THE REPUBLIC OF SERBIA
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The Republic Water Directorate

REPORT ON STRATEGIC ENVIRONMENTAL ASSESSMENT OF THE WATER MANAGEMENT PLAN IN THE REPUBLIC OF SERBIA FOR THE PERIOD 2021–2027

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C O N T E N T S

INTRODUCTORY NOTES

The Strategic Environmental Assessment Report was prepared based on the Decision on the Drafting of the Strategic Environmental Assessment of the Water Management Plan in the Republic of Serbia for the Period 2021-2027 (The Official Gazette of the Republic of Serbia, No. 35/2021).

For the purposes of developing the strategic environmental assessment (hereinafter: SEA), as the SEA procuring entity in the public procurement procedure No 0007, the Ministry of Agriculture, Forestry, and Water Economy of the Republic of Serbia's Republic Water Directorate selected the Institute for Architecture and Urban & Spatial Planning as the drafting authority, entering into the Contract on the Development of the SEA No 404-02-187/2021-07, dated 28 July 2021 (the Ministry), ie.e No 837, dated 28 July 2021 (the Institute), with it.

Pursuant to the Contract, the duty of the drafting authority is to develop a high-quality SEA within the defined deadlines, in line with the Decision on the Drafting of the Strategic Environmental Assessment, the relevant legislation, and the terms of reference defined by the Ministry.

The framework for developing the strategic assessment is the Report on the Strategic Environmental Assessment of the Water Management Plan in the Republic of Serbia for the Period Until 2034, which already specifies the relevant objectives, indicators, guidelines for the sustainable water management, and the environmental monitoring.

For the purposes of developing the SEA, the Institute for Architecture and Urban & Spatial Planning has set up a multidisciplinary team in line with the public procurement terms related to the human resources available as well as the Institute's requirements to ensure high-quality performance.

1. STARTING POINTS FOR STRATEGIC ENVIRONMENTAL ASSESSMENT

Pursuant to Article 13 of the Law on Strategic Environmental Impact Assessment, the starting points for the SEA include:

- Brief overview of contents and objectives of the Water Management Plan in the Republic of Serbia for the Period Until 2021-2027, and its relationship to other plans and programmes;
- Overview of environmental quality and the current state of the environment in the area encompassed by the Report;
- Characteristics of the environment in the areas in which it can be exposed to significant impacts;
- Consideration of environmental protection problems in the plan and explanation of reasons why certain issues have been left out from the assessment process;
- Overview of alternative solutions relating to the environmental protection in the plan and programme, including the alternative solution for non-implementation of the plan, as well as the most favourable solution from the aspect of environmental protection;

Results of prior consultations with authorities and organisations concerned which are important from the aspect of SEA objectives and possible environmental impacts.

All the items listed above are included in this chapter, with the exception of the overview and evaluation of the alternative solutions, given that they were not the subject of the Water Management Plan in the Republic of Serbia for the Period 2021-2027, and that they were addressed in the SEA, which was completed in 2015 for the purposes of the Water Management Strategy.

1.1. Overview of the subject, content, and objectives of the Water Management Plan in the Republic of Serbia for the Period 2021-2027, and its relationship to other documents

1.1.1. Overview of the subject, content, and objectives of the Water Management Plan in the Republic of Serbia for the Period 2021-2027

The subject of the Water Management Plan in the Republic of Serbia for the Period 2021-2027 (Water Management Plan) is a synthesis of all the elements stipulated by the national legislation of the Republic of Serbia (RS) and the currently valid international agreements in the water sector that have been signed by the RS, taking account of the requirements of the European Union (EU) directives related to the water sector, primarily the Water Framework Directive (WFD), from water characterization and analysis of the current condition to defining the programme of measures for the six-year planning periods which will eventually allow the set environmental objectives defined for all surface and ground water bodies (WB) to be attained.

The content of the Water Management Plan has been conceptualized in terms of the areas defined in specific chapters. The characteristics of river basins and the activities envisaged under the six-year planning period in the RS are represented in the 15 chapters of the Water Management Plan.

The Water Management Plan is the key document in the water management process, which aims to ensure a good status of all the waters in line with the currently valid RS legislation, as

well as the international agreements and requirements of the EU directives relating to the water sector, primarily the WFD.

- Chapter 1 is an introduction to the general objectives of the WFD, as well as the legal and organizational framework.
- Chapter 2 describes the river basins and main natural characteristics, including the typology for determining the reference condition for the surface water WBs and the delineation of the surface and ground water bodies.
- Chapter 3 describes human activities in the river basins in terms of the pressures and effects they have on the waters, as well as the risks posed in terms of non-implementation of the WFD objectives.
- Chapter 4 provides an overview and description of the protected areas.
- Chapter 5 describes the monitoring programme for determining the status of surface and ground waters.
- Chapter 6 describes the status of surface and ground waters.
- Chapter 7 describes the environmental objectives and exceptions to the non-implementation of objectives until 2027.
- Chapter 8 describes the economic analyses of water use, the envisaged trends relating to water use, as well as the practical steps and measures undertaken with the aim of ensuring water use cost redemption, including the Polluter-Pays principle.
- Chapter 9 provides a summary of the programme of measures to be implemented at the river basin to ensure that the environmental and other objectives are met within the envisaged time period.
- Chapter 10 is a register of the other programmes relevant to the implementation of the WFD.
- Chapter 11 describes the activities carried out in relation to the involvement of the general public in the preparation of this Plan and its implementation.
- Chapter 12 lists the authorities with a remit over the preparation of water management plans at river basins and the implementation of the WFD, as well as a detailed list of the international agreements.
- Chapter 13 provides contact information allowing the general public to access required information.
- Chapter 14 lists the documents and other sources of information.
- Chapter 15 provides an overview of the relevant legislation.

The iterative and integrated nature of the planning process is best seen in the multiple links between different chapters. The analysis of pressures and effects in Chapter 3 makes the coree of the Water Management Plan. It provides a basis for defining the so-called "important issues in the area of water management" (SWMI), which were the subject of public consultations (Chapter 11), laying down the thematic framework for the development of the Water Management Plan. Chapter 3 is also concerned with risk assessment (assessing the risk of a WB not meeting the objectives of the WFD, which takes account of the protected areas (Chapter 4), the environmental objectives (Chapter 7), and the economic analysis (Chapter 8). The results of the risk assessment can serve to assess the status of those WBs for which the monitoring data are not available yet (Chapters 5 and 6). Still more importantly, the risk assessment is also the basis for formulating the Measures Programme (MP) (Chapter 9). Lastly, combined with the MP, the risk assessment results provide information for Chapters 5 and 7 as, on the one hand, the WBs which are "at risk" require adequate monitoring and, on the other, exceptions may need to be made in cases where the scope of the required measures is too large.

The Water Management Plan is the key document in the process of water management, aiming to ensure a good status for all the waters in line with the currently valid legislation in the RS, as well as the currently valid international agreements and the requirements of the EU directives related to the water sector, primarily the WFD. All the WBs must meet the objectives stipulated in Article 4 of the WFD. Article 4 (1) defines the general objectives of the Water Framework Directive to be met in three management cycles in all the surface and ground water bodies, and introduces the principle of "non-deterioration" (preventing any further deterioration of the water body status).

The main objective of the WFD is the prevention of WB status deterioration, as well as the renewal and protection of the good status of the surface and ground water WB. The good status is defined as a good ecological and a good chemical status of the surface water WB, and a good quantitative and chemical status of the ground water WB. The first cycle of water management in the RS includes the period between 2021 and 2027, which is the third cycle of water management for EU member states. In this period, a full implementation of the measures aimed at attaining a good status of all water bodies in the RS until 2027 is not possible, as there are significant insufficiencies in the data, methodologies, and monitoring, which cannot be brough into full alignment with the WFD and, most importantly, there is a lack of human resources and funds to implement the required measures. Meeting the environmental objectives of the WFD depends to a great extent on the application of the principal measures, mostly those relating to the Urban Waste Water Treatment Directive and the Drinking Water Directive.

All water bodies must meet the objectives laid down in Article 4 of the WFD. Article 4 (1) defines the general objectives of the Water Framework Directive to be met in three management cycles in all the surface and ground water bodies, and introduces the principle of "non-deterioration" (preventing any further deterioration of the water body status):

- A good ecological / chemical status for surface water WB, or a good ecological potential and chemical status for a heavily modified body of water (HMBW) and an artificial bodyof water (ABW);
- A good chemical / quantitative status of a ground water WB;
- Ensuring compliance with any standards or objectives related to protected areas in line with the EU legislation.

In many cases, in order to achieve the environmental objectives of the WFD, it is necessary to implement specific technical or administrative-research measures. However, in some cases, the implementation of these measures poses great technical, ecological, and financial challenges. Therefore, under Article 4 of the WFD, exceptions may be made with respect to the environmental objectives in all cases where for justified reasons a good ecological status / potential cannot be achieved for a specific WB. Under Article 4 (5) of the WFD, it is possible to achieve less stringent environmental objectives for specific bodies of water when they are affected by human activity, or their natural condition is such that the achievement of these objectives would be infeasible or disproportionately expensive. In the first planning cycle in the RS, exceptions as determined under Article 4 (5) were not implemented for surface and ground water WBs. Using these exceptions will be considered for the second planning cycle.

In Article 4 (1) (c), the WFD stipulates the achievement of the environmental objectives for protected areas. For WBs belonging to a protected area, the environmental objectives can be more stringent that the required good status if other EU directives related to protected areas prescribe it: The Drinking Water Directive, the Urban Waste Water Treatment Directive, the

1.1.2. The relationship to other documents – strategies, plans, and programmes

The strategic, planning and legislation documents that form the basis for water management in the Republic of Serbia are defined in the *Water Law*. Mutual harmonization of these and other strategic and planning documents that are passed at the level of the RS and include the aspect of water is necessary and it refers to the following:

- *The Spatial Plan of the Republic of Serbia from 2010 to 2020* (The Official Gazette of the Republic of Serbia No. 88/2010) which sets forth the long-term foundations for organizing, arranging, utilization and protection of the space of the Republic of Serbia. The section dealing with water resources particularly highlights the importance of their sustainable and closely monitored usage, alignment of water system development with other users of space (given the fact that water systems and surface pits impose the strictest requirements for the space that is needed for their development), protection of waters as the most vital resource against pollution, implementation of optimal systems of protection against waters within the planned organization of space and basins, prevention of inadequate unplanned usage of water and space needed for the development of hydro-technical systems, well-adjusted integration of the water economy infrastructure in the ecological and social environment, as well as prevention of wrong moves regarding economy and development – the biggest threat being the water privatization. The big water basins (the Danube, the Sava and the Tisza) are given a multifunctional role, surface waters should have a special importance for the supply of arid and waterless areas, underground waters as public property must be kept under special control, while other rivers, lakes, marshes and ponds should be protected and used in compliance with the international standards applicable to such vital elements of environment.
- *The National Strategy of Sustainable Use of Natural Resources and Goods* (The Official Gazette of the Republic of Serbia, No. 33/2012), which should ensure, alongside the Spatial Plan of the Republic of Serbia, strategic planning of sustainable use and protection of the natural resources and goods in the Republic of Serbia..
- *The Water Management Strategy in the Republic of Serbia Until 2034*(The Official Gazette of the Republic of Serbia, No. 3/17) is a document that will be used in the upcoming period as the basis for the implementation of the water sector reforms, aimed at attaining the required standards in water management, including organizational adaptation and systemic strengthening of the professional and institutional capacities at the national, regional, and local levels. The strategic commitments and objectives laid down in this document, with the exception of the Water Management Plan for the Danube River Basin in the Republic of Serbia, also form the basis for the development of water management plans in water catchment areas, as well as for drafting amendments to the Water Law, inclusive of the funding aspect. At the same time, the frameworks set forth in this Strategy must be taken into account in preparing strategies and plans for spatial design, environmental protection, and other areas which depend on waters or affect them.
- *The Action Plan for the Implementation of the Water Management Strategy in the Republic of Serbia for the Period between 2021 and 2023* (The Official Gazette of the Republic of Serbia, No. 79/21) is a document which aims to define the indicators which, in addition to monitoring the implementation of the Strategy, also ensure harmonization with the activities which are relevant in the European Union to the areas of the environment and waters, specific indicators which need to be monitored at the national level, parameters which improve the statistics in the area of waters, as well as defining

activities with deadlines and bodies, organizations, and public enterprises with a remit over implementing these activities, for the validity period of the Action Plan.

- *The National Environmental Protection Programme* (The Official Gazette of the Republic of Serbia, No. 12/10) defines the strategic objectives of the environmental protection policy, as well as the specific objectives targeting medium protection (air, water, soil) and effects of specific sectors on the environment (industry, energy, agriculture, mining, transport, etc.). In addition, priority objectives are set for the mediums and sectors, and necessary reforms proposed, with the aim of effecting all the changes required to achieve the objectives. The proposed reforms include the reforms of regulatory instruments and economic instruments, the monitoring and information system, the funding system in the area of environmental protection, institutional issues, and requests relating to infrastructure in the area of environmental protection. This document is comprehensive, and formed the basis for the other strategies that have been adopted.

In addition to the listed documents, other regional and local level documents must be observed during the preparation of the planning and investment documentation in the area of water management. Such documentation might have an effect on water management, or it can cover certain water-related issues.

Forms of International Cooperation

The Republic of Serbia engages in cooperation in the area of cross-border watercourses multilaterally, as part of implementing international conventions, as well as through work on the International Commission for the Protection of Rivers and the International Commission for the Sava River Basin, and with its neighbours as part of bilateral cooperation.

International cooperation is necessary and very significant for the water sector, is regulated by international contracts, conventions and agreements that are, or must become, an integral part of the regulatory framework of water management in the RS. The most important documents underpinning the cooperation in the water sector are listed below.

Cooperation in the region of UNECE countries is based on the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992), which represents a binding framework for the protection of international surface and ground waters through prevention, control and environmentally acceptable water management. It has been ratified by a special law[1].

International Cooperation on the Danube Basin is based on the Convention on Cooperation for the Protection and Sustainable Use of the River Danube (Sofia, 1994) whose adoption in the territory of the Republic of Serbia is regulated by a special law[2]. Signatory countries are obligated to strive to sustainable and equitable water management, including the protection, improvement and rational utilisation of surface and ground waters. The implementation of the Convention is under the jurisdiction of the International Commission for the Protection of the

[1] The Law on the Ratification of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the Amendment to Articles 25 and 26 of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (The Official Gazette of the Republic of Serbia – International Agreements, No.1/2010)

[2] The Law on the Ratification of the Convention on Cooperation for the Protection and Sustainable Use of the River Danube (The Official Gazette of the SRY - International Agreements, No. 2/2003)

Danube River[3] (ICPDR) with headquarters in Vienna, and Serbia is a full member since 2003. Under ICPDR, and in accordance with the Memorandum of Understanding signed in Vienna in 2004[4], international cooperation is implemented on the Tisza basin, as well.

International Cooperation for the Water Management on the Sava Basin has been established following the signing of the Framework Agreement on the Sava River Basin (Kranjska Gora, 2002) and its ratification through a separate law[5]. The International commission for the Sava basin was set up in 2003, while in 2006 the Secretariat was established in Zagreb. A special Protocol on the Protection Against Floods, annexed to the Framework Agreement, RS Official Gazette – international contracts 16/2014, regulates the cooperation aimed at prevention and/or minimization of risks of floods by undertaking certain measures and activities. The issues related to navigation on the Sava international waterway are governed by a special Protocol ratified under the law concerning the Framework Agreement on the Sava basin.

Navigation on the Danube, a river with the international waterway status, is conducted in compliance with the Belgrade Convention Regarding the Regime of Navigation on the Danube[6], which also forms the framework for the navigation management between 11 EU members states located in the basin of this river. The Convention is aimed at strengthening the economic relations in the region and underlines the need for maintaining the navigation on the entire river Danube. The implementation of this Convention is coordinated by the Danube Commission, headquartered in Budapest.

The current status of the *bilateral cooperation* in the water sector is not satisfactory, neither in terms of quality, nor in terms of scope. The only active bilateral commissions are those with Romania and Hungary established based on agreements dating back to 1955. Cooperation with Bulgaria has been suspended since 1982. To date, the cooperation with the neighbouring countries in the territory of the former SFRY (Croatia, Bosnia and Herzegovina, Montenegro and Macedonia) has not been regulated, although steps have been made in that direction. The renewed Agreement between the Government of Serbia and the Government of Hungary in the area of sustainable management of transboundary watercourses[7] was signed on 15 April 2019 in Subotica, while a similar document, between the Government of the RS and the Government of Romania[8] was signed on 5 June 2019 in Bucharest. These documents further improve the bilateral cooperation in the water sector.

Trilateral cooperation was achieved in the area of ice congestion defence on the Danube with Hungary and Croatia. It is necessary to create a basis in the upcoming period for establishing a

[3] The International Commission for the Protection of the Danube River – ICPDR (http://www.icpdr.org/)
[4] Towards a River Basin Management Plan for the Tisza river supporting sustainable development of the region - Memorandum of Understanding (www.icpdr.org/icpdr-files/8200)
[5] The Law on the Ratification of the Framework Agreement of the Sava River Basin, The Official Gazette of Serbia & Montenegro - International Agreements, No. 12/04)
[6] Adopted at the International Conference held in Belgrade in August 1948, published in The Official Gazette of the FNRY, No. 4/1949
[7] The Law on the Ratification of the Agreement between the Government of Serbia and the Government of Hungary on the Cooperation in the Area of Sustainable Management of Transboundary Watercourses and Basins of Common Interest (The Official Gazette of the Republic of Serbia – International Agreements, No. 4/2020), (http://www.parlament.gov.rs/upload/archive/files/cir/pdf/zakoni/2020/2004-19.pdf)
[8] The Law on the Ratification of the Agreement between the Government of Serbia and the Government of Romania on the Cooperation in the Aera of Sustainable Management of Transboundary Watercourses and Basins of Common Interest (The Official Gazette of the Republic of Serbia – International Agreements, No. 4/2020), (http://www.parlament.gov.rs/upload/archive/files/cir/pdf/predlozi_zakona/2019/2700-19.pdf)

trilateral cooperation with Hungary and Romania, as well as the Republic of Croatia and the Federation of Bosnia and Herzegovina.

EU Directives Governing the Water Sector

EU water legislation is of great importance not only for the member states, but also for all other countries intending to cooperate with them or become a member of the Union.

The most important act in the water sector is the *EU Water Framework Directive*[9] which represents a strategic but also an operational framework for the achievement of key objectives of the EU water policy: comprehensive protection of all waters, considering the natural interaction between them both with respect to quality and quantity, by applying the principle of integrated water resources management. The concept of integration of all relevant segments in the water sector is the key for attaining the proclaimed goals. The most important positions stated in the Directive are as follows: planning and managing water resources on the basin level, harmonisation of objectives regarding water resources management and environment, integrated management of river basins and setting up competent services for water management on the level of great hydrographical areas, imposing strict requirements for the emission of polluting materials and setting high standards for assessing the water quality in watercourses; economic policy that enables self-funding of the water sector through adequate collection of water and all water-related services; realistic, economic price of water accompanied by strict observance of the principle – user pays, polluter pays, complete reimbursement of all underlying costs, inclusive of the costs related to water protection and the necessary environmental protection. All these Directive provisions are significant for the Serbian water sector strategy, particularly the section regarding the water sector self-funding policy on the basis of realistic economic prices of water and water-related services (water as an economic category), and inclusion in the price of all the costs incurred for the water protection. Also important is a very precise provision on setting up management bodies on the level of great basins as well as inclusion of the public, especially the users, in the management process, in order to change the public from being a passive subject that is always poorly informed and resistant to the proposed actions in the water area to an active participant in the management process, understanding the reasons behind certain measures regarding water and observes the whole structure of all costs related to research, planning, construction, maintenance and protection that must be incorporated in the pricing of water and water related services. Following the adoption of the WFD, the water resources in the EU territory have become the focus of the entire Union, imposing the obligation for every member state to harmonise the legislative, technical and economic approach to water management and ensure a coherent water management strategy. This obligation applies to prospective EU members, as well. The WFD is an "umbrella" directive that incorporates and links other significant directives directly or indirectly dealing with water, the most important being:

- *Directive 91/271/EEC concerning urban waste water treatment*, which sets forth the obligation to treat utility waste water for all agglomerations above 2.000 EC;
- *Directive 91/676/EEC on the protection of waters against pollution caused by nitrates from agricultural sources*, which identifies vulnerable areas exposed to nitrates-caused pollution, and promotes rules of good agricultural practice;

[9] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

- *Directive 75/440/ECC on the quality required of surface water intended for the abstraction of drinking water*, which deals with quality requirements for the water used or intended for abstraction of drinking water;
- *Directive 98/83/EC on the quality of water intended for human consumption*, setting standards for the quality and control of water intended for human consumption (water delivered to the public water supply systems, water used in food processing industry);
- *Directive 2006/7/EC of the European parliament and of the Council concerning the management of bathing water quality and repealing Directive 76/160/EC*, setting standards for the quality and monitoring of the water used for bathing and recreation;
- *Directive 2006/11/EC on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community*, listing dangerous substances whose leakage in the natural receptions is limited or prohibited, as well as setting forth monitoring measures;
- *Directive 2006/118/EC on the protection of groundwater against pollution and deterioration*, aimed at preventing deterioration of ground waters through special measures of pollution prevention and control;
- *Directive 2008/1/EC concerning integrated pollution prevention and control*, which stipulates that industrial plants with a high potential of pollution must obtain permits only if environmental protection requirements are met;
- *Directive 2008/105/EC on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council*, whose aim is to establish environmental quality standards regarding the presence of certain polluting substances identified as priority based on the level of environmental risk;
- *Directive 2009/90/EC laying down pursuant to Directive 2009/60/EC of the European Parliament and of the Council, technical specifications for chemical analysis and monitoring of water status*, setting forth minimum requirements for their implementation during monitoring, as well as identifying rules to prove the quality of analysis results;
- *Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks*, aimed at establishing the framework for the assessment and management of flood risks in order to reduce their negative impact on people, environment, and the economy. Implementing the Directive is important for the RS as the application of guidelines provided in the Directive allows the regulation of harmful effects which reduce the space for natural water retention, arising as a result of the ways land is used. Consequently, the costs and damage that protected resources sustain, caused by floods, are reduced. The starting point of the Directive is: floods cannot be prevented, but with good planning, aimed at avoiding the increase of human settlements and construction of other buildings in floodplains, harmful effects of floods can be avoided. Therefore, member states are required to prepare flood hazard maps and flood risk maps and, among other things, include them in all spatial and regulation plans. This would result in improving technical solutions and decisions related to managing flood risks, allowing more space to be planned for rivers (wherever possible) in order to reduce the harmful effects of floods. Under the Directive, it is necessary to draft a preliminary flood risk assessment, identify marked floodplains, develop flood exposure and flood risk maps for specific marked floodplains, and adopt flood risk management plans. The prepared documents should be made available to the public and aligned with the WFD.

- *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy*, which sets out the framework for community action in the field of marine environmental protection policy.

Obligations stemming from EU Directives and international cooperation

In the framework of the EU integration process, and in order to fulfil its obligations specified in the accepted international conventions and agreements, Serbia has started the transposition of the EU directives that are significant for the water and environmental protection sectors. The *Water Law* from 2010 and the related secondary legislation now include or will be amended to include provisions from the WFD and the Floods Directive, as well as provisions from other directives relating to waters, taking account of the socio-economic situation in the Republic of Serbia. EU legislation is planned to be fully transposed in the Serbian law by 2023.

The Republic of Serbia participates in international activities on the river basins of the Danube, the Sava and the Tisza. The many years of the implementation of the WFD by ICPDR resulted in 2009 in the adoption of the Danube River Basin Management Plan and its Amendment (2015), followed by the adoption of the Tisza Basin Integral Management Plan in 2011 and its Amendment (2019) and the adoption of the Sava River Basin Management Plan (2015). Implementation of the Floods Directive is underway, which should lead to the adoption of the Flood Risk Management Plan for the Danube River Basin. Each of the said plans includes the Common Programme of Measures to be implemented with the aim of improving the basin environment conditions.

Bilateral cooperation is particularly important for the Republic of Serbia due to the fact that a large part of the major watercourse basins (except for the Great Morava) is outside of its territory. The Republic of Serbia works intensively on establishing active bilateral agreements with the neighbouring countries: new agreements have been signed with Hungary and Romania in the area of water management. For that reason, draft agreements with neighbouring countries have been prepared, initiatives and negotiations have been launched for establishing bilateral cooperation that will, inter alia, be based on the common implementation of the WFD and the Floods Directive on cross-border waters.

1.2 Overview of environmental quality and the current state of the environment [10]

In the course of preparation of the Strategic Environmental Impact Assessment, it is necessary to make an overview of the current state and quality of the environment in the area covered by the Assessment, since the characteristics of the current state of the environment are a basis for investigating and evaluating environmental problems in an area. Environmental quality is considered as one of the basic criteria for a balanced and sustainable development in the Republic of Serbia. For the needs of this investigation, the basic characteristics of the current status are defined based upon the existing strategic documents, environment reports, environmental studies, as well as other available professional and scientific literature.

[10] For the analysis and presentation of the environmental quality data, the following data have been used: the data received from the Agency for Environmental Protection; the documentary basis of the Spatial Plan of the Republic of Serbia; The Environment Situation Analysis in the Strategy for the Water Management; The Report on the Condition of the Environment at PE Electric Power Industry Serbia as of 2020; The 2020 Annual Bulletin for Serbia, RHIS; and other available documentation from the spatial plans and studies concerning areas with the most important water objects.

1.2.1. Natural characteristics

1.2.1.1. Climate and meteorological characteristics

The climate and meteorological characteristics in Serbia are defined by the geographical position and relief. Serbia is located in the south of a moderate geographical area and is affected by air currents coming from different directions, causing a diverse climate which is often shaped by the local physical and geographical factors. Based on the research conducted so far, there are three major climate categories in Serbia. Each climate area has separate sub-areas. The first climate area covers Vojvodina and the peri-Panonnian land, The Morava Valley and Eastern Serbia up to the Nišava. The biggest part of this climate area is characterised as the **continental** climate. The southern border is linked to the course of the Nišava river and the West Morava up to the Drina (north-west from Užice). In other parts of the climate area, marked as **A**, the border coincides with the administrative border between Serbia and Bosnia, Croatia, Hungary, Romania and Bulgaria. As part of this area, there are two distinct lowland sub-areas (Vojvodina, peri-Pannonian land, The Morava Valley A-1 and Negotinska Krajina A-1-b) and three mountain sub-areas (the Valjevo hinterland and southern Šumadija A-2-a, the mountains from the Danube to Niš A-2-b and int the far east Stara Planina and Svrljig mountains A-2-v).

The second climate area, marked as **B,** is located south of the previously described area, stretching provisionally to the border with Metohija. Owing to the inability to precisely define the climate types in valleys and ravines (B-1), it was not possible to perform a detailed regionalisation of this area. Separation of sections with lower altitude would result in the scattering of parts with poor network of observation posts. The number of separate sub-areas would exceed the other two areas and insisting on the individuality of each sub-area would require the application of indicators that could hardly be applied to other areas. Since it is not possible to precisely define the separate altitude zones, this area has the biggest challenges when it comes to determining the climate types. The examination of the correlation between high mountain stations and the stations located at the foot of the mountains showed that the temperature regimes on different mountain belts mostly have independent patterns. The most practical solution would be to determine altitude belts that would be given certain temperature ranges according to the sloping and exposed mountain sides. It can be noted that among the defined climate areas, the largest portion of land under woods is in this B Area. There are sections under woods spanning tens and hundreds of square kilometres and as such they are a significant factor for the establishment of climate features. The largest part of the B Area would be categorised as **moderately continental** climate. Separate sub-areas belonging to this area are the Pešter Plateau (B-3-a) and Kosovo (B-3-b).

The third climate area, Area **C,** approximately coincides with the regional-geographical border between Kosovo and Metohija. In the north-east direction, the lower hilly area of Drenice enables the dominant **maritime** air movements in the part of north Kosovo as well. In the south-east direction, down the Prizrenska Bistrica valley, the continental influence is stronger. A separate section in this area is the Metohija ravine (C-1-a), while mountains Šara (C-2-a) and Prokletije (C-2-b), as sub-areas, are marked as separate territorial units.

Air Temperature

Mean annual temperatures fall in a linear manner as the altitude increases, with the vertical gradient at 0,6°C/100 m. In the RS, with its mean air temperature of 11.7ºC, 2020 is the seventh

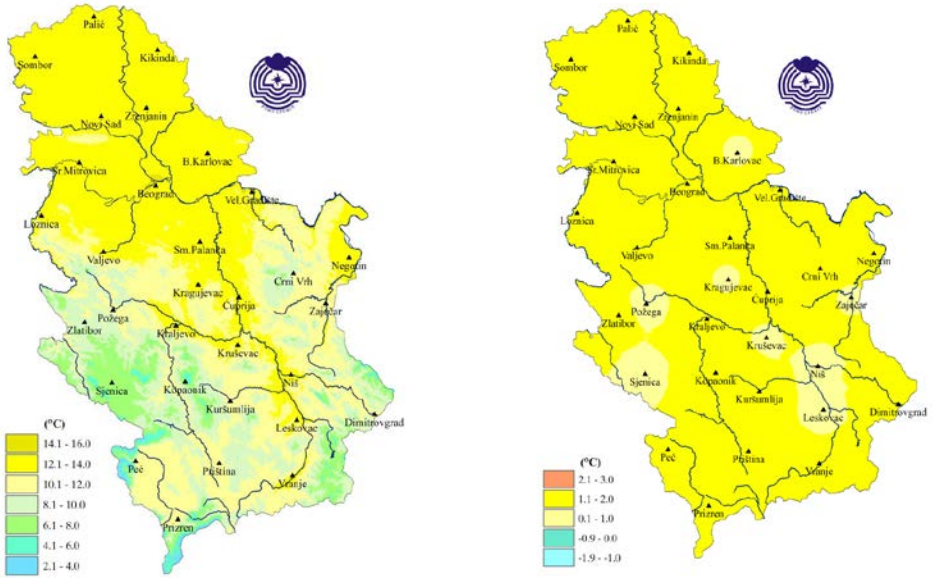
warmest year since 1951, and in Belgrade, with 13.9ºC, the ninth warmest since the beginning of the operation of the meteorological station (in 1888). The mean annual air temperature ranged from 10.6ºC in Požega to 13.9ºC in Belgrade, and in the mountainous regions from 5.0ºC on Mount Kopaonik to 8.8ºC on Mount Zlatibor. The deviation of the mean annual air temperature from the reference period 1981-2010 ranged from 0.9ºC in Zaječar, Kruševac, Sjenica, and Požega, to 1.8ºC in Negotin (Figure 1. 1.). The highest daily air temperature of 36.9ºC in 2020 was measured in Ćuprija, and the lowest, -20.8ºC, in Sjenica. Nine out of ten warmest years in the RS were registered post-2000 (the period 1951-2020), and in Belgrade 14 out of 15 warmest (for the period 1888-2020). In terms of percentile distribution, 202 was in the category of 'very warm' in most of the RS, while the areas of Negotin, Kuršumlija, Ćuprija, Dimitrovgrad, and Kopaonik were in the category of 'extremely warm'.

Precipitation

Most of Serbia had average precipitation in 2020, with the south, southwest, southeast, and some central areas receiving high and extreme precipitation. Dry areas included Valjevo and Kikinda. The precipitation volume ranged from 472.6 mm in Kikinda to 881.2 mm in Kraljevo, and in the mountainous regions from 739.7 mm in Crni Vrh to 1152.3 mm in Mount Kopaonik (Figure 1.2). The precipitation volume percentages deviated from the mean for the period 1981-2010 from 85% in Kikinda to 138% in Kruševac. The number of days with the rainfall from 0.1 mm and more ranged from 112 in Sombor to 140 in Ćuprija, and in elevated areas from 143 on Mount Zlatibor to 160 on Mount Kopaonik.

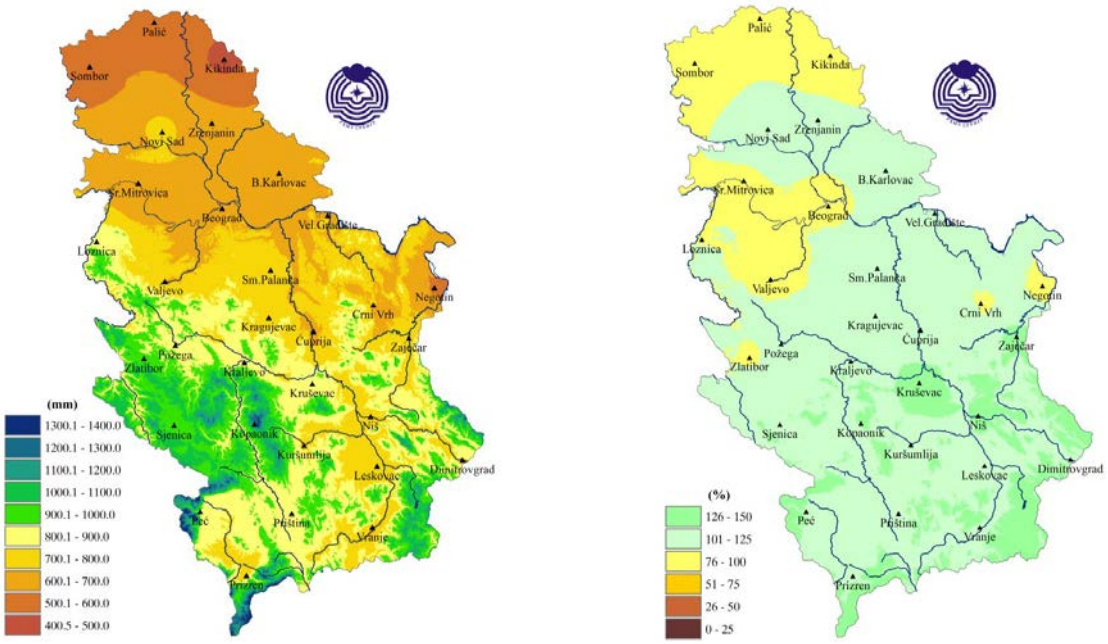
Snow cover was not recorded in Kikinda for the first time. An all-time low number of days was recorded in Loznica, Negotin, and Zaječar. The latest date of the formation of snow cover was recorded in Belgrade. The number of days with a snow cover ranged from 1 in Zrenjanin to 29 in Požega, and in elevated areas from 70 in Sjenica to 133 in Kopaonik. The tallest snow cover was recorded on Mount Kopaonik, standing at 91 cm. In lower-altitude regions, the tallest snow cover stood at 37 cm and was recorded in Kuršumlija.

