VRIJE UNIVERSITEIT BRUSSEL

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 **Erasto Benedict Mukama**

The public defense will take place on **Monday 22nd June 2026 at 3:30pm** in room **I.0.02** (Building I, VUB Main Campus)

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CLIMATE CHANGE AND WATER SCARCITY IN THE GREAT RUAHA RIVER BASIN, TANZANIA: IMPLICATIONS FOR ECOSYSTEMS AND ADAPTIVE WATER MANAGEMENT

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Abstract of the PhD research

Water scarcity is one of the most pressing global challenges of our time, threatening the availability of water for people, ecosystems, and economic development. This challenge is particularly acute in the Global South, where growing populations, expanding agriculture, and increasing water demands are placing unprecedented pressure on river systems that sustain livelihoods and support development. At the same time, climate change is introducing additional uncertainty by altering rainfall patterns and increasing the frequency and severity of droughts, making traditional approaches to water management increasingly inadequate.

This thesis addresses these interconnected challenges by developing a framework to attribute the historical impacts of climate change and assess its future effects on river flows and water balance components using the Soil and Water Assessment Tool Plus (SWAT+) model. Applying the framework to the Great Ruaha River Basin in Tanzania, the study reveals that the observed decline in river flows is likely driven by non-climatic factors, including increasing water abstraction and land-use change, rather than climate change alone. Looking ahead, rising temperatures and increasing rainfall variability are projected to reduce river flows, posing significant risks to agriculture, hydropower production, ecosystems, and local livelihoods.

Recognizing the uncertainty surrounding future climate conditions, the thesis further applies the Climate Risk Informed Decision Analysis (CRIDA) framework, a participatory approach that combined SWAT+ modelling with local knowledge to support more robust and adaptive water resources planning. By bridging science, policy, and stakeholder perspectives, this approach provided practical insights for building climate-resilient water management strategies in the basin and beyond.