



beAWARE

Enhancing decision support and management services in extreme weather climate events

What are the benefits of an enhanced decision support system against wildfires?

The case of beAWARE

PSCE Conference

Bled, Slovenia 13.12.2018

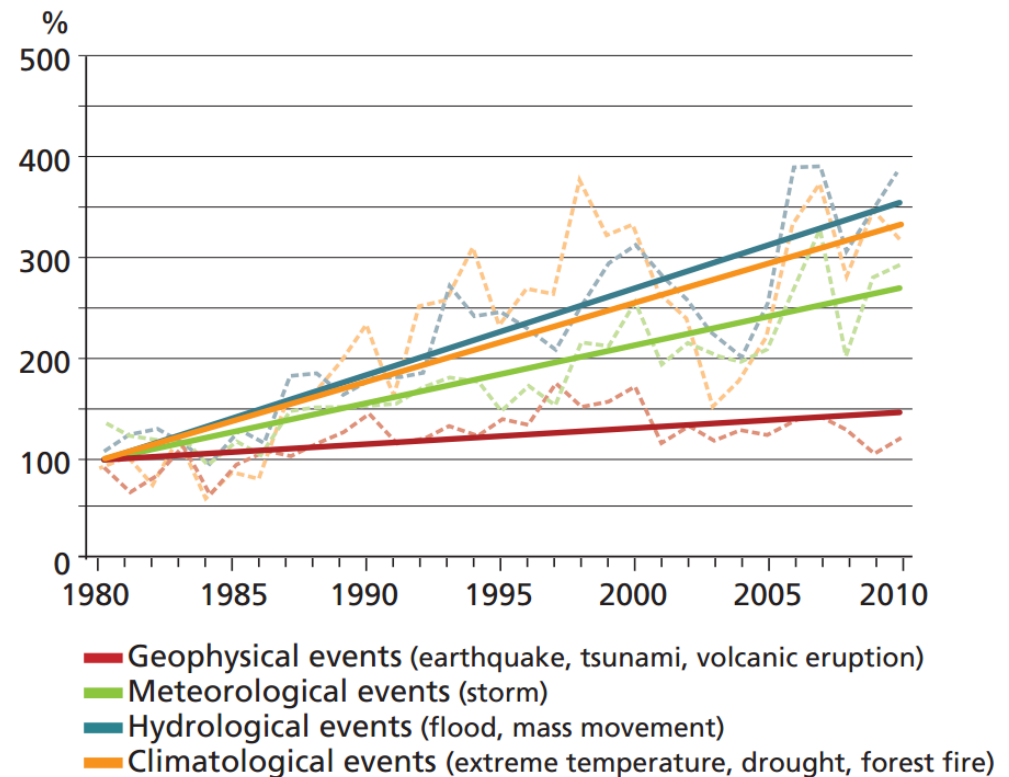
.....



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 700475

The challenge

- Wildfires are an increasing and continuously more dangerous phenomenon
- Droughts and wildfires show the most pronounced upward trend



Trends in different types of natural catastrophe worldwide, 1980–2012 (1980 levels set at 100%; Munich Re NatCatSERVICE)

Source: http://www.droughtmanagement.info/literature/EASAC_trends_extreme_weather_events_europe_2013.pdf

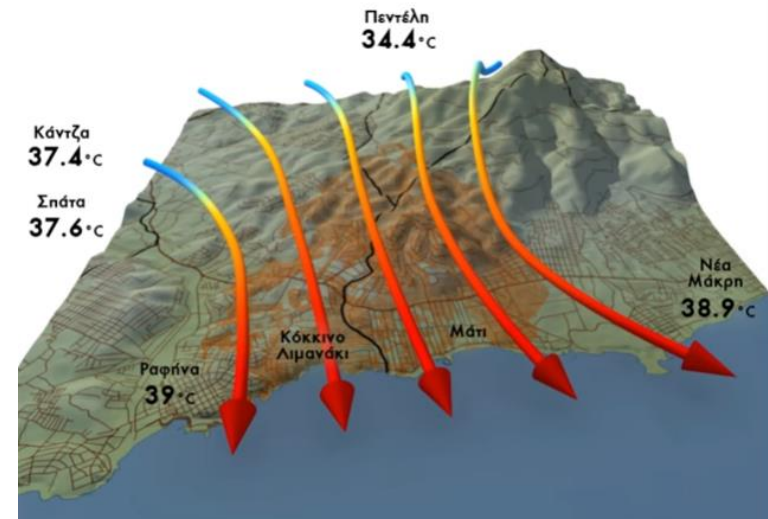
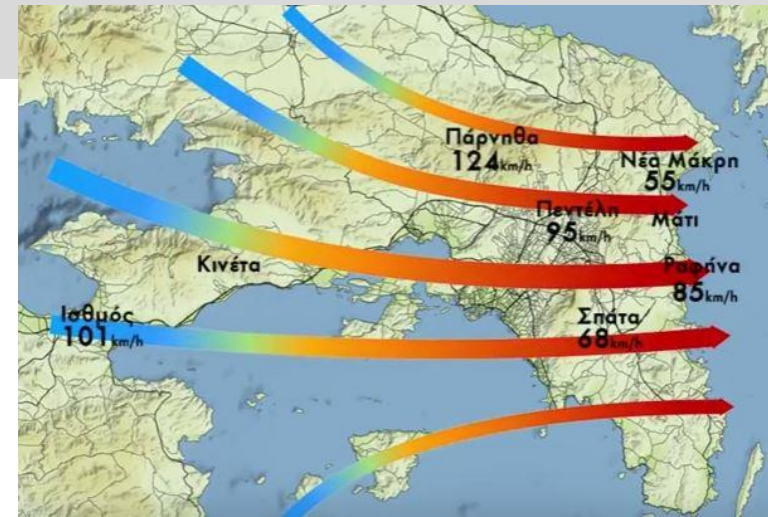


