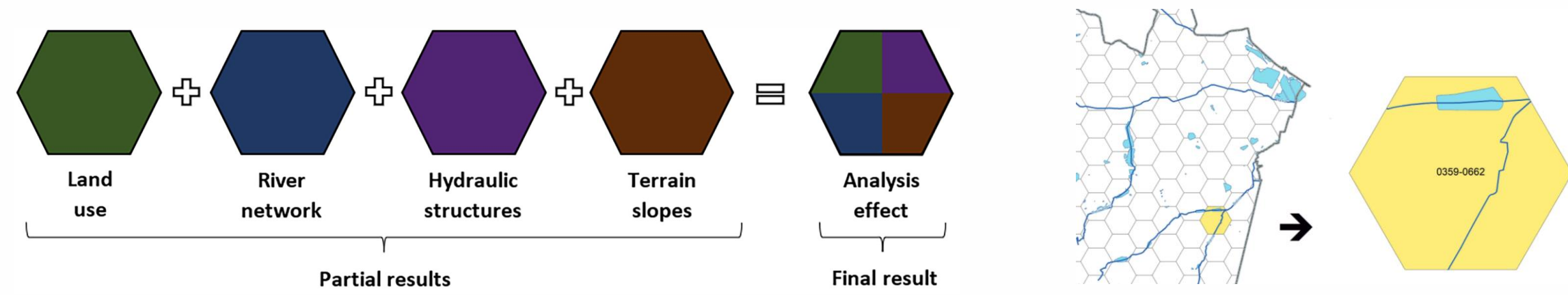


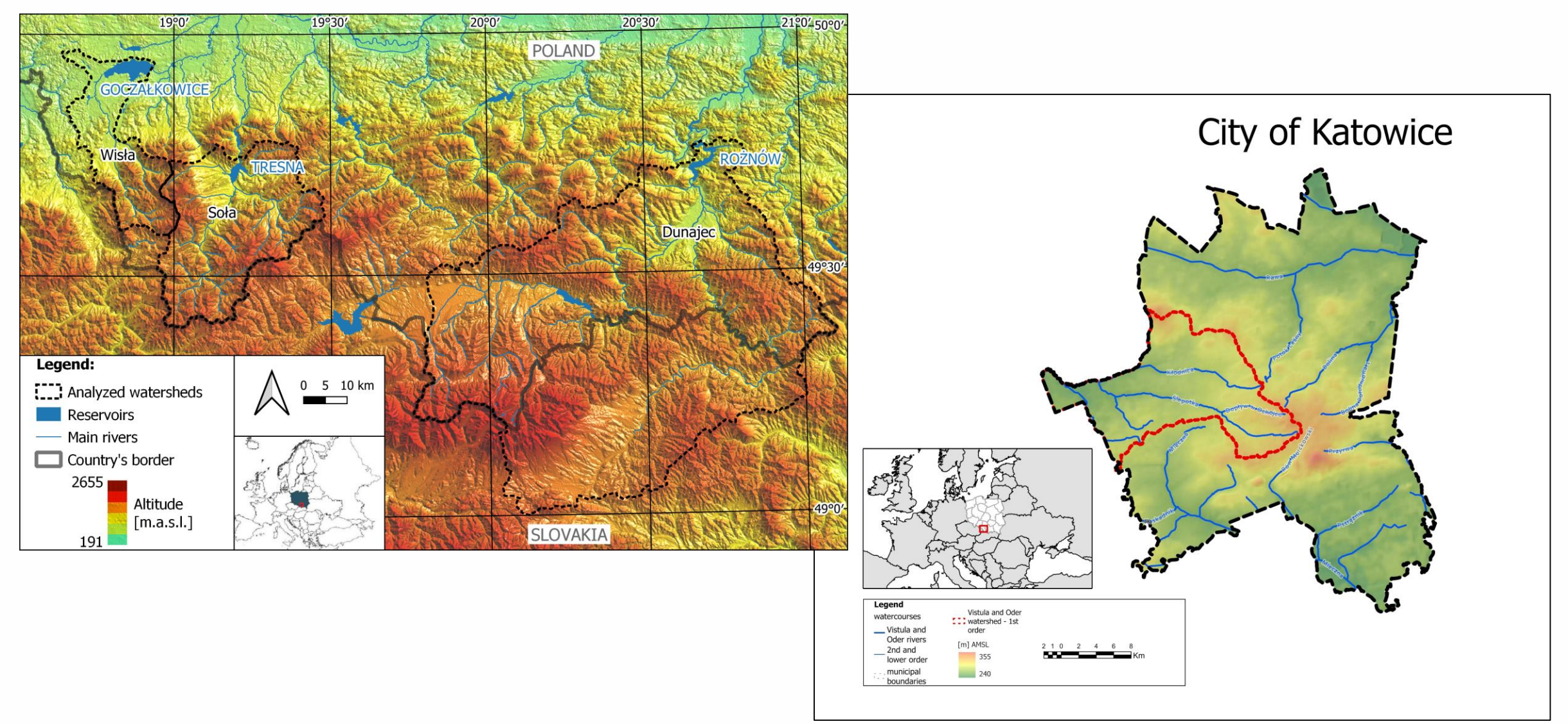
Research background

An analysis of 47 reservoirs of key importance for water management in Poland has shown that they have lost a total of almost 193 million m³ of capacity since the commissioning period. The total initial capacity was 3677.751 million m³, and at present it is 3485.095 million m³. Such a situation may cause difficulties in the proper functioning of the facilities, including the performance of certain functions (including retention and counteracting the effects of drought). In this type of analysis and other water management studies, it is very important to select appropriate data, taking into account its reliability, quality and comprehensiveness. In addition, all planning activities in water management are based on spatial databases. In the case of Water Management Plans, this is the Computer Map of the Hydrographic Division of Poland (MPHP 10k). The hydrographic network is also an element of the Topographic Database (BDOT 10k), introduced by a ministerial decree. In turn, the surface coverage of the land is determined in the Land and Building Register documentation, where the designation of land as flowing waters ('Wp' land use) is binding in civil and legal transactions and court proceedings. These databases operate independently, which precludes their interoperability. This material presents the possibilities of using the base fields in work involving reservoir capacity changes and verifying the consistency of linear and surface water databases.



