



Knowledge Transfer in People-Centered Dam-Related Disaster Program in Cameron Highlands

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ABSTRACT

The inability to face natural hazard leads to the additional economic and infrastructure loss towards people living in high-risk areas such as low-lying areas leading to flooding events. People-centered knowledge transfer program approaches are the first response that is best in establishing a community that is capable and resilient to protect themselves. Sultan Abu Bakar Hydroelectric Dam is a megastructure under Cameron Highlands Batang Padang Hydroelectric Scheme. The dam is located at Ringlet-Bertam Valley Road with a man-made lake on the upstream of the dam called Ringlet Reservoir. The downstream communities along Bertam River consist of a few Orang Asli settlements which particularly vulnerable to flood as some of the houses, structures and farms apparently are within the river reserves or dangerously close to the dam; located within the movement of water flow if released from the dam. The aim of the program is to ensure that the directly affected communities are fully aware and prepare for any untoward incidents in their area, especially related to the failures of dam operations through identifying the lives and livelihood of the communities. This includes preparing community awareness by educating the affected community as a disaster-resilient community through capability formation and capacity building human resources, such as disaster school awareness programs, community awareness programs, and drill exercises. This study revealed that knowledge transfer through people-centered links to human interaction and support from authorities such as village head/representatives were shown to be effective in enabling the community to lessen the negative effects of disasters with the assistance of technological approaches; siren and drills. These calls for the stressing of local authority and implementation partners focused on addressing these underlying causes, as well as the involvement of all stakeholders in scaling the effective coping strategies in order to build resilience within this affected community.

Keywords:

Flooding events; people-centered program; technology; disasters

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1. Introduction

Preparation towards abilities to face disaster are one of the factors that influenced economic and infrastructure loss among those who lived in high-risk areas. People-centered program approaches are best in establishing a community that is capable and resilient to protect themselves. The knowledge transfer is significant in disaster risk reduction (DRR). It gives people and surroundings many benefits, including enhancing people's understanding of the disaster so that people are aware

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of the disaster. However, not everyone can obtain disaster information because some of them have no access or facilities to receive disaster information, especially in rural areas. Hence, it is necessary to reach out to people and share awareness of disasters, so that disaster knowledge can be shared and people will be more aware of the disaster. Sultan Abu Bakar Hydroelectric Dam (SAB) is a megastructure under Cameron Highlands Batang-Padang Hydroelectric Scheme. The dam is located at Ringlet-Bertam Valley Road with a man-made lake on the upstream of the dam called Ringlet Reservoir.

The downstream communities along Bertam River consist of a small town and few Orang Asli settlements which particularly vulnerable to flood as some of the houses, structures, and farms apparently are within the river reserves or dangerously close to the dam; located within the movement of water flow if released from the dam. The aim of the study is to ensure that the directly affected communities are fully aware and prepare for any untoward incidents in their area, especially related to the failures of dam operations through identifying the lives and livelihood of the communities directly affected by any probable failure of the Hydroelectric Scheme. This includes preparing community awareness by educating the affected community as a disaster-resilient community through capability formation and capacity building human resources, such as disaster school awareness programs, community awareness programs, and drill exercises. The United Nations International Strategy for Disaster Reduction (UNISDR) has included EWS as a set of capacities, data, information, and knowledge that allow the early action of individuals and communities exposed to hazards to prepare and evacuate in an appropriate manner and inadequate time to reduce the likelihood of loss of life, personal injury, losses, and damages [1]. UNISDR has underlined EWS should complement four important elements which are risk knowledge, monitoring, communication of warnings, and response capability.

In the long run, risk knowledge can be looked as a systematic data collection and analysis of hazards and vulnerabilities from 4 important aspects which are physical, social, economic and environmental [2]. Information and knowledge about risk and warning situations can be delivered through various communication tools. Preparedness capacity on how to act is the capability to response, which are very significant with resources, skills, and networks of all agencies and stakeholders [2].

