

Disaster Medicine and Technologies

Marta Caviglia, MD, pHDc

*CRIMEDIM – Center for Research and Training in Disaster Medicine,
Humanitarian Aid and Global Health, Università del Piemonte
Orientale - Novara*

02.06.2023

CRIMEDIM

Center for Research and
Training in Disaster
Medicine, Humanitarian Aid
and Global Health

*World Health Organization
Collaborating Centre*

www.crimedim.uniupo.it



**PROFESSIONALIZATION
 OF HEALTH WORKERS
 IN DISASTER AND
 HUMANITARIAN ASSISTANCE**



**OPERATIONAL
 RESEARCH IN DISASTER
 AND HUMANITARIAN
 SETTINGS**

**SIMULATION
 AND EMERGING
 TECHNOLOGIES IN
 DISASTER EDUCATION**



**HOSPITAL DISASTER
 RESILIENCE**



1

**DISASTER MEDICINE EDUCATION
 AND TRAINING FOR DISASTER MANAGERS,
 LEADERS AND POLICY MAKERS**

- European Master in Disaster Medicine (EMDM)
- PhD in Disaster Education, Disaster Medicine and Humanitarian Health
- Disaster and humanitarian fellowship

2

**DISASTER MEDICINE EDUCATION
 AND TRAINING FOR HEALTH PROFESSIONALS**

- Humanitarian Medic
- Disaster Medic
- Hospital Disaster Preparedness
- Pre-deployment Training for Ebola Emergency Response

3

**DISASTER MEDICINE EDUCATION AND TRAINING
 FOR MEDICAL AND NURSING STUDENTS**

- TdmT - Training disaster medicine Trainers
- DisasterSISM
- Disaster Medicine module in the standard medical curriculum at the Università del Piemonte Orientale

4

**AD HOC CURRICULUM
 AND SIMULATION BASED
 TRAINING DEVELOPMENT**

- Basic and Advanced Modular Courses for Health Professionals
- Instructor Course and Faculty Development
- Scenario-Based Training

DISASTER

*“A **serious disruption of the functioning of a community** or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: **human, material, economic and environmental losses and impacts.**”*

www.undrr.org

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www.undrr.org

SLOW ONSET

(desertification, epidemic,
sea level rise)

SUDDEN ONSET

(earthquake, flood,
chemical explosion)



Feb. 6

A magnitude 7.8 earthquake occurred in southern Turkey near the northern border of Syria, followed approximately nine hours later by a magnitude 7.5 earthquake located 95 km to the southwest.

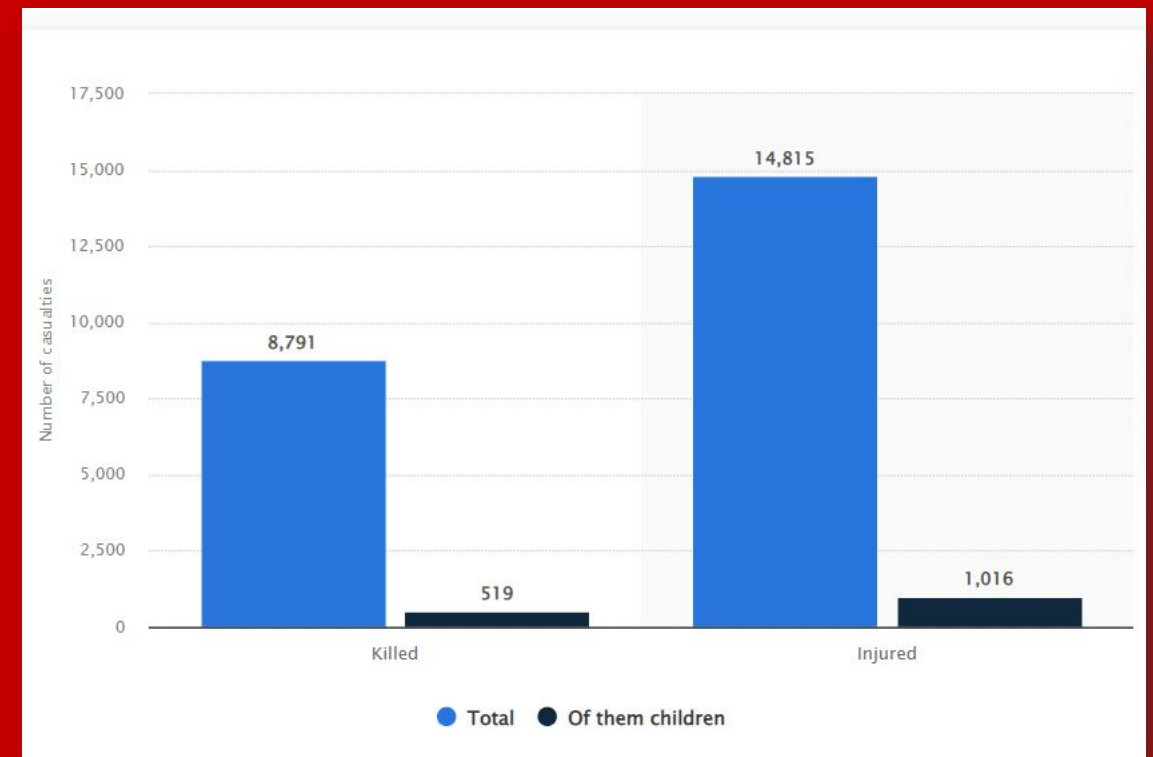
Deadliest earthquake in the region

- > 55,000 death
- > 100,000 injured



Feb. 24

Attacks by Russian forces were reported in major cities across Ukraine, including Berdyansk, Chernihiv, Kharkiv, Odesa, Sumy, and the capital Kyiv.





May. 3





A series of floods are ongoing in and around the cities of Bologna, Cesena, Forlì, Ravenna, and Rimini, in the Emilia-Romagna region of Italy.

