



beAWARE

Enhancing decision support and management services in extreme weather
climate events

700475

D2.7

Pilot Use Cases Setup for the Final System

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Abstract

This deliverable presents the updated version of the use cases setup for the final beAWARE system. In addition, an updated description of all pilot scenarios, the time lapse protocol, the demonstration sites, the equipment that will be used and participants is presented. The purpose of this deliverable is to serve as the mandate or terms of reference for the design, development, and realization for the final beAWARE system.

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Executive Summary

The deliverable reports on the updated setup of the pilot use cases and user requirements, after the interaction of the users with the 2nd Prototype of the system.

In the first chapter, a general overview is given. In the second chapter, a summary of the results of the evaluation of the first and the second prototype are presented. This summary also includes feedback and recommendations concerning the beAWARE technology, pilot organization, and the evaluation methodology to be followed.

In the three following chapters, the final versions of the use cases and user requirements as also the final operational scenarios are presented. Those final versions will be used during the implementation of the final pilot. A detailed description for each one was made, based on the storyline provided in order to offer an analytical presentation of all the steps that will take place. Additionally, for the fire scenario the emergency protocols, the equipment, the participants and the area that the scenario will take place are cited. In the final chapter, the conclusions of this deliverable are given.

New ideas, suggestions, limitations that highlighted during and after the first two pilots from participants, stakeholders and beAWARE partners as well as the evolution/maturation of the beAWARE platform were the motives to reformulate and update the final lists of the use cases and user requirements in order to prepare the final platform which will be tested in the final pilot.

To sum up, in this deliverable, the final approach from the user point of view is presented. This approach focuses on the final use cases and user requirements of each operational scenario, flood, fire, and heatwave, with a specific and clear structure.

Given that the Valencia pilot is the final one, the final platform will be tested, all the changes, updates, modifications, additions, correct steps, possible errors, and concerns have already been taken into account in order to have a product that meets all expectations and needs.

Abbreviations and Acronyms

The following abbreviations have been used in this document:

P1	Prototype 1 / First Prototype
P2	Prototype 2 / Second Prototype
SDS	Scenario Demonstration Site
COC	Command Operational Center
PSAP	Public Safety Answering Point
ASL	Above Sea Level
UI	User Interface
CRCL	Crisis Classification

Glossary

Term	Meaning in beAWARE
A	
<i>Affected</i>	People who are affected, either directly or indirectly, by a hazardous event. Directly affected are those who have suffered injury, illness or other health effects; who were evacuated, displaced, relocated or have suffered direct damage to their livelihoods, economic, physical, social, cultural and environmental assets. Indirectly affected are people who have suffered consequences, other than or in addition to direct effects, over time, due to disruption or changes in economy, critical infrastructure, basic services, commerce or work, or social, health and psychological consequences.
<i>Audio Item</i>	Audio recording.
B	
<i>Building</i>	A structure with walls and a roof, windows and often more than one level, used for a variety of activities, as living, entertaining, or manufacturing (e.g. a house or factory).
C	
<i>Capacity</i>	The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience
<i>Crisis</i>	Situation with high level of uncertainty that disrupts the core activities and/or credibility of an organization and requires urgent action.
<i>Crisis Management</i>	Management process that identifies potential impacts that threaten an organization and provides a framework for building resilience, with the capability for an effective response that safeguards the interests of the organization's key parties, reputation, brand and value, creating activities, as well as effectively restoring operational capabilities. Crisis management also involves the management of preparedness, mitigation response, and continuity or recovery in the event of an incident, as well as management of the overall programme through training, rehearsals and reviews to ensure the preparedness, response and continuity.
<i>Crisis Classification Component</i>	In the content of beAWARE project, it is a component which integrates and deploys the necessary technological solutions enabling stakeholders (authorities, first responders, citizens) to (a) timely aware them for an upcoming extreme natural event by acting as an Early Warning System; (b) provide real-time monitoring of the ongoing crisis, facilitating the risk assessment and decision support processes via the PSAP (Public Safety Answering Points) component.
<i>Critical infrastructure</i>	The physical structures, facilities, networks and other assets which provide services that are essential to the social and economic functioning of a community or society

