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Kerjasama Bersama NADMA Malaysia Bagi Pengurangan Risiko Bencana

Pada 21 Disember 2018 yang lalu, Agensi Pengurusan Bencana Negara (NADMA), Jabatan Perdana Menteri dan SEADPRI-UKM telah mengadakan satu pertemuan di Putrajaya, bagi membincangkan aktiviti kolaborasi semasa dan merencanakan langkah seterusnya bagi kitaran kerja di bawah Rangka Kerja Sendai bagi Pengurangan Risiko Bencana (2015-2030). Sejak bertahun, NADMA dan SEADPRI-UKM telah berkolaborasi sekurang-kurangnya di dalam dua inisiatif setiap tahun bagi memperkukuh pengurangan risiko bencana di dalam negara ini. Inisiatif semasa adalah termasuk pembinaan keupayaan bagi membangunkan penunjuk bagi Sendai Monitor, memberikan sokongan di dalam mengkaji semula Arahan 20 MKN, merumuskan Pelan Sains, Teknologi, dan Inovasi bagi Pengurangan Risiko Bencana, untuk memperkukuh penyelidikan dan menyatukan Pelan Tindakan Nasional untuk Pengurangan Risiko Bencana (myDRR) untuk memperkemaskan operasi pengurusan bencana. NADMA juga memantau kemajuan Projek "Disaster Resilient Cities" yang diketuai oleh SEADPRI-UKM dan Universiti Cambridge, dengan sokongan daripada Dana Newton Ungku Omar, di mana Platform Multi-hazard sedang dibangunkan untuk Dewan Bandaraya Kuala Lumpur, untuk menyediakan amaran awal dan komunikasi risiko.

Kemuncak kerjasama ini adalah Persidangan Kebangsaan Sains, Teknologi dan Inovasi yang pertama untuk DRR yang diadakan pada 5-6 Oktober 2017 dengan kerjasama Akademi Sains Malaysia; yang membawa bersama para penyelidik dari latar belakang pelbagai disiplin, untuk memudahkan interaksi penyelidik dengan pembuat dasar dan pengamal dari kerajaan, masyarakat sivil dan industri mengenai pengurusan bencana. "DRR Research Alliance" yang ditubuhkan di bawah naungan Akademi Sains Malaysia kini berfungsi sebagai platform untuk meneruskan penglibatan antara para penyelidik utama dan pihak berkepentingan lain dalam DRR. Di bawah naungan NADMA, "DRR Research Alliance" dan SEADPRI-UKM kini akan mengadakan Persidangan Kebangsaan ke-2 pada 2019, diikuti oleh Persidangan Asia Pasifik berkaitan Sains dan Teknologi untuk DRR pada tahun 2020.

Mengambilkira jejak rekod SEADPRI-UKM dalam menyediakan khidmat nasihat berkaitan sains sepanjang dekad yang lalu, Ketua Pengarah NADMA, Dato' Mohtar Mohd Abd. Rahman, meminta persetujuan rasmi untuk ditandatangani antara UKM dan NADMA pada tahun 2019. Beliau juga menekankan pentingnya hasil penyelidikan ketara untuk meningkatkan pengurangan risiko bencana di negara ini. Platform Multi-hazard yang sedang dibangunkan untuk Kuala Lumpur dijadikan sebagai contoh, dan NADMA berharap ianya akan siap pada tahun 2019. Keperluan untuk mendekatkan hubungan penyelidikan dan operasi pengurusan bencana di negara ini juga sangat ditekankan. Dalam konteks ini, satu dialog mengenai keperluan penyelidikan dari perspektif operasi dirancang semasa Persidangan Kebangsaan Sains, Teknologi dan Inovasi Kebangsaan Kedua bagi DRR yang akan diadakan pada 14-15 Oktober 2019.

The National Disaster Management Agency (NADMA) of the Prime Minister's Department, Malaysia and SEADPRI-UKM held a meeting on 21 December 2018 in Putrajaya, to take stock of joint activities and plan the next cycle of work under the Sendai Framework on Disaster Risk Reduction (2015-2030). Over the years, NADMA and SEADPRI-UKM have collaborated on at least two initiatives annually to strengthen disaster risk reduction (DRR) in the country. Current initiatives include building capacity to develop indicators for the Sendai Monitor, providing support to review the MKN Directive 20, formulating the National Science, Technology and Innovation Plan on DRR to strengthen research, and consolidating the National Platform and Action Plan on Disaster Risk Reduction (myDRR) for streamlined operations. NADMA is also monitoring progress of the Disaster Resilient Cities Project led by SEADPRI-UKM and University of Cambridge, with support from the Newton Ungku Omar Fund, where a Multi-hazard Platform is under development for the City Hall of Kuala Lumpur, to provide early warning and risk communication.

The pinnacle of the collaboration was the inaugural National Conference on Science, Technology and Innovation for DRR convened on 5-6 October 2017 with the Academy of Sciences Malaysia; this brought together researchers from multidisciplinary backgrounds, to facilitate their interaction with policy makers and practitioners from government, civil society and industry on disaster management. The DRR Research Alliance established under the auspices of the Academy of Sciences Malaysia now serves as the platform to continue this engagement between key researchers and other stakeholders in DRR. Under the aegis of NADMA, the DRR Research Alliance and SEADPRI-UKM will now convene the 2nd National Conference in 2019, followed by the Asia Pacific Science and Technology Conference for DRR in 2020.

Noting the track record of SEADPRI-UKM in providing science advisory services over the past decade, the Director General of NADMA, Dato' Mohtar Mohd Abd. Rahman, called for a formal agreement to be signed between UKM and NADMA in 2019. The Director General also underscored the importance for tangible research outcomes to improve disaster risk reduction in the country. The Multi-hazard Platform that is being developed for Kuala Lumpur was singled out as an example, and NADMA looks forward to its completion in 2019. The need to bridge research and disaster management operations in the country was also strongly emphasised. In this context, a dialogue on research requirements from an operational perspective is planned during the Second National Conference on Science, Technology and Innovation for DRR to be held on 14-15 October 2019.

Article

Hazards in Kanchanaburi, Thailand

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Abstract: Natural and man-made disasters, particularly fire and floods, have increased vulnerability and affected the livelihood of communities in Kanchanaburi Province, Thailand. A field study undertaken by students from the Asian Institute of Technology provides insights on disaster preparednes to these hazards in the Province. Disaster mitigation and prevention measures are critical for this community, to ensure their resilience to future events.

Keywords: Flood, drought, Kanchanburi, vulnerability.

INTRODUCTION

Kanchanaburi is Thailand´s third largest of 76 provinces. It is located about 130 km west of Bangkok and covers an area of 19,480 km^2. There are about 839,776 inhabitants living in the districts of Kanchanaburi Province (Figure 1), which borders Myanmar at the north-west. The Province covers the source valleys of the rivers Kwae Yai and Kwae Noi, which unite to form the Mae Klong River at Kanchanaburi City. Kanchanaburi Province constitutes the largest area of the Mae Klong river basin (19,414.25 square kilometers or 57.30% of total basin area). There are two big dams in the Province that provide water supply for irrigation in this drought-prone area. Agriculture is an important sector and the largest source of employment of rural population in the Kanchanaburi Province. Sugarcane is a major economic crop while rice and fruit are important for food security. Kanchanaburi has rich forestland, but it has been degraded over the years. The Province is experiencing many environmental issues, rapid land use changes, agricultural expansion and increased population pressures as well as poverty (Santiphop, 2009). Deforestation and rapid expansion of agricultural land have been linked to problems of soil erosion and the runoff of surface water causing loss of topsoil.

