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pusat kajian bencana asia tenggara  
southeast asia disaster prevention research initiative

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## Science, Technology and Innovation in Disaster Risk Reduction Sains, Teknologi dan Inovasi bagi Pengurangan Risiko Bencana



Photo by Mohd Faizol Markom

A keynote address was delivered by YBhg. Prof. Emeritus Tan Sri Zakri Abdul Hamid, on the importance of science in enhancing resilience.

Persidangan Kebangsaan Sains, Teknologi dan Inovasi bagi Pengurangan Risiko Bencana telah dianjurkan dengan kerjasama Akademi Sains Malaysia (ASM), Pejabat Penasihat Sains kepada YAB Perdana Menteri, Jabatan Perdana Menteri, Agensi Pengurusan Bencana Negara (NADMA), Jabatan Perdana Menteri, dan SEADPRI-UKM. Ianya telah diadakan pada 5 dan 6 Oktober 2017 yang lalu di Puri Pujangga UKM Bangi, dan telah dirasmikan oleh YBhg. Datuk Dr. Abdul Razak Mohd Ali FASc., Bendahari Kehormat ASM, dan YBhg. Dato' Abd. Rashid Harun, Ketua Pengarah NADMA.

Tujuan persidangan ini diadakan adalah untuk memberi gambaran semasa mengenai keadaan pengurangan risiko bencana (DRR) di Malaysia, yang berkaitan dengan perubahan iklim dan pembangunan mampan. Ia juga menawarkan saluran untuk memberi input mengenai Pelan Sains, Teknologi dan Inovasi Negara yang dicadangkan untuk Pengurangan Risiko Bencana, dan juga bertindak sebagai platform kebangsaan bagi pertukaran amalan terbaik dalam DRR di kalangan penyelidik dan pengamal.

Hampir 100 orang peserta telah hadir, antaranya adalah daripada NGOs, agensi swasta, pihak berkuasa tempatan dan juga ahli akademik daripada universiti awam dan swasta di Malaysia. Ucaptama telah disampaikan oleh YBhg. Profesor Emeritus Tan Sri Dr. Zakri Abdul Hamid, Penasihat Sains kepada YAB Perdana Menteri Malaysia, berkaitan Sains untuk Meningkatkan Daya Tahan.

Sejumlah 11 kertas kerja teknikal telah dibentangkan oleh penyelidik yang kebanyakannya adalah daripada universiti awam dan swasta di Malaysia, yang menekankan kepada kemajuan sains, teknologi dan inovasi dalam DRR, terutamanya di dalam kajian kes tempatan. Sesi pembentangan poster turut diadakan bagi memberi ruang kepada penyelidik muda mempamerkan hasil penyelidikan semasa bertemakan sains, teknologi dan inovasi. Sejumlah 17 poster penyelidikan telah dibentangkan dan manuskrip penuh akan dihantar kepada pihak Jurnal Sains ASM untuk tujuan penerbitan, selepas melalui proses pentasyihan makalah (*peer-review*).

*The National Conference on Science, Technology and Innovation in Disaster Risk Reduction was jointly organised by the Academy of Sciences Malaysia (ASM), Office of the Science Advisor, Prime Minister's Office, National Disaster Management Agency, Prime Minister's Department (NADMA), and SEADPRI-UKM. It was held on 5 & 6 October 2017 at Puri Pujangga UKM Bangi, and officiated by YBhg. Datuk Dr. Abdul Razak Mohd Ali FASc., Honorary Treasurer of ASM and YBhg Dato' Abd Rashid Harun, Director General of NADMA.*

*The aim of the Conference was to provide an insight into the state of disaster risk reduction (DRR) in Malaysia, in relation to climate change and sustainable development.*

*It also offered an avenue to provide input on the proposed National Science, Technology and Innovation Plan for Disaster Risk Reduction and served as the national platform for the exchange of good practices in DRR among researchers and practitioners.*

*More than 100 participants attended, many of whom were from NGOs, the private sector, local authorities, and academia from public and private universities in Malaysia. A keynote address was delivered by YBhg. Professor Emeritus Tan Sri Dr. Zakri Abdul Hamid, Science Advisor to Prime Minister, on Science for Enhancing Resilience.*

*A total of 11 technical papers were presented by researchers mainly from public and private universities in Malaysia, which highlighted the advancement of science, technology and innovation in DRR in local case studies. A poster session was also held in between the presentations, to showcase the current research by young researchers from universities in Malaysia under the science, technology and innovation themes. A total of 17 posters were presented and the full manuscript will be sent to the ASM Science Journal for publication after clearing the peer-review process.*

## Research Notes

### Assessment on the Effectiveness of Emergency Response Time During Landslide Events in Malaysia

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The number of landslide disasters is increasing in Malaysia. Subsequently, its impact on livelihoods and the socio-economic, physical and environmental assets of people and businesses is very significant. Historically, as recorded by Malaysia's Public Works Department, there was a total of 440 landslides in Malaysia over the period of 1973 and 2007. There were more landslides, but they were not properly reported and recorded.

