

# VICAIRE - MODULE 2

## Qualitative Hydrology - Chapter 4

### Summary: Natural quality in streams and rivers

The quality of the water in the streams and rivers is a combination of their ionic composition, the mineralization, the dissolved organic matter contained, and the total and permanent hardness. The composition and the characteristics of the water in the streams and rivers is determinative to a certain degree for their utilisation as a resource for variable economic activities; it is also crucial for the structure and function condition of aquatic ecosystems and the hydro-ecological safety of the river basins.

The quality of surface waters is a result of the interaction between abiotic and biotic factors. Among the first ones are the climate, the conditions in the watershed for transformation of the rains into a flow (geomorphologic - indentation of the relief, slope of the basin, geological - the structure of the rocks; soil - types of soils and areas they take; vegetation - types, age and density of the forest vegetation, afforestation), morphometric index of the river (width, depth, curve) and its hydrodynamic characteristics (speed of the river flow), temperature of the water in rivers.

Usually among the anions contained in the river water the ones with highest concentration are  $\text{HCO}_3^-$  (+  $\text{CO}_3^{2-}$ ),  $\text{SO}_4^{2-}$   $\text{Cl}^-$ , and among the cations  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$  ( $\text{K}^+$ ). Most often the proportion between them is  $\text{HCO}_3^- > \text{SO}_4^{2-} > \text{Cl}^- > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{Na}^+$  ( $\text{K}^+$ ). In respect of the anions the river water is usually hydrocarbonated and sulphated, and in respect of the cations it is usually Calcium. River waters also contain some non-conservative substances - Fe, Cu, Zn, Pb etc. Depending on the conditions in which river waters are formed it contains different in concentration dissolved gases. Oxygen is of great importance concerning the quality of waters. Besides the inorganic components stream and river waters contain a great amount of dissolved (and sometimes not dissolved) organic matter and its concentration varies from 0,5 to 10 mg/dm<sup>3</sup>. The basic components of the organic matter are carbon, oxygen and hydrogen.

The natural quality of waters in streams and rivers is formed by several groups of factors that work together and at the same time:

- climatic conditions in the river basins (geomorphologic, geological, soil, vegetation)
- hydrological (alimentation of river and flow regime)
- hydrodynamic (speed of the river flow) and which are also determine the specific hydrophysical, physical-chemical, hydrobiological and biological processes in the water flow.

Among the hydrophysical processes that affects on the quality of stream and river waters are the transportation of the solid particles, heating and cooling (off), evaporation, freezing (formation of ice), absorption, diffusion and dispersion of the light in the water flows. Important processes for the formation of the water composition are hydrolysis, dissolving of substances, sedimentation, sorption, ionic exchange and so on. An important factor for the quality of waters is the organisms that live there. Directly or by external metabolites they effect on each other and the environment.