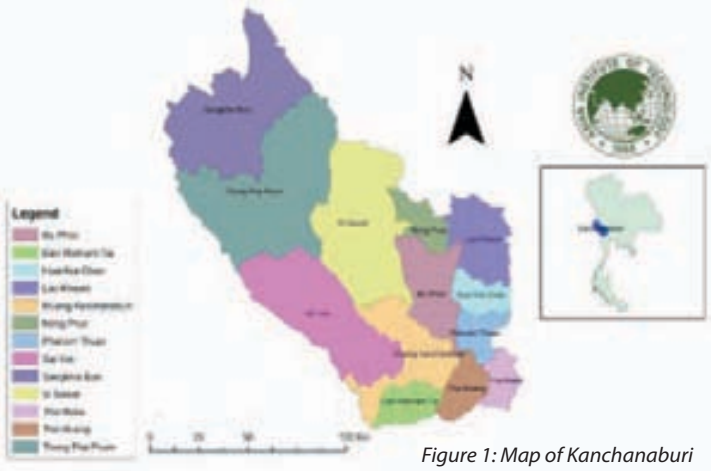

Figure 1: Map of Kanchanaburi

APPROACH

The field study in Kanchanaburi Province was conducted over 3 days by a group of 24 students under the supervision of a lecturer from the Asian Institute of Technology. The focus was on fire and floods, which are the most common disaster events in the Province. Primary information collected from leaders and officers involved in Community Based Disaster Risk Reduction (CBDRR) was supplemented with reports and other publications on hazards and disasters in the Province. The practice of villagers as well as disaster drills conducted in communes, schools and the Mahidol University Campus, located in this province were also observed, to get an insight on disaster preparedness.

FIRE HAZARDS

Fire is the most common hazard in Kanchanaburi Province especially during dry periods. They pose a threat to the economy of the Province which depends on agriculture, especially sugarcane crop. The fires also emit black smoke that affect the visibility for motorists travelling in the Province. They also cause a health threat especially to children and the elderly. Various programs are conducted by the local level government to reduce the level of vulnerability to fires.

At the village level, the provincial health office has provided a good early warning system and preparedness for the hazard. The early warning helps villagers to be better prepared and have improved understanding of evacuation points. They also contribute to reduce breathing problems in places covered by smoke, which can be life-threatening. The community is advised to wear masks to protect themselves from the smoke or, if there are no masks, to cover their noses with a piece of cloth soaked in water. The early warning and guidance have helped the community living in forest areas to respond quickly and reduce their vulnerability. Unfortunately, forest communities are not able to protect their domestic animals. Wild animals are also affected. It was reported that forest fires and extreme dry weather have displaced more than 500 monkeys in the Wang Po of Sai Yoke District, forcing them to seek new shelter and food.

At the school level, Mahidol University provides assistance in conducting fire drills for children, since it is a frequent hazard. When the fire alarm is struck, students have to form a line inside the classroom with the teacher making the head-count. They have to vacate their classroom and make their way to a designated evacuation site. Children are well-organized and this shows the commitment of the university in promoting safety during fires. Furthermore, at this level, the willingness and support of the school principal plays a crucial role in the safety of children whereby all teachers actively participate in the process. Leaders play a pivotal role because of the trust bestowed by the students and teachers. The awareness programs in schools focus on providing a good understanding of evacuation procedures to reduce the vulnerablity of students but there are no proper maps to ensure continuous training for new students and outsiders (Figure 2).

Figure 2: Rudimentary sketches are used to train students on evacuation procedures as there are no proper maps and this hampers continuous training for new students and outsiders.

Article

FLOOD HAZARDS

Weather-related hazards, namely droughts and floods, are the biggest threat in Thailand. At its highest intensity, such events can cause complete devastation including wiping out entire villages. Kanchanaburi Province has experienced both floods and droughts. Projection of future climate under different climate scenarios in the Kanchanaburi Province suggest that the recent trend towards increased precipitation and temperature will continue, hence requiring proactive approach for development of adaptation strategies for agricultural water management (Monprapussorn, 2014). The presence of steep slopes contributes to frequent flash floods during the monsoon season. Kanchanaburi is also prone to effects from cyclones that move from the Indian Ocean to the Bay of Bengal and western Thailand.

Severe floods occured in September-November 2017 affecting many districts including Mueang, Kanchanaburi, Sri Sawat, Dan Makham Tia, Nong Prue, Bo Phloi, Huai Krachao, and Sai Yok (Ongsomwang and Junkaew, 2017). Early warning systems have been installed to reduce the impacts of flash floods. Awareness programmes and training are also organized frequently in Kanchanaburi to enhance disaster preparedness (Figure 3). More investment in such activities could lead to enhanced community resilience.

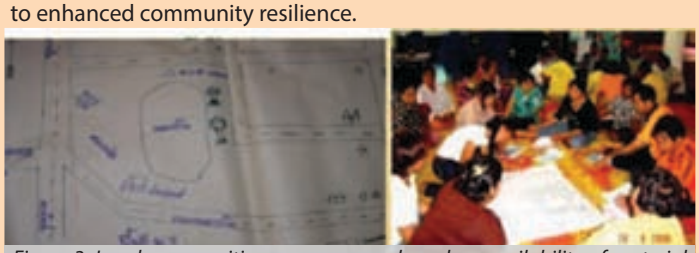

Figure 3: Local communities prepare maps based on availability of material and information as well as their understanding of risk levels.

Traditional knowledge is also used for early warning in many communities. Flooding is triggered by heavy downfall so the behavior of clouds are used as an early warning. Early warning used in the community include bells and other markers placed along the river to detect the rise of critical levels of water during flooding. Electronic communication devices that are used for social networking also serve as a cheap and effective means for communicating early warning for disaster preparedness.

Vulnerability of Communities Near Steep Forests: Severe forest floods triggered by continuous rainfalls are most common in the Huai Krachao District (Figure 4). Tracts of farmland have been devastated in this district. During such an event, the local members help each other to move belongings to higher elevated areas, reflecting the high level of social capital in this community. Flooding cuts off the road linking Huai Krachao and Lao Khwan districts, causing inconvenience and disruption of daily activities. The Provincial Disaster Prevention and Mitigation Office does a quick assessment of the area to repair damages where neccessary. Generally, the flood situation improves and the situation returns to normalcy within a few days if there is no more rain.

Vulnerability of Communities Near Dams: The Singran Dam in the Kanchanaburi Province plays an important role in reducing the impact of floods by storing excess rainwater in its reservoir to be used for irrigation purposes. The release of water from the dam is under the jurisdiction of the Royal Irrigation Department. The dam is maintained every two years to improve resilience of the structure. The dam authority has an advanced communication system to help to ensure early warning for communities in low lying areas (Figure 5). The communities who are living around the dam area are aware of their exposure but the level of vulnerability was quite low because they have a good support from the Thai Government.

Figure 4: The extent of flooding in the Nong Lan Tambon varies over time but some regions experience persistent flooding and require investment in flood mitigation.

Figure 5: Advanced communication systems for early warning and community engagement by dam authorities play an important role to reduce the vulnerability of downstream populations that are exposed to flooding.

CONCLUDING REMARKS

Fire and floods are the most common hazards in Kanchanaburi Province, Thailand. Fires pose a threat to the economy of the Province, which depends on agriculture, especially sugarcane. The fires also emit black smoke that affect the visibility for motorists and pose a health threat to children and the elderly. Floods, in particular forest floods triggered by continuous rainfalls are common and have devastated tracts of farmland in the Huai Krachao District. These communities have a high level of social capital and rely primarily on themselves during disaster events. Communities living downstream of dams are also exposed to floods, but have a higher level of resilience as they have good support from the authorities. Social capital in the form of institutions, networks of relationships between people and the associated norms and values in programs contribute to disaster preparedness in the Kanchanaburi Province. Community-based disaster risk reduction is an effective tool that can be further developed in this area. More investment is required to build resilience of the most vulnerable groups and exposed communities in the Province.

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Article

Case Study of a Landslide in Thit Seint Gon Village, Myanmar

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Abstract: A landslide incident in Thit Seint Gon Village was investigated by the Department of Geological Survey and Mineral Exploration, Myanmar. The landslide had resulted in extensive structural damage to houses and infrastructures including a highway. The field study revealed contributing factors as well as precurser signs leading to the landslide incident. Possible solutions are proposed to mitigate the hazard, enhance early warning and prevent future disaster.

