (metro and trams and light metro are excluded) for a period of time for at least 5 years. The variable is calculated from the passenger kilometer (pkm), defined as the transport of a passenger over a distance of one kilometer.
Figure no. XI.1 shows the volume of passenger modes (passenger journey [thousands of passengers - national km]) at national level between 2013 and 2017.

Figure no. XI.1 - Volume of modes of passenger transport [thousands of passengers - national km] at national level, 2013-2017



	2013	2014	2015	2016	2017
Feroviar	4332859.2	4924523	5106514	4952622	5629215
Rutier	12923021	14060937.6	12914061.7	14609472.1	15319994.1
Căi navigabile	6,700	10,910	9,500	7,650	7,650
Total	17262580.2	18996370.6	18030095.7	19569744.1	20956859.1

Source: National Institute of Statistics

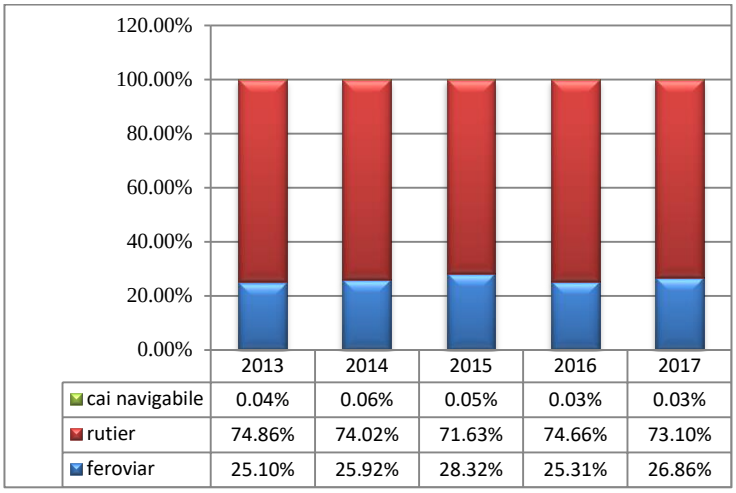
In the case of rail transport, there is a fluctuating trend, decreasing in 2013 by 591,663 thousand national passenger -national km as compared to 2014, and in the years 2015 and 2016 an increase of 181,991 and 28,099 thousand national passenger-national km compared to 2014. There is also an increase in 2017 as compared to 2016. A fluctuating trend is also observed in road transportIn 2013 and 2015 there is a decrease of 1 137 916,6 and 1 146 875,9 thousand passenger - km respectively compared to 2014. In the years 2016-2017 there is a gradual increase over the previous years. In 2013,

inland waterway transport is 6 700, followed by a significant increase in 2014 of 4 210 thousand national passenger-national km. In 2015, it will decrease by 966 274.9 compared to 2014, and in the years 2016-2017 there is a decrease of 1 850 compared to 2015.

The share of each mode of transport in passenger transport

This indicator, shown in Figure no. XI.2, registered relatively different variations for the three modes of transport, thus: a fluctuating trend is taking place in the waterway transport in the years 2013-2014, followed by a decrease in the years 2015-2017. Between 2013-2014 and 2016 there is a considerable increase in road transport, and in 2015 and 2017 there is a decrease compared to 2016 by 3.03% and 1.56%. In the case of the railways in the years 2013-2014 and 2016, a constant passenger journey is recorded. Between 2015 and 2017 there is an increase of 3.01% and 1.55% compared to 2016.

Figure no. XI.2 - Share of each mode of transport in total passengers traveled (%), 2013 - 2017



	2013	2014	2015	2016	2017
cai navigabile	0.04%	0.06%	0.05%	0.03%	0.03%
rutier	74.86%	74.02%	71.63%	74.66%	73.10%
feroviar	25.10%	25.92%	28.32%	25.31%	26.86%

Source: the Ministry of Transport, www:mt.ro

Use of public transport

The volume of local public passenger transport refers to bus and minibus, respectively metro, trams and trolleybuses. Local public passenger transport includes transport within the administrative - territorial area of a locality, without exceeding its limits. The calculated variable is passenger-km (pkm), defined as the transport of a passenger over one kilometer. Analyzing the evolution of the use of public transport at the national level in the period 2013-2017 (table no. XI.1 and figure no. XI.3), there is an increasing tendency for trams in the years 2016-2017 compared to 2015 when the reached the lowest value in the last 5 years of 2 384 674.6. In the case of buses, minibuses, trolleybuses and the metro there is a fluctuating trend. In 2014, the highest growth is 9.52%, as compared to 2013.

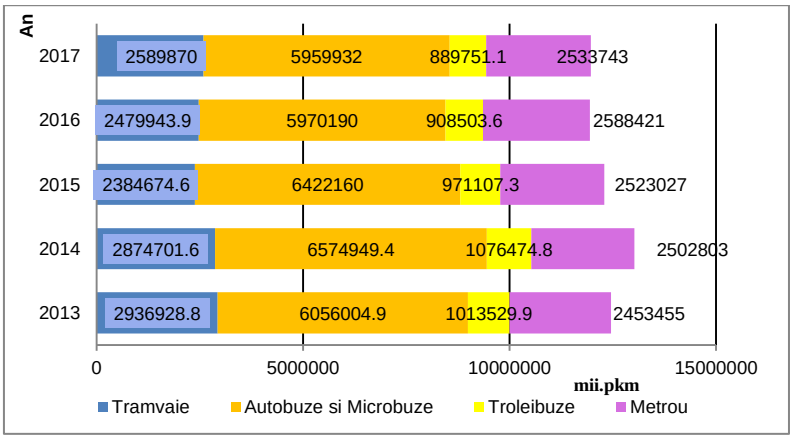
Table no. XI.1- The evolution of the use of public transport (thousands of passengers-km) at national level, 2013-2017

thousands of passengers-km

	2013	2014	2015	2016	2017
Trams	2936928.8	2874701.6	2384674.6	2479943.9	2589870.0
Buses, minibuses	6054004.9	6574949.4	6422160.0	5979190.0	5959932.0
Trolleybuses	1013529.9	1076474.8	971107.3	908503.6	889751.1
Subway	2453455.0	2502803.0	2523027.0	2588421.0	2533743.0
TOTAL	12459918.6	13028928.8	12300968.9	11956059.2	11973296.0

Source: National Institute of Statistics

Figure no. XI.3 - The evolution of the use of public transport (thousands of passenger-km) at the national level 2013 - 2017



Source: National Institute of Statistics

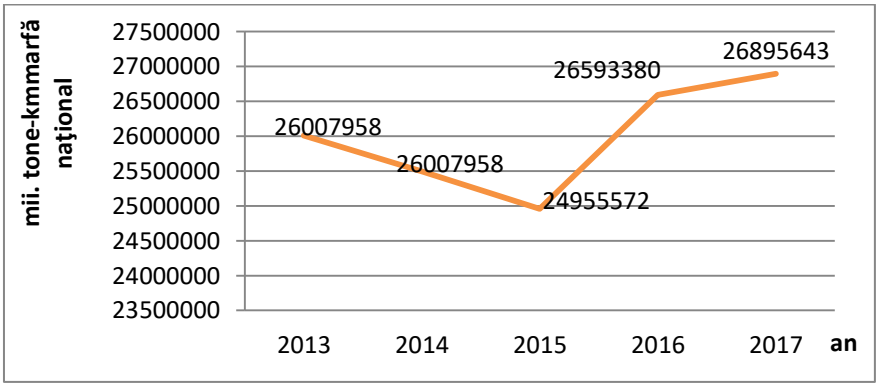
XI.1.3.2. Freight transport

RO 36	Indicator code Romania: RO 36 AEM indicator code: CSI 36

TITLE: FREIGHT TRANSPORT DEMAND
DEFINITION: The demand for freight transport is defined as the amount of internal tonne-kilometers traveled each year. According to the latest metadata, domestic shipping includes road, rail and inland waterways: inland waterways and inland railways are based on national movements ("territoriality principle"), irrespective of the nationality of the vehicle or the ship. Road transport is based on all journeys of vehicles registered in the reporting country.

Road freight transport comprises transport on vehicles registered in the reporting country, and rail and inland waterway transport includes domestic transport, irrespective of the nationality of the transport vehicle, recorded over a period of at least 5 years. The variable is calculated from the tonne-km (tkm) indicator, defined as the transport of one tonne of goods per kilometer.
From the analysis of the evolution of the demand for freight transport at the national level, in the period 2013-2017 (figure no. XI.4 and table no. XI.2), it is observed that in 2013, the total traveled of the goods transported in national transport was of 26 007 958 thousand tonne-km, declining by 2015 when it reached a minimum of 24 955 572 thousand tonne-km. In 2016-2017 there was an increase of 1,637,808 and 1,940,071 thousand tonne-km respectively compared to 2015.

Figure no. XI.4 - Developments in demand for freight transport at national level, 2013-2017



Source: National Institute of Statistics

Table no. XI.2 - Passage of goods in national, rail, road and inland waterway transport

- thousands of tons - km of national freight -

	2013	2014	2015	2016	2017
Railway	10.409.869,0	9.809.197,0	9.956.856,0	10.048.493,0	10.044.636,0
Road	12.504.233,0	12.135.562,0	12.067.769,0	13.139.575,0	13.547.658,0
Waterways	3.093.856,0	3.551.305,0	2.930.947,0	3.405.312,0	3.303.349,0
TOTAL	**26.007.958,0**	**25.496.064,0**	**24.955.572,0**	**26.593.380,0**	**26.895.643,0**

Source: National Institute of Statistics

The share of each mode of transport in freight transport

The modes of transport considered are: a) road, b) rail and c) inland waterways. Road freight transport comprises transport on vehicles registered in the reporting country, and rail and inland waterway transport includes domestic transport, irrespective of the nationality of the transport vehicle. The weight is calculated from the tonne-km (tkm) indicator, defined as the transport of one tonne of goods per kilometer. It is noted that both in the case of demand for passenger transport and freight transport, a high percentage is held by road transport at the expense of other modes of transport. The objectives of sustainable mobility require the transfer of an increasing volume of passenger and freight transport from the road to the rail. Table no. XI.3 and Figures no. XI.5a and XI.5b show the share of each mode of transport in the freight transport (tkm) at national level for the period 2013-2017.

Table no. XI.3 - The share of each mode of transport in total domestic freight transport (rail, road and inland waterways) at national level, 2013-2017

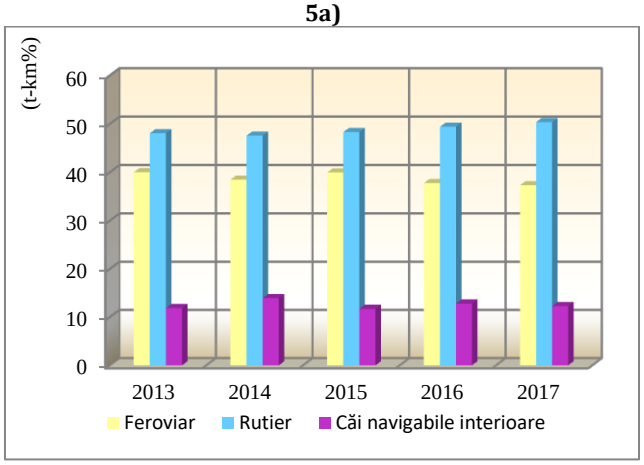
% -

Percentages (%)	2013	2014	2015	2016	2017
Railway	18,47	18,78	19,38	18,20	18,99
Road	75,78	74,70	74,71	75,39	74,73
Waterways	5,75	6,52	5,91	6,41	6,28
TOTAL	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**

Source: Ministry of Transport, www.mt.ro

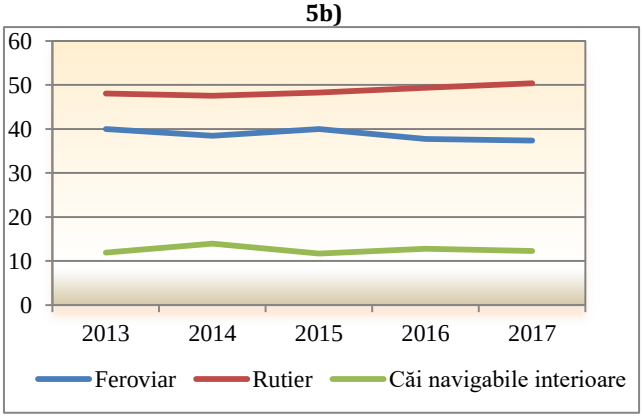
Figure no. XI.5a și XI.5b - The share of each mode of transport in freight transport (tkm)

5a)



Source: Ministry of Transport, www.mt.ro

5b)



Source: Ministry of Transport, www:mt.ro

XI.2. FACTORS INFLUENCING CONSUMPTION
XI.3. PRESSURES ON THE ENVIRONMENT CAUSED BY CONSUMPTION
XI. 3.1. GREENHOUSE GAS EMISSIONS FROM THE RESIDENTIAL SECTOR

RO 10	Indicator code Romania: RO 10 AEM indicator code: CSI 10

TITLE: TRENDS OF GREENHOUSE GAS EMISSIONS
DEFINITION: The indicator represents the (total and sectoral) greenhouse gas emissions trends in relation to Member States' obligations to meet the Kyoto Protocol targets.

Compared with the other greenhouse gas (GHG) sectors of the INEGES National Inventory of GHGs, namely Industrial Processes and Product Use (IPPU), Agriculture, Waste, and Land Use, Land Use Change and Forestry (LULUCF), the Energy sector is the largest source of anthropogenic GHG emissions in Romania. ***In 2016, the energy sector was responsible for approximately 67.03% of total GHG emissions (112,542.36 kt CO2 equivalent).***

According to the IPCC, the Energy sector comprises several sub-sectors:

- 1.A Combustion of fuels;
  - 1.A.1 Energy industry
  - 1.A.2 Manufacturing and Construction;
  - 1.A.3. Transport;
  - 1.A.4 Other sectors (commercial / institutional, residential, agriculture / forestry / fishing);
  - 1.A.5. Other (stationary, mobile);
- 1.B. Fugitive emissions from fuels.

The residential subsector includes the following quantities:

- supply of open flame systems for heating and cooking, including energy consumption for owner-occupied space and administration of economic agents;
- the supply to the population to produce heat and hot water in central heating, and the quantities of coal received by the miners as direct allocations (payments) from mining companies;
- the heat supplied to the public for heating and hot water both from the public and from the automotive production sectors.

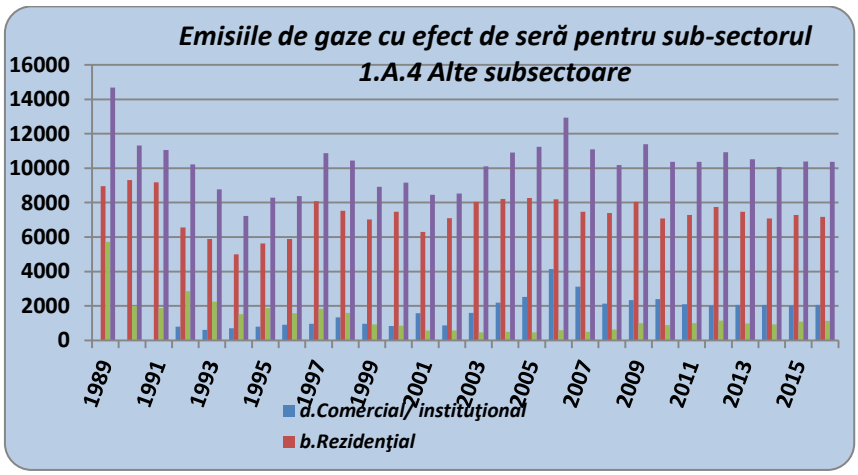
Between 1989 and 2016 the total greenhouse gas emissions registered a decreasing trend, in 2007 they increased by approximately 2.26% compared to the previous year. Between 2008 and 2016, residential and commercial greenhouse gas emissions fell by 3.25%. The share of total GHG emissions in category 1.A.4.b of sub-sector 1.A.4 is approximately 60.99% for the base year 1989 and 69.15% for the year 2016. The contribution of this category is approximately 7.172,19 kt CO2. equivalent in 2016. A major contribution is made to the use of natural gas as a fuel in this category of activity throughout the 1989-2016 period.

