REVIEW ON MALAYSIAN SEISMIC HAZARD AND NATIONAL ANNEX

Ts. Dr. MOHD IRWAN BIN ADIYANTO
COLLEGE OF ENGINEERING

UMP
اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

AARGI WEBINAR

25 SEPTEMBER 2021

SELF-INTRODUCTION

Ts. Dr. Mohd Irwan Adiyanto

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Field of Interest:

- Earthquake Engineering
- Seismic Design
- Seismic Retrofitting
- Reinforced Concrete Design
- Wind Engineering
- Cost Engineering

PARK IR-WAN CHANNEL

Park Ir-Wan
611 subscribers

SUBSCRIBE

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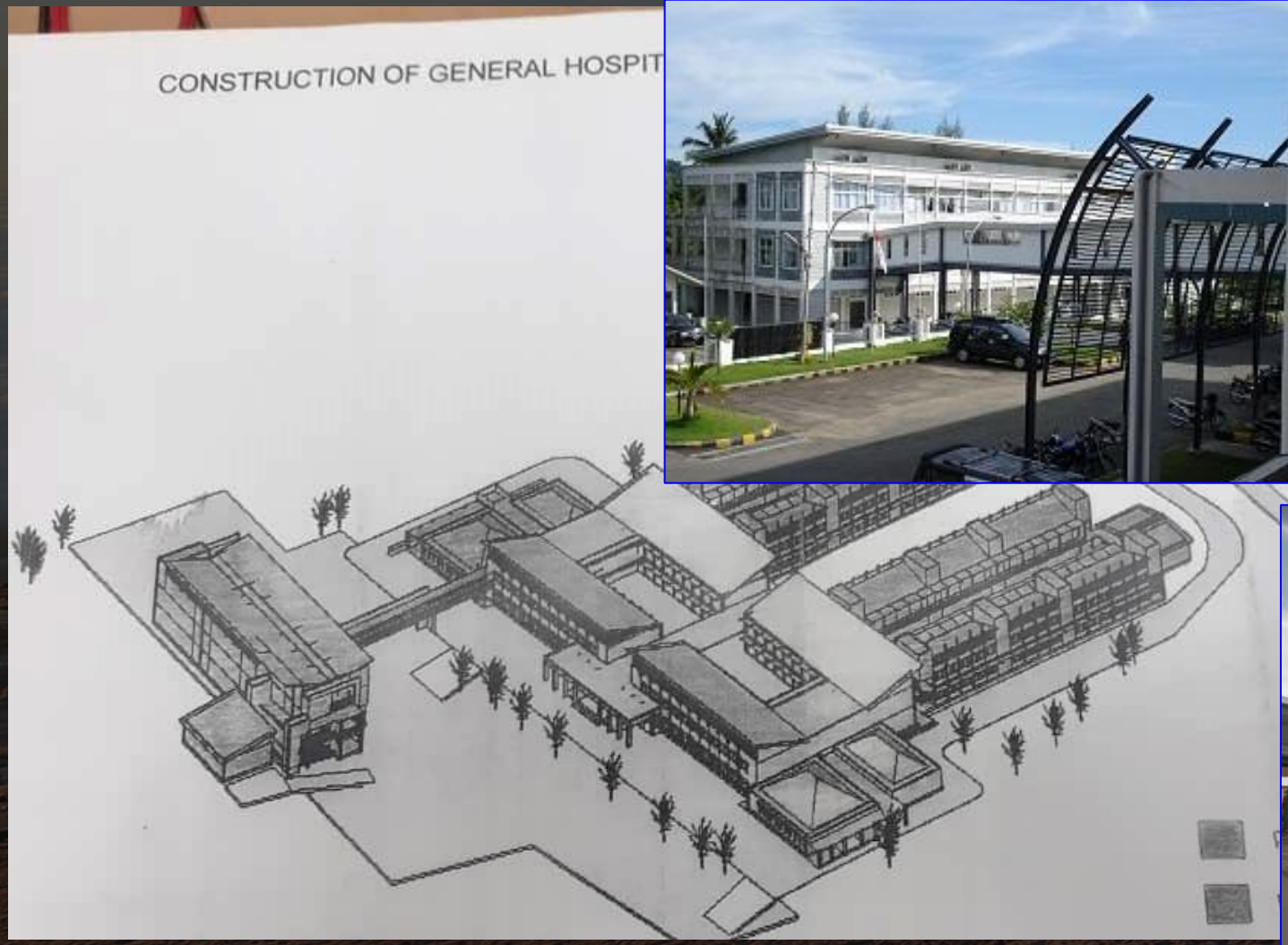
ACEH, INDONESIA: Alamdin Abdullah, Datin Hasnah Hanapi, Sharifah Sakinah Syed Hassan, Datin Susan Abdullah, Tajul Edrus Nordin, Dzulkarnaen Ismail, Hadri Yahaya. **NIAS, INDONESIA:** Abdul Rahman Richard Abdullah, Ariffin Abdul Manaf, Azman Zainon Abidin, Dr. Firdaus Hariri, Dr. Md Arad Jelon, Dzulkarnaen Ismail, Hasman Ibrahim, Hj Mohd Idris, Ir Hanafi Ramli, Ir. Wan Badrul Shah Wan Husain, Kalamani A/P Mariappan, Khalid Dato' Haji Akil, Maroz Hj Azizul Khuzaini, Mohd Hafiz Mohd Amirrol, Mohd Irwan Adiyanto, Mohd Syahir Amran, Mohd Wari Mat Zaki, Mohd. Suhaimi Md. Noor, Norma Mohd Yusof, Nur Intan Merrawaty Mohd Tamrin, Razali Idris, Syed Abdul Haris Syed Mustapa, Tarmizi Mahiyiddin, Yacob Ali, Yusof Hassim, Zullaili Zainal Abidin. **GUNUNG MERAPI, YOGJAKARTA:** Major (R) Abdul Rashid Mahmud, Rohayati Abu Nawar. **YOGJAKARTA:** Anita @ Ani Abdul Malek, Anita Ahmad, Ariffin Abdul Manaf, Azman Zainonabidin, Che Mahmud Mohd Nordin, Chin Kit Sen, Dr Nawaz Hussain Mohamed Amir, Dr Tan Teik Wooi, Dr

Nias

MERCY Malaysia was appointed by Badan Rekontruksi and Rehabilitasi (BRR) in Indonesia to manage the masterplan for the reconstruction of the Rumah Sakit Umum (RSU) Gunung Sitoli in Nias (Gunung Sitoli Hospital – the main referral hospital in Nias). This project is currently in progress. We became the first organisation to receive a grant from the multi-donor Recovery of Aceh and Nias Trust Fund (RNTF) for the rebuilding of Phase 1 & 2.


CONSTRUCTION OF GENERAL HOSPIT


RUMAH SAKIT UMUM
GUNUNGSITOLI

My Partner & Collaborator

Dr. Noor Sheena Herayani Harith

sheena@ums.edu.my

Field of Interest:

- Seismic Hazard Assessment
- Earthquake Structural Design
- Seismological Engineering
- Seismic Vulnerability Assessment

UMS
UNIVERSITI MALAYSIA SABAH

My Partner & Collaborator

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Field of Interest:

- Seismic & Structural Health Monitoring
- Earthquake Structural Design
- Seismological Engineering

UniMAP UNIVERSITI MALAYSIA PERLIS

PARK IR-WAN CHANNEL

INTRO SEISMIC THREATS RANAU EARTHQUAKE NATIONAL ANNEX

UNIVERSITI MALAYSIA PAHANG

THE SIM GROUP

SIM = Simulation

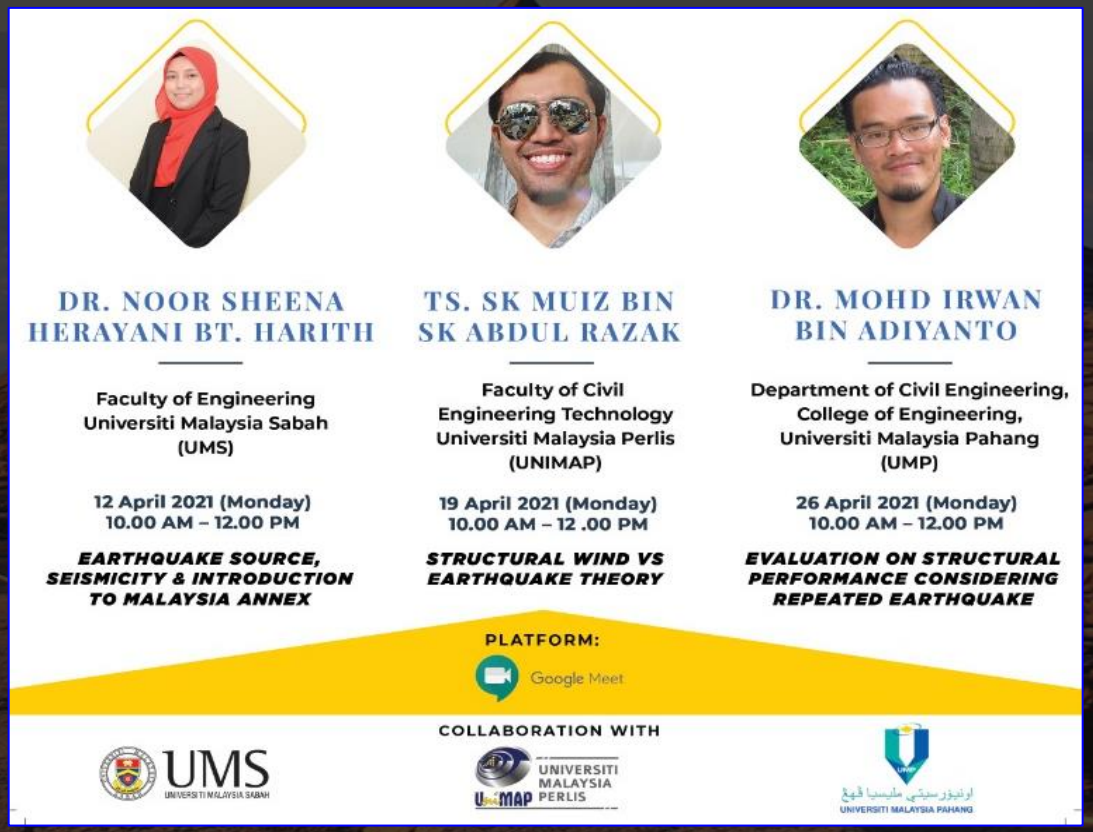
Seismological Investigation & Mapping

Structural Integrity & Monitoring

PARK IR-WAN CHANNEL

INTRO SEISMIC THREATS RANAU EARTHQUAKE NATIONAL ANNEX

THE SIM GROUP



PARK IR-WAN CHANNEL

PLAYLISTS SEISMIC THREATS RANAU EARTHQUAKE NATIONAL ANNEX

CONTENT

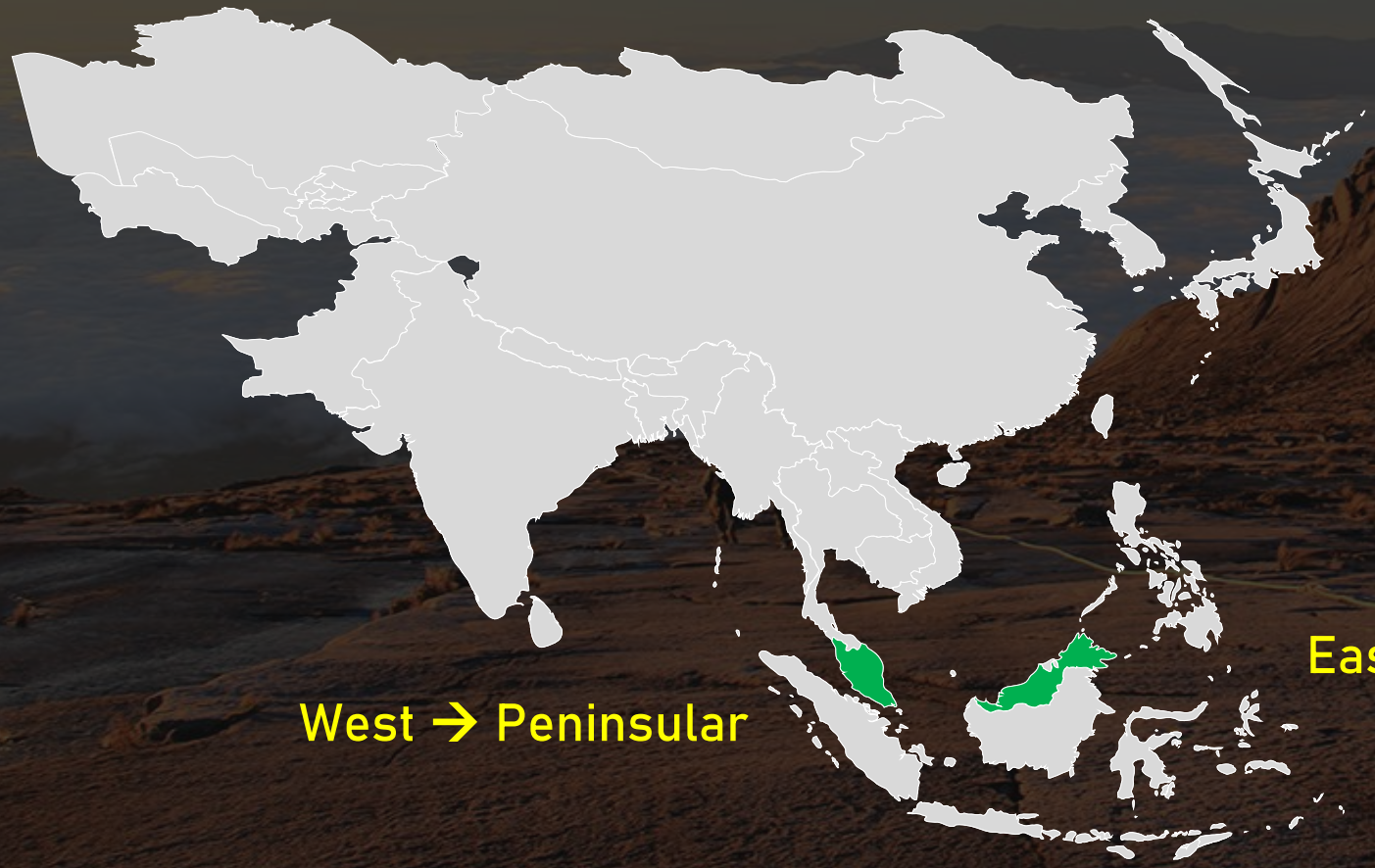
▶ Play + My List

EARTHQUAKE THREATS TO MALAYSIA

2015 RANAU EARTHQUAKE

NATIONAL ANNEX TO EUROCODE 8

MALAYSIA ON THE GLOBE



West → Peninsular

East → Sabah & Sarawak

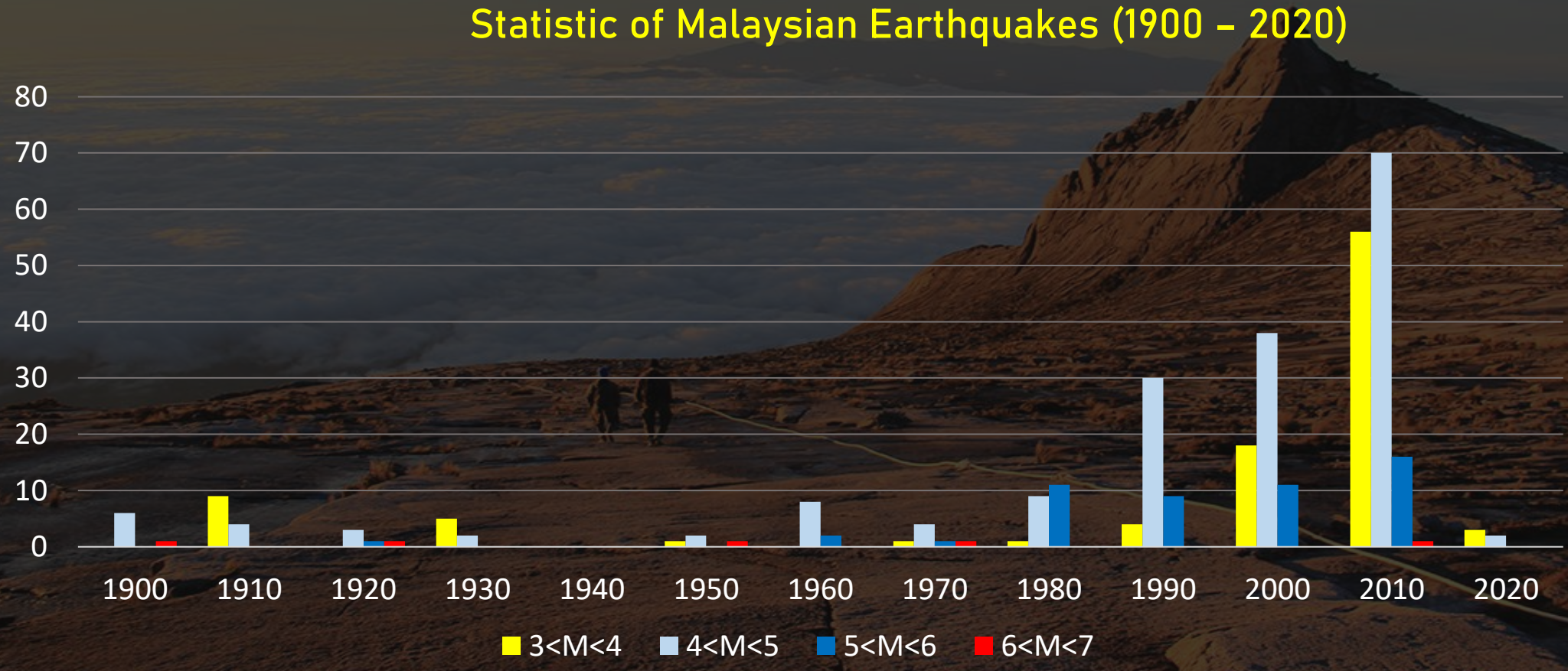
SEISMIC THREATS

Situated in Eurasian plate, affected from two conjunction plate along Indo-Australian & Philippines plate (very active earthquake activities)

Increase in number of low earthquakes and experience large magnitude earthquake (Mw9.1 2004 Acheh Earthquake)

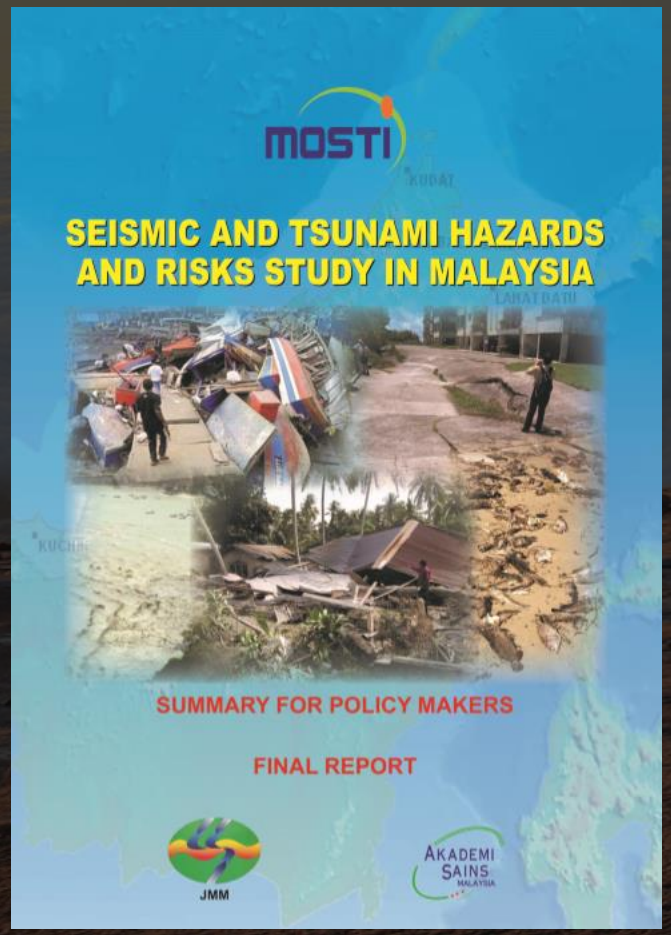
Experienced local earthquake ranging from Mw2.0 – Mw6.5

SEISMIC THREATS



Source: Dr. Noor Sheena Herayani Harith (UMS)

RISKS FROM NEIGHBORING REGIONS



In the overall assessment of seismic threats and risks, JMGM reported that about seventy epicenters, of Mw > 7.0, of very strong earthquakes are clearly located in discrete regions of known tectonic environments, which are:

(a) The Sunda subduction zone to the west of Sumatra and to the south of Java and the Lesser Sunda islands as far east as the Banda Basin. Most are of shallow foci.

(b) The double subduction zones of the Philippines and the Talaud Ridge (Molucca Sea) hosts very strong and shallow earthquakes.

(c) The north arm of Sulawesi is a third zone of very strong and shallow foci earthquakes.

(d) The borders of the Sula microcontinent (or Sula Spur) in eastern Indonesia are marked by several very strong recent earthquakes. This is interpreted as indicating continued westward push of the block along the Sorong (or Irian) transform fault zone.

(e) Teluk Sarera ("Geelvink Baai") between the Doberai Peninsular and the rump of Papua also hosts very strong and shallow earthquakes.

(f) The vast area of Sundaland, over which lies Malaysia, is devoid of very strong earthquakes or any earthquakes of magnitude 6 or greater.

