

Aghien lagoon: a sustainable resource of fresh water for the city of Abidjan (Ivory Coast)? Description of the project and preliminary results

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With more than 6 million inhabitants, Abidjan district faces tremendous difficulties in water supply. The aquifer of the Continental Terminal which is actually the only drinking water source of the city shows a decline of resources and water demand is increasing due to the population growth. Moreover significant evidences of chemical and biological pollution of the groundwater are observed. The Aghien lagoon, the largest freshwater pool located near Abidjan, has been identified by the State of Côte d'Ivoire as a potential resource for the production of drinking water. The main objective of this project is to assess the quantitative and qualitative capacity of the Aghien lagoon to complement the water supply of Abidjan city in the near future.

The main components of the project are:

- to assess the water budget of the lagoon and its tributaries,
- to characterize the spatial and temporal variability of contaminant levels and fluxes from the tributaries toward the lagoon,
- to assess the sustainability of the water resources (quantity and quality) of the lagoon according to land use changes in the catchments .

The project started in January 2015. The first year was devoted to the set-up of hydro-meteorological gauges within the lagoon watershed. Three major tributaries of the lagoon are considered, the Mé (4000 km²), the Djibi (78 km²) and Bete (206 km²) rivers. Since the start of the project, bi-monthly hydrochemical sampling surveys have been carried out along the tributaries and in the lagoon. The data available from the surveys concern the physico-chemical parameters, trace elements, all the forms of nitrogen and phosphorus, organic carbon, suspended solids.

The Djibi and Bete watersheds are partly urbanized while the Mé basin is mainly rural. Baseflow has been identified as the major contribution to streamflow at the annual scale. The Mé flows into a channel downstream to the Aghien lagoon but during the floods, water from the Mé River can flow up the channel and supply the Aghien lagoon. Discharge measurements have shown that over a period of 8 months Bete and Djibi Rivers renewed half of the total volume of the lagoon. The quantification of the Mé contribution is in progress.

In agreement with its high rate of urbanization, Djibi River is highly contaminated. High levels of ammonium and total phosphorus have been observed during both low and high flow conditions. Physico-chemical surveys have shown also higher values of conductivity and lower values of dissolved oxygen in the Djibi River. Despite dilution effect due to the Mé river inflow, the Aghien lagoon is already hypertrophic. The lagoon presents a high biological activity characterized by high values of pH, phosphorus concentration but above all chlorophyll a.

The research in the lagoon is going on to characterize the temporal variability and to quantify the impact of the major flood events on the water quality of the lagoon and its tributaries, urbanized or rural.