Table no. XI.4. Greenhouse gas emissions - sub-sector Other subsectors

Greenhouse gas emissions for the 'Other sub-sectors' sub-sector " (Gg CO2 equivalent)				
Year	1.A.4. Other subsectors			
	a. Commercial/ institutional	b. Residential	c. Agriculture/ forestry/fishing	Total
1989	0	8953	5726	14679
1990	0	9305	2005	11310
1991	0	9176	1873	11049
1992	804	6556	2853	10213
1993	617	5898	2253	8768
1994	696	5004	1520	7220
1995	800	5625	1870	8295
1996	916	5881	1582	8379
1997	961	8077	1832	10870
1998	1336	7517	1591	10444
1999	966	7024	922	8913
2000	836	7463	853	9153
2001	1580	6299	575	8454
2002	879	7090	565	8535
2003	1602	8044	467	10113
2004	2186	8221	498	10905
2005	2525	8260	460	11246
2006	4149	8201	591	12942
2007	3122	7475	498	11094
2008	2142	7403	634	10179
2009	2333	8052	1000	11386
2010	2397	7088	892	10378
2011	2091	7279	997	10367
2012	2012	7754	1159	10925
2013	2066	7471	977	10514
2014	2062	7070	930	10063
2015	2013	7284	1088	10385
2016	2062	7172	1137	10371

Source: NEPA

Figure no. XI.6. The evolution of greenhouse gas emissions in the energy sector - subsector 1.A.4 Other sectors (commercial / institutional, residential, agriculture / forestry / fishing) for the time series 1989-2016



Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

Table no. XI.5. GHG emissions share - subsector 'Other subsectors'

Year	Share(%)		
	a.Commercial/ institutional	b.Residential	c. Agriculture/ forestry/ fishing
1989	0,00	2,96	1,89
1990	0,00	3,77	0,81
1991	0,00	4,52	0,92
1992	0,43	3,51	1,53
1993	0,35	3,33	1,27
1994	0,40	2,87	0,87
1995	0,44	3,12	1,04
1996	0,50	3,21	0,86
1997	0,56	4,72	1,07
1998	0,87	4,91	1,04
1999	0,72	5,21	0,68
2000	0,59	5,30	0,61
2001	1,07	4,27	0,39
2002	0,60	4,84	0,39
2003	1,06	5,33	0,31
2004	1,46	5,47	0,33
2005	1,71	5,59	0,31
2006	2,77	5,48	0,40
2007	2,04	4,89	0,33
2008	1,45	5,00	0,43
2009	1,83	6,31	0,78
2010	1,96	5,80	0,73
2011	1,64	5,69	0,78
2012	1,61	6,21	0,93
2013	1,79	6,48	0,85
2014	1,79	6,13	0,81
2015	1,73	6,27	0,94
2016	1,83	6,37	1,01

Source: NEPA

XI.3.2. ENERGY CONSUMPTION PER CAPITA

RO 27	Indicator code Romania: RO 27 AEM indicator code: CSI 27

TITLE: FINAL ENERGY CONSUMPTION BY TYPE OF ACTIVITY SECTOR
DEFINITION: Quantities of energy supplied to the final consumer for the most diverse energy purposes.

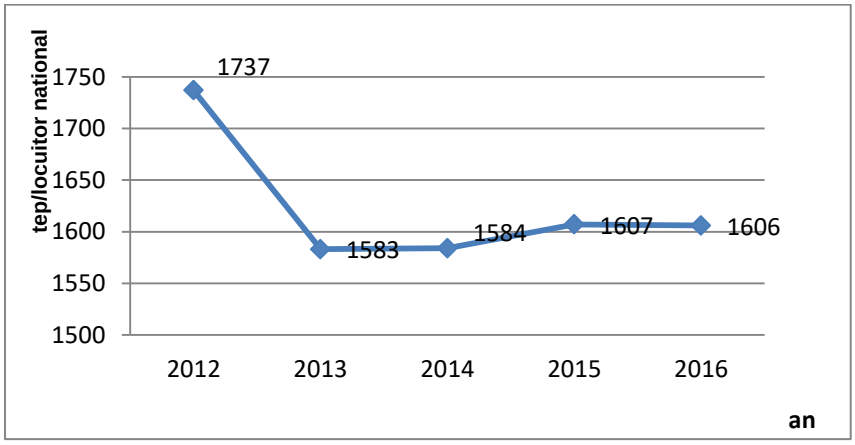
In Romania, final consumption of energy (the amount of energy supplied to the final consumer in the most diverse energy purposes) per capita (figure no. XI.7) recorded a slight decrease in 2012, followed by a sharp decrease in the year 2013, comparative with 2012. Between 2013 and 2014, final energy consumption remained constant, and in 2015 there was a slight increase also in 2016.

Table no. XI.6. Final energy consumption per capita (tep / inhabitant)

2012	2013	2014	2015	2016
1 737	1 583	1 584	1 607	1 606

Source: National Institute of Statistics.- Until the date of elaboration of this report no data were processed for 2017

Figure no. XI.7. Evolution of final energy consumption per capita (thousand tep / inhabitant)



Source: National Institute of Statistics.- Until the date of elaboration of this report no data were processed for 2017

XI.3.3. USE OF MATERIALS

XI.4. GREEN ECONOMY

XI.4.1. PUBLIC INSTITUTIONS AND COMMERCIAL SOCIETES REGISTERED IN EMAS

RO 70	Indicator code Romania: RO 70 AEM indicator code: SCP 033

NAME: NUMBER OF ORGANIZATIONS WITH ENVIRONMENTAL MANAGEMENT SYSTEMS REGISTERED UNDER EMAS AND ISO 14001
DEFINITION: The indicator shows the total number of organizations and the total number of sites registered under the Community eco-management and audit scheme EMAS and the number of organizations certified in accordance with the International Standard for Environmental Management Systems ISO 14001.

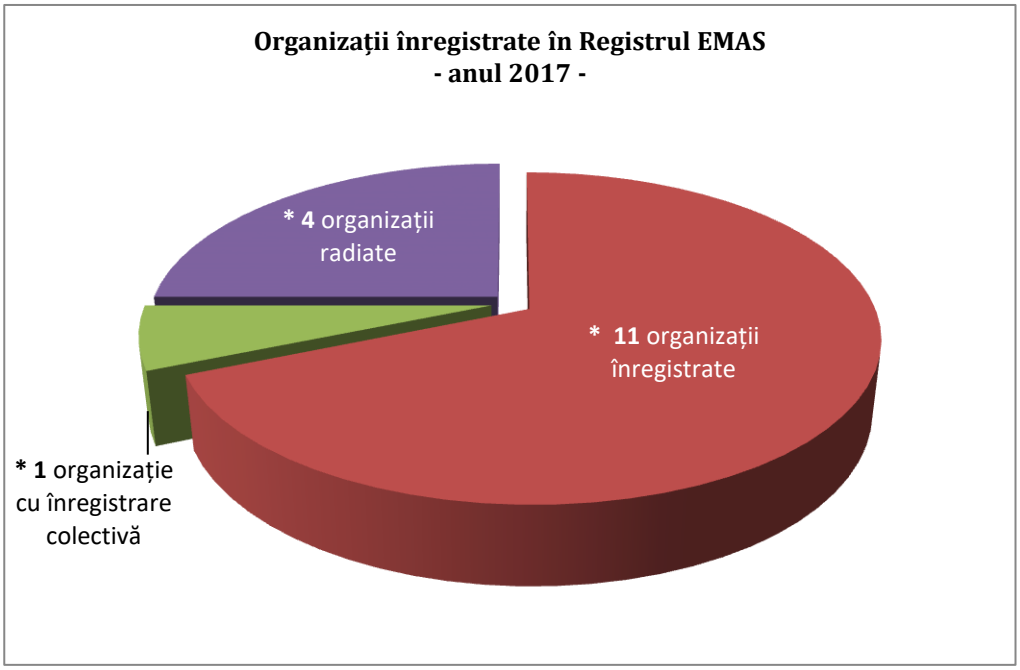
EMAS is a European environmental management tool, a voluntary tool available for any type of organization operating in any economic sector within or outside the European Union, designed to support organizations in continually improving environmental performance, integrating the concept of sustainable development. Enrollment in EMAS leads to: Improving the image and enhancing public credibility with customers, partners, investors and the local community; creating competitive advantage on the national and European markets by improving the environmental and business performance; new business opportunities in markets where organic production processes are important. At European level, organizations show greater concern in achieving environmental performance by controlling their own activities, products or services. Adopting and systematically implementing a set of environmental management techniques in line with ISO 14001 standards can help achieve optimal results for organizations. With the publication of the new version of ISO 14001: 2015 to ensure a consistent approach between the requirements of the EMAS Regulation and those of the ISO 14001 standard, the European Commission published in 2017 Commission Regulation (EU) 2017/1505 of 28 August 2017 of Annexes I, II and III to Regulation (EC) No. No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organizations in a Community eco-management and audit scheme (EMAS). From an economic point of view, EMAS means: saving resources and lower costs, thus reducing spending due to reactive management strategies, such as remediation, payment of penalties for breach of legislation. However, at national level the interest of organizations participating in this scheme is still low, organizations preferring rather to implement and certify an environmental management system according to the ISO 14001 standard. Through environmental statements that organizations have to prepare for EMAS registration, they assume performance indicators, so that when it is updated annually, indicators can be evaluated to determine whether the organization has achieved environmental performance. Table no. XI.7 presents the evolution of the organizations registered in Romania in the EMAS register 2012 - 2017. At the end of 2017, 16 organizations were registered in the EMAS National Registry, but four of them were radiated either due to requests from organizations or because they did not comply with the requirements of the EMAS III Regulation, as shown in Figure no. XI.8. The Oradea Metropolitan Area Association, which in 2013 requested the deletion from the EMAS National Register, was re-registered in EMAS in 2016.

Table nr. XI.7. Evolution of the number of organizations in Romania registered in EMAS, 2012-2017

Organizations in Romania registered in the EMAS Register	**Year 2012**	**Year 2013**	**Year 2014**	**Year 2015**	**Year 2016**	**Year 2017**
Total number of organizations EMAS Registered	7	9	11	15	15	16
Registered organizations	4	5	6	10	11	11
Organizations with collective registration	1	1	1	1	1	1
Radiated organizations	2	3	4	4	3	4

Source: NEPA

Figure no. XI.8 - Number of organizations in Romania registered in EMAS, 2017



Source: NEPA

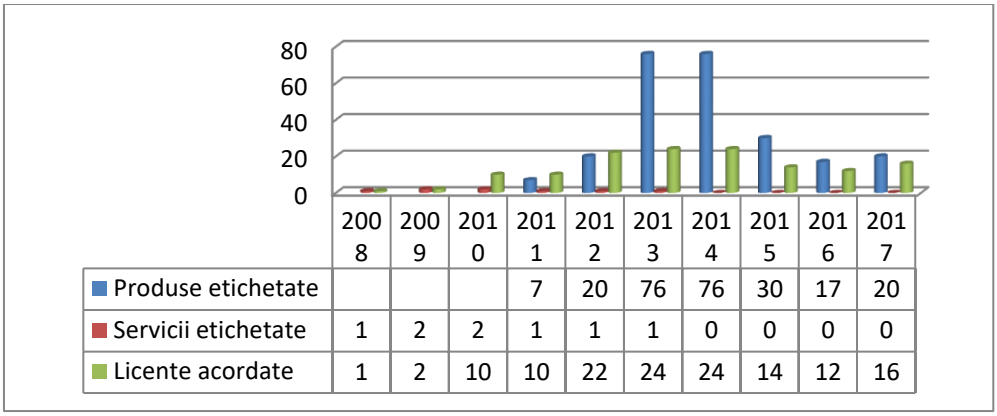
XI.4.2. NUMBER OF PRODUCTS AND SERVICES LABELED WITH THE EUROPEAN ECOLOGICAL LABEL

RO 71	Indicator code Romania: RO 71 AEM indicator code: SCP

TITLE: NUMBER OF PRODUCTS AND SERVICES LABELED WITH THE EUROPEAN ECOLOGICAL LABEL
DEFINITION: The indicator shows the number of products and services for which the European Ecolabel has been awarded year by year. The indicator does not provide information on the share of organic products in the total range of consumer goods available to consumers.

2017 is the year that marks the 25th anniversary of the launch of the first eco-label in 1992. The European Ecolabel is an engine for creating green jobs. The European Commission has launched a major package, with 54 different actions, to help the EU economy become circular. The guideline of this package is to rethink how we do, use and dispense a product, make sure we do not remove the product until we extract a maximum value. Approximately 2000 companies, from household names to local entrepreneurs, are involved in providing approximately 40,000 eco-labeled products ranging from washing powder and shampoo to camping and tourist accommodation. The European Ecolabel demonstrates that sustainable production is perfectly compatible with economical growth and creating more jobs, and that investing in organic labeling is a business opportunity. Figure no. XI.9 shows the evolution of the number of products / services for which the European Ecolabel was granted and the licenses granted during 2008 - 2017.

Figure no. XI.9. Evolution of the number of products and services labeled with the eco-label and licenses granted, 2008-2017



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Produse etichetate				7	20	76	76	30	17	20
Servicii etichetate	1	2	2	1	1	1	0	0	0	0
Licente acordate	1	2	10	10	22	24	24	14	12	16

Source NEPA

XI.4.3. ENVIRONMENTAL CHARGES AND FEES

Environmental investments for compliance

Expenditure on environmental protection

Financial support for environmental protection

Income from environmental taxes

XI.4.4. ECO-EFFICIENCY OF THE MAIN ACTIVITY SECTORS

XI.4.4.1. Energy

RO 29	Indicator code Romania: RO 29 AEM indicator code: CSI 29

TITLE: PRIMARY ENERGY CONSUMPTION BY TYPE OF FUEL
DEFINITION: Total energy consumption or gross domestic energy consumption is the amount of energy needed to meet the domestic consumption of a country**.**

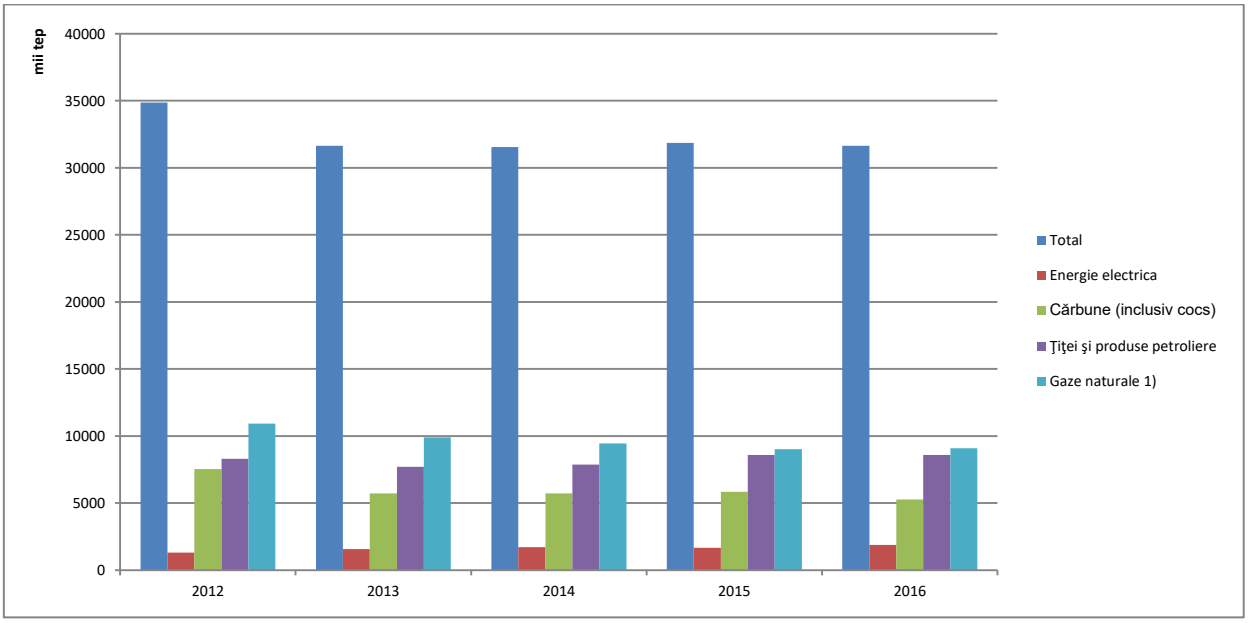
The energy sector contributes to the emission of significant amounts of sulfur dioxide (SO2), carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), fine particles, and wastewater The energy sector includes the following activities: extraction and preparation of coal; extraction of oil and natural gas; extraction and preparation of radioactive ores; the oil processing industry; production, transport and distribution of electric and thermal energy, gas and hot water. The production units are: thermal power stations, hydropower plants and the Cernavoda nuclear power plant. Thermal power plants are the most important source that pollutes the air through combustion processes and generates greenhouse gas emissions (nitrogen oxides, sulfur oxides, CO2) affecting the quality of the atmosphere. Hot water resulting from steam cooling in condensers, changes the qualitative parameters of surface waters, with consequences on aquatic fauna and flora; slag and ash deposits affect the quality of air in the area and underground water. Accidents at thermal power stations, oil spills, affect the quality of surface waters and soilThe environmental impact of energy sources that has attracted particular attention in recent years is that of the atmosphere: acid rain and global warming, effects from the widespread use of fossil fuels.

The impact on water, soil and landscape is also taken into account, which is more manifested at local level. Hydroelectric plants, apparently non-polluting units, also affect environmental factors. Hydroelectric plants change the landscape, ecosystems, variety and number of species, water quality (by concentration in salts). The construction of a hydroelectric plant releases large areas of land, massive deforestation, the population moves to other areas. Due to excess atmospheric humidity in the area, climatic disturbances may occur. Compared to the fossil fuel combustion sector, the production of energy in hydropower plants has a low impact on the environment, furthering a series of benefits, consisting mainly of:

- providing additional debts for water supply to localities and industrial and economic objectives;
- water management services by flood defenses of localities, economic objectives and communication routes;
- contributes to the water abatement by decanting and sedimenting the suspensions transported by rivers, the possibility of retaining certain wastes, petroleum products etc.

