

**EU4GREEN**

# **SURFACE WATER MONITORING DEVELOPMENT PLAN, SERBIA**

**EU 4 Green Recovery:**

**Support the implementation of the Green Agenda for the Western Balkans**

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## ABBREVIATIONS

ADA	Austrian Development Agency
BQE	Biological Quality Element
CA	Competent Authority
CIS	Common Implementation Strategy
DRB	Danube River Basin District
EC	European Commission
EEA	European Environment Agency
EIONET	European Environmental Information and Observation Network
EQR	Ecological Quality Ratio
EQS	Environmental Quality Standard
EU	European Union
EU ETS MRVA	EU Emissions Trading System Monitoring, Reporting, Verification and Accreditation
GAWB	Green Agenda for the Western Balkans
GC-MS	Gas Chromatography–Mass Spectrometry
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
ISO	International Organization for Standardization
LIMS	Laboratory Information Management System
MAC	Macrophytes
MDP	Monitoring Development Plan
MZB	Macrozoobenthos
PAH	Polycyclic Aromatic Hydrocarbon
PFAS	Per- and Polyfluoroalkyl Substances
PHP	Phytoplankton
PHB	Phytobenthos
QA/QC	Quality Assurance / Quality Control
RBD	River Basin District
RBMP	River Basin Management Plan
RBSP	River Basin Specific Pollutant
RHMS	Republic Hydrometeorological Service
RWD	Republic Water Directorate
SEPA	Serbian Environmental Protection Agency
SOP	Standard Operating Procedure
SWB	Surface Water Body
UBA	Umweltbundesamt (Environment Agency Austria)
WIS	Water Information System
WFD	Water Framework Directive
WISE	Water Information System for Europe

# 1. EXECUTIVE SUMMARY

This **Surface Water Monitoring Development Plan (MDP)** provides a structured and practical roadmap for the development, implementation, and operation of a **Water Framework Directive (WFD)-compliant surface water monitoring system in Serbia**. Developed within the framework of the EU4Green initiative, the plan supports Serbia's transition towards **sustainable water management**, improved environmental governance, and alignment with EU acquis under Chapter 27.

The primary objective of the MDP is to establish a monitoring system capable of **reliably assessing the ecological and chemical status**, detecting trends and pressures, and evaluating the effectiveness of measures under River Basin Management Plans (RBMPs). Monitoring is recognised as a **core pillar of river basin management**, providing the data necessary for evidence-based decision-making and compliance with WFD requirements.

The document outlines the **technical and methodological foundations** for WFD-compliant monitoring, including the definition of biological quality elements (BQEs), supporting hydromorphological and physico-chemical parameters, and chemical substances such as Priority Substances and River Basin Specific Pollutants (RBSPs). It describes the three monitoring types required by Annex V—**surveillance, operational, and investigative monitoring**—each fulfilling distinct roles in status assessment, pressure analysis, and problem identification.

A central component of the MDP is the **phased implementation framework**, covering:

- baseline analysis and water body characterisation (Article 5),
- monitoring programme design (Article 8 and Annex V),
- operational implementation,
- data management and quality assurance,
- status assessment and reporting, and
- adaptive review and optimisation.

This phased approach is aligned with the **six-year WFD planning cycle**, ensuring a structured transition from planning to full system operation.

The analysis shows that Serbia has made significant progress in establishing the **legal, institutional, and planning foundations** of water management. A national River Basin Management Plan (2021–2027) is in place, supported by the Law on Water and aligned with WFD principles, including river basin-based planning, environmental objectives, and the Programme of Measures. Monitoring programmes are formally structured in accordance with WFD requirements, including **surveillance, operational, and investigative monitoring**.

However, despite this formal alignment, the system remains **only partially functional in practice**. The most critical challenge lies in the **monitoring system itself**, which does not yet provide sufficient, reliable, and comprehensive data to support effective water management. Monitoring networks are limited in spatial coverage, parameter sets are incomplete—particularly for biological elements and priority substances—and sampling

frequencies are often below WFD standards. As a result, a large proportion of water bodies cannot be assessed with confidence, especially regarding chemical status.

A major issue is also the **fragmentation of data and institutional responsibilities**. Monitoring tasks are divided primarily between the Serbian Environmental Protection Agency (SEPA), responsible for water quality, and the Hydrometeorological Service (RHMS), responsible for water quantity. This split leads to incomplete data integration and limits the development of a unified water information system. Consequently, status assessments are often based on partial datasets or expert judgement, reducing their reliability and usefulness for decision-making.

The MDP highlights that Serbia is currently in a **transitional phase**, moving from formal compliance toward operational implementation. While early stages of the monitoring cycle—such as legal framework and programme design—are largely in place, later stages—such as data integration, status assessment, and adaptive management—remain significantly underdeveloped. This prevents the monitoring system from functioning as a **continuous, feedback-driven management tool**, which is a core requirement of the WFD.

To address these challenges, the MDP defines a phased roadmap (2026–2030) structured around five key tasks: completion of the monitoring framework, capacity and infrastructure development, full implementation of monitoring programmes, development of integrated data systems, and the transition to adaptive, data-driven management. The roadmap prioritises the expansion of monitoring networks, full coverage of biological and chemical parameters, strengthening laboratory and human capacities, and the establishment of a national Water Information System compatible with EU reporting (WISE).

The successful implementation of the roadmap depends on several **strategic priorities**, including the institutionalisation of monitoring systems beyond project-based approaches, increased investment in technical and human capacity, improved inter-institutional coordination, and the establishment of stable long-term financing mechanisms.

In conclusion, Serbia has established a strong foundation for WFD implementation, but **significant efforts are required to operationalise the monitoring system** and ensure that it effectively supports river basin management. Achieving this transition will be essential for meeting EU accession requirements, improving water status, and ensuring sustainable and integrated water resource management in the country.

## 2. INTRODUCTION AND SCOPE

EU4Green is an important element of the continuous support by the European Union to empower and assist the Western Balkans' transition to modern, resource-efficient and competitive economies where growth is decoupled from emissions of greenhouse gases, resource use and waste generation and where climate resilience is pursued. It is the general objective of the project to support the Western Balkans in the implementation of the Green Agenda, thus in the development and transformation towards sustainability and reaching climate neutrality by 2050. Accordingly, EU4Green is a very broad initiative building on the combined expertise and cooperation within the thematic areas EU ETS MRVA, Circular Economy, Depollution Water, Depollution Air, Depollution Soil, Biodiversity, Sustainable Agriculture, Communication, Green Education, Stakeholder participation and Green Finance.

River basin management is based on monitoring of **surface water and groundwater resources** and plays a central role in any River Basin Management Plan (RBMP).

**Surface water monitoring** consists of ecological and chemical monitoring in accordance with the requirements of the Water Framework Directive (WFD). Ecological monitoring includes the assessment of biological quality elements (BQEs), supported by hydromorphological and physico-chemical elements, while chemical monitoring focuses on Priority Substances and other pollutants. These monitoring components are required to supplement and validate the characterization and risk assessment, to establish the status of surface water bodies (SWBs), and to evaluate the effectiveness of the measures implemented to achieve and maintain good ecological and chemical status.

In addition, surface water monitoring is needed to detect long-term trends in water quality, identify emerging pressures, and support the design and adjustment of programmes of measures under evolving environmental and climate conditions.

Sound monitoring is a fundamental instrument for good **surface water governance**. It provides all stakeholders with up-to-date and reliable information on the status and trends of surface waters within a river basin and enables informed decision-making for water management and the implementation of programmes of measures aimed at achieving the environmental objectives laid down by the Water Framework Directive (WFD).

This **Surface Water Monitoring Development Plan (MDP)** addresses the requirements for ecological and chemical monitoring of surface waters in line with the WFD. The comparison with the current situation provides the basis for identifying gaps, drawing conclusions, and formulating options for the progressive development and successful implementation of a WFD-compliant surface water monitoring system.

## 3. WFD COMPLIANT MONITORING

### 3.1. WFD monitoring principles

Article 8 of the Water Framework Directive (WFD) establishes the requirements for monitoring the status of surface waters, groundwater, and protected areas. Monitoring programmes are designed to provide a **coherent and comprehensive overview of water status** within each river basin district.

According to Annex V of the WFD, monitoring of surface waters is required to support the following objectives:

- Classification of ecological and chemical status;
- Supplementing and validating the risk assessment carried out under Annex II;
- Supporting the efficient and effective design of future monitoring programmes;
- Assessing long-term changes in natural conditions and those resulting from widespread anthropogenic activity;
- Estimating pollutant loads transferred across international boundaries or discharged into seas;
- Assessing changes in the status of water bodies identified as being at risk, particularly in response to implemented measures;
- Identifying the causes of failure to achieve environmental objectives where these are not yet known;
- Determining the magnitude and impacts of accidental pollution events;
- Supporting intercalibration exercises (comparison with neighbouring countries);
- Assessing compliance with the objectives and standards for protected areas; and
- Quantifying reference conditions for surface water bodies where these exist.

The results of monitoring programmes are reported within River Basin Management Plans (RBMPs) through **maps of monitoring networks, status assessments, and estimates of the confidence and precision** achieved by the monitoring systems.

Under the WFD, waters to be monitored are assigned to specific geographical and administrative units, in particular **river basins, river basin districts, and individual water bodies**, which form the fundamental units of assessment. Monitoring the status of these water bodies provides the basis for evaluating progress towards achieving the environmental objectives of the Directive.

Before monitoring programmes can be implemented, several preparatory steps must be completed:

- Delineation of surface water bodies;
- Identification of water body types (rivers, lakes, transitional and coastal waters);
- Definition of type-specific reference conditions for all biological quality elements.

Where such information is not yet fully available, particularly at national scale, **pressure analysis combined with expert judgement and/or modelling approaches (risk assessment)** can be used as an interim basis.

Annex V of the WFD distinguishes three main types of surface water monitoring: **surveillance monitoring, operational monitoring, and investigative monitoring**. These are complemented by additional monitoring requirements for protected areas identified under Article 6.

### 3.2. Recent update

Directive (EU) 2026/805 is a **recent update of the EU water policy framework** that amends the Water Framework Directive(2000/60/EC), the Groundwater Directive (2006/118/EC), and the Environmental Quality Standards Directive (2008/105/EC). It aims to strengthen protection of surface water and groundwater by updating the list of regulated pollutants, introducing stricter environmental quality standards, and enhancing monitoring and reporting requirements. The Directive places particular emphasis on emerging contaminants such as PFAS, pharmaceuticals, and microplastics, and promotes more advanced methods, including cumulative risk assessment and effect-based monitoring, in line with the EU's Zero Pollution ambition.

