On the Job Training on

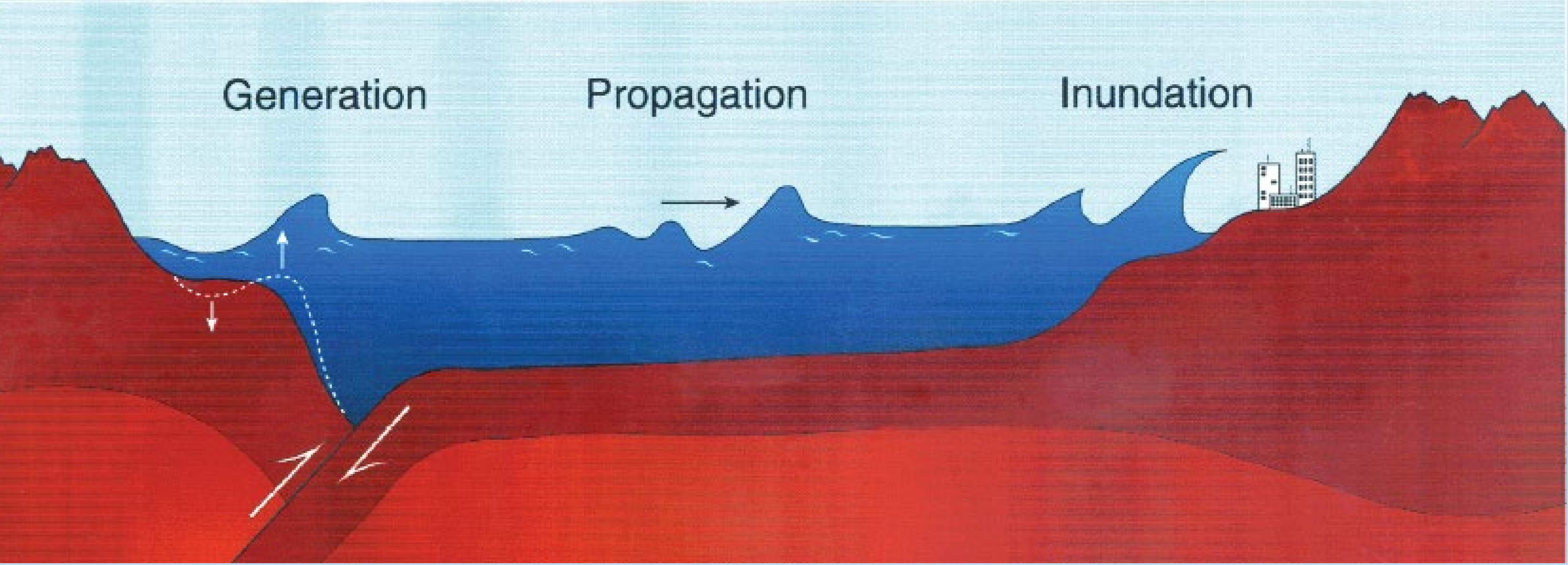
Tsunami Inundation Modelling and Mapping and Development of Tsunami Hazards Maps for Implementation of UNESCO-IOC Tsunami Ready Pilot Sites in Madagascar, Maldives, Seychelles and Sri Lanka

Hyderabad – India, 16–21 March 2026

TIMM 2.5.2: Finalizing grids and boundary conditions for COMMIT

Tsunami Modelling and Forecasting

Tsunami Models



Contents – Work flow

STEPS:

1. Using ComMITserver bathymetry dataset for inundation for area of interest / polit study areas
2. Run the sources (Low hazard and high hazard) sources to identify the "credible" sources and for "selection "
3. Inundation is as expected (in acceptable range) with selected "credible sources", then procced for preparations of custom /user supplied data grid
4. If inundation is not there, then choose another region and Repeat the Steps o1 to 04
5. Using user supplied grids as well as open GEBCO 30 arc sec + SRTM 1 arc sec in “Cgrids” for inundation (given) for with 'selected' sources

Target :

