

Proceedings

# Stakeholders' Contribution to Sustainable Development Goal 6 Targets—Cross-Border Drinking Water Resources Management Perspective <sup>†</sup>

Branislava B. Matić <sup>1</sup> and Barbara Karleuša <sup>2,\*</sup>

<sup>1</sup> Jaroslav Černi Water Institute, 11 226 Belgrade, Serbia; branislava.matic@jcerni.rs

<sup>2</sup> University of Rijeka, Faculty of Civil Engineering, 51 000 Rijeka, Croatia

\* Correspondence: barbara.karleusa@uniri.hr

<sup>†</sup> Presented at the 4th EWaS International Conference: Valuing the Water, Carbon, Ecological Footprints of Human Activities, Online, 24–27 June 2020.

Published: 10 August 2020

**Abstract:** The approach applied in methodology development and application in stakeholder management that contributes to sustainable cross-border drinking water supply and integrated water resources management within the Adriatic region is presented. It was developed through the strategic project Networking for Drinking Water Supply in the Adriatic Region (DRINKADRIA), where eight countries across the Adriatic region contributed in implementation to assess and evaluate the framework for sustainable cross-border drinking water resources management given the constraints and challenges within the project area. The interlinkage among stakeholders' inputs and pertinent Sustainable Development Goal 6 (SDG6) indicators puts into perspective the added value of stakeholders' contribution in addressing relevant issues and options for sustainable cross-border drinking water resources management and SDG6 targets reinforcement.

**Keywords:** sustainable cross-border drinking water resources management; international cooperation; stakeholders; integrated water resources management; SDG6

## 1. Introduction

Climate and land use changes generate immense and complex issues and challenges to sustainable water management around the globe. The UN Agenda 2030 [1] defined 17 Sustainable Development Goals (SDG) as a plan of action for people, planet, and prosperity.

The most relevant for sustainable cross-border drinking water resources management (SCBDWRM) are various SDG6 targets: drinking water availability, sustainability, increasing water use efficiency, water quality improvement, integrated water resources management, international cooperation and capacity-building support, and strengthening the participation of local communities in improving water management [2,3].

Contemporary water management incorporates a number of criteria merged in a way to target economic development, social equity, and environmental sustainability, with the most vital subject being water supply for different users with a sufficient amount of water that meets quality standards [4]. While management of water supply systems is a broad domain well addressed by professionals and researchers, the issue of cross-border water supply systems is not so well recognized [5]. Cross-border drinking water supply systems (hereinafter CBDWSS) are not very typical in Europe and the majority of them in the Adriatic region are the result of political changes in the past century [6]. Water supply management is extremely complicated due to diverse issues (e.g., resources availability, quantity and quality, leakages, accidental pollution, standards, policies, etc.), and this is multiplied at the cross-border level [7].

The main goal of the strategic project Networking for Drinking Water Supply in the Adriatic Region (acronym DRINKADRIA) was to develop a foundation for strategies and procedures that would secure the cross-border water supply with specific emphasis on drinking water resources management in the transboundary context, considering climate change and specific socio-economic aspects [8]. In addition to evaluation of various significant aspects of cross-border drinking water resources management and protection within the project area (climate and land use change impact, monitoring and protection of the legal and policy framework, increased demand during tourist season, etc.), several guidelines for protocols development are proposed to contribute to SCBDWRM [9].

As elaborated in the following discussion, the approach applied in the DRINKADRIA project — to generate stakeholders' inputs that contribute to SCBDWRM and integrated water resources management—indicates the relevance and interlinkage among stakeholders' contribution and SDG6 targets; e.g., a sufficient amount of water that meets quality standards, integrated water resources management, international cooperation, and improved water management.

