Training/Workshop on

Tsunami Evacuation Maps, Plans, and Procedures and
the UNESCO-IOC Tsunami Ready Recognition Programme for the Indian Ocean Member States

Hyderabad - India, 15-23 April 2025

UNESCO-IOC Tsunami Ready Indicators

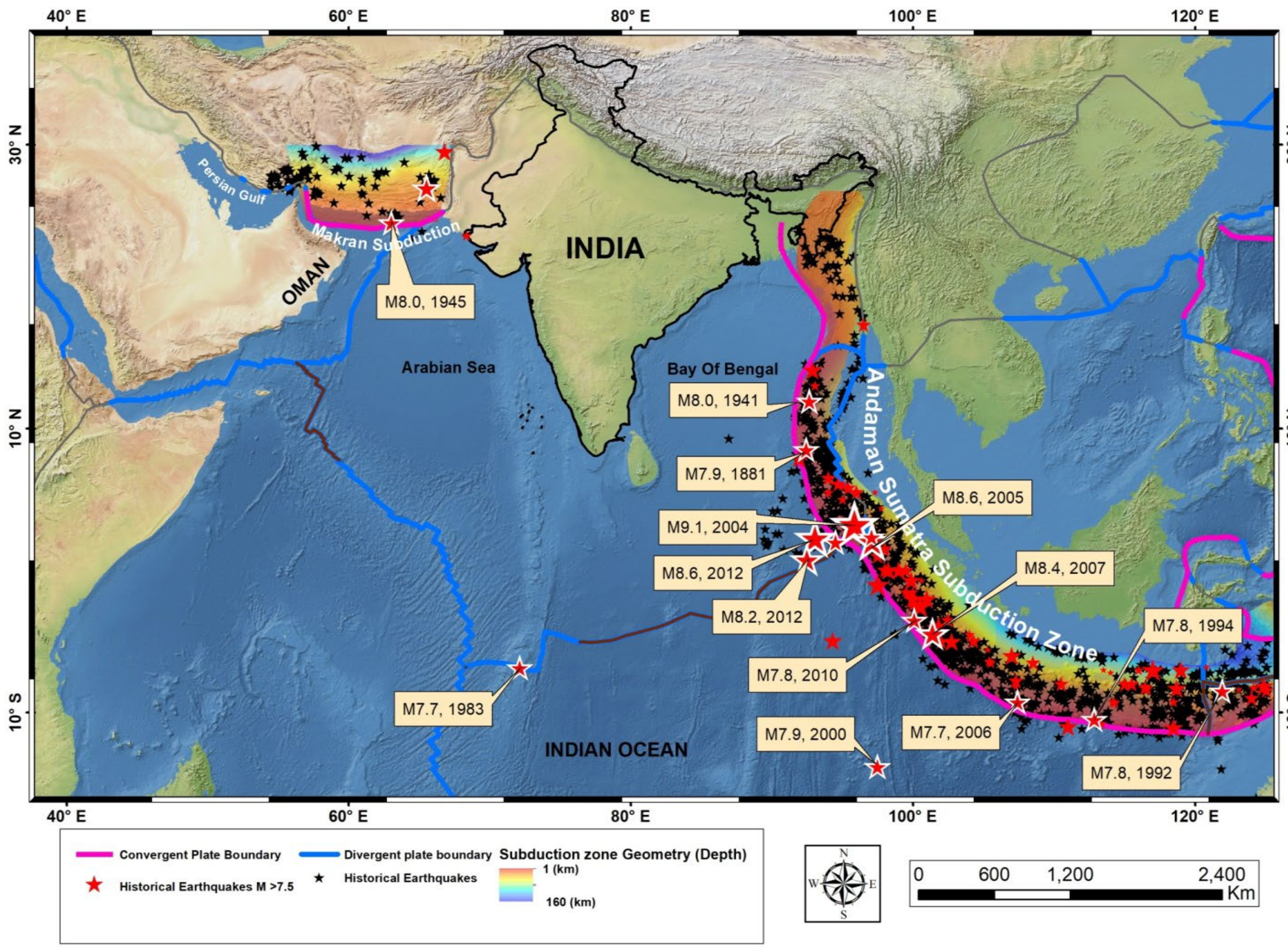
TRRP 18: Lessons Learnt from India on Capacity Building for Tsunami Ready Community

TEMPP 2025

Sunanda Manneela
INCOIS - India
Chair of Northwestern Indian Ocean ICG/IOTWMS

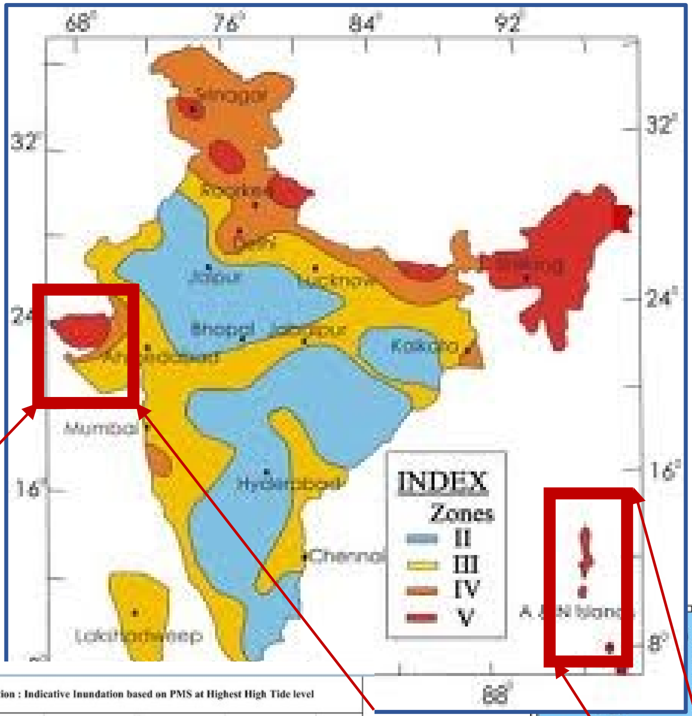
Acknowledgements: Ardito Kodijat and Rick Bailey

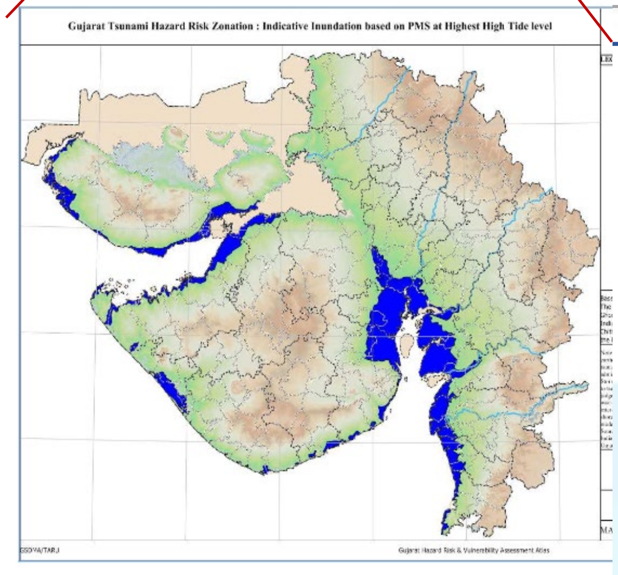
Potential Tsunamigenic Sources in the Indian Ocean

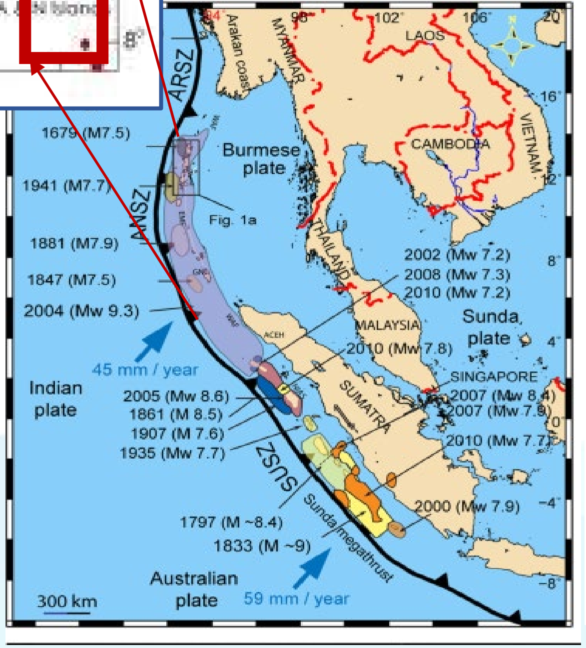


- **Major Subduction Zones**
  - Subduction Zone: Indian and Australian plates are moving north and eastward relative to Eurasian plate forming a convergent boundary
  - Sumatra Andaman Subduction Zone (SASZ) – From Himalayan front southward through Myanmar, Andaman and Nicobar Islands, Sumatra, Java and the Sunda Islands (Sumba, Timor), to the north of Western Australia
  - Sumatra Andaman Subduction Zone (SASZ) ~6000 km
  - Makran Subduction Zone (MSZ) – lies between southeastern Iran and southwestern Pakistan
  - Makran Subduction Zone (MSZ) ~900 km

