



beAWARE

Enhancing decision support and management services in extreme weather
climate events

700475

D2.1

Use Cases and Initial User Requirements

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Abstract

This document describes the use cases and requirements of the beAWARE system, the methodology used to define the use cases and the risks, challenges and the impacts identified and analysed in order to define these use cases.

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Executive Summary

The deliverable reports on the initial set of user requirements for beAWARE, based on profound analysis of operational scenarios for three different pilots: Vicenza (Italy-flood emergency), Valencia (Spain- fire emergency) and Thessaloniki (Greece - heatwave emergency).

This work was targeted to document the identified user needs for the respective user requirements and it was performed to ensure consistency among different contexts.

In the first section it was demonstrated by literature how weather related emergencies, such as floods, fires and heatwaves, are increasing in frequency and magnitude, consequently determining more and more critical impacts. During emergency situation getting accurate information about the scope, extent, and impact of the disaster is critical to creating and orchestrating an effective disaster response and recovery effort. The goal of beAWARE is therefore to propose an integrated solution to support forecasting, early warnings, transmission and routing of the emergency data, aggregated analysis of multimodal data and management the coordination between the first responders and the authorities.

In the second section the methodology, followed to define user requirements, is described. In detail, the results of the activities performed are later reported for each pilot in terms of:

- risks, impacts and difficulties;
- operational scenarios and use cases;
- requirements.

Abbreviations and Acronyms

The following abbreviations have been used in this document:

AEMET	State Meteorological Agency of Spain
AMICO	Flood Forecasting System for the Bacchiglione River Basin
CCAA	Comunidades Autónomas - Autonomous Communities / Regions
CCS	Rescue Coordination Centres
CCE	Control emergency coordination center
CECOM	Firefighters Command Control Centre
CISE	Command Control Centre
COC	Municipal Operational Centres
COM	Mixed Operational Centres
COR	Regional Operations Centres
DICOMAC	Command and Control Direction
DMI	Danish Metrological Institute
DISTER	Fire Detection by Thermal Sensors
IPT	Integrated Product Team
KST	Command Station
LBS	Local Preparedness Staff
PEIF	Special Plan against Forest Fire Risk
PMA	Advanced Command Post
PSAP	Public-safety answering point
UC	Use Case
UR	User Requirement
SCN	Operational scenarios
SUEM	Ready Health Intervention

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1 Introduction

Climate conditions are expected to change worldwide. This includes an increase in intensity and frequency of (among others) extreme weather events. Extreme weather-related events may have great humanitarian impacts entailing loss of lives, in addition to the economic and partly insured losses (EASAC, 2013). Data collected since 1980 by the insurance industry provide one indicator of trends in extreme events. Although these are not direct measures of extreme weather events per se and may not have recorded all perils in the earlier record, they show weather-related catastrophes recorded worldwide to have increased from an annual average of 335 events from 1980 to 1989, to 545 events in the 1990s and to 716 events for 2002–2011. Floods and the ‘climatological’ perils like heat waves, droughts and wild fires show the most pronounced upward trend, followed by storms (Fig. 1-1). The analysis presents a clear distinction between all weather-related perils and geophysical hazard events like earthquakes, volcano eruptions and tsunamis, with the latter group showing only a slight and statistically non-significant increase.

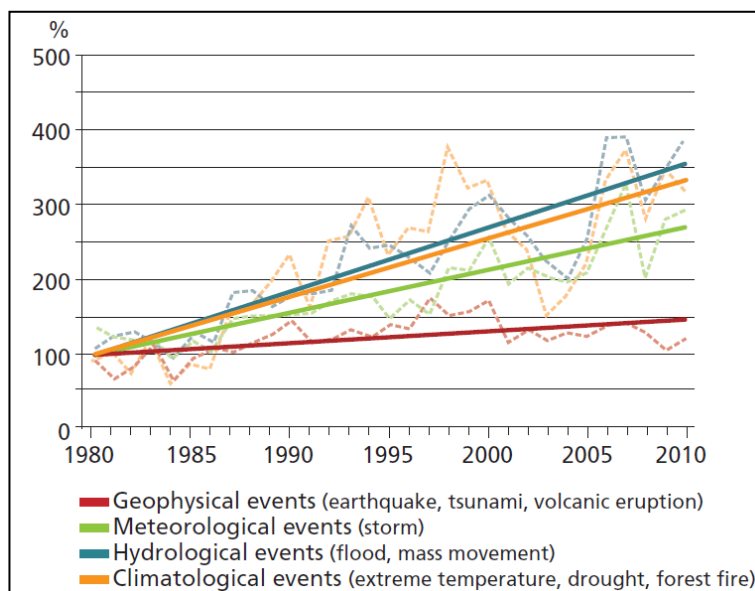


Fig. 1-1. Trends in different types of natural catastrophe worldwide, 1980–2012 (1980 levels set at 100%; Munich Re NatCatSERVICE).

Compared with other continents, the increase in loss-relevant natural extreme events in Europe has been moderate (Fig. 1-2), with an increase of about 60% over the past three decades. The highest increases have occurred in North America, Asia and Australia/Oceania with today about 3.5 times as many events as at the beginning of the 1980s.

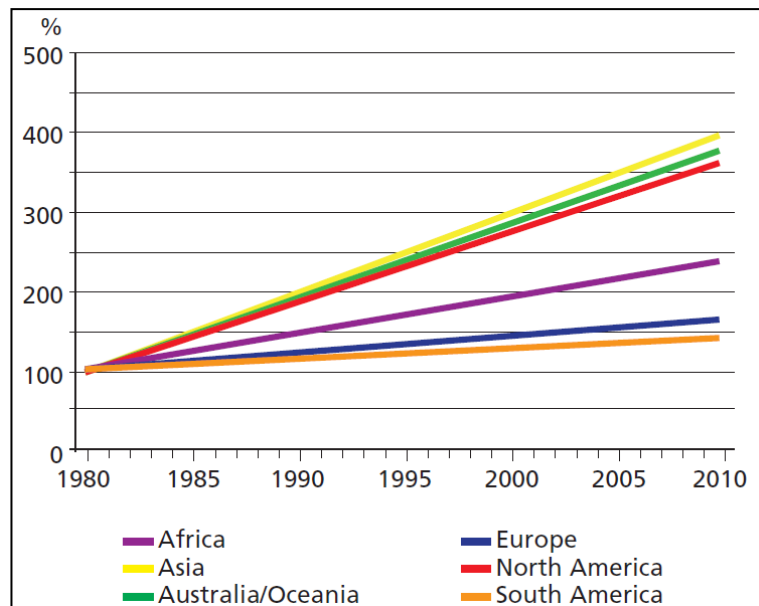


Fig. 1-2. Relative trends of loss-relevant natural extreme events in different parts of the world (1980 levels set at 100%; data from Munich Re NatCatSERVICE).

The economic loss burden of extreme weather events has been considerable, estimated to be €405 billion since 1980 (in 2011 values). The most costly hazards have been storms and floods, amounting to a combined total loss of more than €308 billion. The most affected countries were Germany (455 events), France (425), United Kingdom (415), Switzerland (360), Italy (355) and Spain (317). In agriculture, the 2003 and 2010 heat waves and associated dry conditions resulted in major regional crop shortfalls. The drought conditions and associated fires in the 2010 heat wave also caused a 25–30% drop in the forecast of Russia’s annual grain crop production, compared with 2009.

As result of the above mentioned observations, flooding, heatwaves, fires, etc. will become more common in the future leading to an increased need to better investigate them and develop tools in order to mitigate their possible impacts.

1.1 Floods

There are many different types of floods. They can be distinguished based on the source of flooding (e.g. rivers and lakes, urban storm water and combined sewage overflow, or sea water), the mechanism of flooding (e.g. natural exceedance, defence or infrastructural failure, or blockage) and other characteristics (e.g. flash flooding, snowmelt flood, or debris flow). River floods are a common natural disaster in Europe, and — along with storms — the most important natural hazard in Europe in terms of economic damage. They are mainly caused by prolonged or heavy precipitation events or snowmelt. River floods can result in huge economic losses due to damage to infrastructure, property and agricultural land, and

indirect losses in or beyond the flooded areas, such as production losses caused by damaged transport or energy infrastructure. They can also lead to loss of life, especially in the case of flash floods, and displacement of people, and can have adverse effects on human health, the environment and cultural heritage.

More than 325 major river floods have been reported for Europe since 1980, of which more than 200 have been reported since 2000. The rise in the reported number of flood events over recent decades results mainly from better reporting and from land-use changes. Global warming is projected to intensify the hydrological cycle and increase the occurrence and frequency of flood events in large parts of Europe. Flash floods and pluvial floods, which are triggered by local intense precipitation events, are likely to become more frequent throughout Europe (EEA Report, 2012).

Losses caused by floods in Europe have increased and the death toll continues to be high, as illustrated in Table 1-1.

Table 1-1. Floods in Europe with the highest (inflation-adjusted) losses

Flood date	Country	Inflation-adjusted damage (€)	Number of fatalities
November 1966	Italy	10 billion	70–116
August 1983	Spain	2–6 billion	40–45
November 1994	Italy	4.5–10 billion	64–83
July 1997	Poland, Czech Republic, Germany	2–6 billion	100–115
October 2000	Italy, France, Switzerland	7.5 billion	13–37
August 2002	Germany, Czech Republic, Austria	15 billion	47–54
August 2005	Romania, Bulgaria, Switzerland, Austria, Germany	1.1 billion	53
May/June 2013	Central Europe	13 billion	25

Source: see Table 4.1 on page 61 of the full report (NAS and NMI, 2013), where the sources of information are listed; additional data are from Dartmouth Flood Observatory.

The Floods Directive (EC, 2007) establishes a national and international framework for the assessment and management of flood risks aimed at the reduction of the trans-national adverse consequences for human health, the environment, cultural heritage and economic activity. The Floods Directive also offers citizens, businesses and governments a clear overall understanding of possible flood risks (vulnerable areas and potential damage), the objectives and measures in place to reduce or control the risks and the order in which the designated response teams will implement the measures.

An overview of the concepts of floodrisk and uncertainty and flood terminology to be used in the beAWARE project are reported in FLOODsite (2005).

1.2 Forest Fires

EU Forests and other wooded land cover 155 million ha and 21 million ha, respectively, together more than 42 % of EU land area. The forests play a key role in protecting European ecosystems and biodiversity, have a central role in trapping carbon which would otherwise be released in the atmosphere and thus aggravating climate change..

Forest fires are an integral part of forest ecosystem dynamics in many ecosystems where they are an essential element of forest renewal. They help control insect and disease damage and eliminate litter that has accumulated on forest floors. At the same time, forest fires are an important disturbance agent in many forested landscapes. Fire risk depends on many factors such as weather, vegetation (e.g. fuel load and condition), topography, forest management practices and socio-economic context, to mention the main ones. Extreme fire episodes and devastating fire seasons of recent years in Europe were in most cases driven by severe fire weather conditions. Although most of the wild fires in Europe are ignited by humans (either accidentally or intentionally), it is widely recognised that weather conditions and accumulation of fuel play a dominant role in affecting the changes in fire risk over time. Thus climate change is expected to have a strong impact on forest fire regimes in Europe.

Fire risk depends on many factors, including climatic conditions, vegetation (e.g. fuel load and condition), forest management practices and other socio-economic factors. The number of fires in the Mediterranean region has increased over the period from 1980 to 2000; it has decreased thereafter. In a warmer climate, more severe fire weather and an expansion of the fire-prone area and longer fire seasons, as a consequence, are projected, but with considerable regional variation. The impact of fire events is particularly strong in southern Europe on already degraded ecosystems.

In 1992 a regulation provided the legal framework for specific measures devoted to forest fire prevention between 1992 and 2002. It was replaced 31. December 2002 by Forest Focus. The purpose of Forest Focus was to establish a new EU scheme for monitoring forests and environmental interactions to protect EU forests against pollution and forest fires. The scheme supported the implementation of forest fire prevention measures from 2003 to 2006. Between 2007 and 2013 financing under LIFE+ was available for awareness raising campaigns, providing information to the public, and training of forest fire prevention agents. It was replaced by Regulation 1293/2013 applicable from 2014 to 2020.¹

¹ <http://ec.europa.eu/environment/forests/fires.htm>

The need for a common accepted glossary of terminology to use in Europe for wildfires and forest fires was addressed in the European Forest Fire Networks Project (EUFOFINET). This led to a European Glossary for Wildfires and Forest Fires (2012) which can be used in the beAWARE project.²

1.3 Heat wave due to extreme temperatures

Global climate change is affecting the frequency and intensity of extreme events. Extremes of both warm and cool temperature are important indicators as they can have strong impacts on natural as well as human systems. Importantly, a temperature that is 'normal' for one region may be extreme for another region that has not regularly experienced this temperature in the past. For example, mortality has been estimated to increase by 1-4 % for every 1 °C increase above a locationspecific temperature threshold, with the elderly, disabled and socio-economically deprived at most risk (Baccini et al., 2008; EEA, 2011).

Extremes of cold have become less frequent in Europe while warm extremes have become more frequent. Since 1880, the average length of summer heat waves over western Europe has doubled and the frequency of hot days has almost tripled. Recent cold winters in northern and Western Europe do not contradict the general warming trend on decadal time scales. Historic records show a clear long-term warming trend across Europe but it is normal to observe considerable variability between and within years due to natural variability. Extreme high temperatures are projected to become more frequent and last longer across Europe over the 21st century.

²<http://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Fire-and-Rescue/European-Glossary-for-Wildfires-and-Forest-Fires.pdf>

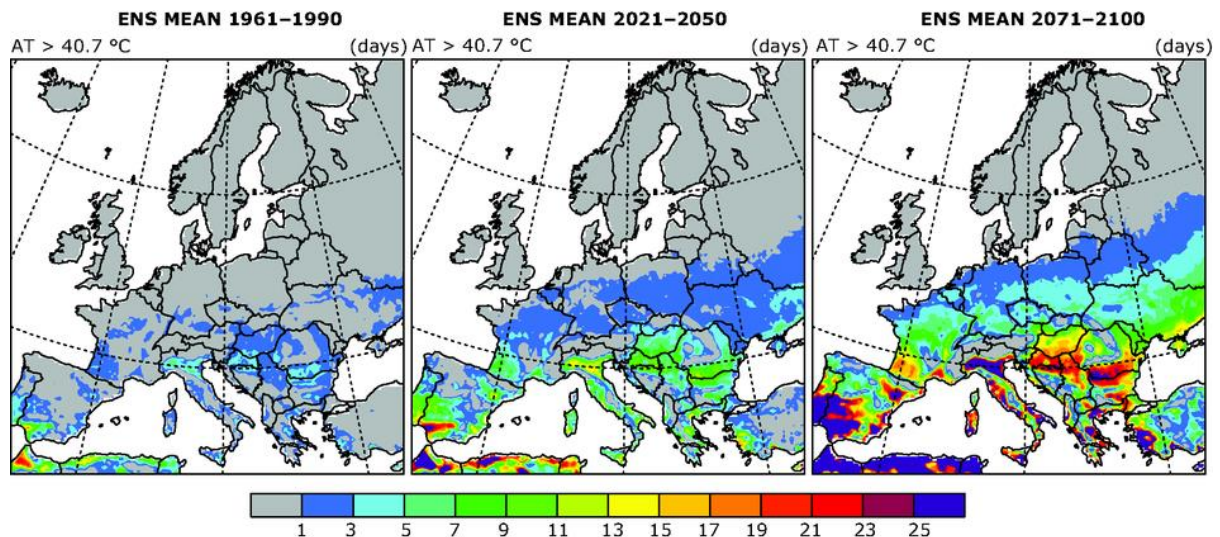


Fig. 1-3. Projected average number of summer days exceeding the apparent temperature³

Note: The maps show the number of summer days in Europe exceeding the apparent temperature (heat index) threshold of 40.7 °C as simulated by five ENSEMBLES Regional Climate Models for the IPCC SRES A1B emission scenario. The apparent temperature (often referred to as the heat index) represents heat stress on the human body by accounting for temperature.

The forecasted increase in the hot days during the summer will most probably increase the appearances of heatwave phenomena as well. Table 1-2 shows the impact of major heatwaves in Europe and the casualties that were related to those, emphasizing the severity of heatwaves.

³ <https://www.eea.europa.eu/data-and-maps/indicators/global-and-european-temperature/global-and-european-temperature-assessment-4>; EU-FP6 project ENSEMBLES; (<http://eca.knmi.nl/ensembles>); Haylock et al, 2008; (<http://www.ensembles-eu.org/>) van der Linden and Mitchell, 2009, Fischer and Schaer, 2010.

Table 1-2. Mortality attributed to hot summers or heatwave periods in Europe⁴

Heatwave event	Excess mortality (all causes, all ages) ^a	Baseline measure
1981—Portugal	1906 excess deaths in Portugal, 406 in Lisbon	Predicted values
1983—Rome, Italy	35% increase in deaths in July 1983 in 65+ age group	Deaths in same month in previous year
1987—Athens, Greece	>2000 estimated excess deaths in heatwave period 21–31 July 1987	Time trend regression adjusted
1991—Portugal	997 estimated excess deaths in heatwave 12–21 July 1991	Predicted values
1995—London, UK	23% (184 estimated excess deaths) in heatwave 30 July–3 August 1995	31-day moving average of daily mortality in previous 2 years
2003—France	14 802 deaths during heatwave period 1–20 August (60% increase). Excess mortality greatest in Paris, Dijon, Poitiers, Le Mans and Lyon (>78% increase)	Average of deaths for same period in years 2000–2002
2003—Netherlands	Estimated 500 excess deaths during heatwave 31 July–13 August	Predicted values from regression model of weekly temperature and mortality series
	1400–2200 excess deaths in summer 2003 (June–August inclusive). 3–5% increases	
2003—Switzerland	Approximately 975 excess deaths (7% increase) in period June–August 2003 (inclusive)	Deaths in previous years 1990–2003
2003—Spain (50 Provincial Capitals) ^b	Approximately 3166–4151 excess deaths in June–August 2003 (inclusive), 8–11% increase in mortality. Excess mortality in August was 2175 deaths, a 17% increase	Predicted values from regression model of daily temperature and mortality time series
2003—Portugal	1317 excess deaths (36% increase 95% CI 29–48%) during 10 day heatwaves (30 July–12 August 2003)	Average daily deaths in period 15–28 July 2003. Estimates for mainland Portugal extrapolated from deaths reported in district capitals
2003—Rome, Italy	In Rome, 944 excess deaths (19% increase) in June to August 2003 (inclusive)	Smoothed daily mean mortality for same period in years 1995–2002
2003—England only	2091 excess deaths, 16% increase in 10 day heatwave 4–13 August 2003	Average of deaths for same period in years 1998–2002

a: Many studies also report deaths by age group, gender, and region or city—refer to the original source for further details
b: 35% of total population of Spain

Note: Comparisons of impacts between countries and between different heatwaves should be avoided because of different methods of estimating the excess, for different heatwave periods, for different populations (urban, rural, major cities), etc. No standardized estimates across European countries have been made for the 2003 heatwave event

Therefore, the development of tools that contribute to more effective management of the phenomenon is essential in order to minimize its impact, especially in urban areas.

1.4 beAWARE Project goals

Disaster response planners, rescue teams and first responders should be able to use a wide variety of technologies and tools to assist them during an incident. In every disaster and crisis, incident time is the enemy, and getting accurate information about the scope, extent, and impact of the disaster is critical to creating and orchestrating an effective disaster response and recovery effort.

⁴ R. Sari Kovats, Kristie L. Ebi, 2006. “Heatwaves and public health in Europe”. European Journal of Public Health

The goal in beAWARE is to develop a uniform system to deal with emergency related to extreme weather conditions that can be adapted to the specific features of case studies and type of emergency. This could lead to an optimization of resources during complex emergency situations and to the possibility of applying the system in different places characterized by similar problems.

More specifically, beAWARE will provide support to authorities and first responders in all the phases of an emergency using a wide variety of technologies that will be developed starting from the understanding of platforms, theories and methodologies that are already used for disaster forecasting and management.

With the aim to improve forecasting, early warning systems, transmission of the emergency data and coordination between first responders and authorities, beAWARE tools will be demonstrated in 3 concrete pilot cases, representative of generic issues related to Flood, Fire, and Heatwave:

1. Floods in Vicenza City (Italy), a highly populated and urbanized area, with extremely complex drainage and irrigation networks and important economic activities, ecological and cultural assets, characterized by high floodrisk;
2. Forest Fires in Valencia (Spain) inside the The Natural Park of L'Albufera located about 8 kilometers far from the City Centre. This ecosystem formed by a lake (L'Albufera), rice fields that surround it, The Devesa forest and beaches with their dune environments is a biodiversity hot spot with a great natural, landscape and cultural value. The Devesa forest is 10 km long, about 1 km wide and occupies an area of 850 ha. It is located in El Saler district, which is mainly dedicated to the agricultural, fishing and tourist sector and has a population of 1704 people although it increases in summer since The Natural Park of L'Albufera is a leisure and beach zone;
3. Heatwaves in Thessaloniki (Greece), a highly populated and urbanized area. It is the 2nd largest city in Greece and on its North-East side is located a suburban forest. Based on a study made in 2013 regarding the density of population in the cities in Greece, the urban complex of Thessaloniki is in the highest population density level in Greece with over 9000 people/km². High temperatures during summer combined with high humidity conditions, create a very challenging and with grate hazards environment.

This document describes the use cases and requirements of the beAWARE system, the methodology used to define the use cases and the risks, challenges and the impacts identified and analysed in order to define these use cases.

2 Methodology

The beAWARE system is intended to provide various services before, during, and after the occurrence of natural disasters focusing on floods, forest fires, and heatwaves, as described in the section above. A common methodology has been used to define the use cases and requirements of the beAWARE system. More specifically, beAWARE started with the identification of the status of available tools through an existing situation analysis in order to clarify the current digital landscape concerning emergency service requirements. beAWARE has studied the requirements of the pilot cases at hand by identifying and interviewing stakeholders (Municipalities, Regional/local Civil Protection Agencies, etc.) concerned with integrated risk management (floods/flash floods/fires/heatwaves), focusing on their needs and the current gaps both in the situational awareness and command and control aspect of the disaster response. Therefore, the first phase of the Project was dedicated to gather the necessary understanding of the users and their needs in order to formulate an initial list of requirements.

Later weekly telcos were performed among the Consortium partners in order to share a common way to report all the informations acquired during the previous phase.

During the **User Requirements Workshop**, held in Venice the 10-11 May 2017, the list of requirements extracted from all the Use Case descriptions was clarified and shared among the consortium partners. As a next step, the technical partners will go through the list of requirements in order to verify their technical feasibility. In detail, a consolidated set of **system requirements** will be elicited. This will include joint consideration of all user requirements from all the scenarios, generalization, abstraction and clustering of similar or associated user requirements, formalization and standardization of the requirement specifications, and allocation of system requirements to beAWARE subsystems.

2.1 Conventions

In detail, the following structure was established: a general emergency situation is subdivided in scenarios, use cases and requirements (Fig. 2-1) following the definitions reported below and characterized by a unique identifier, which allows the partners to speak a “common language”, and to facilitate configuration management in the future.

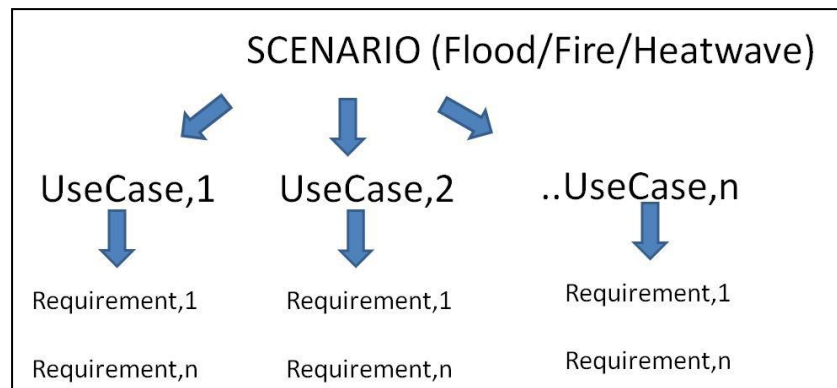


Fig. 2-1: Requirement analysis scheme

An operational **scenario** is defined as the environmental and ecological context of the natural disaster and its impact on the elements at risk and stakeholder assets.

The following naming and indexing convention applies:

- Operational scenarios are catalogued as [SCN_X]
 - The Flood scenario is catalogued as SCN_1
 - The Fire scenario is catalogued as SCN_2
 - The Heatwave scenario is catalogued as SCN_3

A **use case** is defined as a conceptual description of intended or expected utilization of the beAWARE system to prepare for, respond to, or act upon the occurrence of the scenario or various aspects therein. It is defined and specified from the operational user's point-of-view. The use case serves to explain how the end users perceive the system and its intended values, but it is not binding in terms of implementation.

The following naming and indexing convention applies:

- Use Cases are catalogued as [UC_xyy], where x is the identifier of the scenario to which the UC belongs, and yy is the serial number of the use case (we assume that there will not be more than 100 use cases perscenario).

User requirements describe expectations, requests, and guidelines for functionalities, capabilities, conditionalities, and features of the beAWARE system that would facilitate successful completion of the use-cases.

That said, since user requirements may be incomplete, biased, non-realistic, similar, complementary, or even contradicting to other user requirements, the user requirement set constitutes a baseline for a set of functional requirements, that will be elicited and consolidated by the beAWARE system architecture Integrated Product Team (IPT), and will be considered as the binding requirement set.

The following naming and indexing convention applies:

- User Requirements are catalogued as [UR_xzz], where x is the identifier of the scenario in which the requirement originated, and zz is the serial number of the requirement.

All the end users worked on providing specific examples for all their cases, integrated in a document format shared during the telcos. In detail such document had to contain the following informations:

- A graph diagram
- A story line
- Examples of the visual information that might be presented to the authorities (e.g. spots in a map etc)
- Example of the textual information that might be presented to the authorities
- Example of messages that might be presented to the people
- Example of messages that might be presented to first responders
- Example of reports from the first responders that might be presented to the authority (tasks etc.)
- The roles under the term authority
- Mobile application equipment

All the textual examples were provided in both languages (native and English).

2.2 The Requirements Elicitation Process

The purpose of this document is to describe the user requirements for beAWARE, based on profound understanding of the operational scenarios of flood, fire, and heatwave. The process for generating this set of requirements and for transforming it into a formal set of system requirements is defined as the ***requirements elicitation process***.

First, we describe in section 3 the risks and impacts of each operational scenario defined for the beAWARE program – flood, fire, and heatwave – per elements at risks and assets of humanitarian, economic, cultural, and ecological importance. We also describe the difficulties, challenges, and inhibitors of mitigating and preventing these risks.

Secondly, in section 4 we provide an explanation and description of the operational scenarios as they emerge and evolve with current-state solutions and procedures. The scenario description and analysis provides for understanding the ecological situation, environmental and economic impacts and implications, decision-maker roles, responsibilities, and considerations, etc.

Once the description of scenario-related risks and impacts and scenario dynamics are clarified, in section 5 we describe the use-cases for beAWARE systems, which represent how

the end-users and operational stakeholders expect beAWARE to assist them while coping with scenario-related challenges. Use cases describe how users expect or request to interact with beAWARE, which kinds of inputs and outputs they expect or intend to exchange with the system or through the system with other users, and how they perceive the internal dynamics of the system as it provides these values.

Finally, based on the understanding and clarification of how users will interact with the system and benefit from such interactions, in chapter 6 we specify the operational stakeholder and user requests, intents, expectations, constraints, and requirements (collectively referred to as **user requirements**) per use cases of each scenario. The final result is therefore a set of scenario-based, operationally-justified, and prioritized set of user requirements.

Based on this deliverable, a consolidated set of **system requirements** will be elicited. This will include joint consideration of all user requirements from all the scenarios, generalization, abstraction and clustering of similar or associated user requirements, formalization and standardization of the requirement specifications, and allocation of system requirements to beAWARE subsystems. This set of system requirements will be elaborated in D7.2 – System Requirements and Architecture.

An illustration of the requirements elicitation process described above is shown in Fig. 2-2. As we can see the input to this activity is the initial scenario set. The activities pertaining to Task T2.1 and to its corresponding Deliverable D2.1 are Risk and Impact Analyzing, Scenario Analyzing, Use Case Analyzing, and User Requirement Specifying. The latter provides the User Requirement Set – the final output of D2.1, which constitutes the basis for the System Requirement Specification activity and for generating the System Requirement Set.

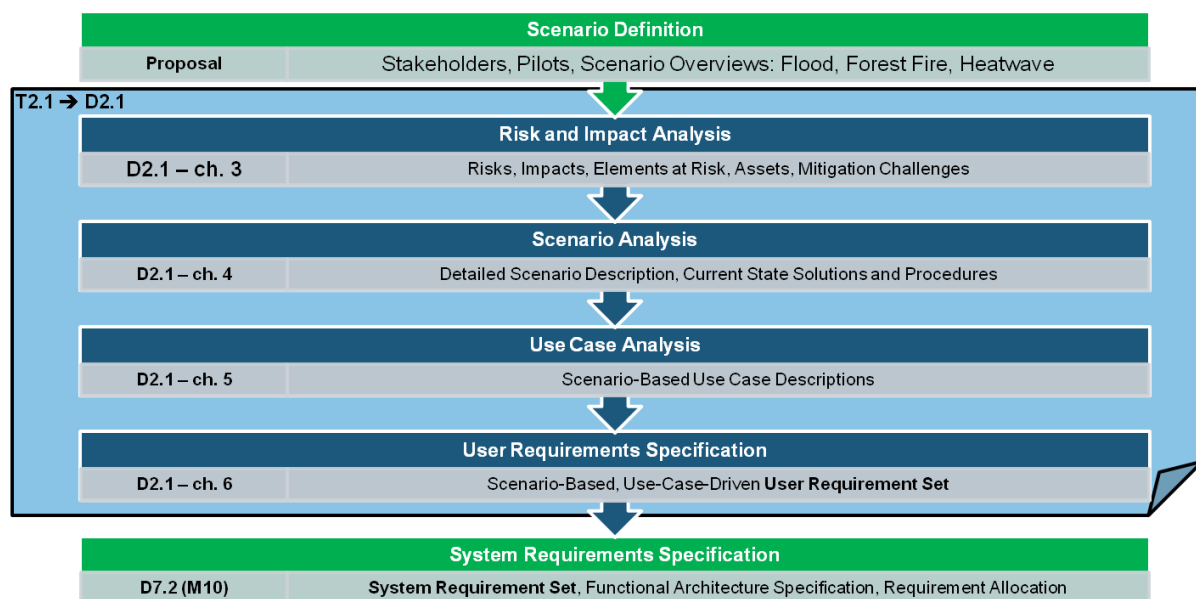


Fig. 2-2. The Requirements Elicitation Process

After the delivery of D2.1 and D7.2, requirements development and implementation continue to evolve throughout the program, with the completion of intermediate prototype versions and the final version. In between, revised and refined requirement sets are going to be published as part of deliverable D2.3 (M15, towards 1st Prototype at M18), D2.5 (M22, towards 2nd Prototype at M24), and D2.7 (M31, towards Final System at M36). This is illustrated in Fig. 2-3 along with more detailed specification of the requirement sets and system version contents.

