

RESILIENCE OF SCHOOL COMMUNITITES IN MALAWI

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Abstract: *Malawi is prone to several natural hazards including flooding - which occurs frequently, and earthquakes – which can cause significant damage to building stock as noticed during the 2009 Karonga earthquake. The impact of such events is exacerbated by poor socio-economic condition of the communities that in turn makes disaster recovery challenging. This study focuses on assessing the resilience of educational communities in Malawi by utilising a community resilience framework initially developed for Nepalese schools as part of the SAFER Nepal project (www.safernepal.net) following the 2015 Gorkha earthquake. The framework uses various indicators ranging from school infrastructure to governance and hazard preparation to capacity. These are assessed through a set of questions which have been built into a mobile app for ease of use by the stakeholders. The objectives of this paper are to report on the application of the SAFER framework in the context of Malawi as a test-bed for other low-income countries and to present the findings from an initial set of schools serving urban and rural communities. The results show that the SAFER framework can be adopted easily for any country to self-assess the resilience of school communities and to take timely measures to improve it.*

1 Introduction

Malawi ranks amongst the lowest countries in terms of Human Development Index (UNDP 2022). At the same time, it is prone to several natural hazards including drought, flood, landslides and earthquakes (World Bank 2019). For example, a large part of southern Malawi was affected by floods in 2015 (Government of Malawi 2015a) and then again in 2019 due to Cyclone Idai (Government of Malawi 2019a). For the education sector alone, the cost to restore quality teaching and learning in the affected schools was estimated to be US\$62.3 million (Government of Malawi 2019a). This included repair of partially damaged schools and provision of temporary alternative learning spaces since some schools were being used as temporary shelters for the internally displaced people. In recent times, Malawi has suffered from two earthquakes: the 1989 earthquake in central Malawi and the 2009 earthquake in Karonga, northern Malawi. The latter was estimated to have affected over 215,000 people including 15,000 school going children (United Nations 2009). There was damage to institutional infrastructure which included damage to at least 17 schools and 48 teachers houses (United Nations 2009). The cumulative impact of such events has been enormous on the country, particularly on housing and agriculture. The Government of Malawi has taken several steps to prepare the country for such events and reduce the impact. For example, to support the reconstruction activities after the 2009 earthquakes, the Department of Housing and Urban Development in collaboration with other agencies

produced Guidelines for Safer House Construction (Government of Malawi 2010). These guidelines are aimed minimising the risk of damage and injury due to various hazards through improvement to construction practices, rather than to produce earthquake resistant design. To mainstreaming disaster risk management, the government published its Disaster Risk Management policy (Government of Malawi, 2015b). This was followed by its National Resilience Strategy (Government of Malawi, 2019b) for the period 2018-2030 which has four pillars: resilient agricultural growth; risk reduction, flood control and early warning system; human capacity, livelihood and social protection; catchment protection and management.

Traditionally, pre- and post-disaster management efforts have tended to focus on minimising damage to infrastructure and on recovery and retrofit. However, the increasing frequency of natural hazards and the associated economic losses require resilience-based approaches which are underpinned by better ability to cope with the events and recover in a timely manner. This requires a holistic view of the system under consideration, whether a city, a power plant or a school. Towards this goal, our SAFER school project in Nepal (www.safernepal.net) has taken a multi-disciplinary approach to examine seismic safety and resilience of schools (Parajuli et al 2020; Agarwal et al 2023). In this, schools are not viewed just as buildings but are inclusive of educational communities such as students, teachers, governing bodies and other stakeholders. The approach has been successfully applied in several schools in Nepal to enhance their resilience. The purpose of this paper is to present the findings from the application of this approach in Malawi schools as a first step towards internationalising this.

The paper is organised as follows: Section 2 provides an overview of the SAFER resilience framework; Section 3 reviews the education system and socio-economic capacity in Malawi; Section 4 outlines the implementation of the SAFER framework in Malawi; Section 5 presents the results and provides a discussion before concluding the paper in Section 6.

