UNESCAP Project TTF-29:

Strengthening Tsunami Warning in the North-West Indian Ocean Through Regional Cooperation

First Regional Workshop on Tsunami Evacuation Planning (TEP)

24 August 2022

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Intergovernmental Oceanographic Commission

Indian Ocean Tsunami Information Centre

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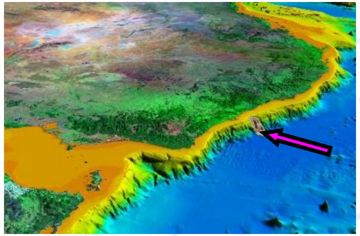
Economic and Social Commission for Asia and the Pacific

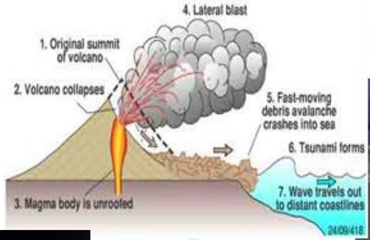
The Tsunami Threat

- Hard to predict
- Hard to characterise
- Very fast moving
- Difficult to monitor
- Hard to warn
- Challenge to educate

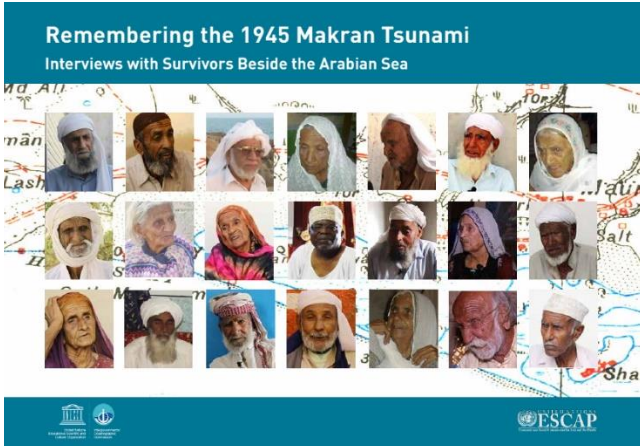
Sources of Tsunami

- Earthquakes along subduction zones (most common cause)
- Undersea landslides
- Volcanoes
- Meteo-tsunamis
- Meteorites





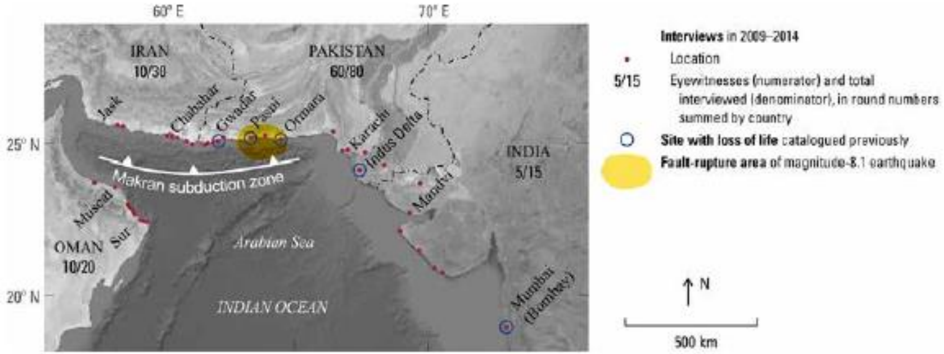
Historical Near-Field Impacts in NWIO



Makran Source Zone

Carried out by Drs. D.M. Kakar, G. Naeem, et al. [2015]

Up to 4,000 deaths



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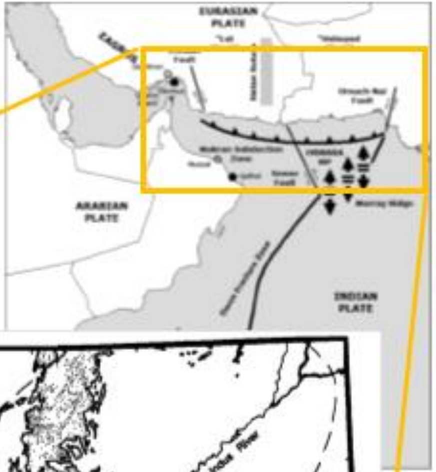
Historical Earthquakes in the Makran Subduction Zone