## **2. Stakeholders' Contribution to Sustainable Cross-Border Drinking Water Resources Management**

Eight countries across the Adriatic region contributed in implementation of the DRINKADRIA project to assess and evaluate the framework for sustainable cross-border drinking water resources management given the constraints and challenges within the project area. The majority of the countries have transboundary water resources and cross-border water supply issues that exist or might occur in the future. Due to the uniqueness of the DRINKADRIA project, it was recognized that capitalization activities contribute in moving from commitment to action, formalizing lessons based on experience, and validate and integrate experience through interaction with stakeholders.

Involvement and joint actions of stakeholders are mandatory to address numerous issues and constraints that affect sustainable cross-border drinking water supply. Within the scope of the DRINKADRIA project, relevant stakeholders from eight countries (Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, Montenegro, Serbia, and Slovenia) are identified [10] with the main goal to capitalize on their experience and knowledge exchange and contribution in moving from commitment to action, formalizing lessons based on experience, and validate and integrate experience through interaction among stakeholders within the region. The methodology for stakeholder management (Figure 1) generates a comparable response based on identified constraints in sustainable cross-border drinking water supply (SCBDWS): significant water losses in water distribution networks, inadequate plans for long-term management of the water supply network, unauthorized water consumption, existing issues and constraints between the neighboring countries, climate change effects and land use changes, increased exploitation, lack of legislation regarding cross-border water supply and cross-border water (re) sources, and undefined and inadequate protection of cross-border drinking water sources.

According to stakeholders' feedback, the key issues for SCBDWRM within the Adriatic region are: water losses, water quantity and quality, and water tariffs that are still levied in some countries. It has been underlined by stakeholders that the relevant issues and key processes for DRINKADRIA in the main categories (losses, quality, quantity, and other) are elaborated properly [11]. However, seasonal changes in water quality and quantity, illegal connections, climate change, policies and legislation frameworks, water utilities' capacities (technical, human, etc.), and the existence/non-existence of a bottom-up approach in decision making are recognized as significant for SCBDWRM by stakeholders in eight countries. Based on answers provided in templates and during the stakeholders' events, it is recognized that common issues should be addressed by improved cooperation among the sectors, and that political will and a strategic framework for SCBDWRM and regional drinking water supply (RDWS) are missing [11]. Finally, all stakeholders involved in the DRINKADRIA project recognized the important role of their institutions for sustainable cross-border drinking water supply and management.

The applied methodology and its main outputs are utilized as valuable input in development of different protocols and models that contribute in improved cross-border/regional water supply [11]; e.g., drinking water protection zones in the Adriatic region, state-of-the-art and guidelines for the improvement of the present status [12], common protocols for water resources monitoring activities in the Adriatic region [13], guidelines for long-term cross-border water supply planning [6], long-term cross-border water supply planning, and regional drinking water supply economics models [14], etc.



**Figure 1.** Schematic of the methodology applied for stakeholder management [10].

### 3. Adriatic Region Cross-Border Drinking Water Supply Interlinkage with SDG6

Seventy-one percent of the global population, or 5.2 billion people, had safely-managed drinking water in 2015, but 844 million people still lacked even basic drinking water [2]. The UN Agenda 2030 [1] defined 17 Sustainable Development Goals (SDG) as a plan of action for people, planet, and prosperity [3]. The most relevant for sustainable cross-border drinking water supply are various SDG6 targets as exhibited in Figure 2.

