Critical Infrastructures Resilience to Tsunami

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Harkunti P. Rahayu

Chair of TTDMP

harkunti@gmail.com

Critical Infrastructure vs Seven Global Targets of SFDRR (2015-2030)

UN World Conference on Disaster Risk Reduction
2015 Sendai Japan

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Substantially Reduce by 2030:

1. Global disaster mortality → 100,000 global mortality rate.
2. Number of affected people globally → 100,000 people.
3. Direct disaster economic loss in relation to global Gross Domestic Product (GDP)
4. Disaster damage to ***critical infrastructure*** and ***disruption of basic services***, among them health and educational facilities, including through developing ***their resilience***

Substantially Increase by 2030:

5. Number of countries with national and local DRR (disaster risk reduction) strategies.
6. International cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework.
7. Access to multi-hazard early warning systems (MHEWS) and disaster risk information and assessments

Basic Service vs Critical Infrastructures at Tsunami Prone Area

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1. Transportation:
- Airport
- Port
- Coastal Highway and Bridges
2. Energy:
- Power Plant
3. Health:
- Hospital with nuclear treatment
- Pharmacy factory
4. Education:
- Schools
5. Many others … Hotels etc

Basic Service vs Critical Infrastructures at Tsunami Prone Area

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BASIC SERVICE	CRITICAL INFRASTRUCTURE	REMARK
1. Accessibility	Airport	Indonesia: NYIA Airport
	Port	
	Railway	
2. Accommodation	Hotel	Indonesia: Bali Tsunami Ready Hotel
3. Energy	Power Plant	
4. Industrial Estate	Heavy Industries (steel manufactures or plywood), Chemical industries	Indonesia: initiated since 2007
5. Tourism area		
4. Health	Hospital especially with nuclear treatment	
	Pharmacy Factories	
5. Education	School	
	University	

Needs for: Tsunami DRR to Coastal Infrastructure

Tsunami Impact in Sendai Airport, Miyagi Pref.

- The Sendai airport (both airside and landside) was almost completely underwater, except for ATC (Airport Tower Control).
- No airplane can be seen, they have either been covered by the water or washed away by the tsunami waves.

Needs for: Tsunami DRR to Coastal Infrastructure

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Ports: Fishing boats and vehicles are carried by a tsunami wave at Onahama port in Iwaki city

Coastal Road and Bridges: Miyako City (Iwate Pref) overtopping seawalls and flooding

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Coastal roads and bridges:

Example: Tsunami and Earthquake in Palu, Indonesia

Coastal buildings:

Example: Phi Phi hotel and its surronding on the devastated Phi Phi island, in southern Thailand 28 December 2004.

Needs for: Tsunami DRR to Coastal Infrastructure

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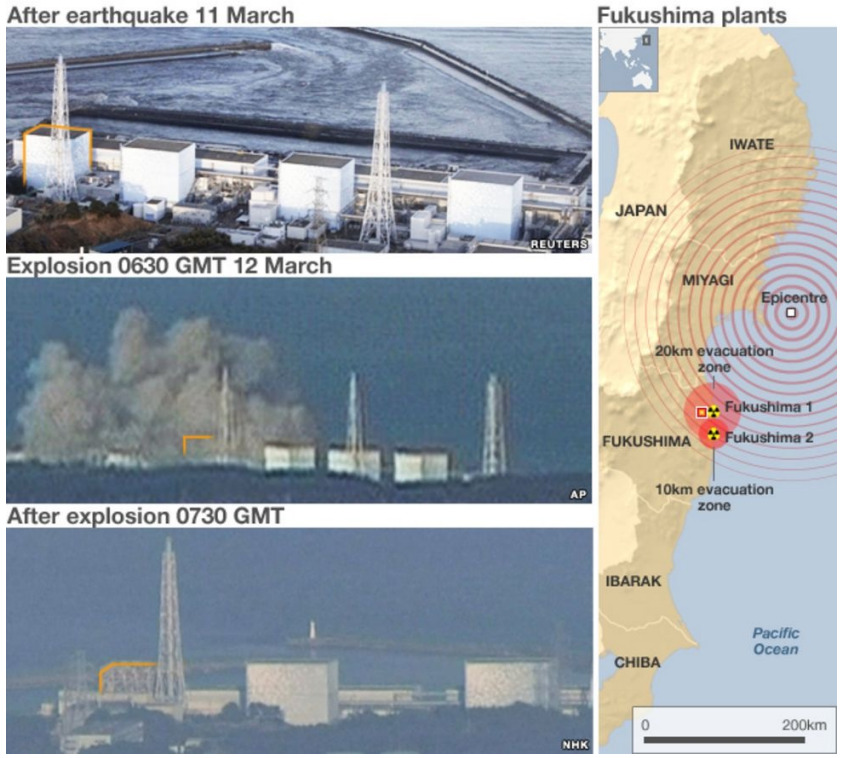
Coastal power plants:



Example: Fukushima nuclear power plant

Coastal wastewater treatment plants:

Example: Coastal Wastewater Treatment Flood in Texas

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Case 1: Airport Ready for Tsunami

GARD

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• Aims

- GARD was developed to focus on surge capacity increase as part of national disaster-risk-reduction programmes.
- GARD is conducted at the airport in close cooperation with all relevant authorities and enables participants to assess and improve their surge capacity.

• Objectives

- Risk assessment
- Contingency Planning
- Increased Airport Preparedness
- Networking exposure to relevant agencies in airport management

GARD creates distinctive and measurable benefits

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- GARD creates a **structured platform** to bring disaster related authorities together.
- GARD enables stakeholders to conduct an detailed **Airport Surge Capacity Assessment**.
- GARD presents main findings and list of critical issues to increase airport surge capacity to a wider audience and **trigger follow-up activities**.
- GARD shares its approach and **enables stakeholders to replicate surge capacity assessments** at other airports.

Critical Point for NYIA Airport Resilience Intervention

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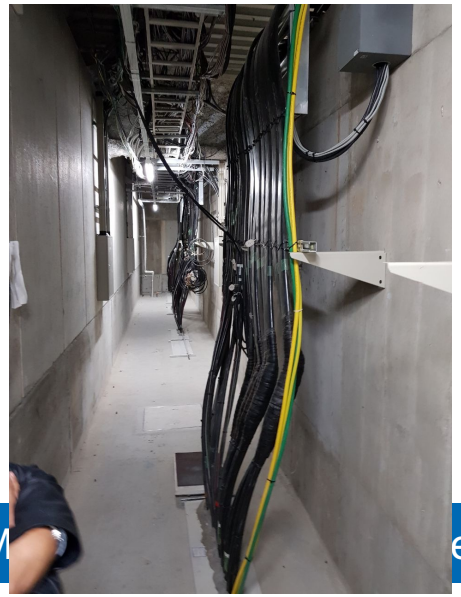
1. Disaster Prevention in infrastructure planning:
   - Coastal Protection
   - Tsunami DRR Based Coastal Land Use Planning
2. Disaster Mitigation in infrastructure Design
   - Airport Terminal Building → Earthquake and Seismic resistant Building ← Building Code
   - Critical Facilities
3. Disaster Preparedness & Tsunami Early Warning
   - AOC – Airport Operation Center
   - ATC – Airport Traffic Control Tower
   - Evacuation Plan
4. Disaster Responses
5. Disaster Recovery

NYIA Learning from Sendai and Kochi Airport



Existing: Get Airport Ready for Disaster

GARD

Get Airports Ready for Disaster

Help Each Other

Disaster Response Teams

* HEO is run by HR; additionally: many local projects in disaster response and recovery

Airport Ready for Tsunami

	TSUNAMI READY INDICATORS
	Stage of achievement
I	ASSESSMENT (ASSESS)
1	**ASSESS-1**. Tsunami hazard zones are mapped and designated
2	**ASSESS-2**. The number of people at risk in the tsunami hazard zone is estimated
3	**ASSESS-3**. Economic, infrastructural, political, and social resources are identified
II	PREPAREDNESS (PREP)
4	**PREP-1**. Easily understood tsunami evacuation maps are approved.
5	**PREP-2**. Tsunami information including signage is publicly displayed.
6	**PREP-3**. Outreach and public awareness and education resources are available and distributed.
7	**PREP-4**. Outreach or educational activities are held at least 3 times a year.
8	**PREP-5**: A community tsunami exercise is conducted at least every two years
III	RESPONSE (RESP)
9	**RESP-1**. A community tsunami emergency response plan is approved.
10	**RESP-2**. The capacity to manage emergency response operations during a tsunami is in place.
11	**RESP-3**. Redundant and reliable means to timely receive 24-hour official tsunami alerts are in place.
12	**RESP-4**. Redundant and reliable means to timely disseminate 24-hour official tsunami alerts to the public are in place.

