AQUAGUARDIAN BASELINE WATER QUALITY SCREENING IN THE SISAK WATER SUPPLY NETWORK

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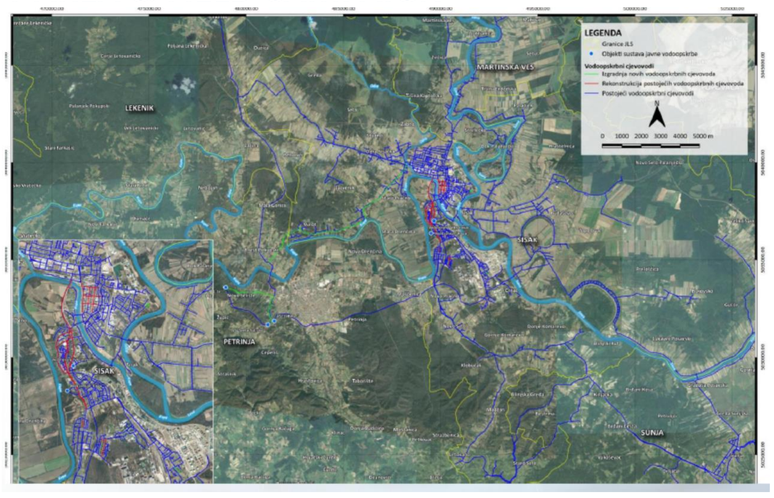
INTRODUCTION

Safe and reliable drinking water supply is essential for public health and increasingly requires monitoring strategies capable of responding to dynamic environmental conditions and emerging water quality threats. Conventional monitoring approaches based predominantly on periodic sampling provide essential information on water quality but may be insufficient for the rapid detection of transient contamination events and early identification of potential risks. The AquaGuardian project addresses these challenges through the development of an integrated early-warning framework combining advanced analytical technologies, real-time sensing, artificial intelligence, and predictive modelling. The integration of laboratory and sensor-generated data is intended to enable continuous assessment of water quality, detection of anomalies, risk prediction, and data-driven decision-making, supporting the transition from reactive monitoring towards proactive management of drinking water supply systems.

Within the Sisak water supply network, comprehensive baseline water quality screening is conducted to characterize reference conditions at locations selected for future real-time monitoring. The integration of physicochemical, microbiological, and ecotoxicological data will provide the scientific basis for interpreting future monitoring data and support the development and validation of the AquaGuardian AI-supported early-warning system for safe, resilient, and sustainable drinking water management.

STUDY AREA & FIELD CAMPAIGN



Sisak water supply network with selected baseline sampling locations.

Photo 1 – Sveto Trojstvo: *Field survey of the monitoring location.*

Photo 2 – Sunja: *Water sampling at the monitoring location.*

MONITORING LOCATIONS

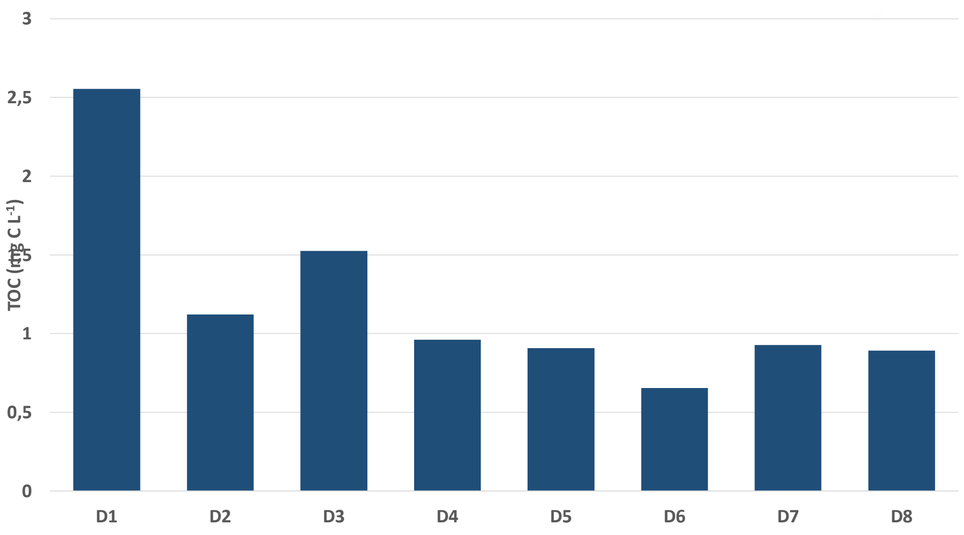
- **D1** Kupa River
- **D2** Treatment plant, treated water
- **D3** Sveto Trojstvo
- **D4** Ivajak, before chlorination
- **D5** Ivajak, after chlorination
- **D6** Sunja
- **D7** Crnac WWTP
- **D8** Preloščica