(Mosti, 2009)

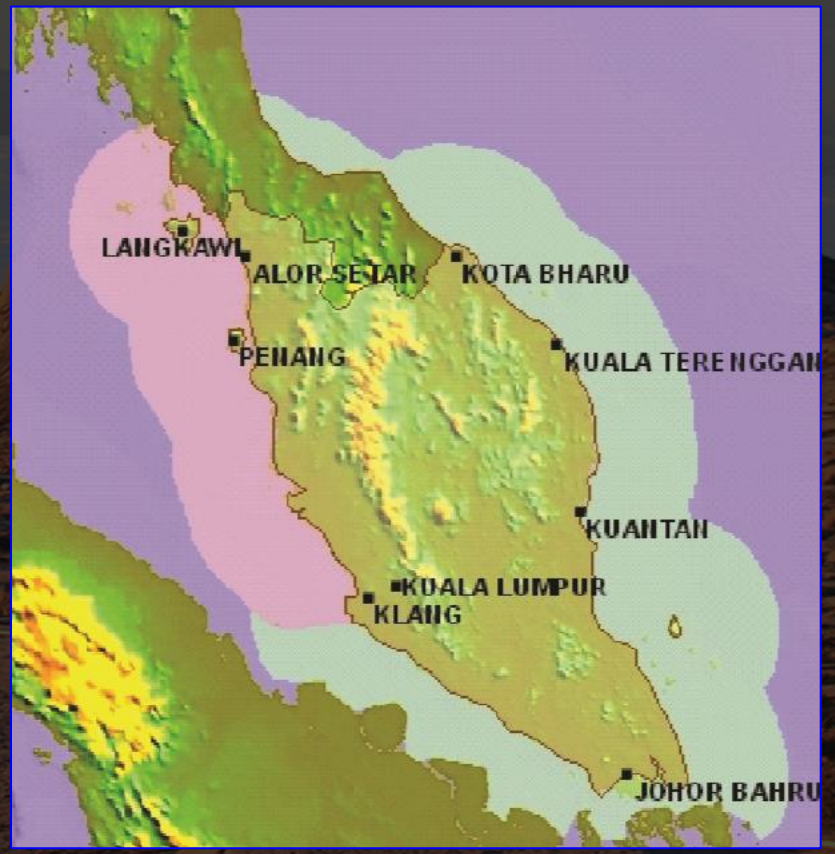
RISKS FROM NEIGHBORING REGIONS

- Dalam Negeri -

DEC 2004

45 maut tsunami:
Ombak besar landa pantai Pulau Pinang, Perlis Kedah, Perak, Selangor

SEBUAH kereta ditolak ombak besar dan tersadai bersama bot nelayan di pangkalan nelayan Kuala Chenang, Langkawi, semalam. - Gambar oleh Hamzah Osman



(Mosti, 2009)

RISKS FROM NEIGHBORING REGIONS

SEMASA

Beberapa Kawasan Di Pantai Barat Bergegar Ekoran Gempa Bumi Di Sumatera

Selasa, 14 Jun 2011 12:00 AM

JUNE 2011

KUALA LUMPUR: Beberapa kawasan di sekitar ibu negara, Putrajaya, Selangor, Perak, Melaka dan Negeri Sembilan dilaporkan mengalami gegaran ekoran insiden gempa bumi yang berlaku di Sumatera Utara, Indonesia.

mk BERITA

Gempa bumi: KL, S'gor, Melaka bergegar

Diterbitkan: May 19, 2008 11:31 PM · Dikemaskini: May 20, 2008 12:38 AM

MAY 2008

Beberapa lokasi di ibunegara dikesan mengalami gegaran berikutan gempa bumi yang melanda Sumatera Utara pada jam 10.26 malam ini.

mk BERITA

Gegaran dirasai di pantai barat

Diterbitkan: Apr 11, 2012 5:19 PM · Dikemaskini: Apr 12, 2012 1:37 AM

APRIL 2012

Amaran tsunami dikeluarkan selepas satu gempa bumi kuat magnitud 8.6 melanda perairan utara Sumatra petang ini, menurut jabatan kajian geologi Amerika Syarikat (USGS),

RISKS FROM NEIGHBORING REGIONS

8 NASIONAL

GEMPA HAMPIRI

» *Sesar aktif berhampiran negara mampu baw*

Oleh Rashiqah Ilmi Abd Rahim
rasyiqah@bh.com.my

Penduduk di negara ini perlu lebih bersedia kerana Malaysia dijangka tidak terlepas daripada mengalami kejadian gempa bumi pada masa akan datang.

Ia terbukti berdasarkan beberapa kejadian gempa bumi kecil yang berlaku hampir setiap bulan sehinggakan negara seperti Malaysia yang suatu ketika dulu asing dengan gegaran gempa, kini turut menerima tempiasnya.

Baru-baru ini, negara digemparkan lagi dengan satu gempa bumi yang lemah dengan kekuatan 4.4 skala Richter berlaku pada 1.40 petang di Pulau Banggi, Kudat. Bagaimanapun, Jabatan Meteorologi Malaysia melaporkan gempa bumi yang berpusat 328 kilometer di barat daya Palawan, Filipina dan 60 kilometer di timur laut Pitas, Sabah itu sebagai tidak menimbulkan ancaman tsunami.

Sesar aktif kerak bumi

Pakar Geo Strategis Universiti Teknologi Malaysia (UTM), Prof Dr Azmi Hassan berkata negara mungkin tidak terlepas daripada ancaman itu berikutan kewujudan beberapa sesar aktif di dalam kerak bumi.

Sesar adalah retakan sangat dalam di kerak bumi yang terjadi apabila perubahan isi padu atau bentuk jasad batuan yang terkumpul membuat batuan retak serta bergerak dan aktif jika proses pengumpulan daya berlaku secara berterusan.

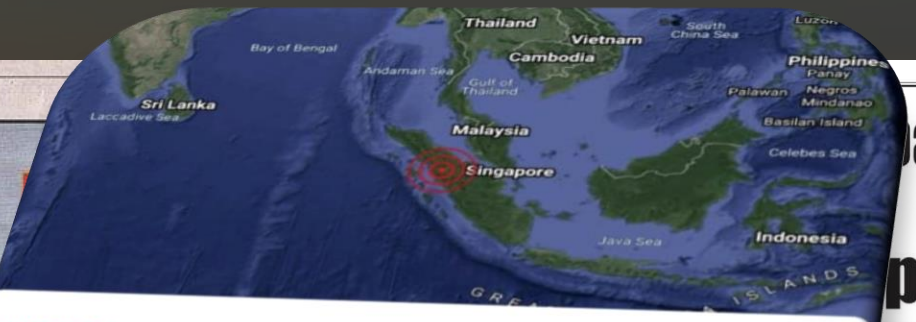
Sekiranya pergerakan sesar aktif itu besar dan sampai di permukaan bumi, ia boleh menyebabkan perubahan fizikal pada muka bumi, seperti retakan memanjang yang mana daya perubahan isi padu pada batuan adalah hasil pergerakan dan interaksi plet bumi.

"Kewujudan sesar aktif di beberapa lokasi di negara ini menunjukkan ada kebarangkalian Malaysia akan mengalami gempa bumi berskala sederhana pada masa depan walaupun terletak di luar kawasan Lingkaran Api Pasifik.

"Namun, tidak semua tempat akan mengalaminya berbanding di Sabah yang ada zon sesar aktif dengan trend Barat Laut-Tenggara mengunjur dari Kundasang Ranau-Pitas ke Lahad Datu-Kunak-Tawau katanya ketika dihubungi BH Ahad.

Meskipun Sabah di antara negeri ... siko menerima gempa bumi, Azmi ber... ia tidak mungkin mengalami gempa ... besar kerana terletak di Luar Lingkar... Pasifik.

Titik gempa beralih



NATION

Tremors felt in KL, PJ due to earthquake in Indonesia

11 Aug 2021 02:11 PM

AUG 2021

PETALING JAYA: An earthquake with an epicentre 18km southeast of Padang Sidempuan, Indonesia led to tremors that shook buildings in several parts of Peninsula Malaysia on Wednesday (Aug 11).

According to the Malaysian Meteorological Department, the earthquake at 1.19pm measured 5.6 on the Richter scale and ccurred at a depth of 19km.

SEMASA Rabu 11 Januari, 2017 3

...ah
...pa
...wesi

...rang penjawat awam Ma... ...ai gegaran kira-kira 2.20

...n saya berada di dalam

...slina Ali, 30, berkata beliau ...egaran selama 10 saat ketika ...perumahan Sekolah Menen...

...017

...ri ...ya ...lia

...ta,

...rannya berlaku sekejap-seke...

...n, kakitangan yang bertugas di ...ekutuan diarahkan mengosong...

...n Kunorhidzwah Ahmat yang ...ndakan FM berkata beliau berada ...nam apabila beliau dan petugas ...ke bawah bangunan.

...alai Bomba dan Penyelamat Zon ...haidi Ismail berkata pihaknya ...panggilan kecemasan mengenai ...a-kira pukul 2.26 petang daripada ... yang berada di Bangunan Perseku...

budhi

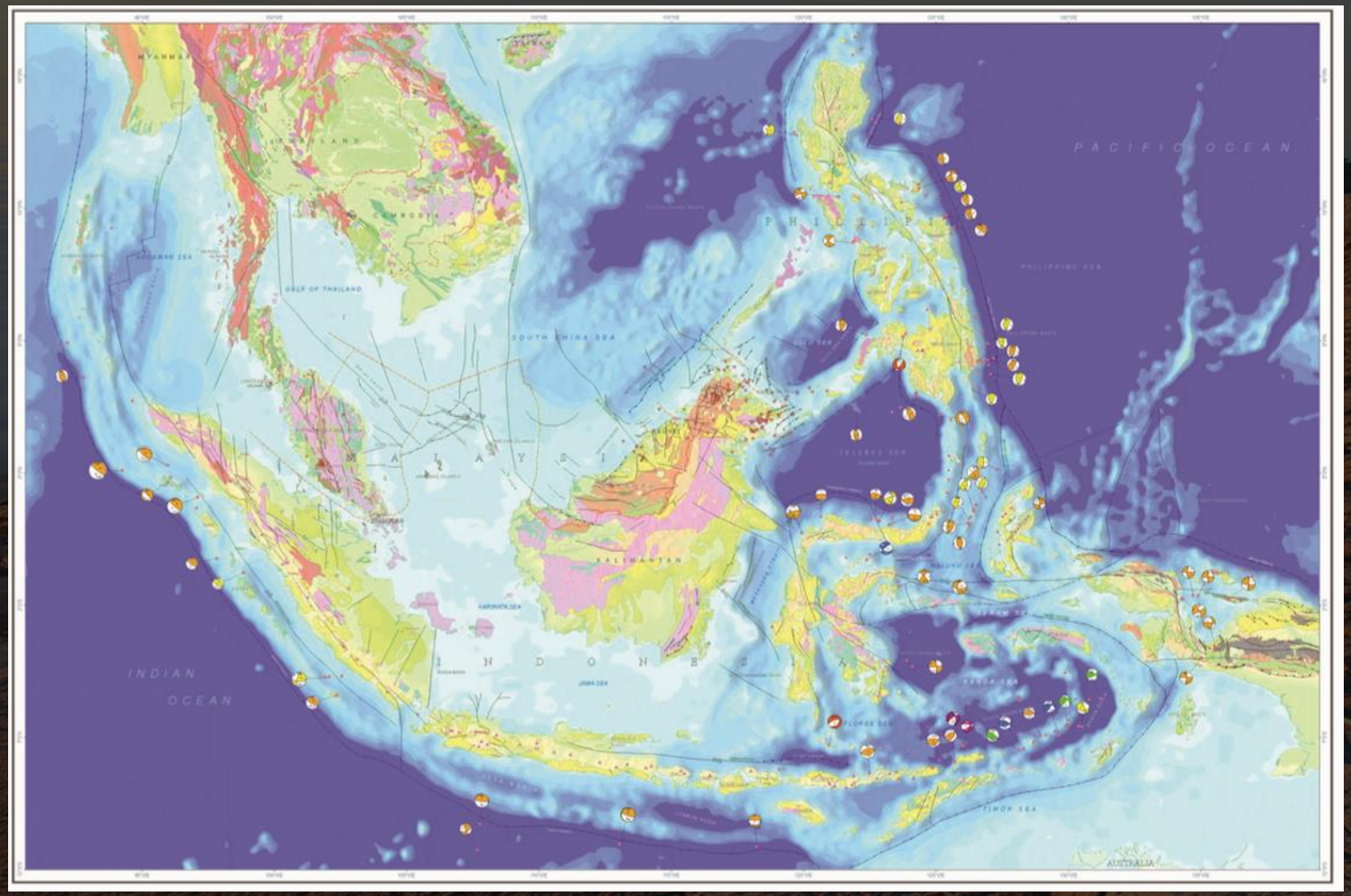
KELUAR... Kakitangan SESB Karamunsing turut keluar untuk menyelamatkan diri.

MENYELAMATKAN DIRI ... Sebahagian kakitangan beberapa bangunan tinggi di Kota Kinabalu turut meninggalkan bangunan masing-masing.

tuan Tawau.

Sementara itu Jabatan Bomba dan Penyelamat Malaysia (JBPM) Sabah berkata pihaknya telah mengarahkan anggota mereka membuat pemantauan di beberapa bangunan tinggi di sekitar Kota Kinabalu.

RISKS FROM NEIGHBORING REGIONS



Seismotectonic map of Malaysia and the surrounding regions (Mosti, 2009)

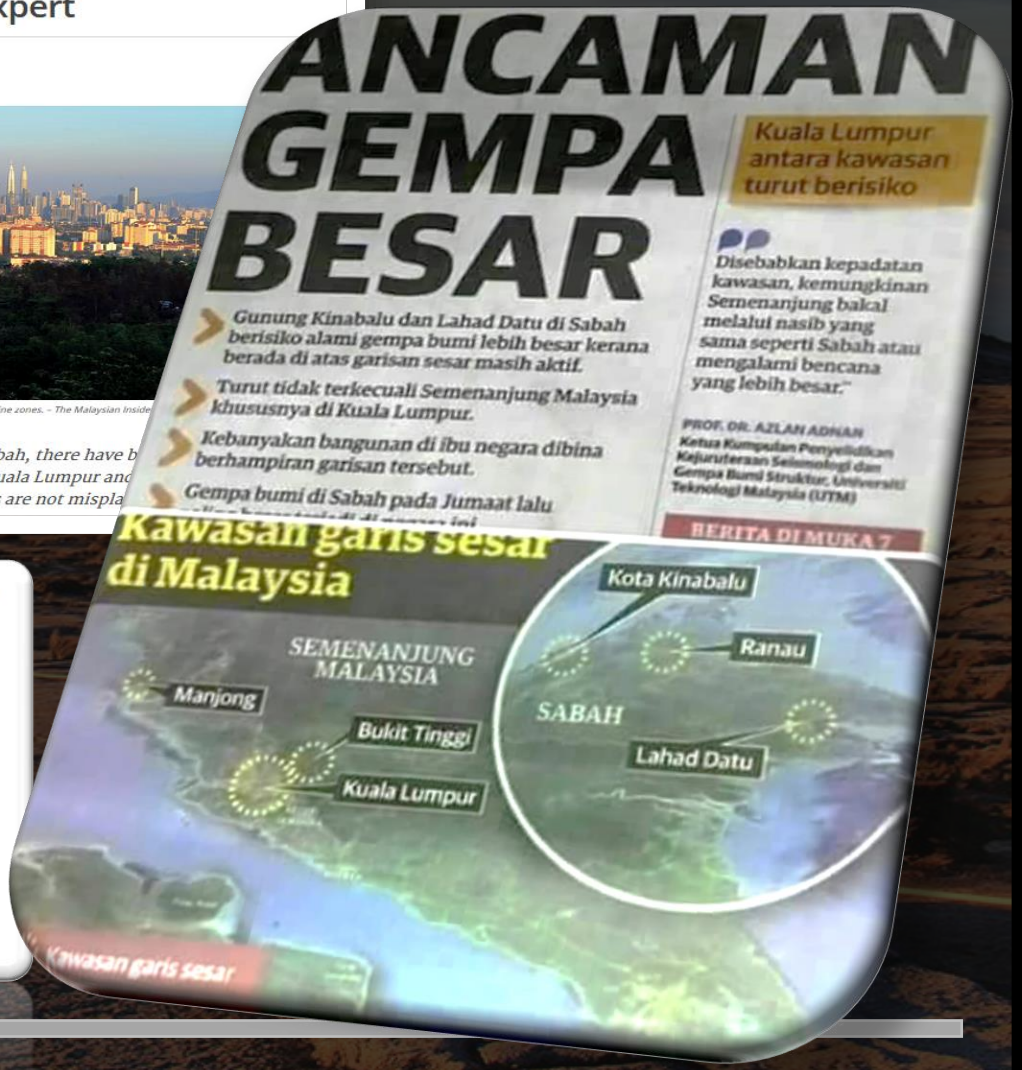
LOCAL EARTHQUAKE RISKS

KL quake possible as ancient fault lines reactivate, says expert

BY MARIA J. DASS
Published: 11 June 2015 7:01 AM

Kuala Lumpur is located near the epicentres of ancient fault line zones. – The Malaysian Inside
2015.

Following the quake tragedy in Sabah, there have b
that an earthquake may also hit Kuala Lumpur and
geological expert, such misgivings are not mispla



Moderate earthquake 'can happen anytime' in Malaysia

Published: 8 February 2013 5:29 PM

KUALA LUMPUR, Feb 8 – Although Malaysians may feel that the country is not prone to earthquakes, experts believe otherwise.

Located at the peripheral of the ring of fire and beside two neighbours, Indonesia and the Philippines, which have seen violent episodes of seismological activities

MET Malaysia

LOCAL EARTHQUAKE RISKS

BH ONLINE

NASIONAL

Gempa kuat di Ranau dijangka berulang

Izwan Abdullah
bhnews@bh.com.my
June 5, 2021 @ 3:48pm

JUN 2021

KOTA KINABALU: Gempa bumi bermagnitud 5.9 skala Richter yang berpusat di Gunung Kinabalu pada 5 Jun 2015 diramal boleh berulang dalam tempoh antara 19 hingga 25 tahun.

Timbalan Pengarah Pusat Operasi Kaji Cuaca dan Gempa Bumi, Jabatan Meteorologi Sabah, Dr Chai Mui Fatt, berkata ramalan itu berdasarkan rekod gempa bumi yang pernah berlaku di Ranau sebelum ini dengan kekuatan hampir sama.

40 gempa di Malaysia sejak 2007

Diterbitkan: Oct 15, 2009 2:27 PM · Dikemaskini: 2:35 PM

Dalam tempoh hampir dua tahun, sejak penghujung 2007, Malaysia mencatatkan 40 gempa bumi lemah, tetapi yang ketara 37 daripadanya berlaku di sekitar garis sesar (garisan g

Tiga lagi g
Jerantut (

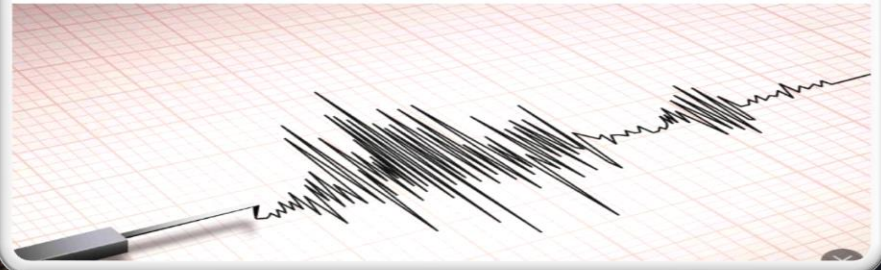
Pengarah
Abas berk
lepas seb
ntong i

BH ONLINE LIVE

Gempa bumi lemah dikesan di Kundasang

September 4, 2021 @ 8:42am

SEPT 2021



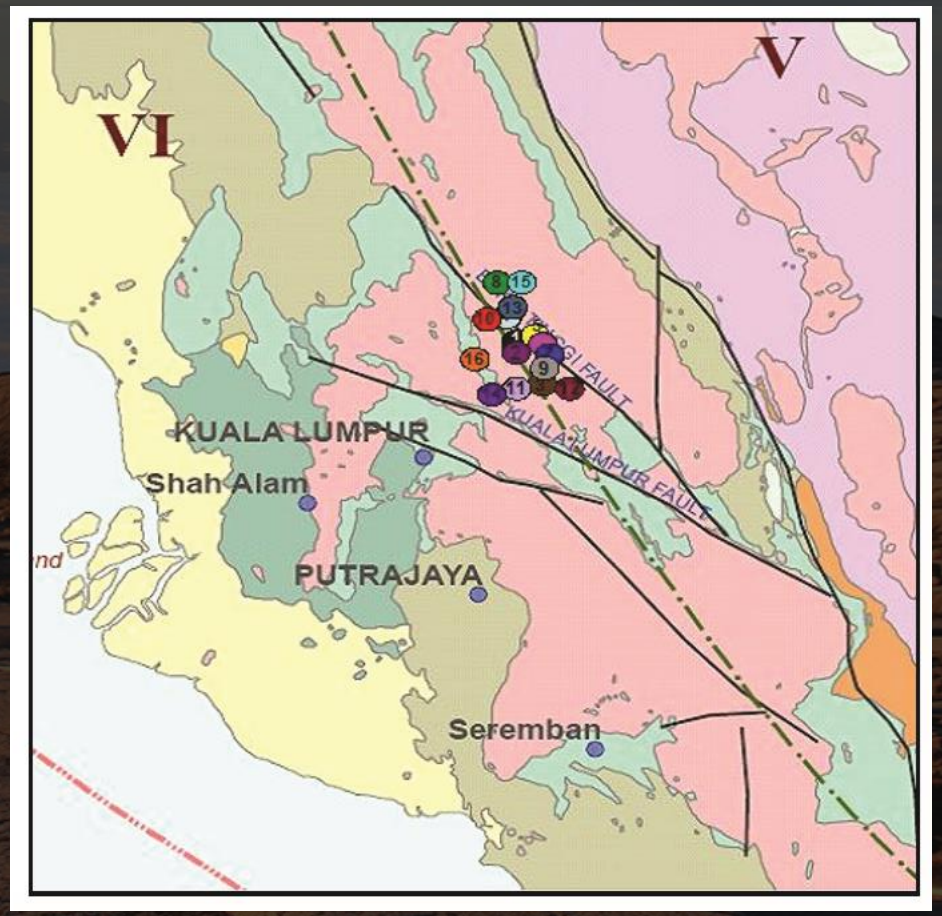
PENINSULAR MALAYSIA

No significant local earthquake in Peninsular before 2007 Bukit Tinggi earthquakes

Categorized as isolated and infrequent

2007-2008 Bukit Tinggi earthquakes:

- Mw2.7 to Mw3.5
- Bukit Tinggi Fault Zone
- Strike-slip fault
- Reactivated due to Sumatran earthquakes

