2018 UK-Malawi Disaster Research Workshop

The main purposes of the UK-Malawi Disaster Research Workshop are to strengthen existing links with academic/industrial partners and to create new links for future collaboration among people who are interested in seismic disaster preparedness and resilience of Malawi and other East African countries. The research theme is closely related to the ***PREPARE*** (Enhancing ***PREP***aredness for ***E***ast ***A***frican Countries through Seismic ***R***esilience ***E***ngineering) project, which is funded by the UK-EPSRC (https://epsrc.ukri.org/). The workshop is built upon active research links among the UK and Malawian universities. A series of talks and discussion sessions is organised to provide overviews of the ***PREPARE*** project and to present the methodology and findings. Participants contribute to the workshop by giving talks on their research that is related to the theme of the workshop. This will provide the ***PREPARE*** investigators and partners with opportunities to brainstorm the next step of the development of the project. The workshop is comprised of conference-style presentation sessions for academics and professionals, workshop modules (in class and in field) for students and junior academic staff at Malawian institutions, and project meetings.

What is PREPARE?

PREPARE is a three-year research project (2017-2020) funded by the UK-EPSRC as part of Global Challenges Research Fund. It aims at developing a holistic seismic risk management framework for East Africa and co-produces practical tools and guidelines for enhanced disaster preparedness in partnerships with local governmental and academic institutions, and at overcoming existing barriers to designing seismically resilient infrastructure in least developed countries using advanced risk assessments and suitable low-cost engineering solutions.

The research objectives of ***PREPARE*** are fivefold:

1. To develop integrated seismic risk assessment tools for East African countries by accounting for alternative hypotheses and uncertainties associated with hazard, exposure, and vulnerability components comprehensively and consistently;
2. To co-produce a variety of seismic hazard-risk maps and seismic design guidelines in collaboration with local governmental and academic partners;
3. To improve the knowledge on tectonic behaviour of major fault systems in East Africa by gathering new field data (geology and GPS) and by analysing regional seismicity data;
4. To develop bespoke seismic vulnerability models of unreinforced masonry (brick) constructions in East Africa through an extensive experimental programme (i.e. material testing of local bricks and pull-over testing of real-scale brick walls) and advanced structural modelling; and
5. To investigate the effectiveness of low-cost engineering solutions to improve the seismic resilience of the buildings and infrastructure in East Africa.

Event Summary

Date: 6th to 10th August 2018

Day 1 – Conference-style research presentation sessions
Day 2 – Workshop modules 1 and 2
Day 3 – Field trip: geological work and building survey
Day 4 – Workshop modules 3 and 4
Day 5 – Project meetings

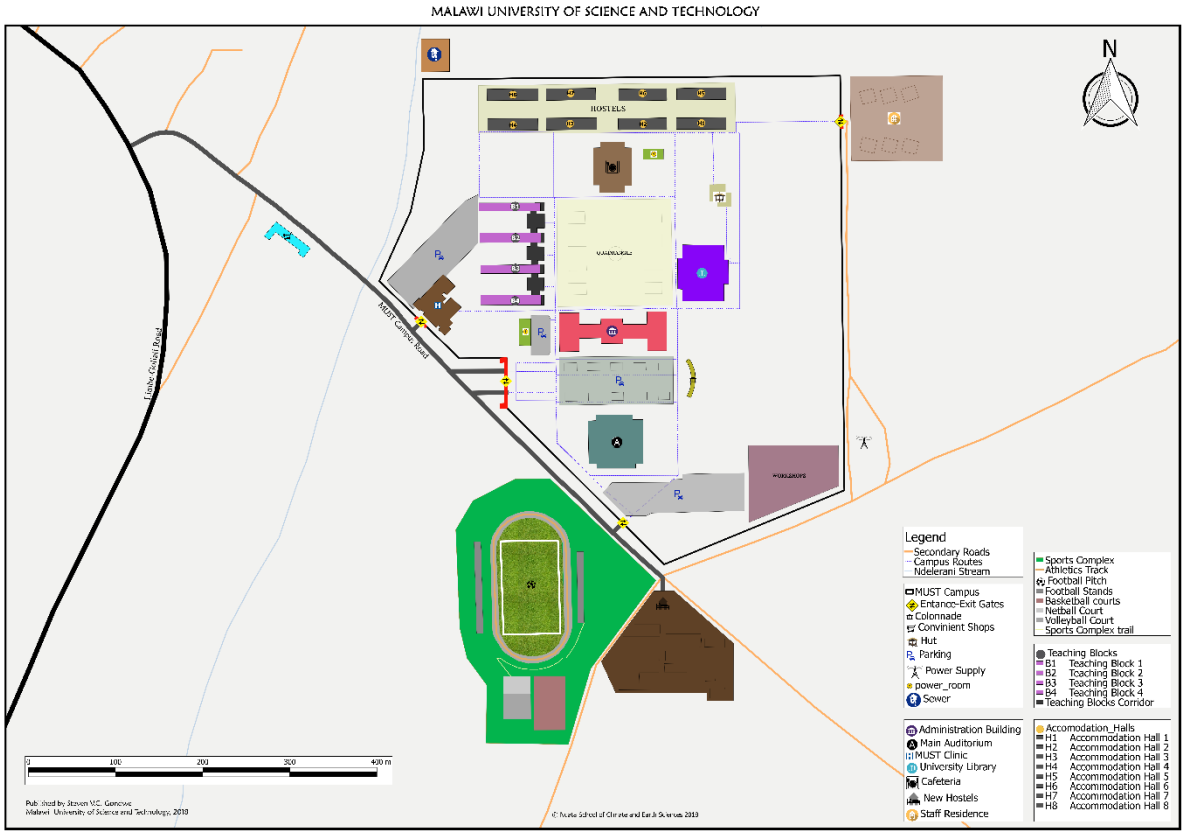
Venue: Malawi University of Science and Technology, Thyolo, Malawi