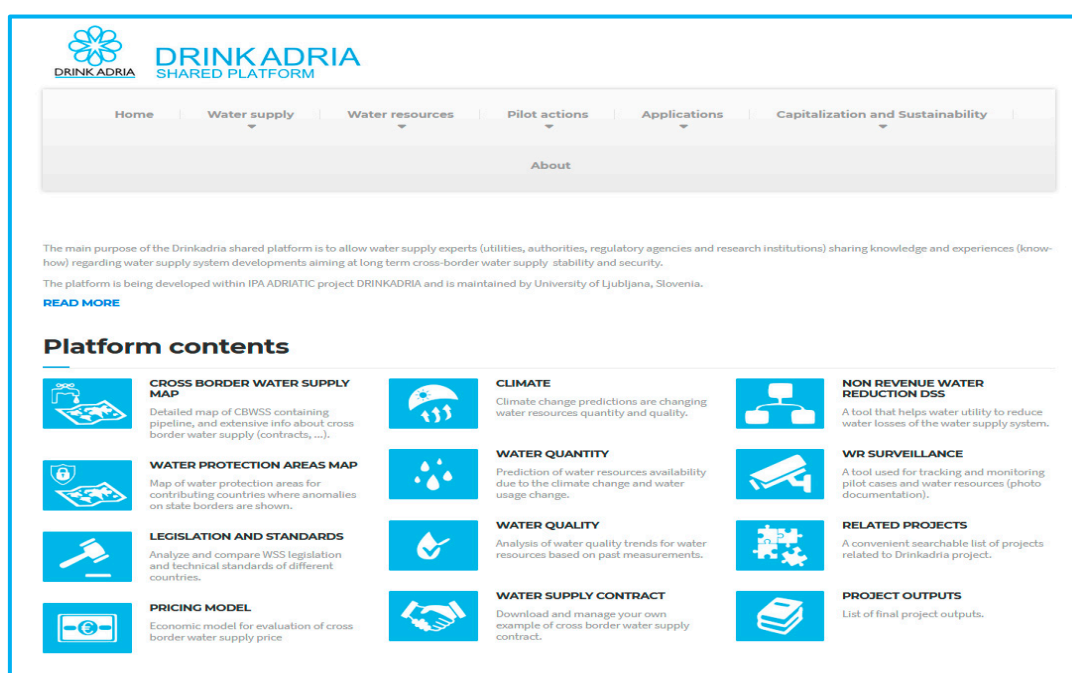
DRINKADRIA project relevant stakeholders (water utilities, authorities, research institutions, universities, etc.) identified main obstacles, issues, and constraints for sustainable cross-border drinking water supply within the Adriatic region. Based on their feedback, water use efficiency by water losses decrease, improved water quality, and implementation of an integrated approach from water source to end user by better cooperation among the various sectors in addressing common issues (climate change, land use changes, socio-economic aspects, etc.), improved cross-border cooperation and capacity building to improve cross-border drinking water supply management are prerequisites for sustainable cross-border drinking water supply. Although the majority of countries within the DRINKADRIA project area participate in different bilateral, multilateral, etc., commissions for transboundary water resources management, there is still a gap in addressing cross-border drinking water supply [10]. Evaluation of national data (e.g., drinking water protection zones delineation, drinking water sources monitoring, etc.) indicated that development of guidelines for protocol development is required for long-term sustainable cross-border drinking water supply. Protocols have to be specific for each cross-border drinking water supply and defined at a bilateral (trilateral) level among countries instead as a unified protocol for the whole Adriatic area [9] due to different constraints and issues.



**Figure 2.** Interlinkage between sustainable cross-border drinking water supply (SCBDWS) and Sustainable Development Goal 6 (SDG6) targets (modified after [1]).

#### 4. Discussion

Given the DRINKADRIA project goal to accomplish a number of activities that contribute in improvement of cross-border drinking water supply (CBDWS) in the Adriatic Basin, one of the objectives that addresses this complex issue was to improve procedures and protocols for safe water supply, simultaneously considering management and protection of water resources in the cross-border context. To address all CBDWS issues within the Adriatic region, stakeholders contributed in pilot actions implementation and development of methodologies, protocols, and guidelines for sustainable long-term management of existing and future CBDWS that are available on a shared platform presented in Figure 3.




**Figure 3.** DRINKADRIA shared platform content overview [15].

All results, outputs, legal frameworks, etc., relevant to SCBDWS are incorporated and available on the DRINKADRIA shared platform, a unique tool that connects water management and water supply experts [15].