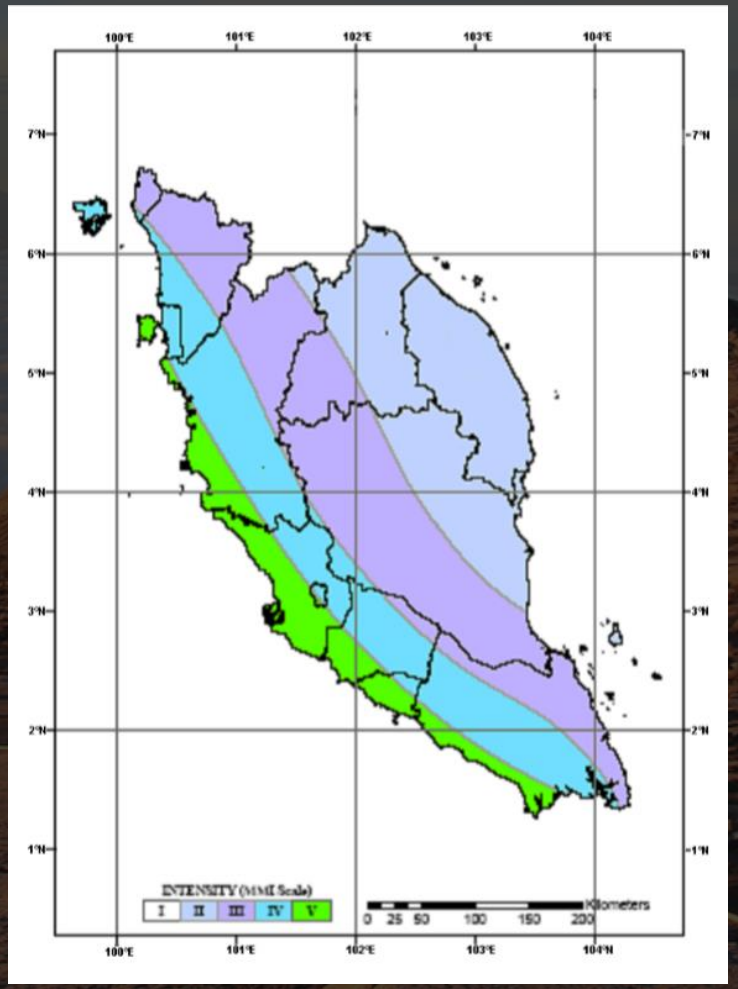


Bukit Tinggi Fault Zones (Mosti, 2009)

PENINSULAR MALAYSIA

Modified Mercalli Intensity (MMI) map (1894 – 2007) for Peninsular Malaysia

Higher intensity toward the west coast up to scale V



(Mosti, 2009)

EAST MALAYSIA

Sarawak:

Experienced at least 21 earthquake (Mw3.5 to Mw5.3) since 1874

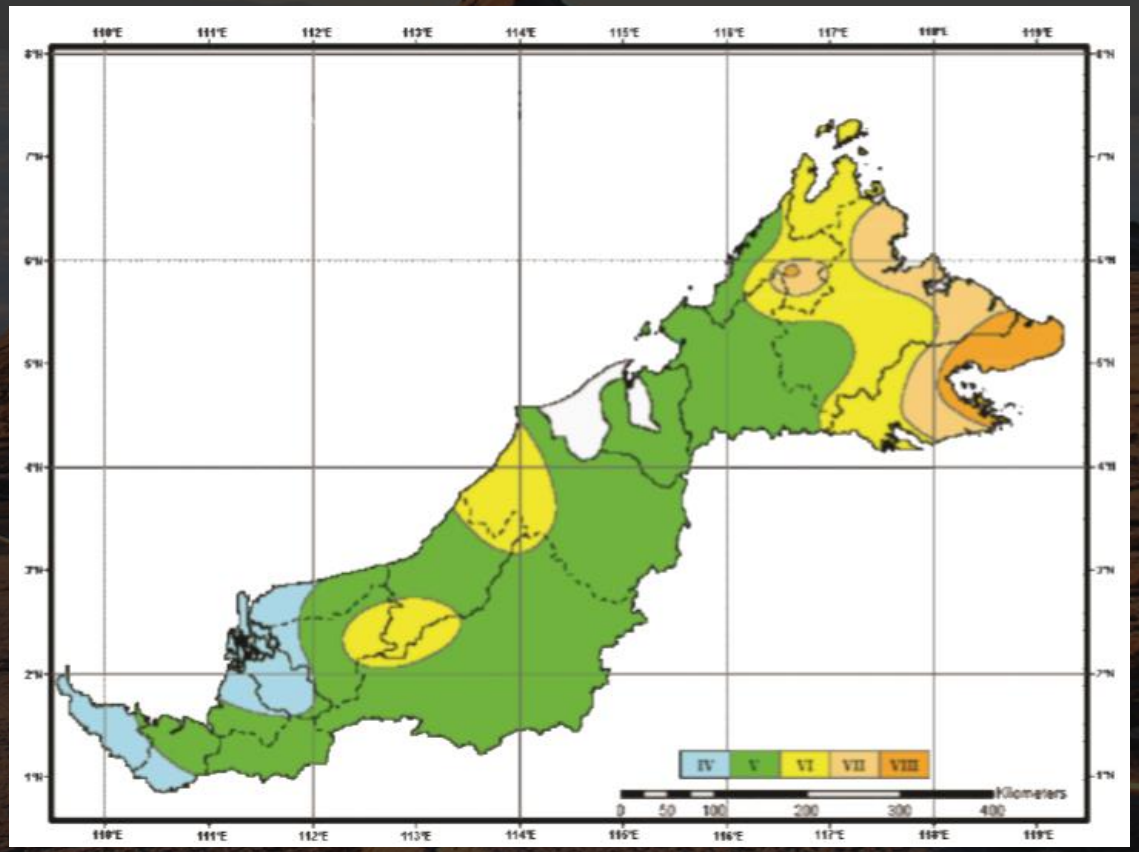
Mercalli Intensity scale up to VI

Sabah:

Experienced at least 65 earthquake (Mw3.3 to Mw6.5) since 1923

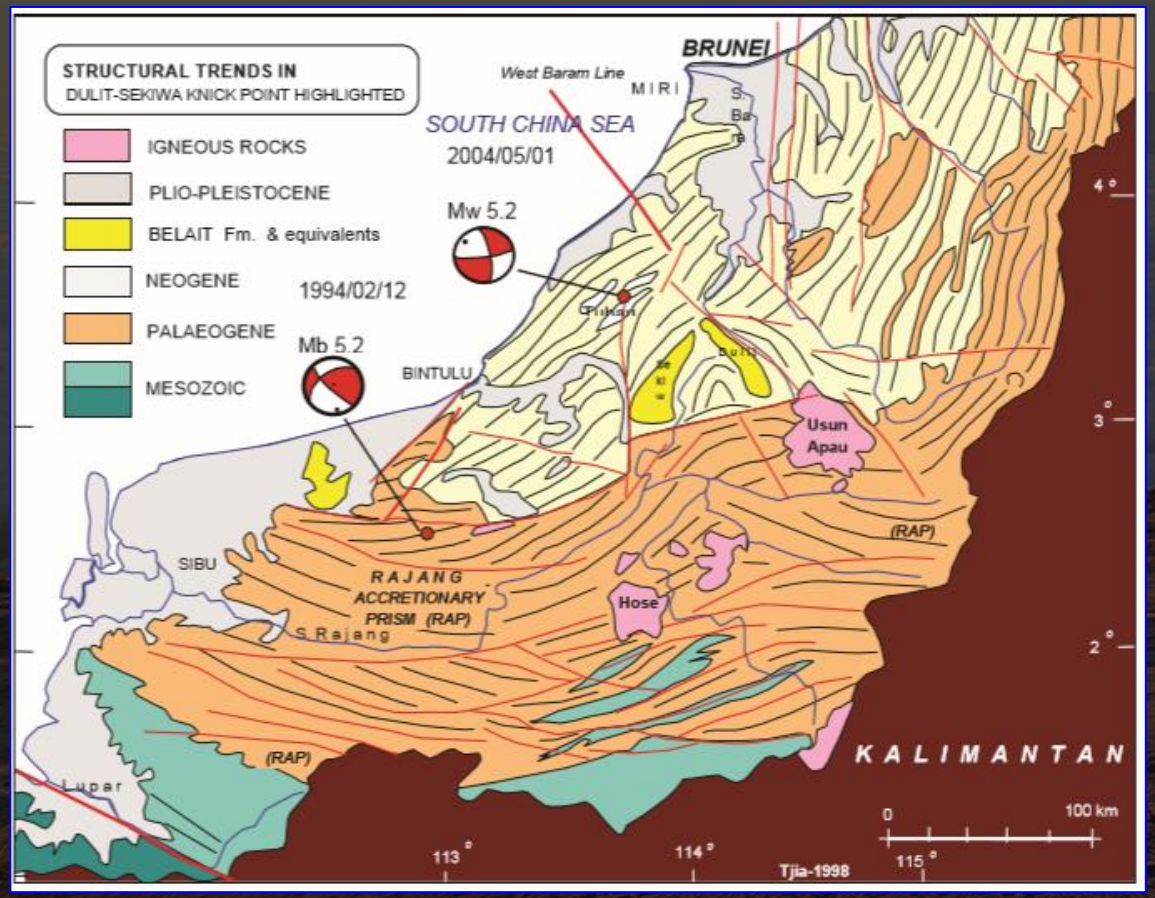
Mercalli Intensity scale up to VIII

Active Faults = Mensaban & Lobou-Lobou in Kundasang & Ranau

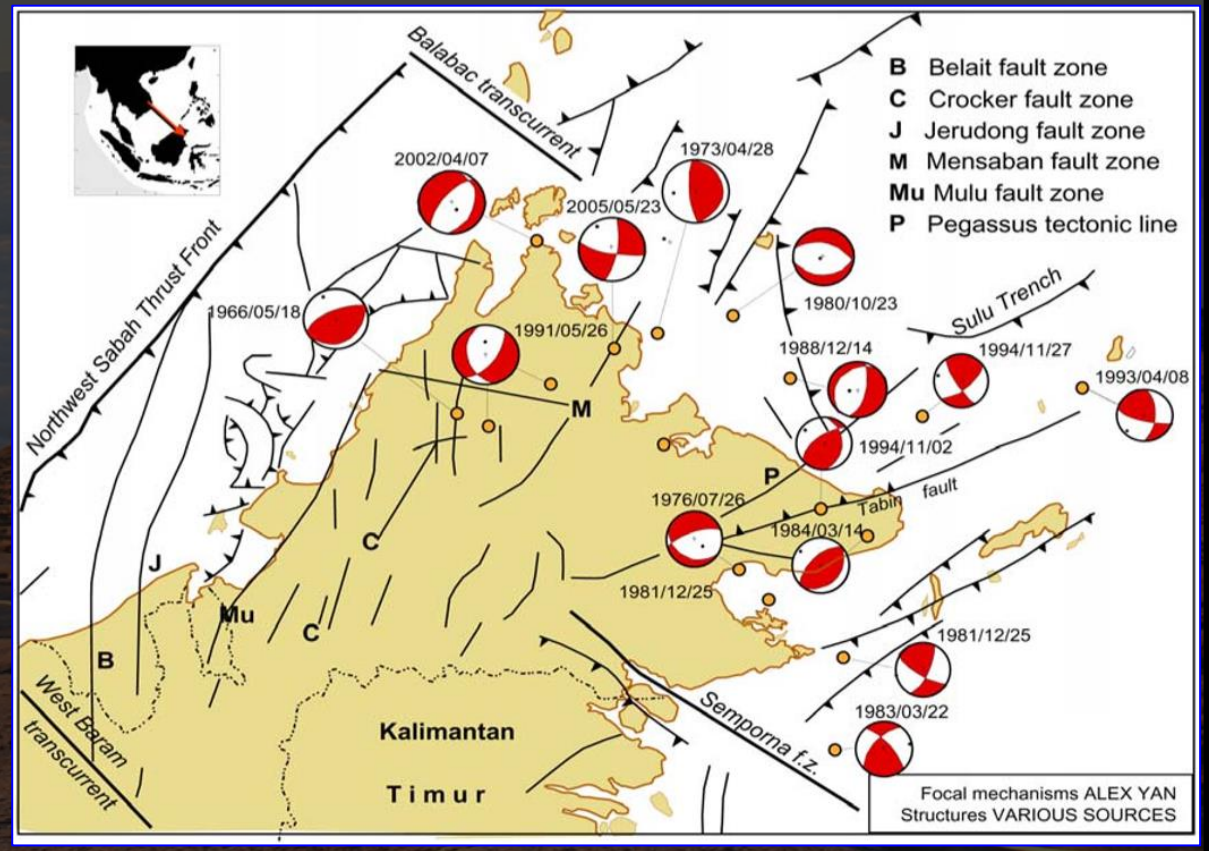


(Mosti, 2009)

EAST MALAYSIA

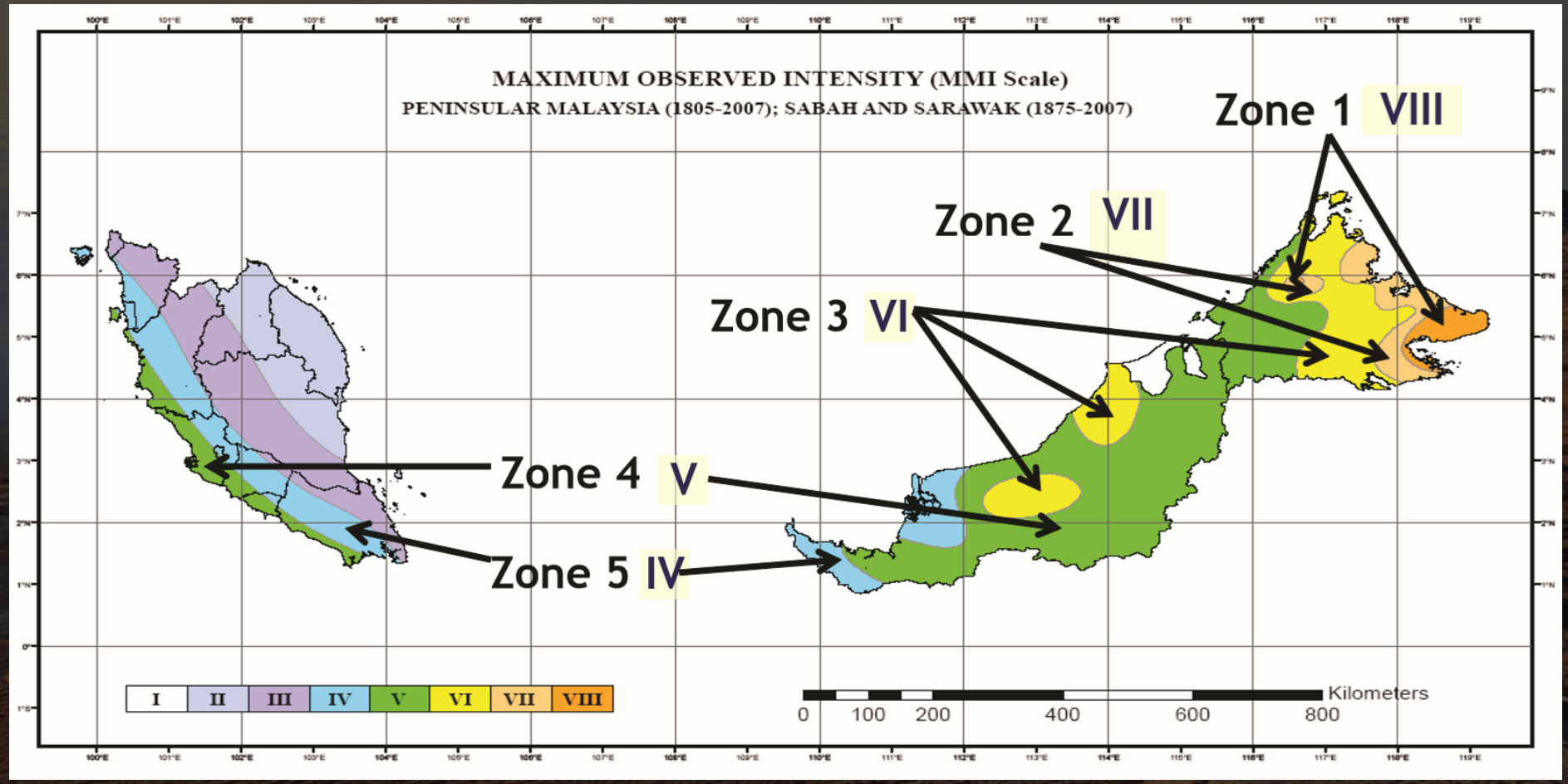


Focal mechanism of earthquakes in Sarawak



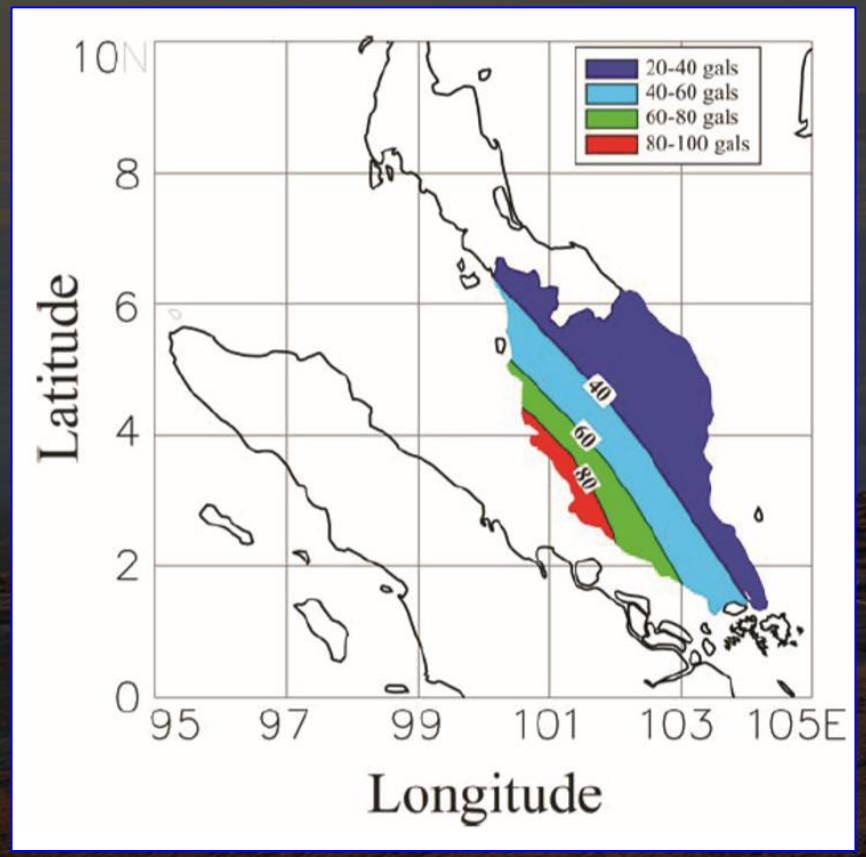
Focal mechanism of earthquakes in Sabah

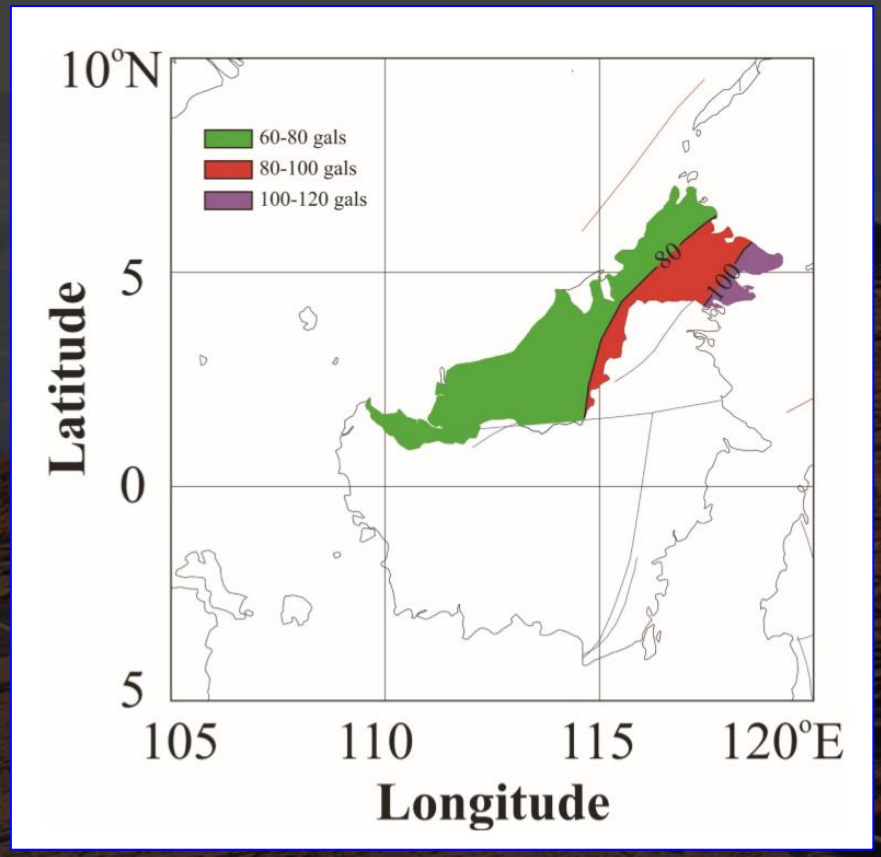
SEISMIC ZONATION



Based on the MMI Scale (Mosti, 2009)

SEISMIC HAZARD MAP





10% PE in 50 years (2009 – 2017), Mosti (2009)

BUILDINGS VULNERABILITY

SEMASA

Kurang 1 peratus bangunan di Malaysia ikuti piawaian kesan beban gempa bumi

Isnin, 12 Oktober 2009 12:00 AM

PULAU PINANG: Kurang satu peratus bangunan di negara ini mematuhi spesifikasi piawaian kesan beban gempa bumi, kata Penyelaras Unit Kajian Bencana (UKB) Universiti Sains Malaysia (USM) Prof Madya Taksiah Abdul Majid.

Penyelidik utama gempa bumi itu berkata menurut kajian pihaknya kebanyakan bangunan di Malaysia kurang mengambil kira faktor itu kerana beranggapan Malaysia tidak berisiko kepada bencana berkenaan.

