Iran’s plans for Tsunami Ready implementation

Mohammad Neissi Shooshtari
Head of Review and monitoring
National Disaster Management Organization

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

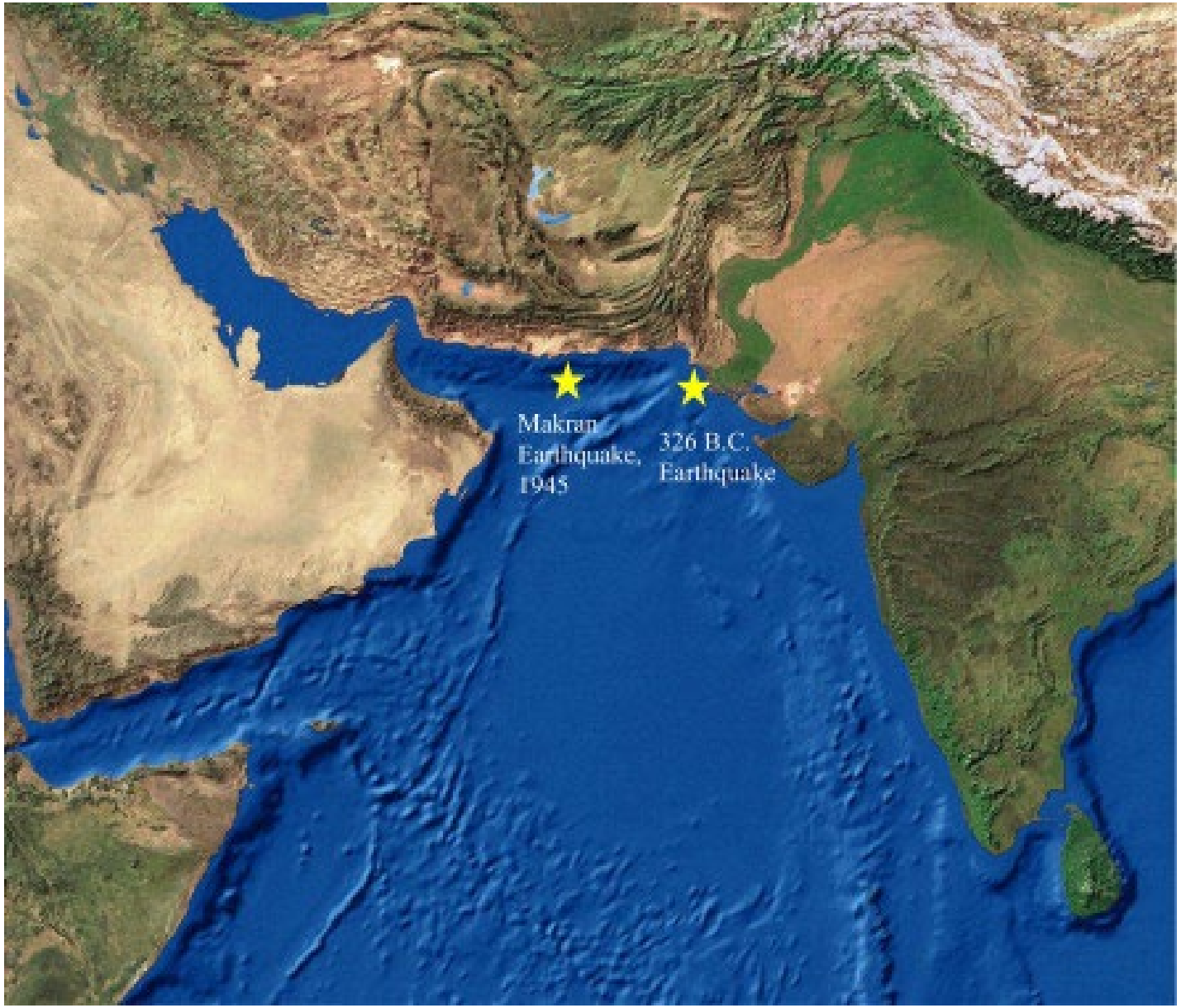
In collaboration with

Introduction

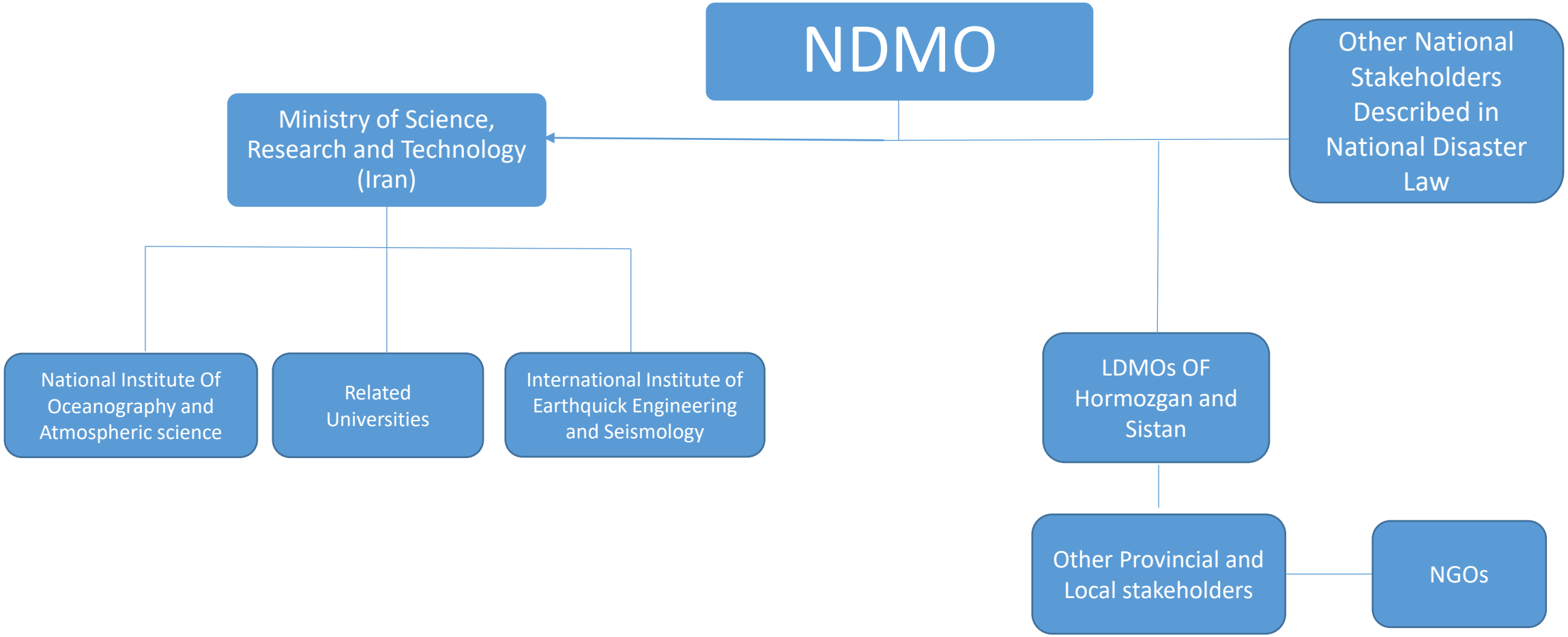
Occurred Long time ago history repeats itself

