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ARISTOTLE-ENHSP “European Natural Hazard Scientific Partnership”
Service Contract N. ECHO/SER/2024/925459

ARISTOTLE - the European Scientific Partnership providing multi-hazard expert assessment to the European Response Coordination Centre

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ARISTOTLE-ENHSP in pills

Scientific expert advice service

- 24/7, multi-hazard at global scale
- provided to the EC Emergency Response Coordination Centre (ERCC)
- operated currently by 20 national and 3 international institutions in Europe *(most institutions have a national mandate)*

Three modalities:

- Emergency Response - ERM (2016 -)
- MH 3x/week Routine Monitoring – ROM (2020 -)
- Scientific Expertise on-demand - SEOD (2022 -)

Background

When major natural events occur there is a strong need for <u>Authoritative, Timely, Multi-Hazard Advice</u>

New directions in the UCPM Decision No 1313/2013/EU:

"(3.e) to increase the availability and use of **scientific knowledge** on disasters"

"(7) The ERCC shall have access to **operational, analytical, monitoring,** information management and communication capabilities to address a broad range of emergencies within and outside the Union (Legal provisions of COM(2020)220 - Amendment of Decision No 1313/2013/EU on a Union Civil Protection Mechanism)

"(8.a) to **further develop** and better **integrate transnational detection and early warning and alert systems of European interest** in order to enable a **rapid response**, and to promote the **inter-linkage between national early warning and alert systems**

Latest revision of the UCPM legislation

EUROPEAN COMMISSION

Brussels, 8.2.2023
COM(2023) 61 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

European Union Disaster Resilience Goals: Acting together to deal with future emergencies

Flagship: Linking global early warning to local action in Europe

The ERCC has developed a range of automated European and global early warning and detection systems through which it monitors events in and outside the Union territory. To translate warnings and alerts from those systems into user-targeted information for emergency response, the Union Mechanism supports European scientific partnerships[23] that provide a 24/7 service for rapid impact assessments for detected or forecast events.

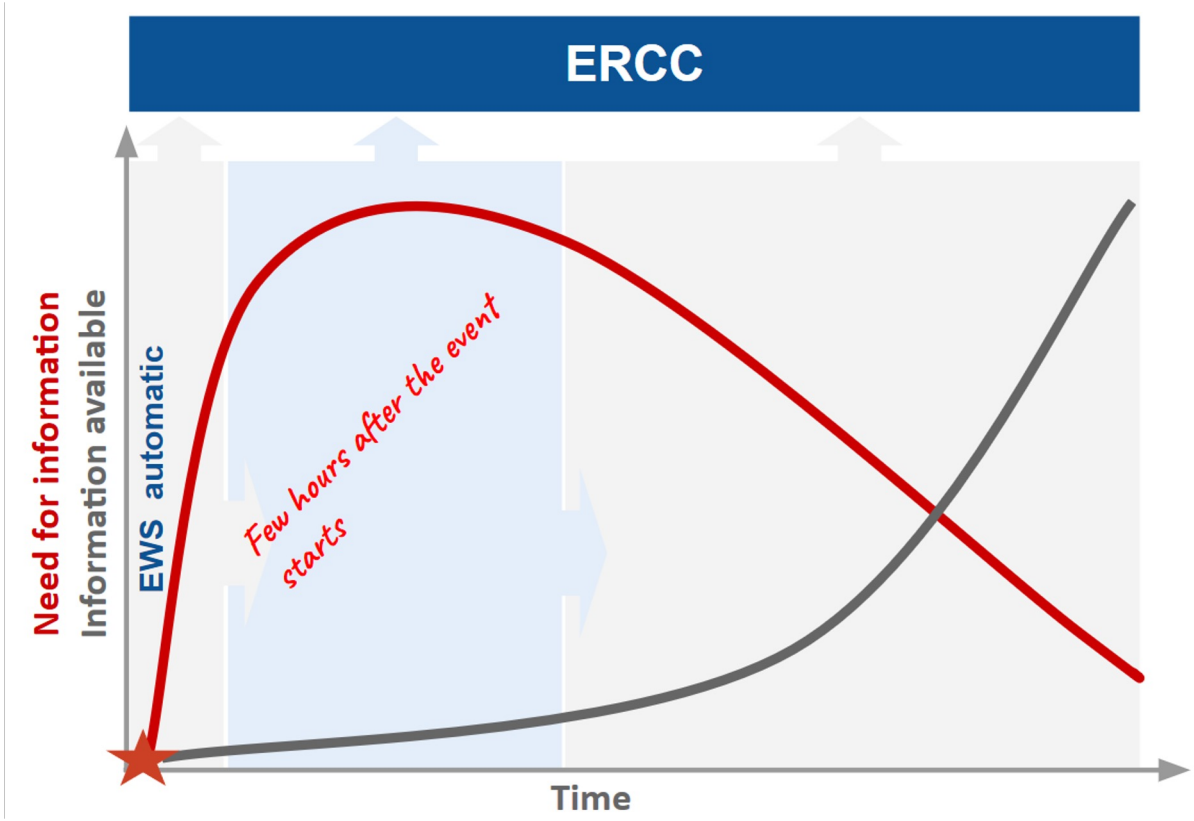
To better support Member States in rapidly interpreting warnings of local events, the ERCC will expand such early warning and analytical capacity into a specific programme for national authorities offering a pro-active and on-demand early assessment service. The ERCC will also develop a multi-hazard "dashboard" that provides European situational awareness to emergency managers. Interoperability with other sectoral systems and civil/military authorities will be promoted to enhance the situational awareness and consequently products of the ERCC[24].