Figure 1.1. The distribution of mean annual temperatures (left) in the RS in 2020, and the deviations of the annual temperature in °C from the mean between 1981 and 2010 (right)



Source: The Annual Bulletin for Serbia in 2020, The RHIS

Figure 1.2. The distribution of annual precipitation volumes (right) in the RS in 2020 (left), and the deviations from the 1981-2010 mean of annual precipitation volumes (mm) in percentages



Source: The Annual Bulletin for Serbia in 2020, The RHIS

1.2.1.2. The hydrographical network and hydro-geological characteristics

Serbia possesses significant aggregate water resources. It is a result of its natural conditions dominated by a mainly hilly and mountain relief, a predominantly waterproof geological base and sizeable quantities of precipitation. The resources include ground and surface water. However, these resources are characterised by space and time inequality and their quality is increasingly under threat.

Territory of the Republic of Serbia is a single water management space comprising parts of the Black Sea basin (rivers of the Danube basin), Aegean Sea (the Lepenac, the Pčinja and the Dragovištica) and the Adriatic Sea (the Drim and the Plavska River), as well as parts of the basins and sub-basins belonging to them.

The largest part of the Serbian territory belongs to the *Black Sea basin* (app 92.5%). The basin's average altitude is 470m; the highest point in the Black Sea basin is the top of the mountain Hajla at 2,400m, at the wellspring of the river Ibar, while the lowest point is at the confluence of the river Timok – only 30m, which is also the lowest point in Serbia. The Black Sea basin encompasses the longest rivers in Serbia: the Dunav, the Tisza, the Sava, the Great Morava, the Mlava, the Pek, the Porečka River and the Timok, with their numerous tributaries. Approximately 176 billion m^3 of water flows toward the Black Sea per year. The river Danube, with the basin surface of around 801,463km^2 and the median flow at the mouth at the Black Sea of approximately 6,500m^3/s, is 24th biggest river in the world, and second biggest in Europe. It reaches Serbia from Hungary, and exits after the confluence of the Timok, at the junction of the three borders with Romania and Bulgaria. In the Serbian territory, several significant tributaries

flow into the Danube: the Tisza, the Sava and the Great Morava, as well as many other smaller rivers.

- The largest left tributary of the Danube is the Tisza (with the basin surface around 157,186km^2, of which approximately 10,856km^2 in Serbia), which is at the same time the biggest Danube tributary in terms of the total basin surface. It enters Serbia from Hungary, at the Banat village of Đale, flowing into the Danube at Slankamen. Other large left tributaries of the Danube are the Tamiš, the DTD channel and the Nera. The largest Tisza tributary in Vojvodina is the Begej.
- The Sava is the longest right tributary of the Danube (in terms of the length and water-richness), entering the Danube at Belgrade. The surface of its basin area is approximately 97,713km^2 (of which around 15,147km^2 in Serbia). Flowing through Serbia, the Sava has many important tributaries: the Drina, the Bosut and the Kolubara.
- The largest Sava tributary is the Drina, with a total basin surface of approximately 20,320km^2, forming the border between Bosnia and Herzegovina and Serbia in a 220km-long stretch. It enters the Sava at the village Crna Bara in Serbia.
- The Lim is the largest right tributary of the river Drina. It enters Serbia from Montenegro at the town of Bijelo Polje, and exits at Priboj, flowing to Bosnia and Herzegovina and entering the river Driva from its territory.
- An important tributary of the Sava, located furthest downstream, is the Kolubara, which is formed by the Obnica and the Jablanica rivers upstream from Valjevo, and enters the Sava near Obrenovac.
- The second-largest right tributary of the Danube river in Serbia is the Great Morava (app. 38,207km^2), whose biggest part of the basin is located in Serbia, with some parts in Montenegro and Bulgaria. Downstream from the point where the South Morava (its basin surface of around 15,696km^2) joins the West Morava (the basin surface around 15.754km^2) near Stalać, the Great Morava receives the following tributaries: the Lugomir, the Lepenica, the Jasenica, the Resava and the Jezava.
- The South Morava is formed by the Binačka Morava and the Moravica, near the town of Bujanovac. The most important tributary of the South Morava is the Nišava, which enters from the neighbouring Bulgaria. Upstream from the Nišava, the South Morava receives the following tributaries: the Veternica, the Jablanica, the Pusta Reka and the Toplica.
- The West Morava is formed by the Moravica and the Đetinja. The most important tributaries of the West Morava are the Ibar, the Rasina and the Čemernica.
- The bigger right tributaries of the Danube downstream from the Great Morava are: the Mlava, the Pek, the Porečka River and, most importantly, the Timok. The Timok is formed by the White Timok and the Black Timok near Zejačar and flows from the village of Bregovo to its confluence into the Danube (with the approximate length of 15.5km as a border river between Serbia and Bulgaria.

The south border of the Black Sea basin is composed of the dividing ridge towards the Aegean Sea and the Adriatic Sea basins. The section of Aegean Sea basin located in the territory of Serbia is a part of the Vardar basin (the Pčinja, the Lepenac) and Struma (the Dragovištica), while the part of Adriatic Sea basin situated in Serbia is the Drim basin (the Beli Drim, the Plavska River).

The *Adriatic Sea basin* stretches across 5.3% of the territory of the RS. It encompasses the Metohijska Ravine with its mountain rim, where the hydrographical system of the White Drim developed. All its tributaries, except the Plavska River, flow entirely through Serbia. From the

territory of the RS, the rivers White Drim (the basin area in the territory of Serbia at 4,283km^2) and the Plavska River (the basin area in the territory of Serbia at 399km^2) flow towards Aegean Sea. The Plavska River flows down the western slopes of the Šara mountain and reaches Albania. The most significant right tributaries of the White Drim are: the Pećka Bistrica, the Dečanska Bistrica and the Erenik, while the left tributaries are the Klina and the Prizrenska Bistrica. The average altitude of this basin is 820m. Approximately 2 billion m^3 of water flows toward Adriatic Sea basin per year.

The *Aegean Sea basin* covers 2.2% of the Serbian territory (1,926km^2). It includes the rivers Lepenac and Pčinja, left tributaries of the river Vardar, and the Dragovištica, the right tributary of the river Struma. Three rivers belong to the Aegean Sea basin and their total basin area in the territory of Serbia is less than 2,000km^2: the Lepenac (app. 681km^2), the left tributary of the Vardar, the Pčinja (app. 516km^2), which also flows to Macedonia and the Dragovištica (the basin area in Serbia at 691km^2), which flows into the river Struma in Bulgaria. The average altitude of this basin is 825m. The Aegean Sea basin receives approximately 0.5m^3 of water a year.

Table 2.1. Minimum annual flows, average multi-annual and maximum annual flows

No.	River	Hydrological station	F (km^2)	$Q_{95\%}$ (m^3/s)	$Q_{sr\ god}$ (m^3/s)	$Q_{1\%}$ (m^3/s)
1.	Drina	Bajina Bašta	14,797	53.50	331.00	6,594
2.	Lim	Brodarevo	2,762	10.70	71.90	1,047
3.	Lim	Prijepolje	3,160	12.00	77.50	1,167
4.	Danube	Bezdan	210,250	952.00	2,268.0	8,356
5.	Danube	Bogojevo	251,593	1,257.00	2,777.0	9,275
6.	Danube	Smederevo	525,820	1,976.00	5,264.0	15,323
7.	Tisza	Senta	141,715	135.00	802.00	4,222
8.	Sava	S. Mitrovica	87,966	273.00	1,535.0	6,706
9.	Ibar	Raška	6,268	5.41	40.73	1,171
10.	Ibar	Ušće	6,883	7.72	46.58	1,260
11.	Ibar	Lopatnica Lakat	7,818	10.50	56.72	1,368
12.	Studenica	Ušće	540	1.74	7.11	229
13.	Lopatnica	Bogutovac	155	0.16	1.94	128
14.	South Morava	Mojsinje	15,390	11.30	93.52	2,131
15.	South Morava	Korvingrad	9,396	4.72	56.11	1,903
16.	South Morava	Grdelica	3,782	1.78	24.68	687
17.	South Morava	Vladičin Han	3,242	1.14	18.82	657
18.	Lužnica	Svođe	318	0.34	2.75	298
19.	Vlasina	Svođe	350	0.78	3.75	331
20.	Vlasina	Vlasotince	879	1.40	7.84	680
21.	South Morava	Vranjski Priboj	2,775	0.60	12.89	709
22.	Gradac	Degurić	159	0.35	2.77	189
23.	Jablanica	Sedlare	140	0.06	1.52	220
24.	Obnica	Belo Polje	185	0.04	1.75	210
25.	Kolubara	Valjevo	340	0.18	3.57	295
26.	Ribnica	Paštrić /Mionica	104	0.05	1.23	473
27.	Ljig	Bogovađa	679	0.12	4.43	270
28.	Kolubara	Beli Brod	1,896	1.28	15.78	621
29.	Visočica	Visočka Ržana	139	0.36	5.44	244
30.	Nišava	Niš	3,870	3.98	28.89	946
31.	Kutinska	Radikina Bara	205	0.09	1.29	150
32.	Visočica	Brajićevci	227	0.00	1.62	169

No.	River	Hydrological station	F (km^2)	$Q_{95\%}$ (m^3/s)	$Q_{sr\ god}$ (m^3/s)	$Q_{1\%}$ (m^3/s)
33.	Trgoviški Timok	G. Kamenica/ /Štrbac/ D. Kamenica	331	0.21	3.23	218
34.	White Timok	Knjaževac	1,242	0.51	7.93	383
35.	White Timok	Vratarnica	1,771	0.58	9.74	406
36.	Black Timok	Zaječar/Gamzigrad	1,199	0.56	10.75	402
37.	Toplica	Pepeljevac	986	0.55	7.10	478
38.	Toplica	Doljevac	2,083	0.81	10.34	721
39.	Kosanica	Visoka	370	0.06	2.14	302
40.	Toplica	Prokuplje	1,774	0.67	9.65	663
41.	Great Morava	Varvarin	31,548	29.20	206.50	3,040
42.	Great Morava	Bagrdan	33,446	31.50	217.90	3,079
43.	Great Morava	Ljubičevski Most	37,320	34.80	233.90	2,738
44.	Lugomir	Jagodina /Majur	427	0.05	1.78	440
45.	Resava	Manastir Manasija	388	0.36	3.66	356
46.	Jasenica	Donja Šatornja	83,60	0.04	0.62	181
47.	West Morava	Gugaljski most/ Kratovska Stena	2,688	3.70	31.77	820
48.	West Morava	Kraljevo/ Miločaj	4,658	4.58	43.00	1,234
49.	West Morava	Jasika	14,721	16.40	105.30	1,844
50.	Đetinja	Stapari		0.44	3.48	320
51.	Moravica	Ivanjica	475	0.66	6.65	311
52.	Moravica	Arilje	831	1.38	10.52	436
53.	Rzav	Arilje		0.92	7.91	306
54.	Skrapež	Požega	630	0.40	4.97	556
55.	Rasina	Brus	213	0.23	2.40	169
56.	Rasina	Bivolje	958	0.71	7.62	430
57.	West Morava	Trstenik	13,902	15.40	103.50	1,784
58.	Dičina	Brđani	208	0.10	1.55	238

Source: The Water Management Strategy in the Republic of Serbia

The south, south-west and western parts of Serbia are richer in water than its central and eastern parts. Given that the mountain areas receive larger quantities of precipitation, these terrains produce specific flows exceeding 15 L/s·km^2. In plain and hilly areas, in the northern and central parts of Serbia, the specific outflow is mostly below 6 L/s·km^2. The lowest quantity is registered in Vojvodina and in the basins of the left tributaries of the Great Morava and the Kolubara (from 2 to 5 L/s·km^2). The richest basins in the Serbian territory are the basins of the Bistrica, the Gradac, the Lopatnica and the Studenica, where the values range from 15 to 17 L/s·km^2.

Table 1.2. Total water quantities in the territory of Serbia, broken down by basins (Aegean, Adriatic and Black Sea)

Watercourse / basin	From other areas			From the territory of Serbia			Total	
	Average	Annual flow	Inflows from	Average	Annual flow	Outflows to		
	m^3/s	10^6 m^3/y		m^3/s	10^6 m^3/y		m^3/s	10^6 m^3/y
Aegean basin								
Lepenac				8.92	281	Mac	8.92	281

Watercourse / basin	From other areas			From the territory of Serbia			Total	
	Average m^3/s	Annual flow 10^6 m^3/y	Inflows from	Average m^3/s	Annual flow 10^6 m^3/y	Outflows to	m^3/s	10^6 m^3/y
Pčinja				3.29	104	Mac	3.29	104
Dragovištica				4.89	154	Bulg	4.89	154
Total Aegean basin							17.1	539
Adriatic basin								
White Drim and Plavska reka				62.79	1,978	Alb	62.8	1,978
Total Adriatic basin							62.8	1,978
Black Sea basin								
Danube with Drava	2,77	87,575	Hung and Cro				2,7	87,575
Tisza with Begej*	825	26,001	Hung and Rum	17.92	564		842	26.565
Chanel Baja-Bezdan* and Plazović stream*	2.00	63	Hungary				2.0	63
Tamiš	39	1,224	Romania	3.40	107		41.8	1,331
Brzavica, Moravica, Karaš, Nera	35	1,104	Romania	5.16	163		40.1	1,267
Sava before Drina	1.13	35,762	Croatia				1.13	35.762
Lim in Serbia				36.34	1,145		36.3	1,145
Drina in Serbia				26.24	826		26.2	826
Drina with Lim	302	9,523	MNG and BiH	62.58	1,971		364	11,494
Kolubara				21.40	674		21.4	674
Sava basin				14.81	467		14,8	467
Sava before confluence	1.43			98.79	3,112		1,535	3,112
Nišava	5.02		Bulgaria	22.83	719		27.8	719
South Morava basin				66.81	2,105		71.8	2,105
Ibar				51.94	1,636		51.9	1,636
West Morava				57.18	1,801		57.1	1,801
Great Morava basin				22.55	710		27.5	872
Danube basin				43.29	1,364		43.2	1,364
Timok				27.90	879		27.9	879
Danube after Timok	5.11			417.76	13,159		5.53	174.57
Total Black Sea basin							5.53	174.57
TOTAL	**5.11**	**16,.415**		**497.65**	**15,676**		**5,617**	**177.09**

Source: The Water Management Strategy in the Republic of Serbia

There is a pronounced spatial heterogeneity in the river outflow from the territory of Serbia. On average, the specific richness of all the basins in Serbia stands at 5.63 L/s·km^2. The lowest values are seen in Vojvodina (1.48 L/s·km^2), the highest in Kosovo and Metohija (9.21 L/s·km^2), while in central Serbia it stands at 6.53 L/s·km^2.

Ground waters are very important Serbian natural resources as they greatly affect the water supply of settlements and the industry. In addition, they are utilised in agriculture, while thermo-mineral waters are also used in medicine and tourism. The territory of Serbia is characterised by a complex combination of tectonic structures and a diverse lithological composition. There are several geo-tectonic sections with distinct geological, geo-morphological and hydrological features. Therefore, they are also different in the hydro-

geological sense as well. The geological composition of the territory of Serbia is characterised by marked complexity, both in terms of the litho-facial and the tectonic features. The complexity of the geological structure and composition is reflected in the diversity of the hydro geological characteristics of the Serbian territory. In such a complex area, several different hydro-geological segments can be identified with specific geological compositions and hydro geological features. Therefore, the following hydro-geological units are identified: the Bačka and Banat area; the Srem, Mačva and Posavo-Tamnava area; south-west Serbia; western Serbia; central Serbia; and eastern Serbia. The ground water bodies represent basic units for groundwater resource management, status monitoring and implementation of measures aimed at ensuring a good status of ground waters.

There are a total of 153 ground water bodies in the Republic of Serbia, of which 152 belong to the Danube (Black Sea) basin, and one belongs to the Aegean basin. The size of individual water bodies ranges from 35km^2 to 2,643km^2. Out of the total number of these water bodies, 131 are national, while 22 are identified as cross-border.

1.2.1.3. Pedological properties

Soil properties depend on a large number of natural factors, such as physical-chemical properties, geological subsoil, hydrogeological and hydrographical conditions, orography, climate, vegetation, presence of macro and microorganisms. Soil formation, including its regeneration, is a very slow process, so that soil may be regarded as a partially renewable resource. The general classification of the soil in Serbia is based on the character of its natural soil moisture, i.e. on the hydro-physical soil properties, which is not only an appropriate, but also a goal-oriented approach in regulating the water regime from the standpoint of implementing hydro and agri-ameliorative measures, as well as with respect to the assessment of the soil's irrigation capacity. The soil in the territory of the Republic of Serbia can be classified into three major categories (the said areas do not encompass the territory of the autonomous province of Kosovo and Metohija):

- Automorphic soil – 6,222,350 ha (80%). Precipitation is the exclusive source of automorphic soil moisture, with water percolating freely through the soil, without long periods of retention of excess water. However, there are several subunits within this category (particularly in the region of the Morava rivers, the Sava region, and partly Bačka and Banat), which, due to degradation, started displaying certain negative properties that should be mitigated and/or removed through hydro- and agri-ameliorative measures.
- Hydromorphic soil – 1,445,555ha (19%). Hydromorphic soil is characterised by occasional or permanent waterlogging caused by surface and ground water acting individually and/or jointly, whereas flood waters provide the additional moisture. This soil is located on lower ground levels, in the depressions of loess, lake and river terraces, particularly in the valleys of large rivers (the Danube, the Tisza, the Sava, the Morava and their tributaries).
- Halomorphic soil – 79,360ha (1%). Halomorphic soil includes defective soil (salt marshes), formed under the dominant impact of easily dissoluble salts. Apart from salt marshes, which are a typical representative of this type of soil, some other types of soil, primarily heavy soil of hydromorphic and automorphic character, are also exposed to adverse effects of salinization and alkalisation to some extent. This type of soil occupies

a relatively small surface, but is quite important for the water regions of Bačka and Banat, Lower Danube and Srem, for both drainage and irrigation.

Table 1.3. The division and surface area of the type of soil in Serbia

Water region	Soil (ha)			
	Automorphic	Hydromorphic	Halomorphic	Total
Banat and Bačka	1,228,016	468,150	77,383	1,773,549
Belgrade	203,656	121,028	0	324,684
Lower Danube	964,049	106,546	0	1,070,595
Morava	2,853,942	327,660	0	3,181,602
Sava	686,827	332,952	0	1,019,779
Srem	285,860	89,219	1,977	377,056
Total in Serbia	6,222,350	1,445,555	79,360	7,747,265

Source: The Water Management Strategy in the Republic of Serbia

Apart from natural conditions and processes, soil properties and its degradation is significantly shaped by constant pressures of human activities, including: mining, community development, infrastructure development, agriculture, forestry, use of chemicals and, as a cause for concern, the increasing usage of the agricultural land of highest quality (envisaged for agricultural usage by law in the majority of countries), for the so-called green field investments, although there is land of lower quality or facilities in the immediate vicinity, which can no longer be used due to deterioration, etc. Numerous soil functions are related to water, namely: irrigation, hydroelectric power plants, urban development, etc. On the other hand, the way soil is used may create an impact on the quality of water and water courses, so this impact ought to be taken into consideration when planning to change soil use. The 2018 Corine Land Cover programme, addressing the basic land cover structure, showed the following land cover structure in Serbia: agricultural land accounts for app. 57%, forest land app. 36%, urban area 4% and water and wetlands for 3% of the country's territory. The Cadastre of Mining Waste in the Republic of Serbia has identified over 250 inactive mines, abandoned mining pits, waste disposal areas, and quarries. It is planned to incorporate the data for over 200 active mines in the mining waste database. The amount of mining waste in the Republic of Serbia is estimated at app. 24 million cubic meters.

1.2.1.4. Biodiversity, geodiversity, area-specific diversity and nature protection

In a biogeographical sense, the territory of Serbia is located at the crossroads of several regions, namely the central-European region, the Pontic-South Siberian and Mediterranean–sub-Mediterranean, and owing to the mountain-high mountain relief, i.e. the height zoning of flora and fauna, it also falls within the Central and South-European and Boreal region. The main feature of the biodiversity of the Republic of Serbia is a great ecosystem, species and genetic diversity, as well as a relatively limited quantities of biological resources, both potential and the ones used.

A total of 1,200 plant communities and 500 sub-associations, divided into 59 vegetation classes, have been registered in Serbia. A large number of these communities is relict endemic, particularly the ones found in gorges, canyons, mires and high mountain areas. Although the RS occupies no more than 1.9% of the European continent, it still boasts the majority of the European ecosystems: 39% of vascular flora, 51% of ichthyofauna, 49% of reptile and amphibian fauna; 74% of avifauna and 67% of mammal fauna of Europe.

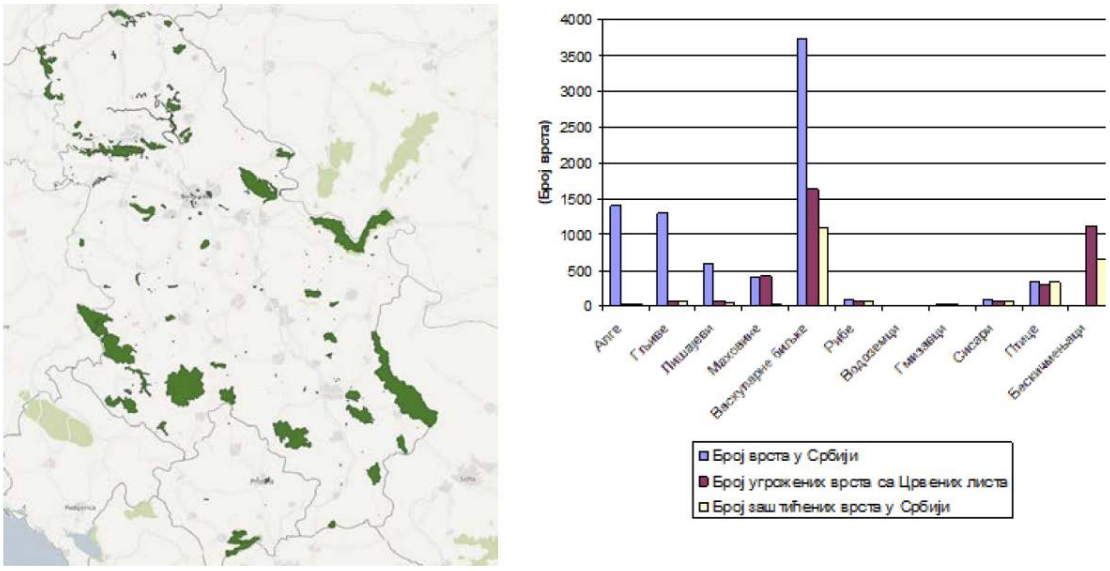
Approximately 44,200 taxa (species and subspecies) are officially registered in the Republic of Serbia. With the recorded 3,662 vascular plant taxa at the level of species and subspecies (39% of the European flora), Serbia is ranked among the countries with the highest floristic diversity in Europe. As many as 1,300 species of fungi and 600 species of lichen are registered and described in the territory of the Republic of Serbia, but it is estimated that the number of fungi species is much higher. Out of 178 species on the European Red List, app. 42 species (23.6%) are in Serbia. Between 98 and 110 fish species and cyclostomata have so far been registered in Serbia. A total of 13 species were proposed for the Red List of Vertebrates of Serbia, and 19 taxa of international importance were also registered. The Serbian territory is home to 19 species of amphibians and 26 species of reptiles with approximately 20 subspecies. The number of bird species of all categories in Serbia (nesting birds, the bird species found in Serbia during winter, those registered during migration, and potentially present birds) is approximately 360, and 343 are internationally important. As many as 95 species of mammals or 50.51% of the total teriofauna of Europe have so far been registered in Serbia, of which 68 are on the Preliminary Red List of Vertebrates of Serbia and 16 on the European Red List.

Serbia is home to 471 natural sites, declared as protected areas, as well as 5 national parks, 18 nature parks, 21 landscapes of exceptional features, 70 nature reserves – strict and special, 315 natural monuments (botanical-dendrological, geomorphological, geological and hydrological) and 6 protected habitats, with the aim of preserving, enhancing and sustainably using the features and values of flora and fauna, geological heritage and landscape of these regions. It also features 36 areas around cultural monuments and monuments with historical significance, 1,784 strictly protected wildlife species, and 860 protected wildlife species.

The amendments to the Rulebook on the Declaration and Protection of Strictly Protected and Protected Wildlife Species of Plants, Animals, and Fungi (The Official Gazette of the Republic of Serbia, No. 5/10, 47/11, 32/16, and 98/16), placed 1,784 species of wild algae, plants, animals, and fungi under strict protection and 860 species under protection. The total of 2,634 species are under protection (with 10 present in both lists as they are under strict protection in the Autonomous Province of Vojvodina and under protection in Central Serbia). Nearly all mammals, birds, amphibians, and reptiles are under a form of protection. Similarly, a great many insects (especially diurnal butterflies) and plants are under protection. Over 50% of strictly protected species are on the lists of international EU conventions and directives, for the most part in the Bern Convention on the Conservation of European Wildlife and Natural Habitats (The Official Gazette of the Republic of Serbia – International Agreements, No. 102/07) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (The Official Gazette of the Republic of Serbia – International Agreements, No.102/07) and the European Birds Directive (79/409/EEC, 209/147/EC). It is estimated that as many as 1,000 species of vascular flora may be under threat in the Republic of Serbia, according to the Preliminary Red List of the Flora of Serbia (2002). Most of the plants under threat in the RS belong to the IUCN category of 'rare plants'.

The total surface area of the protected zones stands at 678.24 ha, making up 7.66% of the territory of the RS and putting Serbia among the European countries with a relatively small share of space under protection and natural sites in the overall state territory.

Figure 1.3. The map pf protected areas in 20202 (left), species under threat and protection in 2019 (right) in the RS



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2019 and 2020

In 2017, three nature parks and a natural heritage site were put under protection:

- The *Bačkotopolska Valley* Nature Park, with the surface area of 522.5 ha,
- The *Radan* Nature Park, with the surface area of 41,312.7 ha,
- The *Zlatibor* Nature Park, with the surface area of 41,923.3 ha,
- The natural heritage site *Two Yew Trees in a Farm Near Novo Orahovo*.

In 2018 and 2019, the following sites were placed under protection:

- The Cultural Landscape *Tršić-Tronoša*, with the surface area of 1,802.57 ha,
- The *Brzansko Moravište* Nature Reserves, with the surface area of 64.76 ha,
- The *Tupužnička Ledenica* Natural Heritage Site – Geo-heritage Sites, with the surface area of 1.23 ha,
- The *Samar Cave* System - Natural Heritage Sites – Geo-heritage Sites, with the surface area of 56.50 ha,
- The *Borački Krš* Natural Heritage Site – Geo-heritage Sites, with the surface area of 68.22 ha,
- The *Bledrija* Natural Heritage Site – Geo-heritage Sites, with the surface area of 398.87ha,
- The *Smederevo English Oak* Natural Heritage Site – Botanical Sites, with the surface area of 0.05 ha,
- The *Karađorđe Mulberry* Natural Heritage Site – Botanical Sites, with the surface area of 0.007 ha,
- The *Platnara Oak* Natural Heritage Site – Botanical Sites, with the surface area of 0.03 ha,
- The *Pterocarya Tree in Sremski Karlovci* Natural Heritage Site – Botanical Sites, with the surface area of 0.03 ha,
- The *Dolova English Oak* Natural Heritage Site – Botanical Sites, with the surface area of 0.04 ha,

- The *Two Big-leaved Downy Oak Trees in Čukljenik* Natural Heritage Site – Botanical Sites, with the surface area of 0.06ha,
- The *Nettle Tree in Miroslava Antića Street in Novi Sad* Natural Heritage Site – Botanical Sites, with the surface area of 0.03 ha,
- The *Yew Tree in Miroslava Antića Street in Novi Sad* Natural Heritage Site – Botanical Sites, with the surface area of 0.007 ha,
- The *Gingko Tree Near the Park Hotel in Novi Sad* Natural Heritage Site – Botanical Sites, with the surface area of 0.02 ha,
- The *English Oak in the Petrovaradin Fortress* Natural Heritage Site – Botanical Sites, with the surface area of 0.02 ha,
- The *Bresničićka Slatina* Protected Habitat, with the surface area of 2.23 ha,
- The *Pančevo Ada* Protected Habitat, with the surface area of 1,309.258 ha,

In 2020, three new protected areas were included:

- The *Osredak* Special Nature Reserve, with the surface area of 245.75 ha,
- The *Kalenić* Strict Nature Reserve, with the surface area of 2 ha and
- The *Tunnel Cave Prerast in the Zamna Canyon* Natural Heritage Site, with the surface area of 39 ha.

The international status of protection was granted to 10 areas placed on the List of Wetlands of International Importance based on the Convention on Wetlands of International Importance especially as aquatic birds habitats (the Ramsar Convention), which occupy a total of 63,319ha and one area placed on the List of Biosphere Reserves based on the UNESCO *Man and Biosphere-Mab* programme, which occupies a total of 53,800ha. Based on relevant international programmes, the Republic of Serbia is home to 43 internationally Important Bird Areas (IBA), 61 Important Plant Areas (IPA) and 40 Prime Butterfly Areas in Europe (PBA). Based on the Convention on the Conservation of Wild Flora and Fauna and Natural Habitats (the Bern Convention), the Emerald Network in Serbia encompasses 61 areas, spanning a total of 1,019,270ha, or around 11.5% of the territory of the Republic of Serbia.

The Decree on Ecological Network (The Official Gazette of the Republic of Serbia, No 102/2010 of 30 December 2010) establishes the Ecological Network in the Republic of Serbia, with the aim of preserving the biological and landscape diversity and habitats of particular importance, and in order to preserve, restore and/or improve disturbed habitats and preserve certain species. The Ecological Network consists of ecologically significant areas, ecological corridors, buffer zones that reduce the negative environmental impacts on ecologically significant areas and ecological corridors. The total of 101 significant ecological areas and 6 areas identified at a later time spread across the surface area of 2,131,360 ha.

1.2.2. The quality of basic environmental factors

The characteristics of the current state of the environment are a basis for investigating and evaluating environmental problems in a given area. Environmental quality is considered as one of the basic criteria for a balanced and sustainable development of the Republic of Serbia. Different factors determine the state of the environment in Serbia, out of which the most important include the following: urban, mining and industrial areas with high population, industry, and traffic densities, which exert pressure on the environment and landscape, posing a threat to environmental quality on the one hand, and to the survival of rural and protected areas with a depopulation trend, with environments preserved to a greater or lesser degree, on the other.

1.2.2.1. Ambient Air Quality

Ambient air quality is certain areas and cities in the RS is dependent on emissions of SO_2, NOx, SO, soot, fine particulate matter and other pollutants generated by different facilities and processes. Major causes of ambient air pollution include the following: obsolete technologies, lack of flue gas purification devices or poor efficiency of filtration devices, irrational use of raw materials and energy resources, poor maintenance, etc. Considerable air pollution comes from inappropriate storage and disposal of by-products, such as fly ash from thermal power plants and mine waste rock from open-pit mines. Levels of traffic-generated pollution are raising, including high emissions of benzene, lead and soot, particularly in large cities. Major sources of air pollution include thermal power plants in the Kolubara and Kostolac lignite basin and the RTB Bor Mining and Smelting Complex. Lignite has a low caloric value and high moisture content, with large quantities of fly ash, sulphur and nitrogen oxides emitted by its combustion. The most important industrial ambient air polluters include the following: the oil refinery in Novi Sad; the cement plants in Beočin, Kosjerić and Popovac, the chemical plants in Pančevo, and Kruševac, and the Smederevo steel mine. The highest levels of pollution come from the low-quality lignite combustion processes (the thermal power plants in Obrenovac, Lazarevac and Kostolac), liquid fuels, etc. (Belgrade, Niš, Užice, Čačak, Valjevo, Kraljevo, Kragujevac, Subotica, etc.).

The ambient air pollution also comes from the use of solid fuels (wood and coal) in households, boiler rooms in buildings and solid fuel burners. The emission of **acidifying gasses** increases their concentration in the air, in turn changing the chemical balance in the environment. The following pollutants serve as indicators of acidifying gasses emission: NO_x, SO_2 and NH_3.

- The greatest contribution to the total emission of acidifying gasses comes from “energy production and distribution” (NO_x on average by 57% and SO_2 on average by 80%) and “agriculture” (on average by 90% in respect of NH_3). Contributing the most to the total emission of acidifying gases for NO_x in 2016 were "energy production and distribution"– 49.55%, and "road transport" – 24.29%; for SO_2 "energy production and distribution" – 92.97%; and for NH_3 "agriculture" – app. 84.67%; the NO_x and SO_2 emission trends have kept constant, falling during the 1998-1999 period, only to record a mild growth thereafter, except for NO_x emission, which fell during the 2011–2012 period. Between 2012 and 2016, with the exception of a mild increase in SO_2 in 2013, the NO_x and SO_2 have remained constant.
- From 1990 to 2016, NH_3 emission kept constant, save for a mild rise since 2005 onwards, and a mild decrease since 2012.

Ozone precursors are substances which contribute to the creation of ground-level, i.e. tropospheric ozone. The indicator shows the total emission and trend of ground-level ozone precursors (NO_x, CO, CH_4 and NMVOC).

- The trend of NMVOC emissions was constant in the entire period, while NO_x emissions fluctuated, mildly growing from 1993 to 2000, falling from 2008, increasing slightly between 2010 and 2011, and then remaining constant.
- In the period from 1990 to 2016, the trend of CO emissions recorded consistently greater fluctuations, both in terms of rising and falling, and decreasing since 2011.
- CH_4 emissions are not shown because there are still no adequate data available.

The greatest contribution to total emissions of ozone precursors is provided by “Road traffic” (17.39% of CO), “Heating plants with power under 50 MW and individual heating” (on average 70.73% of CO and 21.68% of NMVOC). A considerable part of NMVOC emissions is contributed by “Agriculture” with 14.49%, “Use of solvents and industrial products” with 14.07%, and “Use of energy in industry and industrial processes" with 9.46%.

Emissions of **primary suspended particles** and secondary precursors and suspended particles (PM10, NO_x, NH_3 and SO_2). The indicator shows the total emissions and the trend of primary suspended particles smaller than 10μm (PM10) and secondary particle precursors NO_x, NH_3 and SO_2.

