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## Pengurangan Risiko Bencana perlu dilaksanakan secara holistik

## *Disaster Risk Reduction must take a holistic approach*

***Ibrahim Komoo***

*Bukit Antarabangsa Landslide, 2008*

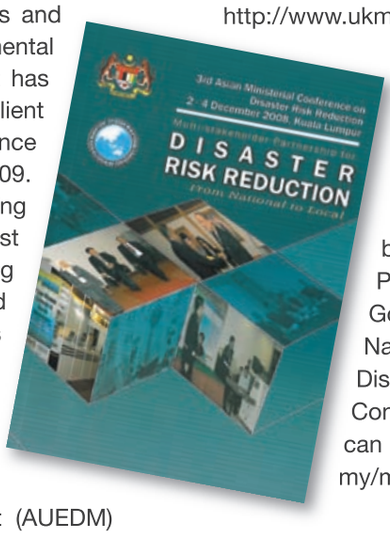
Negara di rantau Asia Tenggara berhadapan dengan risiko bencana alam yang tinggi. Di dalam beberapa tahun terakhir ini, kita dapat menyaksikan pelbagai bencana alam – tsunami, gempa bumi, letusan gunung berapi, gelinciran tanah, banjir dan ribut taufan – yang telah mengorbankan ratusan ribu nyawa dan memusnahkan harta tidak terhingga nilainya. Walaupun setiap bencana perlu ditangani secara individu, kesatuan bencana perlu dilihat berpotensi mengakibatkan bencana pada komuniti atau lokasi yang sama. Gempa bumi, mampu mencetus tsunami, tanah runtuh, banjir di mana impaknya pada kawasan yang serupa. Oleh itu, perancangan dan pengurusan pengurangan risiko bencana perlu dilaksanakan secara holistik.

*Countries in Southeast Asia face a high risk of natural disasters. In the last few years, we have witnessed various natural disasters i.e. tsunamis, earthquakes, volcanic eruptions, landslides, floods and typhoons that has claimed thousands of lives and destroyed properties. While each disaster needs to be addressed in its own way, the combination of disasters must be viewed as a potential hazard to the community at a specific location. Earthquakes can trigger tsunamis, landslides, and floods and impact the same area. Therefore, planning and management for disaster risk reduction should take a holistic approach.*

# Climatic Hazards

The Climatic Hazards Programme of SEADPRI-UKM conducts research and strengthens capacity to support the national agenda on adaptation to extreme weather and climate change. The Programme focuses on research covering aspects of science, technology, socio-economics and governance for disaster risk reduction; postgraduate training at masters and doctoral levels; education and awareness; as well as outreach activities in conjunction with various stakeholders at national and international levels. There are currently three research projects implemented under this Programme. Two of the projects are funded by Universiti Kebangsaan Malaysia under the auspices of the Climate Change Niche and the Malaysian Network for Research on Climate, Environment and Development (MyCLIMATE), hosted by LESTARI-UKM with support from the Ministry of Natural Resources and Environment Malaysia. These are "Environmental Hazards and Human Security: Natural and Geoenvironmental Disaster Prevention and Management" that has been recently completed and "Climate Resilient Development – Linking Science and Governance for Sustainability", which was initiated in 2009. The third project, funded by the Coordinating Committee for Geoscience Programmes in East and Southeast Asia (CCOP) is on developing networking of geoscience institutions and organisations in the region, with special focus on universities.

The Climatic Hazards Programme also helms research activities in Southeast Asia on behalf of the Asian Universities Network for Environment and Disaster Management (AUEDM) based in the Graduate School of Global Environmental Studies, Kyoto University. The AUEDM is a regional education and research platform that promotes sharing and synergies of educational products, experiences and actual implementation of disaster risk reduction efforts; with the research objective of exploring the integration of climate change adaptation and disaster risk reduction. The Programme is also actively engaged with the Intergovernmental Panel on Climate Change (IPCC); specifically in the forthcoming Special Report on "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation". SEADPRI-UKM also represented Malaysia at the Scoping Meeting for the Fifth Assessment Report (AR5) held on 13-17 July 2009 in Venice. The year 2009 saw four capacity building activities organized under the umbrella of this Programme. Further information can be obtained from: http://www.ukm.my/myc




