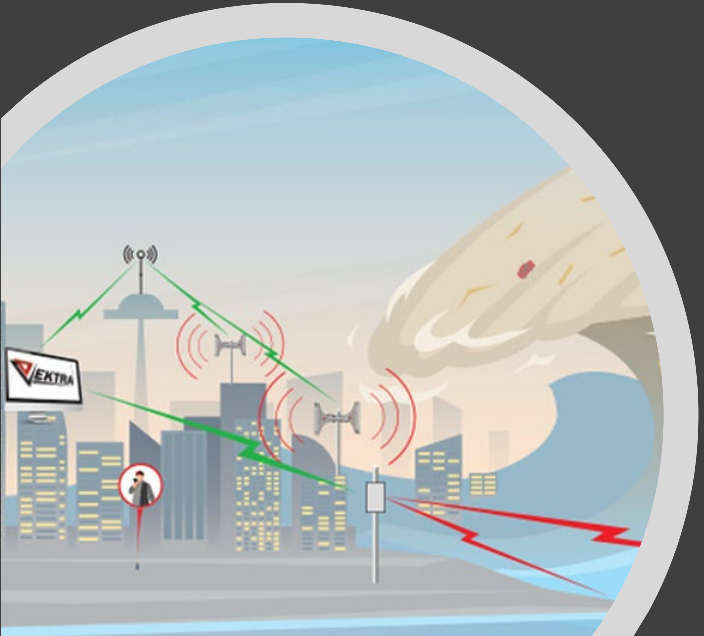
SESSION 2

Dr. DENIS CHANG SENG IOC-UNESCO

- Programme Specialist
- Tsunami Unit (Technical Secretary ICG/NEAMTWS)
- Global Ocean Observation System (GOOS)
- IOC Focal Point UNFCCC NWP on Ocean, and Biodiversity and the International Network for Multi-Hazard Early Warning Systems

Ocean Sea Level Related Risk: The Challenges



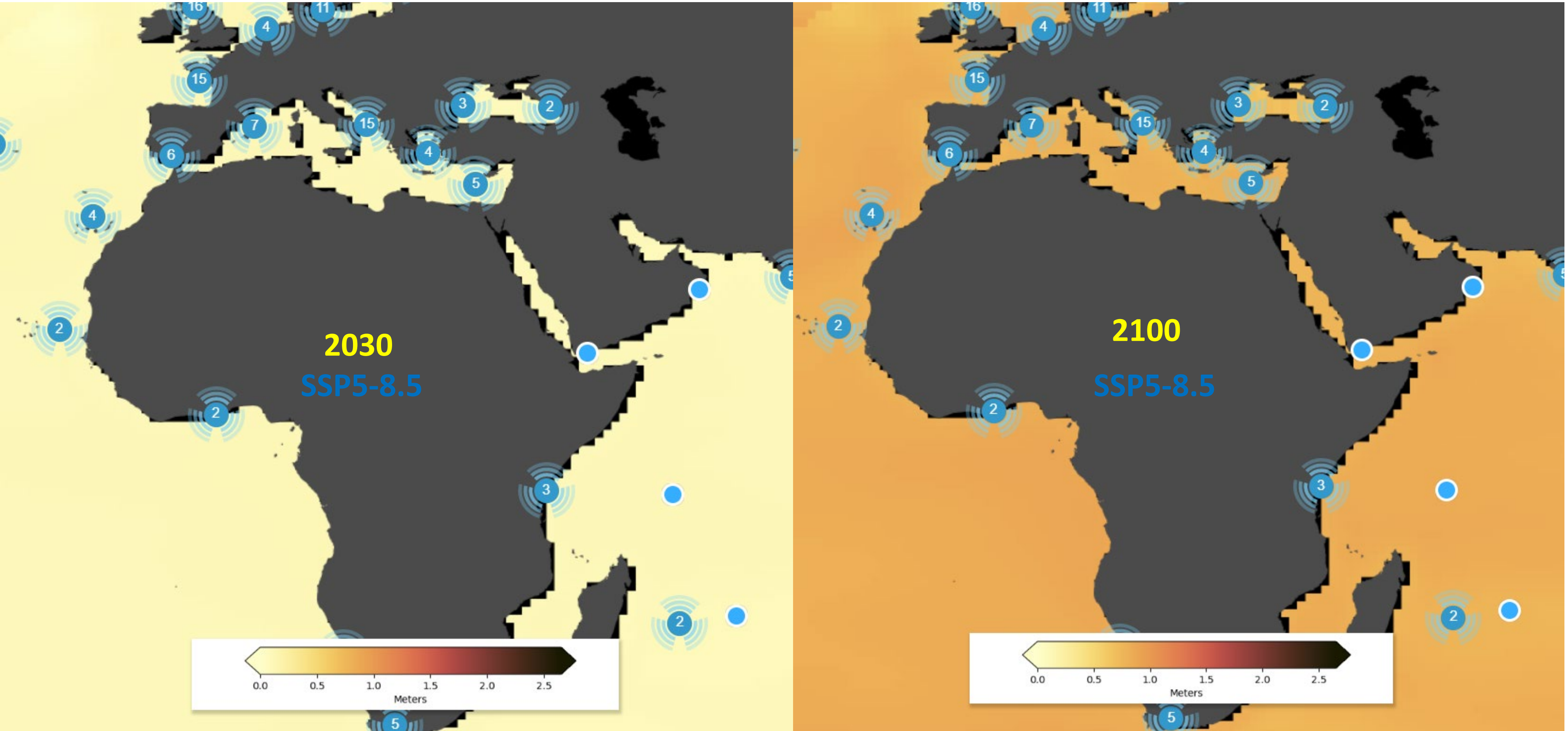
Sea Level Related Hazards and Risks

- Coastal zones are naturally exposed and impacted to different ocean hazards.
    - Tsunamis, Storm Surge and Sea Level Rise
- Human induced climate change favors the increase in frequency and intensity of storm surges and cause sea level rise.
- Tsunami is a low frequency, but high consequence and impact coastal hazard.

Sea Level Rise

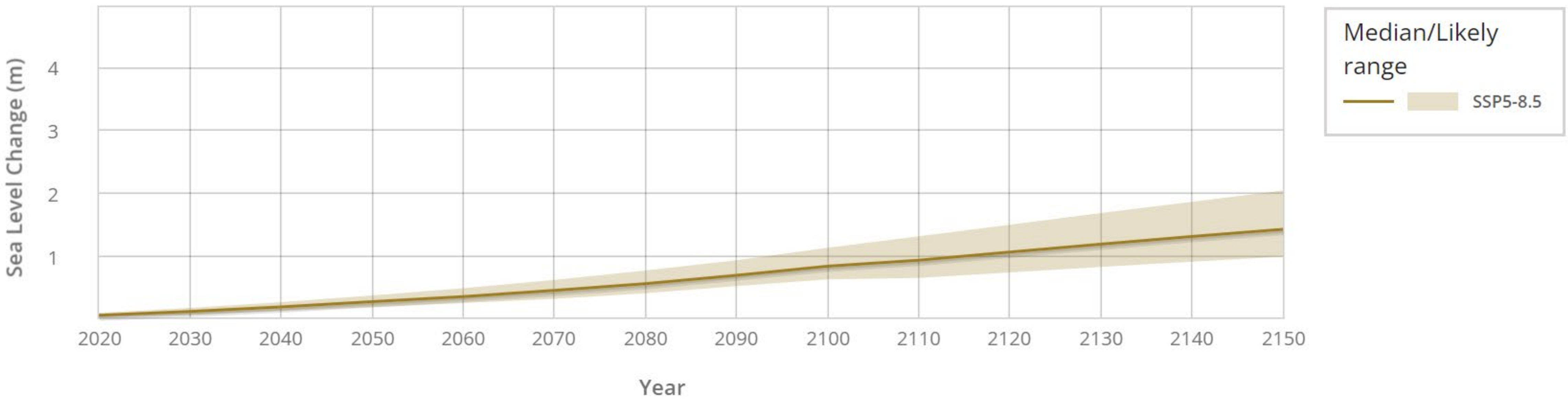
The NASA Sea Level Projection Tool

- **SSP1-1.9**: very ambitious scenario to represent the 1.5°C goal of the Paris Agreement
- **SSP1-2.6**: sustainable development scenario
- **SSP2-4.5**: intermediate scenario
- **SSP3-7.0**: regional rivalry scenario
- **SSP5-8.5**: fossil-fuel based development



Med is turning into the fastest warming sea with irreversible changes for marine and human life.

ALEXANDRIA

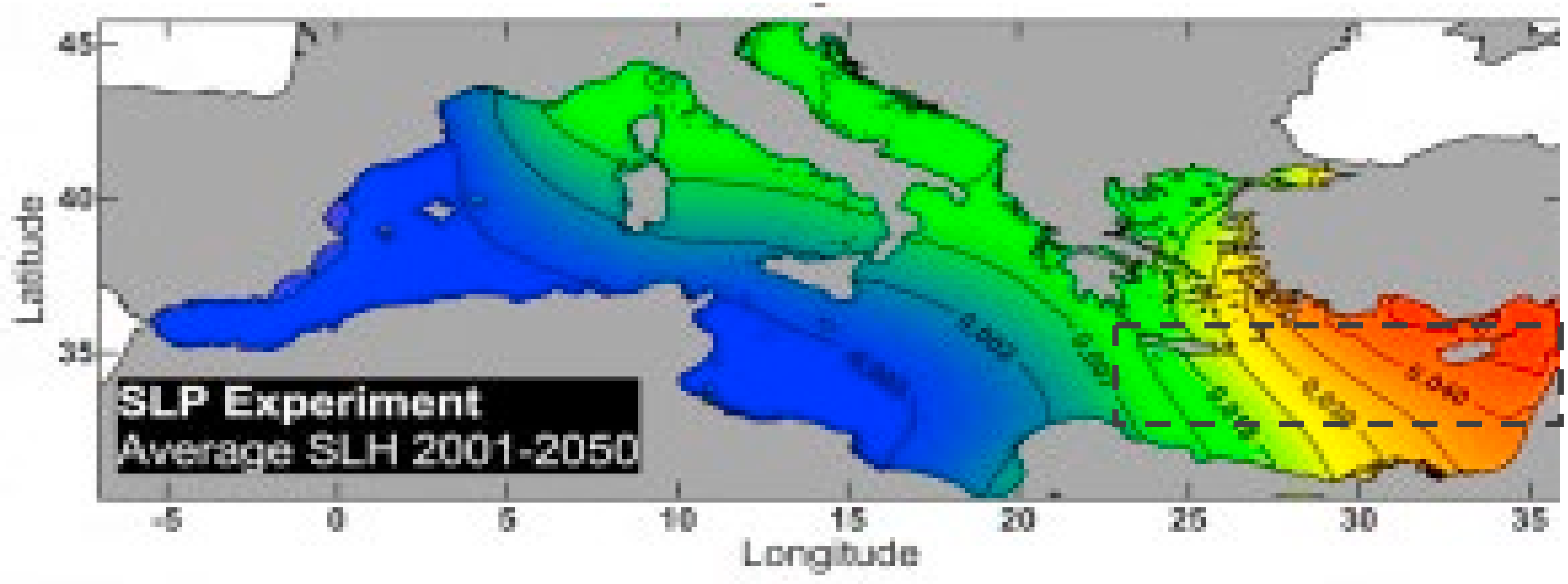


SCENARIO i

SSP1-1.9 SSP1-2.6 SSP2-4.5 SSP3-7.0 **SSP5-8.5** SSP1-2.6 Low Confidence SSP5-8.5 Low Confidence GET DATA

Storm Surges Variability and Trends Under Future Climatic Conditions in the Mediterranean Sea

- West to East gradient
- Alexandria, Egypt and others in the east more exposed to future storm surge?