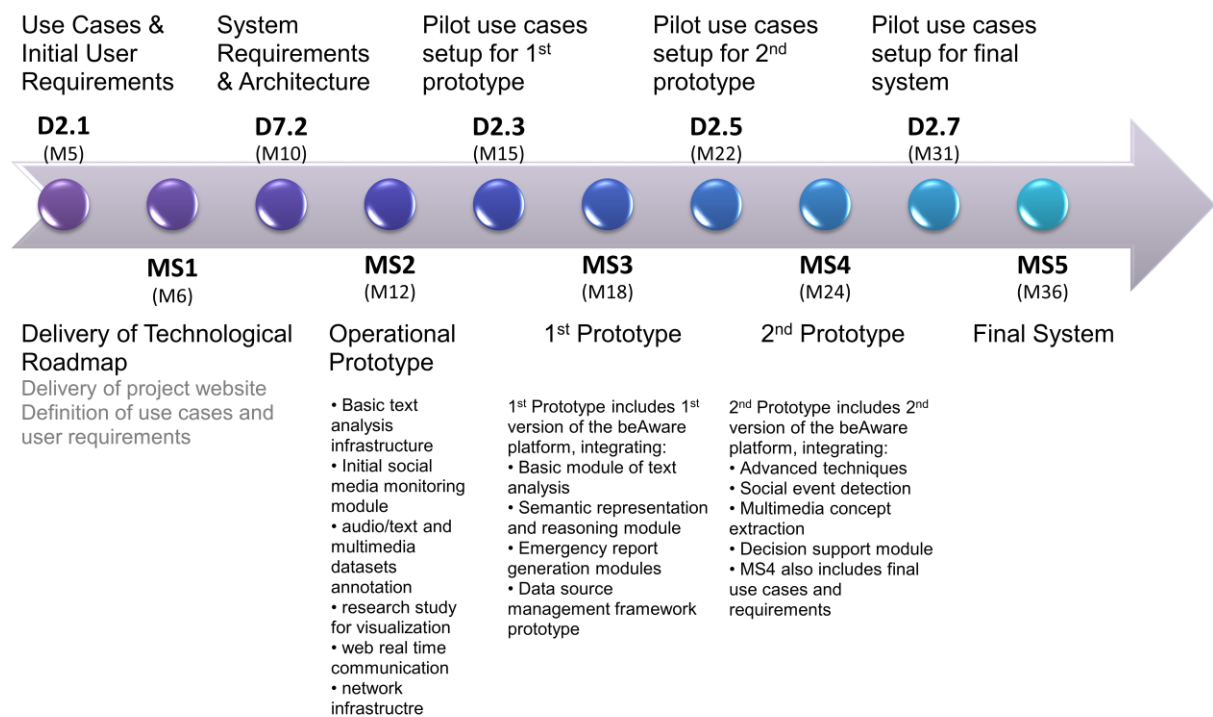


Fig. 2-3. Requirement Development and Delivery Timeline

3 Risks and Impacts for Flood, Fire and Heatwave

Even though the processes that generate the disaster might be fundamentally different, techniques to assess risk, evaluate preparedness, and assist response appear to have much in common and can share and benefit from advances in mobile technologies, communications, video analytics, geographic information science (such as data acquisition and integration; data ownership, access, and liability issues; and interoperability) and information technology in general.

Each one of above cited scenarios (Flood, Fire, and Heatwave) can be characterized by a level of risk: the evaluation of risk and its components is in fact crucial in order to address correctly the development of the beAWARE system.

Therefore risks and impacts will be described in the following in general terms, using the knowledge from the specific cases of Vicenza, Valencia and Thessaloniki respectively, since the goal of the project is to develop technologies that can support the management of these crises in all possible similar contexts.

3.1 The concept of Natural Risk

The concept of risk refers to the combination of the probability of a certain hazard to occur and of its potential negative impacts (EC, 2007; FLOODsite, 2009; UNISDR, 2009):

$$R = f(H \times V \times E)$$

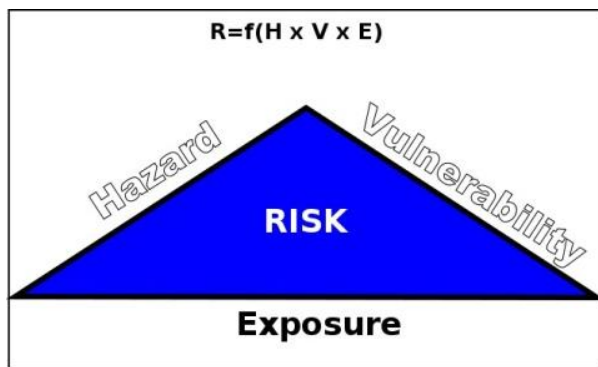
where

Hazard (H): The hazard is the occurrence of the physical event, which can happen with a certain probability and intensity. The difference between the hazard and the disaster is that a hazard may not cause any negative impact (EEA, 2010).

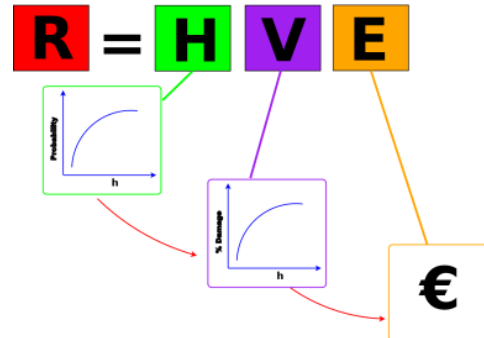
Vulnerability (V): Vulnerability is defined in this report as the susceptibility or predisposition for loss and damage to human beings and their livelihoods, as well as their physical, social, and economic support systems when affected by hazardous physical events. Vulnerability includes the characteristics of a person or group and its situation that influences its capacity to anticipate, cope with, resist, respond to, and recover from the impact of a physical event (Wisner et al., 2004; Schneider et al., 2007; Cardona, 2010; Gaillard, 2010).

Exposure (E): Exposure is defined in this report as the presence of people, livelihoods, environmental services and resources, infrastructure, and economic, social, and cultural assets in areas or places that are subject to the occurrence of physical events and that thereby are subject to potential future negative impacts (UNISDR, 2009; Gasper, 2010).

The first two elements, hazard and vulnerability, are characterized by probability distributions, while the latter, exposure, provides the unit of measurement of risk, that is money (see Fig. 3-1).



(a) Source: Crichton (1999), redrawn.



(b)Source: Martina (2012), redrawn.

Fig. 3-1. Graphical descriptions of risk (Kulturisk FP7 Project, 2011)

Risk is, therefore, the damage that occurs or will be exceeded with a certain probability in a certain time period (Merz et al., 2010).

In the case of a flood event, the hazard outcome is a map of intensity (expressed in terms of depth, persistence, or velocity) of the flood, provided by the hydrological analysis and modeling i.e. flood frequency analysis, geomorphological characteristics of the region under assessment (pathway) and manufactured barriers against the hazard (attenuation) elements of the assessed area. Considering different return times and measures of intensity, multiple hazard maps are produced. Exposure identifies the presence of people and assets and as much as possible the social, environmental and economical value of them. Vulnerability is defined as another map resulting by the combination of physical and social components. The physical component is captured by the likelihood that receptors located in the area considered, could potentially be harmed (susceptibility of receptors). The social one is the ex-ante preparedness of society given their risk perception of awareness to combat hazard and reduce its adverse impact or their ex-post skills to overcome the hazard damages and return to initial state (represented by adaptive and coping capacities).

Hazard, vulnerability and exposure are foreseen as maps, therefore, they are spatially explicit and they will be integrated in a GIS context. For instance, in a grid cell of GIS maps of a certain size, we can explicitly show the expected depth of a flood and the presence of buildings and people and the likelihood of them to be damaged or harmed (Fig. 3-2).

The beAWARE project aims at reducing risk by supporting the implementation of countermeasures that can reduce:

- the power of hazards, e.g. by supporting decision makers in managing structural measures such as dams that can control flood volume;

- the exposure and vulnerability in hazard zones, e.g. by alerting in advance people in flood vulnerable areas. Early warning systems coupled with real time responses are also a useful countermeasure that reduce exposure and vulnerability of people and communities.

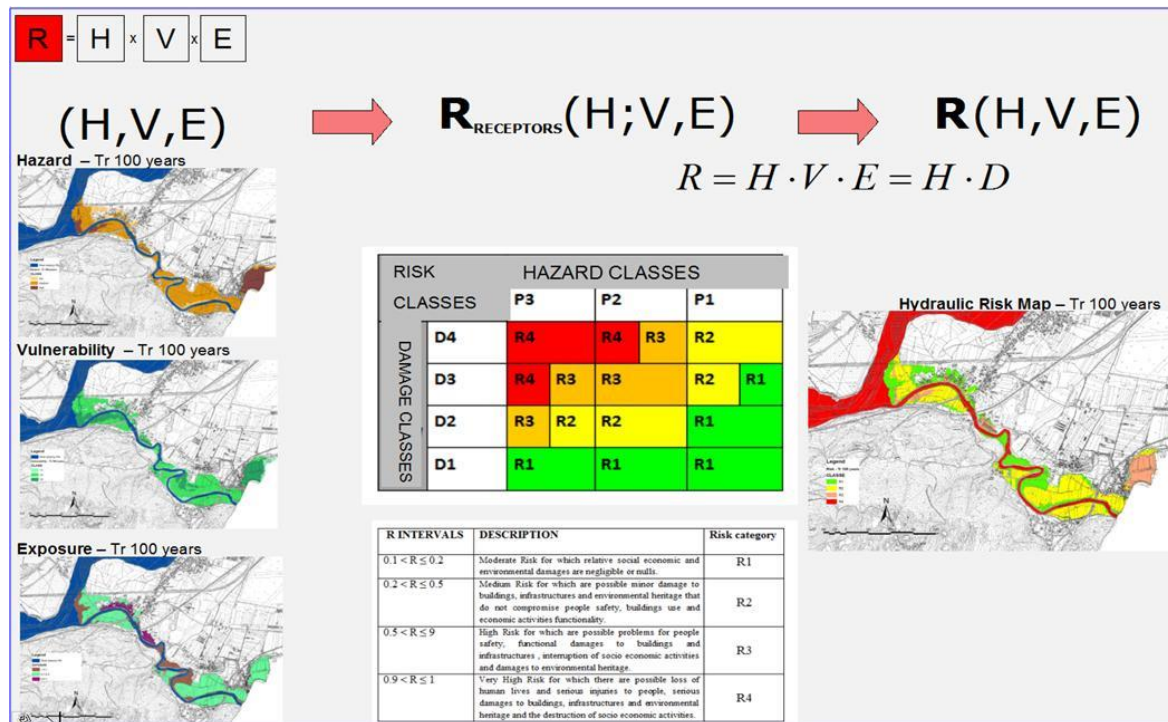


Fig. 3-2. Example of flood risk maps generation (Flood Risk Management Plan - AAWA, 2017)

3.2 Element at Risk

The European Flood Directive (EC, 2007) represents an ad hoc legislative framework to support the development of proper flood management strategies, in order to reduce the adverse consequences for human health, the environment, cultural heritage and economic activities resulting from such calamities. We adapted this classification of exposed elements, commonly used in flood risk analysis, for all the beAWARE scenarios.

In this sense, Table 3-1 reports a list of elements that could be affected by floods, fires or heatwaves belonging to the four main categories of elements at risk: 1) Social, 2) Economic, 3) Ecological, and 4) Cultural.

Table 3-1. Elements at Risk

Macro category	#	Element at risk	Flood	Fire	Heatwave
Social	E01	Inhabitants	Yes, in particular those living close to the river, or in basements and unable to leave their houses (e.g. due to water blocking exit to the street) or cars.	Yes, in particular those living close to forest biomass & visitors	Yes, due to power blackouts, causing elevators not to work Those unable (elders, sick people, etc) to leave their houses and are stuck with no A/C Children, Outdoor workers (construction, roofers, migrant workers), Military , Elderly
Economic	E02	Public & private buildings	Yes	Yes, especially close to the forest	
	E03	Industrial activities	Yes		
	E04	Communication Infrastructure	Yes	Yes	Yes (e.g. Affected Public transport lines)
	E05	Cars	Yes (e.g. parked or moving)	Yes	Cars (e.g. parked or moving)
	E06	Substations and Pumping stations	Yes		Yes substations. Extensive power needs might cause a failure
	E07	Telecommunications	Yes	Yes	
	E08	Road and railway	Yes	Yes	
	E09	Agriculture: livestock	Yes	Yes	Yes, Livestock
	E10	Agriculture: crops and other plants (e.g. Vegetables, Vineyards)	Yes, (oversaturated with water)	Yes	Yes, due to drought

Macro category	#	Element at risk	Flood	Fire	Heatwave
Ecological	E11	Natural habitat	Yes	Yes	
	E12	Forest biomass		Yes	Yes, due to drought
	E13	Animals and plants	Yes	Yes, in protected environment	Yes, in protected environment
	E14	Dunes		An essential task in this environment due to its weakness	
Cultural	E15	Historical buildings	Yes, in particular those located in the city center	Yes	
	E16	Historic sites	Yes		
	E17	Objects of art standing alone or firmly attached as an integral part of buildings	Yes		

3.3 Impacts

According to the Common Implementation Strategy Working Group on Floods (WGF 2012) the **Consequences/impacts/effects** can be defined as : “An impact points at the economic, social or environmental damage that may result from a flood. An impact may be expressed quantitatively or qualitatively. The terms consequence, impact and effect can be used interchangeably”

A possible classification of these impacts is presented in Table 3-2 wich is an elaboration of the catalogue of flood consequences proposed in WGF (2012) which integrates the flood consequences identified in Halcrow (2008), Penning-Rowse et al. (2005) and Ecodecision (2006).

Table 3-2. Impacts

Macro category	#	Impact	Flood	Fire	Heatwave
SOCIAL	IM01	Impact on human health: Quasi direct physical health effects (e.g. Injuries)	Yes Injuries from being knocked over by flood water, thrown against hard objects or struck by moving objects; injuries from over-exertion during the flood (e.g. sprains); hypothermia; cold, coughs, flu, headaches; sore throats or throat infections; skin irritations (e.g. rashes)	Yes Health problems due to exposure to heat & smoke (e.g. respiratory difficulty, burns, shock, and unconsciousness), and malnutrition due to lost crops.	Health problems due to exposure to heat

Macro category	#	Impact	Flood	Fire	Heatwave
	IM02	Impact on human health: Longer term physical health effects:	<p>Yes</p> <p>Gastro-intestinal illnesses; cardiac problems; respiratory problems (e.g. asthma, chest infections, pleurisy); lacerations, abrasions and contusions; sprains and strains; skin irritations (e.g. rashes, dermatitis, etc.); high blood pressure; kidney or other infections; stiffness in joints; muscle cramps; insect or animal bites; erratic blood sugar level (diabetics); weight loss or gain; allergies (e.g. to mould spores)</p>	<p>Yes</p> <p>Respiratory problems; long term skin problems (e.g. fire wounds with infections and scar tissue); malnutrition may cause long term effects (e.g. loss of bone density and damage to the organs).</p>	<p>Health problems due to exposure to heat</p> <p>Body becomes unable to regulate itself & sweating mechanism fails; core body temperature rises</p> <p>Symptoms: Very high body temperature Red, hot skin Rapid strong pulse Throbbing headache Confusion– altered mental state Dizziness, nausea, vomiting Unconsciousness</p>

Macro category	#	Impact	Flood	Fire	Heatwave
	IM03	Impact on human health: Pshycological health effects	<p>Yes</p> <p>Anxiety; panic attacks; increased stress levels; depressions; lethargy / lack of energy; feelings of isolation; sleeping problems; nightmares; flashbacks to the event; increased use of alcohol or drugs; Anger/tantrums; Mood swings/bad moods; increased tensions in relationships (e.g. more arguing); difficulty concentrating on everyday tasks; thoughts of suicide</p>	<p>Yes</p> <p>Anxiety; panic attacks; increased stress levels; depressions; lethargy/lack of energy; sleeping problems; nightmares; flashbacks to the event; increased use of alcohol or drugs; anger/tantrums; mood swings/bad moods; increased tensions in relationships (e.g. more arguing); difficulty concentrating on everyday tasks; thoughts of suicide.</p> <p>The pshycological heath effects depends on the affected person (e.g. their life situation, experience, and copingmechanism)</p>	<p>Yes</p> <p>(e.g. due to Overcrowded public places)</p>

Macro category	#	Impact	Flood	Fire	Heatwave
	IM04	Impact on human health: Death	Yes (e.g. for drowning or severe Injuries)	Yes (e.g. severe injuries caused by heat and smoke, severe malnutrition, overwhelming pshycological effects such as depression)	Yes
	IM05	Impact on family life and social relations: Difficulties in meeting basic needs. Difficulties in recovering the house. Difficulties in coping with relatives suffering from health problems. Evacuation from the area. Loss of time and recreational opportunities. Disruption of financial situation.	Yes	Yes	Yes
	IM06	Disruption of community services (Education Governance Health and home care Security)	Yes	Yes	Yes
	IM07	Loss of memorabilia and irreplicable items	Yes	Yes	

Macro category	#	Impact	Flood	Fire	Heatwave
ECONOMIC	IM08	Buildings (residential) and contents: Damage to the building frabric	Yes	Yes	
	IM09	Buildings (residential) and contents: Damage to contents (domestic appliances; electrical appliances; furniture and furnishings; clothes; ...)	Yes	Yes	
	IM10	Damage to vehicles	Yes – water & mud	Yes – ashes & smoke	
	IM11	Economic activities: Damage to the building frabric	Yes	Yes	
	IM12	Economic activities: Damage to building services	Yes	Yes	
	IM13	Economic activities: Damage to movable equipment	Yes	Yes	
	IM14	Economic activities: Damage to fixtures and fittings	Yes	Yes	
	IM15	Economic activities: Damage to stocks	Yes	Yes	Yes
	IM16	Economic activities: Loss of earnings	Yes	Yes	Yes

Macro category	#	Impact	Flood	Fire	Heatwave
	IM17	Public utilities and related infrastructure: Damage to power plants	Yes	Yes	Yes (as consequence people can be trapped in elevators or stuck in elevators or in houses without A/C)
	IM18	Public utilities and related infrastructure: Damage to water and sewage treatment plants	Yes		
	IM19	Public utilities and related infrastructure: Damage to electricity, gas, district heat, water and telecommunications transmission infrastructure	Yes	Yes	
	IM20	Public utilities and related infrastructure: The phone lines are down or tied up or simply not working.	Yes	Yes	
	IM21	Public utilities and related infrastructure: Losses caused by the disruption of electricity, gas, district heating, water and telecommunication services	Yes	Yes	Yes

Macro category	#	Impact	Flood	Fire	Heatwave
	IM22	Transport infrastructure: Damage to the road, railway, port and airport infrastructure	Yes	Yes Damage to the infrastructure, such as the poorly laid roads, which were un-usable after the fire	
	IM23	Transport infrastructure: Traffic jam	Yes	Yes	Yes
	IM24	Transport infrastructure: Accidents	Yes	Yes	Yes
	IM25	Transport infrastructure: Losses caused by the disruption or interruption of the road and railway network and port and airport infrastructure (not always an economic cost)	Yes (e.g.) Bus service interruption	Yes (e.g.) Bus service interruption	Yes (e.g.) Bus service interruption
	IM26	Agriculture/Arable: Damage to land, Damage to crops, Damage to equipment	Yes	Yes	Yes
	IM27	Agriculture / Livestock: Loss of livestock Damage to land Temporary loss of grazing	Yes	Yes	Yes
	IM28	Agriculture / Horticulture: Damage to land; Loss of produce	Yes	Yes Loss of materials like rubber trees, crops	Yes

Macro category	#	Impact	Flood	Fire	Heatwave
	IM29	Agriculture / Forestry: Damage to forestry	Yes	Yes Loss of forest resources.	Yes
ECOLOGICAL	IM30	Impact on the quantity and quality of ecosystem goods and services	Yes (Power cuts related to floods may disrupt water treatment and supply plants thereby increasing the risk of water-borne diseases as described)	Yes air pollution, waters with forest fire ashes, crop pollution loss of biomass, landscape impact Loss of land, such as the local forest gardens	Yes, microclimate of the city will be affected.
CULTURAL	IM31	Damage to build-up heritage Damage to parks and gardens Damage to archaeological sites	Yes (e.g. Damage to artworks)		

3.4 Difficulties

“Difficulties” are factors preventing the stakeholders from operating efficiently during crisis management. During the first phase of the Project, stakeholders (Municipalities, Regional/local Civil Protection Agencies, etc.) concerned with integrated risk management (floods/flash floods/fires/heatwaves) were identified and interviewed, focusing on their needs and the current gaps both in the awareness and command and control aspect of the disaster response. In detail the following list of difficulties resulted:

Table 3-3. Difficulties

#	Description	Flood	Fire	Heatwave
D01	Uncertainty of weather forecasts	<p>Especially in case of flash floods in small catchment areas caused by small scale rain events, more difficult to be evaluated.</p> <p>Low resolution of weather forecasts (> 5kmq).</p> <p>Increasing uncertainty for forecasts characterized by wider time windows (> 3 days)</p>	Especially for a areas characterized by o special micro-climate conditions	Especially for a small area in real time
D02	Uncertainty of forecast/prediction models	Lack of recorded environmental data (flood areas, water depth) to calibrate Hydrological-hydraulic forecast models.	Fire can start in different ways (e.g. natural or human causes)	

#	Description	Flood	Fire	Heatwave
D03	Missing decision-support system platform: <ul style="list-style-type: none"> - Visualized reports; - Environmental sensor data; - Number of people in danger; - Availability & location of rescue teams in the field 	Yes <ul style="list-style-type: none"> -to know where people are really in danger in order to send rescue teams; - to know the number of people and assets that are (or may be)affected by the flood; -to know real time environmental data (from standard sensors and meteorological radar); - to know flood model forecasts; - to Visualize pertinent information provided via mobile Apps, calls, text messages, as well as social media streams 	Yes <ul style="list-style-type: none"> - to know where people are really in danger in order to send rescue teams or ordering evacuations/confinement; - to know the number of people and assets that are (or may be)affected by the forest fire; - to Visualize pertinent information provided via mobile Apps, calls, text messages, as well as social media streams 	Yes <ul style="list-style-type: none"> - to know where people are really in danger in order to send rescue teams; - to know the number of people and assets that are (or may be)affected by the heatwave; - to Visualize pertinent information provided via mobile Apps, calls, text messages, as well as social media streams

#	Description	Flood	Fire	Heatwave
D04	Missing Automatic warnings & recommendations - Citizens - First responders	- Send location of safe places; - Send warnings in order to avoid possible interferences with ways to be used only by civil protection volunteers; - to warn people of a river overtopping and/or breaking; - to warn people on the progress of flooding and on flooded underpasses; - to warn people approaching a flooded area	Yes - Send location of safe places; - Send warnings in order to avoid possible interferences with first responders; - to warn people of pre-emergency level 3 establishment (extreme fire risk) ; - To inform people of forbidden activities/behaviours; - To inform people of self-protection measures; - to warn people approaching a burning area	Yes - Send location of places of relief; - Send warnings to people about imminent heatwave
D05	Assign tasks to first responders	Yes - Assign tasks to first responders and evaluate their evolution in real time	Yes - Assign tasks to first responders and evaluate their evolution in real time	Yes - Assign tasks to first responders and evaluate their evolution in real time
D06	Limited visibility	Monitor river level, levee overtopping & breaking and rainfall, especially at night	Monitor fire evolution, satellite cameras access.	
D07	Detect people and cars	In the river and in flooded road underpass	Yes, in the forest area	
D08	Limited time between model forecast and the implementation of first responder actions	Yes	Yes	Yes

#	Description	Flood	Fire	Heatwave
D09	Overcrowded in summer time and vacation weekends		Could obstruct the arrival of first responders and make evacuation more difficult	
D10	Difficulty in predicting a blackout			Yes
D11	Handling traffic, even before a blackout occurs			Yes
D12	Dealing with people that will gather in multiple locations across the city			Yes
D13	Pin-point exact location(s) where rescue teams are actually needed	Yes	Yes, due to uncertainty of forest fire forecast. Weather conditions may rapidly change.	Yes, multiple reports from various sources may make it difficult to assess if several rescue teams are required for several different groups of people in danger, or whether all reports are referring to the same incident and one rescue team can handle the situation
D14	Dark spots where communications may be lost	Yes	Yes	

Since beAWARE should address any Flood, Fire, and Heatwave at any geographical location this section was dedicated to the description of the general risks, impacts, and difficulties related to any of these kind of events. In order to demonstrate how the beAware solution will be capable of managing these general challenges, three demonstration scenarios and use-cases will be implemented in Vicenza, Thessaloniki and Valencia. These scenarios and use-cases that are representative for generic issues related to Flood, Fire, and Heatwave are described in the following sections 4 and 5. Finally, starting from current gaps and difficulties

related to these real crisis management problems, expectations from the beAWARE system will be translated in terms of users requirements as reported in section 6.

4 Operational Scenarios

4.1 SCN_1: Flood

Description of Flood Demonstration site

The catchment of the upper Bacchiglione River, closed at Ponte degli Angeli in the historical centre of Vicenza (Fig. 4-1), is located in the north of the Veneto Region, a plain that is fringed by the Alpine barrier at a distance of less than 100 km to the north of the Adriatic Sea (Barbi et al., 2012).

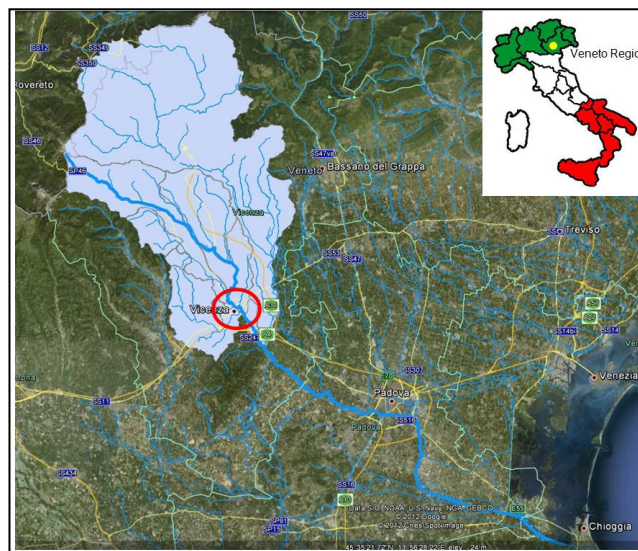


Fig. 4-1. The Bacchiglione Catchment closed at Vicenza

With regard to the precipitation climatology, the southern part of this plain is the drier, with approximately 700–1000 mm of mean annual rainfall, whereas more than 2000 mm are measured close to the pre-alpine chain. Obviously, these differences are mainly related to the mountain barrier and its interaction with southerly warm and humid currents coming from the Mediterranean Sea (Smith, 1979). Indeed, the topography of the region rises from the southern plain at about 30 m above sea level (a.s.l.) to about 1500–2200 m a.s.l. in the first orographic barrier, the pre-alpine chain, and then further to the north to the Dolomites, a mountain massive that peaks at over 3000 m a.s.l. In the northern part of the Bacchiglione catchment, the terrain elevations raise from 250 to 1000 m a.s.l. in less than 1 km, with slopes up to 70%. A significant portion of the annual rainfall often concentrates into very short periods of time in the form of what often turns out to be an extreme event with deep convection playing a central role (Barbi et al., 2012; Rysman et al., 2016). As a consequence, severe flooding events have threatened agricultural and urban areas in the recent years (e.g. Scorzini and Frank, 2015), since the upper Veneto plain is a highly populated and urbanized area. These floods are characterized by low response time (lower than 12 hours) and are also triggered by snowmelt.

In detail, the territory of the Vicenza Municipality lastly was affected by a relevant flood event that happened between 31st October and 1st November 2010. It was triggered by extreme rainfall and snowmelt in the upper Bacchiglione basin: over 500 mm rainfall was recorded.

The Vicenza city centre, a very busy residential and commercial area, was submerged due to the overtopping of the levees at the "Ponte degli Angeli" river section. The Fig. 4-2 shows the map of the cumulated precipitations in the Veneto Region and the time series of water levels reached by the Bacchiglione River in Vicenza at the "Ponte degli Angeli" river section.

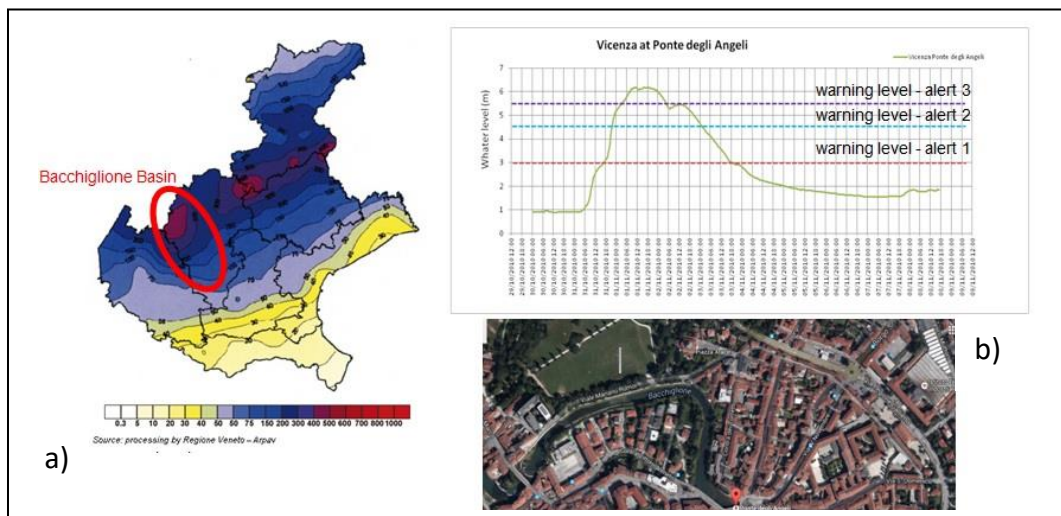


Fig. 4-2. a) The 2010 flood event: a) Cumulative precipitation b) Bacchiglione River levels at Ponte degli Angeli Bridge in Vicenza



Fig. 4-3. Levee breach upstream of Vicenza (a) and flooding of Vicenza City (b) during the 2010 flood

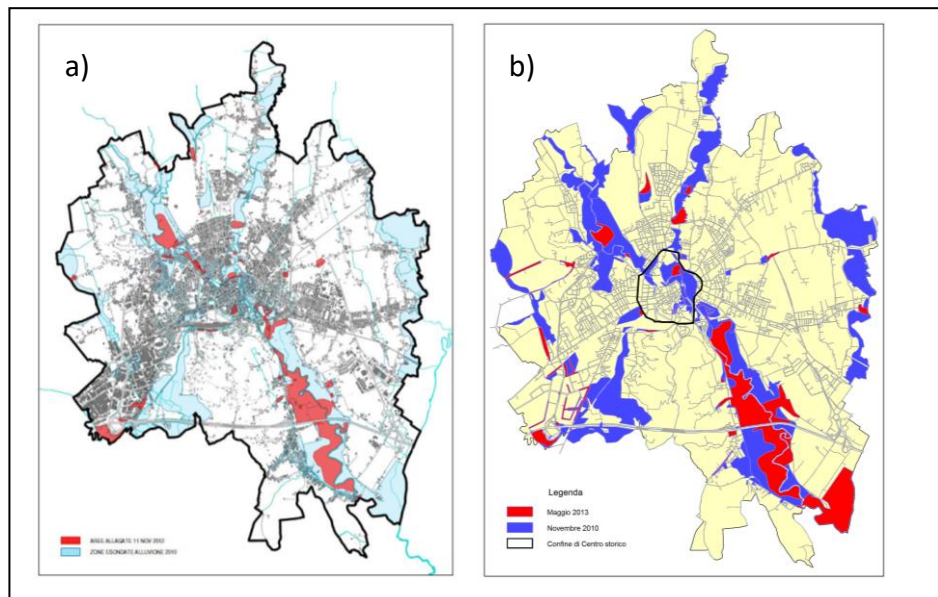


Fig. 4-4. Flooded area in Vicenza after the 2010 flood compared with the 2012 (a) and the 2013 (b) floods
Source: Municipality of Vicenza: <http://www.comune.vicenza.it/>

In other zones floods were caused by levee breaks and surcharge of the existing urban drainage system (Fig. 4-3). The plots reported in Fig. 4-4 show the overall flooded area in Vicenza during the 2010 event compared with other minor flood events occurred in November 2012 and May 2013.