Impact on the region:

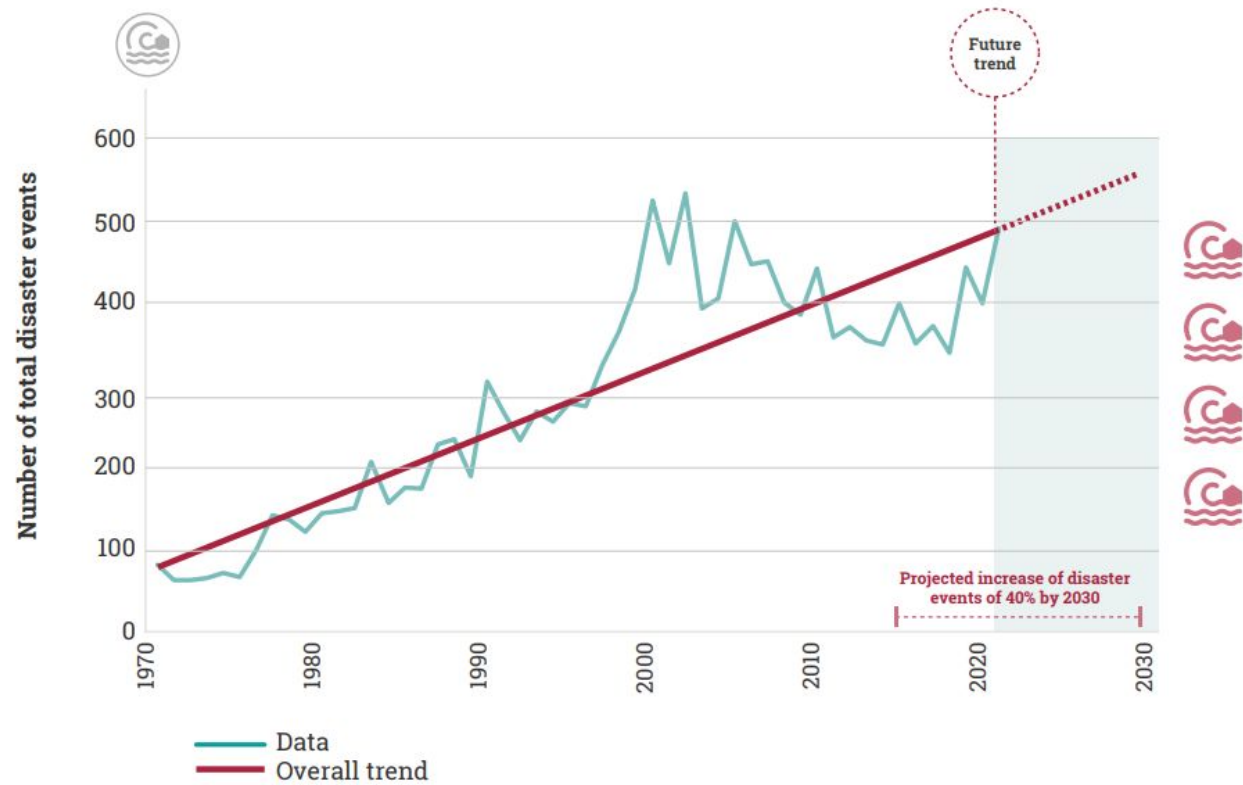
- 14 death
- > 30,000 displaced



2022 Disasters in numbers




-  **387**
Reported disasters
-  **30,704**
Deaths
-  **185 million**
People affected
-  **223.8 billion**
US\$ economic damage

