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Evaluation of Measures for More Effective Utilization and Management of Water Resources within the Framework of SDG 6 in Serbia

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Abstract*— This research analyzes the implementation of Sustainable Development Goal 6 (SDG 6) in the Republic of Serbia. It presents the results of a survey conducted with 11 Serbian water management experts, employing the Quadruple Helix model to incorporate perspectives from government (2 experts), non-governmental organizations (2 experts), academia (3 experts), and the public sector (4 experts). The survey evaluated two primary options: Option 1, "Resources-Oriented Sanitation," and Option 2, "Strengthening Integrated Water Resources Management for Sustainable Use of Water Resources." Experts assessed how the targets of SDG 6 contribute to these measures using a 7-point scale. The final results were based on the average values of the survey responses. The objective of this research is to gain insight into the current state of water management and to understand expert opinions on which SDG 6 targets should be prioritized to effectively achieve the goal by 2030. The findings aim to inform strategic focus areas for improving water management practices towards the realization of SDG 6, enhancing both policy and practice in Serbia's water sector.

Index Terms: Sustainable development goals, decision making support, measures for action, water management.

I. INTRODUCTION

Our natural spaces on earth are At the United Nations headquarters in New York, the Open Working Group established by the UN General Assembly proposed a comprehensive set of global Sustainable Development Goals (SDGs), encompassing 17 goals and 169 targets. In their current form, the SDGs provide a universal framework of goals, targets, and indicators that UN member states will utilize to shape their agendas and policies over the next 15 years [1]. The SDGs set the 2030 Agenda with the ambition to transform the world by ensuring human well-being, economic prosperity, and environmental protection. By addressing goals and targets, the SDGs tackle the multifaceted and complex challenges faced by humanity. These goals are inherently interconnected, and conflicting interactions among them may lead to diverging outcomes [2].

The acceptance of a dedicated water goal (SDG 6) was a major 'game-changer' for water and water-using sectors. The new goal went much further than water supply, sanitation, and hygiene (WASH) and included all aspects of the water cycle, explicitly recognizing that water has an impact across the entire development agenda. It targets water quantity (scarcity) and quality, water-use efficiency, and water-related ecosystems. It promotes a basin approach to water management and the need for Integrated Water Resources Management (IWRM), which goes beyond national administrative boundaries and embraces transboundary water management that affects almost half the Earth's land surface [3]. Achieving SDG 6 is essential for progress on all other SDGs and vice versa. Sustainable management of water and sanitation underpins wider efforts to end poverty, advance sustainable development and sustain peace and stability [4]. Sustainably managing nature's contributions to SDG 6 yields co-benefits such as protecting forest cover (SDG Target 15.2) and enhancing carbon storage and sequestration, contributing to the Paris Climate Agreement and nationally determined contributions (SDG 13), as well as conserving biodiversity (SDG Target 15.5). However, there are trade-offs with the Zero Hunger goal (SDG 2) due to the opportunity costs associated with not engaging in intensive agriculture in priority sustainable use areas. [5].

This research identifies key challenges across various dimensions that must be addressed to achieve Sustainable Development Goal 6 (SDG 6), focusing on the demand, architecture, performance, and outcomes of water management. Key issues include addressing water demand, particularly in water-stressed areas, and considering demand projections under climate change. Reforming the water sector and updating the legal framework are essential components of this effort [6]. Improving the performance of water resource management, optimizing water allocation, enhancing the performance of public utility companies (PUCs) in water supply and sanitation services, managing emerging challenges such as droughts, and improving the monitoring and management of water abstractions are critical performance aspects that need attention. Additionally, supporting the development and upgrading of the agricultural sector, particularly irrigation and drainage, as well as improving water supply, sanitation, flood protection mechanisms, and water body quality and status, are crucial

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outcomes to be achieved [6]. Research indicates that significant efforts are required to meet SDG 6 targets. It is essential to consider all the insights of all professionals and the available data to gain a realistic picture of the challenges faced. Serbian water management experts conducted a comprehensive survey to assess the current state of water management in Serbia, providing precise data on the targets that need more focus to advance not only water management but also the overall quality of life. The World Bank has identified 15 priority actions for Serbia, with eight of these actions directly or indirectly related to water sector reform and legal framework updates [6]. According to [7], the population with access to public sanitation and industrial facilities are significant sources of pollution. The adverse impacts of such pollution can be mitigated by constructing sanitation systems and wastewater treatment plants (WWTPs). These systems are integral to municipal water supply systems and should be developed in tandem to create a cohesive and functional water management infrastructure.