The main end-users in the pilot are:

- The Mayor
- Municipal group of Vicenza Civil Protection;
- National Association of Carabinieri (Italian Army Police);
- National Alpine Trooper Association;
- Coordination of Voluntary Associations of Civil Protection, Province of Vicenza;
- Italian Red Cross
- Fire Brigades
- Local Police
- Regional and local authorities
- AAWA

A summary of the damages encountered during the 2010 flood for all the Veneto Region is reported in the Table 4-1.

Table 4-1. The total damages in Veneto Region after the 2010 flood
Source: Veneto Region (2011)

Damages	Numbers
Deaths	3
People involved	500000
Families	7708
Citizens who had to leave their homes	3500
Companies	2114
Total damage reported through Municipalities for private citizens, businesses and public works	426 million of Euros
Livestock drowned	151000
Municipalities who reported damage	262
Municipalities who reported a damage higher than one million euros	61

In particular the cost of final damages declared by the Vicenza Municipality was 62 million of euros (Veneto Region, 2011). It was the higher cost over all the Veneto Region municipalities. In Table 4-2 the affected assets and the main features of the 2010 flood are reported only for the the City Center of Vicenza.

Table 4-2. Damages to the City Center of Vicenza during the 2010 Flood Event
Source: Municipality of Vicenza: <http://www.comune.vicenza.it/>

Assetts	Number
Assets	12.061
Residents	1.408
Buildings	287

Assetts	Number
Shops	62
Bar	58
Stores, garages	7
Health facilities	3
Pharmacies	24
Schools	10
Public offices	22
Sport structures	5
Oil stations	10
Churches	13
Monuments	1
Accommodation structures	39,0
Length of affected streets (km)	2,7
Flooded area (km ²)	3,4%

Emergency protocol and communications

Emergency protocol

The civil protection is in the frontline during the management of flood events.

In the Italian system, the responsibility for implementing civil protection measures falls with the lowest possible administrative level. The mayor is for this reason the primary civil protection authority within his/her municipality and thus responsible for planning and rescue operations.

In case of concrete emergencies, coordination and operational activities are carried out through a multi-level hierarchical organisation. This consists of the Municipal Operational Centres (COC) at the municipal level, the Mixed Operational Centres (COM) and Rescue Coordination Centres (CCS) at the provincial level, the Regional Operations Centres at the regional level (COR), and the Direction of Command and Control (DICOMAC) at the national level. Even though the DICOMAC represents the national level, it is physically set up on the disaster site or close thereby.

As already said, within the COC the Mayor is the maximum authority and he uses all the municipal structures to realize the risk mitigation strategies. All the operations are coordinated by the Civil Protection Department that uses officials and volunteers. The Civil Protection, with the Fire Department, manages the rescue operations and all the activities oriented towards resorting back to normal life conditions. The National and Regional civil

protection authorities are involved when the event assumes a high gravity level. In these cases often the army is involved in addition to the National Civil Protection System.

In particular, the Vicenza municipality has defined a very clear protocol in response to flooding (the Protocol is described in detail in the official Civil Protection Plan Document <http://www.comune.vicenza.it/file/101876-pde.pdf>).

There are three critical levels before the flood expected event (<http://www.comune.vicenza.it/uffici/dipterr/infrastruttureeverdepubblico/protcivile/rischioallagamenti.php>):

- 1) The first phase is the Ordinary Criticality, here begins the monitoring activities. This state is named "ATTENTION": is declared when the AMICO Flood Forecasting System (Ferri 2012, Mazzoleni 2017) shows potential risk situations in the next 3 days.
- 2) The next phase is the Moderate Criticality. This state is named " PRE - ALARM" (3-5 hours prior to the Maximum forecasted river Level). In this phase the first acoustic alert is activated. At this step, all the programmed prevention measures are taken (closing bulkheads, artificial embankments, preparation of the lamination basins, etc.). Most of these are triggered by observed river levels at the bridge of "Ponte Degli Angeli" with water level varying between 2m to 5.6 meters.
- 3) The third level is the High Criticality; this state is named "ALARM": it's activated when the civil protection foresees that a flood will take place within an hour. The second acoustic alert is activated and all the citizens resident in a soon to be flooded zone are instructed to leave their house. All the rescue resources are activated. When the flood happens, vehicles and men are deployed to give assistance to the population.

The end of the emergency corresponds to the state "END ALARM". A third acoustic alert is activated. After the event the activities are oriented to remove water and mud from buildings and streets. Later a reconnaissance of the damages is necessary.

Communication

Internal communication (between the COC and first responders): The emergency is managed using traditional telecommunications systems / institutional (radio, telephone, fax, etc.).

External communication (between the COC and the Community):

Number for emergency call by citizens:

- Local Police number 0444545311 (if necessary it can also be activated the free municipal number 800127812).
- Other useful numbers:
 - ✓ Firemen: 115
 - ✓ Ready Health Intervention (SUEM): 118
 - ✓ Carabinier: 112
 - ✓ State Police: 113

The alarm systems:

- Acoustic warning system: they warn the population of the central areas (<http://www.comune.vicenza.it/uffici/dipterr/infrastruttureeverdepubblico/protci vile/sirenediallarme.php>);
- Speakers: outside the area covered by the acoustic warning system, the states of the PRE-ALARM and ALARM are announced by means of a speaker transiting in the affected areas.

Communications systems by the COC during an emergency:

- Warnings are sent to people registered to the "text service". In order to register people need to send previously a text message, including name and surname, to the number 392 7338475
- Warnings are published on the website of the Bacchiglione river (www.bacchiglione.it) and on the web site of the city (www.comune.vicenza.it) and on its Facebook and Twitter accounts ([@CittadiVicenza](https://www.facebook.com/cittadivicenza))
- Warnings are provided by the Office of Public Relations whose phone number is 0444221360.
- Warnings are provided by the local media, by local television, from websites of local newspapers and local online newspapers.

Available resourcesGIS data (shape file and grid format):

- Administrative_boundary
- Flood_Risk_Management_Plan
- Hystorical_FLOOD_AREAS
- Study_area_Vicenza
- Technical Regional Map
- Veneto_Hydraulic_network
- Veneto_road and rail networks
- Aerial photos of the study area
- Digital terrain model of the study area

Hydro meteorological data:

- Shape file of the hydro meteorological stations included in the Bacciglione River Basin
- Time series of rainfall, temperature, wind velocity, pressure, water level, snow level (csv, hourly time step from 1992 until now)
- Snow cover from satellite images (grid, 2000-2011)

Social:

- Database of the reports sent by the Mobile app during a series of exercises organized as a part of the FP7 WeSenseIt Project (including text and images)
- Backup of reports from the Facebook and Twitter accounts of the Municipality and from its website
- Videos registered during the last flood events in Vicenza
- Weblinks concerning the real-time description of the last flood events in Vicenza

AMICO Flood Early Warning System:

- Real time flood forecasts (time series of the water level for each modelled section along the river) (txt)
- Shape file of the river network and modelled river cutline
- Previous flood warning reports elaborated on basis of the AMICO results (pdf)

VIDEOCAMERAS:

- Historical records of the 2 video cameras in Vicenza along the Bacchiglione Rivers
- real time streaming data of the 2 video cameras in Vicenza along the Bacchiglione Rivers
- Possibility to install new cameras (better if they are mobile cameras)

4.2 SCN_2: Forest Fire

Description of the Valencia Demonstration site



Fig. 4-5. La Devesa de L'albufera

La Devesa de L'Albufera (also known as *La Dehesa del Saler*) is a natural park (special protection area) located 8 km. away from the city of Valencia. It is a Mediterranean forest with a line of dunes that has been molded over the centuries after the isolation of the Albufera lake from the Mediterranean sea. It is composed of 850 Hectares of Mediterranean pines, palms, kermes oak, mastic scrubs and honeysuckle. This environment attracts many animals, such as birds, small vertebrates and amphibians. Every year hundreds of bird species migrate from Africa to North Europe, and this place becomes a perfect spot for them to recover from this long journey.

The Mediterranean climate is characterized by dry summers and mild, moist winters. Mediterranean climate ecosystems are among the most fire-prone in the world.

The territory of La Devesa de l'Albufera (Valencia) has been affected by some fires in the past. Concretely, in 2015, a fire burned 6 hectares. This event, occurred in August 14th, and had a quick response by the firefighters thanks to an early warning and the proximity of the firefighters command centre. According to local media sources, the time-response between warning and firefighters extinguishing tasks was 12 minutes.



Fig. 4-6. La Devesa de L'albufera (Maps)



Fig. 4-7. A typical fire that occurred at La Devesa de L'albufera and precipitation's chart (monthly)

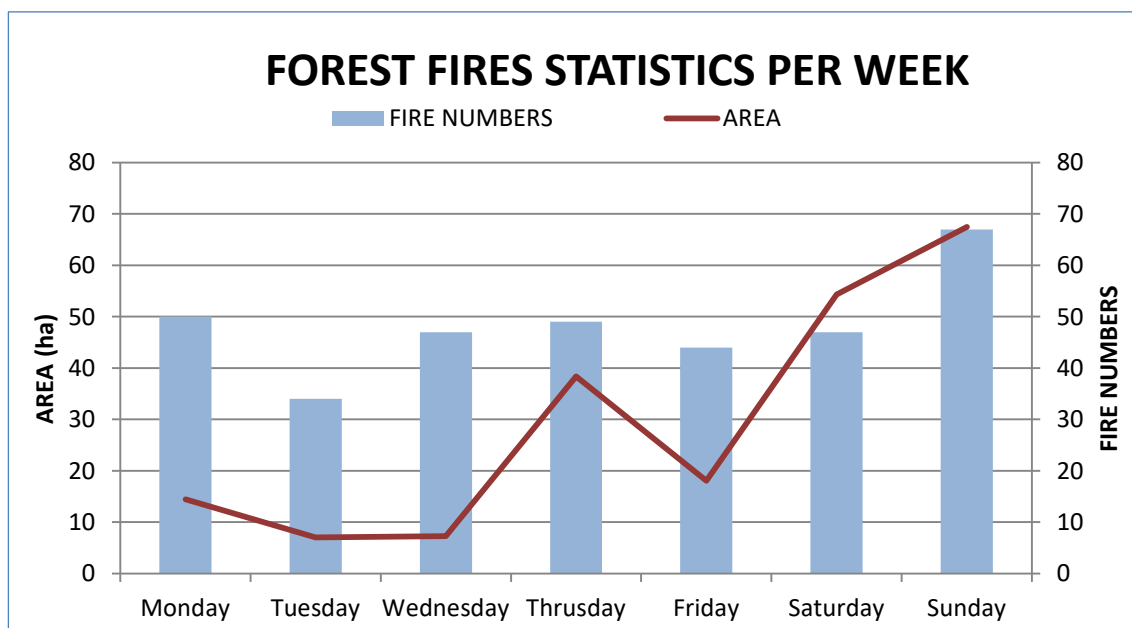


Fig. 4-8. Forest fires chart per week in La Devesa

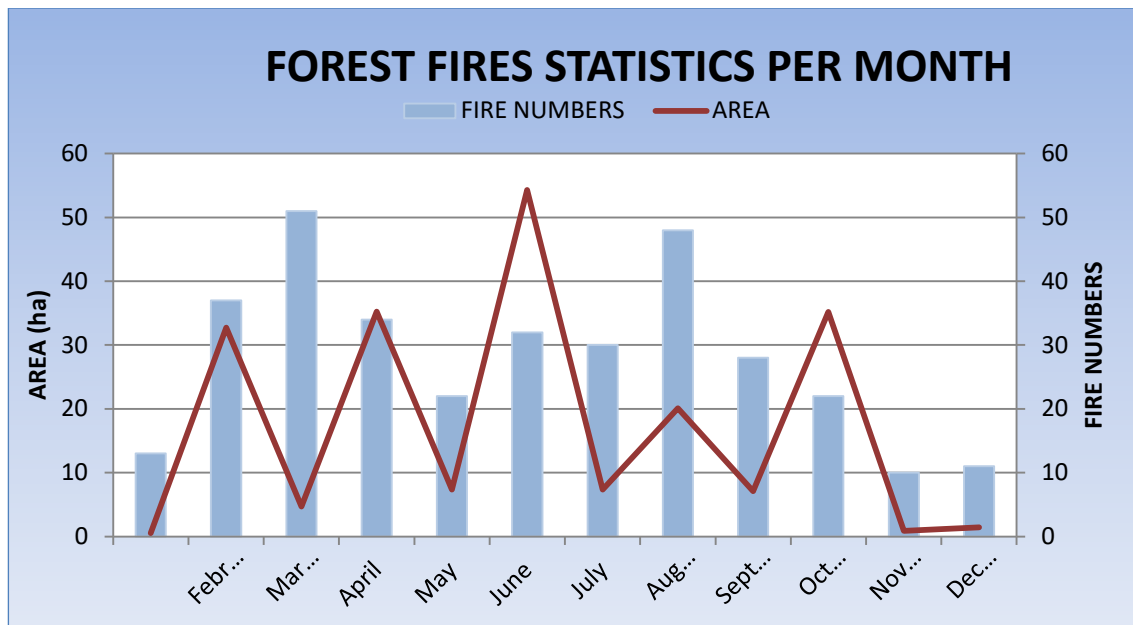


Fig. 4-9. Forest fires chart per month in La Devesa

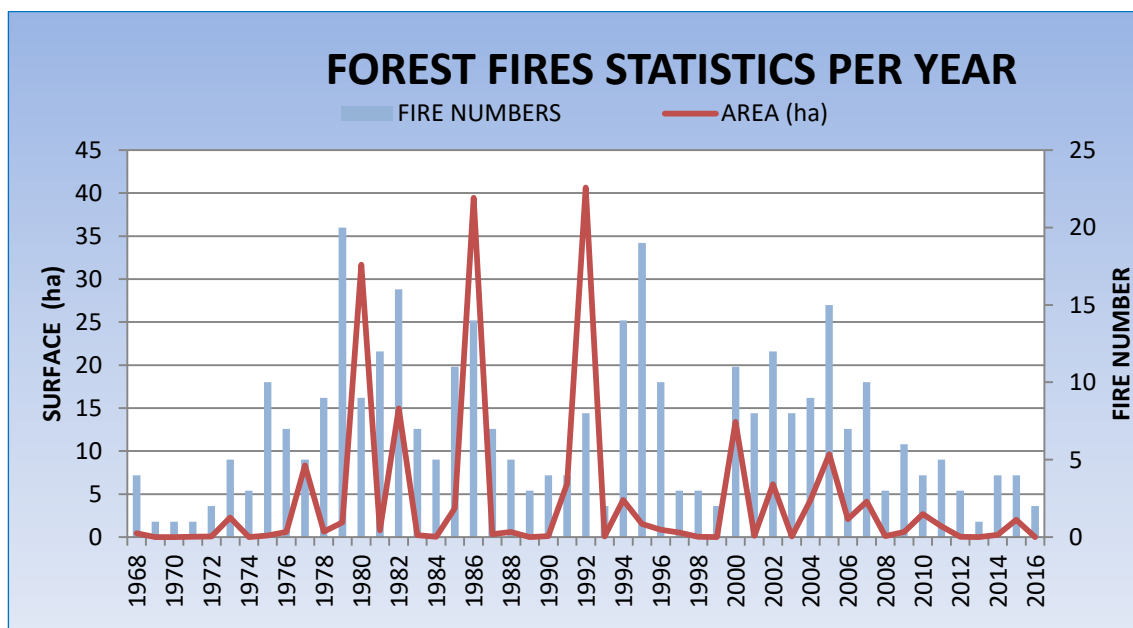


Fig. 4-10. Forest fires chart per year in La Devesa

Once the fire has started, adverse climate conditions such as low humidity, high temperatures and high speed winds can promote a quick propagation of the fire. For example if these values reaches 30-30-30 (<%humidity, >°C and >km/h wind), the fire risk is considered extreme.

Emergency protocol and communications

There are two different emergency levels: one with preventive tasks in which specific emergency has not started (levels 1 to 3), and another one in which the emergency (forest fire in this case) has already started (levels 0 to 3).

The State Meteorological Agency of Spain (AEMET), through the Meteorological Center (CMT) in Valencia, determines each day, for a 48 hour period, a daily rate of forest fire hazard (combined index of ignition and propagation) by area, based on three levels of severity. From this index and other socio-cultural factors and situations that can raise the level of severity, the Generalitat (regional government) declares, through the Autonomous CCE, the corresponding level of pre-emergence:

- Level 1 LOW-MEDIUM RISK OF FOREST FIRES: Mobilization of the monitoring and dynamic regional network, through volunteers, forest rangers, etc.
- Level 2 HIGH RISK OF FOREST FIRE: In addition to the above resources, BRE (Rural Emergency Squad), deterrent surveillance with air regional and state resources.
- Level 3 EXTREME RISK OF WILDFIRE: In addition to the resources mobilized in Level 2, it will also mobilize the Guardia Civil, Autonomic Police, municipalities, brigade

Level 3 Pre-emergency procedure

Once level 3 pre-emergency level notification is received through the autonomic Command Control emergency coordination center (CCE) the Mayor, as Civil Protection Chief of the municipality of Valencia, will mobilize the resources in order to set vigilance services in the most sensitive areas. Firefighters Command Control Centre (CECOM) will warn not only their own resources, but also the rest of municipal resources.

Besides this, the Mayor will issue a proclamation in which this situation is notified, indicating that pre-emergency level 3 (extreme) has been established, and warning that compulsory preventive measures referred to in Decree 98/1995, of May 16 should be taken into account. Among these, any fire authorization previously done is cancelled, and circulation of people and/or vehicles may be restricted. Any work or activity that can constitute a risk may be suspended as well.

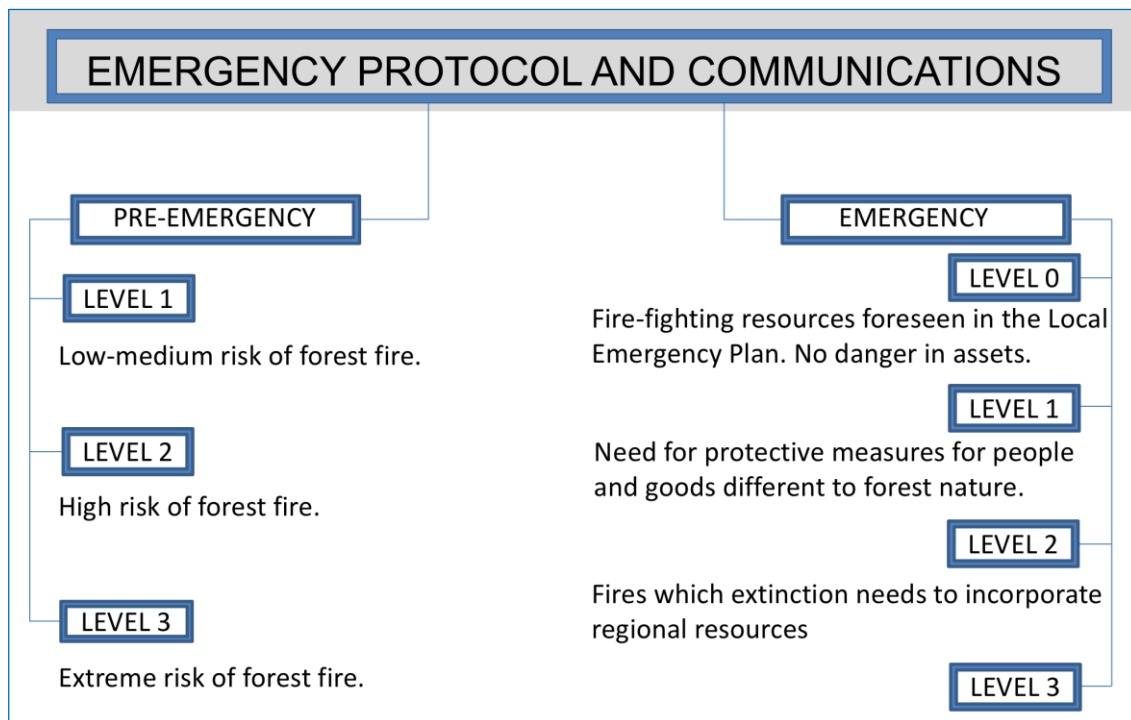


Fig. 4-11. Emergency protocols and communications

Table 4-3.Pre-emergency levels

LEVEL 1	LOW-MEDIUM FOREST FIRE RISK
LEVEL 2	HIGH FOREST FIRE RISK
LEVEL 3	EXTREME FOREST FIRE RISK

JUNIO							JULIO							AGOSTO						
L	M	M	J	V	S	D	L	M	M	J	V	S	D	L	M	M	J	V	S	D
1	2	3	4	5	6	7			1	2	3	4	5						1	2
8	9	10	11	12	13	14	6	7	8	9	10	11	12	3	4	5	6	7	8	9
15	16	17	18	19	20	21	13	14	15	16	17	18	19	10	11	12	13	14	15	16
22	23	24	25	26	27	28	20	21	22	23	24	25	26	17	18	19	20	21	22	23
29	30						27	28	29	30	31			24	25	26	27	28	29	30
														31	1 ^{sep}					

Fig. 4-12. Pre-established days with level 3 pre-emergency (2015)

Besides these pre-established days in the calendar, in the year 2015, for instance, every weekend and bank holiday from April 14th to October 18th, pre-emergency level 3 is established in case that AEMET (Spanish weather agency) determines level 2 out of 5 (moderate level). It should be added to all these days the ones in which AEMET determines extreme risk of fires.

PHASES OF EMERGENCY AT A LOCAL LEVEL

- LEVEL 0:

Level 0 refers to fires that can be controlled using the fire-fighting resources foreseen in the Local Emergency Plan, and which pose no danger to persons or properties.

- **LEVEL 1:**

Fires can be controlled with the mass extinction of the local emergency plan but sees the need for protective measures for people and goods different to forest nature.

- **LEVEL 2:**

Level 2 refers to fires which extinction needs to incorporate regional resources, at the request of the Director of the Emergency Plan (Mayor), and under the Special Plan against Forest Fire Risk (PEIF). It also establishes the possibility of allocating extra resources, when necessary, from the autonomic community (CCAA).

- **LEVEL 3**

Level 3 refers to fires in which the deployment of the means envisaged in the PEIF is necessary, and the direction thereof is assumed by the structure provided therein, in this case the Security and Emergencies Response Agency Director of the Valencian Community. In the early stages of the fire, an initial assessment is carried out (Level 0 or 1) by the current head of the local Fire Brigade (chief technical officer of the PMA) and the PMA (Advanced Command Post) is set up. It constitutes the post technical direction of the work of control and extinction of a fire.

THRESHOLD TRIGGERING

As stated in the use case, according to weather conditions and other socio-cultural factors, there are three pre-emergency risks of forest fire levels, where the third pre-emergency level correspondes to extreme forest fire risk. In this case, all resources are mobilized in order to perform dissuasive surveillance in sensible areas, as well as from this moment, the population must be advised so that they take extreme cautions. Note that any activity with fire will be forbidden.

Therefore, beAWARE system will send messages - once pre-emergency level 3 is declared. On this occasion, the messages are delivered to the population in general to take preventive measures in order to avoid the forest fire taking place.

Furthermore, forest fires are also classified in different levels according to their seriousness, from level 0 to level 3, once they have been produced. Level 1 forest fire is declared when the fire development is likely to require protective measures for people and goods (assets different from forest nature). Consequently, during the forest fire beAWARE system must consider level 1 an activation threshold in order to send messages to the residents in the areas in danger and citizens in general. These messages are supposed to give information about self-protection measures and even advise to be ready for eventual evacuation.

In a third case, the forest fire can spread and endanger resident areas so people who live there must be evacuated. Evacuation orders are currently given by loudspeakers or just in place. beAWARE system will contact people in danger exclusively by sending them messages which will order the evacuation.

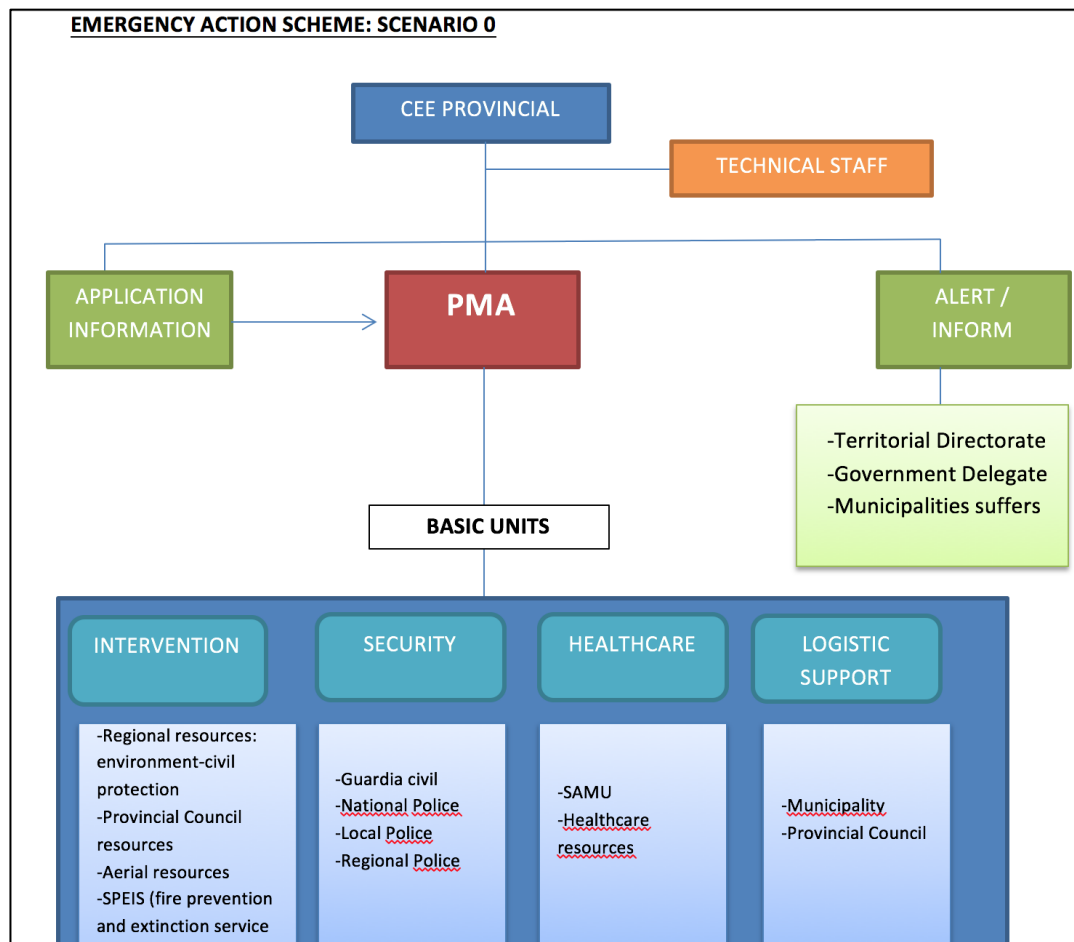


Fig. 4-13. Emergency action scheme

The final declaration of emergency will correspond to the emergency leader (PMA Director, Technical, or Plan Director) and will be communicated to the mobilized units (Intervention, Security, Logistics, Health).

Internal communications

Between Valencia Local Police Command Control Centre (CISE) and Firefighters Command Control Centre (CECOM) there is a direct phone line.

112 (Emergencies coordination center) launches an on line description of the incident which is shared with first responders except with Valencia Local Police. The communication between 112 and PLV is direct by phone.

All first responders have portable communication equipment for internal messages. Regarding PLV officers, they use equipment provided with GPS antenna (geo localized units).

External communications (between Emergencies services and citizens)

112 (Emergencies coordination center)

092 Valencia Local Police resources

080 Firefighters

062 Guardia Civil (it has police competences in all the country)

085 Forest fires

900123505 Traffic Department Center

During an emergency warnings are posted by 112 (@GVA112), PLV (@policialocalvlc) and Firefighters (@bomberosvlc) through social media (Twitter).

Available resources

Preventive resources:

DISTER (Infrared sensors detection system)

The Devesa Natural Park used to have an automatic fire detection system whose objective was to identify and locate the fires during their first moments 24x7x365. This system, commonly called DISTER (Fire Detection by Thermal Sensors), was initially developed by the Polytechnic University of Valencia through a collaboration agreement with the Fire Service of the City of Valencia.

The system had eight thermal cameras and six vision cameras distributed in three observation posts. This configuration enables monitoring approximately 85% of the total surface of the natural park directly, through the use of fixed thermal cameras and the remaining 15% has a maximum window of less than two minutes in the worst case. However, DISTER did not work properly.

In fact, this detection system is out of work currently although some visual fixed cameras are still working and Valencia Firefighters are working in a new system which is supposed to include cameras, temperature sensors and micro-weather stations placed in different areas according to micro-climate issues.

Description of Forest fire measures in Tisvilde Hegn in Denmark

This case presents a forestry area located within the area of Frederiksborg Fire and Rescue Service (FBBR) in Denmark. FBBR work in the field of first responders and civil protection and are responsible for fire extinguishing in the forest called Tisvilde Hegn. The knowledge

presented in this case is useful to support the generic use of the beAWARE system in different territorial context.

The responsible authority for protection measures in the forests is the Nature Agency governed by the Ministry of Environment and Food of Denmark. Protective natural barriers such as controlled combustions and firebreaks in several of the forests have been created. The image below is the forest of Tisvilde Hegn located in the area of FBFR.

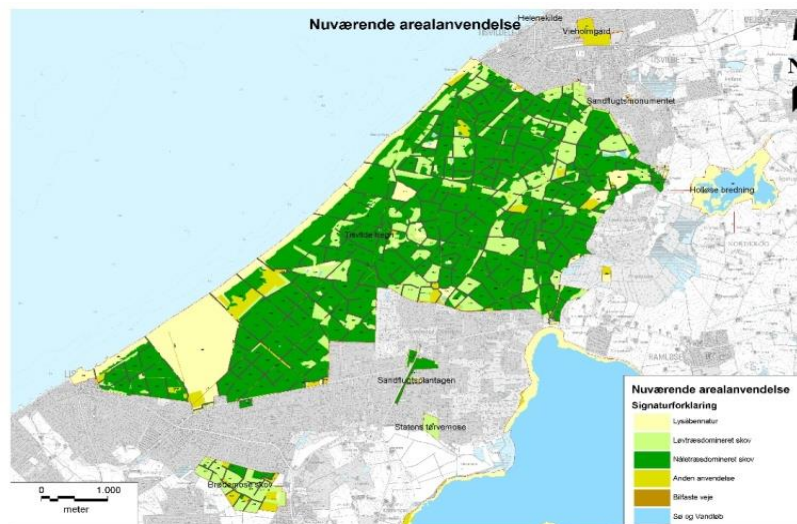


Fig. 4-14. Map of the forest Tisvilde Hegn. The bright green are cleared areas to help prevent and fight fires.

Source: <http://naturstyrelsen.dk/drift-og-pleje/driftsplanlaegning/nordsjaelland/omraadeplaner/tisvilde-hegn/>

In case of a huge forest fire the coordination is gathered at different hierarchal levels on a local and a regional level. On a local level a KST (Command Station) will be gathered nearby the damage site. Here you gather the different agencies involved (police, fire and rescue services, other agencies etc.) which is very important to make a mutual effort in coordination of the response. If the fire is severe enough, which means several fire stations involved, and several municipalities, an LBS (Local Preparedness Staff) will be created where different agencies also will be gathered, just on a more regional level. The aim of the LBS is to overall handle and coordinate the available resources and make sure to dispatch them in the most adequate way in relation to the situation in the affected area.

The operational process will be activated by a telephone call to 112 from someone spotting the fire. This will activate an alarm at the fire and rescue services in the local area. As they respond to the fire incident and assess the situation, they will acknowledge the fire is too big to handle and call for assistance. When a lot of first responders are involved in a fire incident, from different fire stations, and the fire is very big, the KST (command station) will be established as soon as possible to be able to handle the situation in the best way possible from the beginning. When they realize that the LBS needs to be activated, the leading authorities will do so in order to coordinate in a bigger scale.