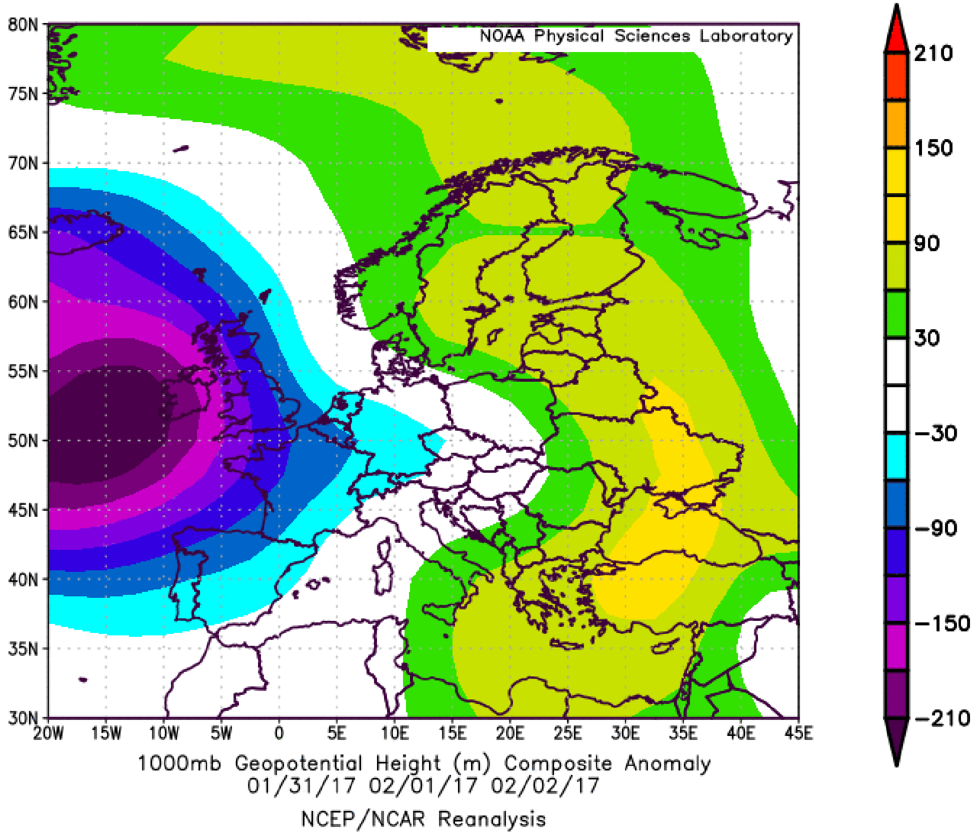
Source: Yannis S.Androulidakis et al

Ocean Swells / Storm Surge/ Meteo-Tsunami?

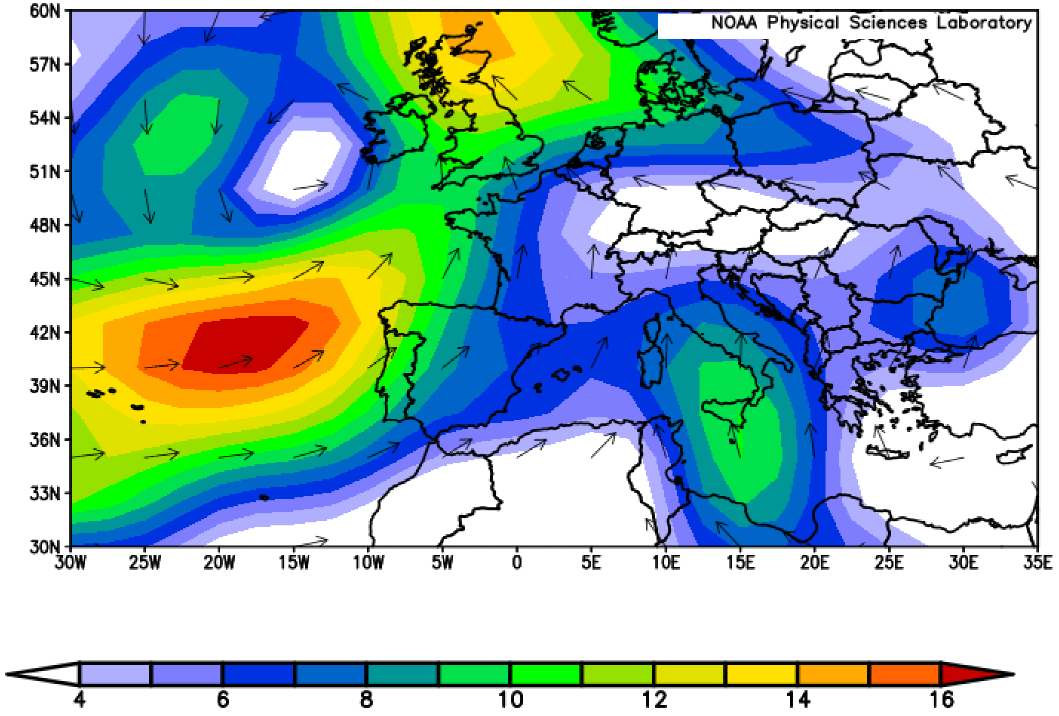
- **Morocco, Jeudi 2 février 2017**

Source: UNESCO, Rabat Office

Associate Atmospheric Anomaly



Geopotential Height Anomaly (1000 mb)



Vector Wind Anomaly (1000 mb)

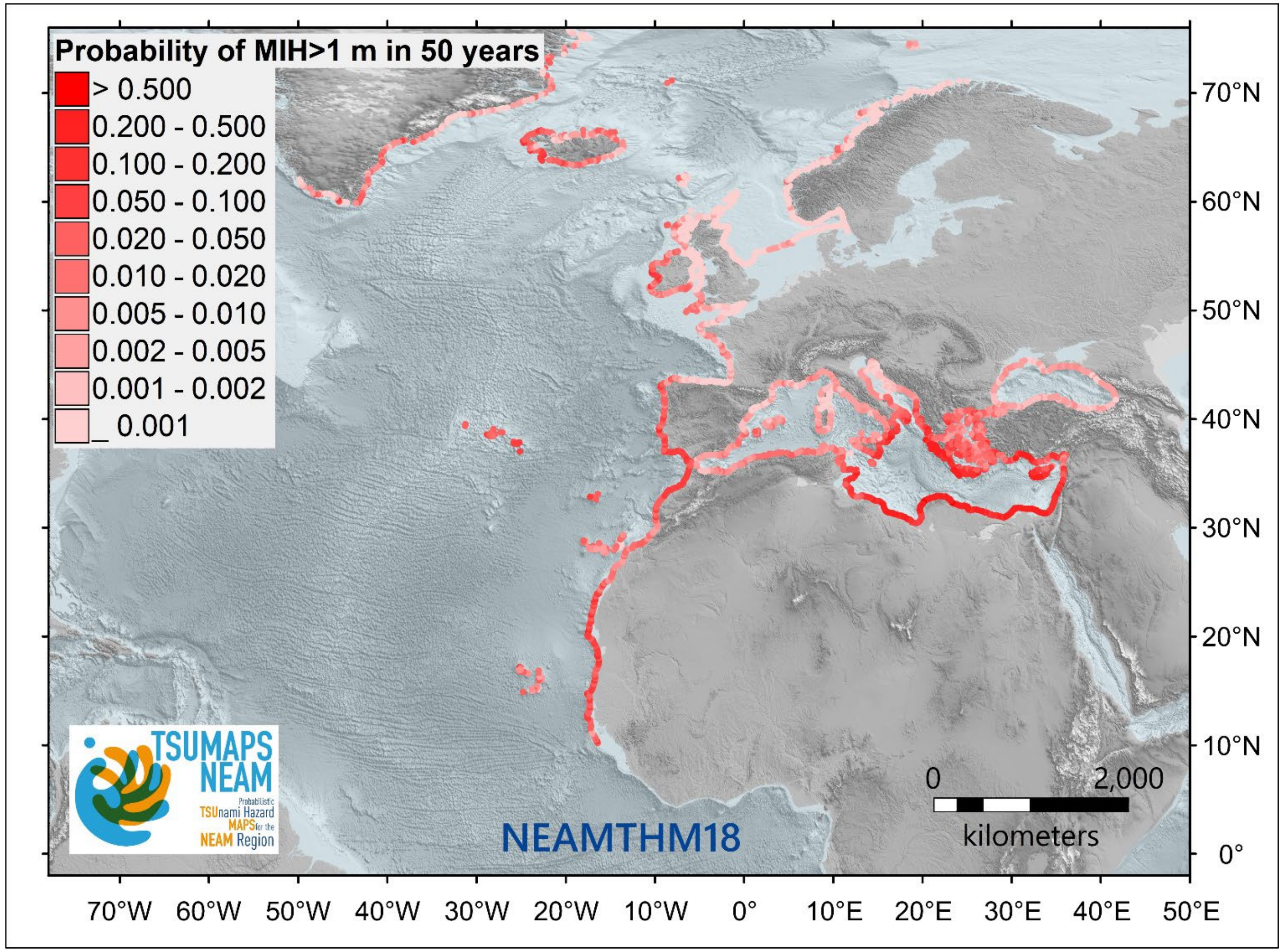
Probability of Tsunami in NEAM Region

In the NEAM region, the probability/likelihood of an earthquake-generated tsunami exceeding a Maximum Inundation Height (MIH) of 1 m in 50 years is illustrated in the Fig.

Note:- MIHs greater than 1 meter tsunamis have been observed recently (Samos and Izmir region 2020, Kos-Bodrum in 2017)

Significant damages reported

Probabilistic tsunami hazard assessment of the NEAM region[1]



[1] Probability of an earthquake-generated tsunami exceeding a maximum inundation height (MIH) of 1 m in 50 years evaluated every ~20 km on the NEAM region coastlines. The map was derived from the NEAM Tsunami Hazard Model 2018 (NEAMTHM18; Basili et al., 2021), which is a product of the TSUMAPS-NEAM project funded by the European Civil Protection and Humanitarian Aid Operations (DG-ECHO). For more details of the model, see http://www.tsumaps-neam.eu. The map presented here was produced with the best information available at the time of modelling. The accuracy of these maps is subject to limitations in the accuracy and completeness of available bathymetry and topographic information, and in the current knowledge of the tsunami sources and characteristics. In the last few years, MIHs greater than 1 meter have been observed during at least three earthquake-generated tsunamis (Samos and Izmir region 2020, Kos-Bodrum in 2017), which caused damage.
Source : TSUMAPS-NEAM project

Recurrence of Tsunami in N-Africa

For more details of the model, see http://www.tsumaps-neam.eu.

Tsunami

Historical and Recent Tsunami Events

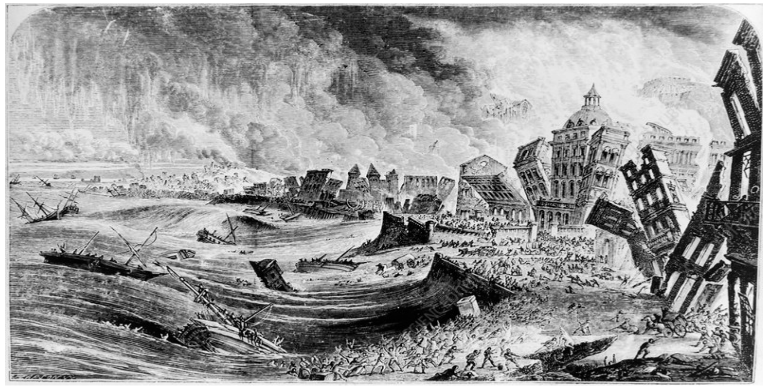
TSP Alerts: 8-11 min
Tsunami waves: 15-20 min
Official Response/ public: >20 min
Reports of some kind kind of 'self-organized' evacuation

THE 1755 EARTHQUAKE & TSUNAMI

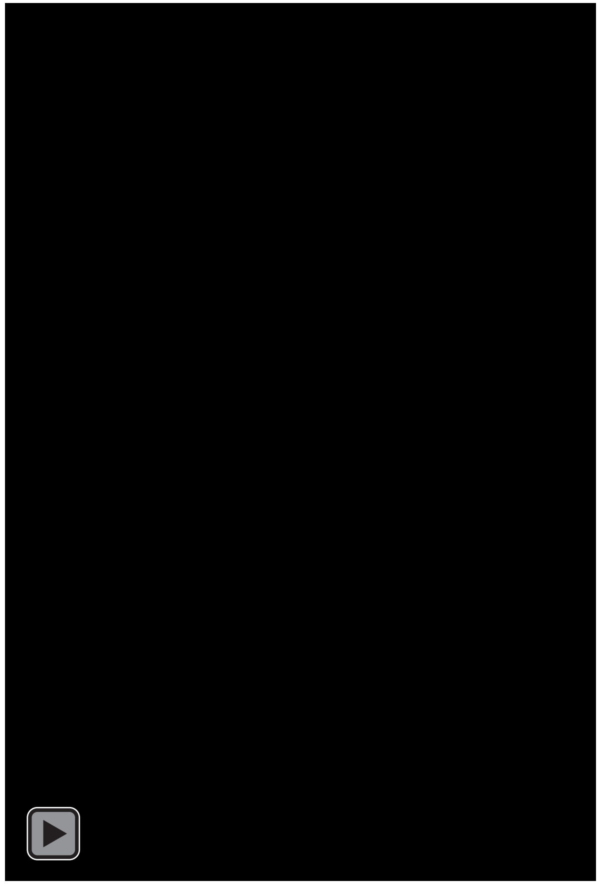
-Lisbon was flooded with tsunami waves of 6 m height.

