The ARISTOTLE Multi-Hazard Expert Advice System in the framework of the European Research Infrastructures

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ARISTOTLE

All Risk Integrated System TOwards Trans-boundary hoListic Early-warning

Pilot Project in the area of Early Warning System for natural disasters
Contract n. ECHO/SER/2015/722144
OUTLINE

● Context
● ARISTOTLE
  ○ The what
  ○ The how
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● EPOS services and ARISTOTLE
● A look into the future
● DRR and EU agenda
Events are multi-hazard

Decision-makers require Authoritative, Timely, Multi-Hazard Advice

Sources:
http://floodlist.com/europe/albania-floods-damage-december-2017
How to combine national centers and ERCC activities?

National Operational Centers → ERCC

Context
From data to Multi-Hazard advice

Operational automatic and non-automatic services

How to provide comprehensive multi-hazard scientific advice?
From data to Multi-Hazard advice

Context

Operational automatic and non-automatic services

COMPREHENSIVE OPERATIONAL MULTI-HAZARD 24*7 SCIENTIFIC ADVICE INTO ERCC/EC
ARISTOTLE builds upon member states national expertise to improve EC coordination and support the CPM by providing:

- **24*7 Expert Advice to ERCC**
- rapid understanding of events and how they might unfold helping to interpret the resulting impact consistent with and built on national mandate
- global scale coverage

Service to be **flexible, scalable and extendable in partners and hazards**
ARISTOTLE Partnership (2016-2018)
• 15 institutions

Coordination
• INGV (ITA) & ZAMG (AUT)
The hazards and response times

Aristotle: The what

Severe Weather
(>5 days)

Floods
(>~5 days)

Volcanoes
(Hours/days ??)

Earthquakes
(can’t be forecasted)

Tsunamis
(minutes-hours)

Weekly reports & Situational awareness reports

3-hour report Intermediate updates

Event
3H

TIME

pro-active mode

reactive mode

ERCC (JRC)

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Aristotle: the how

From data to Multi-Hazard advice

Operational automatic and non-automatic services

COMPREHENSIVE OPERATIONAL MULTI-HAZARD SCIENTIFIC ADVICE INTO ERCC/EC
The Multi-Hazard Operational Board (MHOB)

- 7*24 operational Multi-Hazard advice
- synergy between member states, nationally mandated, scientific institutions
- avails of all the information available
The 24*7 Operational Service

- started 1 February, 2017
- 44 Emergency activations (with corresponding Emergency reports and Update reports)
- Weekly information single hazard and multi-hazard reports
- Situational/monitoring reports specific for an event that may be relevant for ERCC
Activated - reactive mode

Many sources of information

The Iran-Iraq M7.2 Earthquake on the 11/12/2017
EXECUTIVE SUMMARY

A Major earthquake with magnitude 7.2 occurred on Sun Nov 12 18:19:19 2017 (UTC) with latitude 34.93°N, longitude 45.79°E and depth of 33.9 km. This is an inland event situated at the border between Iran and Iraq. The earthquake was strongly felt in the provinces of Kermanshah, Ilam, and West Azerbaijan.

The earthquake can have induced landslides. The weather in Iran is very quiet and settled at the moment and for the coming week is expected no rain or significant wind and there is no central trend, no other major tectonic components could be revealed with the information available at this moment.

According to USGS PAGER and ARISTOTLE exposure analysis, very few people or no people have been exposed to Mercalli Intensities greater than VII level. However, about 447,000 people suffered Mercalli scale intensities greater than VII which can result in damage considering that Iraq is in a "very high risk" class (see FORM). The closest city is Ash Shaiman in Iraq at ~80 km distance. Testimonials inform that people evacuated building in many cities, from Kusawati to Baiji.

At the moment, very little information has been collected within the first 50 km of the epicentre, either because damage is significant - which is the likely seismological scenario - or because of poor communication. However, early reports indicate damage and tens of casualties in the villages near the epicenter. However, a few hundreds of casualties may have occurred given that ~35,000 people are present within 20 km from the epicenter, it is possible that several hundred people have lost their lives in the city of Qaseh Shirin, Kermanshah province; Governor of Qaseh-e Shirin, many injured.

The Mosul dam is ~300 km distant from the epicenter and the ShakeMap indicates Mercalli degree IV which should not induce new damage.

The first estimation provided by GCACS was a “Red Earthquake” indicating a high humanitarian impact. ARISTOTLE judgment indicates orange on a national level.

As consequence of the earthquake, it now started an earthquake sequence that will last several months. Earthquakes like this one can have major aftershocks sometimes larger than magnitude 6 which can result in additional damage.

GEOPHICAL LOCATION

IRAN-IRAQ BORDER REGION: 34.93 45.79
Magnitude 7.2, depth 33 km

OVERALL IMPACT

Medium

LACK OF COPING CAPACITY

Iraq: HIGH (6.9)

ALERT LEVEL

- High
- Medium
- Low

Required Resources

- Sub-national
- National
- International

Basic description

Potential cascading effects / Weather assessment and forecast

Impact assessment with the available information within 3 hours

Potential evolution
The reports (Emergency, weekly / situational) are uploaded onto the ERCC/JRC report sharing platform.
Main Achievements

• Implementation and deployment of a 7*24 operational system after only 12 months from the project start

• Standard Operating Procedures (including the MHOB concept), Governance and Products tailored to the needs of ERCC

• Set up a management and working structure that, building on the partners’ expertise and operational background, allows different communities to work efficiently together with a single aim

• Preparation of a database with an inventory of entities operating 7*24 in the UCPM countries