### 3.3. Precision and confidence

According to Annex V of the Water Framework Directive (WFD), monitoring results shall achieve appropriate levels of **precision and confidence**. What is considered “acceptable”, “adequate”, or “sufficient” will directly influence key design aspects of the monitoring programme, including:

- the number of water bodies included in the different types of monitoring;
- the number of monitoring stations required to assess the status of each water body; and
- the frequency at which parameters representing quality elements are measured.

The Directive does not prescribe fixed quantitative thresholds for precision and confidence. Nevertheless, it is clear that the levels achieved must be sufficient to enable **robust and meaningful assessments of water status**, both spatially and temporally.

In practice, many Member States begin by evaluating their **existing monitoring networks and datasets** to determine the level of precision and confidence that can be achieved with available resources. Monitoring system design is therefore typically an **iterative process**, involving ongoing adjustment and optimisation of networks, parameters, and sampling frequencies in order to reach levels that support reliable classification and decision-making.

In addition, **expert judgement** often plays an important role, particularly in assessing the risk of misclassification. For example, in cases where a water body may be incorrectly classified as being “at risk”, responsible authorities will typically seek to reduce uncertainty through

additional investigations before committing to costly measures. This approach helps ensure that management decisions are both **scientifically robust and proportionate**.

### 3.4. Biological quality elements for surface water

The basis of the classification of surface water bodies are the Biological Quality Elements (BQE) consisting of fish, macroinvertebrates, phytobenthos, phytoplankton, and macrophytes, while physico-chemistry and hydromorphology act as supporting elements.

- Biology
  - Macroinvertebrates (all rivers)
  - Phytobenthos (in small rivers only)
  - Phytoplankton (in very large rivers and lakes/reservoirs only)
  - Fish and macrophytes will be classified by expert judgment or by using local information (fishermen). If no information is available, these BQE will be included in a later phase. The same is true for macroinvertebrates and phytobenthos in lakes.
- Supporting elements
  - General physico-chemical parameters (all rivers and lakes)
  - Hydromorphology (based on a general classification of the river network)

“Supporting” means that the values of the physico-chemical and hydromorphological quality elements are such as to support a biological community of a certain ecological status, as this recognises the fact that biological communities are products of their physical and chemical environment. It is not intended that these supporting elements can be used as surrogates for the biological elements in surveillance and operational monitoring.

According to the WFD, physico-chemical quality elements include 1) general physico-chemical parameters as listed in Annex V of the directive (temperature, O<sub>2</sub>, nutrients, salinity, pH) and 2) specific pollutants to be expected in the respective water body. These River Basin Specific Pollutants (RBSP) have to be identified and selected beforehand.

### 3.5. Chemical quality elements for surface water

Chemical status assessment under the Water Framework Directive (WFD) is based on a defined set of quality elements, primarily focusing on the presence and concentration of chemical substances that may pose risks to aquatic ecosystems and human health. The core elements are the Priority Substances and Priority Hazardous Substances, which are regulated at EU level and subject to Environmental Quality Standards (EQS) in water, and in some cases also in biota and sediments. These substances include heavy metals (e.g. mercury, cadmium, lead), organic pollutants (e.g. pesticides, PAHs), and industrial chemicals. In addition, River Basin Specific Pollutants (RBSPs) are included at national or river basin level to address locally relevant pressures not fully covered by the EU list.

Assessment of chemical status requires monitoring across different matrices, primarily surface water, but increasingly also biota (e.g. fish tissue) and sediments, particularly for

substances that accumulate in the food chain. The evaluation is based on compliance with EQS thresholds, with a strict “one out – all out” principle, meaning that exceedance of any single substance leads to failure of good chemical status. A key component of chemical monitoring is also the analysis of long-term trends, especially for substances that tend to accumulate or persist, in order to identify whether pollution is increasing or decreasing over time.

Together, these quality elements ensure a comprehensive assessment of chemical pressures on surface waters, enabling authorities to detect pollution, assess compliance with environmental objectives, and design targeted measures to reduce emissions and improve water quality.

### 3.6. Quality elements for groundwater and transitional and coastal waters

The Water Framework Directive (WFD) applies to all inland surface waters as well as groundwater and also defines quality elements for **transitional and coastal waters**. As Serbia has no transitional or coastal waters they are omitted from this MDP.

For **groundwater**, EU legislation focuses on achieving **good quantitative status and good chemical status**. In addition, measures must be implemented to **prevent or limit the input of pollutants** and to **identify and reverse significant and sustained upward trends** in pollutant concentrations. For further details on groundwater, reference is made to the document “Monitoring Development Plan – Groundwater, Serbia”.

### 3.7. Surface Water Surveillance Monitoring

The Water Framework Directive (WFD) requires that a sufficient number of water bodies be included in the **surveillance monitoring programme** to provide a representative assessment of the overall surface water status within each catchment and sub-catchment of a river basin district. The design of the monitoring strategy should make use of all available information on **chemical pressures and impacts**, including knowledge of substance properties (as outlined in CIS Guidance Document No. 7), emission sources and data, identified pressures, and results from previous monitoring activities.

Surveillance monitoring must be undertaken for a **minimum period of one year within each six-year River Basin Management Plan (RBMP) cycle**. The Directive specifies that monitoring should be carried out at locations where water dynamics are most relevant at the scale of the river basin district, including:

- rivers with significant flow rates, particularly large rivers with catchment areas exceeding 2,500 km<sup>2</sup>;
- large lakes and reservoirs where water volumes are significant;
- water bodies that cross Member State boundaries; and
- additional sites required to estimate pollutant loads transferred across boundaries and into the marine environment.

Within surveillance monitoring, parameters representing **all biological quality elements (BQEs), hydromorphological elements, and general as well as specific physico-chemical quality elements** must be monitored to ensure a comprehensive assessment of status.

**Proposal for monitoring frequency of surveillance sites:**

With regard to monitoring frequency, a harmonised and practical approach is recommended. For rivers, it is appropriate to sample chemical parameters monthly (12 times) over the course of one year, twice per RBMP cycle. For lakes, general physico-chemical parameters, River Basin Specific Pollutants (RBSPs), and Priority Substances (PS) may be sampled four times over one year, also twice per RBMP cycle (Table 1). It can also be helpful to have one of these sampling events during the turnover phase of the lakes in late autumn in order to get valuable baseline information. Biological monitoring frequencies differ depending on the quality element and water category. In rivers, biological quality elements (BQEs) are typically monitored twice per RBMP cycle (Table 2). In lakes, phytoplankton is recommended to be sampled multiple times (e.g. four times) over a year, with sampling distributed across the vegetation period to capture seasonal variability.

**Table 1: Recommendations for chemical monitoring frequency at surveillance.**

Monitoring	SWB	Quality Elements / Group of Parameters	Frequency within the selected year of the RBMP cycle	Intervals
Chemical Surveillance Monitoring	Rivers	General Physico-Chemical Parameters	12x	at least every 3 years
		River Basin-Specific Pollutants		
		Priority Substances		
	Lakes	General Physico-Chemical Parameters	4x	
		River Basin-Specific Pollutants		
		Priority Substances	12x	

**Table 2: Recommendations for biological monitoring frequency at surveillance sites.**

Monitoring	SWB	Quality Elements / Group of Parameters	Frequency within the selected year of the RBMP cycle	Intervals
Biological Surveillance Monitoring	Rivers	Benthic Invertebrates	1x	at least every 3 years
		Phytobenthos		
		Fish		
		Macrophytes		
		Phytoplankton		
	Lakes	Phytoplankton	4x	
		Fish	1x	
Makrophytes				

\* Applicable in large lowland rivers.

**Table 3: Recommendations for hydromorphological monitoring frequency at surveillance sites.**

Monitoring	SWB	Quality Elements / Group of Parameters	Frequency / Intervals
Hydro-morphological Surveillance Monitoring	Rivers	Continuity	once in 6 years
		Hydrology	continuously
		Morphology	every 6 years
	Lakes	Continuity	-
		Hydrology	Monthly
		Morphology	once in 6 years

### 3.8. Surface Water Operational Monitoring

The objectives of **operational monitoring** are to:

- establish the status of water bodies identified as being at risk of failing to meet their environmental objectives; and
- assess changes in the status of these water bodies resulting from the implementation of programmes of measures.

Operational monitoring must be carried out for all water bodies identified as being at risk of failing the relevant environmental objectives. In addition, it is required for water bodies into which **priority substances** are discharged. However, it is not necessary to monitor every individual water body, as the Directive allows for **grouping of similar water bodies** and representative monitoring, provided that the approach ensures reliable status assessment.

Operational monitoring is **targeted and pressure-specific**, focusing on those parameters and quality elements that are most sensitive to the dominant pressures affecting a water body. For example, where organic pollution is a key pressure in a river, **benthic invertebrates** may serve as the most sensitive biological indicator for assessing ecological impacts.

#### **Proposal for monitoring frequency of operational sites:**

With regard to monitoring frequency, a practical and structured approach is recommended. General physico-chemical parameters should be sampled monthly (12 times per year) in rivers and four times per year in lakes, with monitoring carried out in two separate years within the six-year RBMP cycle (Table 4). As in the surveillance site, it can also be helpful to have one of these sampling events during the turnover phase of the lakes in late autumn in order to get valuable baseline information. For biological quality elements (BQEs), the most indicative quality elements in relation to the present pressures must be chosen to assess the water body at risk of failing the good ecological status. BQEs are typically monitored twice per RBMP cycle in rivers, while in lakes, phytoplankton is recommended to be sampled multiple times (e.g. four sampling events) within a single year, repeated twice within the

RBMP cycle. These sampling events in lakes should be distributed across the vegetation period to adequately capture seasonal dynamics (Table 5). However, if the BQE results do not allow for a clear status assessment due to the dynamics of natural systems and unpredictable events, the monitoring period should be extended by one additional year.

Where point source or diffuse pollution is identified, suspected Priority Substances and River Basin Specific Pollutants (RBSPs) should also be monitored, following comparable frequencies (e.g. 12 times per year in rivers and four times per year in lakes, repeated twice per RBMP cycle).

**Table 4: Recommendations for chemical monitoring frequency at operational sites.**

Monitoring	SWB	Quality Elements / Group of Parameters	Frequency within the selected year of the RBMP cycle	Intervals
Chemical Operational Monitoring	Rivers	General Physico-Chemical Parameters	12x	at least every 3 years
		River Basin-Specific Pollutants	12x*	
		Priority Substances	12x*	
	Lakes	General Physico-Chemical Parameters	4x	
		River Basin-Specific Pollutants	4x*	
		Priority Substances	12x*	

\* If the risk assessment finds the SWB to be affected by point source or diffuse pollution, chemical analysis of the suspected substances should also be conducted. – Rivers: 12x; Lakes: 4x.