Emergency Response Planning (ERP) with the right measures taken at the 'initial stage' of an emergency plays a major role in reducing the impact of a disaster. Response from the rescue team is varied and subject to causes, hill-slope geomorphological processes and characteristics of each landslide. Many ERP elements should be considered, e.g. data on specialized equipment and organizations must be updated. This paper provides a better insight into the effective emergency response preparedness in Malaysia. It also investigates the level of preparedness of the rescue team and the community in landslide-prone areas. Analysis of emergency response time was made based on the Malaysia Civil Defence Force (MCDF) experience recorded during the classical and recent landslide in Hulu Kelang Selangor. The landslide was caused by multiple internal and external factors, mainly induced by inadequate design of retaining structures and slopes. So far, 28 historical landslide events have been reported in the Hulu Kelang area from 1990 to 2011, with 21 of them being triggered by rainfall. The results are promising with respect to emergency response time and its effectiveness.

This paper also addresses the issues and challenges of disaster preparedness and awareness carried out by relevant stakeholders, especially in the context of landslide emergency response. Several best practices of effective emergency response are critically reviewed and presented. In conclusion, this study shows that effective emergency-response preparedness is crucial for supporting an effective early warning system coupled with enhanced public awareness and preparedness with structured training programs.

**Keywords:** Landslide, response time, ERT, emergency, civil defence.

### Reconstruction of a Monsoon Event through Isotopic Fingerprinting of O-18 and Deuterium in Precipitation: A Case Study of Kelantan 2014 Flood Disaster

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Dominant water flux through transpiration reflects the significant role of vegetation in regulating the regional water cycle. Hence, negligence of the role of the forest as a major hydrologic component may undermine the ecosystem capacity to regulate water balance in a tropical region. If this is so, is deforestation the main culprit for the recent (2014) floods in Kelantan?

Initially, datasets of Precipitation and Water Level for the main rivers in Kelantan catchment were observed from December 17, 2014 to January 6, 2015; Sungai Lebir, Sungai Galas and Sungai Kelantan. The dataset was retrieved from the state government official portal [ebanjir.kelantan.gov.my](http://ebanjir.kelantan.gov.my). Results showed an unusual high amount of rainfall co-varies with the water level in the three rivers, reflecting the high intensity of monsoon, the main driver of the water input (rainfall) for the Kelantan watershed. Delta 18O and  $\delta 2H$  of precipitation were analysed to improve understanding of stable isotope systematics in Malaysia, essential for climate-hydrology interpretation of modern stable isotopic fingerprint of  $\delta 18O$  and  $\delta 2H$  preserved in meteoric waters. The Delta 18O and  $\delta 2H$  define Local Meteoric Water Line (LMWL) for Malaysia;  $\delta 2H = 6.6(\pm 0.22)$ ,  $\delta 18O + 2.4(\pm 1.45) \text{‰}$  demonstrating a shallower slope with respect to Kelantan LMWL;  $\delta 2H = 7.73(\pm 0.3)$ ,  $\delta 18O + 6.52(\pm 2.1) \text{‰}$ , reflecting the origin of vapor mass and seasonality of precipitations. Deuterium excess (d) derived from the linear model is relatively lower with respect to the Northeast Monsoon (NEM) in 2013, suggesting more moisture supply for the NEM precipitation in 2014.

Understanding the moisture sources is critical to climate-hydrology study, thus, stable isotope-monitoring facilities should be seriously considered for an extensive national environmental monitoring programme, thus providing comprehensive support to the development of flood forensic and management framework as a complementary to the Disaster Risk Management for Sustainable Development (DRM-SD) agenda.

**Keywords:** Stable isotopes, isotope hydrology, Kelantan, flood forensic.

# Research Notes

## Developing a Household Flood Vulnerability Index

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The objectives of this study are to construct a household-based flood vulnerability index (FVI) and to analyze the relationship between risk and vulnerability associated with a flood event. On the flood vulnerability assessment, this study proposes the use of a FVI model that adopts the methodological approach of Balica and Wright (2010) and other related studies. With reference to Turner et al. (2003)'s vulnerability framework, the VI model generally evaluates vulnerability in terms of its factors; exposure, susceptibility and resilience. In this study, the construction of a household-based FVI model is sourced from the primary and secondary data. While the primary data was collected through the submission of household questionnaire sets, the secondary data was obtained from respective agencies such as Department of Irrigation and Drainage, and the Meteorological Department of Malaysia.

In addition, this study employs the multiple linear regression analysis to investigate the relationship between flood vulnerability and flood risk. The FVI model was applied to characterize affected households in the East Coast region of Malaysia, notably in six severely-hit locations across the states of Kelantan, Pahang and Terengganu, by evaluating their vulnerability levels to floods, accordingly. The computation of FVI model provides standardized comparison of communities' vulnerability to floods and allows for early identification of the most vulnerable communities. The FVI model enables a wider evaluation on flood vulnerability of an area, thus beneficial for decision makers and policy makers alike. Potentially, it can constitute as a key tool in the nation's flood management for prioritizing flood control projects.

**Keywords:** Flood Vulnerability Index (FVI), risk, vulnerability, flood.

## Direct Impact of Flash Floods in Kuala Lumpur: Empirical Evidence Based Analysis

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Flash floods are the most common and disruptive hydro-meteorological phenomena that Malaysian cities most often experience. Especially in the capital city of the country, which is going through rapid development and urbanization processes, more incidences of flash floods are reported than in the past. These flash floods are not confined to the monsoon season nowadays but they occur all of a sudden throughout the year. Although several mitigative and adaptive initiatives have been implemented, flash floods are still a major concern in the city. Therefore, it is important to revisit the matter to allow for the sustainability of Kuala Lumpur pertaining to bringing balance in the urban development and flood management; proper set-up and implementation of land use regulations; stricter laws with regard to socio-economic development of catchment areas that should then be followed by effective enforcement.

