Republic of Serbia
Ministry of Environmental Protection

REPORT ON THE STATE OF ENVIRONMENT IN THE REPUBLIC OF SERBIA

2020

Environmental Protection Agency

Republic of Serbia

Ministry of Environmental Protection

ENVIRONMENTAL PROTECTION AGENCY

Report on the State of Environment in the Republic of Serbia for 2020

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CONTENT

1. INTRODUCTION

The preparation of the annual Report on the State of Environment falls under obligations of the Environmental Protection Agency (hereinafter: the Agency), based on Articles 76 and 77 of the Law on Environmental Protection. However, 2020 was specific regarding environmental protection, both for the whole world and for the Republic of Serbia. The pandemic has brought many objective and subjective limitations, and the environment, due to the fight for public health endangered by the pandemic, has been pushed aside to certain extent, although state bodies have implemented significant activities over the past year, as have scientific institutions and civil society as well. It should be emphasised that the Agency managed, by making excessive efforts, to provide a complete set of data and indicators necessary for the preparation of this Report, as well as additional analyses.

However, initial analyses indicate that, although the decline in economic activity in many countries has reduced pollutant emissions to all environmental media, this has not had a significant impact on its better performance. Some ongoing and future research will show a potential link between the levels of air pollution and transmission of the virus among population, as well as the consequences of changes in global lifestyle on air, water and soil quality, both locally and globally. This is another reason to give priority to “combined” indicators that demonstrate the relationship between pollution levels and human health.

Most of information and data used for the preparation of the Report on the State of Environment in the Republic of Serbia for 2020 (hereinafter: the Report) have been collected through the Environmental Information System, managed by the Agency, but also through direct cooperation with relevant institutions that hold data relevant for the subject area. This information system has become the dominant source of necessary and reliable information in this field in the process of adopting current European Union standards. It is estimated that the role of the Environmental Information System in the Republic of Serbia will become increasingly important in the coming period. This refers, firstly, to the expansion of scope of data collection, which has already been significantly increased by the obligations from the newly adopted laws, as well as the obligations imposed by the European Union legislation. For that reason, it is necessary for other entities that produce and submit information to the Agency to reach the required qualitative and quantitative level, because only in that way the binding mutual cooperation with all data users at the national and international level can be fully achieved.

Due to its complexity and comprehensiveness, the report is the most important document in this area in the Republic of Serbia. It is intended for decision makers in the field of environmental protection, but also for the professionals and general public. In that way, the Report is fully aligned with Article 74 of the Constitution of the Republic of Serbia, which regulates the right of citizens to a healthy environment and timely and complete information about its status.

The Report provides an overview of the state of the environment in the Republic of Serbia on the basis of available data at the time of preparation (May 2021). It can indirectly show the achievement of environmental protection policy goals and measures defined by strategic and planning documents (Decision on defining the National Environmental Protection Program (Official Gazette of RS, No. 12/10)), National Strategy for Sustainable Development (Official Gazette of RS, No. 57/08) and National Strategy for Sustainable Use of Natural Resources and Goods (Official Gazette of RS, No. 33/12). The Report also enables a view to efficacy of measures adopted for the improvement of the state of environment pursuant to current laws pertaining to this area.

The review and assessment of the state of the environment for 2020 is based, as in previous years, on the indicator preview according to thematic units from the Rulebook on the national list of environmental indicators (Official Gazette of RS, No. 37/11 – hereinafter: NLI). In addition to simplified monitoring of the values of individual parameters by year, this way also ensures continuity in monitoring and assessing the state of the environment at the national level, but also comparability and data exchange with other European countries. The revision of NLI is planned for this year, which will define indicators that have proven to be relevant in practice for national and international reporting, which will provide an additional qualitative contribution to the analysis of the state of environment. According to the cause-and-effect processes and the standard typology of indicators of the European Environment Agency (hereinafter: EEA), the indicators given in this report belong to one of the following categories and each of the indicators is abbreviated according to the list:

1) driving forces (DF);

2) pressures (P);

3) state (S)

4) impacts (I);

5) responses (R).

For the preparation of the Report, indicators based on the availability and importance for assessing the situation in certain environmental segments have been accordingly selected.

2. AIR QUALITY AND CLIMATE MONITORING

2.1. AIR EMISSIONS (SO_2, NO_X, PM_{10} and NH_3) (P)

Key messages:

1) the amounts of emitted sulphur oxides are 367.57 Gg;
2) the amounts of emitted nitric oxide are 83.13 Gg;
3) the amounts of emitted particulate matters are 10.30 Gg;
4) the amounts of emitted of ammonia are 3.11 Gg.

Collection and processing of data on air pollutant emissions from stationary sources is carried out on the basis of the Rulebook on the methodology for the development of the national and local Registers of pollution sources, as well as the methodology for types, methods and deadlines of data collection (Official Gazette of RS, No. 91/10, 10/13 and 98/16), as well as on the basis of the Regulation on emission limit values for air pollutants from combustion plants (Official Gazette of RS, No. 6/16), the Regulation on emission limit values for air pollutants from stationary sources of pollution, except for combustion plants (Official Gazette of RS, No. 6/16) and the Rulebook on measurements of air pollutant emissions from stationary sources of pollution (Official Gazette of RS, No. 6/16). The Environmental Protection Agency, in accordance with legal provisions, maintains the National Register of Pollution Sources. Based on the data submitted to the National Register of Pollution Sources by mid-May 2021, the analysis of the economic sectors covered by this Register was made. According to Annex 1 to the said Rulebook, the energy sector includes: Mineral oil and gas refineries, Gasification and liquefaction plants, Thermal power plants and other combustion plants, Coke ovens, Coal mills and Plants for the production of coal and solid smokeless fuels.

Emissions of sulphur oxides

By analysing the data, it was found that total emission of this pollutant in 2020 amounted to 367.57 Gg (Figure 2.1). The most significant emitted quantities originate from thermal power plants in the energy sector.

Emissions of nitrogen oxides

By analysing the data, it was found that total emission of this pollutant in 2020 amounted to 83.13 Gg (Figure 2.2). The most significant emitted quantities originate from energy sector and chemical industry.

Emissions of particulate matters

By analysing the data, it was found that total emission of this pollutant in 2020 amounted to 10.30 Gg (Figure 2.3). The most significant emitted quantities originate from thermal power plants in the energy sector.

Emissions of ammonia

By analysing the data, it was found that total emission of this pollutant in 2020 amounted to 3.11 Gg (Figure 2.4). The most significant emitted quantities originate from the sector of intensive livestock production and fisheries.

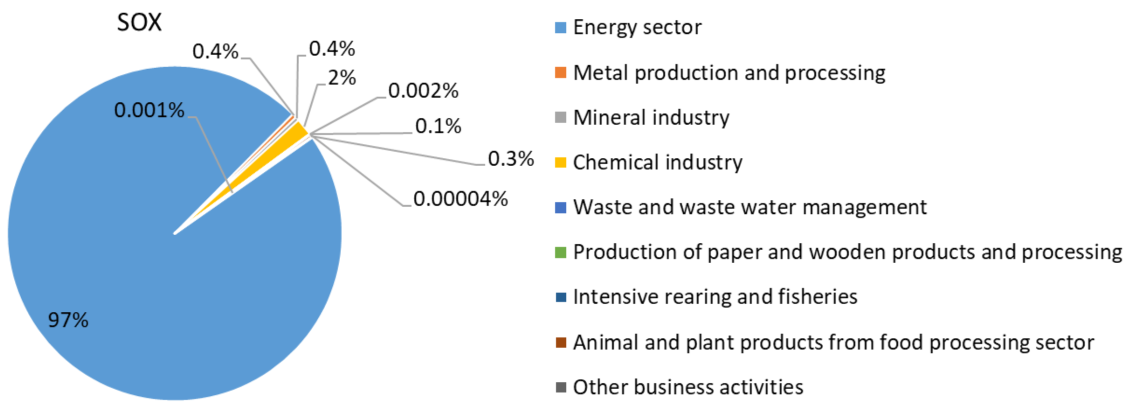


Figure 2.1. Emissions of sulphur oxides

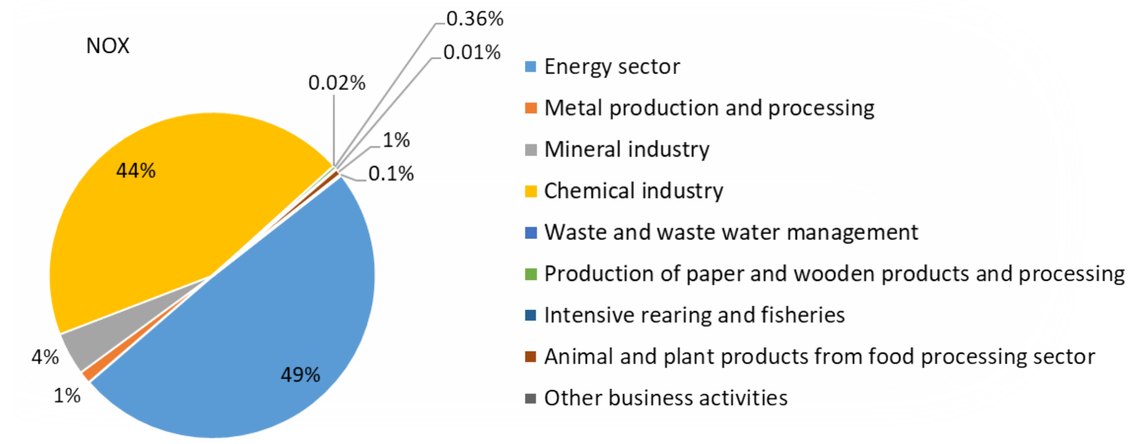


Figure 2.2. Emissions of nitrogen oxides

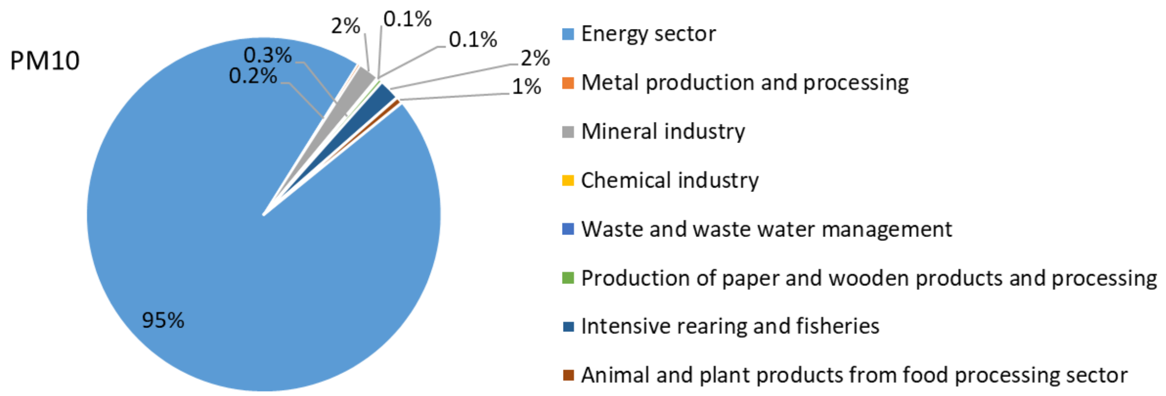


Figure 2.3. Emissions of particulate matters

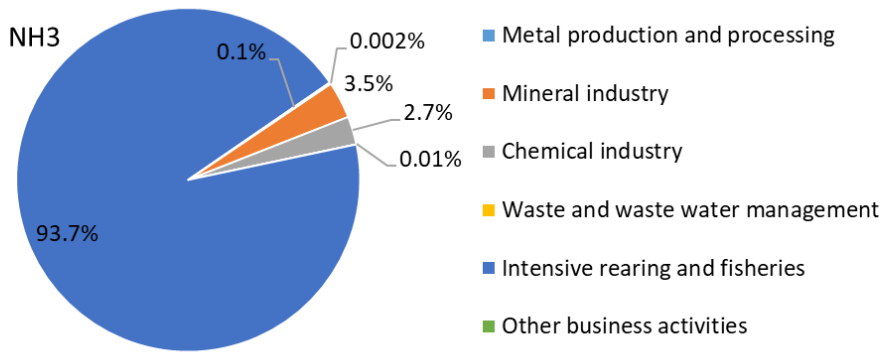


Figure 2.4. Emissions of ammonia

Source of data: National Register of Pollution Sources, Environmental Protection Agency

2.1.1. Acidifying gases emissions (NOx, NH_3 and SO_2) (P)

Key messages:

1) emitted amounts of sulphur oxides indicate a slight decline in the period 1990 – 2019;

2) emitted quantities of ammonia do not indicate significant changes in the specified period.

The indicator monitors the trends of anthropogenic emissions of acidifying gases – nitrogen oxides (NOx), ammonia (NH_3), and sulphur oxides (SOx as SO_2) in the period 1990 – 2019.

The indicator also provides information on emissions by sector in accordance with the EMEP/EEA 2019 methodology.

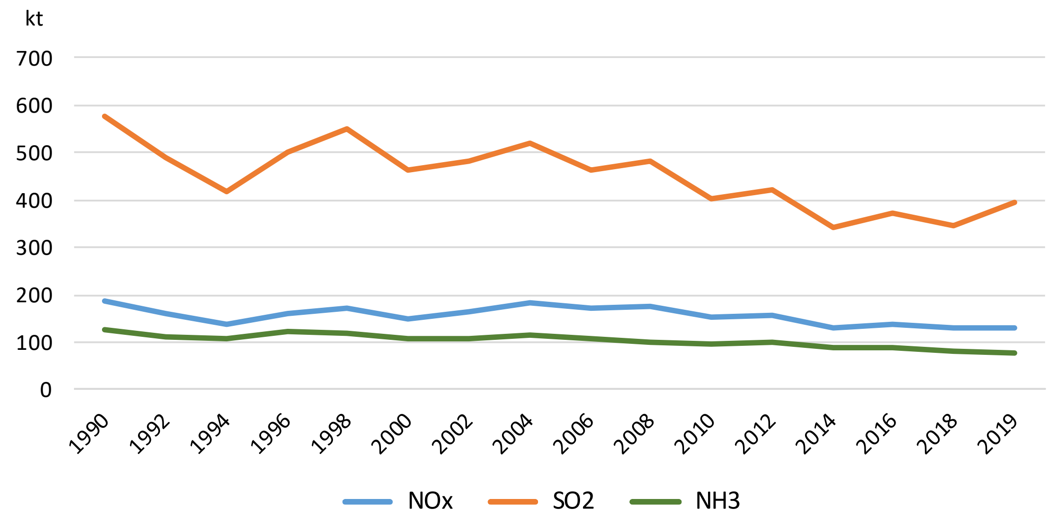


Figure 2.5. Emitted quantities of acidifying gases in the Republic of Serbia in the period 1990 – 2019 expressed in thousands of tonnes

The emission of acidifying gases increases their concentration in the air, which leads to a change in the environmental chemical balance. The indicator of acidifying gases emissions into the air includes the following pollutants: NOx, SO_2 and NH_3 (Figure 2.5).

The most significant contribution to the total amount of emitted acidifying gases in 2019 comes from the "Energy production and distribution" for NOx – 53.84% and "Road transport" – 19.24%, for SO_2 "Energy production and distribution" – 91.50% and "Agriculture" about 90.72% for NH_3 (Figures 2.6, 2.7 and 2.8).

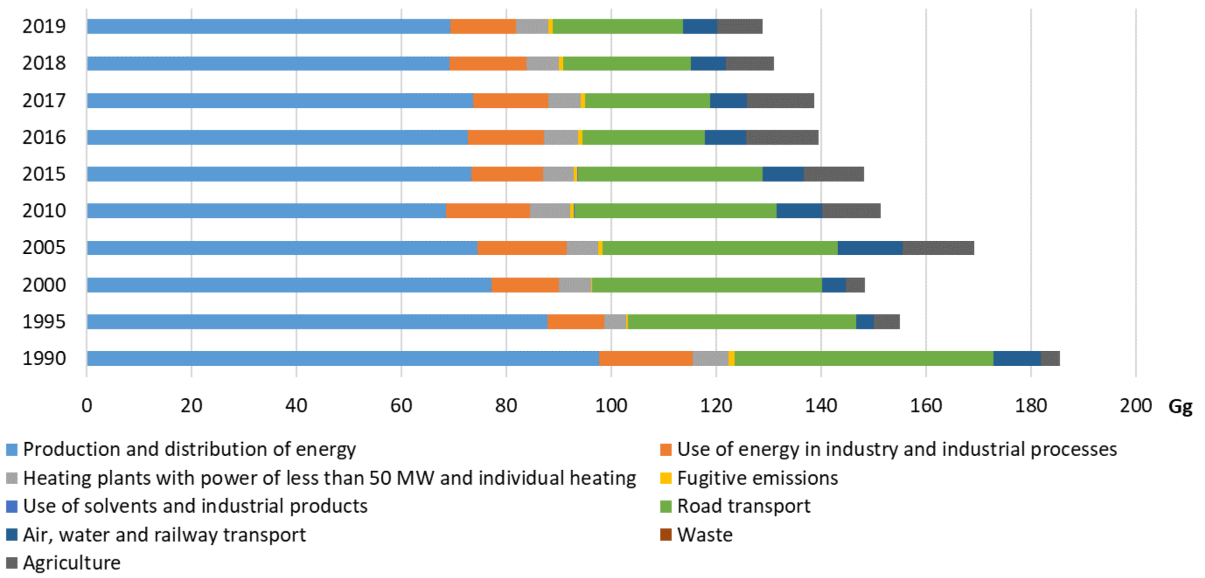


Figure 2.6. Nitrogen oxide emissions by sectors in the period 1990-2019 expressed in thousands of tonnes

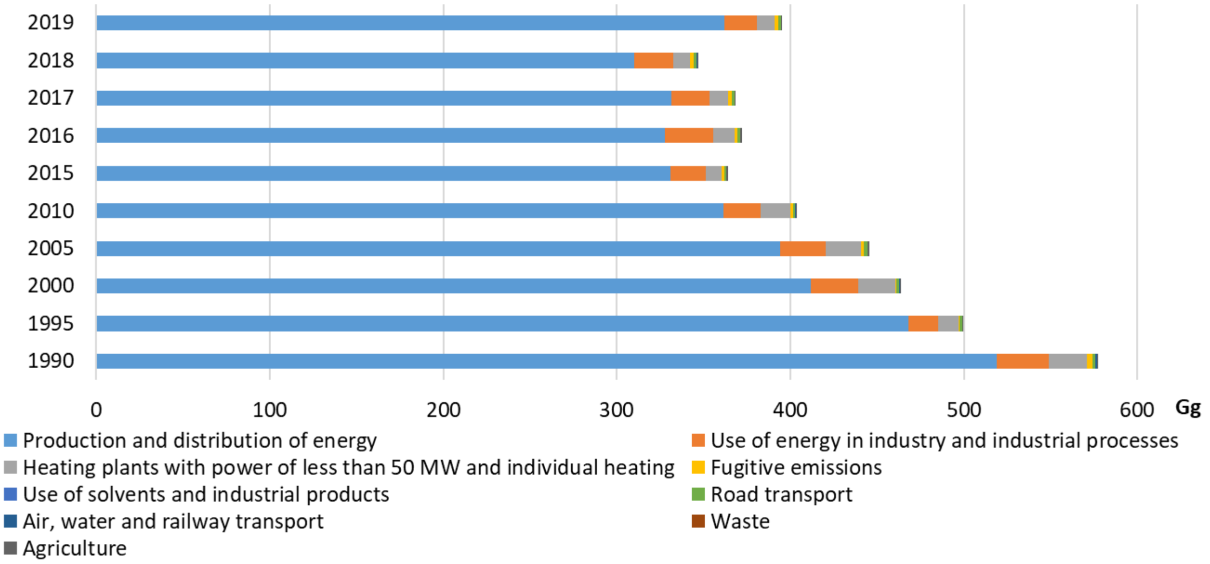


Figure 2.7. Sulphur oxide emissions by sectors in the period 1990-2019 expressed in thousands of tonnes

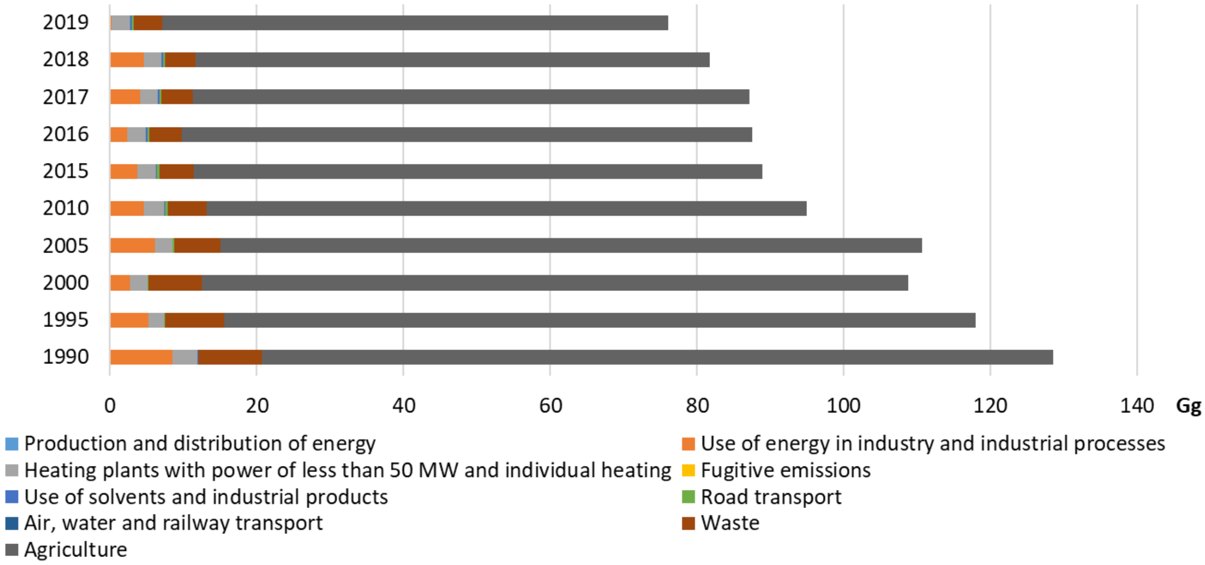


Figure 2.8. Ammonia emissions by sectors in the period 1990-2019 expressed in thousands of tonnes

Source of data: National Register of Pollution Sources, Environmental Protection Agency

2.1.2. Ground-level ozone precursors emissions (NO_x, CO, CH_4 and NMVOC) (P)

Key messages:

1) emitted amounts of carbon monoxide indicate a decline in the period 1990 – 2019;

2) emitted quantities of non-methane volatile organic compounds indicate a very slight decrease in the specified period.

The indicator shows the total emission and trend of ground-level ozone precursors (NOx, CO, CH_4 and NMVOC). The presented data related to the NOx trend correspond to the data used to calculate the CSI 001 indicator.

The indicator also provides information on pollutant emissions by sector in accordance with the EMEP/EEA 2019 methodology.

Ground-level ozone is a secondary pollutant in the troposphere. It is formed in complex photochemical reactions with the emission of gaseous pollutants – precursors of ground-level ozone such as nitrogen oxides, non-methane volatile organic compounds (NMVOC), carbon monoxide (CO) and methane (CH_4) (Figure 2.9). Ground-level ozone is a highly oxidizing agent with proven harmful effects on the living world. It poses a significant problem in areas with expressed photochemical activities, such is the Mediterranean region.

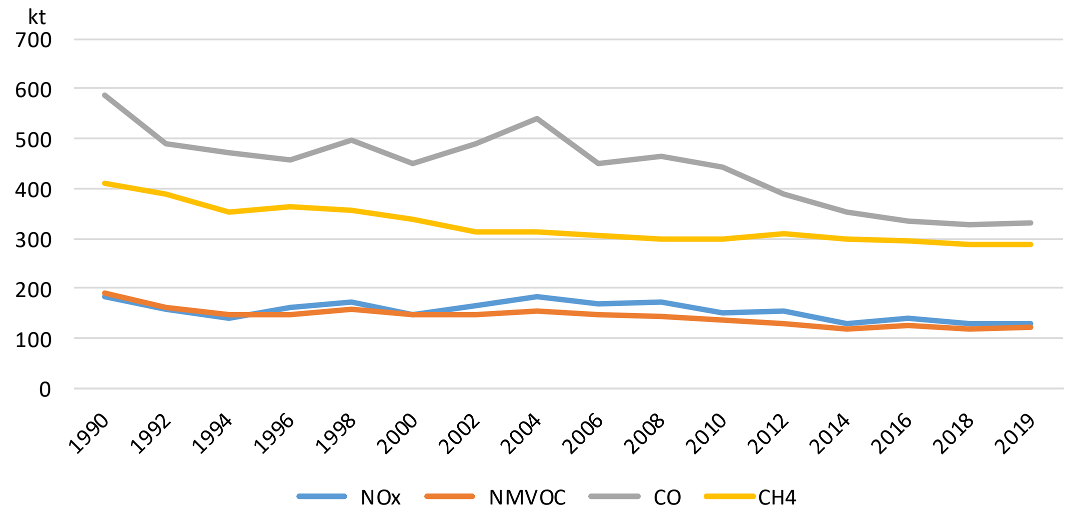


Figure 2.9. Emitted quantities of ozone precursors in the Republic of Serbia in the period 1990-2019

The most significant contribution to the total amount of ozone precursor emissions comes from "Heating plants with a capacity of less than 50 MW and individual heating" (CO – 57.10%, NMVOC with 21.88%), "Waste" (CH_4 – 35.27%). A significant share in NMVOC emissions comes from "Agriculture" – 17.54%, "Use of solvents and industrial products" – 14.21%, "Use of energy in industry and industrial processes" – 8.90% and "Fugitive emissions" – 30.76% (Figures 2.10 and 2.11).

The contribution of NOx emissions by sectors is shown in the indicator CSI 001.

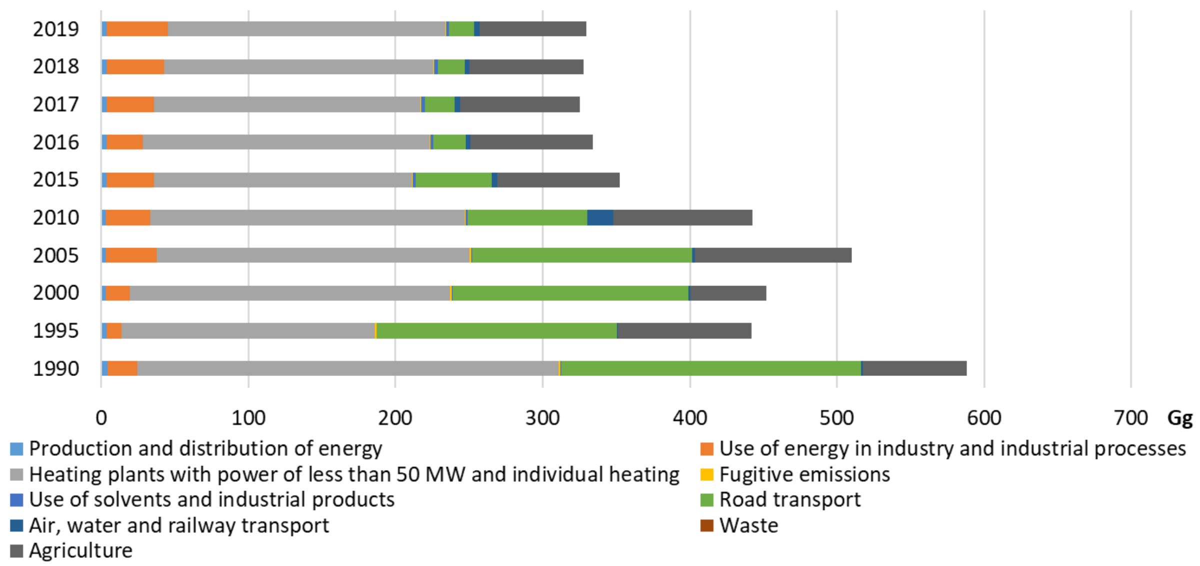


Figure 2.10. Emissions of carbon monoxide by sectors in the period 1990 – 2019 expressed in thousands of tonnes

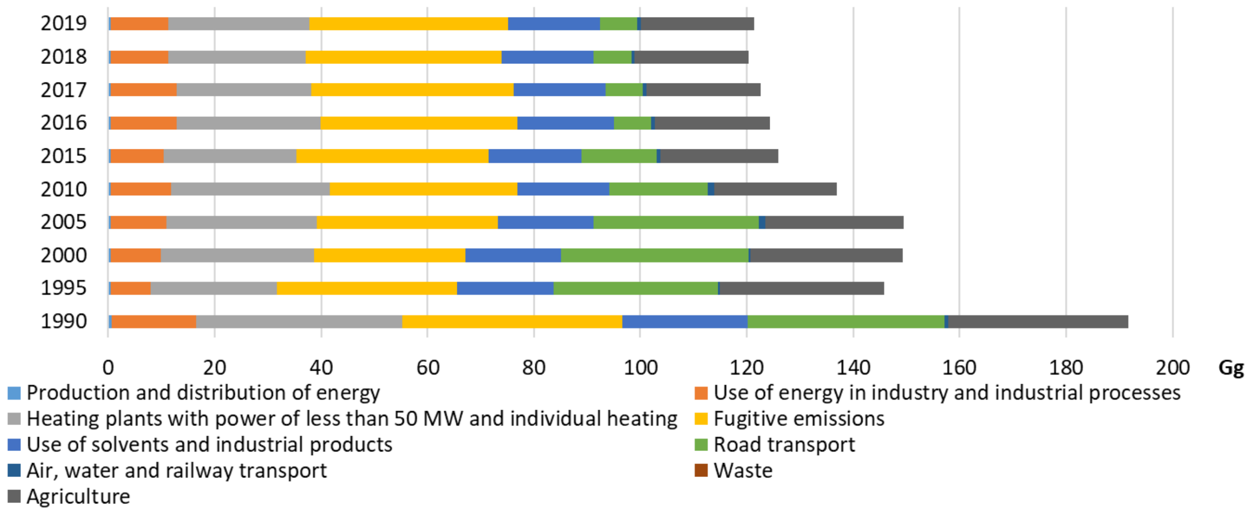


Figure 2.11. Emissions of NMVOC by sectors in the period 1990 – 2019 expressed in thousands of tonnes

Source of data: National Register of Pollution Sources, Environmental Protection Agency

2.1.3. Emission of primary particulate matters and secondary particulate matters precursors (PM_{10}, NO_x, NH_3 and SO_2) (P)

Key messages:

1) emitted amounts of sulphur oxides show a slight decline in the period 1990 – 2019;

2) emitted amounts of ammonia and PM_{10} do not indicate significant changes in the specified period.

The indicator shows the total emission and trend of primary particulate matters smaller than 10µm (PM_{10}) and secondary precursors thereof. i.e., NOx, NH_3 and SO_2.

The indicator also provides information on pollutant emissions by sector in accordance with the EMEP/EEA 2019 methodology.

Particulate matters (dust, smoke, smog) are a mixture of organic and inorganic particles, mostly released into the environment during the fuel combusting processes in energy, traffic and industrial production, but also in manure management operations (Figure 2.12).

The contribution of emissions by sectors for NOx, NH_3 and SO_2 is presented in the indicator CSI 001, and the highest share of PM_{10} emissions comes from “Heating plants of less than 50 MW power and individual heating” around 51.37%, “Energy use in industry and industrial processes” – 12.10% (Figure 2.13).

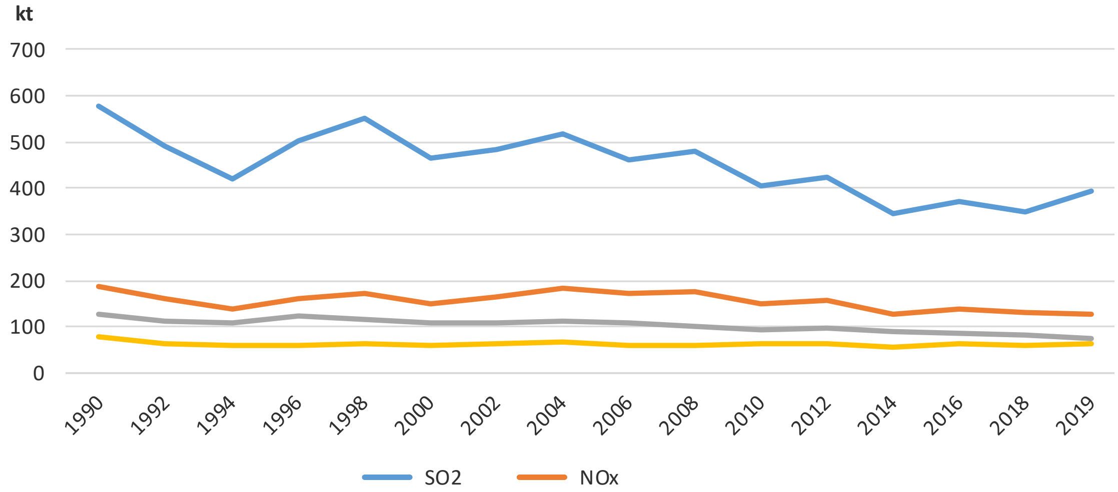


Figure 2.12. Emitted quantities of primary particulate matters and secondary precursors of particulate matters in the Republic of Serbia in the period 1990-2019

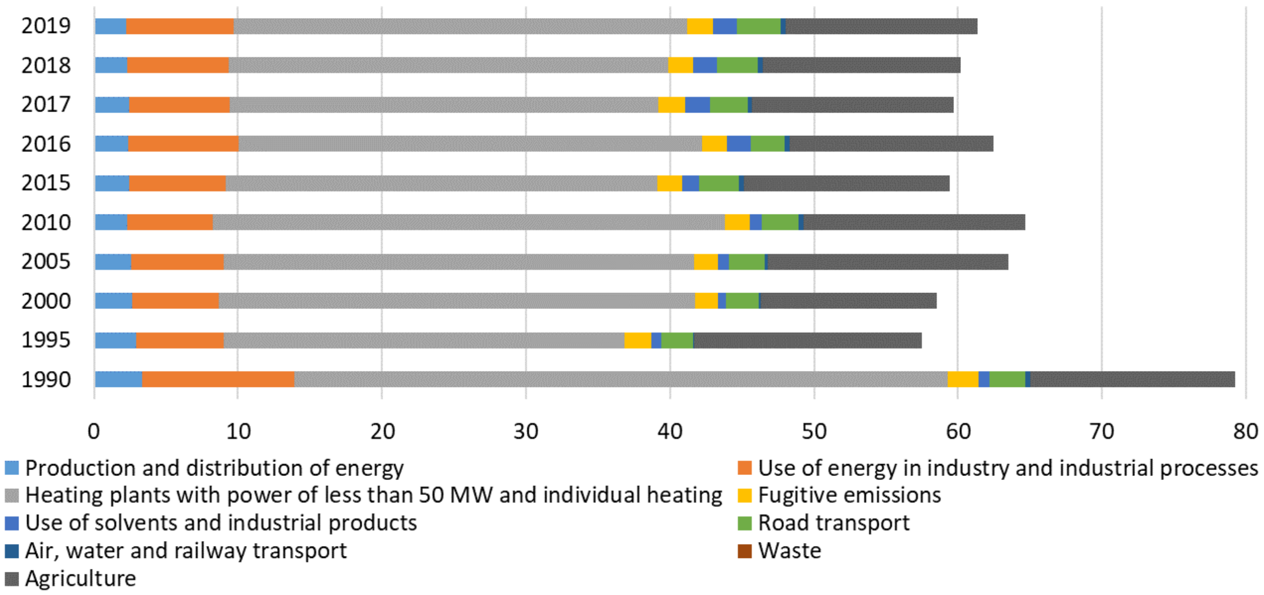


Figure 2.13. Emissions of particulate matters by sectors in the period 1990–2019 expressed in thousands of tonnes

Source of data: National Register of Pollution Sources, Environmental Protection Agency

2.1.4. Heavy metals emissions (P)

Key messages:

1) the amount of heavy metals emitted from anthropogenic sources indicates a decline in the period 1990-1996, and then it shows an increase in emissions, except in the period 2011-2014;

2) lead emissions had decreased in the period 1992-1993, then grew in 1998, to record again a decline in the period 1998-1999. In the period 2000-2008, the emissions were constant, and then there was a significant decline because the production of leaded fuels was terminated.

The indicator follows the trend of anthropogenic emissions of the following heavy metals: Pb, Hg, Cd, As, Cu, Cr, Ni, Se, Zn. The indicator also provides information on pollutant emissions by sector in accordance with the EMEP/EEA 2019 methodology.

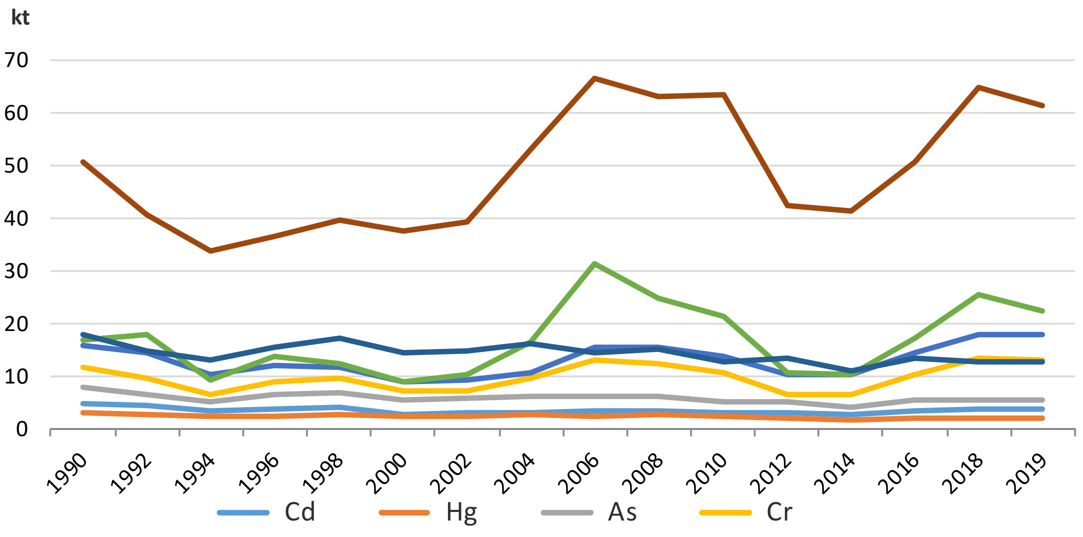


Figure 2.14. Emitted quantities of Hg, Cd, As, Cu, Cr, Ni, Se, Zn in the Republic of Serbia in the period 1990-2019

After a series of studies that demonstrated that heavy metals are long-range transported by atmosphere, and that atmospheric deposition in some areas makes a significant if not dominant share in soil and water pollution, the emissions of heavy metal from anthropogenic sources became the interest of the UNECE/LRTAP Convention on Transboundary Long Range Air Pollution (hereinafter: CLRTAP). Heavy metals are very stable, so that almost all emitted amounts sooner or later reach either soil or water. Due to their persistence, significant toxicity and tendency to accumulate in ecosystems, heavy metals are dangerous for living organisms. The perceived danger of excessive heavy metals emissions has accelerated the adoption of the Protocol on Heavy Metals under the Convention on Transboundary Long Range Air Pollution.

Emissions of priority heavy metals (Pb, Cd and Hg) mainly originate from fuel combustion. The amount emitted depends on the type and amount of fuel combusted, so the emission of cadmium (Cd) will be higher from liquid fuels (heating oil), while the amount of mercury emitted (Hg) will increase if natural gas is used.

Other heavy metals include arsenic, chromium, copper, nickel, selenium and zinc. The sources of emissions of these heavy metals are various. Emissions of arsenic, chromium and nickel are a consequence of their presence in solid fuels and heating oil, but they are also present in raw materials in some production processes, such as the production of glass, iron and steel. Copper and zinc are mostly emitted from brakes and tires wear and tear, and selenium appears as a pollutant in the production of glass and mineral wool.

The trend of total anthropogenic emissions of heavy metals (Cd, Hg, As, Cr, Cu, Ni, Se and Zn) shows a decline in the period 1990-1996, and then the emissions thereof recorded an increase (Figure 2.14).

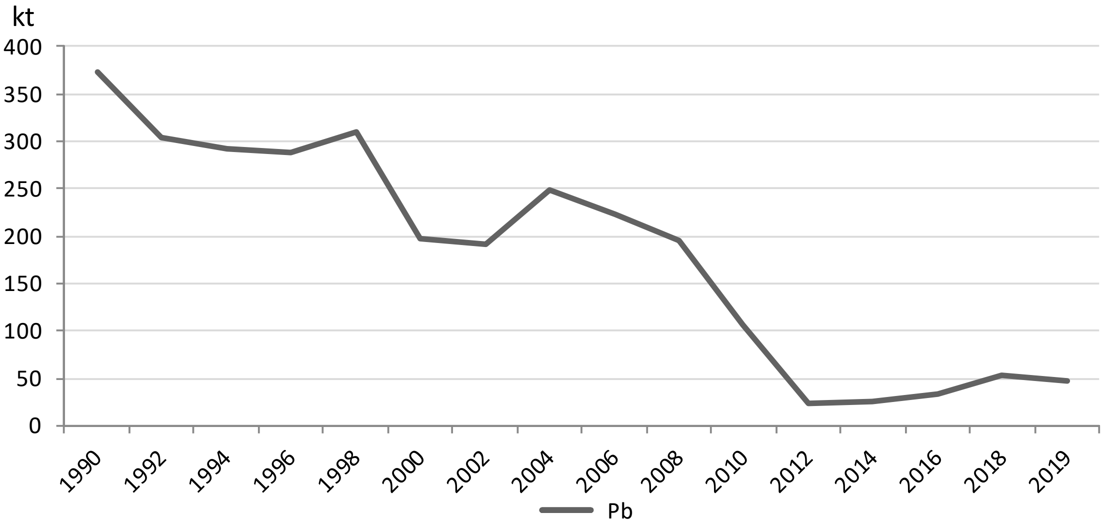


Figure 2.15. Emitted quantities of Pb in the Republic of Serbia in the period 1990-2019

Lead emissions declined in 1992-1993, then there was an increase, and in the period 1998-1999, lead emissions again decreased. In the period 2000-2008, the emissions were constant, and then there was a decline because the production of leaded fuels was terminated (Figure 2.15).

Source of data: National Register of Pollution Sources, Environmental Protection Agency

2.1.5. Emissions of unintentional persistent organic pollutants (uPOPs) (P)

Key messages

Emitted quantities of unintentional persistent organic pollutants show a slight decrease in the period 1990-2019.

The indicator shows the total emission of anthropogenic emissions of unintentional persistent organic pollutants from various sources. Data were collected in accordance with the UNEP methodology according to the Stockholm Convention on Persistent Organic Pollutants. The presented trends refer to polycyclic aromatic hydrocarbons (PAH), i.e., benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dioxins and furans (PCDD/F), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs).

The indicator also provides information on pollutant emissions by sector in accordance with the EMEP/EEA 2019 methodology.

Unintentional persistent organic pollutants are a group of organic pollutants with proven toxic effects. In addition, they are very stable (resistant to chemical, photochemical and biological degradation). They have the property of accumulating in living organisms (bioaccumulation, most often in fat deposits), and they are also prone to transmission over long distances. Due to the property of partial volatility, they can be either found in the gas phase or are absorbed by particles in the atmosphere, which has a harmful effect on human health and the environment.

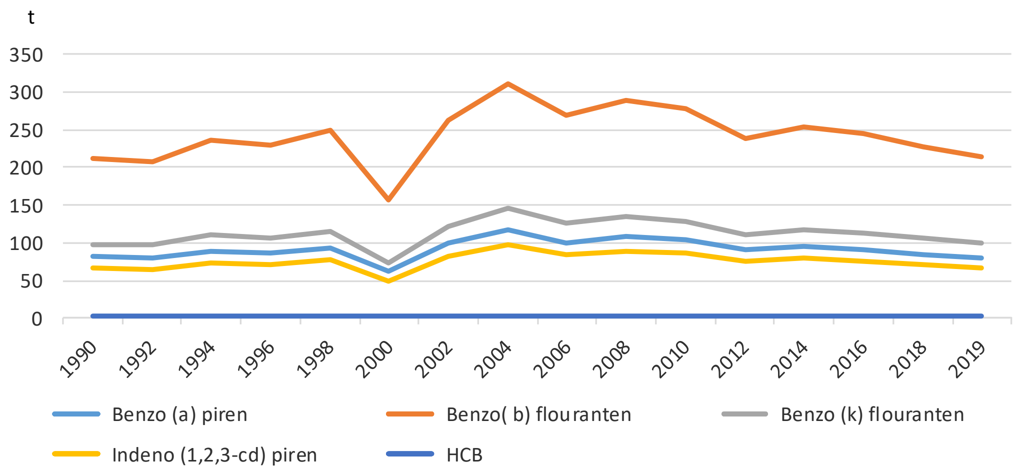


Figure 2.16. Emitted quantities of unintentional persistent organic pollutants (POPs) in the Republic of Serbia in the period 1990-2019

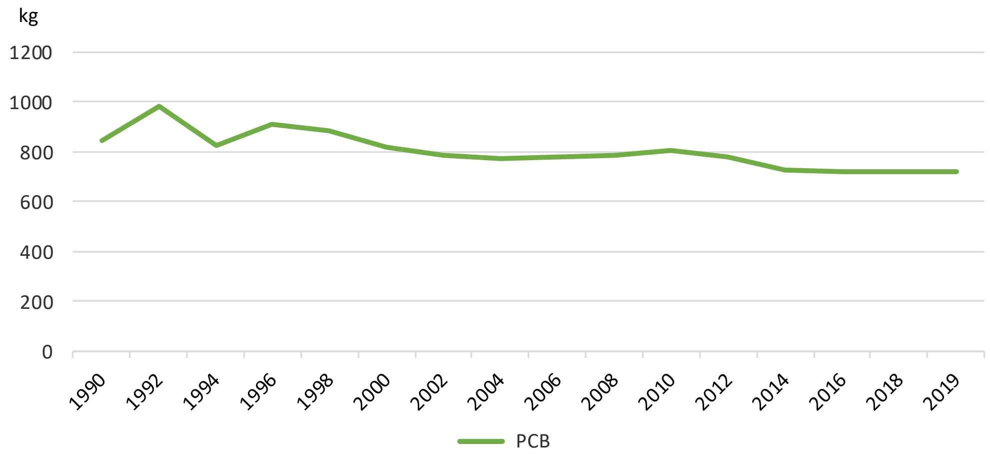


Figure 2.17. Emitted quantities of polychlorinated biphenyls in the Republic of Serbia in the period 1990-2019

In order to reduce the emission of these pollutants, the International Protocol on Persistent Organic Pollutants to the CLRTAP was adopted, which prescribes measures and methods to reduce air pollution caused by these substances. The Protocol prescribes basic obligations which, *inter alia*, prescribe the reduction of total annual emissions of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dioxins and furans (PCDD/F), as well as hexachloro cyclohexane (HCH).

As can be seen from the figures, all of the above-mentioned unintentional persistent organic pollutants have a slight declining trend (Figures 2.16 and 2.17).

Source of data: National Register of Pollution Sources, Environmental Protection Agency

2.2. AIR QUALITY STATUS (S)

2.2.1. Network of automatic air quality measurement stations (AAQMS) (S)

Key messages:

1) during 2020, the Agency carried out, within its areas of competence, air quality monitoring in the Republic of Serbia in the network of Automatic Air Quality Measuring Stations (hereinafter: AAQMS);

2) new measurement points for monitoring the concentrations of pollutants have been established.

The obligations of the Agency, as part of the Ministry of Environmental Protection, in the area of air quality management are defined by the Law on Air Protection (Official Gazette of RS, No. 36/09 and 10/13) and the Law on Ministries (Official Gazette of RS, No. 128/20).

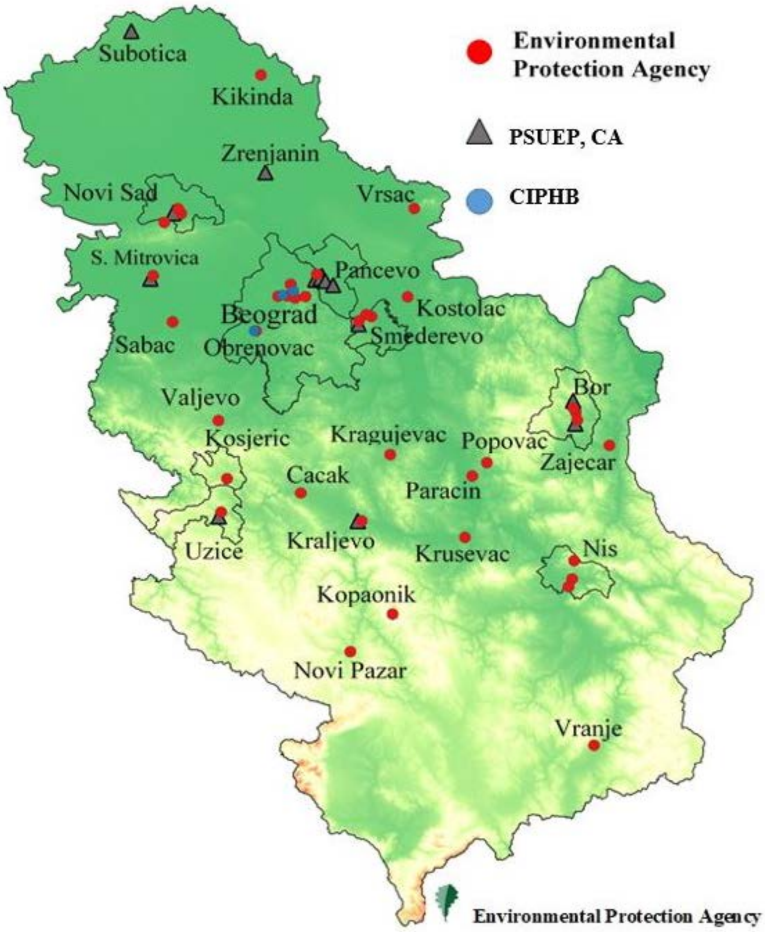


Figure 2.18. National and local network of air quality measurement stations in 2020

During 2020, the Agency continued with the continuous air quality monitoring in the state network of stations in the Republic of Serbia, as well as with the collection and processing of air quality data from institutions involved in the state and local air quality networks. New measurement points have been established by installing AAQMS in Novi Pazar and Vršac, and a sampling point for particulate matters in Radinac (Smederevo).

This Report also includes automatic stations from local air quality networks of the Provincial Secretariat for Urbanism and Environmental Protection (PSUEP), and the City of Pančevo (CP), as well as measurement points where fix measurements of particulate matters are conducted by city administrations of Sremska Mitrovica (CA SM), Užice (CA UE), Subotica (CASU), Novi Sad (CA NS), Niš (CA NI), Kraljevo (CA KV) Bor (CA BO) and Smederevo (CA SD) (Figure 2.18). In the territory of the City of Belgrade, in addition to the stations under the jurisdiction of the Agency, the state network also includes three stations of the City Institute of Public Health of Belgrade (CIPHB), wherefrom only a part of available data was submitted to the Agency in 2020.

Source of data: Environmental Protection Agency, CIPHB, PSUEP, CP, CASM, CAUE, CASU, CANS, CANI, CAKV, CABO, CASD

2.2.2. Functionality of the AAQMS network and air quality assessment in 2020 (S)

Key messages:

The volume of available data in 2020 has increased compared to the previous year.

The operational functionality of the AAQMS has been monitored since its establishment. It is complete when each analyser measures more than 90% of the hourly pollutant concentrations in the course of one calendar year.

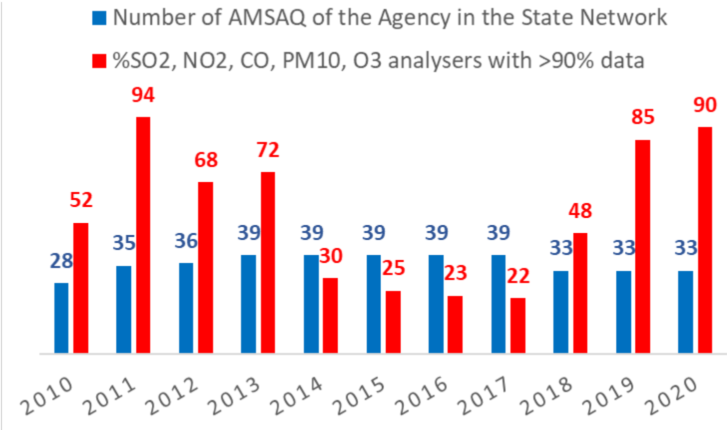


Figure 2.19. Review of the operational functionality of the state network of the Agency's AAQMS in the period 2010-2020

The graph (Figure 2.19) shows that in 2011, 94% of installed automatic analysers for continuous monitoring of ambient concentrations of sulphur dioxide (SO_2), nitrogen oxides ($NO/NOx/NO_2$), carbon monoxide (CO), ground-level ozone (O_3) and particulate matters (PM_{10}) met the prescribed requirement in terms of data volume.

In the years that came, as a consequence of the lack of financial support for maintenance and servicing of equipment of the state network of AAQMS, the number of analysers with the required data volume decreased, and only 22% of installed automatic analysers in the state network of AAQMS met the prescribed criterion for data volume in 2017. Since 2017, the necessary financial resources have been provided, and after the start of regular servicing of equipment during the same year with continuity of financing and maximum involvement of all available resources, there was an increase in analyser performance from 48% in 2018 to 85% in 2019 and 90% in 2020. Measurements at the new stations Vršac and Novi Pazar, which were launched in the first quarter of 2020 and renewed measurements in Paraćin, were not taken into account on this occasion. The fact that the state network of stations has been expanded with Vršac and Novi Pazar stations, and that measurements at the Paraćin station have been renewed, together with an increase in the percentage of functional analysers at already operational stations, demonstrates that air quality monitoring has reached the top of environmental priorities.

Source of data: Environmental Protection Agency

2.2.3. Air quality assessment in zones, agglomerations and cities (S)

Key messages:

1) during 2020, the air quality in the zone of Serbia and in the zone of Vojvodina was clean or slightly polluted, except in the cities of Valjevo, Novi Pazar, Kraljevo, Zaječar, Kragujevac, Subotica, Zrenjanin and Popovac;

2) in the agglomerations of Belgrade, Niš, Bor, Pančevo, Smederevo, Kosjerić and Užice, in 2020, exceedances of the limit values (ELV) of monitored pollutants were recorded, which caused excessive pollution.

When assessing the air quality for 2020, data used were actually available results of reference monitoring in the state and local networks of PSUEP Vojvodina, the Cities of Pančevo, Sremska Mitrovica, Užice, Subotica, Novi Sad, Niš, Kraljevo, Bor and Smederevo.

Official air quality assessment for zones, agglomerations and cities for 2020:

1) in the zone of Serbia and the zone of Vojvodina, the air was clean or slightly polluted in 2020, except in the cities: Valjevo, Novi Pazar, Kraljevo, Zaječar, Kragujevac, Subotica, Zrenjanin and Popovac;

2) in the agglomerations: Belgrade, Niš, Bor, Pančevo, Smederevo, Kosjerić and Užice, the air was excessively polluted in 2020, and in the agglomeration of Novi Sad the air was clean or slightly polluted (Figure 2.20).

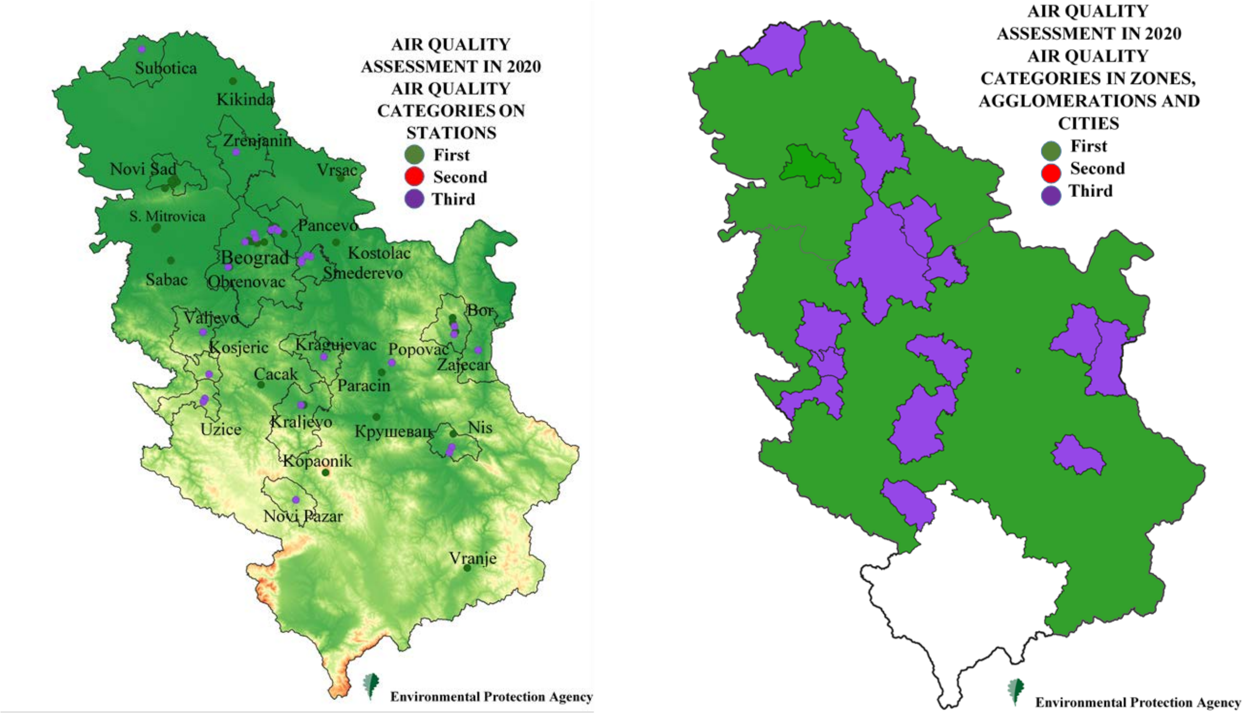


Figure 2.20. Air quality categories by zones, agglomerations and cities in 2020

Source of data: Environmental Protection Agency, CIPHB, PSUEP, CP, CASM, CAUE, CASU, CANS, CANI, CAKV, CABO, CASD

2.2.4. Air quality assessment in the Republic of Serbia (S)

Key messages:

Due to the improvement of monitoring system, by increasing the number of measurement points (primary particulate matters PM_{10} and $PM_{2.5}$) and by increasing the number of data submitted by local governments, more accurate and comprehensive figures of the state of air quality in the Republic of Serbia were obtained.

The table below shows the average annual concentrations of SO_2, NO_2, PM_{10}, $PM_{2.5}$, C_6H_6, CO and O_3, number of days exceeding the daily limit values (Table 1: grey colour – parameter not foreseen by the air quality monitoring programme, purple colour – values higher than ELV, empty cell – parameter that does not reach the required number of valid measurements/results are not submitted).

Table 1. Air quality assessment for 2020

Agglomeration, zone	Station	Air quality categorisation (category)	SO_2 µg/m³	SO_2 Number of days with ca >125 µg/m³	NO_2 µg/m³	NO_2 Number of days with >85 µg/m3	PM_{10} µg/m³	PM_{10} Number of days with >50 µg/m3	$PM_{2.5}$ µg/m³	C_6H_6 µg/m³	CO mg/m³	CO Number of days with >5 mg/m3	O_3 µg/m³	O_3 Number of days with >120 µg/m3
SERBIA	Šabac	I	9	0	19	0					0.73	0		
	Kostolac		14	0	10	0	35	53			0.38	0		
	Kamenički vis - EMEP		12	0	7	0	16	2					89.5	33
	Čačak				21	0					0.57	0		
	Paraćin		9	0	13	0					0.85	0		
	Vranje		10	0	17	0					1.06	0		
	Kopaonik		6	0									80.4	9
	Kruševac				12	0					0.83	0		
	Popovac	III	5	0	28	0	41	79	17		0.43	0	28.0	0
	Kragujevac	III	9	0	18	0	42	68			0.62	0		
	Zaječar	III	21	0	16	0	63	139			0.99	1		
	Kraljevo Policijska uprava (L)	III					48	106	30					
	Kraljevo		8	0	14	0					0.64	0		
	Novi Pazar	III	10	0	16	0	52	121	41				72.1	3
	Valjevo	III	13	0	23	0	63	147	45		0.85	0		
VOJVODINA	Kikinda Centar	I	7	0							0.36	0	72.4	3
	Vršac		7	0	11	0							80.3	12
	Sremska Mitrovica		12	0	21	0					0.67	0		
	Sremska Mitrovica (L)						32	48						
	Beolin Centar		9	0	17	0	37	48						
	Subotica (IPH) (L)	III					36	61	28					
	Zrenjanin (L)	III					42	74						
Belgrade	Beograd Stari grad	III			23	0	33	46	30		0.39	0	52.0	0
	Beograd Novi Beograd		12	1	21	1	32	52	28	2	0.44	0	59.1	0
	Beograd Mostar		12	1	33	1	24	32	19		0.56	0		
	Beograd Vračar		11	1	29	1	35	42	23				40.5	0
	Beograd Zeleno brdo		10	0	27	0					0.33	0	68.9	10
	Obrenovac Centar		18	2	38	0	17	7	8		0.46	0		
	Beograd D. Stefana CIPH						46	90						
	Beograd Obrenovac CIPH						45	95						
	Beograd N. Beograd CIPH						38	74						
Novi Sad	Novi Sad Liman	I	9	0	11	0	32	36			0.27	0	74.6	20
	Novi Sad Rumenačka		9	0	24	0	35	60	22		0.44	0		
	Novi Sad PUC Vodovod i kanalizacija (L)						25	14	17					
	Novi Sad Kać (L)						27	44	22					
	Novi Sad Dečje selo (L)		8	0	17	0	22	12	15	2	0.34	0	62.9	0
Niš	Niš OŠ Sveti Sava	III	9	0	17	0	49	115	31		0.65	0	61.9	1
	Niš IPH Niš		12	0	22	0	47	106	40					
Bor	Bor Gradski park	III	74	58			33	35	16					
	Bor Brezonik		32	17										
	Bor Institut		31	10	35	0					0.34	0		
	Bor Krivelj (L)						27	12						
	Bor Jugopetrol (L)						40	75						
Pančevo	Pančevo Sodara	III	13	0							0.48	0		
	Pančevo Narodna bašta (L)						51	119	37	1				
	Pančevo Cara Dušana (L)		8	0						2	0.48	0	72.3	17
	Pančevo Vatrogasni dom (L)				17	0	30	50	25	3			80.4	40
	Pančevo Vojlovica (L)		10	0			34	74	29					
	Pančevo Starčevo (L)		9	0	15	0	32	73			0.66	0	54.2	1
Smederevo	Smederevo Carina	III			8	0	52	120			0.51	0		
	Smederevo Centar		19	0	24	0	38	76	32					
	Smederevo Radinac						66	148						
	Smederevo (L)						46	120						
Kosjerić	Kosjerić	III	6	0	25	0	56	126	38		0.70	0	57.2	4
Užice	Užice	III	7	0	29	0	59	134	33		0.83	0		
	Užice (L)						46	99						

Source of data: Environmental Protection Agency, CIPHB, PSUEP, CP, CASM, CAUE, CASU, CANS, CANI, CAKV, CABO, CASD

2.2.5. Share of daily values exceedances for SO_2, NO_2, PM_{10}, CO and target value of O_3 (%) in total number of exceedances (S)

Key messages:

1) more than four-fifths of the total number of exceedances of pollutant limit values refers to concentrations of particulate matters PM_{10};

2) air quality in the territory of the Republic of Serbia is predominantly determined by the concentrations of particulate matters PM_{10}.

The indicator shows the percentage of exceedances of daily limit values for SO_2, NO_2, PM_{10}, SO and target values of O_3 in the total number of exceedances during the year.

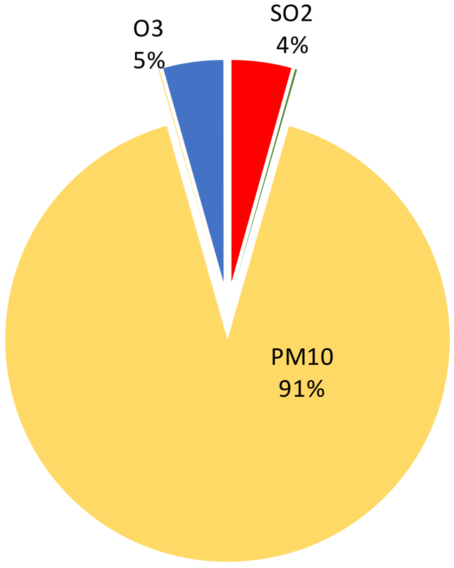


Figure 2.21. Percentage contribution of SO_2, NO_2, PM_{10} and SO to the occurrence of exceedances in daily limit values and target value of O_3 in the Republic of Serbia in 2020

Pollutants measured during 2020 had different effects on the state of air quality in the Republic of Serbia.

The most present pollutants were particulate matters PM_{10}, which in 91% of cases appeared as a cause of excessive air pollution due to exceedances of daily limit values. Other pollutants were in a much smaller percentage above the allowed daily concentration values.

Exceedances of target value of ozone contributed to air pollution in 5% of cases, and sulphur dioxide in 4%. Nitrogen dioxide and carbon monoxide, with less than 1% share in the total number of exceedances, were the least likely to cause air pollution (Figure 2.21).

Source of data: Environmental Protection Agency, CIPHB, PSUEP, CP, CASM, CAUE, CASU, CANS, CANI, CAKV, CABO, CASD

2.2.6. Frequency of the occurrence of concentrations dangerous for human health (S)

Key messages:

Since the establishment of automatic air quality monitoring, only sulphur dioxide in Bor was recorded in constant concentrations dangerous to human health.

The indicator describes the state of air quality related to the occurrence of legally prohibited concentrations dangerous to human health.

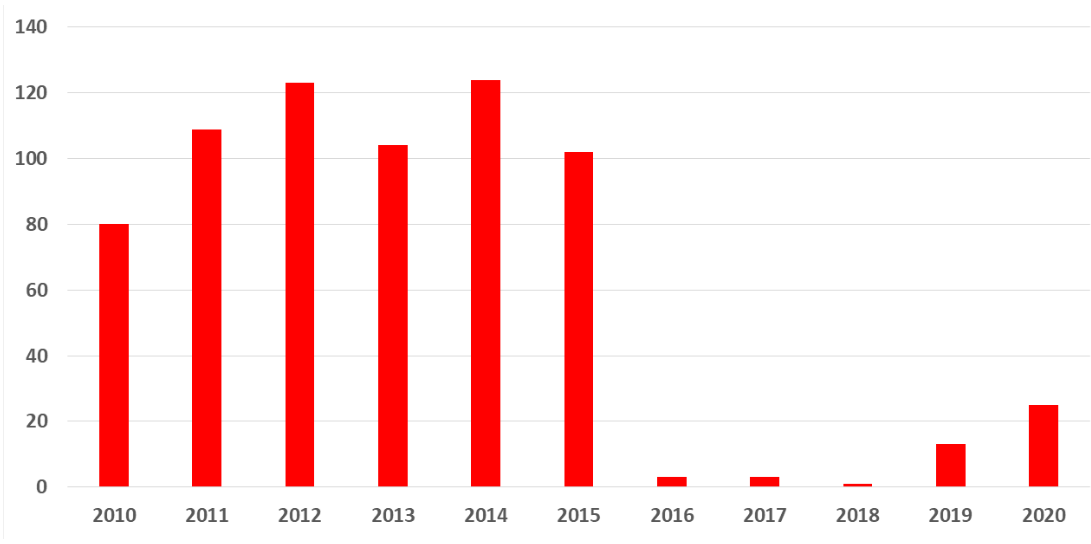


Figure 2.22. Number of episodes with exceedances of SO_2 concentrations higher than 500 μg/m^3 for three or more consecutive hours in Bor (City Park) in the period 2010-2020

Of all pollutants for which there are defined concentrations dangerous to human health (O_3, NO_2 and SO_2), the only episodes with concentrations higher than 500 μg/m^3 in the duration of three consecutive hours have been registered for sulphur dioxide in Bor (measurement point *Gradski park*) every year.

In the Bor agglomeration, according to data from the period 2010-2020, there had been a worrying state of air quality until the commissioning of the new smelter at the end of 2015. Since then, the occurrence of these concentrations has been much rarer. However, the increase in the number of episodes of concentrations dangerous to human health in 2019, and then in 2020, indicates the obligation to further implement measures to reduce air pollution in this agglomeration (Figure 2.22).

Source of data: Environmental Protection Agency

2.2.7. Number of days with exceedances in daily values for SO_2 (S)

Key messages:

Exceedances of the daily limit value of SO_2 in 2020 were measured only in Bor and Belgrade.

The indicator shows the number of days during the year with exceeding the daily limit value of SO_2 – 125 μg/m^3. The indicator describes the impact of SO_2 concentrations on air quality.

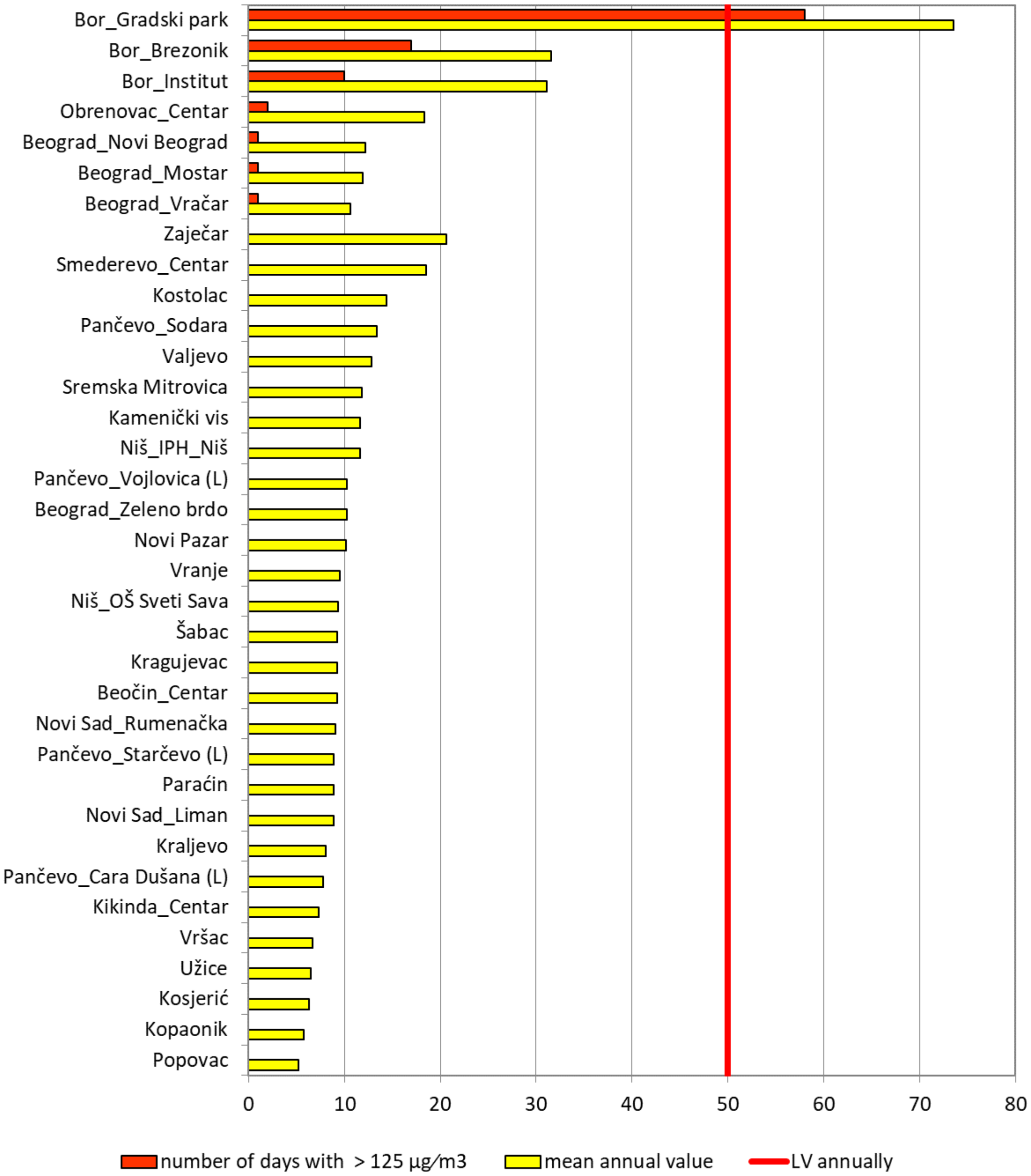


Figure 2.23 Comparative view of the average annual SO_2 concentrations (µg/m^3) and the number of days with LV exceedances in 2020

According to the data from 2020 in Bor, 58 days were recorded at the station *Bor_Gradski park*, 17 days at the station *Bor_Brezonik*, and ten days at the station *Bor_Institut* with exceedances of daily limit values of 125 µg/m^3. In Belgrade, at the measurement point Obrenovac, there were two days with exceedances in daily limit values, recorded at the measurement points Mostar, Vračar and New Belgrade, one day each (Figure 2.23). According to the legal regulations, during the year, the allowed number of days with exceedances in daily limit values is three.

Source of data: Environmental Protection Agency, CP, CANS

2.2.8. Number of days with exceedances of daily values for NO_2 (S)

Key messages:

1) exceedances in daily limit values of NO_2 in 2020 was recorded in the agglomeration of Belgrade;

2) in the territory of the Republic of Serbia, NO_2 did not exceed the annual limit value.

The indicator shows the number of days during the year with exceedances in daily limit values of NO_2 of 85 µg/m^3. The indicator describes the influence of NO_2 concentrations on air quality.