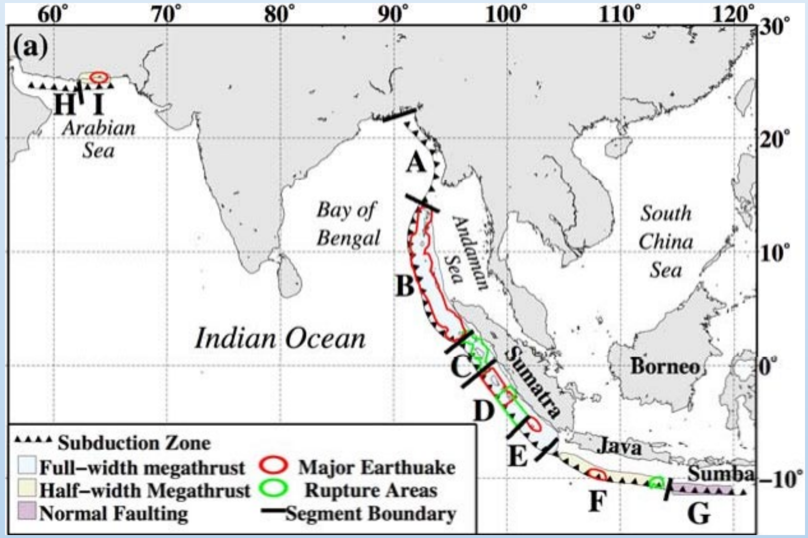
Finalizastion of Grids and Boundary conditions with Comparison ComMITserver bathymetry, user supplied topo-bathy grid and another “free” DEM source (GEBCO & SRTM) for inundation purpose.

Subduction Zone	Segment	Maximum Magnitude (Mw)		
		Historical	Low Hazard	High Hazard
Andaman-Sunda Arc	A	unknown (1762[1])	0.0	9.5
	B	9.2 (1881[2], 2004[3])	9.2	
	C	8.7 (1861,2005[4])	8.7	
	D	9.1 (1797,1833,2007[5])	9.1	
	E	7.6 (2000[5])	7.6	
	F	7.8 (1994[7],2006[8])	7.8	
	G	none	0.0	
Makran	H	unknown (1483[8])	0.0	9.1
	I	8.1 (1945[9])	8.2	
South Sandwich		none	0.0	9.0

Table 2: Summary of megthrust earthquake tsunami source zones used in the low-hazard and high-hazard maps. The three subduction zones considered are shown, along with the segmentation that was used for the low-hazard maps (see Fig. 5a). The maximum magnitude of the historical earthquakes listed in brackexts is listed in the third column. The maximum magnitudes used to generate the low-hazard and high-hazard assessments are shown in columns four and five. Where the maximum magnitude for historical earthquakes is listed as 'unknown' that indicates that a large (possibly megathrust) earthquake occurred, but its magnitude is unknown. By contrast 'none' indicates that there is no known historical occurrence of a megathrust earthquake large enough to generate a destructive tsunami. The years of historical earthquakes are indicated in parentheses with superscripts to indicate the following references: [1] Cummins (2007), [2] Ortiz and Bilham (2003), [3] Stein

Low-Hazard Source Zonation

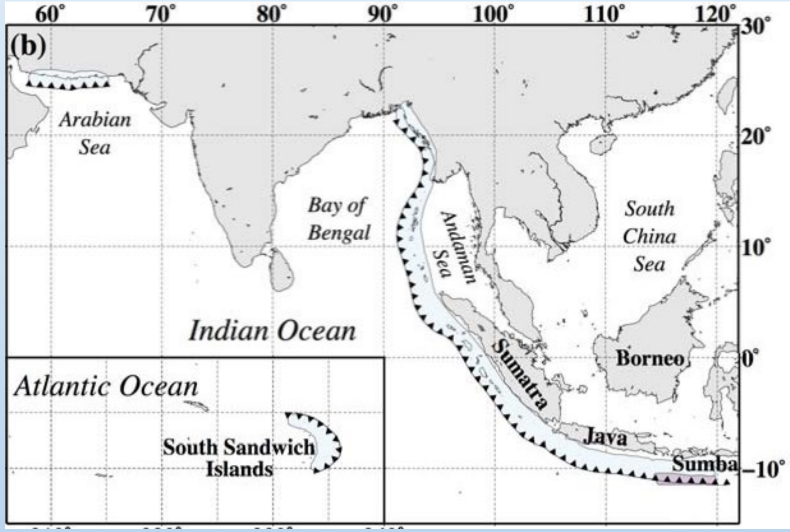
based on only those earthquake sources of tsunami for which there is definite evidence



Each subduction zone source characterized by historical tsunamigenic earthquake occurrence only

High-Hazard Source Zonation

based on all potential subduction zone earthquake sources, including hypothetical ones for which there is no historical or geological evidence



All potential subduction zones can rupture at full width, limited by lesser of magnitude 9.5 events or full subduction zone length

Subduction Zone	Segment	Maximum Magnitude (Mw)		
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Guidance for Selection of Scenarios

- Selection of appropriate scenarios and magnitude may be based on the results of PTHA which provides a range of maximum tsunami amplitude with a 1 in 2000-year chance of being exceeded for each country for a low and high hazard source. The table also provides information on the subduction zone segments that contribute to tsunami hazard for each country.