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Recent examples - Greece

- Mati (Greece) - 2018:
 - 99 people dead
 - 164 people injured
 - 1.276 hectares destroyed
- Characteristics
 - Extremely strong winds (100-120 km/h locally)
 - Temperatures near 40 °C



Source: National Observatory of Athens



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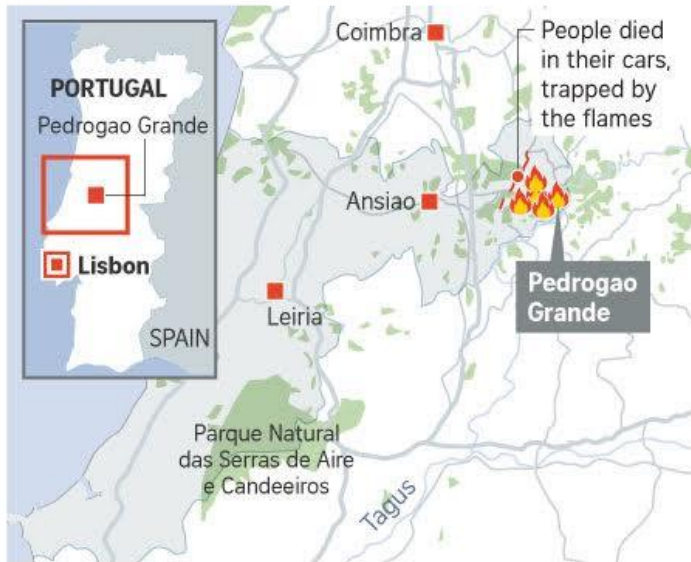
Issues faced

- In the case of Mati the problems that were faced based on reports were:
 - Difficulty in issuing a public alert in order to evacuate the area
 - Coordination and communication issues
 - There was no clear understanding the current status of the situation
 - Many people tried to evacuate using their cars and the narrow streets were jammed → Traffic jam

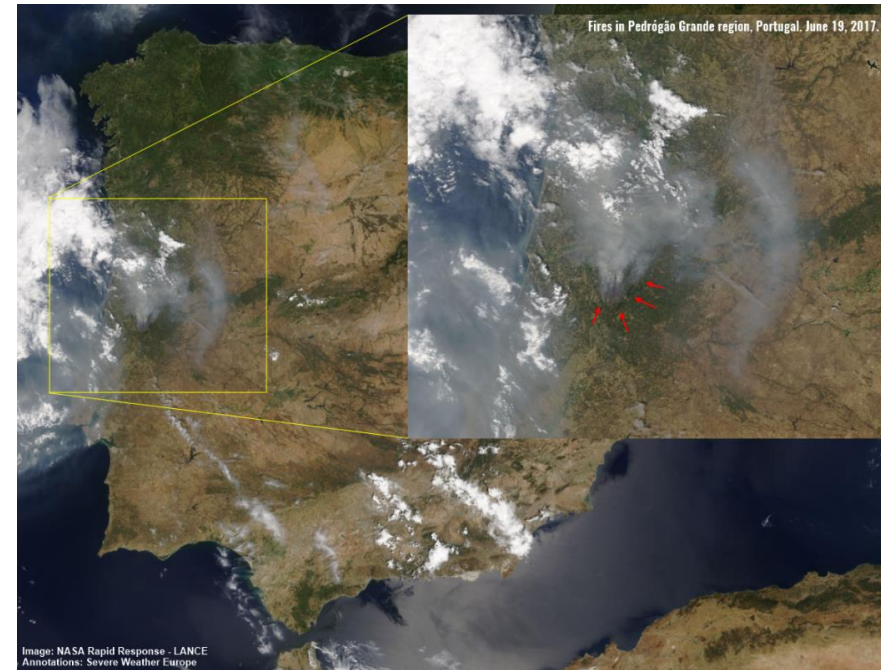


Recent examples - Portugal

- Pedrógão Grande (Portugal) - 2017
 - 66 people dead
 - > 200 people injured
 - > 520.000 forest hectares destroyed



Source: AFP, REUTERS
STRAITS TIMES GRAPHICS



Satellite images show the fires (marked with red arrows) burning intensely yesterday, June 19. Image: NASA MODIS.

