Tsunami Ready Guideline for Critical Infrastructure

Suci Dewi Anugrah
Chair of Tsunami Ready WorkingGroup 3 forthe ICG/IOTWMS

Historical Examples of Critical Infrastructure Affected by Past Tsunamis

EARTHQUAKE AND TSUNAMI– BIAK 1996

EARTHQUAKE AND TSUNAMI FLORES 1992

Biak Seaport, Papua

L. Say Seaport, Maumere

Strategic Area, Korem North Biak

L. Say Seaport, Maumere

www.inimaumere.blogspot.com

EARTHQUAKE AND TSUNAMI– PALU 2018
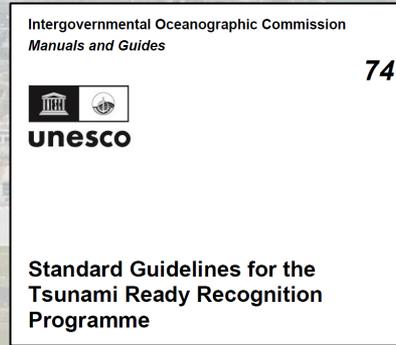
Wani Seaport, Donggala

INTRODUCTION

- Critical infrastructure provides services that are essential for everyday life.
- A disruption to the operation of the critical infrastructure could have serious implications for business, governments and the community, impacting supply security and service continuity.

  https://www.nationalsecurity.gov.au/

- Critical infrastructures often possess more comprehensive resources and capacities.

- Their presence also helps ensure business continuity and facilitates more effective rehabilitation and recovery processes following a tsunami event.

Intergovernmental Oceanographic Commission
Manuals and Guides

74

unesco

Standard Guidelines for the Tsunami Ready Recognition Programme

Standard Guidelines TRC for Community

New Yogyakarta International Airport constructed at the coastal areas

- Critical infrastructure also forms an integral part of coastal communities.

- With operations running continuously 24 hours a day, seven days a week, these facilities have a distinct advantage in maintaining tsunami preparedness.

- There are currently no standardized guidelines specifically developed for recognizing Tsunami Ready for critical infrastructure community.

- Many of critical infrastructure are constructed along coastal areas directly facing the sea

The Distribution Points of Airports Located in Coastal Areas
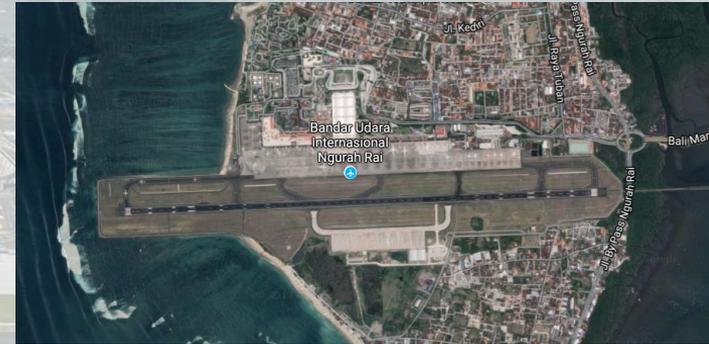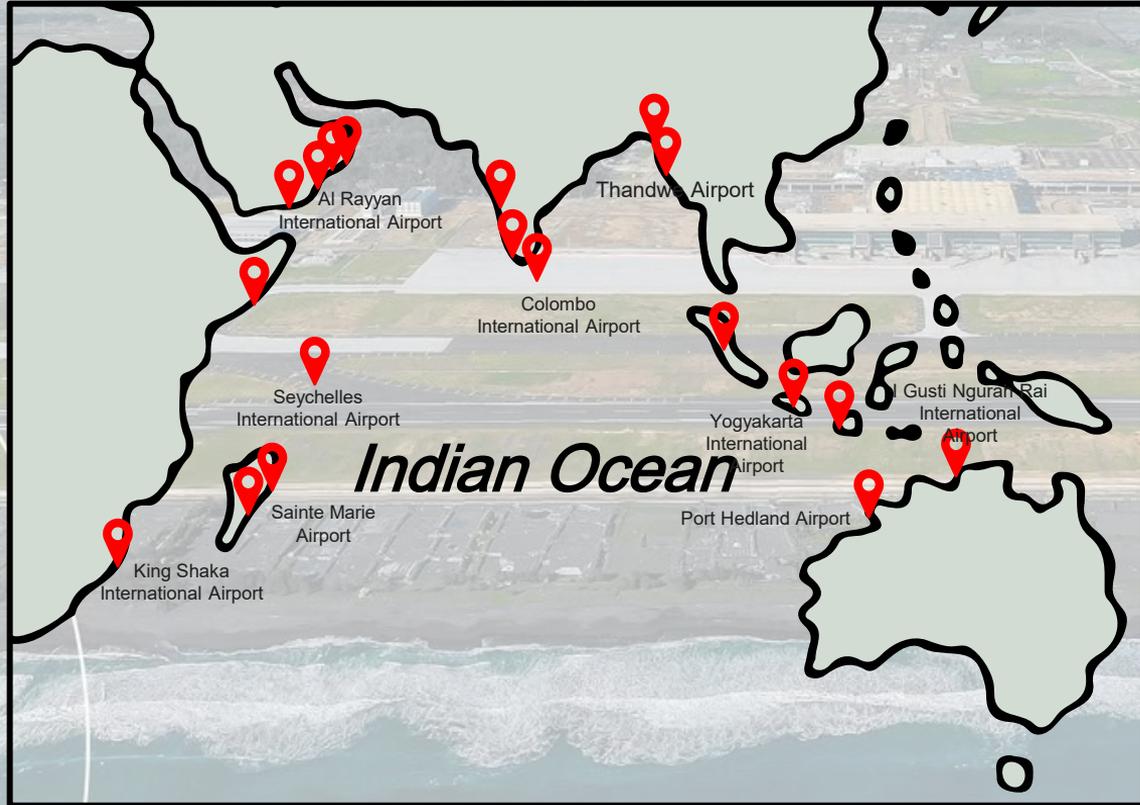
I Gusti Ngurah Rai International Airport