For Europe-wide early warning to be truly effective, Member States are encouraged to review the early warning chain, making sure key information gets to disaster-prone areas at the right time to save lives and assets. Whilst Member States are responsible for national early warning, targeted technical support can be made available under the Union Mechanism to help identify gaps in their early warning systems and build capacity to strengthen the dissemination of warnings to the local level.

[23] Including the European Natural Hazard Scientific Partnership. See: https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/early-warning-and-information-systems_en

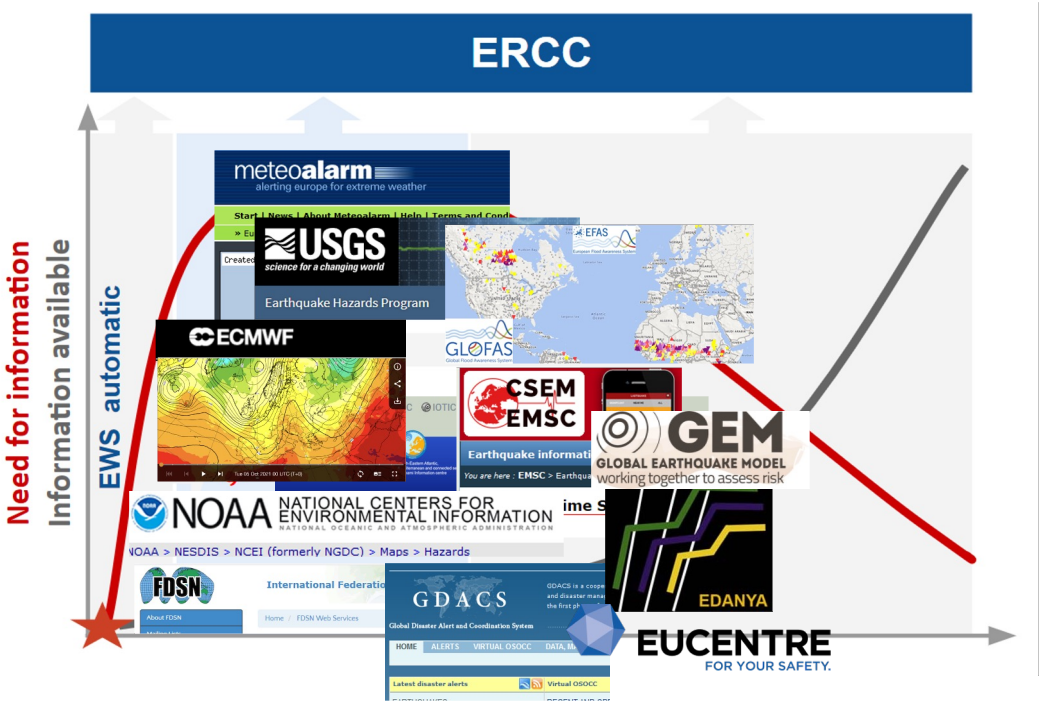
[24] An example of that is, in the maritime domain, the Common Information Sharing Environment (CISE) which is currently under development.