Seismicity Profile of Gujarat and Andaman & Nicobar Islands







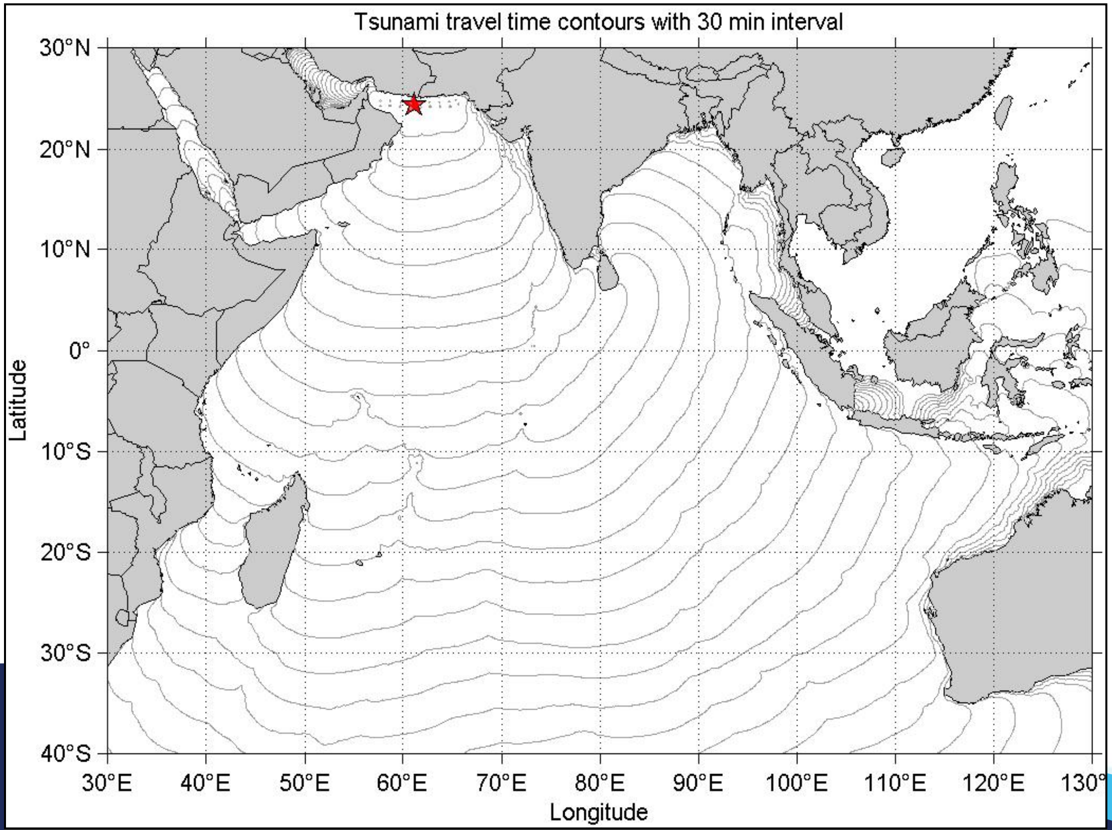
B denotes Eqs in A&N Subduction Zone and I denotes Makran

Segment	Magnitude	Completeness Interval (years)	No. Earthquakes	Recurrence Interval	Historical Events	References
B	8.0	200	3	67	1881[1],1941[1],2004[1]	Ortiz and Bilham (2003)
	9.0	600	3	300	1400[2],2004[1]	Moneke *et al.* (2009), Jankaew *et al.* (2009)
C	8.0	250	4	62	1843[3],1861[3],1907[3],2005[1]	Newcomb & McCann (1987), Briggs *et al* (2005)
	8.5	250	2	125	1861,2005	
D	7.5	250	6	42	1770[3],1797[4],1818[3],1833[4], 2007a[1],2007b[1]	Newcomb & McCann (1987), Natawidjaja *et al* (2006)
	8.5	250	3	83	1797[4],1833[4],2007a[1]	
	8.5	650	7	93	1350[2],1380[2],1606[2],1685[2] 1797[4],1833[4],2007a[1]	Sieh *et al.* (2008)
E	7.5	250	1	>250	2000[1]	Abercrombie *et al.* (2003)
F	7.5	250	6	42	1840[3],1859[3],1921[3], 1994[1],2006[1]	Newcomb & McCann (1987), Abercrombie *et al* (2001), Ammon *et al* (2007)
	8.0	250	2	125	1994[1],2006[1]	
I	8.0	250	≤3	≥83	1765[3],1851[3],1945[1]	Byrne *et al.* (1992)

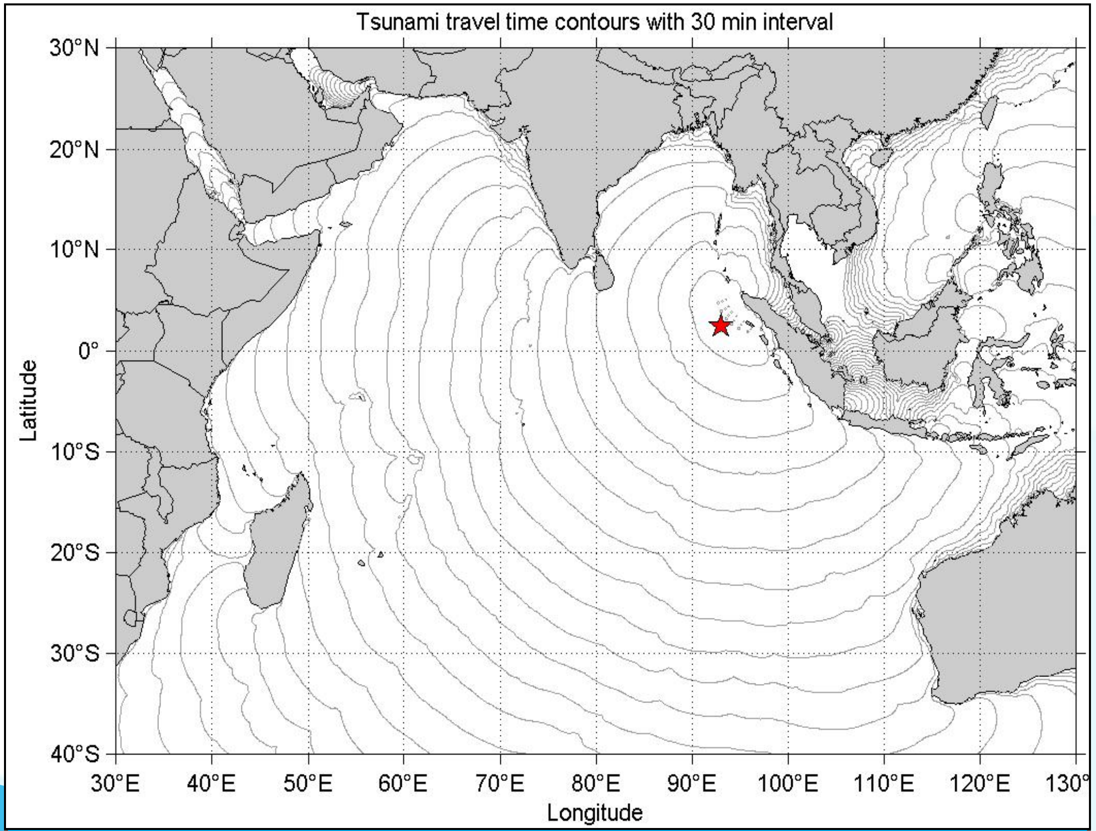
Tsunami Risk Assessment of India

Tsunami Travel Times & Response time

- Depending upon the Earthquake location (Makran/Andaman-Sumatra Subduction Zone) the response time for evacuation of coastal population could range between 20 min to few hours.
- As Andaman & Nicobar Islands are situated right on subduction zone the available response time is very short