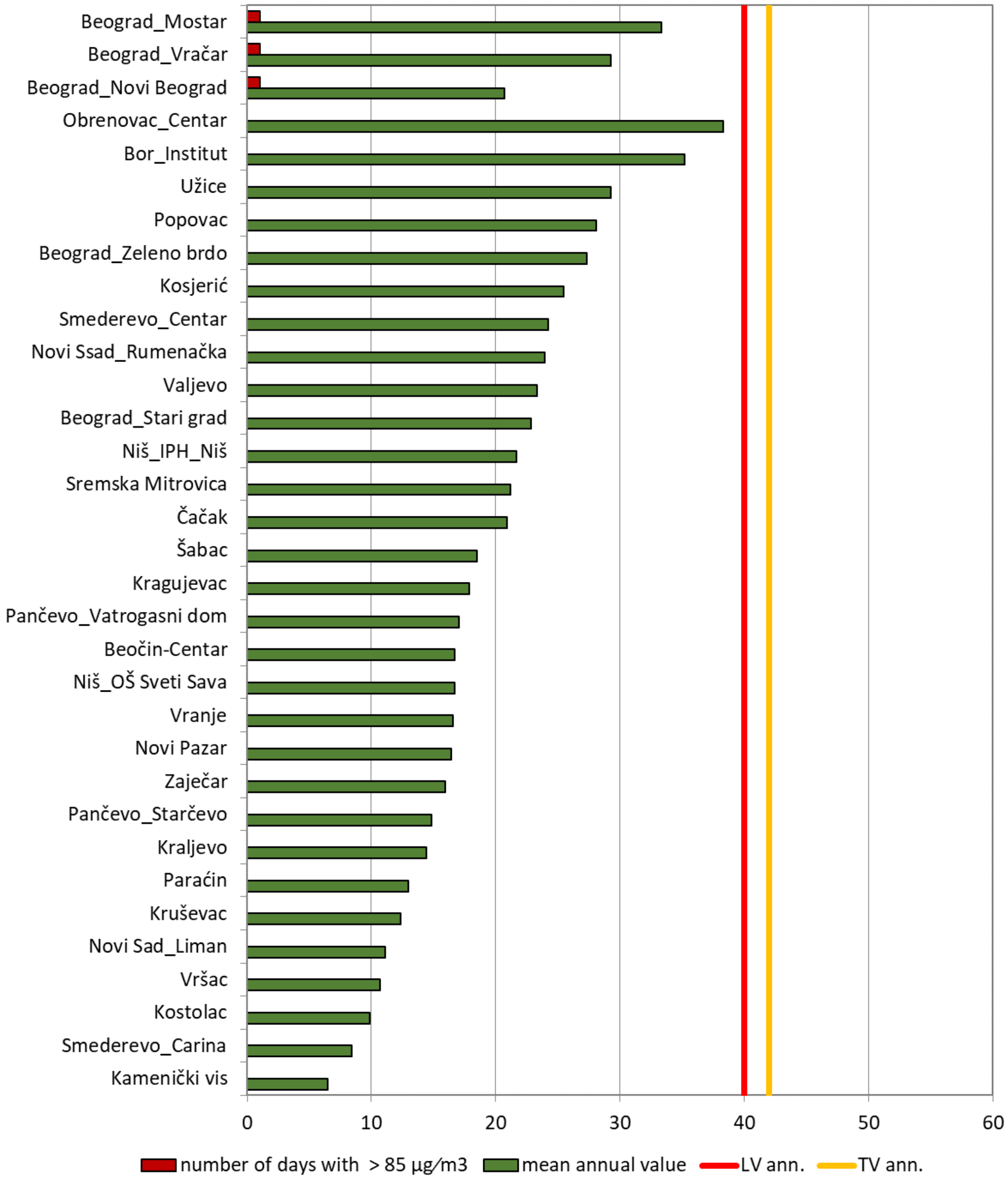


Figure 2.24. Comparative view of the average annual NO_2 concentrations (µg/m^3) and the number of days with exceedance in limit and target values in 2020

According to data from 2020, nitrogen dioxide contributed to poor air quality by exceeding the daily limit values – 85 μg/m^3 in the Belgrade agglomeration at the stations of New Belgrade, Mostar and Vračar for one day (Figure 2.24). According to the legal regulations, not a single day with exceeding the daily limit values is allowed during the year.

Source of data: Environmental Protection Agency, CP

2.2.9. Number of days with exceedances of daily values for PM_{10} (S)

Key messages:

1) in the territory of the Republic of Serbia, PM_{10} has the greatest impact on air quality (causes excessive pollution);

2) exceedances of the daily limit value of PM_{10} in 2020 were recorded at all stations where measurements of this pollutant are carried out.

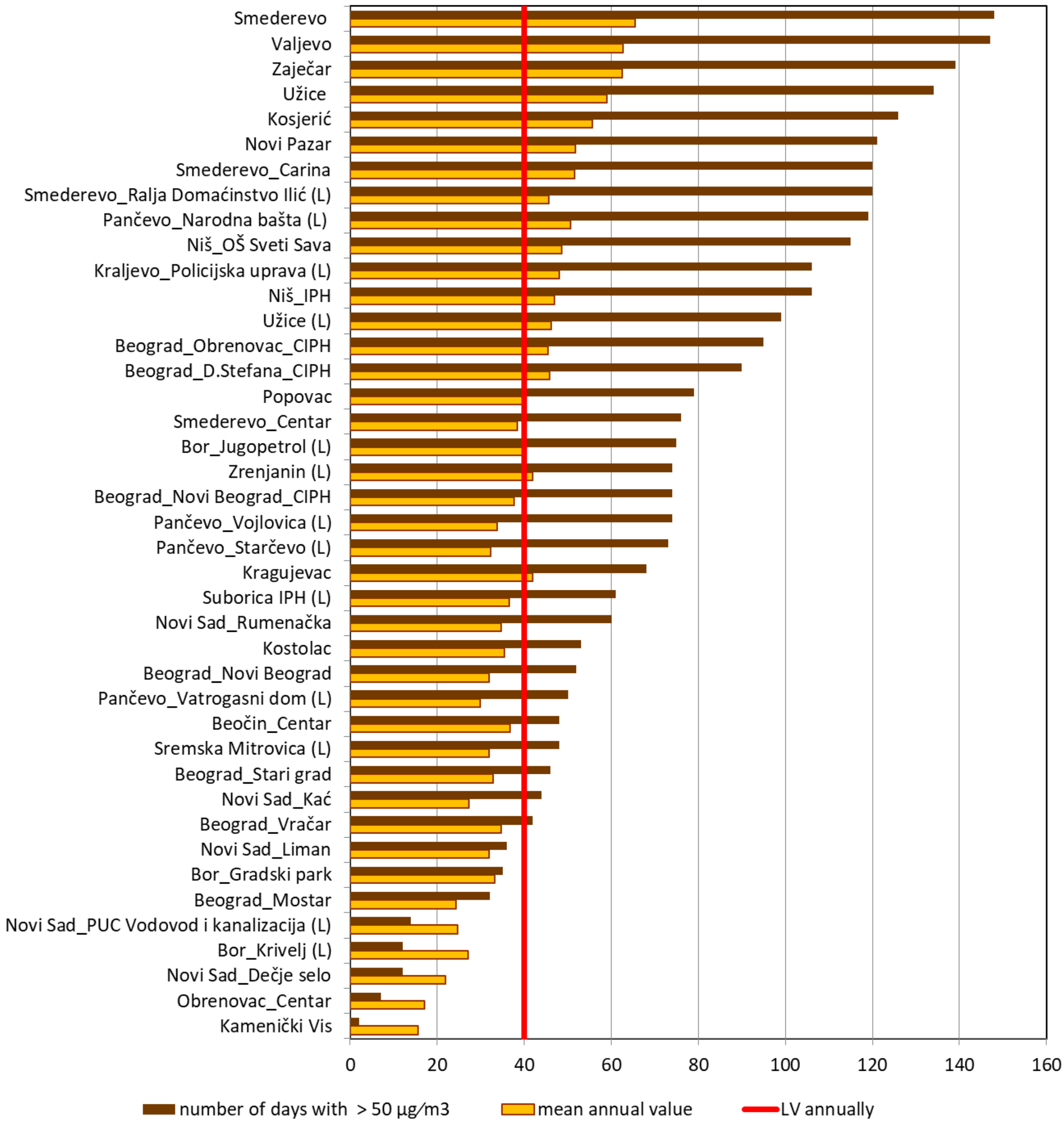


Figure 2.25. Comparative view of the average annual concentration of PM_{10} ($\mu g/m^3$) and the number of days with exceedance of limit values in 2020

The indicator shows the number of days during the year with exceedances in daily limit values for PM_{10} – 50 $\mu g/m^3$. The indicator describes the influence of concentrations of particulate matters with a diameter of less than 10 micrometres on air quality.

According to data from 2020, PM_{10} contributed to poor air quality by exceeding the daily limit values – 50 $\mu g/m^3$ at all stations where measurements were carried out. The largest number of days with exceedances was recorded at the stations *Smederevo_Radinac* (148), *Valjevo* (147), *Zaječar* (139), *Užice* (134), *Kosjerić* (126), and so on (Figure 2.25). According to legal regulations, the allowed number of days with exceedances of limit values is 35 during a year

Source of data: Environmental Protection Agency, CIPHB, PSUEP, CP, CASM, CAUE, CASU, CANS, CANI, CAKV, CABO, CASD

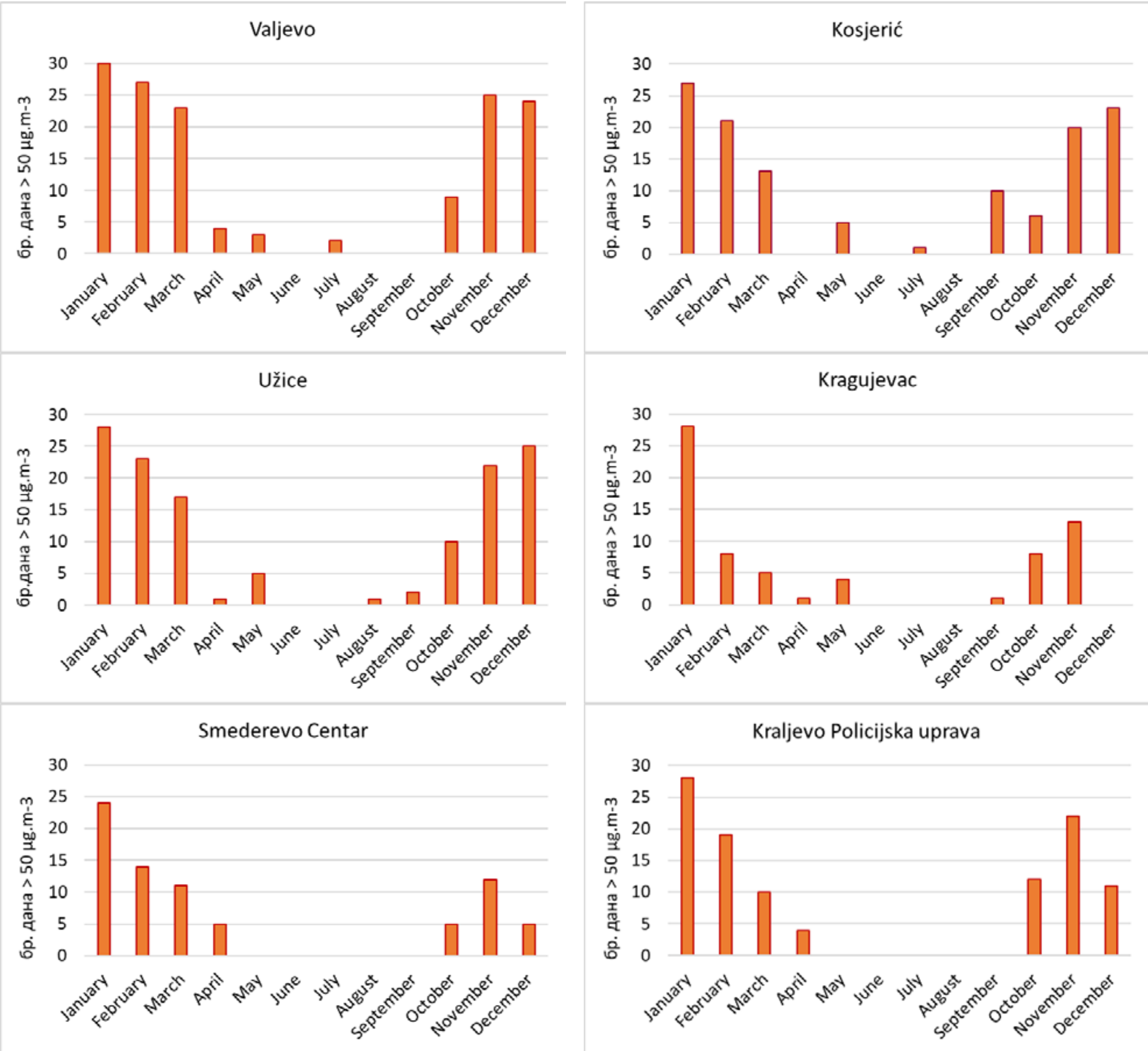
2.2.10. Number of days with exceedances of daily values for PM_{10} by months (S)

Key messages:

In the territory of the Republic of Serbia, all measurement points have predominantly recorded exceedances in daily limit values of PM_{10} in the winter months.

The indicator shows the number of days during each month with exceedances in daily limit values of PM_{10}. The indicator describes more precisely the state of air quality, following the schedule of exceedances of limit values by months due to pollution caused by particulate matters with less than 10 micrometres in diameter.

According to the data from 2020, it can be observed that all stations where measurements of PM_{10} were carried out recorded a large number of days with exceedances in daily limit values during the winter months. The largest number of days with exceedances in daily limit values in the winter months was recorded at the stations *Valjevo* (138), *Užice* (125), *Zaječar* (122), *Kosjerić* (110), *Kraljevo_Policijska uprava* (102), *Smederevo_Centar* (71), and so on (Figure 2.26).



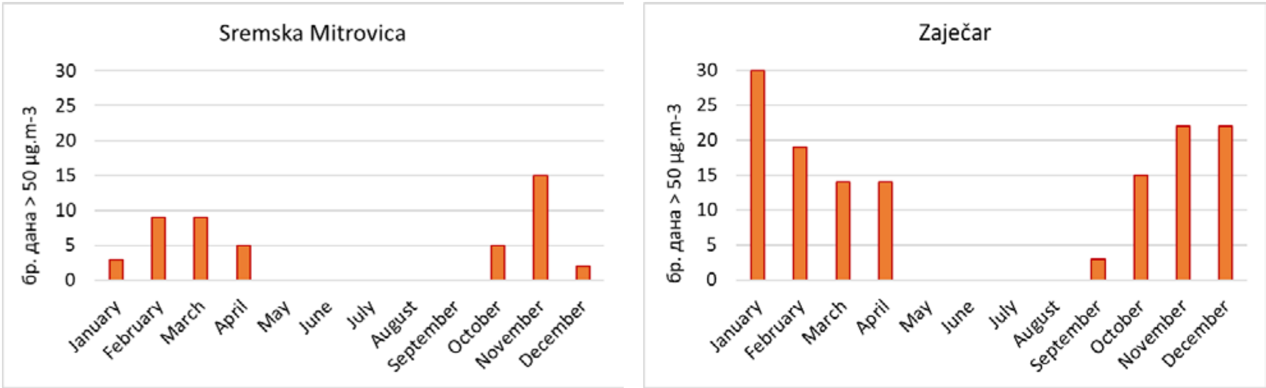


Figure 2.26. Overview of the number of days with exceedances in daily limit values of PM_{10} ($\mu g/m^3$) by months in 2020
Source of data: Environmental Protection Agency, CA SM, CA KV

2.2.11 Number of days with exceedances of target values for maximal daily eight-hour values of ground-level ozone (O_3) (S)

Key messages:

1) in the territory of the Republic of Serbia, ground-level ozone O_3 has the impact on air quality only in the warm part of the year;

2) the maximal daily eight-hour value is exceeded by more than the allowed 25 days, at the measuring stations: *Pančevo_Vatrogasni dom* and *Kamenički vis – EMEP*.

The indicator shows the number of days during the year with exceedances in target values of maximum daily eight-hour concentrations of O_3 – 120 $\mu g/m^3$. The indicator describes the impact of ground-level ozone pollution on air quality.

According to the data from 2020, exceedances in target values of maximum daily eight-hour concentrations of ground-level ozone – 120 $\mu g/m^3$ were recorded at most stations. The allowed number of days with exceedances in target values was exceeded at the stations *Pančevo_Vatrogasni dom*, where there were 40 days recorded, and at the station *Kamenički vis – EMEP* with 33 days (Figure 2.27). According to the legal regulations, the allowed number of days with exceedances in target values is 25 during a year.

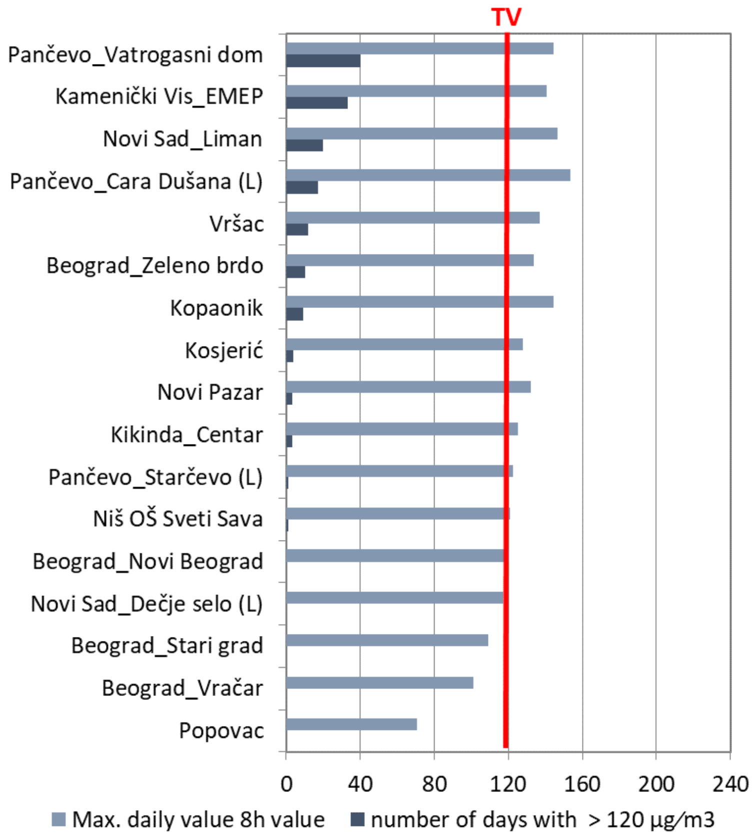


Figure 2.27. Comparative view of maximum daily eight-hour concentrations of O_3 (µg/m^3) and number of days with exceedances of target values in 2020

Source of data: Environmental Protection Agency, CP, CA NS

2.2.12. Number of days with exceedances of target values for maximal daily eight-hour values of ground-level ozone (O_3) between April and September (S)

Key messages:

In the territory of the Republic of Serbia, the largest number of days with recorded concentrations of ground-level ozone O_3 that have impact on air quality occurs in the period between April and September.

The indicator shows the number of days in the warm part of the year with exceedances of maximum daily eight-hour values for ground-level ozone. The indicator describes the impact of the ground-level ozone on air quality in the warm part of the year.

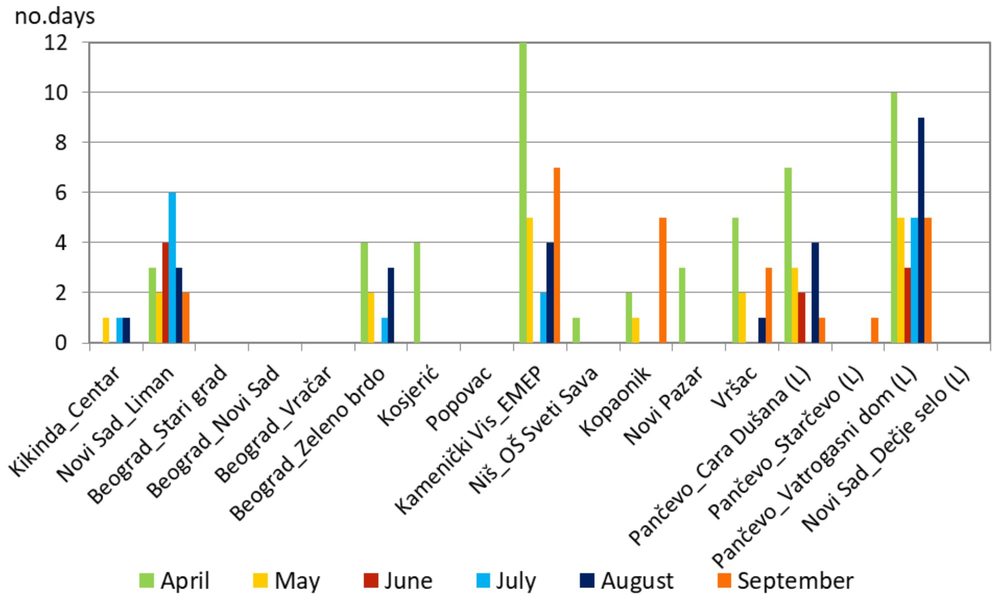


Figure 2.28. Preview of the number of days with exceeded target values in the period between April and September 2020

According to data from 2020, it can be observed that the largest number of days with exceedances of target value for ground-level ozone concentrations in the period between April and September was recorded at the following stations: *Kamenički vis – EMEP*, twelve days in April and seven in September, *Pančevo_Vatrogasni dom* ten days in April and nine in August, Novi Sad *Liman* six days in July, and so on (Figure 2.28).

Source of data: Environmental Protection Agency, CP, CA NS

2.2.13. Number of days with exceedances of limit values of maximal daily eight-hour values for CO (S)

Key messages:

In the territory of the Republic of Serbia, carbon monoxide does not cause excessive air pollution.

The indicator shows the number of days during the year with exceedances of limit values for maximum daily eight-hour concentrations of CO – 10mg/m^3. The indicator describes the influence of CO concentrations on air quality.

According to the data for 2020, the maximum daily eight-hour concentrations of CO exceeded the limit values (10mg/m^3) only at the AAQMS in Zaječar. The number of days with exceedances of limit values was two days in Zaječar (Figure 2.29). According to legislation, not a single day with exceeded maximum daily eight-hour limit value is allowed during a year.

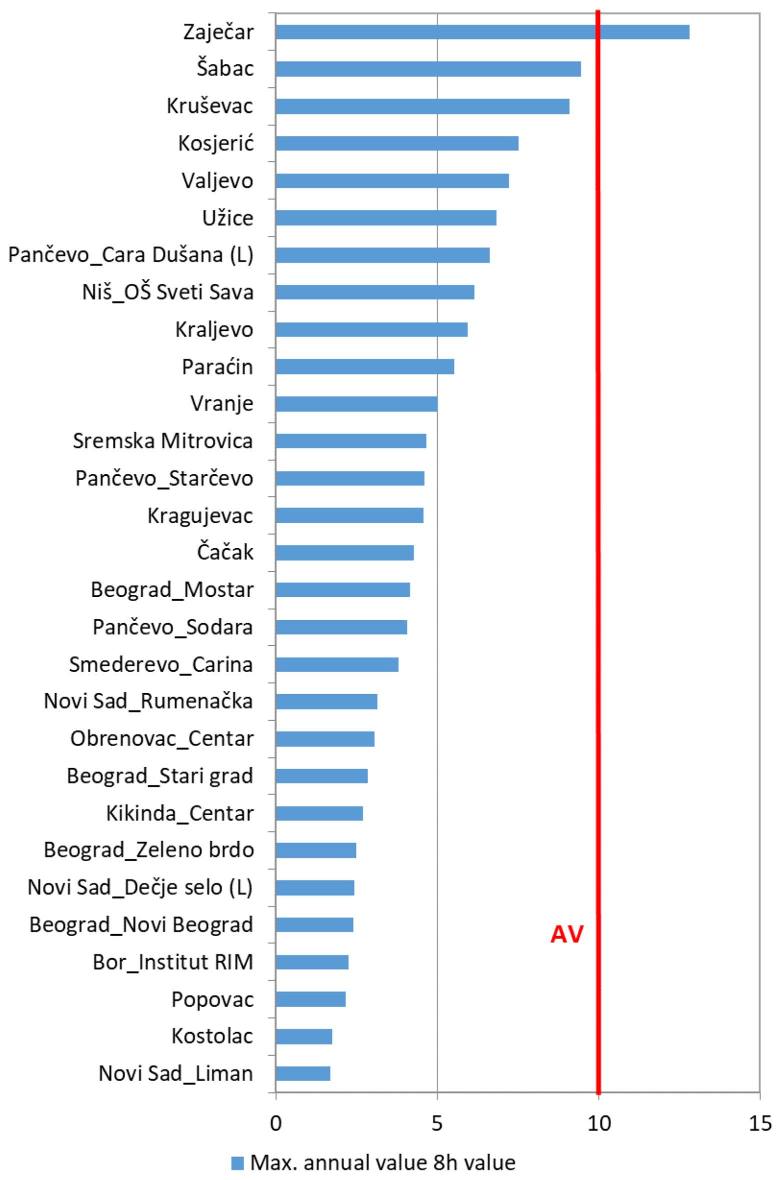


Figure 2.29. Overview of maximum eight-hour CO concentrations (mg/m^3) in 2020

Source of data: Environmental Protection Agency, CP, CA NS

2.2.14. Air quality trend in zones, agglomerations and cities (S)

Key messages:

In the course of 2020, there was an increase in the number of cities with excessive air quality pollution.

In the zones of Serbia and Vojvodina, the scope of measurements and submitted data on air quality conducted and collected by local self-governments has increased, which has given a more detailed picture of the state of air quality.

In the period 2016-2020, Belgrade had excessively polluted air, mainly due to increased concentrations of PM_{10} and $PM_{2.5}$, but also due to increased concentrations of NO_2, which was the case in 2017.

The Novi Sad agglomeration has mostly had clean air in the previous five years, but in 2019, excessive pollution was recorded due to the presence of particulate matters PM_{10}.

		AIR QUALITY CATEGORIES				
		2016	2017	2018	2019	2020
ZONES	**SERBIA**	I	I	I	I	I
	City of Kragujevac	III	III	III	I	III
	City of Kraljevo		III	III	III	III
	City of Zaječar				III	III
	City of Valjevo	III	III	III	III	III
	City of Novi Sad					III
	Popovac			I	I	III
	Vojvodina	I	I	I	I	I
	City of Sremska Mitrovica	III	I	III	I *	I
	City of Subotica	III	III	III	III	III
	City fo Zrenjanin				I	III
AGGLOMERATIONS	Novi Sad	I	I	I	III	I
	Belgrade	III	III	III	III	III
	Pančevo	I	III	III	III	III
	Smederevo			III	III	III
	Bor	I	I	I	III	III
	Kosjerić			III	III	III
	Užice	III	III	III	III	III
	Niš	I	III	III	III	III

Figure 2.30. Trends in air quality by zones, agglomerations and cities in the period 2016-2020

Bor was classified in the first category for three years in a row (2016-2018), but in 2019 and 2020, the annual value of sulphur dioxide resulted in classification into third category – excessively polluted air.

The agglomerations of Pančevo and Niš had clean air in 2016, but for the fourth year in a row they are categorised into third category – excessively polluted air due to pollution with suspended particles PM_{10} and $PM_{2.5}$.

In 2018, 2019 and 2020, the agglomerations of Smederevo and Kosjerić had air quality that belongs to the third category - excessively polluted air due to pollution with particulate matters PM_{10} and $PM_{2.5}$.

The air in Valjevo, as well as in Užice, has been excessively polluted in the last five years due to increased concentrations of PM_{10} and $PM_{2.5}$.

The city of Subotica has been in the third category for five years in a row as a result of pollution with suspended particles RM10 and RM2.5, and the city of Sremska Mitrovica, which has variable air quality in 2020, was in the first category.

The city of Kraljevo has still been, for the fourth year in a row, categorised into third category as a consequence of pollution with particulate matters PM_{10} and $PM_{2.5}$.

The city of Novi Pazar, where measurements of pollutants started in 2020, is classified into third category due to pollution with particulate matters PM_{10} and $PM_{2.5}$.

The cities of Zaječar and Popovac were in the third category of air quality in 2020 due to the presence of particulate matters PM_{10} (Figure 2.30).

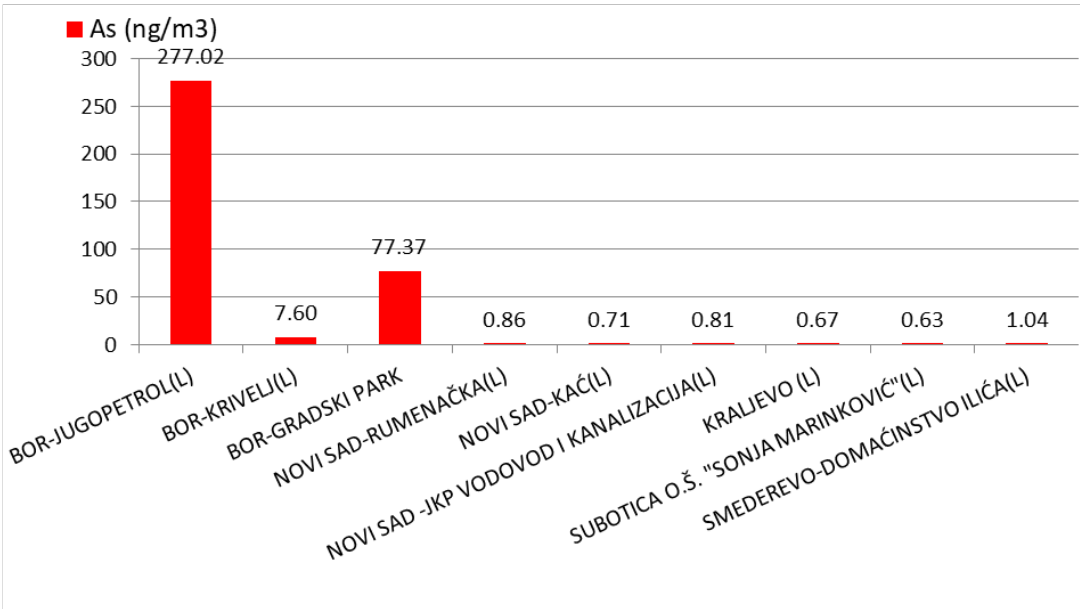
Source of data: Environmental Protection Agency, CIPHB, PSUEP, CP, CASM, CAUE, CASU, CANS, CANI, CAKV, CABO, CASD

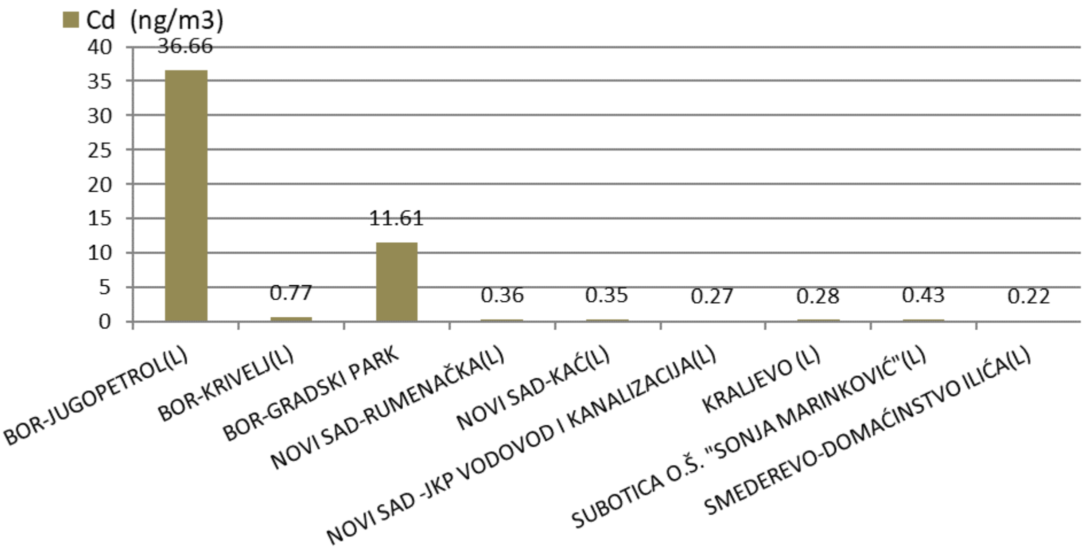
2.2.15. Share of heavy metals in particulate matters PM_{10} (S)

Key messages:

In the course of 2020, the content of arsenic (As) and cadmium (Cd) in particulate matters PM_{10} in Bor significantly exceeded the annual target values.

The content of heavy metals arsenic (As), cadmium (Cd), nickel (Ni) and lead (Pb) in particulate matters PM_{10} was found during 2020 through fixed measurements in Bor, Novi Sad, Kraljevo, Subotica and Smederevo (Figure 2.31).





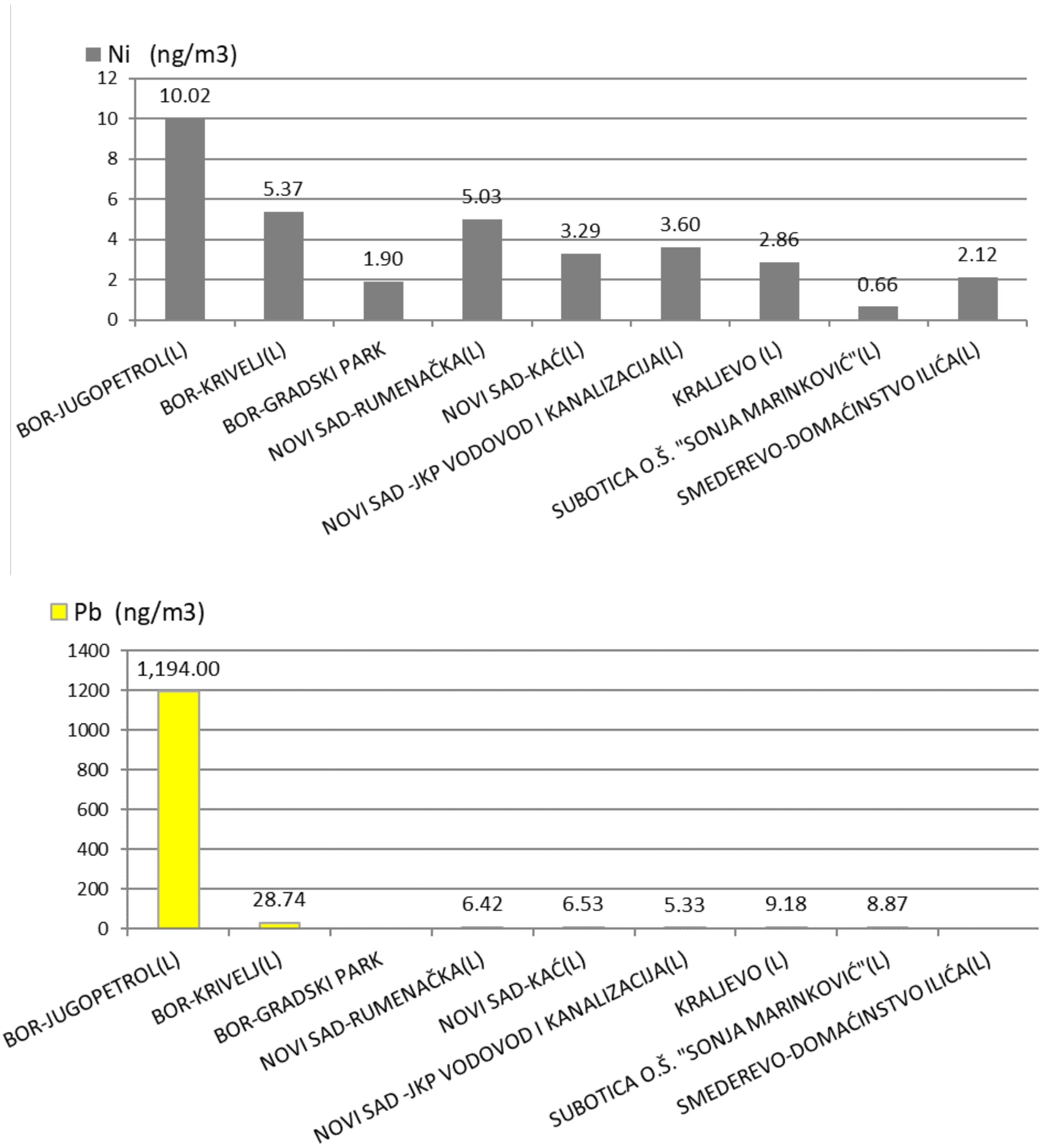


Figure 2.31. Content of arsenic, cadmium, nickel and lead in particulate matters PM_{10}

The average annual value of arsenic in Bor, at the measurement points of *Bor-Gradski park, Bor-Jugopetrol* and *Bor-Krivelj* was 77 ng/m^3, 277 ng/m^3 and 8 ng/m^3, respectively, and cadmium 12 ng/m^3, 37 ng/m^3 and 5 ng/m^3. These results, in comparison with the target annual value of 6 ng/m^3 for arsenic and 5 ng/m^3 for cadmium, showed that target values were exceeded at all measurement points, except for cadmium at the *Bor-Krivelj* station. The limit value of lead 500 ng/m^3 and the target value of nickel 20 ng/m^3 were not exceeded at any station.

Source of data: Environmental Protection Agency, CA BO, CA NS, CA KV, CA SD, CA SU

2.3. ALLERGENIC POLLEN CONCENTRATIONS (S)

2.3.1. Number of days with exceedances of allergenic pollen limit values (S)

Key messages:

The largest number of days with exceedances of limit values for pollen grains was recorded in Niš for birch, in Vranje for grasses, and in Vrbas for regweed.

The indicator monitors daily concentrations higher than 60 pollen grains/m^3 of air for birch and grass, and 30 for regweed.

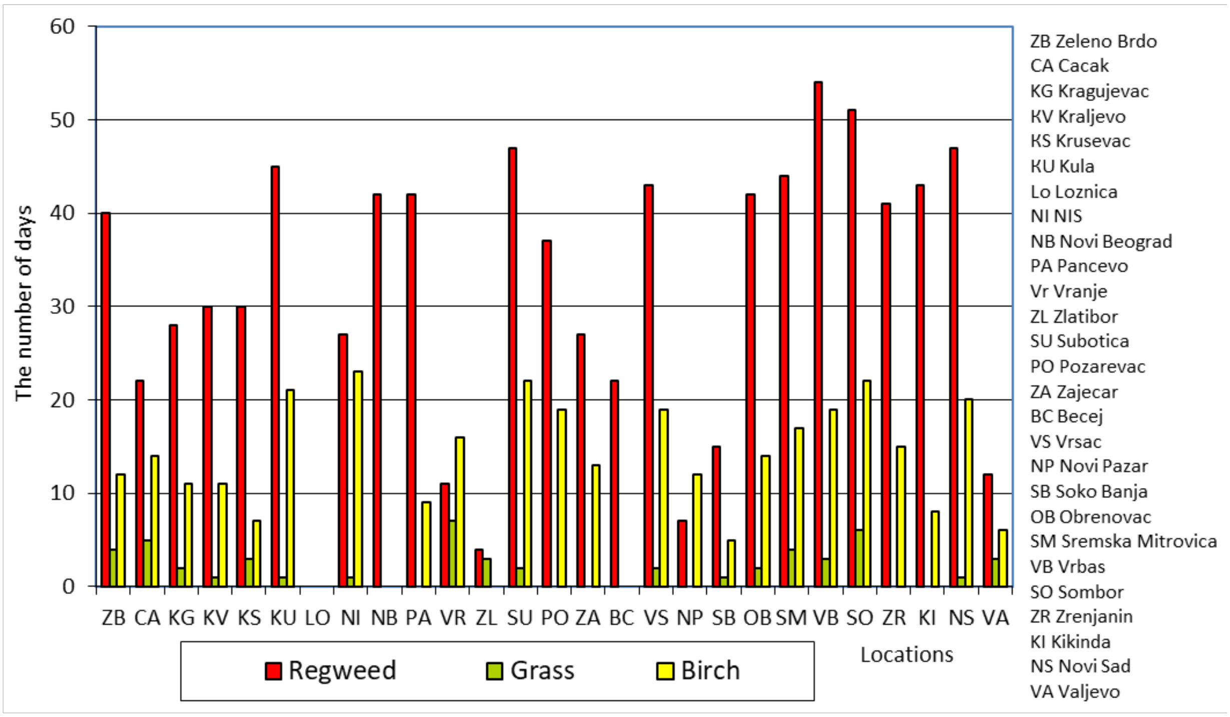


Figure 2.32. Number of days with exceedances of limit values for allergenic pollen in the network of stations in 2020

Figure 2.32 describes the indicator that shows that concentration of regweed pollen was above the limit values for 54 daysin Vrbas. In Vranje, concentration of grass pollen exceeded limit values for seven days, and the concentration of birch pollen in Niš was above the limit values for 23 days (Figure 2.32).

The aeropalynological calendar or flowering calendar – (emissions of allergenic pollen) is a table showing the interval of pollen presence that is monitored during the season (Table 2.2). The period of monitoring of allergenic pollen in the air includes the flowering season of trees, grasses and weeds. In our climate, we monitor pollination from the beginning of February to the end of October:

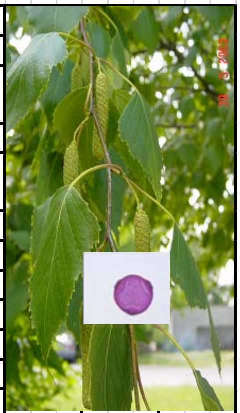
1) the flowering season of trees is from February to May;
2) the grass flowering season is from May to June;
3) the weed flowering season is from June to October.

The beginning and end of pollination can fluctuate from year to year, depending on the weather.

Daily values of aeropolen concentrations (pg/m^3) for the period of seven days, with a forecast for the coming week, can be found on the website www.sepa.gov.rs

Table 2.2. Aeropalynological calendar for 2020

Station Belgrade 2020.			January	Februar	March	April	May	Jun	July	August	Septem	October	Novem	Decemb
Popular name	Latin name													
Hazelnut**	Corylus sp.	TREES												
Alder***	Alnus sp.	TREES												
Jew/Juniper*	Taxaceae/ Cupresaceae	TREES												
Elm*	Ulmus sp.	TREES												
Poplar/ Aspen**	Populus sp.	TREES												
Mapler*	Acer sp.	TREES												
Willow*	Salix sp.	TREES												
Ash**	Fraxinus sp.	TREES												
Birch*	Betula sp.	TREES												
Hornbeam*	Carpinus sp.	TREES												
Plane tree**	Platanus sp.	TREES												
Walnut**	Juglans sp.	TREES												
Oak**	Quercus sp.	TREES												
Mulberry*	Morus sp.	TREES												
Pine / Fir*	Pinaceae	TREES												
Lime*	Tilia sp.	TREES												
Beech*	Fagus sp.	TREES												
Grass ***	Poaceae	GRASS												
Hemp*	Canabis sp.	WEEDS												
Plantain**	Plantago sp.	WEEDS												
Sorrel**	Rumex sp.	WEEDS												
Nettles***	Urticaceae	WEEDS												
Goosefoot/Pigweed**	Chenopod/ Amar	WEEDS												
Mugweed**	Artemisia	WEEDS												
Regweed***	Ambrosia	WEEDS												
Legend	*low pollen grain allergenicity													
	**moderate pollen grain allergenicity													
	***high pollen grain allergenicity													



In addition, daily concentrations are sent to the European Aeroallergen Network (EAN) database. Reducing the risk of negative impact of increased concentrations of allergenic pollen can change from year to year, depending on climate factors, but also on anthropogenic impact (e.g. planting new species in parks and landscaped areas, neglection of arable land and grow of weeds, etc.).

Table 2.3 shows total quantities, pollination duration, and maximum concentration of regweed pollen in one day at the station located in Belgrade (*Zeleno Brdo, ZB*).

Table 2.3. Preview of parameters for regweed at the location of Zeleno Brdo (ZB) Beograd

Year	Total quantity of pollen (number of pollen grains per m^3 of air)	Number of pollination days (days)	Maximal concentrations of pollen in one day (number of pollen grains per m^3 of air)
2004	3373	99	319
2005	1954	96	203
2006	4553	101	411
2007	4210	122	217
2008	4267	127	373
2009	2886	92	329
2010	5662	98	538
2011	3882	107	858
2012	3661	97	219
2013	4183	95	324
2014	2782	77	369
2015	2143	73	524
2016	2625	80	223
2017	7289	94	670
2018	8169	120	637
2019	8960	102	925
2020	8890	91	703

Source of data: Environmental Protection Agency, City Public Health Institutes, Institute of Public Health, Provincial Secretariat for Urbanism and Environmental Protection, Municipal Administrations, Oenological Station and City Administration for Environmental Protection of Novi Sad

2.3.2. Pollen grains maximal concentrations (S)

Key messages:

The highest values of maximum concentrations of pollen grains for birch were recorded in Novi Sad, for grasses on Zlatibor, and for regweed in Vrbas.

The indicator (Figure 2.33) monitors the maximum daily concentrations of pollen grains at all stations in the Republic of Serbia in 2020.

During 2020, the results of allergen pollen monitoring in the Republic of Serbia showed large differences in concentrations depending on the location of the measurement station. Concentrations of allergenic pollen for three types of allergenic plants are presented: regweed, as a representative of weeds; birch, as a representative of trees; and grasses were observed at the family level, as the concentration of their pollen is anyway monitored. In 2020, the highest values were recorded in Novi Sad for birch, on Zlatibor for grass, in Vrbas for regweed pollen. In Novi Sad, the maximum concentration of birch pollen was 1784 pg/m^3. On Zlatibor, the maximum concentration for grasses was 308 pg/m^3. In Vrbas, the maximum concentration for regweed was 1,347 pg/m^3.

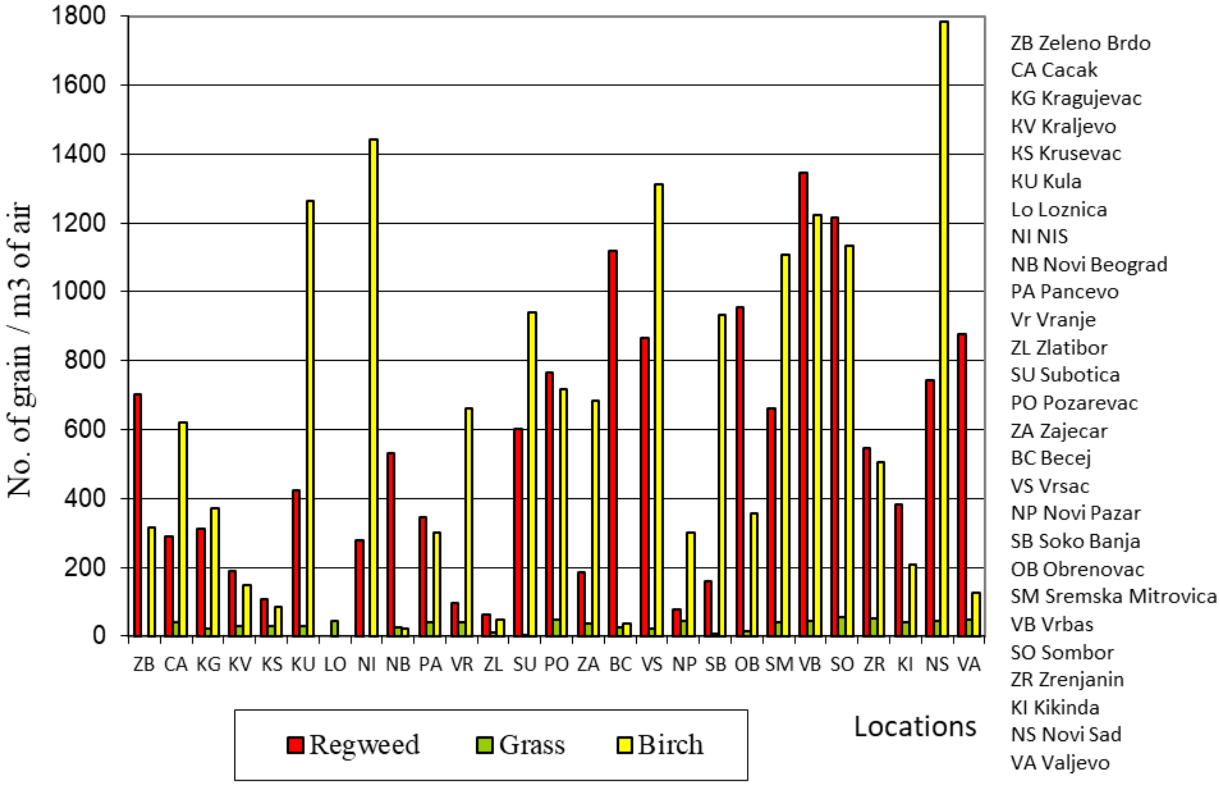


Figure 2.33. Maximum concentration of pollen grains at all stations in the Republic of Serbia in 2020

The indicator showed that maximal concentrations for grass, regweed and birch pollen were the highest in the north of the country. The maximum concentrations of pollen in the air are influenced by meteorological parameters, primarily air temperature, humidity and precipitation. In addition to weather conditions, timely mowing of grass and weeds also reduces the concentration of pollen in the air. To that end, it is necessary to increase the share of controlled destruction, primarily aggressive regweed weeds, as a reliable measure to reduce the concentration of this strongest allergen in the air.

Source of data: Environmental Protection Agency, City Public Health Institutes, Institute of Public Health, Provincial Secretariat for Urbanism and Environmental Protection, Municipal Administrations, Oenological Station and City Administration for Environmental Protection of Novi Sad

2.3.3. Number of pollination days (S)

Key messages

The highest values of the number of days with present pollination for birch were recorded in Vršac, for grasses in Vrbas and Kikinda, and for regweed in Vrbas.

The indicator shows the number of days in which a certain type of allergenic pollen was detected in the air.

The indicator showed the number of days with recorded pollination for all stations in the Republic of Serbia in 2020 (Figure 2.34).

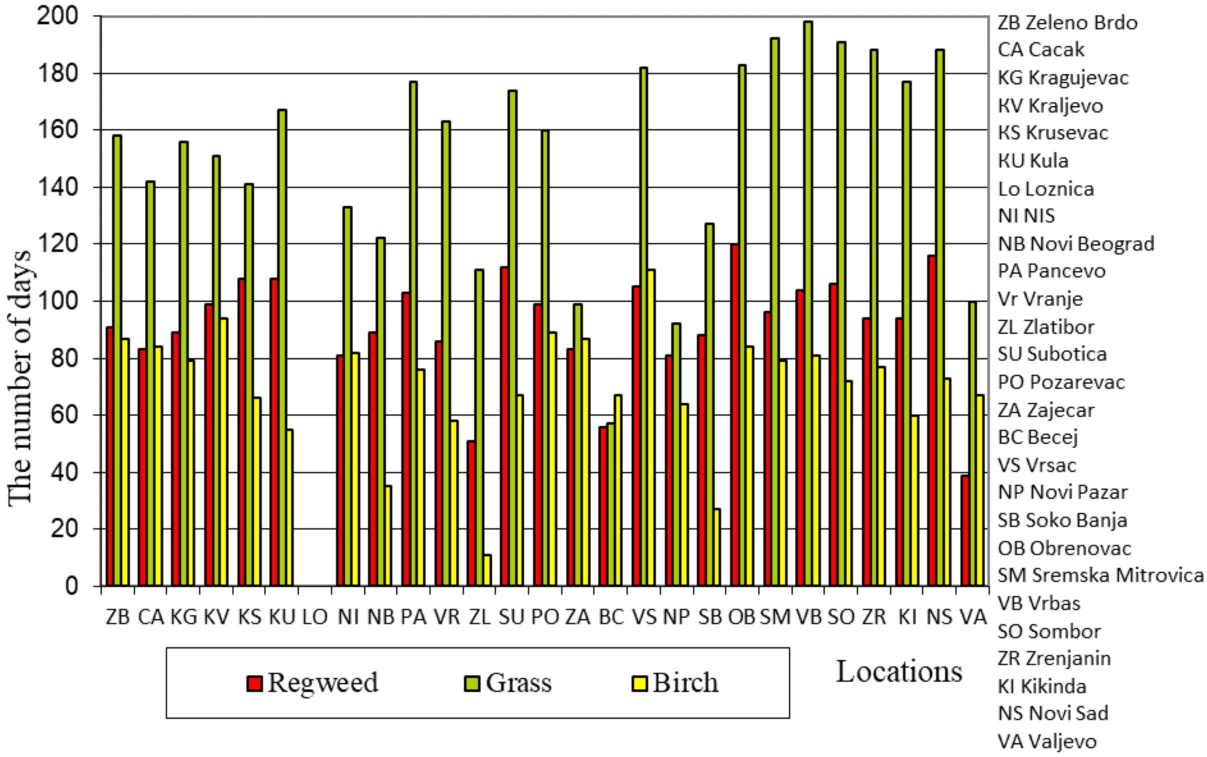


Figure 2.34. Number of pollination days for all stations in the Republic of Serbia in 2020

In 2020, the highest values of this indicator were found in Vršac for birch, in Vrbas for grass and in Obrenovac for regweed.

This indicator shows the number of days in which a certain type of allergenic pollen was detected in the air, regardless of its concentration. The value of this indicator is influenced by current time parameters which do not affect the duration of pollination. Several days of light rain can cause that allergenic pollen does not fly in that air layer in which the sample is collected during the specific period, which does not mean that the pollination itself is interrupted. In Vršac, the number of days with birch pollen detected was 111. In Vrbas, the number of days with grass pollen detected was 198, while in Obrenovac, the number of days with regweed pollen was 120.

Source of data: Environmental Protection Agency, City Public Health Institutes, Institute of Public Health, Provincial Secretariat for Urbanism and Environmental Protection, Municipal Administrations, Oenological Station and City Administration for Environmental Protection of Novi Sad

2.3.4. Total quantity of pollen grains (S)

Key messages

The highest values of the total amount of birch pollen grains were in Subotica, grass in Kraljevo and regweed in Obrenovac.

The indicator shows total amount of a certain type of allergenic pollen at the monitored location, during the entire period of pollination.

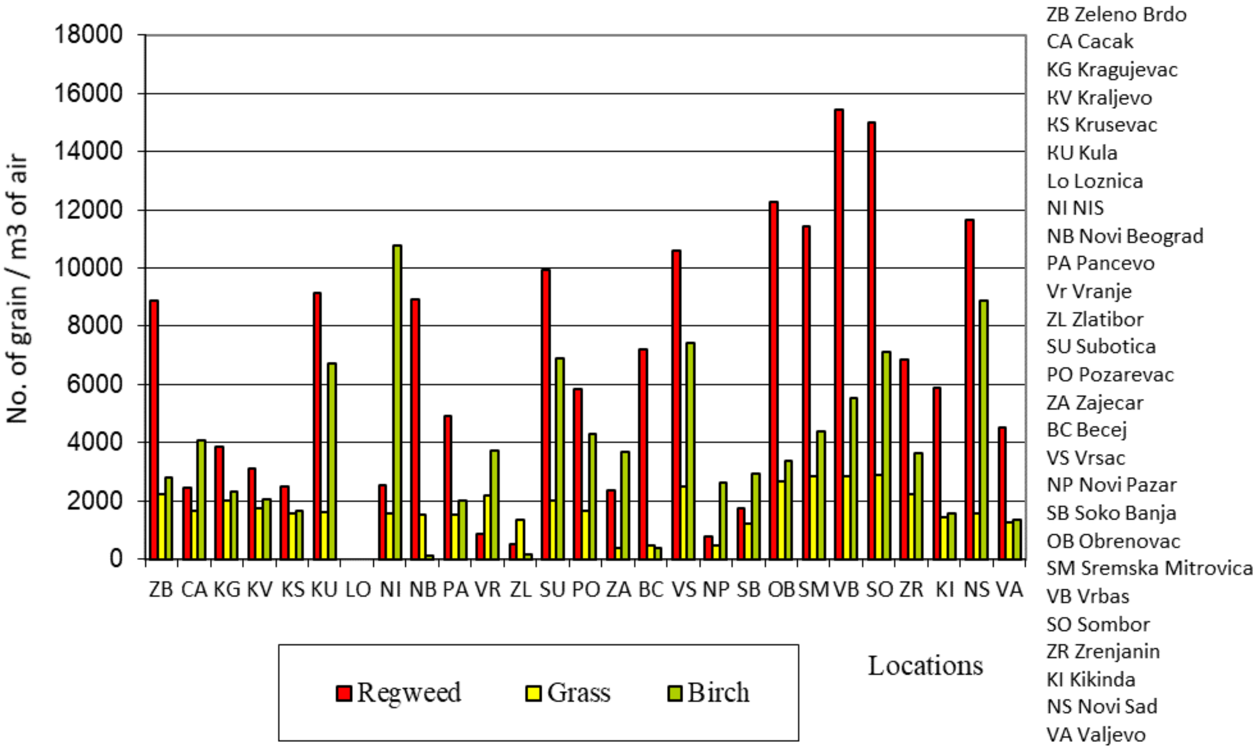


Figure 2.35. Total amount of pollen grains for all stations in the Republic of Serbia in 2020

The figure shows the indicator of the total amount of pollen grains for all stations in the Republic of Serbia in 2020 (Figure 2.35).

The highest values of this indicator for regweed pollen were recorded in Vrbas.

Except for this strongest allergen, the highest values of the total amount of pollen grains of grass were recorded in Sombor, and birch in Niš.

The value of this indicator was the following at the mentioned locations: 10,761 for birch, 2,890 for grass, and 15,429 pollen grains per cubic meter of air for regweed during the entire pollination period.

Source of data: Environmental Protection Agency, City Public Health Institutes, Institute of Public Health, Provincial Secretariat for Urbanism and Environmental Protection, Municipal Administrations, Oenological Station and City Administration for Environmental Protection of Novi Sad

2.3.5. Spatial distribution of total quantity of regweed pollen (S)

Key messages

The highest values of the total amount of regweed pollen were recorded in the north of the country and are decreasing towards the south.

The indicator shows the spatial distribution of the total amount of regweed pollen grains on the territory of the Republic of Serbia and is presented through data from three stations, from north to south. The data shown cover a period of nine years.

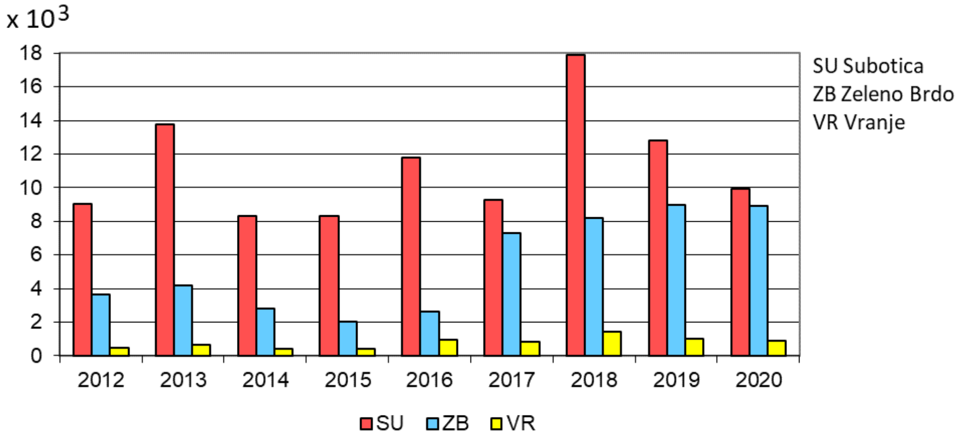


Figure 2.36. Spatial distribution of the total amount of regweed pollen grains at three stations in the Republic of Serbia in the period 2012-2020

This indicator was monitored at three spatially representative stations from the Network of Allergen Pollen Monitoring Stations (Figure 2.37): Subotica, Belgrade (Zeleno Brdo, ZB) and Vranje. Long-term monitoring of the allergenic pollen concentrations for regweed showed that the selected stations are representative for the lateral distribution of pollen grains of this allergenic plant.

The total amounts of regweed pollen grains during the entire pollination period were taken into account.

Data analysis at selected three stations in the period 2012-2020 showed that total amount of this strongest allergen decreases from north to south.

The largest total amount of regweed pollen in 2020 was measured in Subotica, and amounted to 9952 pg/m^3.

In the same year, the total amount of regweed pollen in Belgrade (ZB) was 8,890 pg/m^3, and in Vranje 882 pg/m^3.

The lowest values of this indicator were recorded in 2015, when total amount of regweed pollen was measured 8,308 pg/m^3 in Subotica, in Belgrade (ZB) 1,997 pg/m^3, and in Vranje only 420 pg/m^3, while the highest measured in 2018 were Subotica 17,916 pg/m^3, Belgrade 8,169 pg/m^3, and 1,438 pg/m^3 in Vranje (Figure 2.36).

Based on the monitored indicators, it can be concluded that the highest values for all listed indicators for regweed pollen were recorded at stations located in the north of the country. Bearing in mind that this invasive plant, regweed, spreads from north to south, as well as the fact that AP Vojvodina is climatically and in all other ways very favourable for its survival, the conclusions are not surprising.

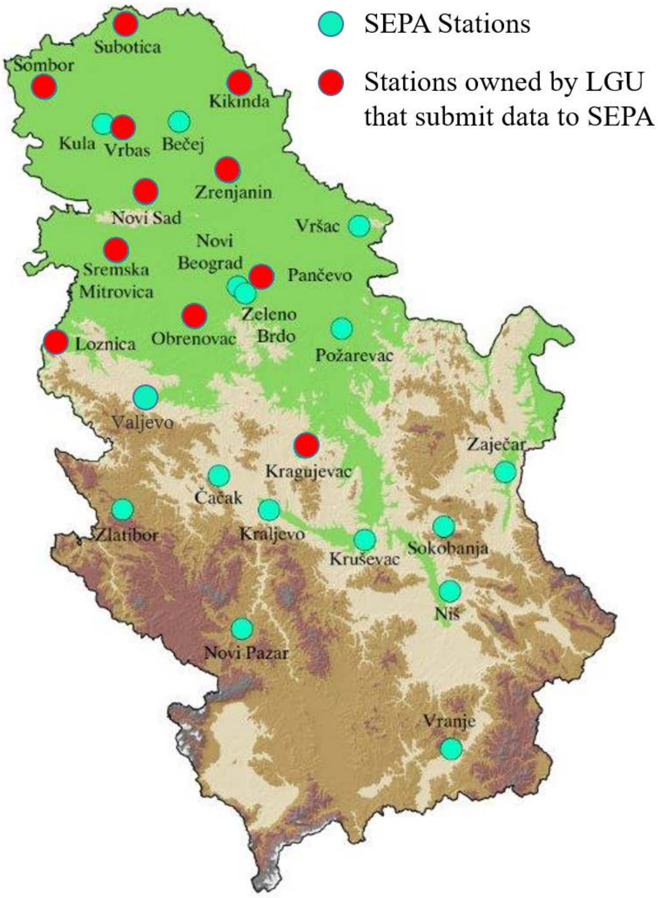


Figure 2.37. Allergen pollen monitoring network

Source of data: Environmental Protection Agency, City Public Health Institutes, Institute of Public Health, Provincial Secretariat for Urbanism and Environmental Protection, Municipal Administrations, Oenological Station and City Administration for Environmental Protection of Novi Sad

2.4. CLIMATE CONDITIONS DURING 2020 (I)

2.4.1. Annual rainfall (I)

Key messages:

In most parts of the Republic of Serbia, 2020 was a rainy year on average.

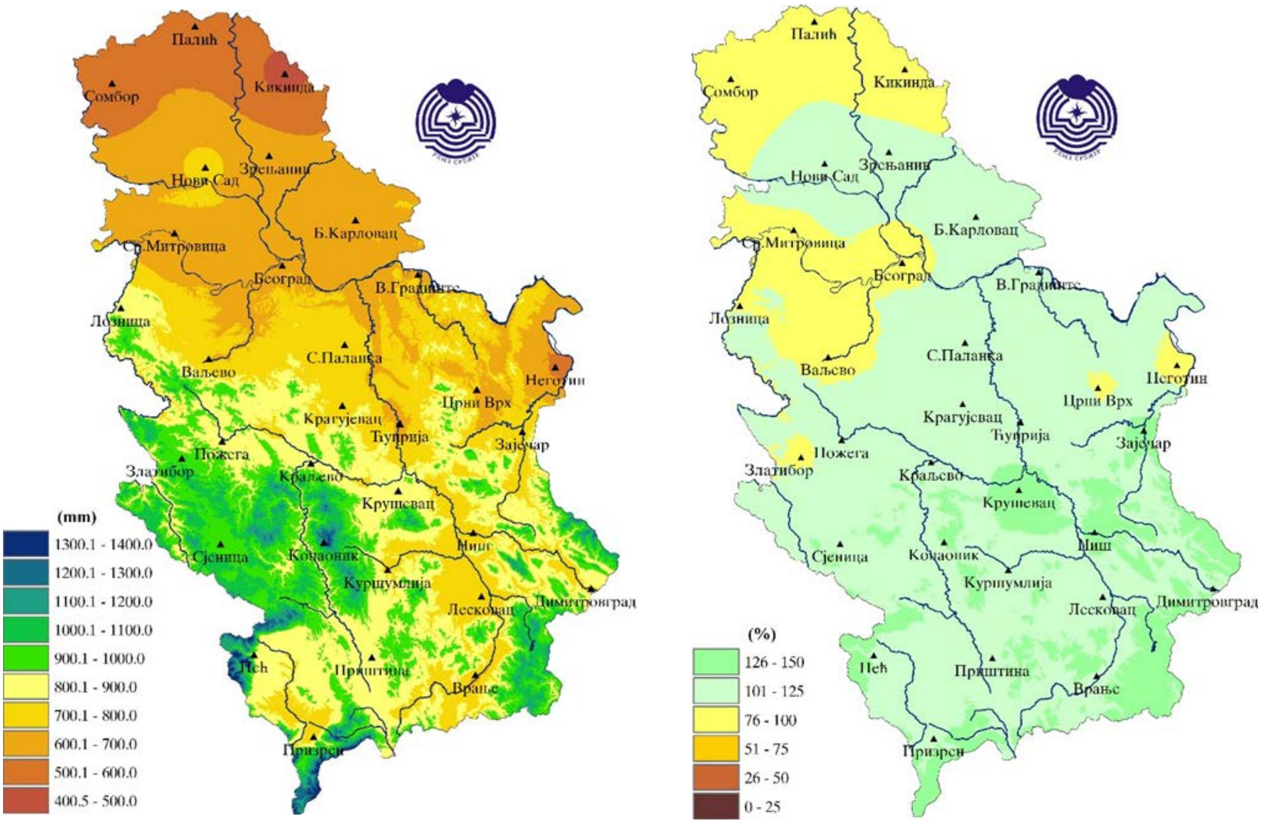


Figure 2.38. Distribution of precipitation in the Republic of Serbia in 2020 (left-had side) and deviations of the annual precipitation in percent from the normal 1981-2010 (right-hand side)

In most parts of the Republic of Serbia, 2020 was on average rainy, and in the south, southwest, southeast and some central parts, it was very rainy and heavily rainy. It was dry in the areas of Valjevo and Kikinda. The amount of precipitation ranged from 472.6 mm in Kikinda to 881.2 mm in Kraljevo, and in the mountains from 781.1 mm in Crni Vrh to 1274.0 mm in Kopaonik. Percentage of precipitation in relation to the reference one for the period 1981-2010 ranged between 85% in Kikinda and 138% in Kruševac (Figure 2.38).

The highest daily amount of precipitation of 86.6 mm was registered on 7 August in Kopaonik, which exceeded the highest daily amount of precipitation there for that month.

For the first time, there was no snow in Kikinda. A record of low number of days was also registered in Loznica, Negotin and Zaječar. The latest date for the snow was recorded in Belgrade. The number of days with snow cover ranged from one in Zrenjanin to 29 in Požega, and in the higher areas from 70 in Sjenica to 133 in Kopaonik. The height of snow cover of 91 cm was recorded on 29 February on Kopaonik, which was the highest cover in the year. In the lower regions, the highest snow cover was registered in Kuršumlija on 25 March, and it was 37 cm high.

Source of data: Republic Hydrometeorological Institute

2.4.2. Annual air temperature (I)

Key messages:

In the Republic of Serbia, 2020 was the seventh warmest year in the period from 1951 and on.

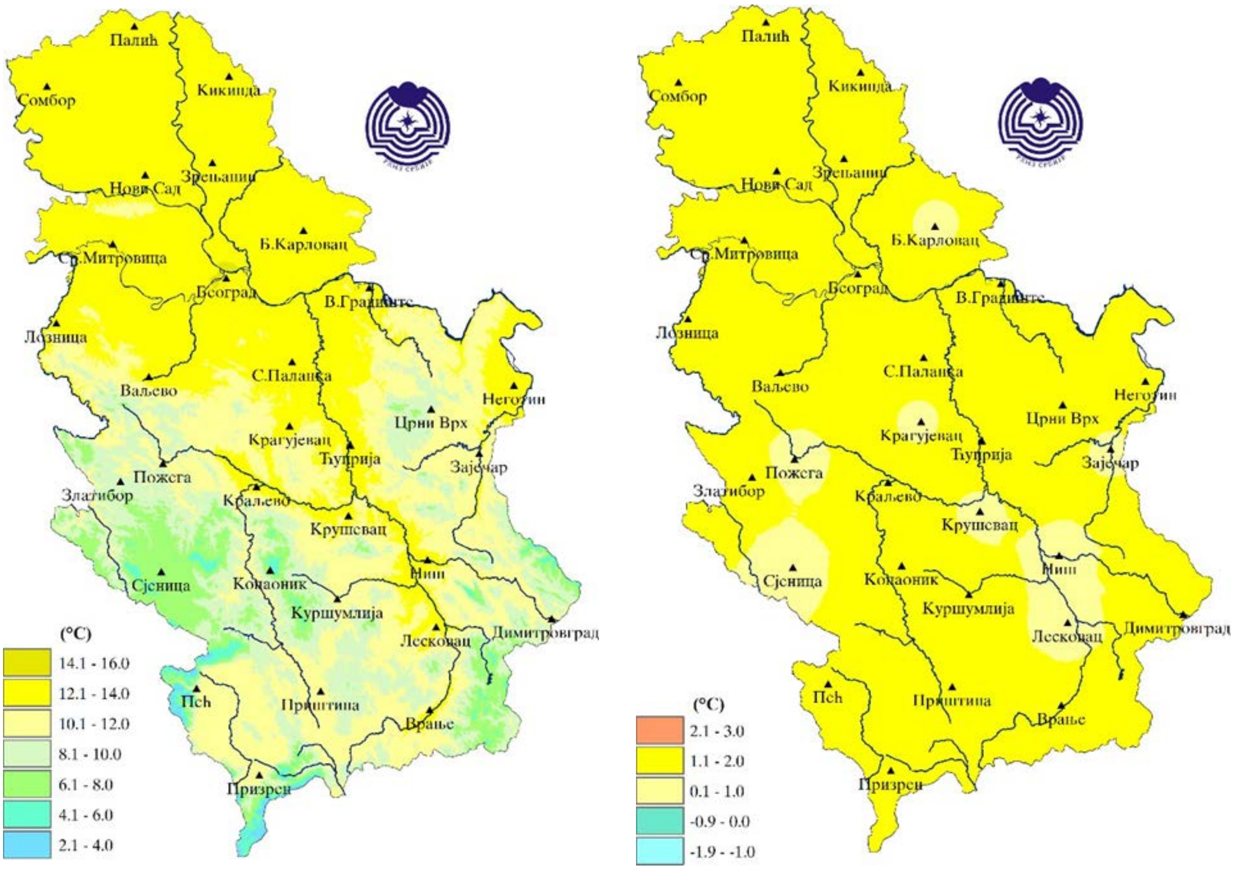


Figure 2.39. Distribution of annual temperature values in the territory of the Republic of Serbia in 2020 (left-hand side) and deviations of the average annual temperature in (°C) from the reference one in the period 1981-2010 (right-hand side)

In the territory of the Republic of Serbia, 2020 was the seventh warmest year in the period from 1951 until today, with average air temperature of 11.7ºC, while in Belgrade it is the ninth warmest year since the beginning of operation of meteorological station (1888), with an average annual air temperature of 13.9ºC. The average annual air temperature ranged from 10.6ºC in Požega to 13.9ºC in Belgrade, and in the mountainous areas from 5.0ºC in Kopaonik to 8.8ºC in Zlatibor (Figure 2.39 – left-hand side).

Deviation of the average annual air temperature in relation to the reference period 1981-2010 ranged from 0.9ºC in Zaječar, Kruševac, Sjenica and Požega to 1.8ºC in Negotin, and 1.4ºC in Belgrade (Figure 2.39 – right-hand side).

According to the distribution of percentiles, 2020 falls in the category of very warm years in most parts of the Republic of Serbia, while the category of extremely warm includes Negotin, Kuršumlija, Ćuprija, Dimitrovgrad and Kopaonik.

Source of data: Republic Hydrometeorological Institute

2.4.3. Consumption of ozone depleting substances (I)

Key messages:

1) In order to protect the ozone layer, the consumption of ozone depleting substances (ODS) has been significantly reduced from 2005 to date;

2) There is no production of ODS in the Republic of Serbia, and records of imports and consumption of these substances are maintained.

The indicator of consumption of ozone-depleting substances represents the total amount of ODS substances consumed. The ODS substances are fully halogenated chlorofluorocarbons (CFCs), chlorofluorocarbons (HCFCs), halons, carbon tetrachloride, 1,1,1-trichloroethane, methyl bromide, bromofluorocarbons and bromochloromethane, in accordance with the provisions of the Montreal Protocol on Substances that Deplete the Ozone Layer, whether alone or in a mixture, new, collected, renewed or processed ones.

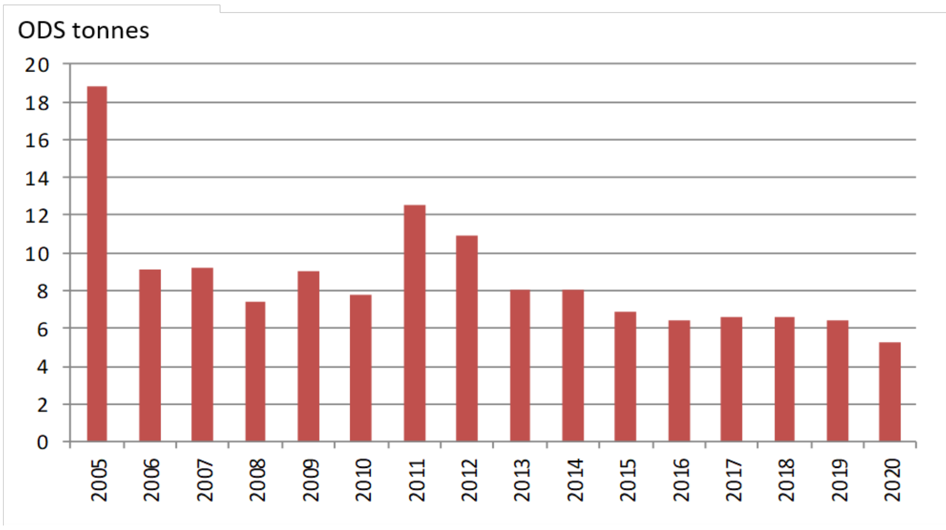


Figure 2.40. Consumption of ozone depleting substances in the period 2005-2020

As of 1 January 2010, the import of all ozone-depleting substances from the Annex to the Montreal Protocol has been prohibited, except for HCFC substances, and as of 1 January 2014, methyl bromide was also banned for import. Import is possible only for cases defined as so-called “Essential use Exemptions”.

The production of ozone-depleting substances is banned in the Republic of Serbia, and imports are allowed only for chlorofluorocarbons consumption of which is controlled through a very efficient permitting and quota system, as well as through project activities financed from the Multilateral Fund for the Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer.