**Table 5: Recommendations for biological monitoring frequency at operational sites.**

Monitoring	SWB	Quality Elements* / Group of Parameters	Frequency within the selected year of the RBMP cycle	Intervals
Biological Operational Monitoring	Rivers	Benthic Invertebrates	1x	at least every 3 years
		Phytobenthos		
		Fish		
		Macrophytes		
	Lakes	Phytoplankton	6x**	
		Phytoplankton	4x	
		Fish	1x	
Makrophytes				

\* Choose the most indicative quality element to the present pressures to assess the status of the water body at risk.

\*\* Applicable in large lowland rivers.

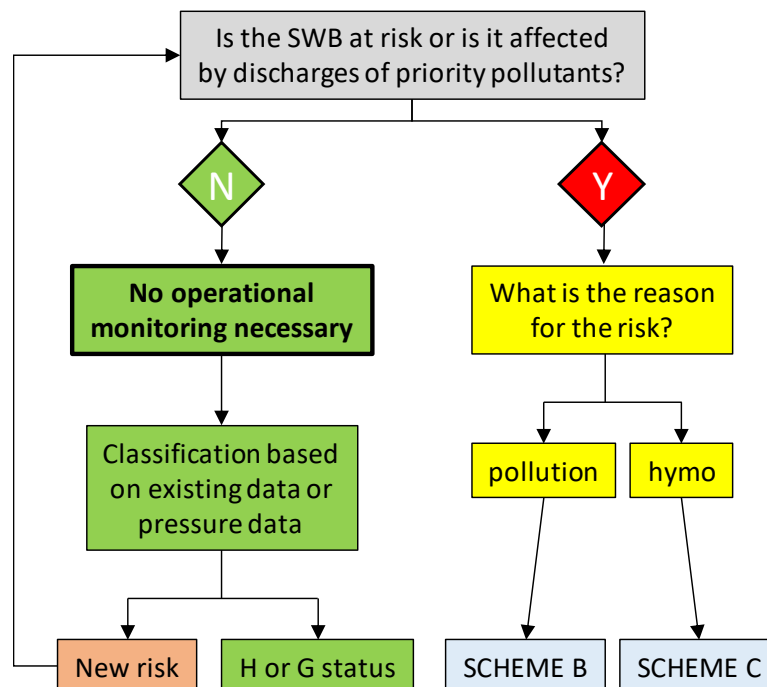
**Table 6: Recommendations for hydromorphological monitoring frequency at surveillance sites.**

Monitoring	SWB	Quality Elements / Group of Parameters	Frequency / Intervals
Hydro-morphological Operational Monitoring	Rivers	Continuity	once in 6 years
		Hydrology	continuously
		Morphology	every 6 years
	Lakes	Continuity	-
		Hydrology	Monthly
		Morphology	once in 6 years

**Choosing operational monitoring sites:**

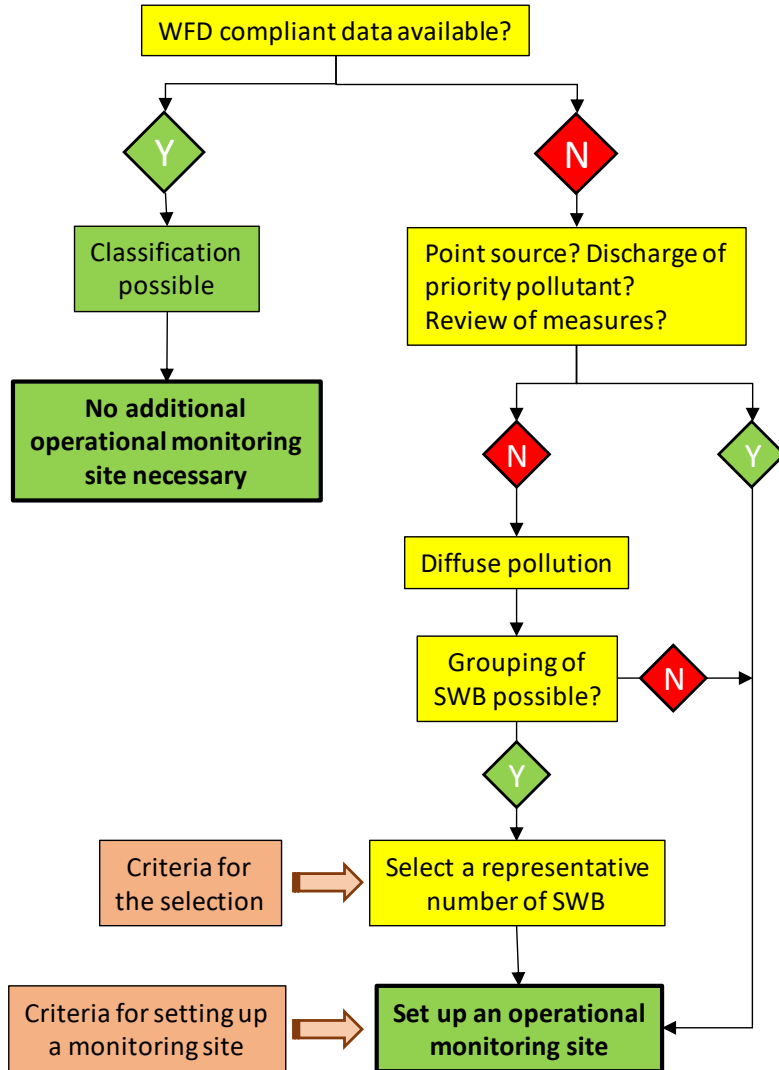
The following schemes A, B, and C (Figure 1, Figure 2, Figure 3) are adapted from a publication on implementing the Austrian Ordinance on the Monitoring of the Quality of Water Bodies (BMLFUW, 2008) illustrate the step-by-step approach on operational monitoring site selection:

## *Scheme A*



**Figure 1: Scheme A of decision tree for choosing operational monitoring sites.**

## ***Scheme B***



**Figure 2: Scheme B of decision tree for choosing operational monitoring sites.**

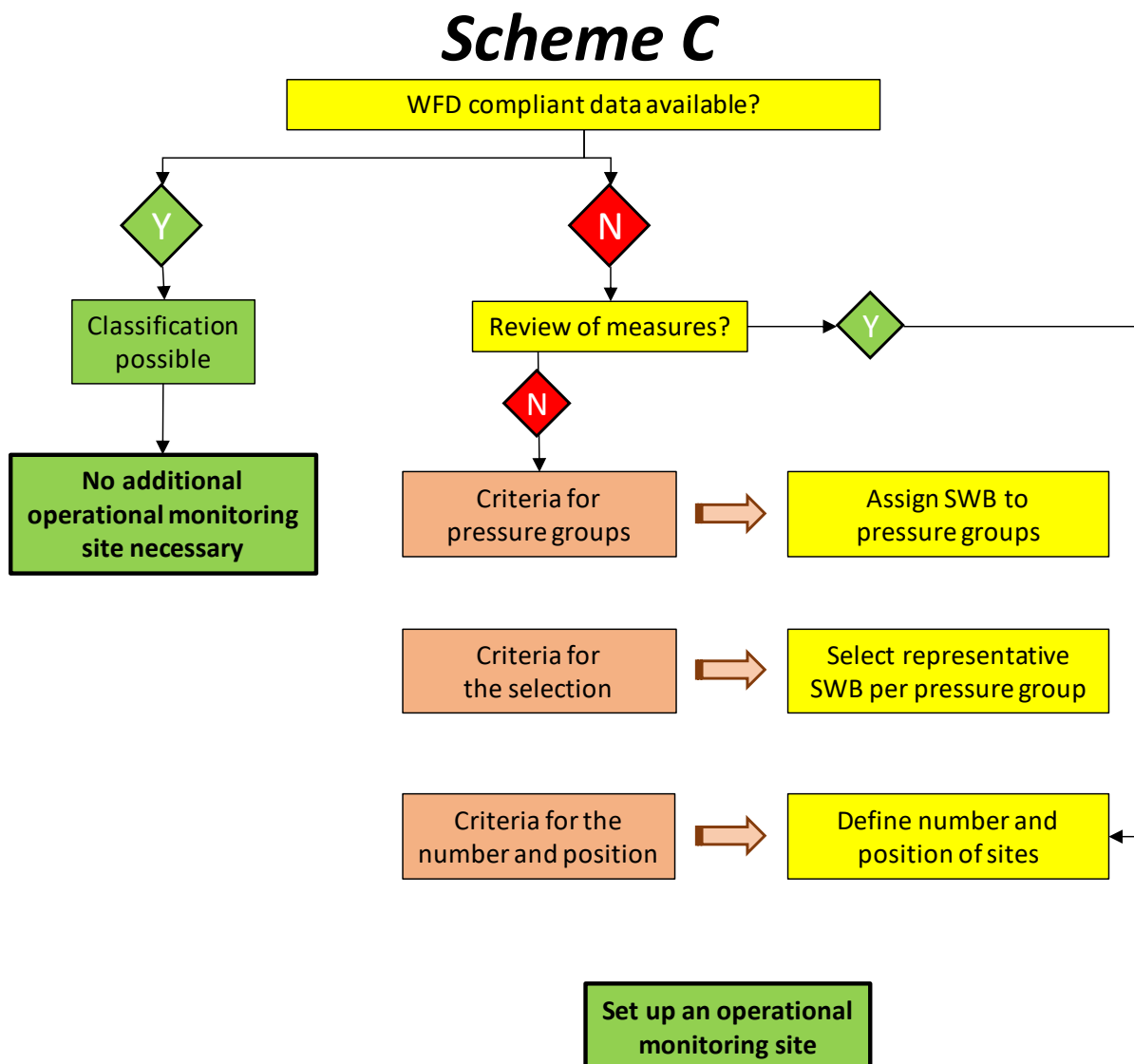
### **Criteria for the selection of representative water bodies from the group:**

- Pollution from diffuse sources
- for successive SWB
  - diffuse load is uniform
  - monitoring site situated in the last SWB (most downstream)
  - Classification results can be applied to the SWB above (upstream)
- for SWB in different regions
  - diffuse load is uniform
  - SWB belong to the same type
  - SWB are comparable in terms of agricultural use

- Affected SWB of the group are affected by the same substance or combination of substances
- At least 25% of the SWB in a group are selected as representatives

**Criteria for the setting up a monitoring site in rivers**

- one site per SWB which is representative for the pollution
- Preferably at the lower end of the SWB
- Beware dilution effects of tributaries
- Distance to possible additional point sources should be at least 1 km or – if the river breadth is >100 m – at least the 10-fold of the river breadth



**Figure 3: Scheme C of decision tree for choosing operational monitoring sites.**

**Criteria for pressure groups in rivers**

A group of SWB

- with same river type,
- affected by the same pressure,
- which can be investigated and classified by the same indicative biological quality element

#### **Criteria for the selection within each pressure group**

- Ideally 1/3 of SWB within each pressure group
- Hydrological context: if possible, select sites within a hydrological subbasin
- No additional pressure (if possible)
- Easy to reach

#### **Criteria for the number and position**

- Morphology: one site in the longest uniform section
- Water abstraction: one site directly below the abstraction
- Continuum: one or two sites, above the weir or dam; if there is series of several weirs or dams, another one below the lowest one
- Impoundment: one site beginning (source) of the impoundment, optionally another site directly above the dam

### **3.9. Surface Water Investigative Monitoring**

**Investigative monitoring** may be required in specific situations as defined in Annex V of the Water Framework Directive (WFD), including:

- where the reasons for exceedances of environmental objectives are unknown;
- where surveillance monitoring indicates that objectives are unlikely to be achieved and operational monitoring has not yet been established; or
- to determine the magnitude and impacts of accidental pollution events.

