Iranian National Institute for Oceanography and Atmospheric Science (INIOAS)

Tsunami Ready

Tsunami Ready program of IRAN

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Iranian National Institute for Oceanography and Atmospheric Science

Indian Ocean Tsunami Ready Workshop
Tanjung Benoa, Bali - Indonesia
22-26 November 2022

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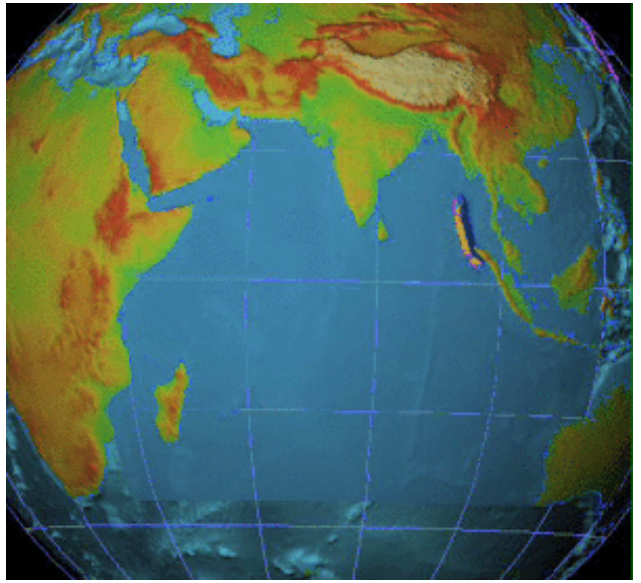
Indian Ocean Tsunami Information Centre

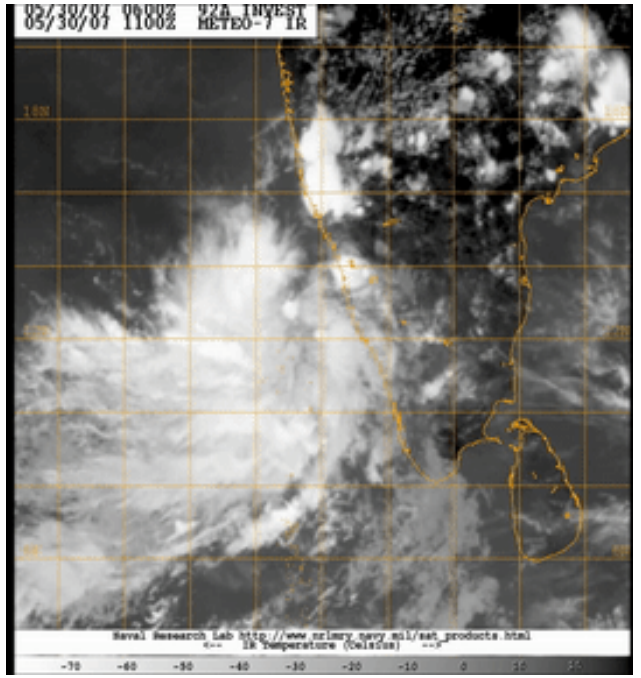
BMKG

In collaboration with UNITED NATIONS ESCAP Economic and Social Commission for Asia and the Pacific

Introduction

- Due to the importance of marine hazards (especially this issue was highlighted after the Indian Ocean tsunami in 2004 and Cyclone Gonu in the Arabian Sea), Iranian National Center for Ocean Hazards (INCOH) was established at INIOAS in 2012 by the approval of the Ministry of Science, Research and Technology of Iran.
- According to the law of NDMO, the Ministry of Science, Research and Technology is obliged to create or strengthen earthquake, volcano, tsunami and landslide monitoring and warning centers in the country through affiliated institutions such as the Institute of Geophysics of the University of Tehran (IGUT), the National Institute of Oceanography and Atmospheric Science and other related institutions.