## Publication 2009

SEADPRI-UKM published the Conference Report of the Third Asian Ministerial Conference on Disaster Risk Reduction, organised by the National Security Council, Prime Minister's Department, Government of Malaysia, United Nations International Strategy for Disaster Reduction (UNISDR) and other Conference Partners. The publication can be downloaded from www.ukm.my/myc/pdf/conference.pdf

**Dari mukasurat 1**

Semua pihak berkepentingan perlu berpadu tenaga dan bertindak sebagai sebuah pasukan. Perkara yang boleh dilaksanakan secara bersama meliputi: menjadikan urusan pengurangan risiko bencana sebahagian daripada perancangan pembangunan negara; menilai risiko pelbagai-bencana di sesuatu kawasan dan mengambil tindakan untuk mengurangkannya; memaklum kepada masyarakat yang berhadapan dengan risiko bencana dan pendekatan pengurangan oleh komuniti; dan melaksanakan program berterusan untuk menghindar atau mengurangkan risiko bencana. Urusan mengurangkan risiko bencana bukan sahaja melibatkan aspek teknikal, tetapi meliputi komponen impak sosio-ekonomi, dan sistem governans bencana. Kerjasama antara agensi kerajaan, pihak berkepentingan dan jaringan antara negara berjiran dapat memastikan hasil yang berkesan.

*All stakeholders should cooperate and act as a team. Things that can be collectively implemented includes: methods of managing disaster risk reduction as one of the agenda in national development planning; evaluating risks of multiple hazards in an area and actions to be taken to reduce it; communicating risk to local communities who are exposed to hazards; and to continue implementing programs to prevent or reduce risk of hazards. Disaster risk reduction involves socio-economic aspects and vulnerability assessment, education and awareness as well as governance for human security and sustainability among others. Cooperation between government agencies, stakeholders and networks between neighboring countries can ensure effective results.*

*Seismic-induced landslides in mountainous area, Pariaman, Indonesia*

# Geological Hazards

The Geological Hazards Programme carries out research on fundamental geological mapping and hazards assessment, as well as development of theoretical frameworks, concepts, policy and management approaches.

A flagship project on "Policy and Planning Responses for Earthquake and Tsunami Hazards in Malaysia" funded by the Academy of Sciences Malaysia, was completed in June 2009. The December 2004 9.3Mw catastrophic earthquake which occurred along Northern Sumatra and the Nicobar and Andaman Islands, resulted in the catastrophic tsunami throughout the region. The impending need was to properly assess the magnitude and extent of the seismic geohazard threat towards Malaysia in order to formulate a policy and strategic actions for future seismic and seismic induced hazards. Earthquake related hazards that needed considering are regional earthquakes from the neighbouring region, earthquake/seismic-induced hazards such as tsunami and landslides after tremors and local earthquakes that originate within Malaysia.

The main goal of the study was to recommend policy and planning responses to address earthquake and tsunami risks based on assessment from historical records and most-likely simulation of scenario cases. Ultimately the baseline information and understanding gained were incorporated into the existing development planning process in order to prevent or minimize adverse impacts of geohazards. Recommendations which were translated into policy statements and strategic action plans include: (1) To regulate and encourage participatory approach in development activities on vulnerable areas; (2) To incorporate seismic and other related geohazards into the development process; (3) To strengthen networking and cooperation amongst all stakeholders – especially on risk reduction activities; (4) To enhance awareness and capacity building amongst all major players on the importance of proper planning and management of development activities; (5) To promote more effective integration of risk reduction into development and humanitarian policy and planning.

The study was carried out in collaboration with the Academy of Sciences Malaysia, Disaster Prevention Research Institute (DPRI), Indonesian Institute of Science (LIPI), Center for Natural Disaster Study in Universiti Malaysia Sabah, and the Institute for Environment and Development (LESTARI), UKM with tsunami modelling support coming from Bandung Institute of Technology (ITB).

# Technological Hazards

In early 2009, the Technological Hazards Programme initiated several activities to kick start the research on chemical hazards in SEADPRI-UKM. A discussion was held with the UKM Research Group on Chemical Management and this was followed by meetings and dialogues with the stakeholders of MyNICHE, a group of experts for chemical management that is represented by various governmental organizations, the private sector and NGOs.

To begin research collaboration with international partners, a visit was made to the Research Centre of Eco-Environmental Sciences (RCEES) of the Chinese Academy of Sciences in Beijing. The RCEES was founded in 1975 and it is the first comprehensive research institution in China that is engaged in research on eco-environmental science and technology. Their research shares similarity to the research strategic plan of the Technological Hazards Programme of SEADPRI-UKM and thus successful collaboration will be of mutual benefit to both research institutions.