(Kukowski et al, 2000)



Earthquakes along the MSZ:

- Recorded Ms 8.1 in 1945
- Historical events in 1765 and 1851
- Only one possible historical event in Western Makran in 1483

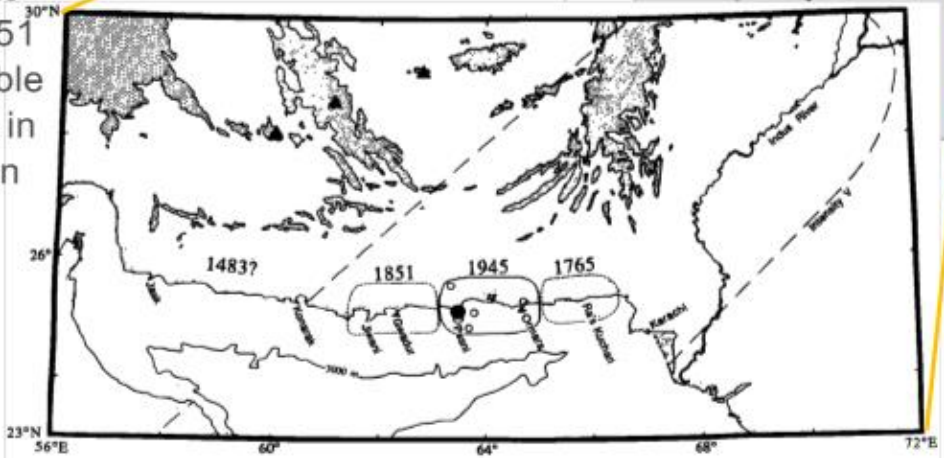
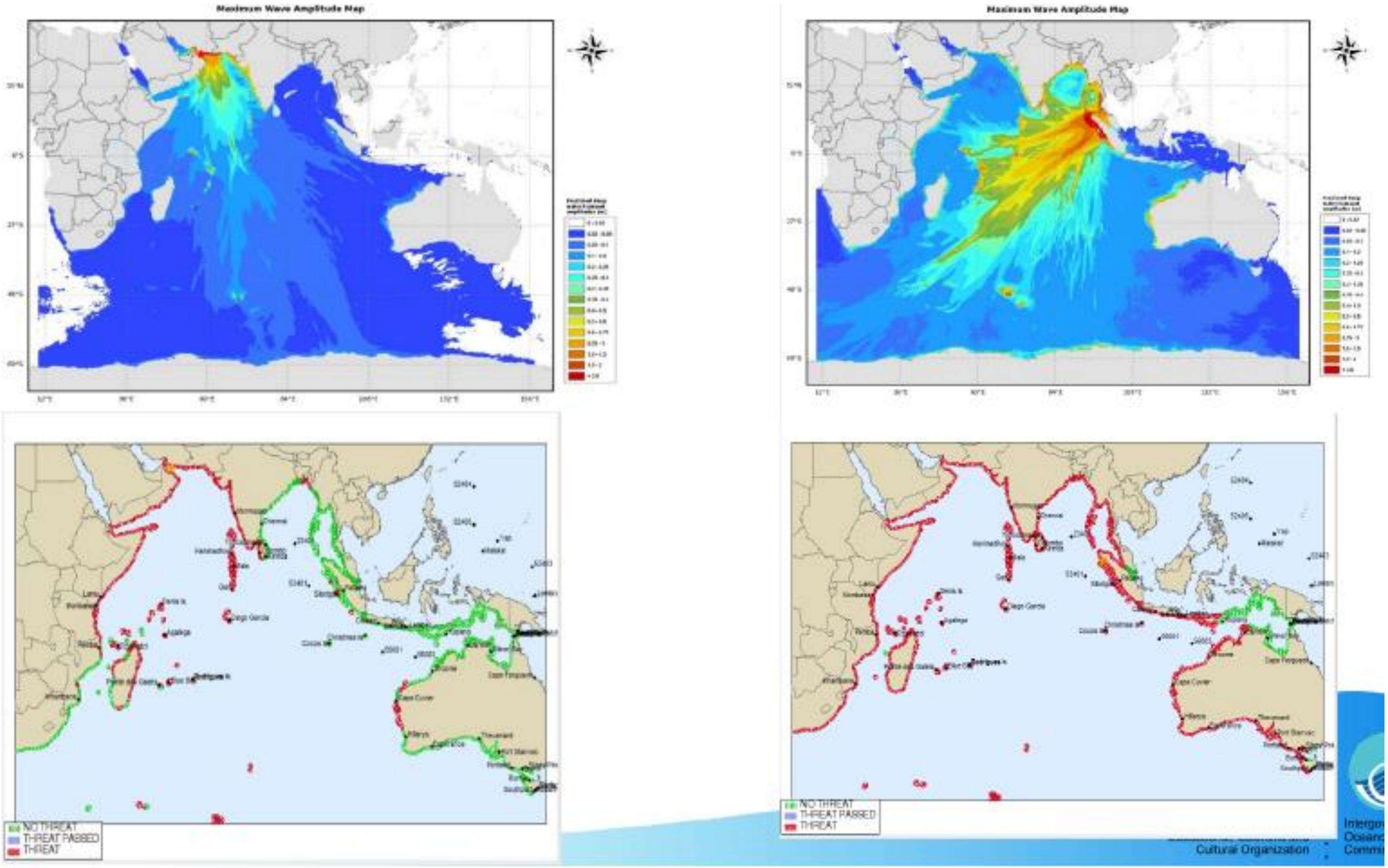