The Cernavoda nuclear power plant pollutes the environment through the large flow of water required in the cooling system and the radionuclide content of the gases, liquids and solids discharged. Reducing the impact of the energy systems on the environment and implementing the norms stipulated in this field imposed by EU regulations are to be achieved by: rehabilitation and modernization works, greening of slag and ash dumps, continuous monitoring of the quality of the environment in the area of the big energy objectives, soil rehabilitation polluted and reintroduced into the agricultural circuit, reducing pollutant emissions to refineries and minimizing losses, ecological recovery of oilfields by reducing operational risk.

Figure no. XI. 10. Energy consumption by type of fuel for the period 2012-2016 (thousand tep)

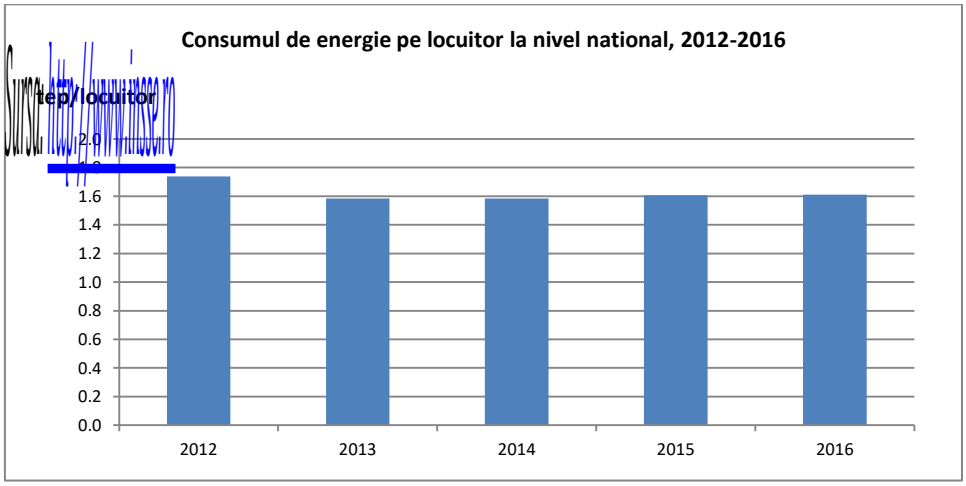


Source: http://www.insse.ro

From figure no. XI.10 on energy consumption by type of fuel it is noticed that the largest share corresponds to the natural gas values for the entire analyzed period and the values corresponding to the types of coal and crude oil fuel have an approximately similar average evolution. The downward trend in energy consumption is also maintained in 2016. Gross domestic consumption (including losses) decreased in 2016 compared to 2015, with 206 thousand toe, representing -0.6%. On types of energy carriers, domestic gross electricity consumption (+225 thousand tep) and natural gas (+84 thousand toe) increased, but coal consumption (including coke) decreased by 586 thousand toe. Consumption of crude oil and petroleum products remained at a relatively constant level compared to 2015. (according to the data published by the National Institute of Statistics).

Gross domestic energy consumption per capita in 2016 was 1606 kg of oil equivalent. The trend of the gross domestic energy consumption per inhabitant during the period 2012-2016 is shown in figure no. XI.11.

Figure no. XI.11 - Energy consumption per capita, expressed in tons of petroleum equivalent (tep)

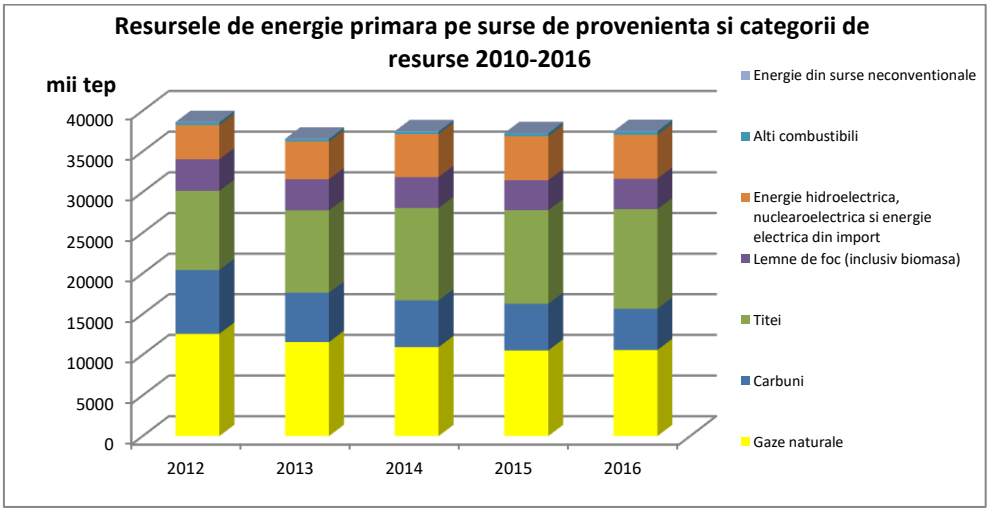


Source: http://www.insse.ro

The analysis of the data presented in Figure XI.11 shows a peak consumption of 1.74 tep in 2012, a decrease to 1.58 tep in the years 2013-2014, followed by a slight increase to 1.61 tep in 2015 and 2016 . In 2012, in 2016, per capita energy consumption decreased by 7.4%.

Primary energy resources in 2016 were 40910 thousand tep of oil equivalent, up 245 thousand tep (+0.6%) over the previous year. Figure no. XI.12 shows the evolution of primary energy resources in the following types of fuels: coal, natural gas, crude oil, firewood (including biomass), other fuels, energy, non-conventional sources of energy. We see the majority share of primary energy production from crude oil and natural gas.

Figure no.XI.12. Primary energy resources by sources of origin and resource categories

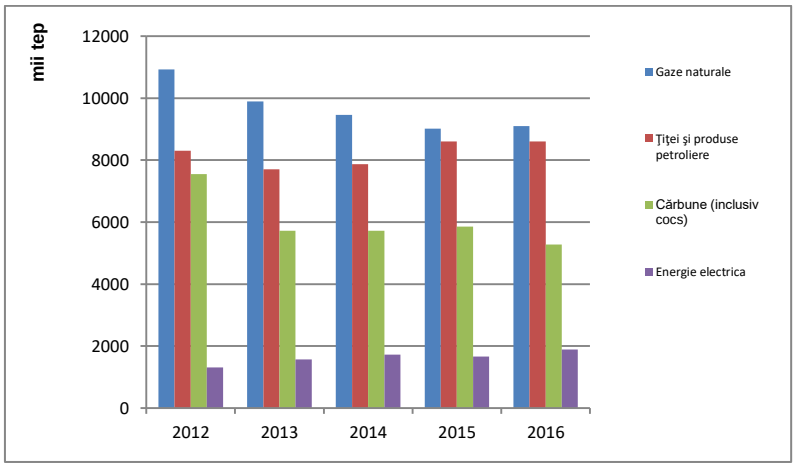


Source: http://www.insse.ro (TEMPO_IND107A_14_8_2018)

Primary energy production of 24798 thousand tep in 2016 decreased by 1589 thousand tep 2015 (26,387 thousand tep), but continued to retain its significant share in total energy resources, accounting for 58.8% of these (down from 2015 by 3.8%). The most significant decrease was recorded in the production of natural gas (-1012 thousand tep), representing - 11.4% compared to the previous year. Primary electricity production grew by 3.4% over the previous year (+77 thousand tep). *National Institute of Statistics*

Total domestic primary energy consumption was 31638 thousand tep in 2016, down 0.6% compared to 2015 and 9.2% over 2012. The peak domestic consumption was reached in 2011, recording - the value of 35648 thousand tep. (Figure no. XI.13)

Figure no.XI.13 - The evolution of primary energy consumption in Romania during the period 2012-2016



Source: http://www.insse.ro

Consumption of natural gas is the largest share of all constituent elements of domestic primary energy consumption, increasing by 1% compared to 2015, but declining by 16.7% compared to 2012.
Under the current challenge of securing energy resources and the need to reduce CO2 emissions and protect the environment, investing in energy efficiency and renewable energy, recovering secondary energy resources, and combating energy poverty is a strategic priority for Romania. ("The Romanian Energy Strategy 2016-2030")

RO 10	Indicator code Romania: RO 10 AEM indicator code: CSI 10

TITLE: GREENHOUSE GAS EMISSIONS TRENDS
DEFINITION: The indicator represents the (total and sectoral) greenhouse gas emissions trends in relation to Member States' obligations to comply with the Kyoto Protocol objectives**.**

See the title XI.3.1.

XI.4.4.2. Industria

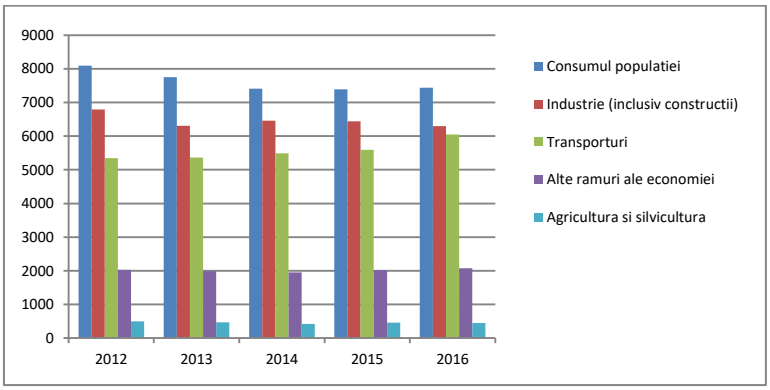
RO 27	Indicator code Romania: RO 27 AEM indicator code: CSI 27

TITLE: FINAL ENERGY CONSUMPTION BY TYPE OF ACTIVITY SECTOR
DEFINITION: Final energy consumption covers the energy supplied to the final consumer for the most diverse energy purposes**.**

See the title XI.3.2.

The assessment of the level of energy dependence at the sector level is done by summing the quantities of energy used in branches of activity according to the energy balance. Quantities used to produce other fuels, energy consumption and transmission and distribution losses, are not included. In 2016, primary energy production decreased by 6.0% compared to 2015 and imports of energy products increased by 15.7%; the gross domestic energy consumption decreased by 0.6% compared to the previous year; the final energy consumption registered an increase of 1.9% compared to 2015. According to data published by the National Institute of Statistics (NIS).

Figure no. XI.14. Energy consumption by types of sectors of activity for the period 2012 - 2016 (thousand tep)

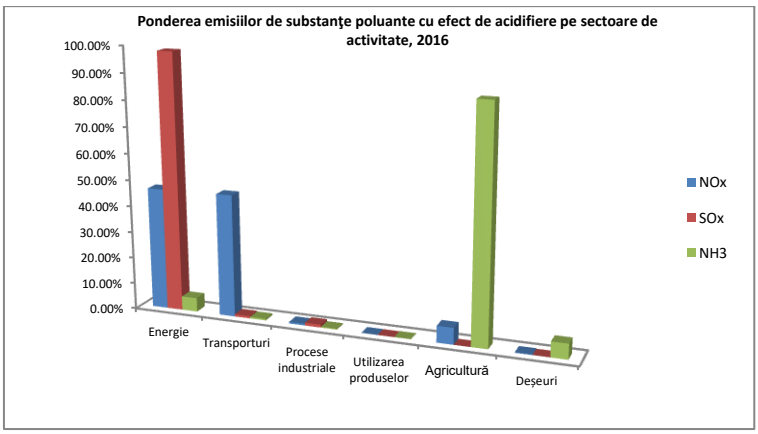


Source: http://www.insse.ro

In Figure no. XI.14 on energy consumption by types of sectors of activity, the period 2012-2016 shows that the largest share of the energy consumption is in the residential sector, followed by the activities in the industry and the transport activities. Trends: Final energy consumption in 2016 increased by 421 thousand tep (+ 1.9%) versus 2015. Final consumption in industry (including construction) decreased by 137 thousand tep (-2.1%). Transport and the tertiary sector registered increases in consumption compared to the previous year (+ 8.2% and + 2.7% respectively) and, with a cumulative weight of 36.4% in the total final energy consumption, compensated the decreases in energy consumption final in industry and agriculture.

Depending on the acidification potential, the trend of anthropogenic emissions of nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2) by sectors of activity at national level: energy, transport, industrial processes, use of products, agriculture, wast, is represented on figure no. XI.15.

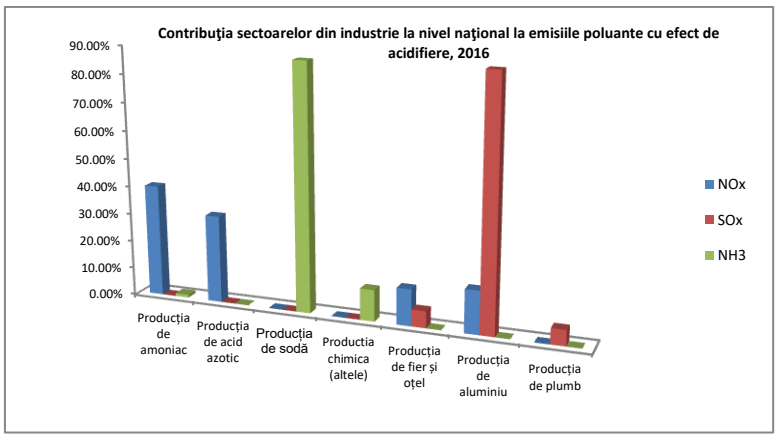
Figure no.XI.15. The share of emissions of acidifying pollutants at national level by sector of activity in 2016



Source: Romania's Informative Inventory Report 2018

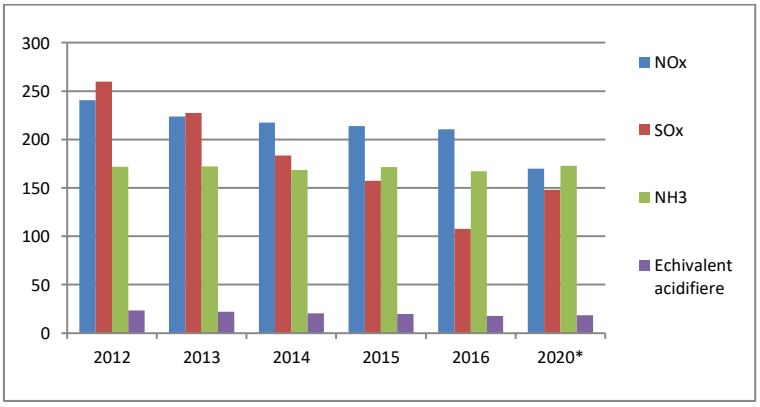
It is found that the acidification effect at national level is predominantly from the energy sector for sulfur oxides, energy and transport for nitrogen oxides and agriculture for ammonia.

Figure no.XI.16. Contribution of industries sub-sectors in 2016 to acidifying pollutants (NOx, SOx, and NH3)



Source: Romania's Informative Inventory Report 2018

Figure no. XI.17 - Evolution of emissions of pollutants with an acidifying effect at national level in the period 2012-2016 and target for 2020



*Note: * Emission ceilings according to the revised Gothenburg Protocol 2010*

From the analysis of the data on the emissions of acidifier substances, the subsectors of activity in the high-value industry sector are aluminum production with significant sulfur dioxide values, followed by soda production with high values for ammonia pollutants and ammonia production where values large are registered for nitrogen oxides pollutants.

Taking into account the 2010 ceilings and the provisions of the revised Gothenburg Protocol on the reduction of air pollutant emissions, commitments to be fulfilled by 2020, it is observed that the evolution of acidifying pollutants at national level throughout the analyzed period follows a downward trend.

The acid equivalent is a parameter for assessing the total amount of acidifying substances emitted into the atmosphere. These substances contribute to the acidification of soil, air and the aquatic environment. The acid equivalent is based on the potential of fixing the H + ions. The calculation takes into account the following pollutants: NOx, SO2 and NH3, and the acid equivalent can be calculated using the following weighting factors: 0.0217 for NOx, 0.0313 for SO2 and 0.0588 for NH3.

XI.4.4.3. Agriculture

RO 25	Indicator code Romania: RO 25 AEM indicator code: CSI 25

TITLE: Gross weight of nutrients
DEFINITION: The indicator estimates the nitrogen surplus on agricultural land. This is done by calculating the balance between the total amount of nitrogen entering the agricultural system and the total amount of nitrogen leaving the system per hectare of agricultural land.