Investigative monitoring is therefore **problem-oriented and case-specific**, and its design must be tailored to the particular issue being addressed. In many cases, it involves **more intensive sampling strategies**, higher monitoring frequencies, and a focused selection of relevant water bodies, sub-areas, and quality elements.

In addition, investigative monitoring may include components of **alarm or early warning systems**, for example to protect drinking water abstractions from accidental pollution. Such systems may rely on **continuous or semi-continuous measurements** of selected parameters, including key physico-chemical indicators (e.g. dissolved oxygen) and, where appropriate, biological indicators.

Given its targeted and flexible nature, investigative monitoring is essentially an “**on-demand**” approach, triggered by specific problems or knowledge gaps. As a result, it is not possible to define standard monitoring sites, parameters, or frequencies in advance; instead, monitoring programmes must be **designed dynamically**, based on the specific objectives and pressures under investigation.

### 3.10. Sampling site selection in surveillance and operational monitoring

**Surveillance monitoring sites** should be strategically located to provide a representative and long-term overview of surface water status across the river basin district. These sites should remain **consistent across multiple RBMP cycles**, allowing for the assessment of trends and long-term changes in water quality and ecological conditions.

In contrast, **operational monitoring sites** should be applied in a more flexible manner and should not be considered part of a fixed, permanent monitoring network. Instead, their selection should directly reflect the need to assess **water bodies identified as being at risk** of failing environmental objectives.

Once the ecological status of a water body has been reliably determined through operational monitoring, it is advisable to **shift monitoring efforts to other at-risk water bodies in subsequent monitoring campaigns**. This approach allows for a more efficient use of resources and supports the progressive improvement of knowledge across the river basin district, ultimately contributing to a more comprehensive and targeted understanding of pressures and impacts.

### 3.11. Sampling and analysis

The representativeness of monitoring programmes begins with **careful and well-informed planning**, making full use of all available data and knowledge within the river basin. A crucial first step is to clearly define the **objectives of monitoring**—that is, the specific questions the monitoring programme is intended to answer.

An equally important aspect is the **planning and execution of sampling**. Errors introduced at the sampling stage—whether through inadequate design or improper field procedures—cannot be corrected by even the most advanced analytical methods. Therefore, it is essential to ensure the use of **appropriate equipment**, accurate selection of sampling locations, correct application of standardised methods, and the deployment of **properly trained personnel**. Effective communication with laboratories is also critical, particularly regarding sampling requirements, sample handling, preservation, and transport, in order to prevent any alteration or degradation of samples before analysis.

A number of international standards define the principles and requirements for ensuring high-quality monitoring and laboratory performance. In particular, **ISO/IEC 17025** provides a widely recognised framework for the competence of testing and calibration laboratories. This standard offers guidance on the key elements required to produce reliable and traceable results, including proper laboratory infrastructure, equipment management, and operational procedures. It

emphasises the need for **safe handling, transport, storage, and maintenance of equipment**, as well as the management of consumables to prevent contamination or deterioration.

Quality assurance (QA) is therefore a fundamental component of monitoring systems, ensuring that results are **valid, reliable, and comparable**. It must be embedded as a continuous and evolving process within laboratory operations, supporting the ongoing improvement of analytical performance and the overall quality of monitoring data.

### 3.12. Data management, maintenance and reporting

Purpose of monitoring is to provide sound data on the current burden of pollution of water bodies, demonstrate long term changes (as result of measures or changes of pressures) as basis for fact-based decision making. Monitoring produces a high amount of data and requires, thus, a consolidated and uniform definition of requirements and format of data. This starts with the output of raw data and their plausibility, storage and maintenance. Full power of data can only be withdrawn, when a complete and consistent set of data is available in a well-maintained database. Pre-requisite is a solid and operational network including a powerful server, which connects all involved institutions.

Collaboration between institutions and entities is key to spreading relevant information and gaining added value from data. This regards checking raw data for plausibility and interpretation of data from different users' angles.

### 3.13. Sustainable Budget

Any form of monitoring requires sustainable budget to guarantee a meaningful set of data. The WFD provides a concept, which needs to be adapted to the needs of every economy to best suit its demands. This encompasses resources for already existing structures in the competent authorities, Ministries and entities to coordinate and administer the concept of the WFD, but also additional expenses for sampling, analysis and data maintenance. Thus, a high degree of awareness about the tasks and obligations at high level is needed to streamline the activities related to the implementation of the WFD.

- There is need for governmental understanding of the necessity, importance and benefits of water monitoring and for strong commitment of sufficient sustainable financing of water monitoring.
- Detailed cost estimations are needed, covering all aspects of monitoring. The estimate should distinguish between
  - sufficient one-time budget to cover the investment costs like infrastructure, equipment etc.;
  - sufficient and guaranteed permanent long-term budget to cover maintenance of infrastructure and equipment; and
  - operational costs for staff, training and consumables.
- It is necessary to demonstrate the political decision makers the benefits of monitoring. The costs of monitoring should be compared with the national economic

benefits gained from e.g. water industries and water related tourism. Such a comparison could strongly convince decision makers of the importance of comprehensive water monitoring.

## 4. WORKPLAN FOR IMPLEMENTATION

The following chapter gives an overview of prerequisites and steps that can be used as a checklist for establishing a WFD-compliant surface water monitoring system. It covers the governance structure and roles of responsible authorities, the design of the monitoring system based on river basin characterisation, and the development of monitoring programmes including selection of parameters, sites, and frequencies. The chapter further describe the implementation of field and laboratory activities, the establishment of data management and QA/QC systems, and the processes for status assessment, classification, and reporting.

### 4.1. Governance, Scope, and Responsibilities

#### 4.1.1. Institutional Setup

- Designation of the **Competent Authority (CA)**
- Definition of roles:
  - Monitoring authority / agency
  - Laboratory services
  - Data management authority
  - Reporting authority
- Establish coordination mechanisms with:
  - River basin authorities
  - Nature conservation bodies
  - Stakeholders (where applicable)

#### 4.1.2. Scope Definition

- River basin district(s)
- Surface water categories:
  - Rivers
  - Lakes
  - Transitional waters
  - Coastal waters
- Monitoring cycle aligned with the **6-year WFD planning cycle**

### 4.2. Phase 1 – Baseline Analysis and System Design

#### 4.2.1. Characterisation of Surface Waters (Article 5)

- Delineation and typology of surface water bodies
- Review of existing data and monitoring programmes
- Identification of:
  - Significant pressures and impacts
  - Waters at risk of failing good status

**Deliverables:**

- Typology and water body register
- Pressure and impact assessment

#### 4.2.2. Definition of Monitoring Objectives

Biological Elements:

- Establish a compliant sampling method
- Establish a compliant lab method
- Gather data on biology in a consolidated database
- Establish a pressure-response-relationship
- Define criteria for type-specific reference (benchmark) conditions (E)
- Set class boundaries (EQR)
- Compile all methods to a binding guidance document (as a basis for the monitoring)

Chemical Elements:

- Establish a pressure-response-relationship
- Which chemical pollutants and indicators are already monitored?
- Which chemical pollutants are missing?
- Establish a compliant lab method

Define objectives for each monitoring type:

- **Surveillance monitoring**
- **Operational monitoring**
- **Investigative monitoring**

Ensure consistency with:

- Ecological quality ratios (EQRs)
- Environmental Quality Standards (EQS)

**Deliverables:**

- Monitoring strategy document

- Type-specific EQRs
- National sampling and assessment guidances

### 4.3. Phase 2 – Monitoring Programme Development (Article 8 & Annex V)

#### 4.3.1. Selection of Monitoring Types

Monitoring type	Purpose
Surveillance	Long-term trends, baseline status
Operational	Status of water bodies at risk
Investigative	Causes of failure or incidents

#### 4.3.2. Parameter Selection

##### 4.3.2.1. Ecological elements:

- Biological quality elements (BQEs):
  - Phytoplankton
  - Macrophytes and phytobenthos
  - Benthic invertebrates
  - Fish fauna
- Supporting elements:
  - Hydromorphology
  - Physico-chemical parameters

##### 4.3.2.2. Chemical elements:

- Priority substances
- River Basin Specific Pollutants (RBSPs)

#### Deliverables:

- Parameter list by water category & monitoring type

#### 4.3.3. Monitoring Network Design

- Selection of monitoring sites:
  - Representative sites
  - Risk-based site selection
- Spatial and temporal coverage
- Sampling frequency according to Annex V

**Deliverables:**

- Monitoring network maps
- Sampling schedules

## **4.4. Phase 3 – Operational Implementation**

### **4.4.1. Field Sampling and Measurements**

- Development of Standard Operating Procedures (SOPs)
- Training of field personnel
- Implementation of sampling campaigns

### **4.4.2. Laboratory Analysis**

- Use of accredited laboratories
- Compliance with QA/QC requirements
- Intercalibration where applicable

**Deliverables:**

- SOPs
- Sampling and analysis reports

## **4.5. Phase 4 – Data Management and Quality Assurance**

### **4.5.1. Data Management System**

- Establishment or adaptation of a central database
- Metadata documentation
- Data validation and plausibility checks

