Working Group 4 Public Awareness, Preparedness and Mitigation

Chair: Cecilia Valbonesi (University of Rome UnitelmaSapienza – INGV)

WG4 updates and perspectives for ICG/NEAMTWS-XVIII session

6-8 February 2024, Paris

UPDATES AND PERSPECTIVES ☞ FOCUS ON:

1. EDUCATION AND INFORMATION ACTIVITIES

2. RISK PERCEPTION ASSESSMENT

3. NEAMWAVE23 - WTAD

NEWS FROM…

- GREECE
- ROMANIA
- SPAIN
- ITALY

EDUCATION AND INFORMATION ACTIVITIES

ROMANIA

EDUCATION AND INFORMATION ACTIVITIES

ROMANIA

1. NIEP tsunami related flyer (see PNG in other slide),
2. 2 roll-ups (which are not finalized yet), one on research and the other one with educational purposes.
3. educational projects and activities earthquake related with tsunami emphasize: article from ICERI conference

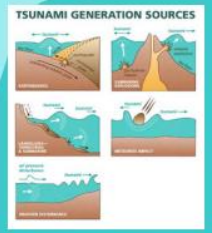
↓

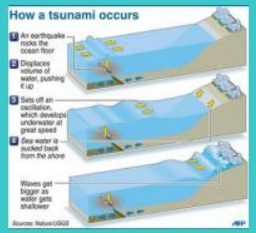
TSUNAMI RESEARCH, EDUCATION AND AWARENESS IN ROMANIA, PROVIDED BY THE NATIONAL INSTITUTE FOR EARTH PHYSICS

R. Partheniu, A.P. Constantin, I.A. Moldovan, A. Tolea, C. Ionescu

National Institute for Earth Physics (ROMANIA)

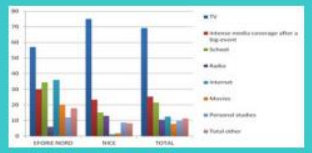
HOW A TSUNAMI MAY OCCUR?





Results of the tsunami knowledge questionnaires from ASTARTE project
(Assessment, STrategy And Risk Reduction for Tsunamis in Europe)

astarte



Where did you hear or learn the word Tsunami?

Do you think Eforie Nord has already been affected by a tsunami?

Do you think Eforie Nord could be affected by a tsunami?

OTHER ASSOCIATED WEBSITES

- http://194.117.20.221/ (ASTARTE project)
- https://www.agithar.uni-hamburg.de/about.html
- http://ctwc.infp.ro/index.php
- https://www.weather.gov/safety/tsunami-outreach
- https://neamtic.ioc-unesco.org

INFORMATION MATERIALS FROM NEAMTIC

SELECTED RESEARCH PAPERS

- Constantin A.P., Moldovan I.A., Lavigne F., Grancher D., Partheniu R., *Perception And Preparedness Of The Tsunami Risk Within The Black Sea (Romania) Communities*, Proc. of the 17th International Multidisciplinary Scientific Geo Conference, pp. 311-318, STEF92 Technology Ltd., ISBN 978-619-7408-00-3, 2017;
- Diaconescu M., Malita Z., *Seismic sources in the Black Sea areal, Natural Hazards, Tsunami events in the Black Sea*, Ed. Oaie Gh., 2007, pp. 71-80;
- Moldovan I.A., Diaconescu M., Partheniu R., Constantin A.P., *Probabilistic seismic hazard assessment in the Black Sea area*, Rom. Journ. Phys, 62, 809, 2017;
- Partheniu R., Diaconescu M., Grecu B., Neagoe C., Marmureanu A., Verdes I., *Earthquakes and tsunamis monitoring in the western Black Sea area*, Proceedings of 5th National Conference on Earthquake Engineering & 1st National Conference on Earthquake Engineering and Seismology, pp. 157-164, Editura Conspress, Bucuresti, ISBN: 978-973-100-342-9, 2015;
- Partheniu R., Constantin A.P., Moldovan I.A., Ioane D., *Comparison between tsunami modeling scenarios for Shabla Area (Black Sea) using two different software*, Studia UBB Ambientum, 64 (LXIV), 2, Cluj-Napoca, ISSN (print): 1843-3855, ISSN (online): 2065-9490, ISSN-L: 1843-3855, 2018;
- Partheniu R., Moldovan I.A., Constantin A.P., Tolea A., Ioane D., *Tsunami modeling of the Shabla seismic area (Black Sea) using TRIDEC Cloud software*, Proc. of 18th International Multidisciplinary Scientific GeoConference, SGEM 2018, Ed. STEF92 Technology Ltd., ISBN 978-6197408-35-5, ISSN 1314-2704, DOI: 10.5593/sgem2018/1.1, 2018;
- Partheniu R., Ghita C., Victorin T., Nastase E., Muntean A., Murat E., Moldovan I. A., Ionescu C., *Monitoring the Black Sea natural hazards using new technology and equipment*, Romanian Reports in Physics, 71, 704, 2019;
- Partheniu R. et al., *Tsunami Modelling of the 8th September 2017 Mexico Earthquake of M 8.1, Using Two Different Software*, IOP Conf. Ser.: Earth Environ. Sci. 221 012058, DOI 10.1088/1755-1315/221/1/012058, 2019;
- Ghita C., Tuta L., Moldovan I.A., Ionescu C., Nicolaescu M., *FastICA Algorithm Applied on Black Sea Water-Level Ultrasound Measurements*, Atmosphere 2022, 13, 1973. https://doi.org/10.3390/atmos13121973.