The chemical hazards research initiative for SEADPRI-UKM was further strengthened with the submission of a research proposal to the UKM Research Niche of Regional Sustainable Development (PLW). The research proposal entitled "Pollution and Safety of Chemicals and Petroleum Hydrocarbons in Langkawi Geopark" is aimed at investigating and documenting hazards that arise from the use of some chemicals and petroleum hydrocarbons in the Langkawi Geopark area. It will address several issues that have not been looked into regarding chemical hazards risk management and disaster prevention to make the development of Langkawi Geopark sustainable and safe. Through this research project, the state of environmental pollution and risk of some chemicals can be evaluated. Furthermore, communication can be enhanced among industries and stakeholders regarding chemical disasters and accidents in the storage/transport of chemicals, especially petroleum hydrocarbons to reduce the risk of disasters. The project will draw on the experience of environmental risk management gained by RCEES of China.

*A discussion with Prof Lu Y. Long and his research team of RCEES in Beijing*

# Global Platform for Disaster Risk Reduction Second Session, Geneva, Switzerland 16-19 June 2009

*Sharifah Diyana Syed Ismail & Ibrahim Komoo*

The Global Platform for Disaster Risk Reduction (DRR), recently held at Geneva, Switzerland with the theme 'Invest Today for a Safer Tomorrow', is the paramount gathering of the world's risk reduction community and was attended by 2000 delegates from more than 300 countries at the global level. The forum, which was held at the Geneva's International Conference Centre, brought together Government decision-makers, policy advisers, scientific and technical experts, representatives from academic institutions and other stakeholders. Delegates from Malaysia were led by the Deputy Minister of the Prime Minister's Department, Datuk Liew Vui Keong and the National Security Council. The delegation comprised representatives from Town and Country Planning Department, Malaysian Meteorology Department, Department of Irrigation and Drainage Malaysia, National Hydraulic Research Institute of Malaysia (NAHRIM) and Southeast Asia Disaster and Prevention Research Institute (SEADPRI-UKM). Prof. Dato' Dr. Ibrahim Komoo, Director of SEADPRI-UKM represented the Institute at this forum.

The forum, which is held every two years provides an opportunity for a broad range of partners to assess progress made on disaster risk reduction since the first session and, crucially, to increase worldwide commitment, to ensure sustained action to reduce disaster risks and assessing the progress on implementing the Hyogo Framework for Action. Discussions were focused on achieving global implementation of the Hyogo Framework for Action in the following matters:-

- Challenges in allocating funds to reduce risk pollution
- Reduce risk of climate change
- Strengthen community leadership through action of disaster prevention
- Safe school facilities and hospital; and
- Improved infrastructural construction after disaster

The main issue highlighted by most countries faced with natural disasters include changing the mind-set of leaders to find ways in preventing the disaster faced instead of responding to assisting communities. The need to actively reduce risk of disaster through education and awareness and poverty reduction especially in communities that are exposed to the risk of disasters was also highlighted. Introduction of an effective national platform to manage disasters was also an issue of importance.

Infrastructure development and communities for most countries have integrated the aspect of reducing risk

*Ground floor collapsed : Two-story shoplot reduced to one-story, Kota Padang, Indonesia*

of natural disasters. An effective approach to reduce risk of natural disasters to the affected community is well looked into. All planning processes and prevention activities, and disaster risk reduction initiatives should involve the community. Most deaths are due to low awareness and education on disaster risk reduction. Awareness and basic education are central towards "creating a culture to reduce risk of disaster" among the community facing natural hazards. The poor have to be given priority in meeting their basic needs as exposure to natural disaster hinders their well being.

Delegates at the forum were of the opinion that the crucial challenge to implement the Hyogo Framework for Action is the absence or weakness of the national platform in managing disasters. The national platform requires the highest leadership at government level and commitment from all parties. This Global Platform in general is focused on countries or regions facing serious natural disasters. During the forum, participants were informed of the outcomes of the Third Asian Ministerial meeting on Disaster Risk Reduction held in Kuala Lumpur on 2-4 December 2008, organised by the United Nations International Strategy for Disaster Risk Reduction (ISDR) and the Government of Malaysia.