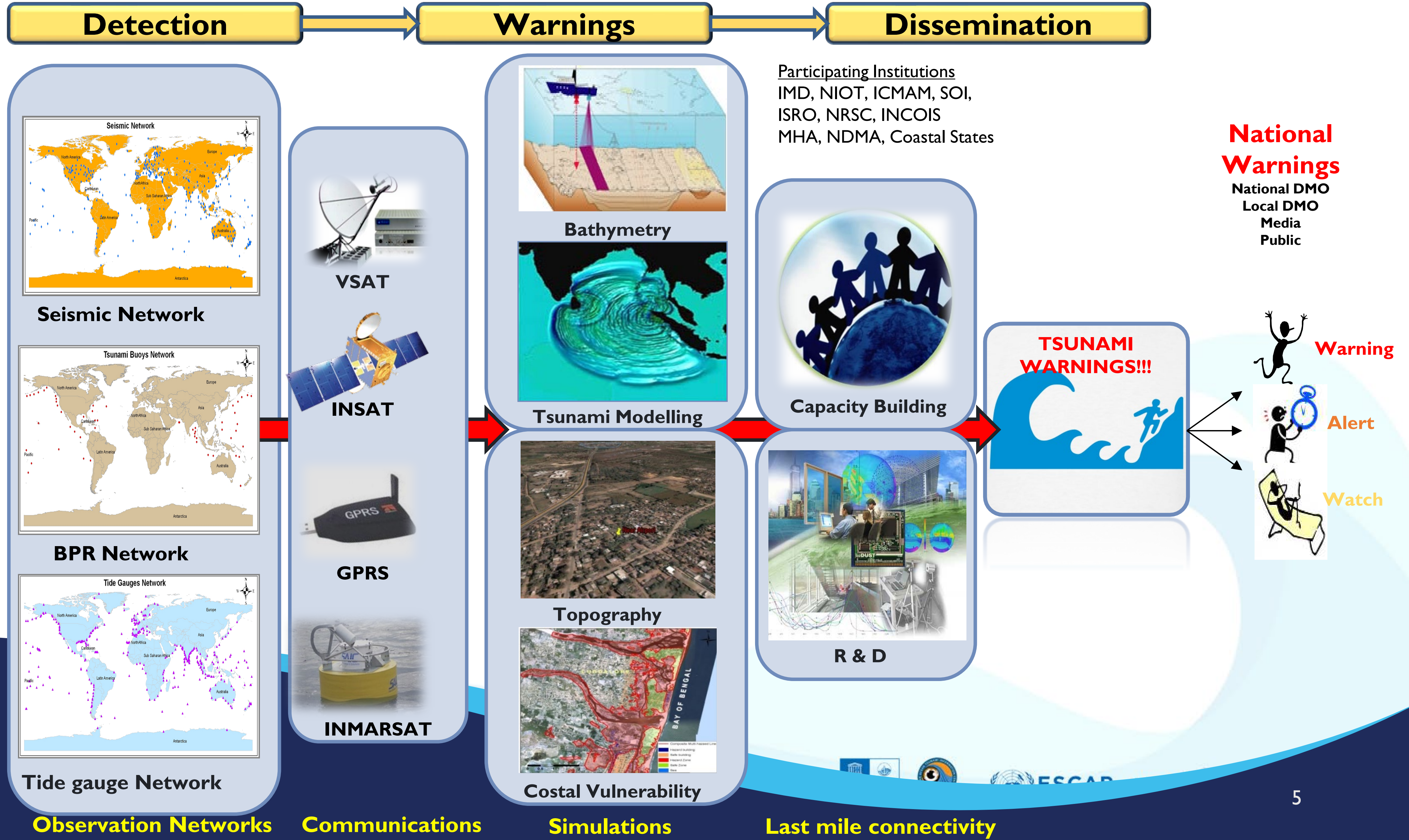


- If Earthquake occurs at Makran Subduction zone, Travel Time to nearest Indian Coast (Gujarat) are 2 to 3 hrs



- If Earthquake happens at Sumatra, travel times to nearest coast (A&N Islands) are 20 to 30 min
- For Indian main land travel times are 2 to 3 hrs

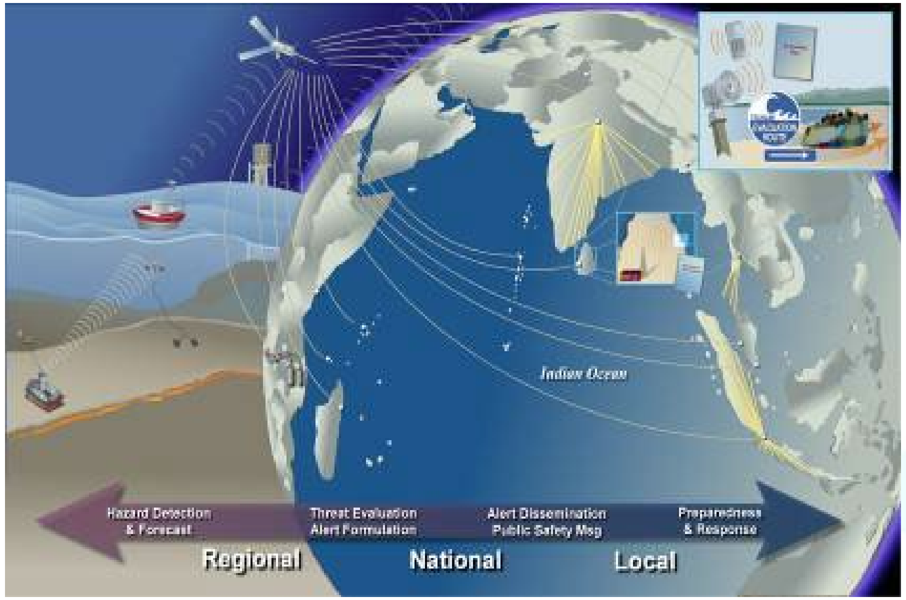
Indian Tsunami Warning System Architecture



End-to-End Tsunami Warning System

Upstream

- Data reception and analysis
- Detection & verification of threat
- Threat evaluation & tsunami forecast
- Warning dissemination



Downstream

- Tsunami awareness and preparedness
- Delivery of public safety message
- Safe evacuations
- Build Tsunami Resilient Communities

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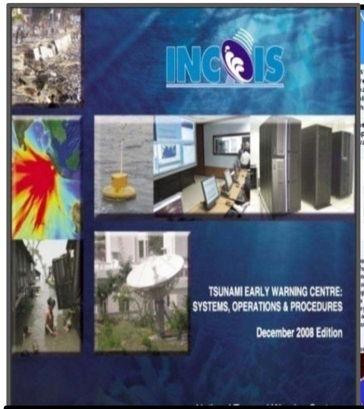
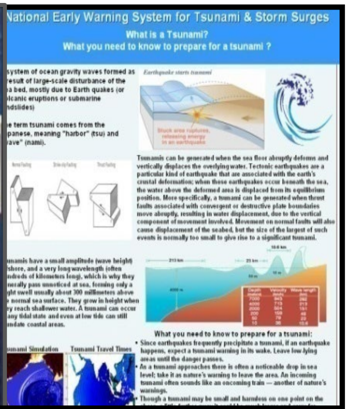
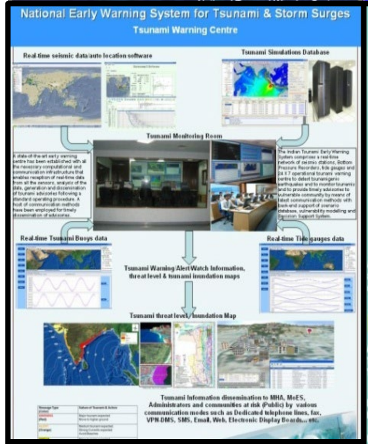
Community Awareness & Preparedness Programmes

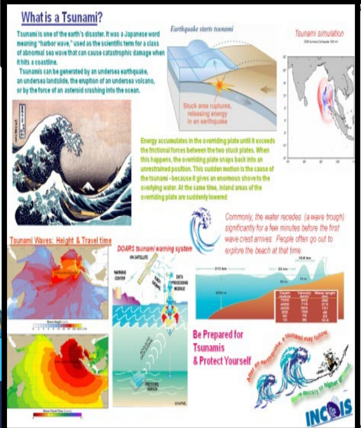
Tsunami Awareness and preparedness through:

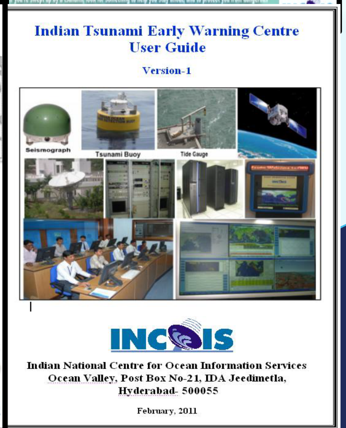
- Regular Trainings/Workshops
- Interactive meetings
- Sensitisation programs
- Informative Booklets, Poster, Leaflets, brochures, etc.
- Short films
- Communication Test
- Tabletop exercises
- Mock drills
- World Tsunami Awareness Day (5 Nov)
- Tsunami Ready programme







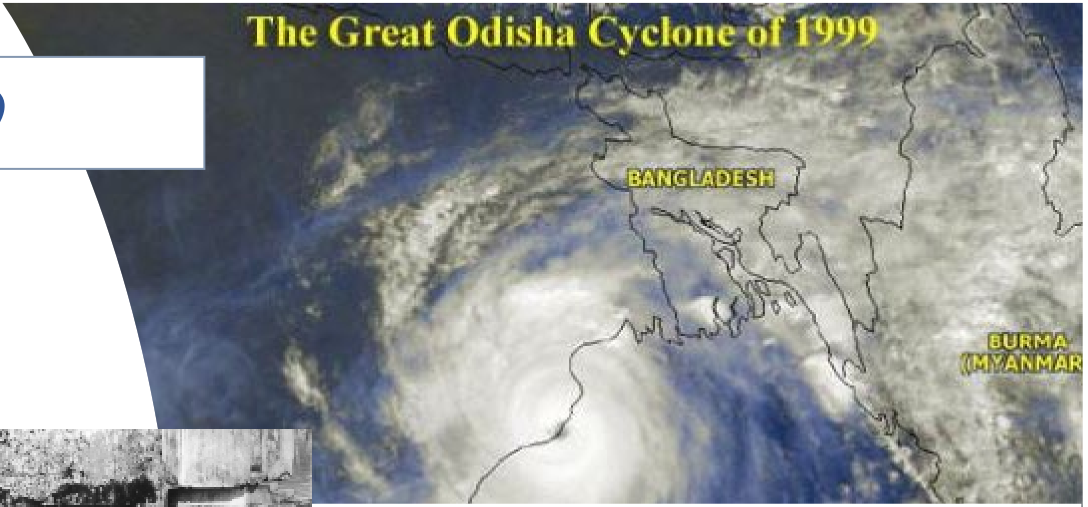


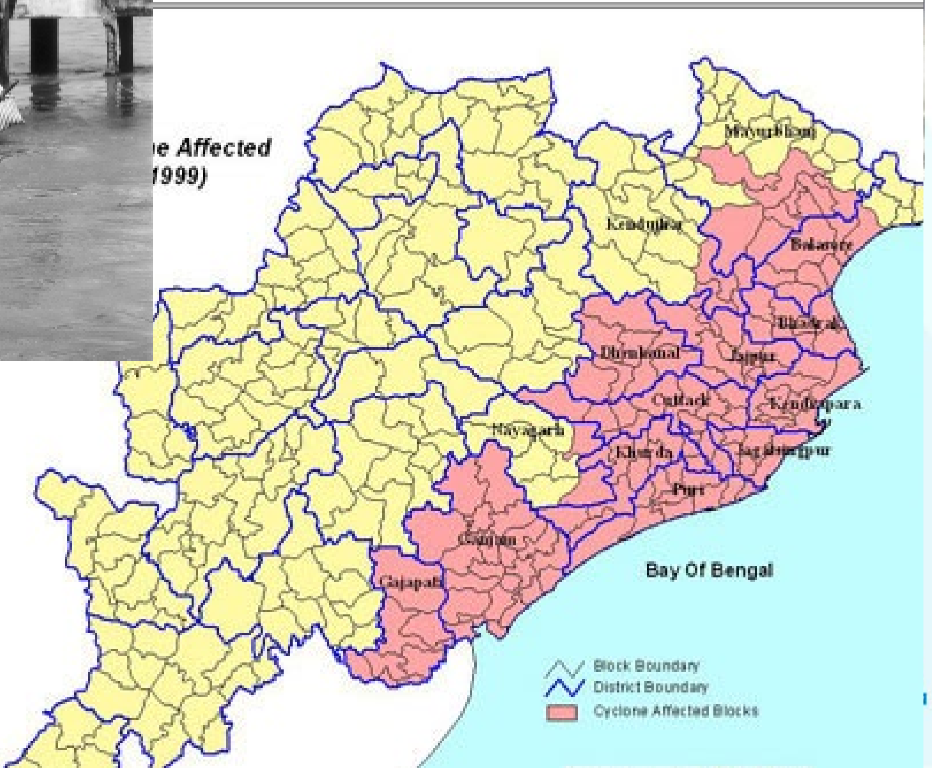


Odisha

The Great Super Cyclone of 1999

Capitalizing on Cyclone Preparedness for Tsunami Ready Community





Impact of The Great Odisha Super Cyclone of 1999

- Human Lives Lost 10.086
- Person Injured: 12.507
- Population Affected: 15.6 Million
- Houses Damaged or washed away 1.8 million

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Courtesy: Ardito Kodijat, 2021

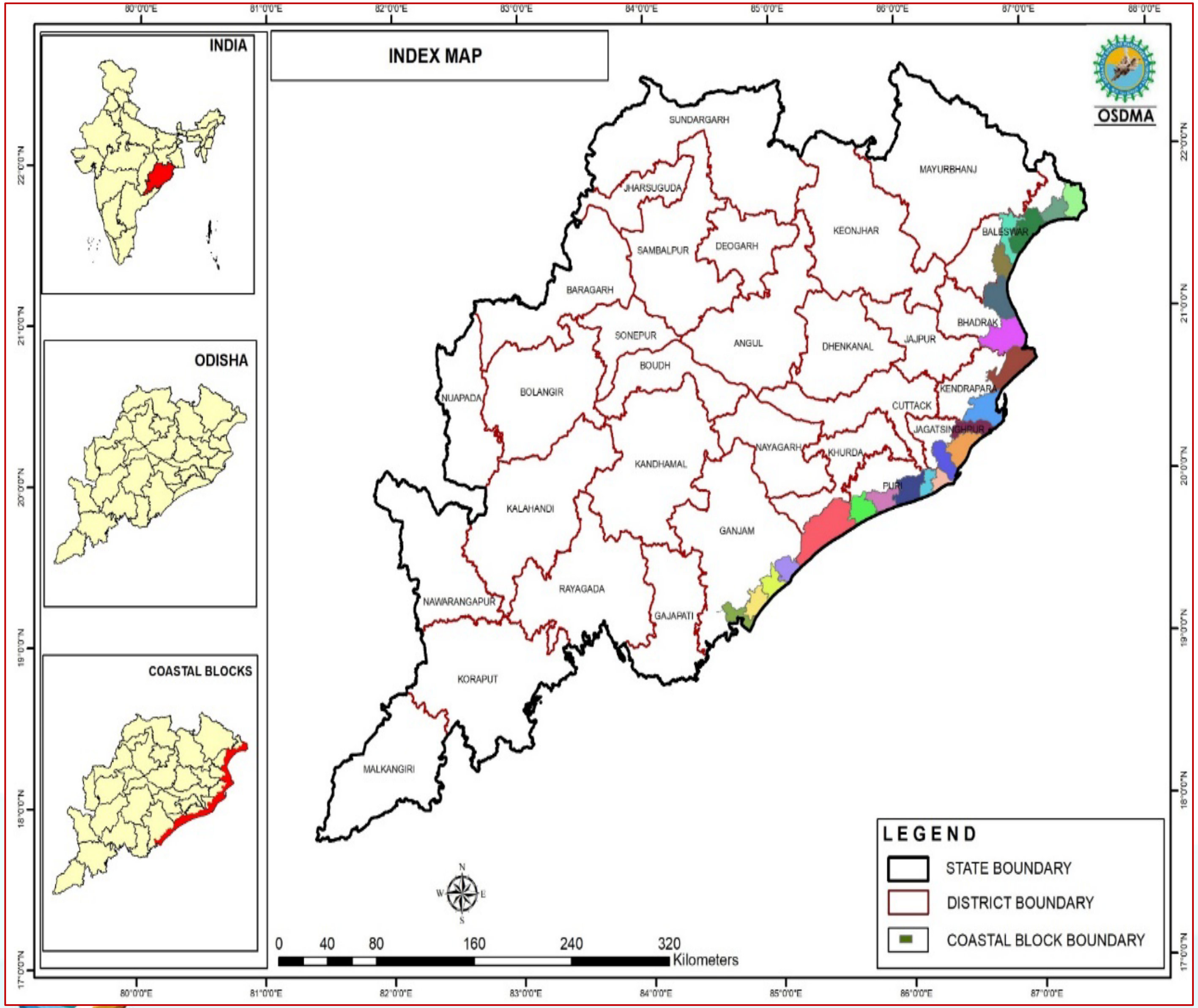
Odisha

Preparedness Action Post Odisha Super Cyclone of 1999

- Construction of Multi-purpose Cyclone Shelters
- Cyclone Resistant Building Construction Technology for Houses
- Community Awareness Program
- Disaster management and Managers at Community
- Central, State, District, Block and Community Disaster Management Plan

