MINISTRY OF ENVIRONMENT, WATERS AND FORESTS

NATIONAL ENVIRONMENTAL PROTECTION AGENCY

REPORT OF INDICATORS YEAR 2018

Bucharest- 2020

CONTENTS

EXECUTIVE SUMMARY

Until 2015, the Annual Report on the state of the environment in Romania aimed to present an information of the public authorities, the political, economic and population decision-makers on the evolution of the quality of the environmental factors: the state of the atmosphere, the waters and the soil, the state of the forests, of the natural habitats, of the flora and fauna, the state of the environment in the urban settlements, the situation of the noise pollution, the radioactivity and the waste. Starting with 2016, according to the current European approach, the annual report on the state of the environment focuses on the problem of the state of the environment, offers assessments on the situation of the environment, scenarios on its evolution, information on the actions that are being taken and what should be done or can be done for its improvement, in the light of the 37 core set indicators (CSI) established by the European Environment Agency (EEA / EEA) taken over and supplemented with 34 other specific indicators, through OMMAP no. 618 / 30.03.2015, for the most correct characterization of the thematic areas of the report. Thus, the current report aims to describe, as close to the European model, the way in which the environmental policies are developed and evolved, the trends in this field and the impact forecast at the level of Romania.
The current report is structured on 12 chapters that deal with the following topics:

- *Ambient air quality and pollution: the status, consequences, determinant factors and pressures affecting air quality, air pollution trends and forecasts as well as policies, actions and measures to improve ambient air;*
- *Water: quality and resources of water, marine and coastal environment;*
- *Soil: quality of soils as a condition and trends, critical areas in terms of soil deterioration, pressures, forecasts and actions taken to improve the quality of soils;*
- *Land use: status, trends, determinant factors, impact of land use change on the environment as well as forecasts and actions taken on land use;*
- *Nature protection and biodiversity: conservation status and trends of biodiversity components, threats and pressures on biodiversity, forecasts and actions taken to protect nature and biodiversity;*
- *Forests: the status and consequences of the national forest fund, the threats and pressures exerted on forests, the trends, forecasts and actions regarding the sustainable management of forests;*

- *Material resources and waste: the status and trends of the use of material resources, in the generation and management of waste as trends, forecasts and impacts, as well as in the policies and actions regarding the use of material resources and waste;*
- *Climate change: the impact of climate change on natural and anthropic systems, determinant factors and pressures on climate change, trends in greenhouse gas emissions, climate change scenarios and forecasts, and actions to mitigate and adapt to climate change;*
- *Urban environment, health and quality of life: status and consequences with highlighting the forecasts and measures taken for sustainable urban development and improving the health and quality of life in urban agglomerations;*
- *Environmental radioactivity: monitoring the radioactivity of environmental factors air, water, soil and vegetation;*
- *Consumption and the environment: consumption trends, factors influencing consumption, pressures on the environment caused by consumption, the green economy, as well as forecasts, policies and measures regarding consumption and the environment;*
- *Trends and changes in Romania compared to the European Union: trends and social, economic changes and environmental policies in Romania and evaluation of Romania's environmental performance.*

The development team, Bucharest 2019

LIST OF SPECIFIC INDICATORS FOR ROMANIA

***Source*: Guide for the elaboration of the annual report on the state of the environment according to the requirements of the European Environmental Status Report (SOER) – O.M.M.A.P. nr. 618/30.03.2015**

Note: The indicators that are not included in the report could not be processed due to lack of data

AIR POLLUTION

- RO 01 Indicator CSI 01 – Emissions of acidifying substances
- RO 02 Indicator CSI 02 – Ozone precursor emissions
- RO 03 Indicator CSI 03 – Primary particle emissions and secondary particle precursors
- RO 04 Indicator CSI 04 – Exceeding the limit values regarding air quality in urban areas
- RO 05 Indicator CSI 05 – Exposure of ecosystems to acidification, eutrophication and ozone

BIODIVERSITY

- RO 07 Indicator CSI 07 – Species of European interest
- RO 08 Indicator CSI 08 – Designated protected areas
- RO 09 Indicator CSI 09 – Species diversity

CLIMATIC CHANGES

- RO 06 Indicator CSI 06 – Production and consumption of substances that lead to the destruction of the ozone layer
- RO 10 Indicator CSI 10 – Trend of greenhouse gas emissions
- RO 11 Indicator CSI 11 – Greenhouse gas emissions projections
- RO 12 Indicator CSI 12 – Temperature at global, European and national level
- RO 13 Indicator CSI 13 – Atmospheric concentrations of greenhouse gases

LAND AND SOIL

- RO 14 Indicator CSI 14 – Land occupancy
- RO 15 Indicator CSI 15 – Progress in the management of contaminated sites

WASTE

- RO 16 Indicator CSI 16 – Generation of municipal waste
- RO 17 Indicator CSI 17 – Generation and recycling of packaging waste

WATER

- RO 18 Indicator CSI 18 – Use of fresh water resources
- RO 19 Indicator CSI 19 – Oxygen-consuming substances in rivers
- RO 20 Indicator CSI 20 – Nutrients in water
- RO 21 Indicator CSI 21 – Nutrients in transient, coastal and marine waters
- RO 22 Indicator CSI 22 – The quality of the bathing water
- RO 23 Indicator CSI 23 – Chlorophyll *a* from transient, coastal and marine waters
- RO 24 Indicator CSI 24 – Treatment of urban waste water

AGRICULTURE

- RO 25 Indicator CSI 25 – Gross balance of nutrients
- RO 26 Indicator CSI 26 – Surface for organic farming

ENERGY

- RO 27 Indicator CSI 27 – Final energy consumption by type of sector
- RO 28 Indicator CSI 28 – Primary energy intensity
- RO 29 Indicator CSI 29 – Primary energy consumption by type of fuel -
- RO 30 Indicator CSI 30 – Primary energy consumption produced from renewable energy sources
- RO 31 Indicator CSI 31 – Electricity consumption produced from renewable energy sources

FISHING

- RO 32 Indicator CSI 32 – State of marine fish stocks
- RO 33 Indicator CSI 33 – Aquaculture production
- RO 34 Indicator CSI 34 – Capacity of the fishing fleet

TRANSPORT

- RO 35 Indicator CSI 35 – Demand for passenger transport
- RO 36 Indicator CSI 36 – Demand for freight
- RO 37 Indicator CSI 37 – Use of alternative fuels and cleaner

AIR POLLUTION

- RO 38 Indicator APE 05 – Heavy metal emissions
- RO 39 Indicator APE 06 – Emissions of persistent organic pollutants

BIODIVERSITY

- RO 40 Indicator SEBI 05 – Habitats of European interest in Romania
- RO 41 Indicator SEBI 07 – Natural protected areas at national level
- RO 42 Indicator SEBI 08 – Protected areas of Community interest designated in accordance with the Habitats and Birds Directive
- RO 43 Indicator SEBI 10 – Invasive allogeneic species
- RO 44 Indicator SEBI 13 – Fragmentation of natural and semi-natural areas
- RO 45 Indicator SEBI 17 – Forest: forest fund, raising and harvesting wood
- RO 46 Indicator SEBI 18 – Forest: dead wood (dry)

CLIMATIC CHANGES

- RO 47 Indicator CLIM 02 – Precipitation average
- RO 48 Indicator CLIM 04 – Extreme precipitation
- RO 49 Indicator CLIM 08 – The degree of snow cover
- RO 50 Indicator CLIM 12 – Increasing sea level at global, European and national level
- RO 51 Indicator CLIM 13 – Increasing sea water temperature
- RO 52 Indicator CLIM 16 – Flows of watercourses
- RO 53 Indicator CLIM 17 – Floods
- RO 54 Indicator CLIM 18 – Hydrological drought
- RO 55 Indicator CLIM 27 – Organic carbon from the soil
- RO 56 Indicator CLIM 30 – The growing season of agricultural crops
- RO 57 Indicator CLIM 32 – The productivity of agricultural crops determined by the lack of water resources
- RO 58 Indicator CLIM 34 – Surfaces occupied by forests
- RO 59 Indicator CLIM 35 – The risk of forest fires
- RO 60 Indicator CLIM 36 – Extreme temperatures and health
- RO 61 Indicator CLIM 46 – Floods and health
- RO 62 Indicator CLIM 47 – The number of degrees-days for heating

WASTE

- RO 63 Indicator Waste 003 – Waste electrical and electronic equipment

WATER

- RO 64 Indicator WHS 01 – Pesticides in groundwater
- RO 65 Indicator WHS 02 – Hazardous substances in watercourses
- RO 66 Indicator WHS 03 – Hazardous substances in lakes
- RO 67 Indicator WEC 04 – Watercourse classification schemes

TRANSPORT

- RO 68 Indicator TERM 08 – Land occupancy through transport infrastructure
- RO 69 Indicator TERM 11 – End-of-life vehicles

SUSTAINABLE CONSUMPTION AND PRODUCTION

- RO 70 Indicator SCP 033 – Number of EMAS and ISO 14001 certified organizations
- RO 71 Indicator SCP - Number of products and services labeled with the European eco-label

Chapter I. ENVIRONMENTAL AIR QUALITY AND POLLUTION

I.1. ENVIRONMENTAL AIR QUALITY: STATUS AND CONSEQUENCES

I.2. DETERMINING FACTORS AND PRESSURES WHICH AFFECT THE QUALITY OF THE ENVIRONMENTAL AIR

I.3. TRENDS AND PROMOTIONS ON ENVIRONMENTAL AIR POLLUTION

I.4. POLICIES, ACTIONS AND MEASURES FOR IMPROVING ENVIRONMENTAL AIR QUALITY

Chapter I ENVIRONMENTAL AIR QUALITY AND POLLUTION

I.1. ENVIRONMENTAL AIR QUALITY: STATE AND CONSEQUENCES

I.1.1. THE QUALITY OF THE ENVIRONMENTAL AIR

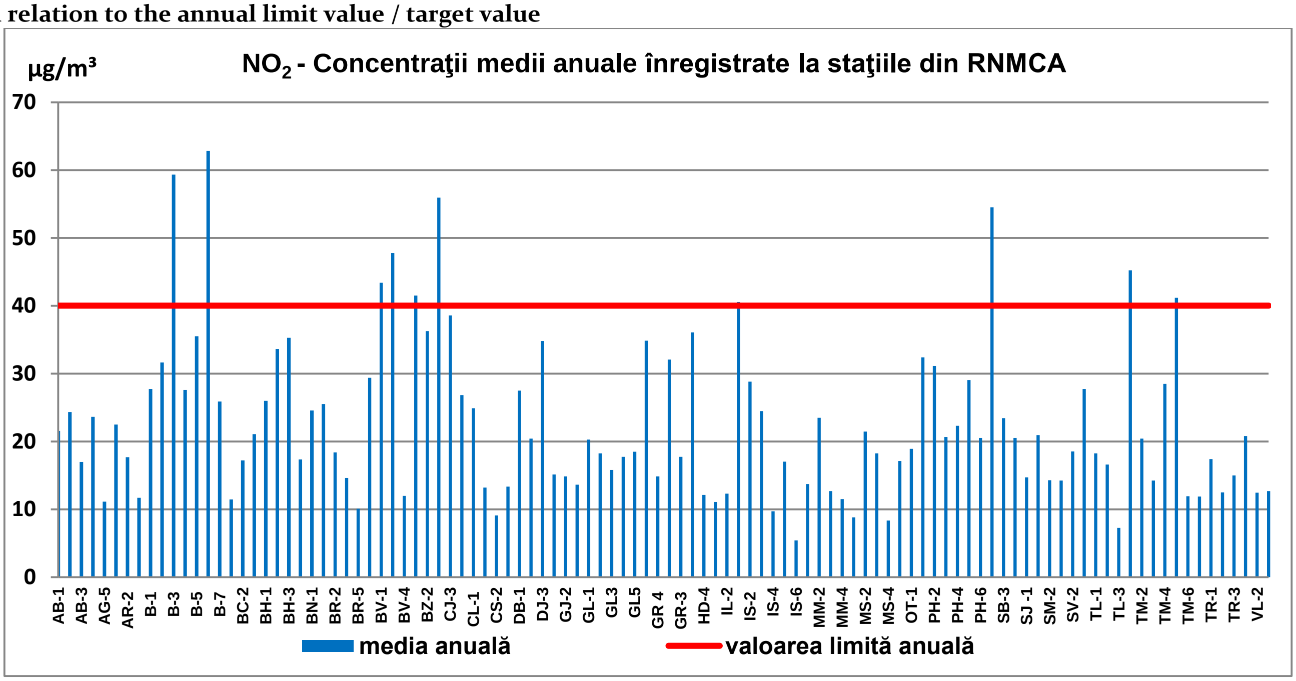
The quality of the surrounding air can be highlighted by choosing indicators that characterize this environmental factor. The level of trust of these indicators depends on the quality of the data used that can be:

- data available from air quality monitoring networks;
- results of studies, inventories, forecasts;
- available data and results reported or obtained through studies at European level;
- scenarios, strategies, programs, objectives, targets at national and European level that monitor air quality and pollution.

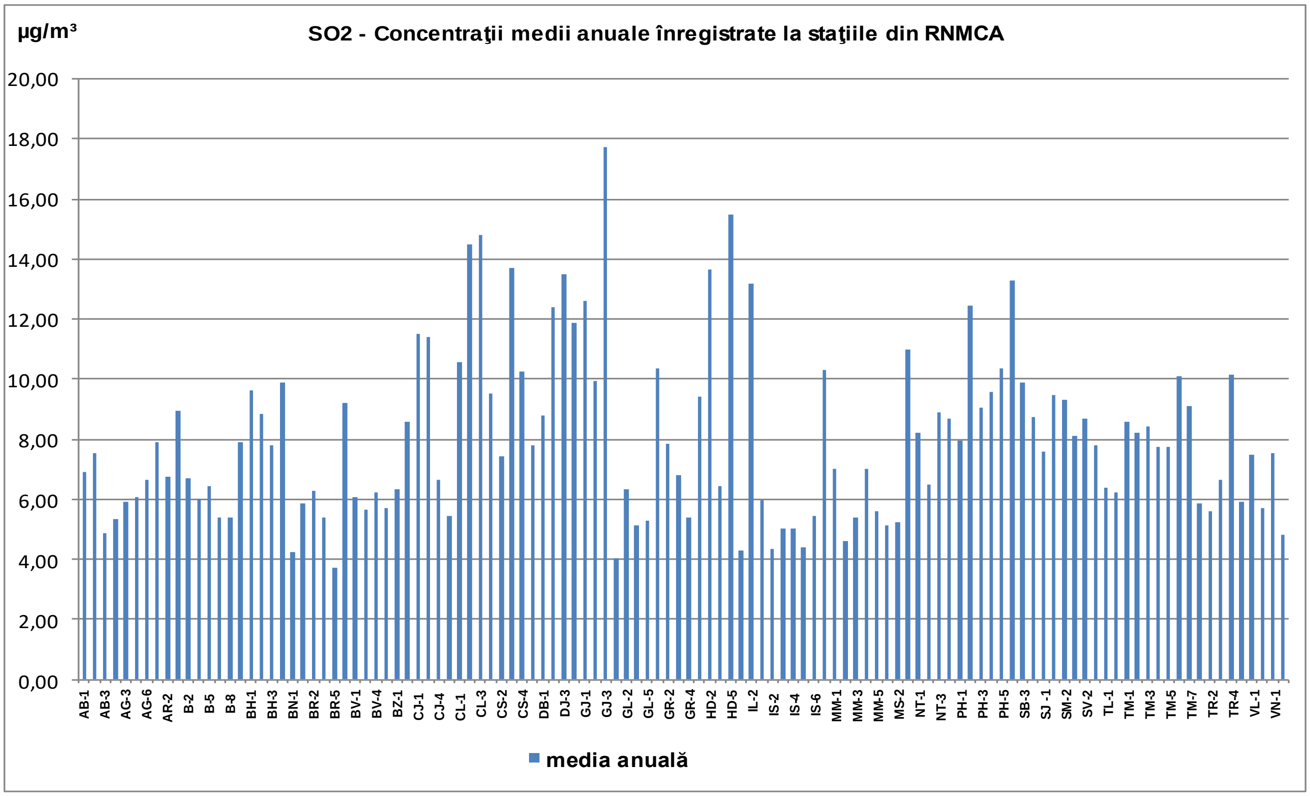
I.1.1.1. Level of average annual concentrations of atmospheric pollutants in ambient air

The average annual concentrations of NO2, SO2, PM10, O3, C6H6, Pb, As, Cd and Ni atmospheric pollutants determined within the RNMCA (National Air Quality Monitoring Network) at the background, traffic and industrial stations in 2018 in relation to the annual limit value / target value are presented in the graphs in figure no I.1.

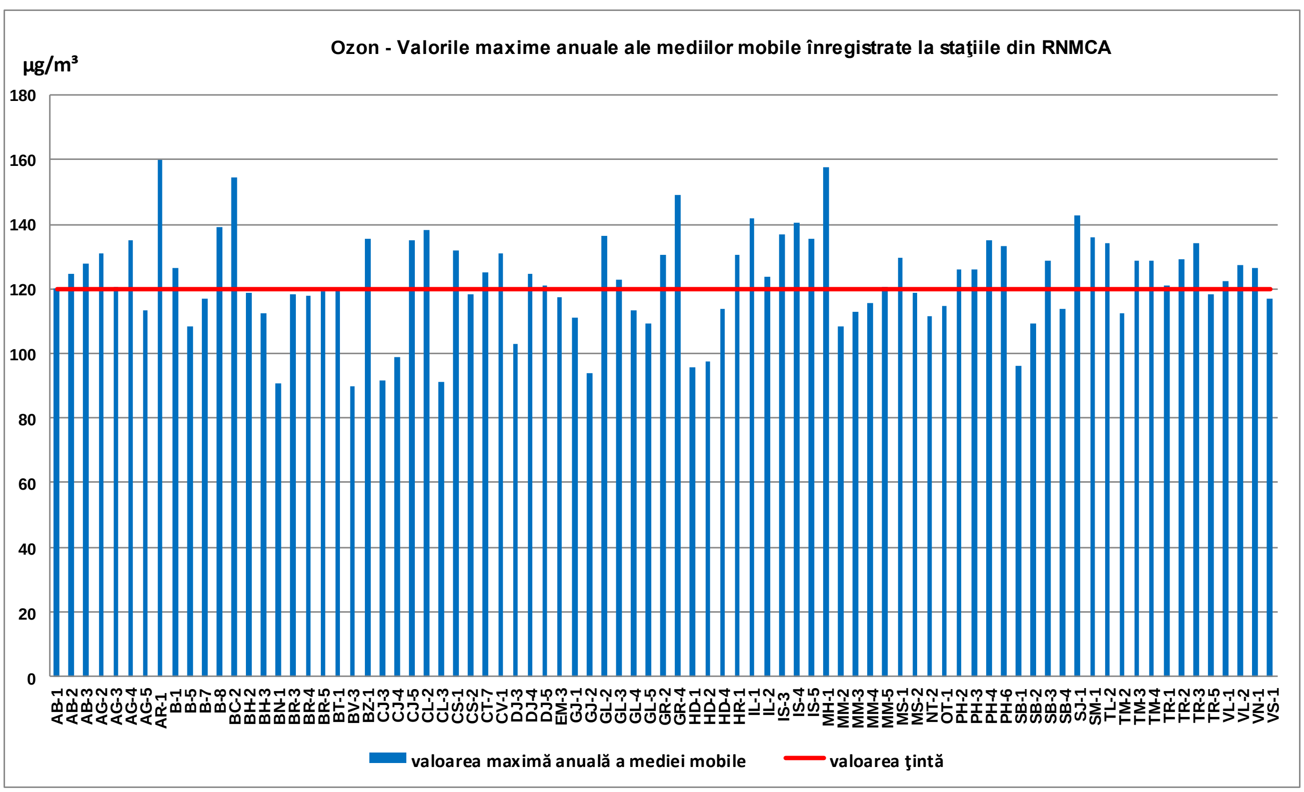
Figure I.1 Annual average concentrations of atmospheric pollutants recorded at national monitoring stations in 2018 in relation to the annual limit value / target value



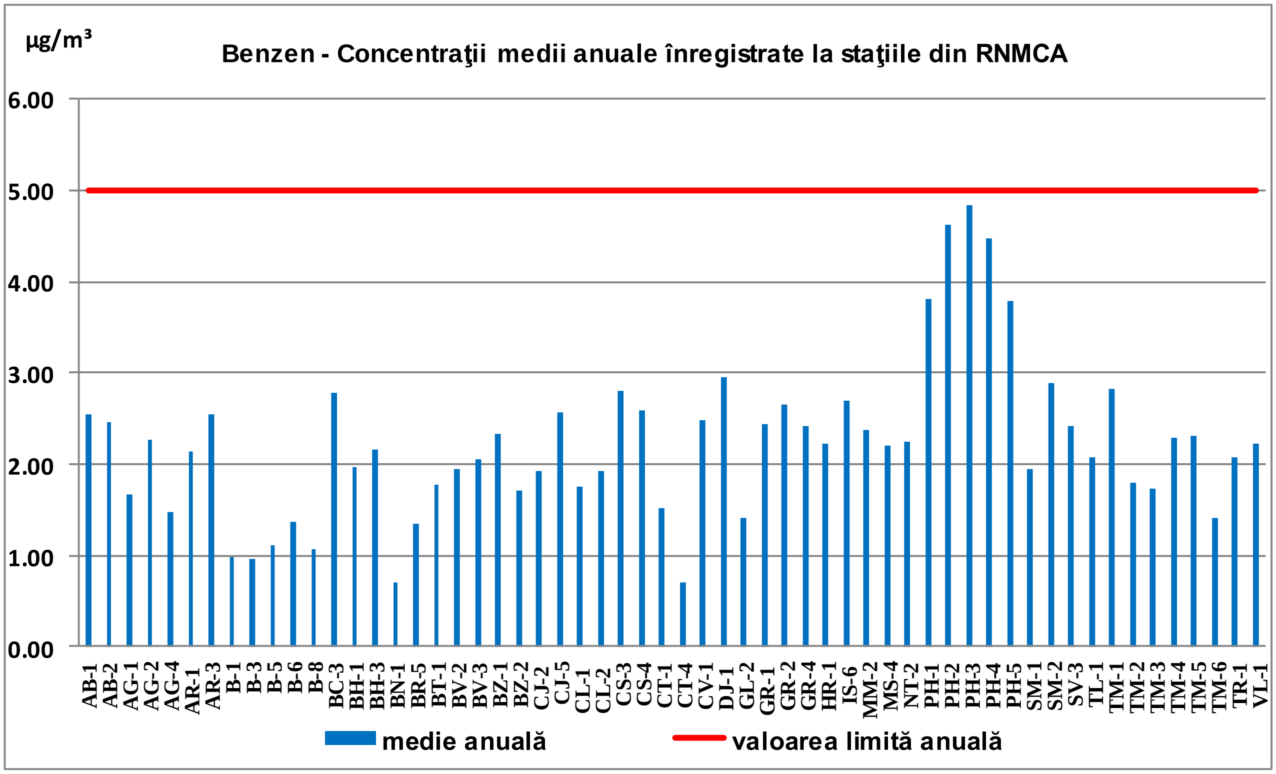
Source: NEPA



Source: NEPA



Source: NEPA



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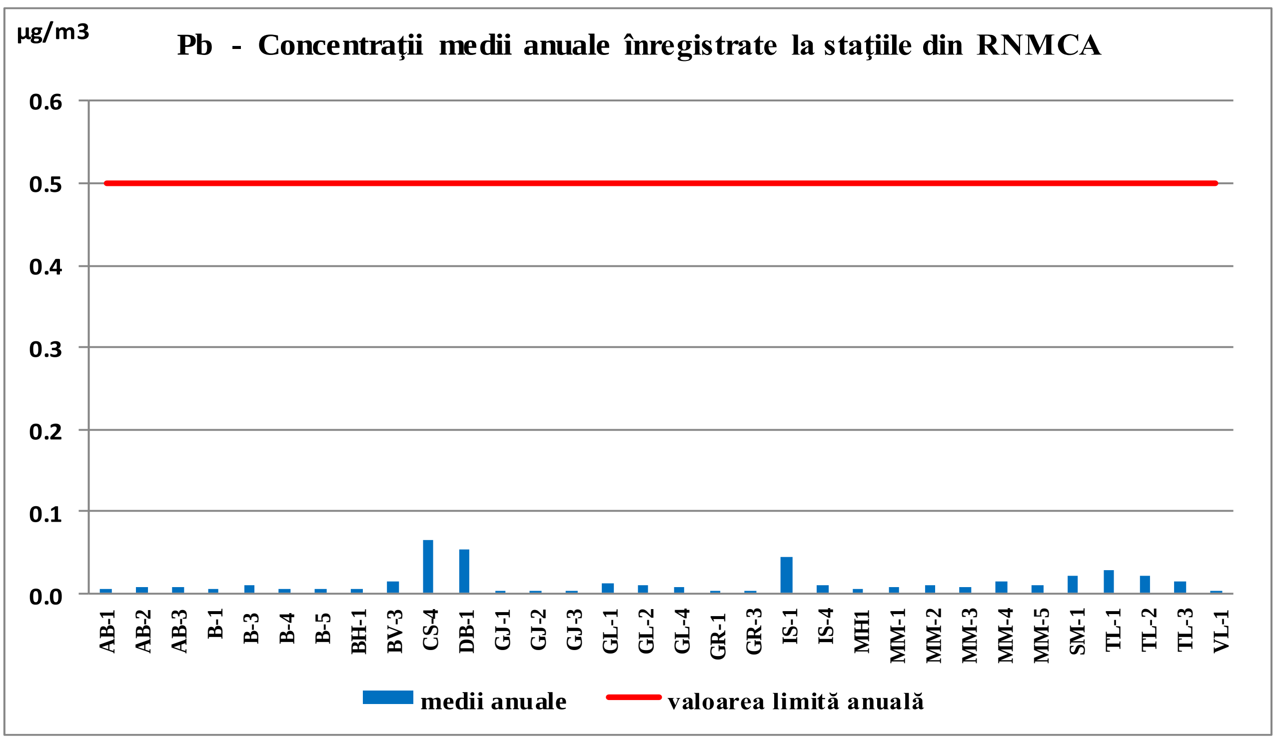

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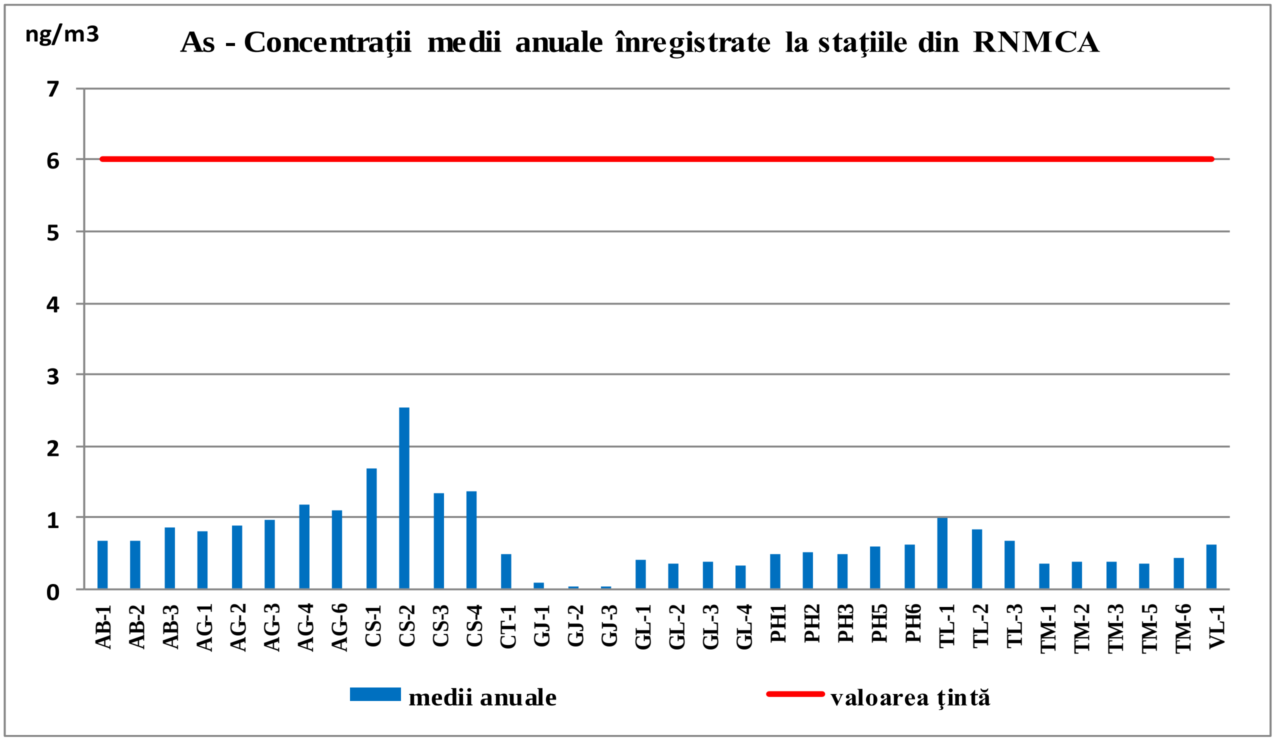

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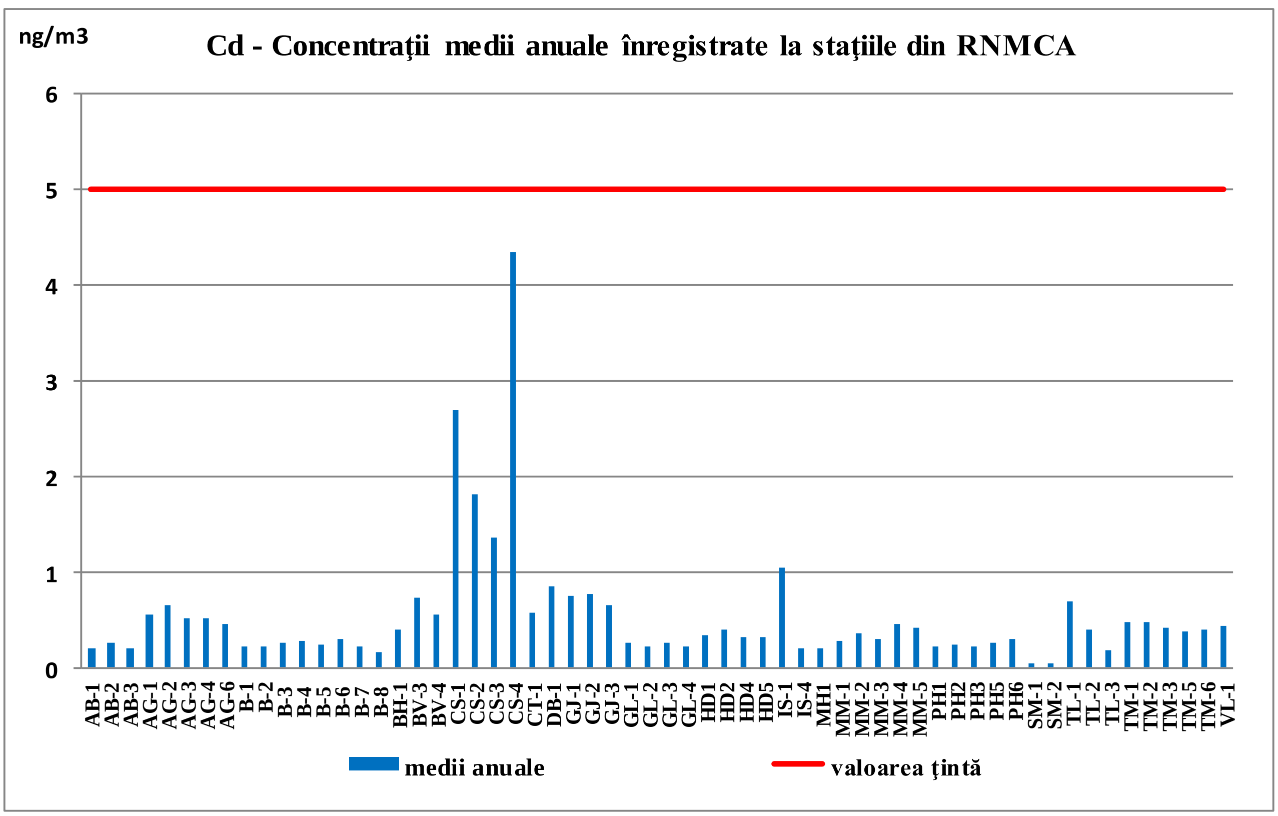

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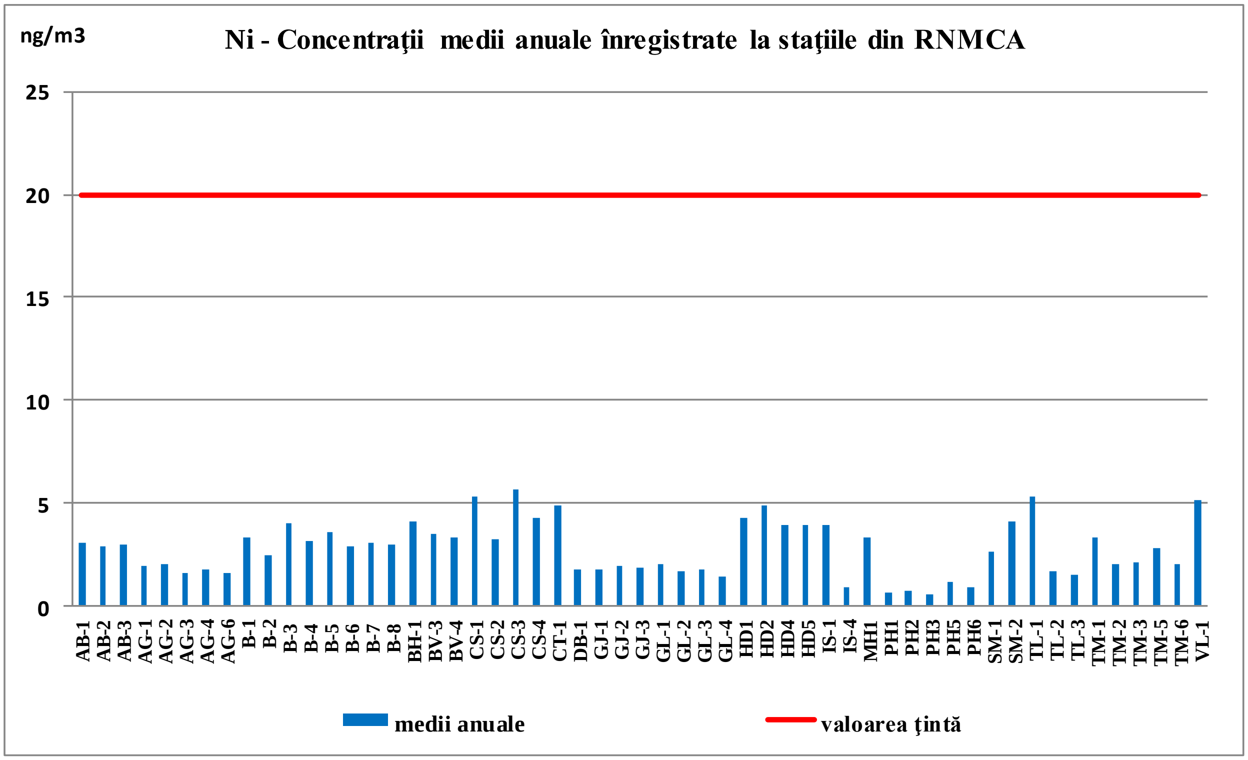


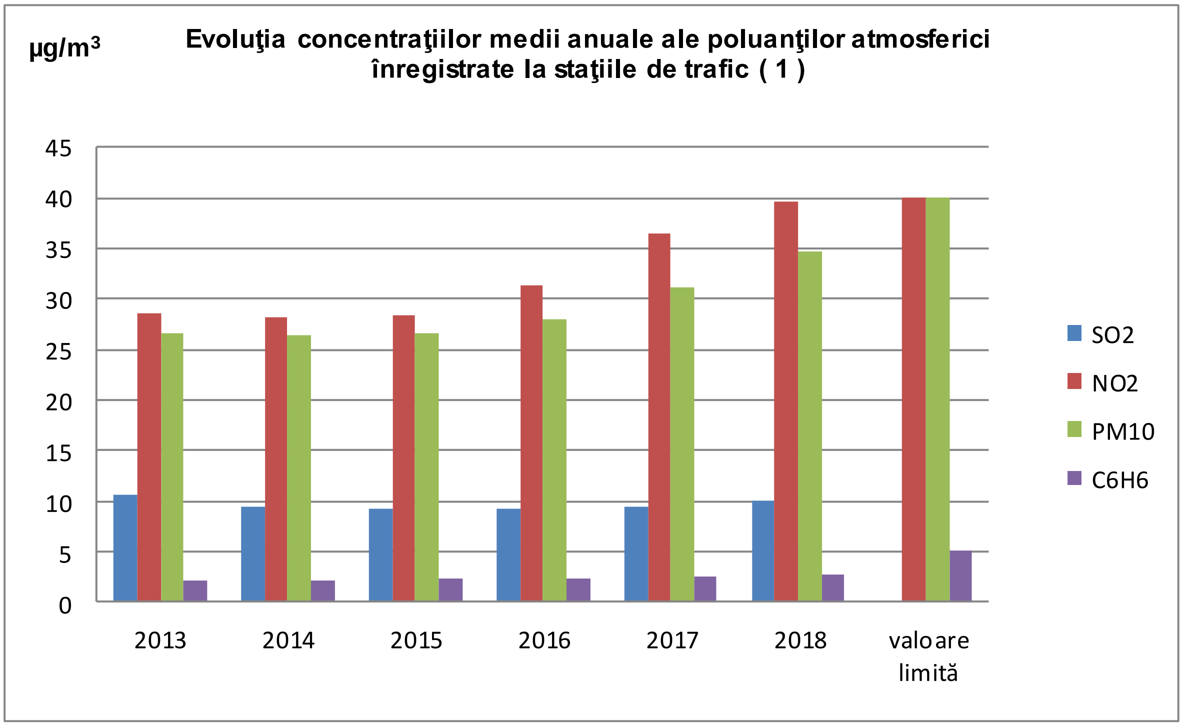
Source: NEPA

From the analysis of the data presented in the graphs in figure I.1 it is found that for NO_2 the annual limit value was exceeded at 10 stations, for PM_{10} the annual limit value was exceeded at 2 stations, for ozone the target value was exceeded at 46 stations. For the benzene, Pb, As, Cd and Ni pollutants, the annual limit values / target values were not exceeded.

I.1.1.2. Trends regarding the average annual concentrations of certain atmospheric pollutants

Most atmospheric pollutants come from combustion in the energy industry, industrial activities that generate emissions of substances and particles that are released into the atmosphere and can reach harmful concentrations. The technical instruments used to record the data on the annual average concentrations of atmospheric pollutants (NO_2, SO_2, PM_{10}, C_6H_6, Pb, Cd, Ni, As) in relation to the annual limit value are the analyzers from the monitoring stations. The trends regarding the average annual concentrations of certain air pollutants from 2013-2018 recorded at different types of air quality monitoring stations in the RNMCA are shown in figure I.2 and figure I.3.

Figure I.2. Evolution of the average annual concentrations of atmospheric pollutants (NO_2, SO_2, PM_{10}, C_6H_6, Pb, Cd, Ni, As) recorded at the traffic stations during 2013-2018



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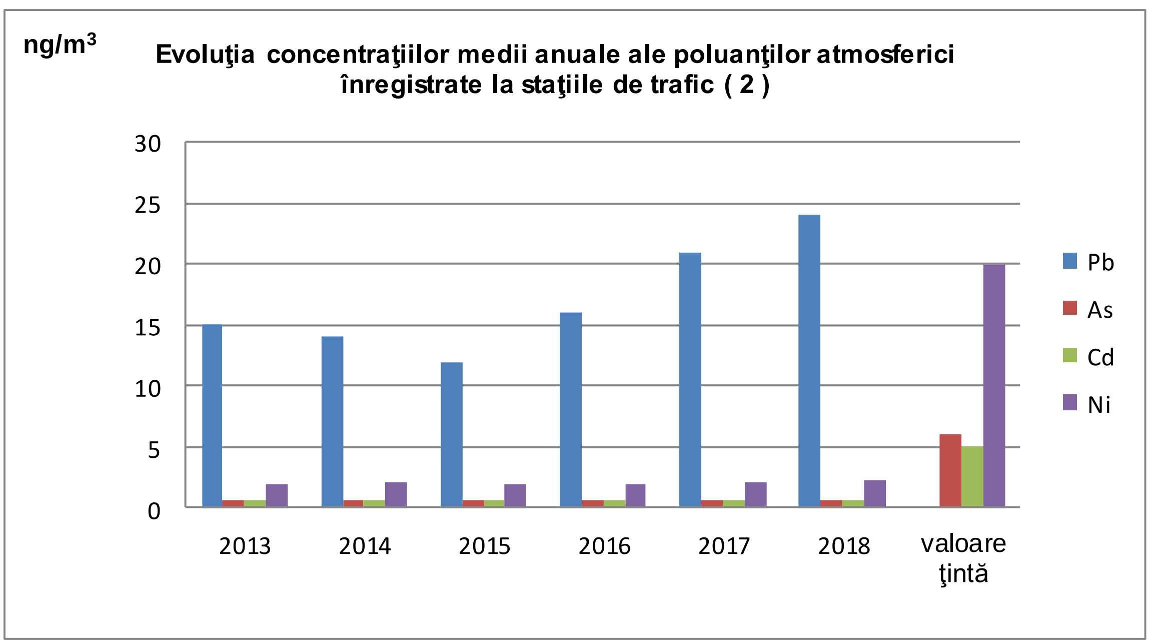
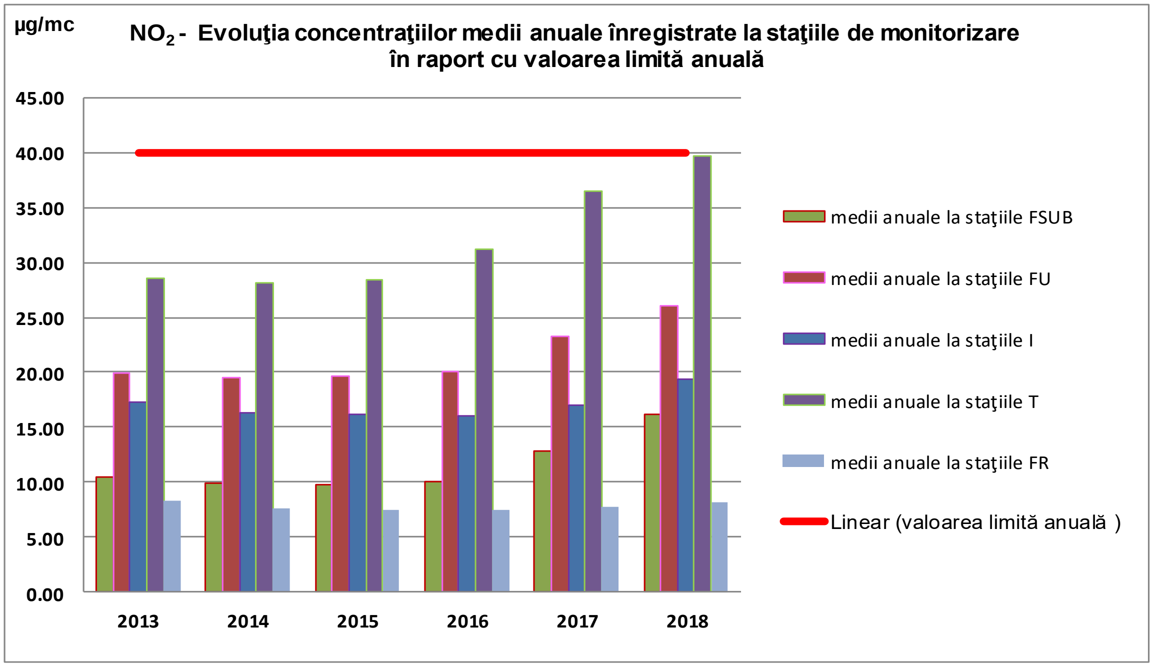


Source: NEPA

From the analysis of the data presented in the graphs in figure I.2 it is found that starting with 2015 for all pollutants studied at the traffic stations there is a general tendency to increase the annual average concentrations, which usually were below the limit values / target values.

Figure I.3 volution of annual average concentrations at NO2, SO2, PM10, C6H6, Pb, As, Cd, Ni during the period 2010-2017 recorded at the monitoring stations in relation to the annual limit value



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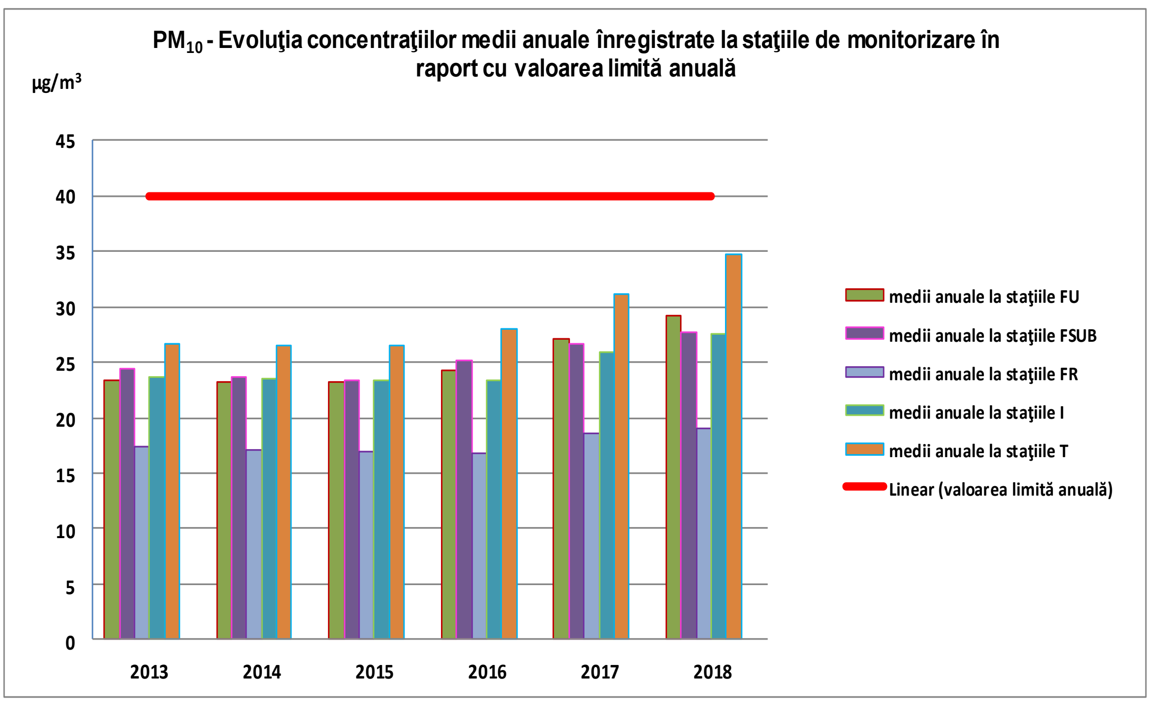

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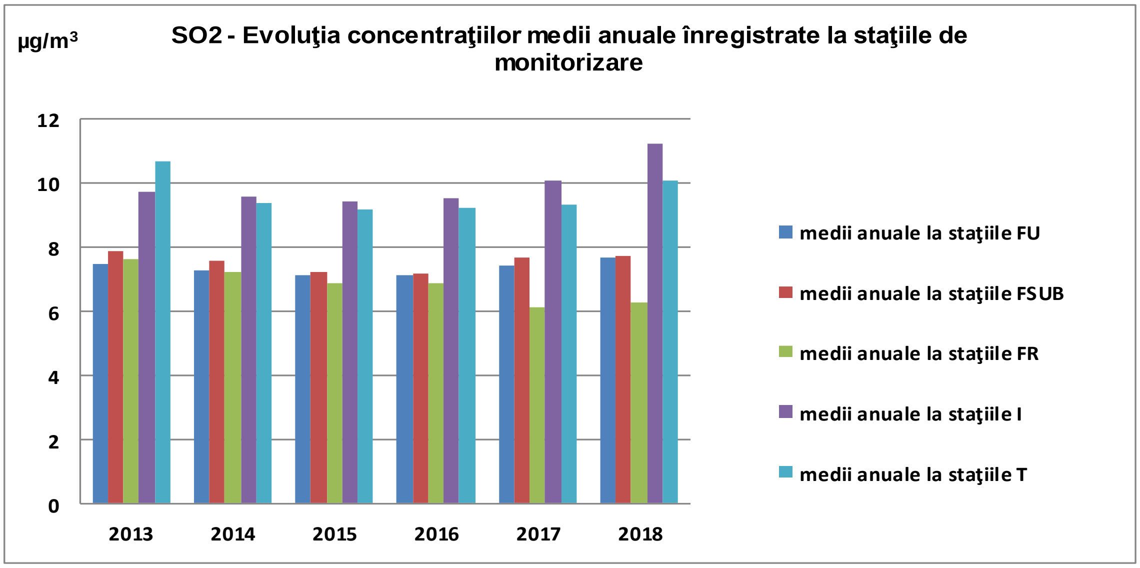

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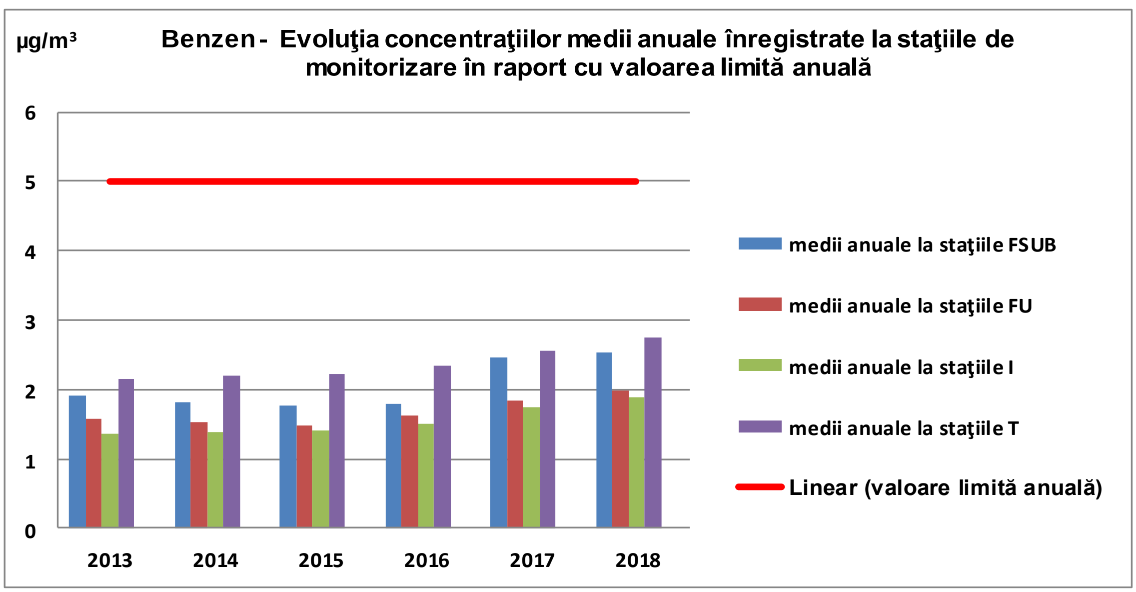

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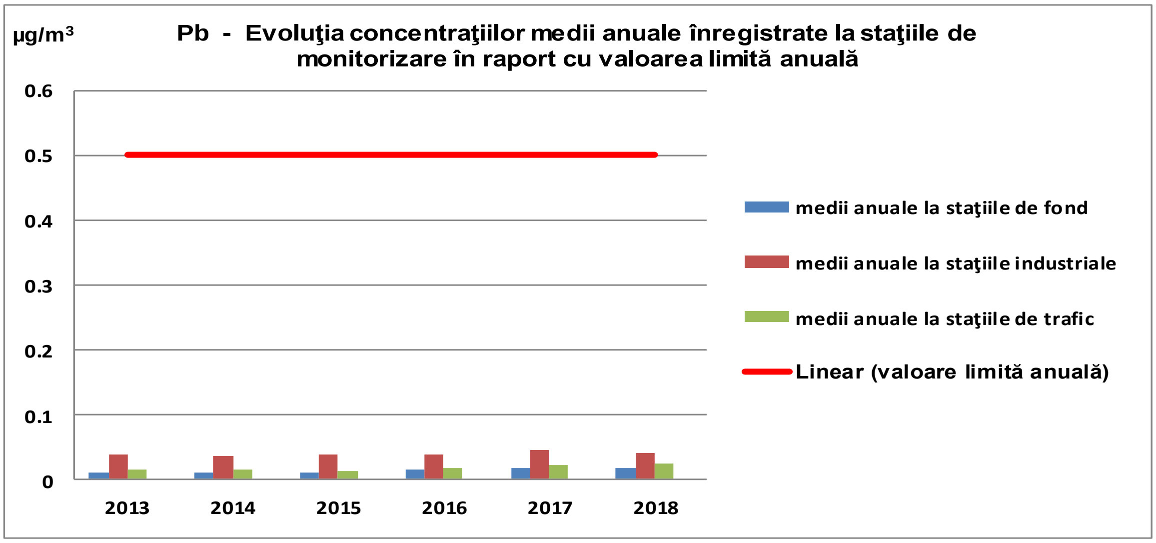

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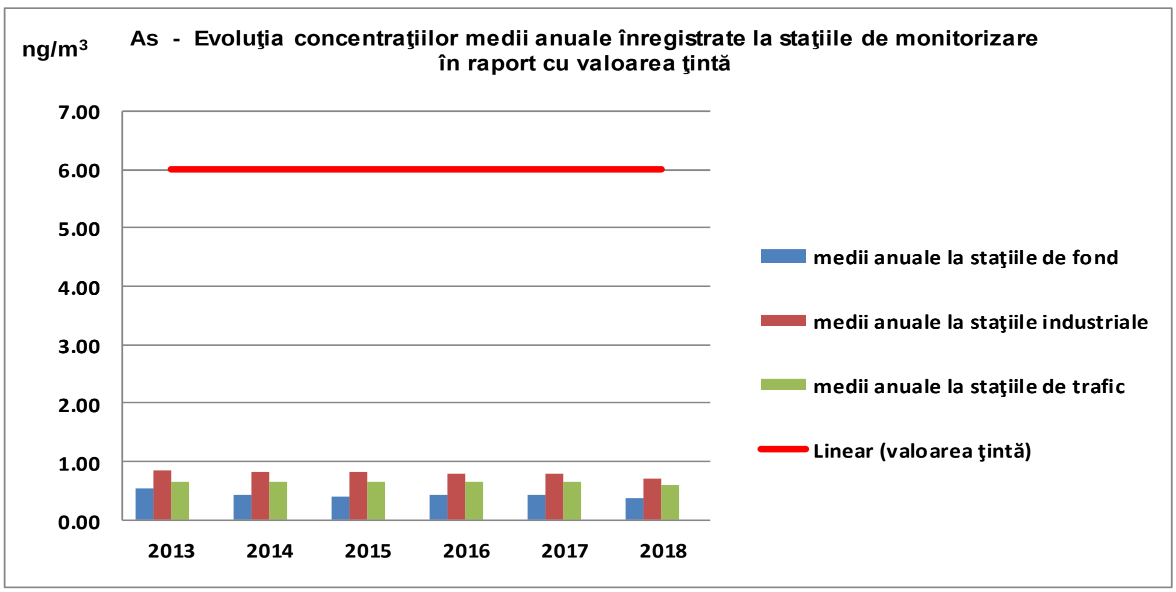

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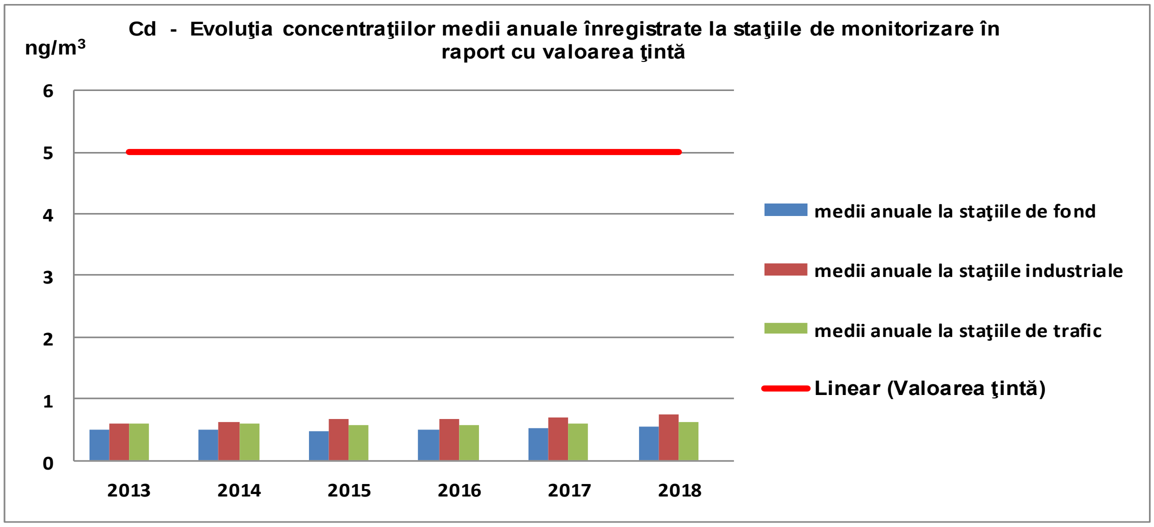

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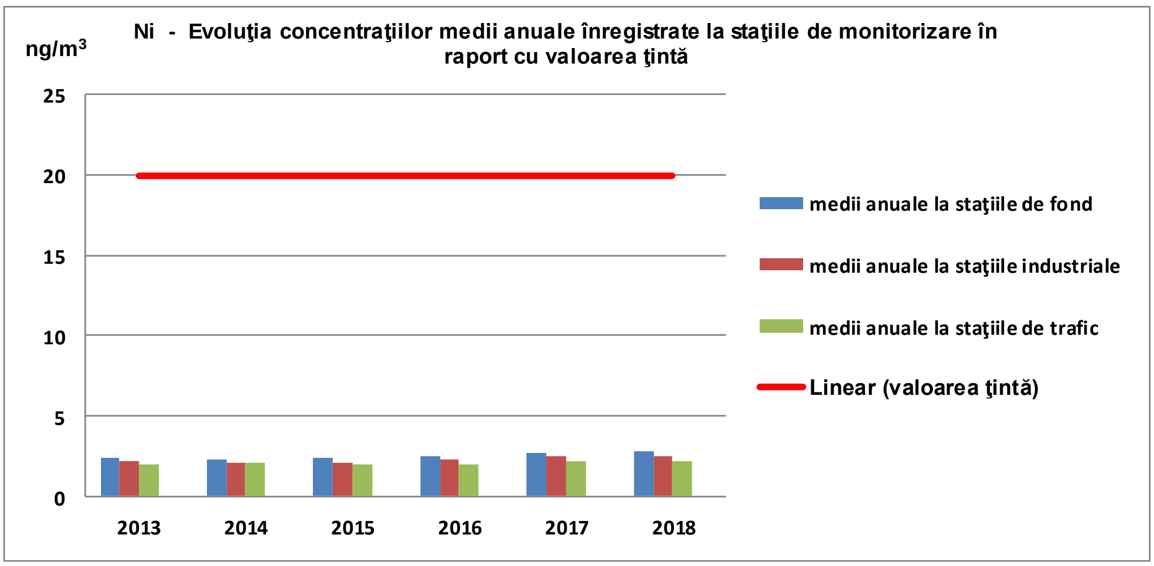


Source: NEPA

Legend:
FU = urban background,
FSUB = suburban background,
FR = rural background / regional background,
I = industrial,
T = transport

From the analysis of the data presented in the graphs in figure I.3, it is found that starting with 2015, for all types of stations, for the majority of pollutants studied there is a general tendency to increase the annual average concentrations (which were usually below limit values / target values), especially for NO_2, PM_{10}, C_6H_6 and Pb.

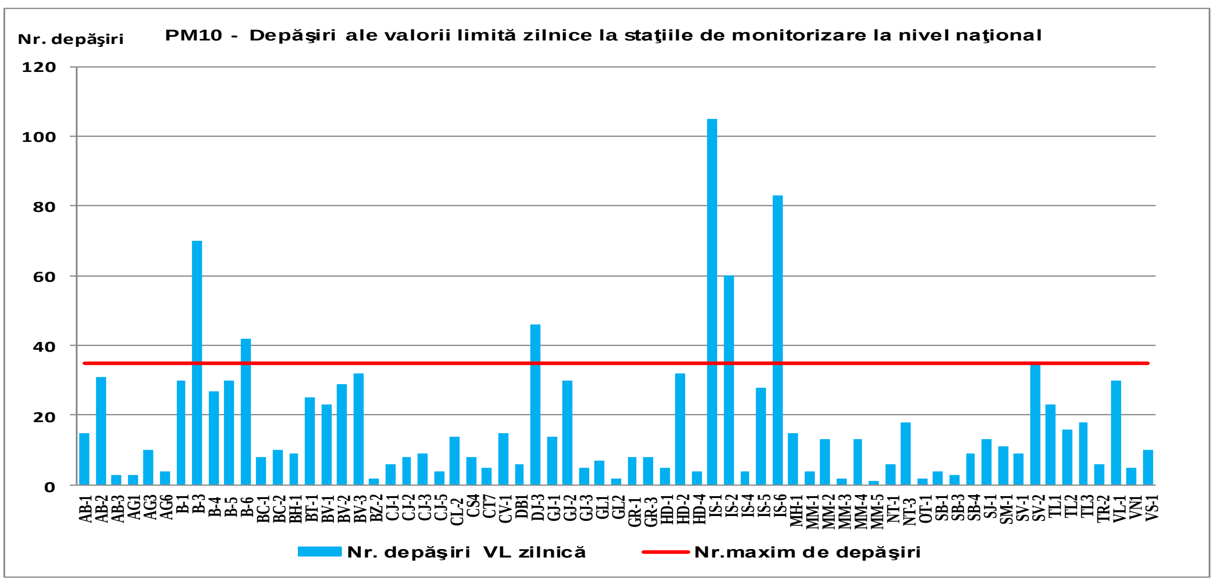
I.1.1.3. Exceeding limit values and target values regarding ambient air quality in urban areas

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

TITLE: EXCEEDING OF THE 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.

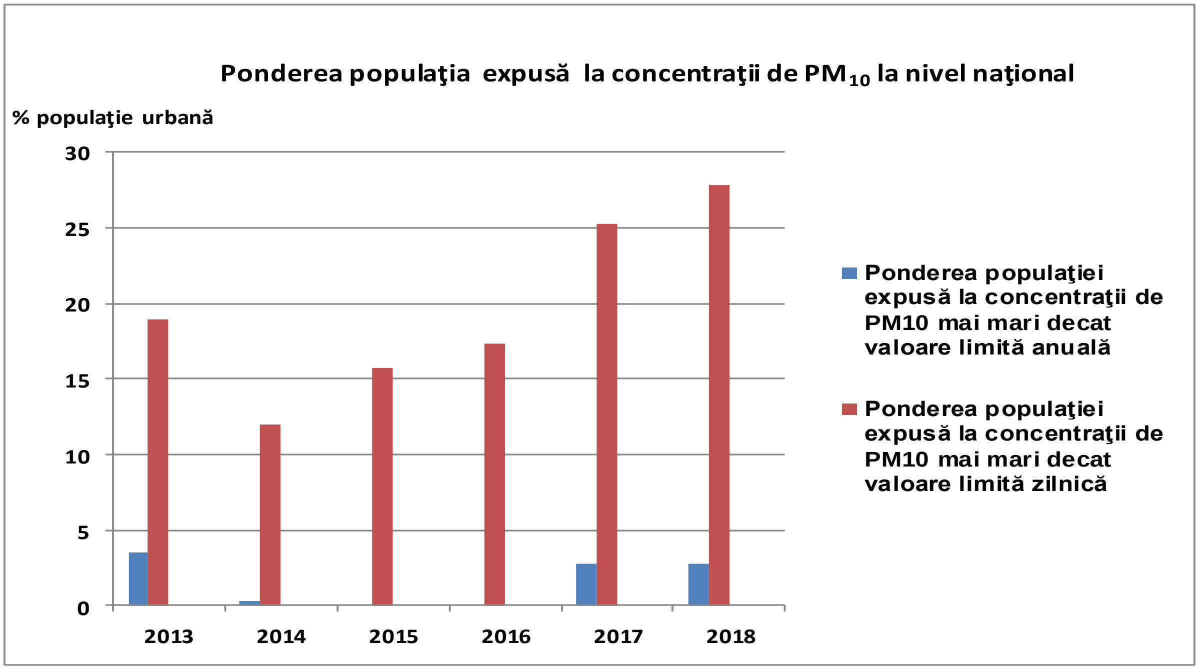
Life quality is strictly correlated and dependent on air quality. The pace of economic, demographic and institutional development requires that well-thought-out and documented measures are taken, in order to control the dangerous air pollution phenomena, to direct the socio-economic-financial development 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 I.4 Number of exceedances of daily limit value for particles in suspensions PM10 at national monitoring stations in 2018



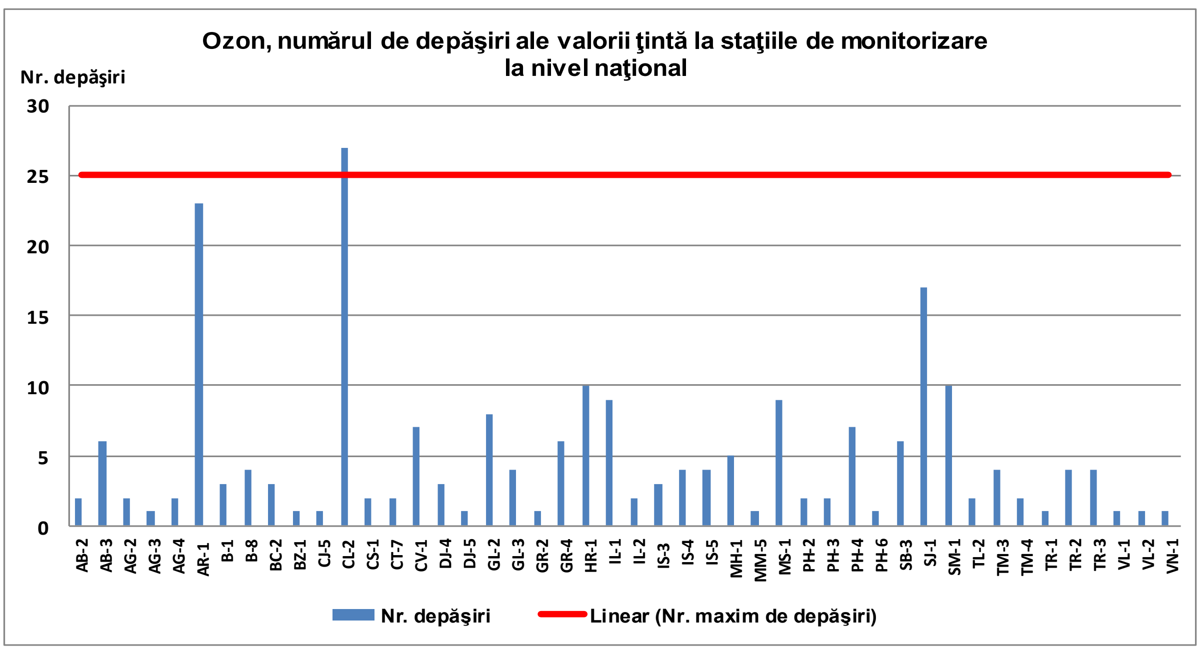
Source: NEPA

Figure I.5 The share of the population at national level that is potentially exposed to concentrations of PM10 that exceed the limit value set for human protection



Source: NEPA

Figure I.6 The number of exceedances of the target value for ozone at national monitoring stations in 2018



Source: NEPA

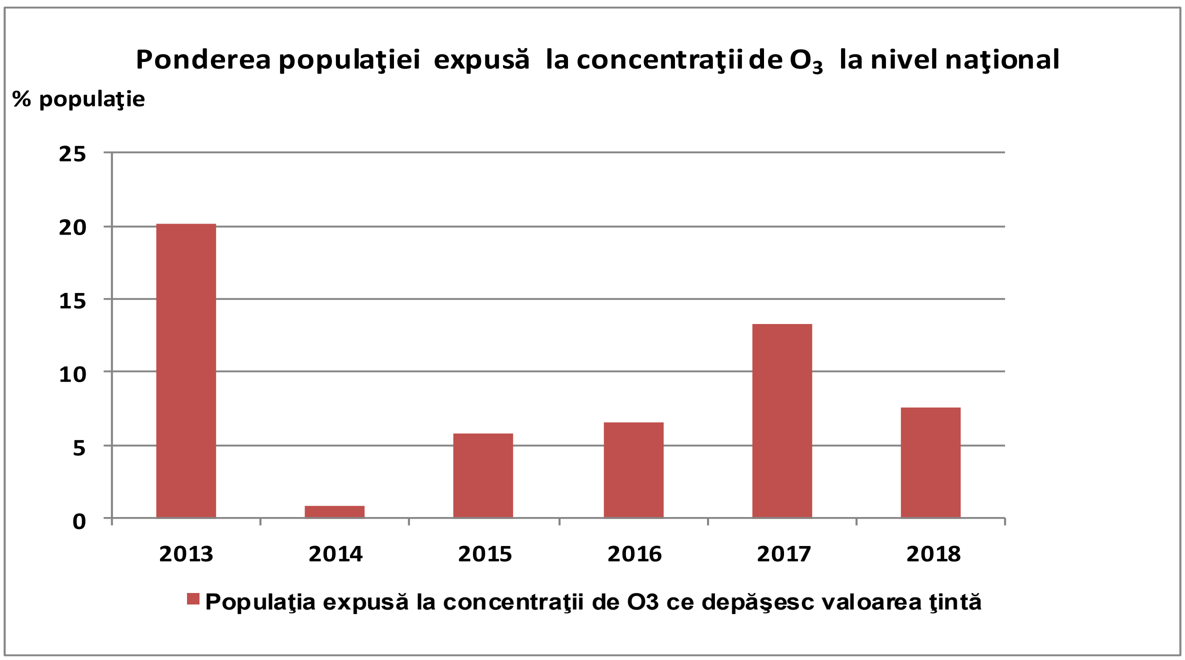
Knowing these effects of environmental pollution on health has led to the need to introduce measures to protect the environment, which also take into account the data on the number of exceedances of the limit value / target value registered at national level.

I.1.2. EFFECTS OF ENVIRONMENTAL POLLUTION

I.1.2.1. Effects of ambient air pollution on health

The ever-increasing demands for electricity, heat, products from the chemical, metallurgical, cement, road and air transport industries are causes for which air pollution is becoming more acute due to the increase in air concentration of some pollutants in the atmosphere (SO_2, NOx, O_3, fine particulate emissions, etc.) or the entry into the atmosphere of harmful compounds (radioactive elements, organic synthetic substances, etc.). The pollution of the atmosphere has unpleasant consequences, often serious on the man and the environment, in various forms: it impedes the development of the vegetation, diminishes the value and the agricultural production, reduces the visibility, leads to the evacuation in the environment of smoke, harmful vapors, etc., but also on the buildings , on the infrastructure and on the technical, electrical and electronic equipment more and more miniaturized, more compact, with more complex functions and therefore extremely sensitive to air pollution, accentuating its wear and degradation. The effects of pollution on the population can be reproduced by graphically presenting data on the share of urban population in Romania potentially exposed to concentrations of pollutants in the surrounding air (SO_2, NO_2, CO, C_6H_6, O_3, PM_{10}, heavy metals from suspensions and deposits - Pb, Cd, As, Ni), exceeding the limit values / target values (in the case of ozone) established for the protection of human health (Figures I.7 and I.8).

Figure I.7 The share of the population at national level that is potentially exposed to concentrations of O3 that exceed the target value set for human protection

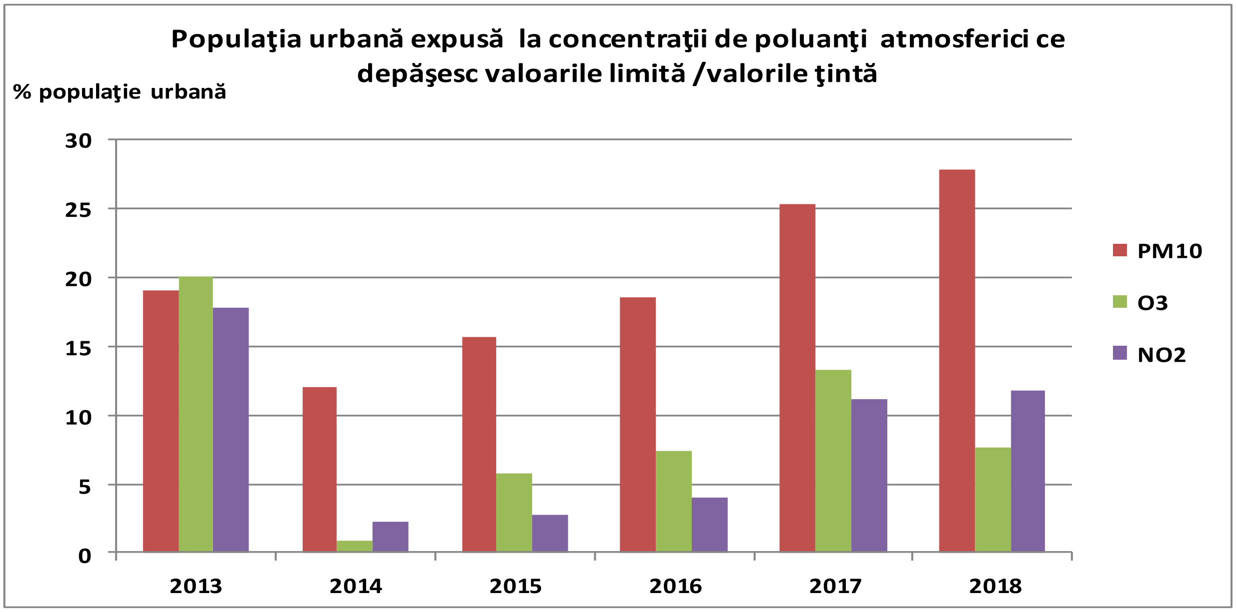


Source: NEPA

The suspended particles are a complex mixture of very small particles and drops of liquid. The sources from which they come are of the most diverse: industrial activity, heating of the population with wood material and fossil fuels, thermoelectric power stations, road traffic that generates emissions both through incomplete combustion of engines and by the wear of tires and road surfaces by rolling or braking. The harmful potential of the suspended particles is dependent on their size, the more the smaller the particle size. Particles with an aerodynamic diameter of less than 10 micrometres are more harmful to health because they pass through the nose and throat and enter the pulmonary alveoli, causing inflammation and intoxication. The particles resulting from industrial activities are controlled by means of electrostatic filters of different types, such as, for example, emissions from cement plants, roasting pyrites in sulfuric acid factories, thermoelectric power plants, etc. There are also particles that cannot be controlled by conventional methods, such as those from natural sources such as fires, sandstorms or wind erosion.

In conclusion, particles, aerosols and smoke can, in the short or long term, have negative effects on the environment, respectively on human health..

Figure I.8 The evolution of the percentage of the urban population exposed to the health damage due to exceeding the limit values of the air quality indicators (NO_2, O_3, PM_{10})



Source: NEPA

The analysis of the data presented regarding the evolution of the percentage of population exposed to the concentrations of pollutants above the limit / target values established for the protection of human health shows that of the three atmospheric pollutants, the powders have the highest share over the whole analyzed period.

I.1.2.2. Effects of ambient air pollution on ecosystems

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

TITLE: EXPOSURE OF ECOSYSTEMS TO ACIDIFICATION, EUTROFIZATION AND OZON
DEFINITION: The indicator shows the ecosystems or cultivated areas that are subject to atmospheric deposition or concentrations of pollutants that exceed the so-called "critical thresholds" or the concentration for a particular ecosystem or cultivated area. At the same time, this indicator shows the state of change of acidification, eutrophication and ozone levels for the environment. The risk for each location is estimated by reference to the "critical level", which represents a quantitative estimation of the exposure to pollutants under which no harmful and significant long-term effects appear, taking into account the present knowledge

The pollution of the surrounding air affects the ecosystems, negatively influencing the development of the fauna and flora, which are sometimes more sensitive than the human organism to the action of the various pollutants. The effects of atmospheric pollutants are different depending on their nature :

- acid gases (carbon monoxide, sulfur dioxide, nitrogen oxides) in combination with precipitation water produce acid rain that affects vegetation.
- nitrogen and sulfur compounds contribute to the formation of smog, which impedes normal photosynthesis and respiration of animals.
- halogen derivatives cause burns to plants and disease called fluorosis in animals (bone deformation and tooth loss).
- the particles reduce the atmospheric transparency by affecting photosynthesis and affect the animals causing respiratory affection similar to those of humans.

Exposure of ecosystems to ozone

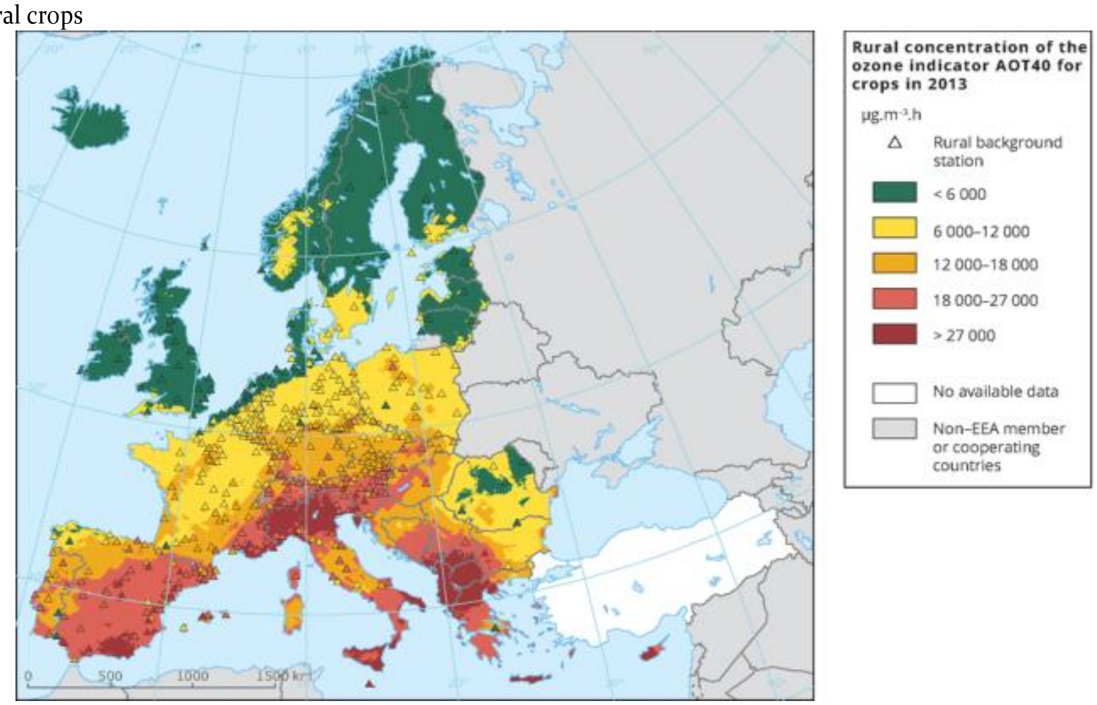
Exposure of agricultural crops, forest areas and vegetation areas to ozone, to a target value AOT40 and long-term objective AOT40.

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) xh*

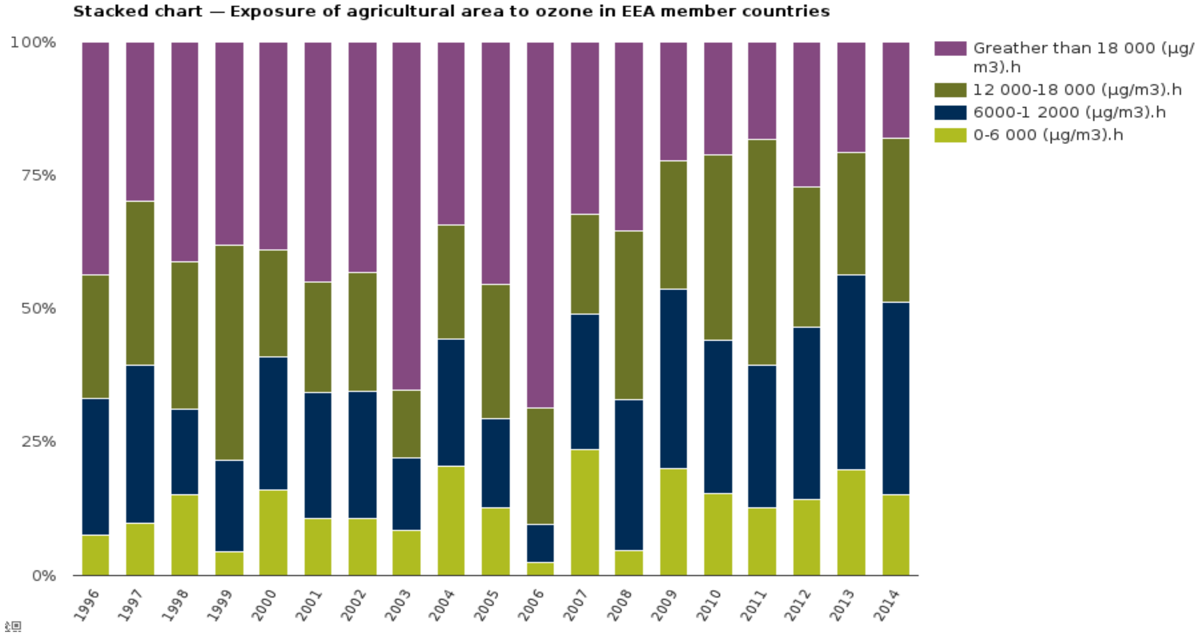
Figure I.9 Exposure of agricultural and forestry areas to AOT40 ozone concentrations in some European countries

Agricultural crops



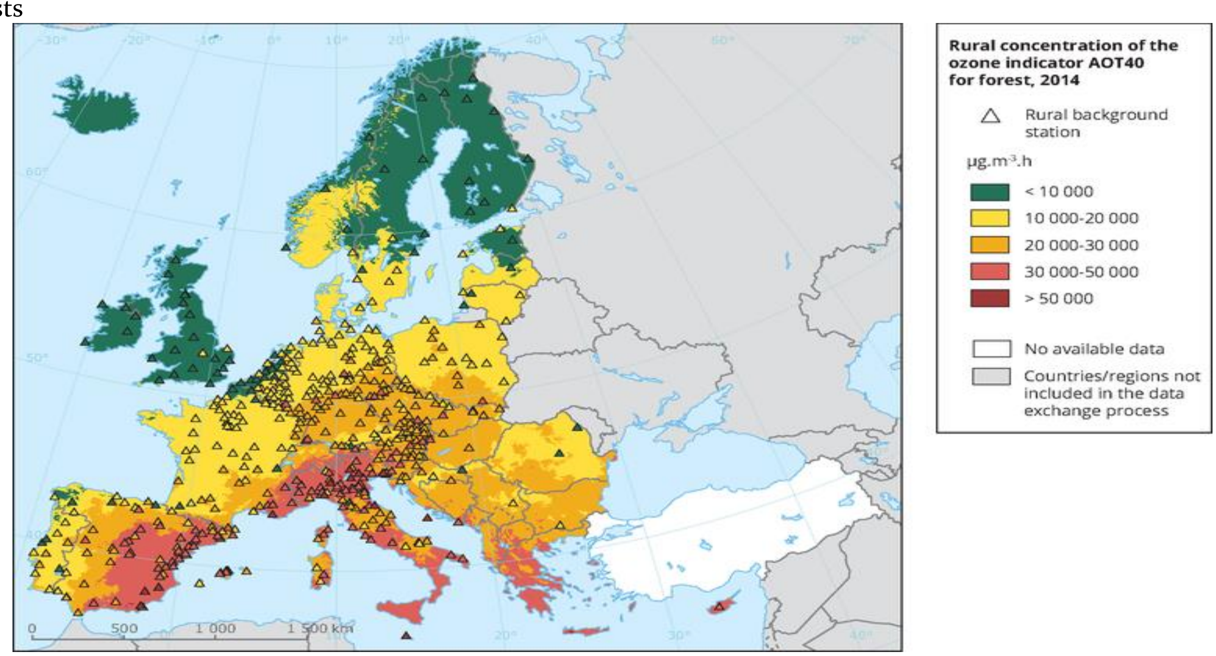
Source: *https://www.eea.europa.eu/data-and-maps/figures/rural-concentration-map-of-the-ozone-indicator-aot40-for-crops-year-7/map11-1-csi005-fig05-86672.eps/image_large/*

Evolution over the years



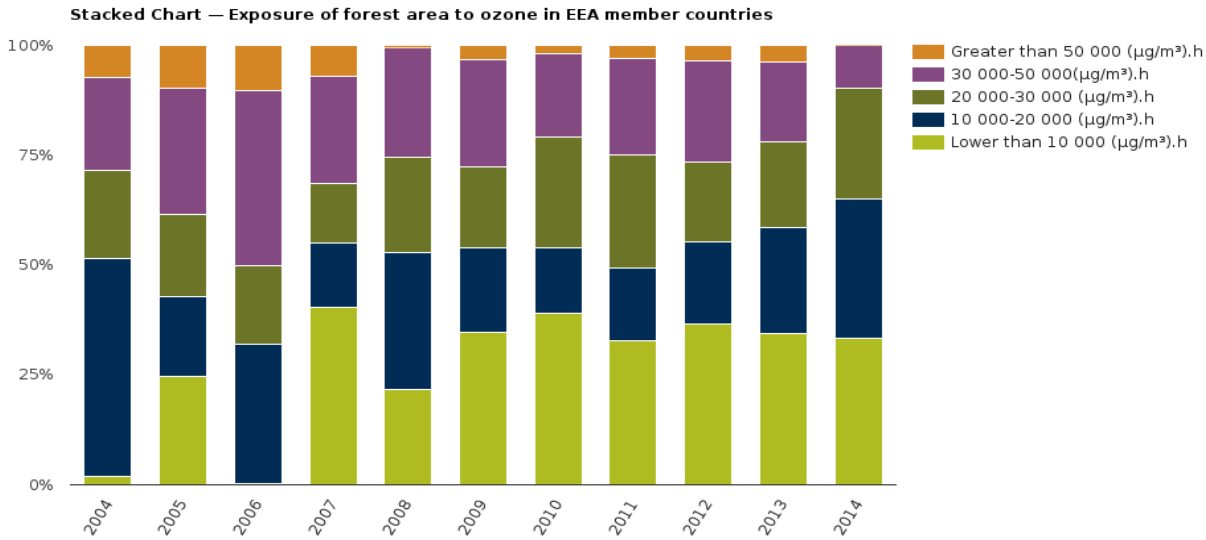
Source: [*https://www.eea.europa.eu/data-and-maps/daviz/exposure-of-agricultural-area-to-4#tab-chart_10/*](https://www.eea.europa.eu/data-and-maps/daviz/exposure-of-agricultural-area-to-4#tab-chart_10/)

Forests



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

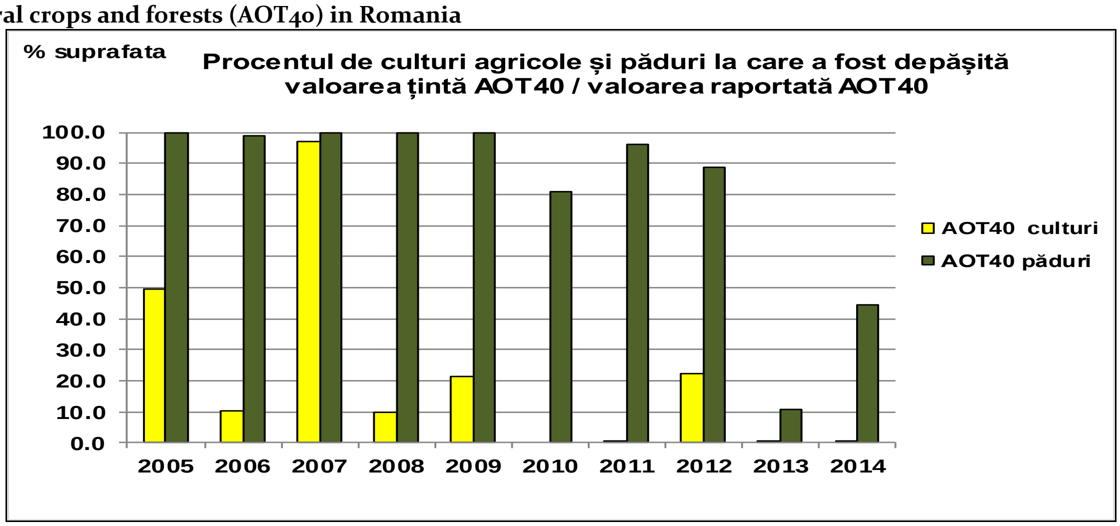


Source: https://www.eea.europa.eu/data-and-maps/daviz/exposure-of-forest-area-to-4#tab-chart_2/

Analyzing the graphs above it is found that most agricultural crops are exposed to ozone concentrations that exceed the long-term objective AOT40 established by the Directive 2008/50 / EC on air quality. Also, a significant part is exposed to levels that exceed the AOT40 target value established by the directive for 2010. In the case of areas covered with forests, the situation is much more unfavorable, both when exceeding the long-term objective AOT40 and exceeding the target value AOT40.

Regarding Romania, it is located in an intermediate area compared to other EU countries, both in agricultural crops and forests, especially in recent years, as can be seen in figures I.9 and I.10.

Figure I.10 Evolution of the percentage of surfaces exposed to ozone concentrations above the target value for agricultural crops and forests (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 surfaces exposed to ozone concentrations above the target value for the ecosystems agricultural crops and forests (AOT40). It is noted that until 2012 the forest areas exposed to ozone concentrations higher than the target value AOT40 remained approximately in the same interval for the entire analyzed period, but since 2013 their percentage has decreased considerably (<50%). In agricultural crops, in 2010, 2011, 2013, 2014 the percentage of the surfaces exposed to ozone concentrations higher than the target value of AOT40 was insignificant.

I.1.2.3. Effects of ambient air pollution on soil and vegetation

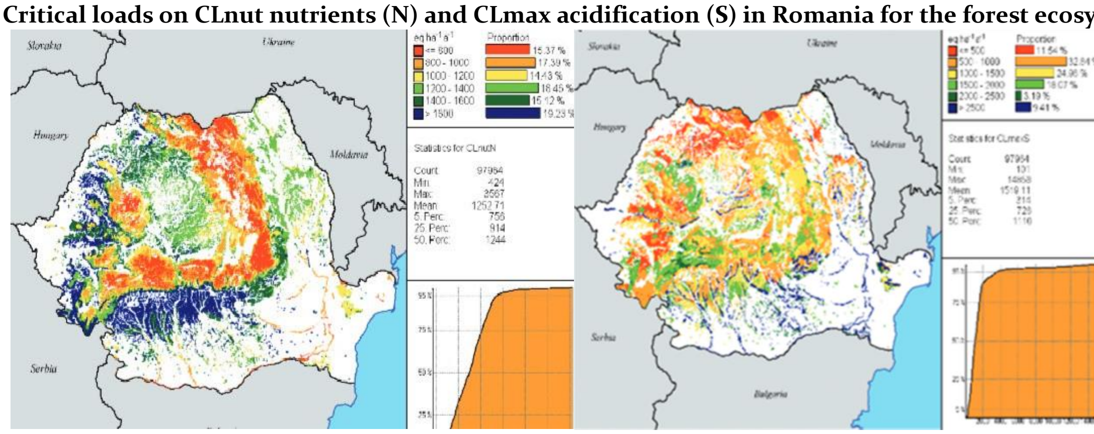
The pollutants emitted in the atmosphere are subjected to dilution and sedimentation processes, conditioned by their properties and by the conditions of the atmospheric environment in which they enter. Suspensions have lower stability in the atmosphere than gases and have a lower diffusion capacity, inversely proportional to their mass and size, thus having a lower capacity to dilute in air relative to gases, instead sedimenting more easily. The main effects of ambient air pollution on soil and vegetation are eutrophication (generated by nitrogen compounds from the atmosphere through sedimentation and precipitation deposition) and acidification (generated by acid rain, which have the source of acid gases: CO_2, SO_2, NOx).

Exposure of ecosystems to eutrophication and acidification

The critical acidity threshold is expressed in acidification equivalents (H +) per hectare per year (eq H + .ha-1.an-1).

The critical eutrophication threshold is expressed in eutrophication equivalents (N) per hectare and year (eq N.ha-1.a-1).

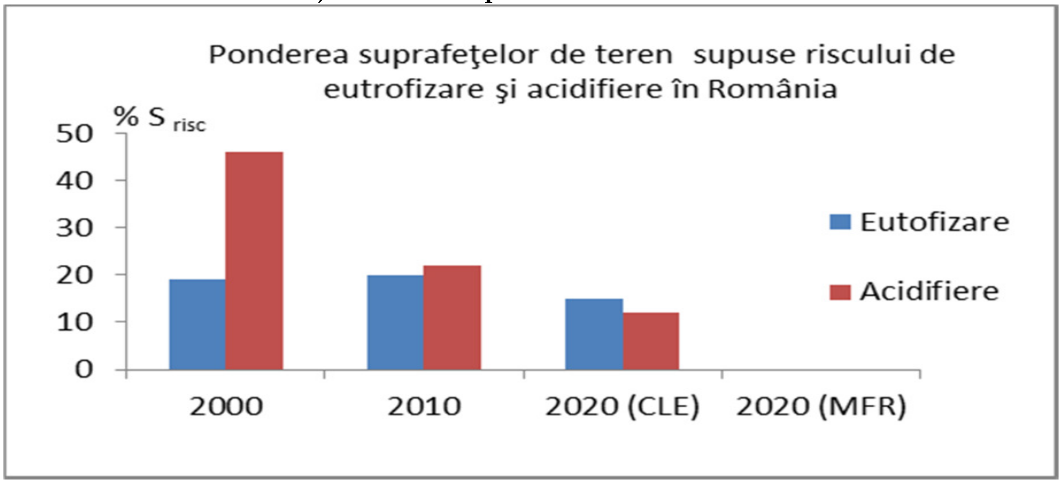
Figura I.11 Critical loads on CLnut nutrients (N) and CLmax acidification (S) in Romania for the forest ecosystem



Source: http://www.rivm.nl/thema/images/CCE08_Country_Romania_tcm61-41923.pdf

The figure below shows the land areas exposed to eutrophication and acidification in Romania according to scenarios based on the environmental legislation in force (CLE) and with maximum possible additional reduction measures (MFR).

Figure I.12 The situation of the lands subjected to eutrophication and acidification in Romania



Source: Coordination Centre for Effects the Data Centre for the Modelling and Mapping of Critical Levels and Loads and Air Pollution Effects, Risks and Trends

Data are presented in graphical form that highlight the share of the land surfaces exposed to eutrophication and acidification in Romania. From the graphical analysis we can see a tendency to decrease both types of risks, regardless of the measures taken into account.

I.2. DETERMINING FACTORS AND PRESSURES THAT AFFECT THE ENVIRONMENTAL AIR QUALITY STATE

I.2.1. EMISSIONS OF ATMOSPHERIC POLLUTANTS AND MAIN SOURCES OF EMISSION

The level of emissions of pollutants released into the atmosphere can be significantly reduced by implementing environmental policies and strategies such as:

- greater use of renewable energy sources (wind, solar, hydro, geothermal, biomass);
- replacement of conventional fuels with alternative fuels (biodiesel, ethanol);
- the use of high energy efficient installations and equipment (low consumption, high efficiency);
- implementation of a program of afforestation and creation of green spaces (CO_2 absorption, retention of fine powders, release of oxygen into the atmosphere).

Three groups of measures have been identified to reduce atmospheric pollutant emissions, namely:

- *Autonomous* measures that represent changes arising from human activities (for example, lifestyle changes), stimulated by control and control approaches (for example, legal restrictions on movement) or by economic incentives (for example, pollution taxes, pollution control systems, emissions trading, etc.).
- *Structural measures* that supply the same level of (energy) services to the consumer, but with less polluting activities. This group includes replacing fuels (for example, switching from coal to natural gas) and improving energy efficiency / energy conservation.
- *Technical measures* developed to capture emissions at source before entering the atmosphere, emission reductions achieved through these options do not change the structure of energy systems or agricultural activities.

The estimation of emissions for each type of atmospheric pollutant is based on indicators, assumptions, and activity data, as well as on the efficiency of elimination of the reduction measures and the degree / size in which these measures are applied.

I.2.1.1. Energy

Final energy consumption by type of sector

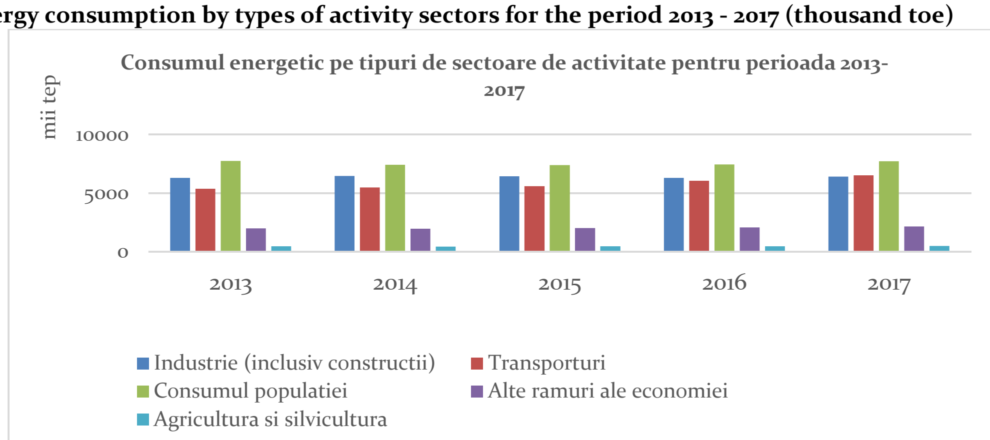
RO 27	Indicator code Romania: RO 27 EEA indicator code: CSI 27

TITLE: FINAL ENERGY CONSUMPTION BY TYPE OF 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 degree of energy dependence at the sector level is performed by summing the amounts of energy used on activity branches according to the energy balance. The quantities used for the production of other fuels, the consumption of the energy sector and the losses of transport and distribution are not included.

Synthesis
In 2017, primary energy production increased by 2.5% compared to 2016, and imports of energy products increased by 3.7%; gross domestic energy consumption increased by 5.5% compared to the previous year; final energy consumption increased by 4.3% compared to 2016 (*cf. INSE, Energy balance 2017*).

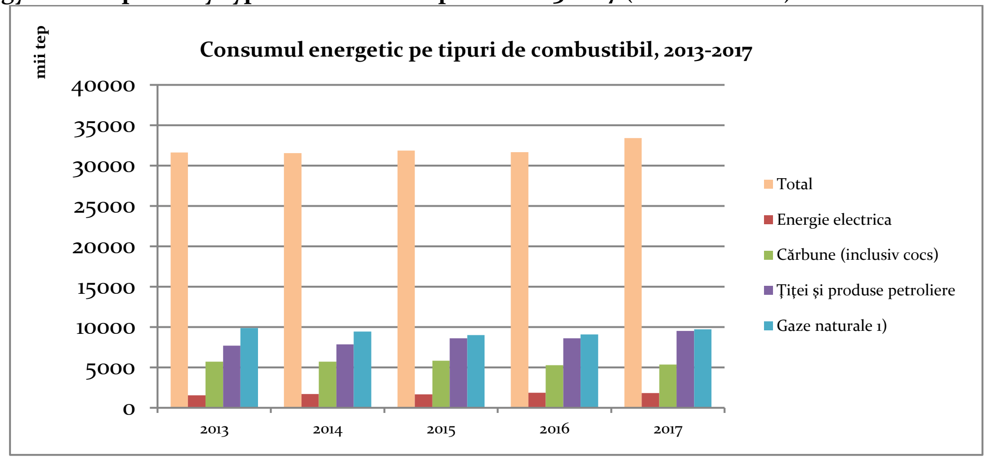
Figure I.13 Energy consumption by types of activity sectors for the period 2013 - 2017 (thousand toe)



Source: http://www.insse.ro/

In figure I.13 regarding the energy consumption by types of activity sectors between 2013-2017 it is observed that the highest share is held by the energy consumption in the residential sector, followed by the industrial activities and the transport activities.. **The final energy consumption** in 2017 increased by 952 thousand toe (+ 4.3%) compared to 2016. The final energy consumption in the industry (including construction) increased by 106 thousand toe (+ 1.7%), mainly due to the large industrial sectors consuming energy resources, such as the chemical and pharmaceutical industry, rubber and plastics products (+57 thousand toe) and the metal construction industry, machinery and equipment (+47 thousand toe), whose cumulative energy consumption represents 30.5% of final consumption in industry (including construction). In metallurgy, the final energy consumption decreased (-48 thousand toe, representing -2.8%) compared to last year.
Transport, the tertiary sector and the population also registered increases in energy consumption compared to the previous year (+ 7.6%, + 4.0%, respectively + 3.6%) and, with a cumulative weight of 70.4%, they contributed significantly to the increase of final energy consumption in 2017.

Figure I.14 Energy consumption by type of fuel for the period 2013-2017 (thousand toe)

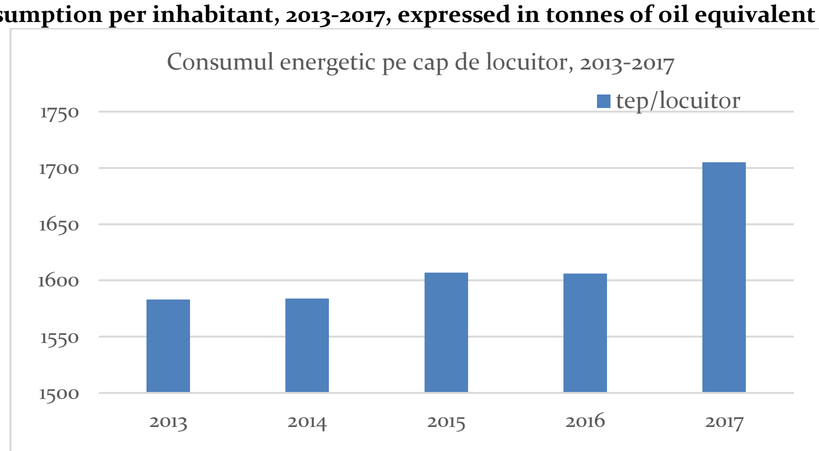


1) Excluding gasoline and ethane from extraction scaffolds that are contained in crude oil.

Source: http://www.insse.ro

In figure I.14, regarding the energy consumption by types of fuel, it is observed that the highest weight corresponds to the values related to natural gas for the entire analyzed period, followed by the one related to the consumption of crude oil and petroleum products. Gross domestic consumption (including losses) increased slightly in 2017, compared to 2016, with 1753 thousand toe, representing + 5.5%. By types of energy carriers, gross domestic consumption of crude oil and petroleum products (+940 thousand toe), natural gas (+618 thousand toe) and coal (including cocs) increased by +104 thousand toe. Electricity consumption remained relatively constant compared to last year (according to data published by the National Institute of Statistics - INS). **Gross domestic energy consumption** per inhabitant in 2017 was 1705 toe / place, + 6.1%, compared to 2016 (1606 toe / place.) The trend of gross domestic energy consumption per inhabitant in 2013-2017 is shown in figure I.15, where there is an increase from 1583 toe / place in 2013, to 1705 toe / place in 2017, + 7.7%.

Figure I.15 Energy consumption per inhabitant, 2013-2017, expressed in tonnes of oil equivalent (toe / inhabitant)



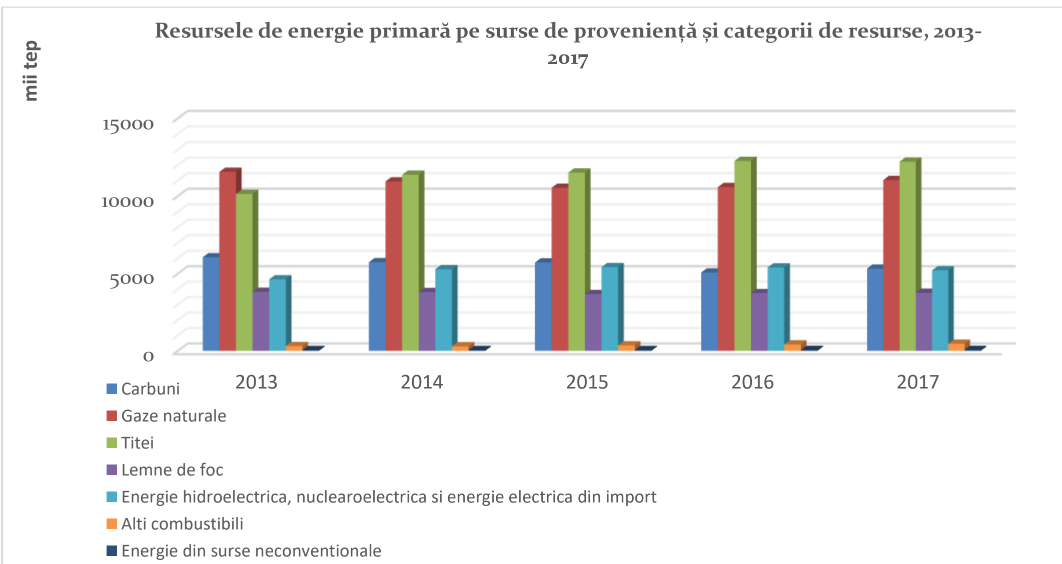
Source: http://www.insse.ro/

Resources and primary energy consumption by type of fuel

RO 29	Indicator code Romania: RO 29 EEA 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.	

The primary energy resources in 2017 were 41821 thousand tons of oil equivalent, increasing by 907 thousand toe (+ 2.2%) compared to the previous year. Figure I.16 shows the evolution of primary energy resources from the following types of fuels: coal, natural gas, crude oil, firewood (including biomass), other fuels, energy, energy from unconventional sources. The majority share of primary energy production from crude oil and natural gas is observed.

Figure I.16 Primary energy resources by source and category of resources, 2013-2017, (thousands tep)

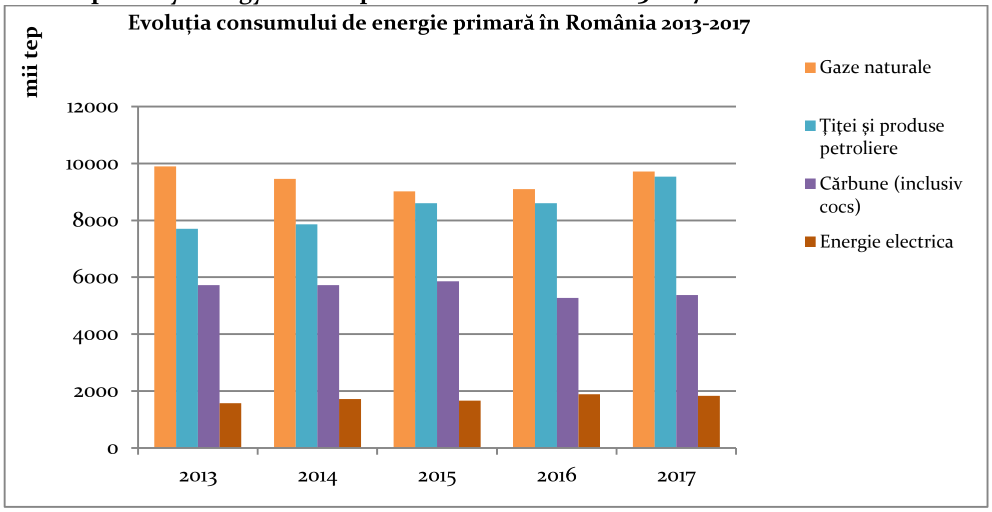


Source: http://www.insse.ro/ (TEMPO_IND107A_14_8_2018)

The primary energy production in 2017, of 25,417 thousand toe, increased by 619 thousand toe as compared to 2016 and continued to maintain its significant share in the total energy resources, accounting for 58.6% of them. The most significant increase was the production of usable natural gas (+746 thousand toe), representing + 9.5% compared to the previous year. Primary electricity production decreased by 10.5% compared to the previous year (-243 thousand toe). A downward trend also registered oil production (-166 thousand toe, representing -4.5%). *National Institute of Statistics.*

The total domestic primary energy consumption was 33391 thousand toe in 2017, up 5.5% compared to 2016.

Figure I.17 Evolution of primary energy consumption in Romania for 2013-2017



Source: http://www.insse.ro/

Given the current challenge of ensuring energy resources and the need to reduce CO2 emissions, as well as the protection of the environment, investments in energy efficiency and renewable energy, recovery of secondary energy resources and combating energy poverty is a strategic priority for Romania.

Emissions of acidifying substances

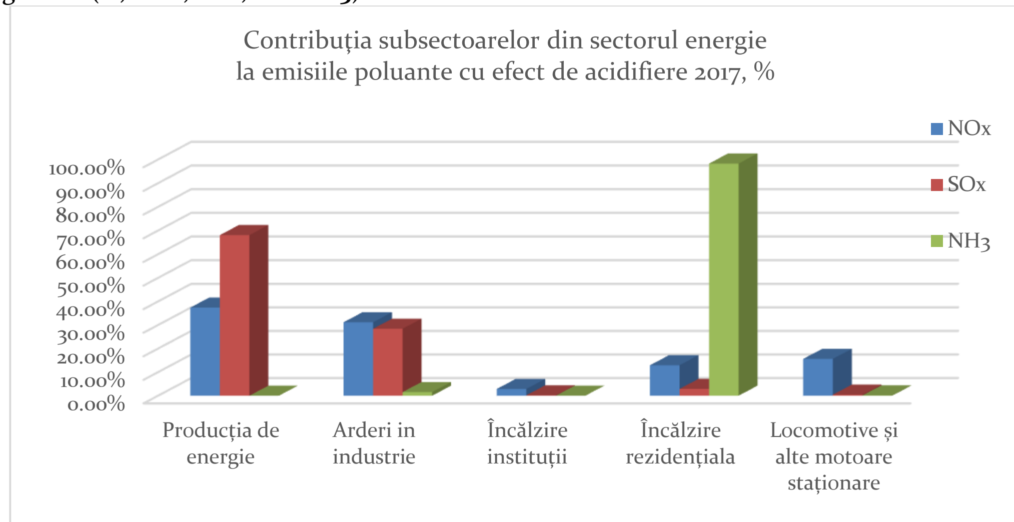
RO 01	Indicator code Romania: RO 01 EEA indicator code: CSI 01

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES

DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NO_x), ammonia (NH_3) and sulfur oxides (SO_x, SO_2), 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 (NO_X), ammonia (NH_3) and sulfur oxides (SO_X, SO_2) is graphically plotted.

Figure I.18 Contributions of the activity subsectors of the energy sector, in 2017, to the emissions of polluting substances with acidifying effect (%, NOx, SOx, and HN3)



Source : Romania's Informative Inventory Report 2019

From the analysis of the data regarding the contribution of the energy sector to the polluting emissions with acidification effect at national level for the reporting period, we observe a 98.3% share of the ammonia resulting from the institutional heating activity and high values of SO2 and NOx weights in the activity of energy production and combustion in industry (Figure I.18).

Ozone precursor emissions

RO 02	Indicator code Romania: RO 02 EEA 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 (CH_4) 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.

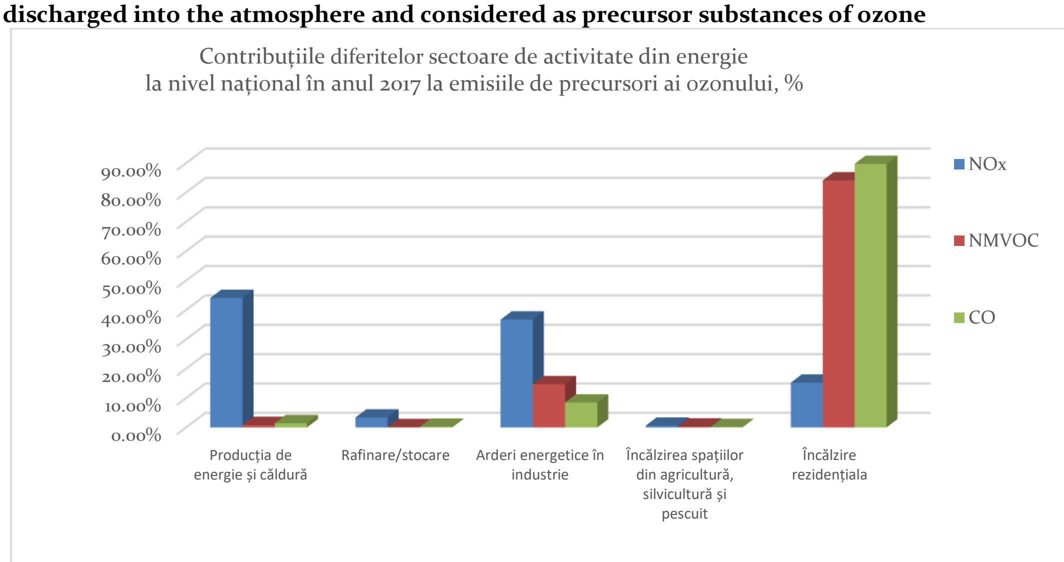
It is responsible for damage to vegetation by atrophy of some tree species in urban areas. During spring and summer, when the daylight range is high, atmospheric photochemical reactions are accelerated, resulting in increased ozone concentrations, especially during very hot days (temperatures above 30 ° 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 I.19 Contributions of the subsectors of activity from the energy sector, in 2017, to the emissions of polluting substances discharged into the atmosphere and considered as precursor substances of ozone



Source : Romania's Informative Inventory Report 2019

Analyzing the situation regarding the contribution of the energy sector to the pollutant emissions with ozone precursors for the reporting period, we find a share of about 90% of the NMVOC and CO pollutants in the residential heating activity and of the NOx pollutant from the energy production activities and heat and energy combustion in industry.

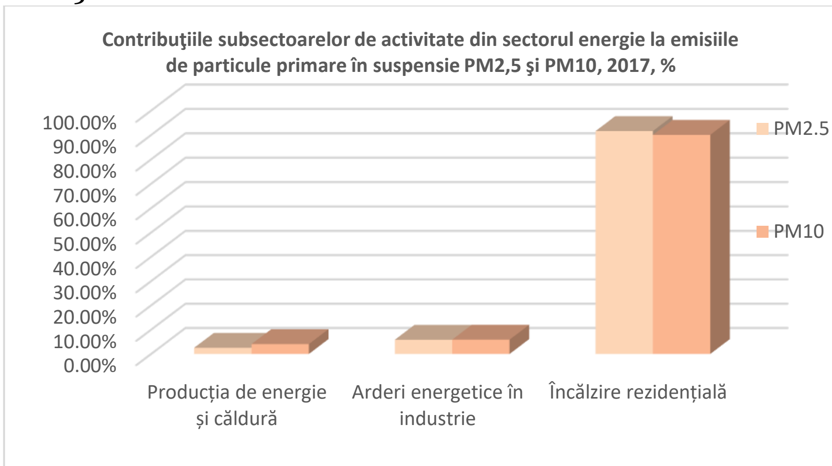
Emissions of primary particles in suspenstion

RO 03	Indicator code Romania: RO 03 EEA 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 (NH_3) and Sulfur dioxide (SO_2), 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 (PM2.5) and 10µm (PM10), derived from anthropogenic sources, by types of activity sectors is presented graphically.

Figura I.20 Contributions of the subsectors of activity from the energy sector, in 2017, to the emissions of primary particles in suspension PM2.5 and PM10



Source : Romania's Informative Inventory Report 2019

From the analysis of the graph above it is found that the main share of the energy sector in the emission of primary particles in suspension PM2.5 and PM10 is held by the residential heating with about 90% of the total. (Figure I.20).

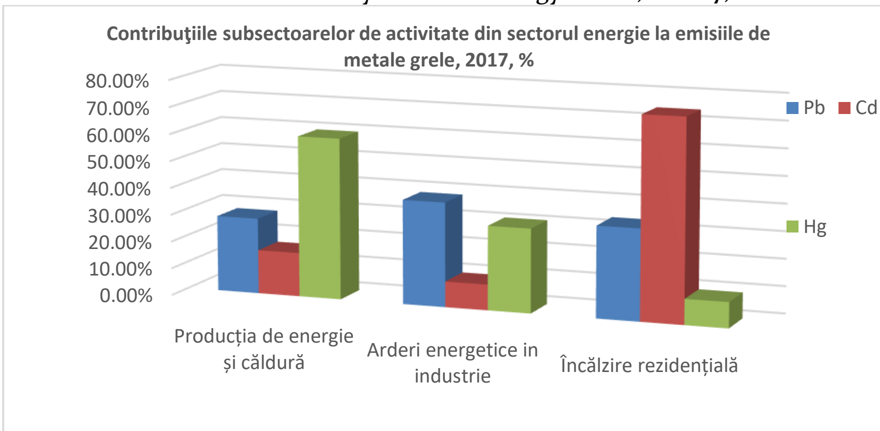
Heavy metal emissions

RO 38	Indicator code Romania: RO 38 EEA indicator code: EPA 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.21).

Figure I.21 Contributions of the subsectors of activity from the energy sector, in 2017, to the emissions of heavy metals



Source : Romania's Informative Inventory Report 2019

From the analysis of the situation regarding the contribution of the energy sector to heavy metal emissions for the reporting period, we find a significant share of mercury emissions from the energy and heat production subsector and the major share of cadmium emissions from the residential heating subsector, the share of emissions of Pb being present in all sectors, with an average of 33%.

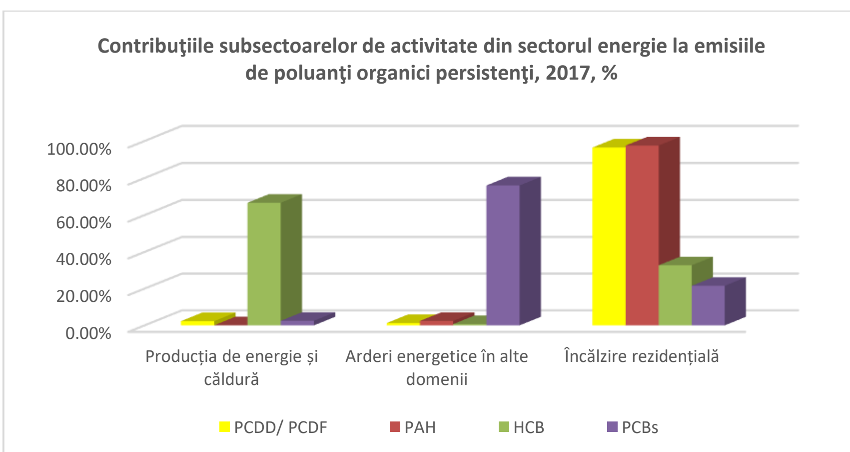
Emissions of persistent organic pollutants

RO 39	Indicator code Romania: RO 39 EEA indicator code: EPA 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, of polycyclic aromatic hydrocarbons (PAHs), by activity sectors is presented graphically (Figure I.22).

Figure I.22 Contributions of the subsectors of activity in the energy sector, in 2017, to the emissions of persistent organic pollutants



Source : Romania's Informative Inventory Report 2019

From the analysis of the data presented regarding the contribution of the energy sector to the emissions of persistent organic pollutants, it is observed that the largest share is the residential heating activity subsector, where over 90% percentages are observed for PCDD / PCDF dibenzofurans and PAH flavored hydrocarbons.

I.2.1.2. Industry

Emissions of acidifying substances

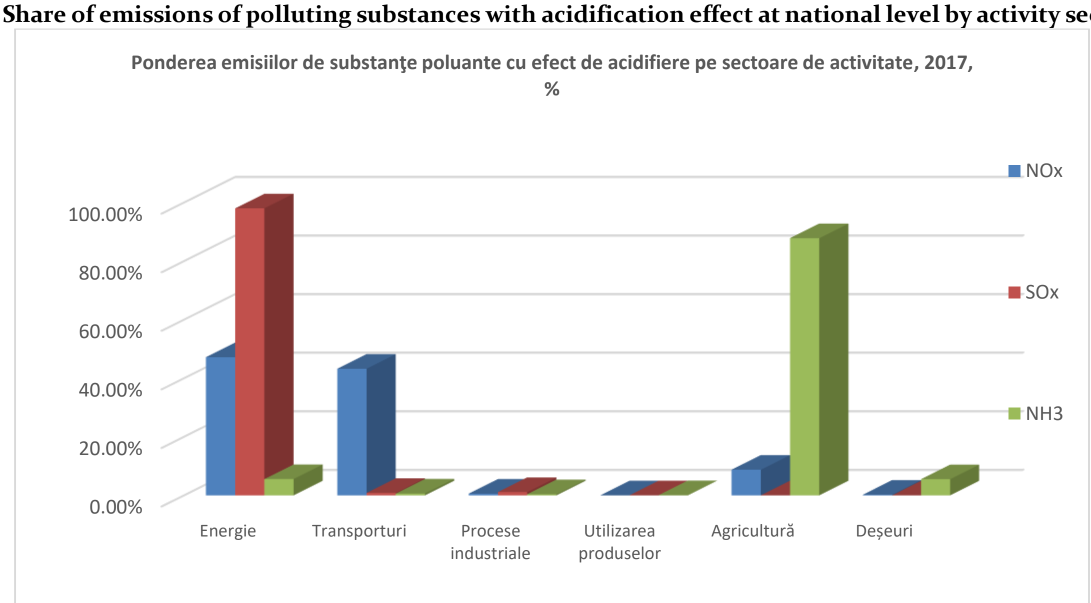
RO 01	Indicator code Romania: RO 01 EEA indicator code: CSI 01

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.23).

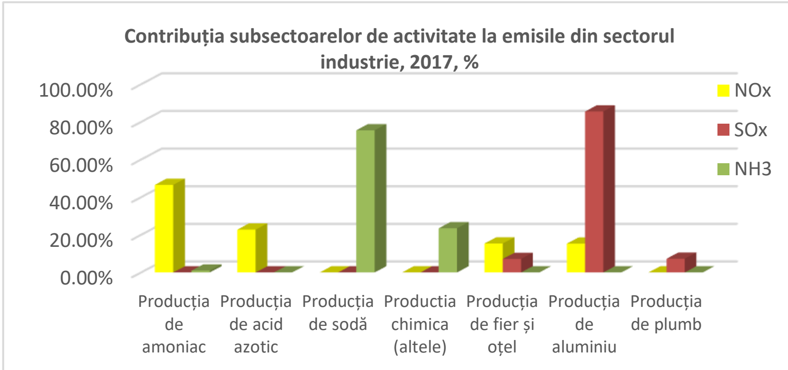
Figure I.23 Share of emissions of polluting substances with acidification effect at national level by activity sectors in 2017



Source: Romania's Informative Inventory Report 2019

It is found that at national level the acidification effect comes predominantly from the energy sector for sulfur oxides, from energy and transport for nitrogen oxides and from agriculture for ammonia. The "energy" sector also includes fuel burns related to industrial processes.

Figure I.24 The contribution of the subsectors of activity in 2017, to the polluting emissions with acidifying effect (NOx, SOx and NH3), from the industry sector.

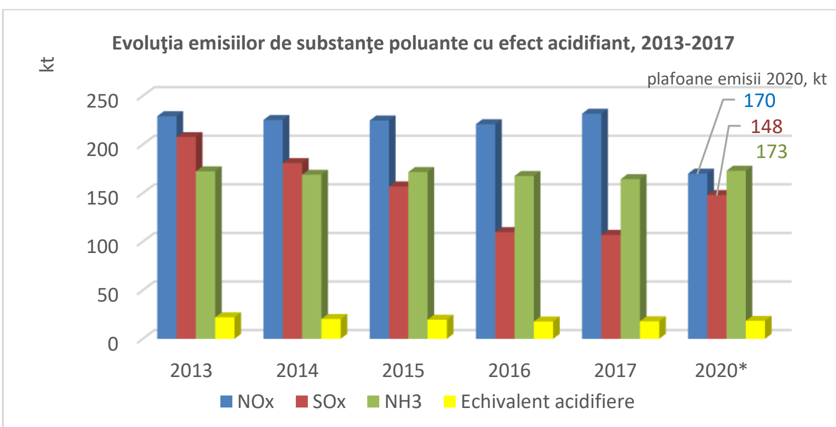


Source: Romania's Informative Inventory Report 2019

In the industrial sector, we note the activities of aluminum production with SOx emissions (85% of the total emission by industry), the production of soda by the emissions of NH3 (75% of the total emission by industry) and the production of ammonia with the emissions of NOx (46% of total emission by industry). For NOx emissions, the activities of production of nitric acid, iron and steel production, respectively aluminum production are noted.

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

Figure I.25 Evolution of emissions of pollutants with acidifying effect at national level between 2013-2017 and target for 2020



*Note : * Target emission ceilings for 2020, according to the revised Gothenburg Protocol 2010*

Taking into account the ceilings for 2010 and the provisions of the revised Gothenburg Protocol on reducing emissions of atmospheric pollutants, commitments to be met by 2020, it is observed that the evolution of emissions of acidifying pollutants at national level throughout the period analyzed follows a downward trend.

The acid equivalent is a parameter for evaluating the total amount of acidifying substances emitted into the atmosphere. These substances contribute to the acidification of the soil, air and aquatic environment. The acid equivalent is based on the potential for fixation of 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 coefficients: *0.0217 for NOx, 0.0313 for SO2 and 0.0588 for NH3*.

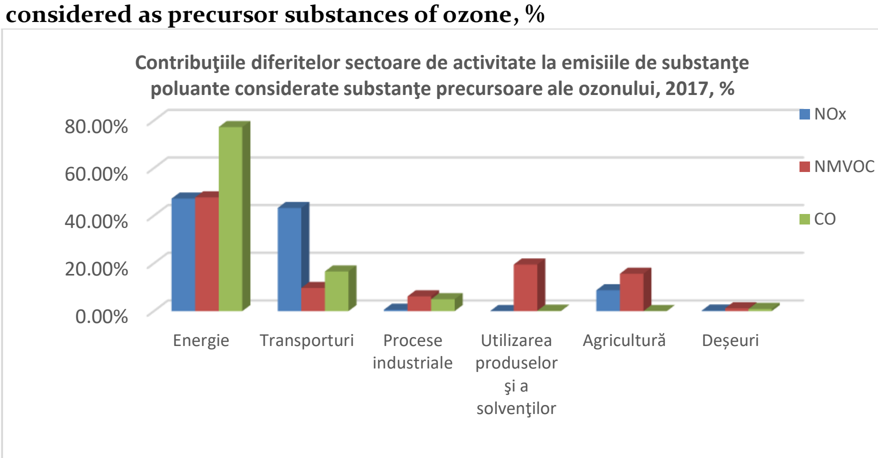
Ozone precursor emissions

RO 02	Indicator code Romania: RO 02 EEA 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 (CH_4) 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 polluting substances released into the atmosphere and considered as ozone precursor substances (NMVOC, NOX and CO) at national level by activity sectors in 2017 are presented in graphical form in figure I.26.

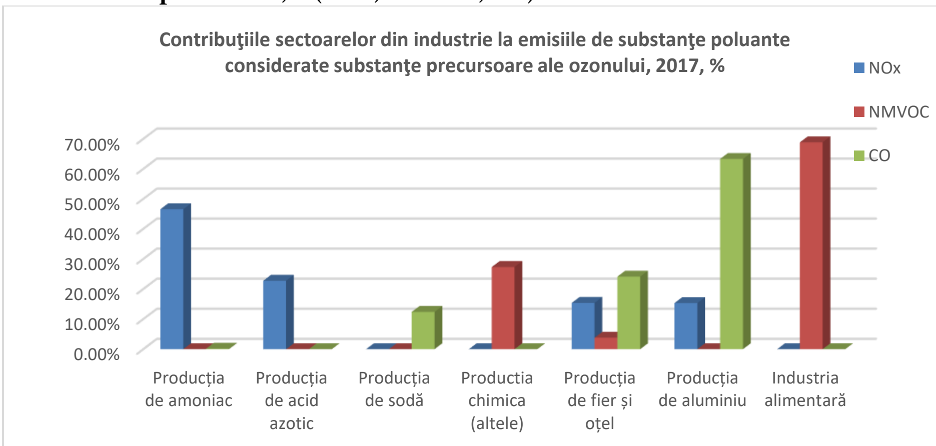
Figure I.26 Contributions of the activity sectors at national level, in 2017 to the emissions of pollutants discharged into the atmosphere and considered as precursor substances of ozone, %



Source: Romania's Informative Inventory Report 2019

The data presented graphically show that the energy sector contributes significantly to the emissions of ozone precursor pollutants at national level, followed by the transport sector. Agriculture and the use of products and solvents sectors significantly contribute to NMVOC emissions.

Figure I.27 The contribution of the activity subsectors in the industry sector, in 2017, to the atmospheric pollutant emissions considered as ozone precursors,% (NOx, NMVOC, CO)



Source: Romania's Informative Inventory Report 2019

From the analysis of the data presented regarding the contribution of the different sectors of activity to the emissions of ozone precursor pollutants in the industrial sector, it is observed a significant share of the subsectors of activity such as aluminum production with high values of CO emissions, production of nitric acid and ammonia with significant values NOx emissions and the food industry which presents the highest values NMVOC emissions.

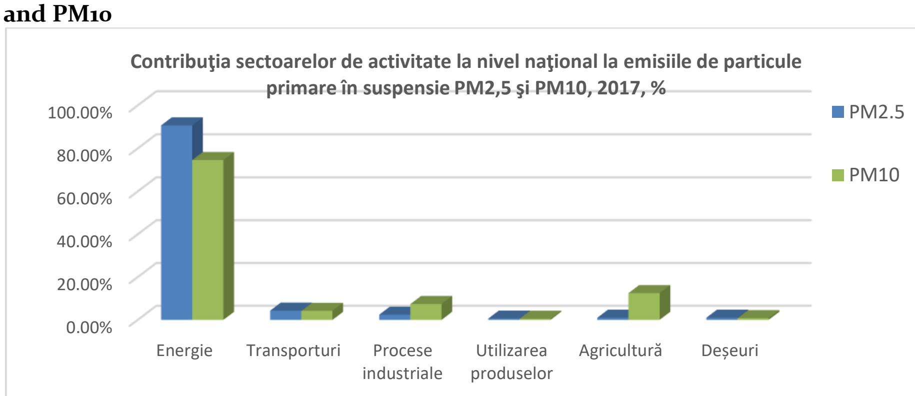
Primary particle emissions and secondary particle precursors

RO 03	Indicator code Romania: RO 03 EEA 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 (NH_3) and Sulfur dioxide (SO_2), 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 shares of the sectors of activity for the emissions of primary particles in suspension PM2.5 and PM10 are presented graphically, at national level, in 2017 (figure I.28).

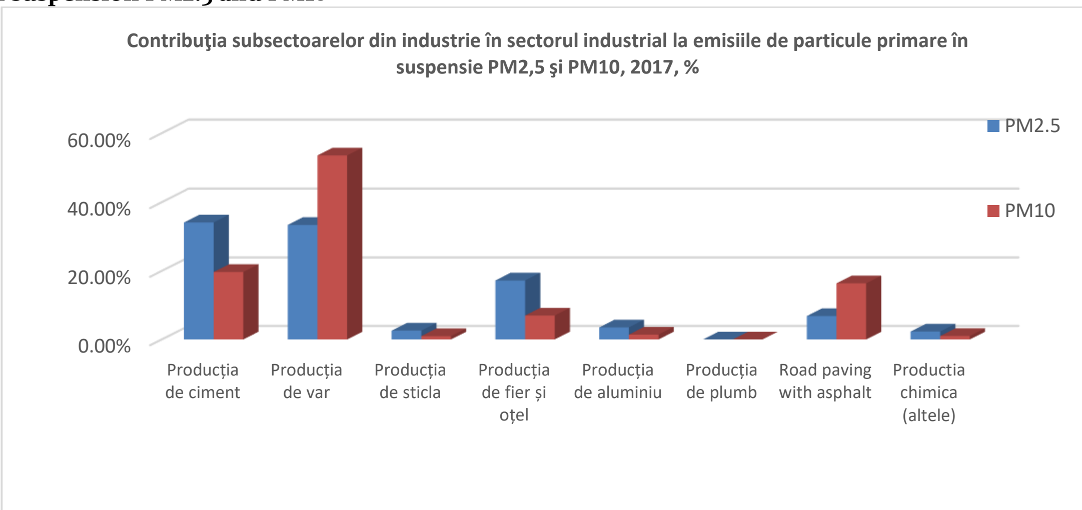
Figure I.28 Contribution of the activity sectors at national level in 2016, to the emissions of primary particles in suspension PM2.5 and PM10



Source : LRTAP-RO- 2019

By comparing the values presented for different sectors of activity at national level, it is found that the share of the energy sector is the highest at the emissions of primary particles in suspension (90.7% PM2.5, respectively 74.6% PM10), mostly in this sector being the emissions of powders generated in the activity of residential heating. With much lower shares the sectors of agriculture and industrial processes in PM10 emissions are highlighted (12.5% and 7.4% respectively).

Figure I.29 The contribution of the activity subsectors from the industry sector, in 2017, to the emissions of primary particles in suspension PM2.5 and PM10



Source: LRTAP-RO- 2019

From the analysis of the data presented regarding the contribution of the subsectors of activity in the industry to the emissions of primary particles in suspension PM2.5 and PM10 in the industrial sector, it is found that the subsectors of lime and cement production have the highest shares, compared to the other activities.

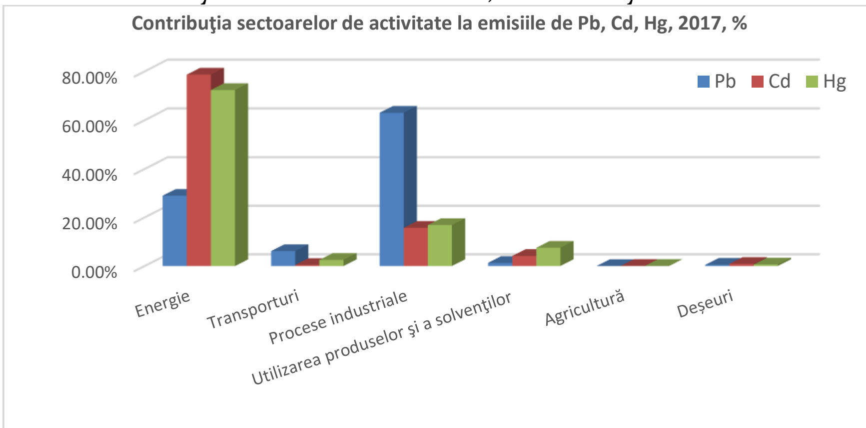
Heavy metal emissions

RO 38	Indicator code Romania: RO 38 EEA indicator code: EPA 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 contributions of the sectors of activity, to the emissions of heavy metals (Cd, Hg, Pb), at national level, in 2017, are presented in the figure I.30.

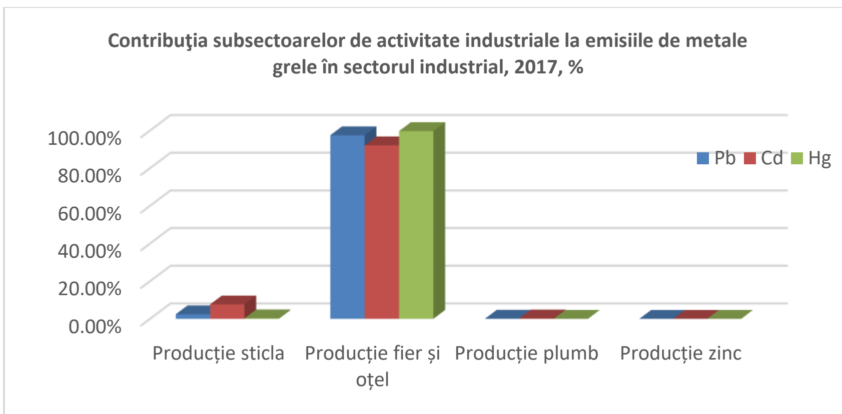
Figure I.30 Contribution of the activity sectors at national level, to the heavy metals emissions Pb, Cd, Hg, 2017



Source: LRTAP-RO- 2019

From the analysis of the presented data, it is found that the sectors of industry and energy have the highest shares at national level, compared to the other activities, in the heavy metal emissions Pb, Cd, Hg.

Figure I.31 Contribution of the activity subsectors from the industry sector to the emissions of heavy metals, Pb, Cd, Hg, 2017



Source: LRTAP-RO- 2019

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

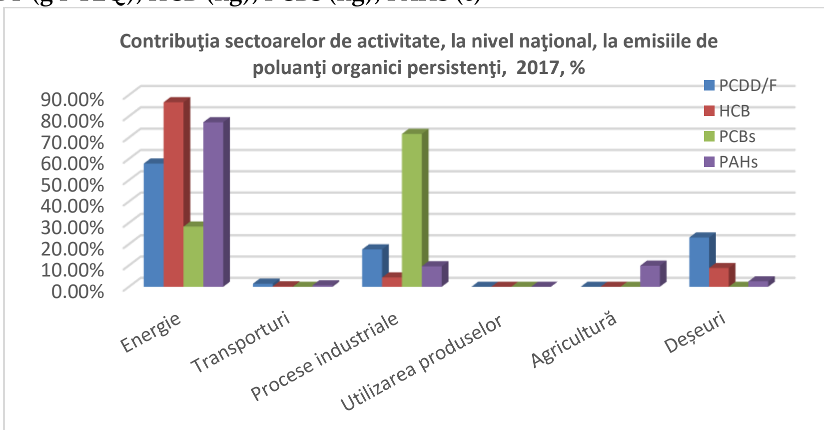
EMISSIONS OF PERSISTENT ORGANIC POLLUTANTS

RO 39	Indicator code Romania: RO 39 EEA indicator code: EPA 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 contributions of persistent organic pollutants-POP (hexachlorobenzene-HCB, polychlorinated biphenyls-PCBs, dioxin-PCDD, furans-PCDF and polycyclic aromatic hydrocarbons-PAHs), by activity sectors at national level, in 2017, are presented in graphical form in the figure I.32.

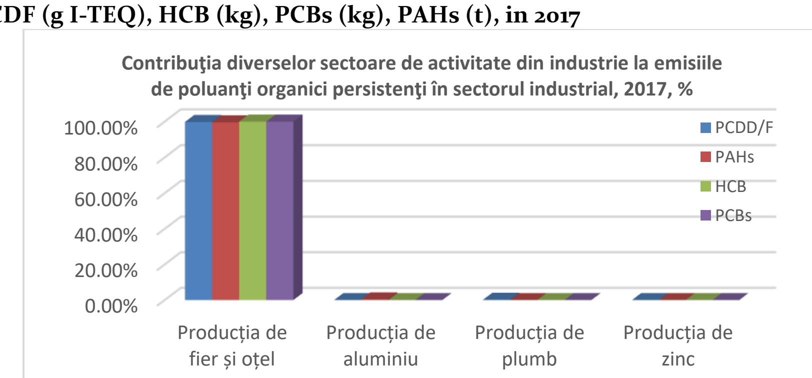
Figure I.32 Contribution of the sectors of activity at national level in 2017, to the emissions of persistent organic pollutants PCDD / PCDF (g I-TEQ), HCB (kg), PCBs (kg), PAHs (t)



Source: LRTAP-RO-2019

It is noted that two sectors of activity at national level make a decisive contribution to the emissions of persistent organic pollutants, these being the energy sector with emissions of hexachlorobenzene, polycyclic aromatic hydrocarbons, dioxins and furans and the industrial sector with polychlorinated biphenyls, in particular. The waste sector contributes with dioxin and furan emissions in much smaller percentages, compared to the two major sectors.

Figure I.33 Contribution of the activity subsectors in the industry sector, to the emissions of persistent organic pollutants, PCDD / PCDF (g I-TEQ), HCB (kg), PCBs (kg), PAHs (t), in 2017



Source: LRTAP-RO-2019

From the graph above it is observed that the activity with the maximum weight for all pollutants is the production of iron and steel.

Industrial emissions

Industry

Industrial activities play an important role in the economic well-being of a country, while contributing to sustainable development. However, industrial activities can also have a significant impact on the environment. The industrial strategy of sustainable development aims to stimulate competitiveness, following the stable economic growth, and the protection of the environment. The air emissions generated by the largest industrial plants represent a considerable part of the total emissions of atmospheric pollutants. Also, these industrial activities also have an important impact on the environmental factors of water, soil, in addition to the generation of waste. The possibility of controlling the activity of industrial installations so that the emissions, the resulting waste and the energy consumption are as small as possible, has been subject to the reform of the legislation at the level of the European Union, finally leading to the appearance in 2010 of the Directive 2010/75 / EU on industrial emissions (IED Directive). Directive 2010/75 / EU on industrial emissions (integrated pollution prevention and control) (recast) aims to prevent and control integrated pollution resulting from industrial activities, by establishing the conditions for prevention, and if not possible, for reducing emissions to air, water and soil, as well as preventing waste generation, in order to achieve a high level of environmental protection considered as a whole. It is also important to use energy efficiently, to prevent accidents and incidents and to minimize their consequences. For the prevention, reduction, elimination of pollution from industrial activities, in accordance with the polluter pays principle, the precautionary principle in environmental decision making and the principle of pollution prevention, principles that best overlap with the concept of sustainable development were established by the IED Directive a general framework for the control of industrial activities, ensuring an efficient management of natural resources, giving priority to taking the measures directly at the source and taking into account when necessary the economic situation, the local environmental conditions or the geographical location and the technical characteristics of the installation.

In addition, the IED Directive promotes public access to information, public participation and access to justice in relation to the procedure for issuing the integrated environmental authorization.

Romania, as a Member State of the European Union has implemented at national level, the Register of Pollutants Emitted and Transferred in accordance with the provisions of Regulation (EC) no. 166/2006 of the European Parliament and of the Council on the establishment of the European Register of Emitted and Transferred Pollutants and amending Council Directives 91/689 / EEC and 96/61 / EC (EPRTR Regulation). The EPRTR Regulation establishes a register of pollutant emissions and transfers at Community level (referred to as "European PRTR / EPRTR") in the form of a publicly accessible electronic database and establishes its operating rules, in order to implement the UN-ECE Protocol regarding the pollutant emission and transfer registers and to facilitate public participation in environmental decision-making, as well as to contribute to the prevention and reduction of environmental pollution.

Directive 2010/75 / EU on industrial emissions (IED) replaces the following seven directives, thus incorporating in a single clear and coherent legislative instrument a set of common rules for the authorization and control of industrial installations based on an integrated approach and application of the best available techniques:

- Directive 2008/1 / EC on integrated pollution prevention and control (IPPC);
- Directive 2001/80 / EC on the limitation of atmospheric emissions of certain pollutants from large combustion plants (LCP);
- Directive 2000/76 / EC on waste incineration;
- Directive 1999/13 / EC on the reduction of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations;
- Directive 78/176 / EC on waste in the titanium dioxide industry;
- Directive 82/883 / EC on the surveillance and control modalities of the areas where there are emissions from the titanium dioxide industry;
- Directive 92/112 / EC on the procedures for the harmonization of programs to reduce the pollution caused by waste from the titanium dioxide industry.

Romania transposed the provisions of the IED Directive by Law no. 278/2013 regarding industrial emissions, which entered into force on 01.12.2013. Chapter II of the new directive contains provisions applicable to the activities set out in Annex 1 and which, where appropriate, reach the capacity thresholds set out in that Annex.As regards the activities listed in Annex 1, the provisions of Directive 2010/75 / EU on industrial emissions are based on several principles, namely:

- an integrated approach that takes into account the environmental performance of the entire installation, including emissions to air, water and soil, waste generation, raw materials use, energy efficiency, noise, accident prevention, as well as restoring a satisfactory state of the site in time of closing, in order to ensure a high level of environmental protection considered as a whole;
- the application in the operation of the industrial facilities of the Best Available Techniques (BAT), as well as the establishment of the authorization conditions and the emission limit values (VLE) for pollutants in compliance with the BAT Conclusions (documents adopted by the European

Commission through Implementation Decisions, which contain information on the level of emissions associated with the Best Available Techniques);

- flexibilitate în stabilirea condiţiilor de autorizare de către autorităţile competente pentru protecţia mediului;
- verificarea conformării instalaţiilor industriale prin implementarea unui sistem de inspecţii de mediu şi planuri de inspecţie incluzând verificarea amplasamentului cel puţin o dată la 1 sau 3 ani;
- participarea publicului la procesul decizional de emitere a autorizaţiilor integrate de mediu şi informarea lui cu privire la performanţele de mediu ale instalaţiilor industriale.

The most important categories of industrial activities provided by Annex 1 of the Directive 2010/75 / EU represented in Romania are the following: Thermo-energy industry, Cement industry, Oil and natural gas refining industry, Chemical and petrochemical industry, Metallurgical industry. The main possible environmental factor affected is the air due to the emissions resulting from the preparation of the raw material, the final processing of the products, the transport and storage of the raw material and the auxiliary products. Also, the non-ferrous metallurgy industry has a possible significant impact on the environment through the emission of pollutants into the atmosphere (combustion gases and powders), by the disposal of technological waste water, the storage of waste, etc. The construction materials industry is represented by important units for the production of cement, lime, refractory bricks, etc., activities that determine the generation of large quantities of powders, as well as gas emissions (especially CO_2, SO_2, etc.). The chemical industry is represented by installations for the production of basic organic and inorganic chemicals, chemical fertilizers, plant protection products, basic pharmaceuticals and explosives. These activities are associated with the generation of emissions from the storage of chemicals used as raw materials and products, with potential significant impact on air, soil and groundwater. The food industry holds an important place in the economy of many regions, being represented by installations for the production of food, beverages and milk from raw materials of animal and vegetable origin. This type of activity can have a significant impact on the environment through emissions of pollutants into the atmosphere, emissions of substances from refrigeration installations, by the discharge of technological wastewater with high organic load, the production of solid waste specific to these types of activity. That is why the operators have paid greater attention to the elimination of these problems by the creation of wastewater treatment plants, the purchase of ecological incinerators for animal waste, etc. The intensive breeding of animals is represented by poultry or pig farms, which generate large amounts of pollutants and manure, which can mainly affect the air (through ammonia and other gases that cause olfactory discomfort), soil and water (generally from manure storage and their spread on agricultural land as organic fertilizer). The machine building industry with possible significant impact on the environment through the metallic waste resulting from the series production and the specific pollutants resulting from the organic solvent treatment of the metal surfaces, objects or products manufactured within this industrial branch. The light industry is represented by pre-treatment factories (operations such as washing, bleaching, textile treatment) or dyeing of fibers or textiles, activities that generate waste and waste water.

The number of installations whose activities are subject to the provisions of Chapter II (IPPC) of the FDI, inventoried in 2019 for 2018, had a slightly decreasing trend in 2018 (960 installations) compared to 2017 (979 installations) and the variation in time of the number of these industrial installations is represented graphically below:

Figure I.34 Variation of industrial installations in Annex 1 of Directive 2010/75 / EU, 2006-2018

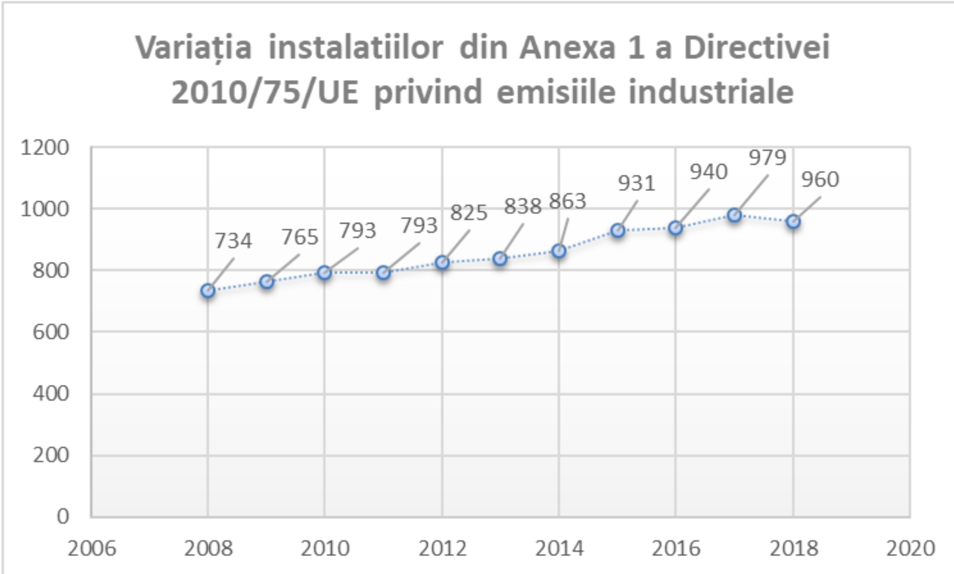
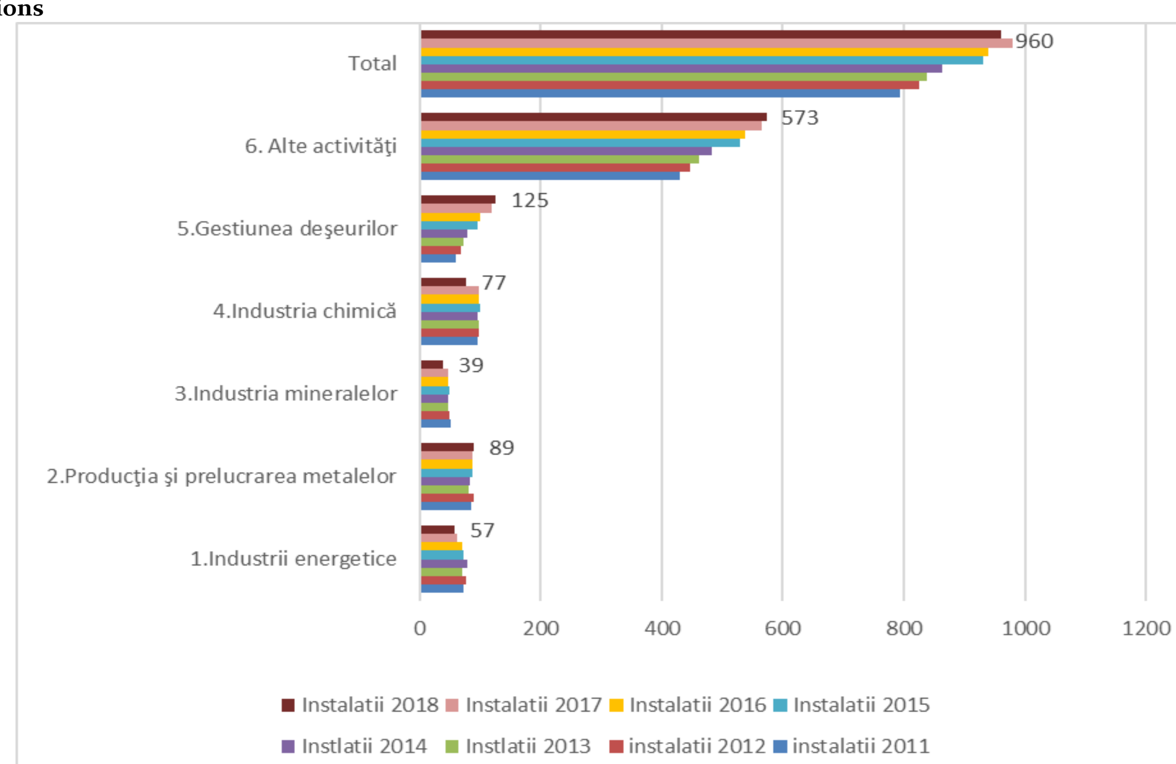
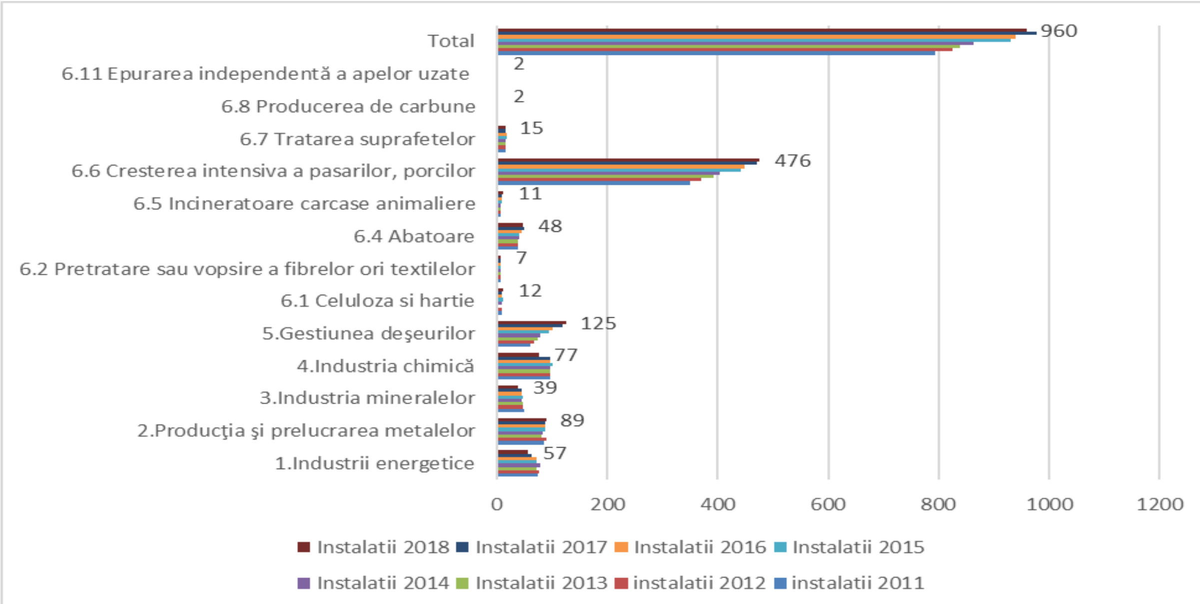


Figure I.35 Industrial activities that comply with the provisions of Chapter II of Directive 2010/75 / EU on industrial emissions



Source: NEPA

Figure I.36 The situation of the authorized installations on industrial sectors at national level



Source: NEPA

Of the total industrial installations, the highest share is represented by the installations in the intensive livestock sector (476 installations).

Chapter III of Directive 2010/75 / EU on industrial emissions (IED)

Chapter III of Law no. 278/2013 regarding industrial emissions presents special provisions for combustion plants whose total nominal thermal power is greater than or equal to 50 MW, regardless of the type of fuel used (solid, liquid or gaseous). The provisions of Chapter III of Law no. 278/2013 regarding industrial emissions applies from January 1, 2016 to the combustion plants authorized before the date of entry into force of the law (01.12.2013) or whose operators have submitted a complete application for authorization before this date, provided that the installations were put into operation at the latest on January 7, 2014.
Integrated environmental permits issued for these combustion plants include less restrictive emission limit values for air emissions. The combustion plants put into operation after January 7, 2014 must comply with much more restrictive emission limit values. Until January 1, 2016 for the existing large combustion plants (IMA) (with a nominal thermal power greater than 50 MW), have been applied the provisions of Directive 2001/80 / EC (LCP), which refers to the limitation of the air emissions of certain pollutants, from large combustion plants: mainly CO_2, SO_2, NOx and powders, from the energy industry. Directive 2001/80 / EC (LCP) regarding the limitation of emissions into the atmosphere of certain pollutants from large combustion plants was transposed into the Romanian legislation by HG 541/2003 regarding the establishment of measures for limiting the air emissions of certain pollutants originating. from large combustion plants which was repealed by HG 440/2010. Starting with 1.01.2016 the latter was repealed by Law no. 278/2013 regarding industrial emissions. Most large combustion plants are part of Chapter 2. Energy industries - activity no. 1.1 - Combustion of fuels in plants with a total nominal thermal power equal to or greater than 50 MW in Annex 1 of Law no. 278/2013 on industrial emissions.
From the total of 184 combustion plants - 32 combustion plants benefit according to art. 32 derogation from the derogation from observing the emission limit values provided for in art. 30 para. (3) and of the desulphurisation rates provided for in art. 31,on the condition that the emission limit values for sulfur dioxide, nitrogen oxides and powders applicable on 31.12.2015 and the individual emission ceilings re respected, during the period 01.01.2016-30.06.2020, 22 combustion plants benefit according to art. 33 of Law no. 278/2013 from the derogation from observing the emission limit values provided for in art. 30 par. (3) and of the desulphurisation rates provided for in art.

31, (they have the right to operate within 17500 hours during the period 01.01.2016- 31.12.2023), 8 combustion plants benefit according to art. 35, from the derogation from observing the emission limit values stipulated in art. 30 paragraph (3) and (4) and the desulphurisation rates provided for in article 31, provided that at least 50% of the useful production of thermal energy, as a moving average over a period of 5 years, is distributed in the form of steam or water heating to a public network for urban heating, between 01.01.2016 - 31.12.2022.

The main purpose of Chapter III Special provisions for combustion plants in Directive 2010/75 / EU on industrial emissions is the reduction of pollutants resulting from large combustion plants, especially the emissions of sulfur dioxide and nitrogen oxides which have acidifying effect on the environment. The energy sector contributes to air pollution with significant amounts of sulfur dioxide, carbon monoxide, carbon dioxide, nitrogen oxides and powders. Reducing the impact of energy systems on the environment is achieved by: rehabilitating and modernizing large combustion plants, changing the used fuel. The reduction of SOx emissions in the energy sector is mainly achieved by abandoning the use of high sulfur fuels (coal or fuel oil) and the use of low sulfur fuels (natural gas). Energy is essential for economic and social well-being, however, energy production and consumption exert considerable pressure on the environment, such as contributing to climate change, deteriorating the environment and producing adverse effects on human health.

In 2017, 71 combustion plants were operated at national level. The main fuels used in these plants are: natural gas, fuel oil, lignite and coal, but in a small number of plants biomass, oil coke and refinery gas are also used.

The emissions of specific pollutants from the combustion plants registered in 2017 are as follows:

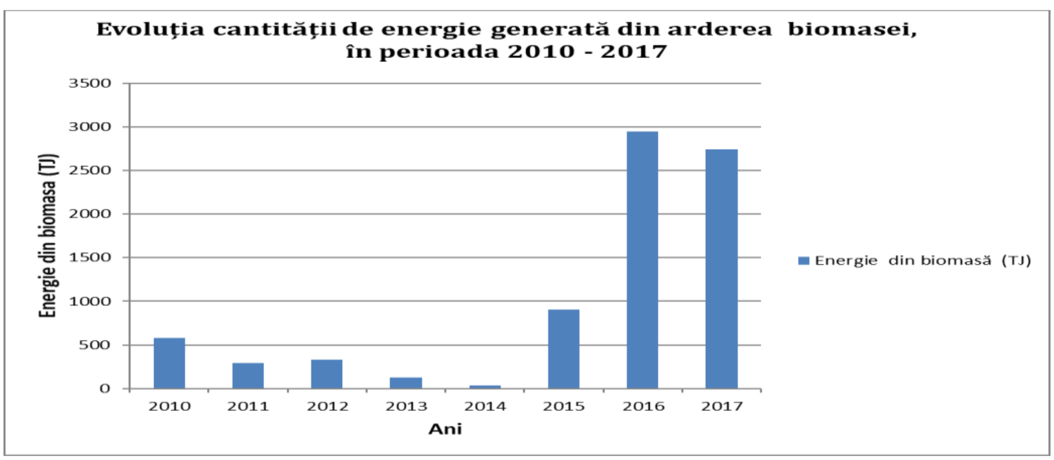
- 43657,776 t sulphur dioxide;
- 28699,962 t nitrogen oxides;
- 3066,324 t powders.

Below is the evolution of the energy generated from combustion of fuels and emissions of SO2, NOx and powders from large combustion plants, from 2010 to 2017.