Term	Meaning in beAWARE
<i>Classification</i>	The action or process of assigning a class, a category, a type, a level or rating to something
<i>Communication</i>	Any type of (tele) communication infrastructure.
D	
<i>Damage</i>	Combination of exposure and vulnerability
<i>Data Analysis</i>	A type of a task involving data analysis.
<i>Disaster</i>	A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts.
<i>Drone</i>	an unmanned aircraft or ship guided by remote control or onboard computers
E	
<i>Early warning</i>	An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events.
<i>Early warning system</i>	The set of capacities needed to generate and disseminate timely early warnings.
<i>Energy</i>	Any type of energy-generating infrastructure.
<i>Exposure</i>	The presence of people, livelihoods, environmental service and resources, infrastructures, economic and social and cultural assets located in hazard-prone area
F	
<i>Forecast</i>	Definite statement or statistical estimation of the likely occurrence of a future event or conditions for a specific area.
<i>Forecasting model</i>	Numeric representation of a physical phenomenon, which - starting from input data (other forecasts, measures, etc.) - solves through numerical techniques its internal equations and provides forecasts as output data.
<i>Flood</i>	An overflow of a large amount of water beyond its normal boundaries, involving an area usually dry, triggered by various events (rainfall, snowmelt, exceeding of a drainage network, ...)
<i>Flood forecasting model</i>	a forecasting model which provide estimation of hydraulic variables (such as water level, velocity, depth...) in a specific domain, from meteorological forecasts or measure (such as: intensity of rain, humidity, temperature...), provided as input

Term	Meaning in beAWARE
<i>Flood map</i>	Hazard outcome in case if flood, expressing the spatial distribution of the intensity of the flood in terms of depth, persistence or velocity
H	
<i>Hazard</i>	The occurrence of process, phenomenon or human activity, with a certain probability and intensity, that may cause negative impacts, such as loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socionatural.
<i>Heatwave</i>	A period of abnormally and uncomfortably hot and usually humid weather
<i>Human</i>	Human beings in danger.
I	
<i>Image Analysis</i>	The task of extracting useful information from still images.
<i>Image Item</i>	Captured image.
<i>Impact</i>	The impact of natural disasters and incidents.
<i>Impact Type</i>	The various types of impacts, like human, economic, and environmental impacts (e.g. injuries, damage to properties etc.)
<i>Incident</i>	An incident of various kind, which takes place during a natural disaster.
<i>Incident Types</i>	The various types of incidents, like e.g. floodings, blocked streets etc.
L	
<i>Living Being</i>	Any living being that is in danger during a natural disaster.
<i>Location</i>	A location (point or area), indicated by latitude, longitude, and radius.
M	
<i>Mission</i>	A mission assigned to a rescue unit during a crisis.
<i>Mitigation</i>	The lessening or minimizing of the adverse impacts of a hazardous event.
<i>Monument</i>	A structure or building to honour a special person or event.
N	
<i>Natural Disaster</i>	The actual manifestation of a natural disaster type. An instance of a natural disaster has specific climate conditions with specific values (e.g. temperature = 45°C) plus some other properties (e.g. start/end time).
<i>Natural Disaster Type</i>	The various types of disasters, like e.g. floods, forest fires, storms or earthquakes etc.
P	
<i>Police</i>	Law enforcement infrastructure and services.
<i>Preparedness</i>	The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from the impacts of likely, imminent or current disasters.