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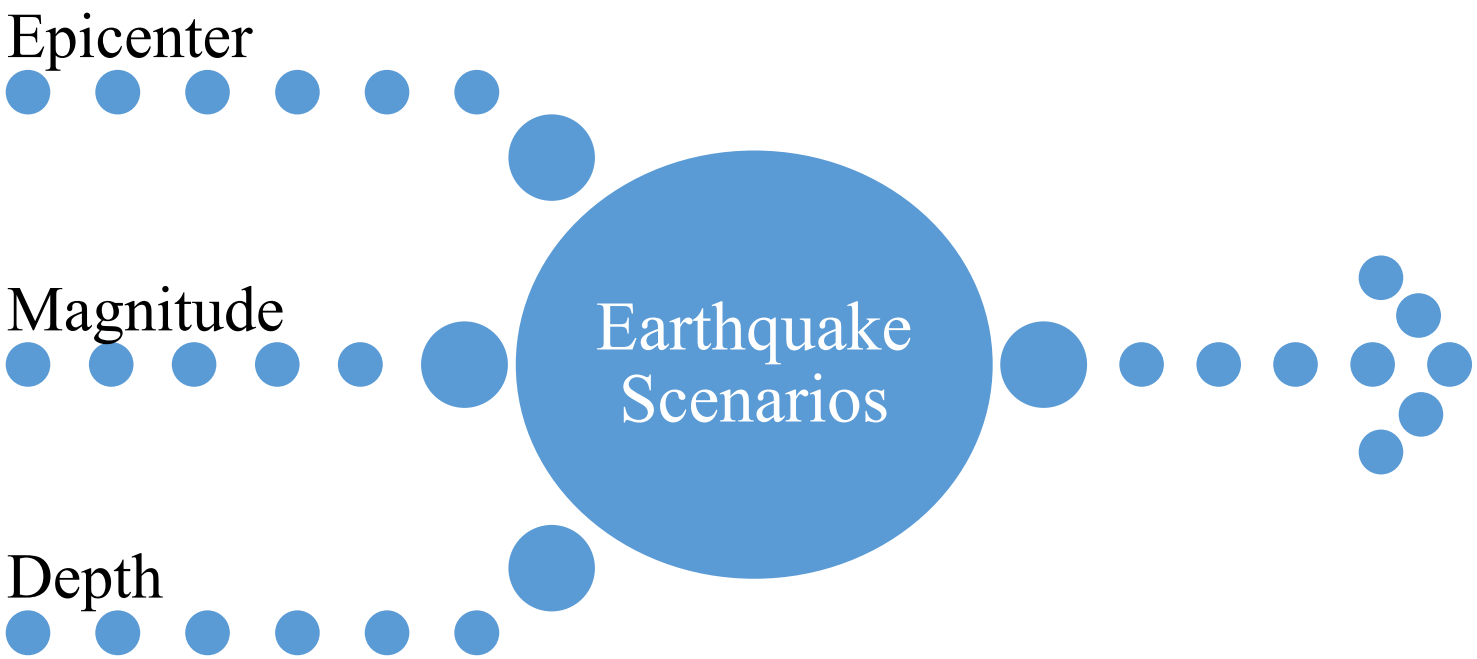
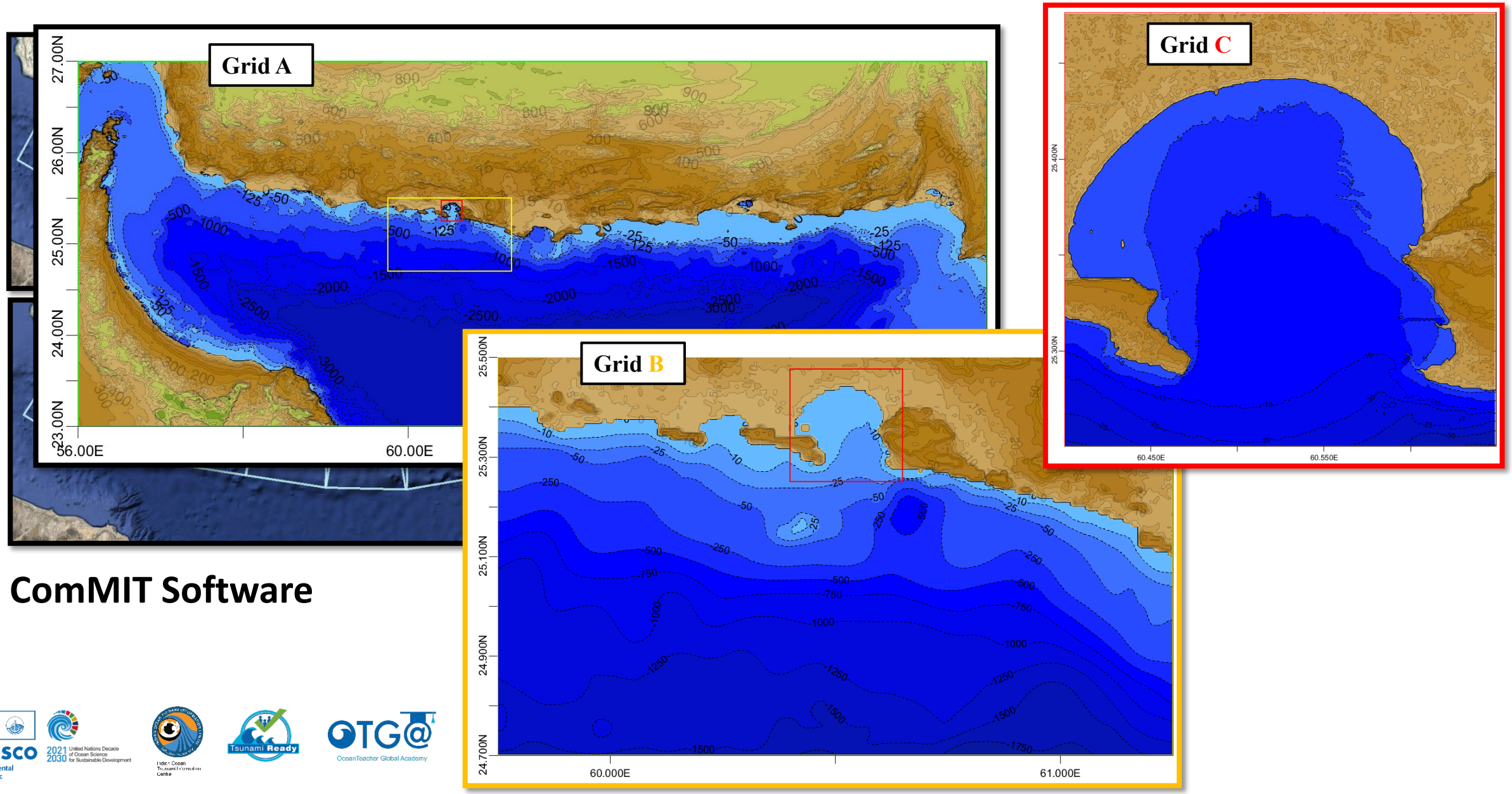
Definition of Tsunami Scenarios



Magnitude Mw	No. of scenarios
7.0	20
7.5	20
7.8	18
8.0	18
8.1	18
8.2	16
8.3	16
8.4	16
8.5	14
8.6	14
8.7	12
8.8	10
8.9	8
9.0	6