2. Importance of Knowledge Transfer in Disaster Risk Reduction (DRR)

An approach to disaster risk reduction helps people assess their emergency response actions in the context of existing and future disaster risks. According to Marchezini *et al.*, [2], they acknowledged that disaster risk reduction, knowledge management, and social learning realms are interconnected and that knowing these connections will help them strengthen disaster risk reduction (DRR) [3]. This opinion is supported by Marchezini *et al.*, [2-4]. This helps them to plan or change their activities to make people and communities safer and more resilient to disasters, and to safeguard efforts to establish and extend conditions for sustainable poverty alleviation and development [5-6].

Programs for children in disaster education have been seen as a creative approach to disaster risk reduction. Education can enhance the perception of risk among children [7-8]. According to research carried out in Japan, there is a clear connection between education, enhanced risk perception, and risk reduction measures for students. Encouraging children to think about the significance of preventive measures and preparedness will bridge the gap between awareness and information practice [7]. Today, disaster education should be specifically discussed as a way of increasing the level of child resilience and transmission of information to reduce the risk of disasters at home.

Women are seen as vulnerable people, and they encounter a lot of difficulties during the disaster [8]. According to Marchezini *et al.*, [2], women have a strong interest in educating and preparing for emergencies and disasters. Disaster education for women may raise the level of education, awareness, and preparedness among all members of the family, especially children [9]. Marchezini *et al.*, [2] explained that women's education in various centers is carried out by formal and informal organizations, mosques, schools, offices, and so on. Nonetheless, the basic steps in the context of disaster education continue to be required. After being educated, some women become active members of the group and serve as agents to educate other people in the community [10]. It can be inferred that these researchers agreed that transmitting knowledge of DRR through women is essential that can bring benefits, particularly to the family of people.

Marchezini *et al.*, [2] studied that elderly people require special training in different ways involving physical disabilities and cognitive disability [8]. Furthermore, psychological help for older people is very important in situations of crisis and should be considered as one of the main tutorials [11]. If people with disabilities are aware of their experiences in the protection of disasters, they can save themselves in these situations without the help of others [8]. Thomas *et al.*, [12] stated the training of these people is related directly to their survival after disasters. Thus, the sharing of knowledge among elderly people become of betterment to the general public.

According to Torani *et al.*, [8], special attention should be given to disaster education for vulnerable people. It is important to note that successful training may prevent or lessen the effects of certain disasters. Trained people can better protect themselves and others. As a result, training will minimize human and financial losses caused by accidents, which are considered a more significant problem for disadvantaged people, but less focus has been put on it and there is no rigorous training program. There are various ways of educating vulnerable people, but the best approach is not really one. So, comprehensive educational services need to be prepared and designed for those facing disasters [8].

3. The People-Centered Approach in Disaster Risk Reduction (DRR)

The people-centered approach is a lateral concept where all levels and a variety of stakeholders share equal responsibility for risk management (preparation, response, and recovery, etc.) [13]. This means no specific stakeholder holds sole responsibility and everything is shared. This will require individuals and communities to know the risks, face up to them, safeguard their rights, make informed choices, and take an active part in decision-making processes [13]. People-centered knowledge transfer is not an easy process. It requires good and strong communication skills between the local authorities and communities. Lots of systematic approaches and diverse activities shall be implemented in ensuring the effectiveness and completeness of people-centered knowledge transfer. All these approaches and activities will eventually allow local communities to understand when, how, and why they are at risk.

According to a study by Torani *et al.*, [8], response capability can be measured based on the flood loss mitigation, which reflected social preparedness. He highlighted based on the case of four main villages of Touré, Larba Birno, Garbey Kourou, and Tallé in the municipality of Gotheye, which the community were prepared with flood risk reduction plans [8]. The plans have taken into consideration of the specific criticalities of each village and propose measures to reduce potential damage. The plans were outlined with various approaches such as participatory hazard identification, probability of flood occurrence, flood-prone areas, asset (mostly housing and crops) identification, and risk reduction actions [14]. Photointerpretation has been conducted to identify the loss of assets in the flood zone [15]. Based on the photointerpretation, a specific planned of actions on risk

prevention and the preparedness actions were outlined for the target communities to increase community's awareness with basic knowledge of the flood risks and of more urgent actions to be taken according to each scenario [16].

