

KATORIA LEKARKAR

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Profile

Hydrologist and water resources engineer with a recently completed PhD from Vrije Universiteit Brussel, focused on water availability, drought and climate adaptation. I combine process-based hydrological modelling, environmental data and field observations to assess water systems and support practical decisions on climate resilience, nature-based solutions and landscape water retention. I bring consultancy and project-management experience from Belgian and international water projects, including direct responsibility for projects worth more than €1 million. I also developed SPONGE, a modular hydrological model for evaluating the potential of water retention measures to increase water availability.

Core Expertise

- Applying hydrological and climate models to assess current and future water availability, drought risks and their effects on water security.
- Evaluating the hydrological benefits of nature-based solutions and water retention measures as adaptation options against droughts and water scarcity.
- Developing water resources strategies, developing water investment plans, and translating technical assessments into practical priorities.
- Communicating hydrological findings through technical reports, maps, proposals, presentations and decision-support outputs for multidisciplinary teams and water-sector stakeholders.
- Coordinating international water and climate projects, including work planning, budgets, partner collaboration, deliverables and reporting.
- Integrating GIS, remote sensing, field observations and environmental datasets in reproducible analysis and modelling workflows.

Research and Professional Experience

PhD Researcher – Water Availability and Climate Adaptation in Belgium

Vrije Universiteit Brussel, Belgium

2022 – 2026

- Applied the mesoscale Hydrological Model (mHM) across Belgium to assess soil moisture droughts, baseflow, groundwater recharge and water availability under historical and future climate conditions.
- Reconstructed historical root-zone soil moisture droughts and assessed how they develop, persist and recover, and their implications for practical drought monitoring and preparedness
- Quantified future changes in groundwater recharge using downscaled global climate models, identifying increasing dependence on winter and spring recharge and substantial summer and autumn losses.
- Evaluated the suitability of low-cost soil moisture sensors for environmental monitoring, including applications in drought monitoring and the performance of nature-based solutions aimed at increasing landscape water retention

- Developed SPONGE, a modular process-based hydrological model to quantify the 'sponge' function of soils and to assess how green adaptation measures influence water availability and drought resilience.
- Applied machine-learning-based attribution to analyse how climatic drivers and land-surface conditions influence future water scarcity.

Project Manager – UNESCO Chair on Open Water Science and Education

Vrije Universiteit Brussel, Belgium

2023 – 2026

- Managed international projects on open hydrological data, environmental monitoring, open-source modelling and climate-resilient water management.
- Coordinated project partners, budgets, work plans, deliverables, reporting and communication for projects with a combined value exceeding €1 million.
- Led the processing, documentation and publication of soil moisture datasets collected using low-cost environmental sensors.
- Developed hydrological modelling and data-analysis training materials using SWAT+ to support Climate Risk Informed Decision Analysis.
- Co-developed dashboards and communication tools for presenting spatial and time-series hydrological information to technical and non-technical users.
- Prepared successful funding proposals and worked with academic institutions, international organisations and water-sector partners.

Water Resources Engineer

Rural Focus Limited, Kenya

2017 – 2020

- Developed water resources strategies, masterplans and investment plans for drought-prone and water-scarce landscapes.
- Conducted feasibility studies for surface and groundwater water supplies and rural water distribution systems.
- Translated hydrological and engineering assessments into prioritised interventions, budgets, implementation plans and recommendations for clients and public authorities.
- Designed, costed and supervised water-supply and distribution infrastructure and prepared technical specifications, maps and project documentation.
- Facilitated participatory planning with communities, practitioners, government agencies and non-governmental organizations.

Education

PhD in Engineering Sciences

Vrije Universiteit Brussel, Belgium

2022 – 2026

- **Thesis:** *Dynamics of subsurface water in a changing climate: An assessment of subsurface controls on water availability and climate adaptation in Belgium.*

MSc in Water Resources Engineering

KU Leuven and Vrije Universiteit Brussel, Belgium

2020 – 2022

- **Thesis:** Climate-change impacts on agricultural water use and hydrological processes in the Nyando catchment, Kenya.

BSc in Civil Engineering

University of Nairobi, Kenya

2011 – 2016

Technical Skills

Data analysis and machine learning: Python, time-series analysis, spatial analysis, data processing and harmonisation, uncertainty assessment, visualisation, machine learning for hydrological applications

Computing and workflows Linux, high-performance computing environments, Git/GitHub, reproducible workflows, QGIS, ArcGIS

Models and tools: mesoscale Hydrological Model (mHM), SWAT+, WetSpa, MIKE 11, engineering design software

Project delivery: technical reporting, proposal writing, data documentation, stakeholder communication, and project coordination

Selected Research and Innovation Outputs

- **SPONGE:** Developed and evaluated a modular model for comparing vegetation restoration, infiltration enhancement, wetlands and other water retention measures through their effects on the local water balance.
- **Belgian soil moisture drought assessment:** Published a national reconstruction showing the exceptional persistence and severity of recent subsurface droughts in Belgium.
- **Groundwater recharge in Belgium under climate change:** Assessed future recharge seasonality using ten global climate models and four emissions scenarios.
- **Evaluating hydrological effects of nature-based solutions:** Combined field monitoring, satellite observations and process-based modelling to assess water retention measures in a restored nature conservation area in Boechout, the Province of Anrwerp.

Languages

English: Fluent / full professional proficiency

Dutch: B1; advancing with language classes

Referees

Prof. Ann van Griensven

PhD promotor and Head of the Water and Climate Research Group, Vrije Universiteit Brussel
UNESCO-IHP Chair on Open Water Science and Education

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