No. of tsunami scenarios: 206 × 4 = 824

Numerical Simulation of Tsunami



ComMIT Software

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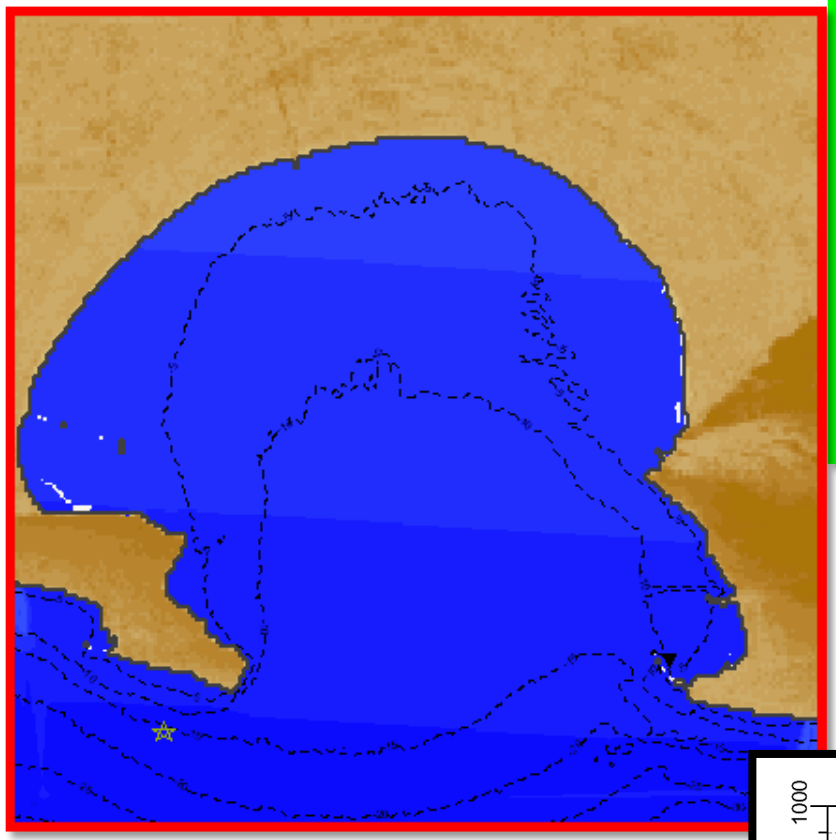
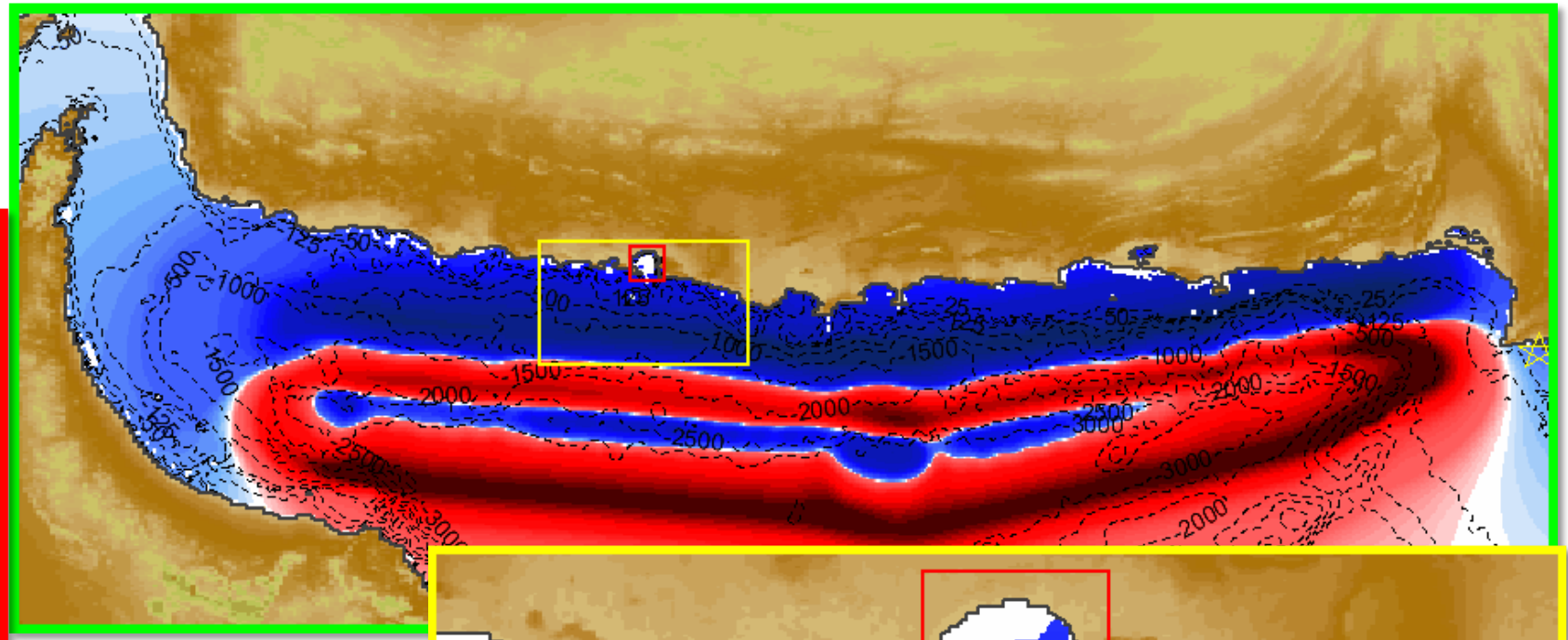
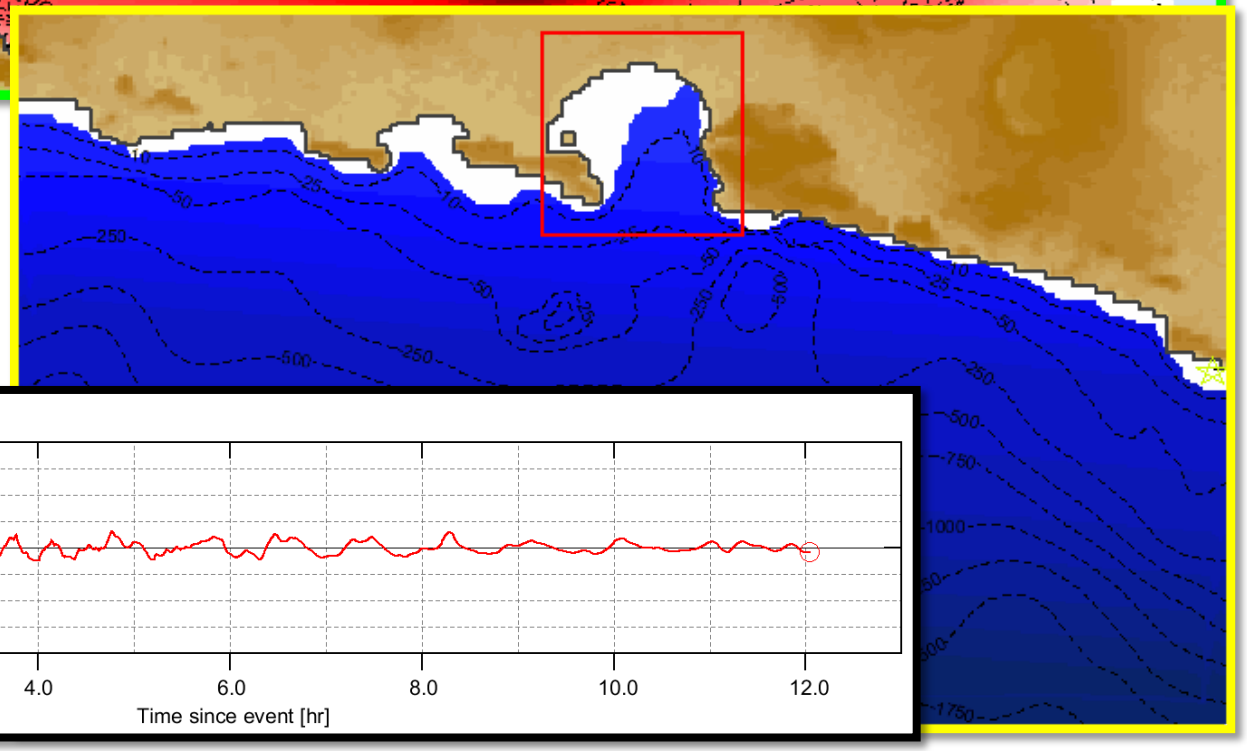
Model Output