Every summer the Danish Metrological Institute (DMI) provides a Drought Index, which show the risk of drought and how severe the drought is. Basically, how dry the ground and fuels on the ground is. This is used by the fire services to assess the risk of fires in the nature and give directions to the public in relation to the risk. The drought index could look like the image below on a summer day:

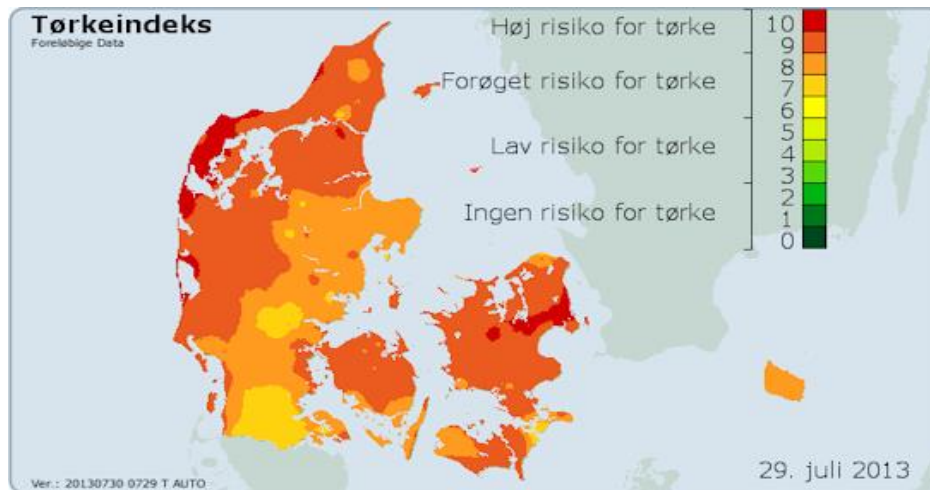


Fig. 4-15. Example of drought index from DMI

Source: <https://www.dmi.dk/nyheder/arkiv/nyheder-2013/7/toerkeindeks-er-tilbage-paa-dmidk/>

4.3 SCN_3: Heatwave

Description of Thessaloniki Demonstration site

The scenario will take place in the wide area of Thessaloniki, which consists of urban, suburban and forest areas. Thessaloniki is the 2nd largest city in Greece and on its North-East side is located a suburban forest. Based on a study made in 2013 regarding the density of population in the cities in Greece, the urban complex of Thessaloniki is in the highest population density level in Greece with over 9000 people/km².

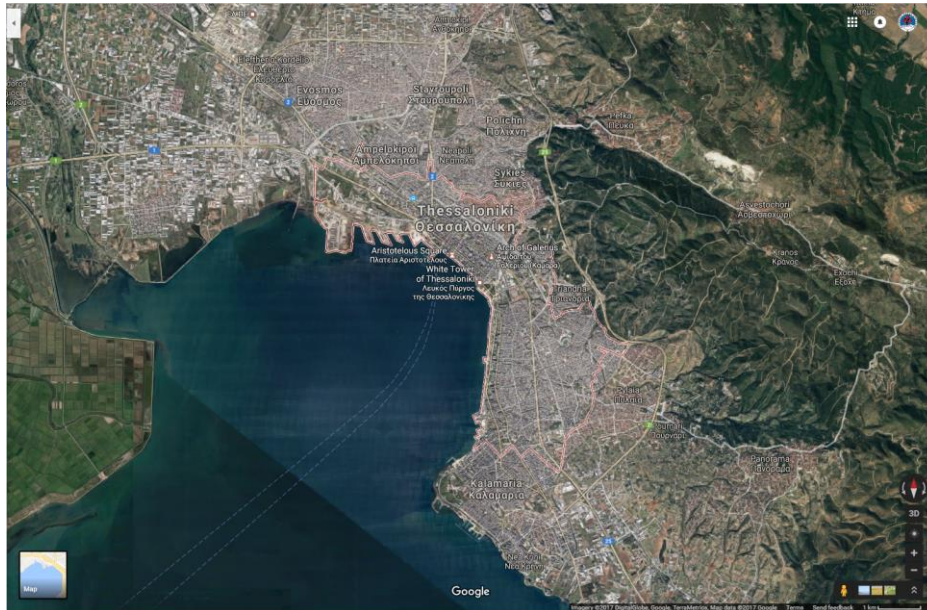


Fig. 4-16. Map of Thessaloniki

The area of Thessaloniki was chosen because according to various studies conducted, the projection of average number of summer days exceeding 40.6 °C over the next years is increasing significantly and additionally the area of Thessaloniki is in the higher rank of the scale, as shown in Fig. 1-3 and Fig. 4-17. Therefore, appearances of heatwaves in the area of Thessaloniki are expected to increase.

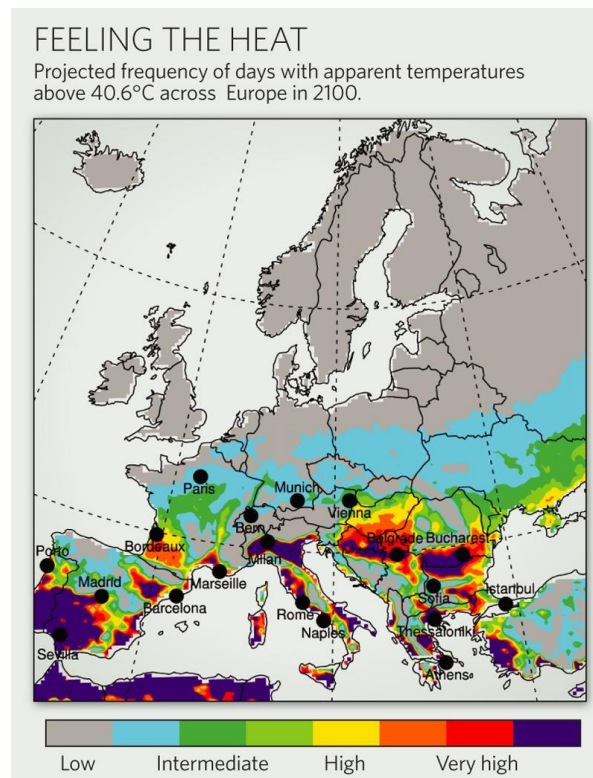


Fig. 4-17. Projected frequency of days with apparent temperatures above 40.6 °C across Europe in 2100⁵

Furthermore, the level of humidity in the area of Thessaloniki and especially in the center of Thessaloniki during the summer period is very high⁶ which has as a result the parallel increase of the heat index, as shown in the table reported in the Fig. 5-19.

According to the proposed scenario, a heatwave will strike during summer and more specifically near the end of August and it will last for a period of 4 days.

The temperatures during that period will be over 37 °C, with an average during the day of 31 °C minimum, and the phenomenon will be very intense, especially inside the city, where the heat index is very high.

In order for all relevant authorities (Municipalities, Fire Department, Hospitals, Civil Protection) to be prepared to address properly the upcoming phenomenon and its consequences, they need to be alerted based on the meteorological forecast the soonest possible and they need to have as many information as possible regarding its progression and the probability of potential impacts.

The side-effects and the problems that are foreseen to occur during the period of the heatwave are significant and diverse. Therefore a wide range of first responders might be

⁵ <http://www.nature.com/news/2010/100517/full/news.2010.238.html>

⁶ <http://mail.meteothes.gr/wxhumiditysummary.php?r=wxhumiditysummary.php>

involved in order to address any possible impacts and to minimize their result and all potential incidents that require effective management. Additionally volunteers will be called to assist the authorities in the management of the situation.

Moreover, a lot of municipalities in the area of Thessaloniki and of course the Municipality of Thessaloniki offer places for the public and especially the elders to find shelter during the daytime when the phenomenon is more intense. For that purpose all municipal authorities issue announcements informing the public about the places that are available.

Furthermore, the excessive demand on power might cause a blackout which in turn will cause even more problems that need to be addressed. Traffic chaos is very likely to occur causing significant problems in the transportation of first responders, ambulances, etc. People will be stuck in elevators and elder people who cannot use the stairs will be stuck at homes without air-conditioning.

Last but not least, since the probability for a forest fire to occur during or even after the period of heatwave is significantly increased, all relative authorities need to be alerted when that risk is very high in order to address any potential fire outbreak in the nearby forest.

Emergency protocol and communications

Internal (between the Civil Protection and first responders)

The emergency is managed using traditional telecommunications systems / institutional.

- Telephone
- Radio
- Fax
- Email

External (between the Civil Protection and the Community)

Alerts are distributed using all possible resources, media and social media, with guides and advices on how to reduce the effects of the heatwave and how to avoid exposure as well as with information on where are the places that the public can visit during the day to avoid exposure to heat.

Useful numbers that the public can use are:

- 112
- Police: 100
- Fire department: 199
- Ambulance service: 166

- Each municipality that provides places with a/c has its own number. For the Municipality of Thessaloniki the number is 2313 313135

Available resources

- Weather data (from various web pages)
- Historical data
 - Press releases
 - Weather data
- Civil protection plan to handle the phenomenon
- Traffic situation

5 beAWARE Use Cases

5.1 Use Cases for the Flood scenario

UC_101: Declaration of the attention status and continuous monitoring of flood forecasting

This Use Case concerns the declaration of the “ATTENTION” status and the continuous monitoring of the forecasted level of risk.

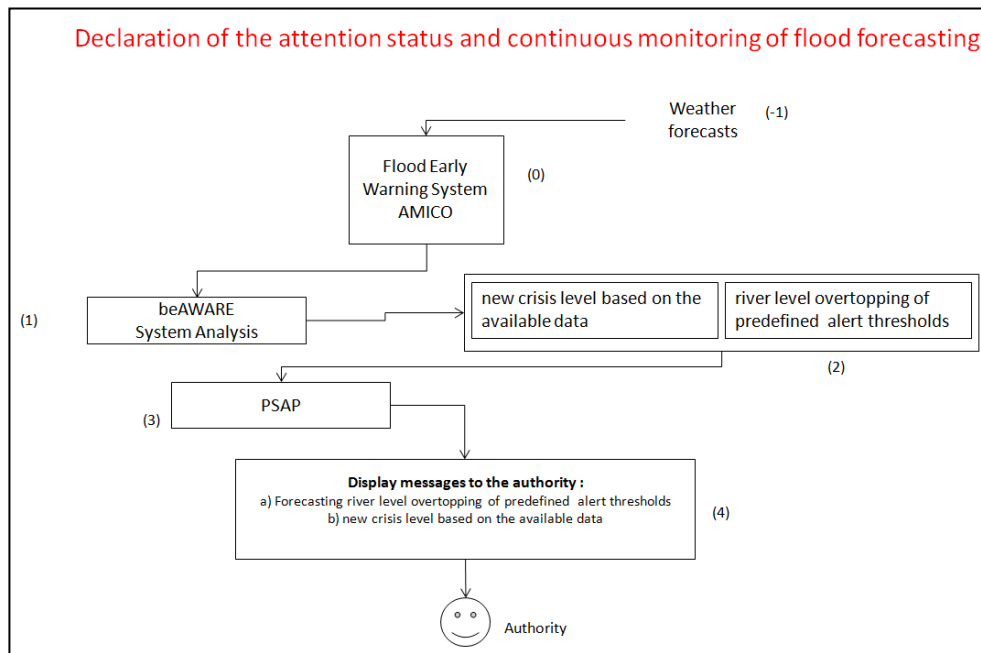


Fig. 5-1. Block Diagram of the UC101

Current Status (initial phase of the scenario)

- Before and during the flood

What is known to the beAWARE system already

- Weather forecast

What is happening

- Weather forecasts feed the Flood Early warning system AMICO (EWS), whose results can be visualized in the Platform

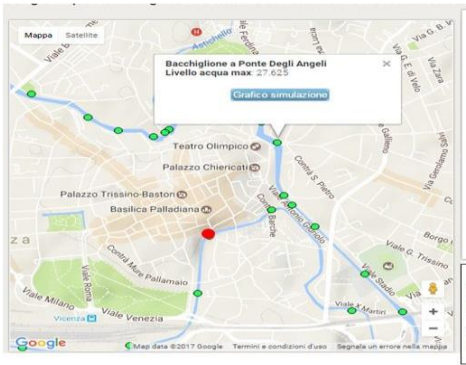

Outcome

- The results of the EWS (river level) can be visualized in the Platform and show potential dangerous situations
- The authority (e.g. mayor), based on these results, declares the “ ATTENTION” status and convenes in formal way the members of the “COC - Municipal Operative Center”,

that will be engaged in monitoring the situation and in the management of the emergency thanks to the Public-safety answering point (PSAP) platform.

- The authority, based on these results, can continuously monitor the evolution of the forecasted flood and evaluate the forecasted level of risk.

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP of the overtoppings:</p>  <p>List of the report:</p> 	<p>Spots in a map (from google map for example), in corresponding to river modelled cross sections, with different colors depending on the overtopping of defined water level thresholds (water level forecasted by AMICO EWS):</p> <p>Colors:</p> <ul style="list-style-type: none"> • green: not overtopped • yellow: 1st threshold overtopped • orange: 2nd threshold overtopped • red: 3rd threshold overtopped <p>Filters could be applied to the time and the spatial scale.</p> <p>Below the map the list of overtopping detected is visualized and ordered by occurrence date and colored based on the same classification used for the spot in the map.</p>

Example of the textual information that might be presented to the authorities

- From first Responders
- From Citiezens

Example of messages that might be presented to the people

- None

Example of messages that might be presented to the first responders

- None

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- Mayor

Mobile application equipment

- None

UC_102: Management of new flood emergencies

This Use Case concerns the management of new emergencies reported by citizens and first responders.

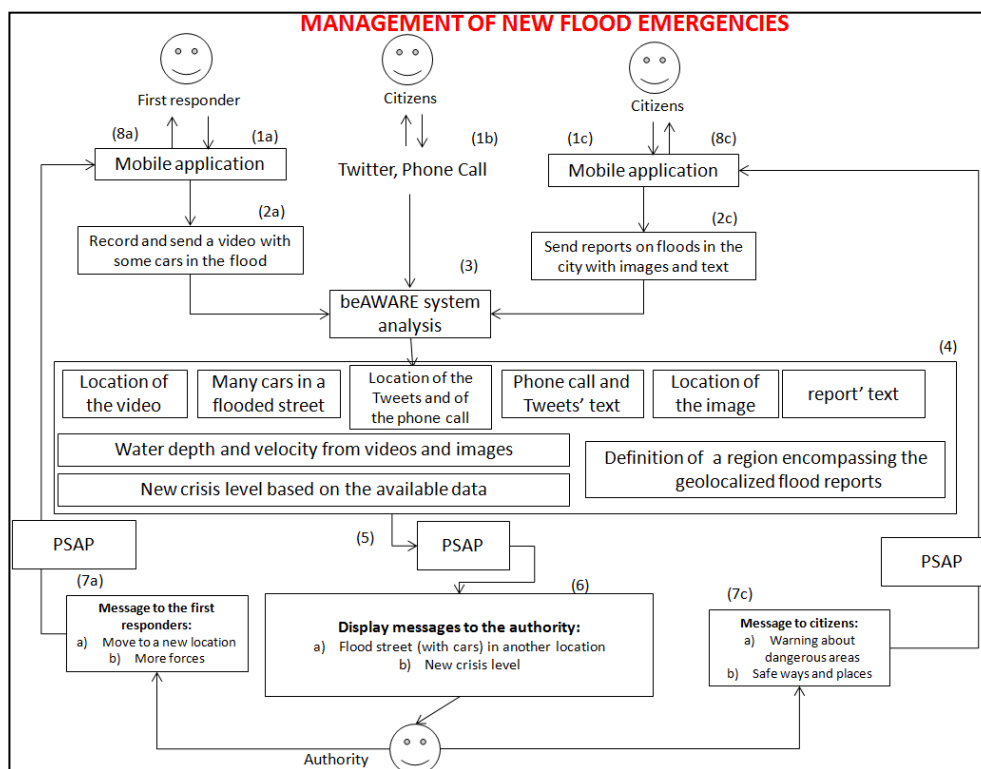


Fig. 5-2. Block Diagram of the UC102

Current Status (initial phase of the scenario)

- During the flood

What is known to the beAWARE system already

- Weather forecast
- Location of the flooded area

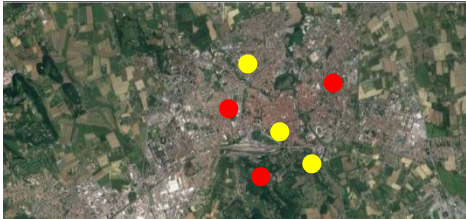

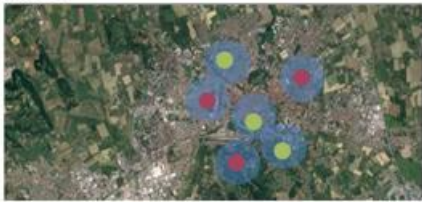
What is happening

- A first responder (rescue service) is recording a video of a flooded street in another location in the city
- Tweets and phone calls are mentioning flooded areas in another location in the city
- Citizens are sending reports on floods with images and text in another location in the city

Outcome

- The authority (e.g. mayor) move forces to the new location
- The authority (e.g. mayor) sends notifications to citizens approaching the dangerous areas and suggests alternative ways
- The system defines a new crisis level based on the available data

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP:</p>  <p>List of the report filtered and ordered by submission date:</p>  <p>MAP:</p> 	<p>Spots in a map (from google map for example) with different colors depending on the filter:</p> <p>Filter= sender:</p> <ul style="list-style-type: none"> citizens first responders (civil protection volunteers) <p>Filter= water depth (evaluated by the beAWARE system from the videos sent by users):</p> <ul style="list-style-type: none"> 0cm 0-10cm 10-50cm <p>Other possible filters could be related to the subject of the emergencies reports (e.g.: viability...), the time and the spatial scale.</p> <p>Below the map the list of the report, filtered and ordered by submission date, is visualized.</p> <p>Virtual regions of interest will be defined by the System, based on the warning received. For example, each message point could be considered as the center of a circle with a radius of 500 m.</p>

Example of the textual information that might be presented to the authorities

- From First Responders**



ITA	ENG
Piazza XX allagata. Richiesta di rinforzi	Square XX flooded. More forces required
Macchine e cassonetti trasportati dalla corrente. Chiudere l'accesso alla strada	Cars and Dumpsters transported by the flow. Close the access to the street
Persone in pericolo in uscita dalle autovetture allagate	People, leaving from their cars, in danger

ITA	ENG
Rigurgito da rete fognaria. Richiesta di rinforzi dotati di idrovore	Surcharge of the drainage network. More forces required, equipped with pumping stations

• **From Citizens**

ITA	ENG
Sottopasso allagato. Una macchina è rimasta intrappolata dentro e il conducente non riesce ad uscire.	Subway flooded. A car is trapped inside, and the driver is not able to leave it
Un albero trascinato dalla corrente si è incastrato nel ponte e il deflusso è impedito. L'allagamento è prossimo.	A tree, transported by the flow, is blocking the bridge's openings. The flow is limited and the river level is reaching the embankment's top
Siamo sul tetto di casa nostra, siamo isolati, ci serve una barca per uscire.	We are on the roof of our home, we are isolated, we need a boat to leave
Le vie del centro si stanno allagando. La gente fa fatica a camminare a causa velocità della corrente.	The city center's streets are going to be flooded. People struggle to walk because of the velocity of the flow.
Alcune persone stanno cercando di spostare la propria macchina per metterle al sicuro ma vengono trascinate via dalla corrente	Some people are trying to move their cars in order to save them, but they are drag away by the flow
Il livello a Ponte degli Angeli ha raggiunto la sponda sinistra e l'acqua sta per sormontare	The water level at Ponte Angeli Bridge reached the left embankment's top and water is going to overtop it
Vicenza in ginocchio! Alluvione in corso!AIUTO!	Vicenza is on its knee! Flood is in progress! HELP!
situazione tragica! una donna morta schiacciata dalle macchine che galleggiavano e una bambina dispersa!	Tragical situation! Dead woman smashed by floating cars and a missing child!
Ho la cantina allagata	Flooded basement
Ho una fattoria e gli animali sono stati inondati. Se non arrivano soccorsi perdo tutto.	My farm is flooded and the animals are drowned inside. If rescue teams do not arrive I will lose everything.
Le strade sono fiumi marroni...l'acqua arriva ai finestrini delle macchine...	The streets are brown rivers...the water is reaching the car windows...
l'acqua mi ha portato via il motorino!	Water flow took my motorbike away

Example of messages that might be presented to the people

ITA	ENG
<p>Alluvione in corso. Allontanarsi rapidamente e in sicurezza dalla zona. Sono stati identificati i seguenti luoghi sicuri non soggetti ad allagamento o esondazione:</p> <ul style="list-style-type: none"> • via Pforzheim - viale Cricoli (park Cricoli) • via Baden Powell (cittadella degli studi) • via Ragazzi del '99 (parcheggio cimitero) • via Trieste (parcheggio viale del Cimitero) • Monte Berico (piazzale della Vittoria) • Park Borgo Berga - nuovo tribunale • corso SS Felice e Fortunato – via Cattaneo (park Cattaneo) • via Cattaneo - via dei Cairoli (ex sedime ferroviario) • viale Btg. Framarin (parcheggio Teatro Comunale) • via Btg. Framarin – via Cengio • via del Mercato Nuovo (parcheggio mercato ortofrutticolo) • via Btg. Val Leogra (park Dogana) • viale Ferrarin (parcheggio centro culturale San Paolo) 	<p>Flood in progress. Escape rapidly and safely. The following safe places were identified:</p> <ul style="list-style-type: none"> • via Pforzheim - viale Cricoli (park Cricoli) • via Baden Powell (cittadella degli studi) • via Ragazzi del '99 (parcheggio cimitero) • via Trieste (parcheggio viale del Cimitero) • Monte Berico (piazzale della Vittoria) • Park Borgo Berga - nuovo tribunale • corso SS Felice e Fortunato – via Cattaneo (park Cattaneo) • via Cattaneo - via dei Cairoli (ex sedime ferroviario) • viale Btg. Framarin (parcheggio Teatro Comunale) • via Btg. Framarin – via Cengio • via del Mercato Nuovo (parcheggio mercato ortofrutticolo) • via Btg. Val Leogra (park Dogana)
<p><small>C: proposed improvement in beAWARE (Decision Making Authorities could define a virtual region of interest, based on the message. Citizens approaching such area will receive notification, thanks to the GPS, concerning with this emergency and the flooding ways)</small></p> 	<p><small>C: proposed improvement in beAWARE (Decision Making Authorities could define a virtual region of interest, based on the message. Citizens approaching such area will receive notification, thanks to the GPS, concerning with this emergency and the flooding ways)</small></p> 
<p>Questo messaggio verrebbe ricevuto in automatico nel caso in cui un cittadino si trova nei pressi di una zona pericolosa</p>	<p>This message will be received automatically by a citizen approaching a dangerous area</p>
<p>Alluvione in corso. SE NON PUOI ABBANDONARE LA CASA SALI AI PIANI SUPERIORI E ATTENDI L'ARRIVO DEI SOCCORSI.</p>	<p>Flood in progress. If you cannot leave your home, reach the highest floors and wait for the rescue teams</p>

ITA	ENG
SE SEI IN MACCHINA EVITA DI INTASARE LE STRADE	If you are driving, do not cause traffic jam
NON PERCORRERE STRADE INONDATE E SOTTOPASSAGGI	Do not move in flooded streets and subways
PRESTA ATTENZIONE ALLE INDICAZIONI FORNITE DALLE AUTORITÀ	Follow suggestions by authority
<p>La distribuzione dei sacchi di sabbia è disponibile presso le seguenti postazioni:</p> <ul style="list-style-type: none"> • Piazza Venti Settembre • Ca' Tosate • Via del Grande (zona stadio) • Viale Ferrarin (lato nord) • Piazza Matteotti (vicino all'ostello della gioventù) • San Pietro Intrigogna (piazzale della chiesa) • Viale Fusinato (parcheggio chiesa San Giorgio) • Via Leoni • Viale del Brotton/ viale Ferrarin • Debba (piazzale della chiesa) • Contra' San Pietro (piazzale della chiesa) • Via Sardegna • Contra' Santi Apostoli 	<p>The distribution of sand packs is available at the following locations:</p> <ul style="list-style-type: none"> • Piazza Venti Settembre • Ca' Tosate • Via del Grande (zona stadio) • Viale Ferrarin (lato nord) • Piazza Matteotti (vicino all'ostello della gioventù) • San Pietro Intrigogna (piazzale della chiesa) • Viale Fusinato (parcheggio chiesa San Giorgio) • Via Leoni • Viale del Brotton/ viale Ferrarin • Debba (piazzale della chiesa) • Contra' San Pietro (piazzale della chiesa) • Via Sardegna • Contra' Santi Apostoli

Example of messages that might be presented to the first responders

ITA	ENG
Squadra X raggiunga Via XX per aiutare cittadini rimasti intrappolati in macchina in un sottopasso allagato.	Team X reached Street XX to help citizens trapped inside cars in a flooded subway
Squadra X raggiunga Via XX per procedere a rimuovere albero che ostruisce il ponte	Team X reached Street XX to remove a tree blocking the bridge's openings
Squadra X raggiunga Via XX per salvataggio tramite elicottero di persone isolate sul tetto di casa	Team X reached Street XX to save by helicopter people isolated on the roof of their home
Squadra X raggiunga Via XX per salvataggio tramite barca di persona trascinata dalla corrente	Team X reaches Street XX to save by boat a person who is drag away by the river flow

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- Mayor

Mobile application equipment

- Personal mobile phone

UC_103: Monitoring river water level and assignment of tasks to first responders

This Use Case concerns the assignment of tasks to first responders based on the monitored water river level.

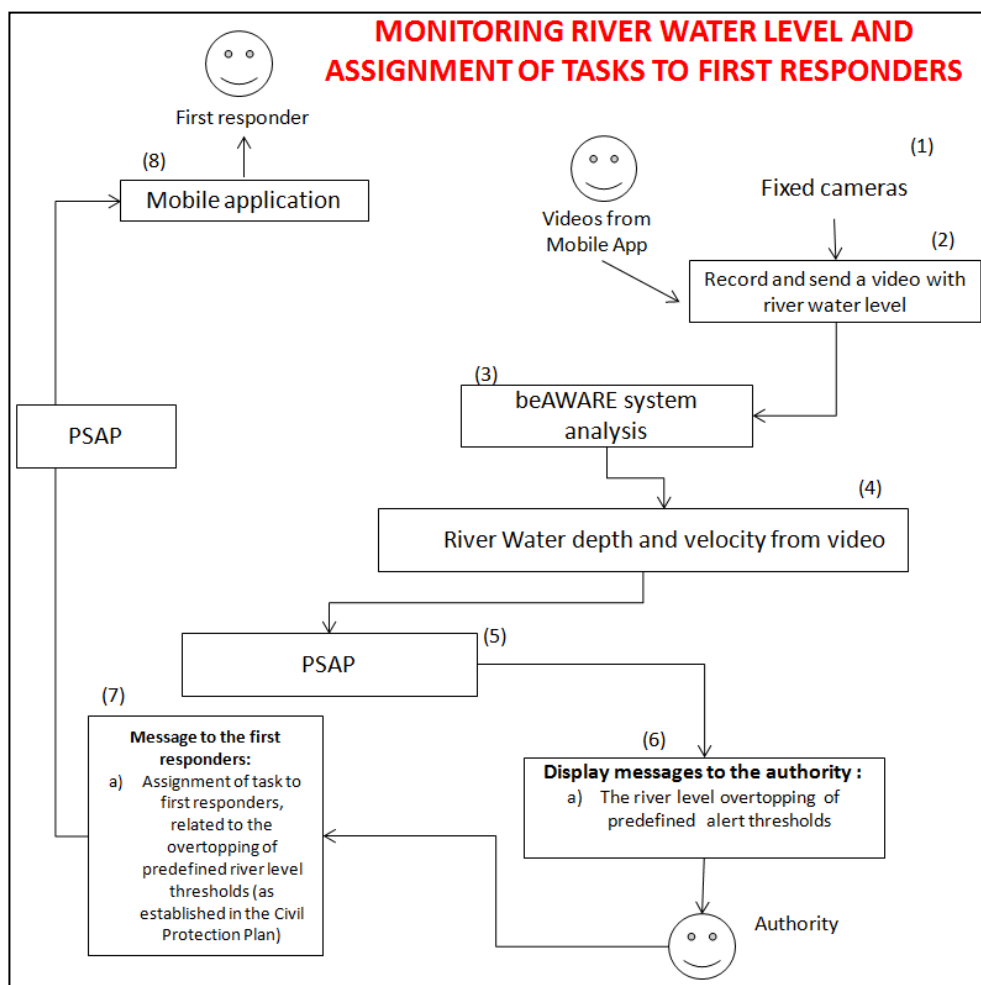


Fig. 5-3. Block Diagram of the UC103

Current Status (initial phase of the scenario)

- Before the flood

What is known to the beAWARE system already

- Weather forecast
- Predefined alert thresholds of river level
- Location of the forecasted flooded area

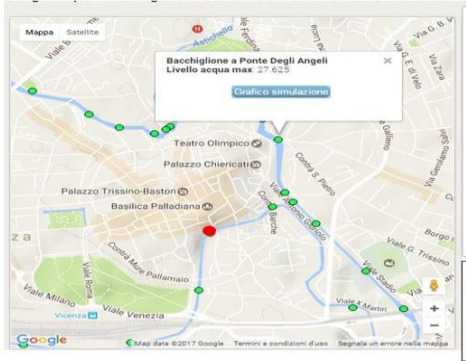



What is happening

- A fixed camera, located in correspondence of a river section of interest, records continuously water level inside the river
- A citizen records video continuously of water level inside the river

Outcome

- Once the river water level overtops predefined alert thresholds, the authority (e.g. mayor) assigns tasks to first responders

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP of the overtoppings:</p>  <p>List of the report:</p> 	<p>Spots in a map (from google map for example), in correspondence of cameras installation, with different colors depending on the overtopping of defined water level thresholds (water level detected by beAWARE tools):</p> <p>Colors:</p> <ul style="list-style-type: none"> green: not overtopped yellow: 1st threshold overtopped orange: 2nd threshold overtopped red: 3rd threshold overtopped <p>Filters could be related on the time and the spatial scale.</p> <p>Below the map is visualized the list of the overtopping detected and ordered by occurrence date and colored based on the same classification used for the spot in the map.</p>
<p>MAP of the assignments:</p>  <p>List of the assignments:</p> 	<p>Spots in a map (from google map for example) with the location of the assignments.</p> <p>Filters could be related on the subject of the tasks, the time and the spatial scale.</p> <p>Below the map the list of the assignments, filtered and ordered by creation date, is visualized.</p>

Example of the textual information that might be presented to the authorities

- **From First Responders**
 - None
- **From Citizens**
 - None

Example of messages that might be presented to the people

- None

Example of messages that might be presented to first responders

ITA	ENG
Azione: Posizionare Aquadike agli estremi di ponte degli Angeli Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place Aquadike at the ends of Ponte degli Angeli Bridge Location : coordinates: North , East address: Street XX
Azione: Posizionare paratie lungo ringhiera largo Goethe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place gates along Goethe street Location : coordinates: North , East address: Street XX
Azione: Posizionare una fila di sacchi lungo via Nervesa della Battaglia Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place a line of sand packs along Nervesa della Battaglia street Location : coordinates: North , East address: Street XX
Azione: Verificare lo stato del terrapieno Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify the status of the embankment Location : coordinates: North , East address: Street XX
Azione: Verificare il funzionamento delle pompe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify working of pumps Location : coordinates: North , East address: Street XX

ITA	ENG
Azione: Verificare la presenza di eventuali risalite fognarie Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential sewage overflow Location : coordinates: North , East address: Street XX
Azione: Verificare l'eventuale mancanza di alimentazione elettrica Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify the Lack of the power supply Location : coordinates: North , East address: Street XX

Report from the first responders to the authority (tasks etc.)