### **4.5.2. Quality Assurance & Quality Control**

- Internal QA/QC procedures
- Participation in interlaboratory comparisons
- Audit and review mechanisms

**Deliverables:**

- Validated monitoring datasets
- QA/QC reports

## **4.6. Phase 5 – Assessment, Classification, and Reporting**

### **4.6.1. Status Assessment**

- Calculation of ecological quality ratios (EQRs)
- Status classification (high → bad)
- Chemical status compliance check

#### 4.6.2. Trend and Pressure Analysis

- Temporal trend analysis
- Linkage with pressures and measures

#### 4.6.3. Reporting

- Input to RBMPs and Programmes of Measures
- Reporting to the European Commission (WISE)

#### Deliverables:

- Status classification results
- Assessment reports
- WFD reporting datasets

### 4.7. Phase 6 – Review and Adaptive Improvement

- Evaluation of monitoring effectiveness
- Review of site selection, parameters, and frequency
- Integration of new methods (e.g. continuous sensors, eDNA)
- Update monitoring programme for next cycle

#### Deliverables:

- Monitoring programme review
- Updated workplan for next WFD cycle

### 4.8. Indicative Timeline (6-Year Cycle)

**Table 7: Indicative timeline for WFD Monitoring**

Year	Key activities
1	Characterisation, design, network setup
2–5	Monitoring implementation & QA
4–5	Status assessment & trend analysis
6	Reporting, review, and redesign

## 4.9. Key Risks and Mitigation Measures

- **Data gaps** → risk-based prioritisation
- **Resource constraints** → phased implementation
- **Method changes** → harmonisation and documentation
- **Climate impacts** → adaptive monitoring strategies

# 5. CURRENT WATER MONITORING SITUATION IN SERBIA

## 5.1. National Legal and Institutional Framework – Serbia

### 5.1.1. River Basin Management Structure

The Republic of Serbia has adopted a national approach to integrated river basin management that is **broadly aligned with the principles of the EU Water Framework Directive (WFD)**. Within this framework, **the entire national territory is treated as a single water management unit**, while being internally organised into five river basin districts:

- **the Danube,**
- **Sava,**
- **Morava,**
- **Ibar–Lepenac, and**
- **Beli Drim districts.**

In institutional and planning terms, however, these districts are not managed through separate plans. Instead, **Serbia has opted for the preparation of a single, national River Basin Management Plan (RBMP)**, covering the period 2021–2027. This choice reflects the hydrographic reality that the vast majority of the country—over 90% of its territory—belongs to the Danube River Basin, making a unified planning approach both practical and consistent with international coordination requirements under the Danube River Basin Management Plan.

The RBMP for 2021–2027 represents Serbia’s first full implementation cycle under the WFD framework. It is therefore positioned less as a fully mature management instrument and more as a foundational planning document, aimed at establishing the necessary methodological, institutional, and analytical basis for future cycles. In this context, it aligns with the broader obligations under EU accession (Chapter 27) and contributes to the harmonisation of Serbia’s water management system with EU standards and transboundary coordination processes, particularly within the International Commission for the Protection of the Danube River.

The planning logic embedded in the RBMP follows the standard WFD cycle. It includes a structured sequence of analytical and operational steps: assessment of pressures and impacts on water bodies, development of monitoring systems, classification of water status, and the definition of a Programme of Measures designed to achieve environmental

objectives. These steps are formally in place and are consistent with WFD methodological guidance.

Despite this formal alignment, the practical implementation of the river basin management cycle remains at an early stage. The RBMP itself acknowledges that significant components of the planning process—particularly monitoring, data collection, and status assessment—are still under development. As a result, many elements of the plan rely on incomplete datasets, indirect assessments, or expert judgement rather than comprehensive empirical evidence. This situation reflects a broader transition phase, in which Serbia is still building the technical and institutional capacity required for fully evidence-based water management.

In this context, the effectiveness of the river basin management structure is closely linked to the ongoing development of monitoring networks and information systems. The RBMP emphasises that the current planning cycle is heavily dependent on strengthening these foundations, particularly in terms of improving spatial coverage of monitoring stations, expanding parameter sets, and increasing the frequency and reliability of data collection. Until such improvements are achieved, the planning system remains constrained in its ability to accurately assess water status and to design and prioritise effective measures.

Overall, Serbia's river basin management structure demonstrates a high degree of formal compliance with WFD requirements but is still evolving in operational terms. The current cycle can therefore be characterised as a capacity-building phase, in which the institutional and methodological framework has been established, but its full functionality depends on addressing significant gaps in monitoring, data availability, and analytical capability.

### 5.1.2. Institutional Responsibilities

The institutional framework for water management in Serbia is characterised by a multi-level governance system involving central authorities, specialised agencies, regional operators, and local service providers. While roles and responsibilities are formally defined, the system is marked by a division of competences across institutions, particularly in relation to monitoring and implementation.

#### Central Level

At the central level, the **Ministry of Agriculture, Forestry and Water Management (MAFWM)** holds the overall responsibility for water policy. It defines strategic priorities, ensures alignment with national development objectives, and oversees the implementation of water management legislation. Within the Ministry, the **Republic Water Directorate (RWD)** acts as the key coordinating body for the WFD process. It is responsible for the preparation and coordination of the River Basin Management Plan, supervision of policy implementation, and communication with international bodies, including EU institutions and river basin organisations.

#### Operational / Regional Level

Operational water management is primarily carried out by the two **Public Water Management Companies (PWMCs)**—**Srbijavode** and **Vode Vojvodine**. These entities are responsible for the day-to-day management of water infrastructure, including flood protection systems, river regulation works, and water allocation. They also play an important role in supporting the implementation of measures defined in the RBMP and contribute technical input to planning processes. Their responsibilities extend to licensing and operational oversight of water use within their respective territories, making them key actors at the interface between policy and implementation.

### Monitoring Institutions

Monitoring responsibilities are divided between two specialised institutions, which represents a critical feature of the Serbian system. The **Serbian Environmental Protection Agency (SEPA)** is responsible for monitoring the chemical and ecological status of surface and groundwater. It develops and implements water quality monitoring programmes and maintains environmental databases, including pollutant registers. In parallel, the **Republic Hydrometeorological Service (RHMS)** is responsible for hydrological monitoring, including the quantitative status of groundwater and hydrological parameters of surface waters. This division of responsibilities reflects a functional distinction between quality and quantity monitoring, but it also introduces challenges related to the integration of data and the development of a unified water information system.

### Local Level

At the local level, **municipalities and their Public Utility Companies (PUCs)** are responsible for the provision of water supply and wastewater services. They operate and maintain local infrastructure for drinking water treatment and distribution, as well as wastewater collection and treatment. Furthermore, they play a central role in implementing components of the Programme of Measures, particularly those related to urban wastewater management and pollution control. However, their capacity varies significantly across the country, which affects the level of service provision and the effectiveness of measure implementation.

### Other Actors

In addition to these core actors, several other institutions contribute to the water management framework. Sectoral ministries are involved according to their mandates, including environmental protection, public health, spatial planning, and energy. Inspectorates are responsible for enforcement and compliance control, while research institutes and academic organisations provide scientific support, data analysis, and methodological development. Together, this network of institutions forms a comprehensive governance structure, but one that requires strong coordination mechanisms to function effectively.

Overall, while institutional responsibilities in Serbia are clearly defined on paper, the effectiveness of the system depends on coordination across multiple actors, sufficient administrative capacity, and improved integration of monitoring and data management functions.

### 5.1.3. Legal Framework

The legal framework governing water management in the Republic of Serbia is primarily based on the **Law on Water (“Official Gazette of the Republic of Serbia”, No. 30/2010, 93/2012, 101/2016, 95/2018 and subsequent amendments)**, which constitutes the central legal act for the sector. This law establishes the principles of integrated water management, defines river basin planning obligations, and provides the legal basis for the preparation and implementation of the River Basin Management Plan (RBMP). It formally incorporates key elements of the **EU Water Framework Directive (Directive 2000/60/EC)**, including environmental objectives, prevention of deterioration, and the requirement for coordinated management at river basin level.

Complementing the Law on Water, Serbia has adopted a set of **secondary legislation and rulebooks**, which provide the technical basis for implementation. Among the most relevant is the **Rulebook on parameters of ecological and chemical status of surface waters and parameters of chemical and quantitative status of groundwater (“Official Gazette of the Republic of Serbia”, No. 74/2011)**, which defines classification criteria and monitoring requirements for water status assessment. Additional rulebooks regulate sanitary protection zones, water quality standards for human consumption, and other specific aspects of water governance.

Beyond the legislative framework, a key strategic document is the **Water Management Strategy of the Republic of Serbia (adopted under the Law on Water)**, which serves as the overarching planning instrument guiding water sector development up to 2030. The Strategy establishes **integrated water management as the main long-term objective** and defines sectoral priorities, investment needs, and implementation timelines. It also identifies structural deficiencies, including insufficient monitoring, weak institutional capacity, and inadequate funding, and proposes measures to address these challenges.

The Strategy explicitly highlights that **existing monitoring systems for surface water and groundwater do not provide sufficient data for effective water management or compliance with EU legislation**, which has direct implications for the implementation of the RBMP and other legal obligations. This confirms the findings of the RBMP and reinforces the conclusion that legal provisions are not yet supported by adequate technical and operational capacity.

Serbia has made substantial progress in the **transposition of EU water-related directives**, particularly in the context of EU accession under Chapter 27. The legal framework reflects partial or advanced alignment with the following directives<sup>1</sup>:

- **Water Framework Directive (2000/60/EC)**
- **Urban Wastewater Treatment Directive (91/271/EEC)**
- **Drinking Water Directive (98/83/EC; recast Directive (EU) 2020/2184)**
- **Nitrates Directive (91/676/EEC) (partial implementation)**

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<sup>1</sup> At this point, it should be mentioned that the recently passed **Directive 2026/805** amends the WFD, the Groundwater Directive, and the EQS Directive. Among other things, this amendment expands and revises priority substances, adds certain emerging pollutants and introduces stricter threshold values.

However, the RBMP and Strategy both indicate that transposition remains **incomplete in certain areas**, particularly with regard to:

- designation of **nitrate vulnerable zones**
- full implementation of **Bathing Water Directive (2006/7/EC)**
- establishment of **comprehensive protected area registers**

The core operational instrument of the legal framework is the **Programme of Measures (PoM)**, established in accordance with Article 11 of the WFD and integrated into the RBMP. The PoM distinguishes between **basic measures**, which ensure compliance with EU directives, and **complementary measures**, which address remaining gaps in achieving environmental objectives. In Serbia, the PoM is heavily focused on basic measures, particularly those related to wastewater treatment, pollution control, and reduction of nutrient inputs.