II. MATERIAL AND METHODS

To achieve SDG goal number 6, the current state of water management in Serbia must be understood. To gain a comprehensive understanding, there is a need for an approach that provides insights from all angles. Therefore, this scientific paper applies the Quadruple Helix model. According to the Quadruple Helix Innovation Theory (QHIT), a nation's economic framework is supported by four key pillars: Academia, Non-governmental organization (NGO), Government, and Civil Society. The clustering and concentration of talented and productive individuals drive economic growth. Consequently, creative cities and knowledge regions are seen as the primary engines of economic expansion. Academia and small and medium enterprises, together with Technological Infrastructures of Innovation, create a cohesive innovation ecosystem where all forms of creativity can thrive. Governments provide the necessary financial backing and regulatory systems to define and execute innovation activities, while Civil Society consistently demands new and improved goods and services [8].

In this research, 11 respondents completed the survey: 2 from the government, 2 from NGOs, 3 from universities, and 4 from the public sector represent enterprises. The common goal for all is clean water and sanitation. To achieve this, there is need to focus on objectives and implement measures that would improve water management in Serbia.

One of the biggest problems in Serbia is poor drinking water quality, which is due to the contamination of surface and groundwater with pesticides and heavy metals, especially in rural areas, where there is almost no quality control, and the inadequate wastewater treatment from industry and infrastructure objects. According to the [6], Belgrade, a capital city, and other major cities lack wastewater treatment facilities. Only a few cities treat sewage in wastewater treatment plants, and out of the 37 existing urban wastewater treatment plants, only 7, which are newly constructed, comply with EU standards and include tertiary wastewater treatment. The low number and efficiency of municipal and industrial wastewater treatment facilities result in significant organic and inorganic discharge [6]. The primary legal framework in the field of water management is the Law on Water ("Official Gazette of RS", nos. 30/2010, 93/2012, 95/2018), which regulates the legal status of water, integrated water management, management of water facilities and wetland areas, water sources, and funding of water-related activities, as well as other issues of importance for water management. According to strategic documents, this law applies to all surface and groundwater within the territory of the Republic of Serbia, including thermal and mineral waters. However, it excludes groundwater used for extracting mineral resources and geothermal energy. The law also covers waterways that form or intersect the borders of the Republic of Serbia and the associated groundwater, as well as the extraction of river sediments that do not contain other valuable minerals [9].

The ultimate step to achieving goals of this research is the amendment, addition, or change of laws. These laws should be effective for the functioning of water management in the country, and they should be economical and human-oriented. This way, it will reach SDG goal 6 more quickly and improve the ecosystem and the daily quality of life for people in Serbia.

The methodology applied by the respondents for conducting the survey involved the use of a 7-point scale and a mapping method as described by [2]. This scale ranges from positive values up to +3, neutral at 0, and negative values down to -3. However, in the results, it is evident that negative values were not utilized, as every SDG sub-goal is inherently consistent and positive in terms of advancing measures.

The detailed representation of the scale and an explanation of the values are illustrated in the accompanying table I.

Table I: Evaluation scheme of the effects of the options/measures on the SDG targets following [2].