The rationale behind (1/3)



Source ERCC

The rationale behind (2/3)

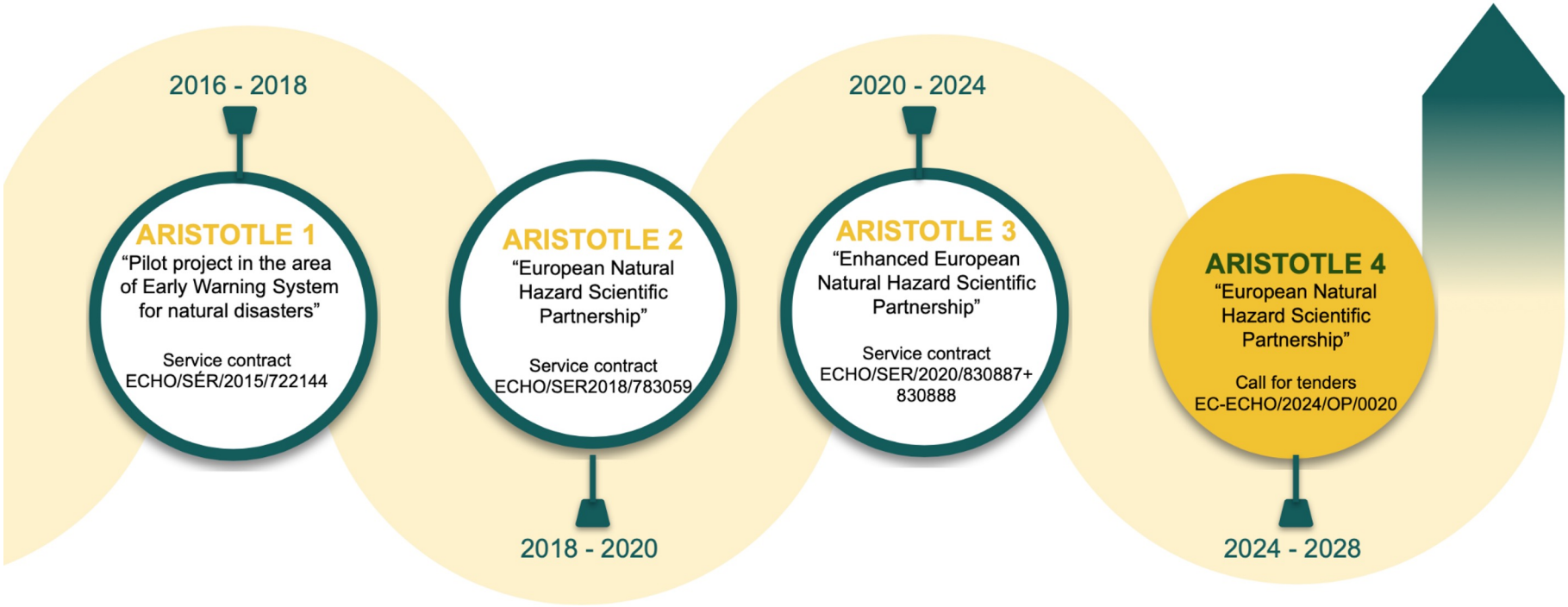


- Multiple sources of information in different locations
- Requirement: From data/information to **WHAT IT MEANS**

The rationale behind (3/3)

- Multiple source … ations
- Requirement: From data/information to **WHAT IT MEANS**