Despite this relatively comprehensive legal and strategic framework, both the RBMP and the Water Management Strategy emphasise that **implementation and enforcement remain limited**. Many provisions exist on paper but are not yet effectively operational due to:

- insufficient administrative and technical capacity
- inadequate monitoring systems
- delays in infrastructure development
- limited financial resources

These constraints are particularly pronounced in areas requiring large-scale investments, such as wastewater treatment, monitoring network expansion, and pollution control systems.

Furthermore, the Strategy points to broader **governance challenges**, including fragmented responsibilities across ministries, insufficient coordination in planning and financing of projects, and underdeveloped institutional capacities at both national and local levels. These challenges directly affect the enforceability of legal provisions and the effectiveness of policy implementation.

In conclusion, Serbia's legal framework for water management demonstrates a **high degree of formal alignment with EU requirements**, supported by a robust primary law, a growing body of secondary legislation, and a comprehensive strategic framework. However, the transition from legal compliance to effective implementation remains incomplete. The lack of reliable monitoring data, combined with institutional and financial constraints, continues to limit the practical application of legal provisions and the achievement of WFD objectives. Strengthening enforcement mechanisms, completing the transposition of remaining directives, and aligning legal requirements with operational capacities will be essential for improving the overall effectiveness of the framework.

#### 5.1.4. Observations and Considerations

The review of the legal and institutional framework for water management in Serbia indicates that the country has established a **comprehensive and formally well-aligned**

**system**, broadly consistent with the requirements of the EU Water Framework Directive (WFD). The existence of a unified River Basin Management Plan, a clearly defined institutional structure, and a relatively advanced legal framework demonstrates a strong commitment to adopting EU water management principles. However, both the RBMP and the Water Management Strategy consistently show that the **operational effectiveness of this framework remains constrained by systemic weaknesses**, particularly in relation to monitoring, institutional capacity, and implementation.

A central observation concerns the **gap between formal alignment and practical implementation**. While Serbia has successfully transposed key elements of EU legislation into national law and established the necessary planning instruments, the actual application of these provisions is still limited. This gap is not primarily due to missing legal provisions, but rather to **insufficient administrative, technical, and financial capacity**. The Strategy explicitly highlights that key institutions, including the Water Directorate, are not yet adequately equipped to fulfil all legal obligations, particularly those associated with EU accession.

Closely linked to this issue is the **fragmentation of institutional responsibilities and coordination challenges**. Although responsibilities are clearly defined across ministries, agencies, and operational bodies, the system involves a large number of actors with overlapping or interdependent mandates. The Strategy points to an “unsatisfactory degree of coordination” in planning, financing, and implementing water sector investments, which reduces the efficiency of governance and delays the execution of key measures. This fragmentation is particularly relevant for cross-cutting issues such as water quality management, infrastructure development, and environmental protection, where effective coordination is essential for achieving measurable results.

A critical constraint throughout the system is the **limited capacity and fragmentation of the monitoring framework**. The division of responsibilities between institutions responsible for water quality (SEPA) and water quantity (RHMS), while functionally logical, has led to challenges in data integration and system coherence. More importantly, both the RBMP and the Strategy emphasise that existing monitoring systems do not provide sufficient data to support effective decision-making or to ensure compliance with EU requirements. This results in a situation where a significant proportion of water bodies cannot be reliably assessed, and where planning decisions are often based on incomplete or low-confidence information. Consequently, the entire river basin management cycle—from status assessment to the design of measures—is affected by uncertainty.

Another important consideration is the **strong dependence of environmental outcomes on infrastructure development**, particularly in the wastewater sector. The legal framework and Programme of Measures place significant emphasis on the implementation of EU directives, especially the Urban Wastewater Treatment Directive and the Nitrates Directive. However, the Strategy highlights that **investment levels have been consistently below what is required**, and that water infrastructure has deteriorated over time due to insufficient maintenance and limited capital investment. This creates a structural constraint where legal obligations exist, but the physical systems required to meet them are not yet in place.

At the local level, the effectiveness of the system is further influenced by **varying institutional capacities among municipalities and public utility companies**. The Strategy indicates that local administrations often lack the technical, financial, and organisational capacity to prepare and implement projects, particularly those requiring international financing. This variability limits the consistent implementation of the Programme of Measures across the country and contributes to regional disparities in water service provision and environmental performance

Finally, the overall assessment suggests that Serbia is currently in a **transitional phase of water management development**, moving from a predominantly infrastructure- and sector-based approach towards an integrated, WFD-compliant system. The Strategy explicitly recognises that achieving fully integrated water management will require **long-term efforts, significant financial investment, and substantial capacity building** across all levels of governance. In this context, the current planning cycle should be understood primarily as a **capacity-building and system-establishment phase**, rather than a stage of full implementation.

In summary, while Serbia has established the core elements of a modern water management framework, the effectiveness of this system is currently limited by **institutional fragmentation, insufficient monitoring capacity, data gaps, and financial constraints**. Addressing these issues will be essential for bridging the gap between formal compliance and practical implementation, and for enabling the country to achieve its environmental objectives under the WFD in future planning cycles.

## **5.2. Human Resources and Capacity Requirements – Biological Monitoring**

### **5.2.1. General Principles**

To ensure successful implementation of WFD-compliant biological monitoring, **trained and experienced experts are essential**. Monitoring teams must be capable of covering all Biological Quality Elements (BQEs) and supporting hydromorphological assessments in accordance with **Annex V requirements**.

The staffing levels presented below represent **minimum requirements per sampling campaign**. Field teams should consist of **at least two persons** to ensure safety, quality control, and validation of results. Efforts should be made to promote **gender balance** in staffing.

## 5.2.2. Minimum Staffing Requirements per Biological Quality Element

Table 8: Minimum staffing requirements per BQE.

Biological Quality Element	Number of Staff	Prerequisites
<b>MZB (macrozoobenthos)</b>	3 (min. two hydrobiologists + one chemist)	Coverage of all macroinvertebrate groups at required taxonomic resolution; strong coordination between field and laboratory; chemist responsible for physico-chemical measurements
<b>PHB / PHP (phytobenthos, phytoplankton)</b>	3 (min. two hydrobiologists + one chemist)	Experienced algae specialist (especially diatoms); laboratory capacity required for chlorophyll-a analysis
<b>MAC (macrophytes)</b>	1	Specialist in aquatic vegetation; diving skills may be required depending on site conditions
<b>FIS (fish)</b>	4 (1 expert + 3 trained staff)	Expertise in river-type-specific sampling methods (e.g. electrofishing); high level of experience required, particularly in large rivers
<b>HYMO (hydromorphology)</b>	2	One expert in hydrology and one expert in morphology; understanding of river processes and habitat structure

**Abbreviations:** MZB = macrozoobenthos (invertebrates); PHB = phytobenthos (diatoms); PHP = phytoplankton; MAC = macrophytes; FIS = fish; HYMO = hydromorphology

## 5.2.3. Competence and Qualification Requirements

- Staff must have **relevant academic backgrounds** (e.g. hydrobiology, ecology, environmental sciences, chemistry)
- Taxonomic expertise is critical, particularly for:
  - macroinvertebrates
  - phytobenthos
  - phytoplankton
  - macrophytes
  - fish fauna
- Laboratories must be equipped and staffed for **specialised analyses**, including chlorophyll-a and biological sample processing
- Competence must be aligned with **intercalibration requirements** and WFD classification systems

#### 5.2.4. Training and Capacity Development

- Continuous **professional development and training programmes** are essential to maintain and upgrade skills
- Institutions should establish **formal internal and external training plans**, with proper documentation
- Regular participation in:
  - interlaboratory comparisons
  - intercalibration exercises
- Training should specifically address **RBMP-identified gaps**, including:
  - limited biological datasets
  - insufficient taxonomic resolution
  - inconsistent application of methods

#### 5.2.5. Organisational and Institutional Requirements

- Monitoring activities should be **centrally coordinated** to avoid fragmentation and ensure consistency
- Clear **roles, responsibilities, and job descriptions** are required
- Regular communication and exchange between field teams, laboratories, and data managers is essential
- Monitoring responsibilities should not be treated as secondary tasks but require **dedicated staff and structures**

#### 5.2.6. Staff Retention and Workforce Planning

- Adequate remuneration is necessary to attract and retain qualified staff
- High levels of motivation should be supported through:
  - clear task definition
  - recognition of expertise
  - career development opportunities
- Forward-looking workforce planning is required to:
  - ensure balanced staffing
  - avoid loss of expertise
  - promote recruitment of young professionals

### 5.3. Human Resources and Capacity Requirements – Chemical Status Assessment

#### 5.3.1. Required Functions and Roles

Chemical status assessment under the WFD requires a combination of **field sampling staff, laboratory analysts, QA/QC specialists, and data experts**. Minimum functional roles include:

- **Sampling teams (2–3 persons per campaign):**
  - Trained technicians for water, sediment, and biota sampling
  - Knowledge of WFD-compliant sampling protocols and preservation requirements
- **Laboratory analysts:**
  - Chemists specialised in trace analysis of Priority Substances
  - Expertise in organic and inorganic pollutant analysis (e.g. metals, pesticides, PAHs)
- **Instrumentation specialists:**
  - Operation and maintenance of advanced analytical equipment (e.g. GC-MS, LC-MS/MS, ICP-MS)
- **QA/QC officers:**
  - Oversight of quality systems, calibration, validation, and interlaboratory comparisons
- **Data management and assessment experts:**
  - Processing of analytical results
  - Compliance checking against Environmental Quality Standards (EQS)
  - Preparation of WISE-compatible datasets

### 5.3.2. Competence and Laboratory Requirements

- Laboratories must achieve and maintain **accreditation (e.g. ISO/IEC 17025)**
- Analytical methods must meet **WFD performance criteria**, including:
  - limits of quantification below EQS values
  - validated and standardised methods
- alternatively, collaboration with regional and beyond regional laboratories should be considered to overcome national limitations
- Staff must be trained in:
  - trace-level chemical analysis
  - sampling and preservation techniques
  - uncertainty estimation and quality control

### 5.3.3. Equipment and Technical Capacity

- Adequate infrastructure is required, including:
  - advanced analytical instruments (GC-MS, LC-MS/MS, ICP-MS)
  - laboratory information management systems (LIMS)
- Capacity for **biota and sediment analysis** must be ensured, not only water samples
- Regular calibration and maintenance of equipment is essential

#### 5.3.4. Training and Quality Assurance

- Continuous **training in analytical methods and QA/QC procedures** is required
- Mandatory participation in:
  - interlaboratory comparison exercises
  - proficiency testing schemes
- Training should target RBMP-identified weaknesses, including:
  - incomplete monitoring of Priority Substances
  - insufficient detection limits
  - inconsistent QA/QC application

#### 5.3.5. Organisational Considerations

- Chemical monitoring should be **institutionalised and not project-based** and sustainably budgeted
- Strong coordination between:
  - sampling teams
  - laboratories
  - competent authorities
- Clear workflows are required from sampling to reporting to ensure **data traceability and compliance**

## 6. GAP ANALYSIS VS. EU REQUIREMENTS (WFD IMPLEMENTATION ROADMAP)

### 6.1. Purpose of the Gap Analysis

This section provides a structured comparison between the **target state defined by this MDP (Phases 1–6)** and the **current status of surface water monitoring in Serbia**, based on the River Basin Management Plan (RBMP), the Water Management Strategy, and the European Commission’s 2023 Serbia Report.