Table I.1 Evolution of the amount of energy generated from the burning of biomass expressed in TJ, during the period 2010 – 2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Energy from biomass (TJ)	582,45	294,94	330,91	128,00	38,91	907,396	2944,463	2744,66

Figure I.37 Evolution of the amount of energy generated from the burning of biomass expressed in TJ, during the period 2010 –2017

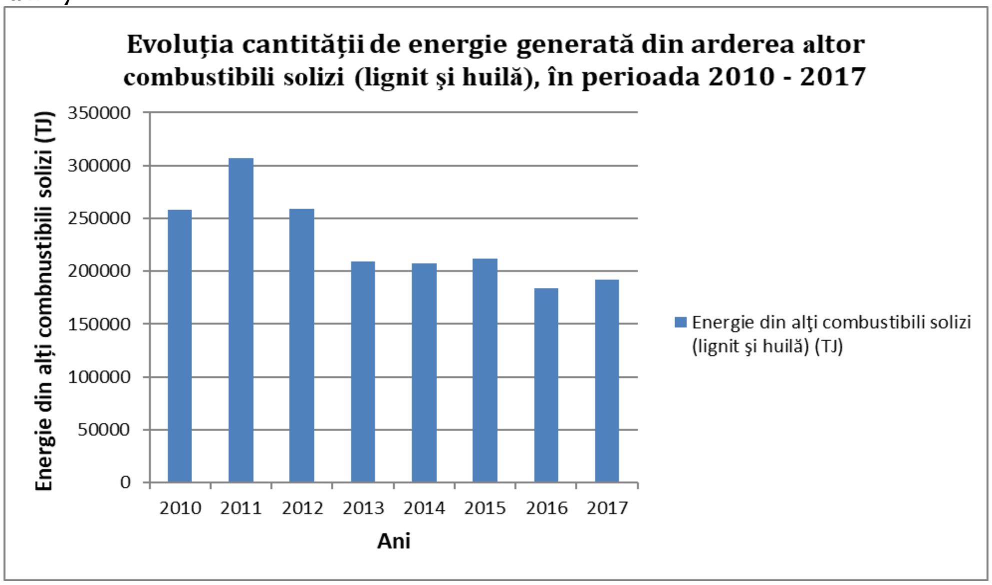


Source: NEPA

Table I.2 Evolution of the amount of energy generated from the combustion of other solid fuels (lignite and oil), between 2010 and 2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Energy from other solid fuels (lignite and oil) (TJ)	257997,20	306876,56	258902,12	208891,93	207672,78	211619,419	183880,389	192209, 76

Figure I.38 Evolution of the amount of energy generated from the combustion of other solid fuels (lignite and oil), between 2010 and 2017

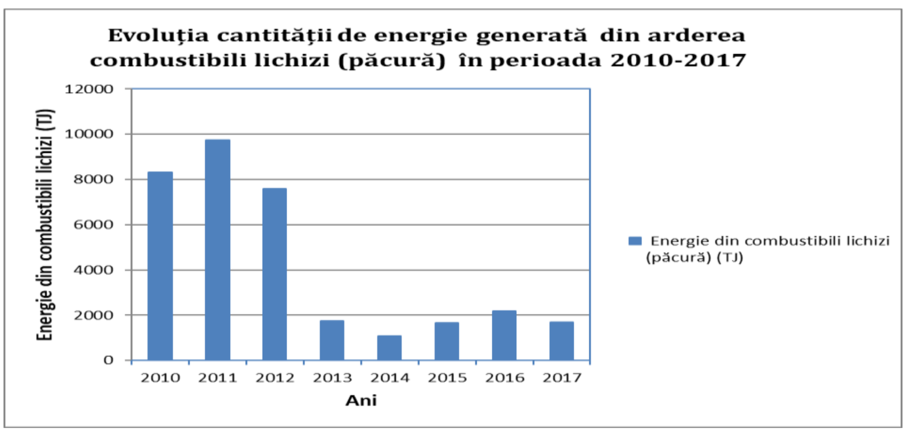


Source: NEPA

Table I.3 Evolution of the amount of energy generated from the burning of liquid fuels (fuel oil), during the period 2010–2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Energy from liquid fuels (fuel oil) (TJ)	8321,594	9744,24	7605,84	1752,87	1077,57	1655,253	2187,866	1690,78

Figure I.39 Evolution of the amount of energy generated from the burning of liquid fuels (fuel oil), during the period 2010–2017

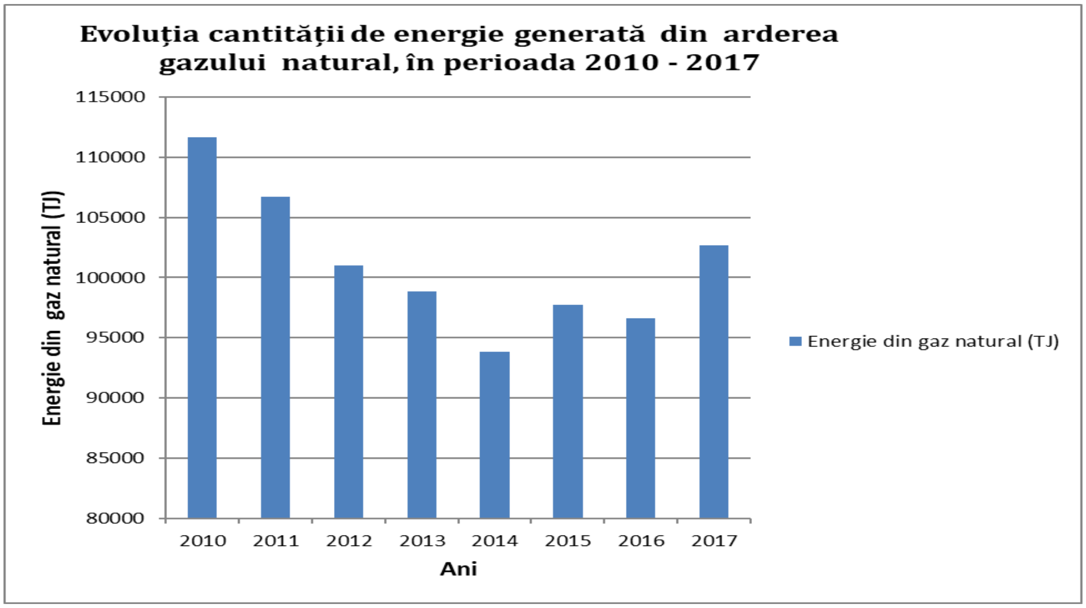


Source: NEPA

Table I.4 Evolution of the amount of energy generated from the combustion of natural gas, during the period 2010 – 2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Energy other gases (TJ)	4492,36	2873,65	2560,37	1868,90	1622,468	1389,004	1999,226	102684,0

Figure I.40 Evolution of the amount of energy generated from the combustion of natural gas, during the period 2010 – 2017

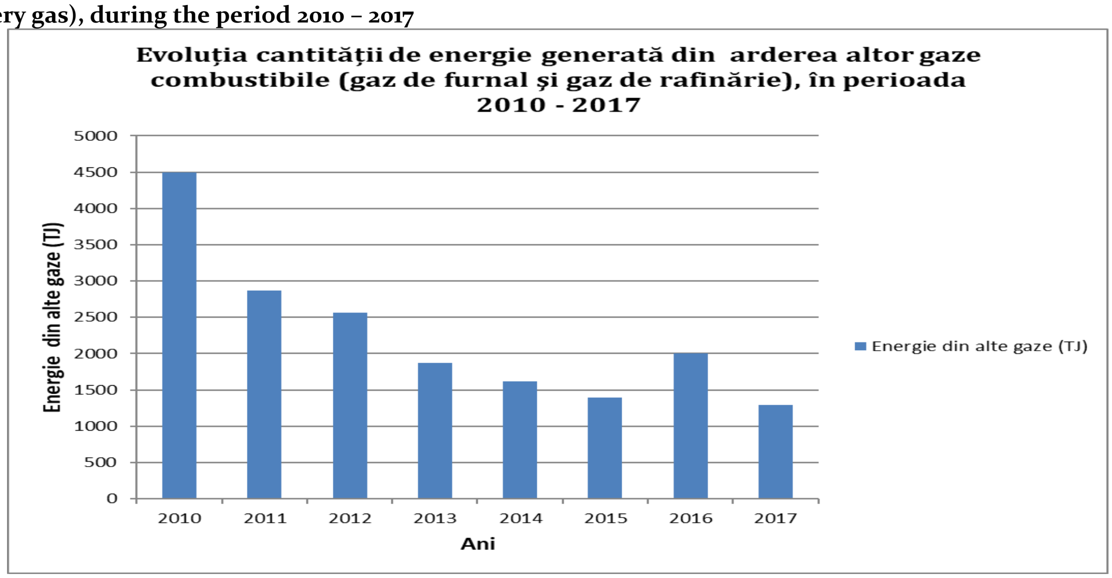


Source: NEPA

Table I.5 Evolution of the amount of energy generated from the combustion of other combustible gases (furnace gas and refinery gas), during the period 2010 – 2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Energy other gases (TJ)	4492,36	2873,65	2560,37	1868,90	1622,468	1389,004	1999,226	1290,66

Figure I.41 Evolution of the amount of energy generated from the combustion of other combustible gases (furnace gas and refinery gas), during the period 2010 – 2017

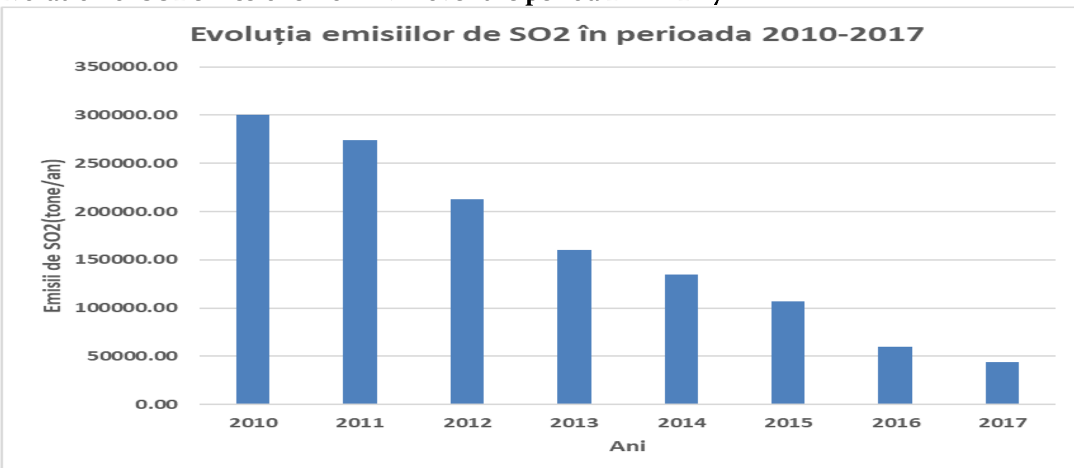


Source: NEPA

Table I.6 Sulfur dioxide (SO_2) tonnes / year emissions from IMA during the period 2010-2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Emissions of SO_2 tonnes / year	300617,792	274246,46	212742,87	160416,57	134967,209	106784,721	59688,957	43657,77

Figure I.42 Evolution of SO_2 emissions from IMA over the period 2010 – 2017

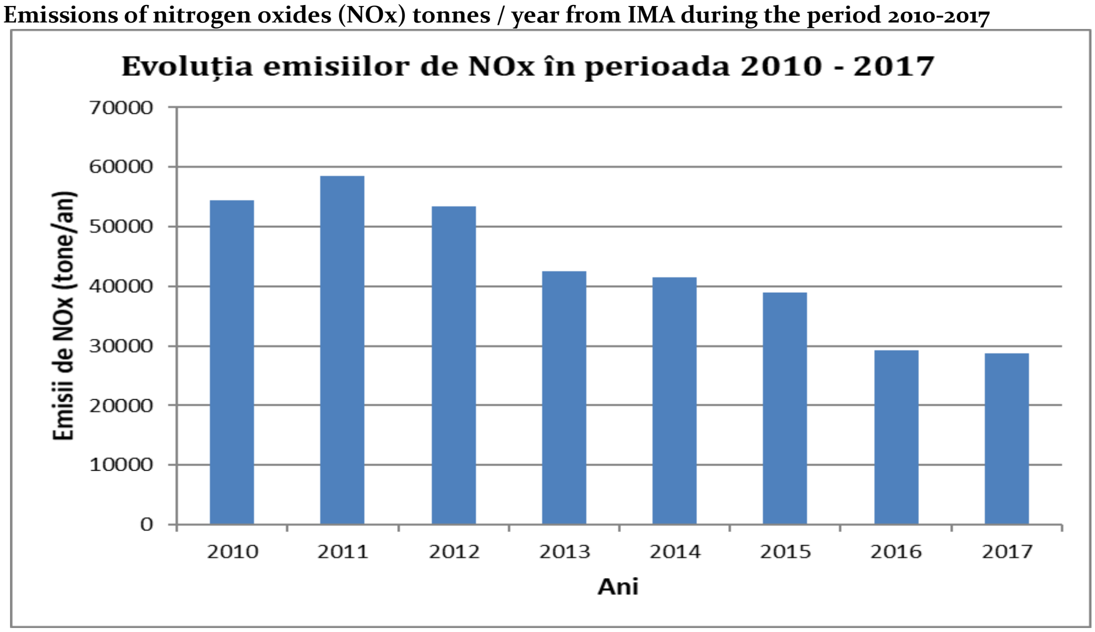


Source: NEPA

Table I.7 Evolution of nitrogen oxides (NOx) tonnes / year emissions from IMA over the period 2010 – 2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
NOx emissions tonnes / year	54412,29	58489,37	53343,40	42438,23	41431,66	38929,58	29207,421	28699,96

Figure I.43 Emissions of nitrogen oxides (NOx) tonnes / year from IMA during the period 2010-2017

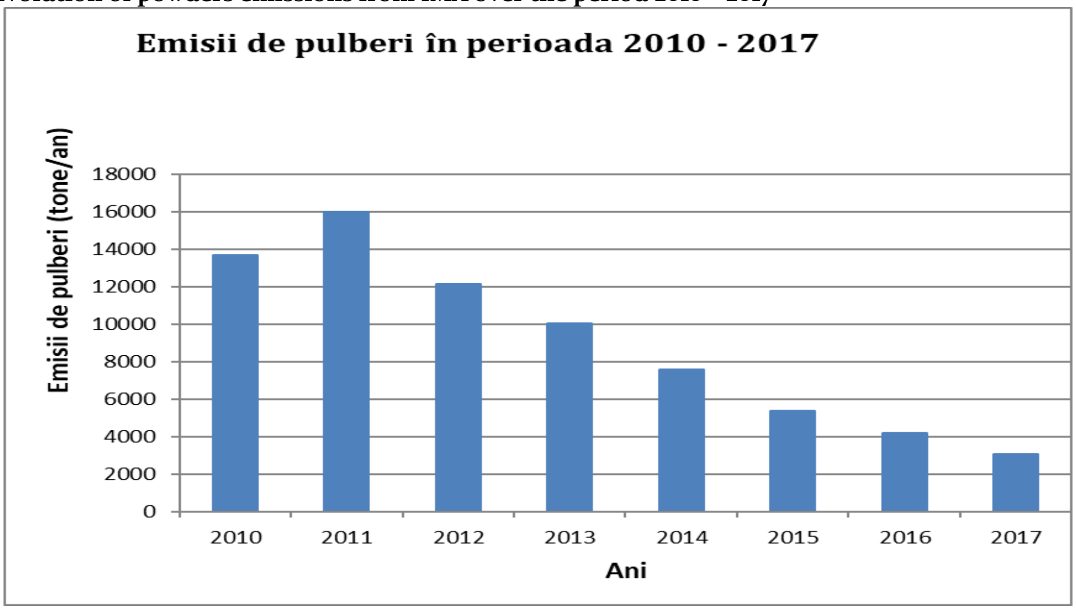


Source: NEPA

Table I.8 Emissions of powders tonnes / year from IMA during the period 2010-2017

Years	2010	2011	2012	2013	2014	2015	2016	2017
Emissions of powders tonnes / year	13665,06	16005,49	12139,02	10052,08	7550,819	5351,270	4171,483	3066,32

Figure I.44 Evolution of powders emissions from IMA over the period 2010 – 2017



Source: NEPA

Chapter IV of Directive 2010/75 / EU on industrial emissions (IED) presents special provisions on waste incineration plants and waste co-incineration plants

Incineration of hazardous and non-hazardous waste can cause emissions of substances that pollute the air, water and soil and have adverse effects on human health. To limit these risks, Directive 2000/76 / EC on waste incineration imposed strict operating conditions and technical requirements for waste incineration and co-incineration plants, which were taken over in Chapter IV of Law no. 278/2013 regarding industrial emissions – *Special provisions regarding waste incineration and waste incineration plants.*

This chapter refers to the technical advances in the control of emissions from incineration / co-incineration activities in terms of reducing pollution, especially those related to setting limit values for atmospheric emissions for dioxins, mercury and powders to which there are added limits on water discharges from waste gas purification plants. According to Law no. 278/2013 on industrial emissions, this chapter applies to the activities in Annex I *(activities 5.2 și 5.3).*

In 2017, 33 incineration plants and co-incineration plants were inventoried.

In order to guarantee the complete combustion of the waste, it is stipulated that all installations must maintain the gases resulting from incineration and co-incineration at a minimum temperature of 850 ° C for at least two seconds. In the case of hazardous waste containing more than 1% halogenated organic matter, expressed in chlorine, the temperature should be brought to 1 100 ° C for at least two seconds. The heat produced by incineration or co-incineration should be used as much as possible.

The limit values of atmospheric emissions for incineration plants are indicated in annex no. VI part 3 of the respective law.

These relate to heavy metals, dioxins and furans, carbon monoxide (CO), powders, total organic carbon (COT), hydrochloric acid (HCl), hydrofluoric acid (HF), sulfur dioxide (SO_2) and nitrogen oxides (NO and NO_2).

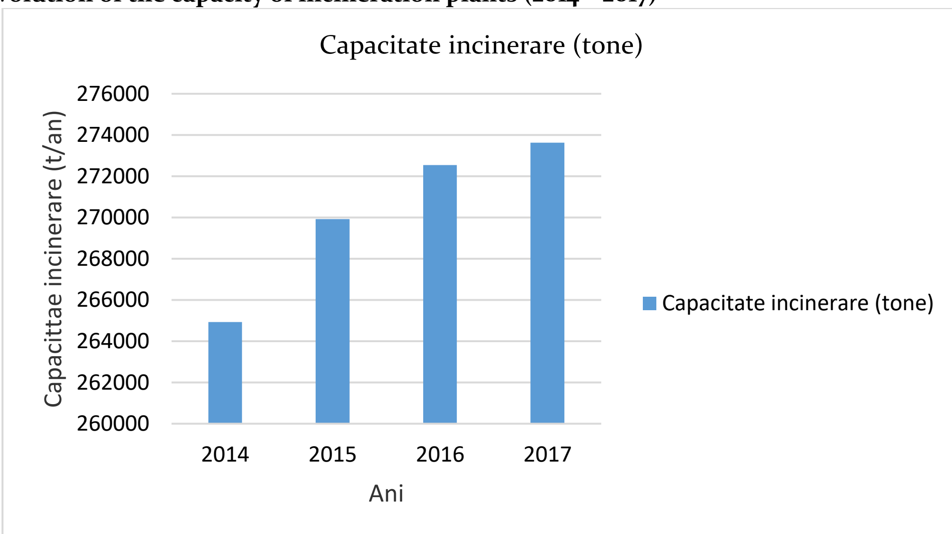
The determination of the limit values of the atmospheric emissions for the co-incineration plants is provided in annex no. VI part 4 of the respective law. There are also special provisions regarding cement kilns and combustion plants for waste co-incineration.

The incineration or co-incineration plants must have an opinion stipulating the conditions for the discharge of the waste water from the waste gas treatment. This opinion must guarantee compliance with the emission limit values indicated in annex no. VI part 5 of the respective law.

The waste generated by incineration or co-incineration should be minimized and recycled as far as possible. When transporting dry residues, precautions must be taken to avoid dispersing them in the environment. Tests must be carried out to determine the physical and chemical characteristics of the residues, as well as their harmful potential.

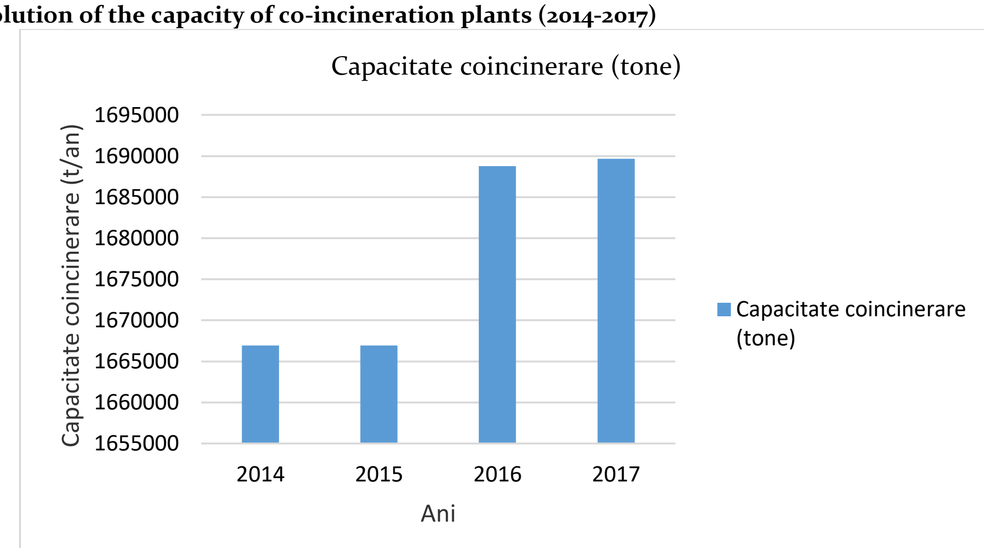
The evolution of the capacities of the incineration and co-incineration plants for the period 2014 - 2017 is presented in the graphs below.

Figure I.45 The evolution of the capacity of incineration plants (2014 – 2017)



Source: NEPA

Figure I.46 Evolution of the capacity of co-incineration plants (2014-2017)



Source: NEPA

Chapter V of the IED is intended for specific provisions applicable to installations and activities using organic solvents

With the advent of the European Parliament's Directive 2010/75 / EU on industrial emissions, Directive 1999/13 / EC on the establishment of measures to reduce emissions of volatile organic compounds (VOCs) due to the use of organic solvents in certain activities and installations has become an integral part of it.

Chapter V is intended for the specific provisions applicable to installations and activities that use organic solvents, activities listed in Annex VII, Part 1 and which reach, where appropriate, the consumption thresholds set out in Part 2 of that Annex.

These provisions aim to prevent or reduce the effects, direct or indirect, due to the emissions of volatile organic compounds (VOCs) in the environment, mainly from the air and the potential risks to human health, through measures and procedures to be implemented, in certain industrial activities whose solvent consumption is higher than the thresholds established for each type of activity. The economic agents that operate the installations that are covered by Chapter V have the obligation to apply the measures and the techniques associated with the best available techniques to ensure the compliance of the operating conditions with one of the following requirements:

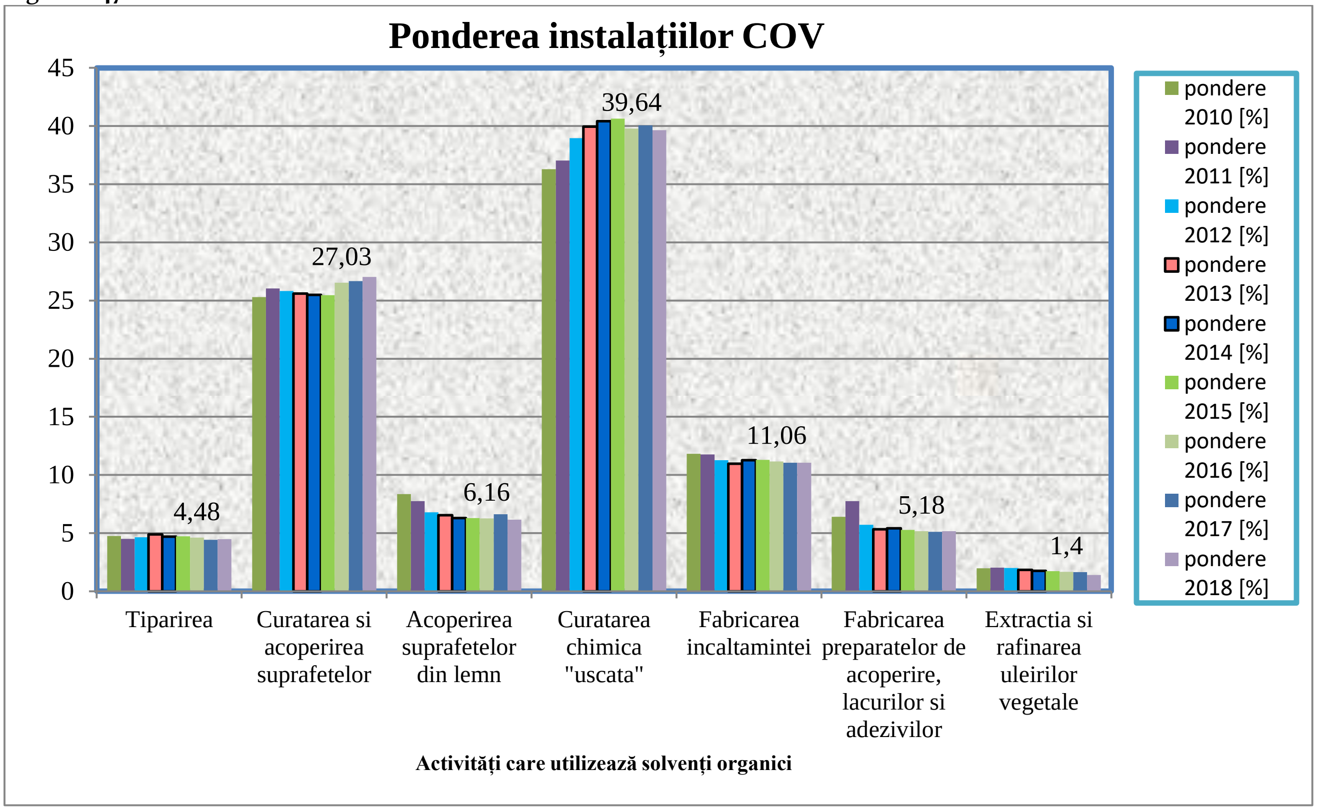
- compliance with VOC emission limit values by using VOC emission capture and treatment equipment;
- applying a VOC Reduction Scheme by reducing solvent consumption by appropriate techniques, or replacing VOC-based solvents with water-based solvents, or with lower VOC content, to provide the possibility to reduce source emissions, reducing equivalent to the one that would be achieved by applying the emission limit values.

The number of installations whose activities are subject to the provisions of Chapter V of the IED, inventoried in 2019 for 2018, was 714 (56 installations also fall under Chapter II - special provisions applicable to the installations and activities listed in Annex I - IPPC), from which the following activities have an important weight:

- printing, with a weight of 4,48 %;
- cleaning and coating surfaces, with a weight of 27,03 %;
- covering of wooden surfaces, with a weight of 6,16%;
- "dry" chemical cleaning, with a weight of 39,64 %;
- footwear manufacture, with a weight of 11,06 %;
- manufacture of paints, varnishes, inks and adhesives, with a weight of 5,18 %;
- extraction and refining of vegetable oils and animal fats, with a weight of 1.40% of the total inventory activities.

The evolution of the number of installations by types of activities is presented in the graph below:

Figure I.47 Share of VOC installations



Source: NEPA

European register of pollutants emitted and transferred (Register E-PRTR)

The European Register of Emitted and Transferred Pollutants (E-PRTR Register) succeeds the European Pollutant Emissions Register (EPER Register). The register is designed as an electronic database that can be accessed by the public at the following address http://prtr.ec.europa.eu/ . At European level, on 18 January 2006, Regulation (EC) no. 166/2006 of the European Parliament and of the Council on the establishment of the European Register of Pollutants emitted and transferred and amending Council Directives 91/689 / EEC and 96/61 / EC ("E-PRTR Regulation"). The register contains specific data and information on emissions of pollutants into air, water, soil, on transfers of pollutants from wastewater, hazardous and non-hazardous wastes, outside the locations of industrial complexes, from all EU Member States. Reporting is required if the capacity threshold and emission or transfer thresholds outside the site of pollutants in wastewater or waste are exceeded. Romania has implemented at national level the provisions of the EPRTR Regulation through H.G. no. 140/2008 regarding the establishment of measures for the application of the provisions of Regulation (EC) of the European Parliament and of the Council no. 166/2006 regarding the establishment of the European Register of Pollutants Emitted and Transferred and the modification of Council Directives 91/689 / EEC and 96/61 / EC, which establishes the institutional framework necessary for the direct application of the EPRTR Regulation.

According to the requirements of the EPRTR Regulation, the National Agency for Environmental Protection has created the national website of the Register of Transmitted and Transferred Pollutants (PRTR) that allows the public access, both in the country and abroad, to the environmental information regarding the industrial complexes in Romania, by accessing the address http://prtr.anpm.ro . The link according to the request of the European Commission was sent at European level to be integrated in the European register in the section "Links - National Registers".

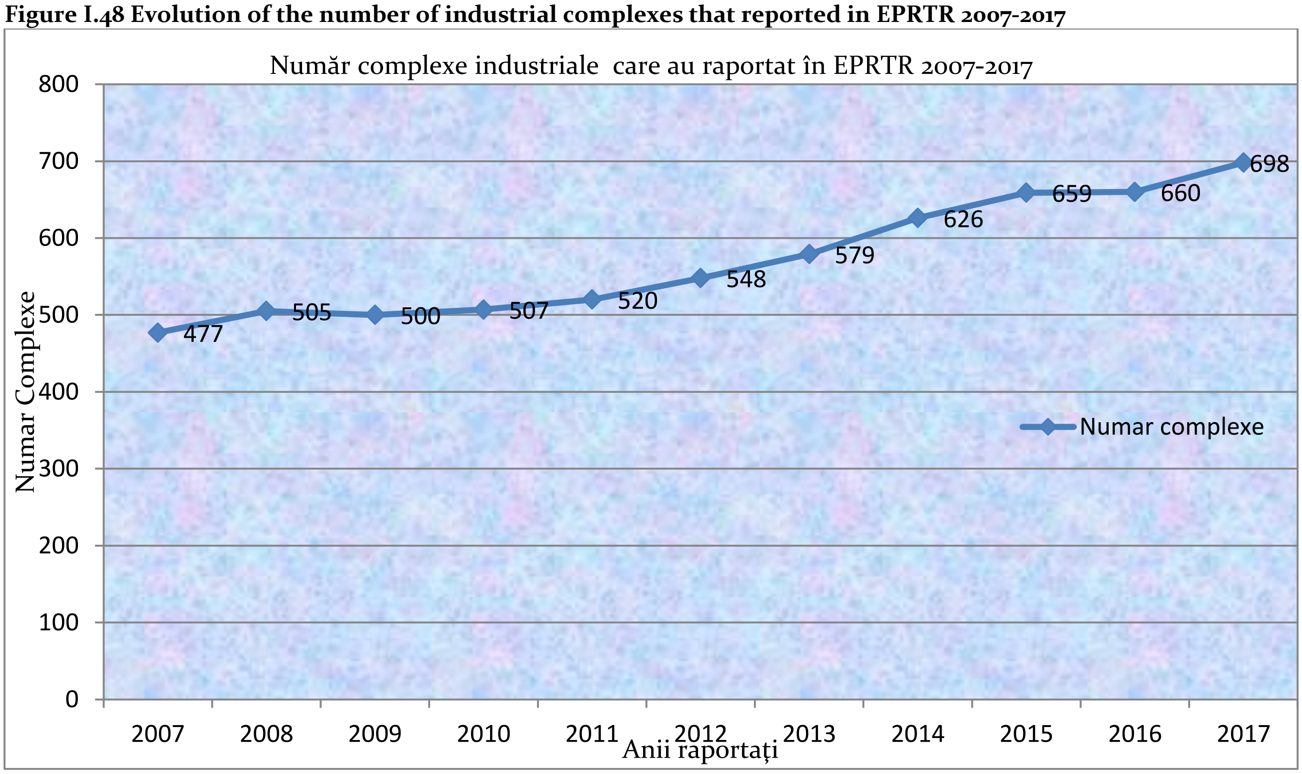
Both the European EPRTR and the national PRTR Registry contain information for the period (2007-2017), the data collections for the latter year being reported by the Member States to the European

Commission by March 30, 2019. The EPRTR Regulation has set new requirements, in addition to those established by the EPER Decision, extending the reporting for the industrial sectors covered by the IPPC Directive to a number of non-IPPC activities, thus totaling 66 activities grouped into 9 industrial sectors, including underground mining and exploration / exploitation activity of oil and gas fields.

The collection for the year 2017, at national level, comprises a number of 698 industrial complexes respectively sites that registered exceedances of the threshold values established by Annex II of the EPRTR Regulation, with 221 industrial complexes more than in 2007 (477), with 193 industrial complexes more than 2008 (505), with 198 industrial complexes more than 2009 (500), with 191 industrial complexes more than 2010 (507), with 178 industrial complexes more than 2011 (520), with 150 industrial complexes more than in 2012 (548), with 119 industrial complexes more than in 2013 (579), with 72 industrial complexes more than in 2014 (626), with 39 industrial complexes more than in 2016 (657) and with 38 more industrial complexes compared to 2016 (660).

The evolution of the number of industrial complexes registered in the EPRTR Register is presented below:

Figure I.48 Evolution of the number of industrial complexes that reported in EPRTR 2007-2017

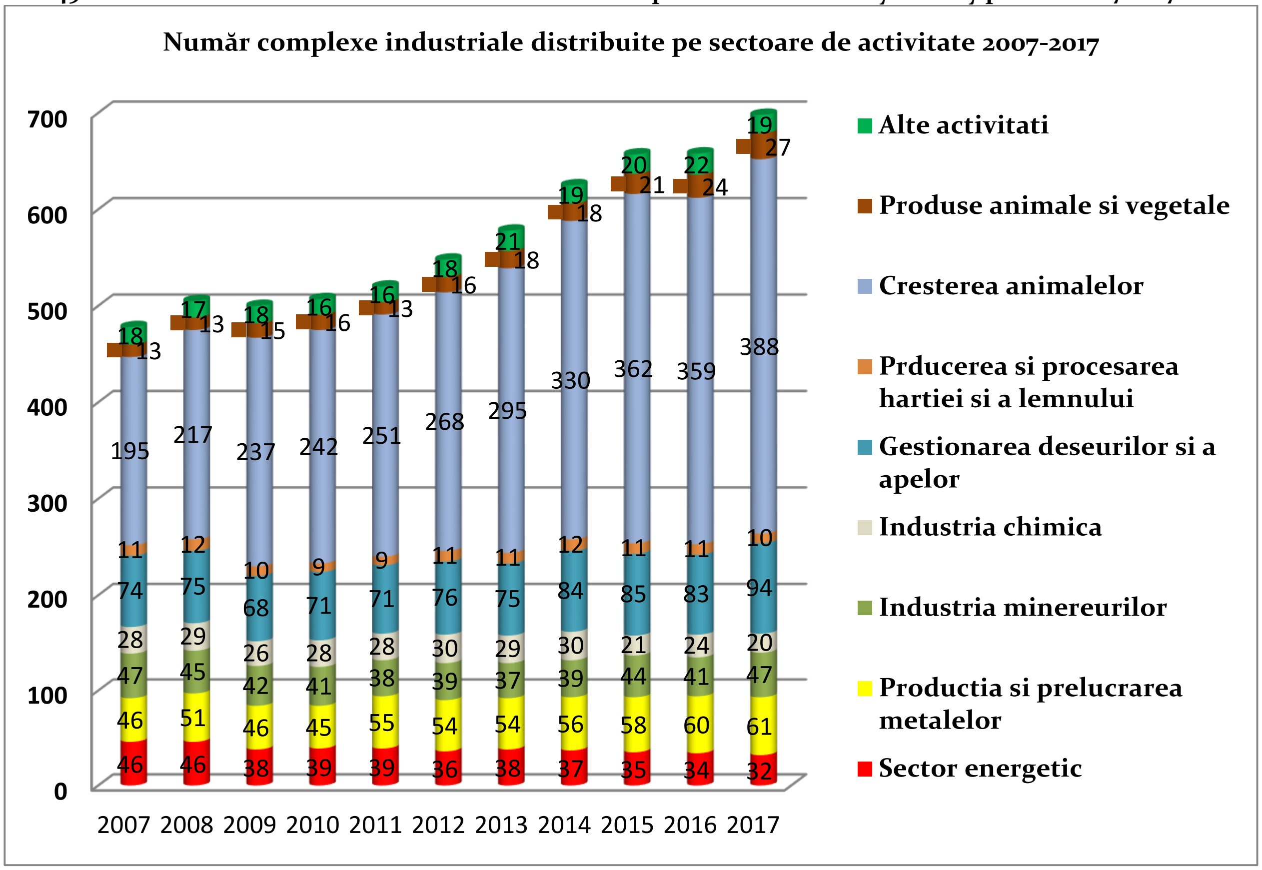


Source: NEPA

Compared to 2016, in 2017 there is an increase of 5.75% in the number of complexes registered in the National PRTR Register and compared to 2007 an increase of 46.025%. In the 2017 collection, a number of 55 industrial complexes were registered for the first time in the national PRTR Register.

The evolution of the number of industrial complexes distributed by activity sectors is presented below:

Figure I.49 Evolution of the number of EPRTR industrial complexes distributed by activity period 2007-2017



Source: NEPA

As can be seen, the share of the total number of installations reported in the energy sector, the production and processing of metals, the mineral industry, the chemical industry, the production and processing of paper and wood, the plant animal products sector, as well as other activities, remains more or less the same over time series and the number of reported industrial complexes that carry out the activity of animal husbandry was continuously increasing until 2015, after which for 2016 there is a small decrease followed by a new increase in 2017 with approximately 8.07% compared to 2016.Their distribution across the development regions is as follows:

- Region 1 North - East 86 industrial complexes,
- Region 2 South - East 99 industrial complexes
- Region 3 South – Muntenia 147 industrial complexes,
- Region 4 South West – Oltenia 37 industrial complexes,
- Region 5 West 105 industrial complexes,
- Region 6 North - West 87 industrial complexes,
- Region 7 Center 108 industrial complexes,
- Region 8 Bucharest – Ilfov 29 industrial complexes.

The pollutants reported by the industrial complexes registered in the ninth round of European reporting are presented below.

Air - Emissions from sites

For 2017, air emissions of 23 pollutants were reported that exceeded the threshold values, which represents only 37.70% of the total pollutants established by Annex II of the regulation. The pollutants recorded are: carbon dioxide (CO_2), including biomass-free carbon dioxide (CO_2 excl. Biomass), carbon monoxide (CO), nitrogen oxides (NOx), nitrous oxide (N_2O), sulfur oxides (SOx)), powders (PM_{10}), ammonia

(NH_3), methane (CH_4), perflorocarbons (PCF), dioxins and furans (PCDD), volatile nonmethane (VOC), cadmium (Cd), mercury (Hg), nickel (Ni) volatile organic compounds), lead (Pb), zinc (Zn), chromium (Cr). The pollutants emitted into the air in 2017 came from 27 industrial activities, less with 3 industrial activities compared to 2007 (30 industrial activities), with 4 industrial activities more than in 2009 (23 industrial activities), with an industrial activity more compared to 2008, 2010 and 2011 (26 industrial activities), more with 6 industrial activities compared to 2013 (21 industrial activities), with 5 more activities compared to 2014 and 2012 (22 industrial activities), more with 3 industrial activities compared to 2016 and the same as in 2015.

The significant contribution to the total national emission values for the pollutants listed above is as follows:

CO_2 in total quantity at national level of 37691000000 kg / year was emitted by 13 industrial activities, the maximum contribution of about 60.51% being due to thermal power plants and other combustion plants, followed by the activities of producing cement, lime and cement clinker. glass, with approximately 15.09%, from the installations for the production of crude iron and non-ferrous metals by 11.32%, from the oil and gas refineries with about 6.28%, from the plants for the production of phosphorus, nitrogen fertilizers or potassium, by approximately 4.52%, by inorganic and organic chemical production plants by about 1.29%, by underground mining operations by about 0.28% and 0.72% by paper production and cardboard.

Excluded biomass **CO_2** at national level was only 39400000 kg / year, representing 0.104% of the total CO_2 emitted. This emission is reported by a single industrial complex that carries out production activity of primary wood products.

NO_x in the total national quantity of 42711000 kg / year was issued by 13 industrial activities. The most important contribution is given by thermal power plants and other combustion plants with approximately 66.47%, followed by 15.49% from the manufacture of cement or lime and glass, 5.92% from the phosphorus fertilizer industry, nitrogen and potassium, 6.2% from the installations for the production of crude iron and non-ferrous metals and 3.62% from the oil and gas refineries. The rest of the activities (underground mining, inorganic chemical production plants and paper and cardboard production) account for only 2.3%.

Heavy metal emissions into the air were like this:

SO_x, in a total national quantity of 46671000 kg / year, was issued by 6 industrial activities. The most important contribution is given by the energy sector as follows: approximately 92.49% of thermal power plants and other combustion plants, approximately 1.92% of oil and gas refineries and approximately 1.25% being given by the cement production industry and lime. The remaining 2 activities (iron and steel production plants and non-ferrous metal smelting plants) total only 4.34%.

PM_{10}, in a total national quantity of 3511800 kg / year, was issued by 6 industrial activities. The most important contribution is given by thermal power plants and other combustion plants with about 65.27% followed by crude iron production plants with about 23.12%, by the cement and lime production industry with about 6.66%, by the phosphorus, nitrogen or potassium fertilizer industry with about 1.71%, by the oil and gas refineries with about 1.65% and about 1.59% by the intensive growth of the birds and pigs.

CH_4, in a total national quantity of 58687000 kg / year, was issued by 4 industrial activities. The most important contribution is given by the landfill of waste with approximately 79.81% followed by underground mining with approximately 10.94%, by the intensive growth of birds and pigs by approximately 8.10% and the urban waste water treatment plants with approximately 1.15%.

NH_3, in total national quantity of 20169000 kg / year, was issued by 5 industrial activities. The most important contribution is given by the intensive growth of birds and pigs by about 98.84%, followed by the fertilizer industry based on phosphorus, nitrogen or potassium with about 0.76%, 0.18% being given by the production industry cement and lime, 0.07% of the production of inorganic chemicals and 0.15% of the production of paper and cardboard.

NMVOC, in a total national quantity of 6690000 kg / year, was issued by 9 industrial activities. The most important contribution is given by the industry for the production of inorganic chemicals and from the installations that use chemical or biological processes in the industrial production of basic pharmaceutical products with approximately 35.73%, followed by the oil and gas refineries with about 19, 27%, by the surface treatment plants with about 18.07%, followed by the application industry of molten metal and the iron and steel industry with about 9.9%, the production of paper and cardboard with about 10, 47% and waste storage with about 6.56%.

Hg, in a total national quantity of 164.7 Kg / year, was issued by 3 industrial activities. The most important contribution is given by the thermal power plants and other combustion plants of about 61.32%, followed by the iron and steel production plants with approximately 32.18% and by the hazardous waste recovery or disposal facilities with 6, 50% .

Ni, in a total national quantity of 256 kg / year, was issued by 2 industrial activities. The contribution of 64.45% is given by the iron and steel industry and 35.55% is by the oil and gas refineries.

Cd, in a total national quantity of 77 kg / year was issued by 2 industrial activities, the contribution of 85.71% being from the iron and steel industry and 14.29% from the oil and gas refineries**.**

Zn, in a total national quantity of 7918 kg / year was issued by 3 industrial activities, the contribution being 88.77% from the iron and steel industry, 4.66% from the cement and lime production industry and from 6 , 57% of foundries of ferrous metals.

Cr, in a total national quantity of 370 kg / year was issued by an industrial activity, the contribution being 100% from the iron and steel industry.

Pb, in a total national quantity of 4080 Kg / year was issued by an industrial activity. The 100% contribution is given by the iron and steel industry**.**

Thus, in a total national quantity of 374 kg / year it was issued by an industrial activity. The 100% contribution is given by the iron and steel industry.

Evolution of pollutants in the air between 2007 and 2017

Following the analysis of the evolution of the quantities of pollutants emitted into the air at national level, the following trends can be observed in the period 2007-2017:

CO_2, in 2010 registered a maximum decrease with approx. 32% compared to 2007 and with 20.18% compared to 2008, in 2011 the CO_2 emission registered a slight increase compared to 2010, 2012 representing a decrease with about 8.2% compared to 2011, in 2013 a decrease is observed compared to 2012 with 14.55%, in 2015 the CO_2 emission registered a slight increase of 2.02% compared to 2014, in 2016 the emission of CO_2 registered a slight decrease of 6.75% compared to 2015 and in 2017 the CO_2 emission registered a slight increase of 1.8% compared to 2016 and a decrease of approximately 43.08% compared to 2007;

The CO recorded the lowest value in 2012 with approx. 65.16% less than in 2007, with approx. 50.23% less than in 2008, with approx. 15.28% less than 2010, with approx. 12.57% less than in 2011, starting with 2013 the CO emission registered a continuous increase until 2015, so that in 2015 the emission registered an increase of approximately 44.37% compared to 2012, in 2016 the CO emission decreased by 2.84% compared to 2015, and in 2017 the CO emission decreased by 3.96% compared to 2016 and a decrease of **53.07%** compared to 2007;

NOx registered a continuous decrease compared to 2007, in 2013 (53807 to) registering the lowest value with approx. 59.02% less than in 2007, in 2014 the emission of NOx increased by approximately 1.8% compared to 2013, in 2015 it registered a small increase of 2.69% compared to 2014, in 2016 the emission of NOx decreased by 23.4% and in 2017 the emission of registered NOx has the lowest value (42683to) about 67.49% less than in 2007;

SOx registered a continuous decrease compared to 2007, the national total in 2017 (46,671 to) being approximately 90.60% lower than in 2007, with approx. 78.79% lower than 2012 and 25.79% lower than 2016**;**

CH_4 registered a continuous decrease compared to 2007, in 2017 it registered the lowest value (58687 to), being about 61.78% lower compared to 2007 and compared to 2016 lower by 10.95%;

NH_3 recorded a continuous decrease compared to 2007 until 2010 (approximately 40% lower than 2007), the emission in 2017 representing an increase with approx. 32.88% compared to 2010, and a decrease of 5.17% compared to 2016;

PFC registered a decrease in the period 2007 - 2009, in this last year registering a value of approximately 83% lower than in 2007, followed by a slight increase in 2010 and 2011, but maintaining the same gap and reporting a value with approx. 72% lower than the value of 2007, followed for 2012 by a decrease of approximately 41.42% compared to 2011, for 2013 the value emitted in the air by PFC is 17.28% lower than in 2012, for 2015 the value issued by PFC in the air is 4.79% higher than in 2014, for 2016 the value issued is 11.44% lower than in 2015 and for 2017 the value issued by PFC is lower by 4.35% compared to 2016;

NMVOC in the period 2007 - 2012 had a constant downward evolution, in 2012 registering the lowest reported value, lower by 75.2% compared to 2008, 57.4% compared to 2009, 43.4% compared to 2010 and with 2% compared to 2011, in 2013 the value for NMVOC registered an increase compared to 2012 with 49.08%, for 2014 the value issued registered a slight increase compared to 2013 with 7.5%, for 2015 it registered a slight increase compared to 2014 with 4.3%, for 2016 the registered value was 21.88% higher than for 2015 and the value registered for 2017 is lower than for 2016 with approximately 36.51% ;

PM10, in the period 2007 - 2017 had a constant downward evolution, in 2017 registering the lowest reported value, with 88.10% compared to 2007, with approx. 73.43% compared to 2012**;**

Ni registered an increase in 2007 - 2010, followed by a decrease in 2011 (by approx. 32%) compared to 2010 and for 2017 the total of nickel registered a decrease with 90.16% compared to 2010 when it was registered highest value (2602.9 kg), with 88.33% compared to 2012 and 48.9% compared to 2016**;**

Cr has a sinusoidal evolution, it registered a decrease in the period 2007 - 2010, from 937 kg / year to 0 Kg / year in 2010, in 2012 the amount of chromium emitted reaches 922 kg / year, in 2013 the total of chromium emitted in the air is 156 Kg / year, in 2016 total chromium emitted in the air is 404 kg and in 2017 the quantity decreased to 370 kg;

Hg had a general downward evolution, with a slight increase of 2% in 2008 compared to 2007, followed by a decrease with 51.84% in 2010 compared to 2007 and a small increase in 2011, followed by a decrease in 2012 and 2013 and then an increase in 2014 and 2015. The value reported in 2016 is 93.3% lower than the value recorded in 2007 and the one reported in 2017 (164.7 kg) is higher than in 2016 by approximately 0, 9 kg;

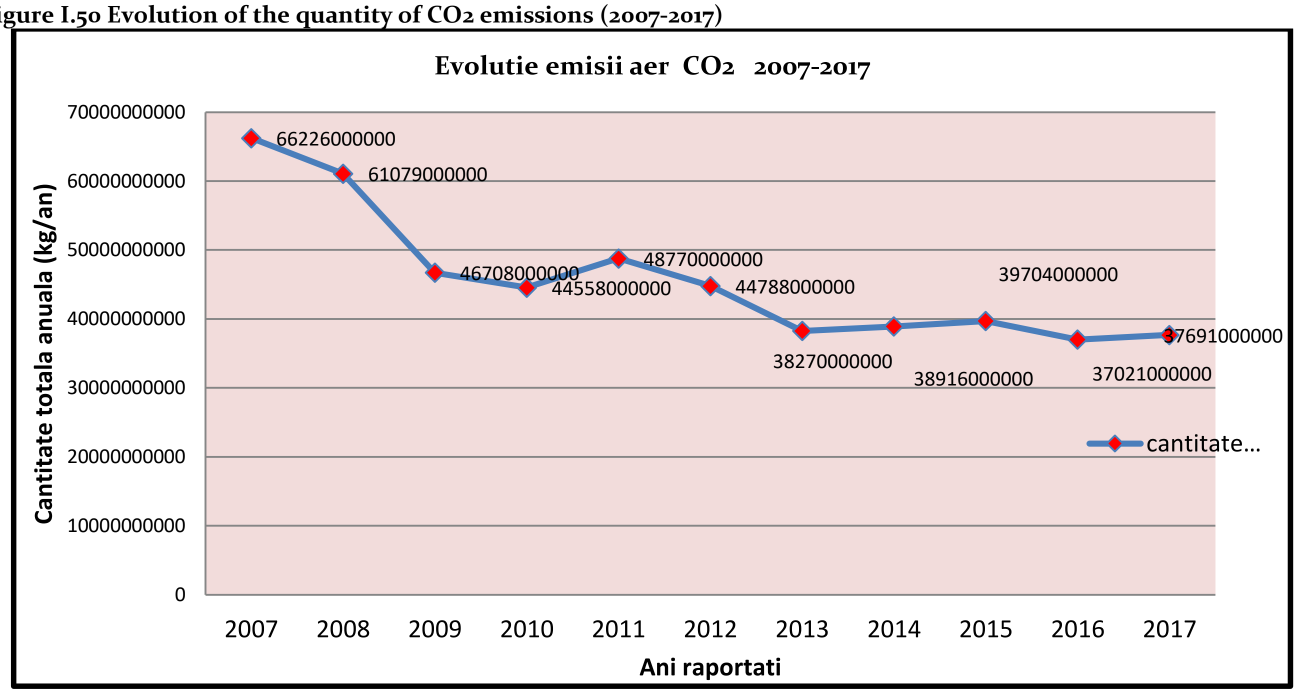
Cd registered a decrease between 2007 and 2008, in 2009 the highest reported value was recorded, this being 208.9% higher than in 2007, after 2009 the quantity of cadmium emitted registered a downward evolution until 2013 when the lowest value (22 kg) was recorded, followed by an increase in 2014 and 2015, the value reported in 2015 is 395% higher than in 2013, the one in 2016 is 377.27% higher than in 2013 and the value reported in 2017 is higher than 2013 by 350%;

Zn recorded a decrease in the period 2007 - 2009, with a value in 2009 of about 95% lower than the value of 2007, followed by a slight increase in the period 2010 - 2012, the value of 2012 being about 92% lower than that of 2007, the value registered in 2013 is 46.31% lower than in 2012, in 2014 and 2015 there is an increase by 318%, respectively 359%, compared to 2013, in 2016 there is a decrease with approximately 9.63% compared to 2015 and in 2017 there is a decrease compared to 2016 with approximately 10.14%;

Pb in the period 2007 - 2012 had a constantly downward evolution, in 2012 and 2013 registering the lowest reported value, after 2013 there is an increase of the reported value so that the quantity reported in 2017 was 66.07% lower compared to 2007.

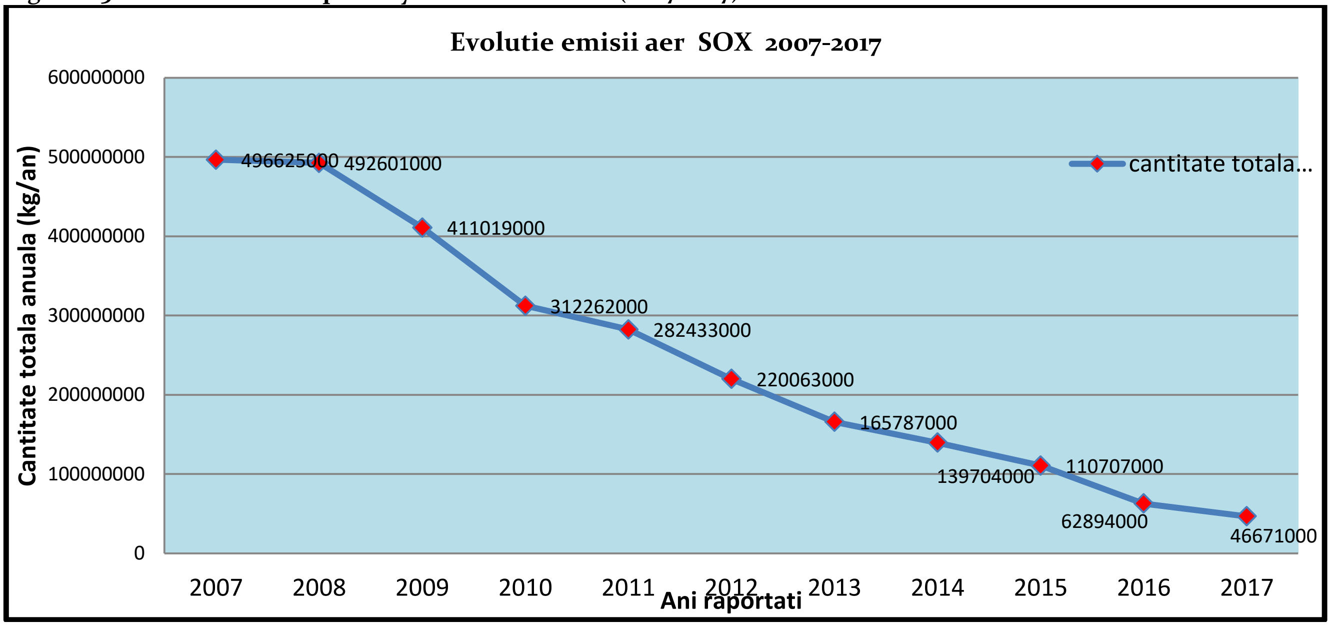
The evolution in the period 2007-2017 of the amount of pollutants emitted into the air is shown in the figures below:

Figure I.50 Evolution of the quantity of CO2 emissions (2007-2017)



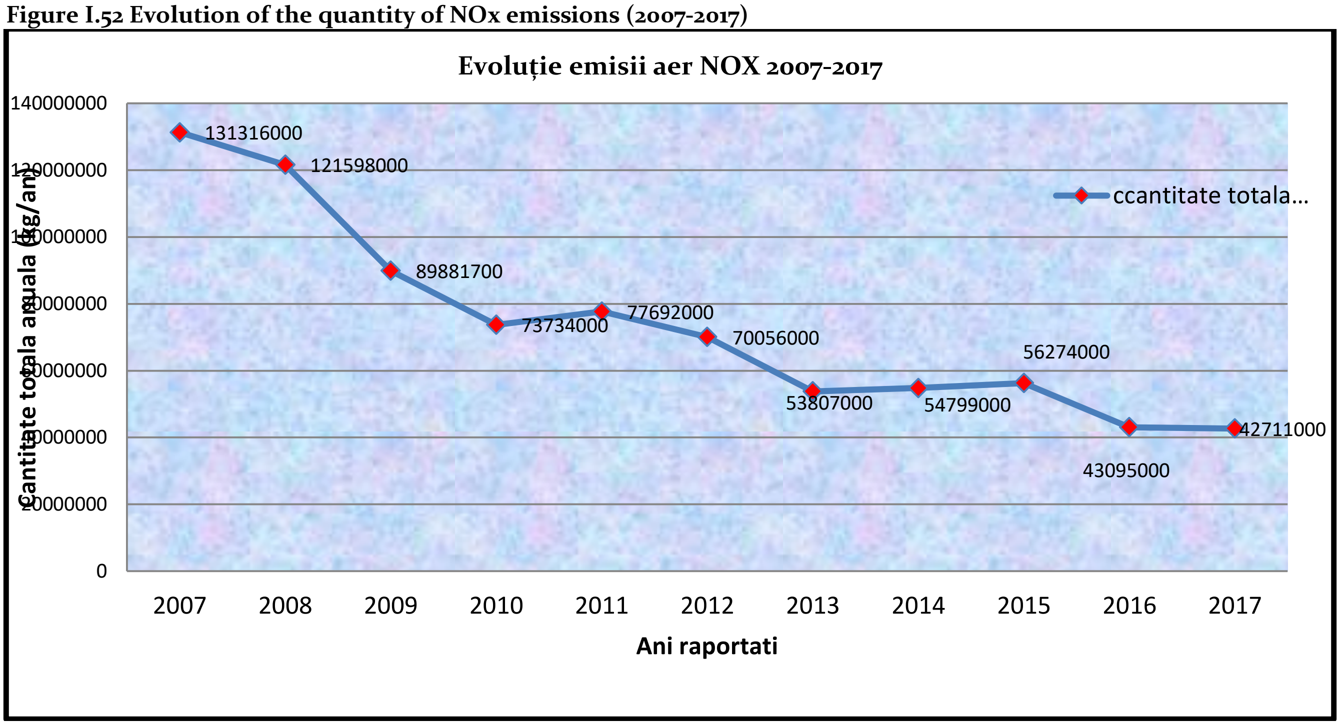
Source:NEPA

Figure I.51 Evolution of the quantity of SOx emissions (2007-2017)



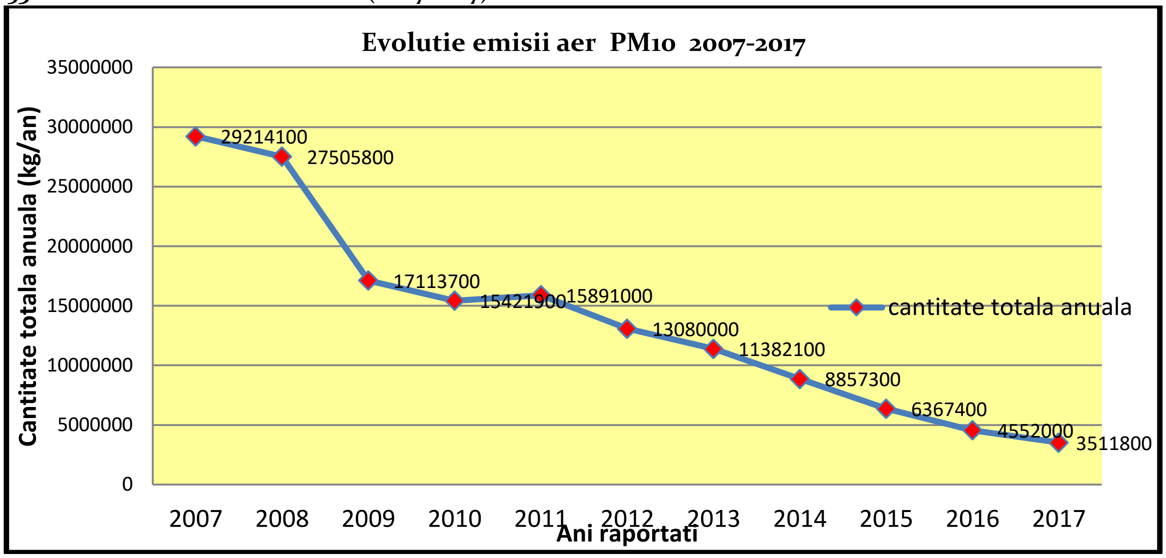
Source:NEPA

Figure I.52 Evolution of the quantity of NOx emissions (2007-2017)



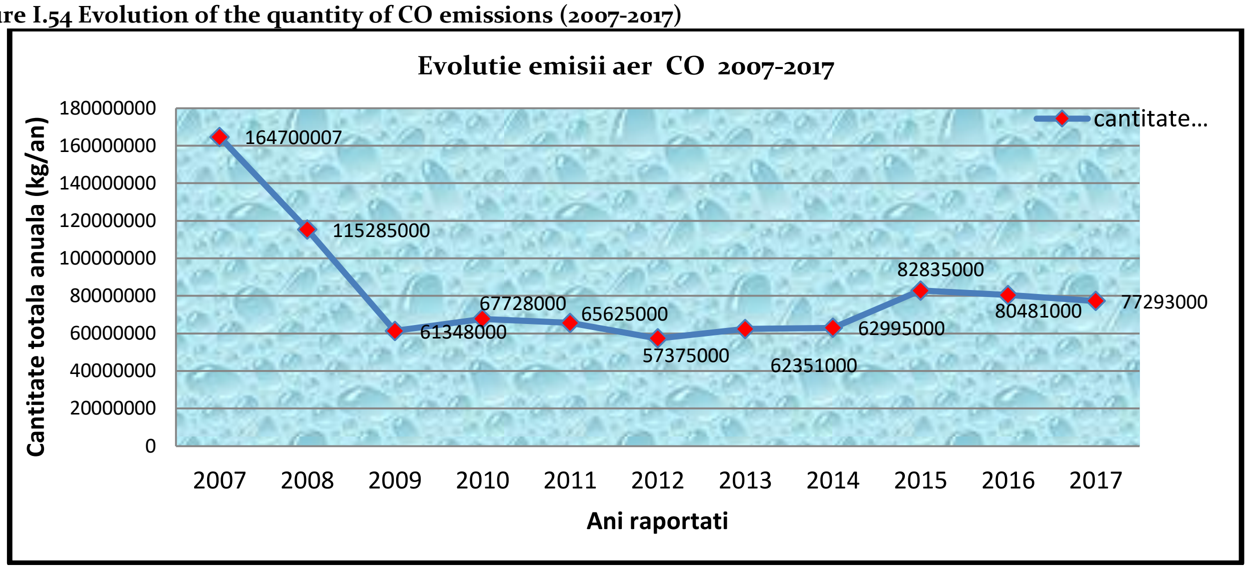
Source:NEPA

Figure I.53 Evolution of PM10 emissions (2007-2017)



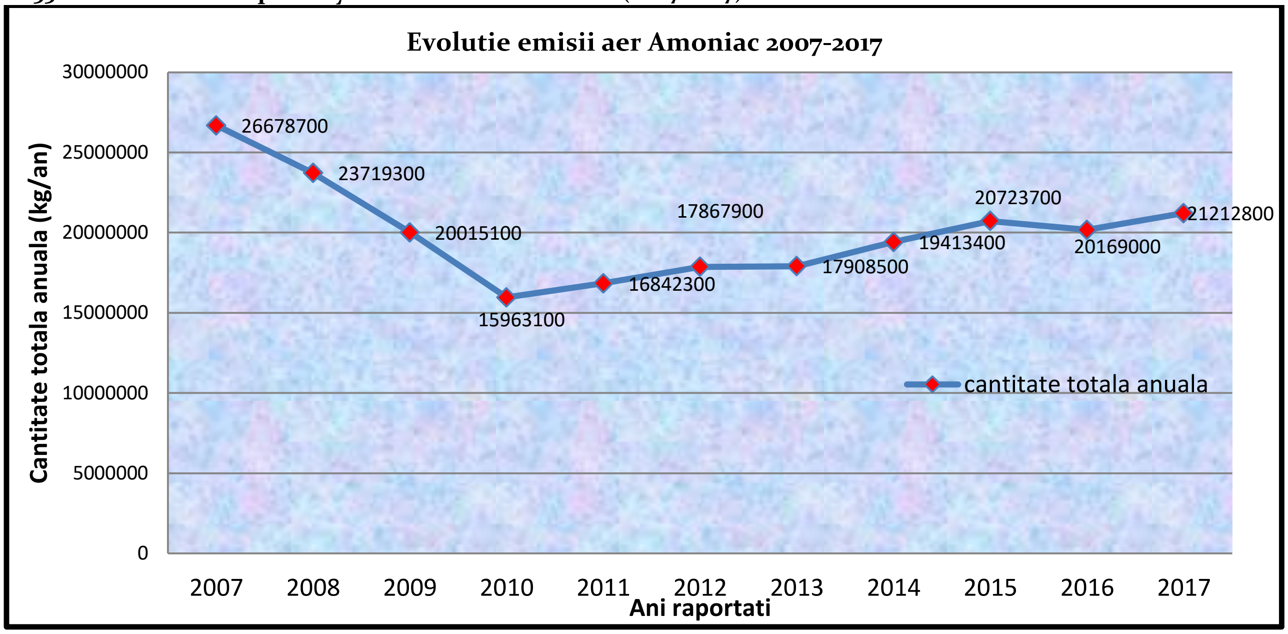
Source:NEPA

Figure I.54 Evolution of the quantity of CO emissions (2007-2017)



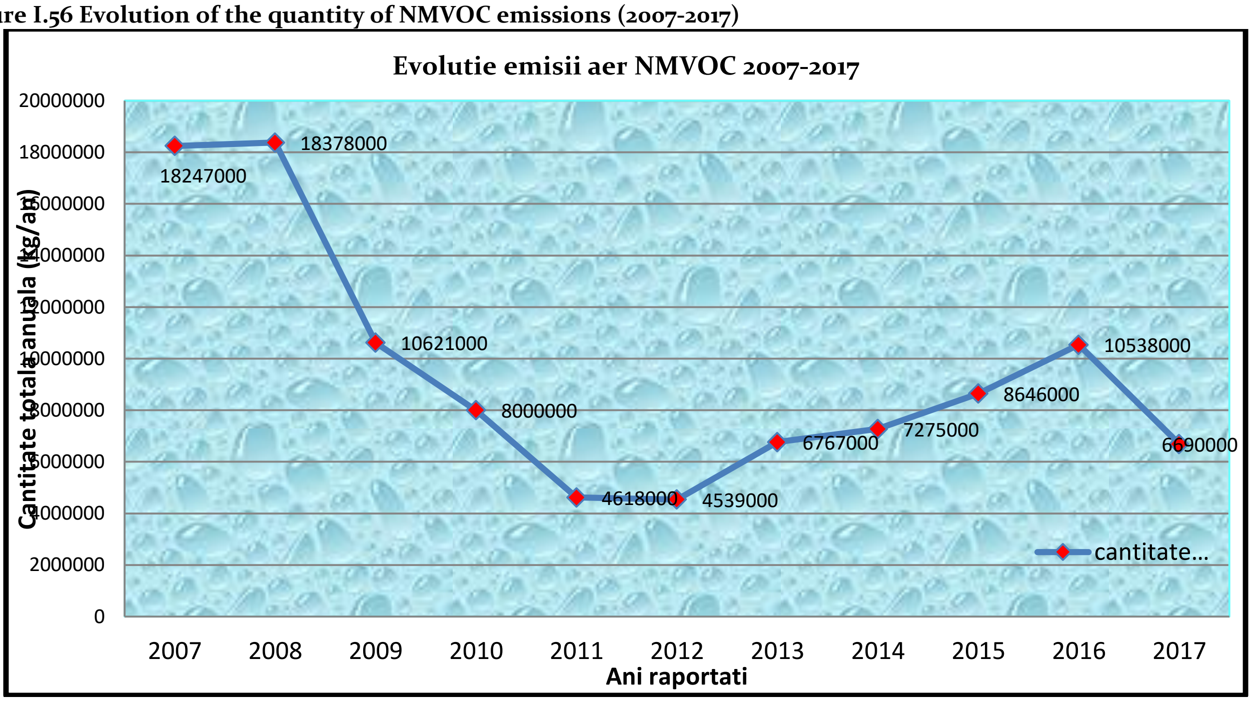
Source:NEPA

Figure I.55 Evolution of the quantity of ammonia emissions (2007-2017)



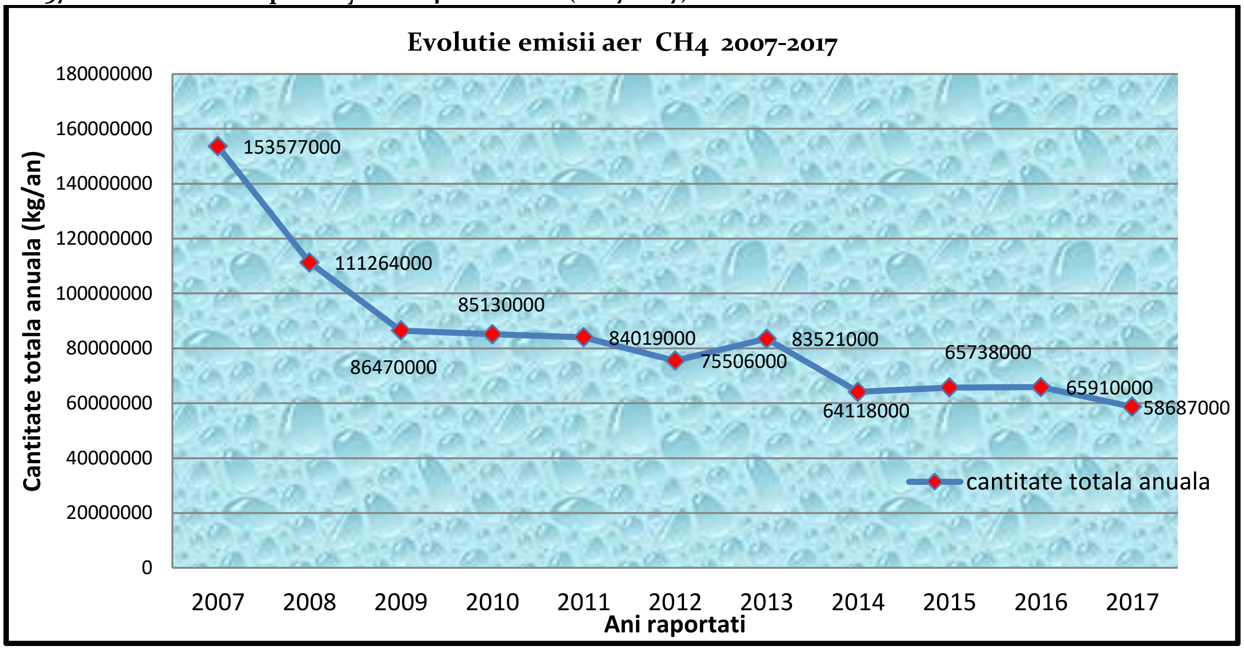
Source:NEPA

Figure I.56 Evolution of the quantity of NMVOC emissions (2007-2017)



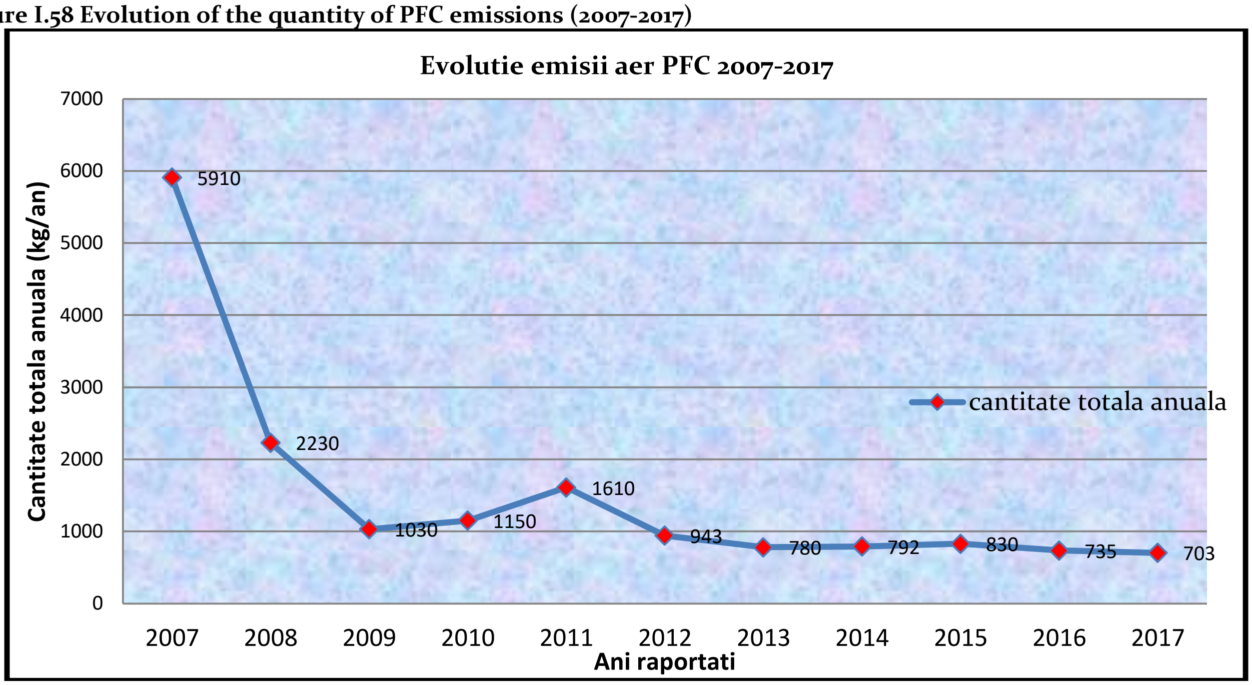
Source:NEPA

Figure I.57 Evolution of the quantity of CH_4 emissions (2007-2017)



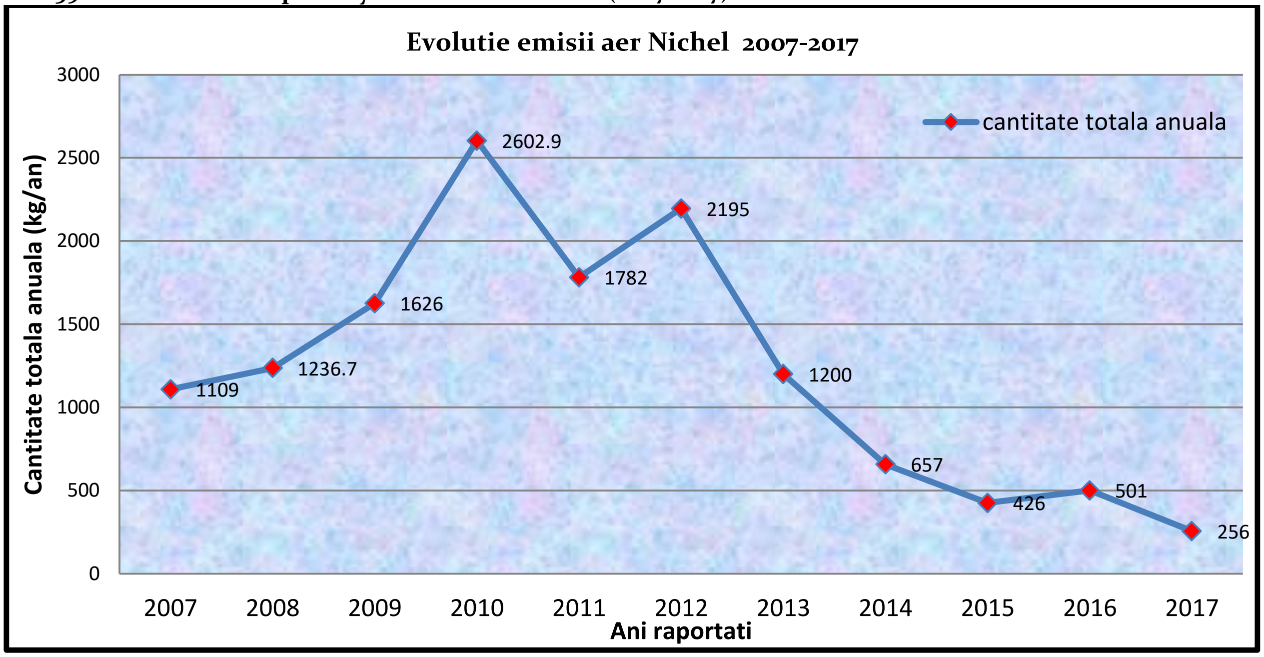
Source:NEPA

Figure I.58 Evolution of the quantity of PFC emissions (2007-2017)



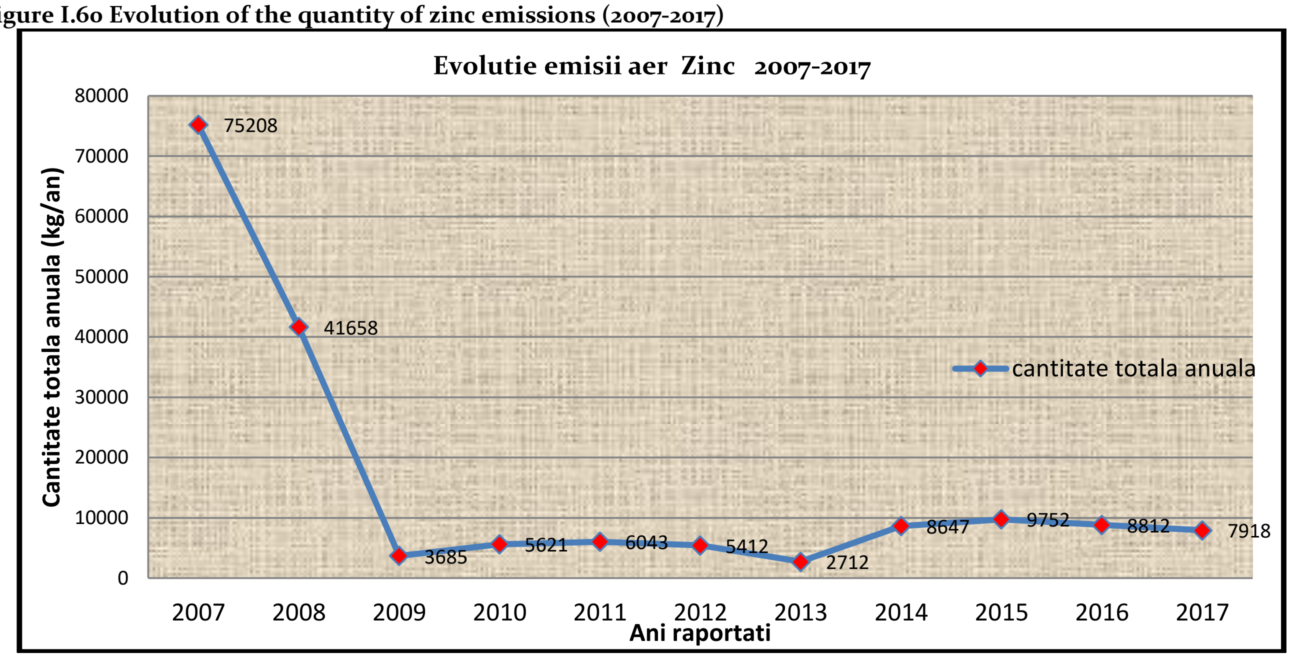
Source:NEPA

Figure I.59 Evolution of the quantity of nickel emissions (2007-2017)



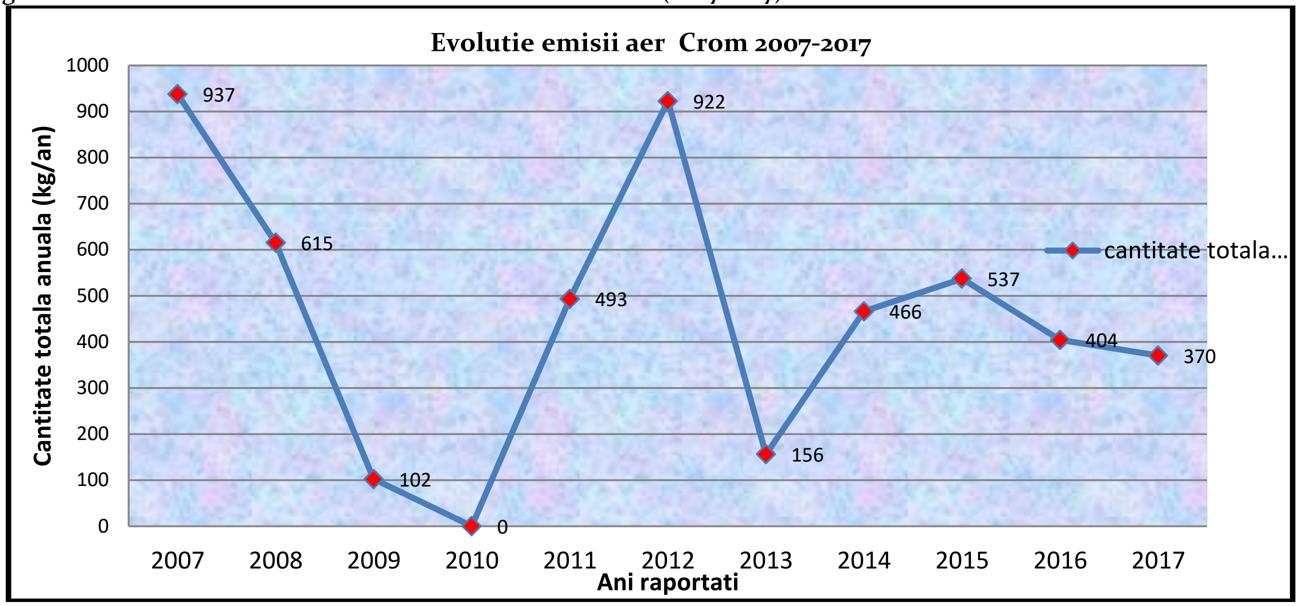
Source:NEPA

Figure I.60 Evolution of the quantity of zinc emissions (2007-2017)



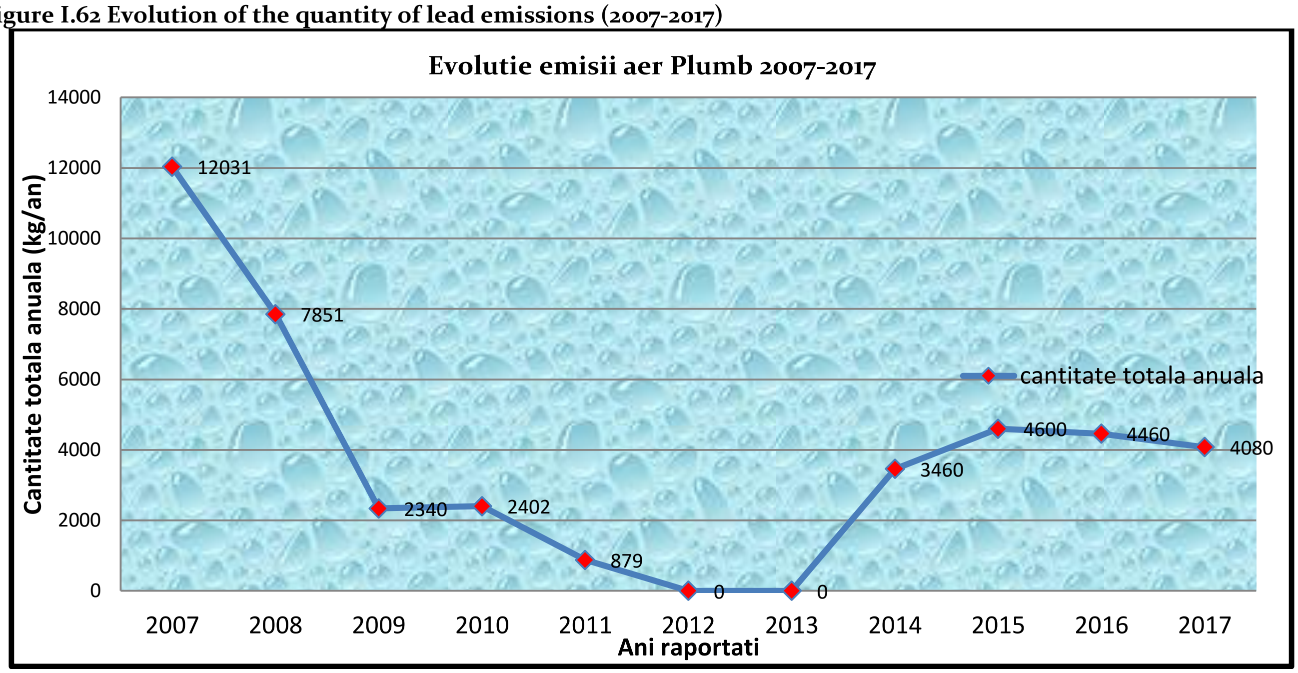
Source:NEPA

Figure I.61 Evolution of the amount of chromium emissions (2007-2017)



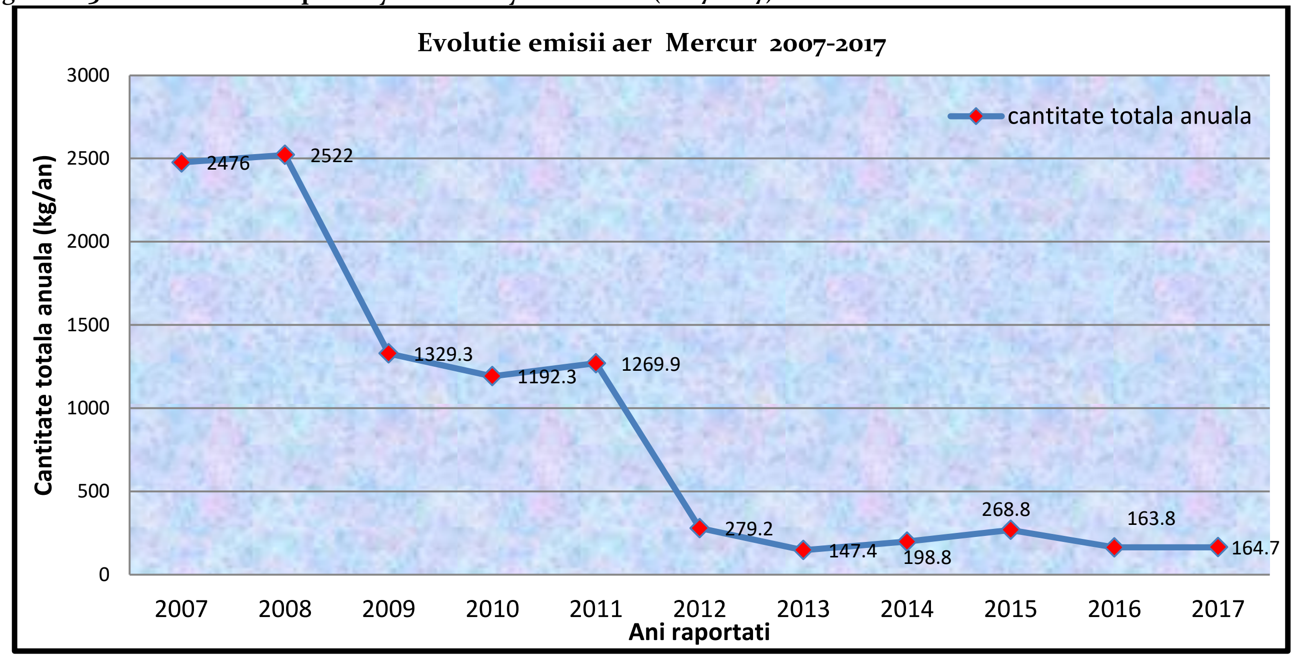
Source:NEPA

Figure I.62 Evolution of the quantity of lead emissions (2007-2017)



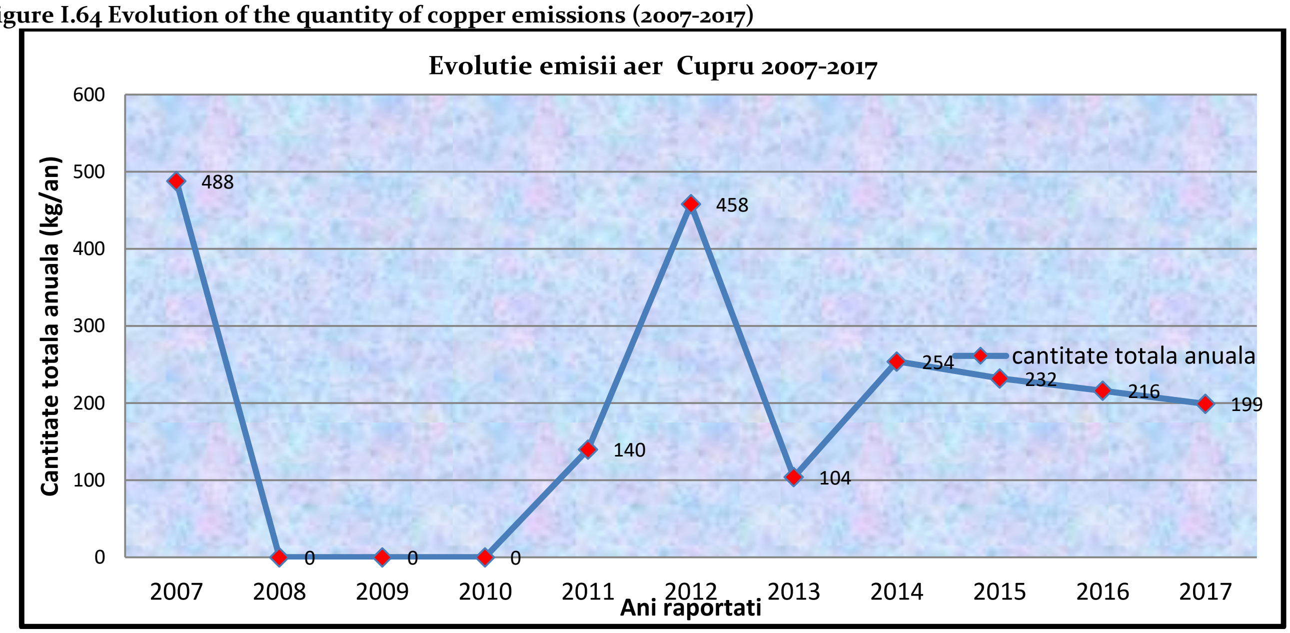
Source:NEPA

Figure I.63 Evolution of the quantity of mercury emissions (2007-2017)



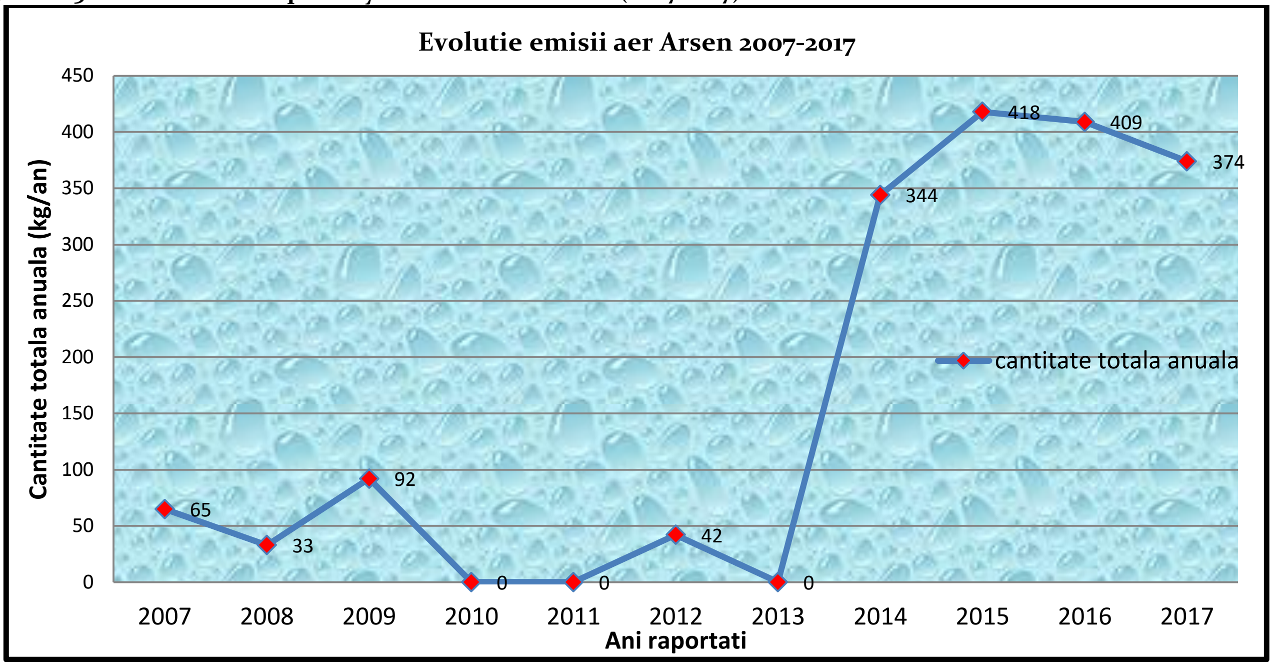
Source:NEPA

Figure I.64 Evolution of the quantity of copper emissions (2007-2017)



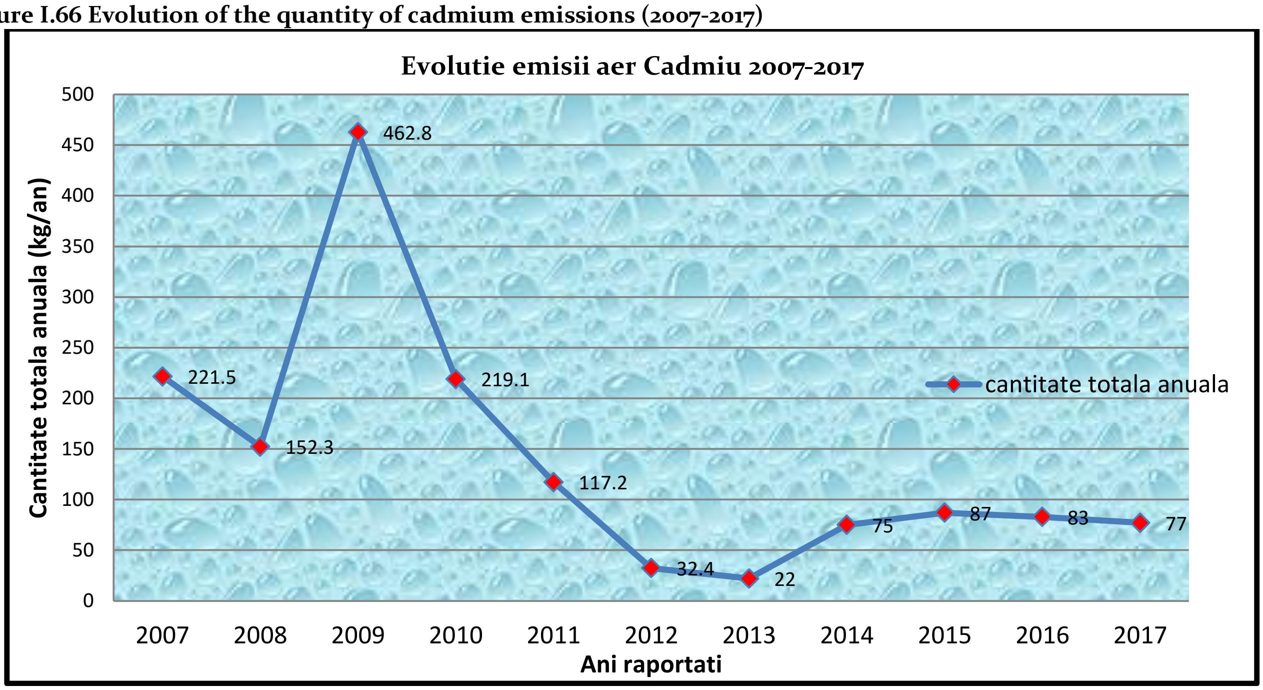
Source:NEPA

Figure I.65 Evolution of the quantity of arsenic emissions (2007-2017)



Source:NEPA

Figure I.66 Evolution of the quantity of cadmium emissions (2007-2017)



Source:NEPA

From the graphs presented above, it can be observed that although the energy sector continues to improve its environmental performance, it contributes to air pollution with significant amounts of sulfur dioxide, carbon monoxide, carbon dioxide, nitrogen oxides and powders. Analyzing at national level the evolution of these main pollutants emitted into the air, there is a general tendency to decrease them. We can say that reducing the impact of energy systems on the environment was achieved by rehabilitating and modernizing large combustion plants, by developing desulphurization, deoxygenation and dusting installations. At the same time, the reduction of SOx emissions in the energy sector was achieved by renouncing the use of fuels with a high sulfur content (coal or fuel oil) but also by using fuels with a low sulfur content (natural gas). But we must admit that this decline in emissions also occurred due to the closure of some installations. But overall, in 2017 compared to 2007, most of the emissions from the energy sector were reduced as follows: SOx by about 90.40%, NOx by about 66.57%, PM10 by 89.39% and CO2 by about 43.49 %

I.2.1.3. Transport

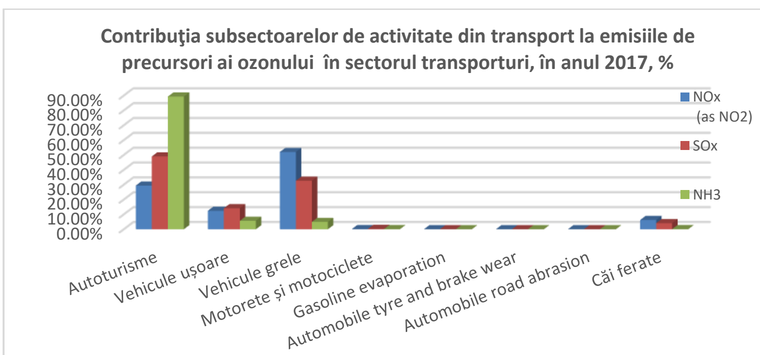
Emissions of acidifying substances

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

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

Depending on the acidifying potential of anthropogenic emissions: nitrogen oxides (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), the respective trends of the subsectors of activity in the transport sector (without aviation) are presented graphically.

Figure I.67 Contribution of the subsectors of activity from the transport sector to the emissions of pollutants with acidification and eutrophication effect, in 2017 (NOx, SOx, NH_3)



Source : Romania's Informative Inventory Report 2019

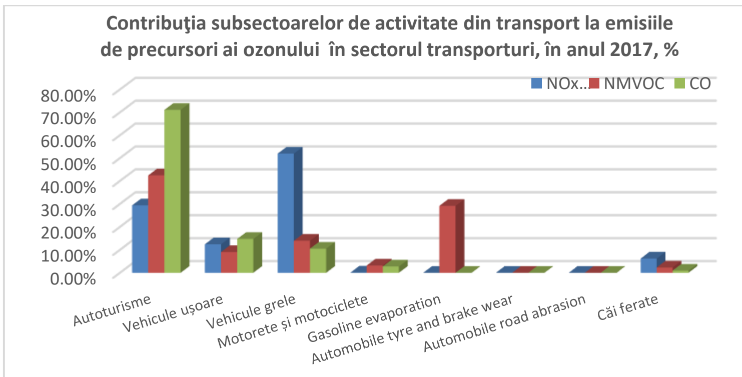
From the analysis of the data regarding the acidifying potential of anthropogenic emissions of oxides of nitrogen (NOx), ammonia (NH3) and sulfur oxides (SOx, SO2), it is found that the sub-sectors of activity cars and heavy vehicles have the highest share, followed by light vehicles and emissions from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

Ozone precursor emissions

RO 02	Indicator code Romania: RO 02 EEA 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 (CH_4) 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 I.68 Contribution of the subsectors of activity from the transport sector to the emissions of ozone precursors, in 2017 (NOx, NMVOC, CO)



Source: Romania's Informative Inventory Report 2019

From the analysis of the data regarding the contribution of the transport activity subsectors, in 2017, the emissions of ozone precursors in the transport sector show the highest values for CO and NMVOC pollutants in the category of cars and petrol evaporation, followed closely by the heavy vehicles category with highest value for nitrogen oxide pollutants.

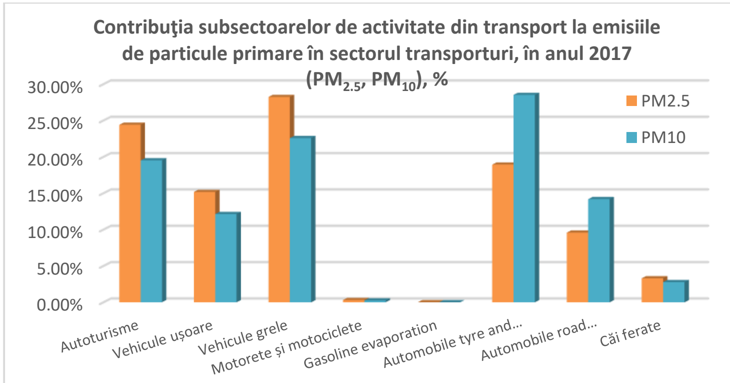
Primary particle emissions and secondary particle precursors

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

TITLE: PRIMARY PARTICLES EMISSIONS AND SECONDARY PARTICLE PRECURSORS
DEFINITION: This indicator shows the primary particle emission (PM2,5) and 10 µm (PM10) and secondary particle precursors (NOx, ammonia (NH_3) and Sulfur dioxide (SO_2), 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 (PM2.5) and 10µm (PM10 respectively) is shown graphically.

Figure I.69 Contribution of the subsectors of activity in the transport sector to the emissions of primary particles, in 2017 (PM2.5, PM10)



Source: LRTAP-RO-2019

From the analysis of the data regarding the contribution of the subsectors of the transport activity, in 2017, to the emissions of primary particles and precursors of the secondary particles, it is found that the activities with the highest share result from the category of cars, heavy vehicles and tire and brake wear.

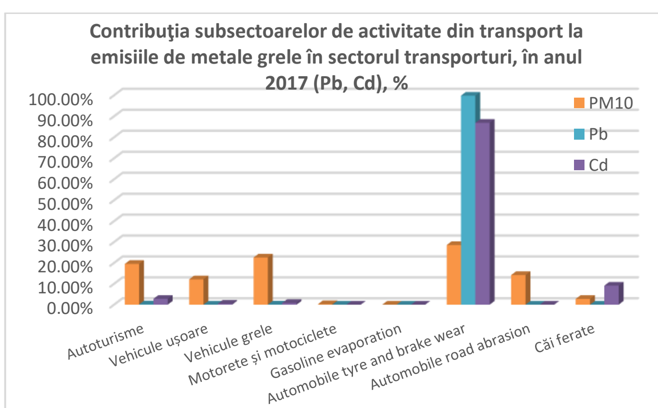
Heavy metal emissions

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 anthropic heavy metal emissions from the subsectors of activity in the transport sector at the level of 2017 is presented graphically (Figure I.70).

Figure I.70 Contribution of the subsectors of activity from the transport sector to the emissions of heavy metals, in 2017 (Pb, Cd)



Source: LRTAP-RO- 2019

From the analysis of the data on the contributions from the transport sector at the national level, to the emissions of heavy metals, it is found that the highest weight has the same activities, namely: passenger transport and heavy vehicles for Cd and for the wear of brake pads for Pb.

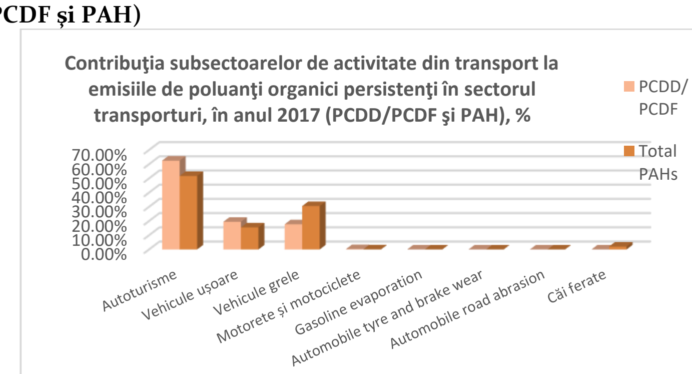
Emissions of persistent organic pollutants

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 the anthropogenic emissions of persistent organic pollutants, of polycyclic aromatic hydrocarbons (PAH) is presented graphically, by subsectors of activity in the transport sector at the level of 2017 (figure I.71).

Figure I.71 The contribution of the subsectors of activity in the transport sector to the emissions of persistent organic pollutants, in 2017 (PCDD/PCDF şi PAH)



Source: LRTAP-RO-2019

From the analysis of the data on the contributions from the transport sector, the persistent organic pollutant emissions show that even for these pollutants the highest share is the categories of passenger cars and heavy vehicles, followed by light vehicles.

I.2.1.4. Agriculture

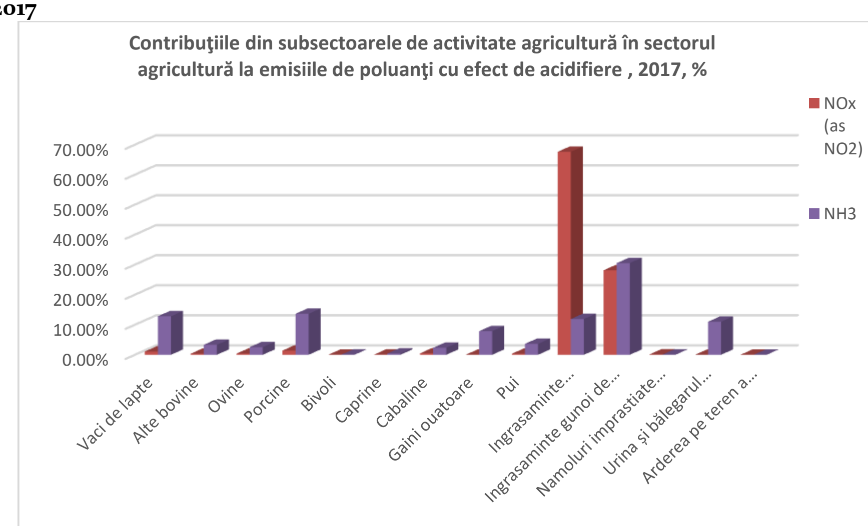
Emissions of acidifying substances

RO 01	**Indicator code Romania: RO 01** **EEA 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 (NH_3) and sulfur oxides (SOx, SO_2), 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.

The trend of anthropogenic emissions of acidifying substances: nitrogen oxides (NOx), ammonia (NH_3), as well as changes in emissions from the main subsectors of the agricultural sector at the level of 2017 is presented graphically. Contributions from the subsectors of agriculture to the emissions of pollutants with acidifying effect in the agricultural sector (NOx, NH_3), are presented in graphic form (Figure I.72).

Figure I.72 Contributions of the subsectors of activity in the agriculture sector to the emissions of acidifying pollutants (NOx and NH_3), in 2017



Source: Romania's Informative Inventory Report 2019

From the analysis of the data presented regarding the contribution of the activity of the agricultural subsectors to the emissions of acidifying pollutants, it is found that the activities with impact on the emissions of acidifying pollutants are the raising of animals (dairy cows, pigs, laying hens), followed by the application of synthetic and natural fertilizers in agricultural crops. The subsector of application of inorganic fertilizers with nitrogen (including urea) on the soil is the main contributor to NOx emissions from agriculture..

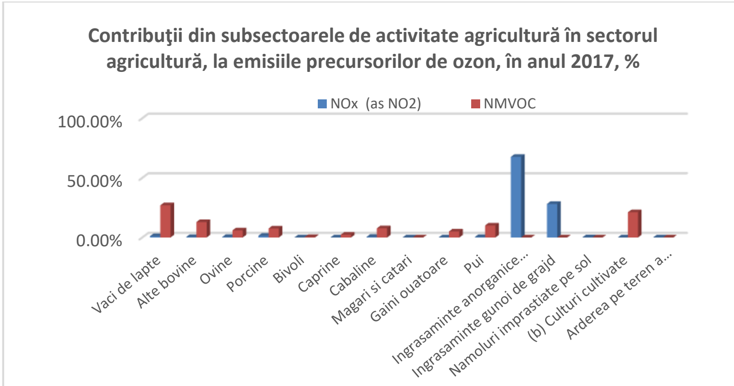
Ozone precursor emissions

RO 02	Indicator code Romania: RO 02 EEA 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 (CH_4) 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 ozone precursor pollutants from the ground (troposphere): nitrogen oxides (NOx) and non-methane volatile organic compounds (NMVOC), coming from the subsectors of the agricultural sector, are processed and presented graphically in figure I. 73.

Figure I.73 Contributions of the subsectors of activity from the agriculture sector to the emissions of ozone precursors (NMVOC and NOx), in 2017



Source: Romania's Informative Inventory Report 2019

From the analysis of the data presented regarding the contribution of the activity of the agricultural sectors, to the emissions of the ozone precursors at the national level, it is found that the activities regarding the breeding of animals (milk cows, laying hens, other cattle) have the highest weight for the NMVOC pollutant and for the emissions of NOx, the main issuer is the subsector of activity of application of inorganic fertilizers with nitrogen (including urea).

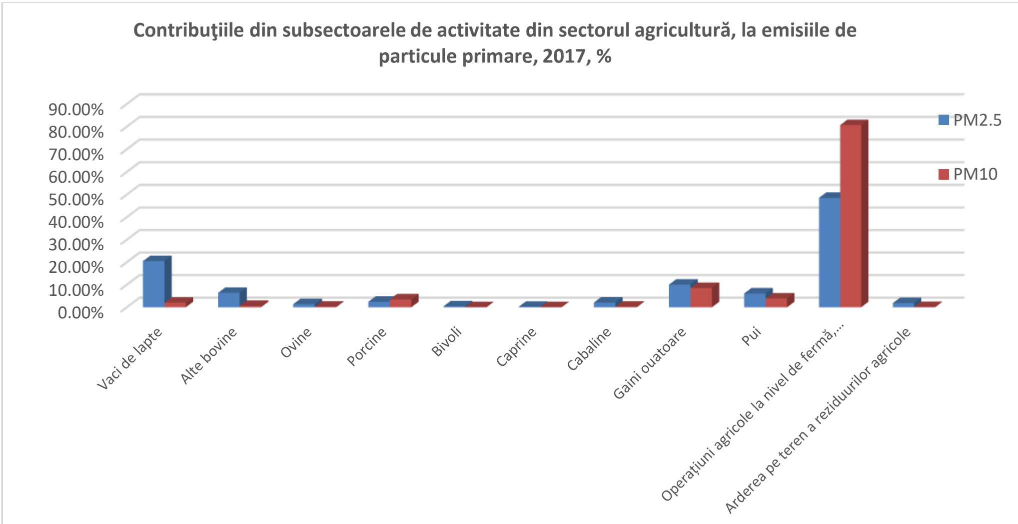
Primary particle emissions and secondary particle precursors

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

TITLE: PRIMARY PARTICLES EMISSIONS AND SECONDARY PARTICLE PRECURSORS
DEFINITION: This indicator shows the primary particle emission ($PM_{2,5}$) and 10 µm (PM_{10}) and secondary particle precursors (NOx, ammonia (NH_3) and Sulfur dioxide (SO_2), 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 contributions of the subsectors of activity from the agriculture sector to the $PM_{2,5}$ and PM_{10} primary particulate emissions, in 2017, are presented in graphical form (figure I.74).

Figure I.74 Contributions of the subsectors of activity from the agriculture sector to the emissions of primary particles PM2.5 and PM10, 2017



Source: LRTAP-RO-2019

From the analysis of the data regarding the contribution of the activity of the agricultural sectors, to the PM2,5 and PM10 primary particle emissions in the agricultural sector, it is found that a significant share is held by the activity of agricultural operations in farms, transport and storage, followed by the activity of breeding milk cows.

Emissions of persistent organic pollutants

RO 39	Indicator code Romania: RO 39 EEA indicator code: EPA 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 activity sector had a non-significant contribution (0.06%) in 2017 to the polycyclic aromatic hydrocarbon (PAH) emissions, resulting from the field burning activity of agricultural residues.

I.3. TRENDS AND FORECASTS ON ENVIRONMENTAL AIR POLLUTION

I.3.1. TRENDS CONCERNING EMISSIONS OF MAIN ATMOSPHERIC POLLUTANTS

RO 01	Indicator code Romania: RO 01 EEA 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 (NH_3) and sulfur oxides (SOx, SO_2), 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 values of emissions of pollutants released into the atmosphere are directly proportional to:

- the level of production achieved from various sectors of activity at national level;
- refurbishment of installations (cleaner technologies, with emissions of minimal pollutants);
- the replacement of old installations, which are not economically and financially justified to be refurbished, with new, non-polluting installations;
- the transposition of the European legislation into the Romanian legislation so as to achieve the targets regarding the limitation of the pollutant emissions in the atmosphere, the maintenance and the improvement of the air quality indicators.

The pollutants that exceed the limit values are generally PM_{10} and NO_2 (for traffic pollution). Rarely exceeded values are recorded at CO, SOx and O_3, but generally lower than the total number of exceedances allowed. The main measures to be taken are:

- maintaining restrictions on truck traffic in the center of Bucharest;
- reducing traffic jams by implementing a smart traffic control system;
- increasing the attractiveness of public transport and cycling;
- increasing control over constructions (the obligation of cleaning in the areas bordering the construction, resulting in the reduction of suspended particles).

From the analyzes of the data regarding the dispersion of pollutants in the atmosphere, we appreciate that there are areas that are exposed to the increased risk of pollution, especially those with high density of buildings and those with heavy circulation.

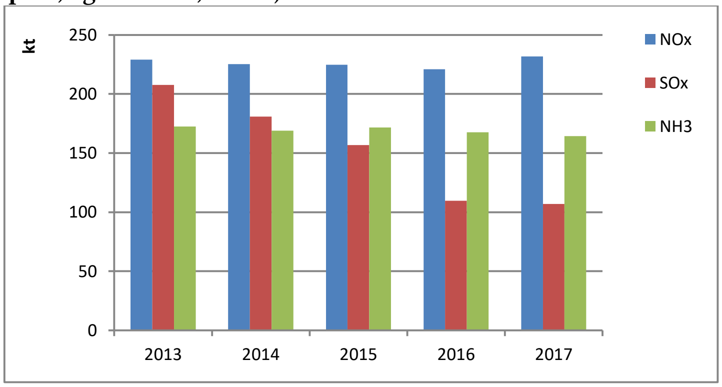
The evolution of air pollution is a complex problem, generated by numerous activities, mainly energy and industrial production, traffic, residential heating, agriculture and waste; in urban areas, the increase in traffic and its control are the main factors that influence the tendency of atmospheric emissions.

Emisii de substanțe acidifiante

The trend of atmospheric pollutant emissions by activity sectors (energy, industry, transport, agriculture, waste) at national level is presented during 2013-2017.

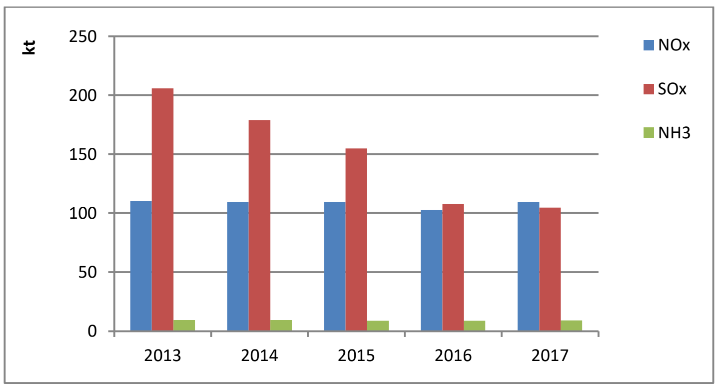
Data are presented in graphical form regarding the emission trend of the pollutants with acidification and eutrophication effect (NOX, SOX and NH_3), at national level during 2013-2017, (figures I.75 - I.79).

Figure I. 75 Trend of atmospheric pollutant emissions with acidification and eutrophication effect at national level 2013-2017 (energy, industry, transport, agriculture, waste)



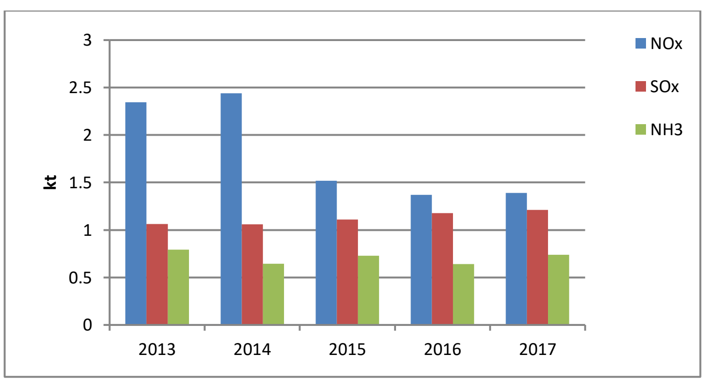
Source: LRTAP-RO 2019

Figure I.76 Emissions trend of acidifying pollutants (NOx, SOx and NH3) from the energy activity sector in the period 2013-2017



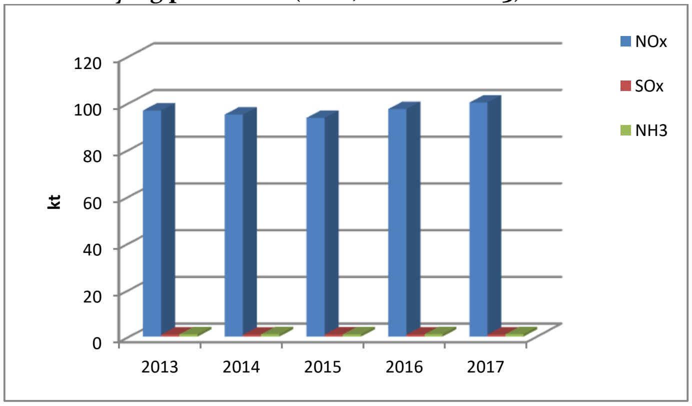
Source: LRTAP-RO-2019

Figure I.77 Trend of the emissions of acidifying pollutants (NOx, SOx and NH3) from the industrial activity sector during 2013-2017



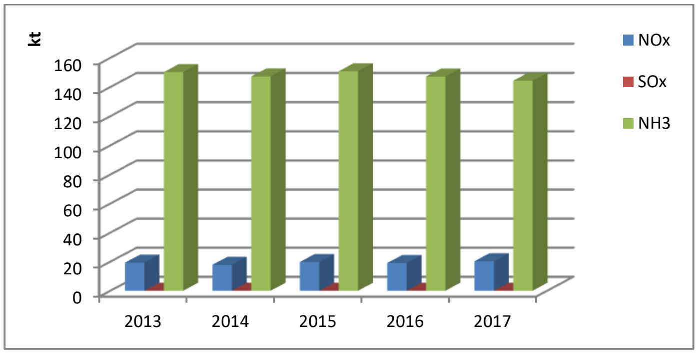
Source: LRTAP-RO-2019

Figure I.78 Trend of emissions of acidifying pollutants (NOx, SOx and NH3) from the transport sector during 2013-2017



Source: LRTAP-RO-2019

Figure I.79 Trend of emissions of acidifying pollutants (NOx, SOx and NH3) from the agricultural sector at national level during 2012-2016



Source: LRTAP-RO-2019

The target emissions of sulfur dioxide and nitrogen oxides have a decreasing evolution as a result of the progressive implementation by the activity holders of the measures to comply with the emission limit values. The study of the interaction of the pollutant with the environment in which the dispersion takes place is done considering all the factors that influence its evolution in time and space.

From the data analysis we can observe a slight tendency to decrease the emissions of pollutants with acidification effect at national level during the analyzed period. In sectors, the decrease is mainly manifested in the energy and industry sectors, agriculture and transport sectors showing increasing or decreasing variations, from year to year.

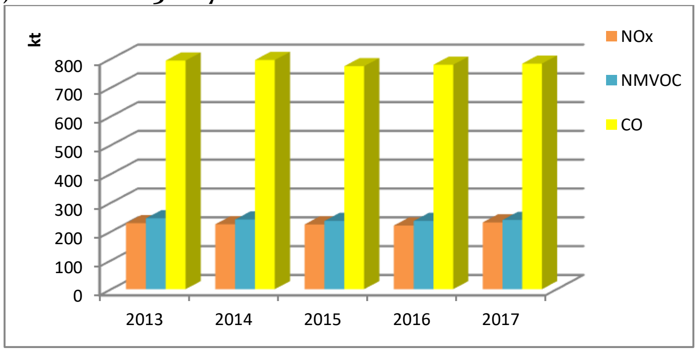
Ozone precursor emissions

RO 02	Indicator code Romania: RO 02 EEA 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 (CH_4) 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.

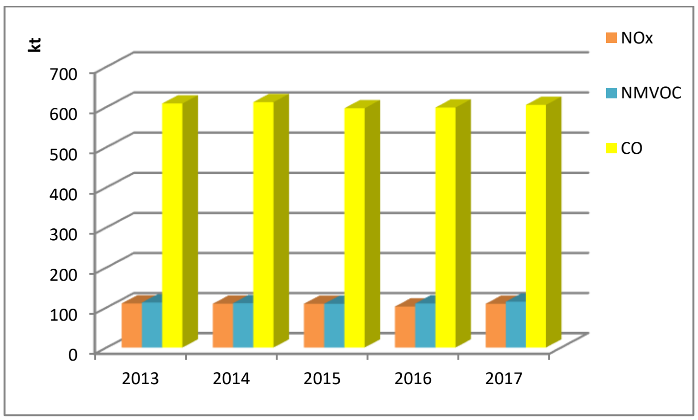
The trend of ozone precursor emissions (NOx, NMVOC, CO) is presented in graphical form, at national level during 2013-2017 (Figures I.80 - I.84).

Figure I.80 The trend of emissions of ozone precursor atmospheric pollutants at national level (energy, industry, transport, agriculture, waste) between 2013-2017



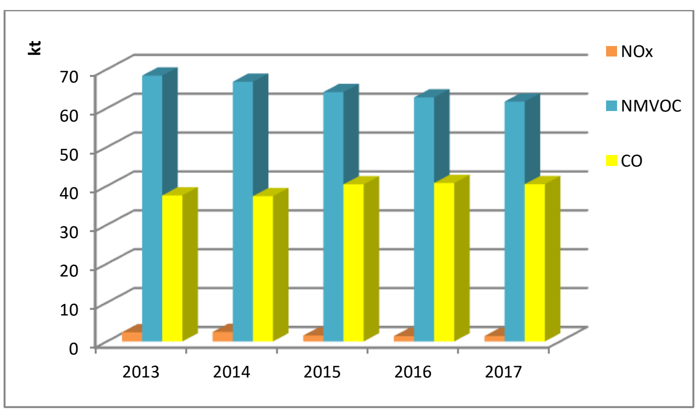
Source: LRTAP-RO-2019

Figure I.81 The trend of emissions of ozone precursor pollutants (NOx, NMVOC and CO) from the energy activity sector, between 2013-2017



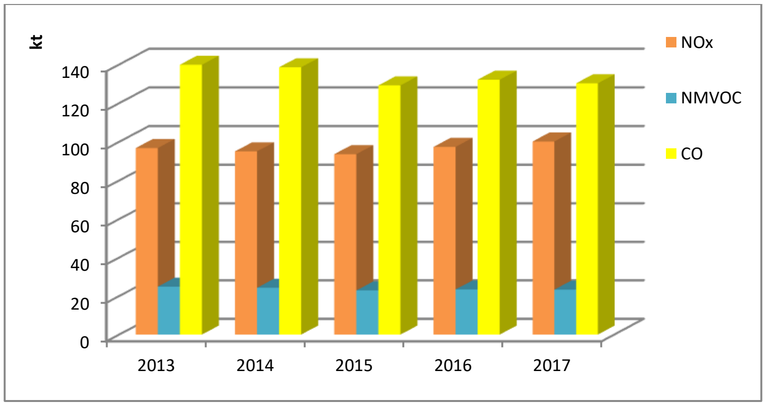
Source: LRTAP-RO-2019

Figure I.82 The trend of emissions of ozone precursor pollutants (NOx, NMVOC and CO) from the industrial activity sector, between 2013-2017



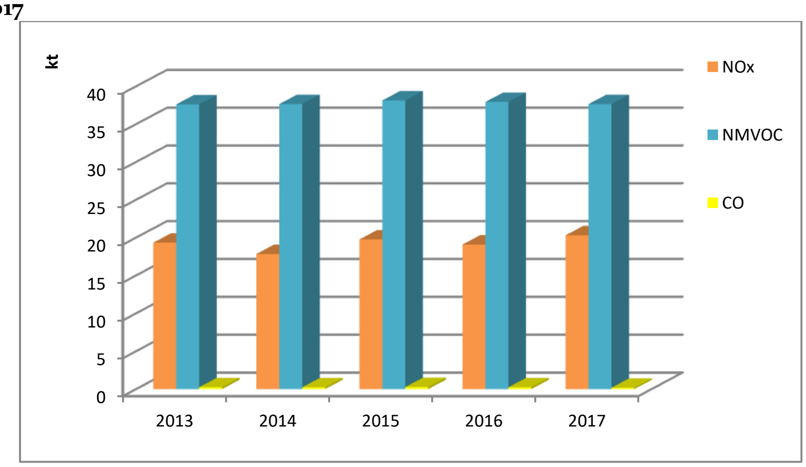
Source: LRTAP-RO-2019

Figure I.83 The trend of emissions of ozone precursor pollutants (NOx, NMVOC and CO) from the transport sector, between 2013-2017



Source: LRTAP-RO-2019

Figure I.84 The trend of emissions of ozone precursor pollutants (NOx, NMVOC and CO) from the agricultural activity sector, between 2013-2017



Source: LRTAP-RO-2019

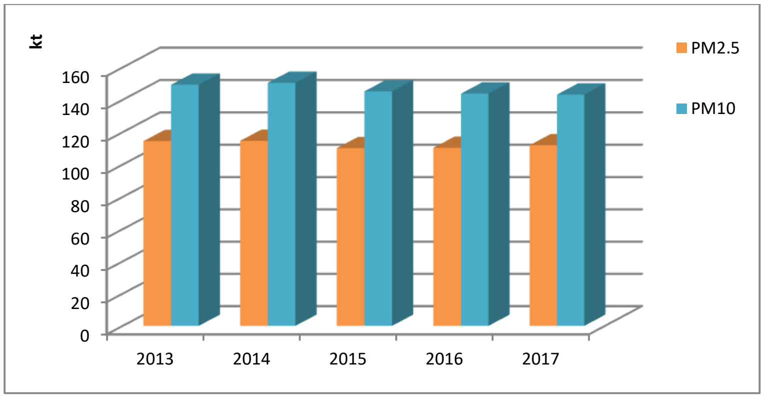
Primary particle emissions and secondary particle precursors

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

TITLE: PRIMARY PARTICLES EMISSIONS AND SECONDARY PARTICLES PRECURSORS
DEFINITION: This indicator shows the primary particle emission (PM2,5) and 10 µm (PM10) and secondary precursors of particles (NOx, ammonia (NH_3) and Sulfur dioxide (SO_2), 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.

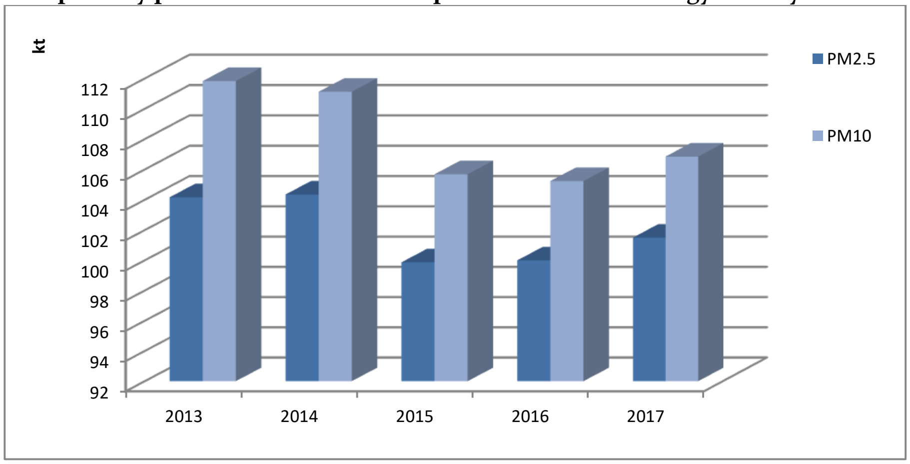
The trend of emissions of primary particles with a diameter of less than 2.5 µm (PM2.5) and 10µm (PM10) in suspension, respectively expressed in kt, at national level in 2013-2017, are presented in graphic form (Figures I.85 - I.89).

Figure I.85 Trends of primary particle emissions at national level (total energy, industry, transport, agriculture, waste) 2013-2017



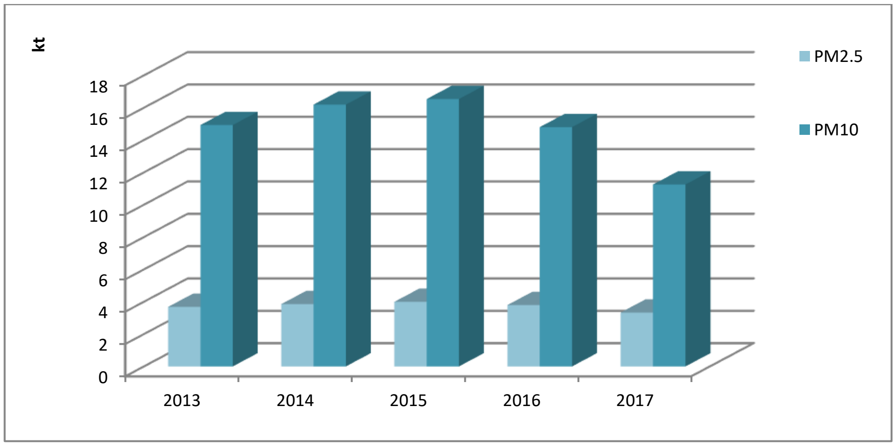
Source: LRTAP-RO-2019

Figure I.86 The trend of primary particle emissions in suspension from the energy activity sector during 2013-2017



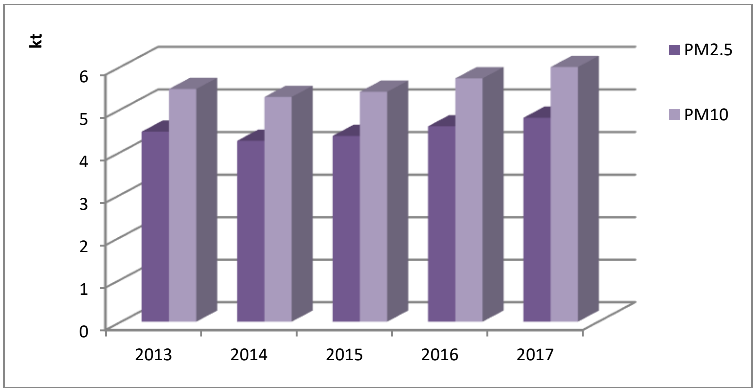
Source: LRTAP-RO-2019

Figure I.87 Trend of primary particle emissions in the industrial sector from 2013 to 2017



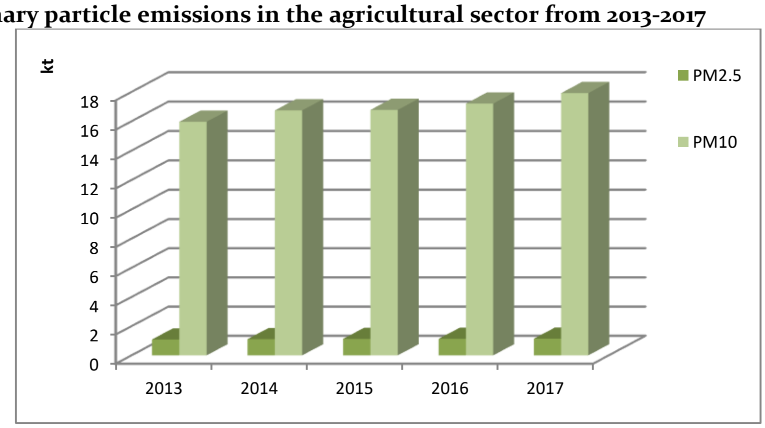
Source: LRTAP-RO-2019

Figure I.88 Trend of primary particle emissions in suspension from the transport sector during 2013-2017



Source: LRTAP-RO-2019

Figure I.89 Trend of primary particle emissions in the agricultural sector from 2013-2017



Source: LRTAP-RO-2019

From the analysis of the data sets on the trend of PM2,5 and PM10 primary particle emissions at national level, we can observe the main sectors with major contributions in primary particle emissions: the energy sector and the agriculture sector.

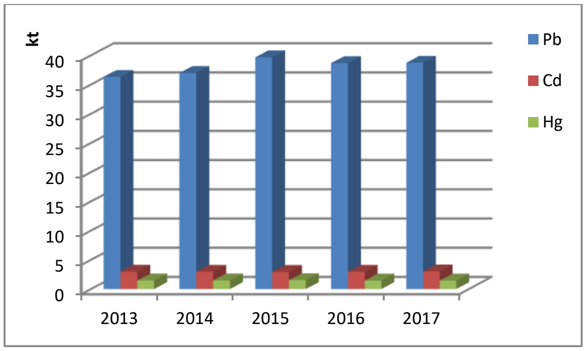
The overall trend of primary particles emissions in 2013-2017 is decreasing.

Heavy metals emissions

RO 38	Indicator code Romania: RO 38 EEA 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.**	

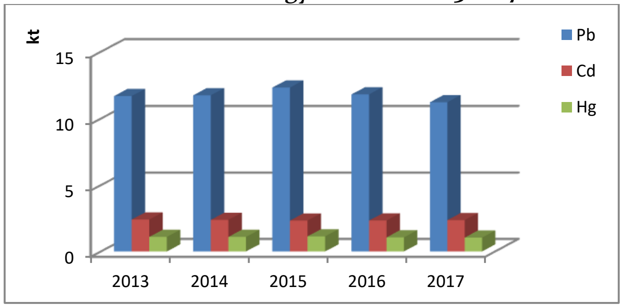
The trend of emissions of heavy metals cadmium (Cd), mercury (Hg) and lead (Pb), **at national level** between 2013-2017, are presented in graphical form (figures I.90 - I.93).

Figure I.90 Trend of heavy metal emissions (Cd, Hg and Pb) at national level (total energy, industry, transport, agriculture, waste) 2013-2017



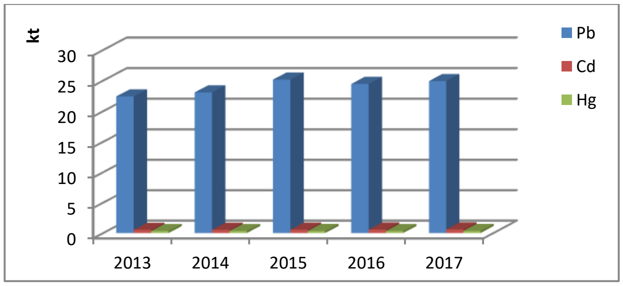
Source: LRTAP-RO-2019

Figure I.91 Trend of heavy metal emissions from the energy sector in 2013-2017



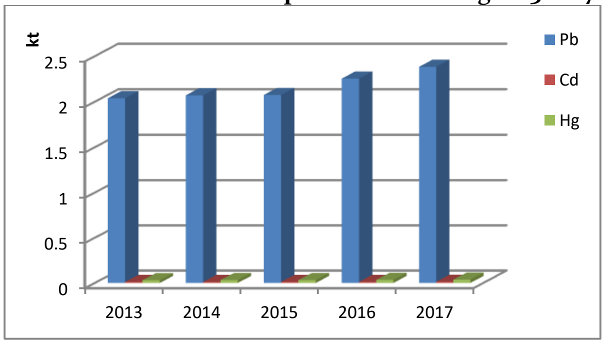
Source: LRTAP-RO-2019

Figure I.92 Trend of heavy metal emissions from the industrial sector in 2013-2017



Source: LRTAP-RO-2019

Figure I.93 Trend of heavy metal emissions from the transport sector during 2013-2017



Source: LRTAP-RO-2019

At national level, from the analysis of the data presented regarding the tendency of heavy metals emissions, the increase is observed during the period 2014-2015, the trends revealing the periods of exit from the economic crisis 2010-2013 in which the economic and industrial activities were reduced, in the years 2013-2017 the activities growing against the backdrop of economic growth. The transport sector shows an annual growth trend with an average of 13% on the Pb indicator, mainly due to the increase of the number of cars at national level, both civil and industrial, in 2017 the Pb emissions being 5.7% higher compared to 2016. Overall, at national level, Pb emissions increased in 2017 by 6.7% compared to 2016, those of Cd increased by 1% and those of Hg decreased by 0.8%.

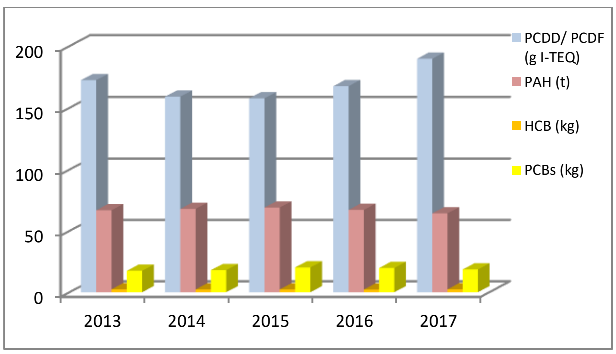
Emissions of persistent organic pollutants

RO 39	Indicator code Romania: RO 39 EEA indicator code: EPA 06

DENUMIRE: EMISII DE POLUANŢI ORGANICI PERSISTENŢI
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.

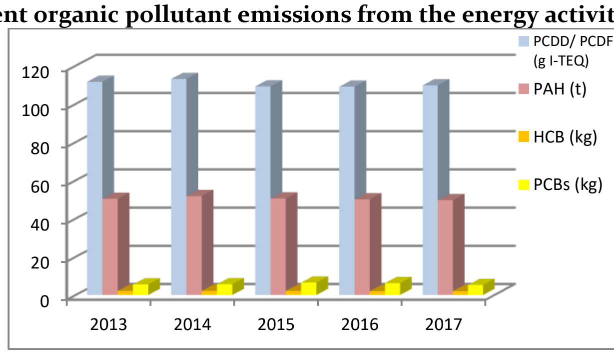
The trend of persistent organic pollutant emissions (hexachlorobenzene-HCB, hexachlorocyclohexane-HCH, polychlorinated biphenyls - PCB, dioxin - PCDD, furans-PCDF and polyaromatic hydrocarbons-HPA), at national level in 2013-2017, is shown in Figures I.94 - I.97.

Figure I.94 Trend of persistent organic pollutants emissions (hexachlorobenzene HCB, hexachlorocyclohexane HCH, polychlorinated biphenyls PCB, dioxin PCDD, furans PCDF and polyaromatic HPA hydrocarbons), at netional level between 2013-2017



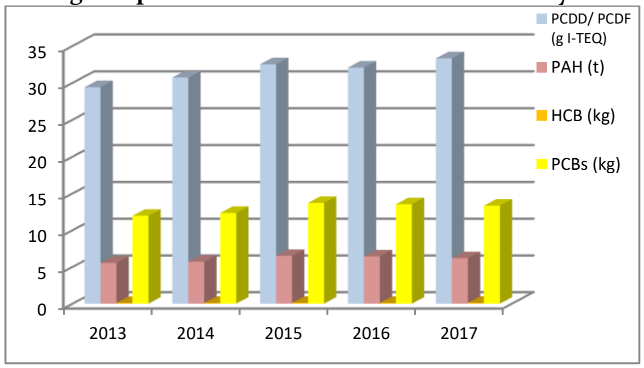
Source: LRTAP-RO-2019

Figure I.95 The trend of persistent organic pollutant emissions from the energy activity sector during 2013-2017



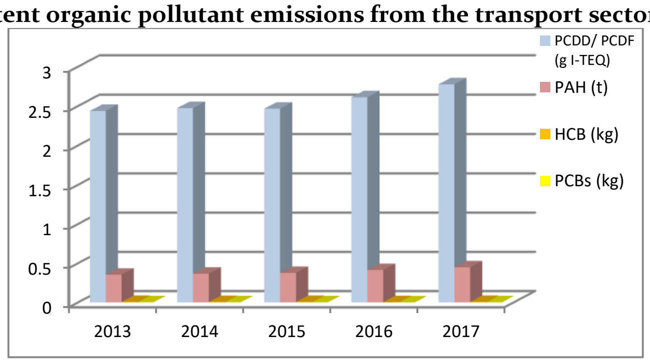
Source: LRTAP-RO-2019

Figure I.96 The trend of persistent organic pollutant emissions from the industry sector during the period 2013-2017



Source: LRTAP-RO-2019

Figure I.97 The trend of persistent organic pollutant emissions from the transport sector during 2013-2017



Source: LRTAP-RO-2019

In the sectors of industry and transport, there is a tendency to increase the emissions of persistent organic pollutants due mainly to the intensification of the industrial activity after 2013, namely the increased growth of the car park in all categories of cars, both the category of light and heavy vehicles. The socio-economic, financial and political measures that create the legislative framework, as well as objectives of national and European environmental plans, projects and programs have been highlighted as instruments for controlling and preventing emissions of atmospheric pollutants according to the requirements of the directives on quality of life and the environment.

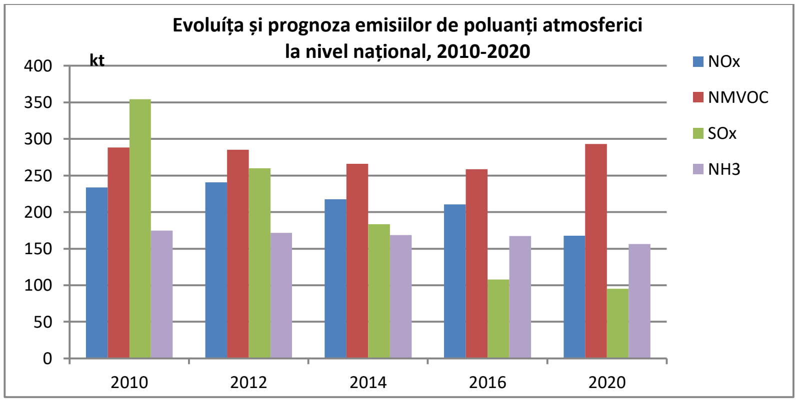
I.3.2. FORECASTS ON THE EMISSIONS OF THE MAIN ATMOSPHERIC POLLUTANTS

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:

- production of electricity by partially replacing fossil fuels with alternative sources: nuclear power (commissioning of Cernavoda CNE reactors 3 and 4), wind energy, energy produced in the fields of photovoltaic panels, etc.;
- reduction of sulfur content in fuels and gases and partial replacement of diesel fuel with biodiesel;
- replacing heating in rural households (traditional wood-burning stoves) with modernized stoves that use as pellet fuel and have high combustion yields and low pollutant emissions;
- introduction into operation of vehicles equipped with electrically powered engines;
- the provision of economic-financial mechanisms that allow the replacement of installations with significant pollutant effect on the environment with less polluting ones;
- provision of facilities for retention, capture, storage of polluting substances (eg carbon capture and storage at large combustion plants - IMA, electrostatic filters, low NOx burners, scrubbing, etc.).

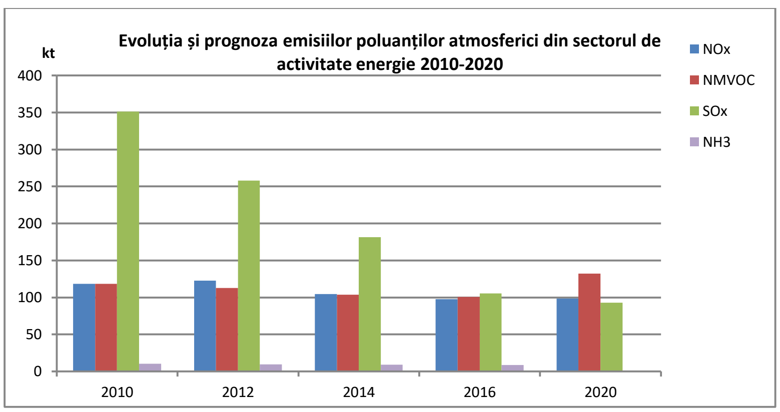
The evolution and forecast of atmospheric pollutant emissions by sectors of activity (energy, industry, transport, agriculture, waste) at national level for the years 2010, 2012, 2014, 2016 and 2020, are presented in graphical form (Figures I.98 - I.102).

Figure I.98 Evolution of atmospheric pollutant emissions by activity sectors (energy, industry, transport, agriculture, waste) at national level for the period 2010-2016 and the target forecast for 2020



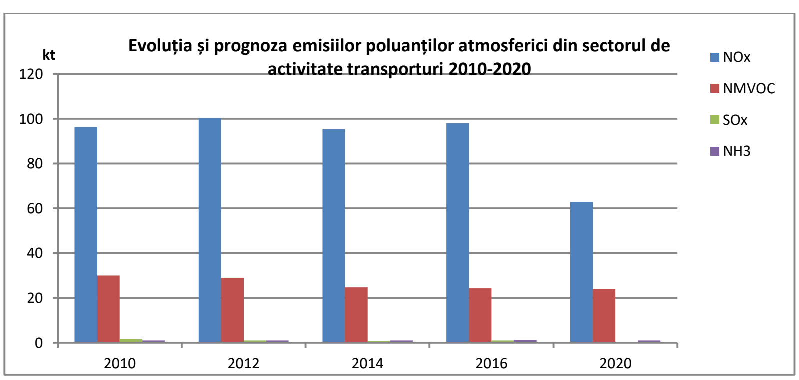
Source: National_emission_projections_2030_Annex_IV

Figure I.99 Evolution and forecast of atmospheric pollutant emissions (NOx, NMVOC, SOx and NH3) from the energy activity sector at national level for the period 2010-2020



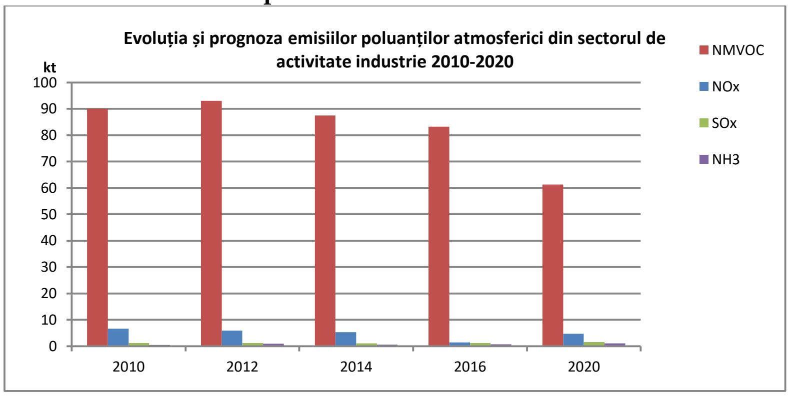
Source: National_emission_projections_2030_Annex_IV

Figure I.100 Evolution and forecast of atmospheric pollutant emissions (NOx, NMVOC, SOx and NH3) from the transport sector at national level for the period 2010-2020



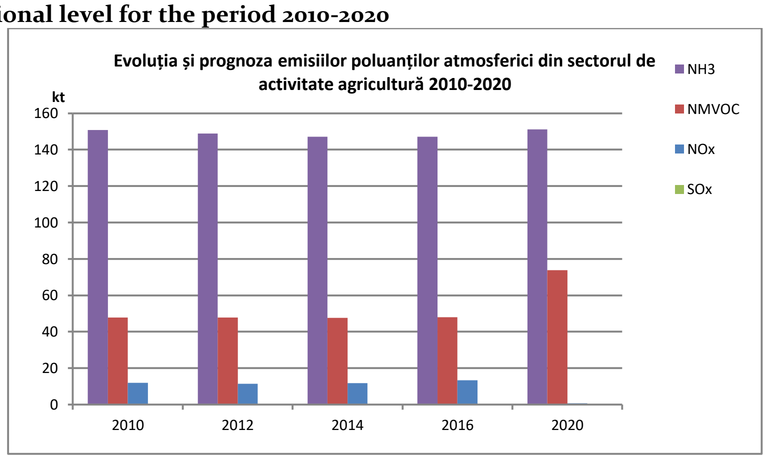
Source: National_emission_projections_2030_Annex_IV

Figure I.101 Evolution and forecast of atmospheric pollutant emissions (NOx, NMVOC, SOx and NH3) from the industry activity sector at national level for the period 2010-2020



Source: National_emission_projections_2030_Annex_IV

Figure I.102 Evolution and forecast of atmospheric pollutant emissions (NOx, NMVOC, SOx and NH3) from the agricultural sector at national level for the period 2010-2020



Source: National_emission_projections_2030_Annex_IV

From the analysis of the data presented regarding the evolution of the emissions of atmospheric pollutants at national level, we find a decrease of them in all the sectors of activity.

The preliminary forecasts developed include a number of different estimates (scenarios), which include combinations of support elements related to changes in activity levels (e.g., economic growth or decline), as well as the impact of new technologies, techniques and practices that correspond as local, national or regional efforts, ("policies and measures").

They are intended to reduce emissions, which range from emissions controls for vehicles and industrial plants and incentives for cleaner fuels and technologies or changes in economic factors (e.g, fuel price increases), measures aimed at fuel exchange and behavioral modifications. (e.g, raising awareness).

These approaches include measures such as: applying complex techniques and technologies to reduce and control or encourage new technologies.

The assumptions related to the preliminary forecasts made are based on a range of data sets, including forecasts of industrial development, population growth, changes in agro-technical models and transport demand.

The medium and long term emission factors reflect the technological advances, the environmental regulations, the improvement of the operating conditions of the installations and of the used equipment and any expected modification of the fuel formulations.

The speeds of penetration of new technologies are important in the development of sector factors with a high level of confidence, emission, for any target year of forecasting.

I.4. POLICIES, ACTIONS AND MEASURES FOR IMPROVING ENVIRONMENTAL AIR QUALITY

The assessment of ambient air quality is regulated by Law no. 104/2011 on ambient air quality transposing Directive 2008/50 / EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe and Directive 2004/107 / EC of the European Parliament and of the Council on arsenic, cadmium, mercury, nickel, polycyclic aromatic hydrocarbons in ambient air. Law no. 104/2011 regarding the surrounding air quality provides for the establishment of agglomerations and air quality management areas in which the environmental concentrations of pollutants do not meet the air quality objectives (limit values or target values). For these areas it is necessary to manage the air quality by developing and implementing air quality plans / programs, which should include in addition to the measures to reduce emissions and measures to protect sensitive groups of the population.

In 2012 it was approved by the MMP Order no. 3299/2012 methodology for the realization and reporting of the inventories regarding the emission of pollutants into the atmosphere, in a unitary way, throughout the territory of the country, in accordance with the provisions of the European legislation and of the international conventions in the field to which Romania is a party..

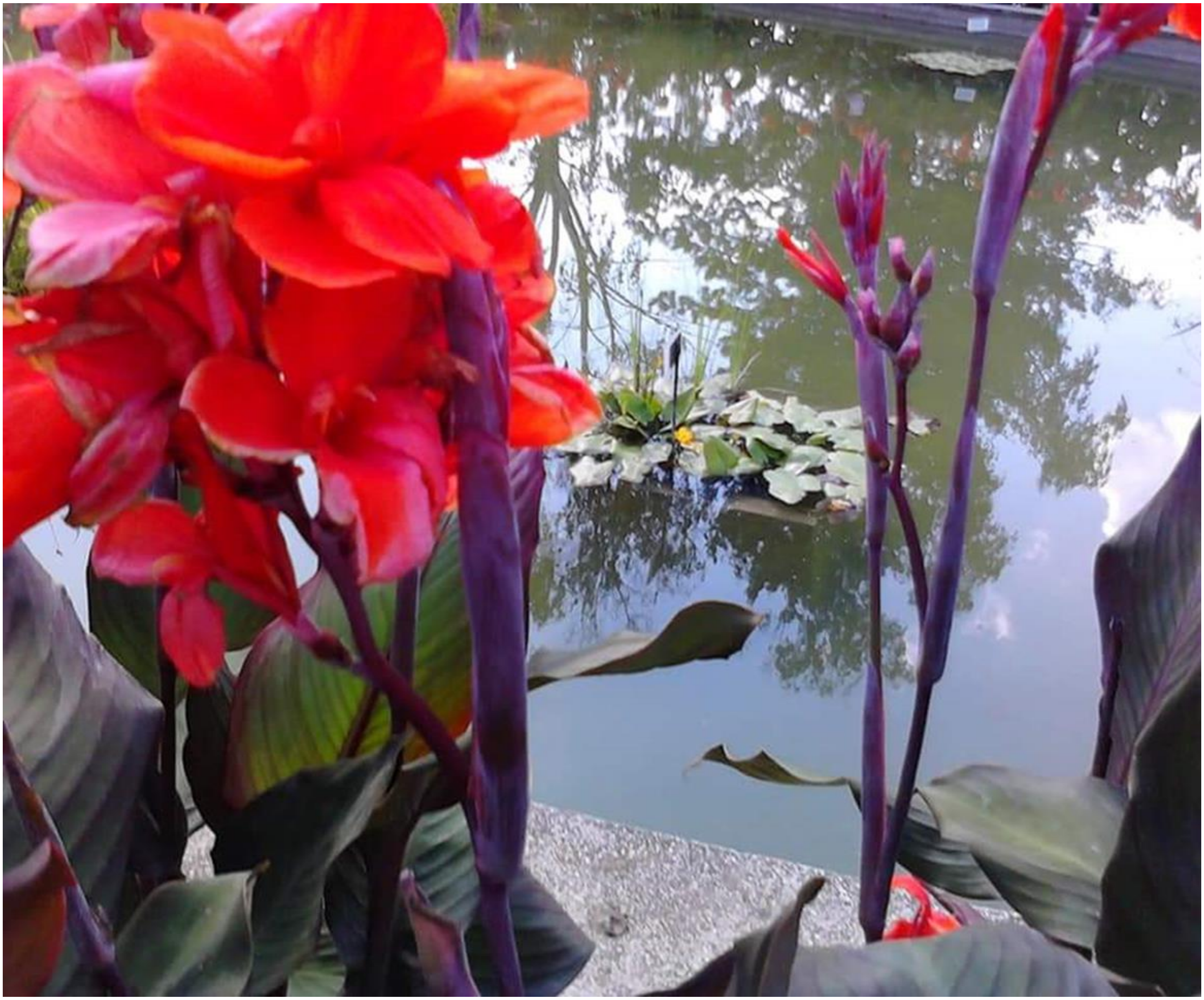
The inventory of pollutant emissions into the atmosphere at national level is based on the preparation of reports to European and international bodies and the establishment of compliance with Romania's obligations on pollutant emissions into the atmosphere. Taking into account the methodology approved by Order no. 3299/2012, local and national inventories that are reported to the *European Commission, the European Environment Agency, the Convention on Long-Range Transboundary Air Pollution, the Convention on Persistent Organic Pollutants adopted at Stockholm, the United Nations Framework Convention on Climate Change correlate with each other*.

The program to stimulate the renewal of the national car park, financed by the Administration of the Environment Fund from the budget of the Environment Fund, aimed at improving the quality of the environment by supporting the population in the purchase of new vehicles by granting cash bonuses to the owners of older vehicles and willing to buy a new car, less polluting, predicting the reduction of the effects of air pollution on the environment and population health, caused by the emissions of gases from used vehicles.

The program to stimulate the renewal of the National Car Park 2017: *28,366 used vehicles were thrown away and 24,960 new vehicles were financed, the amount financed being of 166,890,500 lei, of which 20,418,600 lei for legal persons and 146,471,900 lei for natural persons; the total value financed in 2017 is 193,152,500 lei. The difference of 26,262,000 lei is related to the firing requests submitted in 2016 and funded in 2017.*

The Rabla Plus program: *242 electric vehicles were financed, the value being 9,830,000 lei of which 6,885,000 lei for legal persons and 2,945,000 lei for natural persons; the value financed in 2017 is 9,890,000 lei. The difference of 60,000 lei is related to the firing applications submitted in 2016 and financed in 2017; also, within the category, there were 9 contracts for non-reimbursable financing worth RON 1,601,741.54 for the development of the recharging infrastructure for electric vehicles.* (source: https://www.afm.ro/main/informatii_publice/raport_anual_utilizare/raport_privind_utilizarea_fm_2017.pdf/

Chapter 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 18

Indicator code Romania: RO 18
EEA 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.

$$WEI = \frac{C_T}{R_T} * 100$$

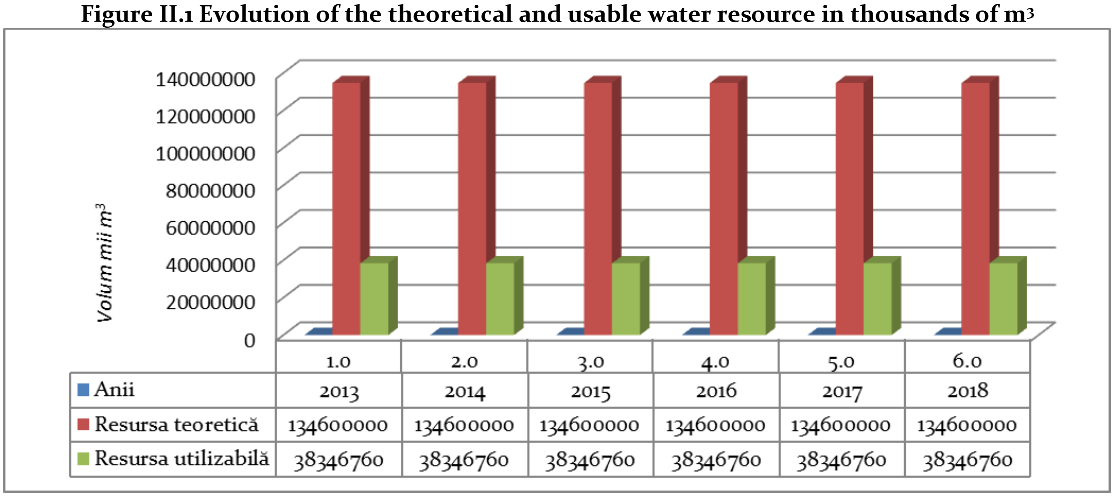
where: WEI is the water exploitation index, expressed in%;
CT - average annual total freshwater abstraction, expressed in billions of m3 / year;
RT - the total annual average national renewable water resources, expressed in million m3 / year.

Table II.1 Theoretical and usable water resource in thousands of m3

Years	Theoretical resource (thousands m3)	Usable resource * (thousands m3)
2013	134600000	38346760
2014	134600000	38346760
2015	134600000	38346760
2016	134600000	38346760
2017	134600000	38346760
2018	134600000	38346760

** The usable resource, according to the degree of planning of the river basins, also includes the resource related to the coastal lakes, as well as the resource provided by indirect external re-use along the river.*

Figure II.1 Evolution of the theoretical and usable water resource in thousands of m3



SURFACE WATER RESOURCES

The surface water resources of Romania come from 2 categories of sources, respectively:

- inland rivers (including natural lakes);
- Danube river.

For the users in Romania the main share in ensuring the necessary resource is the inland rivers. The natural lakes have reduced water volumes, except for the coastal lakes in the Razelm - Sinoe lagoon system which, although they have appreciable volumes, have brackish water due to the connections with the Black Sea waters.The Danube River, although it holds the priority in terms of the total volume of the resource, being located eccentrically relative to the national territory, is less used as a source of usable water. So far the only use of the water resource provided by the Danube has been in the agricultural field (for irrigation).

The natural water resource of the year 2018 from the inland rivers represented a flow volume of 40722 * 106m³, which places it near the level of the average multiannual volume calculated for a long period (1950 - 2018), respectively 40054 * 106m³. In this context, the year 2018 can be considered a normal year.

Compared with the last 5 years (2013 - 2017), the flow volume in 2018 is 11.1% higher than the multiannual average of the annual stock (36651 * 106m³) during the mentioned period (table II.2).

The increase compared to the multiannual average of the last 5 years is explained by the fact that the year 2018, compared to the other years, was somehow a rainy year, placing it in the group of years considered hydrologically normal.

In the last 5 years there have been drought years, for example the year 2017, compared to the year 2018, which led to the decrease of the average value of the water resource (figure II.2).

Extending the analysis of the comparative evolution of the resource for the year 2018, at the level of the main basins we find that in the south and east of the country, the volume passed in 2018 was surpassed by the multiannual average of the last 5 years. The situation is observed in the river basins of the Jiu, Nera and Cerna rivers (Table II.2). The largest increase is seen in the Vedea river basin, where the annual stock in 2018 represented 146.9% of the average of the multiannual stock (2013-2017) followed by the hydrographic basin of the Prut river which represented 130% of the average of the medium stock over the last 5 years.

In conclusion, 2018 was a normal year in terms of the amount of total water resource coming from inland rivers, the average annual stock being equal to the long-term average multi-year value.

The Danube river presents a situation similar to the one recorded on the inland river courses, the volume passed at the entrance to the country (st. H. Baziaș) and the one registered at the exit from the country (st. H. Isaccea) being below the average level calculated on the last 5 years (Table II.3).

The resource corresponding to the Danube river at the entrance to the country is 79975.3 mid. m³ in 2018 (respectively 71429 billion.m³ in 2017 and 85008.8 billion.m³ in 2013-2017), 6% less than the multiannual average of the river, which for the last 60 years is about 85000 billion . m³ (the values represent 50% of the volumes flown on the Danube at the entrance to the country, related to Romania, the other half returning to the Republic of Serbia). Compared to the total volume of the resource offered by the inland rivers (407222 * 106m³), at the exit of the country (Isaccea), the Danube had a volume flow of about 5 times greater (204952 * 106 m³). The considerable resource represented by the Danube river is, however, poorly accessible due to the pollution of the waters of the river and the eccentricity of its position in relation to potential users in Romania.

The average resource at the level of Romania is about 0.170 million m³ / km². In 2018, the richest water resource returned to the Vedea, Prut, Tisa, Crișuri, Mureș, Siret basins, to the river basins of the small tributaries of the Danube, while the most deficient units from this point of view were the basins of the Someș, Bega rivers. - Timiș - Caraș, Nera - Cerna, Jiu, Argeș, Ialomița and Dobrogea.

Also, in 2018, Romania had a specific resource from the inland rivers of 2074.47 m³/ place / year compared to 1963 milloc. (population of Romania on January 1, 2017).

Table II.2 The average theoretical water resources of the year 2018, compared to the previous period (2013-2017)

River basin	Parameter	F (km²)	Q annual average (m³/s)							Q_{2018}/Q_{med} (%)
			2013	2014	2015	2016	2017	Average 2013-2017	2018	
TISA	Q	4540	57.9	40.9	50.1	62.2	74.57	57.134	70.7	123.7

	V		1826	1288	1579	1980	2352	1805	2230	
SOMEȘ	Q	17840	112.9	68.7	92.6	129.8	95.21	99.842	93.21	93.4
	V		3559	2166	2919	4105	3003	3150.4	2939	
CRIȘURI	Q	14860	86.3	51.9	55	90.4	64.92	69.704	81.48	116.8
	V		2723	1637	1734	2859	2047	2200	2569	
MUREȘ	Q	29390	125.4	127	124	176.4	116.1	133.78	159.4	119.2
	V		3954	4005	3910	5578	3661	4221.6	5027	
BEGA - TIMIȘ - CARAȘ	Q	13060	94.6	73.1	57.132	78.85	46.61	70.058 4	66.3	94.6
	V		2984	2305	1802	2487	1470	2209.6	2091	
NERA - CERNA	Q	2740	36.06	54.2	41.75	35.8	19.38	37.438	33.01	88.2
	V		1137	1710	1317	11329	611	3220.8	1041	
JIU	Q	10080	100	168	129	154	70.8	124.36	111	89.3
	V		3154	5298	4068	4870	2233	3924.6	3500	
OLT	Q	24050	128	226	168	162	134	163.6	205	125.3
	V		4037	7127	5298	5123	4226	5162.2	6465	
VEDEA	Q	5430	7.07	37.7	17.6	15.9	7.15	17.084	25.1	146.9
	V		223	1188	555	503	225	538.8	791	
ARGEȘ	Q	12550	74	95.4	83.8	75	57.68	77.176	74.85	96.9
	V		2333	3008	2642	23726	1819	6705.6	2361	
IALOMITA	Q	10350	40.51	61.9	42.5	45.1	40.2	46.042	45	97.7
	V		1278	1952	1340	1426	1268	1452.8	1419	
DUNĂREA	Q	34141	26.7	41.7	36.9	33.1	23.55	32.39	35.17	108.6
	V		841	1316	1164	1047	743	1022.2	1109	
SIRET	Q	42890	219	288	206	217	160.3	218.06	272.57	124.9
	V		6899	9084	6481	6862	5055	6876.2	8596	
PRUT	Q	10990	17.8	13.1	6.92	7.39	13.72	11.786	15.16	128.6
	V		560	412	218	234	433	371.4	478	
DOBROGEA	Q	5480	2.05	2.51	3.92	4.88	2.63	3.198	3.34	104.4
	V		65	79	124	154	82.8	100.96	105	
Total Romania without the Danube river (fig. 2.1)	Q	238391	1128	1350	1115	1288	926.8 3	1161.56 6	1291.29	111.2
	V		35573	42575	35151	40732	29228	36651.8	40722	

Q = flow (m^3/s); V = total volume ($10^6 m^3$)

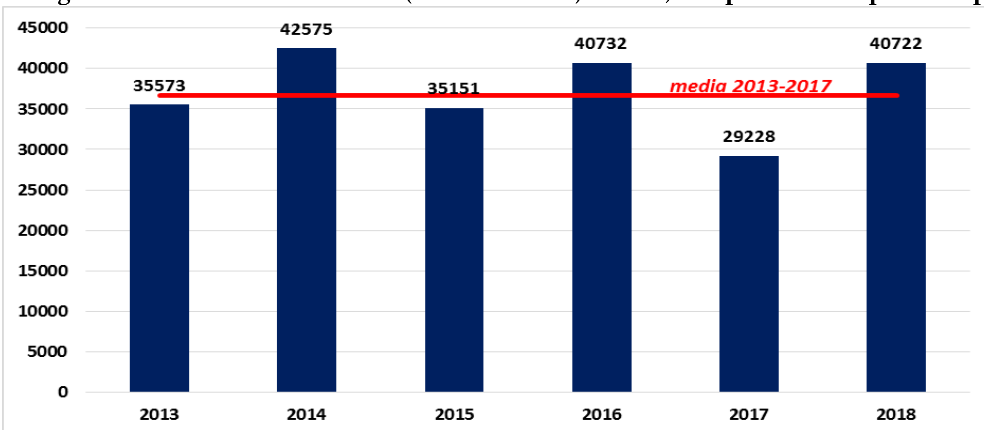
Table II.3 The theoretical water resource of the Danube river in 2018, compared to the previous period (2013-2017)

Hydrometric control stations on the Danube river	Param eter	Q annual average (m^3/s)							Q_{2018}/Q_{med} (%)
		2013	2014	2015	2016	2017	Average 2013-2017	2018	
Baziaș	Q	6080	6016	4920	5410	4530	5391.2	5072	94
	V	19173 9	1897 21	15515 7	17061 0	1428 58	170017	15995 0	
	V 1/2	95870	9486 1	7757 9	8530 5	7142 9	85008. 8	7997 5,3	

Isaccea	Q	7170	7439	6170	6470	5210	6491.8	6499	100
	V	226113	234596	194577	204038	164303	204725.4	204952	

Q = flow (m^3/s); V = total volume ($10^6 m^3$); V 1/2 = 50% of the volumes flown on the Danube at the entrance to the country, related to Romania, the other half returning to the Republic of Serbia

Figure II.2 The average theoretical water resources (volume 106 m³) of 2018, compared to the previous period (2013-2017)



UNDERGROUND WATER RESOURCES

Groundwater resources represent the volume of water that can be extracted from an aquifer, so the volume of water that can be exploited. This notion is complex, because the amount of water that can be supplied by an aquifer depends on the volume of reserves and is limited by the technical and economic possibilities, of conservation and protection of resources.