Courtesy: Ardito Kodijat, 2021

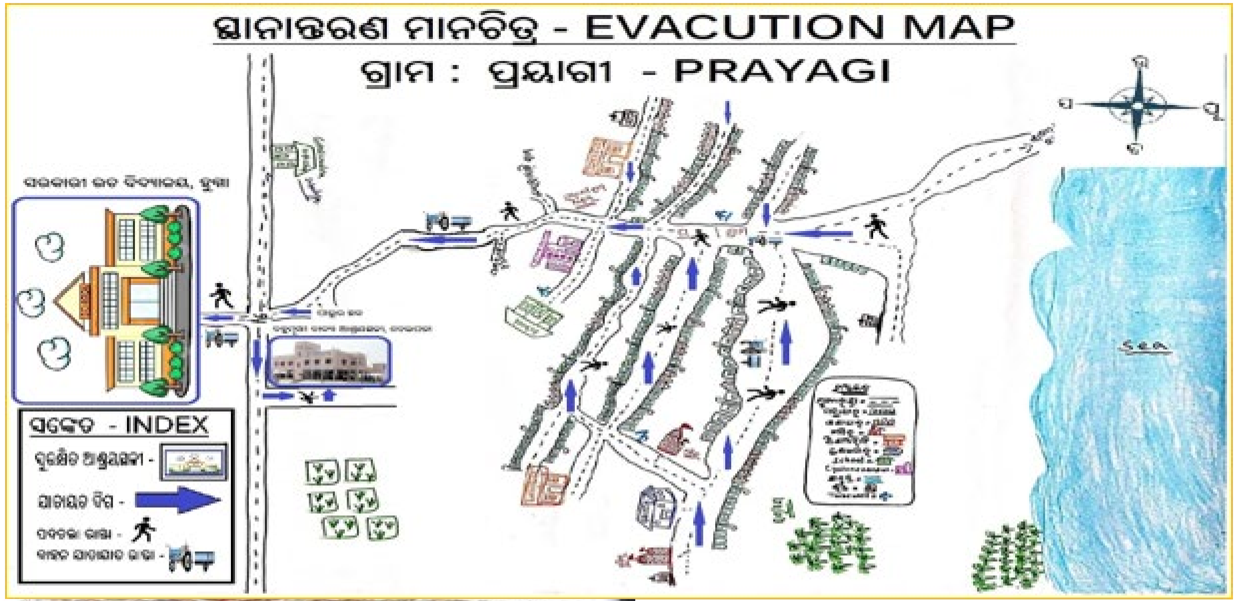
Odisha Coastal Villages

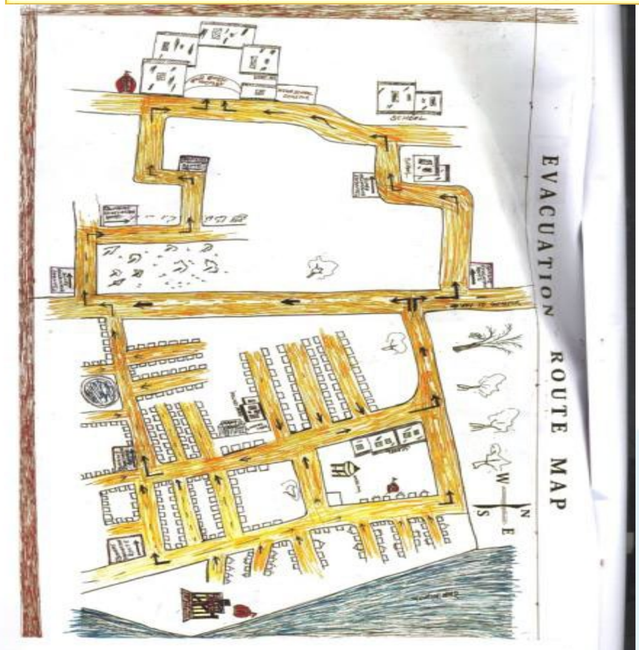


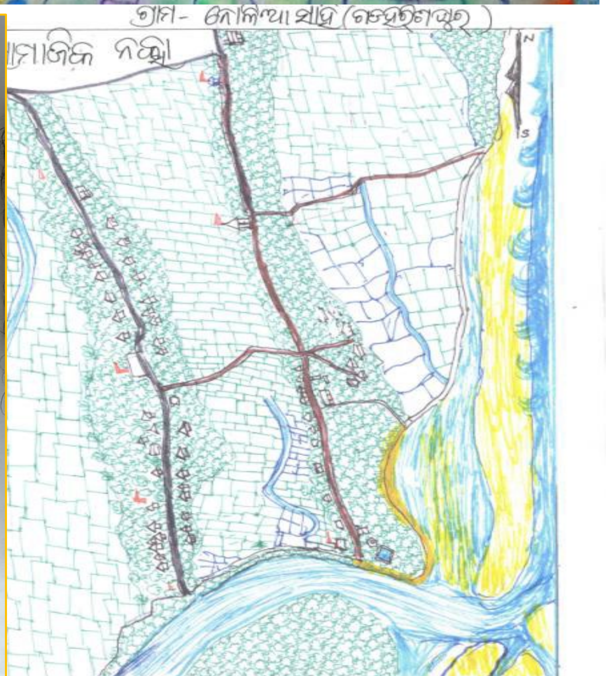
District	Block	GP	Village	ULB	Ward	Total (V+W)
Balasore	5	29	62	0	0	**62**
Bhadrak	2	15	40	1	1	**41**
Kendrapada	2	12	61	0	0	**61**
Jagatsinghpur	3	14	25	1	18	**43**
Puri	6	33	86	2	23	**109**
Ganjam	4	17	42	2	23	**65**
Total	**22**	**120**	**316**	**6**	**65**	**381**

- Hazard zone maps
- Number of people live in the tsunami hazard zones
- Identified vulnerable groups
- Inventory of economic, infrastructural, political and social resources
- Public display of tsunami information

Odisha Evacuation Maps by Community Members (I-5)







