BENGKEL KONSULTATIF PELAN SAINS, TEKNOLOGI, INOVASI BAGI PENGURANGAN RISIKO BENCANA DRR (STI4DRR)

TAKLIMAT

STI FOR LANDSLIDE HAZARDS

Zamri Ramli

Jabatan Mineral Dan Geosains Malaysia

ISNIN | 24 JULAI 2017 | 8.30pagi -5.00 Petang
KELAB GOLF DANAU KOTA, UKM BANGI
LANDSLIDE OVERVIEW IN MALAYSIA


✅ Extreme climate, rapid urbanization, excessive anthropogenic activity and environmental degradation increase our exposure to natural hazards

“Expected to lose an additional RM 17 billion in the next 25 years if comprehensive mitigation plan is not seriously taken into account”

Since 1973:
- More than 400 landslides reported
- More than 600 fatalities
- RM 3 billions economic loss
Landslide prone areas in Malaysia

Detailed mapping on slope hazard and risk

(source: NSMP, 2009)
Spatial Landslide Hazard and Risk Assessment Framework

Crucial to address the issues and solutions in a comprehensive and effective data management to assist decision-making system.

Need a fast, accurate, efficient, cost effective, low-labor, reliable mapping and analyzing tool

Driven by the state of art-of-the-art SCIENCE, TECHNOLOGY & INNOVATION

Foster Disaster Risk Reduction (DRR)
LANDSLIDE AND ADVANCED LiDAR TECHNOLOGY
Implementation Framework for Landslide Hazard and Risk Mapping

Risk = Probability of losses occurring
Risk = Hazard * Exposure * Vulnerability
= Temporal Probability = Consequences or losses
= Temporal Probability

Degree of loss to Elements-at-Risk
Quantification of Elements-at-Risk

Hazard
- Temporal probability
- Duration
- Time of onset
- Type of hazard

Hazard Intensity
- Spatial extent
- Initiation
- Spreading/runout

Vulnerability
- Vulnerability function

Exposure
- Spatial overlay of hazard and elements at risk

Elements-at-Risk
- Type of Elements-at-Risk
- Temporal variation
- Quantification
  - Number
  - Economic value
- Location

Technical and professional expertise from several fields: Engineering geology, geotechnical engineering, land survey, remote sensing (LiDAR) and geospatial.
### TOTAL INVENTORY

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area</td>
<td>1350 km²</td>
</tr>
<tr>
<td>Landslides</td>
<td>2188</td>
</tr>
<tr>
<td>Slopes</td>
<td>7410</td>
</tr>
<tr>
<td>Critical Slopes</td>
<td>262</td>
</tr>
</tbody>
</table>

### BIL AREA (KM²)

<table>
<thead>
<tr>
<th>BIL</th>
<th>AREA (KM²)</th>
<th>INVENTORY</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Selangor (650 km²) (North and South)</td>
<td>Landslides</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slopes</td>
<td>5003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical Slopes</td>
<td>153</td>
</tr>
<tr>
<td>2</td>
<td>Pahang Cameron Highlands (275 km²)</td>
<td>Landslides</td>
<td>626</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slopes</td>
<td>1214</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical Slopes</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>Perak Ipoh (200 km²)</td>
<td>Landslides</td>
<td>223</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slopes</td>
<td>206</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical Slopes</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>Sabah Kota Kinabalu (155 km²)</td>
<td>Landslides</td>
<td>258</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slopes</td>
<td>868</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical Slopes</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>Kundasang (70 km²)</td>
<td>Landslides</td>
<td>1084</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Slopes</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Critical Slopes</td>
<td>30</td>
</tr>
</tbody>
</table>

### National Landslide and Slope Inventory (2014-2016)

PROJEK PBRC CAMERON HIGHLANDS
275 km²
This sophisticated and advanced system will be offering many datasets and outputs, which will be utilised by stakeholders from the federal government, state government agencies, local councils and the public.
STI Towards A Resilient Community

Before disaster: Recovery after disaster

During:
- Planning for DRR (disaster preparedness, capacity building and risk reduction)

Post Disaster:
- Proposing solutions/mitigations (short-term)
- Proposing solutions/mitigations (long-term)

Immediate: (recovery and adaptation to disasters)

1 - 3 years:
- More than 3 years:

Disaster / Disturbances:
- Community
- Local entrepreneurs
- Government agencies
- Universities (Facilitator)
- NGOs

From highly vulnerable:
- Disaster Resilient Community Action Plan, early warning system, training and capacity building, risk and hazard mapping, indicators for monitoring

Monitoring of progress (Short-term):
- Problem solution
- Development projects/programs

Feedback / Review:

Monitoring of progress (Long-term):
- Problem solution
- Development projects/programs

Feedback / Review:

to higher level of preparedness and response

Review / improvement / adjustment
Cabaran memperkasakan STI

- Kesukaran menterjemahkan pengetahuan sains kepada dasar dan garispanduan pelaksanaan (sumber Komoo, 2017)
  - Maklumat terkumpul lengkap...respon polisi masih terbatas dan tidak selari dengan pengetahuan yang telah terkumpul.
  - Kurang kerjasama antara para saintis dengan pembuat dan pelaksana dasar
  - Kurangnya kemahiran untuk mengolah dapanan sains menjadi dokumen pengaruh dasar

- Akses dan Penyelarasan Maklumat Inter Agensi
- Kekangan Bajet
SYOR memperkasakan STI Bahaya Tanah Runtuh

- Pemakaian Elemen STI Dalam Garis Panduan/Polisi/Akta
- Penglibatan Pelbagai Disiplin Kepakaran (*dedicated group*)
- **Multi Engagement** (termasuk Perkukuhkan jaringan dan galakkan dialog serta kerjasama di kalangan pakar-pakar bencana, teknikal dan saintifik, perancang pihak-pihak berkepentingan (stakeholders) dgn komuniti yang terlibat)
- **Penyelidikan dan Pembangunan** (Lebih banyak penyelidikan yang serius, bersepadu dan beritegrasi dengan menggunakan pendekatan pelbagai disiplin)
- **Amaran Awal** (cerun-cerun yang kritikal menyebabkan bencana, melakukan pemantauan dan penyebaran maklumat)
- **Mitigasi** (Memberi Penekanan kepada Kawalan Bukan Struktur Berbanding Kawalan Struktur)
LANDSLIDE HAZARDS

Science and Technology

TERIMA KASIH... zamri@jmg.gov.my