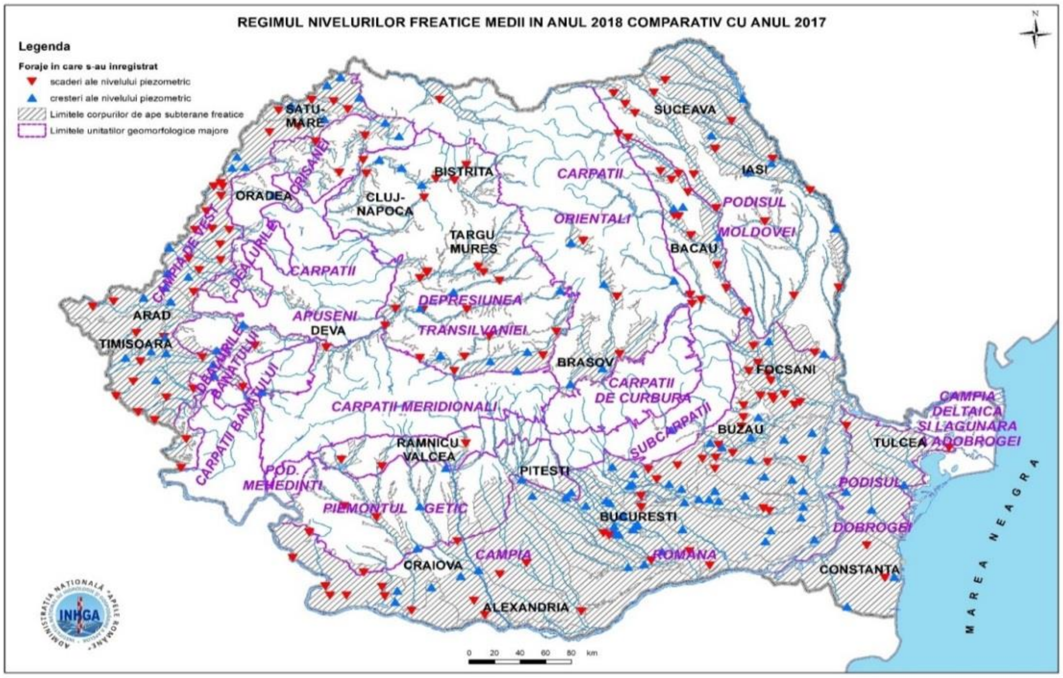
Groundwater reserves represent the volume of gravitational water stored in a given period or at a given time, in an aquifer or rock store. The reserves are thus conditioned by the geological structure, that is, by the geometry of the aquifer and by the effective porosity or storage coefficient, a factor that expresses the volume of free water in the rock store. Reserves depend exclusively on volumetric data and are expressed in units of volume (usually in m³). The total groundwater resources in Romania were estimated at 9.68 billion m³ / year, of which 4.74 billion m³ / year groundwater and 4.94 billion m³ / year of deep underground water, representing about 25 % of surface water. Generally, the groundwater from the first aquifer horizon encountered in the depths, is used for irrigation and industry, for the feed of the population being used the water captured by springs and deep wells. The water quality is determined by the mineralogical and chemical composition of the rock in which the groundwater is located, but also by the regional and / or local tectonic evolution. Thus, there are deep underground waters with a high degree of mineralization, such as those in the northern part of Moldova (where deposits are mainly composed of sandy clays and fine sands, aquifers with a low capacity for cutting and small thickness), the central part - in the northern part of the Transylvanian Depression or in the Carpathian curvature (due to daily or shallow diapers). These qualitative aspects make the groundwater unable to be used to feed the population. In the Transylvania Depression, the Western Plain and the West of Oltenia, the deep waters naturally have high ammonium contents, which determines their non-impotable character and the application of treatment measures.

Characterization of groundwater flow regime shallow in 2018 compared to 2017

Based on the statistical processing performed on the characteristic values of the piezometric levels measured in a number of 271 representative wells, the characterization of the hydrogeological year 2018 has been elaborated in comparison with the previous year and with the characteristic values (multiannual monthly average and historical minimum). The interpretation of the results has been integrated spatially within the major geomorphological units of Romania.

From the calculation of the annual and multiannual averages updated at the level of 2018, it follows that in approximately 45% of the monitoring wells, the depth of the piezometric level increased up to 236cm (Ceamurlia, Dobrogea de Sud), and in 55% it decreased up to 103cm (Brastavățu, Caracal Plain), as illustrated in figure II.3. Regarding the historical minimum values (maximum depths of the piezometric levels), in 2018 they were not exceeded.

Figure II.3 The groundwater flow regime in 2018 compared to the previous year



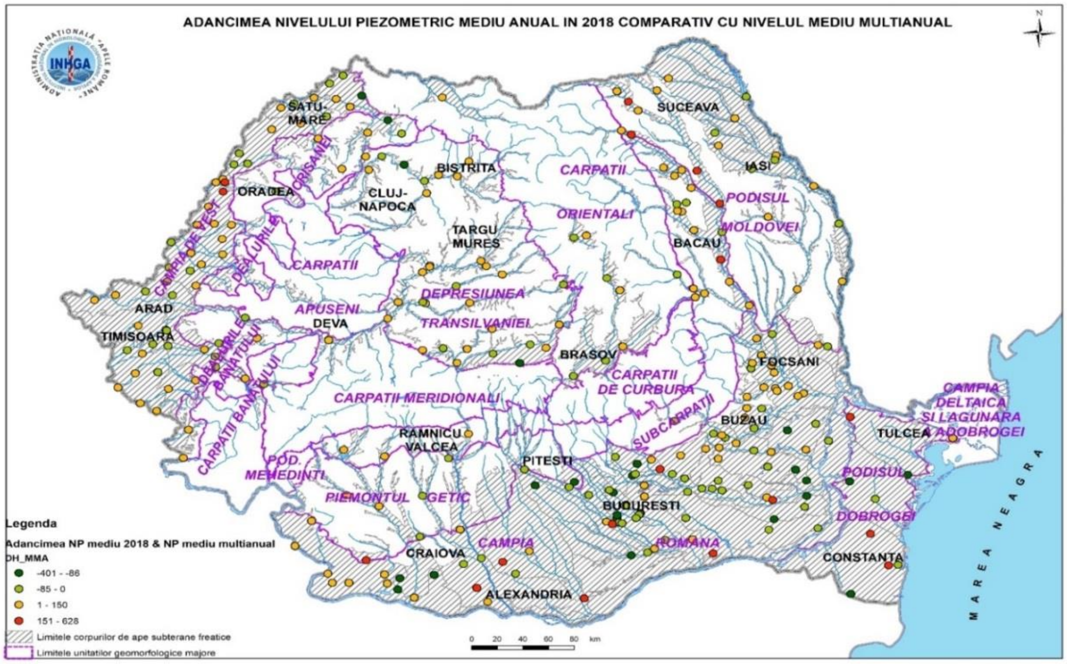
The differences calculated between the average values of 2018, the average values of 2017 and the multiannual values, grouped by geographical area, are summarized in the table II.4.

Table II.4 The differences between the annual averages 2018 compared to the year 2017 and the multiannual averages

Area / Exceedings of the depth of the piezometric level (cm)	No. of drillings	Annual averages 2018 and 2017		Annual averages 2018 and multiannual averages	
		Max	Min	Max	Min
A. Câmpia Română, Piemontul Getic și Subcarpații Getici	116	47	-181	628	-401
B. Câmpia de Vest, Dealurile Crișanei și Banatului	65	191	-136	168	-109
C. Depresiunea Transilvaniei și depresiunile din Carpații Orientali	42	103	-113	309	-96
D. Podișul Moldovei, Subcarpații Orientali și de Curbură	39	32	-61	208	-63
E. Podișul Dobrogei	9	34	-236	422	-170

The average values of the year 2018 were, compared to the multiannual average, to higher values up to 400cm (Siliștea, Piteștiului Plain) in 29% of the wells and lower with up to 630cm (Conesti, Burnas Plain) in 67% of these (figure II.4).

Figure II.4 The depth of the annual average piezometric levels compared to the multiannual average values



In conclusion, for the year 2018 there was a decrease of the levels in the wells located in the plains of Oltenia, Teleorman, Bărăganul de Nord, Câmpia Siretului, in the zone of Sub-Carpathians of curvature and Oriental, in the meadow areas of the Siret and Prut rivers and in the southern part of Depression of Transylvania (Făgăraş Depression), and sometimes in the Western Plain. Compared to the multiannual regime, the most frequent decreases were manifested throughout the Moldavian Plateau and in significant areas of the Western Plain and in the Bărăgan Plain.

II.1.1.2. Use of water resources

II.1.1.3. Extreme events caused by water flows

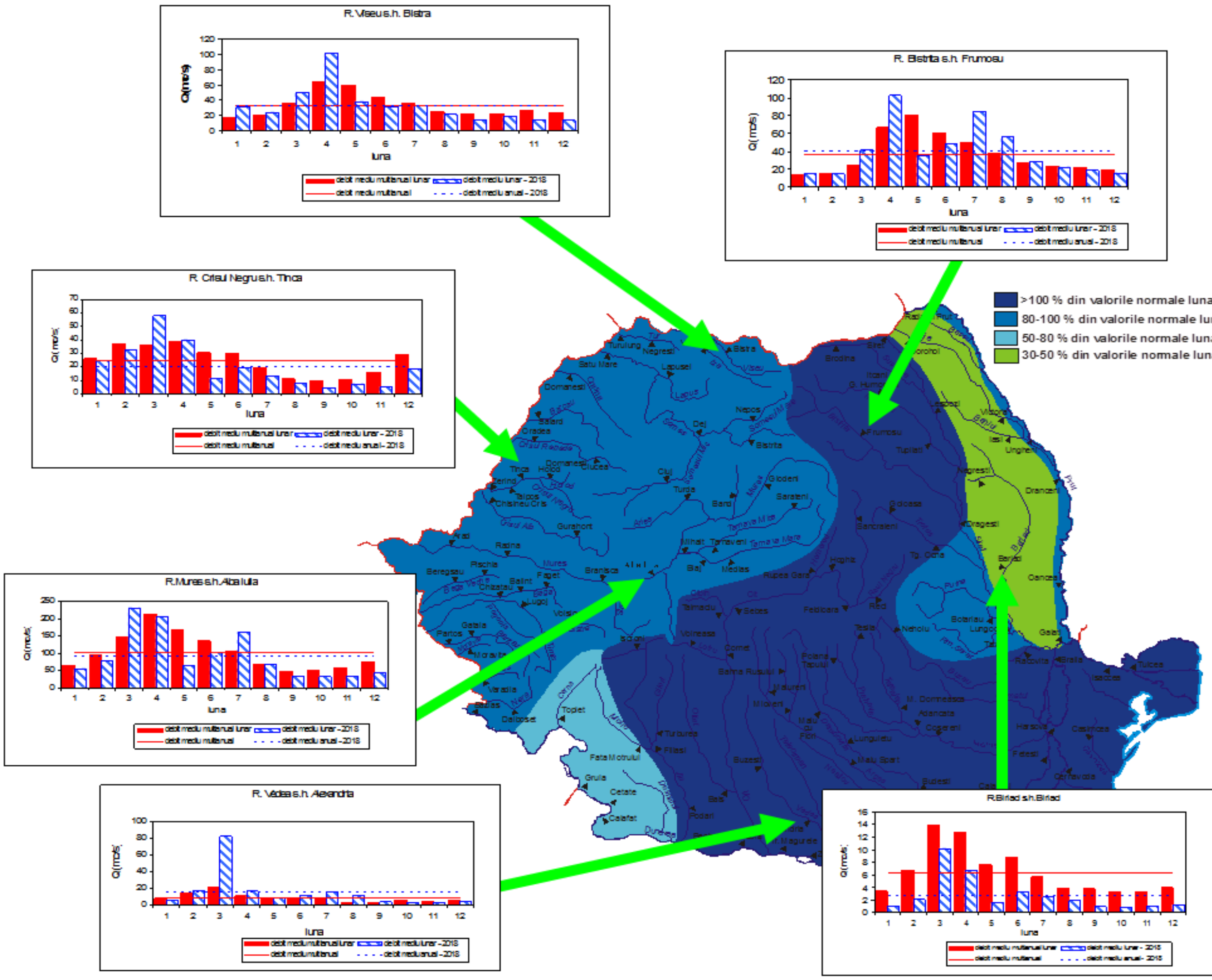
RO 52	Indicator code Romania: RO 52 EEA indicator code: CLIM 16
TITLE: WATER COURSES DEBT **DEFINITION:** The indicator defines the estimated changes in daily, monthly, seasonal and annual average flows of watercourses.	

HYDROLOGICAL CHARACTERIZATION OF THE YEAR 2018

I) RIVERS

In 2018, the hydrological regime was at values between 80 - 100% of the multiannual averages, higher (over the monthly norms) on the rivers in the river basins: Jiu, Olt, Vedea, Argeş, Ialomiţa, Buzău, Suceava, Moldova, Bistriţa, Trotuş superior, on the upper and middle course of the Siret and on the rivers in Dobrogea and smaller (50-80% of the multiannual averages) on the rivers in the river basins: Cerna, Desnățui, Drincea and Motru. The lowest values of average annual flows (30-50%) were recorded on the rivers in the Bârlad basin and on the tributaries of the Prut. (figure II.5).

Figura II.5 Distribution of the coefficients of annual modules (the ratio between the annual average flow and the multiannual average flow) for 2018, the hydrograph of the monthly average flows ( ) compared to the normal monthly values ( ), annual average throughput 2018 ( ), multiannual average throughput ( ) at some representative hydrometric stations for the main areas of the country



During 2018, the most important meteorological and hydrological dangerous events were recorded in March, June and July 2018. The most affected hydrographic basins were in March Crasna, Barcău, Târnave, Desnățui, upper Olt , Vedea, Neajlov, upper Buzău , in June the rivers from the upper Olt basins, Prahova, Buzău, Trotuș, Putna, Suceava, Jijia, the upper Prut and isolated on some rivers in Banat and Dobrogea and in July on Olteț, Cibin, tributaries of the upper and middle Olt, Vedea, Moldova, Siret middle and lower course, Jijia, upper Prut and isolated on the rivers of Dobrogea.

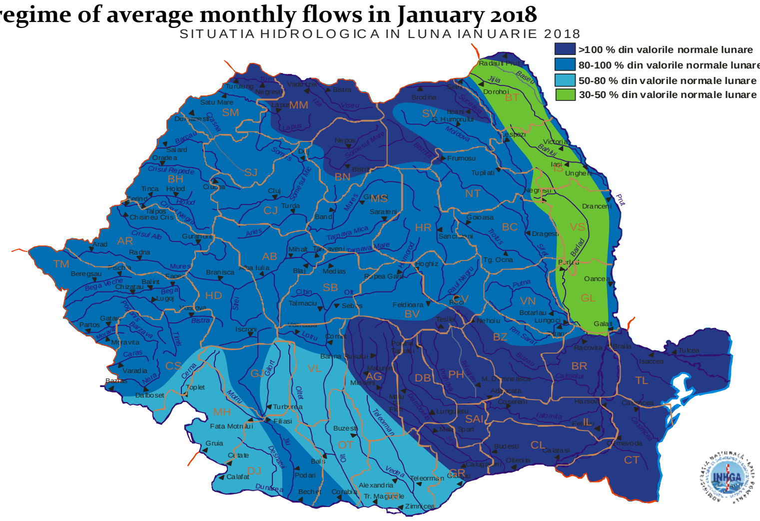
Also, during the period May - August 2018, as a result of important precipitation events quantitatively and with a torrential character, dangerous hydrological phenomena were frequently represented by important leaks on the slopes, torrents, streams, fast floods on the small hydrologically unmonitored rivers, which have often produced major local flood effects.

In 2018, based on the hydrological situation and the weather forecasts, before the onset of dangerous phenomena, 42 HYDROLOGICAL WARNINGS (41 ORANGE AND 1 RED CODES), 16 WARNINGS - YELLOW CODE, 118 warnings for immediate phenomena(out of which 7 RED CODE) and 474 warnings for immediate phenomena.

Characterization of the winter months 2018

In January 2018, the hydrological regime of the river basins in Romania (figure II.6) was generally between 80-100% of the monthly multiannual averages, being higher (over the monthly norms) in the river basins of the rivers: Vişeu, Iza, Tur, Someşul Mare, Lăpuş, Argeş, Ialomiţa, Buzău, Bistrita superior, Suceava, on the upper course of the Prut and on the rivers of Dobrogea and smaller, between 50-80% of the monthly multiannual averages in the river basins: Cerna , Motru, Desnăţui, Olt inferior, Vedea and between 30-50% in the river basin of Bârlad and on the tributaries of the Prut.

Figure II.6 Hydrological regime of average monthly flows in January 2018



In the first two days of January 2018, the river flows were generally stationary, except for the rivers of Maramureş and Crişana where they were slightly decreasing.

Between January 3rd-5th, the flows were increasing due to the combined effect of the liquid precipitation, the transfer of water from the snow layer and the propagation on the rivers in the river basins: Vişeu, Iza, Tur, Crişuri, Bega, Bârzava, Moraviţa, Caraş, Nera, Cerna, Suceava, Bistriţa, Trotuş, Putna, Rm. Sărat, Buzău and in the upper basins of Someş, Mureş, Olt, Jiu, Arges and Ialomiţa. On the other rivers the flows were relatively stationary. In this interval, the Tur river was located above the ATTENTION QUOTES at the Micula hydrometric station.

Between January 6th and 14th, 2018, the debts were relatively stationary, except for the first day and the last four days when they were decreasing on the rivers in the northwest of the country. Isolated increases in levels and flows were recorded on January 8th and 9th on Vişeu, Iza, Someşul Mare, Lăpuş and Prahova and on January 12th on some rivers in the south of the country.

Between 15th-16th the flow rates of the rivers were decreasing, except for the rivers of Oltenia, Muntenia, Dobrogea and southern Moldova where they were generally stationary.

Between January 17th and 19th, the flows were generally increasing due to the combined effect of the liquid rainfall, the water supply from the snow layer and the propagation, except for the rivers in the Siret, Prut and Dobrogea basins where they were generally stationary. During this time there were significant leaks on the slopes, torrents, streams, fast floods on the small rivers with local flood effects and significant increases in levels and flows with exceedances of the DEFENSE QUOTES on some small rivers in the lower basins of the Criş Alb and Mureş and the upper basins of Bega and Timiş.

In this interval were located over:

- FLOOD QUOTES: Valea Mare – Târnova, Timercea – Tăuţ şi Bega – Balinţ.
- ATTENTION QUOTES: Cigher – Tăuţ, Monoroştia – Monoroştia, Bega – Făget, Bega – Chizătău, Gladna – Firdea, Hăuzeasca – Firdea, Rusca – Voislova Rusca, Bistra – Obreja, Tău – Soceni, Chizdia – Ghizela and Bega Veche – Pişchia.

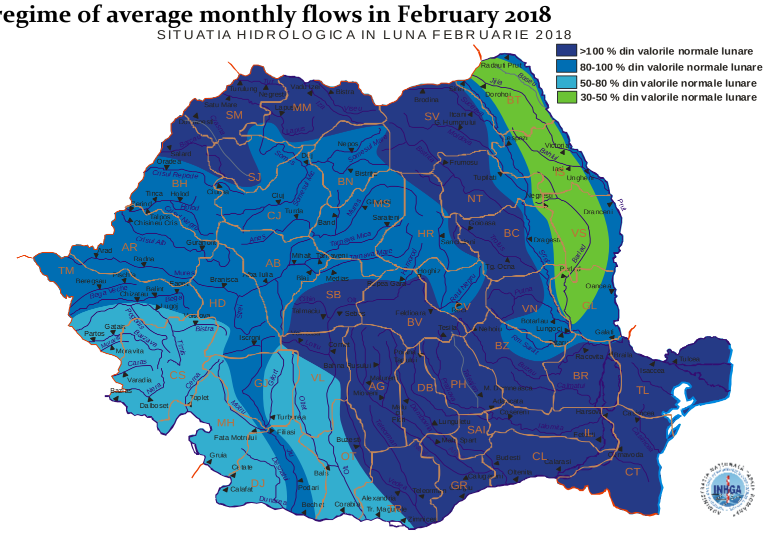
Between January 17th and 22nd, the flows were generally stationary, except for the middle and lower courses of the rivers in the western part of the country where they were increasing through propagation and the rivers of Dobrogea where they were increasing due to the precipitation recorded during this interval.

Between January 23rd and January 31st, the flows were generally stationary, except for the first four days when the rivers of Maramureș, Crișana and Banat the flows were decreasing and the last two days, when there were increases, due to the water supply from the snow layer, the diminution of the ice formations and the propagation on the rivers of Maramureș, Crișana, Moldova and from the upper basins of the rivers of Oltenia, Muntenia and Transylvania.
The ice formations (ice on the banks, fog) present on the first day of January 2018 on some rivers in the upper basins of Mureș, Olt, Trotuș Suceava, Moldova and Bistrița were shrinking, diminishing and eliminating in the first five days and they maintained only in the upper basins of Moldova, Bistrița, Trotuș and Jijia between 6th-13th January.
Between January 14th and 16th, the ice formations (ice at the shore, ice bridge, streams of fog) were expanding and intensifying, being present, at the end of this interval, on most of the rivers in the country, except the rivers of Banat and Crișana where they were present only in isolation.
Between January 17th and 20th, the ice formations entered a process of shrinking, diminishing and eliminating, due to liquid precipitation and high temperatures.
From the 24th to the 27th of January, ice formations appeared again, and the existing ones were expanding and intensifying, being present again on most of the rivers in the country (ice at the banks, streams, ice bridge).During the last four days of the month, the ice formations were diminishing and shrinking, being present on the last day of the month on the rivers of Muntenia, Transylvania and Moldova (generally ice on the banks, and the ice bridge being present in the river basins: Suceava, Moldova, Jijia, on the upper course of Siret and on some tributaries of the upper Mureș, Bistrița, Trotuș, Bârlad and the upper Olt).
In February 2018, the hydrological regime of the hydrographic basins in Romania (figure no. II.7) was at the following values:

- above the monthly norms in the river basins of the rivers: Vişeu, Iza, Tur, Lăpuș, Crasna, Barcău, Vedea, Arges, Ialomița, Buzau, Trotuș, Bistrița, Suceava, on the lower course of Someș, on the upper courses of Moldova and Putna, in the middle basin of the Olt and the rivers of Dobrogea;
- between 80-100% on the rivers in the river basins: Someșul Mare, Someșul Mic, Crișul Repede, Crișul Negru, Crișul Alb, Mureș, Bega Veche, Bega, Rm.Sărat, on the courses of Jiu, Siret and Prut, on the upper course of Olt and on the middle and lower courses of Moldova and Putna;
- between 50-80% of the multiannual monthly averages in the river basins of the rivers: Timiș, Bârzava, Moravița, Caraș, Nera, Cerna, Motru, Desnățui, Gilort and on the rivers in the lower basin of the Olt;
- between 30-50% on the rivers in the Bârlad river basin and on the tributaries of the Prut.

During the first two days of February 2018, the river flows were generally stationary, except for the Crișul Alb, the Crișul Negru, the Arieș, the lower courses of the Someș and Mureș and the upper course of the Siret where they were increasing due to the failure of the snow layer and the propagation..

Figure II.7 Hydrological regime of average monthly flows in February 2018



Between February 3rd-5th, 2018, the flows were generally increasing due to the combined effect of the liquid precipitation, the water supply from the snow layer and the propagation, with more significant increases on some rivers in Maramures, Crișana and northern Transylvania.

During this interval, the rivers at the hydrometric stations were located above the ATTENTION QUOTES: Iza-Vadu Izei, Mara-Vadu Izei, Tur-Negrești Oaș, Tur-Călinești Oaș, Tur-Turulung, Tur-Micula, Valea Rea-Huta Certeze, Talna-Pășunea Mare, Firiza-Firiza, Budac-Budacu de Jos, Barcău-Marghita, Fînețelor-Sărsig, Valea Satului-Buceș, Ampoi-Zlatna, Crișul Alb-Crișcior, Crișul Alb-Vața de Jos and Crasna-Domănești.

Between 6th and 8th February, the flows were generally decreasing, except for the middle and lower courses of the large rivers, where there were increases by propagation, and in the last day of this interval there were increases on the rivers in Dobrogea. The ATTENTION QUOTES were maintained, due to the propagation, the lower courses of the Tur and Crasna. Between February 9th and 12th, the flows were generally increasing, due to the liquid precipitation, the transfer of water from the snow layer and the propagation on the rivers from the river basins: Someș, Crasna, Barcău, Crişuri, Trotuş, Bârlad, Prut, on the upper course of Siret and the rivers of Dobrogea. In other rivers, the flows were generally decreasing.

During this interval, the rivers at the hydrometric stations were located above the ATTENTION QUOTES: Glavacioc-Crovu, Tur-Micula, Crasna-Domănești and Crasna-Berveni.

Between February 13th and 14th, the flows were generally decreasing, except for the rivers of Oltenia, Muntenia and Moldova where they were relatively stationary.Between 15th and 18th February, the flows were generally increasing due to the liquid precipitation, the transfer of water from the snow layer and the propagation on the rivers in the river basins: Bega Veche, Bega, Timiş, Bârzava, Jiu, Olt inferior, Vedea, Argeș, Ialomița , Buzău, Rm. Sărat, Putna, Moldova, Bistrița and Dobrogea. On the other rivers the flows were relatively stationary.

Significant increases in levels and flows were recorded on some small rivers in the south-east and south of the country due to the more important quantitative precipitations, when the rivers at the hydrometric stations were located above: ATTENTION QUOTES: Telița-Poșta Frecăței -Vârtoapele, Glavacioc-Crovu, Călmățui-Cireșu, Neajlov-Vadu Lat and Dâmbovița-Dragomirești. Also, the Crasna river at Berveni and Domănești hydrometric stations were kept above these quotes.

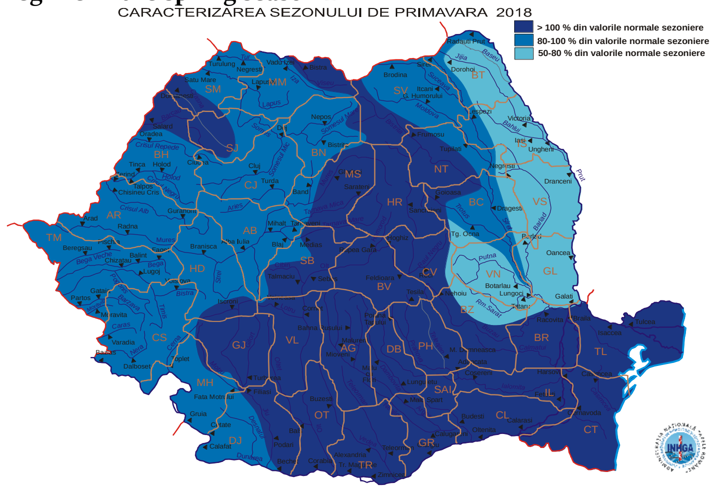
Between February 19th and 28th, the flows were generally stationary, except for the first two days when there were increases on the rivers in the northwest of the country and the last three days of the month when the flows were generally decreasing on the south rivers, the center and the east of the country.

The ice formations (ice on the banks, fog, ice bridge) present on the first day of February 2018 on most of the rivers in Transylvania, Muntenia and Moldova were narrowing, diminishing and eliminating in the first decade of the month, they remained in the intervals 11th-18th and 21st-24th February and were expanding and intensifying in the intervals 19th-20th and 25th-28th, so that at the end of the month they were present on most of the rivers, except for some rivers in Crișana, Banat and western Oltenia.

Characterization of the 2018 spring season

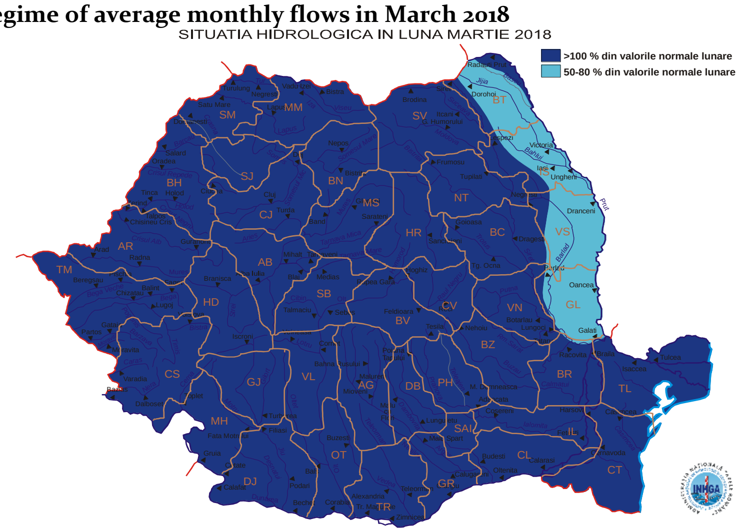
In the spring of 2018 the hydrological regime of the rivers in Romania (figure II.8) was at values around and over seasonal multiannual averages, smaller (50-80% of seasonal norms) on the rivers in the Putna, Rm. Sărat river basins, Bârlad and Prut middle and lower.

Figure II.8 The hydrological regime in the spring season 2018



In March 2018, the hydrological regime of the river basins in Romania (figure II.9) stood at values above the monthly multiannual averages, except for the rivers in the middle and lower basins of Bârlad and Prut, where they had values between 80-100% of the monthly norms.

Figure II.9 Hydrological regime of average monthly flows in March 2018



Between March 1st and 6th, 2018, the flows were generally stationary, except for the first two days, when, on the south and east rivers, the flows were decreasing. Increases in levels and flows, due to the combined effect of liquid rainfall, water supply in the Between March 7th and March 15th, the liquid precipitation, marked by quantity, combined with the water supply from the snow layer and with the propagation, caused increases of levels and flows on most rivers. Significant increases in levels and debts, with exceedances of the DEFENSE QUOTES, were recorded on the rivers of Maramureș, Crișana, Transilvania, Banat, Oltenia and Muntenia. The most important floods, which led to the overrun of the FLOOD QUOTES and the DANGER QUOTES, were snow layer and propagation, were recorded on March 3rd and 4th on some rivers in the river basins: Crasna, Barcău, Crișul Alb, Crișul Negru, Bega, Timiș, Caraș, Nera, Cerna, Jiu, Vedea, Arges, Trotuș, Putna, on the upper course of the Prut and on the rivers of Dobrogea. recorded on March 8th and 9th on the rivers in the Vedea and Neajlov basins, on March 10 and 11 in the Desnățui and Călmățui basins and on March 13th and 14th, on many rivers in the river basins: upper and middle Olt, Târnave, Vedea, Neajlov and on upper Buzău.

Between March 16th-26th, the flow of rivers was generally decreasing, except for the period March 17th-19th when there were increases on the rivers of Maramureş, Crişana, Transilvania, Banat and Muntenia. Significant increases, with exceedances of the DEFENCE QUOTES, occurred during this time, especially on the Tur, Crasna and Barcău rivers.

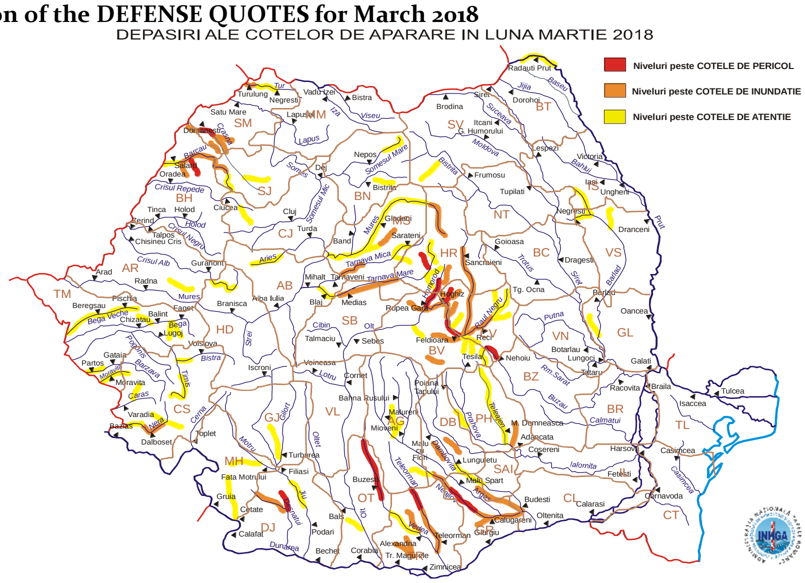
It is worth mentioning that during this whole period, there were above the DEFENSE QUOTES, due to the propagation of the floods formed previously, many rivers from the previously affected river basins: upper and middle Olt, Târnave, Călmăţui, Argeş inferior.

Between March 27th and March 28th, the flows were generally increasing due to the combined effect of the water supply from the snow layer, liquid precipitation and propagation. Significant increases in levels and flows, with exceedances of DEFENSE QUOTES, have been recorded on the rivers of Banat, Oltenia and Muntenia. The most significant increases, with exceedances of the FLOOD QUOTES and the DANGER QUOTES were those on the rivers from the river basins: Călmăţui, Vedea, Neajlov and Sabar.

In the last days of the interval, the flows were generally increasing on the north and east rivers due to the water supply from the snow layer, precipitation and propagation and generally stationary on the other rivers. Due to the propagation of the previously formed floods, the lower courses of some rivers in the west and south of the country were maintained over the DEFENSE QUOTES.

The situation of exceeding the DEFENSE QUOTES in March 2018 (preliminary maximum values determined based on the data from the operational flow) is presented in figure II.10.

Figura II.10 The situation of the DEFENSE QUOTES for March 2018



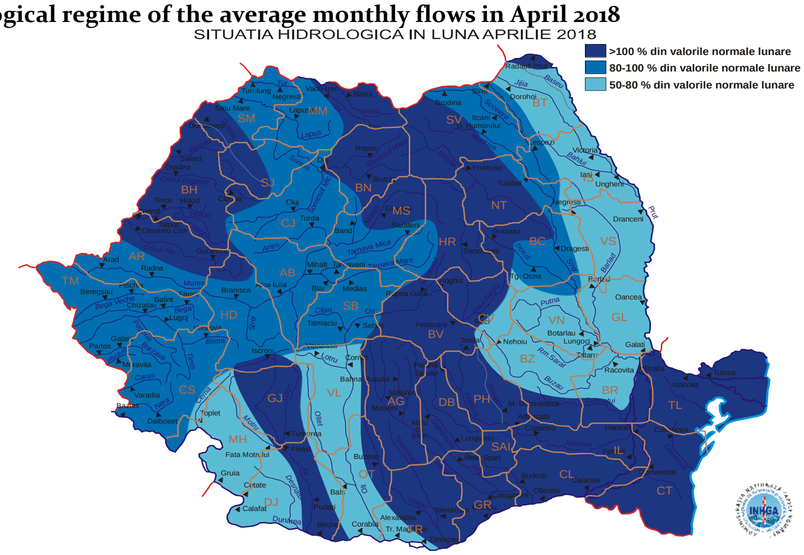
The ice formations (ice on the banks, fog, ice bridge) present on the first day of March on most of the rivers, with the exception of some rivers in Crişana and Banat, were expanding and intensifying in the first two days of the month and in the interval March 20th- 24th, and on the other days of the month they were down, diminishing until the total elimination at the end of the month.

In April 2018, the hydrological regime of the river basins in Romania (figure II.11) was at the following values:

- above the monthly norms in the river basins of the rivers: Vişeu, Iza, Someşul Mare, Crasna, Barcău, Crişul Repede, Crişul Negru, Crişul Alb, Jiu (except for Motrul), Vedea, Argeş, Ialomiţa, Bistriţa, in the upper basins of Mureş, Olt , The sidewalk, Moldova, Prut and the rivers of Dobrogea;
- between 80-100% on the rivers in the river basins: Tur, Someşul Mic, Someş (downstream Dej), middle and lower Mureş, Bega Veche, Bega, Timiş, Bârzava, Moraviţa, Caraş, Nera, Olt middle, Suceava, on the middle courses and lower of the Moldova and the Trotuş and on the upper and middle course of the Siret.
- between 50-80% of the monthly multiannual averages in the river basins of the rivers: Cerna, Motru, Desnăţui, Olt inferior, Buzau, Rm. Sărat, Putna, Bârlad, Prut middle and lower and on the lower course of Siret.

In the first two days of April 2018, the flows were generally increasing as a combined effect of the recorded precipitations, the transfer of water from the snow layer and the propagation, except the rivers from the basins: Crasna, Bega, Timiș, Bârzava, Moravița, Caraș, Ialomița, the tributaries of the Prut which were decreasing and the rivers of Dobrogea where the flows were relatively stationary.
During this interval, the rivers at the hydrometric stations were located above the ATTENTION QUOTES: Bega Veche-Cenei, Urlui-Furculești, Argeș-Budești, Glavacioc-Crovu, Neajlov-Călugăreni, Dâmbovița-Dragomirești, Fânețri-Sulsig, Crișul Alb-Vața de Jos, Crișul Negru-Tinca and Bistra-Chiribiș.
Between April 3^{rd} and April 6^{th}, debts were generally down. In the first two days of the interval there were increases due to the propagation on the middle and lower courses of the rivers in the western part of the country, and in the following two days the increases were determined by the combined effect of precipitation, the yielding of water from the snow layer and the propagation and they recorded in the river basins: Vișeu, Someșul Mare, Bârzava, Caraș, Nera, Cerna, Bistrița, Arieș, on the upper courses of Mureș, Olt and Jiu and on the middle course of the Prut.

Figure II.11 The hydrological regime of the average monthly flows in April 2018



During this interval, the rivers at the hydrometric stations were located above the ATTENTION QUOTES: Crasna-Domănești, Crasna-Berveni, Barcău-Sălard, Crișul Negru-Talpoș, Crișul Negru-Zerind, Crișul Alb-Chișineu Criş, Bega Veche-Cenei, Urlui -Furculești and Dâmbovița-Dragomirești.
Between 7^{th} and 12^{th} of April, the flows were generally decreasing, except for the first day, when the liquid rainfall, combined with the water supply from the snow layer and with the propagation, caused increases in levels and flows on most rivers, except those in the southeast. Increases were also recorded in the following days on some rivers in the north, center and southwest of the country.The rivers at the hydrometric stations were located over the ATTENTION QUOTES: Crasna-Domănești, Bega Veche-Cenei, Bârzava-Partoş, Moravița-Moravița, Urlui-Furculești.
Between April 13^{th} and 17^{th}, river flows were generally decreasing, except for the last two days when the rivers in Oltenia, Muntenia and Dobrogea were relatively stationary.Between 18^{th} and 23^{rd} April, the flows were generally decreasing, except for the rivers in Dobrogea where they were stationed. Small increases, due to the low quantitative precipitation, the transfer of water from the snow layer in the mountain area and the propagation, were recorded in the first days of this interval on Vișeu, Iza, Someșul Mare, Suceava and on the upper courses of Argeș, Moldova, Bistrița and the Prut. In the range 20^{th}-22^{nd}, it was located above the ATTENTION QUOTES, by propagation, the Prut river at the Oancea hydrometric station.
In the last week of April the flows were generally stationary, except for some rivers in the west and center of the country where they were decreasing. Isolated increases in levels and flows due to the precipitations dropped in the first part of this interval were recorded on some rivers in Maramureș, northern Transylvania and Moldova.

In May 2018, the hydrological regime of the river basins in Romania (Figure II.12) was between 30-50% of the monthly multiannual averages, higher on Jiu, Gilort, on the rivers in the hydrographic basins Vedea, Argeș, Ialomița and on the rivers of Dobrogea (50-80% of the monthly norms) and lower during the course of Siret, on most of its tributaries: Suceava, Moldova (middle and lower basin), Trotuș, Putna, Rm. Sărat, Bârlad and on the tributaries of Prut (below 30% of the monthly average).

Figure II.12 Hydrological regime of average monthly flows in May 2018

Between 1st and 7th May 2018, the debts were generally stationary on the rivers of Crișana, Banat, Oltenia, Muntenia and Dobrogea and decreasing on the other rivers. Isolated increases in levels and flows due to precipitation during this interval, in the form of a rainfall, were recorded in the first and last two days on some rivers in Maramures, Crișana, Banat and northern Moldova.

Between May 8th and 11th, the flows were relatively stationary, except for some rivers from Banat (Bega Veche, Timiș, Bârzava, Nera, Cerna), Crișana (Crișul Negru), Moldova (upper course of Prut, Putna, Rm. Sărat, Trotuș, Bistrita, Moldova, Suceava), Transylvania (Upper Olt, Arieș, Târnava Mare), Muntenia (Prahova, Buzău, upper courses of Argeș and Ialomița) and Oltenia (upper courses of Jiu, Motru, Gilort) where they were growing due to falling precipitation and propagation. In the last two days of this interval there were further increases isolated by levels and flows due to precipitation, in the form of a

Between 16th and 18th May, the river flows were generally increasing on the rivers of Maramureș, Crișana, Banat, Oltenia and those of the north of Muntenia, Transylvania and Moldova, due to the combined effect of falling precipitation and propagation. On the other rivers the flows were relatively stationary.

downpour, on some tributaries of the middle and lower Olt, the lower Argeș and on some small rivers in the hydrographic basins: Crișul Negru, Nera , Vedea, Jiu, the upper basins of Mureș and Timiș and on the rivers of Dobrogea.

Between 12th and 15th May, the flows were generally stationary, except for the first day, when they were decreasing on the rivers in the western half of the country and the last two days when on the rivers in the river basins: Buzău, Trotuș, Suceava, Jijia, the upper basins of Argeș, Moldova and the upper and middle courses of the Prut were increasing due to falling precipitation and propagation. Small increases in levels and flows due to precipitation, as a downpour, were also recorded on some small rivers in the upper basins of Someșul Mic, Crișul Alb, Arieș, Olt, Olteț, Neajlov, Dâmbovița, in the middle and lower basin of Mureș, the upper basins of Timiș, Bârzava, Nera, Cerna and Buzău and on some small rivers in the hill and mountain area.

Significant increases in levels and flows, due to precipitation in the form of rainfall and more important quantities, were recorded on the Crișul Alb, the rivers of Banat, in the lower basin of Mureș and in the upper basin of Jiu.

During this interval, the rivers at the hydrometric stations were located above the ATTENTION QUOTES: Gladna - Firdea, Terpezița - Gabru and

Moravița - Moravița. Small increases in levels and flows were also recorded in the last day of this interval on some rivers in the river basins of Vedea, Ialomița, the upper and middle basin of the Olt and the lower basin of Argeș.

Between 19th-22nd of May the flows were generally decreasing on the western rivers and relatively stationary on the other rivers.On the first day of this interval there were increases due to the precipitation and propagation on the rivers in the river basins: Vișeu, Iza, Tur, Lăpuș, Someșul Mare, Crișul Repede, the upper and middle basin of Criș Negru, the upper basins of Crișul Alb and Bistrița. There were also significant leaks on the slopes, torrents, streams, fast floods on small rivers with possible local flood effects and rapid increases in flows and levels on some small rivers in the Tur, Lăpuș, Someșul Mare, Crișul Repede and Crișul Negru river basins. The Valea Rea river was situated at the ATTENTION QUOTES at the Huta Certeze hydrometric station.

On the second day of this interval there were also increases on some rivers in the upper basin of Argeş and significant leaks on the slopes, torrents, streams, fast floods on small rivers with possible effects of local floods and rapid increases in flows and levels on some small rivers in the hill and mountain areas in the center and south of the country, and in the last day there have been increases on some rivers in Maramureş, Crişana, Banat, Transylvania and Oltenia and the Sighişoara river at the hydrometric station Brazii has been located above the ATTENTION QUOTES.

Between 23rd-24th May the flows were generally decreasing, except for the rivers in the Siret, Prut and Dobrogea basins where they were stationary and the rivers of Jiu, where they were increasing due to the falling precipitation and propagation.

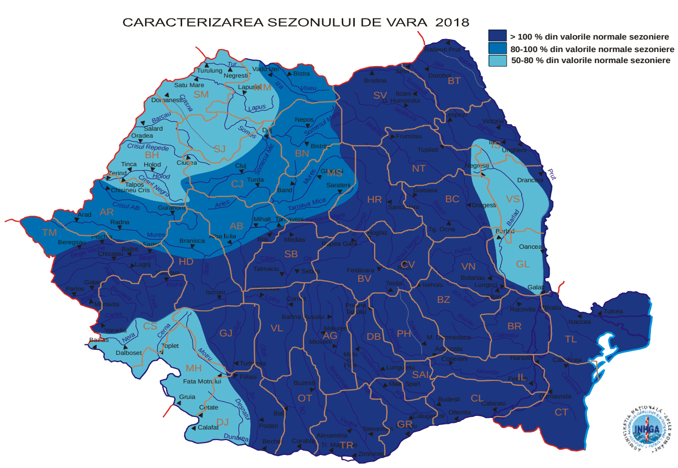
Between 25th and 29th May, the debts were generally stationary. Exceptions were made by some rivers in the river basins: Vişeu, Iza, Someş, Crişul Negru, Crişul Albru, Arieş, Timiş, Bârzava, Caraș, Nera, Jiu, Olt, Argeș and Ialomița where the flows were increasing due to the falling precipitations and propagation. Due to rainfall, in the form of a downpour and with a torrential character, there were slopes, torrents, streams, fast floods on small rivers with local flood effects and rapid increases in levels and flows on some rivers in the western mountain areas in the center and south of the country.

The Hăuzeasca river was situated at the ATTENTION QUOTES at the Fîrdea hydrometric station. In the last two days of the month, the flows were decreasing on the rivers in the western part of the country and relatively stationary on the other rivers.

Characterization of the summer season 2018

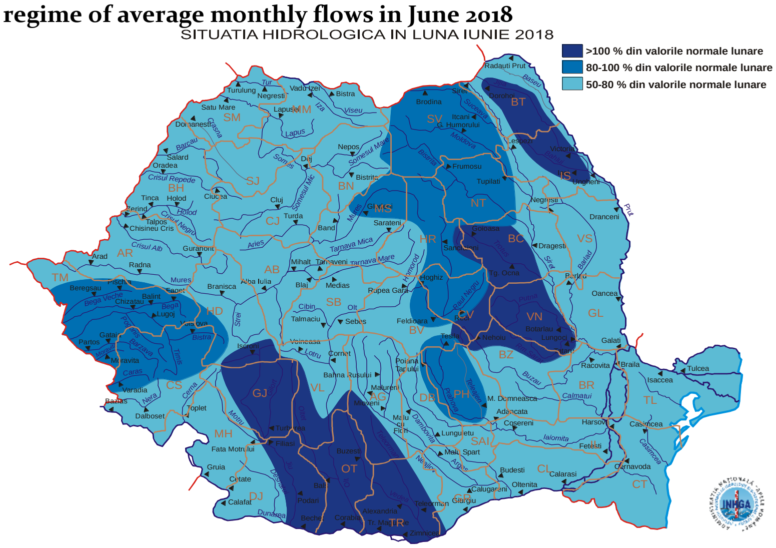
In the summer of 2018 the hydrological regime of the rivers in Romania (figure II.13) was generally above the seasonal multiannual averages and below them, with modulating coefficients between 50-80% of the seasonal norms on the rivers in the Tur, Someş river basins and inferior, Crasna, Barcău, Crișul Repede, Crișul Negru, Nera, Cerna, Motru, Desnățui and Bârlad and between 80-100% on Vișeu, Iza, Someșul Mare, Someșul Mic, Crișul Alb, Arieș, Târnava Mică and Mureș middle and inferior .

Figure II.13 The hydrological regime in the summer season 2018



In June 2018 the hydrological regime of the river basins in Romania (figure II.14) was generally between 50-80% of the monthly multiannual averages, higher on Bega Veche, Bega, Timiş, Bârzava, Moraviţa, Caraş, Prahova, Suceava, Moldova, Bistriţa, Mureş superior and Olt superior (80-100% of monthly norms) and over the multiannual monthly averages on the rivers in the basins Jiu, Gilort, Olt inferior, Vedea, Buzău superior, Trotuş, Putna, Rm. Sărat and Jijia.

Figure II.14 Hydrological regime of average monthly flows in June 2018



Between June 1st and 9th, 2018, the flows were generally stationary, except for some rivers in the river basins Vişeu, Iza, Tur, Someş, Crasna, Barcău, Crişul Rapede, Crişul Negru, Crişul Alb, Mureş, Bega Veche, Bega, Timiş, Bârzava, Moraviţa, Caraş, Nera, Moldova, Bistriţa, Trotuş, Putna, Rm.Sărat, Buzău and from the upper basins of the rivers: Jiu, Olt and Ialomiţa, which were increasing on June 4th due to recorded precipitation and propagation. During the last three days of this interval due to the precipitation, there were significant leaks on the slopes, torrents, streams, fast floods on the small rivers, with possible effects of local floods and rapid increases of flows on some rivers in Maramureş, Crişana, Banat, Transilvania and Dobrogea.

During this interval, the rivers at the hydrometric stations were located above the ATTENTION QUOTES: Monoroştia - Monoroştia, Bistra - Chiribiş and Topolog - Saraiu. On June 10, the flows were increasing due to the precipitations falling in the interval and the propagation on the rivers in most river basins, except the rivers in the river basins: Tur, Someş, Târnave, the upper and middle course of Mureş, the upper course of Crişul Alb, the middle and lower courses of Siret and Bârlad and the rivers of Dobrogea where the flows were relatively stationary.

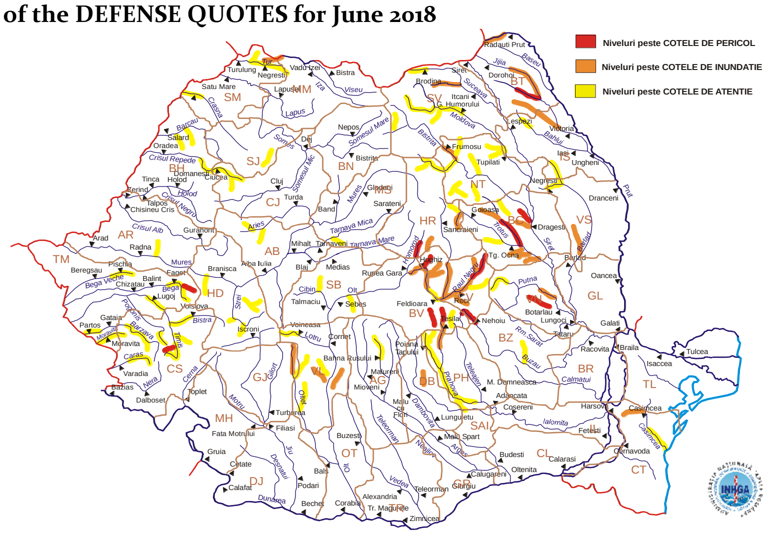
There were significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with local flooding effect on some rivers in the river basins: Arieş, Bega, Timiş, Bârzava, Moraviţa, Caraş, Nera, Cerna, some rivers from the upper and middle basins of Crişurile, some tributaries of the lower Mureş and the middle Olt, the tributaries of the Danube upstream sector Drobeta Tr. Severin. Between 9 and 10 June, the Saşa river was situated over the DANGER QUOTES at the Poieni hydrometric station.

Between 11th and 12th of June 2018, the flows were generally slightly lower, except for the rivers Vişeu, Iza, Tur, Someşul Mare, Arieş, Târnave, Bega Veche, the upper basins of Lăpuş, Crasna, Barcău, Crişul Repede, Crişul Alb, Mureş, Olt, the upper and middle basin of Vedea, some tributaries of Crişul Negru and the lower Olt, the lower courses of Someş, Crişul Negru, Crişul Alb, Mureş, Bega, Timiş, Bârzava, Caraş, Nera and the upper course of the Prut, where they were increasing due to the rainfall in the range and the propagation and relatively stationary on the rivers Buzău, Putna, Rm. Sărat, Bistriţa, Bârlad, Dobrogea river basins, the middle course of the Prut and its tributaries.

There were significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with local flooding effect on some rivers in the Iza, Tur, Trotuş, Putna, Buzău river basins, the upper Crasna, Bega Veche, Bega rivers, on some small tributaries of the upper Argeș, the middle Mureș and the lower Siret due to the significant precipitations that fall in the interval. The Bega Veche river was situated above the ATTENTION QUOTES at Pişchia hydrometric station.
Between June 13th and 16th, 2018, the flows were increasing due to the combined effect of the falling rain and the propagation, except for the first part of the interval where the flows were relatively stationary on the south and east rivers. During this interval, there were exceedances of the DEFENCE QUOTES on some rivers in Maramureş, Crișana and Banat.
Between June 17th and 18th, 2018, the flows were decreasing, excepting the rivers from the basins: Vedea, Siret (excluding the Trotuș and the upper course of Bistriţa), Prut, Olt middle and lower, the upper basins of Argeș and Ialomiţa, on the lower course of Someş , on the middle and lower courses of the Criș Negru and Criș Alb, on the middle course of the Mureș and on the rivers of Dobrogea where they were increasing due to the precipitation falling in the interval and the propagation. Also, there were significant leaks on the slopes, torrents, streams and rapid increases of local flood levels and flows on some rivers in the middle basin of the Olt and on some small rivers in the northwest and east of the country, as a result of significant quantities of precipitation falling in the range. There have been exceedances of the DEFENSE QUOTES on some rivers in the river basins: Bega Veche, Moraviţa, middle and lower Olt, Bârlad and Casimcea.
Between June 19th-21st, 2018, the flows were decreasing, except for the first day of the interval, when they were increasing due to the combined effect of the fallen precipitation and propagation on Someșul Mic, Cerna, Olteț, Arges, Doftana, the upper and middle basins of Someș , Vedea, Teleorman, the upper basins of Lăpuș, Crasna, Barcăului, Arieș, Bistriţa, some tributaries of the lower Mureş downstream Acmariu, the lower courses of Iza, Tur, Mureș, Timiș, Moravița, Nera, Bârlad, Jijia, Bahlui, the course of Siret, the middle and lower course of the Prut.
There were important leaks on the slopes, torrents, streams and rapid increases of levels and flows with local flooding effect on some rivers in the upper basins of Criș Repede, Bega, Timiș, Pogăniș, Bârzava, Caraș, on some small rivers in the middle and lower part of the Crișul Alb basin and the lower basin of Mureș, from the upper basin of Argeș and from the middle and lower basin of Olt, as a result of the significant quantitative precipitations falling in the interval in the form of rainfall. There have been exceedances of the ATTENTION QUOTES on some rivers in Banat and on some tributaries of the lower Olt.
Between June 22nd-23rd, 2018, the flows were increasing as a result of the rainfall during the interval and the propagation, except the rivers from the Bârlad basin and those from Dobrogea where they were stationary. Also during this period there were significant leaks on the slopes, torrents, streams and rapid increases of levels and flows with local flooding effect on some rivers in the river basins Vișeu, Iza, Tur, Crișul Repede, Mureș, the lower basin of Olt, the upper basins of Olt and the right tributaries of Siret, as a result of precipitation falling in the interval in the form of a shower and more quantitatively significant. THE DEFENSE QUOTES have been exceeded on some small tributaries of Olt, Crișului Repede, Mureș and Moravița.
Between June 24th-27th, 2018, the flows were decreasing, except for the first day of the interval when the flows were increasing due to the precipitations falling in the interval and the propagation on the rivers from the basins: Lăpuș, Crișul Negru, Ialomița, Rm. Sărat, Putna, Trotus, the course of Mureș, the middle and lower courses of Someș, Suceva and Moldova, the lower courses of Crasna, Barcău, Crișul Alb, Târnave, Cerna and Olt, the upper basin of Olt, the upper and middle courses of Moldova and the upper and lower courses of Buzău and in the last day of the interval when they were growing on the rivers in the basins: Buzău and Ialomița and stationary on those in the river basins Nera, Cerna, Jiu, Olt, Argeș and the rivers in Dobrogea.
Between June 28th-30th, 2018, the flows were generally increasing due to the fall in the range and the propagation, except for the rivers in the Crasna, Barcău, Arieș, Crișuri river basins where they were relatively stationary. Significant increases in levels and flows, with exceedances of DEFENSE QUOTES, were recorded on the rivers of Oltenia, Muntenia, Moldova and Dobrogea. The most significant growths, with exceedances of the FLOOD QUOTES and the DANGER QUOTES, were those on the rivers in the river basins: upper and middle Olt, upper Buzău , Siret middle course, Putna, Trotuş, Jijia and Prut upstream Ac. Stânca Costești.

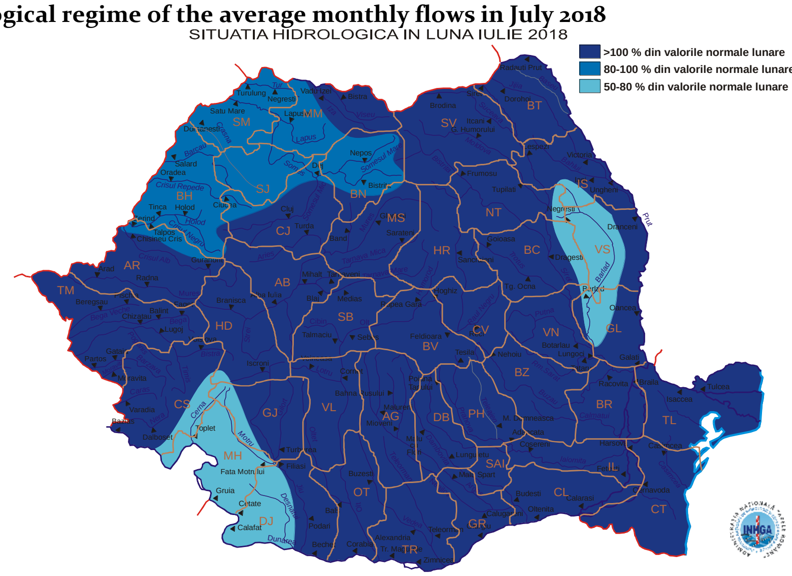
The situation of exceeding the DEFENSE QUOTES in June 2018 (preliminary maximum values determined based on the data from the operational flow) is presented in figure II.15.

Figure II.15 The situation of the DEFENSE QUOTES for June 2018



In July 2018 the hydrological regime of the river basins in Romania (figure II.16) was generally higher than the monthly multiannual averages, lower on the rivers in the river basins: Tur, Someşul Mare, Someş-downstream Dej, Crasna, Barcău, Crişul Repede and Crişul Negru (80-100%) and those in the river basins: Cerna, Motru, Desnăţui and Bârlad (50-80% of the monthly norms).

Figure II.16 The hydrological regime of the average monthly flows in July 2018



On the first day of July 2018, the flows were generally increasing as a combined effect of the rainfall during the interval and the propagation on the rivers of Maramureş, Transylvania, Muntenia, Moldova and Dobrogea. On the other rivers, the flows were slightly decreased. Due to the significant quantitative precipitation, in the form of rainfall and with a torrential character, there were important leaks on the slopes, torrents, streams, fast floods with local flood effects and rapid increases of levels and flows, with exceedances of the DEFENSE QUOTES, on many rivers in the north, center and east of the country, as well as isolated, on some small rivers in the hill and mountain areas.

The most significant increases, due to both the quantitatively marked precipitations and to the propagation of the floods formed in the previous days, with exceedances of the FLOOD QUOTES and the DANGER QUOTES, occurred in the upper basins of the Olt, Prahova and Prut, in the middle and lower basin of the Trotuș, on the middle course of Bistrița and on some tributaries of Jijia (Sitna and Miletin). Frequent overruns of the ATTENTION QUOTES were recorded on the the Olt, Siret and Prut river basins.

Between July 2nd and 7th, 2018, the debts were generally slightly lower, except for the first three days when there were increases by propagation in the middle and lower courses of Olt, Siret, Prut and Jijia, maintaining the levels above the DEFENSE QUOTES and the last two days when there were increases due to rainfall on the rivers in Dobrogea (with exceedances of the ATTENTION QUOTES on Topolog and Casimcea) and on some rivers in Maramureș and Crișana.

The new episode of precipitation, marked quantitatively from July 8th-11th, led to new levels and flow increases, gradually, on most rivers, first on the north, west and center rivers, then on the south and east. Significant increases, with exceedances of the FLOOD QUOTES and the DANGER QUOTES, were registered in the hydrographic basins: Cibin, Simila, Secaș, Desnățui, Gilort, Lotru, Olteț and in the upper basin of Vedea. Between July 12th and 15th, the debts were decreasing. Isolated increases in levels and flows were recorded on some small rivers in the river basins: Arieș, Moldova, Bistrița, Trotuș, the upper basins of Mureș, Olt, Argeș, Ialomița, some tributaries of the middle and lower Olt and some rivers from Dobrogea, as a result of precipitation in the form of a shower, isolated in high quantity.

Between July 16th and 19th, 2018, the flows were generally decreasing, except for the rivers in Dobrogea and some rivers in the southwest of the country where they were stationary. Increases in levels and flows due to rainfall during the first two days of the interval were recorded on some rivers in Maramureș and in the last two days on some rivers in Crișana, Banat, Moldova, northern Oltenia and Muntenia. Also, there were significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with effect of local floods and more significant increases in levels and flows on some rivers in the hill and mountain areas in the north, center, west, southwest of the country and in Dobrogea, as a result of significant precipitations falling in the interval, in the form of rainfall and isolated, with torrential character.

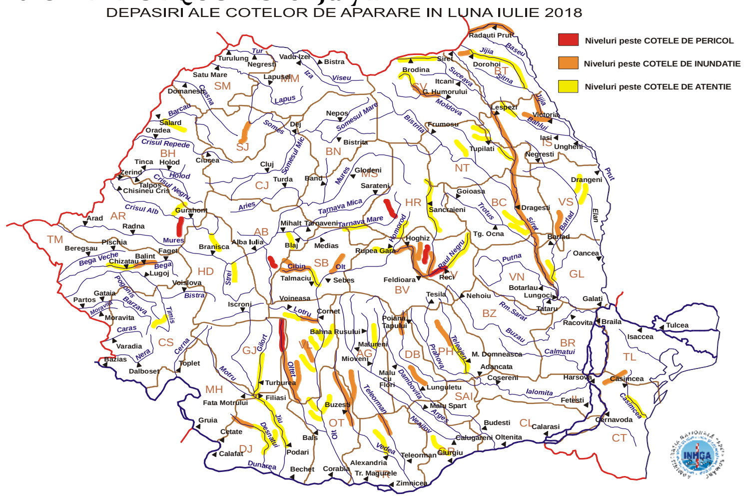
Between July 20th and 25th, 2018, the flows were increasing due to the combined effect of the falling rainfall and propagation on most rivers, in the first two days on the rivers of Maramureș, Crișana, Banat, Transylvania and northern Moldova, in the next two days on the rivers of Muntenia and Moldova and in the last day on most rivers in the west, north, center and east of the country. Significant increases in levels and flows, with exceedances of DEFENSE, have been recorded on some rivers in Moldova, Banat, Transylvania, Muntenia and Dobrogea. The most significant increases, with the exceedance of the DANGER QUOTES, were on the Feernic river and with exceedances of the FLOOD QUOTES on the Slănic, Topolog, Danube Valley, Agrij and Moldovița rivers. Also, there were significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with local flooding effect on some rivers in Muntenia, Moldova and Dobrogea, as a result of the significant quantity precipitations falling in the interval, in the form of rainfall and with torrential character.

Between July 26th-28th, 2018 the flows were decreasing, except for the course of Siret, the rivers from the basins of Bârlad, Prut, some rivers from the hill and mountain areas of Oltenia and Muntenia and some rivers from Dobrogea where they were increasing, due to the combined effect of the precipitation falling in the interval, frequently in the form of a shower and with torrential character and the propagation. And during this time there were significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with the effect of local flooding on some rivers in the center, south and east of the country. The FLOOD QUOTES were exceeded on the upper course of Prut and the DANGER QUOTES on the river Sighișoara.

In the last three days of July 2018, the flows were generally increasing due to the falling precipitations and the propagation, first on the rivers of Maramureș, Crișana, Transilvania, Oltenia, Muntenia and Dobrogea and then on those of Oltenia, Muntenia and Moldova, with exceedances of the DEFENCE QUOTES. Significant leaks on the slopes, torrents, streams, rapid increases in levels and flows with effect of local floods and more significant increases in levels and flows, with exceedances of the FLOOD and DANGER QUOTES, were recorded mainly on some small rivers in the upper basin of Olt.

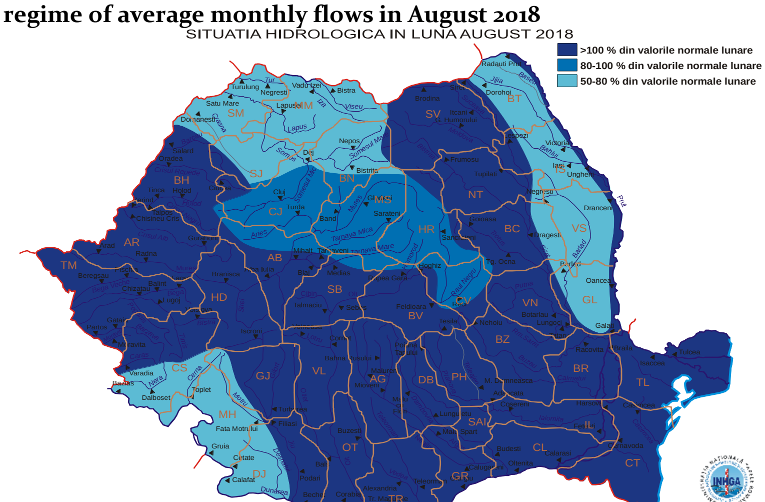
The situation of exceeding the DEFENSE QUOTES in July 2018 (preliminary maximum values based on the data from the operating flow) is presented in figure II.17.

Figure II.17 The situation of the DEFENSE QUOTES for July 2018



In August 2018, the hydrological regime of the river basins in Romania (figure II.18) stood at values above the monthly multiannual averages on the rivers in the river basins: Barcău, Crişul Repede, Crişul Negru, Crişul Alb, Mureş-Downstream confluence Târnave and on the lower courses of Târnave, Bega Veche, Bega, Timiş, Bârzava, Moraviţa, Caraş, Jiu (without Motru), Olt-downstream confluence with the Negru river, Vedea, Argeş, Ialomiţa, Siret and its right tributaries (Suceava, Moldova, Bistriţa, Trotuş, Putna, Rm.Sărat, Buzău), along the river Prut and on the rivers of Dobrogea. On the other rivers, the average flows were below the norms of August, with mode coefficients ranging between 50-80% on the rivers in the river basins: Vişeu, Iza, Tur, Someş (without Someşul Mic), Crasna, Nera, Cerna, Motru, Desnăţui, Bârlad and the tributaries of Prut and between 80-100% on Someşul Mic, Arieş, in the upper basins of Mureş and Olt and in the upper and middle basins of Târnave.

Figure II.18 Hydrological regime of average monthly flows in August 2018



Between August 1st and 4th, 2018, the flows were generally increasing as a combined effect of the precipitation falling in the interval and the propagation, on the first day on the rivers of Oltenia, Muntenia and Moldova, and in the next three days on those of Oltenia, Muntenia, Banat, western Moldova, on some rivers in Crişana and on the upper course of Prut. In this interval, due to the significant quantitative precipitation, in the form of a downpour and with a torrential character, there were important leaks on the slopes, torrents, streams, fast floods with local flood effects and rapid increases in levels and flows, with exceedances of the DEFENCE QUOTES, on some rivers in the north and east of the country, as well as in isolation, on some small rivers in the center and south.

- In this interval were exceeded:
- FLOOD QUTES on rivers at hydrometric stations: Buhai-Pădureni Bolătău-Poiana Largului, Prut-Oroftiana and Jitin-Jitin.
- ATTENTION QUOTES on the rivers at the hydrometric stations: Jijia-Dângeni, Jijia-Dorohoi, Oraștie-Grădiștea de Munte, Bârlad-Negrești, Chișindia-Chișindia, Sibișel-Sibișel, Glavacioc-Crovu, Pluton- Pluton, Topolița-Păstrăveni and Prut-Rădăuți Prut.

Also, on the last day of this interval, as a result of the controlled flow rates, from the accumulation of Stânca Costești on the Prut river, the level at the Stânca Downstream hydrometric station (embanked sector) was above the DANGER QUOTES.

Between August 5th and 10th, 2018, the flows were generally slightly lower, except for the rivers in Dobrogea where they were stationary. The exception was the days of August 7th, 8th and 10th when there were increases due to local precipitation, in the first two days on Someșul Mare, Suceava, Moldova, Bistrița, Trotuș, on some rivers in the upper basins of Argeș, Ialomița and on the rivers of Dobrogea (with the passing of THE ATTENTION QUOTES on Ialomiciora-Fieni and Casimcea-Cheia) and on the last day on the upper courses of Crișul Pietros, Crișul Negru, Crișul Alb and Arieș. On the last day of the interval, due to the downstream propagation of the discharged flows, the ATTENTION QUOTES were exceeded at the Oancea hydrometric station.

Between 11th and 16th of August, the flows were generally decreasing, except for the rivers in Dobrogea where they were stationary and the middle and lower course of the Prut on which there were increases due to propagation occurred. Isolated increases in levels and flows were recorded on the days of August 13th and 14th on Trotuș and the upper courses of Moldova and Timiș and on August 16th on some rivers in the southwest and northeast of the country (with exceedances of ATTENTION QUOTES on Orăștie-Grădiștea de Munte and Izvorul Giumalău-Pojorâta), as a result of precipitation in the form of a rainfall, isolated more quantitatively. Throughout this interval, the Prut river was maintained over the ATTENTION QUOTES at the Oancea hydrometric station.

Between 17th and 20th August 2018, the rates were relatively stationary, except for the rivers of Maramureș, the north of Moldova and the north of Crișana where they were decreasing.

The main feature of this interval was represented by the atmospheric instability recorded during the day, manifested by precipitation in the form of a rainfall, isolated with torrential character and more quantitatively significant, which determined on small areas and in short periods of time, significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with the effect of local floods and significant increases in levels and flows on some rivers, especially in the hill and mountain areas in the north, center and west of the country.

Between 21st-28th of August 2018, the debts were generally stationary, except for the rivers in the Siret and Prut basins where they were slightly decreasing. In the first part of this interval, there were increases due to the combined effect of the fallen precipitation and the propagation on some rivers in the river basins: Vișeu, Someș, Crișul Repede, Crișul Alb, Arieș, Timiș, Bârzava, Buzău, Trotuș, Suceava, Moldova, Bistrița, upper Prut and upper Argeș, with the passing of the ATTENTION QUOTES on Bughea-Bughea de Jos and Tomnatec-Drăgoiasa on August 23rd. In the second part of the interval there were increases in Vișeu, Iza, Tur, Someș, Crasna, Barcău, Suceava, Moldova, Bistrița and in the upper basins of Olt, Mureș, Arieș, Timiș, Bârzava, Jiu and Prut.

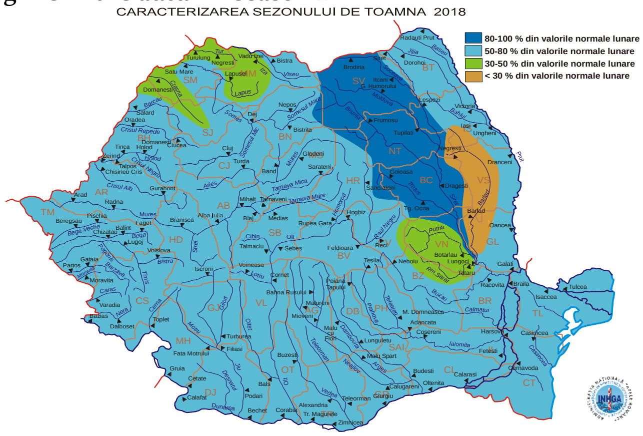
Also, every day of this interval, there were significant leaks on the slopes, torrents, streams and rapid increases in levels and flows with local flooding effect on some small rivers, especially in the mountain area, due to rainfall in the form of a shower.

In the last three days of August, the flows were slightly lower, on the rivers of Maramureș, Crișana, Transilvania and Banat and relatively stationary on those of Oltenia, Muntenia, Moldova and Dobrogea.

Characterization of the autumn season 2018

In the autumn of 2018 the hydrological regime of the river basins in Romania (figure II.19) was below the seasonal multiannual averages with modular coefficients ranging from 50-80% of the seasonal norms, smaller (30-50% of the seasonal multiannual averages) in the hydrograph basins Tur, Lăpuș, Crasna, lower Iza , Putna and Rm. Sărat (80-100%) on the rivers in Suceava, Moldova, Bistrita, Trotuș and on the middle and lower course of Siret. The lowest values of average flows (below 30%) were recorded on the rivers in the Bârlad basin.

Figure II.19 The hydrological regime in the autumn season 2018



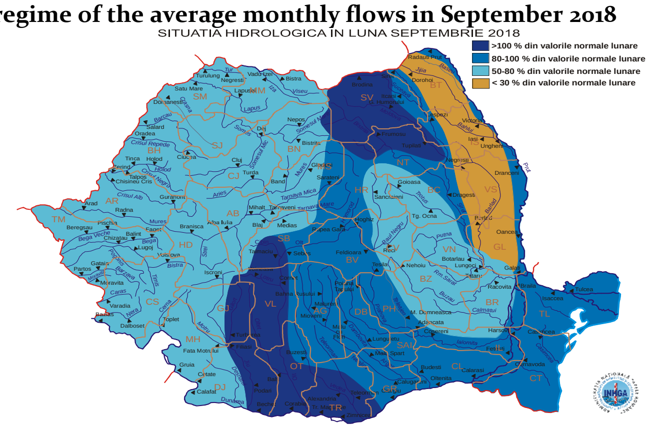
In September 2018 the hydrological regime of the hydrographic basins in Romania (figure II.20) was at the following values:

- above the normal monthly values on the lower course of Jiu and on Gilort, on the tributaries of Olt downstream of the Sebeș Olt hydrometric station, on the lower course of Vedea, in the upper and middle basins of Suceava and Bistrița and in the hydrographic basin of Moldova;
- between 80-100% of the monthly norms on the rivers in the river basins: Upper and Middle Vedea, Argeș, Ialomița, on the upper courses of Mureș and Târnave, on the middle course of Olt, on the lower course of Suceava, on the courses of Siret and Prut and on the rivers of Dobrogea;
- between 50-80% of the monthly multiannual averages in the river basins of the rivers: Vișeu, Iza, Tur, Someș, Crasna, Barcău, Crișul Repede, Crișul Negru, Crișul Albiu, Mureș middle and lower, Bega Veche, Bega, Timiș, Bârzava, Moravița, Caraș, Nera, Cerna, Motru, Desnățui, Călmățui, Buzău, Rm. Sărat, Putna, Trotuș, on the upper and middle courses of Jiu and on the upper course of Olt;
- less than 30% of the monthly multiannual averages in the Bârlad river basin and on the tributaries of Prut.

Between September 1st and 3rd, 2018, the river flows were generally stationary, with the exception of the rivers in Jiu and Ialomița basins, the right tributaries of Siret and the tributaries of Prut where they were decreasing. Isolated increases in levels and flows, due to the rainfall recorded in the first two days, occurred on some small rivers in the hill and mountain areas in the west and southwest of the country..

Between 4th and 7th of September 2018, the flows were generally stationary, except for the first two days when they were growing on the rivers of Crișana, Banat and the west of Oltenia and the last two days when the growths were generally on the rivers in the hill and mountain areas in Oltenia, Muntenia and Moldova, due to the combined effect of the rainfall during this period and the propagation. Isolated increases in levels and flows have also occurred on some small rivers and in other areas of the country.

Figure II.20 The hydrological regime of the average monthly flows in September 2018



Between 8th and 15th of September 2018, the debts were generally stationary, except for the first day when they were decreasing on the rivers of Crişana, Banat, western Oltenia, northern Moldavia and the Târnave basin, between 8th and 12th of September when they were increasing on the upper course of Prut and the last days of the interval when they were decreasing on the upper course of Prut. Isolated increases in levels and flows, due to the rainfall recorded between September 11th-13th, occurred on some small rivers in the hill and mountain areas in the north and center of the country.

Between September 16th and 18th 2018, the flows were generally stationary, except for the first day of the interval when they were increasing as a result of the falling precipitations and propagation on the rivers in the river basins Vişeu, Iza, Someş, Cibin and in the upper basins of the rivers: Tur, Mureş, Suceava, Moldova, Bistriţa and Buzău and the last day when they were decreasing on the rivers in the river basins Vişeu, Iza, Lăpuş, Someşul Mare, Bistriţa, Putna, Rm. Sărat, Buzău, Bârlad, Siret course, lower course of Someş, the upper and lower course of Mureş, the upper and middle courses of Suceava and Moldova and the middle course of Prut. In isolation, there have been significant leaks on the slopes, torrents, streams and higher increases of flows and levels due to the precipitations that have fallen in the mountain areas of the north of the country.

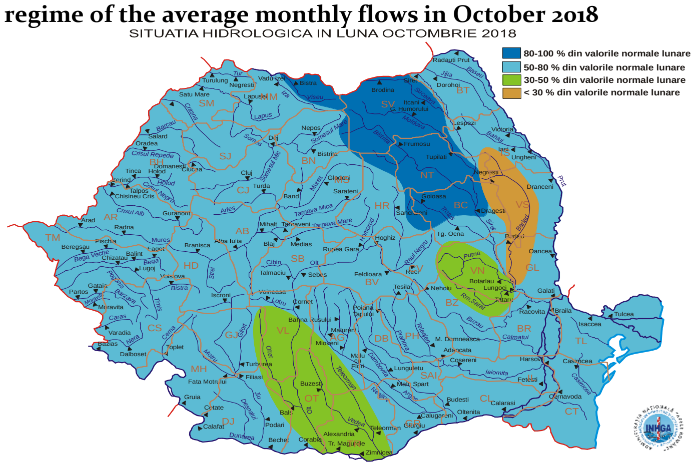
Between September 19th-22th 2018, the flows were generally stationary, excepting the rivers from the river basins: Someş, Suceava, Bârlad and the upper courses of Mureş and Prut, where they were decreasing.

Between 23rd and 25th of September 2018, the flows were increasing due to the combined effect of the falling precipitations and the propagation on the rivers in the river basins: Vişeu, Iza, Tur, Someş, Crasna, Barcău, Crişul Repede, Crişul Negru, Crişul Alb, Bega, Timiş , Bârzava, Bistriţa and on the middle course of Mureş. On the other rivers the flows were stationary.

In the last days of September 2018, the debts were generally stationary, except for the first two days when the upper courses of the rivers of Maramures, Crişana and Banat the flows were decreasing, and through propagation there were increases on the middle and lower courses of the rivers: Someş, Crasna, Barcău, Crişuri, Timiş, Bârzava, Bistriţa and on the upper course of Prut.

In October 2018 the hydrological regime of the river basins in Romania (Figure II.2), stood at values generally between 50-80% of the monthly multiannual averages. Higher values (80-100% of the monthly norms) were recorded on Vişeu, Suceava, Moldova, Bistriţa, the upper course of Trotuş and the middle course of Siret, and lower values on the tributaries of the lower Olt, on Vedea, Rm. Sărat, Putna (30-50%) and on the rivers in Bârlad river basin (under 30%).

Figure II.21 The hydrological regime of the average monthly flows in October 2018

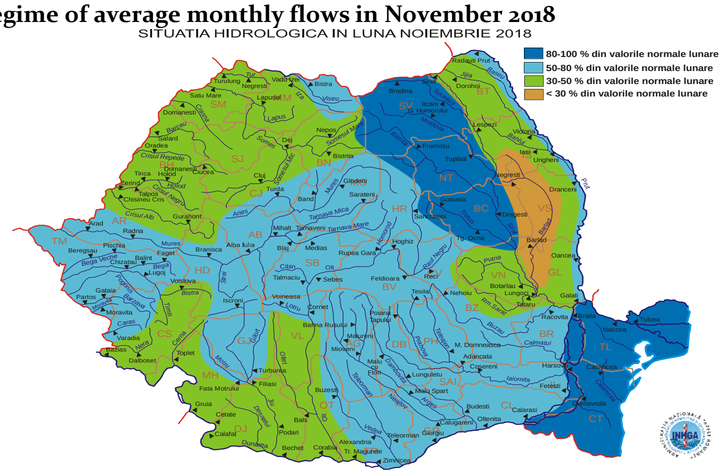


In the first two decades of October 2018, the flows were generally stationary. The rivers of Maramureş, Crişana and Transilvania were exceptionally high when the rainfall and propagation increased between October 2nd-3rd, and during October 4th-6th the flows were decreasing. Also, increases in levels and flows due to the propagation were recorded on the days of October 2nd and 6th on the upper course of Prut and decreases between 7th and 16th of October on the course of Prut and between 14th and 16th of October on the upper course of Siret.

Between October 21st and 25th, 2018, the flows were generally increasing as a result of the falling precipitations and the propagation on the rivers in the river basins Vișeu, Iza, Tur, Someș, Crasna, Barcău, Crișuri, Arieș, Someș, Bega, Timiș, Bârzava, Moravița, Caraș, Nera, Cerna and upper Jiu.
Significant increases in levels and flows, with the reaching and exceeding of the ATTENTION QUOTES, have occurred in the last two days of the interval on some small rivers in the upper basins of Crișul Repede, Crișul Negru, Arieș and Timiș, due to the significant quantitative precipitation, in the form of a shower.
The rivers at the following hydrometric stations were located above the ATTENTION QUOTES: Valea Galbenă-Pietroasa, Crișul Pietros-Pietroasa, Fântâna Galbenă-Stâna de Vale, Arieș-Scărișoara and Goleț-Goleț.
On the other rivers, the flows were stationary, except for the rivers Bistrița and Moldova, which registered increases on the first day of the interval and the upper course of Prut, where the flows were increasing on the days of October 23rd and 24th.
Between October 26th and 31st, 2018, the flows were generally stationary, except for the rivers in the northwest of the country where they were generally decreasing. Isolated increases were recorded on the days of October 28th and 29th on Vișeu, Iza and Someșul Mare and on the last day of the month on the upper course of Prut.
In November 2018 the hydrological regime of the river basins in Romania (figure II.22) was at the following values:

- between 80-100% of the monthly norms on the rivers in the river basins: Suceava, Moldova, Bistrița, Trotuș, on the middle course of Siret and on the rivers in Dobrogea;
- between 50-80% of the monthly multiannual averages in the river basins of the rivers: Vișeu, upper Iza , Mureș, Olt upper and middle, Bega Veche, Bega, Timiș middle and lower, Bârzava, Moravița, Caras, Jiu upper and middle, Vedea, Argeș, Ialomița, Buzău and along the Prut river;
- between 30-50% of the monthly norms on the rivers in the river basins: middle and lower Iza, Tur, Someș, Crasna, Barcău, Crișul Rapede, Crișul Negru, Crișul Alb, upper Timiș, Nera, Cerna, Desnătui, Jiu inferior, Olt inferior , Rm.Sărat, Putna, on the upper course of Siret and on the tributaries of the Prut;
- less than 30% of the monthly multiannual averages in the river basin of Bârlad.

Figure II.22 Hydrological regime of average monthly flows in November 2018

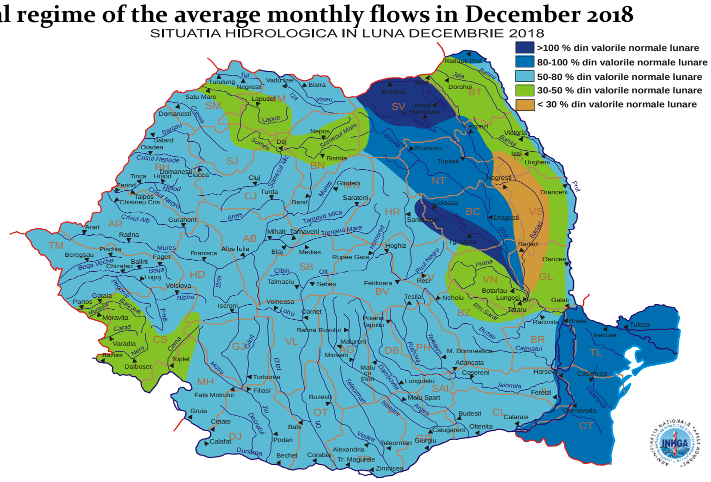


During the first two decades of November 2018, the debts were generally stationary, except for the first four days of the month when on the rivers of Maramureș, Crișana and on the upper course of Prut the flows were decreasing and the last five days when there were increases of levels and flows due to rainfall and propagation, between 15th and 16th of November 2018 on Siret and its right tributaries, and between 19th and 20th of November on the upper courses of the rivers of Crișana, on the upper Prut, on the rivers of Dobrogea and on some rivers of Oltenia and Muntenia.
Between November 21st and 24th, 2018, the flows were generally increasing as a result of the falling precipitations and the propagation on the rivers in the river basins: Crasna, Barcău, Crișuri, Arieș, Bega, Timiș, Bârzava, Caraș, Nera, Cerna. Isolated increases were also recorded on some rivers in Moldova, Muntenia and Oltenia, and on the other rivers the flows were generally stationary.

Between November 25th and 26th, 2018, the flows were generally stationary, except for the rivers in the northwest of the country where the decline and the upper course of Prut, where there were increases by propagation.
Between November 27th and 28th, 2018, the flows were increasing due to the combined effect of the falling precipitations, the transfer of water from the snow layer and the propagation on the rivers of Maramures, Crișana, Banat and Moldova. On the other rivers the flows were relatively stationary.
In the last two days of November 2018, the flows were slightly lower on the north, west and east rivers and stationary on the center and south.
In the last decade of the month, ice formations (ice at the banks, streams of fog) appeared on some small rivers in central and northern Moldova.
In December 2018, the hydrological regime of the hydrographic basins in Romania (figure II.23) was at the following values:

- over the monthly multiannual averages on the rivers in the river basins: Suceava, upper Moldova and Trotuș;
- between 80-100% of the monthly norms in the hydrographic basin of Bistrita, on the middle and lower course of Siret, on the upper course of Prut and on the rivers of Dobrogea;
- between 50-80% of the monthly multiannual averages in the river basins of the rivers: Vișeu, Iza, Tur, Someșul Mic, Crasna, Barcău, Crișul Repede, Crișul Negru, Crișul Alb, Mureș, Bega Veche, Bega, Timiș, Desnățui, Jiu, Olt, Vedea, Argeș, Ialomița, Buzău and on the middle and lower courses of Prut.
- between 30-50% of the monthly norms on the rivers in the river basins: Someș (except Someșul Mic), Bârzava, Moravița, Caraș, Nera, Cerna, Putna, Rm.Sărat and the tributaries of Prut;
- less than 30% of the monthly multiannual averages in the river basin of Bârlad.

Figure II.23 The hydrological regime of the average monthly flows in December 2018



In the first three days of December 2018, the flows were generally decreasing on the rivers in the northern half of the country and relatively stationary on those in the southern half.
Between 4th and 15th of December 2018, the flows were generally stationary, except for the first two days and between 9th and 11th of December, when there were increases in levels and flows due to rainfall, the water supply from the snow layer and the propagation on the rivers of Maramureș and northern Moldova and isolated, on some rivers in Crișana, Banat and southern Moldova.

Between December 16th-21st, 2018, the flows were generally stationary, except for the first three days when there were increases due to rainfall, the water supply from the snow layer and the propagation on the rivers of Banat, Oltenia, Muntenia and southern Moldova and the last two days when the increases were recorded on some rivers in Crișana.
Between December 22nd and 25th, the liquid precipitations, falling on a high temperature background and in the presence of a snow layer, led to increases on the rivers in the western half of the

country and on the upper course of Prut. On the other rivers the flows were relatively stationary.
During the last two days of this interval, there were significant leaks on the slopes, torrents, streams, fast floods with local flooding effects and increases in levels and flows with exceedances of DEFENSE QUOTES on some rivers in Crișana and Banat, as a result of the combined effect of the more significant quantitative liquid precipitations falling in the interval and the transfer of water from the snow layer.

They were located above :

- FLOOD QUOTES on rivers at hydrometric stations: Crișul Alb - Crișcior, Sebiș - Sebiș, Ampoi - Zlatna, Bistra - Voislova Gară and Bistra - Obreja;
- ATTENTION QUOTES on rivers at hydrometric stations: Valea Rea - Huța Certeze, Crișul Alb - Gurahonț, Crișul Negru - Suștiu Crișul Negru - Beiuș, Crișul Negru - Tinca, Briheni - Suștiu, Valea Roșie - Pocola, Groșeni - Archiș, Valea Satului - Buceș, Iosa - Iosășel, Crișul Alb - Vața de Jos, Moneasa - Moneasa, Rănușa - Moneasa, Goleț - Goleț, Bistra - Voislova Bucova, Sebeș - Turnu Ruieni and Sașa - Poieni.

In the last days of December 2018, the flows were generally decreasing on the rivers in the western half and stationary on the other rivers.The ice formations (ice on the banks, fog, ice bridge) present on the first day of December were kept without major changes during the first two decades, then entered into a process of diminishing, narrowing and eliminating most of the rivers from west and south of the country, so that in the last days of the month there were (ice at the shore and ice bridge) on the rivers in the upper basins of Mureș, Olt, Argeș, Ialomița and Prahova, on the upper and middle course of Siret and most of its tributaries, on the upper course of Prut and its tributaries.

The situation of the overview of THE DEFENSE QUOTES in 2018 (maximum preliminary values determined based on the data from the operating flow) is presented in tables II.5 ÷ II.21.

Table II.5 Exceeding flood and danger quote levels in January 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Valea Mare	Târnova	AR	300	13.9	17.01	14	300+0	-
Timercea	Timercea	AR	212	9.35	17.01	14	200+12	-
Bega	Balinț	TM	560	89.2	18.01	09	550+10	-

Table II.6 Exceeding attention quote levels in January 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Cigher	Tăuți	AR	270	10.2	17.01	15	250+20
Bega	Făget	TM	232	33.8	17.01	22	220+12
Bega	Chizătău	TM	288	125	18.01	18	200+88
Gladna	Firdea	TM	148	22.8	17.01	16	110+38
Hăuzeasca	Firdea	TM	228	15.7	17.01	16	180+48
Chizdia	Ghizela	TM	345	14.8	17.01	18	250+95
Bega Veche	Pischia	TM	120	4.70	18/19.01	20-02	120+20
Rusca	Voislova Rusca	CS	186	30.0	17.01	18	150+36
Bistra	Obreja	CS	118	78.4	17.01	20	85+33
Tău	Soceni	CS	72	4.00	17.01	18-20	60+12

Table II.7 Exceeding flood and danger quote levels in February 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Călmățui	Cireșu	BR	365	14.2	16.02	14	350+15	

Table II.8 Exceeding attention quote levels in February 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Iza	Vadu Izei	MM	305	167	04.02	03	300+5
Mara	Vadu Izei	MM	190	102	03.02	21	180+10
Tur	Negrești Oaș	SM	175	5.96	03.02	19	170+5
Tur	Călinești Oaș	SM	387	32.1	04.02	18-21	350+37
Tur	Turulung	SM	393	47.5	04.02	21	360+33
Tur	Nicula	SM	345	52.8	05.02	18-21	300+45
Valea Rea	Huța Certeze	SM	172	11.4	03.02	19	170+2
Talna	Pășunea Mare	SM	278	33.6	03.02	24	270+8
Firiza	Firiza	MM	116	24.0	03.02	18	110+6
Budac	Budacu de Jos	BN	135	20.3	03.02	18	130+5
Crasna	Domănești	SM	458	27.1	05.02	09	400+58
Crasna	Domănești	SM	490	33.0	11.02	24	400+90
Crasna	Berveni	SM	540	31.2	12.02	15	490+50
Crişul Alb	Criscior	HD	215	58.5	04.02	03	170+45
Crişul Alb	Vaţa de Jos	HD	420	92.4	04.02	15	350+70
Valea Satului	Buceş	HD	164	12.5	03.02	20	160+4
Neajlov	Vadu Lat	GR	182	46.8	17.02	15	150+32
Valea Câinelui	Vârtoapele	TR	203	2.45	04.02	21	200+3
Valea Câinelui	Vârtoapele	TR	226	3.68	15.02	11	200+26
Glavacioc	Crovu	GR	205	7.50	19.02	12-18	200+5
Călmăţui	Cireşu	BR	300	7.67	16.02	06	300+0

Table II.9 Exceeding flood and danger quote levels in March 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Tur	Micula	SM	338	48.2	20.03	21	310+28	
Crasna	Supuru de Jos	SM	470	138	18.03	08	400+70	
Crasna	Craidorolț	SM	522	147	18.03	16-17	450+72	
Crasna	Domănești	SM	587	55.6	20.03	04-05		550+37
Crasna	Berveni	SM	661	74.1	20.03	14	590+71	
Maria	Rătești	SM	312	6.60	18.03	08	300+12	
Barcău	Marca	SJ	443	62.5	18.03	06	425+18	
Barcău	Marghita	BH	370	24.2	18.03	09	300+70	
Bistra	Chiribiş	BH	523	43.5	18.03	08		500+23
Fânețelor	Sărsig	BH	377	36.0	18.03	09	375+2	
Chechet	Ghilești	SM	336	25.5	18.03	10-11	300+36	
Mureş	Suseni	HR	170	18.8	13.03	24	150+20	
Niraju Mic	Miercurea Nirajului	MS	345	42.6	14.03	08	300+45	
Târnava Mare	Vânători	MS	596	378	14.03	08	550+46	
Târnava Mare	Sighișoara	MS	480	336	14.03	13-15	450+30	
Târnava Mare	Mediaș	SB	442	304	15.03	12	400+42	
Feernic	Simonești	HR	190	94.5	13.03	24		150+40
Târnava Mică	Bălăușeri	MS	247	89.3	14.03	18	220+27	
Târnava Mică	Târnăveni	MS	347	89.3	16.03	04-06	300+47	
Bega Veche	Beregsău	TM	306		28/29.03	18-10	300+6	
Nera	Dalboșeț	CS	308	145	18.03	15	300+8	
Nera	Sasca Montană	CS	289	209	19.03	04	280+9	

Desnățui	Călugărei	DJ	280	20.8	09.03	22-24	250+30	
Desnățui	Călugărei	DJ	280	20.8	27.03	24	250+30	
Desnățui	Dragoia	DJ	467	34.5	10.03	06	450+17	
Desnățui	Dragoia	DJ	478	42.4	28.03	08	450+28	
Terpezița	Gabru	DJ	320	29.3	09.03	17		320+0
Terpezița	Gabru	DJ	290	23.2	28.03	05	270+20	
Olt	Sâncrăieni	HR	258	101	14.03	05-06	250+8	
Olt	Micfalău	CV	308	127	15.03	10-13	250+58	
Olt	Podu Oltului	BV	515	305	14.03	17-21	450+65	
Olt	Feldioara	BV	522	567	14.03	15-16		490+32
Olt	Hoghiz	BV	467	469	14.03	17-19	350+117	
Râul Negru	Reci	CV	406	94.3	14.03	22	400+6	
Bârsa	Zărnești	BV	135	62.7	14.03	06-10	125+10	
Homorod	Dumbrăvița	CV	330	67.8	14.03	02	300+30	
Aita	Aita Mare	CV	150	61.0	13.03	20-24	140+10	
Ozunca	Bățanii Mari	CV	250	23.7	13.03	21	250+0	
Cormoș	Brăduț	CV	305	68.0	13.03	22		230+75
Vârghiș	Vârghiș	CV	142	78.1	13.03	24	100+42	
Homorodu Mare	Sânpaul	HR	390	105	14.03	02		350+40
Homorodu Mare	Rupea Gară	BV	452	184	14.03	06-10		430+22
Homorodu Mic	Lueta	HR	157	15.9	13.03	20	130+27	
Cozd	Dacia	BV	318	48.2	14.03	02	250+68	
Neajlov	Vadu Lat	GR	292	122	09.03	09-11		260+32
Neajlov	Vadu Lat	GR	295	126	15.03	04-09		260+35
Neajlov	Vadu Lat	GR	310	146	28.03	14-16		260+50
Neajlov	Călugăreni	GR	264	65.8	11.03	12-14	260+4	
Neajlov	Călugăreni	GR	262	135	17.03	09	260+2	
Neajlov	Călugăreni	GR	286	186	31.03	06	260+26	
Neajlov	Moara din Groapă	DB	136	53.4	14.03	12	120+16	
Neajlov	Moara din Groapă	DB	151	68.0	27.03	16	120+31	
Călmățui	Crângu	TR	189	21.9	11.03	02	120+69	
Călmățui	Crângu	TR	173	17.9	29.03	14	120+53	
Teleorman	Tătărăști	TR	273	82.2	08.03	06-07		250+23
Teleorman	Tătărăști	TR	290	89.0	14.03	02		250+40
Teleorman	Tătărăști	TR	298	92.6	28.03	01-02		250+48
Teleorman	Teleorman	TR	184	110	10.03	03	180+4	
Teleorman	Teleorman	TR	185	111	15.03	18	180+5	
Teleorman	Teleorman	TR	212	134	29.03	06-08	180+32	
Glavacioc	Crovu	GR	264	29.6	10.03	18	250+14	
Glavacioc	Crovu	GR	257	26.9	16.03	09-10	250+7	
Glavacioc	Crovu	GR	264	29.6	29/30	22-09	250+14	
Sabar	Poenari	GR	208	12.3	10.03	08	200+8	
Sabar	Poenari	GR	238	15.1	16.03	12-15	200+38	
Sabar	Poenari		255	16.8	29.03	12	200+55	
Sabar	Vidra	IF	434	70.0	15.03	16-18	410+24	
Urlui	Furculești	TR	200	7.50	14/15.03	13-03	200+0	
Vedea	Buzești	OT	480	112	14.03	04	450+30	
Valea Câinelui	Vârtoapele	TR	336	28.8	13.03	22-24	300+36	
Valea Câinelui	Vârtoapele	TR	332	27.6	28.03	04	300+32	

Potop	Gura Foii	DB	360	50.1	13.03	21	330+30	
Colentina	Colacu	DB	200	10.5	27.03	12-14	200+0	
Cricovul Sărat	Cioranii de Jos	PH	330	141	14.03	08	330+0	
Buzău	Sita Buzăului	CV	409	218	14.03	04-05		350+59

Table II.10 Exceeding attention quote levels in March 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Tur	Turulung	SM	375	40.5	18/19.03	21-06	360+15
Someşul Mare	Valea Mare	BN	114	17.9	17.03	06	110+4
Budac	Budacu de Jos	BN	140	21.3	09.03	18	130+10
Crasna	Domănești	SM	465	28.5	10.03	18	400+65
Crasna	Domănești	SM	425	21.8	14.03	15	400+25
Crasna	Domănești	SM	402	18.5	16.03	15	400+2
Crasna	Berveni	SM	496	24.7	12.03	03	490+6
Zalău	Borla	SJ	250	40.9	18.03	24	250+0
Barcău	Nuşfalău	SJ	190	90.1	18.03	24	100+90
Barcău	Balc	BH	507	50.7	18.03	06	400+107
Barcău	Sălard	BH	613	92.6	19.03	06	510+103
Henţ	Morlaca Henţ	CJ	128	26.8	18.03	11	125+3
Crişul Alb	Vaţa de Jos	HD	360	53.9	07.03	24	350+10
Cigher	Tauţ	AR	256	8.28	18.03	07	250+6
Timercea	Timercea	AR	172	6.81	18.03	06	150+22
Mureş	Topliţa	HR	240	96.8	14.03	15	200+40
Mureş	Stânceni	MS	225	177	14.03	18	170+55
Mureş	Gălăoaia	MS	230	278	14.03	22-24	170+60
Mureş	Luduş	MS	356	412	16.03	14	300+56
Mureş	Glodeni	MS	206	314	14.03	18-22	180+26
NIraju Mare	Miercurea Nirajului	MS	224	58.4	14.03	12	175+49
Niraj	Cinta	MS	435	84.8	14.03	18	350+85
Arieş	Scărişoara	AB	127	55.7	18.03	10	120+7
Hodoş	Nicoleşti	HR	220	14.7	13.03	15	220+0
Scroafa	Saschiz	MS	445	72.8	14.03	03	400+45
Târnava Mică	Sărăţeni	MS	168	66.2	14.03	06	150+18
Târnava Mică	Blaj	AB	341	58.5	17.03	12	320+21
Cuşmed	Crişeni	HR	196	24.8	4.03	06	170+26
Gladna	Firdea	TM	110	8.30	07.03	11	110+0
Hăuzeasca	Firdea	TM	186	7.30	07.03	11	180+6
Chizdia	Ghizela	TM	285	7.04	07.03	06	250+35
Chizdia	Ghizela	TM	260	6.20	20.03	10	250+10
Chizdia	Ghizela	TM	265	6.30	25.03	06	250+15
Bega Veche	Pischia	TM	128	5.10	07/09	22-06	100+28
Bega Veche	Pischia	TM	118	4.60	20/21	18-09	100+18
Bega Veche	Pischia	TM	122	4.80	25/26	22-06	100+22
Bega Veche	Cenei	TM	348	9.40	29.03	14-18	320+28
Bistra	Obreja	CS	100	59.0	07.03	15	60+40
Timiş	Teregova	CS	121	16.8	18.03	18	120+1
Bârzava	Partoş	TM	101	20.9	07.03	09-14	50+51
Bârzava	Partoş	TM	120	22.5	10.03	10	50+70
Bârzava	Partoş	TM	110	21.6	25.03	22-24	50+60
Moraviţa	Moraviţa	TM	304	11.7	07.03	18	250+54
Moraviţa	Moraviţa	TM	283	8.60	10.03	02	250+33
Moraviţa	Moraviţa	TM	270	7.10	26.03	24	250+20

Gârlişte	Gârlişte	CS	70	7.30	18.03	11	70+0
Nera	Naidăş	CS	192	195	19.03	11	170+22
Prigor	Prigor	CS	148		18.03	14	130+18
Miniş	Bozovici	CS	128	56.5	18.03	10	100+28
Jiu	Răcari	DJ	350	485	08.03	09	330+20
Jiu	Răcari	DJ	332	425	13.03	21	330+2
Jiu	Răcari	DJ	348	478	19.03	09-12	330+18
Jiu	Răcari	DJ	336	438	29.03	09	330+6
Jilţ	Turceni	GJ	253	33.6	28.03	06	250+3
Huşniţa	Strehaia	MH	310	28.4	28.03	06	300+10
Drincea	Cujmir	MH	262	31.3	10.03	08	250+12
Drincea	Cujmir	MH	325	48.1	28.03	12	250+75
Drincea	Corlăţel	MH	190	38.0	28.03	03	150+40
Olt	Sfântu Gheorghe	CV	248	176	14.03	12	200+48
Râul Negru	Lemnia	CV	336	9.10	13.03	24	300+36
Caşin	Ruseni	CV	372	111	14.03	03	300+72
Covasna	Covasna	CV	98	12.1	13.03	21	80+18
Covasna	Boroşneul Mare	CV	424	33.8	14.03	03	400+24
Teliu	Teliu	BV	150	24.9	13.03	20	150+0
Timiş	Dâmbu Morii	BV	125	27.2	14.03	06	100+25
Tărlung	Lunca Mărcuşului	BV	470	59.7	14.03	12	400+70
Baraolt	Baraolt	CV	368	61.4	13.03	21	300+68
Homorodu Mare	Băile Homorod	HR	115	79.9	13.03	15	100+15
Şercaia	Şercaia	BV	200	72.6	14.03	06-12	175+25
Valea Mare	Dopca	BV	91	15.6	14.03	01	75+16
Teslui	Reşca	OT	344	79.8	10.03	12	310+34
Teslui	Reşca	OT	348	77.2	28.03	09-12	310+38
Teslui	Teslui	OT	250	13.0	26.03	21	250+0
Neajlov	Moara din Groapă	DB	116	37.0	08.03	21	100+16
Râul Doamnei	Ciumeşti	AG	215	325	13.03	18	200+15
Argeş	Budeşti	CL	273	446	14.03	18-21	250+23
Argeş	Budeşti	CL	282	473	18.03	15	250+32
Râul Târgului	Piscani	AG	100	138	13.03	18	100+0
Bughea	Bughea de Jos	AG	152	9.60	13.03	13	150+2
Urlui	Furculeşti	TR	181	4.80	10.03	12	150+31
Urlui	Furculeşti	TR	175	4.00	28.03	15	150+25
Vedea	Buzeşti	OT	410	70.0	08.03	03	350+60
Vedea	Buzeşti	OT	434	82.4	28.03	03	350+84
Vedea	Alexandria	TR	432	276	09.03	09-10	380+52
Vedea	Alexandria	TR	434	281	15.03	03	380+54
Vedea	Alexandria	TR	460	338	28.03	21	380+80
Valea Câinelui	Vârrtoapele	TR	235	4.70	08/09.03	18-06	200+35
Valea Câinelui	Vârrtoapele	TR	274	11.7	11.03	03	200+74
Dâmbovnic	Slobozia	AG	112	68.0	08.03	03	80+32
Dâmbovnic	Slobozia	AG	125	81.0	14.03	02	80+45
Dâmbovnic	Slobozia	AG	109	65.2	27.03	21	80+29
Dâmboviţa	Dragomireşti	IF	214	2.62	10.03	01	200+14
Dâmboviţa	Dragomireşti	IF	235	3.59	15.03	21	200+35
Dâmboviţa	Dragomireşti	IF	274	6.30	29.03	12-14	200+74
Colentina	Colacu	DB	168	6.80	08.03	09-10	150+18
Colentina	Colacu	DB	188	9.10	14.03	12	150+38
Cotmeana	Ciobani	AG	208	137	14.03	01	150+58
Ciorogârla	Bragadiru	IF	335	68.6	14.03	07	250+85
Sabar	Vidra	IF	368	41.4	28.03	12-24	360+8
Cricovul Dulce	Moreni	DB	235	105	13.03	14	230+5
Cricovul Dulce	Băltiţa	PH	200	127	13.03	19	200+0

Teleajen	Cheia	PH	106	12.1	14.03	06	100+6
Teleajen	Moara Domnească	PH	392	136	13.03	21-23	350+42
Ialomiţa	Siliştea Snagovului	IF	368	199	14.03	15	350+18
Buzău	Vama Buzăului	BV	212	48.4	14.03	02	210+2
Teşna	Coşna	SV	175	31.9	14.03	09	160+15
Trotuş	Lunca de Sus	HR	90	8.10	14.03	13-15	80+10
Jijia	Dorohoi	BT	425	26.5	14.03	18	360+65
Jijia	Dorohoi	BT	419	18.5	16.03	09-10	360+59
Jijia	Dângeni	BT	389	7.87	16.03	03	380+9
Buhai	Pădureni	BT	252	5.86	16.03	09-10	250+2
Bârlad	Negreşti	VS	552	18.0	16.03	21	450+102
Bârlad	Negreşti	VS	565	20.4	29.03	09	500+65
Sacovăţ	Ţibana	IS	302	6.30	16.03	08	300+2
Vaslui	Soleşti	VS	410	5.15	15.03	12	400+10
Vaslui	Codăeşti	VS	448	7.78	31.03	09	400+48
Zeletin	Galbeni	VN	287	6.78	29.03	06	270+17
Prut	Rădăuţi Prut	BT	292	438	15.03	21-24	290+2

Table II.11 Exceeding attention quote levels in April 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Ilva	Poiana Ilvei	BN	158	43.3	01.04	24	150+8
Budacu	Budacu de Jos	BN	170	27.3	01.04	21	130+40
Crasna	Domăneşti	SM	492	32.1	03.04	15	400+92
Crasna	Berveni	SM	536	23.2	04.04	09-15	490+46
Barcău	Sălard	BH	532	40.8	03.04	06	510+22
Bistra	Chiribiş	BH	375	11.8	01.04	06	350+25
Fâneţelor	Sărsig	BH	304	14.2	02.04	06	275+29
Crişul Negru	Tinca	BH	403	182	02.04	15-18	350+53
Crişul Negru	Talpoş	BH	732	211	02.04	24	680+52
Crişul Negru	Zerind	AR	662	183	03.04	18	600+62
Crişul Alb	Vaţa de jos	HD	367	57.8	02.04	11	350+17
Crişul Alb	Chişineu Criş	AR	603	97.2	04.04	18	600+3
Chizdia	Ghizela	TM	250	5.80	02.04	02	250+0
Bega Veche	Cenei	TM	335	8.20	04-05.04	22-18	320+15
Rusca	Voislova Rusca	CS	158	17.4	01.04	16-18	150+8
Goleţ	Goleţ	CS	270	4.10	18.04	20	270+0
Bârzava	Partoş	TM	115	22.1	08.04	14	50+65
Moraviţa	Moraviţa	TM	262	6.30	08.04	06	250+12
Prut	Oancea	GL	446	185	20.04	12-18	440+6

TableII.12 Exceeding attention quote levels in May 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Sighişoara	Brazii	AR	168	19.1	21.05	15	150+18
Saşa	Poieni	TM	56	9.60	24.05	18	50+6
Nădrag	Nădrag	CS	-40	5.30	24.05	18	-40+0
Moraviţa	Moraviţa	TM	270	7.10	17.05	06-14	250+20
Terpeziţa	Gabru	DJ	254	17.9	16.05	12	220+34
Urşani	Horezu	VL	252	30.1	24.05	20-21	250+2

Table II.13 Exceeding flood and danger quote levels in June 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Valea Rea	Huţa Certeze	SM	225	46.6	12.06	20	200+25	
Scroafa	Saschiz	MS	488	94.7	30.06	23	450+38	
Saşa	Poieni	TM	101	20.8	09.06	21		100+1
Saşa	Poieni	TM	120	26.0	15.06	17		100+20
Goleţ	Goleţ	CS	390	26.4	13.06	17		350+40
Olt	Micfalău	CV	305	124	30.06	19	250+55	
Olt	Podu Olt	BV	486	261	30.06	24	450+36	
Olt	Hoghiz	BV	410	403	30.06	24	350+53	
R. Negru	Lemnia	CV	431	20.4	30.06	11-12		420+11
R. Negru	Reci	CV	409	120	30.06	23	400+9	
Caşin	Ruseni	CV	448	172	30.06	17	440+48	
Teliu	Teliu	BV	216	63.0	30.06	15-16	200+16	
Bârsa	Zărneşti	BV	190	129	30.06	12		175+15
Baraolt	Baraolt	CV	401	77.2	30.06	12	400+1	
Ozunca	Băţanii Mari	CV	278	31.8	30.06	10	250+28	
Cormoş	Brăduţ	CV	240	42.8	29.06	19		230+10
Cormiş	Brăduţ	CV	260	50.0	30.06	12		230+30
Homorodu Ma	Sânpaul	HR	350	46.0	29.06	20		350+0
Homorodu Ma	Sânpaul	HR	316	30.9	30.06	11	310+6	
Homorodu Mi	Lueta	HR	139	11.7	30.06	11	130+9	
Tărlung	Lunca Mărcuşului	CV	552	77.8	30.06	08		540+12
Luncavăţ	Oteşani	VL	190	148	21.06	14	190+0	
Topolog	Milcoiu	VL	228	168	18.06	06	220+8	
Olteţ	Nistoreşti	GJ	160	69.5	21.06	14	160+0	
Slănic	Gura Ocniţei	DB	450	65.6	29.06	15	450+0	
Doftana	Teşila	PH	180	128	30.06	13	170+10	
Buzău	Sita Buzăului	CV	340	143	30.06	10	275+65	
Buzău	Sita Buzăului	CV	400	208	30.06	19		350+50
Putna	Mirceşti	VN	548	941	28.06	08	500+48	
Putna	Mirceşti	VN	520	470	30.06	03	500+20	
Râmna	Groapa Tufei	VN	398	218	29.06	19		350+48
Soloneţ	Părhăuţi	SV	300	166	30.06	15	300+0	
Bistriţa	Frumosu	NT	300	380	30.06	11	300+0	
Bacău	Bârnat	BC	348	210	30.06	12		330+18
Negel	Măgura	BC	170	34.2	30.06	05	150+20	
Trotuş	Lunca de Sus	HR	158	27.5	30.06	11-14	120+38	
Trotuş	Tg. Ocna	BC	438	848	30.06	12		400+38
Trotuş	Oneşti	BC	460	979	30.06	12	400+60	
Trotuş	Vrânceni	BC	557	2794	30.06	15		500+57
Oituz	Ferăstrău	BC	270	288	28.06	01	250+20	
Caşin	Haloş	BC	400	227	29.06	23	400+0	
Tazlău	Helegiu	BC	370	10.96	30.06	12		350+20
Tazlău Sărat	Lucăceşti	BC	260	219	30.06	09	250+10	
Trebeş	Mărgineni	BC	564	132	30.06	12	500+64	
Trebeş	Luncani	BC	430	43.0	30.06	08	400+30	
Tutova	Rădeni	VS	372	68.0	16.06	14-15	310+62	
Tutova	Plopana	VS	440	15.2	16.06	10	400+40	
Prut	Oroftiana	BT	473		30.06	24	470+3	
Vămeşoaia	Iaşi	IS	170	26.8	28.06	18	150+20	
Jijia	Dângeni	BT	476	37.2	30.06	15	470+6	

Sitna	Drăcşani Av.	BT	592	69.2	30.06	17		550+42
Sitna	Todireni	BT	430	101	28.06	24	350+80	
Sitna	Todireni	BT	358	67.4	29.06	20	350+8	
Sitna	Todireni	BT	465	127	30.06	23		450+15
Miletin	N. Bălcescu	BT	445	63.8	30.06	22	420+25	
Miletin	Şipote	IS	269	41.9	30.06	23	250+19	
Topolog	Saraiu	CT	442	21.1	30.06	20		400+42

Table II.14 Exceeding attention quote levels in June 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Tur	Negreşti Oaş	SM	190	9.70	12.06	18	170+20
Tur	Călineşti Oaş	SM	360	23.2	13.06	12	350+10
Tur	Călineşti Oaş	SM	377	24.7	14.06	15	350+27
Turţ	Gherţa Mare	SM	288	21.0	12.06	21	250+38
Iza	Săcel	MM	86	17.8	30.06	21	80+6
Sălăuţa	Romuli	BN	100	10.1	30.06	20	80+20
Budacu	Budacu de Jos	BN	143	21.9	30.06	23	130+13
Crasna	Domăneşti	SM	433	19.2	15.06	03	400+33
Almaş	Almaşu	SJ	210	32.0	13.06	23	160+50
Bistra	Chiribiş	BH	375	11.8	09.06	02	350+25
Bistra	Chiribiş	BH	378	12.2	13.06	15	350+28
Fâneţelor	Sărsig	BH	300	13.7	13.06	15	275+25
Henţ	Morlaca Henţ	CJ	130	28.0	20.06	18	125+5
Henţ	Morlaca Henţ	CJ	170	60.1	22.06	16	125+45
Săcuieni	Morlaca Henţ	CJ	160	51.7	15.06	20	125+35
Crişul Repede	Ciucea	CJ	125	108	16.06	01	100+25
Crişul Repede	Ciucea	CJ	100	80.0	22.06	20	100+0
Crişul Repede	Vadu Crişului	BH	177	123	18.6	06	175+2
Luncoiu	Brad	HD	204	19.4	29.06	19	200+4
Râuşor	Râu de Mori	HD	160	19.7	13.06	21	100+60
Mureş	Suseni	HR	135	22.7	30.06	21	120+15
Galbena	Haţeg	HD	155	44.8	17.06	22	150+5
Monoroştia	Monoroştia	AR	268	18.3	03.06	20	200+68
Dobra	Dobra	HD	200	29.5	15.06	16	200+0
Domald	Zagăr	MS	156	16.7	22.06	21	150+6
Orăştie	Grădiştea de Munte	HD	67	10.6	19.06	19	65+2
Orăştie	Grădiştea de Munte	HD	66	10.1	22.06	16	65+1
Sibişel	Sibişel	HD	90	19.7	22.06	16	80+10
Albac	Albac	AB	157	22.6	15.06	21	150+7
Abrud	Câmpeni	AB	180	53.5	16.06	19	180+0
Cuşmed	Crişeni	HR	170	16.7	30.06	17	170+0
Saşa	Poieni	TM	60	8.75	17.06	18	50+10
Bega Veche	Pischia	TM	115	4.50	11.06	18	100+15
Bega Veche	Pischia	TM	117	4.60	17.06	02-06	100+17
Bega Veche	Cenei	TM	324	7.41	29/30.06	22-22	320+4
Bega	Făget	TM	230	33.4	16.06	04	220+10
Goleţ	Goleţ	CS	270	4.10	09.06	19	270+0
Goleţ	Goleţ	CS	295	8.90	19.06	16	270+25
Timiş	Teregova	CS	150	31.9	13.06	18	120+30
Timiş	Lugoj	TM	150	229	14.06	06	150+0
Sebeş	Turnu Ruieni	CS	290	42.4	13.06	17	250+40
Tău	Soceni	CS	74	6.90	19.06	17	60+14
Bistra	Voislova Bucova	CS	100	16.4	09.06	21	100+0
Bistra	Voislova Gară	CS	162	18.9	09.06	21	150+12

Bistra	Voislova Gară	CS	154	16.1	19.06	18	150+4
Bistra	Obreja	CS	86	48.3	19.06	20	85+1
Valea Mare	Reşiţa	CS	156	11.9	13.06	20	130+26
Valea Doman	Reşiţa	CS	154	7.46	19.06	18	140+14
Bârzava	Moniom	CS	234	34.0	13.06	20	220+14
Bârzava	Moniom	CS	269	52.1	19.06	18	220+49
Bârzava	Partoş	TM	133	23.8	15.06	22	50+83
Bârzava	Partoş	TM	92	20.1	21.06	14	50+42
Moraviţa	Moraviţa	TM	307	12.2	15.06	18	250+57
Caraş	Caraşova	CS	149	29.7	14.06	02	140+9
Radimna	Radimna	CS	150	32.4	29.06	20	130+20
Olt	Feldioara	BV	395	395	30.06	21	340+55
Bârsa	Zărneşti	BV	105	35.9	15.06	18	100+5
Homorodu Mic	Lueta	HR	110	6.90	18.06	24	100+10
R. Negru	Lemnia	CV	334	9.28	28.06	06	300+34
Caşin	Plăieşii de Jos	HR	118	26.5	22.06	19	100+18
Caşin	Plăieşii de Jos	HR	128	30.3	30.06	09	100+28
Covasna	Covasna	CV	80	7.53	27.06	12	80+0
Covasna	Covasna	CV	103	13.4	30.06	21	80+23
Covasna	Boroşneu Mare	CV	417	32.8	30.06	12	400+17
Ghimbăşel	Râşnov	BV	175	43.6	30.06	15	150+25
Timiş	Dâmbu Morii	BV	104	19.5	30.06	12	100+4
Vârghiş	Vârghiş	CV	72	40.9	30.06	24	50+22
Şercaia	Şercaia	BV	288	134	30.06	21	175+113
Cârţişoara	Cârţişoara	SB	235	46.9	30.06	16	230+5
Hârtibaciu	Corlăţel	SB	435	65.0	30.06	12	400+35
Lotru	Valea lui Stan	VL	167	26.0	21.06	15	165+2
Topolog	Sălătruc	VL	120	49.1	30.06	15	90+30
Topolog	Milcoiu	VL	205	96.5	30.06	18	185+20
Luncavăţ	Oteşani	VL	180	131	14.06	24	140+40
Luncavăţ	Oteşani	VL	140	71.0	18.06	19	140+0
Luncavăţ	Vaideeni	VL	50	52.2	21.06	12	40+10
Urşani	Horezu	VL	256	34.3	14.06	24	250+6
Urşani	Horezu	VL	252	30.0	16.06	12	250+2
Urşani	Hotezu	VL	261	39.8	21.06	14	250+11
Bistriţa	Genuneni	VL	159	58.2	16.06	10	150+9
Bistriţa	Băbeni	VL	210	113	16.06	13	200+10
Cerna	Măciuca	VL	250	84.7	28.06	06	240+10
Tarâia	Polovragi	GJ	146	10.5	21.06	12	130+16
R. Doamnei	Bahna Rusului	AG	188	62.0	30.06	15	170+18
Cricovul Dulce	Moreni	DB	316	186	29.06	12	230+86
Cricovul Dulce	Băltiţa	PH	235	175	29.06	19	200+35
Prahova	Buşteni	PH	143	81.9	30.06	13	100+43
Prahova	Prahova	PH	270	152	30.06	21-22	250+20
Azuga	Azuga	PH	130	36.0	30.06	13	100+30
Vl. Cerbului	Buşteni	PH	80	26.7	30.06	13	70+10
Buzău	Sita Buzăului	CV	263	89.1	27.06	16	225+38
Buzău	Sita Buzăului	CV	258	86.2	29.06	19	225+33
Buzău	Vama Buzăului	BV	245	63.6	30.06	16	210+35
Slănic	Cernăteşti	BZ	208	52.4	30.06	19	200+8
Răcătău	Recea	BC	280	11.3	16.06	12	250+30
Putna	Lepşa	VN	260	82.0	27/28.06	24-01	250+10
Putna	Mirceşti	VN	478	600	27.06	21	450+28
Suceava	Brodina	SV	250	155	29.06	18	250+0
Suceava	Brodina	SV	294	360	30.06	23	250+44
Suceava	Tibeni	SV	332	470	30.06	18	300+32

Brodina	Brodina	SV	152	43.0	30.06	08	150+2
Moldova	Prisaca Dornei	SV	258	142	29.06	16	250+8
Moldova	Gura Humorului	SV	230	633	30.06	11	200+30
Moldova	Roman	NT	350	1060	30.06	24	300+50
Suha	Stulpicani	SV	134	84.4	30.06	10	120+14
Topoliţa	Păstrăveni	NT	182	84.8	30.06	18	150+32
Agapia	Filioara	NT	230	45.0	30.06	13	200+0
Tomnatic	Drăgoioasa	SV	65	9.00	29.06	19	50+15
Tomnatic	Drăgoioasa	SV	55	6.24	30.06	10	50+5
Bolătău	Poiana Largului	NT	200	22.5	30.06	9-16	200+0
Bistricioara	Tulgheș	HR	154	64.0	30.06	14	150+4
Bistricioara	Bistricioara	NT	100	74.0	30.06	12-16	100+0
Putna	Tulgheș	HR	150	27.8	30.06	11-12	150+0
Tarcău	Cazaci	NT	200	132	30.06	11-15	200+0
Dămuc	Dămuc	NT	160	32.0	30.06	11	120+40
Bicaz	Bicaz Chei	NT	170	36.4	30.06	11	150+20
Cracău	Magazia	NT	132	55.6	29.06	16	130+2
Cracău	Magazia	NT	178	87.6	30.06	11	130+48
Răcătău	Recea	BC	280	113	16.06	12	150+30
Trotuș	Lunca de Sus	HR	90	8.10	14.06	13	80+10
Trotuș	Ghimeș Făget	BC	160	61.0	30.06	11-14	150+10
Trotuș	Goioasa	BC	204	174	30.06	11	200+4
Ciobănus	Ciobănuș	BC	158	20.1	30.06	11-12	130+28
Uz	Cremenea	BC	172	131	30.06	16	150+22
Dofteana	Dofteana	BC	290	140	28.06	12	250+40
Dofteana	Dofteana	BC	251	93.9	30.06	10	250+1
Oituz	Ferăstrău	BC	232	212	30.06	07	180+52
Tazlău	Scorţeni	BC	220	210	30.06	11	200+20
Trebeș	Podiș	BC	288	16.5	30.06	10	250+38
Valea Rece	Valea Rece	HR	165	36.5	30.06	08	150+15
Bârlad	Negrești	VS	604	29.4	17.06	11	500+104
Sacovăţ	Tibana	IS	380	38.2	17.06	14	300+80
Stavnic	Frenciugi	IS	400	3.60	17.06	12	400+0
Tutuva	Rădeni	VS	280	10.0	17.06	08	250+30
Tutova	Rădeni	VB	265	7.69	28.06	24	250+15
Tutova	Rădeni	VS	288	11.7	30.06	18	250+38
Tutova	Puiești	VS	285	16.6	17.06	11	250+35
Tecucel	Tecuci	GL	400	14.8	16.06	12	360+40
Tecucel	Tecuci	GL	432	25.6	27.06	24	360+72
Tecucel	Tecuci	GL	442	29.4	28.06	21	360+82
Prut	Rădăuţi	BT	324	511	30.06	24	290+34
Ciric	Iași	IS	215	3.00	30.06	21-24	170+45
Horincea	Gănești	GL	240	13.0	30.06	06	200+40
Jijia	Dorohoi	BT	419	18.5	29.06	10	360+59
Jijia	Dorohoi	BT	438	23.0	30.06	22	360+78
Jijia	Todireni	BT	333	55.6	30.06	23	210+123
Buhai	Padureni	BT	280	9.80	30.06	16	250+30
Miletin	Șipote	IS	240	30.0	17.06	13	150+90
Bahlui	Hârlău	IS	266	16.4	30.06	24	210+56
Topolog	Saraiu	CT	340	7.85	07.06	16	300+40
Topolog	Saraiu	CT	301	5.11	27.06	18	300+1
Topolog	Saraiu	CT	320	6.35	28.06	06	300+20
Topolog	Saraiu	CT	326	6.67	29.06	06	300+26
Casimcea	Cheia	CT	190	6.50	17.06	19	150+40
Casimcea	Cheia	CT	200	7.41	27.06	16	150+50

Table II.15 Exceeding flood and danger quote levels in July 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Agrij	Românași	SJ	195	114	24.07	23	150+45	
Secaş	Cunta	AB	503	72.9	09.07	12-14		500+3
Bega	Balinţ	TM	615	120	20.07	19	550+65	
Desnățui	Călugărei	DJ	251	16.3	09.07	19	250+1	
Olt	Podu Olt	BV	547	364	02.07	06-08	450+97	
Olt	Feldioara	BV	435	446	02.07	14	420+15	
Olt	Hoghiz	BV	465	467	03.07	8-10	350+115	
R. Negru	Reci	CV	473	161	01.07	10-13		400+73
Cormoş	Brăduț	CV	227	37.8	01.07	21	210+17	
Cibin	Cristian	SB	356	165	09.07	11	350+6	
Cibin	Cristian	SB	352	159	09.07	22-23	350+2	
Cibin	Sibiu	SB	363	66.7	09.07	16	350+13	
Cibin	Sibiu	SB	373	71.4	10.07	02	350+23	
Cibin	Sibiu	SB	380	75.0	11.07	03	350+30	
Sălişte	Sălişte	SB	155	33.2	07.07	18	150+5	
Sălişte	Sălişte	SB	175	47.0	09.07	04	150+25	
Lotru	Vl. lui Stan	VL	195	65.0	10.07	12	195+0	
Bistrița	Băbeni	VL	272	243	10.07	12-13	255+17	
Olteț	Nistorești	GJ	234	198	10.07	09		200+34
Olteț	Oteteliş	VL	224	329	10.07	20	200+24	
Cerna	Măciuca	VL	400	362	10.07	20	350+50	
Vedea	Buzești	OT	475	108	11.07	04	450+25	
Cotmeana	Ciobani	AG	274	183	10.07	24	250+24	
Teleorman	Tătărăști	TR	219	60.6	11.07	14	200+19	
Colentina	Colacu	DB	295	25.8	10.07	23		250+45
Siret	Lespezi	SV	451	1185	01.07	09-10	451+1	
Siret	Drăgești	BC	445	1797	01.07	18-20	400+45	
Siret	Cosmești	GL	394		01.07	09	350+44	
Jijia	Andrieșeni	IS	407	96.4	01.07	20	400+7	
Miletin	Șipote	IS	277	45.5	01.07	07-14	250+27	
Miletin	Hălceni	IS	301	31.6	03.07	05-06	290+11	
Prut	Oroftiana	BT	604		01.07	21	470+134	
Prut	Rădăuţi Prut	BT	414	788	02.07	12-14	410+4	
Simila	Băcani	VS	522	19.9	07.07	20	500+22	
Topolog	Saraiu	CT	490	36.4	05.07	13	400+90	
Agrij	Românași	SJ	195	114	24.07	22	150+45	
Sighişoara	Brazii	AR	220	30.5	08.07	15	200+20	
Sighişoara	Brazii	AR	300	307	26.07	18		250+50
Feernic	Simonești	HR	160	67.9	24.07	22		150+10
Bega	Balinţ	TM	615	120	20.07	19	550+65	
Noul	Noul Român	SB	570	151	29.07	16	500+70	
Ozunca	Bățanii Mari	CV	340	46.3	29.07	14		300+40
Cormoş	Brăduț	CV	210	31.0	29.07	17	210+0	
Ialomicioara	Runcu	DB	510	61.0	27.07	21	500+10	
Slănic	Vârbilău	PH	280	98.6	22.07	16	200+80	
Moldova	Prisaca Dornei	SV	304	197	24.07	13	300+4	
Moldovița	Dragoșa	SV	330	304	24.07	12	330+0	
Bolătău	Poiana Largului	NT	290	74.5	29.07	09	250+40	
Buhai	Pădureni	BT	308	14.1	31.07	17	300+8	
Prut	Oroftiana	BT	495		26.07	02	470+25	
Topolog	Saraiu	CT	450		23.07	16	400+50	

Table II.16 Exceeding attention quote levels in July 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Fâneţelor	Sărsig	BH	304	14.2	28.07	18	275+29
Târnava Mare	Sighişoara	MS	310	128	01.07	06	300+10
Secaş	Colibi	AB	320	6.00	01.07	09	300+20
Secaş	Colibi	AB	330	6.60	09.07	14	300+30
Goleţ	Goleţ	CS	282	6.10	07.07	10	270+12
Jiu	Filiaşi	DJ	320	695	11.07	03	300+20
Jiu	Răcari	DJ	422	738	11.07	03	330+92
Jiu	Podari	DJ	308	644	11.07	12	300+8
Gilort	Turburea	GJ	508	370	10.07	21	450+58
Desnăţui	Călugărei	DJ	168	6.30	08.07	03	150+18
Terpeziţa	Gabru	DJ	236	9.26	10.07	15	220+16
Desnăţui	Dragoia	DJ	410	17.3	11.07	03	400+10
Olt	Sâncrăieni	HR	212	74.5	01.07	03	200+12
Cozd	Dacia	BV	207	15.4	01.07	03	200+7
Homorodu Mare	Sânpaul	HR	266	20.4	08.07	17	250+16
Cibin	Tălmaciu	SB	160	167	10.07	15	150+10
Râul Mic	Pisc	SB	60	6.76	08.07	18	50+10
Latoriţa	Gura Latoriţei	VL	215	33.0	10.07	15-18	205+10
Olănești	Olănești Băi	VL	242	40.3	10.07	12	230+12
Bistriţa	Genuneni	VL	171	66.5	10.07	09	150+21
Otăsău	Păușești	VL	140	23.5	10.07	11	140+0
Bistricioara	Tomșani	VL	105	52.2	10.07	10	100+5
Topolog	Milcoiu	VL	192	58.7	10.07	15	185+7
Luncavăţ	Oteșani	VL	160	99.8	10.07	10	140+20
Luncavăţ	Șirineasa	VL	270	182	10.07	10	250+20
Urşanilor	Horezu	VL	276	60.8	10.07	10	250+26
Pesceana	Șutești	VL	315	71.7	10.07	15	250+65
Mamu	Strejești	OT	338	65.6	10.07	15	300+38
Beica	Pleșoiu	OT	375	60.4	10.07	24	300+75
Olteţ	Nistorești	GJ	130	26.9	09.07	13	130+0
Teslui	Teslui	OT	260	15.0	10.07	24	250+10
Vl. Câinelui	Vârtoapele	TR	227	3.80	11.07	09-12	200+27
Colentina	Colacu	DB	178	8.80	09.07	01	150+28
Siret	N. Bălcescu	NT	538	779	01.07	06	500+38
Moldova	Roman	NT	350	1060	01.07	03	300+50
Jijia	Todireni	BT	339	57.3	01.07	02-04	210+129
Bahlui	Hârlău	IS	269	15.6	01.07	24	210+59
Lohan	Curteni	VS	220	3.95	07.07	24	200+20
Crasna	Vinețești	VS	345	0.862	08.07	09	340+5
Casimcea	Cheia	CT	300	25.0	05.07	22	150+150
Topolog	Saraiu	CT	370	10.6	08.07	18	300+70
Topolog	Saraiu	CT	325	6.70	11.07	15	300+25
Fâneţelor	Sărsig	BH	304	14.2	28.07	18	275+29
Orăștie	Grădiștea de Munte	HD	72	13.0	23.07	19	65+7
Orăștie	Grădiștea de Munte	HD	80	47.0	26.07	18	65+15
Orăștie	Grădiștea de Munte	HD	70	12.0	27.07	15	65+5
Orăștie	Grădiștea de Munte	HD	68	11.1	28.07	18	65+3
Orăștie	Grădiștea de Munte	HD	68	11.1	29.07	17	65+3
Orăștie	Grădiștea de Munte	HD	74	14.0	31.07	18	65+9
Luncoiu	Brad	HD	245	32.6	23.07	18	200+45
Moneasa	Moneasa	AR	84	11.5	23.07	13	80+4

Secaş	Colibi	AB	390	14.2	24.07	11	300+90
Secaş	Colibi	AB	360	9.80	25.07	11	300+60
Secaş	Colibi	AB	420	20.2	26.07	05-06	300+120
Secaş	Colibi	AB	350	8.60	30.07	06	300+50
Bega	Chizătău	TM	232	81.3	21.07	04-06	200+32
Olt	Hoghiz	BV	327	310	30.07	06	300+27
R. Negru	Lemnia	CV	370	13.5	29.07	18	300+70
Vârghiş	Vârghiş	CV	54	31.4	24.07	18	50+4
Noul	Noul Român	SB	402	66.9	25.07	06	400+2
Homorodu Mic	Lueta	HR	118	8.08	27.07	21	100+18
Baraolt	Baraolt	CV	376	69.6	29.07	16	300+76
Ozunca	Băţanii Mari	CV	216	19.0	30.07	18	200+16
Cozd	Dacia	BV	249	25.0	30.07	03	200+49
Teslui	Teslui	OT	250	13.0	27.07	20	250+0
Bughea	Bughea de Jos	AG	170	15.3	20.07	18	150+20
Glavacioc	Crovu	GR	204	7.20	18.07	09-12	200+4
Teleajen	Moara Domnească	PH	362	101	22.07	23	350+12
Siret	Drăgeşti	BC	328	990	26.07	18	300+28
Siret	Drăgeşti	BC	310	900	30.07	20	300+10
Suceava	Brodina	SV	274	207	24.07	13	250+24
Suceava	Brodina	SV	260	176	25.07	06	250+10
Moldova	Fundu Moldovei	SV	150	72.2	24.07	13	150+0
Moldova	Fundu Moldovei	SV	152	73.8	25.07	06	150+2
Moldova	Prisaca Dornei	SV	260	144	25.07	06	250+10
Pluton	Pluton	NT	160	34.4	29.07	09	150+10
Agapia	Filioara	NT	200	25.0	19.07	11	200+0
Agapia	Filioara	NT	200	25.0	24.07	15	200+0
Topoliţa	Păstrăveni	NT	155	53.0	24.07	22	150+5
Bârnat	Bacău	BC	272	86.0	19.07	24	250+22
Cracău	Magazia	NT	132	55.4	24.07	14	130+2
Bolătău	Poiana Largului	NT	200	22.5	25.07	11	200+0
Trebeş	Podiş	BC	260	11.9	19.07	17	250+10
Trebeş	Mărgineni	BC	418	59.0	19.07	24	400+18
Miletin	Şipote	IS	188	15.9	27.07	18	150+38
Buhai	Pădureni	BT	250	5.58	29.07	06	250+0
Jijia	Dorohoi	BT	360	8.07	31.07	23	360+0
Tecucel	Tecuci	GL	415	19.5	30.07	24	360+55
Prut	Rădăuţi Prut	BT	370	633	26.07	10	290+80
Topolog	Saraiu	CT	390	12.9	24.07	18	300+90
Topolog	Saraiu	CT	363	9.90	30.07	22	300+63
Casimcea	Cheia	CT	155	3.99	22.07	20	150+5
Casimcea	Cheia	CT	165	4.65	23.07	10	150+15
Teliţa	Poşta Frecăţei	TL	111	1.46	25.07	14	100+11

Table II.17 Exceeding flood and danger quote levels in August 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Jitin	Jitin	CS	350	25.5	03.08	15	300+50	
Bolătău	Poiana Largului	NT	300	83.0	01.08	15		300+0
Prut	Oroftiana	BT	474		02.08	17-18	470+4	
Prut	Stânca aval	BT	393	703	04.08	12		375+18

Table II.18 Exceeding attention quote levels in August 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Chisindia	Chisindia	AR	150	20.5	01.08	17	150+0
Orăştie	Grădiştea de Munte	HD	86	20.2	01.08	20	65+21
Orăştie	Grădiştea de Munte	HD	74	14.0	15.08	18	65+9
Sibişel	Sibişel	HD	120	29.4	01.08	14	80+40
Bughea	Bughea de Jos	AG	150	9.00	23.08	16	150+0
Glavacioc	Crovu	GR	200	6.00	01.08	13-16	200+0
Ialomicioara	Fieni	DB	320	89.5	07.08	14	300+20
Pluton	Pluton	NT	177	42.0	01.08	14	150+27
Izvoru Giumalău	Pojorâta	SV	85	10.8	15.08	18	70+15
Topoliţa	Păstrăveni	NT	155	53.0	01.08	09	150+5
Bârlad	Negreşti	VS	548	17.4	01.08	21	500+48
Prut	Rădăuţi Prut	BT	361	605	02.08	24	290+71
Prut	Oancea	GL	448	187	12.08	12-24	440+8
Casimcea	Cheia	CT	320	34.0	07.08	15	150+170

Table II.19 Exceeding attention quote levels in October 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Fântâna Galbenă	Stâna de Vale	BH	62	1.35	24.10	12	50+12
Valea Galbenă	Pietroasa	BH	148	30.7	24.10	12-15	125+23
Crişul Pietros	Pietroasa	BH	215	51.0	24.10	12-15	200+15
Arieş	Scărişoara	AB	137	65.2	24.10	15	120+17
Goleţ	Goleţ	CS	270	3.20	24.10	14	270+0

Table II.20 Exceeding flood and danger quote levels in December 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF FLOOD QUOTES	Exceed OF DANGER QUOTES
Crişul Alb	Crişcior	HD	265	83.5	24.12	22	250+15	
Sebiş	Sebiş	AR	337	68.7	24.12	20	325+12	
Ampoi	Zlatna	AB	300	38.0	24.12	18	300+0	
Bistra	Voislova Gară	CS	212	43.2	24.12	18	200+12	
Bistra	Obreja	CS	160	127	24.12	20	150+10	

Table II.21 Exceeding attention quote levels in December 2018

River	Hydrometric station	County	Maximum level (cm)	Maximum flow (mc/s)	Day	Hour	Exceed OF ATTENTION QUOTES
Valea Rea	Huţa Certeze	MM	170	10.4	22.12	21	170+0
Crişul Alb	Vaţa de Jos	HD	417	90.2	25.12	09	350+67
Crişul Alb	Gurahonţ	AR	170	120	24.12	21	150+20
Valea Satului	Buceş	HD	185	17.4	24.12	15	160+25
Iosa	Iosăşel	AR	160	16.8	24.12	16-18	150+10
Moneasa	Moneasa	AR	108	18.4	24.12	13	80+28
Moneasa	Rănuşa	AR	235	24.9	24.12	15	200+35
Crişul Negru	Suştiu	BH	185	24.7	24.12	18	170+15
Crişul Negru	Beiuş	BH	262	122	24.12	18-21	225+37
Crişul Negru	Tinca	BH	392	173	25.12	12	300+92
Briheni	Suştiu	BH	207	18.5	24.12	15	175+32
Valea Roşie	Pocola	BH	295	50.0	24.12	18	250+45
Groşeni	Archiş	AR	160	15.5	24.12	14	150+10

Goleț	Goleț	CS	296	7.50	24.12	17	270+26
Bistra	Voislova Bucova	CS	150	41.2	24.12	18	100+50
Sebeș	Turnu Ruieni	CS	255	24.3	24.12	18	250+5
Sașa	Poieni	TM	67	10.8	24.12	16	50+17

II. THE DANUBE RIVER

In 2018, the monthly average flows recorded on the Danube upon entering the country (Baziaş section) were above the monthly multiannual averages between January - April 2018 and below the monthly norms, with values between 53-84% of the monthly multiannual averages in May - December 2018. The lowest value of the monthly average flow was recorded in October (53% of the monthly multiannual average). Figures II.24 and II.25 show the evolution of average, maximum and minimum monthly flows on the Danube, upon entering the country.

The maximum value of the Danube flow when entering the country was 11200 m3 / s in the range March 23-24, 2018, and the minimum value was 1850 m3 / s in the range October 21-30, 2018.

Analyzing the evolution of the minimum rates in this range, there is a decreasing trend between January - March and May - October 2018 and increasing in April and in November - December 2018. Regarding the maximum rates, they showed an increasing evolution in March and between November - December 2018 and a decreasing one between January - February 2018 and April - October 2018.

Figure II.24 The evolution of monthly average flows on the Danube, at the entrance to the country, in 2018

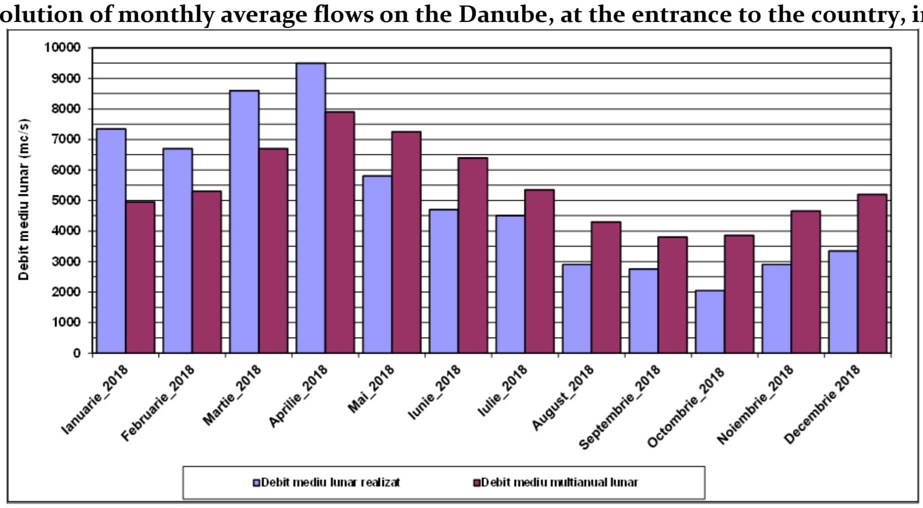
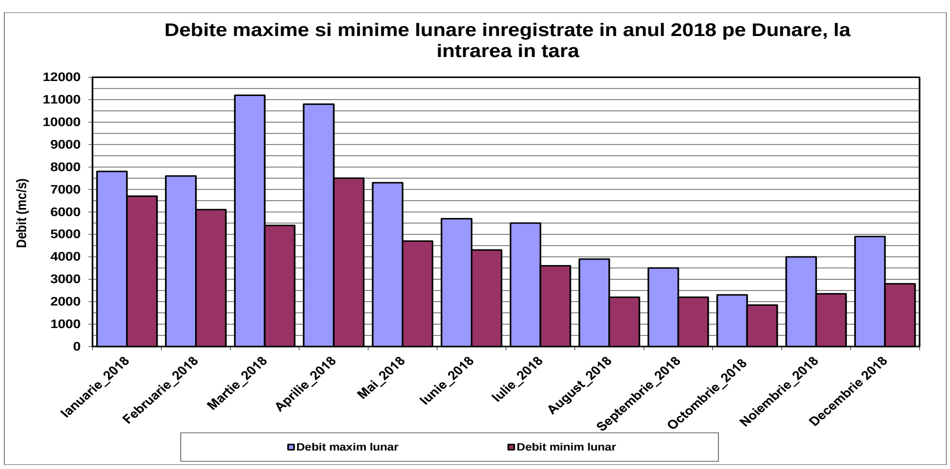


Figure II.25 Evolution of the maximum and minimum monthly flows recorded on the Danube, at the entrance to the country, in 2018



Characterization of the hydrological regime of the Danube in the winter season 2018

In the winter season the average flows at the entrance to the country (Baziaş section) were above the monthly multiannual averages, with values between 129-148% of the monthly norms.

In January 2018, the flows at the entrance to the country (Baziaş section) decreased from the value of 7200 m^3 / s registered on the first day of the month to 6900 m^3 / s on January 5^{th}, increasing to 7800 m^3 / s between January 12^{th} and 15^{th} (maximum monthly value), decreasing to the value of 7100 m^3 / s on January 23^{rd}, slightly increasing to 7300 m^3 / s on January 20^{th} and 21^{st}, and then decreasing to the minimum monthly of 6700 m^3 / s on the last day of the month.

In February 2018, the flows at the entrance to the country (Baziaş section) decreased from the value of 6500 m^3 / s recorded on the first day of the month to 6200 m^3 / s during the days of February 4^{th} and 5^{th}, increasing to 7600 m^3 / s on February 11^{th}-13^{th} (maximum monthly value), decreasing to the minimum monthly value of 6100 m^3 / s recorded on February 21^{st} and 22^{nd}, slightly increasing to 6400 m^3 / s on February 25^{th}-27^{th} and again decreasing to 6200 m^3 / s on the last day of the month.

Characterization of the hydrological regime of the Danube in the spring of 2018

In the spring season 2018 the average flows recorded on the Danube at the entrance to the country (Baziaş section) had values over the monthly multiannual

In March 2018, the flows at the entrance to the country (Baziaş section) decreased from the value of 6000 m^3 / s recorded on the first day of the month to 5400 m^3 / s on March 5^{th} (the minimum monthly value), increasing until at the maximum monthly value of 11200 m^3 / s recorded on March 23^{rd} and 24^{th}, then decreasing to 10200 m^3 / s on the last day of the month.

From March 16 until the end of the month, the DEFENCE QUOTES were exceeded, gradually, at all hydrometric stations located on the Romanian sector of the Danube, down Gruia, with levels generally above Phase I of DEFENSE and temporarily above Phase II of DEFENSE at hydrometric stations: Calafat (21^{st}-26^{th} of March), Bechet (20^{th}-31^{st} of March), Corabia (21^{st}-31^{st} of March), Tr. Măgurele (22^{nd}-31^{st} of March), Zimnicea (23^{rd}-31^{st} of March), Giurgiu (26^{th}- 31^{st} of March), Oltenita (26^{th}-31^{st} of March), Cernavodă (27^{th}-31^{st} of March), Hârşova (24^{th}-27^{th} of March), Brăila (28^{th}-31^{st} of March) and Galaţi (30^{th}-31^{st} ofMarch) and above PHASE III of DEFENSE in Hârşova (28^{th}-31^{st} of March).

In April 2018, the flows at the entrance to the country (Baziaş section) increased from the value of 10100 m^3 / s registered on the first day of the month to 10800 m^3 / s on the days of April 6^{th} and 7^{th} (the maximum monthly value), then decreasing to 7500 m^3 / s on the last day of the month (minimum monthly value).

averages in March and April (120-128%) and below the monthly average in May (80%) - table II .22.

Due to the high flows recorded at the entrance to the country (Baziaş section), with values that exceeded 10,000 m^3 / s from March 21^{st} until April 14^{th}, the DEFENSE PHASES were maintained above the quotes at all hydrometric stations located on the Romanian sector of the Danube, downstream Gruia, throughout the month of April.

In the first half of April the levels were above the DEFENSE PHASE I on the Gruia-Calafat, Giurgiu-Calarasi, Isaccea-Tulcea and Vadu Oii sectors, above the DEFENSE PHASE II on the Bechet-Zimnicea, Brăila-Galaţi and the Cernavoda and above DEFENSE PHASE III in Hârşova.

In the second half of the month the levels were generally above the DEFENSE PHASE I (between April 15^{th} and 25^{th} in the Bechet-Tulcea sector, and in the last days in the Isaccea-Tulcea sector.).

In May 2018, the flows at the entrance to the country (Baziaş section) decreased from the value of 7300 m^3 / s recorded on the first day of the month (maximum monthly value) to 6100 m^3 / s on May 6^{th}, relatively stable until on May 13^{th}, then slightly decreasing to the value of 4700 m^3 / s recorded on the last day of the month (minimum monthly value).

Table II.22 Characteristic values for March, April and May

Characteristic values	Month		
	March	April	May
Daily maximums (1931-2017)	**14800 m^3/s (1981)**	**15800 m^3/s (2006)**	**13200 m^3/s (2006;2014)**
Maximum monthly averages	**10400 m^3/s (1981)**	**14100 m^3/s (2006)**	**10500 m^3/s (2006)**
Daily maximums 2018	**11200 m^3/s**	**10800 m^3/s**	**7300 m^3/s**

Multiannual monthly averages	**6700 m³/s**	**7900 m³/s**	**7250 m³/s**
Monthly averages 2017	**8600 m³/s**	**9500 m³/s**	**5800 m³/s**

Characterization of the hydrological regime of the Danube in the summer of 2018

In the summer season 2018 the average monthly flows of the Danube at the entrance to the country (Baziaş section) were below the monthly norms, with values between 67-84% (table II.23).

Table II.23 Characteristic values for June, July and August

Characteristic values	Month		
	June	July	August
Daily minimums (1931-2017)	**2630 m³/s (1993)**	**2130 m³/s (2003)**	**1520 m³/s (2003)**
Minimum monthly averages	**3120 m³/s (1993)**	**2340 m³/s (2003)**	**1950 m³/s (2003)**
Multiannual monthly averages	**6400 m³/s**	**5350 m³/s**	**4300 m³/s**
Daily minimums 2018	**4300 m³/s**	**3600 m³/s**	**2200 m³/s**
Monthly averages 2018	**4700 m³/s**	**4500 m³/s**	**2900 m³/s**

In June 2018, the flows at the entrance to the country (Baziaş section) decreased slightly from the value of 4700 m³ / s recorded on the first day of the month to 4300 m³ / s on June 14th and 15th (the minimum monthly value), rising to the maximum monthly value of 5700 m³ / s on June 21st and 22nd, then slightly decreasing to the value of 4400 m³ / s recorded on the last day of the month.

In July 2018, the flows at the entrance to the country (Baziaş section) increased from the value of 4500 m³ / s registered on the first day of the month to 5500 m³ / s on the days of July 5th and 6th (maximum monthly value), in decrease to the minimum value of 3600 m³ / s on July 25th and 26th, then a slightly increase to the value of 4000 m³ / s recorded on the last day of the month.

In August 2018, the flows at the entrance to the country (Baziaş section) decreased slightly, from the value of 3900 m³ / s recorded on the first day of the month (the maximum monthly value) to the value of 2200 m³ / s on 28th of August (the minimum monthly value), then slightly increasing to 2400 m³ / s on the last day of the month.

Characterization of the hydrological regime of the Danube in autumn 2018

The average monthly flows of the Danube at the entrance to the country (Baziaş section) registered in the autumn season of 2018 were below the monthly norms, with values between 53-72% of the monthly norms (table II.24).

Table II.24 Characteristic values for September, October and November

Characteristic values	Month		
	September	October	November
Daily minimums (1931-2017)	**1470 m³/s (2003)**	**1040 m³/s (1949)**	**1040 m³/s (1949)**
Minimum monthly averages	**1900 m³/s (1947;2003)**	**1440 m³/s (1947)**	**2080 m³/s (1947)**
Multiannual monthly averages	**3800 m³/s**	**3850 m³/s**	**4650 m³/s**
Daily minimums 2018	**2200 m³/s**	**1850 m³/s**	**2350 m³/s**
Monthly averages 2018	**2750 m³/s**	**2050 m³/s**	**2900 m³/s**

In September 2018, the flows at the entrance to the country (Baziaş section) increased, from the value of 2500 m³ / s recorded on the first day of the month to the value of 3500 m³ / s during the period September 9th-11th (the maximum monthly value), then slightly decreasing to the value of 2200 m³ / s on the last day of the month.

In October 2018, the flows at the entrance to the country (Baziaş section) decreased slightly from the value of 2300 m³ / s recorded on the first day of the month (maximum monthly value), to the value of 1850 m^3 / s in the 21st- 30th of October (the minimum monthly value), then slightly increasing to the value of 2050 m3 / s on the last day of the month.

In November 2018, the flows at the entrance to the country (Baziaş section) increased from the value of 2400 m^3 / s registered on the first day of the month to the value of 4000 m^3 / s on November 7th (the maximum monthly value), decreasing to 2350 m^3 / s in November 22nd-23rd (minimum monthly value), then slightly increasing to 2600 m^3 / s on the last day of the month.

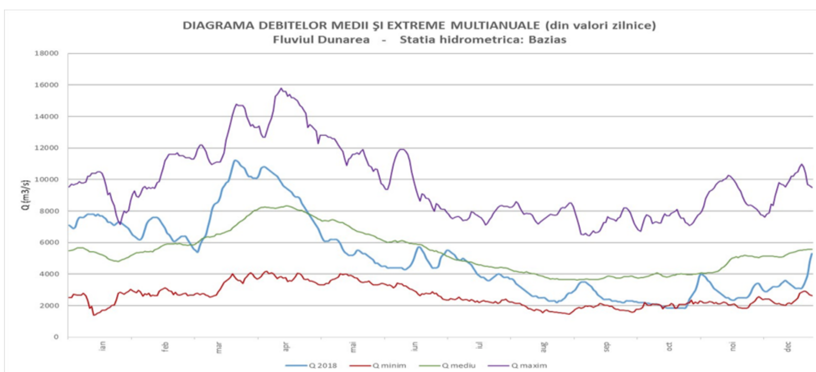
Characterization of the hydrological regime of the Danube in December 2018

In December 2018, the flows at the entrance to the country (Baziaş section) increased from the value of 2800 m3 / s (the minimum monthly value) registered on the first day of the month to the value of 3400 m3 / s on days 4th and 5th of December, decreasing to the value of 2900 m3 / s on December 8th, increasing to the value of 3600 m3 / s (on December 18th, slightly decreasing to 3100 m3 / s between December 23rd-26th, and then increasing to the maximum value of December 2018 of 4900 m3 / s on the last day of the month.

For the overall analysis of the evolution of the hydrological regime from 2018 in figure II.26 is presented the variation of daily flows in the Baziaş section compared to the evolutions of the average and extreme (minimum and maximum) daily flows, determined on the basis of the rates recorded during the entire observation period.

As it can be seen, the average daily rates recorded during the year 2018 were below the multiannual daily averages between February 2nd-February 7th, April 29th-July 3rd and July 16th-December 31st. Regarding the maximum daily flows recorded during this period, they were below the historical maximum values. The daily minimum rates were above the historical minimum values, except for October 20th-31st, when the values of the minimum rates were below the historical minimum daily values.

Figure II.26 Average daily and extreme flows on the Danube upon entering the country (2018 values compared to historical values)



The hydrological regime on the Danube at the entrance to the country (Baziaş section), the year 2018, is within the hydrological regime close to normal. It should be emphasized that at the level of the 12 months, this normal hydrological regime resulted from the surplus regime between January - April 2018, combined with the deficient one between May - December 2018 in the entire Danube basin.

The hydrological regime on the Danube at the entrance to the country (Baziaş section) in the autumn season falls under the deficient hydrological regime.Thus, from the comparison of the average flows registered in the autumn months 2018 with those of the data series registered in the same season from 1931-2017, the following are obtained:

- in September, out of the 86-year period analyzed, there were 18 more years with average values lower than the average flow value of 2750 m^3 / s recorded in September 2018;
- in October, however, the value of the average flow of 2050 m^3 / s in 2018 is the fourth value in the series, the lowest average value being that of 1440 m^3 / s in 1947. It should be mentioned that the value of the minimum flow of 1850 m^3 / s recorded this month is a low value, the eighth value in the series of observations, the historical minimum value being 1040 m^3 / s from October 1949;

- in November 2018, an average flow of 2900 m^3 / s was recorded, the value representing the tenth value in the data string, the lowest average value being 2080 m^3 / s since 1947.

II.1.1.4. Hydromorphological changes of watercourses

-

II.1.2. FORECASTS

II.1.2.1. Water availability, demand and shortage

II.1.2.2. Flood risks and pressures

RO 53	Indicator code Romania: RO 53 EEA indicator code: CLIM 17
TITLE: FLOODS **DEFINITION: The indicator highlights the tendency of major floods to occur at national level, as well as the expected changes in the variation of floods with a return period of 100 years.**	

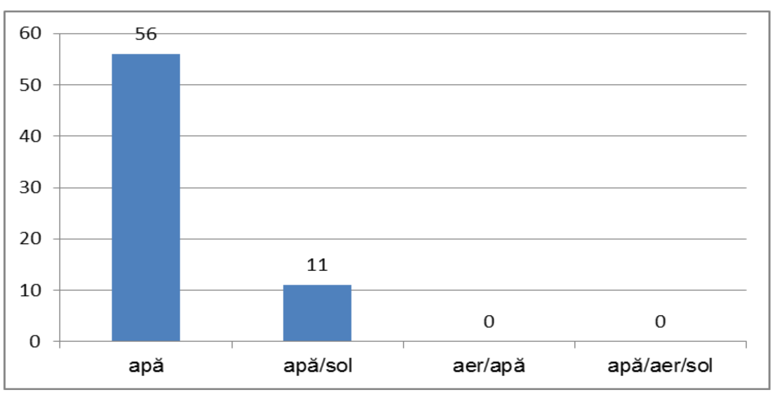
The data is not updated by ANAR for the year 2018.

Over 60% of the environmental events registered at national level in 2018 were caused by:

- the extraction activities/ exploitation of the hydrocarbon deposits and the transport of petroleum products, the causes being: the old age, the degradation, the cracking of the pipes and the discharges / the spills of domestic waste water / the technological and industrial waters not purified or insufficiently treated with or without fish mortality.

There was no major impact on environmental factors or human health for the environmental events recorded in 2018.

Figure II.27 Evolution of incidents / pollution at national level in 2018 having one of the environmental factors affected, the water



Source: NEPA

II.1.3. Use and efficient management of water resources

Source: Data transmitted by the National Administration "Romanian Waters" and the National Institute of Hydrology and Water Management (ANAR-INHGA)

II.2. WATER QUALITY

II.2.1. WATER QUALITY: STATE AND CONSEQUENCES

II.2.1.1. Water quality of the watercourses

Note - The quality assessments of water courses at the level of 2018 are not updated by ANAR.

RO 65	Indicator code Romania: RO EEA Indicator Code: VHS 02

TITLE: DANGEROUS SUBSTANCES IN WATER COURSES
DEFINITION: The indicator quantifies the concentrations (annual averages) of dangerous substances present in the watercourses. The dangerous substances required for reporting are those listed in H.G. no. 351/2005 regarding the approval of the Program for the gradual elimination of discharges, emissions and losses of priority dangerous substances, modified and completed by H.G. no. 1038/2010.

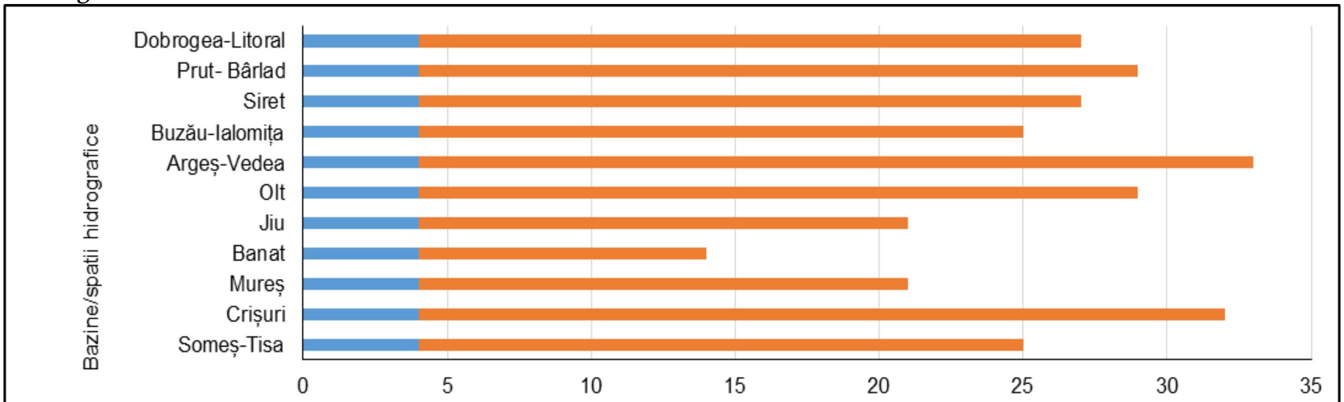
For this indicator, consideration was given to reporting the priority substances from H.G. no. 570/2016 which are the basis of the assessment of the chemical status of surface waters (water investigation environment). Also, by exceeding the SCM, we mean both the exceedances to the SCM-MA and to the SCM-MAC (according to H.G. no. 570/2016).
The distribution of the number of priority substances monitored in the watercourses on hydrographic spaces / basins in 2017 is presented in table II.25 and figure II.28.

Table II.25 Priority substances monitored in watercourses on hydrographic spaces / basins in 2017 (no.) - WATER investigation environment

Space / river basin	Monitored length (Km)	Monitored sections (no.)	Monitored priority substances	
			Priority metals (no.)	Organic micropollutants (no.)
Someș - Tisa	3525,87	61	4	21
Crișuri	1088,02	40	4	28
Mureș	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 "Romanian Waters "

Figure II.28 Priority substances monitored in watercourses on hydrographic spaces / basins in 2017 - WATER 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
Micropoluanți organici (nr.)	21	28	17	10	17	25	29	21	23	25	23

Source: Data transmitted by the National Administration "Romanian Waters "

Table II.26 shows the share of the monitoring sections with a concentration higher than the SCM (%) between 2011 and 2017.