2 SAFER school resilience framework

SAFER school project is taking a holistic approach to resilience of schools, from physical infrastructure to educational communities in Malawi. Vulnerability assessments of schools generally focus on the structural condition evaluation considering one or more hazards in the region. However, functioning of schools depends upon a range of other factors including governance and funding, provision of supporting infrastructure and more importantly, the resourcefulness of educational communities including teachers, pupils and parents. School community is the first agent to respond to any disaster event, hence their capacity to resist and cope with such events is as important as that of the school buildings. Our research, using Nepal as a case study, has proposed a novel approach to the resilience assessment of schools and communities with a goal of uninterrupted education under safe environment. A school resilience framework (Parajuli et al 2020; Agarwal et al 2023) has been developed which allows capturing of localized information on the school practices and situation in schools and communities. Four major dimensions and corresponding 14 indicators, shown in the Figure 1 and defined below, are used in the evaluation.

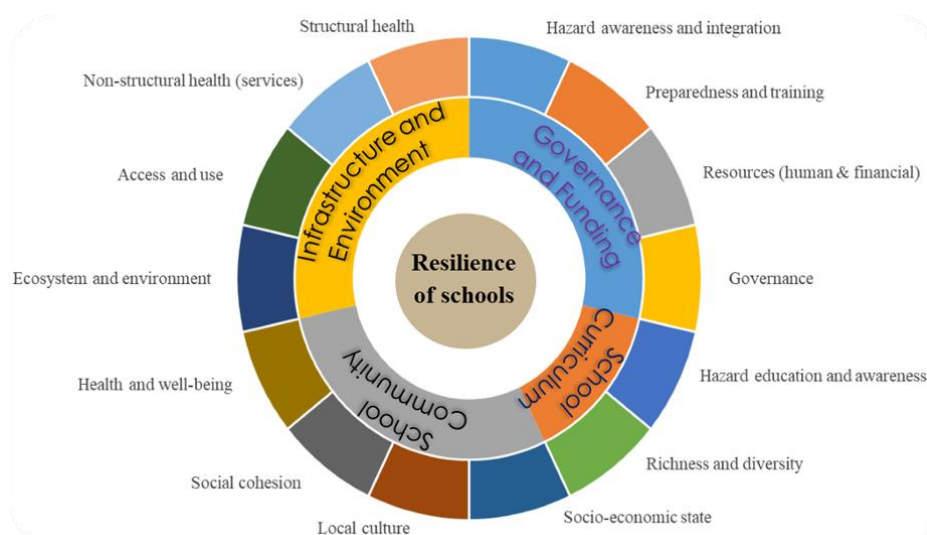


Figure 1. SAFER school resilience framework.

2.1 Governance and funding dimension

Management of human, financial and other resources in the wake of disaster risk mitigation and planning are covered in this dimension. Sources of funding, engagement of stakeholders in school management and decision processes, disaster risk awareness and preparedness programs and management are considered. The corresponding indicators are grouped under the following headings:

Hazard awareness and integration

Hazard awareness activities and planning from the administrative side in school are the part of this indicator. Hazard awareness and knowledge transfer through generations via story telling are also covered. State of school on assigning a focal person, providing risk information to children in general and in specific conditions are also reflected in this indicator.

Preparedness and training

This indicator is specifically directed at identifying preparedness measures and plans in the school and nearby community to resist shocks and stresses. Planning to handle higher number of pupils, activities for disaster preparedness including drills, early warnings and other instruments in the community are represented under this indicator. Trainings, mitigation measures and planning also contribute to this. All of this in turn will contribute to the scale of impact of a hazardous event and the rapidity of recovery.