PARK IR-WAN CHANNEL

PLAYLISTS SEISMIC THREATS RANAU EARTHQUAKE NATIONAL ANNEX

CONTENT

▶ Play + My List

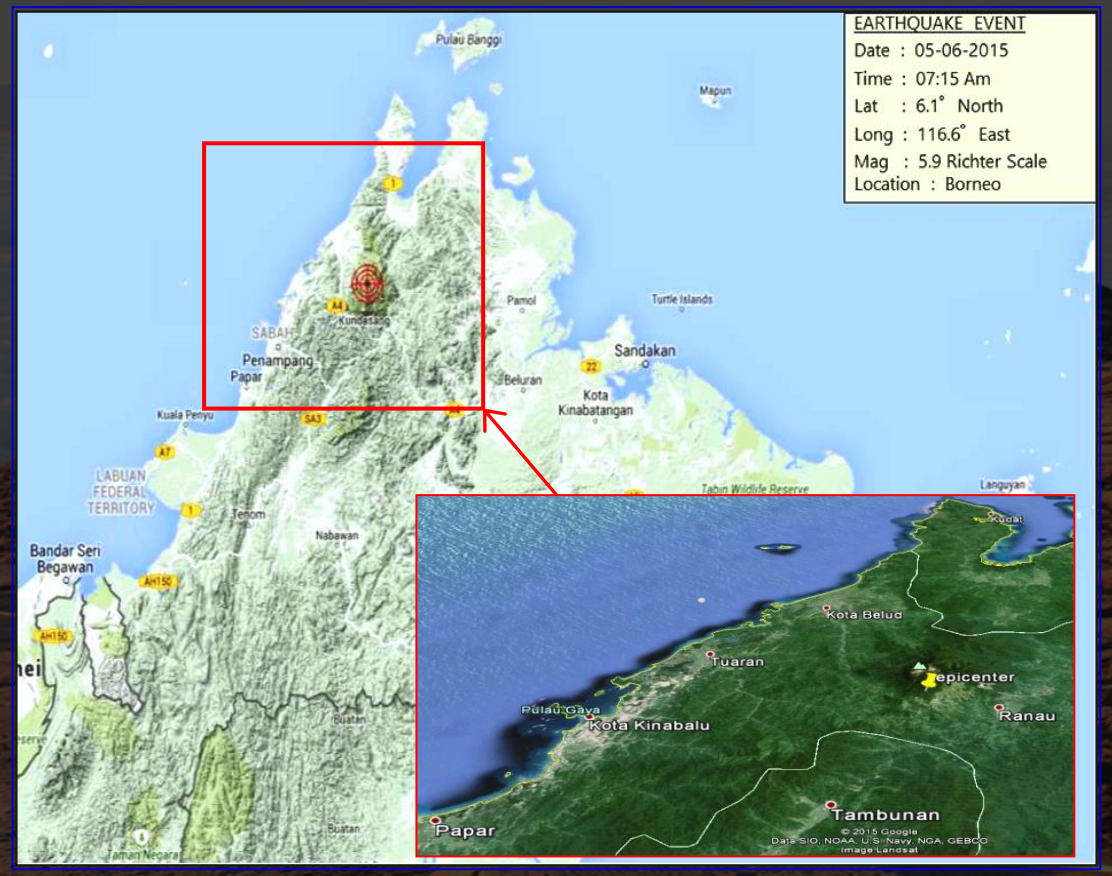
EARTHQUAKE THREATS TO MALAYSIA

2015 RANAU EARTHQUAKE

NATIONAL ANNEX TO EUROCODE 8

2015 RANAU EARTHQUAKE

Date : 5th June 2015
Time : 7:15 am
Mw : 6.1
Epicenter : 16 km Northwest Ranau
Depth : 10 km
Tremors : Ranau, Kundasang, Tambunan, Tuaran, Kota Kinabalu, Kota Belud



HEADLINES

Gempa Sabah: Gegaran terkuat sejak 1976

Share Tweet

MyMetro › Node

Ranau earthquakes damages estimated at RM95mil: Masidi Manjun

By Kristy Inus - July 3, 2015 @ 4:42pm

NST

Gempa Sabah : Jumlah Keseluruhan Kematian 19 Orang, Kata Pegawai Penyelamat

Sabtu, 06 Jun 2015 6:11 PM

Oleh: THE STAR

THE STAR

Gempa bumi terkuat di Malaysia

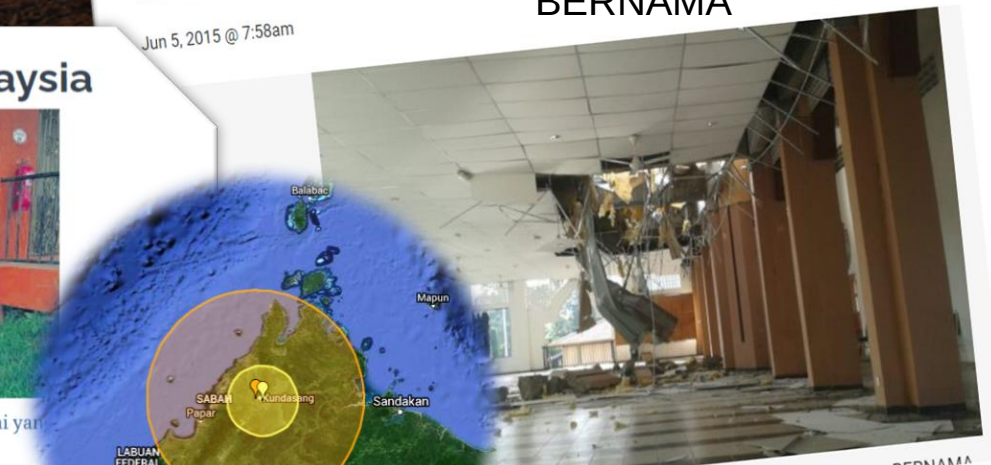
BEBERAPA tiang sebuah rumah hampir patah akibat gempa bumi yan
Sabah semalam.

KOTA KINABALU – Suasana tenang pada awal pagi di kebanyakan daerah d
tukar menjadi kelam-kabut apabila gempa bumi yang berpusat di Kundas
ini berlaku selama 15 saat pada pukul 7.15 pagi semalam.

Ranau, Sabah dilanda gempa bumi 6.0 Richter

Jun 5, 2015 @ 7:58am

BERNAMA



HISTORY OF EARTHQUAKES IN SABAH

KEJADIAN GEMPA BUMI YANG PERNAH MENGEGARKAN RANAU

1989 :
Gempa bumi berukuran 5.6 pada skala Richter mengegarkan Ranau, gegaran susulan juga dirasai di bahagian-bahagian lain pantai Sabah

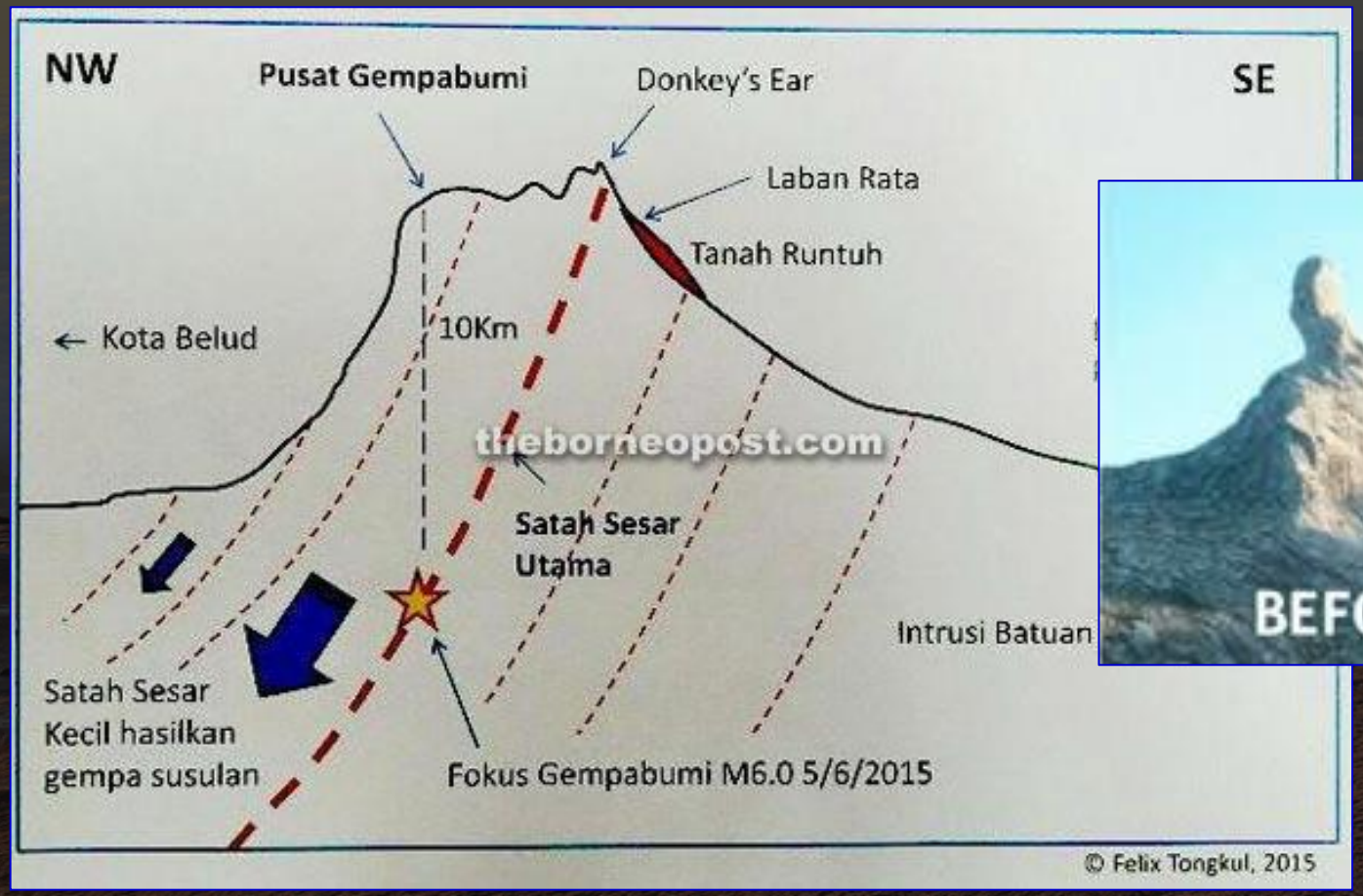
2005 :
Gempa bumi keamatan rendah berlaku pada 01.54 pagi, berukuran 4.1 pada skala Richter dan berpusat di 5.8 darjah utara dan 16.8 darjah timur pada awal pagi Khamis 03 Mac 2005

2010 :
Gempa bumi 2.6 magnitud berlaku di 11km timur laut Ranau

GEMPA BUMI YANG PERNAH MENGEGARKAN SABAH

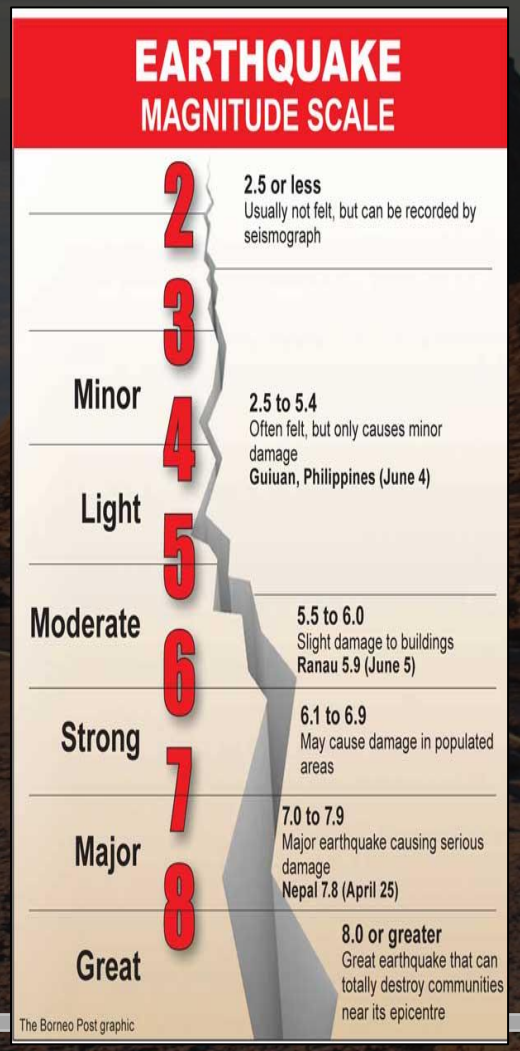
1897 : 100km di luar Sabah (8.7 Magnitud)
1976 : Lahad Datu (5.6 Magnitud)
2005 : Timur Tawau (5.8 skala Richter)
2011 : Lahad Datu (3.3 skala Richter)
2011 : Tongod, Sandakan (4.0 skala Richter)
2012 : Kunak (3.7 skala Richter)
2013 : Kudat, pantai utara (3.6 skala Richter)
2014 : Pulau Banggi, Kudat (4.4 skala Richter)

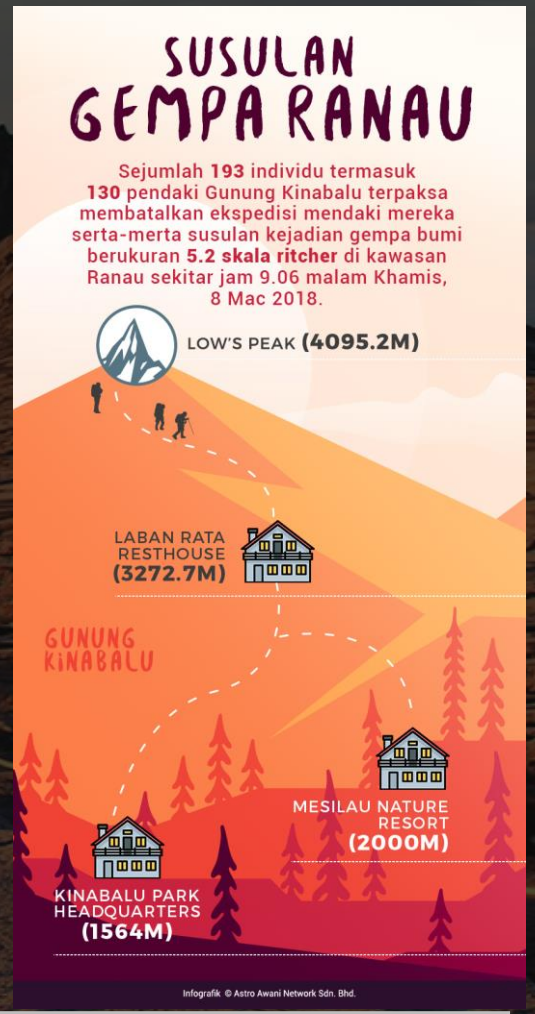
FOCUS AND EPICENTER



THE SERIES

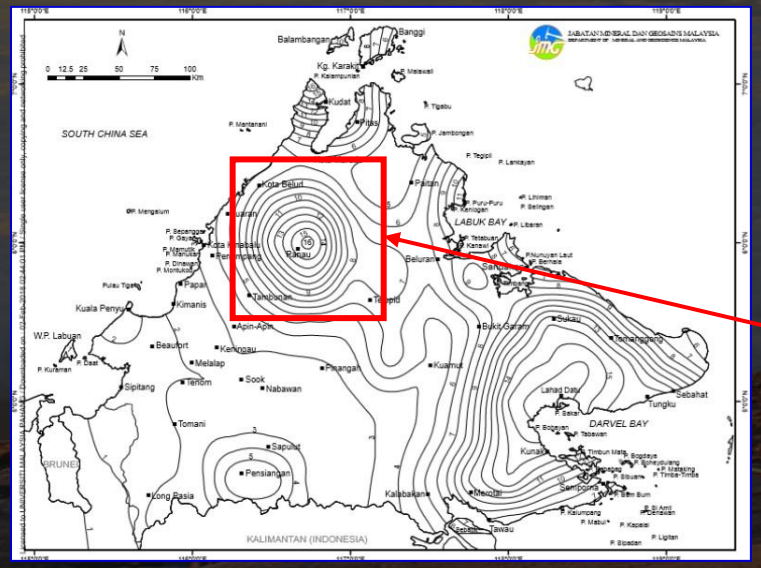
No	Date	Time	Latitude	Longitude	Magnitude	Category
1	05/06/15	7:15 am	6.1º N	116.6º E	6.1	Moderate
2	05/06/15	7:22 am	6.1º N	116.4º E	3.3	Weak
3	05/06/15	7:28 am	6.1º N	116.8º E	3.5	Weak
4	05/06/15	7:56 am	6.2º N	116.4º E	3.6	Weak
5	05/06/15	9:51 am	6.2º N	116.5º E	3.9	Weak
6	05/06/15	12:05 pm	6.1º N	116.5º E	4.0	Weak
7	05/06/15	9:12 pm	6.0º N	116.6º E	4.3	Weak
8	06/06/15	1:45 pm	6.1º N	116.5º E	4.5	Weak
9	06/06/15	7:57 pm	6.0º N	116.6º E	3.3	Weak
10	07/06/15	7:35 am	6.2º N	116.5º E	3.0	Weak
11	07/06/15	1:32 pm	6.1º N	116.6º E	3.7	Weak
12	09/06/15	1:40 pm	6.1º N	116.5º E	3.2	Weak

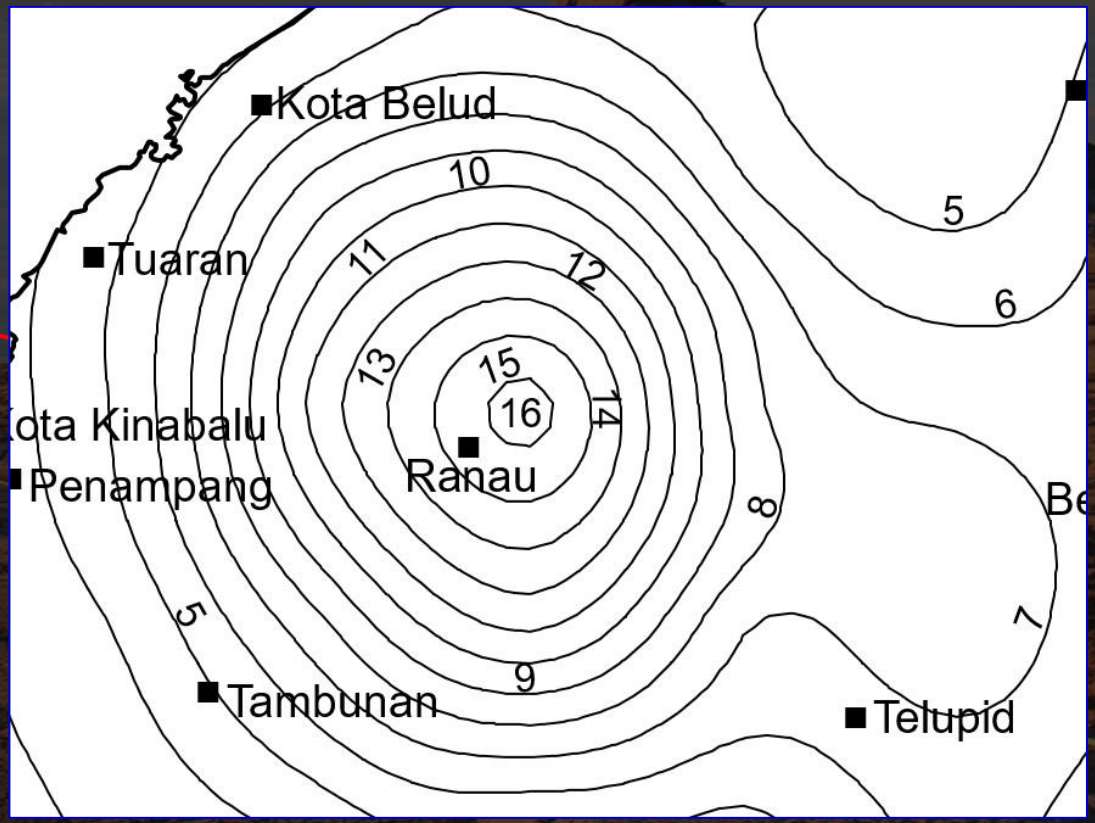




SEISMIC HAZARD MAP

Sabah Seismic Hazard Map (2017 – present)





RECONNAISANCE MISSION TEAM

SAVE AND RESCUE MISSION

VISITED SITES

Code	Site Name	Latitude	Longitude	Area	Type of structure
1	IPD Ranau	6.1º N	116.6º E	Ranau	RC frame
2	Masjid Jamek Ar-Rahman	6.1º N	116.4º E	Ranau	RC frame
3	SMK Mat Salleh	6.1º N	116.8º E	Ranau	RC frame
4	SMK Ranau	6.2º N	116.4º E	Ranau	RC frame
5	SMK Mohamad Ali Ranau	6.2º N	116.5º E	Ranau	RC frame
6	Hospital Ranau	6.1º N	116.5º E	Ranau	RC frame
7	Chon Chu Kung Temple	6.0º N	116.6º E	Ranau	RC frame
8	Dream World Resort	6.1º N	116.5º E	Kundasang	RC frame

