Geophysical Research Abstracts
Vol. 20, EGU2018-15382, 2018
EGU General Assembly 2018

Water management strategies to mitigate effects of climate change impacts on water quality in an intermittent river in the Brazilian Semi-arid

Renato Fernandes (1), Rodolfo Nóbrega (2), Ticiana Studart (3), and Cleiton Silveira (4)

(1) Regional University of Cariri, Department of Civil Construction, Juazeiro do Norte, Brazil (renatodeof@urca.br), (2) Department of Geography & Environmental Science, University of Reading, Reading RG6 6DW, United Kingdom, (3) Federal University of Ceará, Department of Water Resources and Environmental Engineering, Fortaleza, Brazil, (4) University of International Integration of Afro-Brazilian Lusophony, Redenção, Brazil.

Studies on stream water quality in intermittent rivers are scarce, despite their importance in providing ecosystem services in arid and semi-arid regions. In this context, our research focuses on management strategies of an intermittent river located in the Brazilian Semi-arid region, the Jaguaribe River. The Jaguaribe River has a watershed area of 72,000 km^2 and an extension of 610 km, where three large regulating reservoirs operate and reduce the intermittency of the lower Jaguaribe watershed. However, changes in the climate may affect the regulating capacity of these reservoirs, which in turn will change the river biochemistry and, consequently, its self-purification capacity. Furthermore, this river is likely to face changes in its water quality due to increases in the domestic sewage effluent released into the stream. To assess the degree of these impacts, we developed water quality projections based on 20 Global Circulation Models (GCMs) of the Fifth Intergovernmental Panel Report on Climate Change for the 2040–2069 and 2070–2099 periods and the RCP4.5 and RCP8.5 scenarios. We used the Soil Moisture Accounting Procedure (SMAP) hydrological model to estimate the reservoir inflow based on the GCMs outputs. This information was used in a network flow model (AcquaNet) to simulate the downstream flow with 90% of guarantee, also known as reference flow. We identified thresholds of reference flow decrease by sensitivity analysis of changes in Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO) using the Qual2E stream water quality model, and then developed management strategies by defining goals for reducing the BOD load and the variation of the predicted reference flow. Our results showed that to meet the satisfactory water body classification (class 2) – established by the Brazilian legislation for reservoirs for supplying water for human uses – the reduction in the reference flow must be less than 45% for the period 2040–2069, and less than 20% for the period 2070–2099 considering increases in domestic sewage effluent released into the stream due to population growth. Following these thresholds in the reference flow and the sensitivity analysis, the BOD load associated to the domestic sewage effluent into the stream released into the river need to be reduced by 20% (2040–2069) and 10% (2070–2099) to meet the goals of maintaining the BOD and DO levels at a the satisfactory water quality classification in the Jaguaribe River. The progressive reduction of BOD load accordingly to the regulated flow and to the Brazilian water classification system is a promising management strategy that can be already established to circumvent future setbacks in preserving adequate stream water quality standards.