



UNESCO/IOC – NOAA ITIC Training Program in Hawaii (ITP-TEWS Hawaii)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME
15-26 September 2025, Honolulu, Hawaii

Preparedness for Maritime Community

Tsunami Planning for Ports and Harbours

Japan Examples

Dr. Laura Kong
Director, ITIC



Marine Preparedness : Ports and Harbors

– New policy in Japan after Tohoku tsunami –



Japan Meteorological Agency

May 2018

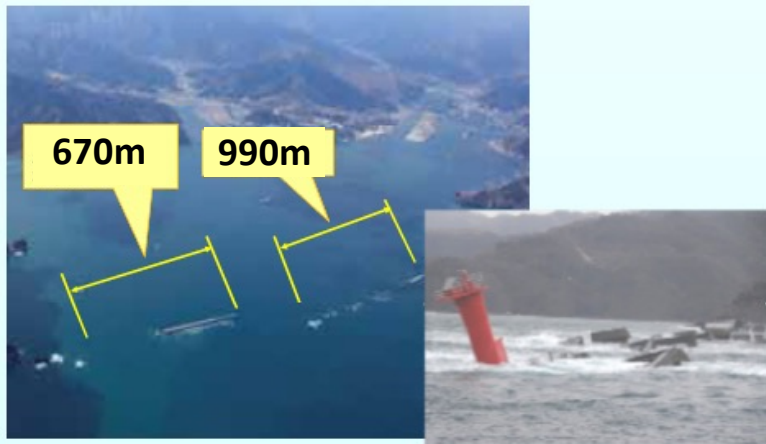
Laura Kong, ITIC (NTHMP, July 2018)

Damages at ports and harbors were seen in wider area of Pacific coast of East Japan (Aomori, Iwate, Miyagi, Fukushima, Ibaraki and Chiba) by Tohoku tsunami in 2011.

