



SCHOOL OF NATURAL
AND APPLIED SCIENCES



BI-MONTHLY SEMINAR SERIES

SPEAKER



**Prof. Kobus
Du Plessis**

Stellenbosch University, RSA

HOST



**Prof. Cosmo
Ngongondo**

University of Malawi

TITLE

**THE DEVELOPMENT OF A REGIONAL
MAXIMUM FLOOD MAP FOR MALAWI**

19 SEPT, 2025 | 14hrs CAT



Meeting ID: 839 4073 2135

Passcode: 461924

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ABSTRACT

The Regional Maximum Flood (RMF) is an upper bound (envelope) indication of the most extreme flood expected in a particular homogeneous storm region. The method is used internationally for disaster risk management and the design of large infrastructures such as the spillways of large dams.

The approach builds on work done by Francou and Rodier (1967) who noticed that in a hydrologically homogeneous region and catchments areas larger than 100 km², the regional envelope curves (upper bound of a group of flood peaks) for large flood events converged to a single point. They developed the so called “Francou and Rodier” equation, which uses only the catchment area of a particular point of interest to calculate the expected RMF. To use the equation, the Francou and Rodier regional coefficient (K), the only unknown for a particular catchment, needs to be determined. This is done through an empirical approach, using existing maximum observed flood peaks, the catchment area of the site where the observed flood peak was measured, and the regionalisation of the associated K-values, calculated using the Francou and Rodier equation.

After regionalisation of the K-values, a K – map for Malawi can be compiled, which then can be used to calculate the RMF at any place of interest in Malawi. Various research also indicated that it is possible to develop an empirical ratio between the RMF and floods with recurrence intervals (RI) of 1 in 50 to 1 in 200 years, which is particularly useful to determine the upper boundary of flood peaks for different RI at ungauged sites, anywhere in the country.

The approach needs a well distributed network of flow gauge stations, the annual maximum flood peak series, the maximum observed flood peak and the catchment area of each station. 1-Day rainfall, and if available, representative stations for Malawi with rainfall data logged at 15 min intervals, is advisable. The latter is needed for the calculation of RMF for catchments of 1 km², while 1 day rainfall is used for regionalisation of the K-values. This research will be done in collaboration with similar work underway in Zambia and Mozambique and it is anticipated that a Southern Africa RMF map could be developed using the input from Malawi as one of the key building blocks.

The research will be done under co-supervision of Prof JA du Plessis from the University of Stellenbosch, who have completed the updated method for South Africa in 2022.

BRIEF BIO



Prof. JA du Plessis has more than 38 years of experience in the field of water engineering in South Africa. He joins the University of Stellenbosch in 2003 and is presently a Professor in Hydrology and Environmental Engineering in the Civil Engineering Department. He specialized in water resource evaluations, flood hydrology and he provide institution support to various local authorities.

Prof Du Plessis serves as a member of the Executive committee in the Board of the Institute of Municipal Engineers for Southern Africa (IMESA) where he is the Director for training and skills development.

He also serves on the Education and Training committee of South African Institute of Civil Engineers (SAICE) and serves on the Editorial Panel of the SAICE Journal. He is a former Head of the Department of Civil Engineering at the University of Stellenbosch. He is a fellow member of both SAICE and an Honorary Fellow of IMESA and is a professional registered engineer with the Engineering Council of South Africa.

QUALIFICATIONS

BEng (Civil), M Eng (Risk Management of Water Resources) and PhD (Integrated Water Demand Management in Local Governance).

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