Table nr. II.26 Share of monitoring sections with a concentration higher than SCM (%) between 2011 and 2017

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

Source: Data transmitted by the National Administration "Romanian Waters "

RO 67

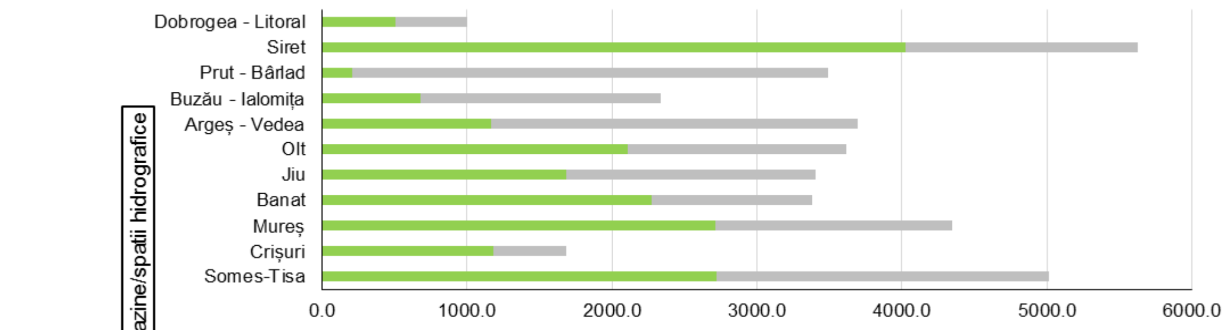
Indicator code Romania: RO 67
EEA indicator code: WEC 04

TITLE: WATER COURSE CLASSIFICATION SCHEMES
DEFINITION: Watercourse classification schemes are designed to provide an indication of the degree of pollution

ECOLOGICAL STATUS / ECOLOGICAL POTENTIAL OF MONITORED WATER COURSES (natural water bodies, strongly modified, artificial - rivers) ON SPACES / HYDROGRAPHIC BASINS AND AT NATIONAL LEVEL

The assessment of the ecological status / ecological potential of the monitored watercourses (natural water bodies, strongly modified, artificial - rivers) on spaces / hydrographic basins in 2017 (km) is presented in figure II.29.

Figure II.29 Ecological status / ecological potential of monitored watercourses (natural water bodies, strongly modified, artificial - rivers) on spaces / hydrographic basins in 2017 (km)



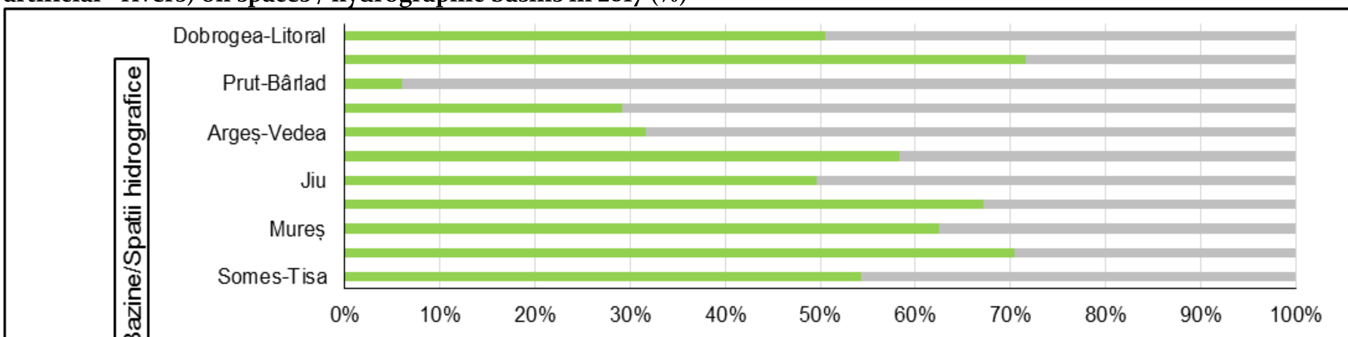
	Somes-Tisa	Crișuri	Mureș	Banat	Jiu	Olt	Argeș - Vedea	Buzău - Ialomița	Prut - Bârlad	Siret	Dobrogea - Litoral
SE bună / bun (km)	2724.8	1184.1	2714.8	2271.7	1687.3	2109.5	1168.8	682.8	208.3	4026.8	505.0
SE inferioară stării bune (km)	2290.7	497.8	1634.1	1109.4	1719.3	1506.0	2529.2	1654.6	3283.1	1603.1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

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

Source: Data transmitted by the National Administration "Romanian Waters "

The assessment of the ecological status / ecological potential of the monitored watercourses (natural water bodies, strongly modified, artificial - rivers) on spaces / hydrographic basins in 2017 (%) is presented in figure II.30.

Figure II.30 Ecological status / ecological potential of monitored watercourses (natural water bodies, strongly modified, artificial - rivers) on spaces / hydrographic basins in 2017 (%)

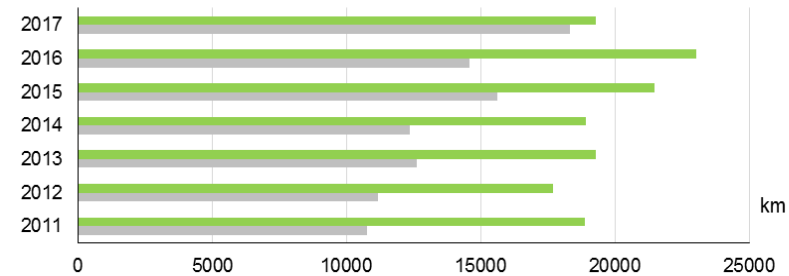


	Somes-Tisa	Crișuri	Mureș	Banat	Jiu	Olt	Argeș-Vedea	Buzău-Ialomița	Prut-Bârlad	Siret	Dobrogea-Litoral
SE bună / bun (%)	54.33	70.40	62.43	67.19	49.53	58.35	31.61	29.21	5.96	71.53	50.53
SE inferioară stării bune (%)	45.67	29.60	37.57	32.81	50.47	41.65	68.39	70.79	94.04	28.47	49.47

Source: Data transmitted by the National Administration "Romanian Waters "

The evolution of the ecological status / ecological potential of the monitored watercourses (natural water bodies, strongly modified, artificial - rivers) at national level in the period 2011 - 2017 (km) is presented in figure II.3.

Figure II.31 The evolution of the ecological status / ecological potential of the monitored watercourses (natural water bodies, strongly modified, artificial - rivers) at national level in the period 2011 - 2017 (km)

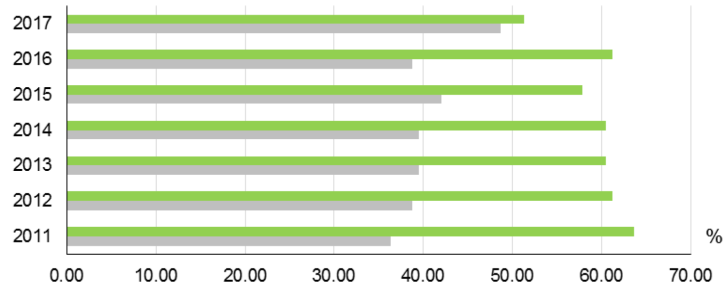


	2011	2012	2013	2014	2015	2016	2017
SE bună / bun (km)	18877.32	17696.49	19290.4	18910.44	21489.82	23035.7	19283.8
SE inferioară stării bune (km)	10758.22	11189.98	12602.4	12352.14	15621.2	14575.9	18321.6

Source: Data transmitted by the National Administration "Romanian Waters "

The evolution of the ecological state / the ecological potential of the watercourses (natural water bodies, strongly modified, artificial - rivers) monitored at national level between 2011 and 2017 (%) is presented in figure no. II.32.

Figure II.32 The evolution of the ecological state / the ecological potential of the watercourses (natural water bodies, strongly modified, artificial - rivers) monitored at national level between 2011 and 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 "Romanian Waters "

The evolution of the ecological status / ecological potential of the monitored watercourses (natural water bodies, strongly modified, artificial - rivers) at national level during 2011 - 2017 is presented in table II.27.

Table II.27 The evolution of the ecological status / ecological potential of the monitored watercourses (natural water bodies, strongly modified, artificial - 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 infertor to the good status (%)	36,3	38,73	38,57	39,5	42,13	38,72	48,72

Length of monitored river network (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 "Romanian Waters "

II.2.1.2. Water quality of lakes

Note - The quality assessments of lakes water at the level of 2018 are not updated by ANAR.

RO 66

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

TITLE: DANGEROUS SUBSTANCES IN LAKES
DEFINITION: The indicator quantifies the concentrations (annual averages) of dangerous substances present in lakes. The dangerous substances required for reporting are those listed in H.G. no. 351/2005 regarding the approval of the Program for the gradual elimination of discharges, emissions and losses of priority dangerous substances, modified and completed by H.G. no. 1038/2010.

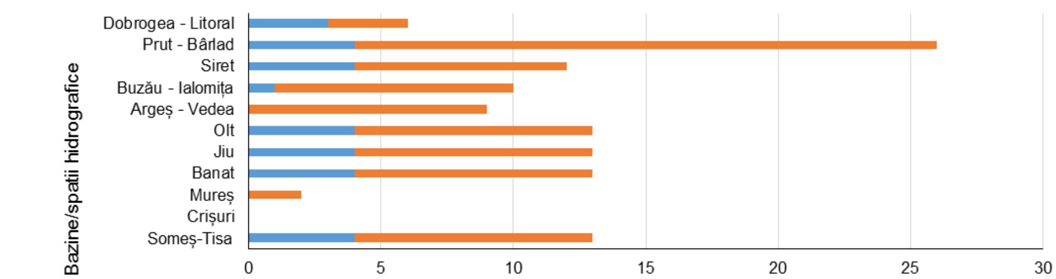
For this indicator, consideration was given to reporting the priority substances from H.G. no. 570/2016 which are the basis for the assessment of the chemical status of surface waters (water investigation environment). Also, by exceeding to the SCM is meant both the exceedances to the SCM-MA and to the SCM-MAC (according to H.G. no. 570/2016).
The distribution of the number of priority substances monitored in lakes (natural, strongly modified and artificial lakes) by areas / hydrographic basins in 2017 is presented in the table no. II.28 and figure no. II.33.

Table II.28 Distribution of priority substances monitored in lakes (natural, strongly modified and artificial lakes) by hydrographic areas / basins in 2017 - WATER investigation environment

Space / river basin	Water bodies (no.)	Priority substances monitored		Monitored sections (no.)
		Priority metals (no.)	Organic micropollutants (no.)	
Someș - Tisa	12	4	9	10
Crișuri	8	0	0	0
Mureș	8	0	2	2
Banat	9	4	9	4
Jiu	16	4	9	3
Olt	11	4	9	7
Argeș - Vedea	18	0	9	2
Buzău - Ialomița	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 "Romanian Waters "

Figure II.33 Distribution of priority substances monitored in lakes (natural, strongly modified and artificial lakes) by hydrographic areas / basins in 2017 - WATER 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 "Romanian Waters "

Table II.29 The share of the sections for monitoring the priority substances with concentrations higher than the SCM (%) for the year 2017 on hydrographic areas / basins - WATER investigation environment

Space / river basin	Monitored sections (no.)	Monitored sections with concentrations higher than SCM (no.)	Share of monitored 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 "Romanian Waters "

The evolution of the monitoring sections with higher concentration than the SCM is presented in table II.30.

Table II.30 Share of monitored sections with a concentration higher than SCM (%) between 2011 and 2017

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

Source: Data transmitted by the National Administration "Romanian Waters "

II.2.1.3. Groundwater quality

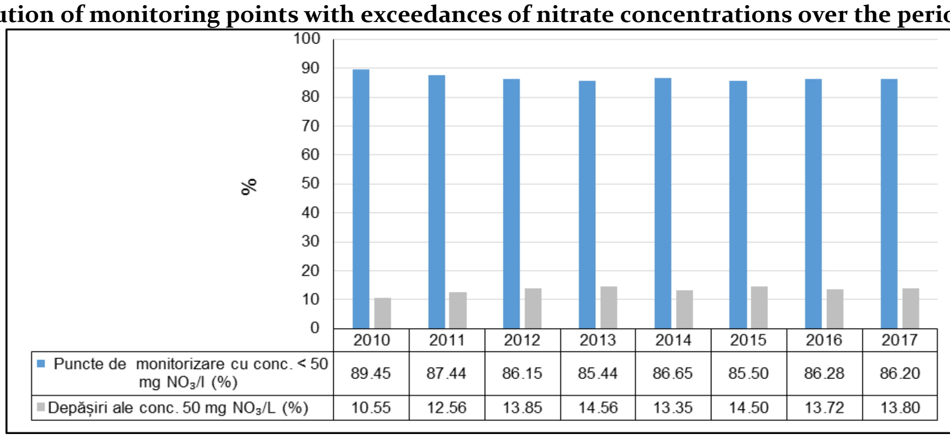
Note - Groundwater quality assessments for the year 2018 are not updated by ANAR.

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

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

EVOLUTION OF THE NUMBER OF MONITORING POINTS WITH EXCEEDANCES IN THE NITRATE CONTENT IN THE PERIOD 2011 – 2017 (%)

Figure II.34 Evolution of monitoring points with exceedances of nitrate concentrations over the period 2011 - 2017 (%)



Source: Data transmitted by the National Administration "Romanian Waters "

RO 64	Indicator code Romania: RO 64 EEA Indicator Code: VHS 01

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

Distribution of the number of monitoring points for pesticides on hydrographic areas / basins in 2017

Table II.31 Pesticides monitored in 2017 (number)

2017				
Space / river basin	**Monitored water bodies (number)**	**Monitoring points (total no.)**	**Points where pesticides are monitored (number)**	**Monitored pesticides (număr)**
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 "Romanian Waters "

The share of monitoring points with a higher concentration than 0.1 µg / L from the number of boreholes in which pesticides are monitored for 2017

Table II.32 The share of monitoring points with a higher concentration than 0.1 µg / L from the number of boreholes in which pesticides are monitored for 2017 (%)

Space / river basin	Points where 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 "Romanian Waters "

Evolution of monitoring points with higher concentration than 0.1 µg / L for the period 2011 - 2017 (%)

Table II.33 Evolution of monitoring points with higher concentration than 0.1 µg / L for the period 2011 - 2017 (%)

Year	2011	2012	2013	2014	2015	2016	2017
Number of monitored pesticides	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
Share of monitoring points with a higher concentration than 0.1µg / L from the no. of the points where the pesticides are monitored (%)	6,12	2,99	2,7	0	6,3	3,31	2,0

Source: Data transmitted by the National Administration "Romanian Waters "

Table II.34 Number of monitored points where pesticides are monitored and number of points with a higher concentration than 0.1µg / L in 2017

Pesticides	No. of points where pesticides are monitored	No. of monitoring points with higher conc. 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 "Romanian Waters "

II.2.1.4. The bathing waters quality

RO 22

Indicator code Romania: RO 22
EEA indicator code: CIS 22

TITLE: BATHING WATER QUALITY
DEFINITION: The indicator expresses in percentage terms the coastal and inland bathing areas that comply with the mandatory standards and recommended levels for microbiological and physico-chemical parameters.

In the bathing season 2018 (June 1st - September 15th), 50 natural bathing areas were inventoried on the territory of Romania, for which the territorial PH (DSP) have established 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 and in one area it is on a lake with fresh water.

Romania, as a member country of the European Union, has monitored and reported to the EC, in a standardized and unitary form, the bathing water quality of the 2018 season. Thus, the purpose of protecting the health of the population in relation to the bathing waters of the landscaped areas of Romania was fulfilled.
All the natural areas arranged for bathing reported by Romania to the EC in 2018, for which the bathing water analyzes were carried out, were in accordance with the sampling frequency and determined values, with the mandatory values from the legislation in force in Romania.
The evaluation of the water quality from the total of 50 natural areas for bathing identified and reported by Romania to the EC (EIONET platform - EU platform created by EEA) in 2018 was carried out for the continuously monitored areas during the last 4 years and the classification evaluation was applied, using the database of the current season (2018) and of the 3 previous seasons; this evaluation was carried out according to Directive 2006/7 / EC, respectively to the provisions of H.G. no. 546/2008, art. 18-24, and the provisions of annex no. 2.

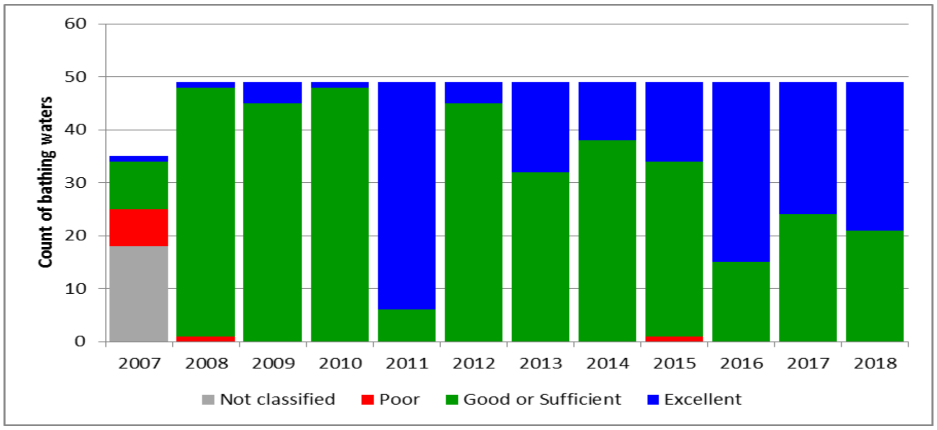
- excellent 56,00% (28),
- good 40,00% (20),
- satisfactory 4,00% (2) și
- unsatisfactory 0,00% (0).

As a result of the classification of bathing waters, the possibility of grouping bathing areas was not created because they fluctuate in quality from year to year.
During the bathing season 2018 there was a pollution of petroleum products in the Mangalia area but due to the rapid interventions the quality of the water from the bathing area was not affected. No other short-term pollution was reported and no abnormal situation was reported.

Within PH (DSP) Constanța and Tulcea there was no need to take special management measures in their bathing areas because there were no changes in the quality of bathing water during the monitoring and no risk of adverse health consequences was identified for the users. Apart from the bathing areas reported to the EC, for the bathing season 2018, 10 territorial PH (DSPs) reported the presence of 24 natural bathing areas, arranged and not arranged.
Even if the quality of the water for arranged areas fell within the guide values and / or the mandatory values, none were monitored at a frequency according to the law in order to prove the stability of the water quality and to register it for EC reporting.
With regard to the 17 not arranged bathing areas, few samples were collected for monitoring the microbiological indicators, only PH (DSP) Constanta has 9 determinations for the two zones.
The microbiological indicators fall within the guide values in 2 zones, at the mandatory values in 3 zones and in the others zones the values were non-compliant or were not monitored (bathing was prohibited).
The health assessment and inspection of the natural bathing areas carried out by the PH (DSPs) of the counties that identified bathing areas on their territory led to a better knowledge of the bathing area in order to prevent the occurrence of the possible health risks of the population frequenting the areas.
In order to achieve the water protection objectives for all surface water bodies, especially for protected areas, such as those designated as bathing water, it is necessary to identify the anthropic pressures and to evaluate their impact on the water quality. In order to achieve this goal, the local ABA must consider the areas where a bathing location is actually established and then cooperate with the local PH (DSPs).
In order to establish the quick and adequate management actions in the event of short-term pollution episodes (PTS) and abnormal situations, it is necessary for NEPA (ANPM) - WBA (ABA) together with the territorial PH (DSPs) to realize / reassess the surface water profiles on which are located the natural bathing areas (arranged and unarranged) according to H.G. no. 546/2008 (Annex 3) and the Water Law no. 107/1996, as subsequently amended and supplemented.
Also, according to the aforementioned legislation, NEPA - WBA must make available to the territorial PH (DSPs) the results obtained through the monitoring network of surface water bodies, as the case may be, and operational monitoring for those with risks, obtained in the points near the natural bathing areas (sea / rivers / lakes), respectively additional monitoring (bathing areas being protected areas). This, especially since 2014 was the last year that the Ministry of Health monitored bathing waters according to H.G. no. 459/2002, after which the physical-chemical parameters were no longer analyzed according to a monitoring schedule, but only in cases of suspected pollution.

Thus, it is necessary to set up an information system for the rapid transmission of the results to the territorial PH (DSPs) so that they, together with the representatives of NEPA - WBA and with the local administration, can immediately establish measures to protect the population's health.
Regarding the evolution of bathing water quality from 2007 to 2018, it is presented in the graph in figure II.35 presented in the "BWD Report For the Bathing Season 2018 Romania" of the EEA.
https://www.eea.europa.eu/themes/water/europes-seas-and-coasts/assessments/state-of-bathing-water/country-reports-2018-bathing-season/bwd2018-nationalreport-ro.pdf/view

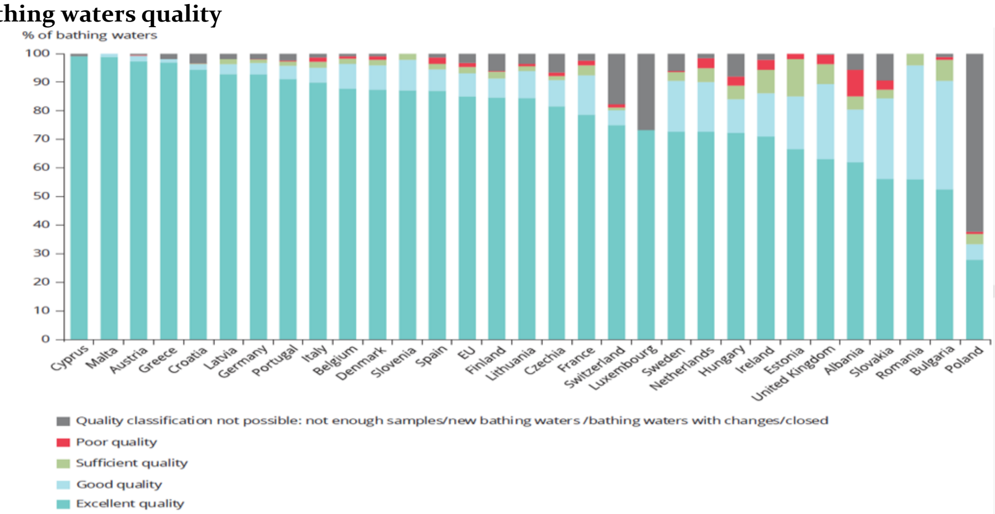
Figure II.35 Evolution of bathing water quality from 2007 to 2018 presented in EEA's "BWD Report For the Bathing Season 2018 Romania"



The trend of bathing water quality in Romania for the period 2007-2018

It is noted that in Romania within the classifications of the last 3 years there have been no areas where the water quality is unsatisfactory, but the percentage of those classified as good and satisfactory is still high. The quality of bathing waters is predominantly in conformity only with the values in the mandatory norms and not with the reference ones to which we must aim. From the annual reports of the EU Member States it was found that Romania has no bathing areas that are not in the classification for 2017.

Figure II.36 Bathing waters quality



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-2018

The objective of continuous improvement of surface water quality must be considered, because the specialists / managers in the field of bathing waters within the EC want to eliminate in the near future the category of "satisfactory" quality water (complying only with the mandatory norms).

II.2.2. DETERMINING FACTORS AND PRESSURES THAT AFFECT THE QUALITY OF WATERS

II.2.2.1. Significant pressures on water resources in Romania

RO 25	Indicator code Romania: RO 25 EEA indicator code: CIS 25

TITLE: GROSS NUTRIENT BALANCE

DEFINITION: The indicator estimates the nitrogen surplus on agricultural land. This is achieved by calculating the balance between the total amount of nitrogen entering the agricultural system and the total amount of nitrogen coming out of the agricultural system, reported on the surface unit of the agricultural land. The indicator shows all the inputs and outputs of nitrogen from an agricultural field. The inputs consist of the amount of nitrogen applied through mineral and natural fertilizers, nitrogen fixed by plants and emissions into the air. Exit nitrogen is contained in crops, grass and crops consumed by animals. Nitrogen emissions in the form of NO_2 are difficult to estimate and are not taken into account.

The gross balance of the nutrients provides an indication of the risk of contamination of surface and groundwater bodies as a result of the surplus of nutrients from agricultural surfaces.

In accordance with the Water Framework Directive 2000/60 / EC, within the management plans of the river basins / hydrographic spaces, significant pressures were considered which result in failure to achieve the environmental objectives for the water body. Depending on how the water body's receiving system works, it can be known whether a pressure can cause an impact. This approach, correlated with the list of all pressures and with the particular characteristics of the receiving basin, leads to the identification of significant pressures.

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

The application of the set of criteria has led to the identification of significant punctiform pressures, taking into account the discharges of purified or unclean water in the surface water resources:

- **human agglomerations** (identified in accordance with the requirements of the Directive on urban waste water treatment - Directive 91/271 / EEC), which have over 2000 equivalent inhabitants (s) who have wastewater collection systems with or without wastewater treatment plants and which discharge into water resources ; also, agglomerations <2000 l.e. they are considered significant point sources if they have a centralized sewerage system; also, are considered significant sources of pollution, human agglomerations with unitary sewage system that do not have the capacity to collect and purify the mixture of wastewater and rainwater during periods of heavy rainfall;

- **industry**:

  - installations covered by Directive 2010/75 / EEC on industrial emissions (FDI Directive) - including units that are inventoryed in the Register of Transferred and Transferred Pollutants (E-PRTR), which are relevant to the water environment factor;
  - establishments that discharge hazardous substances (lists 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

hazardous substances discharged into the aquatic environment of the Community);

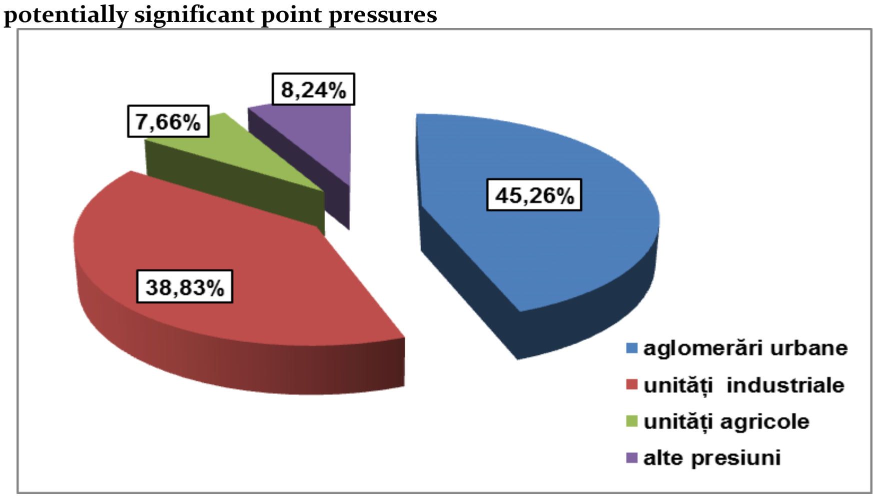
- ➢ other units that evacuate in water resources and that do not comply with the legislation in force regarding the environmental factor of water;

❖ **agriculture**:

- ➢ zootechnical farms covered by Directive 2010/75 / EEC on industrial emissions (FDI Directive) - including units that are listed in the Register of Emitted and Transferred Pollutants (E-PRTR), which are relevant to the water environment factor;
- ➢ farms that discharge hazardous substances (lists 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 hazardous substances discharged into the aquatic environment of the Community);
- ➢ other agricultural units with point discharge and which do not comply with the legislation in force regarding the environmental factor water.

In the National Management Plan of the river basins / hydrographic spaces in Romania, updated and approved by H.G. no. 859/2016, a total number of 2970 water users using the surface water resources as a receiver of the drained water were inventoried at national level, from which, taking into account the criteria mentioned above, a total number of 1409 sources resulted potentially significant points (626 urban, 563 industrial, 106 agricultural and 114 other pressures such as logging, aquaculture, etc.).

Figure II.37 Share of potentially significant point pressures



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

It is found that the largest share of point pressures is represented by human agglomerations, with approx. 45%, respectively the waste water evacuated from the systems of collection and treatment of urban agglomerations.

Regarding the diffuse sources of significant pollution, identified with reference to the use of the land, it may be mentioned:

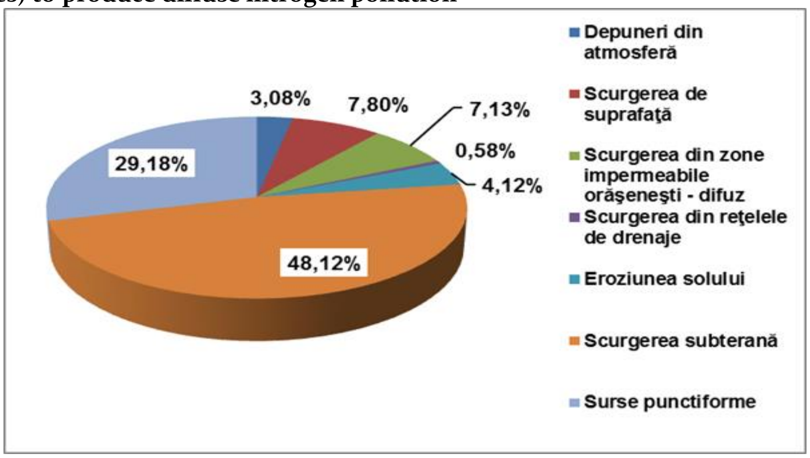
- ➢ human agglomerations / localities that do not have wastewater collection systems or appropriate sludge collection and disposal systems from wastewater treatment plants, as well as localities that have non-compliant household waste deposits;
- ➢ agro-zootechnical farms that do not have adequate storage / use systems, localities identified as areas vulnerable to nitrate pollution from agricultural sources, units that use pesticides and do not comply with the legislation in force, other agricultural units / activities that can lead at 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 quantities of pollutants emitted by diffuse sources of pollution can be estimated by applying mathematical models. For example, the Model MONERIS (Modeling Nutrient Emissions in River Systems) allows the estimation of nutrient emissions (nitrogen and phosphorus) taking into account six ways of producing diffuse pollution: surface runoff, sewerage runoff, underground runoff, runoff from waterproof city areas, atmosphere deposits and soil erosion.

The application of the MONERIS model is made at the elaboration of each management plan, the latest information being available at the level of 2012. It is specified that these data were updated for the second management plan with values from 2012, based on the completion of the application of the MONERIS model at national level. (within the Danube International District), as well as at the level of international sub-basins (Tisa).

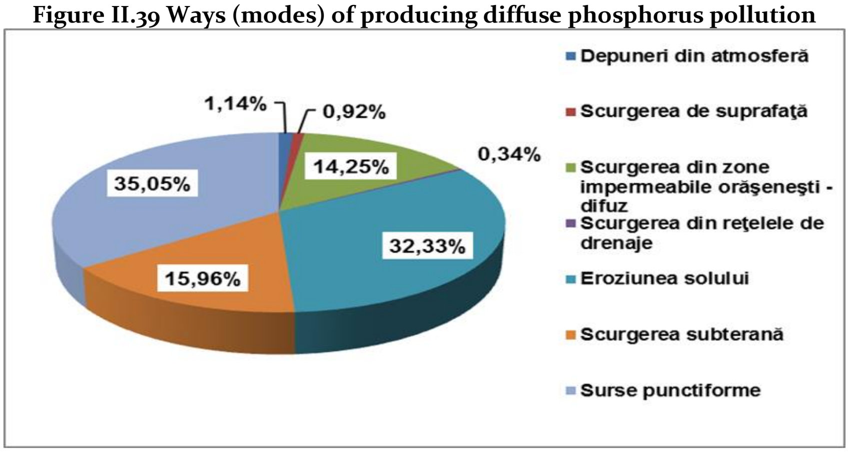
Figures II.38 and II.39 show the contribution of the modes of production of diffuse pollution with nitrogen and phosphorus for 2012, considering the ways presented above.

Figure II.38 Ways (modes) to produce diffuse nitrogen pollution



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

Figure II.39 Ways (modes) of producing diffuse phosphorus pollution



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

Also, the MONERIS model quantifies the contribution of the various categories of pollution sources to the total emission of nutrients. Thus, for diffuse sources of pollution, these categories of sources are represented by: agriculture, localities (human settlements), other sources (for example the deposition of nitrogen oxides in the atmosphere), as well as the natural background.

It is worth noting that the MONERIS model takes into account all sources of pollution, not only those identified as significant.

Table II.35 shows the nitrogen and phosphorus emissions from diffuse pollution sources, taking into account the contribution of each category of pollution sources.

Table II.35 Nitrogen and phosphorus emissions from different sources for 2012

Diffuse sources of pollution	Nitrogen emissions		Phosphorus emissions	
	tones	%	tones	%
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 diffuse emission over the total surface	3,05 kg N/ha		0,22 kg P/ha	
Specific average diffuse emission from agriculture on the agricultural surface	1,18 kg N/ha		0,21 kg P/ha	

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

It is observed that approx. 22% of the amount of nitrogen emitted by diffuse sources is due to agricultural activities and about 19% of the total diffused phosphorus emission is due to human settlements / agglomerations.

Compared to the total emissions from diffuse sources of pollution evaluated in the first National Plan for the management of river basins / hydrographic spaces (since 2005), there is a significant reduction of the total emissions of nitrogen (by approx. 39%) and phosphorus (by approx. 45%), mainly due to the application of efficient measures and the reduction / closure of some economic activities. Thus, in the period 2009 - 2012 the number of human agglomerations without sewerage systems was reduced, by the construction of new sewerage networks and the level of connection to them was increased, and in agriculture the provisions of the Action Programs for the protection of waters against pollution with nitrates from agricultural sources were applied and the Code of Good Agricultural Practice.

A total number of 5431 potentially significant diffuse pressures for water bodies that do not reach environmental objectives contribute to the diffuse pollution, of which:

- 1298 agglomerations greater than 2000 l.e. which are not equipped with wastewater collection systems (including agglomerations where in 75 collection / treatment systems occur phenomena of water spills during rainy weather);
- 3678 agglomerations smaller than 2000 l.e. without collection systems;
- 263 significant diffuse agricultural pressures;
- 61 industrial units and
- 57 others (fishing activities, etc..).

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

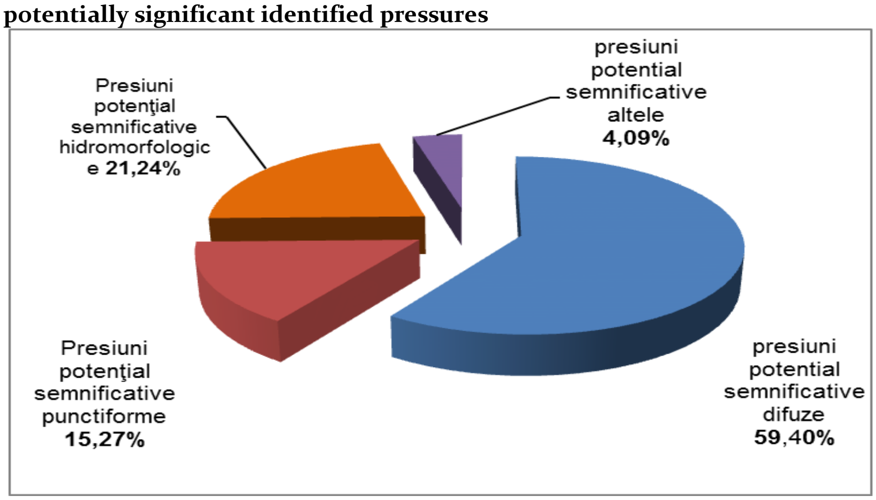
Another important category of significant pressures is that related to significant hydromorphological pressures. Changes in the hydromorphological characteristics of the watercourses (changes in natural courses, changes in the hydrological regime, deterioration of aquatic biodiversity, etc.) cause an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

In 2013, at the national level, a number of 1960 hydromorphological pressures potentially significant were identified. Following the application of the validation process of potentially significant pressures - hydromorphological alterations with the achievement of environmental objectives by surface water bodies, at national level, a number of 226 significant hydromorphological pressures were identified.

Concluzionând, în anul 2013 s-a identificat un număr total de 8800 presiuni potențial semnificative, tipul și ponderea acestora fiind prezentate în figura II.43. Se constată că ponderea cea mai mare a presiunilor potențial semnificative este reprezentată de presiunile difuze - aglomerări umane fără sisteme de colectare și agricultură, precum și de presiunile hidromorfologice.

According to the synthesis of the water quality elaborated by the National Administration "Romanian Waters", at national level, a number of 1272 water users have been identified that can cause accidental pollution and which have developed their own plans for preventing and combating accidental pollution. In 2017, there were 70 accidental pollution of surface water courses, mainly on the inland rivers: 19 with petroleum product and other hydrocarbons, 28 with raw sewage, two pollution with mine water, 6 pollution with low oxygen conditions, 4 with unidentified substances, 5 with other substances and 6 with semi-solid waste. The phenomena had local / basin 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 structure of aquatic biocenoses, the effects of the phenomena in question were reduced only to the local change of the values of the physical-chemical indicators, without inducing a significant change in aquatic biodiversity in the long term. The production of accidental pollution is mainly caused by the negligence manifested by some economic operators during the development of the technological processes or the non-observance of the legislative provisions regarding the evacuation of waste water in the water resources.

Figure II.40 Share of potentially significant identified pressures



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

Regarding the type and size of the anthropic pressures that can affect the groundwater bodies (according to the Water Framework Directive 2000/60 / EC - Annex II - 2.1), they are considered:

- point and diffuse sources of pollution:

- the sources of pollution due to human agglomerations without wastewater collection and treatment systems (domestic, industrial, agricultural, etc.) or without appropriate waste collection systems;

- sources of diffuse pollution caused by agricultural activities (agrozootechnical farms that do not have adequate manure storage systems, etc.) and industrial activities through non-compliant landfills (industrial, domestic, construction, etc.);

- other potentially polluting anthropic activities.

From the point of view of the impact on the quantitative state of the groundwater bodies, the quantitative pressures are considered significant water withdrawals, which can exceed the natural rate of aquifer recharge.

- water sampling and recharging of groundwater bodies:

According to the provisions of the Water Framework Directive 2000/60 / EC, Annex II - 2.3, the selection criteria for water withdrawals are considered to be those which take into account water withdrawals> 10 m^3 / day. In Romania, groundwater is generally used for water supply to the population, as well as for industrial, agricultural, etc. purposes. In 2013, at national level, 46 significant underground water exploitations were identified, respectively catchments with flows greater than or equal to 1500 thousand m^3 / year.

Regarding the balance of sampling / recharging, which leads to the assessment of the groundwater body quantitatively, no particular problems are reported, the sampling being lower than the natural rate of refueling.

In the first National Management Plan, 19 underground water bodies were identified that did not reach the good chemical status due to the following parameters: nitrogen and ammonium, for which exceptions from the objectives were reached until 2027. Due to the measures taken in the first cycle of implementation and as a result of the current assessment of the chemical state (year 2015), 128 underground water bodies are in good chemical condition and 15 are in poor chemical condition.

The update of the inventory of significant pressures on water resources, respectively the analysis of pressures and impact, based on the use of the DPSIR (Driver-Pressure-State-Impact-Response-Anthropic-Pressure-State-Impact-Response) concept, will be carried out in 2020, within the process of updating the Basin / Spatial Management Plans for the third planning cycle (2022-2027), in order to establish the necessary measures to improve the ecological status / ecological potential and the chemical status of surface water bodies and the quantitative and chemical state of groundwater bodies.

II.2.2.2. Wastewater and sewerage networks

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

TITLE: URBAN WASTEWATER TREATMENT

DEFINITION: The indicator quantifies the level of population connection to wastewater collection and treatment systems. The indicator also illustrates the efficiency of national wastewater treatment programs, the efficiency of policies to reduce nutrient and organic substances discharges, as well as the implementation stage of the national wastewater treatment requirements (91/271 / EEC and 98/15 / EC) at national level.

In relation to their provenance, wastewater is classified as follows: domestic waste water, are those that are discharged after they have been used for household needs in homes and units of public use; urban wastewater, defined as domestic wastewater or a mixture of domestic wastewater with industrial wastewater and / or meteorological water and industrial wastewater, those that are discharged as a result of their use in technological processes for obtaining industrial or agro-industrial finished products.

Urban wastewater is defined as domestic wastewater or a mixture of domestic wastewater with industrial wastewater (generally from the agro-food industry) is collected through sewerage systems and taken over and treated in wastewater treatment plants.

Untreated wastewater from human agglomerations (cities and villages - the most concentrated inhabited areas) contribute to the pollution of surface and groundwater. The pollution is mainly due to the following aspects:

- Reduced rate of connection of population equivalent to wastewater collection and treatment systems;
- Improper operation of existing wastewater treatment plants;
- Improper management of sludge from wastewater treatment plants (by-products of the wastewater

treatment process, considered biodegradable waste);

- Development of urban areas without providing and equipping with water supply and sewerage systems and installations, which are then reflected by the discharge of raw water into natural emissions, which leads to insufficient protection of water resources.

The quality of the surface water is directly influenced by the waste water discharges, not purified or insufficiently purified, from point sources, urban, industrial and agricultural. The impact of these pollution sources on natural receivers depends on the flow of water and its loading with polluting substances.

Water pollution is a process of altering its physical, chemical or biological quality, produced by a human activity, after which the waters become unfit for use. It can be said that a water can be polluted not only when it shows visible changes (color changes, irises of petroleum products, unpleasant odors) but also when, although apparently good, it contains, even in a small amount, toxic substances.

Chemical pollution results from the discharge in water of some chemical compounds of the type: nitrates, phosphates and other substances used in agriculture; residues from the metallurgical, chemical, wood, cellulose, smelters or organic substances (solvents, dyes, biodegradable substances from the food industry) etc.

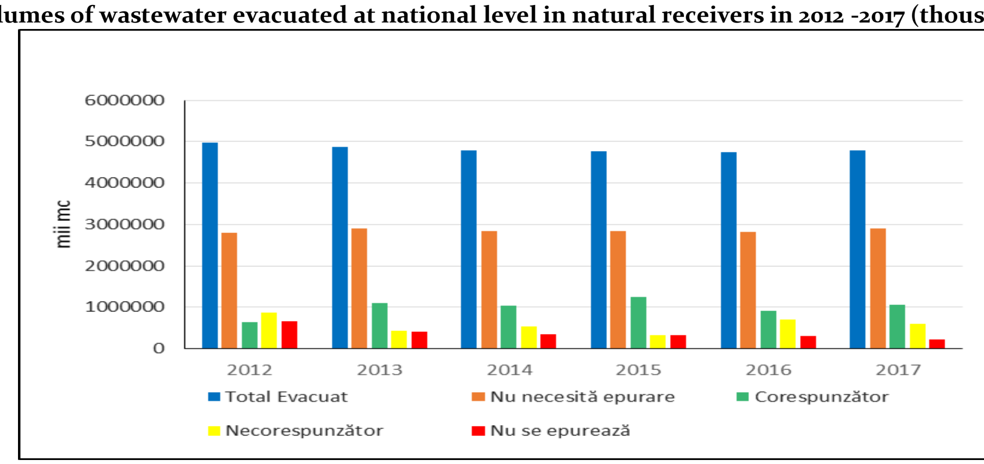
According to the results of the assessment of the situation at national level, the total volume discharged in 2017 was 4795.96 million cubic meters, of which 2905.16 million cubic meters (60.57%) are cooling waters, waters classified as wastewater that do not require purification.The situation regarding the volumes of wastewater discharged during the period 2012 - 2017 is presented in table II.36 and figure II.41.

Table II.36 Volumes of wastewater evacuated at national level in natural receivers between 2012 and 2017 (thousands m3)

Year	Total Evacuated	It does not require purification	It is purified		It is not purified
			Adequate	Inadequate	
2012	4985141,14	2787700,63	650290,43	881306,72	665843,36
2013	4872641,26	2911880,03	1113315,00	433497,30	413948,93
2014	4784719,64	2845917,86	1039378,07	541982,06	357441,65
2015	4762839,23	2846131,59	1242300,03	336213,33	338194,27
2016	4745681,89	2811834,25	914232,29	705086,32	314529,02
2017	4795960,86	2911561,51	1055539,91	604374,29	224485,15

Source: National Administration "Romanian Waters", Synthesis of Romanian Water Quality

Figure II.41 Volumes of wastewater evacuated at national level in natural receivers in 2012 -2017 (thousands m3)



Source: National Administration "Romanian Waters", Synthesis of Romanian Water Quality

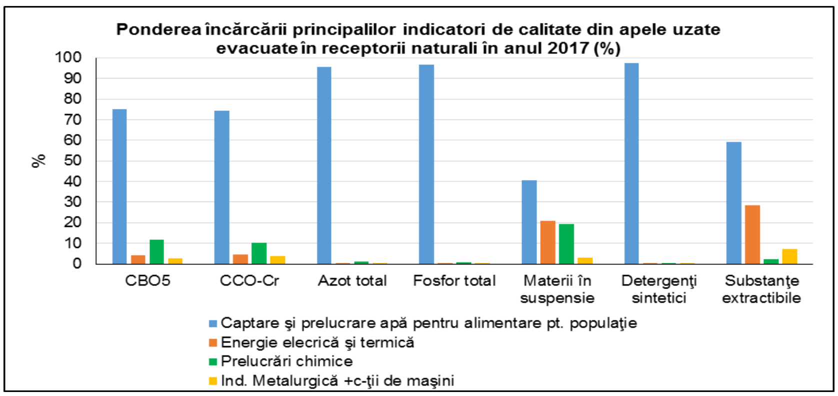
Regarding the weight of loading of the main quality indicators from wastewater discharged into natural receivers, by activities of the national economy, without taking into account the loading related to the cooling waters, the situation is presented in table II.37 and figure II.42.

Table II.43 Share of loading of the main quality indicators from wastewater discharged into natural receivers in 2017 (%)

The main economic activities	Share of loading of the main quality indicators from wastewater discharged into natural receivers in 2017 (%)						
	CBO5	CCO-Cr	Total nitrogen	Total phosph orus	Materials in suspension	Synthetic detergents	Extractable substances
Collection and processing of water for food supply to the population	75,26	74,41	95,75	96,70	40,77	97,35	59,25
Electricity and thermal energy	4,28	4,43	0,05	0,03	21,01	0,03	28,43
Chemical processing	11,64	10,22	1,31	0,86	19,51	0,45	2,43
Metallurgical Industry and Construction of cars	2,83	3,82	0,12	0,07	3,03	0,06	7,22

Source: National Administration "Romanian Waters", Synthesis of Romanian water quality

Figure II.42 Share of loading of the main quality indicators from wastewater discharged into natural receivers in 2017 (%)



Source: National Administration "Romanian Waters", Synthesis of Romanian water quality

The statistics compiled and presented annually in the "Synthesis of water quality in Romania" prove that of the wastewater that requires treatment, the greatest impact is wastewater from urban agglomerations, especially regarding the pollution with organic substances (CBO5 and CCO-Cr) and nutrients (total nitrogen and total phosphorus).

Tables II.38 and II.39, respectively figures II.43 and II.44 highlight the ones stated above.

Table II.38 The total volume of urban waste water discharged into natural receivers during the period 2012 – 2017 (mil. m³/year)

Year	Volume of urban waste water discharged into natural receivers				
	Total	It does not require purification	Properly purified	Inappropriate purified	It is not purified
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	1110,701	0,485	757,153	260,195	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 "Romanian Waters", Synthesis of Romanian water quality

Figure no.II.43 Evolution of the collection and treatment of volumes of urban waste water discharged into natural receivers during the period 2012 - 2017

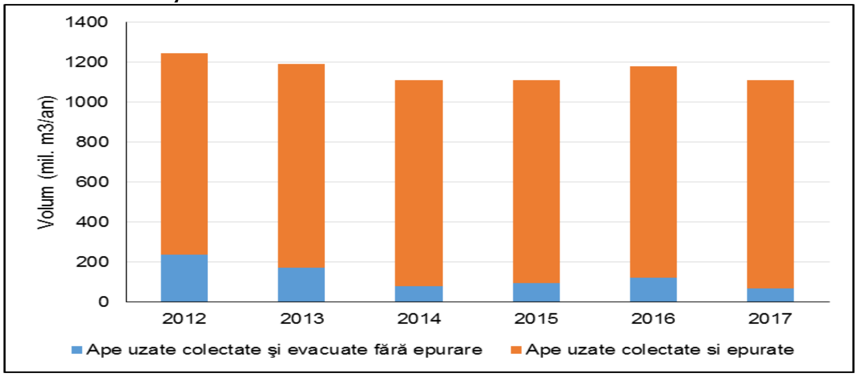
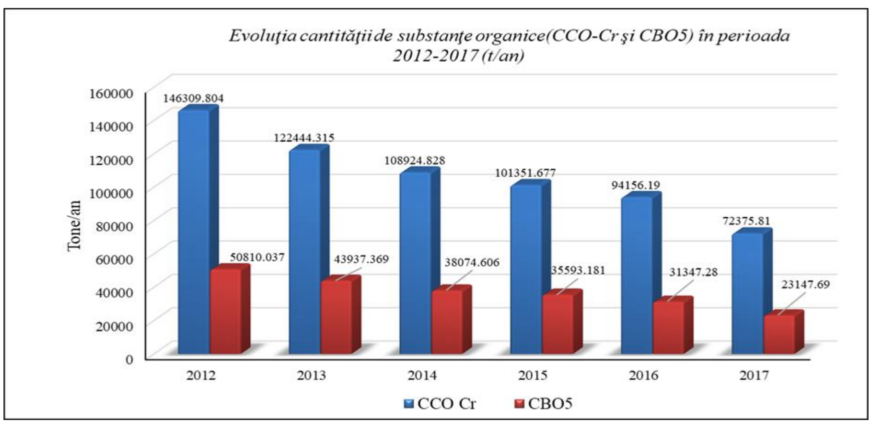


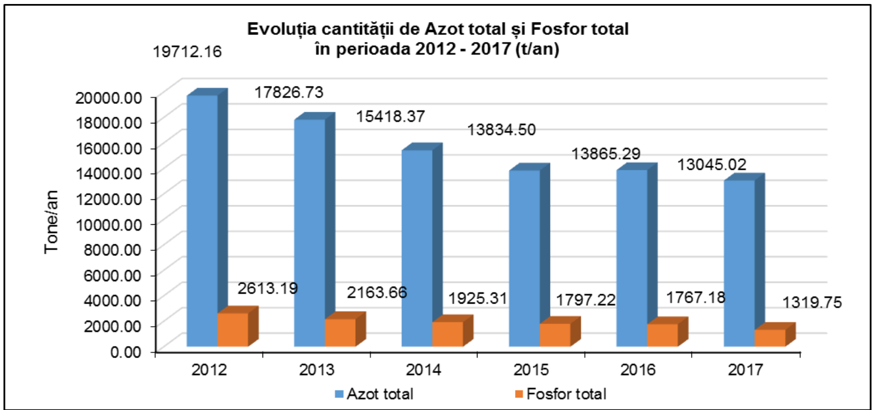
Table no.II.39 The pollutant loading (tonnes / year) of the effluents evacuated from the urban agglomerations in the natural receivers

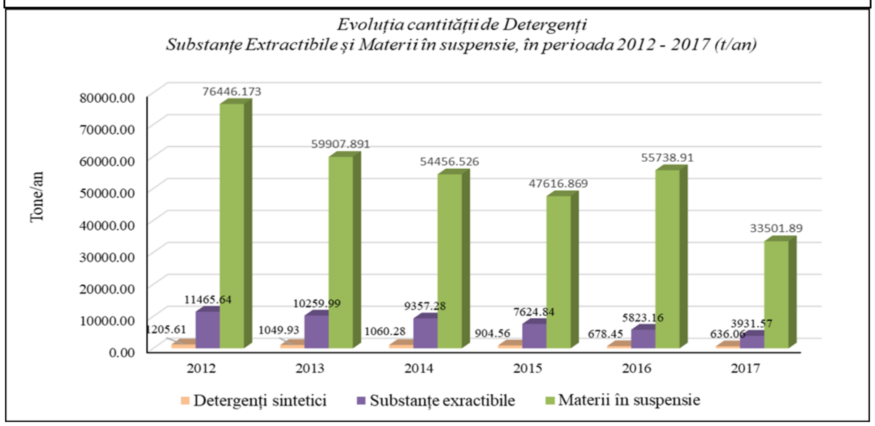
Pollutant	Amount of pollutants (tonnes / year)					
	2012	2013	2014	2015	2016	2017
CBO_5	50810,04	43937,37	38074,61	35593,18	31347,28	23147,69
CCO-Cr	146309,80	122444,32	108924,83	101351,68	94156,19	72375,81
Azot total	19712,16	17826,73	15418,37	13834,49	13865,29	13045,02
Total phosphorus	2613,19	2163,66	1925,31	1797,22	1767,18	1319,76
Materials in suspension	76446,17	59907,89	54456,53	47616,87	55738,90	33501,89
Synthetic detergents	1205,61	1049,93	1060,28	904,56	678,45	636,07
Extractable substances	11465,64	10259,99	9357,28	7624,84	5823,16	3931,57

Source: National Administration "Romanian Waters", Synthesis of Romanian water quality

Figure no.44 Developments on pollutant loading of urban waste water discharged into water resources during the period 2012 - 2017







Source: National Administration "Romanian Waters", Synthesis of Romanian water quality

The level of collection and treatment of urban waste water

Domestic and industrial wastewater exerts significant pressure on the aquatic environment, due to the loading with organic materials, nutrients and dangerous substances. Considering the large percentage of the population living in urban agglomerations, a significant part of the wastewater is collected through sewage systems and transported to wastewater treatment plants. The level of purification, prior to discharge, and the status of the receiving waters determines the intensity of the impact on aquatic ecosystems.

Compliance with the provisions of the Directive on urban waste water treatment (91/271 / EEC), amended and supplemented by the Directive 98/15 / EC of 27 February 1998, respectively of the types of treatment processes applied, are considered as representative indicators for the level of pollutant removal from wastewater and for the potential improvement of the aquatic environment.

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

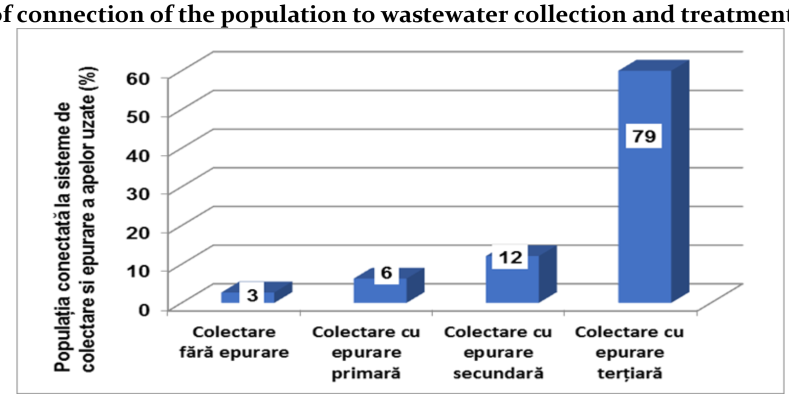
According to the National Institute of Statistics, in 2017, a number of 9,978,886 inhabitants had the houses connected to the sewerage systems, these representing approx. 50.8% of the population of Romania. In terms of wastewater treatment, the population with housing connected to the sewage systems provided with wastewater treatment plants was 9,710,077 persons, representing approx. 49.4% of the country's population. Also, the degrees of connection of the population to the wastewater collection and treatment systems differentiated by treatment levels are shown in figure II.48.

The evolution of the degree of connection of the population to the systems of collection and treatment of the waste water according to the type of the purification process applied (figure II.49) indicates a constant increase of the number of the population benefiting of services of waste water, consequence of the extension and the construction of the infrastructure related. It is noted that in the last period, the proportion of tertiary waste collection systems has increased in particular. Primary (mechanical) purification removes some of the suspended solids (approx. 40-70%), while secondary (biological) purification uses aerobic and / or anaerobic microorganisms to decompose a large part of the organic substances (ca. 50-80%), remove the ammonia (about 75%) and retain some of the nutrients (about 20-30%). Tertiary (advanced) treatment effectively removes organic matter, phosphorus compounds and nitrogen compounds.

Also, the efficiency of the national programs on wastewater treatment, the efficiency of the existing policies for reducing the discharges of nutrients and organic substances is evaluated through the implementation stage of the requirements of Directive 91/271 / EEC on wastewater treatment, modified by Directive 98/15 / EC. The proposed targets for the implementation of the provisions of Directive 91/271 / EEC, 98/15 / EC and 2000/60 / EC are:

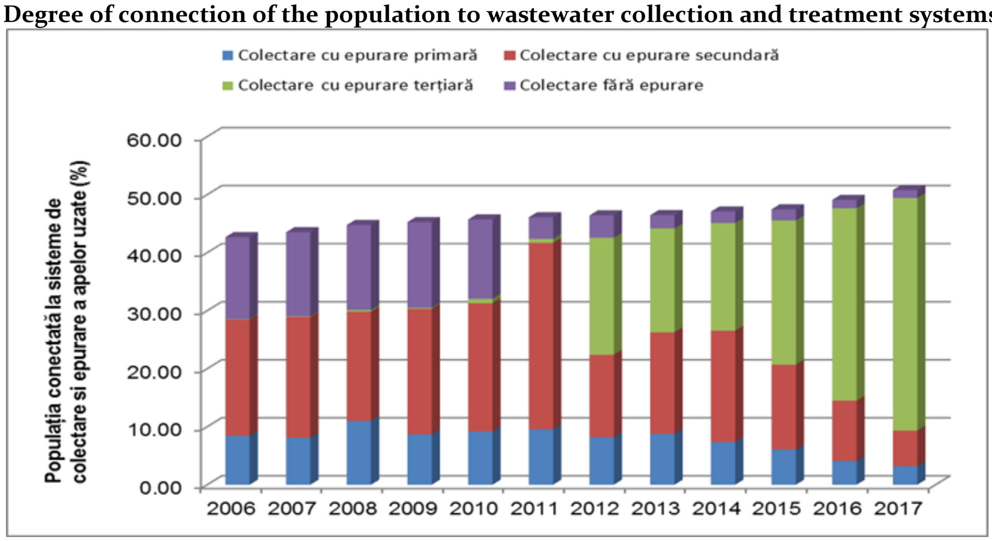
- to sewerage systems by expanding sewerage networks (from 69.1% of the equivalent inhabitants connected in 2013, to 80.2% in 2015 and 100% in 2018);
- increasing the degree of connection of human agglomerations by more than 2,000 l.e. to the wastewater treatment plants by the construction of new wastewater treatment plants and by the rehabilitation and modernization of the existing ones, to achieve a coverage of 60.6% l.e. in 2013, 76.7% l.e. in 2015 and 100% l.e. in 2018.

Figure no. II.45 Degree of connection of the population to wastewater collection and treatment systems, in the year 2017



Sursa: Institutul Național de statistică, www.insse.ro

Figure no. II.46 Degree of connection of the population to wastewater collection and treatment systems, 2006 – 2017



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

As a member country of the European Union, Romania is obliged to improve the quality of its environmental factors and 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 accordance with the Position Paper of Romania in the Accession Treaty, Chapter 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 urban wastewater treatment, amended by Directive 98 / 15 / EC, National Program for Rural Development 2007-2013 and 2014-2020, Sectoral Operational Program for Environment 2007-2013, Operational Program for Large Infrastructure 2014-2020 (POIM). Also, at the regional level were elaborated Environmental Protection Plans, and at the local level all the economic agents were obliged to elaborate and to implement compliance plans.

The wastewater treatment directive (91/271 / EEC and 98/15 / EC) aims to protect the environment from the adverse effects of urban waste water discharges and provides standards / levels of treatment that must be achieved before discharging these waters into receptors. In this respect, the directives require Member States to provide:

- secondary collection and treatment systems for all agglomerations with more than 2,000 equivalent inhabitants (l.e.) having direct discharge in water resources;
- tertiary collection and treatment systems for all agglomerations over 10,000 l.e. which have discharge in water resources considered sensitive areas.

Considering both the positioning of Romania in the river basin of the Danube river and the Black Sea basin, as well as the need for environmental protection in these areas, Romania declared its entire territory as a sensitive area. This decision is materialized in the fact that all agglomerations with more than 10,000 equivalent inhabitants (l.e.) must provide an infrastructure for urban wastewater treatment that allows advanced treatment, especially in terms of nutrients (total nitrogen and total phosphorus). As regards secondary treatment (biological stage), 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) achieved as a result of the implementation of the Directives on urban wastewater treatment and of the IPPC / IED Directive should be considered an integral part of the programs of measures to achieve the environmental objectives set out in The Water Framework Directive (2000/60 / EC), which aimed at achieving until 2015 the good chemical and ecological status for all water bodies. The wastewater treatment directive has been fully transposed into the Romanian legislation by H.G. no. 352/2005 regarding the modification and completion of H.G. no. 188/2002 for the approval of norms regarding the conditions of discharge in the aquatic environment of the waste water.

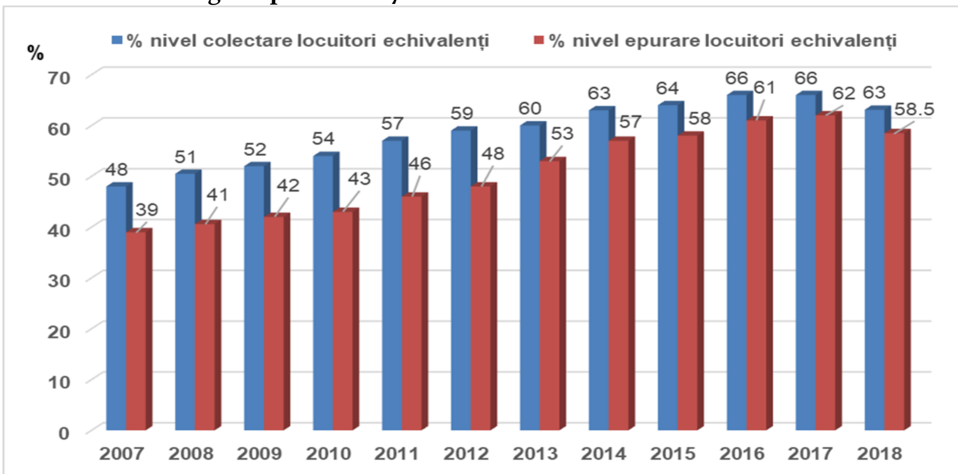
Thus, the requirements regarding the compliance with the transitional terms negotiated for the collection and treatment systems (assumed by Romania through the Accession Treaty, Chapter 22 - Environment, Water Quality), as well as the status of a sensitive area for the entire territory were introduced in the legislation of Romania.

H.G. no. 352/2005 includes three technical regulations regarding: collection, treatment and disposal of municipal waste water (NTPA 011), conditions for the discharge of waste water in the sewage networks of the localities and directly in the sewage treatment plants (NTPA 002) and the limits of loading with pollutants of industrial and city wastewater for disposal in natural receivers (NTPA 001).

From the data of the National Administration "Romanian Waters", regarding the works on the water / wastewater infrastructure, at national level, the levels of collection and treatment of the biodegradable organic load (expressed in%) of the human agglomerations with more than 2,000 l.e. has grown in recent years. In 2018, the values of the levels of collection and purification of the biodegradable organic load were 63.1% for the collection of the waste water, respectively 58.48% for the treatment of the waste water.

According to the report made by the National Administration "Romanian Waters", in the human agglomerations greater than 2000 l.e., the degree of connection to the wastewater collection system registered an increase of approx. 15% at the end of 2018 compared to 2007 (figure II.47). Regarding the degree of connection to urban wastewater treatment plants, it increased by approx. 24% between 2007 and 2017.

Figure no.II.47 Evolution of the levels of collection and treatment (%) of the biodegradable organic loads (l.e.) of the waste water at national level during the period 2007-2018



Source: National Administration "Romanian Waters", report "Stage of the works for the purification of urban waste water and of the capacities in execution and put into operation for human agglomerations"

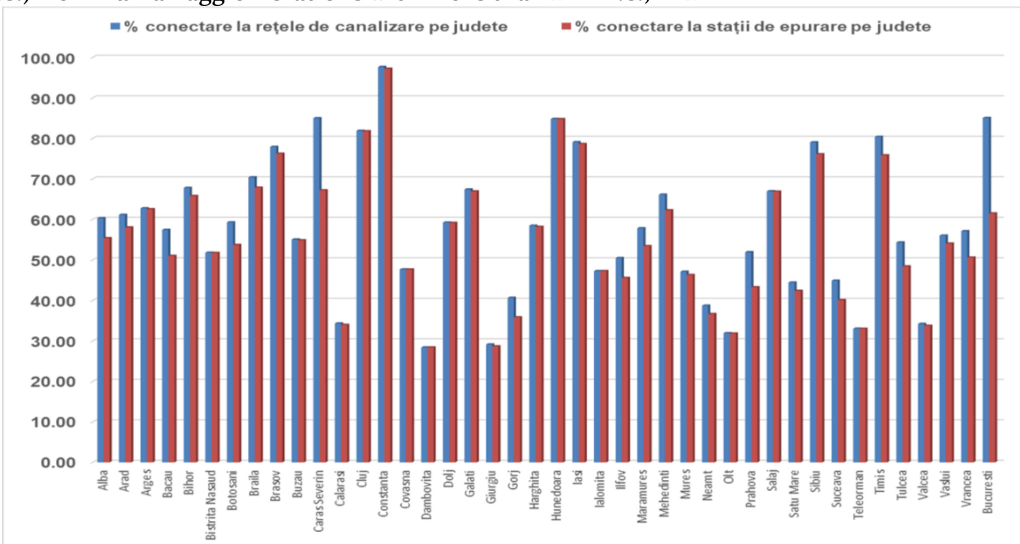
Changing national levels of collection and treatment has several causes, most of which are mainly mentioned:

- change in the number and size of agglomerations - the number and organic load (in equivalent inhabitants) of agglomerations greater than 10,000 l.e. decreased, and of the agglomerations by 2,000 - 10,000 l.e. increased, as a result of the re-delimitation of agglomerations, based on the updating of the planning documents, respectively the County Master Plans and the financing applications for the accomplishment of the necessary works for the realization of the systems of collection and treatment of waste water from human agglomerations; also, the updating of the size of the agglomerations contributes to the decrease of the number of the population and of the economic activities, which led to the modification of the classification of the agglomerations by size categories and implicitly to the modification of their number and size.;
- the low level of trust of the data and information transmitted, due both to misinterpretations of the requirements of the Directive and the data required for reporting, but also to the inconsistency of the information provided by the water service operators and the local authorities;
- in some human agglomerations, works are under way to rehabilitate the treatment plants, so that the collected waste water is discharged directly, without treatment, in the water resource.

At the county level (figure II.51), the highest degrees of connection to the sewerage networks (over 80%) are identified in the counties: Caraș Severin, Cluj, Constanța, Hunedoara, Timiș and in the agglomeration of Bucharest, and at the opposite pole. (under 30%) are the counties of Dâmbovița and Giurgiu. Regarding the connection degrees to the treatment plants, the situation is as follows: in 3 counties (Cluj, Constanța, Hunedoara) there were registered values of the connection level at the treatment plant of over 80%. In some of the counties, the percentage of purification increased compared to December 2017, values less than 30% being registered in the counties of Dâmbovița and Giurgiu.

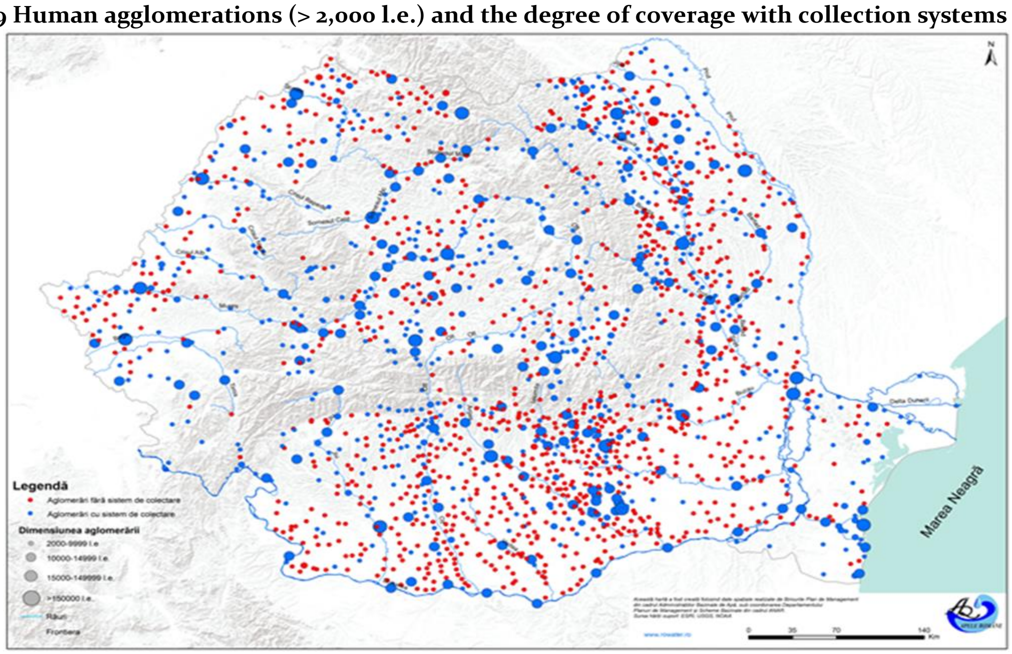
The situation of equipping human agglomerations with collection and treatment systems is presented in figure II.48, respectively figure II.49.

Figure no.II.48 The situation at the county level of the collection and purification of the biodegradable load from wastewater (l.e.) from human agglomerations with more than 2000 l.e., in 2018



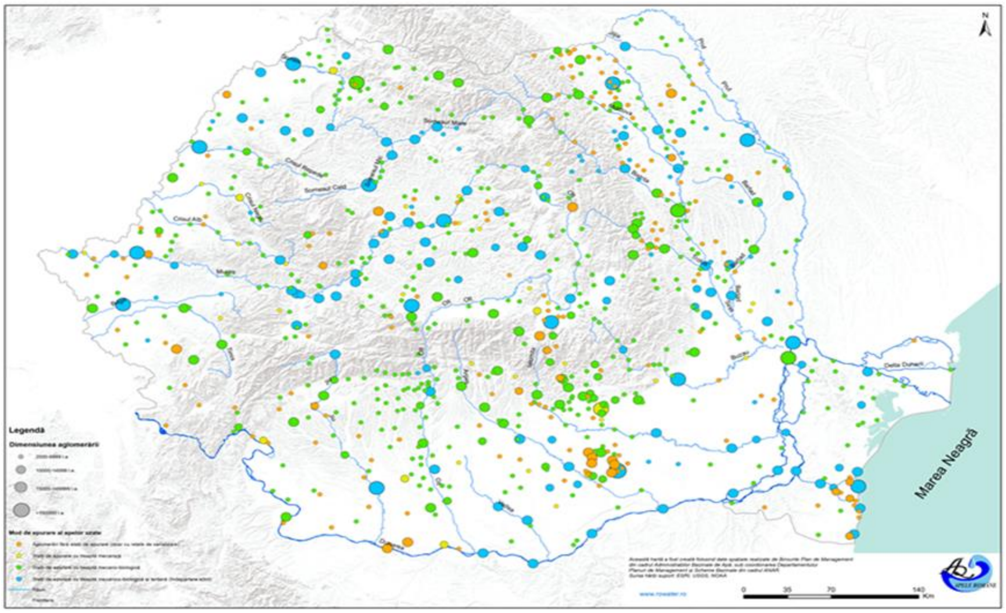
Source: National Administration "Romanian Waters", report "Stage of the works for the purification of urban waste water and of the capacities in execution and put into operation for human agglomerations" in 2017

Figure no. II.49 Human agglomerations (> 2,000 l.e.) and the degree of coverage with collection systems in 2017



Source: National Administration "Romanian Waters", report "Stage of the works for the purification of urban waste water and of the capacities in execution and put into operation for human agglomerations" in 2017

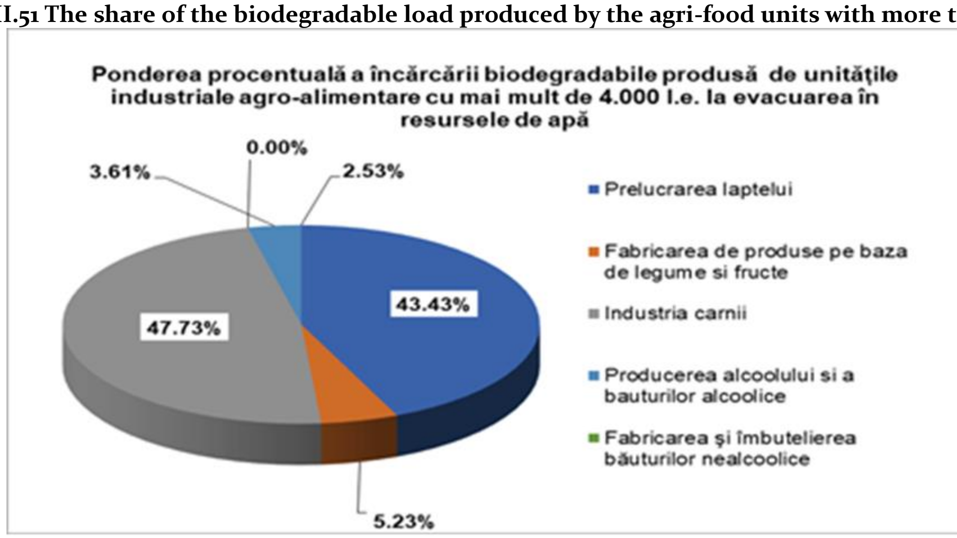
Figure no. II.50 Human agglomerations (> 2,000 l.e.) and the degree of coverage with treatment systems in 2017



Source: National Administration "Romanian Waters", report "Stage of the works for the purification of urban waste water and of the capacities in execution and put into operation for human agglomerations" in 2017

Regarding the activity profile, most agro-industrial units fall into the fields of industrialization of meat and milk, the manufacture of alcoholic beverages, the manufacture of vegetables and fruits and the manufacture and bottling of non-alcoholic beverages (figure II.51). The highest percentage of the biodegradable load produced by the agri-food industrial units with more than 4000 l.e. on evacuation in water resources was identified for the meat industry (about 48%) and the milk processing industry (43%), and the brewing units are either closed or have greatly reduced their production (<4,000 le) or they stopped their activity.

Figure no. II.51 The share of the biodegradable load produced by the agri-food units with more than 4000 l.e.



Source: National Administration "Romanian Waters", report "Stage of the works for the purification of urban waste water and of the capacities in execution and put into operation for human agglomerations" in 2018

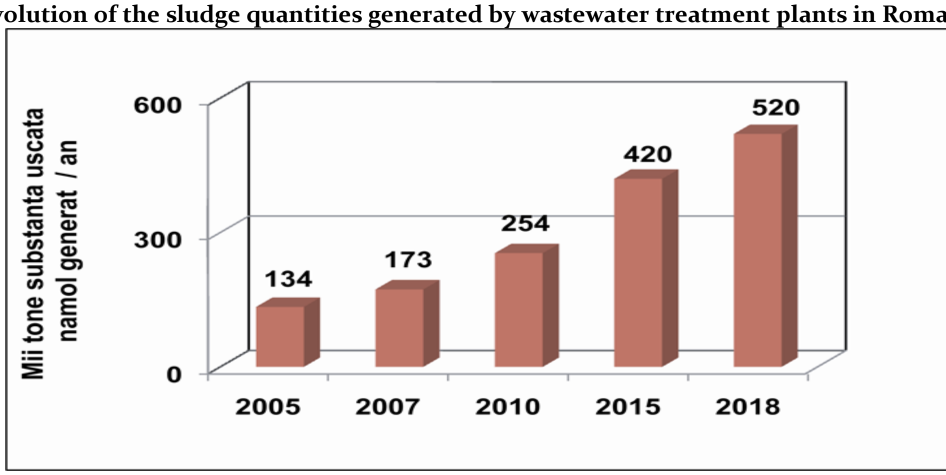
The implementation of the requirements of Directive 91/271 / EEC on urban wastewater treatment will implicitly also lead to a significant increase in the volume of sludge resulting from urban wastewater treatment plants. From the situation provided by the National Institute of Statistics on the management of the sludge from the ubane treatment plants at the level of 2016 (table II.40) it is observed that, from the total amount of sludge generated in the sewage treatment plants approx. 16.51% was used in agriculture.
According to the first National Management Plan of the river basins / hydrographic spaces in Romania (elaborated in 2009), it was estimated to be obtained at the end of the compliance period (the year 2018) an amount of sludge of approx. 520.850 tonnes of dry matter / year compared to approx. 172,529 tonnes of dry matter / year obtained in 2007 (figure II.52). This forecast corresponds to the planned situation regarding the compliance of the agglomerations in 2004, according to the National Plan for the implementation of the Directive 91/271 / EEC on urban waste water treatment.

Table no. II.40 The national use of the sludge from the urban treatment plants in 2017

Uses of sludge	Sludge quantity (million tons s.u./year)
Total quantity produced	**283,34**
Use in agriculture	35,01
Composting and other applications	1,76
Storage on arranged platforms	168,45
Sea evacuation	0
Incineration	0,02
Others	78,1

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

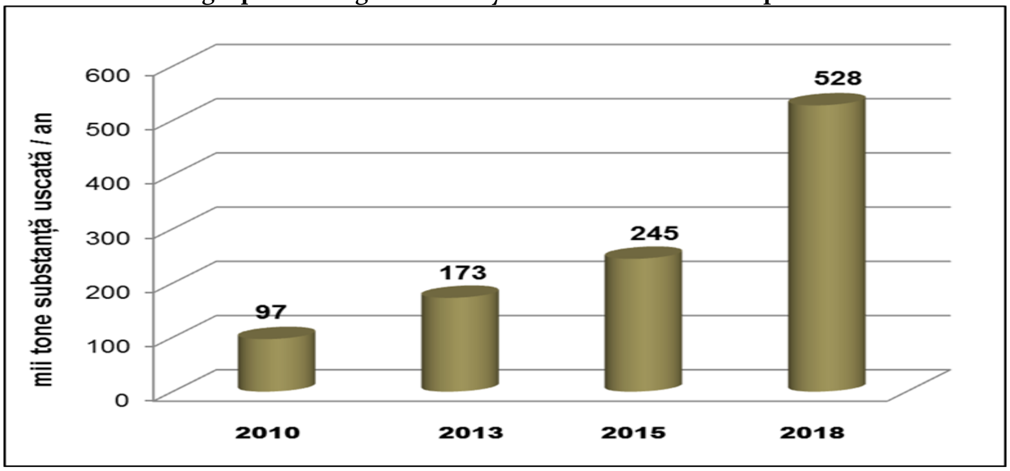
Figure no.II.52 Evolution of the sludge quantities generated by wastewater treatment plants in Romania



Source: National Administration "Romanian Waters", National Plan for the management of river basins / hydrographic spaces in Romania approved by HG no. 80/2011

The national strategy for the management of sewage sludge, developed within the technical assistance of SOP ENV, provides a framework for planning and implementing measures for managing the increasing volumes of sludge from existing, rehabilitated and new urban treatment plants in Romania. The estimated future quantities of sludge produced were evaluated according to figure II.53. This forecast corresponds to the planned situation regarding the compliance of the agglomerations at the level of 2011, taking into account the changes produced in the delimitation of the human agglomerations and of the type of treatment required to comply.

Figure no.II.53 Evolution of the sludge quantities generated by wastewater treatment plants in Romania



Source: Ministry of Environment, Waters and Forests, National Strategy for the management of sewage sludge - project POSM / 6 / AT / I.1.2010, "Development of the national policy for the management of sewage sludge")

From the comparative analysis of the data in table II.46 and figures II.55 and II.56, the planning scenario for 2018 is optimistic, given that it started from the hypothesis that human agglomerations with more than 2,000 l.e. they will all be equipped with appropriate wastewater treatment plants, which in fact has not been achieved practically. Thus, at the level of 2017, the amount of sludge generated in the urban treatment plants reached approx. the planned value from 2015, a value that is at approx. 54% of the value for the year 2018.

In order to accelerate the compliance process, the Compliance Plan for the implementation of the directive on urban wastewater treatment is being updated, by preparing a technical assistance project, called "Improving the capacity of the central public authority in the field of water management in the planning, implementation" and reporting of European water requirements ”and financed from the Operational Program Administrative Capacity, implemented by the Ministry of Water and Forests, in collaboration with the World Bank. The project includes the following actions:

- analysis of the compliance status with the provisions of Directive 91/271 / EEC;
- analysis and redefinition of agglomerations, taking into account the possibility of compliance by promoting individual collection systems and with adequate treatment;
- analyzing the situation of investments in wastewater;
- estimating the investment needs for compliance and identifying possible sources of financing;
- elaboration of a strategic financing plan and a new compliance planning in time;
- creation of a platform for processing, monitoring and reporting information related to the implementation of Directive 91/271 / EEC.

The competent Romanian authorities estimate that the update of the Compliance Plan will be completed at a time correlated with the deadline within the memorandum for the national evaluation and the action plan regarding the fulfillment of the favorable condition regarding "Updated planning for the necessary investments in the water and wastewater sector", provided by proposing the EC Regulation establishing common provisions for a number of EU post-2020 funds. Also, within this project, will be developed by the Ministry of Water and Forests a national Strategy on water supply, collection and treatment of waste water and a review of regulations in order to increase efficiency in the application of specific legislation. Within the National Strategy, the way in which the specific infrastructure planning, financing and implementation will continue will be established. The competent Romanian authorities estimate that the National Strategy will be finalized, similar to the Compliance Plan, at a time correlated with the term to be established in the memorandum for the national evaluation and the action plan regarding the fulfillment of the favorable condition.

Currently, the project has been selected for funding by the Managing Authority of the Operational Program Administrative Capacity, to be concluded the financing contract. Also, the activities of the World Bank on collecting data and information necessary for the re-delimitation of human agglomerations, as well as clarifying specific aspects for mapping during field visits are ongoing.

The aforementioned project will be based on the results obtained from another project that has been running for about 1 year, regarding the elaboration of a Report on the strategic options for managing the regionalisation policy in Romania from the perspective of fulfilling the compliance commitments. This is a technical assistance project financed through the Operational Program Technical Assistance, implemented by the Ministry of European Funds, through the Managing Authority for the Large Infrastructure Operational Program (AM POIM), in collaboration with the Ministry of Waters and Forests, the Romanian Water Association and the National Water Authority Regulations for Community Public Utility Services. The project provides:

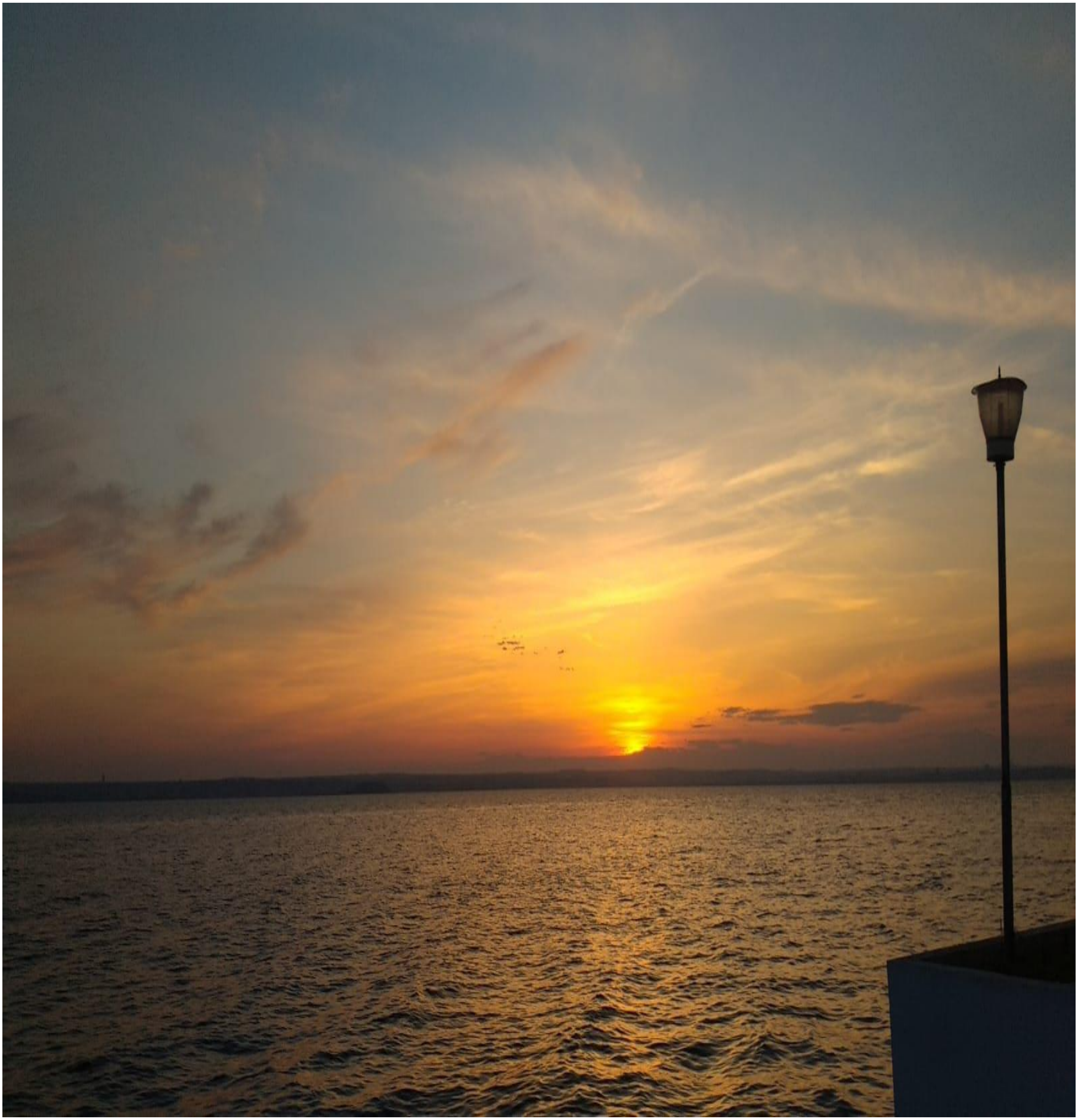
- complete analysis of the water and wastewater sector;
- strategic options regarding the development and consolidation of the regionalization policy;
- establishing the same types of indicators in the delegation contract, calculated on the basis of a common methodology;
- development of the current benchmarking platform;
- analysis and revision of the delegation framework contract, including the elaboration of a methodology for its revision every 5 years.

The competent Romanian authorities estimate that the implementation of the technical assistance project will be completed by January 2020.

So far, within the project, the action on the analysis of the water and wastewater sector has been implemented, as well as the realization of the document on strategic options, documents that have been circulated for observations and comments to all the factors involved in the water sector. Also, the reports on the benchmarking methodology were made and a first series of regional seminars took place with the theme of non-invoiced water and performance-based contracts.

II.2.3. Water quality trends and forecasts

II.2.4. Policies, actions and measures to improve the quality of water



II.3. MARINE AND COSTIER ENVIRONMENT

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

II.3.1.1. Status of protected marine areas

RO 41	Indicator code Romania: RO 41 EEA Indicator Code: SEBI 07

TITLE: PROTECTED NATURAL AREAS OF NATIONAL INTEREST
DEFINITION: marine protected areas. The indicator describes the evolution of marine protected 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.ROSCI0094 Izvoarele sulfuroase submarine de la Mangalia
9.ROSCI0269 Vama Veche - 2 Mai.

Figure II.54 Map 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

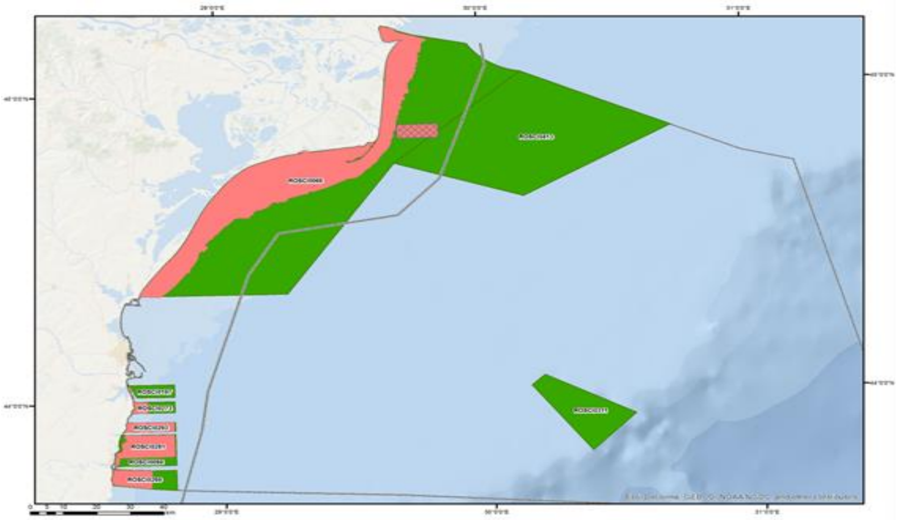


Table II.41 shows the areas of sites of community importance in the Romanian Black Sea sector.

Tabelul II.41 The areas of sites of community importance in the Romanian Black Sea sector

Nr. crt.	Site	Surface in 2018 (km^2)
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 Costinești	48,84
8.	ROSCI0311 Canionul Viteaz	353,77
9.	ROSCI0413 ZPF-SL	1.868,15
	TOTAL	**6.057,19**

The share of marine sites of Community importance in the Romanian Black Sea sector is shown in table no II.42.

Tabelul II.42 Share of sites of community importance (SCI) in the Romanian Black Sea sector.

Area	Surface SCI (km^2)	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

In 2018, the legislation regarding the administration of protected natural areas was modified (Emergency Ordinance No. 75/2018 for amending and supplementing normative acts in the field of environmental protection and the regime of aliens). Thus, scientific reserves, nature reserves, nature monuments and, as the case may be, geoparks, sites of universal natural heritage, wetlands of international importance, sites of community importance, special conservation areas and special avifaunistic protection areas that do not require special management structures are administered by the National Agency of Protected Natural Areas.

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.

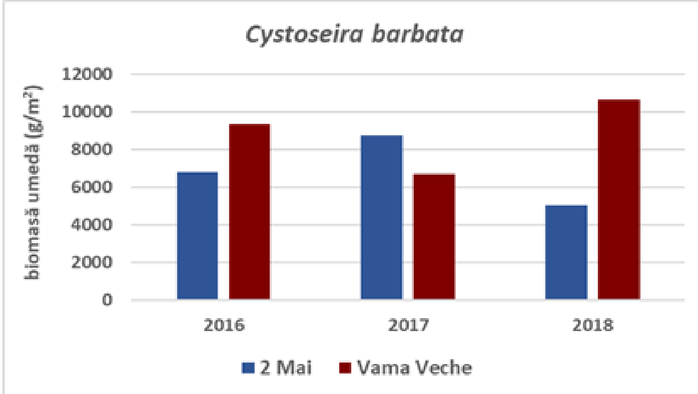
The status and trends of the marine and coastal environment of „Acvatoriul Litoral Marin Vama Veche - 2 Mai" were also monitored in 2018.

Fitobentos

The Vama Veche-2 Mai Marine Reservation (Natura 2000 site - ROSCI0269) offers optimum conditions for the development of phytobenthic communities from the qualitative and quantitative point of view, due to the mosaic appearance of the area, the presence of the hard substrate and an adequate transparency. From the point of view of the phytobenthic elements, the primary interest is the perennial brown alga Cystoseira barbata, which is one of the reasons why the area received the reservation status. This species forms true underwater scrubs, with a rich associated fauna and flora, between 1 - 3 meters deep, generating a habitat characteristic of the southern extremity of the Romanian coast.The monitoring of the phytobenthic component was carried out in summer 2018 through field expeditions, underwater photographs and filming and sampling, which were subsequently subjected to qualitative and quantitative analysis. The perennial brown alga C. barbata (figure II.55) varied quantitatively between 3,200 and 20,000 g / m2, similar evolutions with previous years (figure II.56).

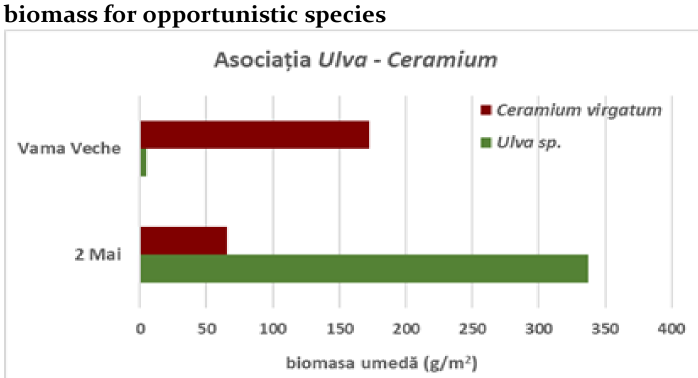
Figure II.55 Appearance of the brown algae Cystoseira barbata in the natural environment (original photo)

Figure II.56 Wet biomass variation for the perennial species Cystoseira barbata (evaluation period 2016-2018)



As for the opportunistic species, during the summer season, within the reservation dominated the association Ulva - Cladophora - Ceramium, characteristic for the warm period of the year. In 2 Mai, the green alga Ulva rigida developed intensively, with a variation of fresh biomass between 500 and 850 g / m2, while in Vama Veche it predominated near Ulva. rigida and red algae Ceramium virgatum, with a maximum of fresh biomass of 400 g / m² (Figure II.57).

Figure II.57 Variation of wet biomass for opportunistic species



In fact, the two species mentioned above are species associated with the Cystoseira belt from the Vama Veche Marine Reserve - 2 Mai and the main components of algal deposits that form during the summer season on the shore, due to favorable environmental conditions (figure II.58).

Figure II.58 Appearance of algal deposits in the reservation area (August 2018) (original photo)

In recent years, however, these episodes of the formation of impressive quantities of seaweed on the shore have been punctiform, increasingly reduced both in frequency and in size within the reserve.

Zoobentos

From the point of view of benthic biocenoses, the reserve has a mosaic appearance, on a relatively modest surface, which also gives the organisms that populate it a high biodiversity character.

The main types of habitats encountered in this aquarium are:

- hard-rocky habitat - representing more than half of the reserve surface, having a uniform layout in the north, south and west, consisting of limestone or stone platforms. These habitats are continuous between the shore line and depths up to 12-18 m;
- sandy habitat - cornered to the eastern and central parts, occupying almost 30% of the surface of the bottom, being formed of mobile sediments with distinct granules, rough to the pebble and non-adherent;
- wet habitat - disposed towards NE and isolated islands on the surface of the reserve, occupying less than 10% of the bottom of the aquarium, being made up of mobile sediments, with sand granules and sludge;
- sandy-muddy habitat - occurring especially in the eastern area, covering only 6% of the surface and being composed of mobile sediments.

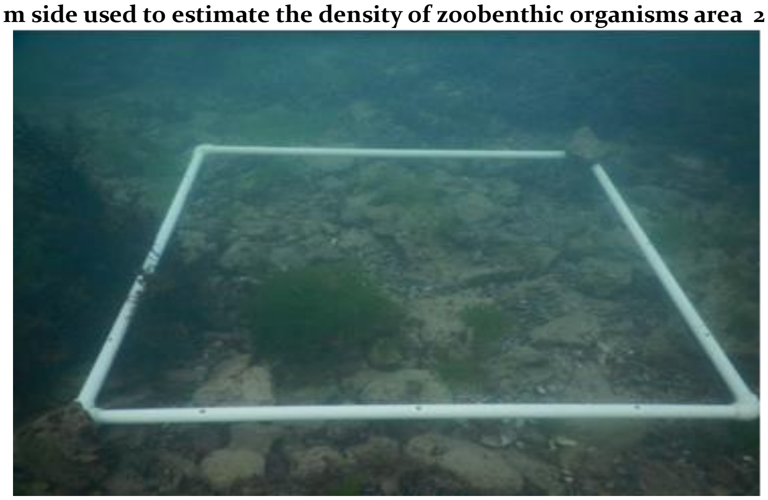
Given the large area occupied by the rocky habitat within the reserve, an analysis of the stone species was made in 2018.

In the areas with hard substrate in the reserve, in addition to the visual analyzes performed by direct immersion, some rarer species have been analyzed quantitatively.

In the summer of 2018, around 10 scientific dives were realized both at the shallow (1-5 m) area and at greater depths (10-15 m).

To estimate the density of organisms, a 1 m square was used, which sat on the seabed and all the organisms of interest inside it were counted (figure II.59).

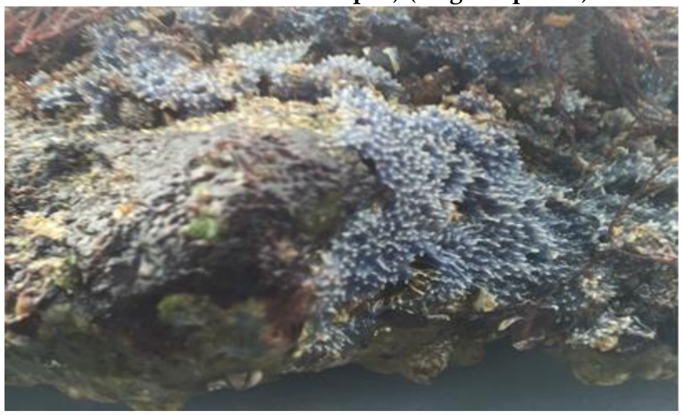
Figure II.59 Square with 1 m side used to estimate the density of zoobenthic organisms area 2 Mai, 2018 (original photo)



Of the sessile organisms, also in 2018, the molluscs of the species Mytilus galloprovincialis and Mytilaster lineatus dominated in density and biomass, which, besides occupying large areas in the reserve, also housed numerous other smaller, macrobenthic and meiobenthic species.

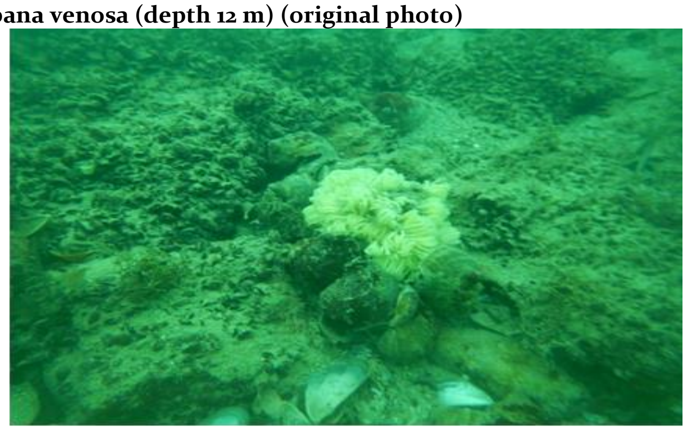
Another important presence in the reservation area was the sponges Dysidea fragilis. At depths of 10-18 m, its blue colonies are quite frequent (figure II.60). Dysidea form special agglomerations, being able to cover the rocky bottom, including the mussel colonies, on large areas.

Figure II.60 Dysidea fragilis (on stone removed from 12 m depth) (original photo)



In 2018, the invasive gastropod Rapana venosa was also frequently observed (figure II.61).

Figure II.61 Reproductive rapana venosa (depth 12 m) (original photo)



Gibbula divaricata (Figure II.72) was observed trapped on rocks from 0.5 m depths to 10-12 m. The highest densities of Gibbula divaricata gastropod (10-12 ind / m^2) were observed on stones at shallow depths (0.5 -1 m).

Figure II.62 Live specimens of Gibulla divaricata and Mytilus galloprovincialis from the Vama Veche area (original photo)

Scientific diving has once again proved to be a very good method of analyzing the state of marine ecosystems. The general conclusion is that the state of the ecosystem in the reserve is a good one and no major changes were observed compared to 2017, when the method of investigation was the same (scientific diving).

Ihtiofauna

Ihtiofauna is a basic component of marine biodiversity from the Romanian coast. In the last decades, in the marine ecosystem the diversity of the ichthyofauna has undergone important changes, both qualitatively and quantitatively. These changes occurred as a result of the alteration of environmental conditions, but also due to inadequate fisheries management.

Some of these changes have had a major impact on both pelagic and benthic fish populations, affecting common and rare species, brood and adults, commercial and non-commercial fish populations, thus reducing time until near the disappearance of some fish populations and very rarely the introduction of new species.

To ensure the sustainability of fishery resources, their exploitation must be based on ecosystem principles that take into account all the interactions of the target stock with predators, competing species or prey, the hydroclimatic and hydrochemical effects, the interactions between fish and habitat, the effect of fishing on fishery resources and habitat.

During the period May - August 2018, fish samples were collected from the talians located in the southern part of the Romanian coast in the Natural Reserve area "Vama Veche Marine Coastal Aquarium - 2 May".The marine talian is a large fishing trap type tool, installed at depths of 5-12 m (figure II.73). In the marine talians, the fishing (concentration) and retention (catching) chambers of the fishing object are installed parallel to the shore, these can reach lengths of 70 m, while the role for directing the fish has wings made of mesh, with lengths 300 - 500 m, placed perpendicular to the shore direction (Radu Gh. et al., 2008). The collected fish samples were analyzed in the laboratory of ichthyology.

Figura II.63 Talian fishing on the Romanian coast (original photo)

The inventory of ichthyofauna on the Romanian Black Sea coast totaled 134 species belonging to a number of 45 families, of which 20 are very common, 25 species are rare, 69 are very rare, and 20 are absent (Petranu, 1997). During the analyzed period, from a qualitative point of view, a number of 12 families were identified in the "Vama Veche-2 Mai Marine Coastal Aquarium" Nature Reserve (table II.43).

Table II.43 Qualitative structure of the biodiversity of the ichthiofauna in the Vama Veche-2 Mai Marine Coastal Aquarium" Nature Reserve

Family	Species	Popular name
Atherinidae	*Atherina hepsetus*	aterină
Callionymidae	*Calliumymus pudillus*	șoricel de mare
Clupeidae	*Sprattus sprattus*	șprot
	Alosa tanaica	rizeafcă
Carangidae	*Trachurus mediterraneus ponticus*	stavrid
Centracanthidae	*Spicara smaris*	smarid

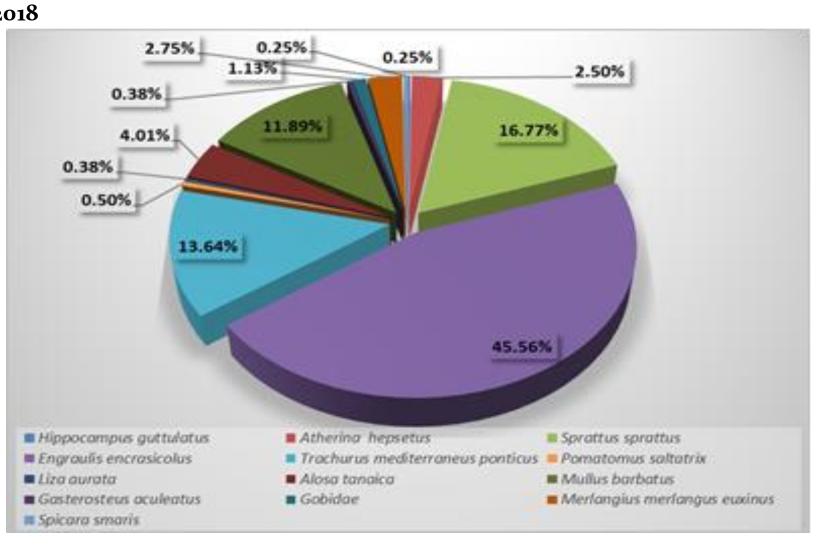
Engraulidae	*Engraulis encrasicolus*	hamsie
Gadidae	*Merlangius merlangus euxinus*	bacaliar
Gobidae		guvizi
Mullidae	*Mullus barbatus*	barbun roșu
Mugilidae	*Liza aurata*	chefal
Pomatomidae	*Pomatomus saltatrix*	lufar
Syngnathinae	*Hippocampus guttulatus*	căluț de mare

The quantitative evaluation of the ichthyofauna fished during the period studied in the "Vama Veche-2 Mai Marine Coastal Aquarium Natural Reserve of the Romanian coast of the Black Sea showed catches especially of commercial species, non-commercial species having a low occurrence frequency, mainly due to the fishing tool used (talian) (figure II.64).

Figure II.64 Capture at the Fishermen's Point from2 Mai: lard, mackerel, anchovy, sprat, turbot etc. (original photo)

In 2018, in the reserve area the value of the catch of Engraulis encrasicolus was the highest, representing 45.56% of the total, the second value being that of the catch of sprat, of 16.77%, followed by that of the horse mackerel, of 13.64%. Non-commercial species were present in the proportion of 0.1 - 2% (figure II.65).

Figure II.65 Graphical representation of the ichthyofauna identified in the Natural Reserve "Vama Veche-2 Mai Marine Coastal Aquarium", in 2018



Marine mammals

Within the Natural Reserve "Vama Veche-2 Mai Marine Coastal Aquarium", species of marine mammals, dolphins, which are species of European importance (present in Annex II of Directive 92/43 / EEC) have been identified; were observed in the summer of 2018 the species of cetaceans 1349 T. t. ponticus and 1351 P. p. relicta, which use the area as a place of passage and feeding. There are no data regarding the size of the populations of the two species of cetaceans, neither on the Romanian coast nor in the Black Sea. According to the Natura 2000 standard sheet, for the populations of these species within the site, the D rating is granted, that is to say, an insignificant population.

According to the IUCN criteria, T. t. Ponticus (aphid) is considered endangered (EN). It is characteristic of the entire pontic basin.

Awareness and communication, ecological education

The communication and awareness actions are one of the pillars of the activity of the custodian team. In this regard, informative leaflets were made with the description of the Reservation, which were distributed both to the tourists in the area, as well as during the different events organized by the INCDM. Also, at the Gymnasium School in 2 Mai, an Information Center operates, within which the members of the Junior

P. p. Relicta (marsuin) is characteristic of the entire pontic basin; is listed as Endangered.
During 2018, in the beach area related to the protected natural area "Vama Veche-2 Mai Marine Coastal Aquarium" (ROSCI0269) no specimens of failed cetaceans were identified..

Ranger ecological club operate**.** With the help of Junior Rangers, informative leaflets were distributed throughout the summer season. Awareness and education activities were carried out among the students. In this sense, during the week "Scoala Altfel" 2018, lectures were held and films were made regarding the Vama Veche-2 Mai Marine Reservation. More than 200 students from Constanța county learned about the existence of this protected marine area.

Figure II.66 Aspects of World Environment Day, June 5th, 2018

To mark the World Environment Day, in 2018 the National Institute for Marine Research and Development "Grigore Antipa" (INCDM) Constanța organized on June 5th an action with the Junior Ranger of the Vama Veche- 2 Mai Marine Reserve at the Gymnasium School no. 2 from the locality 2 Mai. The event was registered among the activities of ensuring the custody of the Vama Veche- 2 Mai Marine Reservation, as well as of the Working Group for Marine Waste within the INCDM (figure II.66). The theme for 2018 was "Beat Plastic Pollution" and the organizers urged governments, industries and communities to come together and find sustainable alternatives to the excessive use of plastic that pollutes the oceans and threatens our health. As part of the activity, the Junior Rangers team for the summer season 2018 was confirmed and trained, which started its activity through a marine waste monitoring exercise through the Marine Litter Watch App (MLW) mobile application, created by the European Environment Agency (EEA).
In conclusion, the state of the marine environment at the site ROSCI0269 (Vama Veche-2 Mai Marine Coastal Aquarium) presents a slight tendency of improvement, constant in recent years, confirmed by the presence of a remarkable diversity of species. No major pollution sources have been identified in the area of the protected natural area. There were no special events in the perimeter of the Vama Veche-2 Mai Marine Reservation, which would modify / alter the marine habitats. The custodians did not encounter problems either in relation to the tourists present in the beach area related to the Vama Veche-2 Mai Marine Reservation or in the one with the local authorities, who have always supported the actions carried out in the area. By Notification no. 6820 / 22.11.2018 sent to the National Institute for Marine Research and Development "Grigore Antipa" (INCDM) Constanța by the National Agency for Protected Natural Areas, it was requested to surrender the obligations and rights regarding the administration of the protected area mentioned above. INCDM has submitted to the deadline the documentation requested according to Annex 1 sent along with the Notification, in electronic format and on paper, so that, at present, it no longer holds the duties of custodian of ROSCI0269: The Natural Reserve "Vama Veche-2 Mai Marine Coastal Aquarium".

Marine habitats

In 2018, INCDM was not approached for research on the knowledge and monitoring of habitats classified according to the requirements of the Habitats Directive (Council Directive 92/43 / EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora species.). Instead, it was effectuated the "Study on the elaboration of the report on the ecological status of the Black Sea marine ecosystem according to the requirements of art. 17 of the Framework Directive Strategy for the marine environment (2008/56 / EC) "funded by the Ministry of Waters and Forests (contract no. 60 / 29.08.2018) which addressed the issues of habitats through the requirements of the Framework Directive for the Strategy of the Marine Environment (available on -line at the address http://cdr.eionet.europa.eu/ro/eu/msfd_art17/2018reporting/textreport/envxbptkq/Romania_roof-report.pdf) .

For the sedimentary habitats studied, the conclusions were as follows:

- In the studied area, by superimposing the sampling stations on the sedimentological maps, using as a basis the map of the habitat types from EMODnet (EUSeaMap), the following major types of habitats were identified.:
- In the water body with variable salinity (Sulina - Periboina, at depths of 5-20-30m): infralitoral sands; cross-border muds; circalitoral muds.
- In the body of coastal water (Periboina - Vama Veche, at depths of 5-20m): infralittoral sands; circalittoral sands; circalittoral muds. In addition to the large physical sedimentary habitats, in the body of coastal water there has been identified the cross-border rock with photophilic algae, a special type of habitat, which has been well studied and characterized only from a floristic point of view. It includes two subtypes, depending on the dominant floristic species: the subtype with brown algae Cystoseira barbata and the one with red algae of the genus Phyllophora (Coccotylus truncatus dominant species).
- In the body of marine waters: circalittoral muds with biogenic reefs of Mytilus galloprovincialis (27-57m), mixed sediments and wide circalittoral reeds with Modiolula phaseolina (70-100m).
- In the period 2012-2017 in the water body with variable salinity the good ecological state (GES) was reached, all the types of large benthic habitats identified and analyzed by applying the M-AMBI * (n) multiparametric index, being in good ecological state. Also, the coastal water body, in which three types of benthic habitats have been identified and studied on sedimentary substrate populated by zoobenthal organisms, has reached good ecological status (GES) for the 2012-2017 reporting period.

During the studied period, the infralittoral rocky habitat with photophilic algae reached good ecological status for both key habitat subtypes, both Cystoseira and Phyllophora, an analysis carried out following the application of the EI multiparametric index. The assessment period for the Phyllophora habitat was much shorter (2016-2017), as the distribution area of this species was recently identified, so constant monitoring of this type of habitat is needed in the future to observe the exact evolution trend. Also, the subtype with Zostera, defined within the major sandy-malos infralittoral major habitat, reached good ecological status (GES) during 2012-2017, based on the analysis made using the EI index.

- In marine waters, the habitat of the circalittoral reefs with biogenic reefs of Mytilus galloprovincialis did NOT reach the good ecological status (non-GES). When assessing the condition, in addition to the MAMBI index * (n), (whose average value for the period 2012-2017 was at the threshold value of 0.68), living biomass and indicator, which had very low values, were used as an indicator, much smaller than the target (target) previously set. On the other hand, the habitat of mixed sediments and mixed sedimentary sediments with Modiolula phaseolina from the broad seagrass reached the good state (GES), although its evaluation period was shorter (2015-2017). Its trend of evolution will be followed later. Habitats with hard substrate in the water bodies in which they are present have not been evaluated due to the lack of recent data. Coastal sedimentary habitats were not evaluated due to lack of quantitative data.

For the habitat coastal sands with Donacilla cornea and infralittoral sands with Donax trunculus there are only qualitative observations, the quantitative data not being sufficient for an adequate assessment of their ecological quality.

II.3.1.2. The state of marine living ecosystems and resources

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

TITLE: DIVERSITY OF SPECIES
DEFINITION: The indicator describes the status and trends of biodiversity, more precisely the variation of biodiversity over time in the context of relevant environmental policies, in particular the European Biodiversity Strategy; sustainable fishing is pursued until 2015 (setting maximum production to ensure sustainable use of fish resources).

FITOPLANCTON

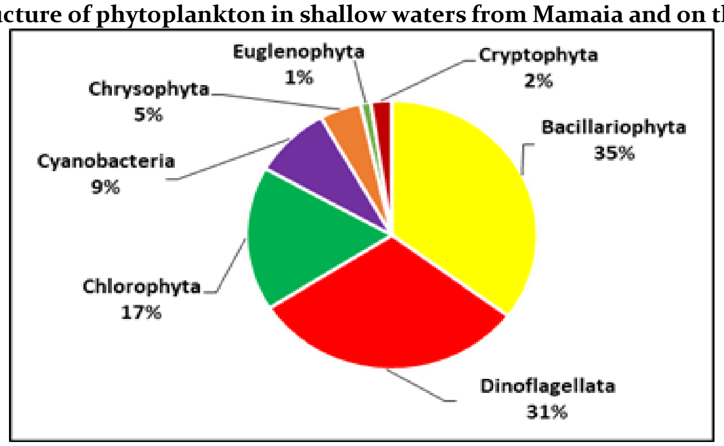
In 2018, the identification of the qualitative and quantitative structure of phytoplankton, as an indicator of the state of eutrophication, was made following the analysis of the samples collected in July (41 stations) and September (7 stations) on the profiles of the monitoring network of waters with variable salinity, of coastal and marine waters from the Romanian Black Sea coast.

From the spatial distribution of the mean values per decade of salinity from the available data World Ocean Data (ftp://ftp.nodc.noaa.gov/) and INCDM (www.nodc.ro), but also from the monthly average values of chlorophyll for period 07.2002-10.2013 (disc.sci.gsfc.nasa.gov/Giovanni) and according to EC decision 848/2017, the Romanian marine waters were classified into four bodies of water:

- BLK_RO_RG_TT03 - waters with variable salinity (from baseline to 30 m isobath),
- BLK_RO_RG_CT - coastal waters (from baseline to 30 m isobath),
- BLK_RO_RG_MT01 - seawater (shelf) - over the 30 m isobath to the 200 m isobath,
- BLK_RO_RG_MT02 - seawater - over 200 m isobath.

Following the analysis of phytoplankton samples from the shallow waters of Mamaia and those from the two expeditions made on the continental shelf of the Black Sea in 2018, 173 species with varieties and forms were identified, belonging to 7 taxonomic groups (Bacillariophyta , Dinoflagellata, Chlorophyta, Cyanobacteria, Chrysophyta, Euglenophyta and Cryptophyta) (figure II.67). The dominance of diatoms is observed in the annual qualitative structure of phytoplankton (with 61 species), followed by dinoflagellates (with 53 species), chlorophytes (with 30 species) and cyanobacteria (with 15 species). The remaining groups (chrysophytes, cryptophytes and euglenophytes) were represented by fewer species (8, 4, respectively, 2 species).

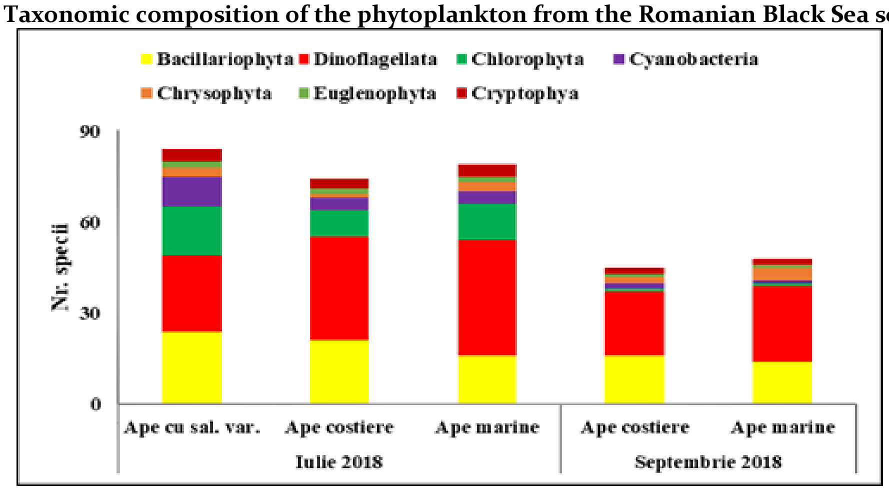
Figure II.67 Qualitative structure of phytoplankton in shallow waters from Mamaia and on the continental shelf, in 2018



On the continental shelf of the Black Sea, in July the greatest diversity was encountered in the waters with variable salinity (84 species), where the total number of diatoms (24 species) was very close to that of dinoflagellates (25 species). They were followed by sweet-salmastricole species from the chlorophyte group (16 species) and from the cyanobacteria group (10 species).

Of the groups with predominantly marine species, salmastricole (chrysophytes, euglenophytes, cryptophytes) were less representative (2-4 species each). In the coastal and marine waters the dominance of the dinoflagellates is maintained, being represented by 34, respectively, 38 species. Chlorophytes, with 9-12 species and cyanobacteria with 4 species, are most noticeable in marine waters. The remaining groups (chrysophytes, euglenophytes and cryptophytes were represented by 1-4 species (figure II.68).

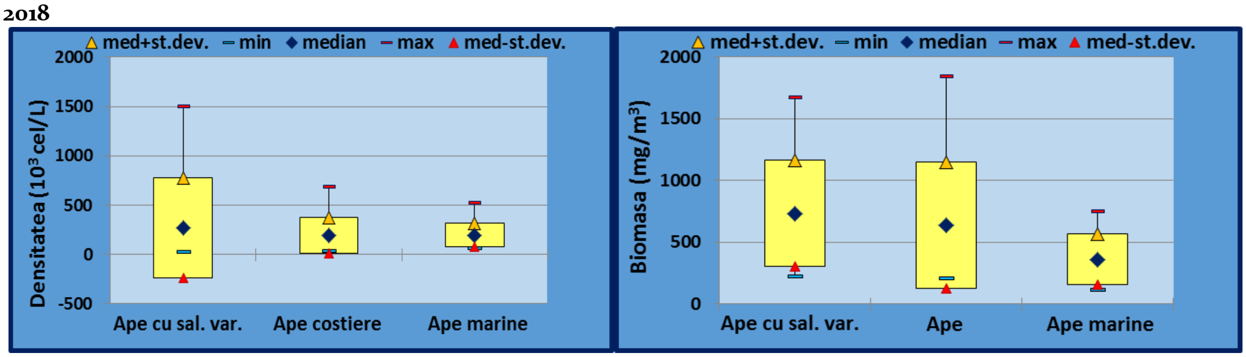
Figure II.68 Taxonomic composition of the phytoplankton from the Romanian Black Sea sector, in 2018



In September, on the East Constanța profile, dominance also returned to the dinoflagellates, both in coastal waters (21 species) and in marine waters (21 species). They were followed by diatoms (with 16 species in coastal waters and 14 species in marine waters). The other groups (chlorophytes, cyanobacteria, chrysophytes, euglenophytes and cryptophytes) had a smaller diversity, being represented by 1-4 species.

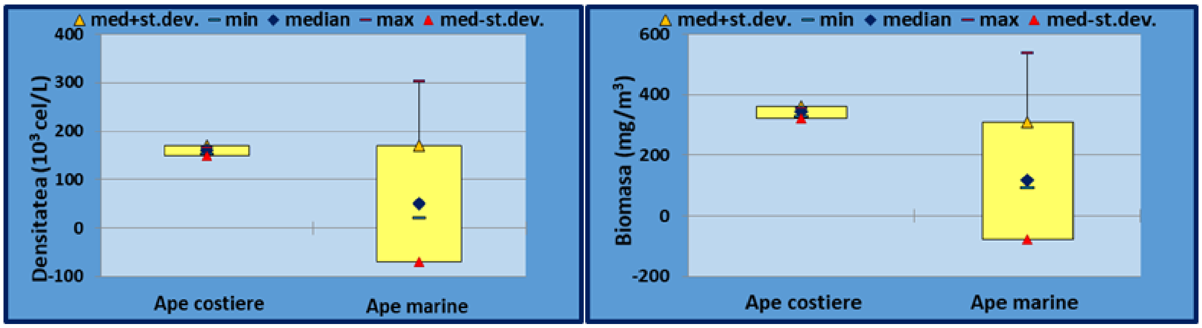
In July, phytoplankton abundances and biomass ranged from $28,40 \cdot 10^3$ and $1,51 \cdot 10^6$ cel / L and 114 and 1843 mg / m^3. The distribution of quantities by type of water shows maximum values recorded in the waters with variable salinity, regarding the total density of phytoplankton. Regarding the total biomass recorded, the maximum value was found in the coastal waters (figure II.69).Thus, the highest values of the phytoplankton densities and biomass in the waters with variable salinity, respectively, the coastal waters, were recorded on the Portița 1 stations respectively, East Constanta 2, in the surface horizon.

Figure II.69 Variation of phytoplankton densities and biomass in Romanian coastal, marine and transient waters, in July 2018



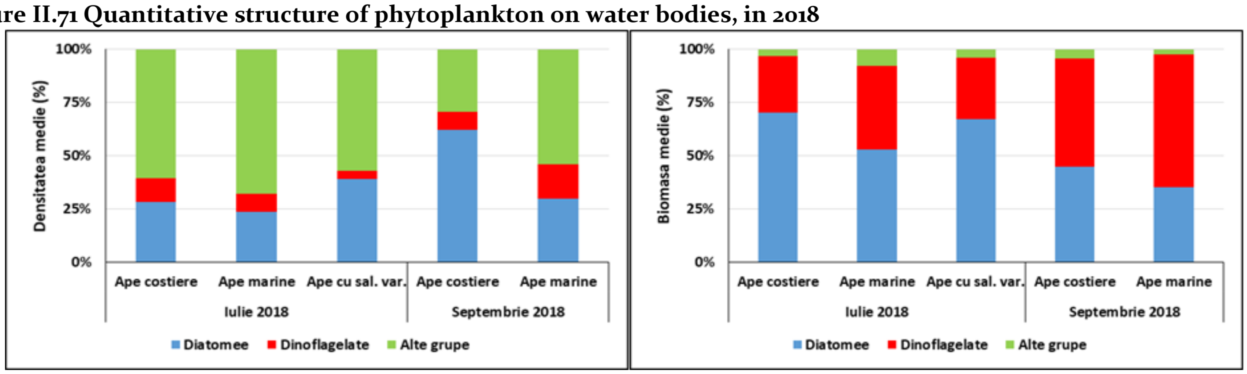
In September, phytoplankton abundances and biomass ranged from 20,50 · 103 and 302,72 · 103 cel / L and 94 and 539 mg / m^3. The distribution of quantities by type of water shows maximum values recorded in marine waters (figure II.70).Thus, the highest values of phytoplankton densities and biomass in marine waters were recorded on the East Constanta 3 station, on the surface horizon. In the coastal waters, the maximum values were found on the eastern station Constanta 2, in the surface horizon (166,76 · 103 cel / L and 356 mg / m^3).

Figure II.70 Variation of phytoplankton densities and biomass in Romanian coastal, marine and transient waters, in September 2018



Regarding the quantitative structure of phytoplankton (Figure II.71), we can see the dominance of the species from other groups, mainly of the cyanobacteria (Planktolyngbya circumcreta and Phormidium hormoides) and of the coccolithophorid Emiliania huxleyi, reaching between 57-68% of the average density in July in all bodies of water. In September, the dominance returned to diatoms in coastal waters (Pseudonitzschia delicatissima and Cyclotella meneghiniana). The other groups were dominant in marine waters, with 54% of the total average density, the most important being cyanobacteria (Phormidium hormoides), cryptophytes (Hillea fusiformis) and coccolithophorids (Emiliania huxleyi).

Figure II.71 Quantitative structure of phytoplankton on water bodies, in 2018



Diatoms were dominant in the average biomass in July, with 53-70% of the total in all water bodies, followed by dinoflagellates (with 27-39%). The other groups had a small contribution (about 3-8%). Of the diatoms, the most important species were: Pseudosolenia calcar-avis (1593 mg / m^3), Cyclotella meneghiniana (781 mg / m^3) and Thalassiosira subsalina (708 mg / m^3). Of the dinoflagellates, the following were noted: blood Akashiwo (478 mg / m^3), Protoperidinium granii (209 mg / m^3), Round wafer (190 mg / m^3).
In September, the dominance in the average biomass returned to the dinoflagellates (51-62%), being followed by diatoms (35-45%), both in the coastal waters and in the marine waters. Of the most important dinoflagellate species found in these areas, we mention: Prorocentrum micans (180 mg / m^3), Neoceratium furca (73 mg / m^3), Protoperidinium granii (52 mg / m^3) and Blood Akashiwo (49 mg / m^3). Among diatoms, Pseudosolenia limestones (101 mg / m^3), Chaetoceros affinis (42 mg / m^3), Cyclotella meneghiniana (39 mg / m^3), Nitzschia longissima (38 mg / m^3) were noted.

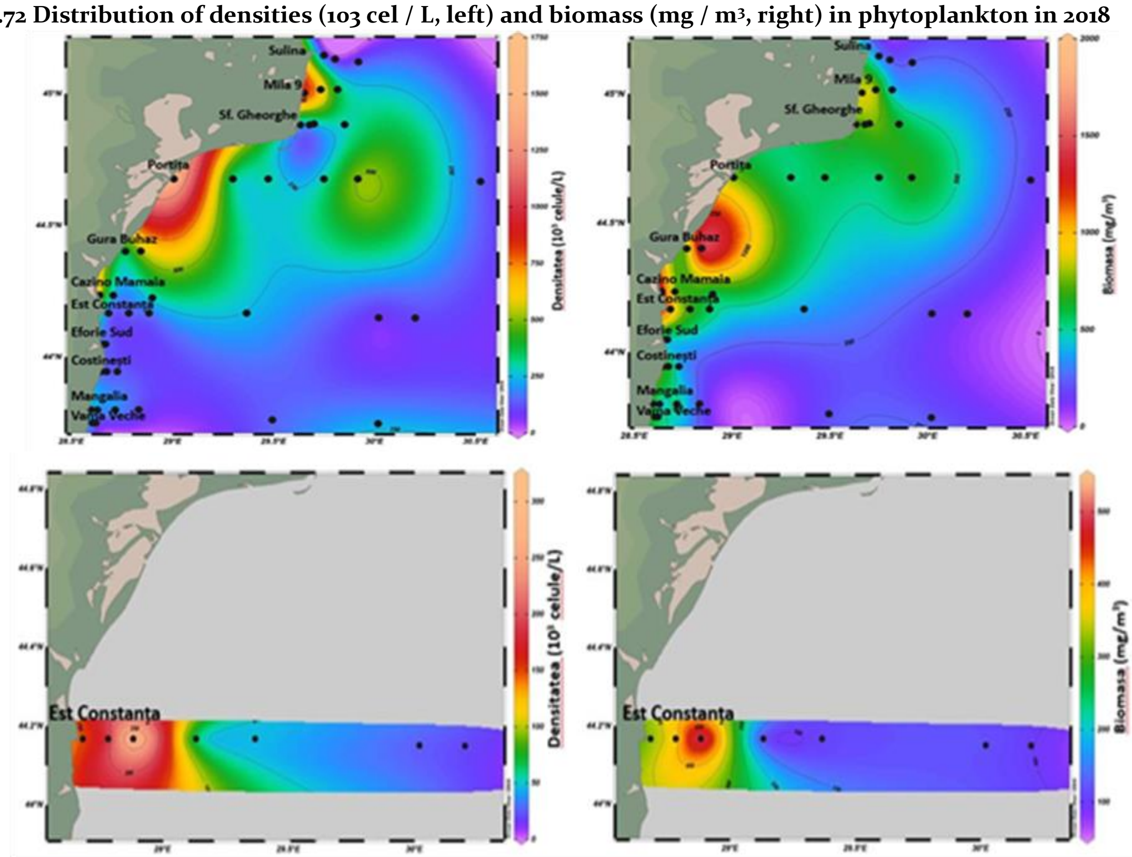
Regarding the distribution of phytoplankton in the surface horizon (figure II.72) the following specifications are made:

- In July, higher values of total density were recorded in the northern area, on the Mila 9 profile, the isobaths of 5 and 20 m, where the values varied between 751-994 · 103 cel / L, and on the Portița station 1, where the maximum value of 1.51 · 106 cel / L was reached. The values decrease towards the south of the coast, reaching approx. 39 · 103 cel / L on the Vama Veche profile, isobath of 20 m. Also, lower values are observed in waters farther from the influence of the Danube waters, as well as with the removal of the shore, in the southern area (below 200 · 103 cel /L).

Regarding the distribution of the phytoplankton biomass, the highest values were recorded in the coastal waters (East Constanța 2 - 1843 mg / m^3, Gura Buhaz 20 m - 1703 mg / m^3, Casino Mamaia 5 m - 1434 mg / m^3, East Constanța 1 - 1260 mg / m^3) and in the waters with variable salinity (Miles 9 5 m - 1678 mg / m^3, Miles 9 20 m - 969 mg / m3, St. Gh. 30 m - 879 mg / m^3). Also, the values decrease with the removal of the influence of the waters The Danube and with the shoreline removal up to 213 mg / m^3 at Mangalia 2 station, respectively 114 mg / m^3 at East Constanta 7 station.

In September, the maximum values of density and biomass were found on the eastern station Constanta 3 (303 · 103 cel / L and 539 mg / m^3), values that decreased to 21 · 103 cel / L and 100 mg / m^3 at East Constanta 7 station.

Figure II.72 Distribution of densities (103 cel / L, left) and biomass (mg / m³, right) in phytoplankton in 2018

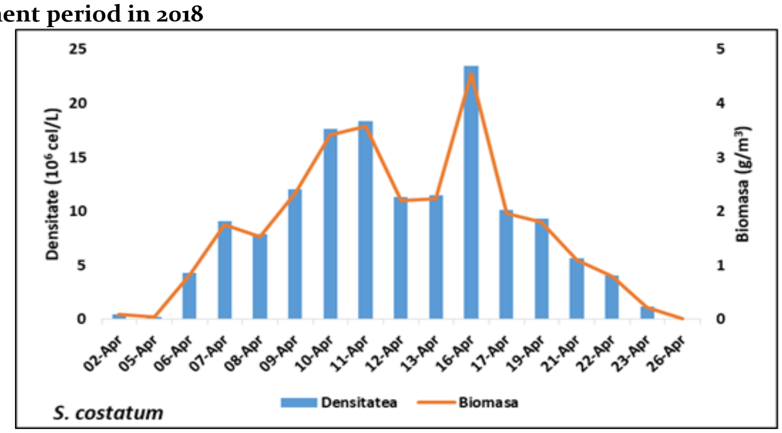


- **Algae blooms**

During the year 2018, in the waters of the continental shelf and in the shallow waters of Mamaia, four species of microalgae recorded more than one million cells per liter, with only one species compared to 2017. The size of these phenomena was higher, up to 23.44 · 106 cel / L, compared to the maximum value of 13.6 · 106 cel / L, registered in 2017.

The first flowering phenomenon of the year was caught, in February, in the shallow waters of Mamaia. It was determined by the development of the cyanobacterium Planktolyngbya circumcreta (1,02 · 106 cel / L), a species whose development was also surprised in July, on the Portița 1 station (1,09 · 106 cel / L).
From mid-March to early April, another species from the cyanobacteria group (Pseudanabaena limnetica) recorded densities of over 1 · 106 cel / L (1,89 · 106 cel / L on 12th of March, 3,18 · 106 cel / L on March 26th and 3,92 · 106 cel / L on April 5th).
And this year, the large-scale development of the species of diatoms Skeletonema Costatum has been noted, starting with April 6th (4,29 · 106 cel / L). The maximum value was almost 2 times higher (23,44 · 106 cel / L, on April 16th) than the one registered in 2017 (13,6 · 106 cel / L, on March 12th) (figure II.73).

Figure II.73 Variation of density and biomass of the species Skeletonema costatum in shallow waters of Mamaia during the maximum development period in 2018



Another diatom species, Cerataulina pelagica, produced an isolated, low intensity (1.4 · 106 cel / L) flowering phenomenon on May 17th, in the shallow waters of Mamaia. With this event, the maximum value of this year's biomass was recorded (5.38 g / m³, of which approximately 94% was C. pelagica biomass).

- **Assessment of the ecological status of water bodies based on the biomass element (mg / m³) in 2018**

Phytoplankton is one of the basic biological elements in the Water Framework Directive (WFD) and is also considered in 4 descriptors of the Marine Strategy Framework Directive (MSFD): Biodiversity (D1), Non-indigenous species (D2), Trophic network (D4) and Eutrophication (D5).
The phytoplankton biomass indicator shows the level and trends of biomass values (mg / m³) of the warm season (May-September) in the Romanian coastal waters. The assessment of the ecological status was performed for the waters with variable salinity, the coastal and marine waters, for the warm season of 2018, by calculating the 90th percentile for the biomass values corresponding to the surface layer (0 m) of each profile and comparing with the threshold value in the methodology.
Thus, it can be observed that the values of the biomass obtained for the variable salinity and marine waters of the hot season of 2018 were below the maximum allowed value, placing them in the good ecological state.
In the coastal waters, the values obtained for the northern area profiles (Gura Buhaz, Casino Mamaia and East Constanța) exceeded the target value set for this body of water (950 mg / m³). Thus, the body of coastal waters was classified in bad ecological state (table II.44).

Table II.44 Ecological status of water bodies based on biomass element (mg / m³) in 2018

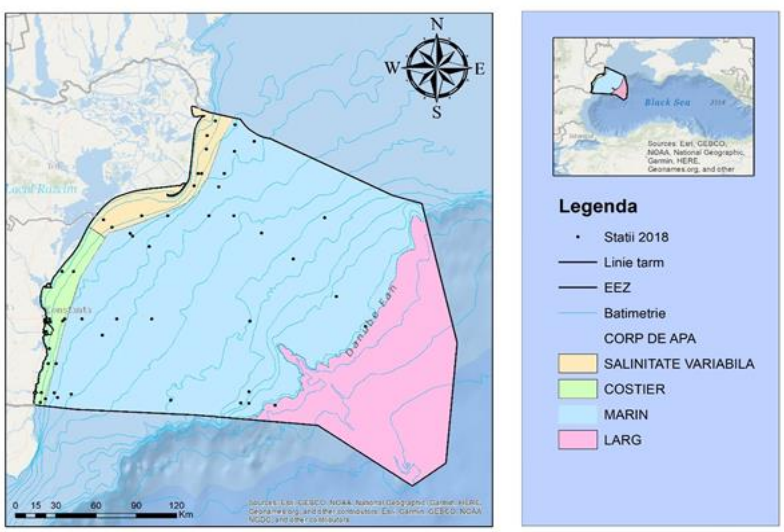
Water body	Profile	Target value (mg/m³)	Obtained value 2018 (percentile 90)	Ecological state
Water with variable salinity				
BLK_RO_RG_TT03	Sulina	3000	290	

	Mila 9	3000	1607	
	Sf. Gheorghe	3000	850	
	Portița	3000	727	
Coastal waters				
BLK_RO_RG_CT	Gura Buhaz	950	1592	
	Cazino Mamaia	950	1345	
	Est Constanța	950	1668	
	Eforie Sud	950	429	
	Costinești	950	726	
	Mangalia	950	728	
	Vama Veche	950	598	
Marine waters				
BLK_RO_RG_MT01	Sulina	800	289	
	Mila 9	800	303	
	Sf. Gheorghe	800	632	
	Portița	800	645	
	Cazino Mamaia	800	453	
	Est Constanța	800	645	
	Costinești	800	346	
	Mangalia	800	521	
		Good ecological state	**Bad ecological state**	

Zooplankton

The stations from which samples were collected covered the entire Romanian continental shelf of the Black Sea (figure II.74).

Figure II.74 Map with the location of zooplankton sampling stations in 2018



Micro Zooplankton

In 2018, the population of tintinides from the microzooplankton component was evaluated in July. In this respect, 34 samples were analyzed, from horizons 0 and 10 m, from 18 stations located on the profiles of Portița, Est-Constanța and Mangalia.

The samples were collected with Niskin bottles, stored in plastic containers (500 ml) and stored with formalin in final concentration 4%.

In the laboratory, the samples were concentrated to a final volume of 10 ml by repeated sedimentation. The final volume was fully analyzed under the inverted microscope (Olympus XI 51) using 200x and 400x magnification factors.

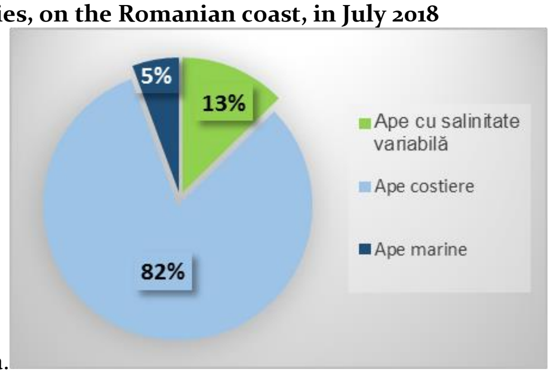
The taxonomic identification of tintinides was made according to their shape and size, according to the literature of speciality. For the qualitative and quantitative analysis, both the voids of the tintinides and those with the protoplasm were taken into consideration, as it has been shown that the mechanical and chemical disturbances associated with the collection and fixation procedures can cause the cell to detach from the lorica (Thompson & Alder, 2005). The density of organisms was expressed in individuals / liter (indiv./L). The volume of the lorica was calculated based on the total length and the aboral diameter of the lorica, respectively on the geometric shape assumed for each species. The biomass was expressed in carbon biomass (µgC / L) using the specific biovolume conversion formula, for biological material conserved with formol (Verity & Langdon, 1984).During the analyzed period the population of tintinides was characterized by 6 species belonging to the genera Tintinnopsis, Favella and Eutintinnus respectively (table II.45).

Table II.45 List of species of tintinides identified in July 2018, on the Romanian Black Sea coast

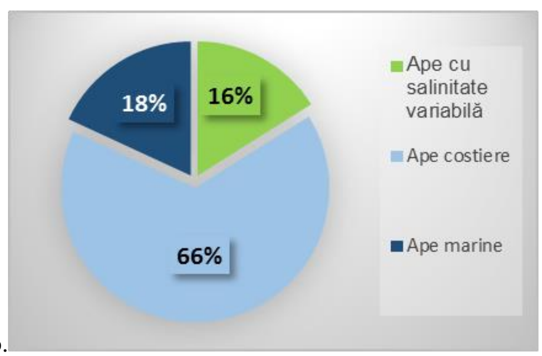
Order	Family	Gender	Species	Water with variable salinity	Coastal waters	Marine waters
Choreotrichida	Codonellidae	*Tintinnopsis*	*Tintinopsis beroidea*			+
			Tintinopsis minuta	+	+	+
	Ptychocylididae	*Favella*	*Favella ehrenbergii*		+	
	Tintinnidae	*Eutintinnus*	*Eutintinnus apertus*		+	+
			Eutintinnus lasus-undae			+
			Eutintinnus tubulosus	+	+	+

The water body with variable salinity was characterized by the lowest diversity of microzooplankton species (Tintinnopsis minuta, respectively Eutintinnus tubulosus). In terms of density, the population of tintinides is 13% of the total density. The biomass recorded was 16% of the total biomass during the period studied (figure II.75). The highest density in this water body was recorded by the T. minuta species (21 individuals / L), while the maximum biomass was recorded by the E. tubulosus species (0.03 µgC / L).

Figure II.75 Distribution of the density (a), respectively of the biomass (b) of the population of tintinides, on water bodies, on the Romanian coast, in July 2018



a.

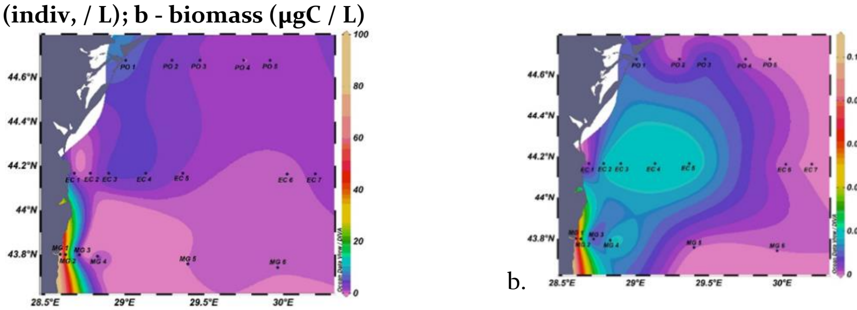


b.

The coastal body water was characterized by a diversity of four species of tintinides (Table II.51). It was the best represented water body, the tintinides population recording 82% of the total density and 66% of the total biomass during the analyzed period, respectively. The dominant species from a quantitative point of view was T. minuta, recording density and biomass values of 158 individuals / L and 0.13 µgC / L, respectively.

The marine water body was characterized by five species of tintinides, thus registering the highest diversity (table II.51). From the quantitative point of view, 5%, respectively 18%, of the density, respectively the total biomass of the population during the Compared to the same period last year, a completely different qualitative structure can be observed, meaning that in July 2018 a smaller number of microzooplankton species were identified, different from those identified in 2017. From a quantitative analyzed period, were present in this water body (figure II.75). The dominant species in quantitative aspect was E. tubulosus, which recorded density and biomass values of 7 individuals / L, respectively 0.05 μgC / L.
point of view, an increase in density from north to south of the coast and a decrease in density from shore to offshore, a situation also encountered last year (figure II.76).

Figure II.76 The quantitative distribution of the population of tintinides from the Romanian Black Sea coast, in July 2018: a - density (indiv, / L); b - biomass (μgC / L)



a.

b.

Conclusions:

- In July 2018, the population of tintinides from the microzooplankton component was represented by 6 species belonging to the genders Tintinnopsis, Favella and Eutintinnus respectively.
- From a qualitative point of view, the water body with variable salinity recorded the lowest diversity of species (2), while the marine water body was the best represented from this point of view (5 species).
- Following the quantitative analysis of the population of tintinides from the Romanian coast, the highest density was found in the coastal water body (82%), and the lowest in the marine water body (5%).).
- Following the analysis of the dominance of the species on each water body, it was observed that the minuta Tintinnopsis species dominated the water bodies with variable salinity, respectively coastal, whereas the species Eutintinnus tubulosus dominated the marine water body, which corresponds to the species ecology.
- The qualitative structure of the tintinides population analyzed in July 2018 is totally different in number of species, constituent species and their dominance, compared to the one registered in the same period last year.
- Quantitatively, we observe an increase of the density from the north to the south of the coast, respectively from the offshore stations, a situation encountered last year, during the same period analyzed.

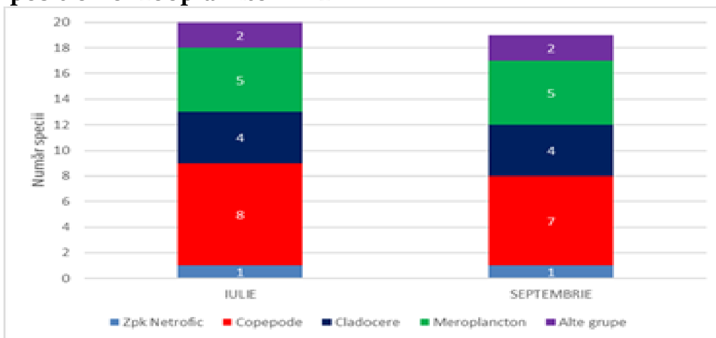
Mesozooplankton

In order to identify the ecological status of the mesozooplankton populations on the Romanian Black Sea coast, during 2018, within the program of monitoring the state of the marine environment, two sets of samples were taken and analyzed.

The mesozooplankton samples were collected from the network of stations represented in figure II.84, the network covering the three types of water bodies (with variable salinity, coastal and marine). The two expeditions undertaken covered only the hot season (one expedition in July and one expedition in September).

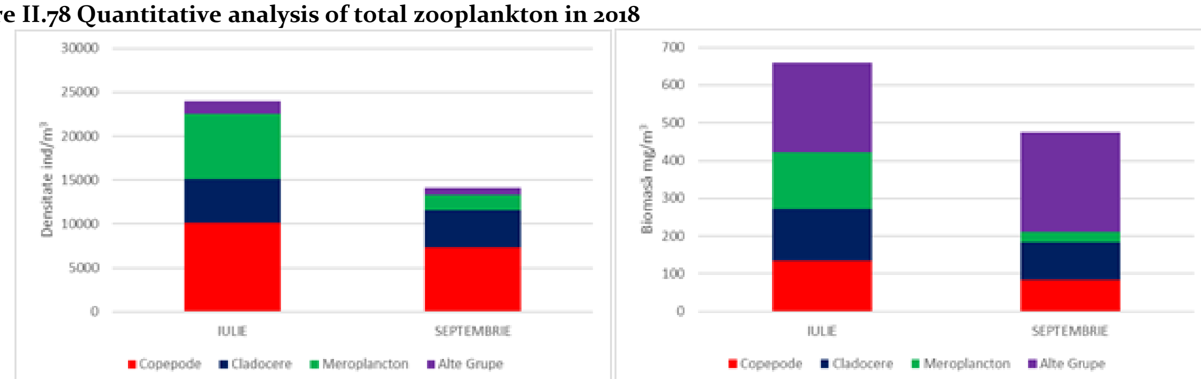
The qualitative composition of the mesozooplankton population of 2018 reached a total number of 20 species. The maximum number of species was recorded in July, in the marine water body, when the copepods dominated, with eight species, followed by meroplankton, with five species (figure II.77). In September, again dominated the copepods, with seven species, and the meroplankton with five, the total number of species this month being 19.

Figure II.77 Qualitative composition of zooplankton in 2018



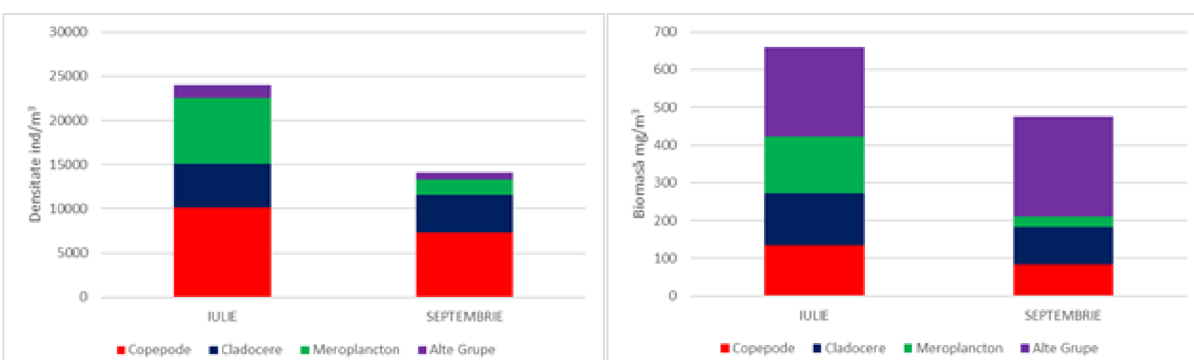
Regarding the quantitative structure of the mesozooplankton community in 2018, the highest values were recorded in July (32,081 ind.m³, 1,376 mg / m³), compared to September, when density values of 15,032 were recorded ind.m3 and biomass of 557 mg.m³. Trophic zooplankton dominated both months, with the maximum recorded in July (23,948 ind.m³, 660 mg.m³). The nontrophic component represented by Noctiluca scintillans reached low values of density and biomass in September 2018, with values of 939 ind.m³ and 83 mg.m³ (figure II.78).

Figure II.78 Quantitative analysis of total zooplankton in 2018



Within the trophic component, the copepods were the best represented, especially in July, when they reached the maximum density, with a value of 10.127 ind · m³, respectively a biomass 135 mg · m³, followed by the meroplanktonic component (7381 ind.m³, 148 mg.m³). In September, the copepods were again dominant (7,311 ind.m³, 85 mg.m³), followed by cladoceras (4,285 ind · m³, 98 mg · m³) (figure II.79).

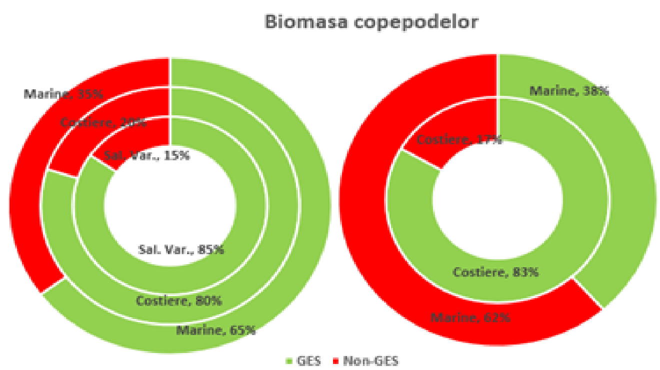
Figure II.79 Quantitative analysis of trophic zooplankton in 2018



The assessment of the ecological status for the year 2018 of the marine environment from the point of view of the zooplankton component was carried out only for the hot season (July and September), taking into account the distribution on water bodies corresponding to the Marine Strategy Framework Directive (DCSMM).The assessment of the reference conditions and the setting of the limits for defining the good ecological status (GES) was made based on the statistical analysis of the data from 1960-2002, as well as on the expert's judgment by calculating the 90th percentile of the values for each season and each water body for: copepod biomass, mesozooplankton biomass and Noctiluca scintillans biomass. The values obtained were comparable with the averages of 1960-1969 (Good Ecological Status / GES) and 1977-2002 (Bad Ecological Status / Non-GES). From the biomass values obtained for the analyzed indicators, the percentages that characterize each water body were calculated, according to the ecological status achieved in the analyzed samples in 2018. The warm season was characterized by two sets of samples collected in July and September. In July, the ecological evaluation of the three water bodies (with variable salinity, coastal and marine) was done, and in September only the coastal and marine body were evaluated, from the water body with variable salinity, no samples were collected.

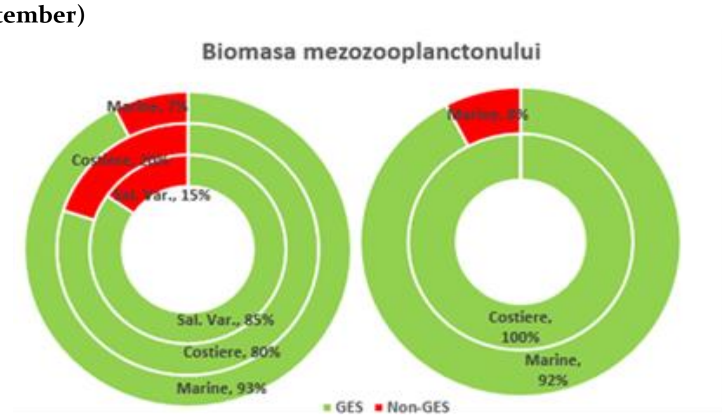
Thus, in July, in the case of the indicator "Biomass of copepods" values were recorded above the threshold of good ecological status in all three water bodies, the good ecological status being reached in a proportion of 85% in the waters with variable salinity, 80% in coastal waters and 65% in marine ones. In September, only the coastal body reached the good ecological state, in proportion of 83%, in the marine waters registering values below the threshold limits, thus placing the body in the bad ecological state, in proportion of 62% (figure II.80).

Figure II.80 Ecological status of water bodies based on the indicator "Biomass of copepods" in the hot season 2018 (left - July, right - September)



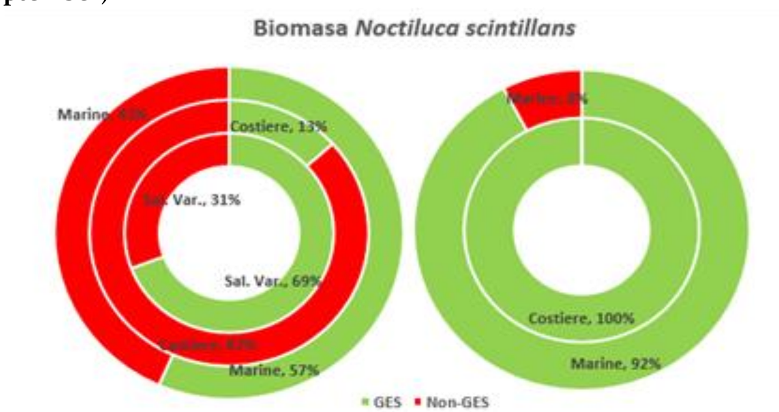
In the case of the indicator "Mesozooplankton biomass", in July 2018, the good ecological status was reached 85% in the waters with variable salinity, 80% in the coastal waters and 93% in the marine waters. In September, the water bodies again reached good ecological status, the coastal body reaching 100%, and the marine body reaching 92% (figure II.81).

Figure II.81 Ecological status of water bodies based on the indicator "Mesozooplankton biomass" in the warm season 2018 (left - July, right - September)



In the case of the indicator "Biomass Noctiluca scintillans", in July 2018, the good ecological status was reached in a proportion of 69% in the waters with variable salinity and in a proportion of 57% in the marine waters, the coastal waters not achieving the good ecological status (Figure II.82).
In September there were values for good ecological status in both analyzed water bodies, 100% in coastal waters and 92% in marine ones.

Figure II.82 Ecological status of water bodies based on the indicator "Biomass Noctiluca scintillans" in the warm season 2018 (left - July, right - September)



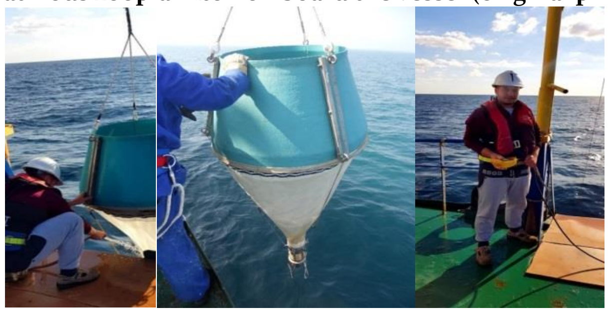
Conclusions:

- ➢ From a qualitative point of view, the mesozooplankton from 2018 was represented by a total number of 20 species, the copeopods and the meroplankton being dominant.
- ➢ The mesozooplankton community showed variations in density and biomass, with the highest values being recorded in July. July and September are characterized by the dominance of the trophic component of the mesozooplankton community, the unofficial zooplankton represented by the dinoflagellate Noctiluca scintillans reaching low values.
- ➢ Within the trophic component, the copepods dominated qualitatively in both months, followed by the meroplanktonic component in July and the cladocera group in September.
- ➢ Analyzing the ecological status of water bodies, it is observed that during the warm season, in July, the good ecological status is recorded for the indicators "Copepod biomass" and "Mesozooplankton biomass" in all three water bodies. The exception was the biomass Noctiluca scintillans in the coastal waters, where the ecological condition was reached in a proportion of over 87%, the other water bodies recording values for the good ecological status.
- ➢ In September, the good ecological status prevailed for the analyzed indicators, except for the "Biomass of copepods", where the good ecological status was reached in only 38% in the marine waters, the coastal water body being in the good ecological state in 83%

Gelatinous zooplankton

In order to determine the status of the macrozooplankton populations, in the summer season 2018, two shipments were executed (July and August) in which 50 samples were collected.In this interval, five macrozooplankton species were identified: Aurelia aurita scifozoar, ctenoforul Pleurobrachia pileus, Mnemiopsis leidyi și Beroe ovata and scifozoar Rhizostoma pulmo. The latter species was evaluated as presence by visual observations, which could not be collected with the equipment used for the evaluation of the macrozooplankton.
Macrozooplankton was always collected from the research vessels, which allowed for the proper and safe handling of the fillet, but at the same time also provided the stability conditions necessary for the analysis of the samples immediately after sampling (Figure II.83).

Figure II.83 Method of taking gelatinous zooplankton on board the vessel (original photo)



At the Romanian coast the sampling of the macrozooplankton samples is done with the Hansen-type fillet with a diameter of 70 cm and the eye of the 300 µm screen.
The biological material is obtained by vertical traction of the fillet in the mass of water (from 2 m above the sea floor to the surface), at low speed (0,5-1 m / s), in order to prevent the deterioration of the gelatinous organisms or the clogging of the screen. After collection, the fillet is gently washed with seawater hose to remove organisms or mucus from them.
The organisms in the collecting beaker are carefully moved into a bucket and immediately identified, counted and measured. The large specimens are washed with sea water, above the container in which the sample was extracted from the fillet. All organisms in the sample are measured (depending on the species: width, aboral length and total length respectively). The measurements are made using a ruler, by placing them directly on the laboratory table or a plastic plate (in the case of large organisms of the species Aurelia aurita). In the case of small specimens, a crumpled Petri dish, filled with water, is used, in which the organisms are suspended, to allow their measurement without the appearance of deformation of the body.
The density and wet biomass of the gelatinous organisms was expressed in ind./m³ respectively g / m³. The calculation of these parameters was carried out in accordance with the recommendations of the Monitoring Guide for macrozooplankton (or gelatinous plankton).
In the warm season, in all three water bodies evaluated (coastal, with variable salinity and marine), the species Aurelia aurita was dominant.
In the coastal water body the highest value of the biomass of the Aurelia aurita species is 6.60 g / m3.
With a spread on the entire Black Sea platform of Romania, in the water body with variable salinity was reported the species Beroe ovata, with the maximum biomass value of 1.31 g / m³.
In the marine water body, the biomass value of the species Mnemiopsis leidyi reached 1.87 g / m³.
Pleurobrachia pileus species reached the lowest biomass value of 0.38 g / m³ in the marine water body, due to the small size of the species (2-30 mm).

Figure II.84 Distribution of biomass values of gelatinous zooplankton species on the continental shelf of the Black Sea

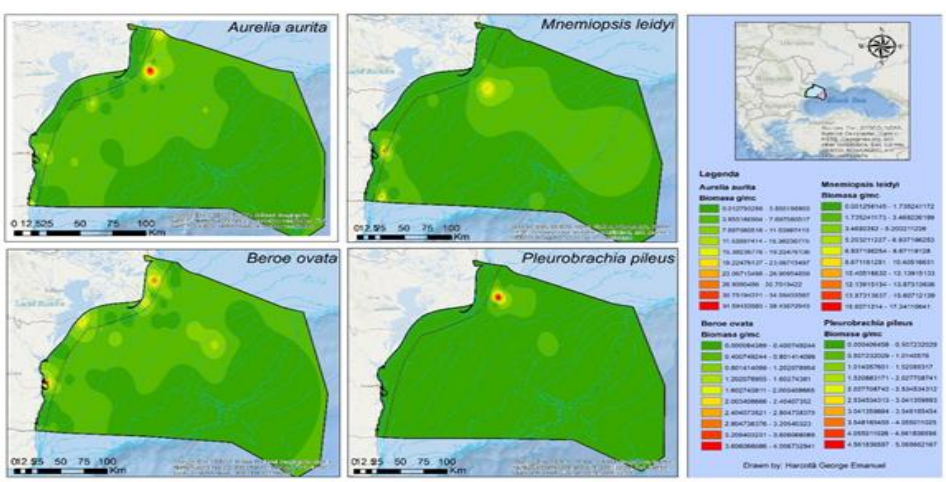
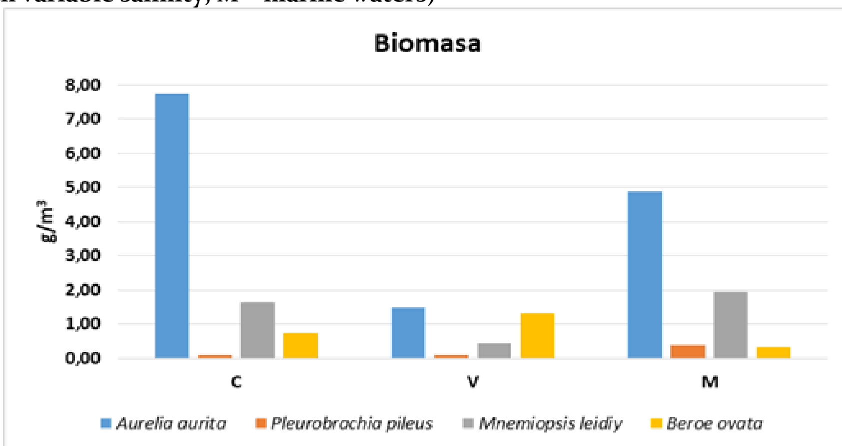


Table II.46 Average biomass (g / m3) of zooplankton gelations in hot season in water bodies

Water body	*Aurelia aurita*	*Pleurobrachia pileus*	*Mnemiopsis leidyi*	*Beroe ovata*
Coastal	6,60	0,08	1,78	0,78
Variable	1,50	0,08	0,44	1,31
Marine	5,40	0,38	1,87	0,30

Figure II.85 Biomass (g / m3) of gelatinous zooplankton in the warm season in each body of water, in 2018 (C = coastal waters, V = waters with variable salinity, M = marine waters)



Regarding the density of macrozooplankton organisms, in the hot season, the dominant species was Pleurobrachia pileus.

In the coastal water body the species Aurelia aurita, reached the maximum density of 1.14 ind / m³. In the water body with variable salinity the species Pleurobrachia pileus reached the maximum density of 1.60 ind / m³, and in the marine water body 1.70 ind / m³. (Figure II.86, Table II.47).

Figure II.86 Distribution of density values of gelatinous zooplankton species on the continental shelf of the Black Sea

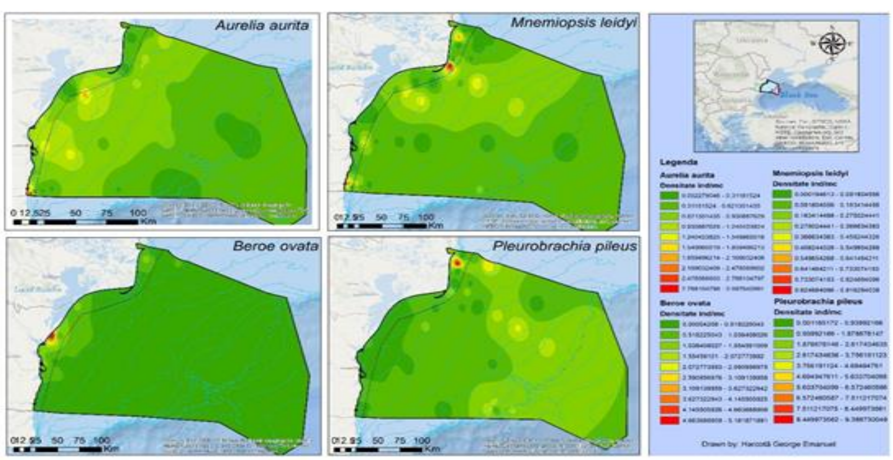
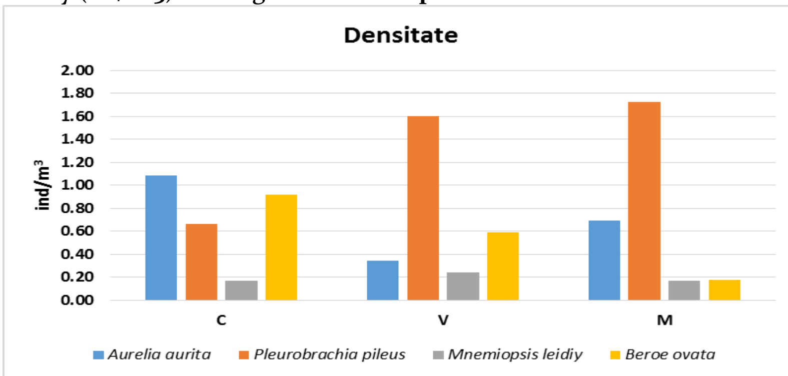


Table II.47 The density (in / m3) of the gelatinous zooplankton in the hot season

Water body	Aurelia aurita	Pleurobrachia pileus	Mnemiopsis leidiy	Beroe ovata
Coastal	1,14	0,63	0,18	1,00
Variable	0,34	1,60	0,24	0,59
Marine	0,69	1,70	0,17	0,17

Figure II.87 The density (in / m3) of the gelatinous zooplankton in the warm season in each body of water



Conclusions:

- The gelatinous zooplankton community was represented in 2018 by five species: Aurelia aurita, Rhizostoma pulmo and Pleurobrachia pileus ctenophores, Mnemiopsis leidyi and Beroe ovata.
- From the point of view of the spatial distribution of density, the species Aurelia aurita was encountered in large quantities from north to south, along the Romanian continental shelf of the Black Sea.
- Pleurobrachia pileus species reached higher density values in the northeastern part of the Romanian continental shelf.
- Ctenoforo Beroe ovata showed higher density values in the central part of the Romanian coastal area.
- Ctenophore Mnemiopsis leidyi recorded low density values, signaling more in the northeastern part of the Black Sea, up to the 100 m isobath.