METHODOLOGY & WORKFLOW

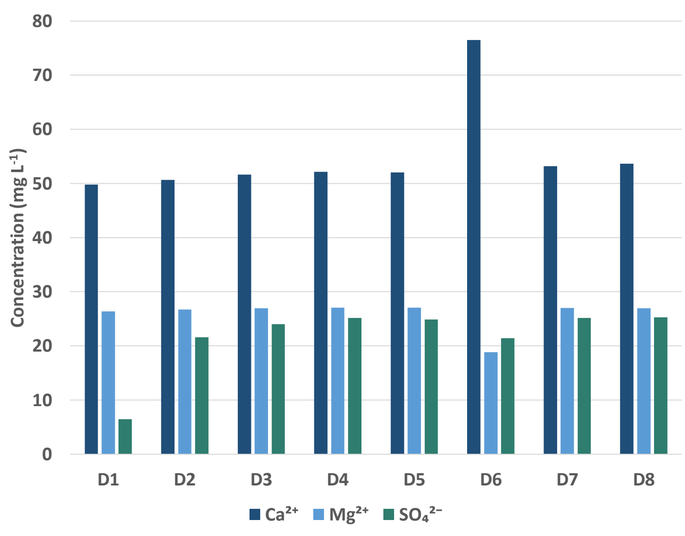
- **Sampling** – 8 baseline locations across the water supply network
- **Laboratory analysis** – Physicochemical, microbilological and ecotoxicological parameters
- **Advanced analytics** – IC; GC–MS; GC–QqQ (targeted); HPLC; ICP–MS
- **Data integration & AI modelling** – Data fusion, anomaly detection and predictive analytics
- **Early-warning system** – Real-time alerts and decision support for water safety

RESULTS

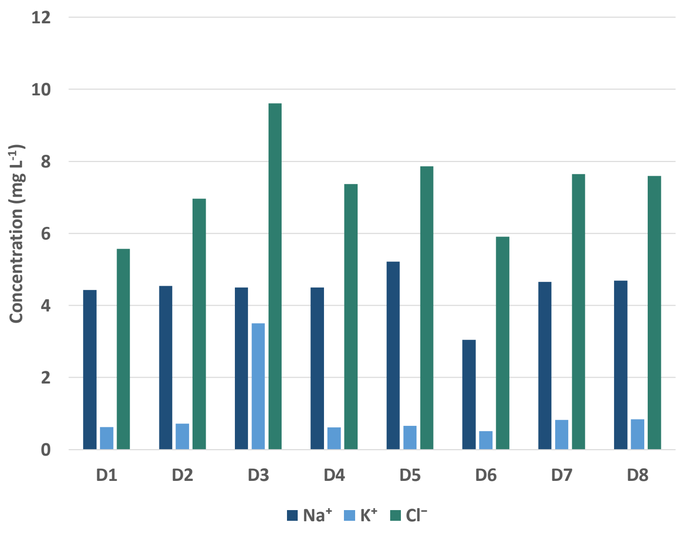
A | Organic matter profile



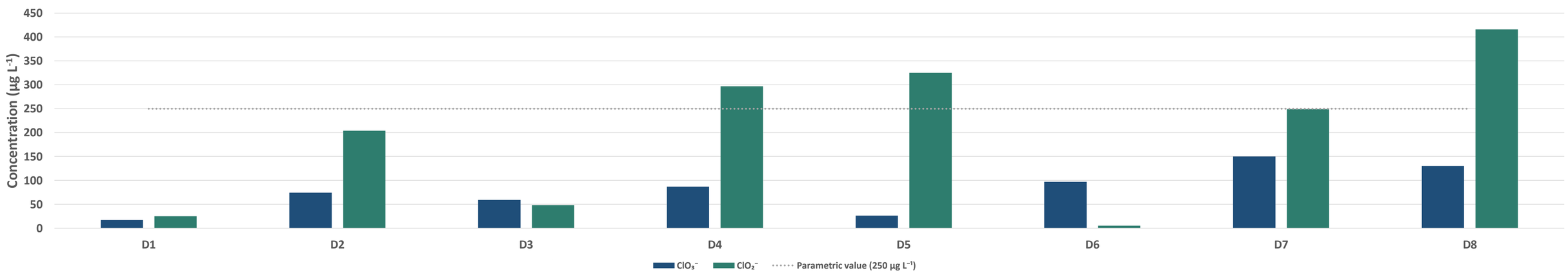
B1 | Dominant ions



B2 | Minor ions



C | Disinfection-related oxychlorine species



CONCLUSION

- **Spatial variability** in organic matter and ionic composition was observed across the Sisak water supply network.
- **Chlorite concentrations** exceeded the parametric value at **D4**, **D5** and **D8**, while **D7** reached the parametric value (250 µg L⁻¹).
- The established baseline provides reference conditions for future real-time monitoring and supports the development and validation of the **AquaGuardian** AI-supported early-warning system.

ACKNOWLEDGMENT

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