Calugareni street, no 12, Magurele, Ilfov county, Romania, Postal code 077125

NATIONAL INSTITUTE FOR EARTH PHYSICS

Tsunami Research & Education

INFP

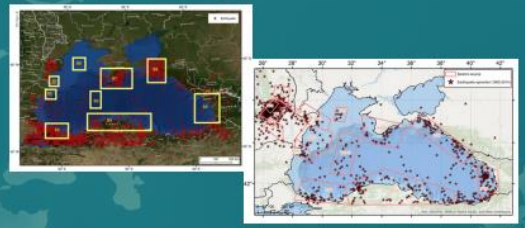
WHO ARE WE?

The National Research and Development Institute for Earth Physics (NIEP) is a top scientific institution in Romania that operates in the field of Earth Sciences and phenomena directly or indirectly related to Earth vibrations and the way seismic waves propagate through the subsurface.

The Dobrogea Seismological Observatory in Eforie, Romania, was founded in 2008. It is a secondary data collection and processing center, as well as a tsunami monitoring center for the coastal region.

NIEP serves as Romania's Tsunami National Contact (TNC) and Tsunami Warning Focal Points (TWFP) within the Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean, and connected seas (ICG/NEAMTWS), and takes part in annual meetings and multiple tsunami exercises (NEAMWave14, NEAMWave17, NEAMWave21).

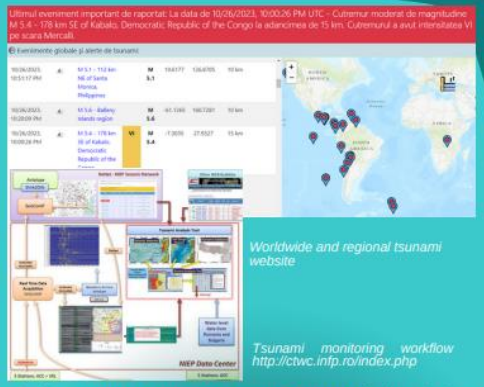
The Black Sea coast faces a potential tsunami risk, attributed to the Shabla seismic zone. Historically, 22 tsunamis were recorded (Papadopoulos et al., 2011), with the most notable and recent event occurring on 31st March, 1901. During this event, an earthquake of magnitude Mw 7.2 struck Shabla area, causing tsunami waves that reached approximately 4 m in height.
Multiple approaches in zoning seismic sources have been carried out within various projects and research papers.



NIEP TSUNAMI-RELATED PROJECTS

- **PROFET** - Multidisciplinary Researches On Natural Hazards. Case Study: Tsunami Type Phenomenon In The Black Sea (national project-n.p.)
- **MARINEGEOHAZARD** - Set-Up And Implementation Of Key Core Components Of A Regional Early-Warning System For Marine Geo-Hazards Of Risk To The Romanian-Bulgarian Black Sea Coastal Area (regional project-r.p.)
- **GTIMS** - Global Tsunami Informal Monitoring Service (international project - i.p.)
- **GTIMS2** - Global Tsunami Informal Monitoring Service 2 (i.p.)
- **ASTARTE** - Assessment, Strategy and Risk Reduction for Tsunamis in Europe - Black Sea (i.p.)
- **ARISTOTLE** - All Risk Integrated System Towards the Holistic Early-Warning (i.p.)
- **AGITHAR** - Accelerating Global Science in Tsunami Hazard and Risk Analysis (i.p.)
- **REACTIVE** - The Research Center For Climate Change Due To Natural Disasters And Extreme Weather Events (n.p.)
- **CRESCENTO** - Increasing The Research Capacity In The Field Of Seismology Engineering At The Seismological Observatories And Stations Within The National Seismic Network (n.p.).

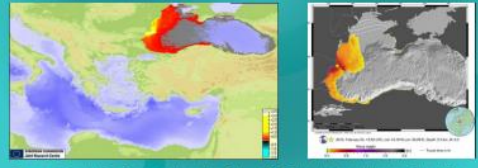
TSUNAMI MONITORING & MODELING



Worldwide and regional tsunami website

Tsunami monitoring workflow http://ctwc.infp.ro/index.php

The first **TSUNAMI EARLY WARNING SYSTEM** in the Black Sea was implemented and installed in 2013 within the MARINEGEOHAZARDS project, a collaboration between the National Institute of Marine Geology and Geoecology (GeoEcoMar), the Institute of Oceanology and the Geological Institute of the Bulgarian Academy of Sciences. A dedicated website and the internal tsunami monitoring workflow are presented above. Antelope software is used to collect, monitor and process seismic data, while Tsunami Analysis Tool (TAT) and TRIDEC Cloud software are used for tsunami modeling. Moreover, we also record and use sea level data.



