



# Challenges of Natech emergency management

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# Natural hazard triggered **TECH**nological accident

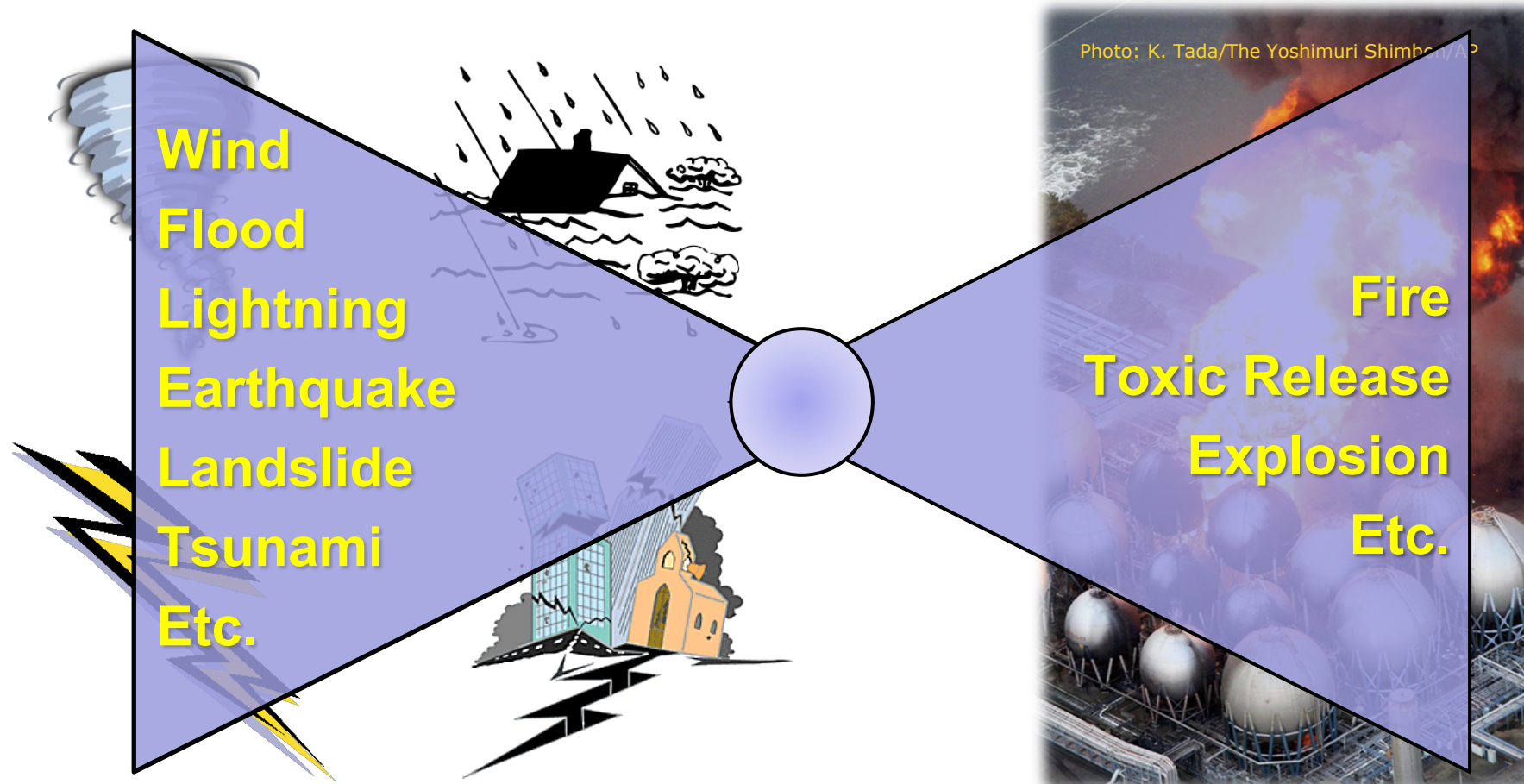




Photo: USGS



Source: P. Danihelka



Photo: Kansas Wing of the Civil Air Patrol



Photo: AP Photo/Kyodo News



Photo: Petroecuador



Photo: D. Tsuda



Photo: D. Brasuell (IFW Magazine)