Resources (human and financial)

This relates to access to resources. The more resourceful a school and community is, the more resilient the school can be. A range of evidence can relate to resourcefulness. Funding is key to identify the appropriate preparedness and mitigation measures that can be put in place. It is recognized that state funding may be constrained by other competing demands but a school may be able to tap funding from other sources. Classroom sizes and student numbers, spare capacity of teachers and classrooms, teaching and learning materials and their availability are also represented in resources.

Governance

Good governance is important for robustness and recovery. This includes having a clearly laid out crisis plan for continuity of education. Participatory governance would be of great value where views of all key stakeholders are represented and hence the strengths and limitations of preparedness and mitigation measures can be derived from different perspectives. Status of resource planning, policies, participation of other stakeholders in decision process, safety measures at school premises are also assessed under this indicator.

2.2 School curriculum dimension

Flexibility, richness and diversity of delivery of education are central to this dimension. Hazard education and practices to abide with national or local level curriculum are represented. Following two indicators are categorized under this dimension.

Hazard education

This indicator shows whether the curriculum or the lessons cover the hazard education or not. Responses from teachers, students and head teacher contribute to this indicator. Questions covered include the hazard education specific classes, drills and trainings as part of curriculum, knowledge and perception of hazards through educational offerings.

Richness and diversity

Different ways of addressing educational needs and/or well-being of children contribute to resilience. General state of stresses in classroom, richness of materials and methods, frequency of extracurricular activities are assessed under this indicator. This also reflects the delivery methods and its effectiveness of regular classes, flexibility of curriculum in incorporating hazard and risk mitigation plans in the school.

2.3 School community dimension

Stakeholders at local level, their strength and bonding point to their level of integration; stronger the local community, more resilient the school community. Local culture, social cohesion, health and wellbeing of the community and socio-economic state of the community are assessed under this dimension.

Local culture

Local culture of the community in several aspects of social activities are influential in mobilising resources and recovery after any disaster. Local languages, practices on use of public facilities, value system, priority on the child education in the local community are represented through this.

Social cohesion

Social connectivity of children and their families have a positive impact on children's well-being, especially in times of crisis. It is assumed the more supportive their social environment is, the more likely they are to continue their education. Engagement of other community members in school activities, relationships between teachers, students and parents, community contribution to school are represented under this indicator.

Health and well-being

Health and well-being of the school community contributes to the robustness, and rapidity in recovery. Hence the overall condition is being observed from questions under this indicator. Cleanliness and hygiene at school, first aid kits and regular health checkup, lunch and meals, counselling are assessed through engagement with the school community.

Socio-economic state

Any evidence of social capacity in terms of physical or economical would contribute to resourcefulness. Social state of local community including parents, their strength on disaster risk awareness, preparedness and mitigation plans directly contribute to school resources. Ability to contribute to recovery through funding and voluntary activities are assessed and presented through this indicator.

2.4 Infrastructure and environment dimension

Local environment and infrastructures in the school are assessed and presented through four indicators: ecosystem of the community, access and use of school infrastructures and their structural and non-structural condition.

Ecosystem and environment

Shocks and stresses due to environment and ecosystem are identified. Disruptions in education as a result of local climate are assessed under this indicator. Risk mitigation measures and results are studied; it also shows the exposure of community to the hazards.

Access and use

The purpose here is to gauge the difficulty in getting to school by both the pupils and staff. It is assumed the bigger the school catchment, more difficult it may be to get to the school when conditions are not favourable e.g. heavy rain. A school can be a valuable asset for a community for holding community events and for shelter in times of crisis. Unless due measures are put in place, both these uses have the potential to cause disruption to education.

Non-structural health

Services and utilities in the school premises ultimately contribute towards several factors from health and well-being to quality of education. Hence, assessing the status of such facilities is one of the major perspectives in a resilient educational community. Water supply, sanitation, power supply, communication, thermal comfort are assessed and presented through this indicator.