The analysis identifies key gaps and translates them into **priority actions**, forming a practical implementation roadmap toward WFD compliance. It highlights a **consistent and systemic gap between formal alignment with EU requirements and effective implementation in practice**. This gap is particularly pronounced in the areas of **monitoring, data availability, institutional capacity, and infrastructure development**, all of which are critical for compliance with Chapter 27 (Environment and Climate Change).

## 6.2. Phase-by-Phase Gap Overview

While Serbia has largely established the planning and legal foundations of WFD-compliant monitoring, significant gaps remain across all operational phases, particularly in monitoring implementation, data integration, and status assessment, resulting in a system that is only partially functional.

**Table 9: General gap overview aligned with MDP phases.**

MDP Phase	WFD Requirement	Current Status in Serbia	Gap Level
<b>Phase 1 – Characterisation</b>	Full typology, pressures, risk assessment	RBMP completed; typology and pressure analysis largely established but strongly constrained by limited monitoring data and low-confidence assessments	<b>Moderate</b>
<b>Phase 2 – Programme Design</b>	WFD-compliant monitoring (BQEs, chemicals, network)	Monitoring programmes formally defined (surveillance, operational, investigative), but network design is incomplete; limited spatial coverage and insufficient biological and chemical parameter coverage	<b>High</b>
<b>Phase 3 – Implementation</b>	Regular, systematic monitoring campaigns	Monitoring performed, but with limited station density, inconsistent frequency, and partial parameter coverage; groundwater monitoring particularly insufficient; data often not representative	<b>High</b>
<b>Phase 4 – QA/QC &amp; Data</b>	Accredited labs, QA/QC systems, integrated databases	Laboratory capacities exist but system is fragmented; QA/QC not fully harmonised; data split between SEPA and RHMS; lack of unified national water information system	<b>High</b>
<b>Phase 5 – Assessment &amp; Reporting</b>	Full classification (EQR, EQS) and WISE reporting	Status assessments largely incomplete; many water bodies have unknown chemical status; assessments often based on limited datasets or expert judgement; reporting partially aligned but low confidence	<b>Very High</b>
<b>Phase 6 – Adaptive Improvement</b>	Continuous optimisation of monitoring system	Improvements ongoing, mainly driven by RBMP cycle and EU accession process; however, optimisation is slow, constrained by funding, institutional capacity, and data limitations	<b>Medium–High</b>

## 6.3. Key Systemic Gaps Identified

Building on the observations in Chapter 5, the following systemic gaps are synthesised. The phase-based comparison highlights a number of **systemic gaps** that cut across all stages of the Monitoring Development Plan (MDP). These gaps are not isolated technical shortcomings, but rather **structural issues affecting the overall functionality of the**

**monitoring system** and its ability to support compliance with the Water Framework Directive (WFD).

A first and most critical systemic gap relates to the **insufficient effectiveness of the monitoring system as a whole**. Although Serbia has formally established monitoring programmes in line with WFD requirements, the actual network remains underdeveloped. Spatial coverage is limited, monitoring frequencies are often below required levels, and parameter coverage—particularly for priority substances and biological elements—is incomplete. As explicitly stated in the Water Management Strategy, existing monitoring does not generate sufficient data for effective water management or compliance with EU requirements. This gap propagates through all subsequent phases of the system, affecting assessment, planning, and decision-making.

Closely linked to this is a second systemic gap concerning **data availability, reliability, and integration**. The current monitoring outputs do not provide a robust and coherent dataset for status classification. In many cases, assessments of ecological and chemical status rely on limited measurements or expert judgement, resulting in low confidence levels. The fragmentation of responsibilities between SEPA (water quality) and RHMS (water quantity) further contributes to a lack of integrated data management. The absence of a unified national water information system prevents efficient data sharing, validation, and analysis, thereby limiting the development of evidence-based policies and measures.

A third systemic gap is found in **institutional fragmentation and limited administrative capacity**. While responsibilities are formally defined, the involvement of multiple institutions with overlapping or weakly coordinated mandates creates inefficiencies in implementation. The Water Management Strategy identifies insufficient staffing and capacity within key institutions, particularly in the Water Directorate, while the European Commission report highlights broader weaknesses in public administration and coordination mechanisms. These constraints reduce the ability of institutions to design, operate, and continuously improve monitoring programmes in line with WFD requirements.

Another fundamental issue is the **weak linkage between monitoring results and water management decisions**. In a fully functioning WFD system, monitoring outputs should directly inform pressure analysis, status classification, and the prioritisation of measures. In Serbia, however, this feedback loop is only partially operational. Due to limited and uncertain data, the Programme of Measures is often defined based on general assumptions rather than detailed, location-specific evidence. This reduces the efficiency and effectiveness of interventions and delays progress toward achieving environmental objectives.

In addition, there is a significant **dependency on infrastructure and investment conditions**, which represents a structural constraint beyond the monitoring system itself. The effectiveness of water quality monitoring is closely tied to the existence of wastewater treatment, pollution control systems, and hydromorphological management. The Strategy clearly indicates that long-term underinvestment and deterioration of infrastructure continue to affect water status across the country. As a result, even where monitoring exists, the system may continue to record poor status due to unresolved pressures, limiting the impact of management efforts.

A further systemic gap relates to the **limited implementation capacity of the Programme of Measures**. While the RBMP provides a structured and WFD-compliant planning document, many measures remain at the planning stage or are deferred to future cycles. Financial constraints, weak project preparation capacity, and administrative barriers reduce the pace of implementation. The European Commission report similarly identifies limited progress in environmental implementation under Chapter 27, reinforcing the conclusion that the transition from planning to execution remains a key challenge.

Finally, Serbia’s system is characterized by a **slow transition from formal compliance to adaptive management**. The MDP Phase 6 target state requires continuous optimisation of monitoring networks based on feedback and performance evaluation. In Serbia, such adaptive mechanisms are still underdeveloped. Improvements are ongoing, largely driven by external pressures such as EU accession requirements and donor-funded projects, rather than by an internally functioning optimisation loop.

### 6.4. Gap-to-Action Matrix (Priority Measures)

The gap-to-action matrix links the identified systemic gaps to targeted measures and positions them within the WFD implementation cycle. This approach ensures that recommended actions are consistent with the phased development of monitoring systems and river basin management planning.

**Table 10: Gap-to-Action Matrix identifying key measures.**

Gap Area	Identified Gap	Key Measures	Phase Link
<b>Monitoring Programme Implementation</b>	Monitoring programmes formally defined but not fully operational; insufficient spatial coverage, low frequency, and incomplete parameter sets	<ul style="list-style-type: none"> <li>• Expand and optimise national monitoring network to ensure full water body coverage</li> <li>• Increase sampling frequency in line with WFD requirements</li> <li>• Ensure full implementation of surveillance, operational, and investigative monitoring</li> <li>• Strengthen groundwater monitoring integration</li> </ul>	Phase 2 and 3
<b>Biological Monitoring</b>	Limited or inconsistent monitoring of biological quality elements (BQEs); weak taxonomy and expert capacity; partial ecological assessments	<ul style="list-style-type: none"> <li>• Develop and standardise national methods for all BQEs (phytoplankton, macrophytes, benthos, fish)</li> <li>• Build national taxonomic expertise and training programmes</li> <li>• Integrate biological monitoring fully into routine monitoring</li> <li>• Improve intercalibration alignment with EU methods</li> </ul>	Phase 2 and 3
<b>Chemical Monitoring</b>	Incomplete monitoring of priority substances; missing specific pollutants; limited	<ul style="list-style-type: none"> <li>• Expand monitoring to full WFD priority substances and river basin specific pollutants</li> <li>• Introduce systematic sediment and biota monitoring</li> </ul>	Phase 2 and 3

	sediment and biota monitoring	<ul style="list-style-type: none"> <li>• Upgrade analytical methods and detection limits</li> <li>• Ensure compliance with EQS standards</li> </ul>	
<b>Laboratory Capacity &amp; QA/QC</b>	Fragmented laboratory system; inconsistent QA/QC procedures; limited harmonisation and accreditation	<ul style="list-style-type: none"> <li>• Strengthen laboratory accreditation (ISO 17025) across all institutions</li> <li>• Develop national QA/QC framework and protocols</li> <li>• Introduce regular interlaboratory comparisons</li> <li>• Harmonise analytical procedures across institutions</li> </ul>	Phase 3 and 4
<b>Data Management &amp; WISE</b>	Fragmented data systems (SEPA vs RHMS); no unified water information system; limited interoperability and reporting	<ul style="list-style-type: none"> <li>• Establish integrated national water information system</li> <li>• Harmonise datasets between quality and quantity monitoring</li> <li>• Develop WISE-compatible reporting workflows</li> <li>• Improve data validation, storage, and accessibility</li> </ul>	Phase 4 and 5
<b>Status Assessment</b>	Low-confidence status classification; many water bodies with unknown chemical status; reliance on expert judgement	<ul style="list-style-type: none"> <li>• Develop and apply standardized classification tools (EQR, EQS)</li> <li>• Increase data completeness and monitoring coverage</li> <li>• Improve methodologies for ecological and chemical status assessment</li> <li>• Reduce reliance on expert judgement through data-driven assessment</li> </ul>	Phase 2, 3 and 5
<b>Monitoring Network Design</b>	Monitoring network insufficiently representative; limited coverage of pressures and water bodies	<ul style="list-style-type: none"> <li>• Redesign and optimise monitoring network based on pressure–impact analysis</li> <li>• Increase number of monitoring stations</li> <li>• Ensure coverage of all relevant water body types and pressures</li> <li>• Integrate surface–groundwater interaction monitoring</li> </ul>	Phase 1 and 2
<b>Institutional Capacity &amp; Coordination</b>	Fragmented responsibilities (SEPA, RHMS, RWD); weak coordination; limited staffing and technical capacity	<ul style="list-style-type: none"> <li>• Strengthen coordination mechanisms between institutions</li> <li>• Establish integrated monitoring governance framework</li> <li>• Increase staffing and technical capacity</li> <li>• Improve inter-ministerial cooperation and data sharing</li> </ul>	All phases
<b>Sustainability of Monitoring</b>	Monitoring partly project-driven; insufficient and unstable financing; limited long-term planning	<ul style="list-style-type: none"> <li>• Secure long-term funding mechanisms for monitoring</li> <li>• Integrate monitoring into regular institutional budgets</li> <li>• Improve cost recovery and economic instruments</li> <li>• Strengthen project preparation for EU and international funding</li> </ul>	All phases

## 6.5. Conclusions

The gap analysis demonstrates that Serbia has established the **foundational elements of a WFD-compliant water monitoring system**, but that these elements are not yet functioning as a fully integrated and operational framework capable of supporting effective river basin management and EU accession requirements under Chapter 27.

