

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Albert Nkwasa**

The public defense will take place on **Monday 18th December 2023 at 3:30pm** in the **Green Room** (U-Residence, VUB Main Campus)

To join the digital defense, please click [here](#)

REGIONAL TO CONTINENTAL MODELLING OF WATER QUALITY IN AFRICA: IMPRINTS OF GLOBAL CHANGE ON RIVER NUTRIENTS AND SEDIMENTS

BOARD OF EXAMINERS

Prof. Abdellah Touhafi

Prof. Iris De Graeve

Prof. Wim Thiery

Prof. Steven Eisenreich

Prof. Rafael Marcé

Dr. Tang Ting

PROMOTORS

Prof. Ann Van Griensven

Abstract of the PhD research

Surface water pollution has emerged as one of the predominant environmental challenges of this century, as human activities and climate change considerably alter the natural quality of freshwater ecosystems. In Africa, gauging the true extent of how polluted or impacted freshwaters are remains challenging simply because the quality of many freshwater bodies has not been, and remains, unmonitored. For this reason, we developed a continental water quality model for 5644 river reaches to: (1) map out polluted rivers in Africa and (2) understand how human activities and climate change are influencing the water quality of rivers on the continent.

Using the Sustainable Development Goal (SDG) 6.3.2 criteria, which designates a water body as having "*good ambient water quality*" if 80 % or more of its monitored values meet their targets, our findings show that 45 % and 14 % of African rivers fail to meet the set water quality thresholds for simulated Total Phosphorus (TP) and Total Nitrogen (TN), respectively. When synthesizing data for both TP and TN, 33 % of the rivers do not qualify as having "*good ambient water quality*" for the recent decade (2010 - 2019). Looking at the historical impact of human and climate drivers on TN and TP exports to African coastal waters over the past 40 years (1980 to 2019), our analysis focuses on four major drivers: (i) climate change, (ii) fertilizer and manure changes, (iii) point source changes, and (iv) land use changes. Results show that climate change has been the dominant driver, causing both increases and decreases in nutrient exports. While climate change is having mixed impacts, human drivers are primarily contributing to an increase in the nutrient fluxes.

We hope that this model can try to bridge the water quality data gap in Africa, particularly in areas devoid of observational data, and be used to inform assessments in a broad range of water quality issues from inland and to coastal ecosystems.