Fig. 6. Historical great earthquakes of Makran. Maximum estimated rupture areas are shown for historic sequences; thin solid line shows our estimate of the approximate rupture area of the 1945 earthquake (see text for discussion). The epicenter of 1945 mainshock is shown as large solid circle; aftershocks shown by open circles. The intensity 5 isoseismal of 1945 event from *Pendse* [1948] is shown as long dashed line. Solid triangles mark major volcanic centers. Regions elevated more than 1500 m are enclosed by dotted pattern.

(Byrne et al., 1992)



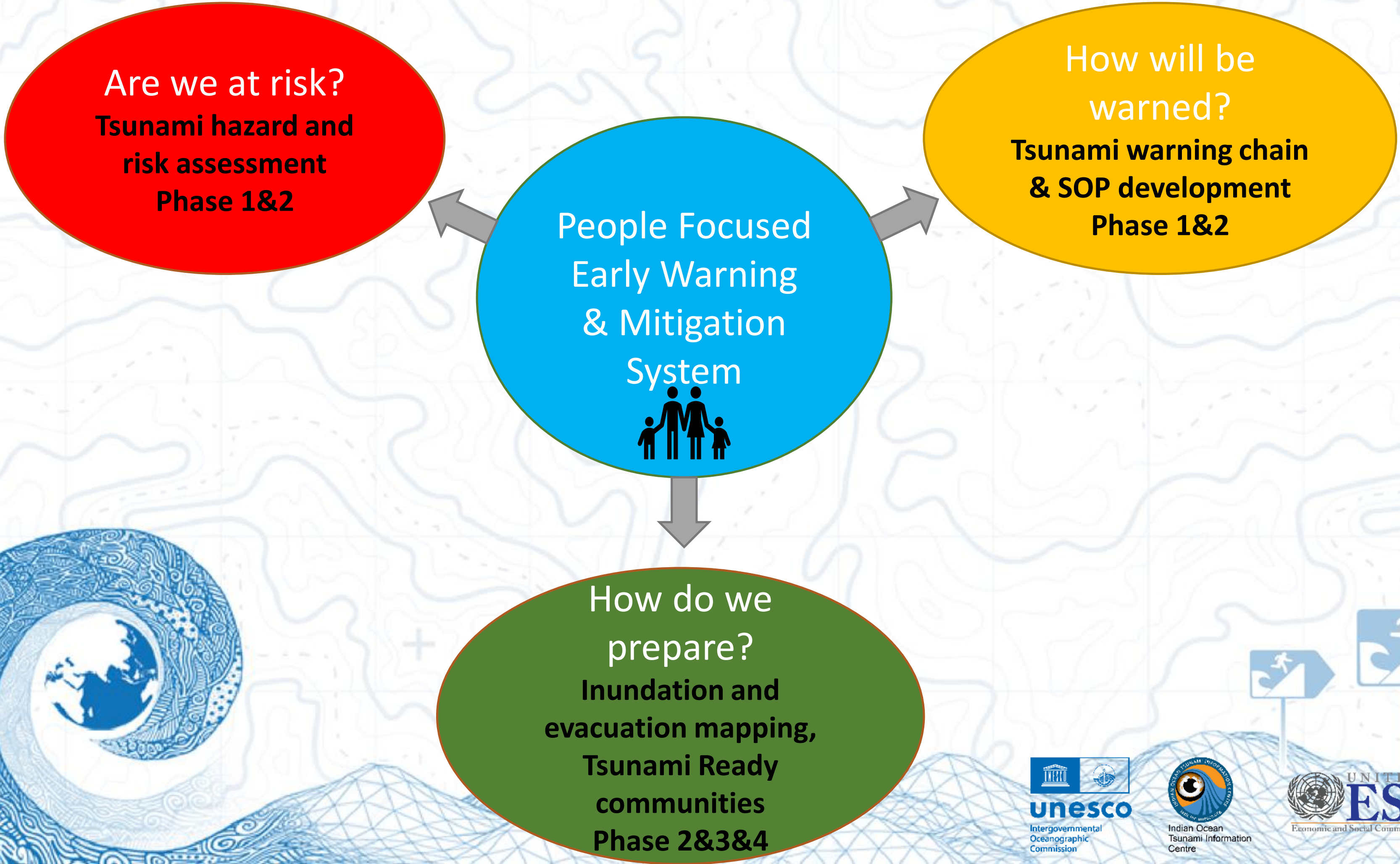
Possible Scenarios for Near-Field and Far-Field Tsunami Threats to NWIO

Hazard: Different Levels of Threat

- **Land Threat:**
  Life threatening and devastating land inundation impacts…
  low lying coast evacuations required

- **Marine Threat:** Damaging ocean currents and surges, plus potential minor land inundation, leading to serious economic impacts…

  no major evacuations required