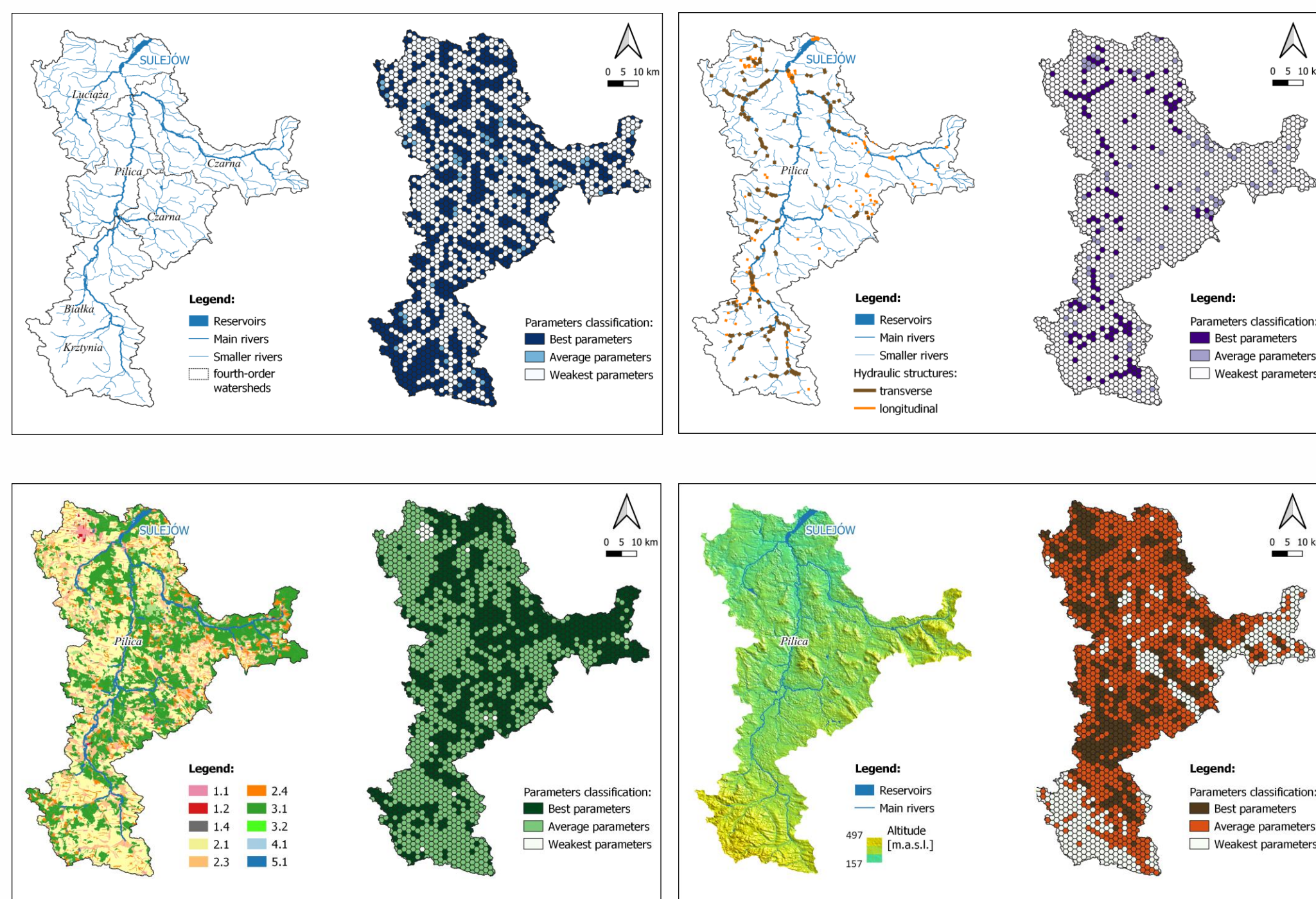
Study area and methods

The work covered the catchment areas of the reservoirs: Goczałkowice on the Vistula, Rożnów on the Dunajec, Tresna on the Soła and Sulejów on the Pilica, as well as the city of Katowice. For this purpose, multi-criteria spatial analyses based on a grid of basic fields (hexagon geometry) were used. In the case of the reservoirs, anthropogenic pressures and natural impacts affecting the reduction of their capacity were assessed by analysing the following factors: land use, hydrographic network density, hydrotechnical structures and land slopes. In the area of Katowice, the quality of data was verified and the areas of the highest discrepancies between the MPHP 10k, BDOT 10k databases and the land with 'Wp' land use in the cadastre were determined. In addition, it was verified whether these lands are owned by the State (according to the guidelines of the Water Law Act).