Structural health

Information about the school buildings contributes to their vulnerability to hazards. Different pieces of information about school building are also helpful for an assessment of the rapidity of recovery following a disaster. Design, planning and construction quality, structure typology, age and general state of building is

assessed. Disruption to continuity of education due to structural failures are also studied. Questions relating to quality control not only tell us about vulnerabilities but also guide what kind of preparedness measures and intervention schemes are needed against hazards.

2.5 Assessment tools

A set of questions for the purpose of community participation in the process has been prepared based on Nepalese schools and community practices. These have been incorporated in a mobile app for the ease of use. A webapp has also been developed for the analysis of collected data at different levels: school, municipality, and province. These details are available in Parajuli et al (2022). The purpose of this research is to test the SAFER framework in Malawi for its applicability, including further development if required.

3 Malawi context

Malawi is a predominantly rural country in eastern Sub-Saharan African (SSA) region but is urbanising rapidly. It has a population of 18 million (2018 estimate) with a high percentage of school going children. Malawi Growth and Development Strategy II (MGDS II) (Government of Malawi 2012) was based on six thematic areas including Infrastructure Development, and Social Support and Disaster Risk Management in parallel with Sustainable Economic Growth, Social Development, Governance, and Gender and Capacity Development. MGDS III (Government of Malawi 2017) has 5 key priority areas - education and skills development being one, together with agriculture, water development and climate change management; energy, industry and tourism development; transport and ICT infrastructure; health and population. Education continues to be a top spending priority of the Government of Malawi.

3.1 School education

Malawi Education Act 2013 (Government of Malawi 2013) provides brief information about the education system in Malawi. The primary education (6-14 years in grades 1 to 8) is free and compulsory; this is the responsibility of the local government. Secondary and college education (14-18 years) is managed at ministerial level. Based on funding, there are three categories of schools: government, assisted and private schools. Education committee under the local government has the authority to manage funds, training and facilities in general. School Management Committee (SMC), established by local government, consists of community members and local officers. SMC is responsible for appointing teachers, monitoring students' attendance, and maintenance of school buildings and furniture. There is a National Curriculum which is flexible. School Inspectors are appointed to monitor the quality of education and to provide guidance to teachers. Teachers generally live in staff accommodation in school.

Malawi Government spends more on education than most low-income countries, but education outcomes are mixed (UNICEF, 2018). The Sub-Saharan African average spending on education as a percentage of GDP is ca. 5%, Malawi allocated nearly 6% of its GDP to education in financial year 2018/19. This is about 1% of GDP more than most low-income countries.

4 Implementation of SAFER framework in Malawi

This section aims to capture the process followed to implement the SAFER framework in Malawi. It should be noted that the initial development of the framework required an understanding of the local education system, local culture and practices, and an ability to engage with the local communities. In Nepal, this was achieved through a partnership with local NGOs who were already supporting the school rebuilding activities after the 2015 earthquake. In Malawi, there are a few NGOs supporting school education or construction but at a much smaller scale. However, there was a good working relationship between the researchers at the University of Bristol and Malawi Polytechnic (now Malawi University of Business and Applied Sciences) through PREPARE project (<https://www.bristol.ac.uk/engineering/research/international-development/natural-disasters/prepare-africa/>). This made it possible for the authors of this paper to exchange the ideas and work together to implement the SAFER framework. This included familiarisation with the Malawi school system and an understanding of the local culture and practices with focus on education and disaster risk management. The local team were provided details of the framework and had a training session in the use of the SAFER mobile app.

It soon became apparent that while the framework covered the relevant indicators, but the evidence bases to arrive at the indicators could be widened to include further hazards (e.g. cyclones), and local practices (e.g.

student absences, role of tribal chiefs in rural areas). This did suggest that other countries might require capturing some other information, hence this led to conceiving a generalised framework with a wider evidence base which could be tailored to individual countries by ticking/unticking a flag associated with each question.