Climate in action

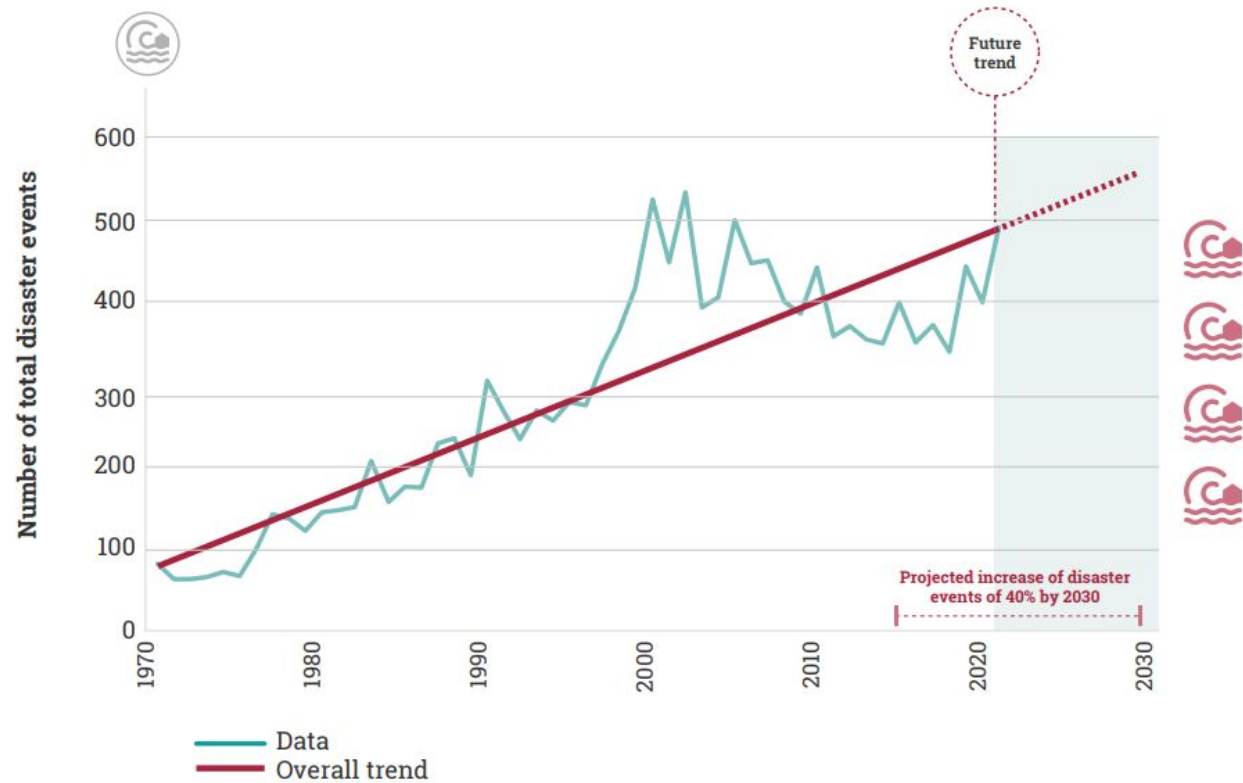




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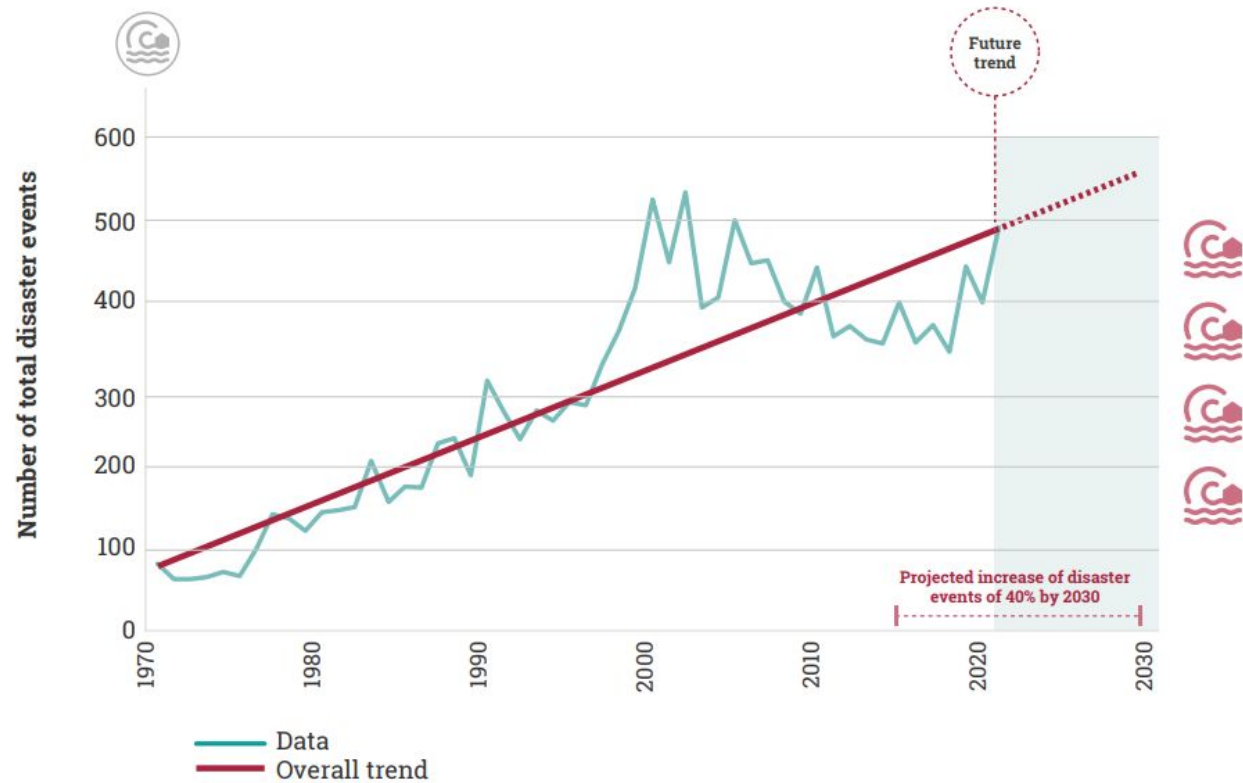
Globalized Economic Development
 Population growth
Climate change
 Environmental degradation
 Weak Governance
 Poorly planned urban development
 Inequality
 Poverty



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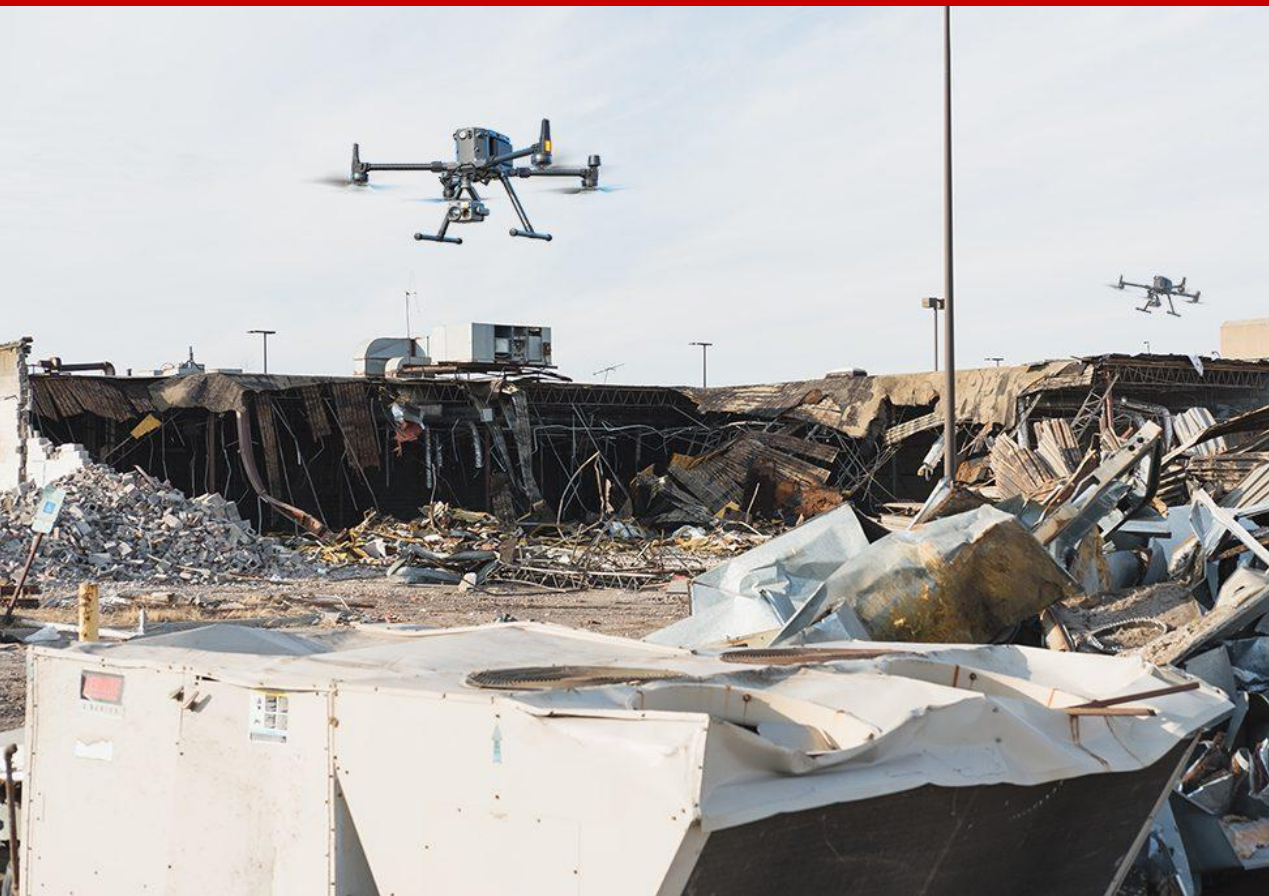
Climate in action