- None

The roles under the term authority

- Mayor

Mobile application equipment

- Personal Mobile Phone

UC_104: Evaluation of the execution of tasks -

This Use Case concerns the evaluation of the execution of the tasks assigned to first responders during an emergency.

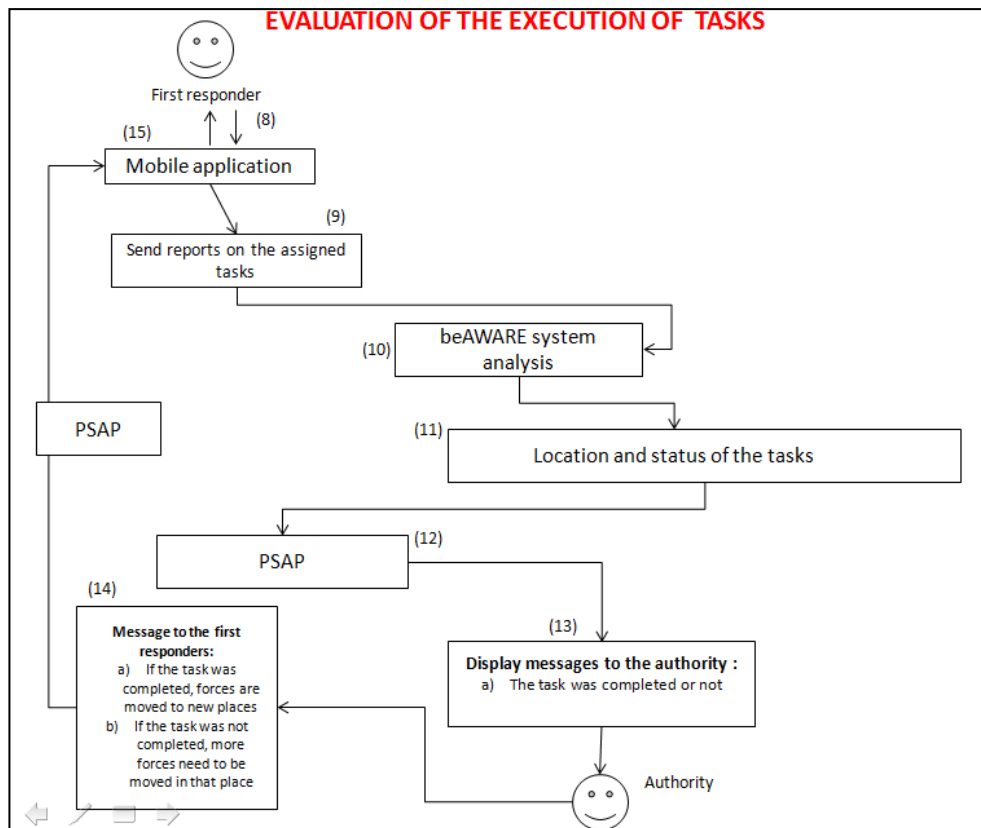


Fig. 5-4. Block Diagram of the UC104

Current Status (initial phase of the scenario)

- Before the flood

What is known to the beAWARE system already

- Weather forecast
- Predefined alert thresholds of river level
- Location of the forecasted flooded area



What is happening

- Once the river water level had overtopped predefined alert thresholds, the authority (e.g. mayor) assigned tasks to first responders

Outcome

- The authority (e.g. mayor) evaluates in real time the execution of the assigned tasks and has a global visualization of the activities performed

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP of the assignments:</p>  <p>List of the assignments:</p> 	<p>Spots in a map (from google map for example) with the location of the assignments, with different colors depending on the status:</p> <p>Status of the assignment:</p> <ul style="list-style-type: none"> • white (task assigned) • green (task assigned and completed) • red (task assigned but not completed) <p>Filters could be related on the subject of the tasks, the time and the spatial scale.</p> <p>Below the map the list of the assignments, filtered and ordered by creation date, is visualized.</p>

Example of the textual information that might be presented to the authorities

- **From First Responders**
 - None
- **From Citizens**
 - None

Example of messages that might be presented to the people

- None

Example of messages that might be presented to the first responders (support another team unable to perform the assigned task)

ITA	ENG
Azione: Raggiungere squadra XX in quanto bisognosa di supporto Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Team XX needs support Location : coordinates: North , East address: Street XX

Example of messages that might be presented to the first responders (move to another location to perform a new assigned task)

ITA	ENG
Azione: Posizionare Aquadike agli estremi di ponte degli Angeli Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place Aquadike at the ends of Ponte degli Angeli Bridge Location : coordinates: North , East address: Street XX
Azione: Posizionare paratie lungo ringhiera largo Goethe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place gates along the Goethe street Location : coordinates: North , East address: Street XX
Azione: Posizionare una fila di sacchi lungo via Nervesa della Battaglia Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place a line of sand packs along Nervesa della Battaglia street Location : coordinates: North , East address: Street XX
Azione: Verificare lo stato del terrapieno Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify the status of the embankment Location : coordinates: North , East address: Street XX
Azione: Verificare il funzionamento delle pompe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify working of pumps Location : coordinates: North , East address: Street XX

ITA	ENG
Azione: Verificare la presenza di eventuali risalite fognarie Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential sewage overflow Location : coordinates: North , East address: Street XX
Azione: Verificare l'eventuale mancanza di alimentazione elettrica Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential missing of power supply Location : coordinates: North , East address: Street XX

Example of reports from the first responders that might be presented to the authority (tasks etc.)

ITA	ENG
Stato del task: Completato Commento: Tutto ok	Status of the assignment: Completed Comment: All is ok
Stato del task: Non completato Commento: Ho bisogno di più tempo	Status of the assignment: Not Completed Comment: I need more time
Stato del task: Non completato Commento: Ho bisogno di rinforzi	Status of the assignment: Not Completed Comment: I need more support

The roles under the term authority

- Mayor

Mobile application equipment

- Personal Smartphones with Android or Windows or iOS Operating System installed

UC_105: Monitoring rainfall

This Use Case concerns the assignment of tasks to first responders based on the monitored rainfall intensity.

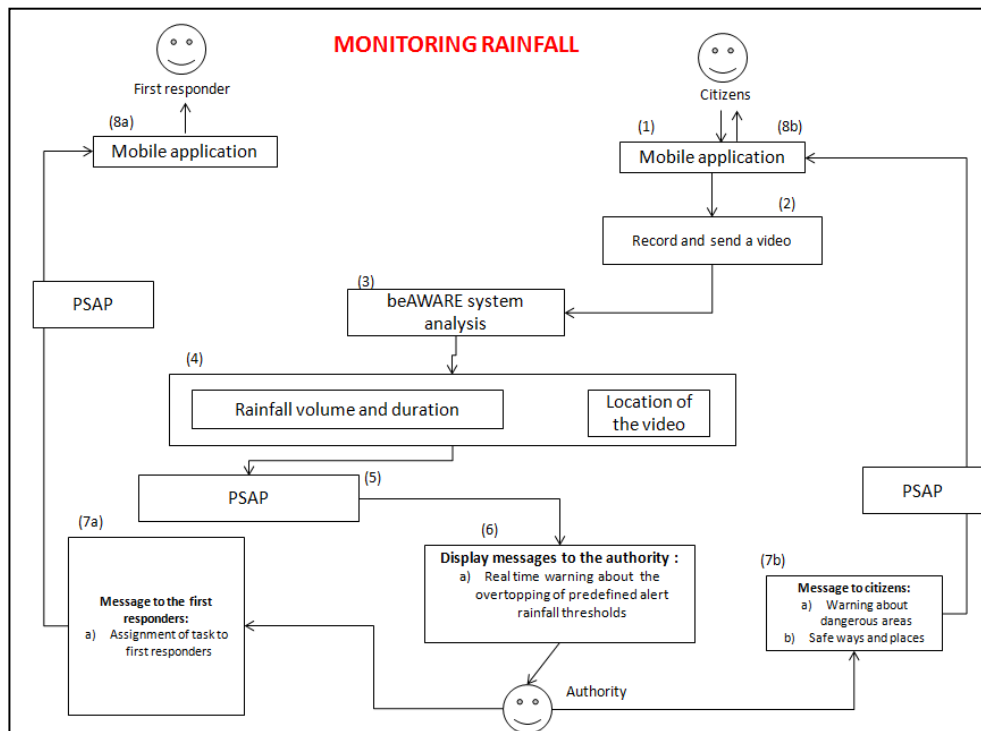


Fig. 5-5. Block Diagram of the UC105

Current Status (initial phase of the scenario)

- During an intense rainfall event

What is known to the beAWARE system already

- Weather forecast
- Land use
- Soil moisture
- Location of the forecasted flooded area
- Predefined alert rainfall thresholds

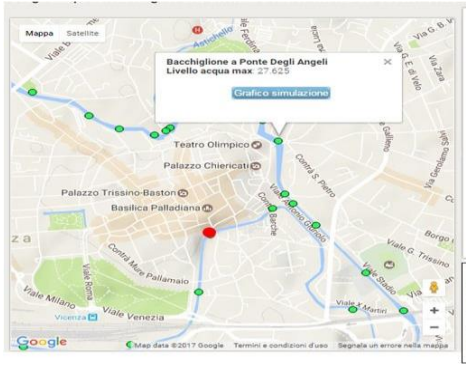

What is happening




- Citizens are recording a video about a rainfall event

Outcome

- Once the rainfall threshold is overtopped the authority (e.g. mayor) assigns tasks to first responders (e.g. Pumping stations to be activated)
- Once the rainfall threshold is overtopped the authority (e.g. mayor) sends notifications to citizens approaching the dangerous areas (e.g. underpass to be avoided) and suggests alternative ways

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)


VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p data-bbox="215 481 561 517">MAP of the overtoppings:</p>  <p data-bbox="215 1019 451 1055">List of the report:</p> 	<p data-bbox="724 481 1378 701">Spots in a map (from google map for example) with different colors depending on the overtopping of defined rainfall intensity thresholds, detected by videos recorded by citizens:</p> <p data-bbox="724 712 820 748">Colors:</p> <ul data-bbox="772 763 1276 920" style="list-style-type: none">• green: not overtopped• yellow: 1st threshold overtopped• orange: 2nd threshold overtopped• red: 3rd threshold overtopped <p data-bbox="724 925 1378 1005">Filters could be related on the time and the spatial scale.</p> <p data-bbox="724 1093 1378 1267">Below the map is visualized the list of the overtopping detected and ordered by occurrence date and colored based on the same classification used for the spot in the map.</p>

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP of the assignments:</p>  <p>List of the assignments:</p> 	<p>Spots in a map (from google map for example) with the location of the assignments.</p> <p>Filters could be related on the subject of the tasks, the time and the spatial scale.</p> <p>Below the map the list of the assignments, filtered and ordered by creation date, is visualized.</p>
<p>MAP:</p> 	<p>Virtual regions of interest will be defined by the System, based on the warning received. For example each message point could be considered as the center of a circle with a radius of 500 m.</p>

Example of the textual information that might be presented to the authorities

- **From First Responders**
 - None
- **From Citizens**
 - None

Example of messages that might be presented to the people

ITA	ENG
Possibile Alluvione causa piogge intense. Prudenza!	Potential flood due to intense rainfall. Take care!
<p><small>C: proposed improvement in beAWARE (Decision Making Authorities could define a virtual region of interest, based on the message. Citizens approaching such area will receive notification, thanks to the GPS, concerning with this emergency and the relative ways)</small></p> 	
Questo messaggio verrebbe ricevuto in automatico nel caso in cui un cittadino si trova nei pressi di una zona pericolosa	This message will be received automatically by a citizen approaching to a dangerous area
EVITA DI PERCORRERE SOTTOPASSAGGI	Do not move in subways
PRESTA ATTENZIONE ALLE INDICAZIONI FORNITE DALLE AUTORITÀ	Follow suggestions by the authority

Example of messages that might be presented to first responders

ITA	ENG
Azione: Verificare il funzionamento delle pompe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify working of pumps Location : coordinates: North , East address: Street XX
Azione: Verificare la presenza di eventuali risalite fognarie Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential sewage overflow Location : coordinates: North , East address: Street XX

ITA	ENG
Azione: Verificare l'eventuale mancanza di alimentazione elettrica Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential missing of power supply Location : coordinates: North , East address: Street XX

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- Mayor

Mobile application equipment

- Personal Mobile Phone

UC_106: Monitoring river breaking/overtopping and assignment of relative tasks

This Use Case concerns the assignment of tasks to first responders based on the monitored river breaking/overtopping.

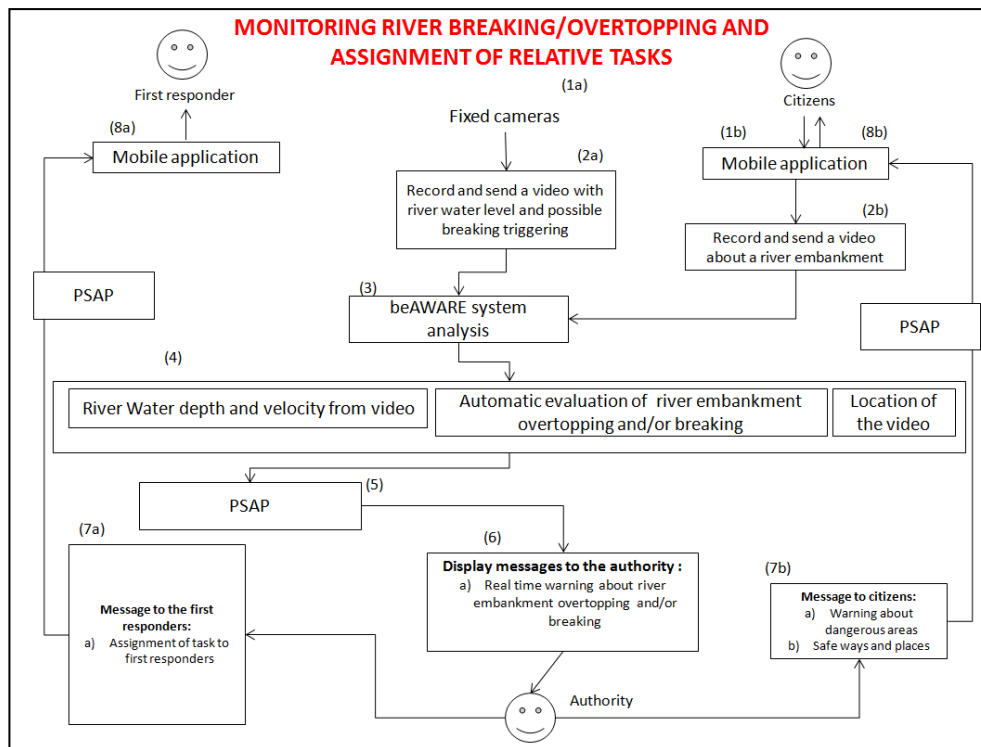


Fig. 5-6. Block Diagram of the UC106

Current Status (initial phase of the scenario)

- Before the flood

What is known to the beAWARE system already

- Weather forecast
- Location of the forecasted flooded area

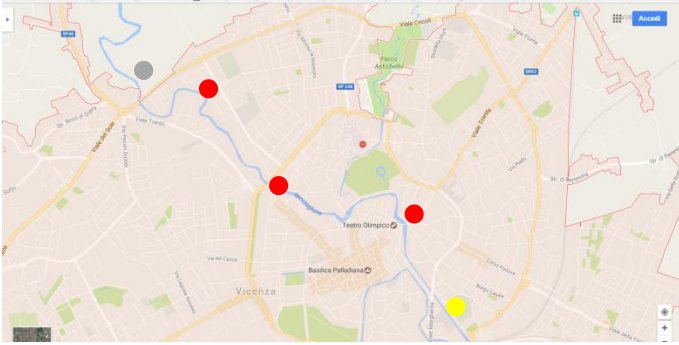


What is happening



- A fixed camera, located in correspondence of a river section of interest, records continuously water level inside the river and the possible breaking triggering
- Citizens are recording a video about a river embankment

Outcome

- Once the embankment is overtopped or broken the authority (e.g. mayor) assigns tasks to first responders
- Once the embankment is overtopped or broken the authority (e.g. mayor) sends notifications to citizens approaching the dangerous areas and suggests alternative ways

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP:</p>  <p>List of the report filtered and ordered by submission date:</p>  <p>MAP:</p> 	<p>Spots in a map (from google map for example) with different colors depending on the status of the embankment detected by videos recorded by citizens and the fixed cameras:</p> <p>Colors:</p> <ul style="list-style-type: none">• grey: not overtopped/broken• yellow: start overtopping/breaking• red: overtopping/breaking in progress <p>Filters could be related on the time and the spatial scale and status.</p> <p>Below the map the list of the report, filtered and ordered by submission date, is visualized.</p> <p>Virtual regions of interest will be defined by the System, based on the warning received. For example each message point could be considered as the center of a circle with a radius of 500 m.</p>

VISUALIZATION	DESCRIPTION OF THE VISUALIZATION
<p>MAP of the assignments:</p>  <p>List of the assignments:</p> 	<p>Spots in a map (from google map for example) with the location of the assignments.</p> <p>Filters could be related on the subject of the tasks, the time and the spatial scale.</p> <p>Below the map the list of the assignments, filtered and ordered by creation date, is visualized.</p>

Example of the textual information that might be presented to the authorities

- **From First Responders**
 - None
- **From Citizens**

ITA	ENG
Stato dell'argine: Normale Commento: Tutto ok	Status of the embankment: not overtopped/broken Comment: All is ok
Stato dell'argine: Innesco rottura/sormonto Commento: Pericolo!! l'acqua comincia ad uscire dall'argine	Status of the embankment: start overtopping/breaking Comment: I need more time
Stato del argine: Rottura/sormonto in corso Commento: Sto scappando! Allontanarsi dalla zona!	Status of the embankment: overtopping/breaking in progress Comment: I am escaping! Leave this place!

Example of messages that might be presented to the people

ITA	ENG
<p>Alluvione in corso. Allontanarsi rapidamente e in sicurezza dalla zona. Sono stati identificati i seguenti luoghi sicuri non soggetti ad allagamento o esondazione:</p> <ul style="list-style-type: none"> • via Pforzheim - viale Cricoli (park Cricoli) • via Baden Powell (cittadella degli studi) • via Ragazzi del '99 (parcheeggio cimitero) • via Trieste (parcheeggio viale del Cimitero) • Monte Berico (piazzale della Vittoria) • Park Borgo Berga - nuovo tribunale • corso SS Felice e Fortunato – via Cattaneo (park Cattaneo) • via Cattaneo - via dei Cairoli (ex sedime ferroviario) • viale Btg. Framarin (parcheeggio Teatro Comunale) • via Btg. Framarin – via Cengio • via del Mercato Nuovo (parcheeggio mercato ortofrutticolo) • via Btg. Val Leogra (park Dogana) • viale Ferrarin (parcheeggio centro culturale San Paolo) <p><small>C: proposed improvement in beAWARE (Decision Making Authorities could define a virtual region of interest, based on the verified warning message. Citizens approaching such area will receive notification, thanks to the GPS, concerning with this emergency and potential danger zone).</small></p>  <p>Questo messaggio verrebbe ricevuto in automatico nel caso in cui un cittadino si trova nei pressi di una zona pericolosa</p>	<p>Flood in progress. Escape rapidly and safely. The following safe places were identified:</p> <ul style="list-style-type: none"> • via Pforzheim - viale Cricoli (park Cricoli) • via Baden Powell (cittadella degli studi) • via Ragazzi del '99 (parcheeggio cimitero) • via Trieste (parcheeggio viale del Cimitero) • Monte Berico (piazzale della Vittoria) • Park Borgo Berga - nuovo tribunale • corso SS Felice e Fortunato – via Cattaneo (park Cattaneo) • via Cattaneo - via dei Cairoli (ex sedime ferroviario) • viale Btg. Framarin (parcheeggio Teatro Comunale) • via Btg. Framarin – via Cengio • via del Mercato Nuovo (parcheeggio mercato ortofrutticolo) • via Btg. Val Leogra (park Dogana) <p><small>C: proposed improvement in beAWARE (Decision Making Authorities could define a virtual region of interest, based on the verified warning message. Citizens approaching such area will receive notification, thanks to the GPS, concerning with this emergency and potential danger zone).</small></p>  <p>This message will be received automatically by a citizen approaching to a dangerous area</p>

ITA	ENG
Alluvione in corso. SE NON PUOI ABBANDONARE LA CASA SALI AI PIANI SUPERIORI E ATTENDI L'ARRIVO DEI SOCCORSI.	Flood in progress. If you cannot leave your home, reach the highest floors and wait for the rescue teams
SE SEI IN MACCHINA EVITA DI INTASARE LE STRADE	If you are driving, do not cause traffic jam
NON PERCORRERE STRADE INONDATE E SOTTOPASSAGGI	Do not move in flooded streets and subways
PRESTA ATTENZIONE ALLE INDICAZIONI FORNITE DALLE AUTORITÀ	Take care about suggestions by authority
<p>La distribuzione dei sacchi di sabbia è disponibile presso le seguenti postazioni:</p> <ul style="list-style-type: none">• Piazza Venti Settembre• Ca' Tosate• Via del Grande (zona stadio)• Viale Ferrarin (lato nord)• Piazza Matteotti (vicino all'ostello della gioventù)• San Pietro Intrigogna (piazzale della chiesa)• Viale Fusinato (parcheggio chiesa San Giorgio)• Via Leoni• Viale del Brotton/ viale Ferrarin• Debba (piazzale della chiesa)• Contra' San Pietro (piazzale della chiesa)• Via Sardegna• Contra' Santi Apostoli	<p>The distribution of sand packs is available at the following locations:</p> <ul style="list-style-type: none">• Piazza Venti Settembre• Ca' Tosate• Via del Grande (zona stadio)• Viale Ferrarin (lato nord)• Piazza Matteotti (vicino all'ostello della gioventù)• San Pietro Intrigogna (piazzale della chiesa)• Viale Fusinato (parcheggio chiesa San Giorgio)• Via Leoni• Viale del Brotton/ viale Ferrarin• Debba (piazzale della chiesa)• Contra' San Pietro (piazzale della chiesa)• Via Sardegna• Contra' Santi Apostoli

Example of messages that might be presented to first responders

ITA	ENG
Azione: Posizionare Aquadike agli estremi di ponte degli Angeli Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place Aquadike at the ends of Ponte degli Angeli Bridge Location : coordinates: North , East address: Street XX
Azione: Posizionare paratie lungo ringhiera largo Goethe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place gates along the Goethe street Location : coordinates: North , East address: Street XX
Azione: Posizionare una fila di sacchi lungo via Nervesa della Battaglia Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Place a line of sand packs along Nervesa della Battaglia street Location : coordinates: North , East address: Street XX
Azione: Verificare lo stato del terrapieno Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify the status of the embankment Location : coordinates: North , East address: Street XX
Azione: Verificare il funzionamento delle pompe Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify working of pumps Location : coordinates: North , East address: Street XX
Azione: Verificare la presenza di eventuali risalite fognarie Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential sewage overflow Location : coordinates: North , East address: Street XX
Azione: Verificare l'eventuale mancanza di alimentazione elettrica Posizione : coordinate: Nord , Est indirizzo: Via XX	Action: Verify potential missing of power supply Location : coordinates: North , East address: Street XX

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- Mayor

Mobile application equipment

- Personal Smartphones with Android or Windows or iOS Operating System installed

QUERY TO THE PSAP

UC_107: First responders monitoring

This Use Case concerns a possible query to the PSAP to monitor first responders activities.

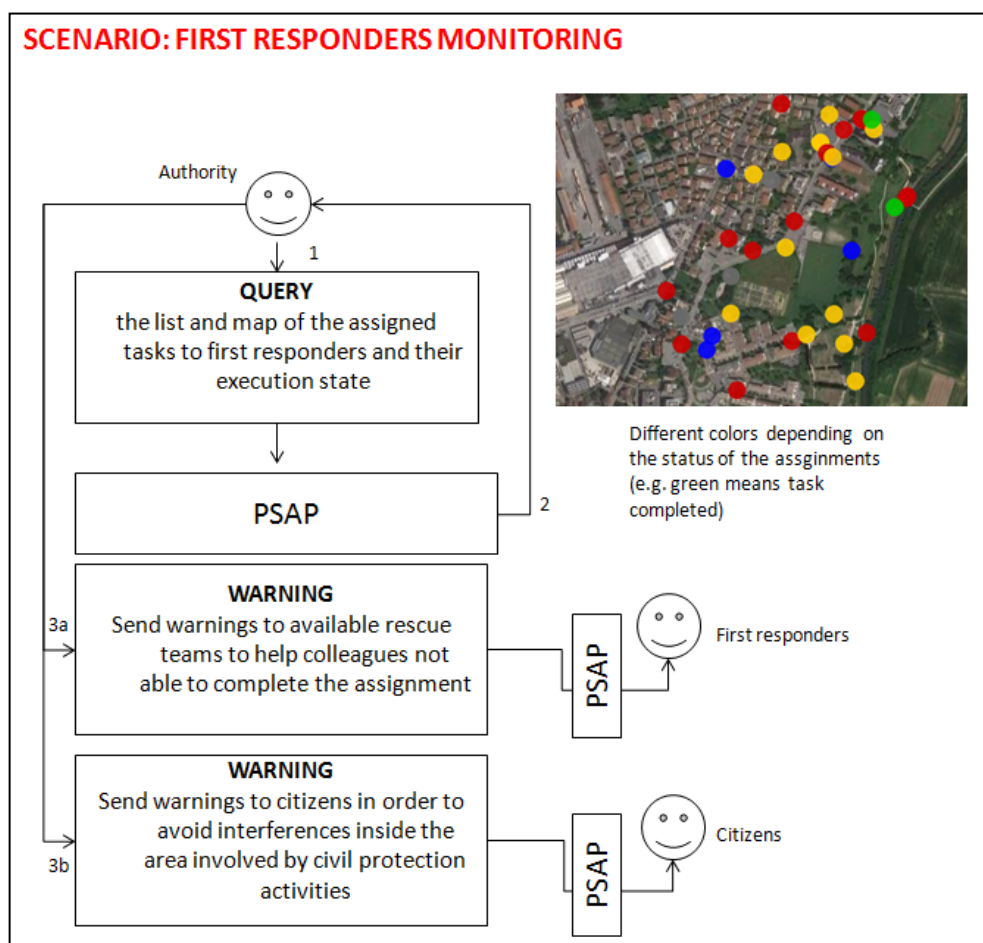


Fig. 5-7. Block Diagram of the UC107

Current Status (initial phase of the scenario)

- During a flood event

What is happening

- First responders are performing the tasks assigned by the authority. Some of them were not able to complete the task.

Outcome

- The Mayor can visualize the assigned tasks to first responders and their execution state
- The Mayor can send warnings to available rescue teams to help colleagues not able to complete the assignment
- The Mayor can send warnings to citizens in order to avoid interferences inside the area involved by civil protection activities

UC_108: Flood forecasting alerts

This Use Case concerns a possible query to the PSAP to detect possible future forecasted flood events.

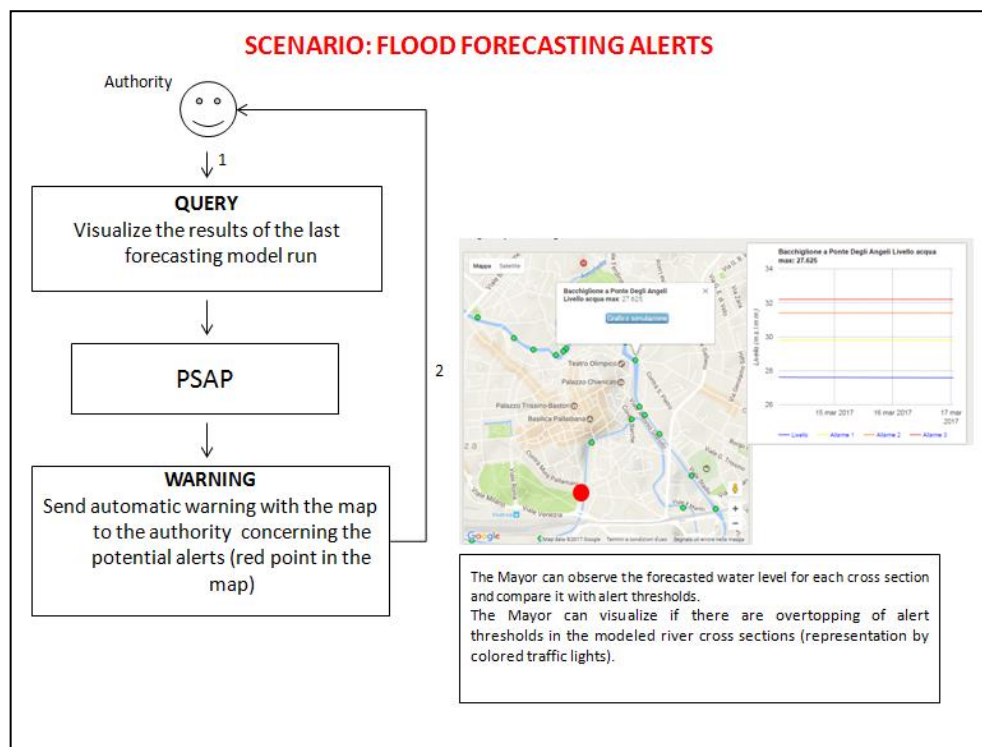


Fig. 5-8. Block Diagram of the UC108

Current Status (initial phase of the scenario)

- Before a flood event

What is happening

- Intense rainfall event is forecasted

Outcome

- The Mayor can visualize if there are overtopping of alert thresholds in the modeled river cross sections
- Warnings are sent automatically to the authority concerning potential alerts

5.2 Use Cases for the Fire scenario

UC_201: Management of forest fires emergencies

This use case involves all the phases related to a forest fire once it has started.

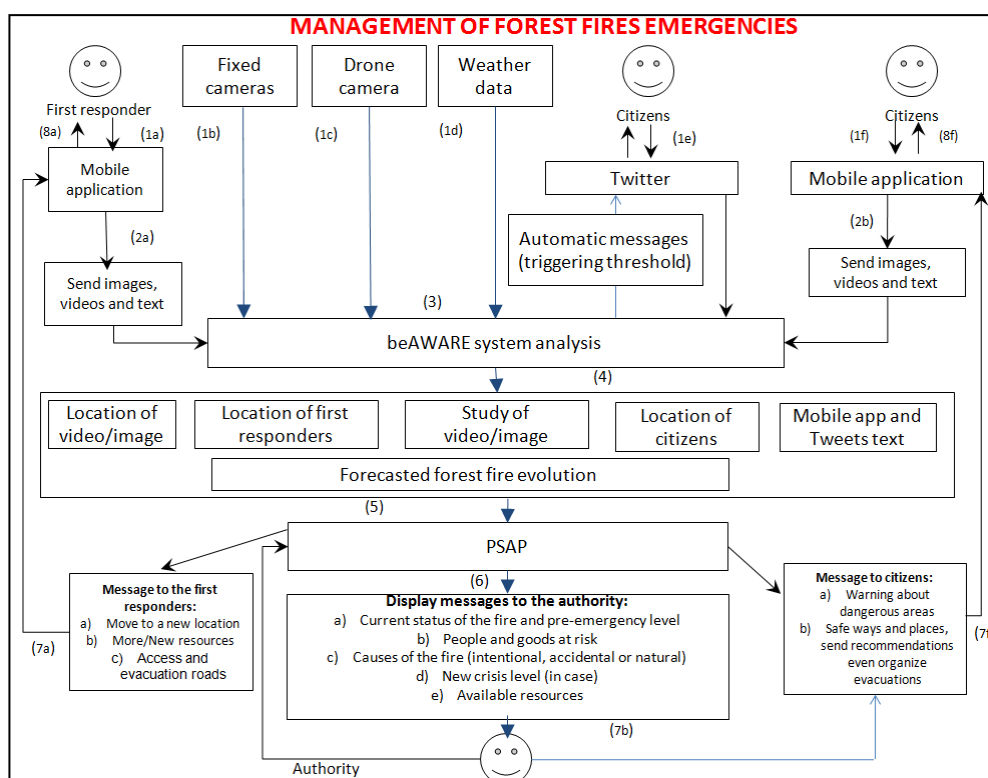


Fig. 5-9. Block Diagram of the UC201

Current Status

- During the forest fire

What is known to the beAWARE system already

- Weather forecast
- Level of the forest fire crisis
- Location of the forest fire

What is happening

- A first responder is sending images/videos/text

- Inputs from cameras and weather data
- Tweets are mentioning forest fire emergency
- Citizens are sending reports on forest fires with images, videos and text

Outcome

- The authority (e.g. Mayor) move forces to the new location
- The authority mobilize more or new resources (e.g. planes or helicopters)
- The authority sends notifications to citizens approaching the dangerous areas and suggests alternative ways
- The authority points safe ways and places, sends recommendations and even organizes evacuations.