(c) MLIT

Failure of breakwater

○Kamaishi port, Iwate



○Hachinohe port, Aomori



Collapse of seawalls

○Ofunato port, Iwate



Damage by sea wracks

○Shiogama port, Miyagi



Machine Damage

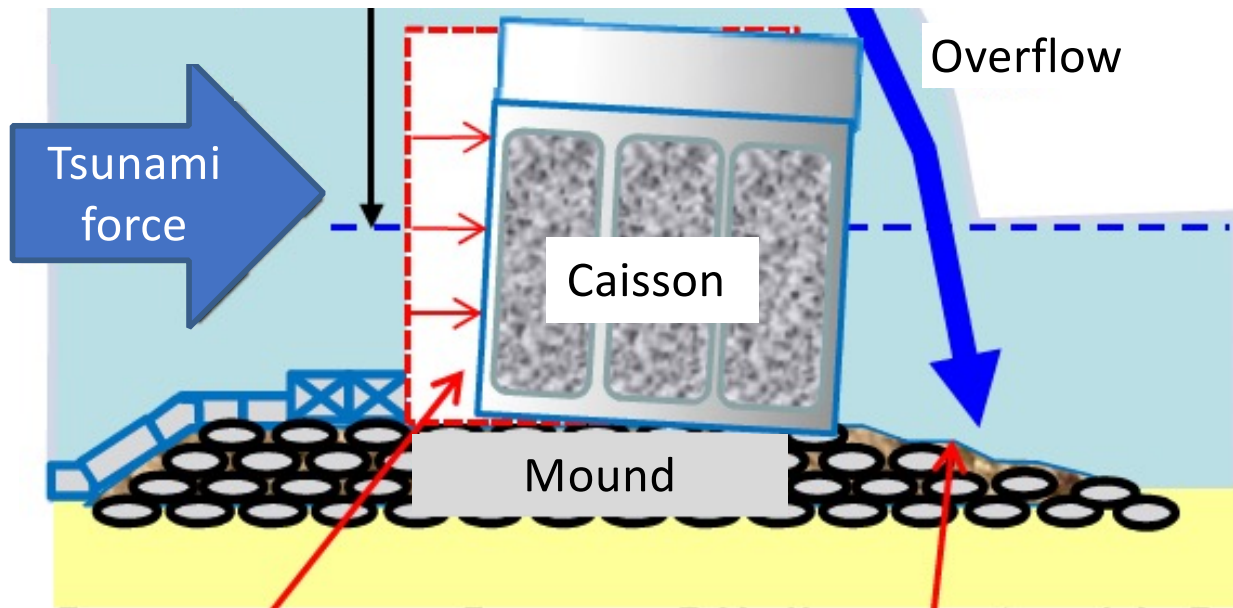
○Shiogama port, Miyagi



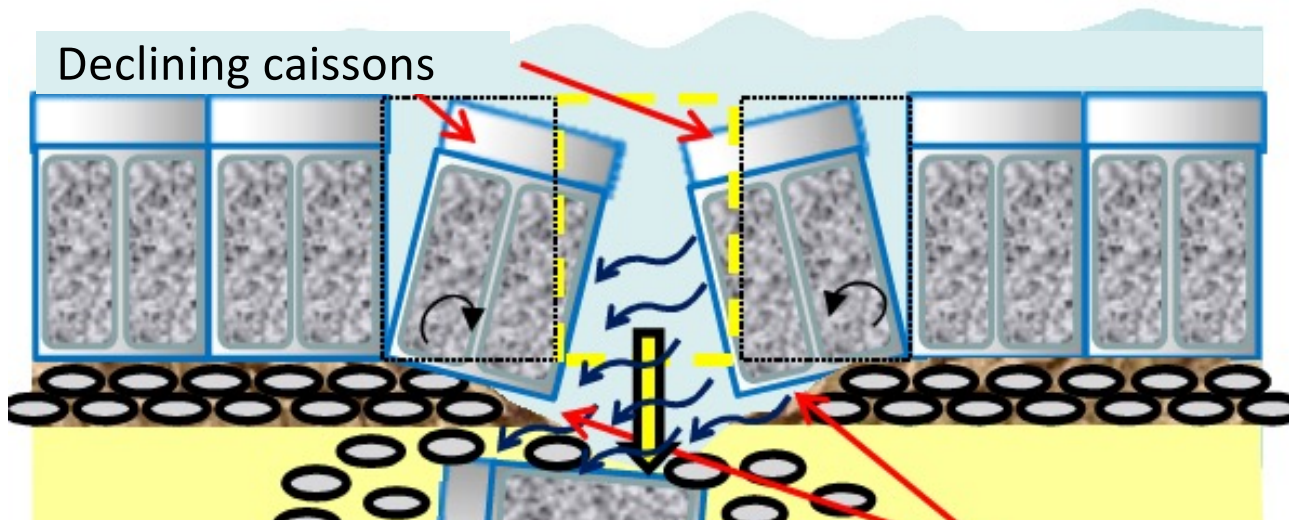
Scattered Containers

○Shiogama port, Miyagi





Some caissons slid down due to tsunami force and mound wash-out by the overflowed tsunami

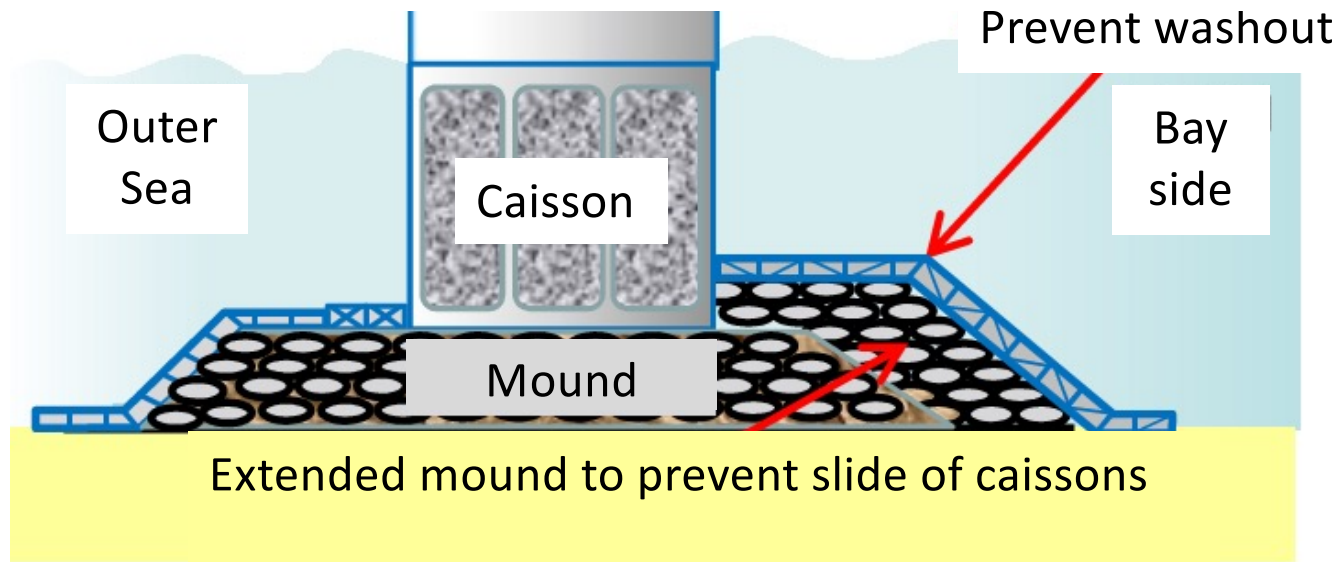


Tsunami flow concentrated to slid-down caissons
It washed out mound and makes decline of caissons