- The trend of emissions of PM10 and NH_3 is constant, except for NH_3 emissions for the period from 2006, when it began to rise mildly.
- The trends of emissions of NO_x and SO_2 were almost identical from 1990; from then, both were on the rise, only to fall sharply in 1998 and 1999, when the emissions became constant, with the exception of 2011 and 2012, when the emissions of SO_2 declined, subsequently decreasing mildly and remaining constant until 2016.
  The contribution of PM10 emissions is the highest by “Heating plants with power under 50MW and individual heating”, averaging at 58.77%, and "Use of energy in industry and industrial processes" with 12.88%.

The total emissions of **heavy metals** of anthropogenic origin controlled by the LRTAP convention (Cd, Hg, Pb, As, Cr, Cu, Ni, Se and Zn).

- The trend of emissions of heavy metals shows a plunge from 1990 to 1993, followed by growth from 1994 to 1998, after which emissions remained stable up to 2012. An increase was recorded between 2013 and 2014 in Zn, Cr, Cu, and Ni, remaining constant until 2016.
- The trend of total anthropogenic emissions of heavy metals (Cd, Hg, As, Cr, Cu, Ni, Se and Zn) declined from 1990 to 1996, after which emissions rose.
- The emissions of lead dropped from 1992 to 1993, which was followed by growth and a subsequent contraction from 1998 to 1999. From 2000 to 2008, emissions were constant, after which they fell because fuels containing lead stopped being produced.

In 2020, the Agency for Environmental Protection continued implementing the operational monitoring of air quality in the national air quality monitoring network at the level of the Republic of Serbia. In 2011, 94% of the installed SO2, NO2, CO, O3, and PM10 analysers achieved valid hour value availability in excess of 90%. In subsequent years, such a measuring availability percentage was not achieved; in 2012, it stood at 68%, in 2013 at 72%, in 2014 at 30%, in 2015 at 25%, and in 2016 at 23%, in 2017 at 22%, in 2018 at 48%, only to jump to 85% in 2019, and reaching 90% in 2020.

In 2020, the Agency for Environmental Protection continued implementing the operational monitoring of air quality in the national air quality monitoring network at the level of the Republic of Serbia, as well as collecting the data on air quality from the institutions which are part of the nation-wide and local air quality networks. In assessing air quality in 2020, the available results of the reference monitoring in the nation-wide and local networks were used.

According to the ASAQM data, the mean annual value of sulphur-dioxide concentrations above the limit value (50 μg/m^3) in 2020 was only recorded at the Bor City Park station. Values exceeding the daily limit value (125 μg/m^3) were recorded only at the Bor City Park, Bor Brezonik, Bor Institute, Obrenovac Centre, Belgrade Mostar, Belgrade Vračar, and Belgrade Nopvi Beograd stations. Hour values exceeded the limit value (350 μg/m^3) at the Bor City Park, Bor Brezonik, and Bor Institute stations.

In 2020, the annual limit value for NO_2, of 40 μg/m^3 was not exceeded anywhere. Values exceeding the daily limit value of 85 μg/m^3 were recorded in Belgrade at the Belgrade Mostar, Belgrade Vračar, and Belgrade Novi Beograd stations. The hour values did not exceed the limit values (150 μg/m^3) more than 18 times.

In 2020, values exceeding the annual limit value for the suspended particle PM_{10} (40 μg/m^3) were recorded at the following stations: Smederevo Radinac, Valjevo, Zaječar, Užice, Kosjerić, Smederevo Customs, Novi Pazar, Pančevo, Narodna Bašta, Niš – The Saint Sava Elementary School, The Niš Police Administration, The Niš Institute for Public Health, Užice, Smederevo, Belgrade – Despota Stefana Street – The City Institute for Public Health, Belgrade – Obrenovac - The City Institute for Public health, Zrenjanin, Kragujevac, and Popovac. Values exceeding the daily limit value of 50 μg/m^3 in 2020 were recorded in all the measuring stations, with their numbers ranging from two days at the Kamenički Vis station to 148 days at the Smederevo Radinac station. The highest daily concentrations of PM_{10} in 2020 were recorded at the Beočin Centre station and the Pančevo Narodna Bašta station. In 2020 as much as in previous years, suspended particles were the prevalent pollutant in the RS.

In 2020, the tolerance value reached the annual limit value. Values exceeding the annual value of STAGE 1 $PM_{2.5}$ (25 μg/m^3) were recorded at the following stations: Valjevo, Novi Pazar, Niš – The Institute for Public Health, Kosjreić, Pančevo – Narodna Bašta, Užice, Smederevo Centre, Belgrade – Veliki Crljeni, Niš – The Saint Sava Elementary School, Belgrade – Stari Grad, Kraljevo – The Police Administration, Belgrade – Obrenovac, Pančevo, Bojvodina, Belgrade – Novi Beograd, and Subotica – The Institute for Public Health.

The annual limit value of carbon-monoxide (3 μg/m^3) was not exceeded at any measuring station in 2020. The limit value of the maximum daily eight-hour concentration of carbon-monoxide (10 μg/m^3) was exceeded at the Zaječar station.

The results of the 2020 benzene measurements revealed that the annual limit value was not exceeded.

In 2020, the target value of ground-level ozone (120 μg/m^3) was exceeded for more than 25 days at the following stations: Belgrade – Lazarevac, Belgrade – Vinča, Pančevo – The Firefighters' Centre, Kamenički Vis EMEP, and Belgrade – Novi Beograd – The City Institute for Public Health.

The results of the benzo(a)pyrene measurements in 2020 indicated that the annual target value (1 ng/m^3) was exceeded at Valjevo, Užice, Sombor, (APV), and Novi Sad – Kać.

In 2020, detection and quantification of allergenic pollen in ambient air continued. The ambrosia pollen was prevalent in 2020 as well.

- In the area of the RS, with the exception of the cities of Kragujevac, Valjevo, Kraljevo, Zaječar, Novi Pazar, and Popovac, the air quality was Category I, i.e. clean or slightly polluted air;
- In the area of Vojvodina area, with the exception of the cities of Subotica and Zrenjanin, the air quality was Category I, i.e. clean or slightly polluted air;
- In the agglomerations of Belgrade, Niš, Smederevo, Pančevo, Užice, and Kosjerić, the air quality was Category III, i.e. excessively polluted air, due to exceeding the limit value for suspended particles PM_{10} and $PM_{2.5}$;
- In the agglomerations of Novi Sad, the air quality was Category I, i.e. clean or slightly polluted air;
- In the agglomerations of Bor, the air quality was Category III, i.e. excessively polluted air, due to exceeding the limit value for SO_2.
- In the territories of the cities of Valjevo, Kraljevo, and Novi Pazar, the air quality was Category III, i.e. excessively polluted air, due to exceeding the limit value for the suspended particles PM_{10} and $PM_{2.5;}$ In Kragujevac, Zaječar, Popovac, and Zrenjanin, due to exceeding the limit value for the suspended particles $PM_{10;}$ and in Subotica, due to exceeding the limit value for the suspended particles $PM_{2.5}$.

Table 1.4 shows the overview of the air quality assessment for 2020. Grey – a parameter not envisaged in the air quality programme; Purple – values exceeding the limit value; Red – value exceeding the tolerance value; Empty cell – a parameter without the required number of valid measurements. The categorisation carried out in this way represents the official assessment of air quality for 2020, and can be summed up as follows:

- **Category I**, *clean air or slightly polluted air* (where the limit values are not exceeded for any pollutant) was recorded in 2020 at the following ASAQM measuring stations: Šabac, Kostolac, Kamenički Vis-EMEP, Čačak, Paraćin, Vranje, Kopaonik, Kruševac, Popovac, Kragujevac, Zaječar, Kraljevo – The Police Administration, Kraljevo, Novi Pazar, Valjevo, Kikinda Centre, Kikinda APV, Vršac, Sremska Mitrovica, Sremska Mitrovica, Beočin Centre, Subotica, Obedska bara APV, Subotica (The Institute for Public Health), Novi Sad - Liman, Novi Sad - Rumenačka, Novi Sad – PE Water Supply and Sewage System, Novi Sad - Kać, Novi Sad - Dečje Selo.
- **Category III**, *excessively polluted air* (where the tolerance values for one or more pollutants are exceeded) was recorded in 2020 at the following ASAQM measuring stations: Belgrade - Stari Grad, Belgrade - Novi Beograd, Belgrade - Mostar, Belgrade - Vračar, Belgrade - Zeleno Brdo, Obrenovac Centre, Beograd - D. Stefana Street – The City Institute for Public Health, Belgrade - Obrenovac The City Institute for Public Health, Belgrade - N. Beograd - The City Institute for Public Health, Belgrade - Ovča, Belgrade - Veliki Crljeni, Belgrade - Tošin Bunar, Belgrade - Lazarevac Belgrade - Obrenovac - Ušće, Belgrade - MC Dr Mišović, Belgrade - Vinča, Niš – The Saint Sava Elementary, Niš – The Niš Institute for Public Health, Bor – The City Park, Bor - Brezonik, Bor - Institute, Bor - Krivelj, Bor - Jugopetrol, Pančevo - Sodara, Pančevo - Narodna Bašta, Pančevo - Cara Dušana, Pančevo – The Firefighters' Centre, Pančevo - Vojlovica, Pančevo - Starčevo, Smederevo - Customs, Smederevo - Centre, Smederevo - Radinac, Smederevo - Ralja – The Ilić Household, Kosjerić, Užice.

Table 1.4. Air quality assessment for 2020 based on the mean annual concentration of pollutants and the number of days when the daily limit values were exceeded

Агломерација, ЗОНА	Станица	Оцена квалитета ваздуха (категорија)	Годишње вредности концентрација загађујућих материја											
			SO_2		NO_2		PM_{10}		$PM_{2.5}$	C_6H_6	CO		O_3	
			µg/m³	Број дана са >125 µg/m³	µg/m³	Број дана са >85 µg/m3	µg/m³	Број дана са >50 µg/m3	µg/m³	µg/m³	mg/m³	Број дана са >5 mg/m3	µg/m³	Број дана са >120 µg/m3
СРБИЈА	Шабац	I	9	0	19	0					0.73	0		
	Костолац		14	0	10	0	35	53			0.38	0		
	Каменички Вис - ЕМЕП		12	0	7	0	16	2					89	33
	Чачак				21	0					0.57	0		
	Параћин		9	0	13	0					0.85	0		
	Врање		10	0	17	0					1.06	0		
	Копаоник		6	0									80	9
	Крушевац				12	0					0.83	0		
	Поповац	III	5	0	28	0	41	79	17		0.43	0	28	0
	Крагујевац	III	9	0	18	0	42	68			0.62	0		
	Зајечар	III	21	0	16	0	63	139			0.99	1		
	Краљево Полицијска управа (Л)	III					48	106	30					
	Краљево		8	0	14	0					0.64	0		
	Нови Пазар	III	10	0	16	0	52	121	41				72	3
	Ваљево	III	13	0	23	0	63	147	45		0.85	0		
ВОЈВОДИНА	Кикинда Центар	I	7	0							0.36	0	72	3
	Кикинда АПВ												47	0
	Вршац		7	0	11	0							80	12
	Сремска Митровица		12	0	21	0					0.67	0		
	Сремска Митровица (Л)						32	48						
	Беочин Центар		9	0	17	0	37	48						
	Суботица АПВ		8	0			37	61	24		0.73	0	40	0
	Обедска бара АПВ		6	0										
	Суботица (ЗЗЈЗ) (Л)	III					36	61	29					
	Зрењанин АПВ	III	11	0	20	0	42	74						
Београд	Београд Стари град	III			23	0	33	46	30		0.39	0	52	0
	Београд Нови Београд		12	1	21	1	32	52	28	3	0.44	0	59	0
	Београд Мостар		12	1	33	1	24	32	19		0.56	0		
	Београд Врачар		11	1	29	1	35	42	23				41	0
	Београд Зелено брдо		10	0	27	0					0.33	0	69	10
	Обреновац Центар		18	2	38	0	17	7	8		0.46	0		
	Београд Д. Стефана ГЗЗЈЗ		15	0	35	11	46	90			1.00	0		
	Београд Обреновац ГЗЗЈЗ		12	2	10	0	45	95						
	Београд Н. Београд ГЗЗЈЗ		26	1	27	1	38	74					77	31
	Београд Овча (Л)		29	0	12	1	26	44	22	2	0.73	0	62	2
	Београд Велики Црљени (Л)		28	0	11	0	44	107	32	2	0.91	0		
	Београд Тошин бунар (Л)		10	0	23	0								
	Београд Лазаревац (Л)		36	0	12	0							93	69
	Београд Обреновац Ушће (Л)		47	8	16	0	39	69	30					
	Београд КБЦ др Мишовић (Л)				17	1	27	24	20					
	Београд Винча (Л)		17	0	13	0					0.49	0	86	45
Нови Сад	Нови Сад Лиман	I	9	0	11	0	32	36			0.27	0	75	20
	Нови Сад Руменачка		9	0	24	0	35	60	22		0.44	0		
	Нови Сад ЈКП Водовод и канализација (Л)						25	14	17					
	Нови Сад Кај (Л)						27	44	22					
	Нови Сад Дечје село (Л)		8	0	17	0	22	12	15	2	0.34	0	63	0
Ниш	Ниш О.Ш. Св. Сава	III	9	0	17	0	49	115	31		0.65	0	62	1
	Ниш ИЗЈЗ Ниш		12	0	22	0	47	106	40					
Бор	Бор Градски парк	III	74	58			33	35	17					
	Бор Брезоник		32	17										
	Бор Институт		31	10	35	0					0.34	0		
	Бор Кривељ (Л)						27	12						
	Бор Југопетрол (Л)						40	75						
Панчево	Панчево Содара	III	13	0							0.48	0		
	Панчево Народна башта (Л)						51	119	37	1				
	Панчево Цара Душана (Л)		8	0						2	0.48	0	72	17
	Панчево Ватрогасни дом (Л)				17	0	30	50	25	3			80	40
	Панчево Војловица (Л)		10	0			34	74	29					
	Панчево Старчево (Л)		9	0	15	0	32	73			0.66	0	54	1
Смедерево	Смедерево Царина	III			8	0	52	120			0.51	0		
	Смедерево Центар		19	0	24	0	38	76	32					
	Смедерево Радинац						66	148						
	Смедерево Раља Домаћинство Илић (Л)						46	120						
Косјерић	Косјерић	III	6	0	25	0	56	126	38		0.70	0	57	4
Ужице	Ужице	III	7	0	29	0	59	134	33		0.83	0		
	Ужице (Л)						46	99						

Source: The Annual Report on Air Quality in the Republic of Serbia for 2020.

1.2.2.2. Water quality

Surface water quality is generally determined by the operation of industrial plants, agricultural production, and long-lasting periods of drought both in the territory of the Republic of Serbia and in the neighbouring countries and basins of transboundary watercourses. The main sources of pollution of surface water in Serbia is untreated industrial and communal wastewater, drainage water from agricultural activities, drainage and seepage water from landfills, and pollution associated with river navigation, floods and the operation of thermoelectric power plants.

The characteristics (in terms of quantity and quality) of surface and groundwater are determined by monitoring relevant parameters. The results of monitoring are also used to define the water level in watercourses from the standpoint of watercourse regulation and protection against damaging effects of water, including forecasts in order to protect against floods. For decades, the Republic Hydrometeorological Institute of Serbia monitored the parameters of surface water and groundwater of water-table aquifers, according to the annual programme whose content is prescribed by law. Starting from 2011, this programme has been implemented by both the Institute and the Agency for Environmental Protection.

The quality of surface water in Serbia is monitored on river watercourses, some canals and reservoirs; recently, monitoring has been expanded to include groundwater – but only the water-table aquifers. The position of measuring points, as well as the number and frequency of measuring of parameters are not appropriate on all watercourses, and observations on small and medium watercourses are too infrequent, which is also reflected in the reliability of assessment of the quality of surface and groundwater and the status of bodies of surface and groundwater. Furthermore, groundwater of deep aquifers is not monitored, which needs to change in the upcoming period.

The level of development of the system for collection and removal (primary and secondary sewage network and main sewage collectors) and treatment of wastewater from settlements (water treatment plants) is low relative to European standards. This particularly refers to the level of development of water treatment plants, which is why most communal wastewater is released to the recipients without undergoing necessary treatment. In the past several decades, a little over 50 public water treatment plants were built in settlements with over 2,000 people in Serbia. Of these constructed plants, 32 are now operational, of which only a few work per their designed criteria, while the efficiency of others is far below the designed levels. The effects of public wastewater treatment (for selected parameters) are given in the following table, at the level of basins.

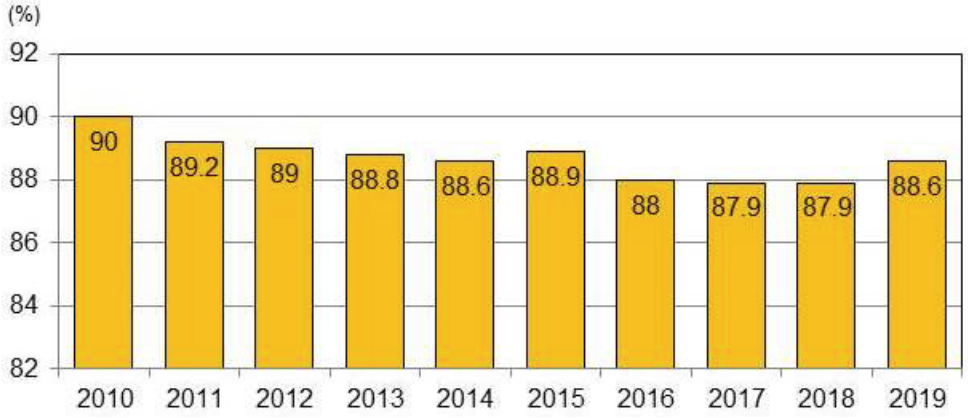
Table 1.5. Effects of communal wastewater treatment at the level of basins

Basin	Number of residents connected	Effective treatment			Number of plants
		BOD, PE	total N, PE	total P, PE	
S. Morava	40,766	23,903	10,054	9,325	5
W. Morava	22,988	13,793	4,598	4,598	1
G. Morava	242,178	151,114	73,379	39,684	8
Tisza	124,547	90,130	59,422	61,577	6
Sava	82,967	44,886	32,582	16,479	3
Danube	90,814	61,236	26,547	17,922	9
TOTAL	**604,260**	**385,061**	**206,582**	**149,584**	**32**

Source: The Water Management Strategy in the Republic of Serbia

The percentage of polluted (untreated) wastewater exhibits a favourable (declining) trend in the period 2010-2019. In 2019, it stood at (88.6%), having increased from the 2018 level (Fig. 1.4).

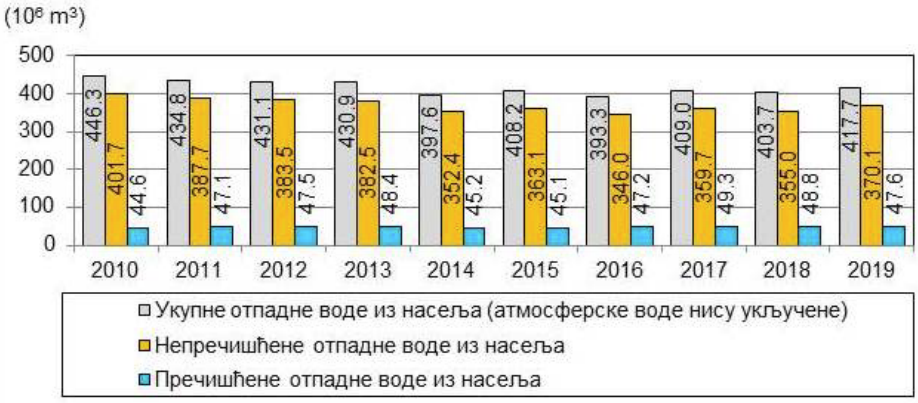
Figure 1.4. The percentage of untreated wastewater in the RS (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

The total amount of wastewater in the period 2010-2019 exhibits a favourable (declining) trend. The average amount of polluted (untreated) wastewater in the same period stood at 370.2 mil (m^3/y) (88.7% of the total wastewater), and also exhibits a favourable (declining) trend. The average amount of treated wastewater in the same period stands at 11.3% of the total wastewater, and has no significant trend (Figure 1.5).

Figure 1.5. The amount of wastewater in the RS (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

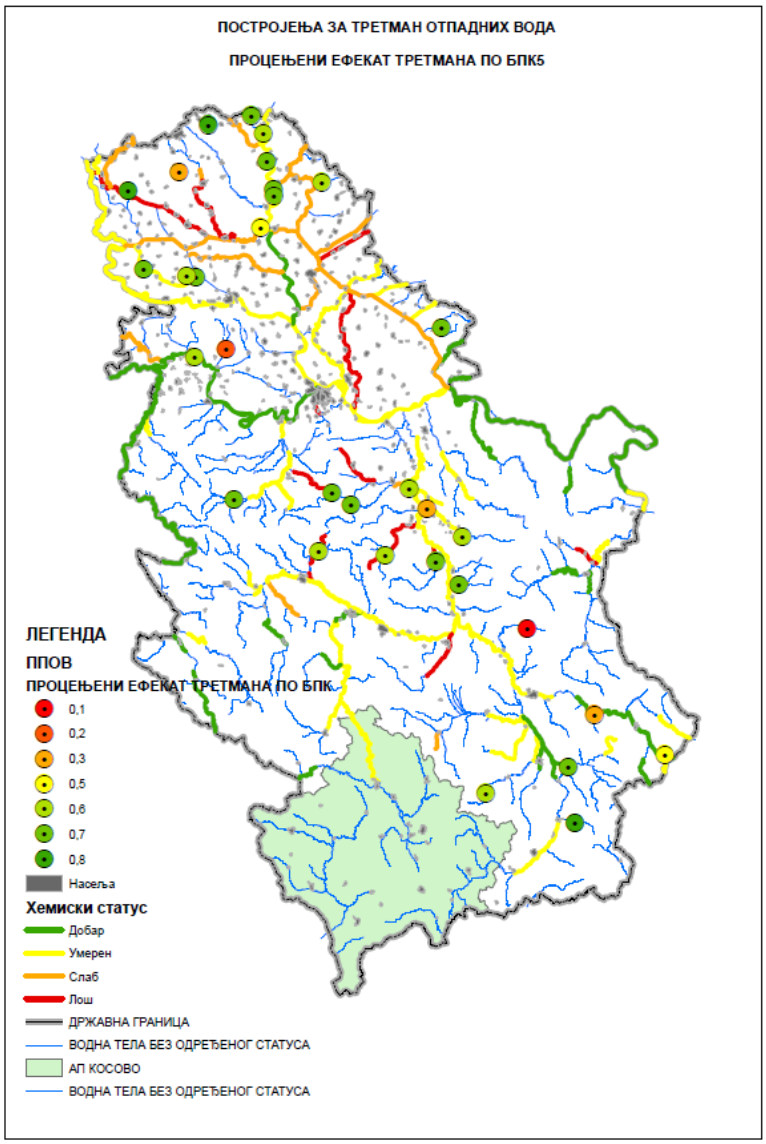
The bulk of untreated wastewater (95% - 100%) is found in the Nišava, Belgrade, Zlatibor, Bor, Rasina, Pirot, Toplica, Braničevo, South Bačka, Central Banta, and Srem regions. The least amount is found in the North Bačka (32%), Kolubara (42.1%), North Banat (42.3%), and Šumadija (47.1%) regions (Figure 1.6).

Figure 1.6. Untreated wastewater per region in 2019

Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

The plants currently in operation service around 600,000 people, although their total effective treatment comes at around 385,000 PE (population equivalent). The conclusion that follows is that less than 10% of the population is covered by some degree of wastewater treatment (14.2%, based on the report of the Agency for Environmental Protection for2020). The overall effect of treatment in terms of the removal of organic loading is below 65%, with the nitrogen components below 35%, and the phosphorus components below 25%. Furthermore, the spatial distribution of the plants constructed in Serbia is uneven. The concentrated sources of pollution from settlements with over 2,000 inhabitants make up around 80% of the total pressure in relation to the phosphorus parameter, and around 70% in relation to the nitrogen produced by the population. The current industrial capacities within settlements are most frequently connected to the public sewage system. There is insufficient reliable data on the type and quantity of industrial wastewater from these industrial plants to draw appropriate conclusions. Given the fall in production in Serbia, the share of industrial wastewater in settlements dropped significantly and is estimated at under 20% (down from around 45% in the 1980s).

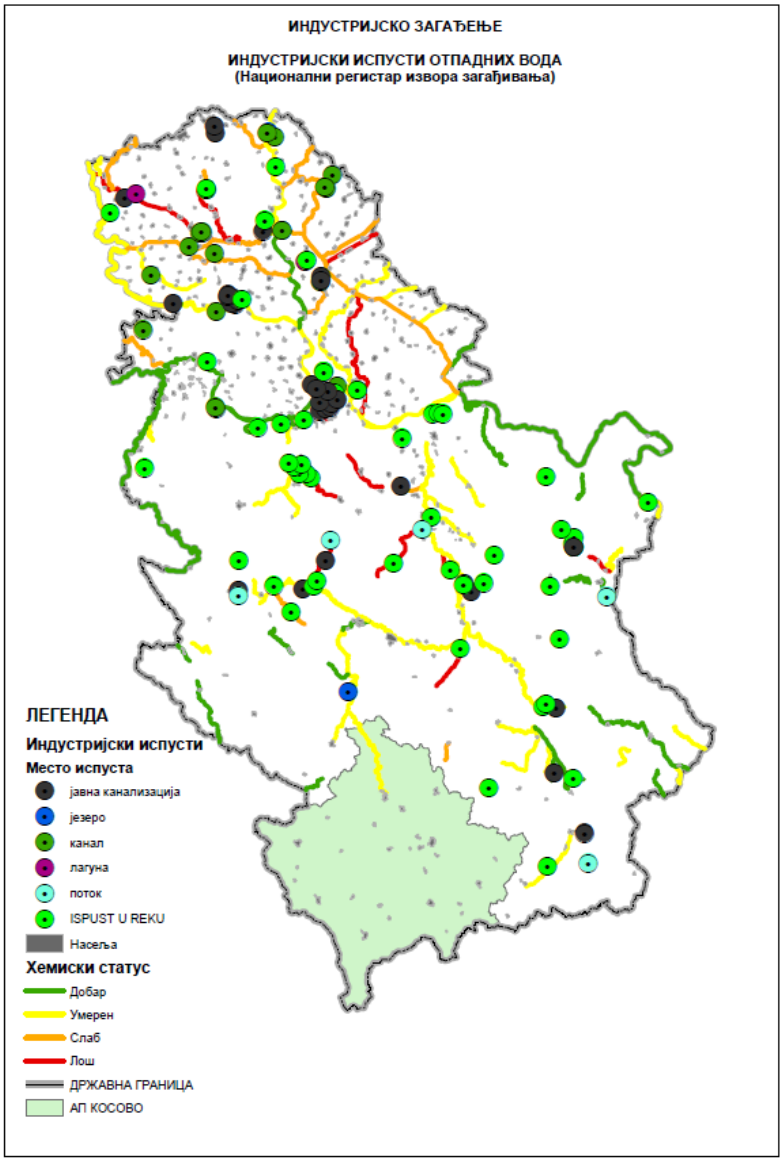
Figure 1.7. Wastewater treatment plants in Serbia and the assessment of effects of treatment on BOD5



Source: The Water Management Strategy in the Republic of Serbia

As regards industry, it is clear that there are most often no constructed plants for the pre-treatment of industrial wastewater before its release into city sewage systems, i.e. recipients, or that their operation is inefficient, which can also jeopardise the functioning of existing communal wastewater treatment plants and the well-being of life in aquatic and riparian ecosystems. Records on industrial water pollution for large polluters are kept in the National Register of Pollution Sources (The Agency for Environmental Protection), and for smaller polluters in local registers at the level of local self-governments. Practice has shown that the majority of polluters do not submit reports in a regular and timely manner, and those that do submit them provide incomplete data, which makes reliable quantification of pressures from the industry impossible. Since there is no relevant data, the figure below shows the locations where wastewater is released by large industrial capacities.

Figure 1.8. Industrial pollution – industrial wastewater discharge



Source: The Water Management Strategy in the Republic of Serbia

The dispersed sources of pollution are partly made up of the population connected not to public, but rather to individual sewage systems (or other types of sanitation with a negligible effect in terms of water protection). Quantification of the impact of dispersed pollution due to seepage from the terrain, primarily from agricultural surfaces, is conducted on the basis of targeted monitoring. As this type of monitoring is still not used in our country, the assessment was conducted based on a database on land cover (CORINE 2018) and the expert assessment of pressures (in kg/ha/year) in terms of the usage of space. According to the level of development of the sewage infrastructure, the Republic of Serbia is a medium-developed country, while in terms of wastewater treatment, it is among the worst. Namely, the sewage network covers around 55% of the population, while less than 10% is covered by any degree of wastewater treatment.

Only a few industries use pre-treatment of technological wastewater before releasing it into sewage networks or other recipients.

Quality of water – Serbian Water Quality Index

The Serbian Water Quality Index (SWQI) monitors nine parameters of physical and chemical properties; water temperature, pH, electrical conductivity, dissolved oxygen, BOD_5, suspended matter, total nitrogen oxides (nitrates + nitrites), orthophosphates, ammonium; and one parameter related to microbiological quality of water (the most probable number of coliform bacteria. It provides a measure of the state of surface water in terms of general surface water quality, not taking account of priority or hazardous substances. Water quality analysis using the *SWQI* indicators was conducted for the river basins in the Republic of Serbia. The total value is an unnamed number between 0 and 100, as a quantitative indicator of the quality of a specific water sample, with 100 being the highest quality. The indicator is calculated as the median of an array of mean annual values of SWQI, taken at measuring stations. The Mann-Kendall test and the non-parametric Sen's method determine the existence of a trend and its intensity.

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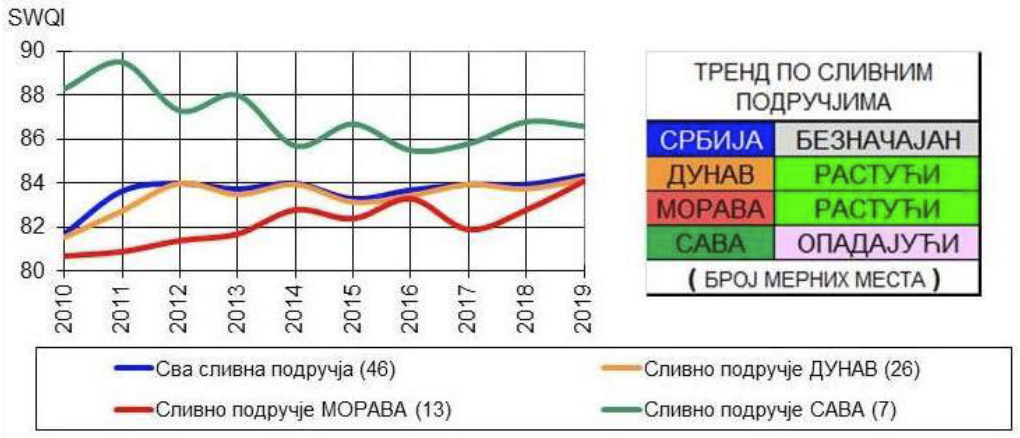
Graph 1 shows the SWQI median trends in Serbia's drainage basins (2010-2019). The SWQI analysis was conducted at 46 measuring stations at which there has been sampling continuity in the period 2010-2019. In the entire territory of the RS, a favourable insignificant trend has been identified; in the Danube and Morava basins, a favourable (increasing) one; and in the Sava river basin, an unfavourable (decreasing) trend. The SWQI median values range between 80 and 90, which corresponds to 'good' and 'very good' water quality, respectively.

Graph 1.1. The SWQI median trends in the drainage basins in the RS (2010-2019)

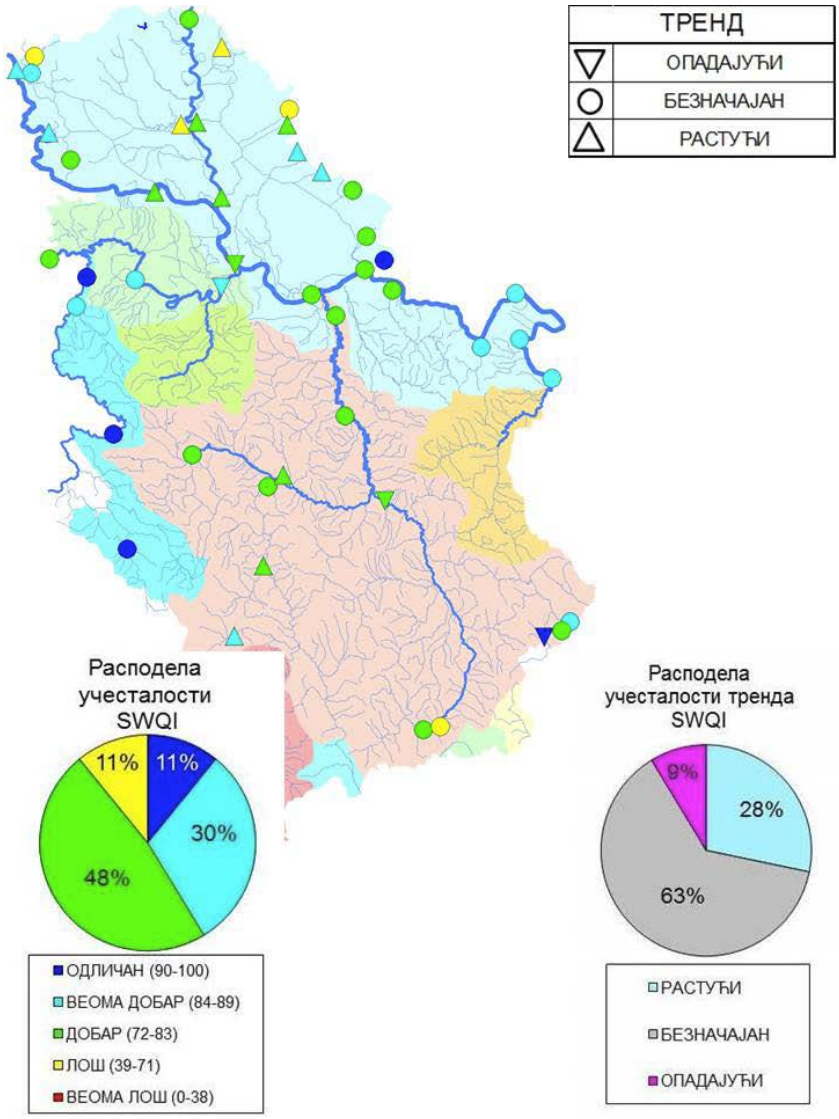


Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Poor water quality based on the SWQI parameters was identified at four (11%) measuring stations: Bačko Gradište (The DTD Canals), Vrbica (Zlatna), Hetin (Stari Begej), and Bački Breg (Plazović). At these locations, an insignificant trend was identified, with the exception of Vrbica and Bačko Gradište, where there is a favourable (increasing) one. An unfavourable (decreasing) one was identified at four (9%) of measuring stations, but with good, very good, and excellent water quality (Figure 1.9).