PHYTOBENTOS

In 2018, the study of the phyto-benthic communities was carried out qualitatively and quantitatively, from the level of the Năvodari - Vama Veche coastal strip, where the main habitats were analyzed.

Cross-border rock and biogenic reefs and Cross-border reefs, with related sub-types: habitat with Cystoseira and habitat with Zostera. 84 trial samples were collected at 11 stations.

With regard to communities formed strictly from opportunistic species, they were quantitatively dominated by green algae in most of the monitored stations, mainly Ulva species (U. rigida and U. intestinalis main components).

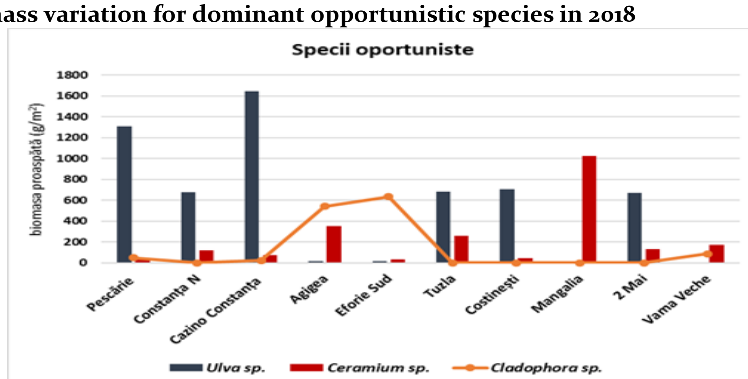
These were constant presence along the entire coast, as part of the Ulva - Cladophora - Ceramium photophilic association.

The biomass of the Ulva species was high during the summer season 2018, with maximum values of 1700 g / m2 (Casino Constanța) and 1300 g / m² (Fisheries).

The species of Cladophora, generators of large biomass in previous years, have not developed so intensely, with maximums of 630 g / m² (Eforie Sud) and 540 g / m² (Agigea).

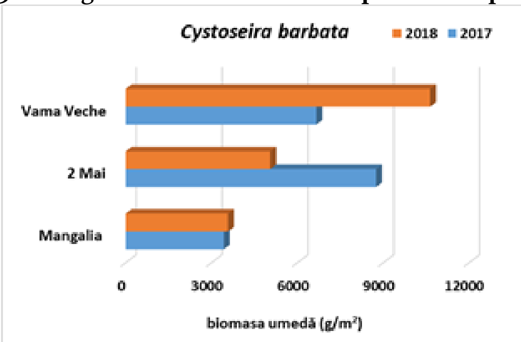
Among the rhodophytes, Ceramium species have intensely populated the hard substrate from shallow (up to 5 m) and have registered a more intense development only in certain areas: 1000 g / m² (Mangalia) and 350 g / m² (Agigea) (figure II.88).

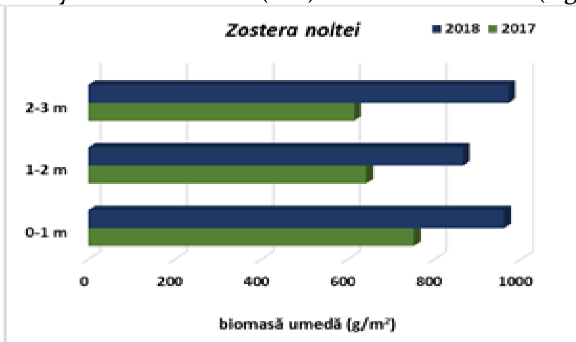
Figure II.88 Average biomass variation for dominant opportunistic species in 2018



As for the brown alga Cystoseira barbata, it continues to form well-developed fields south of the coast, with high average biomass, ranging from 3500 - 10500 g / m2 (maximum value recorded at Vama Veche), slightly higher compared to the year 2017 (Figure II.89). The marine Phanerogama Zostera noltai maintained its distribution area in Mangalia and Năvodari, with average biomass ranging from 850-1000 g / m².

Figure II.89 Average biomass variation for perennial species Cystoseira barbata (left) and Zostera noltei (right)





The two species have great ecological value, forming the two key sub-types of habitat: the habitat with Cystoseira - part of the main habitat Infralitoral rock and biogenic reefs and the habitat with Zostera - part of the main habitat Infralitoral slopes. These two habitats of interest were evaluated from an ecological point of view on the basis of the EI ecological index, in accordance with the requirements of the Marine Strategy Framework Directive. The two habitats, both with Cystoseira (figure II.100) and with Zostera (figure II.101), although with a fragmented distribution, withdrawn to the southern part of the coast, are in a good ecological state (SEB) in the last two years.

Figure II.90 Ecological status of the habitat with Cystoseira barbata in 2018 based on the EI index

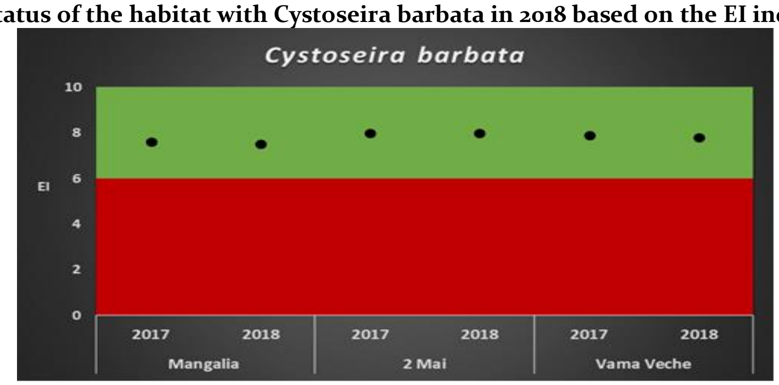
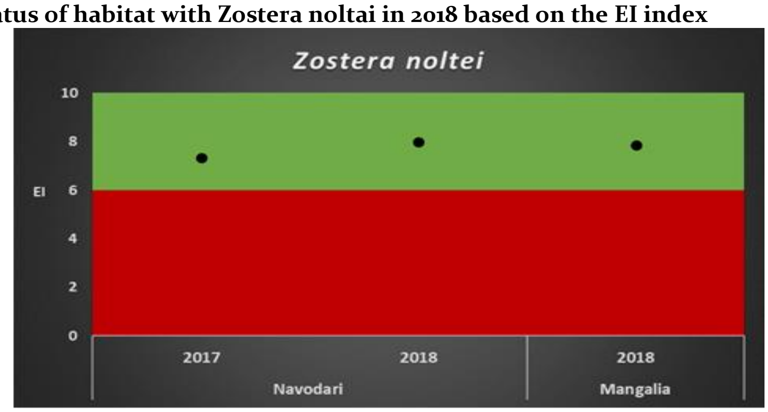
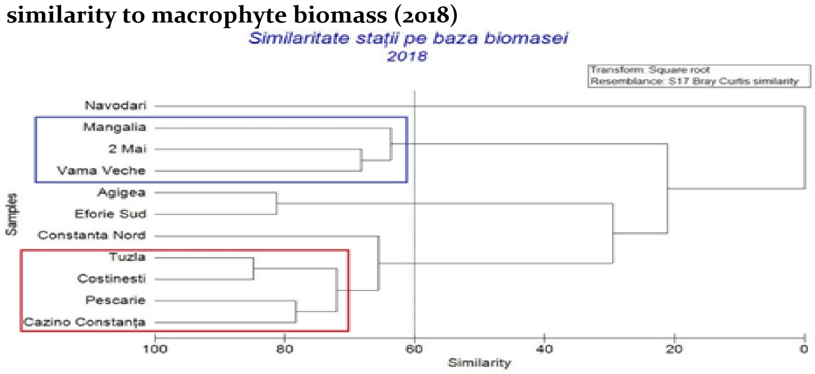


Figure II.91 Ecological status of habitat with Zostera noltai in 2018 based on the EI index



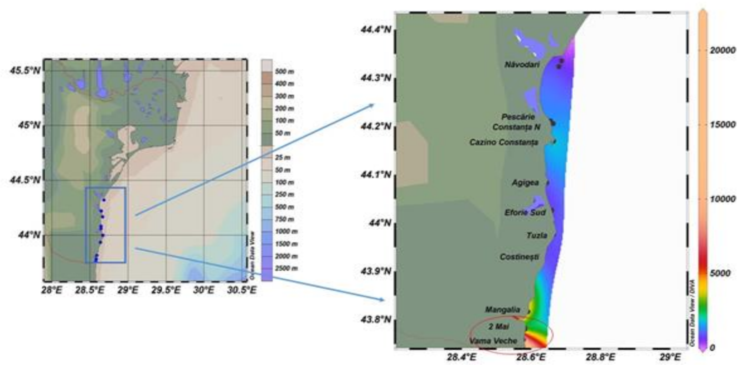
Regarding the similarity between the stations, analyzed on the basis of the type of algal associations and the values of biomass, we observe a high similarity between the stations Mangalia, 2 Mai and Vama Veche, due to the clear dominance of the association Cystoseira barbata - Ulva rigida. Also, a high similarity exists between the stations Pescărie, Casino Constanța, Tuzla and Costinești, due to the presence of the photophile association characteristic of the summer season Ulva - Cladophora - Ceramium (figure II.92).

Figure II.92 Bray-Curtis similarity to macrophyte biomass (2018)



Analyzing the values of biomass, it is observed that the highest values were recorded in the southern area of the Romanian coast, due to the presence of algal communities that are predominantly formed from perennial species (figure II.93).

Figure II.93 Graphic representation of biomass (g / m²) by stations in 2018



Of the species of Phyllophora, currently only two species have been identified on the Romanian coast, namely P. crispa - in the north of the Romanian coast - and Coccotylus truncatus - Constanta area. An important aspect in the study of phytobenthic communities was the recent identification of a species of rhodophytes considered missing on the Romanian coast - Dasya elegans (syn. Dasya baillouviana (S.G.Gmelin) Montagne, 1841).

Conclusions:

- 84 samples were collected from 11 stations from the main habitats Infralitoral rock and biogenic reefs and Infralitoral slopes.
- There is a clear dominance of the Ulva species among the opportunistic macroalgae during the summer season 2018.
- The perennial species Cystoseira barbata and Zostera noltai maintain their recovery period on the Romanian shore in the Mangalia - Vama Veche area.
- The two sub-types of habitats with a key ecological role, the habitat with Cystoseira and the habitat

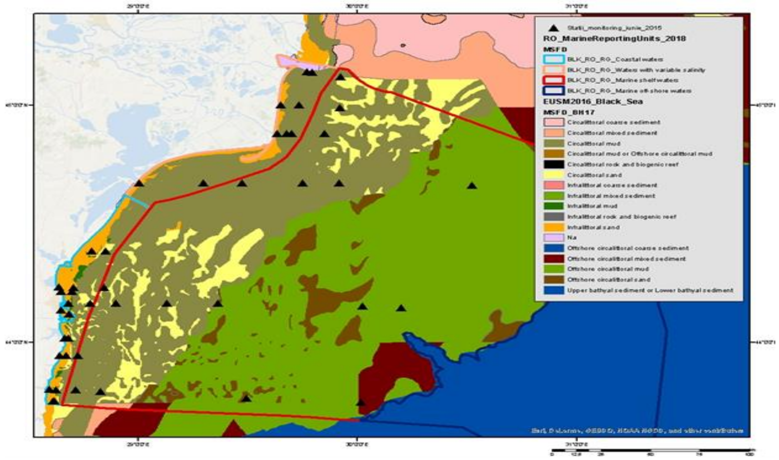
with Zostera, are in good ecological condition (SEB) according to the DCSM criteria.

- Phyllophora species signaling on the Romanian coast.
- Identification of the red alga Dasya elegans, after a long period when it was considered extinct.

ZOOBENTHOS

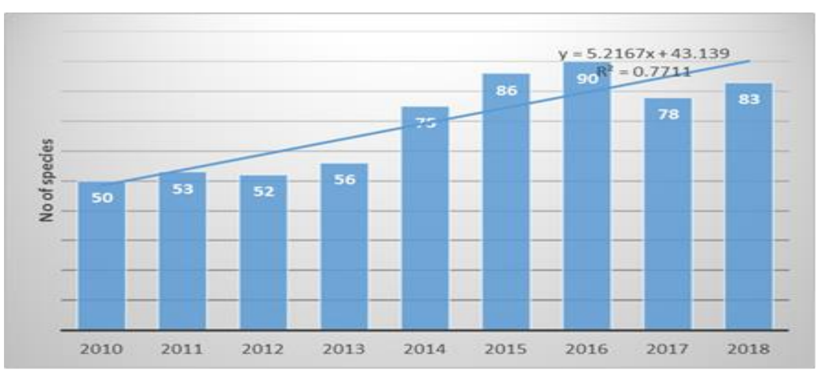
In 2018, the macrozoobentos was monitored on the entire continental shelf near the Romanian shore. From the national monitoring network, from the sedimentary substrate, 38 samples were collected from as many stations located on 13 profiles, between Sulina and Vama Veche (figure II.94). The sample collection was performed with the Van Veen type bodengreifer, according to the methodology approved at the regional level (Todorova, Konsulova, 2005).

Figure II.94 Map of monitoring stations on the Romanian continental platform superimposed over the main types of physical habitats and water bodies according to the Marine Strategy Framework Directive (DCSMM)



Following the processing of the samples, a total of 83 macrozoobenthic species were identified, the variation of the number of species thus falling within the limits recorded during the last 5 years (75 species in 2014 and 90 species in 2016). Although, in the last 5 years, the tendency of variation of the number of macrozoobenthic species is stationary, analyzing the situation over a period of 9 years, an increasing tendency is observed (R2 = 0.77) (figure II.95).

Figure II.95 Variation in the number of macrozoobenthic species identified in Romanian marine waters during 2010-2018



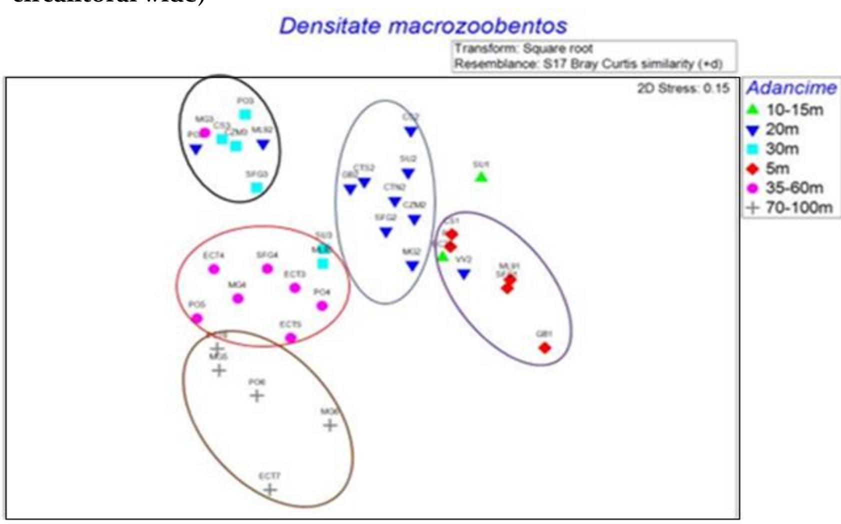
The species of identified macrozoobenthic invertebrates were distributed on the main water bodies and on the large types of physical habitats:

- 33 species in transient marine waters (respectively waters with variable salinity), of which in 18 the sandy and sandy-muddy infralitoral habitats and 26 in the circum-coastal muddy habitats;

- 34 species in the coastal waters, 22 in the sandy sub-coastal habitats (5 m isobath) and 32 in the surrounding sandy habitats;
- 57 species in the waters of the continental shelf at depths between 30 and 60 m, in the circum-coast;
- 29 species in the waters of the wide offshore, at depths between 70 and 100 m.

The distribution of the main faunal communities on depths and coastal floors in the analyzed stations is very well illustrated in figure II.106. Thus, the communities on the cross-border sediments are very similar, whether they are located in waters with variable salinity or in coastal ones (circled with purple in figure II.106); the difference lies in the dominance of the bivalve Lentidium mediterraneum, which is more dense in transitional waters. Similarly, at a depth of 20 m are communities dominated by polychaetes and molluscs such as Chamelea galina, Spisula subtruncata, Anadara kagoshimensis (circled with blue in figure II.106). In the waters of the continental shelf, communities of organisms are dominated by the bivalve Mytilus galloprovincialis, along with polychaetes such as Polydora cornuta, Prionospio cirrifera, Heteromastus filiformis, Nephtys hombergii and Terebellides stroemii (circled in red in figure II.106). Interesting is the presence in the area of some communities passing to the mussel community or interspersed with biogenic reefs of mussels between 20 and 40 m, in which species of bivalve molluscs such as Abra prismatica (more abundant north of Constanța), Spisula subtruncata (more abundant south of Constanța) and with a lower frequency of Acanthocardia paucicostata; next to them is a rich fauna of polychaetes, dominated by Melinna palmata and Nephtys hombergii (circled with black in figure II.96).

Figure II.96 The MDS on the analyzed stations indicates the distribution of the macrobenthic fauna communities on benthic depths and floors (purple-infralitoral; blue - circalitoral; red - circalitoral with Mytilus; black - circalitoral with various fauna; brown - circalitoral wide)



The ecological status of the macrozoobentos from the transient, marine and coastal water bodies characterized by the presence of fine sands, with shallow mesohaline waters and exposed predominantly to the northeast winds and waves, was evaluated by applying the M-AMBI index * (n).

n transient marine waters, the density of the benthic invertebrate fauna was dominated by the Ampelisca diadema amphipod (6090 ind / m²), the Lentidium mediterraneum bivalve (2480 ind / m²) and the Melinna palmata polychaete (1410 ind / m²). The maximum density values of the Ampelisca amphipod and the Lentidium bivalve mentioned above were recorded at a depth of 5 m, while Melinna was present in a larger number at 20 m.

The values of the M-AMBI * index (n) indicated a good ecological status of the transient marine waters, all the values of the M-AMBI * (n) being higher than the threshold value of 0.61 (figure II.97).

In coastal water bodies, the densities of benthic invertebrates were also dominated by the Ampelisca diadem (15,450 ind / m² at Gura Buhaz on the 5 m isobath), the bivalve Lentidium mediterraneum (8450 ind / m² at the Gura Buhaz on the isobath on 5 m) and the polichetele Capitella capitata (450 ind / m² at Gura Buhaz on the 20 m isobath) and Spio decorata (450 ind / m² at Constanța Nord on the 20 m isobath). The other molluscs (Chamelea gallina, Cerastoderma glaucum, Abra prismatica, Spisula subtruncata, Anadara kagoshimensis) had densities below 100 ind / m².

The ecological status of the coastal water bodies was evaluated based on the values of the M-AMBI * (n) multimetric index. In this case, a much greater variation of the index values can be observed, from the poor ecological state (Mangalia 5 m), to very good condition (Constanța Sud 20 m) (figure II.98).

However, despite the fact that 82% of the stations were in good and very good condition, according to the "One out, all out" principle (OOAO) of the Water Framework Directive, the coastal waters are in ecologically poor condition.

Figure II.97 Ecological status of transient marine waters in 2018 resulting from the application of the M-AMBI index * (n) on the densities of macrobenthic invertebrates

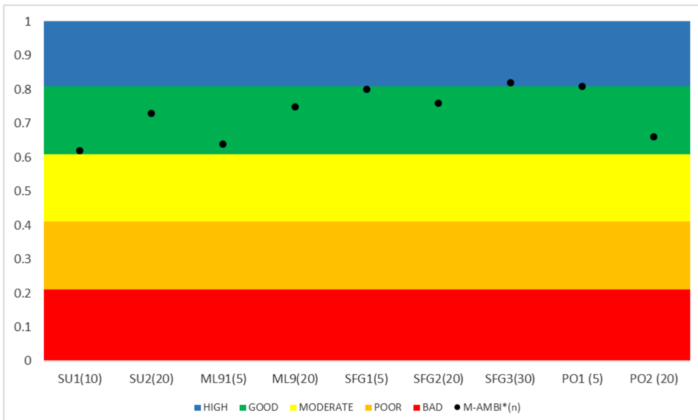
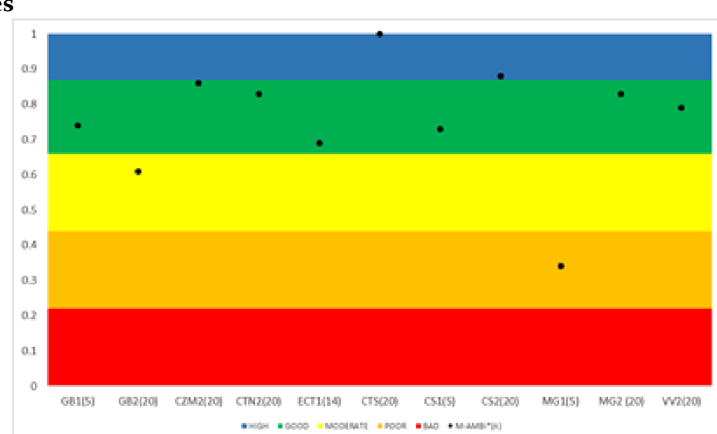


Figure II.98 Ecological status of coastal waters in 2018 resulted by applying the M-AMBI index * (n) on the densities of macrobenthic invertebrates



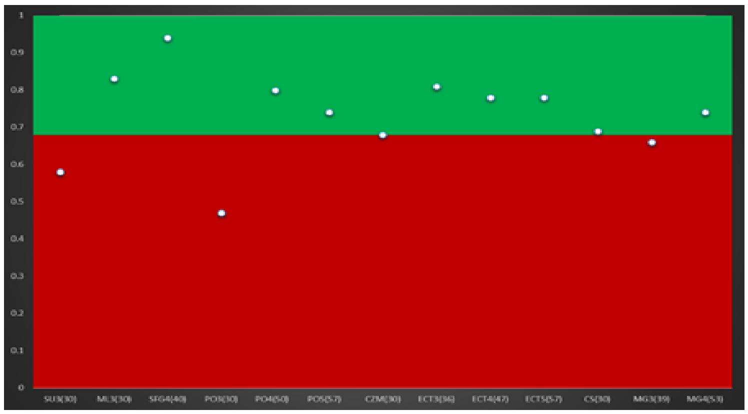
In the waters of the continental shelf, there are mainly clumps on which the shells of various molluscs exist, forming a substrate suitable for fixing mussels. At depths between 30 and 57-60 m is the community of deep mussels, more recently referred to as biogenic reefs with Mytilus galloprovincialis on the circalitorial slopes. Another community, dominated by the molluscs Abra prismatica and Spisula subtruncata, on the one hand, and the polychaetes Melinna palmata and Nephtys hombergii, on the other, is cornered between the isobaths of 20 and 40 m, along the Romanian continental platform, as mentioned above (figure II.106).

In these communities, the densities of macrozoobenthic organisms were dominated by the polychaetes Polydora cornuta (max. 2200 ind / m² -

Sulina 30 m) and Melinna palmata (max. 2100 ind./m² - Portița 30 m), followed by molluscs Mytilus galloprovincialis (max. 410 ind./m² - Portița 57 m) Subtruncated spisula (max. 230 ind./m² - Costinesti 30 m) and Abra prismatic (200 ind./m² - Costinesti 30 m), as well as the Phtisica marine amphipod (250 ind. ./m² - Sf. Gheorghe 40 m). Biomass was obviously dominated by the bivalve Mytilus galloprovincialis (1 - 1064 g / m²).

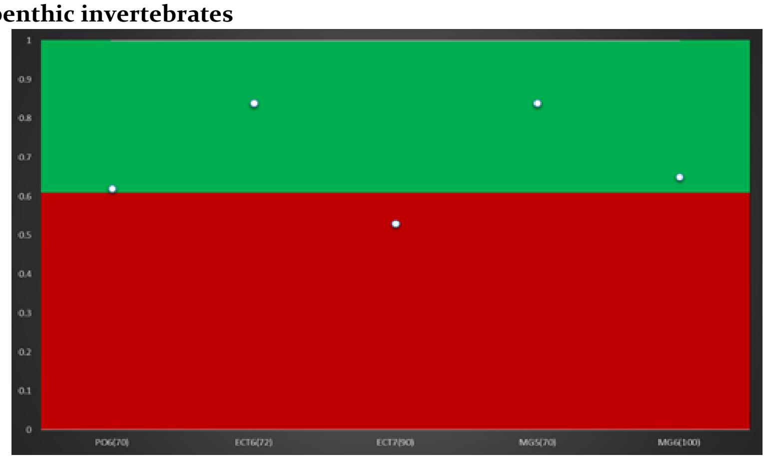
The ecological status of the communities of organisms on the mobile sediments of the circum-coast on the Romanian continental shelf, evaluated using the M-AMBI * index (n), showed a poor condition in 23% (3) of the stations (M-AMBI * (n)) <0.68), 77% (8) stations being in good condition (M-AMBI * (n) ≥ 0.68) (figure II.99).

Figure II.99 Ecological status of sedimentary habitats on the Romanian continental shelf in 2018, resulting by applying the M-AMBI index * (n) on the densities of benthic invertebrates



In the bathymetric range 70-100 m, in the monitoring network there are only 5 stations, one of them on the profile of Portița (70 m), 2 on the east Constanța (72 and 90 m) and 2 on Mangalia (70 and 100 m). This is the wide circalitoral, which in the Romanian sector is dominated by a fauna composed of the bivalve Modiolula phaseolina (densities between 110 and 310 ind / m2), the polychaetes Terebellides stroemii, Prionospio cirrifera, Phyllodoce maculata (with densities below 100 ind./m2), Ampelisca diadema crustaceans, Apseudopsis ostroumovi (with densities below 100 ind./m2), Eugyra adriatic molgulid ascidia (with densities of 100 - 150 ind./m2), Leptosynapta inhaerens echinoderm, Callipallele phantoma and Altopallele phantoma; In total, 29 species were identified in this depth range. The ecological status of this community, evaluated by applying the M-AMBI index * (n) shows that one of the five stations (20%) was in poor condition, the rest being in good condition (figure II.100).

Figure II.100 Ecological status of sedimentary habitats in the offshore in 2018, resulting by applying the M-AMBI index * (n) on the densities of benthic invertebrates



Conclusions

The monitoring of benthic communities in 2018 highlighted the following:

1. In the 38 stations monitored at depths between 5 and 100 m, 83 macrozoobenthic species were identified. This number, although lower than in 2016 (90 species), is in the general growth trend of the last 9 years (2010-2018).

2. The greatest diversity of species was found in the depth range 30-60 m, where 57 species were identified on sedimentary substrate, followed by sediments from coastal waters (34 species), waters with variable salinity or marine transients (33 of species) and of the wide offshore (29 species).

3. The standardized M-AMBI multimeter index (M-AMBI * (n)) applied to the densities of benthic species showed a good ecological status of the transient marine waters, compared to the weak one of the coastal waters, where there are populated areas and, therefore, more strongly affected by anthropogenic influences.

4. If the same "one out all out" (OOAO) principle is applied, both the fauna in the biogenic reefs of Mytilus galloprovincialis and the wide sedimentary circalitoral dominated by the Modiolula phaseolina bivalve, it turns out that both are in poor ecological condition.

5. However, if we apply the principle of proportions, then, taking into account the fact that, in both types of district habitats, more than 75% of the stations were in good condition, then we can consider them in good ecological condition.

LIVING MARINE RESOURCES

The living marine resources were mainly represented by the fish species. The fish fauna on the Romanian coast of the Black Sea comprises over 140 species and subspecies, however, in the last decades, significant changes in the structure of the ichthyofauna, as well as the ethological ones, have been observed in the fish populations.These can be correlated with various actions and activities such as: significant river contribution of the Danube, intensification of maritime traffic, tourism, intensification of port activities, urbanization of coastal areas, overfishing, but also with inadequate gear, penetration of foreign species and other antrophic influences.

Marine biological resources obviously contribute to the survival of humanity. Although they have the property to regenerate, they are not infinite and therefore must be managed properly. The study of the biodiversity of the ichthyofauna represents the basis for a sustainable fisheries management.

In 2018, the evaluation of the ichthyofauna was carried out by taking bi-monthly samples from the talians located at the fishing points located along the Romanian coast of the Black Sea, from Vadu to Vama Veche, samples taken from the Edighiol area with gillnets, but also samples. taken with pelagic and demersal trawl (Figure II.10).

Figura II.101 a) Talian installed in area 2 Mai, b) Talian capture (original photo, 2018)

a)

b)

The samples were analyzed in the laboratory from a quantitative and qualitative point of view. After the systematic classification, biometric analyzes were performed, and the interpretation of the results was achieved by: classification by weight, length and sex; determining the degree of maturation; age determination by otolith analysis, but also by scalimetry.

Also, to estimate the biological diversity within the ichthyofauna identified in the samples taken from the fishing points, we calculated the Margalef Index (Magurran, 2004):

DMg = (S-1)/lnN

It is considered that values> 2 represent a low species diversity in the analyzed community, and values <5 indicate a high species diversity (Magguran, 2004). Analyzing the samples collected in the year 2018, from the ichthiofauna from the Romanian coast, 43 species belonging to 30 families were identified (table II.48).

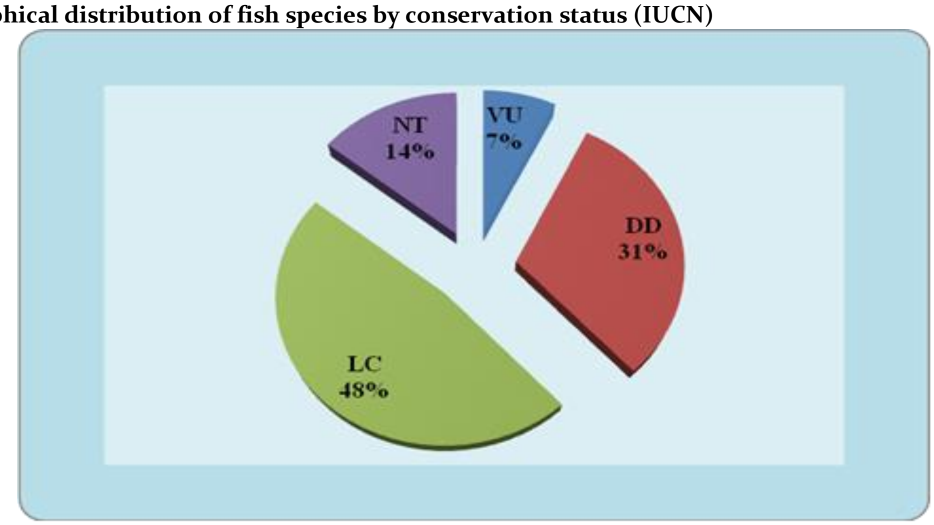
Table II.48 Systematic distribution of species from the ichthyofauna, 2018

Family	Species	Popular name
Acipenseridae	*Acipenser gueldenstaedti colchicus*	nisetru
	Acipenser stellatus	păstrugă
	Huso huso	morun
Atherinidae	*Atherina hepsetus*	aterina mare
Belonidae	*Belone belone euxini*	zărgan
Blenniidae	*Coryphoblennius galerita*	cocoșel de mare
Callionymidae	*Calliumymus pusillus*	șoricel de mare
Carangidae	*Trachurus mediterraneus ponticus*	stavrid
Centracanthidae	*Spicara smaris*	smarid
Clupeidae	*Sprattus sprattus*	șprot
	Alosa immaculata	scrumbie de Dunăre
	Alosa tanaica	rizeafcă
	Clupeonella cultriventris	gingirică
Engraulidae	*Engraulis encrasicolus*	hamsie
Gadidae	*Merlangius merlangus euxinus*	bacaliar
	Gaidropsarus mediterraneus	galea
Gasterosteidae	*Gasterosteus aculeatus*	ghidrin
Gobiidae	*Neogobius melanostomus*	strunghil
	Mesogobius batrachocephalus	hanus
	Gobius niger	guvid negru
	Pomatoschistus microps leopardinus	guvid de nisip
Mugilidae	*Mugil cephalus*	laban
	Liza aurata	chefal auriu
Mullidae	*Mullus barbatus*	barbun
Ophididae	*Ophidion rochei*	cordeluță
Pleuronectidae	*Platichthys flesus*	cambulă
Pomatomidae	*Pomatomus saltatrix*	lufar
Rajidae	*Raja clavata*	vulpe de mare
	Dasyatis pastinaca	pisică de mare
Sciaenidae	*Umbrina cirrosa*	milacop
Scombridae	*Sarda sarda*	pălămidă
Scophthalmidae	*Psetta maxima*	calcan
Scorpaenidae	*Scorpaena porcus*	scorpie de mare
Serranidae	*Serranus cabrilla*	biban de mare
Soleidae	*Solea lascaris*	limbă de mare
Sparidae	*Boops boops*	gupă
Squalidae	*Squalus acanthias*	rechin
Syngnathinae	*Syngnathus variegaus*	ac de mare
	Syngnathus typhle	ac de mare
	Hippocampus guttulatus	căluț de mare
Trachinidae	*Trachinus draco*	dragon

Triglidae	*Trigla lucerna*	rândunica de mare
Uranoscopidae	*Uranoscopus scaber*	bou de mare

The predominant constant species were: anchovy, horse mackerel, turbot, sprat, atherine, with slight variations from month to month. Also, under the Marine Strategy Framework Directive, the conservation status of vulnerable fish has been selected as an appropriate measure to report information on the biodiversity of the marine environment, especially regarding the impact of fisheries on diversity. Thus, the state of conservation of the species identified within the ichthiofauna from the Romanian coast, in 2018, falls into the IUCN categories (figure II.102).

Figure II.102 Graphical distribution of fish species by conservation status (IUCN)



Where:
VU - vulnerable
NT - almost threatened with extinction
LC - not threatened with extinction
DD - insufficient data

As can be seen in the graph, in the analysis of the ichthyofauna in 2018, the species not threatened with extinction predominate, 48%, the vulnerable species representing the smallest percentage 7%. Among the vulnerable species were identified individuals belonging to the family Acipenseridae (sturgeons); in the catches of 2018, isolated specimens were observed. Sturgeon fishing has been banned in Romania since 2006 for a period of 10 years, then the ban was extended for another 5 years, so by 2021 a recovery of the population of Acipenseridae in our country is expected. In the Edighiol area, transient water body, with low salinity, both brackish and freshwater species have been identified (Table II.49).

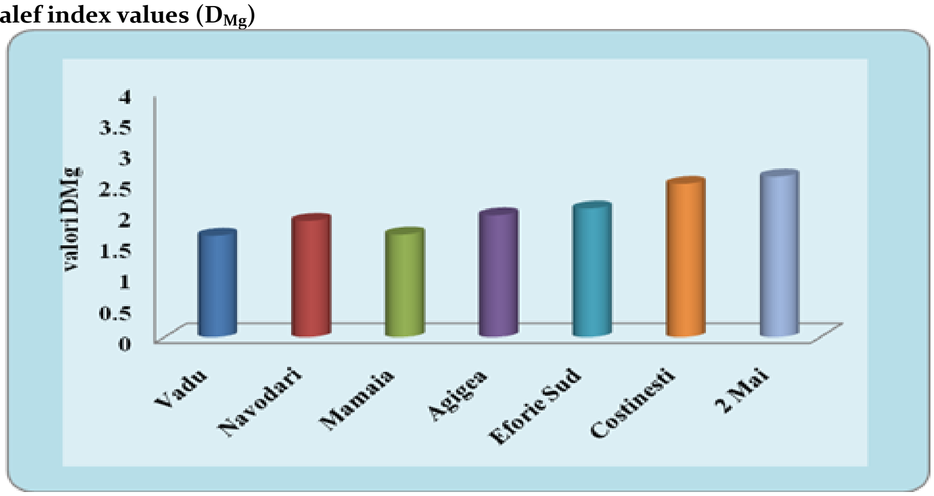
Table II.49 The systematic distribution of the sampled species from the Edighiol area, 2018.

Family	Species	Popular name
brackish species		
Acipenseridae	*Acipenser stellatus*	păstrugă
Atherinidae	*Atherina hepsetus*	aterina mare
Clupeidae	*Alosa immaculata*	scrumbie de Dunăre
	Alosa tanaica	rizeafcă
	Clupeonella cultriventris	gingirică
Engraulidae	*Engraulis encrasicolus*	hamsie
Gasterosteidae	*Gasterosteus aculeatus*	ghidrin
Gobiidae	*Neogobius fluviatilis*	guvid de baltă
	Gobius niger	guvid negru

	Pomatoschistus marmoratus	guvid de nisip
Mugilidae	*Mugil cephalus*	laban
	Liza aurata	chefal auriu
Mullidae	*Mullus barbatus*	barbun
Soleidae	*Solea lascaris*	limbă de mare
sweet water species		
Percidae	*Perca fluviatilis*	biban
	Sander lucioperca	şalău
Cyprinidae	*Abramis brama*	plătică
	Aspius aspius	avat
	Carassius gibelio	caras
	Pelecus cultratus	sabiță
	Rutilus rutilus	babușcă
	Scardinius erytrophthalmus	roșioară

Thus, it is observed that the brackish species predominate in 64%, the sweet species representing only 36%, a characteristic situation for transient water bodies. Of the brackish species, the alosa, the Clupeonella cultriventris, the anchovy and of the sweet water species predominated the cyprinids. Regarding the Margalef index, the most numerous fish species were identified in area 2 Mai, with a DMg value of 2.61 (figure II.103).

Figure II.103 Margalef index values (D_{Mg})



There is an increase in the value of the Margalef index in the southern area of the coast, a situation that can be correlated with the greater availability of food, being areas and with rocky substrate in the southern part, but also with the lack of salinity variations, oscillations that manifest more chosen in the area from the mouths of the Danube. Also, the lowest value of the Margalef index was recorded in the Mamaia area, an area known for intense summer tourism activity.

Conclusions

In the framework of the ichthyofauna, in 2018, 43 species belonging to 30 families were identified, to which are added another 2 families with 8 species from the Edighiol area, transitional water body. Also, in the Edighiol area, although the brackish species (64%) predominated, sweet water species (36%) were also identified).

In the marine area, anchovy, horse mackerel, turbot, sprat, atherina predominated, and in the transitional area predominated: alosa, Clupeonella cultriventris, anchovy, cyprinids.

Regarding the vulnerable species identified, in 2018 a value of 7% was registered, slightly higher percentage compared to previous years.

Regarding the Margalef diversity index, there were recorded values indicating a high diversity (DMg = 2.61) but also values indicating a low diversity (DMg = 1.65). In the southern area of the coast there was a

richer species diversity. Because fish depend on a huge variety of plants and invertebrates for their nutrition, fish-rich areas are invariably populated by a host of other organisms, so sustainable management of ichthyofauna is required by continuing research and education to raise awareness of the importance of living marine resources.
In the last decade, the interest for the exploitation of marine molluscs in the Black Sea has increased significantly, Turkish fisheries being an example in this respect; using methods such as diving, using rakes, shovels, but also dredging methods, collect species of molluscs such as Chamelea gallina, Rapana venosa, Mytilus galloprovincialis etc.Currently, in Romania, of the most molluscs is the gastropod rapana (Rapana venosa), which represents 98% of the annual catch. The tool used is the beam-trawl in the areas with sedimentary substrate and the autonomous diver in the areas with hard substrate. The mussels (Mytilus galloprovincialis) are fished from the natural environment only with the help of the autonomous diver. Significant quantities of mussels are released annually, so that from 2018, the National Agency for Fisheries and Aquaculture (ANPA) has introduced a quota (Total Allowable Capture) for this resource.
Clam fishing has not been regulated so far in Romanian waters, and the tool used (hydraulic dredger) was introduced among the legal tools in 2018 (Ministry of Agriculture and Rural Development - Order no. 1369/2018 regarding the technical characteristics, conditions of use of the tools admitted to commercial fishing and commercial fishing methods in marine and continental waters).
In Romania, bivalves are not considered a common food, but in the last decade there has been a slight increase in the consumption of rapana, mussels and oysters in the public food. Moreover, for the promotion of the mussels, starting with 2014, the "Festival of the mussels" is organized". (https://www.facebook.com/festivalulscoicilor/).

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

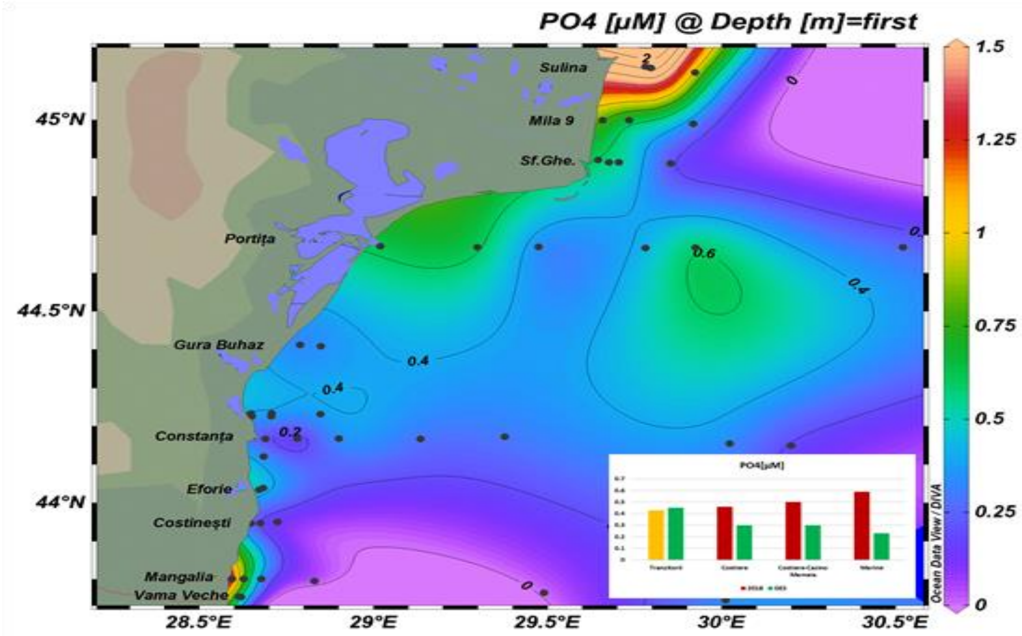
The nutrients

RO 21	Indicator code Romania: RO 21 EEA indicator code: CIS 21

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

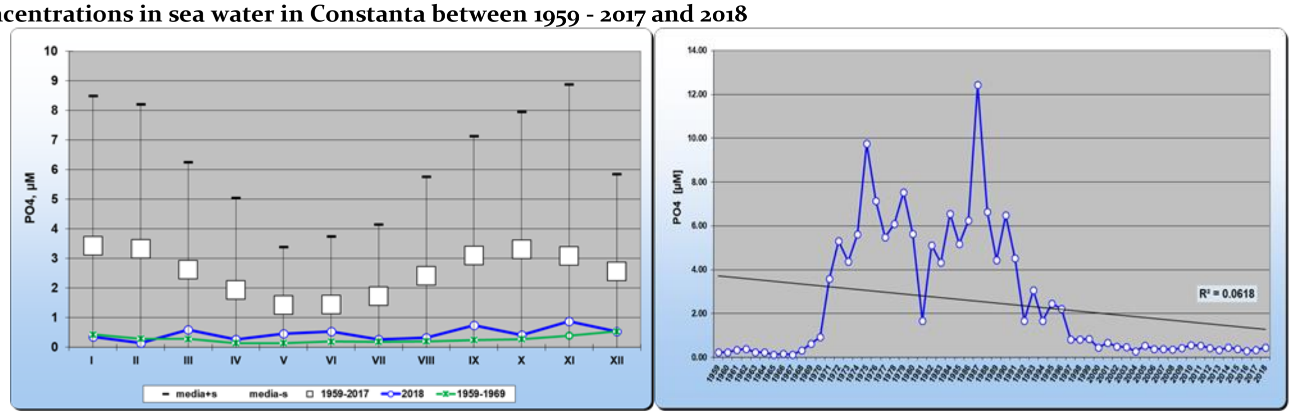
Nutrients, the main cause of eutrophication, were investigated in 2018, by analyzing the samples (N = 175) taken from the water column (0-90 m) in two oceanographic expeditions, undertaken in the hot season, July and September, on the monitoring network consisting of 51 stations and on the East Constanta profile (7 stations) covering all the typologies included in the Water Framework Directives (DCA) and the Strategy for the Marine Environment (DCSMM) - transient, coastal and marine waters.
The evolution trends were obtained by statistical analysis of the historical data (1959/1976/1980 - 2017) and of the daily samples collected in 2018 from the station Casino - Mamaia 0 m (N = 208).
Phosphate concentrations, (PO4) 3-, recorded in the water column, values between 0.01 - 3.04 μM (media 0.32 μM, median 0.25 μM, standard deviation 0.34 μM). The maximum values were found on the surface, in July, in the area of the Danube's mouths (Sulina profile, up to 20 m isobath), but also in Mangalia station 5 m. During 2018, a potential risk of non-compliance with the good ecological state is observed in coastal and marine waters (figure II.104).

Figure II.104 Spatial variability of phosphate concentrations in the waters of the Romanian Black Sea coast and the comparative situation with the target values for achieving good ecological status, 2018



In the long term, the monthly averages of the year 2018 differ significantly (test t, 95% confidence interval, $p < 0.0001$, $t = 9.3184$, $df = 22$, Dev.St. difference = 0.222) from those multiannual, 1959-2017, due to lower values recorded in 2018. However, the monthly averages in 2018 are significantly higher than those of the reference period 1959-1969 (Figure II. 105).

Figure II.105 Comparative situation of the multiannual (a) and annual (b) monthly averages of phosphate concentrations in sea water in Constanta between 1959 - 2017 and 2018



a b

Between 1959-2018, the average annual values of phosphate concentrations ranged from 0.13 µM (1967) to 12.44 µM (1987), with their decrease starting from 1987 (figure II.115). The average value of 2018, 0.46 µM, exceeds the characteristic range of the reference period of the 1960s (multiannual average 1959-1969 0.28 µM ± 0.14 µM). Thus, there is a potential risk of failure to reach the good state due to the high concentrations in spring and autumn (figure II.105).

Inorganic forms of nitrogen (nitrogen, nitrogen and ammonium) recorded heterogeneous values along the entire Romanian Black Sea coast, summing up the value proposed as a target for assessing the good ecological status, especially in coastal and marine waters (Table II.50).

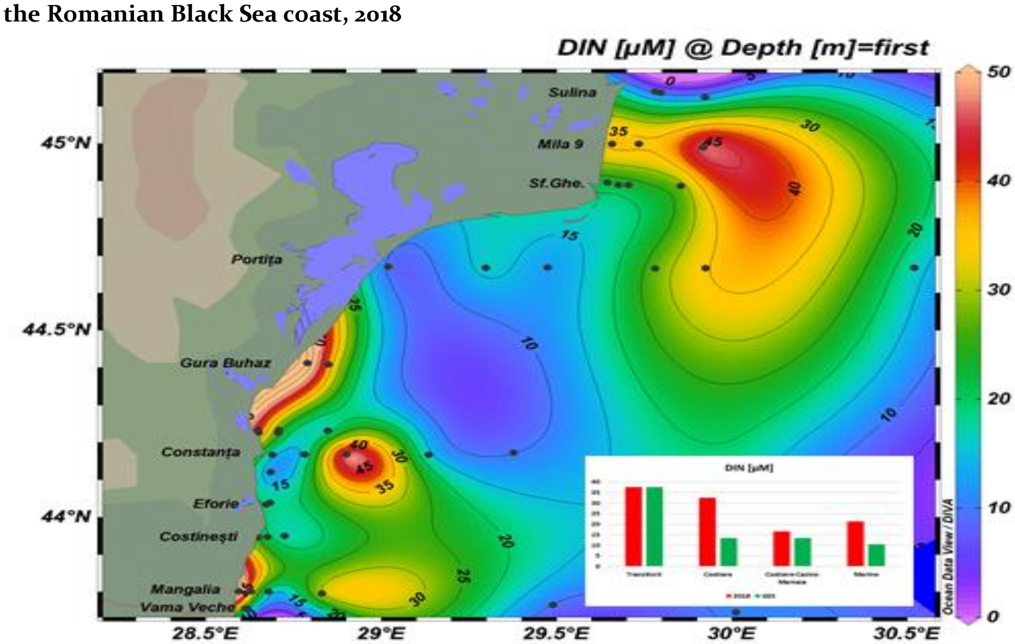
Table II.50 Descriptive statistics of the concentrations of the inorganic forms of nitrogen in the surface waters of the Black Sea - 2018

N=51	Transient (N=8)				Coastal (N=20)				Marine (N=23)			
	Min.	Max.	Media	75%	Min.	Max.	Media	75%	Min.	Max.	Media	75%
NO_3, μM	0,07	20,53	9,68	19,39	2,72	48,19	15,47	18,69	1,38	56,27	9,25	12,45
NO_2, μM	0,08	17,31	3,27	2,89	0,01	42,26	12,03	14,91	0,07	27,96	4,05	4,80
NH_4, μM	0,91	38,09	7,36	5,76	0,64	5,42	1,56	1,79	0,84	26,05	7,09	9,07
$\sum N_{anorganic}$ (DIN), μM	5,91	42,59	20,30	37,61*	8,66	91,19	29,08	32,55*	6,11	69,24	20,38	21,34*
Target value GES, DIN μM				37,50				13,50				10,50

** The values exceed the proposed target value for achieving good ecological status*

In general, higher values of inorganic nitrogen were observed in the area of direct influence of the Danube (Mila profile 9). The reduced forms, nitrogen and ammonium, predominate in the areas with anthropogenic impact (Gura Buhaz, Constanța, Mangalia 5m, East Constanța). Comparative analysis of inorganic nitrogen concentrations in the warm season, in surface waters and target values (proposed GES) highlights the moderate risk of not achieving good ecological status in transient waters and a major risk for coastal and marine waters (north of the continental shelf) (Figure II.106).

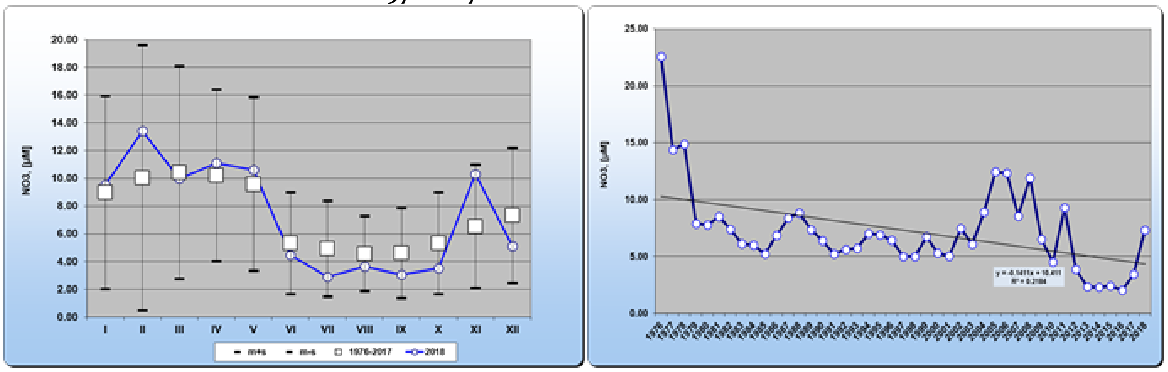
Figure II.106 Spatial variability of inorganic nitrogen concentrations (DIN-sum of nitrogen, nitrogen and ammonium) in the waters of the Romanian Black Sea coast, 2018



Trends in evolution

Nitrogens -The multiannual monthly averages of 1976-2017 and the monthly averages of 2018 are comparable (t test, 95% confidence interval, p = 0.9914, t = 0.0109, df = 22, St. Dev difference = 1.305) as a result of the quite high concentrations from 2018 (figure II.115). In the long term (annual averages 1976-2018), the annual average of 7.30 μM can be reached in 2018 (figure II.107).

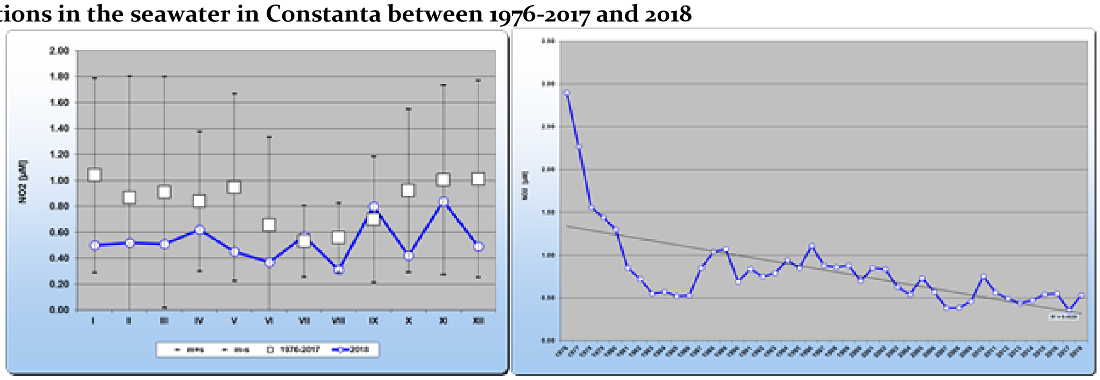
Figure II.107 Comparative situation of the multiannual (a) and annual (b) monthly averages of the concentrations of nitrates in sea water in Constanta between 1976-2017 and 2018



a b

Nitrites -The multiannual monthly averages 1976-2017 and the monthly averages for 2018 differ significantly (t test, 95% confidence interval, p = 0.0003, t = 4.3452, df = 22, St. Dev. Difference = 0.069) as a result of the lower concentrations from 2018 (figure II.108a). In the long term (1976-2018), we can see, in 2018, the average 0.53µM (figure II.108b).

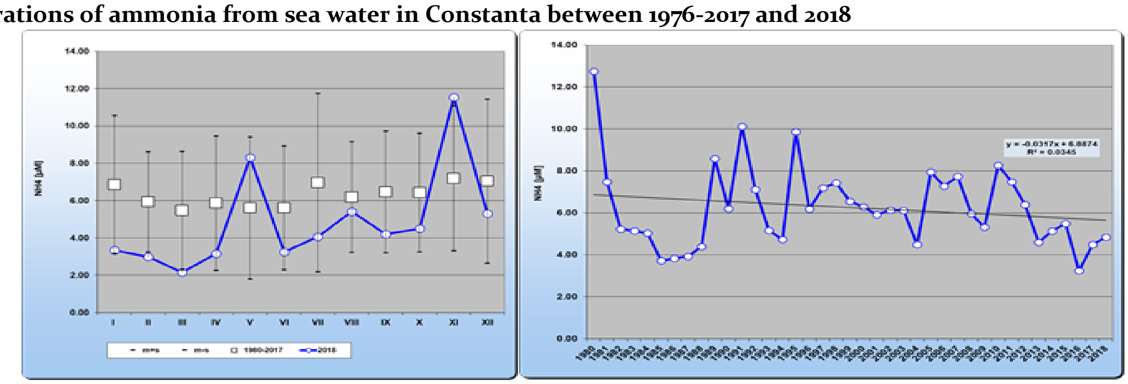
Figure II.108 Comparative situation of the multiannual (a) and annual (b) monthly averages of the nitrogen concentrations in the seawater in Constanta between 1976-2017 and 2018



a b

Ammonium - Multiannual monthly averages for the period 1980-2017 and monthly averages for 2018 do not differ significantly (t test, 95% confidence interval, p = 0.07751, t = 1.8519, df = 22, St. Dev. Difference) = 0.783) as a result of comparable concentrations in 2018 (figure II.109a). In the long term (1980-2018), the average annual concentration of 4.85µM is observed in 2018 (figure II.109b).

Figure II.109 Comparative situation of the multiannual monthly averages (a) and from December (b) of the concentrations of ammonia from sea water in Constanta between 1976-2017 and 2018

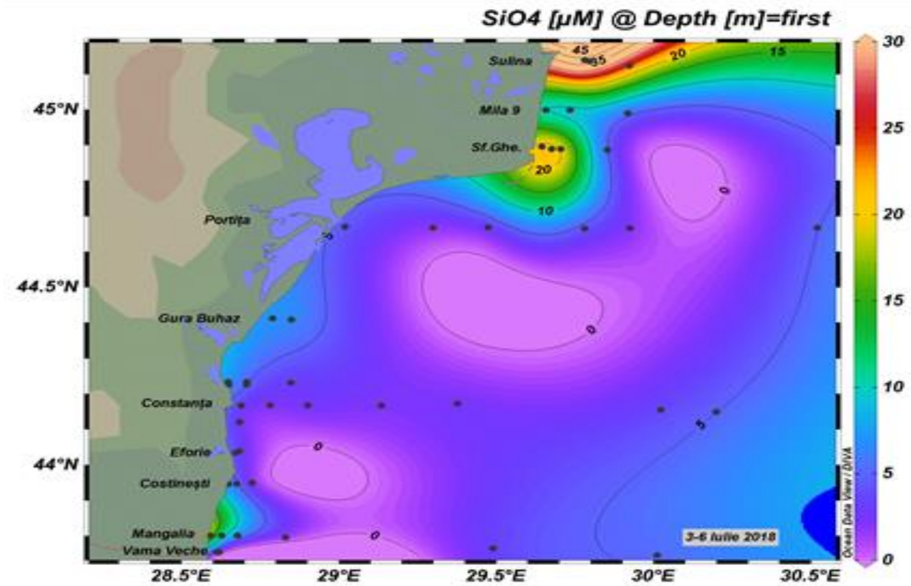


a b

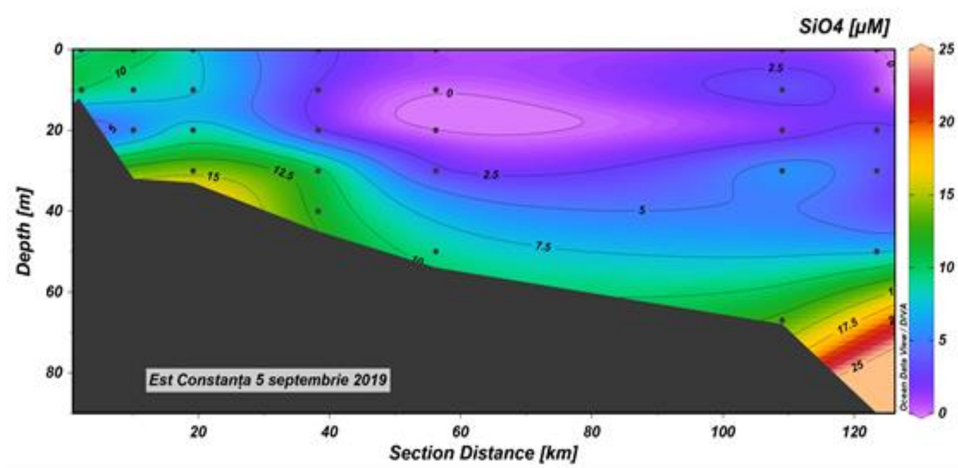
The high averages of May and November are due to the periods of mineralization of the organic substance produced as a result of algal blooms during the same period as well as the prolonged uppwelling phenomenon between 22.10 - 12.11.2019.

Silicates (SiO_4) 4- - had concentrations in the range 0.1 - 48.9 µM (mean 8.0 µM, median 5.1 µM, standard deviation 8.1 µM). The higher values are due either to the river contribution (figure II.110) or to the accumulations from the water-sediment interface at the end of the warm season (figure II.111).

Figure II.110 Spatial variability of silicate concentrations in waters from the Romanian Black Sea coast, 2018



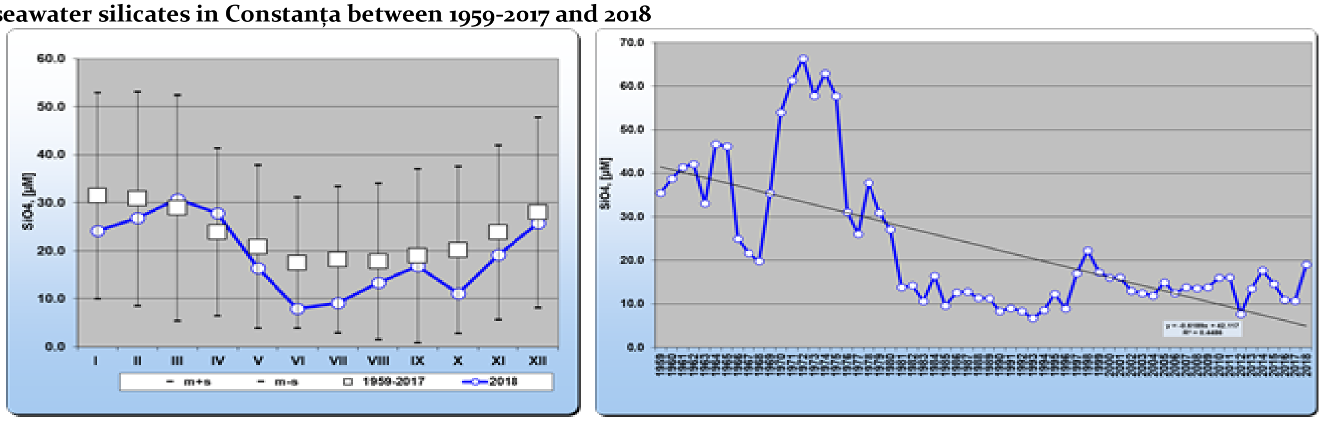
Distribution in the water column (0-90 m) of the silicate concentrations in the waters of the Romanian Black Sea coast, 2018



In Constanta, the multiannual monthly averages from 1959-2017 and the monthly averages from 2018 do not differ statistically (test t, 95% confidence interval, p = 0.1313, t = 1.5673, df = 22, Dev.St. of the difference = 2,722) (figure II.120a).

The average annual concentrations of silicates in the seawater in Constanța are in the range 6.7 µM (1993) - 66.3 µM (1972) and in 2018 they recorded an average of 19.1 µM, representing 54% of the multiannual average of the period of reference 1959-1969 (35.1 µM) (figure II.120b).

Figure II.112 Comparative situation of the multiannual (a) and annual (b) monthly averages of the concentrations of seawater silicates in Constanța between 1959-2017 and 2018



a b

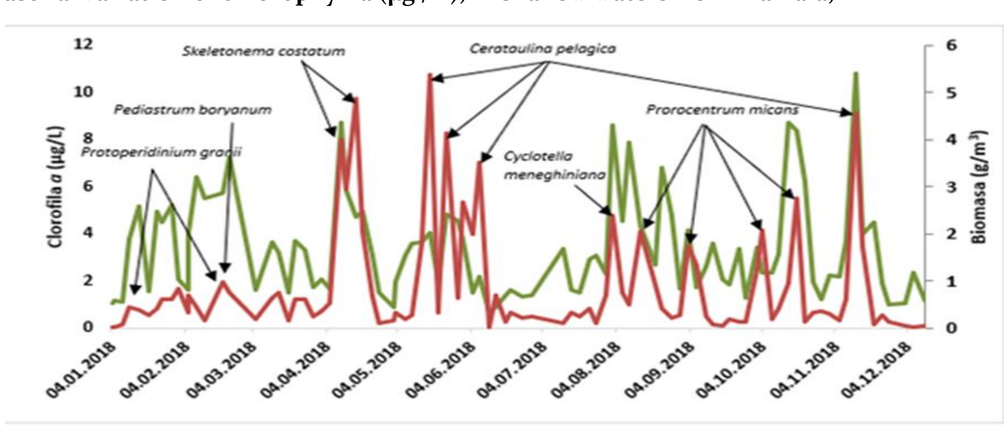
Chlorophyll a

RO 51	Indicator code Romania: RO23 EEA indicator code: CIS 23

TITLE: CHLOROPHYLL A OF TRANSITIONAL, COASTAL AND MARINE WATERS
DEFINITION: The indicator describes: average annual concentrations in summer (expressed in micrograms / L), classification of concentration levels (low, moderate, high), trends in average surface concentrations in summer for chlorophyll a (expressed in micrograms / L). Chlorophyll a is the most common biochemical parameter determined in oceanography, being a unique indicator of plant biomass and marine productivity. In summer, when primary production is limited to nutrients only, chlorophyll a concentration is linked to 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 was included in the list of indicators for the "Eutrophication" domain in the "Water Framework Directive" of the European Union, which represents one of the impact parameters to be monitored.
The chlorophyll content determined in the shallow waters of Mamaia, in 2018, ranged between 0.64 and 10.80 µg / L compared to the values recorded in 2017 (0.19 and 19.03 µg / L).
The maximum values of chlorophyll a were recorded during the autumn. They ranged from 0.99 µg / L to 10.80 µg / L (in November), with a seasonal average value of 3.55 µg / L. During this period, high values of the biomass of the species Skeletonema Costatum, Leptocylindrus minimus, Protoperidinium granii, Neoceratium furca, Lingulodinium polyedrum, Cerataulina pelagica and Prorocentrum micans (~ 2-4.6 g / m3) were observed, the largest contribution being the last two species.
During winter, lower values were recorded, ranging from 1.04 to 7.27 µg / L, with a seasonal average of 3.45 µg / L. Higher values were recorded during spring (up to 8.74 µg / L with a seasonal average of 3.34 µg / L) and in summer (up to 8.58 µg / L with a seasonal average of 3 , 05 µg / L). The highest biomass values during the spring were made by the diatoms C. pelagica and S. Costatum. At the beginning of the summer it is possible to observe the further development of the C. pelagica species and its gradual replacement with Cyclotella meneghiniana and Pseudosolenia calcar-avis and P. granii dinoflagellates, Akashiwo sanguinea, Round oblea, P. micans, the latter having the highest value.

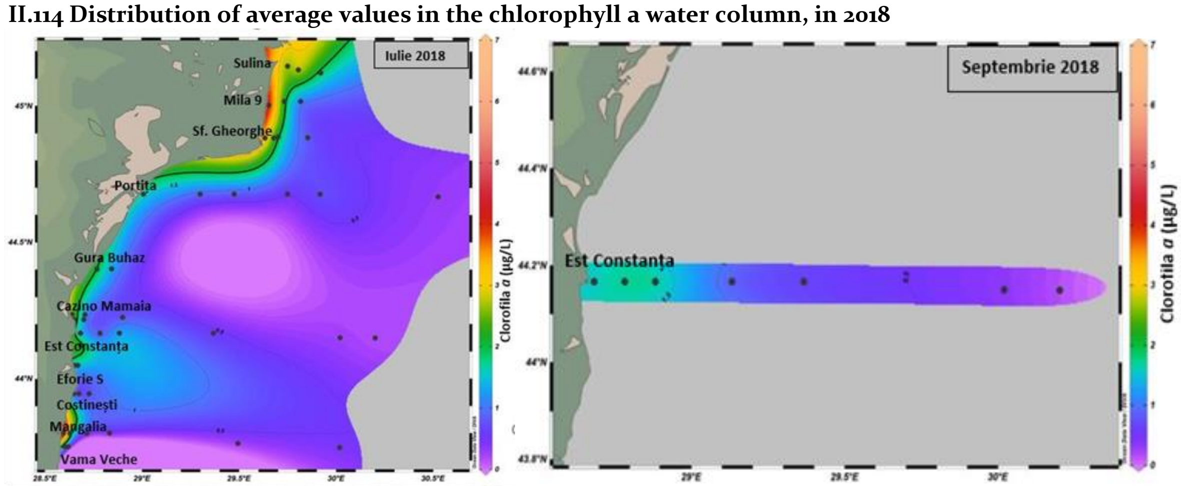
Figure II.113 Seasonal variation of chlorophyll a (μg / L), in shallow waters from Mamaia, in 2018



Chlorophyll a concentrations recorded in July ranged from 0.03 to 8.31 μg / L, the maximum value being recorded in the waters with variable salinity, on Sulina 20M station, in the surface horizon. The values recorded in September, on the East Constanta profile were between 0.06 and 2.67 μg / L, the maximum value being recorded in the marine waters, on the Constanta station 3, in the surface horizon. (Figure II.121)

Analyzing the distribution of the average values in the water column (figure II.122 it can be observed that in July, the maximum values were recorded in the waters with variable salinity (Sulina 20M - 3.73 μg / L, Mila 9 5M - 4.83 μg / L and St. Gh. 5M - 3.81 μg / L) and in the coastal waters of Mangalia (station 1 - 6.54 μg / L). In marine waters, the average values in the water column were reduced, between 0.17 and 1.81 μg / L. In September, the average values in the water column were between 0.16 and 1.77 μg / L, the maximum value being recorded in marine waters (Constanta station 3).

Figure II.114 Distribution of average values in the chlorophyll a water column, in 2018



Source: NATIONAL INSTITUTE OF MARINE RESEARCH - DEVELOPMENT "GRIGORE ANTIPA" CONSTANȚA

The most important hydrographic unit of Constanța county is the Black Sea, located in the eastern part of the county. The Black Sea is a continental sea and has an area of 411,540 km². The maximum depth is greater than 2,211 m, but due to the configuration of the shore and the submarine relief, the water depth is smaller around the Romanian shore. The salinity is 20 - 22 ‰ on the surface of the water and up to 28 ‰ in depth, but it decreases due to the fresh water supply (in the Black Sea many fresh waters are poured). At the level of the Constanta County Station of the National Environmental Guard during the period 2013-2018 there were 31 accidental pollution that affected the water quality in the Danube - Black Sea Canal and in the coastal area of the Black Sea.

Table II.51 illustrates the numerical situation of the accidental pollution recorded at GNM CJ Constanta in the period 2013-2018.

Table II.51 Numerical situation of accidental pollution

Reference perion	2013	2014	2015	2016	2017	2018
No. of accidental pollution	6	8	3	4	4	6

Most of the accidental pollution was registered in the port of Constanța in the harbor damages due to oil leaks and other hydrocarbons coming from the ships that crossed the port aquarium.
As a result of the accidental pollutants recorded, they were located, the causes of their production and the type of pollutant were identified, the category it belongs to, the quantity, the sampling method, the evolution trends were analyzed and what measures were taken at the source..

Source: GNM

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

Temperature

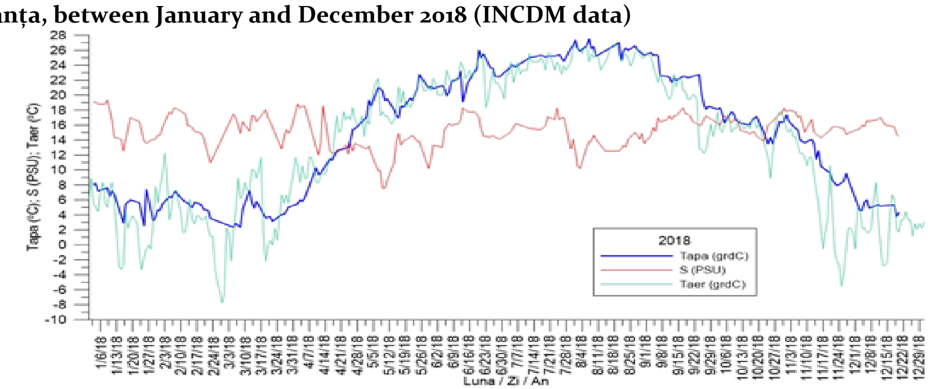
RO 51

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

TITLE: INCREASING THE SEA WATER TEMPERATURE
DEFINITION: This indicator can be defined by: the annual average of the surface water temperature anomalies; the trend of the annual average of the surface water temperature at the surface.

The evolution of the temperature in the active layer is determined by the periodic changes of the thermal balance and the dynamics of the air masses at the air-water interface (figure II.115), while in the depth layers the vertical distribution is maintained by the geothermal flow.

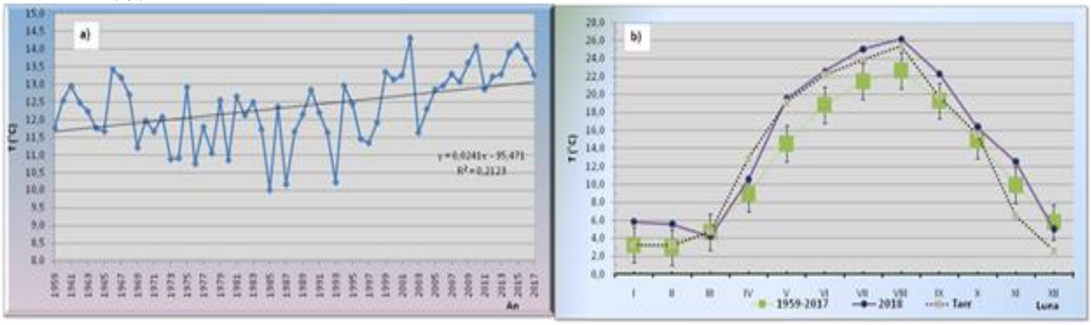
Figure II.115 Daily evolution of air temperature (https://giovanni.gsfc.nasa.gov/giovanni/), water temperature and salinity in Constanța, between January and December 2018 (INCDM data)



The temperature of the seawater, in Constanța, at the level of the 12 months of the analyzed period (average tap 2018 = 15.1 ° C), was 2.8 ° C higher than the reference one (average tap 1959 - 2017 = 12, 3 ° C). The maximum daily temperature measured at 27.5 ° C was measured on August 7, not at all surprising, given the evolution of air temperature (figure II.116a, II.116b). Compared to the multiannual situation, the averages in Constanta exceeded them almost throughout the whole of 2018. The exception is March and December, with a monthly average below 0.5 ° C and 0.8 ° C compared to the period of reference (figure II.126b).

Compared to the reference period, the year 2018 can be characterized as an atypical year from a thermal point of view, with significant positive differences. Thus, the maximum difference of 5 ° C was determined in May (14.5 ° C in the period 1971 - 2017 compared to 19.5 ° C in 2018) (figure 116b).

Figure II.116 Comparative situation of the multiannual (a) and monthly (b) averages of seawater temperature in Constanța, between 1959 - 2017 and 2018



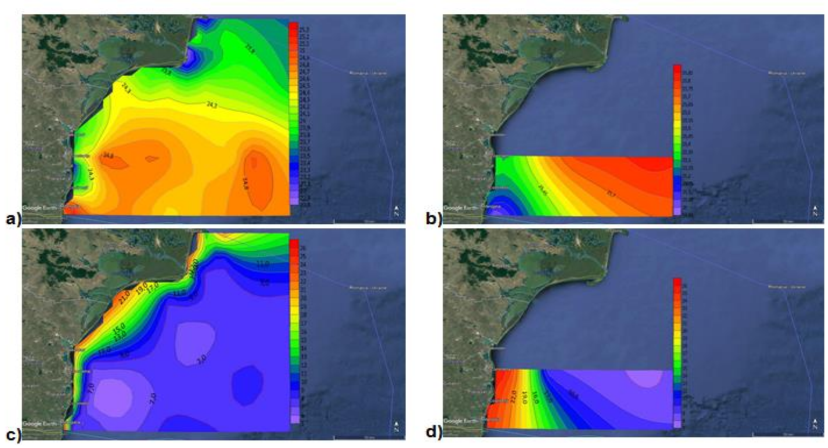
The tendency of the water temperature in the surface layer for the period 1959 - 2016 is slightly increasing by about 0.024 ° C / year (figure II.126a).

Throughout the western continental shelf of the Black Sea, in the entire water column, the water temperature recorded values between 6.6 ° C and 25.9 ° C. The minimum values belong to the Cold Intermediate Layer (SIR ≤ 8 ° C) corresponding to the East-Constanta 4 station (July) at a depth of about 30 m.

During the summer, the temperature distribution was homogeneous from the surface to the bottom layer (figure II.127a, c) with values between 6.6 - 25.4 ° C. The maximum values were recorded in the south of the Romanian continental shelf, at the Vama Veche station 20 m in the surface layer (figure II.127a). In the northern part, the surface temperature distribution follows the direction of flow of the currents in the form of fans formed due to the speed of the Danube flow at the mouth of the sea but also, the tangential velocity of the wind.

The water temperature above the seabed reached the upper limit of the CIL (Cold Intermediate Layer), in the marine area, with depths greater than 20 m. Thus, the water temperature increased by 0.6 ° C passing from the northern side (Tapă Gura Buhaz = 23.8 ° C) to the southern one (Tapă Vama Veche = 24.4 ° C) in the shallow area (0 - 10 m isobath). The strong stratification is observed from the depth of 10 m depth to the bottom. Over the 20 m isobath, the temperature gradient increases significantly from north to south, strongly influenced by the new cold layer formed due to the winter convection. Due to the subduction process this newly formed cold layer is located in the deep layers occupying a wide area (figure II.117c, d) and, which is integrated in the CIL in the convergence zone under the influence of the anticyclonic current from the western part of the Black Sea.

Figure II.117 Horizontal temperature distribution: a, b) at the surface (0 m) and c, d bottom, along the Romanian continental shelf - July (a, c) and September (b, d) 2018



During the autumn period, the temperature distribution is homogeneous on the surface (Fig. II.127c) with values between 24.9 - 25.8 ° C. The maximum values were recorded at the Constanța 6 (70 m) and Constanța 7 (90 m) offshore stations in the surface layer (figure II.127b). The water temperature above the seabed reaches the upper limit of the CIL (Cold Intermediate Layer), in the central part of the Romanian continental plateau, in the marine area with depths greater than 40m (figure II.127d).

Conclusions

- The degree of sea agitation, given by the frequency of waves higher than 1m, was weak in July (49.46% / 31 days). The maximum degree of sea agitation, on the Beaufort scale, was 5 - 7 degrees (maximum wave height of 3.8 m), registering in February.
- The temperature of the sea water, in Constanța, at the level of 2018 was 2.8 ° C higher than the reference one (1959 - 2017). For the western part of the Black Sea, there are three characteristic water bodies: the upper quasi-homogeneous layer (SSQ), the seasonal thermocline and the cold intermediate layer (CIL). CIL, in the hot season (July) reaches depths greater than 25m and in autumn, depths greater than 40m.
- During the spring-summer period (May - September 2018), in the coastal area, no upwelling phenomena were recorded.

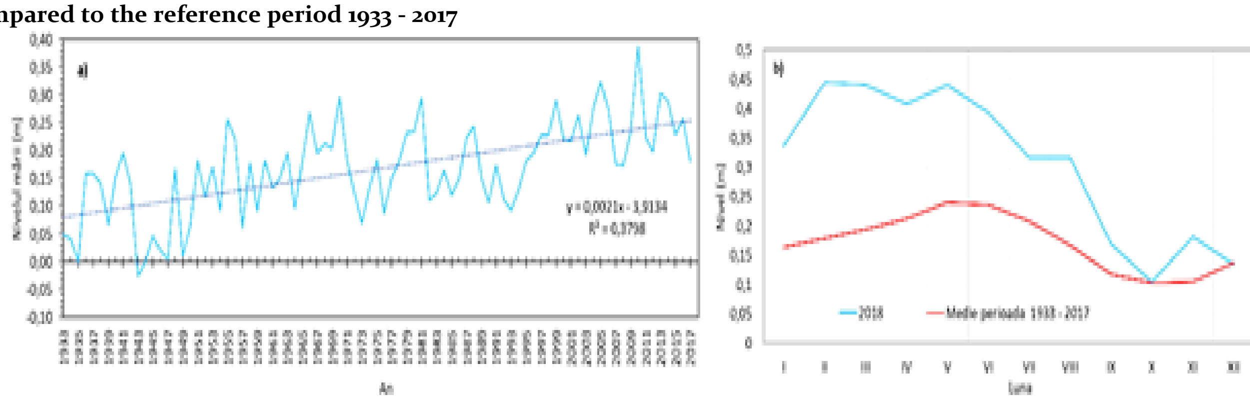
Sea level

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

TITLE: INCREASING SEA LEVEL AT GLOBAL, EUROPEAN AND NATIONAL LEVEL
DEFINITION: The indicator reflects the change of the average sea level, the absolute evolution of the sea level using satellite data**.**

The level of the sea, as one of the status indicators of the coastal zone, presented in 2018 two distinct oscillation stages. Compared with the reference period (the multiannual monthly averages between 1933 and 2017) it was characterized by a constant exceedance of the monthly average values during the whole year (figure II.128b). The year 2018 is characterized by a maximum of 0.44 m (with 0.27 m above the multi-monthly value of the reference period), recorded in February and a minimum of 0.105 m in October (with 0.022m over the multi-monthly value of the reference period).
Regarding the evolution of the sea level on the Romanian coast, we specify that in the long term, the trend is increasing, with a rate of approx. 0.002m / year (Figure II.118a).

Figure II.118 Black Sea level fluctuations on the Romanian coast: a) annual averages 1933 - 2017, b) monthly averages 2018 compared to the reference period 1933 - 2017



II.3.2. THE SITUATION CONCERNING THE MARINE FISHERY FUND

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

TITLE: THE STATE OF MARINE FISH STOCKS DIVERSITY OF THE SPECIES
DEFINITION: The indicator refers at the estimated quantity of fish for the main species of fish in the Romanian Black Sea sector. The indicator monitors the proportion of fish stocks in excess of the total number of commercial stocks, by fishing areas 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 diversity of the Ithiohauna from the Romanian coast undergoes permanent changes both qualitatively and quantitatively. These changes came after the environmental conditions were altered, but also due to the applied fisheries management. Some of these changes had a major impact on both pelagic and benthic fish populations, affecting common and rare species, broods and adults, fish populations with commercial or non-commercial value, thus generating the disappearance of some populations over time and very rarely the introduction of new fish species.
For the qualitative and quantitative determination of the fish stocks, the fish samples collected from the talians located along the Romanian coast from Vadu to Vama Veche were analyzed and by shipments with the beach nest. The samples collected from the talians were taken by the researchers from INCDM Constanța during the period May - October, biweekly, being analyzed in the laboratory of Ichthyology. Shipments were conducted in August in the northern part of the Romanian coast and in Baia Mamaia in October, being drawn six tons during each expedition to depths between 0.5 - 5 m. Qualitatively the following families and fish species appeared frequently on the Romanian coast (table II.5).

Table II.52 Qualitative structure of the ichthyofauna biodiversity on the Romanian coast

Family	Species	Popular name
Atherinidae	*Atherina hepsetus*	aterina
Blenniidae	*Coryphoblennius galerita*	Cocoșel de mare
Belonidae	*Belonebeloneeuxini*	zărgan
Callionymidae	*Calliumymus pusillus*	șoricel de mare
Clupeidae	*Sprattus sprattus*	șprot
	Alosa immaculata	scrumbia de Dunăre
	Alosa tanaica	rizeafcă
	Clupeonella cultriventris	gingirică
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	*Ophidionrochei*	cordeluță
Mullidae	*Mullus barbatus*	barbun roșu
Mugilidae	*Mugil cephalus*	laban
Pleuronectidae	*Platichthysflesus*	cambulă
Rajidae	*Rajaclavata*	vulpe de mare
	Dasyatis pastinaca	pisică 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	căluț de mare
Squalidae	*Squalus acanthias*	rechin
Trachinidae	*Trachinus draco*	drac de mare
Triglidae	*Trigala lucerna*	rândunică de mare

Source: Ministry of Agriculture and Rural Development (MADR)

Indicators for living marine resources

The industrial fishing activity in the Romanian marine sector, from 2018, has been realized in two ways:- fishing with active gears, carried out with coastal trawlers, at depths greater than 20 m;- fishing with fixed gears practiced along the coast, in 12 fishing points, located between Sulina-Vama Veche, at shallow depths, 3 - 11 m / talian, but also at depths of 20 - 60 m / gullies and longs.

The following trends have been reported::

► **Evolution of status indicators:**

◊ Stock biomass for the main fish species (Table II.53) indicates:

- the biomass of the sprat population was estimated at about 42,599 tonnes, almost double than the one obtained in the previous year, but in general it has a natural, almost normal fluctuation;
- the biomass of the cod population was estimated at 23,171 tonnes, almost equal, from the estimates from 2017;
- the biomass of the turbot population was estimated at 2,065 tonnes, higher than the previous year's estimates (26.25%) and almost equal, compared to the estimates of 2016;
- the biomass of the shark population was estimated at 5,556 tonnes, much higher than the estimated values, between 2014 and 2017 (about 400%);
- the biomass of the rapeseed population was evaluated at about 17,500 tonnes, equal to the one appreciated in the previous year.

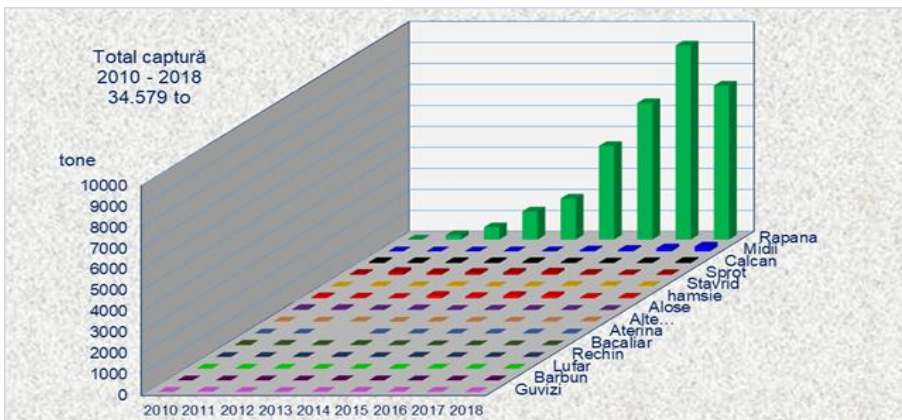
Table II.53 The value of stocks (tonnes) for the main fish species in the Romanian Black Sea sector.

Species	2013	2014	2015	2016	2017	2018
Sprat	56.429	60.000	48.903	114.653	23.269	42.599
Cod	19.797	5.550	7.112	6.928	20.911	23.171
Gobies	300	300	300	300	300	300
Turbot	554	298	999	2.117	1.523	2.065
Shark	4.483	1.520	1.657	1,550	1.223	5.556
Rapana	-	13.000	13.000	14.000	17.500	17.000

The legalization of the trawl fishery for rapana in July 2013 led to the development of a specialized fishery of the species, with a substantial increase in landings from one year to the next (a maximum of 9,244 tonnes / 2017), which decreased the pressure on the stocks of turbot and sprat, species closely regulated and monitored by the European Commission. The decrease in pressure on the two stocks was reflected in the evaluations carried out in 2018.

◊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 2018 were: rapana – 7,330 t; mussels (231 t); anchovy (31 t), sprat (32 t); horse mackerel (29 t); turbot (57) t; alose (9.208 t) and mullet (8 t) (figure no II.119.). In addition to these species, other species also appeared in the catches: atheros (0,058 t), blue fish (0,148 t), grey mullet (2,100 t), gobies (6.426 t), knout goby (2,895 t) Black Sea shad (1,879 t), pontic shad(1,052 t), blue fish (8,042 t), needlefish (2,486 t), thornback ray (3,769 t), sarda (0,102 t) and dasyatis (3,095t).

Figura II.119 Structure of catches (t) of the main species of fish fished in the Romanian marine sector between 2008 and 2018



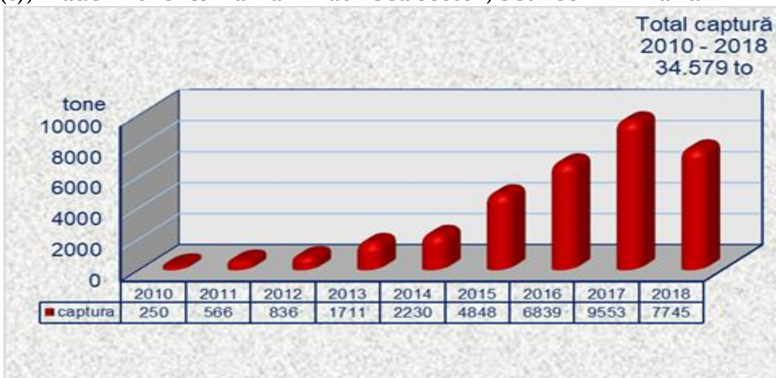
► **Evolution of pressure indicators:**

◊ the fishing effort continues the reduction trend reported since 2000. Thus, in 2087, in active fishing activated 4 vessels (24-40 m), using in fishing: 1 pelagic trawl, 8 beam trawls, 120 gillnets for turbot, 1 vessel (18-24 m), using: 2 beam trawls and 18 vessels (12-18 m), using: 36 beam trawls. In fixed-line fishing practiced along the Romanian seaside, a number of 103 boats, respectively 11 boats (under 6 m) and 92 boats (6-12 m), were used: 1 pelagic trawl, 29 taliens, 14 beams trawls, cages for rapana harvesting, 1.326 gillnets for turbot, 257 gillnets for Black Sea shad, 149 gillnets for gobies, 55 sea cat gillnets, 2 beach nets, 24 longlines for gobies, 24 mounts and 37 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. Over the last six years, catches have increased, respectively: 1,711 tonnes / 2013, 2,231 tonnes / 2014, 4,847 tonnes / 2015, 6,839 tonnes / 2016, 9,553 tonnes / 2017 and 7745 tonnes / 2018. (figure II.120).

The tendency to increase the level of catches during the last six years, was not due to the fish ichthyofauna, but the appearance of the interest of the economic agents, in the manual harvesting and with beam trawl, of the species rapana (Rapana venosa), which has increased from year to year, from about 65% / 2012, to 98.6% / 2017, from the total capture made on the Romanian Black Sea coast.

Figure II.120 Total catch (t), made in the Romanian Black Sea sector, between 2008 and 2018



► **Evolution of impact indicators:**

◊ the percentage of species whose stocks are outside the safety limits has been close to that of previous years being almost 90%. Exceeding the safety limits is not only due to the exploitation of the Romanian marine sector, the majority of the fish species having a cross-border distribution, which requires a management at regional level;

◊ the percentage of the complementary species from the Romanian catches continues to be maintained at a level similar to that of the last years, being 20%;

◊ changes in the structure by size classes (age, length), compared to the period 2010 - 2017, except for the report which shows a rejuvenation of the groups, due to a very good complement, to the other species appeared in the catches, the biological parameters were maintained almost at the same values;

◊ CPUE (catch per fishing effort unit), resulting in fishing in the Romanian coastal area:

- with fixed tools:

a. boats < 6 m:

respectively 57.83 kg / day and 44.76 kg / hour, at a fishing effort of 5 talians, 13 months, 113 days, 146 hours and one catch of 6,535 kg;

- turbot gillnet: 1,874 kg / boat, 31.23 kg / gillnet; 937.0 kg / month; 312.33 kg / day; 56.79 kg / hour, at the effort of a boat, 60 gillnets, 2 months, 6 days, 33 hours and a catch of 1,874 kg;
- gillnet for Black Sea shad: 176.33 kg / boat, 18.24 kg / gillnet; 88.17 kg / month; 40.69 kg / day; 21.16 kg / hour; at an effort of 3 boats, 29 boats, 6 months, 13 days, 25 hours and a catch of 529 kg;
- gillnet for gobies: 153.25 kg / boat, 21.89 kg /gillnet; 131.25 kg / month; 34.05 kg / day; 16.13 kg / hour, at an effort obtained by: 4 boats, 28 gillnets, 4 months, 18 days, 38 hours and a catch of 613 kg;
- longlines: 73 kg / boat, 14.6 kg / longline; 73.0 kg / month; 36.50 kg / day; 18.25 kg / hour, at an effort obtained by a boat, 5 longlines, 1 months, 2 days, 4 hours and a catch of 73 kg;
- talian: 1,307.0 kg / talian: 502.69 kg / month,
- manual rapana harvesting: 18,698.5 kg / boat, 28,047.75 kg / diver; 4,006.82 kg / month; 405.02 kg / day; 71.05 kg / hour, at an effort of 6 boats, 4 people, 28 months, 277 days, 1579 hours and a catch of 112,191 kg.

b. boats 6 - 12 m:

- talian: 855.59 kg / boat, 855.59 kg / talian: 288.51 kg / month, respectively 32.91 kg / day, 20.45 kg / hour in a fishing effort made by 29 boats, 29 talians, 86 months, 754 of days, 1,213 hours and a catch of 24,812 kg;
- turbot gillnet: 1,194.89 kg / boat; 26,427 kg /gillnet; 380.19 kg / month; 183.83 kg / day; 7.56 kg / hour, in an effort made by 28 boats, 1,266 gillnets, 88 months, 183 days, 665 hours and a catch of 33,457 kg;
- gillnet for Black Sea shad: 111.59 kg / boat; 16.64 kg / gillnet; 52.69 kg / month; 17.01 kg / day; 7.51 kg / hour; to an effort obtained by 34 boats, 228 gillnets, 72 months, 223 days, 505 hours and a catch of 3,794 kg;
- gillnet for gobies: 184.39 kg / boat; 25.90 kg / gillnet; 120.56 kg / month; 25.48 kg / day; 11.19 kg / hour; at an

effort of 17 boats, 121 gillnets, 26 months, 123 days, 280 hours and a catch of 3,134.6 kg

- gillnets for catfish: 175.5 kg / boat; 3.51 kg / gillnet; 117 kg / month; 87.75 kg / day; 39 kg / hour; at an effort of 2 boats, 100 gillnets, 3 months, 4 days, 9 hours and a catch of 351 kg;
- longlines for gobies: 64.6 kg / boat, 22.02 kg / longline; 24.84 kg / month; 6.73 kg / day; 3.81 kg / hour, in an effort obtained by 15 boats, 44 longlines, 39 months, 144 days, 254 hours and a catch of 969 kg;
- beach fishing net: 55.0 kg / boat; 55.0 kg /net; 27.5 kg / month; 18.33 kg / day; 4.58 kg / hour, in an effort made by 2 boats, 2 nets, 4 months, 6 days, 24 hours and a catch of 110 kg;
- beam trawl: 65,737.71 kg / boat; 65,737.71 kg / beam trawl; 17,043.11 kg / month; 1,811.67 kg / day; 345.857 kg /trawling, 261.012 kg / hour; to an effort obtained by: 14 boats, 14 beam trawl, 54 months, 508 days, 2,661 trawlings, 3,526 hours and a catch of 920,328 kg;
- manual rapana harvesting: 43,595 kg / boat; 9,300.27 kg / man; 12,237,193 kg / month; 1,541.48 kg / day; 292.155 kg / hour; to an effort made by 32 boats, 150 people, 114 months, 905 days, 4,775 hours and a catch of 1,395,040 kg;
- cages for rapana harvesting : 1,765 kg / boat; 11.77 kg / cage; 882.5 kg / month; 392.22 kg / day; 86,097 kg / hour; to an effort made by 2 boats, 300 cages, 4 months, 9 days, 41 hours and a catch of 3,530 kg;
- volts: 57,35 kg / boat; 31.00 kg / volt; 34.75 kg / month; 9,558 kg / day; 2,364 kg / hour, in an effort made by 20 boats, 37 volts, 33 months, 120 days, 485 hours and a catch of 1,147 kg;
- pelagic trawl: 1,265.0 kg / vessel, 1,265.0 kg / pelagic trawl; 421.66 kg / month; 158.12 kg / day; 23.02 kg / trawling, 20.74 kg / hour, at an effort obtained by 1 ship, 1 pelagic trawl, 3 months, 8 days, 55 trawlings, 61 hours and a catch of 1,265 kg;
- mounts: 58.75 kg / boat; 32.5 kg / mount; 22.94 kg / month; 7.65 kg / day; 2.18 kg / hour, in an effort made by 16 boats, 24 mounts, 34 months, 102 days, 357 hours and a catch of 780 kg.

- with active tools:

a. boats 12 - 18 m:

- pelagic trawl: 588.0 kg / vessel, 588.0 kg / pelagic trawl; 294.0 kg / month; 47.04 kg / day; 13.21 kg / trawling, 12.78 kg / hour, at an effort obtained by 2 vessels, 2 pelagic trawls, 4 months, 25 days, 89 trawlings, 92 hours and a catch of 1,176 kg;
- beam trawl: 197,679.28 kg / ship; 98,838.64 kg / beam trawl; 34,884.58 kg / month; 3,350.5 kg / day; 464.22 kg / trawling, 412,477 kg / hour, at an effort obtained by: 18 vessels, 36 beam trawl, 102 months, 1062 days, 7,665 trawlings, 8,955 hours and a catch of 3,558,227 kg.

b. boats 18 - 24 m:

- beam trawl: 265,620 kg / ship, 132,810.0 kg / beam trawl; 44,270.0 kg / month; 3,124.94 kg / day; 649,438 kg / trawling, 174.406 kg / hour, at an effort obtained by a ship, 2 beam trawl, 6 months, 85 days, 409 trawlings, 1523 hours and a catch of 265,620 kg;

c. boats 24 - 40 m:

- pelagic trawl: 22,090 kg / ship; 4,418.0 kg / month; 1004.09 kg / day, 162.43 kg / trawling, 162.43 kg / hour, at a fishing effort of 1 vessel, 5 months, 22 fishing days, 136 trawlings and 136 trawling hours and a catch of 22.090 kg;
- turbot gillnets: 738.0 kg / ship; 6.15 kg / gillnet; 369.0 kg / month; 147.6 kg / day; 41.0 kg / hour, at an effort made by 1 ship, 120 gillnets, 2 months, 5 days, 18 hours and a catch of 738 kg;
- beam trawl: 273,987.75 kg / vessel; 136,993.87 kg / beam trawl; 37,791.42 kg / month; 4,044.10 kg / day; 436.286 kg / trawling, 395.22 kg / hour, at an effort obtained by: 4 vessels, 8 beam trawls, 29 months, 271 days, 2512 trawlings, 2773 hours and a catch of 1,095,951 t.

Measures to solve critical problems

► at national level

- preserving the biological diversity of marine ecosystems and protecting endangered species;
- the use of selective fishing tools and techniques - non-destructive, cost-effective, that respects the environment and protects living marine resources;
- development of mariculture and diversification of mariculture products.

► at regional level

- development of programs / projects to assess the state of fish stocks and to monitor the environmental conditions and biological factors that influence them;
- creation of a regional fisheries database;
- tackling rigorous actions to combat illegal fishing.

Source: Ministry of Agriculture and Rural Development (MADR)

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

RO 33

Indicator code Romania: RO33
EEA indicator code: CIS 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 2018, no marine aquaculture farm was operating on the Romanian coast, so the pressure exerted by this activity was zero.

RO 34

Indicator code Romania: RO 34
EEA 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.

Tables II.54 and II.55 summarize the situation in 2018 regarding active and inactive vessels / vessels in the Romanian coastal area with an active capacity of 1,376.63 GT and 5,813.9 kW.

Table II.54 Total boats / vessels active in 2018.

Length classes boats/ships	Total active boats/ships	Fishing technique	Medium length (m)	Medium age (ani)	Total GT	Total kW	No. of people
< 6 m	11	PG	5.19	14.9	8.45	93.5	32
6-12 m	58	PG	7.68	22.69	95.22	618.99	139
6-12 m	34	PMP	8.22	13.9	150.66	804.59	122
12 - 18 m	18	PMP	14.68	8.67	576.3	2,895.57	72
18-24 m	1	PMP	20.2	19	70	184.00	4
> 24 m	4	PMP	25.75	26.8	476	1,217.25	19
TOTAL	**126**		**81.72**	**105.96**	**1376.63**	**5813.9**	**388**

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.*

Table II.55 Total boats / vessels inactive in 2018.

Length classes boats/ships	Total active boats/ships	Medium length (m)	Medium age	Total GT	Total kW
< 6 m	7	5.17	18.9	5.58	4.41
6-12 m	33	8.06	18.48	65.37	321.32
12-18 m	1	14.9	1	24.87	109
TOTAL	**41**	**28.13**	**38.38**	**95.82**	**434.73**

Potential risks to the coastal system generated by the action of natural factors

The coastal and marine area of Romania is facing increasing pressures, mainly as a result of population growth, urbanization, development of agriculture, fisheries and industry. The coast is subject to erosion, water pollution, decline of renewable resources, loss of biological diversity, loss of wetlands and destruction of the landscape. The need to cope with the impact of climate change in the future in combination with finding adaptive answers is also a problem.

The main pressures facing the coastal area and the Romanian navy are:

- **Increased environmental risks due to climate change:** increasing sea level, increasing the incidence of extreme storms and exceptional phenomena such as tornadoes / seashells, coastal erosion, rising water temperatures, changing salinity and reducing biological diversity.

The intensification of morphodynamic processes due to climate change and changes in shoreline configuration lead to lower sediment transport rates and associated sediment budget and materialize by amplifying erosion phenomena at both beaches and cliffs and implicitly loss of property / damage to infrastructure.

After 1990, the need for space for new constructions, private houses or destined for the tourist circuit, led to the expansion of the built areas, especially in the coastal area. The INSSE data analysis (figure II.121 shows an increase of approximately 23% in the number of dwellings in the coastal area from about 160000 in 1990 to over 200,000 in 2017, both in the existing urban areas (leading to an increase in the density of buildings and the decrease of green space) as well as by extending it out of the city. Several constructions appeared in the area adjacent to the sector of Lake Siutghiol (Mamaia resort), the coastal cordon of Lake Techirghiol (Eforie Nord-Eforie Sud) gradually destroying the system of dunes, cliffs of Costinesti, etc. The constructions, in many cases less than 100 m from the water line, are strongly carried out and deteriorated during the storm episodes (figure II.122).

Figure II.121 Evolution of the number of dwellings (UAT coastal area, 1990-2017), data source: INSSE

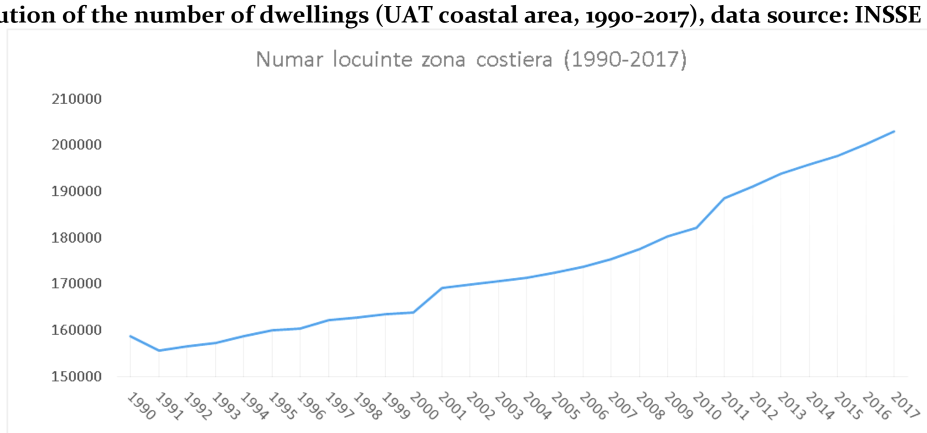
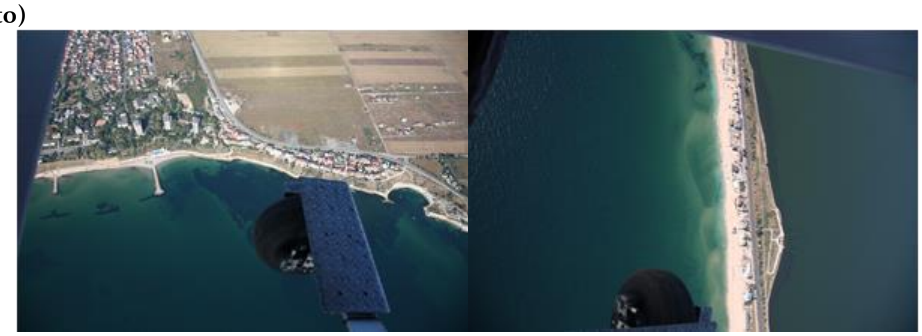


Figure II.122 a. Expansion of urban areas (Eforie Nord-Agigea) b. Beach constructions - coastal sector Eforie Nord-Eforie Sud (original photo)



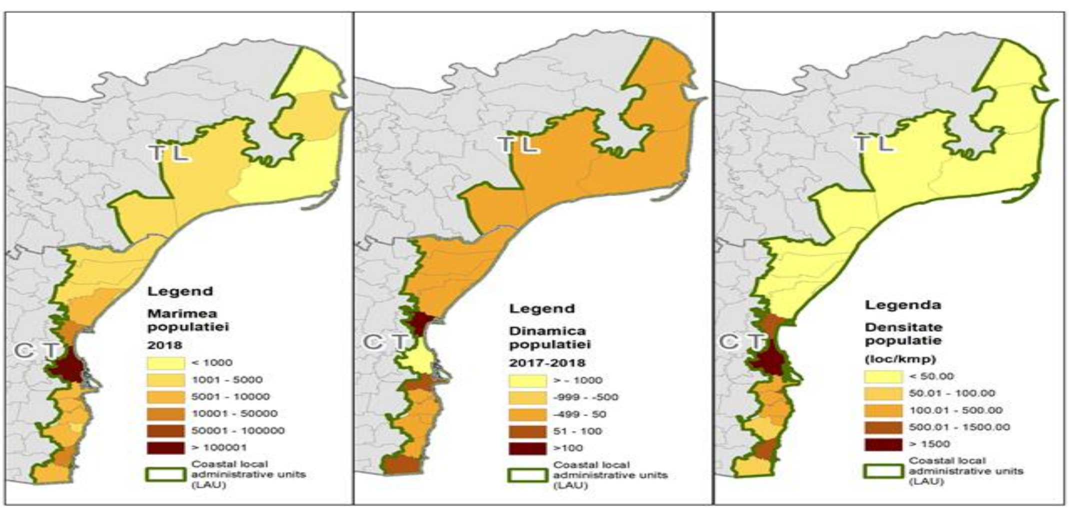
In the short term (2013-2015), within the project "Protection and rehabilitation of the southern part of the Romanian Black Sea coast in the area of Constanța and Eforie Nord, Constanța county", five priority projects were planned and implemented to reduce the risk of coastal erosion and rehabilitation along a length of 7.1 km of coast in the following locations: South Mamaia, North Tomis, Central Tomis, South Tomis and Eforie Nord. The second phase of the mentioned project (2014-2020) constantly provides for artificial re-sanding of the beaches and the construction / rehabilitation of the emitted and submerged coastal structures for 6 sectors from the south of the coast: Costineşti, Olimp, Jupiter-Neptun, Mangalia-Venus-Aurora, Mangalia-Saturn, 2 Mai.

- **Urbanization of the coastal area,** mainly as a result of the concentration of population, housing, the development of uncontrolled tourism and the increase of leisure activities. Uncontrolled development has negative effects on the marine environment and the landscape and increases the pressure on the ecosystem, which eventually leads to the loss of marine habitats**.**

Over the last 20 years the built area has expanded by more than 30%, being focused on the residential development, in the immediate vicinity of the Black Sea or the coastal lakes (Siutghiol, Techirghiol, Tatlageac).

Within the coastal zone, the city of Constanța together with the neighboring localities concentrates a permanent population of over 430000 inhabitants (62% of the total population of the county), on an area of only 30% of the county territory and with an average number of floating population during the season spa-touristic of minimum 150,000 people. Most of the population (~ 83%) is concentrated in the urban area, of which 80% in the city of Constanța with densities of over 1500 inhabitants / km and 20% inhabitants in the other component cities of the Constanța Metropolitan Area, the rest of the population being concentrated in rural area. Another area of urban agglomeration is found in the south coast - the Mangalia area, the population increasing greatly during the summer due to the Mangalia North tourist area. The coastal area in the north of the coast is characterized by a low number of inhabitants and low values of population density (below 50 inhabitants / km) due to the natural conditions and belonging to the Danube Delta Biosphere Reserve (figure II.123). It is noted, higher concentrations of population during the summer season in the areas Sulina, Sf. Gheorghe, Gura Portiței, Vadu being affected especially on the wild beaches. Compared to 2017, there is a decrease in the population in the urban area of Constant city and a slight increase in the number of inhabitants in adjacent areas (Năvodari, Eforie).

Figure II.123 Number of inhabitants, population dynamics (2017-2018) and density at the level of territorial administrative units (UAT), coastal area (data source: INSSE)



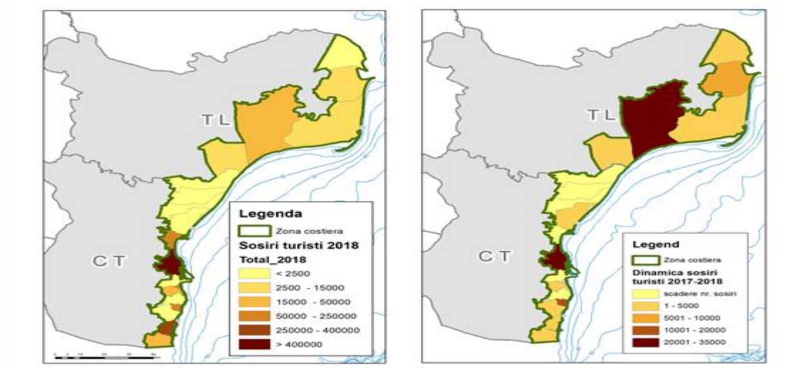
Urban development of areas adjacent to the shoreline can cause habitat destruction and fragmentation through illegal constructions, changing currents and sediment dynamics, but also by pollution due to the discharge of wastewater during the construction and operation of these buildings.

- **Tourist activities in the coastal area**

The relationship between the environment and tourism has a special significance, the protection and conservation of the environment probably representing the essential condition for the progress and development of tourism. This relationship is complex: on the one hand, the natural environment, through its components, provides basic resources for the tourism sector, on the other hand tourism has a positive and negative impact on the environment, by modifying its components.

Figure II.124 a. High density of tourists on the beach (Neptun) b. Urbanization of the coastal area (Municipiul Constanța) (original photo)

Figure II.125 Tourist arrivals, 2018, dynamic tourist circulation (2017-2018), territorial administrative unit level (UAT), coastal area (data source: INS)



The number of tourists has steadily increased since 2002, reaching in 2018 to over 1,480,473 arrivals, increasing by ~ 16% compared to 2017, with a pronounced seasonal character, resulting in a concentrated impact during the summer months, in especially July and August, representing more than 60% of the total arrivals, when the population grows in the area several times (figure II.126 and figure II.127). The spatial analysis of arrivals during 2017-2018 shows an increase for the northern area of the coast (especially Sulina - Sfântu Gheorghe - Murighiol - Portița) and Costanța (including Mamaia resort) and a slight decrease for the Eforie and Costinesti sectors.

Figure II.126 Tourism circulation (2002-2018) (data source: INSSE)

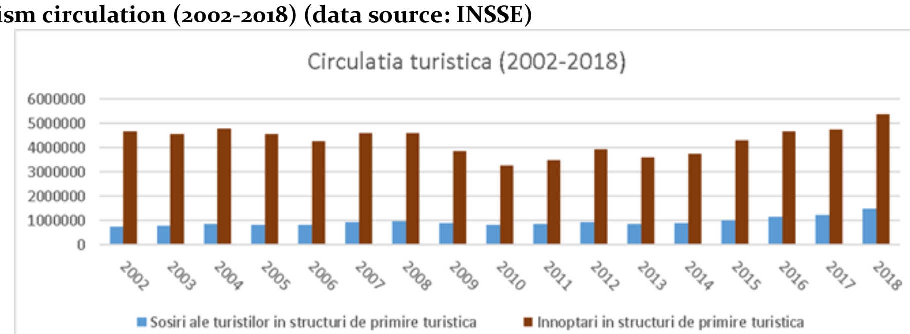
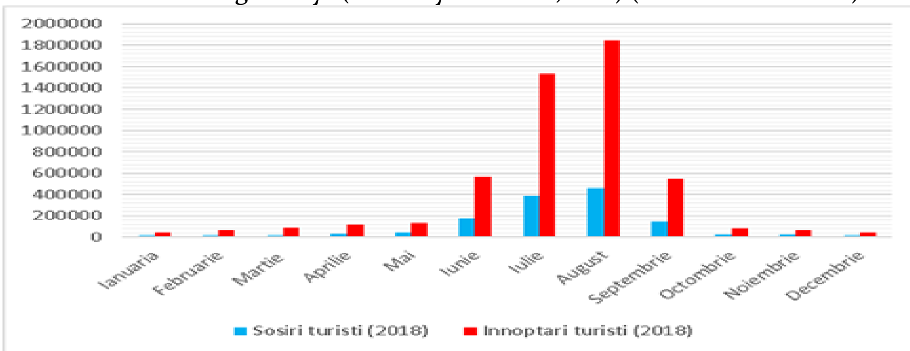


Figure II.127 Tourist arrivals and overnight stays (monthly situation, 2018) (data source: INSSE)



The high density of tourists on the beach can cause chemical or nutrient pollution, direct destruction of shellfish populations by crushing the shells, generating non-degradable hazardous waste (PET packaging - plastic bottles, lids, plastic glasses, packaging, plastic bags and bags). On the Romanian coast, the highest density of tourists on the beach can be found in Mamaia / Constanța, Eforie, Costinești and Vama Veche. Compared to 2017, there is an increase in the number of tourists in the Danube Delta area - Sf. Gheorghe, Murighiol, Jurilovca.

- **Port and transport activities**

In 2018, the seaports (Constanta, Constanța Sud-Agigea, Midia and Mangalia) had a total traffic of 61,303,774 tonnes of goods (an increase of 5% compared to 2017). According to the INS, the traffic increased continuously from ~ 32% in the period 2009-2018 (figure II.128), some of the traffic being represented by products at risk of pollution: oil and petroleum products, chemicals, minerals, derived chemicals from coal and tar (figure II.129).

Figure II.128 Total port traffic (1970 - 2018, seaports) (data source: Maritime Ports Administration)

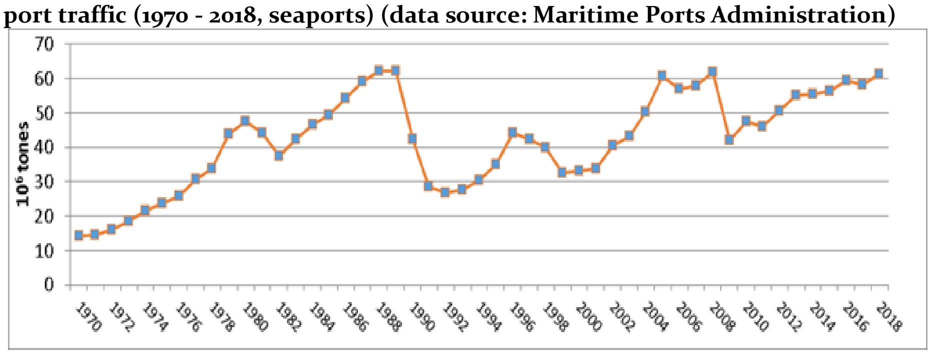
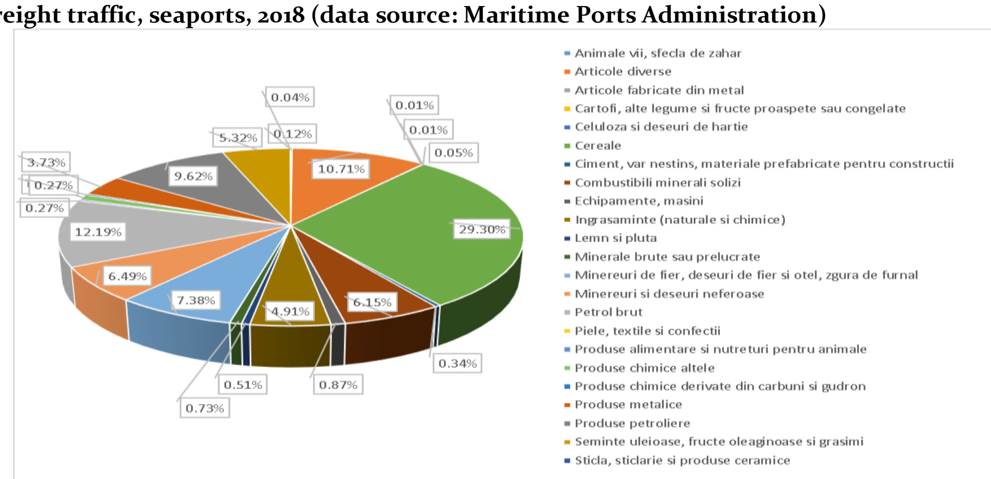


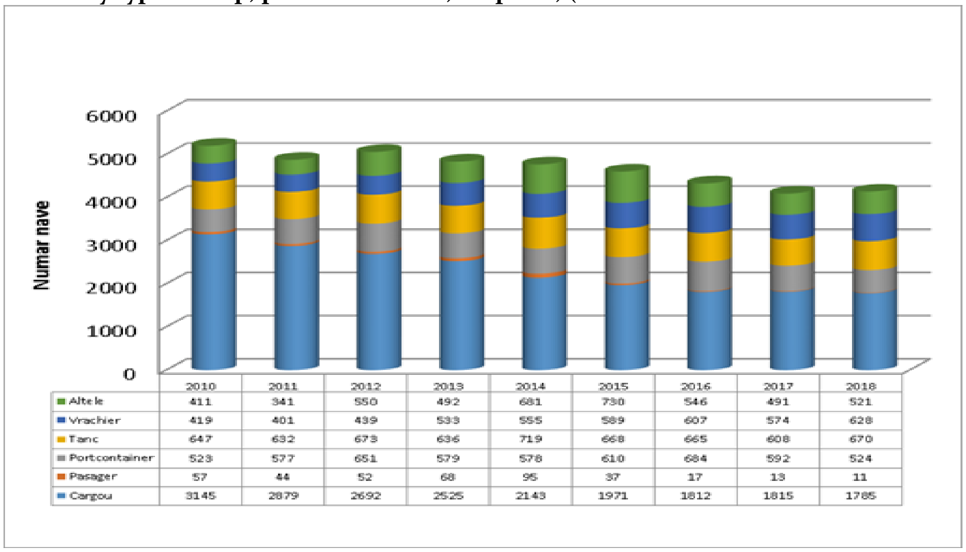
Figure II.129 Freight traffic, seaports, 2018 (data source: Maritime Ports Administration)



The maritime transport sector generates risks both on the coast and in the marine environment, as well:

- Coastal erosion / intervention in sediment dynamics at regional level
- Extraction of natural resources / sand from submerged beach
- Water / air pollution (hydrocarbons, greenhouse gases, solid waste from diffuse sources, etc.) in adjacent areas; noise pollution;
- Pollution due to maritime transport, ecosystem imbalance through the intrusion of foreign species through ballast waters
- Loss of endangered species / habitats
- Uncontrolled development of industrial activities related to ports (discharges, accidental pollution, tank washing).

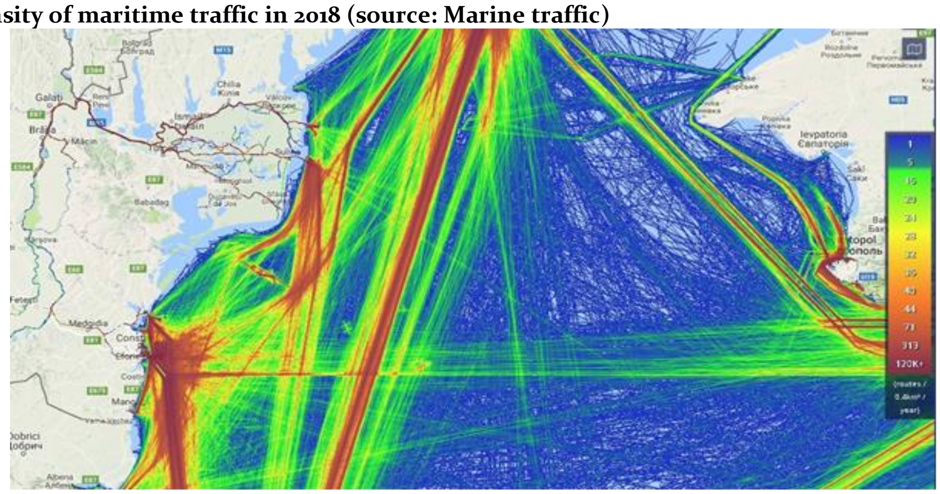
Figure II.130 Port traffic by type of ship, period 2010-2018, seaports, (data source: Maritime Ports Administration)



	2010	2011	2012	2013	2014	2015	2016	2017	2018
Altele	411	341	550	492	681	730	546	491	521
Vrachier	419	401	439	533	555	589	607	574	628
Tanc	647	632	673	636	719	668	665	608	670
Portcontainer	523	577	651	579	578	610	684	592	524
Pasager	57	44	52	68	95	37	17	13	11
Cargou	3145	2879	2692	2525	2143	1971	1812	1815	1785

In terms of maritime traffic, it is concentrated in the southern coastal area and the mouths of the Danube, the routes being to the main ports in the Black Sea, especially to Istanbul and the Bosfor (density greater than 1200 routes / 0.4 kmp / year) and is generally represented , of bulk vessels, tank and port container (figure II.130 and figure II.131).

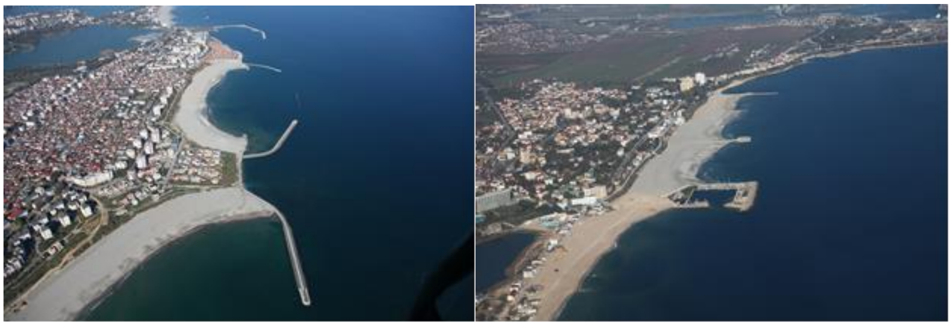
Figure II.131 Intensity of maritime traffic in 2018 (source: Marine traffic)



Increased impact on marine habitats - especially in the special conservation areas of the Natura 2000 network. Coastal protection works and sand beaches, increasing demand for space for tourist activities, water sports, new buildings, mainly holiday homes,

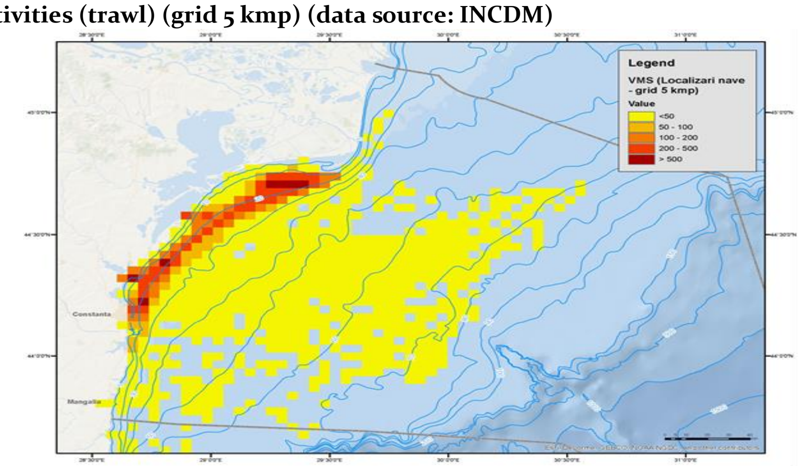
growth port traffic negatively affected the functions of natural habitats and species.
More than 7 km of shore has already been the object of coastal protection works, which will be extended in the following period, the impact on marine habitats and marine species / ecosystems materializing through morphological change, physical parameters change, pollution , modification of sediment composition etc (Figure II.132).

Figure II.132 Work done in the first part of the coastal erosion reduction project (a. Tomis Nord, b. Eforie Nord) (original photo)



- **The fishing activities** can have a negative effect on the benthic habitats - from the analysis of the VMS data it was established that the fishing activities with the trawl beam are carried out in the perimeter delimited by the isobaths 5-7 m and 30 m deep, from Constanta to the Sahalin Peninsula, the affected area is about 1500 km2 (figure II.133). The habitats in this perimeter overlap the infralitoral floor (sands) and circalitoral floor (sands and slopes).

Figure II.133 Fishing activities (trawl) (grid 5 kmp) (data source: INCDM)



- **Other risks induced by industrialization and agriculture:**
  - Eutrophication of coastal waters
  - Water / air pollution (nutrients, pesticides, s.a.)
  - Habitat loss / land vegetation / endangered species
  - Landsliding
  - Noise pollution
  - Water / air pollution (hydrocarbons, greenhouse gases, solid waste from diffuse sources, s.a.)
  - Loss of habitats / endangered species.

  Regarding the prioritization of the frequency of occurrence, there are some major risks to the coastal ecosystem: eutrophication, loss of bio-diversity, algal blooms, pollution with hydrocarbons / heavy metals / toxic chemicals and biological.
  Also, the loss of the quality of the coastal / bathing waters determined, on the one hand, by the change of the flow conditions of the water and

sediments, is felt as a risk in case of loss of transparency, the increase of the number of suspensions and / or the increase over the limit of the dissolved substance (with the modification of the marine optical regime), of the salinity, the dissolved oxygen, but also of the increase on the other hand the concentration of nutrients, silicates, detergents, heavy metals, organic pollutants / hirocarbons, as an impact of the different socio-economic activities of the coastal area, can constitute a major risk on the related biota, affecting the health and well-being of the coastal ecosystems.

II.3.4. Integrated management of coastal areas and maritime spatial planning

Chapter 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 EEA 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 on 6.3 million ha, of which about 2.3 million arranged with anti-erosion works, which are currently heavily degraded; this together with the landslides (about 0.7 million ha) cause soil losses of up to 41.5 t / ha/year.
Wind erosion is manifesting on almost 0.4 million ha, with the danger of extension, knowing that, in recent years, some forests and protective curtains have been cleared from areas with sandy soils, susceptible to this degradation process. The respective soils have a small edaphic volume, low water retention capacity and suffer from drought, having low fertility.
Excessive skeleton content in the upper soil affects about 0.3 million ha.

Table III.1 The area of agricultural land affected by various productive capacity limiting factors

Factor's name	Affected area[1] 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	-

Soil abrasion is felt on about 0.6 million ha, with some aggravating tendencies in irrigated or drained and irrationally exploited perimeters, or in other areas with secondary salting potential, totaling another 0.6 million ha.
The deterioration of the structure and the secondary compaction of the soil ("plow's sole") manifests on

about 6.5 million ha; primary compaction is present on about 2 million ha of arable land, and the tendency to form the crust on the surface of the soil, on about 2.3 million ha.

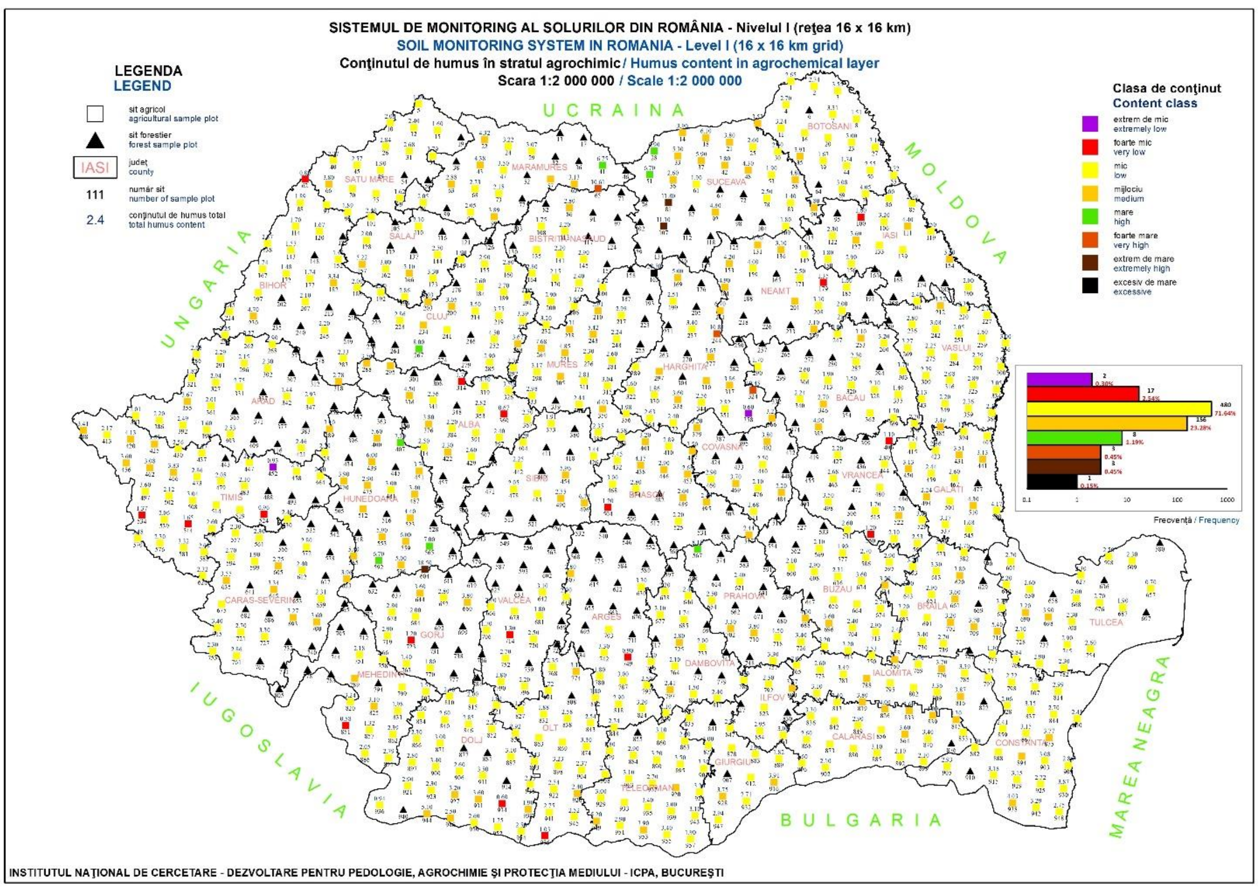
The agrochemical state, analyzed on 66% of the agricultural fund, has the following unfavorable characteristics:

- strong and moderate acidity of the soil on about 3.4 million ha agricultural land and moderate-strong alkalinity on about 0.2 million ha agricultural land - weak to very low insurance of the soil with mobile phosphorus, about 6.3 million ha agricultural land;
- poor soil insurance with mobile potassium, on about 0.8 million ha agricultural land;
- poor assurance of nitrogen soil on about 5.1 million ha agricultural land;
- ensuring extremely low to low humus soil on almost 7.5 million ha of agricultural land;
- shortcomings of microelements on large areas, especially zinc deficiencies, strongly felt in corn cultivation on about 1.5 million ha.

The humus content (H,%) determined in the agrochemical layer of the agricultural monitoring sites in the 16x16 km network at country level, presented values in the extremely small - excessively high domain, the highest weight returning to soils with low humus content. (71.6%), followed by soils with medium content (23%) (fig. III.1):

Physico-chemical and chemical pollution of the soil affects about 0.9 million ha; particularly strong aggressive effects on the soil produce pollution with heavy metals (especially Cu, Pb, Zn, Cd) and sulfur dioxide, identified especially in the critical areas Baia Mare, Zlatna, Copșa Mică. In total, the particulate pollution carried by the wind 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 the heavily affected areas. Oil and salt water pollution from oil, refining and transport operations is present on about 50 000 ha.

Figure III.1 Spatial distribution of humus content values in agrochemical layer of agricultural sites monitoring network 16x16 km



The deterioration of the soil by various excavation works affects about 24 000 ha, which is the most serious form of soil deterioration, encountered in the case of daily mining, as for example, in the mining basin of Oltenia. The quality of the lands affected by this type of pollution decreased by 1-3 classes, so that some of these surfaces became practically unproductive.

Covering the soil with solid waste and residues has led to the removal of about 18,000 hectares of agricultural land from the agricultural circuit.
The mentioned data are also evidenced by the results of the re-inventory of the lands affected by different processes presented in summary in table III.2.

Table III.2 General situation of soils in Romania affected by different processes

General Process Name		Code	Area (ha) and degree of damage					Total
			poor	moderate	strong	very strong	excessive	
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	**32191645**
		TOTAL III	**11029343**	**14687038**	**8738809**	**3728902**	**1627791**	**39811883**
Total general			**12742504**	**16352013**	**9775795**	**4329915**	**1961232**	**45161495**[2)]

Source: National Institute for Research and Development for Pedology, Agrochemistry and Environmental Protection (I.C.P.A.) and County Offices for Pedological and Agrochemical Studies (O.J.S.P.A.)

[2)] *The same surface can be affected by several processes*

III.2. CRITICAL AREAS FOR SOIL DEGRADATION

III.2.1. SITES POTENTIALLY CONTAMINATED AND CONTAMINATED BY ANTHROPIC PROCESSES

The management of potentially contaminated and contaminated sites aims to minimize any adverse effects of pollutants on human health and the environment.

RO 15

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

TITLE: The progress made in managing potentially contaminated and contaminated sites
DEFINITION: The management of potentially contaminated and contaminated sites comprises the following stages: preliminary investigation, detailed site investigation, implementation of risk reduction measures for potentially contaminated sites and remediation of contaminated sites.

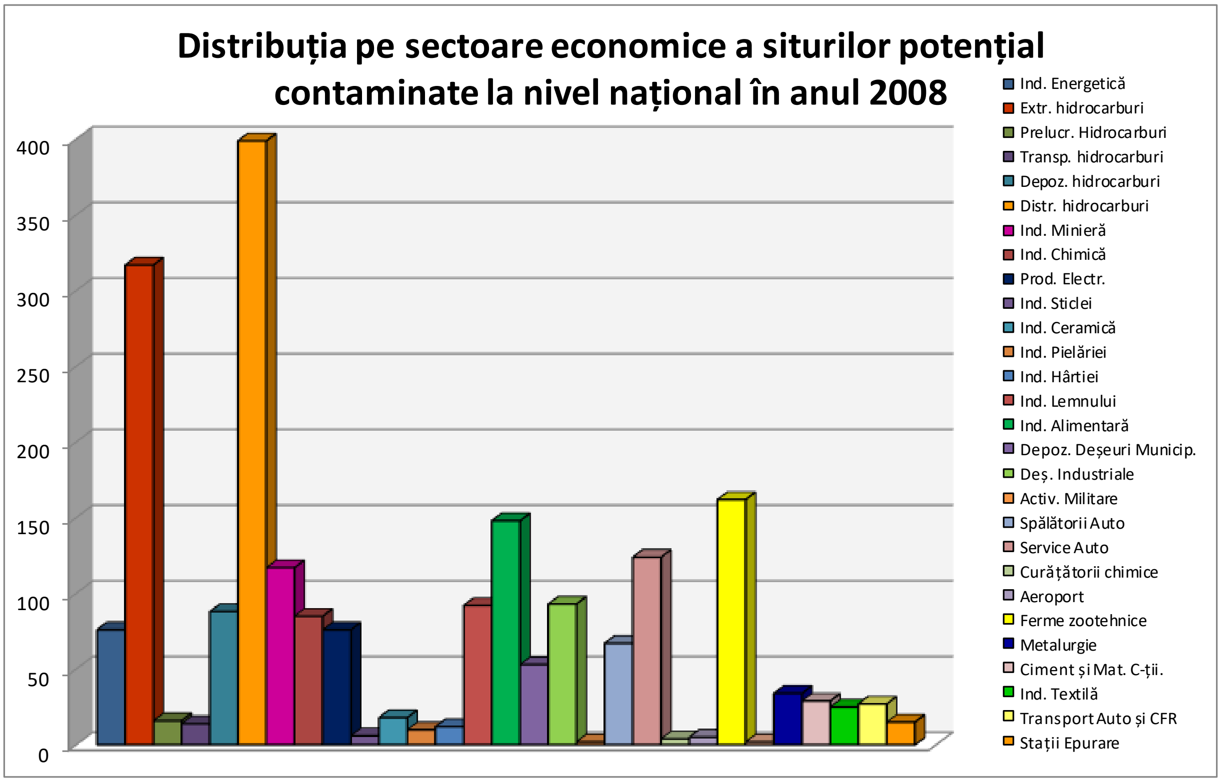
A preliminary national inventory of potentially contaminated sites was prepared at the level of 2008 based on the answers to the questionnaires provided for in Annexes 1 and 2 of HG 1408/2007 on the methods of investigating and evaluating soil and subsoil pollution. According to this inventory in Romania, there were 1628 potentially contaminated sites distributed by economic sectors as follows:

- 151 potentially contaminated sites in the mining and metallurgical industry;
- 834 potentially contaminated sites in the oil industry;
- 85 potentially contaminated sites in the

chemical industry;

- 558 potentially contaminated sites from other activities (industry-specific activities: energy, electrotechnics and electronics, glass, ceramics, textiles and leather, cellulose and paper, wood, cement, machine building, food, military activities, specific land transport activities, airports , specific agricultural and zootechnical activities) (figure III.2).

Figure III.2 Distribution by economic sectors of the potentially contaminated sites at national level in 2008



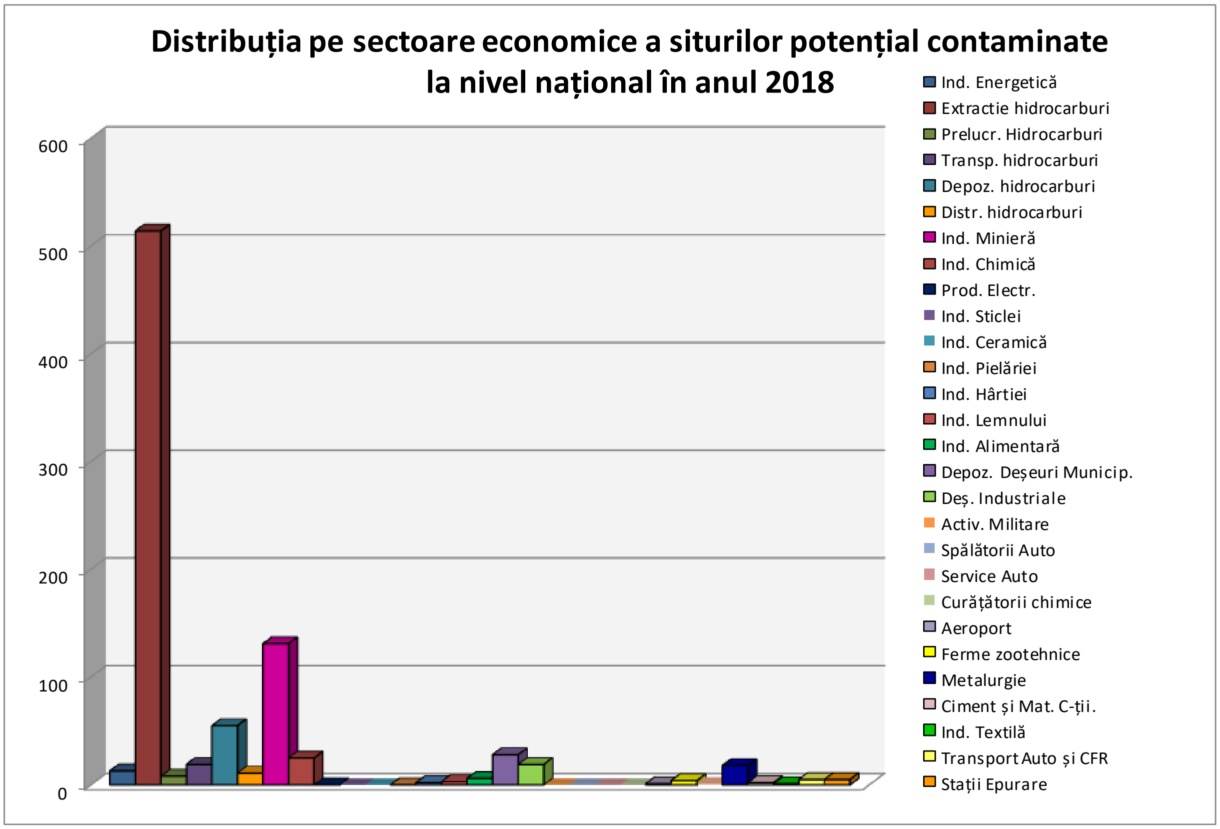
Source: NEPA

In 2015 it was published in the Official Gazette, HG no. 683/2015, approving the National Strategy and the National Plan for the Management of Contaminated Sites in Romania, based on the national inventory updated by the National Agency for Environmental Protection.

The synthetic situation at the level of 2018 of the sites on which anthropic activities with soil impact have been / are carried out, based on the information communicated by the subordinated and centralized institutions at national level, is graphically represented in figures III.3 and III. 4. According to this reinventory, a number of 870 potentially contaminated sites were identified, broken down by economic sectors as follows:

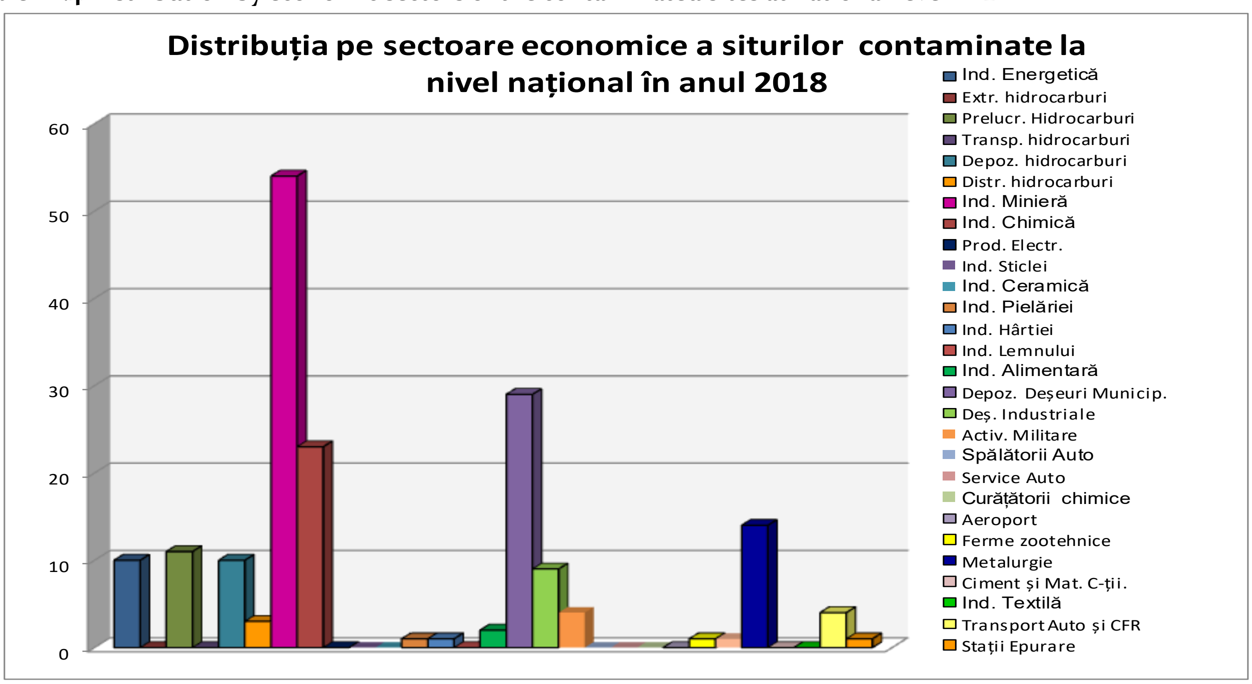
- 149 potentially contaminated sites in the mining and metallurgical industry;
- 607 potentially contaminated sites in the oil industry;
- 25 potentially contaminated sites in the chemical industry;
- 89 potentially contaminated sites from other activities (industry specific activities: energy, textile, machine building, food, specific land transport activities, zootechnical activities, etc.).

Figure III.3 Distribution by economic sectors of potentially contaminated sites at national level in 2018



Source: NEPA

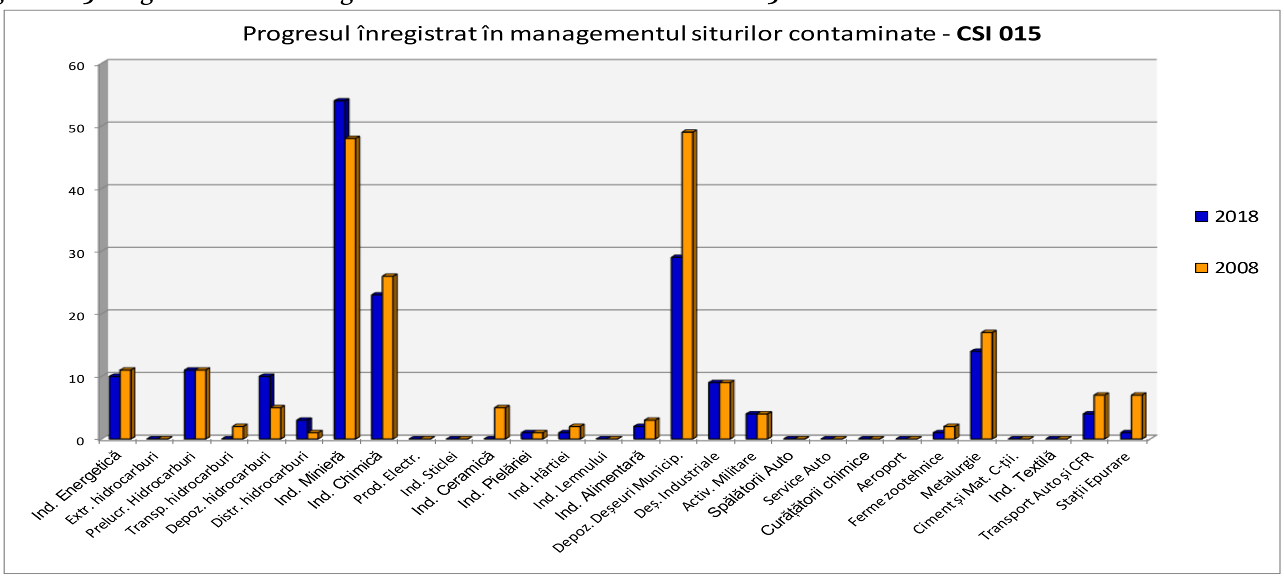
Figure III.4 Distribution by economic sectors of the contaminated sites at national level in 2018



Source: NEPA

National inventory of potentially contaminated and contaminated sites that was the basis of the HG no. 683/2015 is in a continuous numerical dynamic so that the total number of sites, for some fields of activity, is expected to increase as a result of the investigation of the former industrial platforms, of the areas where agricultural activities were carried out, the lands on which they have hazardous waste deposits have been placed after their closure and post-closure monitoring, 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 III. 5, according to the EEA indicator: CSI 015 - The progress registered in the management of contaminated sites. Thus, there is a decrease in the number of contaminated sites, as a result of remediation work in the oil industry, the mining industry and in terms of the sites destined for the storage of household waste, for example in the counties of Bihor, Călărași, Constanța, Arad, Vrancea, Hunedoara and Tulcea.

Figure III.5 Progress in the management of contaminated sites – CSI 015



Source: NEPA

By reducing the number of contaminated sites in the period 2015-2018, the need for investments and financing priorities for the contaminated sites sector for the 2014-2020 funding period estimated in the National Strategy and the National Plan for the Management of Contaminated Sites in Romania has changed in a positive way.

The National Strategy envisages the provisions of the EU directives in force related to the protection of the environment and human health, such as the Directive of the European Parliament and of the Council (2000/60 / EC) establishing a Community water policy framework, the European Council 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, European Council Directive (79/409 / EEC) on the conservation of wild birds, Directive Council (92/43 / EEC) on the conservation of natural habitats and of wild fauna and flora. An EU soil protection directive is not in place, but there is a common general approach to soil contamination issues. This approach is based on risk assessment and management associated with soil pollutants, the concept being called "Risk-Based Land Management" (RBLM).

Regarding the estimated costs for investigating and evaluating the risks of the 870 potentially contaminated sites as well as their remediation if, following the detailed investigation of the soil and the subsoil, they are declared contaminated (figure III.4), compared to the value carried at the level of 2015, 7.145 billion Euro, for the 1183 potentially contaminated sites from that time level, we consider that the value will continue to register a significant decrease, similar situation and for the 177 contaminated sites (figure III.4), maintaining the decreasing trend from 2018. The financing of the pollution investigation and evaluation works is supported by the economic operator or the landowner. For orphan contaminated sites belonging to the public domain of the state, the works of investigation and evaluation of the pollution of the geological environment are financed from the state budget through the budgets of the authorities that administer them or from structural and cohesion funds, through projects approved for financing according to the rules of implementation of these funds. The financing of measures to restore the geological environment of the contaminated sites is supported by the polluter.

Soil pollution as a result of activity in the industrial sector (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 Mehedinți 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, Copșa 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 (SO_2, NO_x 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, Brașov, 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 Caraș-Severin (150 ha) and Galați (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 the national level, the upward pollution predominates, which is generally due to the breakage of pressure pipes (extraction pipes, fluid transport pipes to the separation parks, etc.), the leakage of these can reach the groundwater. The hydrocarbon retention capacity in the soil / subsoil depends on the clay content found in the soil / subsoil layers, which can generally infiltrate up to 70-80 cm and even more, making the depollution process more difficult (in the case of a downward migration from the surface). In the case of a well in production / preservation / abandonment, the contamination occurs from the level of the technical accident (breaking of the operating column, occurrence of cracks / deterioration of the cemented area behind the columns) to the surface, to the ground level or remains to the groundwater level. (upward migration). An important indicator illustrating the retention of these products in soil is the carbon / nitrogen (C / N) ratio.In the 5 counties inventoried (Bacău, Covasna, Gorj, Prahova and Timiş) 751 ha are affected, of which 278 ha are heavily affected.

Accidental pollution

In 2018, 166 environmental incidents were reported across the country (Figure III.7).

For the period 2012-2018, the breakdown by main environmental factors of the environmental incidents is shown in table III.3.

Table III.3 The distribution of the accidental pollution by the main environmental factors of the environmental incidents

Environmental factors / Years	2011	2012	2013	2014	2015	2016	2017	2018
Air	12	115	27	24	34	24	38	44
Water	46	46	53	49	58	53	73	56
Water/Soil	14	3	3	5	10	3	5	11
Air/Soil	0	0	0	0	0	5	4	3
Air/Water	0	0	0	0	0	2	0	0
Soil	122	343	359	345	294	82	73	52

At the level of the regions of economic development, the situation is presented as follows:

NORTH-EAST REGION - Bacău 11, Botoșani 0, Iași 7, Neamţ 0, Suceava 8, Vaslui 0 - total 26 incidents, mainly caused by leaks from the crude oil pipelines, with high degree of corrosion, spills / water leaks unused or insufficiently purified domestic and industrial waste with or without fish mortality, fires / self-ignition at landfills, damage to an oil well, etc. Of the total accidental pollution, 6 have as polluter S.C. OMV Petrom, 3 have as polluter S.C. Iasi Airport and 2 have as polluter S.C. Compet S.A Ploiești. The environmental factors affected were soil, subsoil, groundwater and air. *There were no environmental incidents recorded in Botoșani, Neamț and Vaslui counties.*

REGION 2 SOUTH-EAST - Brăila 4, Buzău 1, Constanţa 12, Galaţi 4, Tulcea 1, Vrancea 0 - total 22 incidents caused mainly by: oil leaks and petroleum products from corroded or cracked pipes, greenhouses golf course Dana 79, unpolluted or insufficiently purified sewage discharges with or without fish mortality, vegetation fires / self-ignition at landfills, etc. Of the total accidental pollution, 4 have as polluter S.C. Competit S.A Ploiești, 2 have as polluter S.C. ROMSOCI S.R.L. and 3 have as polluter S.C. Oil terminal S.A. Constant. The environmental factors affected were soil, subsoil, groundwater and air. *No environmental incidents were recorded in Vrancea County.*

REGION 3 SOUTH MOUNTAIN - Argeş 10, Călărași 0, Dâmboviţa 11, Giurgiu 10, Ialomiţa 5, Prahova 22, Teleorman 4 - total 62 incidents, caused by: oil spills due to pipeline failures or their corrosion, domestic / industrial wastewater spills / leaks not purified or insufficiently treated with or without fish mortality, non-functional oil pipelines, fires at industrial installations, intervention on the Ecostar vessel, overturning of bitumen-laden tankers, self-ignition at landfills, etc. Of the total accidental pollution, 14 have as polluter S.C. Compet S.A Ploiești and 23 have as polluter S.C. OMV Petrom. The environmental factors affected were soil, subsoil, groundwater and air. *No environmental incidents were recorded in Calarasi County.*

REGION 4 SOUTH-WEST OLTENIA - Dolj 2, Gorj 1, Mehedinţi 1, Olt 2, Vâlcea 1 - total 7 incidents, caused by: malfunctions in corroded oil transport pipelines, derailment of oil product transport train, fire at ash dump, self-ignition of waste, etc. Of the total accidental pollution, 1 has as polluter S.C. Compet S.A Ploiești and 3 have as polluter S.C. OMV Petrom. The environmental factors affected were soil, subsoil, groundwater and air.

REGION 5 WEST - Arad 1, Caraş-Severin 5, Hunedoara 3, Timiş 3 - total 12 incidents, caused by: accidental discharges of waste water, fire at a non-hazardous waste deposit, ash dust / particulate suspension on the tailings pond, fire to plastic packaging, fire to a protected natural area, etc. Of the total accidental pollution, 5 have as polluter S.C. Moldomin S.A. The environmental factors affected were soil, subsoil, groundwater and air.

REGION 6 NORTH-WEST - Bihor 1, Bistriţa-Năsăud 1, Cluj 2, Maramureş 1, Satu-Mare 0, Sălaj 0 - total 5 incidents, caused by: fire plant manufactures plastics, leaks of mine water, outbreaks with open flame at temporary storage of household waste , road accident with paint and primer leak, etc. The environmental factors affected were soil, subsoil, groundwater and air. *In Satu-Mare and Sălaj counties there were no environmental events.*

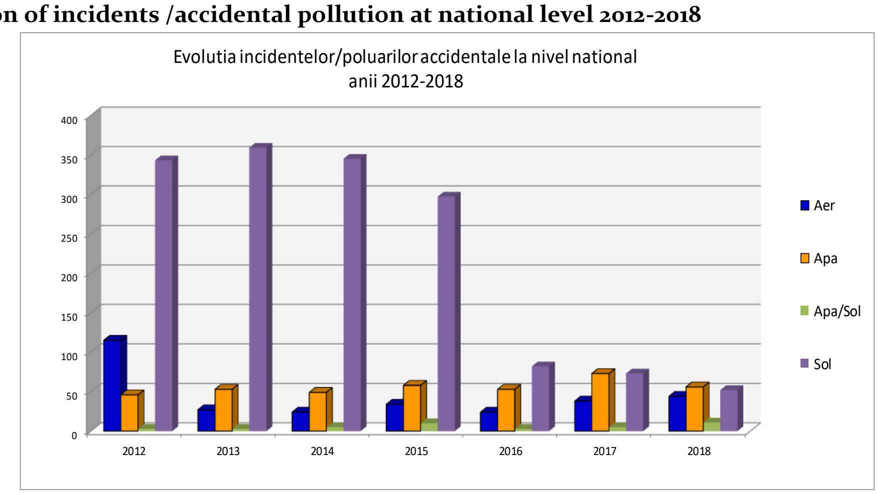
REGION 7 CENTER - Alba 2, Braşov 7, Covasna 2, Harghita 4, Mureş 13, Sibiu 2 - total 30 incidents, caused by: discharges / spills of domestic wastewater / technological and industrial wastewater that are not clean or insufficiently cleaned with or without fish mortality, explosion at one shooting tunnel, road accident with overturning tanks with dangerous or non-dangerous products, forest fire, short circuit at an industrial electrical installation, etc. The environmental factors affected were soil, subsoil, groundwater and air.

REGION 8 BUCHAREST - ILFOV - Bucharest 0, Ilfov 2 - total 2 incidents, caused by: accidental leakage of crude oil from pipelines corroded to transport petroleum products and fire from a short circuit to an industrial plant. The environmental factors affected were soil, subsoil, groundwater and air. *There were no environmental events in Bucharest.*

CONCLUSIONS:

- There is a 15.73% decrease in the events recorded in 2018 compared to 2017 (197 events). Compared to 2016 (173 events) and 2015 (396 events) the decrease is - 4.04% and respectively - 58.08% compared to 2018 (166 events).
- Over 60% of the national events registered at national level in 2018 are caused by:
  - the extraction activities of the hydrocarbon deposits and the transport of petroleum products, the causes being: the age, the degradation, the cracking of the pipes and
  - discharges / spills of domestic wastewater / technological and industrial waters not purified or insufficiently purified with or without fish mortality.
- There was no major impact on environmental factors or human health for the environmental events recorded in 2018. The evolution of the environmental incidents at national level for the year 2018 and the interval 2012 - 2018 as well as the evolution of the pollution according to the affected environmental factors is presented graphically below.

Figure III.6 Evolution of incidents /accidental pollution at national level 2012-2018



Soure: NEPA

III.3. PRESSURE ON THE QUALITY STATE OF SOILS

III.3.1. THE USE AND CONSUMPTION OF FERTILIZERS

RO 25	Indicator code Romania: RO 25 EEA 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.

Table III.4 and Figure III.7 show the situation of applying chemical fertilizers on agricultural soils in the 2005-2018 stage, from which it is noted the tendency of applying chemical fertilizers on surfaces that represent over 57% of the arable area of the country (in the year 2018 being fertilized about 72%), but also the decrease of the area fertilized in 2018 by 532,381 ha compared to the year 2017.

Compared to 1999, the following findings can be made:

- the quantities of chemical fertilizers applied (N, P_2O_5, K_2O) reached maximum values at the level of 2018.
- applied quantities increased by about 44% at N, by 57% at P_2O_5 and by about 21% at K_2O compared to 2017.
- compared to 1999, the quantities of N and P_2O_5 applied in 2018 registered increases of up to 240%, and those of K_2O of up to 500%.
- the total quantities of NPK increased from 35.4 kg in 1999 to 89.8 kg in 2018 on arable land.
- of the total fertilizers used in 2018, those based on N represent 65%, those with phosphorus 27%, and those based on potassium 8%.

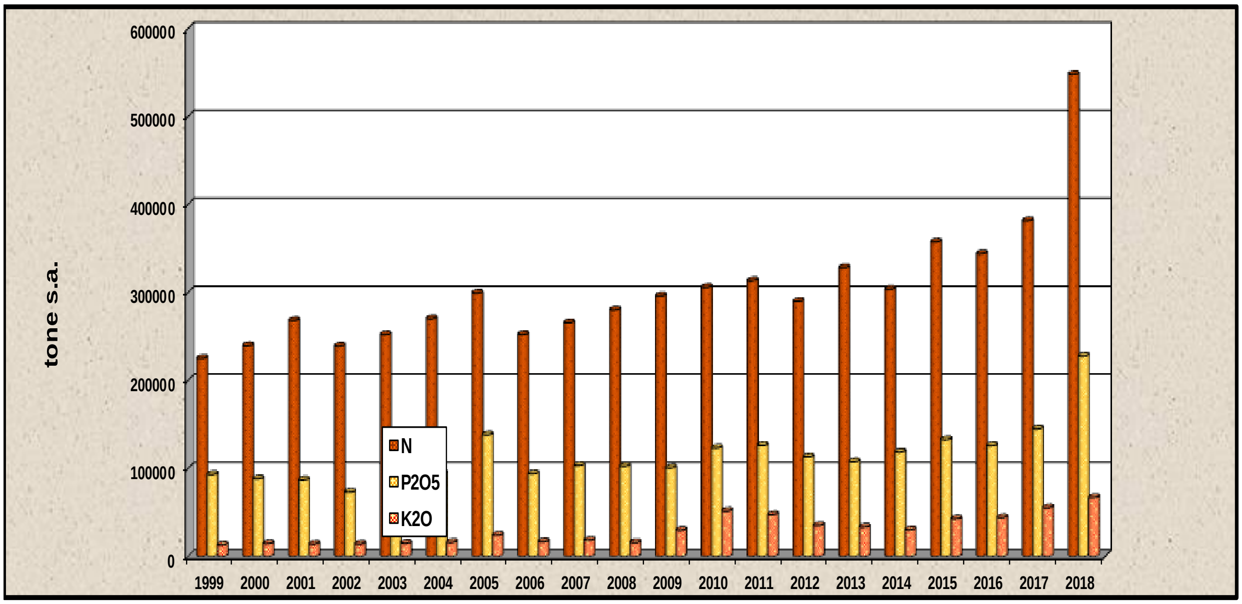
Table III.4 The use of chemical fertilizers in the agriculture of Romania between 1999-2018

Year	Chemical fertilizers used (tonnes of active substance)				$N+P_2O_5+K_2O$ ($kg.ha^{-1}$)		Fertilized surface, ha
	N	P_2O_5	K_2O	Total	Arabil	Agricol	
1999	225000	93000	13000	331000	35,4	22,5	3640900
2000	239300	88300	14600	342200	36,5	23,0	3724578
2001	268000	87000	14000	369000	39,3	24,8	-
2002	239000	73000	14000	326000	34,7	22,0	-
2003	252000	95000	15000	362000	38,5	25,6	-
2004	270000	94000	16000	380000	40,3	25,8	-
2005	299135	138137	24060	461392	49,0	31,3	5737529
2006	252201	93946	16837	363000	38,5	24,7	5388348
2007	265487	103324	18405	387000	41,1	26,3	6422910
2008	279886	102430	15661	397977	42,3	27,1	6762707
2009	296055	100546	29606	426207	45,3	29	5889264
2010	305756	123330	51500	480586	51,0	32,7	7092256
2011	313333	126249	47362	486944	51,8	33,3	6893863
2012	289983	113045	34974	438002	46,8	30,0	6340780
2013	328088	107543	33324	468955	49,9	32,1	5965817

2014	303562	118574	30103	452239	48,2	30,9	6676089
2015	357352	132657	42693	532702	56,7	36,41	6574741
2016	344000	126000	44000	514000	54,7	35,13	6491498
2017	381342	144869	55259	581470	61,89	39,74	7272565
2018	547694	227605	66894	842193	89,9	57,7	6740184

Source: INS, MADR

Figure III.7 The use of chemical fertilizers in the agriculture of Romania between 1999-2018



Source: Ministry of Agriculture and Rural Development

The amount of natural fertilizers (table III.5) applied in 2018, compared to the one used in 1999, is less than about 12%, and the surface on which natural fertilizers were applied registered slight increases compared to 1999 and year 2017, and the average quantity applied in 2018 was 18.9 t / ha.

In 2018, only 8.52% of the cultivated area was fertilized with natural fertilizers, which, corroborated with the data of mineral fertilization, indicates that a balance of the nutritional balance of these lands is necessary in order to produce safe and stable crops.