3.1 Technology-Based Program

The innovative technology approach can be part of education, as one of the modern ways of exchanging knowledge about DRR. In New Zealand, Tarchiani *et al.*, [17] presented a new alternative with museum disaster video games that could instil knowledge of disaster by displaying hazards, vulnerabilities, capacities, and DRR, with constructivist learning theory supporting the use of video games. This method allowed the visitor to explore how the serious disaster video game Quake Safe House shares their perspective of Quake Safe House based on game content, game mechanics, player motivation, skill-building, and social interaction. It could also foster learning about disaster and DRR through museum visitors and enable researchers to gain insights into whether and how serious video games in a museum environment can build awareness and knowledge about disasters [18].

3.2 Community-Based Program

Workshops can also be used to improve and raise awareness of the disaster among the general public, especially in rural areas that lack access to the latest technology and education. In New Zealand, Tarchiani *et al.*, [17] proposed a workshop that identified core social resilience indicators that capture a combination of structural and cognitive attributes. The workshop consisted of hazards researchers, emergency management practitioners, and policymakers focused on these objectives including defining what social resilience means to them, identifying what factors are essential to building community social resilience, and identifying current and potential initiatives that improve community social resilience. This workshop will concentrate progressively on the importance of social resilience and how it contributes to community preparedness, disaster response, and recovery from disasters [19].

On the other hand, in the Philippines, Tarchiani *et al.*, [17] discussed the experiences of an international NGO working with youth on community risk mapping and reduction activities. Possible risk communication tasks for the youth include setting up warning signs, planning emergency drills, and helping to disseminate awareness through social media use. With their wide connections and networks, and up-to-date knowledge of social media and mobile devices, young people can be a vital asset in risk communication and follow-up actions such as exchanging information about people in need of support, making it easier for authorities to respond, assisting with relief operations and managing evacuation centres, raising awareness of the disaster and fundraising. The mechanisms for youth participation in information-sharing, consultation, decision-making, taking intervention, assessing outcomes, and receiving input should be clear if we are to expect improved outcomes in terms of the quantity and consistency of youth involvement in DRR in general and in particular risk communication [20].

Mitchell *et al.*, [21] study on children and youth as communicators of disaster risk in persuading the family and communities to act. This study focuses on the children's group in El Salvador and New Orleans. A participatory approach was employed with methods including transect walks, community mapping, risk identification, risk ranking, and visioning exercises to determine the risks present in the community and which were deemed significant by the participants. The findings of this study show that the roles of children and youth as potential informants within informal and formal risk

communication networks have been significantly underestimated, but their positive role in disaster risk reduction must also be seen in the light of its possible burdens.

3.3 Education-Based Program

Education today is one of the main aspects to be considered in order to learn about disaster risk reduction, especially at a young age, such as children and teens. Brazil is the country in South America that has used education to share awareness in DRR. According to Muñoz *et al.*, [22], they run school safety and disaster education in schools and universities to improve their curriculum skills and high-school related learning. Schools would need to become knowledge producers rather than reproducers of centrally distributed information. The strategy will raise awareness of natural hazards and preparedness for disasters. Furthermore, schools are becoming safer, and school admissions have better security plans which will make students safer in schools and learn more about hazards and preparedness [22].

De Mendonca *et al.*, [23] agreed and introduced a geo-hydrological disaster risk reduction educational approach for elementary school students in a public school. The guiding elements of this action plan were a problem-based, cross-cutting, and interdisciplinary approach for implementing the main idea in this elementary student, addressing the natural, environmental, and human issues. Using this teaching methodology, which involved school teachers, a professor with geo-hydrological disaster expertise and a local risk management institution, the students had the opportunity to discuss these matters of geo-hydrological disaster [23]. Similarly, it has been agreed by Muñoz *et al.*, [22] and De Mendonca *et al.*, [23] to raise understanding of disasters among students using education at schools is very effective.