Table no. XI.8. Area cultivated in 2017

Area cultivated in 2017 (ha)	**8.307.344**

Source: M.A.D.R

Table no. XI.9. Surfaces and quantities of chemical and natural fertilizers used in agriculture in 2017

Specification	Surface	Quantity	Share of the cultivated area
	Hectares (ha)	Tons – 100% active substance	%
Chemical	7.272.565	581.470	87,54
Nitrous	5.218.331	381.342	62,82
Phosphatic	2.765.381	144.869	33,29
Potassic	1.278.542	55.259	15,39
Natural	708.364	12.625.073	8,53

Source: M.A.D.R; I.N.S. - TEMPO – Agricultural area and agricultural production - Agri - environment indicators

Table no. XI. 10. Surfaces and quantities of pesticides used in agriculture in 2017

Specification	Surface	Quantity	Share of the cultivated area
	Hectares (ha)	Kilograms of active substance	%
Insecticides	2.217.777	1.001.430	26,70
Fungicides	2.395.123	2.282.330	28,83
Herbicides	3.605.714	3.575.547	43,40

Source: M.A.D.R; I.N.S. - TEMPO – Agricultural area and agricultural production - Agri - environment indicators

XI.4.4.4. Transports

RO 35	Indicator code Romania: RO 35 AEM indicator code: CSI 35

TITLE: PASSENGER TRANSPORT DEMAND
DEFINITION: Passenger transport demand is defined as the amount of passenger-kilometers traveled each year. Domestic passenger transport includes car, bus and coach transport and trains.
See title XI.1.3.1.

The volume of inland passenger transport (expressed as a percentage change from the base year of the current passenger value-of-year value) for the 2013-2017 period.

Tabele no. XI.11. Volume of inland passenger transport, 2013-2017

2013=100

Percents (%)	2013	2014	2015	2016	2017
Railway	100	113,7	117,9	114,3	129,9
Road	100	108,8	99,9	113,0	118,5
Waterways	100	162,8	142,1	114,2	114,2
TOTAL	**100**	**110,0**	**104,4**	**113,4**	**121,4**

Source: Ministry of Transports

Table no. XI.12. National passenger transport, 2013-2017

- thousands of passengers -

	2013	2014	2015	2016	2017
Railway	57.159,5	64.525,3	66.261,7	64.251,8	68.868,3
Road	272.153,8	279.642,8	272.899,6	300.845,3	323.746,9
Waterways	134,0	167,0	169,0	153,0	153,0
Aerial	1.123,7	995,4	1.009,6	1.785,7	2.744,3
TOTAL	**330.571,0**	**345.330,5**	**340.339,9**	**367.035,8**	**395.512,5**

Source: National Institute of Statistics

Table no. XI. 13 - Share of each mode of transport in the total national passenger transport, 2013-2017

%

	2013	2014	2015	2016	2017
Railway	17,29	18,68	19,47	17,50	17,41
Road	82,33	80,98	80,18	81,97	81,86
Waterways	0,04	0,05	0,05	0,04	0,04
Aerial	0,34	0,29	0,30	0,49	0,69
TOTAL	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**

Source: Ministry of Transports

Table no. XI. 14. Volume of local public transport by modes of transport (buses and minibuses, metro, trams and trolleybuses) at national level, 2013-2017

thousands of passengers -km

	2013	2014	2015	2016	2017
Trams	2.936.928,8	2.874.701,6	2.384.674,6	2.479.943,9	2.589.870,0
Buses and minibuses	6.056.004,9	6.574.949,4	6.422.160,0	5.979.190,0	5.959.932,0
Trolleybuses	1.013.529,9	1.076.474,8	971.107,3	908.503,6	889.751,1
Metro	2.453.455,0	2.502.803,0	2.523.027,0	2588421,0	2.533.743,0
TOTAL	**12.459.918,6**	**13.028.928,8**	**12.300.968,9**	**11.956.059,2**	**11.973.296,1**

Source: National Institute of Statistics

Table no. XI.15. The volume of passenger transport (passenger journey) at national level, 2013 -2017

thousands of passengers -km

	2013	2014	2015	2016	2017
Railway	4.332.859,2	4.924.523,0	5.106.514,0	4.952.622,0	5.629.215,0
Road	12.923.021,0	14.060.937,6	12.914.061,7	14.609.472,1	15.319.994,1
Waterways	6.700,0	10.910,0	9.520,0	7.650,0	7.650,0
TOTAL	**17.262.580,2**	**18.996.370,6**	**18.030.095,7**	**19.569.744,1**	**20.956.859,1**

Source: National Institute of Statistics

RO 36	Indicator code Romania: RO 36 AEM indicator code: CSI 36

TITLE: DEMAND FOR TRANSPORT OF GOODS
DEFINITION: The demand for freight is defined as the amount of internal tonne-kilometers traveled each year. According to the latest metadata, domestic shipping includes road, rail and inland waterways: inland waterways and inland railways are based on national movements ("territoriality principle"), irrespective of the nationality of the vehicle or the ship. Road transport is based on all journeys of vehicles registered in the reporting country.

See title XI.1.3.2.

Table no. XI. 16. Goods transported at national level by rail, road and inland waterway, 2013 - 2017

thousands of tons

	2013	2014	2015	2016	2017
Railway	41.267,9	41.548,8	43.431,3	41.761,7	44.260,6
Road	169.313,0	165.254,0	167.447,0	172.957,0	174.134,0
Waterways	12.848,0	14.421,0	13.246,0	14.697,0	14.632,0
TOTAL	**223.428,9**	**221.223,8**	**224.124,3**	**229.415,7**	**233.026,6**

Source: National Institute of Statistics

Table no. XI. 17. Passage of goods in national rail, road and inland waterway transport

mii tone -km

	2013	2014	2015	2016	2017
Railway	10.409.869,0	9.809.197,0	9.956.856,0	10.048.493,0	10.044.636,0
Road	12.504.233,0	12.135.562,0	12.067.769,0	13.139.575,0	13.547.658,0
Waterways	3.093.856,0	3.551.305,0	2.930.947,0	3.405.312,0	3.303.349,0
TOTAL	**26.007.958,0**	**25.496.064,0**	**24.955.572,0**	**26.593.380,0**	**26.895.643,0**

Source: National Institute of Statistics

Table no. XI.18. Share of each mode of transport in total domestic goods transport (road, rail, inland waterway) at national level, 2013-2017

%

Procente (%)	2013	2014	2015	2016	2017
Railway	18,47	18,78	19,38	18,20	18,99
Road	75,78	74,70	74,71	75,39	74,73
Waterways	5,75	6,52	5,91	6,41	6,28
TOTAL	**100,00**	**100,00**	**100,00**	**100,00**	**100,00**

Source: Ministry of Transports

XI.4.4.5. Housing

RO 27	Indicator code Romania: RO 27 AEM indicator code: CSI 27

TITLE: FINAL ENERGY CONSUMPTION BY TYPE OF ACTIVITY SECTOR
DEFINITION: Final energy consumption covers the energy supplied to the final consumer for the most diverse energy purposes.

See title XI.4.4.2.

RO 10	Indicator code Romania: RO 10 AEM indicator code: CSI 10

TITLE: GREENHOUSE GAS EMISSIONS TRENDS
DEFINITION: The indicator represents the (total and sectoral) greenhouse gas emissions trends in relation to Member States' obligations to comply with the Kyoto Protocol objectives**.**

See title XI.3.1.

RO 16	Indicator code Romania: RO 16 AEM indicator: CSI 16

TITLE: MUNICIPAL WASTE GENERATION
DEFINITION: The indicator expresses the total amount of municipal waste generated per capita (kg per capita and year.)

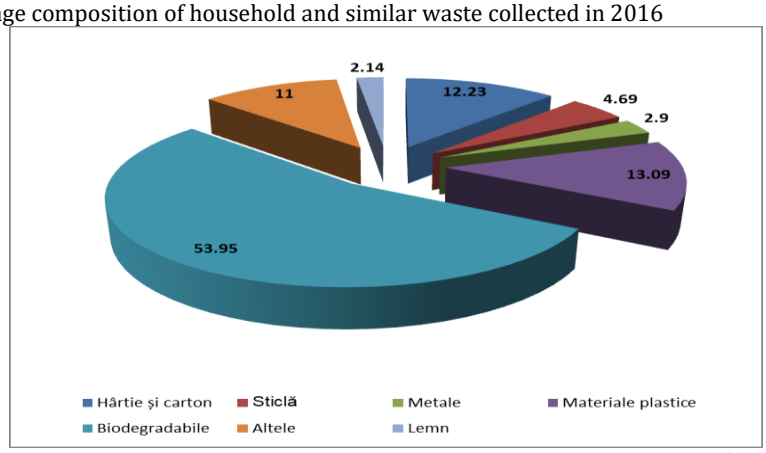
In accordance with the provisions of the National Waste Management Strategy 2014-2020, "municipal waste is represented by all household and similar waste generated in urban and rural areas in households, institutions, commercial units and from economic operators, street waste collected from public premises, buildings, streets, parks, green spaces, plus building and demolition waste resulting from the interior design of dwellings collected by sanitation operators". The collection of municipal waste is the responsibility of the municipalities, which can carry out these tasks either directly (through specialized services within the Local Councils) or indirectly (by delegating this responsibility on a contractual basis to specialized and authorized companies for the performance of sanitation services). In 2016, the amount of municipal waste collected through the specialized services of the municipalities or the sanitation companies was 5260 thousand tons. Of the total amount of municipal waste collected by sanitation operators, 79% is household waste and assimilable waste.

Table no.XI.19. Waste collected by municipalities in 2016 (thousand tons; %)

Waste collected	Quantity collected - thousands of tons	Percent %
domestic and similar waste	4301	82
waste from municipal services	691	13
construction / demolition waste	268	5
TOTAL	**5260**	**100**

Source: National Environmental Protection Agency

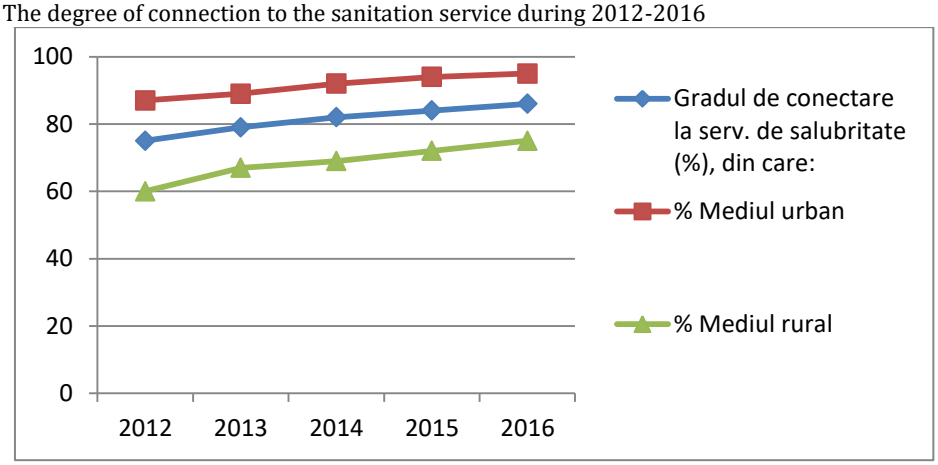
Figure no.XI.18. Percentage composition of household and similar waste collected in 2016



Source: National Environmental Protection Agency

It should be noted that collection of municipal waste is not generalized at national level. Figure XI.19 shows the evolution of the connection to the sanitation service in 2012-2016.

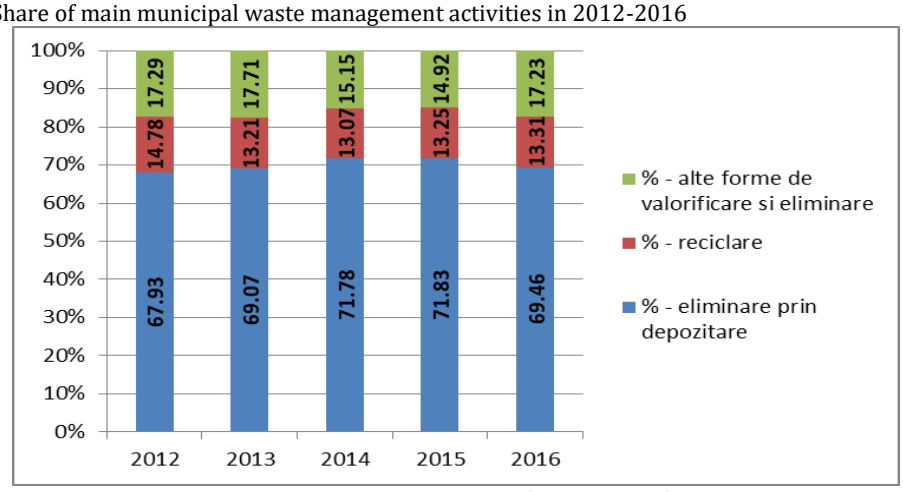
Figure no.XI.19. The degree of connection to the sanitation service during 2012-2016



Source: National Environmental Protection Agency

From the above information, we see a year-on-year increase in the connection to the sanitation service. The amount of waste generated by the population not served by sanitation is calculated using the following generation indices: 0.9 kg / place / day for the urban area and 0.4 kg / place / day for the rural area. Municipal waste management involves the collection, transport, recovery and disposal of waste, including the monitoring of landfills after closure. ***Responsibility for municipal waste management rests with local government, which, through its own means or through the concession of the sanitation service to an authorized operator, must ensure collection (including separate collection), transport, treatment, recovery and final disposal of such waste.*** Some of the collected municipal waste is sent directly for final (material or energy) recovery or disposal, while another part is sent to intermediate treatment plants (sorting stations, composting plants). ***The disposal of municipal waste is done exclusively by storage. Until now, municipal waste incineration plants have not been put into operation in Romania. At the end of 2017, 40 compliant landfills were authorized to operate.***

Figure no. XI.20. Share of main municipal waste management activities in 2012-2016



Source: National Environmental Protection Agency

Energy efficiency of buildings

The yield of the thermoelectric power plants and their own technological consumption

XI.5. FORECASTS, POLICIES AND MEASURES CONCERNING CONSUMPTION AND THE ENVIRONMENT

XII.TRENDS AND CHANGES IN ROMANIA COMPARATIVE TO THE TRENDS IN THE EUROPEAN UNION

XII.1.TRENDS AND CHANGES IN ROMANIA

XII.2.EVALUATION OF THE ENVIRONMENTAL PERFORMANCE OF ROMANIA

Chapterl XII. TRENDS AND CHANGES IN ROMANIA COMPARATIVE TO THE TRENDS IN THE EUROPEAN UNION

XII.1. TRENDS AND CHANGES IN ROMANIA

XII.1.1. SOCIAL

XII.1.1.1. DEVELOPMENT OF POPULATION NUMBER AT THE NATIONAL LEVEL AND IN URBAN AGGLOMERATIONS
DISTRIBUTION OF POPULATION BY RESIDENCE ENVIRONMENT

XII.1.2. ECONOMICS
XII.1.2.1. GDP DEVELOPMENT ON NATIONAL LEVEL AND MAIN ACTIVITY SECTORS GDP evolution by main sectors of activity

XII.1.3. ENVIRONMENTAL POLICIES

XII.2. EVALUATION OF THE ENVIRONMENTAL PERFORMANCE OF ROMANIA

XII.2.1. GHG EMISSIONS INTENSITY AND EMISSIONS OF GHG PER CAPITA

RO 10	Indicator code Romania: RO 10 AEM indicator code: CSI 10

TITLE: TRENDS OF GREENHOUSE GAS EMISSIONS
DEFINITION: The indicator represents the (total and sectoral) greenhouse gas emissions trends in relation to Member States' obligations to meet the Kyoto Protocol targets.

Compared with the other greenhouse gas (GHG) sectors of the INEGES National Inventory of GHGs, namely Industrial Processes and Product Use (IPPU), Agriculture, Waste, and Land Use, Land Use Change and Forestry (LULUCF), the Energy sector is the largest source of anthropogenic GHG emissions in Romania. ***In 2016, the energy sector was responsible for about 67.03% of total GHG emissions (112,542.36 kt CO2 equivalent).***

According to the IPCC, the Energy sector comprises several sub-sectors:

- 1.A Combustion of fuels;
  - 1.A.1 Energy industry
  - 1.A.2 Manufacturing and Construction;
  - 1.A.3. Transports;
  - 1.A.4 Other sectors (commercial / institutional, residential, agriculture / forestry / fishing);
  - 1.A.5. Other (stationary, mobile);
- 1.B. Fugitive emissions from fuels.

The residential subsector includes the following quantities:

- supply of open flame systems for heating and cooking, including energy consumption for owner-occupied space and administration of economic agents;
- the supply to the population to produce heat and hot water in central heating, and the quantities of coal received by the miners as direct allocations (payments) from mining companies;
- the heat supplied to the public for heating and hot water both from the public and from the automotive production sectors.