Scenario M9.0D15B15







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Model Output

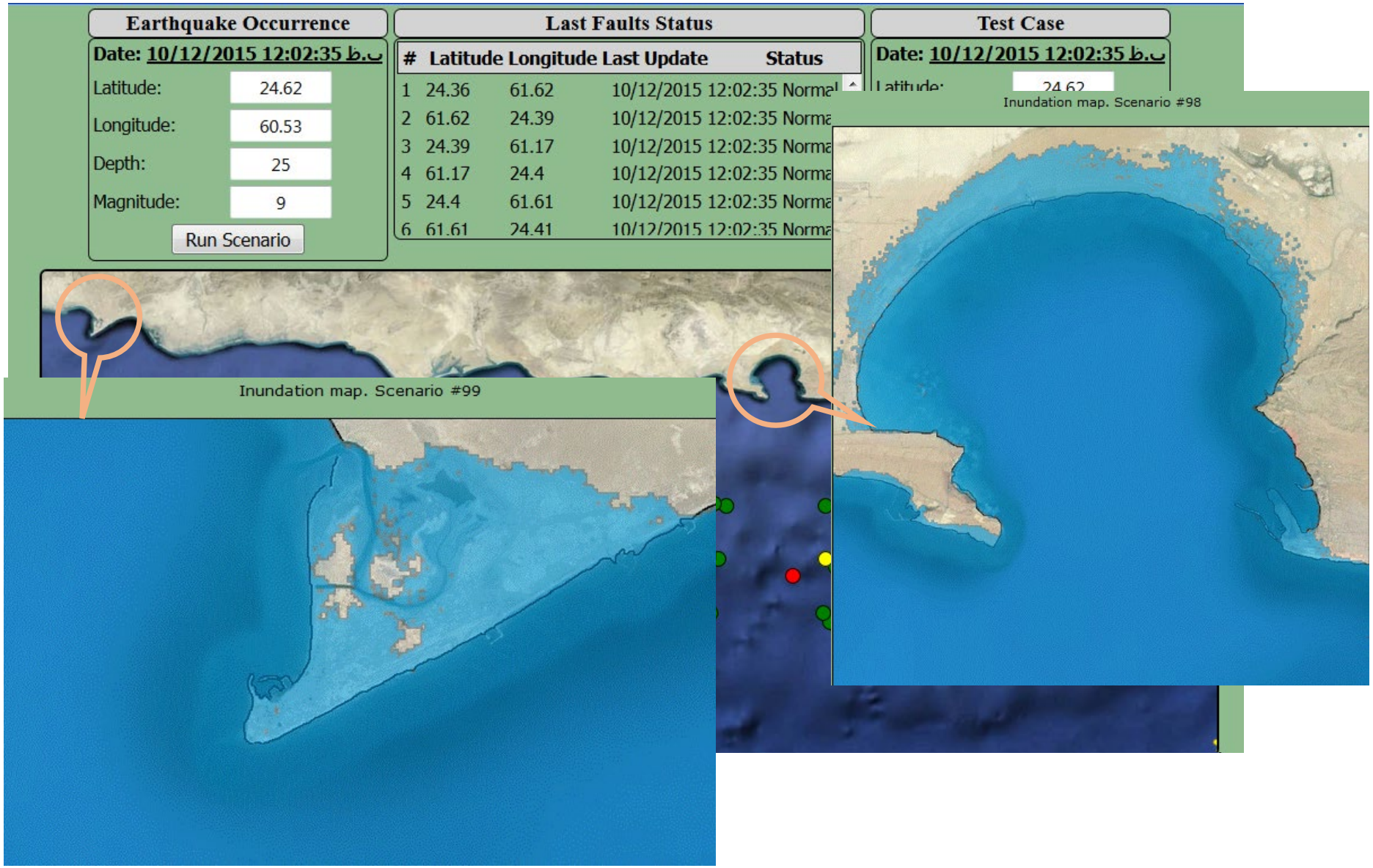
- T1 : Arrival time of first detectable tsunami wave (2 cm amplitude wave).
- T2 : Arrival time of first wave exceeding 0.5 m threat threshold.
- T3 : Arrival time of maximum amplitude wave.
- T4 : Arrival time of last wave exceeding 0.5 m threat threshold.
- Max-deep: the maximum height of tsunami wave.
- Max-beach: the maximum height of tsunami wave at 1m depth point.