-estimated 60,000 deaths.

-10,000 may have lost their lives in Morocco.

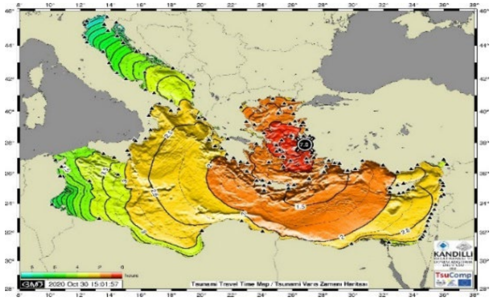


https://media.sciencephoto.com/image/e3700073/800wm

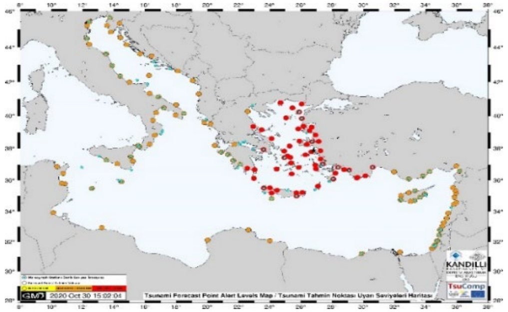


OCT 2020 SAMOS-IZMIR TSUNAMI

source KOERI, Turkey



Tsunami travel time



Forecast point alert (Watch, Advisory and Information) map,

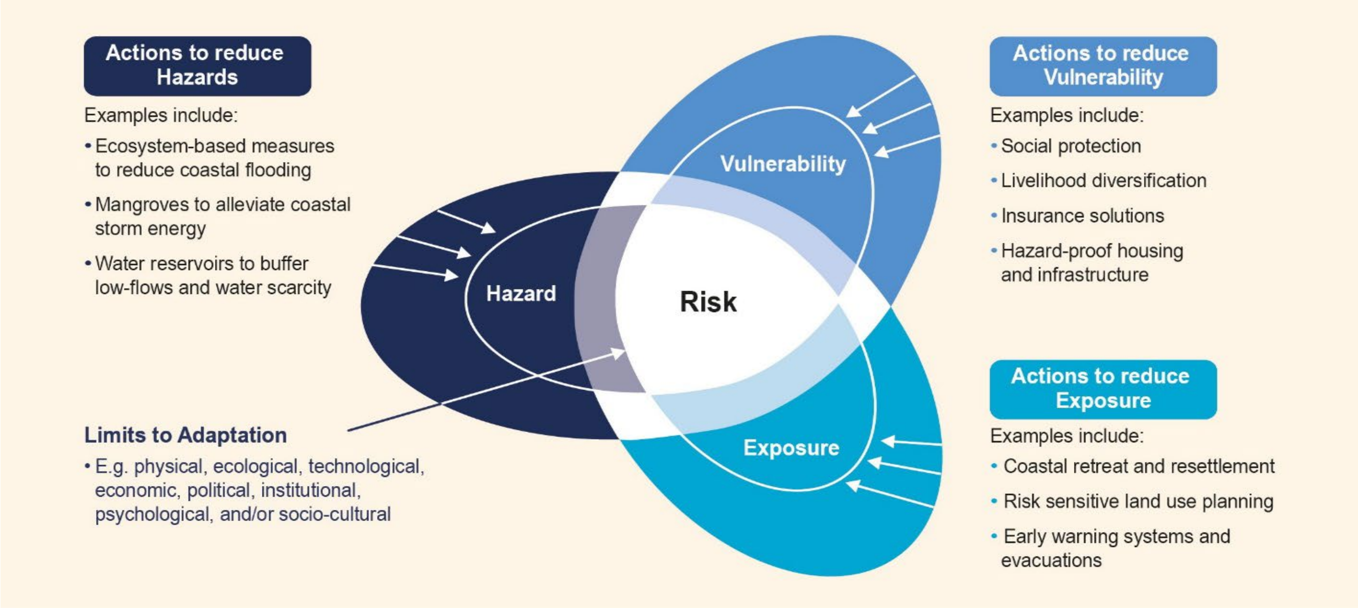
Challenges

Hazards

- Climate change, multi-source and complex mechanisms of tsunami generation (including non-seismic)

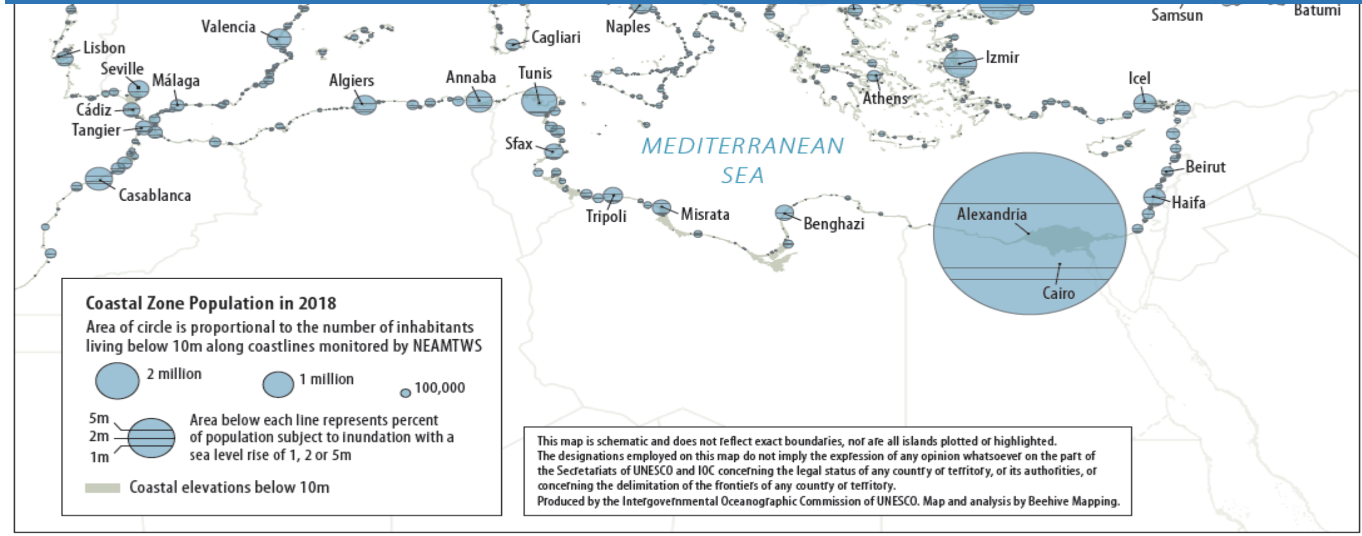
Exposure, Vulnerability and Risks

- Increasing coastal population, coastal tourism activities, blue economy etc
- Low awareness and preparedness. The risks posed by all the three ocean related hazards are largely underestimated in the South-Mediterranean countries (Schmid and Chang Seng 2021)
- Effectiveness and inclusive, people centered End–to-End EWS. Early Warning and Early Action Challenges (EWEA).
- Governance e.g., regulations, policies, standard operating procedures are usually lacking, especially in connecting national to the community level.
- Coastal urban planning and management



Below 10 meters:
116 million & increasing

Excluding dynamic exposure / vulnerability: Seasonal variability in population associated with tourism activities

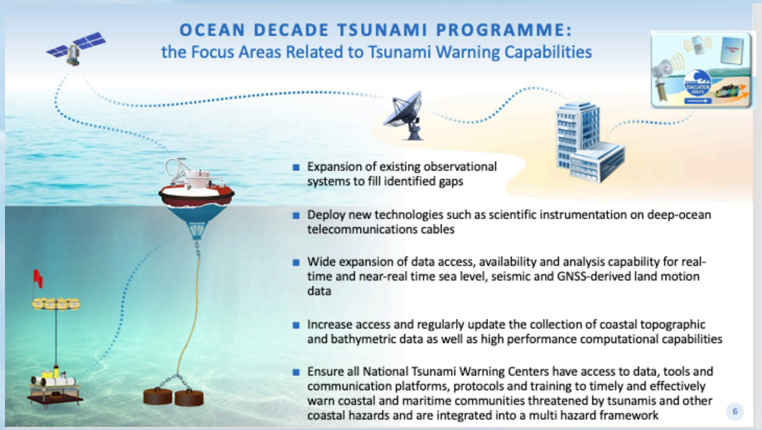


ICG/NEAMTWS 2030 Strategy

Mr. BERNARDO ALIAGA
UNESCO IOC

- Programme Specialist
- Head of Tsunami Unit (a.i)
- Technical Secretary for the Caribbean (ICG CARIBE EWS)and the Pacific Tsunami Warning and Mitigation System (ICG PTWS)

IOC Tsunami Programme and UN Ocean Decade



UN Ocean Decade (2021-30)

- Once-in-a-generation opportunity to address gaps in tsunami warning , enhance community preparedness and contribute to "A Safe Ocean"
- IOC Assembly 31 (Dec. A-31/3.4.1) established the Ocean Decade Tsunami Programme + Scientific Committee to Develop Research, Development & Implementation Plan
  - Technological & Observational Advances to reduce uncertainties
  - 100 % at risk communities prepared & resilient to tsunamis by 2030 (Tsunami Ready, etc.)

IOC Assembly

IOC Executive Council

IOC Secretariat Tsunami Unit

ICG/PTWS Pacific
ICG/IOTWMS Indian
ICG/CARIBE EWS Caribbean and Adjacent Regions
ICG/NEAMTWS NE Atlantic and Mediterranean