Term	Meaning in beAWARE
<i>Prevention</i>	Activities and measures to avoid existing and new disaster risks. Prevention (i.e., disaster prevention) expresses the concept and intention to completely avoid potential adverse impacts of hazardous events. While certain disaster risks cannot be eliminated, prevention aims at reducing vulnerability and exposure in such contexts where, as a result, the risk of disaster is removed. Examples include dams or embankments that eliminate flood risks, land-use regulations that do not permit any settlement in high-risk zones, seismic engineering designs that ensure the survival and function of a critical building in any likely earthquake and immunization against vaccine-preventable diseases. Prevention measures can also be taken during or after a hazardous event or disaster to prevent secondary hazards or their consequences, such as measures to prevent the contamination of water.
<i>Priority</i>	The condition that occurs when something (i.e. an incident, an event, a crisis etc..) is regarded as more or less important, according to a pre-defined rating scale
<i>Property</i>	Any type of private property.
<i>Public awareness</i>	The extent of common knowledge about disaster risks, the factors that lead to disasters and the actions that can be taken individually and collectively to reduce exposure and vulnerability.
<i>Public information</i>	Information, facts and knowledge provided or learned from researches or studies, which available for dissemination to the public.
R	
<i>Recovery</i>	The restoring or improving of livelihoods and health, as well as economic, physical, social, cultural and environmental assets, systems and activities, of a disaster-affected community or society, aligning with the principles of sustainable development and “build back better”, to avoid or reduce future disaster risk
<i>Relief Place</i>	a place giving temporary protection in case of natural disaster
<i>Resilience</i>	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.
<i>Responder</i>	A first responder unit, (e.g. a firefighter, police officer or emergency medical physician).

Term	Meaning in beAWARE
<i>Response</i>	Actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. Disaster response is predominantly focused on immediate and short-term needs and is sometimes called disaster relief. Effective, efficient and timely response relies on disaster risk-informed preparedness measures, including the development of the response capacities of individuals, communities, organizations, countries and the international communities.
<i>Risk</i>	The combination of the probability of certain hazard to occur and of its potential negative consequences.
<i>Risk assessment</i>	A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.
<i>Risk management</i>	the application of risk reduction policies and strategies to prevent new risks, reduce existing risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.
<i>Risk map</i>	Spatial distribution of risk in a certain area, obtained by evaluation and combination of hazard, exposure and vulnerability in each point of a spatial grid of a certain size
<i>River Section</i>	graphic representation of a river, obtained by the intersection a river reach with a vertical plane usually orthogonal to the main direction of the flow
S	
<i>Scenario operational scenario</i> <i>or</i>	environmental and ecological context of the natural disaster, including also its impacts, the elements at risk and the stakeholder assets
<i>Sensor</i>	an instrument that observes a property or phenomenon with the goal of producing an estimation of the value of a reference parameter.
<i>Severity</i>	Measure of the possible consequences of a hazard, for example given by the comparison between a measurement or forecast of a weather variable (e.g. temperature, water level, rain ...) and one or more predefined alert thresholds.
<i>Stakeholder</i>	Every subject (person or groups) who holds interest or concern regarding a certain action, objective, project and who can be affected by it or can affect it.
<i>Street</i>	The road network infrastructure.
<i>Subway</i>	Subway infrastructure.
T	

Term	Meaning in beAWARE
<i>Text Analysis</i>	The task of analysing textual corpora.
<i>Text Item</i>	A piece of text.
<i>Transportation</i>	Transportation services and infrastructure.
<i>Technical requirement</i>	formalization, standardization and elaboration of the user requirement specification and allocation in the beAWARE subsystems
U	
<i>Use Case</i>	conceptual description of intended or expected utilization of the beAWARE system to prepare for, respond to, or act upon the occurrence of the scenario.
<i>User Requirement</i>	expectation, request and guidelines for functionalities, capabilities, conditionalities and features that would facilitate the successful completion of an use case
V	
<i>Video Analysis</i>	The task of extracting useful information from video sequences.
<i>Video Item</i>	A video recording.
<i>Vulnerability</i>	Susceptibility or predisposition for loss and damage to human being and their livelihoods, as well as their physical, social and economic system when affected by hazardous physical event.
W	
<i>Water depth</i>	the height of the water (in a river section, channel section, pipe section or specific point of flooded area) measured from the bottom or the ground
<i>Water Level</i>	The height of the water (in a river section, channel section, pipe section, specific point of a flooded area...) measured from well-defined zero (i.e. the mean sea level)
<i>Weather station</i>	A place equipped with sensors for measure weather, meteorological, hydrological or hydraulic variables