New Yogyakarta International Airport

Al Rayyan International Airport

Thandwe Airport

Colombo International Airport

Seychelles International Airport

Indian Ocean

Yogyakarta International Airport

I Gusti Ngurah Rai International Airport

Sainte Marie Airport

Port Hedland Airport

King Shaka International Airport

GUIDELINE OF TSUNAMI READY FOR CRITICAL INFRASTUCTURE

12 TSUNAMI READY INDICATORS
for Critical Infrastructure

OUTLINE DOCUMENT

TSUNAMI READY INDICATORS FOR CRITICAL INFRASTRUCTURE

Same Foundation, The approach **adopts the 12 UNESCO-IOC Tsunami Ready indicators,** adjusts them based on **the type and function of each critical infrastructure** (e.g., airport, port, industrial zone).

Breakdown Each indicator is **interpreted in context**:

- − **Assessment,**
- − **Preparedness,**
- − **Response**

	TSUNAMI READY INDICATORS FOR CRITICAL INFRASTRUCTURE COMMUNITIES
I	**ASSESSMENT (ASSESS)**
1	**ASSESS-1**. Tsunami hazard zones within and surrounding the critical infrastructure area are mapped and formally designated, taking into account site-specific vulnerabilities such as access routes, power systems, and key operational facilities.
2	**ASSESS-2**. The number of personnel, service users, and operational assets at risk within the tsunami hazard zone is identified and quantified.
3	**ASSESS-3**. Essential economic, infrastructural, technical, and organizational resources available for tsunami preparedness, response, and recovery are identified and documented.
II	**PREPAREDNESS (PREP)**
4	**PREP-1**. Clear and easily understandable tsunami evacuation maps specific to the critical infrastructure area are developed, approved, and integrated into facility emergency plans.
5	**PREP-2**. Tsunami information, including evacuation routes and safe zones, is clearly displayed through standardized signage and information boards accessible to employees, visitors, and stakeholders.
6	**PREP-3**. Educational, communication, and training materials on tsunami awareness and preparedness are made available and disseminated among all personnel and relevant contractors.
7	**PREP-4**. Regular outreach or internal capacity-building activities on tsunami preparedness are conducted at least three times a year, ensuring participation of both management and operational staff.
8	**PREP-5**. A full-scale or tabletop tsunami drill involving internal emergency teams and external response agencies is conducted at least once every two years to evaluate coordination and readiness.
III	**RESPONSE (RESP)**
9	**RESP-1**. A tsunami emergency response plan specific to the critical infrastructure facility is developed, approved, and aligned with local and national disaster management frameworks.
10	**RESP-2**. Adequate capacity, personnel, and resources are established to manage emergency operations and maintain critical functions during a tsunami event.
11	**RESP-3**. Reliable, redundant communication systems are in place to ensure timely receipt of 24-hour official tsunami alerts from authorized agencies.
12	**RESP-4**. Reliable, redundant communication and dissemination systems are in place to promptly deliver official tsunami alerts and safety instructions to all staff, contractors, and facility users.

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01

Ensuring Human Safety

Strengthen tsunami preparedness to protect the safety of workers, service users, and visitors at critical infrastructure sites such as airports, ports, and industrial zones.