	T1 (s)	T2 (s)	T3 (s)	T4 (s)	Max beach or deep (cm)
C Grid (west)	1440	1440	1536	43136	2053.70
C Grid (center)	2944	2944	3488	28928	205.46
C Grid (east)	832	864	1056	24672	1274.15
B Grid (west)	960	960	1152	26784	1244.15
B Grid (center)	896	896	1088	26880	884.47
B Grid (east)	672	672	960	22816	1171.93

Web-based Software for Tsunami Detection and Warning

- A preliminary web-based tsunami detection system was developed.
- The system receives the online earthquake data from national seismic network (IGUT).
- If an earthquake occurs in the Makran subduction zone, the system will be activated.
- Based on the magnitude and location of earthquake, the most similar scenario is selected from the database and inundation maps are generated for the most populated areas including Chabahar and Jask cities.

Web-based Software for Tsunami Detection and Warning



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NTWC SOP

- Colour code
- Definition

TSP Information to NTWC

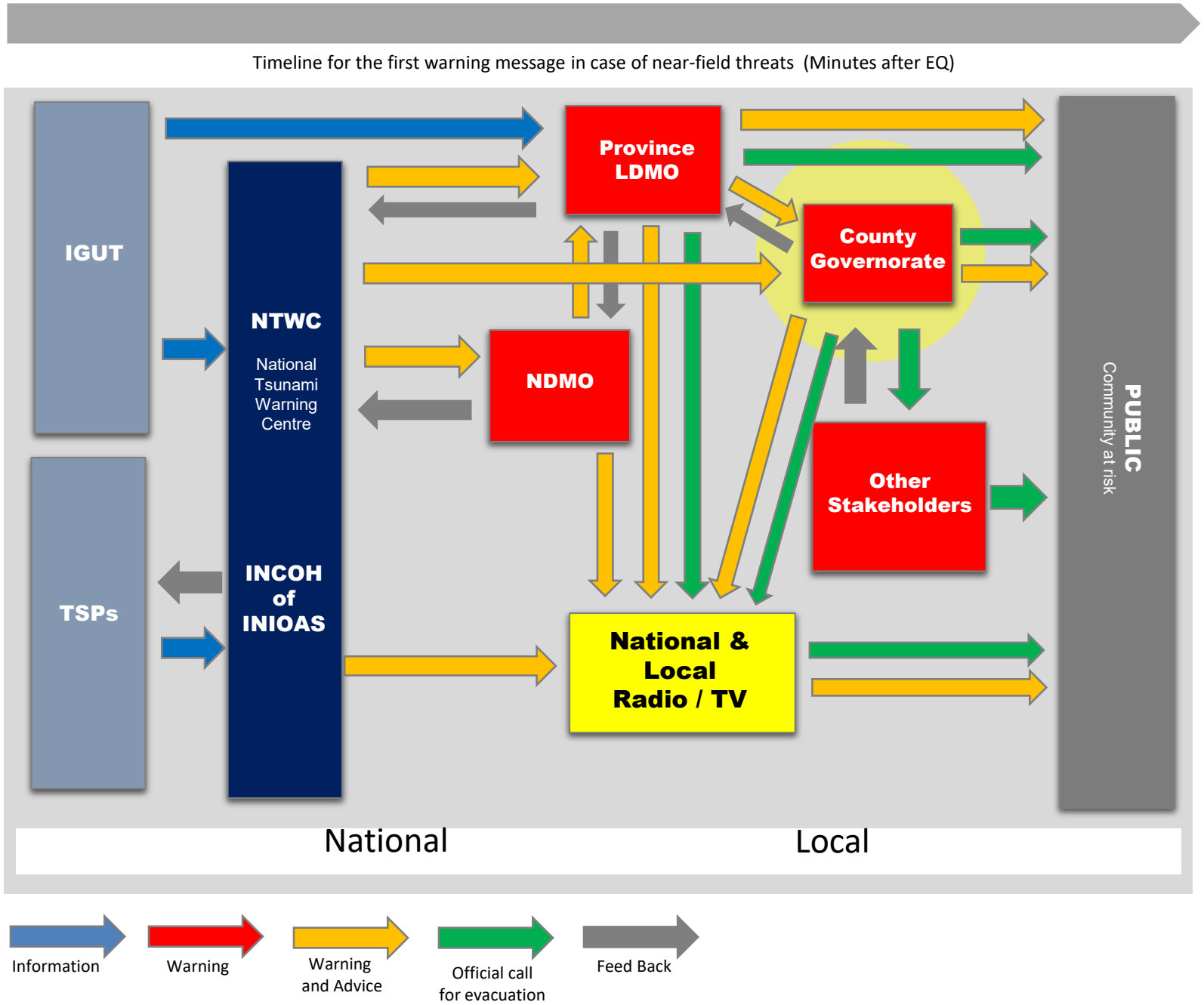
Warning by NTWC (without advice attached): seems that this is currently not practised in the NWIO countries