Interaction	Name	Explanation
+3	Indispensable	The implementation of the option/measure is essential to achieve a target.
+2	Reinforcing	The implementation of the option/measure enhances the achievement of a target significantly.
+1	Enabling	The implementation of the option/measure creates conditions that are conducive to the achievement of a target.
n	Neutral	The implementation of the option/measure has no significant effect on a target.
-1	Constraining	The implementation of the

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Interaction	Name	Explanation
		option/measure creates conditions that are detrimental to the achievement of a target.
-2	Counteracting	The implementation of the option/measure clearly impedes the achievement of a target.
-3	Inhibiting	The implementation of the option/measure makes it impossible to achieve the target

The primary question asked the respondents where the greatest focus should be placed, specifically which sub-goals should be emphasized. Nonetheless, it is important to emphasize that all goals are significant, and none have a negative impact on the proposed measures to enhance water management in Serbia. While the emphasis may vary, the contribution of each sub-goal is acknowledged as crucial.

III. RESULTS AND DISCUSSION

To clarify SDG 6, it is subdivided into eight targets, which collectively address the multifaceted aspects necessary to achieve the goal of clean water and sanitation. These targets are comprehensively outlined in Table II. The importance of SDG 6 is encapsulated by the statement: “Fresh water, in sufficient quantity and quality, is essential for all aspects of life and sustainable development. The human rights to water and sanitation are widely recognized by Member States. Water resources are integral to all forms of development, including food security, health promotion, poverty reduction, economic growth across agriculture, industry, and energy sectors, and the maintenance of healthy ecosystems” [4].

In this research, a survey was conducted involving Serbian experts from the water management sector. The survey was designed around two primary options: Option 1, which focuses on "Resources-Oriented Sanitation," and Option 2, which aims at "Strengthening Integrated Water Resources Management for Sustainable Use of Water Resources." Option 1 comprises 13 measures, while Option 2 includes 7 measures. The experts were tasked to evaluate which targets should be prioritized to effectively implement the specified measures, using a seven-point scale as detailed in Table I.

The results are presented in Table III and Table IV. These findings offer valuable insights into the prioritization of targets necessary in achieving the proposed measures and providing a robust foundation for strategic decision-making in the water management sector in Serbia.

Table: II Targets of SDG 6 [4].

Target	Explanation
6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
6.5	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
6.a	By 2030, expand international cooperation and capacity- building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies.
6.b	Support and strengthen the participation of local communities in improving water and sanitation management.

Option 1, “Promoting efficient use and management of water resources,” is focused on enhancing water use efficiency (Target 6.4), minimizing water losses in supply systems, and identifying alternatives to secure water supply without excessively developing natural water resources. As reported on [4] this target seeks to ensure that sufficient water is available for people, the economy, and the environment by decreasing water withdrawals and improving water-use efficiency across all sectors of society. Ensuring environmental water requirements is essential for maintaining ecosystem health and resilience, ensuring that sufficient water is consistently available in the environment to support natural processes.

The table III presents a summarized assessment of the effects of the measures defined in Option 1 on the SDG 6 targets. The primary impact is an enhancement in water-use efficiency (Target 6.4). By safeguarding drinking water resources and upgrading water supply infrastructure, Target 6.1 is also significantly improved. Other measures support engagement and raise awareness about efficient water use in general (Target 6.b), as well as the concept of virtual water and its external impacts (Target 6.a). This comprehensive evaluation highlights how these goals collectively contribute to achieving the measures, ensuring sustainable water management and access to clean water and sanitation for all.

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Table: III Assessment of the impacts of the measures outlined for Option 1 "Resources-oriented sanitation" [11], on SDG 6 Targets (+3 = indispensable; +2 = reinforcing; +1 = enabling; n = neutral, refer to Table I).

