

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 **Derrick Muheki**

The public defense will take place on **Friday 16th October 2026 at 5:10pm** in room **I.0.02** (Building I, VUB Main Campus)

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DATA RESCUE FOR CLIMATE CHANGE ASSESSMENT IN CENTRAL AFRICA: REVEALING CONGO BASIN WARMING AND AN INCREASE IN HOT EXTREMES ATTRIBUTABLE TO HUMAN INFLUENCE

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Abstract of the PhD research

The Congo Basin in Central Africa hosts the world's second-largest tropical rainforest and the second-largest river, both of which help regulate regional and global climate. Yet it remains one of the few regions where international assessments have not reported observed changes in extreme heat and heavy rainfall since the 1950s, nor linked such changes to human influence. This is mainly because historical weather records are hard to access and peer-reviewed studies are limited.

To address this knowledge gap, we undertake climate data rescue missions in the Democratic Republic of the Congo (DRC), particularly at the archives of the Institut National pour l'Etude et la Recherche Agronomiques (INERA), which contain handwritten tabular records of weather observations taken at 37 stations distributed across the DRC. During these missions, we photograph over 9,000 paper records stored in the archives.

We then develop MeteoSaver, a free and publicly available software that uses artificial intelligence to automatically read and transcribe such records. By applying MeteoSaver to the INERA records, we produce a unique dataset comprising more than one million records of daily temperature and rainfall, and subsequently analyse the climate trends. Our results reveal consistent warming trends during the period 1961–1990. Hot days became more frequent, nearly doubling in the 1980s compared to the 1960s, while cold days became less frequent.

Lastly, we focus on the 2024 heatwave in Kinshasa, DRC. Our analysis shows that a comparable heatwave would have been virtually impossible in a world without human-induced climate change, with the event about 3.8°C more intense than it would have been under pre-industrial climate.

By documenting the data rescue missions, transcription workflow, and providing free transcription software, the thesis demonstrates the importance of climate data rescue and offers a replicable framework for similar projects.