Historical record

1945
4000 killed
in coast of Iran, Oman, India and Pakistan

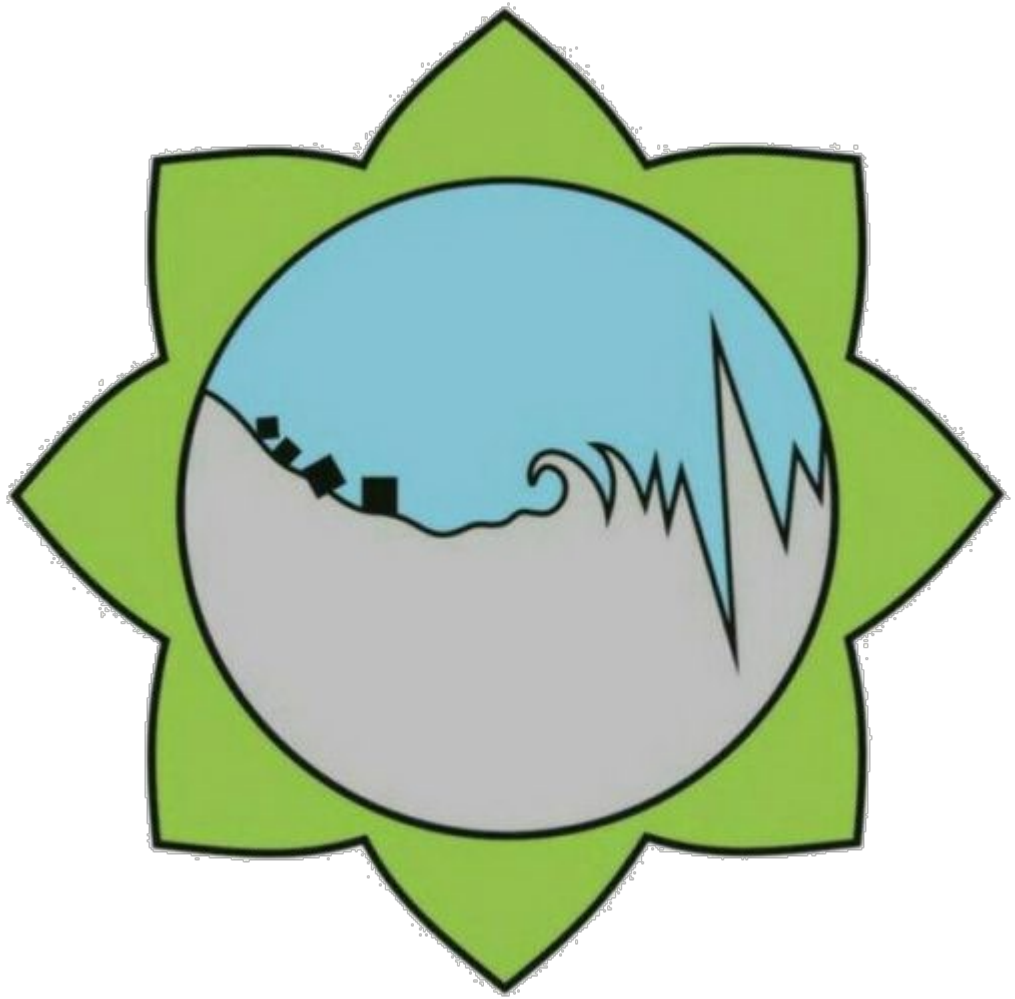


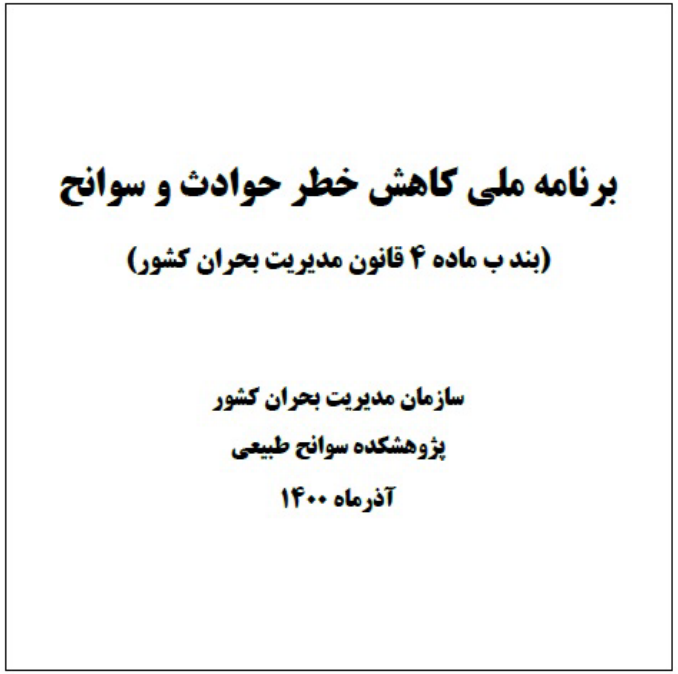
Disaster Management Organization law and Tsunami relates diagram



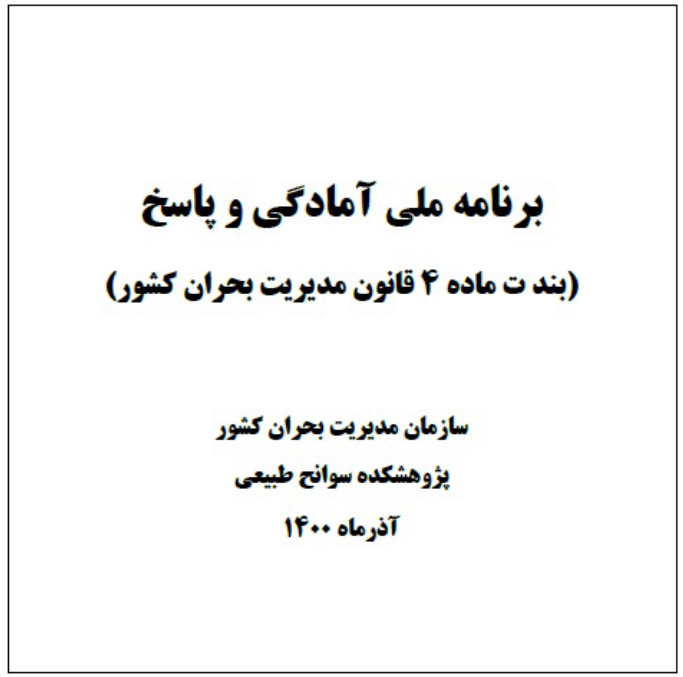
National Disaster management law in 2019

integrated management system for policy making, planning, coordinating research and executive activities in a cohesive manner, concentrated information dissemination and supervision over different phases of disaster management as well as rehabilitation and reconstruction of disaster stricken areas.





National Risk Reduction Program(NRRP)



