Comparative Risk Assessment – Exercise

Penilaian Risiko Komparatif - Latihan

STRENGTHENED INDONESIAN RESILIENCE
StIRRRA
REDUCING RISK FROM DISASTERS

Sumbawa DRR Action Plan Workshop

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3 – 5 August 2015

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Moving from Hazard to Risk
Merubah Kerawanan menjadi Risiko

- A greater consideration of *Impacts* pertimbangan yang lebih besar terhadap *dampak*
- *Relative* or *comparative* risk assessment allows us to compare earthquakes with tsunamis (‘apples’ with ‘bananas’) penilaian risiko secara relatif atau komparatif memungkinkan kita membandingkan gempa dengan tsunami (‘apel’ dengan ‘pisang’)

First step – basic risk analysis
Langkah pertama – analisis risiko dasar

Likelihood of Occurrence	Consequence				
	1	2	3	4	5
	Insignificant	Minor	Moderate	Major	Catastrophic
(A) Almost Certain	Moderate	High	Very High	Extreme	Extreme
(B) Likely	Low	Moderate	High	Very High	Extreme
(C) Possible	Low	Moderate	Moderate	High	Very High
(D) Unlikely	Very Low	Low	Moderate	High	Very High
(E) Rare	Very Low	Very Low	Low	Moderate	High

Source: Auckland CDEM Group Plan: Draft: 2010-2015

Based on: Qualitative Risk Analysis Matrix (AS/NZS ISO 31000:2009)

Hazard	Risk Analysis		
	Likelihood	Consequence	Risk Rating
Lifeline Utility Failure: Electricity	C	5	Very High
Human Epidemic	C	5	Very High
Volcanic Eruption: Distant Source Eruption	B	4	Very High
Cyclone	B	4	Very High
Flooding: River/Rainfall	A	3	Very High
Erosion: Coastal Cliff	A	3	Very High
Erosion: Landslide/ Land Instability	A	3	Very High
Volcanic Eruption: Auckland Volcanic Field	E	5	High
Animal Disease/Epidemic	C	4	High
Crash: Aircraft	C	4	High
Earthquake	D	4	High
Lifeline Utility Failure: Water/Waste	C	4	High
Hazardous Substance Spill	B	3	High
Introduced Species/Pests	C	3	Moderate
Lifeline Utility Failure: Communications	C	3	Moderate
Lifeline Utility Failure: Fuel	C	3	Moderate
Lifeline Utility Failure: Roading	C	3	Moderate
Criminal Acts: Terrorism	C	3	Moderate
Criminal Acts: Civil Unrest/Riot	C	3	Moderate
Crash: Rail	C	3	Moderate
Flooding: Tsunami (regional/local)	D	3	Moderate
Crash: Road	B	2	Moderate
Drought: Agricultural	B	2	Moderate
Flooding: Tsunami (distant)	B	2	Moderate
Fire: Urban	C	2	Moderate
Lifeline Utility Failure: Airport	C	2	Moderate
Lifeline Utility Failure: Gas	C	2	Moderate
Lifeline Utility Failure: Port	C	2	Moderate
Flooding: Storm Surge	C	2	Moderate
Drought: Water Supply	C	2	Moderate
Lifeline Utility Failure: Gas	C	2	Moderate
Dam Failure	D	2	Low
Crash: Marine	D	2	Low
Fire: Rural	B	1	Low
Tornado	B	1	Low

Good first filter for the top risks, but

filter pertama yang baik untuk risiko yang paling atas, namun

- **Is very coarse kasar**
- **Doesn't differentiate enough between consequences and across different hazards tidak membedakan antara konsekuensi dan kerawanan yang berbeda**

Source: Auckland CDEM Group Plan DRAFT 2010-2015

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SMG Assessment Penilaian SMG

***S**eriousness, **M**anagement, **G**rowth*

- Semi-quantitative
- Defines ‘consequences’ in more detail mendefinisikan ‘konsekuensi’ secara lebih detail
- Enables a comparative assessment to be undertaken memungkinkan penilaian komparatif
- Assesses how well the hazard is being managed menilai seberapa baik pengelolaan kerawanan
- Good for when there is *limited information* about hazards and risks memberi hasil yang baik saat ada keterbatasan informasi mengenai kerawanan dan risiko
- Can be used to identify gaps in knowledge dapat mengidentifikasi kekosongan dalam pengetahuan
- The process is more important than the outcome! proses lebih penting dari hasil!

