



## Hydrogeological proxies of urban weathered hard rock aquifers in Central Africa: Contribution for a sustainable water management and supply in high populated city

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Shallow groundwater resources, especially in hard rock environment, constitute an important part of urban water supply in developing countries, appropriate to the low level of economic development. However, increasing urban population and dependence on shallow groundwater systems make it imperative to evaluate the availability and the contamination of these resources, and define new strategies of water exploitation taking into accounts these findings and constrains. This study has been carried out on the shallow groundwaters of Yaounde, central Africa. Based on head slug-in tests, chemical and isotope analyses, we demonstrate the importance of geomorphological and geological settings that constrain hydrogeology, urban occupation and therefore, water exploitation and contamination. Slug test results show spatial variability of well recovery rates with higher values recorded in the valleys compare to the hills, presenting saturated hydraulic conductivity of  $10^{-6}$ - $10^{-8}$  m/s. Groundwater evolves from recharge zone as Ca-HCO<sub>3</sub> in the hillside lateritic system to discharge zone in the slope/valley colluvium/alluvium system as NaK-NO<sub>3</sub>. The groundwater composition dominated by silicates/water interaction in the hillside lateritic system, and anthropogenic processes in the slopes and valleys.  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$  of nitrates indicates that nitrate pollution of groundwater is mainly from sewage and human waste. Shallow groundwater in the hillside/new urban district and to a lesser extent slopes should therefore be protected and prioritised for usability and sustainability of the resources while ensuring the abstraction of the deeper part of the shallow aquifer in the valley/central districts due to the presence of denitrification. The proposed conceptual scheme for Yaounde can then be used as a guide in the development, exploitation and management of local wells in hard rocks system of Africa.