Source: <http://www.severe-weather.eu/news/high-fire-hazard-across-large-parts-of-europe-june-20/>



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Issues faced

- In the case of Pedrógão Grande the problems that were faced based on reports were:
 - Absence of an early warning system in place
 - Difficulty in issuing a public alert in order to evacuate the area
 - Coordination and communication issues
 - There was no clear understanding the current status of the situation
 - No pre-positioning of forces
 - No analysis of the evolution of the situation based on the available meteorological information



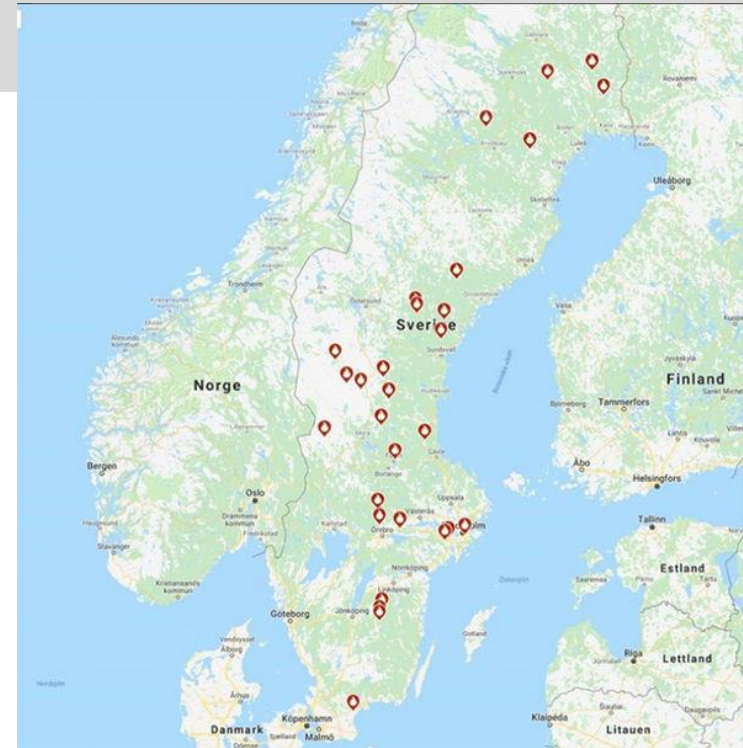
Recent examples – Sweden

- Sweden - 2018
 - Total of 250 km² of forest area was affected



Sweden fire satellite MAP: Aerial picture showing smoke billowing from the Sweden wildfires (Image: GETTY).

Source: <https://www.express.co.uk/news/world/993021/sweden-fire-satellite-map-aerial-pictures-wildfire-norway-sweden>



This map shows where fires were burning in Sweden
Image: SOSAlarmSverige).

Source: <https://www.express.co.uk/news/world/993472/Sweden-fire-map-Sweden-wildfires-drought-heatwave/>



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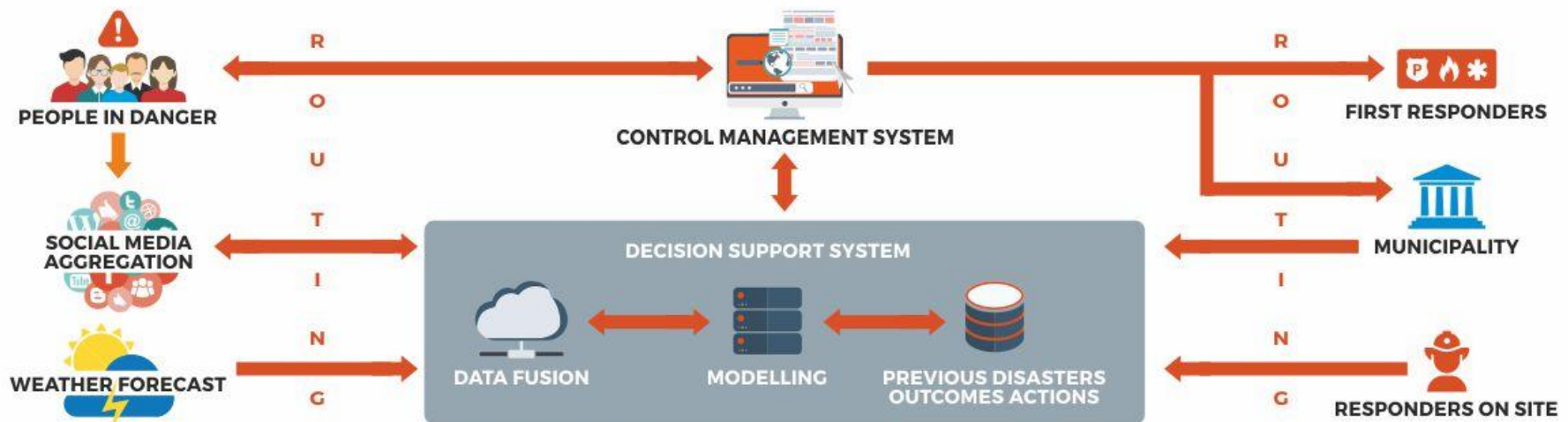
Benefits of Decision Support Systems