The schedule for reducing the consumption of chlorofluorocarbons is prescribed by the Regulation on ozone depleting substances treatment, as well as on the conditions for issuing permits for import and export of these substances (Official Gazette of RS, No. 114/13), which is implemented by the Ministry of Environmental Protection as competent authority.

Consumption of substances from the HCFC group in the Republic of Serbia was the lowest so far in 2020, and amounted to 5.26 ODP tonnes (Figure 2.40).

Source of data: Ministry of Environmental Protection

3. WATER

3.1. SURFACE WATER QUALITY (S)

3.1.1. BOD-5 (indicator of consumption of oxygen in surface water) (S)

Key messages:

1) insignificant trend of BOD-5 was found in all watersheds, as well as in the entire territory of the Republic of Serbia in the period 2010-2019;

2) unfavourable (growing) trend of BOD-5 was registered only at 24% of measurement points (nine locations) in the period 2010-2019. The unfavourable quality condition was found at 6% of measurement points (two spots in AP Vojvodina);

3) according to the BOD-5 indicator, the quality of water in the watercourses of the Republic of Serbia had improved in 2019 compared to 2018.

The indicator monitors the concentrations of biological oxygen consumption (BOD-5) in rivers, enabling the assessment of the state of surface waters in terms of biodegradable organic load. It is used to show spatial and temporal variations of oxygen-consuming substances and their long-term trends. The value of BOD-5 is the basic indicator of surface water pollution by organic substances.

The indicator is calculated as the median of the series of mean annual values of BOD-5 measured at the measurement points. Mann-Kendall test and non-parametric Sen'S method were used to determine the presence and assessment of the trend intensity.

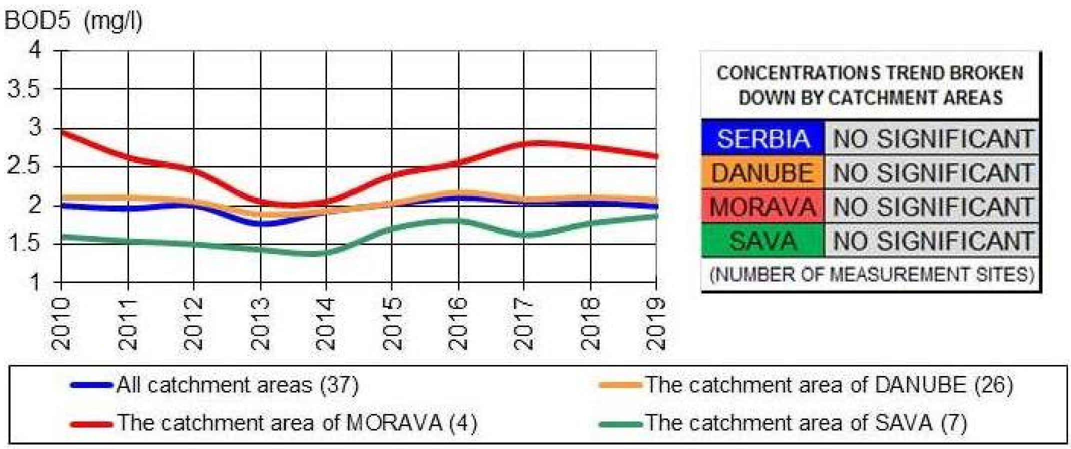


Figure 3.1. Trends of the BOD-5 median in watersheds of the Republic of Serbia (2010-2019)

The analysis of BOD-5 was conducted at 37 measurement points where continuous sampling was carried out in the period 2010-2019. Insignificant BOD-5 median trend was found in all watersheds. Median values range from 1.3-3.0 (mg/l), which corresponds to good ecological status (Figure 3.1).

Unfavourable (growing) trend of BOD-5 was detected at nine measurement points, which makes 24% of the analysed measurement points. The good side is that average ten-year value of BOD-5 is low at these measurement points. Higher average ten-year value of BOD-5 was found at the measurement points of Bač and Bačko Gradište (DTD Channels) in AP Vojvodina, which is 6% of measurement points. An insignificant ten-year trend of water quality was found in these locations (Figure 3.2).

According to the BOD-5 indicator, water quality had improved in 2019 compared to 2018. Only at one measurement point (Bačko Gradište (5.61 mg/l)), the concentration of BOD-5 exceeded the value of 4 (mg/l) in 2019 (DTD channels) (Figure 3.3).

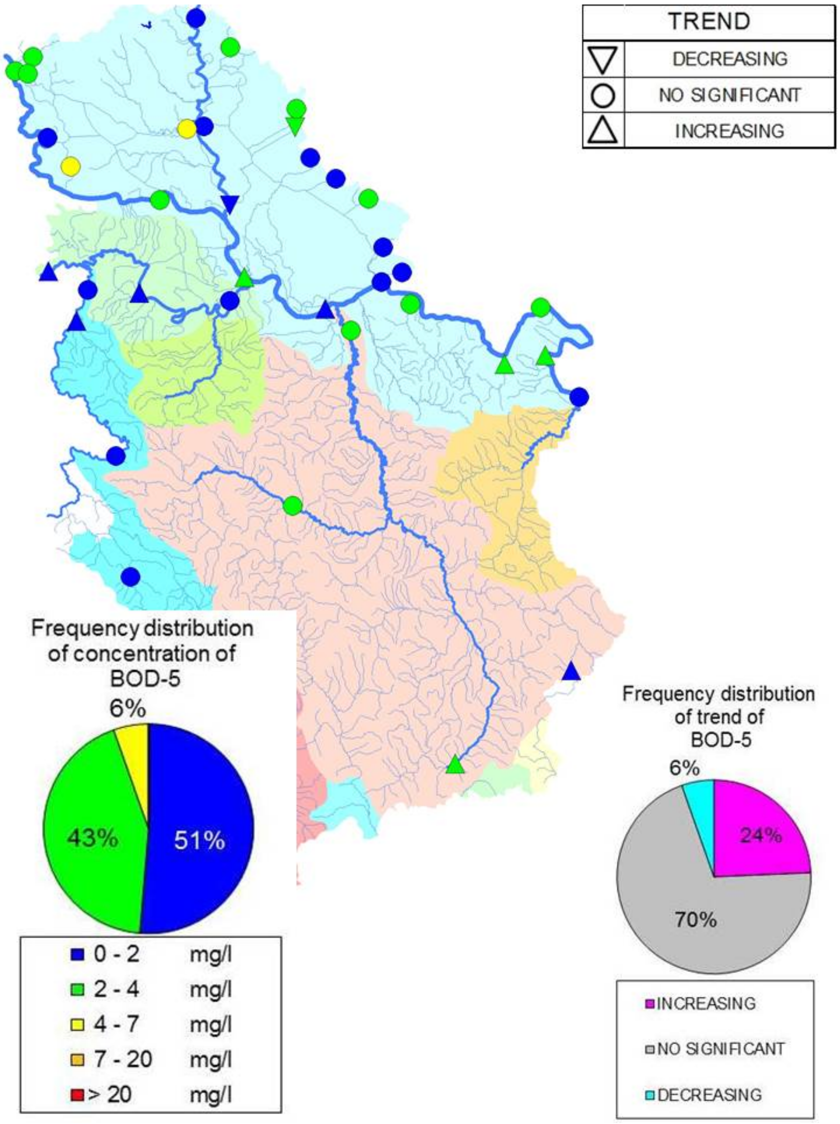


Figure 3.2. The trend and mean value of BOD-5 in watercourses of the Republic of Serbia (2010-2019)

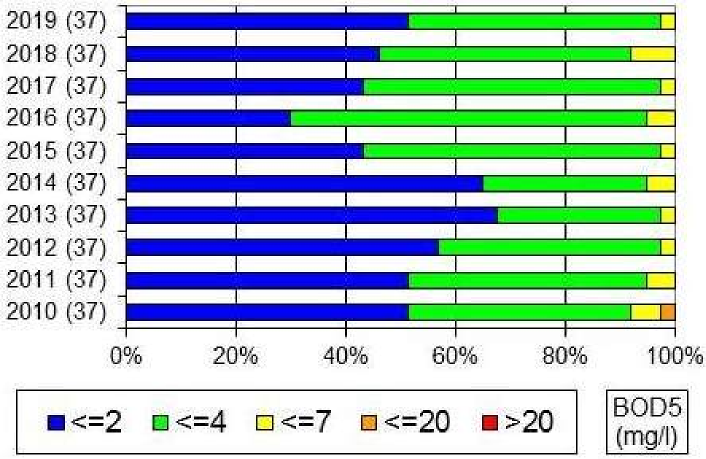


Figure 3.3. Distribution of frequency of BOD-5 in watercourses of the Republic of Serbia (2010-2019)

Source of data: Environmental Protection Agency

3.1.2. Ammonium ion (NH_4-N) (indicator of oxygen consumption in surface water) (S)

Key messages:

1) in the period 2010-2019, the unfavourable (growing) trend of median ammonium was detected in the Sava River Basin;

2) in the territory of AP Vojvodina there was no unfavourable (growing) trend of average values of ammonium in the period 2010-2019;

3) according to the indicator that monitors the content of ammonium, the worst water quality in the watercourses of the Republic of Serbia within the observed period 2010-2019 was recorded in 2019.

The indicator monitors the concentration of ammonium (NH_4 - N) in rivers, enabling the assessment of the state of surface water in terms of ammonium. It is used to show spatial and temporal variation of oxygen-consuming substances and their long-term trends. Ammonium is an indicator of possible bacterial activity in human and animal waste that reaches surface waters through the sewerage system or through run-off.

The indicator is calculated as the median of a series of mean annual values of ammonium measured at measurement points. Mann-Kendall test and non-parametric Sen'S method were used to determine the presence and assessment of the trend intensity.

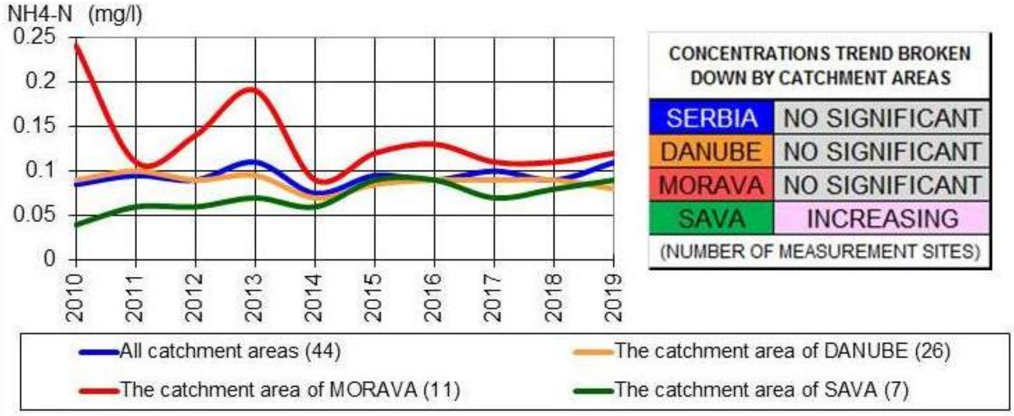


Figure 3.4. Trends in the ammonium median in the watersheds of the Republic of Serbia (2010-2019)

The analysis of ammonium were conducted at 37 measurement points where continuous sampling was carried out in the period 2010-2019. Unfavourable (growing) trend of the ammonium median was found in the Sava River Basin. An insignificant trend in the same period was detected in the Morava and Danube Basins, as well as in the entire territory of the Republic of Serbia. Median values range from 0.04-0.25 (mg/l), which corresponds to good ecological status (Figure 3.4).

The unfavourable (growing) trend of average ammonium values in the period 2010-2019 was detected at 13% (six) measurement points in the Republic of Serbia. In the Sava River Basin, unfavourable (growing) trend was found at 71% (five out of seven) measurement points, but it is good that the ammonium concentrations in the Sava River Basin are low as they do not exceed 0.1 (mg/l) (Figure 3.5).

According to the indicator that monitors the content of ammonium, water quality in the watercourses of the Republic of Serbia had deteriorated in 2019 compared to 2018, and it was the worst in the observed period 2010-2019 (Figure 3.6).

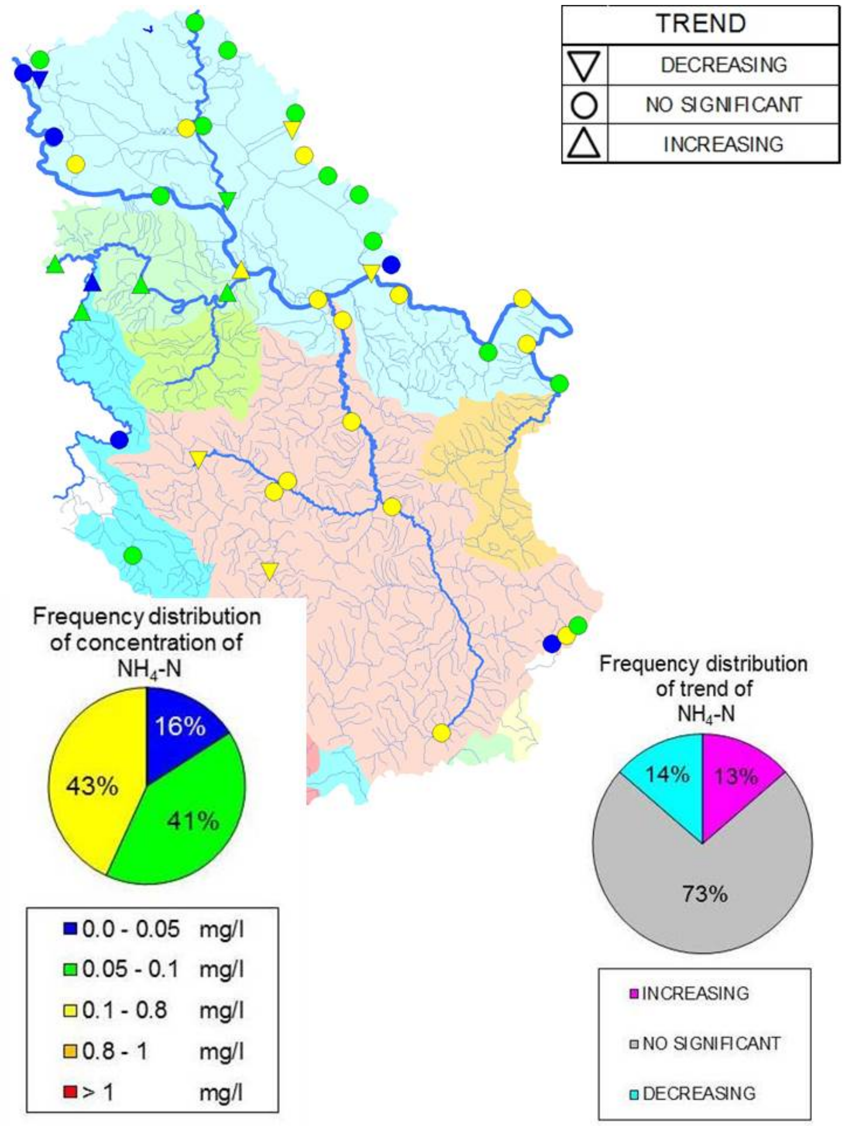


Figure 3.5. Trend and mean value of ammonium concentrations in watercourses of the Republic of Serbia (2010-2019)

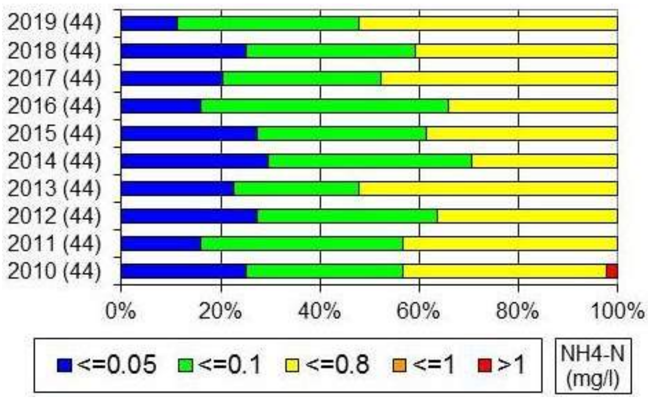


Figure 3.6. Distribution of frequency of ammonium in watercourses of the Republic of Serbia (2010-2019)

Source of data: Environmental Protection Agency

3.1.3. Nutrients in surface water – nitrates (NO_3-N) (S)

Key messages:

1) in the period 2010-2019, the growing trend of nitrates was detected in the Sava and Morava River Basins as well as in the entire territory of the Republic of Serbia;

2) nitrates are present in the rivers of the Republic of Serbia in very low concentrations. Water quality at all measurement points belongs to excellent and good ecological status;

3) the content of nitrates in the watercourses of the Republic of Serbia had worsened in 2019 compared to 2018.

The indicator monitors nitrate (NO_3-N) concentrations in rivers, enabling the assessment of surface water conditions regarding the nutrient concentration. It is used to show spatial and temporal variations of nutrients and long-term trends thereof. The most important source of nitrate pollution is run-off from agricultural land.

The indicator is calculated as the median of a series of mean annual values of nitrate measured at relevant measurement points. Mann-Kendall test and non-parametric Sen'S method were used to determine the presence and assessment of the trend intensity.

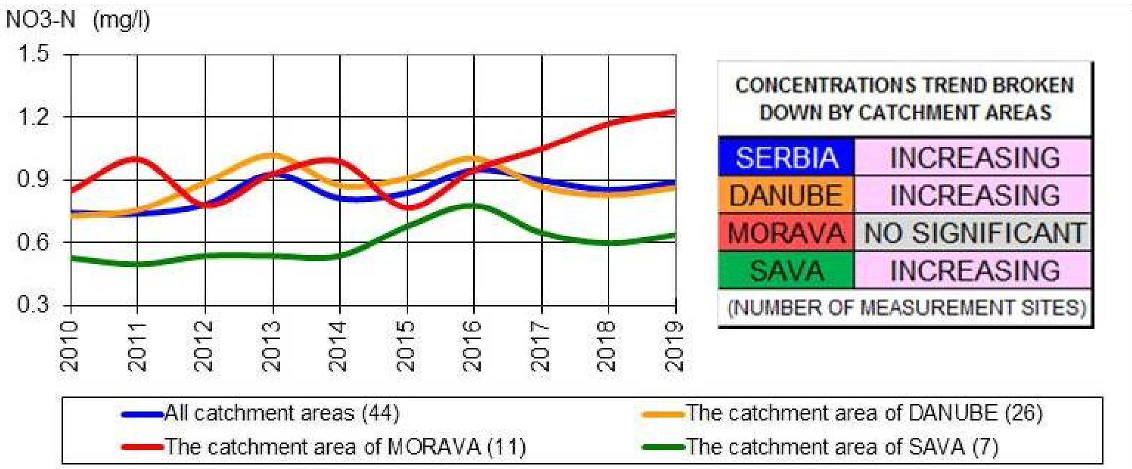


Figure 3.7. Trends of nitrates median in the watersheds of the Republic of Serbia (2010-2019)

Nitrates were analysed at 44 measurement points where continuous sampling was conducted in the period 2010-2019. An insignificant trend of nitrate median was detected in the Danube River Basin, while a growing (unfavourable) trend was found in the Sava and Morava River Basins, as well as in the entire territory of the Republic of Serbia. It is good that the median values range from 0.5 to 1.23 (mg/l), which corresponds to excellent and good ecological status (Figure 3.7).

The quality of river water in the Republic of Serbia, in terms of nitrates, belongs to the class of excellent ecological status at 91% of measurement points. Unfavourable (growing) trend of nitrates was found at 23% (ten) measurement points: Zemun, Tekija, Brza Palanka, Radujevac (Danube), Kusiće (Pek), Srpski Itebej (Navigable Begej), Ljubičevski Most (Velika Morava), Ristovac, Mojsinje (South Morava) and Mrtvine (Gaberska River). It is good that the mean values of nitrates at these measurement points are low and within the limits of excellent ecological status (Figure 3.8).

The content of nitrates in the watercourses of the Republic of Serbia deteriorated in 2019 compared to 2018, but it is very low and within the limits of the ten-year average (Figure 3.9).

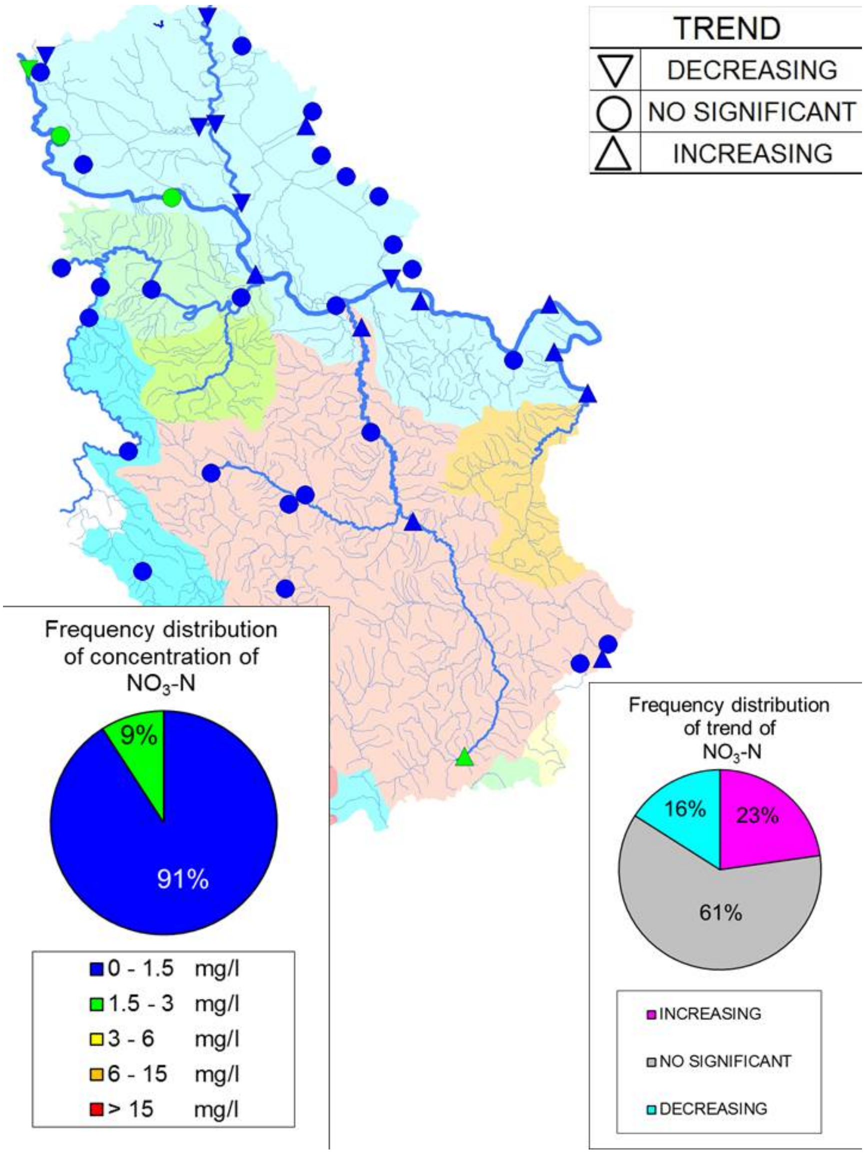


Figure 3.8. Trend and mean value of nitrate concentrations in watercourses of the Republic of Serbia (2010-2019)

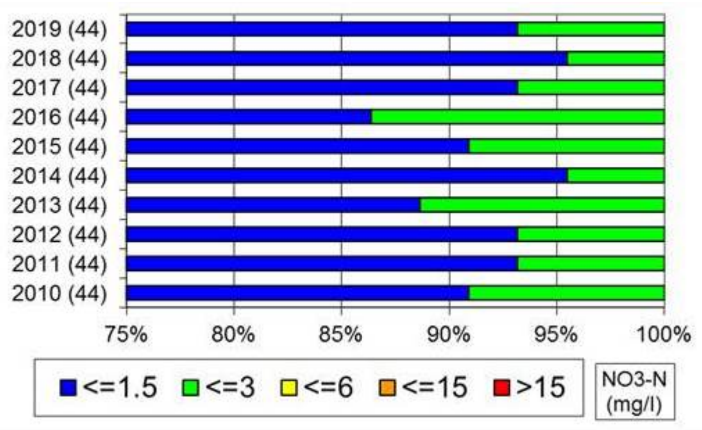


Figure 3.9. Distribution of frequency of nitrates in watercourses of the Republic of Serbia (2010-2019)

Source of data: Environmental Protection Agency

3.1.4. Nutrients in surface water – orthophosphates (PO_4-P) (C)

Key messages:

1) regarding orthophosphates, insignificant trend was detected in all watersheds of the Republic in the period 2010-2019;

2) according to the content of orthophosphates, the rivers of the Republic of Serbia did not have good ecological status at 18% of measurement points in the period 2010-2019. Unfavourable (growing) trend was detected in ten (23%) measurement points in the same period;

3) according to the indicator that monitors the content of orthophosphates, water quality in the watercourses of the Republic of Serbia maintained the same level of quality in the period 2012-2019.

The indicator monitors orthophosphate (PO_4-P) concentrations in rivers, enabling the assessment of surface water status in terms of nutrient concentrations. It is used to show spatial and temporal variations of nutrients and their long-term trends. The most significant source of orthophosphate pollution comes from municipal and industrial wastewater.

The indicator is calculated as the median of a series of mean annual values of orthophosphates measured at the measurement points. Mann-Kendall test and non-parametric Sen'S method were used to determine the presence and assessment of the trend intensity.

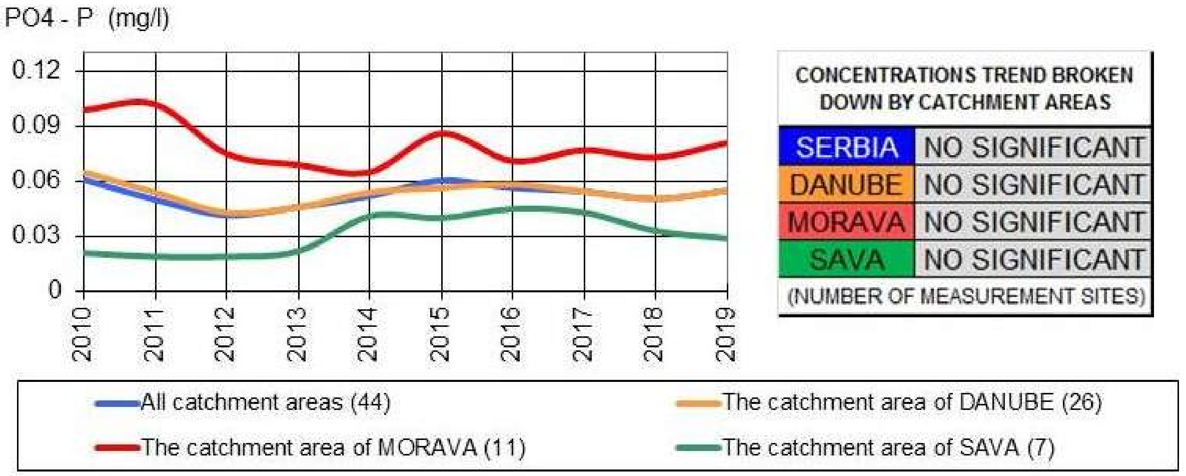


Figure 3.10. Trends of orthophosphate medians in watersheds of the Republic of Serbia (2010-2019)

The analysis of orthophosphates was conducted at 44 measurement points where continual sampling was conducted in the period 2010-2019. Insignificant trend of orthophosphates has been determined in all watersheds and on the entire territory of the Republic of Serbia. The orthophosphate median values range from 0.019 to 0.1 (mg/l), which corresponds to good ecological status (Figure 3.10).

The quality of river water in the Republic of Serbia, in terms of orthophosphates, does not belong to good ecological status at eight (18%) measurement points. The worst situation is at the measurement points in AP Vojvodina: Bački Breg (Plazović) where unfavourable (growing) trend and an average ten-year concentration of 0.586 (mg/l) were detected, Hetin (Stari Begej) 0.389 (mg/l) and Vrbica (Zlatica) 0.271 (mg/l) with insignificant trend in the observed period (Figure 3.11).

In 2019, Bački Breg (Plazović) 0.45 (mg/l) and Hetin (Stari Begej) 0.342 (mg/l) recorded an average concentration higher than 0.2 (mg/l). According to the orthophosphate indicator, water quality remains without significant changes at the analysed measurement points in the period 2012-2019 (Figure 3.12).

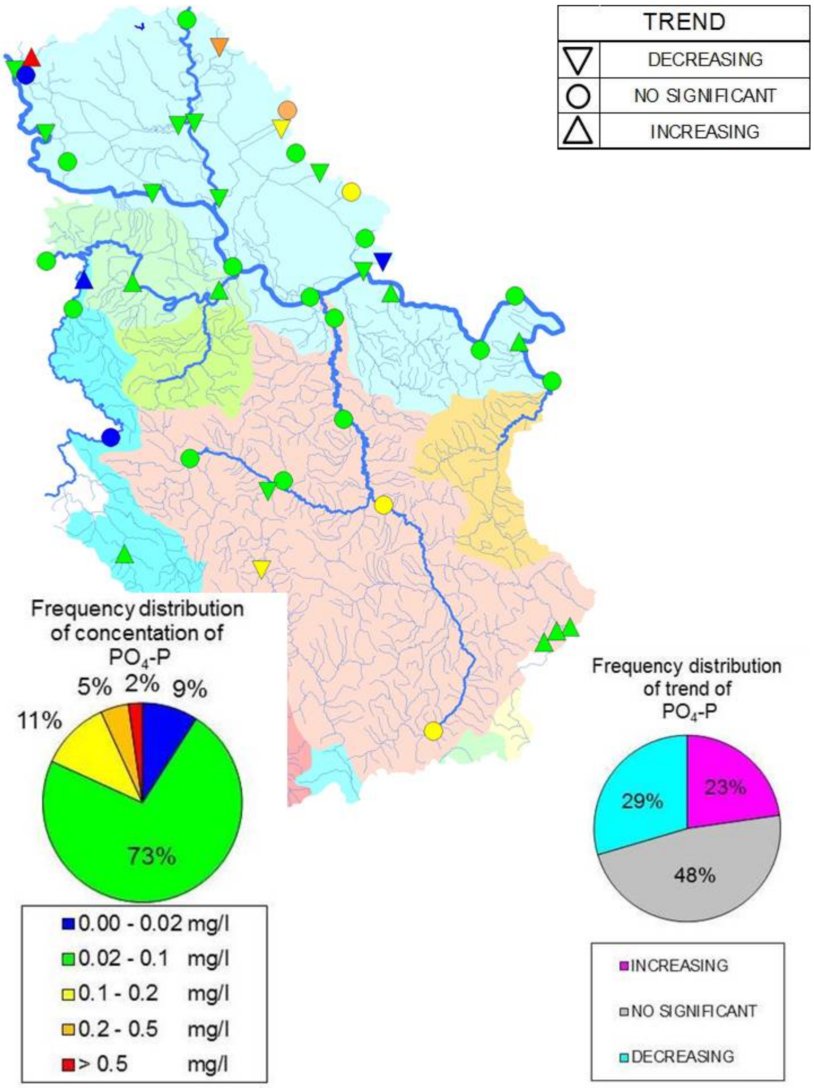


Figure 3.11. Trend and mean value of orthophosphate concentrations in watercourses of the Republic of Serbia (2010-2019)

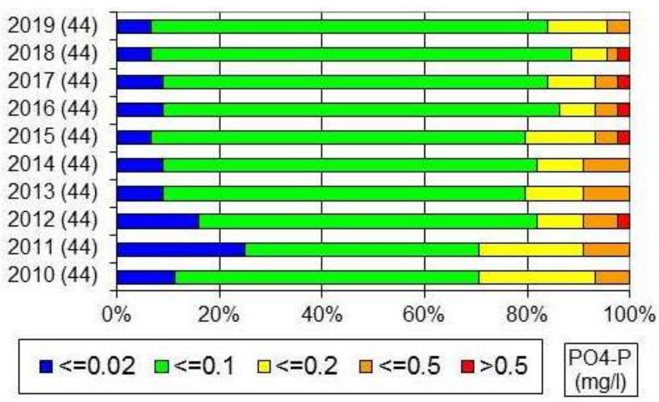


Figure 3.12. Distribution of frequency of orthophosphates in watercourses of the Republic of Serbia (2010-2019)

Source of data: Environmental Protection Agency

3.1.5. Serbian Water Quality Index SWQI – surface water quality (S)

Key messages:

1) the SWQI indicator recorded insignificant trend of water quality in the period 2010-2019 in the entire territory of the Republic of Serbia. In the Danube and Morava River Basins, the SWQI median trend is favourable (growing) and unfavourable (declining) in the Sava River Basin;

2) poor quality according to SWQI was detected at 11% of measurement points (four locations in AP Vojvodina and Ristovac on South Morava);

3) in the period 1998-2019, as many as 67.6% of quality samples categorised as "very poor" came from the territory of AP Vojvodina.

Serbian Water Quality Index (SWQI) monitors nine parameters of physical and chemical quality (water temperature, pH value, electrical conductivity, percentage of oxygen saturation, BOD-5, suspended particulate matter, total oxidised nitrogen (nitrates + nitrites), orthophosphates and ammonium), and one parameter of microbiological quality of water (most likely, the number of coliform bacteria), enabling the assessment of the surface water status in terms of overall surface water quality, without taking into account priority and hazardous substances. The total value is an unnamed number from 0 to 100 as a quantitative indicator of the quality of a particular water sample, where 100 stands for the best quality.

The indicator is calculated as the median of a series of mean annual SWQI values measured at the measurement points. Mann-Kendall test and non-parametric Sen'S method were used to determine the presence and assessment of the trend intensity.

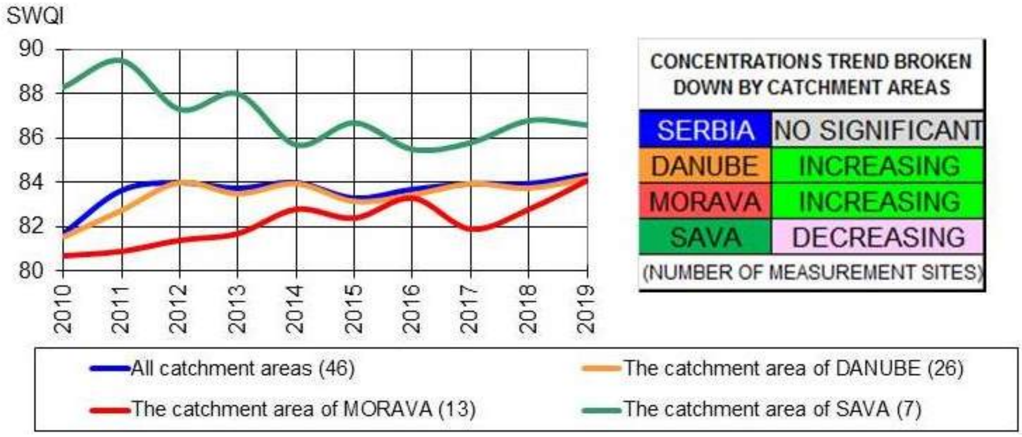


Figure 3.13. Trends of median SWQI in the watersheds of the Republic of Serbia (2010-2019)

The SWQI analysis was conducted at 46 measurement points where continuous sampling was conducted in the period 2010-2019. An insignificant trend was detected on the entire territory of the Republic of Serbia, a favourable (growing) trend in the Danube and Morava River Basins, while unfavourable (declining) trend was determined in the Sava River Basin. The median values of SWQI range from 80 to 90, which corresponds to "good" and "very good" quality (Figure 3.13).

Poor quality, according to the SWQI parameter, was detected at four (11%) measurement points: Bačko Gradište (DTD Channels), Vrbica (Zlatica), Hetin (Stari Begej), Bački Breg (Plazović) and Ristovac (South Morava). An insignificant trend was found at these locations, except near Vrbica and Bačko Gradište, where favourable (growing) trend was recorded. Unfavourable (declining) trend was found at four (9%) measurement points, but with good, very good and excellent water quality (Figure 3.14).

By analysing 27,291 samples from 261 measurement points sampled on average once a month in the period 1998-2019, the worst situation was found in the territory of AP Vojvodina, where 39.5% of samples belong to classes "poor" and "very poor", with as many as 67.6% of samples in the class "very bad" coming from this territory (Figure 3.15).

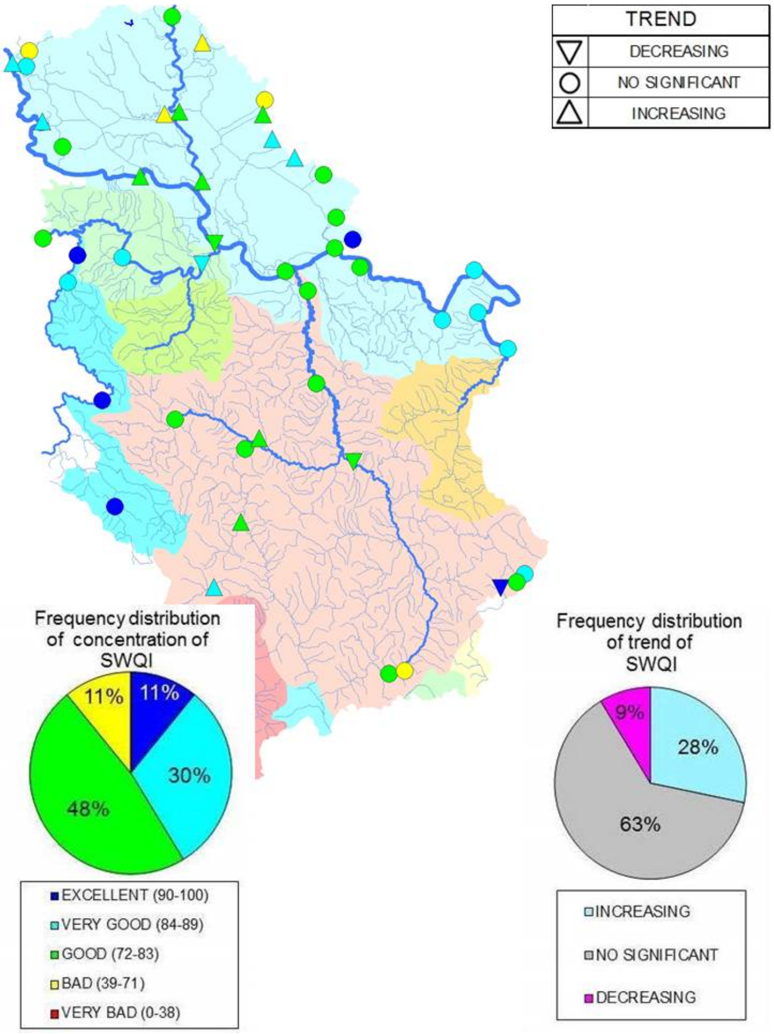


Figure 3.14. Trend and mean value of SWQI in watercourses of the Republic of Serbia (2010-2019)

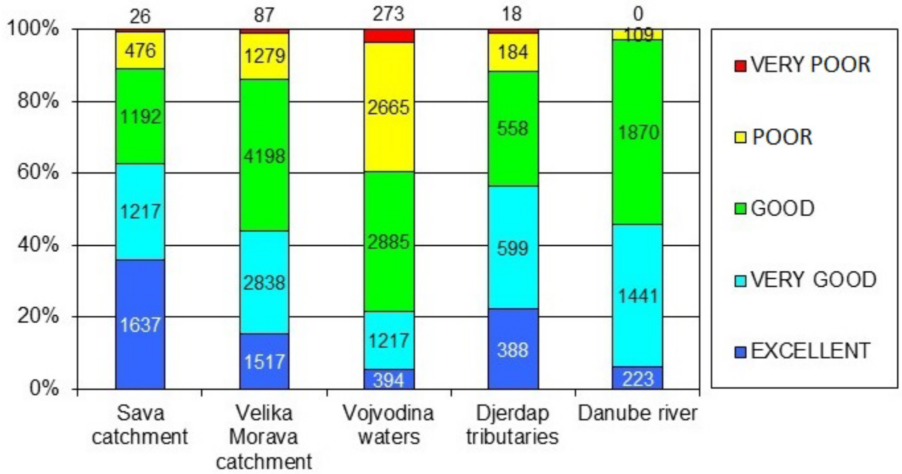


Figure 3.15. Analysis of water samples by SWQI method as per watersheds of the Republic of Serbia (1998-2019)

Source of data: Environmental Protection Agency

3.1.6. Priority substances and priority hazardous substances (S)

Key messages:

1) in 2019, there were five parameters of priority and priority hazardous substances (hereinafter referred to as: PHS) which exceeded allowed average annual concentrations at 36% measurement points. The maximum allowed concentrations (hereinafter referred to as: MAC) were exceeded in six parameters at 43% of the measurement points;

2) persistent organic pollutants (hereinafter referred to as: POPs chemicals) did not exceed the permitted concentrations.

The *Regulation on limit values for priority and PHS that pollute surface waters and deadlines for the achievement thereof* defines substances and their allowed average and maximum concentrations that must not be exceeded in order not to jeopardize long-term or short-term environmental quality standards for surface waters, therefore for human health.

Priority and PHS include POPs chemicals. The main objective of the Stockholm Convention is to ban or restrict the production, use, emission, import and export of these substances in order to protect human health and the environment.

Table 3.1. POPs of chemicals higher than LOQ in watercourses of the Republic of Serbia in 2019

Permanent Organic Pollutant (POPs)	CAS No	Limit of quantification (LOQ)	Measured value >LOQ (µg/l)	Number of measurements > LOQ (Total number of measurements)	Watercourse (Reservoir)	Measuremnt site
Dieldrin	60-57-1	0.002	0.002	1(11)	Koritnicka reka	Bela Palanka 1
DDT, p,p'	50-29-3	0.001	0.003	1(11)	Ibar	Kraljevo
Beta-Endosulfan	33213-65-9	0.005	0.009	1(11)	Jadar	Lesnica
Alpha-Endosulfan	959-98-8	0.005	<LOQ			
Alpha-HCH	319-84-6	0.001	<LOQ			
Beta-HCH	319-85-7	0.001	<LOQ			
Gamma-HCH (Lindane)	58-89-9	0.001	<LOQ			
Aldrin	309-00-2	0.001	<LOQ			
Chlordane	57-74-9	0.001	<LOQ			
Heptachlor	76-44-8	0.001	<LOQ			
Endrin	72-20-8	0.005	<LOQ			
Hexachlorobenzene	118-74-1	0.001	<LOQ			
Pentachlorobenzene	608-93-5	0.001	<LOQ			

POPs chemicals did not exceed allowed concentrations, but their mere presence above the limit of quantification (LOQ) indicates caution because they are resistant to photolytic, biological and chemical degradation, due to which they are transmitted unchanged by air and water, evaporation and condensation processes to the regions where they were not used (Table 3.1).

In 2019, the PHS analysis was conducted at 77 measurement points of watercourses and four measurement points at one reservoir. MACs that cause short-term consequences in ecosystems were exceeded at 35 measurement points of watercourses. Six parameters recorded exceedance of MACs (Table 3.2).

Allowed annual average concentrations (hereinafter referred to as: AAC) that cause long-term consequences in ecosystems were exceeded at 29 measurement points. The parameters where exceedances of AAC was recorded are nickel dissolved, lead dissolved, cadmium dissolved and benzo(a)pyrene (Table 3.3).

Table 3.2. Exceeded MACs for PHS in surface waters of the Republic of Serbia in 2019

Hazardous Priority Substance (HPS)	CAS No	Maximum allowed concentration (MAC) (µg/l)	Maximum measured value (µg/l)	Vatercourse	Measurement site
Mercury dissolved	7439-97-6	0.07	0.5	Raca	Markovac
Mercury dissolved	7439-97-6	0.07	0.5	Dulenska reka	Dragosevac
Mercury dissolved	7439-97-6	0.07	0.46	Kanali DTD	Prigrevica
Mercury dissolved	7439-97-6	0.07	0.3	Dumaca	Sabac (Jelenca)
Mercury dissolved	7439-97-6	0.07	0.3	Kudos	Jarak
Mercury dissolved	7439-97-6	0.07	0.25	Kanali DTD	Bac
Mercury dissolved	7439-97-6	0.07	0.2	Dunav	Tekija
Mercury dissolved	7439-97-6	0.07	0.2	Karas	Dobricevo
Mercury dissolved	7439-97-6	0.07	0.2	Kanali DTD	Novo Milosevo
Mercury dissolved	7439-97-6	0.07	0.17	Tisa	Novi Becej
Mercury dissolved	7439-97-6	0.07	0.17	Bosut	Batrovci
Mercury dissolved	7439-97-6	0.07	0.17	Kolubara	Mislodjin
Mercury dissolved	7439-97-6	0.07	0.15	Plazovic	Backi Breg
Mercury dissolved	7439-97-6	0.07	0.12	Sava	Jamena
Mercury dissolved	7439-97-6	0.07	0.1	Dunav	Brza Palanka
Mercury dissolved	7439-97-6	0.07	0.1	Tisa	Titel
Mercury dissolved	7439-97-6	0.07	0.1	Nera	Kusic
Mercury dissolved	7439-97-6	0.07	0.1	Kanali DTD	Novi Sad 1(g.v.)
Mercury dissolved	7439-97-6	0.07	0.1	Sava	Sabac
Mercury dissolved	7439-97-6	0.07	0.1	Tamnava	Brgule
Mercury dissolved	7439-97-6	0.07	0.1	Velika Morava	Ljubicevski Most
Mercury dissolved	7439-97-6	0.07	0.1	Uglješnica	Kragujevac
Mercury dissolved	7439-97-6	0.07	0.1	Busur	Petrovac 1
Mercury dissolved	7439-97-6	0.07	0.1	Timok	Srbovo
Mercury dissolved	7439-97-6	0.07	0.09	Moravica (Banatska)	Vatin
Mercury dissolved	7439-97-6	0.07	0.09	Kanali DTD	Backo Gradiste
Mercury dissolved	7439-97-6	0.07	0.09	Plazovic	Ridjica
Mercury dissolved	7439-97-6	0.07	0.09	Vitovnica	Kaliste
Mercury dissolved	7439-97-6	0.07	0.08	Plovni Begej	Srpski Itebej (g.v.)
Mercury dissolved	7439-97-6	0.07	0.08	Vukodraz	Usce
Mercury dissolved	7439-97-6	0.07	0.08	Ibar	Kraljevo (Ibar)
Cadmium dissolved	7440-43-9	1.5	33.89	Timok	Srbovo
Nickel dissolved	7440-02-0	34	225.2	Tamis	Jasa Tomic
Nickel dissolved	7440-02-0	34	161.3	Plazovic	Backi Breg
Nickel dissolved	7440-02-0	34	118.8	Plazovic	Ridjica
Nickel dissolved	7440-02-0	34	95.7	Stari Begej	Hetin
Nickel dissolved	7440-02-0	34	86.8	Bajski kanal	Backi Breg
Nickel dissolved	7440-02-0	34	61.8	Timok	Srbovo
Nickel dissolved	7440-02-0	34	56.9	Tisa	Novi Becej
Nickel dissolved	7440-02-0	34	56	Kanali DTD	Backo Gradiste
Nickel dissolved	7440-02-0	34	52.9	Kanali DTD	Novi Sad 1(g.v.)
Nickel dissolved	7440-02-0	34	45	Brzava	Markovicevo
Nickel dissolved	7440-02-0	34	39.3	Zlatica	Vrbica
Nickel dissolved	7440-02-0	34	38.4	Plovni Begej	Srpski Itebej (g.v.)
Nickel dissolved	7440-02-0	34	35.7	Kanali DTD	Prigrevica
Benzo(b)fluoranthene	205-99-2	0.017	0.042	Dunav	Tekija
Benzo(g,h,i)perylene	191-24-2	0.0082	0.009	Dunav	Tekija
Benzo(k)fluoranthene	207-08-9	0.017	0.042	Dunav	Tekija

Table 3.3. Exceeded AACs for PHS in surface waters of the Republic of Serbia in 2019

Hazardous Priority Substance (HPS)	CAS No	Allowed average annual concentration (µg/l)	Calculated average annual concentration (µg/l)	Number of mesurements during the year	Vatercourse	Measurement site
Lead dissolved	7439-92-1	1.2	1.41	10	Dunav	Bogojevo
Lead dissolved	7439-92-1	1.2	1.23	3	Kanali DTD	Bac
Cadmium dissolved	7440-43-9	1.5	11.05	11	Timok	Srbovo
Nickel dissolved	7440-02-0	4	34.93	12	Plazovic	Backi Breg
Nickel dissolved	7440-02-0	4	34.9	12	Tamis	Jasa Tomic
Nickel dissolved	7440-02-0	4	28.11	4	Kanali DTD	Backo Gradiste
Nickel dissolved	7440-02-0	4	26.89	11	Timok	Srbovo
Nickel dissolved	7440-02-0	4	22.04	11	Plazovic	Ridjica
Nickel dissolved	7440-02-0	4	20.02	12	Stari Begej	Hetin
Nickel dissolved	7440-02-0	4	16.78	4	Kanali DTD	Novo Milosevo
Nickel dissolved	7440-02-0	4	15.77	12	Kanali DTD	Novi Sad 1(g.v.)
Nickel dissolved	7440-02-0	4	15.23	12	Tisa	Novi Becej
Nickel dissolved	7440-02-0	4	14.11	11	Bajski kanal	Backi Breg
Nickel dissolved	7440-02-0	4	12.58	12	Brzava	Markovicevo
Nickel dissolved	7440-02-0	4	12.15	12	Plovni Begej	Srpski Itebej (g.v.)
Nickel dissolved	7440-02-0	4	11.13	12	Zlatica	Vrbica
Nickel dissolved	7440-02-0	4	11.1	3	Kanali DTD	Bac
Nickel dissolved	7440-02-0	4	10.23	11	Kanali DTD	Prigrevica
Nickel dissolved	7440-02-0	4	10.05	10	Dunav	Bogojevo
Nickel dissolved	7440-02-0	4	10.01	9	Moravica (Banatska)	Vatin
Nickel dissolved	7440-02-0	4	9.02	5	Kanali DTD	Kajtasovo (ustava g.v.)
Nickel dissolved	7440-02-0	4	8.25	11	Nera	Kusic
Nickel dissolved	7440-02-0	4	7.78	12	Tisa	Titel
Nickel dissolved	7440-02-0	4	7.23	12	Karas	Dobricevo
Nickel dissolved	7440-02-0	4	7.04	11	Dunav	Bezdan
Nickel dissolved	7440-02-0	4	5.88	11	Raca	Markovac
Nickel dissolved	7440-02-0	4	5.8	11	Kudos	Jarak
Nickel dissolved	7440-02-0	4	4.79	12	Dunav	Banatska Palanka
Nickel dissolved	7440-02-0	4	4.55	11	Ugljesnica	Kragujevac
Nickel dissolved	7440-02-0	4	4.48	10	Sava	Sabac
Benzo(a)pyrene	50-32-8	0.00017	0.000719	8	Kalenicka reka	Varvarin
Benzo(a)pyrene	50-32-8	0.00017	0.000636	11	Bajski kanal	Backi Breg
Benzo(a)pyrene	50-32-8	0.00017	0.000409	11	Gruza	Vitanovac
Benzo(a)pyrene	50-32-8	0.00017	0.000396	12	Dunav	Tekija
Benzo(a)pyrene	50-32-8	0.00017	0.000396	12	Plazovic	Backi Breg

Source of data: Environmental Protection Agency

3.2. GROUND WATER QUALITY (S)

3.2.1. Nutrients in ground water – nitrates (NO_3-N) (S)

Key messages:

1) in the entire territory of the Republic of Serbia and in all watersheds, an insignificant trend of nitrates was recorded in the groundwater in the period 2010-2019;

2) average ten-year concentration higher than 50 (mg/l) was not detected in any measurement point in the period 2010-2019;

3) according to the nitrate indicator, quality of groundwater in the territory of the Republic of Serbia in 2019 deteriorated compared to 2018.

The indicator monitors nitrate (NO_3) concentrations in groundwater, enabling the assessment of groundwater status in terms of nutrient concentration. It is used to show spatial and temporal variations of nutrients and their long-term trends. Excessive amounts of nutrients that runs into the soil from urban areas, industry and agricultural land lead to an increase in concentrations, which causes groundwater pollution. This process has a negative impact on the use of water for human consumption and for other purposes.

The indicator is calculated as the median of a series of mean annual nitrate values measured at measurement points. Mann-Kendall test and non-parametric Sen'S method were used to determine the presence and assessment of the trend intensity.

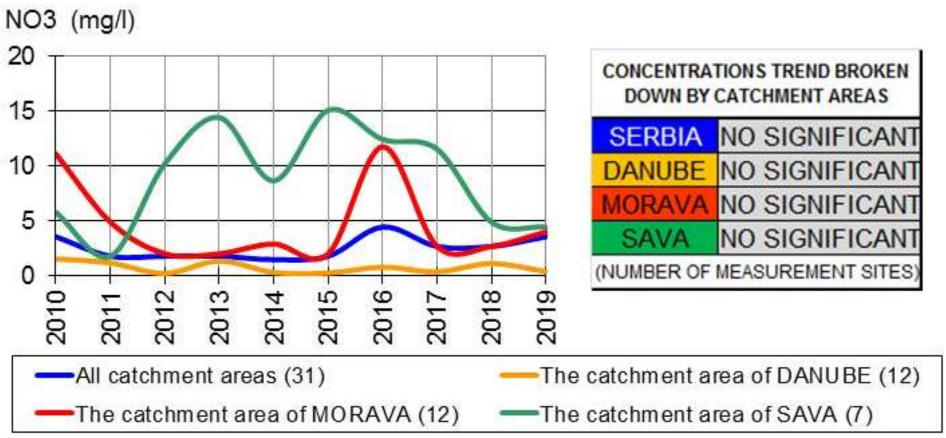


Figure 3.16. Trends of nitrate median in groundwater of the Republic of Serbia (2010-2019)

The analysis of groundwater nitrate was conducted at 31 measurement points where there was continuous sampling in the period 2010-2019. Insignificant trend of nitrates was recorded in the entire territory of the Republic of Serbia and in all watersheds, which means that there are no significant changes in quality (Figure 3.16).

The average ten-year concentration higher than 50 (mg/l) was not detected at any measurement point in the period 2010-2019. A relatively high average ten-year concentration greater than 25 (mg/l) was detected at the measurement points of Šid (W-1/D) (46.5 mg/l) in the Sava River Basin, Novi Sad (RS-1/1) (45, 3 mg/l) in the Danube River Basin, Lozovik-Vlaški Do (37.6 mg/l) and Obrež-Ratare (29.8 mg/l) in the Morava River Basin (Figure 3.17).

In 2019, the allowed nitrate concentration of 50 (mg/l) was exceeded only at two measurement points: Zrenjanin (ZR-1/D) (90.1 mg/l) in the Danube River Basin and Šid (Š-1/D) (51.4 mg/l) in the Sava River Basin. Groundwater quality deteriorated in 2019 compared to 2018 (Figure 3.18).

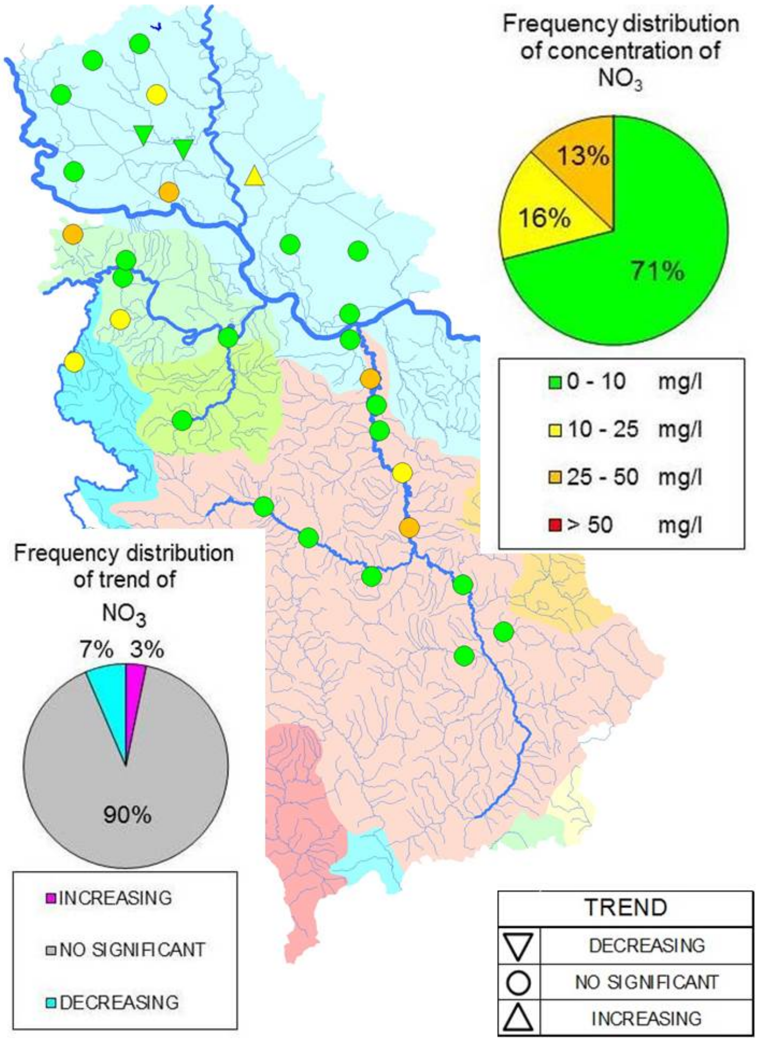


Figure 3.17. Trend and mean value of nitrate concentrations in groundwater of the Republic of Serbia (2010-2019)

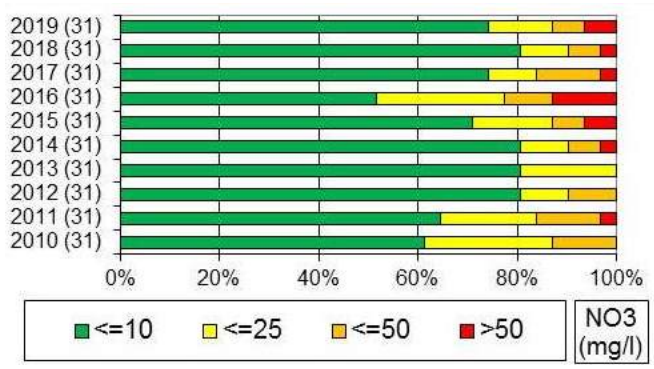


Figure 3.18. Distribution of frequency of nitrate in groundwater of the Republic of Serbia (2010-2019)

Source of data: Environmental Protection Agency

3.3. DRINKING WATER QUALITY (I)

Key messages:

1) 67.3% of public water supply systems in urban settlements recorded overall sanitation of drinking water (both in the physical-chemical and in the microbiological sense) in 2019, while 16% of water supply systems recorded both deficiencies in terms of sanitation;

2) 26.6% of public water supply systems in urban settlements of the Republic of Serbia recorded physical and chemical inappropriateness of drinking water in 2019;

3) 27.9% of public water supply systems in urban settlements of the Republic of Serbia recorded microbiological inappropriateness of drinking water in the same period.

The indicator monitors the share of drinking water samples which do not meet the prescribed values for drinking water parameters in total number of drinking water samples taken from public water supply systems. The indicator provides information on the risks of negative impacts of drinking water on human health and indicates the extent to which the supply of drinking water is in accordance with sanitary and hygienic conditions and standards.

The indicator is calculated as the quotient of the number of non-sanitary samples and the total number of samples, multiplied by 100 (physico-chemical and microbiological indicators), aggregated or individually for the specified groups of consumers.

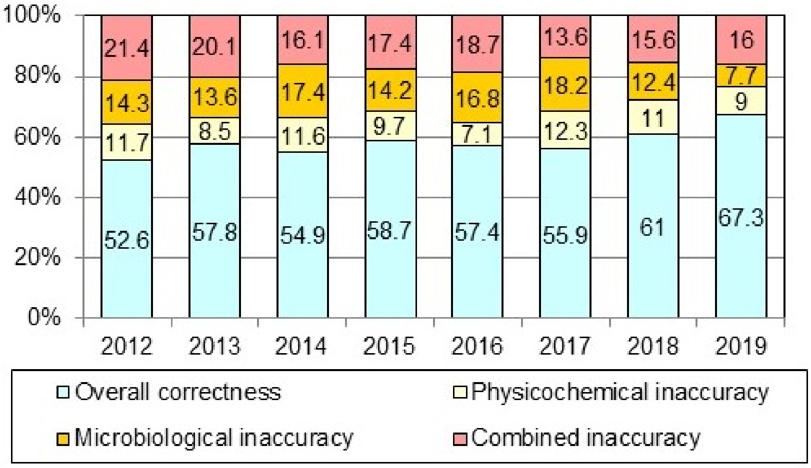


Figure 3.19. Sanitation of drinking water from public water supply systems in urban settlements in the Republic of Serbia in the period 2012-2019

The analysis of drinking water quality in 2019 was conducted in 156 public water supply systems in urban settlements. The criterion for physical and chemical quality of drinking water is up to 20% of non-sanitised samples. The criterion for the microbiological quality of drinking water is up to 5% of defective samples. In 2019, 67.3% of public water supply systems in urban settlements recorded overall sanitation of drinking water, both in the physical-chemical and microbiological terms, and it is the highest that year in the period 2012-2019 (Figure 3.19).

In 2019, 25% of public water supply systems in urban settlements of the Republic of Serbia recorded physical and chemical inappropriateness of drinking water, mostly on the territory of the Autonomous Province of Vojvodina (Figure 3.20).

In the same period, 23.6% of public water supply systems in urban settlements of the Republic of Serbia recorded microbiological inappropriateness of drinking water (Figure 3.21). This deficiency was also recorded mainly in the territory of AP Vojvodina and in the territory of Zlatibor area.

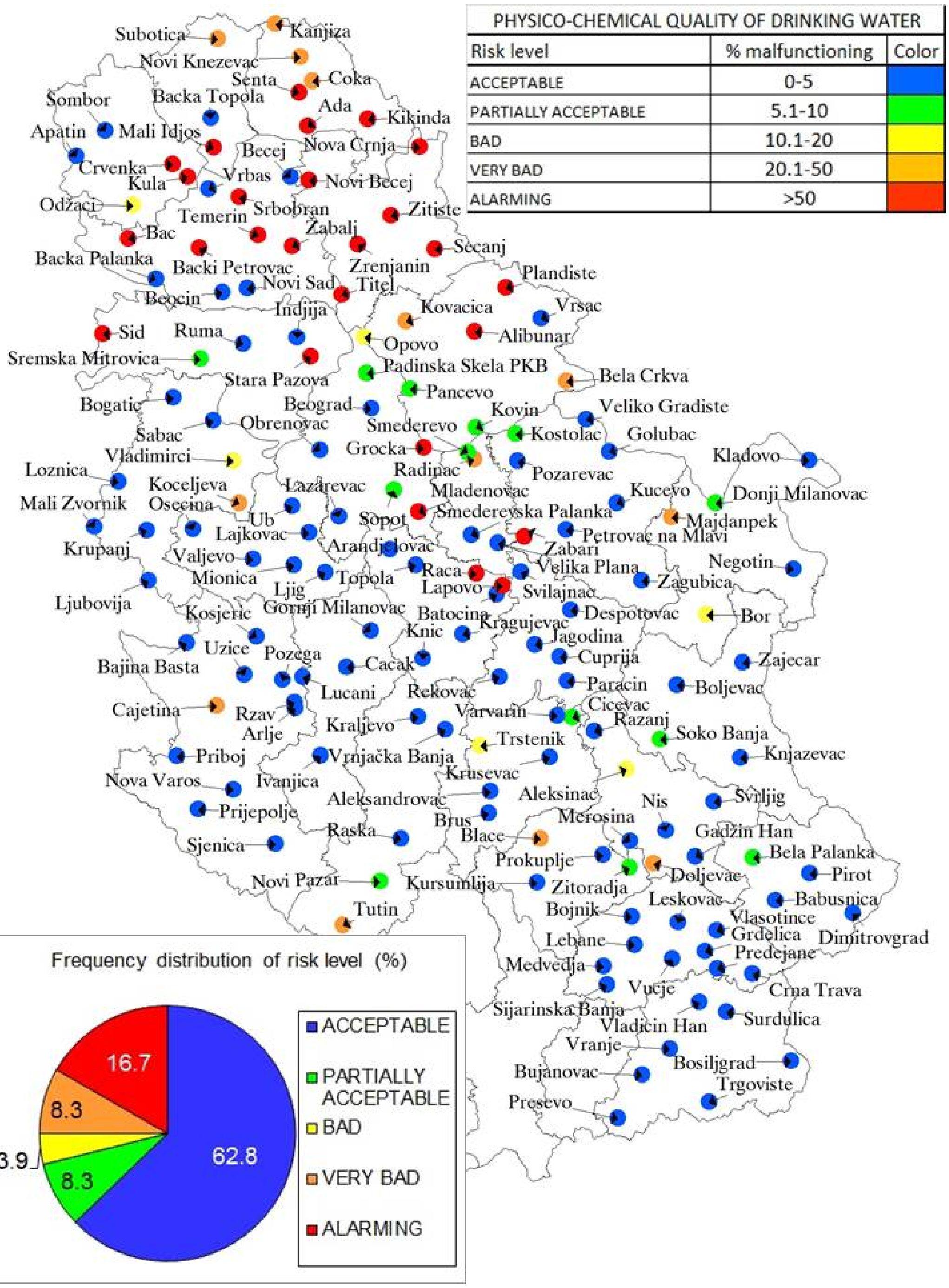


Figure 3.20. Physico-chemical inappropriateness of drinking water of public water supply systems in urban settlements (2019)

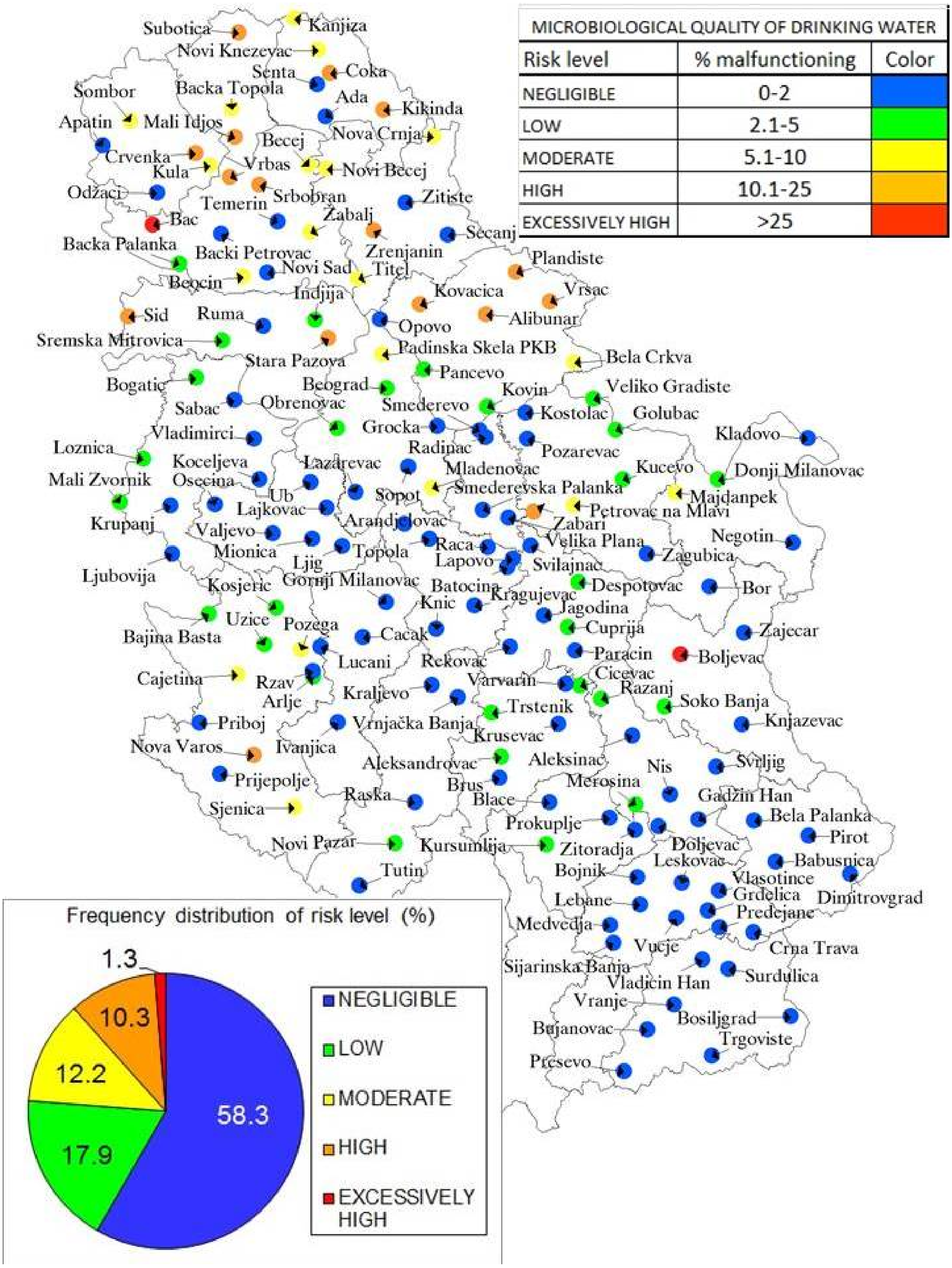


Figure 3.21. Microbiological inappropriateness of drinking water in public water supply system in urban settlements (2019)

Source of data: Institute of Public Health of Serbia “Dr Milan Jovanovic Batut”

3.4. SANITARY-TECHNICAL CONDITIONS FOR WATER SUPPLY AND CANALISATION (R)

3.4.1. Percentage of population connected to public water supply system (R)

Key messages:

1) the percentage of residents connected to the public water supply was constantly growing in the period from 2000-2019;

2) the highest percentage of connection to the public water supply in 2019 is in Zapadnobački, Severnobanatski, Južnobanatski, Srednjobanatski and Sremski counties, and the lowest in Nišavski and Toplički counties.

The indicator monitors the number of inhabitants connected to the public water supply system in relation to total number of residents, enabling the assessment of the society's reaction to the supply of population with healthy drinking water.

The indicator is calculated as the quotient of the number of inhabitants connected to the public water supply system (i.e., a set of interconnected technical-sanitary facilities and equipment, intended to provide the population and businesses of the settlement with drinking water that meets the requirements in health terms) and the total number of inhabitants multiplied by 100, and is expressed in percentages.

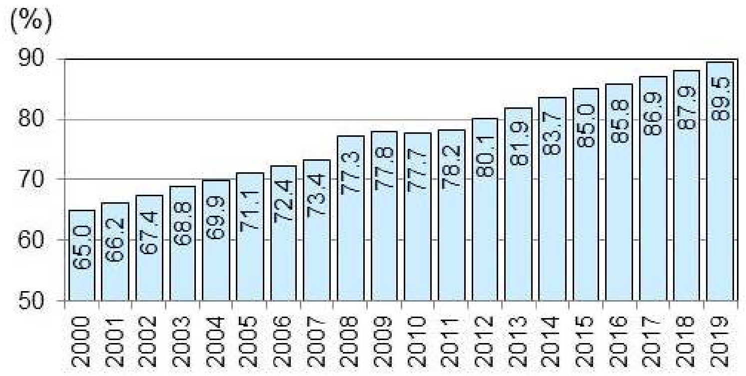


Figure 3.22. Percentage of inhabitants connected to public water supply (2000-2019)

The percentage of residents connected to the public water supply was constantly growing in the period 2000-2019. The connection of 65% to the system in 2000 had increased by 24.5% until 2019, and in 2019 amounted to 89.5%, which will provide a larger number of population and businesses of the settlement with drinking water and production that meets the requirements in health terms (Figure 3.22).

The highest percentage of the population connected to the public water supply is in the Zapadnobački, Severnobanatski, Južnobanatski, Srednjobanatski and Sremski counties, where 100% of the population is connected. The lowest percentage is in Nišavski (51.3%) and Toplički (68.8%) counties (Figure 3.23).

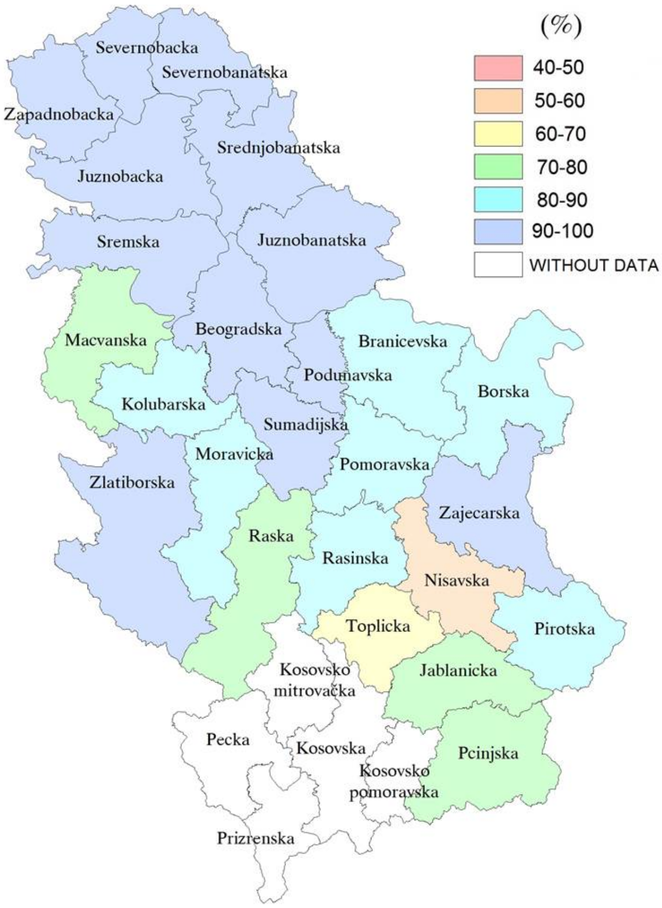


Figure 3.23. Percentage of inhabitants connected to public water supply systems by areas (2019)
Source of data: Statistical Office of the Republic of Serbia

3.4.2. Percentage of population connected to public sewerage system (R)

Key messages:

1) the percentage of residents connected to the public sewerage system was constantly growing in the period 2000-2019;

2) the highest percentage of connections is recorded in the City of Belgrade and Šumadijski county, and the lowest in Zapadnobački and Nišavski counties.

The indicator monitors the number of inhabitants connected to the public sewerage system in relation to the total number of inhabitants, enabling the assessment of the society's reaction to the improvement of living conditions and health of the population.

The indicator is calculated as a quotient of the number of inhabitants connected to the public sewerage (i.e., a set of technical and sanitary facilities that ensure continuous and systematic collection, channelling and discharge of wastewater from settlements and businesses into appropriate recipients) and the total population, multiplied by 100, and is expressed as percentage.