Once a set of questions had been framed, the issues of communication and engagement with the local authorities and educational communities were explored. The local team liaised with the education authorities who welcomed such efforts as part of disaster risk management. The Bristol team arranged research ethics approval for engagement with the school communities. As before, separate questionnaires were prepared for school children, teachers, headteacher, school management committee and parents/guardians. These were implemented in the mobile app in English. While English is an official language in Malawi, the questionnaires were also translated in *Chichewa*, a commonly spoken local language. Arrangements were also made to administer the questionnaires in paper form due to limited mobile devices and access to the internet. During this pilot study we aimed to recruit schools in different development settings (rural, semi-urban, urban), different terrains (hilly or flat), and different geographic regions prone to different hazards (e.g. floods in the south and earthquakes in the north). Figure 2 summarises the overall school community engagement process for collecting data.

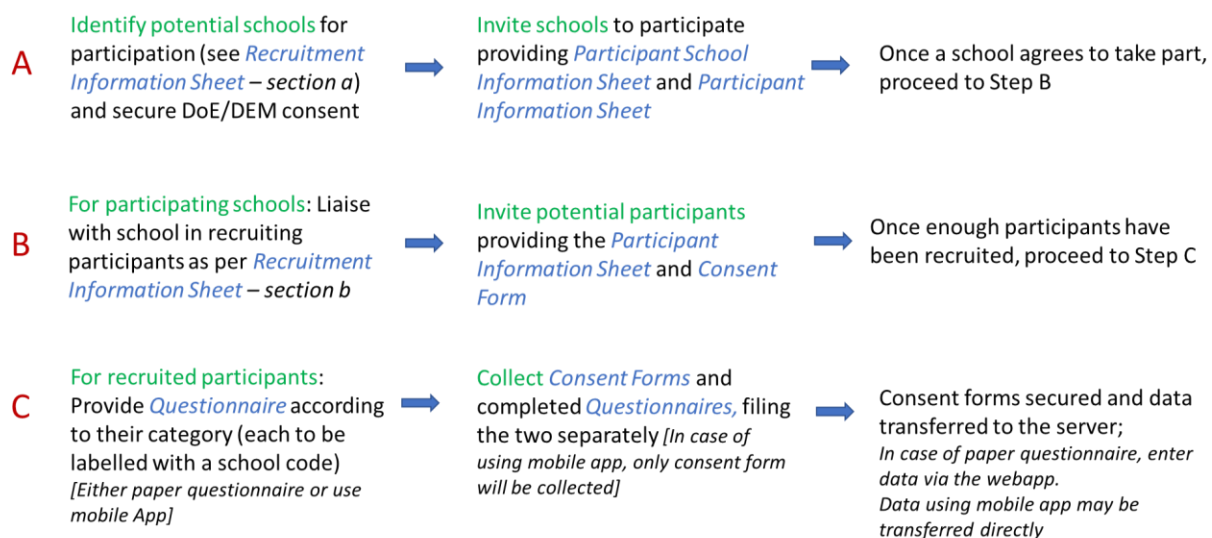


Figure 2. School community engagement process.

5 Results and discussion

The local team visited a number of schools in different parts of the country to collect data. This was transferred to the SAFER web server and processed. The web application, accessible from any browser, can provide a hierarchical view of the outputs for multiple schools – colours indicating the resilience bands. This is shown in Figure 3(a) for individual schools and in Figure 3(b) for clusters of neighbouring schools. The latter can also be generated for a district or a province to plan adaptation measures and policy making at that level.

Figure 4 shows the individual results on a radial chart for two example schools. A higher score represents good supportive evidence for the corresponding resilience indicator. The indicators with lower scores suggest examining the corresponding aspects for improvement through appropriate actions or adaptation measures. Here, the Central Malawi school appears more resilient than the Southern Malawi school (*note*: the plots are to different scales). The latter also shows a much lower score for hazard awareness, and this is something the participants had started realising while completing the questionnaire. Indeed, SAFER app should be used as a support tool rather than an evaluation tool by an external body. Of course, schools can use this at timely intervals to monitor their progress towards becoming better resilient.