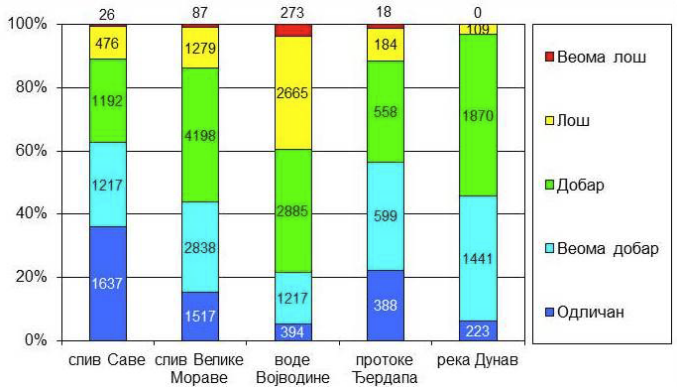
The analysis of 27,291 samples from 261 measuring stations, sampled on average once per month between 1998 and 2019, revealed that the Autonomous Province of Vojvodina has the worst condition. The 'poor' and 'very poor' indicators apply to 39.5% of samples from this territory, and 'very poor' to as much as 67.6% of samples from this territory (Graph 1.2)

Figure 1.9. The SWQI trends and mean values in Serbia's water courses (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Graph 1.2. Water sample analysis using the SWQI method in Serbia's drainage basins (1998-2019)

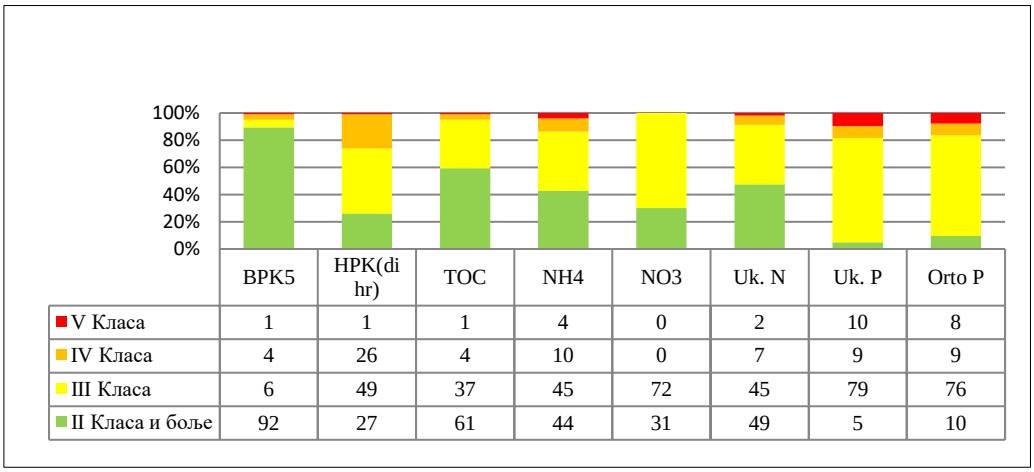


Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Surface water quality

Assessment of the quality of surface water represents the foundation for all planning documents which define the measures for the achievement and preservation of the sound condition of water and enables the monitoring of the impact of human activity on its quality. For decades, the only authority in the Republic of Serbia responsible for systematic examination and measurement of the parameters of surface water quality was the Republic Hydrometeorological Institute of Serbia (RHMIS). Since 2011, the list of competent institutions to monitor water quality was expanded to include the Agency for Environmental Protection, an administrative authority within the Ministry and the RHMIS. The assessment of the quality of surface water was performed by identifying their average quality and identified long-term trends, above all according to parameters which indicate the pollution of surface water caused by various groups of pollutants. Based on the available data, a classification was performed for the bodies of water which are covered by the network of surface water quality monitoring stations.

Figure 1.10. Bodies of water, according to the Regulation on Limit Values of Pollutants [11] in Surface Water, Groundwater, and Sediments, and Deadlines for Achieving them for the Period between 2004 and 2012



	BPK5	HPK(di hr)	TOC	NH4	NO3	Uk. N	Uk. P	Orto P
V Класа	1	1	1	4	0	2	10	8
IV Класа	4	26	4	10	0	7	9	9
III Класа	6	49	37	45	72	45	79	76
II Класа и боље	92	27	61	44	31	49	5	10

Source: The Water Management Strategy in the Republic of Serbia

The majority of bodies of water fall into quality classes II and III (over 80% of monitored bodies of water), while fewer than 20% of bodies of water belong to quality classes IV and V. It should be underlined that bodies of water in large watercourses, primarily the Danube, the Tisza, the Sava, and the Drina rivers, as a rule, meet the criteria for quality class II, with the exception of the orthophosphate content at the exit section of the Danube, which belongs to class III. Higher orthophosphate content in this section of the Danube probably stems from the used methodology of sampling.[12] The deterioration in the quality of some bodies of water was recorded mostly in smaller watercourses and canals in Vojvodina, as well as near larger settlements.

In general, the conclusion is that the quality of surface water is relatively good, given the fact that less than 10% of wastewater undergoes adequate treatment.

[11] The Regulation on Limit Values of Pollutants in Surface Water, Groundwater, and Sediments, and Deadlines for Achieving them for the Period between 2004 and 2012 (The Official Gazette of the Republic of Serbia, No. 50/2012).

[12] The samples on the benchmark station for this body of water are taken along the right shore (the state boundary is located at the centre of the Danube), rather than in the middle, as is usual for all other observed profiles.

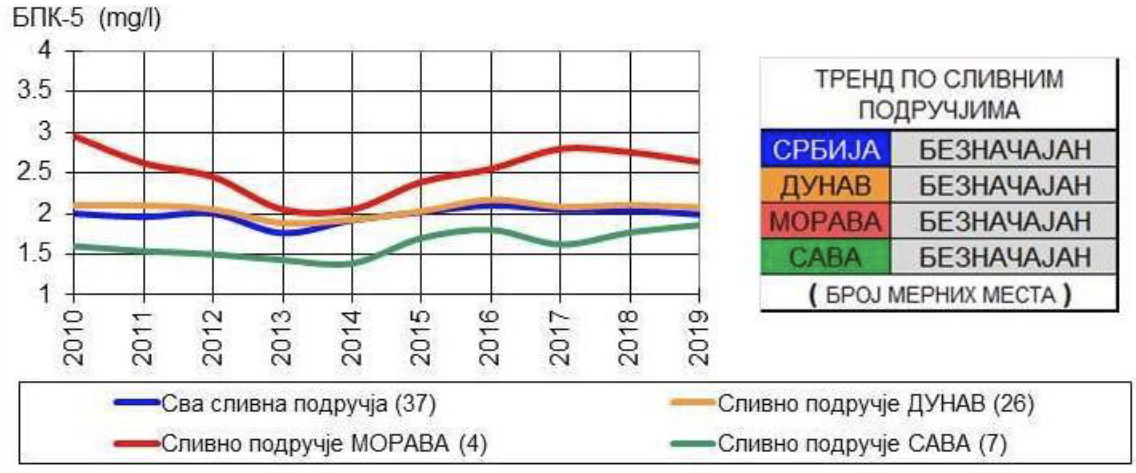
It is particularly significant to note that the water quality of the Danube at its exit from Serbia is considerably better than the quality at its entrance, indicating improvement of the water throughout the country. This precise and easily provable fact is underused in Serbia's appearances before international bodies, although it could be used to show the important role that Serbia plays in the protection of the Black Sea, which is an important objective of all measures for the protection of the Danube.

BOD-5

This indicator monitors the degree of the biological consumption of oxygen (BOD-5) in rivers, providing a measure of the condition of surface waters in terms of the biodegradable, organic load. It is used to demonstrate the spatial and temporal variations in the substances consuming oxygen, as well as their long-term trends. The BOD-5 concentration is the main indicator of the degree of pollution of surface waters by organic matter.

The BOD-5 analysis was conducted at 37 measuring stations at which there is sampling continuity in the period 2010-2019. An insignificant trend of median BOD-5 was identified at all the drainage basins. The median values range from 1.3 to 3.0 (mg/l), which corresponds to a good ecological status (Figure 1.11).

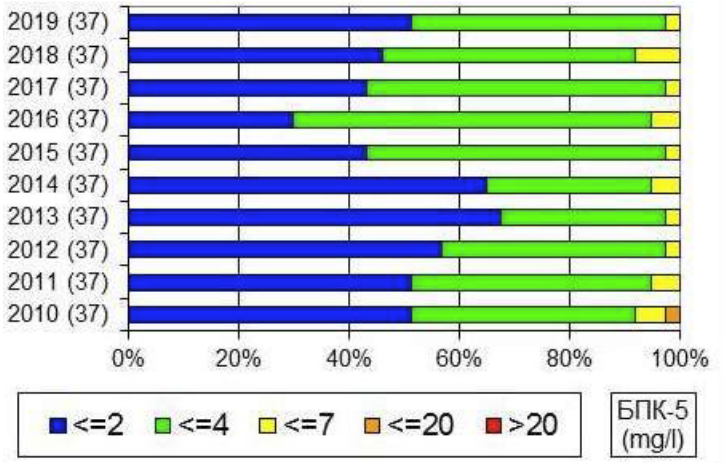
Figure 1.11. The BOD-5 median trends in Serbia's drainage basins (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Compared to 2018, water quality improved in 2019 in terms of the BOD-5. Only one measuring station – Bačko Gradište (The DTD Canals) – recorded BOD-5 concentrations higher than 4 (mg/i) in 2019 – (5.61 mg/l; Figure 1.13).

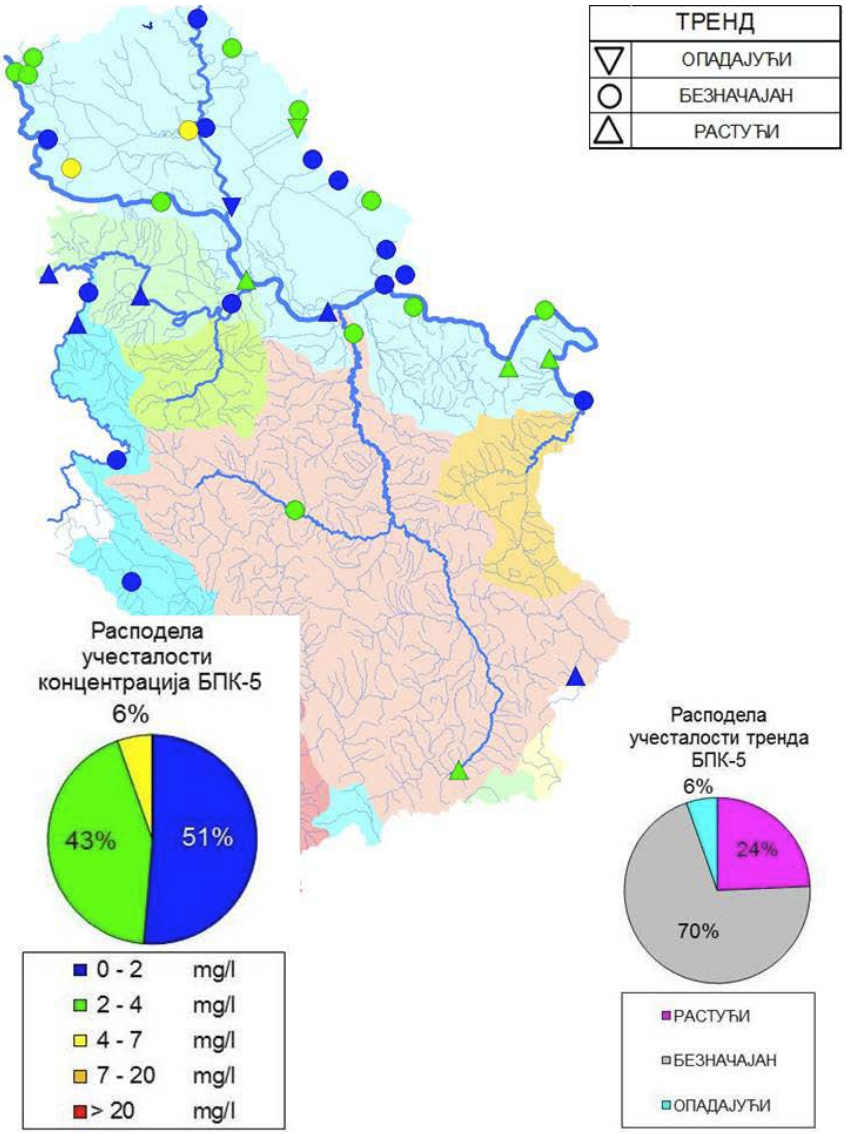
Figure 1.12. The distribution of BOD-5 concentrations in Serbia's water courses (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

An unfavourable (increasing) BOD-5 trend was identified at nine measuring stations, which is 24% of all analysed measuring stations. It is good that at these measuring stations the average ten-year concentration of BOD-5 is low. Higher average ten-year concentrations of BOD-5 were recorded at the measuring stations Bač and Bačko Gradište (The DTD Canals) in the Autonomous Province of Vojvodina, which is 6% of all measuring stations. At these locations, an insignificant ten-year trend for water quality was identified (Figure 1.12).

Figure 1.13. The trend and mean value of BOD-5 concentrations in Serbia's water courses (2010-2019)



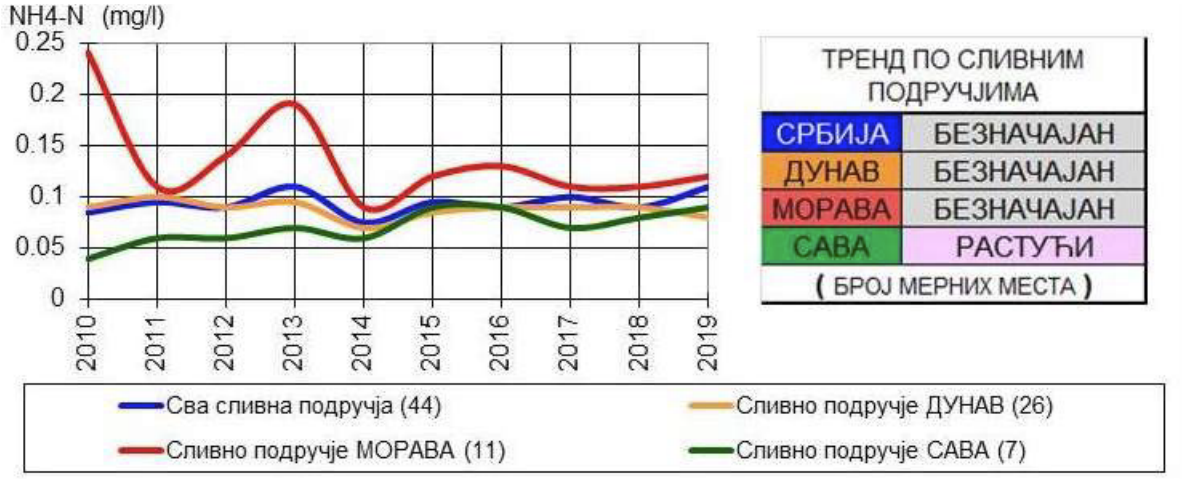
Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

AMMONIUM (NH_4-N)

This indicator monitors the concentration of ammonium (NH_4 – N) in rivers, providing a measure of the condition of surface waters in terms of ammonium. It is used to demonstrate the spatial and temporal variations in the substances consuming oxygen, as well as their long-term trends. Ammonium is an indicator of potential bacterial activity of human and animal waste, which reaches surface waters via sewage systems or in washouts. The indicator is calculated as the median of an array of mean annual values of ammonium, taken at measuring stations. The Mann-Kendall test and the non-parametric Sen's method determine the existence of a trend and its intensity.

The ammonium analysis was conducted at 44 measuring stations at which there is sampling continuity in the period 2010-2019. An unfavourable (increasing) trend of the ammonium median was identified in the Sava river basin. In the same period, an insignificant trend was identified in the Morava and Danube river basins, as well as in the entire territory of the RS. The median values range from 0.04 to 0.25 (mg/l), which corresponds to a good ecological status (Figure 1.14).

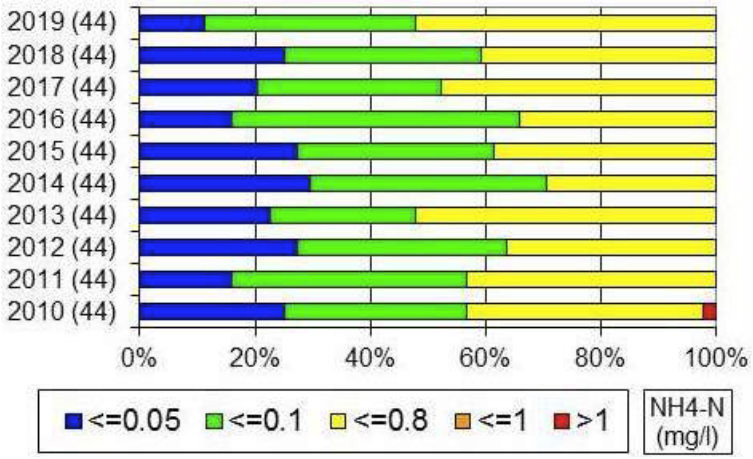
Figure 1.14. The ammonium median trends in Serbia's drainage basins (2010-2019).



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

As per the ammonium content indicator, the water quality in Serbia's water courses deteriorated in 2018 compared to 2018, and it is the lowest for the observed period 2010-2019 (Figure 1.16).

Figure 1.15. The distribution of ammonium concentrations in Serbia's water courses (2010-2019)

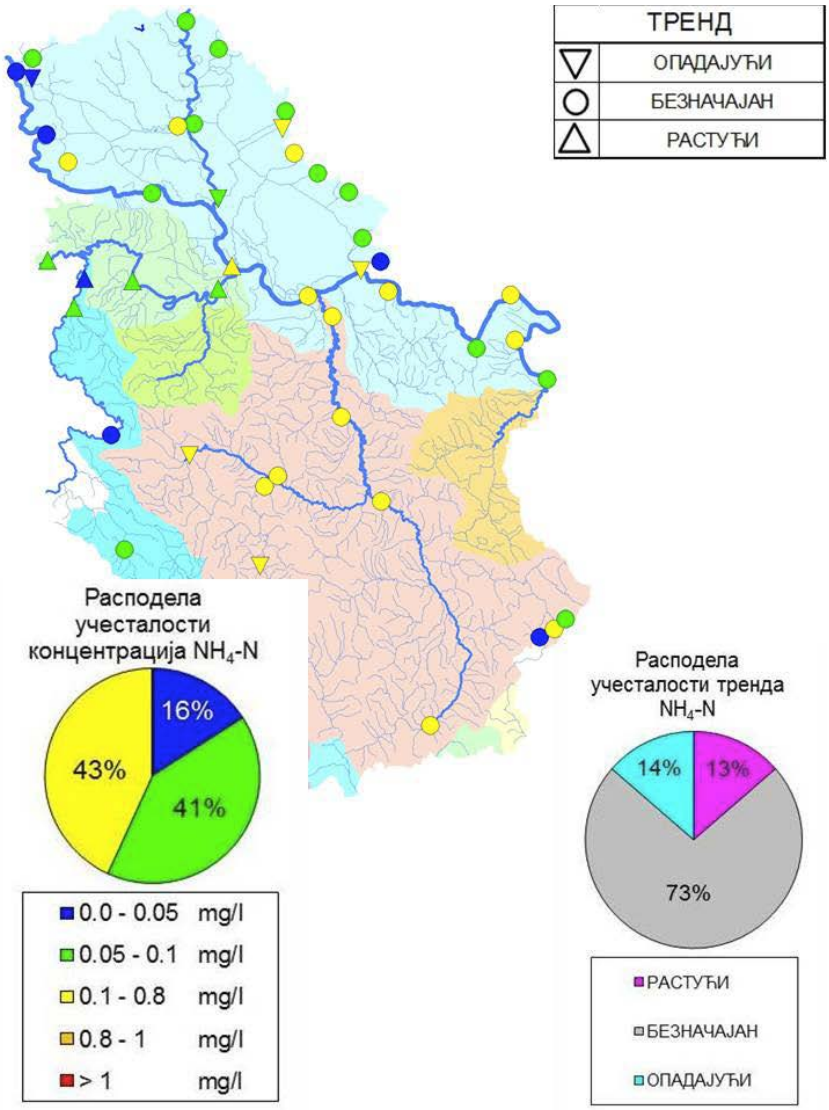


Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

An unfavourable (increasing) trend has been identified with respect to the mean values of ammonium in the period 2010-2019, at 13% of the measuring stations in the RS. In the Sava river basin, an unfavourable (increasing) trend was identified at 71% (five out of seven) of the

measuring stations, but it is good that the ammonium concentrations in the Sava basin are low and do not exceed 0.1 (mg/l) (Figure 1.15).

Figure 1.16. The trend and mean value of ammonium concentrations in Serbia's water courses (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

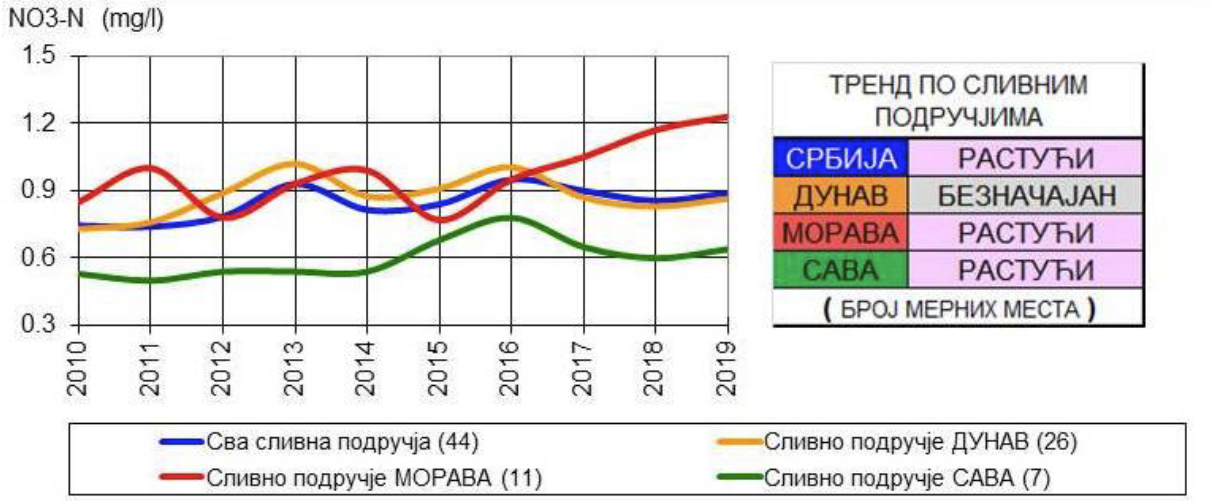
NITRATES (NO_3-N)

This indicator monitors the concentration of nitrates (NO_3-N) in rivers, providing a measure of the condition of surface waters in terms of nutrient concentrations. It is used to demonstrate the

spatial and temporal nutrient variations, as well as their long-term trends. The most important source of nitrate pollution are farmland washouts. The indicator is calculated as the median of an array of mean annual values of nitrates, taken at measuring stations. The Mann-Kendall test and the non-parametric Sen's method determine the existence of a trend and its intensity.

The nitrate analysis was conducted at 44 measuring stations at which there is sampling continuity in the period 2010-2019. An insignificant nitrate median trend was identified in the Danube river basin, and an increasing (unfavourable) trend was identified in the Sava and Morava river basins, as well as in the entire territory of the RS. It is good that the median values range from 0.5 to 1.23 (mg/l), which corresponds to a good ecological status (Figure 1.17).

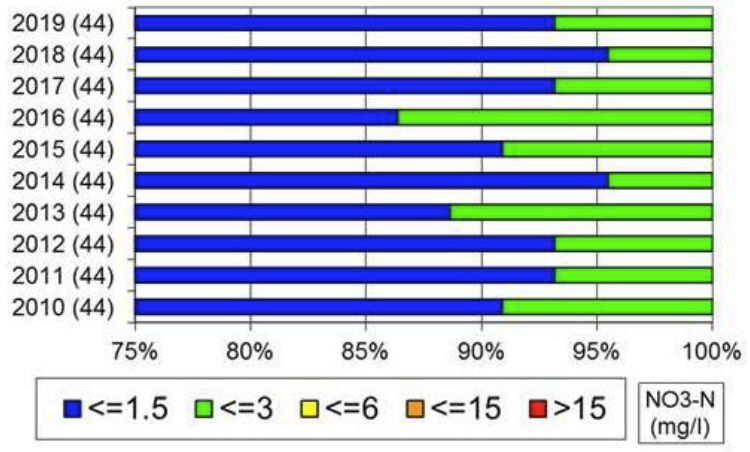
Figure 1.17. The nitrate median trends in Serbia's drainage basins (2010-2019).



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

The content of nitrates in Serbia's water courses in 2019 deteriorated compared to 2018, but is very low and within the ten-year average (Figure 1.18).

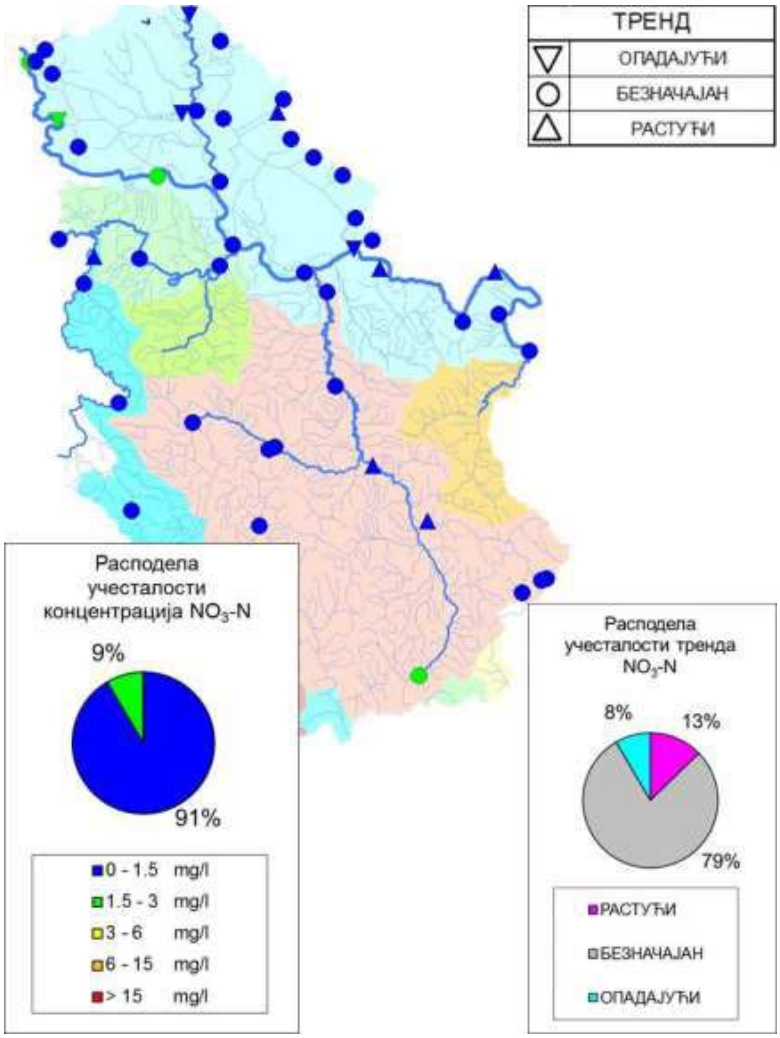
Figure 1.18. The distribution of nitrate concentrations in Serbia's water courses (2010-2019).



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

In terms of nitrates, the water quality in the Republic of Serbia has an excellent ecological status at 91% of the measuring stations. An unfavourable (increasing) trend for nitrates was identified at 23% (10) measuring stations: Zemun, Tekija, Brza Palanka, Radujevac (The Danube), Kusiće (Pek), Srpski Itebej (Plovni Begej), Ljubičevski Most (Velika Morava), Ristovac, Mojsinje (South Morava), and Mrtvine (the Gaberska Reka). It is good that the mean values of nitrates at these measuring stations are low and with an excellent ecological status (Figure 1.18).

Figure 1.19. The trend and mean value of nitrate concentrations in Serbia's water courses (2010-2019)



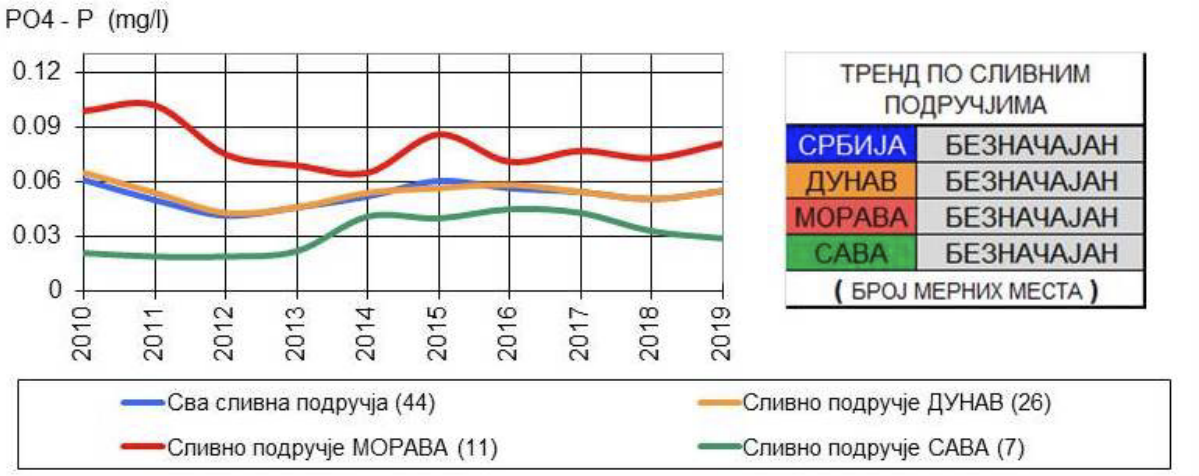
Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

ORTHOPHOSPHATES (PO_4-P)

This indicator monitors the concentration of orthophosphates (PO_4-P) in rivers, providing a measure of the condition of surface waters in terms of nutrient concentrations. It is used to demonstrate the spatial and temporal nutrient variations, as well as their long-term trends. The most important source of orthophosphate pollution is urban and industrial wastewater. The indicator is calculated as the median of an array of mean annual values of orthophosphates, taken at measuring stations. The Mann-Kendall test and the non-parametric Sen's method determine the existence of a trend and its intensity.

The orthophosphate analysis was conducted at 44 measuring stations at which there is sampling continuity in the period 2010-2019. An insignificant orthophosphate trend was identified in all the drainage basins and the entire territory of the Republic of Serbia. The median values of orthophosphates range from 0..019 to 0.1 (mg/l), which corresponds to a good ecological status (Figure 1.20).

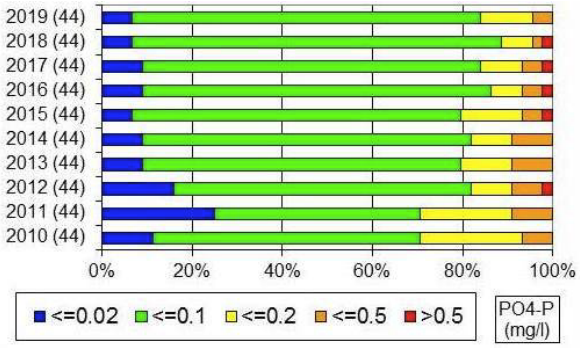
Figure 1.20. The orthophosphate media trends in Serbia's drainage basins (2010-2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Average concentrations exceeding 0.2 (mg/l) in 2019 were recorded in Bački Breg (Plazović), at 0.45 (mg/l) and Hetin (Stari Begej), at 0.342 (mg/l). As per the orthophosphates indicator, the water quality has had no significant changes at the analysed measuring stations in the period 2012-2019 (Figure 1.21).

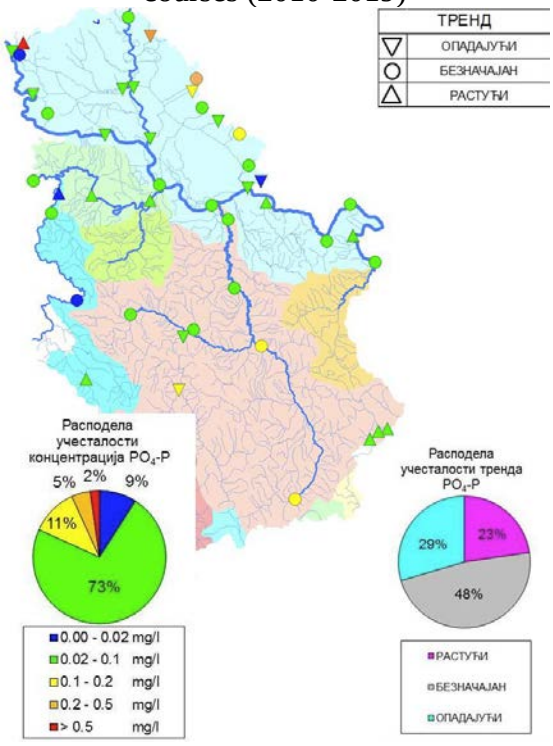
Figure 1.21. The distribution of orthophosphate concentrations in Serbia's water courses (2010-2019).



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

The quality of river water in the RS does not have a good ecological status with respect to orthophosphates at eight (18%) measuring stations. The following Autonomous Province of Vojvodina measuring stations recorded the poorest data: Bački Breg (Plazović), with an unfavourable (increasing) trend and the average ten-year concentration of 0.586 (mg/l); Hetin (Stari Begej), at 0.389 (mg/l); and Vrbica (Zlatna), at 0.271 (mg/l), with an insignificant trend in the observed period (Figure 1.21).

