



Pilot sites to study variation in groundwater quality in suburban area of Dakar using geochemical and multivariate statistical approaches

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The Thiaryoye shallow and unconfined sandy aquifer is an important groundwater reservoir in the region of Senegal's capital Dakar. However, its quality is deteriorated due to anthropogenic activities including land occupation and practice, inadequate sanitation facilities and suburban agriculture practices like in many other similar larger and growing cities all around the globe. Despite the alarming groundwater quality, little is known about the transport and fate of contaminants in soils and groundwater. Therefore, the objective of the study was to understand sources, and mechanisms and fate of contaminants in the unsaturated zone and groundwater. Thus, in three sampling campaigns (pre-, post-, and during rainy season), soil, groundwater and surface water, and rainwater were taken and analyzed for physicochemical parameters, major and minor elements, and stable isotopes of water, and nitrate and organic matter in soil. Classical methods used in hydrogeochemistry and additionally, multivariate statistical techniques and GIS tools were used for data analysis. Results from hydrochemistry analysis exhibited a value of NO_3 , Cl, and Na and SO_4 far above the WHO drinking-water guideline standard. These concentrations vary according to the season. However, the order of magnitude is the same over the time: $\text{NO}_3 > \text{Cl} > \text{Na} > \text{SO}_4$. At some locations, elevated contents in ammonia (NH_4) were found in the water (0.5 mg/L to 137 mg/L). The study of the dynamics of land occupation and land use together with the groundwater quality showed a positive evolution from 1960s to the present day. Indeed, the rapid population growth coupled with the lack of collective and adequate sanitation systems, and the anarchic land occupation and land use have contributed significantly to the supply in anthropogenic dissolved salts such as NO_3^- , Cl⁻, and SO_4^{2-} as well as the marine influence from the leaching of sea spray.