Tsunami simulation for an earthquake of Mw= 8, in Shabla Area, Western Black Sea

SOFTWARE	LAT.	LONG.	MAG.	H	MAX WAVE (M)
TAT	43.45	28.69	7	5	Varna 0.1, Techirghiol / Costinesti 0.1
TRIDEC					Varna 0.25
TAT	43.45	28.69	7.2	10	Varna 0.2, Constanta / Techirghiol 0.1
TRIDEC					Varna 0.41
TAT	43.45	28.69	7.5	10	Varna 0.6, Costinesti / Mangalia / Constanta 0.3
TRIDEC					Varna 0.8, Constanta 0.11
TAT	43.45	28.69	7.5	30	Balchik 0.2, Varna 0.2, Mangalia 0.1
TRIDEC					Varna 0.87, Constanta 0.13
TAT	43.45	28.69	8	10	Kranevo 0.8, Varna 0.5, Costinesti / Mangalia / Techirghiol 0.6
TRIDEC					Burgas 1.07, Varna 0.55, Constanta 0.65
TAT	43.45	28.69	8	5	Kamen Bryag 4.3, Varna 2.1, Costinesti 2.0
TRIDEC					Varna 2.42, Burgas 0.7, Constanta 0.32

GREECE

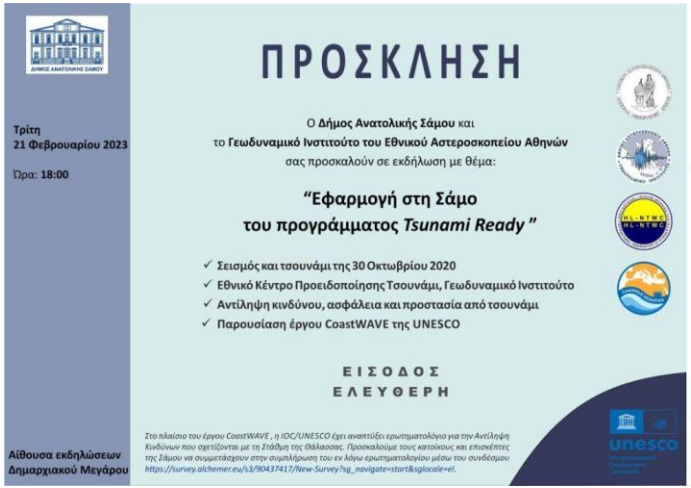
WG4 update for ICG/NEAMTWS-XVIII session

Greece

Education

Within the CoastWAVE project, the following educational activities were undertaken in Samos, Greece:

- February 2023 – an event was organized to raise tsunami awareness of the general population and to present the TRRP through its local application within the CoastWAVE project. The event opened with a presentation from the project coordinator, Dr. Derya Dilmen Vennin, followed by presentations from the Greek CoastWAVE team members. The Municipality of Eastern Samos presented on the management of the consequences of the earthquake and tsunami in the city of Samos on the 30th of October, 2020.



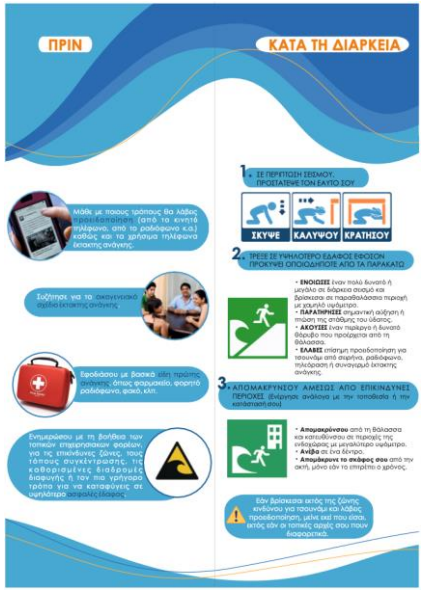
Education

Within the CoastWAVE project, the following educational activities were undertaken in Samos, Greece:

- May 2023 – another tsunami awareness activity was organized at the auditorium of the Town Hall targeting the education sector. Two high schools attended the event, namely the 1st experimental high school of Samos and the 2nd high school of Samos, with a total number of 400 participants including students and teachers. The activity included general presentations on earthquakes and tsunamis including self-protection measures, information on the CoastWAVE project and the local application of the TRRP, a quiz game, and a Q&A session involving both students and teachers.

Education - brochures

- Translation of the brochures developed by IOC-UNESCO within the CoastWAVE project.
- More brochures will be developed, including a brochure on the TRRP and one including the local tsunami evacuation plan in Samos.



SPAIN

Tsunami Awareness and Education activities

ACTIVITIES AROUND WTAD 2023 AND NOV. 1ST.

- **Tsunami awareness** activities for **students**
- Restoration of the historical painting on the 1755 tsunami in Chipiona
- Procession Nov 1st, commemorating 1755 tsunami in Chipiona
- **Tsunami Awareness Day Conference**
- **Tsunami Walk Exercise**

Tsunami Awareness Activities Students

WTAD 2023 Conference

Tsunami Walk Exercise

1st Nov. Tsunami Procession

IH cantabria
INSTITUTO DE HIDRÁULICA AMBIENTAL
UNIVERSIDAD DE CANTABRIA

EDUCATION AND INFORMATION ACTIVITIES

ITALY

Civil Protection Department

ISPRA

INGV

ITALY
C.P.D.

PROTEZIONE CIVILE
Presidenza del Consiglio dei Ministri
Dipartimento della Protezione Civile

«I DON'T TAKE RISKS» OBJECTIVES

www.protezionecivile.gov.it

Two main objectives →

- to **inform and involve citizens** in the process of knowledge and risk mitigation; and, in the process,
- to **expand the training** of civil protection volunteers.

13 editions →

- **tens of thousands** of volunteers trained,
- **hundreds of thousands** of citizens involved.

And thanks to the digital approach these numbers could grow much faster.