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ESCAP TTF-29 Project Plan:

Better understand tsunami risk	Phase 1 (completed)
Build national tsunami warning chains	**Phase 2a**
Assess and develop inundation and evacuation mapping capability	**Phase 2b**
Train in inundation and evacuation mapping	Phase 2c (proposed)
Prepare at-risk communities to be Tsunami Ready	Phase 3 (proposed)

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Science Informing
Tsunami Warning Response and
Community Preparedness

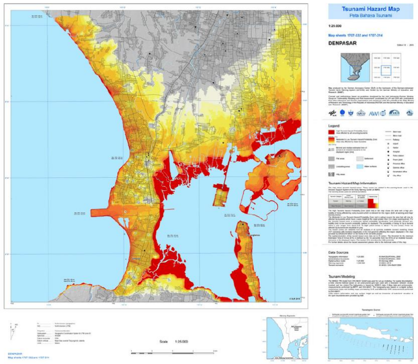
Improved scientific understanding of tsunami hazard in NWIO

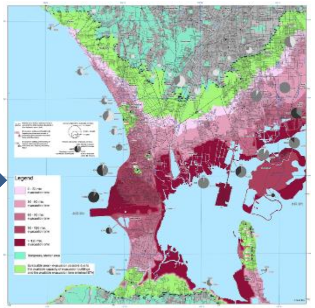
Enhanced tsunami model for forecasting

Inundation modelling

Inundation maps

Evacuation maps





UNESCO-IOC Tsunami Ready Recognition Programme

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Community performance-based programme

Active collaboration of the public (community), community leaders, local and national emergency management agencies, and the national tsunami warning centre.