The percentage of residents connected to the public sewerage system was constantly growing in the period 2000-2019. The connection of 40.2% in 2000 had increased by 25% until 2019 and in 2019 it amounted to 65.2%, which will improve living conditions of wider population and businesses of the settlement, and provide a healthier environment (Figure 3.24).

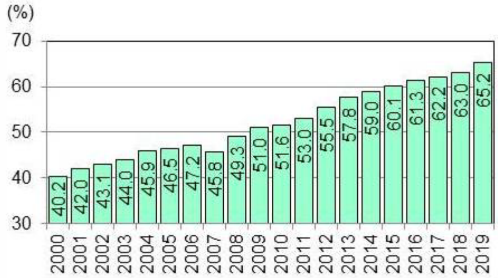


Figure 3.24. Percentage of residents connected to the public sewerage system (2000-2019)

The highest percentage of the population connected to the public sewerage is in the City of Belgrade (86.1%) and Šumadijski county (75.6%). The lowest percentage is in Zapadnobački (31.3%) and Nišavski (34.2%) counties, where residents are mostly connected to septic tanks (Figure 3.25).

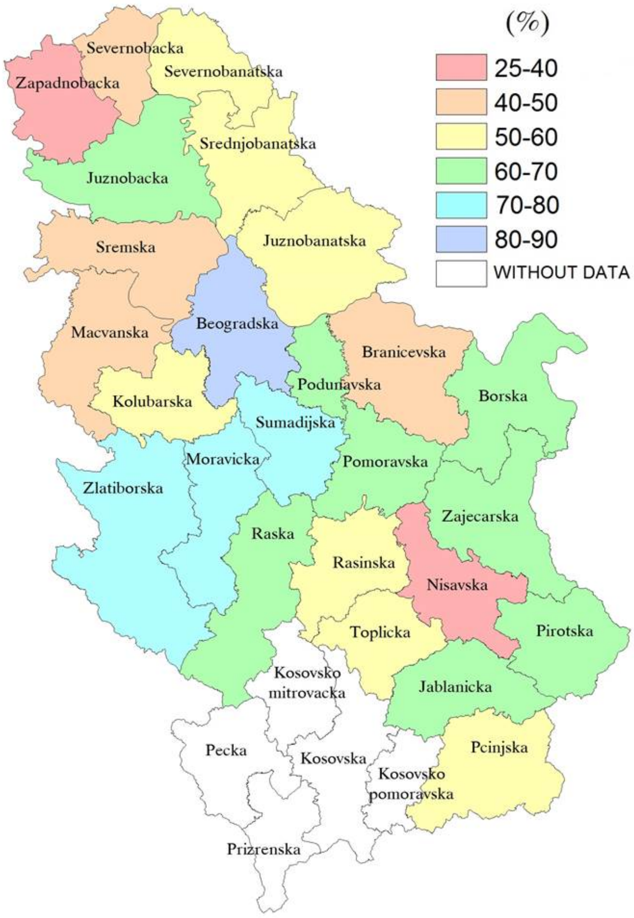


Figure 3.25. Percentage of inhabitants connected to the public sewerage system by counties (2019)

Population that is not connected to the public sewerage mostly uses septic tanks for evacuation of their wastewater, while a smaller part uses dry systems and non-specific installations for evacuation of wastewater. There is a significant difference in the degree of connection of the population to the sewerage system in relation to the connection to the water supply, especially in settlements with less than 50,000 residents, which creates specific danger for groundwater pollution.

Source of data: Statistical Office of the Republic of Serbia

3.5. PUBLIC SEWERAGE WASTE WATER TREATMENT PLANT (R)

Key messages:

1) percentage of population covered by wastewater treatment service recorded a favourable (growing) trend in the period 2010-2019;

2) the percentage of the population covered by wastewater treatment system, depending on the type of treatment, also recorded a favourable (growing) trend in the period 2010-2019 for all three types of treatment (primary, secondary and tertiary).

The indicator monitors the percentage of the population connected to plants for treatment of wastewater from public sewerage with primary, secondary and tertiary treatment, in relation to the total population in the country and represents the reaction of society in the area of water protection. The indicator is calculated as the quotient of the number of residents connected to plants for treatment of wastewater from public sewerage with primary, secondary or tertiary treatment (i.e., a set of technical and sanitary facilities that provide continuous and systematic collection, canalisation, treatment and discharge of wastewater and atmospheric water from the settlement and businesses into appropriate recipients) and the total population multiplied by 100, and is expressed as a percentage.

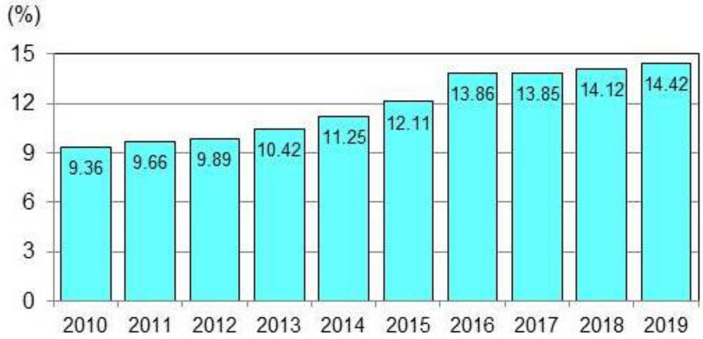


Figure 3.26. Percentage of population covered by wastewater treatment service in the Republic of Serbia (2010-2019)

The percentage of the population covered by wastewater treatment service was constantly growing in the period 2010-2019. In 2019, it amounted to a maximum of 14.42%, and compared to 2010, it had increased by 5.06% (Figure 3.26).

The percentage of population covered by wastewater treatment service, depending on the type of treatment, also recorded a favourable (growing) trend in the period 2010-2019 for all three types of treatment (primary, secondary and tertiary). In the period 2016-2019, tertiary treatment increased significantly as perfect treatment system, and 3.53% of the population was connected to this treatment type in 2019. This type of wastewater treatment in 2019, compared to 2010, was higher by 2.3% (Figure 3.27).

The Severnobački county recorded the most treated wastewater for all types of treatment, discharged into wastewater disposal systems in 2019 (96.1%). The City of Belgrade, Srednjobanatski, Zlatiborski, Rasinski, Toplički and Nišavski counties did not record treated wastewater in the same period (Figure 3.28).

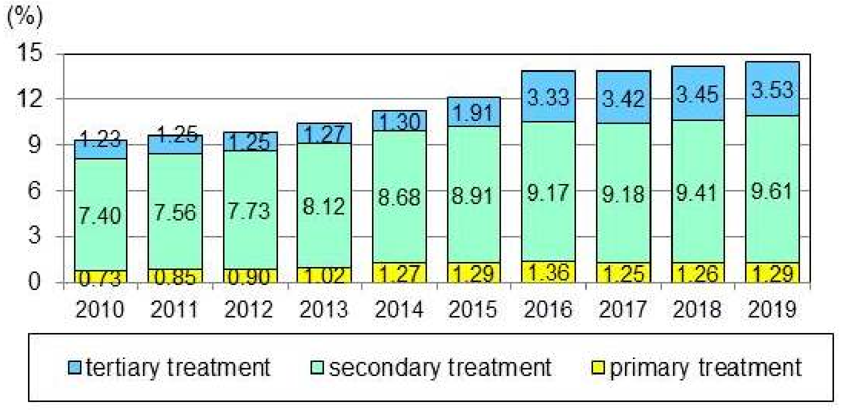


Figure 3.27. Percentage of population covered by wastewater treatment depending on the type of treatment in the Republic of Serbia (2010-2019)

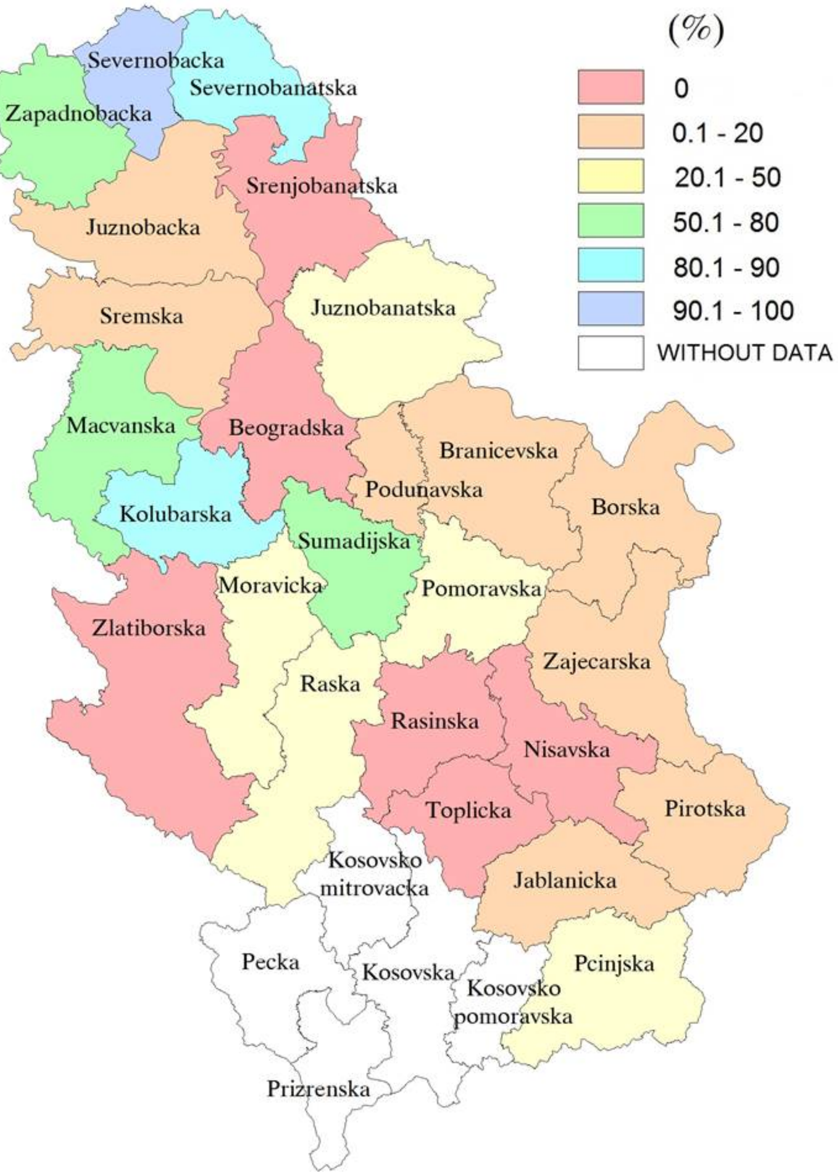


Figure 3.28. Treated wastewater by counties (2019)

Source of data: Statistical Office of the Republic of Serbia

3.6. POLLUTED (UNTREATED) WASTE WATER (P)

3.6.1. Polluted (untreated) waste water (P)

Key messages:

1) percentage of polluted (untreated) wastewater had a favourable (declining) trend in the period 2010-2019;

2) quantities of total wastewater (treated and untreated, atmospheric water excluded) recorded a favourable (declining) trend in the period 2010-2019, while the trend in the amount of treated wastewater was insignificant, which means that there were no significant changes.

The indicator monitors the share of untreated wastewater discharged into surface water bodies (water recipients) in relation to the total amount of discharged wastewater. It defines the level and type of pressure on natural waters, which can provide information needed to develop nature protection measures, and help to assess measures to increase the efficiency of wastewater treatment systems management. Due to inability to provide treatment of all wastewater delivered for treatment to treatment plants, due to insufficient capacity or inefficient use of the plant, the indicator is the response of society as an important factor in the load on aquatic ecosystems. The indicator is calculated as the quotient of the volume of untreated wastewater discharged and the total volume of discharged wastewater multiplied by 100, and is expressed as a percentage.

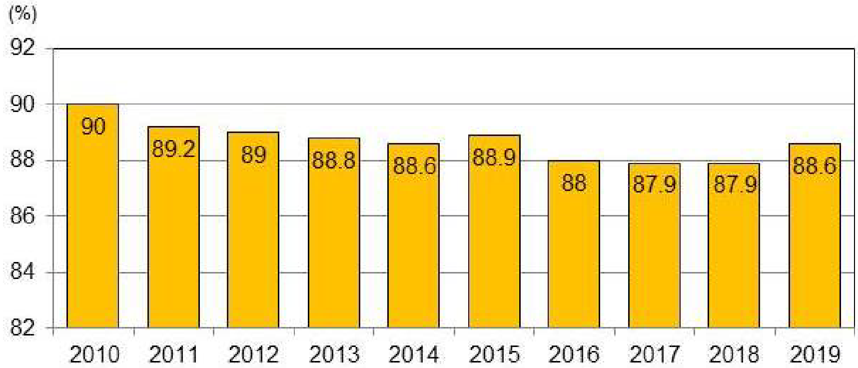


Figure 3.29. Percentage of untreated wastewater in the Republic of Serbia (2010-2019)

The percentage of polluted (untreated) wastewater had a favourable (declining) trend in the period 2010-2019. In 2019, it amounted to (88.6%) and had increased compared to 2018 (Figure 3.29).

Quantities of total wastewater in the period 2010-2019 recorded a favourable (declining) trend. The average amount of polluted (untreated) wastewater in the same period was 370.2 million (m^3/year) (88.7% of total wastewater), and also recorded favourable (declining) trend. Average amount of treated wastewater in the same period was 11.3% of total wastewater, which is an insignificant trend (Figure 3.30).

The most untreated wastewater (95% - 100%) is recorded in the City of Belgrade, Nišavski, Zlatiborski, Borski, Rasinski, Pirotski, Toplički, Braničevski, Južnobački, Srednjobantski and Sremski counties. The lowest untreated quantities are in the Severnobački (32%), Kolubarski (42.1%), Severnobanatski (42.3%) and Šumadijski (47.1%) counties (Figure 3.31).

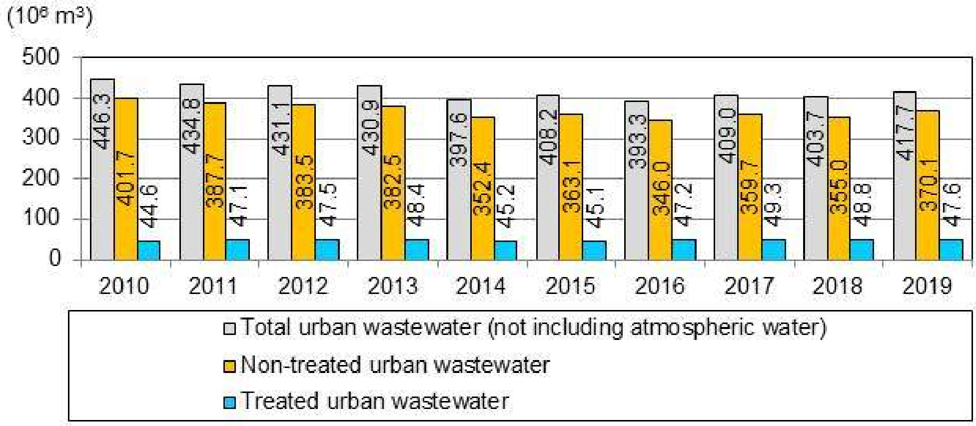


Figure 3.30. Quantities of wastewater in the Republic of Serbia (2010-2019)

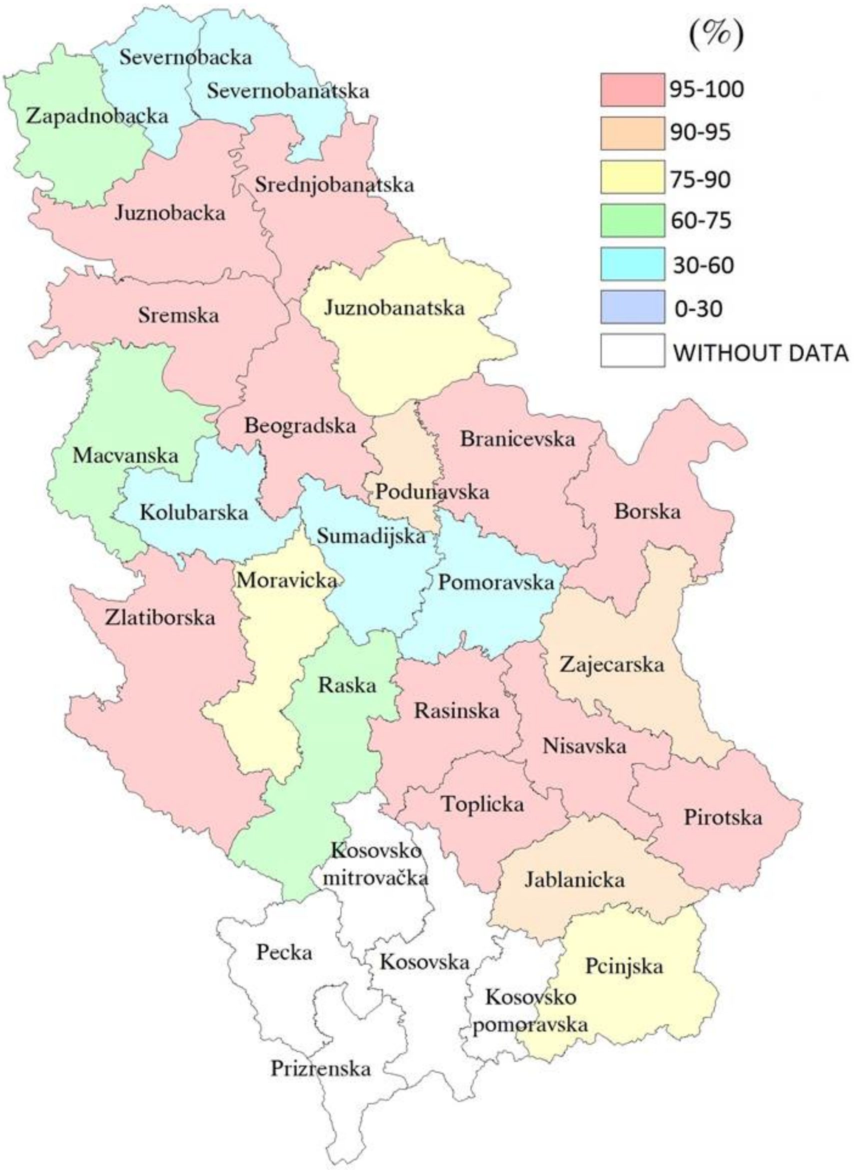


Figure 3.31. Untreated wastewater by counties (2019)
Source of data: Statistical Office of the Republic of Serbia

3.7. EMISSIONS TO WATER (P)

3.7.1. Nitrogen (N) and phosphorous (P) emissions in waste water (P)

Key messages:

1) there were 356 submitted reports from plants representing major sources of pollution in the Republic of Serbia (Pollutant Release and Transfer Register – hereinafter referred to as: PRTR plants) and from public utility companies (hereinafter referred to as: PUCs) on industrial and urban wastewater;

2) emitted quantities of total nitrogen for 2020 amounted to 12,866.4 t;

3) emitted quantities of total phosphorus for 2020 amounted to 1,375.3 t.

Point sources of pollution include pollutants from sewerage systems and/or wastewater treatment plants and industrial plants that can be reduced to a single point of discharge of wastewater into the recipient. It defines the level and type of pressure on natural waters.

Annual amount of pollutant emissions is calculated through the concentration of pollutants in mg/l and the volume of wastewater discharged per year in m^3/year).

Emissions of pollutants from industrial sewage systems are summarised below.

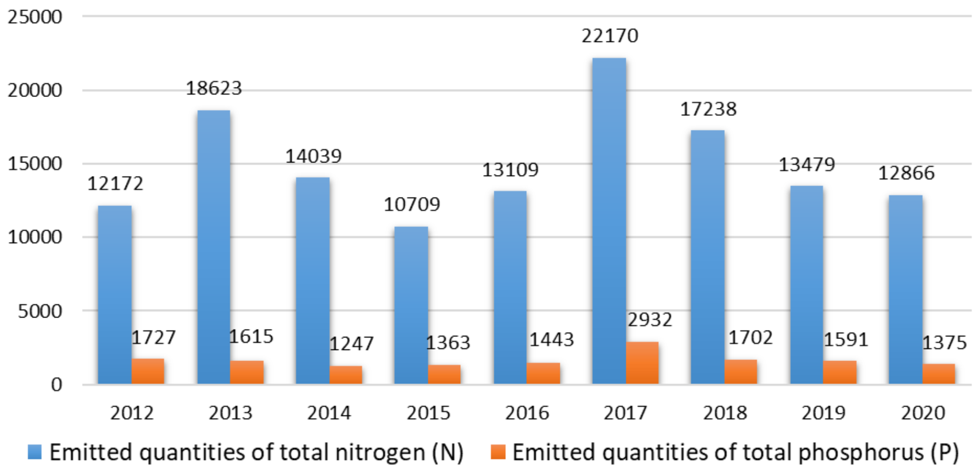


Figure 3.32. Overview of emitted quantities of nitrogen (N) and phosphorus (P) in urban and industrial wastewater in the Republic of Serbia disaggregated by years

Based on the received data, the analysis of emission balance of pollutants was conducted, and the amounts of total nitrogen, total phosphorus in urban and industrial wastewater were presented (Figure 3.32). Since 2017, when the total emission of nitrogen and phosphorus slightly increased, a favourable (declining) trend had been recorded, which continued in 2020 as well.

For the reporting year (2020), 156 PRTR plants submitted reports and 79 PUCs sent data on wastewater.

By processing the submitted data, it can be concluded that the largest emitted amounts of nitrogen and phosphorus in industrial wastewater come from plants from the energy sector and from PUCs that manage waste and wastewater at the municipal level (Figures 3.33 and 3.34).

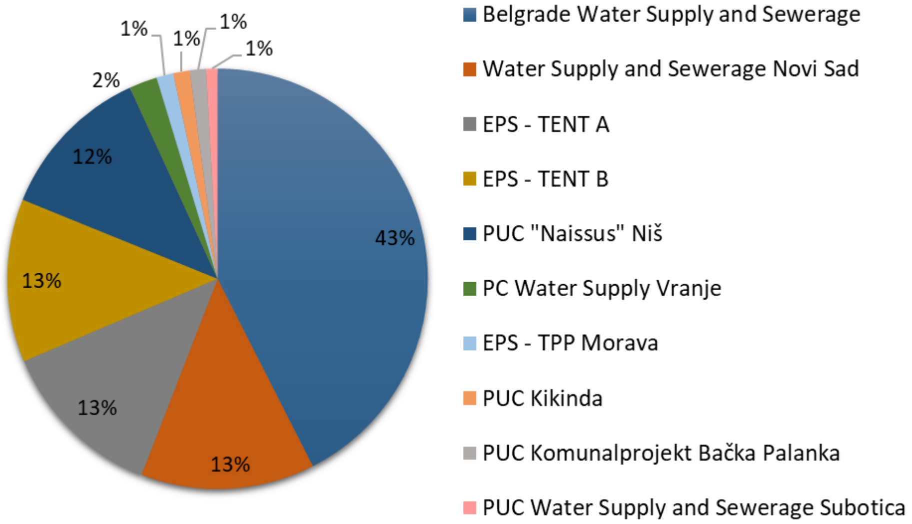


Figure 3.33. The largest sources of nitrogen pollution in the Republic of Serbia in 2020

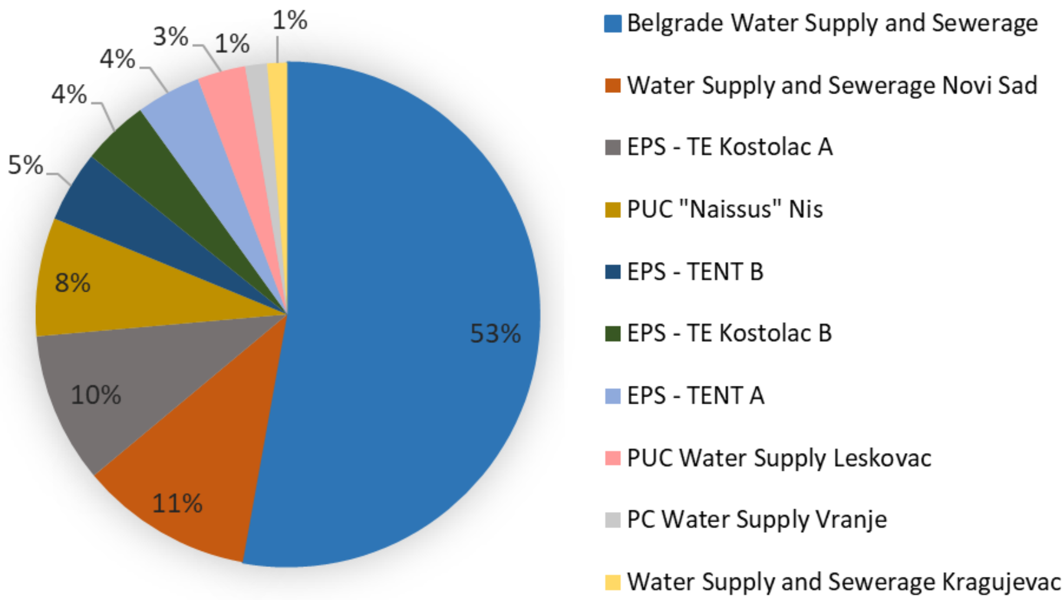


Figure 3.34. The largest sources of phosphorus pollution in the Republic of Serbia in 2020
Source of data: Environmental Protection Agency

3.7.2. Pollutant (heavy metals) emissions from point sources (P)

Key messages:

1) the share of emitted quantities of heavy metals is insignificant in the total emission of pollutants;

2) emissions of zinc (Zn) and zinc compounds in 2020 were, as in the previous period, dominant in relation to total emissions of other heavy metals.

Point sources of pollution include pollutants from sewage systems and/or wastewater treatment plants and industrial plants that can be reduced to a single point of discharge of wastewater into the recipient. It defines the level and type of pressure on natural waters.

Annual amount of pollutant emissions is calculated through the concentration of pollutants in mg/l and the volume of wastewater discharged per year in m^3/year).

Emissions of pollutants from industrial sewage systems are summarised below

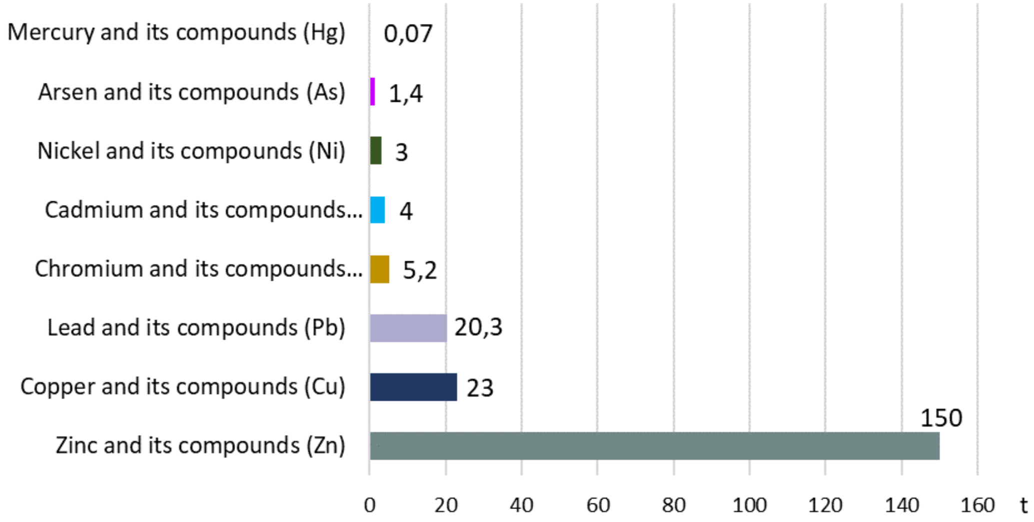


Figure 3.35. Emitted quantities of heavy metals in wastewater in the Republic of Serbia in 2020

The chart shows data on the balance of heavy metals emissions (arsenic, cadmium, copper, zinc, lead, mercury, nickel and chromium) in wastewater for 2020 (Figure 3.35).

The share of heavy metal emissions in the total emissions of pollutants in the Republic of Serbia is only 0.1%, but their monitoring is important due to the high toxicity and negative impacts, primarily on human health.

Emissions of zinc and zinc compounds for the reporting year (2020) doubled compared to the previous one (2019), when it amounted to 71.8 t.

Source of data: Environmental Protection Agency

4. NATURE AND BIOLOGICAL DIVERSITY

4.1. PROTECTED AREAS (P)

Key messages:

1) during 2020, the areas under certain degree of protection increased by 285.25 ha;

2) 7.66% of the territory of the Republic of Serbia is under protection, with a total area of 678,237 ha.

The indicator represents the total area of protected sites and the percentage of the territory under protection in relation to the total area of the Republic of Serbia.

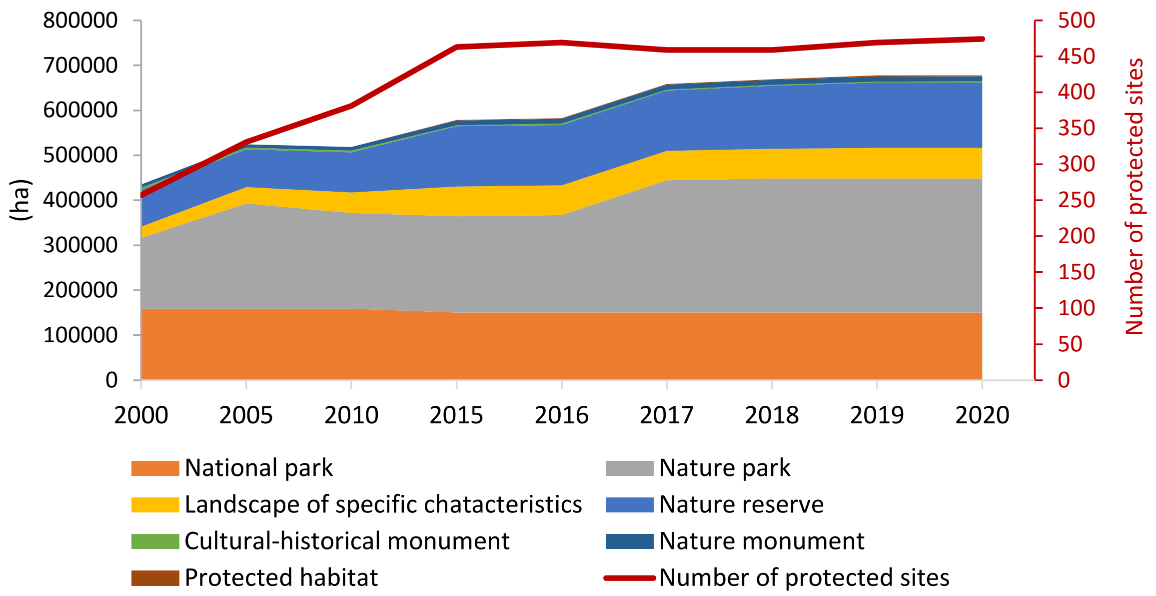


Figure 4.1. Cumulative area of protected sites in the Republic of Serbia

The total area of protected natural sites amounts to 678,237 ha, which represents 7.66% of the territory of the Republic of Serbia. A total of 473 protected sites and resources are under protection of the state. During 2020, the area of protected sites increased by 285.25 ha. The Special Nature Reserve “Osredak” (Figure 4.1) was declared, and the status of the strictly protected Nature Reserve “Kalenić” and the Natural Monument “Tunnel Cave *Prerast* in the Zamna Canyon” was revised.

Pursuant to the national legislation, the procedure for protection of natural site is initiated when the Institute for Nature Protection of Serbia submits a protection study to the competent authority and when the Ministry of Environmental Protection informs the public about the procedure of initiating the protection of natural site on the website of the Ministry of Environmental Protection. These sites are considered protected even though no protection act has been adopted yet (Figure 4.2).

The Spatial Plan of the Republic of Serbia envisages that about 12% of the territory of the Republic of Serbia will be under some kind of protection by 2021.

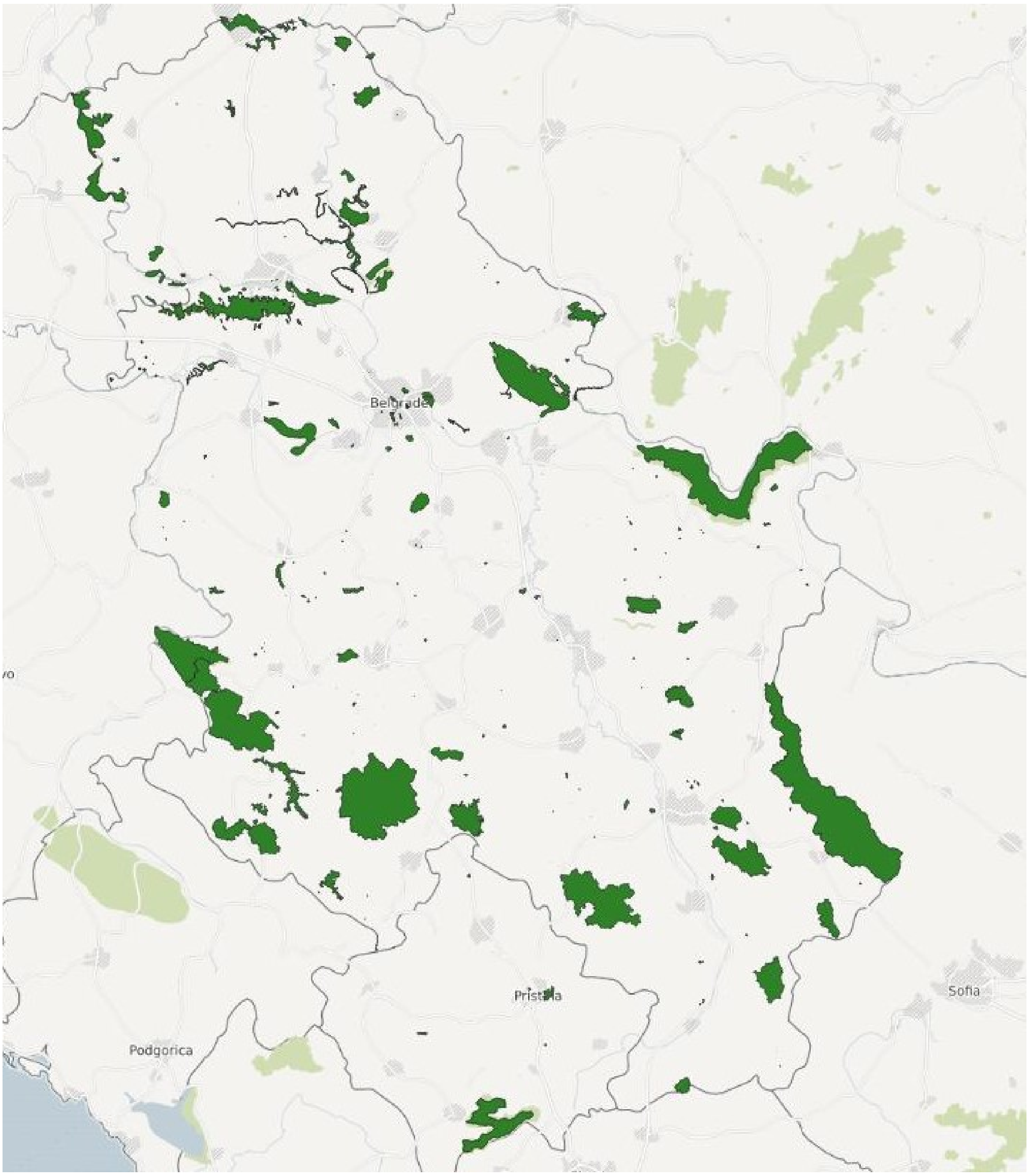


Figure 4.2. Map of protected sites
Source of data: Institute for Nature Protection of Serbia

5. SOIL

5.1. AGRICULTURAL LAND STATUS

5.1.1. State of agricultural land in Central Serbia (S)

Key messages:

Central Serbia is dominated by soils with weakly acidic to acidic reaction, carbonate-free to weakly carbonated, weakly humous to humous, with low and high content of readily available phosphorus, and soils with optimal and high content of readily available potassium.

Systematic control of fertility of arable agricultural land is carried out in order to determine the level of nutrients in agricultural land, so as to ensure proper use of mineral and organic fertilizers.

The study includes the analysis of basic chemical properties of agricultural land within the fertility control: substitution acidity (pH in H_2O and nKCl), $CaCO_3$ (%), humus (%), N (%) and readily available forms of phosphorus (P_2O_5 - mg/100g) and potassium (K_2O - mg/100g).

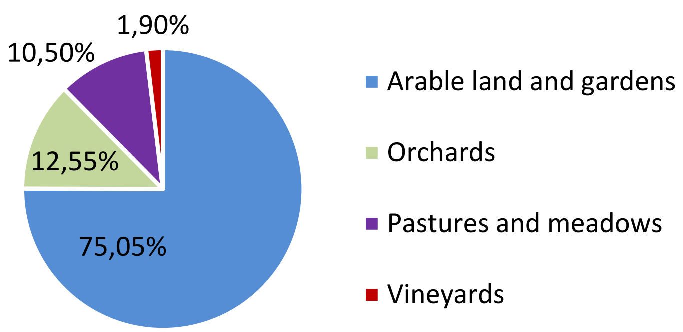


Figure 5.1. Percentage share of samples according to land use

Out of a total of 31,245 tested samples of agricultural land taken from a depth of up to 30 cm, 75.04% belong to arable land and gardens, 12.55% to orchards, 1.90% to vineyards, and 10.50% to pastures and meadows (Figure 5.1).

The test results indicate that the largest number of soil samples taken from arable land and gardens, orchards, vineyards, pastures and meadows belong to the class of weakly acidic reaction (pH in nKCl 5.5-6.5) (Figure 5.2).

Test results of the $CaCO_3$ content show that weakly carbonated soils ($CaCO_3$ 0-2%) are found in vineyards and pastures and meadows (Figure 5.3).

The analysis of humus shows that arable land and gardens and vineyards mostly belong to the class of low humous soils (1-3% humus), while pastures and meadows, as well as orchards, belong to the class of humous soils (3-5% humus) (Figure 5.4).

The results of the analysis of readily available phosphorus show that the largest number of samples of arable land and gardens, orchards, pastures and meadows belong to the class of soils with high content of readily available phosphorus (P_2O_5 25-50 mg/100g), while vineyards are in the class of low content of P_2O_5 5-10 mg/100g) (Figure 5.5).

Analysis of readily available potassium content shows that soils contain the most optimal and high potassium content (K_2O 15-25 and 25-50 mg/100g) (Figure 5.6).

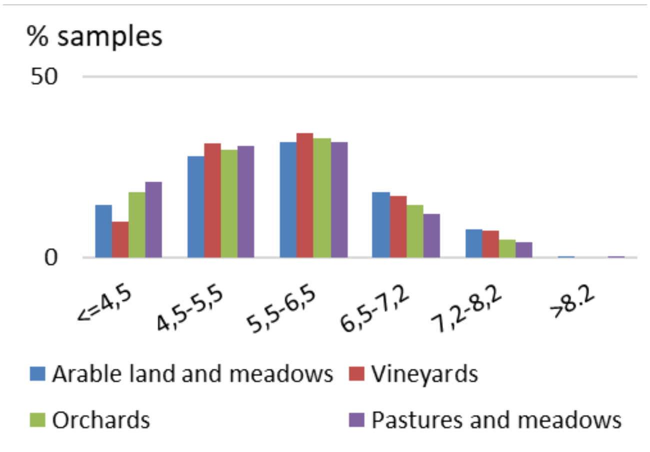


Figure 5.2. Substitutional acidity (pH in nKCl-y)

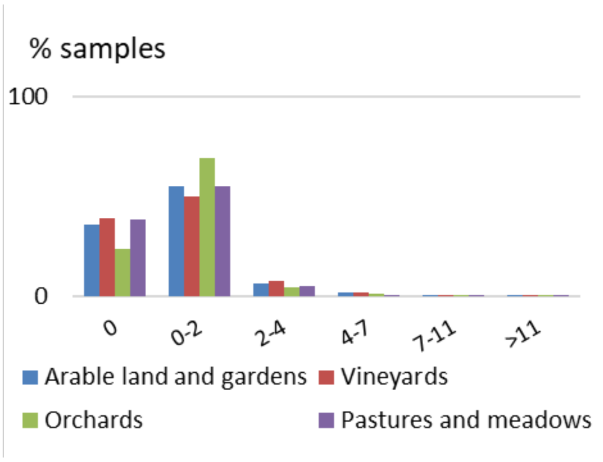


Figure 5.3. Content of $CaCO_3$ (%)

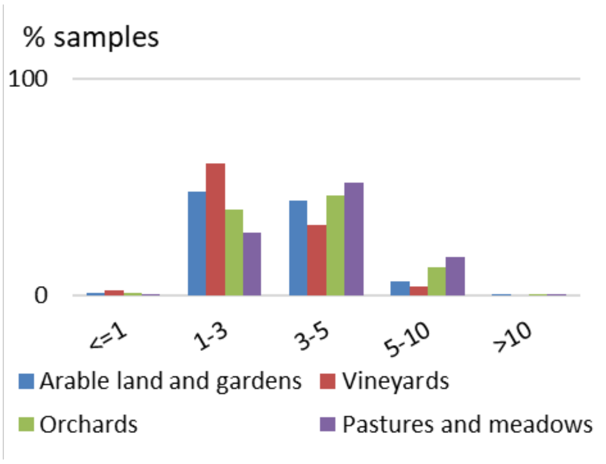


Figure 5.4. Content of humus (%)

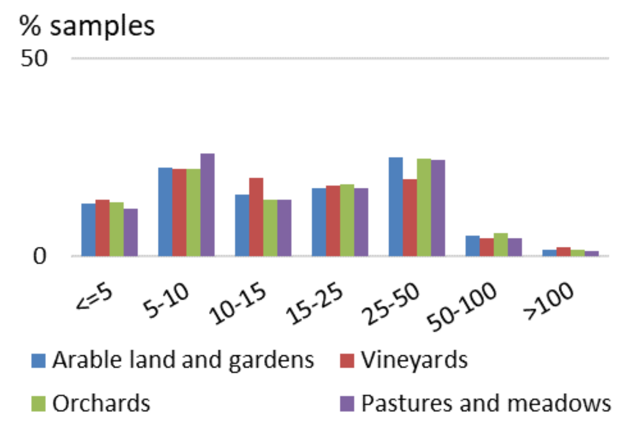


Figure 5.5. Content of readily available forms of phosphorous (P_2O_5-mg/100g)

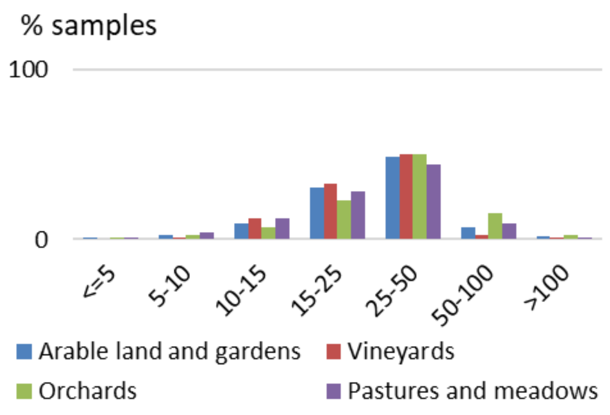


Figure 5.6. Content of readily available forms of potassium (K_2O-mg/100g)

Source of data: Ministry of Agriculture, Forestry and Water Management – Sector for Rural Development

5.2. CONTENT OF ORGANIC CARBON IN SOIL (S)

Key messages:

1) in Central Serbia, the average content of organic carbon in agricultural land at a depth of 0-30 cm was measured at 1.9% and it belongs to the category of low content;

2) the results of fertility control of agricultural areas in Central Serbia in 2020 show that the largest number of samples (55.7%) has a low content of organic carbon.

The indicator monitors the organic carbon content in individual soil layers in order to determine the degree of soil degradation from the reduction of organic carbon content.

Determining the content of organic carbon in the soil is the basis for calculating the accumulation of organic matter in the layer up to one meter of soil depth.

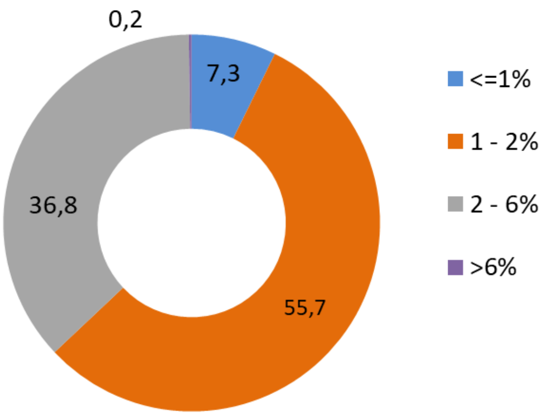


Figure 5.7. Content of organic carbon (OC)

The results of the analysis of a total of 34,995 soil samples within the control of fertility of agricultural land in the territory of Central Serbia indicate that 55.7% of samples have a low content of organic carbon (1.1-2%). Medium organic carbon content (2.01-6%) was found in 36.8% samples, very low content (<1%) in 7.3% samples, while only 0.2% has high content (<6%) (Figure 5.7).

Based on the data of humus content in agricultural land on the territory of Central Serbia, an average organic carbon content of 1.9% was found in 34,995 samples taken from a depth of up to 30 cm, and it falls in the category of soils with low content of humus (1.01-2.0%) .

Arable land and gardens, as well as vineyards and orchards, predominantly fall in the category of soils with low organic carbon content (Table 5.1).

Table 5.1. Share of organic carbon content categories by use of agricultural land in the territory of Central Serbia (%)

Land use (number of analysed samples)	Very low	Low	Medium	High
	(≤1.0%)	(1.01-2.0%)	(2.01-6.0%)	(>6.01%)
Vineyards and orchards (6,128)	7	53	39.7	0.3
Pastures and meadows (3,478)	4.3	39.6	55.7	0.4
Arable land and gardens (25,389)	7.8	58.5	33.5	0.2

Source of data: Ministry of Agriculture, Forestry and Water Management

5.3. THE LEVEL OF THREAT FOR URBAN ZONE LAND (S)

Key messages:

1) in 2020, the degree of threat for land from chemical pollution in urban zones was monitored in eight local self-government units, with a total of 248 samples examined;

2) the most frequent exceedances of limit values were recorded for Ni, Cu, Cr, Zn, Cd, Pb, As, Co and Hg.

The indicator monitors the degree of vulnerability of land to chemical pollution in urban areas based on exceedances of the limit and remediation values of hazardous and harmful substances in compliance with the Regulation on limit values of polluting, harmful and hazardous substances in soil (Official Gazette of RS, No. 30/18 and 64/19) (Figures 5.8 and 5.9).

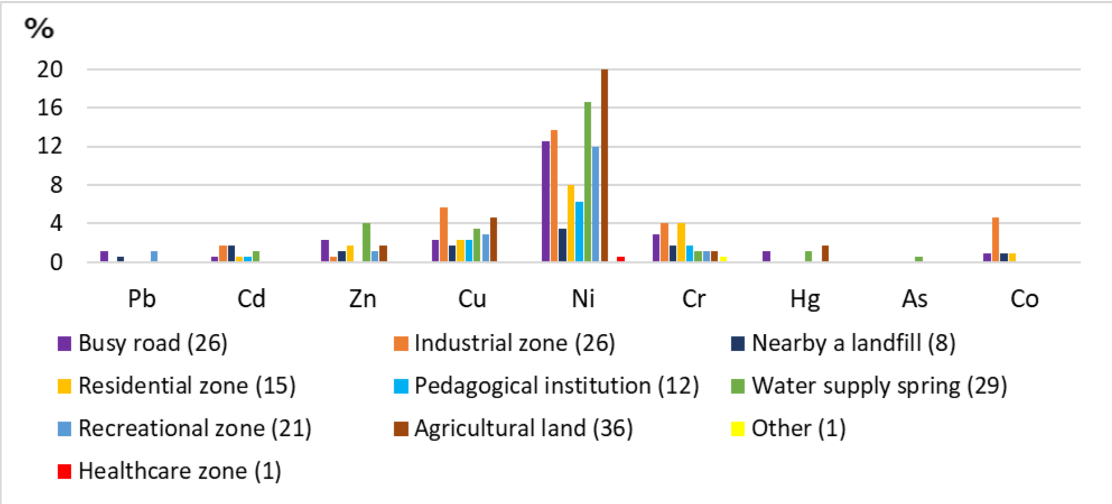


Figure 5.8. Limit values exceeded and number of tested samples at depth 0-30 cm

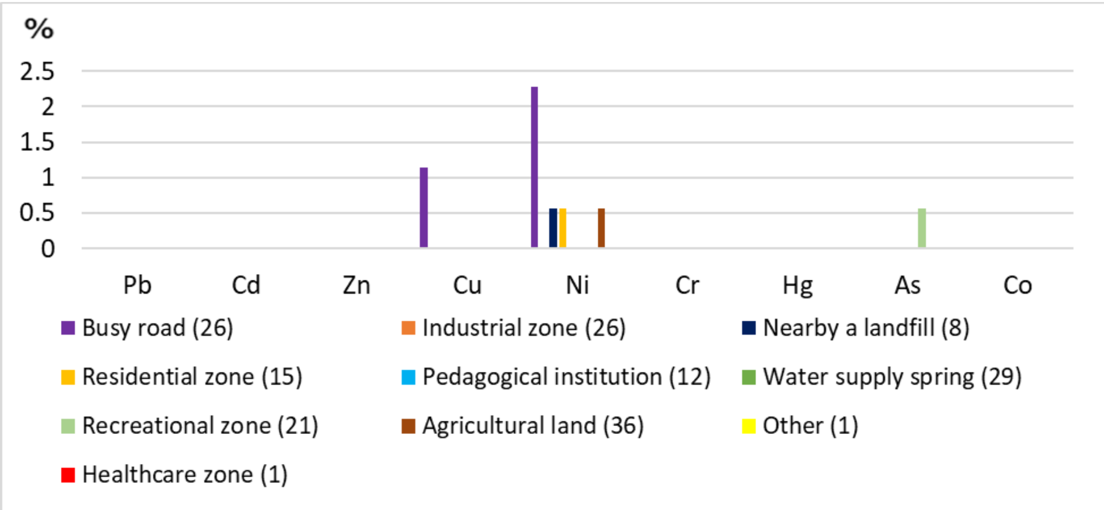


Figure 5.9. Exceedances of remediation values and number of tested samples at depth of 0-30 cm

In the territory of the City of Belgrade, the results show exceedances of limit values for Zn, Cu, Ni, Cr and Hg in the zone of water supply springs, residential, recreational and agricultural land zones, while the remediation values were exceeded for As in the recreational zone in one sample.

In the City of Niš, the limit values for Cd, Cu, Zn, Ni, Cr and Co were exceeded in soil samples in the industrial and traffic zones, near the landfill, and residential and recreational zone. The remediation value was not exceeded in any sample.

In the territory of the City of Kruševac, concentrations in soil samples in the industrial, residential zone, road traffic and agricultural land zones were increased for Pb, Zn, Cu, Ni, Sr and Hg, while remediation values were exceeded for Ni in the traffic zone in four samples, residential zone in one and agricultural land zone in one sample.

In the City of Čačak, the highest concentrations of Ni and Sr were found in the industrial and traffic zones.

The limit values were exceeded in the City of Požarevac for Zn, Cu and Ni near the traffic and industrial zone, in the samples from agricultural land, recreational zone and the zone of the water supply spring.

In the territory of the City of Smederevo, the limit values were exceeded for Pb, Cd, Zn, Cu, Ni and Sr, in the recreational, industrial and pedagogical facility zones, near landfills, water supply springs and agricultural land, while the remediation value for Ni was exceeded near the landfill in one sample.

In the Municipality of Trstenik, limit values were exceeded for Zn, Cu, Ni and Hg in the zone of agricultural land.

In the Municipality of Vladimirci, the results show that the limit value for Ni was exceeded in the zones of the pedagogical institution, recreational zone, as well as in the zone of agricultural land.

Maps with land testing points and marked exceedances are presented below (Figure 5.10).

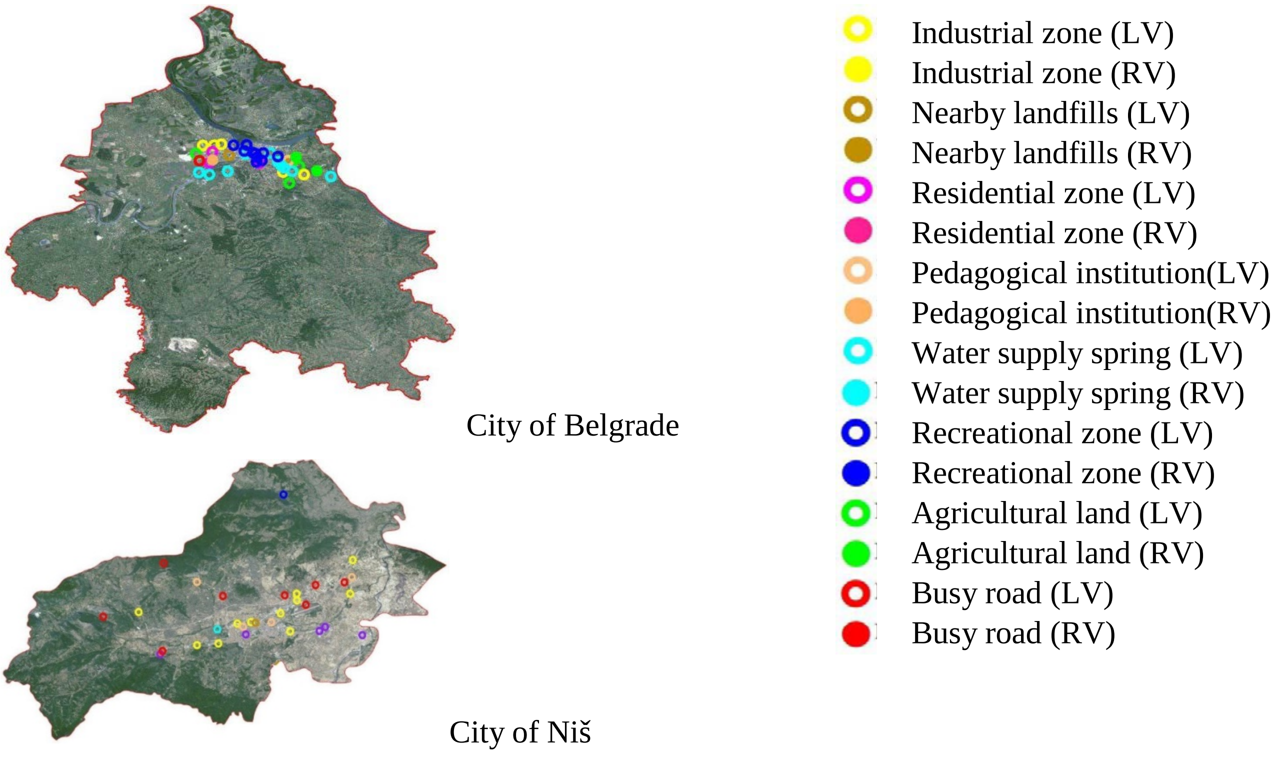


Figure 5.10. Test points where limit values (LV) or remediation values (RV) of individual elements were exceeded

Source of data: city and municipal administrations of Belgrade, Kruševac, Niš, Čačak, Požarevac, Smederevo, Trstenik and Vladimirci

5.4. CONTAMINATED SITES MANAGEMENT (P)

5.4.1. Progress contaminated sites management

Key messages:

In 2020, in the territory of the Republic of Serbia, 213 locations were identified as potentially contaminated and contaminated sites.

The indicator monitors the progress in managing localised sources of land pollution at the national and international levels.

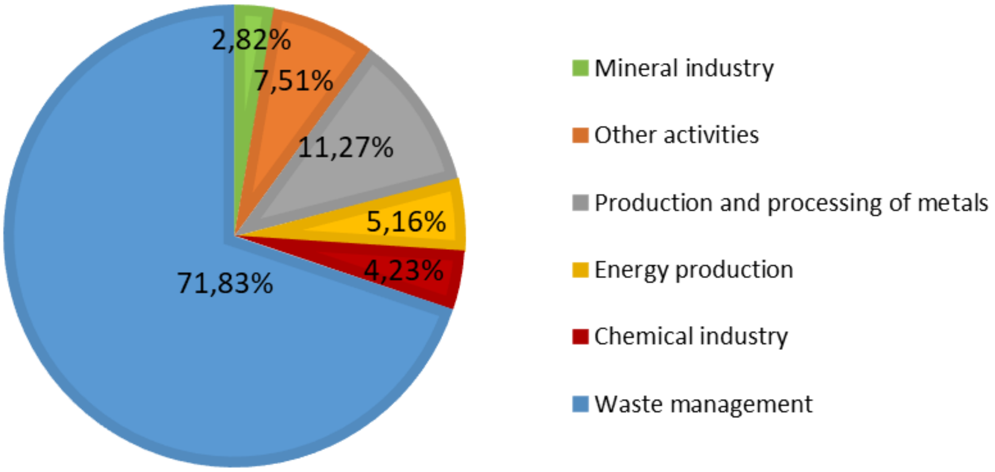


Figure 5.11. Share of main localised sources of land pollution in the total number of identified locations (%)

Based on the submitted data, 213 locations were identified in the Republic of Serbia where activities that are carried out are regulated by the Rulebook on the list of activities that may cause land pollution and degradation, on the procedure, data content, deadlines and other requirements for land monitoring (Official Gazette of RS, No. 102/20).

Out of the total number of reported sites, the report on land monitoring was submitted by 21 companies. Based on the Rulebook on the content and manner of maintaining the Cadastre of contaminated sites, on the type, content, forms, manner and deadlines for data submission (Official Gazette of RS, No. 58/19), the analysis results show that six companies confirmed the presence of pollutants, harmful and hazardous substances in concentrations above the remediation value as prescribed by the Regulation on limit values of pollutants, harmful and hazardous substances in soil (Official Gazette of RS, No. 30/18 and 64/19).

Waste management sites have the largest share in the identified sites – 71.83%, within which there are also non-sanitary landfills – dumpsites, which are managed by local self-government units (Figure 5.11). Figure 5.12 shows the basic characteristics of dumpsites that refer to potential soil pollution.

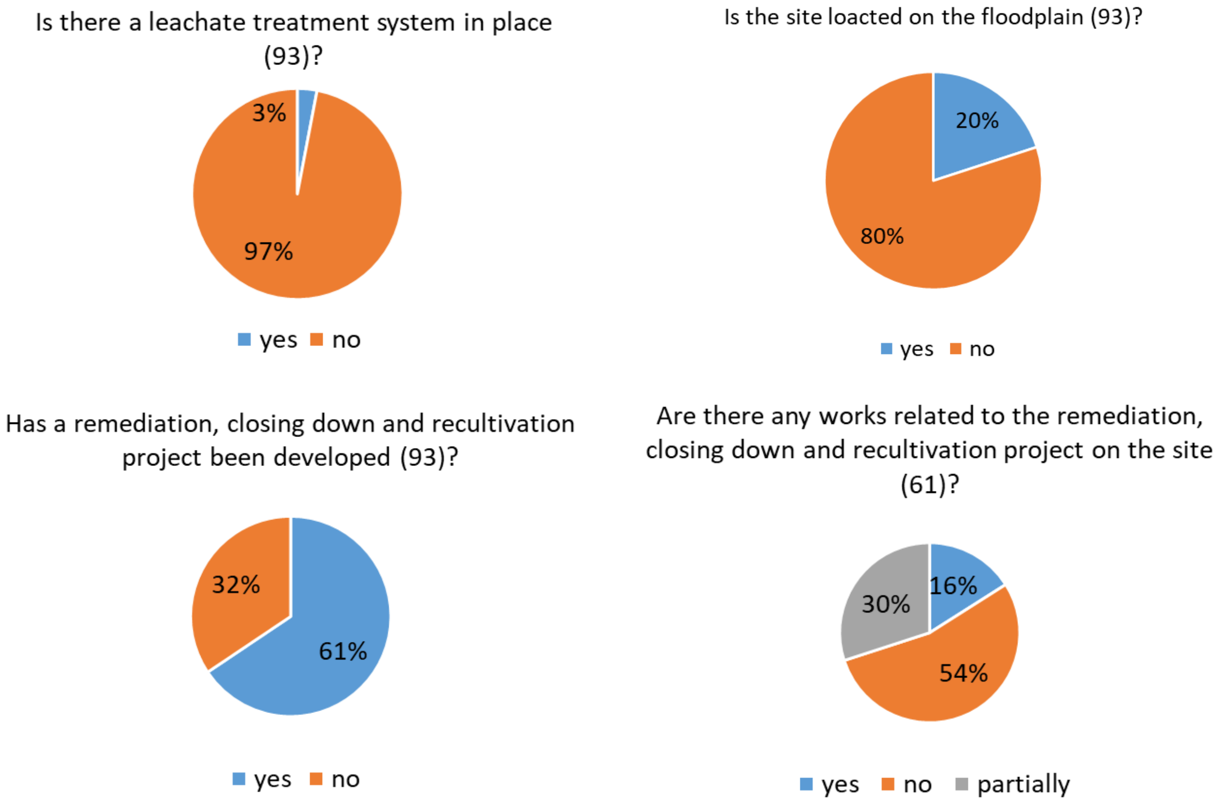


Figure 5.12. Basic characteristics of dumpsites (total number of answers)

Based on the Report of the Ministry of Mining and Energy, data on degraded areas and disposed tailing from larger mining companies in the Republic of Serbia that have significant pollution are presented in the form of table (Table 5.2).

Table 5.2. Data on degraded areas and land degraded by disposal of tailing from larger mining companies in the Republic of Serbia that record significant pollution

Company	Soil degraded by overburden (ha)	Soil degraded by disposed tailing (ha)
Electric Power Industry of Serbia	158,77	0,00
CRH Serbia	1,37	1,63
Concern Farmacom, Lece Mine	0,00	20,10
Serbia Zijin Copper Bor	20,10	58,68
Jugo-Kaolin	1,19	1,60
Bosil-Metal		0,30
PC for underground exploitation of coal	13,92	2,69
Total	195,35	85,00

Source of data: Ministry of Mining and Energy, Environmental Protection Agency

5.4.2. Testing of soil from the surroundings of dumpsites in the territory of AP Vojvodina

Key messages:

In the AP Vojvodina, the degree of endangerment of non-agricultural land from chemical pollution was explored in the area of 30 municipalities and cities, at 113 illegal dumpsites. A total of 1,130 samples were analysed.

The Provincial Secretariat for Urbanism and Environmental Protection examined the degree of endangerment of non-agricultural land from chemical pollution at 113 illegal dumpsites in the area of AP Vojvodina.

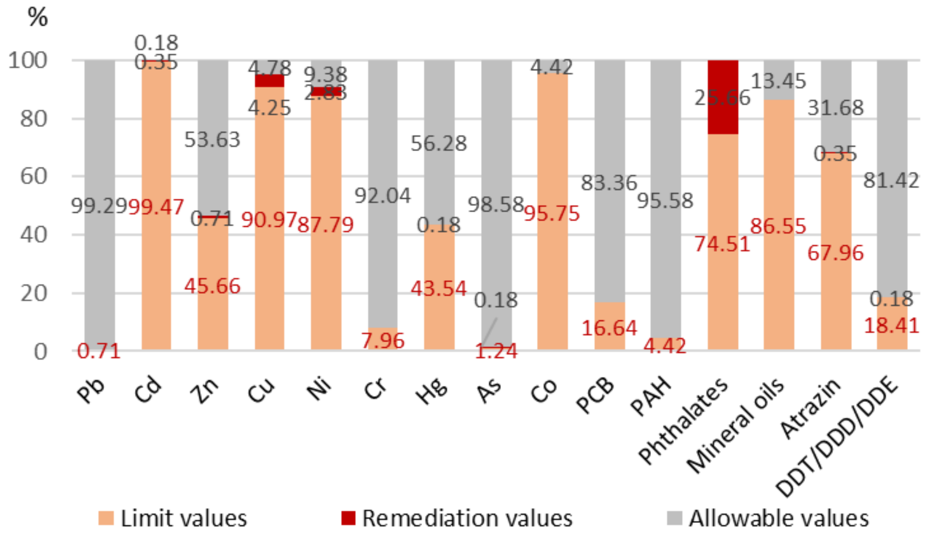


Figure 5.13. Percentage of exceedances at depths of 0-30 cm in the central points of the dumpsites

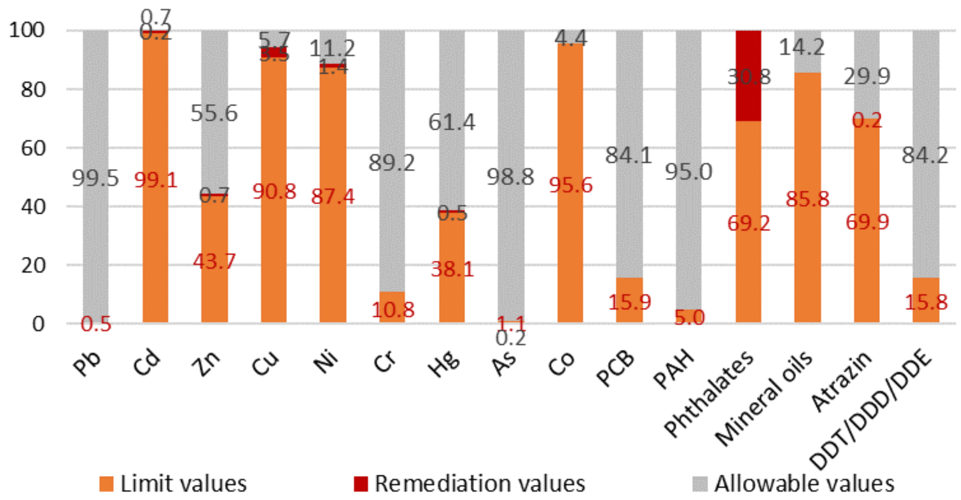


Figure 5.14. Percentage of exceedances at depths of 30-60 cm in the central points of the dumpsites

The analysis of heavy metal content in soil samples showed that remediation values were exceeded for cadmium, zinc, copper, nickel, mercury and arsenic, while the content of lead, chromium and cobalt above the prescribed limit values was not identified in the soil samples.

Analysis of the pesticide content and their metabolites in soil samples showed that remediation values were exceeded for DDE/DDD/DDT and atrazine.

Concentrations of total PCBs, PAHs and mineral oils exceeded the limit values, but did not exceed the remediation values.

Analysis of the content of phthalate esters shows that the content of phthalate esters is higher than the remediation value in 319 out of a total of 1,130 samples (Figures 5.13, 5.14 and 5.15).

The analyses were conducted in accordance with the Regulation on limit values of pollutants, harmful and hazardous substances in soil (Official Gazette of RS, No. 30/18 and 64/19).

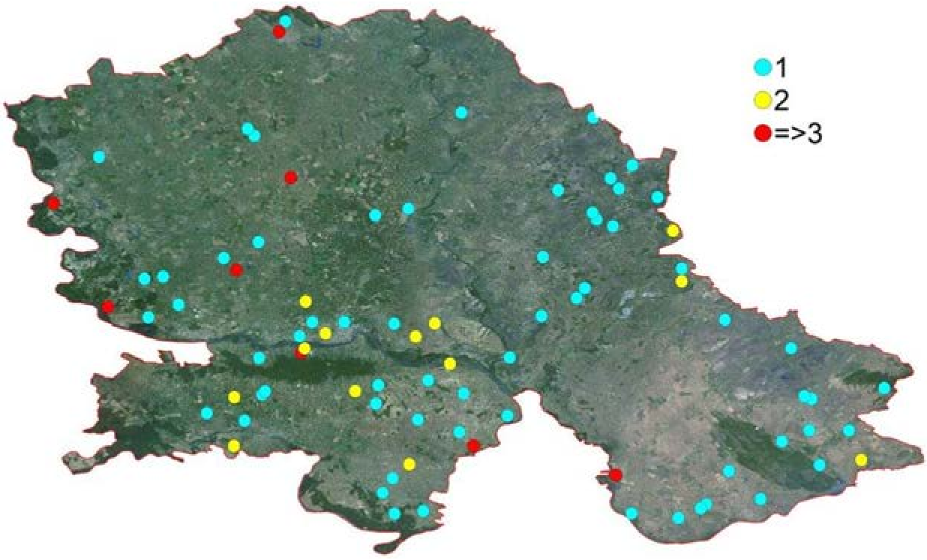


Figure 5.15. Test sites where remediation values (RV) of individual elements were exceeded
Source of data: Provincial Secretariat for Urbanism and Environmental Protection

6. WASTE MANAGEMENT

6.1. MUNICIPAL WASTE (P)

Key messages:

1) new methodology for the calculation of the total amount of municipal waste and the level of recycling in the Republic of Serbia was prepared and adopted;

2) total amount of municipal waste is slightly increasing;

3) data on municipal waste were submitted by 102 local self-government units, i.e., public utility companies.

The indicator shows the quantities of generated and disposed municipal waste, the average coverage with waste collection service, as well as its morphological composition. The indicator monitors the achievement of strategic goal: waste prevention and reduction.

During 2020, the Agency prepared the Methodology for the calculation of total amount of municipal waste and the level of recycling in the Republic of Serbia. This methodology is based on field measurements carried out by public utility companies pursuant to the Law on Waste Management. The methodology is in line with the requirements of Commission Implementing Decision (EU) 2019/1004 laying down rules for the calculation, verification and reporting of waste data in accordance with Directive 2008/98/EC, as well as for reporting to the Eurostat. Directive 2008/98/EC and Implementing Decision 2019/1004 establish entirely new rules for reporting on municipal waste in order to clearly prove that the objectives of this type of waste management are met. The afore mentioned Methodology includes waste codes from the European Waste Catalogue, which denote different fractions of municipal waste.

To that end, the level of municipal waste recycling was calculated for the period 2017 – 2020, which is presented in Table 6.1.

Table 6.1. Municipal waste indicators*

	2017	2018	2019	2020*
Total quantity of generated municipal waste (mill. t)	2.71	2.77	2.80	2.92
Recycled fractions of municipal waste (mill. t)	0.283	0.330	0.334	0.343
Exported fractions of municipal waste (mill. t)	0.098	0.096	0.109	0.114
Quantities of collected and landfilled waste (mill. t)	2.33	2.34	2.36	2.46
Average coverage with waste collection service (%)	83.7	87.2	86.2	86,4
Mean daily quantity of municipal waste per capita (kg)	1.07	1.10	1.11	1.15
Level of recycling of municipal waste	14.1	15.4	15.8	15.7

* Estimation carried out based on the number of inhabitants in 2019

Data on municipal waste are submitted by public utility companies from local communities. In 2020, reports were submitted by 102 PUCs. There is an increase in the amount of generated and collected municipal waste (Table 6.1). The coverage of municipal waste collection service is maintained at the values from the previous period.

Morphological composition of municipal waste in 2020 (Figure 6.1) indicates the highest prevalence of biodegradable waste in the percentage of 48.4%. Types of waste that are much less present include: paper and cardboard, fine fractions and other (leather, diapers, rubber, etc.).

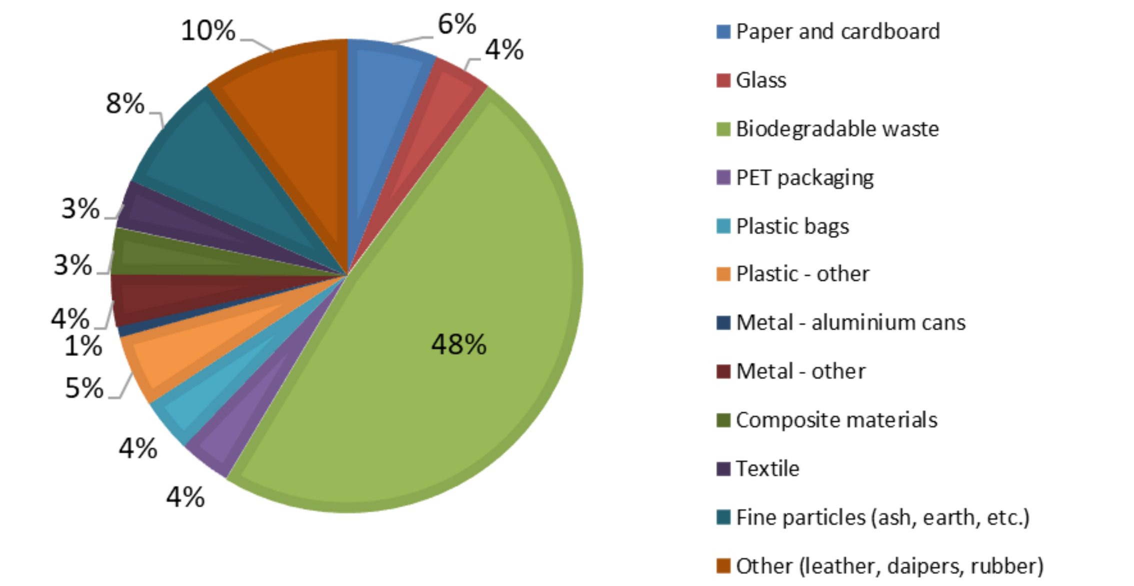


Figure 6.1. Morphological composition of municipal waste in 2020

So far, 11 sanitary landfills have been built in the Republic of Serbia, of which nine regional and two local ones. The table shows the amount of disposed waste at sanitary landfills in the period 2016-2020.

Table 6.2. Quantities of landfilled waste at sanitary landfills

Sanitary landfill	2016	2017	2018	2019	2020
RSL “Duboko” Užice	77.930	75.295	79.764	82.214	83.541
RSL “Vrbak” Lapovo	49.749	41.266	35.264	68.166	57.396
RSL Kikinda	50.903	50.411	55.056	50.231	37.478
RSL “Gigoš” Jagodina	74.113	62.893	61.660	75.360	69.042
RSL “Željkovac – D2” Leskovac	63.380	69.255	71.102	71.369	82.953
RSL “Muntina padina” Pirot	31.685	29.987	28.456	30.903	30.654
RSL “Jarak” Sremska Mitrovica	48.126	50.912	51.080	55.369	56.680
RSL Pančevo	34.093	25.815	25.358	28.562	76.225
RSL Subotica	/	/	/	4.056	27.382
SL “Meteris” Vranje	19.890	16.841	17.247	20.087	21.946
SL “Vujan” Gornji Milanovac	13.628	15.203	14.655	1.4580	15.361
Total	463.497	437.878	439.642	500.897	558.568

As can be seen from Table 6.2, there is an increase in the amount of landfilled waste in sanitary landfills every year.

Source of data: Environmental Protection Agency

6.2. WASTE GENERATION (INDUSTRIAL, HAZARDOUS) (P)

Key messages:

1) the trend of ever higher number of plants that submit reports on the produced quantities of waste continues;

2) fly ash from coal has the largest share in the generated industrial waste.