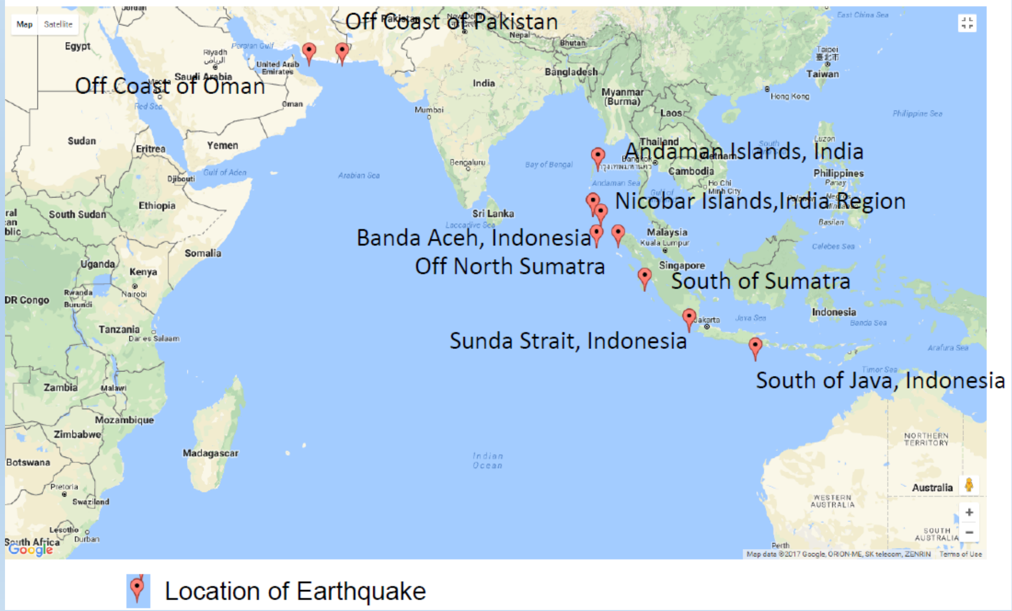
Indian Ocean nation	1/2000yr tsunami amplitude (m)		Most Important Subduction Zone Segments
	low	high	
Bangladesh	0.5	0.6	Andaman
British Ocean Territory	1.1	1.7	Andaman, Sumatra
Burma	1.1	1.5	Andaman, Sumatra
Comoros	0.3	0.5	Makran, Andaman, Sumatra
Djibouti	0.2	0.4	Makran
India	1.9	3.1	Makran, Andaman, Sumatra
Indonesia	5.6	7.1	Andaman, Sumatra, Java and Sumba
Iran	0.3	2.7	Makran
Kenya	0.5	0.8	Andaman, Sumatra
Madagascar	1.0	2.2	Andaman, Sumatra, Java, Sth Sandwich
Maldives	2.2	3.0	Andaman, Sumatra, Makran
Mauritius	1.2	1.7	Andaman, Sumatra, Makran
Mayotte	0.3	0.4	Andaman, Sumatra, Makran
Mozambique	0.5	1.4	Andaman, Sumatra, Sth Sandwich
Oman	0.6	3.8	Andaman, Sumatra, Makran
Pakistan	0.9	2.8	Makran
Reunion	0.7	1.4	Andaman, Sumatra, Sth Sandwich
Seychelles	0.8	1.2	Andaman, Sumatra, Makran
Somalia	0.7	1.1	Andaman, Sumatra, Makran
South Africa	0.6	1.6	Andaman, Sumatra, S Sandwich
Sri Lanka	2.9	3.7	Andaman, Sumatra
Tanzania	0.5	0.9	Andaman, Sumatra, Makran
Thailand	1.9	2.6	Andaman, Sumatra
United Arab Emirates	0.1	0.8	Makran
Yemen	0.8	1.3	Makran, Andaman, Sumatra

Table 1: Summary of results for all the nations considered in the study for one particular measure of the offshore tsunami hazard, the name of country is listed in the first column. The second and third columns show the maximum tsunami amplitude with a 1 in 2000 year chance of being exceeded for any point off the Indian Ocean nation shown in the first column for the low hazard and high hazard assessments, respectively. The nations shown in red have the highest (greater than 2m maximum tsunami amplitude in the high hazard map) hazard at this return period. The nations shown in green have the lowest (tsunami amplitude is less than 1m in the high hazard map) at the 2000 year return period. The fourth column lists the subduction zones which make the greatest contribution to the 1 in 2000 year hazard for that particular nation.