Photo: NOAA



Photo: R.M. Reed, USCG

# Factors affecting Natech emergency management

- Simultaneous releases from single or multiple sources over large areas



Photo: K. Sasahara/Associated Press

# Factors affecting Natech emergency management

- Loss of safety barriers and utilities for accident prevention and mitigation (water, power)



Source: Gulf Restoration Network

Photo: D.J.Phillip/AP

# Factors affecting Natech emergency management

- Access to affected sites may be hampered



# Factors affecting Natech emergency management

- Hazmat releases (toxic, fires, explosions) can endanger rescue personnel and disaster victims, for example:
  - Released flammables can stratify on and be dispersed over large areas with the flood waters, and ignite → risk of cascading events



Photo: USGS

# Factors affecting Natech emergency management

- Some chemicals react violently with (flood) water to produce toxic or flammable vapors → secondary risk to emergency responders

Flood target	Substances	Final scenarios
Warehouse	Calcium carbide (acetylene after water contact)	Fire
Atmospheric storage tanks	Nitric and sulphuric acids	Toxic gas cloud dispersion
Warehouse	Phosphorus	Fire, Explosion, Toxic gas cloud dispersion
Warehouse	Oleum	Explosion, Toxic gas cloud dispersion
Warehouse	Calcium carbide (acetylene after water contact)	Fire, Explosion
Warehouse	Cyanide salts (hydrogen cyanide after water contact)	Toxic gas cloud dispersion

*\*From V. Cozzani, M. Campedel, E. Renni, E. Krausmann, Industrial accidents triggered by flood events: Analysis of past accidents, J Haz. Mat., 2010*



# Factors affecting Natech emergency management

- Competition for scarce emergency response resources



# Factors affecting Natech emergency management

- Non-functional or inappropriate standard civil protection measures (shelter in place, evacuation)



# Natech emergency management: rising to the challenge

- Natech accident complexity is high: preparedness is key for successful consequence mitigation
- Natech emergency plans should:
  - Consider the possibility of multiple and simultaneous releases, and loss of utilities
  - Assume that offsite response resources may be unavailable
  - Assume that safety barriers do not exist or are non-functional
  - Consider increased risk of cascading effects
  - Consider that shelter in place or evacuation might be impossible due to natural hazard impacts on buildings and roads



# General considerations I

1. The **vulnerability of emergency response resources** to natural hazards and to Natech accidents should be assessed, incl. response capacity needed in case of simultaneous natural disaster and Natech accident(s).
2. If **effectiveness of prevention and mitigation measures** during natural hazard conditions is not clear, the emergency plan should not rely on such measures.
3. If the **continued service of utilities** during natural hazard conditions cannot be ensured, the emergency plan should not rely on them.
4. Emergency plans should include strategies to adopt when both **main and backup utilities are unavailable**.