A long journey to enhance the ENHSP



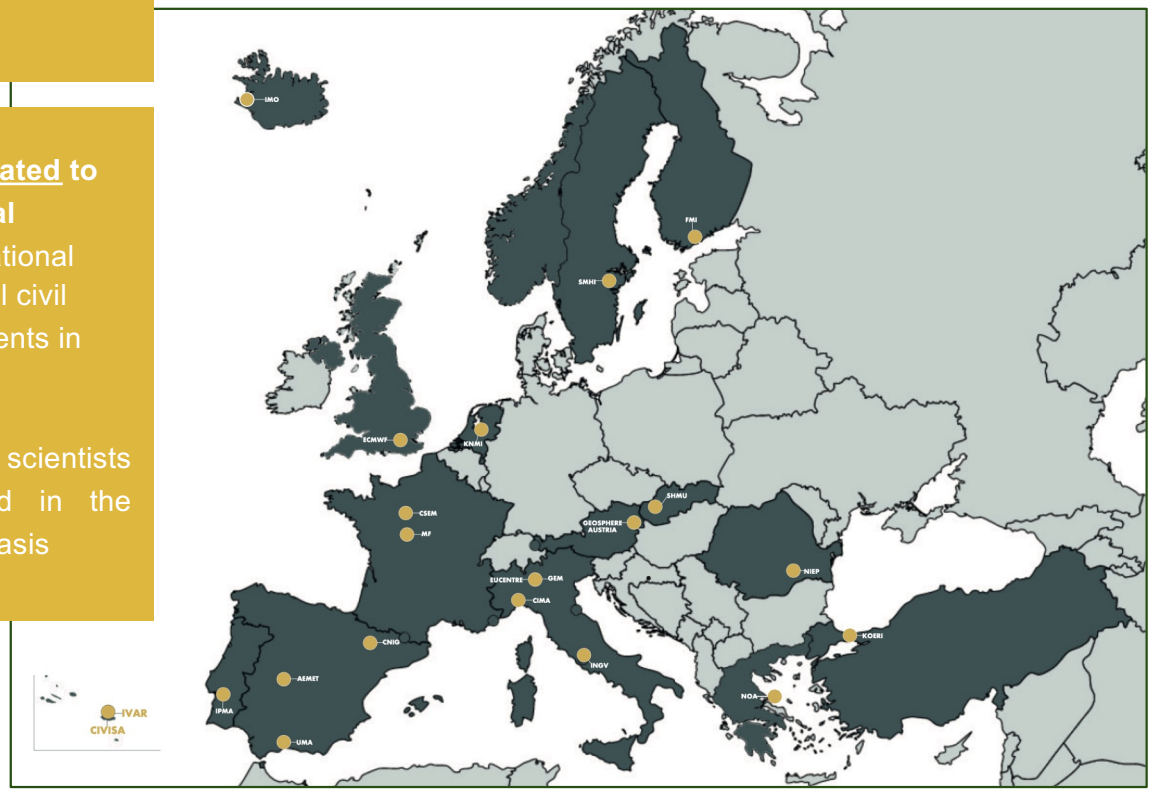
The ARISTOTLE-ENHSP Consortium

23 Partners (20 national + 3 international organizations)

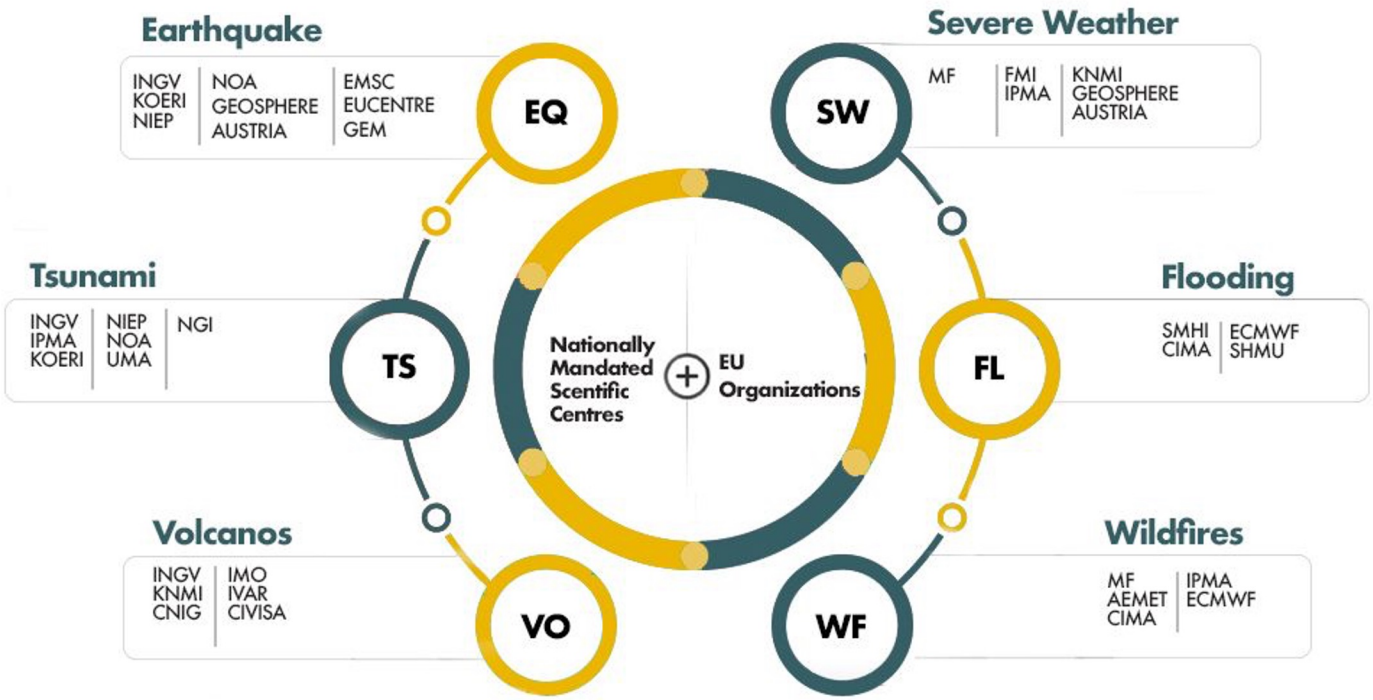
14 Countries

- N° 16 partners are **formally-mandated to provide advice to relevant national authorities or institutions** (e.g., national regulatory authorities and/or national civil protection authorities) for natural events in Europe.