Keywords: Landslide mitigation, disaster mitigation, Myanmar.

INTRODUCTION

Landslides are a serious problem in Myanmar, affecting the economy and social wellbeing. In September 2017, initial crack signs appeared before a roadway structure completely failed, following heavy rainfall in the vicinity of Thit Seint Gon. The Ministry of Natural Resources and Environmental Conservation Myanmar carried out field investigations from 17-23 October 2017, to understand the event and propose solutions.

Thit Seint Gon Village is situated in the Mogok Township (Gemstone Tract) of Mandalay Region, Myanmar. The population is very sparse and mostly consists of the Lisu race. The village lies on the Mogok-Mandalay highway and is located between Sa Khan Gyi Village and Kyat Pyin (Figure 1). The area is a hilly region and is almost above 1000 m in elevation. It consists of steep slopes located on the southern part of a mountain of 1320 m in height. Generally, the slopes are more than 50° with sparse vegetation. The annual rainfall is between 2000-4000 mm. Approximately 112 days of heavy rainfall was observed in August. The average temperature is about 19.5°C and the lowest temperature is 13°C in January, which is the cold season.

The rock units of the study area (300,000 m^2) are made up of quartzite, calc-silicate rocks, marble, sandy soil, alluvium and leuco-granite (Figure 2). The weathered leuco-granite has low strength in engineering properties. Crack signs are common in the sandy soil of weathered leuco-granite.

METHOD

Field investigation conducted in the Thit Seint Gon area used a geological map of 1:1000 scale. Previous findings served as a basis for the current investigation. Records indicate that the upper portion of the slope failed in 2008 due to heavy rainfall. The soils collapsed about 2-3 m in the weathered leuco-granite and remained as scarps in some places.

KEY FINDINGS

The direction of the initial cracks were NW-SE and about 15-20 cm in width. The apertures of initial cracks ranged from few mm to 10 cm. The occurrences were found continuously along NE-SW at most places and along NW-SE at some places (Figure 3). It was reported that water seeped out at four places near the roadway and buildings. The concrete floors of several houses in the village were damaged and the road was uplifted by about 20-30 cm by stress from the upper portion of the slope. No crack signs were found at the southern part of the road. All of the crack signs and damages occurred in the weathered leuco-granite rocks (Figure 4).

Figure 1: Location of the Thit Seint Gon Village.

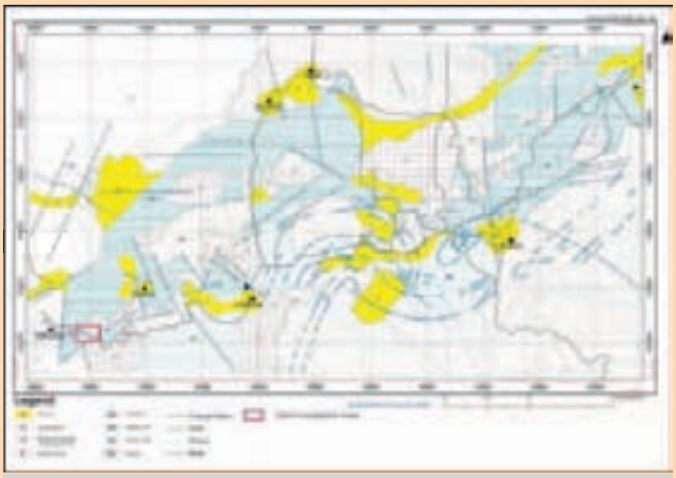

Figure 2: Geology of the Thit Seint Gon Village.

Figure 3: Cross section along the failure plane of the slope.

Article

Figure 4: Cracks in the weathered leuco-granite rocks.

Figure 5: The sandy soil with sparse vegetation is susceptible to erosion.

The slope movement was influenced by several factors. These include the steep slope angle, torrential rainfall, increasing pore water pressure, lithology condition, local faults and direction of initial crack signs, previous soil slide cases and human activities. The torrential rainfall of 29 August 2017 triggered the landslide. The slope comprised sandy soil with sparse vegetation and is easily susceptible to erosion by the rainfall (Figure 5). As such, excess water increased the weight of the slope material while poor drainage contributed to an increase in pore water pressure.

The strength of the slope materials influence the magnitude and frequency of landslide and related events. The weathered leuco-granite was eroded by rainfall droplets and surface runoff. Considering the high porosity and permeability of the sandy leuco-granite, the soil moisture content and pore water pressure may have increased drastically. Increased pore water pressure from saturation reduces the strength of the slope materials. Many signs of initial cracks, water leakage from the toe of the slope and uplifting of the car road were observed in the area. Field investigation suggests that the landslide was complex; with land subsidence due to sinkholes, rotational movement of discontinuous debris, earth flow under steep slopes and poor cohesion.The identification of areas where landslide hazards may occur is the first step for mitigating landslides in Thit Seint Gon Village (Figure 6). Other recommendations include designing slopes or engineering structures to prevent and control the failure. Loading on the top of the slopes, placing fills on slopes, changing water conditions on slopes and cutting into sensitive slopes should be avoided.

Drainage control is usually an effective way to stabilize a slope. Removal of unstable slope materials (grading), construction of retaining walls, control of surface and subsurface drainage or some combination of these could also be considered.

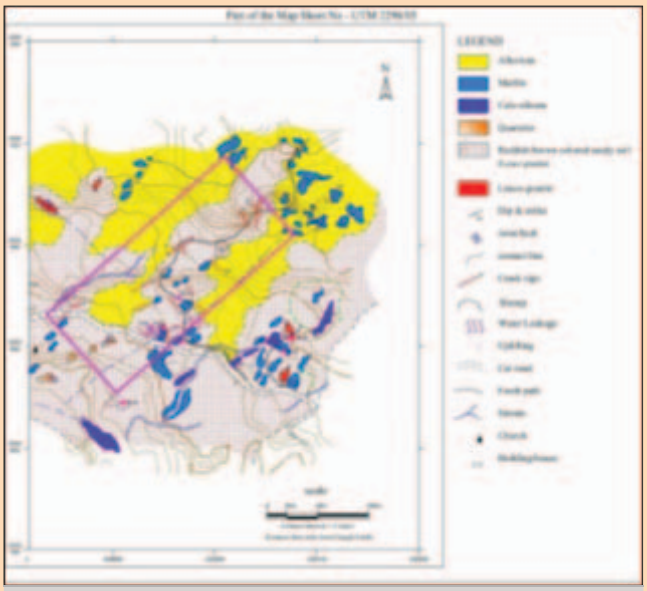

Figure 6: Possible landslide hazardous zones in the Thit Seint Gon Village.

CONCLUDING REMARKS

Landslides in the Thit Seint Gon area were triggered by heavy rainfall. Field investigations revealed that initial cracks indicating potential failures are confined to the weathered leuco-granite that occur in the area. Recommendations made to the local government include getting a geotechnical engineer to design a drainage system for both the surface and subsurface, reinforcement of the earth wall and planting of vegetation, to mitigate and prevent future landslides at the Thit Seint Gon Village.

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Article

Case Study of River Bank Erosion in Vietnam

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Abstract: Mekong River is a vital natural resource for aquaculture, agriculture, forestry and industry in Vietnam. However, river bank erosion and sedimentation of Mekong River has caused detrimental effects on human life and the economy. The Vietnamese government has conducted a study employing Mike21 software and 3D movable riverbed models suited to the local conditions to predict future trends of river erosion and sedimentation in the area. This has improved support for decision-making including landuse planning and early-warning systems.

Keywords: River bank erosion, Mekong River, sedimentation.

INTRODUCTION

The Mekong River is one of the longest fresh natural rivers in the world, flowing across five countries. Starting from the Tibetan Plateau this river runs through China's Yunnan province, Vietnam, Laos, Cambodia and Thailand. Tributaries in the lower Mekong River can be categorized into two major systems: tributaries that scarify from the raining season and tributaries forming the low topography regions of lower rainfall. The landscape and course of the river are controlled by the complex geology and drainage system as well as anthropogenic activities such as agriculture and fishery. In the recent decade, river bank erosion and sedimentation have caused detrimental effects on human life and restrained economic growth. A national project of the Vietnamese Government called KC08-15 had been implemented to understand the behavior of river banks in the lower Mekong delta.