Based on 12 Indicators

Developed from **best practices and lessons learnt** worldwide.

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.

UNESCO-IOC Tsunami Ready Recognition Programme

Implement across NWIO in Phase 3 to achieve Tsunami Ready Certification of 100% at-risk coastal communities to meet UN Ocean Decade 2030 Goal

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Phase 1 UNESCAP TTF-29 Project

Project Funder: UNESCAP Tsunami Trust Fund
Participating Member States: India, Iran, Pakistan, *Oman & UAE as self-funded*
Target Groups: NTWCs, DMOs, Media, Communities, Response Agencies
Project Duration: 24 Months - completed

Outcomes:

1. **Better understanding of the risk knowledge based on scientific research**
2. **Improvement of warning services at NTWC level and the organization of the national warning chains to assure timely warnings and rapid response with due emphasis on self-protection for near source events.**

Phase 2 UNESCAP TTF-29 Project

Project Funder: UNESCAP Tsunami Trust Fund
Participating Member States: India, Iran, Pakistan, *Oman & UAE as self-funded*
Target Groups: NTWCs, DMOs, Media, Communities, Response Agencies
Project Duration: 12 Months: December 2021 – December 2022

Outcomes:

1. **Finalisation of Phase-1 activities in tsunami risk knowledge and strengthening of national tsunami warning chains.**
2. **Gap analysis and development of guidance on tsunami inundation mapping and evacuation planning in the NWIO region.**

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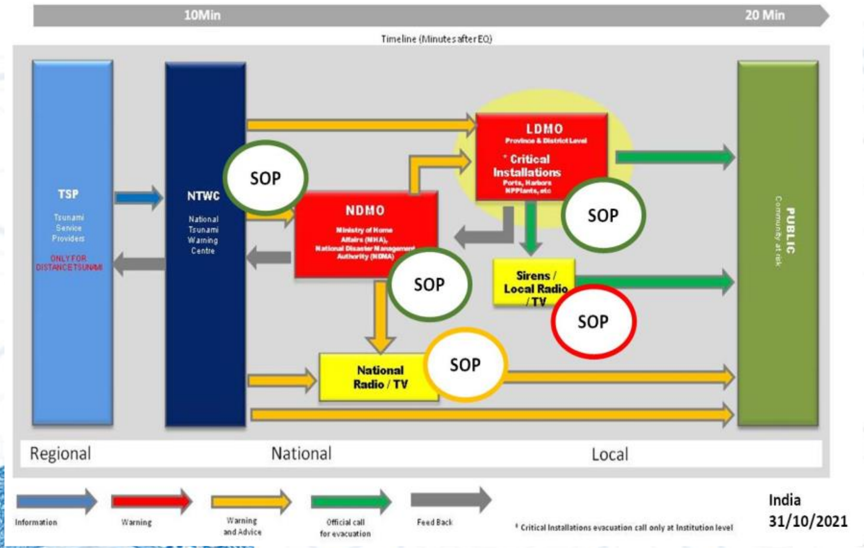
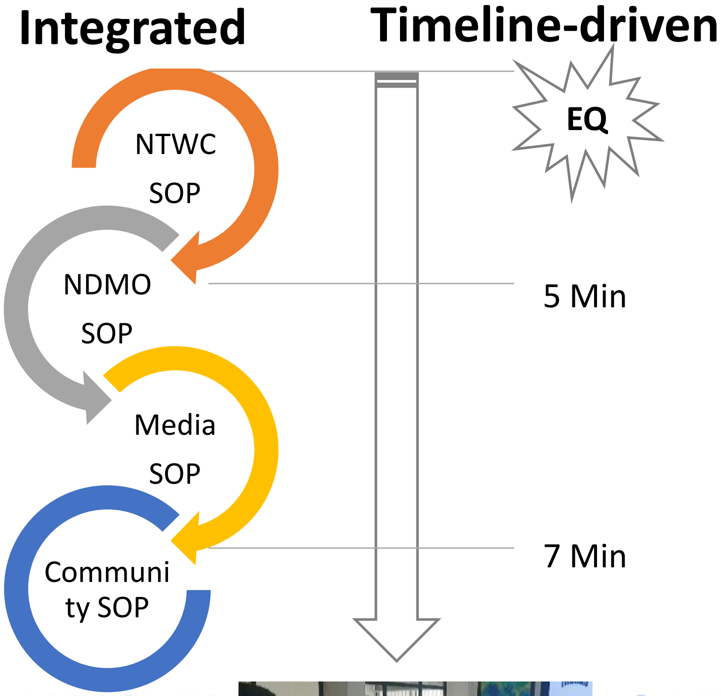
National Tsunami Warning Chains & SOPs