- In general, the benefits of a DSS can be summarized in:
 - Time saving
 - Early warning
 - Enhance effectiveness
 - Improve interpersonal communication
 - Offer a competitive advantage
 - Increase decision maker satisfaction
 - Promote learning
 - Increase organizational control
- The goal is to demonstrate how the above can support the management of wildfires



beAWARE concept

- **beAWARE** proposes a **holistic approach** to the realization of **crisis management frameworks** supporting **all the phases** in an emergency sequence
- **beAWARE** offers an integrated solution to provide **early warnings, risk assessment, aggregated analysis of multimodal data** and **decision support** to the authorities in order to **plan** and **coordinate** the most effective response with the available resources

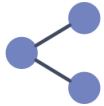


beAWARE

Data products



Weather Data



Social Media



Sensors



Drones



Mobile App

Integration



Knowledge Base



Database

EARLY WARNING

REASONING

Technologies



PSAP



Report
Generation



Mob. App



Text Analysis



Video Analysis



Crisis
Classification



Image
Analysis



Audio Analysis



Social Media Analysis

Stakeholders



Citizens



Authorities

PREVENTION



PREPAREDNESS



RESPONSE

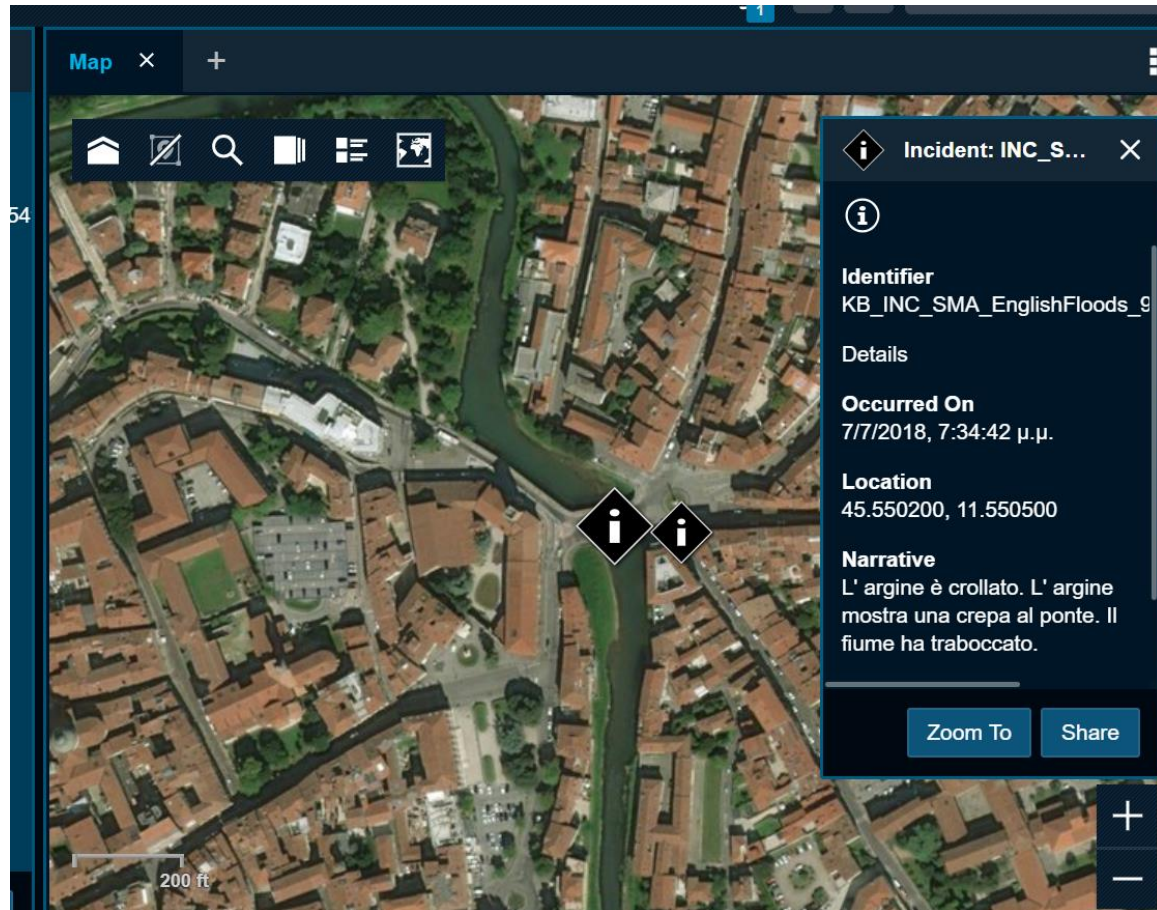
beAWARE tools

- Alert based on meteorological Data (pre-emergency) - Crisis Classification
- Multilingual Text Analysis
- Aggregate Multimodal Information
 - Weather Data
 - Sensor Data
 - Social Media
 - Multimedia
- Image Analysis - Video Analysis - Drones
- Information from sensors
- Task Management
- Report Generation
- PSAP