The evolution of the campaign

2011	Rischio sismico
2013	Rischio sismico + maremoto
2014	Rischio sismico + maremoto + alluvione
2019	Rischio sismico + maremoto + alluvione + vulcani
2023	Rischio sismico + maremoto + alluvione + vulcani + incendi boschivi

2023 campaign

754 squares
588 municipalities
927 associations
7000 volunteers

ITALY
ISPRA

EDUCATION AND INFORMATION ACTIVITIES

ISPRA ACTIVITIES:

- Continuous updating of ISPRA's webpage dedicated to SiAM https://www.isprambiente.gov.it/it/servizi/sistema-nazionale-di-allerta-maremoti-1
- News and articles in this periodic: https://www.isprambiente.gov.it/it/pubblicazioni/periodici-tecnici/prue

EDUCATION AND INFORMATION ACTIVITIES

- ISPRA PROPOSAL:

A. Analysis on the tsunamis risk perception among the Italian coastal areas for Tsunami Ready programme (with TT on Tsunami Ready),

B. Plan for school lessons on tsunami risk management as part of Institute's annual environmental education program

https://www.isprambiente.gov.it/it/attivita/formeducambiente/educazione-ambientale/programma-di-iniziative-per-le-scuole

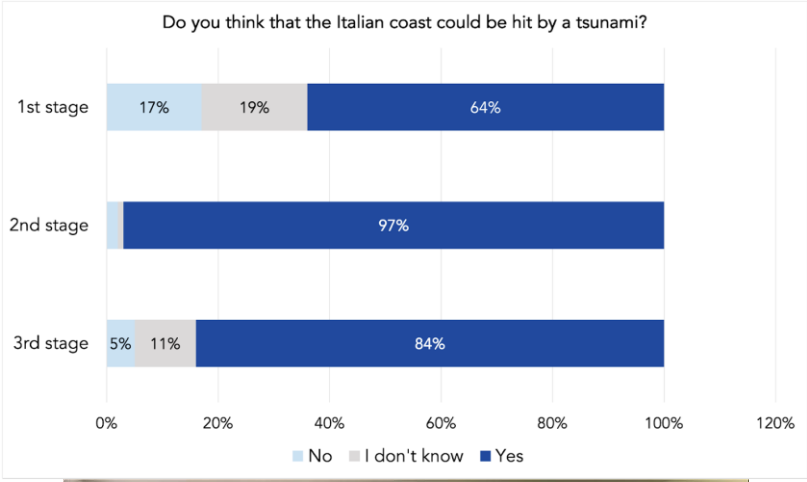
ITALY
INGV

Italy – WG4 activities 2023

- **Education and Information**
  - Schools/University (Tivoli, Otranto, Rome)
  - Public events (INGV-Rome, World Ocean Day)
  - Website (News, events, Story maps)
- **Tsunami risk perception studies**
  - Italian coasts (peninsular regions and main islands)
  - Stromboli volcano
- **Exercises**
  - NEAMWave2023
  - Others (SismaExe)
- **Media coverage** (Stromboli Dec. 2022, Turkey Feb. 2023, Japan Jan. 2024, Outreach events, etc.)

Tsunami at school

- An experimental tool for increasing students' awareness of tsunami hazard
- High school in Tivoli (Rome) in cooperation with a Science teacher (geologist)
- Questionnaire to involve students directly
- Three surveys in presence (tabula rasa, after a lesson with videos, after one year)
- Paper submitted Jan. 2024



Otranto (a Tsunami Ready candidate in Apulia)

- Lesson on tsunamis with 12-14 yrs-old students and teachers
- Videos
- Interaction (Q/A)

Palmi (a Tsunami Ready candidate in Calabria)

- Interactive lesson on tsunamis with 14-18 yrs-old students, teachers and local authorities
- Film on the 2004 IOC
- Interaction (Q/A)

Cover of Tsunami Quiz on Kahoot.
The image evokes a common distortion of how a tsunami is imaged.

Santa Severa Castle, near Rome

WOD23 / Tsunami pool

News on the CAT-INGV website in 2023

01.01.24 - Giappone: terremoto M 7.4 e allerta tsunami
Tsu-Memo: il terremoto e maremoto del 28 dicembre 1908, raccontato in una Story Map
NEAMWave '23: 6 e 7 novembre 2023, il test del Sistema italiano per l'Allerta Maremoto
WTAD 2023 | 5 novembre 2023 #GetToHighGround
Tsu-Memo: 30 ottobre 2020, lo tsunami in Grecia e in Turchia
Tsunami Ready - un percorso partecipato per avviare Larnaca (Cipro) al riconoscimento di comunità Tsunami Ready
Secondo te l'isola di Stromboli può essere colpita da uno tsunami?
25.07.23 - Turchia: messaggio d'informazione per terremoto M 5.6
A Cipro il meeting per definire le aree di pericolosità locale da tsunami e le fasce d'inondazione a Larnaca
Tsunami Ready - Palmi (RC) in corsa per ottenere la certificazione UNESCO di comune Tsunami Ready
Tsunami Ready - Il comune di Otranto (LE), in Puglia, aderisce al programma di mitigazione del rischio tsunami
21.04.23 - Malta, messaggio d'informazione per terremoto in mare
18.04.23 - Tsunami Ready. Otranto (LE) si prepara a conquistare i 12 indicatori che le varranno il titolo di comune Tsunami Ready
14.04.23 - La Strategia per la riduzione del rischio tsunami nell'area NEAM 2022-2030
Tsu-Memo: 1 aprile 1946 e la nascita del primo Centro di Allerta Tsunami
Tsu-Memo: 11.03.11 lo tsunami del Giappone e gli oggetti dispersi e ritrovati
20.02.23 - Turchia, allerta tsunami ADVISORY per terremoto in prossimità della costa
09.02.23 – A Minturno gli ultimi step per diventare il primo comune italiano Tsunami Ready
30.01.23 - Malta, messaggio d'informazione per terremoto in mare
25.01.23 - Grecia, messaggio d'informazione per terremoto in mare
24.01.23 - Malta, messaggio d'informazione per terremoto in mare
Stromboli, 4 dicembre 2022: tsunami sì o tsunami no?