The indicator shows the quantities of waste generated by types and activities in which they are generated, and it monitors the achievement of the strategic goal: waste prevention and reduction.

Companies report to the Environmental Protection Agency on the waste they generate in the course of their activities and the manner of handling the generated waste. Based on the data submitted through reports for 2020, 9.57 million tonnes of waste was generated in that year in the Republic of Serbia. Out of that, 68,000 t was hazardous waste. From the received reports submitted through the information system of the NRPS of the Environmental Protection Agency, the types of waste monitored in compliance with Article 4 of the Law on Waste Management (Official Gazette of RS, No. 36/09, 88/10, 14 / 16 and 95/18 – state law) are presented, i.e., waste from Group 01 – Wastes resulting from exploration, mining, quarrying and physical and chemical treatment of minerals, is not presented here.

Approximately 4,300 plants provided data on waste generated during the activity and the manner of handling. The number of plants that submitted annual reports had increased, but the amount of waste generated is lower than in the previous year. Some plants that are major polluters and that provide data over the years operated in 2020 with reduced capacity.

Thermal energy facilities are the largest waste generators. Ash, slag and dust from boilers together with the fly ash from the coal, Waste Code 10 01 in the Waste Catalogue, were generated in the amount of 7.78 million tonnes, i.e., they make up 81% of the total amount of generated waste. Other types of waste originating from thermal processes are also present in significant quantities: unprocessed slag, waste from slag processing, solid waste based on calcium, generated in the process of gas desulphurisation. These are followed by excavation and land generated in construction activities, solidified and other waste from waste treatment plants, packaging waste and scrap metals (Table 6.3).

The discrepancy between the amount of waste generated and the amount of waste handed over for further treatment is the amount of waste that remained in the warehouse of the waste generator (Table 6.4). Out of the total amount of generated waste, 1,763,052 t (18%) was reported, while 7,812,437 t (82%) remained at the source locations, and mainly refers to coal fly ash. Wastes from slag processing from the iron and steel industry represent the largest quantities of landfilled waste and recovered waste. Out of the exported quantities of non-hazardous waste, iron-containing metals are the most represented.

As for hazardous waste only, the handling method was reported for 65,032 t, or 96%. The largest share of the amount of disposed hazardous waste consists of sludges and filter cakes from gas treatment that contain hazardous substances. Significant amounts of hazardous waste submitted for recovery operations are oil-containing wastes and specially collected electrolyte from batteries and accumulators. Hazardous components removed from discarded equipment, cleaning acid and slag from thermal lead metallurgy represent the largest amounts of hazardous waste exported (Figure 6.2).

Table 6.3. Recorded quantities of generated waste by origin, without household municipal waste

Group	Activity generating the waste	Qty of non-hazardous waste (t)	Qty of hazardous waste (t)
01	Mining	/	/
02	Agriculture and food preparation and processing	117.766	0,6
03	Wood processing, paper and cardboard	46.090	/
04	Leather, fur and textile industry	8.617	/
05	Petroleum, natural gas refining and coal treatment	/	1.884
06	Inorganic chemical processes	125	654
07	Organic chemical processes	7.069	521
08	Coatings, adhesives, sealants and printing inks	2.142	1.634
09	Photographic industry	227	576
10	Waste from thermal processes	8.362.618	17.159
11	Surface treatment and coating of metals and other materials	1.166	1.560
12	Shaping and surface treatment of metal and plastic	43.201	954
13	Oil wastes and wastes of liquid fuels	/	8.098
14	Waste organic solvents, refrigerants	/	133
15	Waste packaging, absorbents, wiping clothes	131.072	4.038
16	Wastes not otherwise specified	51.269	18.770
17	Construction and demolition waste	316.632	4.247
18	Wastes from human and animal health care	268	3.184
19	Wastes from waste management facilities	334.867	2.590
20	Municipal and similar wastes	84.391	1.869
	Total	9.507.519	67.872

Table 6.4. Manner of handling the generated waste

Waste characterisation (t)	Generated (t)	Handed over for temporary storage to another company (t)	Handed over for treatment (t)	Handed over for recovery (t)	Export (t)
Hazardous	67.872	15.999	13.816	31.262	3.955
Non-hazardous	9.507.519	362.586	479.350	797.211	58.873

Figure 6.2. Manner of handling hazardous waste

Source of data: Environmental Protection Agency

6.3. PACKAGING (P)

Key messages:

1) total amount of packaging placed on the market of the Republic of Serbia in 2020 was 362,236.7 t;

2) the amount of recovered packaging waste, reported by operators of the packaging management system, amounted to 226,020.8 t in 2020, with 216,711.2 t of packaging waste recycled;

3) general and specific national goal of the Republic of Serbia in 2020 were met for recovery in the amount of 62.6% and for the recycling in the amount of 60%.

The indicator shows the amount of produced packaging and packaging waste, by types and activities in which it is generated. The indicator monitors the achievement of the national goal: recovery and recycling of packaging waste.

Figure 6.3. Trends of quantities of packaging placed on the market and reused packaging waste

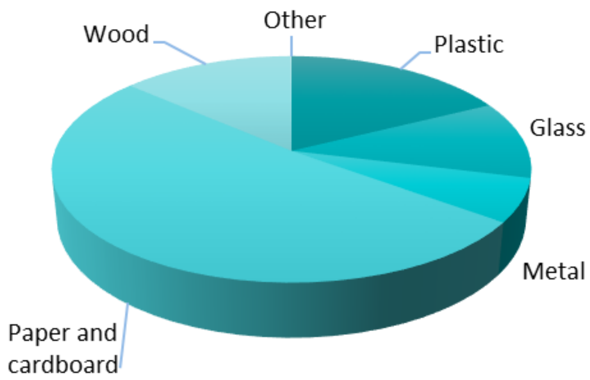


Figure 6.4. The share of recovered packaging waste by type of packaging in 2020

Packaging and packaging waste management is regulated by the Law on Packaging and Packaging Waste (Official Gazette of RS, No. 36/09 and 55/18). Packaging waste includes a number of types of waste given in the Waste Catalogue in Chapter 15 01.

Seven operators are permitted to manage packaging waste. In 2020, operators managed packaging waste on behalf of 1,918 legal entities, who placed 360,942.8 t of packaging on the market of our country. Legal entities that did not transfer their obligations to the operator reported the amount of 1,293.9 t of packaging placed on the market of the Republic of Serbia.

The amount of packaging waste handed over for recovery was 226,020.8 t in 2020, of which 216,711.2 t of packaging waste was recycled (Figures 6.3 and 6.4). General and specific national goals for the Republic of Serbia were met in 2020, i.e., those referring to recovery in the amount of 62.6%, and for the recycling in the amount of 60%.

Source of data: Environmental Protection Agency

6.4. QUANTITIES OF SPECIAL WASTE STREAMS (P)

Key messages:

1) the quantities of disposed special waste streams were reduced in comparison to the previous year;

2) the quantities of exported waste oils and imported waste tires increased compared to the previous year.

The indicator shows the quantities of special waste streams by type. The indicator is made on the basis of annual data of waste producers on the amount of waste generated from products that after use become special waste streams by type and amount of waste reported by operators who perform waste management.

Table 6.5. Quantities of waste produced

Waste type	Generated waste (t)
WEEE	3.660
Asbestos-containing waste	209
Waste oils	4.887
Waste tyres	10.855
Waste batteries and accumulators	2.369
End-of-life vehicles	957
ELV that do not contain liquids and other components	2.389

Table 6.5. shows quantities of generated waste reported by the companies that report to the Agency on the types and quantities of waste they generate in their business activity. The generated quantities of these types of waste are significantly higher compared to previous years. The amounts of PCB-containing oils are not presented in this table.

Table 6.6. Quantities and manner of dealing with special waste streams in 2020

Waste type	Disposed (t)	Treated (t)	Exported (t)	Imported (t)
WEEE	/	41.716	4,88	/
Asbestos-containing waste	240	2,1	/	/
Waste oils	/	2.178	730	/
Waste tyres	72	49.512	/	6.186
Waste batteries and accumulators	/	15.839	4.280	4.782
End-of-life vehicles	/	2.391	/	/

Table 6.6. shows quantities of special waste streams for six waste types for which the quantity of products placed on the market is monitored.

Compared to the previous year, the quantities of disposed and treated asbestos-containing waste were reduced. The amount of imported waste tires increased, and the amount of imported and exported waste batteries and accumulators decreased. The quantities of exported waste oils increased.

In 2020, 165.42 tonnes of PCB-containing waste was generated. The share of oils for insulation and heat transfer, hydraulic oils containing PCBs amounted to 57,538 t, and transformers and capacitors containing PCBs, waste components and construction and demolition waste containing PCBs amounted to 107,884.1 t. Treated quantity of this waste type amounted to 80.82 t. Out of that quantity, waste oils for insulation and heat transfer containing PCBs, present in the amount of 47.66 t, were treated in R9 operation, which means the operation of re-refining or other method of waste oil recovery. The company that decontaminates equipment contaminated with polychlorinated biphenyls submitted report stating that it treated 33.16 t of waste transformers and capacitors containing PCBs in the R7 process. The quantities of treated waste containing PCBs increased compared to the previous year.

In the mentioned period, 179,171 t of this type of waste was exported. Out of that, 55,948 t of waste oils for insulation and heat transfer containing PCBs were exported to the Swiss Confederation, and 123,223 t of transformers and capacitors containing PCBs were exported to the Republic of Romania.

Source of data: Environmental Protection Agency

6.5. QUANTITIES OF WASTE GENERATED IN FACILITIES FOR HEALTH CARE AND OF PHARMACEUTICAL WASTE (P)

Key messages:

1) the amount of produced and treated medical waste continues to increase slightly compared to previous years;

2) Approximately 90% of waste generated in health care institutions is waste whose collection and disposal is subject to special requirements to prevent infection.

The indicator shows the amount of waste generated in facilities for human and animal health care, as well as pharmaceutical waste, by waste type. The indicator monitors the achievement of the goal: waste prevention and reduction.

Institutions that generate waste in the course of activities related to human and animal health care, 1,066 of them, reported that they had generated 3,452 tonnes of waste from Group 18 in 2020. The trend of ever growing number of reports continues, but the amount of waste is slightly increased compared to previous year.

Table 6.7. Quantities of waste generated, Group 18 (t)

Waste code	Description	Qty of generated waste (t)
18 01	wastes from natal care, diagnosis, treatment or prevention of disease in humans	
18 01 01	sharps (except 18 01 03)	160.29
18 01 02	body parts and organs including blood bags and blood preserves (except 18 01 03)	36.5
18 01 03*	wastes whose collection and disposal is subject to special requirements in order to prevent infection	3096.68
18 01 04	wastes whose collection and disposal is not subject to special requirements in order to prevent infection	59.26
18 01 06*	chemicals consisting of or containing hazardous substances	14.94
18 01 08*	cytotoxic and cytostatic medicines	43.34
18 01 09	medicines other than those mentioned in 18 01 08	7.38
18 01 10*	amalgam waste from dental care	0.002
18 02	wastes from research, diagnosis, treatment or prevention of disease involving animals	
18 02 01	sharps (except 18 02 02)	0.06
18 02 02*	wastes whose collection and disposal is subject to special requirements in order to prevent infection	28.86
18 02 03	wastes whose collection and disposal is not subject to special requirements in order to prevent infection	4.4
18 02 05*	chemicals consisting of or containing hazardous substances	0.12
18 02 07*	cytotoxic and cytostatic medicines	0.17
20 01	separately collected fractions from municipal waste	0.06
20 01 32	medicines other than those mentioned in 20 01 31	0.37

It can be seen from Table 6.7. that the largest share of reported waste is the one whose collection and disposal is subject to special requirements to prevent infection. Pharmacies also reported that they generated waste drugs from group 20 in the amount of 0.37 t.

In the same period, 66 health care institutions that have plants for the treatment of this type of waste reported that they processed 3,510 tonnes of waste generated in health care institutions, of which 18 tonnes were generated in institutions that carry out diagnostics and prevention of animal diseases, and 3,492 tonnes in institutions which provide health care to humans (Table 6.8).

There were 68.33 t of waste medicines and 39.36 t of chemicals containing hazardous substances generated during the provision of health care, and these quantities were exported to the Republic of Austria.

Table 6.8. Quantities of treated waste, Group 18 (t)

Waste code	Description	Qty of treated waste (t)
18 01	wastes from natal care, diagnosis, treatment or prevention of disease in humans	
18 01 01	sharps (except 18 01 03)	64.95
18 01 02	body parts and organs including blood bags and blood preserves (except 18 01 03)	2.82
18 01 03*	wastes whose collection and disposal is subject to special requirements in order to prevent infection	3377.69
18 01 04	wastes whose collection and disposal is not subject to special requirements in order to prevent infection	21.9
18 01 08*	cytotoxic and cytostatic medicines	0.63
18 01 09	medicines other than those mentioned in 18 01 08	23.78
18 02	wastes from research, diagnosis, treatment or prevention of disease involving animals	
18 02 02*	wastes whose collection and disposal is subject to special requirements in order to prevent infection	17.9

Source of data: Environmental Protection Agency

6.6. COMPANIES AUTHORISED FOR WASTE MANAGEMENT (P)

Key messages:

1) total number of active permits in the Register of issued waste management permits is 2,443;

2) the largest number of waste management permits was issued for waste storage and transport, while the smallest number of permits was issued for waste disposal.

The indicator shows the number of companies authorised for waste management, according to their roles. The indicator monitors the achievement of goals: waste prevention and reduction, as well as achieving the organised and sustainable waste management. The indicator is made on the basis of data from the Agency's database on issued waste management permits, issued by the Ministry of Environmental Protection, i.e., competent authority of the Autonomous Province or local self-government unit pursuant to the Law on Waste Management.

Table 6.9. Overview of valid waste management permits (updated 05/18/2021)

	MINISTRY			AP VOJVODINA			LOCAL SELF-GOVERNMENTS
	Total	Non-haz.	Haz.	Total	Non-haz.	Haz.	Non-hazardous
Collection	735	694	246	54	52	14	161
Transport	842	811	190	58	56	13	156
Storing	136	107	116	58	49	42	881
Treatment	132	107	103	41	40	28	670
Disposal	6	6	3	3	2	2	37
Total number of permits per competent authority	1240			124			1079
Issued permits in total	2443						

In accordance with the Law on Waste Management, the competent authority issues the permit and submits the data from the Register of permits to the Agency. The Agency maintains a register of issued waste management permits. The database is available on the Agency's website, where it is also possible to find revoked waste management permits.

The Register of issued waste management permits contained 2,443 valid permits in May 2021, which is slightly higher compared to the same period last year (Table 6.9 and Figure 6.5). The Register of revoked waste management permits contains data about 16 revoked permits during 2020 (Table 6.10).

Table 6.10. Review of revoked waste management permits

Revoked waste management permits	2012	2013	2014	2015	2016	2017	2018	2019	2020
	1	2	0	1	18	16	30	46	16

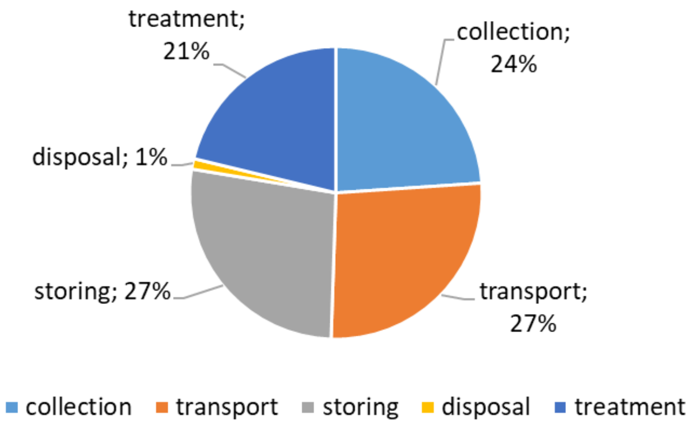


Figure 6.5. Permits according to waste-related activities

Source of data: Environmental Protection Agency

6.7. QUANTITY OF SEPARATED, COLLECTED, RECOVERED AND DISPOSED WASTE (P)

Key messages:

1) in relation to the previous year, the quantities of disposed hazardous waste were reduced;

2) metal scraps and waste from thermal processes are types of waste that are most present in waste subjected to recovery operations.

The indicator shows the amount of recovered waste according to the procedures for recovery (R operations) and waste subjected to disposal, according to the disposal procedures (D operations). The indicator directly monitors the achievement of the strategic goal: waste prevention and reduction, i.e., sustainable waste management.

Table 6.11. Quantities of disposed waste according to D operations

Disposal operation	Qty of disposed waste (t)	
	Hazardous	Non-hazardous
D1		1,279,063
D2		50
D5	11,658	694,207
Total	11,658	1,973,320

Based on Table 6.11., which shows quantities of waste disposed through different operations in accordance with the D list of waste disposal operations, it can be seen that waste that is non-hazardous in nature is mostly disposed of by D1 operation (deposit into or onto land, e.g. landfill), and hazardous waste mainly by D5 operation (specially engineered landfill, e.g. placement into lined discrete cells which are capped and isolated from one another and the environment).

During 2020, approximately two million tonnes of waste were disposed, of which 11.6 thousand tonnes of hazardous waste. Hazardous waste was mostly disposed of at the landfill for industrial waste disposal, where 11,389 t of hazardous waste was disposed, and 269 tonnes were disposed of at regional landfill, which holds a permit for disposal of hazardous waste. Hazardous waste disposed of in the landfill for industrial waste mostly includes sludge and filter cakes that contain hazardous substances.

Based on the data submitted by 320 operators, holders of permits for waste recovery, 2.1 million tonnes of waste was treated in 2020. Out of the total amount of treated waste, metals are the most represented, followed by slag from thermal processes, waste paper, and paper and cardboard packaging. Out of quantities of hazardous waste, electrical and electronic equipment, lead batteries and sludge from the bottom of the oil refining tanks make a significant share.

Based on data shown in Table 6.12., which provides an overview of quantities of waste that were treated by different procedures in accordance with the R list, it can be seen that 90 thousand t of hazardous waste and 2.01 million tonnes of non-hazardous waste were treated in R1 - R11 operations. Out of non-hazardous waste, most was treated in R4 operation, i.e. recycling/reclamation of metals and metal compounds, since scrap iron and other metals are the types of waste that are most represented in the waste subjected to recovery, and quantities of waste treated by R5 and R3 processes are also significant, which are operations of recycling/reclamation of other inorganic materials and recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes). When it comes to hazardous waste, most of it was also treated in R4 operation, followed by R1 – use principally as a fuel or other means to generate energy, and R7 - recovery of components used for pollution abatement.

Table 6.12. Quantities of waste recovered in R operations

Treatment operation	Qty of treated waste (t)	
	Hazardous	Non-hazardous
R1	9,164	247,755
R2	13	311
R3	3,732	415,364
R4	57,507	846,186
R5	265	405,800
R6		
R7	8,563	11,828
R8		
R9	1,264	2
R10	718	268
R11	8,898	82,627
Total	90,124	2,010,141

Table 6.13. Quantities of secondary raw materials

Waste type	Quantities of waste subjected to waste recovery operations (t)
Metal	392,976
Plastic	57,684
Glass	1,929
Wooden waste	66,303
Paper and cardboard	262,531
Batteries and accumulators	15,839
Textile	1,024

Submitted data for 2020 enabled the conduct of analysis on treatments of individual groups of waste that represent secondary raw materials. The document used in the selection of secondary raw materials – Position of the European Commission and the Social Committee related to the selection of secondary raw materials, taking into account the national needs for certain types of waste materials that are secondary raw materials. The quantities of secondary raw materials subjected to recovery through one of the R operations are presented in Table 6.13.

Source of data: Environmental Protection Agency

6.8. TRANSBOUNDARY MOVEMENT OF WASTE (P)

Key messages:

1) 424,071 tonnes of waste was exported from the Republic of Serbia in 2020, which is more than in the previous year;

2) 296,523 t of waste was imported, which is more than in the previous year;

3) the trend of import and export of the same types of waste continues.

The indicator shows the movement of waste quantities in cross-border waste circulation, by types and countries. The indicator monitors progress in achieving the goal: sustainable waste management.

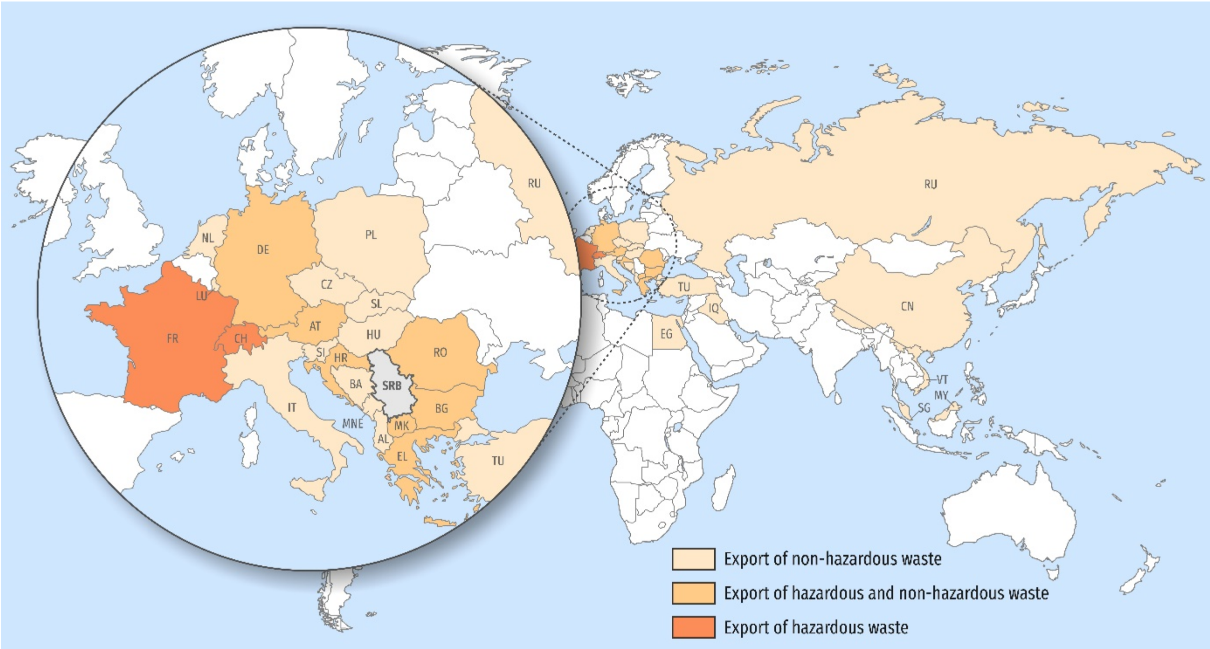
Figure 6.6. lists the countries to which the waste was exported or from which it was imported. Figure 6.6. indicates the exported waste through colours – the darkest colour indicates the countries to which only hazardous waste was exported, the lighter colour the ones to which both hazardous and non-hazardous waste was exported, and the lightest colour those countries to which only non-hazardous waste was exported. Figure 6.6. indicates the imported waste through colours – the countries from which the import of both hazardous and non-hazardous waste was conducted is shown in a darker colour, and the country from which only non-hazardous waste was imported is shown in a lighter colour. Most waste was exported to the Republic of Bulgaria, the Republic of Northern Macedonia, the Republic of Albania and the Republic of Croatia. Most waste was imported from the Republic of Turkey, the Republic of Croatia, Hungary and Bosnia and Herzegovina.

During 2020, 424,071 tonnes of waste was exported from the Republic of Serbia, of which 12,796 tonnes of hazardous and 411,275 tonnes of non-hazardous waste. More than half of the exported waste is metal, of which the most common are metals that contain iron. Significant quantities of exported waste are waste paper and cardboard and paper packaging, glass and plastic packaging, slag from iron casting furnaces and waste edible oils and fats. The export of hazardous waste mainly consists of lead batteries and accumulators, followed by hazardous components removed from discarded electrical and electronic equipment, waste from thermal metallurgy of lead, and soil and waste acids from chemical surface treatment and metal coating.

Large quantities of waste for which there are processing capacities in the country are still exported.

As for the import, 296,523 t of waste was imported, of which 7,109 t of hazardous and 289,414 t of non-hazardous waste. Waste paper and cardboard and waste paper and plastic packaging make up more than half of the amount of imported waste. These are followed by grinding waste from the thermal processes from iron and steel industry. Hazardous waste is composed of lead batteries, slag and dross from thermal lead metallurgy and waste from mechanical treatment of waste containing hazardous substances.

The trend of importing and exporting the same types of waste as are, for example, waste paper and metals, still continues.



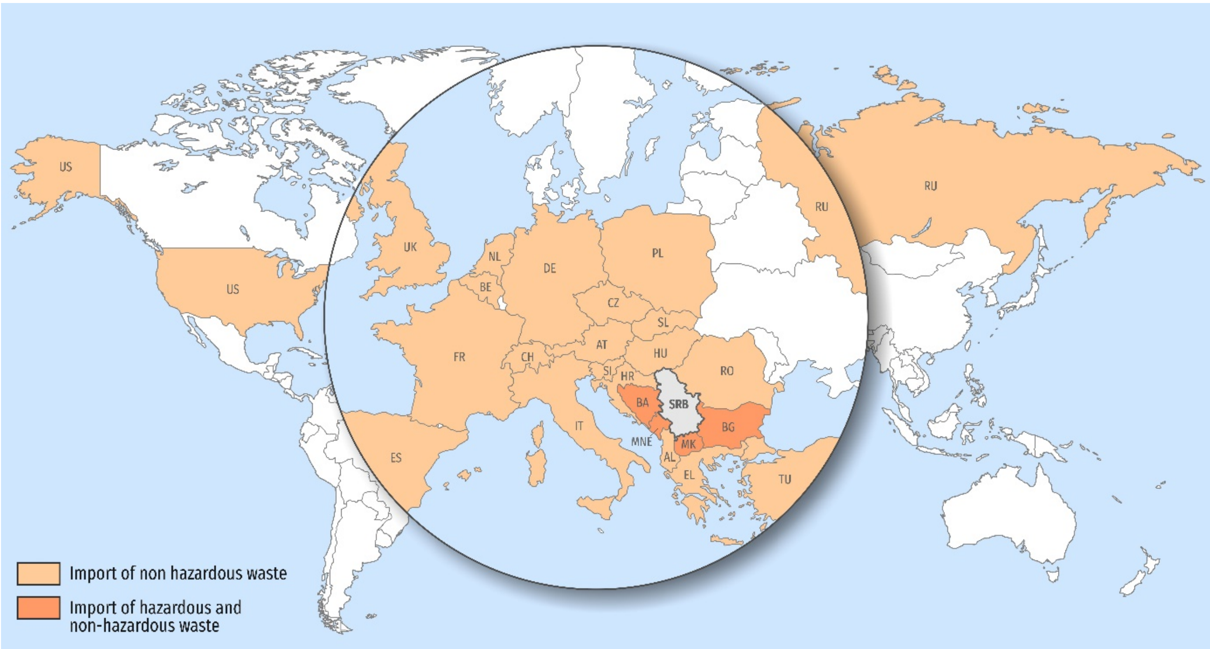


Figure 6.6. Countries to which waste was exported and from which it was imported

Source of data: Environmental Protection Agency

7. NOISE

7.1. INDICATOR OF NOCTURNAL AND TOTAL NOISE IN CITIES AT THE TERRITORY OF THE REPUBLIC OF SERBIA (P)

Key messages:

1) the results of noise monitoring were analysed for 2020; monitoring data were collected from 16 local self-government units (LGUs) and their156 measurement points, and from four agglomerations and their 50 measurement points;

2) the city of Niš is still the only one with 24-hour continuous monitoring;

3) The Ministry of Environmental Protection has completed the Project "Development of strategic noise maps of the Nis agglomeration", implemented during 2019, and all relevant data and strategic noise maps have been made public.

The overall noise indicator L_{den} describes the interference for a period of 24 hours, for day-evening-night stages, and represents acoustic quantity that describes environmental noise. Nocturnal noise indicator L_{night} describes interference during the night in the period from 10 p.m. to 6 a.m. The unit by which both indicators are expressed is the decibel (dB).

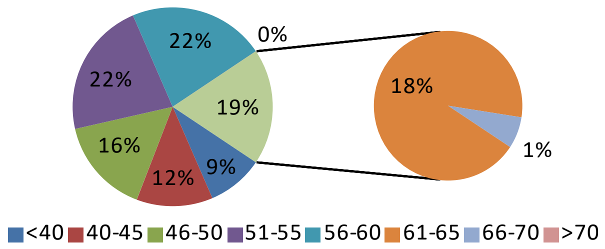


Figure 7.1. Percentage distribution of L_{night} nocturnal noise indicators by bands for the analysed cities in the Republic of Serbia

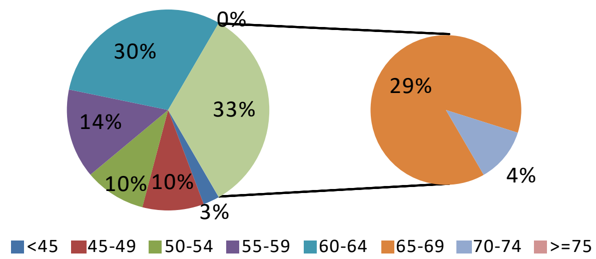


Figure 7.2. Percentage distribution of the total noise indicator L_{den} for the analysed cities in the Republic of Serbia

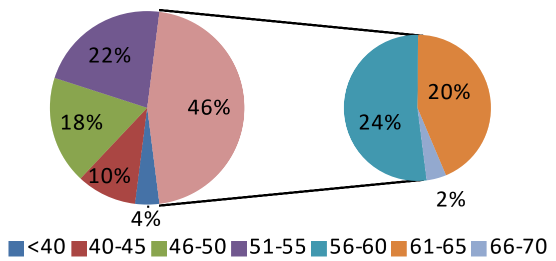


Figure 7.3. Percentage distribution of L_{night} nocturnal noise indicators by bands for agglomerations

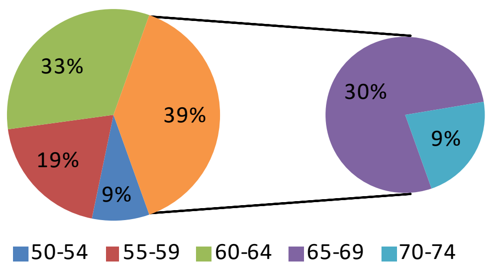


Figure 7.4. Percentage distribution of the total noise indicator L_{den} by bands for agglomerations

Data from four agglomerations of the Republic of Serbia (50 measurement points) were submitted to the Agency, while 16 local self-government units (156 measurement points) provided valid data. After analysing the data, it can be concluded that the highest percentage of indicators of total noise L_{den} was in the range of 60-64 dB, while the highest percentage of indicators of nocturnal noise L_{night} was in the range of 51-55 dB and 55-60 dB, and the percentage of those that recorded 70 dB was negligible. If four agglomerations (50 measurement points) are observed independently of other urban areas in the territory of the Republic of Serbia where monitoring is conducted, it is concluded that the highest percentage of total noise indicators L_{den} ranges between 60 and 64 dB, while the highest percentage of night noise indicators L_{night} ranges between 56 and 60 dB, the percentage of exceedances of 70 dB is negligible here (Figures 7.1-7.4.).

Strategic maps of the agglomeration of Niš are presented on the website of the Ministry of Environmental Protection, Environmental Protection Agency, as well as on the website of the City of Niš.

The source of data: LGUs that submitted data on noise monitoring to the Environmental Protection Agency within the legal deadline or published on their websites or the websites of the City Institutes of Public Health.

Data from 24-hour monitoring for the city of Niš is uploaded on https://www.znrfak.ni.ac.rs

7.2. INDICATOR OF NOCTURNAL AND TOTAL NOISE ORIGINATING FROM TRAFFIC (P)

Key messages

1) in 2019, AD “Infrastructure of Serbian Railways” made strategic noise maps for 25.88 km of railway on the section of Batajnica – Beograd Centar – Ovča, whose position is presented in Figures 7.8. and 7.9., while in 2021, they started drafting action plan based on strategic noise maps (SNM).

2) in 2018, public company “Roads of Serbia” has developed action plans for noise protection based on SNM made for 843 km of state road network (Figure 7.7).

Strategic noise maps represent data on the current and estimated noise levels, which are shown by noise indicators and are made for the main roads (average annual traffic of more than 3,000,000 vehicles), main railway services (traffic of more than 30,000 trains) and main airports (more than 50,000 operations per year), and they are revised every five years.

Environmental noise protection action plans are plans that contain measures aimed at protecting against noise and the effects thereof on the environment, as well as measures to reduce noise in case of limit values exceedances.

The overall noise indicator L_{den} describes noise interference for a period of 24 hours (day-evening-night), and the nocturnal noise indicator L_{night} describes noise interference during the night from 10 p.m. to 6 a.m. These indicators describe noise in the environment, and are expressed in decibels (dB).

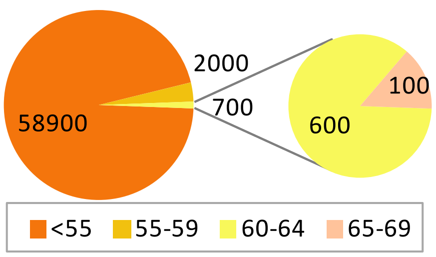


Figure 7.5. Number of inhabitants exposed to the bands of the total noise indicator L_{den}

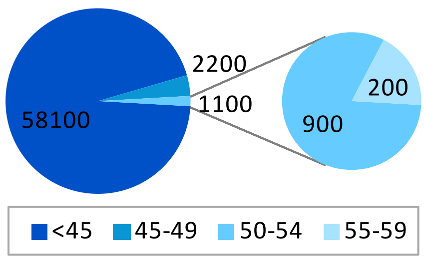


Figure 7.6. Number of inhabitants exposed to bands of night noise indicators L_{night}

In 2019, AD “Infrastructure of Serbian Railways” developed SNMs for three railway sections: section number 101: Beograd – Šid – Državna granica (Tovarnik), section Novi Beograd – Batajnica, total length 16.22 km; line number 106: Beograd Centar – Pančevo Glavna stanica – Državna granica (Stamora Moravita), section Beograd Centar – Ovča, total length 12.54 km; line number 110: Beograd Centar – Novi Beograd, total length 3.00 km, i.e., total length of lines for which strategic noise maps are planned is 25.88 km; the calculation does not include the length of structures (tunnels “Stadion” and “Vračar”) for which the research was not required. Drafting of the action plans for these sections began in 2021 (Figure 7.8).

The analysis of data from SNMs shows that the statistics include residents exposed to noise of 55 and more dB for L_{den} and 45 and more dB for L_{night}, and in order to ensure this, a 300 m wide corridors to the left and right sides of the mail railway section were taken into consideration. The largest number of inhabitants, 58,900, was exposed to the total noise indicator L_{den}, which is less than 55 dB (Figure 7.5), while 58,100 inhabitants were exposed to values of nocturnal noise indicator L_{night} of less than 45 dB (Figure 7.6).

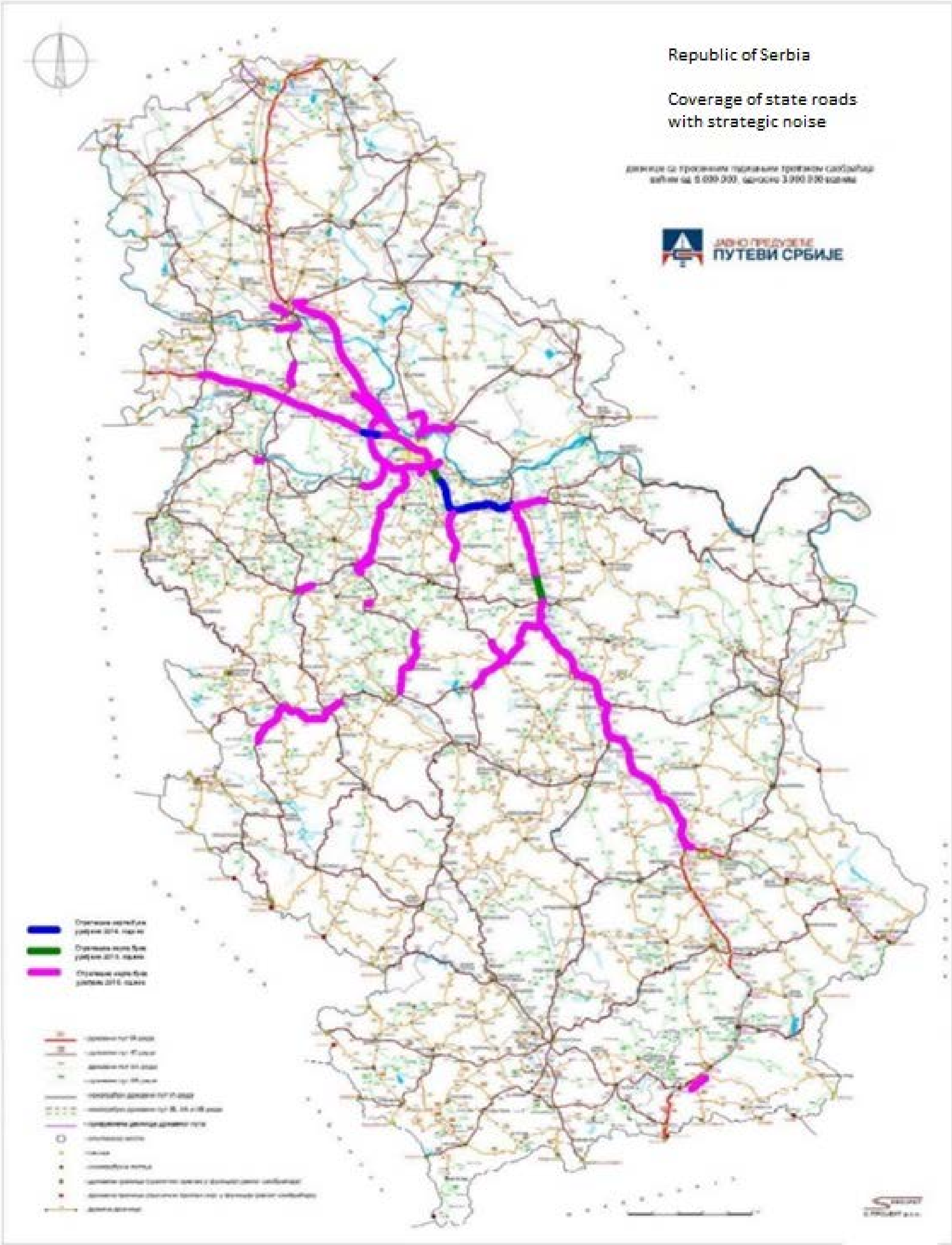


Figure 7.7. Map of the coverage of state roads with strategic noise maps

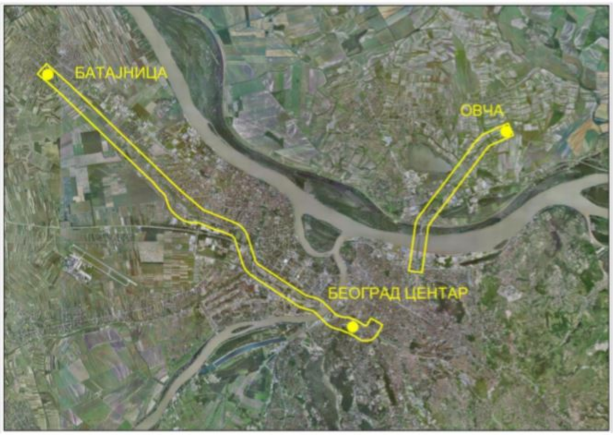


Figure 7.8. Position of the railway section Batajnica – Beograd Centar – Ovča for which strategic noise maps are created

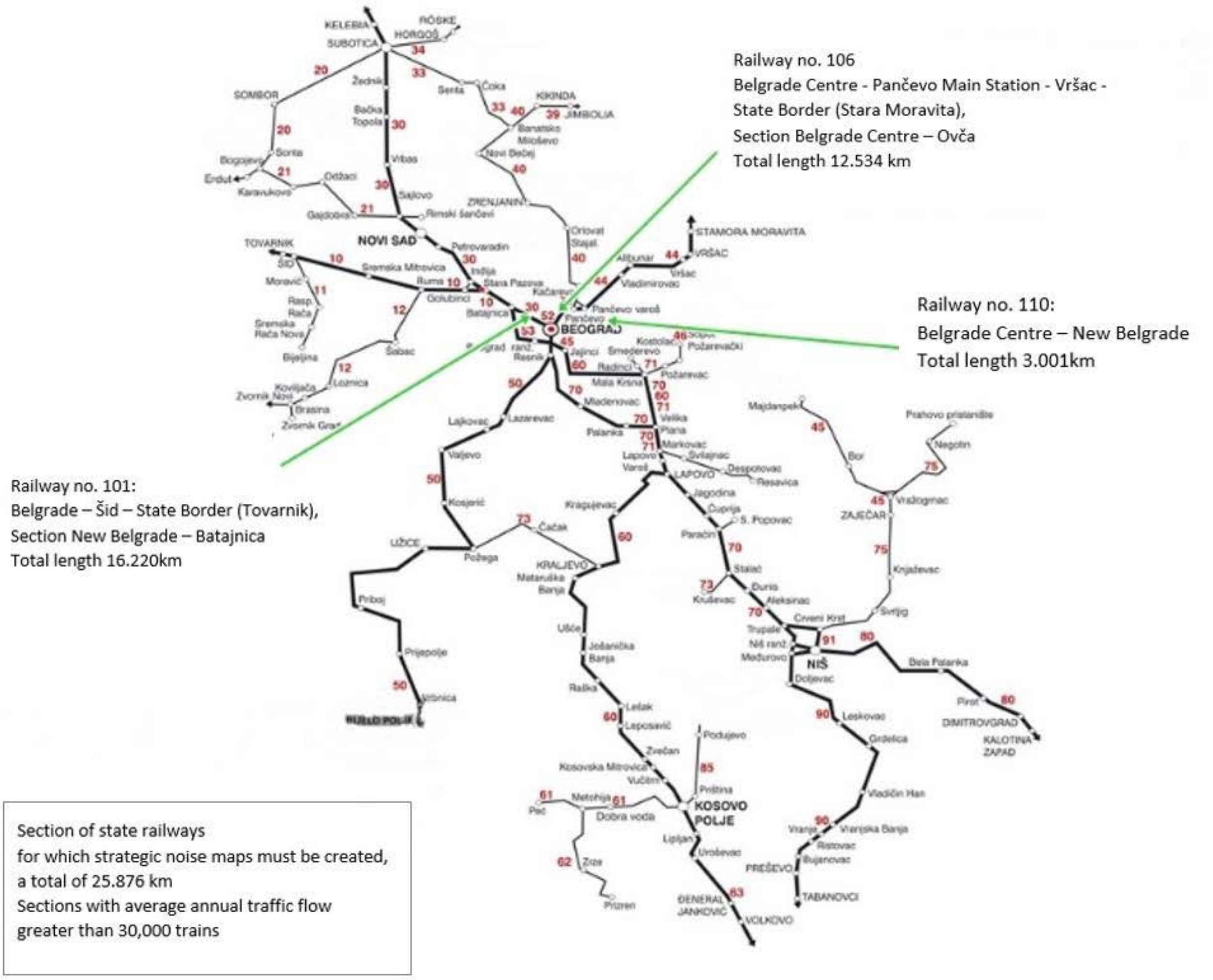


Figure 7.9. Detailed map of state railways subjected to the development of strategic noise maps

Source of data: AD “Infrastructure of Serbian Railways”, PC “Roads of Serbia”

8. NON-IONISING RADIATION

8.1. LEVELS OF NON-IONISING RADIATION AT THE TERRITORY OF THE REPUBLIC OF SERBIA (P)

Key messages

Data for 12,685 base radio stations were submitted to the Environmental Protection Agency in 2020.

The indicator defines stationary and mobile sources whose electromagnetic field located in the zone of increased sensitivity (areas of residential zones where persons can stay as long as 24 hours a day) reaches at least 10% of the amount of the reference, limit value prescribed for that frequency.

Sources of non-ionizing radiation of special interest, as well as Zones of increased sensitivity are terms defined and described in the Rulebook on sources of non-ionizing radiation of special interest, types of sources, manner and period of their testing (Official Gazette of RS, No. 104/09), in accordance with the recommendations of the World Health Organisation.

There are 12,685 base radio stations in the territory of the Republic of Serbia. Of that number, 290 were declared sources of non-ionizing radiation of special interest. An overview of total number of base radio stations for which the authorities submitted data within the legal deadline, as well as sources of special interest to different owners is given in Figure 8.1. Figure 8.2. illustrates the change in the number of base radio stations and IPI over the last six years.

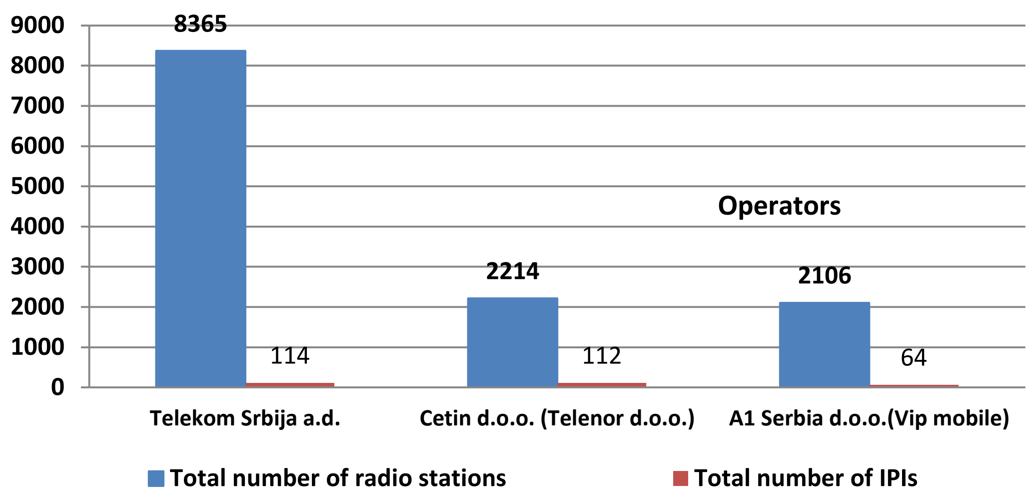


Figure 8.1. Preview of owners, total number of base radio stations and sources of special interest in 2019

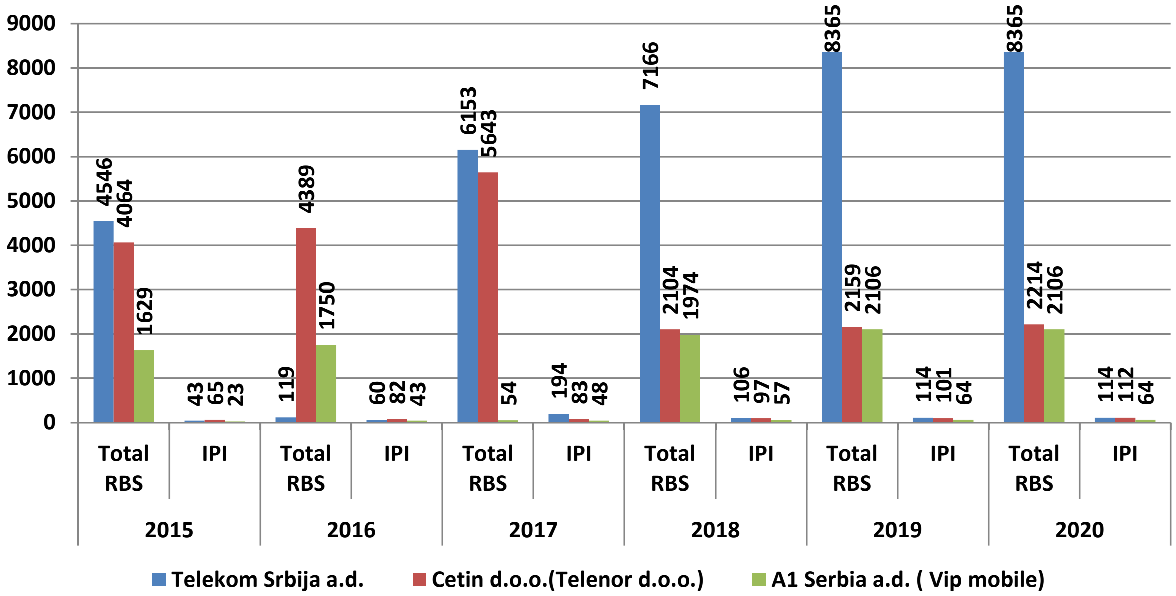


Figure 8.2. Change in the number of base radio stations and IPI over the last five years for three mobile operators

Source of data: Telekom Srbija ad; Cetin doo; A1 Serbia ad.

9. FORESTRY, HUNTING AND FISHERY

9.1. HEALTH STATUS OF FORESTS (P)

Key messages:

1) during 2020 no drying up of trees was registered, while strong defoliation was reduced compared to 2019;

2) as for healthy trees, more than 90% of coniferous and deciduous trees did not have or had just weak defoliation.

Forest health is monitored through tree defoliation indicators in the ICP Forests monitoring network.

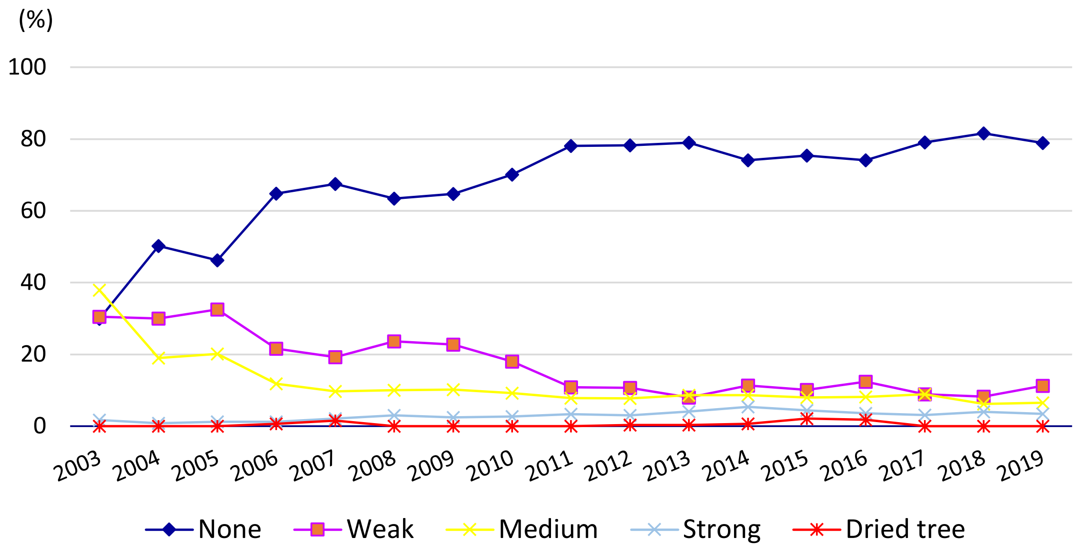


Figure 9.1. Defoliation of coniferous species

Assessment of the condition of forest species was conducted in 2020 at 130 bioindication points, on a total of 2,956 trees, 358 coniferous and 2,598 deciduous trees. During 2020, no drying up of trees was registered. Strong defoliation had decreased compared to 2019.

As for healthy trees, 91.3% of coniferous and 93.1% of deciduous trees did not have or had just weak defoliation. Defoliation was not registered on 92.5% of fir trees, 95.1% of spruce trees, 91.3% of white pine trees and 43.3% of black pine trees. About 35% of black pine trees are caught by moderate and strong defoliation (Figure 9.1).

When it comes to deciduous species, 91.7% of hornbeam, 89.9% of Hungarian oak, 86.8% of beech, 78% of Turkey oak and 72.6% of sessile oak trees did not have defoliation. Moderate and weak defoliation of deciduous species has decreased compared to 2019 (Figure 9.2).

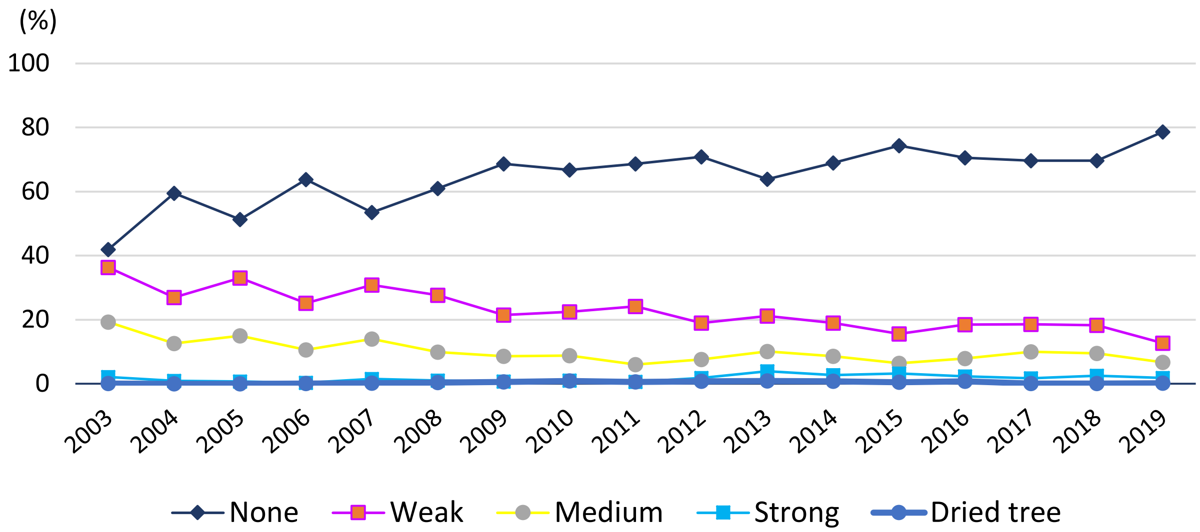


Figure 9.2. Defoliation of deciduous species

Source of data: Institute for Forestry – national focal centre for monitoring of forest status

9.2. DAMAGE IN STATE-OWNED FORESTS (P)

Key messages:

1) the intensity of human-caused damage in state forests increased 2019;

2) damage from insects and natural disasters had been reduced compared to 2018.

The indicator represents the recorded damage in forests according to agents, and is expressed in cubic meters.

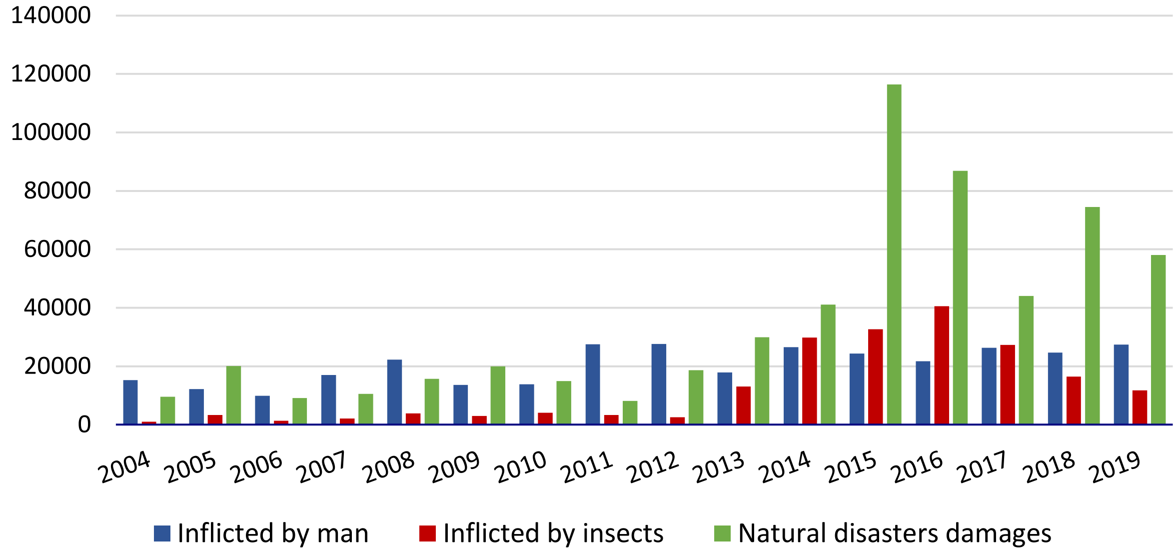


Figure 9.3. Damage made to state-owned forests according to agents

Agents that cause damage in forests are biotic, abiotic and anthropogenic. Biotic agents include insects and diseases, wild animals and cattle grazing in the forest. Abiotic agents include fire, storm, wind, snow, drought, mud deposits and avalanches. Anthropogenic agents include illegal logging or other damage in the forest caused by logging that leads to a decrease in the health and vitality of forest ecosystems.

In the course of 2019, the intensity of man-made damage in state forests increased by over 12% compared to the previous year. More than 27,000 cubic meters of wood were illegally logged from state forests, mostly in the region of southern and eastern Serbia. Damages caused by insects had been reduced by about 30% compared to 2018, and there had been a trend of decreasing damage in the last four years. The damage caused by natural disasters was lower by about 22% compared to 2018, and there was a trend of decreasing damage over the last five years (Figure 9.3).

The pressure on forests is also exacerbated by intensive tourism and recreational activities that cause forest fires, pollution and destruction through air pollution, traffic or grazing livestock.

Source of data: Statistical Office of the Republic of Serbia

9.3. DAMAGE CAUSED BY FIRES (P)

Key messages:

In the course of 2019, 3,397 cubic meters of wood burned down.

The indicator represents the recorded damage from forest fires, expressed in cubic meters and hectares.

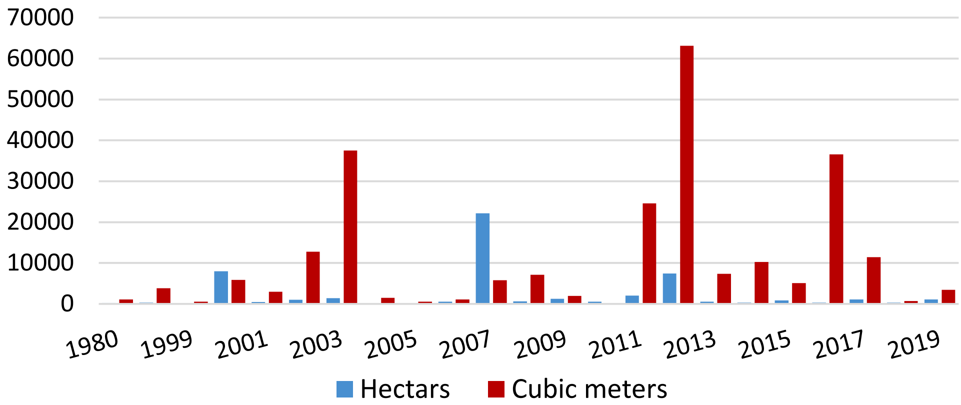


Figure 9.4. Damage caused by forest fires

Forest fires are one of the most significant forms of damage in forests. Although controlled burning can lead to increased biodiversity of species, uncontrolled forest fires have very negative consequences for the ecosystem, such as desertification, erosion, and water losses.

In the course of 2019, 3,397 cubic meters of wood burned down, which is almost five times more than in 2018. Compared to the previous year, when forest fires affected an area of about 303 ha, the area affected by fire during 2019 was 1,079 ha, which is almost four times larger burned area (Figure 9.4).

Climate change, i.e., alternating dry and rainy periods, is increasingly actualizing the problem of forest fires and damage in forests from natural disasters. Moreover, direct damages in the lost wood mass are no longer as important as the loss of public forest functions after the fire (hydrological, protective, climatic, hygienic-health, touristic and recreational, etc.).

Burned area on the site Belege-Belčin Dol, Stara Planina Nature Park Photo: S. Popovic

Within the Nature Park “Stara Planina”, the fire caught a total area of 2,108 ha, of which the total area under forests was 550 ha (235 ha state- and 315 ha privately-owned areas). The fire mostly caught the unforested area, i.e. pastures and meadows on a total area of 1,558 ha.

Source of data: Statistical Office of the Republic of Serbia

9.4. POPULATION DYNAMICS OF MAIN HUNTING SPECIES (P-S)

Key messages:

1) the number of populations of the most important hunting species was stable in the period 2014-2018;

2) hunting of roe deer and quail had decreased, while hunting of wild boar, fallow deer, rabbit and pheasant had increased.

The indicator represents the number of populations of selected main hunting species in the Republic of Serbia.

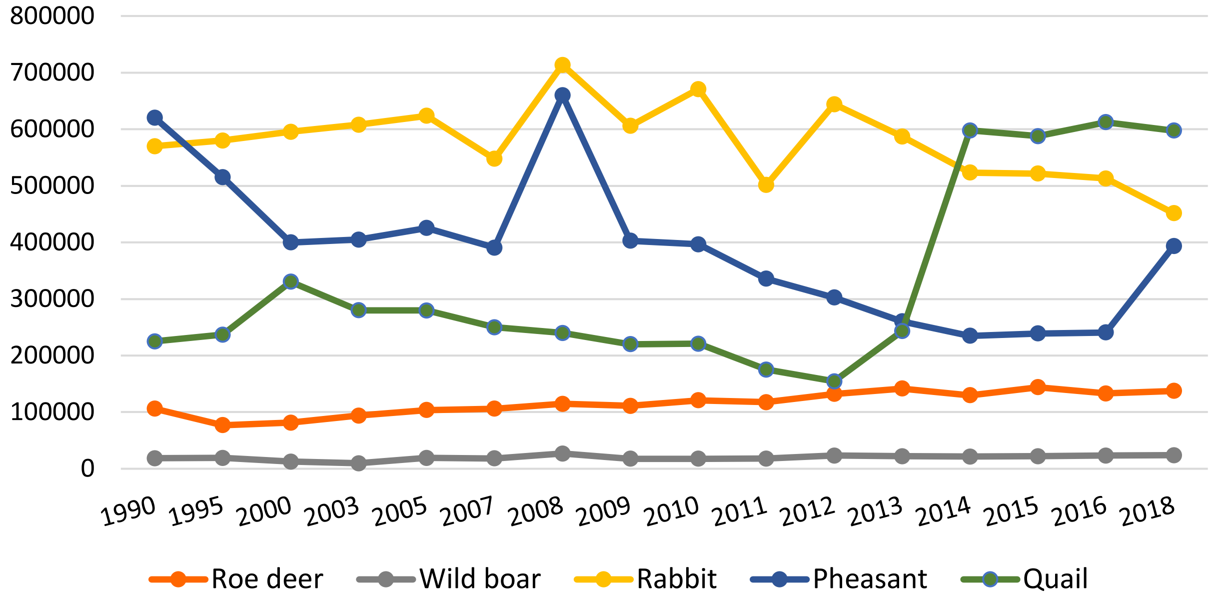
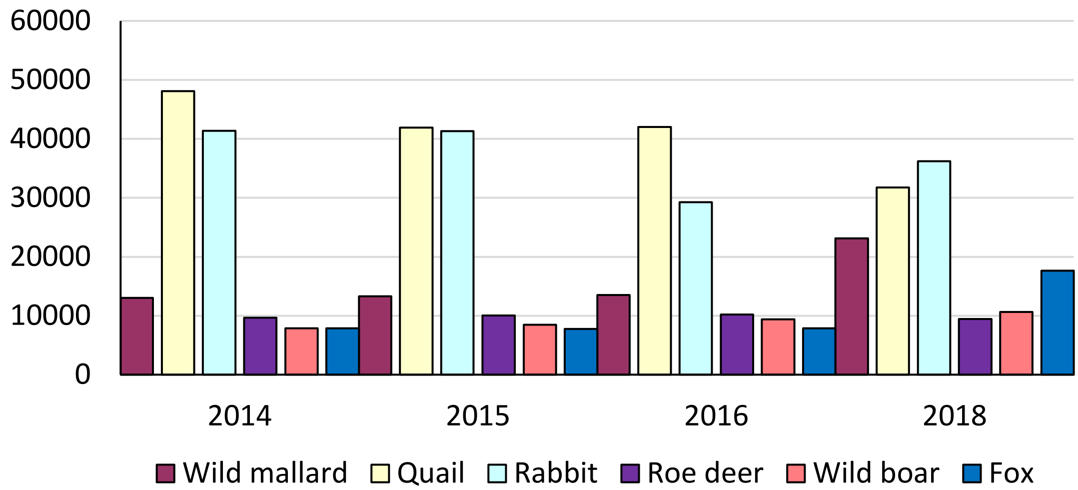


Figure 9.5. Trends in number of populations of selected hunting species

Except for the population of rabbits, the trend in the number of populations of the most important hunting species was stable in the period 2014-2018. The population of pheasants had increased significantly (Figure 9.5).



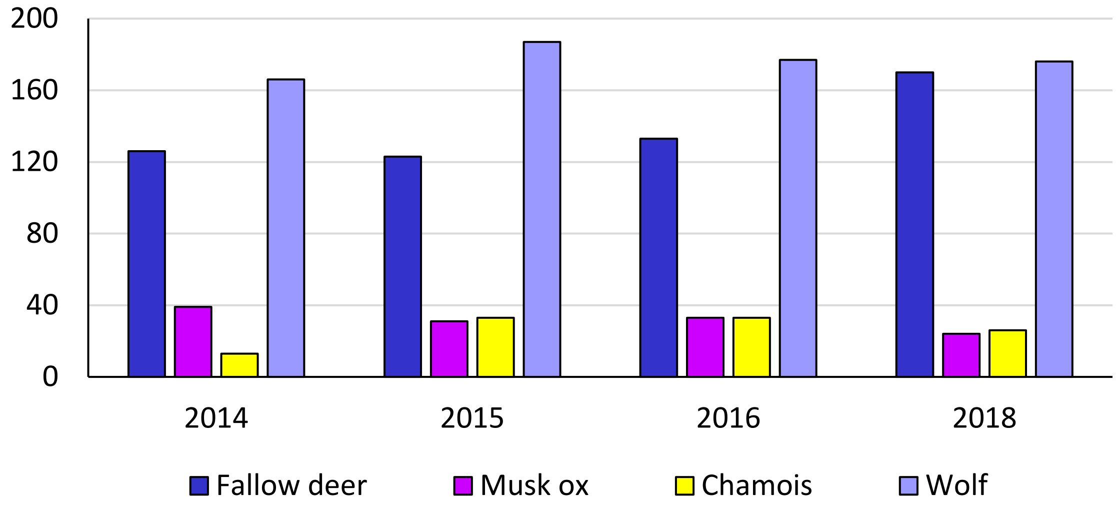


Figure 9.6. Catch of most significant hunting species

During the hunting season of 2018-2019, hunting of deer decreased by about 7%, of wild boar increased by about 13%, and of fallow deer increased by about 28%. Mouflon and chamois catches were reduced by about 30%. The catch of quail decreased by about 25%, while the catch of pheasants increased by about 80% and rabbit by about 24%. About 170-180 wolves are shot annually. This year, 10,000 more foxes were shot than the usual number of 7,000-8,000 (Figure 9.6).

Source of data: Forest Administration

9.5. FRESH WATER FISHERY (P)

Key messages:

1) commercial fishing decreased by about 14%, and recreational fishing by about 30%;

2) the catch of carp, catfish and perch had significantly reduced compared to 2019.

The indicator represents the amount and structure of fish caught.

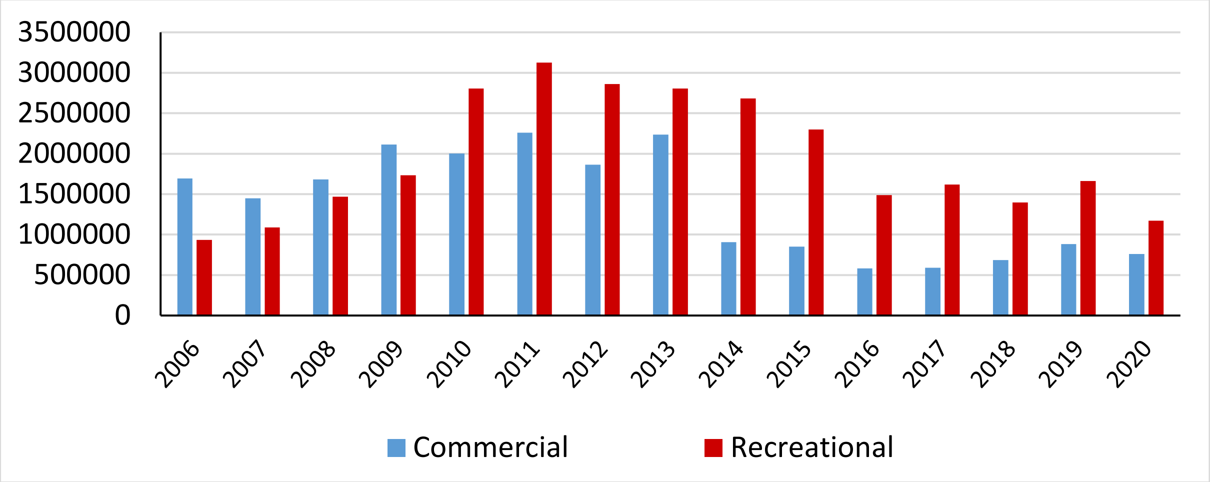


Figure 9.7. Freshwater fishing in the Republic of Serbia (new methodology of the RSO and SEPA)

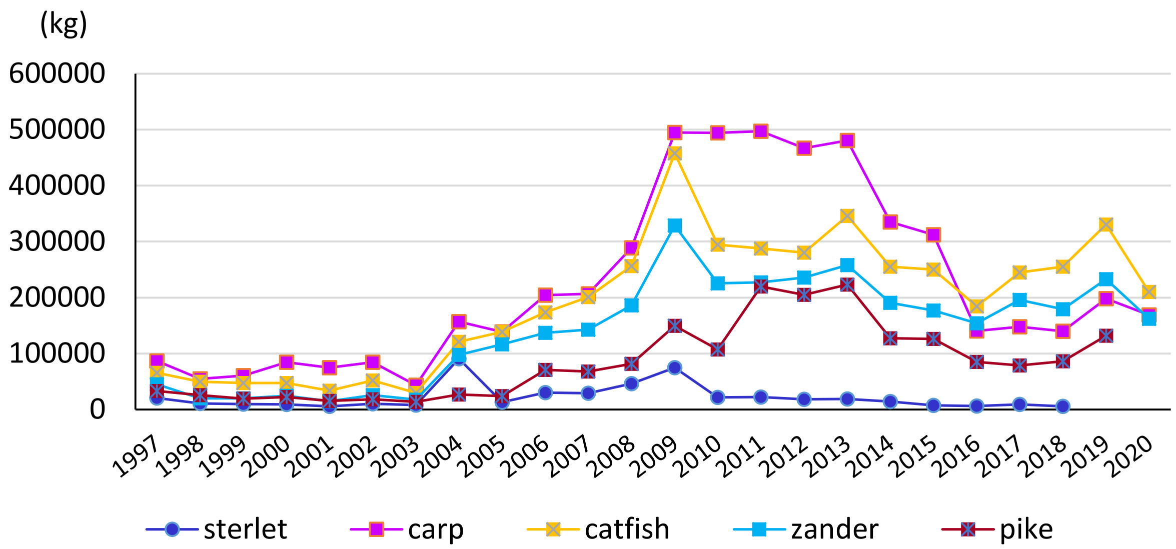


Figure 9.8. Structure of fishing in the Republic of Serbia

In the course of 2020, a total of 1,931 t of fish was caught, which is about 24% less than in 2019. Carp fishing was reduced by about 15%, perch by about 30%, while catfish catch was reduced by about 37%. In accordance with the decision of the Ministry of Environmental Protection from 1 January 2019, the fishing for sturgeon is prohibited (Figure 9.7).

The number of professional fishermen (408) had increased by about 8% compared to 2019. The total number of issued licenses for recreational fishing was 96,001, which is about 8% more than in 2019. The intensity of recreational fishing decreased by about 30%, while the intensity of commercial fishing decreased by about 14%, compared to 2019 (Figure 9.8).

Source of data: Statistical Office of the Republic of Serbia

9.6. PRODUCTION IN AQUACULTURE (DF)

Key messages:

1) production of table fish decreased by about 23% compared to 2019;

2) production in carp ponds decreased by about 25%, while production in trout ponds decreased by over 40%.

The indicator represents the amount of fish produced and caught in fishponds.

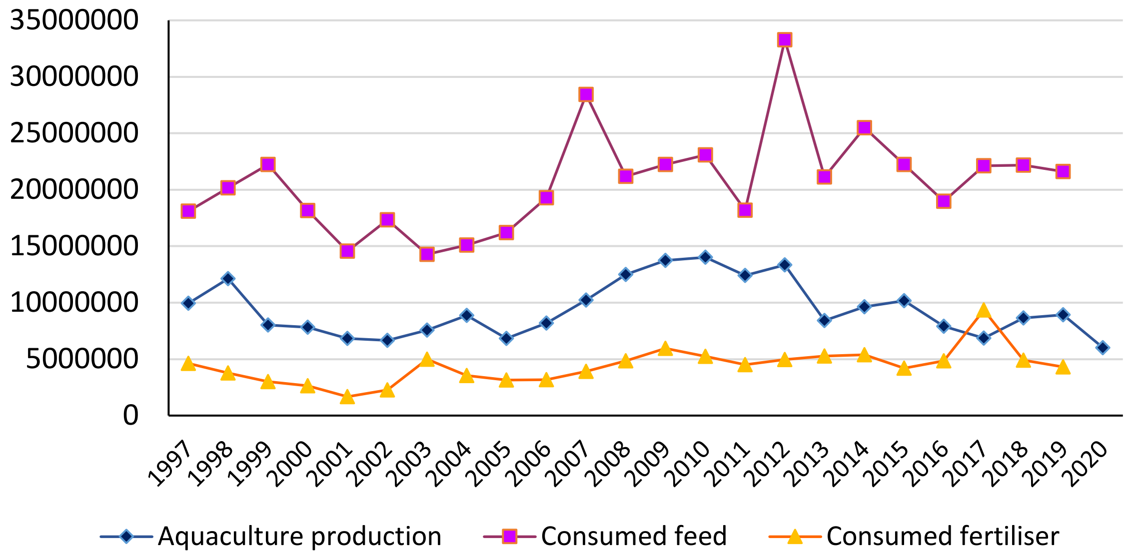


Figure 9.9. Production in aquaculture

The total production of table fish during 2020 was about 6,010 t, which is about 23% less than in 2019 (Figure 9.9).

Production in carp ponds decreased by about 25%, while production in trout ponds decreased by over 40% compared to 2019 (Figures 9.10 and 9.11).