	SDG 6 targets								
	Measures	6.1	6.2	6.3	6.4	6.5	6.6	6.a	6.b
1.1	Definition of specific quality standards.	+2	+1	+2	+1	+2	+1	+1	+1
1.2	Networking between companies.	+1	+1	+2	+1	+2	+1	+2	+2
1.3	Promote and advertise water- saving technologies and farming practices in agriculture.	+1	+1	+1	+2	+2	+1	+2	+2
1.4	Splitting of fees for discharging wastewater and stormwater.	+1	+1	+1	+2	+2	+1	+2	+2
1.5	Reduction of peak consumption.	+2	+2	+1	+2	+1	+1	+1	+2
1.6	Efficient water use in households.	+2	+2	+1	+2	+1	+1	+1	+2
1.7	Awareness raising about virtual water.	+3	+2	+3	+3	+2	+2	+2	+2
1.8	Planning of resource use.	+3	+2	+2	+2	+2	+2	+2	+2
1.9	Water pipeline rehabilitation.	+2	+1	+1	+2	+1	n	+1	+2
1.10	Increased monitoring.	+1	+1	+2	+1	+2	+1	+2	+2
1.11	Information on own water consumption.	+1	+1	+1	+2	+1	+1	+1	+2
1.12	(Condition-based) maintenance and rehabilitation measures.	+2	+1	+2	+2	+1	+1	+1	+2
1.13	Research on efficient water use.	+2	+2	+2	+2	+2	+2	+2	+2
Results		+2	+2	+2	+2	+2	+1	+2	+2

The results from the survey on Option 1 indicate that all goals are regarded as equally important for the implementation of the measures with the exception of Target 6.6, which was considered of slightly lesser significance by Serbian experts. Notably, the most frequent utilization in the survey was observed five times. Among these, three instances were related to Measure 1.7, which focuses on "Awareness Raising about Virtual Water," specifically associated with Targets 6.1, 6.3, and 6.4. This suggests that Measure 1.7 should be given particular attention. A rating of +3 was also assigned to Measure 1.4, "Splitting of Fees for Discharging Wastewater and Stormwater," where Target 6.3 received the highest score. Target 6.1 emerged as the most critical for Measure 1.7 and for Measure 1.8, which involves "Planning of Resource Use." This indicates that Target 6.1 is inextricably linked to the achievement of multiple goals. According to the survey results, target 6.b, which emphasizes supporting and strengthening the participation of local communities in improving water and sanitation management, is identified as the most crucial for the successful implementation of measures. This results are not surprising, considering the current state of water treatment in Serbia, which is notably low with minimal water purification practices in place. As highlighted in [6], Serbia boasts a high water supply coverage rate, with only five percent of the population not connected to improved piped water supply systems. However, this high coverage rate masks the underlying issue of deteriorating infrastructure that has been neglected for decades. There is an urgent need to upgrade and rehabilitate many piped water supply systems. Additionally, urban wastewater treatment is virtually non-existent in Serbia, and wastewater disposal through sewer systems is significantly lower compared to water supply coverage. This indicates that substantial efforts and focus for future projects should be directed towards improving wastewater treatment and sanitation infrastructure. The second most critical target for Serbia, according to experts, is target 6.4, which aims to increase water-use efficiency and ensure a sustainable supply of freshwater. Enhancing water-use efficiency is essential to address water scarcity and to substantially reduce the number of people suffering from water shortages.

The survey results show a neutral impact only once: Target 6.6, which concerns the evaluation of water quality and the ecological and hydro-morphological status of water-related ecosystems, was rated neutrally concerning Measure 1.9, "Water Pipeline Rehabilitation." This implies that Target 6.6 does not exhibit significant positive or negative interactions with this measure. All other measures were rated with values of +1 or +2, indicating their considerable importance in achieving the specified targets. This underscores the relevance of these measures in advancing progress towards the overall goals. Consequently, it is evident that efforts must be directed towards all mentioned targets, as each one is crucial. The interconnection between the goals and measures means that progress in one area positively impacts the others. Working on one target inherently enhances all related measures, which significantly benefits our overall results. This integrated approach ensures that all efforts contribute to the broader objective of sustainable water management and the successful attainment of SDG 6. When focusing on

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measures, not every one of them requires the same level of effort. Measure 1.7 has been identified as needing the most attention and focus for successful implementation. This measure, which emphasizes awareness about water, highlights the need for comprehensive education across all sectors and age groups. Achieving this measure necessitates collective action, as it can only be realized through the concerted efforts of the entire community. The positive aspect of succeeding in this measure is that it will automatically improve our position concerning Measure 1.6. These two measures are closely linked to Measures 1.8 and 1.13, suggesting that all four measures should be addressed simultaneously and in a coordinated manner. In addition to these, water management professionals have identified Measure 1.18 as the second most demanding in terms of required effort for successful implementation. Again, this highlights that these measures are interconnected. Conversely, the measure requiring the least effort is the definition of water quality standards (1.1), which we are closest to achieving. This is not surprising given that Serbia has its own Water Quality Index, which is widely implemented across the country. This index is well-defined and easy to use, which explains why this measure does not demand as much work.