Multilingual Text Analysis

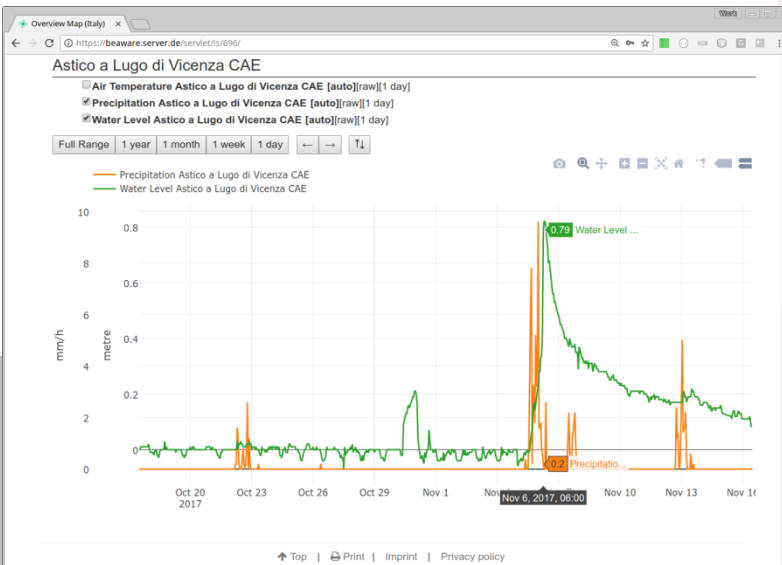
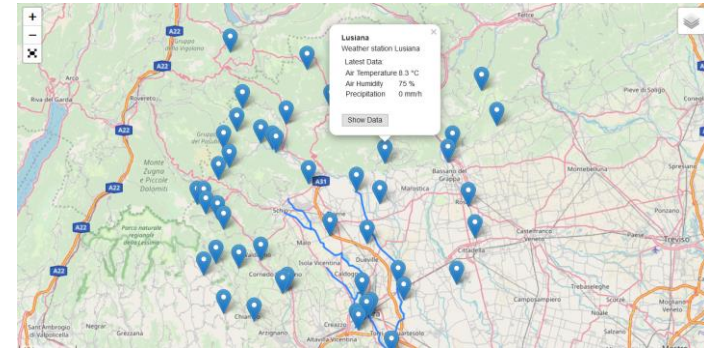
- Analysis from English, Greek, Italian and Spanish texts
 - Text from **tweets**
 - Text from **mobile application** (first responders/people in danger)
 - Text from automatic **speech recognition output**



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Aggregate Multimodal Information

- **Weather data**
 - Forecast & Current data
- **Sensor data**
 - Sensor-thing server
 - Hydrological and hydraulic modelling
- **Social media**
 - Collection of Tweets for Fire, Flood, Heatwave for English, Spanish, Greek and Italian
- **Multimedia**



The figure is a screenshot of the beAWARE website, which aggregates social media information about flooding. The page is titled 'English Floods' and displays a list of tweets. The tweets include:

- Matteotti square is flooded. #underwater #flooding (Thu, 19 Oct 2017 16:04:07)
- The sewers are flooded. #Vicenza #flooding (Thu, 19 Oct 2017 16:39:24)
- Help! All the levees have collapsed. #flooding (Thu, 19 Oct 2017 16:57:58)
- #Rain and #flooding: black Saturday of financial market (Thu, 19 Oct 2017 17:07:37)
- Today, I've a good reason for not going working in #vicenza! #flooding (Thu, 19 Oct 2017 17:20:01)
- Every #flooding, let all people make synchronized swim with glittering swimsuits (Thu, 19 Oct 2017 17:24:03)
- #weatherAlert, Streets dello Stadio is going to be flooded. People struggle to walk because of... <https://t.co/julfaxcXJK> (Fri, 20 Oct 2017 10:53:01)

The page also features a 'beAWARE' logo, a 'Privacy policy' link, and buttons for 'Insert to DB' and 'Empty the DB'.