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

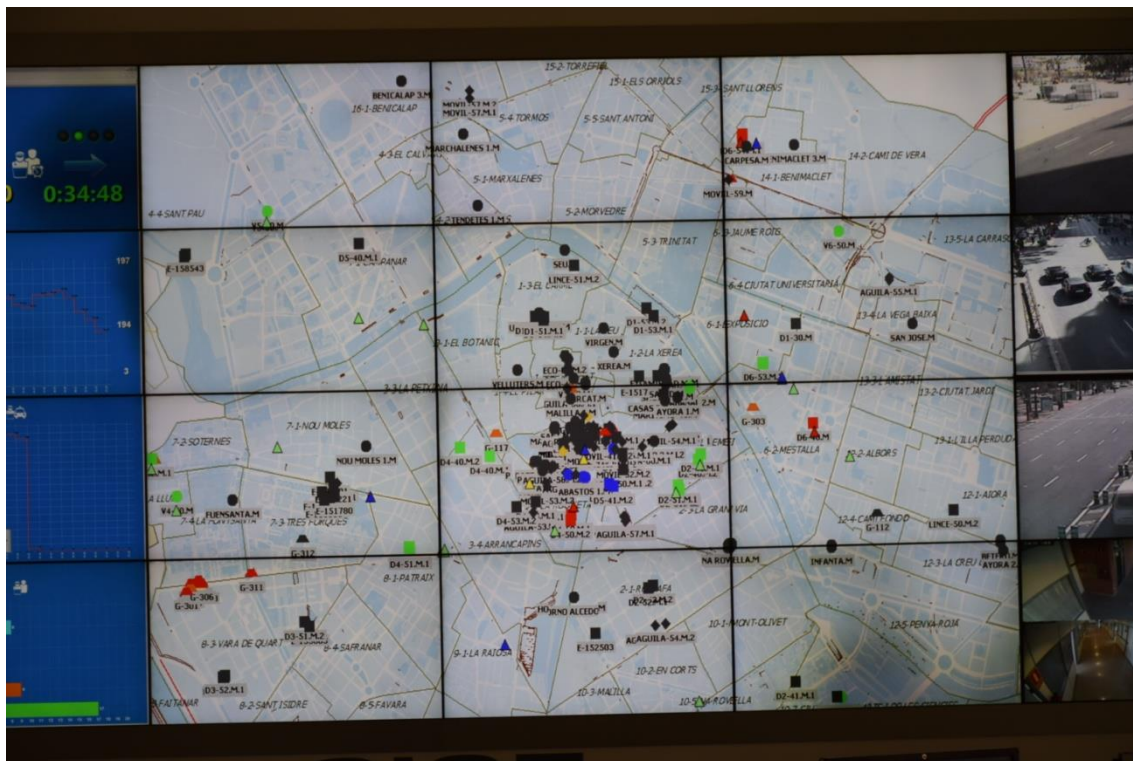


Fig. 5-10. PSAP visualization of resources and requirements at PLV

- Video Wall that shows a map of the city with:
 - Location of Police patrols in the map displaying them with different geometrical shapes and colours according to the police tasks.
 - Location of the cranes.
 - Location of the incidents displaying them in the map-video Wall according to their level of gravity.

- in streets, they are identified in the video wall. Visualization of the Traffic cameras images in the video wall.

Example of the textual information that might be presented to the authorities

SPA	ENG
<ul style="list-style-type: none"> - Causas del incendio (en caso de conocerlas). - Extensión. - Daños personales o materiales. - Bienes en peligro. - Nivel de emergencia. - Recursos activos en el lugar 	<ul style="list-style-type: none"> - Causes of the fire (in case that they are known). - Affected area. - Personal or material damages - Assets at risk. - Level of emergency. - Active resources in the location

Example of messages that might be presented to the people (level 0 of emergency)

SPA	ENG
<ul style="list-style-type: none"> - Incendio declarado en la Devesa, sigue las instrucciones de las autoridades y difúndelas a los vecinos. - Mantén la calma y no permanezcas cerca del incendio - Nunca tomes decisiones personales en caso de un incendio forestal. Puede suponer un grave riesgo para ti mismo, y puede dificultar las labores de extinción. 	<ul style="list-style-type: none"> - A forest fire is taking place at the Devesa, follow the authorities' instructions, and disseminate them among the neighbours. - Stay calm and do not stay near the fire. - Don't make personal decision in case of forest fire. It can become a serious risk for yourself, and it can make more difficult the extinguishing tasks.

Example of messages that might be presented to the people (level 1 of emergency)

SPA	ENG
<ul style="list-style-type: none"> - En caso de incendio forestal, cuando salgas, por favor cierra la puerta y las ventanas. No olvides cortar la luz. - Nunca tomes decisiones personales en caso de un incendio forestal. Puede suponer un grave riesgo para ti mismo, y puede dificultar las labores de extinción. Ten siempre preparadas o fácilmente localizables las cosas que consideres más importantes. - No arriesgues tu vida por salvar objetos personales. - Evita acercarte a la Devesa, toma rutas alternativas 	<ul style="list-style-type: none"> - In case of forest fire when you go out, please close the door and the windows and remember to cut the electricity. - Don't make personal decision in case of forest fire. It can become a serious risk for yourself, and it can make more difficult the extinguishing tasks. Your most important things must be easily located and always ready. - Don't risk your life to save personal objects! - Avoid approaching to the Devesa, take alternative routes.

Example of messages that might be presented to first responders

(TRANSCRIPTION OF COMMUNICATIONS BETWEEN PSAP/CISE AND FIRST RESPONDERS DURING A FOREST FIRE IN "LA DEVESA")

SPA	ENG
<p>12:10</p> <p>POLO (PLV PSAP): Lince-50 aquí Polo</p> <p>LINCE-50: Adelante</p> <p>POLO: Diríjase al restaurante La Duna, desde allí están viendo una columna de humo próxima al cortafuegos de la Rambla, Bomberos se dirige.</p> <p>LINCE-50: Recibido Polo, nos encontramos cerca, ahora le informo.</p>	<p>12:10</p> <p>POLO(PLV PSAP): Lynx-50 here Polo</p> <p>LYNX-50: Forward POLO</p> <p>POLO: Go to the restaurant La Duna, from there citizens are looking at a smoke column next to the firebreak of the Rambla, Firefighters are on their way.</p> <p>LYNX-50: Polo, roger. We are close, we will inform to you in a bit.</p>

SPA	ENG
<p>12:18</p> <p>LINCE-50: Polo, llegada de LINCE-50. El incendio todavía no es muy grande pero se puede descontrolar rápidamente, el viento sopla con fuerza. Indique a bomberos que entrando por el cortafuego de la Rambla se accede bien a la cabeza del incendio.</p> <p>POLO: Recibido</p> <p>LINCE 50: Polo, de momento se está quemando pasto y matorral, se habrán quemado unos 20 metros cuadrados, el frente principal ya tiene aproximadamente 4 metros de longitud, y se dirige hacia la pinada.</p>	<p>12:18</p> <p>LYNX-50: Polo, arrival of Lynx-50. The fire is still not very big but it may be quickly uncontrolled, the wind blows hard. Tell Firefighters that entering through the Rambla firewall they would access well to the head of the fire.</p> <p>POLO: Roger</p> <p>LYNX-50: Polo, it is burning grass and scrub at the moment, there are burned about 20 square meters so far, the main front already has approximately 4 meters in length, and is being directed towards the pinnacle.</p>
<p>12:22</p> <p>LINCE 50: Polo llegada de bomberos, ahora le indico los indicativos.</p> <p>LINCE-50: Se han personado dos unidades, el BUP-3 y el BUL-1.</p> <p>POLO: Recibido. A partir de este momento, por favor compañeros céntrense en controlar los accesos al camino donde se colocan los vehículos Autobombas, cortándolos totalmente si fuera necesario para facilitar el tránsito a los vehículos de extinción de incendios y de asistencia sanitaria. Todas las comunicaciones respecto a la evolución del incendio o posible necesidad de más medios de extinción, las hará el mando de bomberos presente en la zona.</p>	<p>12:22</p> <p>LYNX-50: Polo, firefighters have arrived, in a bit I will indicate the unit name.</p> <p>LYNX-50: There have been two units, the BUP-3 and the BUL-1.</p> <p>POLO: Roger. From this moment, please stick to the accessing control to the road where the pumping vehicles are parked, cutting them completely if necessary to facilitate the transit of fire-fighting and assistance vehicles. All communications regarding the evolution of the fire or possible need of more resources for the fire extinction will be made by the Firefighters head present in the area.</p>

SPA	ENG
<p>12:36</p> <p>LINCE-50: POLO aquí LINCE-50</p> <p>POLO: Adelante</p> <p>LINCE-50: Los bomberos se encuentran en estos momentos evaluando todo el perímetro y apagando todos los rescoldos que queden encendidos, para evitar posibles reproducciones/activación del incendio.</p> <p>LINCE-50: En estos momentos los bomberos ya han controlado el incendio, prácticamente ya no se ven llamas, y van a iniciar las labores de remate y liquidación.</p> <p>POLO: Recibido</p> <p>LINCE -50: Bomberos hasta finalizado su labor dando por extinguido el incendio. No obstante, el cabo de bomberos ha decidido que la unidad de extinción permanezca en la zona durante unas horas en prevención debido al nivel 3 de preemergencia y a que el tipo de vegetación en la zona que puede reavivar el incendio, hasta que llegue la noche y/o disminuya en viento. Todo en función de la superficie afectada, tipo de vegetación o climatología).</p>	<p>12:36</p> <p>LYNX-50: Polo here Lince-50</p> <p>POLO: Forward</p> <p>LYNX-50: Firefighters are currently evaluating the entire perimeter and extinguishing all the embers that remain lit to avoid possible reproductions / activation of the fire. Firefighters have already controlled the fire, which is no longer visible, and they are going to start the total extinction and liquidation.</p> <p>POLO: Roger</p> <p>LYNX-50: Firefighters have finished their work considering the fire extinguished.</p> <p>However, the fire department has decided that the extinction unit stays in the area preventively for a few hours due to pre-emergence level 3 and the type of vegetation in the area, that could revive the fire. They will stay until nightfall and /or the pre-emergency level goes down. All depending on the area affected, type of vegetation or climatology.</p>
<p>13:29</p> <p>POLO: LINCE-50 aquí POLO podría indicarme qué tipo de superficie se ha quemado y el tamaño de la misma</p> <p>LINCE 50: El combustible quemado es pastizal y matorral formado principalmente por coscoja y lentisco. Según indica el cabo de bomberos, la superficie afectada es de unos 500 metros cuadrados.</p> <p>POLO: Recibido</p>	<p>13:29</p> <p>POLO: LYNX-50 here Polo. Could you tell me what type of surface has been burned and the size of it?</p> <p>LYNX-50: Burned fuel is grassland and shrub mainly formed by shrub oak and mastic shrub. According to the fire department, the affected area is about 500 square meters.</p> <p>POLO: Roger</p>

SPA	ENG
<p>13:35</p> <p>LINCE 50: POLO cierre el servicio del incendio de La Devesa de El Saler, los bomberos abandonan el lugar y nosotros también, dejando un vehículo de extinción en funciones de vigilancia del área quemada hasta que mejorar las condiciones climatológicas o baje el nivel de preemergencia.</p> <p>A continuación procederemos a realizar un informe policial con los datos del incendio, mencionando sus posibles causas.</p>	<p>13:35</p> <p>LYNX-50: Polo, close the fire service of La Devesa de El Saler, Firefighters leave the place and so do we, leaving an extinction vehicle in surveillance functions around the burned area until conditions are improved or the level of pre-emergence goes down.</p> <p>We will proceed to carry out a police report with the data of the fire, mentioning its possible causes.</p>

Example of reports from the first responders that might be presented to the authority (tasks etc.)

SPA	ENG
<ul style="list-style-type: none"> - Daños personales o materiales. - Superficie afectada por el incendio forestal. - Incendio forestal intencionado, natural o accidental. - Predicción del comportamiento del fuego (en función de las condiciones climatológicas, la vegetación y la topografía). - Recursos activos en el lugar 	<ul style="list-style-type: none"> - Personal damages or material damages - Affected surface by the forest fire - intentional, natural or accidental forest fire - Fire behavior forecast (depending on weather conditions, growth and topography). - Active resources in the location

The roles under the term authority

The highest rank authority in case of metropolitan fire events is the Mayor unless the fire extends to another municipality, or external resources from this municipality are needed. If so, the authority is the highest rank person in service in the General Directorate for Emergencies of the Civil Protection in the Valencian Community (Valencian Region). In case that the fire requires external resources from the Valencian Community, that the fire trespasses into another community, or that it reaches national interest due to its gravity or potential risks, the Emergencies Coordination Center from the Valencian Community will warn to the Interior Minister, who will be the highest authority.

Mobile application

There is no mobile application currently available in Valencia, dealing with warnings and/or service requirements to the PSAP.

UC_202: Activation of first responders

This use case concerns the process of activation of first responders from the fire is detected to the first responders receive their tasks. It shows the use of the mobile application as a tool to provide to the Be@ware system with input data, as well as the order in which a decision for the activation of first responders has been made.

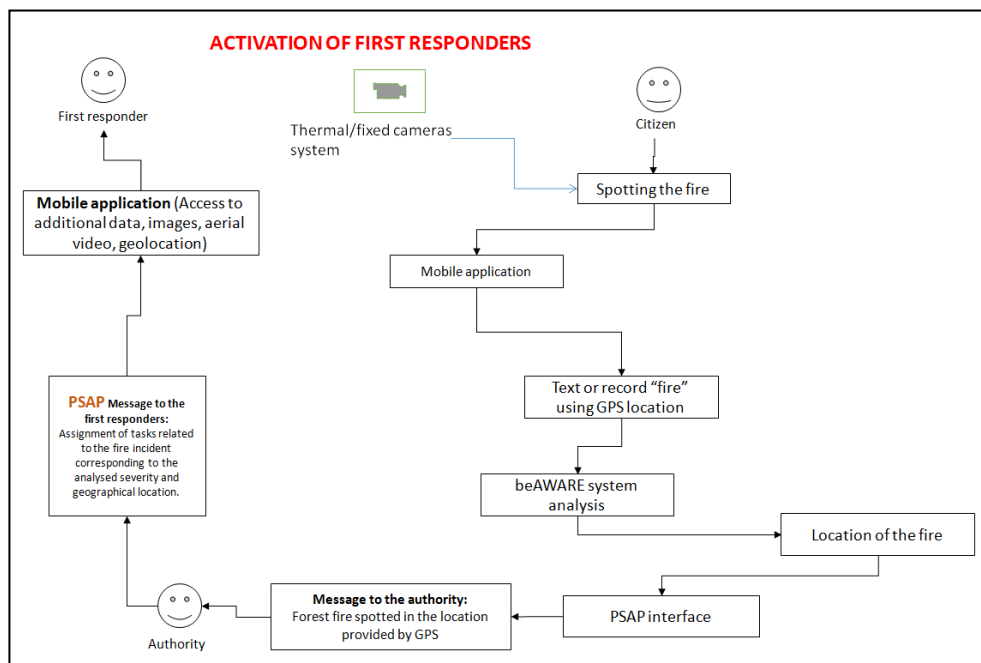


Fig. 5-11. Block Diagram of the UC202

Current status (initial phase of the scenario)

- Before the fire

What is known to the beAWARE system already

- Weather forecast
- Drought index
- Available resources
- Access road

What is happening

- A citizen spots the fire and alerts by using mobile application. This makes it possible to locate the position in the forest by GPS.

Outcome

- By reporting the fire incident, the authorities are alerted and the available resources and first responders are assigned.

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

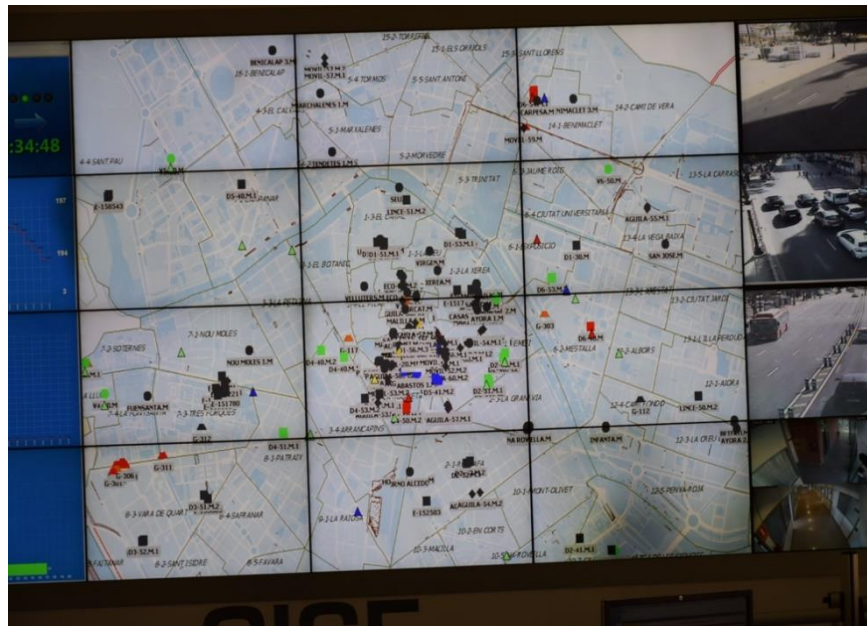


Fig. 5-12. PSAP visualization of resources and requirements at PLV

- Video material from the thermal/fixed cameras system.
- GIS (geographic information system) of the area

Example of the textual information that might be presented to the authorities

DEN	ENG
Brandens placering: En brand er blevet spottet på X placering (GPS koordinater hvis det er muligt).	Location of the fire: A fire has been spotted in X location (GPS coordinates if possible).
Brandens spredning: Branden har bredt sig over X kvm (hvis den viden er kendt).	The spread of the fire: The fire is covering X square miles (if known).
Tilgængelige ressourcer: X køretøjer fra de relevante aktører vil blive sendt til hændelsens placering.	Available resources: X vehicles from the relevant authorities will be sent to the location.
Adgangsveje: Branden kan tilgås via X vej eller alternativt Y vej, alt efter vejrforholdene.	Access roads: The fire can be reached by X road or alternatively Y road depending on the weather conditions.
Mennesker eller bygninger i fare: I fareområdet er X antal personer og Y antal vigtige bygninger.	People or buildings at risk: In the risk area are X residents and Y important buildings.

Example of messages that might be presented to the people

- None

Example of messages that might be presented to first responders

DEN	ENG
Vær opmærksom på vindretningen og tilgå branden fra modsatte side.	Be aware of the wind direction and approach the fire from opposite direction.
X antal brandkøretøjer og brandfolk er blevet indsat til hændelsen.	X number of firetrucks and firefighters have been sent to the incident.
Være opmærksom på personer der bor eller vandrer i området.	Be aware of people living or hiking in the area.
Husk at bære korrekt beskyttelsesudstyr.	Remember to wear personnel protection gear.
Hav sikre evakueringsruter klar i tilfælde af det bliver nødvendigt.	Have safe evacuation roads ready in case they are needed.

Example of reports from the first responders that might be presented to the authority (tasks etc.)

DEN	ENG
Berørt område og brandens spredning: Branden er i X område og har spredt sig til X kvm.	Affected area and spreading of the fire: The fire is in X area and has spread to X square miles.
Forudsigelse af brandens adfærd (afhængig af vejrforhold, bevoksning og topografi): Vi forudser at branden vil bevæge sig i X retning og med Y fart.	Fire behavior forecast (depending on weather conditions, growth and topography): We predict the fire will move in X direction and with Y speed.
Skade på indsatspersonel eller materialer (hvis det er tilfældet).	Personnel damage or material damage (in case any).
Indsatspersonel og køretøjer indsat: X antal brandkøretøjer og brandfolk er indsat i brandslukningsarbejdet.	Personnel and vehicles active: X number of firetrucks and personnel is fighting the fire.

The roles under the term authority

The PSAP will have the incoming call regarding the detection of the fire and will dispatch the relevant authorities.

The incident will primarily involve the fire department, health organizations and the police. Other relevant authorities might be involved, especially in case of evacuation. Health care can be involved in relation to evacuation of elderly or people with disabilities, because they know where they are located and what special precautions you need to take and be aware of.

The police have the final decision authority in this case, but in close cooperation with the fire department. The police and relevant authorities will gather at a local coordination point to work close together and coordinate the incident at management level.

Mobile application equipment

In Denmark, there is a mobile application that you can use for calling the emergency services, PSAP, on 112. When you call the authorities through this app, your GPS location will be sent to the PSAP, so they can locate where you are. It is very useful when the caller is in a rural area or don't know their exact location. The caller just pushes the button saying call 112 (RING 1-1-2) and then the application will make the call for them.

Example of how this application looks:

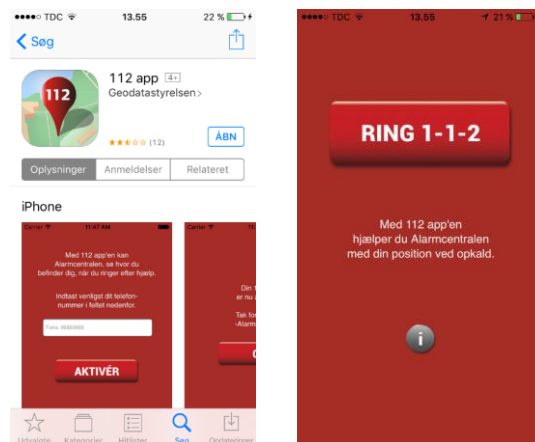


Fig. 5-13. The Danish 112 application for mobile phone

UC₂₀₃: Pre-emergency level 3 activation

This use case concerns the activation of pre-emergency level 3. In this case, all resources are mobilized in order to perform dissuasive surveillance in sensible areas and the population must be advised so that they extreme cautions

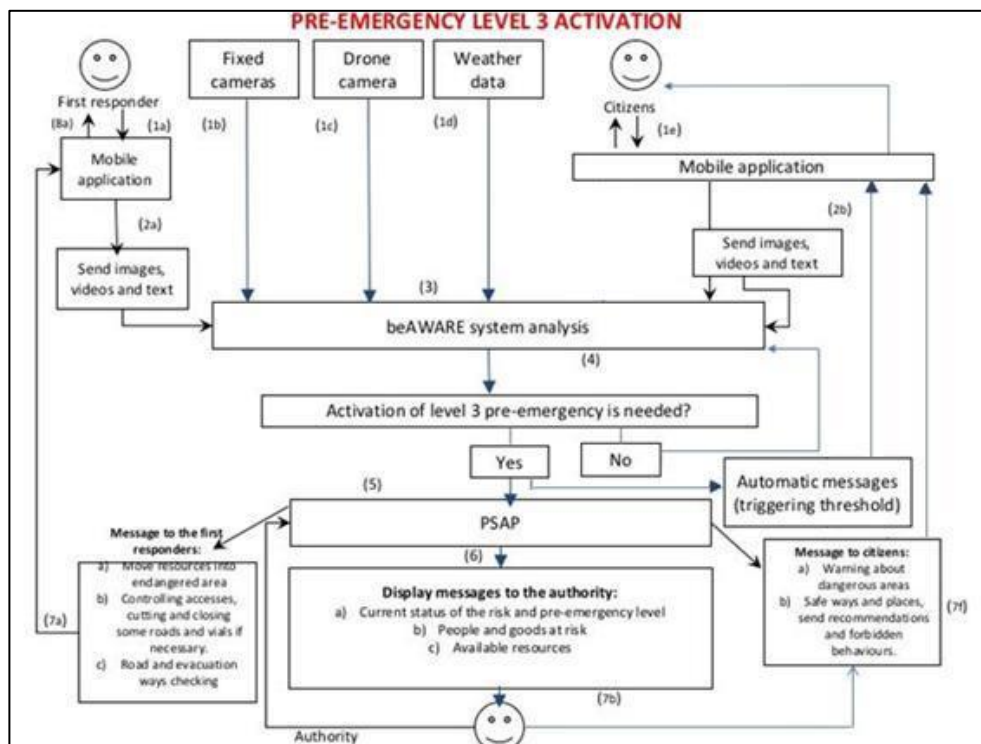


Fig. 5-14. Block Diagram of the UC203

Current status (initial phase of the scenario)

- There is no fire, and the BeAWARE system is analysing different inputs

What is known to the beAWARE system already

- It has already received input from weather forecast, and (if available) from fixed cameras, drones and mobile application users.

What is happening

- The BeAWARE system is analysing the convenience of activation of the pre-emergency level 3. This level considers the risk of wildfire as extreme. In addition to the resources mobilized in Level 2, it will also mobilize the Guardia Civil, Autonomic Police, municipalities, brigades.

Outcome

- The BeAWARE system sees the convenience of establishing level 3 pre-emergency, therefore it informs to the PSAP, and send automatic messages to the people through mobile app.

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

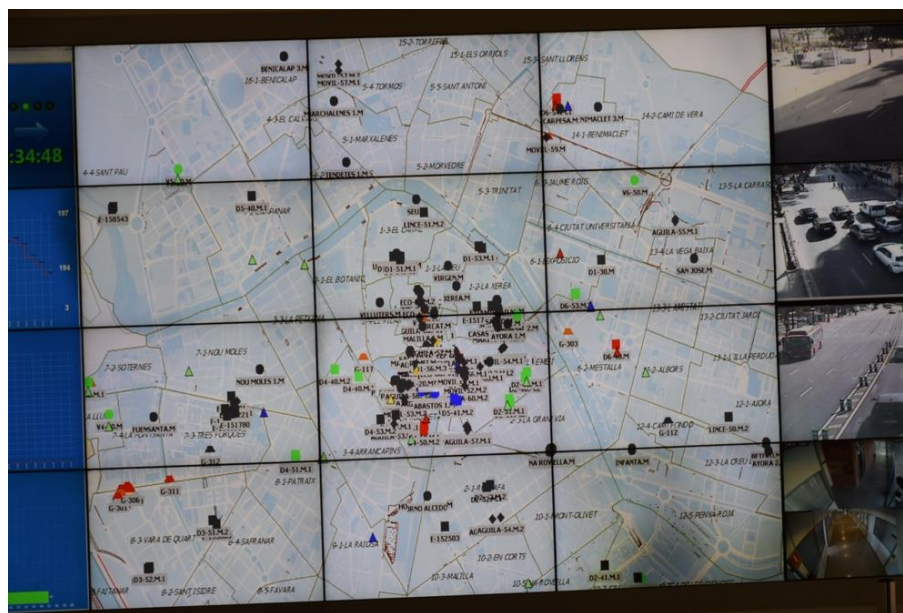


Fig. 5-15. PSAP visualization of resources and requirements at PLV

- Video Wall that shows a map of the city with:
 - Location of Police patrol in the map and display of them with different geometrical shapes and colours according to the police tasks.
 - Location of the cranes.

- Location of the incidents and display of them in the map-video Wall according to their seriousness.
- Traffic cameras in streets, they are identified in the video wall. Visualization of the images in the video wall.

Example of the textual information that might be presented to the authorities

SPA	ENG
<ul style="list-style-type: none"> - Condiciones meteorológicas (temperatura, humedad, dirección y fuerza del viento) - Nivel de pre-emergencia. - Recursos operativos en el lugar. - Bienes y personas en riesgo. - Información sobre estado de las vías de acceso y evacuación. 	<ul style="list-style-type: none"> - Weather conditions (temperature, humidity, wind direction and speed) - Pre-emergency level. - Operative resources in the area. - People and assets at risk. - Level of emergency. - Information about access and evacuation roads status.

Example of messages that might be presented to the people (at a level 3 of pre-emergency)

SPA	ENG
<ul style="list-style-type: none"> - Aviso de alerta 3 de riesgo de incendio extremo. - Prohibido encender fuego y el uso de camping-gas o similares en todo el área de la Devesa. - Prohibido el uso de artificios pirotécnicos. - Estacione su vehículo de forma adecuada, sin cortar vías de acceso y evacuación. - Prohibido arrojar basuras fuera de las zonas habilitadas. - Prohibida la acampada en toda el área de La Devesa. 	<ul style="list-style-type: none"> - Warning of extreme risk of forest fire. - It is forbidden to light a fire and any usage of camping-gas or similar artifacts. - It is forbidden the use of pyrotechnic devices. - Park your vehicle properly, without cutting access and/or evacuation routes. - Throwing litter in unauthorized areas is forbidden. - Camping in the whole area of La Devesa is forbidden.

Example of messages that might be presented to the first responders

- None

We have to bear in mind that some behaviours that are permitted in lower pre-emergency levels may be forbidden during pre-emergency level 3. On the other hand, the use of pictograms in information panels could be convenient to reinforce effective communication. Finally, indicating the amount of the fine in case of breach can help to deter any undesired behaviour.

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- Once level 3 pre-emergency level notification is received through the autonomic Command Control emergency coordination center (CCE) the Mayor, as Civil Protection Chief of the municipality of Valencia, will mobilize the resources in order to set vigilance services in the most sensitive areas. Firefighters Command Control Centre (CECOM) will warn not only their own resources, but also the rest of municipal resources.

Besides this, the Mayor will issue a proclamation in which this situation is notified, indicating that pre-emergency level 3 (extreme) has been established, and warning that compulsory preventive measures referred to in Decree 98/1995, of May 16 should be taken into account. Among these, any fire authorization previously done is cancelled, and circulation of people and/or vehicles may be restricted. Any work or activity that can constitute a risk may be suspended as well.

Mobile application equipment

- Nowadays there is no mobile app warning of these emergencies. However, there are some active Twitter accounts in which organizations share this information, for instance: PLV official Twitter @policialocalvalencia (15.000 followers), Spanish Meteorological Agency @AEMET_Esp (114.000 followers), and Emergencies Command Control of Comunidad Valenciana @GVA112 (68.000 followers).

UC_204: Evacuation management during an emergency

This use case concerns the evacuation management during a forest fire. In case of population at risk, the authority will order the evacuation and first responders will be given instructions to facilitate the evacuation.