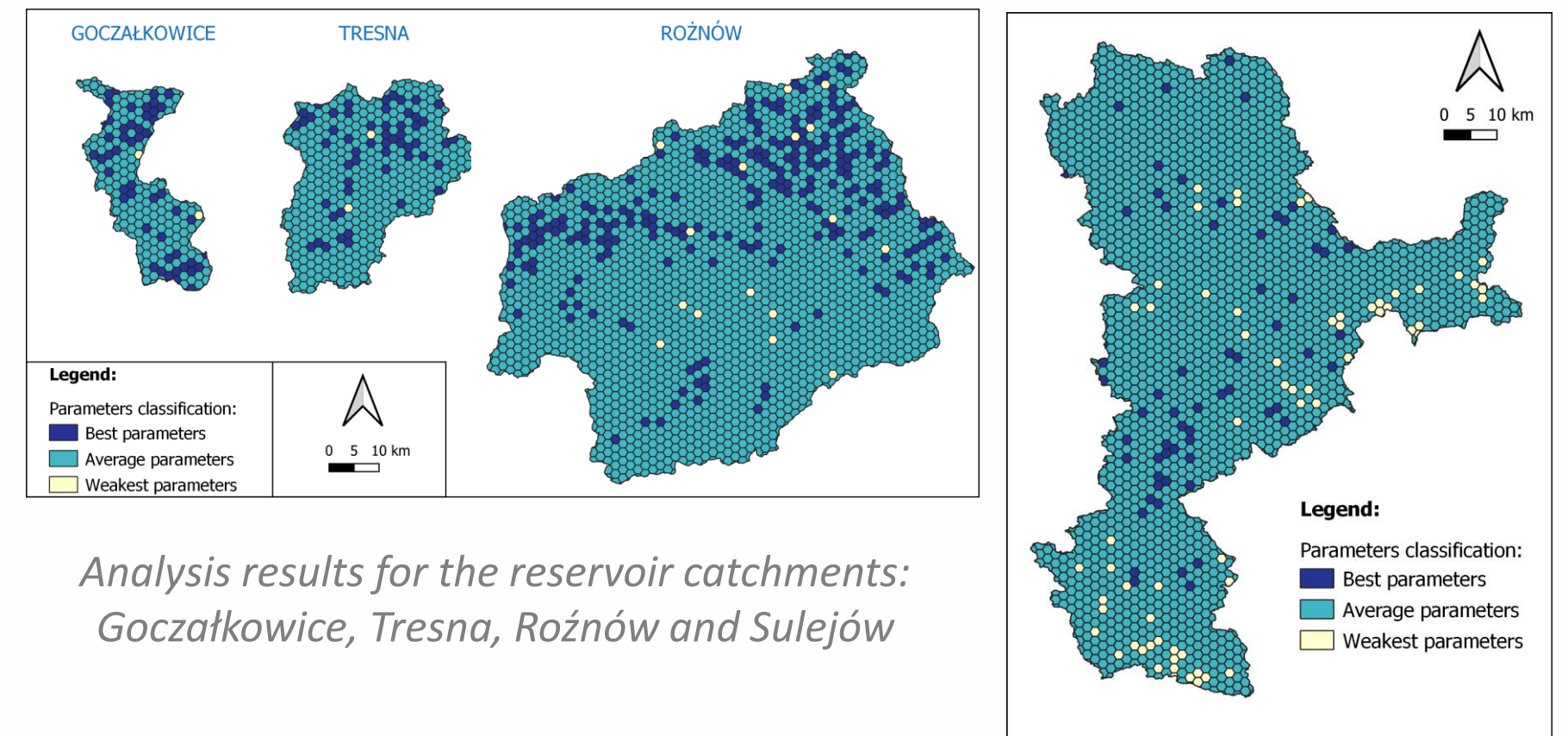
Results

Multi-criteria assessment of factors affecting the reduction of reservoir capacity



Multi-criteria analysis of factors in the Sulejów reservoir catchment area

The application of the author's methodology made it possible to identify, within the study catchments, the fragments that have the best, average and worst parameters in terms of debris delivery to the reservoirs. It has also been established that