This paper imperially analyzes the direct impact of flash floods based on collected data from Dewan Bandaraya Kuala Lumpur (DBKL) and Drainage and Irrigation Department (DID). Flash floods are dealt with these two separate departments: DBKL deals with drainage and street-related flash floods and DID deals with river-related flash floods. This paper focuses on both stakeholders at the same time. It focuses on the direct impact of flash floods for understanding the scenario based on empirical analysis. It is to delineate how a number of causes and consequences are being actually experienced when flash floods occur in the city. The results show that the intensity of rainfall and drainage system-related issues are the main causes flash floods here. This analysis will indicate which particular matters need to be given priority, and what measures would solve the problem.

**Keywords:** Flash flood, flood management, empirical analysis.

# Research Notes

## Rock Slope Protection System for Geodisaster Prone Area: Two Case Studies from China

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Rockfall events are quite common in China. Episodes of rockfall events pose a significant threat to areas where development is being built in close proximity to mountainous terrain. Rock slope instability may have been triggered by human activities, rainfall, earthquake movements and tectonic activities. Due to the needs of rapid urban development, buildings are now being built near stiff cliffs which may be exposed to the risk of rockfalls triggered by rainfall and earthquake activities. Effective planning and coordination are good starting points to explore the probability of rockfall events, particularly those of high magnitude.

This paper presents two case studies from China on a systematic rock slope protection system. The first case study was from Weining Yanshan Village, Weining Province, Guizhou while the second case study is from Lingshan Road, Beijing, China. The case study covered site inspection and data gathering, slope stability assessment, rock fall analysis, and lastly, selection on slope protection or netting system. The selection is normally controlled by site conditions and rockfall behaviour. The results of these studies are expected to be useful as systematic rock slope protection can reduce the potential impact of geohazard occurrences on human safety and infrastructures.

**Keywords:** Rockfall, geohazard, slope stability assessment, rock fall analysis, slop protection.

## Managing Geohazards and Pipeline Rupture along Pipeline Route over Mountainous Region

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The trans-state gas pipeline was constructed from the state of Sabah into Sarawak in East Malaysia. Prior to running the gas in, a test pressure was performed. Two days later, the gas pipeline ruptured and exploded near a small town of Lawas in June 2014. The explosion had caused some ground-shaking and substantial displacement of soils around the location, which led to additional soil disturbances. The fire associated with the explosion also burnt off an extensive area of vegetation which further promoted surface water infiltration over a large area of the site. The soil surrounding the ruptured location was weaker when compared to that before the incident. It is anticipated that ground movement, although it may diminish, would continue for a period of time after the explosion, in particular, during monsoon seasons.

Geohazard assessments at several other locations showed that there were many cases where the pipeline was exposed due to the erosion and scouring process caused by the uncontrolled storm runoff from the surrounding areas. The natural terrains were cut massively and changed without regard to the natural hydrological catchment boundary and its regime. Many locations along the pipeline remained exposed to the elements of weather. Many of the steep slopes would require further assessment and analyses into the stability of slopes. More work is necessary to gather the relevant information for analyses and evaluation of long terms solutions to ensure the integrity of the pipeline. Several recommendations based on risk management concepts have been proposed and presented in this paper.

**Keywords:** Geohazard, gas pipeline, slope stability assessment, mountainous region.

# Research Notes

## Building Human Resilience: The Role of Community Based Training and Awareness Program (CBTAP) for Dam Related Flood Risk Management

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Dams, however significant their contributions are to the society, are not immune to failures and diminishing lifespan not unlike other structural elements in our infrastructure. Despite continuing efforts on design, construction, operation, and maintenance of dams to improve the safety of the dams, there still remain the possibility of unforeseen circumstances which cause dam failures. Seeing that dams are usually integrated into close approximates with the community, dam failures may result consequently, in tremendous loss of lives and properties. Hence, it is imperative to have an emergency response system to minimize any loss of life and optimize the available resources.

A Community-based Training and Awareness Program (CBTAP), which is a community awareness program, will be designed to educate people about the threat and about its management by dam owners and emergency responders, and also about the actions which people could take to respond in their own interests. All the stakeholders, including the public, should be well educated and prepared with the dam disaster evacuation response system.

**Keywords:** Dam, disaster, flood, awareness, preparedness.

## Development of Community Based Early Warning System (CBEWS) in Enhancing Community Preparedness for Dam Related Disasters in Malaysia

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We have witnessed a series of catastrophic floods over the last decade in Malaysia. This has necessitated the adoption of a reliable early warning system. Ultimate concern during any event of natural or manmade disaster would be information dissemination to reduce the disaster impact on lives and property. The Bertam Valley incident in the wee hours of 23 October 2013 has been defined as the game changer of how we view the role of vulnerable communities in facing dam-related disasters. Empowerment of local communities has been considered vital in disaster management, as they are often the first responders to disaster.

Local Community Based Early Warning System (CBEWS) is a smart mechanism operated and maintained by the communities themselves. This study revolves around the actual implementation of such a system in Cameron Highlands in the effort to increase human resilience towards dam-related disasters. While establishing the system, the Bertam Valley community has explored external support from different individuals, communities, organizations and institutions. It is essential that the community develops and maintains close coordination and links with these stakeholders. The performance of early warning systems can be evaluated via key parameters such as timeliness, accuracy, reliability, user friendliness, flexibility, and costs & benefits.