METHODS

Several methods were employed to predict future bank erosion. The trend of erosion rate was generated through historical satellite images to estimate the length of bank erosion, followed by probabilistic statistics.

Table 1: Results of discharge using Acoustic Doppler Current Profiler (ADCP) compared to that computed from the Mike21 software.

Information on erosional rate of the river bank was obtained through empirical methods involving experimental coefficients that employ formulas for various situations depending on characteristics of the area. The software called Mike21 and 3D movable riverbed models were used to obtain 1D, 2D and 3D as well as 4D models to simulate evolution of the river bank and river bed through time. Findings from the simulated model were then compared to field measurements.

PRELIMINARY FINDINGS

Some deviations were observed between the modeled information and field measurements, but the values do not exceed 0.25 m (Table 1). Despite the small difference, the results are only applicable for the short term. The model does not take into account factors such as human activities, building of new dams or hydroelectric power plant, impacts of soil characteristics and sand mining; all of which are of crucial importance. Key findings are illustrated in Figures 1-4.

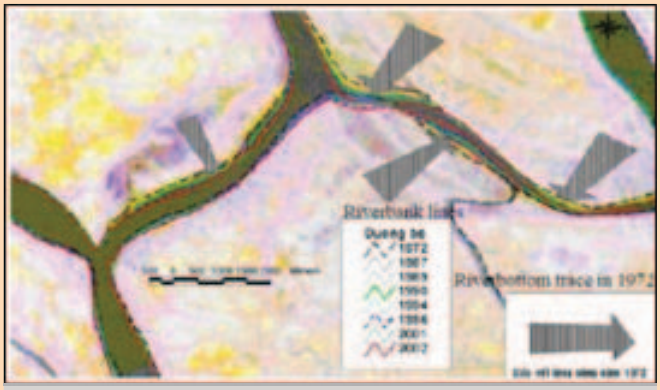

Figure 1: Satellite image showing evolution of the river bank of the Van Mao river from 1972 to 2002.

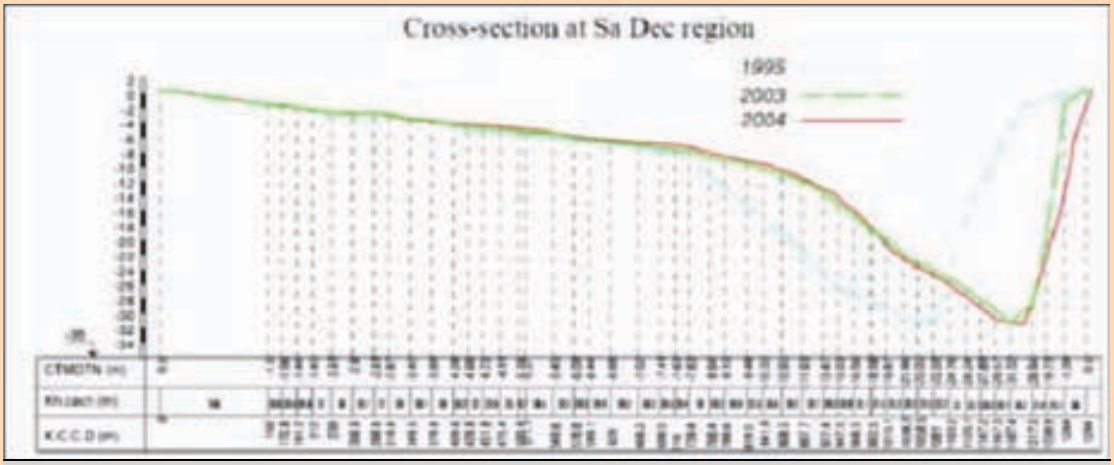

Figure 2: Cross section of the evolution of the Sa Dec river in the years 1995, 2003 and 2004 based on satellite image.

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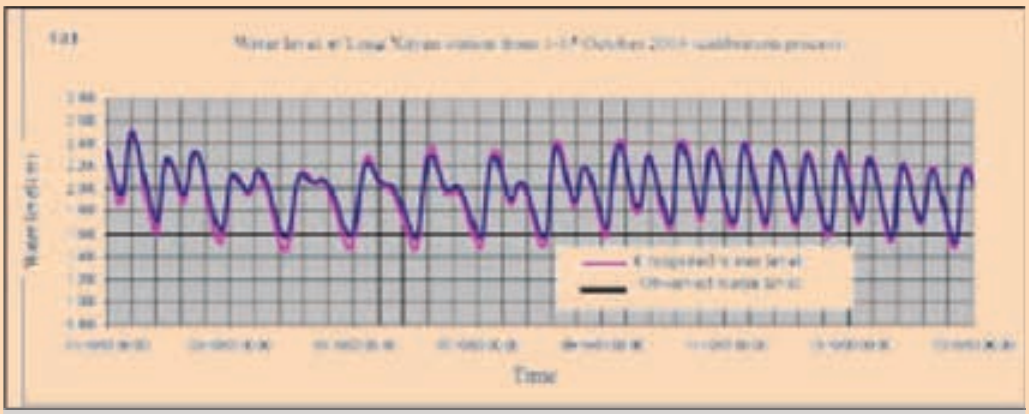

Figure 3: Comparison between measured and simulated water levels at Long Xuyen station.

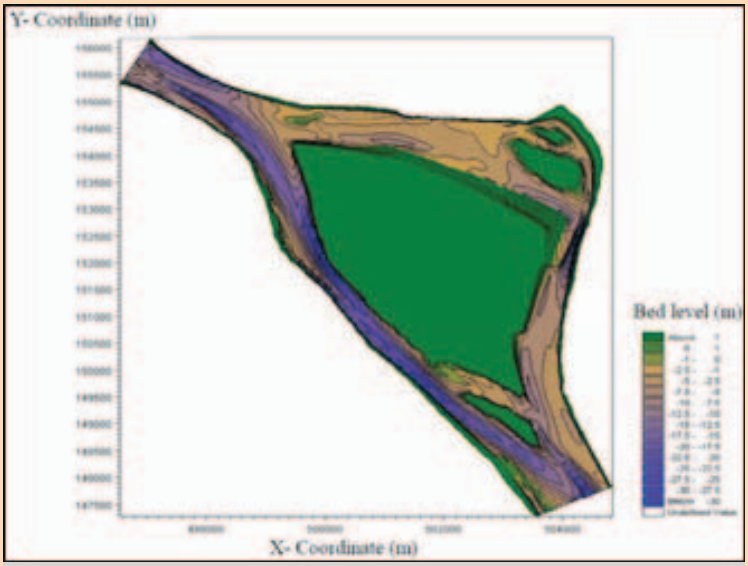

Figure 4: The estimated evolution of river bed levels over the span of two years.

Prior to this project, no scientific measurements were ever taken in this region to prevent the wide range of damage. Based on the findings of this pioneering research, the Vietnamese Government has established a localised model to estimate levels of damage, deterioration and sedimentation of the river bank. The findings have been useful for forming policies that better monitor the landuse, improve efficiency of resource management, and enhance restoration of the river bed system to facilitate transportation. The model also provides inputs for early warning systems. The Government is able to undertake measures according to the severity of hazards to reduce impacts, including relocating people away from high-risk areas. For example, a decision was made to move an entire township as the cost is less compared to implementing structural work to control erosion and river bank sliding.

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Article

Case Study on Floods in Vietnam

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Abstract: Flood disasters rank the highest among natural disasters affecting Vietnam. The number of heavy floods recorded on the main river is rapidly increasing and occurring more irregularly and unpredictably, causing widespread damage, fatalities and high economic losses to the country. This calls for more effective actions from the Government to address further risks from these hazards.

Keywords: Flood hazards, flood risks, disasters, Vietnam.