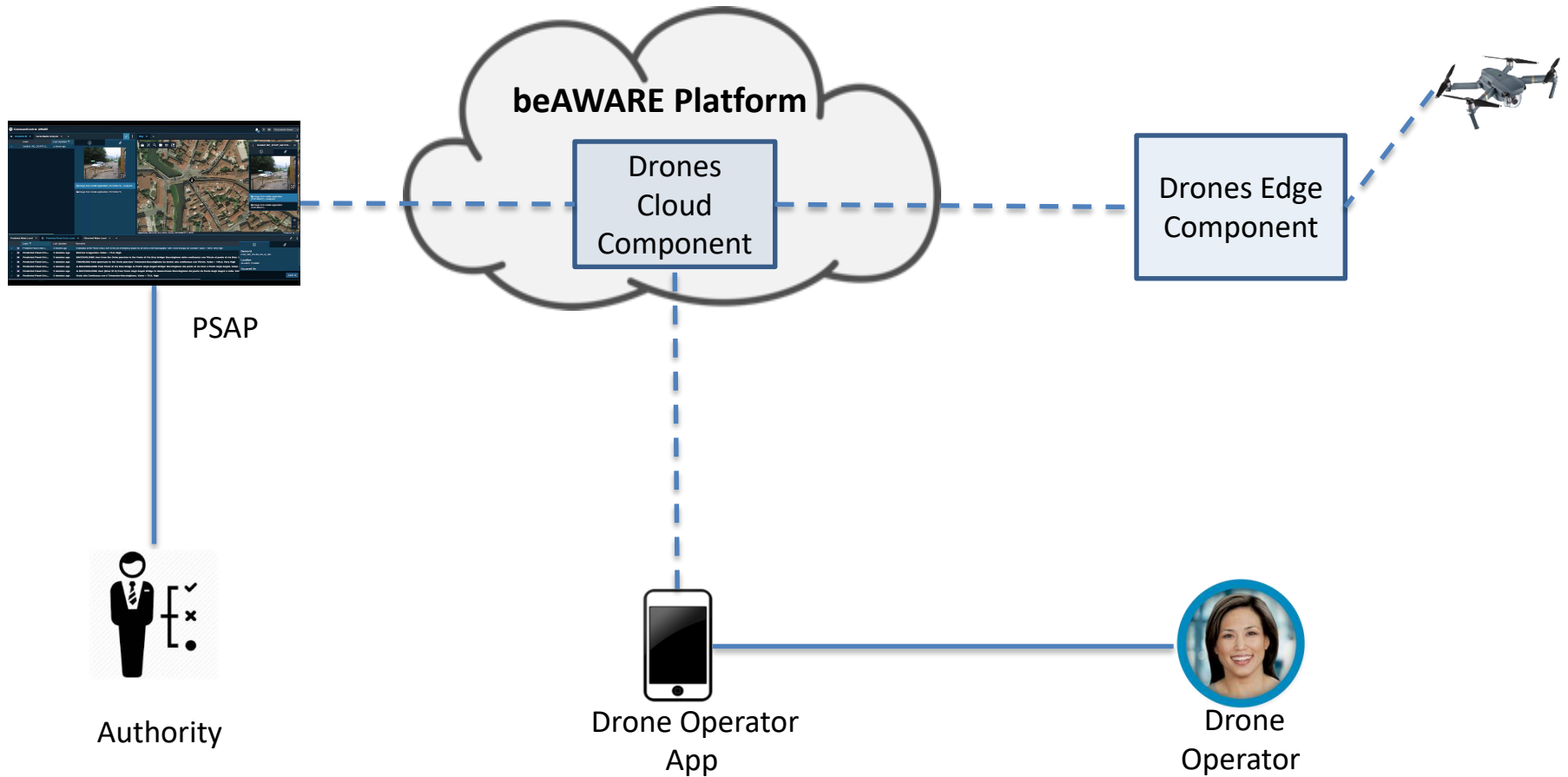
Visual Analysis

- Image, Video and Audio Analysis
 - **Crisis event detection** in images and videos
 - **Traffic analysis** from static surveillance cameras
 - **Automatic speech recognition** component



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Visual Analysis – use of drones



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Visual Analysis – use of drones

- Automatic drone route planning using service parameters
- Autonomous drone piloting
- Automatic invocation of drone's on-board equipment (ex., camera)
- Collection of media and events produced by drone
- Data storage using beAWARE infrastructure
- Communication with media analysis components using beAWARE infrastructure
- Drone component dashboard for management and flight monitoring



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Semantic Integration

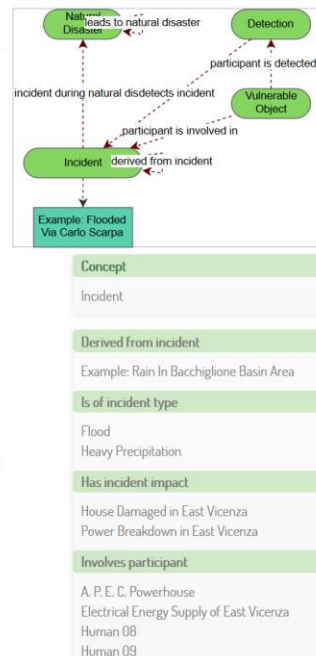
- Reasoning based on multimodal input
- Incidents to PSAP
- Clustering of incidents
- Calculation of incidents' **severity** levels
- Update of the **safe locations** status
- Identify the **crisis type**

Flooded Via Carlo Scarpa

The Via Carlo Scarpa is flooded.