EAGLE'S VIEW

IPD RANAU

MASJID JAMEK AR-RAHMAN

SMK MAT SALLEH

SMK RANAU

EAGLE'S VIEW

SMKA MOHAMAD ALI RANAU

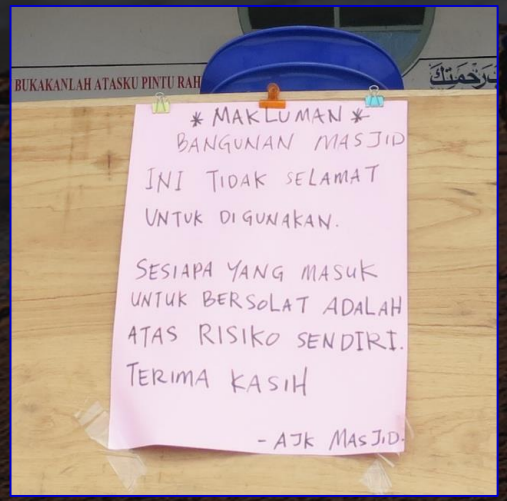
HOSPITAL RANAU

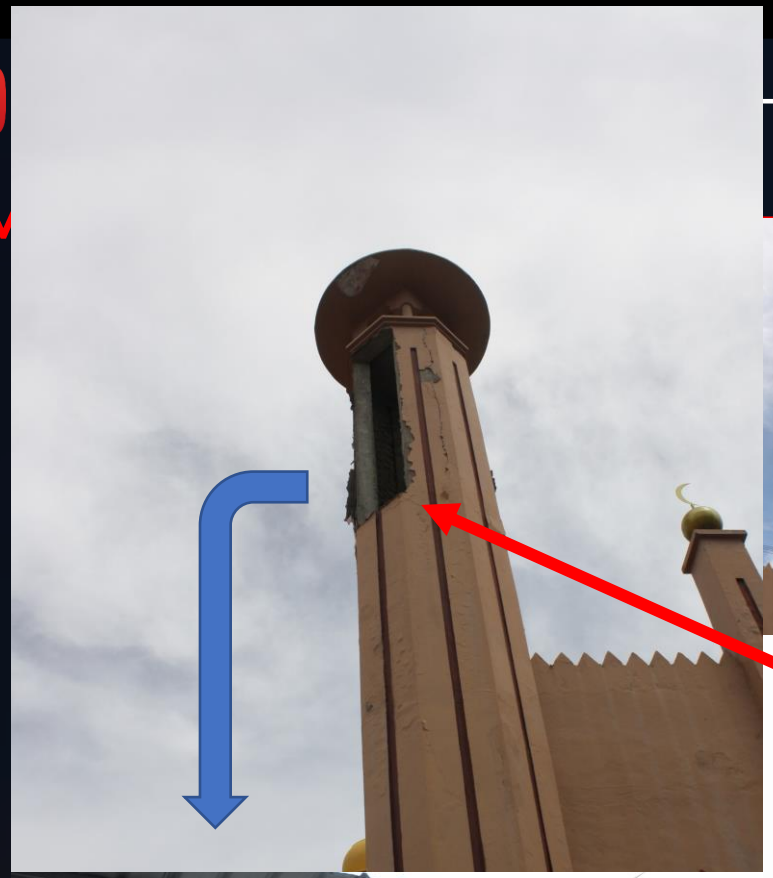
CHON CHU KUNG TEMPLE

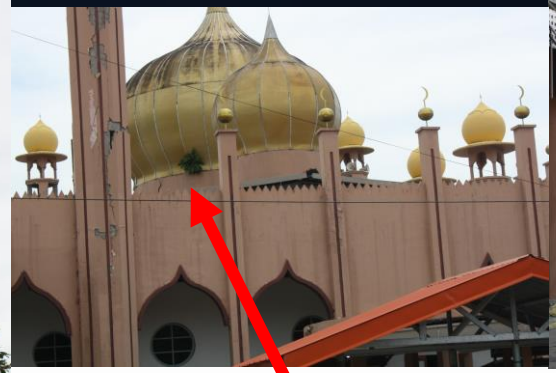
DREAM WORLD RESORT

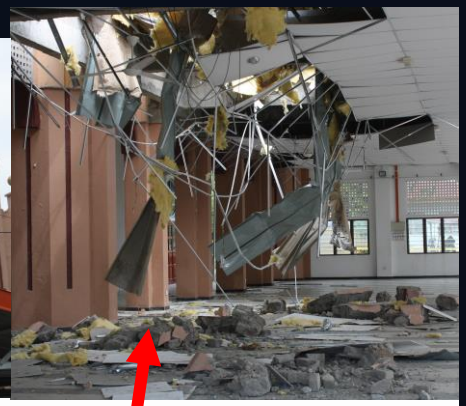
IPD RANAU

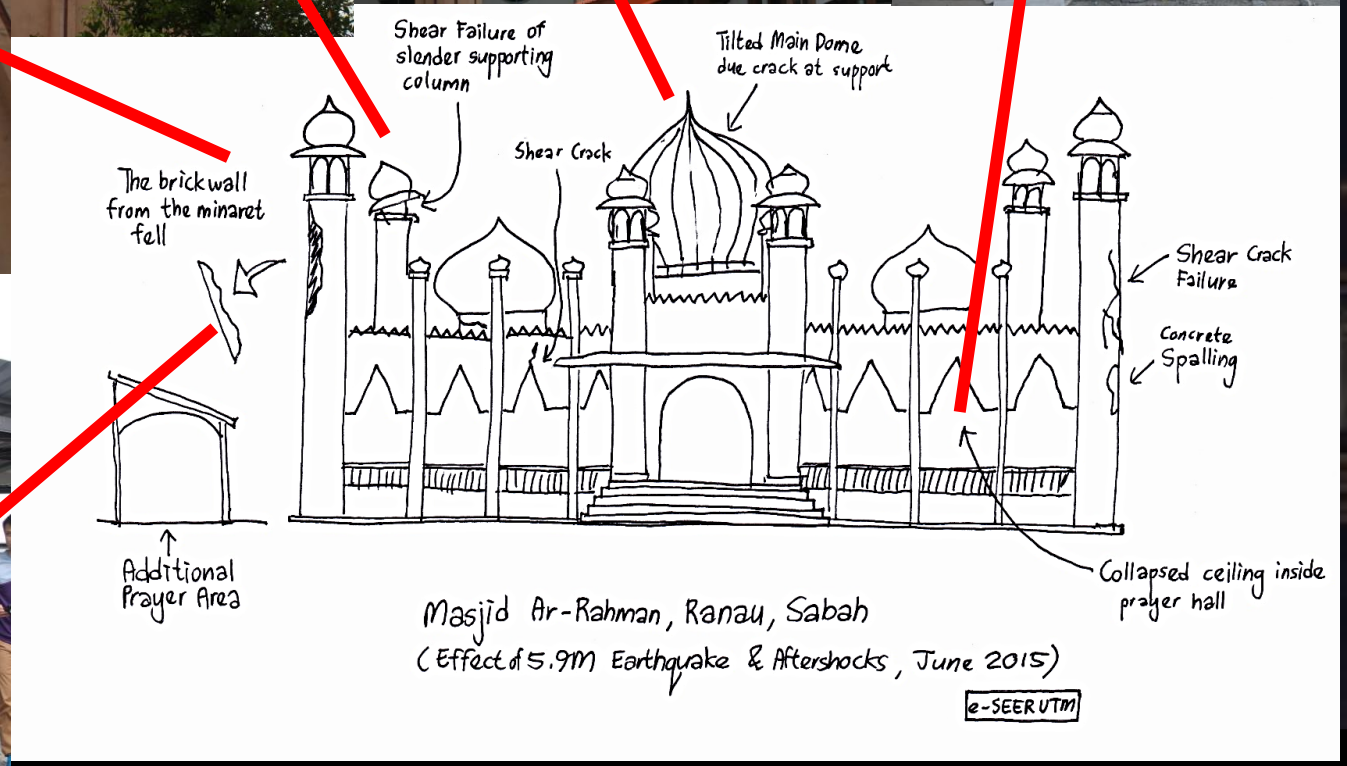
MASJID JAMEK AR-RAHMAN



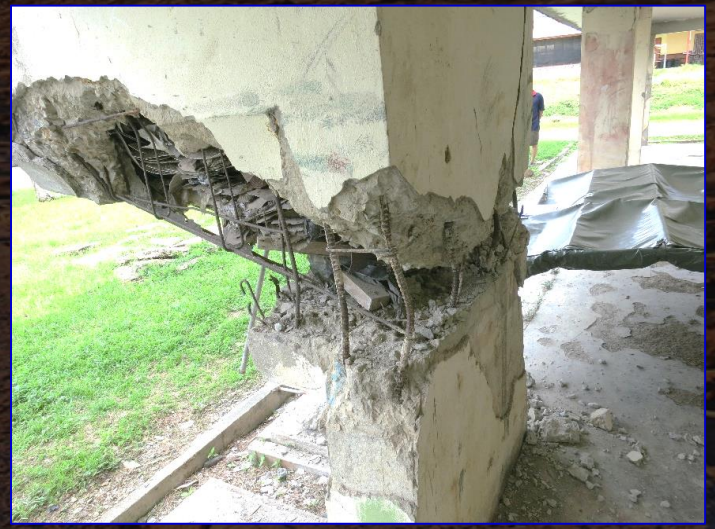







Shear Failure of slender supporting column
Tilted Main Dome due crack at support
Shear Crack
The brick wall from the minaret fell
Shear Crack Failure
Concrete Spalling
Additional Prayer Area
Collapsed ceiling inside prayer hall
Masjid Ar-Rahman, Ranau, Sabah
(Effect of 5.9M Earthquake & Aftershocks, June 2015)
e-SEER UTM

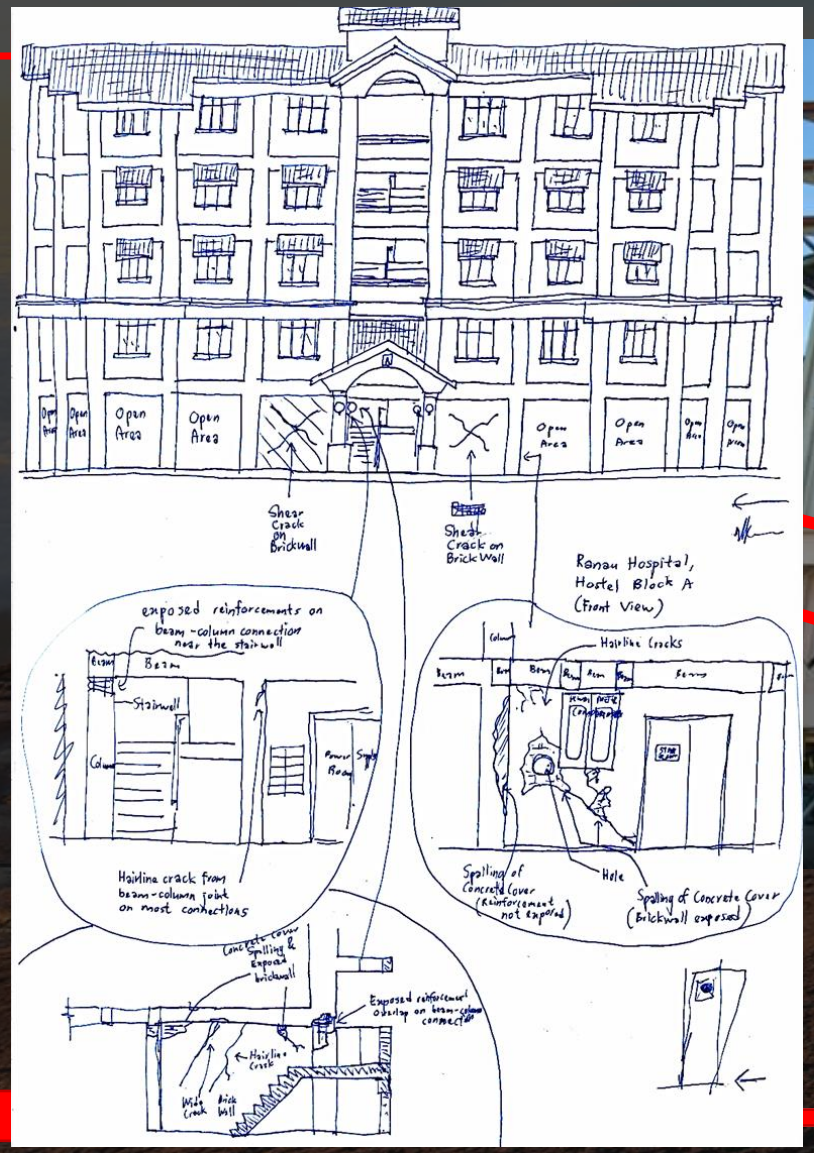
SMK MAT SALLEH



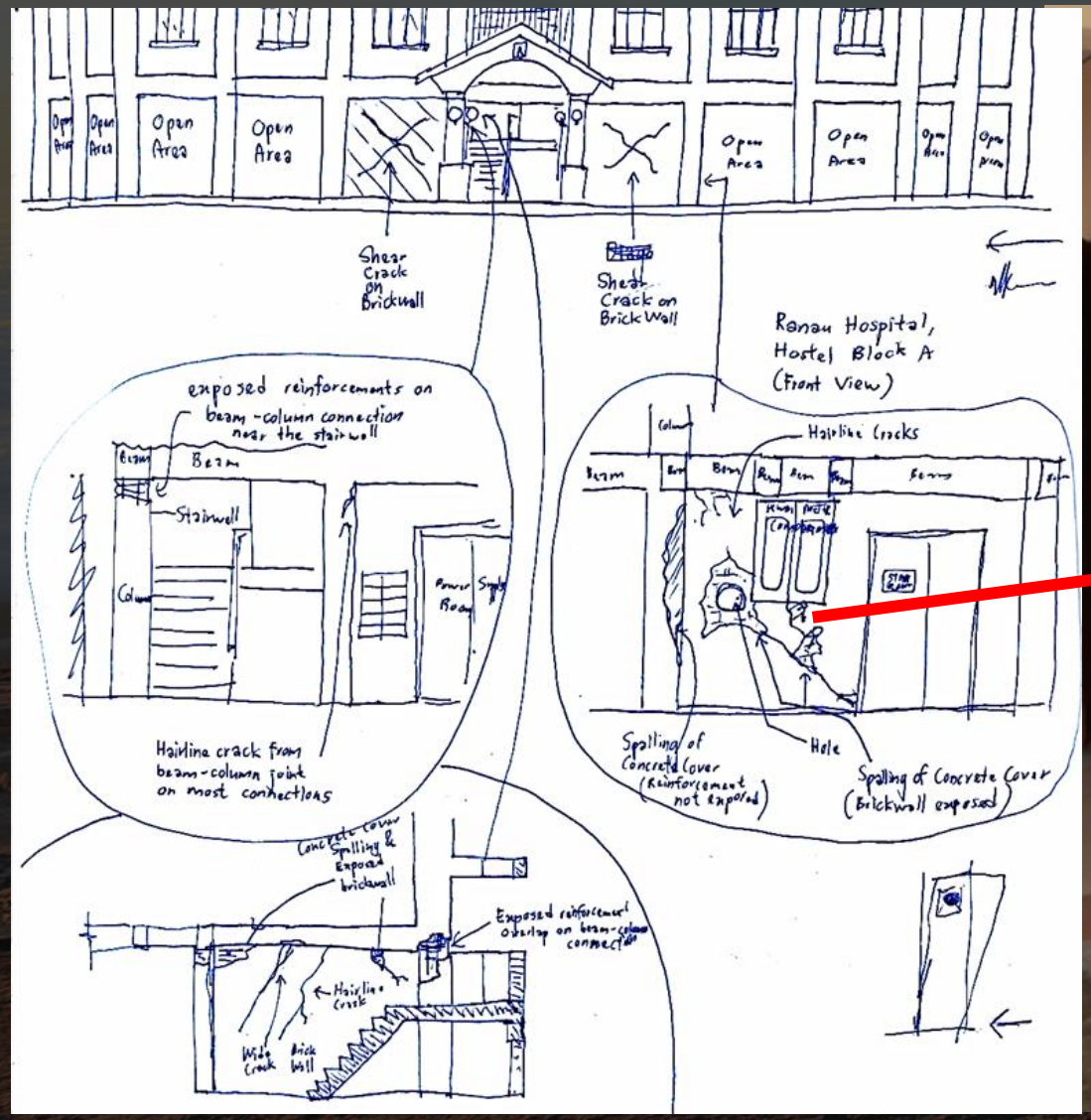
SMK RANAU

SMKA MOHAMAD ALI RANAU

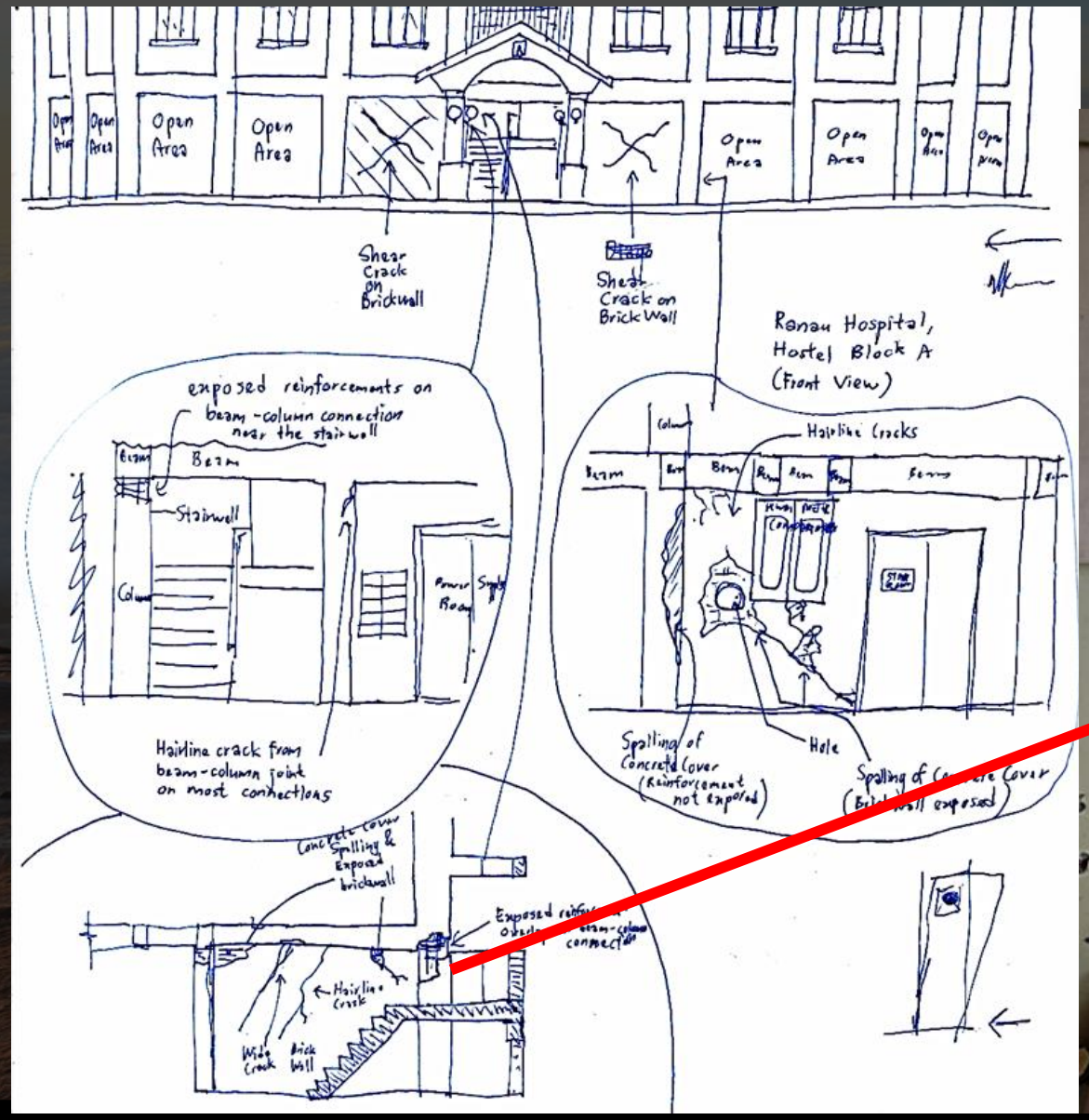
HOSPITAL RANAU



Staff Residential Quarters
Ranau Hospital, Sabah

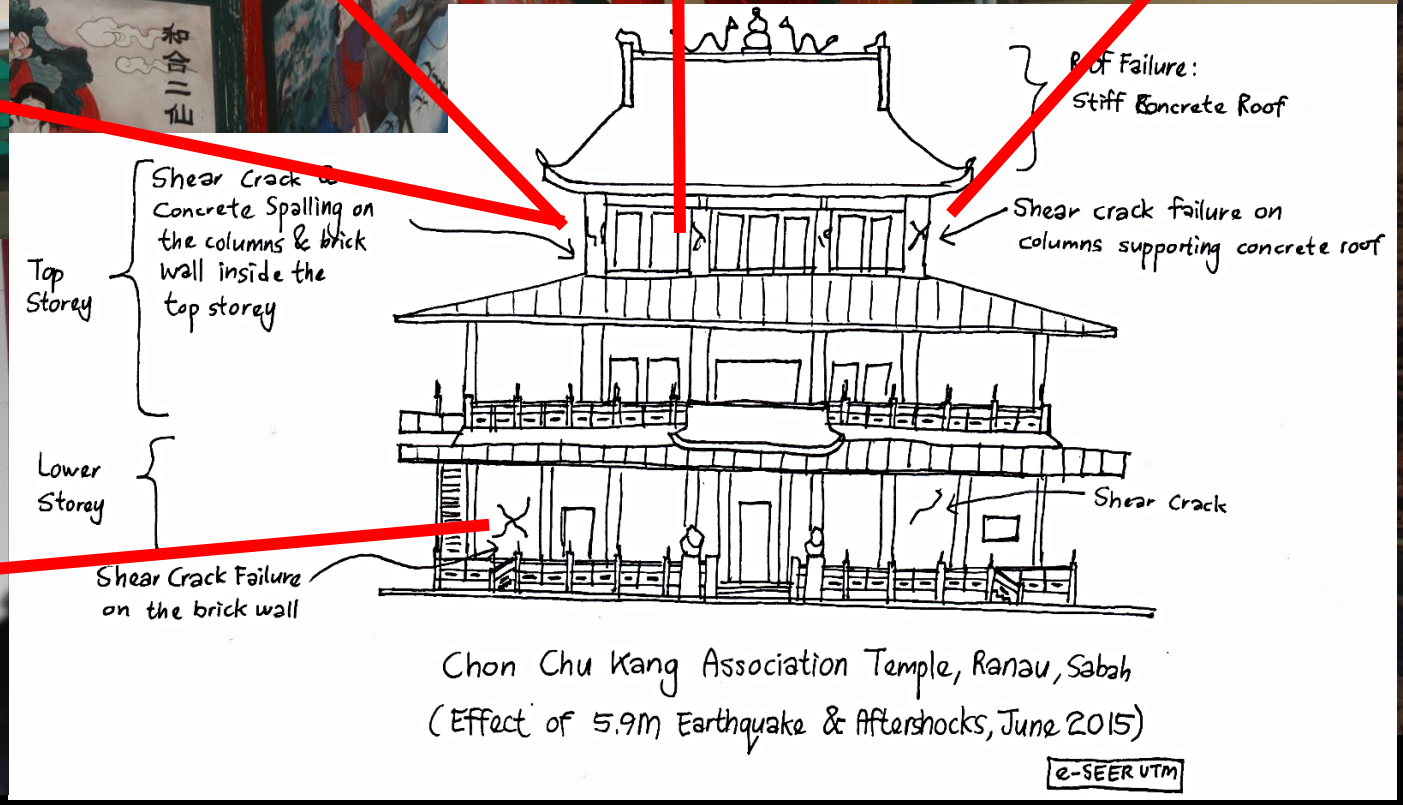

Open Area
Open Area
Open Area
Open Area
Open Area
Shear Crack on Brickwall
Shear Crack on Brick Wall
Ranau Hospital, Hostel Block A (Front View)
exposed reinforcements on beam-column connection near the stairwell
Beam
Stairwell
Column
Hairline crack from beam-column joint on most connections
Hairline Cracks
Spalling of Concrete Cover (Reinforcement not exposed)
Hole
Spalling of Concrete Cover (Brickwall exposed)
Concrete cover Spalling & Exposed brickwall
Exposed reinforcement overlap on beam-column connection
Hairline Crack
Wide Crack
Brick Wall