INTRODUCTION

Vietnam is prone to many kinds of natural disasters, of which storms, floods and drought rank as the worst and most frequent, inflicting substantial human suffering, massive environmental, social and economic damages, and agricultural production losses. The country has around 331,000 km^2 of natural land, located in monsoon humid tropics, and is affected by both oceanic and continental climates. There are 2,360 rivers and streams that have lengths longer than 10 km. The coastal plains are not large but densely populated (60% of population) with many important and rather developed political, socio-economic centers. Total flow of rivers in Vietnam reaches 650 km^3 annually, equivalent to a flow depth of 960 mm. Ratio of flood and low flow varies from 1.5 to 30. Vietnam is at risk of flooding and storms every year. Flood disasters rank highest among natural disasters affecting Vietnam. Over 70% of the population of Vietnam is at risk, many severe flood cases were recorded from year 1945 to 2017.

STORMS AND FLOODS

The ENSO phenomenon is becoming more intense in Vietnam, making weather complicated and unpredictable. The number of heavy floods recorded on the main river is rapidly increasing. Floods have occurred irregularly and unpredictably over the past 12 years, with heavy floods happening more frequently (Figure 1). Examples include the main basin of Da River to Hoa Binh and Son La lakes during the periods of 10/2006, 10/2007, 11/2008, 10/2010,1/2013, 12/2013,1/2015, 12/2015 and 8/2017. Severe events such as the huge flash flood in May 2013 occurred upstream of Cau River and Bac Giang River. Recorded amplitudes were from 3-5 m, up to 7 m, which was the highest for that year.

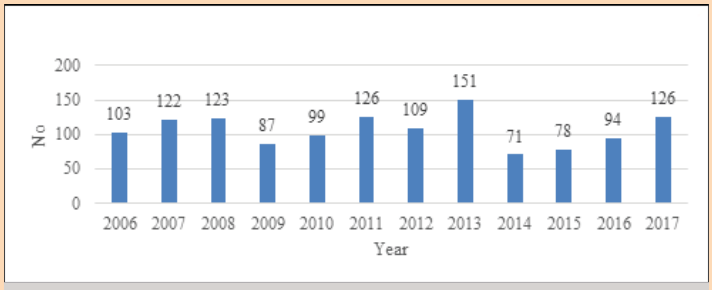

Figure 1: Number of flood events in major rivers.

In addition to flash floods, pluvial and fluvial floods also occur in many provinces of Vietnam. An example is the intense rain that occurred in July 2015. This caused severe landslides that isolated many populated areas in Quang Ninh, Hai Phong, Bac Giang, Dien Bien, Thai Binh, Nam Dinh, Hai Duong, Thanh Hoa Provinces (Figures 2 and 3). The total loss caused by flash floods is more serious over the past 10 years (Figures 5 and 6). Many provinces are frequently damaged by flash floods. These inlcude Ha Giang, Lao Cai, Son La, Tuyen Quang, Cao Bang, Bac Can, and some other areas in Central Vietnam (Figure 6).

Figure 2: Number of flash floods nationwide from 2006 to 2017.

Figure 3: Peak Flood Value on the main basin from 2006 to 2017.

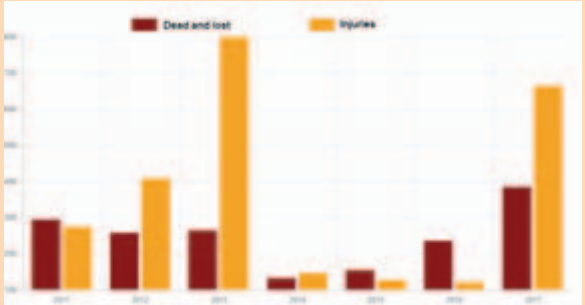

Figure 4: Deaths and injuries due to floods from 2011 to 2017.

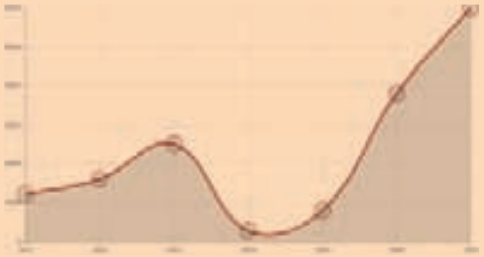

Figure 5: Economic losses due to disasters from 2011 to 2017 (Billions VND)

Article

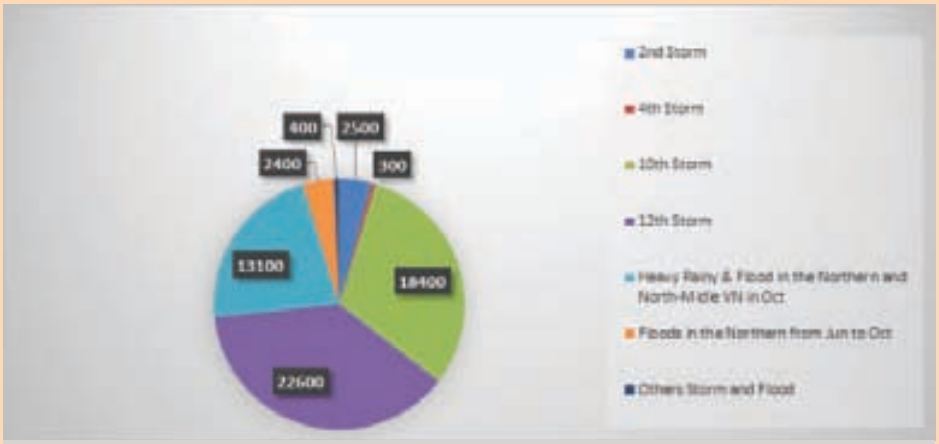

Figure 6: Economic Losses due to Storms and Floods, 2017. (Billions VND)

SOLUTIONS TO PREVENT AND REDUCE THE EFFECT OF DISASTERS

In dealing with disasters, Vietnam has applied many solutions that are implemented nationwide to prevent and reduce the impact of disasters. These include the following measures:

• *Legislative improvements.* The Law on Natural Disaster Prevention and Control 2013 included elements of disaster risk analysis and monitoring; Rule of Meteorological & Hydrological Administration in 2015 requires matching of disaster risk analysis with weather monitoring to strengthen the strategy of other ministries, cities and provinces in order to sustainably develop economy and society.

• *Education programs for society including information on type and risk of floods.* This helped societal engagement where people proactively participated in the disaster prevention strategy of the Government. Information on the four local actions was disseminated to all provinces and cities to quickly respond to disasters. They were on local force, local administration, local logistics and local supplies.

• *Adequate Infrastructure.* Plan and build hydrological infrastructure to provide water for society and economy as well as regulate water flow during floods and rainy seasons; refine river and sea dams to protect against annual floods and salinization; building of water-pumping stations and stream dividers.

• *Protect and plan more forests.*

• *Establish the combination force during disaster,* including military, local volunteers and civilians to join in the emergency; prepare boat and related rescue tools.

• *Improve capacity for flood forecasting*. Establish flood and flash flood warning and forecasting system on the big river system, where floods and flash floods frequently occur; improve the hydrological station network (automatic stations), rainfall estimation using conventional methods, satellite and radar; and more efficient use of hydrological and hydraulic models (e.g. DEM based distributed models).

• *Enhance Research.* Improve flood and flash flood mapping; set up Flood Warning Towers; and enhance capacity in forecasting techniques.

• *Request support from the Asian region countries and international partners.* Develop capacity on data acquisition, information extraction for flood analyses and risk reduction; use high resolution satellite data for flood prevention; continuously invest and build technology infrastructure, weather forecast system using AI and big data.

• *Continuously invest in weather monitoring, forecast and disaster warning systems.* Increase the number of rain measurement stations – target to the density of 40-120 km^2 per measurement point for the long term and 80 km^2 per measurement point for short term; set priority for consistent operation of weather radar systems; enhance ocean storm measurements with floating measurement stations; and for the long term, consider automated storm monitoring.