TR Indicators

GARD
Get Airports Ready for Disaster

Prevention

Mitigation: L1 & L2

TEWS: EOC

Help Each Other

Disaster Response Teams

Task Team D

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Tsunami Ready Yogyakarta International Airport

Intervention on Structural Design: Mitigation L1 and L2

Yogyakarta International Airport (YIA) Siap Jadi Area Evakuasi Bila Terjadi Gempa dan Tsunami

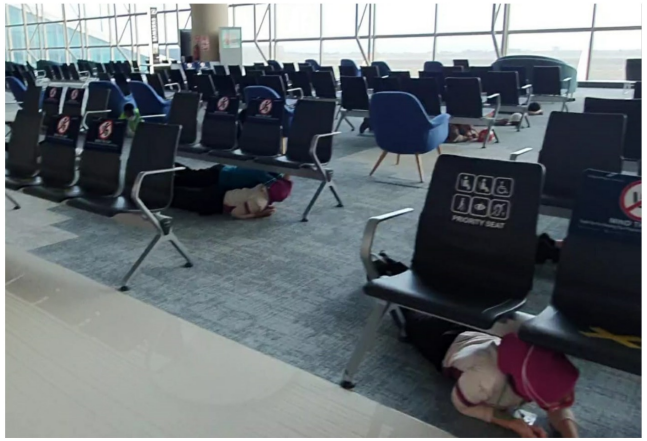
Jumat, 1 April 2022 19:41 WIB

Penulis: Sri Cahyani Putri | Editor: Kurniatul Hidayah

Simulasi mitigasi bencana gempa bumi yang dilakukan di kawasan YIA, Jumat (1/4/2022)

TableTop Exercise and Tsunami Drill for the Biennial Tsunami Exercise of the IOWave 2020

Table Top Exercise at the YIA



Tsunami Drill at the YIA, testing the Tsunami SOP and Tsunami Evacuation Shelter

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Case 2: Hotel Ready for Tsunami

Adapting best Pratices from Sanur Bali

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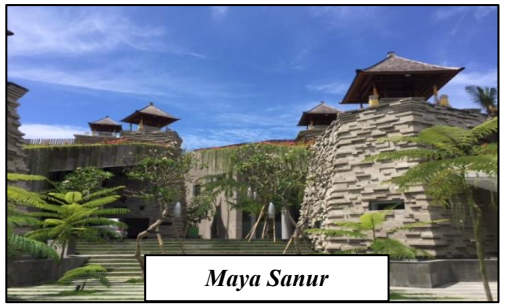
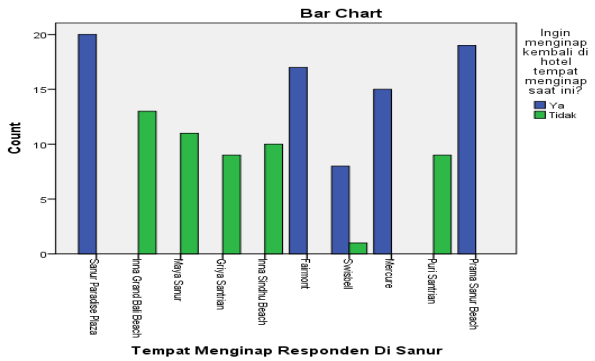
Fairmont Hotel Sanur (Dokumentasi Hotel, 2017)

Bali Tsunami Ready Hotels





H.P.Rahayu et al (2018):

100% tsunami ready hotel guest would like to come back.

Almost 99% non tsunami ready hotel guest will not come back to stay in the hotel

Bali Tsunami Ready Hotel: Kesiapsiagaan hotel

Simulasi tsunami melibatkan wisatawan


Simulasi tsunami melibatkan wisatawan


Perlengkapan penanggulangan bencana


Emergency Response Team yang khusus menangani tsunami


Emergency Response Team yang khusus menangani tsunami

Sumber: Video Simulasi Tsunami Prama Sanur Beach, 2016

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THANK YOU