«Do the best for the most»



CISN ShakeAlert User Display Version 2.4.1 (Build 20140912)

Settings Play Event Show Log Disclaimer View News Silence Mute

Moderate Shaking Expected



Event **PLAYBACK 1989 LomaPrieta_M6.9**
OriginTime Mon Oct 16 22:04:00 PDT 1989
Epicenter is 9 miles (15 km) NE of Santa Cruz

Remaining Time
18

Expected Intensity **V** Estimated Magnitude **6.9**

Probability of Correct Alarm High

Intensity Scale						
Weak	Light	Moderate	Strong	Very Strong	Severe	Extreme
I	II-III	IV	V	VI	VII	VIII

Notice: Earthquake data may be preliminary and subject to change



Haiti 2010

12 Gen

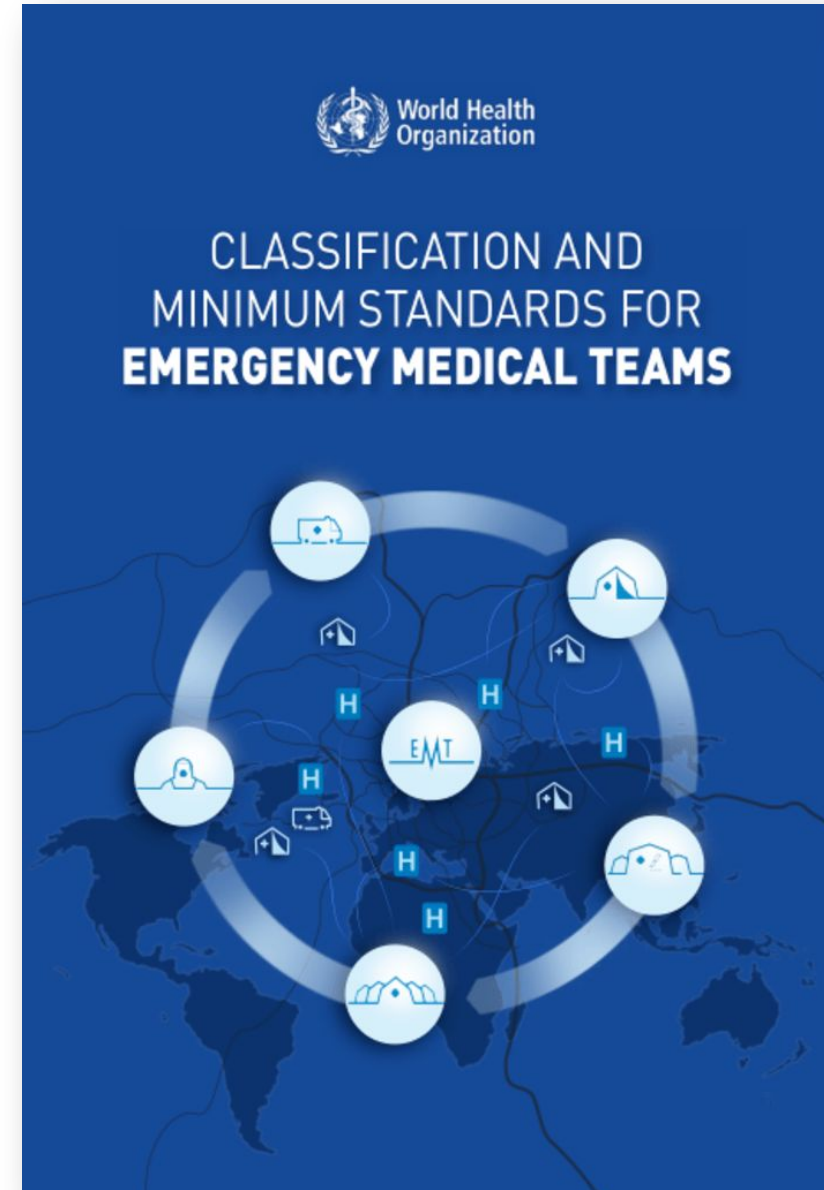
On the 12th of January 2010, a 7.0 earthquake struck Haiti east of the coast, inflicting significant loss of life and widespread destruction.

Death Toll: **220,000 people.**



Haiti 2010

1. Professionalization of Humanitarian Workers
2. EMT initiative (coordination of the relief effort)



Haiti 2010

1. **OpenStreetMaps:** sviluppo di una mappa ad alta risoluzione usata dai soccorritori
2. **Crowdsourcing:** informazioni collezionate dalla popolazione (social media, sms)



cordis.europa.eu



NEXES NEXt generation Emergency Services

ID: 653337
 From: 1 May 2015 to: 30 April 2018

The NEXES Research and Innovation Action aims to research, test and validate the promising integration of IP-based communication technologies and interoperability into the next generation emergency services, so that they attain increased effectiveness and performance. Empowered...



IRIS Reducing the impact of environmental disasters: AI-based assistant for frontline emergency management

ID: 101010486
 From: 1 December 2020 to: 30 June 2023

Imagine a first responder answering the call to a wildfire or to a massive flooding, where there may lives and properties at stake. The information they need to fulfill the mission is crucial. Also, the number of teams and emergency services deployed in these situations is...



iProcureSecurity Strategic Partnership of Emergency Medical Service Practitioners for Coordination of Innovation Procurement

ID: 833291
 From: 1 May 2019 to: 31 December 2020

Emergency Medical Services in Europe are characterised by a pluralistic landscape with diverse organisational setups, professional standards, coordination mechanisms and actors which result from different historical and institutional contexts in EU member states. However...