**Keywords:** Dam, flood, disaster management, early warning system, community.

# Research Notes

## MERCY Malaysia's Building Resilient Communities (BRC) as a Holistic Disaster Risk Reduction Approach to Reduce ASEAN Humanitarian Burden

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The ASEAN region has one of the world's highest levels of disaster risk both in natural and man-made disasters due to the three values in determining risks - hazard, vulnerability, and exposure - being very high. As such, these ASEAN Member States need to work and struggle against disasters with emphasis on the improvement of best practices and approaches, contextualized actions and resiliency blueprint in achieving a resilient ASEAN for the future. The establishment of global developmental frameworks including the Sendai Framework for Disaster Risk Reduction 2015-2030, the Sustainable Development Goals and the Paris Agreement on Climate Change all aim to reduce risk, improve development pathways and reduce the impact of natural hazards. These frameworks focus on holistic, synergistic solutions that integrate economic, social and environmental outcomes. Nevertheless, the ambitious agreed goals which will require the fundamental transformation of communities and cities, and the relevance of these frameworks to the local level - and the translation of national policies based on them into effective local action - are major challenges in ensuring effective impact. Responding to this, MERCY Malaysia had developed a strategic initiative known as Building Resilient Communities (BRC).

BRC is an initiative that combines local government units, local communities, the education sector, health infrastructure and service providers, and the private sector as its primary stakeholder. Its objective is to achieve an understanding for the mainstream humanitarian actors, specialist actors and the public in becoming prepared, responsive and resilient through the involvement of the effectiveness of grassroots projects and programs, and at the same time, suggest policies, guidelines and training input for each community to secure its role-building resiliency. Its pilot projects are located within the ASEAN region with the aim of providing practical examples on how investing in building resilience can help reduce the humanitarian burden as well as demonstrate how investment in local DRR capacities can reduce risk, foster resilience and promote sustainable development. This paper also discusses present current experience of regional approaches to DRR and how civil society organizations in the region cooperate in building a more resilient ASEAN.

**Keywords:** Building resilient communities, ASEAN, MERCY Malaysia, regionalism.

## Development of 'ROAR' Index for Landslide Susceptibility in Malaysia

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Past researchers have made four fundamental assumptions pertaining to landslide assessment: a) landslides will always occur in the same geological, geomorphological, hydrogeological and climatic conditions as in the past; b) the main conditions that cause land sliding are controlled by identifiable physical factors; c) the degree of hazard can be evaluated; d) all types of slope failures can be identified and classified. By inferring to premise a), the probability of repetitive landslide occurrence at the same geological and stratigraphic condition is very high in Malaysia. The lithology characteristics in Malaysia can be divided into 4 main pillars which are unconsolidated deposits, sedimentary and metamorphic rocks, extrusive rocks and intrusive rocks. Each of these pillars has their own hierarchy, for example, acid intrusive, limestone, older alluvium and others.

Previous researchers have successfully developed an index to predict landslide occurrences such as 'ROSE index', 'ROM scale' and 'RS chart' based on the fact that rainfall intensity and soil characteristics play key roles in determining the landslide susceptibility. This research is an extension work to complement those indexes and scales by creating a new index based on stratigraphic characteristics in Malaysia. Analytical Hierarchical Procedures (AHP) was adopted to create the index. It was found that intrusive rocks gave the highest weightage followed by metamorphic rocks, unconsolidated deposits and extrusive rocks.

**Keywords:** Landslide assessment, landslide, analytical hierarchal procedures, Intrusive Rocks.

# Research Notes

## Building a Resilient Community to Disasters: Evaluation of Training Effectiveness for Civilian Preparedness

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Disasters contribute to huge global socio-economic losses and normally result in serious injury and casualty to the civilians. Casualties occur mainly because of insufficient knowledge of disaster-preparedness and how the civilians should respond in the event of disasters. Disasters are predictable in terms of spatial distribution of potential high-risk zone through utilization of modern technology in which most of the exposed community and emergency response team are aware of the hazard zonation within their area. However, the magnitude and temporal probability of disasters is difficult to obtain thus complicating the prediction of disaster occurrences; and once a disaster strikes, a crisis point is rapidly reached. This is the moment when the emergency response team and healthcare personnel require full cooperation and inclusivity of community in reducing the disaster risk.

This study employs a participatory approach with local disaster-exposed civilians in which the civilians were given comprehensive disaster risk reduction training to improve their understanding of surrounding risks towards building a resilient community. Preliminary observation and evaluation using questionnaires and interviews were carried out on 200 civilians that live in the areas of high landslide risk in which 86 of them have been given the training, and the trained civilians show increased interest on the topic and increased understanding on how to cope well during disaster. This pilot study has shown high effectiveness of trained civilians preparedness and emergency response in the event of disaster. Positive feedback and the demands on the continuity of this training indicate that civilians have started to become concerned about the implications and effects of disaster on the community.