Main institutions: University of Bristol, Cardiff University, Malawi University of Science and Technology (MUST), University of Malawi Chancellor College (Chancellor), Malawi Geological Survey Department (GSD), University of Malawi The Polytechnic (Polytechnic)

Main organisers: Katsu Goda (Bristol, katsu.goda@bristol.ac.uk) and Richard Mvula (MUST, rmvula@must.ac.mw)

Directions to MUST:

MUST is located in Thyolo, a tea growing district in Southern Malawi. It is close to the Ndata Farm along the Malowa-Goliati Road, approximately 7km off the Robert Mugabe Highway (M4).



Instructions for speakers:

- Speakers are requested to bring their presentation on USB memory stick or other media to the organiser/session chair before the presentation session.
- General presentations are slated for 20 minutes; approximately 15 mins for the talk and 5 mins for Q&A.
- All presentations will be made using a computer and projector furnished in the room. PowerPoint presentations are standard software for use.

Day 1 (Room: library auditorium)

Schedule:

6:30-7:30 Breakfast (***PREPARE*** team and UK/EA guests)

8:00 Arrival and registration

8:30-9:50 Session 1 (Session chair: Dr. Katsu Goda)

- 8:30-8:35: *Opening ceremony of the workshop* by Dr. A. Nkochi, Lecturer in Bingu School of Culture and Heritage
- 8:35-8:50: *Welcome speech* by Prof. Address Malata, the Vice Chancellor of Malawi University of Science and Technology
- 8:50-9:10: *Overview of **PREPARE** project: seismic risk in Malawi* by Dr. Katsu Goda (Bristol)
- 9:10-9:30: *Evidence for recent fault activity in Southern Malawi* by Drs. Juliet Biggs (Bristol) and Ake Fagereng (Cardiff)
- 9:30-9:50: *An update on the seismic vulnerability of the Malawian constructions* by Drs. Panos Kloukinas and Viviana Novelli (Bristol)

9:50-10:10 Break

10:10-11:30 Session 2 (Session chair: Dr. Ake Fagereng)

- 10:10-10:30: *The role of the Malawi University of Science and Technology on seismic resilience* by Dr. Leonard Kalindekafe (MUST)
- 10:30-10:50: *Mainstreaming disaster risk reduction in construction and human settlements* by Mr. Terrence Namaona (Department of Buildings)
- 10:50-11:10: *Implications of seismic construction or lack of it on building safety and cost* by Dr. Ignasio Ngoma (Polytechnic)
- 11:10-11:30: *The role of Geological Survey in monitoring seismicity in Malawi* by Mr. Kondwani Dombola (GSD)

11:30-12:30 Lunch

12:30-14:10 Session 3 (Session chair: Dr. Juliet Biggs)

- 12:30-12:50: *Tectonic evolution of the Middle Shire basin, South Malawi rift* by Dr. Zuze Dulanya (Chancellor)
- 12:50-13:10: *Hydrofracture, seismicity and stress in the crust* by Prof. Thomas Blenkinsop (Cardiff)
- 13:10-13:30: *Earthquake occurrences in Uganda during the last 100 years and Government's efforts to mitigate earthquake effects in the country* by Dr. Fred Alex Tugume (ESARSWG)
- 13:30-13:50: *Recent seismicity and rapid response in Ethiopia* by Prof. Atalay Ayele (Addis Ababa Univ.)
- 13:50-14:10: *Seismic hazard in Malawi* by Dr. Lostina Chapola (Catholic Univ. Malawi)