02

Anticipating Cascading Hazards

Minimize the risk of secondary disasters that may occur following a tsunami, such as industrial accidents, chemical spills, and logistical failures—particularly in complex environments like industrial areas.

03

Accelerating Recovery and Business Continuity

Support the rapid recovery of operations and public services through well-designed emergency response plans and tested evacuation systems, thereby reducing downtime after a disaster.

04

Maximizing the Role of Critical Infrastructure in Strengthening Community Preparedness

Critical infrastructures possess more comprehensive resources, serve as vital support systems to ensure the safety of surrounding coastal communities. Their continuous 24-hour operations provide a key advantage in maintaining the effectiveness of EWS.

ASSESS Tsunami Hazard Map for the Critical Infrastructure

Critical Infrastructure have to develop tsunami hazard map

- Tsunami hazard zones depict the areas that are prone to tsunami inundation.
- Hazard maps must clearly show which key areas within the infrastructure are exposed to tsunami risk—and the extent of potential impact.
  - Airports: runway, terminal buildings, Parking areas
  - Seaports: docks and berths, passenger or cargo terminals, logistics and parking zones
  - Industrial facilities: administrative offices, warehouses and production units, utility/service zones
- Purpose these maps serve as a foundation for planning evacuation routes, risk communication, and emergency protocols tailored to each location.
- If an airport, port, or hotel doesn't have a tsunami hazard map, they can ask experts to create one.

Tsunami Hazard Map for Benoa Port

Tsunami Hazard Map for Minangkabau Airport

ASSESS 2: Number of people at risk in the tsunami hazard zone is estimated

Include all categories of personnel and users who may be present at the facility, such as employees, contractors, visitors, passengers, and nearby residents who rely on or interact with the infrastructure.

This estimated number of people will form the basis for evacuation plans, specifically for:
- Evacuation capacity
- Evacuation grouping

Staff Eksisting

Area kerja	Jumlah Personil (Pegawai Tetap)	Jumlah Personil (Pegawai Kontrak)
Airport Operation Airside	27	49
Airport Rescue & Fire Fighting	35	62
Cargo Service	7	
Airport Operation Landside & Terminal	26	49
Airport Security	247	900
Airport Equipment	56	52
Airport Facilities	11	14
Airport Commercial & Development	28	38

Airpot Personel Data - Ngurah Rai Airport
Source: PT AP II Ngurah Rai

Grouping People at Risk							
Employees		**Contractors on duty**		**Tenant**		**Visitors/Passengers**	
1	Total employees per shift	1	Maintenance contractors	1	Total tenant	1	Weekday
2	Weekday employees	2	Temporary contractors	2	Staff per tenant	2	Weekend
3	Weekend employees					3	Holiday season
4	Permanent/temporary employees						

ASSESS Essential economic, infrastructural, technical, and organizational resources available are identified and documented.

This assessment recognizes all available resources—both tangible and intangible—that can be mobilized within and around the critical infrastructure facility to reduce tsunami risk and support emergency response operations. The inventory should include financial, technical, logistical, human, and institutional capacities that can be leveraged before, during, and after a tsunami event.

Policies
- Earthquake and Tsunami Response Plan;
- SOPs (Standard Operating Procedures);
- Emergency Plan
- MOU (Memorandum of Understanding) related to mitigation efforts

Disaster Resource Inventory (One-Page Verbal Summary)

ASSESS: Essential economic, infrastructural, technical, and organizational resources available are identified and documented.

The inventory must be regularly updated and integrated into the Tsunami Emergency Response Plan of the facility.

Fire service of Yogyakarta International Airport

- Safety and rescue equipment
- Vehicles
- Medical kits
- Emergency Budget
- Backup power systems
- Communication tools
- Trained response personnel

Tsunami evacuation maps should illustrate:

- evacuation routes,

- vertical or horizontal evacuation points,

- assembly areas, and

- safe zones within and around the facility.

These maps must be based on the tsunami hazard zone maps.

The maps should be created using appropriate print materials and/or digital media;

Use intuitive design, Interactive formats.

Tsunami evacuation maps must be understood by everyone—staff, visitors, service users, and all stakeholders within critical infrastructure.

Ensure the evacuation map includes a "You are here" indicator.

Evacuation Diagram Melbourne Airport

Evacuation routes of Yogyakarta Airport

Earthquake/tsunami information boards can include:
- Evacuation signs
- Assembly point signs
- Information boards containing earthquake and tsunami response education
- Earthquake and tsunami evacuation maps

These information boards must be:
- Easy to understand and bilingual (Indonesian and English)
- Installed in easily visible locations within every building and waiting area

The media for these information boards can be:
- Boards
- Posters
- Digital Signage

Tsunami information signs should be placed in several crowded areas within airport, port, and hotel premises, such as:
- Airport arrival/departure terminals.
- Port passenger/vehicle loading areas.
- Hotel waiting areas, halls, and cafeterias.