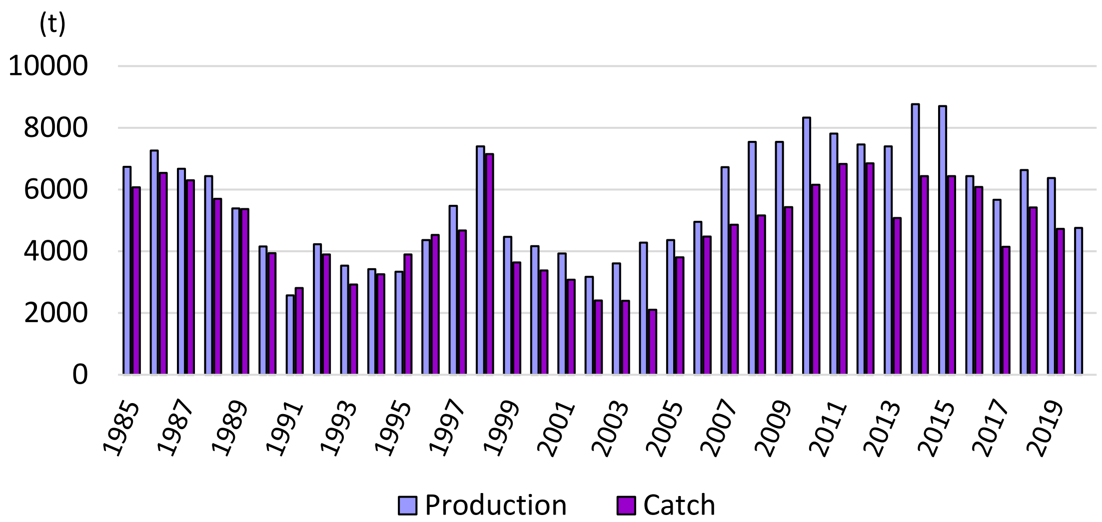


Figure 9.10. Production and catch in carp ponds

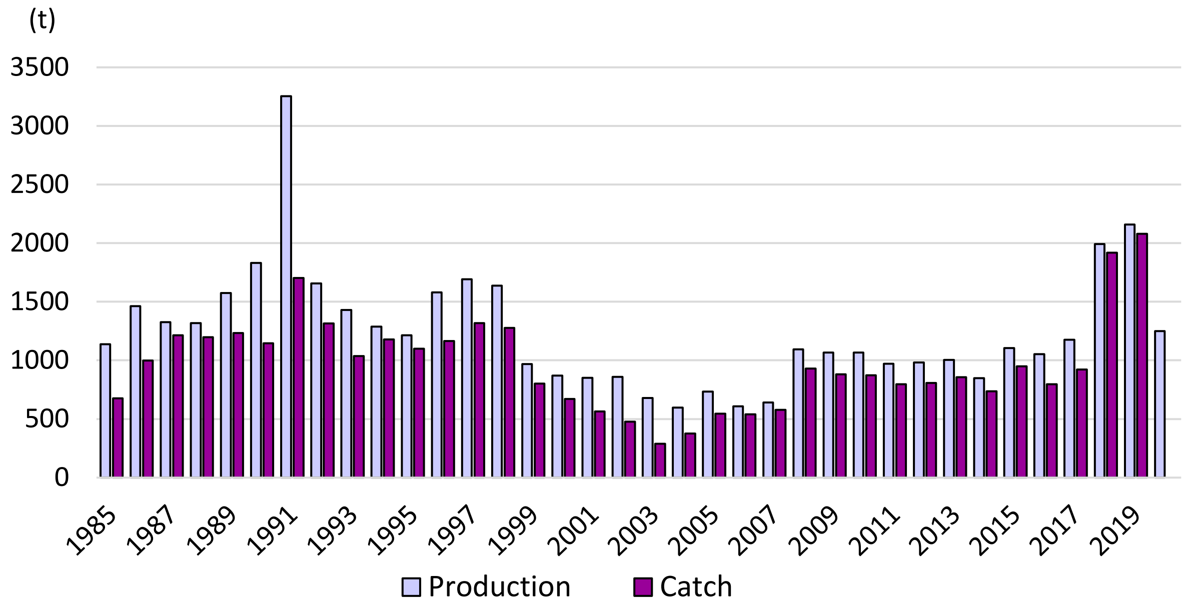


Figure 9.11. Production and catch in trout ponds

Source of data: Statistical Office of the Republic of Serbia

10. SUSTAINABLE USE OF NATURAL RESOURCES

10.1. WATER EXPLOATATION INDEX (WEI) (P)

Key messages:

1) water exploitation index recorded a growing (unfavourable) trend in the period 2010-2019, but under a very low average value of only 2.8%;

2) the affected water resources in the period 2010-2019 amounted to an average of 4,816 million m^3 and had a growing (unfavourable) trend.

The indicator is calculated according to the form WEI = V_{zah} / V_{obn} x 100, expressed in (%).

Affected water resources (V_{zah}) include the total annual volume of surface and groundwater abstracted by industry, agriculture, households and other users.

Renewable water resources (V_{obn}) include the volume of river runoff (precipitation reduced by actual evapotranspiration) and the change in the volume of groundwater, generated under natural conditions only from precipitation on the national territory (internal inflow), as well as the volume of actual inflow of surface and groundwater from neighbouring countries (external inflow), and are calculated as a multi-annual average for 20 consecutive years.

Figure 10.1. Water exploitation index (2009-2018)

Water exploitation index had a growing (unfavourable) trend in the period 2010-2019, but under a very low average value of 2.8% (Figure 10.1).

The problems appear when the index exceeds 20%, and when the limit exceeds 40%, such areas are considered to be the zones under extreme water stress. It indicates that water is available to us in terms of quantity, but it does not show the quality of that water is, and how it is distributed in space. Therefore, it is necessary to determine this indicator by basins as well.

Total abstracted water resources had a growing (unfavourable) trend in the period 2010-2019. The average value in the observed period was 4,816 million m^3, and the minimum value in this period was recorded in 2014 and amounted to 3,935 million m^3 (about 82% of the average value). The maximum value was recorded in 2019 and amounted to 5,619 million m^3, which was 16.6% more than the average value for this period (Figure 10.2).

The long-term average annual value (20 consecutive years) of renewable water resources is 171.64 billion m^3, and represents the sum of precipitation in our territory and the inflow of water from other countries, reduced by actual evapotranspiration. This value was lower by 9.6% in 2019 than the multi-annual average and amounted to 155.1 billion m^3 (Figure 10.3).

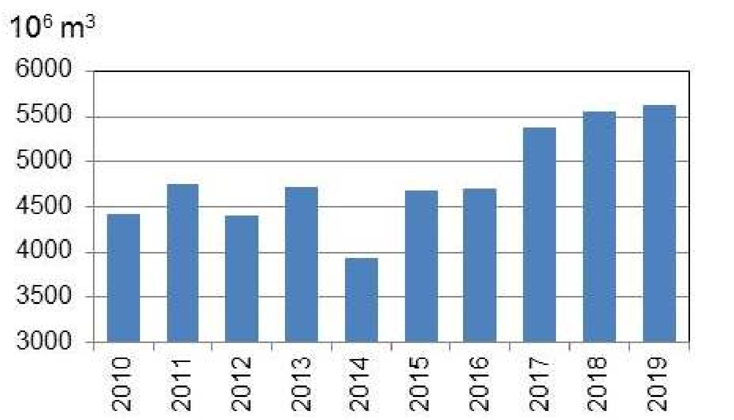


Figure 10.2. Abstracted water resources of the Republic of Serbia in the period 2010-2019

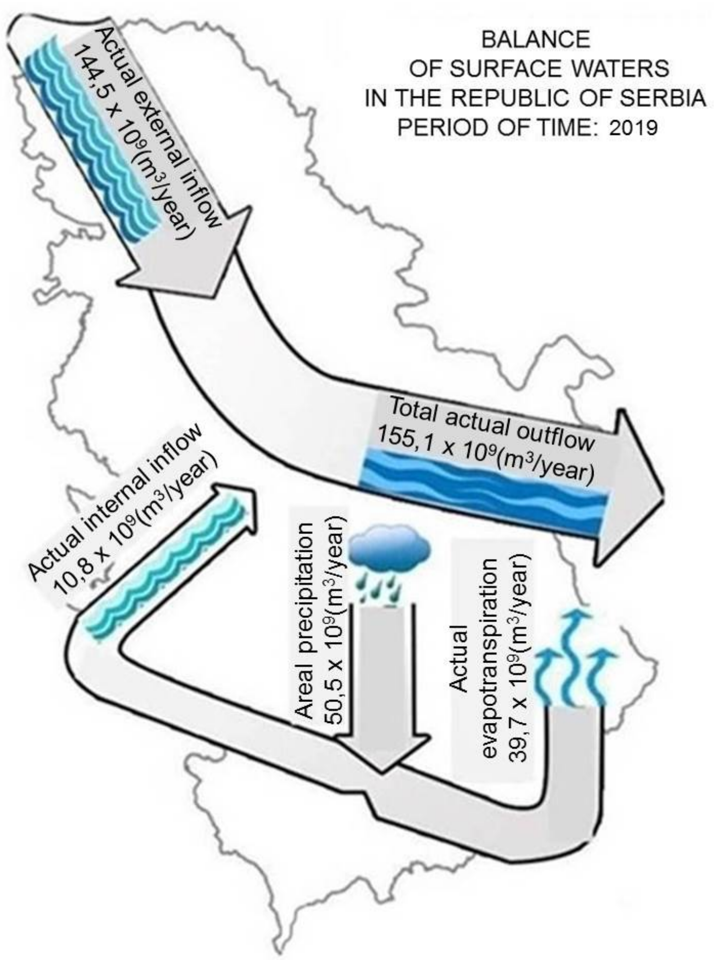


Figure 10.3. Renewable water resources of the Republic of Serbia in 2019

Source of data: Statistical Office of the Republic of Serbia, Republic Hydrometeorological Institute

10.2. WATER USE IN HOUSEHOLDS (P)

Key messages:

1) the use (specific consumption) of water in the household recorded a favourable (declining) trend in the period 2010-2019;

2) Niški and Pčinjski counties and the City of Belgrade recorded the highest specific household water consumption in 2019, and Zaječarski county the lowest one;

3) water delivered to households by public water companies has an insignificant trend in the period 2010-2019, while the number of users connected to the water supply had a favourable (growing) trend in the same period.

The indicator monitors the amount of water used in households and for public communal needs of the population (watering of park areas, public hygiene, etc.). It is the indicator for the pressure of water resources used in households on the sustainable use of renewable water resources at the national level. The use of water in households is calculated by dividing the total water consumed in households during a year by the number of users (residents connected to public water supply systems).

The total amount of water consumed in households during the year is determined based on the amount of water delivered to households from PUCs. The use of water by population that is not supplied from public water supply systems, but belongs to the category of public supply of drinking water to the population, should also be included.

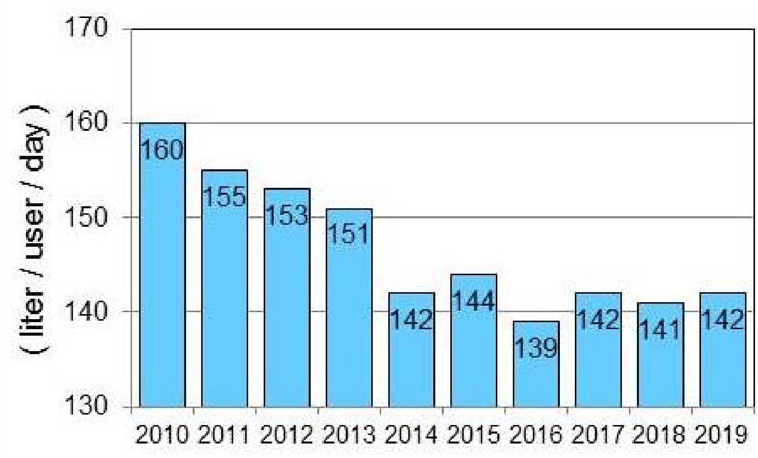


Figure 10.4. Use of water in households (2010-2019)

Household water use (specific consumption) had a favourable (declining) trend in the period 2010-2019. The average specific water consumption in the same period was 146.9 litres/user/day (Figure 10.4).

The highest specific household water consumption in 2019 was in the Niški county – 230.6 litters/user/day, while the lowest was in the Zaječarski county – 82.7 litres/user/day (Figure 10.5).

Water delivered by PUCs to households recorded an insignificant trend in the period 2010-2019 and amounted to an average of 318.6 million m^3. The number of users connected to public water supply systems had a favourable (growing) trend and amounted to a maximum of 6,212,929 in 2019, which is 89.5% of the total population (Figure 10.6).

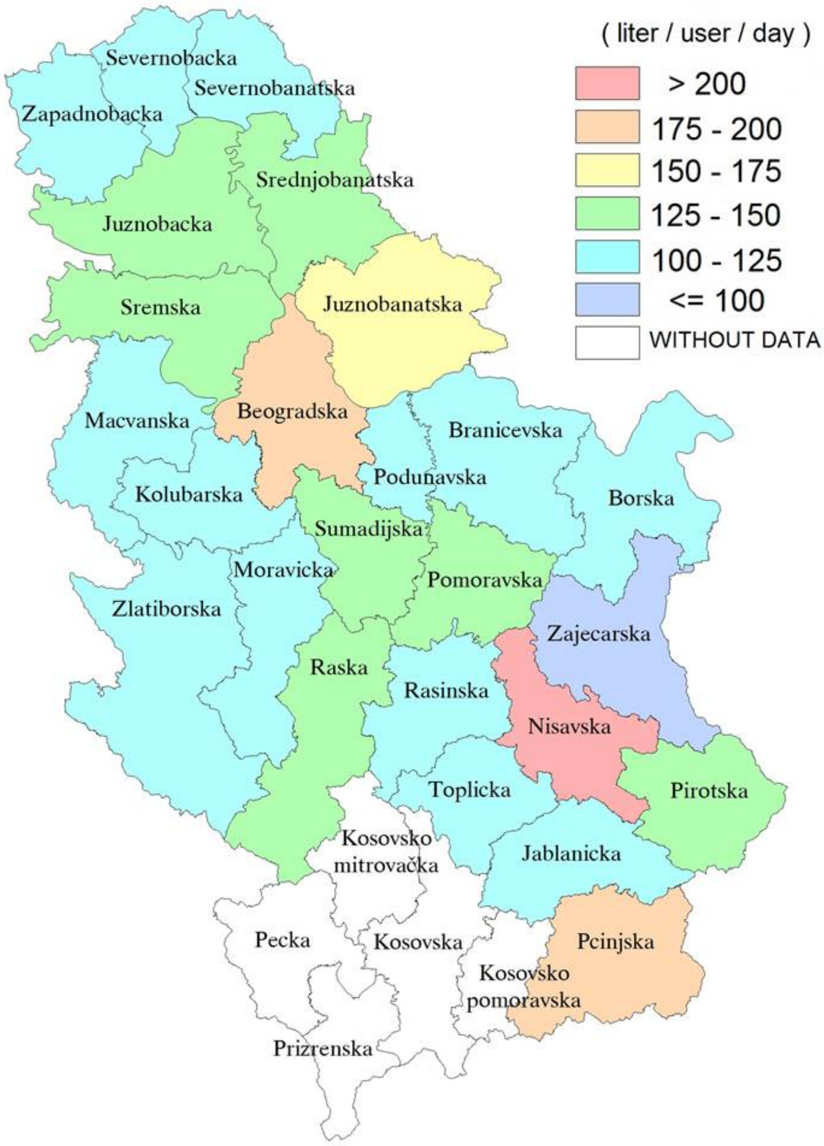


Figure 10.5. Use of water in households by counties of the Republic of Serbia (2019)

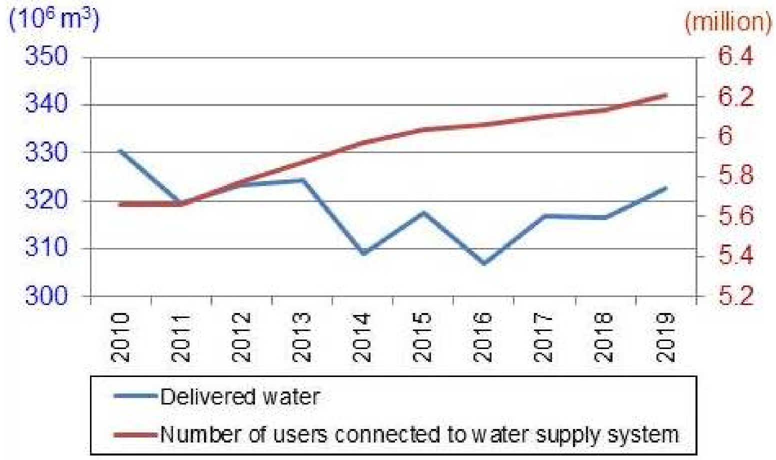


Figure 10.6. Trend of parameters for the calculation of use of water in households (2010-2019)

Source of data: Statistical Office of the Republic of Serbia

10.3. WATER LOSSES (R)

Key messages:

1) water losses in the water supply network of the Republic of Serbia, expressed as a percentage, recorded a growing trend in the period 2010-2019;

2) the largest losses in 2019 were recorded Borski, Kolubarski, Zaječarski and Braničevski counties, and the least ones were recorded in Rasinski, Zapadnobački and Južnobanatski counties;

3) the quantities of abstracted water for public water supply and water delivered from public water supply had an insignificant trend in the period 2010-2019.

The indicator monitors the amount and percentage of water resources lost in water transport (due to leaks and evaporation) between the catchment and delivery points, enabling the assessment of the response to the efficiency of water supply system management, including technical conditions affecting pipelines condition, water price and population awareness in the country.

The indicator is calculated as the absolute and relative discrepancy between the amount of water abstracted by water supply system and the amount delivered to users (households, industry and for other economic activities).

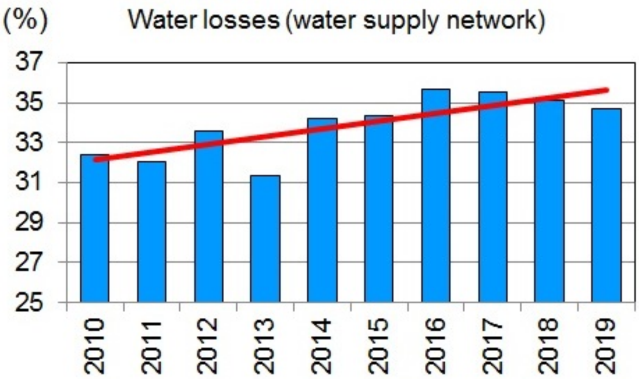


Figure 10.7. Water losses in the water supply network of the Republic of Serbia (2010-2019)

High level of losses is a characteristic of the current supply of the settlement with drinking water from public water supply systems, and they recorded a growing trend and average 33.9% in the period 2010-2019. In 2016, they hit a maximum of 35.7%. In the period 2016-2019, they recorded decline and in 2019 they amounted to 34.7% (Figure 10.7).

Losses of more than 50% in 2019 were recorded in Borski and Zaječarski (56.4%), Braničevski (55.3%) and Kolubarski counties (51.5%). Particularly important is the data on the volume of losses from the Belgrade area, which amounted to 29.8%, and if these were reduced by 10% annually, this quantity would provide the amount of water equivalent to the supply needs of the City of Kragujevac. Losses of less than 20% were recorded in Rasinski (14.2%), Zapadnobački (17.9%) and Južnobanatski counties (19.5%) (Figure 10.8).

Average quantities of abstracted water for public water supply were 657 million m^3 per year in the period 2010-2019, while the average quantities of delivered water in the same period amounted to 434 million m^3 per year, and both had an insignificant trend. Average losses amounted to 222 million m^3 per year (Figure 10.9).

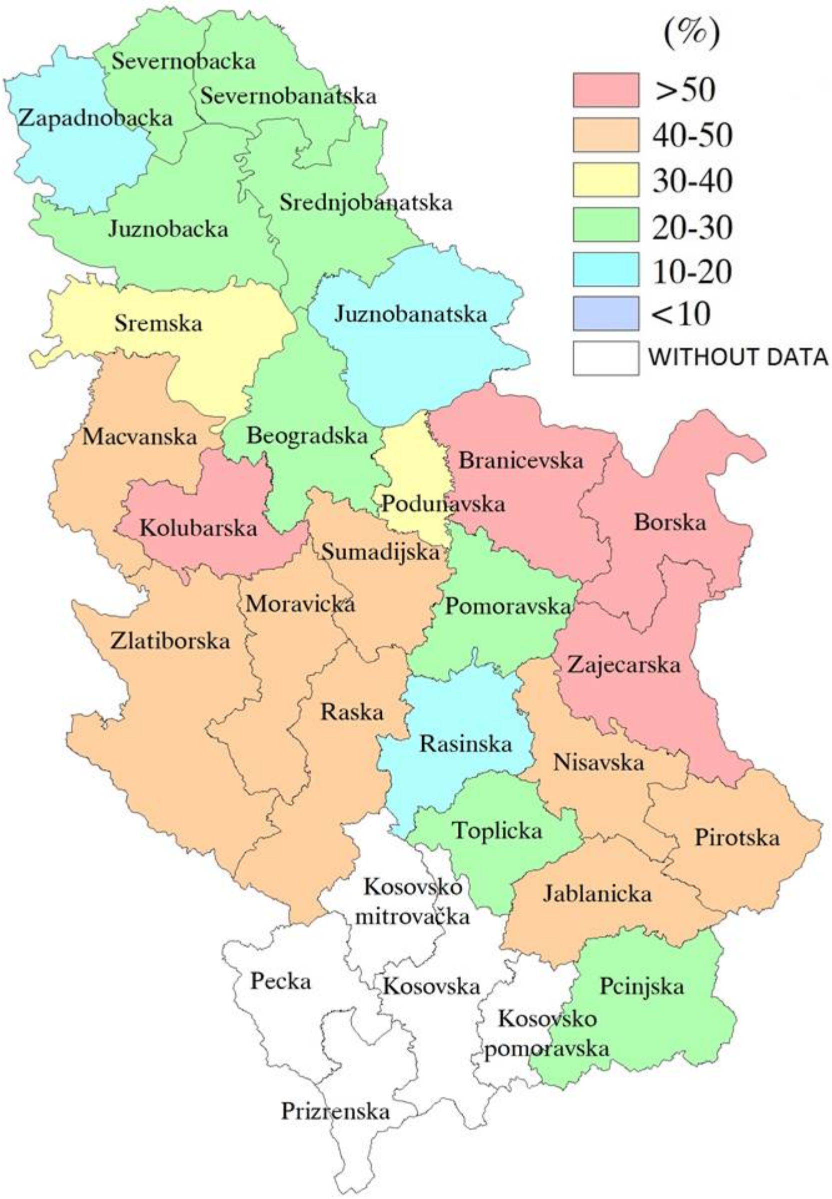


Figure 10.8. Water losses in the water supply network by counties of the Republic of Serbia (2019)

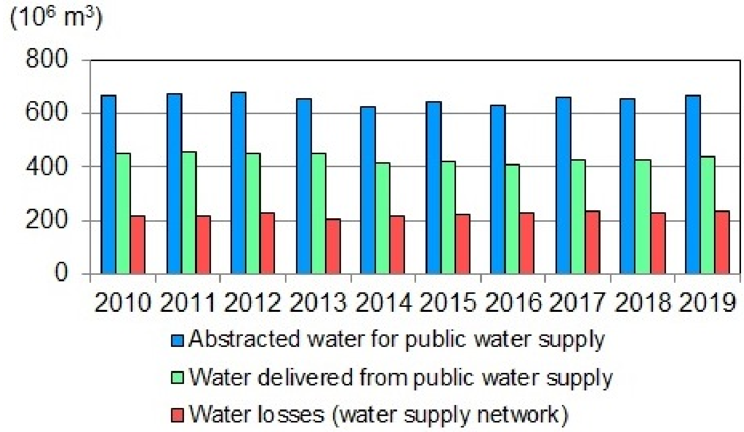


Figure 10.9. The efficiency of water use in water supply systems of the Republic of Serbia (2010-2019)

Source of data: Statistical Office of the Republic of Serbia

10.4. STRUCTURE OF PRODUCTON FROM STATE-OWNED FORESTS (DF)

Key messages:

1) during the last decade there has been an increase in the production of assortments in state-owned forests by about 40%;

2) half of the wood produced in state-owned forests is firewood.

The indicator represents the quantity and structure of forest assortments produced in state forests.

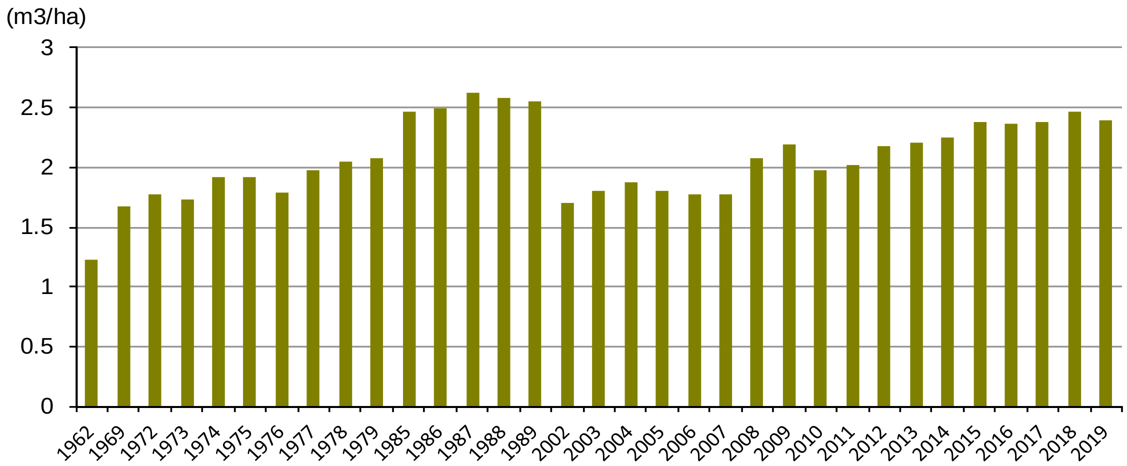


Figure 10.10. Forest assortments produced in state-owned forests

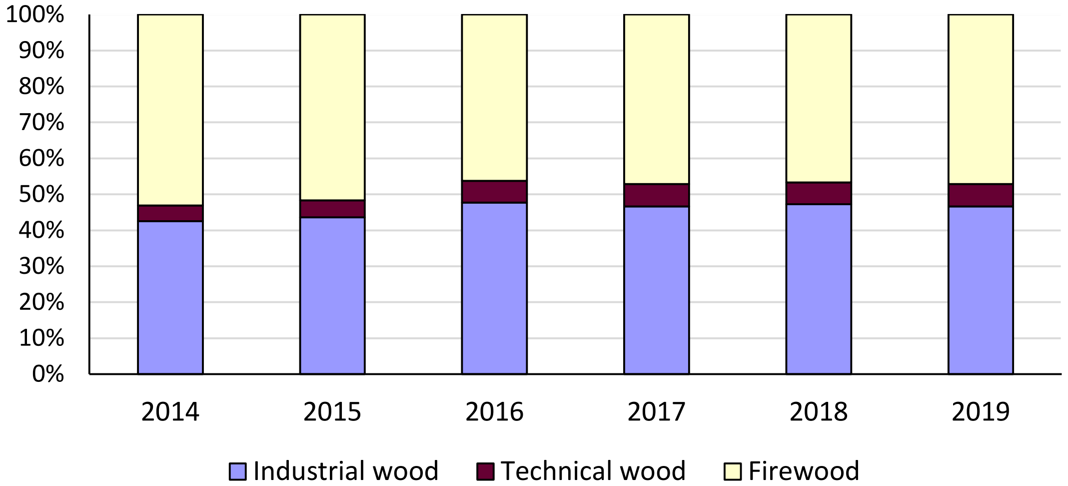


Figure 10.11. Structure of forests assortments from state-owned forests

It can be noticed that over the past decade there has been an increase in the production of assortments from state-owned forests by about 40% compared to 2007, they increased from 2 m^3/ha to 2.46 m^3/ha of forest. In the course of 2019, there was a slight decrease in production to 2.4 m^3/ha (Figure 10.10).

The ratio of firewood and industrial wood on a global level was 51.2: 48.8, while in Europe the ratio was 17.8: 82.2. In the Republic of Serbia, the ratio of firewood and industrial wood is 51:49, with the trend of decreasing share of industrial wood in relation to firewood in 2019 (Figure 10.11).

Source of data: Statistical Office of the Republic of Serbia

10.5. FOREST ROADS (S-P)

Key messages:

1) in 2019, there was a slight decrease in the length of forest roads;

2) the length of modern roads had decreased about four times compared to 2017, but the length of solid roads has increased.

One of the important indicators of the state of forest exploitation. It indicates how to use and manage forests. The greater the length of forest roads, the greater the sustainability of forest exploitation based on planned thinning and clearing.

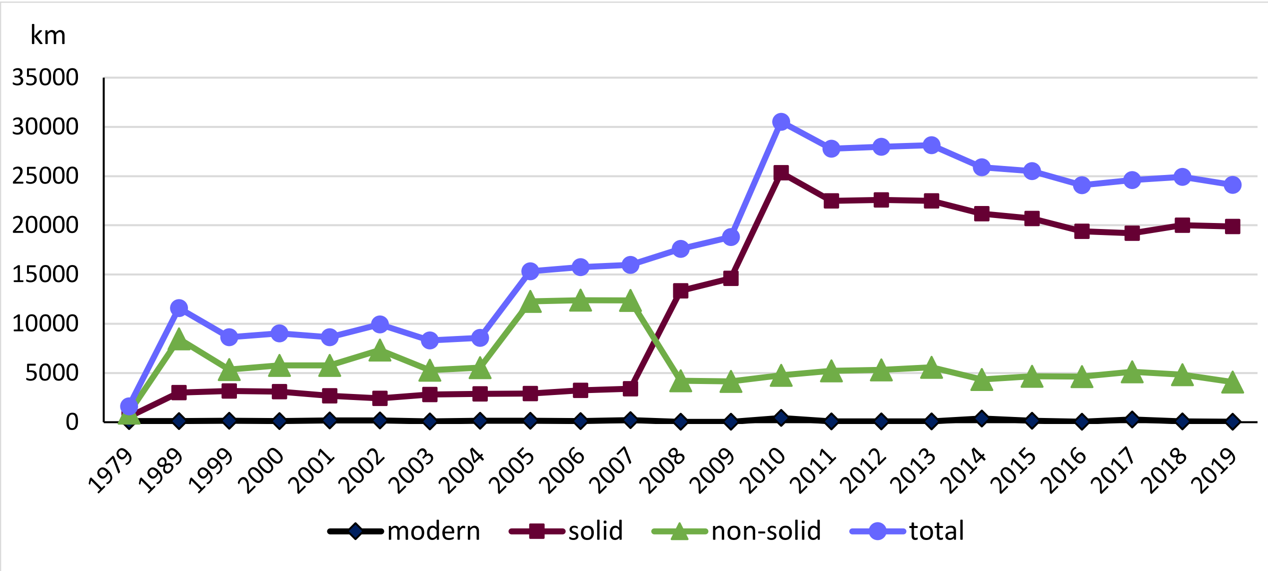


Figure 10.12. Forest roads

In 2019, there was a slight reduction in the length of forest roads by about 900 km (Figure 10.12).

Although the length of modern roads was increased by about 200 km in 2017, in 2018 and 2019 the length of these roads was reduced by about 200 km. In the same period, the length of solid roads increased by about 700 km. The length of soft forest roads has been reduced by about 500 km.

Permanent reduction of the length of forest roads indicates a reduction of forest exploitation "in depth", which can negatively affect the total areas under the forest, as peripheral areas are those that are mainly exploited.

Source of data: Statistical Office of the Republic of Serbia

10.6. FOREST INCREMENT AND LOGGING (S-P)

Key messages:

Annual logging (3,180,227 m^3) was about 35% of the annual volume increment (about 9 million m^3).

The indicator enables the assessment of sustainability of wood production as a potential for future wood availability and logging in forests.

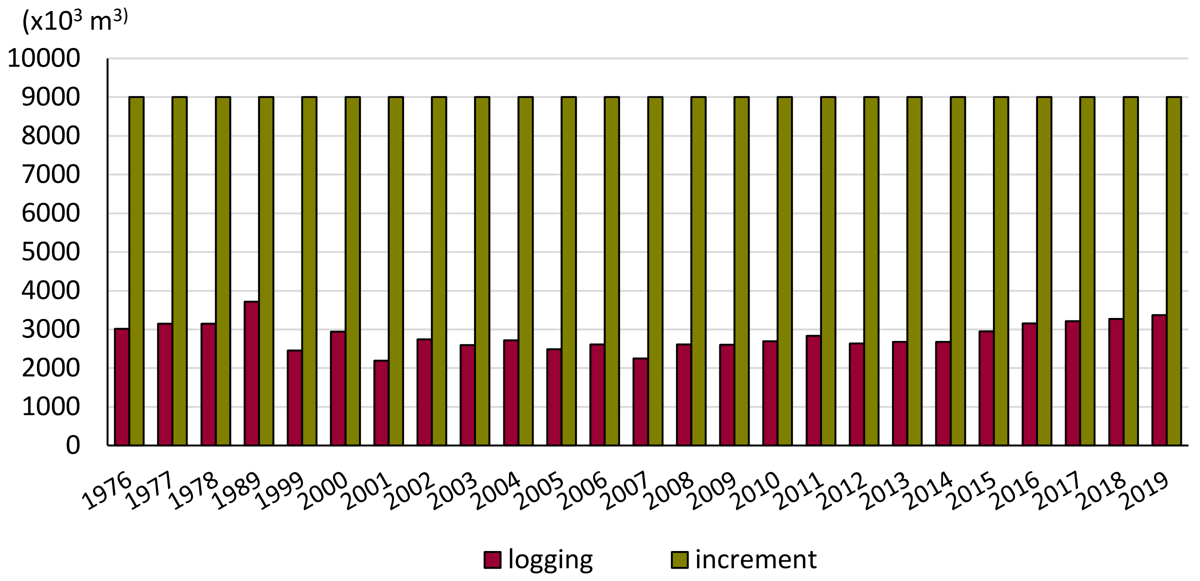


Figure 10.13. Increment and logging in the forests of the Republic of Serbia

Increment

The volume of wood mass in the forests of the Republic of Serbia amounts to about 363 million m^3, which is about 161 m^3/ha. The volume reaches about 159 m^3/ha in deciduous forests, while in coniferous ones the volume is about 189 m^3/ha. The annual volume increment is about 9 million m^3, which is about 4 m^3/ha. In deciduous forests, it amounts to about 3.7 m^3/ha, while in coniferous ones the volume increment goes to about 7.5 m^3/ha. Depending on the productivity of the species, the age structure and the mixture of species, as well as the ownership structure, the annual increment differs to great extent.

Logging

Deforestation is the most important indicator of forestry as of economic sector, but at the same time, it is an indicator of anthropogenic pressure. In the course of 2020, about 3.80,227 m^3 of wood was cut down in the forests of the Republic of Serbia. Compared to 2019, logging decreased by about 6%, while compared to 2007, when the lowest logging was recorded, it increased by about 40% (Figure 10.13). It should be noted that FAO/TCP/YUG/3201 project from 2011, as well as the UNECE report stated that total amount of logged timber volume in the Republic of Serbia in 2012 was 6.099 million m^3 (including the logging outside the forests in the amount of 1.441 million m^3).

Source of data: Statistical Office of the Republic of Serbia

10.7. AFFORESTATION (R)

Key messages:

During 2020, about 1,481 ha of woodland were afforested in the Republic of Serbia.

The indicator represents the area of afforested woodland.

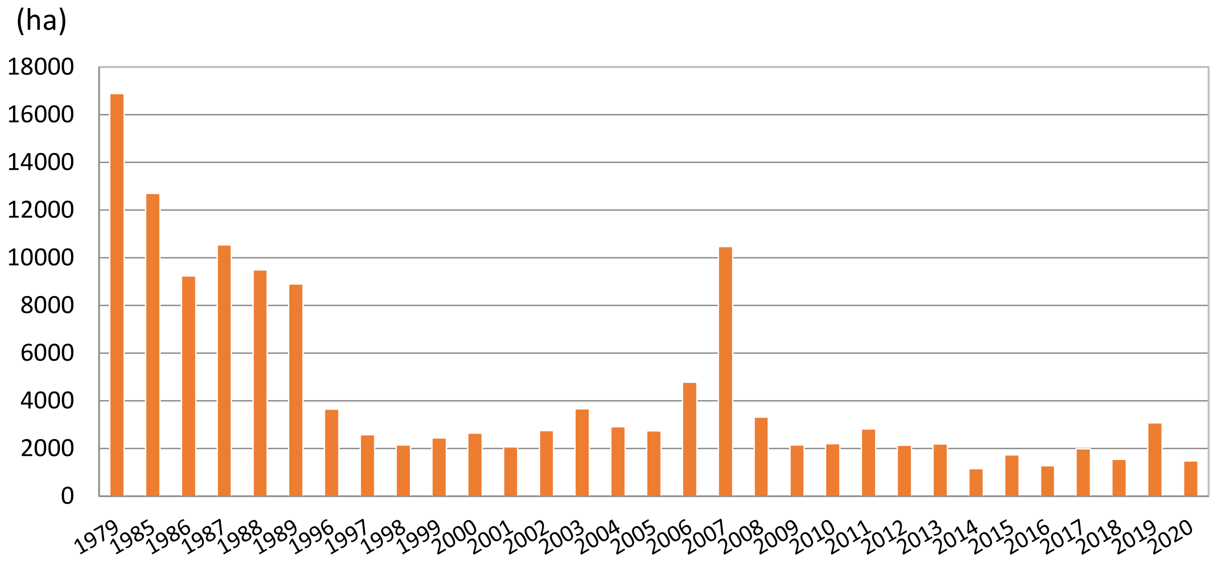


Figure 10.14. Afforestation in the Republic of Serbia

Natural regeneration participates in conservation of genetic diversity and improves the natural structure and ecological dynamics of species. Nevertheless, it should be taken into account that natural regeneration does not always fulfil the quality of management and the achievement of economic goals.

In 2020, about 1,481 ha of woodland was afforested in the Republic of Serbia, which is about 50% less than in the previous year. The planted trees included 538 ha of coniferous and 943 ha of deciduous species, mostly in Šumadija and Western Serbia, and in Vojvodina. At the same time, 1,455 ha of plantations and protection belts were planted, mostly in the region of Vojvodina. It is important to emphasise that this afforestation intensity is significantly lower than in 2007, and the period of 1980s, when about 10,000 ha were afforested annually (Figure 10.14).

Source of data: Statistical Office of the Republic of Serbia

10.8. COLLECTION OF WILD SPECIES FROM THE WILD (DF)

Key messages:

1) during 2020, 2825 t of wild species were collected in the Republic of Serbia

2) in relation to 2018, 60% less quantity was collected

The indicator represents the amount of wild plant and animal species collected from nature.

Regulation on imposing the control over the use and trade in wild flora and fauna (Official Gazette of RS, No. 31/05, 45/05, 22/07, 38/08, 9/09, 69/11 and 95/18 – state law) has allowed the collection of 63 species of plants, 3 species of lichens, 15 species of fungi and 9 species of animals from the wild. Collection permits are issued by the Ministry of Environmental Protection, based on the opinion of the Institute for Nature Protection of Serbia (Figure 10.15).

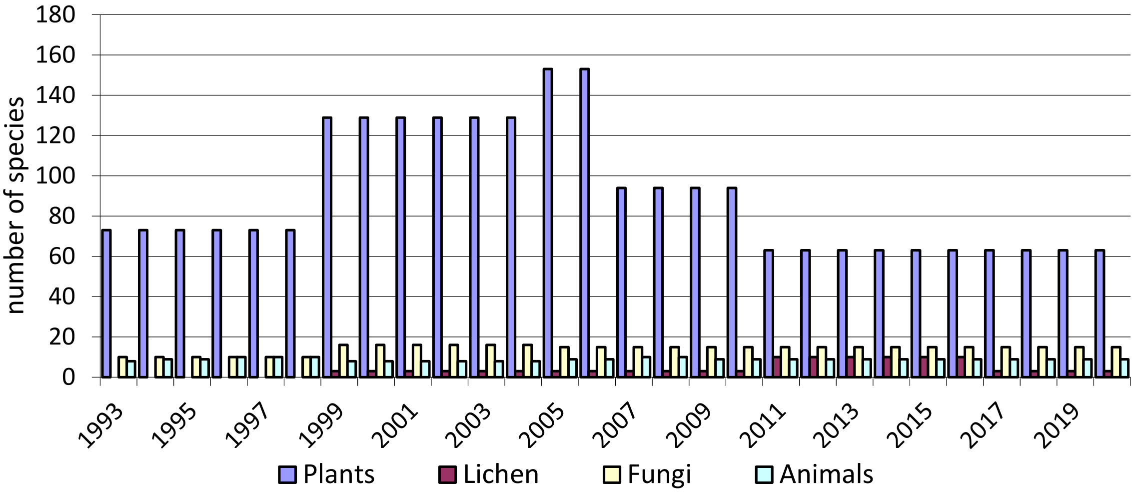


Figure 10.15. Contingents of wild species approved for collection in the Republic of Serbia

In 2020, 2,825 t of wild species were collected in the Republic of Serbia. These include 1,089 t of medicinal herbs, 1,401 t of mushrooms and 335 t of snails. Compared to 2018, 72% fewer medicinal plants, 50% fewer mushrooms and 46% fewer snails were collected (Figure 10.16).

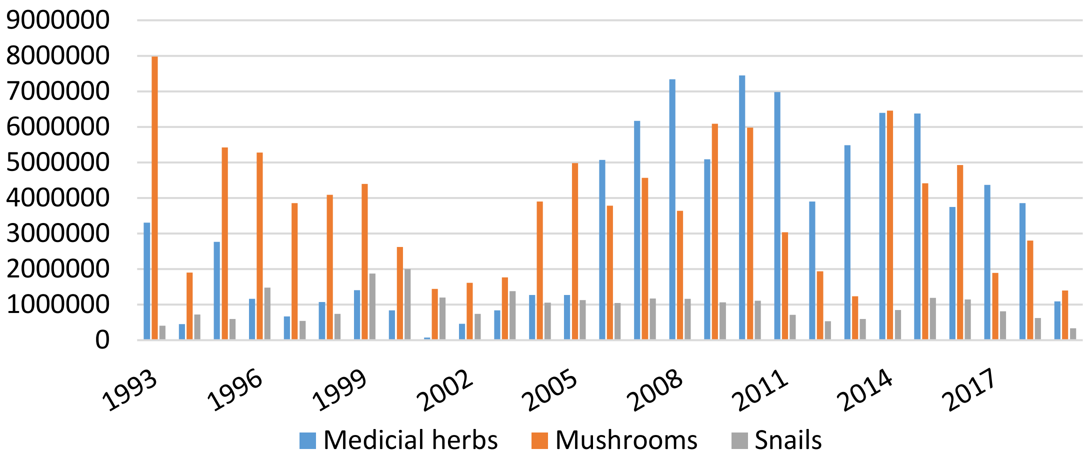


Figure 10.16. Quantities of collected wild species in the Republic of Serbia

Medicinal herbs and mushrooms are traditionally collected in south-eastern, central and western parts of Serbia, while snails are traditionally collected in northern Serbia (Figures 10.17, 10.18 and 10.19).

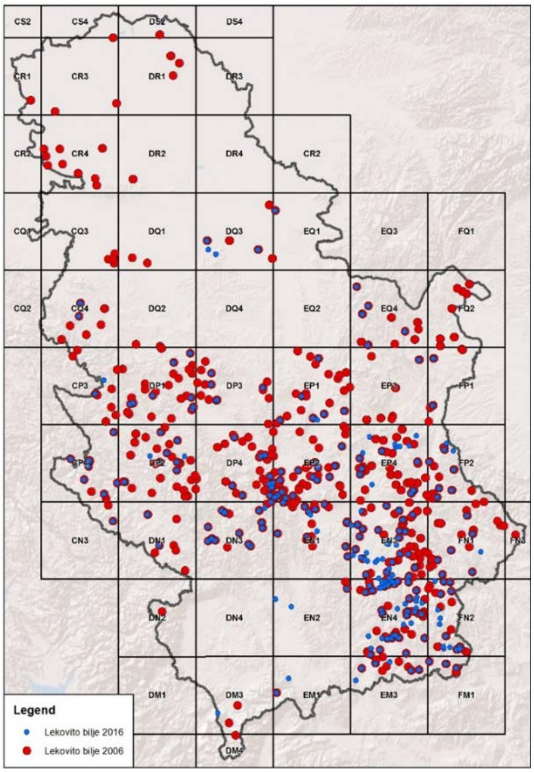


Figure 10.17. Purchase stations for all species of medicinal herbs

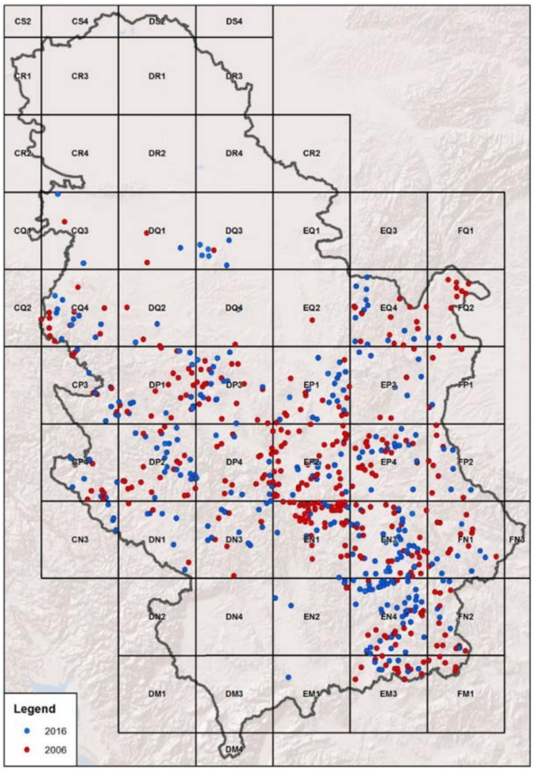


Figure 10.18. Purchase stations for mushrooms

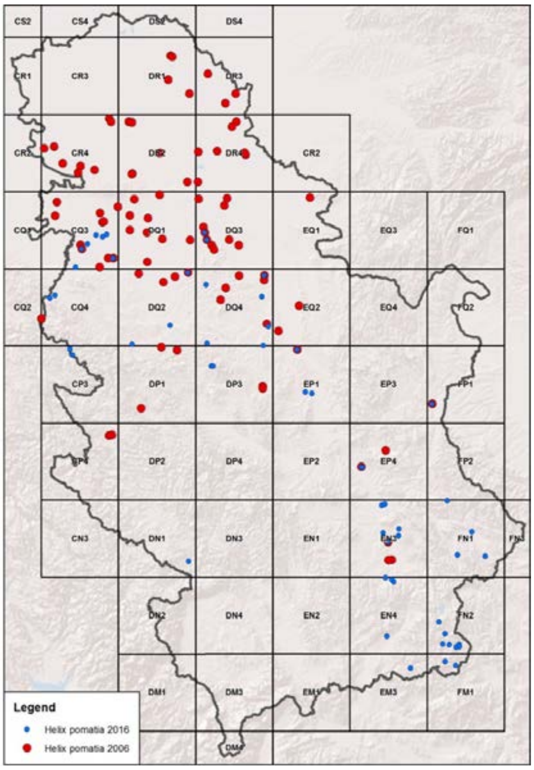


Figure 10.19. Purchase stations for vineyard snail

Source of data: Statistical Office of the Republic of Serbia

11. ECONOMIC AND SOCIAL POTENTIALS AND ACTIVITIES

11.1. INDUSTRY

11.1.1. Eco-label (R)

Key messages:

No applications for granting the right to use the eco-label were submitted in 2020, so there are still two companies entitled to apply this label for 323 products.

The European eco-label is a voluntary label, which promotes products with less negative environmental impact than other, similar products on the market. It helps to identify products and services with lower environmental impact throughout the life cycle.

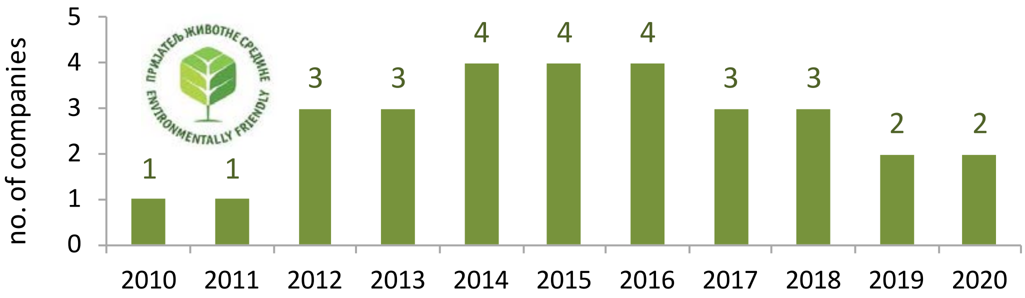


Figure 11.1. Evolution of the number of eco-labels certified companies in the Republic of Serbia

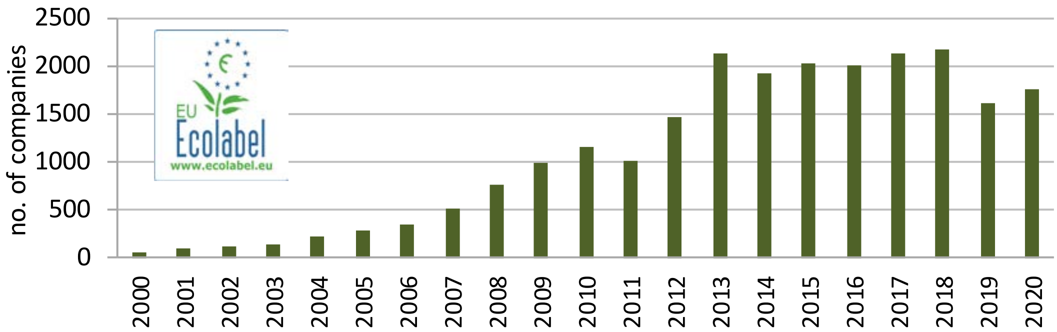


Figure 11.2. Evolution of the number of eco-label certified companies in the European Union

The Ministry of Environmental Protection issued five decisions on granting the right to use the eco-label of the Republic of Serbia in 2019, and 323 products from two companies are entitled to use the national environmental protection label. In 2020, all the mentioned products retained the right to use the eco-label, and there were no new applications for granting the right to use the eco-label (Figure 11.1).

In the European Union, certificates were awarded to 1,757 companies (Figure 11.2) in 2020, and to 75,796 products (goods and services) available on the market. According to the European Commission, there are significant differences between the EU Member States in the number of certificates issued (Figure 11.3), as well as in the number of certified products (Figure 11.4).

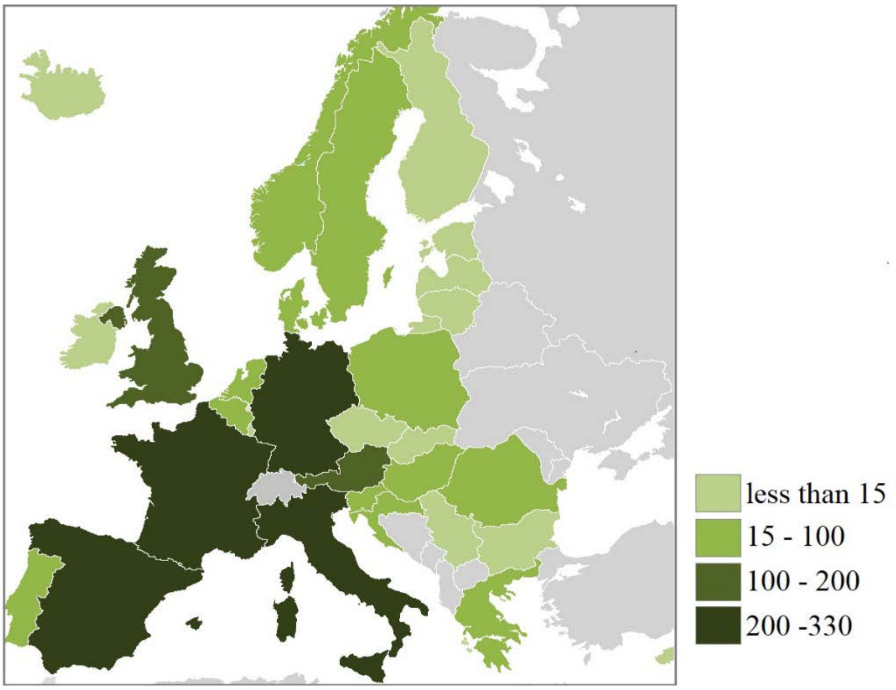


Figure 11.3. Distribution of eco-label certified companies in the EU and in the Republic of Serbia in 2020

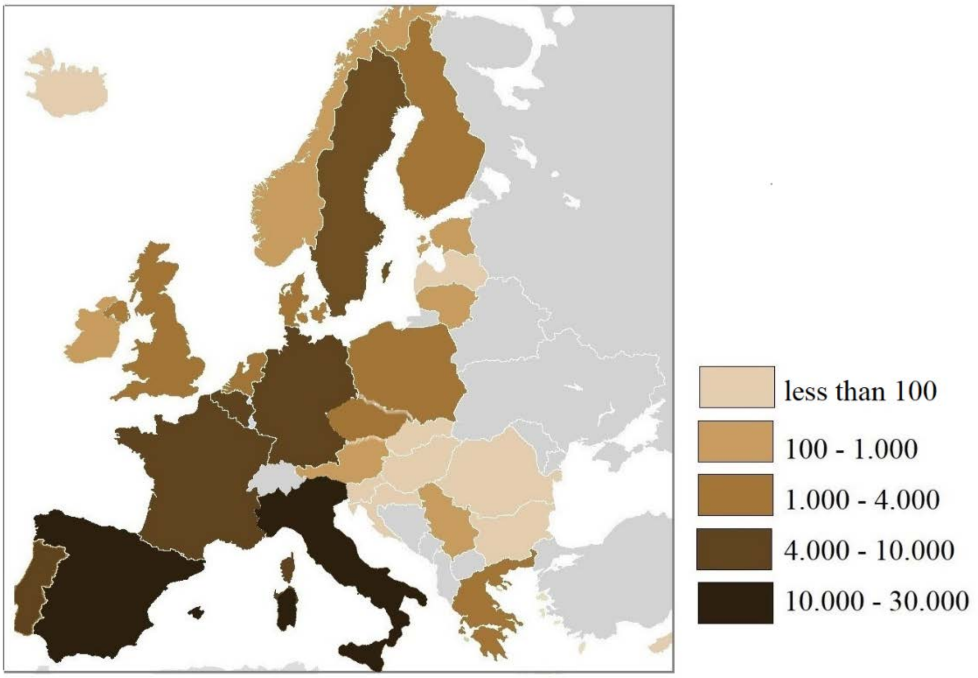


Figure 11.4. Distribution of products with eco-label licenses in the EU and in the Republic of Serbia in 2020

Source of data: Ministry of Environmental Protection, European Commission web page

11.1.2. Number of companies with ISO 14001 certificates (R)

Key messages:

1) in 2019, there were 1,275 companies that held valid ISO (International Organisation for Standardization) 14001 certificates;

2) a significant increase in the number of organisations in the Republic of Serbia that hold ISO 14001 certificates indicates that companies are increasingly engaged in environmental management.

The International Standard ISO 14001 and the Eco-Management and Audit Scheme (hereinafter referred to as: EMAS) standard of the European Union are the two most recognisable and widely used environmental management certification systems applied to both private companies and public institutions.

ISO 14001 defines the requirements for the organisation in terms of environmental protection and pertains to management systems of all processes in the organisation. ISO 14001 certification was promoted as a voluntary measure.

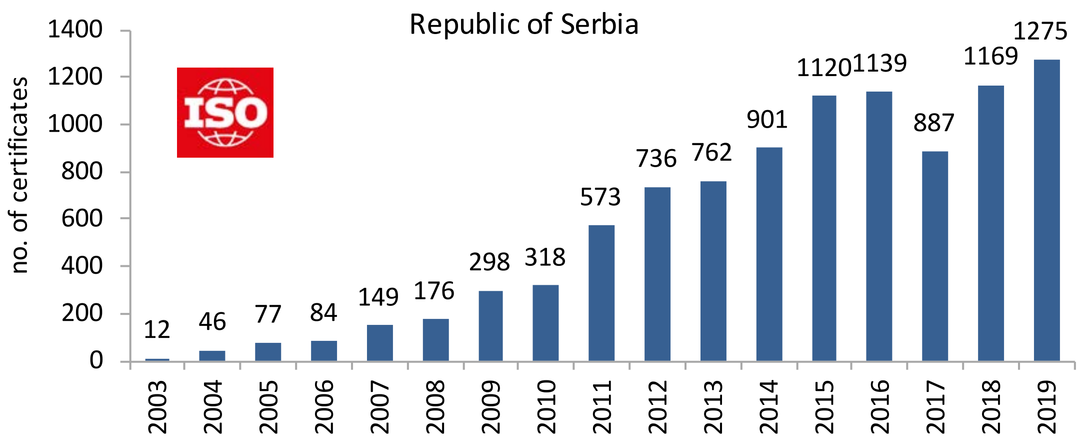


Figure 11.5. Development of the number of ISO 14001 certificates in the Republic of Serbia

According to the data of the International Organisation for Standardisation, the number of ISO 14001 certificates has a significant upward trend in the Republic of Serbia. In 2019, 1,275 companies held valid ISO 14001 certificates (Figure 11.5).

This trend indicates that Serbian companies are increasingly involved in environmental management. Moreover, the introduction of environmental management system is important for companies from economic point of view. On the one hand, they strengthen their competitive position in exports, and on the other, their production is cheaper in the overall balance, because they use raw materials and energy more efficiently, and by reducing emissions and waste generation, the amount of fees for environmental pollution is lower.

According to the International Organisation for Standardisation, there were a total of 102,372 certificates in Europe in 2019 (Figure 11.6), and in the period 2000-2019, the growth in the number of ISO 14001 certificates was slower than in the Republic of Serbia. However, it should be emphasised that there are significant differences between countries in the number of issued certificates according to ISO 14001 (Figure 11.7).

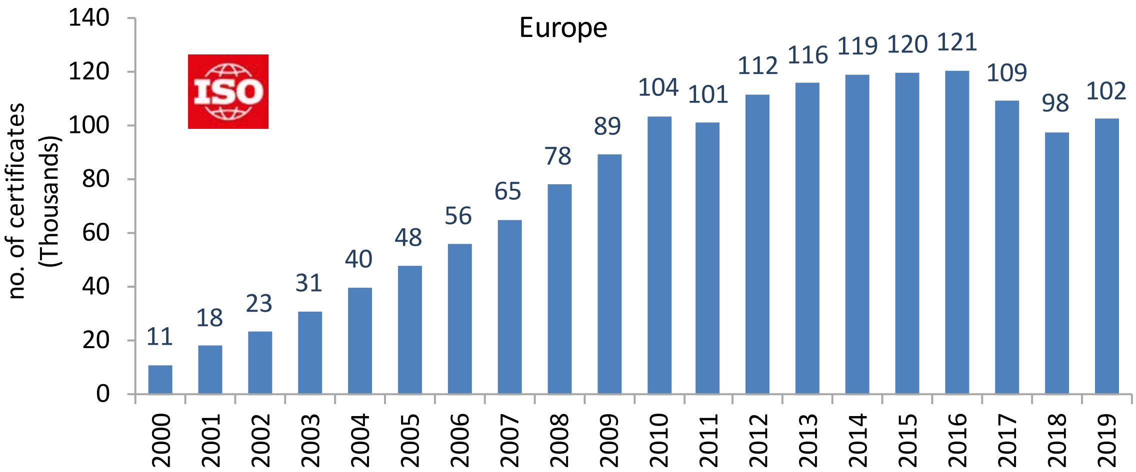


Figure 11.6. Evolution of the number of ISO 14001 certificates in Europe

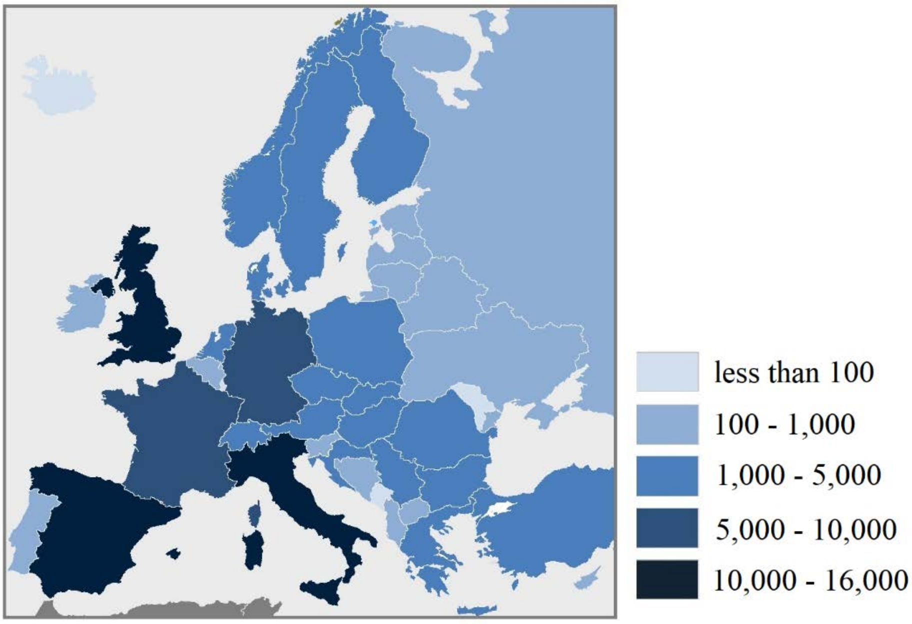


Figure 11.7. Distribution of ISO 14001 certificates in 2019 in Europe

Source of data: ISO Survey 2019 results, accessed on 27 April 2021

11.1.3. Number of companies with EMAS certificates (R)

Key messages:

No registration in the Eco-Management and Audit Scheme (hereinafter: EMAS) was recorded in the Republic of Serbia in 2020.

EMAS is a voluntary environmental management programme, which allows organisations to register their environmental management system in accordance with the relevant Regulation of the European Parliament and the Council. EMAS is fully compatible with ISO 14001, but it goes beyond in its requirements to improve performance.

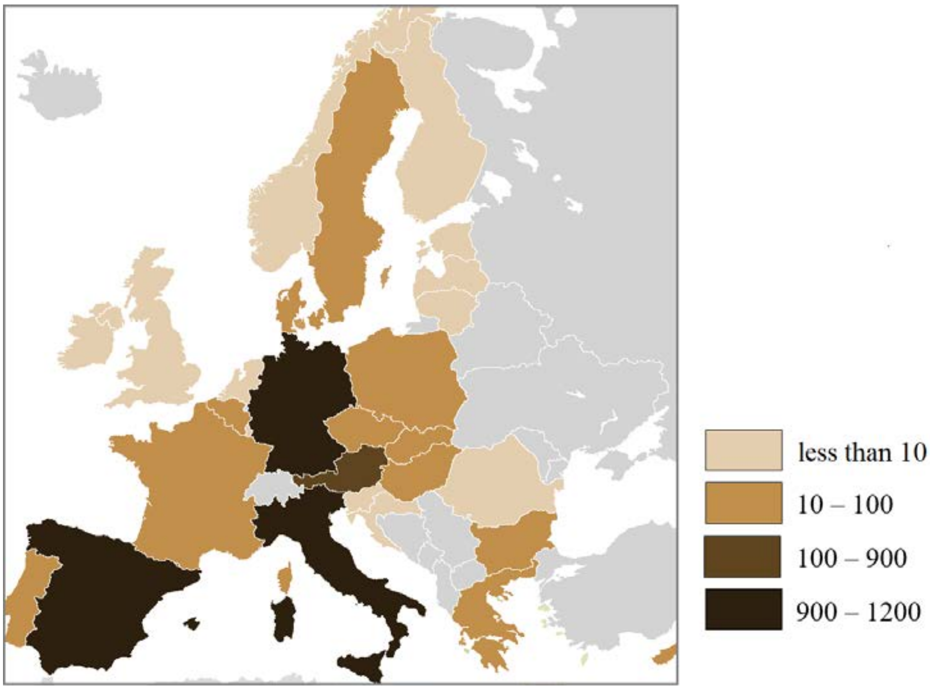


Figure 11.8. Distribution of companies with EMAS certificates in the European Union in 2020

The position of the European Commission regarding the EMAS registration of companies operating outside the European Union is such that registration can be completed only by the competent authority of certain EU Member States. The competent authority of the “third country”, in this case of the Republic of Serbia, may in the process of EMAS registration, at the company’s request, issue a “Certificate of data for which official records are maintained in the area of environmental protection to include legal entity, entrepreneur, organisation and other legal entity with established environmental management system in the EMAS system”.

In 2020, as in previous years, there was no a single application submitted for EMAS registration in the Republic of Serbia.

According to the European Commission, the number of organisations that have obtained ISO 14001 certificate is by far higher than the number of organisations registered under EMAS, which is conditioned by several reasons. Obtaining EMAS registration is more demanding than ISO 14001 certification, and ISO 14001 can be more widely recognised than EMAS in non-European markets.

It should also be noted that there are large differences between countries in terms of EMAS certification. Out of approximately 3,700 registered organisations, approximately 3,000 are located in only three countries: the Federal Republic of Germany, the Kingdom of Spain, and the Republic of Italy (Figure 11.8).

Source of data: Ministry of Environmental Protection; European Commission website, accessed on 6 May 2021.

11.1.4. Activities related to cleaner production (R)

Key messages:

A total of 94 companies participated in the Cleaner Production Programme in the period 2006-2017, a total of 94 companies participated;

The “Programme for the introduction of cleaner production in the Republic of Serbia with the Action Plan for the period 2021-2023” is in the adoption procedure.

Cleaner production means more efficient use of raw materials and energy, reduction of emissions and waste generation. Cleaner production is a preventive strategy for environmental protection that is applied to processes, products and services in order to:

1) Increase overall efficiency and productivity;

2) Improve business opportunities;

3) Reduce risks to human health and the environment.

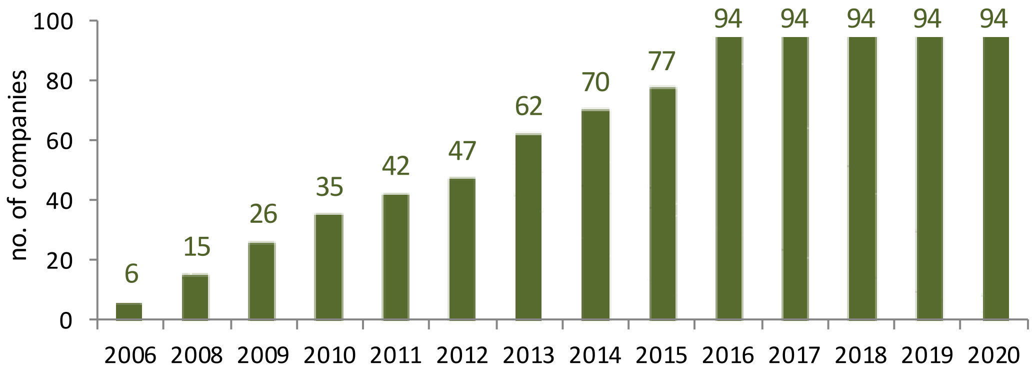


Figure 11.9. Number of companies that introduced cleaner production in the Republic of Serbia

The concept of cleaner production is an inseparable part of the created planning system of the Republic of Serbia in the area of environmental protection, since 2009, when the Government adopted the Strategy for the Introduction of Cleaner Production in the Republic of Serbia (“Official Gazette of RS”, No. 17/09). The Strategy elaborates sustainable development concept by encouraging the application of cleaner production.

In the period 2006-2017, the Cleaner Production Centre implemented with the support of the Ministry of Environmental Protection the Action Plan of the Strategy for the Introduction of Cleaner Production in the Republic of Serbia. There were 94 companies with about 50,000 employees that participated in the Cleaner Production Programme, and 70 national experts were trained (Figure 11.9).

In 2018, the Ministry prepared a new Strategy for the Introduction of Cleaner Production in the Republic of Serbia for the period 2019-2021, which was renamed into to “Programme for the Introduction of Cleaner Production in the Republic of Serbia for the period with the Action Plan”. The document has been updated twice so far – for the period 2020-2022, and for the period 2021-2023. The Programme is currently in the approval procedure, in order to re-send it to competent authorities and organisations for the provision of opinion.

Source of data: Ministry of Environmental Protection.

11.2. ENERGY

11.2.1. Total primary energy consumption per fuel type (DF)

Key messages:

1) in 2020, primary energy consumption amounted to 14.87 million tonnes of oil equivalent (Mtoe), and compared to 2019, it decreased by 2.5%;

2) the share of fossil fuels dominates in the structure of consumption of primary energy with 86.6%, and the share of renewable energy sources is 13.4%.

The indicator shows data on total (gross) primary energy consumption, as well as on primary energy consumption by fuels. The level, development and structure of primary energy consumption give an indication of the extent to which pressures on the environment caused by energy production and consumption are reduced or increased.The primary energy system includes domestic production and net imports of primary energy.

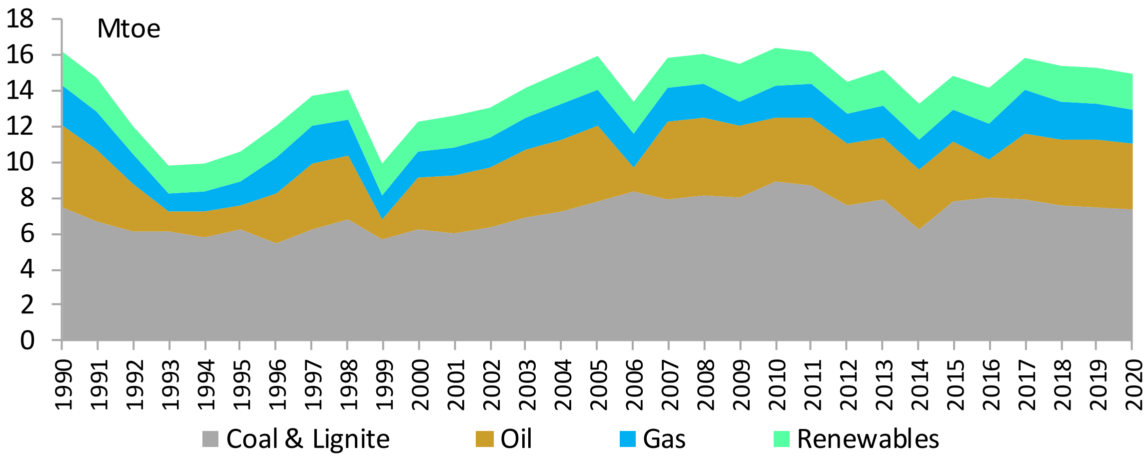


Figure 11.10. Primary energy consumption by fuels in the Republic of Serbia

Primary energy consumption in the Republic of Serbia is characterised by obvious oscillations that are a consequence of changes in the intensity of economic activities. In 2020, energy consumption amounted to 14.87 Mtoe, and compared to 2019, it decreased by 2.5% (Figure 11.10).

The structure of primary energy consumption is constantly dominated by fossil fuels, which in 2020 had a share of 86.6%. Consumption of coal and lignite was 7.34 Mtoe, oil 3.64 Mtoe, and natural gas 1.98 Mtoe. Consumption of renewable energy sources in 2020 was 2.01 Mtoe, with a share in primary energy consumption of 13.4% (Figure 11.11).

For comparison, in the European Union, primary energy consumption decreased by 3.6% in the period 2000-2019, which was a result of a decrease in consumption of coal by 27.8%, oil by 12.5% and nuclear energy by 13.6%. Consumption of renewable energy sources increased by 37%, which is encouraged by national and European policies to promote the use of renewable energy sources, obligations of electricity producers and obligations to use renewable energy sources as transport fuels. The structure of primary energy consumption in the EU-28 is dominated by fossil fuels, which in 2019 participated with 70.3%. The share of nuclear energy was 13.5%, and 16.1% of renewable energy sources (Figure 11.12).

Note: All data for 2020 have been estimated.

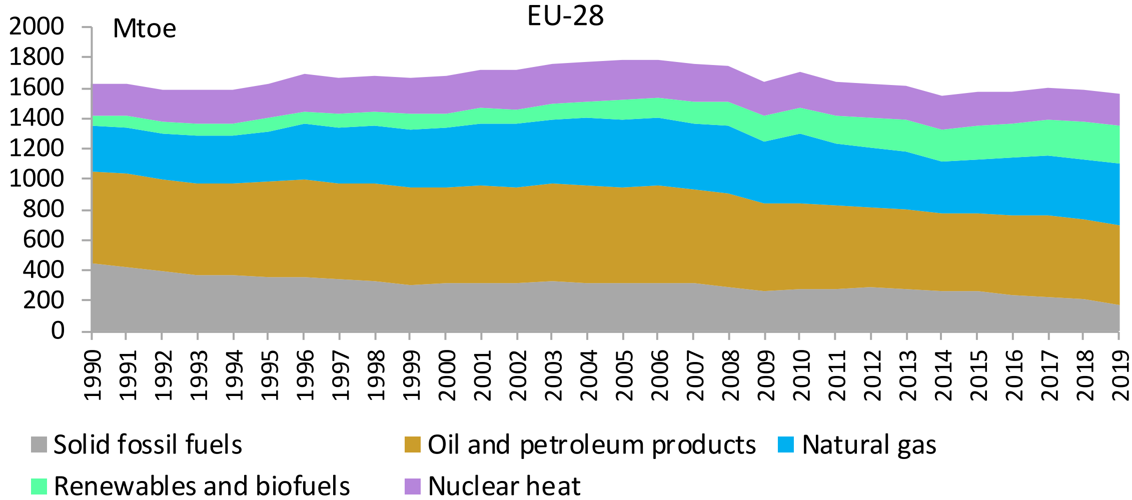


Figure 11.11. Primary energy consumption by fuels in the EU-28

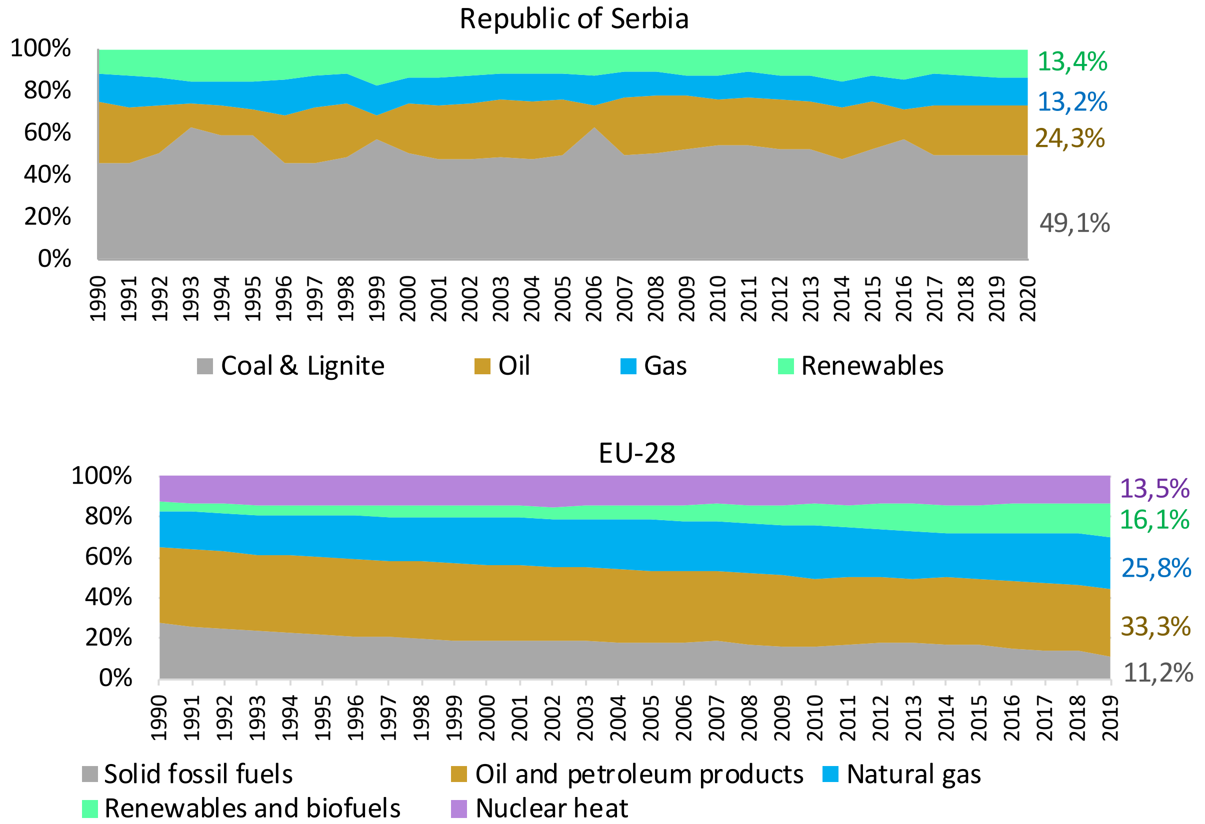


Figure 11.12. Structure of primary energy consumption by fuels in the Republic of Serbia and the EU-28

Source of data: Ministry of Mining and Energy; Energy Balance of the Republic of Serbia for 2021 (“Official Gazette of RS”, No. 156/20); Eurostat website, accessed on 26 April 2021

11.2.2. Total final energy consumption per sectors (DF)

Key messages:

1) final energy consumption in 2020 amounted to 8.30 Mtoe, and slightly decreased compared to the previous year;

2) households had the largest share in the structure of consumption with 35.7%, followed by industry 26.4% and transport 25.6%, while the share of agriculture was 1.9% and other consumers 10.4%.