National preparedness and response program

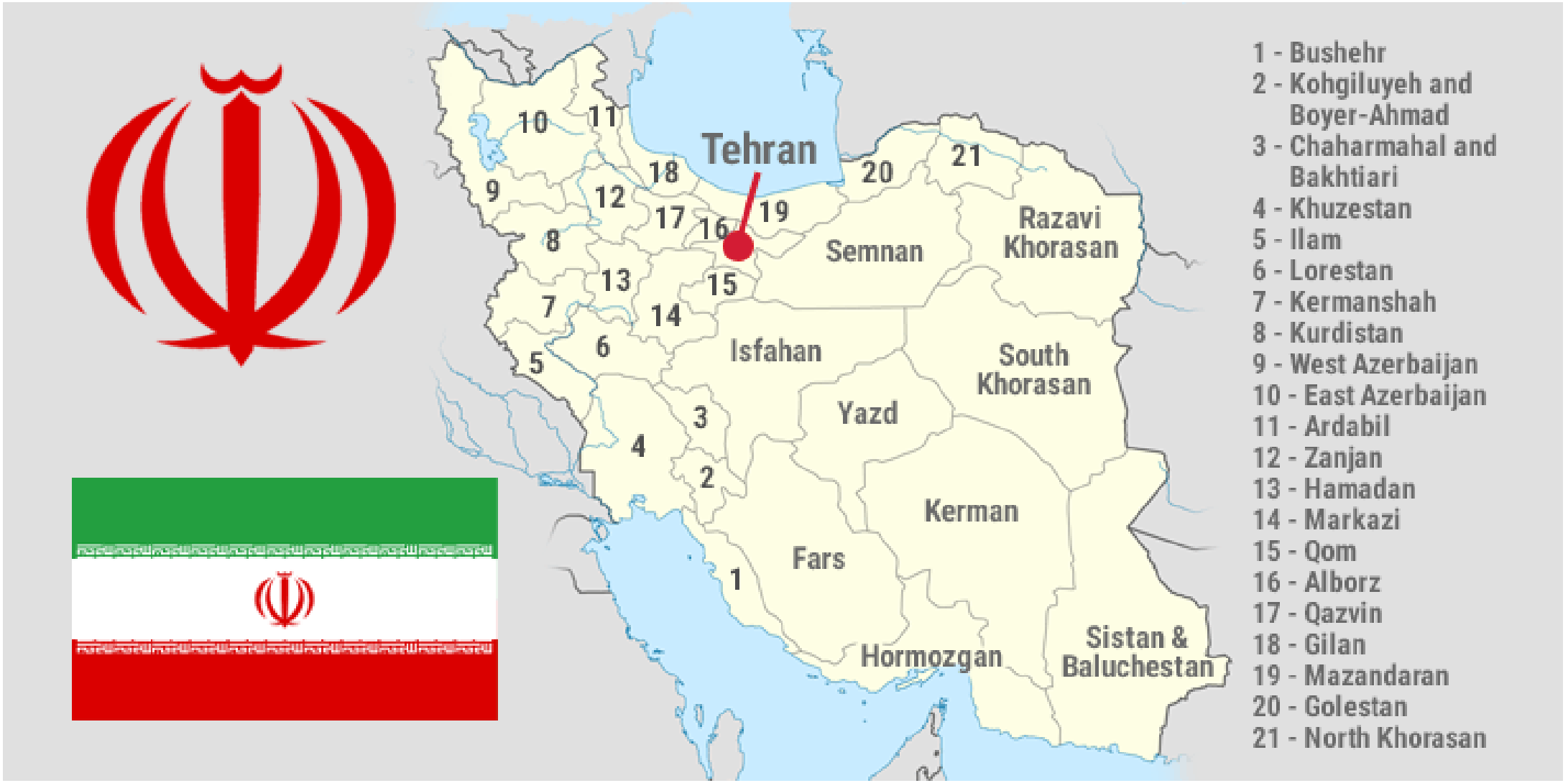
NRRP

Preparation of emergency evacuation plan
For Flood And Earthquake

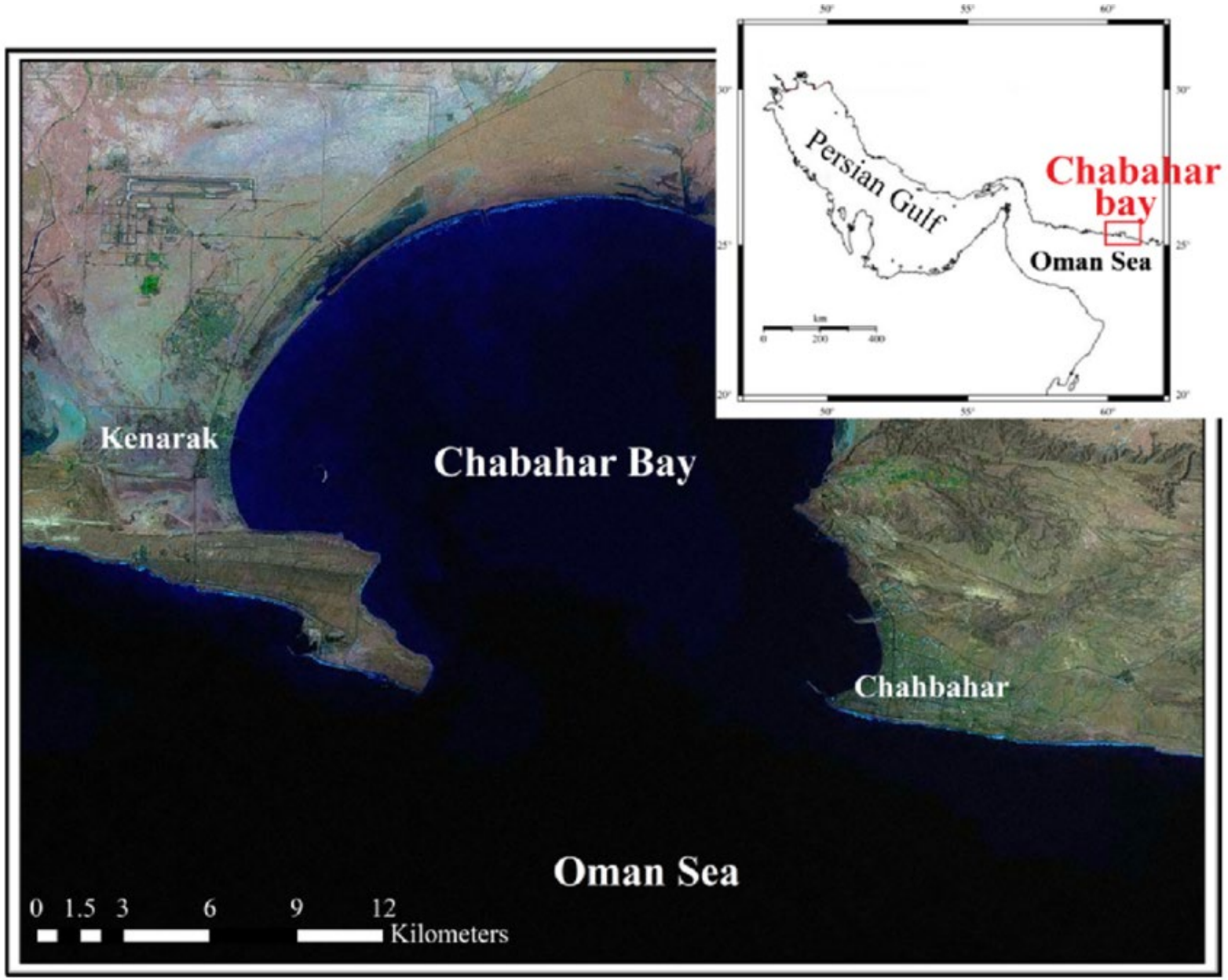
NDMO

Municipalities and villages Organization,
Red Crescent Society,
Ministry of Roads and City Planning,
General Staff of the Armed Forces

Iran


Tehran
Isfahan
Yazd
Kerman
Fars
Hormozgan
Sistan & Baluchestan
South Khorasan
Razavi Khorasan
Semnan
1 - Bushehr
2 - Kohgiluyeh and Boyer-Ahmad
3 - Chaharmahal and Bakhtiari
4 - Khuzestan
5 - Ilam
6 - Lorestan
7 - Kermanshah
8 - Kurdistan
9 - West Azerbaijan
10 - East Azerbaijan
11 - Ardabil
12 - Zanjan
13 - Hamadan
14 - Markazi
15 - Qom
16 - Alborz
17 - Qazvin
18 - Gilan
19 - Mazandaran
20 - Golestan
21 - North Khorasan

Iran has 2 provinces prone to Tsunami



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Iran has 2 provinces prone to Tsunami

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establishment of tsunami monitoring warning system in Jask and Chabahar

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	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 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.