Coordination of Regional TWS

Capacity Development

TOWS-WG
WG on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation System

Standards, Best Practice, Advisory to IOC Governing bodies

ODTP Science Committee

TT on TWO
Task Team on Tsunami Watch Operation

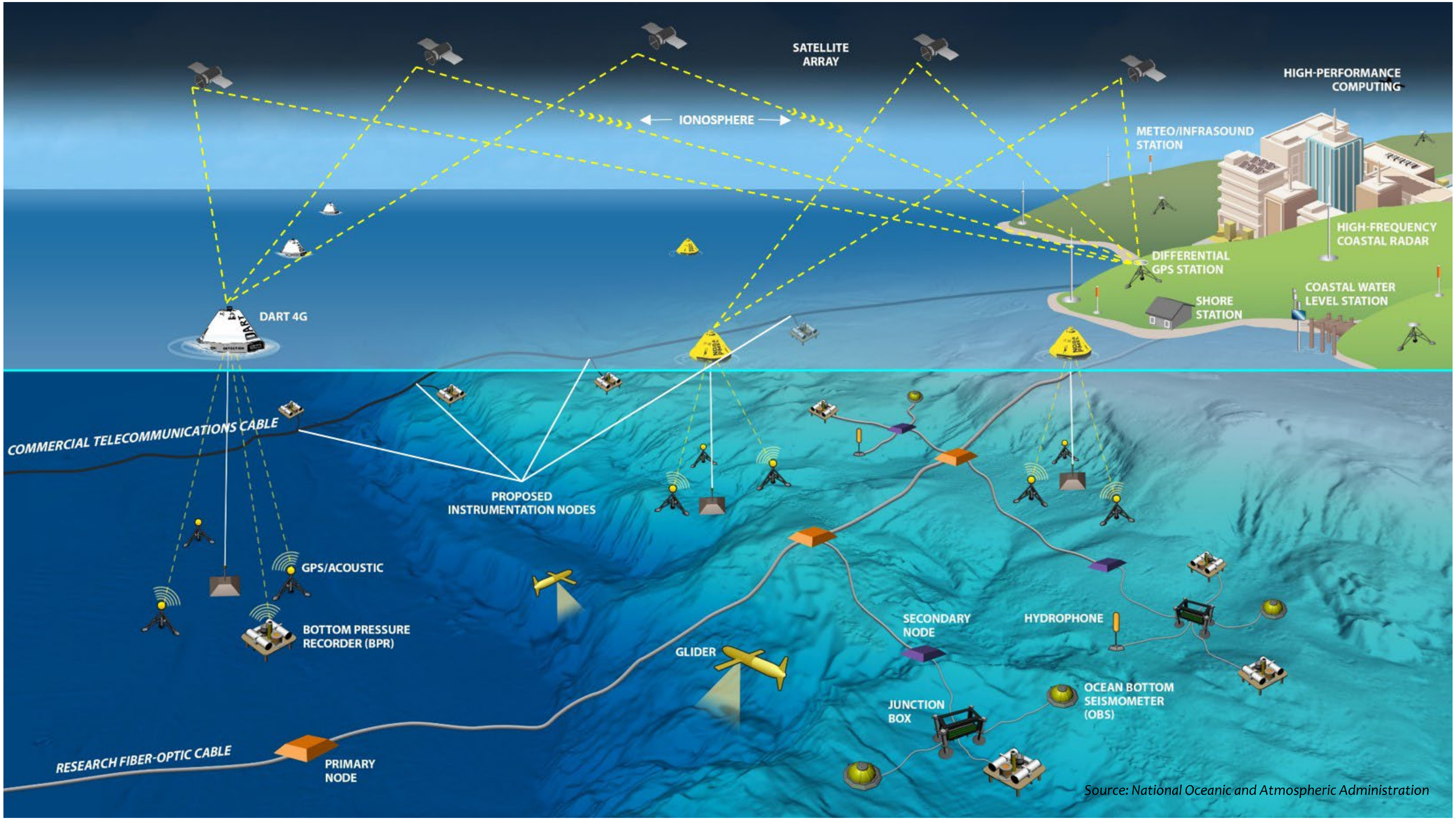
TT on DMP
Task Team on Disaster Management and Preparedness

Governance

- TOWS-WG & ICGs: Global & Regional Steering Committee
- Scientific Committee: Advisory Role
- Special coalition for Tsunami Ready

Rethinking Ocean Observations:

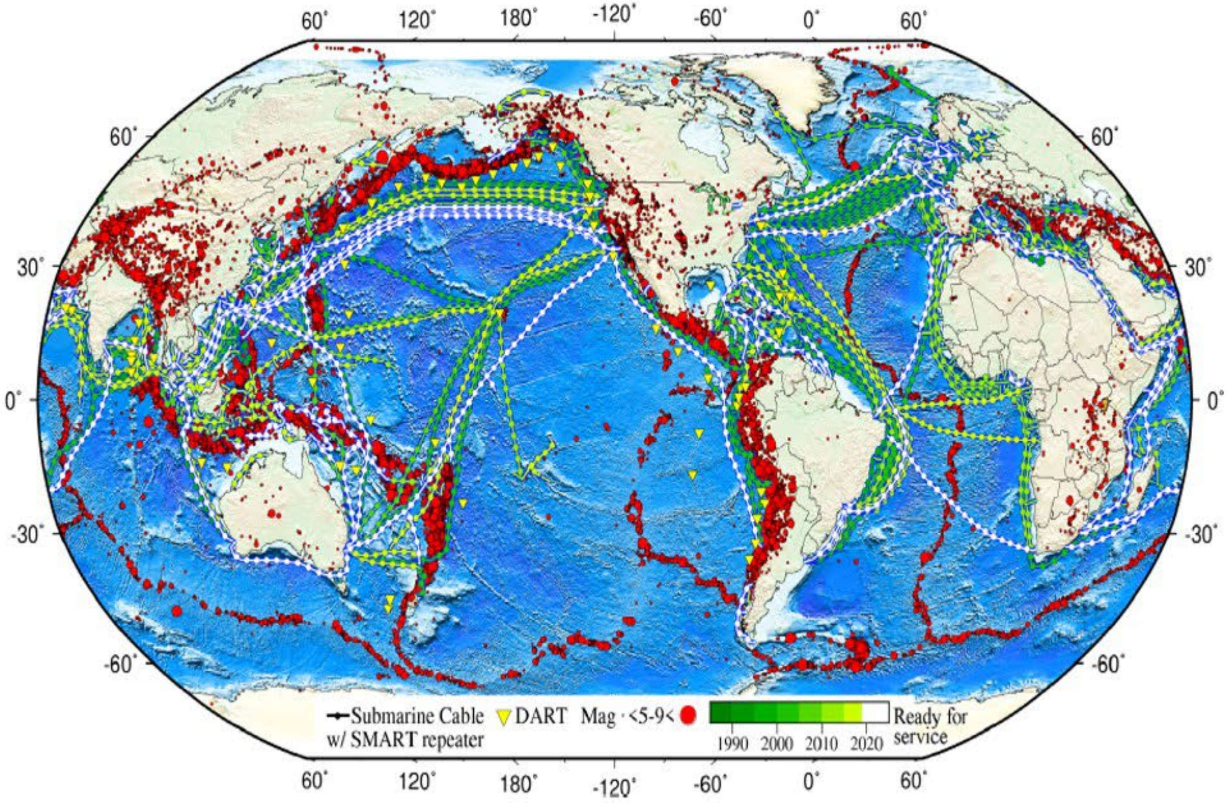
Reducing Uncertainty in Global Tsunami Forecasts



Source: National Oceanic and Atmospheric Administration

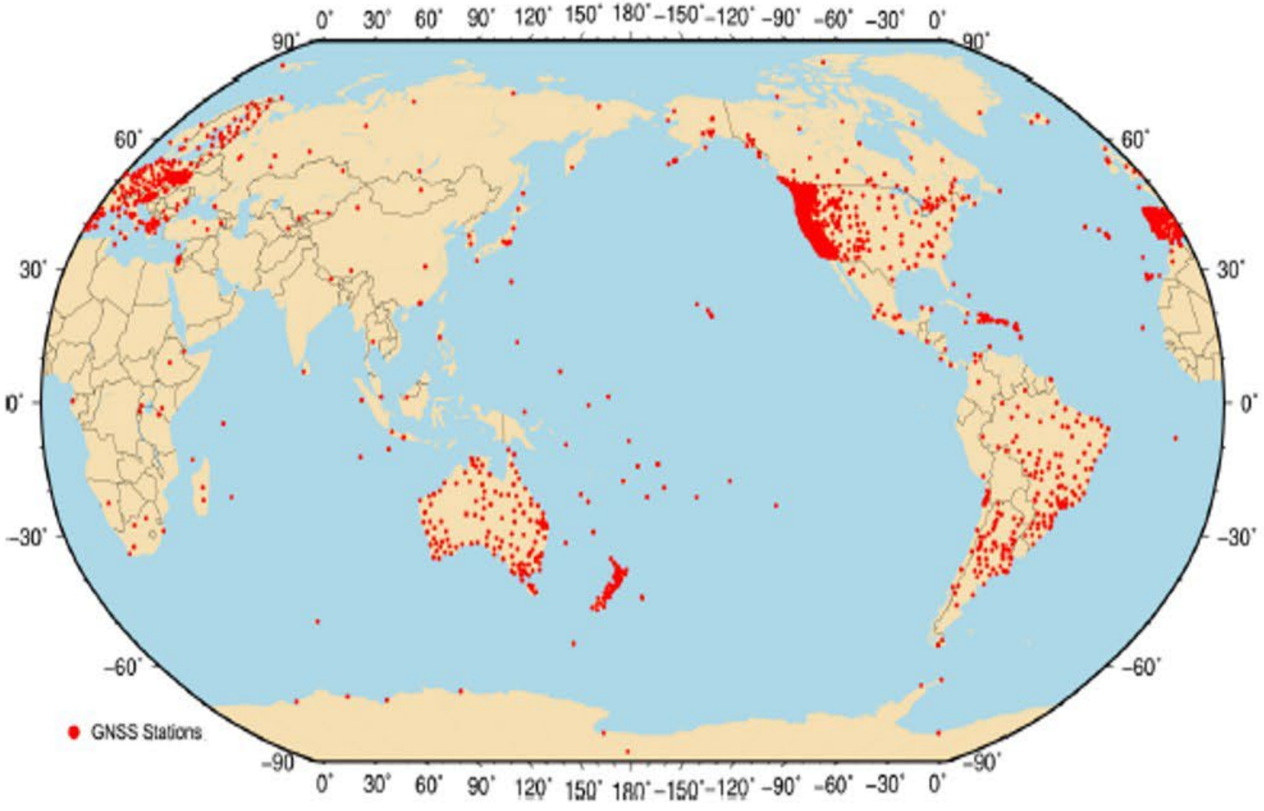
NEW POTENTIAL SOURCES OF SEISMIC OBSERVATIONS FOR TSUNAMI WARNING SYSTEMS

Locations and magnitudes of historical seismic events (red), DART tsunami buoys (yellow triangles) and current (green) and planned (white) submarine cables,. SMART repeaters shown every 300 km



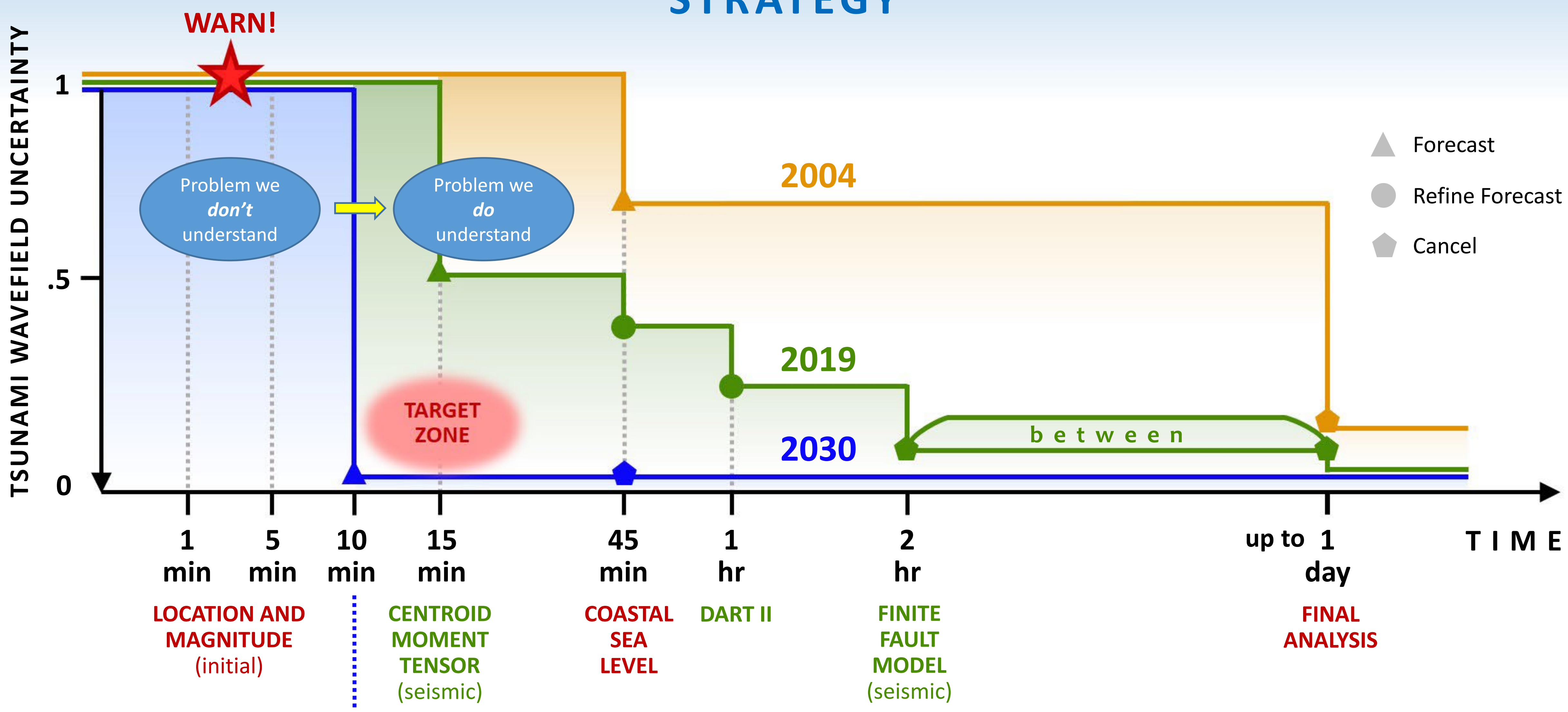
Angove, M . et. al, 2019

The location of 2,260 real-time GNSS stations from public networks around the world



Pacific Northwest Geodetic Array/Central Washington University

STRATEGY



- ▲ Centroid Moment Tensor (GNSS)/Finite Fault Model (GNSS)
- ▲ Full Bottom Pressure (Tsunameters and Cables)
- ▲ In-situ Accelerometers
- ▲ More…

Data Availability 2004—2030

Angove et. all, 2019

"Protecting Communities from the World's Most Dangerous Waves: A Framework for Action under the UN Decade of Ocean Science for Sustainable Development"

1. Risk Knowledge.
    - Improve our understanding of the tsunami hazard by expanding our knowledge of past or potential tsunami sources,
    - Fully understand the impacts to critical infrastructure and marine assets and how to minimize them.