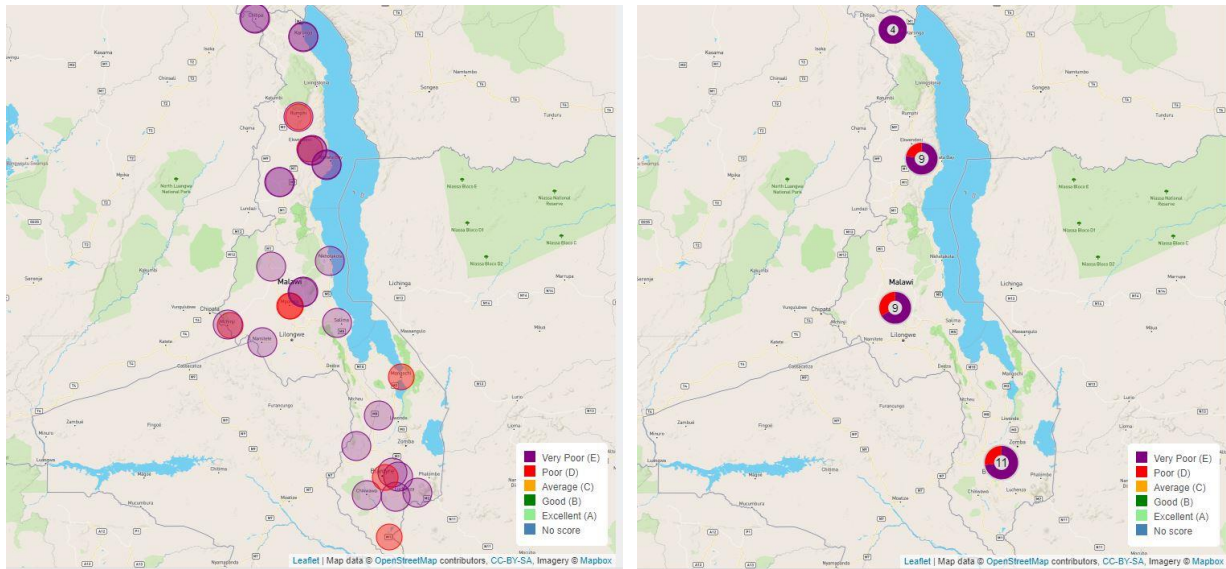
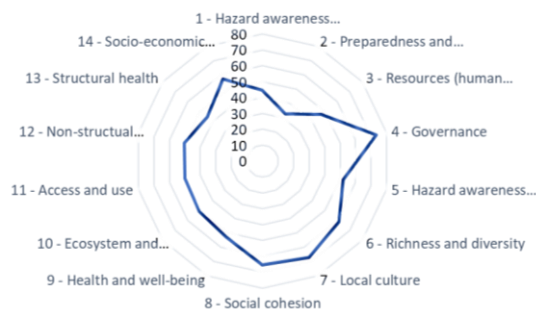
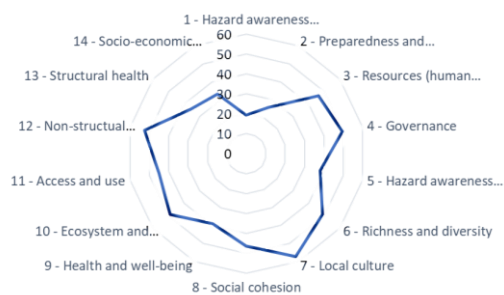


Figure 3. An overview of the resilience of surveyed schools (a) individual schools, (b) clusters of schools.



(a)



(b)

Figure 4. Resilience indicators for schools: (a) Central Malawi, semi-urban, (b) Southern Malawi, rural.