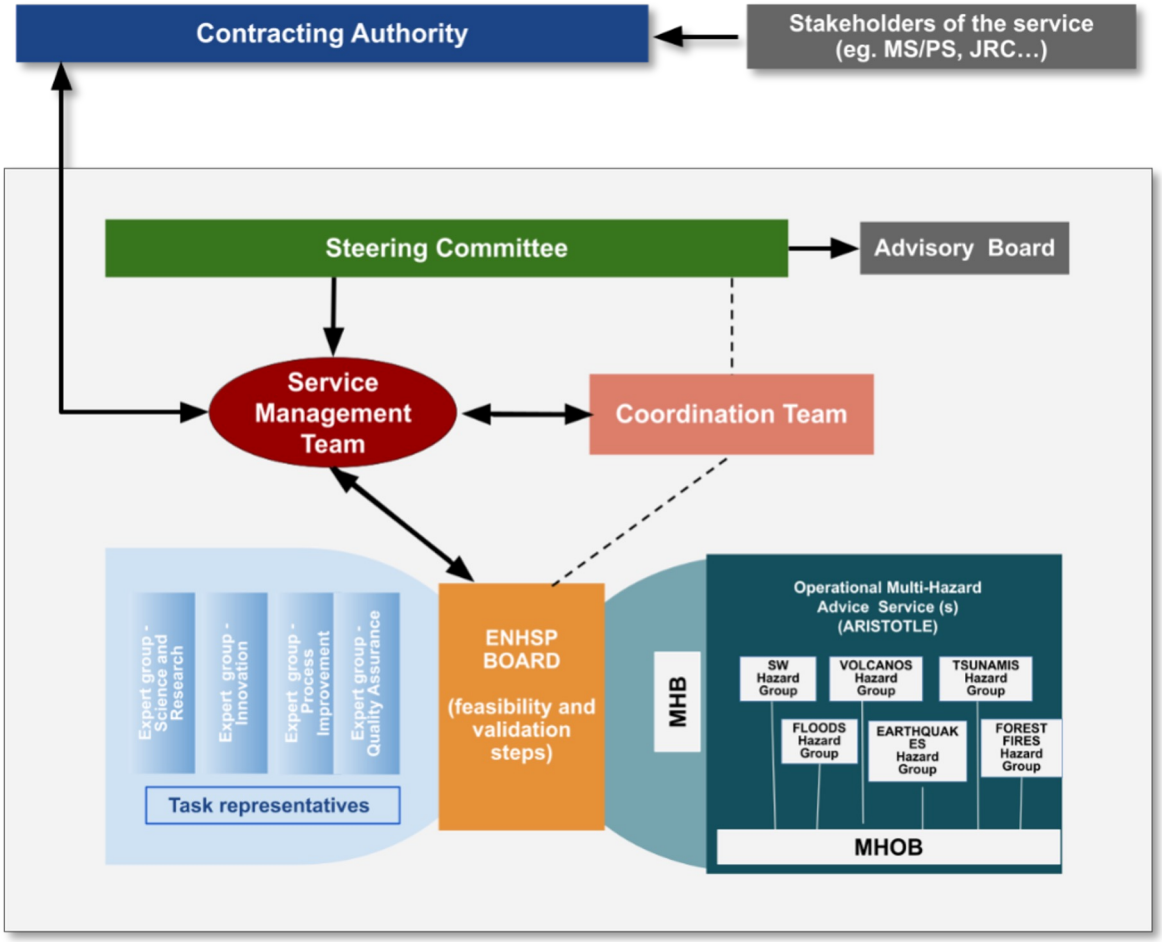
- More than **150 personnel** among scientists and analytical staff are involved in the operational service on a rotational basis