• Preparation of the first-ever “European Natural Hazard Scientific Partnership” (ENHSP)
EPOS services and ARISTOTLE

• EPOS through its own communities in the solid Earth science provides access to a large number of services (e.g., webservice for e.g. waveform and parametric data DBs, quasi real-time data analysis, strong ground motion models, geological information, historical catalogues, ...);

• ARISTOTLE adopts already some of these services (e.g., EMSC and INGV FDSN event webservice, EMSC maps for Seismicity, Moment tensors and PGM&population) and other services developed by the H2020 SERA project for “Real-time earthquake shaking” will be implemented;

• ARISTOTLE can also contribute to the services developed by EPOS
List of web services and databases used by Aristotle SPADA:

1. FDSN event services (USGS, EMSC, INGV, ISC, GFZ; retrieves earthquake information in quasi real-time from major agencies and worldwide catalogs):
   - [http://www.seismiportal.eu/fdsnws/event/1](http://www.seismiportal.eu/fdsnws/event/1)
   - [http://www.isc.ac.uk/iscbulletin/search/webservises/](http://www.isc.ac.uk/iscbulletin/search/webservises/)

2. LandScan15 population services (determines population within geographic polygons, [http://eastview.com/online/landscan](http://eastview.com/online/landscan))

3. Google Maps web services


5. Airport retrieval service (retrieves all size airports from the ourAirports open DB, [http://ourairports.com/data/](http://ourairports.com/data/))


7. Cities retrieval service (retrieves cities from global geonames DB, [http://www.geonames.org](http://www.geonames.org))


9. Countries retrieval service (retrieves ISO2 and ISO3 code countries; [http://www.naturalearthdata.com/downloads/10m-cultural-vectors/10m-admin-0-country](http://www.naturalearthdata.com/downloads/10m-cultural-vectors/10m-admin-0-country))


11. ETOP01 global relief ([https://www.ngdc.noaa.gov/mgg/global/](https://www.ngdc.noaa.gov/mgg/global/))

12. Coastlines service to detect whether a point is at sea or on land adopting the Global Self-consistent, Hierarchical, High-resolution Geography Database ([http://www.soest.hawaii.edu/wessel/gshhg/](http://www.soest.hawaii.edu/wessel/gshhg/))

13. USGS services ([https://earthquake.usgs.gov/fdsnws/event/1/](https://earthquake.usgs.gov/fdsnws/event/1/))
   - a. ShakeMap
   - b. PAGER
   - c. moment-tensor/focal mechanism

   - a. Seismicity (global, regional, local scales, depth, magnitude)
   - b. Moment tensors
   - c. PGM/population


16. GSHAP service ([http://gme.gfz-potsdam.de/pub/GSHAP_Map_Online/gshap_map_online_frame.html](http://gme.gfz-potsdam.de/pub/GSHAP_Map_Online/gshap_map_online_frame.html) or internal map service)

17. Tide tsunami modeling web services ([http://tiedee.tide.kust-anl.edu](http://tiedee.tide.kust-anl.edu))

18. Internal map service for major tsunamiogenic earthquakes

19. Access to NOAA map service ([https://gmap.ngdc.noaa.gov/vi viewers/hazard/layer-0](https://gmap.ngdc.noaa.gov/vi viewers/hazard/layer-0))

20. INFORM database service (retrieves country risk data; [http://www.inform-index.org](http://www.inform-index.org))

21. Countries/Institutions earthquake competent areas/countries service

22. GDACS ([http://www.gdacs.org](http://www.gdacs.org))

23. FL: Roads and rail data: [Open Street Mapping](http://www.openstreetmap.org)

24. FL: Cities data: NASA Global Rural-Urban Mapping Project (GRUMP), v1


26. FL: Historical economic damages: [European Environment Agency](http://www.eea.europa.eu)

27. FL: Hydrological data and prediction of economic damages: [European Flood Awareness System (EFAS)](http://www.efas.eu)
A look into the future

The ENHSP guidelines and recommendations

- The Guidelines are an ARISTOTLE deliverable
- The ENHSP vision is an extension of the ARISTOTLE service into all the steps and aspects required to achieve the best operational advice into the ERCC
- The ENHSP is scalable, flexible and has the ability to adapt to new challenges and to assimilate new techniques as they develop

ARISTOTLE2 passed recently the evaluation procedure and is currently in the process of signing a new contract with DG-ECHO
Commission Work Programme 2018 “An agenda for a more united, stronger and more democratic Europe”

Priorities of the Juncker Commission

An area of Justice and Fundamental Rights based on mutual trust:

The Union aims to promote the well-being of citizens, which means contributing to their security. It has played a key role in protecting citizens against natural disasters in the past year, and must continue to do so. The European Union Civil Protection Mechanism is evidence of European solidarity both inside and outside the Union borders. We will propose to strengthen the mechanism and to endow it with its own operational capacities in order to ensure that the Union can provide better crisis and emergency support to our citizens with maximum efficiency and minimum bureaucracy.

The Commission proposal focuses on two complementary strands of action:

- Strengthening European response capacities: resceEU

A EU civil protection response reserve of civil protection assets will be established to assist Member States in responding to disasters, when national capacities are overwhelmed.

- Stepping up disaster prevention and preparedness

Under today’s proposal, Member States will be asked to share their national prevention and preparedness strategies, in order to collectively identify and address possible gaps. The proposal strengthens cooperation and coherence with existing EU policies dealing with prevention and preparedness.
The National - European synergy loop

- Gains Complementary expertise
- Builds upon national expertise
- Returns additional expertise to national level
Thank you for the attention