**Keywords:** Disaster risk reduction training, civilians preparedness and response, landslide hazard.

## Assessment of Existing Evacuation Centers Using Flood Risk Mapping in Melaka Tengah

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Malaysia is a country that is prone to flooding. In terms of the number of population affected, frequency, extent, duration, and social economic impact, it is the most significant natural hazard for the country. When floods occur, it is sometimes necessary for affected people to be evacuated into temporary shelters. In Malaysia, schools and government buildings are the most common facilities to be designated as evacuation centers (EC) due to its suitability to accommodate a large number of people at one time, and being equipped with essential basic necessities. However, there have been a number of cases, whereby these shelters themselves became inundated, hence forcing evacuees to move out to other locations or to be trapped due to floods.

The Department of Social Welfare, in its Standard Operating Procedure (SOP) on Flood Disaster Management, necessitates ascertaining the flood susceptibility of an evacuation center as it should be located at a safe location, without adverse risk of being affected by floods. The utilization of GIS has greatly improved the management of disaster, particularly in the preparedness, mitigation, and response phase as part of the decision support system. This study utilized GIS to develop flood susceptibility maps, flood hazard maps and flood risk maps for suitability assessment of evacuation centers in Melaka Tengah district, Melaka, by way of categorization matrix. The results can be used by related disaster management authorities to conduct review and in-depth assessment of existing designated evacuation centers to ensure that proper mitigation measures are taken, or if necessary, other suitable buildings are identified to replace evacuation centers that are at risk of being affected by floods.

**Keywords:** Evacuation center, flood risk mapping, flood disaster management, GIS.

## Research Notes

### Local Adaptive Capacity among Community Living in Disaster-prone Area: A case study in Kundasang, Sabah

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Cognition of risk and responses towards disaster by local community is assessed through various means and methods, amongst them is local adaptive capacity, as one of the first important steps in reducing disaster damages and losses. Much has been debated about Disaster Risk Reduction (DRR) giving significance on physical, environment and economy. However, more comprehension is needed to understand social and cultural impacts, which affect community resilience and overall sustainability. Thus, the objective of this study is to examine the socio-cultural impacts of post-disaster on community living in a disaster-prone area.

A case study of local tourism community in Kundasang, Sabah, affected by the earthquake in 2015, is used to shed light and provide an initial understanding of local adaptive capacity. A preliminary assessment using documentary materials and interviews with key informants of the local tourism community in Kundasang are conducted mainly in Kg. Mesilau. The main findings revealed that local adaptive capacity of the tourism community transpired through self-learning, and community networking intensively boosted their capacity to adapt to external shocks. It was also found that self-organization played an important role in the adaptation process. It takes into consideration that local adaptive capacity is crucial for local authorities, planners and scientists in making appropriate decisions to ensure the community well-being in facing disaster in the future. Therefore, future studies will address the local tourism community adaptation processes, with further details on their resilience mechanism.

**Keywords:** local adaptive capacity, tourism community, resilience, sustainability.

### Flood Susceptibility Maps to Support Urban Landuse Decision-Making in Kajang, Malaysia

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In view of the emerging challenges of urbanization and population growth, innovative land use planning and management of urban development to reduce vulnerability and to minimize risks are crucial. The integration of multi-dimensional information using the Geographical Information System (GIS) is useful to support landuse decision-making in urban areas. The development of flood susceptibility maps using GIS will serve as a powerful tool to support informed decision-making to reduce the risk of flooding through appropriate landuse planning. This study is designed to integrate multi-dimensional information using GIS to support landuse decision-making in the Kajang Town. Flooding has been a major problem in this township since the 1970s. The objectives of this study are to prepare an inventory of floods, identify criteria that contributes to the occurrences, and develop a susceptibility map to support informed decision-making. The study employed four main methods. These include compilation of flood incidences to establish a disaster inventory, content analysis to identify the criteria that contributes to flood occurrences, expert elicitation to provide weightage of the criteria and GIS overlay analysis to process and derive thematic maps. Since the analysis was done based on the natural boundaries that are based on the catchment units, the obtained findings of this study were referred to the Mukim Kajang. The flood inventory reveals that floods are most common in Mukim Kajang. The contributing criteria to floods were categorized as topographic factors, geological structures and geomorphologic features, and then weighted according to expert input. The flood susceptibility map reveals high and very high susceptibility areas covered almost the entire of Mukim Kajang which has large tracts of built-up areas. These activities, which have largely occurred along the drainage of the alluvium plain has increased the susceptibility of the area to floods. This study demonstrates the relevance of a flood susceptibility map to support informed decision-making to reduce the risk of floods through appropriate landuse planning.

**Keywords:** Multi-dimensional; decision-making; flood susceptibility map; landuse planning.

# Research Notes

## A Data Integration Model for Multi-Agency Asset in Disaster Logistic Management

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The complexities of disaster occurrence in recent years demand sound and effective disaster management. Since logistics accounts for 80% of overall cost for disaster management, it requires a specific management of its own embedded within the existing disaster management mechanism. This study focuses on the existing disaster logistics management mechanism in Malaysia and how the component assets can be integrated to optimize the utilization of available resources. As there is no linkage between local disaster responding agencies on their disaster logistics management system, there is no quantifiable way to ascertain how much resources are allocated for the purpose. Therefore, a potential data integration model of the multi-agency existing disaster logistics management system is proposed. The proposed data integration model is developed based on the System Development Life Cycle principles, whereby a common data storage approach for data integration is adopted; followed by Extract, Transform, Load architectural pattern for the model. The logical data model comprises four modules; logical extract, logical data quality, logical transform and logical load module. Further expansion could be including resources available from other entities, such as non-governmental agencies and private companies. This research is hoped to pave the way towards a comprehensive disaster logistics management in the country.