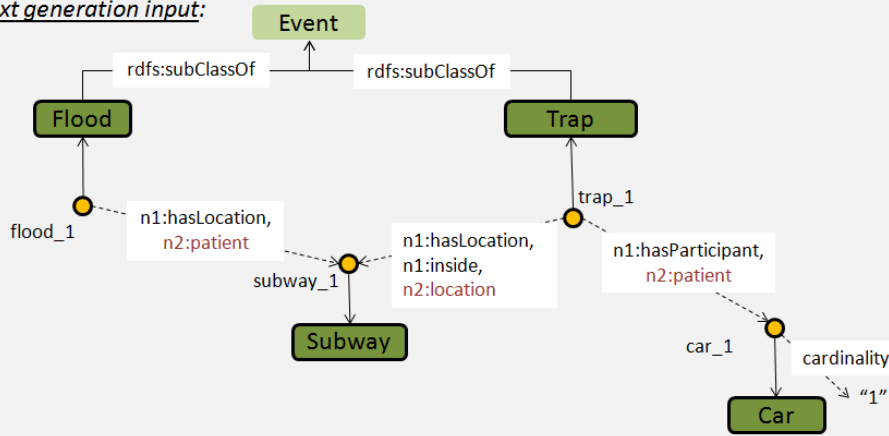


The Via Carlo Scarpa was flooded due to heavy rains. The powerhouse was suffered water damages and was shut down for safety reasons.



Report Generation

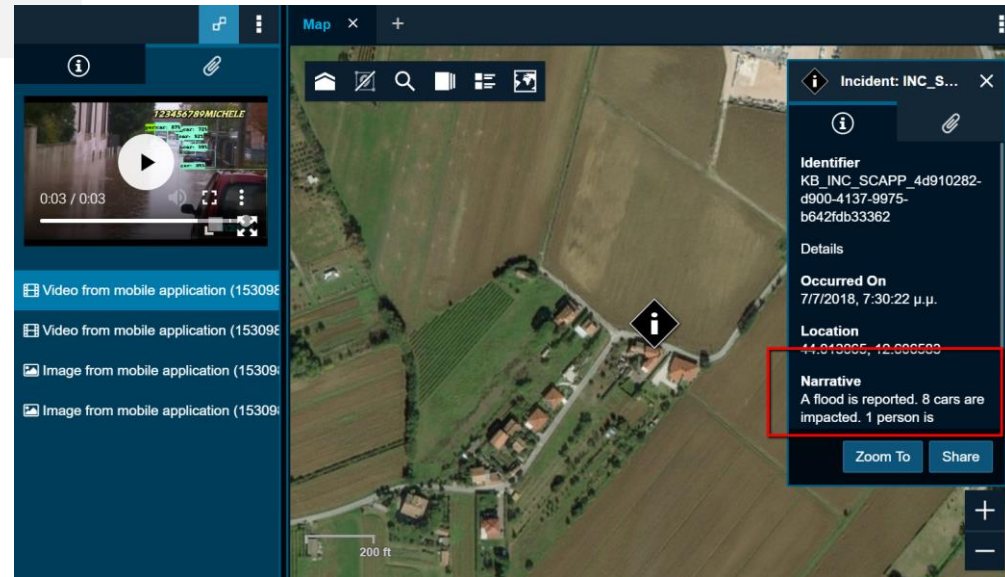
Text generation input:



- Any analysis output is an input to the Report Generation component
- Provide **description/reports** to the authority for an incident or for a cluster of incidents

Text generation output:

- The subway is flooded. There is a car trapped inside.
- A car is trapped in the flooded subway.
- A car is trapped in the subway, which is flooded.
- The subway, in which a car is trapped, is flooded.



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Main Public Safety Answering Point (PSAP)

The screenshot displays the CommandCentral AWARE interface. On the left, there are two 'Event Monitor' panels. The top panel shows a list of incidents with columns for 'Label', 'Last Updated', and 'Address'. The selected incident is 'Place of relief: 4th ...' from 'a day ago', with a video thumbnail showing a fire. The bottom panel shows 'Water Level Bacchi...' incidents, with the selected one from '23 minutes ago' showing a video of a fire scene. On the right, a map shows the geographical context of the incidents, with several location markers. The interface includes navigation icons and a user profile 'beAWARE Thessaloniki'.

The screenshot shows the beAWARE dashboard with a grid of widgets. The top row includes: 'Predicted Flood Crisis Level' (100% gauge), 'Predicted Water Level Measurement' (bar chart), 'Predicted Water Level Category' (bar chart), and 'Predicted Fire Crisis Level' (67% gauge). The middle row includes: 'Observed Flood Crisis Level' (100% gauge), 'Observed Water Level Measurement' (bar chart), 'Observed Water Level Category' (bar chart), and 'Predicted Fire Weather Index' (bar chart). The bottom row includes: 'Predicted HeatWave Crisis Level' (75% gauge), 'Remaining Hours to Heatwave' (line chart), 'Predicted Discomfort Index' (bar chart), and 'For Future Use' (empty chart). A sidebar on the left lists navigation options like 'City Overview', 'Public Alert', and 'Emergency Management'.