PREP. Educational, communication, and training materials on tsunami awareness and prepa[redness] are made available and disseminated among all personnel and relevant contractors.

Suggested outreach and dissemination methods include:

- **Printed materials** (brochures, flyers, safety manuals) distributed in staff offices, passenger terminals, and operational control rooms.
- **Digital dissemination** through official websites, internal networks, public announcement systems, and mobile applications.
- **Visual communication** via billboards, LED displays, or safety information screens placed in high-traffic or public areas.
- **Public service announcements** through airport or port radio systems, social media, or onboard screens (in terminals or vessels).
- **Safety videos or briefings** integrated into staff training programs and passenger information systems.
- **Coordination with local disaster management** agencies to ensure message consistency and timely updates.

Educational activities should be conducted at least **3 times a year**. The material presented should cover:

- Safe actions during earthquakes and tsunamis

- Evacuation routes

- Understanding earthquake information and tsunami early warnings

These activities can include **workshops, K3 (Occupational Health and Safety) training, and campaigns during exhibitions.**

Airports, ports, and hotels need to have regular training for disasters and other force majeure events.

PREP 5. A full-scale or tabletop tsunami drill involving internal emergency teams and external re
agencies is conducted at least once every two years to evaluate coordination and readiness.

Drills can focus specifically on **earthquake/tsunami hazards**, or can be incorporate with other simulation in **Joint Safety & Security Drills (**Counter-Terrorism Response Simulation), Enhancing coordination among disaster response teams, security personnel, and infrastructure managers.

- These exercises can take various forms, such as **tabletop exercises, drills, communication tests**, and more.

- Drills should be conducted routinely, at least **once a year**.

- Participation should include **all staff**, and it's even better if **users/guests** can also be involved.

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Emergency Plan Document

Should at least contain:

- Identification of potential earthquake and tsunami hazards.
- Data on management/staff and users/guests.
- SOPs (Standard Operating Procedures) for Earthquake Response and Tsunami Early Warning.
- Activation of emergency response, command posts, and personnel implementing the emergency response.
- Contact information for relevant institutions, including Focal Points for earthquake information and tsunami early warnings.
- Evacuation plan.
- Evacuation maps.
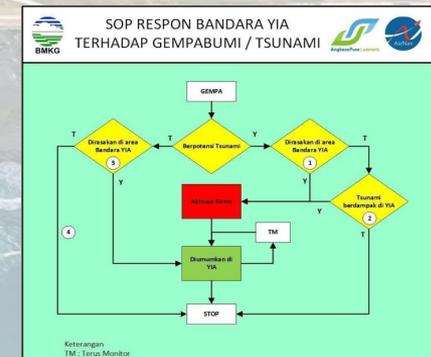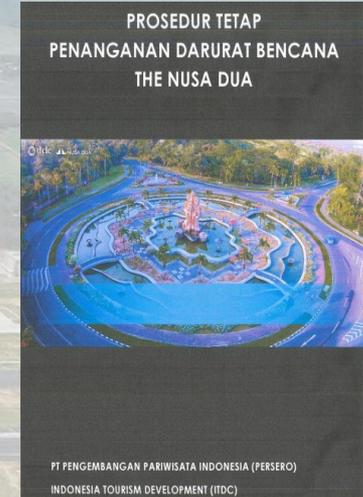- Criteria for "safe" status
- Impact reporting

Angkasa Pura | AIRPORTS

BANDAR UDARA INTERNASIONAL

I GUSTI NGURAH RAI – BALI

BUKU PEDOMAN BANDAR UDARA

SIAGA BENCANA

JUNI 2021

PT ANGKASA PURA I (PERSERO)

PROSEDUR TETAP
PENANGANAN DARURAT BENCANA
THE NUSA DUA

PT PENGEMBANGAN PARIWISATA INDONESIA (PERSERO)
INDONESIA TOURISM DEVELOPMENT (ITDC)

SOP RESPON BANDARA YIA
TERHADAP GEMPABUMI / TSUNAMI

The Critical Infrastructures Authority should have the capacity to execute the response plan, including:

- Quick response team, with the ability and authority to execute tsunami warning and response actions.
- Has Command Centre located in safe zone
- Available on a 24-hour basis.

Equipment or means capable of directly receiving information from NTWC, can include:
- Warning Receiver System
- Radio
- Telephone
- SMS

Equipment or means capable of reaching all managers and users within the area include:
- Alarm;
- Public Announcement (PA) systems;
- Display screens;
- Telephone;
- Radio;
- Social Media Applications

Warning Receiver System

Public Announcement (PA) systems

THANK YOU