Table of Contents

TABLE OF CONTENTS.....	13
LIST OF FIGURES.....	14
1 INTRODUCTION.....	16
2 FIRST AND SECOND PROTOTYPE EVALUATION OUTCOMES.....	18
2.1 From the First to the Second Pilot	18
2.2 From the Second to the Final Pilot	19
3 FLOOD SCENARIO.....	22
3.1 Final Flood Scenario Use Cases	22
3.2 Final Flood Scenario User Requirements	24
3.3 Final Flood Operational Scenario	35
4 FIRE SCENARIO.....	51
4.1 Final Fire Scenario Use Cases	51
4.2 Final Fire Scenario User Requirements	51
4.3 Final Fire Pilot Operational scenario.....	60
4.4 Final Fire Demonstration site	85
4.4.1 Emergency protocols and communication procedures.....	86
4.4.2 Equipment and participants	87
5 HEATWAVE SCENARIO	88
5.1 Final Heatwave Scenario Use Cases.....	88
5.2 Final Heatwave Scenario User Requirements	89
5.3 Final Heatwave Operational scenario.....	98
6 CONCLUSIONS.....	109
7 APPENDIX A	110
7.1 Flood Scenario	110
7.2 Fire Scenario	123
7.3 Heatwave Scenario.....	129

List of Figures

Figure 2. Area of the fire pilot	85
Figure 3. Block Diagram of the updated UC_102	110
Figure 4. Block Diagram of the updated UC_103	112
Figure 5. Block Diagram of the updated UC_105	114
Figure 6. Block Diagram of the updated UC_106	116
Figure 7. Block Diagram of the updated UC_108	118
Figure 8. Block Diagram of the updated UC_109	120
Figure 9. Block Diagram of the updated UC_110	121
Figure 13. Block diagram of the updated UC_202	123
Figure 14. Block Diagram of the updated UC_203	125
Figure 15. Block diagram of the updated UC_204	127
Figure 13. Block Diagram of the UC301	129
Figure 14. Heat Index Table.....	130
Figure 15. Danger levels for fire exposure	133
Figure 16. Block Diagram of the UC303	134
Figure 17. Visual presentation of first responder status.	135
Figure 18. Block Diagram of the UC304	137
Figure 19. Visualization of real time traffic conditions in the city	138
Figure 20. Traffic jam in the Thessaloniki ring road	138
Figure 21. Picture of traffic jam.....	139
Figure 22. Block Diagram of the UC305	140
Figure 23. Visualization of the status of places of relief in the city	141
Figure 24. Block Diagram of the UC306	143
Figure 25. Visual presentation of people in distress	144

List of Tables

Table 1. Colors explanation of tables	16
Table 2. Flood scenario, Final Use Cases.....	22
Table 3. Flood pilot User Requirements Modifications	25
Table 4. Final version script of flood pilot.....	37
Table 5: Fire scenario Use Cases	51
Table 6. Fire pilot User Requirements Modifications	52
Table 7. Pre-emergency (legacy tools)	64
Table 8. Emergency Part A with legacy tools	65