**Keywords:** Disaster management, disaster logistic management, system development life cycle.

## Linkages of Sendai Framework and SDGs: A Preliminary Review

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In 2015, Malaysia had ratified two major frameworks: the United Nations (UN) global policy publication, namely the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR), and the Sustainable Development Goals 2015-2030 (SDGs). In order to facilitate the implementation of these frameworks, the UN has drawn significant indicators for both in the next 15 years. Therefore, there is an urgency to understand the linkages between these two frameworks, and to enable the opportunity to build coherent monitoring and reporting across these policy streams, so as to avoid any double country reporting, especially for agencies in Malaysia. This paper explores other possible linkages between SFDRR and SDGs, especially on the tentative common indicators. Based on qualitative method, preliminary results show that there are additional tentative common indicators between SDGs and SFDRR, especially on SDGs Goal 3, Goal 9, and Goal 11, compared to information officially published by UNISDR in their website. This preliminary finding will contribute to the debates on a need to develop consistent definitions, particularly on resilience and risk which feature as common themes across these two frameworks.

**Keywords:** Sendai Framework for Disaster Risk Reduction, Sustainable Development Goals, common indicator, disaster risk.

## Towards an Integrated Approach of Disaster Management in Reducing Vulnerability of Communities Living in the Vicinity of Hydroelectric Dams

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A 2013 and 2014 tragedy involving multiple flood events in the downstream area of the Sultan Abu Bakar Hydroelectric Dam has become a revelation for stakeholders to execute Integrated Community Based Disaster Management (ICBDM) efforts. ICBDM involves both technical and non-technical capacity building that generally includes community selection, thorough analysis of vulnerable community as well as preparation of detailed risk reduction and response plans. It aims to reduce the vulnerabilities of affected areas and create a resilient community. There is a need for a concentrated effort in building vulnerable group capacities in coping mechanisms through awareness building. This is due to the lacking of community preparedness and the failure in adapting emergency response system can intensify the vulnerability of affected population. This study revolves around three communities living in the vicinity of hydroelectric power schemes in Peninsular Malaysia.

**Keywords:** Disaster management, awareness, preparedness.

# Climatic Hazards Programme

## Malaysia Window to Cambridge at Universiti Kebangsaan Malaysia (MW2C@UKM) Inaugural Training

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On the field trip at Gunung Pass which is exposed to recurrent and large-scale landslides, endangering highway infrastructures and road users. *Photo by Dato' Yunus Abdul Razak.*

The Sendai Framework on Disaster Risk Reduction 2015-2030 identifies the need for progressive communication strategies and preparedness through a participatory process tailored to the need of a wide range of stakeholders. Geoscientists play a crucial role in conveying the results, advice and recommendations from geological investigations. The ability to communicate geohazards effectively to stakeholders is important towards developing community resilience as well as addressing development issues. However, geohazards communication to stakeholders is still a key challenge for geoscientists.

In an effort to address this situation, the inaugural Malaysia Window to Cambridge at Universiti Kebangsaan Malaysia (MW2C@UKM) Training Workshop on "Geohazards and Disaster Risk Reduction: Communicating with Stakeholders" was held from 10th to 12th October 2017 in Malaysia. It was attended by 31 local and regional participants from ASEAN countries as well as the United Kingdom. The training workshop was conducted to enhance the capacity of geologists as geohazard communicators through the sharing of professional experiences and the different modes of risk communication.

The workshop comprised five main sessions: two sessions of technical paper presentations, field trip, a session each on regional perspectives and communicating geoscience. The technical paper presentations on geohazards, disaster risk reduction and engineering geology sessions were held at Hotel Istana Kuala Lumpur in conjunction with the 30th National Geoscience Conference 2017 (NGC 2017) which was organised by the Geological Society of Malaysia. The third session on the second day of the training involved a field trip that started from Kuala Lumpur towards Tambun in Ipoh, Gunung Pass and lastly Cameron Highlands. The focus of the field trip was on geohazard occurrences and also geohazard sites of interest. Local experts from the Department of Minerals and Geoscience Malaysia (JMG) and Public Works Department (JKR) were involved as guides throughout the field trip.

The fourth session on Regional Perspectives was conducted at Heritage Hotel in Cameron Highlands where participants from the ASEAN countries shared their experiences and knowledge related to the issues of geohazards and disaster risk reduction. The last session was on Communicating Geoscience, facilitated by Dr. Alan Thompson who is a director at Cuesta Consulting Ltd., United Kingdom. The discourse was focused on the crucial skills and strategies needed for communicating geohazards particularly to non-specialists; it also addressed local needs in communicating geohazards to various stakeholders with different backgrounds and capacity.

# Geological Hazards Programme

## Disasters and Heritage Areas

Lim Choun Sian

SEADPRI-Universiti Kebangsaan Malaysia



Photo by Lim Choun Sian

The CCOP-SEADPRI-ANCST Workshop on Disasters and Heritage Areas was held on 15 October 2017, at Waterfront Cebu City Hotel, Cebu City, Philippines. The opening address was delivered by Dr. Adichat Surinkum, CCOP Technical Secretariat Director (*right*). SEADPRI-UKM was represented by Dato' Yunus Abdul Razak (*centre*) and Dr. Lim Choun Sian.