the key reservoirs for loss of reservoir capacity in Goczałkowice, Tresna and Rożnów reservoirs is the slope of the catchment. However, in the case of the Sulejów reservoir, the river network and land use are the main factors determining the results obtained and thus influencing a reduction in its operational parameters.



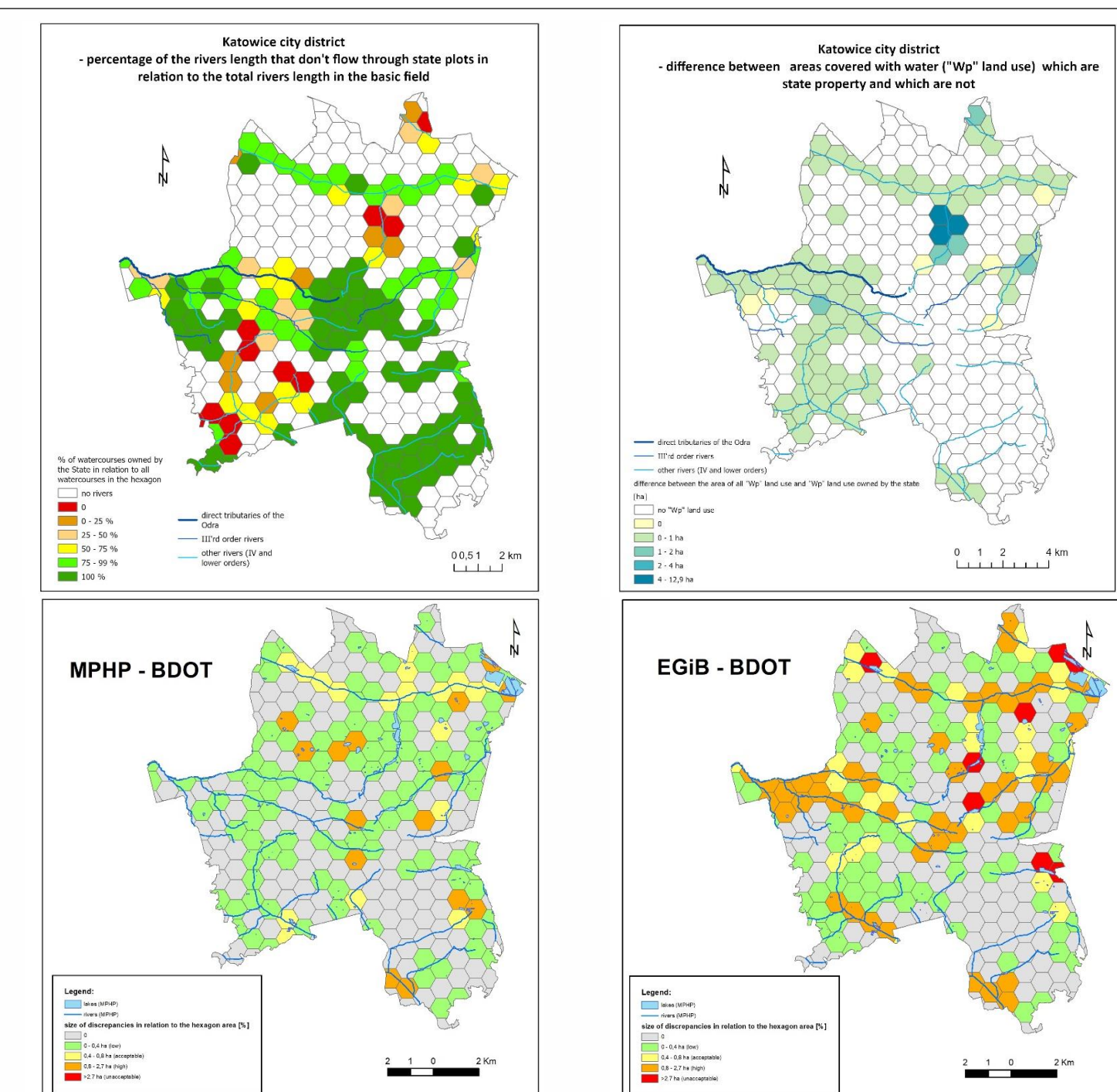
Analysis results for the reservoir catchments: Goczałkowice, Tresna, Rożnów and Sulejów