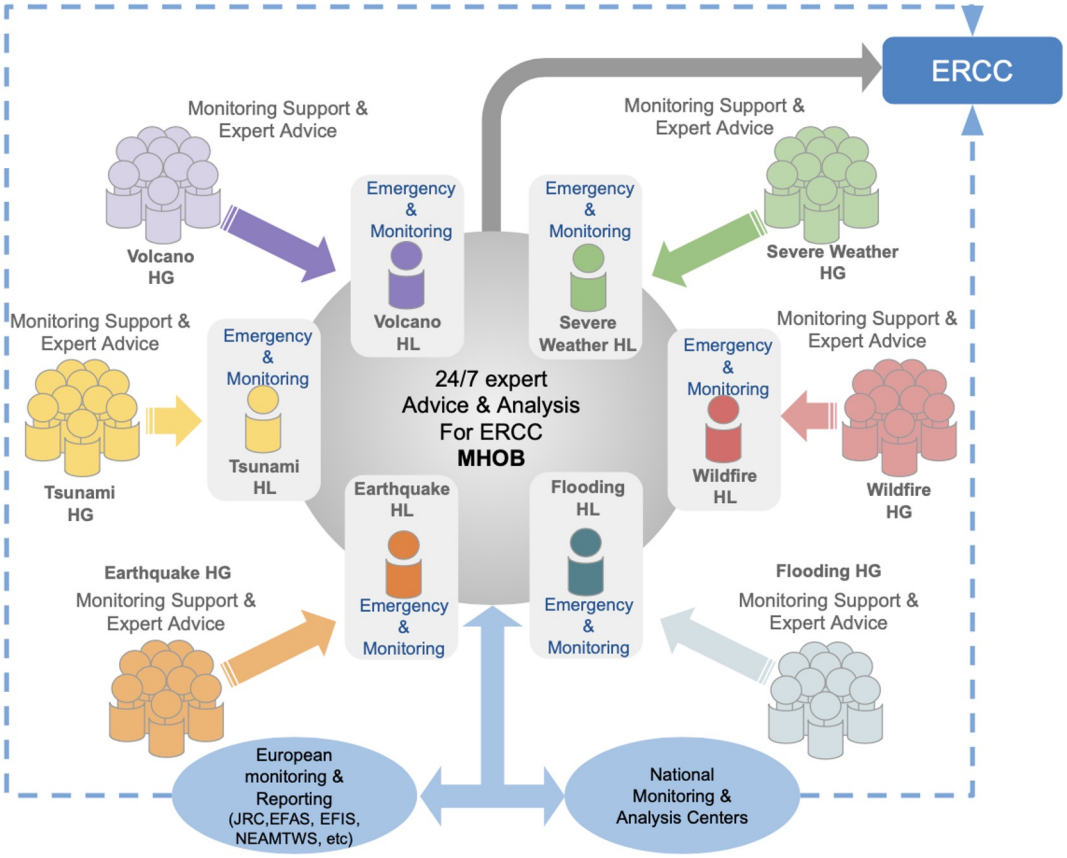
The Hazard Groups



The ARISTOTLE-ENHSP governance



Multi Hazard Operational Board - MHOB
(i.e., a virtual operation room)



The ARISTOTLE-ENHSP service

Emergency Response Mode (ERM) —> Remote service that provides scientific expert advice within the **three hours** from the activation of ARISTOTLE in the form of a **multi-hazard report** and **verbal interaction** with the ERCC

Routine Operational Mode (ROM) —> Remote service that provides scientific expert advise **three times a week** in the form of a monitoring report. The monitoring report delivers information about ongoing events, events which could potentially develop in a catastrophic situation or events that already past and updated information is available or needed.

Scientific Expertise on-demand (SEOD) —> It is aimed to provide the ERCC with additional oral and/or written scientific advice on-demand.

The Emergency Response Mode (ERM) - Full Report

ARISTOTLE-EENHSP EMERGENCY REPORT (AR0238)

EARTHQUAKE IN MYANMAR

MAIN DETAILS

Area	Myanmar (Asia)	**Operation mode**	Reactive
Event start	28 March 2025, 06:20 UTC	**Event end**	-
Report created	28 March 2025, 08:15 UTC	**Report finalized**	31 March 2025, 12:03 UTC

