

Hydrochemical evaluation of surface waters of the Cértima River basin (Portugal)

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The Cértima River stretches over a length of about 45 km and has a total catchment area around 535 km², discharging into the Águeda River which drains into the Vouga River and then to the Ria de Aveiro coastal lagoon. The final section of the Cértima River basin corresponds to the Pateira de Fermentelos, a shallow natural water body resultant of the widening of the river on this area. The Pateira de Fermentelos lagoon is one of the largest natural lakes in the Iberian Peninsula constituting an important wetland with a vulnerable dependent ecosystem.

Recently, on the Vouga River Basin Management Plan it was reported that the Cértima River failed to achieve good surface water chemical status. This research was carried out to illustrate not just the main impacts of pollution sources on the river water quality but also the geochemical contributions for the surface water background composition.

A total of 29 sampling sites were selected in the Cértima River basin taking into account the location of the potential pollution sources and the outcropping areas of the different geological formations. Temper-

ature, pH, electrical conductivity (EC), redox potential (Eh), total dissolved solids (TDS), total alkalinity and dissolved oxygen (DO) were determined *in situ*. Water samples were collected for determination of major, minor and trace elements, as well as total organic carbon (TOC), fluoride, chloride, bromide, nitrite, nitrate, phosphate and sulphate analyses.

Three major hydrochemical facies were identified: (1) the highland waters, characterized by non carbonate rocks, presented a facies dominated by chloride, bicarbonate and sodium, with low TDS; (2) the rest of the basin has a calcium bicarbonate facies, with the highest TDS, resulting from the dissolution of carbonate rocks; (3) the Pano stream waters present a bicarbonate-chloride calcium sodium type water, reflecting the different Cretaceous lithologies and some influence of anthropogenic pressures. The results also show that some of the evaluated parameters values in mountainous areas (sampling sites in the East side of the basin - right bank tributaries), were in general low, reflecting the low anthropogenic pressures and the minor geological contribu-

tion on the hydrochemistry signature of the waters in this area. In contrast, the sampling sites in the alluvial plains (left bank tributaries and main stream) presented higher concentrations for most of the parameters. Some water pollution problems were identified along the Cértima river basin, particularly in the river's middle segment and in the Pateira de Fermen-

telos lagoon. This deterioration of water quality is closely related to agricultural and industrial activities within the basin, as well as to domestic wastewater discharges.

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