# MBEYA UNIVERSITY OF SCIENCE AND TECHNOLOGY

## WEEKLY RESEARCH SEMINAR SERIES

**MUST Community and General Public are cordially invited to attend the 58th Research Seminar Presentation**

**COLLEGE OF ENGINEERING AND TECHNOLOGY (CET)** **DEPARTMENT OF CIVIL ENGINEERING**

**PROJECT RESEARCH TITLE:** Assessment of Failure Modes of Bridges: The Case of River Nzovwe in Mbeya City, Tanzania

**SPEAKER:** Namayan N. Lemeirut (Master's of Student, Civil Engineering Department)

**BIOGRAPHY OF THE SPEAKER:** Namayan N. Lemeirut is a registered Graduate Engineer with ERB in the field of Civil Engineering and holds a Bachelor of Civil Engineering from Mbeya University of Science and Technology. Currently, she is pursuing Master of Science in Civil Engineering at Mbeya University of Science and Technology in Mbeya City, Tanzania. Her future prospect is to strength her competences in conducting applied research in issues related to development of climate resilient infrastructure within Tanzania and beyond.

R-ID NO: 0117

**DATE: Friday 12th November, 2021** **TIME: 15:00 EAT** **VENUE: THEATRE I**

**SUMMARY OF THE PRESENTATION:** The residence of Mbeya City witnessed three bridges along River Nzovwe collapsing on 6th October 2019 due to flash floods. Extrapolation (Kidova *et. al.*, 2021) and California probability approaches were used to predict peak flows for various return periods. Thereafter, a one-dimensional mathematical model (HEC-RAS) was used to analyze bridge waterway and the scour depth at each collapsed bridge. The results indicate that for design of bridge across River Nzovwe a peak discharge of 211$m^3/s$ (50 year return period) should be used. The waterway simulation indicated that for peak flows above 40$m^3/s$ all the bridges were submerged which is accompanied by undesirable scour depth at the footing of abutments. The application of HECRAS in simulating waterways is a suitable approach.

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**COLLEGE OF ENGINEERING AND TECHNOLOGY (CET)** **DEPARTMENT OF GEOSCIENCE AND MINING TECHNOLOGY**

**RESEARCH TITLE:** **Investigation of $CO_2$ and $CH_4$ Competitive Adsorption during Enhanced Shale Gas Production**

**SPEAKER:** **Dr. Raphael Iddphonce (PhD. in Oil and Natural Gas Engineering)**

R-ID NO: 0118

**BIOGRAPHY OF THE SPEAKER:** Dr. Raphael Iddphonce is a Lecturer in the Department of Geoscience and Mining Technology under College of Engineering and Technology at the Mbeya University of Science and Technology (MUST). He holds a PhD. in Oil and Gas Engineering from China University of Geoscience, Master of Science in Renewable Energy and Bachelor of Engineering in Mechanical both from the University of Dar es Salaam, Tanzania. Dr. Iddphonce has worked with Panasonic Battery Company Limited in Tanzania for three years and he has more than fourteen (14) years of experience in teaching. He has published more than ten (10) research papers. Dr. Iddphonce is interested to research on Enhanced Oil and Gas Recovery from both Conventional and Shale Reservoir, and Bioenergy.

**DATE: Friday 12th November, 2021** **TIME: 15:45 EAT** **VENUE: THEATRE I**

**SUMMARY OF THE PRESENTATION:** The $CO_2$–$CH_4$ competitive adsorption during shale gas production was investigated through a replacement dynamics method at an isotherm temperature of 30° C from 14.12 to 7.46 MPa. Gas production performances, pore size distribution, pressure, $CO_2/CH_4$ concentration ratio, and gas flow were considered in the analysis. $CH_4$ production experiments from pure CH4, a mixture of $CO_2$–$CH^4$, and a mixture of $N_2$– $CH_4$ tests were conducted on a Silurian age Lower Jurassic whole shale sample. Findings showed, at the initial stage of production when pressure is high, gas recovery largely depends on depressurization, while in the later stage as pressure decreases, competitive adsorption becomes significant. The analysis of gas flow dynamics revealed bulk flow being dominant in larger pores (>10 nm), and in smaller pores (< 10 nm) for surface diffusion, suggesting gas recovering mechanism transforms from being largely dependent on reservoir depressurization to competitive adsorption as pressure decreases. Therefore, it was inferred that $CO_2$–$CH_4$ competitive adsorption is a dynamic process that changes with production conditions.

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