Parameter classification	Reservoir catchments			
	Goczałkowice	Rożnów	Tresna	Sulejów
3 – the best	23,4%	12,5%	13,6%	3,2%
2 – average	76,6%	87,5%	86,4%	93,5%
1 – the weakest	-	-	-	3,3%

Pieron Ł., Absalon D., Matysik M., 2024: Multi-criteria assessment of factors affecting the reduction of retention capacity of dam reservoirs. *Elementa: Science of the Anthropocene* 12 January 2024; 12 (1): 00069. doi: <https://doi.org/10.1525/elementa.2023.00069>

Pieron Ł., Absalon D., Matysik M. Multi-criteria assessment of factors affecting the reduction of retention capacity in the Sulejów reservoir catchment - verification of the possibility of implementing the original methodology (review)

Spatial multi-criteria analysis of water areas: the district city of Katowice - a case study



From the analysis it emerged that there are areas in Katowice where there is land covered by water in the basic field according to EGIB but no watercourse. The legal status is inconsistent with the real one. Land covered by water according to the Water Law Act should be the property of the State. The difference between the area occupied by land covered by flowing water ('Wp' land use) not owned by the State in relation to the share of all land covered by flowing water in the basic field is somewhere more than 10 ha. The greatest differences are found within the Potok Leśny (a right-hand tributary of the Rawa River in the northern part of Katowice), which is a water device. The differences are therefore the result not so much of a lack of regulation of ownership issues but of a mischaracterisation of the nature of the waters of the Potok Leśny. Critical values between the EGIB and linear surface water databases were noticed in 10 based fields, located mainly in the north-eastern part of Katowice (in the area of the largest surface anthropogenic reservoirs).

← Comparison of consistency of linear databases and verification of whether surface water occurs land owned by the State

Janczewska, N.; Matysik, M.; Absalon, D.; Pieron, Ł. Spatial Multi-Criteria Analysis of Water-Covered Areas: District City of Katowice—Case Study. *Remote Sens.* 2023, 15, 2356. <https://doi.org/10.3390/rs15092356>

Comparison of the occurrence of watercourses on land designated as covered by flowing waters →

Summary

The author's method of spatial multi-criteria analysis, based on basic fields with hexagon geometry, has been successfully applied widely in research related to effective water management. It has the advantage of being highly objective and able to compare any type of spatial data (point, line and polygon). It is therefore a valuable research method and an effective tool in water management work (including retention and drought mitigation), both in terms of assessing factors affecting the reduction of reservoir capacity and verifying the quality of data in surface water and water-covered land use databases.