

The estimation of hydrodynamic parameters for a reach of Someșul Mic River

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Introduction. In recent decades, emerging contaminants in surface waters have become a major environmental concern. Among these, the non-steroidal anti-inflammatory (NSAID) drugs have been detected in Someșul Mic River (Romania), justifying the need for specific policy and decision-making tools. However, data regarding the distribution and behaviour of these compounds in the Someșul Mic River remain limited, requiring local monitoring studies and predictive models' development. Conventional mathematical models rely heavily on the description of the river reach [1]. Therefore, the purpose of this study is to setup the channel geometry and hydrodynamic parameters for an urban reach of Someșul Mic River.

Methodology. The study is based on historical monthly data (2001 – 2005) and on daily measurements collected during a 2025 monitoring campaign at two sampling points along Somesul Mic River, in Cluj-Napoca and Apahida.

Results and discussion. Historical measurements include water depth and water flow, from which the river width and water velocity were estimated using the cross-section geometry and the rating equations (expressing the relationship between the water flow and water depth or channel width). During 2025, depth measurements were used to estimate the channel width (from the cross-sectional geometry), while the water flow was estimated based on water velocity measurements and cross-sectional area.

The evolution of water flow (m^3/s) along the investigated years is depicted in Fig. 1. The figure shows a drastic decline in water resources in 2025 compared to the 2001-2005 period, when flow rates reached significant peaks in April and July (up to $87.3 \text{ m}^3/\text{s}$). After 20 years, these peaks have almost disappeared. Currently, flow rates remain consistently low throughout the

year, indicating a severe and persistent water amount decrease tendency, regardless of the season. This may be due increased water use, less precipitation, increased urbanization or/and climate change effects.

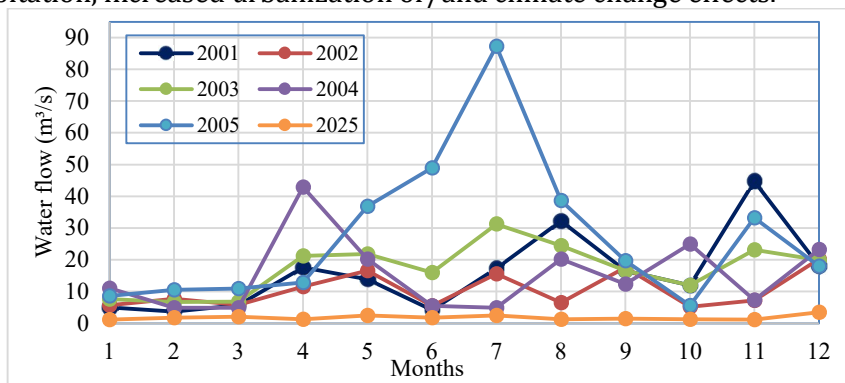


Fig. 1 Water flow at Cluj-Napoca along the investigated years.

The statistical indicators corresponding to the Cluj-Napoca measured data are offered in Table 1, confirming the above-mentioned differences between the historical data and the recent monitoring.

Table 1: The statistical indicators for parameters at Cluj-Napoca.

Parameter	UM	Campaign	Min	Mean	Max
Depth	m	2001-2005	0.25	0.85	3.70
		2025	0.56	0.72	1.00
Width	m	2001-2005	30.00	36.50	46.00
		2025	32.00	35.89	38.00
Velocity	m/s	2001-2005	0.12	0.57	2.86
		2025	0.03	0.07	0.20
Water flow	m³/s	2001-2005	3.75	17.27	87.30
		2025	0.68	1.74	6.75

Conclusions. Historical data and recent monitoring reveal significant flow regime changes in the urban reach of Someşul Mic River. The study results, together with AINS and nutrient concentration measurements from 2005 will be used to develop predictive models to estimate pollutant transport and transformations along the Someşul Mic River.

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[1] Morel, M., Booker, D.J., F., & Lamouroux, N., 2020. *J. Hydrol.*, 582, 124292.