Warning and Advice issued by NTWC: ideally agreed upon with NDMO. Content of advice depends on the respective warning level

Official call for evacuation issued by mandated authority: this implies a separate decision making process by the respective authority and issuing a specific message which includes warning information and a call for evacuation in case it is required

Feedback information between NTWC and TSP or between other institutions involved in the warning chain

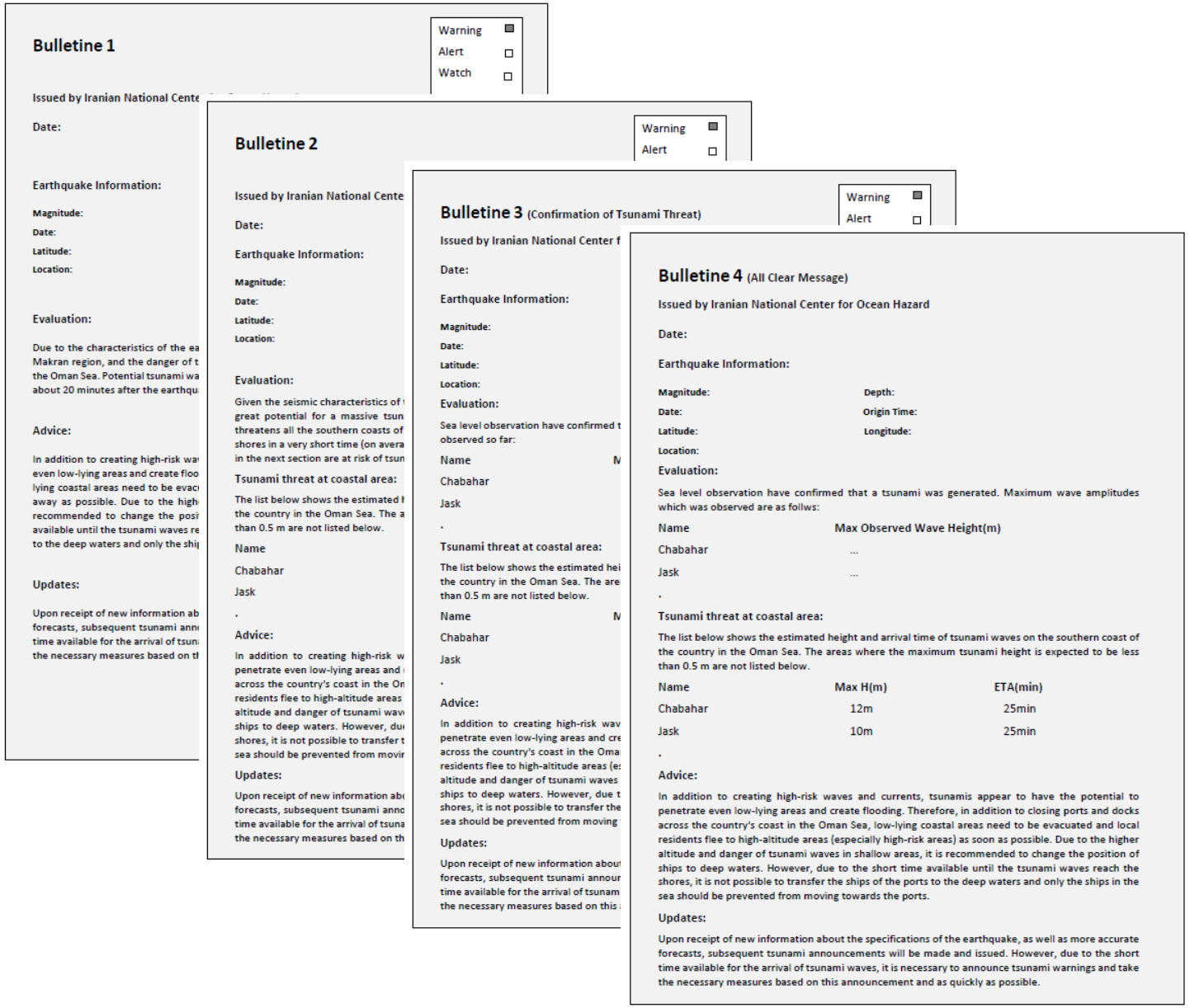
The **Timeline** indicates the targeted deadline to send out the **first warning message** by NTWC and the time when it should arrive at the community at risk **in case of a near-field threat**



NTWC SOP/Bulletin

Earthquake Magnitude at Makran Area	Warning level	Advice
8.0≤Mwp	Warning	Evacuate to high Ground
7.5≤Mwp<8	Alert	Stay away from beaches
7≤Mwp<7.5	Watch	Be prepared to act
Mwp<7	No threat/threat passed	

Threshold of Estimated Wave Height	Warning level	Advice
>2m	Warning	Evacuate to high Ground
0.5-2m	Alert	Stay away from beaches
0.2-0.5m	Watch	Be prepared to act
<0.2m	No threat/threat passed	