NIGHTINGALE Novel InteGrated toolkit for enhanced pre-Hospital life support and Triage IN challenGing And Large Emergencies

ID: 101021957
 From: 1 October 2021 to: 30 September 2024

In a world where disasters and crises also evolve and cross boundaries with speed and ease , their complexity and magnitude increase, and societal repercussions often reach severe scales, it is imperative to increase citizens' upkeep and feeling of safety and provide...

cordis.europa.eu



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23 partners:

- Tool developers
- End-Users (CRIMEDIM: end users coordinator)

+ Advisory Board



Core Objectives

Upgrade evaluation of injured and affected population (**triage**) using digital identification, traceability, fast diagnosis, continuous monitoring, and accurate classification of medical conditions

Optimise **pre-hospital life support and damage control** and enhance utilisation of assets, resources and capacities using AI-based solutions

Enable **shared response** across emergency services and communication between emergency teams and with victims by developing augmented reality tools for first responders

Need
Assessment



Envisioning
& Evaluating



Information
Gathering



User
Requirements
Specification



Triage and vital signs devices

Devices and mobile applications that assist with unique identification of victims and show the triage status of patients. The devices offer hands-free functionalities and visualisation of vital signs of patients

DEVICES

- DIGITAL TRIAGE TAG
- VITAL SIGNS EARPLUG
- FIRST RESPONDER WEARABLE
- TRIAGE AND VITAL SIGNS APP
- AUGMENTED REALITY GLASSES



Intelligent systems

Intelligent systems that enhance situational awareness and operational capacities of emergency teams. The systems provide information about mass casualty incident scenes quickly, supporting fast triage, diagnosis and prognosis of patients whilst allowing optimal utilization of resources and assets

DEVICES

- UAV RAPID TRIAGING SYSTEM
- THERMAL SCANNING SYSTEM
- RESOURCES AND ASSETS OPTIMISATION
- DIAGNOSIS AND PROGNOSIS SERVICE



Interoperability and data fusion

Information-processing modules support interoperable access of heterogeneous data from the field and open data sources. The system integrates early warning notifications and provisional recommendations that can be communicated to victims and the general public.

DEVICES

- EARLY WARNING AND RISK ASSESSMENT
- DECISION SUPPORT SERVICE
- INTEROPERABLE DATA LAKE
- DATA LAYER



Multi-Agency collaboration

Integrated systems that provide a common operational picture and advance coordination and cross-team collaboration of emergency medical services and civil protection agencies

DEVICES

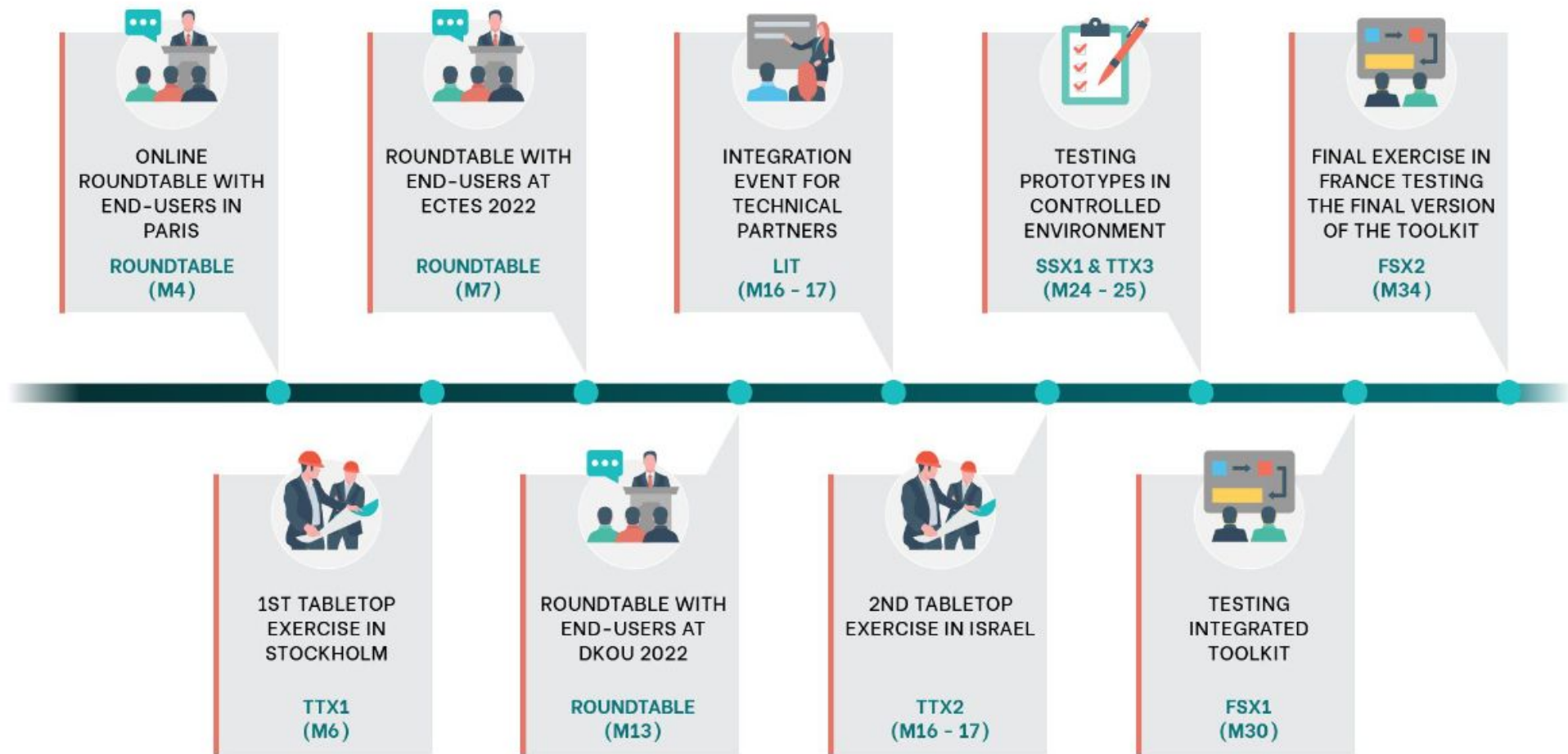
- (C3/IMS)*
- NG 112 (PSAP)**
- SWAPP APP
- SCENARIO BUILDER
- AUGMENTED REALITY SERVICE