Four story maps on tsunamis published in 2022-2023

- Tsunami alerts in the Mediterranean (2017-2023)
- **A journey among the tsunamis in the Mediterranean Sea. From** 365 d.C. to date: An interactive tool to describe tsunamis of the past
- **Tsunamis and wreckage:** Extraordinary stories from the 2011 Japanese tsunami
- **28 december 1908, the dawn of pain in the Messina Straits**

RISK PERCEPTION ASSESSMENT

ROMANIA

RISK PERCEPTION ASSESSMENT

ROMANIA

Translated in Romanian some materials from the NEAMTIC website (3 information flyers and one NEAMTWS activity poster)

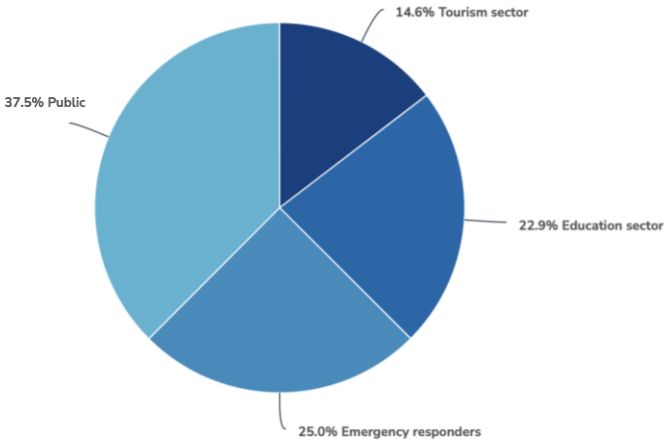
Purpose (to discuss):

Workshops and meetings on tsunami educati on and awareness in the summer time.

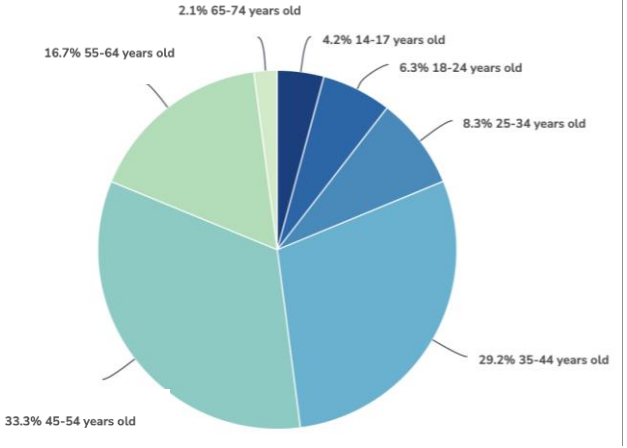
GREECE

Risk Perception Assessment

- Greece participated in the Sea Level Related Hazards Risk Perception Survey Questionnaire developed by IOC/UNESCO to better understand how coastal populations perceive these natural hazards and risks, and develop recommendations for enhanced risk communication strategies and products in the region.
- A small fraction of the local population (49 residents) participated, but the survey still provides a valuable outlook into the local risk perception related to sea related hazards.



Are you part of one of the following sectors?



How old are you?

Risk Perception Assessment

- Most of the survey participants had experienced a tsunami in the past, most likely the 2020 Samos-Aegean tsunami. The majority believes that it is highly likely that the Mediterranean region and their community will experience a tsunami in the next 10 years. The majority also believes that a future tsunami will cause moderate impacts for both the coastal zones of the North-Eastern Atlantic and the Mediterranean Sea and in their community.

- A significant percentage (~40%) of the participants responded that a high impact is expected both at regional and local levels. In the question of what would be the approximate height of a tsunami that can happen soon (e.g., in the next 10 years) in coastal regions of NEAM, the majority of responses ranging between 0.5 – 5 m reflect the expected moderate to high impact from tsunamis and showcase a good understanding of the impact metrics by the participants.

- The overall tsunami awareness of the respondents was further highlighted by the responses on the question related to the expected arrival times of tsunamis in their community and the identification of natural signs of a tsunami and the majority of responses on self-evacuation following a strong shaking due to an earthquake.

SPAIN

Multi-hazard sea level related risk perception studies in Chipiona (Spain)

IOC UNESCO DG ECHO **CoastWAVE** Project

Target groups for the survey include:

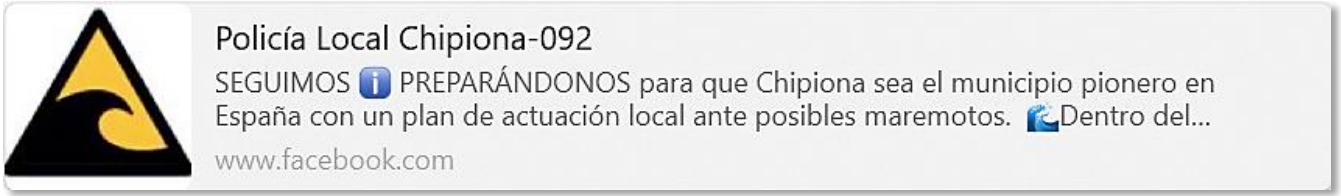
- **Educational sector**, both for students over 14 years of age and for teachers and other personnel associated to educational centres.
- **Emergency management and services sector** (civil protection agencies, police, firefighters, military emergency body, coast guard, etc.)
- **Tourism sector** (hotels, restaurants, stores, tourist guides, sector employees, etc.)
- **General public**