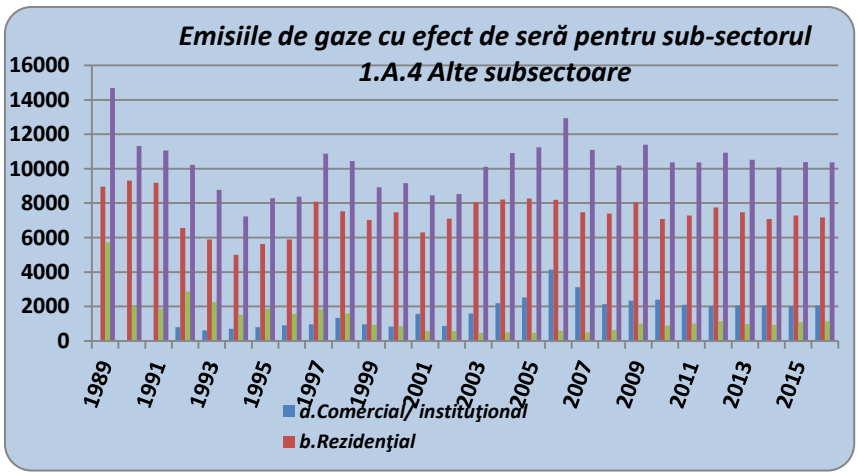
Between 1989 and 2016 the total greenhouse gas emissions registered a decreasing trend, in 2007 they increased by approximately 2.26% compared to the previous year. Between 2008 and 2016, residential and commercial greenhouse gas emissions decreased by 3.25%. The share of total GHG emissions in category 1.A.4.b of sub-sector 1.A.4 is approximately 60.99% for the base year 1989 and 69.15% for the current year, 2016. The contribution of this category is approximately 7.172,19 kt CO2. equivalent in 2016. A major contribution is made to the use of natural gas as a fuel in this category of activity throughout the 1989-2016 period.

Table no. XII.1 - Greenhouse gas emissions - sub-sector Other subsectors

Greenhouse gas emissions for the subsector 'Other subsectors' (Gg CO2 equivalent)				
Year	1.A.4. Other subsectors			
	a.Commercial/ institutional	b. Residential	c.Agriculture/ forestry / fishing	Total
1989	0	8953	5726	14679
1990	0	9305	2005	11310
1991	0	9176	1873	11049
1992	804	6556	2853	10213
1993	617	5898	2253	8768
1994	696	5004	1520	7220
1995	800	5625	1870	8295
1996	916	5881	1582	8379
1997	961	8077	1832	10870
1998	1336	7517	1591	10444
1999	966	7024	922	8913
2000	836	7463	853	9153
2001	1580	6299	575	8454
2002	879	7090	565	8535
2003	1602	8044	467	10113
2004	2186	8221	498	10905
2005	2525	8260	460	11246
2006	4149	8201	591	12942
2007	3122	7475	498	11094
2008	2142	7403	634	10179
2009	2333	8052	1000	11386
2010	2397	7088	892	10378
2011	2091	7279	997	10367
2012	2012	7754	1159	10925
2013	2066	7471	977	10514
2014	2062	7070	930	10063
2015	2013	7284	1088	10385
2016	2062	7172	1137	10371

Source: N.E.P.A.

Figure no. XII.1 - The evolution of greenhouse gas emissions in the energy sector - subsector 1.A.4 Other sectors (commercial / institutional, residential, agriculture / forestry / fishing) for the time series 1989-2016



Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

Table no. XII.2 - Share of GHG emissions - sub-sector "Other subsectors"

Year	Share (%)		
	a.Commercial/ institutional	b.Residential	c. Agriculture/ forestry/ fishing
1989	0,00	2,96	1,89
1990	0,00	3,77	0,81
1991	0,00	4,52	0,92
1992	0,43	3,51	1,53
1993	0,35	3,33	1,27
1994	0,40	2,87	0,87
1995	0,44	3,12	1,04
1996	0,50	3,21	0,86
1997	0,56	4,72	1,07
1998	0,87	4,91	1,04
1999	0,72	5,21	0,68
2000	0,59	5,30	0,61
2001	1,07	4,27	0,39
2002	0,60	4,84	0,39
2003	1,06	5,33	0,31
2004	1,46	5,47	0,33
2005	1,71	5,59	0,31
2006	2,77	5,48	0,40
2007	2,04	4,89	0,33
2008	1,45	5,00	0,43
2009	1,83	6,31	0,78
2010	1,96	5,80	0,73
2011	1,64	5,69	0,78
2012	1,61	6,21	0,93
2013	1,79	6,48	0,85
2014	1,79	6,13	0,81
2015	1,73	6,27	0,94
2016	1,83	6,37	1,01

Source: N.E.P.A

XII.2.2. PRIMARY ENERGY INTENSITY AND TOTAL CONSUMPTION OF ENERGY PER CAPITA

RO 28	Indicator code Romania: RO 28 AEM indicator code: CSI 28 / ERNER 017

TITLE: TOTAL PRIMARY ENERGY INTENSITY
DEFINITION: The indicator is the ratio between gross domestic energy consumption and gross domestic product (GDP), calculated over a calendar year.

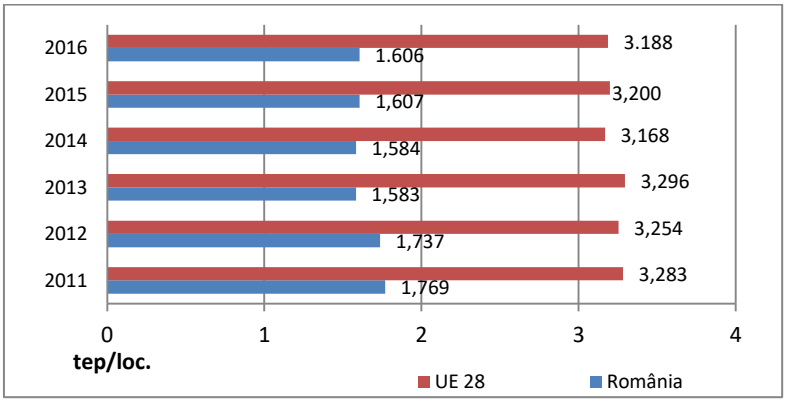
In 2011, the gross domestic energy consumption (CIBE) in the EU-28 was 1700.4 million tep, but the decline in economic activity led to a decline in this indicator between 2011 and 2014, to a minimum of 1608.4 million tep in 2014. Since 2015, gross domestic energy consumption (CIBE) in the EU-28 has started to increase reaching 1640.6 million tep in 2016, a decrease of about 3, 52% compared to 2011, but also a 2% increase from the 2014 minimum, due to the revival of economic activity.

In Romania, CIBE, the gross domestic energy consumption in 2011 was 36,558.4 thousand tep and represented the peak in gross domestic energy consumption, as it decreased in the period 2012-2014 to a minimum of 32157.6 thousand toe. Over the past two years, gross domestic energy consumption has recovered from the rebound in economic activity to 32429.9 thousand tep in 2015 and a slight decrease in 2016 to 32402 thousand tep, about 11.37% lower than in the year 2011.

Gross domestic energy consumption per capita

Gross domestic consumption per inhabitant is the amount of energy per inhabitant where the amount of energy is derived from the sum of primary energy, recovered products, imports and stocks at the beginning of the reference period from which the export is deducted, bunker and stock at the end of the reference period. Between 2011 and 2014, the gross domestic energy consumption per capita in Romania recorded a decrease of about 10.46%, slightly increasing in 2015-2016 to the value of 1.606 tep / inhabitant. At the level of 2016, Romania was at about. half of the EU-28 consumption average. Figure no. XII.2 shows the evolution of the gross domestic energy consumption per capita in Romania compared to the EU-28 in the period 2011-2016.

Figure no. XII.2 - Gross domestic consumption of energy per capita in Romania and the EU during 2011-2016



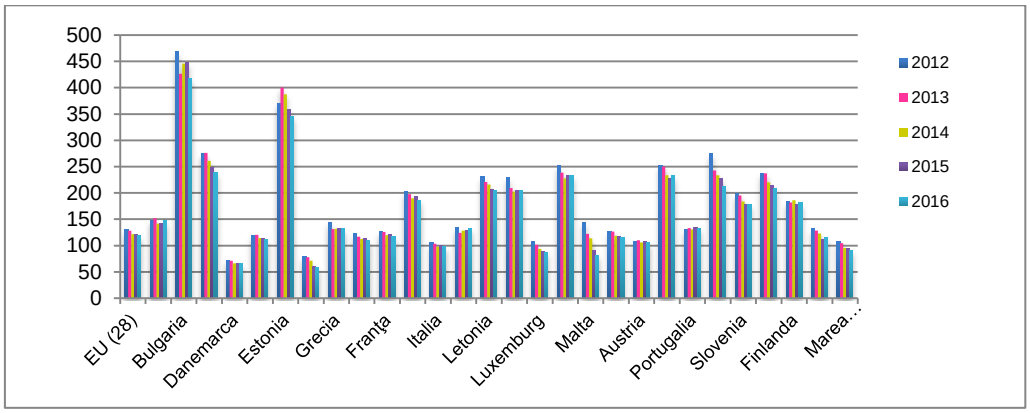
Sources: NIS, Tempo online database; Eurostat, statistic database

Gross domestic energy consumption (CIBE) on gross domestic product

CIBE in each country depends to a large extent on the structure of its energy system, the natural resources available for primary energy production, and the structure and level of development of its economy. ***Energy intensity*** is measured as the ratio between gross domestic energy consumption and production unit - GDP, being a key indicator for measuring progress within the Europe 2020 strategy. The ratio is expressed in kilograms of oil equivalent per 1000 euro, and to facilitate analysis while calculations are based on GDP at constant prices at 2010 prices.

If an economy becomes more efficient in energy use and GDP remains relatively constant, then these indicators should decrease. In 2016, the energy intensity in Romania was 212.8 kgep / 1000 euro compared to the EU-28 level of 119 kgep / 1000 euro, which places Romania among the EU-28 Member States with high energy intensity levels. ***However, in 2012-2016 in Romania the energy intensity of the economy decreased by 22.5%.***

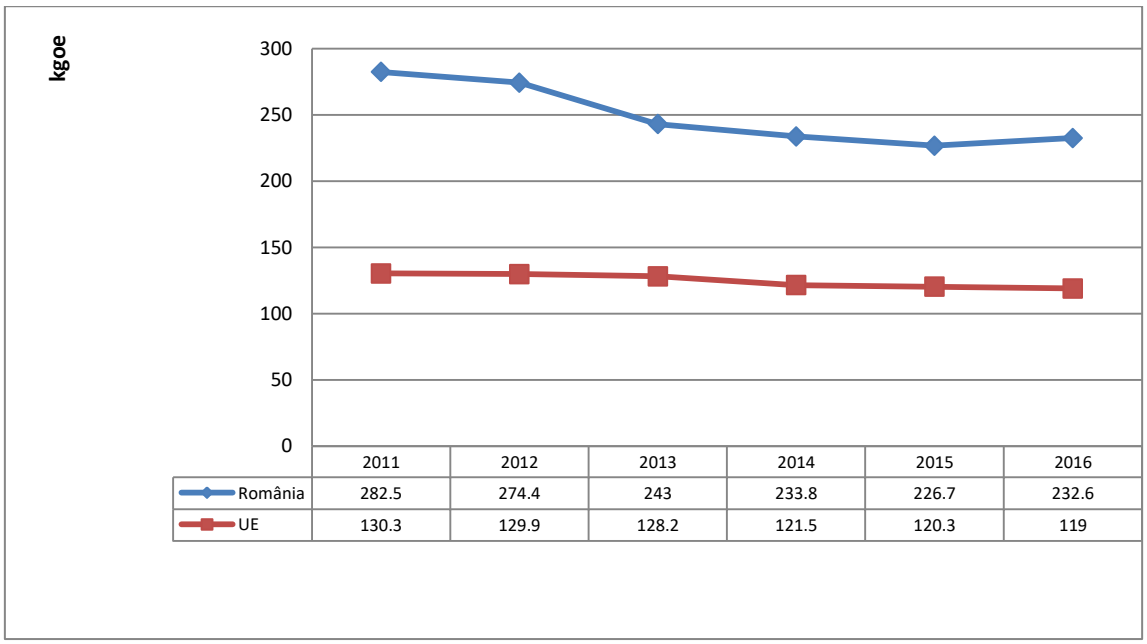
Figure no. XII.3 – Energy intensity level in the EU 28, compared to 2012 with 2016



Sources: Eurostat, statistic database

It should be noted that the structure of an economy plays an important role in determining energy intensity, that the post - industrial economies where the service sector is developed will have relatively low levels of energy intensity, while developing economies where economic activity can have a considerable weight, are characterized by higher energy intensity values.

Figure no. XII.4 - Gross domestic consumption of GDP per capita in Romania and the EU in 2011-2016



	2011	2012	2013	2014	2015	2016
România	282.5	274.4	243	233.8	226.7	232.6
UE	130.3	129.9	128.2	121.5	120.3	119

Sources: NIS, Tempo online database; Eurostat, statistic database

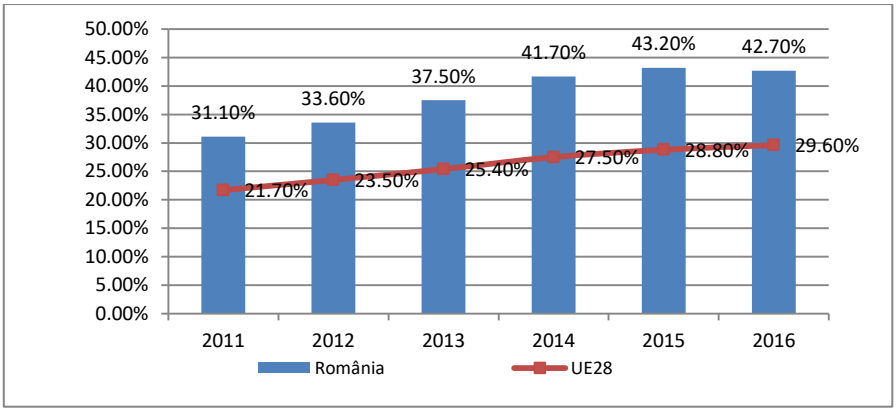
XII.2.3. ELECTRICAL ENERGY FROM RENEWABLE ENERGY SOURCES

RO 31	Indicator code Romania: RO 31 AEM indicator: CSI 31

TITLE: ELECTRICITY CONSUMPTION FROM RENEWABLE ENERGY SOURCES
DEFINITION: The indicator is the ratio of the electricity produced from renewable energy sources to the gross domestic consumption of electricity, expressed as a percentage.

The EU-28 target for 2020 is to have a share of at least 21% of total electricity production in renewable electricity. The latest available information for 2016 (see figure no. XII.5) shows that electricity produced from renewable energy sources contributed 29.6% to total EU-28 electricity consumption. The increase in electricity produced from renewable energy sources in the last decade largely reflects an expansion in two renewable sources of energy, namely wind energy and energy produced from biomass.

Figure no. XII.5 - Share of electricity from renewable energy sources in total electricity in Romania and EU during 2011-2016



Source: Eurostat, statistical database

Between 2011 and 2016, the share of electricity from renewable energy sources at EU level 28 registered a slight increase. During this period, for Romania, there is an increase of 10% to 13% of the share of electricity from renewable sources compared to the EU28 level, which increased from 21.7% to 29.6%. In recent years there has been an increase in the share of electricity produced in nuclear power and wind power plants. The share of electricity from renewable energy sources in Romania (see Figure no.XII.5) experienced an ascending trajectory from 2011-2016, from 31.1% in 2011 to 42.7% in 2016.

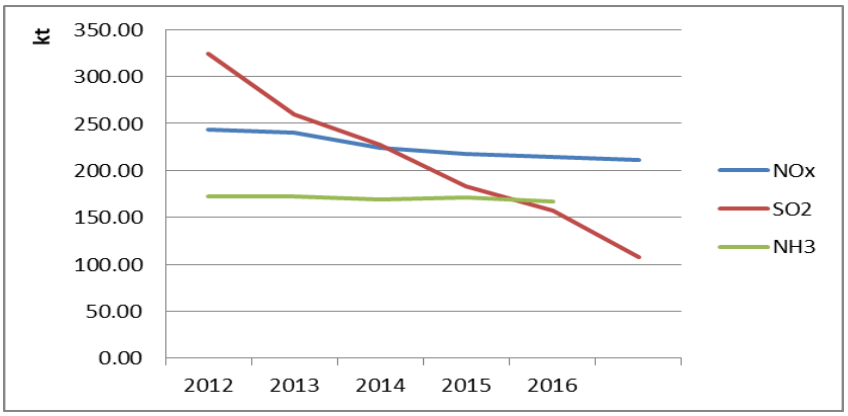
XII.2.4. EMISSIONS OF SUBSTANCES WITH ACIDIFYING EFFECTS

RO 01	Indicator code Romania: RO 01 AEM indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES
DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2) in each of them taking into account its acidifying potential The indicator also provides information on changes in emissions from major source sectors: generation and distribution of energy; energy use in industry; industrial processes; road transport; non-road transport; the commercial, industrial and household sectors; use of solvents and products; agriculture; waste; more.