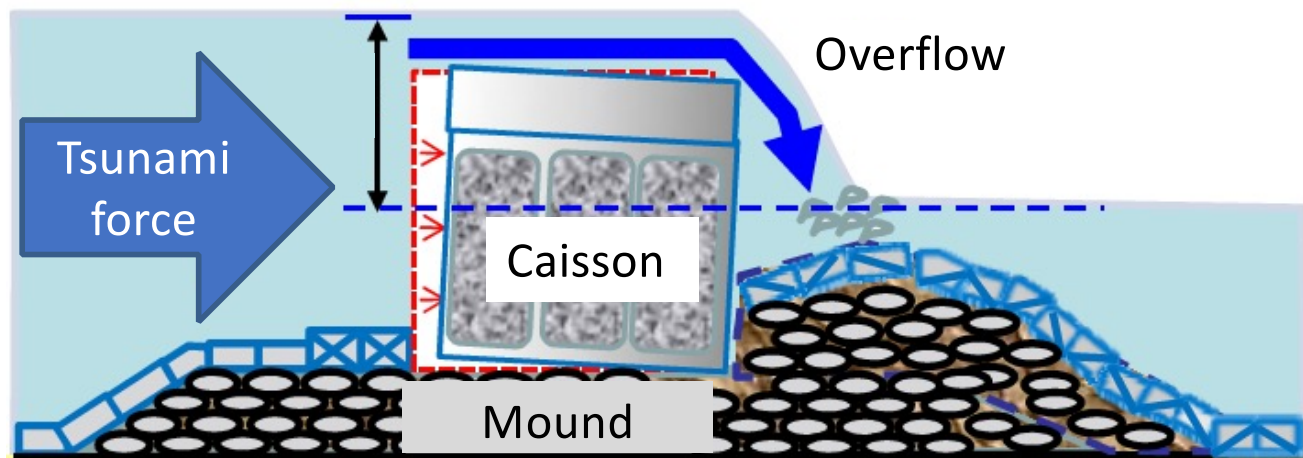
Side Port

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Even tsunami pushed caissons, extended mound can prevent sliding down of caissons

Mound is also protected by cover to prevent washout



- Promotion of tsunami protection/evacuation measures along with targets for disaster prevention/mitigation
 - ✓ Two kinds of measurements – for high-frequency tsunamis and largest class tsunamis
 - ✓ Protection of inner area by seawalls
 - ✓ Evacuation plan at ports and harbors
 - ✓ Enhancement of decision-making system
- Establishing water gates facility management and operation
 - ✓ Safety-first management
 - ✓ Promotion of automation and remote control