From a structural perspective, Serbia performs relatively well in the **early stages of the Monitoring Development Plan (MDP)**. The legal framework, institutional responsibilities, and overall planning architecture are in place and largely aligned with EU requirements. The preparation of the RBMP and the adoption of the Water Management Strategy confirm that the country has successfully transitioned into a formal WFD-compliant planning system.

However, the analysis clearly shows a **progressive decline in system functionality from planning to implementation and beyond**. While Phases 1–3 (characterisation, programme design, and basic implementation) are partially achieved, they remain limited by incomplete monitoring coverage, insufficient parameter scope, and inconsistent application of methodologies. More critically, Phases 4–6 (data management, assessment, and adaptive improvement) are **significantly underdeveloped**, which prevents the system from operating as a continuous, feedback-driven management cycle.

The most critical limitation lies in the **monitoring system itself**, which does not yet provide sufficient, reliable, and comprehensive data. This weakness propagates through the entire water management cycle. In practice, this means that status assessments are often uncertain, the prioritisation of pressures and measures is insufficiently evidence-based, and the overall effectiveness of the Programme of Measures is reduced. This finding is consistently supported by both national strategic documents and the European Commission assessment, which highlights the need for improved implementation capacity and stronger environmental performance under Chapter 27.

A second key conclusion is that **institutional fragmentation and capacity constraints significantly limit system performance**. Although responsibilities are formally defined, coordination between institutions—particularly in the area of monitoring and data management—remains insufficient. This reduces efficiency, creates duplication or gaps in data collection, and impedes the development of a unified water information system.

Furthermore, the analysis confirms that Serbia's monitoring system is embedded in a broader context of **infrastructure deficits and financial constraints**, which directly affect environmental outcomes. Even where monitoring is implemented, the absence of adequate wastewater treatment and pollution control systems limits the ability to achieve good status. As a result, monitoring alone cannot drive improvements unless it is supported by sustained investment and effective implementation of measures.

Another important finding is the **limited functioning of the adaptive management cycle**. The WFD requires continuous optimisation of monitoring systems based on feedback, performance evaluation, and updated knowledge. In Serbia, this process is still emerging and largely driven by external factors such as EU accession requirements and donor-supported projects, rather than by an internally self-sustaining system.

Overall, the gap analysis confirms that Serbia is currently in a **transitional phase**, moving from formal compliance toward operational implementation. The key challenge is no longer the establishment of legal or planning frameworks, but rather their **effective operationalisation** across all phases of the monitoring and management cycle.

**In summary:**

- Serbia has **achieved a solid legal and planning foundation** for WFD implementation.
- The **monitoring system remains the main bottleneck**, limiting the entire management cycle.
- **Data gaps and institutional fragmentation** reduce the reliability and usability of monitoring outputs.
- **Implementation of measures and infrastructure development** are insufficient to meet environmental objectives.
- The system has **not yet reached the stage of adaptive, data-driven management** required by the WFD.

Serbia has formally aligned its water monitoring and management framework with EU requirements; however, substantial gaps in monitoring performance, data integration, institutional capacity, and implementation effectiveness must be addressed to transition from a planning-based system to a fully operational, evidence-driven river basin management system in line with the Water Framework Directive.

## 7. ROADMAP 2026–2030 (IMPLEMENTATION PLAN)

The following roadmap translates the identified gaps into a **time-bound implementation plan (2026–2030)** aligned with the **identified gaps, MDP phases, RBMP findings, and EU Chapter 27 context**.

**Table 11: Roadmap for Monitoring Development (2026–2030).**

Task	Time-frame	Strategic Focus	Key Actions	Expected Outputs
<b>Task A – System Completion</b>	2026	Finalisation of monitoring design and legal/technical framework	<ul style="list-style-type: none"> <li>• Complete monitoring programme design for all WFD elements (BQEs, physico-chemical, chemical, hydromorphological)</li> <li>• Finalise national lists of priority substances and river basin-specific pollutants</li> <li>• Harmonise secondary legislation and monitoring rulebooks with EU requirements</li> <li>• Establish clear institutional coordination procedures (SEPA–RHMS–RWD)</li> </ul>	<ul style="list-style-type: none"> <li>• Updated secondary legislation and technical guidelines</li> <li>• Fully defined WFD-compliant monitoring programme</li> <li>• National QA/QC framework defined</li> <li>• Harmonised institutional roles and responsibilities</li> </ul>
<b>Task B – Capacity &amp; Infrastructure Build-up</b>	2026–2027	Strengthening monitoring capacity and technical infrastructure	<ul style="list-style-type: none"> <li>• Expand monitoring network (surface water and groundwater)</li> <li>• Upgrade laboratory equipment and analytical capacity</li> <li>• Achieve/expand ISO 17025 laboratory accreditation</li> <li>• Recruit and train experts (biology, chemistry, hydrology, data management)</li> <li>• Strengthen field monitoring teams and operational procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Expanded and optimised monitoring network (increased station coverage)</li> <li>• Accredited and upgraded laboratories</li> <li>• Operational monitoring teams across river basins</li> <li>• Increased technical and human capacity</li> </ul>
<b>Task C – Full Monitoring Implementation</b>	2027–2028	Establishment of regular, systematic monitoring	<ul style="list-style-type: none"> <li>• Implement surveillance, operational, and investigative monitoring programmes</li> <li>• Increase monitoring frequency to meet WFD standards</li> <li>• Introduce full monitoring of priority substances (water, sediment, biota)</li> <li>• Integrate biological monitoring into routine programmes</li> </ul>	<ul style="list-style-type: none"> <li>• Regular and harmonised monitoring campaigns</li> <li>• Complete datasets for ecological and chemical parameters</li> <li>• Improved spatial and temporal data coverage</li> <li>• Reliable baseline dataset for status assessment</li> </ul>

			<ul style="list-style-type: none"> <li>• Ensure consistent national sampling methodologies</li> </ul>	
<b>Task D – Data Integration &amp; Assessment</b>	2028–2029	Data validation, classification, and reporting	<ul style="list-style-type: none"> <li>• Develop integrated national Water Information System (WIS)</li> <li>• Harmonise SEPA and RHMS datasets (quality + quantity)</li> <li>• Establish QA/QC data validation workflows</li> <li>• Apply WFD classification tools (EQR, EQS)</li> <li>• Develop WISE-compatible reporting formats and procedures</li> </ul>	<ul style="list-style-type: none"> <li>• Operational centralised monitoring database (WIS)</li> <li>• Fully validated and harmonised monitoring datasets</li> <li>• First complete WFD-compliant status classification</li> <li>• WISE-compatible national reporting system</li> </ul>
<b>Task E – RBMP Update &amp; Optimisation</b>	2029–2030	Integration into planning cycle and adaptive management	<ul style="list-style-type: none"> <li>• Use monitoring results to update RBMP (next planning cycle)</li> <li>• Refine monitoring network and parameters based on performance</li> <li>• Strengthen linkage between monitoring and Programme of Measures</li> <li>• Introduce advanced monitoring techniques (e.g. eDNA, automated sensors where feasible)</li> <li>• Secure long-term sustainable financing mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>• Updated RBMP based on robust monitoring data</li> <li>• Optimised monitoring network and parameter selection</li> <li>• Improved prioritisation and effectiveness of Programme of Measures</li> <li>• Integration of advanced monitoring techniques (e.g. eDNA, sensors)</li> <li>• Transition to adaptive, data-driven management system</li> <li>• Secured long-term sustainable financing for monitoring</li> </ul>

## 7.1. Link to WFD Planning Cycles

The phased roadmap is aligned with the **WFD 6-year planning cycle**. It provides a structured pathway for Serbia to move from a partially functional monitoring system to a fully WFD-compliant and adaptive water management system by 2030, with gradual strengthening of monitoring capacity, data integration, and implementation effectiveness.

- **2026–2027:** Transition phase from planning to full implementation
- **2027–2029:** Data generation for status assessment
- **2029–2030:** Input to next RBMP cycle and reporting obligations

## 7.2. Strategic Priorities

To ensure successful implementation of the roadmap, the following priorities must be addressed:

- **Strengthen the monitoring network and coverage**  
→ Expand spatial coverage and ensure all water bodies and key pressures are adequately monitored
- **Achieve full WFD-compliant parameter coverage**  
→ Complete integration of biological, chemical, and hydromorphological elements, including priority substances
- **Improve monitoring frequency and consistency**  
→ Ensure regular, systematic monitoring campaigns aligned with WFD requirements
- **Establish an integrated water information system**  
→ Harmonise datasets across institutions (SEPA, RHMS) and enable unified data management and reporting
- **Enhance data quality, QA/QC, and laboratory capacity**  
→ Strengthen accreditation, standardisation, and interlaboratory comparability
- **Build institutional capacity and coordination mechanisms**  
→ Improve cooperation between key institutions and increase technical and human resources
- **Strengthen status assessment and classification methodologies**  
→ Move from expert judgement toward robust, data-driven classification (EQR/EQS)
- **Ensure effective linkage between monitoring and measures**  
→ Use monitoring results to prioritise and optimise the Programme of Measures
- **Secure sustainable financing for monitoring systems**  
→ Transition from project-based funding to stable, long-term financing mechanisms
- **Enable adaptive management and continuous system improvement**  
→ Regularly optimise monitoring design based on results and integrate it into future RBMP cycles

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