**PSAP = PUBLIC SAFETY ANSWERING POINT

*C3/IMS = COMMAND, CONTROL AND COORDINATION & INCIDENT MANAGEMENT SYSTEM

TRAINING, INTEGRATION, TESTING AND VALIDATION ACTIVITIES PROGRAMME





Contents lists available at [ScienceDirect](#)

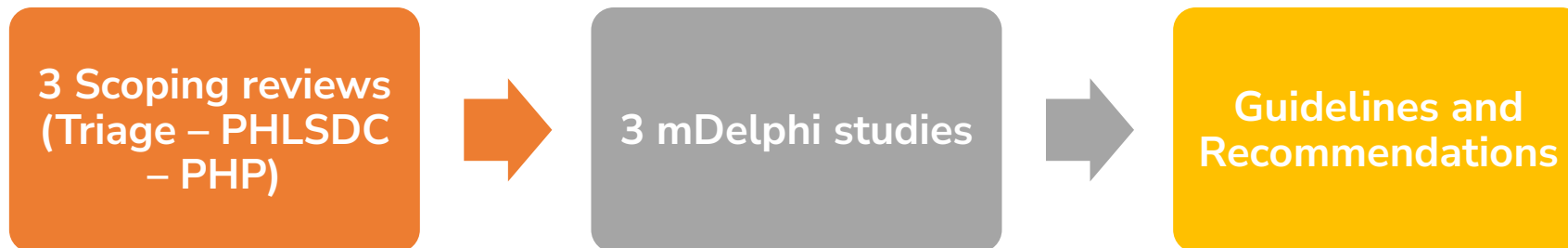
International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdr



An application example of translational science in disaster medicine: From grant to deliverables

Marta Caviglia^{a,*}, Joseph L. Cuthbertson^a, Evangelos Sdongos^b, Roberto Faccincani^{c,d}, Luca Ragazzoni^{a,e,1}, Eric S. Weinstein^{a,1}



“ *La tecnologia deve essere adeguata alle esigenze, agli interessi e alle capacità degli utenti* ”

**Fiducia nei
tool**

**Framework
Legale (Data
protection)**

**Education &
Training**

“ *La tecnologia deve essere adeguata alle esigenze, agli interessi e alle capacità degli utenti* ”

**Tecnologia
inaccessibile**

**Scarso livello di
alfabetizzazione
tecnologica**

**Mancanza di
infrastrutture**

“ *La tecnologia potrebbe determinare un overload di informazioni, difficili da navigare per gestisce le fasi di risposte acute* ”

**Intelligenza
Artificiale**

**FAKE
NEWS**

La tecnologia dovrebbe garantire che le informazioni fornite siano soggette a un adeguato **controllo di qualità**, in modo da assicurare l'accuratezza, l'affidabilità e la veridicità dei dati.



Welcome back, Italy!

We're pleased to resume offering ChatGPT in Italy. To continue on ChatGPT, please confirm that you are 18+ or are 13+ and have consent from your parent or guardian to use ChatGPT.

For information about how we collect and use personal data, please see our [Privacy policy](#). For information about how we develop and train ChatGPT, please see [this help center article](#).

Log out

I meet OpenAI's age requirements

M

quali sono i rischi legati all'utilizzo dell'intelligenza artificiale



L'utilizzo dell'intelligenza artificiale (IA) può comportare vari rischi, tra cui:

1. Bias: L'IA può essere influenzata dai dati di addestramento e dalle preferenze degli sviluppatori, portando a risultati discriminatori o limitati dalla prospettiva umana.
2. Sostituzione del lavoro: l'IA può sostituire alcuni lavori tradizionali, portando alla perdita di posti di lavoro per le persone.
3. Responsabilità: l'IA può prendere decisioni autonome che possono avere conseguenze negative, e la responsabilità di tali decisioni può essere difficile da attribuire.
4. Privacy: l'IA può raccogliere, analizzare e utilizzare i dati personali degli utenti, violando la loro privacy.
5. Sicurezza: l'IA può essere vulnerabile ad attacchi informatici, che possono essere sfruttati per scopi maligni.
6. Dipendenza: la dipendenza dall'IA può portare a una diminuzione delle abilità e delle competenze umane.
7. Impatto ambientale: l'utilizzo dell'IA richiede risorse significative di energia, che possono avere un impatto sull'ambiente.



CONNECTING

Self-driving cars
are as safe as
human drivers

AI is able to make
the scientific
theory

AI defeated human
doctors in contest
to diagnose
tumors

What **CRITERIA** should be followed when introducing new technologies for MCI & Disaster Response?

Need Assessment
(Essential? Important? Nice to have?)

Maintenance requirements
(ease of repair? Availability of spare parts?)

Costs & Sustainability

Competencies required to use the technology in question

Continuity of the training & education required

Ethical Concerns

The **Disaster management cycle** illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred.



01

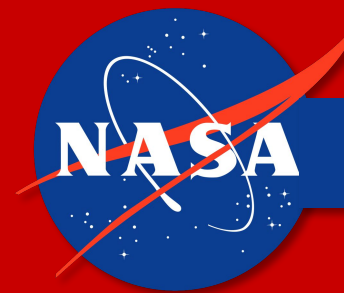
Response

In an emergency, technology can be used to **coordinate and manage the response effort**. It can also be used to provide **information and assistance** to those affected by the disaster.



2005, Hurricane Katrina.

Medical needs of the isolated population were related only in the minority to injury, while **large numbers of patients were in chronic disease-management regimens** (diabetes, anticoagulation, congestive heart failure, immunosuppression, mental illness...).



