The investigation of water quality in the urban area of Cluj-Napoca during autumn and winter

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Introduction Rapid urbanization and continuous wastewater discharges severely degrade urban river ecosystems worldwide. Someșul Mic River is Cluj-Napoca's main ecological corridor and effluent receptor, and the main source for irrigation water downstream Cluj-Napoca. Therefore, its water quality is of critical concern. This study presents the results of a monitoring campaign, and it is part of the first comprehensive water quality research carried out along Somesul Mic River, with the final goal of creating pollutant transport models.

Methodology. The monitoring data comprises daily values of 12 water quality indicators, among which the indicators presented in Table 1. Water samples have been collected during 2025 at two river sites: in Cluj-Napoca at the Elisabeta Bridge (RM1 in Fig. 1) and in Sânnicoară at the 1 Mai Street Bridge (RM2). This study is focused on data collected between Sept. and Dec. 2025. A prior study [1] presents the monitoring results from Jan. to Aug. 2025 and describes the employed laboratory methods for each indicator.

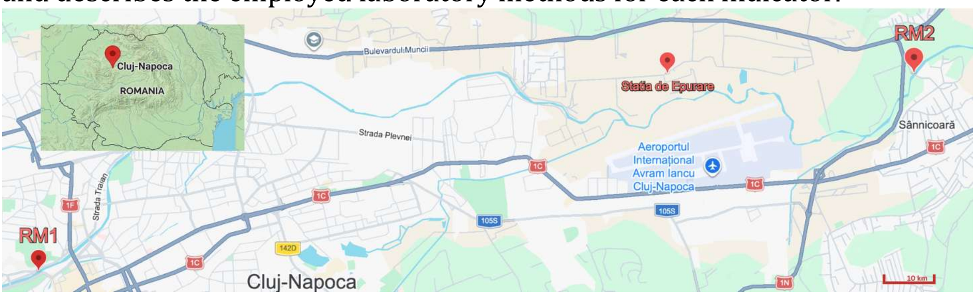

Fig. 1: The location of Somesul Mic River monitoring points [1].

Results and discussion. Measured data has been processed to offer the statistical indicators in Table 1.

Table 1: The statistical indicators for the monitored parameters (Sept.-Dec. 2025).

RM1	Conductibility μs/cm	Turbidity NTU	pH	DO mg O_2/L	COD mg O_2/L	NH_4^+ mg/L	NO_2^- mg/L	NO_3^- mg/L	PO_4^{3-} mg/L
Min	144.000	0.060	6.850	4.540	2.159	0.000	0.018	0.000	0.000
Max	236.000	11.530	8.140	9.140	8.474	10.116	0.312	9.392	2.419
Mean	189.746	1.837	7.527	7.373	3.543	0.732	0.086	1.943	0.384
Median	192.000	1.570	7.600	7.270	3.518	0.246	0.061	0.998	0.254
Std. dev.	19.829	1.611	0.249	1.045	0.939	1.416	0.061	2.398	0.489
RM2	**Conductibility** μs/cm	**Turbidity** NTU	**pH**	**DO** mg O_2/L	**COD** mg O_2/L	NH_4^+ mg/L	NO_2^- mg/L	NO_3^- mg/L	PO_4^{3-} mg/L
Min	158.000	0.280	6.820	2.800	2.100	0.000	0.009	0.412	0.353
Max	596.000	7.710	7.970	8.720	3.800	5.921	5.151	21.882	18.682
Mean	492.758	2.172	7.240	7.064	3.022	1.350	0.969	4.114	7.234
Median	514.000	1.310	7.180	7.330	3.000	1.038	0.356	1.510	6.669
Std. dev.	88.278	1.840	0.250	1.335	0.381	1.160	1.336	5.674	5.233

This dataset indicates a significant difference in water quality between RM1 and RM2. RM2 shows markedly higher mineralization and nutrient loading than RM1: conductivity is ~2.6× higher on average, and mean NO_3^-, NO_2^-, NH_4^+, and PO_4^{3-} are ~2×, ~11×, ~1.8×, and ~19× higher, with large spikes (e.g., NO_3^- up to 21.9 mg/L; PO_4^{3-} up to 18.7 mg/L). Turbidity is slightly higher and more variable, pH is slightly lower, and dissolved oxygen is a bit lower on average with a much lower minimum at RM2 (2.8 vs 4.54 mg O_2/L), indicating episodic oxygen stress; COD is similar or slightly lower at RM2.

From a practical standpoint, these findings provide a crucial baseline for quantifying pollution loads, such as tributary inflows, wastewater inputs, agricultural runoff, or urban drainage. Further work will integrate this continuous dataset to develop and validate pollutant transport models for the river stretch.

Conclusions. This monitoring campaign highlights more stable, better water quality at RM1, significant anthropogenic impacts and greater variability at RM2, evidence of the necessity for continuous observation and efficient pollution source management.

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[1] Lavita, G.E.A. et al., in Conferința […] „Chimia ecologică și a mediului", XXIII Ed., Chișinău, Moldova, ISBN 978-9975-62-931-7 (PDF), 11-13, 2025.