Support Our Subcategory executive and scientific Organizations

- Coordination
- Financially
- Equipment
- facilitation

Development of the National Tsunami Warning Center

- With the aim of developing this center and responding to the needs of the country's Disaster Management Organization and other maritime organizations, it is provided to carry out :
- field measurements, numerical modeling of phenomena, create a database and prepare a maritime hazard zoning map, provide training and information and prepare an operational forecasting system also providing relevant warnings especially in the two regions of Chabahar and Jask

Objective of this center

- 1. Identifying and collecting data on marine hazards in the country
- 2. Preparation of hazard zoning map in the country (first phase: **tsunami**, storm surge, rip current, strong waves, Thunderstorms, tropical storms)
- 3. Creation of the country's marine hazards information bank in the study areas (Chabahar and Jask)
- 4. Providing solutions and materials needed for public education of people and officials
- 5. Preparation of a proposed structure for the optimal interaction of subordinate bodies for monitoring, training and management of crises caused by hazards marine
- 6. Providing prediction models for marine phenomena including waves, sea currents, storm surges
- 7. Setting up a tsunami warning system in Chabahar and Jask

The necessity of establishing the National Center for Forecasting and Warning of Marine Hazards

- About 16 percent of the Iranian population lives in coastal areas
- More than 2,700 kilometers of coastal strip is prone to marine and atmospheric hazards.
- Although tsunami is one of the inevitable natural hazards, it is possible to take necessary measures and preparations based on appropriate studies and forecasts for each coastal region .The losses and damages caused by the tsunami could be reduced to the minimum possible amount.
- The collection of information obtained from historical evidence tells about the occurrence of earthquake tsunamis in the subduction zone of Makran in the past and the possibility of their occurrence in the future. The most prominent of these cases is related to the earthquake and accompanying tsunami in 1945, which killed at least 4000 people. It has left casualties on the coasts of Pakistan, India, Iran and Oman.
- In general, it can be stated that the coasts of the Oman Sea are the most susceptible coastal areas of the country for tsunamis, and it is necessary to assess the risk and predict the dangers and effects of tsunamis in different areas of these coasts.

The necessity of establishing the National Center for Forecasting and Warning of Marine Hazards

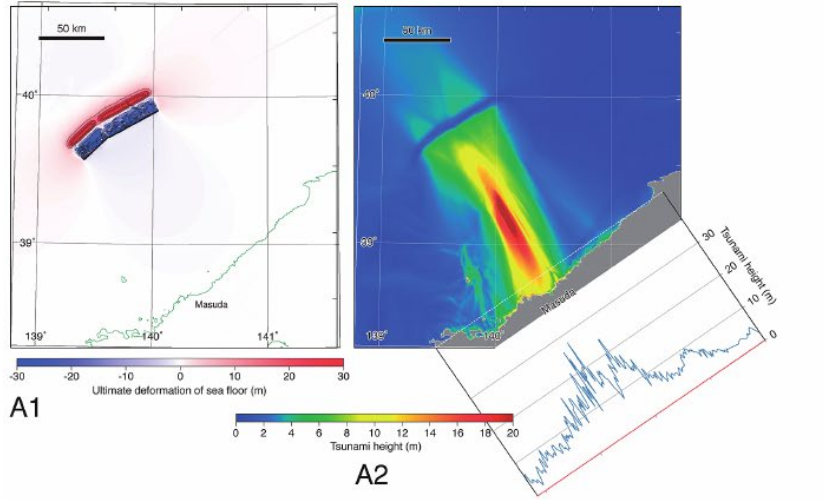
- These plans includes the purchase of the required field equipment, the purchase of the required information and data, the study and modeling of various phenomena that lead to the creation of marine hazards, the creation of a database and the preparation of marine hazard zoning maps, training and information, the design and implementation of an operational forecasting system.

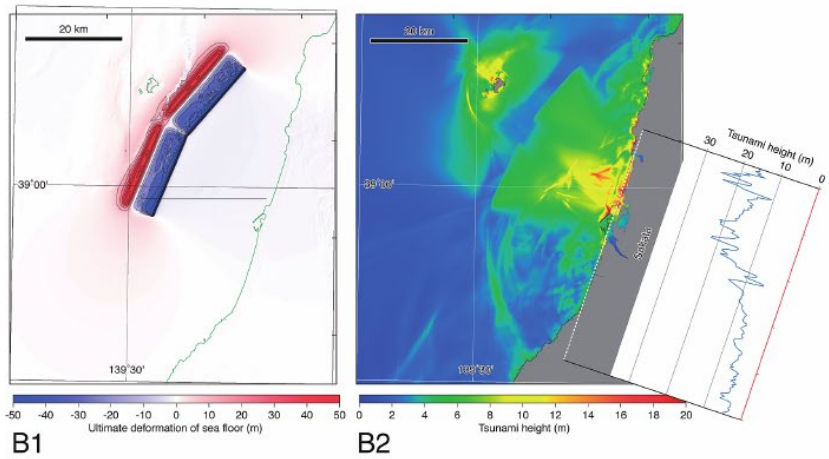
1- Identifying, studying and collecting data related to marine and atmospheric hazards of the country

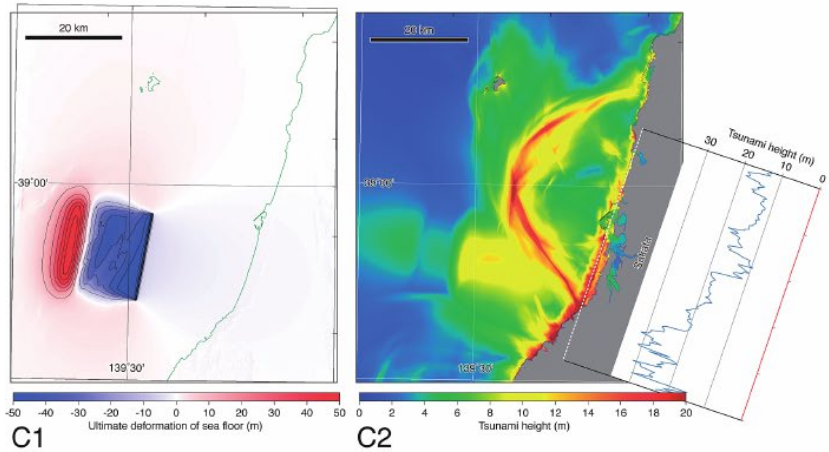
- General identification of maritime and atmospheric hazards of the country
- Collecting and reviewing data sources related to the country's marine and atmospheric hazards
- Collecting and reviewing evidences and documents available in other maritime organizations of the country and Meteorological Organization
- Collecting and checking field data recorded simultaneously with marine and atmospheric hazards
- Field study including interviews with local people and fishermen

2- Numerical study and modeling of tsunami in Oman Sea

- Collecting documents and studies done regarding tsunami in Iran and in similar areas as Makran region
- Collecting information on historical earthquakes and tsunamis, regional seismicity through the study of existing references. Field operations and interviews with local people (regarding the tsunami of 1945)
- Identifying, studying and introducing different and reliable numerical models of tsunami modeling and choosing the appropriate numerical model
- Analyzing earthquake data in Makran region in order to develop earthquake and tsunami scenarios
- Collecting and purchasing hydrographic and topographical data as input to the tsunami model in the study area
- Determining possible earthquake scenarios in Makran fault
- Modeling the stages of production, dissemination and rise of tsunami for the defined scenarios
- Preparation of tsunami inundation maps for different scenarios in important areas