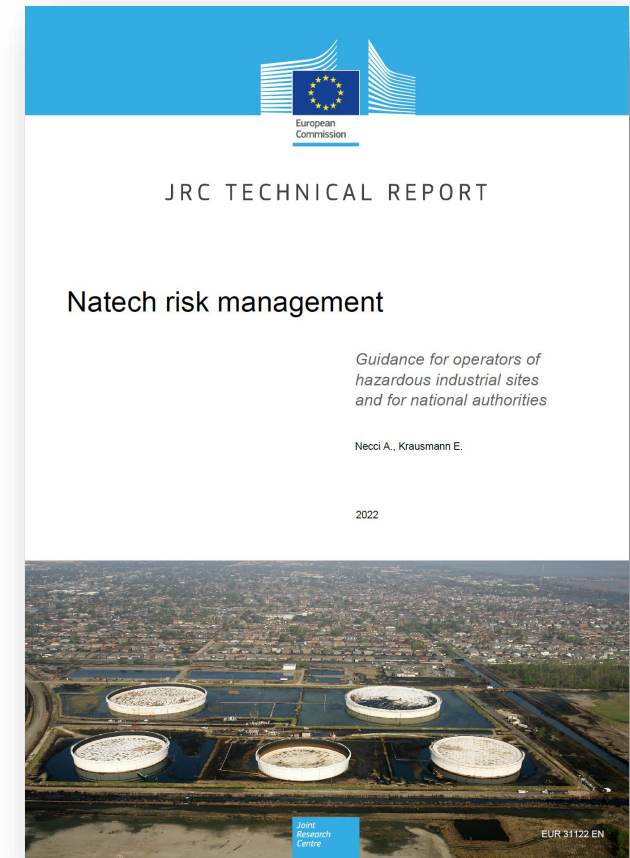
# General considerations II

1. On- and offsite emergency plans should be periodically **reviewed and tested** (table-top and full-scale exercises).
2. Dedicated **training** should be organised to ensure effective response to Natech accidents, considering their specific characteristics.
3. Appropriate **emergency response equipment** should be available in case of exceptional conditions created by a natural hazard (e.g. flood, storm).
4. The **impact of climate change** on natural hazard trigger conditions should be periodically assessed as it can change planning assumptions.

# JRC Natech risk management guidance

- **Technical guidance** for operators of hazardous sites and national authorities (focus Seveso)
- Step-by-step guidance on how to identify, analyse and treat Natech risks
- **Focus on identification and modelling of Natech scenarios**
- Includes a section on emergency management

<https://publications.jrc.ec.europa.eu/repository/handle/JRC129450>

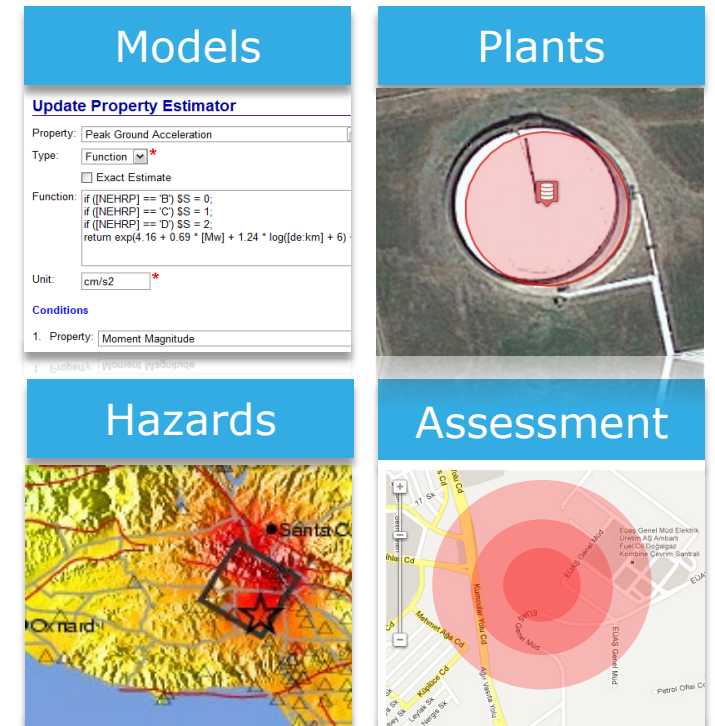


# Natech accident scenario identification

**RAPID-N:** unique web-based, public JRC decision-support system for Natech risk analysis and mapping

- Unites natural-hazard assessment, damage estimation and consequence analysis in one tool
- Users from about 200 institutions globally (government, industry, academia, practitioners)