**For high-frequency tsunami
(once in several tens of years)**

**For largest class tsunami
(once in several hundreds of years)**

Targets for disaster prevention/mitigation

Protect human lives

Protect properties at inner area

Minimum economy loss

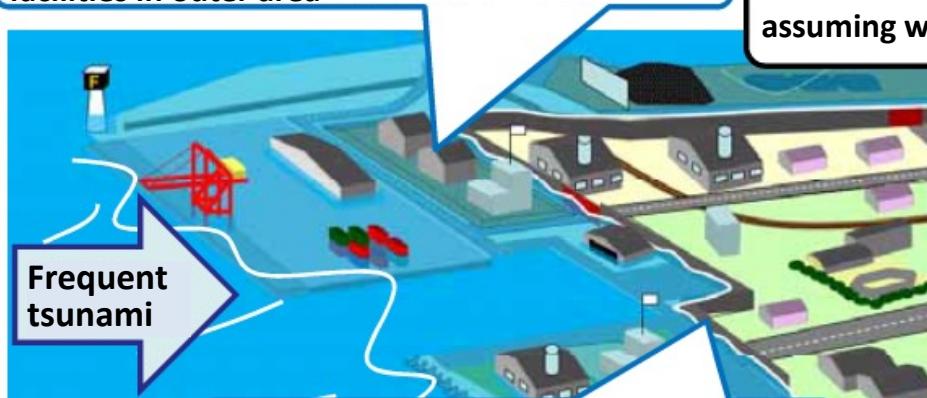
Business continuity at inner area

Preventing large secondary disaster

Continuous port/harbor functions after disaster

Early recovery

Area utilization : prevent damages of major facilities in outer area



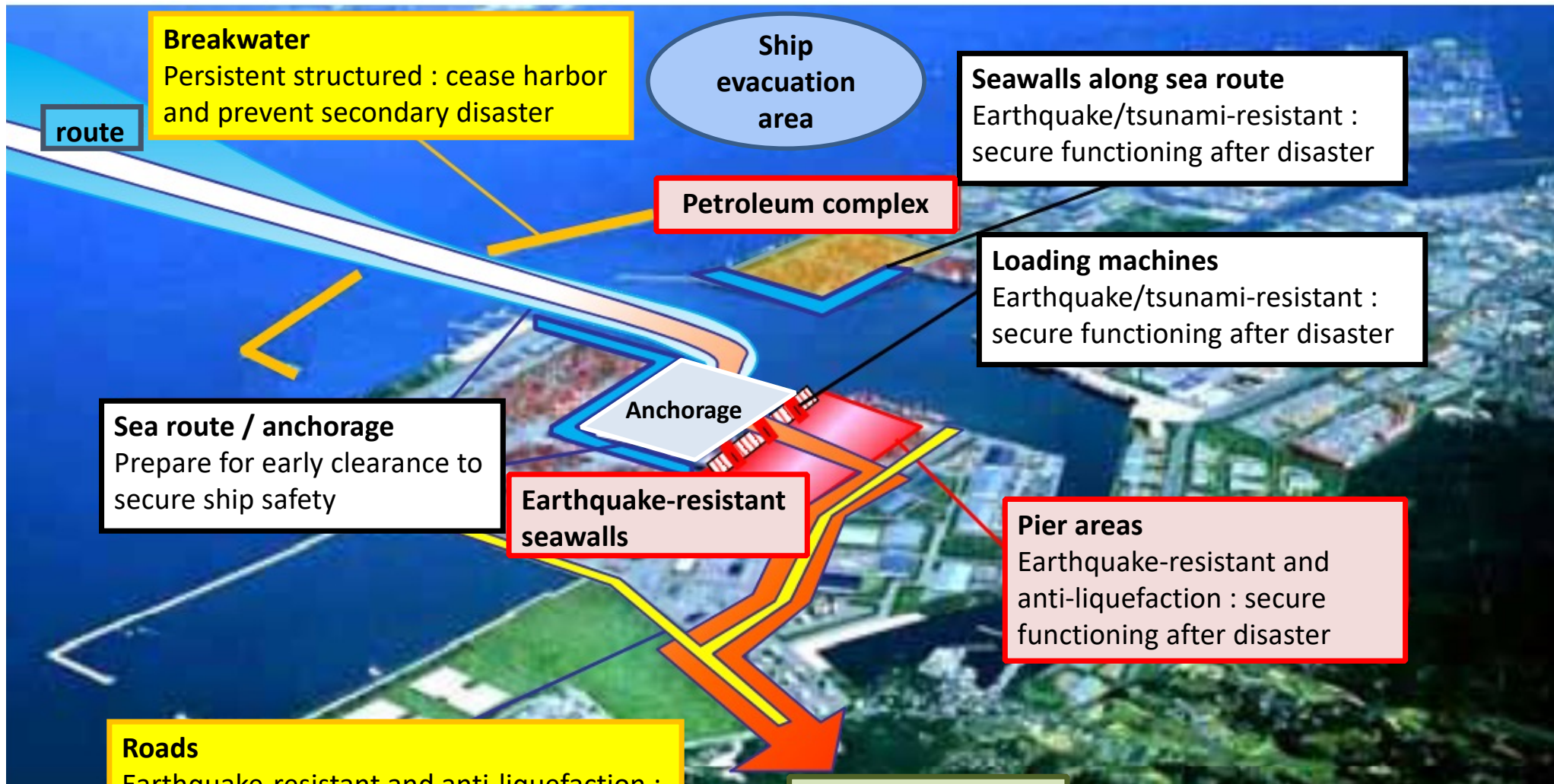
Evacuation plan :
assuming worst scenario

Area utilization : plan assuming
immersion of inner area



of damage due to the earthquake and tsunami

(c) MLIT



International SOLAS

Handbook for making tsunami evacuation manual – Ship Operators

Study Meeting for Improving Ship Evacuation during Tsunami
Ministry of Land, Infrastructure and Transport
March, Heisei 26 (2014)

Introduction

- Utilization of creation guidance
- How to prepare ship tsunami evacuation manual
- Large-scale earthquake targeted for consideration at the Cabinet Office Central Disaster Prevention Council
- Assumption of damage of tsunami caused by a large-scale earthquake
- Tsunami evacuation manual preparation Structure of guidance