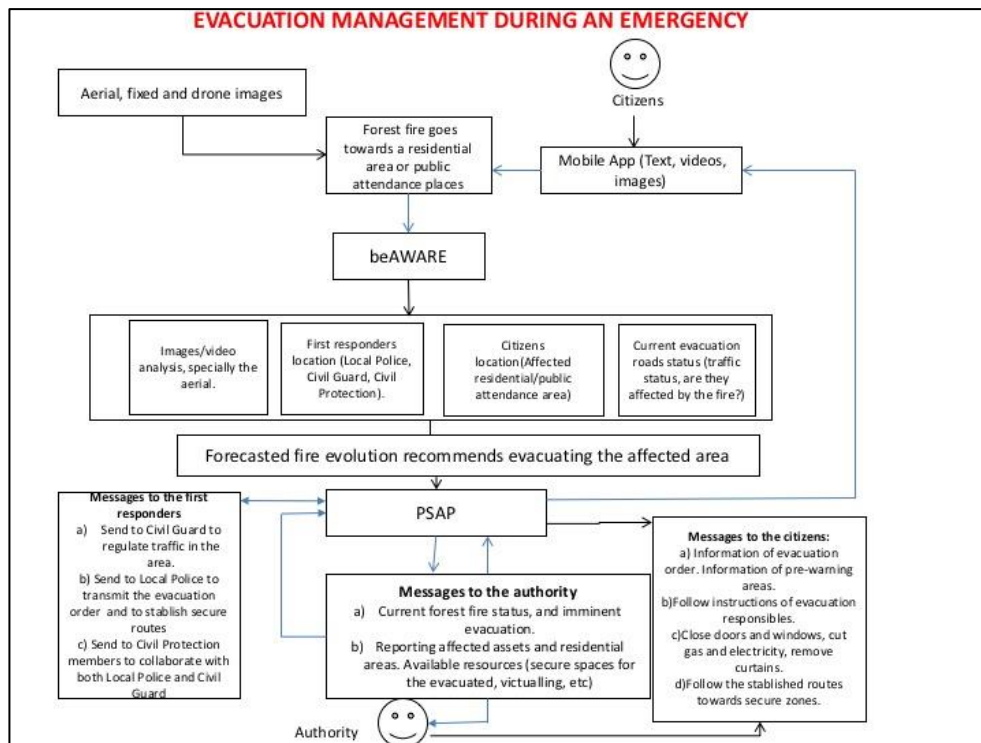


Fig. 5-16. Block Diagram of the UC204

Current status (initial phase of the scenario)

- During a forest fire

What is known to the beAWARE system already

- Weather forecast
- Location and direction of the fire
- Location of citizens at risk
- Location of first responders
- Road status and secure places locations.

What is happening

- Citizens are sending text, video and images of a forest fire going towards a residential area or public attendance place. Aerial video and images are being sent as well.

Outcome

- The authority informs citizens of evacuation order and the PSAP gives instructions to first responders in order to facilitate the evacuation

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

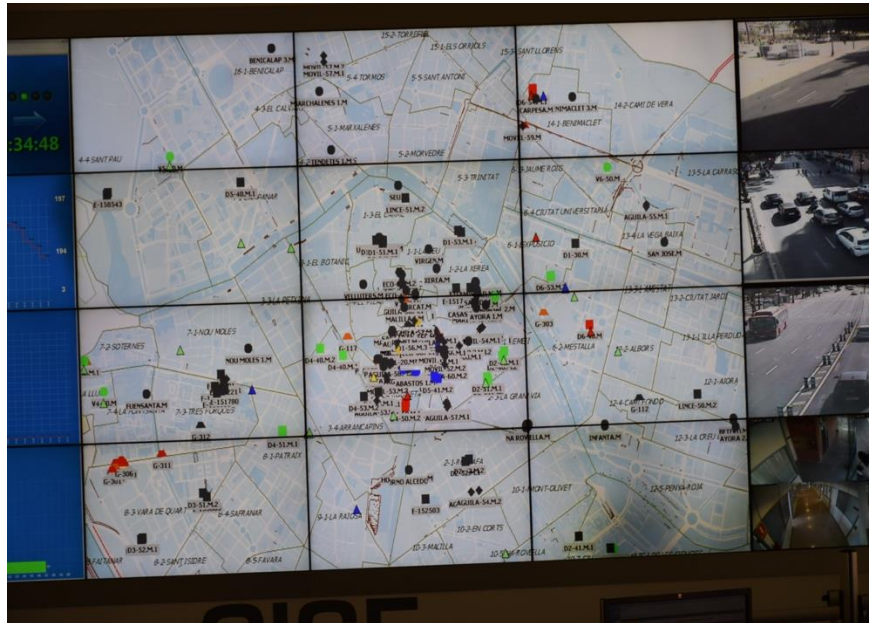


Fig. 5-17. PSAP visualization of resources and requirements at PLV

- Video Wall that shows a map of the city with:
 - Location of Police patrol in the map and display of them with different geometrical shapes and colours according to the police tasks.
 - Location of the cranes.
 - Location of the incidents and display of them in the map-video Wall according to their seriousness.
 - Traffic cameras in streets, they are identified in the video wall. Visualization of the images in the video wall.

Example of the textual information that might be presented to the authorities

SPA	ENG
<ul style="list-style-type: none"> - Causas del incendio (en caso de conocerlas). - Extensión. - Daños personales o materiales. - Bienes en peligro. - Nivel de emergencia. - Recursos activos en el lugar - Información sobre estado de las vías de acceso y evacuación. 	<p>Causes of the fire (in case that they are known).</p> <p>Extension.</p> <p>Personal or material damages</p> <p>Assets at risk.</p> <p>Level of emergency.</p> <p>Active resources in the location.</p> <p>Information about access and evacuation roads status.</p>

Example of messages that might be presented to the people (in evacuation management)

SPA	ENG
<ul style="list-style-type: none"> - En caso de incendio, al salir, cierra la puerta y las ventanas, y corta la luz. - Evacúa en primer lugar a niños, mayores y personas con dificultades respiratorias. - No tomes decisiones personales, puede suponer un grave riesgo. - Sigue las rutas de evacuación y las instrucciones indicadas. - No arriesgues tu vida y la de tu familia por salvar objetos personales. 	<ul style="list-style-type: none"> - In case of forest fire, when going out, close the door and the windows and cut the electricity. - Evacuation: First evacuate the children, elderly and people with breathing problems. - Don't make personal decisions. It can become a serious risk. - Follow the evacuation routes and the instructions of the evacuation staff. - Don't risk your life to save personal objects!

The standard evacuation itineraries are based on the premise of evacuating by the usual exit route of the residential areas. These routes will be changed and adapted to the conditions of the forest fire.

The population will receive the evacuation order through the telephones of their homes and also by megaphone. The population can also be alerted through the phones of presidents, porters and / or administrators.

In order to perform a proper evacuation, all messages transmitted to the citizens must be short, clear and concise. Electric panels and other ways of communication have a limited usage of words, and therefore we need to avoid using secondary information.

Example of messages that might be presented to the first responders

(TRANSCRIPTION OF COMMUNICATIONS BETWEEN PSAP/CISE AND FIRST RESPONDERS DURING AN EVACUATION ORDER IN "LA DEVESA")

SPA	ENG
<p>12:10</p> <p>POLO (PLV PSAP): Lince-30 aquí Polo</p> <p>LINCE-30: Adelante</p> <p>POLO: Por orden del P.M.A. se ordena la evacuación de la zona residencial de La Devesa y la Playa de la Garrofera. La vía de evacuación es Av. Gola de Pujol dirección centro de ciudad. Ordene las medidas necesarias.</p> <p>LINCE-30: Recibido Polo.</p> <p>LINCE-30: Lince-50, acudan a las dos vías de salida de la urbanización, y facilite el tráfico en dirección centro de ciudad.</p> <p>LINCE 50: Recibido.</p> <p>LINCE 30: Lince 51, diríjase a playa La Garrofera y proceda a su evacuación en dirección Av. Gola de Pujol.</p> <p>LINCE 51: Recibido.</p> <p>LINCE 30: Lince 52, acceda al interior de la urbanización Casbah y de las instrucciones para su evacuación.</p> <p>LINCE 52: Recibido.</p> <p>LINCE 30: Lince 53, diríjase a la AV. Gola de Pujol, frente al hotel Sidi Saler y facilite la evacuación en dirección al tallafoc de Pujol.</p> <p>LINCE 53: Recibido.</p> <p>LINCE 30: Lince 54, acuda a la Av. Gola de Pujol cruce con el Tallafoc de Pujol (junto al edificio Siena). Facilite salida dirección Av. De los Pinares.</p> <p>LINCE 54: Recibido.</p> <p>LINCE 30: Lince 55, acuda a Av. Gola de Pujol con Tallafoc de La Garrofera, en prevención junto al vial cortado.</p> <p>LINCE 55: Recibido.</p> <p>POLO: A todas las unidades, el punto de encuentro y de información para los evacuados es en los Viveros Municipales de Av. De los Pinares. Confirman el recibido.</p> <p>...</p>	<p>12:10</p> <p>POLO/(PLV PSAP): Lynx-50 here Polo</p> <p>LYNX-50: Forward POLO</p> <p>POLO/: By Incident Commander's order, Casbah residential area and La Garrofera beach must be evacuated. Evacuation way is Gola de Pujol Avenue towards city centre. Order the necessary measures.</p> <p>LYNX-30: Polo, roger</p> <p>LYNX-30: Lince-50, go to the two exit ways of the residential area, and facilitate the traffic in direction to city center</p> <p>POLO: Roger</p> <p>LYNX-30: Lince 51, go to La Garrofera beach and proceed to its evacuation towards Gola de Pujol Avenue.</p> <p>LYNX-51: Roger</p> <p>LYNX-30: Lince 52, enter inside the Casbah residential area and give instructions for its evacuation.</p> <p>LYNX-52: Roger.</p> <p>LYNX-30: Lynx 53, go to Gola de Pujol Avenue, in front of Sidi Saler hotel, and facilitate the evacuation towards tallafoc of Pujol.</p> <p>LYNX-53: Roger.</p> <p>LINCE 30: Lince 54, go to Av. Gola de Pujol intersection with Tallafoc de Pujol (next to the Siena building). Provide exit towards Av. De los Pinares.</p> <p>LYNX-54: Roger.</p> <p>LYNX-30: Lince 55, go to Av. Gola de Pujol with Tallafoc of La Garrofera, stay there in prevention, next to the cut vial.</p> <p>LYNX-55: Roger.</p> <p>POLO: To all units, the meeting and information point for the evacuees is in the Municipal Nurseries of Av. De los Pinares. Confirm received.</p> <p>...</p>

SPA	ENG
<p>LINCE 30: Recibido.</p> <p>LINCE 50: Recibido.</p> <p>LINCE 51: Recibido.</p> <p>LINCE 52: Recibido.</p> <p>LINCE 53: Recibido.</p> <p>LINCE 54: Recibido.</p> <p>LINCE 55: Recibido.</p> <p>POLO: Lince 40, acuda a los Viveros Municipales para coordinar la actuación en el lugar.</p> <p>LINCE 40: Recibido.</p> <p>LINCE-30: Polo, aquí Lince 30.</p> <p>POLO: Adelante.</p> <p>LINCE-30: Confirme que la Guardia Civil ha establecido recursos en la Av. De los Pinares.</p> <p>POLO: Recibido.</p> <p>LINCE 30: Lince 50, 51 y 52, informen puntualmente del desarrollo de la evacuación, Lince 30 se dirige a ese punto.</p>	<p>LINCE 30: Roger.</p> <p>LINCE 50: Roger.</p> <p>LINCE 51: Roger.</p> <p>LINCE 52: Roger.</p> <p>LINCE 53: Roger.</p> <p>LINCE 54: Roger.</p> <p>LINCE 55: Roger.</p> <p>POLO: Lince 40, go to the Municipal Nurseries to coordinate the action in the place.</p> <p>LINCE 40: Roger.</p> <p>LYNCE-30: Polo, here Lince 30.</p> <p>POLO: Forward.</p> <p>LYNX-30: Confirm that the Civil Guard has established resources at Av. De los Pinares.</p> <p>POLO: Roger.</p> <p>LYNX 30: Lince 50, 51 and 52, report promptly the development of the evacuation, Lynx 30 is going to that point.</p>
<p style="text-align: center;">12:40</p> <p>LINCE 30: Polo, aquí Lince 30.</p> <p>POLO: Adelante.</p> <p>LINCE 30: Completada la evacuación de la playa y de la urbanización, sin incidentes. Permanecemos en los puntos a la espera de instrucciones.</p> <p>POLO: Recibido.</p>	<p style="text-align: center;">12:40</p> <p>LYNX 30: Polo, here Lince 30.</p> <p>POLO: Forward.</p> <p>LYNX 30: Evacuation of the beach and urbanization completed, without incidents. We remain at the points waiting for instructions.</p> <p>POLO: Roger.</p>

We have to take into account several aspects:

In these transcribed communications, Lince 30 represents a high-level commander into the organization (their rank is Inspector). Lince 40 is a medium-level commander (Official), and the rest of resources mentioned are Officers.

The emergency must be worked through a specific channel, avoiding other resources to use the same channel. We already have availability of approximately 20 different channels.

All messages should have a maximum length of 20 seconds, as the communication system does not allow longer messages.

We have to assure that crucial communications have been correctly received by the resources, as La Devesa presents some dark spots where emissions may be lost.

Example of reports from the first responders that might be presented to the authority (tasks etc.)

SPA	ENG
<ul style="list-style-type: none">- Daños personales o materiales.- Incidentes durante la evacuación (si los ha habido).- Número aproximado de personas evacuadas.- Predicción del comportamiento del fuego (en función de las condiciones climatológicas, la vegetación y la topografía).- Recursos activos en el lugar- Información sobre el estado de las vías de evacuación.	<ul style="list-style-type: none">- Personal damages or material damages- Affected surface by the forest fire- intentional, natural or accidental forest fire- Fire behavior forecast (depending on weather conditions, growth and topography).- Active resources in the location

The roles under the term authority

The fire command responsible for the Advanced Command Post will be the one who orders the evacuation.

Mobile application

There is no mobile application currently available in Valencia, regarding the warnings and/or service requirements to the PSAP.

5.3 Use Cases from Heatwave scenario

UC_301: Heatwave forecasting alert

This Use Case concerns the declaration of an “ALERT” before an imminent heatwave and the continuous monitoring of the forecasted weather conditions.

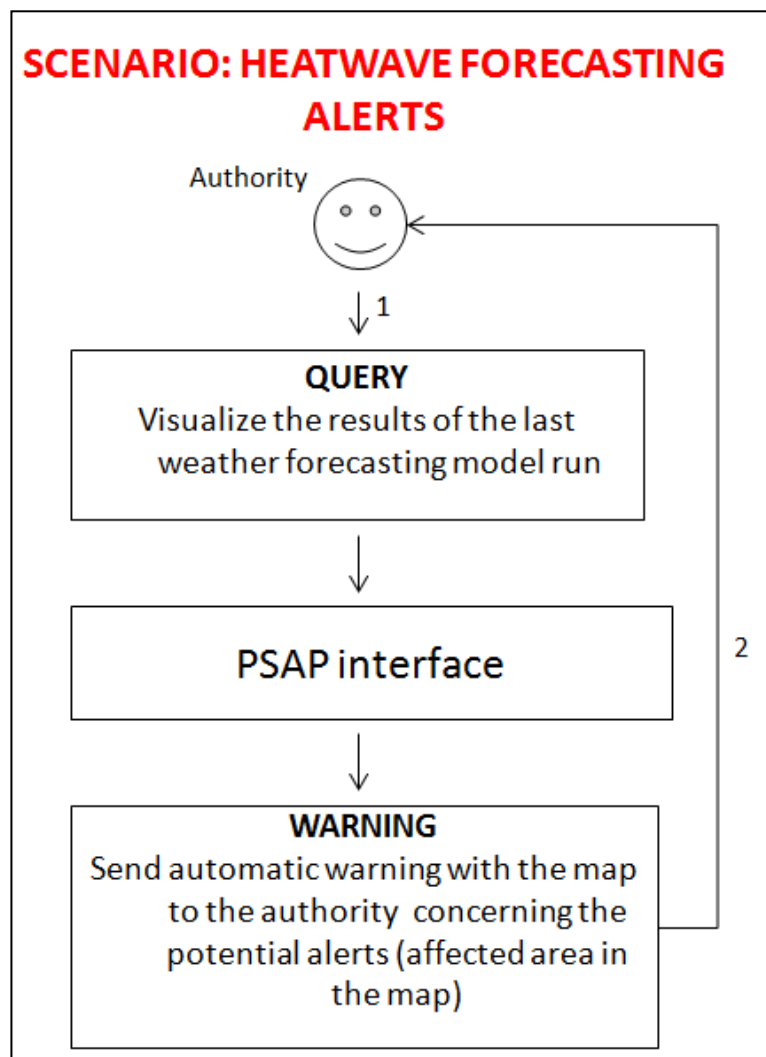


Fig. 5-18. Block Diagram of the UC301

Current Status (initial phase of the scenario)

- Before a heatwave event

What is happening

- Extreme temperatures are forecasted (heatwave)

Outcome

- The authorities can visualize if there is an imminent heatwave and an alert is issued through the system
- The system shows the affected area and the forecasted duration of the event
- Warnings are sent automatically to the authority concerning potential alerts

	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
42°	48	50	52	55	57	59	62	64	66	68	71	73	75	77	80	82
41°	46	48	51	53	55	57	59	61	64	66	68	70	72	74	76	79
40°	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75
39°	43	45	47	49	51	53	55	57	59	61	63	65	66	68	70	72
38°	42	44	45	47	49	51	53	55	56	58	60	62	64	66	67	69
37°	40	42	44	45	47	49	51	52	54	56	58	59	61	63	65	66
36°	39	40	42	44	45	47	49	50	52	54	55	57	59	60	62	63
35°	37	39	40	42	44	45	47	48	50	51	53	54	56	58	59	61
34°	36	37	39	40	42	43	45	46	48	49	51	52	54	55	57	58
33°	34	36	37	39	40	41	43	44	46	47	48	50	51	53	54	55
32°	33	34	36	37	38	40	41	42	44	45	46	48	49	50	52	53
31°	32	33	34	35	37	38	39	40	42	43	44	45	47	48	49	50
30°	30	32	33	34	35	36	37	39	40	41	42	43	45	46	47	48
29°	29	30	31	32	33	35	36	37	38	39	40	41	42	43	45	46
28°	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
27°	27	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
26°	26	26	27	28	29	30	31	32	33	34	34	35	36	37	38	39
25°	25	25	26	27	27	28	29	30	31	32	33	34	34	35	36	37
24°	24	24	24	25	26	27	28	28	29	30	31	32	33	33	34	35
23°	23	23	23	24	25	25	26	27	28	28	29	30	31	32	32	33
22°	22	22	22	22	23	24	25	25	26	27	27	28	29	30	30	31

Fig. 5-19. Heat Index Table⁷

Note: 40 – 45: Increased sense of discomfort, avoid getting tired; 46 – 53: Severe danger, avoid any activity; > 54: Extreme danger for health problems (possible heart attack)

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

- The system should show that a heatwave is imminent along with an estimate of its duration and the possible affected area.

Example of the textual information that might be presented to the authorities

- **From First Responders**
 - None

⁷ http://www.eurometeo.com/english/read/doc_heat

- **From Citizens**

- None

Example of messages that might be presented to the people

- None

Example of messages that might be presented to first responders

- None

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

PSAP, Municipalities, Civil Protection, Fire Department, Hospitals

Mobile application equipment

None

UC_302: Heatwave fire risk assessment

This Use Case concerns the calculation of risk for a forest fire to start as a result of a heatwave, based on the forecasted weather conditions during and after the period of the heatwave.

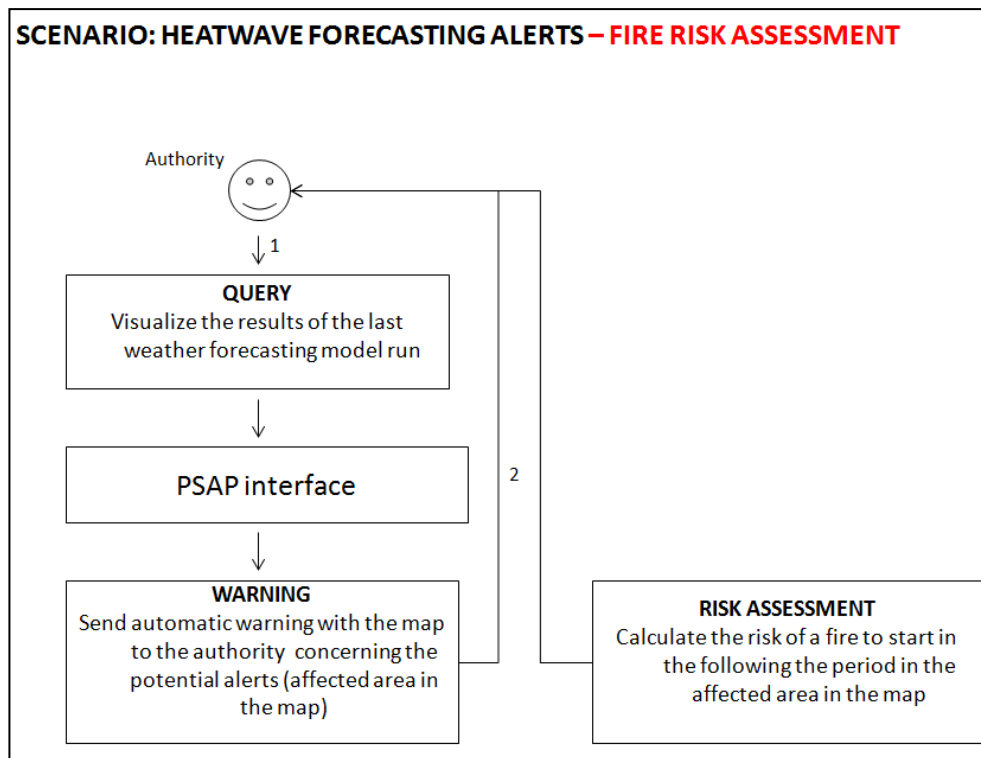


Fig. 5-20. Block Diagram of the UC302

Current Status (initial phase of the scenario)

- Before a heatwave event

What is happening

- Extreme temperatures are forecasted (heatwave)

Outcome

- The authorities can visualize if there is an imminent heatwave and an alert is issued through the system
- The system shows the affected area and the forecasted duration of the event
- Warnings are sent automatically to the authority concerning potential alerts
- A fire risk assessment is issued and sent to the authorities based on the weather conditions in the period following a heatwave

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

The visual information should be presented in the form of a meteorological map of the area with an estimated progression of the event.

In terms of the calculation of the fire risk assessment, the system should present a classification of the probability of fire exposure in the next 10 days, as shown in the fig. 5-21 below.

1. LOW	
2. MEDIUM	
3. HIGH	
4. VERY HIGH	
5. STATE OF ALERT	

Fig. 5-21. Danger levels for fire exposure⁸

It is the same as the Civil Protection uses currently BUT it will refer in a more local level

Example of the textual information that might be presented to the authorities

- **From First Responders**
 - None
- **From Citizens**
 - None

Example of messages that might be presented to the people

- None

Example of messages that might be presented to first responders

- None

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- Civil Protection
- Fire Department

⁸ <http://civilprotection.gr/el/δασικές-πυρκαγιές>

Mobile application equipment

- None

UC_303: First Responder Management

This Use Case concerns a possible query to the PSAP to monitor first responders' activities.

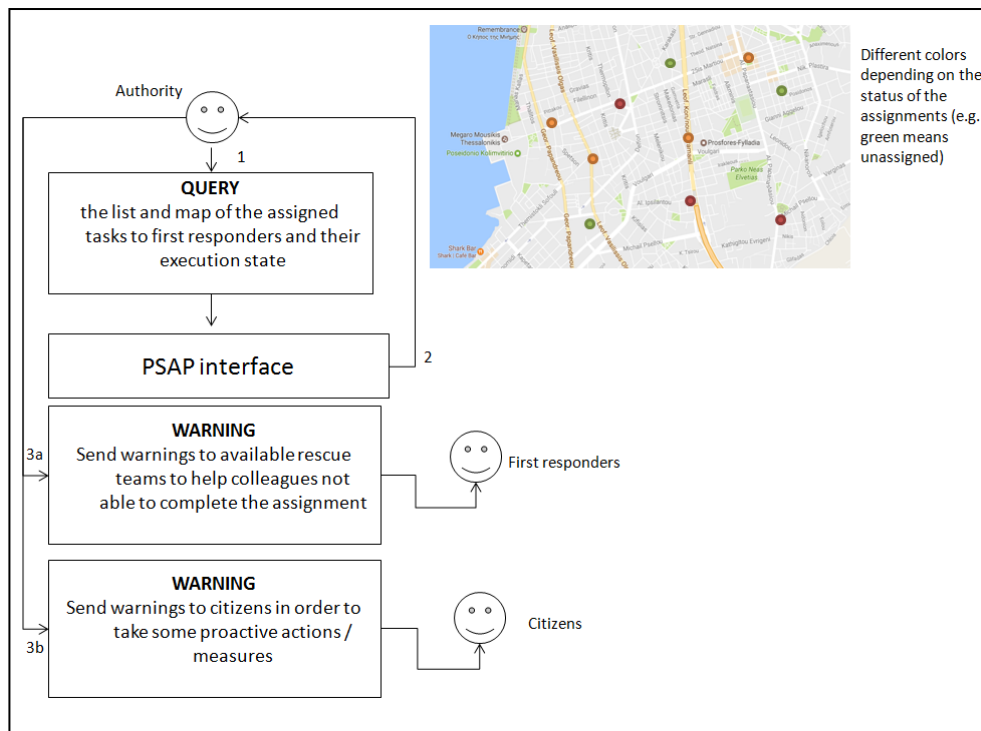


Fig. 5-22. Block Diagram of the UC303

Current Status (initial phase of the scenario)

- During a heatwave event

What is happening

- First responders are performing the tasks assigned by the authorities. Some of them were not able to complete the task or require further assistance.

Outcome

- The authorities can visualize the assigned tasks to first responders and their execution state
- The authorities can send warnings to available rescue teams to help colleagues not able to complete the assignment or require further assistance.
- The Mayor can send warnings to citizens in order to take some proactive actions / measures

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

A map showing the the status of the first responders' assignments (e.g. green means unassigned)

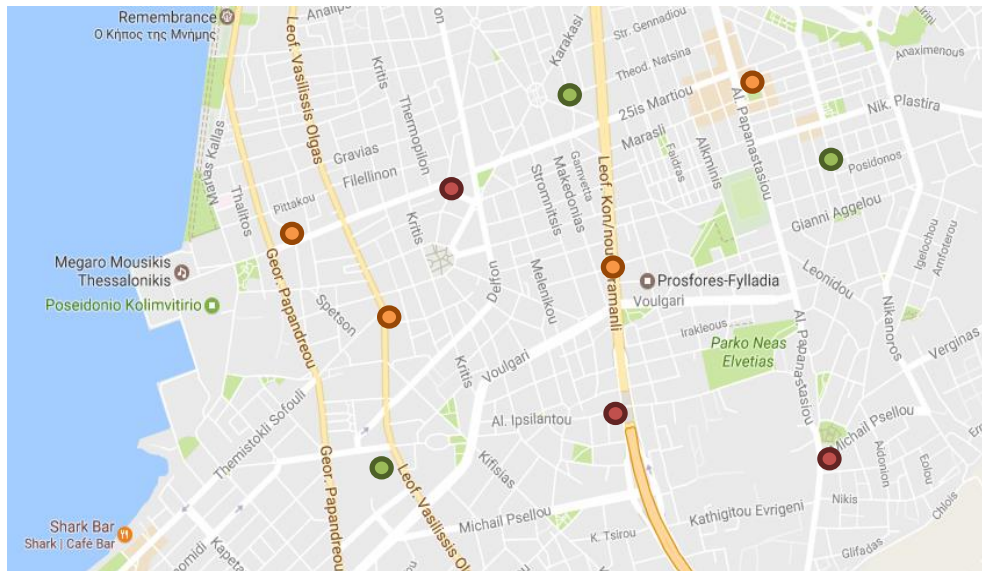


Fig. 5-23. Visual presentation of first responder status.

Example of the textual information that might be presented to the authorities

- From First Responders

GRE	ENG
Αίτημα υποστήριξης Θέση : Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY	Assistance Required Location : coordinates: North , East Address: Street XX, no. YY
Εργασία Ολοκληρώθηκε Θέση : Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY	Task Complete Location : coordinates: North , East Address: Street XX, no. YY

- From Citizens

- None

Example of messages that might be presented to the people

- None

Example of messages that might be presented to first responders

- None

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

PSAP, Fire Department, Municipalities, Traffic Police, EKAV (ambulance service)

Mobile application equipment

Smartphone

UC_304: Management of traffic emergencies

This Use Case concerns the monitoring of traffic jam situations in order to support a more efficient deployment of the first responders.

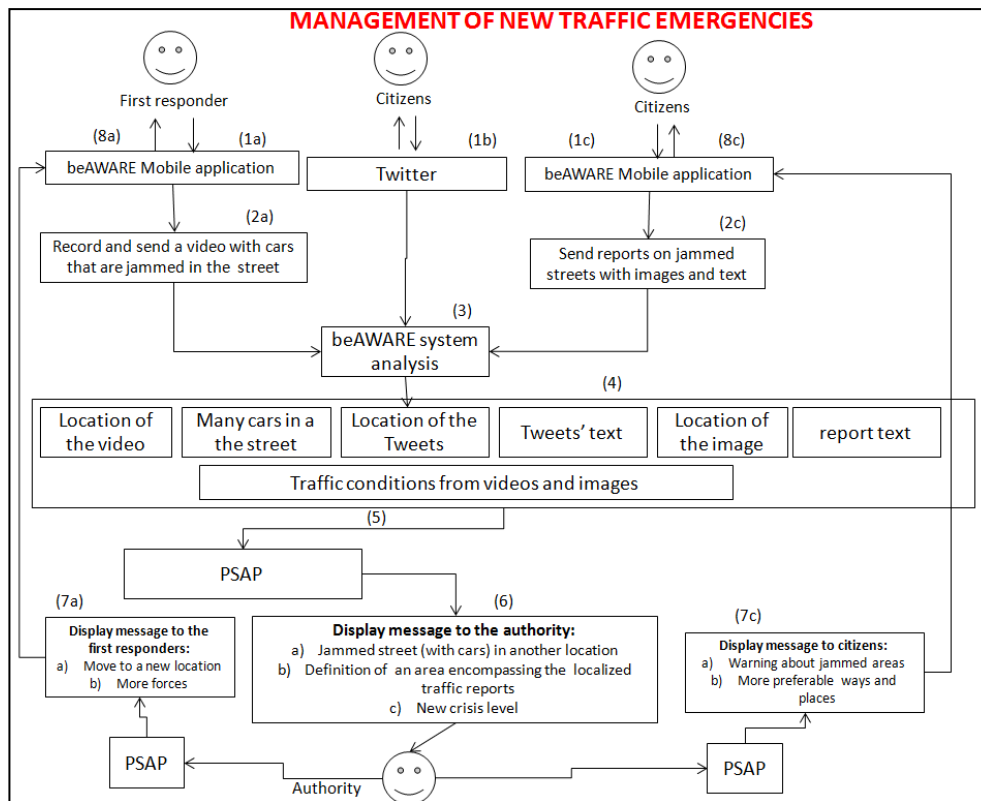


Fig. 5-24. Block Diagram of the UC304

Current Status (initial phase of the scenario)

- During the heatwave

What is known to the beAWARE system already

- Weather forecast
- Current situation of the traffic in the streets

What is happening

- A first responder (rescue service) is recording a video of a jammed street in another location in the city
- Tweets are mentioning jammed streets in the first responder's location
- Citizens are sending reports on jammed streets with images and text in another location in the city

Outcome

- The authority redistributes first responders to more suitable locations
- The authority (e.g. municipality) sends notifications to citizens approaching the jammed areas and suggests alternative ways

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

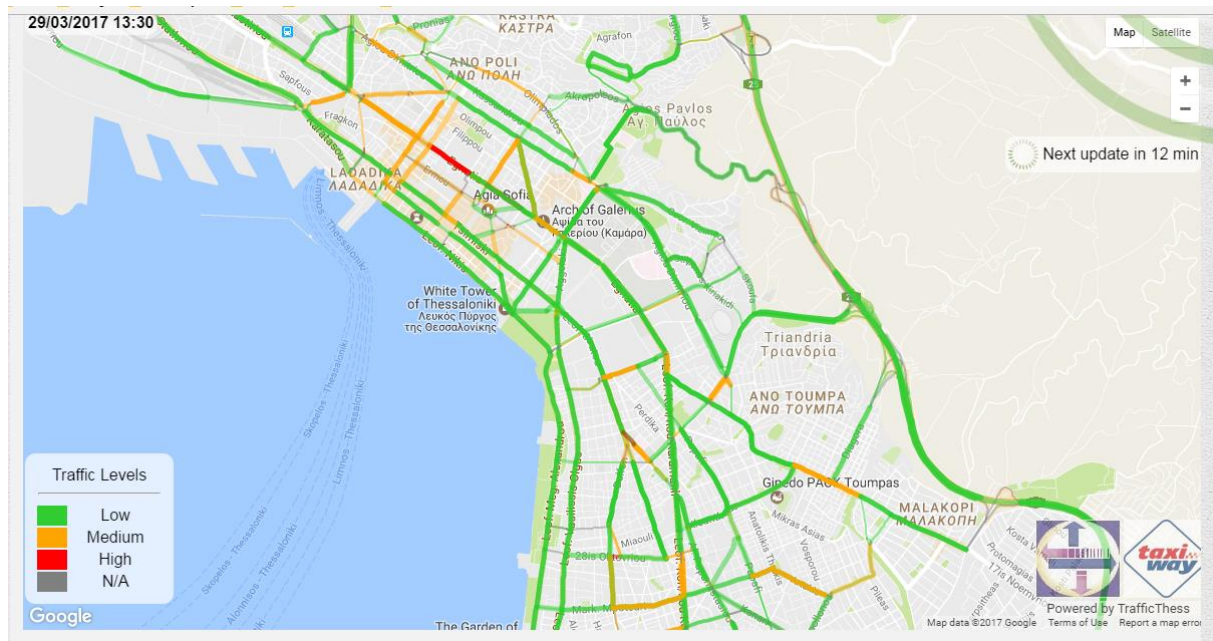


Fig. 5-25. Visualization of real tiem traffic conditions in the city

Different colors depending on the status of the streets

Relative information about the traffic situation can be acquired through google traffic and mobithess.gr

- Photos from known locations:



Fig. 5-26. Traffic jam in the Thessaloniki ring road



Fig. 5-27. Picture of traffic jam

Example of the textual information that might be presented to the authorities

GRE	ENG
Η κίνηση στην οδό «Χ» είναι σε επίπεδο «υψηλό».	Traffic in Street X has reached level “High”

Example of messages that might be presented to the people

GRE	ENG
Η κίνηση στην οδό «Χ» είναι σε επίπεδο «υψηλό». Σας συνιστούμε να επιλέξετε μία εναλλακτική διαδρομή για τον προορισμό σας	Traffic in Street X has reached level “High”. Please be advised to avoid Street X and use alternate routing to your destination.