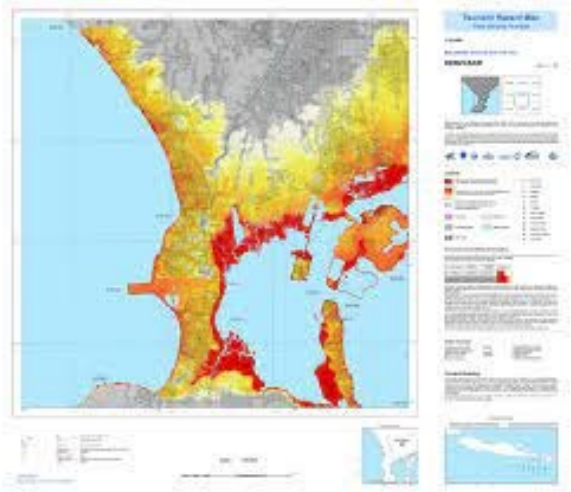


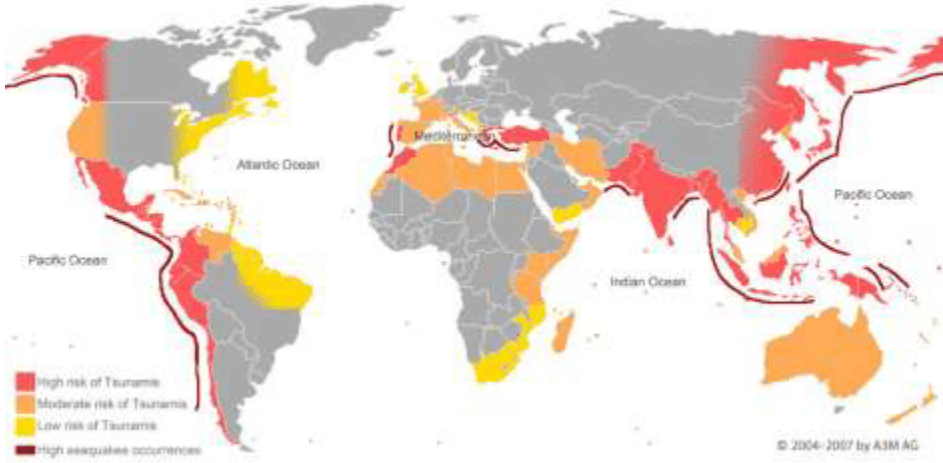




3-Creating a database and preparing Tsunami risk maps and Hazard maps

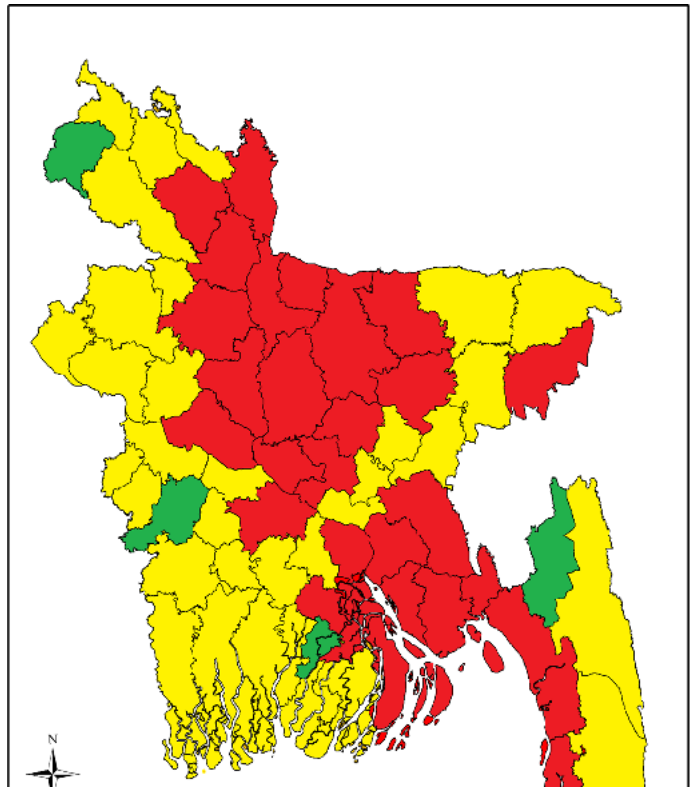
- Examining the requirements and challenges of the project, presenting the project report in part
- Production of marine and atmospheric hazard data culture and standardization methods of different types of data
- Remembrance and development of the portal plan
- Designing and creating metadata database and required software
- Web-GIS
- design and implementation
- Designing and creating a marine risk database
- Designing and implementing software for displaying, analyzing and using project data
- Preparing the procedure for updating the structures and database





4- Preparing a zoning map of high-risk areas from the point of view of physical hazards of the sea

- Determining the location of industrial, commercial, tourism and population density
- Determining the location of access roads
- Determining the location of important ports
- Determining the location of the probability of occurrence of each of the marine and atmospheric hazards
- Providing zoning maps in sensitive and high-risk areas



5-Providing solutions and materials needed for public education of people and officials

- Studying and examining common methods in the world for training people and officials
- the standardization of common education methods according to the conditions of the country
- holding specialized training workshops for officials
- Holding educational workshops for people to learn about and deal with marine and atmospheric hazards
- holding specialized training workshops for rescue and relief groups in the coastal provinces of the country
- Compilation of general methods of dealing with marine and atmospheric hazards
- solution for public education to learn about and deal with maritime and atmospheric hazards
- Participating in the preparation and production of educational films about dealing with marine and atmospheric hazards and broadcasting through
- Public media
- Designing and printing educational brochures, posters, booklets and other educational items

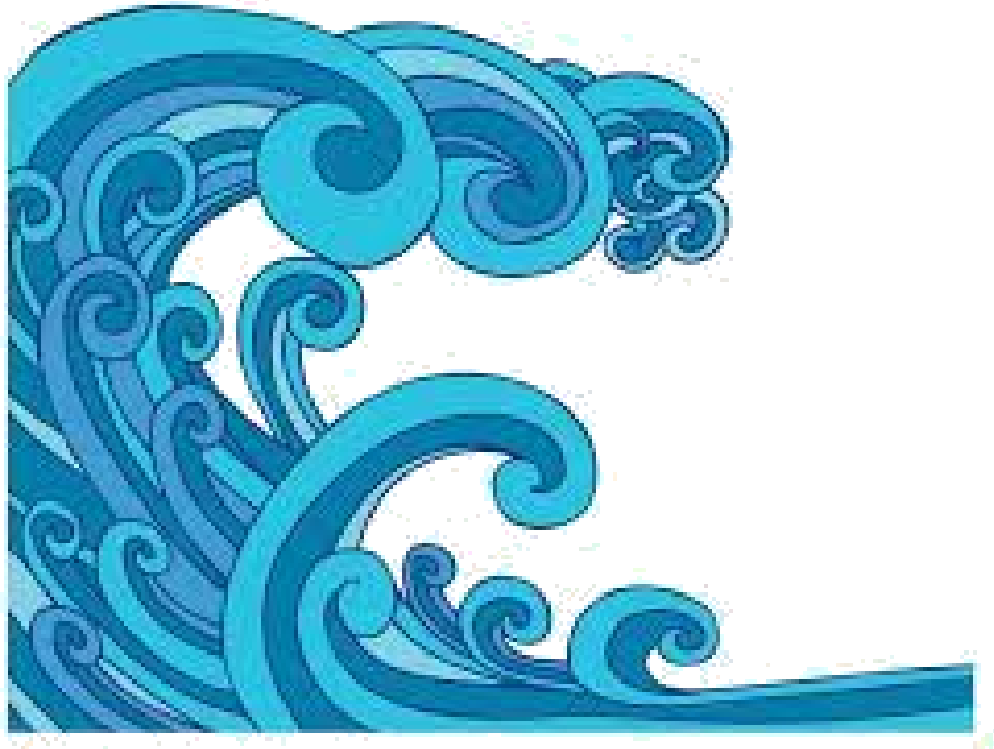
6- Design and launch of operational anticipation system

- Design and implementation of operational prediction model of wind waves in, Oman Sea, North of Indian Ocean
- Designing and launching a model for predicting sea currents in the Oman sea
- Design and implementation of storm surge prediction model in Oman Sea
- Designing and setting up a tsunami warning system in Jask and Chabahar

7-Determining possible fault earthquake scenarios

- These scenarios usually Based on parameters such as the :

-location of the earthquake, the focal depth and the magnitude of the earthquake are separated.