CONCLUSION

The threat of disasters in Vietnam is expected to rise continuously for many years to come. The Vietnam Government understands the risk of disasters to society and the economy, especially from floods and related phenomena. Thus, monitoring and prediction as well as methods to improve disaster response will be pursued. In addition to internal solutions, cooperation and experience from neighbouring countries such as Thailand will be sought. Collaborative research with international organizations will also be enhanced to support effective disaster risk reduction.

SOURCE

Unpublished flood statistics from Vietnam Meteorological and Hydrological Administration (http://www.nchmf.gov.vn)

Research Notes

Natural Hazards in Built–up Areas: Case Study of the Langat Sub–basin, Malaysia

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The built-up areas in Langat sub-basin have expanded rapidly since the 1990s. Over the past two decades, landslides and floods have been widely reported in built-up areas. The effectiveness of any action to reduce the risk of disasters would require multi-dimensional information that matches the needs of the decision-maker. This study is designed to integrate multi-dimensional information using Geographical Information System to support landuse decision-making in the Langat sub-basin. The specific objectives are to prepare an inventory of landslides and floods, identify criteria that contributes to their occurrences, and develop an integrated disaster susceptibility map to support informed decision-making. The study employed four main methods. These include compilation of landslide and flood incidences to establish a disaster inventory, content analysis to identify the criteria that contributes to disaster occurrences, expert elicitation to provide weightage of the criteria and overlay analysis to process and derive thematic maps. The disaster inventory reveals that landslides and floods are most common in Mukim Kajang, which has the highest expansion of built-up areas. The contributing criteria of disasters were categorized as topographic factors, geological structures and geomorphologic features, and then weighted according to expert input. The integrated susceptibility map for the Langat sub-basin was derived from spatial integration of thematic landslide and flood maps with landuse data. Areas with low susceptibility dominates the sub-basin at 167.8 km^2 followed by high susceptibility at 142.7 km^2. Most of the low susceptibility areas are located in Mukim Hulu Langat, which is still covered by natural forests. The high susceptibility areas are primarily in Mukim Kajang and Mukim Cheras, which have large tracts of built-up areas. About 46% of past disasters have occurred within these areas. The study found that the significance of high and very high susceptibility areas are not well-depicted in the integrated map compared to specific landslide and flood thematic maps. Detailed investigation of UKM, located in the Langat sub-basin, has revealed that spatially explicit data at the relevant scale is essential to provide better information to facilitate and expedite the decision-making process for reducing disaster risks.

Implications of Climate Change on the Coastal Zone of Kuala Selangor, Malaysia

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Climate change has contributed to sea level rise which is a significant threat worldwide because it threatens biophysical and socio-economic sectors that impact the landscape, ecosystems and populations of coastal areas; it also endangers coastal zones with increased inundation and salt-water intrusion. This study analyses the impacts of climate change on the coastal zone of Kuala Selangor, identifies areas and activities at risk due to sea level rise, and proposes a holistic approach in adapting to the phenomenon. The study commenced with a review of the literature including government reports, followed by an evaluation of climate change data and analysis of the risk of inundation. Climate change analysis was carried out by comparing past simulation data to future scenarios for four climate-change components: surface temperature, amount of rainfall, sea level and soil water storage. The risk due to projected sea-level rise was assessed using the Geographical Information System, to identify areas exposed to inundation. Surface temperature is projected to rise around 1.6°C to 2.3°C from 2025 to 2050. Higher maximum and lower minimum precipitation is expected with extreme hydrological conditions which heavily influence soil water storage. Sea level is projected to rise by 0.98 m globally and 0.52 m locally in the study area. A sea-level increase of 0.5 m and 1 m will cause serious flooding on agricultural land and built-up areas. The risk of infiltration of saline water through geological layers is low due to the presence of clay layers with very low permeability values on the surface. However, subsurface intrusion of saline water is expected. The adaptation measures proposed for the surface area include land use planning, flood defence structures and infrastructure modifications. For the subsurface, adaptation measures proposed cover groundwater governance, capacity building and groundwater zone mapping. An integrated framework for adaptation planning is suggested to protect the natural resources of Kuala Selangor and advance sustainable development.

Research Notes

Climate Influence on Municipal Solid Waste Disposal Sites in Selangor, Malaysia

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Landfills endangered by climate-related hazards can have adverse effects on the public and on natural resources. Exposure of local landfills to such hazards is still not well studied in Malaysia. Selangor generates the largest amount of municipal solid waste per capita in the country, and has numerous landfills. This study evaluates the exposure and susceptibility of municipal solid waste disposal sites in this state to hazards such as slope failure, floods, and coastal erosion. It also recommends adaptation measures to address the threat of such hazards. The exposure pathways and implications on the community and its environment has been investigated through a case study. Methods employed in the study include exposure and susceptibility evaluation through desktop screening, field investigation as well as impact assessment using the source-pathway-receptor-consequence approach. Exposure screening of 21 historic and operating landfills in Selangor reveals that there are six landfills currently exposed to floods, two to slope failure and two to coastal erosion. Field investigation indicates that the inherent features of the exposed landfills make them vulnerable to the hazards. The case study of Panchang Bedena shows potential for high pollutant release from the landfill through inundation and erosion, and consequently, widespread impact on the community and its environment. The study recommends a revision in the "Guidelines on the Design and Conservation of Environmentally Sensitive Areas (KSAS) for Former and Solid Waste Disposal Sites" to include these types of hazards in order to reduce future risks. It is recommended that Selangor adopt Act 672 to streamline the management of municipal solid waste in a more sustainable way. The review of existing land-use plans in Selangor should also take this aspect into account. In addition, communities located near landfills should be made aware of these potential hazards so that appropriate emergency measures can be put into place to enhance their resilience to disasters.

Spatial Modeling in Slope Failure in Pulau Pinang, Malaysia

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Over the years, the number of hill-side projects has increased in Pulau Pinang. This has contributed to a higher incidence of landslides which has, in turn, resulted in environmental and socioeconomic challenges. Slope failure has become a serious threat, accelerated by rapid development of hilly areas, highway construction, mining activities and river bank instability. The project studied problems related to extensive development of hilly terrain. Factors related to slope failure include increased rainfall, rising river levels, topography, slope angles and soil type, among others. Solutions lie in slope monitoring and planning. Currently, forward planning is being implemented to avoid development in hazardous areas. Slope failure modeling can help planners and developers determine safe locations to develop. Spatial modeling of slope failure is important in reducing unnecessary disasters. The combined efforts of experts in academia, engineering and planning can help cut down the risk of deaths due to such disasters.

Climate Change and Floods in the Klang River Basin

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The Klang River Basin is located in the State of Selangor Darul Ehsan and Federal Territory of Kuala Lumpur. The total stream length is approximately 120 km with a catchment area of about 1,288 km^2. The estimated population of the basin is about 3.6 million, representing 21% of the national population and the growth rate is almost 5% per year. Continuous development and increasing population have contributed to the exploitation of flood prone areas and narrowing of certain stretches of the river. These actions have exposed the basin to floods, especially after a heavy rain. Structural measures to mitigate flooding include two dams on the upstream of Klang River, namely Batu Dam and Klang Gates Dam, the Stormwater Management and Road Tunnel (SMART) and several retention ponds including the Batu-Jinjang Ponds for flood diversion. Flood hazard maps are also used as a tool for flood risk assessment and disaster preparation. There are several studies linking climate change and floods in the Klang River Basin. In one such study, statistical downscaling was used to project the probable variability in rainfall characteristics for an observed period (1975-2001) and compared to three future projections under climate scenarios for the periods 2020s, 2050s and 2080s. The study was conducted at the Kampung Sungai Tua station, in the upper part of the Klang River Basin. The findings indicate that climate change will likely result in increased intensity and frequency of rainfall events, as reported in other similar studies. Therefore, there is a need to update the flood hazard map more frequently to accommodate changes in climate as urbanisation proceeds in the basin.

