A CONTRIBUTION TO DRINKING WATER SOURCES PROTECTION STRATEGIES IN A PORTUGUESE RIVER BASIN

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INTRODUCTION

The river Cavado basin, located in the north-western region of Portugal (Figure 1), has a very intensive use for water supply, irrigation and hydropower generation. New water supply project serving the Oporto Metropolitan Area, with one million people and a design flow of 2.7 m³/s, will introduce new challenges in the river water quality management. Since the river Cavado flow regime is artificially controlled by reservoirs, a flow discharge policy is needed. Moreover, the consideration of wastewater loads in the basin – wastewater treatment plant (WWTP) effluent discharges, untreated industrial wastewater discharges and agricultural diffuse pollution – must be considered to allow adequate river water quality for drinking water supply purposes.

RESULTS

Mathematical models have been applied for a range of river flow conditions to predict water quality changes due to pollutant discharges. Biochemical oxygen demand (BOD), dissolved oxygen (DO), faecal coliforms bacteria (FC), nutrients (N and P) and chlorophyll-a were used as water quality control parameters to assess critical situations near the proposed abstraction point of Areias de Vilar. The river water quality was simulated for different scenarios (Table 1), considering Braga WWTP efficiency, abstracted design flow of 2.7 m³/s, will introduce new challenges in the river water quality management. New water supply project serving the Oporto Metropolitan Area, with one million people and a

CONCLUSIONS

- Results of the model simulations show that the selected quality criteria for BOD and FC are violated in planned WTP sites and in Barcelos region for some critical conditions related to the eventual rupture in Braga WWTP operation.
- Low-flow conditions are more severe to BOD concentrations, while wet-weather periods appears to be more critical for FC bacteria.
- High level of quality control of Braga WWTP as well as construction of Barcelos WWTP seems to be the best way to achieve the desired water quality standards.
- Braga WWTP failure seems to be the major factor for river water eutrophication, even when other nutrient sources are considered.

REFERENCES


METHODOLOGY

Decision support systems (DSS) provide new attractive tools to support river basin management, incorporating data base management, hydrologic, hydrometrics, ecological modelling and geographic information systems. The application of this methodology considering various planning scenarios, in order to establish operational standards at the new water treatment plant (WTP), is summarised in Figure 2 (Vieira, 1999).

Numerical experiments were performed simulating the river flow regime variations on river water quality, in case of water flow abstraction near the proposed abstraction point of Areias de Vilar. The river water quality was simulated for different scenarios (Table 1), considering Braga WWTP efficiency, abstracted flow at 2.7 m³/s, will introduce new challenges in the river water quality management. New water supply project serving the Oporto Metropolitan Area, with one million people and a

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