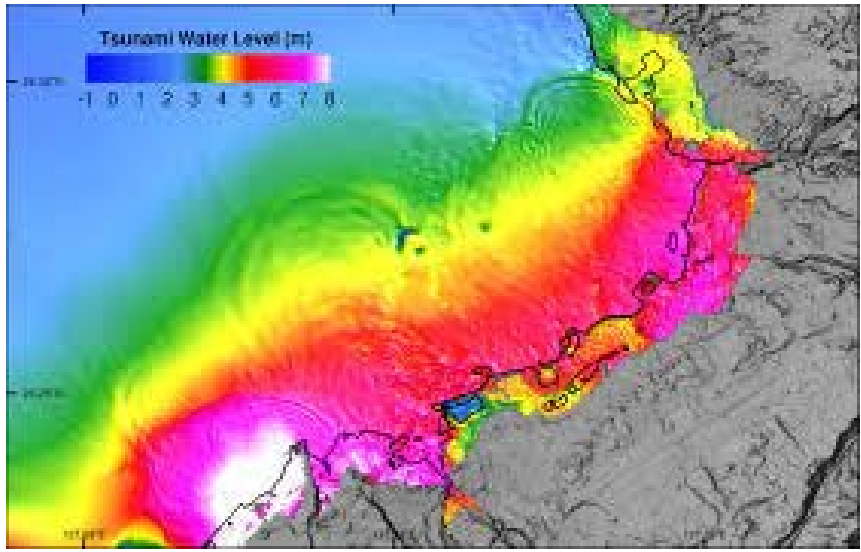


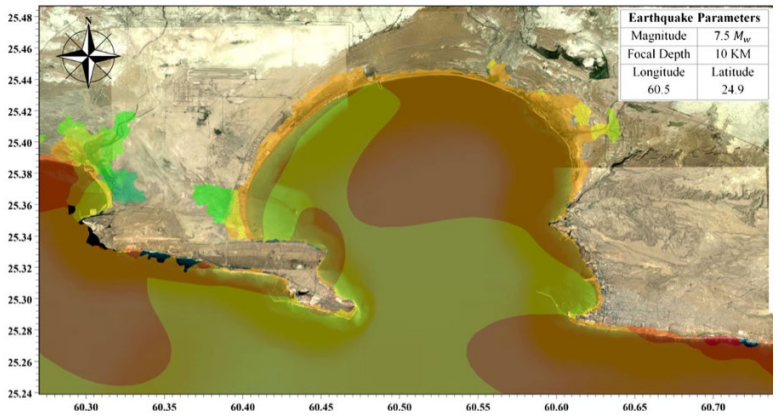
8-Modeling possible scenarios of Tsunami

- The modeling software is prepared with the input of 900 different types of scenarios

9-Preparation of inundation maps for different scenarios

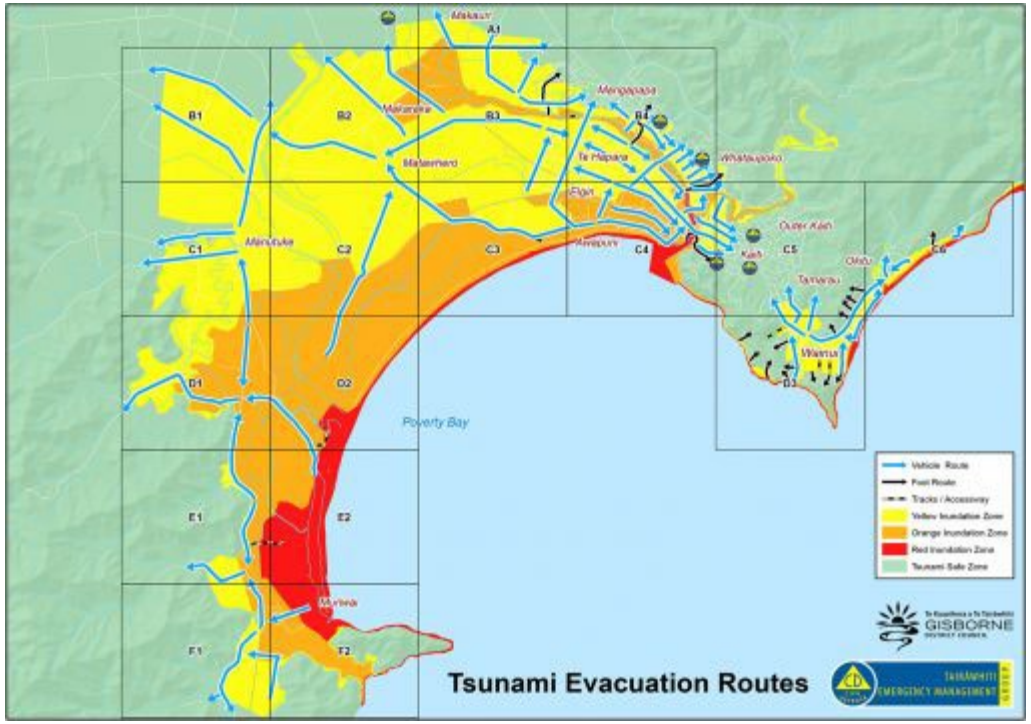
- The most important output of the local tsunami model is to determine the amount of waves rising in the coastal areas. as before It was mentioned that for each earthquake scenario, it is necessary to implement the global tsunami model. Then based on the results Decisions are made regarding the implementation of local tsunami models in different areas, and finally the inundated areas The title of output of local models is obtained. The output of numerical models in a specific format and in the form of raw data It is in the form of (GIS) and in order to use it optimally, these outputs are required in the form of a GIS system Prepare inundation maps. Therefore, in this section, inundation risk maps in specific coastal areas for GIS, different tsunami scenarios of the Makran fault are produced in a format and finally stored in the database.





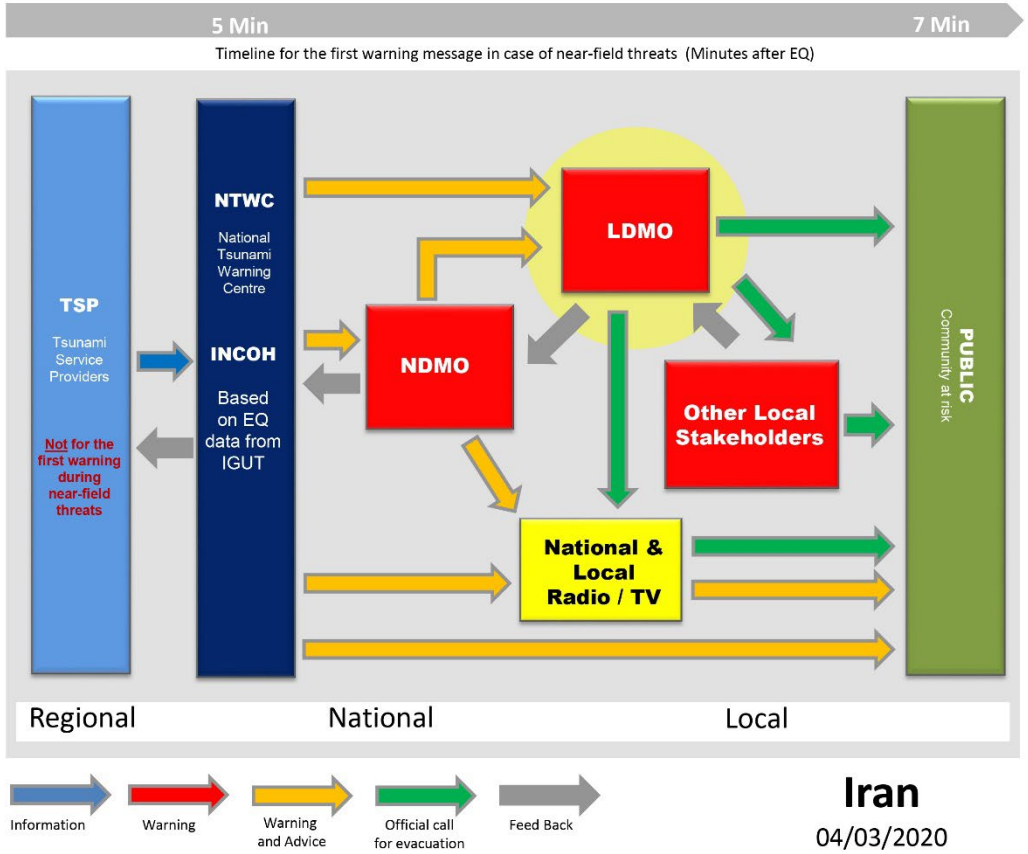
10-Placement of safe points and preparation of maps of evacuation routes in densely populated areas

- Due to the proximity of the Makran fault to the coasts of our country, tsunami waves in a limited time interval and in some areas It takes less than 30 minutes to reach the beaches of our country and densely populated centers such as Chabahar. In the tsunami warning system, after Forecasting and rapid warning of tsunami should evacuate the residents of areas at risk and move to higher areas that this requires the availability of the map of the escape routes. These maps are based on the topography of the city. Maps of the roads and infrastructure of the city and tsunami risk maps are prepared. In the absence of areas It is necessary to build safe and elevated structures near the natural high places at risk Structures are also very sensitive.