De Mendonca *et al.*, [23] and Shaw [24] introduced the School Centered Community Building concept by developing new linkages between school and community. Schools are placed at the center of the community and community members are allowed to participate in educating their children. All the related programs shall be continuously planned and implemented in order to further strengthening DRM plans. The significant challenge is to provide continuous and consistent education for school children as there is a constant transfer of school teachers to different schools every 3–4 years.

4. Study Method

A primary data collection on the target population was conducted in the study area using the closed-ended questionnaire survey method. A total of 847 samples have been gathered from 11 villages within the study area. Selection of samples from the total population was done by using the mixed method which areas were divided into cluster and samples were randomly collected based on 30% of the population of each cluster (11 villages). This sampling technique is to ensure equal probability chances were given to every individual in every village. The survey was conducted on a face-to-face basis, with a bi-lingual survey form. This is due to the areas that were mostly populated by Chinese, Semai, Temiar, and Malay ethnics, and just a few of them can understand English.

5. Analysis

Results analysed based on the survey conducted showed that most respondents are aware of their risk and their understanding and knowledge were reflected in their feedback. Respondents

were basically have undergone a few series of workshops and exercise drills conducted by dam owner and agencies. A ranking of action was made by using the Relative Importance Index (RII) analysis.

The highest RII score representing the preferable action perceived as significant by respondents when disaster was expected to strike. Based on the result in Table 1, the most chosen action with RII score of 2418 ranked as 1st action was to move to the higher ground followed with saving important belongings (RII score = 2139) ranked as the 2nd action to be taken when disaster expected to strike. The least preferred action ranked as no 5 with RII score of 1331 is the action of doing nothing.

Table 1
 RII Rank on Action taken when disaster expected to strike

Action was taken	Responses								I of R scores	Rank
	Very insignificant		Insignificant		Significant		Very Significant			
	F	R score	F	R score	F	R score	F	R score		
Move to higher places	121	121	183	366	241	723	302	1208	2418	1
Save important belongings	153	153	271	542	248	744	175	700	2139	2
Warn others	340	340	316	632	130	390	61	244	1606	3
Wait for rescue team	325	325	350	700	158	474	14	56	1555	4
Did not do anything	437	437	340	680	66	198	4	16	1331	5

Table 2 shows 48.6% claimed they knew about the safe location was from the given instructions by a local authority, while 18.5% said they knew it from friends or family members. There are 18.2% claimed they knew the safe location from village committee members and only 9% received information from Tok Batin or the village representative.

Table 2
 Source of information about the safe location

Medium	F	%
Friends/Family members	157	18.5
Instructions from authority	412	48.6
Village Committee members	154	18.2
Tok Batin/Village representative	76	9
Others	48	5.7
Friends/Family members	157	18.5

The RII analysis was done on precaution measures in facing disaster taken with family members in facing disaster. The result as shown in Table 3 below shows that the highest RII score with 3589 was ranked as 1st important precaution measure taken by respondents and their family in facing disaster is to have well preparation followed with RII score of 3570 ranked as 2nd is the self-preparation by respondents in facing the natural disaster. Meanwhile, the 3rd action taken by respondents and family was to safeguard important family records with RII score of 3544. The least

important or the last ranked action is to have practiced disaster preparedness drill with RII score of 3182.

Table 3

RII ranking on precaution measures in facing disaster taken with family members

Measures	Responses										I of R scores	Rank
	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree			
	F	R score	F	R score	F	R score	F	R score	F	R score		
1) I am prepared for natural disaster	47	47	12	24	74	222	293	1172	421	2105	3570	2
2) My family is well prepared for disaster	39	39	16	32	81	243	280	1120	431	2155	3589	1
3) I have discussed disaster preparedness with my family members	38	38	43	86	111	333	283	1132	371	1855	3444	4
4) I have to safeguard the important family record	35	35	18	36	106	318	285	1140	403	2015	3544	3
5) My family have practiced disaster preparedness drill within the last year	111	111	52	104	121	363	211	844	352	1760	3182	5

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6. Discussion

The result from the survey shows the awareness and risk knowledge in the Lembah Bertam community are highly associated with gender, age, educational level, and residential area; particularly related to a strong cultural influence in the livelihood of the community. Their culture is affecting the exposure towards disaster knowledge and disaster-related cognition. When dealing

with the Orang Asli population, cultural influence is always apparent. Furthermore, most of the men work in the agriculture field and outside of their home while the women mostly stay within their houses managing the family.