When discussing water use efficiency, it encompasses household usage, irrigation, drainage, sewage systems, and much more. The need to raise awareness about water in Serbia is critical. If people were more informed about the source of their water, its quality, and its true significance, the situation would improve. Measure 1.6 focuses on efficient water use in households, emphasizing the importance of using efficient household installations and appliances, raising awareness about the prompt repair of leaks, water use for garden irrigation, and the need for staggered pool fillings. It is essential to increase awareness about water consumption and its costs.

Table: IV Assessment of the impacts of the measures outlined for Option 2 "Strengthening Integrated Water Resources Management for sustainable use of water resources" [11], on SDG 6 Targets (+3 = indispensable; +2 = reinforcing; +1 = enabling; n = neutral, refer to Table I)

	SDG 6 targets								
	Measures	6.1	6.2	6.3	6.4	6.5	6.6	6.a	6.b
2.1	Recording and monitoring human interventions and uses.	+2	+2	+3	+3	+3	+2	+2	+3
2.2	Consideration of ecological indicators and water-specific criteria.	+2	n	+2	+2	+2	+3	+2	+2
2.3	Strengthening inter- and trans- sectoral as well as trans-regional cooperation.	+2	n	+2	+2	+3	+2	+2	+2
2.4	New strategies for assessment and communication.	+2	+1	+2	+2	+2	+2	+2	+2
2.5	Minimizing climate-related water risks (e.g. due to heavy rainfall, drought, etc.).	+2	+1	+2	+2	+2	+2	+2	+2
2.6	Financing a sustainable transformation of the water sector and other water uses.	+2	+1	+2	+2	+2	+1	+2	+2
2.7	Natural water retention measures (NWRM) and no-regret measures.	+2	+1	+2	+2	+2	+1	+2	+2
	Results:	+2	+1	+2	+2	+2	+2	+2	+2

Currently, the price of water in Serbia is generally set at an affordable level and does not reflect the real costs. It varies from approximately 0.43 US$/m³ in smaller settlements in less developed regions to approximately 1.0 US$/m³ in some cities in more developed regions. Lower prices are sometimes due to the lack of sewage services. The average price of water in the country is about 0.76 US$/m³ [10].If water prices were to rise, it would undoubtedly lead to increased attention to water use efficiency, which is the focus of Measure 1.5.

Urban wastewater treatment is almost nonexistent in Serbia. Unlike water supply, wastewater disposal through sewer systems is significantly lower. According to Municipal waste management in Serbia – situational analysis and Water Management Plan for period of 2021-2027 (December 2021), only 56% of the territory is covered by sewer network services. Over 75% of the collected wastewater in Serbia's sewage systems is not treated, meaning only about 10% of the population is connected to wastewater treatment services [6]. These issues necessitate significant attention to the definition of specific quality standards, as highlighted in Measure 1.1. To promote a circular economy, specific quality standards for each type of application must be defined. Legal regulations and uniform guidelines for water definition and reuse must be established, along with the provision of information about the possibilities for process water treatment in the industry.

Option 2, "Strengthening Integrated Water Resources Management for Sustainable Use of Water Resources," addresses the various anthropogenic and potentially competing water demands, including those for drinking, irrigation, agricultural cultivation, manufacturing, and electricity generation in power plants. These diverse uses exert pressure on water resources and related ecosystems,

both quantitatively and qualitatively, through contamination with a variety of substances, posing significant challenges for sustainable management [11].

