

**PhD-thesis: Viviane Umulisa**

**Abstract – Anthropogenic disturbances and the effects of agrochemicals in major wetlands of Rwanda**

River systems and wetlands pollution from anthropogenic sources have been consistently reported in the central-eastern part of Rwanda (Nyiranziza 2015; Nkundimana 2014; Nhapi et al. 2011). Particularity in the Nyabugogo wetland, which transverses the capital city Kigali, high values of nitrates are linked to excessive uses of fertilisers in agriculture areas (Nhapi et al. 2011).

This PhD thesis will be the first to explore the contamination from pesticides application in wetlands located in the Nyabarongo downstream catchment. Aim of the study is to understand transport, transfer and transformation of pesticides in soil, surface water, and ground water, being controlled by numerous biological, physical and chemical reactions (Gavrilescu 2011). A preliminary survey will be conducted to identify types of applied pesticides potentially affecting water quality. Thereafter, snapshot sampling of water and soil will be carried out consecutively four times a year covering both dry and rain seasons. Sampling sites include inlet points on Nyabarongo river system for surface water and boreholes for groundwater. Soil samples will be collected according to different land use activities. Snapshot sampling will be accompanied by *in-situ* measurements such as pH, temperature, electrical conductivity, dissolved oxygen (DO) and redox potential, as well as laboratory analyses for major, minor ions and trace elements. Together with hydrological and meteorological data, the field and laboratory data will provide an overview of groundwater flow and its sources, interactions with surface water and rocks as well as the spatial and temporal variability of water quality (Owor et al. 2011). Additionally, samples will be subjected to a Solid Phase Extraction (SPE) and analyzed by Gas-Chromatography coupled to Mass Spectrophotometry (GC/MS) for selected pesticides residues analysis. For the soil samples, parameters such as soil moisture, organic matter content and clay fraction that influence the pesticides behaviors will be also measured.

Statistical and modeling methods will be applied to describe and quantify the movement and fate of pesticides in environmental compartments with respect to the hydrogeology and climatic conditions in the area. The study will provide an understanding of water quality and its variability with respect to human health, and thus will contribute to develop strategies, which reduce water chemical pollution and assure the sustainable production of quality food in wetlands.

**References**

- Emmanuel Nkundimana, 2014. Assessment of physico - chemical and bacteriological parameters of surface water quality in Nyabugogo wetland.
- Gavrilescu, M., 2011. Fate of pesticides in the environment. *Journal of the Indian Chemical Society*,

88(10), pp.1525–1532.

Nhapi, I. et al., 2011. Assessment of water pollution levels in the Nyabugogo catchment, Rwanda.

*Open Environmental Engineering Journal*, 4, pp.40–53. Available at:

<http://www.benthamscience.com/open/toenviej/articles/V004/40TOENVIEJ.pdf>.

Nyiranziza, R., 2015. “ Assessment of groundwater quality in Nyabugogo wetland .”

Owor, M. et al., 2011. Groundwater/surface-water interactions on deeply weathered surfaces of low relief: evidence from Lakes Victoria and Kyoga, Uganda. *Hydrogeology Journal*, 19(7), pp.1403–1420. Available at: <http://link.springer.com/10.1007/s10040-011-0779-1> [Accessed December 7, 2016].