EXECUTIVE SUMMARY

- A MAJOR earthquake with magnitude 7.7 occurred on Fri Mar 28 06:20:54 2025 (UTC) with latitude 22.01°N, longitude 95.92°E and depth of 10.0 km. This is a inland event at a distance of 323.5 km from the nearest coast.
- There was no tsunami threat for the event.
- The latest USGS-PAGER (2025-03-31 04:09:30 UTC) issued a RED alert for shaking-related fatalities and RED for economic losses indicating significant casualties are probable and extensive damage likely widespread. This expectation is confirmed by EMSC-EQIA preliminary scenarios. Significant and widespread damages are reported from media with buildings and bridges collapsed.
- Given the size of the earthquake, its shallow depth and the geological structure of the affected area, we expect significant exposure to landslides and extensive exposure to soil liquefaction. This could exacerbate the effects of the ground shaking.
- The affected population is large. According to USGS-PAGER, about 2.7 milion people experienced MMI intensity IX and about 4.6 million people experienced MMI intensity VIII.
- Latest Impact assessment of the earthquake provided by GEM (March 30, 2025), indicates that the average number of fatalities should be in the order of about 9,000 people with about 23,000 injured. The average affected population is about 1.6 million people with about 1 milion people rendered homeless.
- Between 1930 and 1956, six M7.0+ earthquakes occurred near the right-lateral Sagaing Fault, resulting in severe damage in Myanmar including the generation of landslides, liquefaction and the loss of 610 lives.
- By March 31, 2025, according to USGS, the earthquake was followed by a series of aftershocks, this includes one magnitude 6.7 and two magnitude 5.1. According to USGS Aftershock Forecast, there is a 72% chance of one or more aftershocks that are larger than magnitude 5, which can be damaging, within the next week. The aftershocks could increase the losses and also can affect the number of displaced people.
- The weather in the region (March 31, 2025 10:00 UTC) will remain calm and sunny over the next few days, with mostly light to moderate winds. Temperatures will reach 35 to 40 °C during the day, dropping to 25 to 20 °C at night. There is almost no precipitation before next week.
- High fire danger is expected today (March 31, 2025) and in the next two days due to hot and dry conditions. Today, FWI values vary between 55 and 65 (locally up to 75), decreasing up to 60 on Wednesday. Fire danger patterns today linked to very high spread conditions (ISI up to 30), decreasing in the next two days up to 20. Very low fuel moisture contents (94 < FFMC < 97).
- Based on the available information provided above, we assess that the earthquake resulted in a major impact and it affected a large portion of Myanmar but it also generated significant shaking in the neighboring countries including Thailand with media reporting damages in Bangkok (distance ~1000 km). Hot weather and high risk of fire in the region could exacerbate the overall critical situation. Considering the overall situation concerning the other hazards (severe weather), we assign a Red alert to this event, expecting that international resources may be necessary.

ARISTOTLE-EENHSP EMERGENCY REPORT (AR0108)

EARTHQUAKE 7.8 TURKEY

MAIN DETAILS

Area	Turkey (Asia)	**Operation mode**	Reactive
Event start	6 February 2023, 01:17 UTC	**Event end**	-
Report created	6 February 2023, 02:44 UTC	**Report finalized**	6 February 2023, 05:11 UTC

EXECUTIVE SUMMARY

- A MAJOR earthquake with magnitude 7.8 occurred on Mon Feb 6 01:17:35 2023 (UTC) with latitude 37.17°N, longitude 37.03°E and depth of 17.9 km. This is a inland event at a distance of 86.4 km from the nearest coast.
- According to the most recent USGS ShakeMap, the maximum estimated intensity in the epicenter area was IX, corresponding to severe shaking and moderate to heavy damage, approximately 7 000 people being exposed to this intensity. More than 340k people experienced intensities larger than VIII (severe shaking - significant damage), while about 2.7 million people experienced intensities larger than VII (very strong shaking, moderate damage).
- The maximum felt intensity was IX (violent shaking- serious damage) according to the USGS "Did You Feel It" responses of 1513 eyewitnesses.
- The USGS-PAGER issued an ORANGE alert for shaking-related fatalities and RED for economic losses indicating significant casualties are probable and extensive damage likely widespread. GDACS reported a RED alert, indicating a high humanitarian impact.
- The earthquake is expected to be followed by numerous aftershocks for some weeks and it cannot be excluded that events as large could occur within the same broader area. At the time of this report, there have been 9 aftershocks with magnitude above 5, the strongest being 6.7. The aftershocks could increase the losses and also can affect the number of displaced people.
- Tallies from various officials put the toll at at least 38 dead in Turkey and 62 in Syria. The death toll is expected to rise in the following hours as rescue operations are going on.
- At least 130 buildings tumbled down in Turkey's Malatya province, neighboring the epicenter, Gov. Hulusi Sahin said. In the Turkish city of Diyarbakir, at least 15 buildings collapsed. Overall, the population in this region resides in structures that are extremely vulnerable to earthquake shaking, with predominant unreinforced brick masonry and low-rise non-ductile concrete frame with infill construction.
- Based on tsunami simulation results, maximum expected wave amplitudes are between 0.1 and 0.3 m in the bay of Iskenderun. Tide gauges in Iskenderun and Erdemli in Turkey have recorded waves of amplitudes of up to 20 cm, with potential for currents, bore, recession, damage in harbors, small inundation on beaches. However, coastal inundation cannot be excluded, particularly in the bay of Iskenderun.
- Secondary hazards such as landslides, liquefaction or gas pipeline explosions are possible and can contribute to additional losses.
- Outbreaks of rain, heavy at times, will affect the region with thunderstorms also possible. The rain will fall as snow on higher ground through Monday with heavy accumulations building up. Temperatures will be around 5 degrees Celsius lower than what is expected for February in this region, with daytime temperatures no higher than 3 degrees Celsius and with overnight temperatures lowering to around Minus 8 degrees Celsius.
- Based on the preliminary information provided above, we assess that the earthquake resulted in a major impact and it affected a large portion of Turkey and Syria. Considering the overall situation concerning the other hazards (severe weather), we assign a Red alert to this event, expecting that international resources may be necessary.