Air acidity is mainly determined by the presence of aerosols that come from various chemical industries, aluminum factories, etc. Increased air acidity has implications for all environmental, construction, and human health factors. Emissions of sulfur oxides, nitrogen oxides and ammonia come mainly from combustion of fossil fuels, chemical processes and transport. These pollutants are transported over great distances to the contaminating source, where in contact with solar radiation and water vapor form acidic compounds. These precipitates are deposited on the soil or enter the composition of the water. For SOx, there was a major decrease of 58.57% over the period 2012-2016, influenced by economic developments, especially for those air pollutants, which mainly result from energy production, industrial processes and road transport. From the analysis of pollutant emission trend data in the activity sectors, it is noted that the reduction of air pollutant emissions in order to comply with air quality standards for certain areas can be predicted as an impact of their impact on the form of data input data complexity, organization, etc.), but also of output (tables, graphs, see subchapter 1.3 Trends and forecasts regarding ambient air pollution in Chapter I - Quality and ambient air pollution). Atmospheric pollutants with an overall acidifying effect decreased by 27.76% in 2012-2016, (NOx - 12.48%, SOx - 58.57% and NH3 - 2.35%). NH3 reduction is mainly due to improving manure management. The reduction of sulfur dioxide emissions comes mainly from the energy sector as a result of the implementation of measures to reduce pollution at large combustion plants.

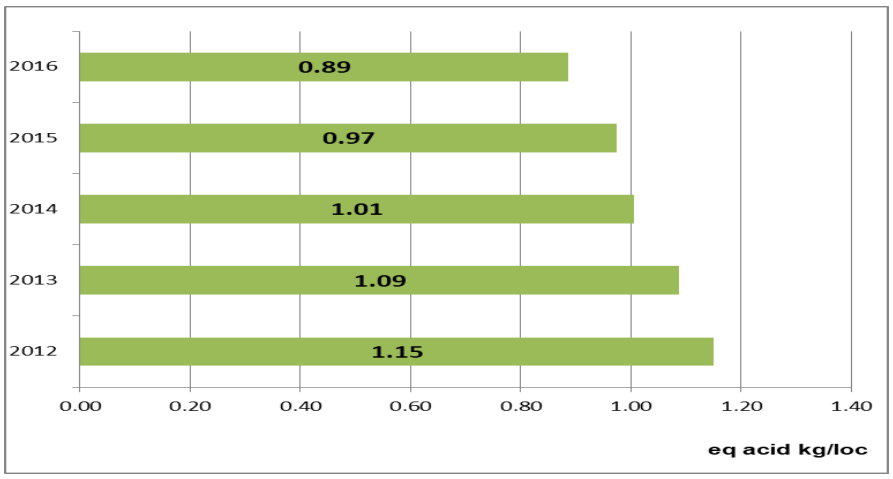
Figure no. XII.6 - Evolution of emissions of acidifying substances (kt), 2012 -2016



Sourc : N.E.P.A. Inventory Atmospheric Pollutants Emissions

In 2016, the level of atmospheric pollutants with an acidifying effect per capita in Romania was 0.89 kg acid equivalent per inhabitant, the EU-28 average being 0.97 kg acid equivalent per inhabitant.

Figure no.XII.7 - Emissions of acidifying substances per capita in Romania, 2012-2012



Source : N.E.P.A. Inventory Atmospheric Pollutants Emissions

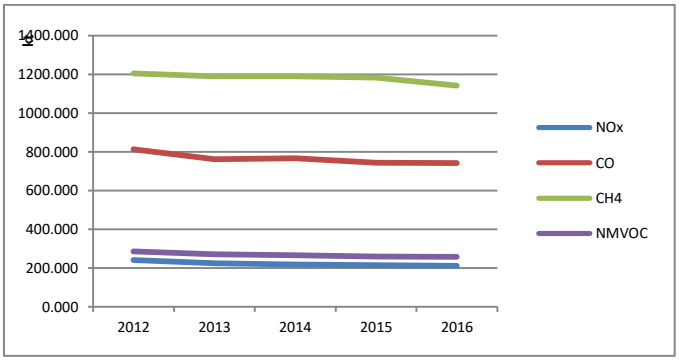
XII.2.5. OZONE PRECURSOR EMISSIONS

RO 02	Indicator code Romania: RO 02 AEM indicator code: CSI 02

TITLE: OZONE PRECURSOR EMISSIONS
DEFINITION: The indicator follows trends in the anthropogenic emissions of ozone precursor pollutants: nitrogen oxides (NOx), carbon monoxide (CO), methane (CH4) and non-methane volatile organic compounds). The indicator also provides information on emissions from the sectors: energy production and distribution, energy use in industry, industrial processes; road transport, non-road transport, commercial-residential combustion, solvents production and use, agriculture, waste, other.

Between 2012 and 2016, the emissions of air pollutants responsible for the formation of tropospheric ozone dropped steadily, with CO emissions dropping by 8.76% and NOx by 12.48% and CH4 by 5.22%. Emissions of non-methane volatile organic compounds (NMVOCs) declined in 2016 as compared to 2012, with 9.39% declining trend since 2012.

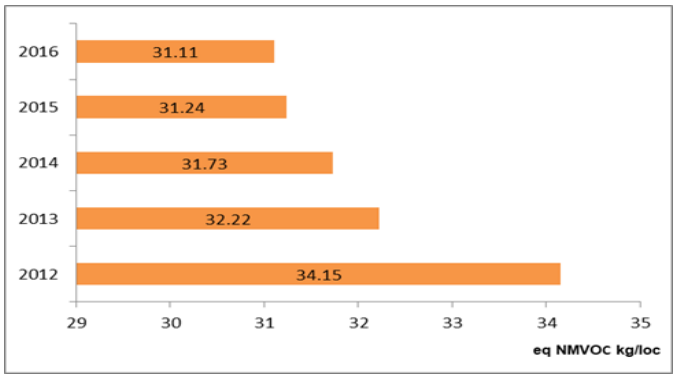
Figure no.XII.8 - Evolution of Ozone Precursor Emissions (kt), period 2012-2016



Source : N.E.P.A. Inventory Atmospheric Pollutants Emissions

Emissions of ozone precursors per capita in Romania recorded a decrease of 8.91% in 2016 compared to 2012, from 34.15 eqNMCOV kg / inhabitant in 2012 to 31.11 eqNMCOV kg / inhabitant in 2016. Figure no. XII.9 presents the evolution of ozone precursor emissions per capita in 2012-2016 in Romania, where the maximum reached in 2012 is 34.15 eqNMCOV kg / inhabitant.

Figure no.XII.9 - Emissions of ozone precursors per capita in Romania (kg / place) 2012 – 2016



Source N.E.P.A.

Emissions of pollutants released into the atmosphere have a downward trend due to the implementation of the principles of sustainable development and the adoption of environmental policies, such as: green electricity production - wind energy, photovoltaic energy, etc .; reducing the sulfur content of fuels and introducing green diesel - biodiesel; replacing the heating of rural households (traditional wood-burning stoves) with stoves that use pellets as fuel; putting into service of hybrid and electric vehicles; provision of economic and financial mechanisms for replacing installations with significant pollutant effect on the environment with other less polluting ones; provision of containment, capture, storage of polluting substances (eg carbon capture and storage at large IMA-firing installations, electrostatic precipitators, low NOx burners, scrubbers, etc.).

XII.2.6. DEMAND FOR TRANSPORT OF GOODS

Demand for freight transport per unit of GDP

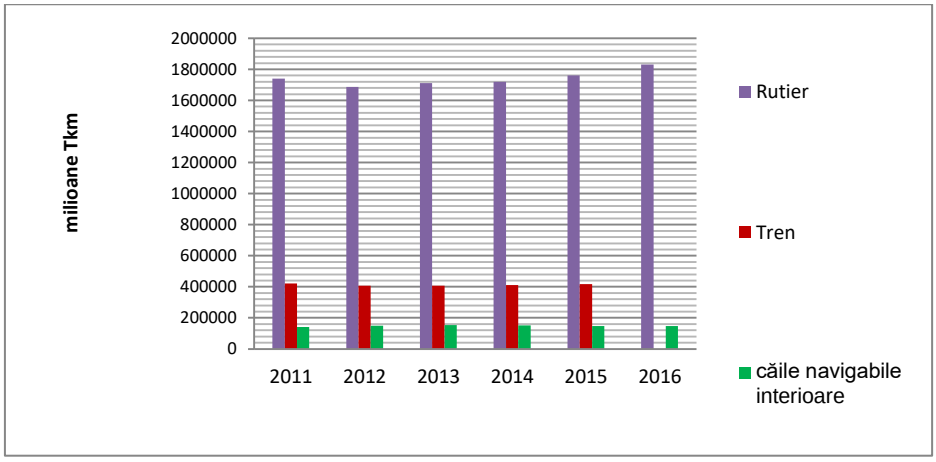
RO 36	Indicator code Romania: RO 36 AEM indicator code: CSI 36

TITLE: DEMAND FOR TRANSPORT OF GOODS
DEFINITION: The indicator is defined by the quantity of goods transported on national territory (road, rail and inland waterways), expressed in tonne-kilometers traveled internally each year.

The level of inland freight transport (measured in tonne-kilometers) may be expressed in terms of GDP. This indicator provides information on the relationship between the demand for freight transport and the size of the economy, and it allows to monitor the intensity of demand for freight transport in relation to economic developments. In 2016, the share of domestic road freight transport in the EU accounted for over three quarters (76.4%) of total domestic freight transport (by tonne-kilometers performed). This share fell slightly in the period 2010-2012, (by 2.3 percentage points) in freight transport, after which it marked a return in the period 2013-2016 to the share of 76.4% of the freight transport, of the maximum in 2009 (77%). After the steep decline in 2010, road freight transport in Romania marked a revival in the period 2011 - 2013 from 36.9% to 40.3, which was also maintained in 2016.

Rail freight transport in the EU-28 between 2011 and 2016 decreased from 18.7% to 17.4%, more pronounced in 2016. Also, in Romania, rail freight transport registered a decrease over the same period from 35.4% to 30.3%.

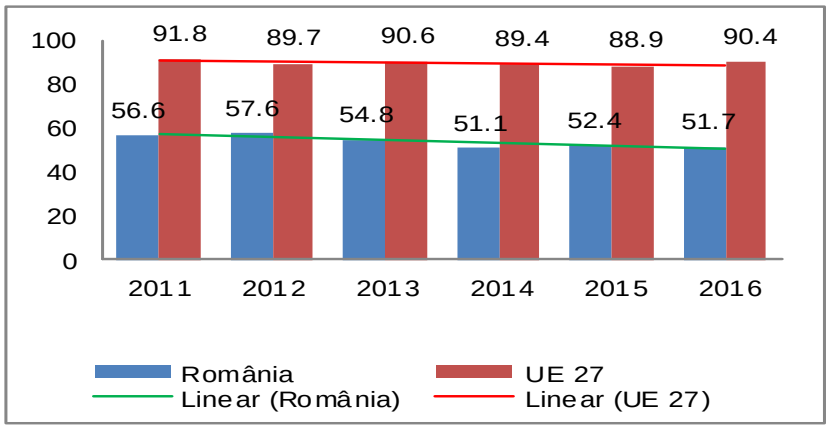
Figure no.XII.10 - The performance of freight transport in the EU-28, between 2011 and 2016



Source: Eurostat, statistical database

The evolution of the ratio between the volume of goods transported internally and GDP (expressed in euro constant prices, at the exchange rate of the reference year 2005) shows a slight tendency to decrease this indicator in Romania, in a trend with the average of the EU-28 countries. Thus, between 2011 and 2016, the volume of goods transported internally per unit of GDP in Romania decreased by 3.9%. In the EU-28, after the increase in 2011, it decreased in 2012, fluctuating in the following years in the range 88.9-90.6, the value for 2016 approaching the upper limit of this range. The evolution of the ratio between the volume of goods transported internally to GDP (expressed in PCS and in Euro 2005) in Romania and EU-28, is presented in figure no. XII.11.

Figure no. XII.11 – The volume of freight transport relative to GDP at the level of Romania and EU-28 during 2011-2016

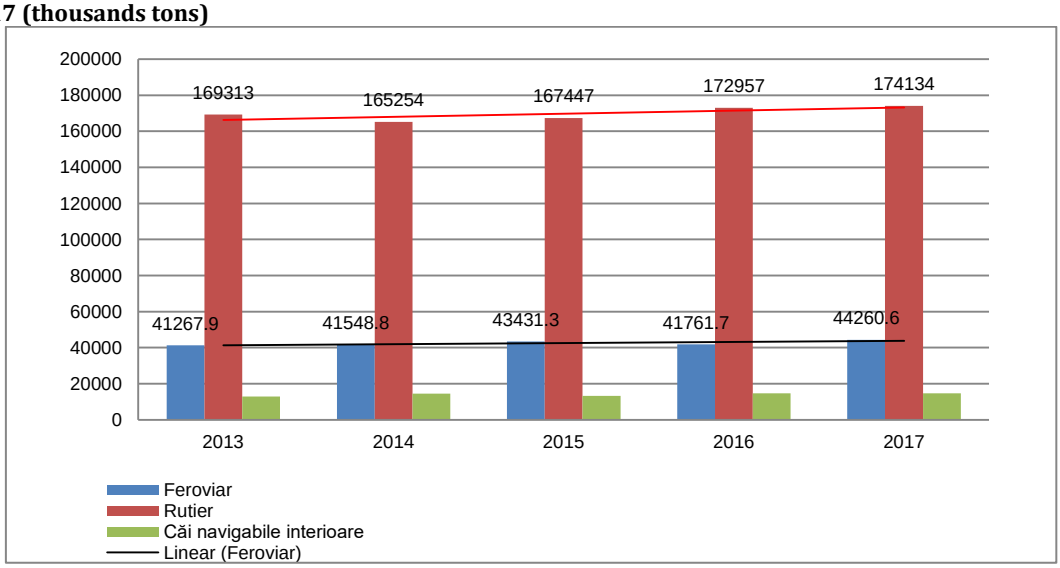


Source: Eurostat, statistical database

Demand for freight transport

Regarding the volume of goods transported internally, in 2017, Romania recorded an increase of 3611 thousand tons (1.57%) compared to the previous year (2016) and 9598 thousand tons (4.29%) as compared to 2013 (For details on national dynamics in the period 2013-2017, see the data presented in XI.1.3.2 - Freight transport within Chapter XI - Consumption and the environment).

Figure no.XII.12 - The volume of goods transported in Romania, by modes of rail, road and inland waterways, during 2013 - 2017 (thousands tons)



Source: The Ministry of Transport

XII.2.7. SURFACE FOR ECOLOGICAL AGRICULTURE

RO 26	Indicator code Romania: RO 26 AEM indicator code: CSI 26

TITLE: ECOLOGICAL AGRICULTURE SURFACE
DEFINITION: The indicator expresses the share of the area earmarked for organic farming (the sum of the current areas with organic farming and the areas undergoing conversion) of the total area used in agriculture.

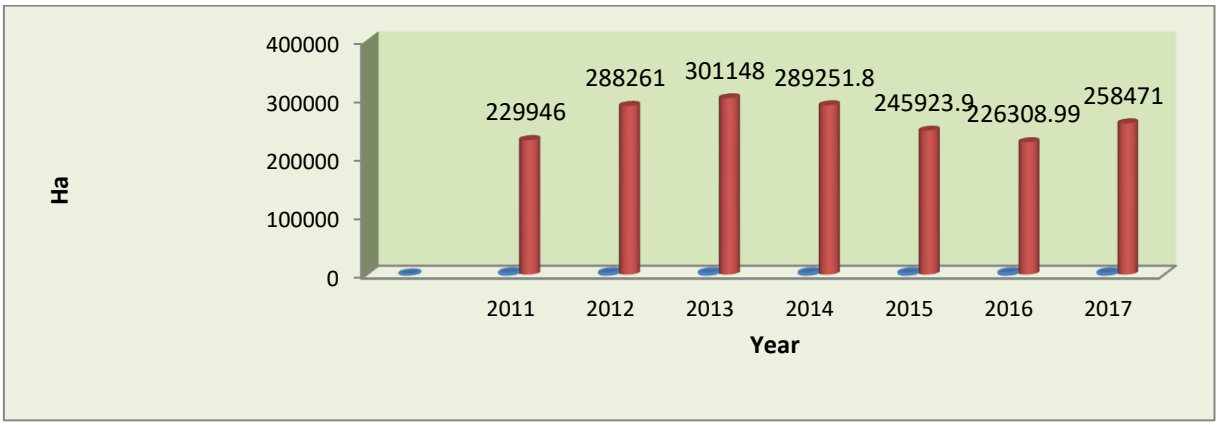
Organic farming is a production system that attaches great importance to protecting the environment and animals by reducing or eliminating genetically modified organisms and synthetic chemicals such as fertilizers, pesticides and growth promoters. Organic farming is a dynamic sector in Romania that has seen an upward trend in recent years. In 2011, the total area cultivated according to the organic production method in Romania was 229.95 thousand ha, and in the year 2017 it was 258.47 thousand ha. Thus, in the year 2017, the areas in the ecological system increased by 12.4% compared to 2011.