HAZARD	RISK PRIORITY FOR ACTION											
	SERIOUSNESS					MANAGEABILITY					GROWTH	
	Social	Built	Economic	Natural	Sub-Total	Reduction	Prepared-ness	Response	Recovery	Sub-total	Sub-total	TOTAL
EQ												
Tsunami												
Flood												
Landslide												
Volcanic Eruption												

Template for SMG Assessment

Seriousness – Social Impact
Keseriusan – Dampak Sosial

What's acceptable?!

Level	Description
1	**No deaths;** **0 – 200 affected (Sumbawa);** ***0.05% of affected community injured / displaced***
2	**No deaths;** **<700 affected (Sumbawa);** ***0.05 – 0.15% of affected community injured / displaced***
3	**0-50 deaths;** **<2,200 affected (Sumbawa);** ***0.15 - 0.50% of affected community injured / displaced***
4	**0-100 deaths;** **<8,700 affected (Sumbawa);** ***0.5 - 2% of affected community injured / displaced***
5	**0->100 deaths;** **>8,700 affected (Donggala);** ***>2% of affected community injured / displaced***

Based on 2014 population projection data: Sumbawa Regency = 434,469
Source: Badan Pusat Statistik Indonesia (web)

Seriousness – Economic Impact
Keseriusan – Dampak Ekonomi

Level	Description
1	Costs less than .5% regional GDP (< US$4 M Sumbawa)
2	Costs between .5% and 2% regional GDP (US$4-$16M Sumbawa)
3	Costs between 2% and 5% regional GDP (US$16-$40M Sumbawa)
4	Costs between 5% and 10% regional GDP (US$40-$80M Sumbawa)
5	Costs greater than 10% regional GDP (> US$80M Sumbawa)

Note: assumes regional GDP (Sumbawa) = approx. US$811M. This is based on population of 434,500 (2014) and Indonesia GDP/capita of US$1866 (2014). *http://www.tradingeconomics.com/indonesia/indicators*

Seriousness – Built Environment Impact
Keseriusan – Dampak Pembangunan Lingkungan

Damage/loss across all categories of built infrastructure
Kerusakan/kerugian terhadap seluruh kategori infrastuktur

Level	Description
1	Little or no damage Kerusakan yang kecil atau tidak sama sekali
2	Light damage to buildings and structures; services remain on-line, but unavailable for a period or hours kerusakan ringan pada bangunan atau struktur; pelayanan tetap berlangsung, namun tidak dapat tersedia pada periode tertentu
3	Variable damage to buildings and structures; services off-line for several hours to days kerusakan yang bervariasi pada bangunan dan struktur; layanan terputus beberapa jam hingga beberapa hari
4	Heavy damage to buildings and structures; services off-line up to several months kerusakan parah pada bangunan dan struktur; layanan terputus hingga beberapa bulan
5	Extensive damage to buildings and structures; many remaining buildings and structures are unrecoverable; all essential services off-line, and some cannot be recovered kerusakan menyeluruh pada bangunan dan struktur; bangunan dan struktur tidak dapat diperbaiki; seluruh layanan dasar terhenti, dan beberapa tidak dapat dipulihkan