The outcomes of the meeting, including the Kuala Lumpur Ministerial Declaration on Disaster Risk Reduction, have been documented and published in the book entitled "Multi-stakeholder Partnership for Disaster Risk Reduction from National to Local". SEADPRI-UKM appreciates the support of the National Security Council in the Prime Ministers Department, for publication of the book.

# 3rd Japan-Malaysia Symposium on Geohazards and Geoenvironmental Engineering: Geotechnical & Ecological Environmental Management for GlobalSustainability Kyoto University, Japan 27-28 October 2009

*Lim Choun Sian & Tajul Anuar Jamaluddin*

The 3rd Japan-Malaysia Symposium on Geohazards and Geoenvironmental Engineering took place on 27-28 October 2009 at the Clock Tower Centennial Hall, Kyoto University, Japan. This was a succession of two previous symposia in Bangi, Selangor and Langkawi, Kedah in December 2004 and November 2007, marking another milestone of Malaysia-Japan joint research in geohazards, geotechnical and geoenvironmental engineering.

The Symposium was organised by Group 8: Geotechnical and Ecological Environmental Management in the JSPS-VCC University Program of "Environmental Science" under the auspices of Japan Society for the Promotion of Science (JSPS) and Vice Chancellors' Council of National Universities in Malaysia (VCC). The Program aims at providing opportunities for Malaysian and Japanese researchers to develop academic exchange and research collaboration in the area of environmental science.

Group 8 has been working on geotechnical and ecological environmental management. Professor Dato' Dr. Ibrahim Komoo is the Group Leader for Malaysian members, while his counterpart, Professor Dr. Takeshi Katsumi was appointed as the Group Leader for the Japanese side after the retirement of Professor Dr. Masashi Kamon in September 2009. The members of Group 8 comprise scientists and engineers from various universities in Malaysia (Universiti Malaya, Universiti Putra Malaysia, Universiti Teknologi Mara, Universiti Teknologi Malaysia and Universiti Malaysia Sabah) and Japan (University of Kyoto, University of Ibaraki and University of Tokyo). The collaboration which has existed since 2000, covers two research priority areas namely Geohazard Prevention Research (exploration and measure of landslide, characteristics of rock weathering, prevention of urban geohazard, anti-liquefaction measure; and preservation of mountainous area), and Geoenvironmental Research (solid waste recycling from geotechnical point of view; proper waste landfill structure; remediation of contaminated land; preservation of groundwater; and education of environmental geotechnics).

The 3rd Symposium was themed "Geotechnical & Ecological Environmental Management for Global Sustainability" and focused on sustainability of the geo-environment and ecological environment, to realise global environmental sustainability through good management and preservation and enrichment of the geo-environment and natural resources. The main subjects relate to prevention and risk assessment of natural and geoenvironmental disasters as well as threats to sustainability of natural resources. The topics covered in the Symposium included:

- Characterisation, investigation and control of natural hazards.
- Characterisation and management of geoenvironmental hazards
- Management of ecosystems and other natural resources in geo-environment; and
- Policy, spatial planning and regulatory issues for management of hazards and vulnerability.

Opening remarks of the Symposium were given by the guests of honour, Professor Dr. Yuzuru Matsuoka (Overall Coordinator for Japan side of JSPS-VCC Core University Program) and Professor Dr. Koichiro Oshima (Dean, Graduate School of Engineering, Kyoto University). This was followed by presentations from Group 8 leaders Professor Dr. Takeshi Katsumi and Professor Dato' Ibrahim Komoo. The Symposium was attended by a total of 40 participants comprising representatives from 10 Malaysian universities and 30 Japanese universities and institutions. This two-day Symposium included paper presentations, discussions and a field visit. A total of 22 papers were presented and compiled in a proceedings. The papers represent the outcome of collaboration between researchers from the two countries through the JSPS-VCC Program.

*Symposium group photo*

# FELLOWS OF SEADPRI-UKM

## SARAH AZIZ ABDUL GHANI AZIZ

Ms. Sarah Aziz received her masters degree in Law from University of London, England. She is a Research Fellow of SEADPRI and LESTARI who is now researching and teaching on environment and development at Universiti Kebangsaan Malaysia. She currently conducts policy oriented research and capacity building, including teaching a course on Conservation Ethics and Law. She also provides input, technical advice and support in the formulation of various government actions and negotiations. Prior to joining UKM as a Research Fellow, she was an advocate and solicitor of the High Court of Malaya.