I Collection of earthquake and tsunami information

1. Information to be collected at the occurrence of the earthquake (Meteorological Agency Presentation Information)
2. Tsunami information to be grasped in advance

II Determine the status of the ship at the time of the tsunami attack

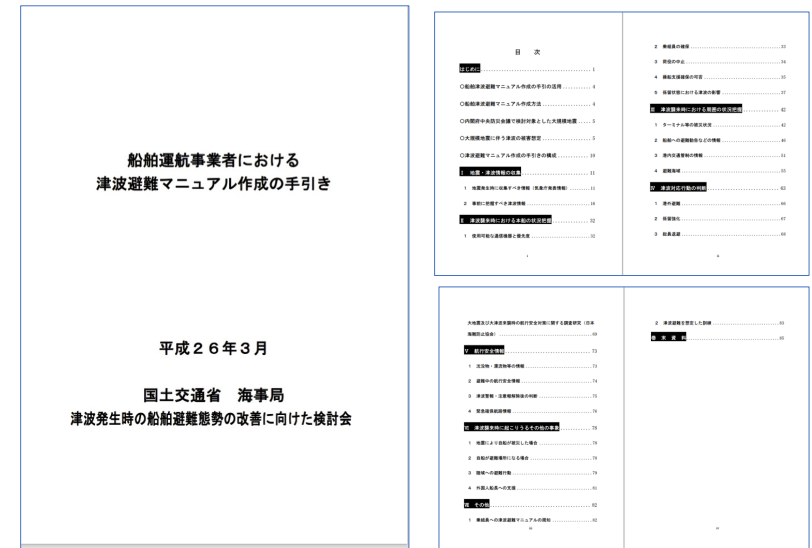
1. Available communication equipment and priority
2. Securing crew
3. Canceling cargo handling
4. Possibility to secure navigation support
5. Influence of tsunami in mooring state

III Grasp the surrounding situation at the time of the tsunami attack

1. Damaged situation at a terminal
2. Information such as evacuation advice to ships
3. Port in port transport Information on control
4. Evacuation area

IV Judgment of tsunami correspondence behavior

1. Evacuation outside the port
2. Mooring enhancement
3. Re-anchoring and mooring



III Navigation safety information

1. Information on sinks, drifting objects, etc.
2. Safety information on navigation during evacuation
3. Judgment after tsunami warning / warning notice
4. Emergency secured route information

VI Other events that may occur at the time of the tsunami attack

1. When your ship is damaged by an earthquake
2. When your ship is to be evacuated
3. Evacuation to the land area Action
4. Support for foreign captain

VII Other

National - Guidelines on harbor tsunami evacuation measures

September Heisei 25 (2013)

Ministry of Land, Infrastructure and Transport Harbor Bureau

1 About the guidelines on harbor tsunami evacuation measures ...

- 1.1 Purpose of guideline
- 1.2 Formulation of guidelines Purpose
- 1.3 Goal of the guideline
- 1.4 Positioning of guidelines
- 1.5 Review based on guidelines and plan to cooperate
- 1.6 Major terms used in guidelines

2 Basic idea concerning formulation of tsunami evacuation countermeasures in ports

- 2.1 Basic idea on tsunami countermeasures at ports
- 2.2 The role of port administrator, country (regional development agency, etc.) related to the formulation of tsunami evacuation measures etc
- 2.3 Ports that need to formulate tsunami evacuation countermeasures at ports
- 2.4 Scope of Tsunami Evacuation Measures at Harbor
 - 2.4.1 Target person
 - 2.4.2 Target area
 - 2.4.3 Target tsunami
 - 2.4.4 Tsunami after the earthquake Target period for evacuation
 - 2.4.5 Countermeasure period for tsunami evacuation measures at ports

3 How to formulate tsunami evacuation countermeasures at ports

- 3.1 Matters that need to be determined in tsunami evacuation measures at ports
- 3.2 Arrangement of characteristics of harbors
- 3.3 Establishment of Tsunami Inundation Assumption at Harbor
- 3.4 Setting of evacuation target area
 - 3.4.1 Review and setting of areas subject to evacuation
 - 3.4.2 Examination and Extraction of Evacuation Difficult Areas
 - 3.4.3 Examination and setting of emergency evacuation sites, tsunami evacuation facilities, evacuation routes, etc.
- 3.5 Securing the safety of those who need to engage in other tasks when a tsunami occurs
- 3.6 Securing means of transmission of tsunami information etc.
- 3.7 Criteria for evacuation judgment in port area
- 3.8 Communicating the tsunami evacuation measures, enlightenment