Seriousness – Natural Environment Impact

Physical effects on the land and environment

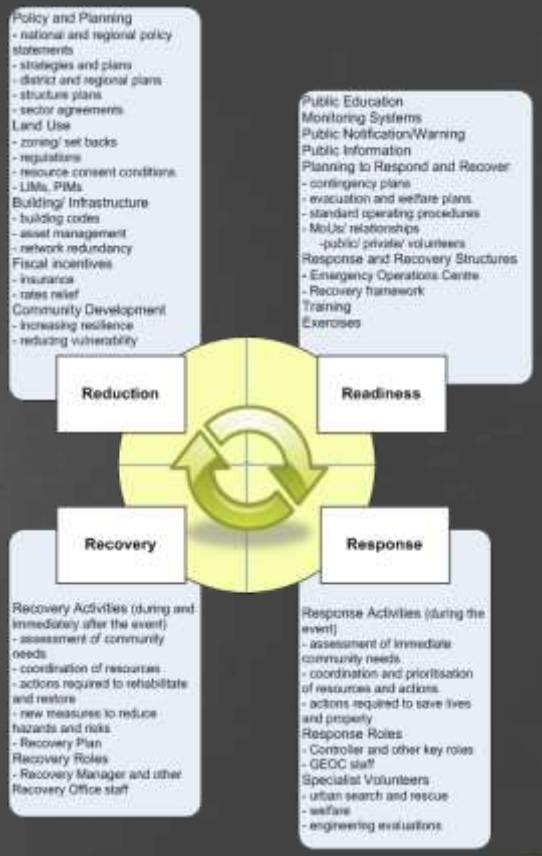
Level	Description
1	Few or no effects
2	Short-term localised effects to ecosystems, requiring clean-up or restoration
3	Damage to multiple ecosystems, temporary or localised landform changes
4	Loss of a significant ecosystem, or damage to multiple systems and ecological effects. Regionally significant and permanent landform changes requiring modified land use
5	Permanent loss of multiple ecosystems and irreversible ecological effects, multiple regionally significant landform changes requiring modified land use

Manageability

Management Difficulty	Current Effort (4Rs)	Rating
Low	High	1
Low	Medium	2
Medium	High	
Medium	Medium	3
High	High	
Low	Low	4
Medium	Low	
High	Medium	
High	Low	5

Manageability – Reduction
Pengelolaan - pengurangan

- Hazard and vulnerability maps **peta kerawanan dan kerentanan**
- Risk modeling **pemodelan risiko**
- Land use planning **rencana tata ruang**
- Building codes **peraturan bangunan**
- Building construction practices **praktik konstruksi bangunan**
- Hazard monitoring networks **jaringan pengawasan kerawanan**
- Reducing built asset vulnerability **pengurangan asset yang dibangun di daerah rentan**
  - Retrofitting
- Increasing community resilience **meningkatkan ketangguhan masyarakat**
  - Increase social capital (health and wellbeing)
  - Awareness and education



Manageability - Preparedness, Response and Recovery

- **Hazard monitoring networks jaringan pengawasan kerawanan**
- **Early Warning Systems and Public Alerting sistem peringatan dini dan peringatan publik**
- **Hazard Contingency Plans Rencana Kontingensi Bencana**
- **Functional Plans Rencana fungsional**
  - Evacuation evakuasi
  - Public Information informasi publik
  - Welfare kesejahteraan
- **Simulations simulasi**
- **Recovery Plans rencana pemulihan**
- **Community education and preparedness pendidikan masyarakat dan kesiapsiagaan**

Growth

Event occurrence probability rise	Changing community exposure	Rating
Low	Low	1
Low	Medium	2
Medium	Low	
Medium	Medium	3
Low	High	
Medium	High	4
High	Low	
High	Medium	
High	High	5