Figure 1.22. The trend and mean value of orthophosphate concentrations in Serbia's water courses (2010-2019)



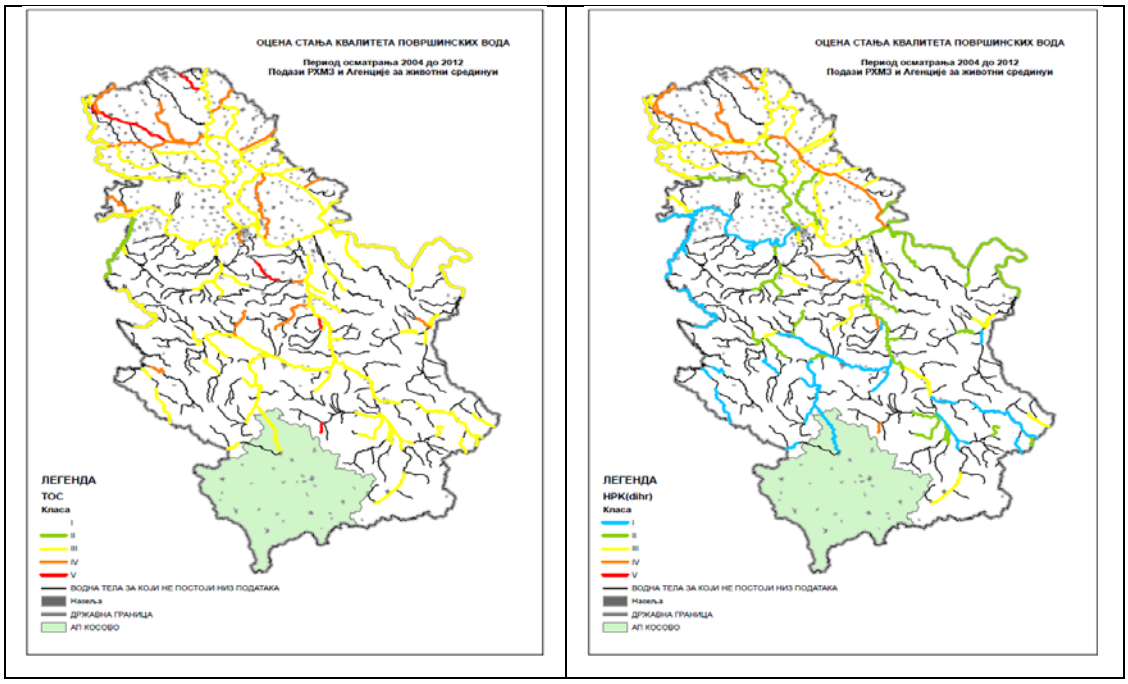
Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

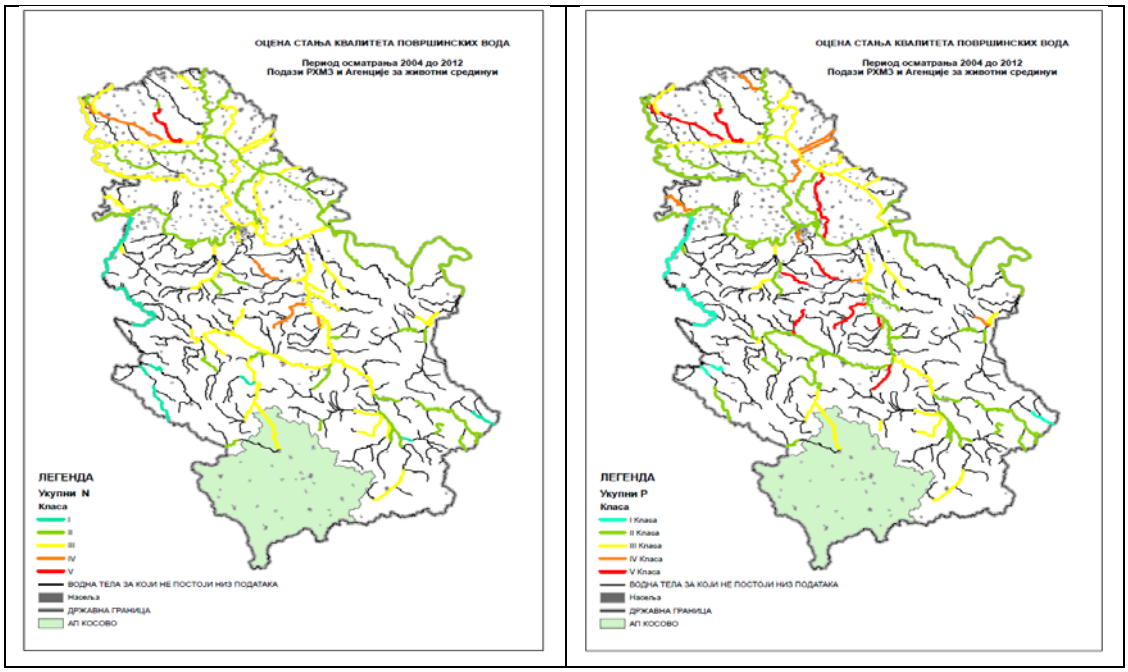
In line with the new approach, quality assessment is made for bodies of water, as special and significant elements of surface water. The assessment is made according to whichever is worse of the environmental and chemical status, for rivers and lakes, and according to the environmental potential and chemical status for man-made and considerably altered bodies of water. Environmental standards define the values of biological (aquatic invertebrates, algae,

macrophytes, microorganisms) and the selected physical and chemical quality parameters (oxygen parameters, acidity, nutrients) compared to the undisturbed, natural state (the benchmark condition) for each type of aquatic ecosystem, while the quality status was defined by standards of environmental quality with regard to priority, priority hazardous and other specific substances. Based on the parameters of environmental and chemical status, the surface water in the territory of the RS, excluding Kosovo and Metohija, was classified into the following types:

- Large lowland rivers dominated by fine sediments (the Danube, the Sava, the Great Morava, the Tisza, the Tamiš, the Begej and the Stari Begej) – type 1;
- Large rivers dominated by medium sediments, excluding rivers in the Pannonian Plain – type 2;
- Small and medium watercourses up to 500 m.a.s.l. dominated by coarse sediments – type 3;
- Small and medium watercourses above 500 m.a.s.l. dominated by coarse sediments – type 4;
- Watercourses in the Pannonian Plain (excluding type 1 watercourses) – type 5;
- Small watercourses outside of the Pannonian Plain not included in other types and watercourses not included in the rulebook which regulates this area – type 6.

Figure 1.23. The assessment of surface water quality in the RS





Source: The Water Management Strategy in the Republic of Serbia

Large rivers and man-made bodies of water were subject to most extensive and thorough monitoring, while the data is scarcest for small and medium watercourses (up to and above 500 m.a.s.l) and small watercourses outside of the Pannonian Plain, whose condition could not be assessed due to insufficient relevant data. The quality of watercourses in terms of biological parameters was poor in around 25% of bodies of water, which include stretches of the South Morava, the Rasina, the Kubršnica, the Nišava, the Begej, the Zlatica, the Turija, the Ljig, the reservoirs Potpeć, Sjenica, Bovan, Gruža, etc. The most threatened bodies of water, with poor quality in terms of the environmental and chemical parameters, include: The Vrbas – Bezdan Canal in the DTD hydro system, and the rivers Krivaja (from the confluence with the DTD canal to the Zobnatica dam) and the Pek (The Gorge of the Kaona, from the confluence of the Ljesnica to the confluence of the Kučajska River.

It should be underscored that a different approach to water quality assessment (within a water area, relative to the environmental and quality status of bodies of water) requires the alignment of the monitoring system with the new requirements in the coming period, including the alignment of the relevant regulations and an adequate selection of monitoring stations. The current monitoring system does not cover the majority of the bodies of water determined by regulations, while numerous quality parameters (indicators) for the assessment of the environmental status according to biological parameters have never been systematically monitored. For this reason, the environmental status was assessed based on partial data and a pressure analysis, as well as on expert assessments.

Based on a great many results of sediment quality examination, with the total number of 277 samples in the period 2012-2017, a detailed understanding was developed of the current status of the contamination of Serbia's river and reservoir sediments by metals and organic micropollutants. The results obtained indicate an increased metal content in river sediments, with the highest relative frequency for Ni (33%), followed by Cr (14%), As (9%), Zn (8%), Cu (6%), Pb (6%), and Cd (4%), which were found in concentrations exceeding the limit values of the sediment quality standard (probable effect level – PEL; effects range low – ERM; the severe effect level – SEL; and toxic effect threshold – TET).

At the same time, the results of the analysis of organic micropollutant content in Serbia's river sediments indicate the presence of organochlorine pesticides. Prominent among them were p,p-DDT, p,p-DDD and p,p-DDE, whose presence was registered in the sediments of some examined rivers in concentrations higher than the MAC and the ERM (effects range low), as well as of lindane (Rasina/Lepenac) in concentrations higher than the limit values for the toxic effect threshold (TET) and the severe effect level (SEL).

The results obtained for reservoir sediments indicate an increased metal content, with the highest relative frequency for Ni (58%), followed by Cr (34%), As (18%), and Cd (3%), in concentrations exceeding the limit value of the sediment quality standard (probable effect level – PEL); effects range low – ERM; severe effect level – SEL, and toxic effect level – TET) (The Quality of River and Reservoir Sediments, The Agency of Environmental Protection, 2019).

Figure 1.24. shows the metal concentration values in Serbia's rivers.

Based on the available data from the monitoring of the biological parameters, ecological status was assessed for app. 800 surface water bodies. By grouping water bodies belonging to the same type and which were subjected to comparable pressures, 1,070 surface water body groups were defined. Based on the defined groups, the ecological status was assessed for 262 more surface water bodies. In classifying the ecological status of surface water bodies, the following biological quality element are used: phytoplankton, aquatic macrophytes/phytobenthos, aquatic invertebrates, and fish. The results of the monitoring are shown in Figure 1.25. As per the analysis of pressures and impacts, lakes and reservoirs were classified as candidates for significantly altered and man-made water bodies, so that ecological status was not assessed. The ecological potential of these surface water bodies could not be assessed due to lack of data.

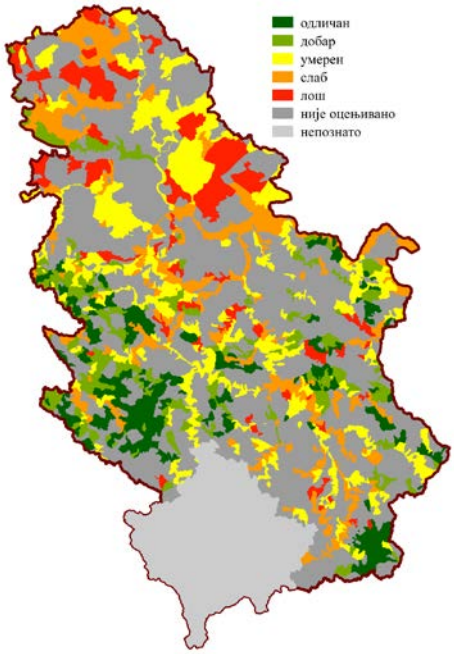
Figure 1.24. Metal concentrations in rivers in the RS

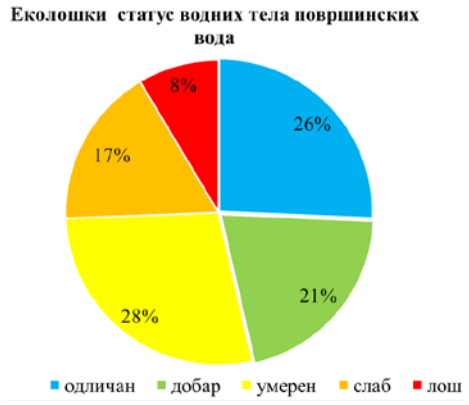
Станица	Водоток	Тип водотока	Метали						
			Арсен	Бор	Бакар	Цинк	Хром (укупни)	Гвожђе (укупно)	Манган (укупни)
			µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Бездан	Дунав	Тип 1	I	I	I-II	I	I	III	I
Богојево	Дунав	Тип 1	I	I	I-II	I	I	III	I
Нови Сад	Дунав	Тип 1	I	I	I-II	I	I	III	I
Земун	Дунав	Тип 1	I	I	I-II	I	I	III	I
Смедерево	Дунав	Тип 1	I	I	I-II	I	I	II	I
Банатска Паланка	Дунав	Тип 1	I	I	I-II	I	I	IV	II
Текија	Дунав	Тип 1	I	I	I-II	I	I	II	I
Брза Паланка	Дунав	Тип 1	I	I	I-II	I	I	II	I
Радујевац	Дунав	Тип 1	I	I	I-II	I	I	III	I
Братинац	Млава	Тип 2	II	I	I-II	I	I	V	IV
Мартонош	Тиса	Тип 1	I	I	I-II	I	I	V	III
Нови Бечеј	Тиса	Тип 1	I	I	I-II	I	I	V	III
Тител	Тиса	Тип 1	I	I	I-II	I	I	IV	III
Јаша Томић	Тамиш	Тип 1	I	I	I-II	I	I	IV	III
Врбица	Златица	Тип 5	II	I	I-II	I	I	II	IV
Хетин	Стари Бегеј	Тип 1	II	I	I-II	I	I	II	III
Српски Итебеј(ГВ)	Пловни Бегеј	ВВТ	I	I	I-II	I	I	IV	III
Марковићево	Брзава	Тип 5	I	I	I-II	I	I	V	III
Ватин	Моравица	Тип 5	II	I	I-II	I	I	IV	II
Добричево	Караш	Тип 5	I	I	I-II	I	I	III	III
Кусић	Нера	Тип 2	I	I	I-II	I	I	III	I
Бач	ДТД_Канал Бачки Петровац-Каравуково	ВВТ	II	I	I-II	I	I	I	II
Бачко Градиште	ДТД_Канал Бечеј-Богојево	ВВТ	II	I	I-II	I	I	I	II
Пригревица	ДТД_Канал Пригревица-Бездан	ВВТ	I	I	I-II	I	I	II	I
Нови Сад_1(ГВ)	ДТД_Канал Нови Сад-Савино Село	ВВТ	II	I	I-II	I	I	II	II
Ново Милошево	Кикиндски канал	ВВТ	I	I	I-II	I	I	II	III
Кајтасово(ГВ)	ДТД_Канал Банатска Паланка-Нови Бечеј	ВВТ	I	I	I-II	I	I	II	II
Бачки Брег_1	Бајски канал	ВВТ	I	I	I-II	I	I	I	I
Бачки Брег_2	Плазовић	Тип 5	V	I	I-II	I	I	II	II
Риђица	Плазовић	Тип 5	V	I	I-II	I	I	II	II
Јамена	Сава	Тип 1	I	I	I-II	I	I	IV	II
Шабац	Сава	Тип 1	I	I	I-II	I	I	III	II
Остружница	Сава	Тип 1	I	I	I-II	I	I	II	I
Батровци	Босут	Тип 2	II	I	I-II	I	I	II	III
Вишњићево	Шидина (Шаркудин)	Тип 3	III	I	I-II	I	I	IV	IV
Ушће	Вукодраж	Тип 3	I	I	I-II	I	I	V	I
Шабац (Јеленча)	Думача	Тип 3	III	I	I-II	I	I	V	IV
Мрђеновац	Добрава	Тип 3	I	I	I-II	I	I	V	III
Бајина Башта	Дрина	Тип 2	I	I	I-II	I	I	I	I
Бадовинци	Дрина	Тип 2	I	I	I-II	I	I	II	I
Пријепоље	Лим	Тип 2	I	I	I-II	I	I	II	I
Лешница	Јадар	Тип 3	II	I	I-II	I	I	IV	III
Лешница_1	Лешница	Тип 3	I	I	I-II	I	I	II	II
Мислођин	Колубара	Тип 2	III	I	I-II	I	I	IV	III
Јарак	Кудош	Тип 3	I	I	I-II	I	IV	IV	III

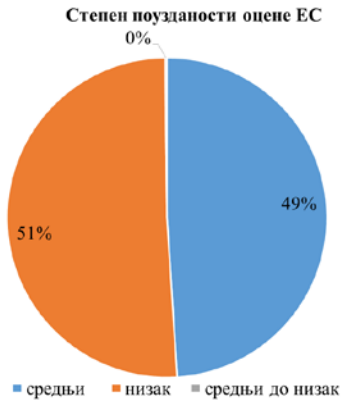
Станица	Водоток	Тип водотока	Арсен	Бор	Бакар	Цинк	Хром (укупни)	Гвожђе (укупно)	Манган (укупни)
			µg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l
Бргуле	Тамнава	Тип 3	III	I	I-II	I	I	IV	IV
Багрдан	Велика Морава	Тип 2	II	I	I-II	I	I	III	III
Љубичевски мост	Велика Морава	Тип 1	II	I	I-II	I	I	V	III
Марковац	Рача	Тип 3	III	I	I-II	I	I	III	IV
Гугаљски мост	Западна Морава	Тип 2	I	I	I-II	I	I	II	II
Краљево	Западна Морава	Тип 2	I	I	I-II	I	I	III	I
Маскаре	Западна Морава	Тип 2	II	I	I-II	I	I	V	III
Витановац	Гружа	Тип 3	I	I	I-II	I	I	III	III
Биволье_1(Испод насеља)	Расина	Тип 3	I	I	I-II	I	I	II	I
Батраге	Ибар	Тип 2	I	I	I-II	I	I	I	II
Рашка	Ибар	Тип 2	III	I	I-II	I	I	III	III
Краљево	Ибар	Тип 2	III	I	I-II	I	I	III	II
Варварин	Каленићка река	Тип 3	I	I	I-II	I	I	III	III
Драгошевац	Дуленска река	Тип 3	I	II-III	I-II	I	I	II	II
Беочић	Жупањевачка река	Тип 3	I	II-III	I-II	I	I	III	II
Крагујевац	Угљешница	Тип 3	II	I	I-II	I	I	V	IV
Ристовац	Јужна Морава	Тип 2	III	II-III	I-II	I	I	V	IV
Мојсиње	Јужна Морава	Тип 2	I	I	I-II	I	I	III	III
Бујановац	Биначка Морава	-							
Димитровград	Нишава	Тип 3	I	I	I-II	I	I	I	I
Ниш_1(Испод града)	Нишава	Тип 2	I	I	I-II	I	I	I	I
Мртвине	Габерска	Тип 3	I	I	I-II	I	I	I	I
Бела Паланка_1	Коритничка река	Тип 3	I	I	I-II	I	I	I	I
Доњи Катун	Јовановачка река	Тип 3	I	I	I-II	I	I	II	I
Петровац_1	Бусур	Тип 3	III	I	I-II	I	I	V	IV
Калиште	Витовница	Тип 3	I	I	I-II	I	I	V	IV
Орљане	Топлица	Тип 3	III	I	I-II	I	I	II	II
Горње Крајнце	Власина	Тип 3	I	I	I-II	I	I	III	II
Трнски Одоровци	Јерма	Тип 4	I	I	I-II	I	I	II	I
Кусиће	Пек	Тип 2	I	I	I-II	I	I	II	II
Мосна(водозахват)	Поречка	Тип 3	I	I	I-II	I	I	I	I
Србово	Велики Тимок	Тип 2	II	I	III	I	I	III	IV

Source: The results of the assessment of surface and ground water quality in 2019

Figure 1.25. The ecological status of surface water bodies

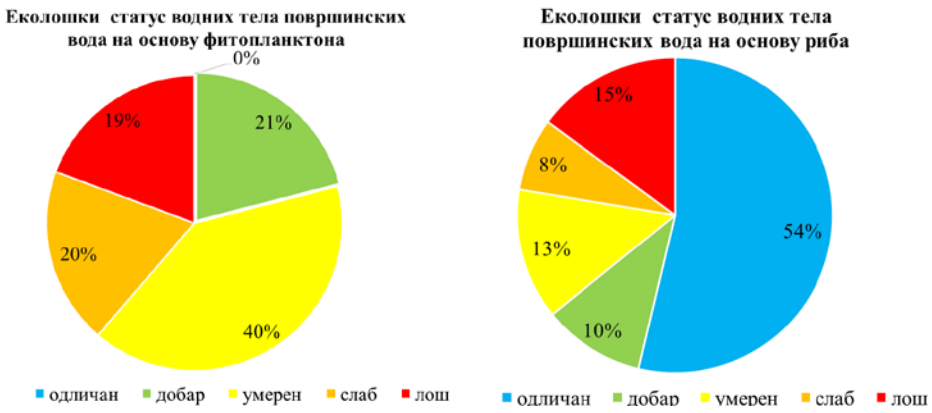

одличан
добар
умерен
слаб
лош
није оцењивано
непознато


Еколошки статус водних тела површинских вода
26%
21%
28%
17%
8%
одличан
добар
умерен
слаб
лош


Степен поузданости оцене ЕС
0%
49%
51%
средњи
низак
средњи до низак


Еколошки статус водних тела површинских вода на основу МЗБ
27%
24%
26%
16%
7%
одличан
добар
умерен
слаб
лош


Еколошки статус водних тела површинских вода на основу фитобентоса и макрофита
26%
35%
24%
9%
6%
одличан
добар
умерен
слаб
лош

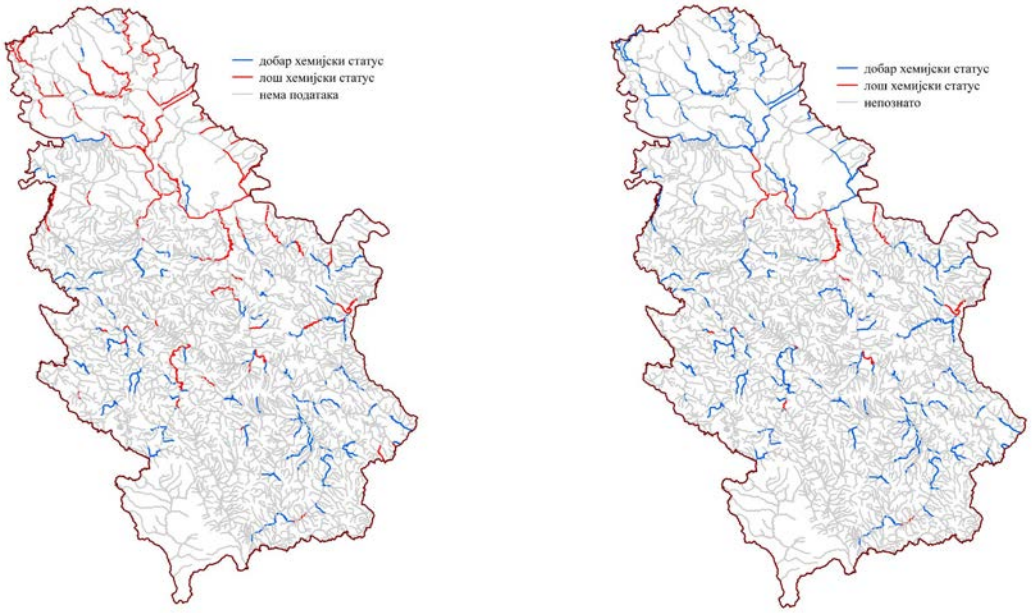


Source: The Draft Water Management Plan in the Republic of Serbia for the Period 2021-2027

The overall status of surface water bodies is determined by assessing the ecological and chemical status. The chemical status is assessed based on environmental quality standards. The Directive on Environmental Quality Standards defines the maximum acceptable concentration and/or average annual concentration for 45 priority and priority hazardous substances, while the domestic legislation determines specific parameters and limits which need to be attained in order for a WB to have a good status. If this is achieved, then the chemical status of a WB can be assessed as 'good'.

Figure 1.26 shows the results of the assessment of the chemical status of surface water bodies, taking account of the results of the monitoring of all the parameters. However, due to the unknown source of pollution for the parameter dissolved Ni (which is possibly natural in origin) and the limitations of the method used to assess PAHs, Endosulfan, and Hg (the detection level for the applied method is higher than 30% of the relevant EQS value prescribed under Article 5 of the Regulation on Priority and Priority Hazardous Substances), a decision was made not to use these parameters as the basis for assessing the chemical status.

Figure 1.26. The assessment of the chemical status (all the parameters exceeding the quality standards) – left, and the assessment of the chemical status of surface water bodies, excluding the Ni, PAH, Endosulfan, and Hg parameters - right



Source: The Draft Water Management Plan in the Republic of Serbia for the Period 2021-2027

Quality of groundwater

Assessment of the quality of groundwater resources in the Republic of Serbia was made based on the available data by competent ministries, monitoring results, technical documents and the results of individual papers and surveys. Adequate assessment of water status, identification of changing trends and the assessment of effects of undertaken protection measures rely on systematic monitoring and updating of data on the quality of groundwater. Representativeness in terms of space and time, as well as the scope of tested parameters, directly affect the quality of data used to determine the quality of water. The natural quality of groundwater in the RS is quite uneven, which is caused by the different mineralogical and petrographic composition of water-bearing areas, genesis of groundwater and aquifers, age of water, different rate of exchange of water, etc., and varies from exceptional quality (which requires no treatment) to water which requires highly complex conditioning procedures prior to usage in public water supply. The chemical composition of the groundwater of the water-table aquifers in the area of *west and south Bačka* is characterised by the mineralisation from 250–500 mg/l in the riparian area of the Sava and Danube rivers, up to 400–800mg/l in the area of the "Varoška" terrace, while in some parts of Bačka this parameter measures over 2,000mg/l. Iron and manganese content is elevated. In northeast Bačka, the principal aquifer is characterised by the mineralisation of 240–480mg/l, while the south part of the area features values of 350–635mg/l.

From the aspect of principal aquifer quality, the area of *Banat* can be divided into 3 areas: the area north of the Begej and Plovni Begej, central Banat (Zrenjanin – Žitište) and south Banat. The quality of water-table and principal aquifers in the area of *Srem* is similar to that in Banat, considering the hydraulic connectedness of these two aquifers. Mineralisation ranges from 600–850mg/l, hardness is over 20ºdH, consumption of $KMnO_4$ is low (3–7mg/l), while iron is regularly elevated (0.5–3.5mg/l). A high arsenic concentration is an important characteristic of the principal aquifer groundwater in the area of *Vojvodina*. High concentrations can be found in the area of central and north Banat (10–50µg/l and over 50µg/l), central and north Bačka (10–50µg/l, and even over 50µg/l) and west Srem (10–50µg/l).

The quality of water from deep aquifers in Bačka and Banat areas is not satisfactory (elevated mineralisation, iron, organic matter, turbidity), while it is considerably higher in the area of Srem.

Table 1.6. The characteristic parameters of taken raw groundwater, whose exceeding of the MAC values is recorded in Vojvodina

District	Total samples	% defective	Parameters exceeding MAC
South Bačka	790	77	colour, consumption of $KMnO_4$, electrical conductivity, ammonium, arsenic, chloroform, nitrites, iron, manganese, turbidity, odour, magnesium, pH, chlorides, trihalomethanes, sodium, phosphates, nickel, fluorine, suspended solids
West Bačka	132	92	colour, turbidity, iron, consumption of $KMnO_4$, manganese, ammonium, chlorides, residue on evaporation
North Bačka	493	94	colour, odour, turbidity, ammonium, iron, arsenic, manganese, nitrites, potassium, mineral oils, aluminium
North Banat	412	98	colour, turbidity, consumption of $KMnO_4$, ammonium, iron, odour, electrical conductivity, chlorides
Central Banat	624	100	colour, turbidity, consumption of $KMnO_4$, ammonium, iron, phosphates, nitrites, chlorides, arsenic, electrical conductivity
South Banat	43	88	colour, turbidity, ammonium, iron, consumption of $KMnO_4$, electrical conductivity, chlorides, odour
Srem	360	25	manganese, ammonium, colour, nitrites, iron, turbidity

Source: The Water Management Strategy in the Republic of Serbia

Particularly evident negative impacts were registered in damaged industrial plants of the petroleum industry (Novi Sad, Pančevo), in the area of some watercourses (The Great Bačka Canal, etc.), in zones of numerous settlements without sewage systems, in zones around farms and industrial and processing plants. In the rest of the territory of the Republic of Serbia (*the area south of the Sava and the Danube*), chemical content of groundwater is diverse, so a general overview will be given by type of water-bearing area. Aquifers in alluvions of large rivers in Central Serbia are generally characterised by relatively low mineralisation, with a highly variable iron content and low manganese content. High electrical conductivity levels above 1,000μS/cm can be considered as indicators of anthropogenic effects and generally occur in combination with high nitrate, chloride and, often, sulphate content.

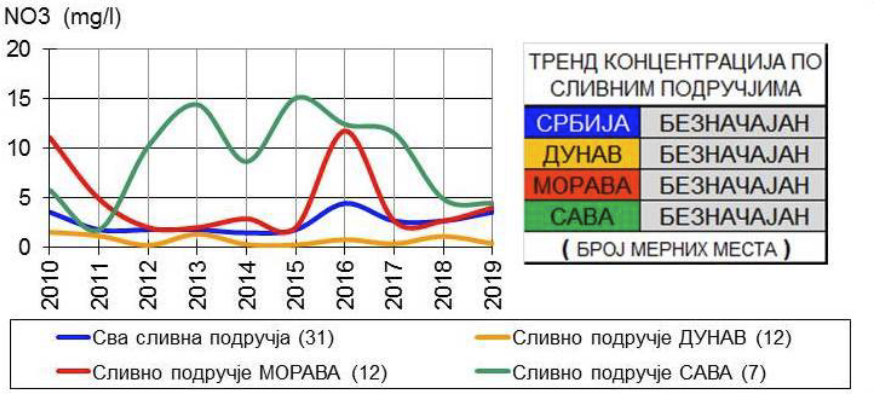
The alluvion of the Great Morava River frequently features increased nitrate concentration, with nitrite concentrations sporadically exceeding the maximum allowable concentration. All of this is reflected in the poor quality of water used in public water supply systems (in line with PHIVP) in the majority of settlements which use individual shallow wells, as well as in the sources used at Garevina, Žabari, Livade, Meminac and Ključ settlements.

The groundwater throughout the RS and in all the drainage basins recorded an insignificant nitrate trend in the period 2010/2019. The average ten-year concentration higher than 50 (mg/l) was not found at any measuring station in the period 2010-2019. As per the nitrate indicator, the groundwater quality in the RS deteriorated in 2019, compared to 2018.

This indicator monitors the concentration of nitrates (NO_3) in the groundwater, providing a measure of the condition of groundwater in terms of nutrient concentrations. It is used to demonstrate the spatial and temporal nutrient variations, as well as their long-term trends. The most important source of orthophosphate pollution is urban and industrial wastewater. An excessive amount of nutrients which is transferred into the soil from urban settlements, industry, and farmland results in an increase in concentrations, leading in turn to groundwater pollution. This process has an adverse effect on the use of water for human consumption and on other uses.

The groundwater nitrate analysis was conducted at 31 measuring stations at which there is sampling continuity in the period 2010-2019. An insignificant nitrate trend was identified in all the drainage basins and the entire territory of the Republic of Serbia, indicating that there was no major change in quality (Figure 1.27).

Figure 1.27. The nitrate median trends in Serbia's groundwater (2010-2019).

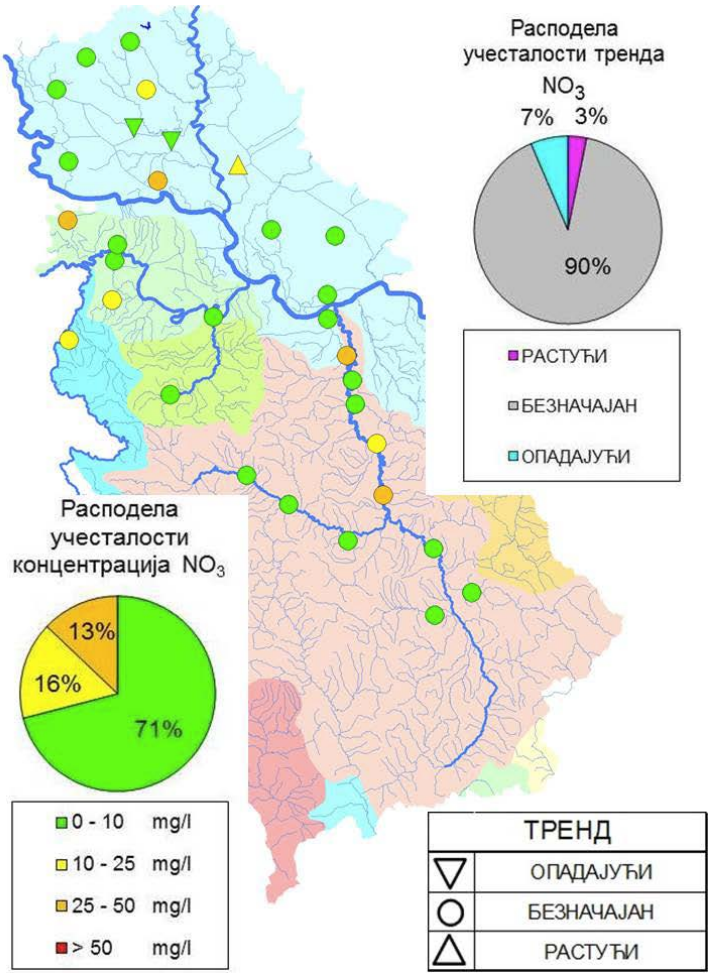


Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Average ten-year concentrations higher than 50 (mg/l) were not found at any measuring station in the period 2010-2019. A relatively high average ten-year concentration, exceeding 25 (mg/l), was found at the following measuring stations: Šid (Š-1/D) (46.5 mg/l) in the Sava river basin; Novi Sad (RŠ-1/1) (45.3 mg/l) in the Danube river basin; and Lozovik-Vlaški Do (37.6 mg/l), and Obrež-Ratare (29.8 mg/l) in the Morava river basin (Figure 1.28).