<p>港海の津波避難対策に関するガイドライン</p> <p>平成25年9月</p> <p>国土交通省 港 湾 局</p>	<p>港海の津波避難対策に関するガイドライン 目次</p> <p>第1章 港海の津波避難対策に関するガイドラインについて..... 1</p> <p>1. 1. 1 ガイドラインの目的..... 1</p> <p>1. 2 ガイドラインの策定経緯..... 1</p> <p>1. 3 ガイドラインの位置づけ..... 2</p> <p>1. 4 ガイドラインの位置づけ..... 4</p> <p>1. 5 ガイドラインによる検討と連携すべき計画等..... 6</p> <p>1. 6 ガイドラインで取り扱うべき事項..... 10</p> <p>第2章 港域における津波避難対策の策定に係る基本的な考え方..... 11</p> <p>2. 1 港域における津波避難対策に係る基本的な考え方..... 11</p> <p>2. 2 津波避難対策の策定等に係る関係機関、国（地方整備局等）の役割..... 13</p> <p>2. 3 港域における津波避難対策を実施する必要がある港域..... 17</p> <p>2. 4 港域における津波避難対策の対策範囲..... 18</p> <p>2. 4. 1 対象港域..... 18</p> <p>2. 4. 2 対象港域..... 18</p> <p>2. 4. 3 対象とする港域..... 18</p> <p>2. 4. 4 対象港域と津波避難対策の対応に関する事項..... 18</p> <p>2. 4. 5 港域における津波避難対策の対策範囲..... 18</p> <p>第3章 港域における津波避難対策の策定等..... 19</p> <p>3. 1 港域における津波避難対策において定める必要がある事項..... 19</p> <p>3. 2 港域の特性の整理..... 21</p> <p>3. 3 港域における津波発生想定の設定..... 23</p> <p>3. 4 避難対策の策定等..... 26</p> <p>3. 4. 1 避難対策の策定等（避難、誘導）..... 26</p> <p>3. 4. 2 避難対策の策定等（避難、誘導）..... 26</p> <p>3. 4. 3 緊急避難場所等、津波避難施設、避難経路等の検討、設定..... 27</p>	<p>3. 5 津波発生時に他の作業に必要とする必要がある港の保安の確保..... 29</p> <p>3. 6 津波発生時の伝達手段の確保..... 32</p> <p>3. 7 津波発生時の伝達手段の確保..... 33</p> <p>3. 8 津波発生時の伝達手段の確保..... 37</p> <p>3. 9 避難訓練..... 40</p> <p>3. 10 その他事項..... 43</p> <p>第4章 港域における津波避難対策の策定等による港域における津波避難対策の策定等..... 44</p> <p>4. 1 港域における津波避難対策の策定等による港域における津波避難対策の策定等..... 44</p> <p>4. 2 港域における津波避難対策の策定等による港域における津波避難対策の策定等..... 47</p> <p>第5章 津波避難対策の自己評価（評価チェックリスト）..... 73</p> <p>港域の津波避難対策に関するガイドラインの適用例..... 76</p> <p>おわりに..... 79</p>
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4 Advancement of tsunami evacuation measures in harbors by further tsunami countermeasures

- 4.1 Basic idea of further measures against tsunami evacuation
- 4.2 Further case of tsunami countermeasures

5. Self assessment of tsunami evacuation measures (evaluation check list)

Protect ships from Tsunami

- Probability of a large, M8-M9 class earthquake occurring within 30 years is appx. 70%.
- A large tsunami may arrive at a short notice on several fronts in Japan.

To decide on evacuation actions quickly, it is important to make **Ship's Tsunami evacuation manual & Response against Tsunami Checklist** in advance.



Damaged ships by Tsunami in Great East Japan Earthquake

Response against Tsunami Checklist

Format of the "Ship's Tsunami Evacuation Manual" with **one sheet (front/back)** for **3 important steps** on tsunami evacuation measures

- ① Basic items to be filled in advance
- ② Information to be confirmed when earthquake / tsunami occurs

How to Fill out 'Response against Tsunami Checklist'

- Check the guidance on "How to Fill out 'Response against Tsunami Checklist'" in our website.
- In preparation for a Tsunami occurring, it is recommended to actively seek information on tsunami in advance.
- Each Ship's Captain fills in the blanks **on consultation with ship's agents.**
- **Even if Captain may not fill in all the blanks in the front page**, this sheet can work as a checklist.
- It should be noted that the use of this sheet is not obligatory by statute.