PUMP ROOM


Open Area
Open Area
Open Area
Open Area
Open Area
Shear Crack on Brickwall
Shear Crack on Brick Wall
Ranau Hospital, Hostel Block A (Front View)
exposed reinforcements on beam-column connection near the stairwell
Beam
Stairwell
Column
Hairline crack from beam-column joint on most connections
Hairline Cracks
Spalling of Concrete Cover (Reinforcement not exposed)
Hole
Concrete cover Spalling & Exposed brickwall
Hairline Crack
Wide Crack
Brick Wall

CHON CHU KUNG TEMPLE

PARK IR-WAN PLAYLISTS SEISMIC THREATS RANAU EARTHQUAKE



DREAM WORLD RESORT

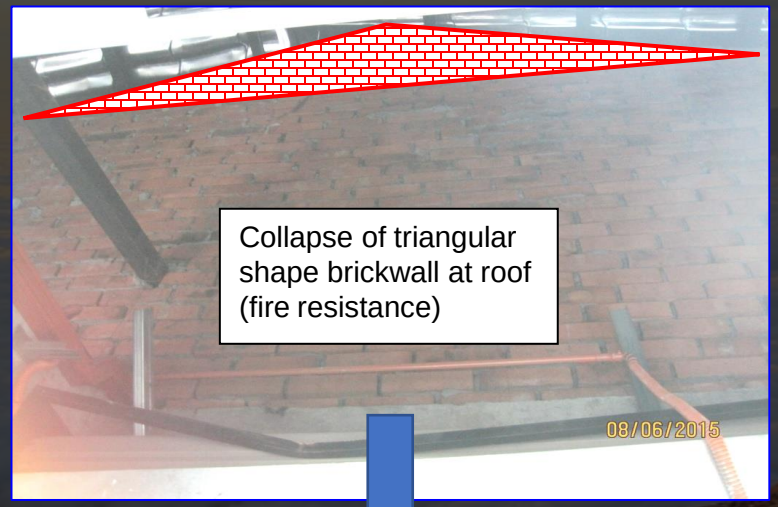
GOLF CLUB

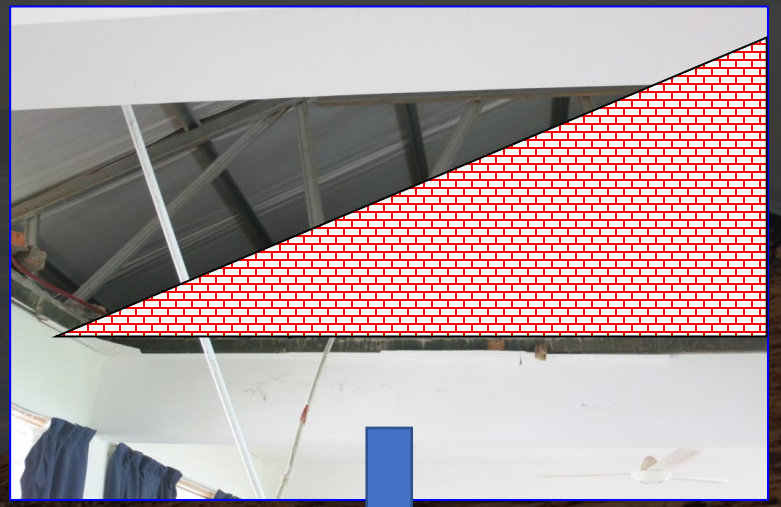
BUILDING DAMAGES CLASSIFICATION

- Damage on nonstructural elements
- Damage on beams
- Damage on columns
- Damage on beam-column joints

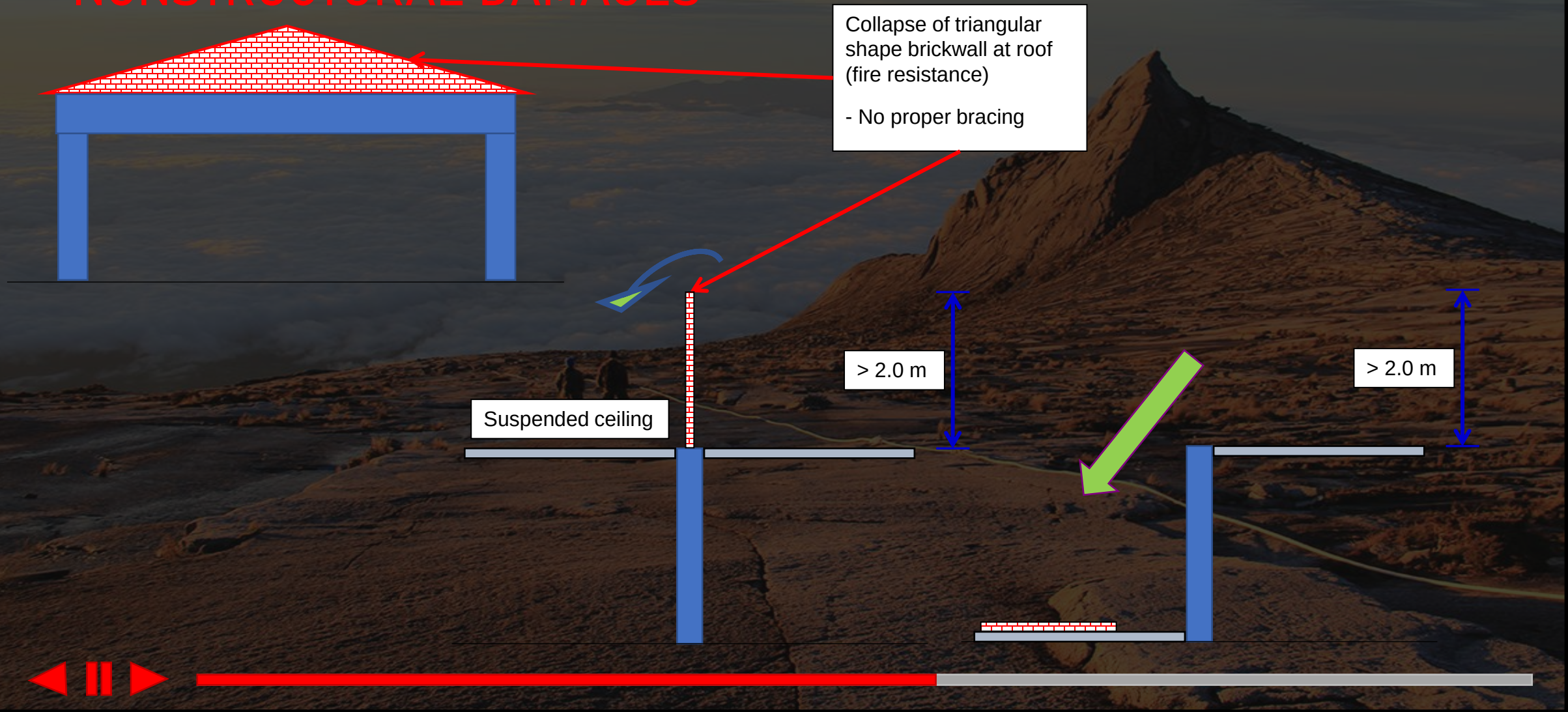
NONSTRUCTURAL DAMAGES - Brickwall

NONSTRUCTURAL DAMAGES





NONSTRUCTURAL DAMAGES



DAMAGE ON BEAMS

No critical damage

Hairline crack

Spalling of plaster

IPD RANAU

HOSPITAL RANAU

HOSPITAL RANAU

HOSPITAL RANAU

DAMAGE ON COLUMNS

Minor damage

Hairline crack

Spalling of plaster

IPD RANAU

IPD RANAU

SMK RANAU

CHON CHU KUNG TEMPLE

DAMAGE ON COLUMNS

Severe damage

Crack

Spalling of concrete cover

HOSPITAL RANAU

CHON CHU KUNG TEMPLE

CHON CHU KUNG TEMPLE

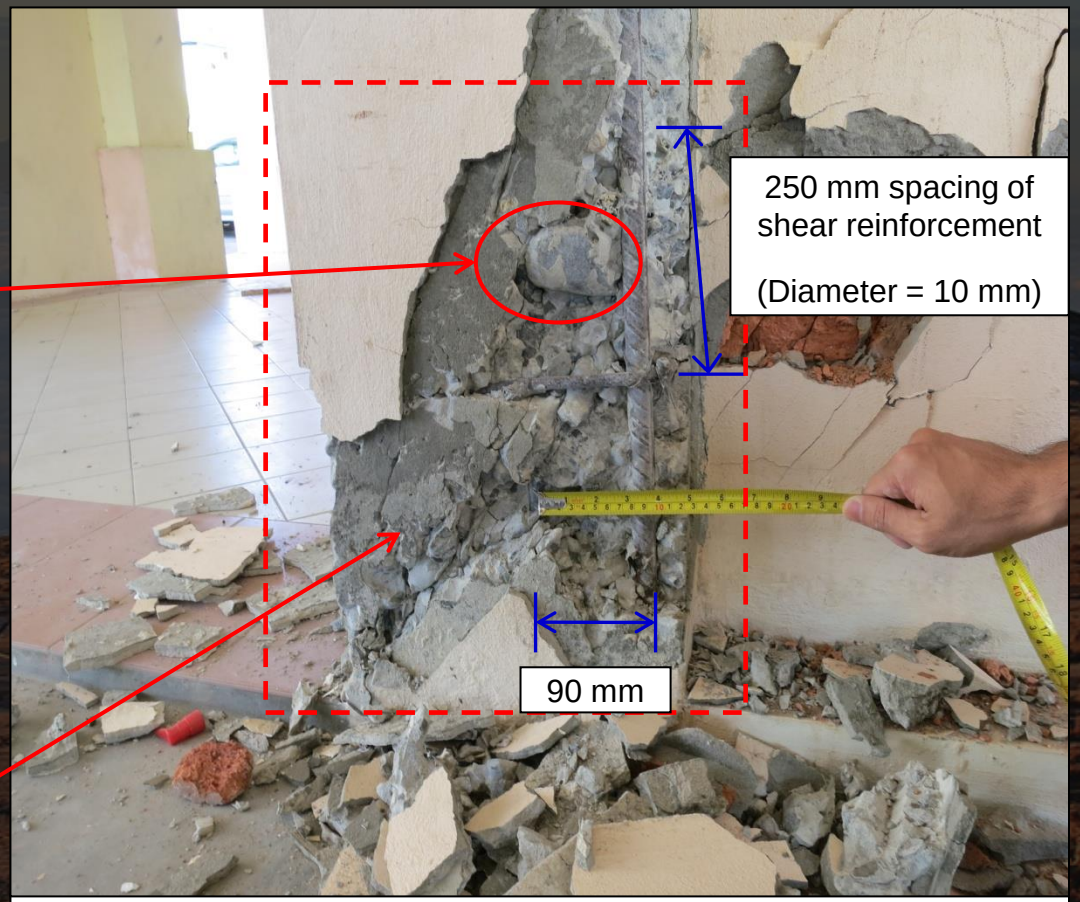
HOSPITAL RANAU

DAMAGE ON COLUMNS

Improper size and type of aggregate

Lack of confinement reinforcement in critical region

EC8: Max = 175 mm (DCM)



HOSPITAL RANAU (300 mm x 300 mm column)

DAMAGE ON COLUMNS

DREAM WORLD RESORT

DREAM WORLD RESORT

Total damage

Lack of confinement reinforcement in critical region

Buckling of reinforcement

Crushing of concrete core

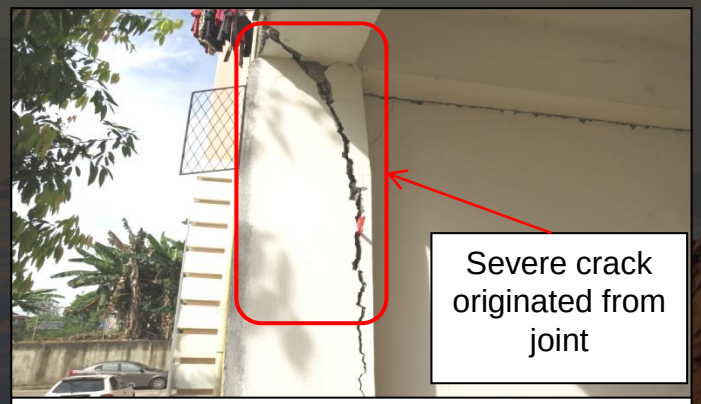
DREAM WORLD RESORT

DAMAGE ON JOINTS

Severe damage

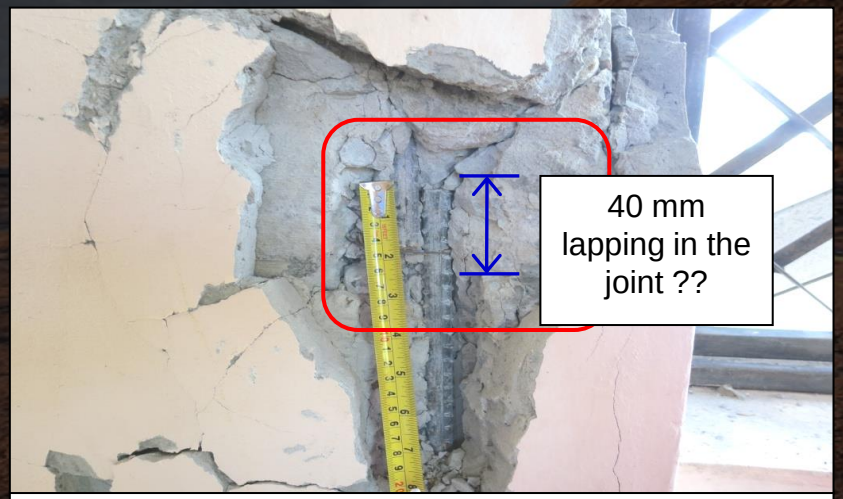
Crack

Spalling of concrete cover

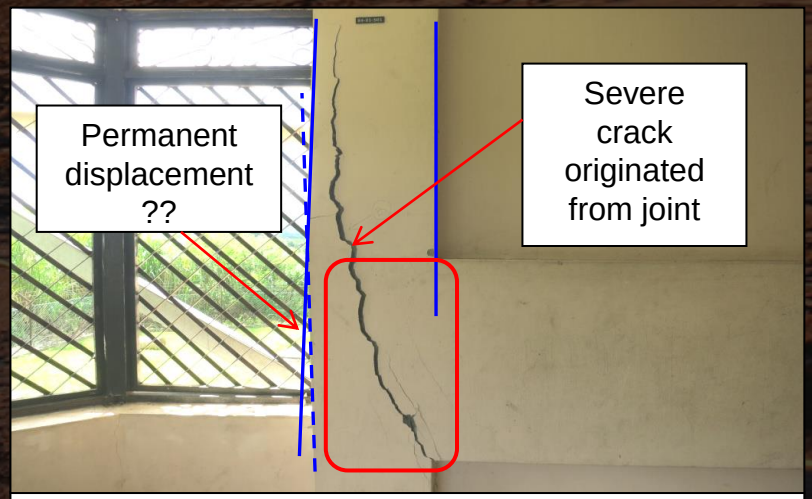


IPD RANAU

IPD RANAU



HOSPITAL RANAU

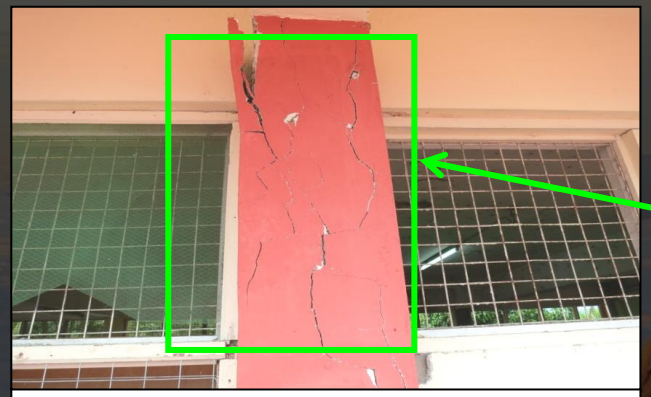


HOSPITAL RANAU

FAILURE MECHANISM

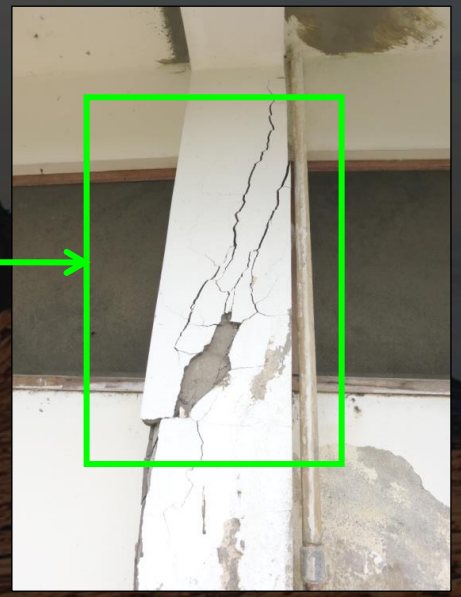
- Short Column Effect
- Soft Storey
- Pounding Effect