- PSAP main environment
- PSAP dashboard

CommandCentral AWARE Thessaloniki Viewer

Incidents x Social Media Analysis x +

Label Last Updated

Incident: INC_SCAPP_6... a minute ago


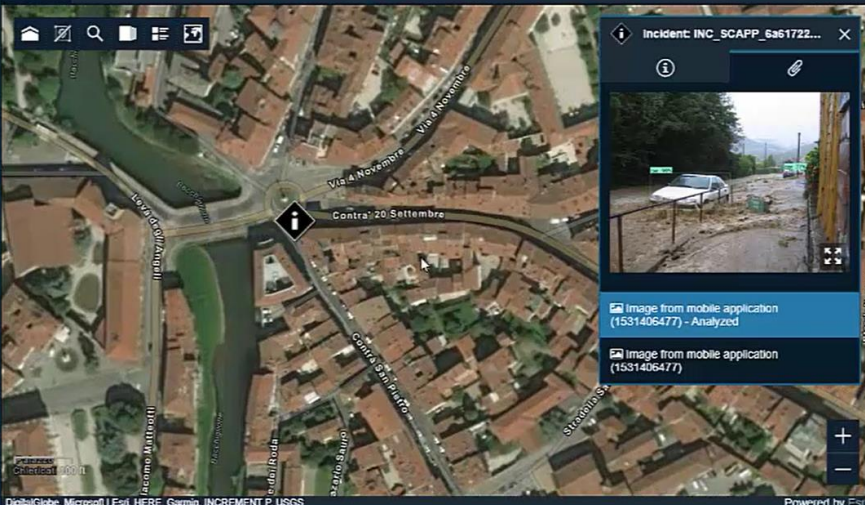


Image from mobile application (1531406477) - Analyzed

Image from mobile application (1531406477)

Map x +



Incident: INC_SCAPP_6a61722...




Image from mobile application (1531406477) - Analyzed

Image from mobile application (1531406477)

Predicted Water Level x Predicted Flood Crisis Level x Observed Water Level x +

Label	Last Updated	Narrative
Predicted Flood Crisis L...	3 minutes ago	Estimation of the Flood Crisis Level in the pre-emergency phase for all rivers in the Municipality/ Tutti I Corsi d'acqua nel Comune. Value = 100.0. Very High
Predicted Flood Cris...	3 minutes ago	Retrone S.Agostino. Value = 75.0. High
Predicted Flood Cris...	3 minutes ago	BACCHIGLIONE river from the Orolo junction to the Ponte di Via Diaz bridge/ Bacchiglione dalla confluenza con POrolo al ponte di via Diaz.
Predicted Flood Cris...	3 minutes ago	TIMONCHIO from upstream to the Orolo junction/ Timonchio-Bacchiglione da monte alla confluenza con POrolo. Value = 100.0. Very High
Predicted Flood Cris...	3 minutes ago	in BACCHIGLIONE from Ponte di Via Diaz bridge to Ponte degli Angeli Bridge/ Bacchiglione dal ponte di via Diaz a Ponte degli Angeli. Value :
Predicted Flood Cris...	3 minutes ago	in BACCHIGLIONE river (River ID 6) from Ponte degli Angeli Bridge to downstream /Bacchiglione dal ponte da Ponte degli Angeli a valle. Val
Predicted Flood Cris...	3 minutes ago	Orolo alla Confuenza con il Timonchio-Bacchiglione. Value = 75.0. High

Device Id
FLCR_1001_FCL_RS_OC_ID_1001

Location
45.544970, 11.538850

Occurred On

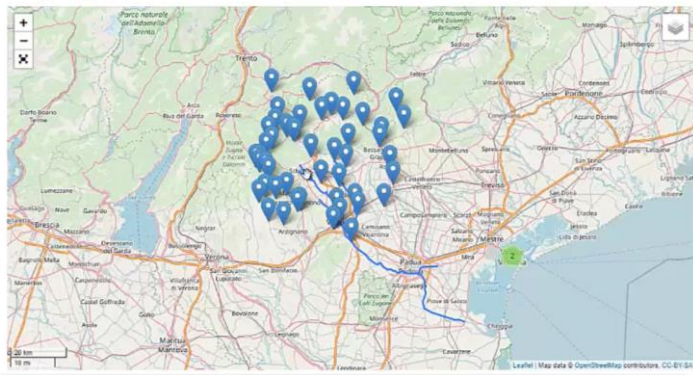
Zoom To

beAWARE



beAWARE OVERVIEW MSP - | LOGIN

Overview Map (Italy)



Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA



Impact

- **Security of people:** beAWARE improves the way in which people interact with the authority
- **Emergency working routines:** the early warning, the DSS and the reasoning mechanism
- **Society:** new communication channels (social media)
- **First responders:** a larger number of emergencies can be detected more quickly and efficiently
- **Policies:** beAWARE contributes to the EU disaster management policies by proposing new strategies and technologies.



Next plans - In Field Demonstrations

- From Nov 2018, **3 field** demonstrations will be carried out (one for each beAWARE prototype) with the participation of end users, decision makers and first responders

FIRE
Valencia, Spain
Nov2019



FLOOD
Vicenza, Italy
Mar2019

HEATWAVE
Thessaloniki,
Greece
20.11.2018



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Thank you!



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