Example of information collection from related organizations

Table of Response against Tsunami				
		Actions to be Taken by a Ship		
		Ship Response to a P&O		
Tsunami Warning & Recommendation	Time Allowance to Tsunami Arrival	Large/Not Specified Ships (Cargo, Fishing, etc.)	Small Ships (Passenger Boats, Fishing Boats, etc.)	Archived/Shipwrecked/Stranded Ships
Tsunami Warning	No	Suspend Cargo Handling/Works, Especially, Emergency Departure	Suspend Cargo Handling/Works, Especially, Emergency Departure	Use of Engine
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		Ship Response to a P&O		

Time series chart

Tsunami caused by earthquakes in the past

Assumed Tsunami submergence map

Example of Required Working Time

Emergency Departure	Working Time (minutes)	
Emergency Departure	5	Suspend the cargo handling works
	2	Call the crews
	17	Prepare for leaving port (Start the engine and thruster)
	5	Release/cut the Mooring → Departure
Staying Alongside	1	Notify the land and operating company after departure
	2	Call the crews
	3	Tight and add mooring lines and tighten the brake of mooring winch
	2	Prepare for anchoring
Evacuation to the Land	3	Prepare the engine and thruster as a readiness for mooring the break and drifting
	3	Discuss and instruct to suspend cargo handling
	1	Check the waterproofing, and close the waterproof doors and sea water valves
	1	Notify and confirm with the land and operation company

Fill in the blank table (decision guideline) based on the information obtained.

Response against Tsunami by Arrival Time (decision guideline)					
Warning Level	Tsunami Height	Berthing		Anchoring	
		Within 30 minutes	More than 30 minutes	Within 30 minutes	More than 30 minutes
Major Tsunami Warning	More than 3m	Evacuation to the Land	Emergency Departure	Emergency Departure	Emergency Departure
Minor Tsunami Warning	1 - 3 m	Staying Alongside	Emergency Departure	Emergency Departure	Emergency Departure
Low Tsunami Recommendations	Less than 1m	Staying Alongside	Emergency Departure	Emergency Departure	Emergency Departure

Example

Name: John Smith [Port: Port of XX] Cargo Ship

Response against Tsunami Checklist
(This sheet is not authorized as obligation by statute.)

Port and Ship Information	Berthing direction: Inbound / Outbound
Port: Port of XX	Quay: Seismic design / Non-seismic design
Berth / Quay: Berth A	

[Port: Port of XX] Cargo Ship

Basic Response List

(Fill in as far as practicable)

Keep monitoring the latest information of Tsunami. (from TV, Radio or VHF)	Confirm Tsunami occurrence indication from Port master, Harbor administrator, etc...
--	--

Name:

【Port: 】 Cargo Ship

Response against Tsunami Checklist

(This the sheet is not authorized as obligation by statute.)

Confirming before port entry in advance

Port and Ship Information		
Port:	Berthing direction: Inbound / Outbound	
Berth / Quay:	Quay: Seismic design / Non-seismic design	
Ship name:	Gross Tonnage:	
Ship type:	Crew:	Cargo:

Basic Information				
Safe water area: From (), () Degree ()m		Water depth: m		
Location :	Latitude: Longitude:	Distance from berth to safe water area : nm		
Time to arrive safe water area: minutes				
Place of evacuation area on land :		Handling support: Tug (Yes · No)		

Contact Point	
Agent:	Operating company:
Stevedore:	Harbor Master:
Liner:	Japan Coast Guard:
Tug Company:	Other:

Confirm Tsunami information in advance, if possible.	The assumed maximum Tsunami height: <input type="text"/> m (time of arrival: <input type="text"/>)
--	--

Response against Tsunami (Basic Policy)					
Warning level	Tsunami height	On berthing		On anchoring	
		Within ~minutes	More than ~minutes	Within ~minutes	More than ~minutes
Major Tsunami warning	More than 3m				
Tsunami warning	1~3m				
Tsunami advisory	Less than 1m				

Earthquake, Tsunami is occurred !!

Earthquake Information (Date - <input type="text"/>)			
Time	Scale	Place	Seismic Intensity
h m	M		
Tsunami Information			
Major Tsunami warning	Tsunami warning	Tsunami advisory	
Time to arrival of Tsunami	m	Anticipated height	m

Judge if Earthquake Tsu
Captain shall

【Port: 】 Cargo Ship

Basic Response List

(Fill in the as far as practicable)

Keep monitoring the latest information of Tsunami.
(from TV, Radio or VHF)

Confirm Tsunami occurrence indication
from Port master, Harbor administrator,
etc...