The CCOP-SEADPRI-ANCST Workshop on Disasters and Heritage Areas on 15 October 2017 was the second of the workshop series held jointly with the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP), SEADPRI and Asian Network on Climate Science and Technology (ANCST) during the CCOP Annual Session.

The first series, CCOP-VIETADAPT-SEADPRI Workshop on Geoscience supporting risk management, water and food security, was held on 30 October 2016 at The Berkeley Hotel Pratunam, Bangkok, Thailand with the collaboration of Geological Survey of Finland (GTK), the Vietnamese Sub-Institute of Hydro-Meteorology and Climate Change (SIHYMECC), and the Vietnamese Centre for Water Resources Warning and Forecasting (CEWAFO).

This year the workshop was themed Disasters and Heritage Areas. Heritage areas or sites are cultural and/or natural sites considered to be of outstanding value, selected on the basis of having cultural, historical, and scientific, or some other form of significance. The scope of heritage areas in this workshop expanded to include World Heritage Sites, national heritage sites, geoparks and conservation parks/areas; areas being unique in some respect as a geographically and historically identifiable piece of special cultural or physical significance. The workshop intended to highlight the inclusivity of three elements: heritage areas of national significance, disasters, and humans.

The workshop started with an opening address by the CCOP Technical Secretariat Director, Dr. Adichat Surinkum, followed by three lead presentations and discussion sessions. The presentations were made as examples for thought starters on heritage areas that linked to disasters or potential natural hazards. The first paper titled *Geohazards in Kinabalu World Heritage Site*, presented by Dato' Yunus Abdul Razak of SEADPRI-UKM and Mr. Zamri Ramli of Department of Mineral and Geoscience Malaysia discussed the recent 5 June 2015 earthquake and landslide problem in the surroundings of the Mount Kinabalu areas, and steps taken for its conservation. The second paper, *Natural Hazards in a Prospective Geopark: The Case of Bohol Island Philippines* was presented by Ms Liza Socorro J. Manzano, from the Mines and Geosciences Bureau Philippines, where the geological landscapes of the aspiring geopark co-exist with hazards from limestone subsidence and earthquakes; and co-seismic features such as active fault scarps and uplifted lands. The third paper titled *Gombak Selangor (Klang Gates) Quartz Ridge: A Potential Geoheritage as World Heritage Site*, was presented by Dr. Lim Choun Sian of SEADPRI-UKM. The paper featured Gombak Selangor Quartz Ridge, also known as Klang Gates Quartz Ridge, as the longest standing quartz dyke in the region and its vulnerability to natural hazards and anthropogenic threats.

The participants in the discussions came from the Philippines, Thailand, Malaysia and CCOP Technical Secretariat; much interest was shown in understanding the uniqueness of the heritage areas, protection and conservation. It was agreed that, in Southeast Asia, looking at heritage areas from the perspective of disaster threats is a very new dimension and should be explored further.

# Technological Hazards Programme

## Early Risk Detection Tools for Building Community Resilience

Tan Ling Ling

SEADPRI-Universiti Kebangsaan Malaysia



Photo by Tan Ling Ling

Gold medal awarded to Dr. Tan Ling Ling (*left*) for the invention of Potential DNA Diagnostic Tool for Optical Dengue Virus Detection at the 28th International Invention, Innovation and Technology Exhibition (ITEX '17), Kuala Lumpur City Centre (KLCC) held from 11-13 May 2017.

Technological hazards originate from technological or industrial conditions. These include accidents, risky handling, infrastructure failures or specific human activities, that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption or environmental damage.

Many innovative products and processes are available as a result of the rapid pace of technological advancement. Endocrine disrupting compounds (EDCs) are chemicals that can interfere with the hormone system in mammals. These EDCs can be found in many household and industrial products, namely pharmaceuticals and personal care products. Pharmaceutical medicines in particular, which are not adequately digested and absorbed in the body will be excreted through the urine and faeces, and eventually released into the environment via entry in the waterways.

Then there are advances in the field of material science, which have made many new procedures and methods for synthesis of various kinds of engineered nanomaterials (ENMs). The advanced ENMs (e.g. carbon-, metal-, metal oxide- and metal sulphide-based nanoparticles) have been extensively applied in the manufacture of cosmetics, pharmaceutical drugs, industrial and defence technologies, corrosion protection layer, personal care, household cleaners and electronic products. As a result, the release of both EDCs and ENMs contribute to the new and emerging contaminants in the environment.

In many parts of the world, the evolution of pollution problems are a reflection of the ineffective risk management and control of the environmental pollution.

The gross environmental pollution may continue over the long run if new products and processes keep releasing the emerging substances without appropriate monitoring and management approaches on a precautionary basis. Therefore, it is of paramount importance to develop innovative techniques, which are capable of making reasonable quantitative assessments of environmental hazards in order to control, reduce or eliminate the disaster risk.

The early warning device has become crucial for early detection of the presence of chemicals and biohazards to enable fast decision-making, thereby allowing subsequent risk management action to take place. In this context, bioelectronics, miniaturization and biotechnology seem to be growing areas that will have a marked influence on the development of potential biosensor/ sensor as an early detection tool for risk assessment in order to compromise between economic growth and environmental preservation in achieving Sustainable Development Goals.

An early warning system such as biosensor allows the impact evaluation of likely, imminent and current hazard events or conditions based on the real time response obtained, such that an accurate preparedness action can be carried out within the framework of disaster risk management to ensure sustainable capacity growth over time.