Methods to conduct the questionnaire, three approaches were applied in Chipiona:

- On-site assisted online surveys
- Focus groups
- Online surveys

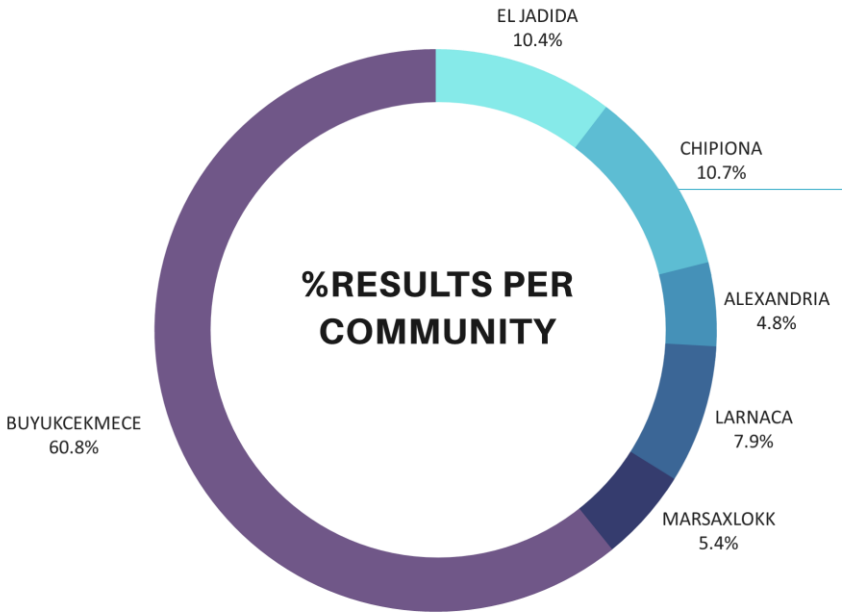
Multi-hazard sea level related risk perception studies in Chipiona (Spain)

IOC UNESCO DG ECHO **CoastWAVE** Project

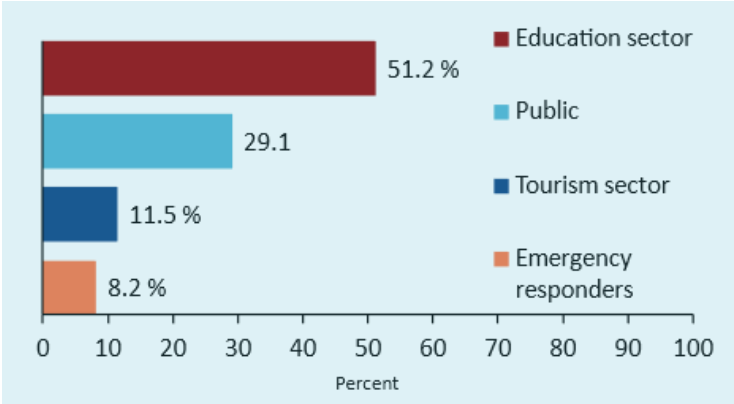


Multi-hazard sea level related risk perception studies in Chipiona (Spain)

IOC UNESCO DG ECHO **CoastWAVE** Project

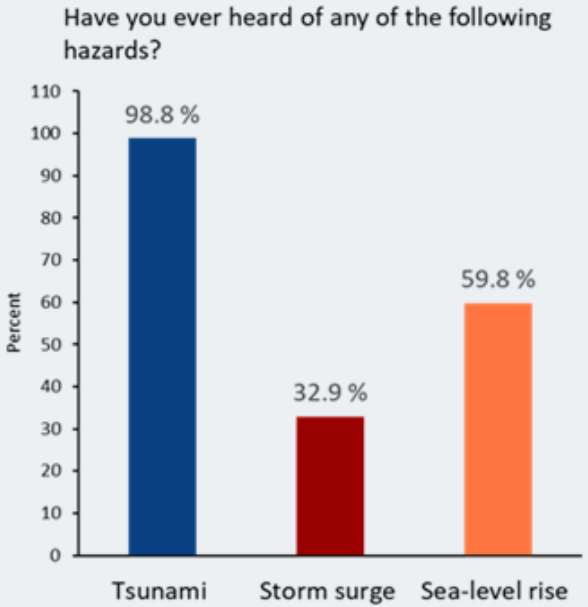


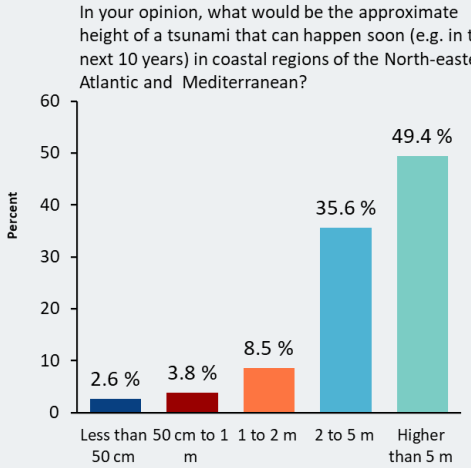
495 respuestas



Multi-hazard sea level related risk perception studies in Chipiona (Spain)

