



# Physicochemical quality and metal pollution of Tabalak pond water (Ramsar site, Niger): Spatio-temporal dynamics and impacts on aquatic organisms

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## ABSTRACT

*Objective:* The present study aimed to evaluate the spatio-temporal assessment disturbances in water quality due to anthropogenic activities around Tabalak pond, based on physicochemical characteristics and metal pollution.

*Methodology and Results:* The physico-chemical variables such as temperature ( $T^{\circ}$ ), electrical conductivity (EC), total dissolved solids (TDS), pH and dissolved oxygen (DO) were measured in situ, while total suspended solids (TSS),  $Cl^{-}$ ,  $SO_4^{2-}$ ,  $HCO_3^{-}$ ,  $CO_3^{2-}$ ,  $NO_3^{-}$ ,  $NO_2^{-}$ ,  $NH_4^{+}$ , P, and trace metal elements (Pb, Zn, Cu, Fe and Cd) were determined in laboratory. It appears from the results that there was no significant difference in water quality among sampling stations. However, a significant seasonal variation influenced temperature, pH, dissolved oxygen,  $Ca^{2+}$ ,  $Mg^{2+}$ ,  $Na^{+}$ ,  $K^{+}$  and total nitrogen ( $P < 0.05$ ) was revealed. High mineralization was detected in hot season. Concentrations of nutrients:  $NO_3^{-}$  ( $1.2\text{--}1.6\text{ mg}\cdot\text{L}^{-1}$ ),  $NO_2^{-}$  ( $1.4\text{--}1.6\text{ mg}\cdot\text{L}^{-1}$ ),  $NH_4^{+}$  ( $1.3\text{--}1.6\text{ mg}\cdot\text{L}^{-1}$ ) and P ( $16\text{--}19.9\text{ mg}\cdot\text{L}^{-1}$ ), exceeded guideline values to protect aquatic life. High values were also recorded for Pb ( $25.98\text{--}43.80\text{ }\mu\text{g}\cdot\text{L}^{-1}$ ), Zn ( $8.13\text{--}10.76\text{ }\mu\text{g}\cdot\text{L}^{-1}$ ), Cu ( $3.4\text{ }\mu\text{g}\cdot\text{L}^{-1}$  at Fallé), and Fe ( $541.25\text{ }\mu\text{g}\cdot\text{L}^{-1}$  at Sillalé). If this trend is maintained, local biodiversity may be severely threatened.

*Conclusion and applications of results:* The results of this study showed the necessity to implement an integrated management approach to preserve the ecosystem services provided by this water body to local populations. An integrated management strategy combining regular physico-chemical monitoring, reducing of pollutant inputs, establishment of vegetated buffer zones, and control of anthropogenic pressures is essential.

**Keywords:** Tabalak pond; Ramsar site; physicochemical parameters; metal pollution; aquatic organisms