During the project implementation, cross-border water supply systems' vulnerability and management were evaluated, and key constraints and issues were comprehensively elaborated by relevant stakeholders based on facts that experience capitalization should be future oriented and aim at a change in collective institutional practice. DRINKADRIA project team members were stakeholders (had interests from different points of view and specific expertise and skills that were identified as making a key contribution to the project goals and objectives) relevant to cross-border/regional water supply. In addition, other relevant stakeholders were identified to be of great significance for improved management of existing and foreseen cross-border drinking water supply. As exhibited in Table 1, stakeholder contribution to SCBDWRM SDG6 targets (Figure 2) and their indicators is straightforward.

**Table 1.** Overview of CBDWS stakeholders' inputs to relevant SDG6 indicators.

Stakeholders' Inputs		SDG6 Indicators
Common methodology for determination of water availability in Adriatic area		6.1.1 Proportion of population using safely managed drinking water services
Common methodology on estimation of climate change-induced land use changes and changes in water quality on test areas		6.3.2 Proportion of bodies of water with good ambient water quality
Common protocol for water (re)sources monitoring activities in the Adriatic region		6.4.1 Change in water-use efficiency over time
Common methodology for water resources vulnerability		6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
Guidelines for the improvement of the drinking water protection zones in the Adriatic region		6.5.2 Proportion of transboundary basin area with an operational arrangement for water cooperation
Guidelines for long term CBDWS planning		6.A.1 Amount of water-related official development assistance that is part of a government-coordinated spending plan
Guidance document on the preparation of the standardized pilot action		6.B.1 Proportion of local administrative units with established and operational policies and procedures for participation of local communities in water and sanitation management

## 5. Conclusions

Information and results presented in this paper indicate that relevant stakeholders contribute significantly to sustainable cross-border drinking water supply. The key issues and constraints identified were comprehensively elaborated within the Adriatic region. This provided groundwork for development of methodologies, protocols, and guidelines that contribute to improved and sustainable cross-border drinking water supply and management of the shared water sources. Overview of Sustainable Development Goal 6 (Table 1), its targets and indicators demonstrate that capitalization of stakeholders' experience reinforces achievement of SDG6.

The methodology applied in the DRINKADRIA project for stakeholder management and a shared platform is a significant milestone in sustainable SCBDWRM within the Adriatic region. Application of this approach to assess stakeholder inputs' relevance to SDGs indicators will very likely generate similar results from other projects implemented within the Europe and other parts of the world, not just with respect to water resources management and environmental protection.

Highlighting the interlinkage of projects outputs with SDGs will very likely enhance active involvement of stakeholders in achievement of sustainable development goals defined in Agenda 2030.

**Author Contributions:** Conceptualization, B.B.M. and B.K.; methodology, B.B.M. and B.K.; formal analysis, B.B.M. and B.K.; investigation, B.B.M. and B.K.; resources, B.B.M. and B.K.; writing, B.B.M. and B.K.; project administration, B.B.M. and B.K.; funding acquisition, B.B.M. and B.K. All authors have read and agree to the published version of the manuscript.

**Funding:** This research was funded by EU IPA Adriatic Cross-Border Cooperation Programme 2007–2013, DRINKADRIA project (1° str./0004) and University of Rijeka projects: Implementation of innovative methodologies, approaches and tools for sustainable river basin management (uniri-tehnic-18-129) and Hydrology of water resources and identification of flood and mudflow risks in karst (uniri-technic-18-54).