SATELLITE
TELECONSULTATION



- Remote triage
- Remote access to disaster management experts
- Remote access to disaster site

Journal of Pediatric Surgery (2012) 47, 221–224



Journal of
Pediatric
Surgery

www.elsevier.com/locate/jpedisurg

Using robotic telecommunications to triage pediatric disaster victims

Rita V. Burke^a, Bridget M. Berg^a, Paul Vee^b, Inge Morton^c, Alan Nager^c,
Robert Neches^d, Randall Wetzel^b, Jeffrey S. Upperman^{a, e, *}

01

Response

In an emergency, technology can be used to coordinate and manage the response effort. It can also be used to provide information and assistance to those affected by the disaster.

02

Recovery

Technology can help with the rebuilding process after a disaster. It can be used to **assess damage, create reconstruction plans**, and coordinate relief efforts.



Preparedness

Technology can be used to **create and implement emergency plans, monitor potential threats** (eg. Weather patterns that could lead to natural disasters)



Response

In an emergency, technology can be used to coordinate and manage the response effort. It can also be used to provide information and assistance to those affected by the disaster.

Mitigation

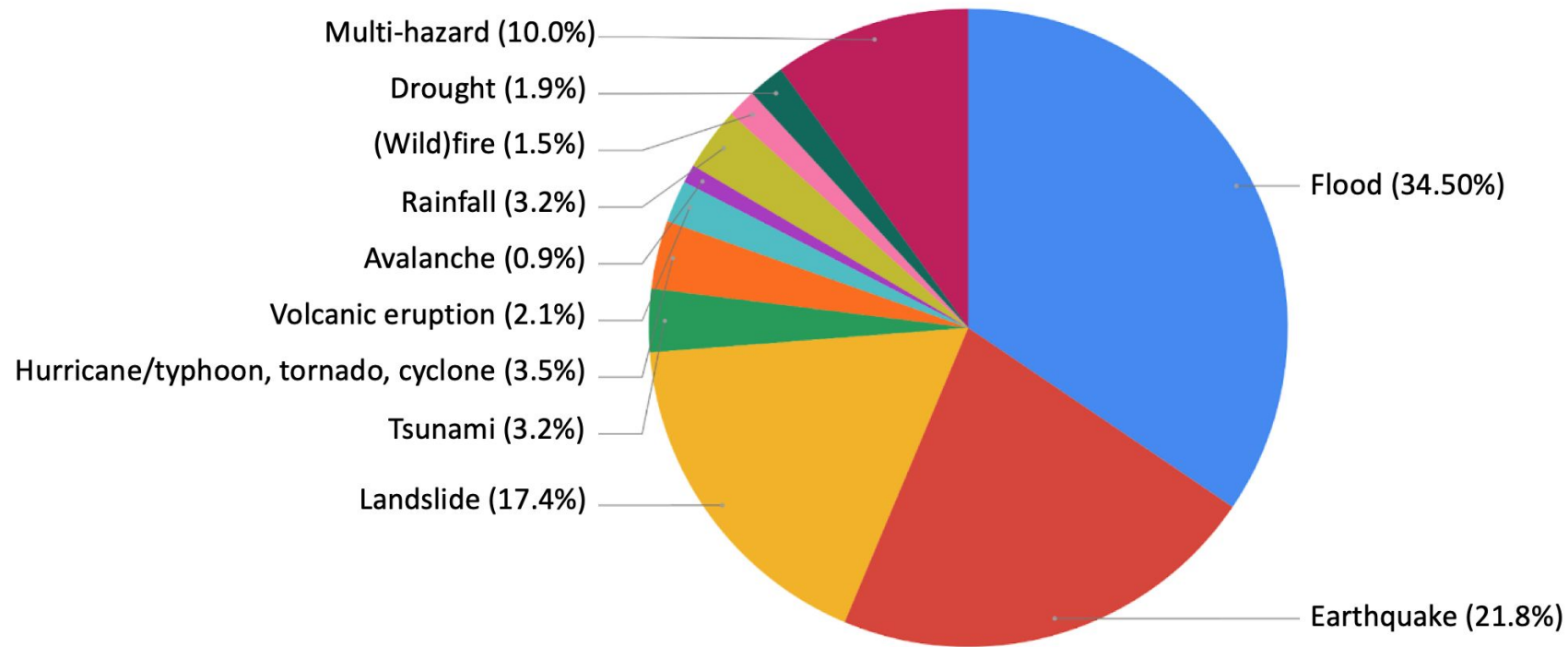
Mitigation, like preparedness, entails doing something to **lessen the chances of a disaster happening again**. These measures are important at any time, but especially in the wake of a disaster when a community or organisation may still be fragile.