## DR. RAWSHAN ARA BEGUM

Dr. Rawshan received her Ph.D. in Environment & Development from Universiti Kebangsaan Malaysia (UKM) in 2006. Prior to joining SEADPRI-UKM as a Research Fellow, she worked in LESTARI as a Post-Doctoral Research Fellow. She has served as a women development officer at the Department of Agricultural Extension in the Ministry of Agriculture, Bangladesh. Dr. Rawshan's major research focuses on environmental and resource economics including waste management, climate change impacts & adaptation and disaster risk reduction. Dr. Rawshan is also a Research Fellow of LESTARI and a member of the Malaysian Network for Research on Climate, Environment and Development (MyCLIMATE) based at LESTARI.

## LIM CHOUN SIAN

Mr. Lim Choun Sian received his M.Sc. in Environment & Development from Universiti Kebangsaan Malaysia in 2004. He is a Research Officer in SEADPRI-UKM. Prior to joining SEADPRI-UKM, he worked in geospatial information analysis using Geographical Information Systems and remote sensing data. He has conducted research on: (i) Landslide investigation and mapping at various localities, (ii)Geohazards (landslide, flood and subsidence) assessment and hazards modelling of Klang Valley, Malaysia; (iii) GIS model for Environmentally Sensitive Areas; and (iv) Earthquake and tsunami hazards analysis in Malaysia.

## TAN CHING TIONG

Mr. Tan Ching Tiong obtained his masters degree in 2004 from Universiti Teknologi Malaysia. He is a Research Officer in SEADPRI-UKM and also a PhD candidate at LESTARI-UKM who studies aspects of adaptive capacity of Malaysia's water sector to climate change. Prior to joining SEADPRI-UKM, he was engaged by the United Nations Development Programme (UNDP) and Ministry of Natural Resources and Environment (NRE) to assist in preparing the country's Second National Communication to the UNFCCC. At SEADPRI-UKM, Mr. Tan's primary research activities concern climate policy in general and adaptation to climate change in specific.

## MOHD KHAIRUL ZAIN ISMAIL

Mr. Khairul received his B.Sc. (Hons) in Applied Science with Islamic Studies (Environment) from Universiti Malaya (UM) in 2008. He did his industrial training at the Construction Industry Development Board (CIDB). He began his career at LESTARI-UKM in October 2008 as a Research Assistant. At SEADPRI-UKM, Mr. Khairul is responsible for office management, development and maintainance of websites as well as management of postgraduates and organizational linkages of the Institute.

## SHARIFAH DIYANA SYED ISMAIL

Ms. Sharifah Diyana received her B.Sc. (Hons) in Chemistry from the School of Science & Technology, Universiti Kebangsaan Malaysia in 2008. She did her industrial training at the Department of Chemistry Malaysia. Ms. Sharifah began her career as an Editorial Executive at Pertubuhan Berita Nasional Malaysia (BERNAMA) and in 2009, she joined SEADPRI-UKM as a Research Assistant. She is currently involved in research projects related to the Climatic Hazards Programme.

# EVENTS ORGANISED/ CO-ORGANISED BY SEADPRI UKM

1. **SEADPRI Forum on Climate Change Adaptation and Spatial Planning: Assessment and Communication of Vulnerability**
   UKM Bangi, Malaysia, 5 Jan 2010
2. **Executive Talk on Global Warming and Climate Change Adaptation**
   Putrajaya International Convention Centre, Malaysia, 22 December 2009
3. **Seminar on Preparing and Giving Scientific Presentations**
   UKM Bangi, Malaysia, 22 December 2009
4. **3rd Japan- Malaysia Symposium on Geohazards and Geoenvironmental Engineering**
   Kyoto University, Japan, 27-28 October 2009
5. **Workshop on the Practice of Knowledge Management for Enhanced Performance**
   UKM Bangi, Malaysia, 10 June 2009
6. **SEADPRI Forum on Hospitals Safe from Disasters**
   UKM Bangi, Malaysia, 6 April 2009

# Gempa Bumi Padang, Indonesia 30 September 2009

*Lim Choun Sian & Tajul Anuar Jamaluddin*

Pada 30 Sept 2009, berlakunya gempa bumi yang berpunca dari barat daya Pulau Sumatra, Indonesia. Siri gegaran ini dirasai sehingga ke daratan Kuala Lumpur dan beberapa bandar utama; sungguhpun Semenanjung Malaysia terpisah oleh Selat Melaka sejauh 500 km. Di daerah Padang, Indonesia yang berjarak kira-kira 50 kilometer dari epicenter gempa bumi, daya gegaran tersebut berupaya meranapkan bangunan dan mencetuskan gelinciran tanah besar atau kegagalan cerun bukit. Sebanyak 135,000 buah rumah musnah dan lebih kurang 145,000 rumah rosak manakala 1,115 orang terkorban. Turutan impaknya, kehidupan masyarakat sebanyak 1.25 juta orang terbantut sama ada dalam bentuk kehilangan tempat tinggal, gangguan kepada pengangkutan, utiliti dan kelumpuhan sosioekonomi penduduk setempat.