Climatic Hazards Programme

Preparing for global warming of 1.5°C: Building capacity of early career researchers in climatic hazards

Joy Jacqueline Pereira

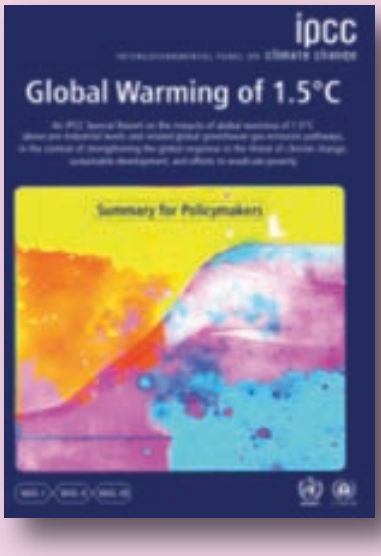
SEADPRI-Universiti Kebangsaan Malaysia

The Workshop on Status of Climate Science and Technology in Asia (15-16 November 2018, Kuala Lumpur) involved early career scientists from nearly 20 countries in Asia, who had the opportunity to interact with key authors involved in the IPCC AR6 cycle.

The Intergovernmental Panel on Climate Change (IPCC) recently released the Special Report on Global Warming of 1.5°C. A key message that comes out very strongly from this report is that we are already seeing the consequences of 1°C of global warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, among other changes. According to the report, tropical Southeast Asia is projected to experience the largest impacts on economic growth if global warming exceeds 1.5°C. Other expected impacts include increase in the number of hot days and heavy rains, higher risks of floods, flash-floods and landslides, net reductions in yields and nutritional value of rice as well as populations that are both exposed and susceptible to poverty, particularly those dependent on agriculture and coastal livelihood. As the sea-level rises, much of the low-lying coasts in areas of Southeast and adjacent South Asia is expected to be affected, bringing new migration and security issues for the region.

In light of these findings, SEADPRI-UKM is strengthening collaboration with key science institutions in Asia to build the capacity of early career researchers in the region and enhance contribution to the corpus of knowledge on climate influenced hazards (climatic hazards) in the region.

This is also in line with our status as the IRDR International Centre of Excellence for Disaster Risk and Climate Extremes (ICoE-SEADPRI-UKM). The effort is supported by the Asian Network for Climate Science and Technology (ANCST) and the Malaysia Window to Cambridge at UKM (MW2C@UKM), which received seed-funding from the Cambridge Malaysian Education and Development Trust (CMEDT), in association with the Malaysian Commonwealth Studies Centre (MCSC) in 2014.



Key findings of the IPCC Special Report on Global Warming of 1.5°C was presented at the Workshop on Status of Climate Science and Technology in Asia by Prof. Joy Jacqueline Pereira, Vice Chair of IPCC Working Group 2 on Impacts, Adaptation and Vulnerability, who was involved as a Review Editor. The full report can be downloaded from https://www.ipcc.ch/

Key partners include the IPCC, Asia-Pacific Network for Global Change Research (APN) and International Science Council Regional Office for Asia and the Pacific (ISC-ROAP), among others. Events held in Malaysia involving early career researchers from Asia covered the following topics: Disaster Resilient Cities: Advances in Meteorological Forecasting and Hazards Assessment (28-29 June 2018), Geohazards and Disaster Risk Reduction (18-20 September 2018), Status of Climate Science and Technology in Asia (15-16 November 2018). Plans are afoot to convene similar workshops in 2019 for early career researchers from Asia and expand coverage to young scientists in the Pacific Island States.

Geological Hazards Programme

Advancing Geoscience for Disaster Risk Reduction at the 54th CCOP Annual Session

Lim Choun Sian

SEADPRI-Universiti Kebangsaan Malaysia

Group photo of 54th CCOP Annual Session and 71st Steering Committee Meeting at Busan, Republic of Korea.

The Thematic Session of the 54th CCOP Annual Session, themed *Geoscience for Future Earth: Beyond History Toward Mystery*, was held in Busan, Republic of Korea, from 28 October to 1 November 2018. The SEADPRI Annual Report on collaborative activities conducted with the CCOP and a technical paper on Geoscience for Disaster Risk Reduction were presented at 54th Session.

The Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP) is an intergovernmental organization, whose mission is to facilitate and coordinate the implementation of applied geoscience programmes in East and Southeast Asia in order to contribute to economic development and the improvement of the quality of life in the region. CCOP promotes capacity building, technology transfer, exchange of information and institutional linkages for sustainable resource development, management of geo-information, geo-hazard mitigation and protection of the environment. CCOP has 14 Member Countries represented by national geological survey departments of East and Southeast Asia including the Mineral and Geoscience Department of Malaysia; Cooperating Countries comprising developed nations, primarily from Europe; and several Cooperating Organizations.

Since 2007, Universiti Kebangsaan Malaysia's SEADPRI has been a Cooperating Organization to the CCOP, conducting activities to build the capacity of geoscientists in the region. The scope of such activities cover geohazards, disaster and climate resilience, geoparks and geoheritage to promote sustainable development.

The Thematic Session provided an opportunity for SEADPRI delegates to interact with participants from CCOP Member Countries, Cooperating Countries and Organizations, to exchange knowledge and expertise on geosciences, raise awareness on some of today's most pressing societal concerns, as well as identify pathways for geoscience to meet the goals of sustainable dveleopment.

In Busan, SEADPRI presented a paper co-authored by Dr. Lim Choun Sian, Dato' Yunus Abd Razak and Prof Joy Jacqueline Pereira. The paper illustrated how geoscience can respond to the call for improving access to disaster risk information and multi-hazard early warning systems; where geoscience services will have to expand beyond the conventional mineral exploration, mining and engineering, and oil and gas sectors. Synthesis from several local level studies in the region and joint workshops where the participants came from CCOP members including early career researchers in the region were used to highlight emerging geological hazards in the advent of climate change. Key aspects from the ongoing project entitled "Disaster Resilient Cities: Forecasting Local Level Climate Extremes and Physical Hazards for Kuala Lumpur", supported by the Newton Ungku Omar Fund (NUOF), illustrated the use of geoscience in assessing and forecasting geophysical hazards in high resolution at the city level. The project, which is under the aegis of the City Hall of Kuala Lumpur, involves 16 partners from academia, government and the private sector including the Geological Society of Malaysia and SEADPRI, which is tasked to build the capacity of geoscientists for enhancing their involvement in disaster risk reduction.

Technological Hazards Programme

Creatine Biosensor: A New Detection Kit for Grading the Freshness of Fish

Tan Ling Ling

SEADPRI-Universiti Kebangsaan Malaysia

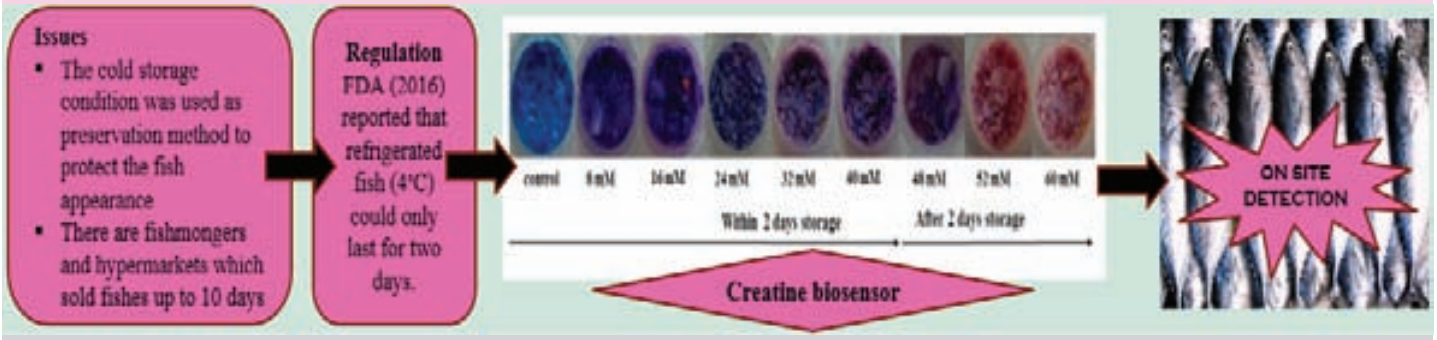
Monitoring the freshness of fish is crucially important to ensure safety of fish for human consumption, as the handling procedures and storage conditions of fish and seafood products may influence their spoilage patterns. Conventional approaches by physical examination through sensory evaluation of fish freshness attributes based on the appearance of eyes, gills, skin, smell and colour as well as texture of meat can sometimes cause confusion. Such mix-up arises because the preservation of fish by treatment with certain chemical preservatives such as formaldehyde, ammonia, sodium chloride, sodium nitrite and sodium hydroxide can alter the physical appearance of fish.

