



Examination of Existing Indicator Schemes for the Urban Water Circularity Assessment

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OUTLINE	EXPERIMENTAL METHODS	CONCLUSION
<p>In urban water management, we are currently facing increased demand for drinking water, adapting to the consequences of climate change, and protecting the environment and the population's health while aging existing infrastructure systems. Addressing problems at the source and monitoring the remaining impacts throughout the chain allows us to protect water resources, restore natural resources, reduce environmental pollution and optimize infrastructure systems that are not yet sustainably designed. Considering the concept of Circular Economy (CE), these problems in cities can be addressed through various measures that have already been developed and tested in many pilot projects but are not yet sufficiently implemented in practice.</p> <p>A key challenge preventing more effective use of the CE concept in various policies, planning, and governance is the establishment of an appropriate system of indicators to assess the current situation and measure the success of the measures taken. It is necessary to develop appropriate indicators that are sufficiently detailed to plan local actions.</p>	<p>A preliminary survey of existing indicator schemes and an analysis of the City Blueprint®¹ scheme was conducted. Indicators were evaluated based on the criteria:</p> <ul style="list-style-type: none"> Whether an indicator address one of the urban circular water management challenges²: restoration and maintenance of the water cycle (1A), treatment and cleaning of wastewater with safe reuse (1B), processing and reuse of nutrients (1C). Can an existing or adapted indicator be used for: macro-level, e.g., city or municipality (2A); mezzo-level, e.g., part of the town, neighborhood (2B); micro-level, e.g., individual plot or building (2C). Whether the indicator measure the success of the implemented CE measures (3A). Is the indicator based on: results of other research, numeric or spatial data, or a predefined evaluation scale (4A). <p>We also determine whether there are publicly available data for indicators at different levels in Slovenia.</p>	<p>From a preliminary analysis of some existing indicator schemes, standards ISO 37123³, ASTM (E3136-18)⁴, European Environment Agency indicators⁵, the Green City Index⁶, the City Blueprint®¹, and Water Sensitive Index⁷, it follows that existing indicator schemes for urban water management already address some of the CE's objectives. The indicators are based on surveys, data, or pre-prepared evaluation scales. The indicators under consideration generally do not allow analysis for the particular neighborhood (mezzo-level) or individual buildings (micro-level), as pointed out as research gap by CE researchers⁸.</p> <p>We can conclude that the CityBlueprint® indicators satisfy a substantial number of criteria, or some adjustments are needed. It is crucial to test available data for each proposed indicator and examine data quality. Only for some indicators, there are already publicly available data. Internal databases (e.g., public utility companies, ministry) will also need to be analyzed for the actual use of indicators. Based on the method presented in the poster, further research will include the consideration of additional already developed indicator schemes.</p>

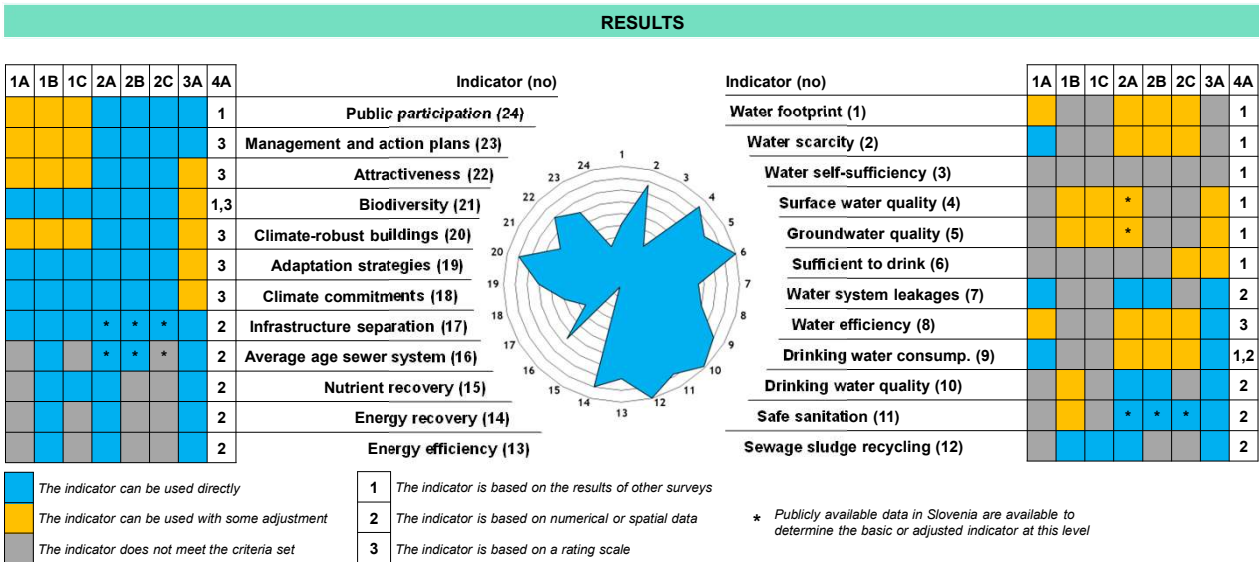


Figure 1: Results of the analysis of the City Blueprint® indicator scheme with the presentation of the original indicator determined for Ljubljana¹