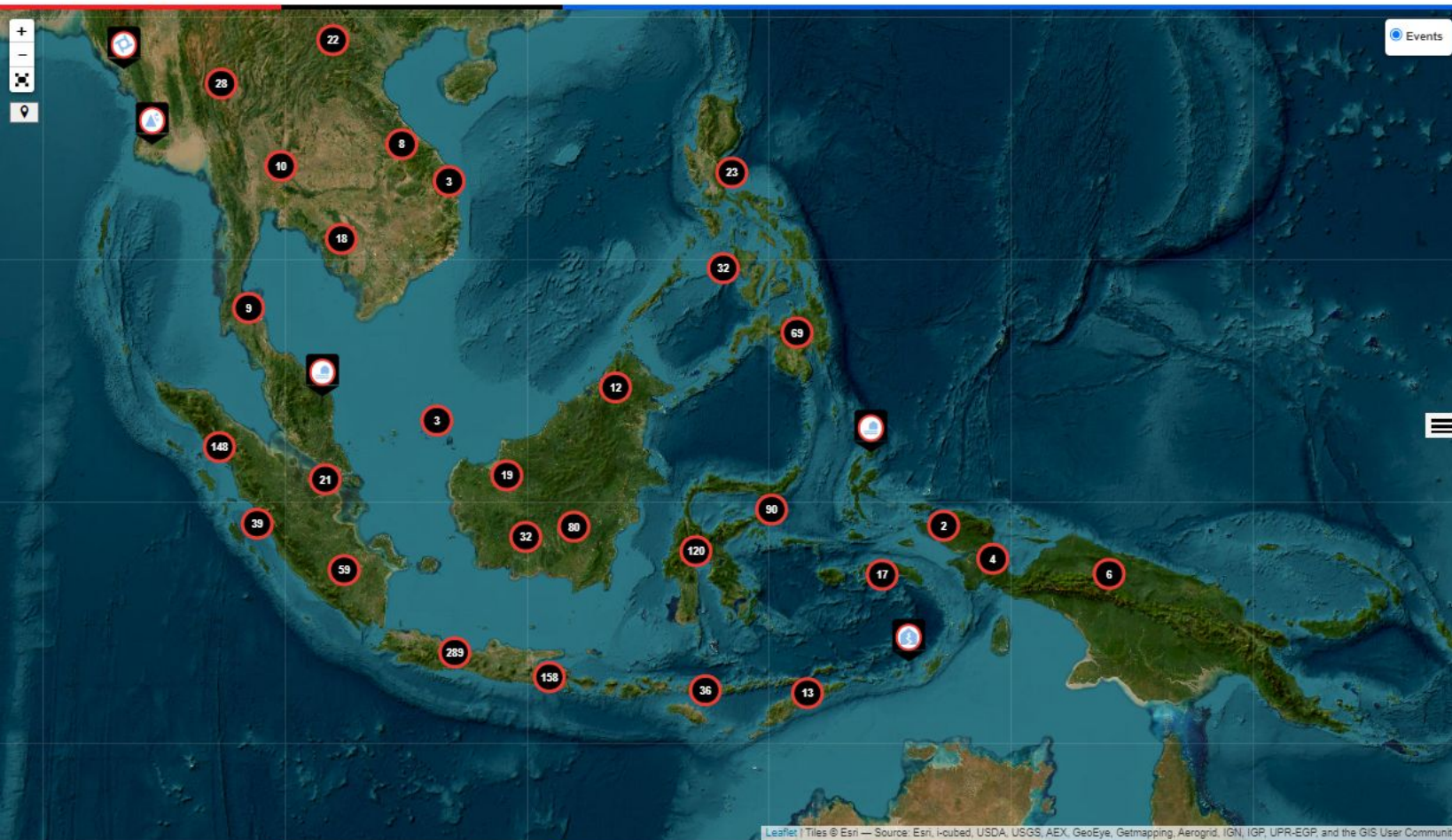


Recovery

Technology can help with the rebuilding process after a disaster. It can be used to assess damage, create reconstruction plans, and coordinate relief efforts.

Application of AI to the **detection and forecasting of natural hazards and disasters** derived from a preliminary literature survey covering articles published between 2018 and 2021 with a focus on (future) DRR applications.





SEARCH Advanced Search +

2012 2022 2023

1012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Results are showing data from
17-5-2022 To 17-5-2023

- CLOSED**
Indonesia, Tornado in Simalungun Regency (North Sumatra)
Sumatera Utara, Indonesia
Tornadoes | Sun, 14 May 2023
- ACTIVE**
Myanmar, Flooding, Landslide, Storms, and Wind in Rakhine, Chin, Kayin, Bago, and Ayeyarwady (TC MOCHA)
Rakhine, Myanmar
Tropical Cyclone | Sun, 14 May 2023
- CLOSED**
Indonesia, Landslide in West Bandung Regency (West Java)
Jawa Barat, Indonesia
Landslide | Sun, 14 May 2023
- CLOSED**
Indonesia, Tornado in South Lampung Regency (Lampung)
Lampung, Indonesia
Tornadoes | Sat, 13 May 2023
- CLOSED**
Indonesia, Strong Wind in Bogor Regency (West Java)
Jawa Barat, Indonesia
Tornadoes | Sat, 13 May 2023
- CLOSED**
Indonesia, Flooding in Oku Selatan Regency (South Sumatra)
Sumatera Selatan, Indonesia
Flood | Sat, 13 May 2023
- CLOSED**
Indonesia, Landslide in West Seram Regency (Maluku)
Maluku, Indonesia
Landslide | Sat, 13 May 2023
- CLOSED**
Indonesia, Landslide in Palopo City (South Sulawesi)
Sulawesi Selatan, Indonesia

Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community



Events

SEARCH

Advanced Search



GET ALERTS

SUBSCRIBE TO ALERTS NOTIFICATION

You can subscribe and customize the area you would like to receive the alert from. The system will send alert notification to your email immediately.

Subscriber Identity

First Name	Last Name
<input type="text"/>	<input type="text"/>
Phone Number	E-mail
<input type="text"/>	<input type="text"/>

Alert Area

Hazard
 Nothing selected

Latitude

Longitude

Geometry

Draw the area by using the polygon or rectangle tools on the map.



Enter Captcha

Submit

All Disasters

Alert / Ongoing

Alert and Ongoing Disasters



Red markers indicate ongoing situations. Orange markers indicate disaster alerts.

- [Tropical Cyclone Mocha - May 2023](#)**

Status: ● Alert • Disaster type: [Tropical Cyclone](#) • Affected countries: [Myanmar](#), + 2 more

- [Rwanda: Floods and Landslides - May 2023](#)**

Status: ● Alert • Disaster types: [Flood](#), + 1 more • Affected country: [Rwanda](#)

- [Colombia: Nevado del Ruiz Volcano - Apr 2023](#)**

Status: ● Alert • Disaster type: [Volcano](#) • Affected country: [Colombia](#)

- [Yemen: Floods - Apr 2023](#)**

Status: ● Alert • Disaster type: [Flood](#) • Affected country: [Yemen](#)

- [Tanzania: Floods - Apr 2023](#)**

Status: ● Ongoing • Disaster type: [Flood](#) • Affected country: [Tanzania](#)

- [Kenya: Floods - Mar 2023](#)**

Status: ● Ongoing • Disaster types: [Flash Flood](#), + 1 more • Affected country: [Kenya](#)



Technology must
serve a need
made clear

Technology must
be secure before
incorporation

Technology must
be equally
developed and
distributed

Disaster Risk

Disaster risk is expressed as the likelihood of loss of life, injury or destruction and damage from a disaster in a given period of time.

UNDRR Global Assessment Report, 2015









UNIVERSITÀ DEL PIEMONTE ORIENTALE

CRIMEDIM

RESEARCH CENTER IN
EMERGENCY AND DISASTER MEDICINE