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TASK OF HYDROGEOGRAPHY IN UTILIZATION AND PROTECTION OF WATER RESOURCES

Hydrogeography as one of the physico-geographical sciences deals with different forms of water occurrence on the Earth. The object of its study is both the surface and subsurface water contained in minerals and soil, which is evaluated mainly from the point of view of its utilization in the system of the human environment. This scientific branch pays attention to some hydrological phenomena, mainly to the runoff of surface and ground water from territory, in connection with their interaction and relationship to other elements of the natural and socio-economic sphere. Hydrogeography is also concerned with the changes evoked by human activities.

In the past the hydrogeographical work was mainly limited to the description of hydrological characteristics of the territories under study and their water bodies, at present problems associated with changes in the human environment due to different human activities dominate, i. e. artificial interference with the water cycle in the landscape as well as changes in water resources caused by these activities. The most important sphere of hydrogeography is the geographical analysis of the natural and socio-economic components of the human environment, and a synthesis of a partial knowledge of some other scientific branches as well as the evaluation of the interrelationships of these factors having impact on the formation and use of water resources.

Hydrogeography should mainly solve problems related to the continuously increasing demands for water as one of the natural resources extremely important for the human society. The disproportion between the water consumption and accessible water resources is increasing due to an extremely uneven distribution of water storages on as well as under the surface of the earth, both as a whole and on the territories of individual states. Most different landscape types occur on the earth surface differing from each other not only by their natural conditions but also by the extent of the changes due to human activities. The volume of the water storage in a water body, its quality and utilization for other purposes is associated with the diversity of natural conditions and the intensity of antropogenic interferences with the landscape.

From the point of view of general classification of natural resources, water is one of the inexhaustible natural resources, its cycle on the earth representing practically an indestructible natural phenomenon. That makes water different from some other natural resources, such as minerals

whose supplies — due to an intense exploitation — have been permanently decreasing. The volume of water storages differs over a region (e. g. drainage basin, artesian basin, etc.) and time. That means that water storages are alternately decreasing and increasing in dependence upon changes of natural conditions, mostly physico-geographical conditions, and upon the impact of human activities. A permanent decrease of water storages may be often due to an excessive withdrawal and an intense intake of ground water.

But there are also cases of intense water consumption for different economic purposes when the volume of water convenient for use is not decreasing but, on the other hand, increasing, e. g. owing to a higher precipitation or thawing of the snow cover, and consequently an increased infiltration of surface water into minerals.

The number of areas characterized by the shortage of water resources has been increasing on the Earth. When regarding the balance of water demand both for water supplies for inhabitants, agriculture and industry — and water resources convenient for utilization in these areas, it is evident that all the demands cannot be met. From the point of view of the water management they become deficient. The extension of dry areas on the Earth is also caused by various human activities. Vast damages and removal of vegetation affecting even the tropical rainforest result in a general extension of deserts and arid areas. One of the unpropitious interferences with the water regime in cultural landscape often resulting in the reduction of water storages is its drainage. Its main purpose is to ameliorate the water regime of the soil, which should favour its utilization and thus increase also the production of cultivated cultural plants. These interferences, however, have usually also a negative effect, especially the acceleration of the runoff of the surface as well as ground water.

The geographical method of water evaluation in the system of the human environment used in hydrogeography is remarkable for the complex conception of the research of this factor. That is why it differs so much from methods of water evaluation applied in some other scientific branches (e. g. in hydrology, hydrogeology) dealing with water only from very specific points of view. The same holds true of the public utility of water as an irretrievable material for the transformation of the energetic potential used in the transport and recreation of the population. The reason why more attention is paid to water now may also be the fact that it occurs in specific natural or artificial water bodies which signify a certain limitation or an insurmountable obstacle from the point of view of the development of the economic activities.

Regarding water from the point of view of geography, much attention is paid to its many-sided significance in the system of the human environment. A convenient solution to the existing problems is being looked for to get nearer to the optimal way of utilization and protection of water resources, both from the point of view of their uneven distribution over a certain territory and variability in time, and a complex utilization and preservation to meet contemporary as well as future needs of the human society. Owing to the large extent of the task in question, it is necessary to take over all pieces of information also from other scientific branches, especially hydrology, geology, hydrogeology, pedology, etc.

as well as from some branches of economic activities, above all the water management.

Characteristic of the geographical approach to the solution of water and water resource problems in the system of the human environment apart from the regional view is also the study of the time variability and the connections with other elements. The aim is not only to find the correlations between water and other elements forming the system of the human environment but also their quantification and classification, and if need be also representation in thematic maps. One of the significant tasks is to determine the limit values of water resource utilization considering the extent of damage caused by the human activities.

The hydrogeographical research of the landscape must be based on an exact knowledge of the water occurrence and the water cycle. It is necessary to find a number of important hydrological and other characteristics, e. g. quantitative and qualitative data on the water body, hydrological regime, etc. With regard to the particularities of the hydrological system it is necessary for the characteristics in question to be determined not only for the area under study but also for the streams running through this territory as well as for the ground water flowing from or running off to the neighbouring areas.

The optimal result of the hydrogeographical landscape research should be a complete quantitative and qualitative characteristics of all parts of the hydrological cycle, especially of those that can be used for the needs of man, i. e. water resources. In fact this form is often replaced by slightly simplified abstractly or materially realized systems (e. g. physical or mathematical models) or balances in direct dependence on the complete knowledge of the landscape, on technical possibilities, or advice of the compilers.