Emergency departure

*Continue to obtain the information of Tsunami
(from TV, Radio or VHF)

- ☐ ① Interruption of cargo work (minutes)
- ☐ ② Crew readiness (minutes)
- ☐ ③ Standby for departure (Engine and Thruster if provided) (minutes)
- ☐ ④ Consider support Tug, handler and Mooring crew are necessary or not
- ☐ ⑤ Confirm store landing facilities (Crane, Loading Arm, Bellows Chute, etc...) available
- ☐ ⑥ Check the suitability of the departure route (Proximity of hazards and other vessels in way of departure route) (minutes)
- ☐ ⑦ Unmooring or cutting lines (minutes)
- ☐ ⑧ Give notice to the shore (relevant departments or the operating company), after departure (minutes)

Staying alongside

*Continue to obtain the information of Tsunami
(from TV, Radio or VHF)

- ☐ ① Crew readiness (minutes)
- ☐ ② Tending mooring lines / Tightening brakes of mooring winches (minutes)
- ☐ ③ Standby anchor (minutes)
- ☐ ④ Standby engine and thruster if provided (To avoid damaging of lines, Surging) (minutes)
- ☐ ⑤ Discuss or instruct for the interruption of Cargo work, etc... (minutes)
- ☐ ⑥ Check watertight measures (close all the watertight doors / openings, etc...) (minutes)
- ☐ ⑦ Give notice to the shore (relevant departments or the operating company) (minutes)
- ☐ ⑧ Check the ways to obtain the latest information.
(Preparing vessel on the advice or the indication from Harbor Master/ Harbor administrator, etc...)
(Check the safe water area in advance for the emergency departure)
(Check the safe area, the evacuation route for evacuation to the land)

Evacuation to the land

*Continue to obtain the information of Tsunami
(from TV, Radio or VHF)

- ☐ ① Crew readiness (minutes)
- ☐ ② Check the safe area, the evacuation route, the required time to evacuate etc... (minutes)
- ☐ ③ Instruct crew to evacuate to land (minutes)
- ☐ ④ Carry out the required work on board till Evacuation to the land (minutes)
(Disengaging the connections such as loading facilities between the ship and the land)

Attention in case of drifting (Additional points)

Type of Tsunami Forecast		Available Time before tsunami arrival	Docked at pier		Small boat	Anchored & mooring buoy	navigating	
			Vessel and medium-sized vessel (including fishing vessel)				Vessel (including fishing boat)	Small boat
			Vessels with hazardous material	Standard (include a working ship)				
Tsunami Warning	Major 3m, 4m, 6m, 8m, Over 10m	imminent	Halt cargo handling and all other operation & (B) (general rule)	Halt cargo handling & (A)	(A)	(E)	(B)	(B) or (A) after getting a shore
		medium	Halt cargo handling and all other operation & (B) (general rule)	Halt cargo handling & (B) or (A)	(D) or (A) ((B) in some case)	(E) or (B)		(B) or (D) ((A) in some case)
		enough	Halt cargo handling and all other operation & (B)	Halt cargo handling & (B)	(D) ((B) in some case)	(B)		(B) or (D)
	Tsunami 1m, 2m	imminent	Halt cargo handling and all other operation & (B) (general rule)	Halt cargo handling & (A) or enforce mooring	(A)	(E)	(B)	(B) or (A) after getting a shore
		medium	Halt cargo handling and all other operation & (B) (general rule)	Halt cargo handling & (B) or (A) or enforce mooring	(D) or (A) ((B) in some case)	(E) or (B)		(B) or (D) ((A) in some case)
		enough	Halt cargo handling and all other operation & (B)	Halt cargo handling & (B) or enforce mooring	(D) ((B) in some case)	(B)		(B) or (D)
Tsunami Advisory	Tsunami Attention 0.5m		Halt cargo handling & enforce mooring or (B)	Halt cargo handling & enforce mooring or (B)	(D) or (B)	(C) ((B) or (E) in some case)	(B)	(D), (B) or enforce mooring
Remarks			The enterprise shall prepare a manual in advance.		If there is appropriate evacuation area in out of port for small boat, (B) is also recommended.	(ZZZ) see below		

- (A) Evacuation on land : All crew shall evacuate to the higher ground because an evacuation by ship is expected to be high risk. Make an effort to prevent the flowing out of ships and security actions for hazardous materials as much as possible.
- (B) Evacuation out of port: Evacuate to the deep water depth and broad area of out of port. (If there is no time to evacuate, stay in the designated emergency evacuation area in the port.)



UNESCO/IOC – NOAA ITIC Training Program in Hawaii (ITP-TEWS Hawaii)
TSUNAMI EARLY WARNING SYSTEMS
AND THE PACIFIC TSUNAMI WARNING CENTER (PTWC) ENHANCED PRODUCTS
TSUNAMI EVACUATION PLANNING AND UNESCO IOC TSUNAMI READY PROGRAMME
15-26 September 2025, Honolulu, Hawaii

Thank You

Dr. Laura Kong
Director, ITIC



Pacific
Community
Communauté
du Pacifique