Bulletine 1

Warning ☐ Alert ☐ Watch ☐

Issued by Iranian National Cente

Date:

Earthquake Information:

Magnitude:
Date:
Latitude:
Location:

Evaluation:

Due to the characteristics of the ea
Makran region, and the danger of t
the Oman Sea. Potential tsunami wa
about 20 minutes after the earthqu

Advice:

In addition to creating high-risk wa
even low-lying areas and create floo
lying coastal areas need to be evac
away as possible. Due to the high
recommended to change the posi
available until the tsunami waves re
to the deep waters and only the shi

Updates:

Upon receipt of new information ab
forecasts, subsequent tsunami ann
time available for the arrival of tsun
the necessary measures based on t

Bulletine 2

Warning ☐ Alert ☐

Issued by Iranian National Cente

Date:

Earthquake Information:

Magnitude:
Date:
Latitude:
Location:

Evaluation:

Given the seismic characteristics of
great potential for a massive tsun
threatens all the southern coasts of
shores in a very short time (on avera
in the next section are at risk of tsun

Tsunami threat at coastal area:

The list below shows the estimated
the country in the Oman Sea. The a
than 0.5 m are not listed below.

Name
Chabahar
Jask
.

Advice:

In addition to creating high-risk w
penetrate even low-lying areas and
across the country's coast in the Om
residents flee to high-altitude areas
altitude and danger of tsunami wav
ships to deep waters. However, du
shores, it is not possible to transfer t
sea should be prevented from movir

Updates:

Upon receipt of new information ab
forecasts, subsequent tsunami anno
time available for the arrival of tsuna
the necessary measures based on th

Bulletine 3 (Confirmation of Tsunami Threat)

Warning ☐ Alert ☐

Issued by Iranian National Center f

Date:

Earthquake Information:

Magnitude:
Date:
Latitude:
Location:

Evaluation:

Sea level observation have confirmed t
observed so far:

Name N
Chabahar
Jask
.

Tsunami threat at coastal area:

The list below shows the estimated hei
the country in the Oman Sea. The are
than 0.5 m are not listed below.

Name N
Chabahar
Jask
.

Advice:

In addition to creating high-risk wav
penetrate even low-lying areas and cre
across the country's coast in the Oma
residents flee to high-altitude areas (es
altitude and danger of tsunami waves
ships to deep waters. However, due t
shores, it is not possible to transfer the
sea should be prevented from moving

Updates:

Upon receipt of new information abou
forecasts, subsequent tsunami annour
time available for the arrival of tsunam
the necessary measures based on this

Bulletine 4 (All Clear Message)

Issued by Iranian National Center for Ocean Hazard

Date:

Earthquake Information:

Magnitude: Depth:
Date: Origin Time:
Latitude: Longitude:
Location:

Evaluation:

Sea level observation have confirmed that a tsunami was generated. Maximum wave amplitudes which was observed are as follws:

Name	Max Observed Wave Height(m)
Chabahar	...
Jask	...

.

Tsunami threat at coastal area:

The list below shows the estimated height and arrival time of tsunami waves on the southern coast of the country in the Oman Sea. The areas where the maximum tsunami height is expected to be less than 0.5 m are not listed below.

Name	Max H(m)	ETA(min)
Chabahar	12m	25min
Jask	10m	25min

.

Advice:

In addition to creating high-risk waves and currents, tsunamis appear to have the potential to penetrate even low-lying areas and create flooding. Therefore, in addition to closing ports and docks across the country's coast in the Oman Sea, low-lying coastal areas need to be evacuated and local residents flee to high-altitude areas (especially high-risk areas) as soon as possible. Due to the higher altitude and danger of tsunami waves in shallow areas, it is recommended to change the position of ships to deep waters. However, due to the short time available until the tsunami waves reach the shores, it is not possible to transfer the ships of the ports to the deep waters and only the ships in the sea should be prevented from moving towards the ports.

Updates:

Upon receipt of new information about the specifications of the earthquake, as well as more accurate forecasts, subsequent tsunami announcements will be made and issued. However, due to the short time available for the arrival of tsunami waves, it is necessary to announce tsunami warnings and take the necessary measures based on this announcement and as quickly as possible.