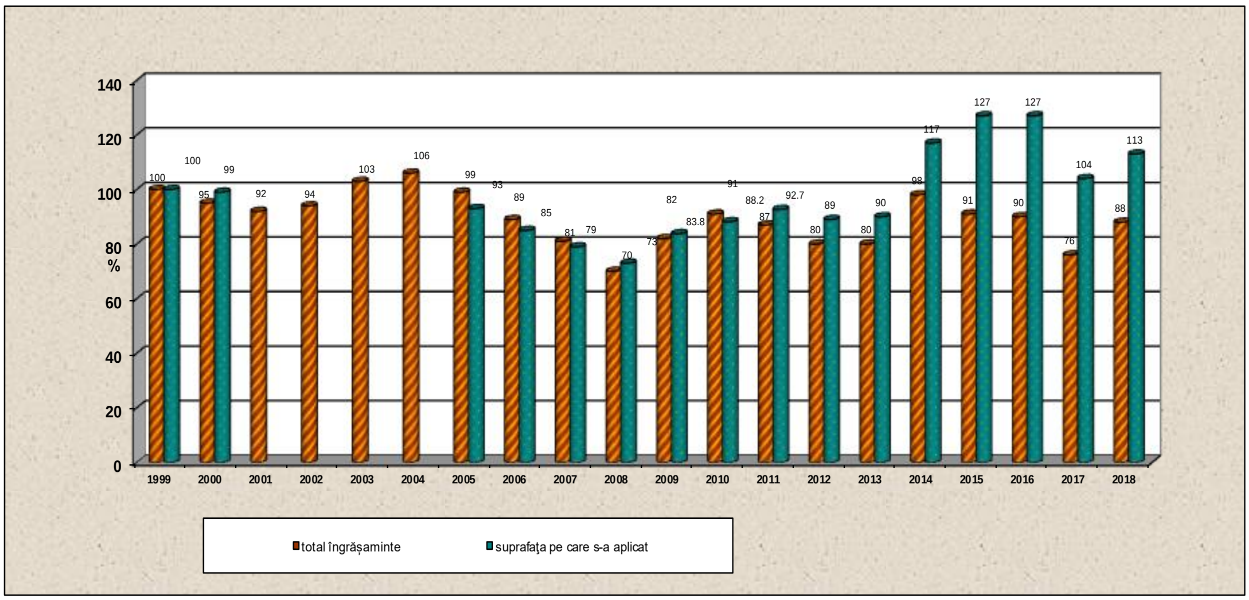
Table III.5 The quantity of natural fertilizers applied in the period 1999-2018

Year	Total fertilizers		The surface on which it was applied		Share of application area to the arable 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	13.292.61713.282.877	80	605694	89	6.48	21.95	89.5	0,91	81
2013		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	7.54	17.8	72.5	0.86	76
2018	14.617.549	88	771814	113	8.52	18.9	77.02	1.00	88

Sources: NIS, Ministry of Agriculture and Rural Development

Figure III.8 The quantity of natural fertilizers applied in the period 1999-2018



Sources: NIS, Ministry of Agriculture and Rural Development

III.4. PROGRAMS AND ACTIONS TAKEN FOR IMPROVING THE QUALITY STATE OF SOILS

RO 26

Indicator code Romania: RO 26
EEA 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.

SURFACE FOR ECOLOGICAL AGRICULTURE

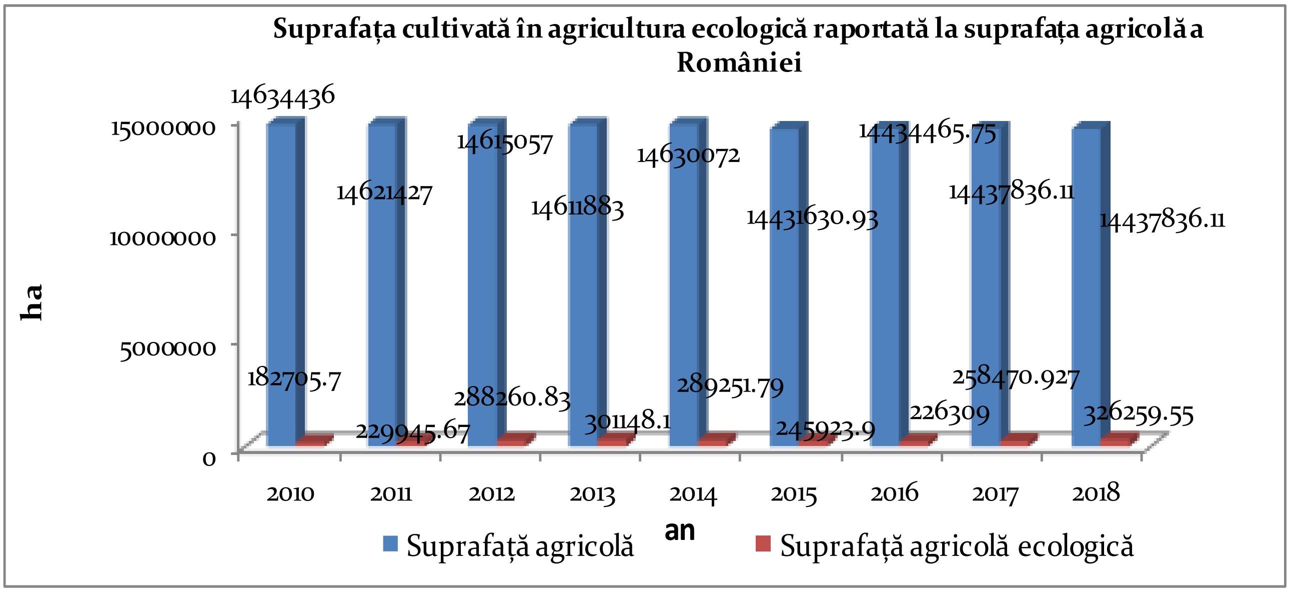
Organic farming is a production system that places great importance on environmental and animal protection, by reducing or eliminating genetically modified organisms and synthetic chemicals such as fertilizers, pesticides and growth regulators (Table III.6, Figure III .9 and Table III.7).

Table III.6 Dinamica operatorilor și a suprafețelor în agricultura ecologică

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018
Number of certified operators in organic farming	3155	9703	15544	15194	14470	12231	10562	8434	9008
Total area in organic farming (ha)	182706	229946	288261	301148	289251.79	245923.9	226309	258470.927	326.259,55
Cereals (ha)	72297.8	79167	105149	109105	102531.47	81439.5	75198.3	84925.51	114.427,49
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	8.751,13
Tuberculous and root plants total (ha)	504.36	1074.98	1124.92	740.75	626.99	667,554	707.026	665.54	505,66
Industrial crops (ha)	47815.1	47879.7	44788.7	51770.8	54145.17	52583.11	53396.9	72388.33	80.193,08
Green harvested plants (ha)	10325.4	4788.49	11082.9	13184.1	13493.53	13636.48	14280.5	20350.75	28.253,75
Other crops on arable land (ha)	579.61	851.44	27.77	263.95	29.87	356.22	258.47	88.25	112,79
Vegetables (ha)	734.32	914.08	896.32	1067.67	1928.36	1210.08	1175.33	1458.78	983,10
Permanent crops (ha) vineyards, cultivated fruit bushes	3093.04	4166.62	7781.33	9400.31	9438.53	11117.26	12019.8	13165.41	18.569,27
Permanent crops (ha) pastures and meadows	31579.1	78197.5	105836	103702	95684.78	75853.57	57611.7	50685.74	66.890,44
Uncultivated land (ha)	10216.8	9758.55	8810.73	9516.33	9058.66	7,225,852	9457.2	9747.94	7.572,80

Source: Communications of inspection and certification bodies;
** Eurostat classification*

Figure III.9 The surface cultivated in organic farming reported on the agricultural surface of Romania



Source: MADR

Table III.7 Evolution of ecologically certified animals [1)]

Indicator	U.M	2010	2011	2012	2013	2014	2015	2016	2017	2018
Livestock cattle (total)	**heads**	**5358**	**6894**	**7044**	**20113**	**33782**	**29313**	**20093**	**19939**	**16890**
Cattle for slaughter	heads	0	314	745	1101	244	491	478	481	701
Milk cows	heads	3026	3599	2643	10088	23906	21667	15171	12472	10694
Other cattle	heads	2332	2981	3656	8924	9632	7155	4444	6386	5495
Total pigs	**heads**	**320**	**414**	**344**	**258**	**126**	-	20	20	9
Pigs for fattening	heads	0	201	212	125	18	43	13	17	-
Breeding sows	heads	30	89	42	77	33	14	7	3	-
Other pigs	heads	290	124	90	56	75	29	0	0	9
Total sheep	**heads**	**18883**	**27389**	**51722**	**72193**	**114843**	**85419**	**66401**	**55483**	**32579**
Sheep, breeding females	heads	11285	21945	-	47472	96737	-	-	-	-
Other sheep	heads	7598	5444	-	24721	18106	-	-	-	-
Goats (total)	**heads**	**1093**	**801**	**1212**	**3032**	**6440**	**5816**	**2618**	**1653**	**1360**
Goats, breeding females	heads	966	596	-	-	5637	-	-	-	-
Other goats	heads	127	205			803	-	-	-	-
Birds total	**heads**	**21580**	**46506**	**60121**	**74220**	**57797**	**107639**	**63254**	**78681**	**83859**
Chickens of meat	heads	0	150	37	-	-	-	-	**285**	-
Laying hens	**heads**	**21580**	**46356**	**6006 4**	-	**57797**	-	**60220**	**77096**	-
Breeding birds	heads	-	-	-	-	-	-	-		-
Other birds	heads	-	-	20	-	-	--	-		-
Turkeys	heads	-	-	20	-	-	-	-		-
Ducks	heads	-	-	-	-	-	-	-		-
Geese	heads	-	-	-	-	-	-	-		-
Others	heads	-	-	-	-	-	-	-	**1300**	-
Equine	**heads**	**284**	**282**	**142**	**200**	**626**	**485**	-	**202**	-
Albine (în număr de stupi)	**bee families**	**64836**	**77994**	**85225**	**81772**	**81583**	-	**86195**	**108632**	**138557**
Other animals	**heads**	**0**	**0**	**5217**	**4878**	**2667**	**79654**	**3353**	**1791**	-

Source: Communications of control bodies approved by MADR

Chapter IV. LAND USE

IV.1. STATE AND TRENDS

IV.2. IMPACT OF CHANGING THE USE OF LANDS ON THE ENVIRONMENT

IV.3. THE DETERMINING FACTORS OF CHANGE OF LAND USE

IV.4. FORECASTS AND ACTIONS TAKEN ON 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
EEA 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. DETERMINING FACTORS OF CHANGE OF LAND USE

RO 14

Indicator code Romania: RO 14
EEA 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.

At the level of 2014 the surface of the land fund was covered with the following categories of land use according to table IV.1 and figure IV.1.

Table IV.1 Repartizarea fondului funciar în anul 2014 pe categorii de folosință[1)]

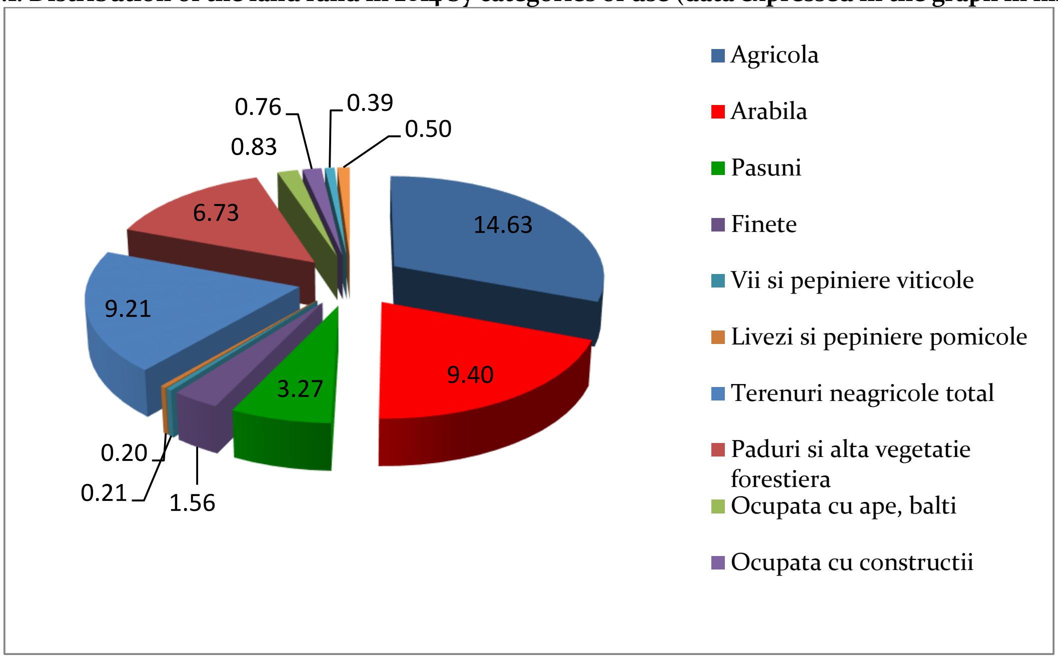
Land surface area by mode of use	Hectares
Agricultural	14630072
Arable	9395303

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: INS, TEMPO-Online Database http://statistici.insse.ro/shop/index.jsp?page=tempo3&lang=en&ind=AGR101A

1) There are no statistical data for the period 2015-2018

Figure nr. IV.1. Distribution of the land fund in 2014 by categories of use (data expressed in the graph in mil. Ha)[1)]



Souirce: NIS

[1)] There is no statistical data for the period 2015-2018

RO 68	**Indicator code Romania: RO 68** **EEA 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, between 2011 and 2018, according to the available national statistical data, shows an insignificant increase (tables IV.2 and IV.3 and figures IV.2 and IV.3).

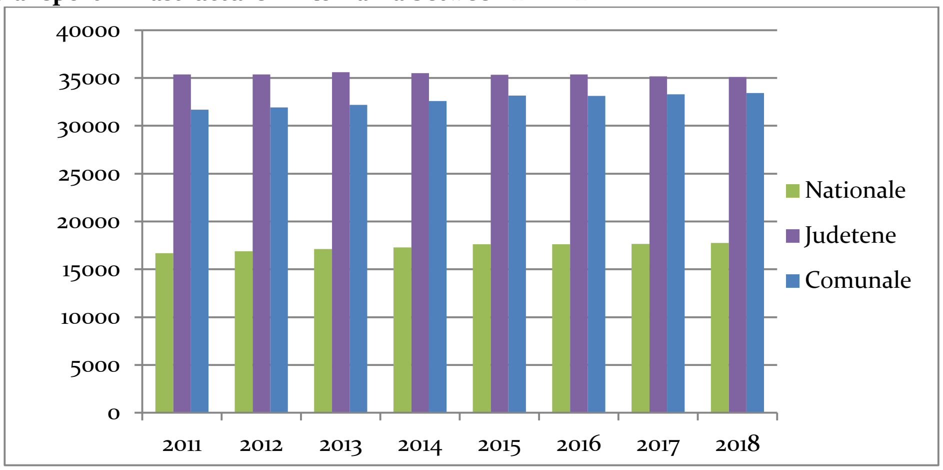
Table IV.2 Road transport infrastructure in Romania between 2011 - 2018

Road categories	Length of kilometers per year							
	2011	2012	2013	2014	2015	2016	2017	2018
National	16690	16887	17110	17272	17606	17612	17654	17740
County	35374	35380	35587	35505	35316	35361	35149	35085

Municipal	31674	31918	32190	32585	33158	33107	33296	33409

Sources: INS, TEMPO-Online Database

Figure IV.2 Road transport infrastructure in Romania between 2011 - 2018



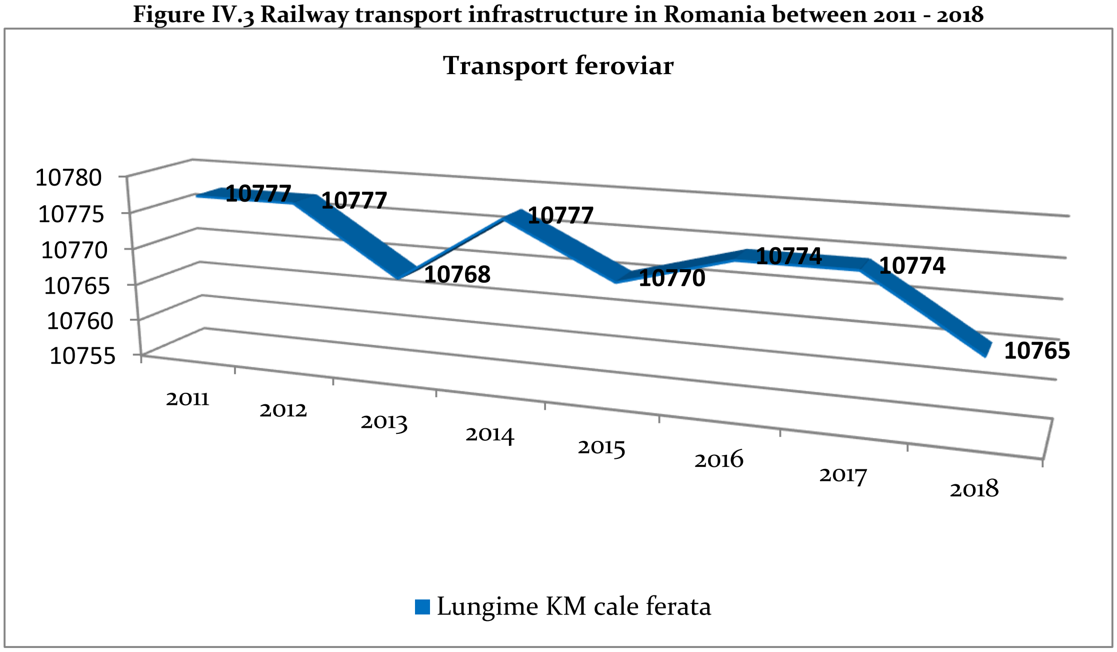
Sources: INS, TEMPO-Online Database

Table IV.3 Railway transport infrastructure in Romania between 2011 - 2018

Rail transport	Year							
	2011	2012	2013	2014	2015	2016	2017	2018
Railway length (km)	10777	10777	10768	10777	10770	10774	10774	10765

Sources: INS, TEMPO-Online Database

Figure IV.3 Railway transport infrastructure in Romania between 2011 - 2018



Sources: INS, TEMPO-Online Database

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.

Chapter V. NATURE PROTECTION AND BIODIVERSITY

V.1. STATE OF CONSERVATION AND TRENDS OF BIODIVERSITY COMPONENTS

V.2. THREATS FOR BIODIVERSITY AND PRESSURES EXERCISED ON BIODIVERSITY

V.3. NATURE PROTECTION AND BIODIVERSITY: PROMOTIONS AND ACTIONS TAKEN

Chapter V. NATURE PROTECTION AND BIODIVERSITY

V.1.1. TRENDS ON THE CONSERVATION OF ECOSYSTEMS AND HABITATS

RO 40	Indicator code Romania: RO 40 EEA 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 by biogeographic regions for which reports have been sent to the Commission, according to Article 17 is presented in the table below:

Table V.1 Number of habitats reported in accordance with Annex I of the Habitats Directive

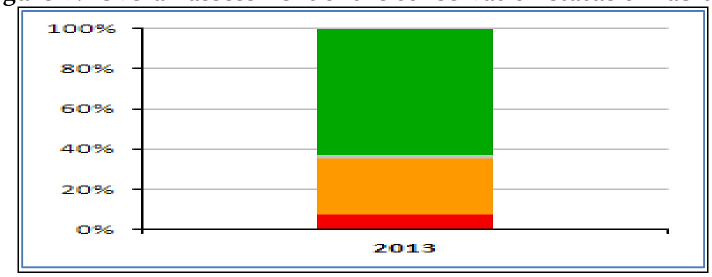
Bioregion	HABITATS	
	Annex I	
	Non-priority	Priority
Number of habitats in Romania	**60**	**25**
	85	
Alpine (ALP)	37	11
Black Sea Pontic (BLS)	18	3
Continental (CON)	34	17
Pannonian (PAN)	11	5
Stepic (STE)	18	6
Black Sea (MBLS)	6	

Source: ibis.anpm.ro și National Summary for Article 17 Romania – 2007-2012 by EC

For the RO40 indicator, the following charts regarding the conservation status of habitats at global level, by biogeographic regions or by habitat classes are relevant.

The overall assessment of the habitats of community interest in Romania is represented as a percentage in Figure V.1.

Figure V.1 Overall assessment of the conservation status of habitats



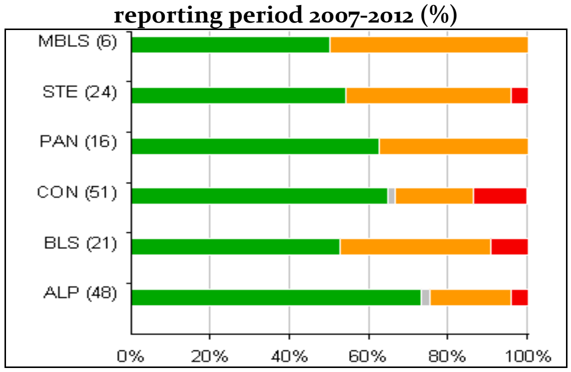
Source: ibis.anpm.ro și National Summary for Article 17 Romania – 2007-2012 by EC

FV - Favorable
NA - Unreported
XX - Unknown
U1 - Unfavorably inadequate
U2 - Unfavorably bad

It is observed that overall the habitats in Romania evaluated and reported are in a percentage of over 60% in a favorable conservation status and about 7% of them were evaluated with "total unfavorable status".

The distribution by biogeographic regions of the conservation status of habitats of European interest in Romania is shown in Figure V.2.

Figure V.2 Conservation status of habitats of European interest in Romania by biogeographic regions, reporting period 2007-2012 (%)

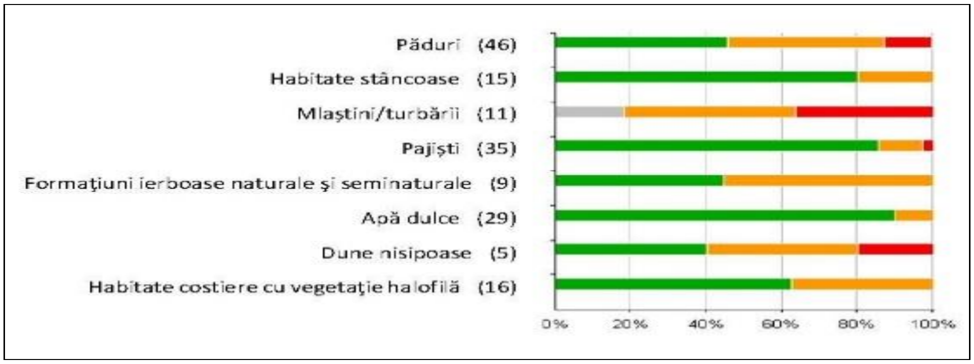


Source: ibis.anpm.ro și National Summary for Article 17 Romania – 2007-2012 EC

***Note:** The number in each bracket corresponds to the number of assessments at each biogeographic region for the 2007-2012 reporting period.*

According to the data reported to the Commission, it is observed that in the alpine region most habitats are found whose conservation status is favorable, region followed by the biogeographic regions: continental, panonic, steppe and pontic.

Figure V.3 Conservation status by habitat classes of European interest in Romania, between 2007-2012 (%)



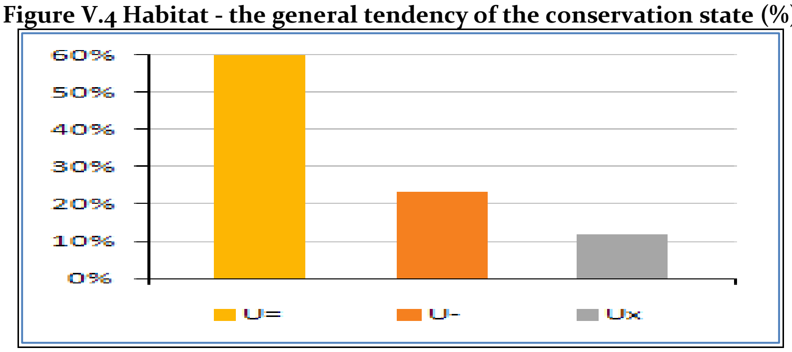
Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

Note: *The number in each bracket corresponds to the number of evaluations for the period 2007-2012.*

Another concern is the habitat class of marshes and peatlands, evaluated in a very high percentage with poor conservation status (over 80%).

The improvement / deterioration trends for habitats with a poor conservation status (U1 and U2) are shown as a percentage in Figure V.4.

Figure V.4 Habitat - the general tendency of the conservation state (%)



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	C Indicator code Romania: RO 07 EEA 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).

In accordance with the provisions of the Habitats Directive, Member States have the obligation to ensure the conservation and restoration of species of flora and fauna of community interest, in a favorable conservation status, in order to contribute to the maintenance of biodiversity.
The conservation status of the species is evaluated at national and biogeographic level and reported on a 3-level scale, coded differently by color, as mentioned for the RO40 indicator in section V.1.1.
The indicator refers to species considered to be of European interest (listed in Annexes II, IV and V of the Habitats Directive) and is currently limited to non-avian species in Annexes II, IV and V of the Habitats Directive. In the long term, following discussions between Member States and the European Commission on reporting under Article 12 of the Birds Directive, it is possible to include bird species in the indicator.
This indicator shows the implementation and progress of the Habitats Directive and is extremely relevant for the Member States and for the nature conservation policy. The results are representative of EU member states and can be integrated at European level.

Also, the total conservation status is estimated for the reporting period and the general trends of the conservation status (qualifications: improved "+", declining "-", stable "=", unknown "x").

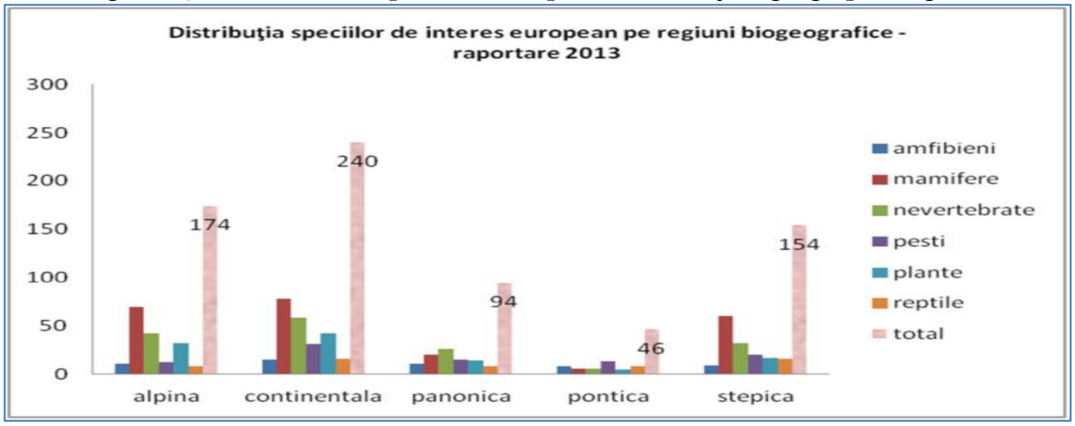
The indicator is based on the number of species in the 3 categories and their changes over time.
Except for large agricultural areas and terrestrial and aquatic ecosystems, which are under the negative impact of pollution sources in which changes in the structure and dynamics of biological diversity are recorded, the rest of the natural environment is preserved in natural quality parameters.
Due to its geographical position, Romania owns and contributes to Europe with a rich and unique biodiversity, both at the level of ecosystems and species, as well as at the genetic level, distributed in the 5 biogeographic regions.
The number of species in each Annex of the Habitats Directive by biogeographic regions for which reports have been submitted to the Commission, in accordance with Article 17 of the Habitats Directive, is presented in the table below:

Table V.2 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**	
Alpine (ALP)	74	7	94	33	20	18
Black Sea Pontic (BLS)	25	1	24	11	15	9
Continental (CON)	114	12	140	44	29	21
Pannonian (PAN)	49	2	55	20	14	10
Stepic (STE)	64	3	87	39	19	13
Black Sea (MBLS)	2		3	1		

Source: ibis.anpm.ro și National Summary for Article 17 Romania – 2007-2012 by EC

Figure V.5 Distribution of species of European interest by biogeographic regions

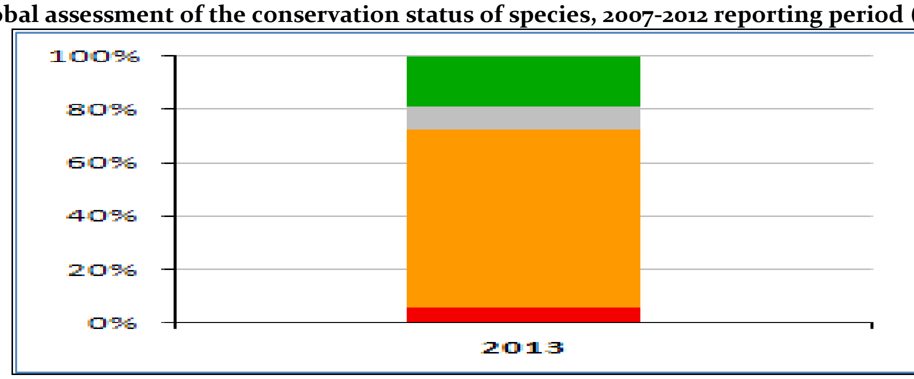


Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

As can be seen, the biogeographic regions with the greatest richness of species of European interest are: continental, alpine and steppe.

At national level, the overall evaluation of the species of community interest is presented as a percentage in the graph below:

Figure V.6 Global assessment of the conservation status of species, 2007-2012 reporting period (%)



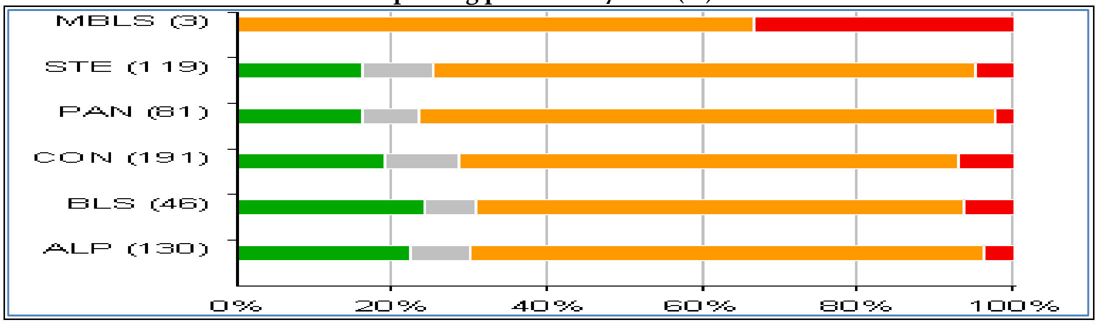
Source: ibis.anpm.ro şi National Summary for Article 17 Romania – 2007-2012 by EC

Legend

- *FV - Favorable*
- *NA - Unreported*
- *XX - Unknown*
- *U1 - Unfavorably inadequate*
- *U2 - Unfavorably bad*

According to the reported data, it is estimated that a large percentage (67%) of the total of the evaluated species have an unfavorable conservation status, while 5% have a total unfavorable status. Thus, with a global value of 72% unfavorable conservation status for species of community interest, Romania is well above the European average (54% in EU-25 - SOER 2010). 18% of the evaluated species have a favorable status (compared to 17% of the EU average), and the percentage of non-evaluated species in Romania is lower compared to the EU average.

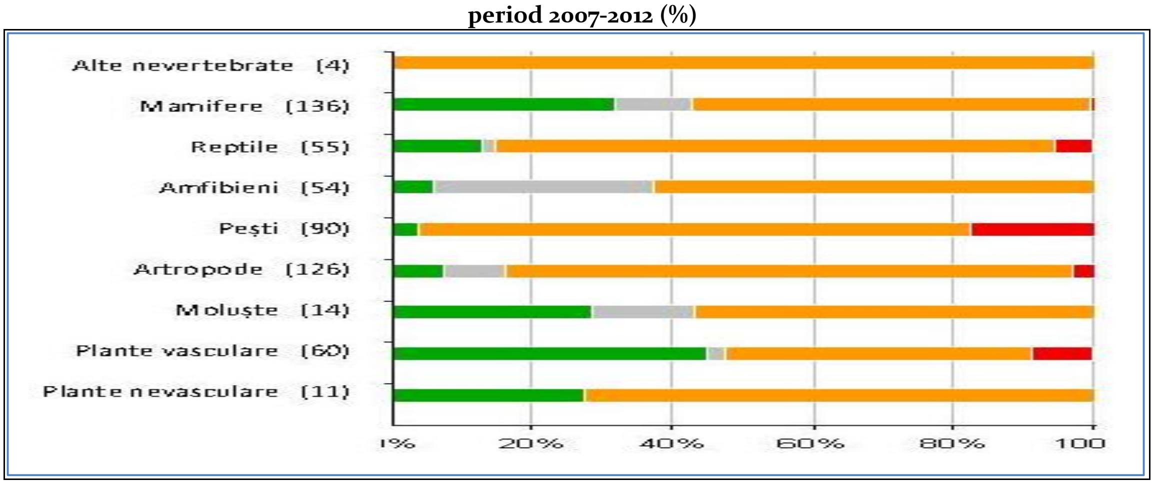
Figure V.7 Conservation status of species of European interest in Romania by biogeographic regions, reporting period 2007-2012 (%)



Source: ibis.anpm.ro și 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 evaluation for any of the species evaluated and reported.

Figure V.8 Conservation status of the species of European interest in Romania by taxonomic groups, for the period 2007-2012 (%)



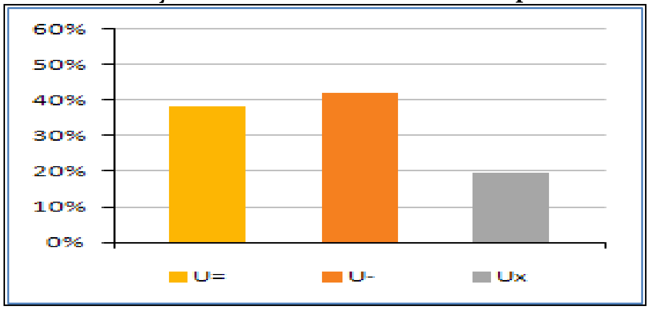
Source: ibis.anpm.ro și National Summaryfor Article 17 Romania – 2007-2012 by EC

Note: *The number in parentheses represents the number of bioregion assessments corresponding to the 2007-2012 reporting period*

From the reported data it is found that of the evaluated species, 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 trends of improvement or deterioration for the species with an unfavorable conservation status (U1 and U2) are presented as a percentage on the graph below.

Figure V.9 Specii – General tendency of the conservation status of species of community interest (%)



Source :ibis.anpm.ro și 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

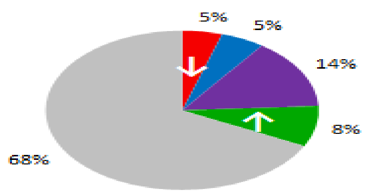
The trends of the bird populations at national level, evaluated according to the data reported in 2014, are presented in the graphs below, where the categories of trends are shown as a percentage: decreasing, stable, fluctuating, increasing or unknown. Includes both short-term and long-term trends. The taxonomic categories Reproduction and Winter Guest are distinctly highlighted.

Figure V.10 Trends of the bird population

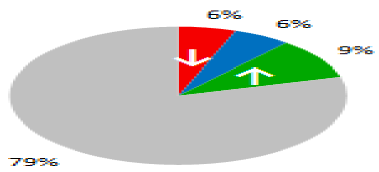
Trends of the bird population on short term

Trends of the bird population on long term

Reproduction

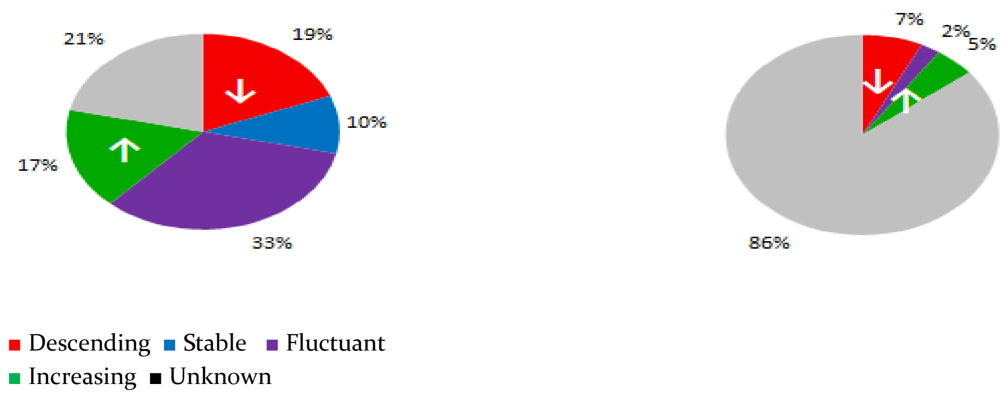


■ Descending ■ Stable ■ Fluctuant ■ Increasing ■ Unknown



■ Descending ■ Stable ■ Fluctuant ■ Increasing ■ Unknown

Winter Guest



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

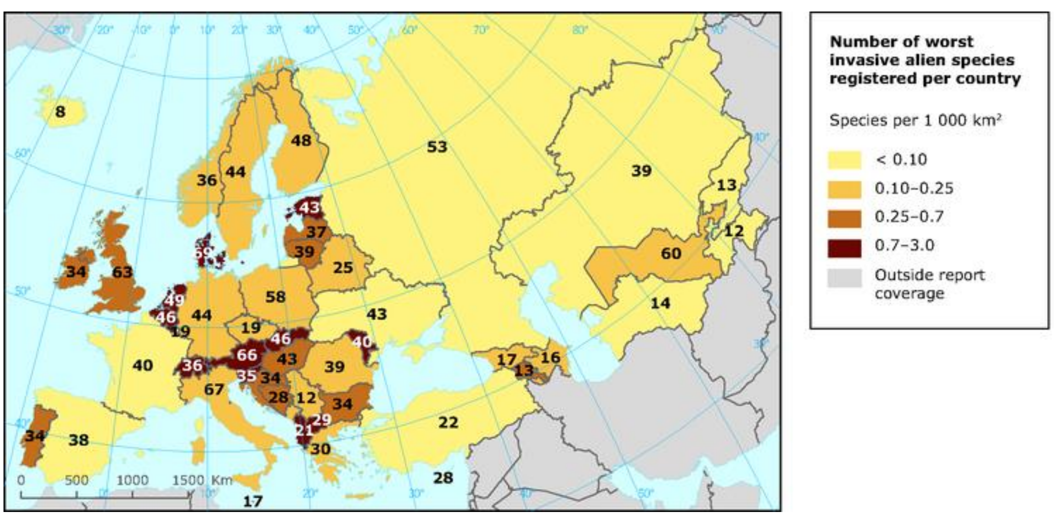
RO 43	Indicator code Romania: RO 43 EEA indicator code: SEBI 010

TITLE: INVASIVE ALLOGENEIC SPECIES
DEFINITION: The indicator comprises two elements: "The total number of 1970 allogeneic species in Europe", showing the evolution of species that have the potential to become invasive allogeneic species, and "the most harmful invasive allogeneic 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 allogeneic, 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 allogeneic species registered in Europe (according to the project DAISIE - Delivering Allogeneic 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 (*Figura V.11 și Figura V.12*).

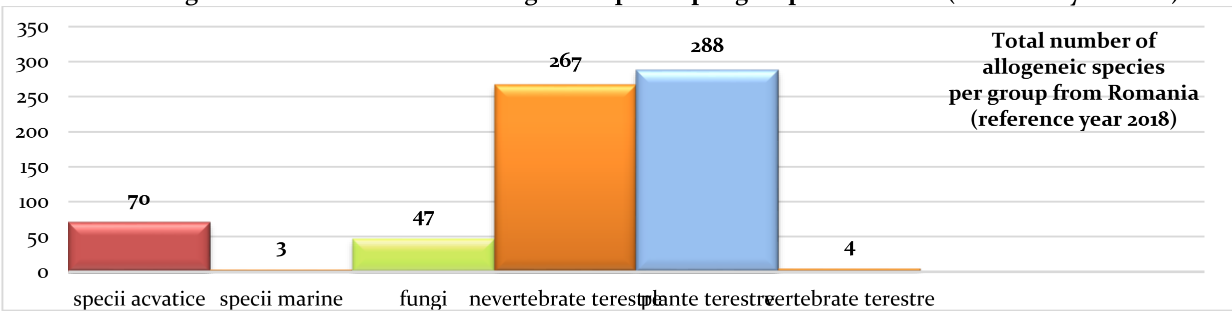
Figure V.11 Number of the most dangerous invasive species per country



Source: DAISIE

In Romania, according to the data voluntarily registered by numerous experts in the application of DAISIE and of the information reported by some local environmental protection agencies, we find approximately 679 allogeneic species, of which 70 aquatic species, 3 marine species, 267 terrestrial invertebrates, 47 fungi, terrestrial vertebrates 288, terrestrial plants 4.

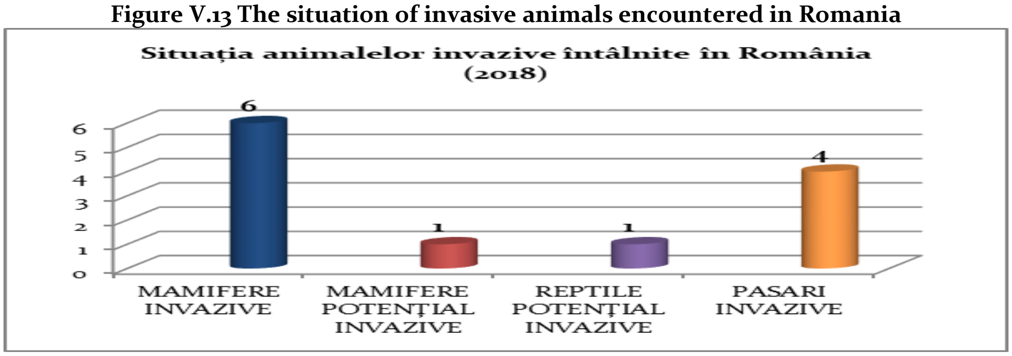
Figure V.12 Total number of allogeneic species per group in Romania (reference year 2018)



Source: DAISIE& APM

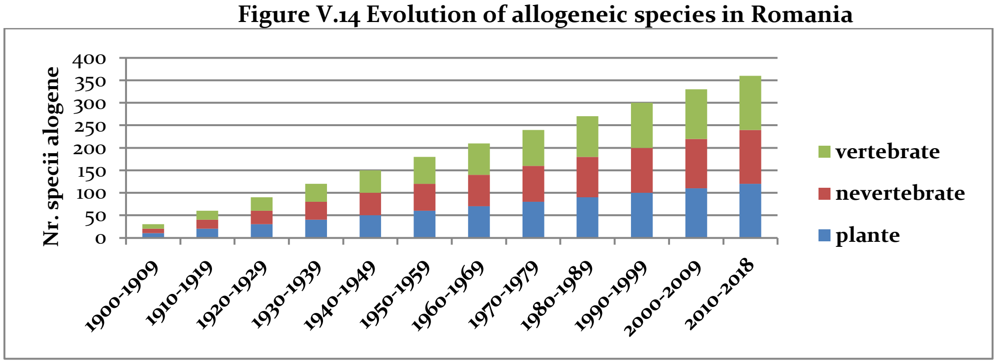
The situation of invasive animals that threaten biodiversity in Romania makes a distinction of the most harmful invasive alien species in the country, on ecosystems and taxonomic groups, regarding their impact on national biodiversity and on the change of abundance or spread. The situation of invasive animals that threaten biodiversity in Romania according to the data transmitted by the local agencies for environmental protection is represented in Figure V.13.

Figure V.13 The situation of invasive animals encountered in Romania



Source: Environmental Protection Agencies

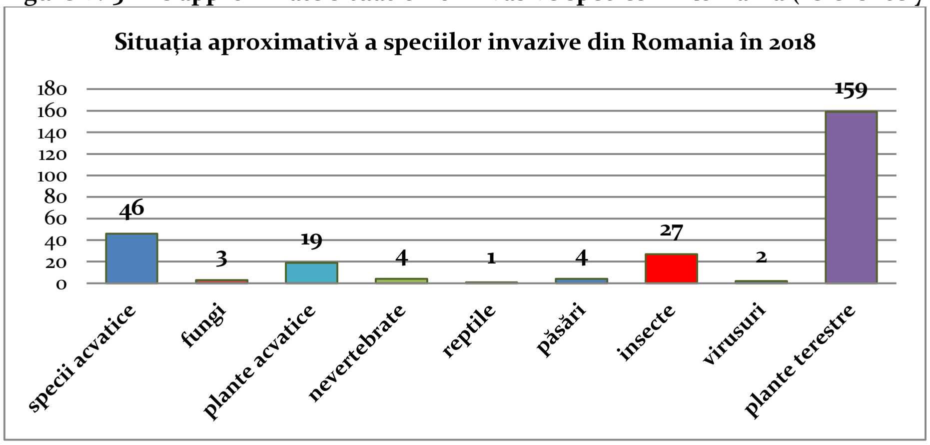
Figure V.14 Evolution of allogeneic species in Romania



Source: Environmental Protection Agencies

According to the data transmitted by some of the Environmental Protection Agencies, an approximate number of 265 invasive species has been established (aquatic species 46, fungi 3, aquatic plants 19, invertebrates 4, reptiles 1, birds 4, insects 27, viruses 2, terrestrial plants 159) (Figure V.15)

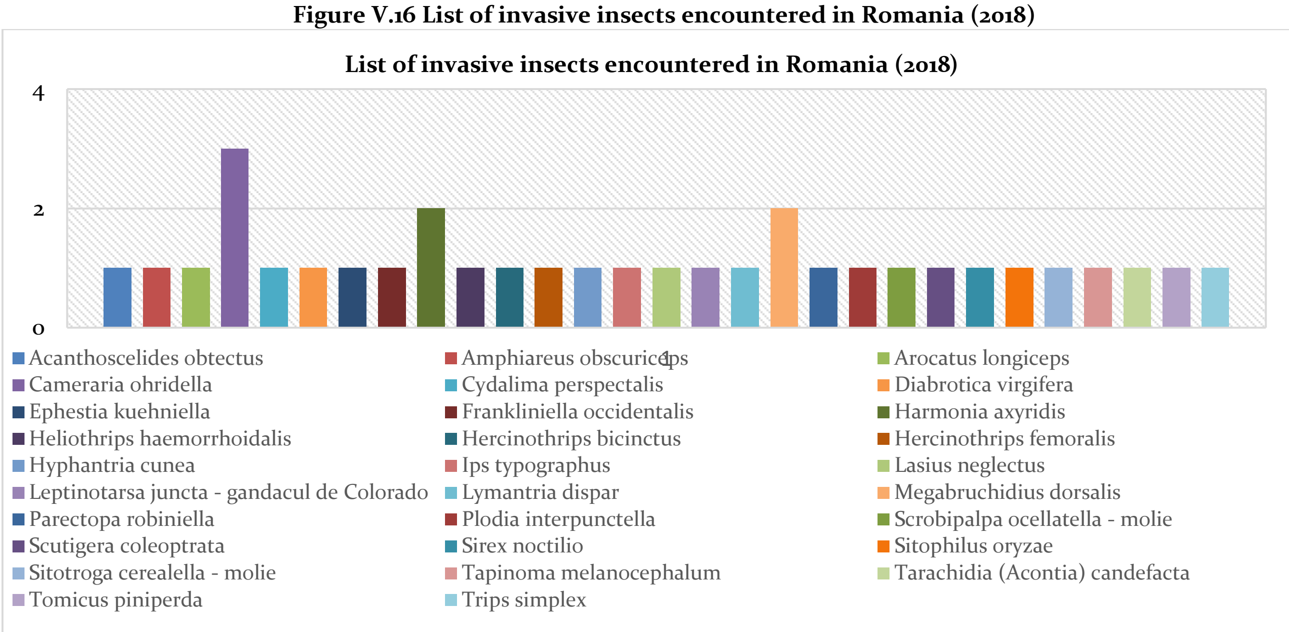
Figure V.15 The approximate situation of invasive species in Romania (reference year 2018)



Source: Environmental Protection Agencies

Invasive species modify natural ecosystems by degrading fertility, by modifying the physico-chemical properties of the soil, by degrading the quantitative and qualitative characteristics of the vegetal carpet that make aggressive competition with the native species for water, light, space. (Figure V.16)

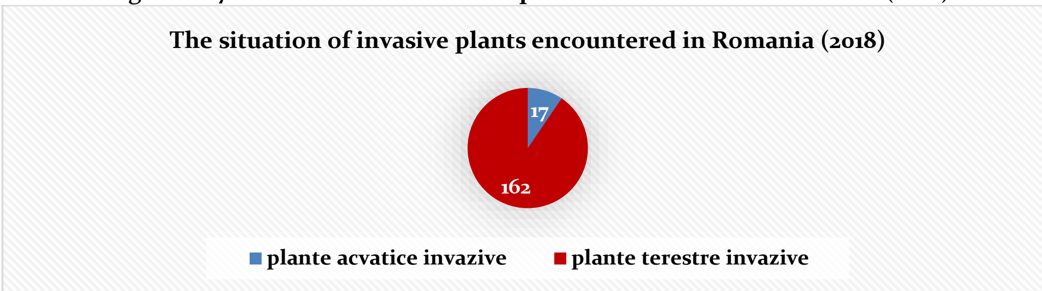
Figure V.16 List of invasive insects encountered in Romania (2018)



Source: Environmental Protection Agencies

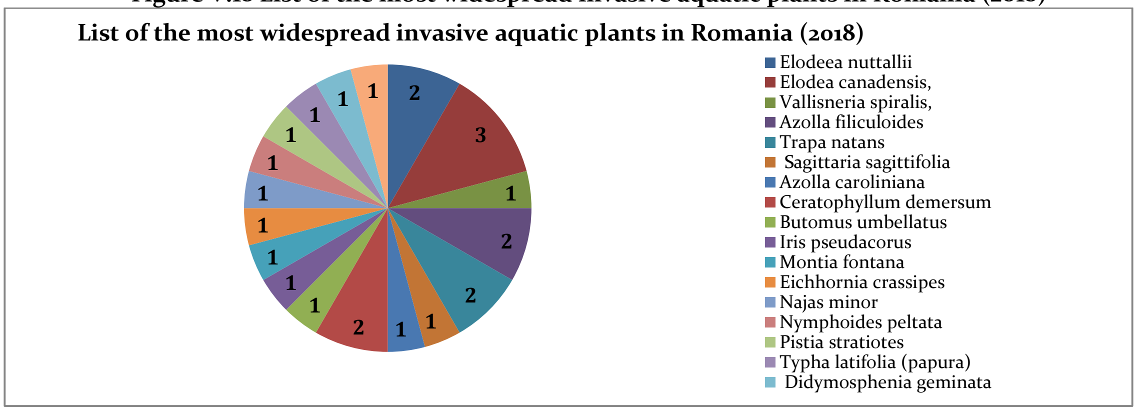
Invasive plant species lead in time to the elimination of native plant species (characteristic of that area), that is, to the decline of biodiversity (loss of biodiversity). Thus, these invasive plants gradually eliminate valuable species - rare protected, or good forage plants (used for pet food - Figure V.17).

Figure V.17 The situation of invasive plants encountered in Romania (2018)



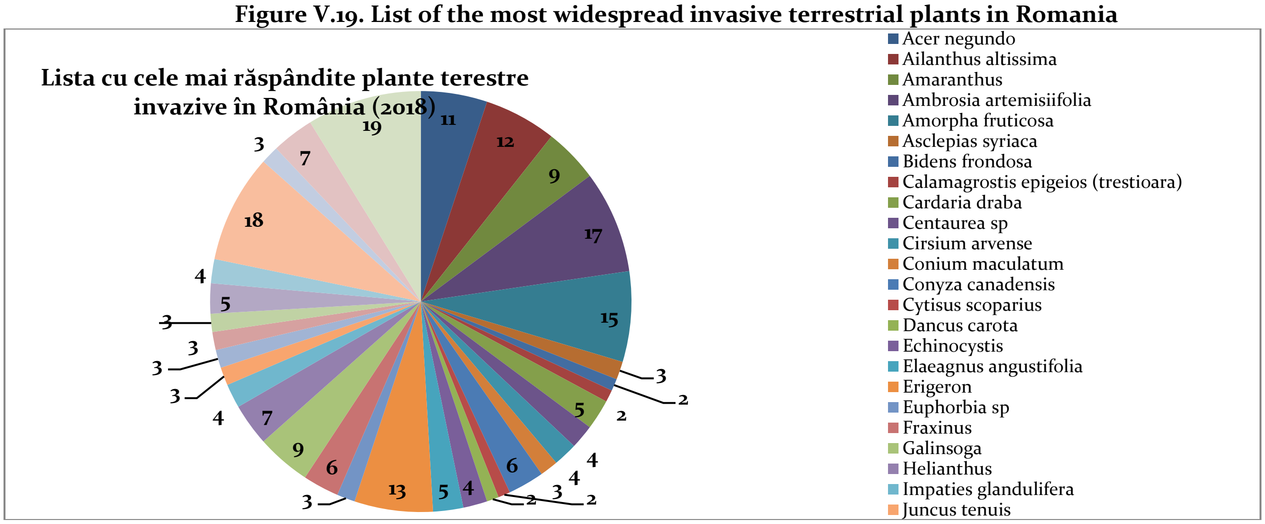
Source: Environmental Protection Agencies

Figure V.18 List of the most widespread invasive aquatic plants in Romania (2018)



Source: Environmental Protection Agencies

Figure V.19. List of the most widespread invasive terrestrial plants in Romania



Source: Environmental Protection Agencies

In conclusion, the current situation in Romania can be characterized by:

- ✓ a low level of awareness of the public opinion and consequently a civil society opposition to the interventions of the government administration;
- ✓ extremely low degree of accessibility of scientific information, especially in relation to species identification, risk analysis, etc.;
- ✓ the absence of a priority approach to the actions regarding the control of invasive species;
- ✓ unintentional 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 EEA 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 has relevance by providing information on the evolution of the surfaces of natural and semi-natural areas for any type of ecosystem. If the area of the area decreases significantly, it will have a negative influence on habitat types and species dependent on these habitat types.

Most often fragmentation occurs as a result of the severe reduction of the habitat surface or by the division induced by roads, railways, canals, power lines, fences, oil pipelines, fire protection barriers or other types of obstacles, which impede the free movement of species.

In many cases, habitat fragmentation appears as islands of initial habitats in hostile landscapes dominated by anthropogenic elements. Habitat fragmentation is recognized as a major threat to biodiversity, most often species being unable to survive in these altered conditions.

There is no data on the fragmentation of habitats in the territory of Romania, necessary to calculate this indicator.

V.2.4.2. Reducing natural and semi - natural habitats

RO 14	Indicator code Romania: RO 14 EEA 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.

The impact of urbanization depends on the area of land occupied and the intensity of land use, for example, the degree of waterproofing of the soil and the population density. Land use by urban extension and the respective infrastructure is generally irreversible and leads to waterproofing of the land as a result of covering the land with housing, roads and other construction works. Occupation of urban land consumes most of the area of agricultural land, and reduces space for habitats and ecosystems that provide important services, such as water balance regulation and flood protection. The lands occupied by the built surfaces and dense infrastructure connect the human settlements and fragment the landscapes, which is also an important source of pollution of water, soil and air.

If this development is realized uncontrolled, without a strategy of urbanism, receiving the private interest, an irreversible deterioration of the biodiversity will occur by: increasing the built area, decreasing the areas occupied by the green spaces, cutting down trees, etc. Real estate pressure especially in areas with natural potential exerts pressure on the biodiversity of protected areas, especially through constructions with seasonal destination, tourism.

The extension of the urban area in the areas in the immediate vicinity of the protected natural areas or even within them for the purpose of further realization of residential areas or even tourist resorts generates a strong pressure on the protected natural areas.

At the national level, reducing the pressures due to the change of the destination of the lands and leading to the loss of natural and semi-natural habitats is one of the objectives set out in the National Strategy and Biodiversity Conservation Action Plan 2013 - 2020.

V.2.5.1. Forest exploitation

RO 45

Indicator code Romania: RO 45
EEA 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).

A threat to forests is the prospect of overexploitation of forests and overcoming the possibility established by forestry arrangements in the context of an increasing demand for wood for both the wood processing industry and the production of renewable energy. To this is added the tendency of export of wood in raw form, not processed with negative effect on the activity of economic operators in the wood processing industry. Regarding the latter aspect, it should be mentioned that this industry belongs entirely to the private sector, so that the central public authority responsible for forestry does not have the skills and intervention tools to influence the economic mechanism of wood recovery in the form of logs, by export, on foreign markets, and any legislative initiative to limit the export would contravene the European Union legislation.

Until 2008, the maximum volume of timber that could be harvested annually from forests was established by government decision, being usually lower than the annual possibility, due to the wood mass located in inaccessible forest basins. In the period 2000 - 2008 the volume of wood established for harvesting has experienced an ascending dynamics, following the application of the provisions of the Ordinance no. 70/1999, regarding the necessary measures for the accessibility of the forest fund, by the construction of forest roads. After the entry into force of Law no. 46/2008 - The forest code, the volume of wood that can be harvested annually from forests cannot exceed the annual possibility established by the forestry arrangements.

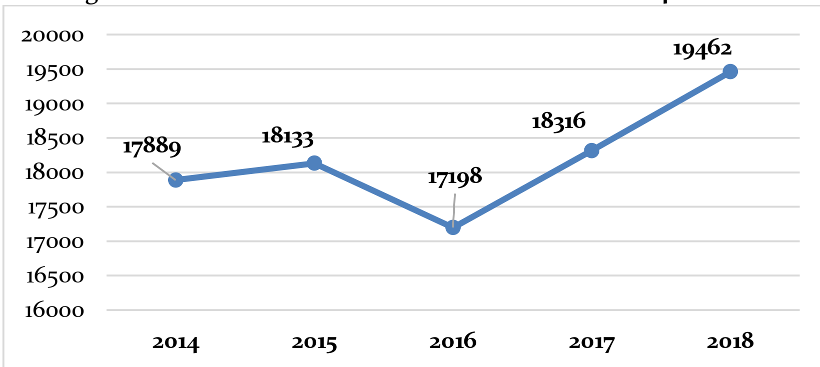
Table V.3 The volume of timber harvested in the period 2014-2018

Year	Main products	By-products	Hygiene products	Total
2014	11928	3785	1928	17889
2015	12045	3889	2199	18133
2016	11107	4138	1953	17198
2017	12133	4374	1809	18316
2018	13776	3957	1729	19462

Source NIS

The timber harvested in 2018 was 6.2% higher than in 2017. The volume extracted in 2018 exclusively from the national forest fund was 18,594 thousand cubic meters, the rest of 868 thousand cubic meters was harvested from the forest vegetation located on land outside the forest fund.

Figure V.20 Volume of timber harvested between 2014 and 2018



Source NIS

The main danger to which forests in Romania are subject is the phenomenon of uncontrolled logging. The permanent economic and social changes and the development of the process of retrocession of the forest lands to the former owners without them being accompanied by appropriate legislative and institutional measures, have had a constant increase of the pressures exerted on the forests.

Faced with the real danger of irreversible degradation of large areas of forest, for preventing and combating illegal logging, but also for fulfilling the obligations assumed by the government program and those established by the Decision of the Supreme Defense Council of the Country, the Ministry of the Environment, Water and Forests of adopted a set of measures as follows:

- On the legislative level, the aim was to ensure an updated and adequate normative framework, which would eliminate the permissive or interpretable lacuna character of the current regulations in the field;
- At the institutional level, the aim was to strengthen the capacity of action of the Forest Guards by extending, both in terms of attributions and in terms of number of personnel and logistics, of the territorial commissariats of forest and hunting regime;
- Ensuring the financial funds needed to reforest the forest land areas from which the timber was harvested and which were not reforested within the legal term;
- Development of the integrated computer system for tracking wood materials SUMAL, operationalizing the FMIMS system and developing the "Forests' Radar" system, alerting the institutions with responsibilities in this area;
- Establishment of antitrust measures in the wood industry, elimination of abuses of dominant position and monopoly, as well as rules of valorization of the wood for the benefit of the sustainable development of the local communities.

V.3. NATURE PROTECTION AND BIODIVERSITY: FORECASTS AND ACTIONS TAKEN

V.3.1. NETWORK OF NATURAL PROTECTED AREAS

RO 41	Indicator code Romania: RO 41 EEA 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.

Changes in data on protected natural areas occurred in 2015 following the implementation by the Ministry of Environment of the project "***Creation of spatial data sets according to the INSPIRE technical specifications for protected natural areas, including Natura 2000 sites, taking into account the optimization the facilities for their administration*** ", through which the limits of the protected natural areas were analyzed, following the collection of data from the field based on the existing documentation. Also, in 2016, several protected natural areas were designated, respectively 1 natural park - Văcărești Natural Park, 23 special avifaunistic protection areas (SPA) and 54 sites of community importance (SCI) and the areas of many existing SCIs were extended.
Thus, at the level of 2016, the number of 945 protected natural areas of national interest with the Danube Delta was reached in Romania, a number that was maintained in 2018.
The table below contains data on the categories of protected natural areas at the level of 2018.

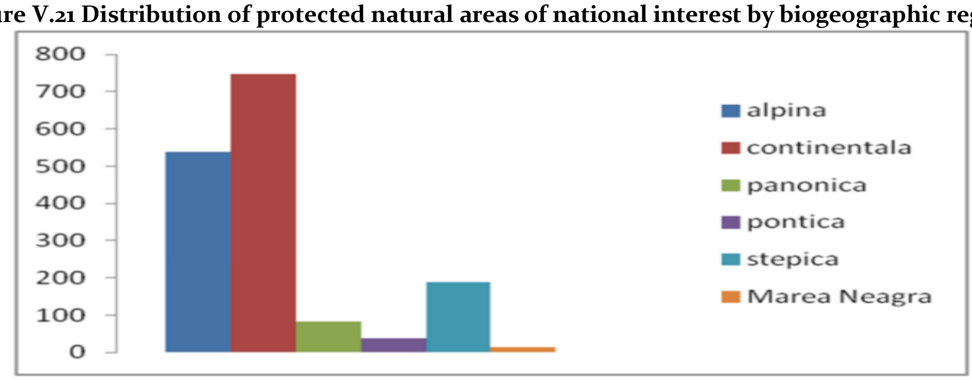
Table V.4 Categories of protected natural areas in Romania at the level of 2018

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

The process of designation of protected natural areas began in Romania since 1926 by designating the Bucegi nature reserve (EUNIS biodiversity database), with an area of 1716.9 ha. Their number increased to 425 in 1990, the largest number of protected natural areas of national interest being registered in the period 2000-2007. Currently, more than 1500 protected natural areas are designated, of which about 2/3 are of national interest, and their distribution by counties and biogeographic regions is presented *in the graphs, tables and maps below*:

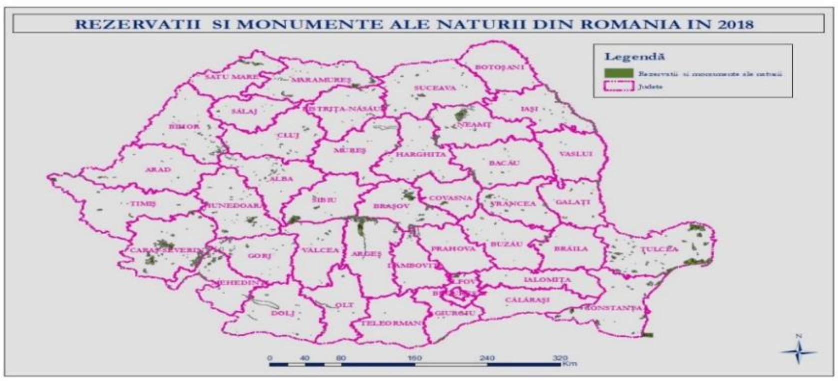
Figure V.21 Distribution of protected natural areas of national interest by biogeographic regions



Source: ibis.anpm.ro MMAP

Figure V.22 National distribution of protected natural areas of national interest: nature reserves and monuments, natural and national parks

Source: MM



Source: MM

TableV.5 National parks in Romania in 2018

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 V.6. Natural parks in Romania in 2018

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
Grădiștea Muncelului-Cioclovina	Hunedoara	38106.85
Putna-Vrancea	Vrancea	38060.18
Bucegi	Prahova, Brașov, Dâmbovița	32519.7
Vânători-Neamţ	Neamţ	30705.62
Comana	Giurgiu	25107
Balta Mică a Brăilei	Brăila	20665.48
Lunca Mureșului	Arad, Timiș	17397.39
Defileul Mureșului Superior	Mureș	10158.58
Lunca Joasă a Prutului Inferior	Galaţi	8109.96
Cefa	Bihor	4977.94
Văcărești	București-sector 4	184.719

Source: MM

RO 42

Indicator code Romania: RO 42
EEA 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 conserving natural habitats, as well as wildlife. In this sense, on the territory of Romania was created the Natura 2000 Ecological Network, through which the species and habitats considered to be of community importance are preserved by designating *sites of community interest SCI - Sites of Community Importance and SPA- The area of special avifaunistic protection*.

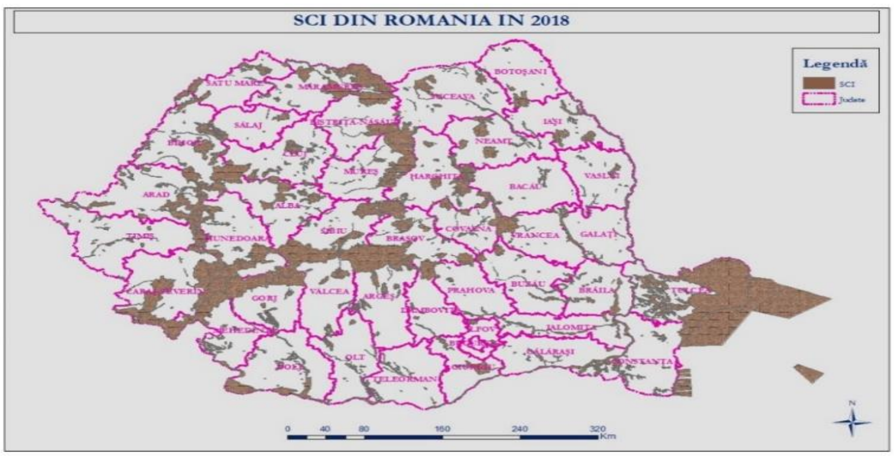
In 2007, in Romania, 273 sites of community importance were designated by *OM 1964/2007 regarding the establishment of the protected natural area regime of sites of community importance, as an integral part of the European ecological network Natura 2000 in Romania* and 108 areas of special avifaunistic protection through *GD 1284/2007 on the declaration of the special avifaunistic protection areas as an integral part of the European ecological network Natura 2000 in Romania*, representing together 17.84% of the country's surface.

As a result of the launch in 2008 of the infringement procedure for the insufficient designation of special avifaunistic protection areas, in the following period new Natura 2000 sites were designated and some of the existing ones were extended. Thus, by designating new sites through *Order no. 2387 of September 29, 2011 for amending the Order of the Minister of the Environment and Sustainable Development no. 1964/2007 regarding the establishment of the regime of protected natural area of sites of community importance, as an integral part of the European ecological network Natura 2000 in Romania and Decision no. 971 of October 5, 2011 for* *amending and completing Government Decision no. 1284/2007 regarding the declaration of the special avifaunistic protection areas as an integral part of the European ecological network Natura 2000 in Romania*. The process continued in 2016 by appointing new SCI and SPA and expanding existing sites. By *Order no. 46/2016 regarding the establishment of the protected natural area regime and the declaration of sites of community importance as an integral part of the European ecological network Natura 2000 in Romania*, 54 new SCI were designated and 29 were extended, and by the *Government Decision no. 663/2016 regarding the establishment of the protected natural area regime and the declaration of the special avifaunistic protection areas as an integral part of the European ecological network Natura 2000 in Romania*, 23 new SPAs have been designated. Thus, at the end of 2016, in Romania, a number of 606 Natura 2000 sites were reached: 435 SCIs and 148 SPAs, a number that was kept until the end of 2018.

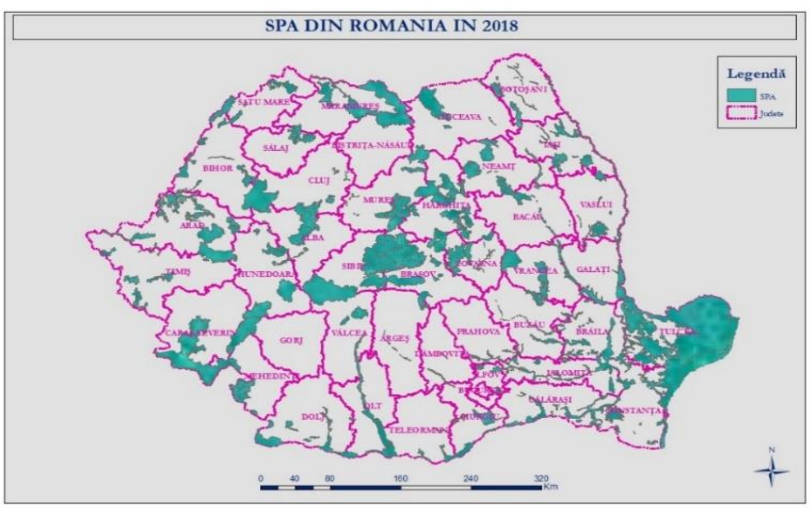
By designating the new sites, the area covered by the Natura 2000 sites increased from about 18% in 2007 to about 23% of the country's surface.

The maps below show the national distribution of SCIs and SPAs at the level of 2018.

Figure V.23 National distribution of Natura 2000 sites



Source: MM



Source: MM

Another category of **protected natural areas is the areas of international interest,** namely biosphere reserves, wetlands of international importance also known as RAMSAR sites and natural sites of universal natural heritage. The map below shows the national distribution of these protected natural areas.

Figure V.24 National distribution of protected natural 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 boundaries of the protected natural areas, mentioned above, in the table below are presented information on their surfaces, as well as on the national distribution of these protected natural areas.

Table V.7 Biosphere Reserves in 2018

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

From the national network of protected natural areas, the ***Danube Delta*** is distinguished, both as a surface and as a level of biological diversity, having triple international status: Biosphere Reserve, Ramsar Site, Natural and Cultural World Heritage Site.

Retezat National Park, being also a Biosphere Reserve, included in the international network of biosphere reserves by the UNESCO Committee "*Man and Biosphere*" (1979), is located in the western part of Romania (it is the oldest national park in Romania, being declared so by law in 1935).

Rodnei Mountains National Park is the largest protected natural area located in the Northern Group of the Eastern Carpathians, covering an area of over 46,399 hectares, of which an outcrop was declared in 1979 as a Biosphere Reserve, within the UNESCO-MAB program.

Ramsar Sites

At the level of 2018, Romania owned 19 Ramsar sites listed in Table V.8, their surfaces being determined to a better accuracy through the project "*Making spatial data sets according to the INSPIRE technical specifications for protected natural areas, including Natura sites 2000, considering the optimization of their management facilities*".

Table V.8 Ramsar sites in Romania in 2018

Name	County	Surface (ha)
Total		**1096640.01**
Delta Dunării	Tulcea, Constanța	576517.86
Parcul Natural Porțile de Fier	Caraș-Severin, Mehedinți	128101.71
Ostroavele Dunării-Bugeac-Iortmac	Călărași, Constanța, Ialomița	81407.92
Blahnița	Mehedinţi	46028.43
Confluența Olt-Dunăre	Olt, Teleorman	45541.16
Calafat-Ciuperceni-Dunăre	Dolj	29379.25
Bistreț	Dolj	27241.59
Parcul Natural Comana	Giurgiu	25107
Dunărea Veche - Brațul Măcin	Brăila, Tulcea, Constanța	24069.34
Brațul Borcea	Călărași, Ialomița	21529.98
Insula Mică a Brăilei	Brăila	20665.48
Suhaia	Teleorman	19707.1
Confluența Jiu-Dunăre	Dolj	19257.46
Parcul Natural Lunca Mureșului	Arad, Timiș	17397.39
Canaralele de la Hârșova	Ialomița, Constanța	7304.79
Iezerul Călărași	Călărași	5008.69
Lacul Techirghiol	Constanța	1272.26
Tinovul Poiana Stampei	Suceava	695.93
Coplexul Piscicol Dumbrăvița	Brașov	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.

The management of this site is carried out in accordance with its own regulations and plans for the protection and conservation, in compliance with the provisions of the Convention on the protection of the cultural and natural world heritage, under the aegis of UNESCO.

Chapter VI FORESTS

VI.1. NATIONAL FOREST FUND: STATE AND CONSEQUENCES

IV.2. THREATS AND PRESSURES EXERCISED ON THE FORESTS

IV.3. TRENDS, PROMISES AND ACTIONS ON SUSTAINABLE FOREST MANAGEMENT

VI. FORESTS

VI.1. NATIONAL FOREST FUND: STATE AND CONSEQUENCES

VI.1.1. EVOLUTION OF THE SURFACE OF THE FORESTRY FUND

RO 45	Indicator code Romania: RO 45 EEA indicator code: SEBI 17

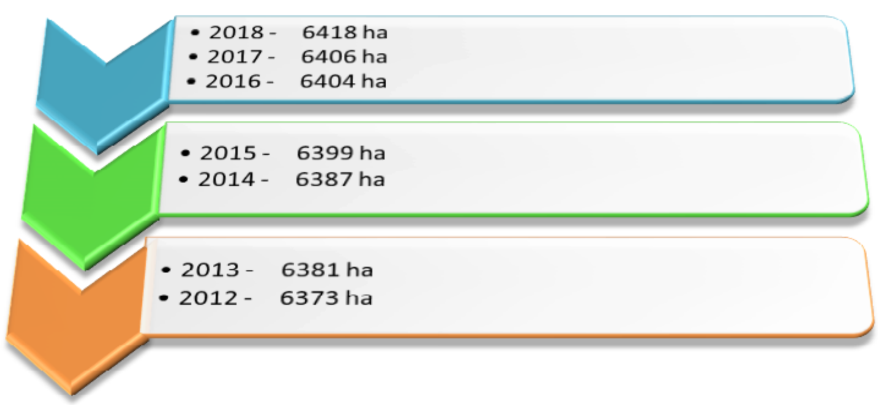
TITLE: FORESTS: forest fund, growing and harvesting of timber
DEFINITION: The indicator shows the evolution of the forest fund, net annual growth and annual cuts, as well as the utilization rate of the forests (the annual cut of the annual increase).

Romania's national forest fund occupies at the end of 2018, an area of 6583 mii hectare, thousand hectares, which represents 27.6% of the country's surface. The surface of the forest fund, as of December 31, 2018, compared to the same date of 2017, registered a slight increase of 18 thousand ha due mainly to the redevelopment of the forest pastures and the introduction into the forest fund of degraded lands, according to the Law no. 46/2008 regarding the Forest Code, republished, with the subsequent amendments and completions.

Table VI.1 Evolution of the surface of the forest fund, by categories of use and species, between 2014 and 2018, in thousands ha

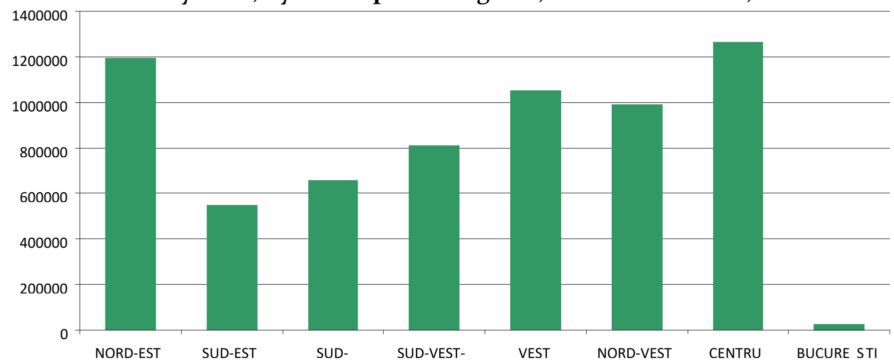
Categories of use	2014	2015	2016	2017	2018
Total forest fund	6545	6555	6559	6565	6583
The surface of forests *, of which:	6387	6399	6404	6406	6418
-resinous	1930	1931	1929	1924	1917
-deciduous	1457	1468	1475	1482	1501
Other land in the forest fund	158	156	155	159	165

Figure VI.1 Evolution of the area of forests * in the period 2012-2018, in thousands ha



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%), Caraş-Severin (6,3%), Bacău (4,1%), Harghita (4%), Neamt (4%), Maramures (4%) and Gorj (3.8%).

Figure VI.2 Distribution of forestry fund, by development regions, at the end of 2018, in ha



The area of forest related to the number of inhabitants is 0.34 ha (as of January 1, 2018 the population of Romania was 19524000 inhabitants-resident population[1]), close to the European one 0.31 ha. [1] *The population of Romania resides on January 1, 2018, according to the data published on the INS website, www.insse.ro*

The average annual growth, at the level of 2018, was 7.8 m3 / year / ha (according to the data provided by the Forestry Fund Inventory), above the European average of 4.4 m3 / year / ha.

Tabelul VI.2 Timber harvest index - in the period 2014-2018, in m3 / year / ha

Year	2014	2015	2016	2017	2018
Timber harvest index - m3 / year / ha	2.7	2.8	2,7	2,8	2,95

VI.1.2. DISTRIBUTION OF FORESTS BY MAIN RELIEF FORMS

Source: Ministry of Water and Forests

VI.1.3. FOREST HEALTH

RO 46	Indicator code Romania: RO 46 EEA indicator code: SEBI 18

TITLE: FORESTS: 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 causes that determined the occurrence and evolution of the phenomenon of premature drying of the trees, according to the observations and the results of the specialized studies, is the climatic changes, which generated the appearance of extreme meteorological phenomena such as: excessive temperatures with high frequency and long duration, long lasting successive droughts, precipitations (rains, snowfall) marked quantitatively related to the unit of time and surface area, early and late frosts, etc.

From a meteorological point of view, the year 2018 was characterized by the existence of two antagonistic periods: January-June period rich in precipitation and July-December period with a deficit of precipitations and temperatures over the multiannual averages specific to these months.

Quite frequently, in recent years, the occurrence of early and late frosts has been observed, which has caused the frosts of young trees.

Due to the physiological weakening 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.

Comparativ cu anii precedenți, procentul de uscare a bradului s-a menținut la un nivel relativ constant, respectiv 7% din suprafața fondului forestier proprietate publică a statului ocupată de această specie (față de 10% în anul 2016 și 8% în anul 2017), cauza principală a acestui fenomen fiind seceta prelungită. Molidul, deși este o specie mai puțin pretențioasă față de regimul hidric din sol comparativ cu bradul, este foarte sensibil la acțiunea vântului și la presiunea exercitată de greutatea stratului de zăpadă.

The resin trees harmed by the abiotic factors constitute a favorable environment for the development of bark beetles, which rapidly infest these trees and produce their mass drying. The most affected by the drying was the softwood trees outside their natural area, especially in the eastern part of the country, where the water deficit in the soil was very pronounced.

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.

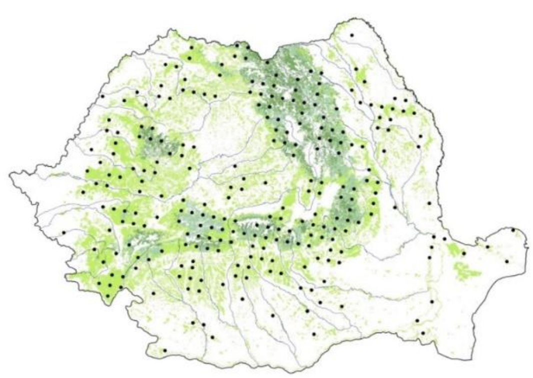
Over the last decades, in several forest areas, pollution has increased, affecting the health of trees and their regeneration capacity. Industrial pollution, both domestic and cross-border, generates the occurrence of acid rain. The harmful effect of the powders resulting from the activity of the units producing the building materials (cement, lime, ballast etc) acts and it is perceived on extensive areas.

Source: Ministry of Water and Forests

The assessment of the health status of the trees in 2018 was carried out within the pan-European network of permanent surveys (Level I), systematically located in all the forests of Europe, with a density of 16x16 km (a survey of 25600 ha) and a number of 245 of surveillance surfaces (Figure VI.3). A total of 5832 trees were evaluated, of which 1051 trees (18%) and deciduous 4781 trees (82%).

During the field assessments, the physiological injuries were recorded, namely the defoliation and discoloration of the foliage in the crown. The evaluation was performed according to the specific methodology ICP-Forests (International Co-operative Programs on Assessment and Monitoring of Air Pollution Effects on Forests) by the specialized personnel of the National Institute of Forestry Development Research "Marin Drăcea" (INCDS).

Figure VI.3 Pan-European Forest Health Monitoring Network (16x16 km - Level I)



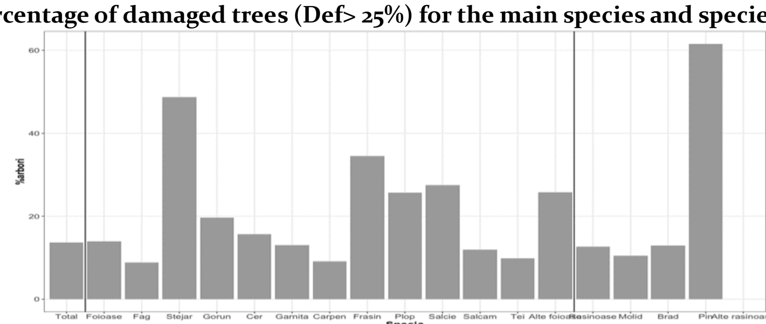
According to the results obtained at national level in 2018, the average percentage of damaged trees (defoliation classes 2-4) is 13.7% down 0.5 percent compared to 2017, but still slightly higher than in 2013-2016. By species groups, an increase of the average percentage of trees damaged by resin trees is observed, from 9.6% in 2015, 10.4% in 2016, 10.7 in 2017 to 12.7 percent in 2018 and an improvement in the case of leaves from 15.0 percent in 2017 to 13.9 percent in 2018, the values returning to those recorded in previous years (13.6 percent in 2013 or 13.9 percent in 2015) (table VI.3).

Table VI.3 Dynamics of the percentage of healthy (Def≤25) and injured trees (Def> 25)

Species groups	Resinous			
Year	**No trees**	**Share%**	**Def≤25%**	**Def>25%**
2013	1103	19.1	86.1	13.9
2014	1103	19.1	86.3	13.7
2015	1103	19.0	90.4	9.6
2016	1120	19.3	89.6	10.4
2017	1092	18.6	89.3	10.7
2018	1051	18.0	87.3	12.7
	Deciduous			
2013	4681	80.9	86.4	13.6
2014	4681	80.9	87.3	12.7
2015	4705	81.0	86.1	13.9
2016	4688	80.7	85.8	14.2
2017	4788	81.4	85.0	15.0
2018	4781	81,9	86,1	13,9
	Total species			
2013	5784	100	86.4	12.9
2014	5784	100	86.5	12.3
2015	5808	100	86.9	13.1
2016	5808	100	86.5	13.5
2017	5880	100	85.8	14.2
2018	5832	100	86,3	13,7

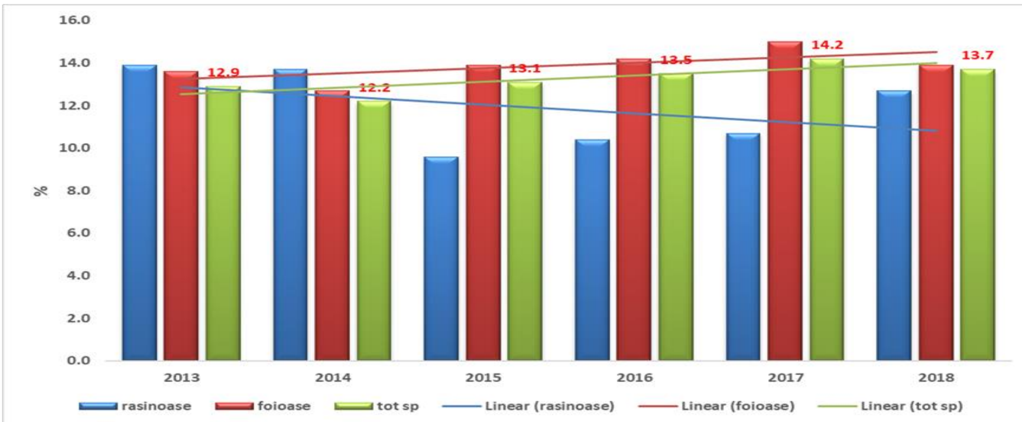
Maximum values of the proportion of damaged trees are found in oak (48.7%), ash (34.5%) and poplar (25.6%). Of the resinous, the spruce has the best state of health (10.4%), slightly decreasing compared to 2017 (9%). On the other hand, there is a significant increase in the percentage of damaged trees, from 35.9% in 2017 to 61.5% in 2018, which cannot be considered as representative at national level due to the low number of trees evaluated.

Figure VI.4 Percentage of damaged trees (Def> 25%) for the main species and species groups in 2018



On a general level, the results of the evaluations carried out in the last years (2013-2018) indicate that the health status of the forests in Romania, evaluated within the pan-European network of permanent surveys (Level I), is relatively constant with insignificant differences from year to year as regards the percentage of trees with a crown defoliation greater than 25% (damaged trees), which in 2013 registered a value of 12.9%, 0.8 percent lower than in year 2018 (13.7%).

Figure VI.5 Percentage of injured trees (defoliation> 25%) for the period 2013-2018



Although the results obtained are not representative at national level, because the transnational network of Level I (16x16km) is statistically assured only at European level, in Romania this indicates at the level of each year the tendency of evolution of the state of health of forests (for healing or decline) compared to previous years.

Source: "Marin Drăcea" National Forestry Research Institute (INCDS))

VI.1.4. RENEWED FORESTS SURFACES

VI.1.5. AREAS WITH DEFICIT OF FOREST VEGETATION AND AVAILABILITIES FOR AFFORESTATION

VI.2 THREATS AND PRESSURES EXERCISED ON THE FORESTS
VI.2.1. CUT FOREST SURFACES

RO 45	Indicator code Romania: RO 45 EEA indicator code: SEBI 17

TITLE: FORESTRY: forest fund, raising and harvesting wood
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 the society has also led to the emergence of types of products that meet the growing needs of different industries, respectively the emergence of many substitutes for wood, but the pressure on the forest ecosystems is still very high for the supply of numerous assortments and there is no provision for a reduction of this demand.
The profile market is better documented and has very high technology standards, so the high quality wood (resonance wood, aesthetic wood, etc.) but also timber and cellulose wood are highly sought after on the profile markets, so that the society itself, through its consumption and development needs puts a lot of pressure.
On the forest ecosystems act elements that come from the area of climate change, the one of the expanding economies and the society that wants to satisfy as quickly as possible the needs of consumption and the profitability - the owners of forests want a maximum profit in the shortest time, fact which is at odds with the availability and regeneration capacity of forest ecosystems.

Figure VI.6 Evolution of logs in m³ / year / ha, 2014-2018

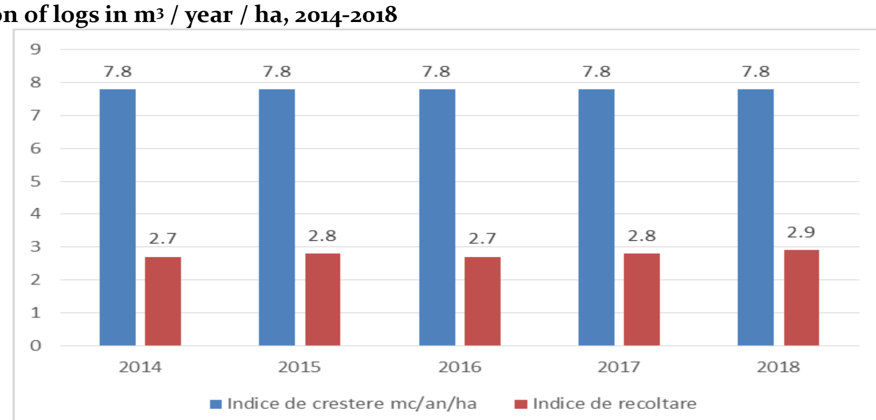


Table VI.4 Evolution of forest areas covered with logs, between 2014-2018

Types of cuttings		Year				
		2014	2015	2016	2017	2018
Regeneration cuttings, of which:	regeneration cuttings in forest-ha	71914	67791	65127	70321	64507
	regeneration cuttings in grove-ha	3642	3665	3229	3212	3573
	substitution cuttings-ha	1002	776	755	728	867
	conservation cuttings-ha	24423	24221	68107	103035	112614
Total		**100981**	**98453**	**137218**	**177296**	**181561**

The evolution of forest fund growth and wood harvesting in Romania is illustrated by the rate of use of forests (the ratio between tree felling and tree growth).

Figure VI.7 Forest use rate in 2014-2018

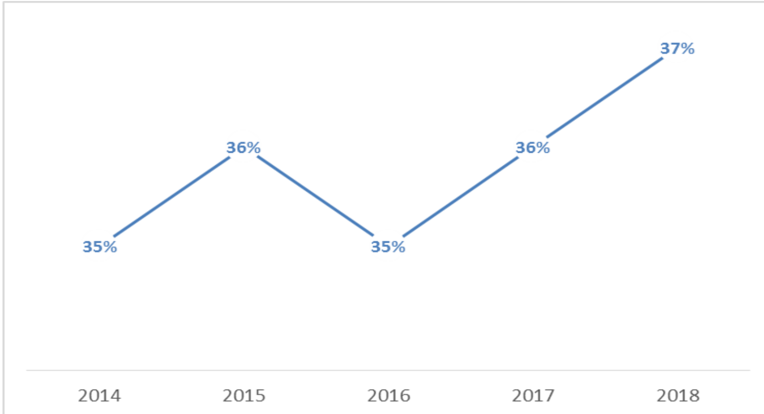
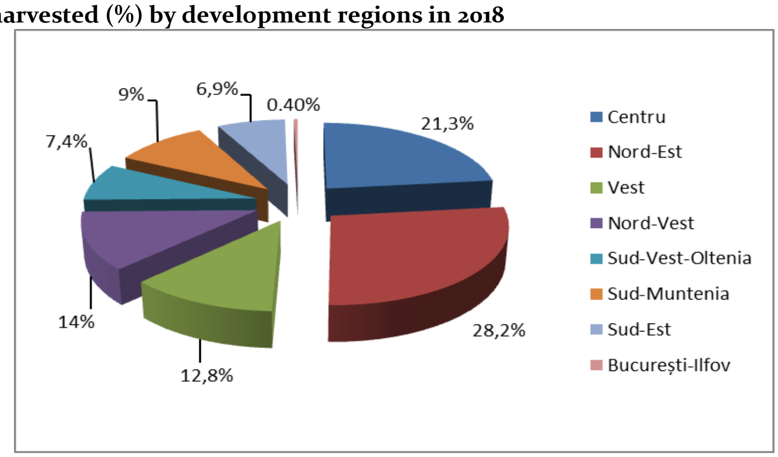
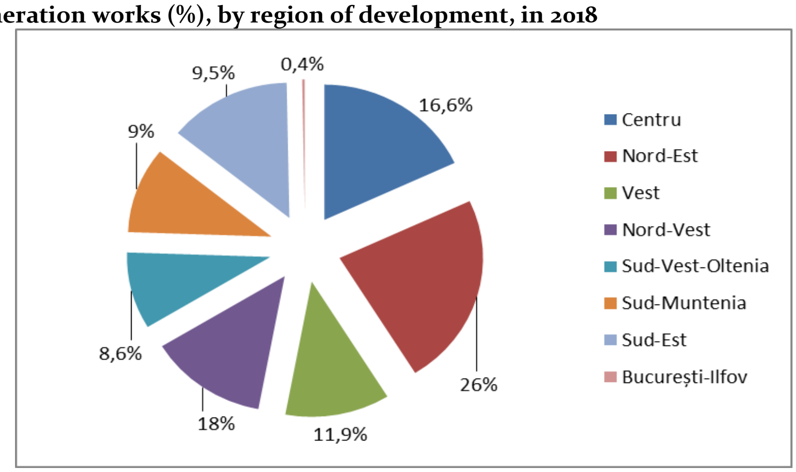


Figure VI.8 Wood mass harvested (%) by development regions in 2018



The largest volume of timber harvested in the NORTH-EAST development region 29.2% of the total volume of timber harvested, followed by the development region CENTER with 21.3% and a smaller share was registered in the development regions WEST by 12.8%, NORTH-WEST by 14%, SOUTH-MUNTENIA by 9%, SOUTH-WEST OLTENIA by 7.4%, SOUTH-EAST by 6.9% and BUCHAREST-ILFOV by 0.4%.

Figure VI.9 Forest regeneration works (%), by region of development, in 2018



Source: Ministry of Water and Forests, www.insse.ro

VI.2.2. CHANGING LAND USE

RO 44	Indicator code Romania: RO 44 EEA 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.

Source: Ministry of Water and Forests

VI.2.3. CLIMATE CHANGE

VI.3. TRENDS, FORECASTS AND ACTIONS ON SUSTAINABLE MANAGEMENT OF FORESTS

Chapter VII. MATERIAL RESOURCES AND WASTE

VII.1. USE OF MATERIAL RESOURCES: STATE AND TRENDS

VII.2. WASTE GENERATION AND 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. MUNICIPAL WASTE GENERATION AND MANAGEMENT

RO 16	Indicator code Romania: RO 16 EEA 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.)

According to the provisions of the National Plan on Waste Management, approved by H.G. no. 942/2017, "*municipal wastes are household wastes and other wastes, which, by nature or composition, are similar to household wastes*". According to Decision 2011/753 / EU establishing norms and calculation methods for verifying compliance with the objectives set in art. 11, paragraph 2 of Directive 2008/98 / EC of the European Parliament and of the Council, municipal waste means household and similar waste. Municipal waste collection is the responsibility of the municipalities, who can carry out these tasks either directly (through the specialized services within the Local Councils) or indirectly (by delegating this responsibility on a contract basis, to specialized and authorized companies to perform the sanitation services).

In 2017, the quantity of waste collected through the specialized services of the mayors or of the sanitation companies was 5311 thousand tons (municipal waste and construction and demolition waste collected from the population).

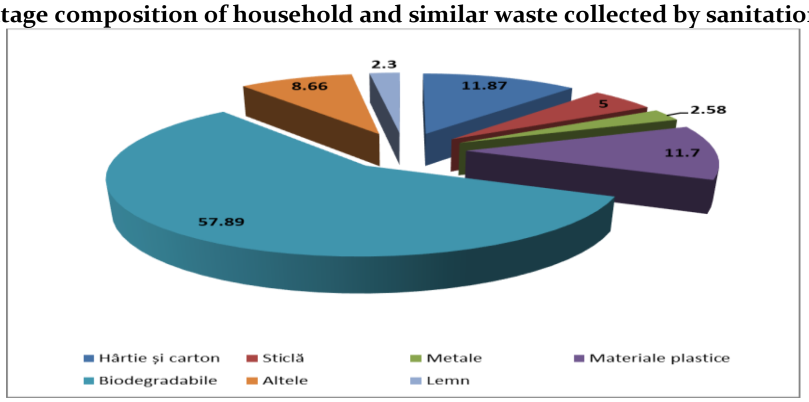
Of the total amount of waste collected by sanitation operators, 84% is represented by domestic and similar waste.

Table VII.1 Waste collected by municipalities in 2017

Waste collected	Quantity collected - thousands of tons	Percent %
Domestic and similar waste	4471	84
Waste from municipal services	612	12
Construction / demolition waste	228	4
TOTAL	**5311**	**100**

Source: National Environment Protection Agency

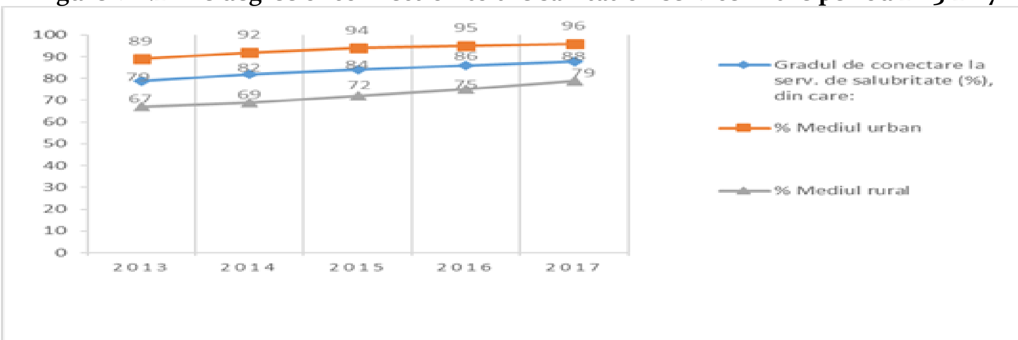
Figure VII.1 Percentage composition of household and similar waste collected by sanitation operators in 2017



Source: National Environment Protection Agency

It should be noted that, at national level, municipal waste collection is not widespread. The figure below shows the evolution of the degree of connection to the sanitation service in the period 2013-2017.

Figure VII.2 The degree of connection to the sanitation service in the period 2013-2017



Source: National Environment Protection Agency

From the above information, there is an increase, from year to year, of the degree of connection to the sanitation service.

The quantities of waste generated by the population that is not served by sanitation services are calculated using the following generation indices: 0.9 kg / place / day for urban area and 0.4 kg / place / day for rural area.

Municipal waste management involves collection, transport, recovery and disposal, including monitoring of landfills after closure.

The responsibility for the management of municipal waste lies with the local public administrations, which, by their own means or by concession of the sanitation service to an authorized operator, must ensure the collection (including separate collection), the transport, the treatment, the recovery and the final disposal of these wastes.

Part of the collected municipal waste is sent directly to the final recovery (material or energy), respectively to disposal, while another part is sent to intermediate treatment plants (sorting, composting stations).

Disposal of municipal waste is done exclusively by landfill. So far, in Romania no installations for the incineration of municipal waste have been put into operation. At the end of 2018, 43 compliant deposits for municipal waste were authorized and in operation.

Indicators of sustainable development regarding municipal waste

According to the recommendations of EUROSTAT (Guide on collecting data on municipal waste), municipal waste represents household and similar waste, generated by households, institutions, commercial units and economic operators.

Includes bulky waste (including WEEE from the population) and waste from parks, gardens and street cleaners, including the contents of road trash cans.

According to the way of collection, the municipal waste is:

- ❖ Collected by or on behalf of municipalities;
- ❖ Collected directly by private economic operators - valid for WEEE and other types of recyclable waste;
- ❖ Generated and not collected by a sanitation operator, but managed directly by the generator.

They are excluded:

- Sludges from urban wastewater treatment;
- Construction and demolition waste.

The indicators of sustainable development regarding municipal waste refer to:

- Municipal waste generated;
- Municipal waste treated by: energy recovery, storage, recycling (excluding composting and anaerobic digestion), composting.

Also, the EUROSTAT guide recommends that the recyclable waste streams (paper, plastic, metal, etc.) that result from the sorting plants and subsequently sent to the recycling facilities should be considered as recycled.

In view of the above, the following municipal waste indicators were calculated at national level:

- ***Municipal waste generated - 5333171 tons in 2017***

  The value was calculated by summing the quantities generated for the following types of waste:

- domestic and similar waste and from municipal services collected by sanitation operators, excluding inert waste;
- domestic waste generated and not collected by sanitation operators;
- recyclable waste from the population, collected through the authorized economic operators, other than the sanitation operators (paper and cardboard, metals, plastic, glass, wood, textiles, WEEE - preliminary data, waste batteries and accumulators)

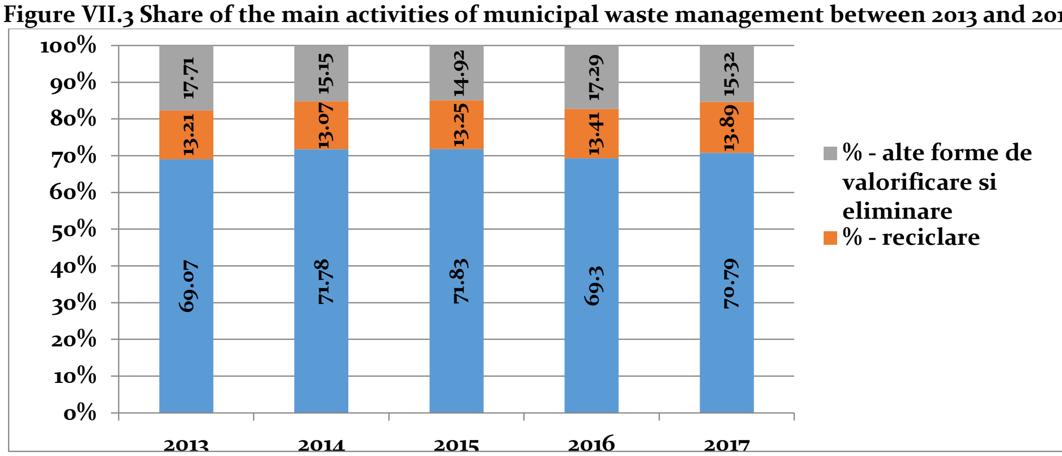
- ***Recycled municipal waste (including composting) - 739384 tons in 2017***

  The value was calculated by summing the recycled quantities for the following types of waste:

- domestic and similar waste and from municipal services collected by sanitation operators;
- domestic waste generated and not collected 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, textiles, WEEE - preliminary data, waste batteries and accumulators).

The recycling rate achieved for municipal waste in 2017 was 13.98%.

Figure VII.3 Share of the main activities of municipal waste management between 2013 and 2017



Source: National Environment Protection Agency

VII.2.3. SPECIAL WASTE FLOWS

VII.2.3.1. Waste electrical and electronic equipment (WEEE)

RO 63	Indicator code Romania: RO 63 EEA 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.

The main objectives of the legislation in force regarding WEEE are:

- preventing the occurrence of waste electrical and electronic equipment and reusing, recycling and other forms of recovery of these types of waste, to reduce to a large extent, the amount of waste disposed of;
- improving the environmental performance of all operators involved in the life cycle of the EEE (producers, distributors and consumers) and especially of the economic agents directly involved in the treatment of waste electrical and electronic equipment.

Only producers registered in the Register of Manufacturers and Importers of EEE, constituted at NEPA, may be placed on the market.

At the beginning of 2006, the procedure for registering the producers of electrical and electronic equipment was started in the Register of manufacturers and importers of electrical and electronic equipment, according to the requirements of the legislation in force. By the end of 2018, there were 3186 manufacturers of electrical and electronic equipment (EEE).

The evolution of the quantities of EEE placed on the market in the period 2013-2017 is presented in the table below.

Table VII.2 EEE placed on the market

Category	Quantities of EEE (tonnes)				
	2013	2014	2015	2016	2017 (preliminary data)
1 - Large household appliances	81810.67	84995.17	103475.36	129548.53	140558.56
2 - Small household appliances	13655.46	10466.12	14667.61	16224.62	18328.05
3 - IT and telecommunication equipment	13759.41	13400.46	13469.45	13231.54	15203.30
4 - Consumer goods	11704.91	14832.53	15236.29	17594.37	27687.20
5 - Lighting equipment	6363.55	5350.9	6010.49	7042.15	9053.10
6 - Electrical and electronic tools	7339.87	7727.25	9654.61	11108.44	18030.20
7 - Toys, sports and leisure equipment	654.42	999.47	1616.51	2150.54	3491.47
8 - Medical devices (except for all implanted and infected products)	416.79	394.51	673.90	564.86	889.27
9 - Surveillance and control instruments	750.14	938.16	2566.35	2126.21	3277.67
10 - Automatic dispensers	348.97	482.54	808.83	1093.56	1225.33
TOTAL	**136804.2**	**139587.1**	**168179.40**	**200684.82**	**237744.11**

Source: National Environment Protection Agency

In order to achieve the annual objectives of collection, reuse, recycling and recovery of WEEE, producers can act:

- individually, using their own resources;
- by transferring these responsibilities, on a contract basis, to a legal economic operator established and authorized for this purpose.

The operating licenses and contact details of the authorized collective organizations are published on the website of the Ministry of the Environment, in the chapter Waste Management - WEEE Commission.

Between 2008 and 2015, an annual WEEE collection target of at least 4 kg waste / inhabitant had to be achieved. Despite all the efforts made by the authorities and responsible economic operators, the annual collection target of 4 kg / inhabitant / year was not reached. The same situation, of not meeting the minimum collection objective stipulated by the legislation (at least 40% compared to the average of the quantities of EEE placed on the market in the previous 3 years) also registered in 2016.

The evolution of the quantities of WEEE collected during 2013-2017 is presented in the table below.

Table VII.3 WEEE collected

Category	Quantities of EEE (tonnes)				
	2013	2014	2015	2016	2017 (preliminary data)
1 - Large household appliances	20315.61	20465.24	24122.22	29592.17	31175.22
2 - Small household appliances	977.49	1021.16	1218.31	1320.07	1303.18
3 - IT and telecommunication equipment	4886.16	4803.3	6837.44	5645.37	6571.14
4 - Consumer goods	4671.74	3513.27	5385.17	7063.19	6545,39
5 - Lighting equipment	837.26	1140.05	1781.32	1292.77	2002.53
6 - Electrical and electronic tools	702.87	815.37	796.00	891.33	903.08
7 - Toys, sports and leisure equipment	89.82	65.6	107.26	115.51	83.39
8 - Medical devices (except for all implanted and infected products)	28.44	34.07	48.43	83.24	67.33
9 - Surveillance and control instruments	505.58	236.42	383.15	411.01	700.15
10 - Automatic dispensers	149.78	64.51	94.84	239.79	337.79
TOTAL	**33164.75**	**32158.99**	**40774.13**	**46654.45**	**49689.20**

Source: National Environment Protection Agency

The collected WEEE is treated both in Romania and in other EU Member States. The capitalization objectives provided by the legislation, respectively achieved, are presented in the following table.

Table VII.4 Recovery targets for WEEE

Category	Objective of recovery envisaged by legislation (%)	Achieved recovery targets (%)				
		2013	2014	2015	2016	2017 (preliminary data)
1 - Large household appliances	80	93	93	70	84	88
2 - Small household appliances	70	89	88	93	75	91
3 - IT and telecommunication equipment	75	85	87	78	99	91
4 - Consumer goods	75	88	88	83	87	77
5 - Lighting equipment	80	92	93	54	80	69
6 - Electrical and electronic tools	70	88	91	95	71	91
7 - Toys, sports and leisure equipment	70	84	84	65	82	84
8 - Medical devices (except for all	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

implanted and infected products)						
9 - Surveillance and control instruments	70	86	88	71	89	95
10 - Automatic dispensers	80	92	93	83	88	86

Source: National Environment Protection Agency

VII.2.3.2. Packaging waste

RO 17

Indicator code Romania: RO 17
EEA 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 VII.5 Packaging placed on the market (tonnes), by material types, 2012-2016

Tip materiale	2012	2013	2014	2015	2016
	tone	tone	tone	tone	tone
sticla	160259	149205	164521	194347	210027
plastic	298042	290279	336818	359036	348794
hartie/carton	303108	311578	388017	441764	427434
metal	58333	54406	65666	66830	64006
lemn	239774	248660	289691	334573	299876
altele	41	11	24	11	31
TOTAL	1059557	1054139	1244737	1396561	1350168

Source: National Environment Protection Agency

TableVII.6 Recovered packaging waste by type of material, 2012-2016

Tip materiale	2012		2013		2014		2015		2016	
	tone	%	tone	%	tone	%	tone	%	tone	%
sticla	106192	66.26	73467	49.24	89103	54.16	79874	41.10	134646	64.10
plastic	154778	51.93	158218	54.51	155353	46.12	170595	47.50	173972	49.90
hârtie/carton	212648	70.16	239745	76.95	325024	83.77	395861	89.60	398322	93.20
metal	32398	55.54	28732	52.81	42147	64.18	42845	64.10	39767	62.10
lemn	102696	42.83	73886	29.71	90680	31.30	105520	31.50	94465	31.50
altele	0	0.00	0	0.00	0	0.00	0	0.00	12	38.70
TOTAL	608712	**57.45**	574048	**54.46**	702307	**56.42**	794695	**56.90**	841184	**62.30**

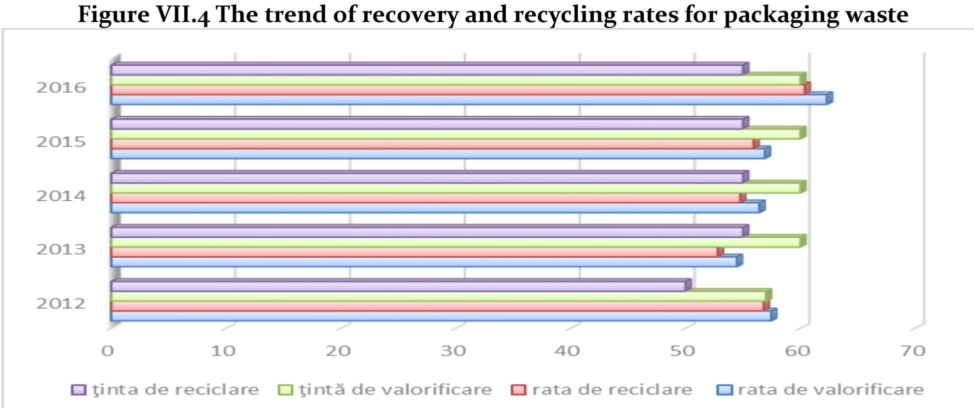
Source: National Environment Protection Agency

Table VII.7 Waste of recycled packaging, by material types, 2012-2016

Tip materiale	2012		2013		2014		2015		2016	
	tone	%	tone	%	tone	%	tone	%	tone	%
sticla	106192	66.26	73467	49.24	89103	54.16	79874	41.10	134646	64.10
plastic	152852	51.29	149940	51.65	149769	44.47	167554	46.70	162351	46.50
hârtie/carton	211698	69.84	232580	74.65	323556	83.39	394300	89.30	395378	92.50
metal	32398	55.54	28732	52.81	42147	64.18	42845	64.10	39767	62.10
lemn	98660	41.15	71902	28.92	77071	26.60	96203	28.80	82891	27.60
altele	0	0.00	0	0.00	0	0.00	0	0.00	0.00	0.00
TOTAL	601800	**56.80**	556621	**52.80**	681646	**54.76**	780776	**55.91**	815033	**60.37**

Source: National Environment Protection Agency

Figure VII.4 The trend of recovery and recycling rates for packaging waste



Source: National Environment Protection Agency

VII.2.3.3. End-of-life vehicles (VSU)

RO 69

Indicator code Romania: RO 69
EEA 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.

The economic operators involved in the management of end-of-life vehicles are: manufacturers, distributors, collectors, insurance companies, as well as operators whose activity object is: treatment, recovery, recycling of end-of-life vehicles, including their components and materials.

Between 2007 and 2014, the economic operators had the obligation to ensure the achievement of the following objectives, taking into account the average empty mass:

- re-use and recovery of at least 75% of the average mass per vehicle and year of vehicles manufactured before January 1, 1980;
- the re-use and recovery of at least 85% of the average mass per vehicle and year of vehicles manufactured after January 1, 1980;
- re-use and recycling of 70% of the average mass per vehicle per year of vehicles manufactured before January 1, 1980;
- re-use and recycling of 80% of the average mass per vehicle and year of vehicles manufactured since January 1, 1980.

Starting with January 1, 2015, the economic operators are obliged to ensure the achievement of the following objectives, taking into account the average empty mass:

- re-use and recovery of at least 95% of the average mass per vehicle and year, for all end-of-life vehicles;
- re-use and recycling of at least 85% of the average mass per vehicle per year, for all end-of-life vehicles.

In order to monitor the achievement of the objectives set out above, economic operators carrying out collection and treatment operations of end-of-life vehicles are required to report specific information. The centralized data at national level are presented below.

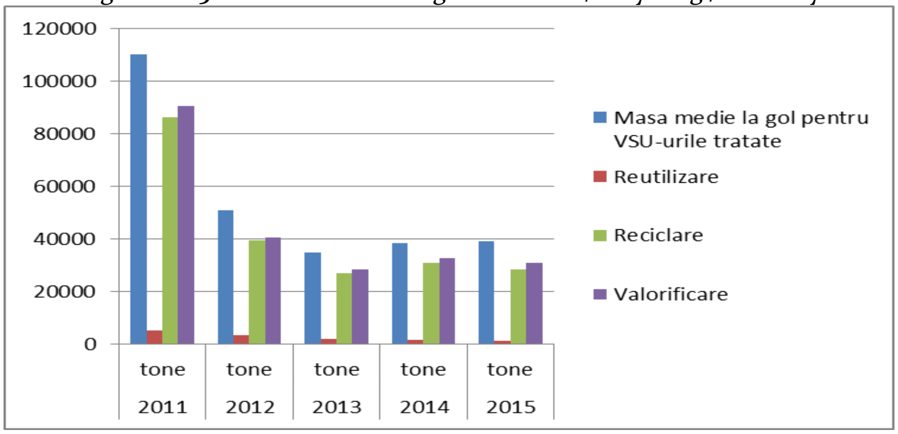
Table VII.8 VSU collected and treated in the period 2011 - 2015

	2011	2012	2013	2014	2015
VSU colectate	124299	55374	37340	43351	43228
VSU tratate	128839	57950	37989	42138	41886

*Diferenţa dintre numărul de vehicule scoase din uz colectate şi numărul de vehicule scoase din uz tratate se datorează vehiculelor scoase din uz în anii anteriori şi rămase în stoc

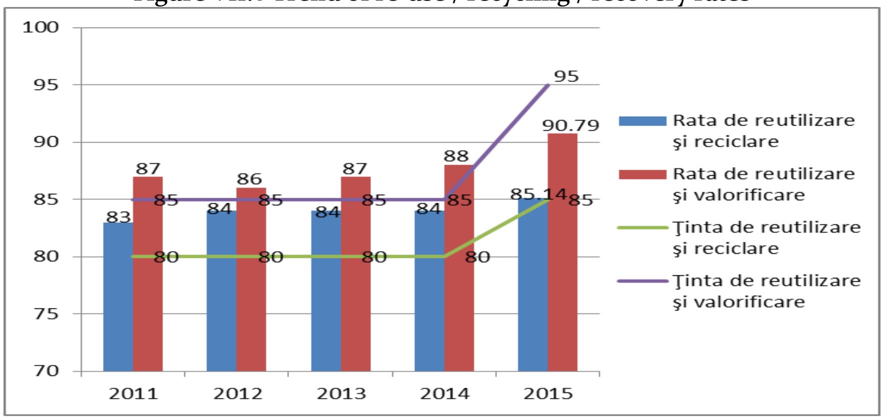
Source: National Environment Protection Agency

Figure VII.5 Evolution of the degree of reuse / recycling / recovery



Source: National Environment Protection Agency

Figure VII.6 Trend of re-use / recycling / recovery rates



Source: National Environment Protection Agency

Chapter VIII. CLIMATE CHANGE

VIII.1. THE IMPACT OF CLIMATE CHANGES ON NATURAL AND ANTHROPIC SYSTEMS

VIII.2. DETERMINING 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 ATTENUTION AND ADAPTATION TO CLIMATE CHANGE

Chapter VIII CLIMATE CHANGE

VIII.1. THE IMPACT OF CLIMATE CHANGES ON NATURAL AND ANTHROPIC SYSTEMS

VIII.1.1. CHANGES RELEVANT TO THE CLIMATE FRAMEWORK IN ROMANIA

RO 12	Indicator code Romania: RO 12 EEA 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 2018

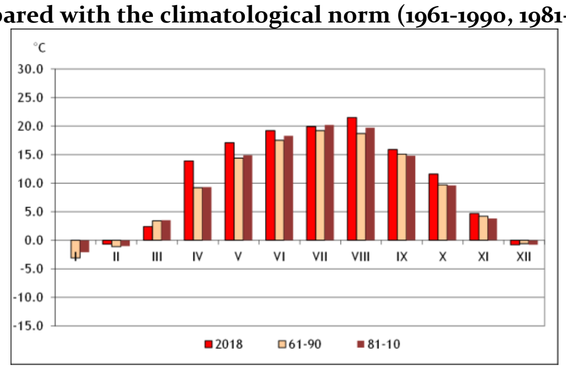
In 2018, the average annual temperature in the country (10.4ºC) was 1.2ºC higher than the standard climatological norm (for the reference period 1981 - 2010). The highest annual average temperatures, over 12º, were recorded in the Romanian Plain, the Western Plain and in the lower areas of Dobrogea. The highest annual average temperature in the country, 13.5ºC, was registered in Moldova Veche, and the lowest, -0.4ºC, in Omu Peak. Negative deviations of the average monthly temperature from the climatological norm (1981 - 2010), corresponding to each particular month, were recorded in March and July and had values of 0.3ºC (June) and 1.1ºC (March) respectively. Positive deviations were recorded in 9 of the 12 months, the average monthly temperature in the country being higher than the climatological norm with values between 0.3ºC (February) and 4.6ºC (April), and in December the deviation was 0. Analyzing the classification in the severity classes of the thermal anomalies from 2018, it is found that the thermal regime was very warm, but especially extremely hot in Transylvania, Maramures, Crişana, Banat, northwest of Muntenia, south of the Black Sea coast and locally in the Danube Delta. Otherwise, the heat regime was warm. It should be noted that **the year 2018 is the third hottest year in Romania, starting with 1900 and up to the present**.
The distribution on the territory of the country of the average annual temperature in 2018 is shown in Figure VIII.2.

Table VIII.1 The average annual temperatures and the annual amounts of precipitation mediated at the level of Romania, during the last 5 years.

Year	2014	2015	2016	2017	2018
Temperature (in ºC)	10,2	10,5	10.4	9,9	10,4
Precipitations (in mm)	807,8	630,1	791,5	673,5	698,8

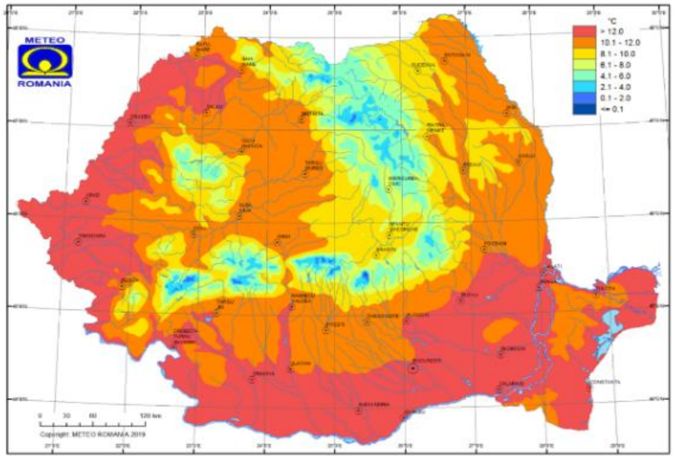
Source: National Meteorological Administration

Figure VIII.1 The average monthly temperature in Romania in 2018, compared with the climatological norm (1961-1990, 1981-2010)



Source: National Meteorological Administration

Figure VIII.2 Average annual temperatures in 2018 (in ºC)



Source: National Meteorological Administration

RO 47	Indicator code Romania: RO 47 EEA indicator code: CLIM 02

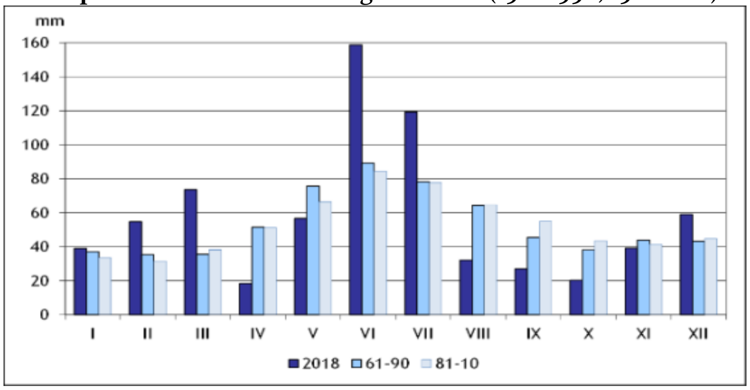
TITLE: RAINFALLS AVERAGE

DEFINITION: This indicator is defined by:

- Annual rainfall trends at national level
- The projected changes in annual rainfall and summer season at national level

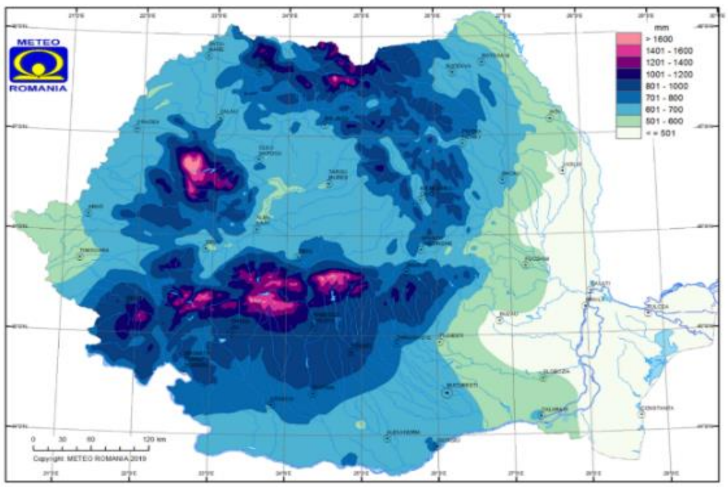
The average amount of precipitation accumulated in 2018 at the level of Romania (698.8 mm) was 10% higher than the standard climatological norm (for the reference period 1981 - 2010). Annual quantities of precipitation, over 800 - 1000 mm, were recorded in the mountainous areas, in the northwest of Muntenia, in areas in the northern half of Oltenia, in the south of Banat and isolated in the rest. The smallest annual precipitation amounts, below 500 mm, were recorded in Dobrogea, south-east of Moldova and northeast of Muntenia. The highest annual amount of precipitation was recorded in Stana de Vale, 1839.2 mm, and the smallest, 296.6 mm, in Sulina. Positive deviations were in 6 of the 12 months, ranging from 16% in January to 92% in March, and negative deviations were recorded in the rest of the months, ranging from 6% in November to 64% in April. Analyzing the classification into severity classes of annual rainfall anomalies, it is found that the rainfall regime was surplus in the south and west of Muntenia, in Oltenia, in the south of Banat, in almost all the northern half of Moldova and in the areas of western and eastern Transylvania, isolated, this being even very surplus or extremely surplus. In the east of Oltenia and west of Muntenia, the precipitation quantities were high, the rainfall regime being very surplus and extremely surplus. In the small areas of eastern Moldova and central Crişana, the rainfall regime was deficient. Otherwise, annual rainfall amounts were within normal limits with isolated surpluses and deficits. The distribution on the territory of the country of the annual quantities of precipitation in 2018 is presented in fig. VIII.4.

Figure VIII.3 The average monthly amount of rainfall in Romania in 2018, compared with the climatological norm (1961-1990, 1981-2010)



Source: National Meteorological Administration

Figure VIII.4 Annual amounts of precipitation in 2018 (in mm).



Source: National Meteorological Administration

RO 49

Indicator code Romania: RO 49
EEA indicator code: CLIM 08

TITLE: THE DEGREE OF SNOW COVERING

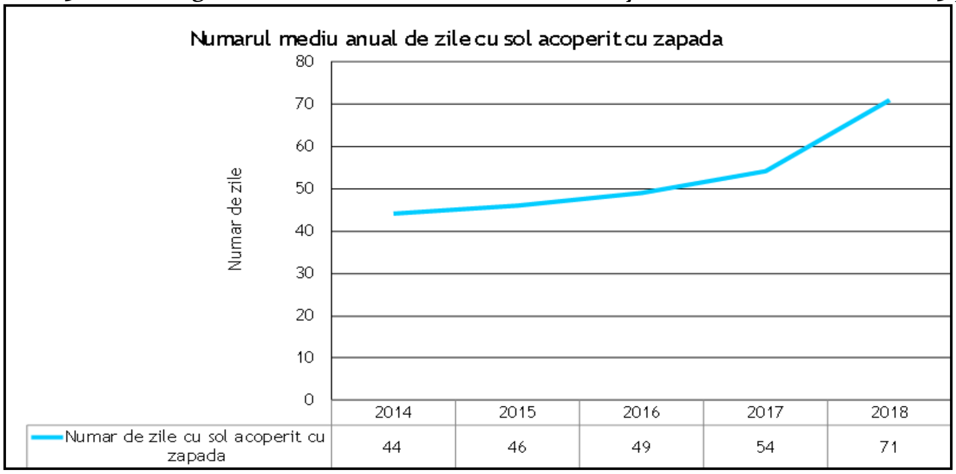
DEFINITION: This indicator is defined by:

- 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

The average annual number of snow-covered days in Romania is illustrated in Figure VIII.5. In 2018, there was an increase in the number of days with snow-covered soil, compared to 2017.

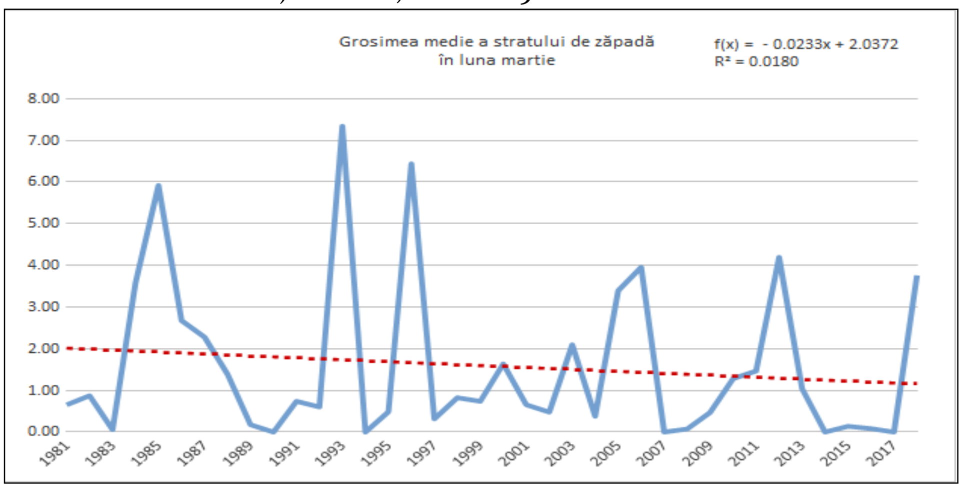
The tendency of the thickness of the snow layer (excluding the mountain stations), highlighted in March, for the period 1981-2018, is one of significant reduction, consistent with the developments recorded in both Europe and Asia (fig. VIII.6) and in agreement with the global warming signal.

Figure VIII.5 The average annual number of snow-covered days in Romania over the last 5 years.



Source: National Meteorological Administration

Figure VIII.6 The evolution of the average thickness of the snow layer (in cm) at the level of Romania (except for the mountain stations) in March, between 1981-2018 and the associated linear trend.



Source: National Meteorological Administration

RO 48	Indicator code Romania: RO 48 EEA indicator code: CLIM 04

TITLE: EXTREME RAINFALL

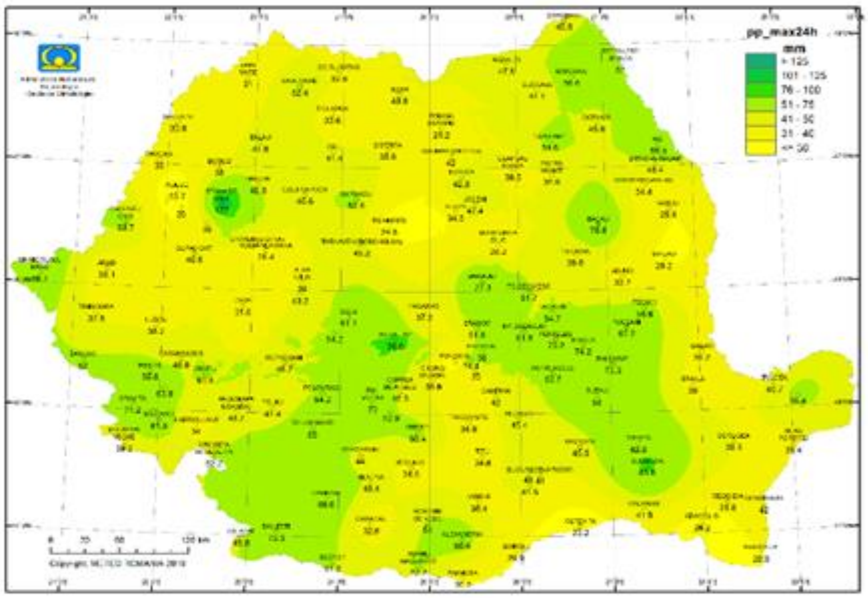
DEFINITION: This indicator is defined by:

- 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

The map regarding the maximum amount of precipitation recorded in 24 hours of 2018 (fig. VIII.7) is consistent with the general characteristics of the year 2018 (fig. VIII.3).

In 2018, the maximum value of the maximum amount of precipitation accumulated in 24 hours, was registered at Stâna de Vale (fig. VIII.7).

Figure VIII.7 The maximum amount of precipitation accumulated in 24 hours, recorded in 2018, at the weather stations covering the territory of Romania (in mm).



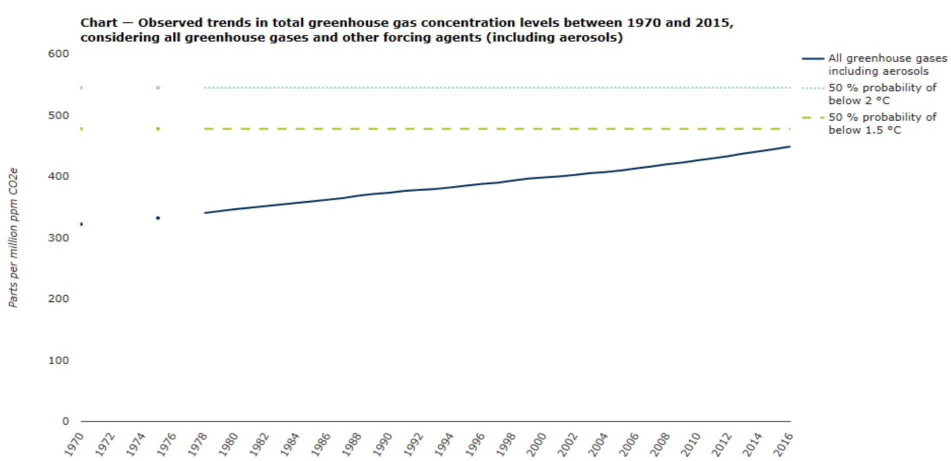
Source: National Meteorological Administration

VIII.1.2. CONCENTRATION OF GREENHOUSE GAS IN THE ATMOSPHERE

RO 13	Indicator code Romania: RO 13 EEA 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 (CO_2, CH_4, N_2O, SF_6, HFCs, PFCs and NF_3).

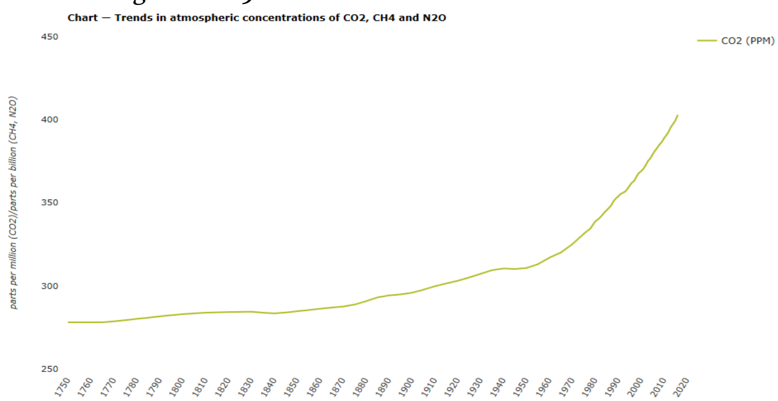
Figure VIII.8 Trends observed in total greenhouse gas concentrations (1970-2016)



Source: https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-6/assessment

The average annual CO_2 concentration reached 403 and 405 ppm in 2016 and 2017 (Figure VIII.9). This represents an increase of over 127 ppm (+ 143%), compared to pre-industrial levels (before 1800) (NOAA, 2015). In general, CO_2 concentrations in the atmosphere exceed the range of concentrations recorded in ice cores over the last 800,000 years (IPCC, 2013) (Figure VIII.9).

Figure VIII.9 Global carbon dioxide concentration



(Source: https://www.eea.europa.eu/data-and-maps/indicators/atmospheric-greenhouse-gas-concentrations-6/assessment)

VIII.1.3. THE IMPACT OF CLIMATE CHANGE ON NATURAL SYSTEMS

VIII.1.3.1. Impact on the marine and coastal environment

VIII.1.3.2 Impact of climate change on watercourses

RO 53	Indicator code Romania: RO 53 EEA indicator code: CLIM 017

TITLE: FLOODS

DEFINITION: This indicator highlights the trend of major floods in Europe, as well as the expected changes in the variation of floods with a 100-year return period.

Table VIII.2 Synthetic table on floods in Romania

No. Crt.	Year	No. events	No. significant events	Affected urban areas
1	2010	94	9	117
2	2011	45	1	19
3	2012	39	6	39
4	2013	74	4	47
5	2014	151	14	72
6	2015	49	2	20
7	2016	171	18	93
8	2017	137	*	68
9	2018	164	*	138

Source: National Administration "Romanian Waters" and National Institute of Hydrology and Water Management
** for the years 2017 and 2018, the data regarding the establishment of significant historical flood events are in operation at the INHGA.*

The population affected by the floods was 6310 inhabitants.

In 2018, 6 extreme drought events were recorded.

VIII.1.4. THE IMPACT OF CLIMATE CHANGE ON SOCIO-ECONOMIC SYSTEMS AND SECTORS

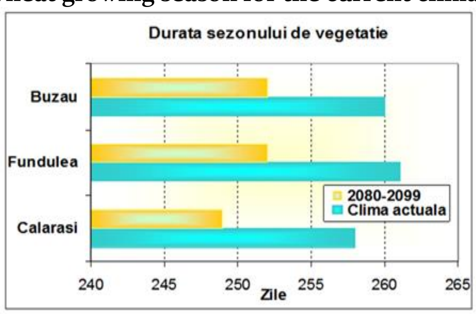
VIII.1.4.1 Agriculture

RO 56	Indicator code Romania: RO 56 EEA 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 season of vegetation represents that period of the year, also called the frost-free season, in which the most favorable conditions of plant development are recorded. Figure VIII.10 shows the duration of the growing season for the wheat crop for both the present period and the period between 2080-2099.

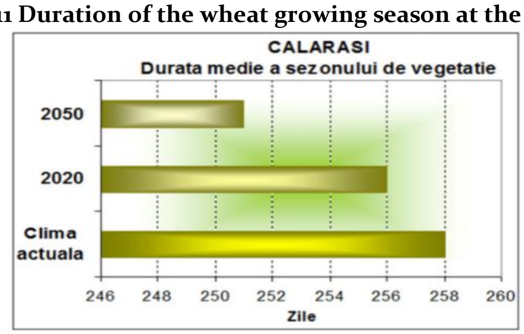
The projections were made using the climatic model RegCM3, developed at ICTP, Trieste, under the IPCC, A1B emission scenario. For all three stations analyzed significant decreases (number of days) of the duration of the vegetation season are observed. For example, in Calarasi (Figure VIII.11), it is possible to observe a decrease of the vegetation season by 2-14 days, due to the increase of the temperature. For the average duration of the growing season, simulations of the HadCM3 climate model were used, for the period 2020-2050, under the IPCC A2 emission scenario.

Figure VIII.10 Duration of the wheat growing season for the current climate and for the period 2080-2099



(Source of the National Meteorological Administration, Extreme meteorological phenomena in Romania - implications on agriculture, 5th edition ICAR Forum)

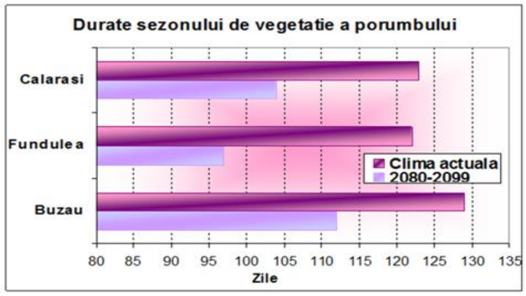
Figure VIII.11 Duration of the wheat growing season at the Calarasi station



(Source of the National Meteorological Administration, Extreme meteorological phenomena in Romania - implications on agriculture, 5th edition ICAR Forum)

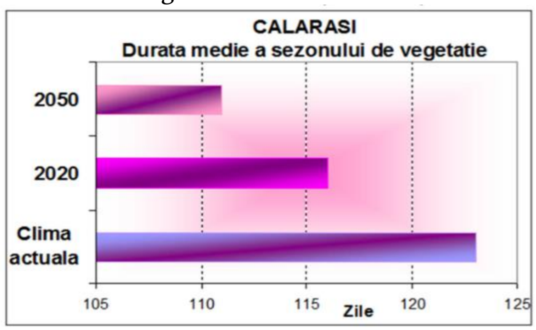
Regarding the corn crop (Figure VIII.12), a decrease of the production is observed as a result of the increase of the water deficits in the soil, especially in the filling phase of the grains. For Calarasi station (Figure VIII.13), the shortening of the vegetation season by 7 days in 2020 and 12 days in 2050, respectively, is observed, as a result of the increase in air temperature.

Figure VIII.12 Duration of the growing season for corn crop for the current climate and for the period 2080-2099



(Source of the National Meteorological Administration, Extreme meteorological phenomena in Romania - implications on agriculture, 5th edition ICAR Forum)

Figure VIII.13 Duration of the vegetation season for corn cultivation at Calarasi station



(Source of the National Meteorological Administration, Extreme meteorological phenomena in Romania - implications on agriculture, 5th edition ICAR Forum)

RO 57

Indicator code Romania: RO 57
EEA indicator code: CLIM 32

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 availability of ground water is directly affected by the water requirement of the crops for evapotranspiration, which depends mainly on the temperature and the vegetation stage of the plant, and the water requirement of the crops depends on the local weather conditions: soil, the development stage of the plant and its characteristics.

Forecasts of climate change (air temperature and precipitation) in Romania for the period 2001 - 2030 were built by applying two extrapolation methods (dynamic and static) recommended by IPCC and applied to some global models (AOGCM) or regional models (RegCM) and applied in the case of the A1B IPCC forecast (small increases in GHG concentrations in the atmosphere in the 21st century).

The statistical results of the forecasts for the period 2001-2030 compared to the period 1960-1990 show the following:

• the air temperature will increase by 0.7 to 1.1 ° C;

• average rainfall values for December and February will decrease, while October and June will increase, and for the other months average values will not change significantly.

The results of the dynamic modeling for the period 2001-2030 compared to the period 1960-1990 show:

• the average temperature will increase further in the eastern part of Romania;

• the temperature of the winter air outside the Carpathians is expected to drop by 1.5 ° C, and in summer it will increase by 0.2 ° C;

• spring - the temperature will increase by 1.8 ° C;
• autumn - the temperature is expected to rise;
• summer - rainfall will increase especially in the west;
• increased rainfall in the autumn season;
• decrease of precipitation in the winter season.

Source: 5th National Communication of Romania, Bucharest January 2010

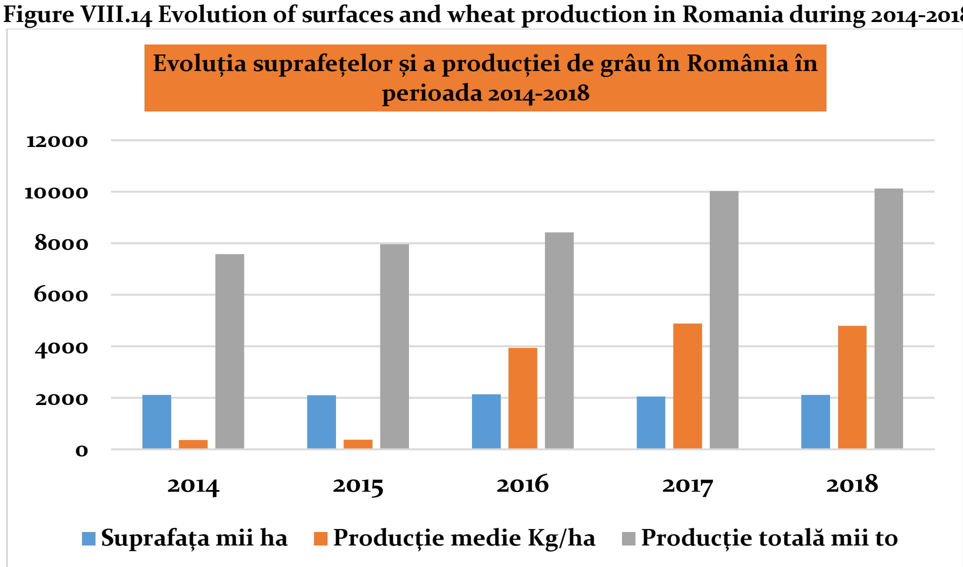
Tablel VIII.3. The cultivated area and production of wheat crop in Romania, 2014-2018

Year	The cultivated surface (thousands hectares)	Production (thousand tons)	Yield (kg / ha))
2014	2112.9	7584.8	3590
2015	2106.6	7962.4	3780
2016	2137,7	8431	3944
2017	2052,9	10035	4888
2018	2109	10130	4803

Data source: https://www.madr.ro/culturi-de-camp/cereale/grau.html/

The evolution of wheat crop yield in Romania (kg / ha), 2014-2018, is illustrated in the figure below.

Figure VIII.14 Evolution of surfaces and wheat production in Romania during 2014-2018



Data source: https://www.madr.ro/culturi-de-camp/cereale/grau.html/

VIII.1.4.2 Forests and forestry

Surfaces occupied by forests

RO 58	Cod indicator România: RO 58 Cod indicator AEM: CLIM 34

TITLE: AREAS OCCUPIED BY FORESTS
DEFINITION: This indicator is defined by:
- The forest area;
- The volume of forest biomass.

A latent danger, still insufficiently studied, towards the integrity of the forest fund, is represented by the effects of climate change.
From the point of view of the effects of climate change, in Romania there was a significant increase of the average annual temperatures for the period 1991-2005 with approx. 0.5 ° C but this increase almost doubled between 1961 and 2007. There were also changes in the regime of some indices associated with extreme rainfall events, such as the significant increase of the maximum duration of the consecutive days interval without precipitation in the south of the country (in winter) and in the west (in summer). In the context of climate change, forests play an important role, not only in capturing carbon dioxide, but also through the production of biomass and their potential in the field of renewable energy.
Since it is almost impossible to determine how much of the impact on forests belongs to recent anthropic climate changes and how much the effect is caused by the normal planetary climate cycle or other factors (natural climate change, previous management mode, etc.), assessments must includes the whole assembly.
The consequences of climate change on Romania's forests are:

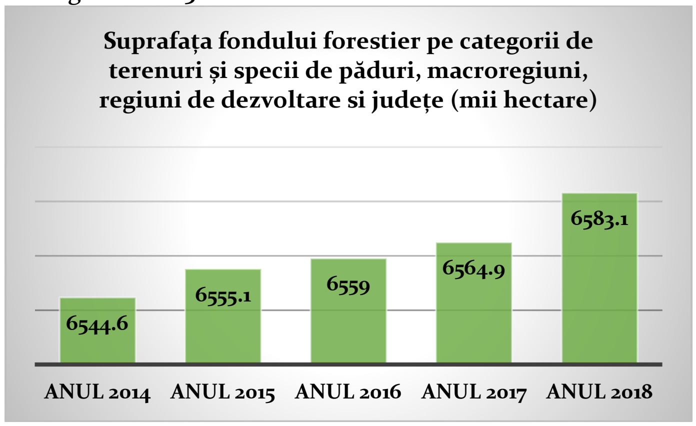
- Accentuation of the devitalization and abnormal drying process of trees, especially in the dry areas of the country, respectively the stepa and the silvostepa;
- Translation of the natural zone from the Romanian geographic space, respectively the passage of the steppe in the semi-desert, of the the 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 forestry fund in the period 2013-2017 by categories of lands and species of forests, macroregions, development regions and counties, is represented in Figure VIII.15.

Figure VIII.15 The evolution of the forest fund surface



INS data source, Tempo-online database

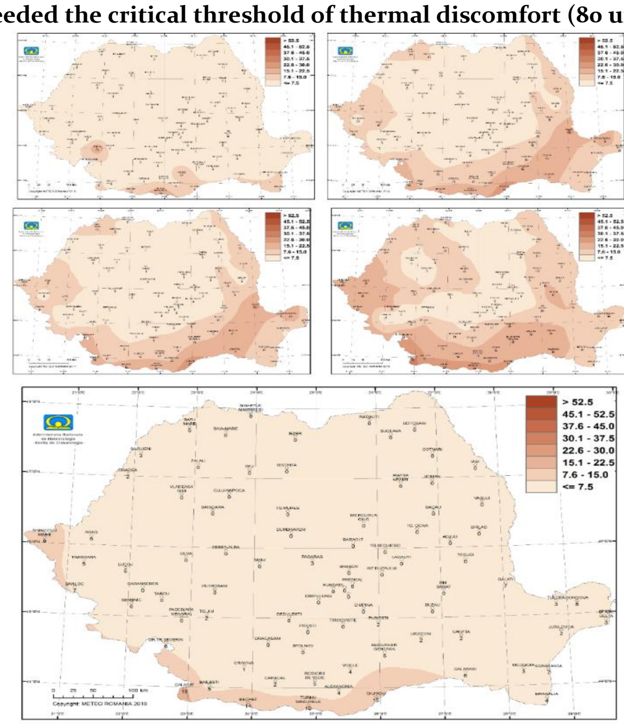
VIII.1.4.3 Human health

RO 60	Indicator code Romania: RO 60 EEA 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.

Waves of heat as well as extreme cold are associated with a sharp decline in well-being regarding population health and increased mortality and morbidity, especially for vulnerable population group.

Figure VIII.16 The number of days in the last 5 years in which the temperature-humidity index ITU has exceeded the critical threshold of thermal discomfort (80 units).



Source: National Meteorological Administration

Figure VIII.16 illustrates that the summer of 2018 was noted by very low values of the number of days in which the temperature-humidity index ITU exceeded the critical threshold of thermal discomfort (80 units). Figure VIII.16 shows for the summer of 2018 a lower thermal stress, especially compared to the summers of 2015, 2016 and 2017, when the number of days with thermal discomfort was much higher, in most of the territory of Romania.

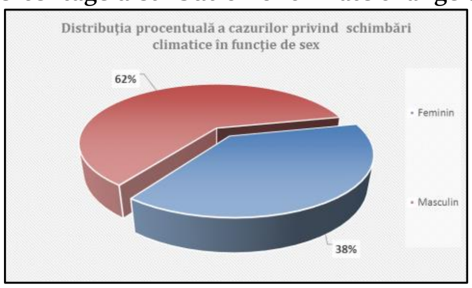
Data on the impact of extreme phenomena on human health

From the data of the report of the electronic register of environmental risks - ReSanMed - for the year 2018:

"In ReSanMed there were 1342 reports in the climate change module (in 2017) and 1750 cases in 2018.

Distribution of cases on Climate Change by gender:

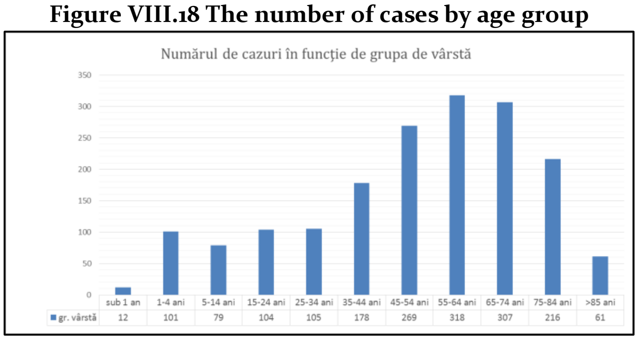
Figure VIII.17 Percentage distribution of climate change cases by gender



Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

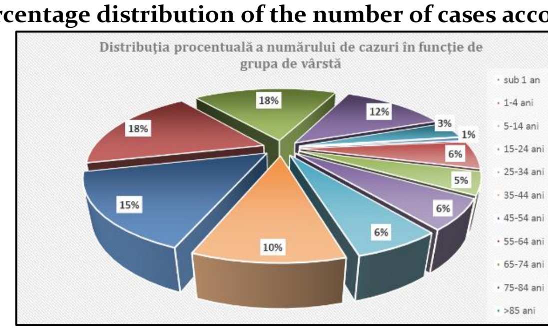
According to the records from the database on the Climate Change module, for the distribution of cases according to age, the following resulted:

Figure VIII.18 The number of cases by age group



Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

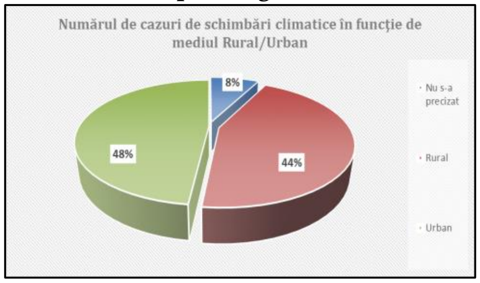
Figure VIII.19 Percentage distribution of the number of cases according to age group



Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

It is found that the most affected age groups are those over 45 years old, and among children, those aged 1-4 years.

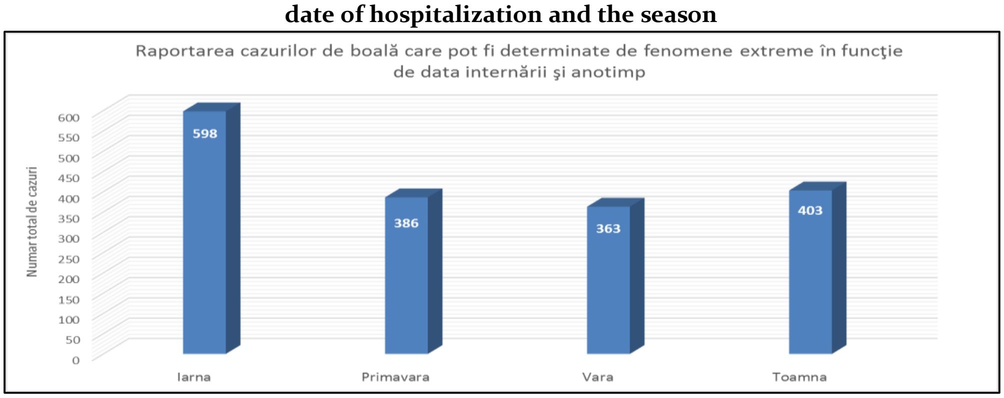
Figure VIII.20 Number of cases depending on the environment (Rural / Urban)

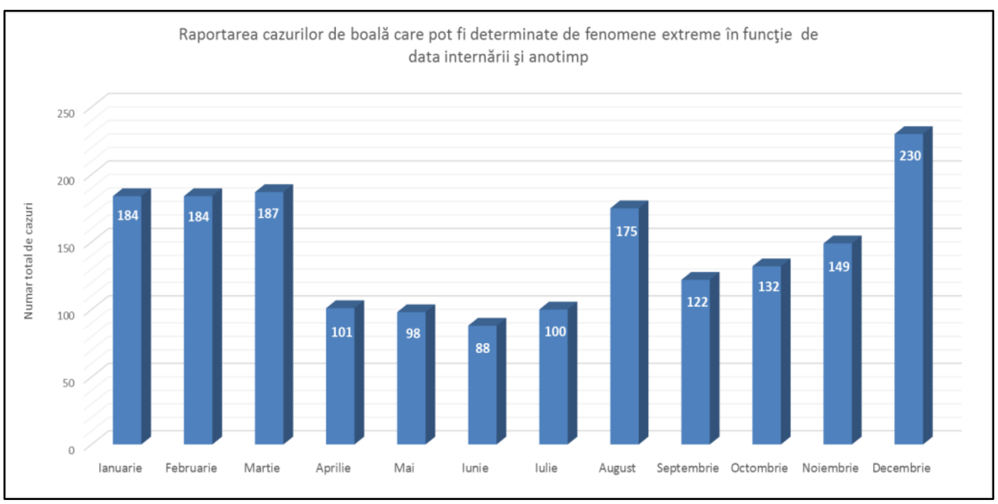


Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

According to the season, most cases were admitted in the winter months (with a maximum in December), with about 60% more than in the other months of the year.
In August most cases of sunburn are noted.

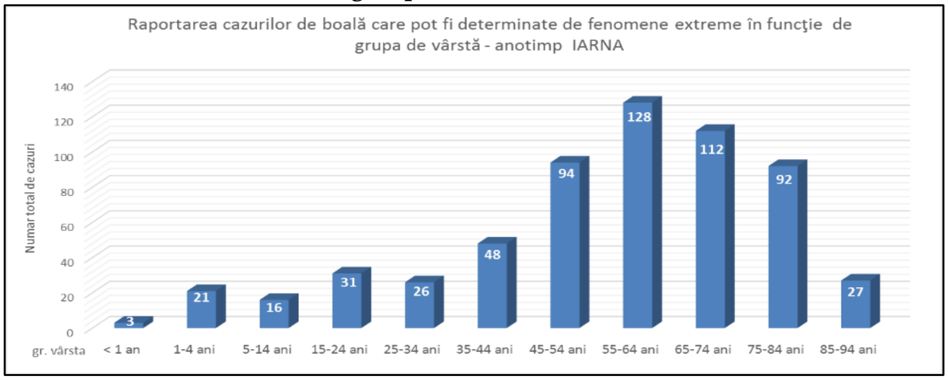
Figure VIII.21 Reporting of disease cases that can be determined by extreme phenomena depending on the date of hospitalization and the season





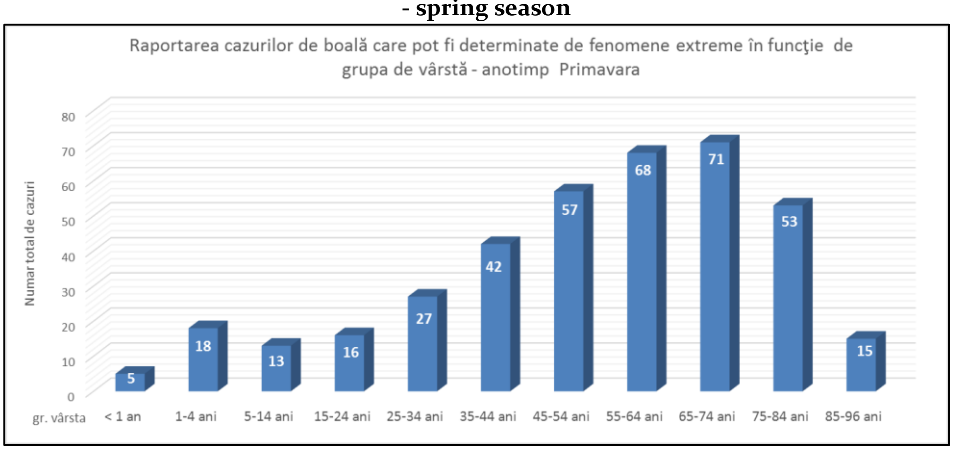
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.22 Reporting of disease cases that can be caused by extreme phenomena depending on the age group - winter season



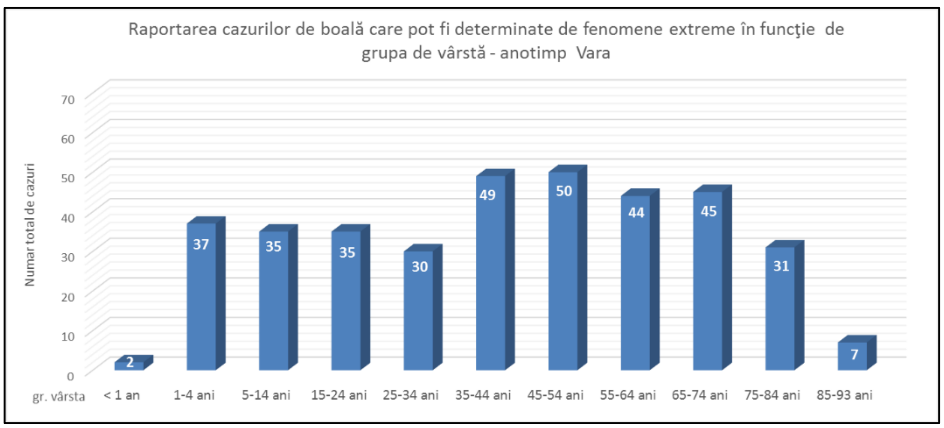
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.23 Reporting of cases of illness that can be caused by extreme phenomena depending on age group - spring season



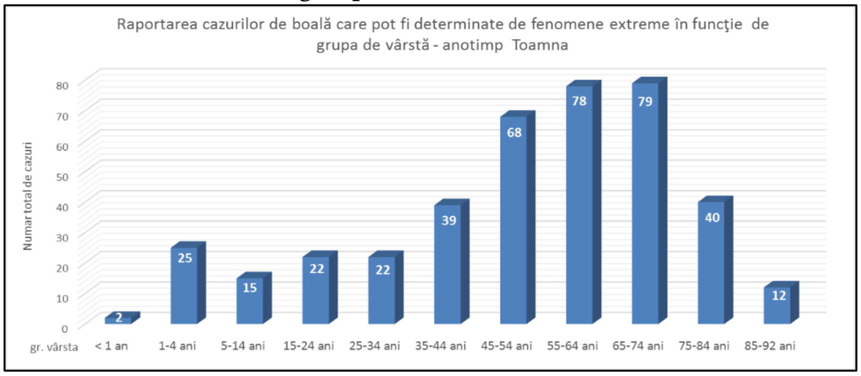
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.24 Reporting of disease cases that can be caused by extreme phenomena depending on age group - summer season



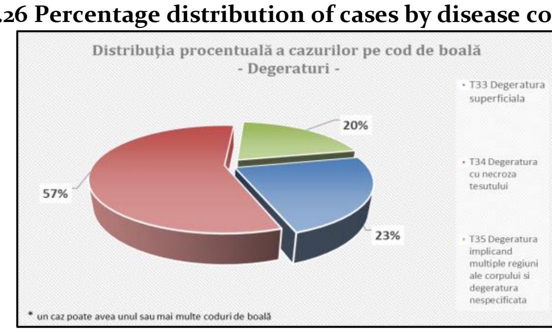
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.25 Reporting of cases of illness that can be caused by extreme phenomena depending on the age group - autumn season



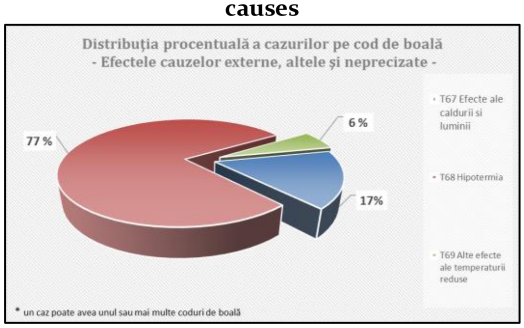
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.26 Percentage distribution of cases by disease code - frostbite



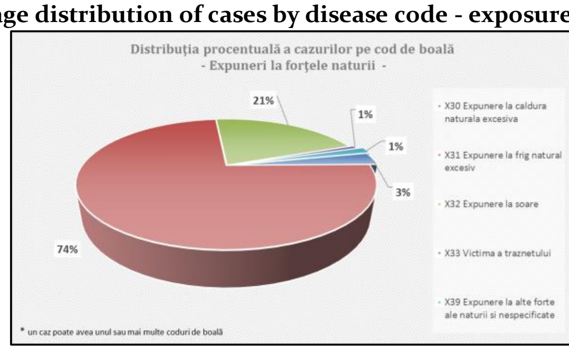
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.27 Percentage distribution of cases by disease code - effects of external, other and unspecified causes



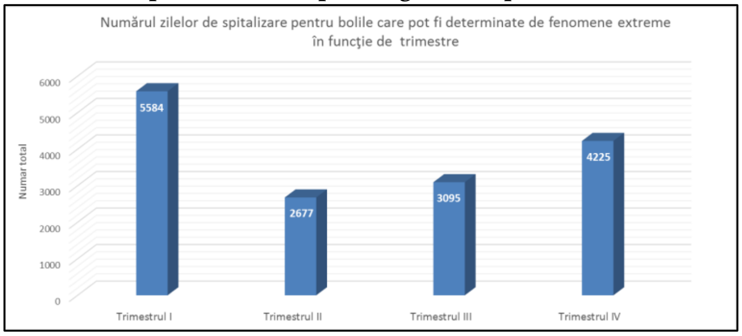
Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.28 Percentage distribution of cases by disease code - exposures to the forces of nature



Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

Figure VIII.29 The number of hospitalization days for diseases that can be determined by extreme phenomena depending on the quarters



Source National Institute of Public Health - National Center for Risk Monitoring in the Community Environment

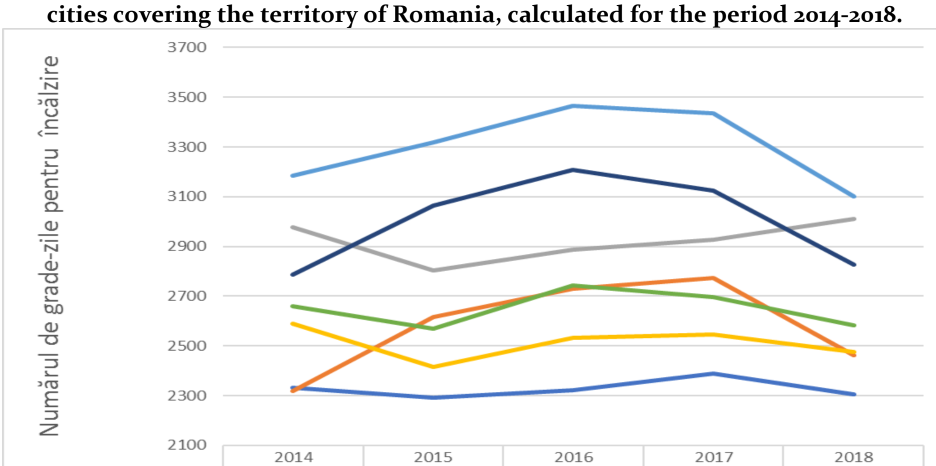
VIII.1.4.4 Energy

RO 62	Indicator code Romania: RO 62 EEA 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 VIII.30 suggests a slight increase in the number of degrees-days for heating, corresponding to the weather data from 7 cities covering the territory of Romania, in 2016 compared to 2015.

Figure VIII.30 The number of degrees-days for heating, corresponding to the meteorological data from 7 cities covering the territory of Romania, calculated for the period 2014-2018.



	2014	2015	2016	2017	2018
Constanta	2331.2	2291.4	2322.6	2387.4	2304.8
Arad	2317.7	2615.6	2728.5	2771.7	2462.5
Iasi	2978.8	2804.2	2886.9	2928.7	3012.3
Bucuresti Filaret	2588.7	2414.4	2531.3	2544.4	2477.3
Brasov	3184.8	3318.2	3464.5	3436.7	3102.3
Craiova	2660.6	2568.3	2742.1	2695.8	2581.6
Cluj Napoca	2785.4	3065.6	3206.6	3125.5	2827

Source: National Meteorological Administration

VIII.2. DETERMINING FACTORS AND PRESSURES ON CLIMATE CHANGE

VIII.2.2. SUBSTANCES DIMINISHING THE OZONE STRUCTURE

RO 06	Indicator code Romania: RO 06 EEA indicator code: CSI 06

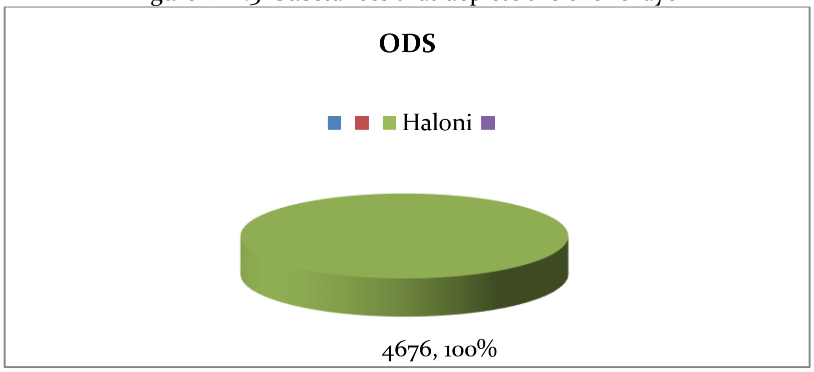
TITLE: PRODUCTION AND CONSUMPTION OF SUBSTANCES LEADING TO OZONE DEPLETION
DEFINITION: This indicator quantifies the production and consumption of Ozone-Depleting Substances (ODS) in Romania. ODS are long-life chemicals containing chlorine and bromine and destroying the stratospheric ozone layer.