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

1. UN Transforming Our World: The 2030 Agenda for Sustainable Development, 2015. Available online: <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication> (accessed on 17 January 2020).
2. UNDP Sustainable Development Goals, 2020. Available online: <https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-6-clean-water-and-sanitation.html> (accessed on 17 January 2020).
3. UN Sustainable Development Goals (SDGs), 2020. Available online: <https://sustainabledevelopment.un.org/sdgs> (accessed on 17 January 2020).
4. Matić, B.; Simić, Z. Prospects for sustainable water resources management within the River Djetinja catchment. In Proceedings of the 10th World Congress on Water Resources and Environment “Panta Rhei”, Athens, Greece, 5–9 July 2017.
5. Altran, E.; Banovec, P.; Toscano, P.; Karleuša, B. Challenges in the Management of Cross-border Water Supply Systems—The DRINKADRIA project. In Proceedings of the Conference Water Ideas 2014, Bologna, Italy, 22–24 October 2014.
6. Vidmar, V.; Matić, B. DRINKADRIA Project Deliverable 5.2: Guidelines for Long Term Cross Border Water Supply Planning, 2016. Available online: [http://drinkadria.fgg.uni-lj.si/capitalization\\_sustainability/project-outputs/](http://drinkadria.fgg.uni-lj.si/capitalization_sustainability/project-outputs/) (accessed on 9 January 2020).
7. Kanakoudis, V.; Papadopoulou, A.; Tsitsifli, S.; Čencur Curk, B.; Karleuša, B.; Matić, B.; Altran, E.; Banovec, P. Policy recommendation for drinking water supply cross-border networking in the Adriatic region. *J. Water Supply Res. Trans.* **2017**, *66*, 489–508.
8. Karleuša, B. About DRINKADRIA Project. In Proceedings of the International Symposium: Cross-Border Water Management, Rijeka, Croatia, 29 January 2016; pp. 13–22.
9. Karleuša, B.; Matić, B. Legislative framework for drinking water monitoring in the Adriatic region. In Proceedings of the 10th World Congress on Water Resources and Environment “Panta Rhei”, Athens, Greece, 5–9 July 2017; pp. 2043–2049.
10. Matić, B.; Miletić-Radić, M. DRINKADRIA project capitalization and sustainability and connection with good practice of dissemination and communication activities. In Proceedings of the International Symposium: Cross-Border Water Management, Rijeka, Croatia, 29 January 2016; pp. 23–38.
11. Matić, B. DRINKADRIA Project Deliverable 3.4: Synopsis Report on Capitalization Processes, 2016. Available online: [http://drinkadria.fgg.uni-lj.si/capitalization\\_sustainability/project-outputs/](http://drinkadria.fgg.uni-lj.si/capitalization_sustainability/project-outputs/) (accessed on 9 January 2020).
12. Brenčić, M.; Čencur Curk, B. DRINKADRIA Project Deliverable 4.4: Drinking Water Protection Zones in the Adriatic Region—State of the Art and Guidelines for the Improvement of the Present Status, 2016. Available online: [http://drinkadria.fgg.uni-lj.si/capitalization\\_sustainability/project-outputs/](http://drinkadria.fgg.uni-lj.si/capitalization_sustainability/project-outputs/) (accessed on 9 January 2020).
13. Karleuša, B. DRINKADRIA Project Deliverable 4.3: Common Protocol for Water Resources Monitoring Activities in the Adriatic Region—Project Report and Annexes, 2016. Available online: [http://drinkadria.fgg.uni-lj.si/capitalization\\_sustainability/project-outputs/](http://drinkadria.fgg.uni-lj.si/capitalization_sustainability/project-outputs/) (accessed on 9 January 2020).

14. Primož, B.; Domadenik, P.; Guduraš, D.; Cilenšek, A.; Vidmar, V. DRINKADRIA Project Deliverable 5.3: Long Term Cross-Border Water Supply Planning and Regional Drinking Water Supply Economics Model, 2016. Available online: [http://drinkadria.fgg.uni-lj.si/capitalization\\_sustainability/project-outputs/](http://drinkadria.fgg.uni-lj.si/capitalization_sustainability/project-outputs/) (accessed on 9 January 2020).
15. DRINKADRIA Shared Platform, 2016. Available online: <http://drinkadria.fgg.uni-lj.si/2016> (accessed on 30 January 2020).



© 2020 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).