Odisha Evacuation Protocols

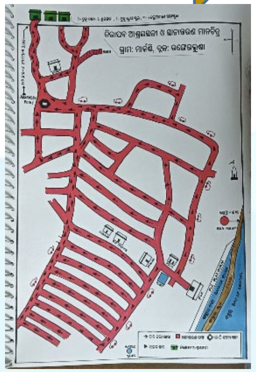
Warning
State EOC/Control Room

District EOCs

Block EOCs

COMMUNITY

Evacuation Routes



Aassembly Points

Evacuation Routes

Tsunami Safe Shelter

COMMUNITY

122 Alert sirens in the tsunami prone villages

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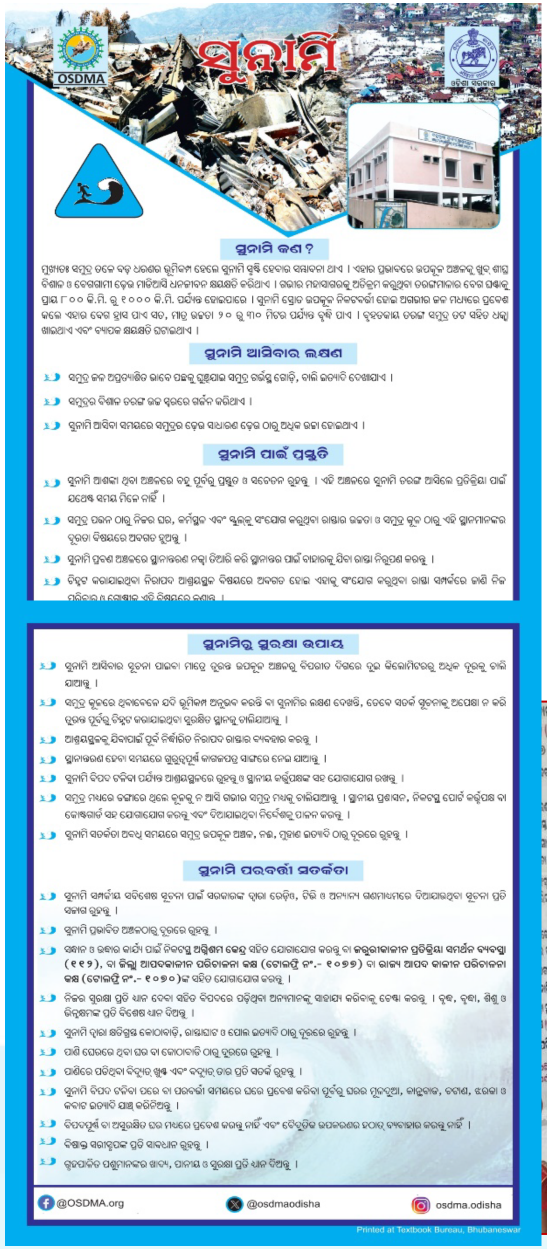
ESCAP

Odisha Outreach and Public Education Material (I-6)



Odisha Awareness Activities (I-7)

Province

Gram Panchayat

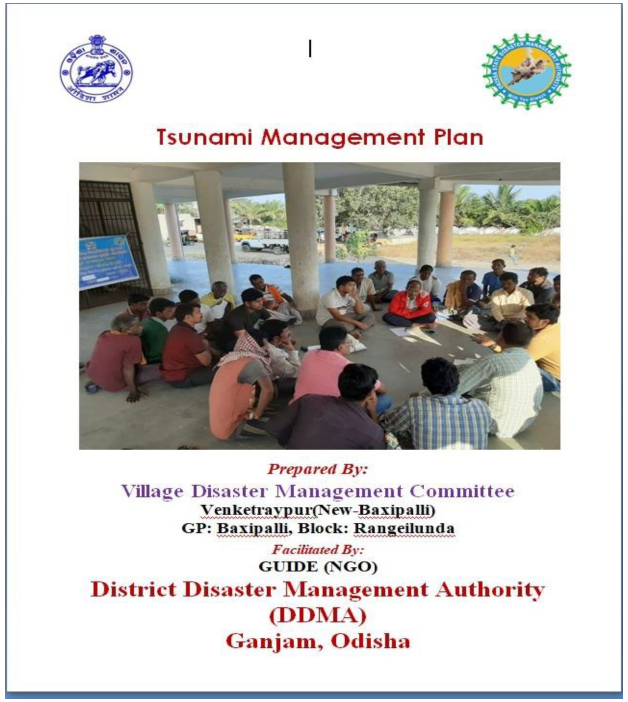
Street plays at Wards

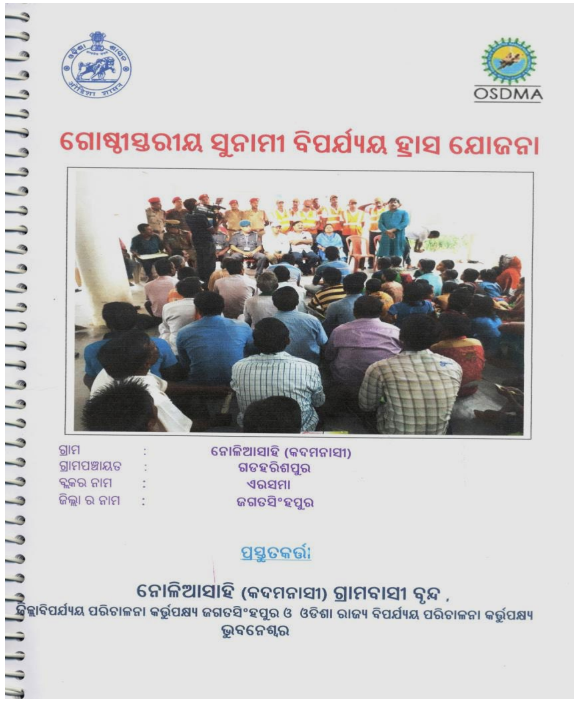
District

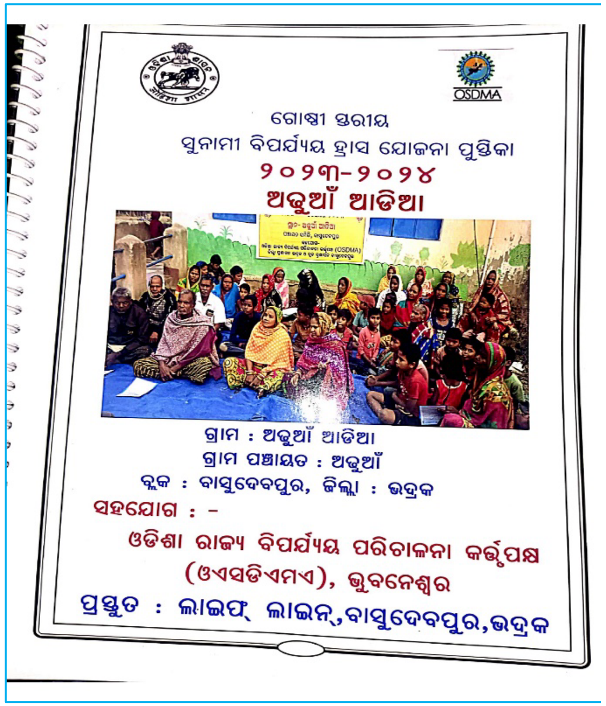
School

Mockdrills (I-8)

Tsunami Emergency Response Plans (I-9)


Tsunami Management Plan
Prepared By:
Village Disaster Management Committee
Venketraypur(New-Baxipalli)
GP: Baxipalli, Block: Rangeilunda
Facilitated By:
GUIDE (NGO)
District Disaster Management Authority
(DDMA)
Ganjam, Odisha


OSDMA
ଗୋଷ୍ଠୀସ୍ତରୀୟ ସୁନାମୀ ବିପର୍ଯ୍ୟୟ ହ୍ରାସ ଯୋଜନା
ଗ୍ରାମ : ନୋଳିଆସାହି (କଦମନାସୀ)
ଗ୍ରାମପଞ୍ଚାୟତ : ଗଡହରିଶପୁର
ବ୍ଲକର ନାମ : ଏରସମା
ଜିଲ୍ଲା ର ନାମ : ଜଗତସିଂହପୁର
ପ୍ରସ୍ତୁତକର୍ତ୍ତା
ନୋଳିଆସାହି (କଦମନାସୀ) ଗ୍ରାମବାସୀ ବୃନ୍ଦ ,
ଜିଲ୍ଲାବିପର୍ଯ୍ୟୟ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ୍ୟ ଜଗତସିଂହପୁର ଓ ଓଡିଶା ରାଜ୍ୟ ବିପର୍ଯ୍ୟୟ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ୍ୟ
ଭୁବନେଶ୍ୱର