The microbiological analysis method involves inoculation and incubation of samples in petri plates at appropriate temperature, followed by colony counting to estimate the specific spoilage bacteria (SSB) count. However, the method requires a long time to produce results in determining the quality and remaining lifespan of fish products.

Generally, fish spoilage involves a complex process in which physical, chemical and microbiological mechanisms could result in the changes of the protein and lipid fractions of the flesh. The chemical and biological changes that take place in a dead fish leads to the formation of nitrogen compounds and biogenic amines. This happens because of protein degradation by endogenous enzymes into amino acids and an increase in the total volatile basic nitrogen (TVBN, e.g. trimethylamine, ammonia and dimethylamine). Determination of TVBN in fish flesh consists of extraction of basic spoilage volatile amines by perchloric acid, followed by steam distillation of the extract collected in boric acid, with subsequent titration against a strong reagent such as sulphuric or hydrocloric acids.

Creatine is a nitrogenous organic acid that occurs naturally in vertebrates. It is abundant in metabolically active tissue such as muscle, heart, brain, blood and urine. Creatine is classified as uremic toxin upon hydrolysis of creatine phosphate and adenosine triphosphate (ATP) by phosphatase. Thus, the creatine level in blood serum and urine is an important factor in the assessment of muscle damage. The creatine content in fish muscle varies from 160 mg/100 g muscle to 720 mg/100 g muscle. FDA advocates that refrigerated fish (4°C) is safe for consumption for a maximum of 2 days. Nevertheless, there are fishmongers and hypermarkets that store and sell fish for up to 10 days. Various analytical methods have been proposed for the determination of creatine in human blood sample. The most common approach is through spectrophotometric Jaffé reaction, based on the chemical response of alkaline sodium picrate to creatine. The greatest disadvantage of this method is that non-specific biological substances present in the biofluids may provide a false positive in the Jaffé reaction. In addition, the method requires specialised instruments, extensive analysis time, high reagent consumption, trained personnel and sample pre-treatment. Alternative methods are equally challenging and disadvantageous.

To overcome these limitations, we have developed an enzymatic bio-otode based on reflectance measurement of biofluid metabolite concentrations (i.e. creatine levels from fish surfaces), as a useful and non-destructive alternative marker to grade the freshness of fish. The proposed optical enzymatic biosensor can be utilized as a portable colorimetric sensor for real-time, rapid and in situ monitoring of creatine in the biofluid from fish body surfaces. The proposed creatine biosensor is a miniature biosensor kit that is easy to handle for testing the freshness of fish.



Creatine biosensor is an alternative on-site detection kit to test the freshness of fish. *(Graphic by Tan Ling Ling)*

Activities

Malaysian delegation at the AHA Centre in Jakarta, Indonesia

Mohd Khairul Zain Ismail[1], Che Siti Noor Koh Poh Lee @ Che Mamat[2] & Mohd Fazrie Rakmat[2]

[1]*SEADPRI-Universiti Kebangsaan Malaysia*
[2] *National Disaster Management Agency (NADMA), Prime Minister's Department*

The national delegation at the AHA Centre in Jakarta, Indonesia on 30 July 2018.

SEADPRI-UKM accepted the gracious invitation of the National Disaster Management Agency (NADMA) Malaysia, to visit the ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) on 30 July 2018. Senior Science Officer, Mohd Khairul Zain Ismail, represented SEADPRI-UKM as a member of the national delegation. The AHA Centre was established to facilitate cooperation and coordination during a disaster in ASEAN Member States. The purpose of the visit was to exchange knowledge and review the best practices of the AHA Centre.

Several technical presentations were made during the visit. The SEADPRI-UKM presentation highlighted the ongoing pilot project jointly led by SEADPRI-UKM and University of Cambridge, under the aegis of the City Hall of Kuala Lumpur (DBKL), which is supported by the Newton Ungku Omar Fund.

The pilot is developing a multi-hazard platform, to strengthen early warning and communication of risks associated with landslides, flash floods, sinkholes, air pollution, heat waves and strong winds in Kuala Lumpur. The potential for collaboration between SEADPRI-UKM and the AHA Centre, to build resilience of cities in the region, drawing on the experience of Kuala Lumpur will be further explored.

The delegation also visited the AHA Command Centre, to get an overview of how the system supports ASEAN Member States on humanitarian assistance in the event of a disaster. Many aspects of the system could be adapted in Malaysia by the National Disaster Command Centre (NDCC).

Malaysia Pledges to Strengthen Disaster Risk Reduction in the Country

Mohd Khairul Zain Ismail[1], Bibi Zarina Che Omar[2] & Joy Jacqueline Pereira[1]

[1] *SEADPRI-Universiti Kebangsaan Malaysia*
[2] *National Disaster Management Agency (NADMA), Prime Minister's Department*

The Malaysian delegation to the 2018 Asian Ministerial Conference on Disaster Risk Reduction (AMCDRR), held on 3-7 July 2018 at Ulaanbaatar, Mongolia was led by the Hon. Deputy Prime Minister of Malaysia, Datuk Seri Dr. Wan Azizah Wan Ismail. Members of the delegation comprised senior officials of the National Disaster Management Agency (NADMA) Malaysia as well as representatives from SEADPRI-Universiti Kebangsaan Malaysia, Universiti Teknologi Malaysia and MERCY Malaysia.

The AMCDRR is a platform for country heads to discuss regional mechanisms in reducing disaster risks in the Asia Pacific. Leaders from the Asia Pacific were joined by about 3000 participants from government, academia, industry and non-government organisations at the Conference.

The Hon. Deputy Prime Minister of Malaysia, Datuk Seri Dr. Wan Azizah Wan Ismail, was presented with a copy of the Bulletin SEADPRI No. 16, which was released at the Asian Ministerial Conference on Disaster Risk Reduction in July 2018 at Ulaanbaatar, Mongolia.

In her Ministerial Statement, the Hon. Deputy Prime Minister highlighted initiatives to strengthen disaster risk reduction (DRR) in Malaysia. This includes the establishment of a science and technology expert panel to provide inputs for national-level operations on disaster management. The formulation of the Science, Technology and Innovation Plan for DRR, to address knowledge gaps on current hazards and emerging threats due to climate change through holistic and systematic approaches, was also highlighted. The country's efforts to address seismic hazards through the development of Malaysian Standards for earthquake resilient building and the National Earthquake Hazard Map, to facilitate risk-informed investment, was also mentioned.

SEADPRI-Universiti Kebangsaan Malaysia is gratified that in her Ministerial Statement, the Hon. Deputy Prime Minister mentioned the ongoing pilot project jointly led with University of Cambridge and funded by the Newton Ungku Omar Fund. The project, which is under the aegis of the City Hall of Kuala Lumpur, involves multiple partners from Malaysia and the United Kingdom, including the Malaysia Meteorology Department, Mineral and Geoscience Department and the Department of Environment. In this project, meteorological parameters such as rainfall, temperature and wind speed are downscaled to the city level for the first time ever in the region, to be used to assess the risk of landslides, flash floods, sinkholes, air pollution, heat waves and strong winds. The pilot will result in the first ever city level multi-hazard forecasting system for the tropics. The Hon. Deputy Prime Minister also noted that the project is expected to provide the impetus for social innovation by facilitating the development of community level disaster resilience plans; to empower special groups, including women, to participate in disaster risk reduction.

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