14:10-14:30 Break

14:30-16:00 Session 4 (Session chair: Prof. Michael Kendall)

- 14:30-14:50: *Seismic risk management in Malawi* by Mr. James Chiusiwa (Department of Disaster Management Affairs)
- 14:50-15:10: *Safer House Construction Guidelines: a tool for mitigating housing related disasters in Malawi* by Mr. Esau Mwambira (Department of Housing)
- 15:10-15:30: *Addressing housing and urban resilience in Malawi: the toolkits* by Mr. John Chome (Habitat Solutions)
- 15:30-16:00: Wrap-up discussion for future collaboration

18:00 Dinner (***PREPARE*** team, UK/EA guests, and Chancellor staff)

Day 2 (Room: library auditorium and upper cafeteria room)

Schedule:

6:30-7:30	Breakfast (***PREPARE*** team, UK/EA guests, and Chancellor staff)
8:00	Students' arrival and registration
8:30-11:30	*Module 1: Tectonics* (library auditorium) – **Session group 1**
	Module 2: Structural & Earthquake Engineering (upper cafeteria room) – **Session group 2**
11:30-12:30	Lunch
12:30-15:30	*Module 1: Tectonics* (library auditorium) – **Session group 2**
	Module 2: Structural & Earthquake Engineering (upper cafeteria room) – **Session group 1**
18:00	Dinner (***PREPARE*** team, UK/EA guests, Chancellor staff, and students)

Planned activities:

- *Module 1: Tectonics*. This session will cover some of the basics of active continental extension and normal faults. We have planned practical exercises that will teach students how to identify active faults and how to measure fault activity. We will focus on normal faults as these are the most common type of faulting found in Malawi. In addition, this will introduce many of the themes and topics that will be covered during the field trip on Day 3. This module will be delivered by Drs. Jack Williams and Luke Wedmore.
- *Module 2: Structural & Earthquake Engineering*. The session will include basic overviews on structural engineering, seismic loading to buildings, and site inspection methods. Strength data of bricks and mortar that are obtained from the building surveys and laboratory testing in Malawi (as part of ***PREPARE*** in collaboration with the Polytechnic) will be discussed to demonstrate the importance of construction materials for structural safety. The session also introduces a building inspection methodology (FAMIVE method, e.g. https://assets.publishing.service.gov.uk/media/57a08977e5274a27b20000bb/EoD_HDYr3_22_June_2015_Seismic_vul_methods.pdf), which will be used during the field trip on Day 3. This module will be delivered by Drs. Viviana Novelli and Panos Kloukinas.

Day 3

Schedule:

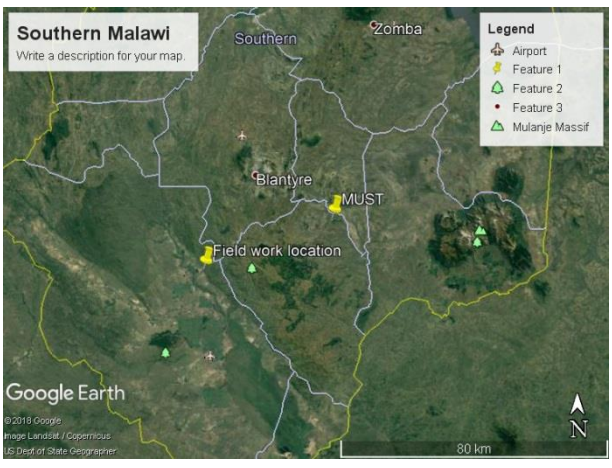
6:30-7:30	Breakfast (***PREPARE*** team, UK/EA guests, Chancellor staff, and students)
7:30	Departure for field trip
9:00-15:00	Field work at the Thyolo Fault, near Chikwawa
16:30	Return to MUST
18:00	Dinner (***PREPARE*** team, UK/EA guests, Chancellor staff, and students)

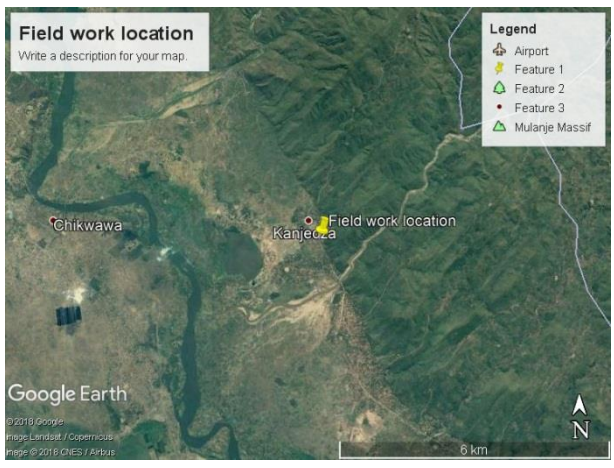
Planned activities:

- The geological field trip is organised for students and junior staff members of Malawian institutions.
- This trip will visit the Thyolo Fault and the town of Chikwawa (see the map below).
- The field trip consists of geological and structural engineering parts, being consistent with the topics discussed in the *Tectonics* and *Structural & Earthquake Engineering* modules on Day 2.
- The activities for the geological component include visiting ~20m high Thyolo Fault scarp which gives evidence of a large pre-historic earthquake and a geological outcrop that exposed the fault in cross-section. These activities will be led by Drs. Luke Wedmore, Jack Williams, Ake Fagereng, and Juliet Biggs.
- The activities for the structural engineering component include that students groups of 4 to 5 members (with mixed backgrounds within each group) will collect building data on FaMIVE inspection forms. Typically, student groups will conduct surveys on 4 to 5 buildings over a 3-hour session. The activities will be led by Drs. Viviana Novelli and Panos Kloukinas.

Transportation arrangement:

- PREPARE car1 (4 seats) – Panos Kloukinas, Viviana Novelli, Thomas Blenkinsop, and Michael Kendall
- PREPARE car 2 (4 seats) – Juliet Biggs, Luke Wedmore, Ake Fagereng, and Jack Williams
- MUST coaster (32 seats) – 11 MUST staff members and 20 MUST students
- Chancellor coaster (32 seats) – 8 Chancellor staff members and 20 Chancellor students
- Polytechnic coaster – 2 Polytechnic staff members and 11 Polytechnic students plus Katsu Goda, Fred Tugume, and Atalay Ayele
- GSD vehicles – 6 GSD staff
- Vehicle hired by the Department of Housing (4 seats) – Esau Mwambira, Kingsley Lungu, Lostina Chapola





Day 4 (Room: library auditorium and upper cafeteria room)

Schedule:

6:30-7:30	Breakfast (***PREPARE*** team, UK/EA guests, Chancellor staff, and students)
8:00-11:00	*Module 3: Seismology* (library auditorium) – **Session group 1**
	Module 4: Seismic Vulnerability Assessment (upper cafeteria room) – **Session group 2**
11:00-12:30	Lunch
12:30-15:30	*Module 3: Seismology* (library auditorium) – **Session group 2**
	Module 4: Seismic Vulnerability Assessment (upper cafeteria room) – **Session group 1**
18:00	Dinner (***PREPARE*** team, UK/EA guests, and Chancellor staff)

Planned activities:

- *Module 3: Seismology.* This session will cover the basics of seismology including the interior of the Earth, anatomy of seismograms and types of seismic waves, earthquakes and plate tectonics, seismic stations and locating seismic events. Students will carry out manual exercise of picking P-wave and S-wave arrivals from seismograms and of locating an event from three stations. This module will be delivered by Prof. Michael Kendall.
- *Module 4: Seismic Vulnerability Assessment.* This session will focus on vulnerability assessment methods. The training will be based on data collected during the field trip on Day 3. Building typologies identified on site will be analysed using the FaMIVE method and finite element models to derive seismic fragility curves. Issues regarding failure modes identification, effect of material properties variation, structural details/deficiencies and modelling assumptions will be discussed. This module will be delivered by Drs. Viviana Novelli and Panos Kloukinas.

Day 5 (Room: library auditorium)

Schedule:

6:30-7:30	Breakfast (***PREPARE*** team, UK/EA guests, and Chancellor staff)
8:00-9:30	Project meeting 1 – 40 min presentation by Bristol/Cardiff Earth Science team (Prof. Michael Kendall and Drs. Juliet Biggs/Ake Fagereng /Luke Wedmore/Jack Williams), followed by discussion (all people involved)
9:30-10:00	Break
10:00-11:30	Project meeting 2 – 40 min presentation by the Bristol Civil Engineering team (Drs. Katsu Goda/Panos Kloukinas/Viviana Novelli), followed by discussion (all people involved)
11:30-12:30	Lunch
12:30-15:00	Project meeting 3 – A way forward to make real impact through the ***PREPARE*** project. Subjects of the discussions include: future collaborations between the UK and East African researchers, and a brainstorming for the next workshop (e.g. August 2019). This will include a short break (e.g. 13:45-14:00) during the session to facilitate more informal discussions.
15:00	Departure
18:00	Dinner (***PREPARE*** team and UK/EA guests)