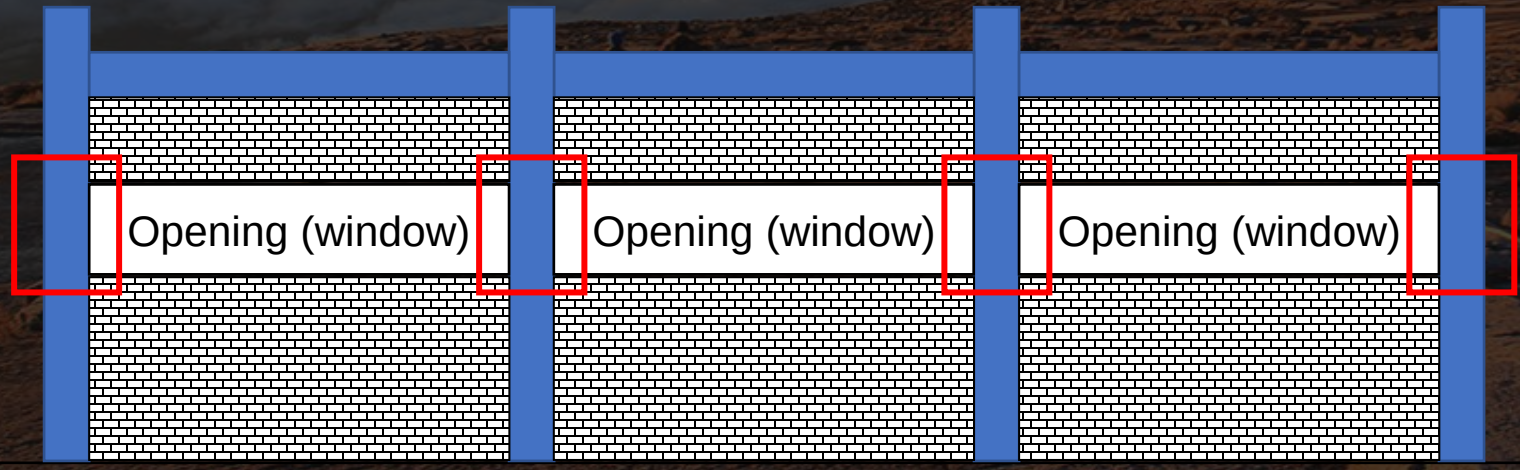
SHORT STOREY



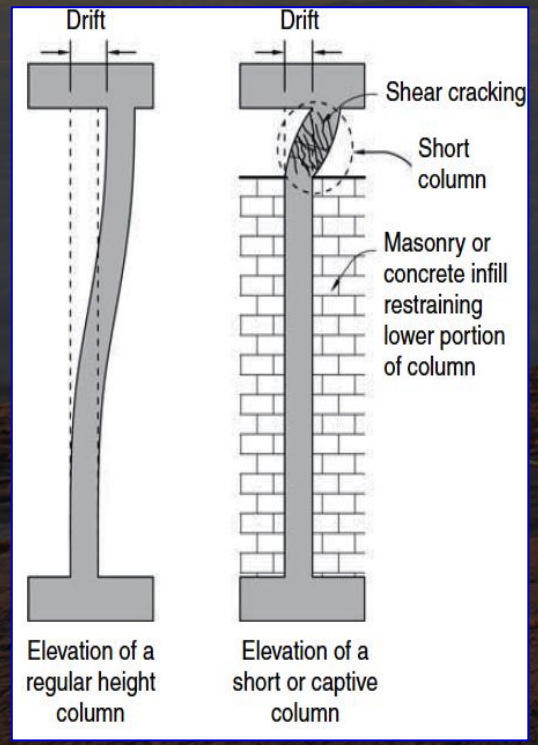
SMK MAT SALLEH RANAU

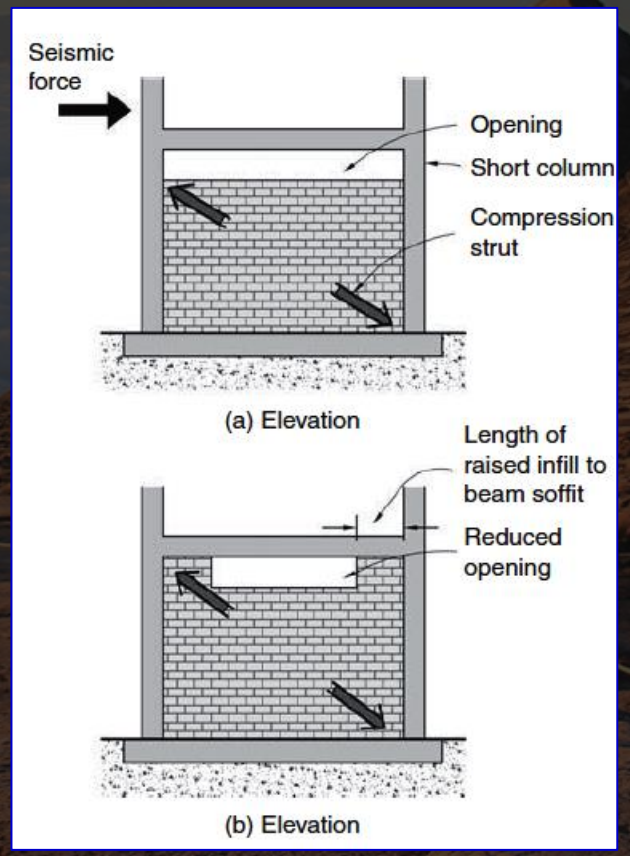
Severe crack





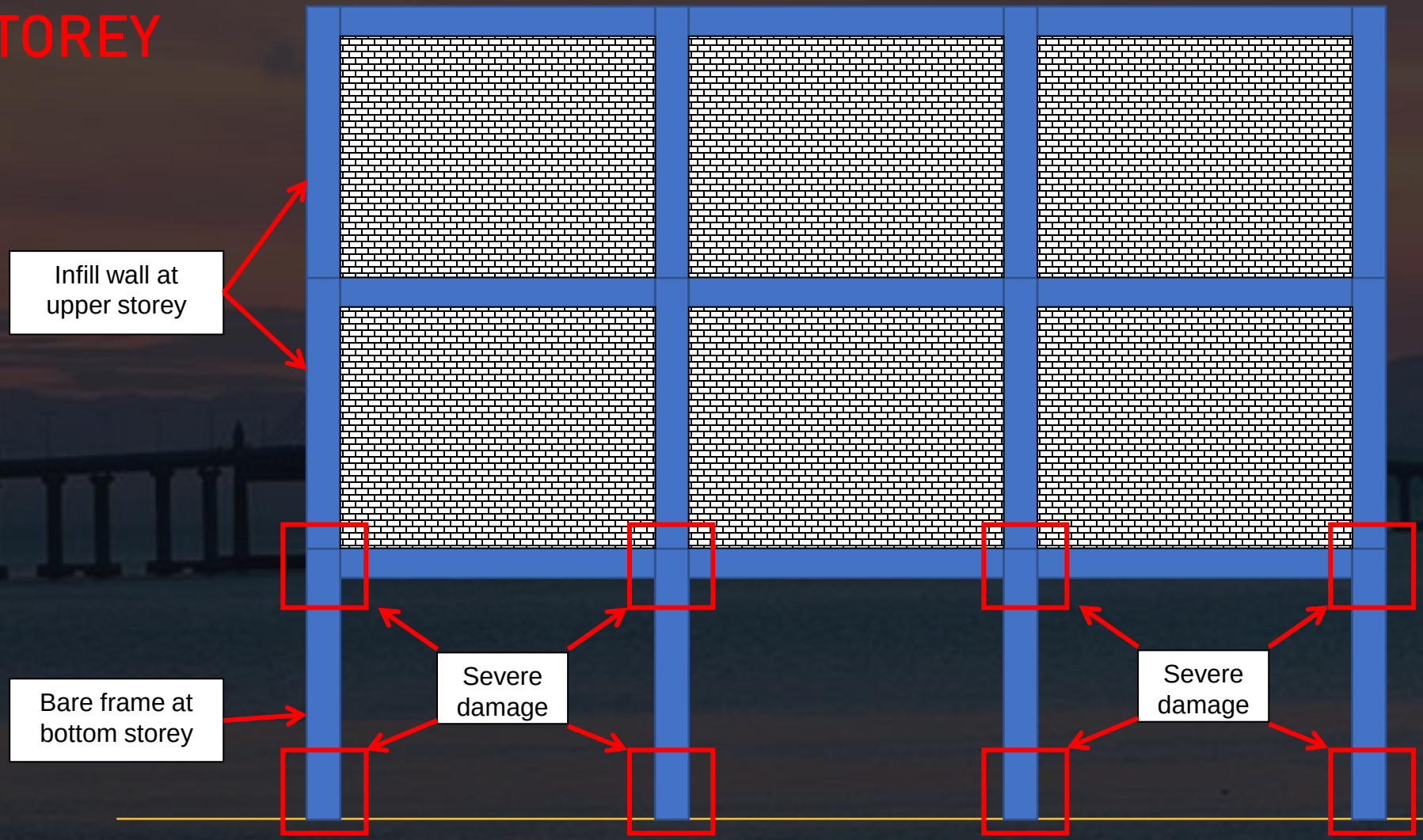
SHORT STOREY



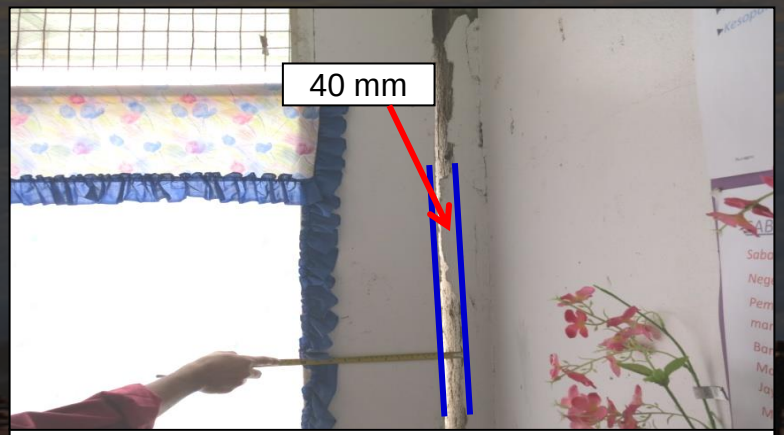


SOFT STOREY

SOFT STOREY


Infill wall at upper storey
Bare frame at bottom storey
Severe damage
Severe damage

POUNDING EFFECT

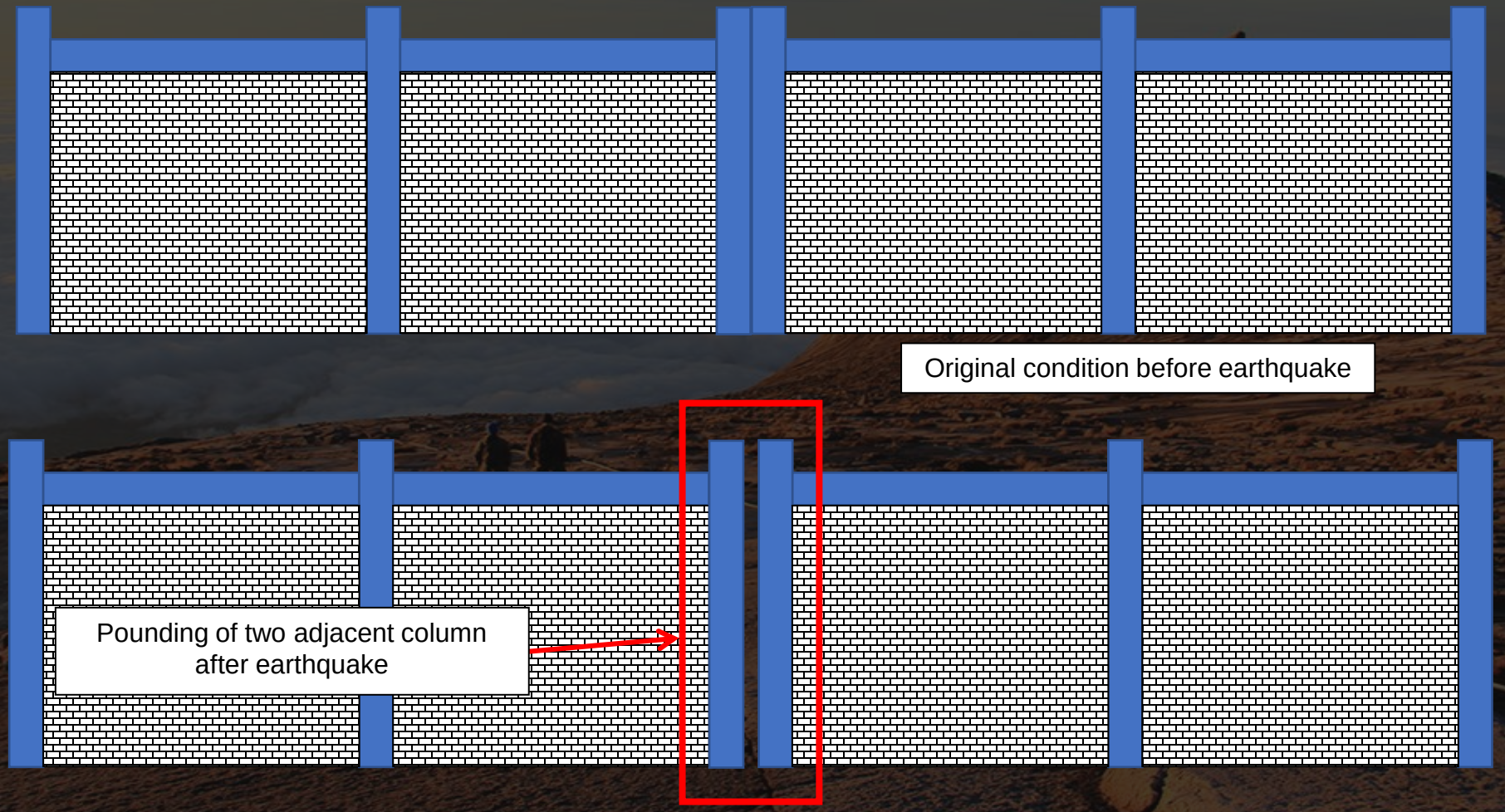


SMK MAT SALLEH RANAU

SMK MAT SALLEH RANAU

SMK MAT SALLEH RANAU

POUNDING EFFECT



PARK IR-WAN CHANNEL

PLAYLISTS SEISMIC THREATS RANAU EARTHQUAKE NATIONAL ANNEX

CONTENT

▶ Play + My List

EARTHQUAKE THREATS TO MALAYSIA

2015 RANAU EARTHQUAKE

NATIONAL ANNEX TO EUROCODE 8

ROAD TO SEISMIC DESIGN

All new Sabah buildings to be quake proof

By RUBEN SARIO

NATION

Monday, 10 Apr 2017 12:00 AM MYT

KOTA KINABALU: Sabah is finalising a building code requiring all new structures, especi... high-rise buildings, to be earthquake pro...

Adopt guidelines for earthquake resistant buildings

Published on: Saturday, October 14, 2017

Text Size: + -

By Datuk Seri Panglima Wilfred Madius Tangau
It was devastating yet not too surprising to learn of the two p... only two weeks last month.

The first occurred on 8th September with a magnitude of 8.1

After the first quake, the worst-hit states of Tabasco, Oaxaca ... a million faced power cuts and many families were displaced ... both quakes – at 65 and 370 respectively according to latest ... earthquake that was said to have taken the lives of almost 1...

Bangunan di Lahad Datu perlu tahan gempa

Mohd Izham Unnip Abdullah - Ogos 26, 2015 @ 12:03am
thaddius@bh.com.my

PELAN pembangunan yang sebelum ini tidak menitikberatkan soal ancaman gempa bumi, akan dikaji semula untuk disesuaikan dengan situasi pergerakan bumi di Lahad Datu, Sabah.

Sebagai langkah awal, satu prosedur operasi standard (SOP) akan diwujudkan sebagai panduan pihak berkuasa tempatan (PBT) dan pemaju melaksanakan projek pembangunan.

Borneo

Garis panduan reka bentuk bangunan tahan gempa bumi di Sabah

October 10, 2017

KOTA KINABALU, 9 Okt – Kementerian Kerajaan Tempatan dan Perumahan (KKTP) Sabah dan Jabatan Standard Malaysia (JSM) hari ini menandatangani Memorandum Persefahaman (MoU) bagi penyediaan garis panduan serta pembangunan Standard Malaysia (MS) untuk kod reka bentuk bangunan tahan gempa bumi, di sini.

ROAD TO SEISMIC DESIGN

MALAYSIA NATIONAL ANNEX TO EUROCODE 8

- ✓ Developed by series of discussion among local experts between 2016 – 2017.
- ✓ The standard will be revised every 5 years

ROAD TO SEISMIC DESIGN

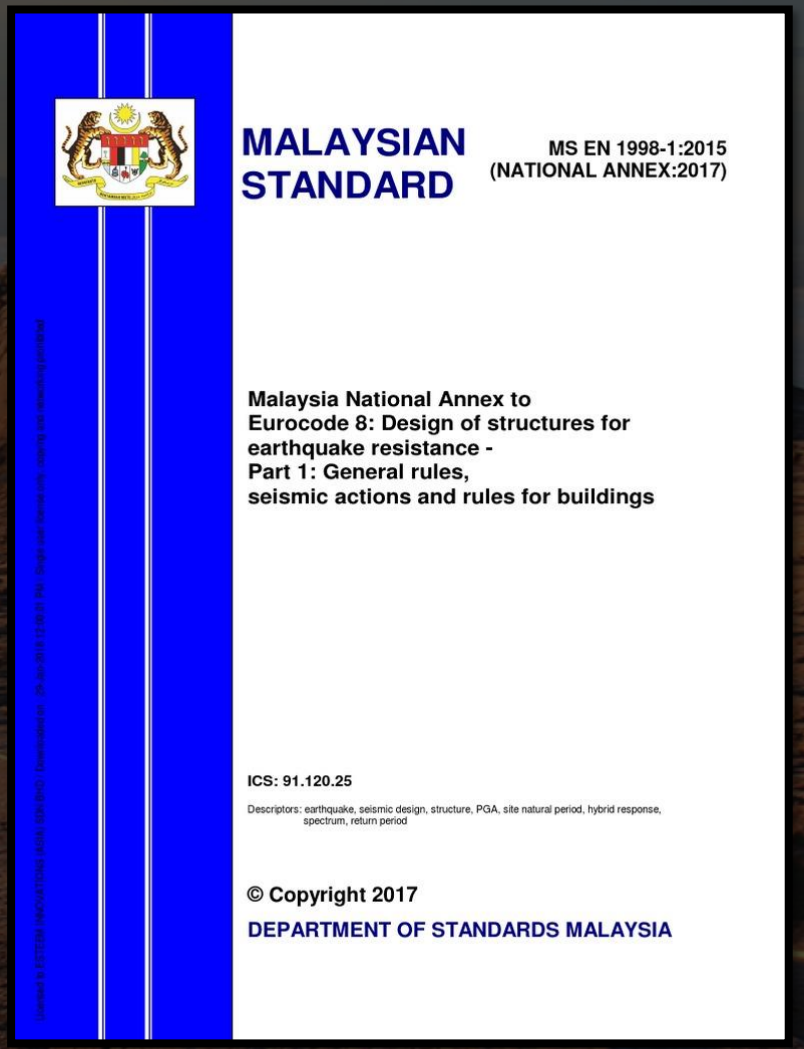
MALAYSIA NATIONAL ANNEX TO EUROCODE 8

KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

KENYATAAN MEDIA

YB DATUK SERI PANGLIMA WILFRED MADIUS TANGAU
MENTERI SAINS, TEKNOLOGI DAN INOVASI
NOVEMBER 2017

MOSTI BANGUNKAN STANDARD BAGI REKA BENTUK STRUKTUR BANGUNAN YANG TAHAN GEMPA BUMI


MALAYSIAN STANDARD

MS EN 1998-1:2015
(NATIONAL ANNEX:2017)

Malaysia National Annex to Eurocode 8: Design of structures for earthquake resistance - Part 1: General rules, seismic actions and rules for buildings

ICS: 91.120.25

Descriptors: earthquake, seismic design, structure, PGA, site natural period, hybrid response, spectrum, return period

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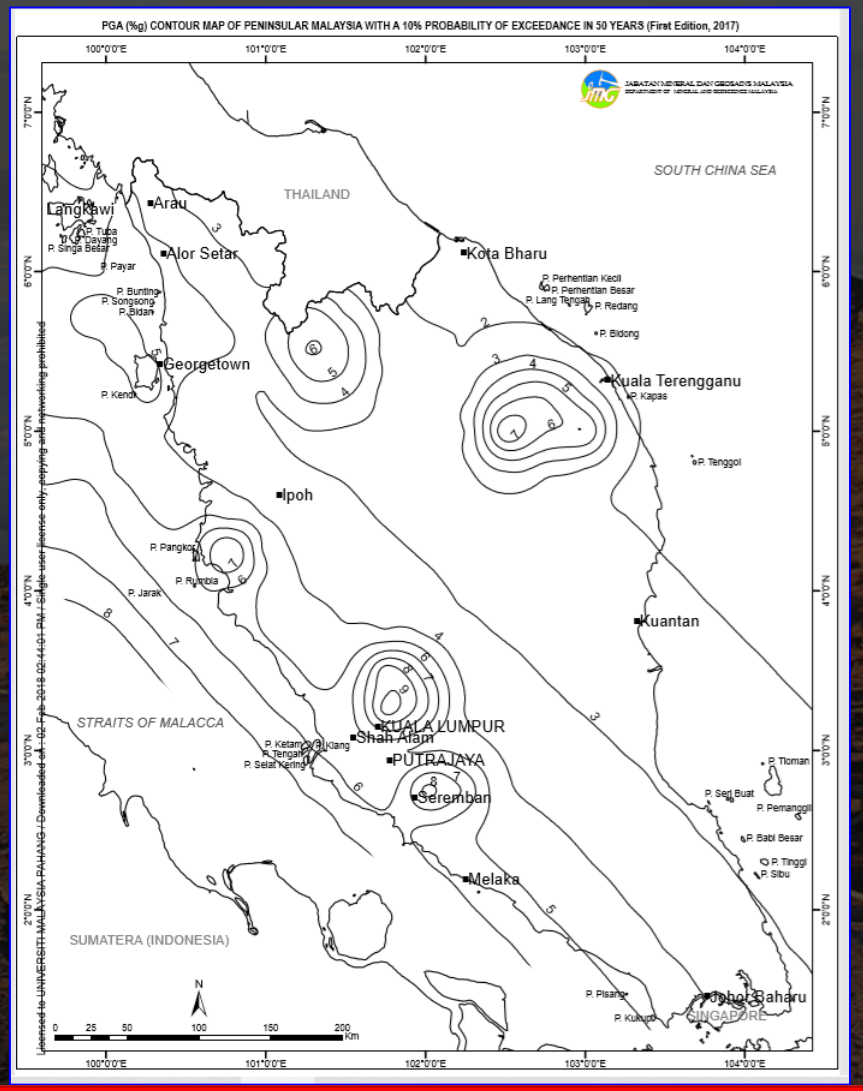
DEPARTMENT OF STANDARDS MALAYSIA

SEISMIC HAZARD MAP

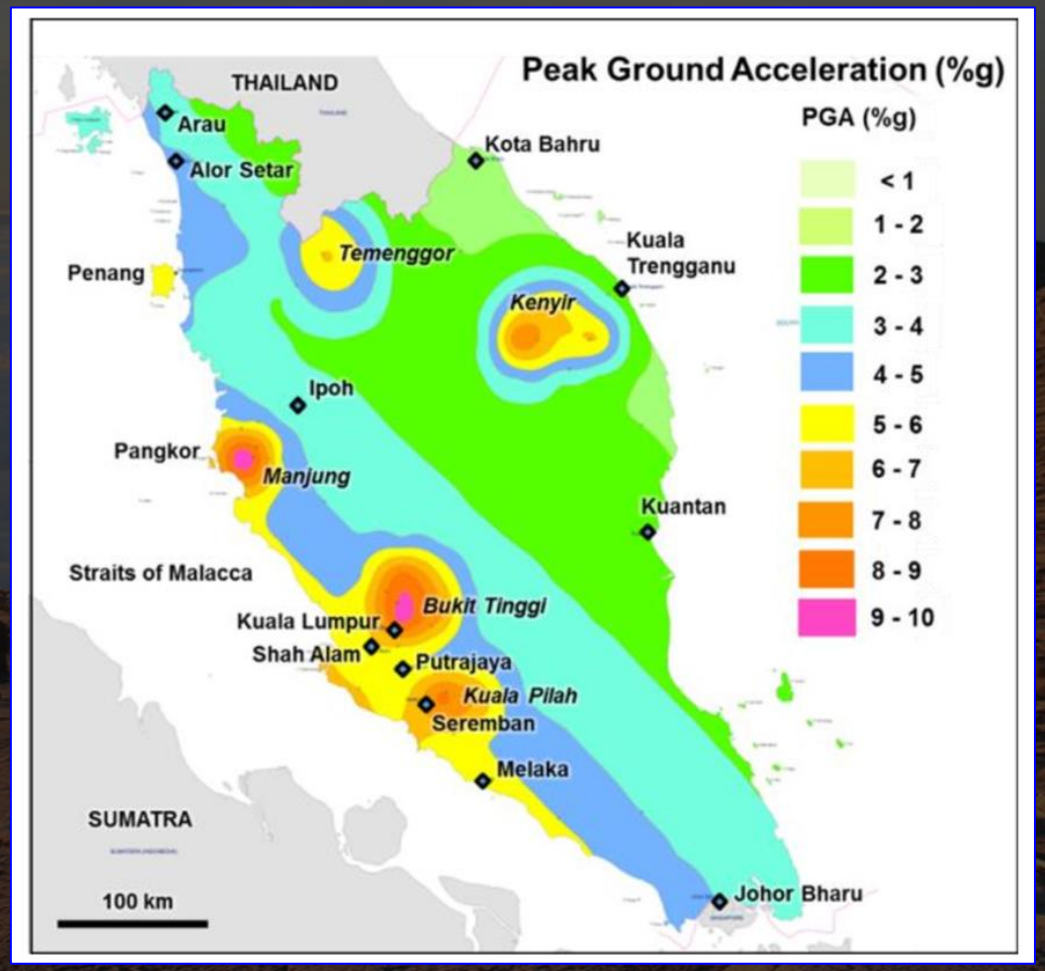
Peninsular Malaysia (10% PE in 50 years)

a_{gR} = 0.02g to 0.09g

Design to ductility class low or medium



CLASS OF DUCTILITY



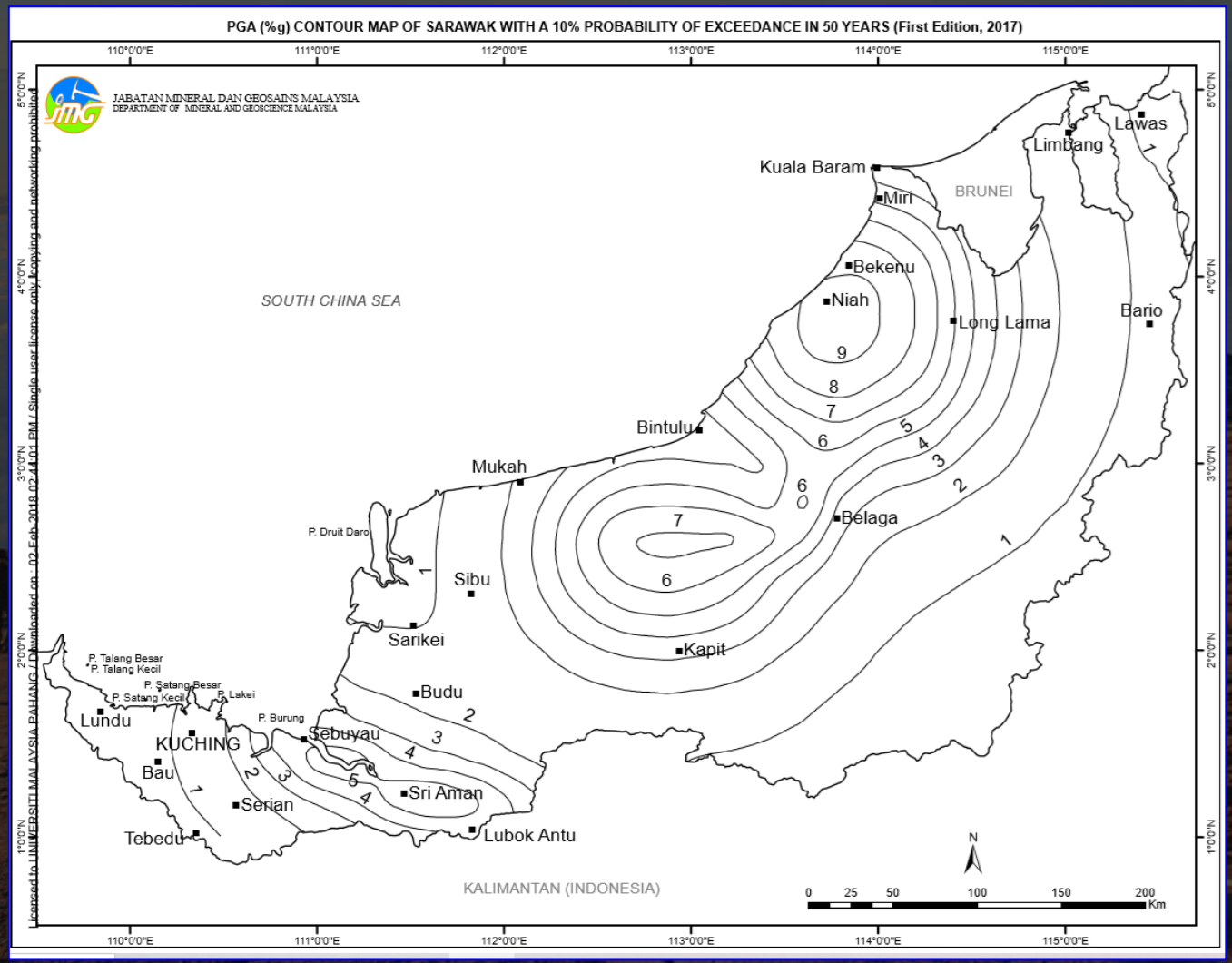
(JMG, 2018)