In Czechoslovakia the hydrogeographical research was directed in the last years to the elaboration of significant characteristics of water resources and the appraisal of their relationship to other elements of the environmental system in some important areas (North Bohemia, Českomoravská vrchovina — Bohemian-Moravian Uplands, the region of Ostrava etc.). Most of them are studies carried out for the needs of the territorial planning, some of them meet the demands of public utility. They are especially concerned with the changes of hydrological and water management conditions which are supposed to be caused in the landscape by some large constructions, e. g. Nové Mlýny (dam) or the nuclear power station in Dukovany, or the opening of new mines, etc.

In future the hydrogeography in Czechoslovakia should assist in solving significant problems related with the continuously increasing water demand and with the negative impact on water resources. At present, the solution to problems associated with the utilization of water resources is of prime importance in Czechoslovakia. These systems represent the systems of elements of the water management which are mutually related and form a whole serving the water management. Their purpose is not only to find the water resources for the water management in the primary spheres of water use but also the amelioration of the water quality, the modification of the water runoff conditions, favourable changes in the human environment, and a number of other measures.

A thorough knowledge of natural and socio-economic conditions of

the territory is a main precondition for the formation of water management systems. Also hydrogeography should participate in the elaboration of sufficiently detailed and complex characteristic of the natural and socio-economic conditions of these territorial units (catchment areas) where the water management systems are supposed to be built. Its main task should be a synthesis of pieces of information gained from other scientific branches, their completion and appraisal. It should also deal with forecasts of future development and with projects of protection of water resources. Some results should be represented in maps. The maps should not show only the hydrological potential of the territory in question and the significance of water resources occurring there but also the influences of natural and socio-economic conditions on their utilization. Apart from this the maps should depict the extent and kind of protection of water resources. The protection as a consequence of economic activities is of much importance with regard to the conditions of the territory in question.

The real significance of hydrogeography will show in future when water management problems are solved. The present water management systems, i. e. the systems which include the drainage basin of rivers on the territory of one state will probably not satisfy the future needs. Presumably, water will be shifted from areas where it is in abundance to areas where it is deficient within the sphere of the catchment area of the main continental rivers. In the solution of the most important problems of the water management an international team of hydrogeographers should cooperate.

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Shrnutí

ÚKOLY HYDROGEOGRAFIE PŘI VYUŽÍVÁNÍ A OCHRANĚ VODNÍCH ZDROJŮ

V minulosti se hydrogeografické práce omezovaly převážně jen na popis hydrologických charakteristik vybraných území a jejich vodních útvarů. V současné době již v nich převažuje hodnocení problémů, které souvisejí se změnami životního prostředí v důsledku různých činností člověka. Jde zejména o komplexní posuzování umělých zásahů do oběhu vody v krajině a změn vodních zdrojů způsobených touto činností. Mezi hlavní úkoly hydrogeografie rovněž náleží geografická analýza přírodních a socioekonomických složek životního prostředí a syntéza dílčích poznatků i z jiných vědních oborů, jakož i hodnocení vzájemných vztahů těch činitelů, které mají vliv na tvorbu a využívání vodních zdrojů, popřípadě i jejich ochranu.

Při geografickém posuzování vody se přihlíží k jejímu všestrannému významu v systému životního prostředí a hledá se takové řešení vzniklých problémů, které by se co nejvíce přiblížilo optimálnímu způsobu využívání a ochrany vodních zdrojů, a to

jak z hlediska jejich nerovnoměrného rozložení na určitém území a proměnlivosti v čase, tak i komplexního využívání a také zachování pro uspokojování současných i budoucích potřeb lidské společnosti. Příznačné pro toto geografické řešení problému vody a vodních zdrojů v systému životního prostředí je nejen regionální zaměření, ale i studium časové proměnlivosti a vazeb na ostatní prvky. Úkolem je nejen zjištění vztahů a závislostí mezi vodou a jinými prvky, které tvoří systém životního prostředí, ale i jejich kvantifikace a klasifikace, popřípadě i znázornění v tematických mapách. Jedním z významných úkolů je též určení mezních hodnot využitelnosti vodních zdrojů s přihlédnutím ke stupni ohrožení činností člověka.

Optimálním výsledkem hydrogeografického výzkumu krajiny by měla být úplná kvantitativní a kvalitativní charakteristika všech částí oběhu vody, zvláště těch, které jsou využitelné pro potřeby člověka, tj. vodních zdrojů. Ve skutečnosti bývá však tato forma často nahrazována v různé míře zjednodušenými, abstraktně představovanými nebo materiálně realizovanými systémy (např. modely) nebo bilancemi, v přímé závislosti na úplnosti poznatků o krajině, technických možnostech, popřípadě i záměru zpracovatelů.

V ČSSR se hydrogeografický výzkum zaměřil v minulých letech na vypracovávání význačných charakteristik vodních zdrojů a zhodnocení jejich vztahu k jiným prvkům systému životního prostředí v některých významných oblastech (severní Čechy, Českomoravská vrchovina, Ostravsko aj.). Šlo vesměs o studie zpracované pro potřeby územního plánování. Kromě toho byly vypracovány i některé studie na základě požadavků společenské praxe. Jde zejména o posouzení změn hydrologických a vodohospodářských poměrů, které způsobí v krajině některé velké stavby, např. vodní dílo Nové Mlýny či jaderná elektrárna Dukovany, resp. výstavba nových dolů apod.

Perspektivně by se měla v ČSSR hydrogeografie uplatňovat především při řešení některých závažných problémů, které souvisejí s neustálým růstem potřeby vody a negativním ovlivňováním vodních zdrojů. V současné době se začíná v ČSSR prosazovat řešení těchto problémů v rámci tzv. vodohospodářských soustav, které představují systémy vodohospodářských prvků spojených vzájemnými vazbami v účelový celek. Základním předpokladem pro jejich vytvoření a úspěšné plnění úkolů je dostatečná znalost přírodních a socioekonomických podmínek příslušného území. Na jejich vypracování by se měla významnou měrou podílet hydrogeografie.

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