Example of messages that might be presented to first responders

GRE	ENG
Η κίνηση στην οδό «Χ» είναι σε επίπεδο «υψηλό». Κινηθείτε μέσω της οδού «Υ»	Traffic in Street X has reached level “High”. “. Redirect through street Y

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- PSAP
- Traffic Police

Mobile application equipment

Smartphone

UC_305: Management of Places for relief

This Use Case concerns the monitoring of the places of relief offered to people as a shelter during the day, in the period of a heatwave.

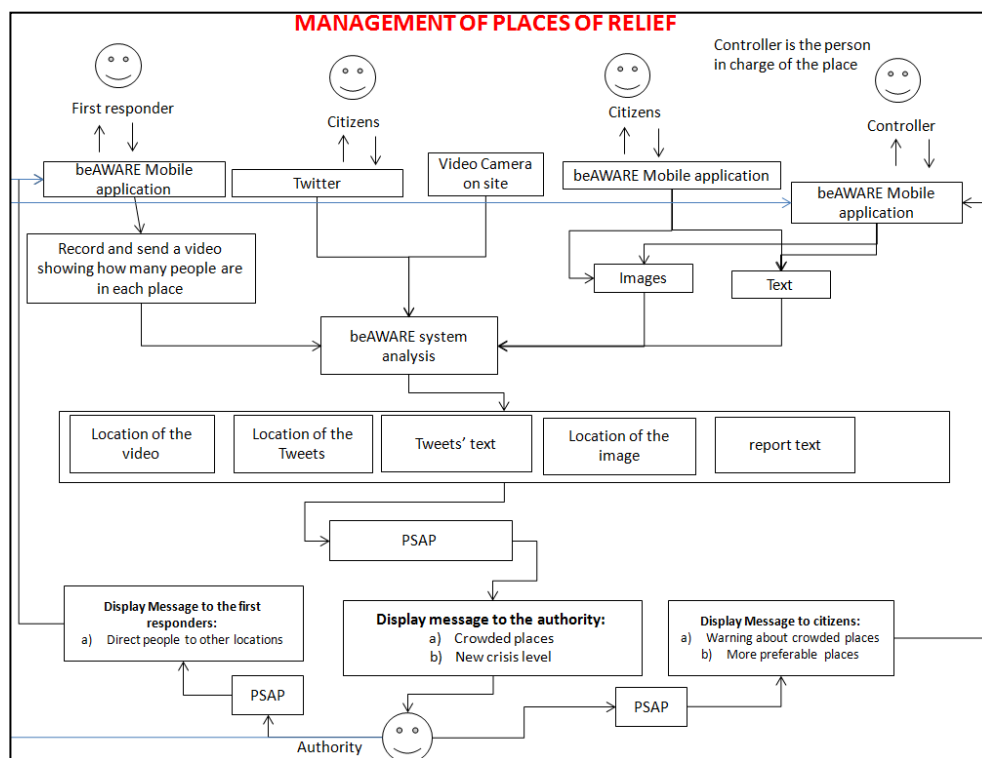


Fig. 5-28. Block Diagram of the UC305

Current Status (initial phase of the scenario)

- During the heatwave

What is known to the beAWARE system already

- Weather forecast
- Current status of occupancy for the places of relief
- Capacity of each place

What is happening

- A first responder (eg volunteer) or the person in managing the place is recording a video of the crowded place
- Tweets are mentioning that the place is crowded
- Citizens are sending reports on jammed streets with images and text in another location in the city
- Cameras on place are recording the number of people that are in each place

Outcome

- The authority informs first responders to direct people to other places
- The authority sends notifications to citizens regarding the occupancy of each place and suggests alternative places
- The status of each place is shown on a map
- Can the map be updated automatically?

Example of the visual information that might be presented to the authorities (e.g. spots in a map etc.)

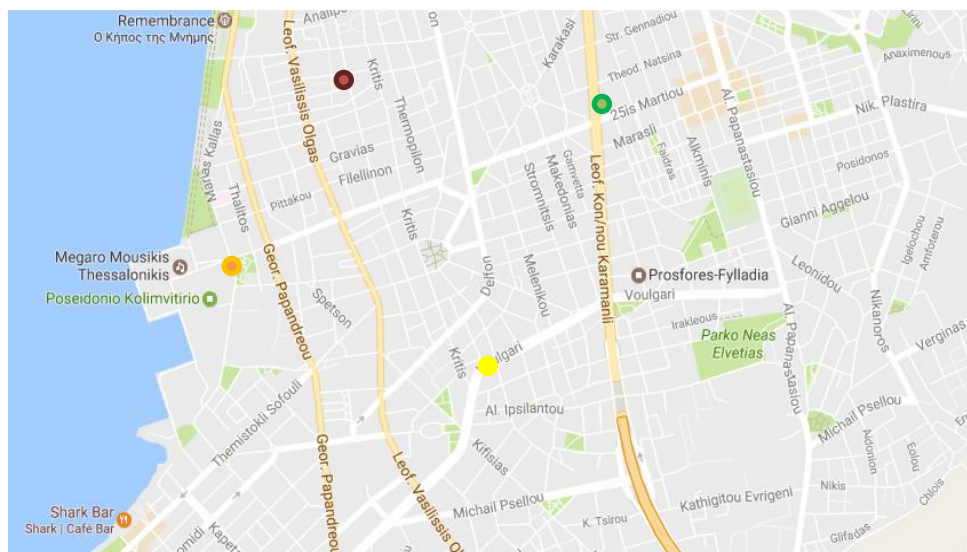


Fig. 5-29. Visualization of the status of places of relief in the city

- Dots on a map (e.g. Google Map) showing the location of the places for relief and its capacity.

Different colors depending on the status of each place's occupancy (e.g. Green means <50% of occupancy, yellow means <70%, orange means <90%, red means >90%).

Example of the textual information that might be presented to the authorities

GRE	ENG
Ενέργεια: Ο χώρος στην οδό «X, no. Y» έχει φτάσει στο Z% της.	Action: Place in street X, no. Y has reached Z% of its capacity.
Θέση: Διεύθυνση: Οδός X, νο. Y	Location: Address: Street X, no. Y

Example of messages that might be presented to the people

GRE	ENG
Ο χώρος στην οδό «X, νο. Y» έχει φτάσει στο όριο της χωρητικότητας του. Θα σας συνιστούσαμε να μεταβείτε στο χώρο (ή χώρους) που βρίσκεται (ή βρίσκονται) στην οδό XX, νο. YY	Place in street X, no. Y has reached its capacity, please be advised to use place(s) Y/Z (address: Street YY) for relief.

Example of messages that might be presented to first responders

GRE	ENG
Ο χώρος στην οδό «X, νο. Y» έχει φτάσει στο όριο της χωρητικότητας του. Οδηγήστε τους πολίτες στο (στους) χώρο (χώρους) που βρίσκεται (ή βρίσκονται) στην οδό XX, νο. YY	Place X (address: Street XX) has reached its capacity, please direct citizens to place(s) Y/Z (address: Street YY) for relief.
Ο χώρος στην οδό «X, νο. Y» έχει φτάσει στο όριο της χωρητικότητας του. Οδηγήστε τους πολίτες στο (στους) χώρο (χώρους) που βρίσκεται (ή βρίσκονται) στην οδό XX, νο. YY	Place X (address: Street XX) has reached its capacity, please direct citizens to place(s) Y/Z (address: Street YY) for relief.

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- None

The roles under the term authority

- PSAP
- Municipal Authorities

Mobile application equipment

Smartphone

UC_306: Response to Power Outage

This Use Case focuses on locating signals through the beAWARE app from people in distress (e.g. elders or sick people who are stuck at home, people stuck in elevators, etc.).

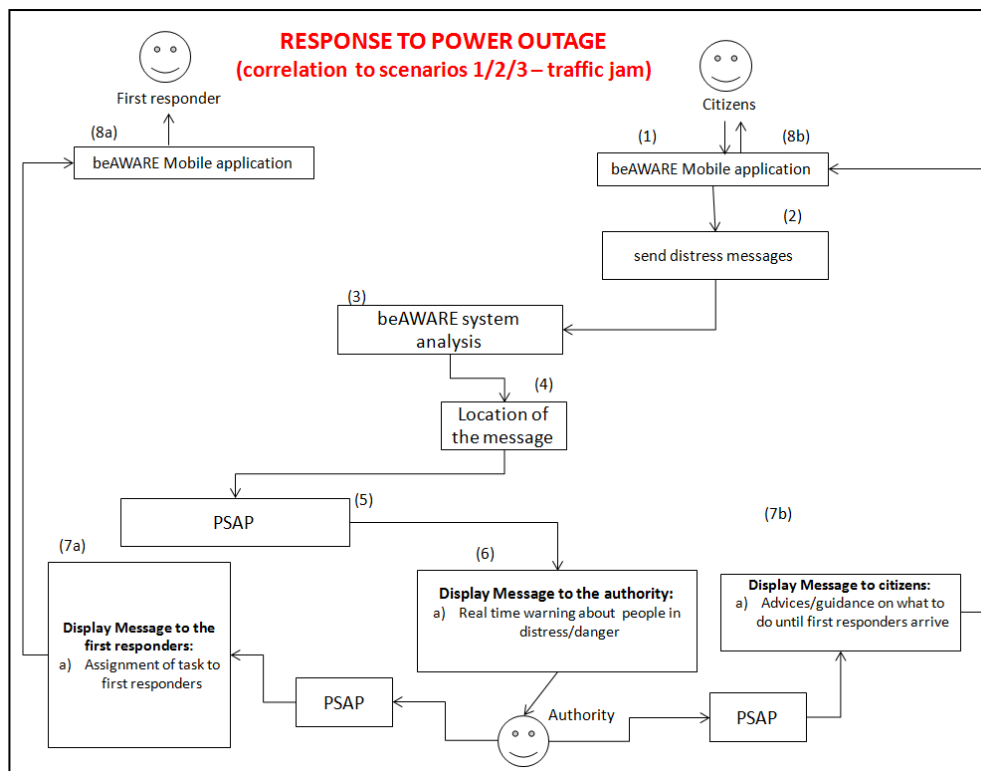


Fig. 5-30. Block Diagram of the UC306

Current Status (initial phase of the scenario)

- During a heatwave event a power outage has occurred

What is known to the beAWARE system already

- Weather forecast

What is happening

- Citizens are sending distress messages
- Hospitals informing for reaching capacity

Outcome

GRE	ENG
Υπάρχουν ηλικιωμένοι εγκλωβισμένοι σε σε σπíti χωρίς A/C Θέση : Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY	Elder people stuck at home with no A/C Location : coordinates: North , East Address: Street XX, no. YY

Example of messages that might be presented to the people

- Advice/guidance on what to do until first responders arrive

Example of messages that might be presented to first responders

GRE	ENG
<ul style="list-style-type: none"> • Από νοσοκομεία σε PSAP <p>Το νοσοκομείο «X» έχει δεν έχει πλέον διαθεσιμότητα κλινών → οδηγήστε τους ασθενείς σε άλλα νοσοκομεία</p> <p>Θέση διαθέσιμων νοσοκομείων: Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY</p>	<ul style="list-style-type: none"> • From Hospitals to PSAP <p>Hospital X has reached capacity and cannot receive more patients → redirect patients to other hospitals</p> <p>Location of new hospitals: coordinates: North , East Address: Street XX, no. YY</p>

GRE	ENG
<ul style="list-style-type: none"> • Από PSAP σε πυροσβεστική <p>Υπάρχουν εγκλωβισμένοι σε ασανσέρ</p> <p>Θέση: Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY</p>	<ul style="list-style-type: none"> • From PSAP to Fire Department <p>People stuck in elevators</p> <p>Location: coordinates: North , East Address: Street XX, no. YY</p>

GRE	ENG
<ul style="list-style-type: none"> Από PSAP σε πυροσβεστική <p>Υπάρχουν ηλικιωμένοι σε σπίτι χωρίς A/C</p> <p>Θέση: Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY</p>	<ul style="list-style-type: none"> From PSAP to Fire Department <p>Elder people stuck at home with no A/C</p> <p>Location: coordinates: North , East Address: Street XX, no. YY</p>

GRE	ENG
<ul style="list-style-type: none"> Από PSAP σε ΕΚΑΒ <p>Το νοσοκομείο «X» έχει δεν έχει πλέον διαθεσιμότητα κλινών → οδηγήστε τους ασθενείς σε άλλα νοσοκομεία</p> <p>Θέση διαθέσιμων νοσοκομείων: Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY</p>	<ul style="list-style-type: none"> From PSAP to Ambulance Services <p>Hospital X has reached capacity and cannot receive more patients → redirect patients to other hospitals</p> <p>Location new hospitals: coordinates: North , East Address: Street XX, no. YY</p>

Example of reports from the first responders that might be presented to the authority (tasks etc.)

- Transport

ENG	GRE
<p>Απεγκλωβισμός / απομάκρυνση ηλικιωμένων ολοκληρώθηκε</p> <p>Θέση: Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY</p>	<p>Evacuation Complete</p> <p>Location: coordinates: North , East Address: Street XX, no. YY</p>

The roles under the term authority

PSAP

Mobile application equipment

Smartphone

6 User Requirements

This section presents the description of the initial user requirements for beAWARE based on the understanding and clarification of how users will interact with the system and benefit from such interactions.

The tables below specify these operational **user requirements** per the use cases of each scenario. The process for generating this set of requirements and for transforming it into a formal set of system requirements is defined as the **requirements elicitation process** and it is reported in section 2.

6.1 Requirements for Flood scenario use cases

UR#	UC#	Requirement name	Requirement description
UR_101	All	Type of visualization	Display information to authorities in a web-gis platform (citizen and first responders reports by calls, apps, social media)
UR_102	101,102,103 104,105,106, 108	Map of the AMICO Flood EWS results	Display reliable and trustful flood forecasts, potential dangerous situations and the forecasted level of risk to the authorities, based on the results of the EarlyWarning System AMICO (improved with the assimilation of Satellite data (snow cover, soil moisture, etc.) and Meteorological forecasts data with a finer spatial resolution provided by FMI)
UR_103	101,102,103 104,105,106, 108	Flood warnings	Provide authorities/citizens with automatic warnings on river levels overtopping some predefined alert thresholds, based on forecast results
UR_104	102, 103, 104, 105, 106	Send/receive emergency reports	Allow citizens to send text, images, audio and video messages from their mobile phone (for the different operative systems) and from their social media account to the authority during bad weather conditions when the GPS signal is low.
UR_105	104	Send task reports	Allow First Responders to send reports about their assignments from their mobile phone to local authorities

UR#	UC#	Requirement name	Requirement description
UR_106	103,106	Visualize video cameras	Display streamed video from video cameras to the authorities/citizens
UR_107	102,103, 104, 105,106	Localize video, audio and images	Provide authorities with the ability to localize videos, audio and images sent by citizens from their mobile phones
UR_108	104	Localize task status	Provide authorities with the ability to localize first responders reports regarding the status of their assigned tasks
UR_109	102	Localize tweets	Provide authorities with the ability to localize Twitter messages concerning a flood event
UR_110	102	Localize calls	Provide authorities with the ability to localize Phone Calls to an emergency number concerning a flood event
UR_111	102	Detect flooded elements from video	Provide authorities with the ability to detect and count flooded elements (e.g. cars and people inside the river)from video and images sent from mobile phones and social media
UR_112	102	Detect element at risk from reports	Provide authorities with the ability to detect the number of element at risk and the degree of emergency from text sent by the mobile app and by social media
UR_113	102	Detect element at risk from calls	Provide authorities with the ability to detect the number of element at risk and the degree of emergency from emergency calls
UR_114	102, 103, 106	Detect water depth and velocity	Provide authorities with the ability to detect water depth and water velocity from video and images sent by the mobile app and social media
UR_115	all	Real time flood mapping	Display flooded areas in real time to authorities/citizens

UR#	UC#	Requirement name	Requirement description
UR_116	102,103,105,106,108	Warning people approaching flood areas	Provide authorities with the ability to warn people in danger with warning messages, once they are approaching a flooded area
UR_117	102	Manage assignments in case of new emergencies	Provide authorities with the ability to manage first responder assignments
UR_118	106	River overtopping	Provide authorities/citizens with the ability to know if the river level is overtopping predefined alert thresholds
UR_119	103	Manage assignments based on river level overtopping	Provide authorities the ability to assign task to first responder teams related to the overtopping of predefined river level thresholds
UR_120	107	Map of rescue teams and task evaluation	Display to authorities the location in time of first responder teams in all the municipality and provide the ability to evaluate in real time the execution of the assigned tasks with a global visualization of the activities performed
UR_121	105	Detect rainfall volume and duration	Provide authorities with the ability to detect rainfall volume and duration from videos (fixed and mobile cameras, social media and mobile app)
UR_122	105	Rainfall warnings	Provide authorities/citizens with the ability to know in real time if the rainfall intensity is overtopping predefined alert thresholds
UR_123	106	Detect embankment exceeding	Provide authorities with the ability to detect from video, automatically (fixed and mobile cameras, social media and mobile app) , if a river embankment is overtopping and/o breaking

UR#	UC#	Requirement name	Requirement description
UR_124	106	Embankment warnings	Provide authorities/citizens with the ability to know in real time if a river embankment is overtopping and/or breaking; the comprehensive and reliable real-time information about the situation, especially the breach enlargement and discharge, the spatial and temporal development of the inundation and the damages
UR_125	102,106	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid interferences inside the area involved by civil protection activities
UR_126	101	Map of Satellite data and weather forecasts	Display updated satellite images and weather forecasts.
UR_127	all	Filters	Provide advanced filters in the data management platform (visualize and list information selected by filters/query)
UR_128	101, 102, 103, 105, 106	Evaluation of the level of risk	Provide authorities with the ability to evaluate the forecasted level of risks (based on all the available dataset)
UR_129	all	Automatic translation from a foreigner applicant	Make easy the communication between people with different languages
UR_130	all	Traffic Status	Display to the authorities the current traffic situation so that they can decide where to direct the first responders or inform them which roots to avoid
UR_131	all	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid a certain area that is jammed with traffic

6.2 Requirements for Fire scenario use cases

UR#	UC#	Requirement name	Requirement description
UR_201	201, 204	Detection of people and goods in danger	Display information authorities/first responders to detect people, cars and buildings in danger.
UR_202	201,202,203,204	Detection of critical aspects	Provide authorities/first responders information in order to detect the following kind of situation, process, material or condition that can cause a wildfire or that could intensify its damaging impacts: Namely drought, air temperature and other weather aspects, fuel accumulation spots, crowds, etc.
UR_203	201,202,204	Study of the smoke behaviour	Provide information authorities/first responders with a study of the smoke behavior (vertical/inclined, column, smoke color...).
UR_204	201,202,204	Identification of the fuel being burned	Provide information to authorities/first responders to know the type of fuel being burned by the colour and the shape of the smoke
UR_205	201-202-204	Analysis of advancing fire	Provide authorities/first responders with an analysis of the the advancing fire (flame progression, height and length).
UR_206	201,202,203,204	Specific weather data	Provide authorities/first responders and citizens with specific weather data of the Devesa place, as it has a specific microclimate that might be different from other places.

UR#	UC#	Requirement name	Requirement description
UR_207	201,202,204	Aerial images	Display authorities/first responders to visualize aerial images of the smoke and the trajectory flames. It will provide information about the extension and the damages (kind of damages, and so on), the tracking of the fire, vehicles and people around the spot, in order to find out possible suspects or victims. Furthermore, if these aerial images provide thermal information it can be used for looking over the fire perimeter once it has been extinguished, in order to locate sleeper fire and to avoid possible reproduction. This aerial images are a must, because the use case is in a forest, and we have not references in the forest, the only tool that can help the coordination center and first responders are aerial images to have information about forest fires (extension, direction of fires, damages, appropriate mobilization of resources, an soon)
UR_208	201,202,203,204	Acces to road traffic cameras	Allow authorities/first responders to have access to the cameras located at CV-500 (La Devesa main road) and CV-5010. Although there are already installed cameras, they are managed and visualized by autonomic resources.
UR_209	201,202,203,204	Electronic traffic panels	Display authorities/first responders to display in electronic traffic panels useful information and evacuation instructions in case.
UR_210	201,202,204	Mobile application	Provide citizens to communicate a fire alert, detected neglects or other risk situations and even send visual data through a mobile application.

UR#	UC#	Requirement name	Requirement description
UR_211	201,202,203,204	Location of vehicles and personnel involved	Display authorities/first responders to visualize GPS location and/or real time footage of vehicles and personnel on the incident site. Transmitted to an online map where the coordination centres can follow both the development of the incident and the location and amount of resources. The online map will also provide the possibility of interacting with the police and other agencies involved
UR_212	201,202,204	Traffic warnings	Sending warnings to citizens in order to avoid interferences inside the area.
UR_213	201,202,203,204	Recommendations	Sending recommendations to citizens.
UR_214	203	Warnings	Sending warnings of pre-emergency alerts to citizens by authorities
UR_215	201,204	Evacuation orders	Ordering evacuations of citizens at risk.
UR_216	201,202,203,204	Internal sharing of information	Sharing data (images, videos, geolocation, reports) regarding the forest fire among authorities & first responders
UR_217	201,202,203,204	Twitter analysis and warning	Warning authorities/first responders about Twitter messages concerning the forest fire event.
UR_218	201,202,204	Automatic detection system	Having an automatic detection system of the forest fire, which is connected to firefighters and police officers
UR_219	201,202,203,204	Coordination and communication between different resources	Provide communication between authorities and first responders, in order to improve their coordination.

UR#	UC#	Requirement name	Requirement description
UR_220	201,202,203,204	Improvement of the signal for telephones and emergency communication	Provide authorities/first responders with an accurate coverage of telephone mobile lines and emergency communication due to there is currently a lack of signal in some spots of the area.
UR_221	201,202,203,204	Geolocalitation of telephone calls	To geolocalize a mobile phone citizen call by sending a request permission message to the citizen, who would accept to be tracked temporarily.
UR_222	201,202	Filter of the emergency messages	Transfer emergency calls by writing (only minor emergencies or only information call). The aim is to save time operator and do not lose emergency calls
UR_223	201	Automatic selection of the level of emergency	This can be doing only with the operator's supervision. The aim is to save time and do not lost emergency calls
UR_224	201,202	Automatic translation from a foreigner applicant	Make easy the communication between people with different languages
UR_225	201,202	Quick search of events and applicants	Data storage, in order to improve indexation of information relative to events and applicants

6.3 Requirements for heatwave scenario use cases

UR#	UC#	Requirement name	Requirement description
UR_301	301, 302, 305, 306	Real time weather forecast	Provide the authorities with real time weather forecast in relation to the progression of the heatwave phenomenon

UR#	UC#	Requirement name	Requirement description
UR_302	301	Automatic warning	beAWARE system to generate and provide the authorities with an automatic warning when an imminent heatwave phenomenon is forecasted
UR_303	302	Risk assessment for a forest fire	Provide the authorities with a risk assessment regarding the probability of a forest fire to occur during or in the upcoming period after a heatwave. The relevant authorities will have an assessment of a fire risk based on the weather forecast during a heatwave and especially during the following days
UR_304	303, 305	Heatwave intensity	Provide the authorities with a risk assessment regarding the intensity of the phenomenon in the city.
UR_305	303, 304, 305	Possible locations for incidents	Display to the authorities visual information about possible locations in the city (or outside the city) where a situation is more likely to develop that will require rescue team intervention (for example, based on past experience, traffic jam and/or accidents will be more likely to occur at a main street intersection/ public park/ entrance to hospitals or banks... etc.). In such cases a decision might be made to send rescue teams in advance to shorten response time if/when an incident occurs
UR_306	303, 305, 306	Number of people affected	Provide the authorities an estimation of the people that might be affected from the phenomenon and in which areas
UR_307	306	Power needs	Provide the authorities an estimation on the power needs during a heatwave based on its foreseen progression

UR#	UC#	Requirement name	Requirement description
UR_308	303, 306	Infrustrtucture overload	Provide the authorities an estimation of damage/overload to the city's infrastructure (phone lines, electricity, water, etc)
UR_309	303	False Alarms	Provide to the authorities a procedure to confirm necessity of rescue teams so they are not sent needlessly to one place instead of somewhere else where they are needed more urgently, therefore the ability to handle false alarms.
UR_310	303, 304, 305	City-wide overview of the event	Provide the authorities to have a city-wide overview of the event – allow decision making authorities an overall view of all incidents handled at any point in time/ see where all rescue teams are located in real-time to allow them to make informed decisions regarding who to send where... etc
UR_311	301, 302, 303, 304, 305, 306	Information Storage	Provide the authorites with access to all historical information by providing storage for all information for future lessons-learned purposes, so that after the heat wave situation is over, decision making authorities can review the information gathered and handled during the event, and set-up better procedures to handle future events more efficiently
UR_312	301, 304, 305, 306	Warning citizens	Provide to citizens warnings through the beAWARE app, of an imminent heatwave and a list of proactive measures and how to reduce its effects
UR_313	303	First responders status	Provide to the authorities the current status and location of all first responders when they are performing their tasks

UR#	UC#	Requirement name	Requirement description
UR_314	303	Assign tasks to first responders	Allow authorities to assign additional tasks to those first responders who are available or even instruct those who are able to assist other responders
UR_315	303, 304	Traffic Status	Display to the authorities to monitor the current traffic situation so that they can decide where to direct the first responders or inform them which routes to avoid
UR_316	305	Capacity of relief places	Provide to the authorities the current state of the available capacity of all relief places provided to the public
UR_317	303 304, 306	Areas with power outage	Display to the authorities the areas where there is a power outage.
UR_318	303, 306	Trapped citizens	Allow authorities to know if there are people trapped (e.g. in an elevator) and display where
UR_319	303, 306	Trapped elders at home	Allow authorities to know if there are elder people trapped in houses without an A/C and display where
UR_320	303, 306	Hospital availability	Show to the authorities the current availability of the hospitals.
UR_321	301, 306	Affected area	Provide to the authorities with a prediction of the affected area
UR_322	304, 305, 305	Information for incident status from Social Media	Provide to the authorities information regarding potential risks in case there is a situation inside the city (eg car accident, etc.) gathered from social media
UR_323	305, 306	Information for Hospital Status from Social Media	Provide to the authorities information regarding overcrowded hospitals and places offered to the public with a/c, gathered from social media

UR#	UC#	Requirement name	Requirement description
UR_324	304	Information for existing situation in the from Social Media	Provide to the authorities information regarding existing traffic conditions all over the city grid gathered from social media
UR_325	305	Suggested places for relief	Provide citizens with information regarding the suggested places for relief through an app.
UR_326	301, 302, 303, 304, 305, 306	Type of visualization	Display to the authorities/citizens all the information in a web-gis platform
UR_327	304, 305, 306	Send emergency reports	Allow citizens to send text, images and video messages from their mobile phone (for the different operative systems) and from their social media account to the authority.
UR_328	303, 304	Send task reports	Allow First Responders to send reports about their assignments from their mobile phone to local authorities
UR_329	304, 305	Visualize video cameras	Display streamed video from video cameras to the authorities/citizens
UR_330	303, 304, 305, 306	Localize video and images	Provide authorities with the ability to localize videos and images sent by citizens from their mobile phones
UR_331	303	Localize task status	Provide authorities with the ability to detect the location of first responders
UR_332	304, 305, 306	Localize tweets	Provide authorities with the ability to localize Twitter messages
UR_333	304, 305, 306	Localize calls	Provide authorities with the ability to localize Phone Calls to an emergency number concerning citizens who are trapped
UR_334	303	Manage assignments in case of new emergencies	Provide authorities with the ability to manage first responder assignments

UR#	UC#	Requirement name	Requirement description
UR_335	303	Map of rescue teams and task evaluation	Display to authorities the movements of first responder teams in all the municipality and provide the ability to evaluate in real time the execution of the assigned tasks with a global visualization of the activities performed
UR_336	304	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid a certain area that is jammed with traffic
UR_337	303	Location of vehicles and personnel involved	Allow authorities/first responders to visualize GPS location and/or real time footage of vehicles and personnel on the incident site. Transmitted to an online map where the coordination centres can follow both the development of the incident, and the location and amount of resources. The online map will also provide the possibility of interacting with the police and other agencies involved
UR_338	304, 305, 306	Warnings	Allow authorities to send warnings of pre-emergency alerts to citizens.
UR_339	303	Evacuation orders	Allow authorities to order evacuations of citizens at risk.
UR_340	303, 304, 305, 306	Internal sharing of information	Allow authorities and first responders to share data (images, videos, geolocation, reports)
UR_341	304, 305, 306	Twitter analysis and warning	Allow authorities/first responders to be warned by Twitter messages concerning traffic jam, availability of places of relief, potential hazards or people in danger
UR_342	303, 304, 305, 306	Coordination and communication between different resources	Provide communication between authorities and first responders, in order to improve their coordination.

7 Conclusions

This document described the initial set of use cases and requirements of beAWARE, the methodology used to define the use cases and the risks, challenges and the impacts identified and analysed in order to define these use cases.

Based on this deliverable, a consolidated set of system requirements will be elicited. This will include joint consideration of all user requirements from all the scenarios, generalization, abstraction and clustering of similar or associated user requirements, formalization and standardization of the requirement specifications, and allocation of system requirements to BeAWARE subsystems. This set of system requirements will be elaborated in D7.2 – System Requirements and Architecture.

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