2. **Monitoring and Warning.**
    - **More quickly detect and measure tsunamis directly, through ocean observations to include instrumentation of undersea cables**
    - **Ensure critical tsunami generation parameters are identified through the optimal use and real-time sharing of new and existing sensors and data**
    - **Leverage the Seabed 2030 hydrographic survey initiative to ensure nearshore coastal zones have complete bathymetric/topographic data coverage at the required resolution**

3. Warning Dissemination and Communication.
    - Ensure full integration of tsunami services within a Multi-Hazard Early Warning Framework
    - Facilitate development of warning dissemination and communication options that are appropriate to geographic, demographic, and infrastructure conditions for the timely dissemination of warnings

Protecting Communities from the World's Most Dangerous Waves: A Framework for Action under the UN Decade of Ocean Science for Sustainable Development”

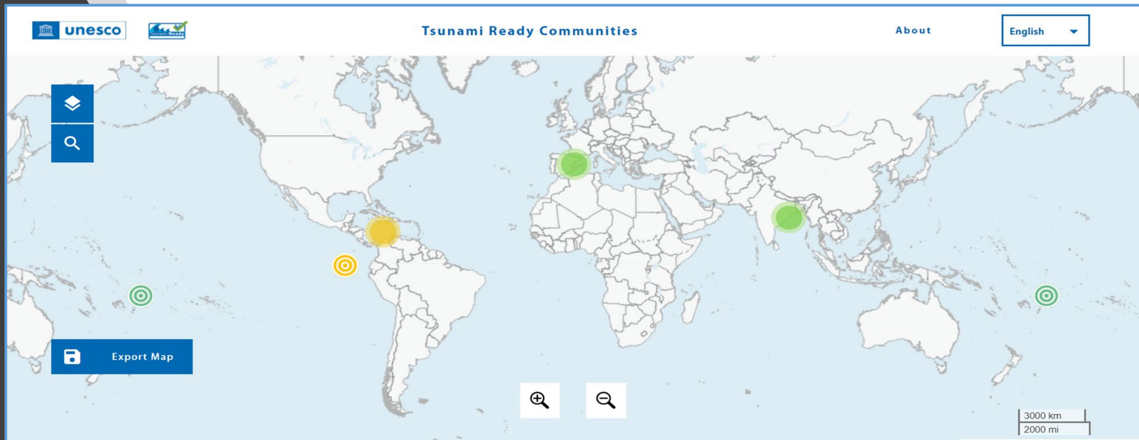
4. Response Capability
    - **Tsunami evacuation maps** must be available for all coastal communities
    - Ensure **100% of tsunami-vulnerable communities** around the world meet the indicators outlined in the **UNESCO/IOC *Tsunami Ready* program**
    - Ensure plans to minimize impacts to **critical infrastructure and marine assets** are in place to enable quicker post-tsunami restoration of services

5. Capacity Development and attention to SIDS and LDCs
    - **Enhanced capacity development** is necessary for the understanding of the tsunami hazard, timely warning and response and resilience.
    - Ensure that **SIDS and LDCs are fully integrated** into all phases of the global Tsunami Warning and Mitigation System.

- 100% of communities at risk of tsunami prepared for and resilient to tsunamis by 2030 through the implementation of the UNESCO/IOC Tsunami Ready Recognition Programme and other initiatives.

- The implementation of the Tsunami Ready Recognition Programme will be a key contribution to achieving the societal outcome ‘A Safe Ocean’ of the Ocean Decade.

Currently 30 TR recognized communities



Scientific Committee for the UN Ocean Decade Tsunami Programme (SC-ODTP)

Goal=Draft a 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme

Timeline

Draft chapters

Consultations with TSU community (TTs/ICGS)

Consult/contributions Member States (CL)

17 Feb 2022

SC 1st meeting (online)

The meeting broadly discuss the terms of reference and agreed on a timeline for delivering the 10-year plan

24-25 Feb 2022

TOWS-WG-XV

TOWS-WG is a standard setting and advisory body to the IOC on tsunami and other coastal hazards. This session discussed SMART Cable, Tsunami Ready & UN Decade

7-8 April 2022

Safe Oceans Lab

Laboratories are innovative formats that function as self-sustaining events. They act as a creative platform to link diverse stakeholders and topics to trigger collaborative efforts regarding the UN Ocean Decade.

13-17 June 2022

IOC-EC 55

IOC Governing body

Tsunami Ready Programme

2nd SC meeting (in person)

Opportunity for an in-person SC meeting – 1st Draft of the 10-Year Plan

December 2022

3rd SC meeting (in person)

Final version of the Draft 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme.

23-24 Feb 2023

TOWS WG XVI

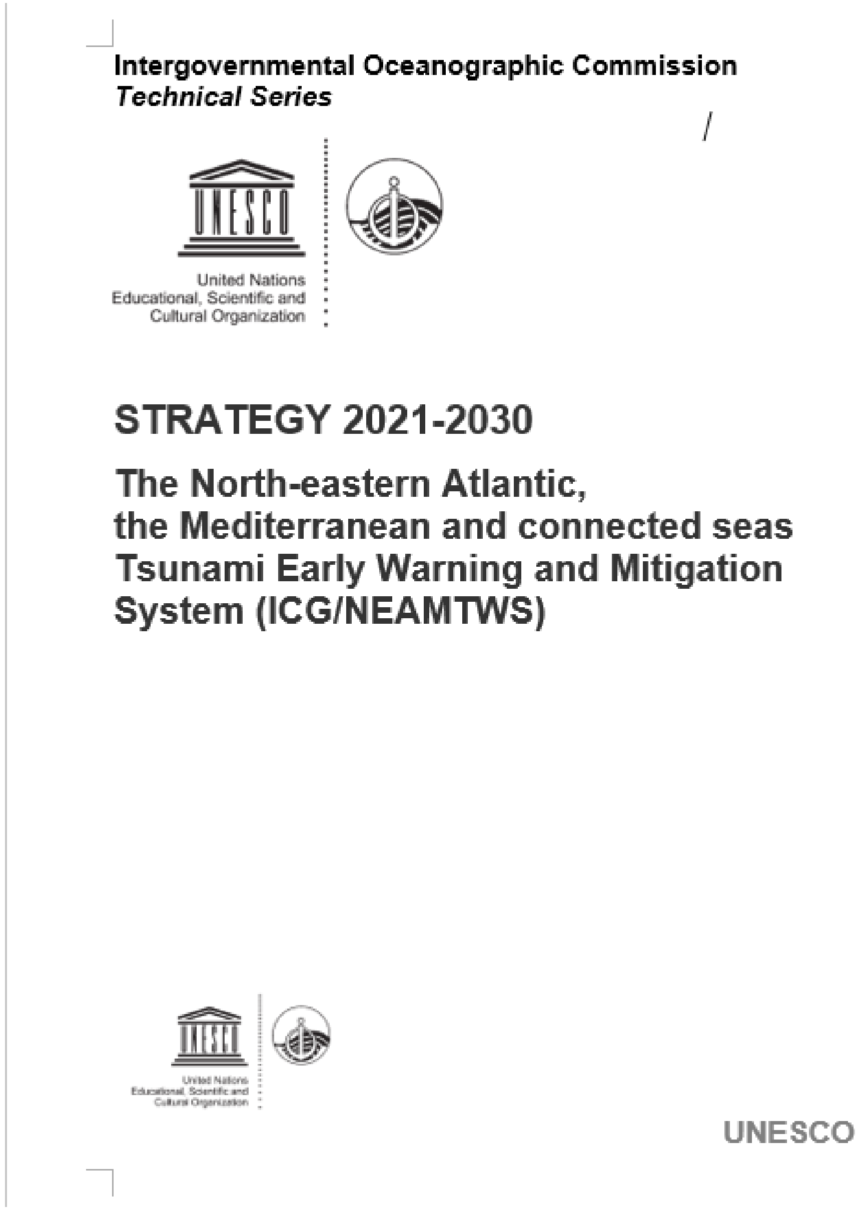
Endorsement of the 10-Year Research, Development and Implementation Plan for the Ocean Decade Tsunami Programme

Dr. ALESSANDRO AMATO ITALY

- Research Director at the National Institute of Geophysics and Volcanology (INGV)
- (Former) Director of the National Earthquake Center and a member of the Major Risks Commission
- Head of the Tsunami Alert Center at INGV
- ICG/NEAMTWS Former Co-Chair Task Team on Documents
- Geologist and seismologist

ICG/NEAMTWS 2021-2030 Strategy

- The new ICG/NEAMTWS 2021-2030 Strategy outlines key objectives for a continuously improving NEAMTWS to meet stakeholder requirements during the period 2021–2030.
- It will also contribute to the UN Decade of Ocean Science for Sustainable Development 2021-2030, in particular by responding to the needs of society for a “safe ocean” where people are protected from ocean hazards.
- Strategy seeks to capitalise on the Ocean Decade societal benefits in order to further improve monitoring, detection and data-sharing among Member States and partners.


Intergovernmental Oceanographic Commission
Technical Series

United Nations
Educational, Scientific and
Cultural Organization

STRATEGY 2021-2030

The North-eastern Atlantic, the Mediterranean and connected seas Tsunami Early Warning and Mitigation System (ICG/NEAMTWS)