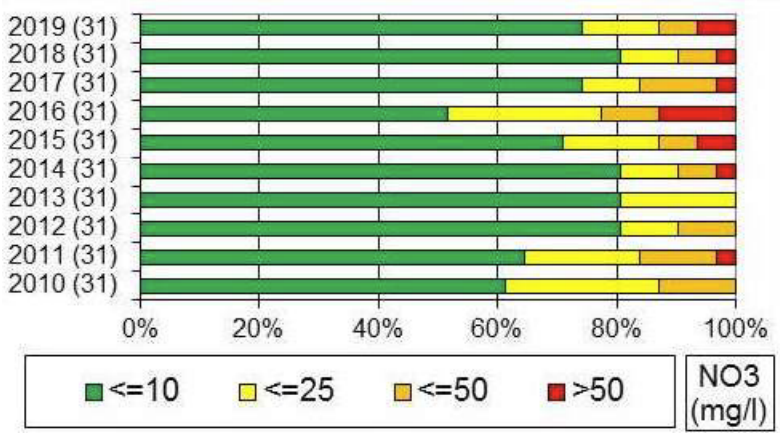
In 2019, the allowable nitrate concentration of 50 (mg/l) was exceeded at only two measuring stations: Zrenjanin (ZR-1/D) (90.1 mg/l) in the Danube river basin, and Šid (Š-1/D) (51.4 mg/l) in the Sava river basin. The groundwater quality in 2019 is poorer than in 2018 (Figure 1.29).

Figure 1.28. The trend and mean nitrate concentration value in Serbia's groundwater (2010 - 2019)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Figure 1.29. The distribution of nitrate concentrations in Serbia's groundwater (2010 -2019).



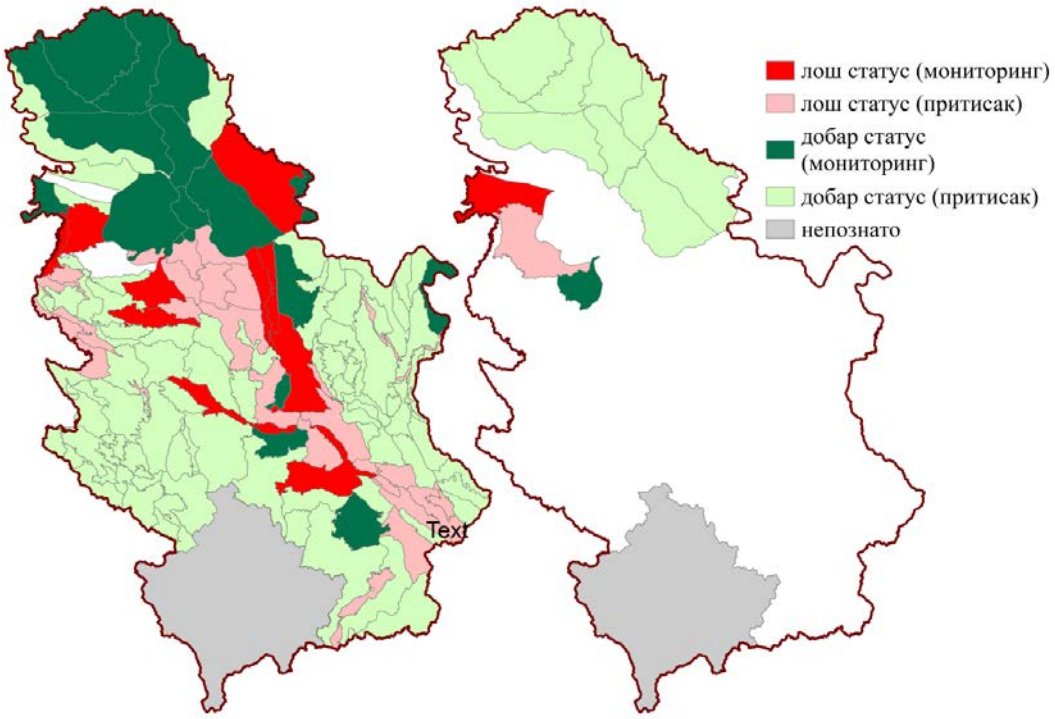
Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

The groundwater status of one body of water or a water body group is a general expression of groundwater body status and is determined by its quantitative and chemical status, whichever of the two is poorer. In order to determine the status of groundwater bodies, the quantitative and chemical statuses are monitored. The criteria for defining the chemical and quantitative

groundwater status in the RS are defined in the Rulebook on the Parameters of the Ecological and Chemical Status of Surface Waters and the Chemical and Quantitative Status of Groundwater (The Official Gazette of the Republic of Serbia, No. 74/2011). Based on the results of the monitoring, it was concluded that of the 141 shallow aquifer groundwater bodies, 10 WBs had a poor chemical status, and 18 WBs had a good status. Based on the results of the monitoring, it was concluded that of the 12 deep aquifer groundwater bodies, one WB had a poor chemical status, and 1 WB had a good status (Figure 1.30).

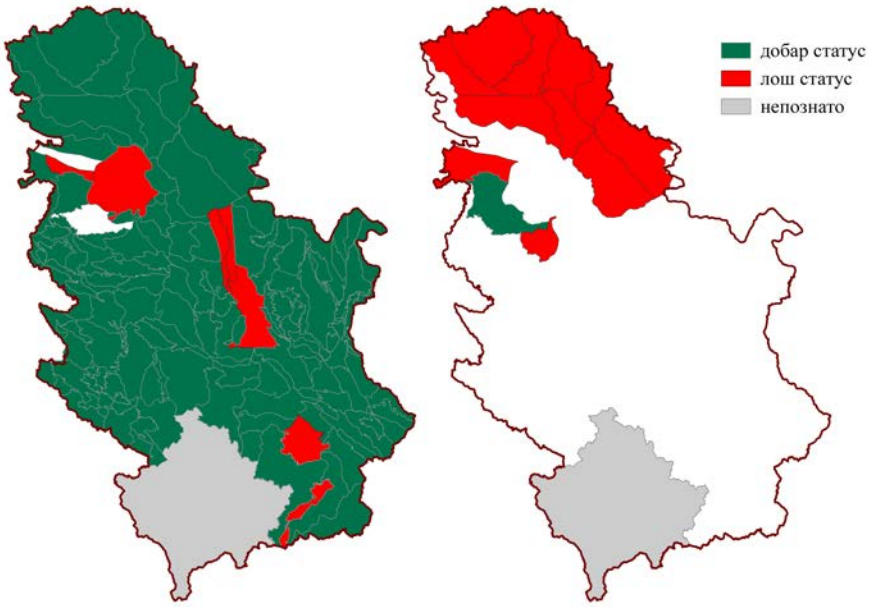
The quantitative status was assessed for all 153 groundwater bodies. It was concluded that 18 groundwater bodies (i.e. 12%) had a poor quantitative status (Figure 1.31).

Figure 1.30. The chemical status of shallow groundwater WBs (left) and deep WBs, based on the monitoring and pressure data



Source: The Draft Water Management Plan in the Republic of Serbia for the Period 2021-2027

Figure 1.31. The quantitative status of shallow groundwater WBs (left), and deep groundwater WBs (right)



Source: The Draft Water Management Plan in the Republic of Serbia for the Period 2021-2027

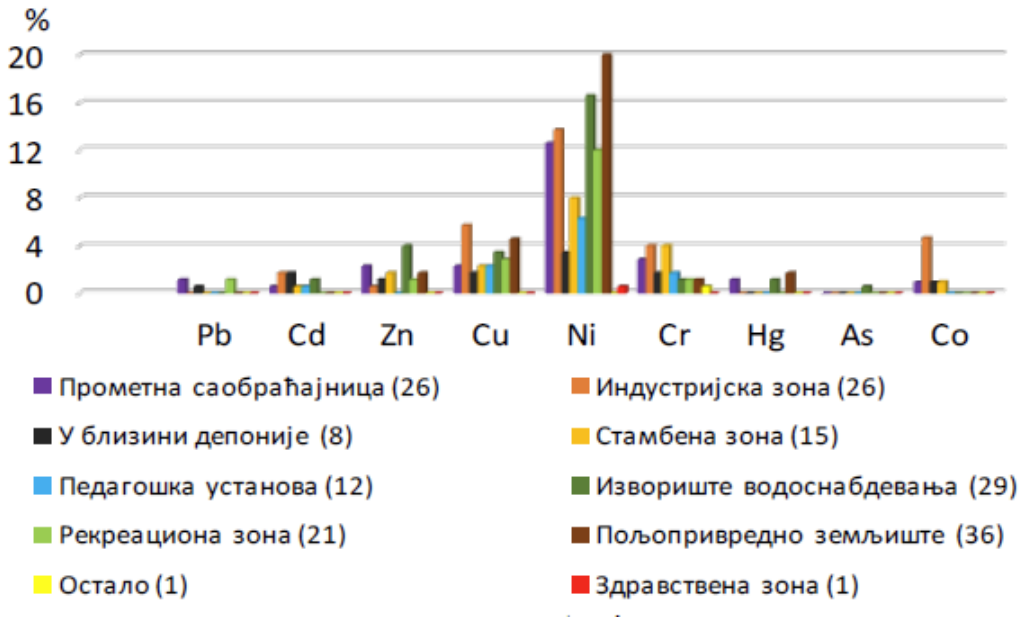
1.2.2.3. Soil quality

In the Republic of Serbia, soil quality, i.e. degree of soil degradation, is affected by numerous natural processes (erosion, landslides, surface runoff). However, soil quality is considerably impacted by anthropogenic phenomena and processes, the most significant of which include: soil pollution by chemical substances (mineral fertilizers, pesticides) and organic fertilizers (solid and liquid manure) used in agricultural production; industrial processes; mining works; inappropriate waste disposal, existence of septic tanks that receive non-sanitary wastes (farm households, livestock farms), pollution of soil along roads due to water drainage issues, changes in land use (illegal construction), etc.

Soil is also polluted by inappropriate agricultural practices, including uncontrolled and inadequate use of artificial fertilizers and pesticides, as well as the absence of quality control of water used for irrigation. Sporadic presence of heavy metals in soil is a result of untreated drainage waters from landfills, as well as from mining facilities and power plants. Soil is polluted in areas of intensive industrial activity, inappropriate waste disposal sites, mining areas, and in locations of various accidents.

In 2020, the degree of exposure of urban area soil to chemical pollution was monitored in eight local self-governments, and a total of 248 samples were tested. The limit values were most often exceeded for Ni, Cu, Cr, Zn, Cd, Pb, As, Co, and Hg. The indicator monitors the degree of exposure of urban area soil to chemical pollution based on exceeding the limit and remediation values of dangerous and harmful substances (Figures 1.28 and 1.29).

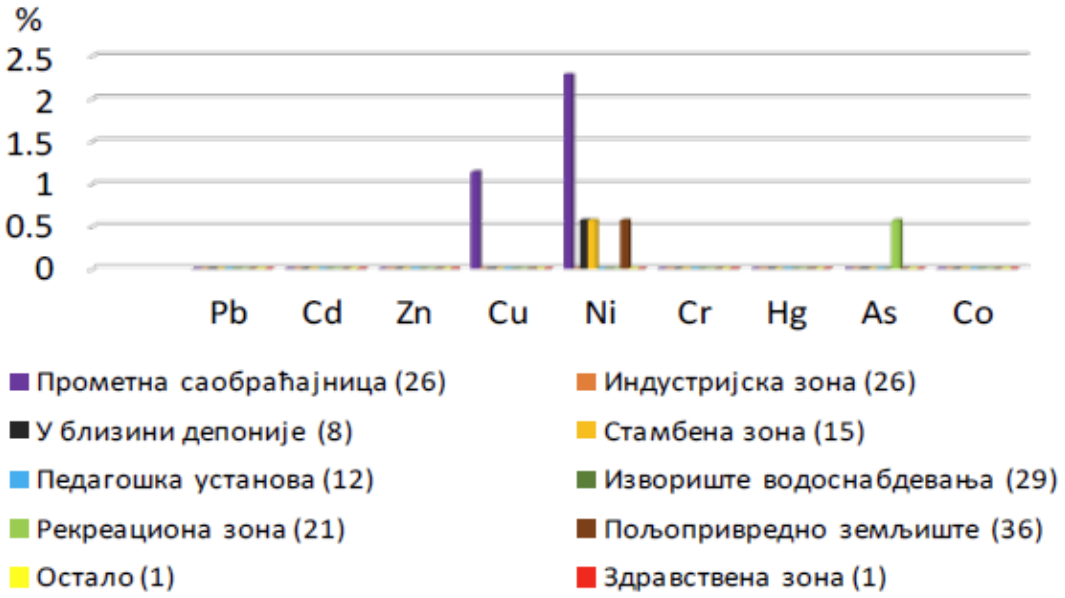
Figure 1.28. Exceedances of the limit values and the number of tested samples at the depth of 0-30cm



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

In the City of Belgrade, the results indicate exceeding the limit value for Zn, Cu, Ni, Cr, and Hg in the water supply source area, the residential area, the recreation area, and the farmland area, while the remediation value was exceeded for As in the recreation area in one sample. In the City of Niš, the limit value was exceeded for Cd, Cu, Zn, Ni, Cr, and Co in the soil samples from the industrial zone, the heavily trafficked road zone, in the vicinity of a landfill, and in the residential and recreational areas. The remediation values were not exceeded in any sample. In the City of Kruševac, soil samples with higher concentrations originated from the industrial zone, the residential area, the heavily trafficked road zone, and the farmland area for Pb, Zn, Cu, Ni, Cr and Hg, while the remediation values were exceeded for Ni in the four samples originating from the heavily trafficked road zone, one from the residential area, and one from the farmland area. In the City of Čačak, the highest Ni and Cr concentrations were recorded in the industrial zone and the heavily trafficked road zone. In the City of Požarevac, the limit values were exceeded for Zn, Cu, and Ni in the vicinity of a heavily trafficked road, the industrial zone, in the farmland area samples, the recreation area, and the water supply source area. In the City of Smederevo, the limit values were exceeded for Pb, Cd, Zn, Cu, Ni, and Cr in the recreation area, the industry zone, and the educational institution area, as well as in the vicinity of a landfill, the water supply source, and in farmland, while the remediation value for Ni was exceeded in the vicinity of a landfill, in one sample. In the Municipality of Trstenik, the limit values were exceeded for Zn, Cu, Ni, and Hg in the farmland area. In the Municipality of Vladimirovci, the results indicate exceeding the limit value for Ni in educational institution areas, the recreation area, as well as in the farmland area.

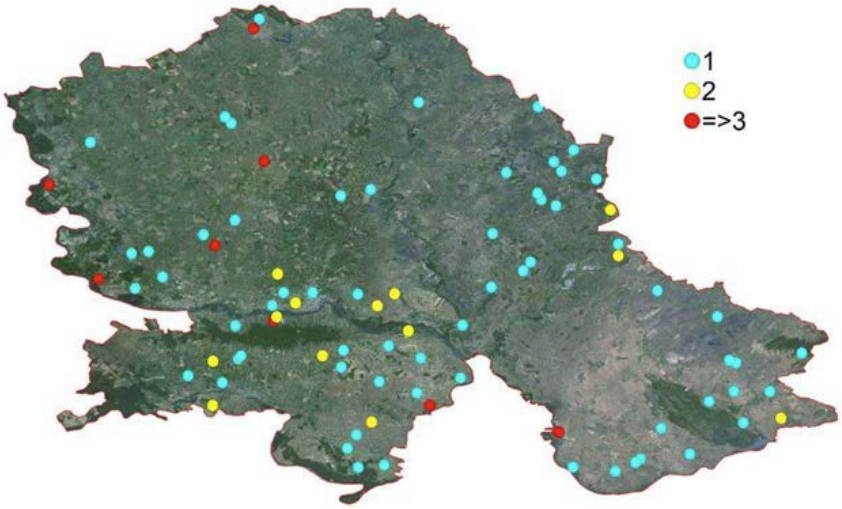
Figure 1.29. Exceedances of the remediation values and the number of tested samples at the depth of 0-30cm



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

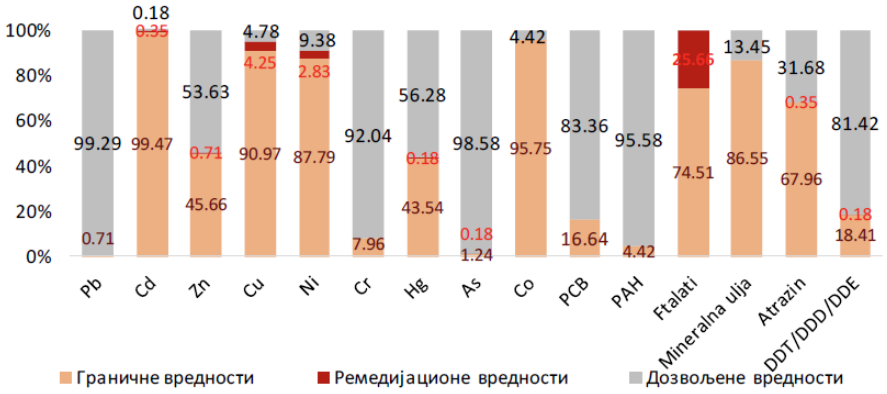
In the Autonomous Province of Vojvodina, the degree of exposure of non-farmland soil to chemical pollution was examined in 30 municipalities and cities, at 113 illegal landfills. A total of 1,130 samples were analysed. The Provincial Secretariat for Urban Planning and Environmental Protection examined the degree of exposure to non-farmland soil to chemical pollution at 113 illegal landfills in the Autonomous Province of Vojvodina. The analysis of heavy metal content in the soil samples indicates that the remediation values were exceeded for cadmium, zinc, copper, nickel, mercury, and arsenic, but the limit values for lead, chromium, and cobalt in the soil samples were not exceeded. The analysis of the content of pesticides and pesticide metabolites in the soil samples indicates that the remediation values were exceeded for DDE/DDD/DDT and Atrazine. The overall concentrations of PSBs, PAH, and mineral oils exceeded the limit values, but not the remediation values. The analysis of phthalate esters indicates that in 319 out of a total of 1,130 samples the content of phthalate esters was higher than the remediation value. The analyses were conducted in line with the Regulation on the Limit Values of Polluting, Harmful, and Hazardous Substances in Soil (The Official Gazette of the Republic of Serbia, No. 30/18 and 64/19) (Figures 1.30, 1.31. and 1.32).

Figure 1.30. Test sites at which the remediation values (RV) of specific elements were exceeded (AP Vojvodina)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Figure 1.31. The exceedance percentages at the depth of 0-30 cm, at landfill central points (AP Vojvodina)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

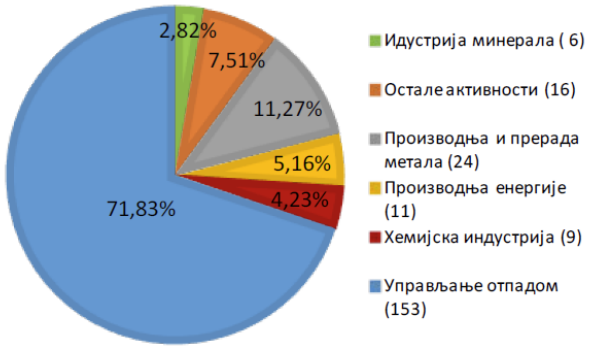
Figure 1.32. The exceedance percentages at the depth of 30-60 cm, at landfill central points (AP Vojvodina)

Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

In 2020, 213 sites were identified in the Republic of Serbia belonging to the categories 'potentially contaminated' and 'contaminated'. The indicator monitors the progress made in managing localized soil pollution sources at the national and international levels.

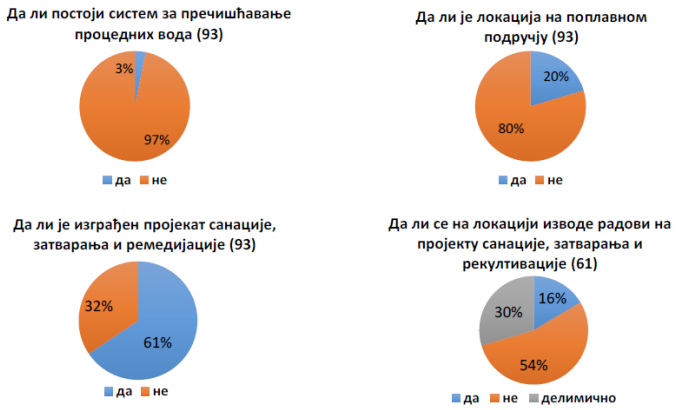
Based on the submitted data, 213 sites were identified in the Republic of Serbia at which the activities listed in the Rulebook on the List of Activities Which Can Cause Soil Pollution and Degradation, the Procedure, Content of Data, Deadlines, and Other Requirements for Soil Monitoring (The Official Gazette of the Republic of Serbia, No. 102/20) take place. Of the total number of reported sites, 21 companies submitted a soil monitoring report. Based on the Rulebook on the Content and Maintenance of the Registry of Contaminated Sites, the Type, Content, Forms, Manner, and Deadlines for Data Submission (The Official Gazette of the Republic of Serbia, No. 58/19), the results of the analyses indicate that at six companies, the presence of harmful and dangerous substances in concentrations exceeding the remediation values was confirmed, in line with the Regulation on the Limit Values of Polluting, Harmful, and Hazardous Substances in Soil (The Official Gazette of the Republic of Serbia, No. 30/18 and 64/19). Of the identified sites, the most prevalent are waste management sites – 71.83%, also containing unsanitary landfills – dump sites, run by local self-governments (Figures 1.33 and 1.34).

Figure 1.33. The share of localized soil pollution sources in the total number of identifies sites (%)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Figure 1.34. The principal characteristics of unsanitary landfills – dump sites (total number of replies)



Source: The Report on the Condition of the Environment in the Republic of Serbia for 2020

Based on the Report of the Ministry of Mining and Energy, the data was presented regarding the degraded areas and disposed tailings originating from major mining companies in the Republic of Serbia with significant contributions to pollution; specifically: The Electric Power

Industry of Serbia (with the total of 158 ha), CRH Serbia (with the total of 3 ha), Serbia Zijin Copper Bor (with the total of 79 ha), Farmakom Concern Lece Mine (with the total of 20 ha), Jugo-Kaolin (with the total of 2.8 ha), Bosil-Metal (with the total of 0.3 ha), The Underground Coal Exploitation PE (with the total of 17ha).

1.2.2.4. Transboundary impacts

As regards transboundary impacts, the most severe water pollution comes from Romania, where the water of the Begej, Tamiš, Zlatica, Karaš and Nera rivers are below the required class. Accidents such as the cyanide spill in the Tisza River from the gold mine in northern Romania, and spills of tailings, left an environmental disaster in their wake, with long-term consequences to the ecosystem in the Republic of Serbia. The Republic of Serbia cooperates with other countries in the region as regards the control and impacts of transboundary pollution. International cooperation primarily refers to the quality of water in the Danube, the Sava, the Tisza, the Tamiš and the Drina rivers. The water in the Danube is particularly important for the Republic of Serbia, chiefly for its water supply and protection of South Bačka and South Banat groundwater against pollution. The pollution of the Danube reflects on the quality of the water in Lake Đerdap. Developing regional cooperation in the field of water resource management is very important. To this end, by ratifying the international Convention on Co-operation for the Protection and Sustainable Use of the River Danube and signing the Framework Agreement on the Sava River Basin, the following is implemented: sustainable water management, regulation of use, protection of water and the aquatic ecosystem, as well as protection of water against adverse effects. Potential transboundary pollution of water in the countries down the Danube (Romania and Bulgaria) can come from Majdanpek and Mining and Smelting Combine Bor (mines, mills, smelting plant and refinery) via the Borska, the Pek, the Timok, the Kriveljska and the Danube rivers. Transboundary pollution of the countries down the Danube is possible via the Sava River (the towns of Šabac, Barič), and transboundary pollution of Bosnia and Herzegovina via the Drina (the towns of Ljubovija, Zajača, Krupanj).

For cross-border watercourses, water regime issues are resolved by international commissions and bilateral agreements with neighbouring countries. This cooperation is particularly important during periods of drought.

As regards groundwater, special attention should be paid to resolving the quantitative status of transboundary groundwater bodies that have become threatened by excessive use. Possible solutions for this problem may lie in bringing additional quantities of water from the coastal sections of big rivers for the purposes of supplying the populace, as well as in exploring the possibility of replenishing the water-bearing layers.

1.2.3. Considered issues and problems of nature and environmental protection in the Water Management Plan, and the reasons for omitting certain issues from the SEA

The criteria for the identification of possible significant impacts of plans and programmes on the environment can be found in Annex I of the Law on Strategic Environmental Impact Assessment. These criteria are based on: the characteristics of the plan/programme and the characteristics of impacts.

In this specific case, in addition to the above criteria, it is especially important to identify problems in environmental protection in the area under the direct influence of facilities and

activities in the water sector, and to analyse possible effects of the above activities on the quality of the environment, and in particular on:

- The quality of basic environmental factors: air, water, soil;
- Natural resources;
- Cultural heritage;
- Waste generation and treatment;
- Human health;
- Social development;
- Economic development.

This SEA thoroughly analyses the relevant environmental impact of the planned activities, in the form of objectives and measures set forth in the Water Management Plan, for the areas of water use, protection against water and water protection. The aim of the above considerations is to develop a strategic approach to planning water systems, including in the conditions of possible water regime changes.

The Strategic Environmental Assessment Report can explain why certain issues related to environmental protection have not been appropriate for consideration. In this specific case, this refers to a lack of a detailed impact assessment of individual facilities and activities in the water sector in the form of a technical and technological analysis, considering that the Water Management Plan was not prepared in sufficient detail to suit such an analysis. This level of detail will be achievable in the preparation of planning and design-related technical documents for each planned water and electrical facility. In this context, the strategic assessment will predominantly be based on the assessment of environmental trends occurring as a consequence of planned priority activities in the water sector.

1.2.4. Prior consultations with stake-holding authorities and organisations concerned

In the preparatory stages of the Decision on Preparing the SEA for the Water Management Plan, consultations were carried out with relevant ministries and institutions. Cooperation with these institutions resulted in the final version of the Decision on the Development of the SEA, based on which the SEA in question was undertaken. Consultations with the stake-holding authorities, organizations, and the general public were conducted during the public inquiry.

In December 2016, the State Water Directorate set up a working group consisting of PWMC personnel, with the aim of preparing elements of the Water Management Plan in the Republic of Serbia for the Period 2021-2027. In late 2017, the SWD set up a broader working group for the preparation of the Plan, which included representatives of other relevant ministries, institutions with remits over oversight and spatial planning, scientific and academic institutions, and representatives of the civic sector. In the process, the SWD coordinated the preparation of the plan.

Including stakeholders in the preparation of the Water Management Plan in the Republic of Serbia for the Period 2021-2027 was carried out by organizing three stakeholder conferences.

The first conference was held on 17 December 2019. On the occasion, two documents were presented by the representatives of the State Water Directorate: The Draft Programme and Timeline for the Preparation of the Water Management Plan in the Republic of Serbia for the Period 2021-2027, and The Draft Report on Important Issues Surrounding Water Management

in the Republic of Serbia". The stakeholders had an opportunity to participate in workshops led by experts from public water economy companies Vode Vojvodine and Srbijavode. The representatives of the government ministries, provincial secretariats, institutes, non-governmental organizations, and many others took part in discussions about the issues, dilemmas, and possible solutions for the following topics: organic pollution of surface waters; nutrient pollution of surface waters; priority and priority substance pollution of surface waters; hydro-morphological pressures; and pressures on the quantity and quality of surface waters. The public inquiry for these two documents was conducted in the period 15 October 2019 and 30 April 2020, after which the Report on the Conducting of the Public Inquiry was prepared, and the documents were amended to reflect the adopted objections.

The second stakeholder conference was held on 15 September 2020. The principal aim of the conference was to bring the expert circles up to speed on the progress made in preparing the Water Management Plan. To that end, three presentations were organized: on the programme of measures, analysis of pressures and impacts, and risk assessment and status of surface and ground water. After the presentations by experts from the State Water Directorate and public water economy companies Vode Vojvodine and Srbijavode were delivered, the participants had the opportunity to comment and ask questions to the institutions entrusted with the preparation of the Water Management Plan. The stakeholders were mostly interested in the methodology applied, as well as when the Water Management Plan would be made available to the general public for comments, and which bodies of water would be monitored.

At the Third Stakeholder Conference, the Draft Water Management Plant in the Republic of Serbia for the period 2021-2027 was presented. The draft plan had been made available for public inquiry, which will be held within the prescribed legal deadline and also include the Draft Report on the Strategic Environmental Assessment of the Water Management Plan in the Republic of Serbia for the Period 2021-2027.

2. GENERAL AND SPECIAL OBJECTIVES OF THE STRATEGIC ENVIRONMENTAL ASSESSMENT AND SELECTION OF INDICATORS

Pursuant to Article 14 of the Law on Strategic Environmental Impact Assessment, general and specific objectives of the strategic environmental impact assessment have been set forth based on requirements and objectives related to environmental protection in other plans and programmes, environmental protection objectives set out at national and international levels, data collected on the state of the environment and significant issues, problems and proposals in respect of environmental protection in the plan or programme. The appropriate indicators that will be used when undertaking the strategic assessment will be selected based on the defined objectives.

2.1. General objectives of SEA

The general objectives of SEA (Table 2.1) have been defined based on requirements and objectives in respect to environmental protection in other strategies, plans and programmes, environmental protection objectives set at the national level, and objectives of relevant sectoral documents related to environmental protection. Based on requirements and objectives in respect to environmental protection set in the above documents, the general SEA objectives have been defined, and they predominantly relate to the following fields of the environment: protection of basic environmental factors, primarily water, and sustainable use of natural resources, as well as improvement in waste management and rational use of hydropower resources aimed at reducing the pressure caused by human activities in environmentally threatened areas; conservation of biodiversity; landscape enhancement; protection of cultural heritage, as well as socio-economic development and strengthening of institutional capacities for environmental protection.

2.2. Specific objectives of SEA

Specific objectives of SEA have been set forth in certain fields of environmental protection in order to achieve general objectives. The specific SEA objectives (Table 2.1) are concrete, partly quantified elaborations of general objectives in the form of guidelines for change and actions (measures, works, activities) for the implementation of these changes. The specific SEA objectives are primarily a methodological measure by which the effects of a plan/programme on the environment are handled and checked. They have to provide a clear picture of key environmental impacts of the Water Management Plan to the decision-making authorities, based on which it is possible to make decisions aimed at environmental protection and achievement of the general objectives of sustainable development.

2.3. Selection of indicators

The SEA indicators (Table 2.1) have been brought into alignment with the indicators set in the Report on the Strategic Environmental Assessment of the Water Management Strategy in the Republic of Serbia for the Period Until 2034 (The Official Gazette of the Republic of Serbia, No. 56/2018). They are in line with the CSD Indicators for Sustainable Development of the United Nations, based on the concept of *cause-effect-response* and the Rulebook on the National List of Environmental Indicators (The Official Gazette of the Republic of Serbia, No. 37/2011).

Table 2.1. Selection of general and specific SEA objectives and selection of relevant indicators with respect to environmental receptors

Area of SEA	General SEA objectives	Special objectives of SEA	Indicators
WATER	**Protection and preservation of surface and ground water quality and protection against water**	- To reduce the pollution of surface and ground water - To lessen the impact of water-power facilities on the hydrological regime	- Water Exploitation Index (WEI) (%) - Water loss (%) - Total amount of water in reservoirs (mil m3/y) - Biological consumption of oxygen in surface waters (BOD5) (mg O2/l) - Emissions of pollutants from point sources in WBs (kg/y) - Polluted (untreated) wastewater (%) - Public sewage system wastewater treatment facilities (%) - Population connected to the public sewage system (%) - Serbian Water Quality Index (SWQI) - The change in water quality due to the anthropogenic activities in the water management sector - The change in the hydrological regime
SOIL	**Protection and sustainable use of forest and agricultural land**	- To protect forest and agricultural land - To reduce land degradation and erosion	- The change in forest land area (%) - The change in agricultural land area (%) - The share of surfaces degraded due to the activities in the water management sector (%) - The area of land threatened by erosion (ha)
AIR AND CLIMATIC CHANGES	**Reducing air pollution levels**	- To reduce the emission of air pollutants to prescribed levels	- The increase in the share of renewable energy resources in the hydropower balance (%)
NATURAL VALUES	**Landscape, natural values and biodiversity and geodiversity protection, preservation and enhancement**	- To protect the area - To protect natural values and landscapes - To preserve biodiversity and geodiversity	- The number of water-power facilities that affect the area - The area of protected natural areas that can be affected by the activities in the water management sector - The number of endangered animal and plant species that can be affected by the activities in the water management sector
CULTURAL HERITAGE	**Preservation of protected cultural heritage**	- To protect the cultural heritage, preserve historical monuments and archaeological sites	- The number and significance of protected immovable cultural monuments that can be

Area of SEA	General SEA objectives	Special objectives of SEA	Indicators
			affected by the activities in the water management sector
WASTE	**Sustainable waste management**	- To advance the wastewater treatment	- The increase in the number of public sewage system wastewater treatment facilities and the increase of the efficiency of wastewater treatment to the required level
SOCIAL DEVELOPMENT	**Population health improvement and social cohesion**	- To lessen the negative impact of the water sector on the health of the population - To improve the quality of life in the area - To preserve the population in rural areas - Protection from the harmful effects of water	- The incidence of diseases that can be attributed to polluted drinking water - The increase in number of households attached to the public water supply system (%) - The increase in number of households attached to the public sewage system (%) - The number of displaced households due to the activities in the water management sector - The number of people potentially threatened by floods
INSTITUTIONAL DEVELOPMENT	**Strengthening institutional capacity for environmental protection**	- To improve the environmental protection service, monitoring and control	- Setting up the Water Management Information System - Strengthening of institutions in the water management sector - The number of measuring locations in the monitoring system
ECONOMIC DEVELOPMENT	**Encouraging economic development**	- To support economic development - To promote local employment To reduce the transboundary impact of water-power facilities on the environment	- The number of tourist activities based on using water resources - The percentage of water management sector employees with the income above the average income in the RS - The decrease in the number of the unemployed due to employment in the water management sector (%) - The number of developmental programmes for environmental protection in the water management sector - The number of water-power facilities with a transboundary impact

Table 2.2. Designation of SEA special objectives

No.	SEA Objective
1.	Reducing surface and groundwater pollution
2.	Mitigating the impact of water facilities on the hydrological regime, improving water regimes through targeted management of water facilities, primarily reservoirs.
3.	Protecting forest and agricultural land
4.	Reducing soil degradation and erosion
5.	Reducing emissions of air pollutants to prescribed values
6.	Protecting landscape
7.	Protecting natural resources and areas
8.	Preserving biodiversity and geodiversity
9.	Protecting cultural heritage, preserving historical monuments and archaeological sites
10.	Improving wastewater treatment
11.	Reducing the negative impact of the water sector on public health
12.	Improving the citizens' quality of life
13.	Preserving population density in rural areas
14.	Protection against harmful effects of water – increasing the degree of protection of defended areas, in line with the recommended level of protection from floods under the Strategy.
15.	Improving the environmental protection service, as well as monitoring and control
16.	Encouraging economic development
17.	Promoting local employment
18.	Reducing transboundary impacts of water facilities on the environment

With respect to the special objectives of the SEA, shown in Table 2.2, the evaluation will be carried out for areas as defined under the Water Management Plan, i.e. based on individual measures for achieving operative objectives. The evaluation is based on the multi-criterial semi-quantitative assessment and identification of strategically significant impacts.