The release of ozone depleting substances into the atmosphere (ODS) leads to the degradation of the stratospheric ozone layer, which is designed to protect humans and the environment against the harmful effect of ultraviolet (UV) radiation. The degradation of the stratospheric ozone layer causes the increase of ultraviolet radiation in the atmosphere, which leads to the appearance of harmful effects on human health, on aquatic and terrestrial ecosystems and on the food chain.

Consumption of substances that depreciate the ozone layer according to Regulation 1005/2009 in 2018

- halons for firefighting on airplanes, military ground machines, military ships - 4676 kg - installed quantity

Figure VIII.31 Substances that deplete the ozone layer



Source: National Agency for Environmental Protection

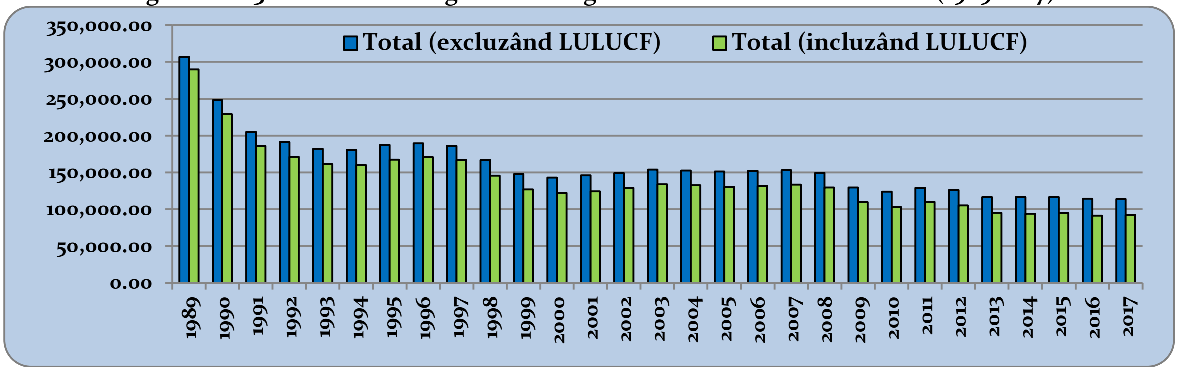
VIII.3. TRENDS OF GREENHOUSE GAS EMISSIONS

RO 10	Indicator code Romania: RO 10 EEA 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.

In 2017, the total emissions of greenhouse gases (excluding the contribution of the sector "Land use, land use change and forestry - LULUCF) decreased by 62.90% compared to the level of 1989 emissions, while the net GHG emissions / eliminations (taking into account CO_2 removals) decreased by 68.19% (Figure VIII.32).
Total greenhouse gas emissions in 2017, with the exception of elimination by absorbers, amounted to 113.795.95 kt CO_2 equivalent.
The trend of emissions reflects the changes in this period characterized by the transition to the market economy; the period can be divided into three sub-periods: 1989-1999, 2000-2008 and 2009-2017.
The decline of economic activities and energy consumption in the period 1989-1992 directly caused the reduction of total emissions during this period. With the entire economy in transition, some large energy-consuming industries have reduced their activities and this is reflected in the reduction of GHG emissions. Emissions began to increase until 1996, following the revitalization of the economy. Given the start of the operation of the first reactor at the Cernavoda nuclear power station (1996), emissions decreased again in 1997. The decrease continued until 1999.
The level of emissions increased after 1999 and reflects the economic development in the period 2000-2008. The limited decrease in GHG emissions in 2005, compared to 2004 and 2006 levels, was caused by the hydrological year, which positively influenced the energy production in hydroelectric power stations. Following the economic crisis, emissions decreased significantly in 2013 compared to 2008; subsequently, the emissions increased due to the increase in the level of economic activities (Figure VIII.32).

Figure VIII.32 Trend of total greenhouse gas emissions at national level (1989-2017)



(Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism)

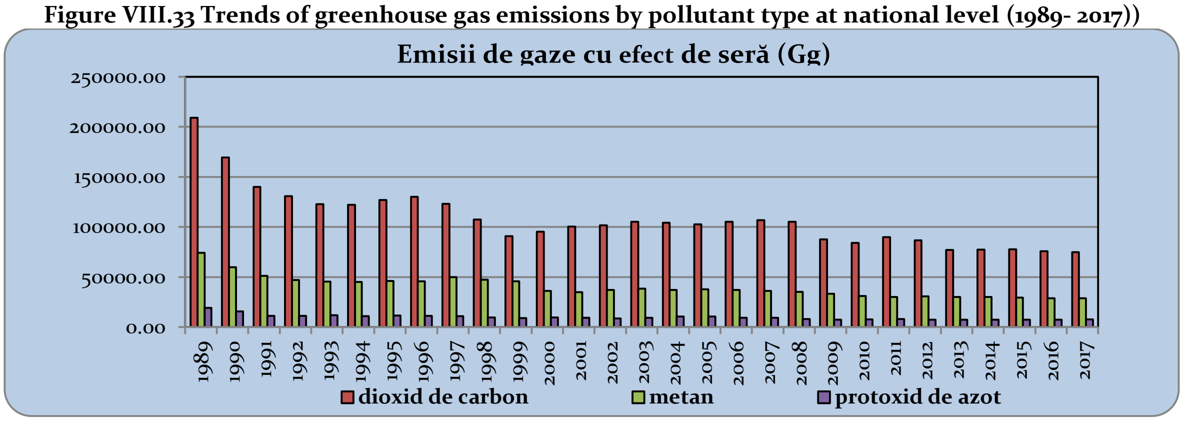
Of the nationally monitored greenhouse gases, carbon dioxide is the most significant pollutant, followed by methane and nitrous oxide (Figure VIII.33).

Carbon dioxide (CO_2) is the most important anthropogenic greenhouse gas. The decrease in CO_2 emissions in 2017 by 64.11% compared to 1989 (from 208,946.39 Gg in 1989 - 68.13% to 74,998.25 Gg in 2017 - 65.91%) is caused by the decrease in the amount of burning fossil fuels in the energy sector (especially in the production of electricity and heat, as well as the manufacturing and construction industries) as a result of the decline in activity.

Emissions of methane (CH_4), mainly related to fugitive emissions from the extraction and distribution of fossil fuels and livestock, decreased in 2017 by 61.22% compared to 1989 (from 74,073,575 Gg in 1989 - to 28,725 , 39 Gg in 2017). The decrease of CH_4 emissions in agriculture is due to the decrease in the level of animal breeding.

N_2O emissions are mainly generated in the agricultural soil activities in the agricultural sector and in the chemical industry activities in the Industrial Processes sector. The decline of these activities (the decline of animal breeding, the decrease of synthetic fertilizers N applied to soil quantities, the decrease of the level of crop production) is reflected in the tendency of N_2O emissions, and decreased in 2017 by 59.24% (from 19,223.69 Gg in 1989 - at 7,834.86 Gg in 2017).

Figure VIII.33 Trends of greenhouse gas emissions by pollutant type at national level (1989- 2017))



(Source: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism)

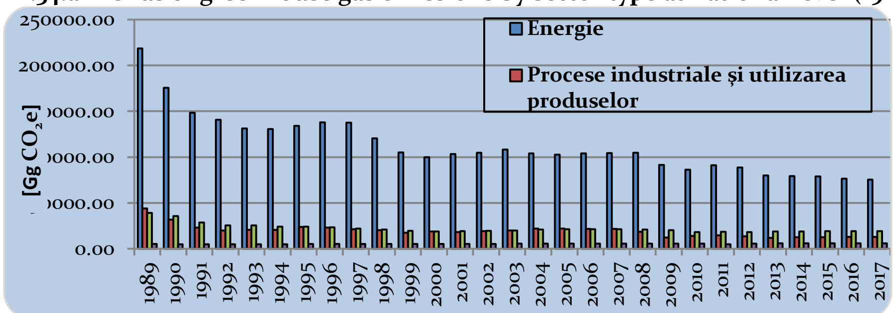
Figure VIII.34 represents the GHG emission trends for each sector of INEGES, excluding the LULUCF sector. The GHG emissions from the energy sector decreased by 65.41%, compared to the base year 1989.

A significant 70.23% decrease in GHG emissions was recorded in the Industrial Processes and Product Use sector in 2017, compared to the level of 1989 as a result of the decline or cessation of certain production activities.

The GHG emissions from the Agriculture sector also decreased in 2017 by 50.79% compared to the 1989 emissions, this fact being based on the following causes: the decline of the livestock sector, the decrease of the agricultural agricultural production, the decrease of the synthetic fertilizer quantities N-based applied to the soil.

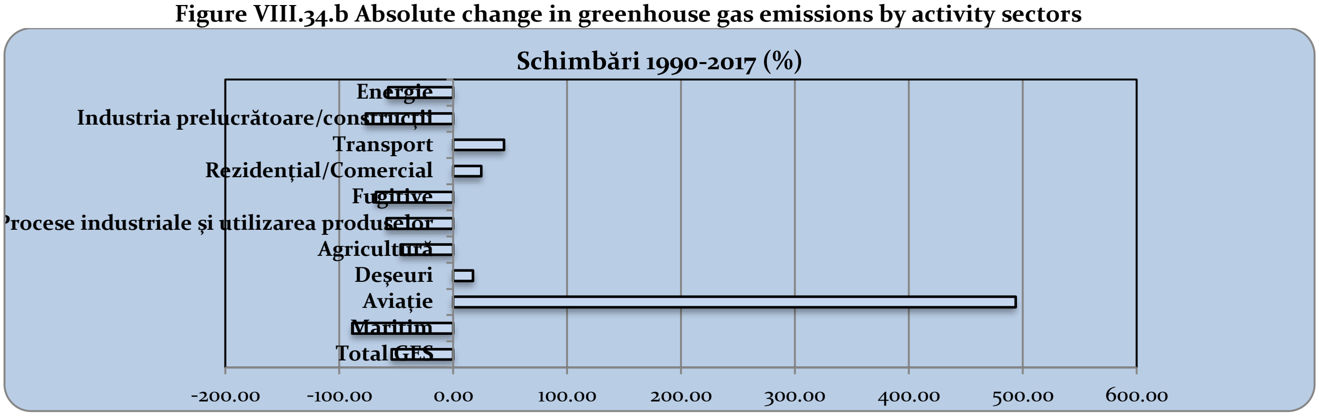
In the Waste sector, emissions increased by 14.71% in 2017, compared to the level in 1989.

Figure VIII.34.a Trends of greenhouse gas emissions by sector type at national level (1989- 2017))



(Sources: National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism)

Figure VIII.34.b Absolute change in greenhouse gas emissions by activity sectors



(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

Greenhouse gas emissions projections

RO 11	Indicator code Romania: RO 11 EEA 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 (CO_2, CH_4, N_2O, SF_6, HFCs, PFCs and NF_3).

Greenhouse gas emission forecasts were made for 3 scenarios:

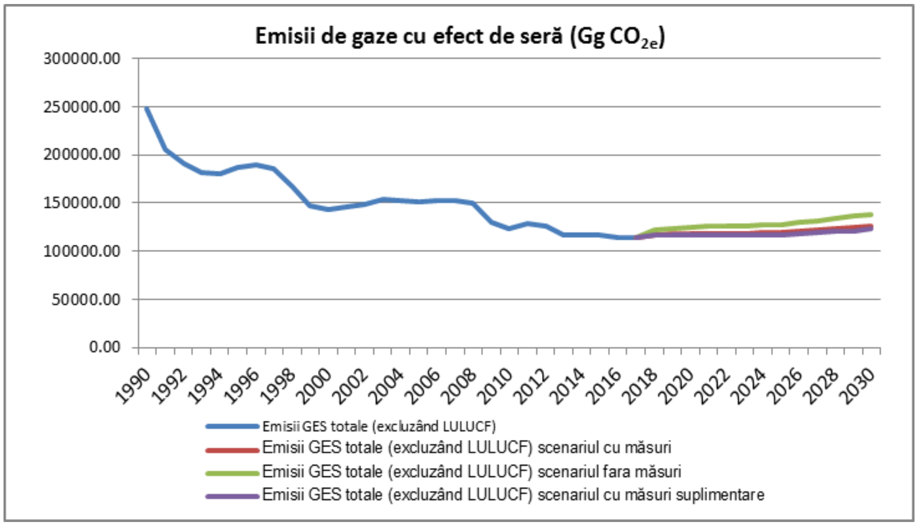
1. Reference scenario that does not include special greenhouse gas emission reduction activities ("no-measures scenario");
2. The scenario similar to the one from the point of view of the evolution of economic-social indicators, but which contains

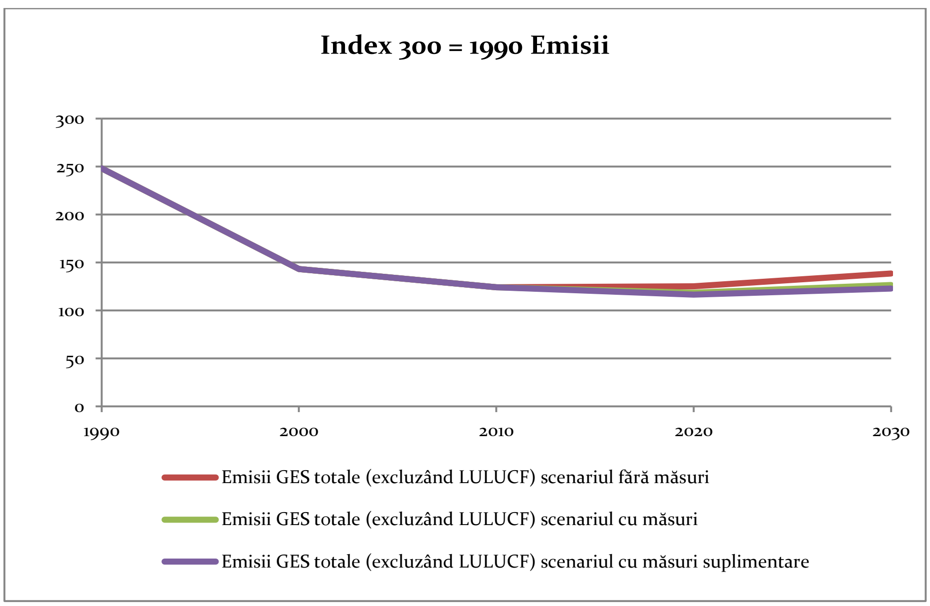
policies and programs for reducing greenhouse gas emissions ("scenario with measures");

3. The scenario with additional measures - similar to the reduction scenario, but which contains programs with additional measures to reduce greenhouse gas emissions ("scenario with additional measures").

Greenhouse gas emissions projections for the three scenarios show an upward trend in the period 2018-2030 (Figures VIII.35 - VIII.37).

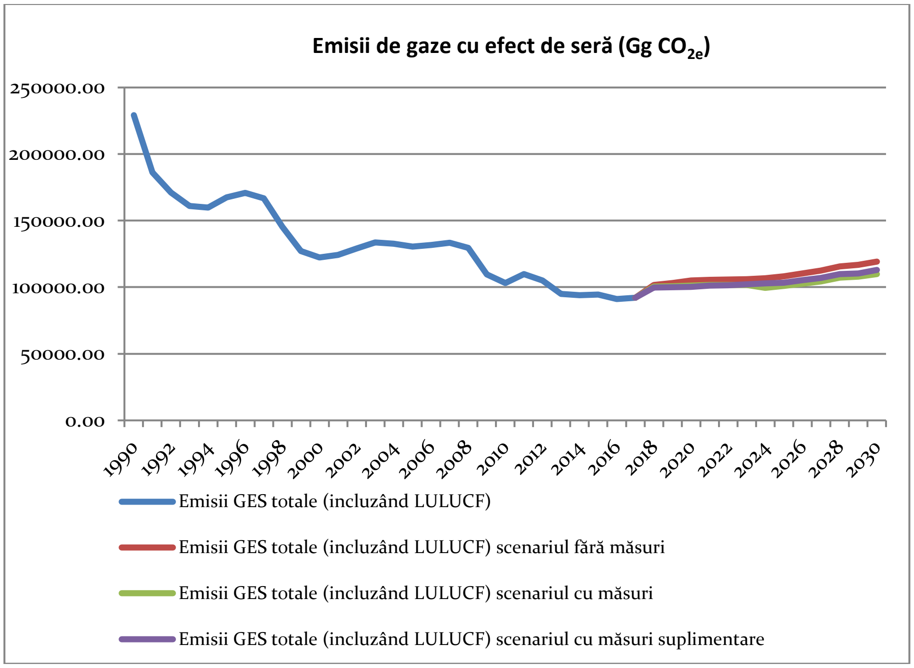
Figure VIII.35 Trends (1990-2017) and projections (2018-2030) of greenhouse gas emissions (excluding LULUCF) at national level





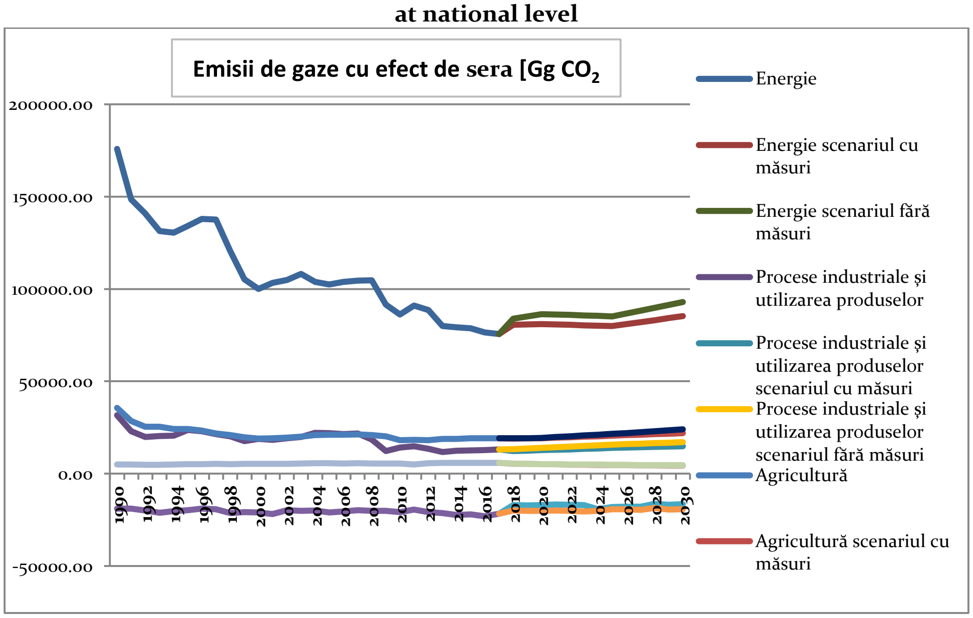
(Data source: Ministry of Environment - Romania's 2017 Report for GHG projection referred în Regulation (EU) No. 525/2013)

Figure VIII.36 Trends (1990-2017) and projections (2018-2030) 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 VIII.37 Trends (1990-2017) and projections (2018-2030) of greenhouse gas emissions by activity sectors, 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

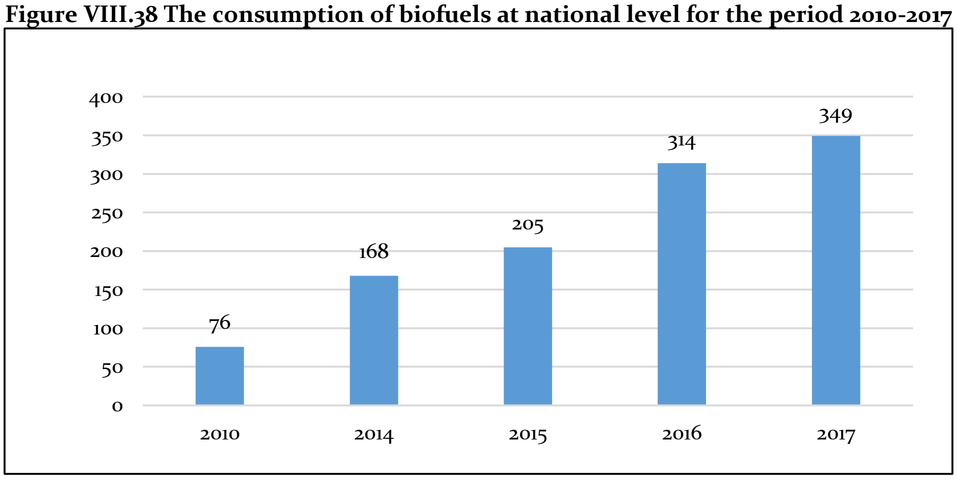
Use of alternative and cleaner fuels

RO 37	Indicator code Romania: RO 37 EEA indicator code: CSI 037

TITLE: USE OF ALTERNATIVE AND CLEANER 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 the national level, the data presented in Figure VIII.38 indicate an increase of the use of biofuels in 2017 by 78.22% compared to 2010.

Figure VIII.38 The consumption of biofuels at national level for the period 2010-2017



Source: Ministry of the Environment

Electricity produced from renewable energy sources

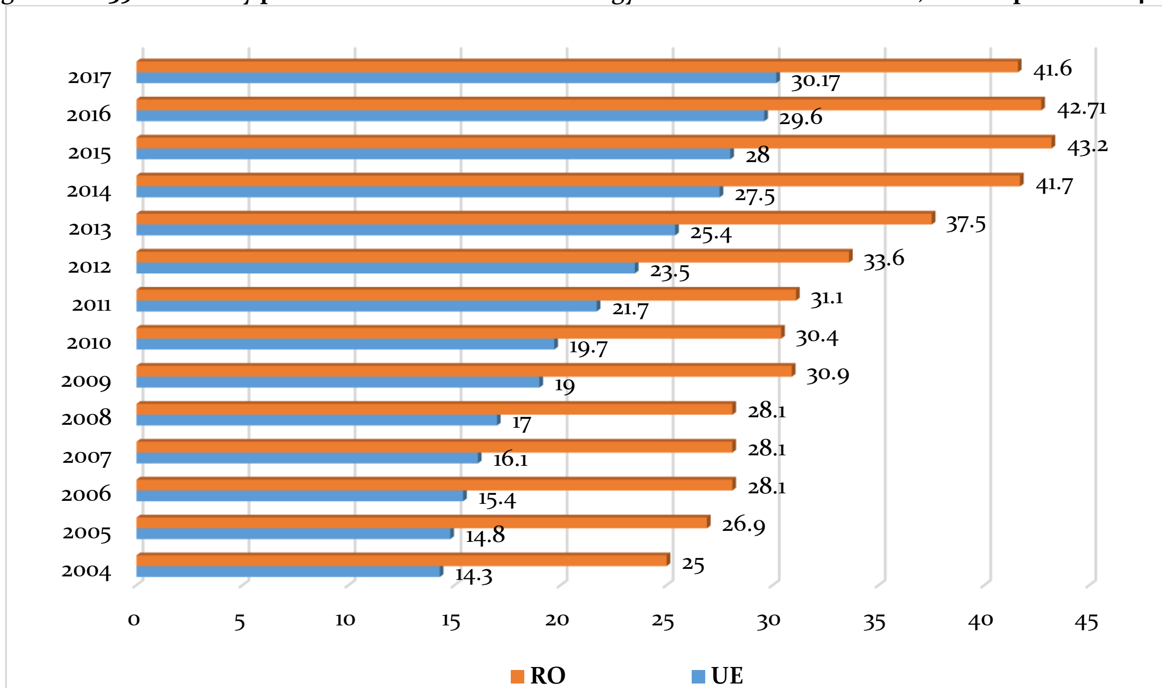
RO 31	Indicator code Romania: RO 31 EEA indicator code: CSI 031

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 the level of the European Union, the share of electricity obtained from renewable sources in total electricity shows for the period 2004-2017 an upward evolution, from the value of about 14.3% recorded in 2004 to the value of about 30.17% recorded in 2017.

At the level of the European Union, the share of electricity obtained from renewable sources in total electricity shows for the period 2004-2017 an upward evolution, from the value of about 14.3% recorded in 2004 to the value of about 30.17% recorded in 2017.

Figure VIII.39 Electricity produced from renewable energy sources at national level, for the period 2004-2017



(Source: Eurostat)

Primary energy consumption produced from renewable sources

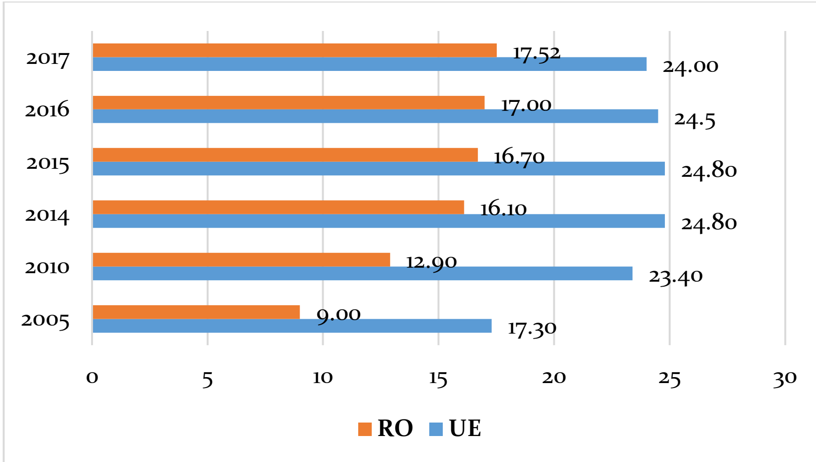
RO 30	Indicator code Romania: RO 30 EEA indicator code: CSI 030 / ENER 029

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 the level of the European Union, the share of renewable energy in the total gross domestic consumption of energy presents an upward evolution for the period 2005-2017, from the value of about 9% recorded in 2005 to the value of about 17.52% recorded in 2017.

Also, at the national level, the share of renewable energy in the total gross domestic consumption of energy presents an upward evolution for the period 2005-2017, and in 2017 there was a decrease of approximately 2.96% compared to the value established in the previous year (Figure VIII.40).

Figure VIII.40 The 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: produsul intern brut - prețuri de piață exprimat în prețuri constante și Euro 2005 pentru România și Uniunea Europeană

Chapter IX URBAN ENVIRONMENT, HEALTH AND QUALITY OF LIFE

IX.1. URBAN ENVIRONMENT AND QUALITY OF LIFE: STATUS AND CONSEQUENCES

IX.2. PROJECTS AND MEASURES TAKEN FOR URBAN DEVELOPMENT - SUSTAINABLE AND IMPROVING THE HEALTH AND QUALITY OF LIFE IN URBAN AGGLOMERATIONS

IX. URBAN ENVIRONMENT, HEALTH AND QUALITY OF LIFE

IX. 1. URBAN ENVIRONMENT AND QUALITY OF LIFE: STATUS AND CONSEQUENCES

IX.1.1. AIR QUALITY OF URBAN AGGLOMERATIONS AND HEALTH EFFECTS

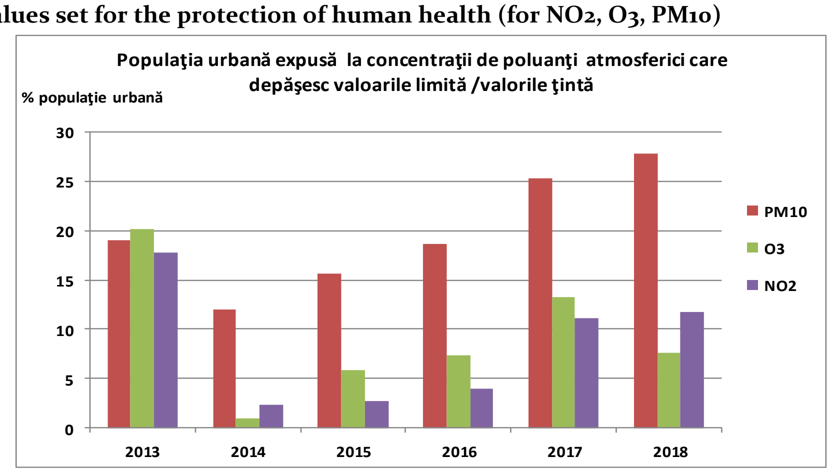
IX.1.1.1. Exceeding the annual average concentration of PM10, NO2, SO2 and O3 in certain urban agglomerations

RO 04	Indicator code Romania: RO 04 EEA 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 (SO_2), particulate matter (PM_{10}), nitrogen dioxide (NO_2) and ozone (O_3) which exceed the limit value established for the protection of 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 (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3), particulate matter (PM10 and $PM_{2.5}$) , 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.

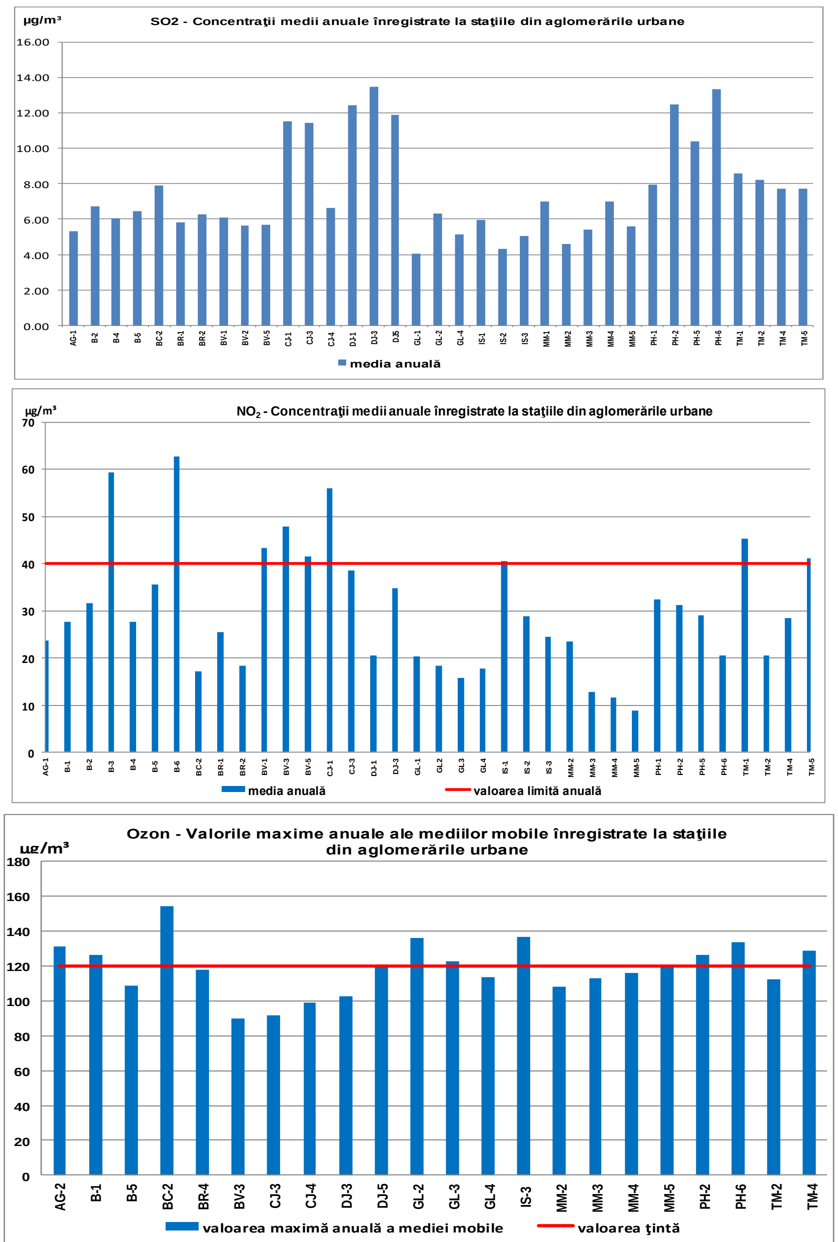
Figure IX.1 Evolution of the percentage of the urban population exposed to concentrations of pollutants exceeding the limit values / target values set for the protection of human health (for NO2, O3, PM10)



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: SO_2, NO_2, O_3, PM_{10}.

Figura IX.2 - Annual average concentrations of atmospheric pollutants recorded at monitoring stations in urban agglomerations in 2018



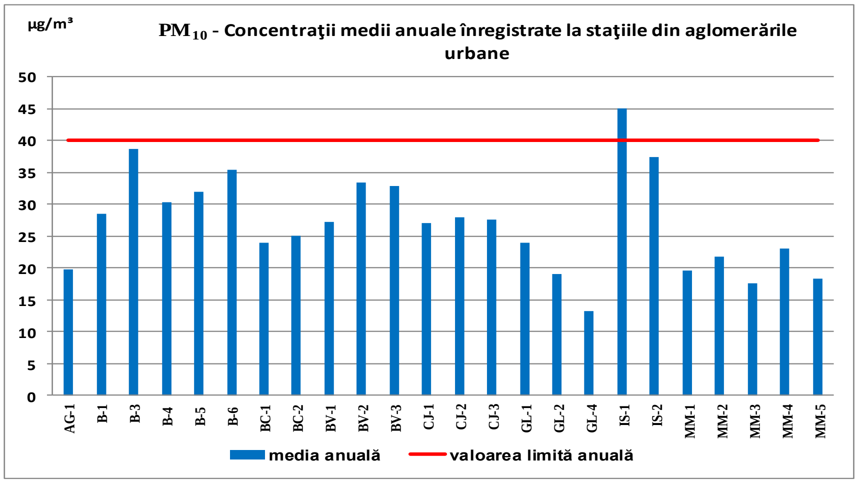


Figure IX.3 Number of exceedences of the daily limit value for particulate matter PM10 in urban agglomeration monitoring stations in 2018

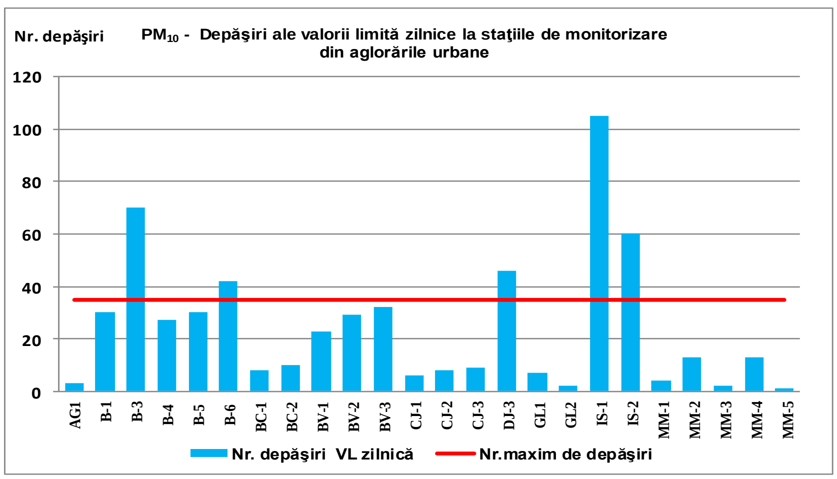
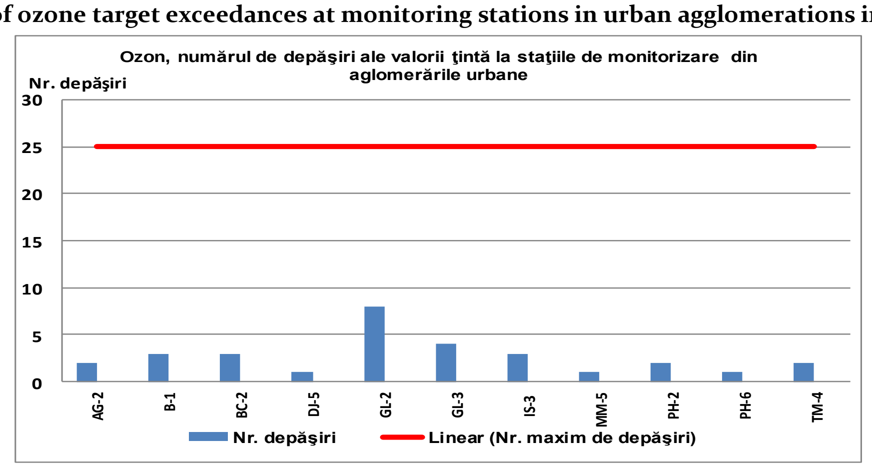


Figura IX.4 Number of ozone target exceedances at monitoring stations in urban agglomerations in 2018



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. PHONIC POLLUTION AND THE EFFECTS ON HEALTH AND QUALITY OF LIFE

IX.1.2.1. Exposure to noise pollution of urban agglomerations with over 250000 inhabitants

IX.1.3. THE QUALITY OF DRINKING WATER AND THE 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 EEA 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.

In the last decade, as a result of climate change and anthropogenic interventions on the environment, there have been intensifications of flood phenomena. In support of the Member States affected by floods, the European Union has developed Directive 2007/60 / EC on the assessment and management of flood risk, known under the generic name of the Flood Directive 2007/60 / EC.Directive 2007/60 / EC on flood risk assessment and management, briefly known as the Flood Directive, has as a general objective the establishment of a framework for the assessment and management of flood risk in order to reduce the negative consequences on human health, the environment, cultural heritage and the economic activities.

The Directive ensures the coordination of the actions within a river basin / district for the implementation of 3 main stages, this being a cyclical process with repeatability at 6 years. Each cycle comprises 3 stages, respectively Preliminary assessment of flood risk - stage 1, Realization of hazard and flood risk maps - stage 2, Realization of Flood Risk Management Plans - stage 3. The first cycle of implementation was completed in March 22, 2016.The information presented in this chapter is the result of the implementation process of Directive 2007/60 / EC on flood risk assessment and management, cycle II.

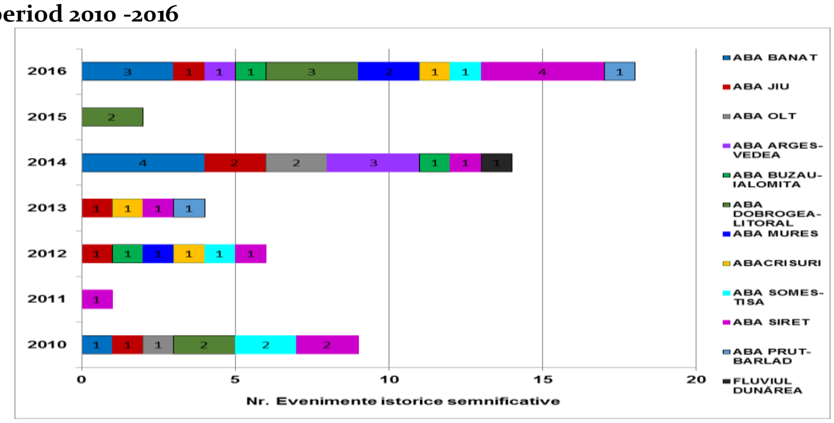
Preliminary assessment of flood risk involves the identification of significant historical floods that had significant consequences on: human activity, environment, cultural heritage and economic activity, but also delimiting areas with potentially significant flood risk A.P.S.F.R. (Areas with Potential Significant Flood Risk).

Significant historical floods were selected following the application of hydrological criteria and some criteria regarding the negative effects of the flood on the four categories of consequences mentioned above.In contrast to cycle I, when the historical floods that occurred in a much more distant period (1970-2010) were analyzed compared to the present moment, for which very detailed information was not held regarding the negative consequences produced by them, in the cycle II the information regarding the damages produced during the analyzed period, respectively 2010 - 2016, are much better documented. This fact allowed a more detailed analysis of the significant negative consequences of the historical floods.

Thus, in this cycle, following the application of the hydrological criteria and the criteria regarding the negative effects of the flood, an analysis was carried out at a greater degree of detail, following the localities and the sectors / river sections / tributaries affected by the significant national / regional event considered.

For the period 2010 - 2016, at the level of the 11 Water Basin Administrations and the Danube River, 54 significant historical flood events were presented in figure no. IX.5.

Figure nr.IX.5 Significant historical events of floods at the level of the Basin Water Administration (ABA) and the Danube river for the period 2010 -2016



The second cycle of implementation of the Flood Directive 2007/60 / EC is in progress, and during the third stage the Development of the Flood Risk Management Plans will be proposed concrete measures to protect the population and the assets. After the implementation of the proposed measures, the risk of producing such unwanted events will be reduced.

Tabelul IX.1 Perioadele și descrierea sumară a cauzelor inundațiilor produse în anul 2018 și localitățile afectate

No. crt.	COUNTY (localități afectate)	PERIOD (the phenomenon produced)
1	<u>**ALBA**</u> <u>**42 localities**</u> **Alba Iulia, Abrud, Cugir, Ocna Mureş, Teiuş, Zlatna,** Albac, Almaşu Mare, Arieşeni, Bistra, Bucium, Bucerdea Grânoasă,	<u>**15.02-31.03.2018**</u> - torrential rains, significant spillage from the slopes, torrents; partial melting of snow <u>**10-24.05.2018**</u> - heavy rains, slopes, rapid flooding

	Cetatea de Baltă, Ceru Băcăinți, Ciuruleasa, Crăcunelu de Jos, Cricău, Cut, Galda de Jos, Gârbova, Gîrda de Sus, Hopîrta, Horea, Ighiu, Jidvei, Livezile, Lupșa, Mirăslău, Pianu, Ponor, Rădești, Rîmeț, Roșia de Secaș, Sălciua, Săsciori, Sîntimbru, Spring, Stremț, Șona, Șugag, Vadu Moților, Vidra,	- increase of debts and levels on the Abrud Valley **June 2018** - heavy rains, spills, torrents; - debt fluctuations, fast floods - lightning - landslides **July 2018** - heavy rainfall, slopes, torrents - overflow: Valea Tătârlaua și Valea Crăciunel - rapid flooding **August.2018** - heavy rainfall, slopes, torrents - lightning - water leakage over a longer period - failure of public utilities **1-12.09.2018** - heavy rainfall, slopes, torrents - overflow Valea Lupșii
2	**ARAD** **12 localities** Bârzava (Căpruța, Lalasint), Brazii (Buceava, Madrigești), Chișindia (Păiușeni), Conop (Conop, Chelmac, Belotint), Frumușeni (Frumușeni, Aluniș), Petriș (Obârșia), Vărădia de Mureș (Lupești)	**15-16.06.2018** - torrential rains, slopes, torrents and streams - rapid flooding on pr. Lupești **17-18.07.2018** - torrential rains, unpaved slopes, torrents and streams - rapid flooding on: Valea Conop, pr. Arăneș, Valea Chelmac, Valea Belotint, Vale Lalasint **26-27.07.2018** - torrential rains, unpaved slopes, torrents and streams - rapid flooding on Valea Sighișoara **01-08.08.2018** - torrential rains, unpaved slopes, torrents and streams - rapid flooding on Valea Frumușeni - overflow Valea Rosia și Vale Păiușeni
3	**ARGEȘ** **148 localities** **Curtea de Argeș**, **Costești**, **Mioveni, Ștefănești (Valea Mare), Topoloveni,** Albeștii de Argeș (Doblea), Albeștii de Muscel (Albești), Albota (Albota, Gura Văii), Aninoasa (Slanic), Arefu, Băbana (Băbana, Groși) , Bârla (Bârla, Afrimești, Ciocești, Malu, Mozăceni, Mozăceni Vale Podișoru, Șelăreasca, Urluieni), Beleti, Bogați, Boteni (Boteni, Balabani, Lunca, Muscel), Botești (Moșteni Greci), Brăduleț (Brăduleț, Brădetu, Galeșu, Piatra, Uleni), Budeasa (Budeasa Mică), Negrești (Negrești), Boteni, Botești (Moșteni Greci), Călinești (Vrănești), Căteasca (Gruiu, Siliștea), Ciofrângeni (Lacurile, Piatra, Schitu Matei), Ciomăgești (Cungrea, Fedelsoiu, Păunești), Cepari (Cepari Pământeni, Cepari Ungureni, Cărpeniș, Morăști, Valea Măgurii, Urluiești), Cocu (Bărbătești, Crucișoara, Richițele de Sus), Corbeni (Corbeni, Oeștii Pământeni, Poienari), Corbi (Corbi, Corbsori, Jgheaburi, Stănești, Poduri), Cuca (Cotu, Teodorești), Davidești (Davidești, Contești, Voroveni),	**1-24.03.2018** - heavy rainfall, slopes - rapid flooding on: râu Neajlov, Valea Murgului, pr. Băidana, pr.Badislava, Valea Grecilor, Valea Lungă, pr. Vrănești, pr. Drăghici, Valea Mare, Valea Mănăstirii, Valea Danului, pr. Vârtej,Valea Buduroiului, pr. Rogojelu, pr. Frăsinelu, pr. Găinușa - landslide, landslide on the right shore on the accumulation Vâlcele - inability to take over debts from ditches and roads **25.03-7.04.2018** - heavy rainfall, slopes - rapid flooding on: r. Vâlsan, r. Argeșel, r. Vedița, pr. Groși, pr. Sorea, pr. Solea, Valea Plopiș, Valea Drăghici, Valea Pechii - landslide **13-19.06.2018** - heavy rainfall, slopes

	Domnești, Hârtiești (Hărtiești, Lucieni), Leordeni (Bantau, Schitu Scoicești), Lunca Corbului (Lunca Corbului, Cătane, Ciești, Mîrghia de Sus, Pădureți) , Mălureni (Pauleasca), Mărăcineni (Mărăcineni, Argeșelu), Merișani (Malu Vânăt), Micești (Micești, Brânzari, Pauleasca, Purcăreni), Mihăiești (Mihăiești, Drăghici, Văcarea, Valea Popii), Mioarele (Matau), Morărești (Morărești, Dedulești), Mosoaia (Ciocanai), Mozăceni, Poienarii de Muscel (Jugur), Recea (Recea, Deagu de Jos, Deagu de Sus, Orodel), Rociu (Rociu, Gliganu de Jos, Gliganu de Sus, Șerbănești), Rucăr, Sălătrucu(Sălătrucu, Văleni), Săpata (Bănărești, Găinușa, Lipia, Turcești), Schitu Golești (Valea Pechii), Slobozia, Stâlpeni (Stâlpeni, , Oprești, Rădești), Stolnici (Cotmeana, Falfani), Tigveni (Tigveni, Bălteni, Badislava, Bălilești, Bârseștii de Jos, Bârseștii de Sus, Blaj, Vlădești), Titești (Bucșenești Lotași, Valea Mănăstirii), Uda (Uda, Bărănești, Cotu, Greabăn), Valea Danului (Borobănești, Vernești), Valea Iașului, Vedea (Vedea, Bădicea, Blejani, Ciurești, Chitani, Dincani, Fata, Fratici Lunganu, Mogoșești, Prodani, Ratoi)	-flood: r. Argeșel, pr. Budeasa Mică, pr. Valea Mare, pr. Valea Vănoaiei, pr. Pauleasca, pr. Valea Largă, pr. Valea Teișului, pr. Valea Purcăreancai, pr. Valea lui Alb, pr. Valea Hotarului, pr. Valea lui Vlad, pr. Valea Schitului, , pr. Valea Cigoii, pr. Valea Ceparilor, pr. Valea Cărpeniș, pr. Valea Urluiești, pr. Valea Schitului, pr. Lazuri, pr. Valea Badislava, pr. Valea Moneil -torrent activation Arsenești - inability to cross streams and storm water drainage ditches - landslide - storm **27.06-31.07.2018** - heavy rainfall, slopes leakage -flood: r. Doamnei, r. Teleorman, r. Dâmbovnic, r. Cotmeana, pr. Buda, pr. Capra, pr. Valea Moșului, Valea Văcarea, pr. Drăghici, pr. Malu, pr. Dealu Malului, Valea Copacilor, pr. Ulmulețu, pr. Rogozea, Valea Oneață, Valea Tâșcovel, Valea Mârghiuța, pr. Tarscov, pr. Băidana, pr. Gligănel, pr. Rogojelu, pr. Sălătrucu, pr. Fata, pr. Vedița, pr. Vetișoara, -landslide - the inability of ditches and road channels to take over the precipitation flows **01-31.08.2018** - heavy rainfall, slopes leakage - flood: Valea Oeasca, pr. Bușaga, Valea Doamnei, Valea Lupului, pr. Carcinov, -landslide
4	**BACĂU** **250 Localities** **Bacău, Onești, Moinești, Dărmănești, Comănești, Slănic Moldova**, **Târgu-Ocna**, Agaș (Agaș, Beleghet, Cotumba, Diaconești, Goiasa, Preluci, Sulta), Asău (Apa Asău, Lunca Asău), Ardeoani (Ardeoani, Leontinești), Berești Tazlău (Berești Tazlău, Enăchești, Bosoteni, Prisaca, Românești, Tescasni, Turluianu), Berzunți (Berzunți, Dragomir), Bîrsănești (Bîrsănești, Albele, Brătești, Caraclau), Blăgești, Buciumi (Buciumi, Răcăuți), Buhoci (Buhoci, Bijghir, Dospinești), Brusturoasa (Brusturoasa, Buruienișul de Sus, Cuchiniș), Caiuți (Caiuți, Blidari, Florești, Heltiu, Mărcești, Popeni, Vrânceni), Cașin (Cașin, Curița), Cleja, Colonești (Colonești, Calini, Spria, Valea Mare, Zapodia), Corbasca (Corbasca, Băcioiu, Marvila, Poglet, Rogoaza, Scărișoara, Vâlcele), Damienești (Damienești, Călugăreni, Drăgești, Pădureni), Dealu Morii (Blaga, Calapodești, Cauia, Negulești), Dofteana (Dofteana, Bogata, Cucuieți, Haghiac, Larga, Seaca, Ștefan cel Mare), Filipeni (Filipeni, Brad, Mărăști, Slobozia, Valea Botului), Filipești (Filipești, Cârligi, Cornești, Galbeni), Ghimeș Făget (Bolovăniș, Răchitiș), Gioseni, Gura Văii (Gura Văii, Capata, Dumbrava, Paltinata, Temelia), Helegiu (Helegiu, Brătia, Deleni, Drăgugești), Hemeiuș (Hemeiuș, Fântânele), Horgești (Horgești, Bazga, Galeri, Răcătău de Jos, Racătău-Răzeși, Recea, Sohodor), Izvorul Berheciului (Izvorul Berheciului, Baimac,	**15 06-01.07.2018** - torrential rains, important spills, torrents and streams; -overflows: râu Siret, r. Bistrița,pr. Barnat, of tributaries pr Slănic , pr. Cernu, pr. Ulm - debit increases pe: r. Tazlău, pr. Tazlău Sărat, pr. Cernu, pr. Buda, pr. Sopa, pr. Brănești, pr. Negel, pr. Carligata -landslide -ice storm **05-31.07.2018** - heavy rainfall, slopes leakage, - increases in levels and flows on rivers Trotuș, -overflow on pr. Răchitiș, pr. Bolovăniș - damage to the main pipeline Valea Uzului-Bacău - exceeding the carrying capacity of the riverbed

	Fagheni, Otelești, Pădureni), Livezi (Livezi, Orasa, Scariga), Luizi Călugăra (Luizi Călugăra, Osebiţi), Măgirești (Măgirești, Prăjești, Stănisești, Șesuri, Valea Arinilor), Măgura (Măgura, Crihan, Dealu Mare, Sohodol), Mănăstirea Cașin (Mănăstirea Cașin, Pârvulești, Scutaru), Mărgineni (Mărgineni, Baraţi, Luncani, Pădureni, Podiș, Poiana, Trebeș), Negri (Negri, Magla, Poiana), Odobești (Odobești, Bălușa, Ciuturești, Tisa Silvestri),Oituz (Oituz, Calcai, Ferăstrău, Hîrja, Poiana Sărată), Orbeni (Orbeni, Scurta), Palanca (Palanca, Cădărești, Ciugheș, Popoiu), Parava (Parava, Drăgușani, Rădoaia, Teiuș), Pâncești (Pâncești, Dienet), Pârjol (Pârjol, Bahnaseni, Bărnești, Băsești, Câmpeni, Hăineala, Hemieni, Pustiana, Tarata), Plopana (Budești, Iţcani, Rusenii de Sus, Rusenii Răsești, Straminoasa), Poduri (Poduri, Bucșești, Cernu, Cornet, Negreni, Prohozești, Valea Sosii), Prăjești, Răcăciuni (Răcăciuni, Ciucani, Gîșteni, Gheorghe Doja), Răchitoasa (Răchitoasa, Barcanu, Bucșa, Dumbrava, Moviliţa, Oprișești, Tochilea), Roșiori Sănduleni (Sănduleni, Versești), Săucești (Săucești, Siretu, Serbești), Scorţeni (Scorţeni, Bogdănești, Bogdănești-Șerpeni, Florești, Florești-Sârbi, Grigoreni), Secuieni (Secuieni, Berbinceni, Chiticeni, Fundeni, Glodișoarele, Văleni), Solont (Solont, Cucuieţi, Sărata), Strugari (Strugari, Cetăţuia, Iaz, Nadișa, Pietricica, Răchitiș), Ștefan Cel Mare (Ștefan cel Mare, Bogdana, Gutinaș, Negoiești, Rădeana, Viișoara), Tamasi (Tamași, Furnicari, Racova), Tătărăști (Tătărăști, Cornii de Jos, Cornii de Sus, Drăgești, Giurgeni, Gherdana, Ungurenii), Târgu Trotuș (Târgu Trotuș, Tuta, Viișoara),Traian, Ungureni (Ungureni, Bărtășești, Bibirești, Botești, Gârla Anei, Viforeni), Valea Seacă (Valea Seacă, Cucova), Zemeș (Zemeș, Bolatău),	
5	**<u>BIHOR</u>** **<u>2 Localities</u>** Criștiorul de Jos (Criștiorul de Sus, Poiana)	**<u>01-03.08.2018</u>** - heavy rainfall, slopes leakage, - overflow : Valea Strechioi, Valea Cosichii, Valea Mare, Valea Ţarinii, Valea Criștior - inability to take over the pluvial network
6	**<u>BISTRIŢA-NĂSĂUD</u>** **<u>32 Localitaţi</u>** **Bistriţa**, Budacu de Jos (Budacul de Jos, Buduș , Jelna), Căianu Mic (Căianu Mic, Căianu Mare, Ciceu Poieni, Dobric), Ciceu-Giurgești (Dumbrăveni), Chiochiș (Jâmbor, Manic, Strugureni), Dumitriţa (Budacu de Sus), Ilva Mare, Lunca Ilvei, Matei, Mărișelu (Sântioana), Negrilești (Negrilești, Breaza, Purcărete), Rodna (Rodna, Valea Vinului), Runcu Salvei, Spermezeu (Spermezeu, Hălmăsău, Sita), Șieuţ (Ruștior, Sebiș), Șintereag (Blăjenii de Jos),Telciu (Bichigiu, Fiad, Telcișor)	**<u>17-18.03.2018 și 02-03.04.2018</u>** - Heavy rainfall, slopes, melting snow layer -landslides -debit increases **<u>03-06.06.2018</u>** - heavy rainfall, slopes leakage, - overflow of uncharted watercourses: pr. Valea Iscradei,pr. V. Aluniș, pr. Valea Ginișor, pr. Valea Rugini, pr. Valea Toaca, pr Valea Fântânele, pr. Valea Sîntioana, pr. Rece -overflow: r. Băilor,r. Meleș, **<u>12-22.06 și 30.06.2018</u>** - heavy rainfall, slopes leakage -overflow of watercourse: Valea Bobeica, Valea Ursoaia, Valea Calului, Hălmaș, Valea Sîţii, Valea Poienii, Valea Lutului, Pârâul de la Tău, Pârâul Slatinii, Valea Mare, Valea Manic - exceeding the drain capacity of ditches and gutters - torrent activation: Budac **<u>27-28.08.2018</u>**

		- precipitation, slopes, - torrent activation - overflow of watercourse pr. Izvoru Roșu
7	**<u>BOTOȘANI</u>** **<u>181 localities</u>** **Botoșani, Bucecea (Bucecea, Călinești), Dărăbani (Dărăbani, Eșanca), Flămânzi, Săveni, Ștefănești (Ștefănești, Stanca),** Albești (Albești, Buimăceni, Coștiugeni, Jijia, Mascateni), Avrămeni, Baluseni, Blândești (Blândești, Cherchejeni, Șoldănești), Brăești (Brăești, Poiana), Broscăuți (Broscăuți, Slobozia), Cândești, Concești (Concești, Movileni), Copalău, Coșula (Coșula, Buda, Pădureni, Supitea), Cordăreni, Corlăţeni (Corlăţeni, Carasa, Podeni, Vlădeni), Corni (Corni, Balta Arsă, Mesteacăn, Sarafinești), Curtești (Curtești, Agafton, Băiceni, Hudum, Lebăda, Mănăstirea Doamnei, Orășeni Deal, Orășeni Vale), Dângeni (Dângeni, Hulub, Iacobeni, Strahotin), Dersca, Dimacheni (Dimacheni, Mateeni, Recea-Verbea), Drăgușeni, Frumușica (Frumușica, Boscoteni, Strorești, Șendreni, Rădeni, Vlădeni Deal), Gorbănești (Bătrânești, George Coșbuc, Silișcani, Socrujeni, Vânători), Havarna(Havarna, Balinti, Gârbeni, Tătărășeni), Hănești (Hănești, Borolea), Hilișeu Horia (Hilișeu Horia, Corjăuți, Hilișeu Cloșca, Hilișeu Crișan, Iezer), Hudești (Hudești, Alba, Baseu, Baranca, Mlenăuți, Vatra), Manoleasa (Manoleasa, Flondora, Sadoveni), Hlipliceni (Hlipliceni, Dragalina), Ibănești, Lunca (Lunca, Baznoasa, Stroiești, Zlătunoaia), Leorda, Manoleasa (Manoleasa, Flondura, Liveni, Loturi Enescu), Mihai Eminescu (Ipotești, Baisa, Cătămărăști, Cătămărăști Deal, Cervicești, Cucorani, Manolești, Stăncești), Mihăileni (Mihăileni, Pârâul Negru), Mihălășeni, Mileanca (Mileanca, Codreni, Scutari, Siliștea), Mitoc (Mitoc, Horia), Nicșeni (Nicșeni, Dorobanţi), Păltiniș (Păltiniș, Cătun, Cuzlău, Grivița, Horodiștea, Slobozia), Prăjeni (Prăjeni, Lupăria), Răchiți (Răchiți, Cismea, Costești, Roșiori), Răuseni, Rădăuți Prut (Rădăuți Prut, Miorcani, Rediu), Romanești, Stăuceni (Stăuceni, Siliștea, Tocileni), Stiubieni (Stiubieni, Ibăneasa, Negreni), Sulița (Sulița, Cheliș, Drăcșani), Suharău, Todireni (Todireni, Cernești, Iurești), Trusești (Trusești, Buhăceni, Ionaseni, Pasateni),Tudora, Ungureni (Ungureni, Durnești, Mândrești, Mihai Viteazu, Sapoveni), Unteni, Vaculești (Vaculești, Gorovei, Saucenița), Vârful Câmpului (Vârfu Câmpului, Dobrinauți-Hapăi, Ionășeni, Lunca, Pustoaia), Viișoara(Viișoara, Cuza Vodă, Viișoara Mică), Vlădeni (Vlădeni, Brehuești, Mândrești), Vlăsănești (Vlăsănești, Sârbi), Vorona (Vorona, Chiscovata, Poiana,Vorona Nouă, Vorona Teodoru)	**<u>14.03.2018 și 26-28.03.2018</u>** - precipitation, slope leaks, snow melt, streams, River discharge: Pârâul lui Martin la confluență cu râu Jijia **<u>26-31.03.2018</u>** - heavy rainfall, slopes, - melting snow layer, splashes -floods on r.Burla **<u>16.05.2018</u>** - heavy rainfall, slopes -wind -ice storm -splashes **<u>14-18.06.2018</u>** - heavy rainfall, slopes -storms **<u>28.06-2.07.2018</u>** - heavy rainfall, slopes - internal water losses - inability to take over the sewerage network - river discharge **<u>07-31.07.2018</u>** - heavy rainfall, slopes -storms -flood: river Prut, river Siret, river Sitna, river Isnovăț
7	**<u>BRĂILA</u>** 5 **<u>Localities</u>** **Însurăței,** Maxineni (Corbu Vechi), Tichilești, Tudor Vladimirescu (Comăneasca), Unirea	**<u>April-May 2018</u>** - excessive drought 05.04.2018-08.05.2018 **<u>June-August 2018</u>** - increases in levels and flows on the river Siret - shore erosion 350 m **<u>10.07.2018</u>** - rain accompanied by hail **<u>27.09.2018</u>** - hoar-frost

8	**BRAȘOV** 71 **localities** **Brașov, Săcele, Predeal, Râșnov**, **Zărnești**, Augustin, Beclean (Beclean, Calbor), Bod, Bran (Bran, Predeluţ, Sohodol, Şimon), Budila, Caţa (Beia, Drăușeni, Ionești), Comăna (Comăna de Jos, Crihalma), Cristian, Crizbav, Dumbrăviţa, Feldioara, Hârseni (Hârseni, Mărgineni, Sebeș-Măliniș), Hărman (Podu Olt), Hoghiz (Hoghiz, Dopca), Homorod (Homorod, Merchea̧sa, Jimbor), Holbav, Hoghiz (Hoghiz, Dopca, Cuciulata), Măieruș (Măieruș, Arini), Mândra (Mândra, Şona, Toderiţa), Ormeniș, Părău (Părău, Grid, Veneţia de Jos, Veneţia de Sus), Poiana Mărului, Prejmer (Prejmer, Lunca Câlnicului, Stupii Prejmerului), Racoș, Şercaia (Şercaia, Hălmeag), Şinca (Şercăiţa), Şinca Nouă (Şinca Nouă, Paltin), Şoarș (Bărcuţ), Teliu, Tărlungeni (Tărlungeni, Purcăreni, Zizin), Ticuș (Ticușu Vechi, Cobor), Ungra, Voila (Voila, Cincșor), Vama Buzăului (Vama Buzăului, Acriș, Buzăiel, Dălghiu), Vulcan	**13-19.03.2018** - heavy rainfall, slopes, -rapid floods in: bh Olt, bh Târlung, bh Bârsa, bh Ghimbășel, bh Homorod, bh Holbav, bh Crizbav, bh Teliu, bh Buzău **28.06-05.07.2018** - heavy rainfall, slopes, -rapid floods in: bh Olt, bh Târlung, bh Bârsa, bh Timiș - torrent activation **20-30.07.2018** - heavy rainfall, slopes - river floods in: bh Ghimbășel, bh Calbor, bh Homorod, bh Olt, bh Sebeș, bh Ormeniș, bh Hârtibaciu, bh Ticuș
	BUCUREȘTI 1 **locality** București sector 4	**February-March.2018** - dangerous weather phenomena
10	**BUZĂU** **68 localities** **Nehoiu** (Nehoiu, Chirlești), **Pătârlagele,** Bisoca, Beceni, Berca (Pleșești), Bozioru, Brăești (Brăești, Brătilești, Ivanetu, Pinu, Pirscovelu, Ruginoasa), Calvini (Calvinii, Băscenii de Sus, Frăsinet, Olari), Cănești (Cănești, Suchea), Cătina (Cătina, Corbu, Slobozia, Valea Cătinei, Zeletin), Cernătești (Cernătești, Aldeni, Băești, Fulga, Manasia, Zărneștii de Slănic), Chiliile (Chiliile, Ghiocari, Glodu Petcari, Poiana Petcari, Trestioara), Chiojdu (Bâsca Chiojdului, Catiasu, Lera, Poienițele, Plescioara), Cozieni, Lopătari (Lopătari, Sareni), Mânzălești (Mânzălești, Bustea, Ghizdița, Jgheab, Satu Vechi, Valea Cotoarei, Valea Ursului), Odăile (Odăile, Gorani, Posobești), Panatău, Pardoși, Sărulești (Sarile cătun, Valea Largă, Valea Stanei), Scorţoasa (Grabicina de Jos), Siriu (Coltul Pietrei), Topliceni (Topliceni, Băbeni, Ceairu, Dedulești, Gura Făgetului, Răducești), Valea Salciei (Modreni), Vintilă Vodă,	**June 2018** - heavy rainfall, slopes. **July 2018** - heavy rainfall, slopes
11	**CARAŞ-SEVERIN** **71 localities** **Reșița, Bocșa, Moldova Nouă, Oravița**, Băuțar (Băuțar, Cornișoru), Berzovia (Gherteniș), Bozovici (Bozovici, Prilipeț), Buchin (Lindenfeld, Poiana), Bucoșnița (Goleț), Cărbunari, Carasova (Carasova, Iablacea), Ciclova Română, Ciuchici, Ciudanovița, Cornereva (Cornereva, Bogaltin, Bojia, Cozia, Dobraia, Hora Mare, Obița, Rustin, Pogara de Sus, Pogara, Poiana Lungă, Topla), Doclin(Doclin, Biniș), Eftimie Murgu, Fîrliug (Fîrliug, Duleu, Scăiuș, Valea Mare), Gîrnic (Padina Matei), Goruia, Lăpușnicu Mare, Lupac, Ocna de Fier, Păltiniș (Păltiniș, Rugi), Pojojena (Pojojena, Belobresca, Susca), Ramna (Barbosu, Valeapei), Răcășdia, Rusca Montană (Rusca Montană, Rușchița), Sasca Montană (Sasca Montană, Sasca Română, Bogodint, Potoc, Slatina Nera), Slatina Timis (Slatina Timiș, Ilova), Socol (Socol, Baziaș, Parneaura, Zlatita), Șopotu Nou	**17-18.01 și 21-22.01.2018** - torrential rains and slopes **29-31.01 și 02-03.02.2018** - torrential downpours, slopes, torrents - strong wind with a look of lust **08-28.03 și 11.04 2018** - heavy rains, spills on the slopes - spring floods **January-March 2018** - torrential rainfall, overlapping with the melting of snow. - ponding **07-08.05.2018** - heavy rains, spills on the slopes - exceeding the carrying capacity of the riverbed pr. Văratec **27.05-18.06.2018**

	(Şopotu Nou, Ravensca), Tîrnova, Teregova, Vermeş, Zăvoi (Poiana Mărului), Zorlenţu Mare (Zorlenţu Mare, Zorlencior)	- torrential rains, spills on the slopes -debit increase: r. Bârzava, pr.Goleț, pr. Gârlişte, pr. Moravița, pr. Valea Seacă, pr.Slatina - inability to take over the sewerage network **<u>19-22.06.2018</u>** - torrential rains, spills on the slopes -debit increase pr. Susara, r. Bârzava **<u>19-30.06. 2018</u>** - torrential rains, spills on the slopes -debit increase: pr. Macicaş, pr. Susca, pr. Morii, pr. Ogaşu Mare **<u>Ma-July 2018</u>** - heavy rains, long-term losses **<u>26-31.07.2018</u>** - torrential rains, spills on the slopes -overflow pr. Canobars - exceeding the carrying capacity of the riverbed **<u>1-3.08.2018</u>** - torrential rains, spills on the slopes -overflow pr. Goruița, -debit increase pr. Jitin **<u>22-23.08.2018 și 26.08.2018</u>** - torrential rains, spills on the slopes **<u>August-October 2018</u>** - lack of rain, temperatures above normal - lacking moisture in a layer of 15-20 cm soil
12	**<u>CLUJ</u>** **<u>61 localities</u>** Băișoara (Muntele Săcelului), Beliş (Beliş, Poiana Horea, Giurcuta de Sus), Călățele (Călățele, Călata, Dealu Negru, Finiciu, Văleni), Cătina (Cătina, Hagău), Ceanu Mare (Ceanu Mare, Fânaţe, Strucut), Chinteni (Chinteni, Feiurdeni, Măcicașu, Pădureni, Vechea), Chiuiești, Ciurila (Săliște), Cojocna (Cojocna, Boju-cătun, Cara, Huci, Straja), Feleacu (Feleacu, Gheorgheni, Sărădiș, Vâlcele), Frata (Olariu, Poiana Frății, Soporul de Câmpie), Gilău (Gilău, Someșul Rece), Iara (Făgetu Ierii, Ocoloșel, Surduc), Margău (Margău, Bociu, Ciuleni, Răchiţele), Măguri Răcătău (Măguri Răcătău, Muntele Rece), Mărişel, Mica, Moldovenești (Moldovenești, Bădeni, Pietroasa, Plăiești, Podeni, Stejăriș), Negreni, Palatca, Poieni (Morlaca, Tranişu, Valea Drăganului), Săcuieu (Rogojel), Săcuieu, Sâncraiu (Brădişoru), Suatu (Aruncuta)	**<u>21.03.2018</u>** Snow and ice coating - gusts of wind **<u>11-21.06.2018</u>** - heavy rainfall, slopes leakage -torrent activation -overflow: v. Călata, v. Henț, v. Lazului, v. Stanciului, v. Bociu, r. Vișag, v. Lupului, pr. Breabân, v. Viștelaia, v. Viilor, v. Cojocna, v.Cesilor, pr. Mărăloiu, v.Largă,pr. Podeni, v. Văleni -torrent activation - inproper maintenance of the gutters and bridges on the property **<u>28.06.2018</u>** - heavy rainfall, slopes leakage - torrent activation - debit increses on pr. Podeni **<u>11-31.07.2018</u>** - heavy rainfall, slopes leakage -overflow valea Ciulii - debit increses on: pr. Ocolișel, pr. Făgetului, pr. Săliște - electric shock and hail - puddles, internal waters **<u>1-28.08.2018</u>** - reducing the flow on the stream Podeni - lowering of the ground level **<u>23.08-3.09.2018</u>**

		- heavy rainfall, slopes leakage - debit increases on: pr. Agastău, pr. Corbu, pr. Aluniș - overflow on valleys Viștelaia și Viilor
13	<u>**CONSTANȚA**</u> <u>**35 Localities**</u> **Cernavodă, Eforie** (Eforie Nord, Eforie Sud), **Hârşova**, Adamclisi (Adamclisi, Urluia, Zorile), Amzacea (Amzacea, Casicea), Ciobanu, Crucea (Băltăgeşti, Crişan, Crucea, Gălbiori, Siriu), Gârliciu, Horia (Horia, Cloşca, Tichilişti), Ion Corvin (Crîngu, Viile), Peştera (Peştera, Ivrinezu Mare, Ivrinezu Mic, Izvorul Mare), Rasova (Rasova, Cochirleni), Saligny (Saligny, Făclia, Ştefan cel Mare), Saraiu, Seimeni (Seimeni, Seimenii Mici, Dunărea), Târguşor	<u>**10.05 2018**</u> - heavy rainfall, slopes leakage - cliff dislocation <u>**26-30.06.2018 şi 5-13.07.2018**</u> - torrential rains - slopes leakage <u>**20-30.07.2018**</u> - torrential rains - slopes leakage
14	<u>**COVASNA**</u> <u>**54 Localities**</u> **Sfântu Gheorghe, Târgu Secuiesc, Baraolt (Racoşu de Sus, Căpeni), Întorsura Buzăului** (Brădet, Floroaia, Scrădoasa), Băţani (Batanii Mari, Băţanii Mici, Herculian, Ozunca Băi), Barcani (Ladăuţi), Bodoc (Olteni, Zalan), Belin (Belin, Belin Vale), Bixad, Bodoc, Boroşneu Mare (Boroşneu Mic), Brăduţ (Filia), Breţcu (Mărtănuş), Brateş (Pachia, Telechia), Boroşneu Mare (Boroşneu Mic, Dobolii de Sus), Cătălina (Hătuica), Chichiş (Chichiş, Băcel), Comandău, Dobârlău (Dobârlău, Lunca Mărcuşului, Valea Dobârlăului), Ghelinţa, Haghig (Haghig, Iaraş), Ilieni (Sâncrai), Malnaş (Valea Zălanului), Mereni, Ozun (Lunca Ozunului, Lisnău, Sântionlunca, Măgheruş), Sânzieni (Sânzieni, Petriceni), Sita Buzăului (Crasna, Zăbrătău), Turia, Valea Crişului (Câlnic), Valea Mare, Vâlcele (Vâlcele, Araci), Zagon, Zăbala (Peteni, Surcea)	<u>**13-17.03.2018**</u> - heavy rainfall, slopes, melting snow layer - flood r. Olt, r. Buzău, r. Negru, pr. Arcuş, pr. Nadaş, pr. Debren, pr. Cormoş, pr. Baraolt, pr. Caşin, pr. Ozunca, pr. Tecse, pr. Bărbat, pr. Ladauţi, pr. Valea Mare, pr. Covasna, pr. Târlung, pr. Dobârlău, pr. Tecse, pr. Malnaş, pr. Lisnău, pr. Crasna, pr. Zăbrătău, pr. Petriceni, pr. Turia, pr. Valea Crişului, pr. Câlnic, pr. Vâlcele - landslide <u>**29.06-03.07.2018**</u> - heavy rainfall, slopes leakage -flood on : r. Olt, r. Buzău, r. Negru, pr. Arcuş, pr. Caşin, pr. Cormos, pr. Baraolt, pr. Breţcu, pr.Covasna, pr. Valea Mare, pr. Tărlung, pr. Bâsca Mare, pr. Dobârlău, pr. Mărcuş, pr. Ghelinţa, pr. Sâncrai , pr. Tecse, pr. Malnaş, pr. Zăbrătău, pr. Caşin, pr. Valea Mare, pr. Vâlcele, pr. Zăbala -overflow: r.Olt în zonă neîndiguită, pr. Baraolt -landslide - dam and breach discharge: r. Negru la Cătălina, pr. Tărlung la Băcel, r. Cormoş la Racoşu de Sus, pr. Dobârlău, r. Caşin la Sânzieni - discharge and infiltration through the dam r. Negru la Ozun <u>**07-08.07.2018**</u> -floods on: pr. Haghig, pr Iaras, pr. Ghelinţa - slopes leakage - clogging of drying channels from the Hărman-Prejmer Landfill in the Chichiş and Dobârlău communes <u>**29-30.07.2018**</u> - precipitation and slopes leakage -overflow pr. Ozunca, pr. Baraolt -flood on: pr. Belinu Mare, pr. Vasar, pr. Lemnia, pr. Turia, pr. Zagon, pr. Ferete -storm

15	**DÂMBOVIȚA** **53 localities** **Moreni, Fien**i (Costești), **Pucioasa** (Diaconești, Malurile, Miculești), Aninoasa (Aninoasa, Săteni, Viforâta), Bezdead (Bezdead, Broșteni, Costișata, Măgura, Tunari), Buciumeni (Buciumeni, Valea Leurzii), Bucșani (Hăbeni, Rățoaia), Dragomirești (Decindeni, Râncaciov), Iedera (Iedera de Jos, Colibași, Cricovul Dulce), Ocnița, Pietroșița (Pietroșița, Dealu Frumos), Pucheni (Pucheni, Brădățel, Meișoare, Valea Largă, Vârfureni), Runcu (Runcu, Bădeni, Brebu, Ferestre, Piatra, Siliștea), Șotânga (Șotânga, Teiș), Valea Lungă (Valea Lungă Cricov, Izvoru, Valea Lungă Ogrea, Valea Lungă Gorgota), Vârfuri (Cârlănești, Șuvița), Voinești (Voinești, Gemenea-Brătulești, Izvoarele, Manga, Mânjina, Oncești, Suduleni), Vulcana Băi (Vulcana Băi, Vulcana de Sus)	**13-16.03.2018** - heavy rainfall, slopes leakage -overflow: v. Sărată, v. Dulce, pr. Pâscov -increased debits on : r. Ialomița, pr. Vulcana, pr. Glod - drainage of water from the field, drops - shore erosion pr. Vârfureni **10-17.04.2018** - erosion on the banks: left bank Ialomicioara II stream, right bank Dâmbovița river at Dragomirești **14-18.06.2018** - heavy rainfall, slopes leakage -overflow: v. Sărată, v. Dulce, pr. Pâscov -increased debits on : r. Ialomița, pr. Vulcana, pr. Glod **26.06-01.07.2018** - heavy rainfall, slopes leakage -increased debits on: r. Ialomicioara II, r. Cricovul Dulce, v. Rusului, Ruda, Valea lui Dan, pr. Strâmbu, v. Știubeie-Tisa -landslide -overflow: local valley Tisa, v. Tinoasa, Valea lui Nat, -shore erosion **30.07-01.08.2018** - heavy rainfall, slopes leakage - increased debits on: Cricovul Dulce, Ruda, Valea Leurzii - inability to retrieve rainwater from the waterways -landslides -erosions **7.08.2018** - heavy rainfall, slopes leakage - increased debits on: pr. Joseni, pr. Ialomicioara II, torent Clincioaia, pr. Giurculeț, pr. Bizdidel, pr. Vulcana -landslides
	DOLJ **32 Localities** **Craiova, Bechet**, **Calafat**, Amărăștii de Jos, Călărași, Calopăr (Calopăr, Sălcuța),Caraula, Carpen (Carpen, Cleanov), Cetate, Cernătești, Coțofenii din Față, Desa, Dăbuleni, Daneți, Ghercești, Mischii, Moțăței, Pielești, Pleșoi, Radovan, Robănești (Golfin), Secu, Șimnicu de Sus, Șopot (Cernat), Țuglui, Vârvoru de Jos (Vârvor, Bujor, Ciutura, Drăgoaia, Gabru),	**martie-aprilie.2018** - Increases in debt following the melting of snow -overflow on the Danube river -debit increases pr. Teslui,pr. Desnățui, pr. Putinei, torent Vâltoare, pr. Terpezita, pr. Ciuturica, pr. Bănăgui - slopes leakage - ponding **iunie 2018** -drought **iullie 2018** - extreme phenomena of meteorological and hydrological character, strong wind and significant amounts of precipitation -hail **9.07.2018** - heavy rain, hail
	GALAȚI **58 Localities**	**15-16.06. și 27-29.06.2018** - heavy rainfall, slopes leakage

	Galaţi, Bereşti, Tg. Bujor,Tecuci, Bălăşeşti, Băneasa, Bereşti Meria, Braniştea, Buciumeni, Cavadineşti, Cerţeşti, Corod, Cuca, Cudalbi, Cuza Vodă, Drăguşeni (Drăguşeni, Adam, Cauieşti, Fundeanu, Ghingheşti, Nicopole), Fârţăneşti,Folteşti (Folteşti, Stoicani), Frumuşiţa (Frumuşiţa, Tămăoani), Fundeni, Ghidigeni, Independenţa, Lieşti, Munteni, Nămoloasa, Nicoreşti (Nicoreşti, Coasta Lupei, Fîntîni, Grozăveşti, Ionăşeşti, Sîrbi), Oancea, Pechea, Piscu, Poiana, Rădeşti (Rădeşti, Cruceanu, Oanca), Rediu, Slobozia Conachi, Smîrdan, Smulţi, Suceveni, Şendreni (Şendreni, Serbeştii Vechi), Tudor Vladimirescu, Ţepu, Umbrăreşti (Salcia), Valea Mărului (Valea Mărului, Mîndreşti), Vârlezi	- transit of major flows evacuated from the Călimăneşti and Movileni accumulations **<u>28.07-01.08.2018</u>** - heavy rainfall, slopes leakage - inability to retrieve streams **<u>14.06-10.07.2018</u>** - heavy rainfall, hail **<u>1.07-31.07.2018</u>** - heavy rainfall, hail
16	**<u>GIURGIU</u>** **<u>22 Localities</u>** Adunaţii Copăceni, Băneasa, Bucşani, Bulbucata, Călugăreni, Clejani, Comana, Crevedia Mare, Găiseni, Ghimpaţi, Gogoşari, Gostinari, Gostinu, Izvoarele, Mârşa, Putineiu, Răsuceni, Roata de Jos, Schitu, Toporu, Ulmi, Vărăşti	**<u>March-April.2018</u>** - heavy rainfall and snow melt - transit flood on the Danube river -overflow: r. Neajlov, r. Câlniştea - flow increase Arges river - snow and blizzard - ponding **<u>April-May.2018</u>** - high temperatures, insufficient rainfall **<u>June-July 2018</u>** - heavy rainfall, strong wind, hail - prolonged drought from April to May and heavy rainfall from June **<u>13-15.06 2018</u>** - heavy rainfall, strong wind, hail **<u>30-31.07 2018</u>** -ponding **<u>August-November.2018</u>** - high temperatures, insufficient rainfall
17	**<u>GORJ</u>** **<u>71 localities</u>** **Târgu Jiu, Novaci (Novaci, Berceşti, Pociovaliştea, Siteşti),Târgu Cărbuneşti,** Alimpeşti (Alimpeşti, Ciupercenii de Olteţ, Corşoru, Nistoreşti, Sârbeşti), Baia de Fier (Baia de Fier, Cernădia), Bărbăteşti (Bărbăteşti, Petreşti),Bengeşti-Ciocadia (Bălceşti, Ciocadia), Berleşti (Berleşti, Gâlceşti, Scurtu), Bolboşi (Bălceşti), Bumbeşti Piţic (Bumbeşti-Piţic, Cârligei, Cârligei Vale, Poienari), Bustuchin (Poieniţa, Pojaru), Căpreni (Căpreni, Satu Nou), Dănciuleşti (Obârşia, Rădineşti, Zăicoi), Dragoteşti (Trestioara), Hurezani, Jupâneşti (Jupâneşti, Pîrîu Boia, Vidin, Vierşani), Licurici (Licurici, Negreni, Totea de Licurici), Logreşti (Târgu Logreşti), Muşeteşti (Muşeteşti, Arşeni, Bîrcaciu, Stănceşti, Stănceşti Larga), Peştişani (Peştişani, Gureni), Polovragi (Polovragi, Racoviţa), Prigoria (Prigoria, Bucşana, Burlani, Călugăreasca, Dobrana, Negoieşti, Racoviţa, Zorleşti), Roşia de Amaradia (Roşia de Amaradia, Şitoaia), Runcu, Săcelu, Schela (Sâmbotin), Stoina (Urda de Sus, Toiaga), Turcineşti (Turcineşti, Cârţiu, Horezu, Rugi),Vladimir (Andreeşti)	**<u>May-June 2018</u>** - heavy rainfall, slopes leakage - river flow increase Gilort, r. Galbenu, pr. Ciocadia, r. Blahniţa -overflow: r. Olteţ, pr. Gilorţel, pr. Rudi, pr. Hirişeşti, pr. Podişoarele, pr. Bâtcani, pr. Iazul Meseriilor, pr. Tauz, pr. Măgura, pr. Neagra, pr. Maliniş, pr. Cernăzoana, pr. Stoiana, pr. Tărâia, pr. Tărâoara, pr. Lia, pr. Prislop, pr.Ciuta, pr. Butura, pr. Prigoroara, pr. Bucşana, pr. Corbu - inability to take water on ditches and creeks -ponding **<u>July.2018</u>** - heavy rainfall, slopes leakage -ponding -debit increase: r. Amaradia, r. Gilort, pr. Măceşu, pr. Galbenu, pr. Tărăoara -overflow: pr. Lupului, pr. Gura Văii, pr. Livezilor, pr. Vâlceaua, pr. Bejenia, pr. Glemeia, pr. Podişoarelor, pr. Seci, pr. Tulbure, pr. Rausini, pr. Valea Viilor, pr. Rătăi, pr. Gruete Răcoaia, pr. Neagra, pr. Măliniş, pr. Cernăzoara, pr. Stoiana, pr. Valea Cerului, pr. Plosca, pr. Ploscuţa, pr. Licurici, pr. Totea, pr. Tărâia, pr.

		Tărâoara, pr. Câlnic, pr. Lia, pr. Prislop, pr.Ciuta, pr. Butura, pr. Prigoroara, pr. Bucşana, pr. Corbu, pr. Cornăţel - river bank erosion Olteţ - inability to take water on ditches and creeks **<u>28.11.2018</u>** - heavy rainfall, slopes leakage - inability to take water on ditches and creeks -ponding
18	**<u>HARGHITA</u>** **<u>104 localities</u>** **Odorheiu Secuiesc, Cristuru Secuiesc, Topliţa, Bălan, Vlăhiţa,** Avrămeşti (Avrămeşti, Cecheşti), Brădeşti, Cârţa (Cârţa, Ineu), Ciucsângeorgiu (Ciucsângeorgiu, Armăşeni), Ciumani, Corbu, Corund, Cozmeni (Cozmeni, Lăzăreşti), Dăneşti, Dârjiu, Dealu (Dealu, Făncel, Sâncrai, Tamaşu, Ulcani), Felicieni (Felicieni, Alexandriţa, Forţeni, Hogia, Poloniţa, Teleac), Frumoasa, Gălăuţaş, Joseni, Lăzarea, Lueta, Lunca de Jos (Lunca de Jos, Baratcos, Valea Boros, Valea Capelei, Valea lui Antaloc, Valea Rece), Lunca de Sus, Lupeni (Lupeni, Morăreni, Păltiniş, Păuleni, Satu Mic), Mădăraş, Mărtiniş (Mărtiniş, Aldea, Călugăreni, Chinuşu, Comăneşti, Ghipeş, Locodeni, Petreni, Sânpaul), Mereşti, Mihăileni (Mihăileni, Nădejdea), Murgeni, Ochland (Ochland, Crăciunel), Păuleni Ciuc, Plăieşii de Jos (Plăieşii de Jos, Caşinu Nou, Imper, Jacobeni), Porumbeni (Porumbeni Mari, Porumbenii Mici), Praid (Bucin, Ocna de Jos, Ocna de Sus), Racu, Remetea, Satu Mare, Sărmaş (Sărmaş, Fundoaia, Hodoşa) , Sândomnic, Sânmartin, Sânsimion (Sânsimion, Cetăţuia), Sântimbru, Siculeni, Subcetate, Şimioneşti (Şimioneşti, Cehetel, Chedia, Chedia Mare, Cobăteşti, Medişoru Mare, Mihăileni, Tărceşti, Turdeni), Tomeşti, Tulgheş, Tuşnad (Tuşnad, Tuşnad Nou, Vrabiia), Ulieş (Ulieş, Ighiu), Vârşag, Voslobeni,	**<u>13-20.03.2018</u>** - heavy rainfall, slopes leakage - the yielding of water from the melting of the snow layer -overflow r. Olt, r. Mureş, r. Târnava Mare, pr. Tarcasa, pr. Rez, pr.Feernic, pr. Szalon, pr. Gada, pr. Homorodu Mic, pr.Aluniş, pr. Homorodu Mare, pr. Ghipeş, pr. Locod, pr. Vrabia, pr. Vrabia, pr. Mitacsi, pr. Tuşnad, pr. Minei, pr. Valea Mare, pr. Caşin, pr. Nyerges, pr.Var, pr. Lunca, pr. Ciucani, pr. Bale, pr. Brădeşti, pr. Orotvany, pr. Lazarea, pr. Corund, pr. Chebeled, pr. Caprelor, pr. Mare, pr. Lăzarea,pr. Daia, pr. Mare, pr. Patak, pr. Geoagiu, pr. Szalon, pr. Feernic -debit increase r. Târnava Mare, r. Olt -landslide **<u>29.03-09.04.2018</u>** - heavy rainfall, slopes leakage - the yielding of water from the melting of the snow layer **<u>04-07.06.2018</u>** - slopes leakage -debit increase pr. Frumoasa, pr. Pustnic - breaking the shore pr Frumoasa afectând DC 6 **<u>14.06-02.07.2018</u>** - heavy rainfall, slopes leakage -overflow: r. Olt, r. Mureş, r. Bistricioara, r. Trotuş, pr. Vârghiş,canal Vârghiş, pr. Sosarju, pr. Rezu, pr. Fişag, pr.Topliţa, pr. Minei, pr. Cerbului, pr. Racu,pr. Groapa Apei, pr. Balli, pr. Bosnyak, pr. Arpad, pr. Szejke, pr. Ghipeş, pr. Homorodu Mare, pr. Vărăriei, pr. Balaju, pr. Asod, pr. Putna, pr. Borviz, pr. Alunului, pr. Rezu Mare, pr. Barasău, pr. Argintărie, pr. Valea Seacă, pr. Sec, pr. Călimani, pr. Zapodea, pr. Măgheruş, pr. Topliţa, pr. Sadokut, pr. Boroş, pr. Valea Capelei, pr. Valea Rece, pr. Csikik, pr. Mare, pr. Dămuc, pr. Poiana Facului, pr. Enke, pr. Caşin, pr. Tekero, pr. Primejdios, pr. Kovar, pr. Repat, pr. Baska, pr. Vrabia, pr. Tuşnad, pr. Mitacsi, pr. Vale, pr. Uz şi pr. Cioucani **<u>07-10.07.2018 şi 19-25.07.2018</u>** - heavy rainfall, slopes leakage -overflow: r. Pr. Hamor, pr. Fierarilor, pr. Nadpatak, pr. Somsarju, pr. Szejke, pr. Sosarok, pr. Mare, pr. Kispatak -debit increase: r. Olt, pr. Homorodu Mare, **<u>24.06-31.07.2018</u>** - heavy rainfall, slopes leakage

		-overflow pr. Vârghiș, pr. Szolga,pr. Daia, pr. Balle, -debit increase: pr. Varcza, pr. Locod -ponding **<u>22-25.08.2018</u>** - heavy rainfall, slopes leakage - overflow pr. Minei, pr. Borviz, pr. Balaju, - debit increase: pr. Ravasz, pr. Minei
19	**<u>HUNEDOARA</u>** **<u>101 localities</u>** **Deva, Brad (Brad, Mesteacăn, Ruda Brad), Petrila, Geoagiu (Geoagiu, Cigmău, Homorod),** Baia de Criș (Caraci, Carastău, Lunca, Tebea), Balșa (Balșa, Almașu Mic de Munte, Ardeu, Galbina, Oprișești, Vălișoara), Baru (Baru, Petros), Băița (Hărțăgani), Boșorod (Alun, Cioclovina, Luncani, Ursici, Târsa), Bănița (Crivadia, Merișor), Brănișca (Bărăștii Iliei, Boz, Căbești, Gealacuta, Furcșoara), Buceș (Tarnița), Bunila (Bunila, Alun, Poienița Voinii, Cernișoara Florese), Burjuc (Burjuc, Brădățel, Glodghilești, Petrești, Tătărăști, Tisa), Densuș (Densuș, Peștenița, Poieni, Ștei), Ilia (Dumbrăvița, Valea Lungă, Sîrbi), Lelese, Luncoiu de Jos (Luncoiu de Jos, Stejărel), Orăștioara de Sus (Orăștioara de Sus, Costești, Costești Deal, Grădiștea de Munte, Ludeștii de Sus), Peștișu Mic (Josani, Mănerău), Pui (Federi, Ohaba Ponor), Răchitova (Răchitova, Ciula Mare, Vălioara), Râu de Mori (Brazi, Clopotiva, Ohaba Sibișel, Sibișel, Suseni-Rîușor), Sălașu de Sus (Sălașu de Sus, Mălăiești, Nucșoara, Paroș), Sântămăria Orlea (Bărăștii Hațegului, Săcel, Sânpetru), Șoimuș (Boholt, Fornădia), Toplița (Vălari), Vața de Jos (Vața de Jos, Basarabasa, Birtin, Căzănești, Ciungani, Ociu, Prăvăleni, Prihodiște, Tătărăștii de Criș,Vața de Sus), Vorța (Vorța, Coaja, Certeju de Jos, Luncșoara, Visca), Zam (Almaș Săliște, Almășel, Godinești)	**<u>18-19.03.2018</u>** - heavy rainfall, slopes leakage **<u>27.05-11.06.2018</u>** - heavy rainfall, slopes leakage -overflow:, pr. Jigorosita, pr. Baloaia,,v. Fierului **<u>12-30.06.2018</u>** - torrential rainfall, slopes leakage -overflow: r. Sibișel, r. Galbena, valea Peștenița - alluvial deposits due to the high flow of the river Valea Luncanilor **<u>07-12.07.2018</u>** - torrential rainfall, slopes leakage -overflow: v. Alun, Valea Roșie, v. Cioclovina, v. Ponor, v. Bătrâna, v. Musariu **<u>20-30.07.2018</u>** - torrential rainfall, slopes leakage -overflow :r. Orăștie, v. Alun, Valea Roșie, v. Cioclovina, v. Dumeasca, pr. Boholt, pr. Boz,pr. Gealacuta, v. Furcșoara, v. Carpeni, v. Satului, v. Vătișoara, v. Ciungani, pr. Prihodiște -strong wind **<u>23-24.07.2018</u>** - torrential rainfall, slopes leakage **<u>31.07-02.08.2018</u>** - torrential rainfall, slopes leakage - increasing the level r. Orăștie, - spills of local valleys, v. Prăvăleni (Ciungani) **<u>15-26.08.2018</u>** torrential rainfall, slopes leakage **<u>06-08.09.2018</u>** - torrential rainfall, slopes leakage
	<u>IALOMIȚA</u> **<u>2 localities</u>** **Slobozia (Slobozia, Bora)**	**<u>05.07.2018</u>** - heavy rainfall - inability to take over the sewerage network
20	**<u>IAȘI</u>** **<u>223 localities</u>** **Pașcani (Pașcani, Blăgești, Boșteni, Gâștești, Lunca, Sodomeni), Hârlău (Hârlău, Pârcovaci), Podu Iloaiei (Cosițeni, Scobălțeni), Târgu Frumos,** Alexandru I. Cuza (Alexandru I. Cuza, Kogălniceanu), Andrieșeni (Andrieșeni, Buhăieni, Drăgănești, Fântânele, Glăvănești, Spineni), Aroneanu (Aroneanu, Dorobanț, Șorogari, Rediu Aldei), Balș (Balș, Boureni), Bălțați (Cotârgaci), Bârnova (Bârnova, Pietrăria, Todirel, Vișani), Belcești, Brăiești (Brăiești, Albești, Buda, Cristești), Ciohorani, Costești (Costești, Giurgești), Ciortești (Ciortești, Coropceni, Deleni, Rotaria, Șerbești), Ciurea (Ciurea,	**<u>07-18.03.2018</u>** - heavy rainfall and slopes leakage. - sudden melting of the snow layer - erosion; left bank Siret river, left bank Bahlueț due to the fluctuations of flow - water flow: Pășcănia **<u>19-20.05.2018</u>** - erosion of the right bank of the river Pietroaia due to the fluctuations of flow causing the decrease of the road section by approximately 2 meters **<u>14-18.06.2018</u>** - heavy rainfall and slopes **<u>28.06-04.07.2018</u>** - heavy rainfall and slopes

	Dumbrava, Hlincea, Lunca Cetăţii, Piciorul Lupului, Slobozia), Coarnele Caprei (Coarnele Caprei, Arama, Petroşica), Comarna, Cozmeşti (Cozmeşti, Podolenii de Jos, Podolenii de Sus), Cotnari (Cotnari, Bahluiu, Cireşeni, Făgăt, Lupăria, Hodora, Zbereni, Valea Racului), Cristeşti (Cristeşti, Homiţa), Cucuteni (Cucuteni, Băiceni, Bărbăteşti, Săcăreşti), Dolheşti (Dolheşti, Brădiceşti), Dumeşti (Dumeşti, Păuşeşti), Fântânele, Gorban (Gorban, Gura Bohotin, Podul Hagiului, Scoposeni, Zberoaia), Grajduri (Cărbunari, Corcodel, Pădureni), Gropniţa (Gropniţa, Bulbucani, Foraşti, Mălăieşti, Săveni, Sîngereni), Hărmăneşti (Hărmăneştii Vechi, Boldeşti), Heleşteni (Heleşteni, Hărmăneasa, Movileni, Oboroceni), Holoboca (Holoboca, Dancu, Valea Lungă), Ipatele (Ipatele, Alexeni, Bâcu, Cuza Vodă), Lespezi (Lespezi, Buda, Dumbrava, Heci), Lungani (Lungani, Crucea, Goeşti, Zmeu), Mădărjac, Miroslovești (Miroslovești, Soci), Moţca (Moţca, Boureni), Mogoşeşti (Mogoşeşti, Budeşti, Mânjeşti), Mogoşeşti-Siret (Mogoşeşti-Siret, Muncelu de Sus) , Movileni (Movileni, Iepureni, Larga Jijia, Potângeni), Oţeleni (Oţeleni, Hîndreşti), Plugari, Popeşti, Popricani (Popricani, Cotu Morii, Ţipileşti), Probota (Probota, Bălteni, Perieni), Răchiteni (Răchiteni, Izvoarele), Răducăneni (Răducăneni, Bohotin, Roşu), Rediu (Rediu, Breazu, Tăuteşti), Româneşti, Roşcani (Roşcani, Rădeni), Ruginoasa (Ruginoasa, Dumbrăviţa, Rediu, Vascani) , Scânteia (Bodeşti, Boroseşti, Rediu), Scobinţi (Scobinţi, Bădeni), Sineşti (Sineşti, Bocniţa, Osoi, Storneşti), Sireţel (Sireţel, Berezlogi, Slobozia), Stolniceni Prăjescu (Stolniceni-Prăjescu, Brăteşti, Cozmeşti), Strunga (Criveşti, Fărcăşeni, Gura Văii), Şcheia (Şcheia, Căueşti, Cioca Boca, Poiana Şcheii), Şipote (Chişcăreni, Iazu Nou, Iazu Vechi, Mitoc), Tansa (Tansa, Suhuleţ), Tătăruşi (Tătăruşi, Iorcani, Pietrosu, Uda, Vâlcica), Tomeşti (Tomeşti, Chicerea, Goruni, Vlădiceni), Trifeşti (Trifeşti, Vladomira, Zaboloteni), Ţibana (Ţibana, Poiana de Sus, Poiana Mănăstirii), Ţibăneşti (Ţibăneşti, Glodenii Gândului, Grieşti, Jigoreni, Răsboieni, Recea, Tungujei, Văleni),Ţigănaşi (Ţigănaşi, Cârniceni, Kogălniceanu, Stejarii), Valea Seacă (Valea Seacă, Conteşti, Topile), Vânători (Vânători, Criveşti, Hârtoape, Vlădnicuţ), Victoria (Icuşeni), Vlădeni (Vlădeni, Alexandru cel Bun, Borşa, Broşteni, Iacobeni, Vâlcele), Voineşti (Voineşti, Lungani, Schitu Stavnic, Slobozia, Vocoteşti)	- erosion on the left bank of the Siret river, near a dwelling **23.07-01.08.2018** - heavy rainfall and slopes - erosion on the right bank of the Pietroaia river in the commune of Ciohorani, affecting the road - erosion on the left bank of the Bahlueţ river in the village of Costeşti village Giurgeşti
21	**ILFOV** **4 localities** **Bragadiru, Măgurele, Popeşti-Leordeni,** Clinceni	**February-March 2018** - heavy rainfall and snowfall -băltiri
22	**MARAMUREŞ** **64 localities** **Şomcuta Mare (Buciumi, Buteasa, Ciolt, Codru Butesei, Finteuşu Mare, Hovrila, Vălenii Şomcutei), Borşa, Cavnic, Dragomireşti, Seini (Seini, Săbişa), Ulmeni (Mânău), Vişeu de Sus,** Ardusat, Ariniş, Bârsana, Bicaz (Bicaz, Ciuta, Corni), Cerneşti (Brebeni, Măgureni), Cicîrlău (Cicîrlău, Ilba), Coaş (Întrerâuri), Copalnic Mănăştur (Copalnic Mănăştur, Berinţa, Copalnic, Preluca Nouă), Cupşeni (Cupşeni, Costeni, Libotin, Ungureni), Deseşti, Dumbrăviţa (Chechiş, Rus, Unguraş), Groşi (Groşi, Ocoliş, Satu Nou de Jos), Groşii Ţibleşului, Mireşu Mare (Mireşu Mare, Iadăra, Remeţi pe Someş, Stejera, Tulghieş), Oarţa	**18-19.03.2018** - water transfer from the existing snow layer - slopes leakage -overflow r. Sălaj **07-14.06.2018** - heavy rainfall, slopes leakage - overflow: V. Oarţei, pr. Goroneasa, V. Ciontului, pr. Poderei, pr. Obreja, V. Calea Măşti, pr. Pe sub Coastă, V. Brebului, V. Cornii, Valea Satului, V. Poienilor, V. Cioulaşului, V. Dumasa, V. Furului, V. Satului **29.06.2018** - heavy rainfall, slopes leakage

	de Jos (Oarţa de Sus), Petrova, Poienile Izei, Repedea, Remetea Chioarului (Remetea Chioarului, Berchez, Posta),Săcălăşeni,Şişeşti (Şişeşti, Bontăieni, Cetăţele, Dăneşti, Negreia, Plopiş, Surdeşti), Valea Chioarului (Curtuiuşu Mare, Fericea, Vărai),	**<u>06-10.07.2018</u>** - heavy rainfall, slopes leakage -ponding - inability to take over the stormwater sewerage network **<u>15.07.2018</u>** - heavy rainfall, slopes leakage - Erosion on the river Vişeu at Vişeu de Sus **<u>19-29.07.2018</u>** - heavy rainfall, slopes leakage -ponding **<u>2.08.2018</u>** - heavy rainfall, slopes leakage -strong wind, ponding **<u>15-16.08.2018</u>** - heavy rainfall, slopes leakage -ponding
23	**<u>MEHEDINŢI</u>** **<u>115 localities</u>** **Baia de Aramă** (Brebina, Mărăşeşti, Negoieşti, Pistriţa), Bala (Bala de Sus, Brateş, Comăneşti, Crasu, Rudina, Vidimireşti), Balta (Prejna), Bâcleş (Bâcleş, Corzu, Smadoviţa), Brezniţa Motru (Brezniţa Motru, Deleni), Coşovăţ, (Făuroaia), Brezniţa Ocol (Brezniţa Ocol, Jidoştiţa, Şuşiţa), Corcova (Corcova, Cordun, Gîrbovăţul de Jos, Jirov, Vlădăşeşti), Cujmir, Dumbrava (Albuleşti, Brăgleasa, Dumbrava de Sus, Golineasa, Higiu, Rocşoreni, Valea Marcului, Vlădica), Godeanu (Godeanu, Marga, Păuneşti, Siroca), Greci (Greci, Bîltanele, Blidaru, Vişina), Husnicioara (Bădiţeşti, Borogea, Celnata, Dumbrăviţa, Oprăneşti, Peri, Priboieşti, Selişteni), Ilovăţ (Ilovăţ, Racova), Iloviţa (Iloviţa, Bahna, Moiseşti), Isverna (Isverna, Buşeşti, Cerna Vîrf, Drăgheşti, Nadanova, Seliştea, Turbata), Izvoru Bîrzii (Izvoru Bîrzii, Schitul Topolniţei de Sus), Malovăţ (Malovăt, Bîrda, Bobaiţa, Colibaş), Obîrşia Cloşani (Obîrşia Cloşani, Godeanu), Oprişor (Oprişor, Prisăceaua) , Ponoarele (Ponoarele, Băluţa, Bîrîiacu, Brînzeni, Ceptureni, Cracul Muntelui, Delureni, Gărdăneasa, Gheorgheşti, Proiteşti, Răiculeşti, Şipotu), Pădina (Biban, Iablaniţa, Olteanca, Slaşoma), Poroina Mare (Poroina Mare, Fîntînile Negre, Stignita), Prunişor (Prunişor, Arvăteşti, Cerevenita, Fântâna Domnească, Gîrniţa, Gutu, Igiroasa, Lumnic, Mijarca, Prunaru), Punghina, Şimian (Cerneţi, Dedoviţa Veche, Erghevita, Poroina, Valea Copcii), Şişeşti (Şişeşti, Crăguieşti, Corcova), Vlădaia (Almăjel, Scorila), Voloiac (Lac Mertesti, Ţiţirig), Vrata	**<u>12 - 28.03.2018</u>** - heavy rainfall, slopes leakage - high water flow rates **<u>12-22.05.2018</u>** - slopes leakage **<u>13-29.06.2018</u>** - slopes leakage, **<u>8-10.07.2018</u>** - slopes leakage, **<u>25.07-01.08.2018</u>** - slopes leakage,
24	**<u>MUREŞ</u>** **<u>43 localities</u>** **Reghin, Sighişoara, Târnăveni, Miercurea Nirajului (Beu, Moşuni, Şardu Nirajului, Veta), Sărmaşu,** Adămuş (Adămuş, Corneşti, Crăieşti), Aluniş (Aluniş, Fiţcău), Apold (Saeş) Band**,** Coroisânmartin**,** Chiheru de Jos (Chieru de Jos, Chieru de Sus, Urisiu de Jos, Urisiu de Sus), Cuci (Bogata, Dătăşeni, Lechinţa), Găleşti (Adrianu Mare), Găneşti, Gheorghe Doja (Leordeni), Ideciu de Jos, Lunca Bradului (Lunga Bradului, Neagra), Măgherani (Şilea Nirajului), Nadeş, Ogra, Saschiz (Saschiz,	**<u>13-16.03.2018</u>** - heavy rainfall, slopes leakage - melting snow -high level of r. Tîrnava Mare, canal J2, -landslide -overflow: r. Mureş, r. Tîrnava Mică, pr. Şaeş -strong wind **<u>06-30.06.2018</u>** - heavy rainfall, slopes leakage

	Cloaştref), Sărăţeni, Sângeorgiu de Mureş, Sânpaul (Sânpaul, Chirileu, Dileu Nou, Sânmărghita), Vânători (Vânători, Feleag), Viişoara (Sântioana)	-overflow: pr. Nadăşa, pr. Padini, pr. Şuteu, pr. Obcina Ferigelor, pr. Bisericii, pr. Scroafa, pr. Cimaş, pr. Cărbunarilor, -high level of watercourses -landslides **08-09.07.2018** - heavy rainfall, slopes leakage -overflow pr. Corneşti, pr. Vâlcele, pr. Fiţcău, pr. Cărbunarilor, -landslide **22-29.07.2018** - heavy rainfall, slopes leakage -overflow: pr. Feleag, pr. Vereş, pr. Şaeş -increasing level pr. Nadeş -ponding, internal waters - inability to take over the sewerage network - high level of watercourses **22-29.07.2018** - heavy rain, hail
25	**NEAMŢ** **249 localities** **Piatra Neamţ**, **Roman**, **Târgu Neamţ** (Târgu Neamţ, Blebea, Humuleşti, Pometea), **Bicaz** (Bicaz, Izvorul Alb, Izvoru Muntelui, Secu), **Roznov** (Chintinici, Slobozia), Agapia (Agapia, Filioara, Săcăluşeşti), Alexandru cel Bun (Viişoara, Agârcia, Bistriţa, Scăricica, Vaduri, Vădurele), Bahna (Bahna, Băhnişoara, Broşteni, Izvoare, Liliac, Tutcani Deal, Tutcani Vale), Bicazu Ardelean (Bicazul Ardelean, Telec, Ţicoş), Bicaz Chei (Bicaz Chei, Bîrnadu, Gherman, Ivaneş), Bîra, Bîrgăoani (Bîrgăoani, Bălăneşti, Dârloaia, Ghelăieşti, Hârtop, Homiceni, Vlădiceni), Bodeşti (Bodeşti, Bodeştii de Jos, Oşlobeni), Boghicea (Boghicea, Căuşeni, Nistria, Slobozia), Borca (Borca, Lunca, Pârâul Cârjei, Pârâul Pântei, Sabasa, Soci), Borleşti (Borleşti, Măstăcan, Ruseni, Şovoaia), Brusturi (Brusturi, Groşi, Poiana, Târzia), Ceahlău (Ceahlău, Pârâul Mare), Cordun (Pildeşti), Cândeşti (Cândeşti, Bărcăneşti, Dragova, Pădureni, Vădurele), Costişa (Costişa, Dorneşti, Frunzeni), Crăcăoani (Crăcăoani, Cracăul Negru, Magazia, Mitocu Bălan, Poiana Crăcăoani), Dămuc (Dămuc, Hămzoaia, Huisurez, Trei Fântâni), Dobreni, Dochia (Băluşeşti), Doljeşti (Doljeşti, Buhonca, Buruieneşti, Rotunda), Dulceşti (Dulceşti, Briţcani, Cârlig, Corhana, Poiana), Drăgăneşti (Drăgăneşti, Orţăşti, Râşca), Dragomireşti (Dragomireşti, Borniş), Dumbrava Roşie (Brăşăuţi, Cut), Fărcaşa (Fărcaşa, Buşmei, Frumosu, Popeşti, Stejaru), Făurei (Făurei, Budeşti, Climeşti, Micşuneşti), Gâdinţi, Gârcina (Gârcina, Almaş, Cuejdiu), Girov (Boţeşti, Dăneşti, Gura Văii, Turtureşti), Ghindăoani, Gherăieşti, Grinţieş, Grumăzeşti (Grumăzeşti, Curechiştea, Netezi, Topoliţa), Hangu (Hangu, Buhalniţa, Chiriţeni, Grozăveşti, Rugineşti), Horia, Icuşeşti (Icuseşti, Băluşeşti, Bătrâneşti, Mesteacăn, Rocna, Spiridoneşti, Tabăra), Ion Creangă (Ion Creangă, Avereşti, Izvor, Recea, Stejaru), Mărgineni (Mărgineni, Hârţeşti, Hoiseşti, Itrineşti), Moldoveni, Oniceni (Oniceni, Gorun, Linşeşti, Lunca, Mărmureni, Pietrosu, Poiana Humei, Pustieta, Solca, Valea	**12-14.03.2018** - heavy rainfall, slopes leakage - increases in levels and flows - transport of alluviums, outbuildings, sheds -erosions **13-18.06.2018** - heavy rainfall, slopes leakage - increases in levels and flows - transport of alluviums, outbuildings, sheds -erosions **28.06-02.07.2018** - heavy rainfall, slopes leaks, streams. - increase in flows and levels, erosion -outcrops **7-09.07.2018** - heavy rainfall, slope leakage, runoff, - outcrops, erosion -increase in flows and levels **11.07-01.08.2018** - heavy rainfall, slopes leakage, - increase in flows and levels **05-06.08.2018** - heavy rainfall, slopes leaks, streams, - increases in levels and flows **15-28.08.2018** - heavy rainfall, slopes leaks, streams. - increases in levels and flows **15.09.2018** - heavy rainfall, slopes leakage,

	Enei), Pâncești (Pâncești, Ciurea, Holm, Patricheni, Tălpălăi) Pângăraţi (Pângărăcior, Oanţu, Preluca, Stejaru), Petricani (Petricani, Boiștea, Tărpești, Ţolici), Piatra Şoimului (Piatra Şoimului, Luminiş, Poieni), Pipirig (Pipirig, Boboiești, Dolhești, Leghin, Pîţîligeni, Pluton, Stânca), Poiana Teiului (Poiana Teiului, Dreptu, Galu, Pârâul Fagului, Petru Vodă, Poiana Largului, Roşeni), Podoleni (Podoleni, Negriţești), Răucești (Răucești, Oglinzi, Săvești, Ungheni), Rediu (Rediu, Beţești, Poloboc, Socea), Români (Români, Goşmani, Siliștea), Ruginoasa (Ruginoasa, Bozienii de Sus), Secuieni (Secuieni, Bârjoveni, Bogzești, Butnărești, Giulești, Prăjești, Uncești), Stănița (Stănița, Chicerea, Ghidion, Poienile Oancei, Veja), Ștefan cel Mare (Ștefan cel Mare, Deleni, Dușești, Soci), Tașca (Tașca, Hamzoaia, Neagra, Ticoș-Floarea), Tarcău (Tarcău, Cazaci, Schitu Tarcău, Straja), Tămășeni (Adjudeni), Timişeşti (Timişeşti, Dumbrava, Preuţeşti), Trifești (Trifești, Miron Costin), Tupilaţi (Tupilaţi, Arămoaia, Totoiești), Valea Ursului (Valea Ursului, Chilii, Bucium, Giurgieni, Muncelu), Văleni (Văleni, David, Munteni), Vânatori-Neamţ (Vânători Neamţ, Lunca, Nemţişor), Zănești	
26	**<u>OLT</u>** **<u>79 localities</u>** **Corabia, Potcoava** (Potcoava, Falcoieni, Sinești, Valea Merilor), **Scornicești** (Negreni, Mihăilești, Popești, Piscani), Bălteni, Bărăști (Bărăști de Cepturi, Bărăști de Vede, Boroești, Ciocănești, Mereni, Moţoiești, Popești), Colonești (Colonești, Barasti, Cârţani, Cholbești, Guești, Mărunţei Bătrâni, Vlaici), Corbu (Buzești, Ciurești), Crîmpoia (Crîmpoia, Buta), Cungrea (Ibănești, Oteștii de Sus), Curtișoara (Linia din Vale, Proaspeţi), Dobrosloveni (Dobrosloveni, Frăsinetu, Rescuta), Grădinari (Grădinari, Petculești, Runcu Mare, Satul Nou), Ianca, Icoana (Floru, Ursoaia), Mihăești (Mihăești, Bucșa), Milcov (Milcovu din Vale, Stejaru, Ulmi), Morunglav (Bărăști, Morunești), Movileni (Movileni, Bacea), Optași Măgura (Optași), Priseaca (Priseaca, Buicești), Șerbănești (Șerbănești, Strugurelu, Șerbăneștii de Sus), Tatulești (Tatulești, Barbalai, Măgura, Micești, Momaiu), Topana (Gojgărei, Ungureni), Verguleasa (Verguleasa, Căzănești, Cucuieţi, Dumitrești, Poganu, Valea Fetei), Vitomirești (Vitomirești, Bulimanu, Donești), Vulpeni (Cotorbești), Vulturești (Vulturești, Dienci, Valea lui Alb, Vlăngărești)	**<u>5-14.03.2018</u>** - heavy rainfall, slopes leakage - internal water losses -overflow: pr. Teslui, v.Pîrvului, p. Vedița **<u>27-29.03.2018</u>** - heavy rainfall, slopes leakage - internal water losses -overflow: pr. Teslui, pr.Vulpeanca, pr. Călmăţuiul Sec, pr. Tisar **<u>14.03-21.04.2018</u>** - internal water losses **<u>15-21.05.2018</u>** - heavy rainfall, - intensifications of the wind -hail **<u>16.06-2.07.2018</u>** - heavy rainfall, slopes leakage **<u>08-11.07.2018</u>** - heavy rainfall, slopes leakage -overflow: river Vedița, pr. Sterpu, **<u>30.07-03.08.2018</u>** - heavy rainfall, slopes leakage - overflow: pr. Milcov, pr. Cinculeasa
27	**<u>PRAHOVA</u>** **<u>39 localities</u>** **Comarnic** (Comarnic, Ghioșești, Poiana), **Sinaia,** Bărcănești (Bărcănești, Româneşti, Tătărani), Bătrâni (Bătrâni, Poiana Mare), Bertea (Bertea, Lutu Roşu), Cerașu (Cerașu, Slon, Valea Lespezii, Valea Borului), Chiojdeanca (Trenu), Drajna (Drajna de Sus, Drajna de Jos), Dumbrăvești (Mălăieștii de Sus), Gura Vitioarei (Bughea de Jos), Izvoare (Schiulești), Măgureni, Măneciu (Măneciu Ungureni, Măneciu Pămănteni), Poiana Câmpina (Bobolia, Pietrișu), Posești (Valea Plopului), Starchiojd (Starchiojd, Brădet, Rotarea, Valea Anei), Şotrile (Vistieru),	**<u>07-30.06.2018</u>** - heavy rainfall, slopes leakage -overflow: pr. Valea Şerbuloaiei, pr. Valea Tisei, pr. Stâmnic, pr. Valea Benia, pr. Valea Lespezii, pr. Vâlcel, pr. Mogoşoaia. -increased debits : r. Doftana, pr. Negraș, pr. Drajna, pr. Stîlpu **<u>10-31.07.2018</u>** - heavy rainfall, slopes leakage -overflow: pr. Bertea, pr. Bătâneanca, pr. Drajna,

	Teişani (Teişani, Bughea de Sus, Olteni, Valea Stîlpului), Telega, Valea Doftanei (Teşila, Trăisteni)	-increased debits: r. Prahova, pr. Izvorul Dorului, pr. Vrăbilău - internal water losses - inability to take over the sewerage network - raising groundwater level
	<u>**SĂLAJ**</u> <u>**35 localities**</u> **Jibou**, Almaş (Jebuc, Sfaras), Buciumi (Buciumi, Bodia, Bogdana), Bocşa, Camar, Cizer, Crasna, Creaca (Borza, Ciglean, Jac), Cristolţ (Cristolţ, Muncel, Poiana Onţii, Văleni), Fildu de Jos (Tetişu), Hereclean (Badon, Panic), Ileanda (Dăbâceni, Sasa), Meseşenii de Jos, Sig (Mal), Românaşi (Românaşi, Chichişa, Romita), Treznea (Treznea, Bozna), Vârşolţ (Vârşolţ, Recea, Verveghiu), Valcău de Jos (Lazuri, Preoteasa, Valcău de Sus)	<u>**07-16.06.2018**</u> - heavy rainfall, slopes leakage -overflow: r. Barcău, pr. Carpinilor, pr. Rupturii, pr. Cizerului - internal water losses, <u>**07-10.07.2018**</u> - heavy rainfall, slopes leakage -overflow: pr. Tetisu - internal water losses, <u>**24.07.2018**</u> - heavy rainfall, slopes leakage -overflow: pr. Danaii, pr. Groşilor, pr. V. Ciumenii, pr. Valea Seacă, pr. Boanca, pr. Saca, pr. Miaua, pr. Jurteana, pr. Merciuga - internal water losses, - inability to take rainwater through ditches, streams, canals
	<u>**SATU MARE**</u> <u>**17 localities**</u> **Tăşnad,** Batarci (Batarci, Comluşa), Beltiug (Rătăeşti), Bogdand (Babţa), Cămârzana, Căuaş (Căuaş, Ady Endre, Ghileşti, Hotoan, Răduleşti), Certeze (Certeze, Moişeni), Santău (Sudurău), Supur (Supuru de Jos, Hurezu Mare), Tarna Mare	<u>**17-30.03.2018**</u> - heavy rainfall -overflow pr. Santău, pr. Ier, pr. Cubic, pr. Cheheţ - internal water accumulations <u>**12-13.06. şi 22.06.2018**</u> - heavy rainfall, slopes leakage -overflow pr. Cerna, pr. Lechincioara, pr. Batarci - internal water accumulations
29	<u>**SIBIU**</u> <u>**28 localities**</u> **Sibiu, Miercurea Sibiului, Ocna Sibiului, Săliște (Săliște, Săcel, Sibiel, Fântânele), Tălmaciu** (Tălmăcel), Apoldu de Jos, Arpaşu de Jos (Arpaşu de Sus), Bazna (Bazna, Velţ), Cristian, Gura Râului, Moşna (Moşna, Nemşa), Orlat, Roșia (Roșia, Caşolţ, Cornăţel, Daia, Sat Nou), Sadu, Şelimbăr, Târnava, Tilişca, Valea Viilor (Valea Viilor, Motiş),	<u>**13-14.06.2018**</u> - heavy rainfall, -debit increase on the river Sadu <u>**29-30.06.2018**</u> - heavy rainfall, slopes leakage <u>**07-11.07.2018**</u> - heavy rainfall, -debit increse on: river Cibin, râu Săliște, river Lungşoara, river Sibiel, pr. Râuşor, pr. Fântânele, pr. Tilişcuța , pr. Moșna, pr. Nemșa -overflow :r. Visa, pr. Arpăşel, pr. Valea Lupului (Mărăjdei), pr. Vorumloc, pr. Apold, pr. Secaş, pr. Gârbova, - inability to take over the sewerage network <u>**23-24.07.2018**</u> - heavy rainfall, slopes leakage -overflow pr. Balta, pr. Rora, pr. Valea Velțului, pr. Hile <u>**24-26.07.2018**</u> - heavy rainfall, slopes leakage -debit increase on river Cibin şi pr. Tilişca.

30	**SUCEAVA** **240 localities** **Suceava, Câmpulung Moldovenesc, Fălticeni, Vatra Dornei** (Vatra Dornei, Roșu), **Broșteni** (Broșteni, Cotârgași, Dârmoxa, Haleasa, Holdița, Neagra), **Cajvana** (Cajvana, Codru), **Dolhasca** (Dolhasca, Budeni, Giulia, Poiana, Poienari, Probota, Siliștea Nouă, Valea Poienii), **Frasin** (Frasin, Bucșoaia, Dorotea, Plutonita), **Gura Humorului** (Gura Humorului, Voroneţ), **Liteni** (Liteni, Corni, Rotunda, Siliștea, Vercicani), **Milişăuţi** (Milişăuţi, Bădeuţi, Lunca), **Salcea**, **Solca**, **Vicovu de Sus,** Adâncata (Adâncata, Călugăreni, Fetești), Arbore (Arbore, Bodnăreni, Clit), Baia (Baia, Bogata), Bălăceana, Bălcăuţi (Bălcăuţi, Gropeni, Negostina), Berchişeşti (Berchisești, Corlata), Bilca Bogdănești, Boroaia (Boroaia, Giulești, Moisa, Săcuța), Breaza (Breaza, Breaza de Sus, Pârâul Negrii), Brodina (Brodina, Falcău, Brodina de Jos, Paltin, Sadău), Bunești (Bunești, Petia), Burla, Cacica (Cacica, Pârțeștii de Sus, Runcu, Soloneţ), Calafindești (Calafindești, Botoșănița Mare), Capu Câmpului, Ciprian Porumbescu , Comănești (Comănești, Humoreni), Cornu Luncii (Păiseni, Brăiești, Sasca Mare, Sasca Mică, Șinca), Dărmănești (Dărmănești, Călinești, Călinești Vasilache, Dănilă, Măreţia Mică), Dolheşti (Dolheşti Mari, Dolheştii Mici, Valea Bourei), Dorna Arini (Dorna Arini, Cozănești, Ortoaia, Sunători), Drăgoiești (Drăgoiești, Lucăcești, Măzănăești), Drăgușeni (Drăgușeni, Broșteni), Dumbrăveni (Dumbrăveni, Sălăgeni), Gălănești (Gălănești, Hurjuieni), Grănicești (Grănicești, Iacobești, Gura Solcii), Fântâna Mare, Frătăuții Noi (Frătăuţii Noi, Costișa), Frătăuții Vechi, Frumosu (Frumosu, Deia, Dragoșa), Grănicești (Grănicești, Dumbrava, Gura Solcii, Iacobești), Hănţeşti (Hănţeşti, Bereşti), Horodniceni (Horodniceni, Botești, Brădățel, Mihăiești, Rotopănești), Iacobeni (Iacobeni, Mestecăniş), Ilişeşti (Ilişeşti, Braşca), Izvoarele Sucevei (Izvoarele Sucevei, Bobeica, Brodina), Marginea, Mălini (Mălini, Pâraie, Poiana Mărului, Văleni Stânișoara), Mănăstirea Humorului (Mănăstirea Humorului, Pleșa), Marginea, Moara (Moara Carp, Bulai, Moara Nica, Liteni, Vornicenii Mari), Moldova Sulița (Moldova Sulița, Benia), Moldoviţa (Moldoviţa, Argel, Demăcuşa, Raşca), Ostra (Ostra, Tărnicioara), Panaci (Panaci, Coverca, Glodu), Păltinoasa (Păltinoasa, Capu Codrului), Pârțeștii de Jos (Pârțeștii de Jos, Deleni, Varvata), Poieni Solca, Pojorâta (Pojorâta, Valea Putnei), Putna, Rădășeni (Rădășeni, Lămășeni), Râșca (Râșca, Slătioara), Sadova, Solca, Preuţeşti (Preuţeşti, Arghira, Basarabi, Huși, Leucușești), Satu Mare (Satu Mare, Ţibeni), Slatina (Slatina, Găinești, Herla), Straja, Stroiești (Stroiești, Zaharești, Vâlcele), Stulpicani (Stulpicani, Gemenea, Negrileasa, Slătioara, Vadu Negrilesei), Şaru Dornei (Şaru Dornei, Gura Haitii), Udești (Udești, Păvălari, Racova, Rădășeni, Reuseni, Ruși Mănăstioara, Securiceni), Ulma (Ulma, Costileva, Lupcina, Măgura, Nisipitu), Vadu Moldovei (Vadu Moldovei, Ciumești, Dumbrăvița, Ioneasa, Mesteceni, Nigotești), Todirești (Todirești, Costîna, Părhăuți, Sîrgheşti, Soloneţ) Valea Moldovei (Valea Moldovei, Mironu), Vatra Moldoviţei (Vatra Moldoviţei, Paltinu), Vama (Vama, Prisaca Dornei, Molid, Strâmtura), Verești (Verești, Bursuceni,	**martie 2018** - heavy rainfall, slopes leakage -torrents -debit increase on: river Suha, pr. Ionac, pr. Corlata, pr. Seaca, pr. Sasca Mare, pr. Solca, pr. Horaiţ, râu Sucevița, pr. Suha Mică - left bank erosion pr. Cetății **mai 2018** - torrential rainfall, slopes leakage **iunie 2018** - torrential rainfall, slopes leakage -debit increse r. Moldova, pr. Caluharca, pr. Suha Mică, pr. Hremetne, pr. Coejeni, pr. Ulma, pr. Trestia -torrent activation La Stâncă -bank erosion **28.06-09.07.2018** - heavy rainfall, slopes leakage -debit increase: river Moldova, river Bistrița, river Suceava, pr. Valea Seacă, pr. Deia, pr. Morii, pr.Şandru, pr. Dârmoxa, pr. Haleasa, pr. Cotârgaşi, pr. Holdiţa, pr. Neagra, pr. Cajvana, pr. Suha, pr. Plutonita, pr. Todiraş, pr. Magherniţa, pr. Voroneţ, pr. Marghi, pr. Solcuţa, pr. Laura, pr. Fresca, pr. Solca, pr. Gârla Morii, pr. Recea, pr.Bogata, pr. Negostina, pr. Criva, pr. Bilca Mare, pr. Seaca, pr. Ciumârna, pr. Hepa, pr. Racova, pr. Soloneţ, pr. Bălcoaia, pr. Şinca, pr. Sasca Mare, pr. Horaiţ, pr. Valea Mare, pr. Lunga, pr. Dulcea, pr. Moldoviţa, pr. Secrieş, pr. Demăcuşa, pr. Băieşcu, pr. Brăteasa, pr. Suha, pr. Muncel, pr. Călimănel, pr. Negru, pr. Hozoaia, pr. Soloneţ, pr. Varvata, pr. Racova, pr. Morii, pr. Putna, pr. Izvor, pr. Râşca, pr. Suha Mică, pr. Lupoaia, pr. Magherniţa, pr. Valea cu Calea, pr. Calanceni, pr. Humărie, pr. Străjii, pr. Ziminel, pr. Cimbrina, pr. Negrileasa, pr. Gemenea, pr Slătioara, pr. Şandru, pr. Boicului, pr. Casei, pr. Mălaiului, pr. Corjeni, pr. Gigolea, pr. Ulma, pr. Suceviţa, pr. Verehia, -torrent activation: Rososa, Hremetne **09-14.07.2018** - heavy rainfall, slopes leakage -debit increase: river Moldova, pr. Humor, pr. Lămăşanu, pr. Rădăşeni, pr. Gemenea, pr. Slătioara, pr. Cânepişte, pr. Păvălari, pr. Mediasca, pr. Valea Seacă **16-31.07.2018** - torrential rainfall, slopes leakage -debit increase: river Moldova, river Suceava, river Şomuzu Mare, pr. Şandru, pr. Izvorul Malului, pr. Podirei, pr. Cotârgaşi, pr. Cajvana, pr. Suha, pr. Branişte, pr. Todiraş, pr. Bălteni, pr. Laura, pr. Bălăceanca, pr. Bogdăniţa, pr. Seaca, pr. Săcuţa, pr. Sadău, pr. Brodina, pr. Hepa, pr. Breaza, pr. Gropii, pr. Negrei, pr. Botoşana, pr. Hotari, pr. Soloneţ, pr. Chilia, pr. Avram, pr. Mamuca, pr. Isachia, pr. Larga, pr.

	Corocăiești),Vicovu de Jos, Voitinel, Volovăț, Vulturești (Vulturești, Giurgești, Hreațca, Jacota, Merești, Osoi, Pleșești, Valea Glodului), Zamoștea	Ilișasca, pr. Moldovița, pr. Dragoșa, pr. Deia, pr. Brădățel, pr. Rotopănești, pr. Arșița, pr. Bobeica, pr. Brodina, pr. Oglinda, pr. Pohoniș, pr. Sucevița, pr. Lucava, pr. Sulița, pr. Demăcușa, pr. Suha, pr. Muncel, pr. Brăteasa, pr. Hozoaia, pr. Păltinoasa, pr. Bejan, pr. Soloneț, pr. Varvata, pr. Racova, pr. Izvoru Giumalău, pr. Vlădești, pr. Râșca, pr. Slătioara, pr. Suha Mică, pr. Lupoaia, pr. Mălaiu, pr. Slătioara, pr. Gemenea, pr. Corjeni, pr. Gigolea, pr. Ulma, pr. Valea Seacă, pr. Păușa, pr. Remezeu **<u>31.07-7.08.2018</u>** - torrential rainfall, slopes leakage -debit increase: r. Suceava, r.Suha, pr. Bogdăneasa, pr. Voroneț, pr. Cireșu, pr. Slătioara, pr. Corea, pr. Partenie, pr. Berchiș, pr. Humăria, pr. Corlata, pr. Sasca Mare, pr. Săscuța, pr. Drăgoiasa, pr. Suha Mare, pr. Lucava, pr. Brăteasa, pr. Huși, pr. Leucușești, pr. Șandru -landslide -ank erosion: pr. Şcheia, r. Suha, -torrent debit increase: Tulnic, Runc, Cetate, Boureni,Șoimu **<u>15-24.08.2018</u>** - torrential rainfall, slopes leakage -debit increase: pr. Valea Seacă, pr. Casei, pr. Sec, pr. Cotârgași, pr. Fierului, pr. Arinu, pr. Arșița, pr Izvor, pr. Rososa, pr. Izvorul Giumalăului, pr. Valea Pojorâtei -torrent activation **<u>25.08-17.09.2018</u>** - torrential rainfall, slopes leakage -debit increase: pr. Cotârgași, pr. Marghi, pr. Moldovița, pr. Dubul, pr. Costileva -torrent activation -landslide
31	**<u>TELEORMAN</u>** **<u>103 localities</u>** **Alexandria, Turnu Măgurele, Videle, Zimnicea,** Balaci (Balaci, Burdeni, Tecuci), Beciu (Beciu, Bârseștii de Jos), Beuca, Botoroaga (Călugăru Tîrnava, Tunari, Valea Cireșului), Bragadiru, Bujoreni (Prunaru), Brânceni, Buzescu, Călinești (Călinești, Antonești, Copăceanca, Licuriciu, Marița), Ciolănești (Ciolănești Deal, Ciolănești Vale, Baldovinești), Ciuperceni, Conțești, Crângeni, Didești (Didești, Însurăței, Satu Nou), Dobrotești (Dobrotești, Merișani), Dracea, Drăgănești de Vede (Măgura cu Liliac), Drăgănești Vlașca, Frăsinet, Frumoasa (Pauleasca), Gălățeni (Gălățeni, Grădișteanca), Gratia (Gratia, Ciurari Deal, Drăghinești), Izvoarele, Lisa, Lița, Lunca, Măgura (Măgura, Guruieni), Măldăieni, Mârzănești, Mereni (Mereni de Jos, Merenii de Sus), Năsturelu, Necșești (Necșești, Belciug, Gârdești), Orbeasca (Orbasca de Jos, Orbeasca de Sus, Lăceni), Plopii Slăvitești (Plopii Slăvitești, Brîncoveanca, Dudu), Plosca, Poeni (Poeni, Brătești), Poroschia (Poroschia, Calomfirești), Putineiu, Săceni, Scrioaștea (Scrioaștea, Brebina, Cucuieți), Seaca, Segarcea Vale (Segarcea Vale, Segarcea Deal, Olteanca),	**<u>14.02-18.02. 2018</u>** - precipitation, slopes leakage -overflow r. Câlniștea, pr. Slătioarele, -ponding - inability to take water on Câlniștea II due to reeding of the area. **<u>04.03-20.04. 2018</u>** - precipitation, slopes leakage -overflow r. Teleorman, Pârâu Câinelui, -ponding - upstream erosion and erosion at the high water discharge at the dam Tinoasa II **<u>16-20.06. 2018</u>** - precipitation, slopes leakage **<u>28.06-07.07. 2018</u>** - precipitation, slopes leakage **<u>09-12.07. 2018</u>** - heavy rainfall, slopes leakage **<u>27-31.07. 2018</u>** - heavy rainfall, slopes leakage

	Siliștea Gumești, Slobozia Mândra, Smârdioasa (Smârdioasa, Șoimu), Stejaru (Stejaru, Bratcov, Gresia, Socetu), Storobăneasa (Storobăneasa, Beiu), Suhaia, Talpa (Talpa Biscoveni, Talpa Ogrăzile, Talpa Rotărești), Tătătăștii de Jos, Tătărăștii de Sus, Traian, Ţigănești, Uda Clocociov, Viișoara, Vitănești (Vitănești, Purani, Siliștea, Schitu Poenari), Vîrtoape	
	<u>TIMIȘ</u> **<u>11 localities</u>** Bethausen (Bethausen, Cladova, Cutina, Leucușești, Nevrincea), Dumbrava (Dumbrava, Bucovăț, Răchita), Pietroasa (Pietroasa, Crivina de Sus, Poieni),	**<u>09-18.06.2018</u>** - heavy rainfall, slopes leakage -overflow: pr. Sasa, pr. Valea Bisericii, pr. Valea Baleasca **<u>19-22.07.2018</u>** - heavy rainfall, slopes leakage -overflow: r. Bega, pr. Valea Șerbenilor, pr. Glăvița,
32	**<u>TULCEA</u>** **<u>9 localities</u>** **Isaccea,** Frecăței (Frecăței, Cataloi, Poșta, Telița), Luncavița, Ostrov, Turcoaia, Văcăreni	**<u>iunie.2018</u>** - heavy rainfall; - slopes leakage - concentrating leaks on the streets **<u>iulie.2018</u>** - heavy rainfall; - slopes leakage - concentrating leaks on the streets
33	**<u>VASLUI</u>** **<u>123 localities</u>** **Murgeni** (Floreni, Raiu, Schineni), **Negrești**, Albești (Albești, Corni Albești, Crasna), Bacani (Bacani, Bălteni, Suseni), Costești (Costești, Chițcani, Dînga, Puntișeni), Cozmești (Cozmești, Balești, Fastaci, Hordilești), Delești (Delești, Hârșova, Mănăstirea), Dragomirești (Dragomirești, Babuta, Belzeni, Ciuperca, Doagele, Poiana Pietrei, Popești, Tulești, Vladia), Fruntişeni (Fruntişeni, Grăjdeni), Găgești (Giurcani), Gherghești (Gherghești, Chetrosu, Corodești, Draxeni, Lazu, Lunca), Grivița (Grivița, Odaia Bursucani, Trestiana), Epureni (Epureni, Barlalești, Bursuci, Horga), Ferești, Garceni (Garceni, Slobozia, Trohan), Hoceni, Ibănești, Ivănești (Ivănești, Blesca, Buscata, Iezărel, Ursoaia, Valea Oanei), Lipovăț (Lipovăț, Chitoc, Corbu), Malusteni (Ghireasca, Lupești, Mănăstirea, Mânzătești), Miclești (Miclești, Chircești, Popești), Osești (Osești, Buda, Pădureni), Pogana (Bogești, Măscurei), Rafaila, Rebricea (Rebricea, Crăciunești, Rateșu Cuzei, Tatomirești, Tufeștii de Jos), Roșiești (Gura Idrici, Valea lui Darie), Solești (Solești, Bousori, Iaz, Satu Nou, Stioborani, Valea Siliștei), Suletea (Suletea, Fedești, Jigalia, Rascani), Tacuta (Tacuta, Dumasca, Focseasca, Mircești, Sofieni), Todirești (Todirești, Cotic, Drăgești, Huc, Plopoasa, Siliștea, Sofronești, Valea Popii, Viișoara), Tutova (Tutova, Bădeana), Viișoara, Vulturești (Vulturești, Buhăiești, Voinești), Vutcani, Zapodeni (Zapodeni, Butucaria, Ciofleni, Delea, Dobroslovești, Macrești, Portari, Telejna, Uncești), Zorleni (Zorleni, Popeni),	**<u>15-17.06 și 27-30.06.2018</u>** - heavy rainfall, slopes leakage -ponding and internal waters - inability to take over the network of canals and road ditches - exceeding the carrying capacity of the channels **<u>07-10.07.2018</u>** - heavy rainfall, slopes leakage -ponding and internal waters - inability to take over the network of canals and road ditches - exceeding the carrying capacity of the channels **<u>18-31.07.2018</u>** - heavy rainfall, slopes leakage -ponding and internal waters - inability to take over the network of canals and road ditches - exceeding the carrying capacity of the channels
34	**<u>VÂLCEA</u>** **<u>263 localities</u>** **Râmnicu Vâlcea (Troian), Băbeni (Băbeni, Pădurețu, Romani, Valea Mare), Băile Govora (Băile Govora, Gătejești), Băile Olănești (Comanca), Bălcești (Bălcești,Benești, Otetelișu, Preoțești), Călimănești**	**<u>14.05-08.06.2018</u>** - heavy rainfall, slopes leakage -rapid flood -strong wind -landslide - inability to take over the sewerage network

	(Călimănești, Căciulata, Jiblea Nouă, Jiblea Veche, Păușa), **Horezu** (Horezu, Rămeşti, Romanii de Jos, Romanii de Sus, Tănăseşti, Urşani), **Ocnele Mari** (Lunca), Alunu (Alunu, Bodești, Coltești, Igoiu, Ilaciu, Ocracu, Roșia), Amărăşti (Padina), Bărbăteşti (Bărbăteşti, Bodeşti, Negruleşti), Berislăveşti (Brădişor, Dăngeşti, Rădăcineşti, Robaia, Scaueni, Stoeneşti), Boişoara (Boişoara, Bumbueşti, Găujani), Budești (Budești, Bârsești, Bercoiu, Linia, Racovița, Ruda), Bujoreni (Bogdăneşti), Bunești (Bunești, Teiușu, Titireci), Câineni (Robeşti), Cernişoara (Cernişoara, Armăseşti, Groşi, Mădulari, Modoia, Obârşia, Sărsăneşti), Copăceni (Copăceni, Bălteni, Bondoci, Hotărasa, Ulmetu, Veţelu), Costesti (Costesti, Bistrita, Pietreni, Văratici), Dăești , Diculești (Diculești, Băbeni-Oltețu, Budești), Drăgoiești (Drăgoiești, Buciumeni, Geamăna), Făurești (Făurești, Bungetani, Găinești, Milești), Frâncești (Frâncești, Genuneni, Mănăilești, Moșteni, Viișoara), Galicea, Ghioroiu (Hereşti, Poienari, Ştirbeşti), Glăvile (Glăvile, Jaroștea, Olteanca, Voiculeasa), Golești (Aldești, Blidari, Drăgănești, Gibești, Opătești, Poenița, Popești), Gușoeni (Gușoeni, Burdălești, Gușoianca, Mângureni, Spârleni), Laloșu (Laloșu, Oltețani, Portărești), Lăcusteni (Lăcusteni, Ciobănești, Contea, Gănești, Lăcustenii de Jos, Lăcustenii de Sus), Lăpușata (Berești, Broșteni, Mijați, Sărulești, Scorușu, Șerbănești), Livezi, Mateești (Mateești, Greci, Turcești), Mădulari (Mamu), Mălaia, Milcoiu, Mihăești (Bârsești, Rugetu), Mitrofani (Mitrofani, Racu), Nicolae Bălcescu (Corbii din Vale, Dosu Râului, Gâltofani, Linia Hanului, Mângureni, Predești, Șerbăneasa, Valea Bălcescu, Valea Viei), Olanu (Casa Veche, Drăgioiu, Nicolești), Orlești (Orlești, Aurești, Procopoaia, Scăioși, Silea), Oteșani (Oteșani, Bogdănești, Cărstănești, Sub Deal), Orlești, Păușești Măglași (Păușești Măglași, Valea Cheii, Vlăduceni), Perișani, Pesceana (Pesceana, Cermegești, Lupoaia, Negraia, Roești, Ursoaia), Pietrari (Pietrari, Pietrarii de Sus), Popești (Popești, Curtea, Dăești, Meieni, Urși, Valea Caselor), Racovița (Racovița, Bradu-Clocotici, Copăceni), Roești (Baiasa, Băjenari, Barbarigeni, Cueni, Frasina, Piscu Scoarţei, Râpa Cărămizii, Saioci), Roșiile (Roșiile, Cherăști, Hotăroaia, Păsărei, Pertești, Rățăiești, Romanești, Zgubea), Runcu (Runcu, Snamana, Surpați, Valea Babei, Vărateci), Sălătrucel (Sălătrucel, Seaca), Sinești (Sinești, Ciucheți, Dealu Bisericii, Popești, Urzica), Slătioara (Coasta Cerbului, Gorunești, Milostea, Mogoșești, Rugetu), Stoenești (Stoenești, Bârlogu, Deleni, Dobriceni, Gruieni, Suseni), Stoilești (Balomireasa, Ghiobești, Izvoru Rece, Vlădulești), Stroești (Stroești, Cireșu, Obrocești), Șirineasa (Șirineasa, Aricioaia, Ciorăști), Șutești (Șutești, Boroșești, Mazili, Verdea), Titești , Tetoiu (Tetoiu, Baroiu, Măneasa, Nenciulești), Tomșani (Bogdănești, Foleștii de Jos), Vaideeni (Vaideeni, Cornet, Cerna, Izvoru Rece, Marița), Valea Mare (Bătășani, Mărgineni, Tortoiești), Vlădești (Vlădești, Fundătura, Priporu, Trundin), Voicești (Tighina), Voineasa (Valea Măceșului, Voineșița), Zătreni (Zătreni, Butanu, Ciortești, Făurești, Manicea, Mecea, Oltețu, Săscioara, Stanomiru, Văleni, Zătrenii de Sus)	**13-30.06.2018** - heavy rainfall, slopes leakage -rapid flood -landslide - inability to retrieve rainwater channels and ditches - inability to take over the sewerage network - strong wind with a look of lust **09-11.07.2018** - heavy rainfall, slopes leakage, -rapid flood -overflow: river Olteț, pr. Pesceana, right bank parapet pr. Bistrița, channel Râioasa, - reactivation of landslides - inability to retrieve rainwater channels and ditches -the destruction through erosion of the deposition on the right bank pr. Stăncălău in Băbeni city

35	**VRANCEA** **159 localities** **Odobești**, **Mărășești**, **Panciu**, Andreiașu de Jos (Andreiașu de Jos, Arșița, Fetig, Răchitașu), Bîrsești (Bîrsești, Topești), Boghești (Bogheștii de Sus, Bichești, Iugani, Plăcințeni, Pleșești, Prisecani, Tăbucești), Bolotești (Găgești, Pietroasa, Vităneștii de sub Măgură), Bordești (Bordești, Bordeștii de Jos), Cîmpineanca (Pietroasa), Cîmpuri (Cîmpuri, Gura Văii), Cîrligele (Cîrligele, Blidari, Bonțești, Dălhăuți), Chiojdeni (Cătăuți, Luncile, Podurile, Seciu), Cotești (Cotești, Budești, Goleștii de Sus, Valea Cotești), Dumbrăveni (Dumbrăveni, Cîndești, Dragosloveni), Dumitrești (Biceștii de Jos), Fitionești (Fitionești, Ciolănești, Ghimicești, Holbănești, Mănăstioara), Garoafa (Garoafa, Făurei), Gura Caliței (Gura Caliței, Cocoșari, Dealu Lung, Groapa Tufei, Lacu lui Baban, Poenile, Plopu, Rașca), Homocea (Costișa, Lespezi), Jariștea (Jariștea, Pădureni, Scînteia), Jitia , Mera (Mera, Livada, Milcovel, Roșioara, Vulcăneasa), Movilița (Movilița, Frecăței), Nănești, Năruja (Năruja, Podu Nărujei, Podu Stoica, Rebegari), Negrilești, Nereju (Nereju, Brădăcești, Chiricari, Nereju Mic, Sahastru), Nistorești (Nistorești, Bîtcari, Brădetu, Făgetu, Podu Șchiopului, Românești, Vetrești, Ungureni), Paltin (Paltin, Prahuda, Tepa), Păunești (Păunești, Viișoara), Ploscuțeni, Poiana Cristei (Poiana Cristei, Dealu Cucului, Mahriu, Odobasca, Petreanu, Podu Lacului), Pufești (Domnești, Domnești Sat), Răcoasa (Verdea), Reghiu (Reghiu, Șindrilari, Ursoaia), Ruginești (Ruginești, Anghelești, Copăcești, Văleni),Slobozia Bradului (Coroteni, Olăreni), Soveja (Dragosloveni, Rucăreni), Spulber (Spulber, Carșochești-Corăbița, Păvălari, Țipău), Străoane (Muncelu, Repedea, Văleni), Tătăranu (Tătăranu, Bordeasca Veche), Tîmboiești (Tîmboiești, Pădureni, Slimnic), Tulnici (Tulnici, Coza, Lepșa), Țifești, Valea Sării (Valea Sării, Colacu, Mătăcina, Poduri), Vidra (Burca-Cucuieți, Irești, Ruget, Tichiriș, Viișoara, Voloșcani), Vintileasca (Bahnele, Neculele, Tănăsari), Vizantea Livezi (Vizantea Mănăstirească, Vizantea Răzășească, Livezile, Mesteacănu, Piscu Radului), Vînători, Vîrteșcoiu (Vîrteșcoiu, Beciu, Faraoanele, Rîmniceanca), Vrîncioaia (Vrîncioaia, Bodești, Ploștina, Muncei, Spinești, Poiana), Urechești,	**12-16.03.2018** - precipitation, slopes leakage -level increse: river Milcov, river Râmnicu Sărat, river Trotuș -erosion: right bank r. Trotuș **23.03-07.04.2018** - precipitation, slopes leakage -sudden melting of the snow layer -level and debit increases: river Râmnicu Sărat, pr. Slimnic, torrent Coltea -erosions: left bank r. Râmnicu Sărat, right bank pr Slimnic la Tîmboiești **08-17.05.2018** - heavy rainfall, slopes leakage **iunie-iulie.2018** - heavy rainfall, slopes leakage -level and debit increases: r. Siret, r. Trotuș, r. Putna, r. Năruja, r. Zăbala, r. Milcov, pr. Domoșița, tr. Plopu, tr. Valea Caselor, pr. Purcăreț, pr. Blaga, pr. Roschița, pr. Tivitău, pr. Arsiminoaia, pr. Caciu, pr. Ochean, pr. Reghiu, pr. Porcului -overflow: r. Rîmna, torent Seaca, torent Pietroasa, torent Pîrîul Satului, pr. Rașca, pr. Bulibașa, pr. Oreavu, pr. Schitului - exceeding leakage capacity Canal ANIF -right bank erosion -ponding **26.07-19.08.2018** - heavy rainfall -level and deit increases:r. Șușița, pr. Tichiriș, tr. Bălanu, tr. Colțea, pr. Verdea, pr. Dragormira, pr. Cremenet, pr. Caciu, tr. Pârâul Sărat,

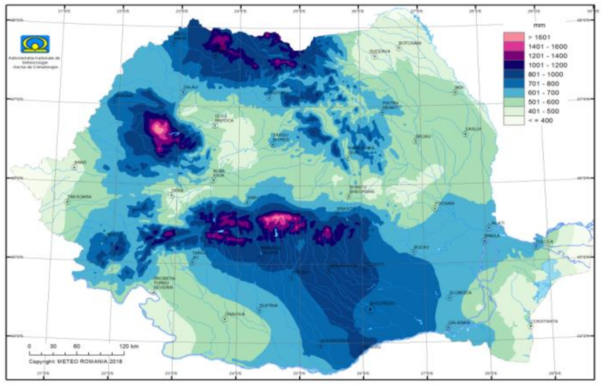
Source: National Administration "Romanian Waters "

Characterization of the year 2017 from a hydrological point of view

The annual amount of precipitation, average per country (673.5 mm), was only 6% higher than the climatological norm (1981 - 2010). Thus, the deviations were positive in eight of the 12 months, ranging from 2% (February) to 73% (October), and the negative deviations were in the remaining four months, January, March June and August, ranging from 12% in March and 37% in January. Annual quantities of precipitation, over 800 - 1000 mm, were mainly accumulated in Maramureș, on the significant areas of Muntenia and Crișana, but also in the mountain area (fig. IX.40).

In 2017, higher values of the maximum amount of precipitation accumulated in 24 hours were recorded, in isolation, in the areas of Banat, Oltenia, Western Carpathians and southern Dobrogea (figure IX.6).

Figure IX.6 Annual amounts of precipitation in 2017 (in mm)



Forecast of the effects of climate change 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: National Meteorological Agency

IX.2. PROGRAMS AND MEASURES ENTERTAINED FOR SUSTAINABLE URBAN DEVELOPMENT AND IMPROVEMENT OF HEALTH AND QUALITY OF LIFE IN URBAN AGGLOMERATIONS

Chapter X. ENVIRONMENT RADIOACTIVITY

National Environmental Protection Agency

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 THE RADIOACTIVITY OF ENVIRONMENTAL FACTORS

X.1.1.	AIR RADIOACTIVITY

X.1.1.1. RATE OF DOSE RANGE

Source: http://www.anpm.ro/debit-doza-gama

- ***No indicators*** –

X.1.1.2. RADIOACTIVITY OF ATMOSPHERIC AEROSOLS

Source: N.E.P.A.

- ***No indicators –***

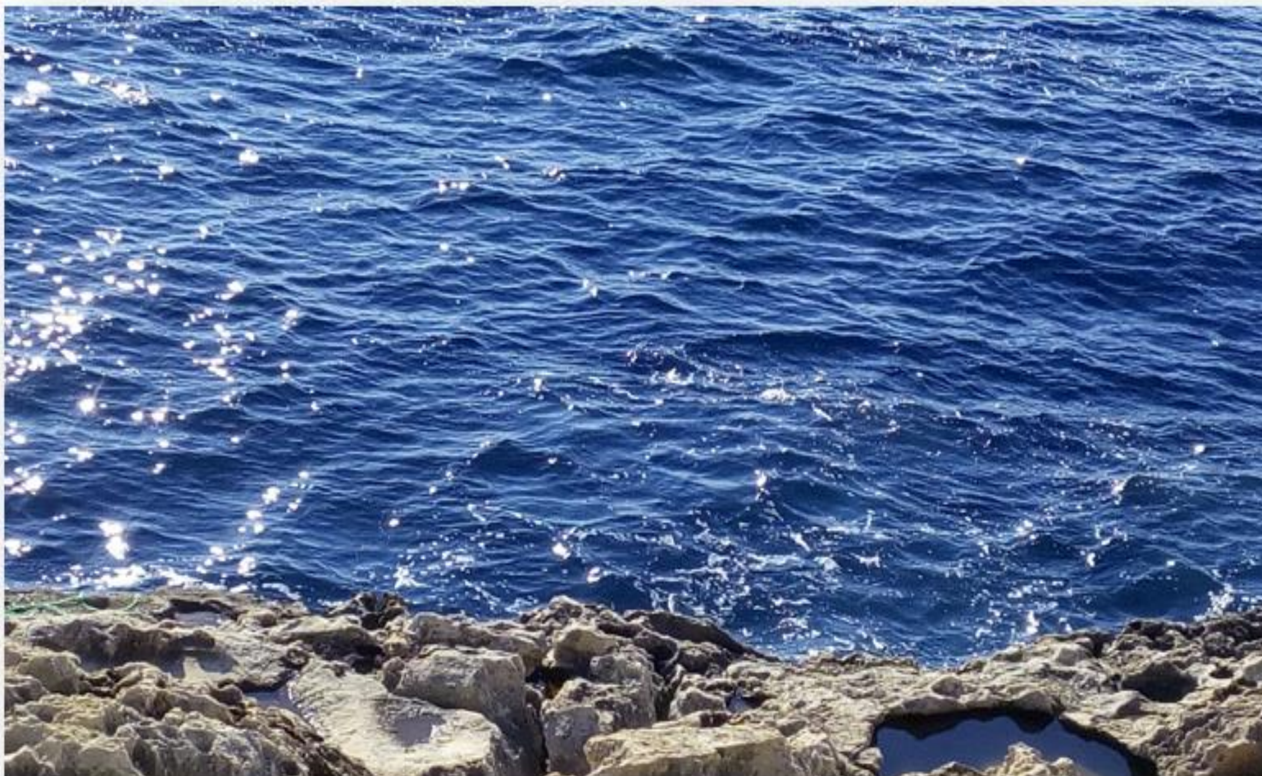
X.1.1.3 RADIOACTIVITY OF TOTAL ATMOSPHERIC DEPOSITS AND PRECIPITATIONS

Source: N.E.P.A.

- ***No indicators –***

X.1.1.3.1. Immediate global beta analysis of total atmospheric deposition samples

Source: N.E.P.A. . - ***No indicators –***



X.1.2.	WATER RADIOACTIVITY

X.1.2.1. RADIOACTIVITY OF THE MAIN RIVERS

Source: N.E.P.A.

- ***No indicators –***

X.1.2.2. RADIOACTIVITY OF THE DANUBE

Source: N.E.P.A.

- ***No indicators –***

X.1.2.3. RADIOACTIVITY OF THE BLACK SEA

Source: N.E.P.A. .

- ***No indicators –***

X.1.3. SOIL RADIOACTIVITY

Source: N.E.P.A. .

- *No indicators* –

X.1.4.	VEGETATION RADIOACTIVITY

Source: N.E.P.A.

- *No indicators* –

Chapter XI. CONSUMPTION AND ENVIRONMENT

Source: "National Strategy for Sustainable Development of Romania 2030"

XI.1. CONSUMPTION TRENDS

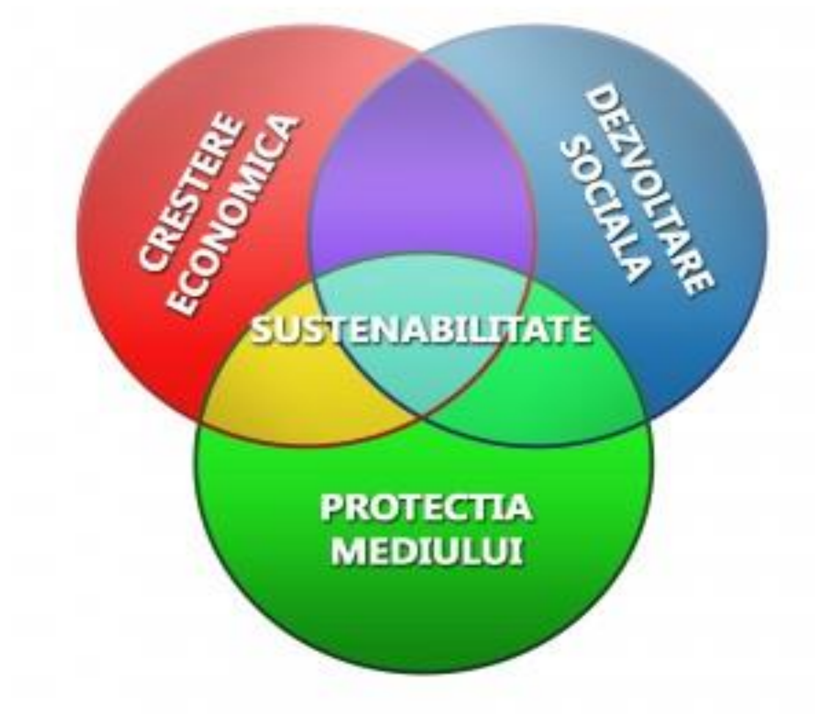
XI.2. FACTORS INFLUENCING CONSUMPTION

XI.3. ENVIRONMENTAL PRESSURES CAUSED BY CONSUMPTION

XI.4. GREEN ECONOMY

XI.5. FORECASTS, POLICIES AND MEASURES CONCERNING CONSUMPTION AND THE ENVIRONMENT

Chapter XI. CONSUMPTION AND ENVIRONMENT



XI.1. CONSUMPTION TRENDS

XI.1.1. FOOD AND BEVERAGE
Annual average per capita consumption, main food and beverages

- ***No indicators*** –

XI.1.2. HOUSING
Electricity consumption in dwellings
Average consumption per person

- ***No indicators*** –

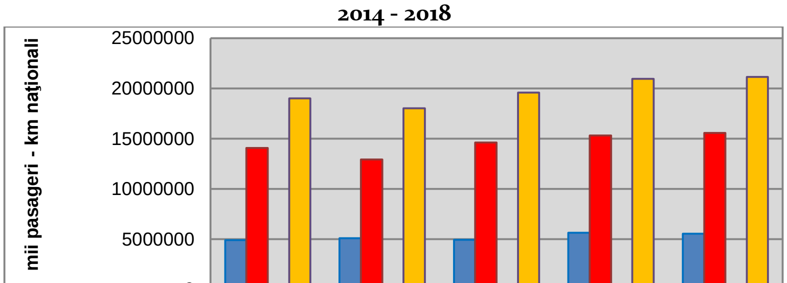
XI.1.3. MOBILITY
XI.1.3.1. Passenger transport

RO 35	Indicator code Romania: RO 35 EEA 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 contains data referring only to the transport on the national territory, regardless of the nationality of the transport vehicle, for the transport of cars, buses and coaches, respectively trains (subway & tram and light subway are excluded) for a period for at least 5 years. The variable is calculated from the passenger - kilometer (pkm) indicator, defined as the transport of a passenger over a distance of one kilometer. Figure XI.1 shows the share of the modes of passenger transport [thousand passengers - national km]) at national level between 2014 - 2018.

Figure XI.1 Share of modes of transport of passengers [thousands of passengers - national km] at national level, 2014 - 2018



	2014	2015	2016	2017	2018
Feroviar	4924523	5106514	4952622	5629215	5542677
Rutier	14060938	12914062	14609472	15319994	15573425
Căi navigabile	10,910	9,500	7,650	7,650	6,000
Total	18996371	18030096	19569744	20956859	21122102

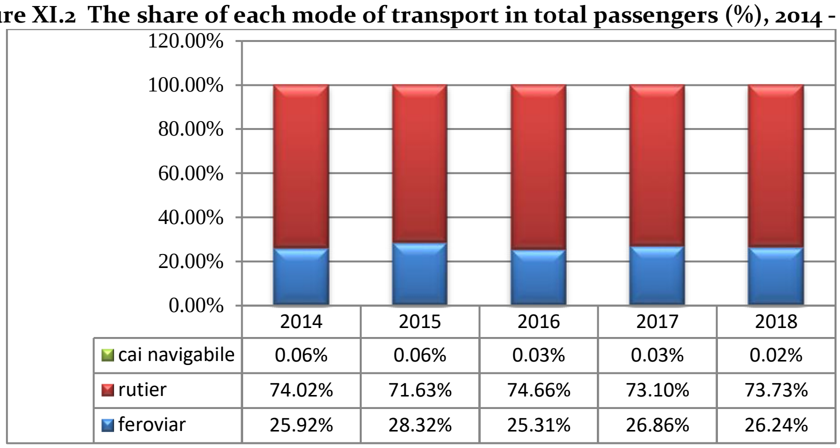
Sursa: Institutul Naţional de Statistică

In the case of rail transport, a stagnation trend is observed between 2014-2016, increasing in 2017 with 676 593 thousand passengers - national km compared to 2016, and in 2018 registering a slight decrease of 86,538 thousand passengers - national km in front from the previous year. A fluctuating trend is also observed in the case of road transport. In 2014 and 2016 there is an increase of 1,146,886 respectively 1,695,410 thousand passengers - national km compared to 2015. Between 2017-2018 there is a progressive increase compared to the previous years. In 2014, water transport is 10,910 thousand passengers - national km followed by a significant decrease in the following years. In 2018 there was a decrease of 4,910 thousand passengers - national km compared to 2014.

The share of each mode of transport in passenger transport

This indicator, shown in figure XI.2, has recorded relatively different variations for the three modes of transport, as follows: in **the waterway transport** there is a decreasing trend from 2014 to 2018. **Road transport** in 2015 registered a slightly decrease compared to 2014 and 2016, and by 2018 there has been a gradual increase. In the **railway transport** there is a tendency of stagnation in the years 2014 and 2016. In the years 2017 and 2018 there are slight variations of growth compared to the previous years, the year 2015 presents the lowest value compared to the other years..

Figure XI.2 The share of each mode of transport in total passengers (%), 2014 - 2018



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** (table no. XI.1 and figure XI.3), there is a fluctuating tendency in the case of trams in the years 2014-2018. In 2015, the lowest value in the last five years was reached at 2,384 674.6. In the case of buses, minibuses, trolleybuses and the subway there is a tendency to slow down the evolution of public transport (thousands of passengers-km).

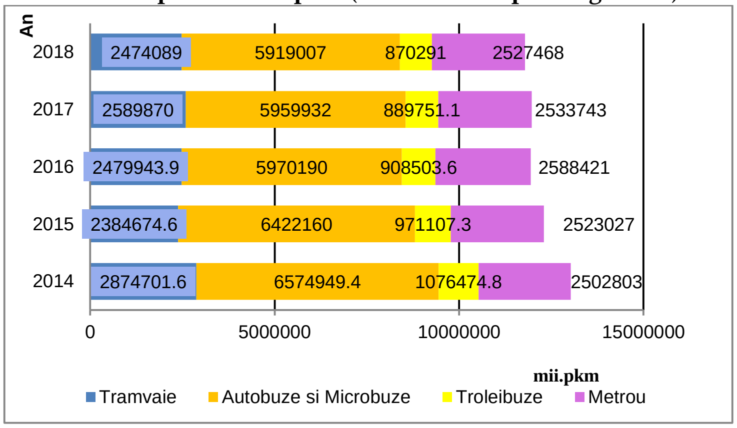
Table nr. XI.1 Evolution of the use of public transport (thousands of passengers-km), at national level, 2014 - 2018

thousands of passengers-km

	2014	2015	2016	2017	2018
Trams	2874701.6	2384674.6	2479943.9	2589870.0	2474089
Buses, minibuses	6574949.4	6422160.0	5979190.0	5959932.0	5919007
Trolleybuses	1076474.8	971107.3	908503.6	889751.1	870291
Subway	2502803.0	2523027.0	2588421.0	2533743.0	2527468
TOTAL	13028928.8	12300968.9	11956059.2	11973296.0	11790855

Source: National Institute of Statistics

Figure XI.3 - The evolution of the use of public transport (thousands of passenger-km) at the national level, 2014 -2018



Source: National Institute of Statistics

XI.1.3.2. Freight transport

RO 36	Indicator code Romania: RO 36 EEA indicator code: CSI 36

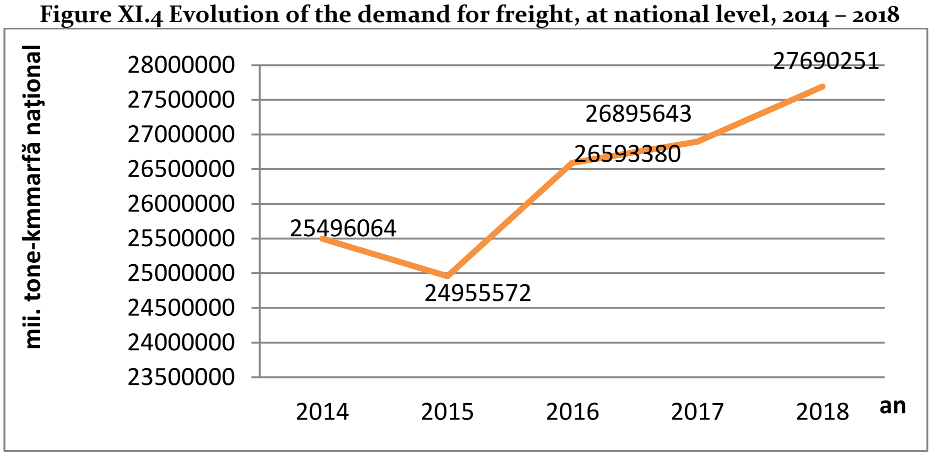
TITLE: FREIGHT TRANSPORT DEMAND

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 (Figure XI.4), it can be observed that in 2015, the total transport of goods transported at national level was 24,955,572 thousand tons-km, registering the lowest value of the 5 years analyzed. In 2018, a maximum value of 27,690 251 thousand tons-km was reached.