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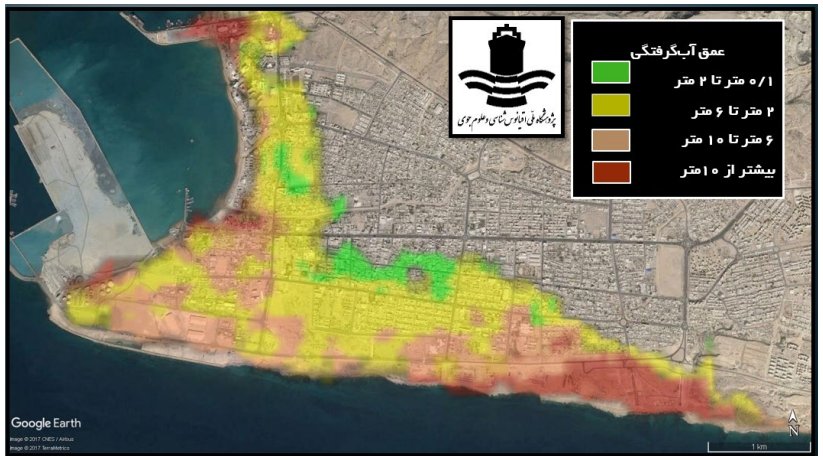
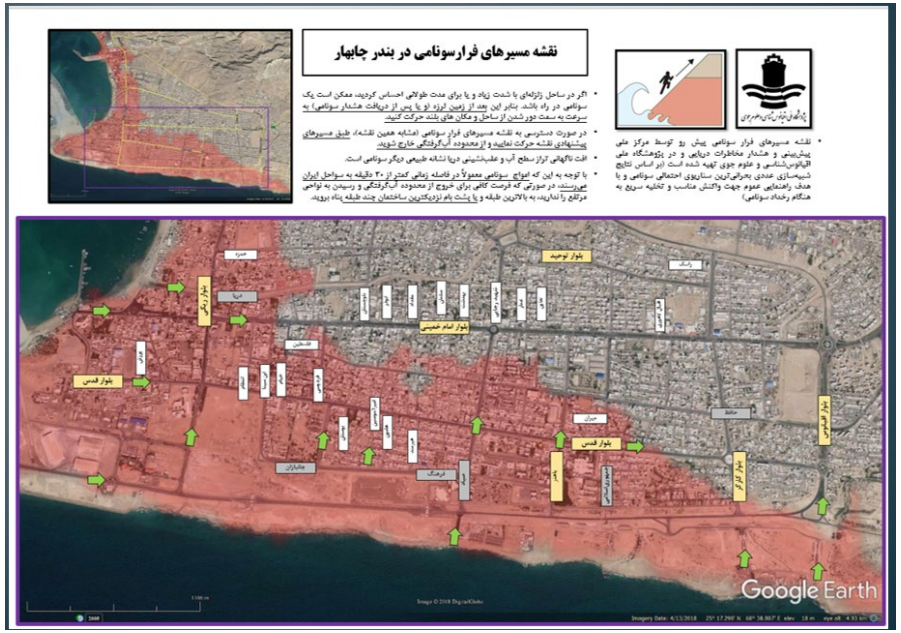
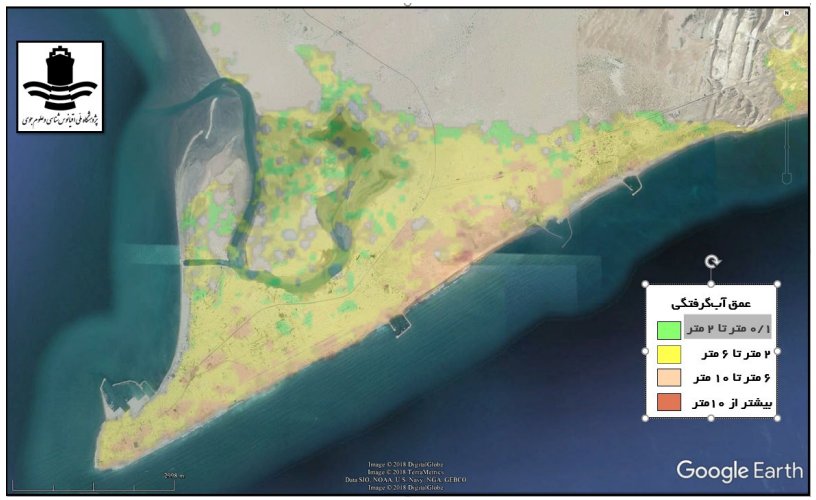
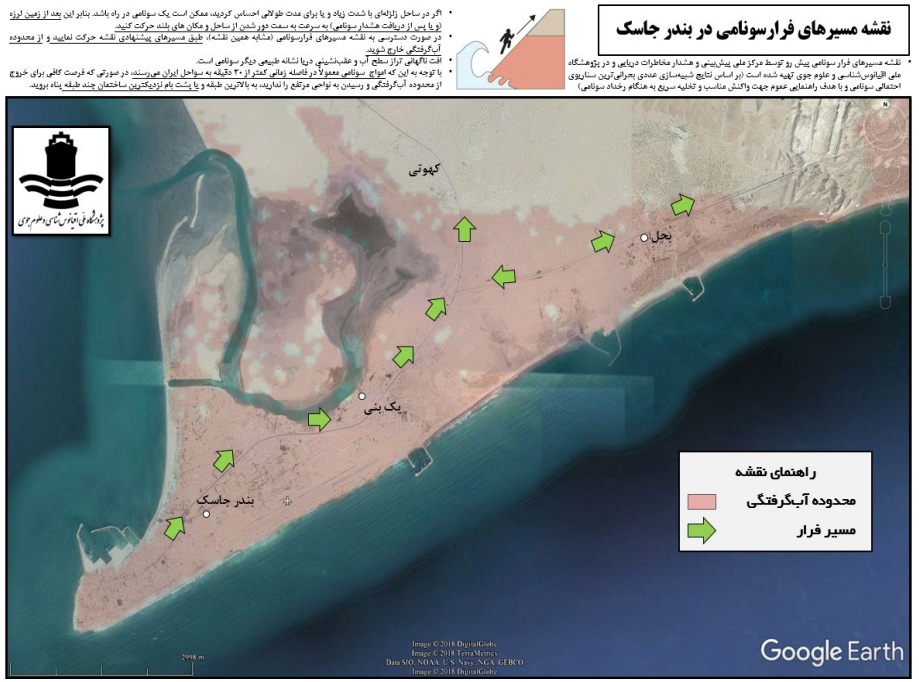
Inundation and Evacuation Map









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National plans to achieve 100% at-risk communities prepared and resilient

- Establishment of a National Board for Implementation of TRP in Iran including all related stakeholders
- Gap analysis for current situation of Iran regarding all TRP indicators at Chabahar and Jask
- Planning to fulfil all analyzed gaps of TRP indicators at Chabahar and Jask
- Implementation and evaluation of TRP at Chabahar and Jask

	TSUNAMI READY INDICATORS
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 three 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.

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Thank You for Your Attention

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