3. ENVIRONMENTAL IMPACT ASSESSMENT

The purpose of preparing the SEA of the Water Management Plan is to consider possible negative trends/adverse effects on the environment and provide guidelines for their mitigation, i.e. reduction to acceptable levels without causing conflicts in the area, while taking into account environmental carrying capacity of the subject area. The Water Management Plan will present water management activities, and is aimed at achieving a good status for all the waters under the WFD, with possible (positive and negative) implications for environmental quality. The SEA provides an analysis of possible effects of planned activities on the environment which will be evaluated against defined objectives and indicators.

Pursuant to Article 15 of the Law on Strategic Environmental Impact Assessment, the assessment of possible effects of plans/programmes on the environment contains the following elements:

- An overview of the assessed impacts of alternative solutions of plans and programmes that are favourable from the standpoint of environmental protection, with a description of measures aimed at preventing and limiting the adverse effects and increasing the positive effects on the environment;
- A comparison of alternative solutions and an overview of the reasons for the selection of the most favourable solution;
- An overview of the assessed effects of plans and programmes on the environment with a description of measures aimed at preventing and limiting adverse effects and increasing positive effects on the environment;
- The manner in which the environmental factors have been taken into consideration in the environmental impact assessment, including the data on: air, water, soil, climate, ionizing and non-ionizing radiation, noise and vibrations, flora and fauna, habitats and biodiversity, protected natural goods, population, human health, cities and other settlements, cultural heritage, infrastructure, industrial and other structures or other man-made values;
- The manner in which the following impact characteristics have been taken into account: probability, intensity, time dimension (duration, frequency, reversibility), spatial dimension (location, geographical area, size of the exposed population, transboundary nature of impact), as well as cumulative and synergistic nature of impact.

3.1. Assessment of alternative solution impact

Given that the Water Management Plan is a development of the Water Management Strategy, it does not consider alternative solutions. Alternative solutions are considered in the Strategic Environmental Assessment of the Water Management Strategy and show that, from the standpoint of suitability to the actual need of the water sector development, the alternative including the implementation of the Water Management Strategy and the strategic guidelines defined thereunder is acceptable from the standpoint of sustainability of provided strategic commitments.

3.2. Evaluation of characteristics and significance of effects of strategic commitments

In the remainder of the SEA, an evaluation of the significance, spatial extent, and probability of impact of planning solutions on the environment is presented. The impact significance is assessed in relation to impact magnitude (intensity) and spatial extent of potential impact. Impacts, i.e. effects of planning solutions, are evaluated according to the magnitude of change by assigning scores from –2 to +2, where the minus sign is used to denote a negative change, while the plus sign denotes a positive change. This evaluation system is used both for individual impact indicators and for related categories through summary indicators.

Table 3.2. The criteria for evaluating impact magnitude

Impact magnitude	Designation	Description
Greater	**–2**	Environmental disturbance of a great extent
Smaller	**–1**	Environmental disturbance of a smaller extent
No impact	**0**	No direct and/or unclear environmental impact
Positive	**+1**	Smaller positive environmental changes
Favourable	**+2**	Favourable environmental changes

The criteria for evaluating the spatial extent of impacts are shown in Table 3.3.

Table 3.3. The criteria for evaluating the spatial extent of impacts

Impact significance	Designation	Description
International	**I**	Possible transboundary impact
National	**N**	Possible impact at the national level
Regional	**R**	Possible impact at the regional level
Local	**L**	Possible impact of local character

The criteria for assessing the probability of impact occurrence are shown in Table 3.4.

Table 3.4. The **s**cale for assessing impact probability

Probability	Designation	Description
100%	**S**	Impact certain
More than 50%	**L**	Likely impact
Less than 50%	**P**	Possible impact
Less than 1%	**N**	Impact not likely

Additional criteria can be derived according to impact duration, i.e. the duration of consequences. Accordingly, temporary/occasional (PO) and long-term (LT) impacts can also be defined. Based on all the above-mentioned criteria, the importance of identified impacts for the achievement of SEA objectives is evaluated.

It is adopted that: Impacts of strategic importance for the Water Management Plan are the ones with strong or greater (positive or negative) effects on the entire territory of the Republic of Serbia or at the regional level, or which imply transboundary impacts, according to criteria shown in Table 3.5.

Table 3.5. The criteria for evaluating strategically important impacts

Magnitude	Size		Designation of significant impacts
Cross-border	Greater positive impact	+2	I+2
	Greater negative impact	- 2	I-2
National	Greater positive impact	+2	N+2
	Greater negative impact	- 2	N-2
Regional	Greater positive impact	+2	R+2
	Greater negative impact	- 2	R-2

Table 3.6. The Water Management Plan measures included in the impact assessment

No	Key Water Management Plan measures
1	Construction or addition of wastewater treatment facilities
2	Reduction of agricultural nutrient pollution
3	Reduction of agricultural pesticide pollution
4	Remediation of contaminated sites (historical pollution, including sediments, groundwater, and soil)
5	Improving the longitudinal continuity of watercourses (e.g. by setting up fish ladders, removing old dams, etc.)
6	Improving WB hydro-morphological conditions not related to longitudinal continuity
7	Improving the ecological flow regime and/or establishing ecological flows
8	Technical measures for improving the efficiency of water use in irrigation, use of water in industry, use of water in the energy sector, or use of water in households
9	Pricing policy for water used in households in line with the principle of full cost redemption for water services
10	Pricing policy for water used in industry in line with the principle of full cost redemption for water services
11	Pricing policy for water used in agriculture in line with the principle of full cost redemption for water services
12	Agriculture advisory services
13	Drinking water protection measures (e.g. setting up sanitary protection zones, etc.)
14	Research, improving the knowledge base by reduction of uncertainty
15	Measures for the phasing out / reduction of emissions, release and loss of priority (hazardous) substances
16	Additions to, or improvement of, industrial wastewater treatment facilities (including farms)
17	Measures for reducing the production of sediments due to soil erosion and surface seepage
18	Measures for the prevention or control of negative impacts of invasive species and imported diseases
19	Measures for the prevention or control of negative impacts of recreational activities, including fishing

No	Key Water Management Plan measures
20	Measures for the prevention or control of harmful effects of fishing and other forms of flora and fauna exploitation / removal
21	Measures for the prevention or control of the introduction of pollution from urban environments, transport, or infrastructure
22	Measures for the prevention or control of the introduction of pollution from forestry
23	Natural water retention measures
24	Adaptation to climate change
25	Measures for the prevention of acidification

Table 3.6 shows the areas and objectives as defined in the Water Management Plan. For each objective in the Water Management Plan, measures are defined for achieving it. Included in the process of multicriterial evaluation are the special objectives of the Water Management Plan, which contain all the measures for achieving them.

The multicriterial evaluation of the special objectives of the Water Management Plan with respect to the objectives of the strategic assessment is presented in tables 3.7 and 3.8.

Table 3.7. Assessment of the size of the impact of the Water Management Plan on environment and sustainable development elements

SEA objectives

1. Reducing surface and groundwater pollution
2. Mitigating the impact of water facilities on hydrological regime, improving water regimes
3. Protecting forest and agricultural land
4. Reducing soil degradation and erosion
5. Reducing emissions of air pollutants to prescribed values
6. Protecting landscape
7. Protecting natural resources and areas
8. Preserving biodiversity and geodiversity
9. Protecting cultural heritage, preserving historical monuments and archaeological sites
10. Improving wastewater treatment
11. Reducing the negative impact of the water sector on public health
12. Improving the citizens' quality of life
13. Preserving population density in rural areas
14. Protection against water – increasing the degree of protection of defended areas to the levels required
15. Enhancing environmental protection service, monitoring and control function
16. Encouraging economic development
17. Promoting local employment
18. Reducing transboundary impacts of water facilities on the environment

Key Water Management Plan measures	SEA objectives																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Construction or addition of wastewater treatment facilities	+2	0	+2	0	+1	+1	+2	+2	0	+2	+2	+2	+1	0	0	+1	+1	+2
Reduction of agricultural nutrient pollution	+2	0	+2	0	+1	+1	+2	+2	0	+1	+2	+1	+2	0	+1	0	0	0
Reduction of agricultural pesticide pollution	+2	0	+2	0	+1	+1	+2	+2	0	+1	+2	+1	+2	0	+1	0	0	0
Remediation of contaminated sites (historical pollution, including sediments, groundwater, and soil)	+2	0	+1	+1	+1	+1	+2	+2	0	0	+2	+1	+2	0	+1	+1	+1	+1
Improving the longitudinal continuity of watercourses (e.g. by setting up fish ladders, removing old dams, etc.)	0	+2	0	0	0	+1	+1	+2	0	0	0	+1	0	+1	0	+1	0	+2
Improving WB hydro-morphological conditions not related to longitudinal continuity	+1	+2	+2	+1	0	+1	+2	+2	+1	0	+1	+1	+1	+2	0	0	0	+1
Improving the ecological flow regime and/or establishing ecological flows	0	+2	+2	+2	0	+1	+1	+2	0	0	0	+1	+1	+2	+1	0	0	+1
Technical measures for improving the efficiency of water use in irrigation, use of water in industry, use of water in the energy sector, or use of water in households	+1	+1	+1	+1	0	0	+1	+1	0	0	+2	+2	+2	+1	0	+2	0	0
Pricing policy for water used in households in line with the principle of full cost redemption for water services	+2	0	0	0	0	+1	+1	+1	0	+2	0	0	0	0	+2	+2	+1	0
Pricing policy for water used in industry in line with the principle of full cost redemption for water services	+2	0	+1	+1	0	+2	+2	+2	0	+2	+2	+1	0	0	+2	+2	+1	0
Pricing policy for water used in agriculture in line with the principle of full cost redemption for water services	+2	0	+1	+1	0	+1	+1	+1	0	+2	+1	0	0	0	+2	+2	+1	0
Agriculture advisory services	+2	0	+2	+2	+1	+1	+1	+1	0	+1	+1	0	+2	0	+2	+1	+1	0
Drinking water protection measures (e.g. setting up sanitary protection zones, etc.)	+2	0	+2	+2	+1	+2	+2	+2	+1	+2	+1	+1	0	0	+1	0	0	0

Key Water Management Plan measures	SEA objectives																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Research, improving the knowledge base by reduction of uncertainty	+1	0	+1	+1	+1	+1	+1	+1	+1	0	0	+1	+1	0	+2	0	+1	0
Measures for the phasing out / reduction of emissions, release and loss of priority (hazardous) substances	+2	0	+2	+2	+2	+1	+2	+2	+1	+1	+2	+1	0	0	+2	0	0	+2
Additions to, or improvement of, industrial wastewater treatment facilities (including farms)	+2	0	+1	+1	+1	+1	+1	+2	0	+2	+2	+2	0	0	+1	0	0	+2
Measures for reducing the production of sediments due to soil erosion and surface seepage	+1	+2	+2	+2	0	+1	+1	0	+1	0	0	0	0	+2	+1	0	0	0
Measures for the prevention or control of negative impacts of invasive species and imported diseases	+2	0	+2	0	0	+1	+1	+2	0	0	+1	+1	0	0	+2	0	0	+2
Measures for the prevention or control of negative impacts of recreational activities, including fishing	+2	0	+1	0	0	+1	+1	+2	0	+1	0	0	0	0	+2	0	0	+1
Measures for the prevention or control of harmful effects of fishing and other forms of flora and fauna exploitation / removal	0	0	+1	+1	0	+2	+2	+1	0	0	0	+1	0	0	+2	0	0	+1
Measures for the prevention or control of the introduction of pollution from urban environments, transport, or infrastructure	+2	0	+1	+1	+2	+2	+2	+2	+1	+2	0	+2	0	0	+2	0	+1	0
Measures for the prevention or control of the introduction of pollution from forestry	+2	0	+2	+1	0	+1	+1	+1	+1	+2	0	+1	0	0	+2	0	+1	0
Natural water retention measures	0	+2	+1	+2	0	+1	+1	+2	0	0	0	+1	+1	+2	0	+1	0	+1
Adaptation to climate change	0	+2	+1	+2	0	0	0	0	0	0	0	+1	0	+2	+1	0	0	0
Measures for the prevention of acidification	+2	0	+2	+2	+2	0	0	+2	0	+1	+2	+1	0	0	+1	0	0	0

* The criteria set out according to Table 3.2.

Table 3.8. Assessment of the spatial scale of the Water Management Plan impact on environment and sustainable development elements

SEA objectives

1. Reducing surface and groundwater pollution
2. Mitigating the impact of water facilities on hydrological regime, improving water regimes
3. Protecting forest and agricultural land
4. Reducing soil degradation and erosion
5. Reducing emissions of air pollutants to prescribed values
6. Protecting landscape
7. Protecting natural resources and areas
8. Preserving biodiversity and geodiversity
9. Protecting cultural heritage, preserving historical monuments and archaeological sites
10. Improving wastewater treatment
11. Reducing the negative impact of the water sector on public health
12. Improving the citizens' quality of life
13. Preserving population density in rural areas
14. Protection against water – increasing the degree of protection of defended areas to the levels required
15. Enhancing environmental protection service, monitoring and control function
16. Encouraging economic development
17. Promoting local employment
18. Reducing transboundary impacts of water facilities on the environment

Special objectives of the Water Management Plan	SEA objectives																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Construction or addition of wastewater treatment facilities	R		L		L	L	L	R		L	L	L	L			R	L	I
Reduction of agricultural nutrient pollution	L		L		L	L	L	R		L	R	R	L		R			
Reduction of agricultural pesticide pollution	L		L		L	L	L	R		L	R	R	L		R			
Remediation of contaminated sites (historical pollution, including sediments, groundwater, and soil)	L		L	L	L	L	L	R			R	R	L		R	L	L	I
Improving the longitudinal continuity of watercourses (e.g. by setting up fish ladders, removing old dams, etc.)		R				L	L	R				L		L		L		I
Improving WB hydro-morphological conditions not related to longitudinal continuity	L	R	R	L		L	R	R				L	L	N				I
Improving the ecological flow regime and/or establishing ecological flows		N	R	L		L	R	R	L			R	L	N	N			I
Technical measures for improving the efficiency of water use in irrigation, use of water in industry, use of water in the energy sector, or use of water in households	L	R	L	L			L	R			R	R	L	L		R		
Pricing policy for water used in households in line with the principle of full cost redemption for water services	L					L	L	L		L					R	R	L	
Pricing policy for water used in industry in line with the principle of full cost redemption for water services	N		R	L		L	R	R		R	R	R			R	R	R	
Pricing policy for water used in agriculture in line with the principle of full cost redemption for water services	R		L	L		L	L	L		L	L				L	L	L	
Agriculture advisory services	N		R	R	R	L	L	N		L	L		L		R	N	L	
Drinking water protection measures (e.g. setting up sanitary protection zones, etc.)	R		L	L	R	L	L	R	L	L	L	L			R			

Special objectives of the Water Management Plan	SEA objectives																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Research, improving the knowledge base by reduction of uncertainty	R		R	L	R	L	R	R	L			R	L		R		L	
Measures for the phasing out / reduction of emissions, release and loss of priority (hazardous) substances	N		R	L	R	L	R	R	L	L	N	R			R			I
Additions to, or improvement of, industrial wastewater treatment facilities (including farms)	R		R	L	L	L	R	R		R	R	R			R			I
Measures for reducing the production of sediments due to soil erosion and surface seepage	L	R	L	L		L	L		L					R	R			
Measures for the prevention or control of negative impacts of invasive species and imported diseases	L		L			L	R	N			R	L			R			I
Measures for the prevention or control of negative impacts of recreational activities, including fishing	L		L			L	L	R		L					L			I
Measures for the prevention or control of harmful effects of fishing and other forms of flora and fauna exploitation / removal			L	L		L	L	R				L			R			I
Measures for the prevention or control of the introduction of pollution from urban environments, transport, or infrastructure	N		R	R	R	R	R	N	L	L		R			R		L	
Measures for the prevention or control of the introduction of pollution from forestry	R		L	L		L	L	L	L	L		L			L		L	
Natural water retention measures		R	L	L		L	L	L				L	L	R		R		I
Adaptation to climate change		R	R	N								R		N	N			
Measures for the prevention of acidification	R		R	N	N			R		L	R	R			R			

* The criteria set out according to Table 3.3.

Table 3.9. Identification and assessment of strategically significant impacts of priority activities

Key Water Management Plan measures	Identification and assessment of significant impacts		Explanation	Other small impacts
	SEA objective	Rank		
Construction or addition of wastewater treatment facilities	1	+2/R/S/D	Reducing urban wastewater pollution (by constructing sewage systems of appropriate capacity and WTFs) and industrial wastewater (by reducing the pollution from industrial facilities entering public communal systems) will ensure a strong positive impact on water pollution reduction and improvement of wastewater treatment, as well as other objectives of the strategic assessment related to natural resources	3, 5, 6, 7, 10, 11, 12, 13, 16, 17
	8	+2/R/V/D		
	18	+2/I/V/D		
Reduction of agricultural nutrient pollution	8	+2/R/V/D	Administrative, technical, and advisory measure will ensure strong positive impacts on an array of strategic environmental assessment objectives related to the protection of water resources, biodiversity, and natural resources of the area, as well as an array of smaller-scale positive impacts which will contribute to improving the quality of the environment and space in general.	1, 3, 5, 6, 7, 10, 12, 13, 15
	11	+2/R/M/D		
Reduction of agricultural pesticide pollution	8	+2/R/V/D		1, 3, 5, 6, 7, 10, 12, 13, 15
	11	+2/R/M/D		
Remediation of contaminated sites (historical pollution, including sediments, groundwater, and soil)	8	+2/R/V/D	Remediating contaminated sites ensures positive effects on all environment factors, especially in terms of the quality of soil, surface and groundwater, preservation of biodiversity, and improvement of the quality of people's lives.	1, 3, 4, 5. 6, 7, 12, 13, 15, 16, 17, 18
	11	+2/R/M/D		
Improving the longitudinal continuity of watercourses (e.g. by setting up fish ladders, removing old dams, etc.)	2	+2/R/V/D	Amending legislation and the mandatory construction of fish ladders at new dams/barriers, preparation of technical guidelines for the construction of fish ladders, preparation of the methodology for identifying water areas are some of the planning measures like regular maintenance and control of watercourses and water-economy structures with strong positive impacts on biodiversity and geodiversity, improving monitoring and reduction of possible cross-border impacts. Amending legislation by introducing ecological flow, protection from torrential floods and erosion, which are based on "green solutions", regulating watercourse beds, which ensures increased flow rate of the watercourse stream bed and the stability of the watercourse banks in line with annual programmes will have a positive effect on biodiversity and geodiversity, as well as on the reduction of possible cross-border impacts. Small positive effects on most other strategic environmental assessment objectives are also expected.	6, 7, 12, 13,
	8	+2/R/V/D		
	18	+2/I/M/D		
Improving WB hydro-morphological conditions not related to longitudinal continuity	2	+2/R/S/D		1, 4, 6, 9, 11, 12, 13, 18
	3	+2/R/V/D		
	7	+2/R/M/D		
	8	+2/R/M/D		
	14	+2/N/S/D		
Improving the ecological flow regime and/or establishing ecological flows	2	+2/N/S/D		4, 6, 7, 9, 12, 13, 15,18
	3	+2/R/V/D		
	8	+2/R/S/D		
	14	+2/N/S/D		
Technical measures for improving the efficiency of water use in irrigation, use of water in industry, use	11	+2/R/M/D	Measures aimed at encouraging efficient and sustainable water use, oversight of the abstraction of surface or groundwater, as well as reservoir	1, 2, 3, 4, 7, 8, 13, 14
	12	+2/R/V/D		

Key Water Management Plan measures	Identification and assessment of significant impacts		Explanation	Other small impacts
	SEA objective	Rank		
of water in the energy sector, or use of water in households	**16**	**+2/R/M/D**	water, by keeping registers of abstracted water and registers of requests for water abstraction and accumulation permits, monitoring, advisory measures, legal measures, economic measures have a positive effect on specific strategic assessment objectives. Ensuring sufficient amounts of water for the purposes of irrigating large plot of agricultural land will have multiple long-term positive strategic impacts on ecological and economic aspects of development, which will indirectly affect the preservation of the population density of rural areas by increasing the efficiency of agricultural production.	
Pricing policy for water used in households in line with the principle of full cost redemption for water services			One of the innovative economic instruments of the WFD is the pricing policy for water supply services, which aims to provide appropriate incentives for efficient use of water resources and, in this way, contribute to the set environmental objectives. The main principle behind attaining this objective is cost redemption for water supply services, inclusive of environment and resource costs. In addition, the application of the "Polluter Pays" or "User Pays" principle should ensure that different forms of water use make corresponding contributions to cost redemption. The "Polluter Pays" and "User Pays" principles are integrated in the Law on Water in the RS. Large current investments and costs of optimizing and operating existing and new urban wastewater treatment infrastructure is not possible without a full redemption of water services, especially in terms of industrial facility water process. The positive effects are related to the economic component of the development.	1, 6, 7, 8, 10,17
	15	**+2/R/M/D**		
	16	**+2/R/V/D**		
Pricing policy for water used in industry in line with the principle of full cost redemption for water services	**1**	**+2/N/M/D**		3, 4, 6, 17
	7	**+2/R/B/D**		
	8	**+2/R/V/D**		
	10	**+2/R/S/D**		
	11	**+2/R/V/D**		
	15	**+2/R/M/D**		
	16	**+2/R/S/D**		
Pricing policy for water used in agriculture in line with the principle of full cost redemption for water services	**1**	**+2/R/M/D**		3, 4, 6, 7, 8, 10, 11, 15, 16, 17
Agriculture advisory services	**1**	**+2/N/M/D**	Measures of the advisory services in the area of agricultural reduce the risks of pollution of agricultural and forest land, and surface and groundwater, as well as the degradation and erosion of soil. They are primarily to do with methods of farming and use of chemical and other means in agriculture, which contributes to integral protection of land and water resources, as well as to the protection of the environment in a general sense.	5, 6, 7, 8, 10, 11, 13, 16, 17
	3	**+2/R/S/D**		
	4	**+2/R/S/D**		
	15	**+2/R/M/D**		
	1	**+2/R/S/D**		

Key Water Management Plan measures	Identification and assessment of significant impacts		Explanation	Other small impacts
	SEA objective	Rank		
Drinking water protection measures (e.g. setting up sanitary protection zones, etc.)	**8**	**+2/R/V/D**	Improved protection of the existing water springs by establishing zones of sanitary protection and implementing appropriate protective measures; development of the monitoring system at the existing and potential surface and groundwater springs; protection of springs; ensuring the balance between abstraction and replenishment of groundwater; conducting exploration works and determining the quantity and quality of water at potential springs. Overall, this will result in a great positive impact of strategic importance for the protection of surface and groundwater. Smaller positive impacts can be expected in relation to most other objectives of the strategic environmental assessment.	3, 4, 5, 6, 7, 9, 10, 11, 12, 15
Research, improving the knowledge base by reduction of uncertainty	**15**	**+2/R/V/D**	Exploration measures, improving the knowledge base by reducing uncertainty, ensures an array of positive impacts on many strategic assessment objectives.	1, 3, 4, 5, 6, 7, 8, 9, 12, 13, 17
Measures for the phasing out / reduction of emissions, release and loss of priority (hazardous) substances	**1**	**+2/R/S/D**	Reducing the amount of polluted matter directly "at the spring"; implementing innovative "green technologies"; providing guidelines, enforcing legislation, availability of stable funding and developing a comprehensive strategy for historically contaminated sites can considerably contribute to a reduction of pollution by priority and priority hazardous substances, especially in high-risk sectors. Positive effects can be expected for nearly all strategic assessment objectives, especially with respect to the reductio of surface water, cross-border impacts, protection of biodiversity, etc.	4, 6, 9, 10, 11
	3	**+2/R/M/D**		
	5	**+2/R/V/D**		
	7	**+2/R/V/D**		
	8	**+2/R/V/D**		
	12	**+2/R/S/D**		
	15	**+2/R/M/D**		
	18	**+2/I/V/D**		
Additions to, or improvement of, industrial wastewater treatment facilities (including farms)	**1**	**+2/R/S/D**	Reducing urban wastewater pollution (by constructing sewage systems of appropriate capacity and WTFs) and industrial wastewater (by reducing the pollution from industrial facilities entering public communal systems) will ensure a strong positive impact on water pollution reduction and improvement of wastewater treatment, as well as other objectives of the strategic assessment related to natural resources, especially biodiversity and health.	3, 4, 5, 6, 7, 15
	8	**+2/R/V/D**		
	10	**+2/R/S/D**		
	11	**+2/R/S/D**		
	12	**+2/R/M/S/D**		
	18	**+2/I/V/D**		
Measures for reducing the production of sediments due to soil erosion and surface seepage	**2**	**+2/R/S/D**	Measures to reduce fine sediments, measures to reduce erosion, and measures to reduce fine sediments from arable and green land, as well as measures to renew the process of natural sediment transport are some of the measures with a good impact on the environment, especially from the standpoint of preserving biodiversity, hydrology, and morphology of WBs.	1, 3, 4, 6, 7, 9, 15
	14	**+2/R/S/D**		

Key Water Management Plan measures	Identification and assessment of significant impacts		Explanation	Other small impacts
	SEA objective	Rank		
Measures for the prevention or control of negative impacts of invasive species and imported diseases	8	+2/N/S/D	The identified measures are for the most part legal, administrative, and regulatory activities aimed at reducing the pressures of biological invasions into water eco-systems. Large positive impacts are expected in the area of biodiversity.	1, 3, 6, 7 ,11, 12
	15	+2/R/V/D		
	18	+2/I/M/D		
Measures for the prevention or control of negative impacts of recreational activities, including fishing	8	+2/R/M/D	Water protection due to recreational activities includes prior implementation of the entire communal infrastructure. This implies a contribution to water protection by improving the wastewater and waste treatment systems, etc. Positive impacts are possible in the context of protection of natural resources and positive impacts on the preservation of biodiversity as a result of measures aimed at protecting aquatic and riparian eco-systems.	1, 3, 6, 7, 10, 15, 18
Measures for the prevention or control of harmful effects of fishing and other forms of flora and fauna exploitation / removal	15	+2/R/V/D		3, 4, 6, 7, 8, 12, 18
Measures for the prevention or control of the introduction of pollution from urban environments, transport, or infrastructure	1	+2/N/S/D	Municipal landfills and dump sites as sites that can be considered as potential sources of pollution of aquatic environments. Measures aimed at preventing or controlling the introduction of pollution from urban environments, transport, or infrastructure ensure some positive impacts on the quality and condition of water, protection of landscape features, quality of life, preservation of biodiversity, as well as other strategic assessment objectives.	3, 4, 9, 10, 17
	5	+2/R/V/D		
	6	+2/R/V/D		
	7	+2/R/V/D		
	8	+2/N/M/D		
	12	+2/R/V/D		
	13	+2/R/M/D		
Measures for the prevention or control of the introduction of pollution from forestry	1	+2/R/M/D		3, 4, 6, 7, 8, 9, 10, 12, 15, 17
Natural water retention measures	2	+2/R/S/D	Expected positive impacts in the form of reduction of hydro-morphological pressures on surface WBs.	3, 4, 6, 7, 8, 12, 13, 16, 18
	14	+2/R/S/D		
Adaptation to climate change	2	+2/R/V/D	Expected climate change not likely to have a measurable impact on water condition in the next six years. Measures to mitigate droughts and floods resulting from climate change are among the most important in terms of environmental impact.	3, 12, 15
	4	+2/N/M/D		
	14	+2/N/V/D		
Measures for the prevention of acidification	1	+2/R/V/D	Measures to prevent acidification would have positive impacts on the strategic assessment objectives related to the pollution of surface and groundwater.	10, 12, 15
	3	+2/R/V/D		
	4	+2/N/M/D		
	5	+2/N/M/D		
	8	+2/R/M/D		
	11	+2/R/M/D		

* The criteria set out according to Table 3.5.

3.3. Summary of significant impacts of the Water Management Plan

Based on the assessment of the significance of the impacts taking account of the measures under the Water Management Plan, it may be concluded that the implementation of the measures envisaged by the Water Management Plan will lead to strategically significant positive impacts in water sector management, water protection, and improving the environment. What is particularly notable is that special attention is paid in the Water Management Plan to the environmental protection aspect in several chapters of the Plan. Certain negative impacts of the activities envisaged under the Water Management Plan are possible, and are related to water use, on the one hand, or to the activities pertaining to the use of, or effect on, water resources and on which the water sector has no direct effect, on the other.

The implementation of the activities and measures under the Water Management Plan contributes to a systematic reduction of water pollution and to water protection, via the implementation of an array of measures (technical, planning, organizational, institutional, and legal) involving the application and development of the European directives and standards in the area of water. This is primarily related to preventive protection, maintenance, and construction of facilities intended for water use and protection, as well as protection against water. Improving water regimes with the aim of implementing the foundational postulate of eco-system protection, i.e. that in the conditions of increasingly unfavourable anthropogenic pressures on the environment, the environment is best protected by means of active management measures, the most significant of which is improvement of water regimes, by purpose-driven management of reservoirs regulated annually (increasing small water bodies and decreasing large water bodies, which are an especially unfavourable form of environment destruction). Soil protection, anti-erosion and biological treatment of drainage basins as the most important condition for integral design, use, and protection of space. Protection of all natural and man-made resources, as well as biodiversity, as a result of the implementation of measured envisaged under the Water Management Plan.

Seen in terms of the most important improvements at the ecological, social, and developmental level, the Water Management Plan can be summarized as follows: the envisaged solutions help attain the very important objectives in the area of environmental protection and improvement below:

- Ensuring healthy drinking water supply, thus preventing waterborne epidemics, which is a significant ecological impact.
- Enabling intensive food production, using irrigation, which is one of the most noble ecological endeavours. This also reduces the ecological pressure on the soil of lower capability, which could then be afforested and used for other purposes.
- The danger of floods is reduced, thus relieving communities from fear of water disasters, and protecting environment from floods as the most severe forms of ecological destruction.
- Increasing low flows during dry and warm parts of the year (low flow enrichment effect), precisely at a time when the survival of the majority of biocenoses in rivers is threatened by the synergy of lower flows, high temperature and low oxygen levels in the water. This implements the environmental protection postulate that active management should help ecosystems survive and develop amid higher anthropogenic pressures.
- Managing water regimes is more efficient: harmful effects of high flows are reduced, and low flows increased, which can significantly help improve ecological

conditions downstream from the reservoir. Improvement of the water regime through flow balancing in the reservoirs and accompanying adjustments and arrangement of riverbanks enable communities, previously stricken by floods or water shortages, to access rivers and integrate the cultivated riverbanks into their urban structures in the most suitable way, once reservoir construction is complete. Within the area of a settlement, flow balancing is carried out according to the principles of the so-called urban regulation, which is one of the most important measures of riverside urban development, either downstream from the reservoirs or in their backwater areas.

- The correct management of the water regime in the reservoir improves the quality of water downstream from the reservoirs and prevents ecological disasters in case of water pollution induced by incidents.
- Construction of reservoirs is accompanied by anti-erosion works in the catchment area, particularly sanitation of the erosion areas of type I and II (excessive and strong erosion). In conducting anti-erosion works, special attention is paid to biotechnical and biological protective measures (afforestation, renewal of degraded forests, amelioration of meadows etc.), which is an ecologically significant contribution to spatial planning.
- Construction of reservoirs is necessarily accompanied by an array of measures aimed at sanitation of settlements, building sewage systems, construction of wastewater treatment facilities (WWTF), in order to protect reservoirs and rivers from eutrophication. These water quality protection measures, which are important for improving water eco-systems, are initiated and funded from dam and reservoir projects.
- And, increasingly importantly, constructing large-scale aquatories as a rule creates favourable conditions for a tourism- and sport and recreation-oriented evaluation of space.

3.3.1. Transboundary impacts

As a signatory to the Espoo Convention and the Kiev Protocol, the Republic of Serbia has undertaken to inform other countries about projects which may have transboundary impacts. The Espoo Convention on Environmental Impact Assessment in a Transboundary Context defines transboundary impact as *"any impact not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another party"*.

If activities are found to cause a significant adverse transboundary impact, for the purposes of ensuring adequate and effective intervention, the Espoo Convention requires the "party", i.e. the government of the country undertaking the activity, to notify any other party (other country's government) which it considers may be affected by the activity as soon as possible and no later than the moment of informing its own public about the proposed activity

With respect to possible transboundary impacts, positive impacts with a strategically significant character have been identified, and are a result of implementing measures aimed at protecting watercourses, developing watercourses in line with the environmental conditions, amd regular maintenance and control of watercourses and water facilities.

The Water Management Plan repeatedly focuses on projects whose implementation requires transboundary cooperation. In addition, importance of inter-state cooperation in the area of

water is emphasized, recognizing thus the significance of a comprehensive understanding and management of this important natural resource.

3.4. Cumulative and synergistic effects

Pursuant to the Law on Strategic Environmental Impact Assessment (Article 15), the strategic assessment should also include an assessment of cumulative and synergistic effects. Significant effects can arise as a result of interactions of numerous smaller effects of the existing facilities and activities, as well as planned activities for the area covered by the plan. An example of "numerous smaller effects" would be the construction of numerous small hydroelectric power plants whose cumulative impact can have very unfavourable ecological effects on, e.g. Serbia's mountainous regions, which are the most valuable and best-preserved ecosystems.

Cumulative effects arise when individual sectoral solutions have insignificant effects, but together create a significant effect.

Synergistic effects arise as a result of the interaction of individual effects, which produces a total effect greater than the sum of the individual effects.