OSDMA
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ସୁନାମୀ ବିପର୍ଯ୍ୟୟ ହ୍ରାସ ଯୋଜନା ପୁସ୍ତିକା
୨୦୨୩-୨୦୨୪
ଅଢୁଆଁ ଆଡିଆ
ଗ୍ରାମ : ଅଢୁଆଁ ଆଡିଆ
ଗ୍ରାମ ପଞ୍ଚାୟତ : ଅଢୁଆଁ
ବ୍ଲକ : ବାସୁଦେବପୁର, ଜିଲ୍ଲା : ଭଦ୍ରକ
ସହଯୋଗ : -
ଓଡିଶା ରାଜ୍ୟ ବିପର୍ଯ୍ୟୟ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ
(ଓଏସଡିଏମଏ), ଭୁବନେଶ୍ୱର
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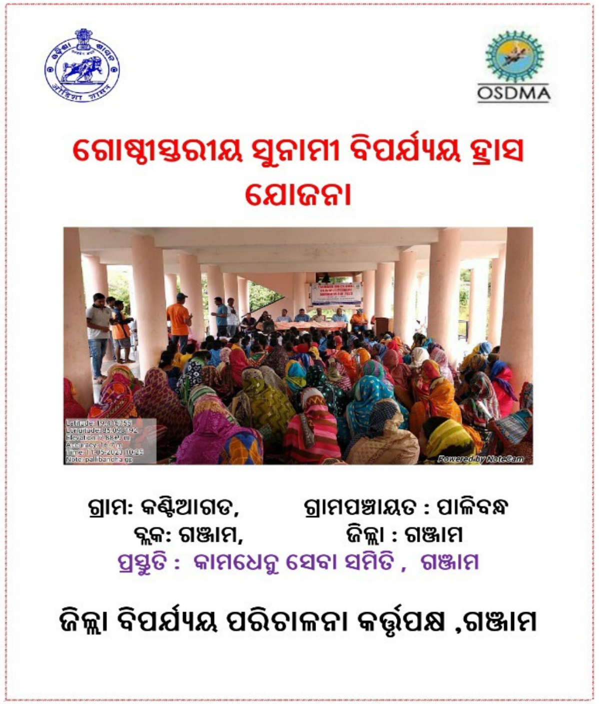
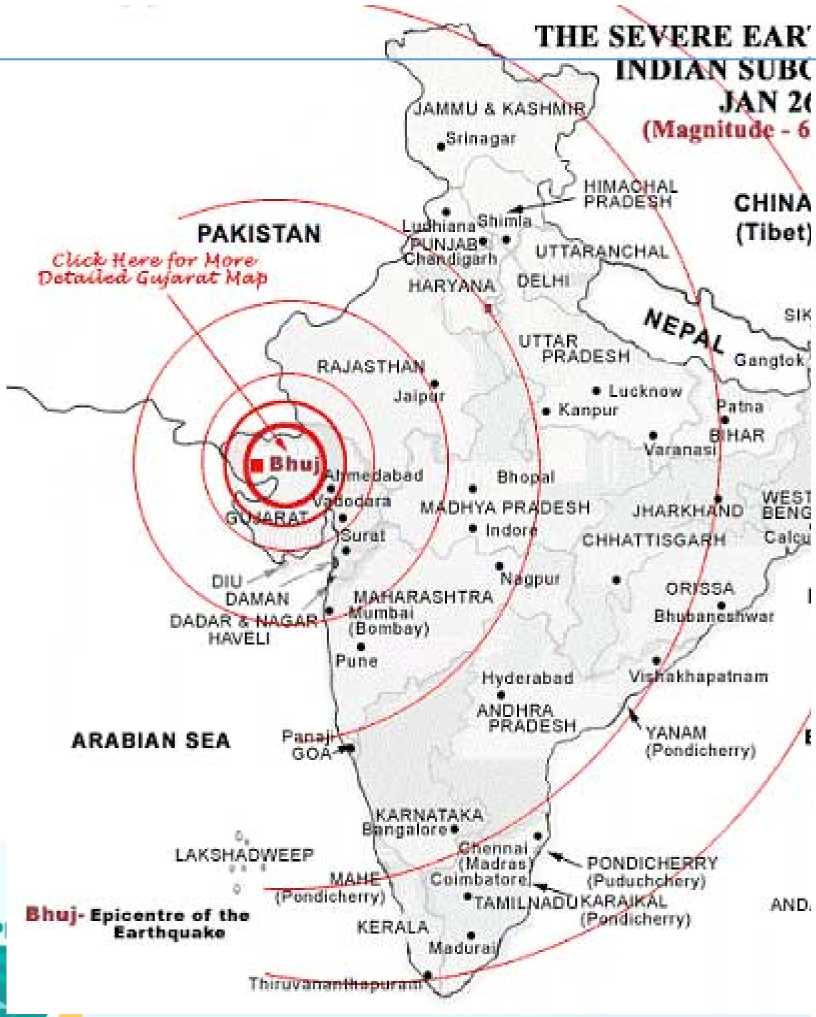
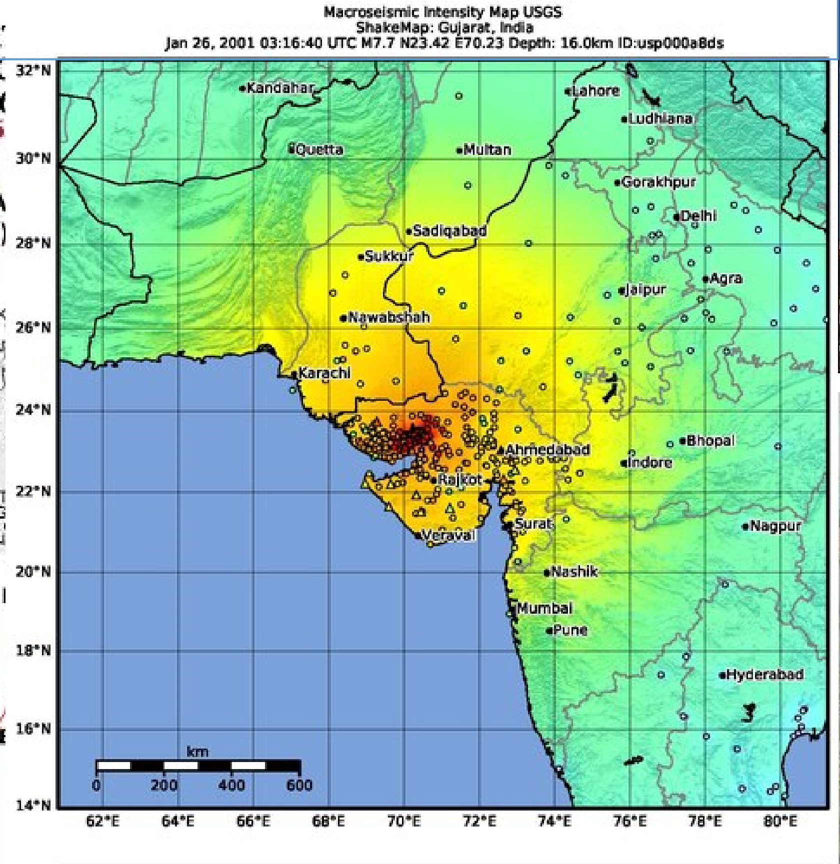

OSDMA
ଗୋଷ୍ଠୀସ୍ତରୀୟ ସୁନାମୀ ବିପର୍ଯ୍ୟୟ ହ୍ରାସ
ଯୋଜନା
ଗ୍ରାମ: କଣ୍ଟିଆଗଡ, ଗ୍ରାମପଞ୍ଚାୟତ : ପାଳିବନ୍ଧ
ବ୍ଲକ: ଗଞ୍ଜାମ, ଜିଲ୍ଲା : ଗଞ୍ଜାମ
ପ୍ରସ୍ତୁତି : କାମଧେନୁ ସେବା ସମିତି , ଗଞ୍ଜାମ
ଜିଲ୍ଲା ବିପର୍ଯ୍ୟୟ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ ,ଗଞ୍ଜାମ

- 365 x 24 State Emergency Operation Centre (SEOC) at State level
- 365 x 24 hrs District Operation Centre (DEOC) with all the communication equipment
- Warning Reception and Dissemination system through different channels from State to District and down the line
- Alert Siren towers installed in 122 strategic locations

Gujarat

Bhuj Earthquake On January 26, 2001, a magnitude 7.7 earthquake devastated this area, killing 20,000 people and destroying buildings, dams, and ports





SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.0066	0.0795	0.954	4.99	8.76	15.4	27	47.4	>83.2
PGV(cm/s)	<0.0028	0.0383	0.524	3.03	6.48	13.9	29.6	63.4	>136
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based on Atkinson and Kaka (2007) Version 1: Processed 2020-06-03T22:49:23Z