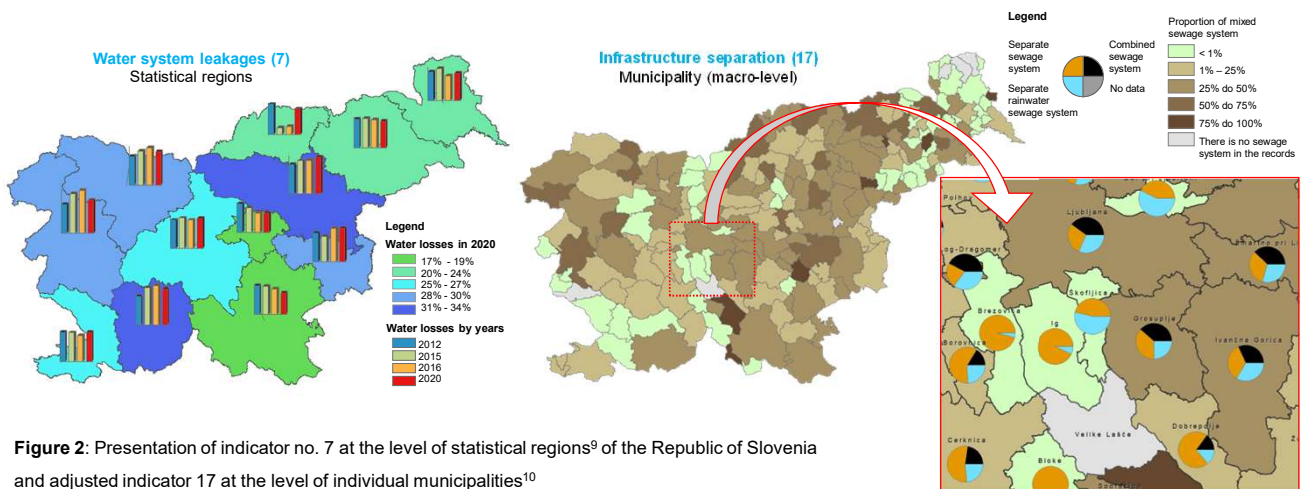


Figure 2: Presentation of indicator no. 7 at the level of statistical regions⁹ of the Republic of Slovenia and adjusted indicator 17 at the level of individual municipalities¹⁰

References:

¹ Koop, S. H. A., & van Leeuwen, C. J. 2015. Application of the Improved City Blueprint Framework in 45 Municipalities and Regions. *Water Resources Management*, 29(13), 4629–4647.

² Atanasova, N., Castellà, J. A. C., Pineda-Martos, R., Nika, C. E., Katsou, E., Istenič, D., Fucher, B., Andreucci, M. B., & Langgraber, G. 2021. *Nature-Based Solutions and Circularity in Cities. Circular Economy and Sustainability*, 3 ISO 37123 ISO 37123. 2019. Sustainable cities and communities – Indicators for resilient cities: 83 p.

³ ISO/WD 59020 ISO 37123. 2019. Sustainable cities and communities – Indicators for smart cities: 85 p.

⁴ ASTM E3136-18. Standard guide for Climate Resiliency in Water Resources. ASTM International, 100 Barr Harbor Drive, PO Box C700. West Conshohocken: 12 p. United States. DOI: 10.1520/E3136-18

⁵ European Environmental Agency (EEA) indicators: https://www.eea.europa.eu/data-and-maps/indicators/#?q=30&c12=operator=or&_start=0&c12=water&c12=waste

⁶ The Green City Index Economist Intelligence Unit, 2009. *European Green City Index, Assessing the environmental impact of Europe's major cities. A research project conducted by the Economist Intelligence Unit, sponsored by Siemens.*

⁷ Rogers, B. C., Dunn, G., Hammer, K., Novala, W., de Haan, F. J., Brown, L., Brown, R. R., Lloyd, S., Ulrich, C., Wong, T. H. F., & Chesterfield, C. 2020. *Water Sensitive Cities Index: A diagnostic tool to assess water sensitivity and guide management actions. Water Research*, 186, 116411.

⁸ Harris s sod Harris, S., Martin, M., & Diener, D. 2021. *Circularity for circularity's sake? Scoping review of assessment methods for environmental performance in the circular economy. Sustainable Production and Consumption*, 26, 172–186.

⁹ The indicator is based on data: Republic of Slovenia Statistical office. *Water supplied from public water supply (1000 m3), cohesion and statistical regions, Slovenia, annually. Obtained 2.5.2022.*

¹⁰ The indicator is based on data: ePROSTOR. Ministry of the environment and spatial planning. *The surveying and mapping authority of the Republic of Slovenia. Consolidated cadastre of public infrastructure.*