11-Preparation of standard operational measures for tsunami warning in the country

- In general, it refers to a set of written instructions that guide a repetitive process or activity by an organization It is applied. For the National Tsunam Warning Center, these instructions (SOPs) describe standard operating procedures (1Agreed steps are used to coordinate various aspects of the Tsunami Rapid Response Plan. In other words Other standard operating measures, a mechanism to improve the effectiveness and reliability of the operation of warning systems and systems Crisis management creates. On the important things in developing the standard operational measures of t National Tsunami Warning Center is coordination and its continuity with th operational standard measures of other institutions, including internationa and national rapid warning institutions and continuity and Full compliance with the standard operational measures of the crisis management organiz and other responsible organizations (and vice versa). By editing In fact, this instruction specifies all the stages of the tsunami warning process and hov different organizations communicate with each other can be Standard operating measures can be a wide range of measures from data processing analysis, communication measures For warnings and a checklist of necessa measures for the general evacuation of beaches, coordination of relevant organizations and role establishment And include the limits of the powers o government, non-government institutions, etc.



12-Designing and standardization of Tsunami warning signs

- In general, it refers to a set of written instructions that guide a repetitive process or activity by an organizationIt is applied. For the National Tsunami Warning Center, these instructions (SOPs) describe standard operating procedures (1Agreed steps are used to coordinate various aspects of the Tsunami Rapid Response Plan. In other wordsOther standard operating measures, a mechanism to improve the effectiveness and reliability of the operation of warning systems and systemsCrisis management creates. One of the important things in developing the standard operational measures of the National Tsunami Warning Center is coordinationand its continuity with the operational standard measures of other institutions, including international and national rapid warning institutions and continuity andFull compliance with the standard operational measures of the crisis management organization and other responsible organizations (and vice versa). By editingIn fact, this instruction specifies all the stages of the tsunami warning process and how different organizations communicate with each othercan be Standard operating measures can be a wide range of measures from data processing, analysis, communication measuresFor warnings and a checklist of necessary measures for the general evacuation of beaches, coordination of relevant organizations and role establishmentAnd include the limits of the powers of government, non-government institutions, etc.

13-Base hardware and equipment

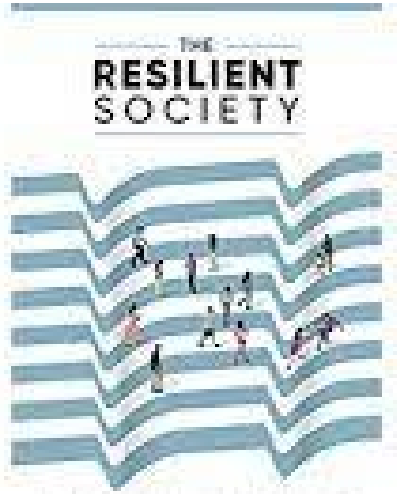
- As mentioned in the previous section, the decision support system requires special hardware equipment The general condition of the equipment required for the central core of the rapid tsunami warning system can be divided into three parts:
- • Operator level
- • Core analysis and calculations
- • Communication

level Operator level that includes user computers, various peripheral equipment such as printers, faxes, copiers, removable memories Carrying, large monitors are used to display and monitor environmental conditions from time to time.

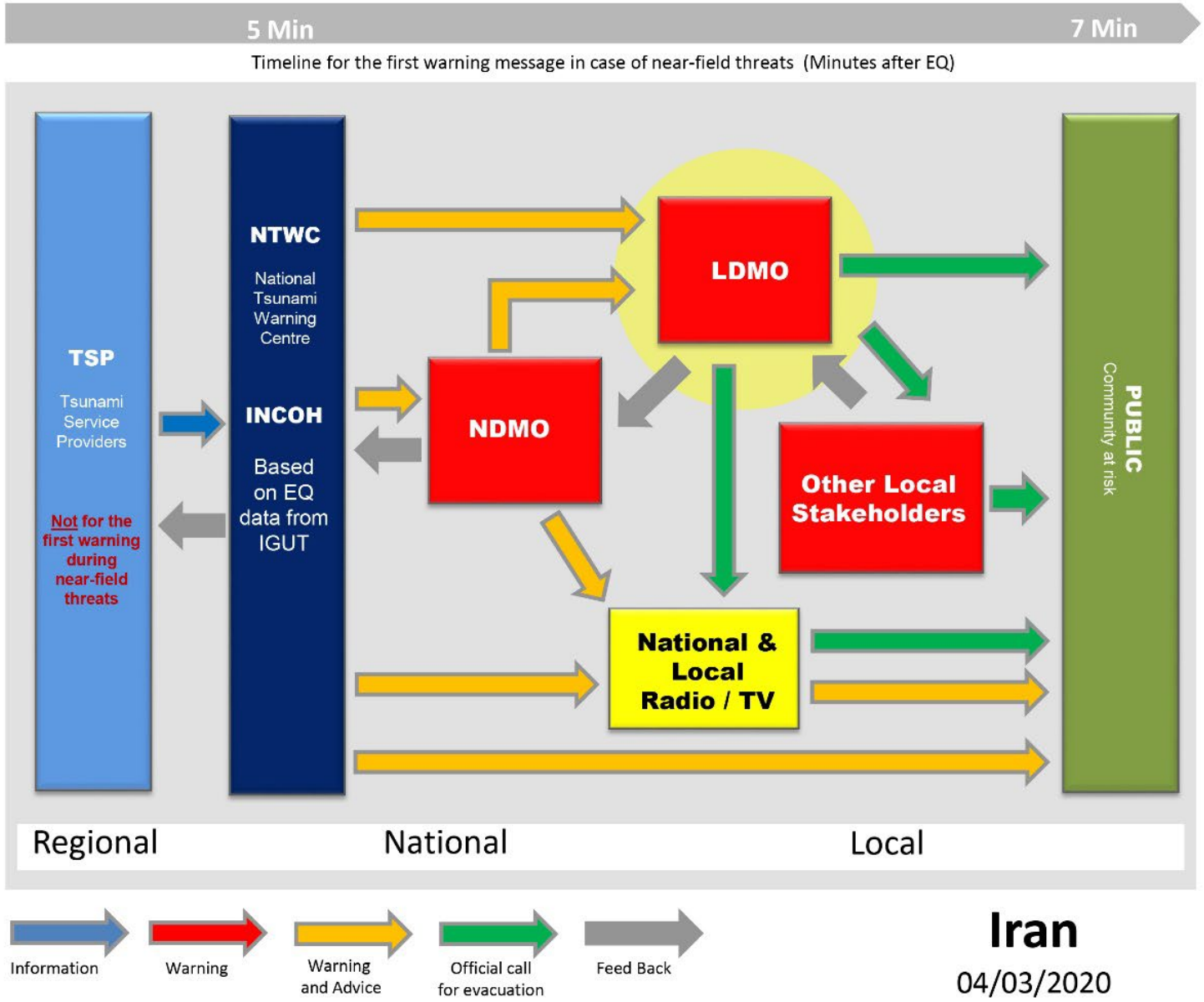
The main part in the hardware part is the core of environmental data analysis and calculations. Usually in design There is a need for zero computing activity, DSS works in such a way that when using the DSS system, the systems not extensive and usually analyzing the input data, matching them with the data stored in the database and producing maps Backup is the risk of flooding. For this reason, a computer server (along with it) that controls the above matters It is enough to have during operation. But before the exploitation stage, in order to carry out heavy calculations, analysis and Generating raw data of inundation maps for multiple earthquake scenarios requires a powerful computing system to minimize the time needed to generate data for storage in the data base. The communication level is a set of hardware that has the role of establishing communication between different monitoring units with the warning center They have a tsunami. This department is also the liaison between the Tsunami Warning Center and other organizations responsible for receiving notifications It will be Hashd Ar. Due to the importance of this section,19National Research Institute of Oceanography and Atmospheric Sciences(Dependent on the Ministry of Science, Research and Technology)The development of the monitoring and warning center for marine hazards related to National Research Institute of Oceanography and Atmospheric Sciences It is necessary to use different communication platforms such as and Point to Point broadband cable connection, satellite connection, wireless connection To be taken into account in critical and emergency situations in case of interruption of backup in the form of (WiMAX & 4G) mobile communication If one of them becomes, the other can be exploited.

