Physical and human influences on fluvial water quality in the Tagus river catchment, Portugal

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Rivers are important resources of drinkable water, ecosystems with a high biologic potency and places of entertainment. Water quality at the catchment scale depends on climate, geology, geomorphology, soils and mainly of land use and land cover. Different activities such as agriculture, livestock, industrial and urban drains have promoted the deterioration of the fluvial water quality. The announced climate changes, the increase of food requirements, as well as the urban concentration of people pose new challenges for the assessment and sustainable management of water quality on the catchment scale.

At present about 2/3 of portuguese population live near coast, in urban centers. Since the last three decades, the largest part of the marginal agricultural land has been abandoned whilst the most productive soils have experienced an intensification on its productivity. The Tagus river catchment, with an area of 24.850 km2 only in the Portuguese territory, shows very important contrasts in climate, geology, geomorphology, land use and population density.

The main objectives of this work are to evaluate and compare the surface water quality in different sub catchments of Tagus river and to contribute to a better understanding of how physical and human factors (such as geology, precipitation, temperature, runoff, land use and land cover and population density) interfere in their spatial-temporal variability.

In order to achieve this issue, twenty sub catchments were selected. The chosen catchments show different locations and areas, and a quite long data series of physical, chemical and biology properties of water, such as nitrates, phosphates, dissolved oxygen, total coliforms, etc.

Making use of Geographic Information System (GIS) tools, a database was created for each sub-catchment containing all the physical and human characteristics. Afterwards, statistical analysis was carried out by using SPSS programme (11.0 for Windows. One-way analysis of variance and the Tukey multiple comparison procedure was performed in order to assess whether differences in physical and human factors and water properties existed among the selected sub catchments. Other statistical procedures were carried out to determine correlations and dependencies between available data.

Obtained results show significant statistical differences ($p < 0,001$) among sub catchments concerning surface water quality. Results allow us to conclude that such water is in good quality, contrary to other water which contains a very high nitrates, phosphates and total coliform levels. The factors which better explain this variability are related to the land use, chiefly when social use is preponderate.