Table no.XII.3 - Dynamics of operators and areas in organic farming

Indicator	2011	2012	2013	2014	2015	2016	2017
Number of certified operators in organic farming	9703	15544	15194	14470	12231	10562	8434
Total area in organic farming (ha)	229946	288261	301148	289251,79	245923,9	226309	258470,927
Cereals (ha)	79167	105149	109105	102531,47	81439,5	75198,3	84925,51
Dried and proteinaceous pulses for the production of grain (including grains and mixtures of cereals and pulses) (ha)	3147,36	2764,04	2397,34	2314,43	1834,352	2203,78	4994,66
Tuberculous and root plants total (ha)	1074,98	1124,92	740,75	626,99	667,554	707,026	665,54
Industrial Cultures (ha)	47879,7	44788,7	51770,8	54145,17	52583,11	53396,9	72388,33
Green harvested plants (ha)	4788,49	11082,9	13184,1	13493,53	13636,48	14280,5	20350,75
Other crops on arable land (ha)	851,44	27,77	263,95	29,87	356,22	258,47	88,25
Vegetables (ha)	914,08	896,32	1067,67	1928,36	1210,08	1175,33	1458,78
Permanent crops (ha) vineyards	4166,62	7781,33	9400,31	9438,53	11117,26	12019,8	13165,41
Permanent crops (ha) pastures and meadows	78197,5	105836	103702	95684,78	75853,57	57611,7	50685,74
Uncultivated land (ha)	9758,55	8810,73	9516,33	9058,66	7225,852	9457,2	9747,94

Source:: MADR

Figure no.XII.13 - Evolution of areas cultivated in organic farming in Romania (ha) between 2011-2017



Source: MADR

The evolution of the areas cultivated in organic farming, as well as of the ecologically certified livestock, with the exception of the number of hives, decreased in the year 2016 compared to 2015.

Table no.XII.4 - Ecological certified livestock - year 2016*

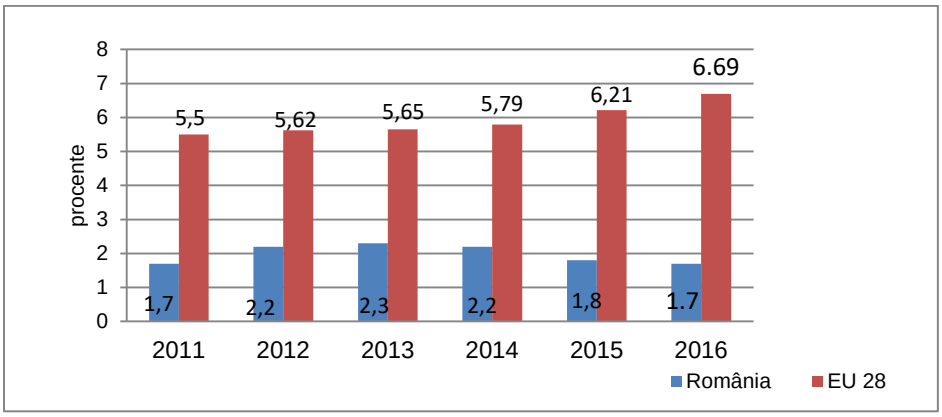
Ecological certified livestock			
		year 2015	year 2016
Livestock	**unit of measurement**	**number**	**number**
Cattle (total)	**heads**	**29313**	**20093**
Cattle for slaughter	heads	491	478
Milk cows	heads	21667	15171
Other cattle	heads	7155	4444
Pigs (total)	**heads**	**86**	**20**
Pigs for fattening	heads	43	13
Breeding sows	heads	14	7
Other pigs	heads	29	0
Sheep (total)	**heads**	**85419**	**66401**
Sheep, breeding females	heads		
Other sheep	heads		
Goats (total)	**heads**	**5816**	**218**
Goats, breeding females	heads		
Other goats	heads		
Birds (total)	**heads**	**107639**	**63254**
Broilers	heads		
Laying hens	heads		
Other poultry than broilers and laying hens	heads		
Equine	heads	485	
Rabbits	heads		
Bees (hives)	number of hives	79654	86195

Source: MADR

**** For the year 2017 no data are available***

At EU-28 level, the share of organic farming areas in the total agricultural area has grown from 5.5% in 2011 to 6.69% in 2016. In Romania, the share of the area earmarked for organic farming increased in 2012 to 2.2% compared to 1.7% in 2011, followed by a decrease in 2016 from the initial level in 2011. Figure no. XII.14 shows the evolution of the share of the area for ecological agriculture from the total area used in agriculture in 2011-2016 in Romania and in the European Union. ** No data available for 2017*

Figure no.XII.14 - Share of the area for organic farming from the total area used in agriculture in Romania and EU - 28 in the period 2011 - 2016, (%)



Sources: MADR; INS; Eurostat, baza de date statistice
www.madr.ro/agricultura-ecologica/dinamica-operatorilor-si-a-suprafetelor-in-agricultura-ecologica.html;
http://statistici.insse.ro /shop/index.jsp?page=tempo3&lang=ro&ind=AGR 101A
http://www.organic-world.net/statistics/statistics-data-tables/statistics-data-tables-excel.html

XII.2.8. GENERATION OF MUNICIPAL WASTE

RO 16	Indicator code Romania: RO 16 AEM indicator: CSI 16

TITLE: GENERATION OF MUNICIPAL WASTE
DEFINITION: The indicator expresses the total amount of municipal waste generated per capita (kg per capita and year).

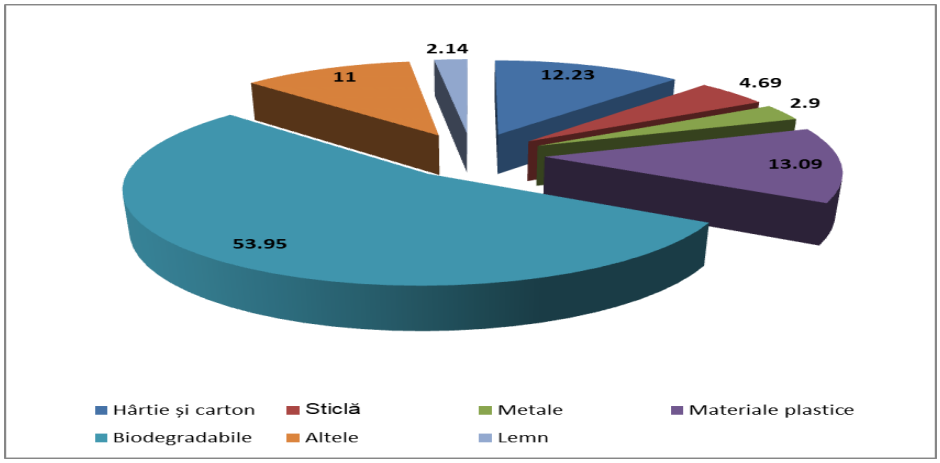
In accordance with the provisions of the National Waste Management Strategy 2014-2020, "municipal waste is represented by all household and similar waste generated in urban and rural areas in households, institutions, commercial units and from economic operators, street waste collected from premises public buildings, streets, parks, green spaces, plus building and demolition waste resulting from the interior design of dwellings collected by sanitation operators". The collection of municipal waste is the responsibility of the municipalities, which can carry out these tasks either directly (through specialized services within the Local Councils) or indirectly (by delegating this responsibility on a contractual basis to specialized and authorized companies for the performance of sanitation services). In 2016, the amount of municipal waste collected through the specialized services of the municipalities or the sanitation companies was 5260 thousand tons. From the total amount of municipal waste collected by sanitation operators, 79% is household waste and similar waste.

Table no.XII.5 - Waste collected by municipalities in 2016 (thousand tons; %)

Waste collected	Quantity collected - thousands of tons	Percent %
domestic and similar waste	4301	82
waste from municipal services	691	13
construction / demolition waste	268	5
TOTAL	**5260**	**100**

Source: National Environmental Protection Agency

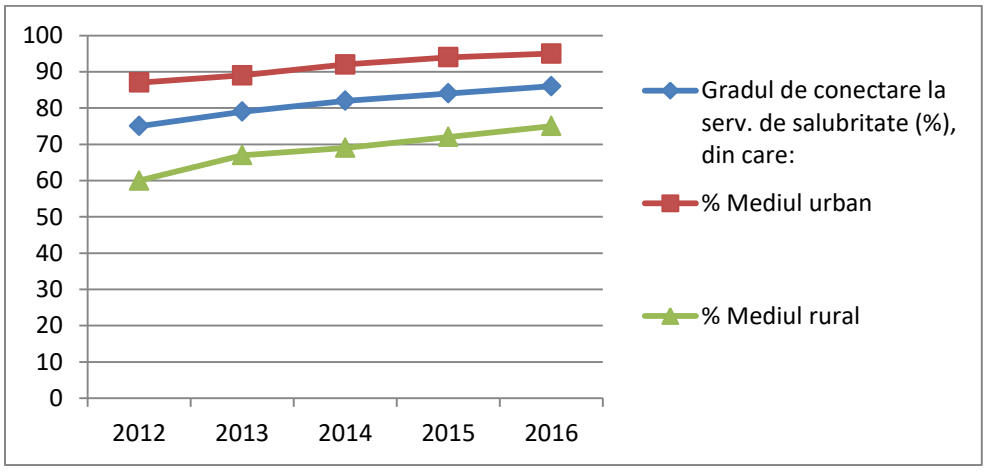
Figure no.XII.15 - Percentage composition of household and similar waste collected in 2016



Source: N.E.P.A

It should be noted that collection of municipal waste is not generalized at national level. Figure XII.16 shows the evolution of the connection to the sanitation service in 2012-2016.

Figure no.XII.16 - The degree of connection to the sanitation service during 2012-2016



Source: National Environmental Protection Agency

From the above information we can see a year-on-year increase in the connection to the sanitation service. The amount of waste generated by the population not served by sanitation is calculated using the following generation indices: 0.9 kg / place / day for the urban area and 0.4 kg / place / day for the rural area. Municipal waste management involves the collection, transport, recovery and disposal of waste, including the monitoring of landfills after closure. ***Responsibility for municipal waste management rests with local government, which, through its own means or through the concession of the sanitation service to an authorized operator, must ensure collection (including separate collection), transport, treatment, recovery and final disposal of such waste.*** Some of the collected municipal waste is sent directly for final (material or energy) recovery or disposal, while another part is sent to intermediate treatment plants (sorting stations, composting plants). ***The disposal of municipal waste is done exclusively by storage. Until now, municipal waste incineration plants have not been put into operation in Romania. At the end of 2017, 40 compliant landfills were authorized to operate.***

Sustainable development indicators on municipal waste

According to EUROSTAT (Municipal Waste Data Collection Guidelines), municipal waste is household and assimilable waste generated by households, institutions, commercial units and economic operators. Included are bulky waste (including WEEE from the population) and parks, gardens and street cleaning, including the contents of street bins.

By collection mode, municipal waste is:

- Collected by or on behalf of the municipalities
- Collected directly by private economic operators - valid for WEEE and other types of recyclable waste
- Generated and unselected by a sanitation operator, but managed directly by the generator

Excluded are:

- Sewage sludge from urban wastewater treatment
- Construction and demolition waste.

Sustainable development indicators on municipal waste refers to:

- Municipal waste generated
- Municipal waste treated by: energy recovery, storage, recycling (excluding composting and anaerobic digestion), composting.

The EUROSTAT Guideline also recommends that recyclable waste streams (paper, plastic, metal, etc.) resulting from sorting facilities and subsequently sent to recycling facilities be considered as recycled.

Considering the information above, the following municipal waste indicators have been calculated at national level*:*

- **Municipal waste generated - 5136029 tonnes in 2016**

The value was calculated by summing the quantities generated for the following types of waste:

• household and similar waste and municipal services collected by sanitation operators

• household waste generated and unchecked by sanitation operators

• recyclable waste from the population, collected through authorized economic operators other than sanitation (paper and cardboard, metals, plastic, glass, wood, biodegradable, textile, WEEE, waste batteries and accumulators)

- **Municipal recycled waste (including composting) - 683771 tonnes in 2016**

The value was calculated by summing up the recycled quantities for the following types of waste:

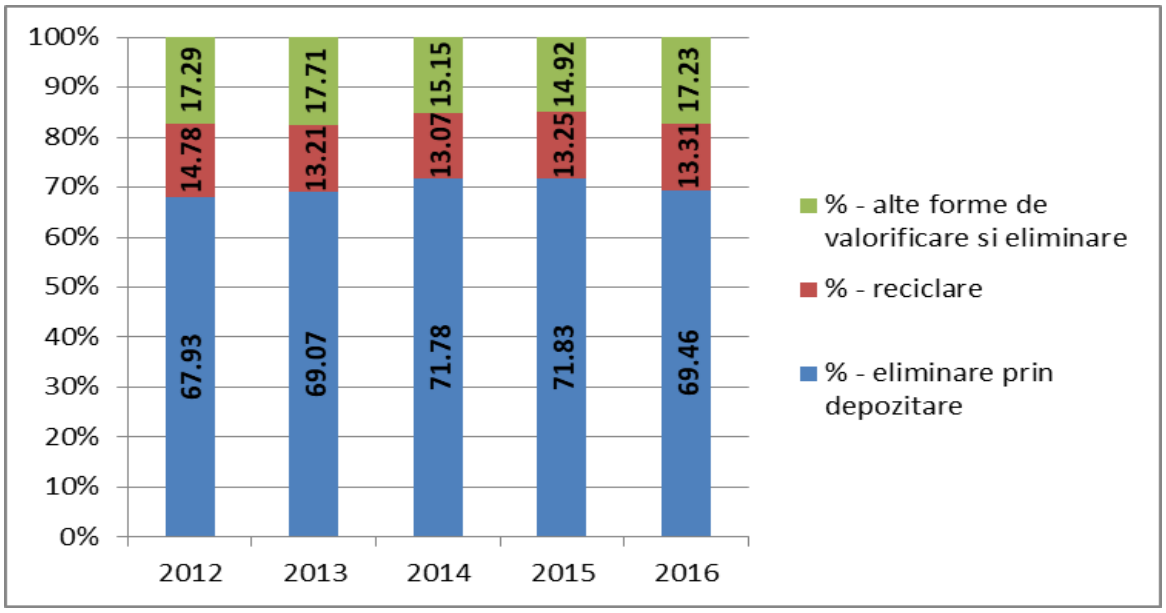
• household and similar waste and municipal services collected by sanitation operators

• household waste generated and unchecked by sanitation operators

• recyclable waste from the population, collected through authorized economic operators other than sanitation (paper and cardboard, metals, plastic, glass, wood, biodegradable, textile, WEEE, waste batteries and accumulators)

- **The recycling rate achieved for municipal waste in 2016 - 13.31%.**

Figure no. XII.17 - Share of main municipal waste management activities in 2012-2016



Source: National Environmental Protection Agency

XII.2.9. USE OF WATER RESOURCES

RO 18	Indicator code Romania: RO 18 AEM indicator: CSI 18

TITLE: USE OF WATER RESOURCES
DEFINITION: The Water Exploitation Index (WEI) represents the total annual average catch of freshwater divided by the total annual national renewable water resources and is expressed as a percentage.

Monitoring the efficiency of water use by different economic sectors at local, regional and national levels is important in achieving the objective of the 7th EU Environment Action Program (2013-2020) to ensure the sustainability of long term. Water abstraction, as a percentage of freshwater resources, provides a good picture at national level on resource pressures in a simple and easy to understand way and presents trends over time. The indicator shows how total water capture exerts pressure on water resources by identifying countries with a high capture compared to existing resources and therefore confronted with water scarcity. Changes to the Water Exploitation Index (WEI) allow for an analysis of how capture changes affect freshwater resources by increasing their pressure or lowering this pressure and making them more sustainable. According to the European Commission's 2009 Water Scarcity & Drought document, if this indicator is below 10% then it is considered that water resources are not under pressure. If it is between 10% and 20% then it is considered that water resources are subject to a reduced pressure and values of the exploitation index higher than 20% indicate the existence of a pressure on the water resources and an index of over 40% is a severe stress signal on water resources.