IOC UNESCO DG ECHO **CoastWAVE** Project





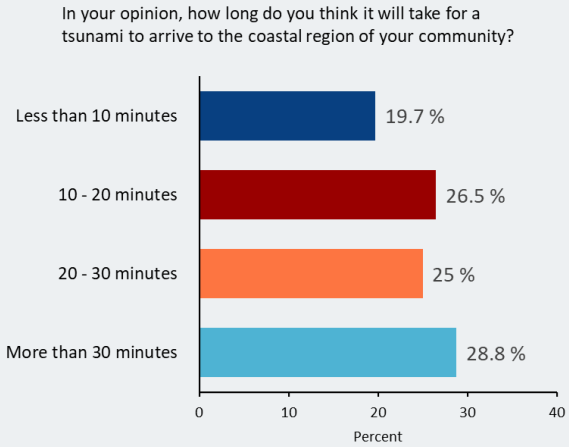
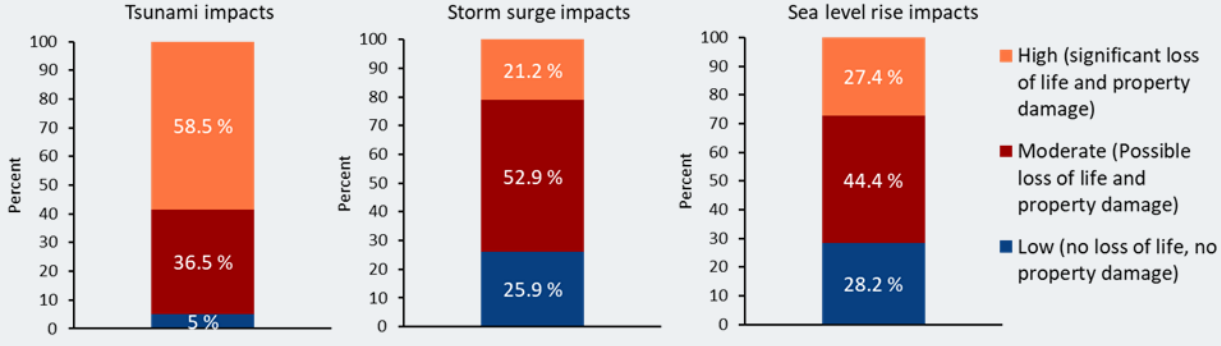


Figure 1. Tsunami height perceived by respondents in the NEAM region (left) and time of arrival in the municipality of Chipiona (right).

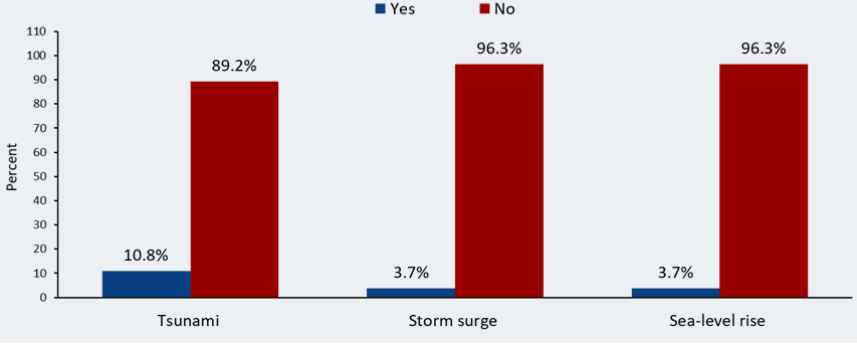
Multi-hazard sea level related risk perception studies in Chipiona (Spain)

CoastWAVE Project

What do you think could be the impacts of the tsunami/storm surge/sea level rise in coastal regions of the Northeastern Atlantic and Mediterranean?



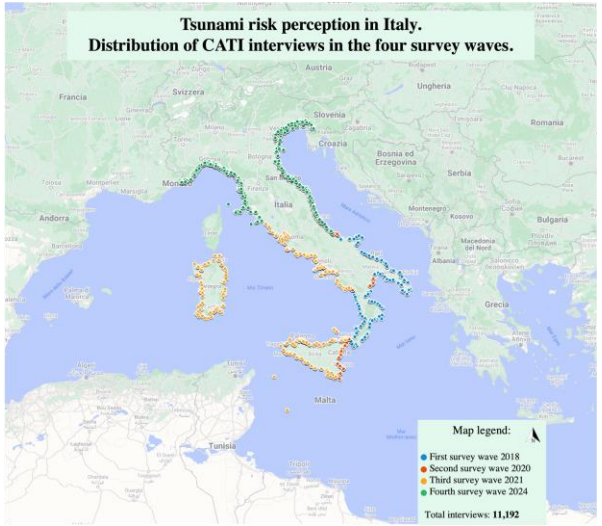
Have you taken any precautions or measures on your own against tsunamis, storm surge or sea level rise?



INGV ITALY

Tsunami risk perception studies

- Fullfillment of the Italian coastal regions in 2023 (central and northern regions)
- Stromboli local survey on tourists (Summer 2023)
- Papers published /submitted (Cugliari et al., 2022; Cerbara et al., submitted; Moreschini et al., submitted; Amato et al., submitted)



WTAD NEAMWAVE23

GREECE

NEAMWave23

- Greece participated in Phase A of the NEAMWave23 through NOA-HLNTWC who transmitted the alert messages as TSP and received the messages of CAT-INGV and KOERI as TWFP of the NEAMTWS.

- Greece also participated in Phase B of the NEAMWave23 through the upstream (NOA -> national CPA) and downstream components of the tsunami warning chain. In the downstream component, NOA-HLNTWC's messages were disseminated to national operational centers, but also to the Prefecture of North Aegean, the Municipality of Eastern Samos and local emergency services of Samos for the needs of the local TTX. A cell broadcast message was also disseminated locally within the framework of NEAMWave23 and the local TTX.