14-Designing and implementing programs related to public education and warning and Tsunami preparedness maneuvers

- The concept is so easy
- Where should we go?
- How should we go?
- What should we take with us?
- Which way should we go?
- .....



15-software


5 Min
7 Min
Timeline for the first warning message in case of near-field threats (Minutes after EQ)
TSP
Tsunami Service Providers
Not for the first warning during near-field threats
NTWC
National Tsunami Warning Centre
INCOH
Based on EQ data from IGUT
LDMO
NDMO
Other Local Stakeholders
National & Local Radio / TV
PUBLIC
Community at risk
Regional
National
Local
Information
Warning
Warning and Advice
Official call for evacuation
Feed Back
Iran
04/03/2020

summary

- Although it seems that tsunami has a low priority among the Different hazards in Iran in terms of occurrence, but it is very important for the National Disaster management organization.
- According to the scientific potentials and specialized authorities, it is expected that the Tsunami Ready program will be implemented in Iran at a good speed for susceptible areas by taking advantage of the experiences and assistance of the organizers of this workshop and the experiences of other countries.

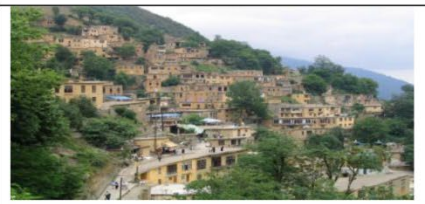
Iran attractions

33pol- Esfahan

Golestan Palace –Tehran

Persepolis- Fars -Shiraz

Arg e Bam- Kerman Province



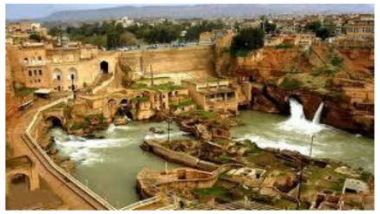
Masule village- Gilan Province

Bazar –Tabriz province

Falak al aflak-Lorestan Province

Biston – Kermansha Province

Saad abad Palace-Tehran



Water Structures –shoshtar –khozestan

Ahvaz bridge- Khozestan

Shire sangi(stone-lione)-Hamadan

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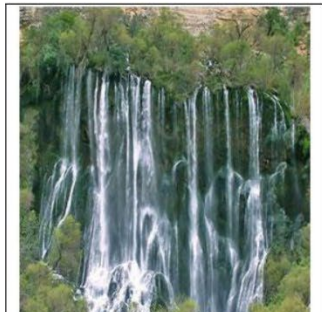

Tehran-the Damavanf Mountain

North of Iran,

Southwest of Iran.

Center & South East of Iran

South of Iran

West of Iran

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Ruins of the Gate of All Nations, Persepolis.

Mount Damavand, Elburz mountains, Iran

Panoramic view from Badab-e Surt stepped travertine terraces, the terraces are formed by two mineral hot springs in Mazandaran Province in northern Iran.

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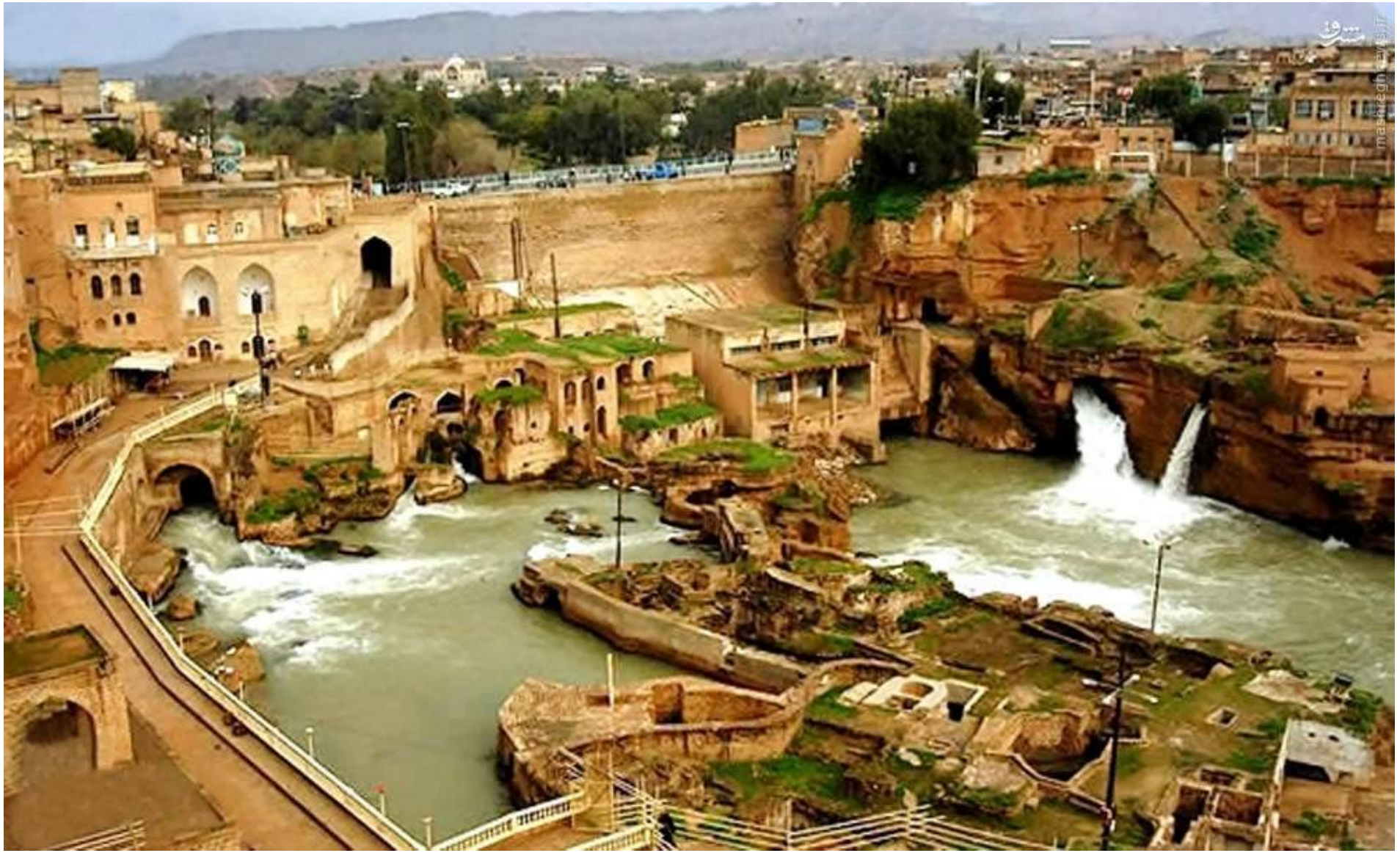

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