The Integrated Water Resources Management (IWRM) approach has been endorsed by numerous international organizations as a comprehensive method for managing water resources. It is increasingly being incorporated into the planning and decision-making processes of water managers and policymakers [12]. Various authors have conducted valuable comparisons and analyses of IWRM definitions. IWRM can be described as a facilitated stakeholder process aimed at promoting coordinated activities to achieve common goals for the multi-objective development and management of water resources, based on sustainable water resource systems. These systems support social objectives indefinitely without compromising hydrologic and ecological integrity. IWRM encompasses objectives, institutions, implementation, and adaptation, reflecting a fusion of top-down and bottom-up approaches. It can take many institutional forms and is most effectively implemented at the river basin or sub-basin scales [13].

The table IV provides a summary of the assessment of the effects of the measures defined in Option 2 on the SDG 6 targets. This option includes measures aimed at demand-oriented research to enhance knowledge on proactive protection (Target 6.6), improvement of ambient water quality (Target 6.3), and the sustainable use and management of groundwater resources (Target 6.4). These measures collectively aim to ensure comprehensive and sustainable water management practices, addressing both the quality and availability of water resources.

The results from the survey on Option 2, which focuses on "Strengthening Integrated Water Resources Management for Sustainable Use of Water Resources," reveal that the implementation of the given targets significantly influences the execution of the measures, with almost all measures being rated with a value of +2. However, it is noteworthy that Target 6.2, which addresses sanitation and hygiene, was deemed of lesser significance for the measures in Option 2, receiving a rating of +1. The highest rating of +3 was assigned six times by water management professionals. Specifically, this rating was given four times for Measure 2.1, "Recording and Monitoring Human Interventions and Uses," with respect to Targets 6.3, 6.4, and 6.b. Additionally, a rating of +3 was also given to Measure 2.2, "Consideration of Ecological Indicators and Water-Specific Criteria," particularly in relation to Target 6.6, which pertains to ecosystems. Furthermore, the implementation of Target 6.5, which involves the sustainable management of water resources, suggests that Measure 2.1, "Strengthening Inter- and Trans-Sectoral as well as Trans-Regional Cooperation," is of substantial importance and requires significant effort. A neutral impact was observed twice, specifically concerning Target 6.2 for Measures 2.2 and 2.3. This indicates that the implementation of this target does not significantly affect these measures. The measure that demands the most effort is Measure 2.1, which encompasses the recording and monitoring of human interventions and uses, the ecological status in the catchment areas, and the quantitative recording of water uses, such as irrigation quantities in agriculture, as well as the water balance components like precipitation, evaporation, and run-off. The opinions of the surveyed experts align with findings from the article [6], which highlight that irrigation infrastructure in Serbia is underdeveloped and underutilized with significant potential for improvement to enhance economic productivity, better yields, and improved resilience. Additionally, groundwater resources are not sufficiently monitored or managed, underscoring the need for comprehensive recording and monitoring systems. However, when focusing on the targets, Target 6.5, which advocates for the implementation of integrated water resources management, emerges as the highest priority for measures under Option 2. This priority is well-founded because integrated water resources management is critical for coordinating the development and management of water, land, and related resources to maximize economic and social welfare without compromising the sustainability of vital ecosystems. Following Target 6.5, targets 6.3, 6.4, and 6.b are collectively ranked as the second highest priorities. These targets are crucial as they address the core issues of water quality, efficiency, and community involvement, all of which are fundamental for sustainable water management. The survey results indicate that Target 6.2, which aims to achieve access to adequate and equitable sanitation and hygiene for all, including ending open defecation, has the least impact on the execution of measures under Option 2.

The Republic of Serbia's primary water management objectives are focused on achieving long-term integrated water management. This entails establishing a harmonized water regime across the entire territory of Serbia, ensuring that the chosen water management strategies optimize economic and social benefits in an equitable and sustainable manner, while also adhering to international agreements [7]. This objective aligns closely with the principles outlined in Measure 2.6.

Measure 2.5 emphasizes the importance of minimizing climate-related water risks, such as those resulting from heavy rainfall and droughts. Effective monitoring and early warning systems are essential for adapting to climate change and managing its impacts. This necessity is also highlighted in the [6] report, which identifies it as a priority action to enhance water security The report explains that the impacts of climate change, coupled with Serbia's ongoing reindustrialization, must be mitigated through measures designed to protect water resources and prevent ecosystem degradation. Without these measures, there will be an increase in pollution and a decline in water quality, as lower water flows lead to reduced dilution of contaminated discharges. Therefore, it is imperative to bolster measures

that increase resilience against extreme weather events to mitigate the damage caused by droughts, floods, landslides, and soil erosion.