As the sensor/biosensor devices are normally small, light-weight and user-friendly, there may be great potential application by the community to detect hazard-causing agents, and take necessary measures at an early stage to thus control the hazardous elements, which cause detrimental effects to humans and the environment. This will render the community aware of the hazardous elements or possible disaster, that build up their resilience against potential threats.

## Activities

### Prinsip Kerja dan Penggunaan Spektrofotometer Ultra-Lembayung Nampak

Tan Ling Ling & Mohd Faizol Markom  
SEADPRI-Universiti Kebangsaan Malaysia



Gambar oleh Tan Ling Ling

Bengkel Prinsip Kerja dan Penggunaan Spektrofotometer Ultra-lembayung Nampak telah diadakan pada 13 April 2017 di Makmal Bencana Teknologi, SEADPRI-UKM. Encik Mohd. Faizol Markom (*dua dari kiri*) sebagai fasilitator dalam bengkel ini dan Dr. Tan Ling Ling (*dua dari kanan*) sebagai ketua projek DIP-UKM.

Program Bencana Teknologi, Pusat Kajian Bencana Asia Tenggara (SEADPRI-UKM) telah mengadakan bengkel prinsip kerja dan penggunaan spektrofotometer ultra-lembayung nampak (UV-Vis) pada 13 April 2017 bertempat di Makmal Bencana Teknologi, SEADPRI-UKM. Bengkel tersebut diadakan ialah bagi memberikan pendedahan kepada pelajar-pelajar sarjana muda dan siswazah dari SEADPRI-UKM dan Fakulti Sains dan Teknologi (FST) serta pembantu makmal berkenaan pengetahuan prinsip kerja asas dan teknik penggunaan spektrofotometer ultra-lembayung nampak yang betul dalam analisis pengukuran kuantitatif spektrum serapan dalam julat panjang gelombang ultra-lembayung nampak 200-800nm. Spektrofotometer UV-Vis yang berjenama JASCO V-730 iRM adalah instrumen optik yang baru diperolehi bawah geran penyelidikan Dana Impak Perdana (DIP), UKM (DIP-2016-028).

Demonstrator dari Agilent Technologies Sales (Malaysia) Sdn. Bhd. telah dijemput untuk memberi ceramah mengenai komponen utama dan konsep operasi asas V730 iRM serta aplikasi spektrofotometer UV-Vis. Sesi ceramah tersebut kemudiannya diikuti dengan latihan eksperimen pengukuran penyerapan sampel yang meliputi i) eksperimen pengukuran spektra sampel air minuman teh hijau, ii) analisis data spektra serapan, iii) kaedah pengukuran kuantitatif, iv) teknik pengukuran sela masa dan v) kalibrasi alat spektrofotometer menggunakan gelas holmium. Walau bagaimanapun, Makmal Bencana Teknologi adalah merupakan makmal instrumen yang melibatkan ujian sampel bahan kimia yang kecil dan cair yang mana tidak melibatkan bahan kimia meruap dan berasid kuat. Kesemua sampel yang telah dianalisis akan dibawa semula ke makmal di mana penyediaan sampel dijalankan untuk pelupusan.

# Activities

## SEADPRI-UKM at 2017 Global Platform for Disaster Risk Reduction 22-26 May 2017, Cancun, Mexico

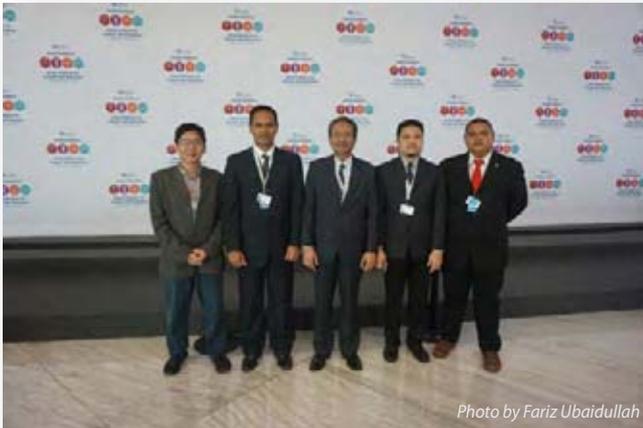


Photo by Fariz Ubaidullah

Malaysian delegation to 2017 Global Platform for Disaster Risk Reduction: *(from left to right)* Dr. Lim Choun Sian of SEADPRI-UKM; Mr. Nor Hisham Mohammad of Sarawak Fire and Rescue Department of Malaysia; Dato' Mohammad Yusoff Wazir of NADMA Malaysia; Mr. Fariz Ubaidullah Mahamud of NADMA Malaysia; and Mr. Mohd Khairul Zain Ismail of SEADPRI-UKM.

Malaysian delegation and ASEAN countries representative during a networking breakfast meeting hosted by Asian Disaster Preparedness Center (ADPC), held at the Moon Palace Resort, Cancun, Mexico, on 25 May 2017.



Photo by Fariz Ubaidullah



Photo by Fariz Ubaidullah

YBhg. Dato' Mohammad Yusoff Wazir, Deputy Director (Post-Disaster Management) of NADMA Malaysia delivered an official country statement during the 2017 Global Platform on Disaster Risk Reduction, held at Moon Palace Resort, Cancun, Mexico, on 22-26 May 2017.