The indicator monitors the progress made in reducing final energy consumption (FEC) in different sectors (final consumers). The final energy consumption for energy purposes is the sum of final energy consumption in all sectors.

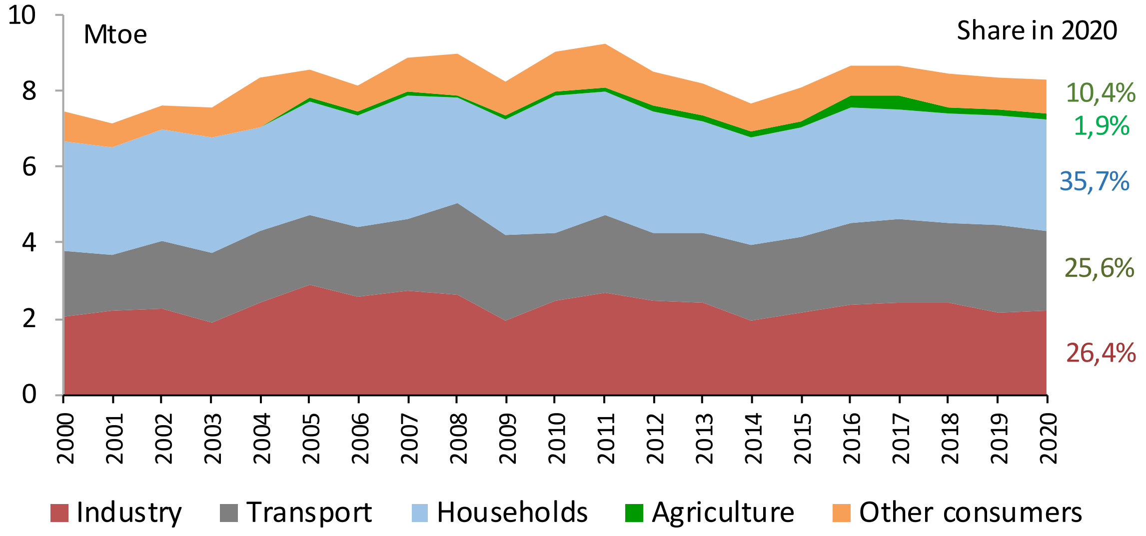


Figure 11.13. Final energy consumption by sectors in the Republic of Serbia

The consumption of final energy for energy purposes amounted to 8.30 Mtoe (million tonnes of oil equivalent) in 2020. Disaggregated by sectors, most energy was consumed in the household sector 35.7%, followed by industry 26.4% and transport 25.6%, while agriculture and public and communal services and other consumers (PCSOC) participated with 1.9% and 10.4% (Figure 11.13).

Compared to 2019, the final energy consumption decreased slightly by 0.08 Mtoe, while it increased by 0.82 Mtoe compared to 2000 (Figure 11.14).

In the observed period, oscillations in energy consumption were visible in the industrial sector, which was conditioned by the change in the intensity of industrial production. Transport recorded increase in the consumption of petroleum products, which is a consequence of the increase in the number of vehicles and greater mobility of population. The consumption of electricity and biomass (firewood) dominates in the household sector. The PCSOC is characterised by a significant change in the structure of energy sources, i.e., the consumption of coal and oil had decreased, and the use of electricity increased, while the consumption of oil dominated in agriculture (Figure 11.15).

Note: All data for 2020 have been estimated.

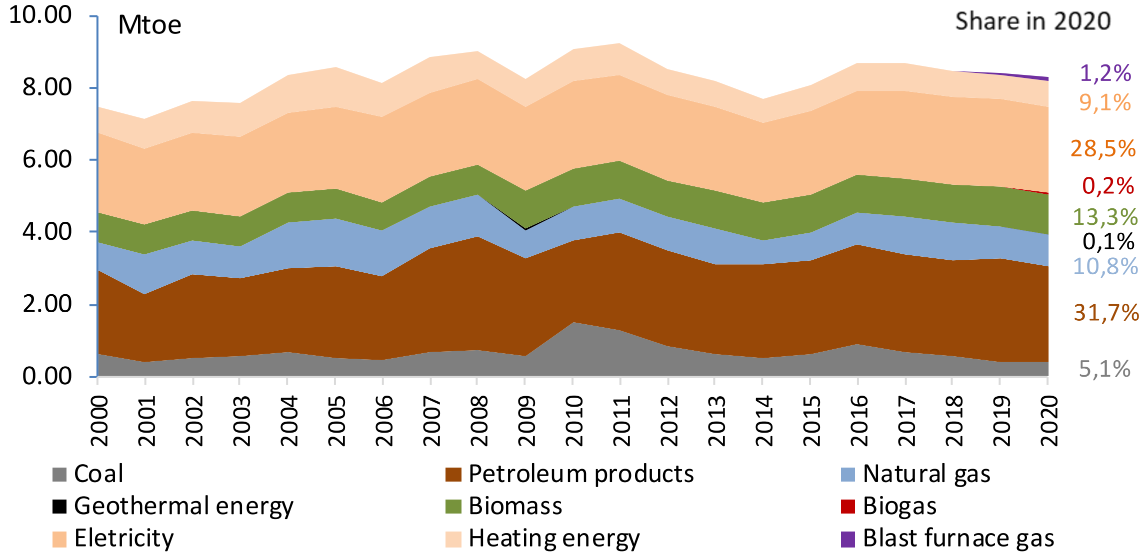


Figure 11.14. Final energy consumption by fuels in total in the Republic of Serbia

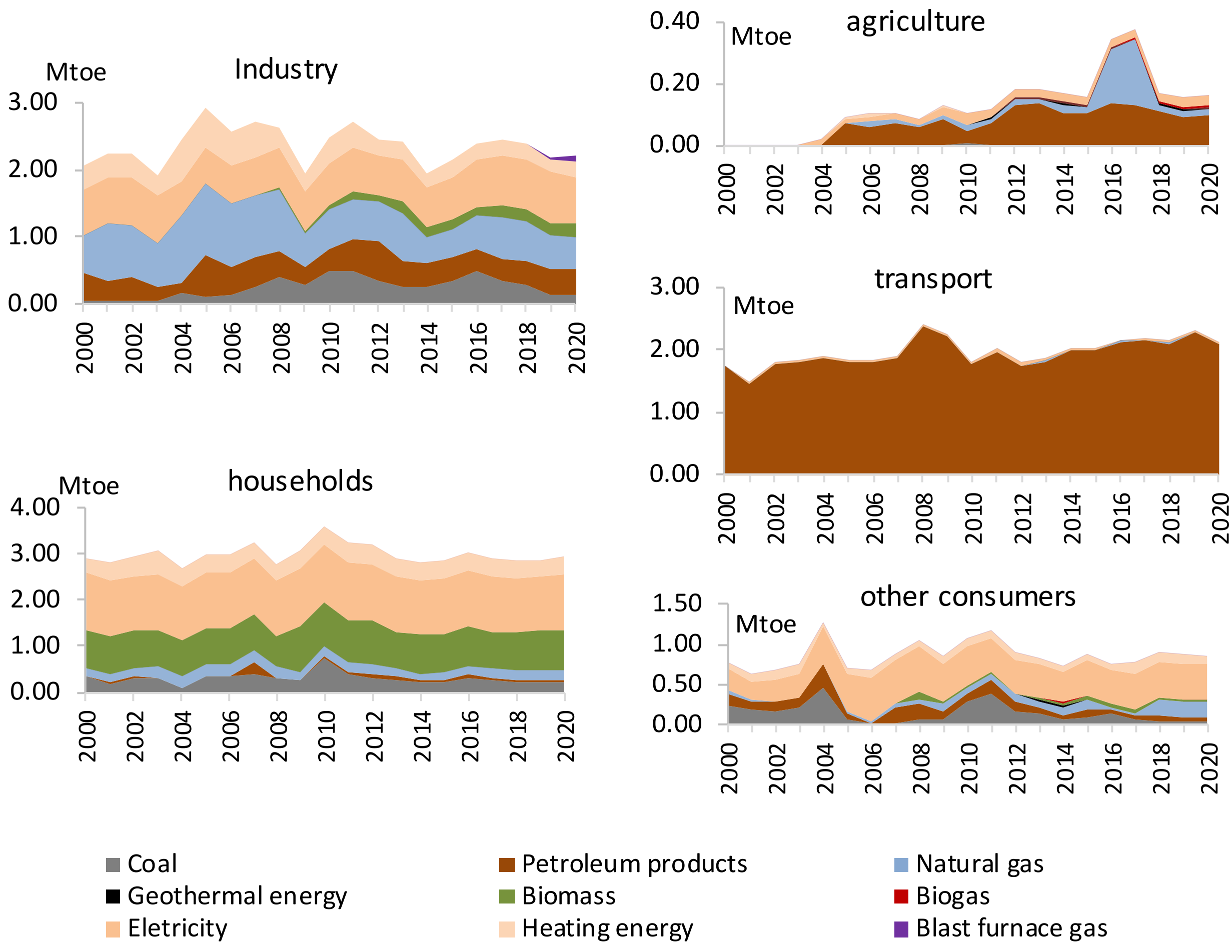


Figure 11.15. Final energy consumption by fuels in sectors in the Republic of Serbia

Source of data: Ministry of Mining and Energy, Energy Balance of the Republic of Serbia for 2021 (Official Gazette of RS, No. 156/20)

11.2.4. Share of renewable energy in gross final energy consumption (R)

Key messages:

1) the share of renewable energy sources in the gross final energy consumption in 2019 amounted to 21.44%;

2) renewable energy accounted for 30.11% of electricity consumption, 26.65% of energy consumption for heating and cooling, and 1.14% of fuel consumption in traffic.

According to the Directive on the Promotion of the Use of Renewable Energy Sources – 2009/28/EC (a piece of legislation of the European Union mandatory for implementation in accordance with the Treaty Establishing the Energy Community, "Official Gazette of RS" No. 62/06)), the share of renewable energy sources (RES) in gross final energy consumption (hereinafter: GFEC) is monitored through the share of RES in the following energy consumption sectors: electricity, heating and cooling, and transport. The gross final energy consumption is the total final energy consumed for the energy purposes of final consumers, including own electricity and heating energy consumption in the electricity and heating energy generation sector and losses in the transmission and distribution of electricity and heating energy.

Based on Directive 2009/28/EC, and pursuant to the Decision of the Ministerial Council of the Energy Community from 2012 (D/2012/04/MS-EnC), a binding target for the Republic of Serbia was set at 27% RES in gross final energy consumption in 2020, and the share of RES in the transport sector should be 10%.

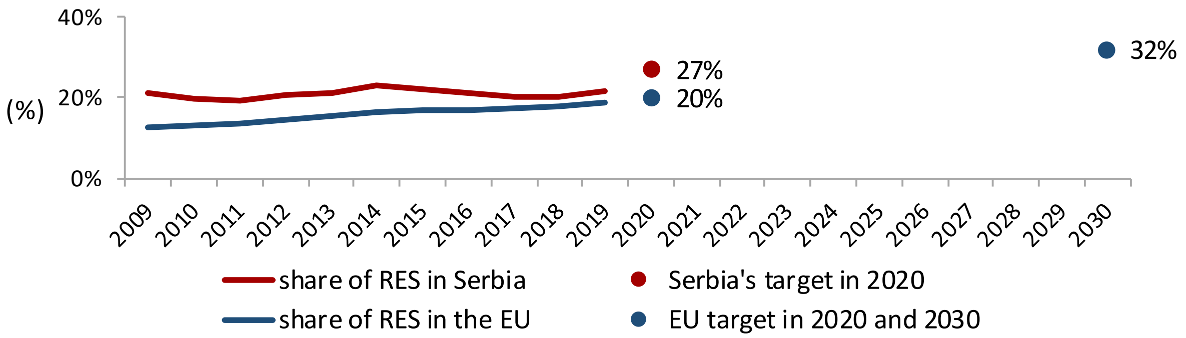


Figure 11.16. Results achieved by 2019 and goals for 2020 for the Republic of Serbia and EU-28

As a part of the system of incentive measures to increase the share of RES in the Republic of Serbia, the construction of power plants using RES is financed, so that 248 power plants with a total capacity of 432.3 MW were built by 2019, and 266 with a total capacity of 514.6 MW by 2020.

According to the latest Eurostat data, the share of RES in the gross final energy consumption of the Republic of Serbia was 21.44% in 2019, the share for the EU-28 was 18.87% (Figure 11.16), but progress at the national level was quite uneven (Figure 11.18). Achieving the target of 32% by 2030 will require significant efforts by individual countries as well.

Disaggregated by consumption sectors, the share of RES in electricity consumption in the Republic of Serbia was 30.11%, in the heating and cooling sector 26.65%, and 1.14% in transport (Figure 11.17).

The estimates pertaining to greenhouse gas emissions reductions achieved through the use of energy from renewable sources are calculated in compliance with Directive 2009/28/EC the estimate for the Republic of Serbia is presented in Figure 11.19.

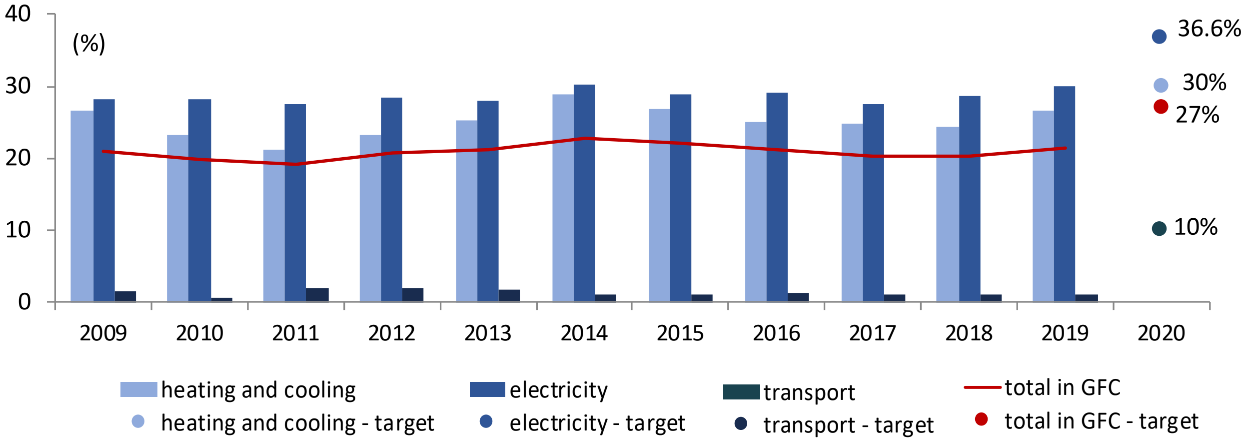


Figure 11.17. Share of RES in energy consumption by sectors and goals for 2020

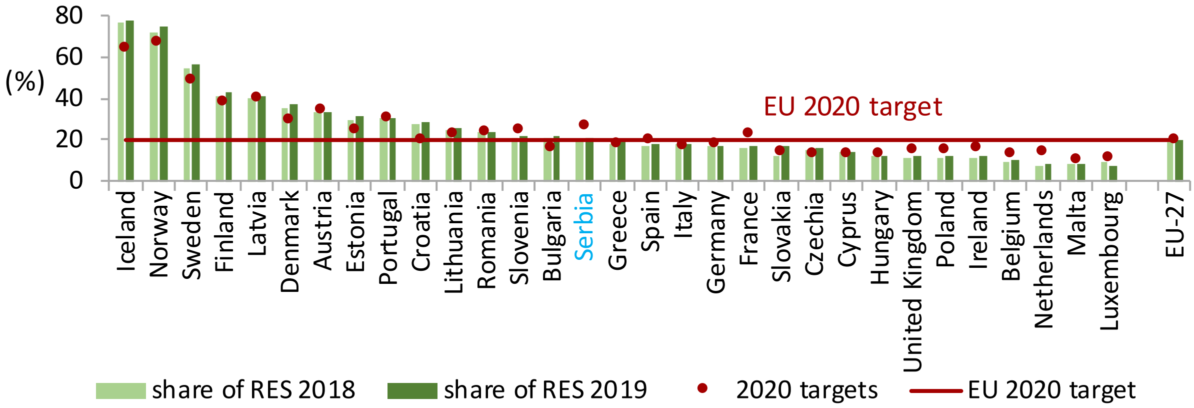


Figure 11.18. Progress towards RES targets in European countries

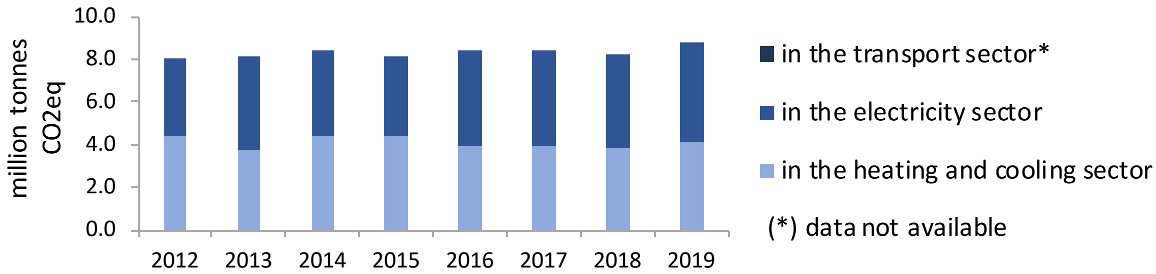


Figure 11.19. Estimated GHG emissions reductions resulting from the use of RES (million tonnes t CO_{2eq})

Source of data: Ministry of Mining and Energy; Ministry of Mining and Energy web page, accessed on 11 May 2021; Eurostat website, accessed on 11 May 2021; website of the European Environment Agency, accessed on 12 May 2021

11.3. AGRICULTURE

11.3.1. Agro-biodiversity (S)

Key messages:

1) there was an increasing trend in the number of heads of certain autochthonous breeds and stocks of domestic animals in the period 2003-2020;

2) with the increase in the number of heads, the number of sites where autochthonous breeds and stocks of domestic animals are reared also increases.

The indicator presents the genetic diversity of species and the distribution of certain indigenous breeds and stocks of domestic animals.

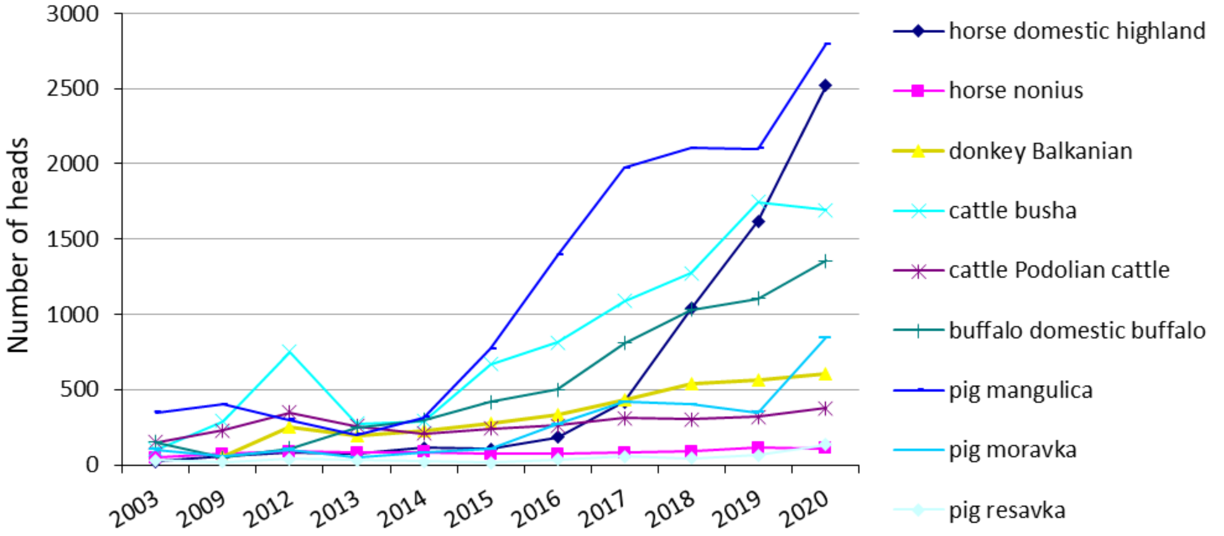


Figure 11.20. Overview of number of heads of certain autochthonic breeds and stocks of domestic animals in the period 2003-2020

Autochthonic breeds of domestic animals are very important for the conservation of agroecosystems (organic livestock, conservation of agricultural areas of high natural value, etc.).

Analysis of data from the period 2003-2020 shows an increase in the population of the largest number of autochthonous breeds and stocks of domestic animals, as well as the sites where they are reared, which is a direct result of the implementation of conservation programmes referring to animal genetic resources in the Republic of Serbia (Figures 11.20 and 11.21).

Incentives include support to a programme related to sustainable rural development in order to improve environmental protection and conservation of autochthonous breeds of domestic animals and a programme of measures for the conservation of animal genetic resources. The animal genetic resources to which these incentives pertain are species and races, i.e. stocks: Podolian cattle, Busha cattle, domestic buffalo, domestic – mountain horse, nonius, Balkan donkey, *mangulica* (black, white and red sort), *moravka* and *resavka* pigs, *pramenka* sheep (*pirotska*, *kriovirska*, *bardoka*, *lipska*, *šarplaninska, vlaško vitoroga, karakačanska*), *čokanska cigaja* sheep, Balkan goat, domestic white goat, poultry – *somborska kaporka chicken, banatski gološijan chicken, kosovski pevač chicken and svrljiška chicken.*

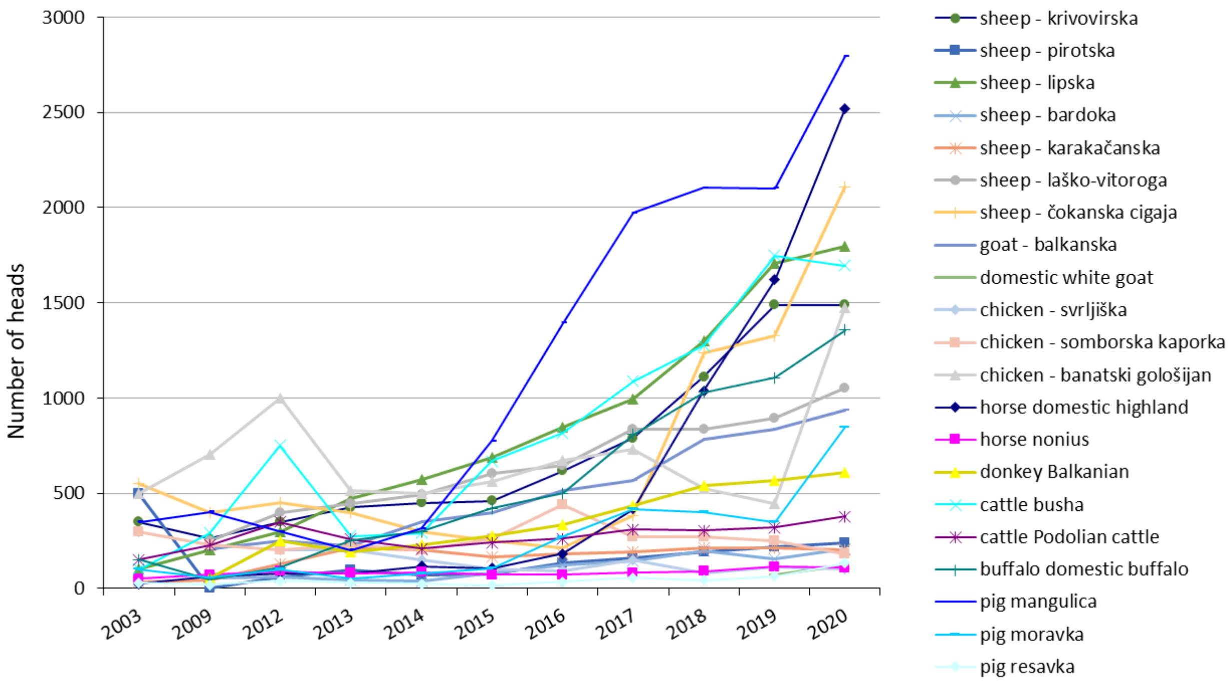


Figure 11.21. Overview of the number of heads of certain autochthonic breeds and stocks of animals in the period 2003-2020

Source of data: Ministry of Agriculture, Forestry and Water Management

11.3.2. Areas under organic production (R)

Key messages:

1) the share of the area under organic production in relation to used agricultural land was 0.61% in 2019;

2) there is an increasing trend of areas under organic production;

3) out of the total area under organic production, the most represented production refers to organic fruit, followed by cereals and industrial plants.

The indicator shows trends in the expansion of areas under organic agriculture and their share in total agricultural production.

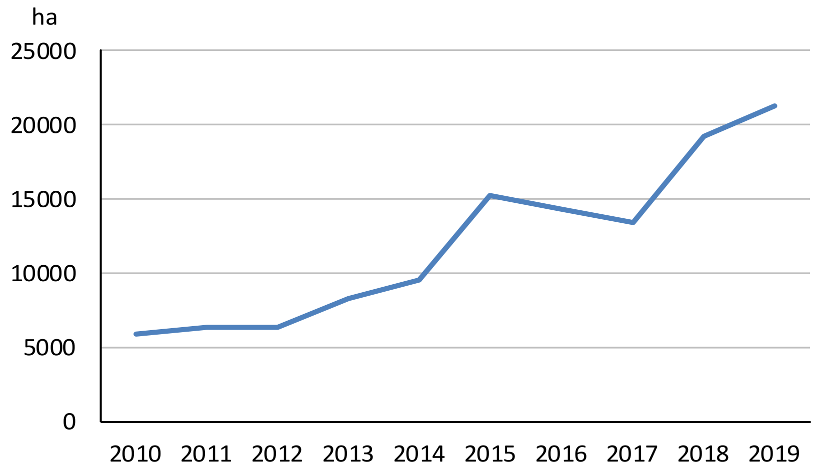


Figure 11.22. Areas on which organic farming methods were applied in the period from 2010-2019

According to the data of the Ministry of Agriculture, Forestry and Water Management, organic production methods were applied on a total of 21,265 ha in 2019, which was 10.44% more than in 2018 (Figure 11.22).

Out of this area, arable land covered 15,915 ha, including meadows and pastures on an area of 5,350 ha (Figure 11.23). In the last two years (2018-2019), a significant increase in the area under meadows and pastures can be noticed due to the development of organic livestock production.

Out of total area under organic production in 2019, the conversion period recorded 7,539 ha, while the areas in organic status amounted to 13,726 ha. The stated number of hectares does not include the areas used for the collection of organic wild berries, mushrooms and medicinal plants, given that in the Republic of Serbia there is no official methodology on the basis of which data could be obtained regarding the total area on which organic wild plant species are collected from natural habitats.

When it comes to regional view, organic production is most represented in the region of Vojvodina with 39.8%, the regions of southern and eastern Serbia with 39.7%, followed by the regions of Šumadija and western Serbia with 20.3%, and Belgrade region with 0.2%.

Out of the total arable land in 2019, fruit production was the most represented with 33.45%, followed by the production of cereals with 30.08%, then by the production of industrial plants with 13.98% and fodder plants with 11.29%. The production of medicinal and aromatic plants were represented with only 1.63%, vegetables with 1.15%, while the areas under the category of other, which include areas without crops, insulation belts, neglected land and other various crops were represented with 8.4%.

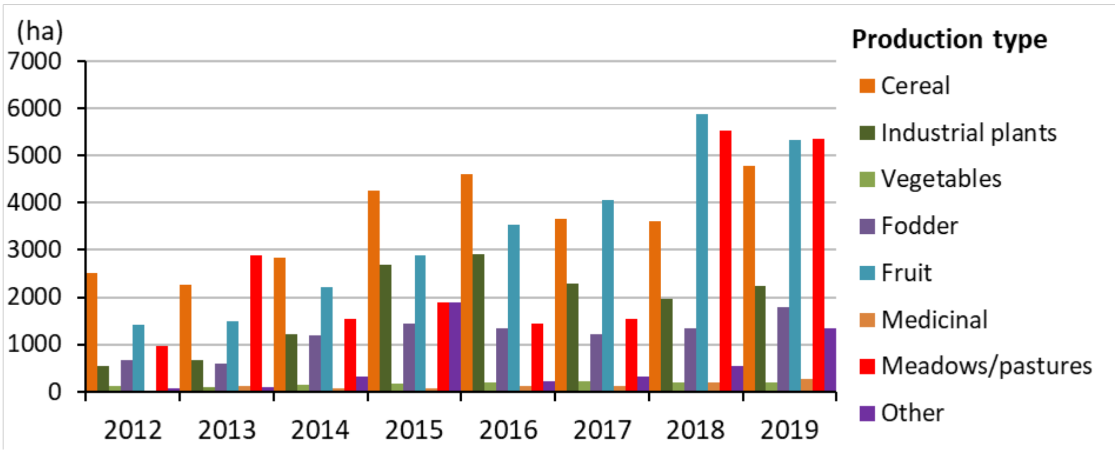


Figure 11.23. Organic plant production by production type (2012-2019)

Source of data: Ministry of Agriculture, Forestry and Water Management

11.3.3. Irrigation of agricultural areas (P)

Key messages:

1) in relation to the total used agricultural area in 2020, 1.5% of the area was irrigated;

2) a total of 69,113 thousand m^3 of water was abstracted for irrigation in 2020, which was 2.1% more than in the previous year;

3) 93.2% of water was abstracted from watercourses, while the remaining quantities were taken from groundwater, lakes, reservoirs and from the water supply network.

The indicator monitors trends in total water consumption for irrigation and irrigated areas. The indicator is calculated on the basis of analysis of data on irrigation water consumption according to irrigation method, origin of irrigation water, irrigated culture and data on annual amount of water consumed in the Republic of Serbia, as well as on analysis of irrigated areas.

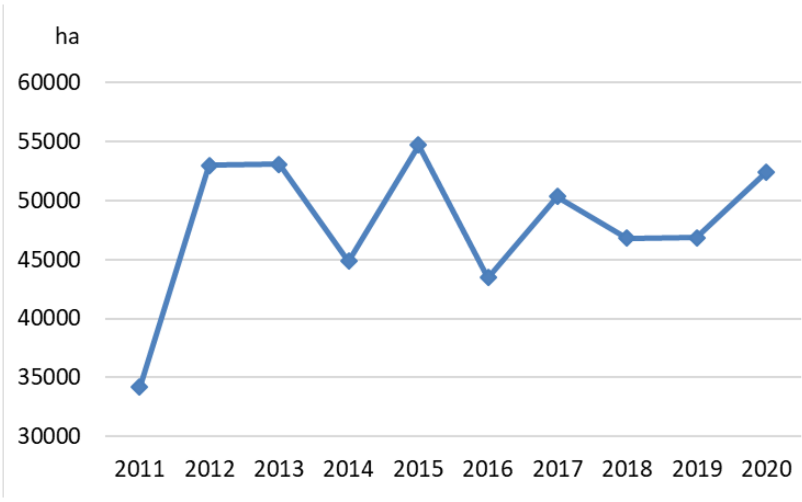


Figure 11.24. Trend of irrigation of agricultural areas in the Republic of Serbia in the period 2011-2020

During 2020, 52,441 ha of agricultural land in the Republic of Serbia were covered by irrigation, which is 11.9% more than in the previous year (Figure 11.24). Arable land and gardens (with 91.7%)

had the largest share in the total irrigated areas, followed by orchards (with 5%) and other agricultural areas (with a share of 3.3%). The most irrigated areas are located in the region of AP Vojvodina, 82%.

In 2020, a total of 69,113 thousand m^3 of water was abstracted for irrigation, which is 2.1% more than in the previous year (Figure 11.25).

The most common type of irrigation was by using sprinkling systems. Out of total irrigated area, 92.5% of the area was irrigated by sprinkling, 7.3% by dripping, and only 0.2% by surface watering.

Out of total irrigated cultures, cereals were the most irrigated (38.18%), followed by industrial plants (18.19%) and vegetables (14.24%) (Figure 11.26).

The survey on irrigation includes business entities and agricultural cooperatives involved in agricultural production and agricultural services and/or in irrigation system management.

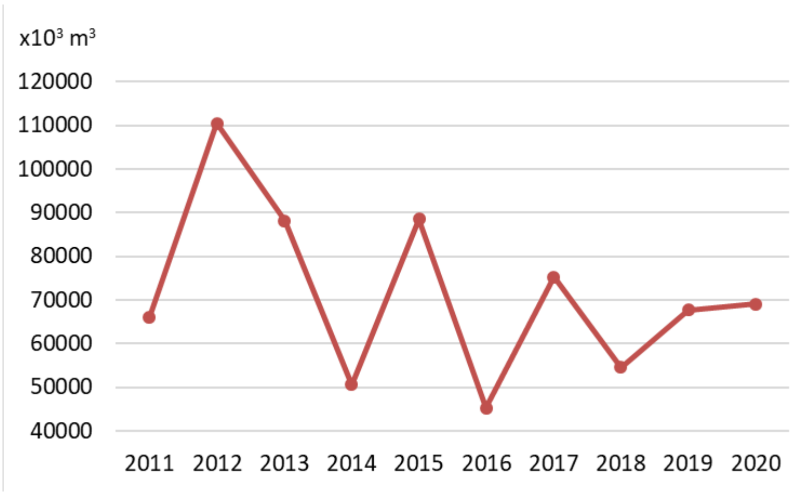


Figure 11.25. Abstracted water used for irrigation of agricultural land in the Republic of Serbia (thousands of m^3)

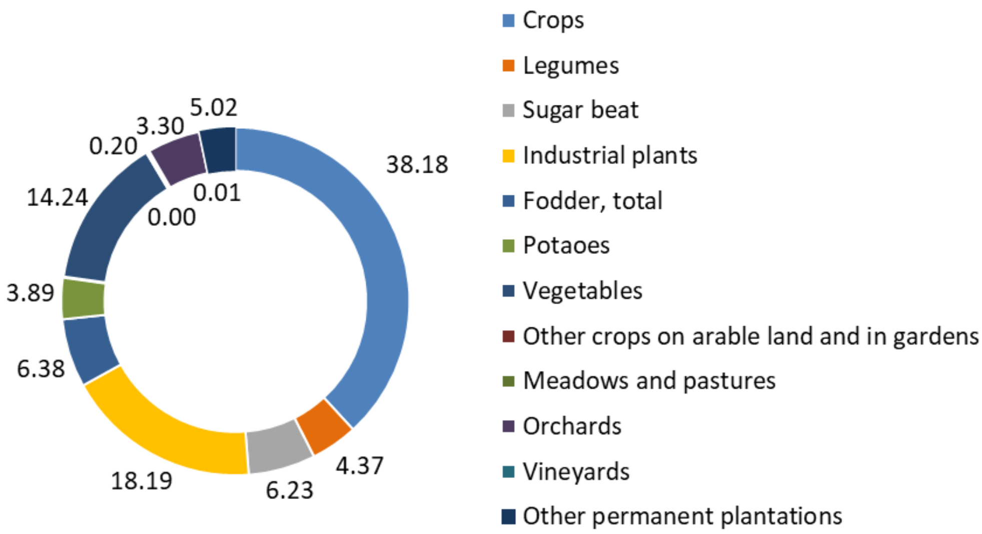


Figure 11.26. Percentage of irrigated areas under agricultural crops and permanent plantations

Source of data: Statistical Office of the Republic of Serbia

11.3.4. Use of land for agricultural production (P)

Key messages:

1) out of total used agricultural land, the largest area is under arable land and gardens, share of which is 74.32%;

2) in the category of arable land and gardens, the largest areas are covered by cereals 66.83% and industrial plants with 18.88%.

The indicator shows trends in the use of agricultural land.

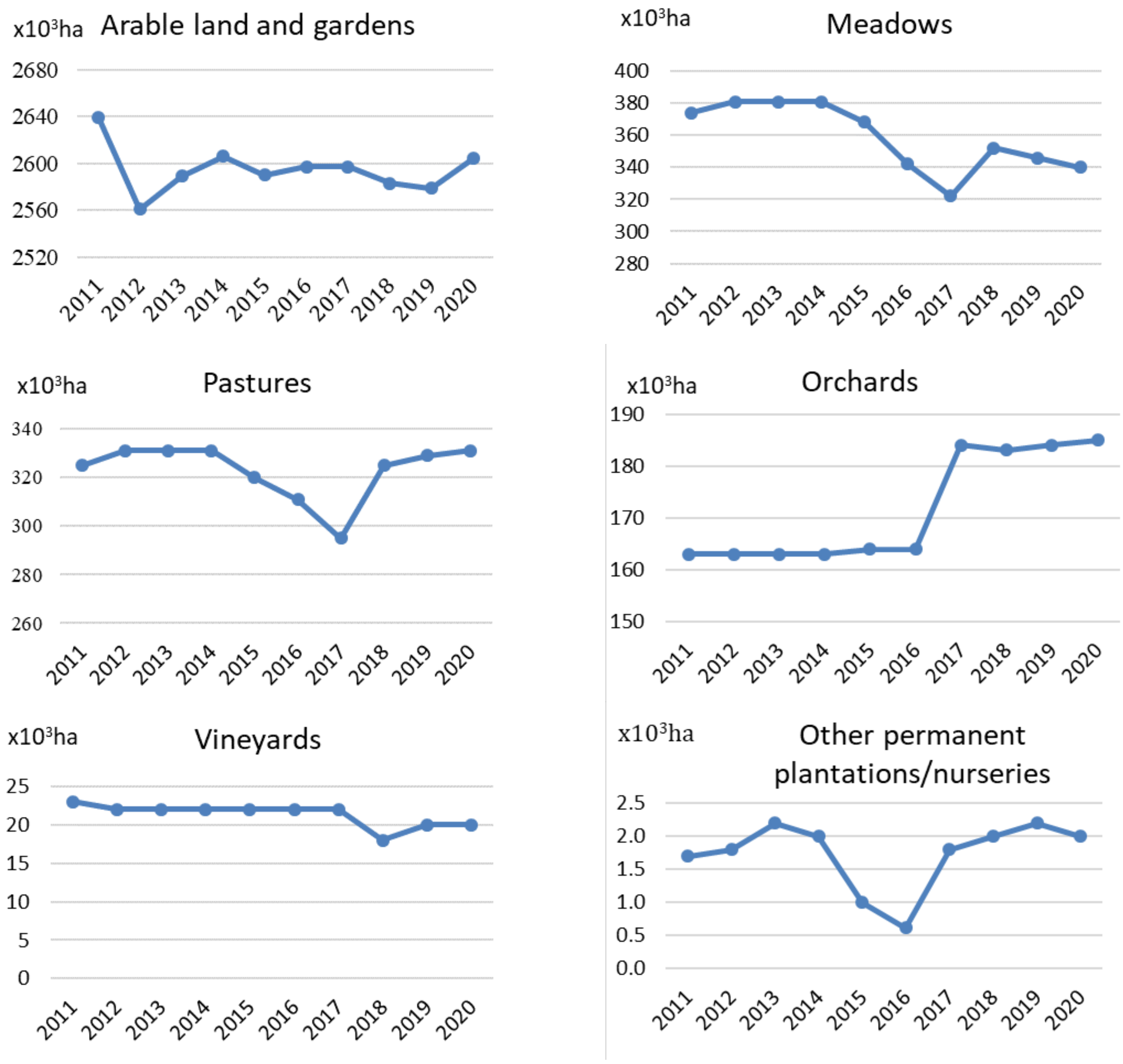


Figure 11.27. Agricultural areas in 2020

According to data of the Statistical Office of the Republic of Serbia for 2020, the used agricultural land in the Republic of Serbia covers 3,504,290 ha, which represents 45.16% of the country’s territory.

Monitoring the structure of used agricultural land in 2020 indicates that the largest share belongs to arable land and gardens with 2,604,295 ha. Meadows and pastures occupy a total of 671,774 ha, or 19.17%, orchards 185,418 ha or 5.29%, vineyards 19,840 ha or 0.57%, other permanent plantations and nurseries occupy 2,245 ha, while backyards occupy 20,718 ha. Compared to 2019, there was an increase in the area under arable land and gardens, pastures and orchards (Figure 11.27).

Monitoring the structure of arable land shows that the largest share is recorded for cereals with 1,740,456 ha or 66.83%, and industrial plants with 491,776 ha or 18.88%.

Source of data: Statistical Office of the Republic of Serbia

11.4. TOURISM

11.4.1. Total touristic circulation (P)

Key messages:

Touristic business in the Republic of Serbia does not endanger the quality of the environment to a greater extent.

This indicator (number of arrivals and number of overnight stays, as well as the ratio of the number of tourist nights and the number of beds) monitors the touristic circulation in the Republic of Serbia, and thus the potential pressures on the environment.

Arrivals include the number of tourists staying in the accommodation facilities, and overnight stays include the number of overnight stays made by tourists in the accommodation facilities during the calendar year.

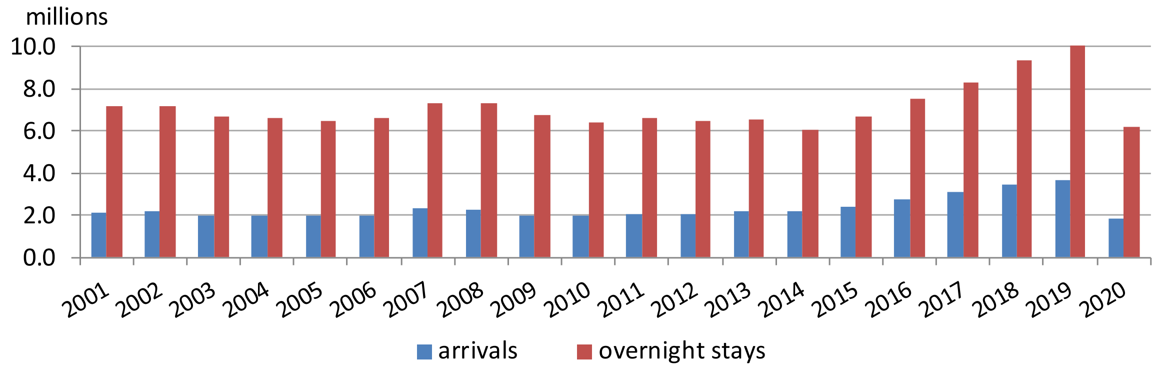


Figure 11.28. Arrivals and overnight stays in the period 2001-2020

Environmental protection and conservation are essential segments for the sustainable development of tourism, so in the Tourism Development Strategy of the Republic of Serbia for the period from 2016 to 2025 ("Official Gazette of RS", No. 98/16), special attention is paid to maintaining quality environment. Bearing in mind that the negative impacts of tourism on the environment are reflected, above all, on natural resources and biodiversity, the mentioned document envisaged the introduction of valorisation and monitoring of protected areas.

Although the Republic of Serbia is not a destination for mass tourism, in the period between 2014 and 2019, touristic activities recorded a stable increase. However, this positive trend did not continue in 2020, when, as a consequence of the pandemic caused by the coronavirus, flights were banned, cancellation of accommodation bookings and the general decline in the activity of the touristic sector.

In 2020, the total number of tourist arrivals amounted to 1,820,021 (a decrease of 50.7% compared to 2019), and 6,201,290 tourist overnight stays were made (a decrease of 38.4% compared to 2019) (Figure 11.28).

The ratio of the number of available beds and overnight stays represents the touristic bed occupancy rate. According to the data of the Statistical Office of the Republic of Serbia, the number of beds had decreased by 1.5% compared to 2019, which indicates that the pressure of construction and infrastructure facilities on the environment was slightly reduced in 2020 (Figure 11.29).

The monthly analysis of the total number of arrivals and the total number of overnight stays indicates that the highest circulation was in the summer months, which means that the greatest pressure on the environment is in that period (Figure 11.30).

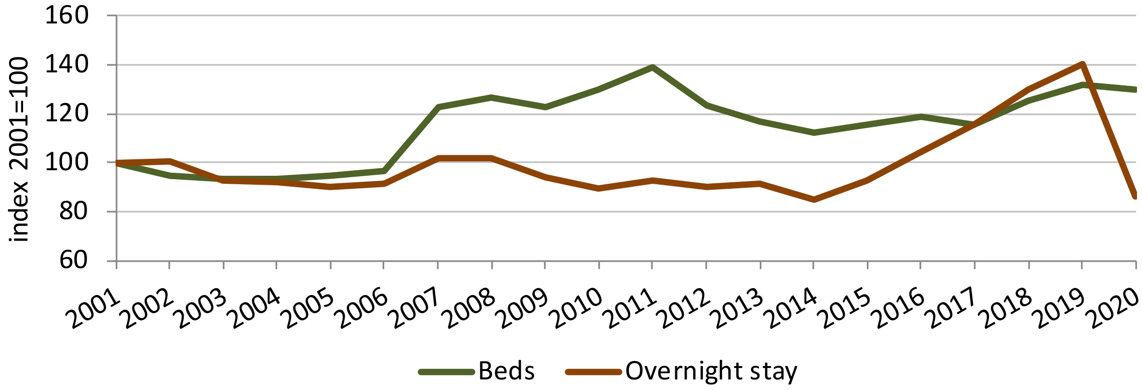


Figure 11.29. Number of available beds and number of overnight stays in the period 2001 – 2020 (index 2001=100)

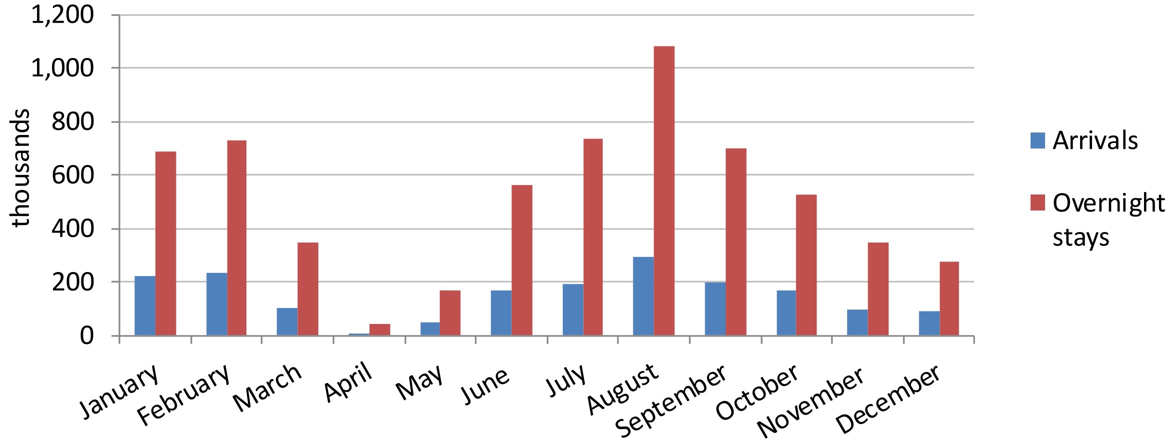


Figure 11.30. Time schedule (by months) of arrivals and overnight stays in 2020

Source of data: Ministry of Trade, Tourism and Telecommunications, Statistical Office of the Republic of Serbia

11.4.2. Touristic circulation per type of touristic destinations (P)

Key messages:

Valorisation of protected areas has been introduced into the touristic activity segment.

The indicator shows the arrivals and overnight stays of tourists, through the time schedule and spatial distribution, according to the types of touristic destinations in the Republic of Serbia, in order to monitor potential pressures on the environment.

According to the established criteria, destinations are classified into five categories: administrative centres, spas, mountain resorts, other touristic resorts and other resorts.

Figure 11.31. Share of the number of arrivals and overnight stay by touristic destinations in 2020

Measured by the number of arrivals, tourists were most numerous in spa resorts with 522,947 arrivals, and in mountain resorts with 460,892 arrivals. Expressed by the number of tourist nights, the most frequently visited touristic destinations in 2020 were spa resorts, with 2.18 million nights, which is 35.2% of the total number of tourist nights in the Republic of Serbia (Figure 11.31).

Domestic tourists mostly chose to stay in spa resorts and mountain centres, while foreigners were most often interested in city destinations, followed by spas and mountains.

A special attraction here are protected natural sites as goods of great importance for the development of tourism. Bearing in mind that the negative impacts of tourism on the environment are reflected, above all, on natural resources and biodiversity, sustainable management of protected natural areas is an important condition for increasing the touristic circulation. In this context, the Tourism Development Strategy of the Republic of Serbia for the period from 2016 to 2025 (Official Gazette of RS, No. 98/16), provides for the tourist valorisation of such areas, bearing in mind all the potentially positive and negative effects of tourism development that can be reflected on them.

Source of data: Ministry of Trade, Tourism and Telecommunications, Statistical Office of the Republic of Serbia

11.4.3. Intensity of mountain tourism (P)

Key messages:

The most attractive touristic destinations are Zlatibor and Kopaonik, followed by Tara and Divčibare mountains.

The indicator shows the arrivals and overnight stays of tourists in mountainous resorts in order to monitor the pressures on natural resources and biodiversity.

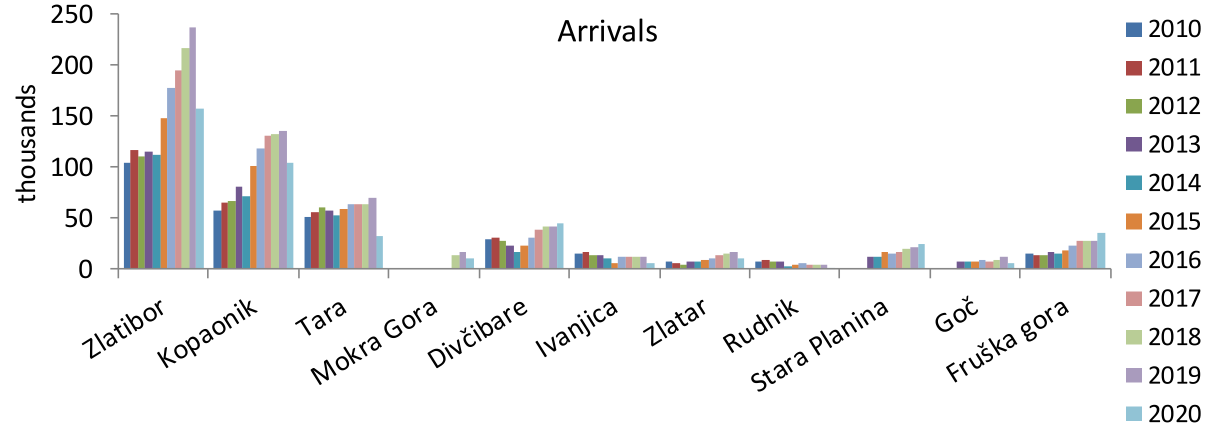


Figure 11.32. Arrivals of tourists in mountainous resorts in the period 2010-2020

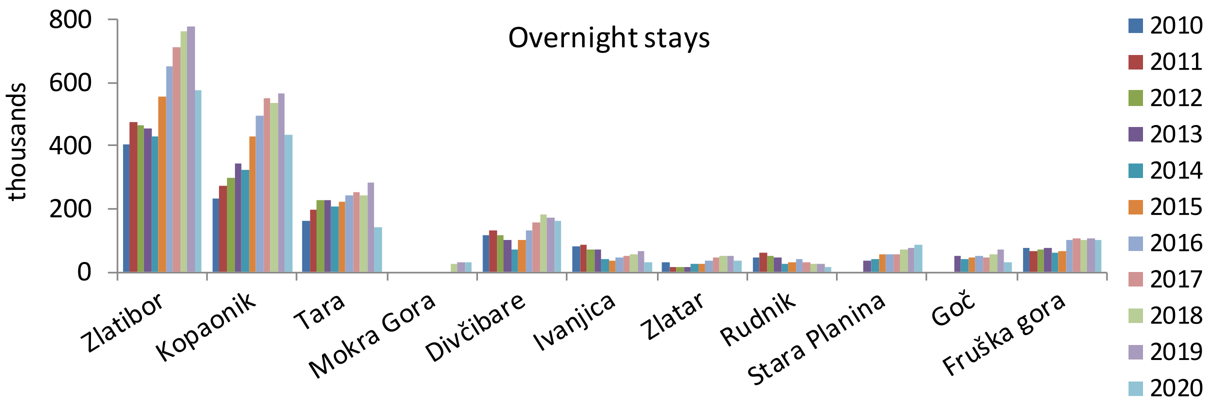


Figure 11.33. Overnight stays in mountainous resorts in the period 2010-2020

This indicator is important for monitoring the system of biodiversity protection in the Republic of Serbia, because the increase in the number of tourists in the protected area may have a negative impacts on biodiversity.

A total of 460,892 arrivals were registered in mountain resorts in 2020, which was a decrease of 27.8% compared to 2019, and the total number of tourist nights was 1,747,172 overnight stays, again a decrease compared to the previous year by 24.1 %. The average length of stay in mountain centres in 2020 was 3.79 days. The most visited mountains were Zlatibor (about 575 thousand nights) and Kopaonik (about 432 thousand nights). The longest stays of tourists was registered on Rudnik (6.78 days).

In the period 2010-2020, Zlatibor (Nature Park) and Kopaonik (National Park) were the most attractive for tourists, followed by Tara (National Park) and Divčibare. In the observed period, the number of tourist arrivals and overnight stays on Zlatibor and Kopaonik doubled, while on other mountains it slightly changed (Figures 11.32 and 11.33).

Tourists were less likely to visit other mountains covered by different types of nature protection system, such as Fruška gora (National Park), Goč (Special Nature Reserve), Stara Planina and Mokra Gora (Nature Parks) (Figure 11.34).

Figure 11.34. Mountains included in some form of nature protection system

Source of data: Ministry of Trade, Tourism and Telecommunications, Statistical Office of the Republic of Serbia

12. IMPLEMENTATION OF ENVIRONMENTAL LEGISLATION

12.1. EFFICACY IN IMPLEMENTATION OF LEGISLATION (R)

Key messages:

1) During 2020, the Sector for Supervision and Preventive Action in the Environment conducted 2,055 inspection controls and filed 70 charges for misdemeanour, 20 charges for economic offence and 2 criminal charges;

2) In 2020, the Republic Inspectorate achieved 88% of the planned 90% inspections, and almost twice as much achieved the percentage of inspections without finding any irregularities from the plan.

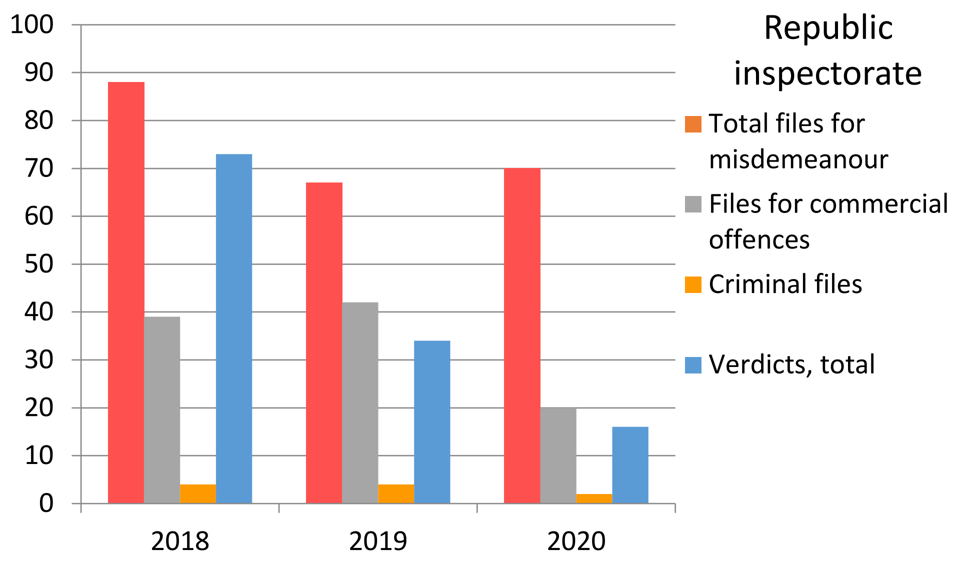
This indicator shows the degree of success in the implementation of environmental legislation, and is based on the reports of the Republic and Provincial Environmental Inspectorates for 2020.

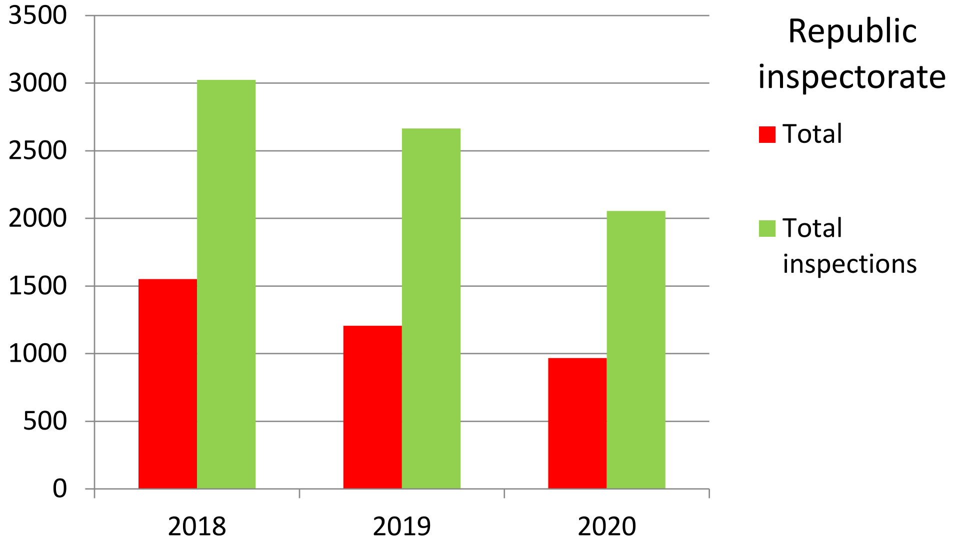
The indicator that has been monitoring, for the last three years, the number of misdemeanour, criminal, as well as files for economic crime and the total number of verdicts indicates a downward trend in 2020, which can be partly explained by reduced economic activity during the pandemic.

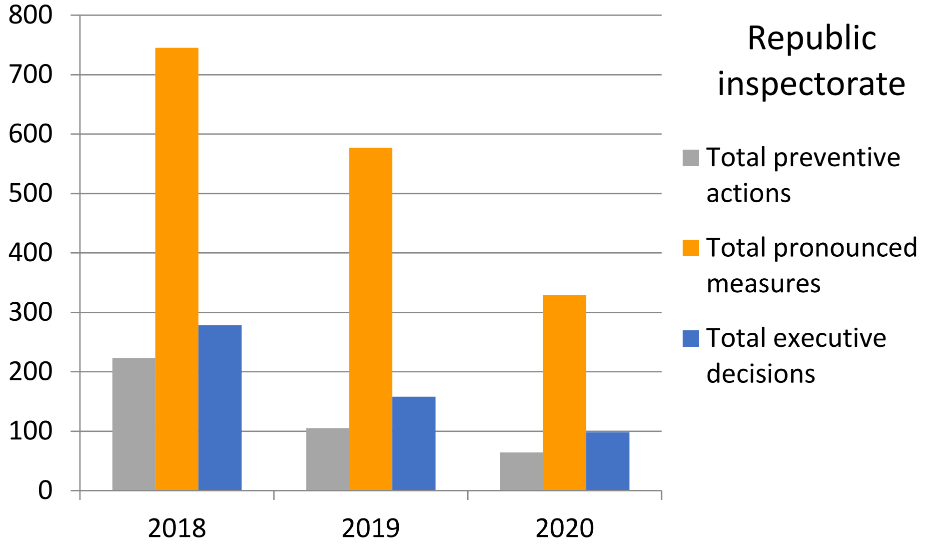
The number of orders and inspections also recorded a decrease in this period, which indirectly indicates, in addition to reduced intensity of economic activities, adequate preventive work of the inspectorates and the insufficient number of inspectors in the field.

The largest decline was recorded in the number of preventive actions of the Republic Inspectorate which indicates that previous activities had achieved the goal, but also that the number of files, i.e. monitoring of work does not record such a trend (Figure 12.1).

The enforcement of regulations in the field of environmental protection is carried out by the Environmental Inspectorate at three levels of control: republic, provincial and local self-government units (city/municipal). Having in mind the number of laws entrusted to local self-government units and insufficient capacities, primarily organisational and personnel ones (out of 145 local self-government units, 10 of them do not have environmental inspectors), there was a need for better coordination of inspection supervision and joint inspections with local inspectors. Therefore, during 2020, 65 joint inspections were carried out together with local inspectors, where 31 illegalities were identified, as presented in the local inspectors' reports.


100
90
80
70
60
50
40
30
20
10
0
2018
2019
2020
Republic inspectorate
Total files for misdemeanour
Files for commercial offences
Criminal files
Verdicts, total


3500
3000
2500
2000
1500
1000
500
0
2018
2019
2020
Republic inspectorate
Total
Total inspections


800
700
600
500
400
300
200
100
0
2018
2019
2020
Republic inspectorate
Total preventive actions
Total pronounced measures
Total executive decisions

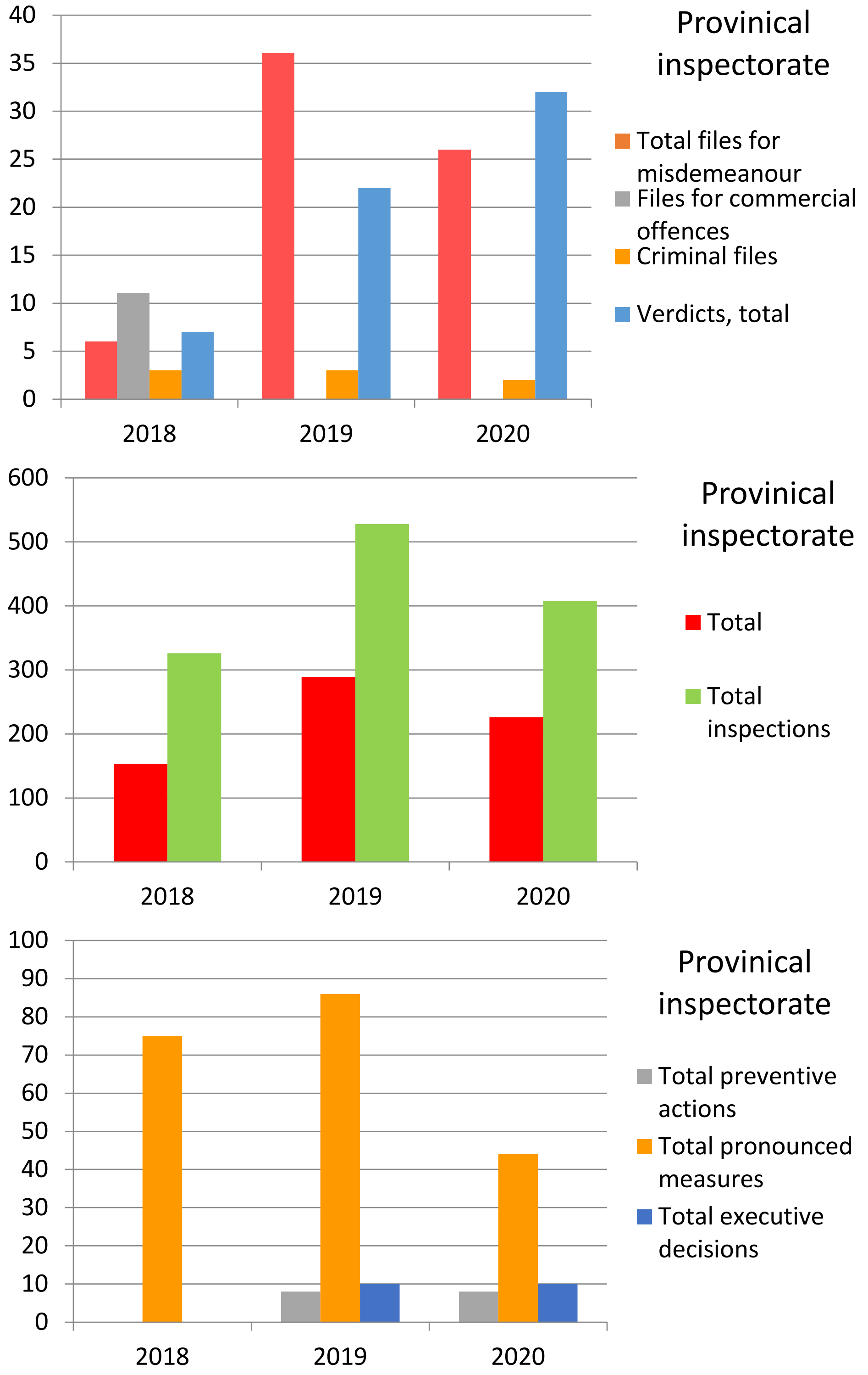


Figure 12.1. Enforcement in the area of the Republic of Serbia in the period 2018-2020

In 2020, the percentage of conducted inspections was 88% of the envisaged 90% from the annual work plan of the Republic Environmental Inspectorate and operational work plans (Figure 12.2). The lower level of completion was the result of a smaller number of inspectors in the Sector for Supervision and Preventive Action in the Environment.

In the same period, the percentage of supervision without identified illegalities was 74% of the 38% envisaged in the annual work plan (Figure 12.3). The reason for the higher performance was the preventive action of the Inspectorate pursuant to the Law on Inspection Supervision, as well as the published checklists on the website of the Ministry, which are available to all supervised entities.

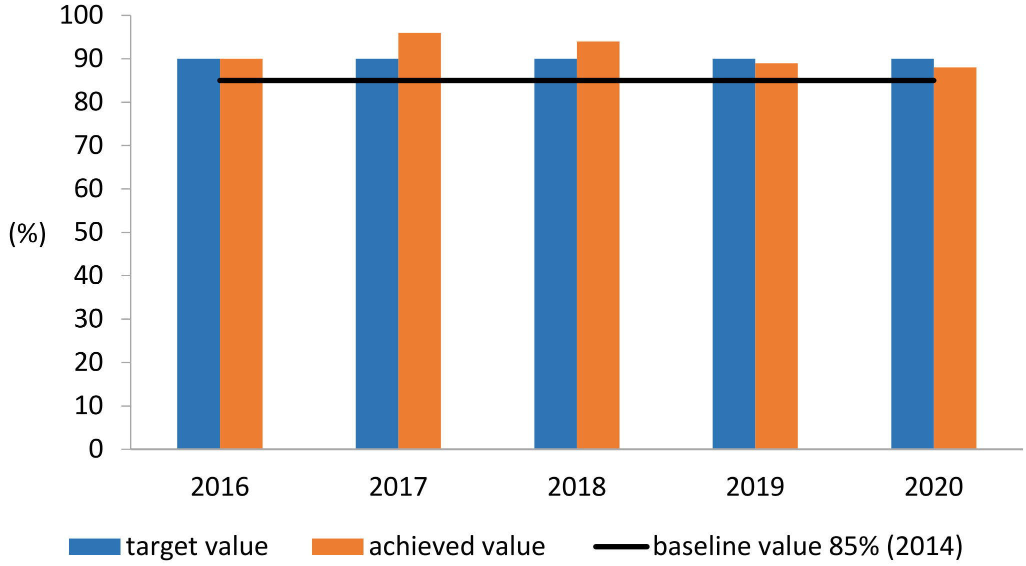


Figure 12.2. Percentage of conducted inspection controls compared to those envisaged by the Inspectorate plans and operational work plans

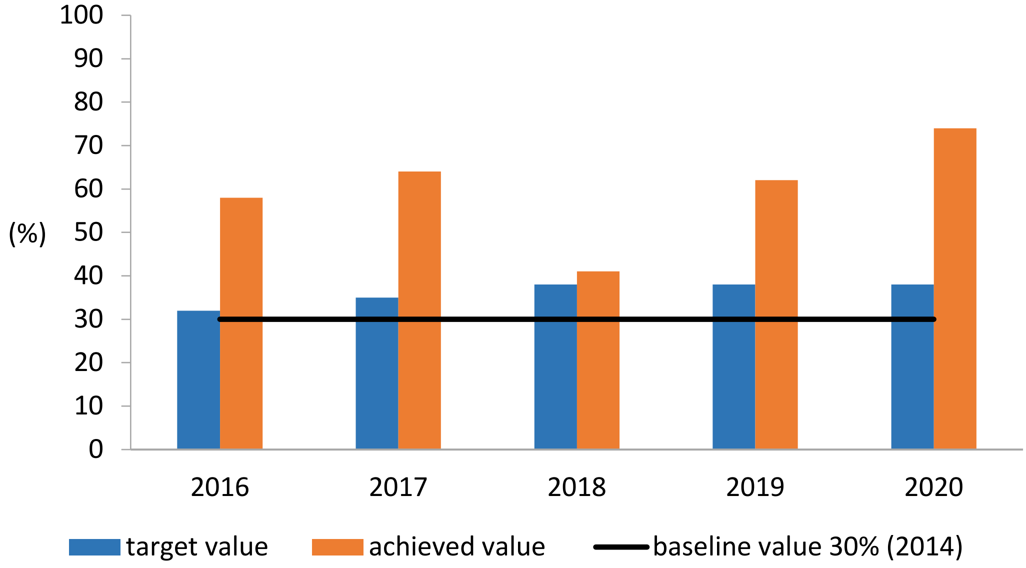


Figure 12.3. Percentage of controls without any irregularities found

Source of data: Sector for Supervision and Preventive Action in the Environment of the Ministry of Environmental Protection and Sector for Inspection Affairs of the AP Vojvodina

12.2. NON-ROUTINE WATER SAMPLING (R)

Key messages:

Nine non-routine water sampling were conducted in 2020, initiated by water and environmental inspectors of the relevant ministries.

This indicator shows the number of non-routine sampling of the Agency in case of accidental pollution of surface or groundwater. Any such water sampling includes, in addition to measurements and observations at the locations where the pollution occurred, also the conduct of laboratory analyses of samples.

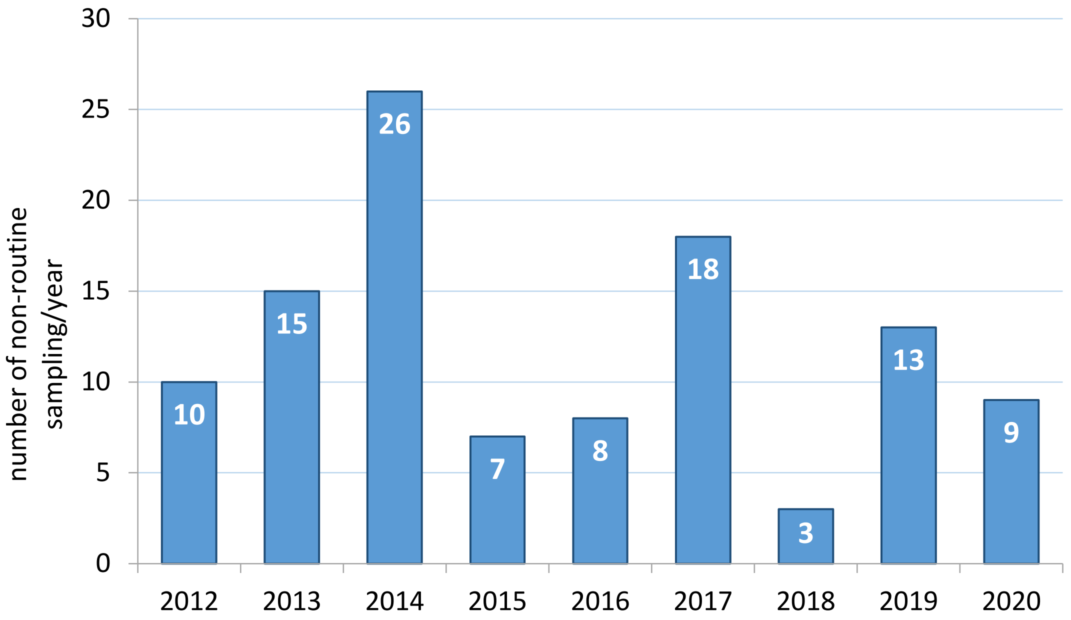


Figure 12.4. Number of non-routine sampling done by the Agency

In addition to implementing the regular annual water status monitoring programme, the Agency is legally obliged to conduct non-routine monitoring of water quality at the site of potential accidental pollution at the call of the relevant water or environmental inspector.

When it comes to the observed period of 2012-2020, it can be concluded that the number of non-routine sampling varied, and that the maximum was reached in 2014 because the catastrophic floods caused an increased number of incidents (Figure 12.4), which resulted in a drastic threat for the environment.