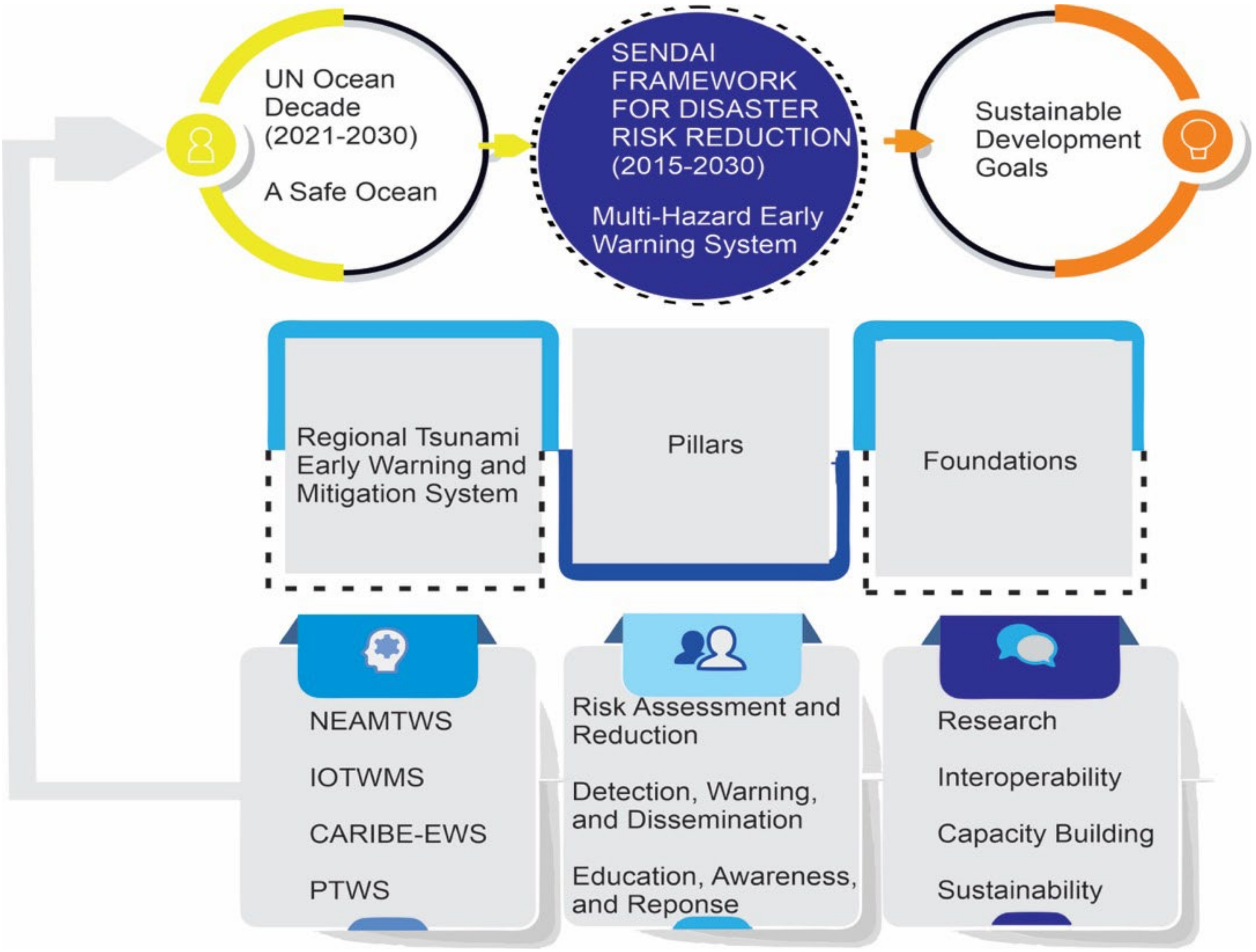
United Nations
Educational, Scientific and
Cultural Organization

UNESCO

The vision

- Coastal communities around the North-eastern Atlantic, Mediterranean and connected seas are **resilient to tsunamis** and other sea-level related hazards, with an effective **tsunami warning and mitigation system** that is based on Member State **participation**.

The general framework



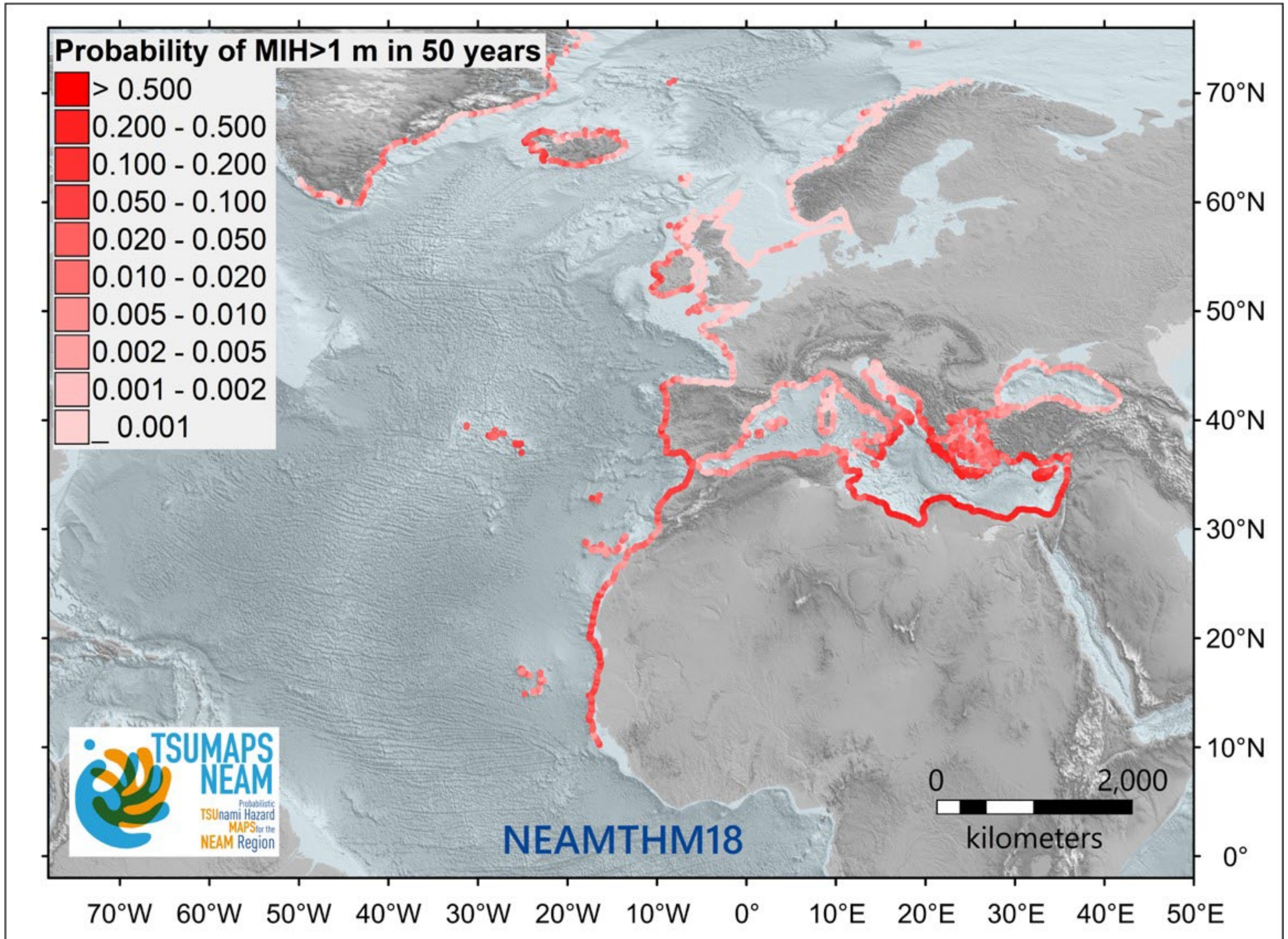
The Three Pillars

- The Strategy of the North-eastern Atlantic, Mediterranean and connected seas Tsunami Warning and Mitigation System is founded on three pillars:
- **1. Tsunami Hazard and Risk Assessment**
- **2. Detection, Warning and Dissemination**
- **3. Awareness and Response**
- These pillars require a foundation of interoperability and sustainability and the enabling activities of research and capacity-building

PILLAR 1:
Tsunami Hazard and Risk Assessment

- **Objective 1.1**: Implementation of probabilistic methodologies in tsunami hazard and risk assessment
- **Objective 1.2**: Member states to develop specific tsunami hazard and risk assessments for vulnerable national sub-regions
- **Objective 1.3**: Develop regional hazard assessment for landslide-generated tsunamis
- **Objective 1.4**: Multi-source tsunami hazard assessment

Probabilistic Tsunami **Hazard** Assessment of the NEAM Region: the NEAMTHM18 (Basili et al. 2021)

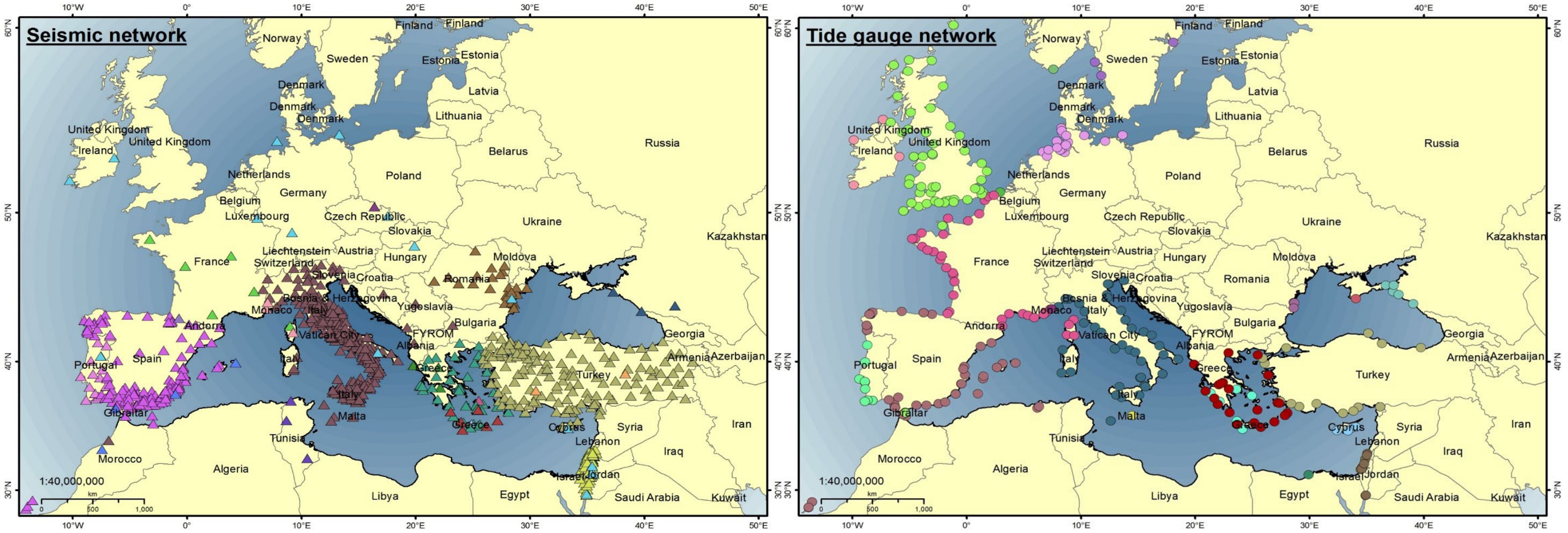


Probability of an earthquake-generated tsunami exceeding a maximum inundation height (MIH) of 1 m in 50 years evaluated every ~20 km on the NEAM region coastlines. The map was derived from the NEAM Tsunami Hazard Model 2018 (NEAMTHM18; Basili et al., 2021), which is a product of the TSUMAPS-NEAM project funded by the European Civil Protection and Humanitarian Aid Operations (DG-ECHO). For more details of the model, see http://www.tsumaps-neam.eu. The map presented here was produced with the best information available at the time of modelling. The accuracy of these maps is subject to limitations in the accuracy and completeness of available bathymetry and topographic information, and in the current knowledge of the tsunami sources and characteristics. In the last few years, MIHs greater than 1 meter have been observed during at least three earthquake-generated tsunamis (Samos and Izmir region 2020, Kos-Bodrum in 2017 and Samos in 2020), which caused damage.

PILLAR 2: Detection, Warning and Dissemination

- **Objective 2.1**: Increase, densify and ensure sustainability of the seismic and sea-level detection networks, particularly to include regions/Member States with low coverage
- **Objective 2.2**: Realise installation of multi-hazard observations systems composed of co-located tide-gauge/accelerometer/GNSS sensors
- **Objective 2.3**: Plan and implement an “Inter-Operability Tool”
- **Objective 2.4**: Develop and implement additional monitoring tools
- **Objective 2.5**: Implement Probabilistic Tsunami Forecasting
- **Objective 2.6**: Threat levels
- **Objective 2.7**: Additional sources of tsunami observations

Improving Seismic and Sea Level Networks



PILLAR 3: Awareness and Response

- **Objective 3.1**: Understanding perceptions of coastal hazards and risks
- **Objective 3.2**: Strengthen public and local authority awareness of tsunami and associated hazards and how to prepare to respond
- **Objective 3.3**: Develop tsunami-related curriculum programmes for all levels of education
- **Objective 3.4**: Develop and deliver suitable and sustainable capacity-building programmes to facilitate effective and efficient response and coordination
- **Objective 3.5**: Develop and maintain the NEAMTIC tsunami information website
- **Objective 3.6**: Establish rapid and effective evacuation mechanisms given the risk assessment guidance and data
- **Objective 3.7**: Develop and conduct regular exercises to test early warning systems and evacuation mechanisms
- **Objective 3.8**: Roll out the “Tsunami Ready” initiative in coastal communities

NE

	TSUNAMI READY INDICATORS	Date of evaluation:		
	Stage of achievement	**Initial stage**	**Medium stage**	**Final stage**
I	**MITIGATION (MIT)**			
1	MIT-1. Tsunami hazard zones are mapped and designated			
2	MIT-2. The number of people at risk in the tsunami hazard zone is estimated			
3	MIT-3. Available ec resources are iden			
4	MIT-4. Tsunami inf			
II	**PREPAREDNESS**			
5	PREP-1. Easily un developed.			
6	PREP-2. Outreach resources are avai			
7	PREP-3. Outreach <u>times a year.</u>			
8	PREP-4: A Tsunam every two years			
III	**RESPONSE (RES**			
9	RESP-1. A commu (EOP) has been pr			
10	RESP-2. The capa operations during a			
11	RESP-3. Redunda hour official tsunami alerts have been identified.			
12	RESP-4. Redundant and reliable means to timely disseminate 24-hour official tsunami alerts to the public have been identified.			