Epicenter gempa bumi iaitu jarak mendatar ke pusat/ *hypocenter* gempa bumi, terletak lebih kurang 60km barat-laut dari kota Padang (magnitud 7.6Mw), pusatnya pada 80km di bawah epicenter, menimpa wilayah Padang pada 30 September 2009 jam 5.16 petang waktu tempatan (waktu Malaysia 6.16 petang) diikuti oleh gempa susulan (5.5Mw) pada 20 minit kemudian. Pasukan penyelidik di SEADPRI-UKM berkesempatan meninjau ke daerah Padang pada 7 – 11 November 2009. Walaupun sudah sebulan berlalu, kesan kemusnahan fizikal oleh gempa bumi dahsyat itu masih nyata. Cerapan ketika kerja lapangan ini dibuat di beberapa kawasan di daerah Padang, Pariaman, Bukit Tinggi dan Agam. Keadaan kerosakan dan suasana masyarakat di setiap kawasan adalah berbeza.

Kota Padang, bandar pesat pada topografi landai yang didasari bahan geologi aluvium usia Kuarterner, terletaknya 50km dari epicenter. Banyak bangunan yang melebihi dua tingkat rosak teruk, kebanyakannya mengalami kegagalan struktur di mana seluruh tingkat paras bawahnya ranap. Ekstrimnya, bangunan berdinding kaca dominan berupa *'showroom'* kereta hampir musnah keseluruhannya. Walau bagaimanapun, kebanyakan kedai bertingkat yang mengalami retakan minimal masih tegak dan selamat.

Kawasan perkampungan di utara Daerah Pariaman dan juga Kampung Ladang terdiri daripada rumah-rumah tunggal yang letaknya 30km dari epicenter. Proksimiti daerah-daerah ini yang amat dekat dengan pusat gempa bumi mendedahkan kawasan ini kepada gegaran yang kuat. Jenis topografinya adalah perbukitan landai hingga kaki gunung berapi kuno yang curam dan geologi batuannya jenis mendapan batuan gunung berapi bertuf yang tidak terkosolidasi/tericih. Banyak rumah kampung di kawasan Pariaman mengalami retakan teruk sehingga tidak dapat didiami. Fenomena yang paling dasyat ialah gelinciran tanah bersaiz besar apabila isipadu tanah di tebing curam dan tinggi yang menggelongsor menuruni cerun. Sebuah perkampungan di Kampung Talang seolah-olah 'dihanyutkan' oleh debris gelinciran tanah besar ini dari cerun 300m di puncak bukit. Kombinasi keadaan batuan geologi, rupa bumi jenis lurah sempit dan panjang, hujan lebat dan gegaran gempa bumi menyumbang kepada musibah ini.

Pengalaman kajian di tempat bencana gempa bumi amat bermakna dan berguna dalam pengurangan risiko bencana dari segi perancangan dan kawalan pembangunan fizikal serta respons terhadap bencana seismik. Banyak perkara daripada kerja lapangan singkat ini dapat dijadikan panduan dan renungan dalam pencaturan untuk respons bencana seismik dan bencana-bencana cetusan seismik seperti: (i) Zon tanah runtuh, contohnya aliran debris di daerah Agam di mana letaknya sumber bencana di mana option mitigasi agak sukar; dan (ii) Walaupun gempa bumi di kota Padang boleh dikatakan amat hebat, ironinya terdapat bangunan lama masih tegak tetapi bangunan baru yang berjiran ranap sepenuhnya dan kebanyakan bangunan satu tingkat umumnya selamat. Pembaikan mungkin dapat dibuat melalui kawalan dan piawai pembinaan. Ketika lawatan, kehidupan warga Padang rancak semula dan semakin pulih daripada debris-debris gempa bumi lepas. Bangunan, kedai dan rumah yang rosak sedang diperbaiki dan yang runtuh ditegakkan semula.

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