e.g. climate change effects = more storms, rainfall, droughts, sea-level rise

e.g. population growth; intensification; growth in number of coastal communities

Hazard Identification	Risk Priority for Action											
	Seriousness					Manageability					Growth	Total
	Social	Built	Economic	Natural	Sub-total	Reduction	Readiness	Response	Recovery	Sub-total	Sub-total	
Natural Hazards												
Volcanic Eruption: Auckland Volcanic Field	5	5	5	4	9.8	1	2	4	5	3	3	15.8
Volcanic Eruption: Distant Source	4	4	4	3	7.8	3	4	4	4	3.75	4	15.55
Lifeline Utility Failure: Electricity	4	4	5	2	7.9	4	3	3	3	3.25	4	15.15
Cyclone	3	3	3	2	5.8	5	4	4	5	4.5	4	14.3
Human Epidemic	5	1	5	1	7.2	2	2	2	5	2.75	4	13.95
Lifeline Utility Failure: Roading	3	3	3	1	5.6	4	3	4	2	3.25	5	13.85
Earthquake	4	4	4	2	7.6	3	3	5	5	4	2	13.6
Lifeline Utility Failure: Water/Waste	3	2	4	4	6	4	3	4	2	3.25	4	13.25
Lifeline Utility Failure: Communications	3	2	4	1	5.4	4	3	4	3	3.5	4	12.9
Major Crash Road	4	2	2	1	5.8	3	3	1	1	2	5	12.8
Erosion: Landslide/ Land Instability	3	3	3	1	5.6	5	5	1	1	3	4	12.6
Hazardous Substance Spill	3	2	3	4	5.7	5	5	1	1	3	3	11.7
Lifeline Utility Failure: Fuel	3	2	4	1	5.4	3	3	4	3	3.25	3	11.65
Flooding Tsunami (regional/local)	3	3	3	2	5.8	3	4	4	4	3.75	2	11.55
Criminal Acts Terrorism	3	2	3	1	5.1	4	3	3	2	3	3	11.1
Criminal Acts Civil Unrest/Riot	3	2	3	2	5.3	3	3	2	3	2.75	3	11.05
Dam Failure	4	3	3	3	7	2	2	4	4	3	1	11
Major Crash Aircraft	4	2	3	3	6.5	1	1	4	4	2.5	2	11
Animal Disease/Epidemic	4	1	4	2	6.1	3	3	4	5	3.75	1	10.85
Flooding River/Rainfall	3	3	3	2	5.8	2	3	2	4	2.75	2	10.55
Introduced Species/Pests	3	1	3	3	5	3	3	3	4	3.25	2	10.25
Fire Urban	3	3	3	2	5.8	1	2	3	3	2.25	2	10.05
Lifeline Utility Failure: Airport	2	1	3	1	3.6	4	3	4	2	3.25	3	9.85
Lifeline Utility Failure: Gas	2	1	3	1	3.6	4	3	4	2	3.25	3	9.85
Lifeline Utility Failure: Port	2	1	3	1	3.6	4	3	4	2	3.25	3	9.85
Erosion: Coastal Cliff	2	3	3	2	4.8	2	4	1	1	2	3	9.8
Flooding: Storm Surge	2	1	3	1	3.6	4	4	4	4	4	2	9.6
Drought: Agricultural	2	1	3	2	3.8	2	3	1	4	2.5	2	8.3
Major Crash Rail	4	1	2	1	5.3	1	1	3	3	2	1	8.3
Drought: Water Supply	3	1	3	1	4.6	1	3	3	2	2.25	1	7.85
Flooding Tsunami (distant)	2	1	2	1	3.3	3	2	1	4	2.5	2	7.8
Lifeline Utility Failure: Gas	2	1	2	1	3.3	2	3	2	2	2.25	2	7.55
Major Crash Marine	2	1	2	2	3.5	1	1	2	2	1.5	2	7
Fire Rural	1	1	2	2	2.5	3	3	1	1	2	2	6.5
Tornado	1	2	1	1	2.5	1	3	1	1	1.5	2	6

Exercise Latihan

- Breakout into 4 groups pembagian dalam 4 kelompok
- Appoint a facilitator / note-taker (same person) menunjuk fasilitator / notulen
- Facilitator reports back at the end fasilitator memberikan laporan pada akhir acara
- Pick 1 or 2 hazards - earthquake, tsunami, landslide, flood (~ 15mins/ hazard) memilih 2 atau 3 bencana
- Consider a *Maximum Credible Event* for each menentukan Kejadian Maksimum yang Kredibel
- Work your way across the table using the notes as a guide isilah table dengan notes sebagai acuan

Try not to focus on the numbers – it's the discussion that's important!

Jangan hanya terpusat pada angka – yang penting adalah proses diskusi

Reporting Back

- What is your top risk(s)?Apakah risiko utama yang anda hadapi?

- Is enough being done to manage the risk?Apakah risiko yang ada telah dikelola dengan baik?
- Where should the effort go?Kemana arah pengelolaan yang ingin dituju?

- Where are the gaps?Dimana celah yang ada?

- What information is lacking?Informasi apa yang kurang tersedia?

SMG Assessment – Pros and Cons

Benefits Manfaat

- Greater engagement of agencies keterlibatan yang lebih besar dari instansi terkait
- More systematic assessment of risks penilaian risiko yang sistematis
- Greater understanding of information gaps pemahaman mengenai kekosongan informasi

Limitations batasan

- Often not systematic enough sering kurang sistematis
- Over-reliance on numerical rating system terlalu bergantung pada sistem peringkat numeris
- Information variable across hazards (subjective and qualitative) variasi informasi pada kerawanan (subyektif dan kualitatif)
- Inconsistent application of the method across the country (although improving) aplikasi yang tidak konsisten dengan metode pada Negara yang lain
- Lack of risk evaluation criteria kurangnya kriteria evaluasi risiko