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 **Annika Schlemm**

The public defense will take place on **Friday 17th October 2025 at 4 pm** in room **D.2.01** (Building D, VUB Main Campus)

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THE ART OF CONNECTING THE WATER-ENERGY-FOOD-ENVIRONMENT NEXUS: INSIGHTS FROM A PARTICIPATORY, MULTI-METHOD STUDY IN EAST AFRICA

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Abstract of the PhD research

How can we manage the interconnected challenges of water, energy, food, and environmental systems in an era of climate change and resource scarcity? Traditional sectoral approaches have proven inadequate, particularly in data-scarce regions of the Global South where these challenges converge most intensely. This thesis addresses this question through the Upper White Nile basin in East Africa – a transboundary watershed that supports 70 million people across five countries, facing mounting pressures on its natural resources.

Through seven empirical chapters employing innovative participatory methods, the research builds progressively from conceptual framing to practical intervention. The thesis begins by establishing what societies value in nature, revealing how scientific assessments and local stakeholder perspectives offer complementary rather than competing insights. This understanding is then made operational through integrating ecosystem services within the water-energy-food-environment (WEFE) nexus framework, transforming abstract concepts into concrete conservation priorities. Moving beyond static assessments, stakeholder co-developed indicators enable dynamic modelling that captures how climate change amplifies vulnerabilities across interconnected systems. These assessments are then translated into actionable strategies through participatory mapping of Nature-based Solutions that simultaneously address ecological degradation and livelihood needs.

However, understanding where and how to intervene proves insufficient without confronting why solutions fail to materialise. Policy analysis reveals fundamental disconnects between rhetoric and implementation reality, exposing how power imbalances, knowledge hierarchies, and colonial legacies constrain effective environmental management. Addressing these barriers requires not only institutional reform but also transforming how environmental stewardship develops. Finally, this research examines innovative participatory arts approaches that enhance environmental stewardship through capital development and community benefit motivations.

This thesis demonstrates how participatory approaches enhance rather than compromise scientific rigour, offering replicable frameworks for knowledge co- production that balance global technologies with community-based systems – providing pathways toward more equitable and effective environmental management in transboundary watersheds globally.