△ Seismic Instrument ○ Reported Intensity ★ Epicenter ▭ Rupture

Kerala

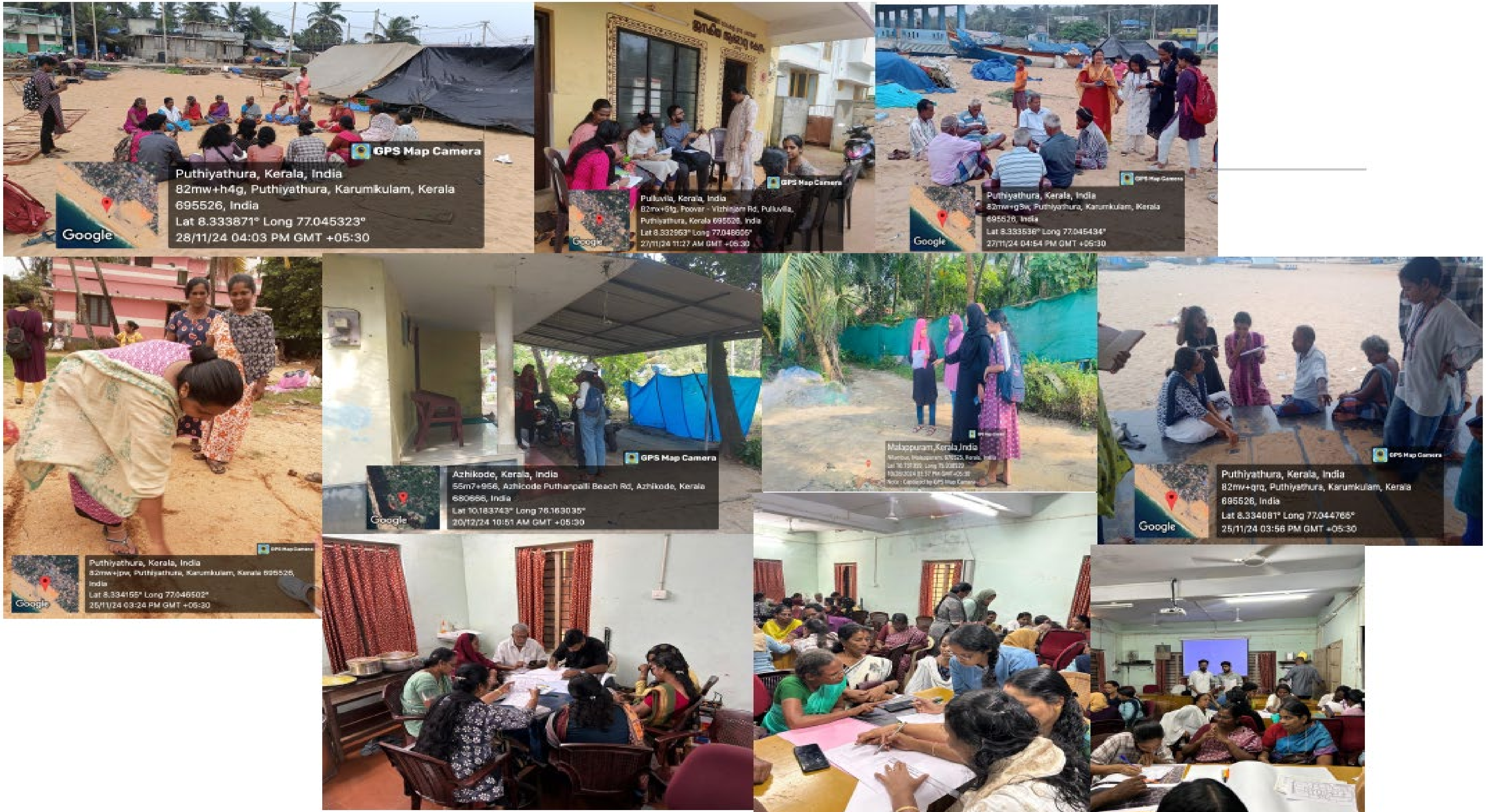
Selected Grama Panchayats and Districts in Kerala

1. KARUMKULAM, Thiruvananthapuram
2. ALAPPAD, Kollam
3. PURAKKAD, Alappuzha
4. EDAVANAKKAD, Ernakulam
5. ERIYAD, Thrissur
6. VELIYANCODE, Malappuram
7. CHEMANCHERY, Kozhikode
8. AZHIKODE, Kannur
9. VALIYAPARAMBA, Kasaragod

Detailed 6 Steps in TRP Activities

No:	The steps	The Needs	Action	Responsible stakeholders
1	Planning	Planning Group	determination of the team	Working Group on Biodiversity, Climate Change and Disaster Management
			training the team	District Disaster Management Authority (District Hazard Analyst and LSG DM Plan Coordinator), University
		the time to prepare the plan.	by the month of august	The working group on biodiversity, climate change and disaster management
		Finances	State Disaster Response Fund, Local Self-Government Unique/Development Fund	KSDMA, Panchayat, UNESCO
2	Disaster Risk Analysis	Maps	using the information provided by INCOIS	State Disaster Management Authority, University
3	Draft evacuation plan	strategy of evacuation plan	empower civil defence, Aapda Mitra, Kudumbashree, NGO, karayogam, church committees and clubs	13th working Group on Biodiversity, Climate Change and Disaster Management
		Areas where evacuation is required	are identified from areas as per the maps provided by KSDMA and inspected locally	With the help of university/research institutions.
		Evacuation method	Priority will be given to pregnant women, children, differently-abled people, bedridden patients, senior citizens, women and men	13th working Group on Biodiversity, Climate Change and Disaster Management
4	Project review, approval, implementation	social analysis	Civil Defence, Apada Mitra, Kudumbashree, NGO, Karayogam, Church Committees, Clubs	university/research institutions assistance
		Identifying areas to be evacuated and routes to be used	Based on maps provided by the State Disaster Management Authority	13th working Group on Biodiversity, Climate Change and Disaster Management
5	Popularity among the public	Notices, leaflets, Reels, Video	Meeting, Social Media Group, Household based communication	Biodiversity, Climate Change and Disaster Management Working Group
6	Mock drill	Practical review of the prepared plan	Evacuate people in areas to be evacuated in a timely manner through routes to be evacuated	State/District Disaster Management Authority, Working Group on Biodiversity, Climate Change and Disaster Management

Kerala


GPS Map Camera
Puthiyathura, Kerala, India
82mw+h4g, Puthiyathura, Karumkulam, Kerala
695526, India
Lat 8.333871° Long 77.045323°
28/11/24 04:03 PM GMT +05:30
Google
GPS Map Camera
Azhikode, Kerala, India
55m7+956, Azhikode Puthanpalli Beach Rd, Azhikode, Kerala
680666, India
Lat 10.183743° Long 76.163035°
20/12/24 10:51 AM GMT +05:30
Google
Puthiyathura, Kerala, India
82mv+qrq, Puthiyathura, Karumkulam, Kerala
695526, India
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25/11/24 03:56 PM GMT +05:30
Google

Success of Tsunami Ready in India

1. **Strong advocacy by the UNESCO-IOC through IOTIC and IOTWMS** on the Tsunami Ready initiative through organization of Regional TEMPP trainings, preparation of IOTR guidelines, Regional IOWave drills, post-IOWave and IOTR lessons learnt workshops, etc.
2. **INCOIS - as NTWC taking the lead in creating the right framework conditions for implementing TR by setting up of the NTRB** chaired by the TNC with members from NDMO and LDMO, as well as technical support and training by the NTWC to the DMOs for preparation of hazard and inundation maps, etc.
3. **Background work (Cyclone Preparedness) already undertaken in Odisha in the past decades** in developing DRR policies and plans for Cyclone, Tsunami and other Hazards, setting up Provincial/District/Block level EOCs, establishing multi-level communication systems, participation in IOWave drills, NGO work in training of community volunteers, etc
4. **Strong involvement of the provincial DMO (OSDMA, KSDMA, GSDMA) and the political leadership in Provinces** due to the benefits they see in implementing Tsunami Ready in enhancing preparedness for other frequent hazards such as cyclones
5. **Strong community ownership of DRR activities in villages** due to their horrifying experience of the 1999 super cyclone .
6. **Opportunity to leverage financial resources** for implementation of Tsunami Ready from already existing national and provincial DRR programmes.

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Courtesy: Ardito Kodijat, 2021

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Motivation

Visit of National Tsunami Ready Board Members (NTRB) to Odisha

Commitment

unesco Intergovernmental Oceanographic Commission
Indian Ocean Tsunami Information Centre
ESCAP
INCOIS
BMKG
Tsunami Ready

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unesco Intergovernmental Oceanographic Commission
Indian Ocean Tsunami Information Centre
ESCAP
INCOIS
BMKG
Tsunami Ready

Thank you

IOC/UNESCO Indian Ocean Tsunami Information Centre
IOTIC-BMKG Programme Office

Disaster Risk Reduction and Tsunami Information Unit
UNESCO Jakarta Office

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