A community's resilience has to do with having a collective response and action from all stakeholders to help reduce vulnerability. In the event of disasters, social characteristics of household members such as age, gender, and other characteristics, for example, educational background and disabilities influence the vulnerability to the disaster effects [25]. Using indigenous knowledge in weather forecasting should aid the preparedness and community's reaction in time of disaster. Instead, the community's reaction when disaster comes is highly dependent on public warning and movement which deliberately delays their reaction time. Hence exposing the community to the adverse effects of the disaster that caused the death of four people in the 2013 flooding event. However, during the implementation of EWS, the community is more exposed to disaster knowledge and thus, no casualty reported in the 2014 flood event.

Understanding the risk of living area can help in guiding the preparation for disaster prevention and response measures. Knowing the detailed impact of disasters on their livelihood and how they cope with the situation could facilitate the planning and preparedness to protect them from further vulnerabilities. Lembah Bertam is vulnerable to the detrimental effect of monsoon or any other natural disasters. Furthermore, different disaster cognition was evident in different age and highest educational level, resulting from different exposure to floods and experience of flood impacts. Different ages have different awareness levels of disaster events that could influence their safety and well-being. Younger generations are working and receiving educations as compared to older generations. They are knowledgeable about IT and have much easier access and exposure to technology. They can easily get the latest information from internet sources, etc. In addition, respondents with higher educational levels are showing a higher disaster awareness, provided that they have more access to learning essential disaster knowledge.

The greater effect of the training program and disaster-related cognition (i.e., expectations and worry about a future disaster, beliefs in mitigation and preparedness, etc.) lies in the awareness effort of individuals. Preparedness action could facilitate the use of tools for analysing the situation and identifying the action to be taken in time of disaster events. Furthermore, a continuous preparedness saves lives, reduces personal suffering, and losses, while lessening the destruction of property and economic loss [26]. In other words, personal preparedness will empower the person with relevant skills to cope with the event. The survey revealed personal preparedness behavior of the Lembah Bertam community is very much influenced by residential areas and the highest educational level. People who are more educated are more likely to prepare themselves with enough resources in expecting disaster events. Furthermore, different proximity to disaster breach causes different preparedness level in the community.

7. Conclusion

There are four main factors that highly influence the awareness and preparedness level of the community in Lembah Bertam. The factors are gender, age, highest educational level, and residential areas. The factors influencing the community's awareness are gender, age, highest educational level, and residential areas, whereas the factor influencing the community's preparedness are the highest educational level and residential areas only. Hence, the most critical factor is the residential area and educational level, as it affects both the awareness and preparedness level of the Lembah Bertam community. After the analysis, some recommendations are proposed for future capability formation and capacity building human resources. The strategy is focusing on two categories: 1) Technical

aspect, 2) Human interaction. Technical upgrades are for the long-term preparation and sustainable approach while human interaction is an additional resource.

In conclusion, this study revealed that deep-rooted links to gender, age, highest educational level, residential areas, culture, and unsatisfactory knowledge on disaster preparedness were responsible for failure to overcome the effects of floods in disaster-prone communities of Lembah Bertam. However, human interaction and support from authorities such as village head/representatives were shown to be effective in enabling the community to lessen the negative effects of disasters with the assistance of technological approaches; siren and drills. This calls for the stressing of local authority and implementation partners focused on addressing these underlying causes as well as the involvement of all stakeholders in scaling the effective coping strategies in order to build resilience within this community and other similarly affected areas.