Final SOP NTWC/DMO/Broadcast Media Training Workshop to be hybrid during 19-23 September

New Additional Activity:
NWIO Regional tsunami exercise

Activity

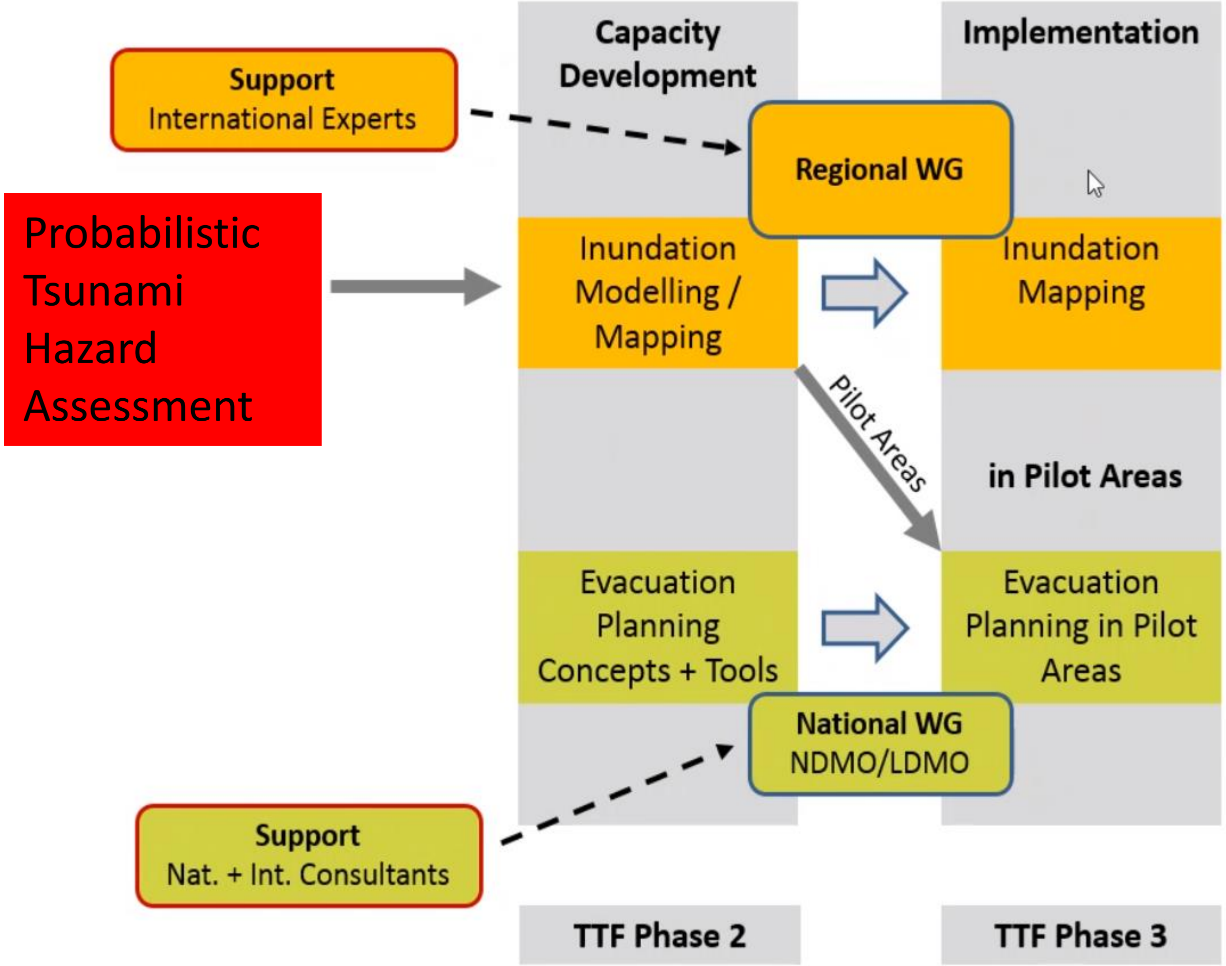
- Table-top exercise
- NWIO region

Output

- Test and refine national tsunami warning chains established during Phase-1 of project.

NWIO Table-top SOP Exercise to be held in hybrid format (regional online & national face-to-face meetings during 1-3 November 2022.

Gap analysis and development of guidance on tsunami inundation mapping and evacuation planning in the NWIO region.



Tsunami Inundation Mapping:
Gap analysis and development of guidance

Activity

- Included in ICG/IOTWMS WG-NWIO activities
- Underpinned by PTHA model of Phase-1 and Phase-2a
- Cooperation and exchange of knowledge on tsunami modelling and inundation mapping
- Gap analysis of tsunami inundation capabilities in the region

Output

- Development of a unified approach and method for tsunami modelling and inundation mapping for the NWIO region.

Key Players

- Regional Reference Group
  - Agencies that hold data: bathymetry and topography
  - Modellers
  - National Tsunami Warning Centers, Regional Researchers/Academics, and International Experts
  - Consultant to undertake a NWIO Region Inundation Modelling Gap Analysis

Tsunami Evacuation Planning:
Gap analysis and development of guidance

Activity

- Support establishment of national working groups on tsunami evacuation planning involving DMOs to facilitate implementation in each participating country
- Synthesise existing information on tsunami evacuation planning: approaches, standards, methodologies & best practices
- Gap analysis of current member state capabilities
- Guide development of national tsunami evacuation planning policies, standards and approaches