Romania's water resources are made up of surface waters - rivers, lakes, the Danube River - and underground waters. At national level, Romania's water resources are relatively poor and unevenly distributed over time and space. These sum theoretically about. 134.6 billion cubic meters, consisting of surface waters, namely rivers, lakes, the Danube river and underground waters, of which the usable resource, according to the degree of hydrographic basin arrangement, is approx. 40 billion cubic meters. Compared to 2012, Romania's water requirement decreased by 0.2 billion cubic meters in 2017, from 7.2 billion cubic meters to 7 billion cubic meters, broken down into three categories of users: population - 1.145 billion cubic meters of water compared to 1.10 billion cubic meters in 2012, agriculture - 1.37 billion cubic meters of water compared to 1.28 billion cubic meters in 2012 and 4.48 billion cubic meters of water for the industrial sector compared to 4.81 billion cubic meters m 2 in 2012. In relation to the water requirement in 2017, which was 7 billion cubic meters, the volume of water used was 6.77 billion cubic meters, still increasing by 0.29 billion cubic meters of water of 2012, when the volume of water taken was 6.49 billion cubic meters of water. Split on the three categories of users (population, industry, agriculture):

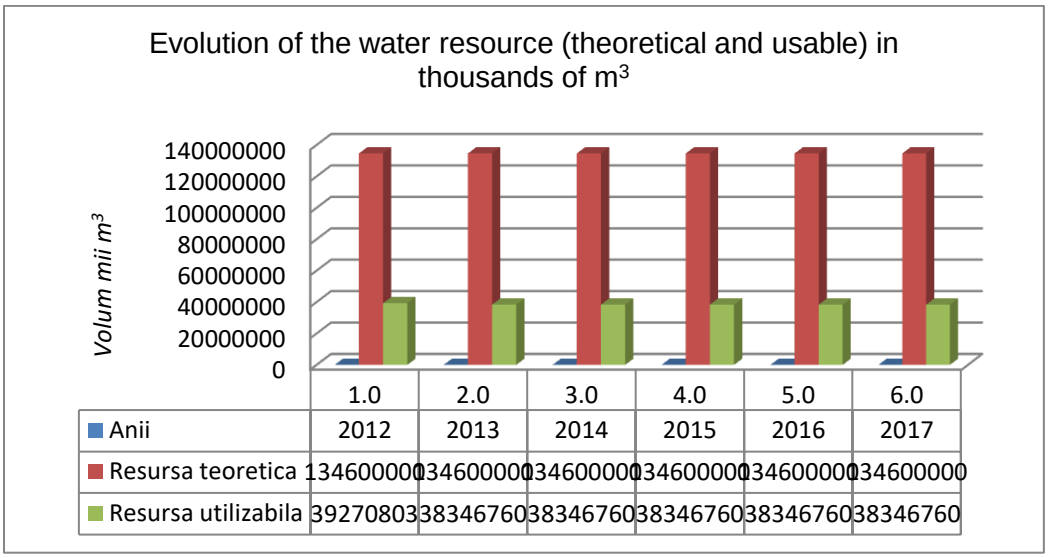
- the volume of water collected in the agricultural sector increased from 1.09 billion cubic meters in 2012 to 1.49 billion cubic meters in 2017;
- the industrial sector consumed 4.23 billion cubic meters in 2017 compared to 4.34 billion cubic meters in 2012;
- for the population the volume of water taken in 2017 was approx. 1,048 billion cubic meters, being approximately equal to the one taken in 2012 (1,052 billion cubic meters). (Statistics based on data provided by the National Administration "Apele Române"*).*

Table no. XII.6 - Potentially and technically usable water resources (theoretical and usable)

Years	Theoretical resource	Usable resource
2012	134600000	39270803
2013	134600000	38346760
2014	134600000	38346760
2015	134600000	38346760
2016	134600000	38346760
2017	134600000	38346760

Source: A.N.A.R.

Figure no.XII.18 – Evolution of the water resource (theoretical and usable) in thousands of m³



Source: A.N.A.R.

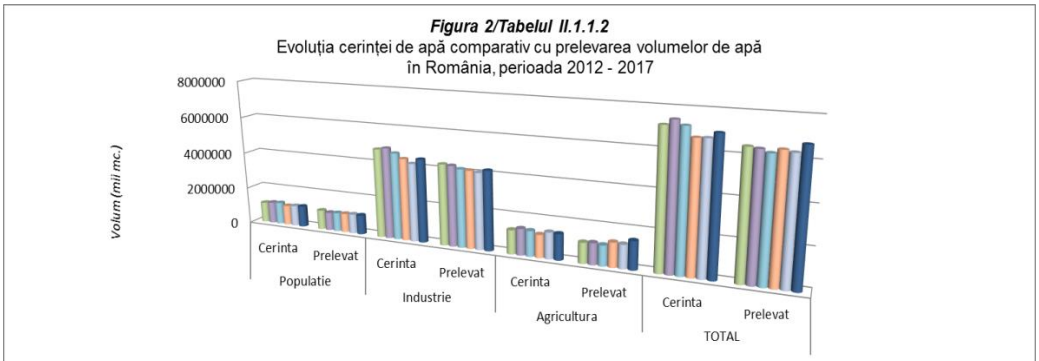
Table no. XII.7 - Evolution of water demand versus sampling of water volumes (thousand m³), 2012-2017

Source	*Population*		*Industry*		*Agriculture*		*TOTAL*	
	Demand	*Sample*	*Demand*	*Sample*	*Demand*	*Sample*	*Demand*	*Sample*
Surface	597740	558094	1731890	1578079	689127	735573	3018757	2871746
	617004	514753	1927355	1427053	829435	768548	3373794	2710354
	669012	542360	2010819	1341359	850863	816313	3530694	2700032
	568137	546977	1782359	1285454	875837	910626	3226333	2743057
	579424	536969	1690074	1244955	998258	888659	3267756	2670583
	594990	535160	1707998	1350532	942300	1035709	3245288	2921401
Underground	412498	411522	242297	156086	28592	30150	683387	597758
	453685	400677	181544	153620	30386	25924	665615	580221
	435448	397883	179770	129393	31460	27903	646678	555179
	434383	420464	173783	134530	35993	35365	644159	590359
	472993	454977	166987	140553	40674	39518	680654	635048
	482213	452958	162548	147014	44805	46458	689566	646430
Source	*Population*		*Industry*		*Agriculture*		*TOTAL*	
	Demand	*Sample*	*Demand*	*Sample*	*Demand*	*Sample*	*Demand*	*Sample*
Danube	92518	82633	2830627	2602250	561716	327830	3484861	3012713
	89748	64277	2792627	2721731	548205	340143	3430580	3126151
	84774	76607	2474334	2685627	472783	234995	3031891	2997229
	69200	62869	2449641	2716769	302339	344753	2821180	3124391

	69170	59187	2336364	2684657	363069	314452	2768603	3058296
	67599	60042	2595753	2725887	387068	408583	3050420	3194512
Black Sea		84	8584	9802			8584	9886
	63	62	8964	10046		45	9027	10153
	63	63	8804	13198	36	33	8903	13294
	61	49	11803	7011			11864	7060
	60	65	9503	9533			9563	9598
	58	52	10287	10253			10345	10305
TOTAL 2012	*1102756*	*1052333*	*4813398*	*4346217*	*1279435*	*1093553*	*7195589*	*6492103*
TOTAL 2013	*1160500*	*979769*	*4910490*	*4312450*	*1408026*	*1134660*	*7479016*	*6426879*
TOTAL 2014	*1189297*	*1016913*	*4673727*	*4169577*	*1355106*	*1079244*	*7218130*	*6265734*
TOTAL 2015	*1071781*	*1030359*	*4417586*	*4143764*	*1214169*	*1290744*	*6703536*	*6464867*
TOTAL 2016	*1121647*	*1051198*	*4202928*	*4079698*	*1402001*	*1242629*	*6726576*	*6373525*
TOTAL 2017	*1144860*	*1048211*	*4476586*	*4233686*	*1374173*	*1490751*	*6995619*	*6772648*

Source: A.N.A.R.

Figure no.XII.19 – Evolution of water demand compared to the sampling volume of water (thousands m³), 2012-2017



	Populatie		Industrie		Agricultura		TOTAL	
	Cerinta	Prelevat	Cerinta	Prelevat	Cerinta	Prelevat	Cerinta	Prelevat
TOTAL 2012	1102756	1052249	4804814	4336415	1279435	1093553	7187005	6482217
TOTAL 2013	1160437	979769	4901526	4302404	1408026	1134615	7469989	6416788
TOTAL 2014	1189234	1016913	4673727	4169577	1355106	1079211	7218067	6265701
TOTAL 2015	1071781	1030359	4417586	4143764	1214169	1290744	6703536	6464867
TOTAL 2016	1121647	1051198	4202928	4079698	1402001	1242629	6726576	6373525
TOTAL 2017	1144860	1048212	4476586	4233686	1374173	1490750	6995619	6772648

Source: A.N.A.R.

Table no. XII.8- Evolution of water demand compared to the sampling volume of water (%), 2012 – 2017

Sursa	Anii	Populatie			Industrie			Agricultura			TOTAL		
		Cerinta	Prelevat	Grad de realizare (%)	Cerinta	Prelevat	Grad de realizare (%)	Cerinta	Prelevat	Grad de realizare (%)	Cerinta	Prelevat	Grad de realizare (%)
Suprafata	2012	597740	558094	93.4%	1731890	1578079	91.1%	689127	735573	106.7%	3018757	2871746	95.1%
	2013	617004	514753	83.4%	1927355	1427053	74.0%	829435	768548	92.7%	3373794	2710354	80.3%
	2014	669012	542360	81.1%	2010819	1341359	66.7%	850863	816313	95.9%	3530694	2700032	76.5%
	2015	568137	546977	96.3%	1782359	1285454	72.1%	875837	910626	104.0%	3226333	2743057	85.0%
	2016	579424	536969	92.7%	1690074	1244955	73.7%	998258	888659	89.0%	3267756	2670583	81.7%
	2017	594990	535160	89.9%	1707998	1350532	79.1%	942300	1035709	109.9%	3245288	2921401	90.0%
Subteran	2012	412498	411522	99.8%	242297	156086	64.4%	28592	30150	105.4%	683387	597758	87.5%
	2013	453685	400677	88.3%	181544	153620	84.6%	30386	25924	85.3%	665615	580221	87.2%
	2014	435448	397883	91.4%	179770	129393	72.0%	31460	27903	88.7%	646678	555179	85.9%
	2015	434383	420464	96.8%	173783	134530	77.4%	35993	35365	98.3%	644159	590359	91.6%
	2016	472993	454977	96.2%	166987	140553	84.2%	40674	39518	97.2%	680654	635048	93.3%
	2017	482213	452958	93.9%	162548	147014	90.4%	44805	46458	103.7%	689566	646430	93.7%
Dunare	2012	92518	82633	89.3%	2830627	2602250	91.9%	561716	327830	58.4%	3484861	3012713	86.5%
	2013	89748	64277	71.6%	2792627	2721731	97.5%	548205	340143	62.0%	3430580	3126151	91.1%
	2014	84774	76607	90.4%	2474334	2685627	108.5%	472783	234995	49.7%	3031891	2997229	98.9%
	2015	69200	62869	90.9%	2449641	2716769	110.9%	302339	344753	114.0%	2821180	3124391	110.7%
	2016	69170	59187	85.6%	2336364	2684657	114.9%	363069	314452	86.6%	2768603	3058296	110.5%
	2017	67599	60042	88.8%	2595753	2725887	105.0%	387068	408583	105.6%	3050420	3194512	104.7%
Marea Neagra	2012		84		8584	9802	114.2%				8584	9886	115.2%
	2013	63	62	98.4%	8964	10046	112.1%		45		9027	10153	112.5%
	2014	63	63	100.0%	8804	13198	149.9%	36	33	91.7%	8903	13294	149.3%
	2015	61	49	80.3%	11803	7011	59.4%				11864	7060	59.5%
	2016	60	65	108.3%	9503	9533	100.3%				9563	9598	100.4%
	2017	58	52	89.7%	10287	10253	99.7%				10345	10305	99.6%
TOTAL	2012	*1102756*	*1052249*	*95.4%*	*4804814*	*4336415*	*90.3%*	*1279435*	*1093553*	*85.5%*	*7187005*	*6482217*	*90.2%*
TOTAL	2013	*1160437*	*979769*	*84.4%*	*4901526*	*4302404*	*87.8%*	*1408026*	*1134615*	*80.6%*	*7469989*	*6416788*	*85.9%*
TOTAL	2014	*1189234*	*1016913*	*85.5%*	*4673727*	*4169577*	*89.2%*	*1355106*	*1079211*	*79.6%*	*7218067*	*6265701*	*86.8%*
TOTAL	2015	*1071781*	*1030359*	*96.1%*	*4417586*	*4143764*	*93.8%*	*1214169*	*1290744*	*106.3%*	*6703536*	*6464867*	*96.4%*
TOTAL	2016	*1121647*	*1051198*	*93.7%*	*4202928*	*4079698*	*97.1%*	*1402001*	*1242629*	*88.6%*	*6726576*	*6373525*	*94.8%*
TOTAL	2017	*1144860*	*1048212*	*91.6%*	*4476586*	*4233686*	*94.6%*	*1374173*	*1490750*	*108.5%*	*6995619*	*6772648*	*96.8%*

Source: A.N.A.R.

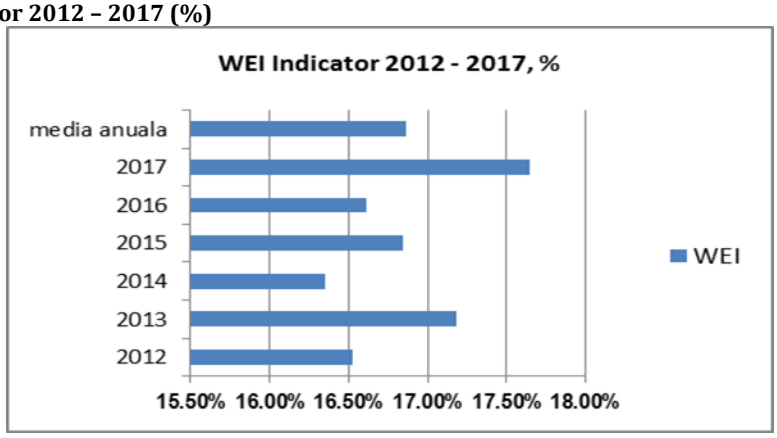
WEI values (%) over the period 2012-2017 (Table XII.9 and Figure no.XII.20 - WEI indicator 2012 - 2017,%) are below 20% ***so it can be considered that the water resources of Romania are subject to a reduced operating pressure***.

Table no. XII.9 - The evolution of water consumption in Romania 2012-2017 (mld m^3)

Years	*2012*	2013	*2014*	*2015*	*2016*	*2017*	*Medie ani*
Usable resource mld m^3	39,27	38,35	38,35	38,35	38,35	38,35	38,50
Total water sampling mld m^3	6,49	6,59	6,27	6,46	6,37	6,77	6,49
WEI Indicator	16,53%	17,18%	16,35%	16,84%	16,61%	17,65%	16,85%

Source: NEPA processing based on data provided by the National Administration "Apele Române"

Figure no. XII.20 - WEI Indicator 2012 – 2017 (%)



Source: NEPA processing based on data provided by the National Administration "Apele Române"

The potential and technical water resources usable for 2017 (Water Balance - Requirement for 2017) are presented in Table no. XII.10.

Table no.XII.10 – The potential and technical water resources usable for 2017

Water source Indicator of characterization	Total thousands m³
A. Inland rivers	
1. Theoretical resource	40 000 000
2. The existing resource according to the degree of basin arrangement *	13 679 121
3. Water demand for uses according to capture capacities in operation	3 245 288
B. Danube (directly)	
1. Theoretical resource (in the entry section of the country) **	85 000 000
Usable resource under the current arrangement	20 000 000
2. Requirement of water for use according to capacities in operation ***	3 050 420
Water source Indicator of characterization	**Total thousands m³**
C. Underground	9 600 000
1. Theoretical resource	
from which:	4 700 000
• groundwater	4 900 000
• Deep water	
2. Usable resource	4 667 639
3. Requirement of water for use according to capacities in operation	689 566

D. Black Sea Water demand for uses according to capture capacities in operation	10 345
Total resources 1. Theoretical resource	**134 600 000**
2. Existing resource according to the degree of basin arrangement	**38 346 760**
3. Water demand for uses according to capture capacities in operation	**6 995 619**

Note

** - also includes the network of coastal lakes, as well as the resource provided by direct external reuse along the river;*
*** - ½ of the multiannual average stock at the entry into the country;*
**** - including volumes transferred to the Seaside basin*

Table no.XII.11 – The ratio demand / sampling for water resources in 2017

Water demand		**Water sampling**		**Degree of use**
Activity	Value (mld.mc)	Activity	value (mld.mc)	%
Population	1,145	Population	1,05	91,70
Industry	4,48	Industry	4,23	94,40
Agriculture	1,37	Agriculture	1,49	108,75
Total	**6,995**	**Total**	**6,77**	96,80

Source: National Administration „Apele Române"

The total water requirement for 2017 has amounted to approx. 6995619 thousand mc. The actual water discharges from direct sources within insured services amounted to 6772648 thousand cubic meters, increasing by 0.22 billion cubic meters compared to 2016, in which 6373525 thousand cubic meters of water were sampled***. At the present stage of river basin planning, ensuring the water requirement of the users was possible both for surface and underground sources.*** **Specialists of the National Institute of Hydrology and Water Management (NIHWM) show that average annual river flows will decrease by 20-30% between 2021-2050 and 30-40% by 2071-2100.** Changes in river flow require a series of adaptation measures to ensure water resources for the population, industry and agriculture. Thus, new criteria and design techniques for dams and constructions are required, as well as the development of new procedures for the exploitation of water management systems that take into account the degree of uncertainty in the evolution of the hydrological regime.