

PRINCIPLES OF HYDROLOGICAL REGIONALISATION AN EXAMPLE OF THE UPPER VISTULA BASIN (POLAND, EAST-CENTRAL EUROPE)

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Regionalisation has for many years been a standard hydrological tool, which is used to enable us to translate data measured at one point to points where measurements have not been carried out. There may be other approaches to regionalisation and they all deal with distribution of water in space and time. Principles of regionalisation are found in Grigg (1967). In previous works, hydrological regions have been based on geologic, climatic, or even administrative criteria (Beable and McKerchar 1982, Gottschalk 1985). The use of those criteria makes it easy to assign an ungauged site to a region, but these regions might not necessarily be hydrologically homogeneous (Wiltshire 1986). The procedure of regionalisation becomes increasingly quantitative and objective, using statistical and other methods to reduce the number of value judgements and subjective decisions. Delimitation of hydrologic regions, which are defined as areas where precipitation, runoff, evaporation, and groundwater resources are similar, is the main purpose of the paper. A procedure of delimitation of hydrologic regions has been adopted, which consists of three stages:

- (a) classification of elementary units resulting in typological classes,
- (b) distinction of spatial classes on the map, and
- (c) distinction of hydrologic regions using the geographic method of dominant and subdominant units.

The study area was the southern drainage basin of the Vistula River (Fig. 1), which consists of high alpine mountains as well as uplands and lowlands. It seems advantageous to examine a new method of regionalisation in various physiographic areas. The investigated area was divided into regular grid cells

independent of basin boundaries. There is the possibility of storage and use of various data sets lie in the grid-cells system (Simo 1986). The distance between grid lines varies according to the following relationship (Simmers 1984).

$$0.05 A \leq l \leq 0.1 A$$

where

l = grid spacing and
 A = total investigated area.

Units can be of any size, and characteristics chosen for discriminants between regions should be directly related to the purpose for which regionalisation is to be carried out.

Ward's taxonomy was used for classification of elementary units in the Upper Vistula Basin. The similarity between objects was measured by the Euclidian distance coefficient. The choice to stop grouping was not made arbitrarily; dendrograms which are statistical measures of the efficiency of grouping and spatial distribution of classes on the map, were taken into consideration. The spatial classes can neither be too detailed nor too general and should refer to the purpose of regionalisation. The dominant and subdominant method is based on the internal structure of spatial classes and dominant elementary units belonging to some class demonstrating the highest percentage of area or greatest frequency. A region is assumed to be an area where elementary units belong to one dominant typologic class. There may also be other subdominant elementary units of another typologic class or classes.

Altogether 27 hydrologic regions were identified in the Upper Vistula Basin (Fig. 1). They differ mainly in surface water and groundwater resources.

It is believed that the regionalisation procedure presented in this paper could be useful in practical hydrology, e.g. within network planning, physiographic evaluation of the investigated area, and generalisation of results from the representative basin. Taxonomy greatly facilitates interpretation of data sets. The presented procedure of regionalisation can be useful for all types of terrain in the world.

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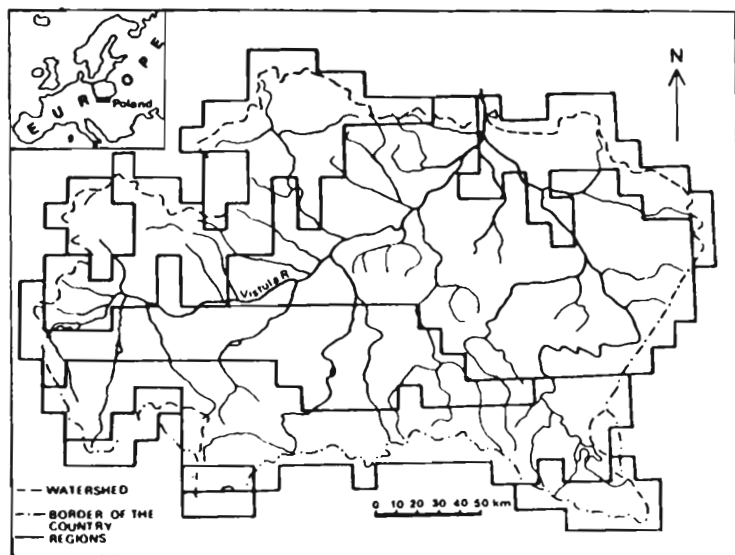
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Figure 1. Hydrologic regions in the Upper Vistula Basin



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