Guidance for Selection of Scenarios

- Each country may consider selecting 4 scenarios from the table below run inundation model using ComMIT. Based on the results of the model runs, a composite inundation line may be generated for further hazard assessment

S. No.	Latitude	Longitude	Magnitude	Region	Comments
1	24.8 N	62.2 E	9.0	Off Coast of Pakistan	
2	24.8 N	58.2 E	9.2	Off Coast of Iran	IOWave 18 Scenario ???
3	12.65 N	93.5 E	9.0 to 9.2	Andaman Islands	
4	7.2 N	92.9 E	9.0 to 9.2	Nicobar Islands	
5	3.3 N	96.0 E	9.3	Banda Aceh / Off North Sumatra	Dec 26, 2004 Event IOWave18 Scenario???
6	1.93 S	99.22 E	9.2	South of Sumatra	
7	6.94 S	104.7 E	9.0 to 9.2	Sunda Strait	
8	10.4 S	112.8 E	9.1	South of Java	



ComMIT Unit Sources for PTHA Suggested Scenarios

<u>**cut and paste into "Model->Sources from Solution/Combination"**</u>

- Off Coast of Pakistan
  Mw 9.0, mk2-7, rows a-b, alpha=14.7839
  14.7839*mk2b+14.7839*mk2a+14.7839*mk3b+14.7839*mk3a+14.7839*mk4b+14.7839*mk4a+14.7839*mk5b+14.7839*mk5a+14.7839*mk6b+14.7839*mk6a+14.7839*mk7b+14.7839*mk7a

- Off Coast of Iran
  Mw 9.2, mk4-10, rows a-b, alpha=25.284
  25.284*mk4a+25.284*mk4b+25.284*mk5a+25.284*mk5b+25.284*mk6a+25.284*mk6b+25.284*mk7a+
  25.284*mk7b+25.284*mk8a+25.284*mk8b+25.284*mk9a+25.284*mk9b+25.284*mk10a+25.284*mk10b

- Andaman Islands
  Mw 9.2, io5-12, rows a-b, alpha=22.123
  22.123*io5a+22.123*io5b+22.123*io6a+22.123*io6b+22.123*io7a+22.123*io7b+ 22.123*io8a+22.123*io8b+22.123*io9a+22.123*io9b+22.123*io10a+22.123*io10b+
  22.123*io11a+22.123*io11b+22.123*io12a+22.123*io12b

- Nicobar Islands
  Mw 9.2, io11-18, rows a-b, alpha=22.123
  22.123*io11a+22.123*io11b+22.123*io12a+22.123*io12b+22.123*io13a+22.123*io13b+22.123*io14a+22.123*io14b+22.123*io15a+22.123*io15b+22.123*io16a+22.123*io16b+22.123*io17a+22.123*io17b+22.123*io18a+22.123*io18b

- Banda Aceh, North Sumatra
  Mw 9.3, io17-24, rows a-b, alpha=31.250
  31.250*io17a+31.250*io17b+31.250*io18a+31.250*io18b+31.250*io19a+31.250*io19b+31.250*io20a+31.250*io20b+31.250*io21a+31.250*io21b+31.250*io22a+31.250*io22b+31.250*io23a+31.250*io23b+31.250*io24a+31.250*io24b

- South of Sumatra
  Mw 9.2, io24-31, rows a-b, alpha=22.123
  22.123*io24a+22.123*io24b+22.123*io25a+22.123*io25b+22.123*io26a+22.123*io26b+22.123*io27a+22.123*io27b+22.123*io28a+22.123*io28b+22.123*io29a+22.123*io29b+22.123*io30a+22.123*io30b+22.123*io31a+22.123*io31b

- Sunda Strait
  Mw 9.2, io33-40, rows a-b, alpha=22.123
  22.123*io33a+22.123*io33b+22.123*io34a+22.123*io34b+22.123*io35a+22.123*io35b+22.123*io36a+22.123*io36b+22.123*io37a+22.123*io37b+22.123*io38a+22.123*io38b+22.123*io39a+22.123*io39b+22.123*io40a+22.123*io40b

- South of Java
  Mw 9.1, io44-49, rows a-b, alpha=14.7839
  14.7839*io44b+14.7839*io44a+14.7839*io45b+14.7839*io45a+14.7839*io46b+14.7839*io46a+14.7839*io47b+14.7839*io47a+14.7839*io48b+14.7839*io48a+14.7839*io49b+14.7839*io49a

Conclusions

- Bathymetry and topography data (DEM) have important role for tsunami modelling
- DEM data with high resolution will generate more detailed and accurate inundation
- Detailed bathymetry and topography data is needed for tsunami inundation modelling

Thank you