SEISMIC HAZARD MAP

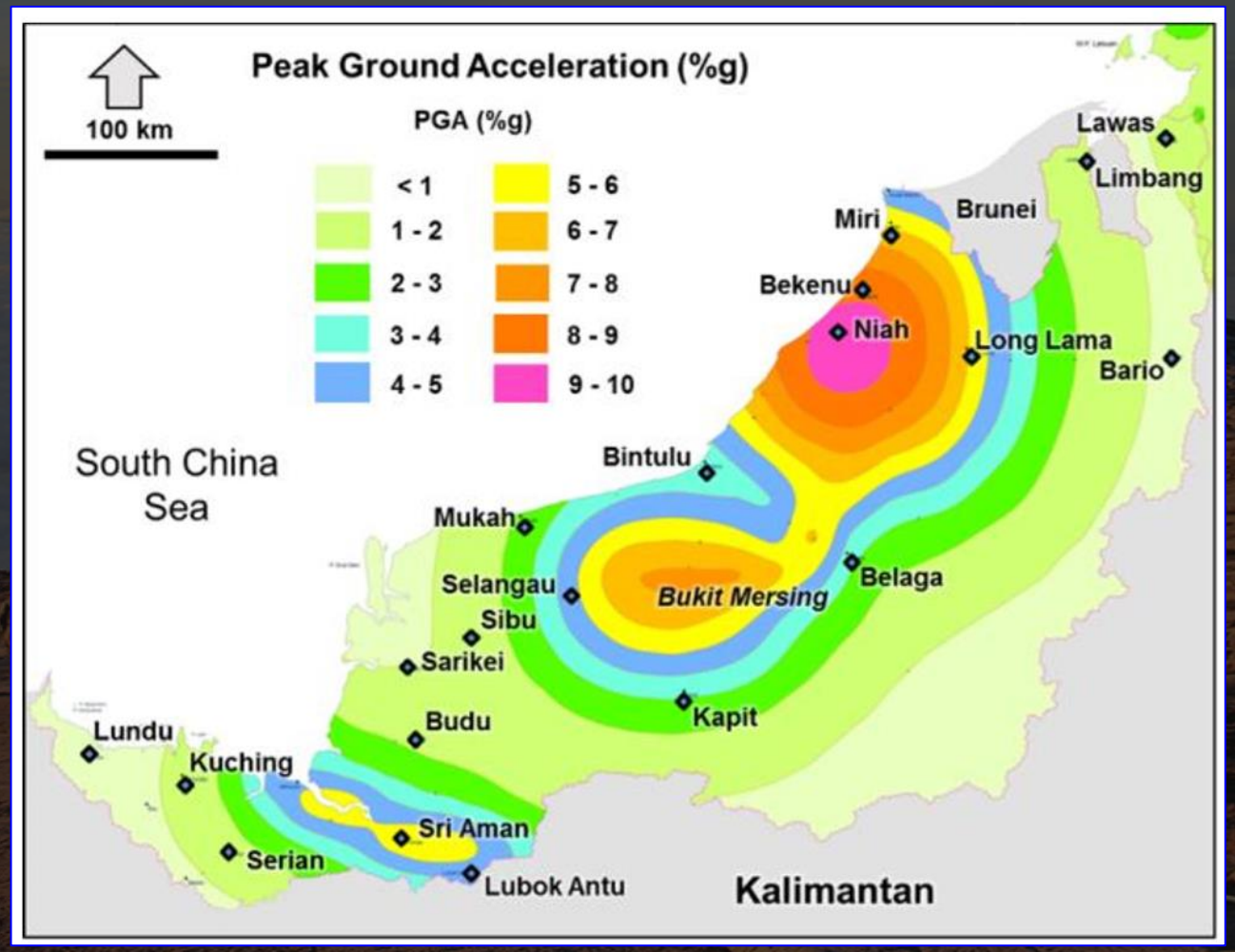
Sarawak (10% PE in 50 years)

a_{gR} = 0.02g to 0.09g

Design to ductility class low or medium



CLASS OF DUCTILITY



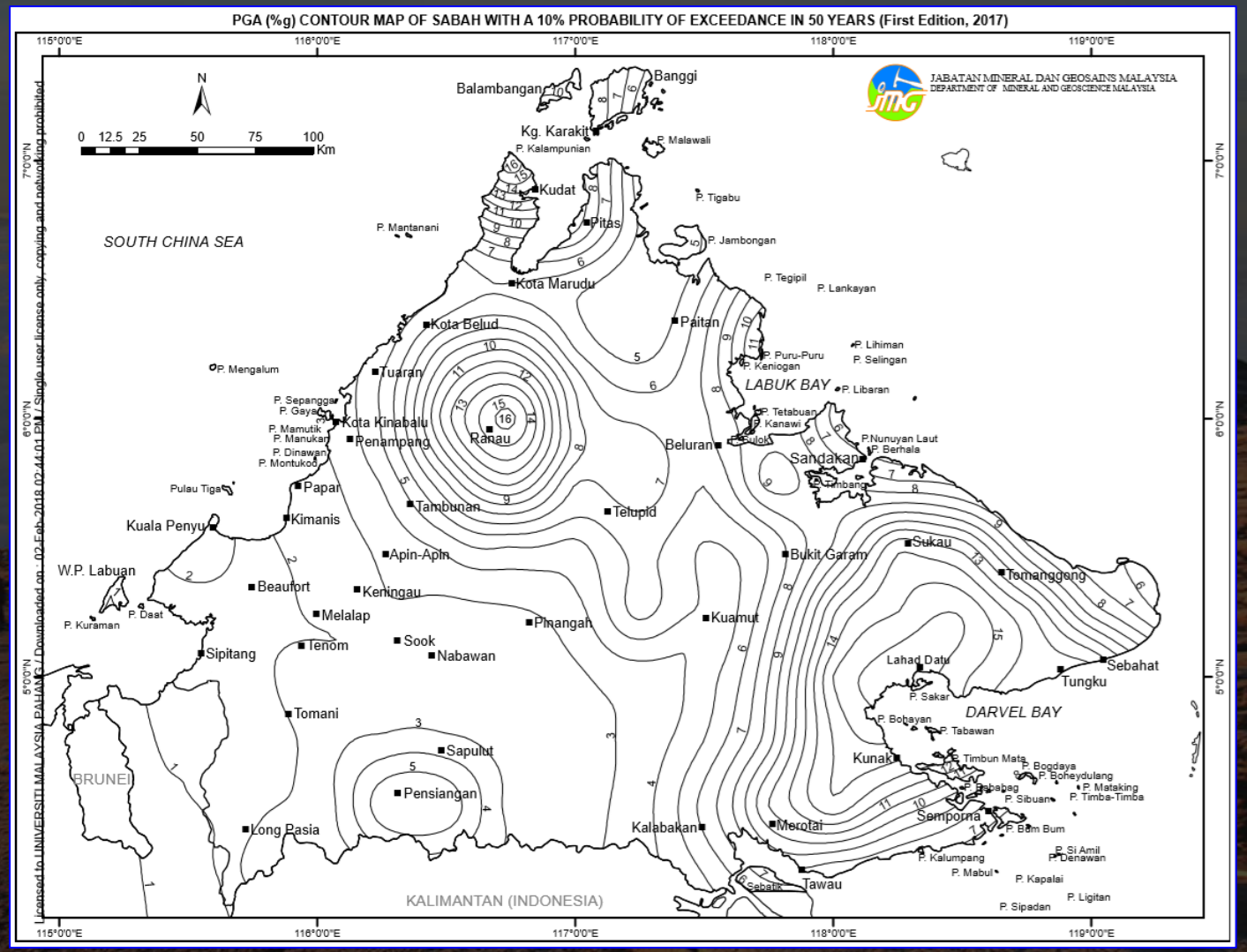
(JMG, 2018)

SEISMIC HAZARD MAP

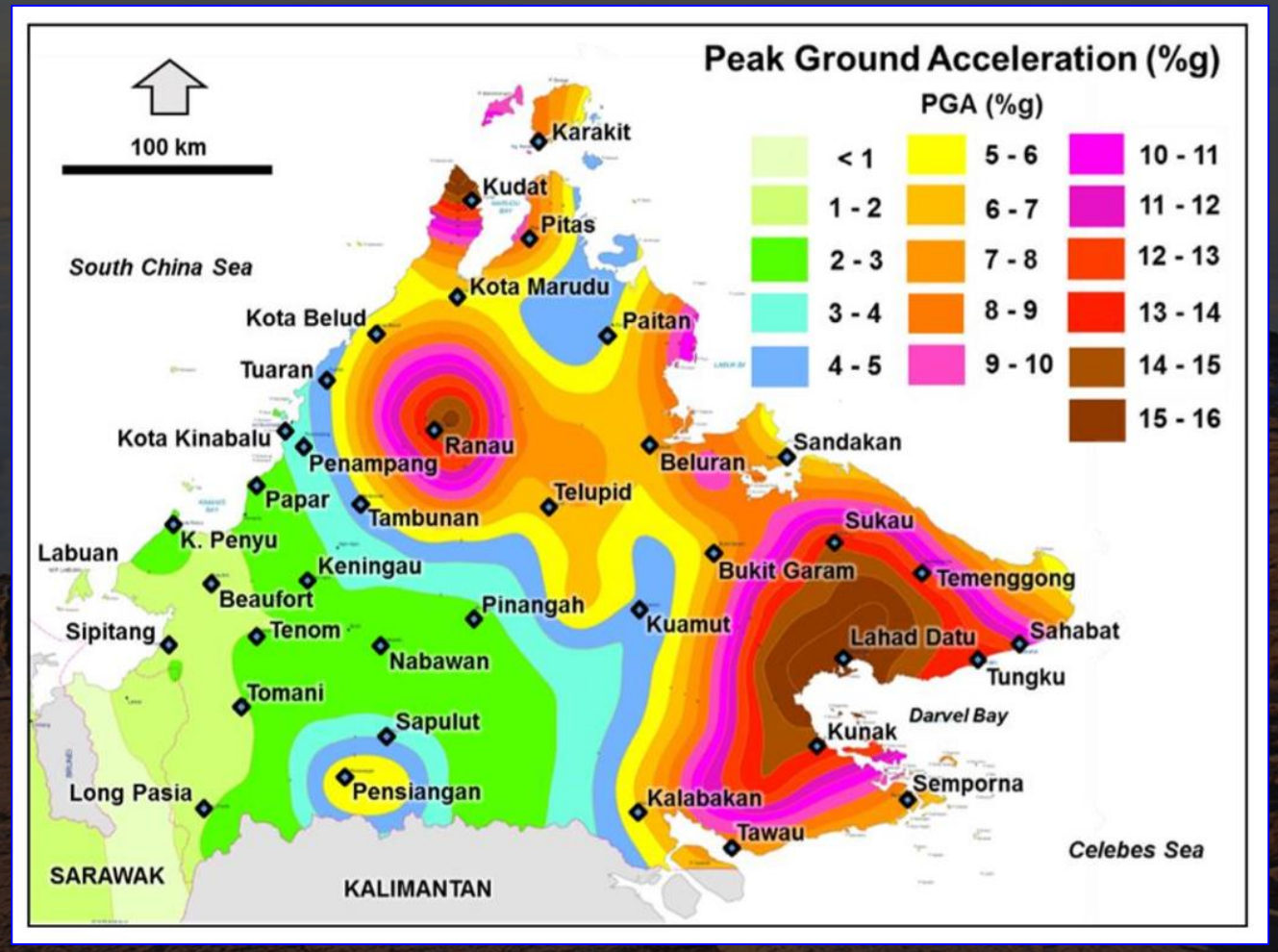
Sabah (10% PE in 50 years)

a_{gR} = 0.01g to 0.16g

Design to ductility class low or medium



CLASS OF DUCTILITY



(JMG, 2018)

IMPORTANCE CLASSES & IMPORTANCE FACTOR, γ_I

Recommended by Eurocode 8 (2004)

Table 4.3 Importance classes for buildings

Importance class	Buildings
I	Buildings of minor importance for public safety, e.g. agricultural buildings, etc.
II	Ordinary buildings, not belonging in the other categories.
III	Buildings whose seismic resistance is of importance in view of the consequences associated with a collapse, e.g. schools, assembly halls, cultural institutions etc.
IV	Buildings whose integrity during earthquakes is of vital importance for civil protection, e.g. hospitals, fire stations, power plants, etc.

NOTE Importance classes I, II and III or IV correspond roughly to consequences classes CC1, CC2 and CC3, respectively, defined in EN 1990:2002, Annex B.

Recommended by National Annex (2017)

Table E.1. Importance factor (γ_I) for Malaysia

Building importance class	Importance factor 1 (γ_I)	Recommended building categories
I	0.8	Minor construction
II	1.0	Ordinary buildings (individual dwellings or shops in low rise buildings)
III	1.2	Buildings of large occupancies (condominiums, shopping centres, schools and public buildings)
IV	1.5	Lifeline built facilities (hospitals, emergency services, power plants and communication facilities)

SOIL FACTOR, *S*

Recommended by Eurocode 8 (2004)

Ground type	S	T_B (s)	T_C (s)	T_D (s)
A	1.0	0.15	0.4	2.0
B	1.2	0.20	0.5	2.0
C	1.15	0.20	0.6	2.0
D	1.35	0.20	0.8	2.0
E	1.4	0.15	0.5	2.0

Recommended by National Annex (2017)

Peninsular:

Ground type	S	T_B (s)	T_C (s)	T_D (s)
A	1	0.05	0.2	2.2
B	1.4	0.05	0.3	2.2
C	1.15	0.05	0.5	2.2
D	1.35	0.3	0.8	2.2
E	1.4	0.15	0.5	2.2

Sabah:

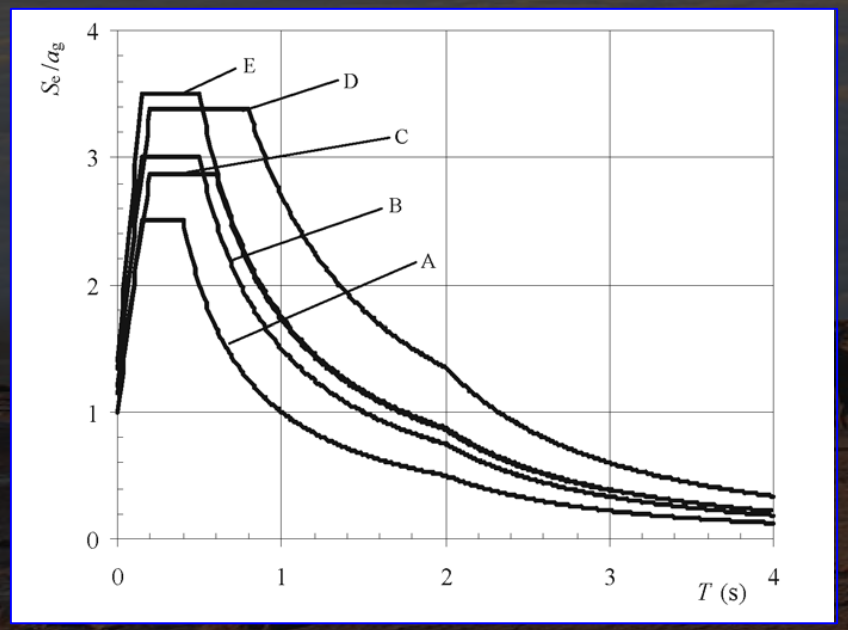
Ground type	S	T_B (s)	T_C (s)	T_D (s)
A	1	0.1	0.4	2
B	1.4	0.15	0.4	2
C	1.35	0.15	0.6	2
D	1.35	0.2	0.8	2
E	1.4	0.15	0.5	2

Sarawak:

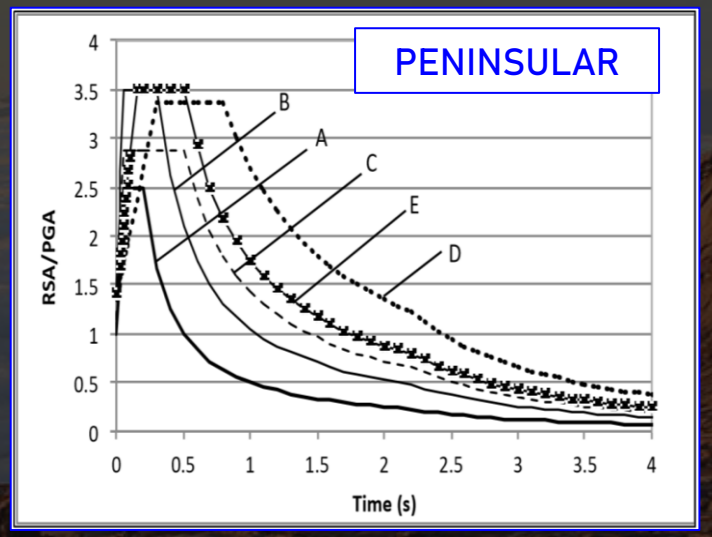
Ground type	S	T_B (s)	T_C (s)	T_D (s)
A	1	0.05	0.5	1.2
B	1.2	0.15	0.5	1.2
C	1.3	0.2	0.5	1.2
D	1.35	0.2	0.5	1.2
E	1.4	0.15	0.5	1.2

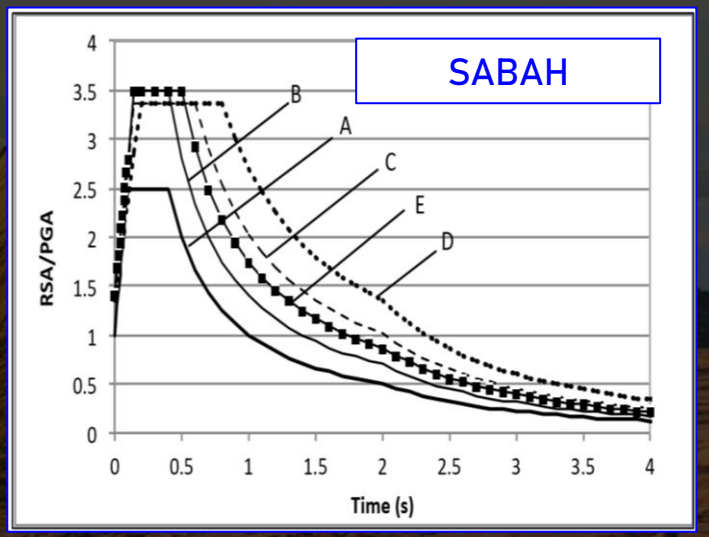
ELASTIC RESPONSE SPECTRUM

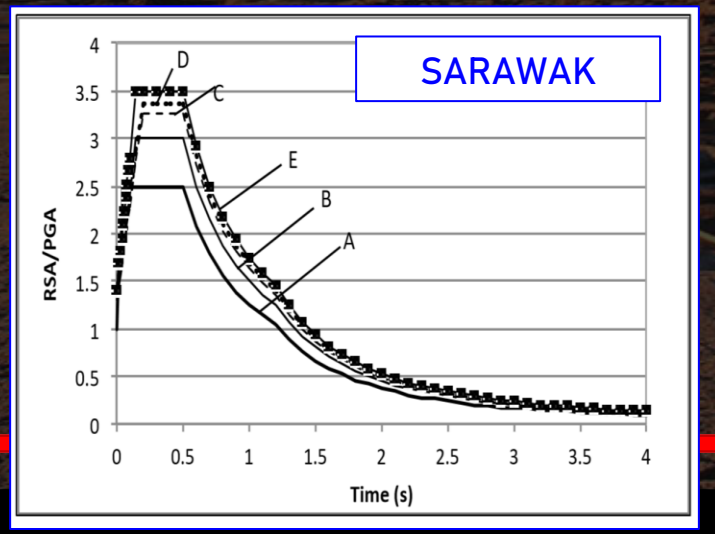
Recommended by Eurocode 8 (2004)



Recommended by National Annex (2017)







PARK IR-WAN CHANNEL

HOME PLAYLISTS INTRODUCTION METHOD RESULTS CONCLUSION

THANK YOU FOR WATCHING!

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