 <https://rapidn.jrc.ec.europa.eu>



# RAPID-N Natech risk analysis - Example



RAPID-N  
Rapid Natech Risk Assessment Tool

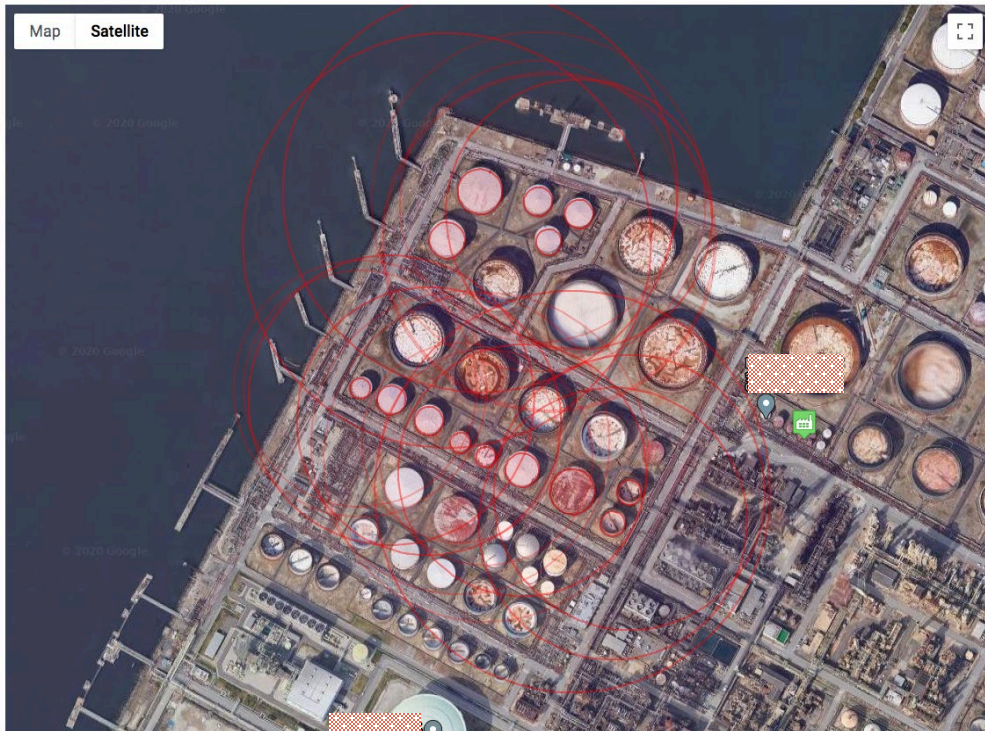
European Commission > JRC > RAPID-N

## Risk Assessment

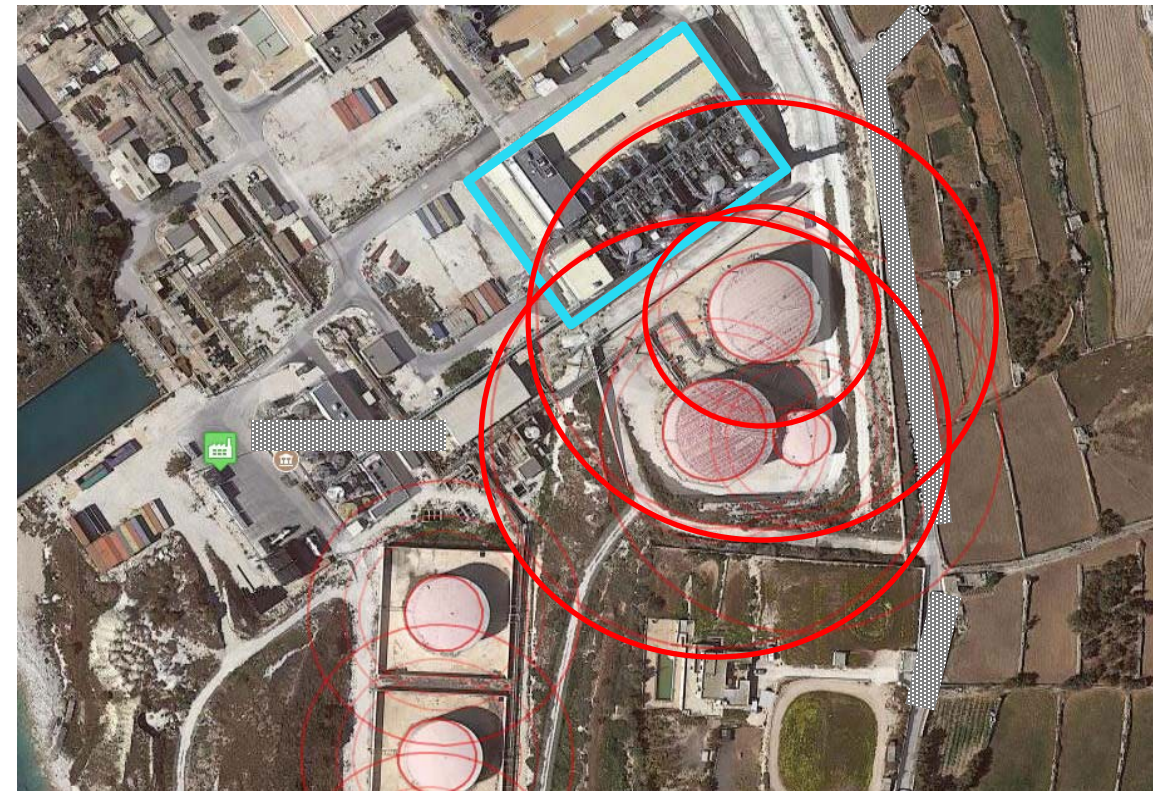
This is an experimental system, made available without commitment to experts in the domain for test and verification. The results produced by this system depend heavily on the data, models and assumptions used, and should not be used for decision making without careful validation of those.