It is worth highlighting two limitations of the results shown above. First, the responses to questions from each category of participants are averaged and when using paper questionnaire, not every participant responded to every question. This issue can be overcome by using the mobile app. Second, there is bound to be some subjectivity and bias in responses depending on the participants' knowledge and experience, hence, data should be collected from more participants where possible.

6 Conclusion

With increasing occurrence of natural hazards, it is imperative to create resilient infrastructures such as schools. However, there is a need to approach this problem from a systems perspective such as SAFER schools framework. This paper has examined the suitability and implementation of previously developed SAFER tools in Malawi schools. The Nepal questionnaire was found to be equally applicable in Malawi apart from adding a few context specific questions or response options. The exercise was well-received by the

educational community and this provides support for take-up of the SAFER tools by other low-income countries.

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8 References

- Agarwal J., Parajuli R., Xanthou X., Sextos A. (2023). SAFER: Improving seismic resilience of schools and educational communities, *Proceedings of 14th International Conference on Applications of Statistics and Probability in Civil Engineering (ICASP 14)*, 9-13 July, Dublin. <http://hdl.handle.net/2262/103656>
- Government of Malawi (2010). Guidelines for Safer Construction. Available online: <https://reliefweb.int/report/malawi/guidelines-safer-house-construction-technical-manual>
- Government of Malawi (2012). Malawi Growth and Development Strategy II. Available online <https://cepa.org.mw/Library/government-publications/Malawi%20Growth%20and%20Development%20Strategy%20II.pdf/view>
- Government of Malawi (2013). Malawi Education Act. Available online : <https://www.education.gov.mw/index.php/edu-resources/acts-policies-guidelines?download=36:malawi-education-act>
- Government of Malawi (2015a). Malawi 2015 floods post disaster needs assessment report. Available online: <https://reliefweb.int/sites/reliefweb.int/files/resources/Malawi-2015-Floods-Post-Disaster-Needs-Assessment-Report.pdf>.
- Government of Malawi (2015b). National disaster risk management policy. Available online: http://www.ifrc.org/docs/IDRL/43755_malawidrmpolicy2015.pdf.
- Government of Malawi (2017). Malawi Growth and Development Strategy III. Available online: https://npc.mw/wp-content/uploads/2020/07/MGDS_III.pdf
- Government of Malawi (2019a). Malawi 2019 floods post disaster needs assessment report. Available online: <https://www.unicef.org/malawi/reports/malawi-2019-floods-post-disaster-needs-assessment-report>
- Government of Malawi (2019b). National Resilience Strategy. Available online: <https://www.unicef.org/malawi/reports/national-resilience-strategy>
- Parajuli R. R., Xanthou M., Agarwal J., & Sextos A. G. (2020). Resilience of educational communities in developing countries: a multi-disciplinary approach. *17th World Conference on Earthquake Engineering*, Sendai, Japan.
- Parajuli R. R., Xanthou M., Agarwal J., & Sextos A. G. (2022) Smart tools for self-assessing community resilience in seismic regions: a case study from Nepal. *3rd European conference on earthquake engineering and seismology*, Bucharest.
- UNDP (2022). Human Development Report 2021/22. Available online: https://hdr.undp.org/system/files/documents/global-report-document/hdr2021-22pdf_1.pdf
- UNICEF (2018). Towards Improved Education for all in Malawi, Education Budget Brief. Available online: https://www.unicef.org/malawi/media/376/file/Education_Budget_Brief_2018_2019.pdf
- United Nations (2009). Malawi - Karonga Earthquake Situation Report III. Available online: <https://reliefweb.int/report/malawi/malawi-karonga-earthquake-unrc-situation-report-no-3>
- World Bank (2019). Disaster risk profile – Malawi. Available online: [malawi_low.pdf \(gfdrr.org\)](https://www.worldbank.org/publications/malawi_low.pdf)