References

- [1] Marchezini, Victor, Flávio Eduardo Aoki Horita, Patricia Mie Matsuo, Rachel Trajber, Miguel Angel Trejo-Rangel, and Débora Olivato. "A review of studies on Participatory Early Warning Systems (P-EWS): Pathways to support citizen science initiatives." *Frontiers in Earth Science* 6 (2018): 184. <https://doi.org/10.3389/feart.2018.00184>
- [2] Marchezini, Victor, Rachel Trajber, Débora Olivato, Viviana Aguilar Munoz, Fernando de Oliveira Pereira, and Andréa Eliza Oliveira Luz. "Participatory early warning systems: youth, citizen science, and intergenerational dialogues on disaster risk reduction in Brazil." *International Journal of Disaster Risk Science* 8, no. 4 (2017): 390-401. <https://doi.org/10.1007/s13753-017-0150-9>
- [3] Weichselgartner, Juergen, and Patrick Pigeon. "The Role of Knowledge in Disaster Risk Reduction." *International Journal of Disaster Risk Science* 6, no. 2 (2015): 107. <https://doi.org/10.1007/s13753-015-0052-7>
- [4] Renn, Ortwin. "Stakeholder and public involvement in risk governance." *International Journal of Disaster Risk Science* 6, no. 1 (2015): 8-20. <https://doi.org/10.1007/s13753-015-0037-6>
- [5] Briceño, Sálvano. "Looking back and beyond Sendai: 25 years of international policy experience on disaster risk reduction." *International Journal of Disaster Risk Science* 6, no. 1 (2015): 1-7. <https://doi.org/10.1007/s13753-015-0040-y>
- [6] Faber, Michael Havbro, Luisa Giuliani, Alexandra Revez, Suranga Jayasena, Jörgen Sparf, and José Manuel Mendez. "Interdisciplinary approach to disaster resilience education and research." *Procedia Economics and Finance* 18 (2014): 601-609. doi:[10.1016/S2212-5671\(14\)00981-2](https://doi.org/10.1016/S2212-5671(14)00981-2)
- [7] Torani, Sogand, Parisa Moradi Majd, Shahnam Sedigh Maroufi, Mohsen Dowlati, and Rahim Ali Sheikhi. "The importance of education on disasters and emergencies: A review article." *Journal of education and health promotion* 8 (2019). doi:[10.4103/jehp.jehp_262_18](https://doi.org/10.4103/jehp.jehp_262_18)
- [8] Muttarak, Raya, and Wiraporn Pothisiri. "The role of education on disaster preparedness: case study of 2012 Indian Ocean earthquakes on Thailand's Andaman Coast." *Ecology and Society* 18, no. 4 (2013).
- [9] Muzenda-Mudavanhu, Chipso, Bernard Manyena, and Andrew E. Collins. "Disaster risk reduction knowledge among children in Muzarabani District, Zimbabwe." *Natural Hazards* 84, no. 2 (2016): 911-931.
- [10] Tuladhar, Gangalal, Ryuichi Yatabe, Ranjan Kumar Dahal, and Netra Prakash Bhandary. "Assessment of disaster risk reduction knowledge of school teachers in Nepal." *International Journal of Health System and Disaster Management* 3, no. 1 (2015): 20. doi:[10.4103/2347-9019.147142](https://doi.org/10.4103/2347-9019.147142)
- [11] Thomas, Tracy N., Michelle Leander-Griffith, Victoria Harp, and Joan P. Cioffi. "Influences of preparedness knowledge and beliefs on household disaster preparedness." *Morbidity and Mortality Weekly Report* 64, no. 35 (2015): 965-971. doi:[10.15585/mmwr.mm6435a2](https://doi.org/10.15585/mmwr.mm6435a2)
- [12] Scolobig, Anna, Tim Prior, Dagmar Schröter, Jonas Jörin, and Anthony Patt. "Towards people-centred approaches for effective disaster risk management: Balancing rhetoric with reality." *International journal of disaster risk reduction* 12 (2015): 202-212. <https://doi.org/10.1016/j.ijdrr.2015.01.006>
- [13] Tiepolo, Maurizio, Maurizio Rosso, Giovanni Massazza, Elena Belcore, Souradji Issa, and Sarah Braccio. "Flood assessment for risk-informed planning along the Sirba river, Niger." *Sustainability* 11, no. 15 (2019): 4003. <https://doi.org/10.3390/su11154003>
- [14] Belcore, E., M. Piras, A. Pezzoli, G. Massazza, and M. Rosso. "Raspberry pi 3 Multispectral Low-Cost Sensor for Uav Based Remote Sensing. Case Study in South-West Niger." *ISPRS-International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* 4213 (2019): 207-214.