Several pil

Thank you
Grazie
Merci
Gracias
Obrigado
Ευχαριστώ
Teşekkürler
شكرًا لك
ありがとうございました
多謝

Dr. DENIS CHANG SENG
IOC-UNESCO

- Programme Specialist
- Tsunami Unit (Technical Secretary ICG/NEAMTWS)
- Global Ocean Observation System (GOOS)
- IOC Focal Point UNFCCC NWP on Ocean & Biodiversity and the International Network for Multi-Hazard Early Warning Systems

Building on Current Achievements

Governance, Partnerships and Collaboration:

Enhancing and Scaling-Up Actions though CoastWAVE Project

Tsunami Last Mile Project-Phase 1

Greece & Turkey

- The 'Tsunami Last Mile' Phase 1 project (2018-2021) was implemented by the JRC and partners in Kos (Greece) and Bodrum (Turkey)

- The TLM project has shaped tsunami preparedness at community level following the tsunami events in 2017

Source: JRC

Tsunami Last Mile Phase 1 Results

Bodrum

Min PGA to alert*: **0.04 g (0.39 m/s²)**
Max event: **Mw 7.8 Amorgos+landslide** **
Evacuation routes: **identified**
Installations:
1 IDSL
2 Seismic sensors

Drill exercise **5/11/2019**
Table Top Exercise involving all local administrations up to Regional Governor and regional AFAD

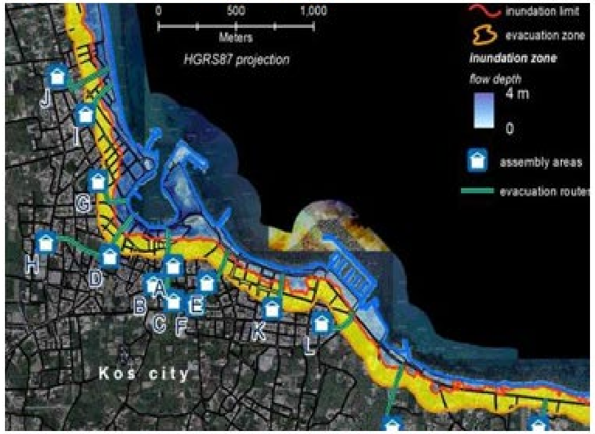
corresponding to a Mw 6.0 event at 100km

Kos

Max PGA to alert*: **0.05 g (0.49** m/s²)
Max event: **Mw 7.8 Gokova Bay**
Evacuation routes: **identified**
Installations:
2 TAD and 2 IDSL
2 Seismic sensors
1 Long range siren
68 Tsunami signs

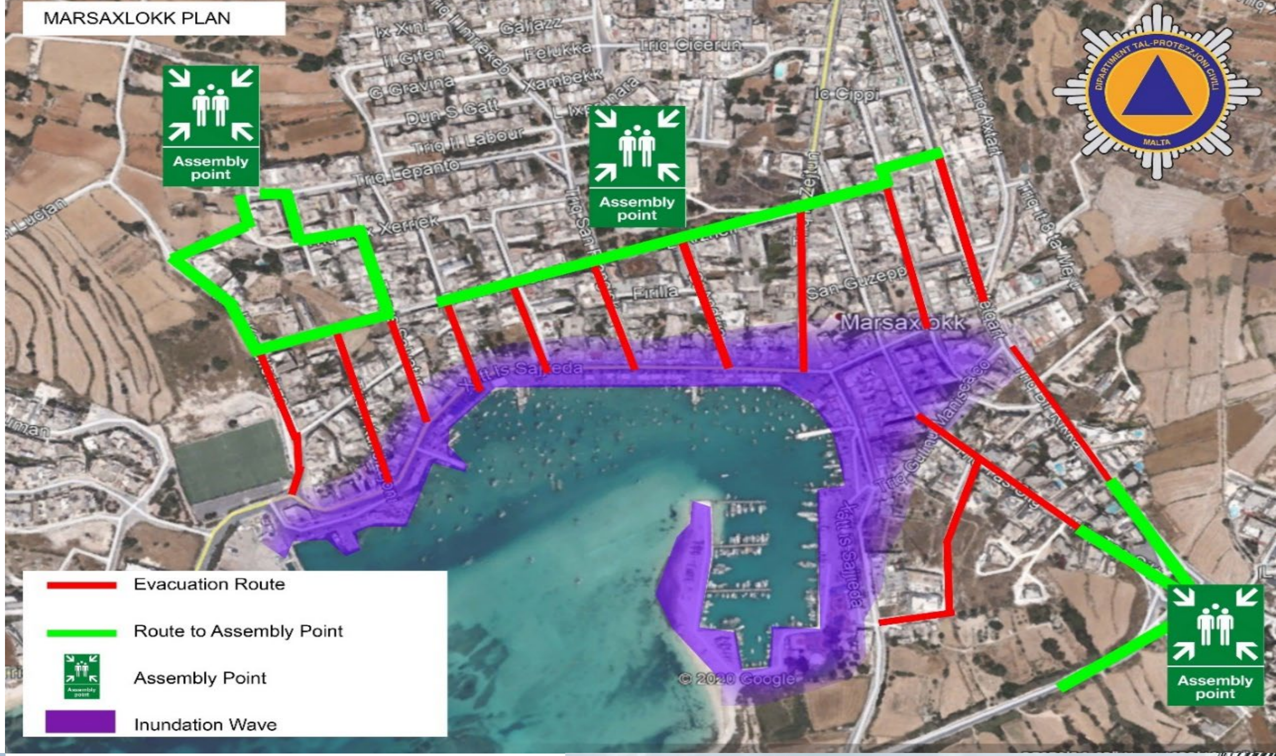
Drill exercise **19/11/2019**
2 schools via evacuation signs
General Secretariat of Civ. Protection
KATWARN technology tested

***PGA and Mw not for the same event*



JRC Last Mile Project
Phase 2
Malta

- Project Implementation Study Area: Marsaxlokk town (Floating Population of 7000)
- Malta first end-to-end exercise, 5 Nov 2021



Malta Civil Protection Department

Source
Malta CPD /JRC / M. Santini 2021

IOC DG ECHO NEAMTWS PROJECT

- CoastWAVE Project “*Strengthening the Resilience of Coastal Communities in the North-East Atlantic and Mediterranean Region to the Impact of Tsunamis and Other Sea Level-Related Coastal Hazard*”
- **Funded** by the European Union (EU) Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO)

unesco
Intergovernmental Oceanographic Commission

Funded by the European Union

Geographical scope/benefitting countries	North Eastern Atlantic and Mediterranean Sea: Cyprus, Egypt, Greece, Malta, Morocco, Spain, and Turkey
Technical Advise	France and Italy
Area of influence	40 NEAMTWS Member States
Period	01/09/2021 --- 30/03/2024

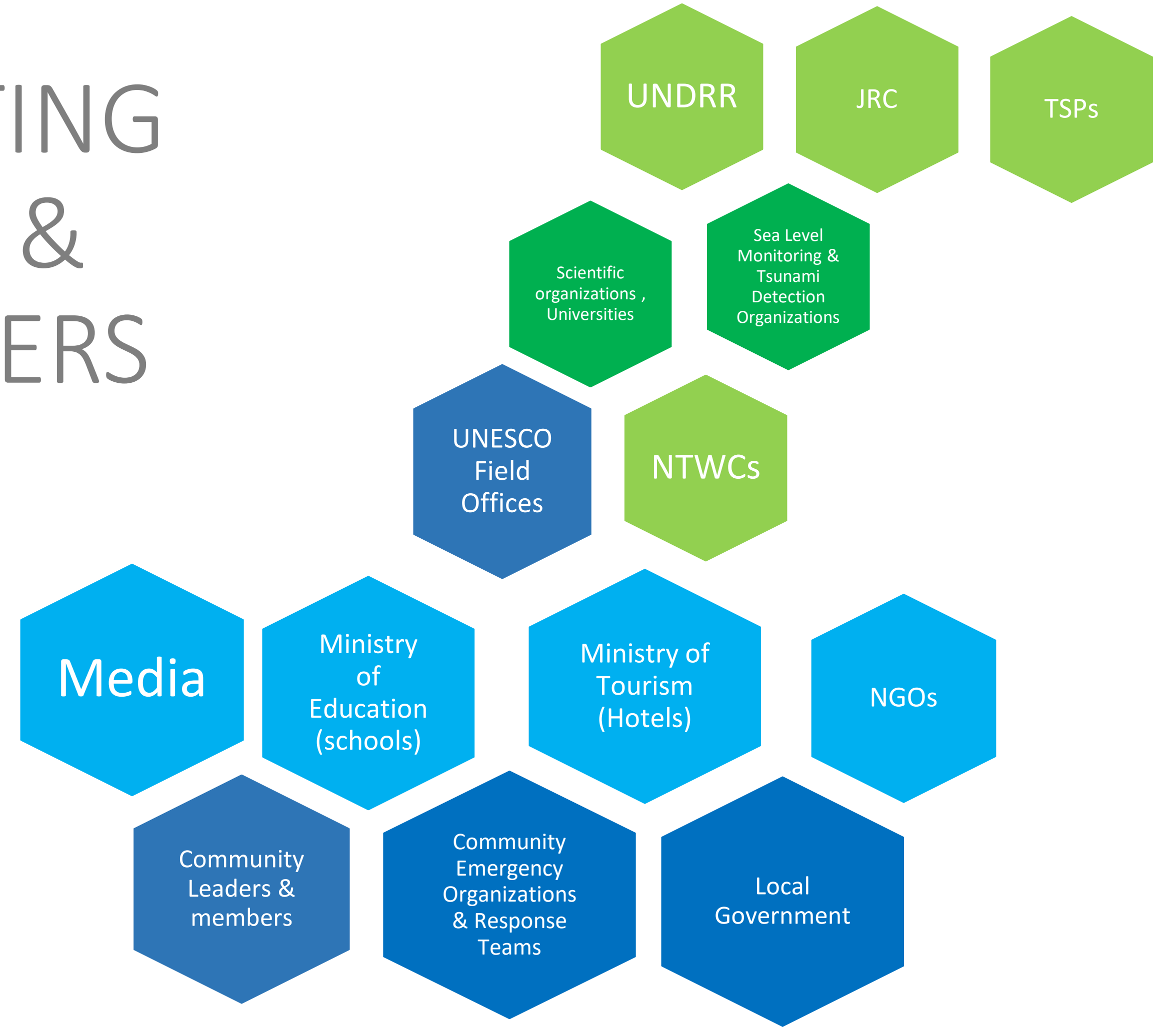
PROJECT GOALS

1. Improved understanding of tsunami and sea-level related risks.
2. Better communication strategies to govern sea-level related risk
3. Enhanced real time detection and monitoring capacities
4. Improved framework for the sustainability of the existing Inexpensive Device for Sea Level (IDSL) Network
5. Improved alert/warning capacity
6. **At least seven Tsunami Ready recognized communities by 2023**

CoastWAVE NEAMTWS

CoastWAVE Project

PROJECT IMPLEMENTING PARTNERS & STAKEHOLDERS



- CoastWAVE Project submitted as an IOC Ocean Decade Project

CoastWAVE NEAMTWS

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

- EU ECHO Project

Video 1

Dr. DERYA I. VENNIN
IOC-UNESCO

- Associate Project Officer at IOC-UNESCO
- Subject area: Marine and Coastal engineering, Physical Oceanography
- Activities: Management of "Strengthening the Resilience of Coastal Communities in the North-East Atlantic, Mediterranean Region to the Impact of Tsunamis and Other Sea Level-Related Coastal Hazards (CoastWAVE)" Project

Detection, Monitoring and Alerting Systems

Project Countries:
Cyprus, Morocco, Egypt, Malta, Turkey, Spain and Greece

Detection & Monitoring

Why Monitor Water level?