As the number of non-routine water quality sampling is quite significant almost every year (there were nine in 2020), in order to adequately respond to emergency pollution of surface and groundwater, it is necessary to increase the capacity of the Agency, i.e. to form a larger number of field teams that can respond as soon as possible to all calls by inspectors in case of incidents.

After the field visit and sampling, information on emergency water pollution is available on the Agency's website.

Source of data: Environmental Protection Agency

13. ENVIRONMENTAL PROTECTION SYSTEM COMPONENTS

13.1. ECONOMIC INSTRUMENTS (R)

13.1.1. Budget expenditures (R)

Key messages:

According to the latest available data, the estimated expenditures from the budget amounted to about 0.3% of the gross domestic product (hereinafter: GDP) in 2019, which was the same as in 2018.

This indicator pertains to expenditures from the budget of the Republic of Serbia disbursed from the ’’environmental protection’‘ budgetary function.

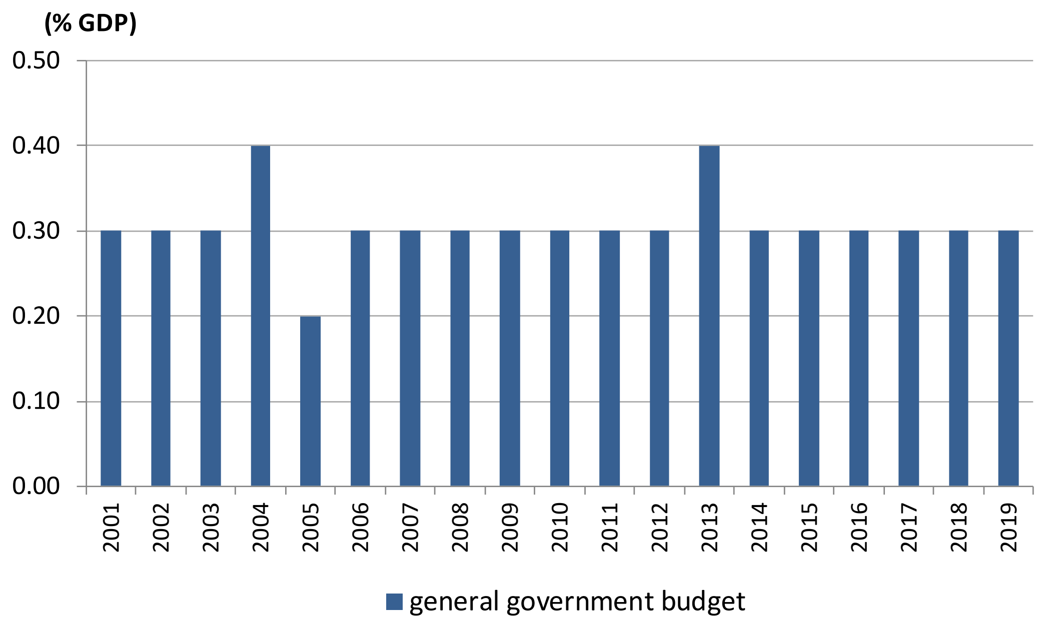


Figure 13.1. Budget expenditures

Based on the latest available data from the Ministry of Finance, according to the functional classification of expenditures at the state sector level (republic, local government and extra-budgetary funds), for environmental protection in 2019 approximately 0.3% GDP was allocated, which is a similar amount to that in 2018 (Figure 13.1).

Expenditures from the budget of the Republic of Serbia related to environmental protection amounted to about 0.1% of GDP in 2019, while, according to estimates, expenditures intended for environmental protection at local level (budgets of AP Vojvodina and of municipalities and cities) amounted to about 0.2% of GDP, which also does not represent a change compared to the previous year.

Source of data: Ministry of Finance, March 2020

13.1.2. Revenues from charges and fees (R)

Key messages:

According to available data, total revenues from collected environmental fees amounted to RSD 7.74 billion, or 0.14% of GDP in 2020.

Charges belong to environmental economic instruments, the goal of which is to promote the reduction of the environmental pressure by applying the “polluter pays” and “user pays” principles.

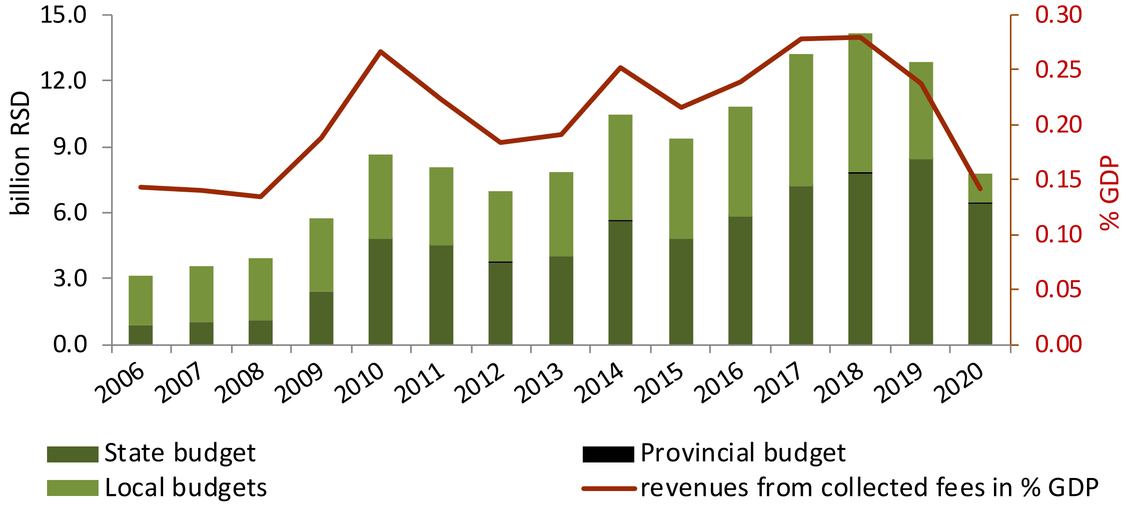


Figure 13.2. Revenues from collected charges for the protection and improvement of environment

According to the Treasury Administration, revenues from collected fees amounted to RSD 7.74 billion dinars (0.14% of GDP) in 2020, which was considerably lower than the previous year, when they amounted to RSD 12.85 billion. These revenues were distributed to the Republic budget in the amount of RSD 6.42 billion, to the budget of AP Vojvodina in the amount of RSD 16.86 million and to local budgets in the amount of RSD 1.30 billion (Figure 13.2).

The largest contribution was made from fees for products that become special waste streams after use, which amounted to RSD 4.31 billion and fees from emissions of SO_2, NO_2, particulate matters and disposed waste in the amount of RSD 3.24 billion (Figure 13.3).

Revenues from fees levied by the Ministry of Environmental Protection in the amount of RSD 7.57 billion are fees charged for environmental pollution, which include fees for ozone depleting substances and plastic bags, for emissions of SO_2, NO_2, particulate matters and generated or disposed waste (the revenues are 60% of the total amount of these fees), as well as fees for products that become special waste streams after use, and fees for packaging and packaging waste (total amount of fees).

The budget fund for environmental protection of AP Vojvodina collects fees for the use of the fishing areas, and such collected income amounted to RSD 16.86 million in 2020.

Revenues of local environmental budget funds include fees for ozone depleting substances and plastic bags, for emissions of SO_2, NO_2, particulate matters and generated or disposed waste (the revenues are 40% of the total amount of these fees) and special fees for protection and improvement of environment, which are their income in the whole amount. Without data on the amount of special fees for the protection and improvement of the environment, the revenues of the local environmental budget funds amounted to RSD 1.30 billion in 2020.

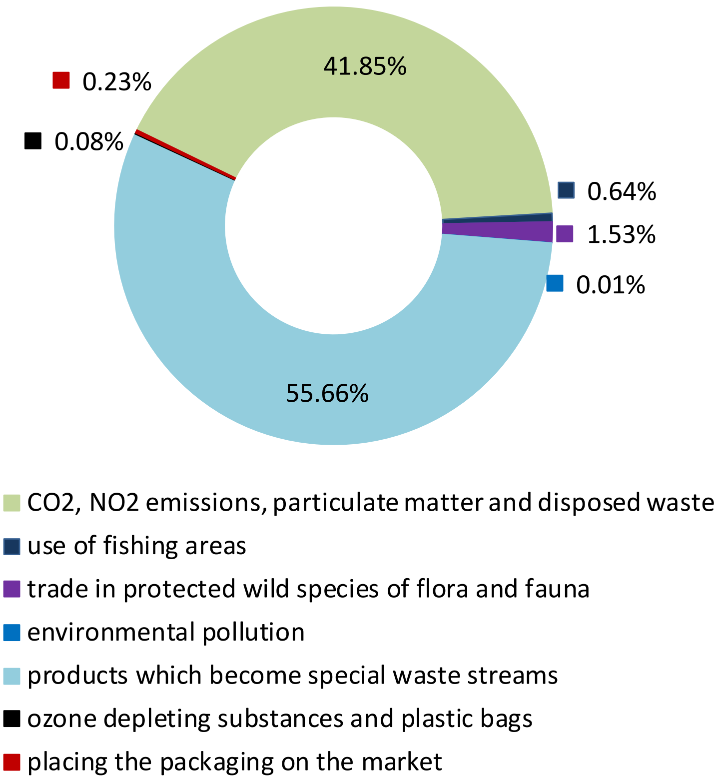


Figure 13.3. Structure of revenues from collected fees in 2020

Source of data: Treasury Administration, Ministry of Environmental Protection

13.1.3. Revenues from taxes (R)

Key messages:

1) according to the data of the Statistical Office of the Republic of Serbia, total revenues collected from environmental taxes amounted to RSD 211.83 billion, or 4.18% of GDP in 2018;

2) taxes for environmental pollution and taxes for the use of resources collected in the amount of RSD 14.67 billion, accounted for 0.29% of GDP.

Environmental taxes are one of the economic instruments for pollution control and management of natural resources, aimed at influencing the behaviour of economic operators, producers and consumers.

The Statistical Office of the Republic of Serbia calculates environmental taxes, which according to the Eurostat methodology include four types of taxes: energy taxes, taxes in the area of transport, taxes on environmental pollution and taxes on the use of resources. Revenues from these taxes are revenues of state institutions and organisations at different levels of government, i.e., only a part of these revenues belong to the environmental budget funds at all levels.

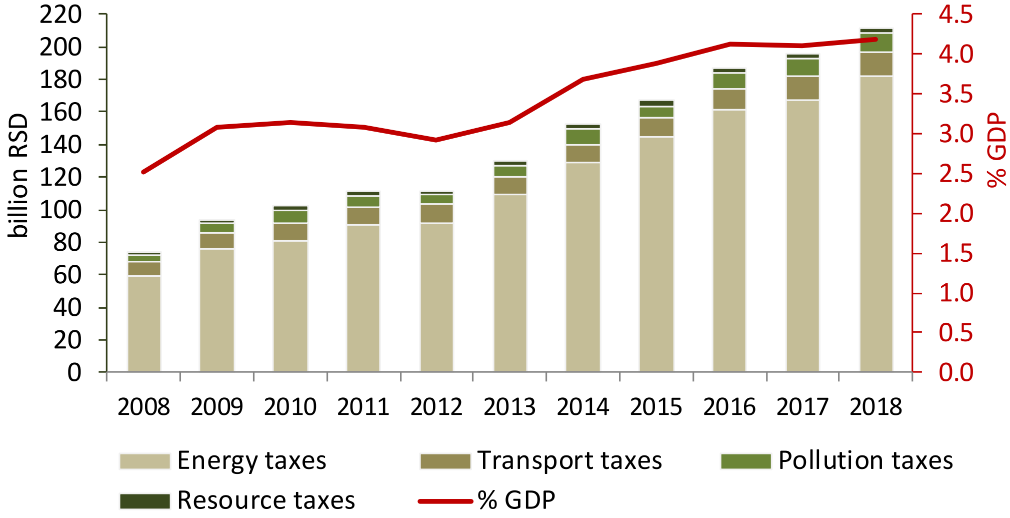


Figure 13.4. Revenues from environmental taxes

According to the latest data for 2018, tax revenues amounted to RSD 211.83 billion, or 4.18% of GDP. Energy taxes, which constantly dominated in the observed period, reached the amount of RSD 182.39 billion in 2018, and taxes in the field of transport RSD 14.77 billion. Taxes for environmental pollution amounted to RSD 11.61 billion, and for the use of resources RSD 3.05 billion, which in total for these two types of taxes, approximately correspond to the amount of environmental fees in 2018 (Figures 13.4. And 13.5).

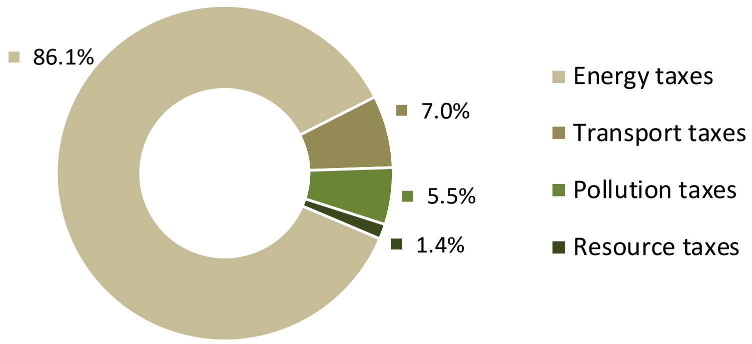


Figure 13.5. Structure of revenues collected from environmental taxes

From the aspect of types of institutional units that pay taxes, the largest part of taxes in 2018 was paid by households as consumers (RSD 81.89 billion). Manufacturing industry, mining, construction and other industry paid RSD 56.10 billion in total, and all other administrative and service activities, transport, trade and other activities, a total of RSD 73.89 billion (Figure 13.6).

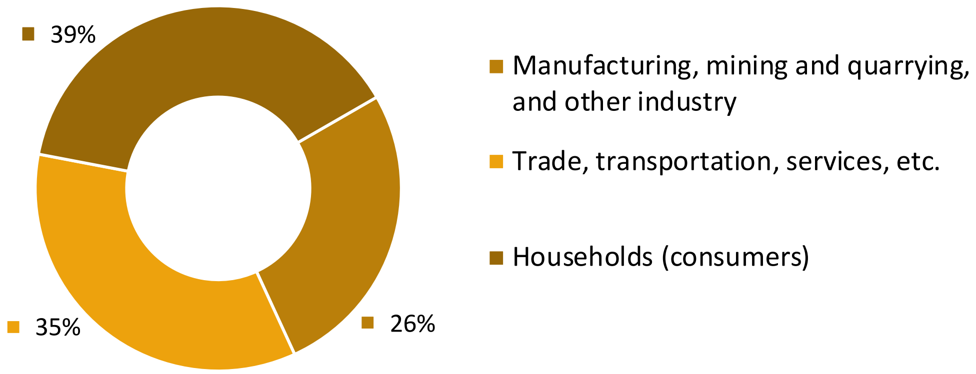


Figure 13.6. Structure of institutional units that pay taxes

Source of data: Statistical Office of the Republic of Serbia, March 2021

13.1.4. Investments of economic sectors in environmental protection (R)

Key messages:

1) estimated investments of economic sectors amounted to 3.62 billion dinars in 2020, or 0.07% of GDP;

2) in relation to total funds, the largest share is made by the sector of Energy and Mining with 85.6%.

According to available data and in accordance with the revised method of calculating indicators from 2018, investments of economic sectors in environmental protection, directly or indirectly, amounted to RSD 3.62 billion in 2020, or 0.07% of GDP. Indirect investments include funds for energy efficiency improvement, as well as incentives and subsidies for sustainable management of forests and agricultural land and sustainable tourism (which is discussed in more detail in the indicator Incentives and subsidies).

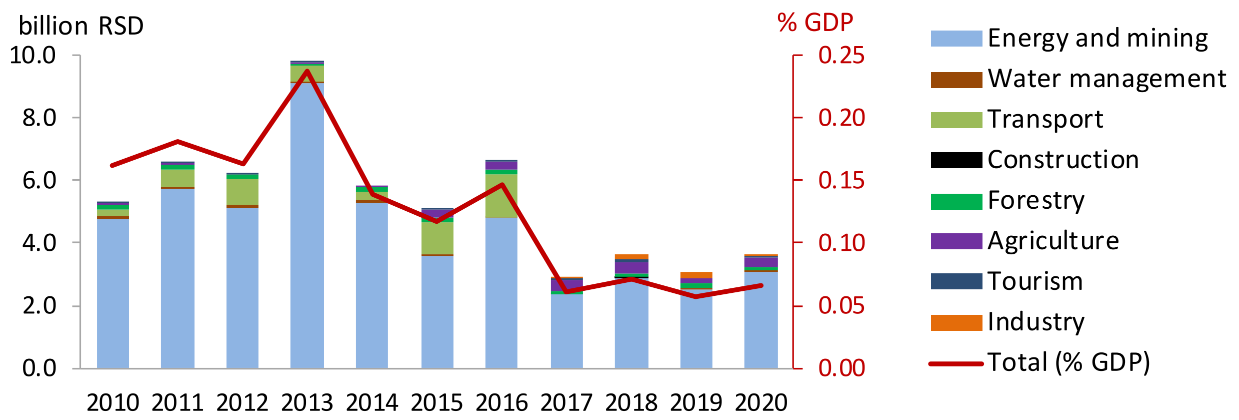


Figure 13.7. Total investments made by economic sectors in the environmental protection

Considerable oscillations are noticeable during the observed period, which are mostly conditioned by the change in environmental investments of the energy sector, i.e., the Public Enterprize “Electric Power Industry of Serbia” and the NIS Group. In 2020, as in previous years, the Energy and Mining sector contributed the most with RSD 3.1 billion (Figures 13.7 and 13.8).

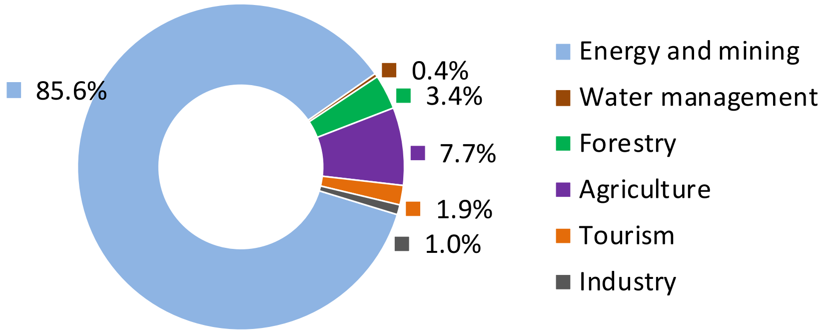


Figure 13.8. Structure of investments made by economic sectors

According to available data, no information was found on how much funds were invested from the budget, or from own revenues, i.e., from loans and donations. Since 2019, the data have been completed, and only funds from the budget and own funds of companies are presented, considering that international loans and donations are analysed in the indicator of international financial support.

Source of data: Ministry of Trade, Tourism and Telecommunications, Forest Directorate, Republic Water Directorate, Directorate for Agrarian Payments, Ministry of Mining and Energy, Ministry of Construction, Transport and Infrastructure, Ministry of Economy.

13.1.5. Funds for subsidies and other incentive measures (R)

Key messages:

1) allocated incentives and subsidies in 2020 were estimated at RSD 4.79 billion, or 0.09% of GDP;

2) in the structure of these funds, the largest share of 69% are incentives for waste reuse and recovery.

The indicator monitors the economic incentives in the field of environmental protection provided by the state.

According to available data and in accordance with the revised method of calculating indicators, a total of RSD 4.79 billion of incentives, subsidies and grants was allocated for environmental protection in 2020, which is 0.09% of GDP (Figure 13.9). The source of these funds are budget funds, environmental fees, as well as funds of international organisations.

The largest incentive funds were allocated by the Ministry of Environmental Protection – Green Fund of the Republic of Serbia for waste reuse and recovery of (recycling industry) in the amount of RSD 3.31 billion, and the Ministry of Environmental Protection as a form of support to the Directorate for Radiation and Nuclear Safety and Security of Serbia and the Institute for Nature Conservation of Serbia (RSD 306.6 million). Incentives for organic agriculture were awarded by the Ministry of Agriculture, Forestry and Water Management in the amount of RSD 278.6 million. Incentives and subsidies for nature protection were awarded by the Ministry of Environmental Protection and the Provincial Secretariat for Urban Planning and Environmental Protection of AP Vojvodina in the amount of RSD 235.1 million, and for the control of harmful organisms (RSD 366.2 million) by the Provincial Secretariat for Urban Planning and Environmental Protection of AP Vojvodina.

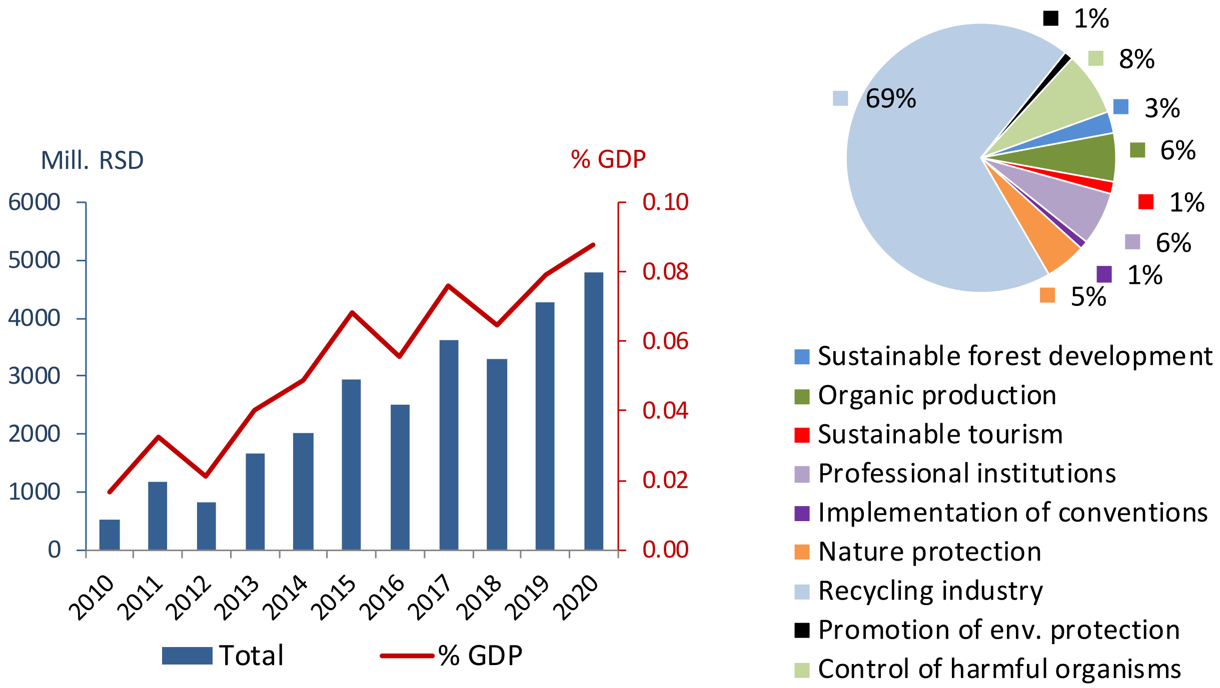


Figure 13.9. Allocated funds and their structure in 2020

Other subsidies, grants and incentives were awarded by the Ministry of Environmental Protection, the Green Fund of the Republic of Serbia, the Budget Fund for Forests of the Republic of Serbia, the Provincial Secretariat for Urban Planning and Environmental Protection of AP Vojvodina and the Ministry of Trade, Tourism and Telecommunications.

Source of data: Ministry of Environmental Protection; Forest Directorate; Republic Water Directorate; Agricultural Land Administration; Ministry of Trade, Tourism and Telecommunications; Ministry of Mining and Energy; Ministry of Construction, Transport and Infrastructure; Ministry of Economy, Ministry of Agriculture, Forestry and Water Management, and Provincial Secretariat for Urban Planning and Environmental Protection of AP Vojvodina.

13.1.6. International financial support (R)

Key messages:

1) total donations for 2020 are estimated at RSD 7.48 billion (0.14% of GDP), and loans are estimated at RSD 1.56 billion (0.03% of GDP);

2) the largest donors are the European Union with RSD 4.84 billion and the Federal Republic of Germany with RSD 2.22 billion.

The indicator shows international financial support – donations and loans for the sectors “Environmental Protection” and “Water Supply and Waste Management”.

According to the estimates of the ISDAKON database of the Ministry of Finance, the estimated value of total international financial support to sectors of “Environmental Protection” and “Water Supply and Waste Management” amounted to RSD 9.05 billion in 2020, expressed through gross domestic product, this is 0.17 % of GDP (Figures 13.10 and 13.11). Donations and loans allocated to these sectors in 2020 are presented in Table 13.1.

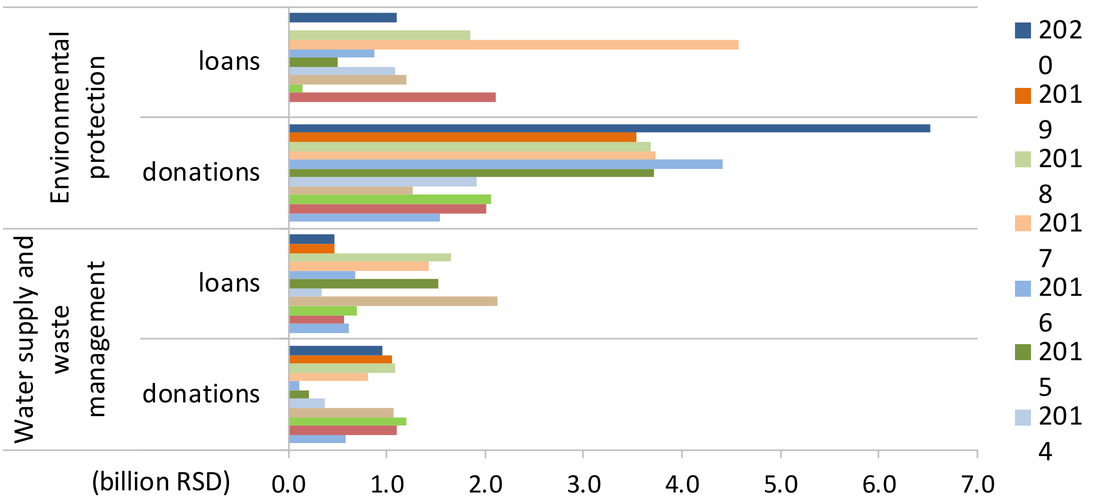


Figure 13.10. International financial support – donations and loans to sectors of "Environmental Protection" and "Water Supply and Waste Management"

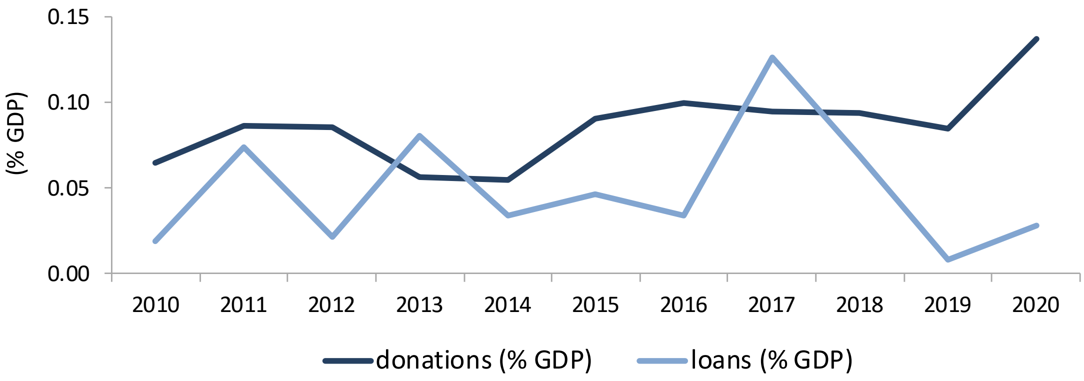


Figure 13.11. "International financial support – donations and loans to sectors of "Environmental Protection" and "Water Supply and Waste Management" expressed in % of GDP

Table 13.1. International financial support – donations and loans to sectors of "Environmental Protection" and "Water Supply and Waste Management" in 2020

Sectors	Donations		Loans		Total by sectors	
	Billions RSD	% GDP	Billions RSD	% GDP	Billions RSD	% GDP
Environmental protection	6.52	0.12	1.10	0.02	7.62	0.14
Water supply and waste management	0.96	0.02	0.47	0.01	1.43	0.03
TOTAL	7.48	0.14	1.57	0.03	9.05	0.17

In 2020, the largest donors to the sector of "Environmental Protection" were the European Union with RSD 4.9 billion, the Federal Republic of Germany with RSD 1.4 billion, and the Kingdom of Sweden with RSD 325 million, and to the sector of "Water Supply and Waste Management" was the Federal Republic of Germany with RSD 872 million and Switzerland with RSD 90 million (Figure 13.12).

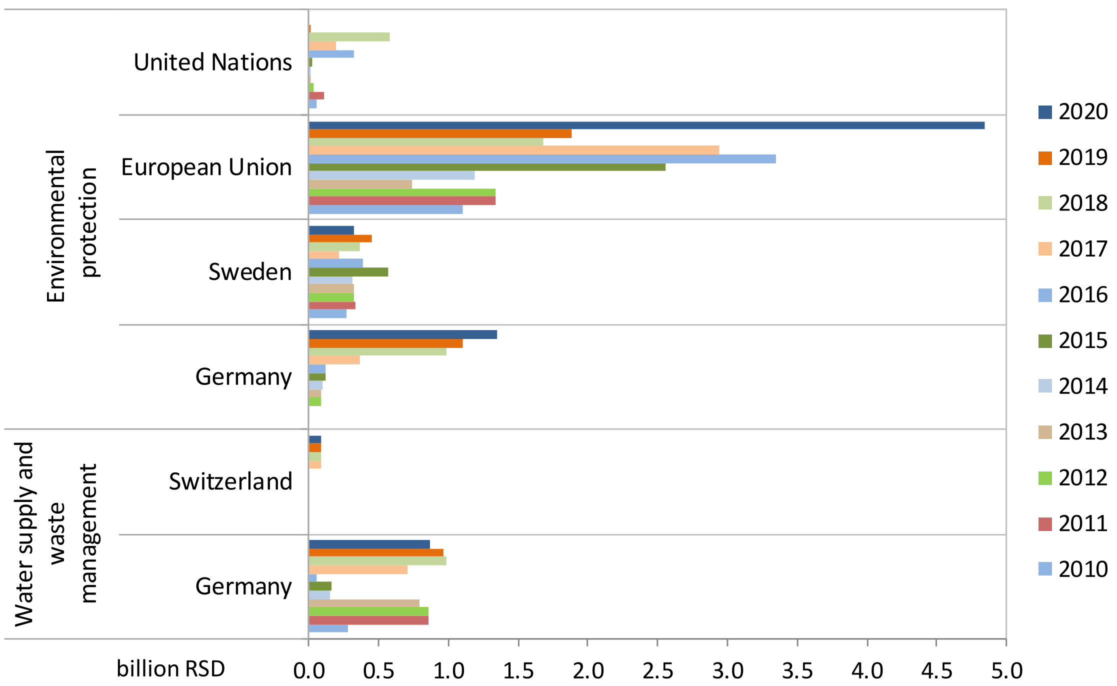


Figure 13.12. Largest donors to sectors of "Environmental Protection" and "Water Supply and Waste Management"

Source of data: ISDAKON database of the Ministry of Finance, acceded on 18 May 2021

13.1.7. Investments and current expenses (R)

Key messages:

1) the total amount of investment funds and current expenditures amounted to RSD 42.37 billion in 2019, or 0.78% of GDP;

2) the most of that amount was invested in waste management (RSD 2,474.84 million) and nature protection (RSD 1,201.26 million), while the largest current expenditures went to waste management (RSD 17,762.11 million) and wastewater management (RSD 3,707.70 million).

Investments into environmental protection include investments in environmental protection activities (methods, technologies, processes, equipment and parts thereof, etc.), aimed at collecting, treating, monitoring and controlling, reducing, preventing or removing pollution or any other environmental degradation resulting from business activities.

Current expenditures for environmental protection include labor expenditures, expenditures for operation and maintenance of environmental protection equipment and payments to third parties for environmental services aimed at preventing, reducing, treating or removing pollution or any other environmental degradation resulting from business activities.

According to the latest data from the Statistical Office of the Republic of Serbia, the total amount of funds for investments and current expenditures amounted to RSD 42.37 billion in 2019, or 0.78% of GDP. Out of that amount, investments accounted for RSD 11.61 billion, and current expenditures for RSD 30.76 billion.

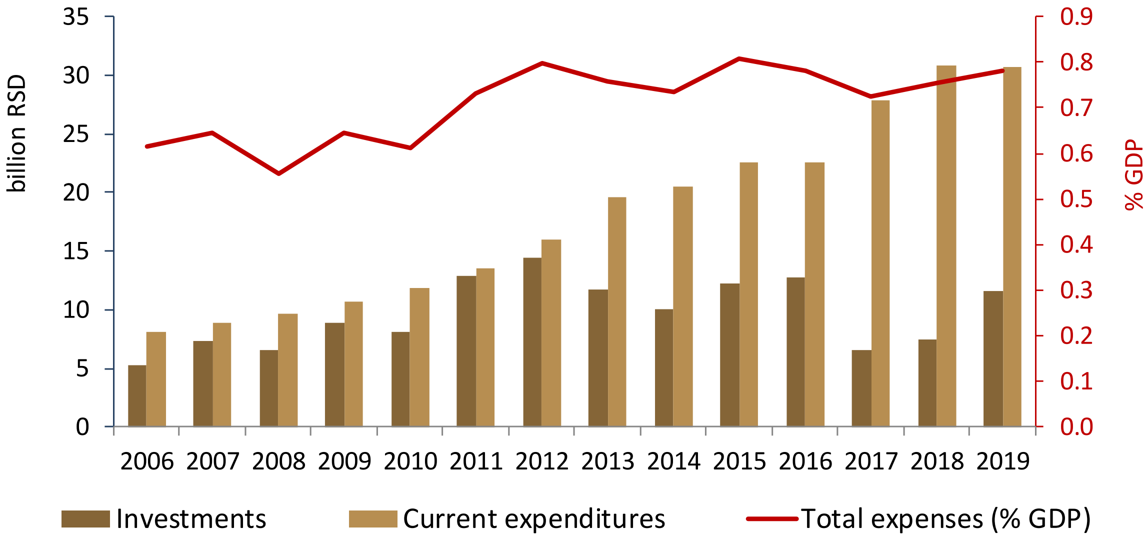
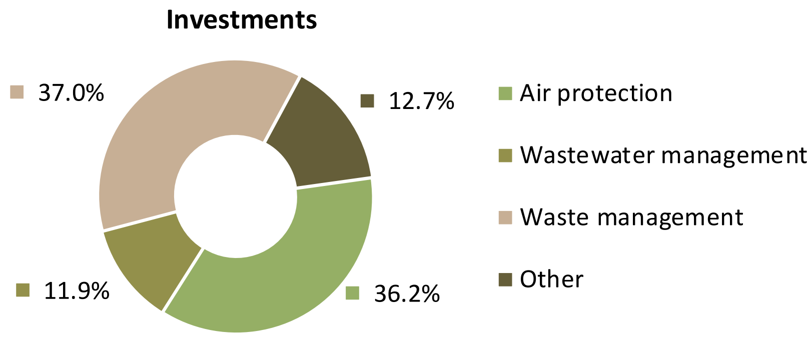


Figure 13.13. Investments and current expenses in the period 2006-2019

Current expenditures were constantly increasing in the period 2006-2019, while investment levels fluctuated (Figure 13.13).

In the course of 2019, the greatest investments referred to waste management with RSD 4.29 billion and air protection with RSD 4.2 billion. However, while the largest current expenditures were allocated to waste management, in the amount of RSD 22.0 billion, they were the smallest for air protection and amounted to RSD 0.4 billion (Figures 13.14 and 13.15).

According to the data of the Statistical Office of the Republic of Serbia, total investments and current expenditures can be analysed, but not the structure of the sources of these funds. In other words, there is no data on how much was invested from the budget, how much from own revenues, or from loans, donations and other financial sources.



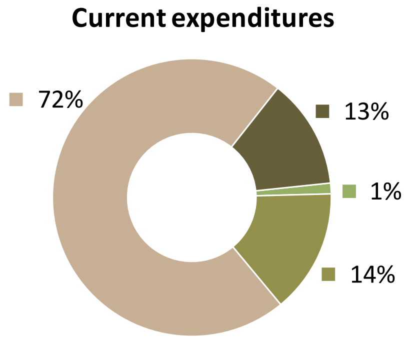


Figure 13.14. Structure of investments in 2019

Figure 13.15. Structure of current expenditures in 2019

Source of data: Statistical Office of the Republic of Serbia, March 2021

14. CIRCULAR ECONONY

14.1. PROGRESS IN THE INTRODUCTION OF CIRCULAR ECONOMY (R)

Key messages:

The "Road Map for the Circular Economy in Serbia" was published in 2020.

The transition to a circular economy is a complex, comprehensive and, above all, time consuming, systemic process. It is a way to separate societies from unsustainable linear economies, which result in the depletion of limited resources.

Although the generally accepted definition of circular economy is still missing, it can be said that circular economy is an economy in which the value of products, materials and resources is maintained in the economy for as long as possible, while minimising waste generation. The circular economy model is designed to reduce the use of natural resources and energy to a minimum, to reduce waste generation, pollution and other negative environmental impacts (Figure 14.1).

Global trends are moving towards circular economy to replace a deeply rooted linear economy and waste management. Circular economy also includes the protection of human rights through sustainable development, global security of natural resources, combating climate change, energy security, provision of sufficient food, reducing inequalities, enabling more transparent public finances and social security, protecting health and ensuring cleaner environment and the rights of future generations on resources.

Through the project implemented by the UNDP "Platform for Circular Economy for Sustainable Development in Serbia", the "Roadmap for Circular Economy in Serbia" was completed in May 2020, following the example of the EU Member States that had adopted this type of document. The roadmap has been translated into English and posted on the website of the European Platform for Circular Economy. This document aims to initiate a dialogue between all stakeholders in the process of transition from a linear to a circular economy, to encourage the industrial sector to apply circular business models and innovative solutions, and to initiate society to apply systemic changes in thinking, culture and attitudes towards resources. The Republic of Serbia is the first country in the region to have this type of document.

Other strategic documents adopted in 2020, which include circular economy and efficient use of resources, are the Strategy of Industrial Policy of the Republic of Serbia for the period from 2021 to 2030 (Official Gazette of RS, No. 35/20) and the Strategy of Smart Specialisation in the Republic of Serbia for the period from 2020 to 2027 (Official Gazette of RS, No. 21/20), as presented in Figure 14.2.

Figure 14.3. shows material flows in 2019 in the Republic of Serbia, according to the Eurostat methodology. It includes imports and extraction of raw materials, processing and consumption of materials, all the way to pollutant emissions, waste generation, waste landfilling or recycling and exports.

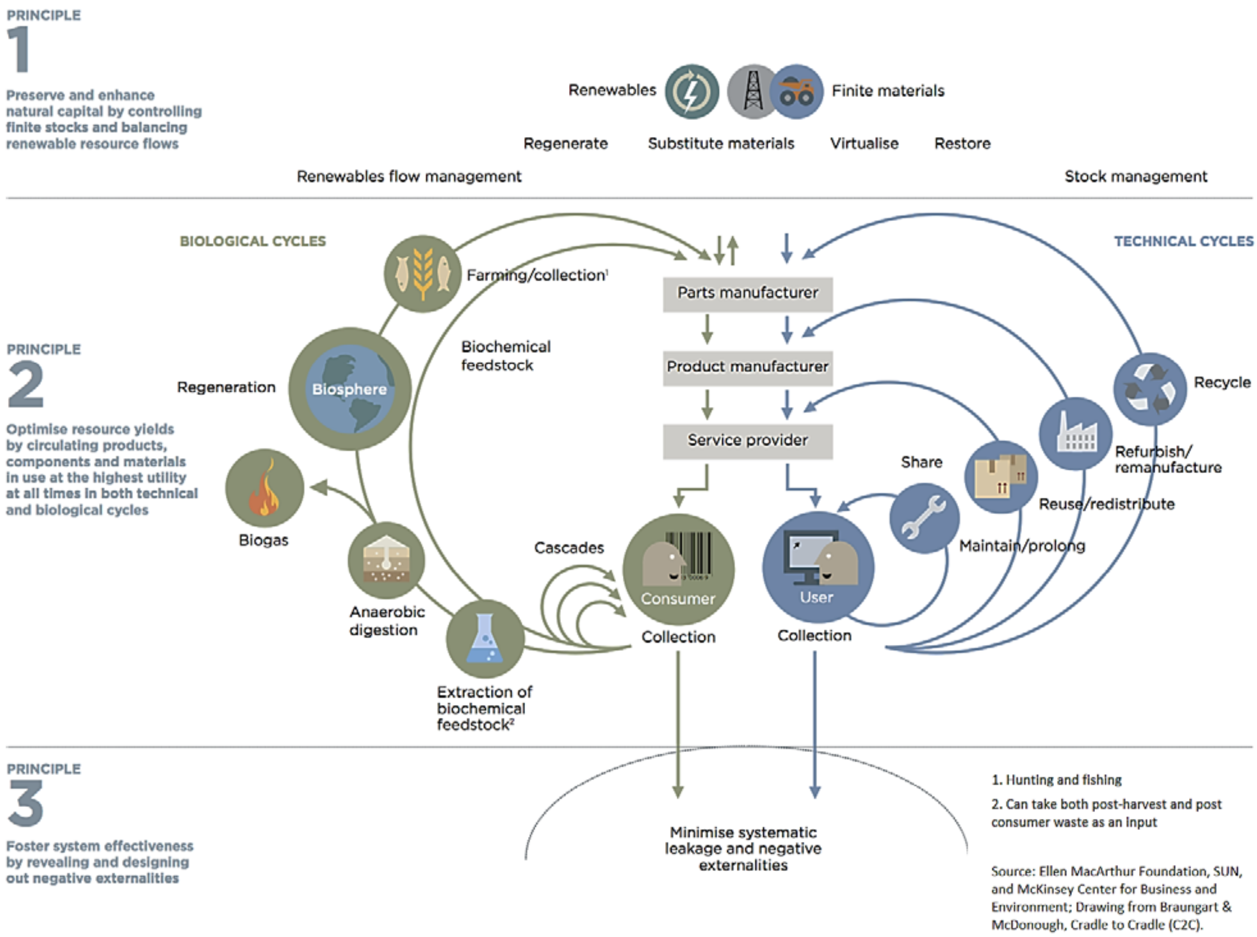


Figure 14.1. The system chart shows the continuous flow of technical and biological materials through the “circle of values”(Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C))

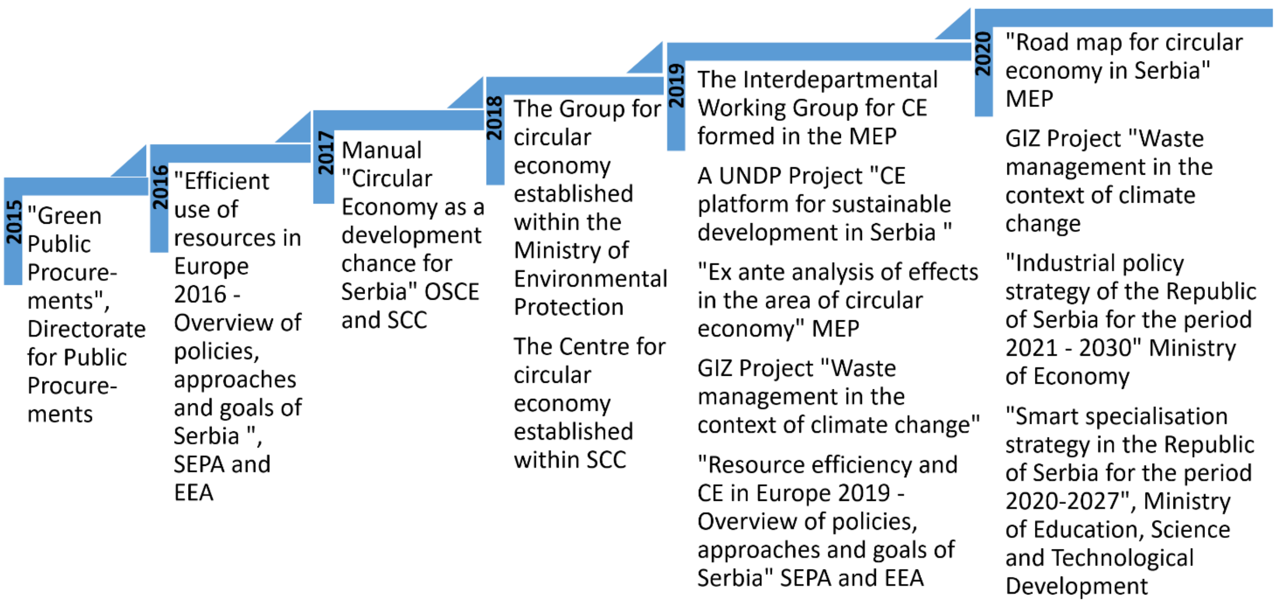
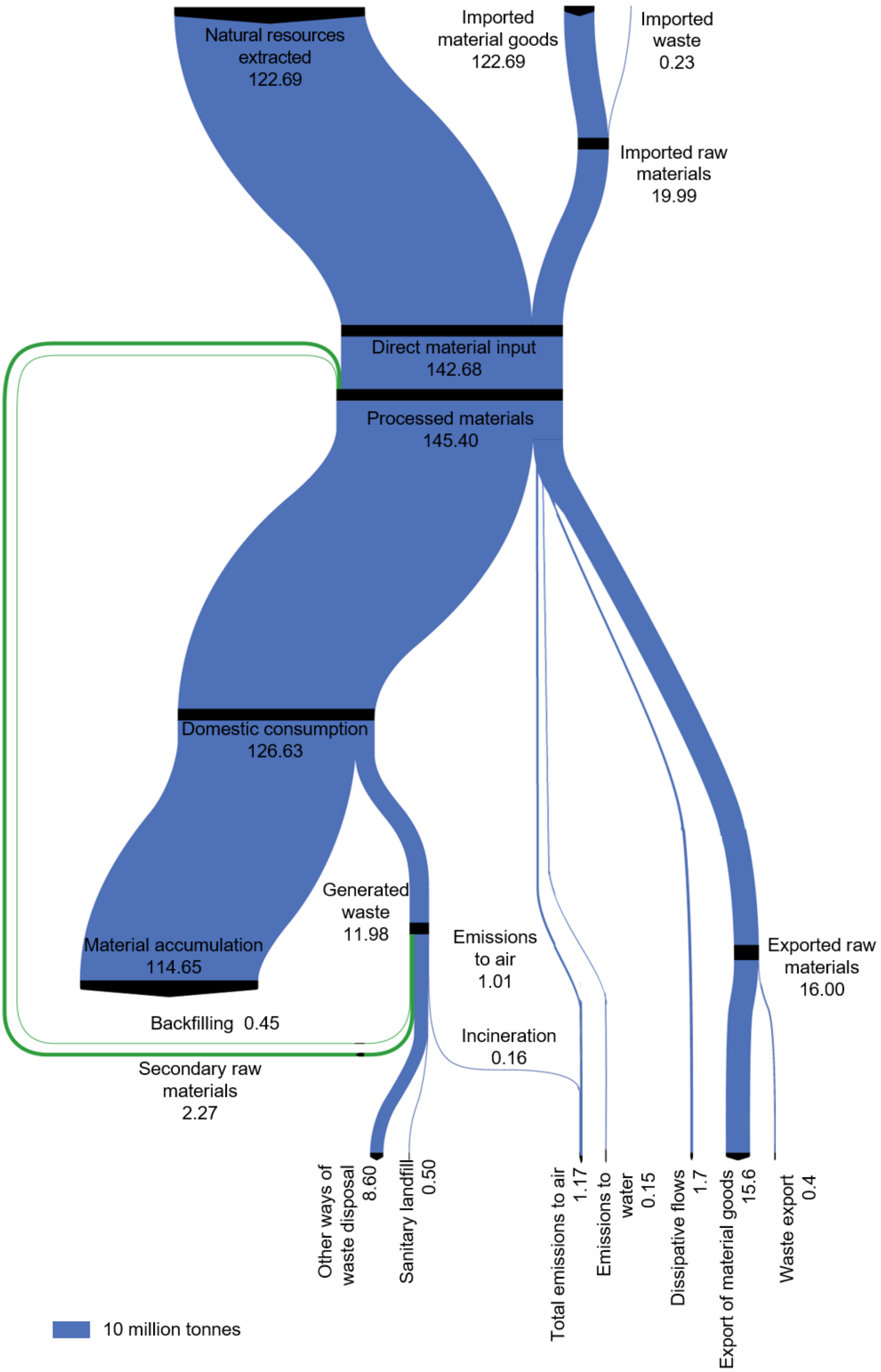


Figure 14.2. Progress in the introduction of circular economy in the Republic of Serbia



Material flows true to scale in million tonnes/year in 2019 in Serbia

Note: Numbers may not sum up to total due to rounding

Figure 14.3. Schematic overview of material flows in 2019 in the Republic of Serbia

Source of data: Ministry of Environmental Protection, Digital Platform for Circular Economy and Faculty of Technical Sciences in Kragujevac

14.2. DOMESTIC MATERIAL CONSUMPTION (S)

Key messages:

1) consumption of domestic resources recorded a slight increase, and amounted to 126.63 million tonnes in 2019;

2) the consumption of resources is constantly dominated by fossil fuels, which in 2019 participated in the consumption with 30%.

Natural resources support economic and social development, but excessive consumption of these resources has resulted in environmental degradation and economic losses. Consumption of domestic resources is one of the basic indicators of the circular economy and sustainable production and consumption. The indicator shows the trend of consumption of domestic material resources in total, as well as consumption per capita.

Consumption of domestic material resources (hereinafter: Domestic Material Consumption – DMC), refers to total quantity of resources (raw materials) extracted and used in the national economy, increased by gross imports.

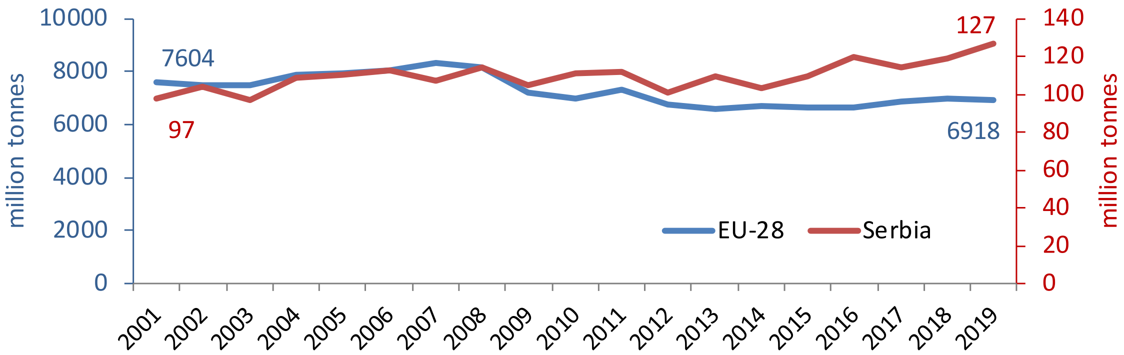


Figure 14.4. Total DMC in the Republic of Serbia and in the EU

According to the latest data from the Statistical Office of the Republic of Serbia, DMC in the Republic of Serbia amounted to 126.63 million tonnes in 2019, which was 6.5% more than in 2018. At the same time, DMC increased by 30% compared to 2001, and such a trend has a negative meaning, because the annual consumption of resources is increasing. In the same period, a 10% decrease in DMC was recorded in the European Union (Figure 14.4).

Consumption of domestic resources per capita in the Republic of Serbia increased from 12.98 t in 2001 to 18.23 t in 2019, which is an increase of 40% (Figure 14.5). For comparison, the average consumption of domestic resources per capita in the EU in 2019 was 13.47 t (Figure 14.6).

Due to its environmental impact, the structure of resources plays a significant role in monitoring resource consumption. The main components of total DMC are biomass, fossil fuels, non-metallic minerals (mainly materials used in construction) and metals (including metal ores). The share of the four main components of total DMC in the Republic of Serbia varied significantly between 2001 and 2019. In the observed period, the share of biomass decreases from 36% to 29%, and fossil fuels remained at the same level of 36%. In 2019, the share of non-metallic minerals was 20%, and metals and metal ores 15%. In 2019, non-metallic minerals reached the largest share in the European Union with 49%, and biomass with 25%. Fossil fuels accounted for 21%, and have a slight declining trend, reducing their environmental impact (Figure 14.7).

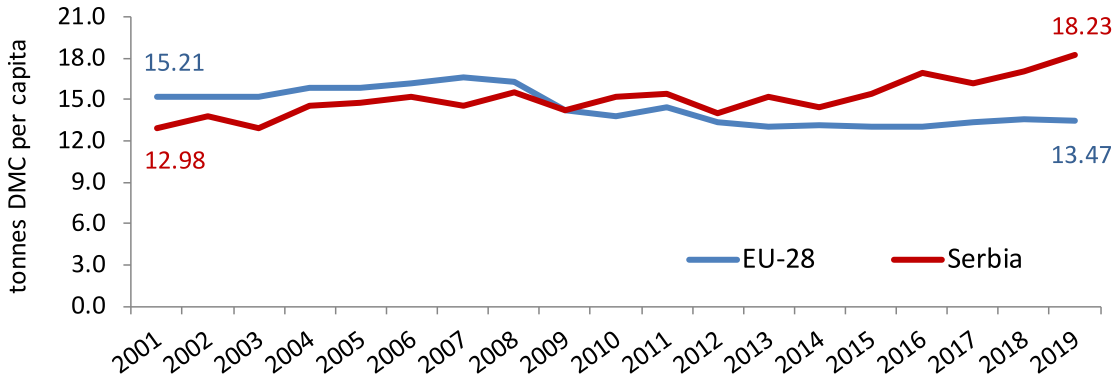


Figure 14.5. DMC per capita in the Republic of Serbia and in the EU

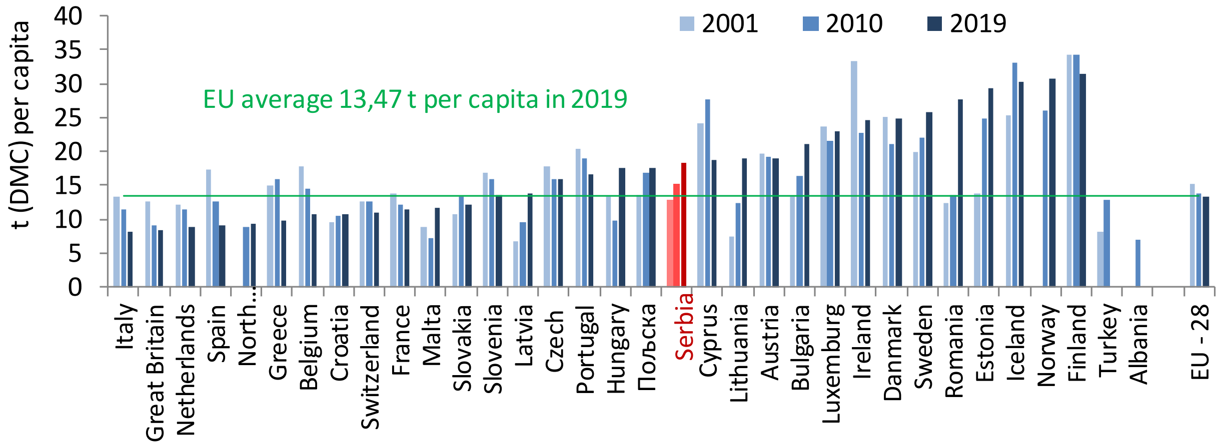


Figure 14.6. DMC per capita in the Republic of Serbia and in the EU in 2001, 2010 and 2019

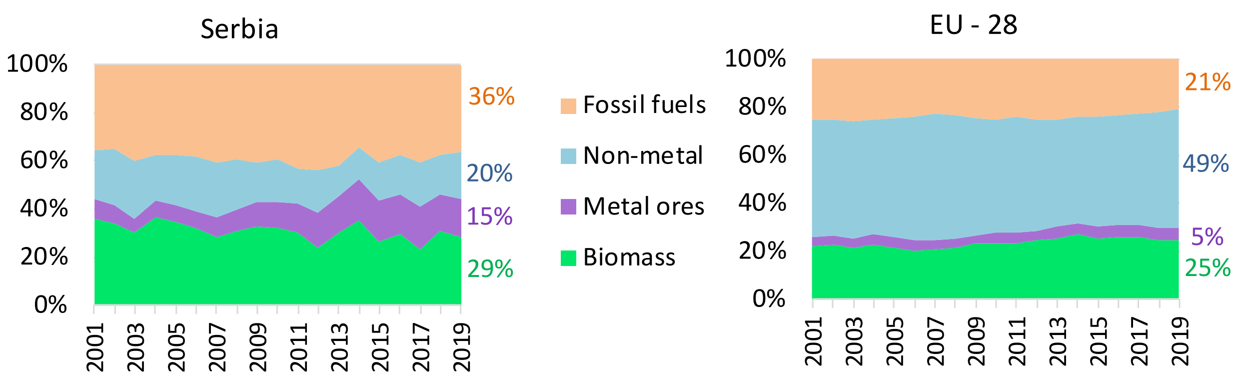


Figure 14.7. Structure of resource consumption by type of materials in the Republic of Serbia and EU-28

Source of data: Statistical Office of the Republic of Serbia, 30 March 2021, Eurostat web page, acceded on 16 May 2021

14.3. RESOURCE PRODUCTIVITY (S)

Key messages:

Significant increase in resource productivity was recorded in the Republic of Serbia in the period 2001-2019, which in 2019 amounted to RSD 39.2 per kilogram.

Resource productivity (RP) is calculated as the ratio between gross domestic product (GDP) and domestic material consumption (DMC) and shows how productively a country's economy consumes resources when creating products and services for the market needs. If GDP grows faster than DMC, resource productivity increases, and vice versa. The goal is to increase more efficient use of resources, i.e. to obtain greater economic value of resources.

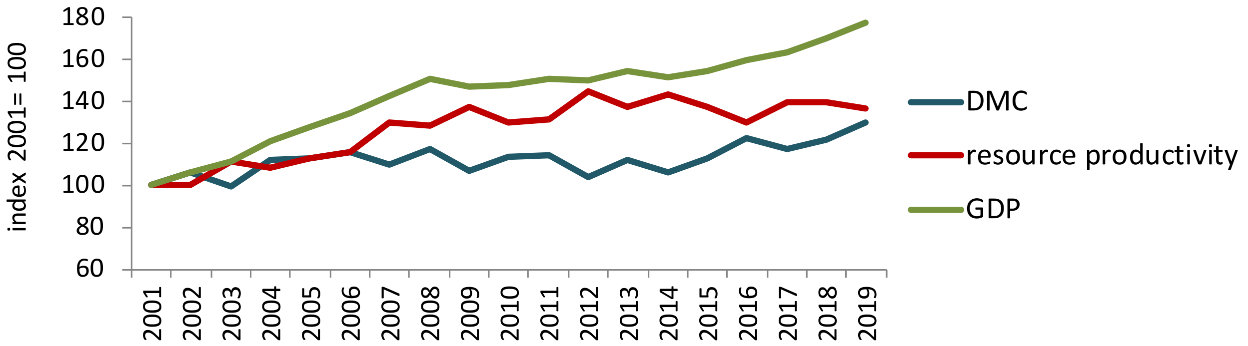


Figure 14.8. Resource Productivity, Domestic Material Consumption and Gross Domestic Product in the Republic of Serbia (index 100 = 2001)

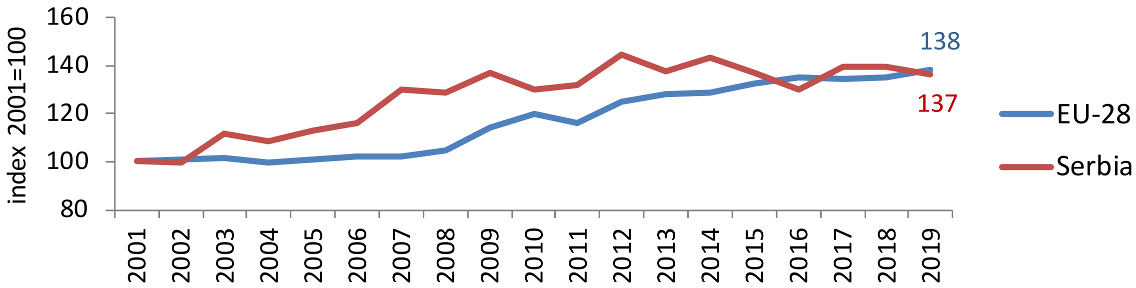


Figure 14.9. Resource Productivity in the Republic of Serbia and in EU-28 (index 100 = 2001)

The European Union Sustainable Development Strategy and the Europe 2020 Strategy are oriented towards economic growth while improving resource efficiency, with the aim of reducing the use of non-renewable natural resources with the use of renewable natural resources at a pace that will not impair their regeneration. Therefore, decoupling of gross domestic product and consumption of domestic resources is a key goal of these Strategies.

Resource Productivity in 2019 amounted to RSD 39.2 per kilogram, which is 2.15% less than in 2018, i.e. the growth of material consumption was higher than the growth of GDP compared to the previous year. Compared to 2001, resource productivity increased by 37%, due to faster GDP growth than the growth in material consumption (Figure 14.8).

For comparison, in the same period, Resource Productivity increased by 38% in the European Union (Figure 14.9), but it should be noted that both Resource Productivity levels and trends heavily varied from country to country (Figure 14.10).

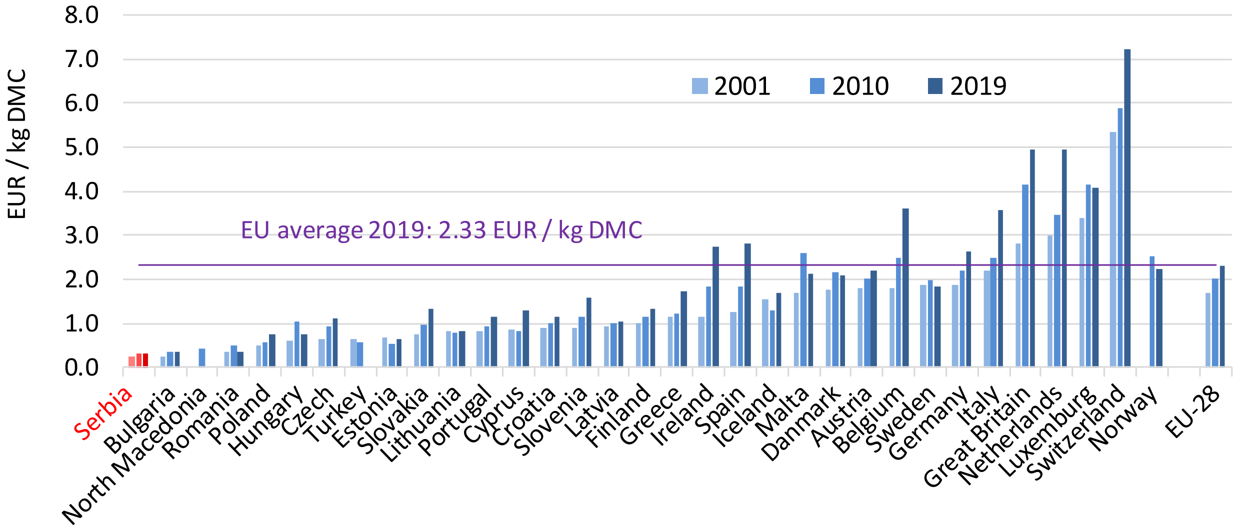


Figure 14.10. Resource Productivity in European countries in 2001, 2010 and 2019

Source of data: Statistical Office of the Republic of Serbia, acceded 30 March 2021, Eurostat web page, acceded on 16 May 2021

15. CONCLUSION

Based on relevant data, information and analysis from this Report, the following conclusions have been drawn according to thematic areas:

Air emissions

The largest emitted quantities of sulphur oxides, nitrogen oxides and particulate matters in 2020, as in previous years, came from thermal power plants, chemical, mineral and food industries. The most significant contribution to the total amount of emitted acidifying gases in 2019 was given by: “Energy production and distribution” for NOx – 53.84% and “Road transport” – 19.24%, and for SO_2 “Energy production and distribution” – 91.50% and “Agriculture” about 90.72% for NH_3. Acidifying gas emissions were calculated according to the EMEP/EEA 2019 methodology. The share of PM_{10} emissions is the highest for “Heating plants with a capacity of less than 50 MW and individual heating”, around 51.37%, and “Energy use in industry and industrial processes” with 12.10%.

Air quality and pollen allergens

The air quality in the territory of the Republic of Serbia in 2020, as in previous years, was predominantly affected by the concentrations of particulate matters.

In the course of 2020, air quality in the zone of Serbia and in the zone of Vojvodina was clean or slightly polluted, except in the Cities of Valjevo, Novi Pazar, Kraljevo, Zaječar, Kragujevac, Subotica, Zrenjanin and Popovac. In the agglomerations of Belgrade, Niš, Bor, Pančevo, Smederevo, Kosjerić and Užice, limit values (LV) of monitored pollutants were exceeded in 2020, which caused excessive pollution. During 2020, there was a small increase in the number of cities with excessive air quality pollution, and in Bor, an increase was again recorded in the number of occurrences of sulphur dioxide concentrations dangerous to human health. The content of arsenic (As) in the particulate matters PM_{10} in Bor again significantly exceeded the annual target value. The volume of available data in 2020 had increased compared to the previous year, despite the difficult working conditions during the pandemic.

In 2020, the highest values of the total amount of pollen grains for birch pollen were registered in Novi Sad (1784 pg/m^3) on Zlatibor for grass pollen (308 pg/m^3), in Vrbas for regweed pollen (1347 pg/m^3). The only reliable measure to reduce the concentration in the air of regweed pollen, as the strongest allergen, is to increase the controlled destruction of this aggressive weed.

Water quality

The latest available data for water quality indicators refer to 2019. According to the SWQI indicator, there was an insignificant trend of changing water quality on the territory of the Republic of Serbia in the period 2010-2019. Poor quality according to SWQI was determined at 11% of measurement points (four locations in AP Vojvodina and Ristovac on South Morava). According to the BOD-5 indicator, water quality in the territory of the Republic of Serbia was without significant changes in the period 2010-2019. Concentrations are low and within the limits of good ecological status. According to the ammonium indicator (NH_4-N), water quality in the territory of the Republic of Serbia was without significant changes in the period 2010-2019, except in the Sava River Basin, where an unfavourable (growing) trend of ammonium concentrations had been found. Concentrations are low and within the limits of good ecological status. According to the indicator for nitrates (NO_3-N), water quality had an unfavourable (growing) trend in the territory of the Republic of Serbia in the period 2010-2019, except in the Danube River Basin, where there was an insignificant trend of changing water quality. Concentrations, however, are very low within the limits of excellent and good ecological status. According to the orthophosphate indicator (PO_4-P), water quality on the territory of the Republic of Serbia was without significant changes in the period 2010-2019. Eight (18%) measurement points do not belong to good ecological status.

In 2019, five parameters of priority and priority hazardous substances exceeded the allowed average annual concentrations at 36% of measurement points. The maximum allowed concentrations were exceeded for six parameters at 43% of measurement points. Persistent organic pollutants (POPs chemicals) did not exceed the permitted concentrations.

In 2019, 67.3% of public water supply systems in urban settlements had sanitised drinking water in both physical-chemical and microbiological sense, which is the highest percentage for the observed period of 2010-2019. The percentage of residents connected to public water supply and public sewerage systems was constantly growing in the period 2000-2019. The water exploitation index was very favourable because it recorded a very low average value of only 2.8% in the period 2010-2019. Water loss in the water supply network of the Republic of Serbia, expressed as a percentage, averaged at 33.9% and had an unfavourable growing trend in the period 2010-2019. Use of water in households (specific consumption) had a favourable (declining) trend in the period 2010-2019. The percentage of polluted (untreated) wastewater recorded a favourable (declining) trend in the period 2010-2019. The percentage of the population covered by wastewater treatment system recorded a favourable (growing) trend in the period 2010-2019.

Emissions to water

The dominant water pollution in the Republic of Serbia with nitrogen and phosphorus comes from utility and industrial sources which discharge their untreated wastewater into water intakes through sewage systems. The largest emitted amounts of nitrogen and phosphorus in industrial wastewater come from plants from the energy sector and from PUCs that manage waste and wastewater at local level, followed by chemical and mineral industries. Total emissions of nitrogen and phosphorus from point sources of municipal and industrial wastewater are lower compared to the previous year in the Republic of Serbia, i.e. they record a positive (declining) trend. The share of heavy metal emissions in the total emissions of pollutants in the Republic of Serbia was only 0.1%, but their monitoring is important due to the high toxicity and negative impact, primarily on human health.

Biodiversity, forests, hunting, fishing

In 2020, 285 new hectares of the territory of the Republic of Serbia were placed under protection. A total of 2,633 species of plants, animals and fungi are protected, of which 1,783 species are strictly protected. The health condition of forests is relatively good. During the last decade, there had been an increase in the production of assortments from state-owned forests by about 40%. The number of populations of the most important hunting species had been stable in the last five years, and while the catch of roe deer, mouflon, chamois and quail had decreased, the catch of wild boar, fallow deer, rabbit and pheasant had increased. Commercial fishing decreased by about 14%, and recreational fishing by about 30%, while aquaculture production decreased by about 23% compared to 2019.

Soil

In 2020, 213 sites were identified in the Republic of Serbia in the category of potentially contaminated and contaminated sites. The largest share in the identified locations is held by waste management sites – 71.83%, which include unsanitary landfills – dumpsites, managed by local self-government units. In 2020, the degree of endangerment of soil from chemical pollution in urban zones was monitored in eight local self-government units.

The area of central Serbia is dominated by soils with weakly acidic to acidic reaction, carbonate-free to weakly carbonated, weakly humous to humous, with low and high content of readily available phosphorus, and soils with optimal and high content of readily available potassium. The results of fertility control of agricultural areas in central Serbia in 2020 showed that the largest number of samples (55.7%) had a low content of organic carbon.

Waste

About 9.57 million tonnes of waste were produced in the Republic of Serbia. Out of that, 68,000 t was hazardous waste. Based on the morphological composition of municipal waste, it can be concluded that biodegradable waste takes the highest share. Ash, slag and dust from boilers, together with fly ash from coal (waste code 10 01 in the Waste Catalogue) were generated in the amount of 7.78 million tonnes, or 81% of the total amount of waste generated, which indicates that thermal power plants are the largest waste generators.

The total amount of packaging placed on the market of the Republic of Serbia was 362,236.7 t in 2020, and the amount of recovered packaging waste, reported by the operator of the packaging management system was 226,020.8 t, with 216,711.2 t of packaging waste recycled. In 2020, 165.42 tonnes of PCB-containing waste were generated.

Eleven sanitary landfills received 558,568 t of waste. The total number of active waste management permits is 2,443. During 2020, 424,071 tonnes of waste was exported from the Republic of Serbia, and 296,523 tonnes of waste was imported. General and specific national goals for the Republic of Serbia in 2020 were met for waste recovery, in the percentage of 62.6%, and for waste recycling in the percentage of 60.0%.

Noise

The results of noise monitoring from 16 local self-government units (156 measurement points) were analysed, and in four agglomerations (50 measurement points) for 2020. The City of Niš is still the only one with 24-hour continuous monitoring, which is worrying.

Non-ionizing radiation

There are 12,685 base radio stations on the territory of the Republic of Serbia. Out of that number, 290 were declared sources of non-ionizing radiation of special interest.

Industry

This chapter presents the measures taken to manage environmental protection. In the Republic of Serbia, over the past two decades, there had been a significant increase in the number of organisations with ISO 14001 certificates, while eco certification of companies stagnated, and there has been no EMAS registration so far.

Energy

The volume of energy consumption had been oscillating for many years, and the structure of consumption is constantly dominated by fossil fuels. In 2020 their share reached 86.6%. Households have the largest share in final energy consumption with 36%. The target share of renewable energy sources in the final energy consumption for the Republic of Serbia is 27% by 2020, and in 2019 the share was 21.4%. Reductions in GHG emissions due to the use of energy from renewable sources are on the rise, and in 2019 were estimated at 8.8 million tonnes of CO_{2eq}.

Agriculture

Trend in the number of heads of certain autochthonous breeds and stocks of domestic animals showed an increase in the period 2003-2020, with the increased number of heads and the number of rearing sites.

In relation to the total used agricultural land in 2020, 1.5% of the area was irrigated, and 69,113 thousand m^3 of water was abstracted, which is 2.1% more than in the previous year. The share of the area under organic production in relation to used agricultural land was 0.61% in 2019.

Tourism

Although the increase of tourists in the last few years is evident, the Republic of Serbia is not a destination of “mass tourism” and touristic activity does not endanger the environmental quality to a greater extent. Special tourist attraction are protected natural areas in the mountains, the most visited are Zlatibor and Kopaonik, followed by Tara and Divčibare.

Economic instruments

Estimated budget expenditures, according to available data, amounted to about 0.3% of gross domestic product (GDP) in 2019, as in previous years, and revenues from fees, which had an increasing trend, dropped significantly in 2020 to 0.14 % of GDP from 0.24% in 2019. Investments of economic sectors, recording large oscillations, were 0.07% of GDP in 2020. Donations that had a growing trend are estimated at 0.14% of GDP, and loans at 0.03% of GDP. Incentives and subsidies, which were also constantly increasing, amounted to 0.09% of GDP, with the largest share of subsidies for the recycling industry of 69%. The total amount of funds for investments and current expenditures was constantly increasing, and in 2019 it amounted to 0.78% of GDP, but investments had been decreasing in recent years, and in 2019 they amounted to 0.21% of GDP.

Circular economy

The “Road Map for Circular Economy in Serbia” was published in 2020, and the strategies of industrial policy and smart specialisation were adopted. The main indicators of circular economy are related to the efficient use of resources. Domestic material consumption had a slightly increasing trend, and such a trend has a negative meaning because the annual consumption of resources was increasing, and in 2019 it amounted to 127 million tonnes. On the other hand, the productivity of resources is in a constant significant increase, which has a positive meaning, and in 2019 it amounted to RSD 39.2 per kilogram.

The Report on the State of Environment in the Republic of Serbia for 2020 contains relevant data and information based on official data of state institutions, scientific and professional organisations and from other participants responsible for monitoring the state of certain environmental media. It will be possible to monitor the expected effects of the measures adopted by the state authorities in the following reports on the basis of monitoring of all environmental factors.

We would like to thank all institutions and individuals who contributed to the production, collection, and processing of the relevant information necessary to produce this Report.

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