Figure XI.4 Evolution of the demand for freight, at national level, 2014 – 2018

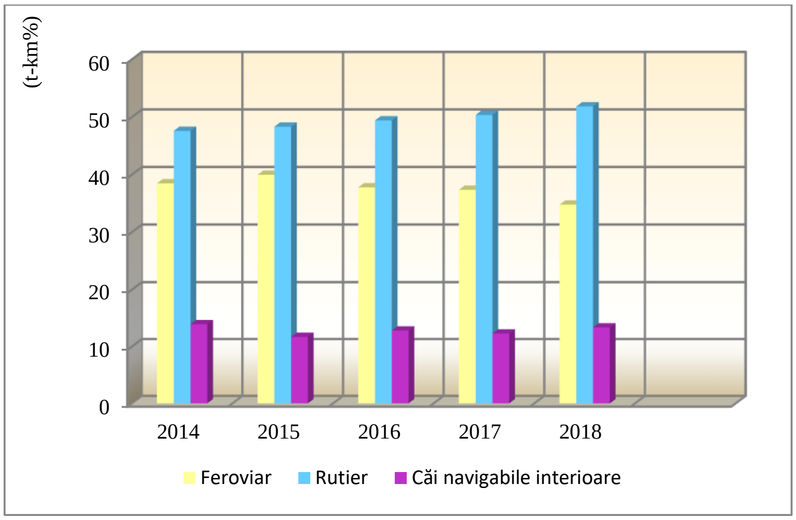


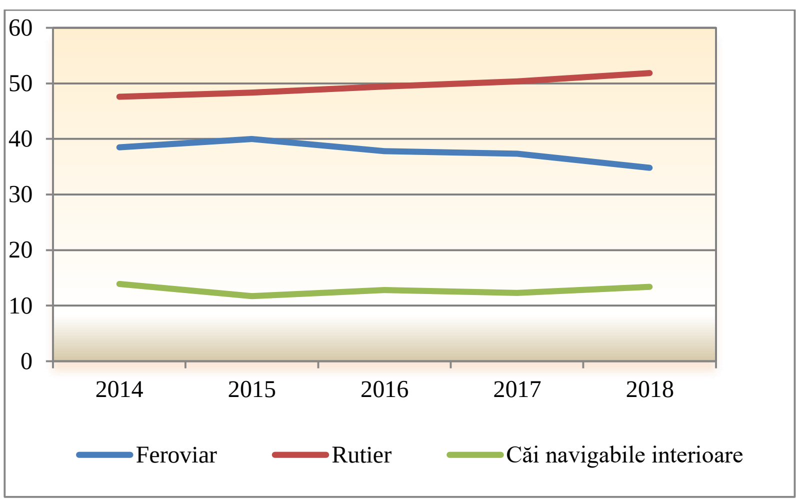
Source: National Institute of Statistics

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. Figure XI.5 shows the share of each mode of transport in the freight transport (tkm) at national level, for the period 2014 - 2018.

Figure XI.5 The share of each mode of transport in the transport of goods (tkm)





Source: Ministry of Transport, www.mt.ro

XI.2. FACTORS INFLUENCING CONSUMPTION

- **No indicators –**

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 EEA 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 2017, the energy sector was responsible for approximately 66.39% of total GHG emissions (113.795,95 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 2017, the total greenhouse gas emissions (Table XI.2) registered a decreasing trend, in 2007 they increased by about 0.69% compared to the previous year. Between 2008 and 2017, greenhouse gas emissions from the residential and commercial sector increased by 3.11%.
The share of total GHG emissions of category 1.A.4.b in sub-sector 1.A.4 (figure XI.6 and table XI.3) is approximately 59.34% for the base year 1989 and 68.53 % for 2017.
The contribution of this category is approximately 7,667.80 kt CO2. equivalent in 2017. There is a major contribution of the use of natural gas as a fuel in this category of activity, for the entire period of time 1989-2017.

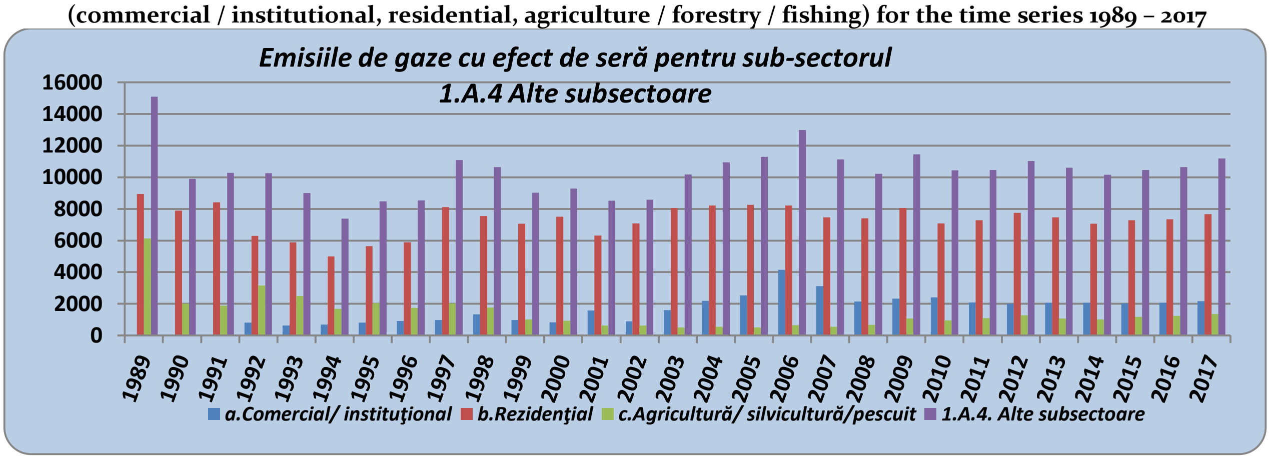
Table XI.2 Greenhouse gas emissions - sub-sector Other subsectors

Greenhouse gas emissions for the 'Other sub-sectors' sub-sector ' (Gg CO_2 equivalent)				
Year	1.A.4. Other subsectors			
	a. Commercial/ institutional	b.Rezidențial	c.Agriculture/ forestry/fishing	Total
1989	**institutional**	8953	**forestry/fishing**	15088
1990	0	7892	2005	9897
1991	0	8414	1873	10287
1992	804	6292	3155	10251

1993	617	5898	2487	9002
1994	696	5008	1680	7384
1995	800	5640	2046	8486
1996	916	5881	1739	8537
1997	961	8117	2014	11091
1998	1336	7558	1750	10644
1999	966	7057	1010	9033
2000	836	7510	939	9285
2001	1580	6314	634	8528
2002	879	7091	618	8588
2003	1602	8060	509	10172
2004	2186	8222	542	10950
2005	2522	8262	499	11283
2006	4149	8206	640	12996
2007	3122	7475	539	11136
2008	2142	7403	673	10217
2009	2333	8058	1068	11459
2010	2397	7088	960	10445
2011	2091	7279	1084	10454
2012	2012	7756	1265	11033
2013	2066	7471	1064	10601
2014	2062	7070	1017	10150
2015	2013	7284	1176	10473
2016	2067	7341	1235	10643
2017	2174	7668	1347	11188

Source: N.E.P.A

Figure 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 – 2017



Source: N.E.P.A - National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

Table XI.3 GHG emissions share - subsector 'Other subsectors'

Year	Share (%)		
	a.Commercial/ institutional	b.Residential	c. Agriculture/ forestry/ fishing
1989	0,00	2,92	2,00
1990	0,00	3,18	0,81
1991	0,00	4,11	0,91
1992	0,42	3,29	1,65
1993	0,34	3,24	1,37
1994	0,39	2,78	0,93
1995	0,43	3,01	1,09
1996	0,48	3,10	0,92
1997	0,52	4,36	1,08
1998	0,80	4,53	1,05
1999	0,65	4,77	0,68
2000	0,58	5,25	0,66
2001	1,08	4,32	0,43
2002	0,59	4,76	0,42
2003	1,04	5,24	0,33
2004	1,43	5,39	0,36
2005	1,67	5,46	0,33
2006	2,73	5,40	0,42
2007	2,04	4,88	0,35
2008	1,43	4,95	0,45
2009	1,80	6,22	0,82
2010	1,93	5,72	0,77
2011	1,62	5,63	0,84
2012	1,60	6,16	1,00
2013	1,78	6,42	0,91
2014	1,77	6,08	0,87
2015	1,73	6,25	1,01
2016	1,81	6,42	1,08
2017	1,91	6,74	1,18

Source: N.E.P.A

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: The final energy consumption covers the quantities 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 in such a way as to include industry, transport, households, services and agriculture.

The assessment of the degree of energy dependence at the sector level is performed by summing the amounts of energy used on activity branches according to the energy balance. The quantities used for the production of other fuels, the consumption of the energy sector and the losses of transport and distribution are not included..

In Romania, the final energy consumption (the amount of energy supplied to the final consumer for the most diverse energy purposes) per inhabitant (table XI. 4 and figure XI. 9) registered a progressive increase between 2013-2016. Thus, the gross domestic energy consumption per inhabitant in 2017 was 1705 toe / place, + 6.1%, compared to 2016 (1606 toe / place.) Respectively an increase from 1583 toe / place in 2013, to 1705 tel.loc in 2017, + 7.7% in the period 2013-2017 (cf. INSE, Energy balance 2017).

Table XI.4 Final energy consumption per capita (toe / inhabitant)

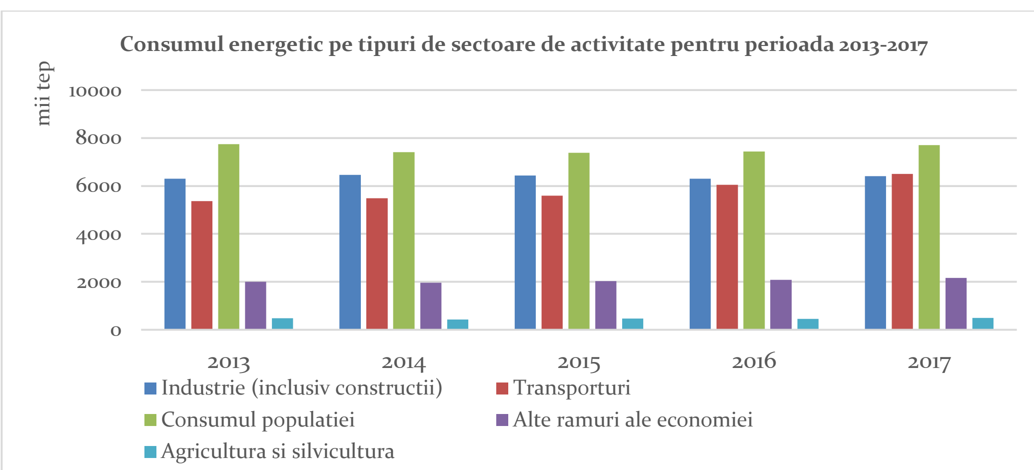
2013	2014	2015	2016	2017
1 583	1 584	1 607	1 606	1705

Source: National Institute of Statistics

- until the date of preparation of this report, the data for the year 2018 have not been processed

In Figure XI. 7 regarding the energy consumption by types of activity sectors between 2013-2017, it is observed that the highest share is held by the energy consumption in the residential sector, followed by the industrial activities and the transport activities. **The final energy consumption** in 2017 increased by 952 thousand toe (+ 4.3%) compared to 2016. The final energy consumption in the industry (including construction) increased by 106 thousand toe (+ 1.7%), mainly due to the large industrial sectors consuming energy resources, such as the chemical and pharmaceutical industry, rubber and plastic products (+57 thousand toe) and the metal construction industry, machinery and equipment (+47 thousand toe), whose cumulative energy consumption represents 30.5% of final consumption in industry (including construction). In metallurgy, the final energy consumption decreased (-48 thousand toe, representing -2.8%) compared to last year. Transport, the tertiary sector and the population also registered increases in energy consumption compared to the previous year (+ 7.6%, + 4.0%, respectively + 3.6%) and, with a cumulative weight of 70.4%, they contributed significantly to the increase of final energy consumption in 2017.

Figure XI. 7 Energy consumption by types of activity sectors for the period 2013 - 2017 (thousand toe)

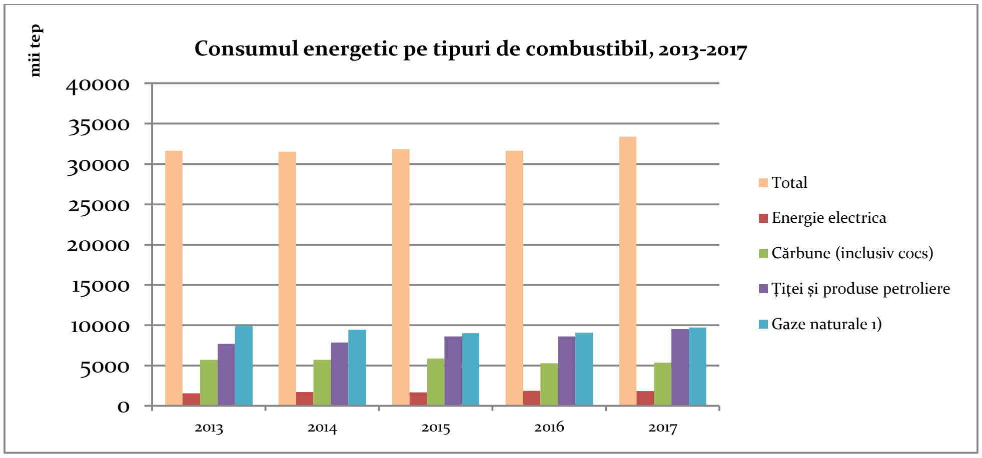


Sursa:http://www.insse.ro

- until the date of preparation of this report, the data for the year 2018 have not been processed

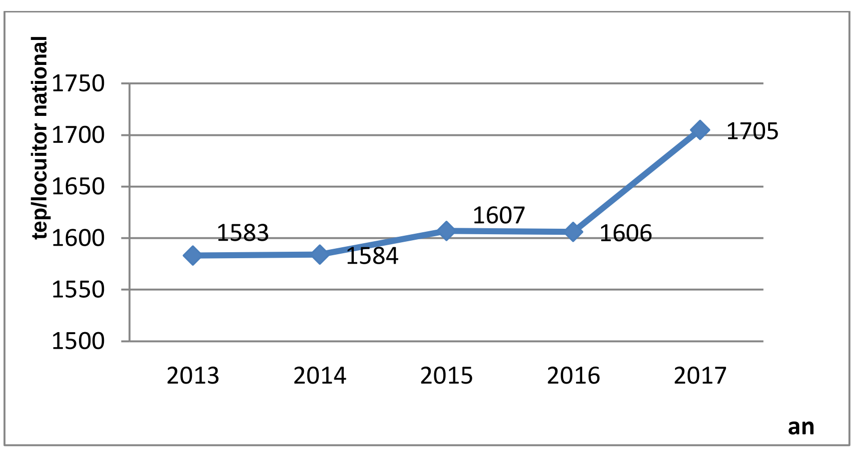
In figure XI.8, regarding the energy consumption by types of fuel, it is observed that the highest weight corresponds to the values related to natural gas over the whole period analyzed, followed by that related to the consumption of crude oil and petroleum products. Gross domestic consumption (including losses) increased slightly in 2017, compared to 2016, with 1753 thousand toe, representing + 5.5%. By types of energy carriers, gross domestic consumption of crude oil and petroleum products (+940 thousand toe), natural gas (+618 thousand toe) and coal (including coke) increased by +104 thousand toe. Electricity consumption remained relatively constant compared to last year. (according to data published by the National Institute of Statistics (INS).

Figure XI.8 Energy consumption by type of fuel for the period 2013-2017 (thousand toe)



1) Excluding gasoline and ethane from extraction scaffolds that are contained in crude oil
The data for the year 2018 have not been processed until the date of this report
Source: http://www.insse.ro

Figure XI.9- Evolution of final energy consumption per capita (thousand toe / inhabitant)

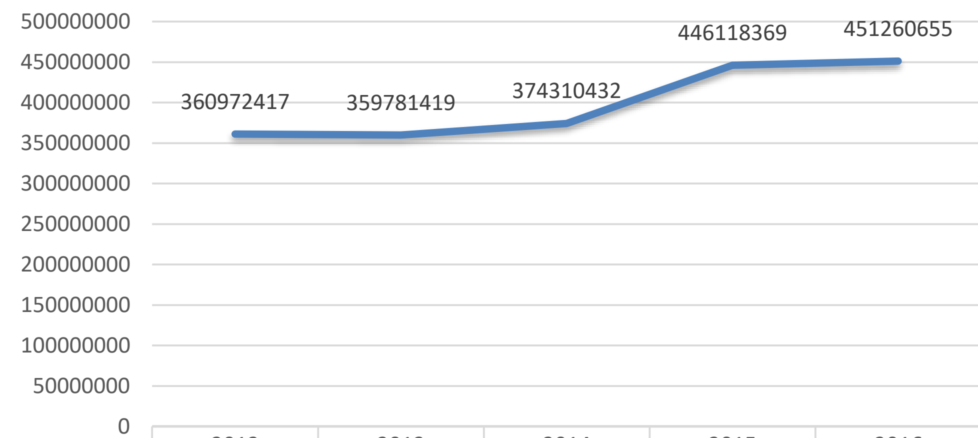


Source: National Institute of Statistics http://www.insse.ro
- until the date of preparation of this report, the data for the year 2018 have not been processed

XI.3.3. USE OF MATERIALS

Domestic Material Consumption (DMC) - includes the total amount of materials used directly in the economy (internal extraction used plus imports). The DMC components are: direct material inputs (DMI) and material export. It provides the calculation elements of the decoupling indicators regarding the use of resources.The Internal Consumption of Materials indicator (figure XI.10) had a variable tendency, registering minimum growth values between 2012-2014 respectively, a significant increase in 2015 followed by a stagnation in 2016.

Figure XI.10 Evolution of domestic consumption of materials (millions of tonnes), 2012 - 2016



	2012	2013	2014	2015	2016
Series 1	360972417	359781419	374310432	446118369	451260655

Source: National Institute of Statistics - until the date of elaboration of this report the data for the years 2017,2018 have not been processed

XI.4. GREEN ECONOMY

XI.4.1. PUBLIC INSTITUTIONS AND COMMERCIAL SOCIETES REGISTERED IN EMAS

RO 70	Indicator code Romania: RO 70 EEA 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.

The Community Environmental Management and Audit System (EMAS) is the European environmental management tool, a voluntary tool available to any type of organization operating in any economic sector, within or outside the European Union, designed to support organizations in improving continuous environmental performance, integrating the concept of sustainable development. ***EMAS and the eco-label are part of a broader package of product policy tools that contribute to the circular economy.*** Given the voluntary nature of this system as well as its low level of knowledge, the number of organizations applying for EMAS registration at national level is quite low, with organizations preferring rather to implement and certify an *environmental management system, according to ISO 14001 standard*. In order to support organizations, the European Commission, in consultation with EU Member States and stakeholders in the sectors addressed, has prepared two documents for each sector: a concise sector reference document (SRD) and a detailed technical report on the best environmental management practices ("*good practices report*"), for different sectors that have been identified as a priority. Such documents have been prepared for the sectors:

- retail,
- tourism,
- food indusrt and beverages,
- car production,
- manufacture of electrical and electronic equipment,
- public administration and
- agriculture.

For the construction and waste management sectors, the reports on the best practices have been finalized, and the SRDs are in progress. *Sector reference documents (SRD)* on best environmental management practice provide guidance and inspiration to organizations in certain sectors on how to improve environmental performance. By the environmental statements that the organizations must prepare for EMAS registration, they assume the performance indicators, so that at its annual update, the indicators can be evaluated to determine if the organization has achieved environmental performance. In 2018, EMAS registration was granted for SN Nuclearelectrica SA Cernavoda CNE Branch, being the first organization with this type of activity that was registered in EMAS.

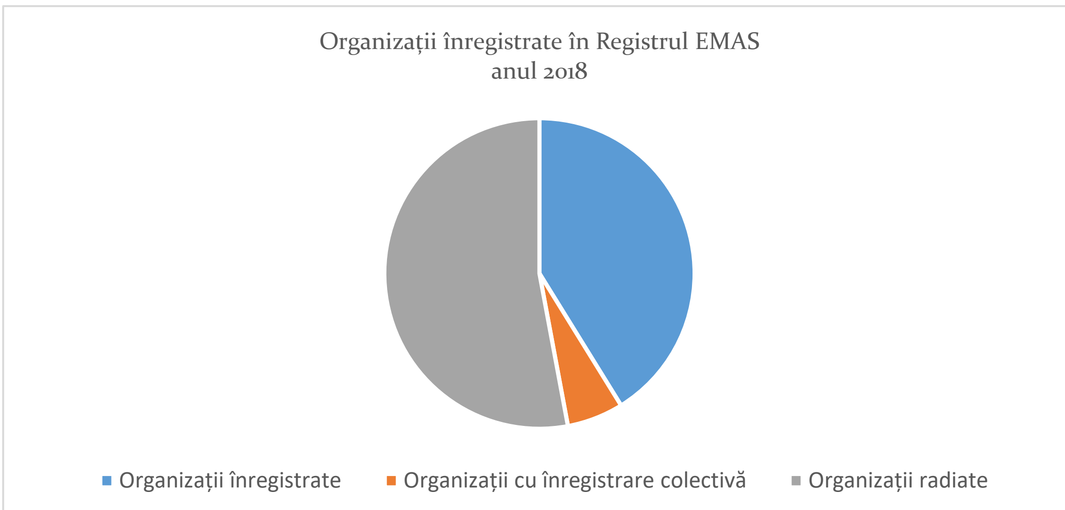
At the end of 2018, 17 organizations were registered in the EMAS National Register, but 9 of them were canceled, either due to requests from organizations due to the lack of funds needed to verify and validate the environmental statement, or because they were not complied with the requirements of the EMAS III Regulation (figure XI.11). The evolution of the number of Romanian organizations registered in EMAS between 2013 and 2018 is presented in table XI.5 .

Table XI.5 Evolution of the number of organizations in Romania registered in EMAS, 2013 – 2018

	Year 2013	Year 2014	Year 2015	Year 2016	Year 2017	Year 2018
Total number of organizations EMAS Registered	9	11	15	15	16	17
Registered organizations	5	6	10	11	11	7
Organizations with collective registration	1	1	1	1	1	1
Radiated organizations	3	4	4	3	4	9

Source: N.E.P.A

Figure XI.11 The number of organizations in Romania registered in EMAS, year 2018



Source: N.E.P.A

XI.4.2. NUMBER OF PRODUCTS AND SERVICES LABELED WITH THE EUROPEAN ECOLOGICAL LABEL

RO 71	Indicator code Romania: RO 71 EEA indicator code: SCP

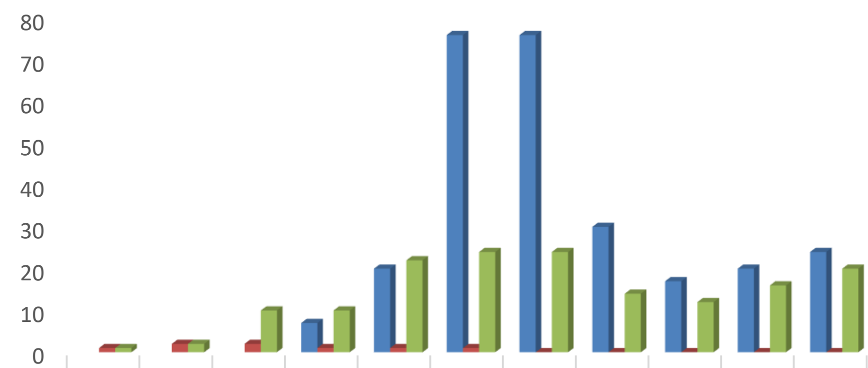
TITLE: NUMBER OF PRODUCTS AND SERVICES LABELED WITH THE EUROPEAN ECOLOGICAL LABEL
DEFINITION: The indicator shows the number of products and services for which the European Ecolabel has been awarded year by year. The indicator does not provide information on the share of organic products in the total range of consumer goods available to consumers.

The European eco-label shows that sustainable production is perfectly compatible with economic growth and job creation and that investing in eco-label compliance is a business opportunity.

At EU level, the decrease in the number of licenses and products granted, for several years, is mainly due to the entry into force of the new criteria, and companies wishing to use the EU eco-label must prove to comply with them.

In contrast, for 2018, statistics show that the number of eco-labels granted for products / services and licenses has gradually increased throughout this year for several product groups, mainly paints and varnishes, interior and exterior polishes, processed paper, woven paper, hard surface cleaning products. This situation can also be observed in Romania.The indicator shows the cumulative evolution of the number of products and services for which the European eco-label has been awarded (figure XI.12). Significant increases are in 2013 and 2014 of products labeled with the European eco-label. There are fifty-six products registered in 2013. In 2015, two European eco-labels were granted, for two products, and 2 licenses; no eco-labels were granted in 2016. In 2017, eco-labels were granted for 3 products and 4 licenses, and in 2018 eco-labels were granted for 4 products and 4 licenses.

Figure XI.12 Evolution of the number of products and services labeled with the eco-label and licenses granted, 2008 - 2018



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Produse etichetate				7	20	76	76	30	17	20	24
Servicii etichetate	1	2	2	1	1	1	0	0	0	0	0
Licente acordate	1	2	10	10	22	24	24	14	12	16	20

Source: N.E.P.A.

XI.4.3. ENVIRONMENTAL CHARGES AND FEES

XI.4.3.1. Environmental investments for compliance

XI.4.3.2. Expenditure on environmental protection

XI.4.3.3. Financial support for environmental protection

XI.4.3.4. Income from environmental taxes

- ***No indicators*** –

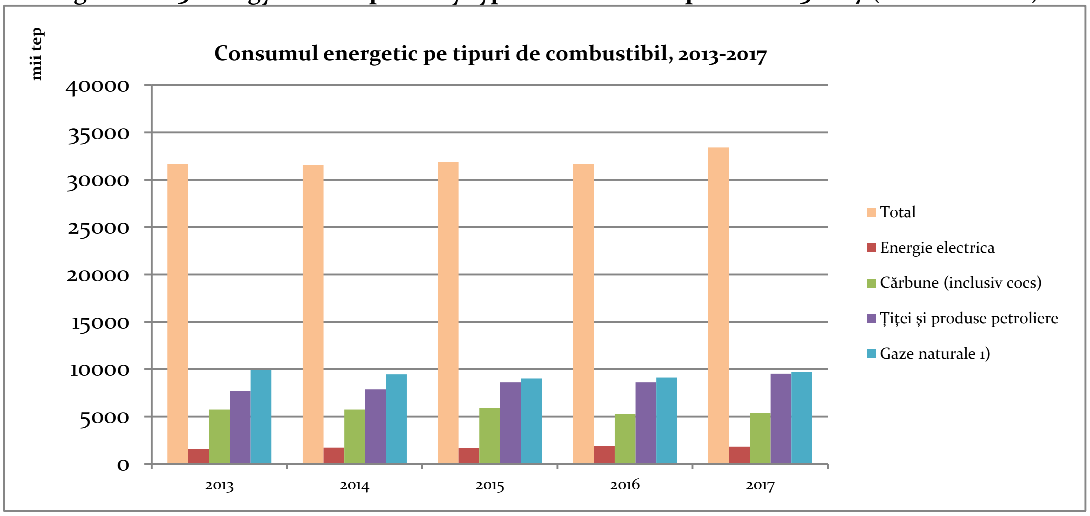
XI.4.4. ECO-EFFICIENCY OF THE MAIN ACTIVITY SECTORS

XI.4.4.1. Energy

RO 29	Indicator code Romania: RO 29 EEA 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.

Figure XI. 13 Energy consumption by type of fuel for the period 2013-2017 (thousand toe)

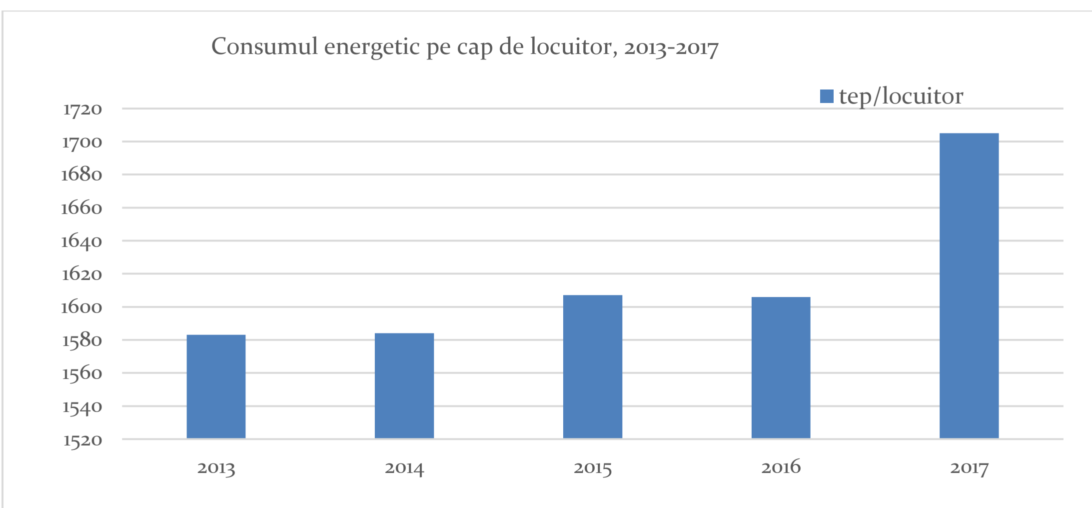


1) Excluding gasoline and ethane from extraction scaffolds that are contained in crude oil

Source: http://www.insse.ro - until the date of preparation of this report, the data for 2018 have not been processed

Regarding the energy consumption by types of fuel (figure XI.13), it is observed that the highest share corresponds to the values related to natural gas over the entire period analyzed, followed by that related to the consumption of crude oil and petroleum products. Gross domestic consumption (including losses) increased slightly in 2017, compared to 2016, with 1753 thousand toe, representing + 5.5%. By types of energy carriers, gross domestic consumption of crude oil and petroleum products (+940 thousand toe), natural gas (+618 thousand toe) and coal (including coke) increased by +104 thousand toe. Electricity consumption remained relatively constant compared to 2016. (according to data published by the National Institute of Statistics (INS).

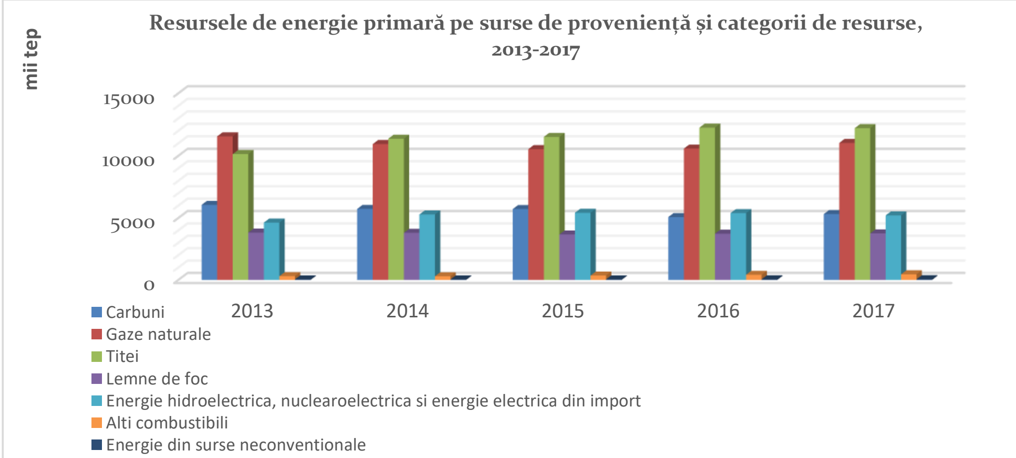
Figure XI.14 Energy consumption per capita, 2013 - 2017, expressed in tonnes of oil equivalent (toe / inhabitant)



Source: http://www.insse.ro - until the date of preparation of this report, the data for 2018 have not been processed

The gross domestic energy consumption per inhabitant in 2017 was 1705 toe / place, + 6.1%, compared to 2016 (1606 toe / place.) The trend of gross domestic energy consumption per inhabitant in the period 2013-2017 is shown in figure XI.14, where there is an increase from 1583 toe / place in 2013, to 1705 toe / place in 2017, + 7.7%.

Figure XI.15 - Primary energy resources by source and category of resources, 2013 - 2017 (thousands tep)

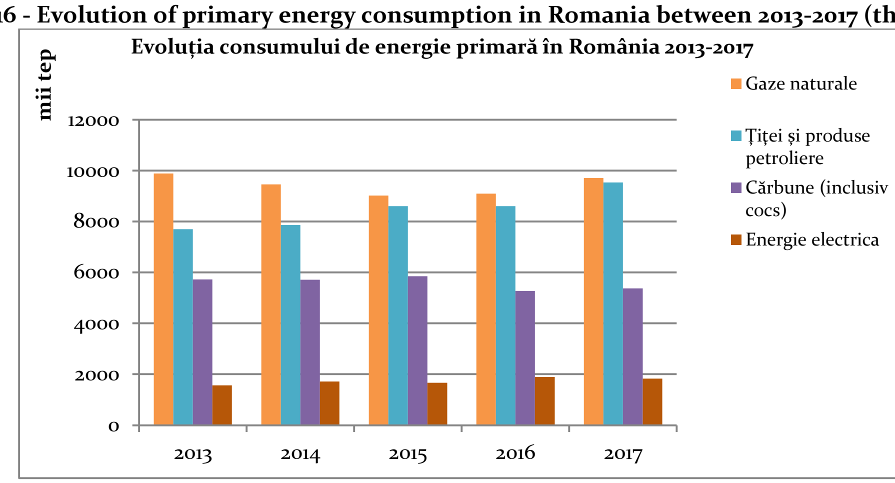


Source: http://www.insse.ro (TEMPO_IND107A_14_8_2018) - until the date of preparation of this report, the data for 2018 have not been processed

The primary energy resources in 2017 were 41821 thousand tons of oil equivalent, increasing by 907 thousand toe (+ 2.2%) compared to the previous year. Figure XI.15 shows the evolution of primary energy resources from the following types of fuels: coal, natural gas, oil, firewood (including biomass), other fuels, energy, energy from unconventional sources. The majority share of primary energy production from crude oil and natural gas is observed.

The primary energy production in 2017, of 25,417 thousand toe, increased by 619 thousand toe as compared to 2016 and continued to maintain its significant share in the total energy resources, accounting for 58.6% of them. The most important increase was the production of usable natural gas (+746 thousand toe), representing + 9.5% compared to the previous year. Primary electricity production decreased by 10.5% compared to the previous year (-243 thousand toe). A downward trend also registered oil production (-166 thousand toe, representing -4.5%). *National Institute of Statistics.* **The total domestic primary energy consumption** was 33391 thousand toe in 2017, increasing by 5.5% compared to 2016. The evolution of primary energy consumption in Romania between 2013 and 2017 is shown in figure XI.16.

Figure XI.16 - Evolution of primary energy consumption in Romania between 2013-2017 (thousands tep)



Source: http://www.insse.ro - until the date of preparation of this report, the data for 2018 have not been processed

Given the current challenge of ensuring energy resources and the need to reduce CO2 emissions, as well as the protection of the environment, investments in energy efficiency and renewable energy, recovery of secondary energy resources and combating the energy poverty phenomenon is a strategic priority for Romania. ("Romania's Energy Strategy 2016 - 2030")

RO 10	Indicator code Romania: RO 10 EEA indicator code: CSI 10

TITLE: GREENHOUSE GAS EMISSIONS TRENDS

DEFINITION: The indicator shows the trends (total and by sectors) of greenhouse gas emissions in relation to the obligations of the Member States to comply with the Kyoto Protocol objectives. The emissions are presented according to their type and are analyzed according to their potential contribution to the amplification of the global warming phenomenon**.**

The indicator provides information on the emissions from the main anthropogenic sources of greenhouse gases, distributed on the following emission sectors (according to the IPCC nomenclature): energy supply and use, transport, industry, agriculture, waste, etc. *The indicator does not refer* to emissions from international aviation and maritime transport, which are not regulated by the Kyoto Protocol. Generally, these sources are not taken into account when calculating the total greenhouse gas emissions reported at national and European level. Also, emissions from land use, land use change and forestry (LULUCF) are not included in the total greenhouse gas emissions. (Bibliographic source: EEA, *indicators,* http://www.eea.europa.eu/data-and-maps/indicators).

The context of the relevant environmental policies

This indicator aims to support the European Commission's annual assessment of progress in reducing emissions in the EU and in Member States, in order to meet the objectives included in the Kyoto Protocol under the ***EU Greenhouse Gas Monitoring Mechanism (EU Regulation***) No. 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions, as well as reporting, at national and Union level, other information relevant to climate change and repealing Decision No 280 / 2004 / EC*)*. The ultimate goal of the ***United Nations Framework Convention on Climate Change (UNFCCC***) is to stabilize greenhouse gas (GHG) concentrations "at a level that will prevent dangerous (human-induced) anthropogenic interference with the climate system. ***The Kyoto Protocol***, which follows the United Nations Framework Convention on Climate Change, is one of the most important international legal instruments in the fight against climate change. It sets mandatory targets for reducing greenhouse gas emissions for industrialized countries and the European Union. ***The European Union's annual greenhouse gas inventory*** and inventory report, officially submitted to the UNFCCC Secretary, is prepared on behalf of the European Commission by the European Thematic Center for Air and Climate Change of the European Environment Agency (ETC / ACM), supported by the Joint Research Center and Eurostat. The EC inventory is elaborated according to the EU Regulation no. 525/2013. The purpose of this Regulation and the subsequent legislation is to:

- monitor all anthropogenic GHG emissions covered by the Kyoto Protocol in the Member States;
- evaluate the progress made in meeting the GHG reduction commitments under the UNFCCC and the Kyoto Protocol;
- implement the UNFCCC and the Kyoto Protocol with regard to national programs, greenhouse gas inventories, national systems and registers of the European Union and its Member States, as well as the relevant procedures provided for by the Kyoto Protocol;
- ensure that Member States and the Community communicate to the UNFCCC Secretary timely comprehensive, accurate, coherent, comparable and transparent information.

Law 24/1994 - Romania has ratified the ***United Nations Framework Convention on Climate Change (UNFCCC***), which creates the general framework for intergovernmental action on climate change. One of the main objectives of the UNFCCC is the atmospheric stabilization by keeping the concentrations of greenhouse gases at a level that prevents the disruption of the climate system. Romania was the first country, included in Annex I of the United Nations Framework Convention, which ratified by **Law no. 3/2001 The Kyoto Protocol**, thus committing to an 8% reduction of greenhouse gases, in the period 2008-2012, compared to the base year considered to be 1989.

The national strategy on climate change and economic growth based on low carbon emissions for the period 2016-2020, adopted by Government Decision no. 739/2016. The overall objective of this strategy is to mobilize and enable private and public actors to reduce GHG emissions from economic activities in line with national targets and commitments to the EU and adapt to the impact of both current and global climate change. and future. The implementation of the strategy will help Romania to make the transition to a climate-resilient economy and to determine an advantageous situation for all parties involved**. *The national action plan for the implementation of the National Strategy on climate change and economic growth based on low carbon emissions for the period 2016-2020,*** adopted by the aforementioned Government Decision. The overall objective is to support the Romanian Government in preparing climate change actions for both GHG emission reduction and adaptation policies within the Operational Programs for the 2014-2020 financial cycle. ***Directive 2003/87 / EC - regarding the establishment of a scheme for the commercialization of the greenhouse gas emission certificates transposed in the Romanian legislation by HG no. 780/2006,*** allows economic agents from the sectors covered by the Directive to participate in the greenhouse gas emissions trading, offering the opportunity for climate change issues to be looked at economically. For the implementation of *H.G. no. 780/2006 regarding the establishment of the scheme for the commercialization of the greenhouse gas emissions certificates***, the National Allocation Plan (NAP)** was elaborated, through which the Romanian Government establishes and assigns the number of greenhouse gas emission certificates. greenhouse they intend to allocate at national level. ***Decision no. 406/2009 / EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce greenhouse gas emissions so as to comply with the Community's commitments to reduce greenhouse gas emissions by 2020.***

Legislation specific to the National System for Estimating the Level of Anthropic Emissions from Sources or Retention by Sequestration of All Greenhouse Gases (SNEEGES):

- *GD no. 1570/2007 regarding the establishment of the National System for Estimating the level of the anthropic emissions from sources or of the restraints by sequestration of all the Greenhouse Gases,* regulated by the Kyoto Protocol, with the subsequent modifications and completions.;
- *Order of the Minister of the Environment no. 1376/2008* - for approving the procedure regarding the reporting of INEGES (National Inventory of Greenhouse Gas Emissions) and on the way of answering the observations and questions arising from the INEGES review;
- *Order of the Minister of the Environment no. 1474/2008* - for the approval of the procedure regarding the processing, archiving and storage of data specific to the National Inventory of greenhouse gas emissions.
- *Order of the Minister of Environment and Climate Change no. 1442/2014* regarding the approval of the procedure regarding the selection of estimation methods and emission factors necessary to estimate the level of greenhouse gas emissions.;
- *Order of the Minister of Environment and Climate Change no. 1602/2014* for the approval of the Plan on quality assurance and control (QA / QC) of the National Inventory of Greenhouse Gas Emissions.

The greenhouse gases covered by the UNFCCC are: carbon dioxide (CO_2), methane (CH_4), nitrogen oxide (N_2O), hydroflurocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and trifluoride of nitrogen (NF_3). According to the provisions of this law, an annual assessment of greenhouse gas emissions is carried out.

Targets

The indicator analyzes trends in total GHG emissions in the EU since 1990 in connection with EU and Member State objectives. The European Union and its Member States, including Romania, have independently communicated a target of reducing greenhouse gas emissions associated with economic activities of 20% reduction by 2020 compared to 1990 levels. The target of reducing emissions for Romania for the years 2013-2020 is part of the common target of the European Union. The European Union target is implemented in the context of the EU Energy and Climate Change Package.

At national level, the limitation and reduction of greenhouse gas emissions is achieved by applying the GHG Emissions Trading Scheme (EU ETS) (the target set at European level for Romania is - 21% in 2020, compared to the hypothetical level of emissions from the EU ETS sector since 2005) and by applying the provisions included in Decision no. 406/2009 / EC.

Taking into account the obligations to respect the annual national GHG emission reduction targets in accordance with the provisions of Decision no. 406/2009 / EC, it is necessary for each economic sector to develop strategies and action plans that identify the measures and resources needed to ensure at national level the linear emission trajectory between 2013-2020.

Progress made in reducing greenhouse gas emissions in Romania

Environmental policies related to climate change are an extremely important step, and Romania must adhere to the European effort to meet the ambitious goals set in the EU climate change policy. The national GHG emission reduction policy follows the European approach, respectively on the one hand ensuring that some economic operators participate in the implementation of the GHG emission trading scheme and, on the other, adopting sectoral policies and measures in so that at national level the GHG emissions from these sectors comply with the linear trajectory of the emission limits established by applying Decision no. 406/2009 / EC. The GHG Emissions Trading Scheme (EU ETS) regulates emissions from plants with production capacity and considerable emissions from the Energy and Industrial Processes sectors. In order to optimize the planning of GHG emission reductions from the other sources that are not covered by the EU ETS scheme, a correlation of the sectoral annual emission plans from the regulated sources is required by applying Decision no. 406/2009 / EC (non EU ETS), taking into account the emissions and the reduction potential of each sector, as well as the national economic development priorities. Analyzing the amount of CO2 emissions at the European Union level, it was found that the largest quantity is the result of the production of electricity and heat. For example, coal-based energy production in EU countries generated around 973 million tonnes of CO2 emissions in 2005, which represents 23% of total EU CO2 emissions. As regards Romania, the CO2 emissions generated by different sectors of activity also highlight the major contribution of the energy sector and of transport, which means that these are the areas on which measures and actions to reduce CO2 emissions are needed. ***According to the national inventory of greenhouse gas emissions made by our country in 2017, GHG emissions from the Energy sector represent approximately 82% of the total, including LULUCF and 66.39% of the total, excluding LULUCF (****Table XI.6 and Figures from XI.17****).*** At the European Union level, the Transport Sector remains the sector with the highest impact on greenhouse gas emissions, with a growth trend of 26% between 1990 and 2007, respectively 1% between 2006 and 2007, due in mainly increasing the demand for the transport of passengers and goods as well as the preference for the use of roads as a mode of transport in exchange for other less polluting modes of transport.

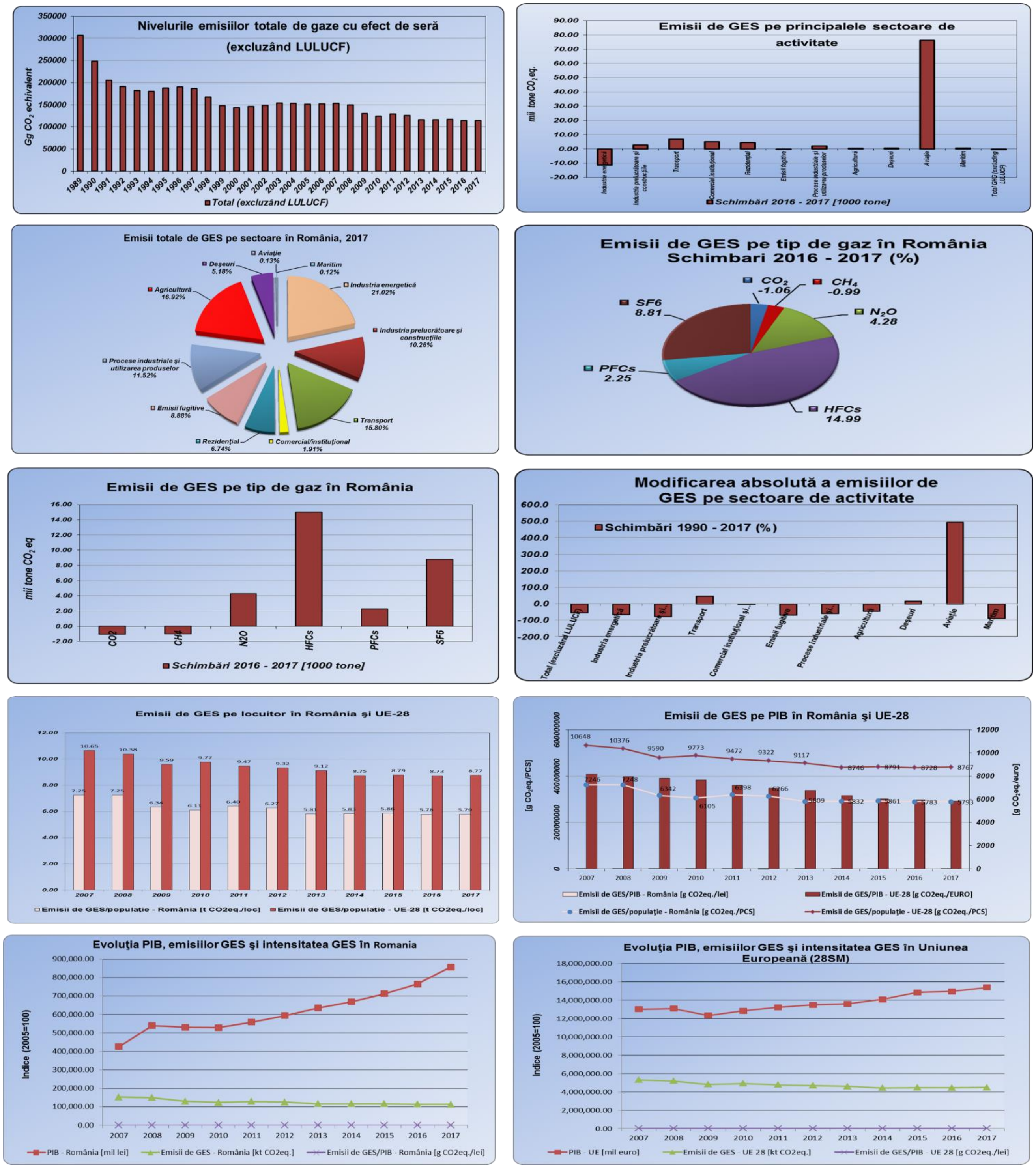
Table XI.6 - Total annual greenhouse gas emission levels between 2000 and 2017 (thousands of tonnes CO2 equivalent)

Year	Total emissions (excluding LULUCF)	Total emissions (including LULUCF)
2000	143.126,49	122.214,49
2001	146.156,29	124.346,35
2002	148.861,18	129.109,99
2003	153.745,21	133.623,38
2004	152.515,69	132.669,88
2005	151.352,50	130.446,21
2006	152.072,15	131.623,07
2007	153.116,77	133.439,59
2008	149.572,57	129.483,38
2009	129.622,37	109.559,94
2010	123.904,96	103.186,84
2011	129.229,58	109.752,54
2012	125.917,07	105.093,61
2013	116.304,94	94.987,14
2014	116.328,57	93.991,94
2015	116.462,88	94.532,77
2016	114.272,30	91.167,19
2017	113.795,95	92.115,92

Source: N.E.P.A.

Figures XI.17 - Total GHG emission levels - GHG emissions by main sectors of activity - Total GHG emissions by sectors in Romania, 2017 - GHG emissions by type of gas in Romania Changes 2016 - 2017% - GHG emissions by type of gas in Romania - Absolute change in GHG emissions by activity sectors - GHG emissions per capita in Romania and EU 28 - GHG emissions in GDP in Romania and EU 28 - GDP evolution, GHG emissions and GHG intensity in Romania - GDP evolution, GHG emissions and GHG intensity in the EU (28 MS)

Source: N.E.P.A.



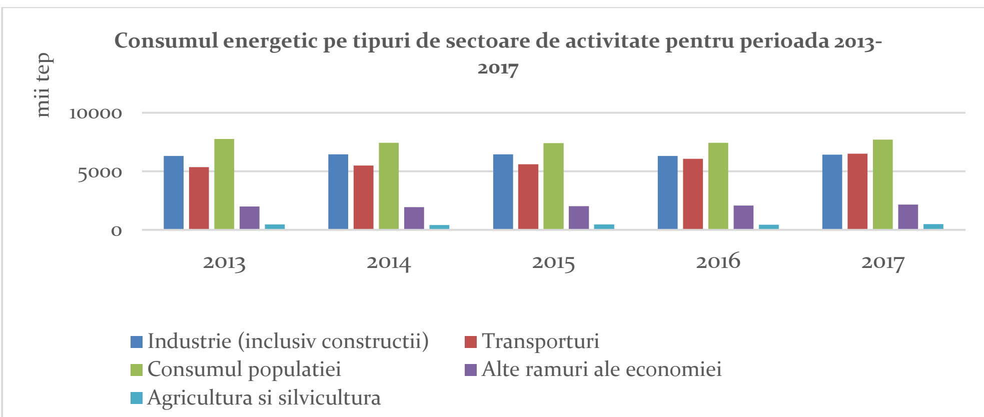
XI.4.4.2. Industry

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

TITLE: FINAL ENERGY CONSUMPTION BY TYPE OF ACTIVITY SECTOR
DEFINITION: The final energy consumption covers the energy supplied to the final consumer for the various energy purposes. It is calculated as the sum of the final energy consumption in all sectors of activity. They are structured in such a way as to include industry, transport, households, services and agriculture.

The assessment of the degree of energy dependence at the sector level is made by summing the amounts of energy used on the branches of activity according to the energy balance. The quantities used for the production of other fuels, the consumption of the energy sector and the losses of transport and distribution are not included.In 2017, primary energy production increased by 2.5% compared to 2016, and imports of energy products increased by 3.7%; gross domestic energy consumption increased by 5.5% compared to the previous year; final energy consumption increased by 4.3% compared to 2016 (cf. INSE, "Energy balance 2017")

Figure XI.18 Energy consumption by types of activity sectors for the period 2013 - 2017 (thousand toe)



Source:http://www.insse.ro - until the date of preparation of this report, the data for 2018 have not been processed

Regarding ***the energy consumption by types of activity sectors*** between 2013-2017, it is observed that the highest share is held by the energy consumption in the residential sector, followed by the industrial activities and the transport activities (*figure XI.18*) **The final energy consumption** in 2017 increased by 952 thousand toe (+ 4.3%) compared to 2016. The final energy consumption in the industry (including construction) increased by 106 thousand toe (+ 1.7%), mainly due to the large industrial sectors consuming energy resources, such as the chemical and pharmaceutical industry, rubber and plastics products (+57 thousand toe) and the metal construction industry, machinery and equipment (+47 thousand toe), whose cumulative energy consumption represents 30.5% of final consumption in industry (including construction). In metallurgy, the final energy consumption decreased (-48 thousand toe, representing -2.8%) compared to 2016. Transport, the tertiary sector and the population also registered increases in energy consumption compared to 2016 (+ 7.6%, + 4.0%, respectively + 3.6%) and, with a cumulative weight of 70.4%, contributed significantly to the increase of final energy consumption in 2017.

XI.4.4.3. Agriculture

RO 25	Indicator code Romania: RO 25 EEA 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 XI.7 presents the situation of the application of chemical fertilizers on agricultural soils during the period 2005-2018, from which it is noted the tendency of applying chemical fertilizers on surfaces that represent over 57% of the arable area of the country (in 2018 being fertilized approx. (72%), but also the decrease of the area fertilized in 2018 by 532,381 ha compared to 2017. Compared to 1999, the following findings can be made:

- the quantities of chemical fertilizers applied (N, P2O5, K2O) reached maximum values at the level of 2018,
- applied quantities increased by about 44% at N, by 57% at P2O5 and by about 21% at K2O compared to 2017,
- compared to 1999, the quantities of N and P2O5 applied in 2018 registered increases of up to 240%, and those of K2O of up to 500%,
- the total quantities of NPK increased from 35.4 kg in 1999 to 89.8 kg in 2018 on arable land,
- of the total fertilizers used in 2018, those based on N represent 65%, those with phosphorus 27%, and those based on potassium 8%.

The quantity of natural fertilizers (table XI.8) applied in 2018, compared to the one used in 1999, is less than about 12%, and the surface on which natural fertilizers were applied registered slight increases compared to 1999 and year 2017, and the average quantity applied in 2018 was 18.9 t / ha.In 2018, only 8.52% of the cultivated area was fertilized with natural fertilizers, which, corroborated with the data of mineral fertilization, indicates that a balance of the nutritional balance of these lands is necessary in order to produce safe and stable crops.

Table XI.7 Use of chemical fertilizers in the agriculture of Romania between 1999 and 2018

Year	Chemical fertilizers used (tonnes of active substance)				$N+P_2O_5+K_2O$ (kg.ha^{-1})		Fertilized surface, ha
	N	P_2O_5	K_2O	Total	Arable	Agricultural	
1999	225000	93000	13000	331000	35,4	22,5	3640900
2000	239300	88300	14600	342200	36,5	23,0	3724578
2005	299135	138137	24060	461392	49,0	31,3	5737529
2006	252201	93946	16837	363000	38,5	24,7	5388348
2007	265487	103324	18405	387000	41,1	26,3	6422910
2008	279886	102430	15661	397977	42,3	27,1	6762707
2009	296055	100546	29606	426207	45,3	29	5889264
2010	305756	123330	51500	480586	51,0	32,7	7092256
2011	313333	126249	47362	486944	51,8	33,3	6893863
2012	289983	113045	34974	438002	46,8	30,0	6340780
2013	328088	107543	33324	468955	49,9	32,1	5965817
2014	303562	118574	30103	452239	48.2	30,9	6676089
2015	357352	132657	42693	532702	56.7	36,4	6574741
2016	344000	126000	44000	514000	54.7	35,1	6491498
2017	381342	144869	55259	581470	61.8	39,7	7272565
2018	547694	227605	66894	842193	89,8	57,7	6740184

[1]*Source: I.N.S, M.A.D.R*

Table XI.8 The quantity of natural fertilizers applied between 1999 and 2018

Year	Total fertilizers		The surface on which it was applied		Share of application area to the arable area	The average quantity per ha			
						at the applied surface		at the agricultural surface	
	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
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	630.293	92.7	6,70	23,02	94	0.99	88
2012	13.292.617	80	605.694	89	6,48	21,95	89,5	0,91	81
2013	13.282.877	80	613.563	90	6,53	21,65	88,2	0,91	81
2014	16.261.702	98	795.031	117	8,47	20,45	83,3	1,11	98
2015	15.212.325	91	864.218	127	9,20	17,60	71,7	1,04	92
2016	14.927.000	90	862.330	127	9,18	17,3	70,5	1,02	90
2017	12.625.073	76	708.364	104	7,54	17,8	72,5	0,86	76
2018	14.617.549	88	771.814	113	8,52	18,9	77,02	1,00	88

[1]*Source: I.N.S, M.A.D.R*

XI.4.4.4. Transport

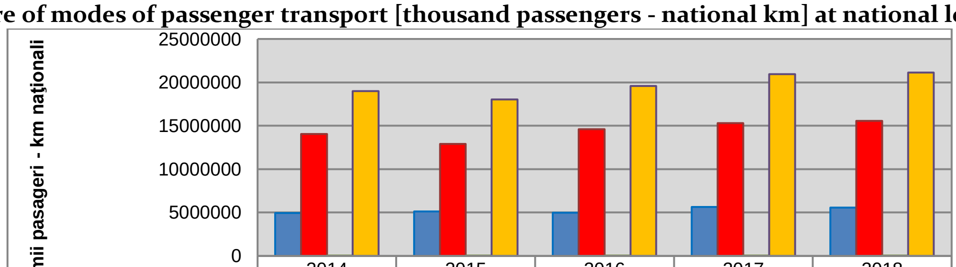
RO 35

Indicator code Romania: RO 35
EEA 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 contains data referring only to the transport on the national territory, regardless of the nationality of the transport vehicle, for the transport of cars, buses and coaches, respectively trains (subway & tram and light subway are excluded) for a period for at least 5 years. The variable is calculated from the passenger - kilometer (pkm) indicator, defined as the transport of a passenger over a distance of one kilometer. Figure XI.19 shows the share of the modes of passenger transport [thousand passengers - national km]) at national level between 2014 - 2018.

Figure XI.19 Share of modes of passenger transport [thousand passengers - national km] at national level, 2014 - 2018



	2014	2015	2016	2017	2018
Feroviar	4924523	5106514	4952622	5629215	5542677
Rutier	14060938	12914062	14609472	15319994	15573425
Căi navigabile	10,910	9,500	7,650	7,650	6,000
Total	18996371	18030096	19569744	20956859	21122102

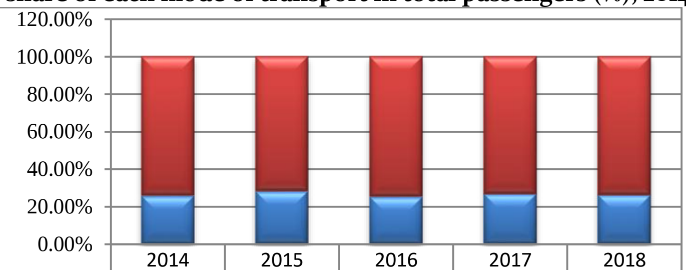
Source: I.N.S., Ministry of Transport

In the case of rail transport, a stagnation trend is observed between 2014-2016, increasing in 2017 with 676 593 thousand passengers - national km compared to 2016, and in 2018 registering a slight decrease of 86,538 thousand passengers - national km in front from the previous year. A fluctuating trend is also observed in the case of road transport. In 2014 and 2016 there is an increase of 1,146,886 respectively 1,695,410 thousand passengers - national km compared to 2015. Between 2017-2018 there is a progressive increase compared to the previous years. In 2014, water transport is 10,910 thousand passengers - national km followed by a significant decrease in the following years. In 2018 there was a decrease of 4,910 thousand passengers - national km compared to 2014.

The share of each mode of transport in passenger transport

This indicator, presented in figure XI.20, has recorded relatively different variations for the three modes of transport, as follows: in the **waterway transport** there is a decreasing trend from 2014 to 2018; in **road transport** in 2015 it registered a slight decrease compared to 2014 and 2016, and until 2018 there was a gradual increase; in the **railway transport** there is a tendency of stagnation in the years 2014 and 2016. In the years 2017 and 2018 there are slight variations of growth compared to the previous years, the year 2015 presents the lowest value compared to the other years.

Figure XI.20 The share of each mode of transport in total passengers (%), 2014 - 2018



	2014	2015	2016	2017	2018
cai navigabile	0.06%	0.06%	0.03%	0.03%	0.02%
rutier	74.02%	71.63%	74.66%	73.10%	73.73%
feroviar	25.92%	28.32%	25.31%	26.86%	26.24%

Source: I.N.S., Ministry of Transport, www.mt.ro

Use of public transport

The volume of **local public passenger transport** refers to the transport by bus and minibus, respectively by metro, tram and trolley buses. The local public passenger transport includes the 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 a distance of one kilometer. Analyzing the **evolution of the use of public transport** (table XI.9 and figure XI.21), there is a fluctuating trend in the case of trams in 2014-2018. In 2015, the lowest value in the last five years was reached at 2,384 674.6. In the case of buses, minibuses, trolleybuses and the subway there is a tendency to slow down the evolution of public transport (thousands of passengers-km).

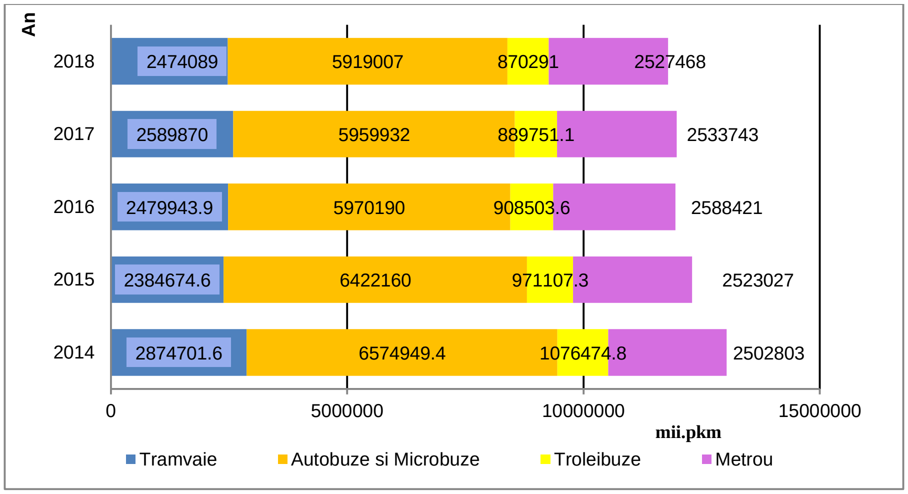
Table XI.9 Evolution of the use of public transport (thousands of passengers-km), at national level, 2014 - 2018

thousands of passengers -km

	2014	2015	2016	2017	2018
Trams	2874701.6	2384674.6	2479943.9	2589870.0	2474089
Buses and minibuses	6574949.4	6422160.0	5979190.0	5959932.0	5919007
Trolleybuses	1076474.8	971107.3	908503.6	889751.1	870291
Metro	2502803.0	2523027.0	2588421.0	2533743.0	2527468
TOTAL	13028928.8	12300968.9	11956059.2	11973296.0	11790855

Source: National Institute of Statistics

Figure XI.21 - Evolution of the use of public transport (thousands of passengers-km), at national level, 2014 -2018



Source: National Institute of Statistics

RO 36	Indicator code Romania: RO 36 EEA indicator code: CSI 36

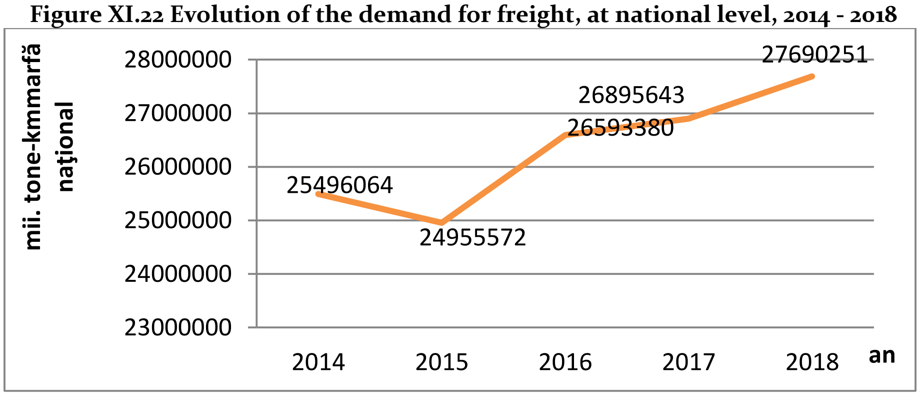
TITLE: DEMAND FOR TRANSPORT OF GOODS

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.

Road freight includes transport by vehicles registered in the reporting country, and rail and inland waterway transport include transport on the national territory, regardless of the nationality of the transport vehicle, registered for a period of at least 5 years. The variable is calculated from the ton-km (tkm) indicator, defined as the transport of one tonne of goods over a distance of one kilometer.

From the analysis of the evolution of the demand for freight (figure XI.22) it can be observed that in 2015, the total route of the goods transported at national level was of 24 955 572 thousand tons-km, registering the smallest value of the 5 years analyzed. In 2018, a maximum value of 27,690 251 thousand tons-km was reached.

Figure XI.22 Evolution of the demand for freight, at national level, 2014 - 2018

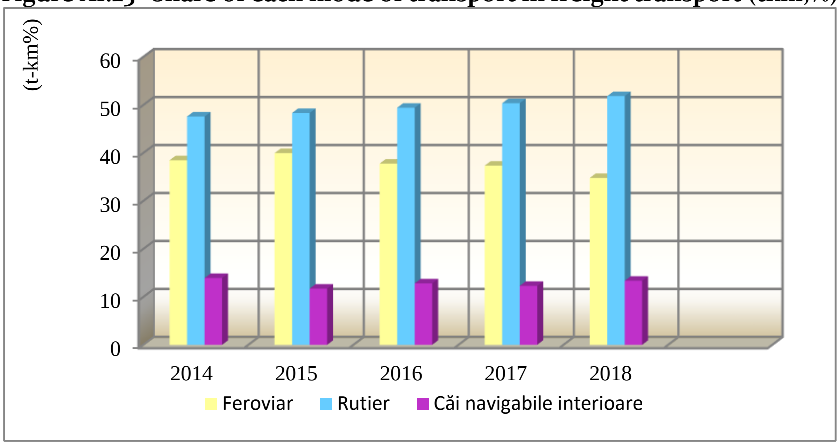


Source: National Institute of Statistics

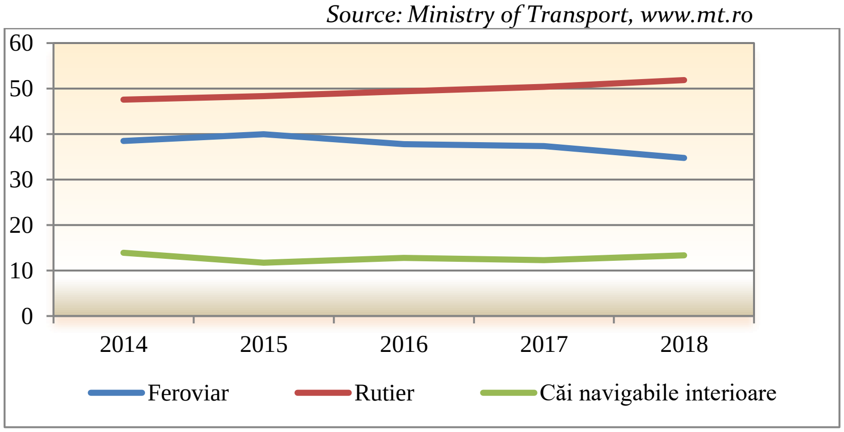
The weight of each mode of transport in the transport of goods

The modes of transport considered are: a) road, b) rail and c) inland waterways. Road freight transport includes transport in vehicles registered in the reporting country, and rail and inland waterway transport include transport within the national territory, regardless of the nationality of the transport vehicle. The share is calculated from the ton-km indicator (tkm,%), defined as the transport of one tonne of goods over a distance of one kilometer. It can be observed that both in the case of the demand for passenger and freight transport, a large percentage holds the road transport to the detriment of the 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 railway. Figure XI.23 shows the weight of each mode of transport in the transport of goods (tkm) at national level, for the period 2014 - 2018.

Figure XI.23 Share of each mode of transport in freight transport (tkm,%)



Source: Ministry of Transport, www.mt.ro



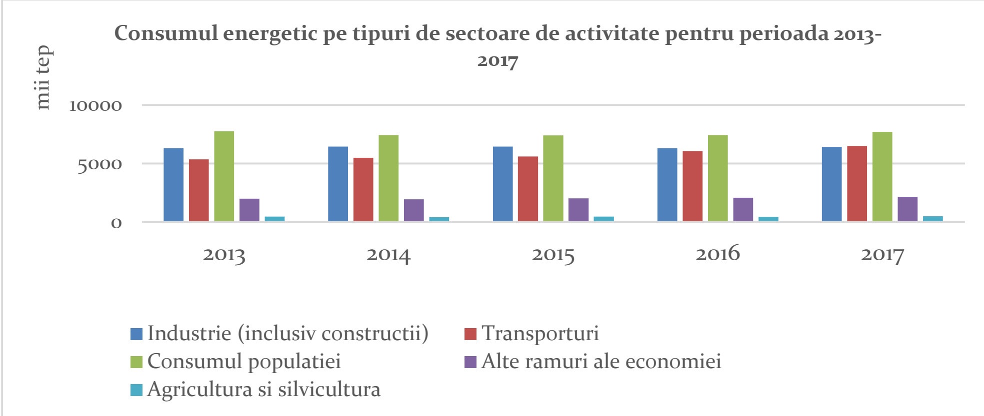
Source: Ministry of Transport, www.mt.ro

XI.4.4.5. Housing

RO 27	Indicator code Romania: RO 27 EEA 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.

Figure XI.24 Energy consumption by types of activity sectors for the period 2013 - 2017 (thousand toe)



Source:http://www.insse.ro

Regarding ***the energy consumption by types of activity sectors*** between 2013-2017 it is observed that the highest share is held by the energy consumption in the residential sector, followed by the industrial activities and the transport activities (*figure XI.24*) **The final energy consumption** in 2017 increased by 952 thousand toe (+ 4.3%) compared to 2016. The final energy consumption in the industry (including construction) increased by 106 thousand toe (+ 1.7%), mainly due to the large industrial sectors consuming energy resources, such as the chemical and pharmaceutical industry, rubber and plastics products (+57 thousand toe) and the metal construction industry, machinery and equipment (+47 thousand toe), whose cumulative energy consumption represents 30.5% of final consumption in industry (including construction). In metallurgy, the final energy consumption decreased (-48 thousand toe, representing -2.8%) compared to 2016. Transport, the tertiary sector and the population also registered increases of energy consumption compared to 2016 (+ 7.6% , + 4.0%, respectively + 3.6%) and, with a cumulative weight of 70.4%, contributed significantly to the increase of final energy consumption in 2017.

RO 10	Indicator code Romania: RO 10 EEA 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.

Between 1989 and 2017, the total emissions of greenhouse gases** (Table XI.10) **registered a decreasing trend, in 2007 they increased by about 0.69% compared to the previous year. Between 2008 and 2017, greenhouse gas emissions from the residential and commercial sector increased by 3.11%.The share of total GHG emissions of category 1.A.4.b in sub-sector 1.A.4** (figure XI.25 and table XI.11) **is approximately 59.34% for the base year 1989 and 68.53 % for 2017.

The contribution of this category is approximately 7,667.80 kt CO2. equivalent in 2017. There is a major contribution of the use of natural gas as a fuel in this category of activity, for the entire period of time 1989-2017.

Table XI.10 Greenhouse gas emissions - "Other subsectors" subsector

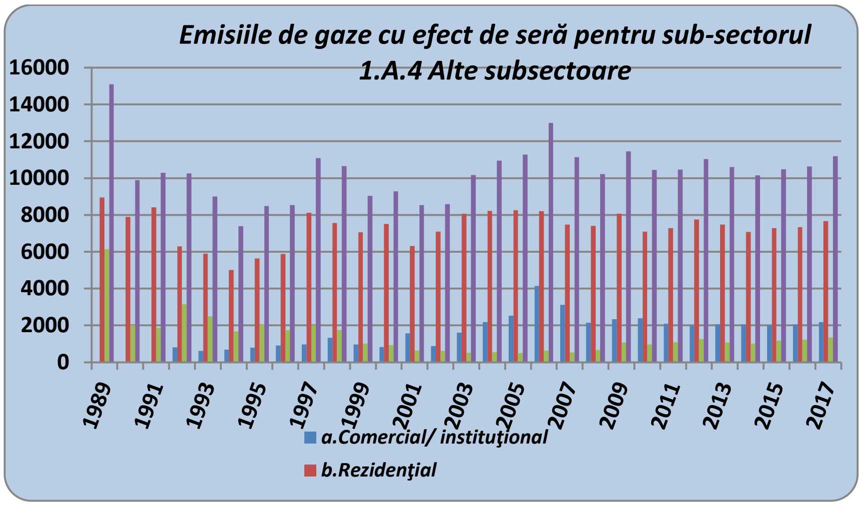
Source: N.E.P.A.

Greenhouse gas emissions for the "Other subsectors" sub-sector ($Gg\ CO_2$ equivalent)				
Year	1.A.4. Other subsectors			
	a. Commercial/ institutional	b.Residențial	c.Agriculture/ forestry / fishing	Total
1989	0	8953	6136	15088
1990	0	7892	2005	9897
1991	0	8414	1873	10287
1992	804	6292	3155	10251
1993	617	5898	2487	9002
1994	696	5008	1680	7384
1995	800	5640	2046	8486
1996	916	5881	1739	8537
1997	961	8117	2014	11091
1998	1336	7558	1750	10644
1999	966	7057	1010	9033
2000	836	7510	939	9285
2001	1580	6314	634	8528
2002	879	7091	618	8588
Greenhouse gas emissions for the "Other subsectors" sub-sector ($Gg\ CO_2$ equivalent)				
Year	1.A.4. Other subsectors			
	a. Commercial/ institutional	b.Residențial	c.Agriculture/ forestry / fishing	Total
2003	1602	8060	509	10172
2004	2186	8222	542	10950
2005	2522	8262	499	11283
2006	4149	8206	640	12996
2007	3122	7475	539	11136
2008	2142	7403	673	10217
2009	2333	8058	1068	11459
2010	2397	7088	960	10445
2011	2091	7279	1084	10454
2012	2012	7756	1265	11033
2013	2066	7471	1064	10601
2014	2062	7070	1017	10150

2015	2013	7284	1176	10473
2016	2067	7341	1235	10643
2017	2174	7668	1347	11188

Source: N.E.P.A.

Figure XI.25 Evolution of greenhouse gas emissions from the Energy sector - Subsector 1.A.4 Other sectors (commercial / institutional, residential, agriculture / forestry / fisheries) for the time series 1989 - 2017



Source: N.E.P.A - National emissions reported under the EU Greenhouse Gas Monitoring and Reporting Mechanism

Table XI.11 Share of GHG emissions - the subsector „Other subsectors"

Year	Share (%)		
	a.Commercial/ institutional	b.Residenţial	c. Agriculture/ forestry/ fishing
1989	0,00	2,92	2,00
1990	0,00	3,18	0,81
1991	0,00	4,11	0,91
1992	0,42	3,29	1,65
1993	0,34	3,24	1,37
1994	0,39	2,78	0,93
1995	0,43	3,01	1,09
1996	0,48	3,10	0,92
1997	0,52	4,36	1,08
1998	0,80	4,53	1,05
1999	0,65	4,77	0,68
2000	0,58	5,25	0,66
2001	1,08	4,32	0,43
2002	0,59	4,76	0,42
2003	1,04	5,24	0,33

2004	1,43	5,39	0,36
2005	1,67	5,46	0,33
2006	2,73	5,40	0,42
2007	2,04	4,88	0,35
2008	1,43	4,95	0,45
2009	1,80	6,22	0,82
2010	1,93	5,72	0,77
2011	1,62	5,63	0,84
2012	1,60	6,16	1,00
2013	1,78	6,42	0,91
2014	1,77	6,08	0,87
2015	1,73	6,25	1,01
2016	1,81	6,42	1,08
2017	1,91	6,74	1,18

Source: N.E.P.A.

RO 16

Indicator code Romania: RO 16
EEA 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.)

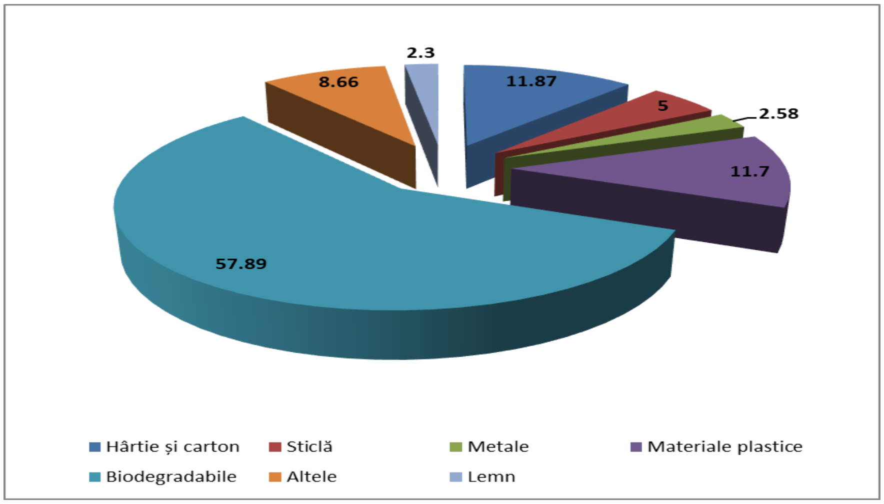
According to the provisions of the National Plan on Waste Management, approved by H.G. no. 942/2017, "municipal wastes are household wastes and other wastes, which, by nature or composition, are similar to household wastes". According to Decision 2011/753 / EU establishing norms and calculation methods for verifying compliance with the objectives set in art. 11, paragraph 2 of Directive 2008/98 / EC of the European Parliament and of the Council, municipal waste means household and similar waste.
Municipal waste collection is the responsibility of the municipalities, who can carry out these tasks either directly (through the specialized services within the Local Councils) or indirectly (by delegating this responsibility on a contract basis, to specialized and authorized companies to perform the sanitation services).
In 2017, the quantity of waste collected through the specialized services of the mayors or of the sanitation companies was 5311 thousand tons (municipal waste and construction and demolition waste collected from the population). Of the total amount of waste collected by the sanitation operators, 84% is represented by domestic and similar waste (table XI.12 and figure XI.26)

Table XI.12 Waste collected by municipalities in 2017 (thousand tons; %)

Waste collected	Quantity collected - thousands of tons	Percentt %
domestic and similar waste	4471	84
waste from municipal services	612	12
construction / demolition waste	228	4
TOTAL	**5311**	**100**

Source: National Environmental Protection Agency

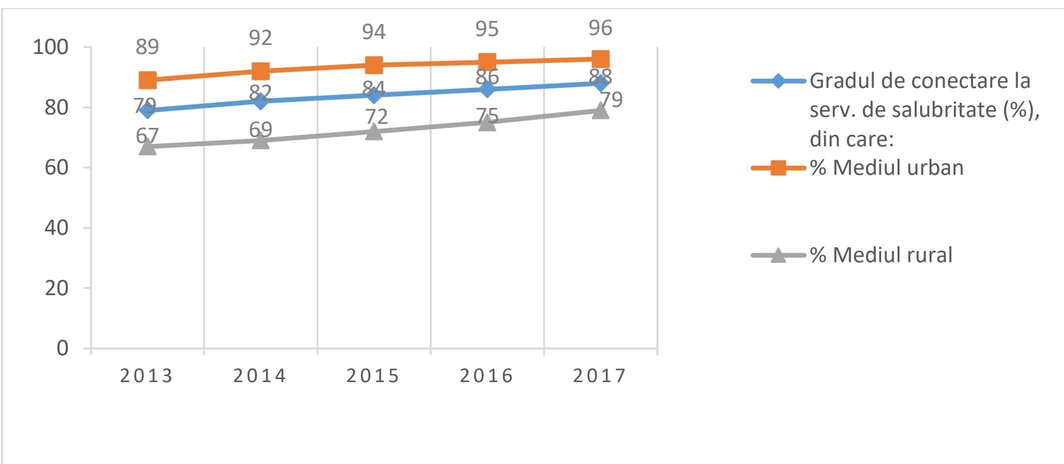
Figura XI.26 Percentage composition of household and similar waste collected by sanitation operators in the year 2017



Source: National Environmental Protection Agency

It should be noted that, ***at national level, municipal waste collection is not widespread***. *Figure XI.27 shows the evolution of the degree of connection to the sanitation service in the period 2013-2017.*

Figure XI.27 The degree of connection to the sanitation service in the period 2013-2017



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).

Disposal of municipal waste is done exclusively by landfill. So far, in Romania no installations for the incineration of municipal waste have been put into operation. At the end of 2018, 43 compliant deposits for municipal waste were authorized and in operation.

Indicators regarding municipal waste, at national level:

- ***Municipal waste generated in 2017 - 5324764 tons***

The value was calculated by summing the quantities generated for the following types of waste:

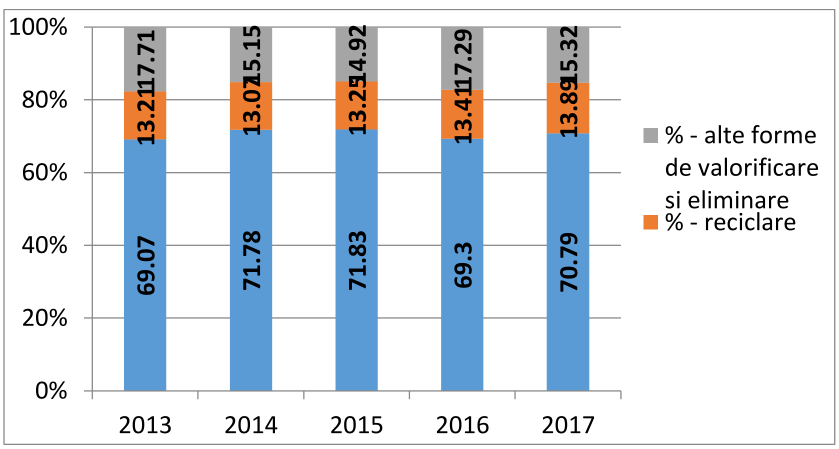
  - domestic and similar waste and from municipal services collected by sanitation operators, excluding inert waste,
  - domestic waste generated and not collected by sanitation operators,
  - recyclable waste from the population, collected through authorized economic operators, other than sanitation operators (paper and cardboard, metals, plastic, glass, wood, textiles, WEEE - preliminary data, waste batteries and accumulators).

- ***Recycled municipal waste (including composting) in 2017 - 739384 tons***

The value was calculated by summing the recycled quantities for the following types of waste:

  - domestic and similar waste and from municipal services collected by sanitation operators,
  - domestic waste generated and not collected 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, textiles, WEEE - preliminary data, waste batteries and accumulators).
  - **The degree of recycling achieved for municipal waste in 2017 - 13.89 %**

Figure XI.28 Share of main municipal waste management activities in 2013-2017



Source: National Environmental Protection Agency

XI.4.4.5.1. Energy efficiency of buildings

XI.4.4.5.2. The efficiency of thermoelectric power plants and their own technological consumption

- *No indicators* –

XI.5. FORECASTS, POLICIES AND MEASURES CONCERNING CONSUMPTION AND THE ENVIRONMENT

- *No indicators* –

Chapter XII. TRENDS AND CHANGES IN ROMANIA COMPARED TO TRENDS IN THE EUROPEAN UNION

XII.1. TRENDS AND CHANGES IN ROMANIA

XII.1.1. SOCIAL
XII.1.2. ECONOMICS
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
XII.2.2. PRIMARY ENERGY INTENSITY AND TOTAL ENERGY CONSUMPTION PER CAPITA
XII.2.3. ELECTRICAL ENERGY FROM RENEWABLE ENERGY SOURCES
XII.2.4. EMISSIONS OF ACIDIFYING SUBSTANCES
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XII.2.6. REQUEST FOR TRANSPORTATION OF GOODS
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XII.2.8. MUNICIPAL WASTE GENERATION
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Chapter 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. EVOLUTION OF NUMBER OF POPULATION AT NATIONAL LEVEL AND IN URBAN AGGLOMERATIONS

XII.1.2. ECONOMICS

XII.1.2.1. GDP EVOLUTION ON NATIONAL LEVEL AND MAIN ACTIVITY SECTORS

XII.1.3. ENVIRONMENTAL POLICIES

- **No indicators –**

XII.2. ASSESSMENT OF ENVIRONMENTAL PERFORMANCE OF ROMANIA

XII.2.1. GHG EMISSIONS INTENSITY AND EMISSIONS OF GHG PER CAPITA

RO 10	Indicator code Romania: RO 10 EEA 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.

The indicator presents the existing trends in greenhouse gas emissions and analyzes the trends (total and by sectors), in relation to the obligations of Member States to comply with the Kyoto Protocol objectives. The emissions are presented according to their type and are analyzed according to their potential contribution to the amplification of the global warming phenomenon. The natural greenhouse effect has the role of regulating the average temperature of the Earth while maintaining optimal living conditions. Solar energy reaches the earth in the form of short wavelength radiation. Some are reflected by the atmosphere and the earth's surface. Most of it passes through the atmosphere and warms the surface of the earth which, in turn, emits infrared radiation, with high wavelength (heat). Changing the radiative balance, thus changing the balance between the radiation entering and leaving the contour of the Earth and its atmosphere, increases the global temperature (positive change) or decreases it (negative change). Some gases in the atmosphere absorb heat and, reflecting it back to the surface of the earth, heat the atmosphere. These are the so-called greenhouse gases (GES or GHG - "greenhouse gases") (NEPA, Report on the state of the environment in Romania).

Definitions (according to UNFCCC - United Nations Framework Convention on Climate Change):
Emissions: release of greenhouse gases and / or their precursors into the atmosphere over a specific area and time period. *Greenhouse gases:* represents those gaseous components of the atmosphere, both natural and anthropic, which absorb and re-emit infrared radiation. *Disposal*: any process, activity or mechanism that removes a greenhouse gas, an aerosol

or a precursor of a greenhouse gas from the atmosphere. *Source:* any process or activity that releases a greenhouse gas, an aerosol, or a precursor to a greenhouse gas in the atmosphere. *Gases:* The greenhouse gases provided under the UNFCCC are: CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3. This list does not include greenhouse gases, which are also substances that deplete the ozone layer and are controlled by the Montreal Protocol.

Emissions sources: The indicator provides information on emissions from the main anthropogenic sources of greenhouse gases, distributed over the following emission sectors (according to the IPCC nomenclature): supply and use of energy, transport, industry, agriculture, waste, etc. The indicator does not refer to emissions from international aviation and maritime transport, which are not regulated by the Kyoto Protocol. Generally, these sources are not taken into account when calculating the total greenhouse gas emissions reported at national and European level. Also, emissions from land use, land use change and forestry (LULUCF) are not included in total greenhouse gas emissions. *Bibliographic source: EEA, indicators,* http://www.eea.europa.eu/data-and-maps/indicators

Relevant environmental policies

The indicator supports the European Commission's annual assessment of progress in reducing emissions in the EU and in the Member States, in order to meet the objectives included in the Kyoto Protocol under the EU Greenhouse Gas Monitoring Mechanism (EU Regulation No 525 / 2013 on a mechanism for monitoring and reporting greenhouse gas emissions, as well as reporting, at national and Union level, other information relevant to climate change and repealing Decision No 280/2004 / EC). The ultimate goal of the United Nations Framework Convention on Climate Change (UNFCCC) is to stabilize greenhouse gas (GHG) concentrations "to a level that will prevent dangerous (human-induced) anthropogenic interference with the climate system."

The Kyoto Protocol, which follows the United Nations Framework Convention on Climate Change, is one of the most important international legal instruments in the fight against climate change. It sets mandatory targets for reducing greenhouse gas emissions for industrialized countries and the European Union. The European Union's annual greenhouse gas inventory and inventory report, officially submitted to the UNFCCC Secretariat, is prepared on behalf of the European Commission by *the European Thematic Center for Air and Climate Change* of the European Environment Agency (ETC / ACM), supported by the *Joint Research Center and Eurostat*. The EC inventory is elaborated according to the *EU Regulation no. 525/2013*. The purpose of this Regulation and the subsequent legislation is to:

- monitor all anthropogenic GHG emissions covered by the Kyoto Protocol in the Member States;
- evaluate the progress made in meeting the GHG reduction commitments under the UNFCCC and the Kyoto Protocol;
- implements the UNFCCC and the Kyoto Protocol with regard to national programs, greenhouse gas inventories, national systems and registers of the European Union and its Member States, as well as the relevant procedures provided for by the Kyoto Protocol;
- ensures that the Member States and the Community communicate to the UNFCCC Secretariat timely comprehensive, accurate, coherent, comparable and transparent information.

Legea 24/1994 - România a ratificat Convenția-cadru a Națiunilor Unite asupra Schimbărilor Climatice (UNFCCC) care creează cadrul general al acțiunilor interguvernamentale privind schimbările climatice. Unul dintre obiectivele principale ale UNFCCC îl reprezintă stabilizarea atmosferică prin păstrarea concentrațiilor gazelor cu efect de seră la un nivel care să prevină perturbarea sistemului climatic. ***Romania was the first country, included in Annex I of the United Nations Framework Convention, which ratified by Law no. 3/2001 Kyoto Protocol, thus committing to an 8% reduction of greenhouse gases, in the period 2008-2012, compared to the base year considered to be 1989.***

National strategy for climate change and economic growth based on low carbon emissions for the period 2016-2020*, adopted by the Government Decision no. 739/2016*. The overall objective of this strategy is to mobilize and enable private and public actors to reduce GHG emissions from economic activities in line with national targets and commitments to the EU and adapt to the impact of both current and global climate change. and future. The implementation of the strategy will help Romania to make the transition to a climate-resilient economy and to determine an advantageous situation for all parties involved. ***The national action plan for the implementation of the National Strategy on climate change and economic growth based on low carbon emissions for the period 2016-2020,***

adopted by the aforementioned Government Decision. The overall objective is to support the Romanian Government in preparing climate change actions for both GHG emission reduction and adaptation policies within the Operational Programs for the 2014-2020 financial cycle.

Directive 2003/87 / EC - regarding the establishment of a scheme for the commercialization of the greenhouse gas emission certificates transposed in the Romanian legislation by H.G. no. 780/2006, allows economic agents from the sectors covered by the Directive to participate in the greenhouse gas emissions trading market, offering the opportunity for climate change issues to be looked at economically. For the implementation of H.G. no. 780/2006 regarding the establishment of the scheme for the commercialization of the greenhouse gas emissions certificates, the ***National Allocation Plan (NAP***) was elaborated by which the Government of Romania establishes and assigns the number of greenhouse gas emission certificates they intend to allocate at national level. *Decision no. 406/2009 / EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce greenhouse gas emissions so as to comply with the Community's commitments to reduce greenhouse gas emissions by 2020.*

Legislation specific to the National System for Estimating the Level of Anthropic Emissions from Sources or Retention by Sequestration of All Greenhouse Gases (SNEEGES):

- *H.G. no. 1570/2007 regarding the establishment of the National System for Estimating the level of the anthropic emissions from sources or of the restraints by sequestration of all the Greenhouse Gases,* regulated by the Kyoto Protocol, with the subsequent modifications and completions;
- *Order of the Minister of the Environment no. 1376/2008* - for approving the procedure regarding the reporting of INEGES (National Inventory of Greenhouse Gas Emissions) and on the way of answering the observations and questions arising from the INEGES review;
- *Order of the Minister of the Environment no. 1474/2008* - for the approval of the procedure regarding the processing, archiving and storage of data specific to the National Inventory of greenhouse gas emissions.
- *Order of the Minister of Environment and Climate Change no. 1442/2014* regarding the approval of the procedure regarding the selection of the estimation methods and the emission factors necessary to estimate the level of greenhouse gas emissions.;
- *Order of the Minister of Environment and Climate Change no. 1602/2014* for the approval of the Plan on quality assurance and control (QA / QC) of the National Inventory of Greenhouse Gas Emissions.

The greenhouse gases covered by the UNFCCC are carbon dioxide (CO_2), methane (CH_4), nitrogen oxide (N_2O), hydroflurocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and trifluoride. of nitrogen (NF_3). According to the annual legal provisions, an assessment of the greenhouse gas emissions is carried out.

Targets and objectives

The indicator analyzes trends in total GHG emissions in the EU since 1990 in connection with EU and Member State objectives. ***The European Union and its Member States, including Romania, have independently announced a target for reducing greenhouse gas emissions associated with economic activities of 20% reduction by 2020 compared to 1990 levels.*** The emission reduction target for Romania for 2013-2020 is part of the common target of the European Union. The European Union target is implemented in the context of the EU Energy and Climate Change Package. ***At national level, the limitation and reduction of greenhouse gas emissions is achieved by applying the GHG Emissions Trading Scheme (EU ETS) (the target set at European level for Romania is - 21% in 2020, compared to the hypothetical level of emissions from the EU ETS sector since 2005) and by applying the provisions included in Decision no. 406/2009 / EC. Taking into account the obligations to comply with the annual national GHG emission reduction targets in accordance with the provisions of Decision no. 406/2009 / EC, it is necessary for each economic sector to develop strategies and action plans that identify the measures and resources necessary to ensure at national level the linear emission trajectory between 2013-2020.***

The national GHG emission reduction policy follows the European approach, respectively on the one hand ensuring that some economic operators participate in the application of the GHG emission trading scheme and, on the other, adopting sectoral policies and measures in so that at national level the

GHG emissions from these sectors comply with the linear trajectory of the emission limits established by applying Decision no. 406/2009 / EC. The GHG Emissions Trading Scheme (EU ETS) regulates emissions from plants with production capacity and considerable emissions from the Energy and Industrial Process sectors. In order ***to optimize the planning of GHG emission reductions from other sources that are not covered by the EU ETS scheme***, a correlation of the annual emission sector plans from the regulated sources is required by applying Decision no. 406/2009 / EC (non EU ETS), taking into account the emissions and the reduction potential of each sector, as well as the national economic development priorities. Analyzing the amount of CO_2 emissions at the European Union level, it was found that the largest quantity is the result of the production of electricity and heat. For example, coal-based energy production in EU countries generated around 973 million tonnes of CO_2 emissions in 2005, which represents 23% of total EU CO_2 emissions. As for Romania, the CO_2 emissions generated by different sectors of activity also highlight the major contribution of the energy sector and of transport, which means that these are the areas on which measures and actions to reduce CO_2 emissions are needed. ***According to the national inventory of greenhouse gas emissions made by our country in 2017, GHG emissions from the Energy sector represent approximately 82% of the total, including LULUCF and 66.39% of the total, excluding LULUCF.*** At the European Union level, the Transport Sector remains the sector with the highest impact on greenhouse gas emissions, with a growth trend of 26% between 1990 and 2007, respectively 1% between 2006 and 2007, due in mainly increasing the demand for the transport of passengers and goods as well as the preference for the use of roads as a mode of transport in exchange for other less polluting modes of transport.

Starting with 2002, Romania submits annually to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), the National Inventory of Greenhouse Gas Emissions (INEGES), prepared according to the relevant IPCC methodology, in accordance with the national provisions on SNEEGES. UNFCCC requests accurate and regularly updated data on greenhouse gas emissions from industrialized countries, using comparable methodologies. To estimate anthropogenic greenhouse gas emissions, all countries must use the 2006 IPCC Guidance on National Greenhouse Gas Inventories. To be aggregated into a single figure, the emissions of different individual gases are converted to CO_2 equivalent, using the global warming potential (GWP) as provided in the IPCC guide. GWP is an estimation measure given by the contribution of each greenhouse gas to global warming (*Table XII.1*).

Table XII.1 – GWP for GHG

Gas	The potential of global warming (GWP)
carbon dioxide	1
methane	25
nitrous oxide	298
fluorinated gases (HFCs, PFCs, SF_6, NF_3)	11-22800

Sursa: N.E.PA. acc. Guide IPCC

HFCs and PFCs comprise a large number of different gases, with different GWPs. Countries report HFCs and PFCs in the CO_2 equivalent in millions of tons. Total emissions exclude greenhouse gas emissions and absorbents from land use, land use change and forestry (LULUCF) - table XII.2, figures XII.1 - (*Strategic directions of sustainable development in Romania, European Institute of Romania - Strategy and policy studies, 2006, http://www.ier.ro/documente/SPOS2006_ro/Spos2006_studiu_3_ro.pdf*).

Data analysis and interpretation

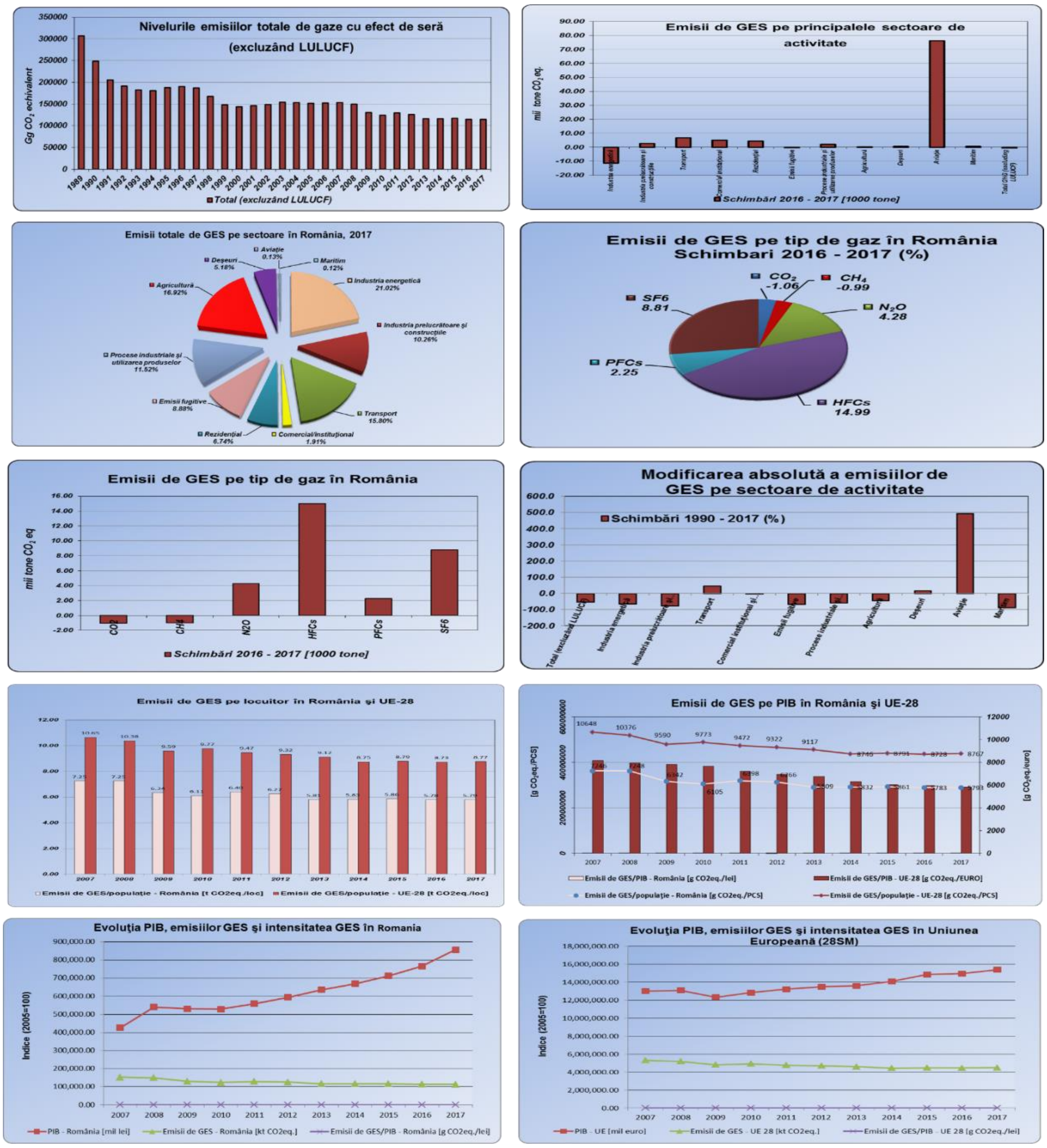
When there is a clear quantitative objective associated with a political objective, the evolution of the indicator is evaluated in relation to the direction that theoretically leads to the target. The evaluation is based on the deviation of the current evolution of the indicator from the theoretical 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 theoretical average annual growth rate that would be required to be met the target from the target year is: 100% or higher, the indicator is evaluated as "towards the target" (clearly favorable); between 80 and 100%, the indicator is evaluated as "close to the target" (moderately favorable); below 80%, the indicator is evaluated as "far from the target" (moderately unfavorable). In addition, the changes are evaluated as clearly unfavorable if they are in the wrong direction, that is, far from the target direction. Indicators designed to measure decoupling are evaluated based on the decoupling size. "Absolute decoupling" is the situation where the pressure on the environment decreases, even if the economy is growing, and the indicator is evaluated as "clearly favorable". Two other situations are interpreted as unfavorable trends, as both refer to an increase in pressure on the environment. When the pressure on the environment increases, but at a lower rate than that of the economic variable, it is called "relative decoupling" and is considered "moderately unfavorable". And when the pressure on the environment increases the same or at a rate higher than that of the economic variable, it is mentioned as a situation in which no decoupling has taken place and is considered "clearly unfavorable".

Table XII.2 Total annual greenhouse gas emissions levels between 2000 and 2017, thousands of tonnes CO2 equivalent

Year	Total emissions (excluding LULUCF)	Total emissions (including LULUCF)
2000	143.126,49	122.214,49
2001	146.156,29	124.346,35
2002	148.861,18	129.109,99
2003	153.745,21	133.623,38
2004	152.515,69	132.669,88
2005	151.352,50	130.446,21
2006	152.072,15	131.623,07
2007	153.116,77	133.439,59
2008	149.572,57	129.483,38
2009	129.622,37	109.559,94
2010	123.904,96	103.186,84
2011	129.229,58	109.752,54
2012	125.917,07	105.093,61
2013	116.304,94	94.987,14
2014	116.328,57	93.991,94
2015	116.462,88	94.532,77
2016	114.272,30	91.167,19
2017	113.795,95	92.115,92

Source: N.E.P.A.

Figures XII.1 Graphical representation of total annual greenhouse gas emission levels in the period 1989 - 2017 (thousands of tonnes CO2 equivalent) by activity sectors and per inhabitant in Romania and compared to the EU 28



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 EEA 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.

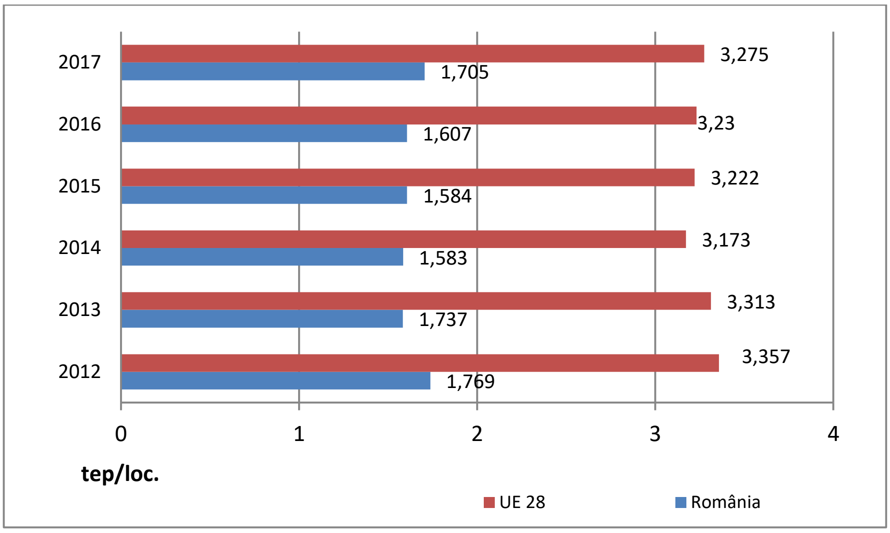
In 2011, gross domestic energy consumption (CIBE) in the EU-28 was 1707.8 million toe, but the decline of economic activity led to a decrease of this indicator between 2011 and 2014, to a minimum of 1613.4 million toe in 2014. Since 2015, gross domestic energy consumption (CIBE) in the EU-28 has started to grow to reach the value of 1674.9 million toe in 2017, a decrease of approximately 1, 93% compared to 2011, but also an increase of 3.67% compared to the 2014 minimum, due to the revival of economic activity.

In Romania, CIBE, the gross domestic energy consumption in 2012 was 35 648 thousand toe and represented the peak in the gross domestic energy consumption, since in the period 2012-2014 it decreased to a minimum of 31,538 thousand toe. In the last two years the gross domestic energy consumption registered a recovery due to the revival of the economic activity, to the value of 31,844 thousand toe in 2015 and 33391 thousand toe in 2017 with approximately 6.33% lower than in 2011.

Gross domestic energy consumption per capita

The gross domestic energy consumption per inhabitant represents the amount of energy related to a inhabitant, where the amount of energy is resulted by summing the primary energy production, the recovered products, the import and the stock at the beginning of the reference period from which the export, bunker and stock at the end of the reference period are reduced. Between 2011 and 2014, the gross domestic energy consumption per inhabitant in Romania registered a decrease of approximately 10.46%, slightly increasing in 2015-2017 to the value of 1,705 toe / inhabitant. At the level of 2016, Romania stands at approx. half of the average consumption in the EU-28. Figure XII.2 shows the evolution of the gross domestic energy consumption per inhabitant in Romania compared with the EU-28 in the period 2012-2017.

Figure XII.2 Gross domestic energy consumption per inhabitant at the level of Romania and the EU in the period 2012-2017

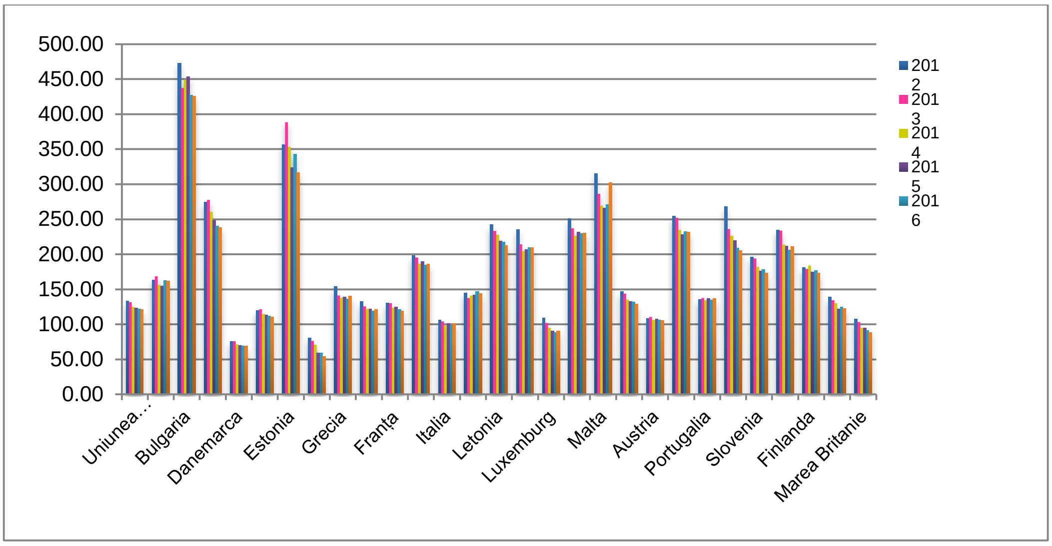


Sources: INS, Tempo online database; Eurostat, statistical database

Gross domestic energy consumption (CIBE) on gross domestic product

The CIBE in each country depends to a large extent on the structure of its energy system, on the natural resources available for the production of primary energy, as well as on the structure and level of development of its economy. ***Energy intensity*** is measured as the ratio between gross domestic energy consumption and the unit of production - GDP, being a key indicator for measuring progress under the Europe 2020 Strategy. The report is expressed in kilograms of oil equivalent to 1000 euros, and to facilitate the analysis over time, the calculations are based on GDP at constant prices at the prices of 2010. If an economy becomes more efficient in energy use and the GDP remains Relatively constant, then these indicators should fall. In 2017, the energy intensity in Romania was 205.6 kgep / 1000 euros, compared to the level registered in the EU-28 of 120.0 kgep / 1000euro, which places Romania among the EU-28 member states with high levels of energy intensity. However, ***in the period 2012-2017, in Romania the energy intensity of the economy decreased by 23.29%*** *(figures XII.3 and XII.4)*

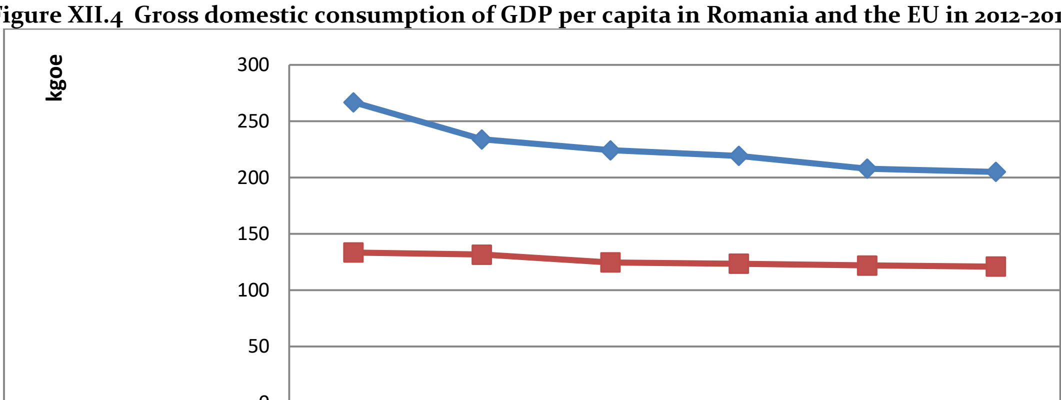
Figure XII.3 Energy intensity level in EU 28, comparison between 2012 - 2017



Sources: Eurostat, statistical database

It should be noted that, the structure of an economy plays an important role in determining energy intensity, that post-industrial economies where the service sector is developed will have relatively low levels of energy intensity, while developing economies, where economic activity may have a considerable weight, are characterized by higher values of energy intensity.

Figure XII.4 Gross domestic consumption of GDP per capita in Romania and the EU in 2012-2017



	2012	2013	2014	2015	2016	2017
România	266.89	234.03	224.33	219.32	207.92	205.1
UE	133.54	131.58	124.64	123.62	122.03	120.99

Sources: NIS, Tempo online database; Eurostat, statistic database

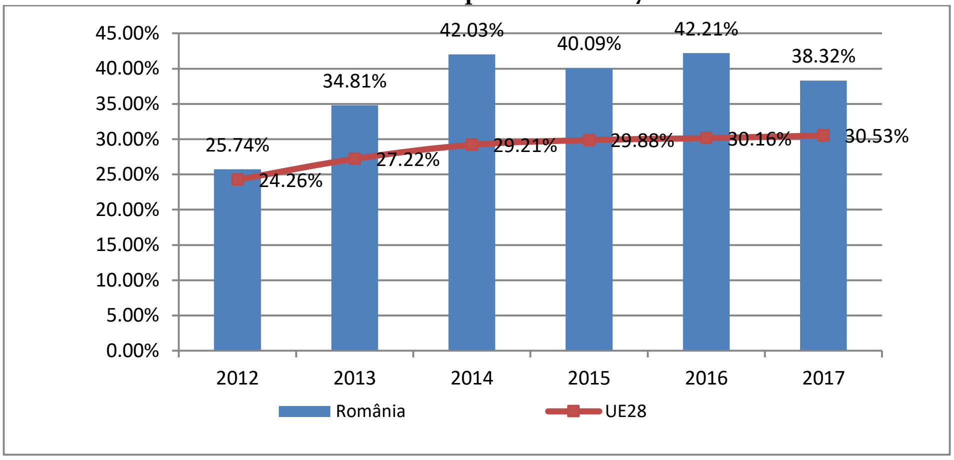
XII.2.3. ELECTRICAL ENERGY FROM RENEWABLE ENERGY SOURCES

RO 31	Indicator code Romania: RO 31 EEA 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 for electricity from renewable sources to account for at least 21% of total electricity production. The latest information available, for the year 2017 (figure XII.5) shows that the electricity produced from renewable energy sources contributed by 30.53% to the total electricity consumption in the EU-28. The increase in electricity produced from renewable energy sources over the last decade largely reflects an expansion into two renewable energy sources, namely wind energy and biomass energy.

Figure XII.5 The share of electricity from renewable energy sources in total electricity at the level of Romania and the EU in the period 2012-2017



Source: Eurostat, statistical database

Between 2012 and 2017, the share of electricity from renewable energy sources at EU level 28 shows a slight growth trend. In this period there is an increase from 24.26% to 30.53% of the share of electricity from renewable sources at EU level28. In recent years there has been an increase in the share of electricity produced in nuclear and wind power plants. The share of electricity from renewable energy sources in Romania (see figure XII.5), has experienced an upward trajectory between 2012 and 2017, from 25.74% in 2012 to 42.03% in 2014, with a cap trend at this level in 2016 (42.21%) or even the decline in 2017 (38.32%).

XII.2.4. EMISSIONS OF SUBSTANCES WITH ACIDIFYING EFFECTS

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

TITLE: EMISSIONS OF ACIDIFYING SUBSTANCES

DEFINITION: The indicator follows the trends in anthropogenic emissions of acidifying substances: nitrogen oxides (NO_x), ammonia (NH_3) and sulfur oxides (SO_x, SO_2) 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.

The acidity of the air is mainly determined by the presence of mineral acids which are in aerosol form and come from the various chemical industries, aluminum factories, etc. The increased acidity of the air has implications for all the environmental factors, the constructions and the health of the people. Emissions of sulfur oxides, nitrogen oxides and ammonia, come mainly from the burning of fossil fuels, chemical processes and transport. These pollutants are transported over long distances to the source of impurities, where in contact with solar radiation and water vapor form acid compounds. Through precipitation they deposit on the ground or enter the composition of the water.

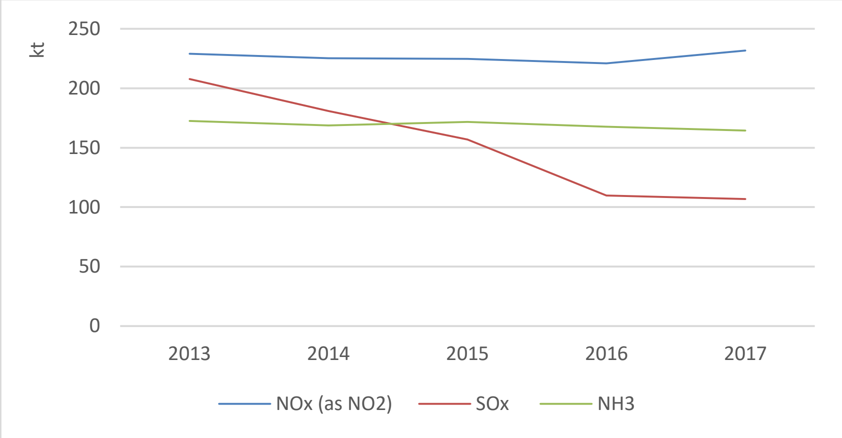
For SOx, there was a major decrease, with 48.5%, in the period 2013-2017, influenced by the economic developments, especially for those atmospheric pollutants that result mainly from energy production, industrial processes and road transport.

From the analysis of data on the trend of pollutant emissions from the sectors of activity it is observed that the reduction of atmospheric pollutant emissions, in order to comply with the air quality norms for certain areas, can be predicted / anticipated as an effect of their impact depending on the form of the data input (data complexity, organization of data, etc.), but also output ***(tables, graphs, see subchapter I.3 Trends and forecasts regarding ambient air pollution in* chapter I Air quality and pollution**).

Overall, the emissions of air pollutants with acidifying effect decreased in 2013-2017 by 17.43%, (SOx - 48.5% and NH3 - 4.7% (*figure XII.6*).

The NH3 reduction is mainly due to improved manure management. Romania is among the Member States that contributed the most to reducing SOx emissions between 2008 and 2017. This is the consequence of the environmental policy, of reducing the pollutant emissions at national level in the energy, industrial, transport, agriculture and waste sectors. NOx had an insignificant growth of 1.1% in 2017, compared to 2016.

Figure XII.6 Evolution of emissions of acidifying substances (kt), period 2013 -2017

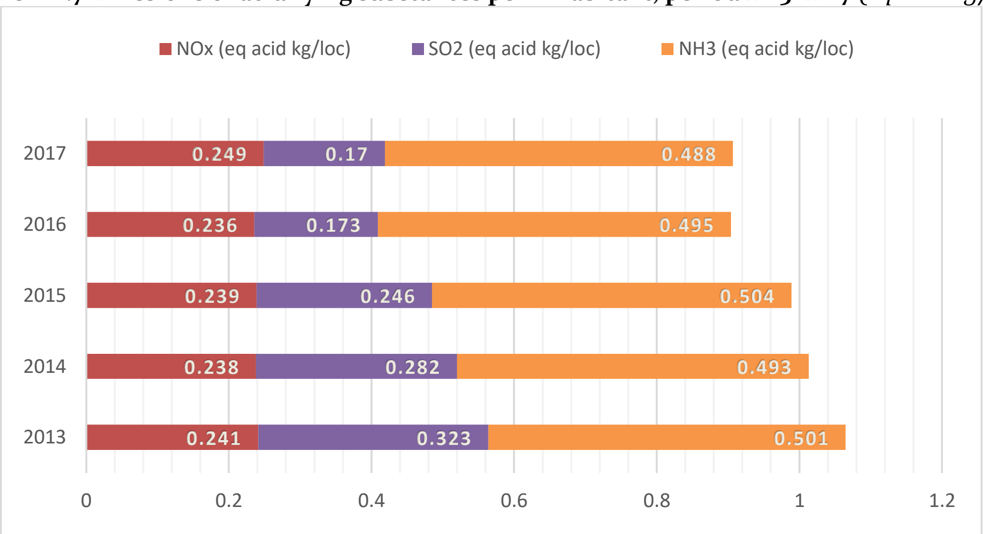


Source N.E.P.A.- Inventory Atmospheric Pollutant Emissions

In 2017, the level of emissions of air pollutants with acidifying effect per capita in Romania was 0.91 kg acid / place equivalent, the EU-28 average being 0.97 kg acid / place equivalent.

Figure XII.7 shows the evolution of the emissions of acidifying substances in eq acid kg / inhabitant in the period 2013-2017, at the level of Romania, which decreased from 1,065 total eq acid kg / place in 2013, to 0.907 total eq acid kg / place in 2017, meaning -14.8%.

Figure XII.7 Emissions of acidifying substances per inhabitant, period 2013 -2017 (*eq acid kg/loc*)



Source N.E.P.A.- Inventory Atmospheric Pollutant Emissions

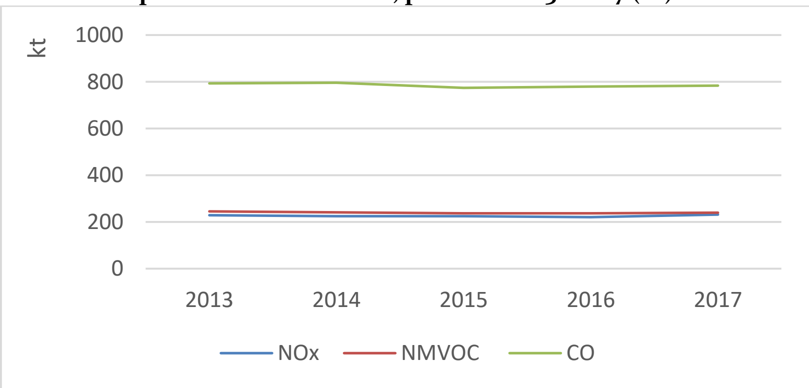
XII.2.5. OZONE PRECURSOR EMISSIONS

RO 02	Indicator code Romania: RO 02 EEA 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 (CH_4) 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 2013-2017, the emissions of atmospheric pollutants responsible for the formation of tropospheric ozone had minimal variations ± depending on the intensities of the activities in energy, industry, transport and agriculture, the general trend being slightly lower in 2017 compared to the previous years to CO emissions - 1.3%, and for NMVOC emissions -2.3% compared to 2013, NOx emissions slightly increasing by 1.13% compared to 2013, *figure XII.8*.

Figure XII.8 Evoluția emisiilor de precursori ai ozonului, perioada 2013 – 2017 (kt)

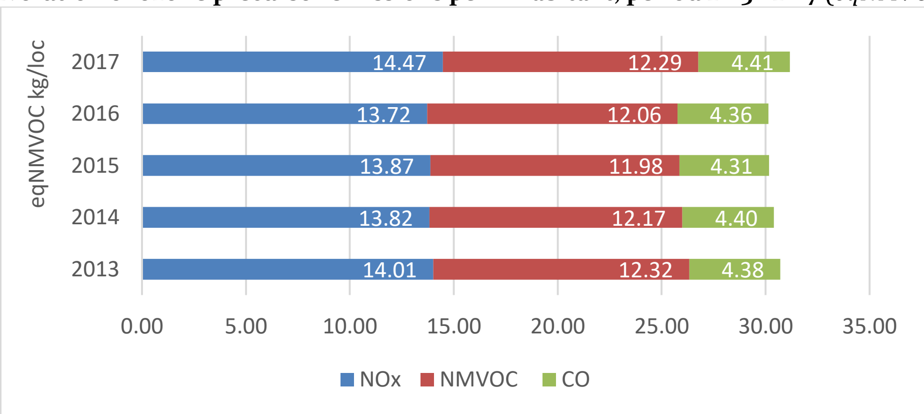


Source N.E.P.A.- Inventory Atmospheric Pollutant Emissions

Ozone precursor emissions per inhabitant in Romania increased in 2017 by 1.5% compared to 2013, from *30.7 eqNMCOVkg / place* in 2013, to *31.2 eqNMCOVkg / place* in 2017.

Figure XII.9 shows the evolution of ozone precursor emissions per inhabitant during 2013-2017 in Romania. We observe small fluctuations of decrease and growth in the period 2013-2017, the increase from 2017 taking place on account of the growth of the car park and the intensification of the activities in industry and agriculture.

Figure nr.XII.9 Evolution of ozone precursor emissions per inhabitant, period 2013 - 2017 (*eqNMVOC kg/loc*)



Source N.E.P.A.- Inventory Atmospheric Pollutant Emissions

Emissions of pollutants released into the atmosphere have a downward trend following the implementation of the principles of sustainable development and the adoption of environmental policies, such as: the production of green electricity - wind energy, photovoltaic energy, hydro, etc; reducing sulfur content in fuels and fuels and introducing biodiesel and bioethanol into fuels; replacing the heating of households in the rural area (traditional wood stoves) with modernized stoves that use pellets as fuel; introduction into operation of hybrid and electric vehicles; the provision of economic-financial mechanisms that allow the replacement of installations with significant polluting effect on the environment with less polluting ones; provision of facilities for retention, capture, storage of polluting substances (eg carbon capture and storage at large combustion plants-IMA, electrostatic filters, low NOx burners, scrubbers, etc.).

XII.2.6. DEMAND FOR TRANSPORT OF GOODS

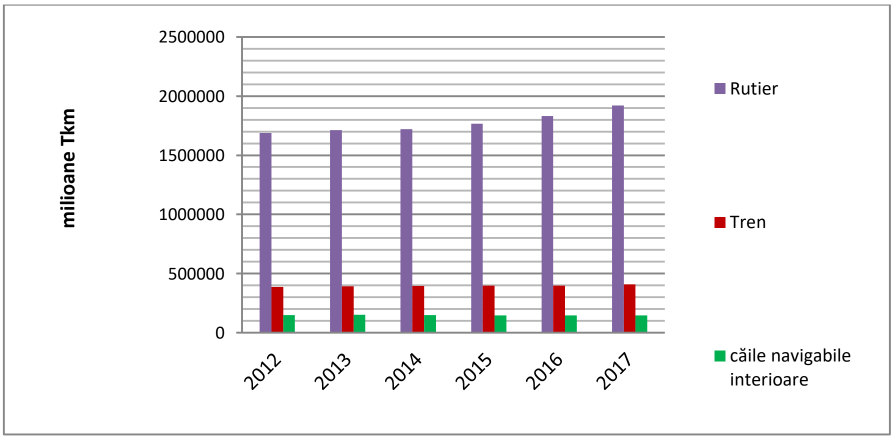
Demand for freight transport per unit of GDP

RO 36	Indicator code Romania: RO 36 EEA 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 2017, ***the share of domestic road freight transport in the EU*** accounted for over three quarters (76.7%) of total domestic freight transport (by tonne-kilometers performed) (*figura XII.10*). This share registered a slight decrease in the period 2010-2012, (by 2.3 percentage points) from the freight transport, subsequently marking a comeback in the period 2014-2017 from 74.8% to the share of 76.7% from freight transport, level close to the maximum of 2009 (77%). After the steep decrease in 2010 (from 52.4 in 2009 to 36.9% in 2010), in Romania the road freight transport marked a revival in the period 2011 - 2013 from 36.9% to 40.3, a value that it was maintained in 2016. A resumption of growth was registered in 2017 at 42.4%. ***The rail freight transport,*** in the period 2011 - 2017, in the EU-28, registered a gradual decrease, from 18.7% to 17.3%, more accentuated in 2016. Also, in Romania the rail freight transport registered a decrease in the same period from 35.4% to 30.2%, more pronounced in 2012 (31.4%).

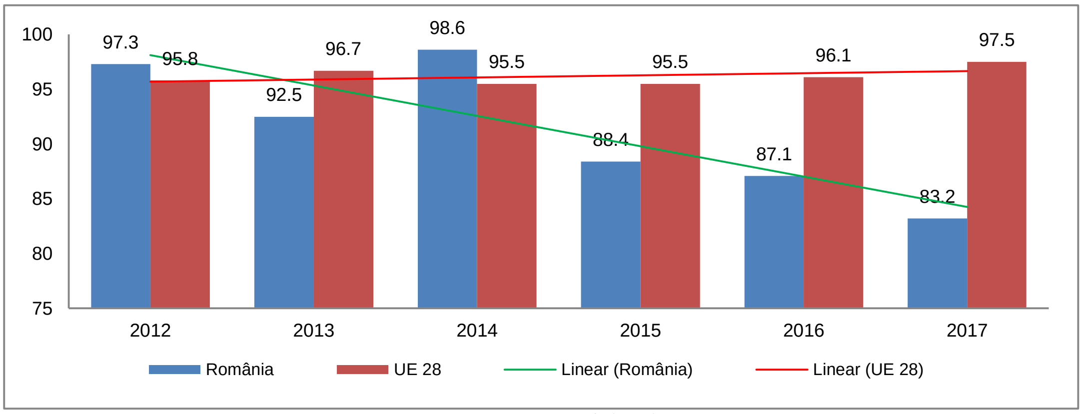
Figure XII.10 Performance of freight transport in the EU-28, during the period 2012 – 2017



Source: Eurostat, statistical database

The evolution of the ratio between the volume of the goods transported internally and the GDP (expressed in euros constant prices, at the exchange rate of the reference year 2005) shows a slight tendency of decrease of this indicator at the level of Romania, in trend with the average of the EU-28 countries. Between 2012 and 2017, the level of the volume of goods transported internally reported to the unit of GDP in Romania decreased by 14.1%. In the EU-28, after the increase registered in 2011, it decreased in 2012, oscillating in the following years between 95.5-97.5, the maximum value being recorded in 2017. The evolution of the ratio between the volume of goods transported internally by GDP (expressed in PCS and in Euro 2005) in Romania and EU-28, is presented in *figure XII.11*.

Figure XII.11 The volume of freight transport reported to GDP at the level of Romania and EU-28 during 2012-2017

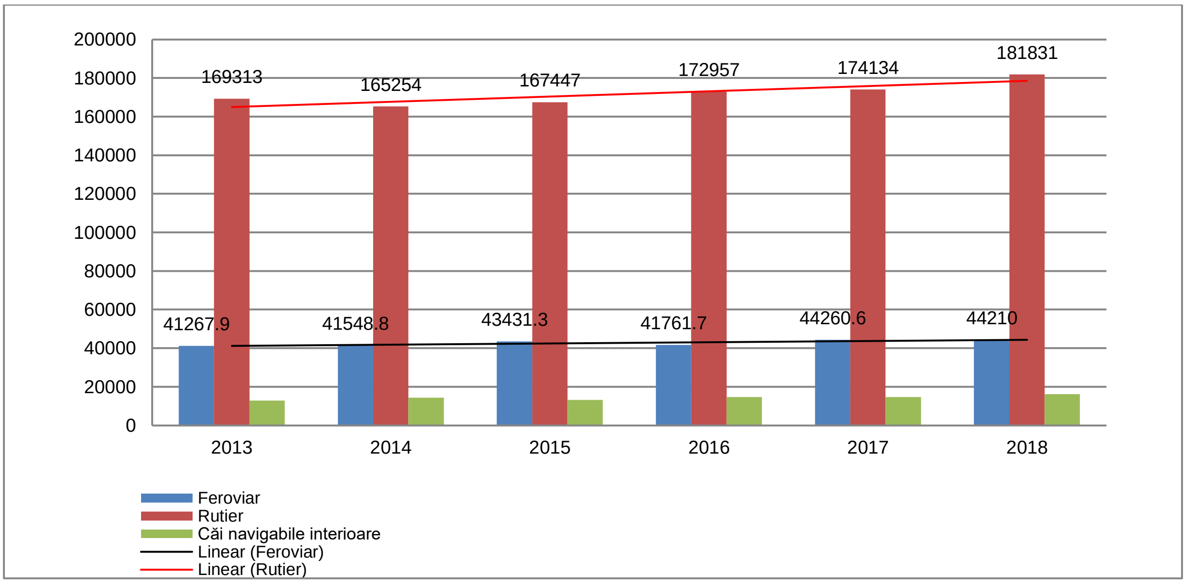


Source: Eurostat, statistical database

Demand for transport of goods

Regarding the volume of goods transported internally, in 2018, in Romania it registered an increase of 9154.4 thousand tons (3.93%) compared to the previous year and with 18752.1 thousand tons (8.39%) compared to year 2013.

Figure XII.12 The volume of goods transported at the level of Romania, by rail, road and inland waterways, between 2013 and 2018 (thousand tons)



Source: Ministry of Transport

XII.2.7. SURFACE FOR ECOLOGICAL AGRICULTURE

RO 26	Indicator code Romania: RO 26 EEA 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.

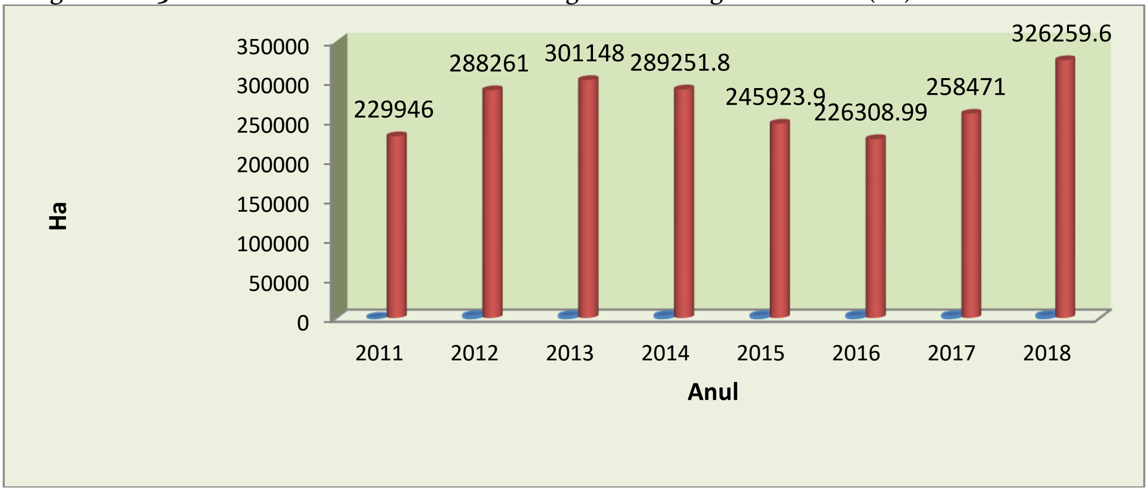
Organic farming is a production system that places great importance on environmental and animal protection, by reducing or eliminating genetically modified organisms and synthetic chemicals such as fertilizers, pesticides and growth regulators. Organic farming is a dynamic sector in Romania that has undergone an upward evolution 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 2018 it was 326.26 thousand ha. Thus, at the level of 2018, the areas in the ecological system increased by 26.23% compared to the previous year and by 41.89% compared to 2011 (*table XII.3, figure XII.13*).

Tabelul XII.3 Dynamics of operators and areas in organic farming

Indicator	2011	2012	2013	2014	2015	2016	2017	2018
Number of certified operators in organic farming	9703	15544	15194	14470	12231	10562	8434	9008
Total area in organic farming (ha)	229946	288261	301148	289251,79	245923,9	226309	258470,927	326259,55
Cereals (ha)	79167	105149	109105	102531,47	81439,5	75198,3	84925,51	114427,4926
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	8751,13
Tuberculous and root plants total (ha)	1074,98	1124,92	740,75	626,99	667,554	707,026	665,54	505,66
Industrial Cultures (ha)	47879,7	44788,7	51770,8	54145,17	52583,11	53396,9	72388,33	80193,08
Green harvested plants (ha)	4788,49	11082,9	13184,1	13493,53	13636,48	14280,5	20350,75	28253,75
Other crops on arable land (ha)	851,44	27,77	263,95	29,87	356,22	258,47	88,25	112,79
Vegetables (ha)	914,08	896,32	1067,67	1928,36	1210,08	1175,33	1458,78	983,10
Permanent crops (ha) vineyards	4166,62	7781,33	9400,31	9438,53	11117,26	12019,8	13165,41	18569,27
Permanent crops (ha) pastures and meadows	78197,5	105836	103702	95684,78	75853,57	57611,7	50685,74	66890,44
Uncultivated land (ha)	9758,55	8810,73	9516,33	9058,66	7225,852	9457,2	9747,94	7572,80

Source: MADR

Figure XII.13 Evolution of areas cultivated in organic farming in Romania (ha) between 2011-2018



Source: MADR

The evolution of the cultivated areas in organic farming, as well as the organic certified livestock, with the exception of the number of beehives, decreased in 2016 compared to 2015 (*table XII.4*).

Table XII.4 Ecological certified livestock - year 2016*

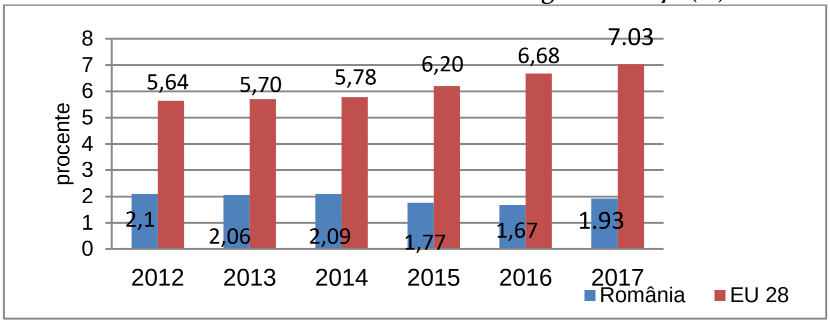
Ecological certified livestock			
		anul 2015	anul 2016
Livestock	unit of measurement	number	number
Cattle (total)	**heads**	**29313**	**20093**
Cattle for slaughter	heads	491	478
Milk cows	heads	21667	15171
Other cattle	heads	7155	4444
Pigs (total)	**heads**	**86**	**20**
Pigs for fattening	heads	43	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 years 2017 and 2018 there are no data available***

At EU level 28, the share of the areas destined to organic farming from the total area used in agriculture registered an increase, from 5.5% in 2011, to 7.03% in 2017. In Romania, the share of the surface destined to organic farming registered an increase in 2012, to 2.2% compared to 1.7% in 2011, followed by a decrease in 2016 to 1.67% and a resumption of growth in 2017 to 1.93%. Figure XII.14 shows the evolution of the share of the surface destined to organic farming from the total area used in agriculture during 2012-2017 in Romania and in the European Union.* ***For 2018 there are no data available.***

Figure XII.14 The share of the surface destined to organic farming from the total area used in agriculture at the level of Romania and the EU - 28 during 2012 - 2017* (%)



Sources: MADR; INS; Eurostat, statistical database.
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
EEA 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).

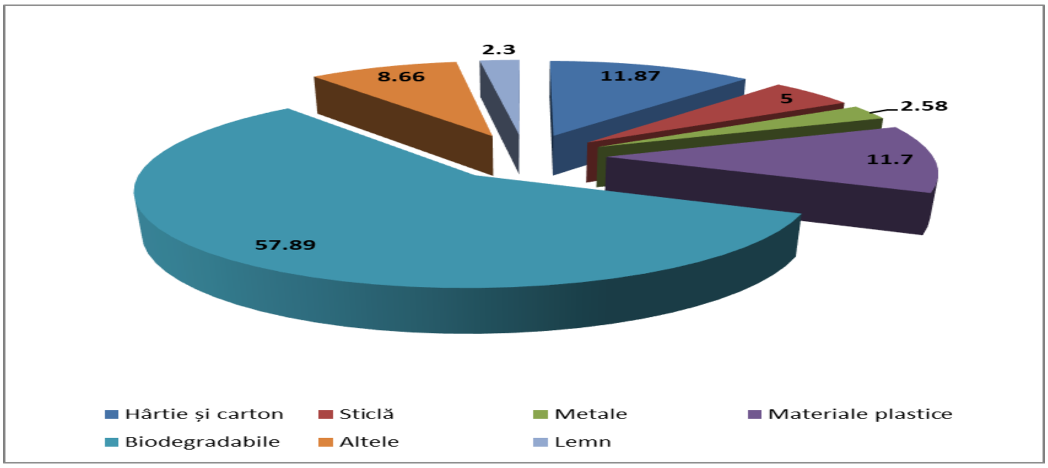
According to the provisions of the National Plan on Waste Management, approved by H.G. no. 942/2017, "municipal wastes are household wastes and other wastes, which, by nature or composition, are similar to household wastes". According to Decision 2011/753 / EU establishing norms and calculation methods for verifying compliance with the objectives set in art. 11, paragraph 2 of Directive 2008/98 / EC of the European Parliament and of the Council, municipal waste means household and similar waste. Municipal waste collection is the responsibility of the municipalities, who can carry out these tasks either directly (through the specialized services within the Local Councils) or indirectly (by delegating this responsibility on a contract basis, to specialized and authorized companies for performing the sanitation services). In 2017, the quantity of waste collected through the specialized services of the mayors or of the sanitation companies was 5311 thousand tons (municipal waste and construction and demolition waste collected from the population). Of the total amount of waste collected by sanitation operators, 84% is represented by domestic and similar waste.

Table XII.5 Waste collected by municipalities in 2017 (thousands tonnes; %)

Waste collected	Quantity collected - thousands of tons	Percent %
domestic and similar waste	4471	84
waste from municipal services	612	12
construction / demolition waste	228	4
TOTAL	**5311**	**100**

Source: National Environmental Protection Agency

Figura XII.26 Percentage composition of household and similar waste collected in 2017

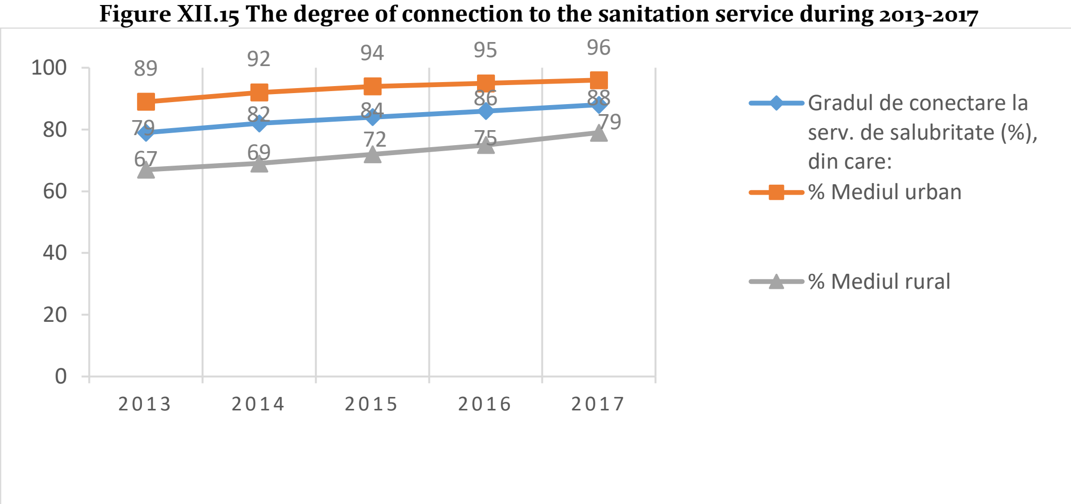


Source: National Environmental Protection Agency

It should be noted that, ***at national level, municipal waste collection is not widespread***.

Figure XII.15 shows the evolution of the degree of connection to the sanitation service in the period 2013-2017.

Figure XII.15 The degree of connection to the sanitation service during 2013-2017



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). ***Disposal of municipal waste is done exclusively by landfill. So far, in Romania no installations for the incineration of municipal waste have been put into operation. At the end of 2018, 43 compliant deposits for municipal waste were authorized and in operation***.

Sustainable development indicators on municipal waste

According to the **recommendations of EUROSTAT** (***Guide on collecting data on municipal waste***), municipal waste represents household and similar waste, generated by households, institutions, commercial units and economic operators. Includes bulky waste (including WEEE from the population) and waste from parks, gardens and street cleaners, including the contents of road trash cans.

According to the way of collection, the municipal waste is:

- Collected by or on behalf of municipalities
- Collected directly by private economic operators - valid for WEEE and other types of recyclable waste
- Generated and not collected by a sanitation operator, but managed directly by the generator

Excluded:

- Sludges from urban wastewater treatment
- Construction and demolition waste

The indicators of sustainable development regarding municipal waste refer to:

- Municipal waste generated
- Municipal waste treated by: energy recovery, storage, recycling (excluding composting and anaerobic digestion), composting.

Also, the EUROSTAT guide recommends that the recyclable waste streams (paper, plastic, metal, etc.) that result from the sorting plants and subsequently sent to the recycling facilities should be considered as recycled.

In view of the above, the following ***municipal waste indicators were calculated at national level:***

- **Municipal waste generated - 5324764 tons in 2017**

The value was calculated by summing the quantities generated for the following types of waste:

- domestic and similar waste and from municipal services collected by sanitation operators, exclusive inert waste
- domestic waste generated and not collected 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, textiles, WEEE, waste batteries and accumulators)

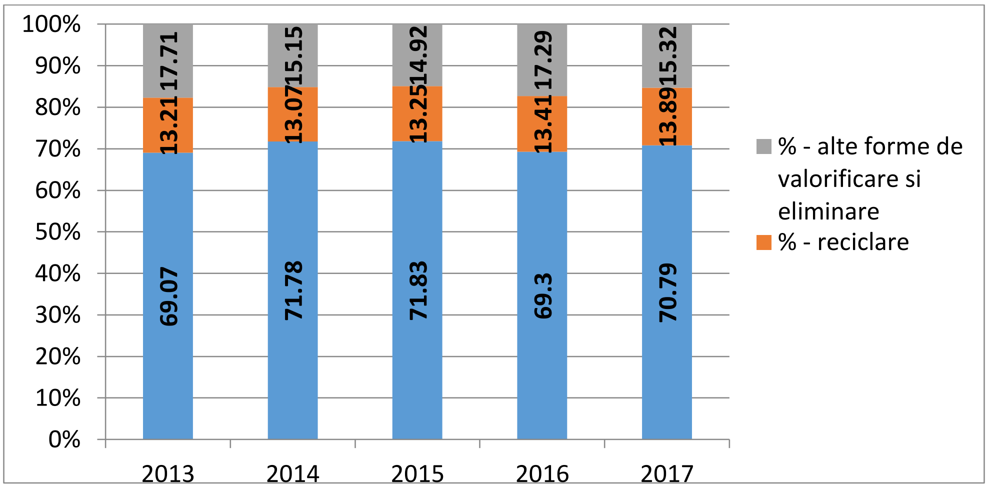
- **Recycled municipal waste (including composting) - 739384 tons in 2017**

The value was calculated by summing the recycled quantities for the following types of waste:

- domestic and similar waste and from municipal services collected by sanitation operators
- domestic waste generated and not collected 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, textiles, WEEE, waste batteries and accumulators)

Recycling rate achieved for municipal waste in 2017 - 13.89%

Figure XII.16 Share of main municipal waste management activities in 2013-2017



Sursa: Agenția Națională pentru Protecția Mediului

XII.2.9. USE OF WATER RESOURCES

RO 18	Indicator code Romania: RO 18 EEA 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**.**

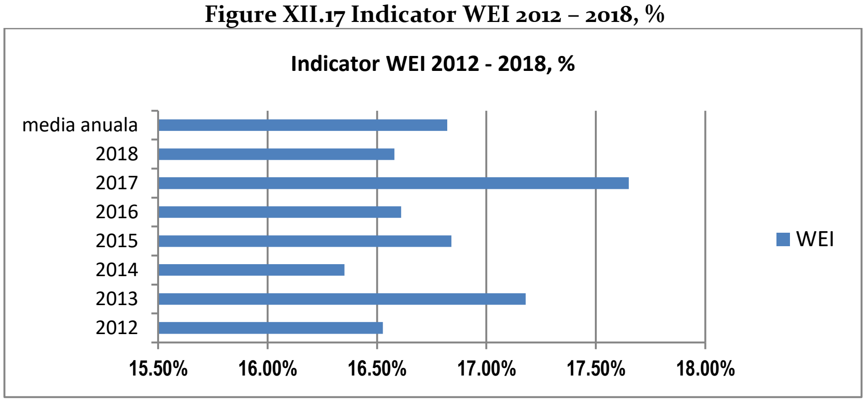
One notion used in water resource management is that of water pressure. It is, in general, directly related to an over-sampling of water that exceeds the resources available in certain areas. The ratio between total freshwater sampling and total resources generally indicates the existence of pressure on water resources and bears the name of *water exploitation index (WEI)*. According to the document drafted by the European Commission in 2009 Water Scarcity & Drought, if this indicator is below 10%, then it is considered that water resources are not under pressure. If this indicator is between 10 and 20% then water resources are considered to be under reduced pressure, and values of the operating index greater than 20% indicate the existence of a pressure on water resources, and an index of over 40% it is a sign of severe stress on water resources. The WEI values (%) for the period 2012-2018 (*represented in Figure XII.17 - WEI indicator 2012 - 2018,%*) are below the percentage of 20% so that ***it can be considered that Romania's water resources are subjected to reduced pressure by exploitation.***

Table XII.6 The evolution of water consumption in Romania 2012 - 2018 (mld m³)

Years	***2012***	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***Medie ani***
Usable resource mld m³	39,27	38,35	38,35	38,35	38,35	38,35	38,35	38,48
Total water sampling mld m³	6,49	6,59	6,27	6,46	6,37	6,77	6,36	6,47
Indicator WEI	16,53%	17,18%	16,35%	16,84%	16,61%	17,65%	16,58%	16,82%

Source: National Administration ”Romanian Waters”

Figure XII.17 Indicator WEI 2012 – 2018, %



Source: National Administration ”Romanian Waters”

At national level, Romania's water resources are relatively poor and unevenly distributed over time and space. These sum up theoretically approx. 134.6 billion cubic meters, consisting of surface waters, respectively rivers, lakes, the Danube river and groundwater, of which the usable resource, according to the degree of river basin arrangement, is 38.35 billion cubic meters. Compared to 2013, the water demand in Romania decreased by 0.62 billion cubic meters in 2017, from 7.48 billion cubic meters of water to 6.86 billion cubic meters, being broken down into the three categories of users as follows: for population 1.159 billion cubic meters of water in 2018 compared to 1.161 billion cubic meters in 2013, agriculture 1.622 billion cubic meters of water in 2018 compared to 1.408 billion cubic meters in 2013 and 4.076 billion cubic meters of water for the industrial sector in 2018 compared to 4.911 billion cubic meters in 2013. Reported at the water requirement of 2018, which was 6.857 billion cubic meters, the volume of water taken (used) was 6.358 billion cubic meters, decreasing by 0.069 billion cubic meters of water compared to 2013, when the volume of water withdrawn was 6.427 billion cubic feet of water. Breakdown by the three categories of users (population, industry, agriculture): the volume of water taken in the ***agricultural sector*** increased from 1.135 billion cubic meters in 2013 to 1.344 billion cubic meters in 2018;

- ***the industrial sector*** consumed 3.933 billion cubic meters in 2018, down from the consumption of 4.312 billion cubic meters recorded in 2013;
- for the ***population*** the volume of water taken in 2018 was approx. 1,081 billion cubic meters, higher than the one taken in 2013 (0.98 billion cubic meters). (*Statistics made according to the data provided by the National Administration ”Romanian Waters”).*

Romania's water resources consist of surface waters - rivers, lakes, the Danube River - and groundwater. The potential and technically usable water resources for 2018 (*Water Balance - Requirement for 2018*) are presented in *Table XII.7*.

Table XII.7 Potential and technically usable water resources for 2018

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	2 965 116
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 ***	3 164 721
Water source/Indicator of characterization	**Total thousands m³**
C. Underground	9 600 000
1. Theoretical resource from which:	
• groundwater	4 700 000
• deep water	4 900 000
2. Usable resource	4 667 639
3. Requirement of water for use according to capacities in operation	716 504
D. Black Sea	
Water demand for uses according to capture capacities in operation	10 244
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	**6 772 648**

Source: National Administration ”Romanian Waters”

Notă

**   - 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*

Reported to the current population of Romania, it turns out:

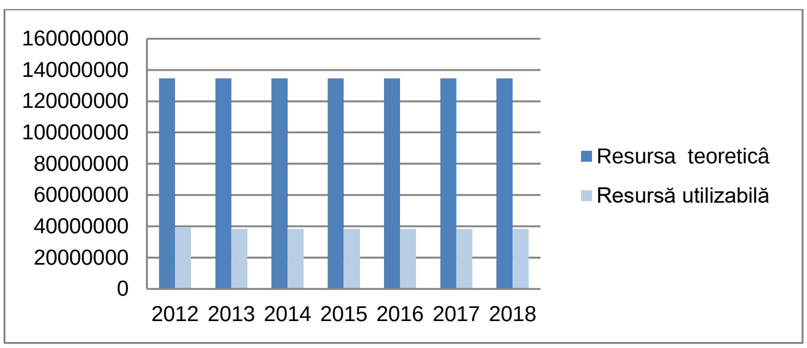
- ***the specific resource usable in natural regime, of approx. 2660 m³ / loc. and year, taking into account the contribution of the Danube;***
- ***specific, theoretical resource, of approx. 1770 m³ / place. and year, considering only the contribution of the inland rivers, from this point of view Romania in the category of countries with relatively low water resources in relation to the resources of other states.***

Table nr.XII.8. Volume of water resource (theoretical and usable)

Years	Theoretical resource (thousands mc)	Usable resource (thousands mc)
2012	134600000	39279387
2013	134600000	38346760
2014	134600000	38346760
2015	134600000	38346760
2016	134600000	38346760
2017	134600000	38346760
2018	134600000	38346760

Source: National Administration "Romanian Waters"

Figure XII.18 Evolution of the water resource (theoretical and usable) (thousands m³), 2012-2018



Source: National Administration "Romanian Waters"

The main water resource of Romania is ***the inland rivers***. A basic feature of this resource category is the very large variability in space:

- the mountain area, which accounts for half the volume;
- the variability of the specific average flow (1 l / s and km2 in the low areas, up to 40 l / s and km2 in the high areas).

Another feature is the very pronounced variability over time, so that the spring produces significant floods, followed by prolonged droughts..

The Danube, the second largest river in Europe (with a length of 2850 km, of which 1075 km on the Romanian territory) has an average stock at the entrance to the country of 174 x 109 m³.

Groundwater resources are made up of existing water deposits in groundwater and deep water layers. The distribution of the underground drain varies on the large tectonic units in the territory of the country as follows: 0.5-1 l / s and km² in North Dobrogea; 0,5-2 l / s and km² in the Moldavian Plateau; 0.1-3 l / s and km² in the Transylvanian Depression and the Panonian Depression; 0.1-5 l / s and km² in North Dobrogea and the Danube Platform; 5-20 l / s and km² in the Carpathian area, especially in the Southern Carpathians and in the karst areas of the Jiu and Cerna basin.

In 2018 the total raw water samples were 6.358 billion.m3 of which: Population 1.08 billion.m3; Industry 3,933 mld.m3; Agriculture 1.344 bln.m3. Water withdrawals decreased from 7.96 billion m3 in 2000, to 6.358 billion m3 at present, due to the decrease of industrial activity; reducing water consumption in technological processes; reducing losses; the application of the economic mechanism in water management. For 2018, the requirement / sampling ratio for water resources is presented in *table XII.9*.

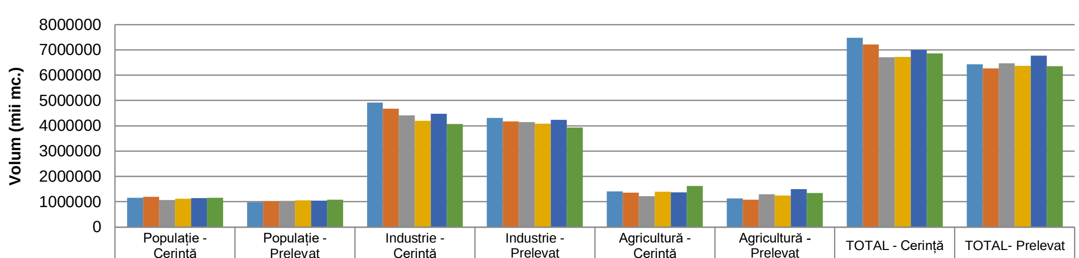
Table XII.9 Requirement / withdrawal report for water resources in 2018

Water requirement		**Water Samples**		**Degree of use**
Activity	Valoare (mld.mc)	Activitate	Valoare (mld.mc)	%
Population	1,159	Populație	1,081	93,27
Industry	4,076	Industrie	3,933	96,49
Agriculture	1,622	Agricultură	1,344	82,86
Total	**6,857**	**Total**	**6,358**	92,70

Source: National Administration "Romanian Waters"

The total water requirement for the year 2018 sumed up approx. ***6 856 585 thousand cubic meters***. The actual samples of water from direct sources, within the insured services, amounted to 6 357 853 thousand cubic meters, decreasing by 0.415 billion cubic meters compared to 2017, year in which 6772648 thousand cubic meters of water were taken**.** ***In the current stage of planning the river basins, ensuring the water demand of the users has been possible, both for surface and underground sources.***

Figure XII.19 Evolution of the water requirement compared to the sampling of water volumes (thousands m3) in Romania, 2013 – 2018



	Populație - Cerință	Populație - Prelevat	Industrie - Cerință	Industrie - Prelevat	Agricultură - Cerință	Agricultură - Prelevat	TOTAL - Cerință	TOTAL- Prelevat
TOTAL 2013	1160500	979769	4910490	4312450	1408026	1134660	7479016	6426879
TOTAL 2014	1189297	1016913	4673727	4169577	1355142	1079244	7218166	6265734
TOTAL 2015	1071780	1030358	4417584	4143764	1214169	1290744	6703533	6464866
TOTAL 2016	1121647	1051198	4202928	4079698	1402001	1242629	6726576	6373525
TOTAL 2017	1144860	1048211	4476586	4233686	1374173	1490751	6995619	6772648
TOTAL 2018	1159111	1080546	4075796	3933432	1621678	1343875	6856585	6357853

Source: National Administration "Romanian Waters"

The specialists of the National Institute of Hydrology and Water Management (INHGA) show that the average annual flows of the rivers will decrease by 20-30% between 2021-2050 and 30-40% by 2071-2100. The changes undergone by the flows of the rivers require a series of adaptation measures to ensure the water resources for the population, industry and agriculture. Thus, new criteria and techniques for the design of dams and constructions are needed, as well as the elaboration of new procedures for exploiting the water management systems that take into account the degree of uncertainty in the evolution of the hydrological regime.

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III). LEGISLATION

Ordinul nr. 46/2016 privind instituirea regimului de arie naturală protejată şi declararea siturilor de importanţă comunitară ca parte integrantă a rețelei ecologice europene Natura 2000 în România.

Directiva 92/43/CEE a Consiliului din 21 mai 1992 privind conservarea habitatelor naturale și a speciilor de faună și floră sălbatică.

Raportul Comisiei către Parlamentul European și Consiliu privind progresele realizate în ceea ce privește crearea de zone marine protejate în conformitate cu articolul 21 din Directiva 2008/56/CE, Comisia Europeană Bruxelles, 2015.

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Directiva Parlamentului și a Consiliului European 60/2000/EC privind stabilirea unui cadru de acțiune comunitar în domeniul politicii apei.

Legea nr. 46/2008 - Codul silvic, republicată, cu modificările și completările ulterioare.

Hotărârea Guvernului nr. 349/2016 privind declararea zonei naturale "Acumulare Văcăreşti" ca parc natural şi instituirea regimului de arie naturală protejată.

Legea nr. 5/06 martie 2000 privind aprobarea Planului de amenajare a teritoriului naţional - Secțiunea a III-a - zone protejate cu modificările și completările ulterioare.

Hotărârea Guvernului nr. 2151 din 30 noiembrie 2004 privind instituirea regimului de arie naturală protejată pentru noi zone*).

Hotărârea Guvernului nr. 1581 din 8 decembrie 2005 privind instituirea regimului de arie naturală protejată pentru noi zone.

Hotărârea Guvernului nr. 1143 din 18 septembrie 2007 privind instituirea de noi arii naturale protejate.

Hotărârea Guvernului nr. 1066 din 20 octombrie 2010 privind instituirea regimului de arie naturală protejată asupra unor zone din Rezervaţia Biosferei "Delta Dunării" și încadrarea acestora în categoria rezervaţiilor ştiinţifice.

Hotărârea Guvernului nr. 1217 din 2 decembrie 2010 privind instituirea regimului de arie naturală protejată pentru Parcul Natural Cefa.

Hotărârea Guvernului nr. 1284/2007 privind declararea ariilor de protecţie specială avifaunistică ca parte integrantă a reţelei ecologice europene Natura 2000 în România cu modificările și completările ulterioare.

Hotărârea Guvernului nr. 971 din 5 octombrie 2011 pentru modificarea și completarea Hotărârii Guvernului nr. 1.284/2007 privind declararea ariilor de protecţie specială avifaunistică ca parte integrantă a reţelei ecologice europene Natura 2000 în România.

Ordinul nr. 1964 din 13 decembrie 2007 privind instituirea regimului de arie naturală protejată a siturilor de importanţă comunitară, ca parte integrantă a reţelei ecologice europene Natura 2000 în România cu modificările și completările ulterioare.

Ordinul nr. 2387 din 29 septembrie 2011 pentru modificarea Ordinului ministrului mediului și dezvoltării durabile nr. 1.964/2007 privind instituirea regimului de arie naturală protejată a siturilor de importanţă comunitară, ca parte integrantă a reţelei ecologice europene Natura 2000 în România.

Hotărârea Guvernului nr. 663/2016 privind instituirea regimului de arie naturală protejată şi declararea ariilor de protecţie specială avifaunistică ca parte integrantă a reţelei ecologice europene Natura 2000 în România.

Ordonanța de Urgență a Guvernului nr.57 din 20 iunie 2007 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei și faunei sălbatice cu modificările și completările ulterioare.

Legea nr. 49 din 7 aprilie 2011 pentru aprobarea Ordonanţei de urgenţă a Guvernului nr. 57/2007 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei şi faunei sălbatice.

Hotărârea Guvernului nr. 1000/2012 privind reorganizarea şi funcţionarea Agenţiei Naţionale pentru Protecţia Mediului și a instituțiilor publice aflate în subordinea acesteia cu modificările și completările ulterioare.

Ordinul nr. 1052/2014 privind aprobarea Metodologiei de atribuire în administrare și custodie a ariilor naturale protejate cu modificările și completările ulterioare.
Legea nr. 95/2016 privind înfiinţarea Agenţiei Naţionale pentru Arii Naturale Protejate şi pentru modificarea Ordonanţei de urgenţă a Guvernului nr. 57/2007 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei și faunei sălbatice cu modificările și completările ulterioare.

Ordonanța de Urgență a Guvernului nr. 90/2016 privind stabilirea unor măsuri pentru asigurarea managementului ariilor naturale protejate.

Legea nr. 104/2011 privind calitatea aerului înconjurător, cu modificările și completările ulterioare.

Directiva 2008/50/CE a Parlamentului European și a Consiliului privind calitatea aerului înconjurător și un aer mai curat pentru Europa.

Directiva 2004/107/CE a Parlamentului European şi a Consiliului privind arsenul, cadmiul, mercurul, nichelul, hidrocarburile aromatice policiclice în aerul înconjurător.

Directiva 2010/75/UE privind emisiile industriale (IED).

Directiva 2000/76/CE privind incinerarea deșeurilor.

Legea nr. 278/2013 privind emisiile industriale.

Directiva 2001/80/CE (LCP) privind limitarea emisiilor în atmosferă a anumitor poluanţi provenind de la instalaţii de ardere de dimensiuni mari (LCP).

Directiva 78/176/CE privind deșeurile din industria dioxidului de titan.

Directiva 92/112/CE privind procedurile de armonizare a programelor de reducere, în vederea eliminării, a poluării cauzate de deșeurile din industria dioxidului de titan.

Directiva 82/883/CE privind modalitățile de supraveghere și control al zonelor în care există emisii provenind din industria dioxidului de titan.

Directiva 2008/1/CE privind prevenirea și controlul integrat al poluării (IPPC).

Directiva 1999/13/CE privind reducerea emisiilor de compuși organici volatili datorate utilizării solvenților organici în anumite activități și instalații.

Ordinul MMSC nr. 3299/2012 pentru aprobarea metodologiei de realizare și raportare a inventarelor privind emisiile de poluanți în atmosferă

H.G. nr. 683/2015, respectiv Strategia Națională și Planul Național de Acțiune pentru Gestionarea Siturilor Contaminate din România.

Directiva 2000/60/EC a Parlamentului European și a Consiliului privind stabilirea unui cadru de politică comunitară în domeniul apei.

Directiva 98/83/EEC Consiliului European privind calitatea apei destinate consumului uman.

Directiva Consiliului European 80/68/EEC privind protecţia apelor subterane împotriva poluării cauzate de anumite substanţe periculoase.

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Directiva Consiliului 92/43/EEC referitoare la conservarea habitatelor naturale și a florei și faunei sălbatice.

HG nr. 1408/2007 privind modalitățile de investigare și evaluare a poluării solului și subsolului.

Hotărârea nr. 529/2013 pentru aprobarea Strategiei naționale a României privind schimbările climatice, 2013-2020.