Water Level Data is used for:

- Research into sea level change and ocean circulation
- Coastal protection during events such as storm surges
- Providing flood warning and monitoring tsunamis
- Tide tables for port operations, fishermen, and recreation
- Defining datums for national or state boundaries

Source: GOOS / IOC-UNESCO

- Applications of water level data range from making nautical charts to global sea level monitoring
- Real time monitoring is essential for tsunami detection, storm surge and warning, sea level rise, oceanographic and climate research

Detection & Monitoring

Why we need water level data of tsunami ?

- Detect the presence of a tsunami in deep-ocea
- Measure tsunami arrival and wave height nea and at the coast
- Validate tsunami models

Photo Credit: Ca

Detection & Monitoring

How are tsunamis measured/observed?

In Deep Ocean: sensors including

- Tsunameters (DART Buoys)
- Smart cables
- DAS (Distributed Acoustic Sensing)

Photo Credit: NOAA

Near the Coast: GPS sensors on buoys

On Coast:

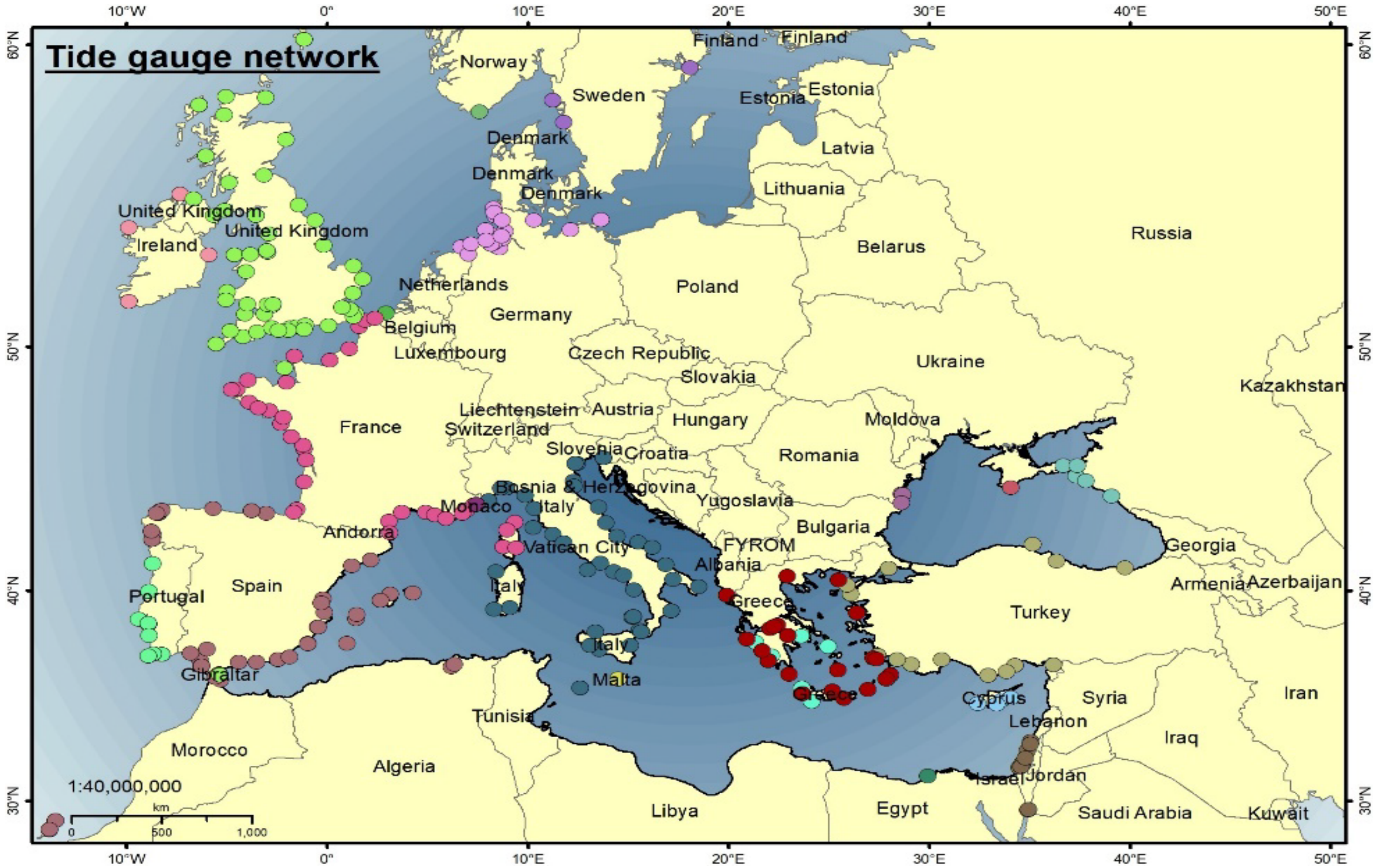
Photo Credit: NOAA

- Tide gauges that record a data on period of 1min

- High-precision coastal real-time Global Navigation Satellite Systems

Detection & Monitoring

Current Coastal Sea Level Station Network-Tide Gauges at NEAMTWS



Map of sea level networks used by NEAMTWS Tsunami Service Providers (IOC-UNESCO)

- Total of 240 operational stations
- Most stations provide values every minute and are updated each 5 minutes.

Detection & Monitoring

NEAMTWS Current JRC Network of Inexpensive Device for Sea-Level Measurement (IDSL) Devices

- Developed for Tsunami Hazard monitoring in NEAMTWS area of IOC-UNESCO
- Cheap and effective
- Long term reliability is being tested
- Missing coverage of North Africa coasts

- 40 devices in NEAM

Detection & Monitoring

NEAMTWS Current Network of IDSLs

DG ECHO CoastWAVE Project Implementation

- Install new IDSLs
- Upgrade the existing IDSLs
- Update the existing technology of IDSLs
- IDSLs to be repaired in 7 project countries
- 4 IDSLs to be installed including Morocco and Egypt
- Its reliability, duration and quality need to be determined.

in collaboration with IOC-UNESCO and DG ECHO.

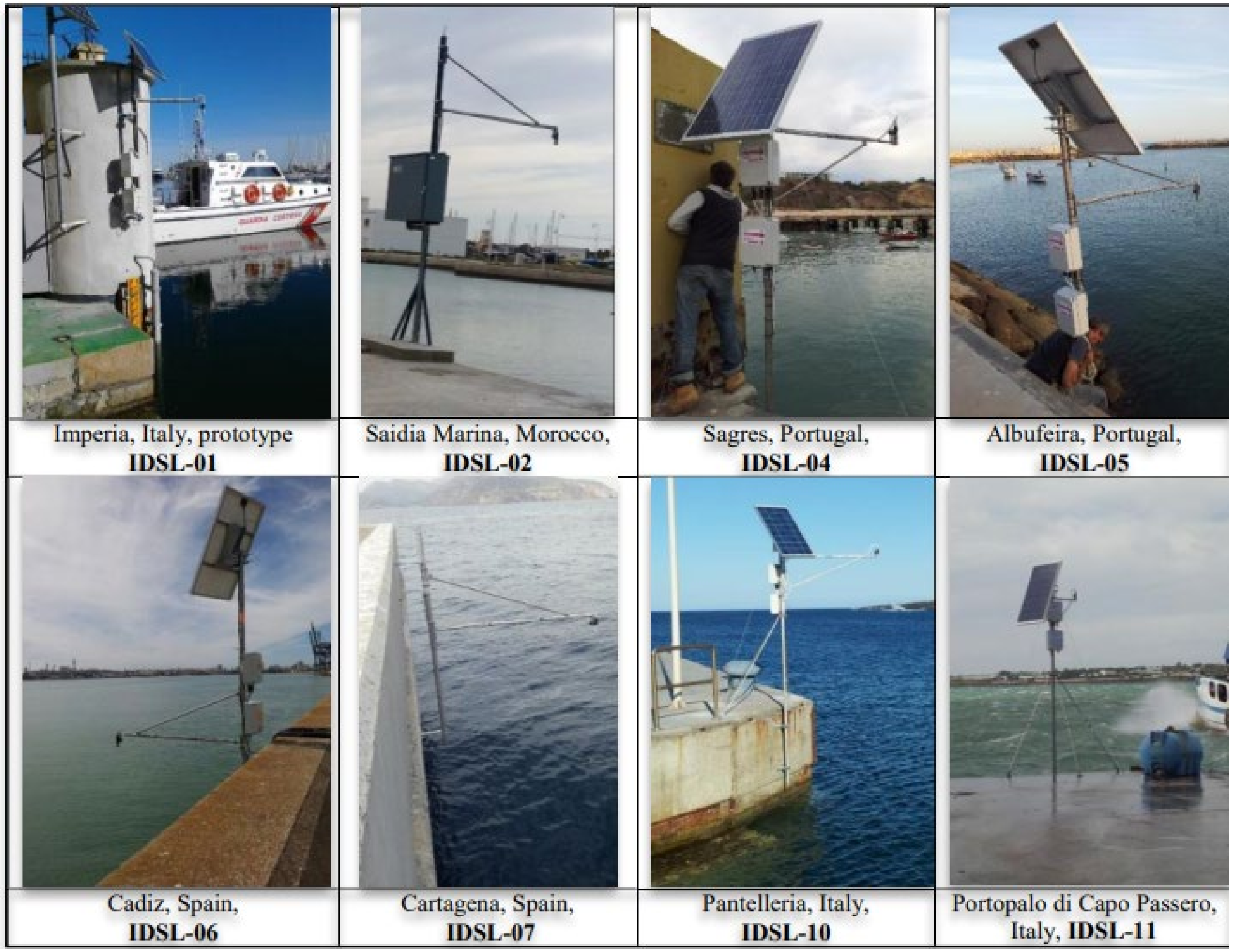


Photo Credit: JRC

Detection & Monitoring

Ongoing Technological Efforts at Italy

INFRASTRUCTURES

Finanziato dall'Unione europea
NextGenerationEU

MUR

REFORMS AND INVESTMENTS UNDER THE RECOVERY AND RESILIENCE PLAN
NextGenerationEU

Proposal submitted for

- 2+2 DART Buoys
- Further OBPs linked to intermediate depth wave buoys (ISPRA)
- 10 new generation Tide-Gauges (ISPRA)
- Numerous seismic and GNSS stations
- Cabled Observatories - Smart Cables
- USV for shallow water bathymetric surveys
- Tier-1 and Tier-2 HPC Centers
- New research Vessels (ISPRA)
- ...

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Detection & Monitoring

New Technologies-UN Decade of Ocean Science for Sustainable Development (2021-2030)

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Tsunami observations on Maritime Infrastructure provide:

- More tsunami observations
- Co-located environmental observations
- Better monitoring and prediction capabilities
- Efficient operations of maritime facilities and sustainable management practices.
- Closer stakeholder collaboration
- Extensive Coverage at Low Cost

Detection & Monitoring

New Technologies-UN Decade of Ocean Science for Sustainable Development (2021-2030)

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

TSUNAMI MONITORING by SHIPS:

GPS-equipped ships enable each vessel to act as an open-ocean tide gauge, supporting tsunami monitoring.

Photo Credit: Mario Tama / Getty Images file

Alert Systems

Tsunami Alerting Device (TAD) **in NEAM Region**

- Developed by EU JRC
- Delivers warning messages
- Consists of a panel equipped with data receivers, a display, an alerting siren and a loudspeaker.
- Can be automatically activated by the GDACS system or can be connected to local sea level system
- Provides multi-usage for local authority: to interact with the population in normal times (greeting messages, touristic or public useful information)
- TADs will be installed under COASTWAVE DG ECHO Project

Photo Credit: JRC