The European Commission does not warrant the accuracy of data or processes in the system, and is not responsible for any damage, loss, or improper decision resulting from its use.

Map Satellite



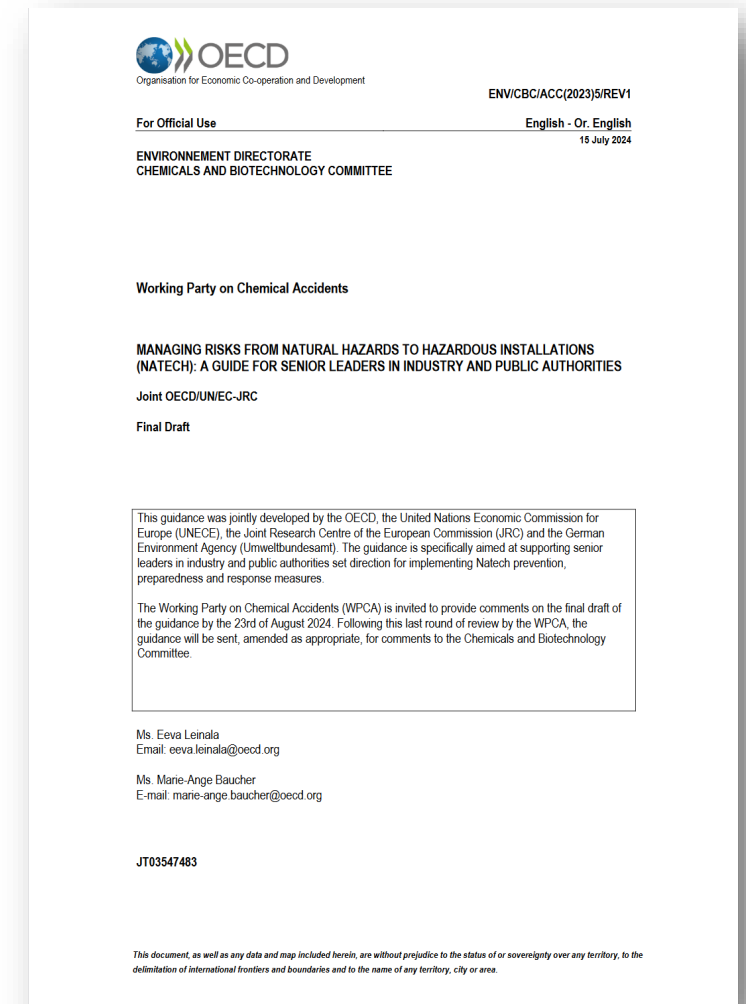
## Potential cascading effect





# OECD-UN-JRC Natech risk management guidance

- **Guidance for senior leaders in industry and public authorities:**
  - What should I do to ensure good governance of Natech risk?
  - How do I gather and organise the capabilities and competences to do it?
  - How do I ensure that my organisation continues to adapt to a changing environment?
- **Includes a section on emergency management**
- **To be launched on 28 November at UNECE COP**



# Thank you

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# JRC support to Natech risk management



## Forensic analysis and gap analysis

- Incident analysis for industry & critical infrastructure
- Lessons learned and recommendations
- Natech incident database: eNATECH

## Risk governance and guidance

- Natech risk management performance indicators
- Guidance on Natech risk management
- Collaboration with OECD and UN



## Natech risk analysis/mapping

- Identify Natech hotspots and screen for cascading risks
- Web-based system for rapid Natech risk analysis and mapping: RAPID-N

## Capacity building

- Training workshops on Natech risk analysis and risk reduction
- Joint Natech risk-analysis case studies