- [15] Fakhruddin, S. H. M., Akiyuki Kawasaki, and Mukand S. Babel. "Community responses to flood early warning system: Case study in Kaijuri Union, Bangladesh." *International Journal of Disaster Risk Reduction* 14 (2015): 323-331. <https://doi.org/10.1016/j.ijdrr.2015.08.004>
- [16] Tarchiani, Vieri, Giovanni Massazza, Maurizio Rosso, Maurizio Tiepolo, Alessandro Pezzoli, Mohamed Housseini Ibrahim, Gaptia Lawan Katiellou et al. "Community and impact based early warning system for flood risk preparedness: The experience of the Sirba River in Niger." *Sustainability* 12, no. 5 (2020): 1802. <https://doi.org/10.3390/su12051802>
- [17] Gampell, Anthony Viennaminovich, J. C. Gaillard, Meg Parsons, and Loïc Le Dé. "Exploring the use of the Quake Safe House video game to foster disaster and disaster risk reduction awareness in museum visitors." *International journal of disaster risk reduction* 52 (2021): 101934. doi: [10.1016/j.ijdrr.2020.101934](https://doi.org/10.1016/j.ijdrr.2020.101934)
- [18] Kwok, Alan H., Emma EH Doyle, Julia Becker, David Johnston, and Douglas Paton. "What is 'social resilience'? Perspectives of disaster researchers, emergency management practitioners, and policymakers in New Zealand." *International Journal of Disaster Risk Reduction* 19 (2016): 197-211. <https://doi.org/10.1016/j.ijdrr.2016.08.013>
- [19] Fernandez, Glenn, and Rajib Shaw. "Urban disasters and risk communication through youth organizations in the Philippines." In *Urban disasters and resilience in Asia*, pp. 195-207. Butterworth-Heinemann, 2016.
- [20] Mitchell, Tom, Katharine Haynes, Nick Hall, Wei Choong, and Katie Oven. "The roles of children and youth in communicating disaster risk." *Children Youth and Environments* 18, no. 1 (2008): 254-279.
- [21] Muñoz, Viviana Aguilar, Barbara Carby, Enrique Castellanos Abella, Omar Dario Cardona, Tania López-Marrero, Victor Marchezini, Lourdes Meyreles, Débora Olivato, Rachel Trajber, and Ben Wisner. "Success, innovation and challenge: school safety and disaster education in South America and the Caribbean." *International journal of disaster risk reduction* 44 (2020): 101395. <https://doi.org/10.1016/j.ijdrr.2019.101395>
- [22] de Mendonca, Marcos Barreto, Teresa da Silva Rosa, and Alexandre Rosa Bello. "Transversal integration of geohydrological risks in an elementary school in Brazil: A disaster education experiment." *International journal of disaster risk reduction* 39 (2019): 101213.
- [23] Shaw, Rajib, ed. *Community practices for disaster risk reduction in Japan*. Springer Science & Business Media, 2014.
- [24] Osuret, Jimmy, Lynn M. Atuyambe, Roy William Mayega, Julius Ssentongo, Nathan Tumuhamy, Grace Mongo Bua, Doreen Tuhebwe, and William Bazeyo. "Coping strategies for landslide and flood disasters: a qualitative study of Mt. Elgon Region, Uganda." *PLoS currents* 8 (2016). doi: [10.1371/currents.dis.4250a225860babf3601a18e33e172d8b](https://doi.org/10.1371/currents.dis.4250a225860babf3601a18e33e172d8b)
- [25] Sinha, Abhinav, D. K. Pal, P. K. Kasar, R. Tiwari, and A. Sharma. "Knowledge, attitude and practice of disaster preparedness and mitigation among medical students." *Disaster Prevention and Management: An International Journal* (2008). doi: [10.1108/09653560810901746](https://doi.org/10.1108/09653560810901746)