NEAMWave23 – local TTX in Samos

- A local TTX and a school drill was organized in Samos within the framework of NEAMWave23 and the CoastWAVE project.

- The local TTX organized by the Greek CoastWAVE team and the Municipality of Eastern Samos involved personnel from the Prefecture of North Aegean, the Municipality of Eastern Samos, the local emergency services, the Greek Army, and the local education sector.
- The aim of the local TTX was to:
  - Test the local emergency and tsunami evacuation plans for the city of Samos prepared within the framework of the CoastWAVE project;
  - Test the transmission and reception mechanisms for tsunami messages;
  - Promote preparedness for earthquakes and tsunamis.

NEAMWave23 – school drill in Samos

- A local TTX and a school drill was organized in Samos within the framework of NEAMWave23 and the CoastWAVE project.

- The school drill involved two schools of Samos, namely the 1st experimental high school of Samos and the 2nd high school of Samos. The pupils were asked to follow the school protocol for earthquakes, and following the receipt of the tsunami warning through the cell broadcast message to move to the closest assembly area through a predefined escape route.
- The aim of the school drill was to
  - Test the school emergency plan for earthquakes and the tsunami evacuation plan for the city of Samos prepared within the framework of the CoastWAVE project;
  - Promote preparedness for earthquakes and tsunamis.

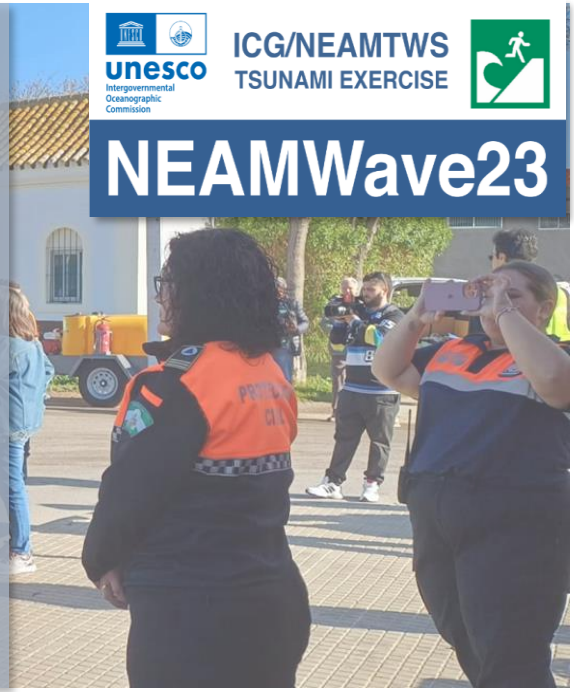
NEAMWave23 – TTX and school drill in Samos

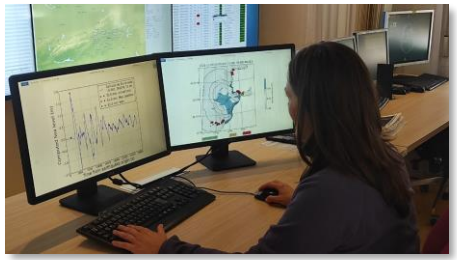
SPAIN

NEAMWave 23 Exercise – Spain – Andalucía - Chipiona

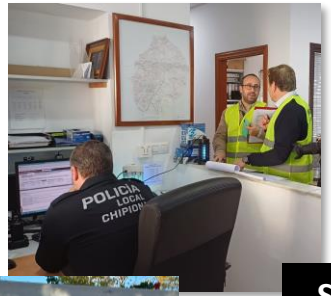
Organised and coordinated by IHCantabria and IGN (National Tsunami Warning Centre), in collaboration with: NCPA, CP Andalucía, IEO (TNC), Chipiona City Council, Local Police Chipiona, Civil Protection Chipiona and IOC-UNESCO

- Nearly 300 participants, including 11 institutions and 213 students between 3 and 12 years old.
- The tsunami warning communication chain in Spain (times and means), from the national level through the autonomous community to the municipal level, was tested. One school was evacuated to the nearest Assembly Point.
- The exercise identified some areas for improvement in coordination, communication and the evacuation process.

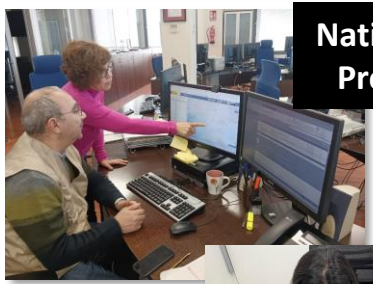




IGN (NTWC)



Locval Police HQ



National Civil Protection

School evacuation CEIP M.M. Aparecro

Civil Protection Junta Andalucía

Chipiona City Council

IOC UNESCO VIDEO LINK

Video link

ITALY
INGV

WTAD / NEAMWave2023

November 2023

- Preparation of the scenario and public information (INGV)
  - NEAMWave '23: 6 e 7 novembre 2023, il test del Sistema italiano per l'Allerta Maremoto
  - WTAD 2023 | 5 novembre 2023 #GetToHighGround

- Activities by DPC (see presentation on Wednesday)
  - Io Non Rischio campaigns
  - Movie and comic book
  - Exercise with CP - local/regional/national authorities

- Minturno (vertical evacuation at primary school / nursery)

WTAD

ROMANIA

Posted news related to WTAD on NIEP website, Facebook and other media , days before the event.

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