- Develop strategies for utilising PTHA and inundation mapping capabilities

Output

- Set of national policies, standards and approaches for tsunami evacuation planning in participating countries
- Translation of key guides and documents into local languages for LDMOs

Key Players

- National Reference Groups
  - Disaster Management Organisations (P/LDMOs, NDMOs)
  - Emergency Managers
  - Community Leaders and other local-level stakeholders
  - International consultant supported by national consultants to assist with compilation of National Tsunami Evacuation Mapping Gap Analysis

National and Regional Workshops and Meetings Sharing and Developing Best Practices

Activity	Modality	Date
Regional Tsunami Evacuation Planning Workshop	Online	24 Aug
PTHA Hackathon	Hybrid, Italy	29 Aug – 9 Sept
Regional WG Inundation Modelling Meeting	Online	8-9 Sept
National Tsunami Evacuation Planning WG meetings	National	12-16 Sept
SOP NTWC/DMO/Broadcast Media Workshop	Hybrid, national	19-22 Sept
Makran Source Zone Science Exchange Meeting	Hybrid, national	17-18 Oct
NWIO Regional Inundation Science Meeting	Online	19-20 Oct
NWIO Table-top SOP Exercise	Hybrid, national	1-3 Nov
Best Practices Tsunami Evacuation Planning Workshop	Hybrid, Indonesia	23 Nov

Consultancies

Key Tasks

- *Development of training & briefing materials*
- *Identification of best practices in inundation & evacuation mapping*
- *Workshop & meeting preparation*
- *Reporting outcomes*

Consultants

- *Indian National Center for Ocean Information Services (INCOIS)*
- *Mr. Mehdi Masoodi (Iran)*
- *Ms. Ghazala Naeem (Pakistan)*
- *Mr. Harald Spahn (International)*
- *Dr. Jorn Lauterjung (International)*

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