Table 3.10. Identification of possible cumulative and synergistic effects of the Plan

WATER
Construction of RHP and small hydroelectric power plants (particularly if a large number of small hydroelectric power plants is constructed on the same water course – cumulative impacts) can lead to a disruption in the hydrological regime on watercourses. Coupled with tourism development and regulation, maintenance and preservation of watercourses, pressures can build up on water bodies.
Implementation of said planning solutions and their joint effect should enable sustainable water management along with efficient water protection at all levels.
SOIL
Construction of hydroelectric power plants with a powerhouse at the toe of the dam and/or small hydroelectric power plants necessarily leads to more or less intensive flooding and changes in soil use upstream from the dam, which also happens during the planning of new reservoirs. Interaction of these strategic solutions exerts certain pressures on soil.
Interaction of said planning solutions will ensure protection of soil (forest and agriculture), particularly the soil located close to water bodies, and exposed to pressures, flooding etc.
AIR AND CLIMATE CHANGES
/
Positive cumulative effects on the reduction of exposure of the population to polluted air are created using renewable energy sources and ensuring sufficient amounts of water during drought, when wildfire and consequent pollution of air can occur. Interaction of said solutions contributes to air protection and reduction in greenhouse gases.
NATURAL VALUES
Use of hydropower potential, coupled with the expansion of tourist offer, could create certain pressures on natural values.
Interaction of a whole series of planning solutions will create multiple positive impacts in respect to protection of natural values and biodiversity, particularly in case of aquatic ecosystems.
CULTURAL HERITAGE
/

Preventive protection of cultural heritage will be undertaken through the interaction of strategic solutions relating to protection from harmful water effects and responsible planning and implementation of plans in water management.
WASTE
/
Implementation of measures in the water protection sector relating to implementation of projects and application of cutting-edge technologies in wastewater treatment, along with planning and other institutional measures and water monitoring, will ensure significant improvements in wastewater treatment and directly contribute to improvement of water quality.
SOCIAL DEVELOPMENT
/
The presented planning solutions envisaging a higher number of connections to city water supply networks and faecal and atmospheric sewage systems will create a cumulative long-term positive impact on public health. Solutions envisaging the development of nautical tourism and intensification of water transport give a positive cumulative contribution to the improvement of the quality of life of the population through encouragement of local economic development and employment. The implementation of measures for protection against floods and the environmental effect of water facilities on the environment have a positive cumulative effect on the quality of life of citizens.
INSTITUTIONAL DEVELOPMENT
/
The presented planning solutions will make a positive cumulative contribution to institutional development in the water sector, with multiple positive effects on efficient and sustainable management of water resources in the Republic of Serbia.
ECONOMIC DEVELOPMENT
/
In addition to contributing to the water management system improvement, the interaction of the presented strategic solutions in the water sector will also provide significant prerequisites for economic development.

positive impact negative impact

3.5. Description of guidelines for preventing and mitigating negative impacts and maximizing positive impacts on the environment

The Water Management Plan envisages detailed measures aimed above all at water protection and, consequently, at environmental protection in a general sense. Based on the results of the multi-criterial analysis of the planning solutions, further supplementing the detailed protection measures envisaged under the Water Management Plan, the following environmental protection guidelines are set out, to be followed in the implementation of the Plan.

3.5.1. General guidelines

- It is mandatory to strictly implement legislation pertaining to environmental protection and undertaken international obligations in the water sector and the environmental protection sector;
- It is mandatory to implement measures for achieving objectives of environmental protection pursuant to the provisions of the Water Law (The Official Gazette of the Republic of Serbia, No 30/10, 93/12, and 101/16), which include prevention of deterioration, protection and improvement of all surface and groundwater bodies with the aim of achieving a good status of surface and groundwater as well as protected areas;
- It is mandatory to implement guidelines for environmental protection defined in the Water Management Plan and the associated SEA, as well as to develop them in detail

in the process of implementing the Water Management Plan, i.e. by drawing up appropriate planning documentation and technical documentation for specific projects;
- It is mandatory to monitor environmental quality in accordance with applicable legislation and the Environmental Monitoring Programme as defined in the SEA;
- Ensure education and public participation in all stages of the implementation of projects in the water sector;
- In respect to the activities likely to cause transboundary impact, "the party" i.e. the state is obliged to undertake activities – for the purposes of ensuring adequate and efficient intervention – aimed at informing all other parties (states) which it considers will be affected by said activities as soon as possible and no later than the moment it informs its own public on such activities;
- Continue and promote international cooperation in projects involving water protection, development, and application of BAT technologies of surface and groundwater protection;
- Ensure data availability, education and public participation in all stages of the implementation of projects in the water sector – by establishing a comprehensive water management information system, available online, regarding all significant aspects related to water quality and local socio-economic development (hydrology, state (quality) of waters/watercourses, information on water transport, information on dangers of floods and flood water, information regarding hunting and fishing, nautical tourism etc.), through public opinion surveys, special focus groups, and through transparency and discussions on the projects in the water sector;
- Ensure data availability, education and public participation in all stages of the implementation of projects in the water sector – by establishing a comprehensive water management information system, available online, regarding all significant aspects related to water quality and local socio-economic development (hydrology, state (quality) of waters/watercourses, information on water transport, information on dangers of floods and flood water, information regarding hunting and fishing, nautical tourism etc.), through public opinion surveys, special focus groups, and through transparency and discussions on the projects in the water sector;
- Ensure the participation of stakeholders in the following: reviewing reports on watercourse environment conditions; assessments of reports on implementation and proposed content of new documents on water policy; in working groups for the preparation of public policy documents; procedures for monitoring the implementation of ecological policy and water resource condition monitoring;
- Ensure availability of information, education and public participation in all stages of the implementation of guidelines and projects in the water sector.

3.5.2. Guidelines for capital water economy projects

- Reservoir parameters, primarily backwater levels, should be chosen in accordance with the ecological criteria, being mindful of characteristics of the reservoir as a biotope in the exploitation period. Solutions proposing shallow reservoirs should be avoided, as such reservoirs are prone to the eutrophication process.
- All ancillary reservoir facilities (dams, evacuation parts, head gates, machinery storage houses of hydroelectric power plants, etc.) should be placed in such a way so as to integrate them into the environment in the best possible way. The majority of these facilities, except for the dam, may be placed below the ground in case of rivers with special spatial values.

- Borrow pits should be located in the areas which will later become backwater, or if this is not possible, these areas should be modelled and revitalized by means of biological measures, and even used for the enrichment of ambient values.
- Each project must be accompanied with a thorough ichthyologic analysis, which will indicate whether there is a need to construct facilities for fish migration (fish ladders, pool-and-weirs, fish elevators) within the hydro-engineering complex. Reservoirs are new water biotopes, and they allow human action to control the desired development path of the ichthyofauna. This fact should be borne in mind when planning any activity regarding fish stocking and construction of fish protection facilities (fish ladders, hatcheries, etc).
- The dynamics of the initial filling of the reservoir should be planned and carried out in accordance with ecological requirements. The reservoir area should be thoroughly cleaned immediately prior to filling, in order to prevent any unfavourable effects on the eutrophication process.
- The characteristic of the outlet tower (capacity, number of gates and its height, the choice of the type of the valves) should be brought into line with ecological requirements. In order to ensure that the guaranteed minimum sustainable flow discharged from the reservoir is of highest quality – facilities for the discharge of the flow ought to be constructed as selective water intakes, allowing the managing of the amount and quality of the water discharged. The water discharge should be adjusted to the requirements of the downstream biocenoses (discharge from an adequate temperature layer, most suitable for the development stage of the downstream biocenoses. In order to manage the flows discharge, water stops need to be adjustable. It is necessary to ensure aeration of the flow (cone valves are most adequate in this respect), so as to manage the oxygen regimes of the guaranteed minimum sustainable flows. It follows that outlet towers should be constructed in such a way that allows efficient management of temperature and oxygen regimes downstream from the dam.
- Floodgates need to be constructed in line with the relevant regulations and meet the criteria of basic reservoir use and provision of additional flood wave reception space.
- Hydro-technical facilities need to be constructed in such a way so as to ensure the prescribed minimum sustainable flow pursuant to Article 81 of the Water Law (The Official Gazette of the Republic of Serbia, No. 30/10), which does not affect the survival, growth and migration of fish and other water organisms.
- Groundwater regimes in the area of low shorelines need to be controlled through systems of protection which provide full protection against overwatering. These systems should be established as manageable systems which enable improvement of water regimes compared to their natural state. These systems should also be adjusted to other hydropower engineering and ecological objectives (irrigation, tourism valorisation of area).
- Anti-erosion protection of at reservoir basins should be regarded as a wider measure of development and cultivation of the catchment area. Special attention should be paid to biological measures of catchment area protection (afforestation, amelioration of meadows), treating them in the long run not merely as an ecological factor, but also as a factor of stabilising economy for the survival of the communities located in the parts of the catchment area where soil is of lower quality.
- Managing reservoir levels should be adjusted to both ecological and tourism standards. For instance, stable water levels should be ensured during the period of fish spawning, in order to prevent loss of roe in the shallow water, and stabilise the water level of those reservoirs that play a tourism-related role during the summer period.

- All biological interventions in the system (fish stocking, afforestation, etc.) should be carried out only after carefully conducted ecological studies, so that interventions would not disrupt the desired and already attained ecological balance.
- Guaranteed minimum sustainable flows should be selected with respect to ecological requirements, treating them as a dynamical category and adjusting them to biocenoses development downstream from the reservoirs (discharge of higher flows during the warmer parts of the year, which is the time of reproduction of all species in the ecosystem).
- To keep reservoirs in the most favourable trophic states, it is necessary to take adequate measures of quality protection of the water entering the reservoir. Through adequate monitoring of the reservoir water quality, and by applying mathematical methods of quality development, it is necessary to detect the aging of the reservoir in a timely fashion, so as to take adequate protection measures.
- Regular waste extraction activities and dredging as a regular measure of maintenance of reservoirs with the aim of ensuring longer operation of the hydro-technical facilities.
- Envisage appropriate forest protection corridors in new water areas, for the sake of animal protection during their migration and safer crossing of water obstacles (rivers, derivation channels).
- Water areas and hydro-technical facilities within the settlements should be planned from the viewpoint of harmonious functional and aesthetic integration into the urban environment. The construction of reservoirs in the urban areas should be used to connect settlements with water areas in the most harmonious manner.
- Handling extracted river sediment must be in line with the provisions of the Law on Waste Management (The Official Gazette of the Republic of Serbia, No. 36/2009, 88/2010 and 14/2016).

4. GUIDELINES FOR UNDERTAKING THE SEA AT LOWER HIERARCHICAL LEVELS

Pursuant to Article 16 of the Law on Strategic Environmental Impact Assessment, the Strategic Environmental Assessment Report contains guidelines for plans or programmes at lower hierarchical levels which specify the need for carrying out the strategic assessment and environmental impact assessment, as well as aspects of environmental protection and other issues of importance for environmental impact assessment of plans and programmes at lower hierarchical levels.

The strategic environmental assessment is required for all planned capital water facilities envisaged under the Water Management Plan. For these facilities, strategic environmental assessments must be conducted in order to properly contextualise possible impacts on environmental quality, as well as the cumulative and synergic impacts, and define appropriate protection measures geared towards limiting possible adverse impacts.

Pursuant to the propositions and provisions of the Law on Environmental Impact Assessment (The Official Gazette of the Republic of Serbia, No. 135/04 and 36/09), it is possible to request an Environmental Impact Assessment Study at the level of project-technical documentation for specific water facilities. In respect to planned activities defined under the Water Management Plan, and as regards the Regulation on Establishing the List of Projects which Require Environmental Impact Assessment and the List of Projects which May Require Environmental Impact Assessment (The Official Gazette of the Republic of Serbia, No. 114/08), the following projects require an Environmental Impact Assessment Study[13]:

1. Hydro-technical facilities for the transfer of water resources between river basins aiming at preventing possible shortages of water where the amount of water transferred exceeds 100 million cubic metres/year; in all other cases, facilities for the transfer of water resources between river basins where the multi-annual average flow of the basin of abstraction exceeds 2,000 million cubic metres/year and where the amount of water transferred exceeds 5% of that flow, excluding transfers of piped drinking water.
2. Wastewater treatment plants in settlements with a population of over 100,000 people.
3. Dams and other installations designed for holding back or permanent storage of water, where a new or additional amount of water held back or stored exceeds 10 million cubic metres.
4. Activities and installations for which an integrated licence is issued pursuant to the Regulation on the Types of Activities and Facilities for which an Integrated Licence is Issued (The Official Gazette of the Republic of Serbia, No. 84/05).

For other water facilities of smaller capacities and smaller-scale activities, pursuant to Article 8 of the Law on Environmental Impact Assessment, the Project Promoter is obligated to submit to the authority responsible for issues related to environmental protection the Request to Determine the Need to Conduct an Environmental Impact Assessment Study, pursuant to the Law on Environmental Protection (The Official Gazette of the Republic of Serbia, No. 135/04, 36/09 and 72/09 – 43/11 – Constitutional Court), the Law on Environment Impact Assessment (The Official Gazette of the Republic of Serbia, No. 135/04 and 36/09), the Rulebook on the

[13] All the stated projects require the preparation of an appropriate planning document with the Report on Strategic Environmental Impact Assessment in accordance with the postulates stated in Paragraph 4 of Chapter 4 of the subject Strategic Environmental Assessment.

Contents of the Environmental Impact Assessment Study (The Official Gazette of the Republic of Serbia, No. 69/2005), and the Regulation on Establishing the List of Projects which Require Environmental Impact Assessment and the List of Projects which May Require Environmental Impact Assessment (The Official Gazette of the Republic of Serbia, No. 114/08).

5. PROGRAMME FOR ENVIRONMENTAL MONITORING DURING THE IMPLEMENTATION OF THE WATER MANAGEMENT PLAN

The precondition for achieving environmental protection objectives, i.e. the SEA objectives, is to establish an efficient monitoring programme as one of the main priorities in the implementation of the Water Management Plan. Under the Law on Environmental Protection, the government adopts a monitoring programme pursuant to special laws for the period of two years for the entire territory of the Republic of Serbia, while local self-governments adopt environmental monitoring programmes for their territories, which must be harmonised with the programme of the government.

The Law on Strategic Environmental Impact Assessment sets forth the obligation of defining the environmental monitoring programme during the implementation of plans or programmes for which the SEA is undertaken. The Law also specifies the contents of the monitoring programme, which shall include the following:

1) Description of the objectives of plans and programmes;
2) The environmental monitoring indicators;
3) The rights and obligations of competent authorities, etc.

Further, this programme can also be an integral part of the existing monitoring programme provided by the competent environmental protection authority. In addition, monitoring should provide information on the quality of the existing report, which can be used in making future reports on the state of the environment.

Moreover, the Water Management Plan pays special attention to the analysis of surface and groundwater monitoring, which should be conducted in line with the Monitoring Programme below.

5.1. Description of the Water Management Plan objectives

The description of the general and specific objectives of the Water Management Plan is provided in more detail in Chapter 1 of the SEA Report. Therefore, more attention will be paid to the objectives of the Environmental Monitoring Programme. The main objective in creating a monitoring system is to provide, amongst other things, a timely response to and warning of possible negative processes and accident situations, as well as a more detailed insight into the status of elements of the environment and an identification of the need to undertake protection measures depending on the degree and type of pollution. It is necessary to provide continuous monitoring of the state of environment and activities, in this specific case for the entire territory of the Republic of Serbia (especially on sites of the existing or planned water facilities), thus opening the possibility for rational environmental management.

Pursuant to the Law on Environmental Protection, the Republic, autonomous province and local self-government units, within their competencies specified by the Law, provide continuous environmental control and monitoring in line with this Law and other special laws. Under Article 69 of said Law, the objectives of the Environmental Monitoring Programme are as follows:

- Providing the monitoring;

- Defining monitoring content and methods;
- Specifying organisations authorised for conducting the monitoring;
- Defining the monitoring of sources of pollution by wastewater and sold waste which ends up in watercourses or on riverbanks;
- Establishing an information system and specifying the data delivery method for the purposes of maintaining an integrated cadastre of polluters, and
- Introducing obligations regarding reporting on the state of the environment according to the prescribed content of environmental reports.

The key planning objective in this case is to protect water resources and provide protection from the harmful effects of water, as well as the protection of other natural and environmental factors, along with creating the conditions for sustainable socio-economic development of the area. In correlation with the above-mentioned objectives, the key fields of monitoring are: water, air, soil, air pollutant emissions, noise and natural values (through biodiversity, geological heritage, landscape, forests).

5.2. Indicators for environmental monitoring

Environmental monitoring is conducted by the systematic measurement, examination, and evaluation of environmental and pollution indicators, including the monitoring of natural factors, i.e. environmental changes and characteristics.

Considering the spatial coverage of the Water Management Plan and possible pollution, the monitoring system primarily relates to the following measuring activities:

- The system for measuring the level and flow within the network of measuring stations under the jurisdiction of Hydrometeorological Institute of Serbia. The network can be expanded by additional measuring stations in the event of the planning of facilities and systems, and these stations will be included in the regular network of measuring stations, for the purposes of subsequent monitoring of the water management system operation.
- In case a measuring station is to be submerged after a reservoir is constructed, additional measuring stations need to be set in a timely fashion both upstream from the backwater and downstream from the dam, so that parallel monitoring provided by all three stations (the station to be submerged and the new stations that will remain operational) could allow correlation to be identified and, in this way, the hydrological analyses of the flow time series to be carried out as normal.
- Water quality control and monitoring in the territory of the Republic of Serbia. In addition to the regular stations for monitoring of water quality in the state system (The Hydrometeorological Institute of Serbia and The Environmental Protection Agency), some water management systems (e.g. HS DTD, large springs of surface and groundwater of alluvial origin) require the establishing of additional stations, as these systems need to have very reliable data on water quality used for irrigation or abstracted and purified for water supply systems.
- Control of implementation of sanitary protection in the zones around water sources.
- Monitoring of soil quality through control of soil pollution levels.

All the above-mentioned parameters should be monitored in relation to indicators given according to environmental receptors shown in Table 2.1 of the SEA, as well as pursuant to laws and by-laws for the environmental aspects specified below. In addition to the above,

monitoring of the implementation of planning protection measures defined within the SEA is also of particular importance.

5.2.1. Water Quality Monitoring System

The Annual Water Quality Monitoring Programme is the main document for water quality monitoring. Pursuant to Articles 108 and 109 of the Law on Waters (The Official Gazette of the Republic of Serbia, No. 30/1093/12, 101/16, 95/18 and 95/18 – state law), the Programme is established by a government regulation at the beginning of each calendar year for the current year. The Programme is implemented by the Republic Hydrometeorological Institute of Serbia and the Serbian Environmental Protection Agency. The monitoring includes the following: for surface water – volume, water levels and flow rates up to the level of importance for ecological and chemical status and ecological potential, as well as the parameters of ecological and chemical status and ecological potential; for groundwater – levels and control of chemical and quantitative status. In implementing the Water Management Plan, it is necessary to establish the obligation of expanding the network of observation points and determine the competencies for implementing additional obligations of water status monitoring.

The monitoring of water facilities supply water to the population is carried out by public health protection institutes with local jurisdiction (at the level of local self-management units, where there is one), while the extent and type of the monitoring are adapted to the schedule of the implementation of planning solutions related to water supply.

Continuous measurements of water volume and testing of water quality are carried out for water bodies from which more than 100 cubic metres of water can be taken per day and which are earmarked by the Water Management Plan for drinking water supply and sanitary and hygiene needs.

Measurements and testing are carried out by the republic organisation responsible for hydrometeorological activities in accordance with the annual programme adopted by the Ministry of Agriculture and Environmental Protection (based on Article 78 of the Law on Waters).

Based on Article 74 of the Law on Waters, a public company or other legal entity involved in water supply services is obliged to install devices for permanent and systematic water measuring and quality control at water intakes, and undertake measures for ensuring safety of drinking water and maintenance of hygiene in the facilities, as well as to undertake adequate technical measures to keep the devices in good working order.

5.2.2. Soil Quality Monitoring System

The basis for soil-quality monitoring intended for agricultural production is specified by the Law on Agricultural Land (The Official Gazette of the Republic of Serbia, No. 62/06 , 65/08, 41/09, 112/15, 80/17 and 95/2018 – state law), and in related to determining the concentration of harmful and hazardous matter in the soil and in irrigation water. It is carried out according to the programme promulgated by the government minister responsible for the domain of agriculture. The soil quality testing can be carried out by authorized legal entities (enterprises, companies, etc.) authorised by the competent ministry. The government minister also prescribes allowable concentrations of hazardous and harmful matters, as well as methods for testing them.

The fertility control of arable agricultural land and the amount of applied mineral fertilizers and pesticides is carried out as appropriate, and no less than once per five years. These activities can be carried out by a registered, authorised and qualified legal entity, while costs are borne by the users or owners of agricultural land. The soil test report contains mandatory recommendations for the type of fertilizers to use and the best methods for improving chemical and biological soil properties.

The protection of agricultural land, as well as agricultural land monitoring, is a mandatory element of the agricultural base, whose content, method of drafting and adoption are governed by Articles 5–14 of the Law on Agricultural Land. The same Law also envisages the Strategic Environmental Assessment of the Agricultural Base.

Monitoring of soil erosion, particularly washouts and the accumulation of materials by action of water, is an important instrument for successful protection of both agricultural land, forestland and other types of land, which was included in the Law on Agricultural Land and Law on Forests as an explicit obligation, and in the Law on Environmental Protection as an obligation in principle. The provisions of Articles 61 and 62 of the Law on Waters also envisage the protection against harmful effects of erosion and flash floods.

5.2.3. Emission monitoring

The methodological postulates of the majority of the discussed environmental monitoring systems rest on the measuring and monitoring of the *quality of ambient air and water*, i.e. pollutants in the ambient air and water, without reflecting directly on the source of the pollution, or the causes. However, it is very important – even more important than determining the pollution level – to monitor the emissions from the concentrated sources of pollution.

The Law on Integrated Environmental Pollution Prevention and Control (The Official Gazette of the Republic of Serbia, No 135/04 and 36/09) sets forth the obligation of monitoring the emissions/effects at their source, as an integral part of obtaining an integrated permit for the plants and activities with potential negative effects on the environment and human health, regulated by enactments of the government (The Regulation on the Types of Activities and Installations for which an Integrated Permit is to be Issued – *The Official Gazette of the Republic of Serbia, No. 84/05*), The Regulation on Content of the Programme of Measures for Adapting the Existing Installation Or Activities to the Prescribed Conditions (*The Official Gazette of the Republic of Serbia, No. 84/05*), The Regulation on the Criteria for Determining the Best Available Techniques for the Implementation of Quality Standards and for Determining Emission Limit Values in an Integrated Permit (*The Official Gazette of the Republic of Serbia, No. 84/05*), or a decision by Minister responsible for environmental protection (The Rulebook on the Content and Methods for Keeping the Register of Issued Integrated Permits – The Official Gazette of the Republic of Serbia, No. 69/05). The integrated permit, issued by the authority responsible for environmental protection (at the national, provincial or municipal level – depending on which authority grants a building permit) also contains a monitoring plan to be implemented by the *operator* (the legal or physical entity which operates or controls the plant, etc.).

5.2.4. Natural resource monitoring

The main objective is to establish a biodiversity monitoring system, i.e. to monitor natural habitats and the population of wild flora and fauna, primarily vulnerable habitats and rare,

endangered species, but also the condition and changes of landscape features and the geological heritage. All the above-mentioned monitoring is a direct responsibility of the Institute for Nature Conservation of Serbia and the Provincial Institute for Nature Protection in Novi Sad respectively, based on medium-term and annual programmes for the protection of natural resources. The monitoring is carried out pursuant to the provisions of the Law on Nature Protection (The Official Gazette of the Republic of Serbia, No 36/09 and 88/10, and the correction 91/10, 14/16, 95/18 – state law and 71/2021) and the related bylaws.

5.3. Rights and Obligations of Competent Authorities

The rights and obligations of competent authorities related to environmental monitoring stem from the Law on Environmental Protection, i.e. Articles 69–78 of the Law. Pursuant to said articles of the Law, the rights and obligations of competent authorities are as follows:

1. The government adopts monitoring programmes for the period of two years;
2. Local self-government units adopt monitoring programmes for their territories, which programmes must be in accordance with the programme of the government;
3. The government and local self-government units respectively provide financial resources for the monitoring;
4. The government sets the criteria for determining the number and distribution of measuring stations, the network of measuring stations, the scope and frequency of measurements, the classification of monitored phenomena, the methods of work and indicators of environmental pollution and their monitoring, as well as the data delivery time frame and methods;
5. Monitoring can be carried out only by authorised organisations. The Ministry sets detailed requirements which authorised organisations must meet, and designates authorised organisations upon prior consent of the Minister responsible for the specific area.
6. The government specifies the types of air emissions and other phenomena which are subject to pollution monitoring, as well as the methods of measurement and sampling, the method of recording, as well as the data delivery and storage deadlines;
7. State bodies, organisations and local self-government units, authorised organisations and the polluters are obliged to submit monitoring data to the Serbian Environmental Protection Agency as prescribed;
8. The government sets the content and method of maintaining the information system, the methodology, structure, commonalities, categories and levels of data collection, as well as the content of the information which must be regularly provided to the public;
9. The information system is maintained by the Serbian Environmental Protection Agency;
10. The minister sets the methodology for preparing the integrated cadastre of polluters, as well as the type, methods, classification and time frame of data delivery;
11. The government submits annual environmental reports to the National Assembly;
12. Competent local self-government authorities submit environment reports for their territories to the assembly once in two years;
13. Environmental reports are published in the official journals of the Republic of Serbia and local self-government units respectively.

Pursuant to the Law on Environmental Protection and other regulations, state bodies, local self-government units, authorised and other organisations are obliged to fully and objectively inform the public in a timely fashion about the current state of the environment, i.e. the phenomena which are subject to ambient air quality and emissions monitoring, as well as about

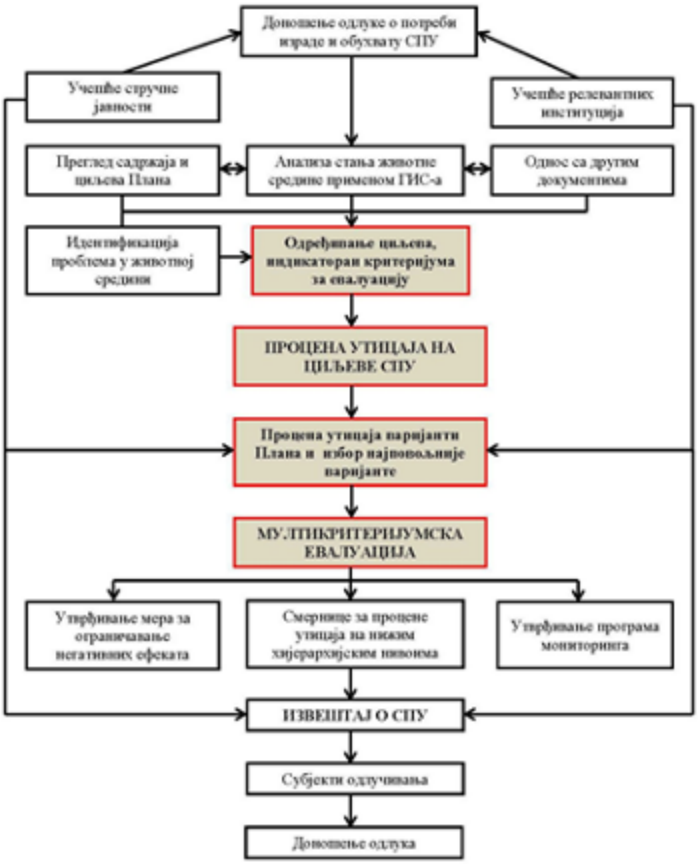
the warning measures or the spread of pollution which may pose a threat to people's lives and health. Furthermore, pursuant to the same law, the public has a right to access the prescribed registries or records containing relevant information and data.

6. OVERVIEW OF THE USED METHODOLOGY

6.1 The methodology for undertaking the SEA

In preparing the SEA, the evaluation methodology and method used was developed as part of the scientific project funded by the Ministry of Science and Environmental Protection, titled "Strategic Environmental Assessment Methods in Planning the Spatial Development of Lignite Basins" (implemented by the IAUSPS). Methods with a proven track record in the EU countries were used as the basis for developing this model. The methodology employed was based on a multicriterial expert qualitative evaluation of ecological, social, and economic aspects of development in the space covered by the Water Management Plan, as the basis for evaluating space for further sustainable development. In terms of general methodological principles, the SEA was drawn up by defining the starting programme elements (the content and objectives of the Water Management Plan), alongside the starting assumptions, and the current state of the environment. A significant part of the research was dedicated to the following: an assessment of the current condition, based on which ecological guidelines could be provided for the purposes of planning; a qualitative identification of possible impacts of planned activities on the main elements of the environment; and an analysis of the strategic provisions based on which ecological guidelines are formulated for the implementation of the Water Management Plan. The approach that was employed had proven useful in over 40 conducted and adopted SEA in this country and abroad, for different hierarchical levels of planning, and some of the results were presented in top international science journals (e.g. *Renewable Energy Journal, Environmental Engineering and Management Journal, etc.*).

Figure 6.1. The SEA procedural faremwork and methodology



6.2. Difficulties in undertaking the SEA

The lack of a uniform methodology for conducting this type of assessment has necessitated special efforts in order to carry out the analysis, assessment and valuation of strategic commitments in the context of environmental protection and to use an appropriate model for preparing a strategic document for environmental protection.

A problem related to the Water Management Plan for which the SEA is conducted lies in the fact that the measures for implementing strategic or operative objectives are not supported by technical documentation. As a result, not all relevant facts needed for a precise identification of impacts are known. However, given that the strategic environmental assessment is not an instrument used to determine such impacts, but rather to assess potential environmental trends, this shortcoming can be considered conditional. A detailed and precise assessment is the subject of studies looking into the effects of individual projects on the environment.

The Draft Water Management Plan and the collected and updated available environmental data for the territory of the Republic of Serbia were the basis for undertaking the SEA.

7. OVERVIEW OF DECISION-MAKING METHODS

The importance of potential negative and positive impacts of the proposed Water Management Plan on the environment, human health, and social and economic status of the local communities necessitates adequate and transparent inclusion of parties concerned (investors, competent authorities, local authorities, non-governmental organizations, and the population) in the decision-making process in respect of environmental protection issues at a level higher than the current practice of holding formal public inquiries on the Draft Water Management Plan.

Article 18 of the Law on Strategic Environmental Impact Assessment stipulates that the authorities and organisations concerned should participate and have the option of submitting their opinion within 30 days.

The authority competent for the preparation of plans/programmes ensures public participation in the consideration of the Strategic Assessment Report prior to the submission of the request for granting the approval of the Strategic Assessment Report (Article 19). The authority competent for the preparation of plans/programmes informs the public about the manner and deadlines for reviewing the content of the report and submitting opinions, as well as about the time and venue of the public inquiry organised in accordance with the law regulating the procedure for the adoption of the plan/programme.

The participation of competent authorities and organizations is ensured in written form and through presentations and consultations in all stages of conducting and reviewing the strategic assessment. The participation of the public concerned and non-governmental organizations is provided through public media and public presentations.

The authority with a remit over the preparation of the plan/programme prepares the Report on the Participation of the Authorities, Organisations, and the Public Concerned, which contains all the opinions on the SEA, as well as the opinions submitted during the public reviewing and inquiry. The Strategic Assessment Report is submitted for evaluation to the authority with a remit over environmental protection alongside the report on expert opinions and public inquiry. The evaluation is carried out according to the criteria specified in Annex II of the Law. Based on the evaluation, the authority with a remit over environmental protection approves the strategic environmental assessment report within 30 days from the receipt of the request for evaluation.

After collecting and processing all opinions, the authority with a remit over preparation of the plan/programme submits the Draft Water Management Plan and the Strategic Assessment Report to the competent authority for the purposes of making a decision on it.

8. OVERVIEW OF CONCLUSIONS OF THE STRATEGIC ENVIRONMENTAL ASSESSMENT REPORT

The Strategic Environmental Assessment of the Water Management Plan in the Republic of Serbia for the Period 2021-2027 analysis the current state of the environment, the importance and characteristics of the Water Management Plan, the characteristics of the impact of planned priority objectives, as well as other issues and problems in environmental protection, in line with the criteria for identifying potential impacts on the environment. In this process, the main approach focused on expected trends that may result from activities in the water sector.

In preparing the SEA, the methodology that was used was based on the defining objectives and indicators of sustainable development, as well as the multicriterial evaluation of measures formulated in the Water Management Plan with respect to the set objectives of the SEA and the relevant indicators. The methodology was fully in line with the approach employed in preparing the SEA for the adopted Water Management Strategy in the Republic of Serbia.

The planning solutions were assessed with respect to the following: siye of impact; spatial extent of potential impact; impact probability; and impact duration.

Based on evaluating the significance of the impacts, which took account of the main planning solutions under the Water Management Plan and the measures for implementing them, it can be concluded that the implementation of the solutions envisaged under the Water Management Plan will result in strategically significant positive effects in the areas of water sector regulation, protection of water and space, and improving the environment. Bringing the Water Management Plant into line with the European water management directives and standards, as well as the special attention paid to the environmental impact aspect, formulated in several chapters of the Plan, certainly contributed to this.

The implementation of measures envisaged under the Water Management Plan contributes to the reduction of water pollution by undertaking an array of measures (technical, planning-related, organizational, institutional, legal). These measures are based primarily on preventive protection, maintenance and construction of facilities intended for water use, water protection, and protection against water. Improving water regimes with the aim of implementing the basic eco-system protection postulate, stating that in conditions of increasingly unfavourable anthropogenic effects on the environment, the environment is best protected by active management measures. The most important among these measures is improving water regimes, i.e. by purpose-driven management of reservoirs regulated annually (increasing small water bodies and decreasing large water bodies, which are an especially unfavourable form of environment destruction). Soil protection, anti-erosion and biological treatment of drainage basins as the most important condition for integral design, use, and protection of space. Protection of all natural and man-made resources, as well as biodiversity, as a result of the implementation of measured envisaged under the Water Management Plan

In relation to possible cross-border impacts, the Water Management Plan emphasizes the importance of inter-state cooperation in the water sector, and provides a list of activities necessitating cross-border cooperation, in itself an important step forward in drafting a strategic document at the national level.

Although the Water Management Plan provides a comprehensive set of measures for the implementation of the Plan and monitoring of the current state, the SEA provides additional guidelines aimed at ensuring the sustainability of the planning solutions.

In light of all of the above, it can be concluded that the Water Management Plan in the Republic of Serbia for the Period 2021-2027 provides solutions geared towards water protection and protection against harmful effects of water and, as such, has a distinctly positive impact on the environment and the water sector as one of its most important elements. As a result, in terms of the effect on the environment, this document can be considered acceptable and aligned with the European water sector standards.