In the project [15] it has been observed that Serbia is actively seeking collaboration with international partners, particularly EU member states. According to the AF ESRS Appraisal Stage report, Serbia's environmental risk management practices, including those in the scientific sector, are largely aligned with relevant EU directives. As an EU pre-accession country, Serbia has received substantial guidance and support from the EU to harmonize its regulations in various areas such as environmental protection, waste management, occupational health and safety (OHS), civil protection, climate action, and sustainable development. This aligns with Target 2.4, which emphasizes the need to consider the interests of all water users across different sectors. Achieving this requires new participatory processes and multi-actor stakeholder approaches. The concept of ecosystem services, for example, can facilitate the joint consideration of ecological and economic factors, ensuring that all perspectives are integrated into water management strategies. By fostering international collaboration and aligning with EU standards, Serbia is working towards a more comprehensive and inclusive approach to water resource management.

IV. Conclusion

The analysis of water management in Serbia highlights both strengths and weaknesses that directly relate to the targets of Sustainable Development Goal 6 (SDG 6), providing insights into how the country can align its efforts with these global objectives.

On the positive side, Serbia benefits from strong government support and European funding aimed at upgrading water networks and treatment facilities. This support is instrumental in advancing infrastructure improvements and is crucial for achieving Target 6.1, which calls for universal and equitable access to safe and affordable drinking water by 2030. The widespread urban connectivity to mains and sewage networks also aligns with Target 6.2, which aims to provide access to adequate and equitable sanitation and hygiene for all, with a special focus on vulnerable populations.

Unfortunately, significant weaknesses undermine progress towards several targets. The low tariff rates contribute to substantial water wastage, reflecting inefficiencies that hinder progress towards Target 6.4, which seeks to increase water-use efficiency and reduce the number of people suffering from water scarcity. The limited number of wastewater treatment facilities exacerbates pollution levels, challenging Serbia's ability to meet Target 6.3, which aims to improve water quality by reducing pollution and increasing the safe reuse of wastewater. Additionally, rural areas, which are poorly connected to sewage systems, underscore the challenges in meeting Target 6.2, particularly for disadvantaged populations.

The existing anti-pollution measures are often inadequate, indicating a need for stronger actions to protect water-related ecosystems, as stipulated in Target 6.6, which aims to restore and protect vital water-related ecosystems. Furthermore, Serbia's current legislative framework does not fully support effective water management or anti-pollution measures, highlighting the need to enhance integrated water resources management (Target 6.5) and strengthen local community involvement in water and sanitation management (Target 6.b).

Based on the opinions of Serbian water management professionals, the greatest emphasis should be placed on Target 6.4, which aims to substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity. This target is pivotal for reducing the number of people suffering from water scarcity and reflects where Serbia currently stands in its water management efforts.

Following closely are Targets 6.3 and 6.b, which also hold significant importance and present considerable opportunities for progress and improvement. Target 6.3 focuses on improving water quality by reducing pollution and increasing the safe reuse of wastewater, while Target 6.b emphasizes supporting and strengthening local community participation in water and sanitation management. Both areas are crucial for advancing Serbia's water management framework and addressing current shortcomings.

To accurately assess Serbia's standing and future prospects, it is essential to conduct thorough surveys, publish scientific studies, and analyze findings comprehensively. This will provide a clear understanding of current conditions and guide future efforts towards achieving more ambitious water management goals.

Achieving these targets by 2030 presents a considerable challenge for Serbia, requiring extensive effort, effective organization, and, importantly, international assistance. The journey towards fulfilling SDG 6 will demand substantial improvements in water management practices, infrastructure development, and legislative support. By addressing these critical areas and leveraging both national and international resources, Serbia can make significant strides toward achieving its water management goals and ensuring sustainable water resources for future generations.

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