Key components of the ERM Full Report

- basic description of the main event
- potential cascading effects
- multi-hazard assessment included
- weather assessment and forecast, always included
- impact and exposure assessment
- potential evolution

WITHIN THREE HOURS
(from the ERM triggering)

The Emergency Response Mode (ERM) - Lite Report

Geographic location: Campi Flegrei, Italy
Event timing: ongoing and reported on February 20, 2025

Description: Brady Seismic Swarm Activity at Campi Flegrei, Italy

General Overview:

The Phlegraean Fields are a vast active volcanic area affected by the phenomenon of "bradyseism": a ground deformation involving slow lowering (subsidence) phases alternating with more rapid uplift phases, the latter generally followed by shallow, low-magnitude earthquakes.

Ground deformation

According to Osservatorio Vesuviano (INGV): from mid-April to July 2024 the average uplift rate in the area of maximum deformation was approximately 20±3 mm/month at the GNSS station of Rione Terra (RITE) near Pozzuoli. Since August, the average uplift rate in the area of maximum deformation has been about 10±3 mm/month at the RITE GNSS station. In the two days following the onset of the swarm (February 15), an uplift of about 0.5 - 1 cm was recorded at the stations in the area of maximum deformation. Only with the data from the coming weeks will it be possible to determine if there are significant variations in the average monthly uplift rates.The total uplift recorded at the RITE GNSS station is approximately 21 cm since January 2024.

Degassing

In the reference week, continuous data monitored by the geochemical network did not show significant variations in the acquired parameters, although they confirmed the ongoing trends of heating and pressurization of the hydrothermal system, as well as an increase in the emitted fluid flow.

In the Pisciarelli area (on the northeastern outer slope of the Solfatara), which has shown the most significant variations in degassing processes in recent years, continuous measurements of soil CO_2 flux indicate the persistence of the multi-year trends previously identified. In the past week, the measured soil CO_2 fluxes did not show significant changes compared to previous periods.

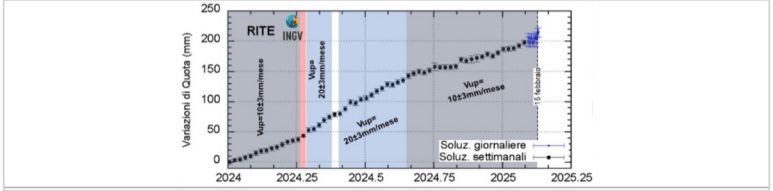


Figure 1 GNSS monitoring showing uplift

Key components of the ERM Lite Report

- general overview of the main event
- expert assessment
- possibile evolution
- weather assessment and forecast, always included

WITHIN THREE HOURS
(from the ERM triggering)

The Routine Multi-Hazard Monitoring report (ROM)

HEADLINES

- Ongoing earthquake sequence and warm weathe in Myanmar
- High threat of severe weather and flooding in the US
- Very High Fire Danger over Mexico

SUMMARY

Key components of the ROM Report

- general overview of the main events
- expert assessment on the impact
- possibile evolution
- weather assessment and forecast, always included
- long lived events included, if any (example: volcanic eruption)

3x/week

The Scientific Expertise on-demand (SEOD)

Specific ad-hoc purpose	Products and sub-services
Anticipation, planning and preparedness	Oral and ppt slides
To better respond to disasters (before and during major disasters)	Support to the drafting of an ERCC analytical brief
Physical deployment in Brussels at ERCC premises	-
Reach-back mode	Acting as a back-office, scientific support to specific UCPM missions to provide remote oral and/or written support to specific missions carried out by UCPM experts and/or the Commission. This should include technical and scientific exchange and backing for deployed teams on the ground.
To support operational preparedness	Scenarios-based products

Some deliverables produced

- Scenario-based earthquake and tsunami impacts assessment: Santorini-Amorgos zone, Greece (02.2025)
- Volcanic eruptions in the Reykjanes peninsula, Iceland March 2024
- Scientific assessment on the Wildfires occurred in Chile last February 2024
- VO scenario - Campi Flegrei (Italy) 2023
- EQ/TS scenario - Earthquake-induced tsunami in the Mediterranean March 2023
- provided specific adjournments on the weather conditions in Ukraine with the outbreak of the 2022 war

The service is managed by the Service Mgt. Team and provided by about ~100 very dedicated expert scientists and technologists that participate actively to a «de facto» multi-hazard, European 7/24h virtual emergency room and their essential contribution is greatly acknowledged.

Thank you for the attention

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