Table 9. Emergency – Part B with Legacy Tools	67
Table 10. Pre-emergency with beAWARE	69
Table 11. Emergency Part A (with beAWARE)	70
Table 12. Emergency Part B (with beAWARE).....	74
Table 13. Pre-emergency (blended).....	76
Table 14. Emergency - part A (blended)	77
Table 15. Emergency - part B (blended).....	82
Table 16. Heatwave scenario, Final Use Cases.....	88
Table 17. Heatwave pilot User Requirements Modifications	89
Table 18. Heatwave updated scenario.....	101
Table 19. Updates from the UC_102.....	110
Table 20. Updates from the UC_103.....	113
Table 21. Updates from the UC_105.....	115
Table 22. Updates from the UC_106.....	117
Table 23. Updates from the UC_108.....	118
Table 12. Updates from the UC_202.....	123
Table 13. Updates from the UC_203.....	125
Table 14.Updates from the UC_204.....	128

1 Introduction

In this Deliverable, the evaluation results of the first and second Prototypes (P1 and P2) are cited in order to outline the actions that are proposed and will be taken for the next and final setup. Additionally, the final Use Cases, User Requirements and Operational Scenarios for all three scenarios are presented.

Furthermore, an analysis of the last pilot exercise, the one that will take place in Valencia for the fire scenario, with all relevant details is also reported, along with all Use Cases that will be tested in the pilot as also the process that led to the refinement of their final version. More specifically, the evaluation that took place after the first two pilots helped to make the necessary changes and upgrades on the beAWARE platform in order to conclude them to the final setup for all the use cases. It is worth to state, that this deliverable is referred to the last refinement of the pilot setup which will be tested for all 3 scenarios.

In order to achieve these requirements, the platform will be tested against real-life conditions, as in the 1st and 2nd beAWARE pilots and evaluated based on the interaction with the technology that the end users experienced during those pilots. Thanks to the P1 and P2 evaluations, the Consortium was able to gather precise feedbacks and indications from the end users' and participants' perspective, in order to incorporate them into the design modifications for the final steps so as to have the final setup of the platform.

Moreover, in order to have a clear and concrete understanding of the different color-coding of the tables of Use Cases, User Requirements and Operational Scenarios that are presented at chapters 3, 4 and 5, the next table explains the color definition.

Table 1. Colors explanation of tables

CHANGES AT THE TABLES	COLOR
No Change	WHITE
Updated	BLUE
New	GREEN
Reverted to the initial	ORANGE

Last, it should be reported that the process followed from D2.1 up to this Deliverable ensured equally weighted implementation for all the scenarios. Prototyping and testing methodology looped already twice in reaching a successful end-solution for user adoption. On this last loop, the beAWARE platform will be setup for the final field test that will take place in Valencia. A demo report of the final version will be presented in D7.8. After the pilot, an online demo version of the platform will be launched to support the final evaluation of the system. As a final step, an evaluation report of the final system will be compiled and delivered in D2.8.

To sum up, since the beAWARE platform is at its finalization, the setup for each of the use cases is presented in the following chapters along with the complete storyline for each scenario and the User Requirements to be met. These will serve as the reference for the realization of the final beAWARE system.

2 First and Second Prototype Evaluation Outcomes

The excellent collaboration between end users and technical partners, the successful implementation of the two previous pilots, where the first and the second prototypes were tested, accompanied with the fruitful evaluations that followed them, lead to the setup of the final system.

From a ‘decisional’ and an ‘operative’ point of view many upgrades and improvements were made from the First to the Second Prototype (P1 to P2), of the beAWARE platform and mobile application. All these upgrades, provided the ability to understand the full spectrum of the platform and the application in order to be easily used from PSAP operators and other agencies at the Control Room and from citizens and rescuers on the field.

2.1 From the First to the Second Pilot

The P1 was realised on the field with the heatwave Pilot, which although it was small in scale provided even from this early stage useful feedback for the system. There was noticed that beAWARE can provide efficient support to the PSAP operators in understanding and managing new incidents. A very positive asset for the beAWARE platform is that it can manage and overcome legacy tools and can support and deliver faster and more reliable data from the field to the control room (rescuers, and/or citizens to PSAP and vice-versa).

An important first remark was that it takes a considerable amount of time the capabilities of the beAWARE to be conceived by the control room operators. To address this problem a training cycle was adopted to be carried out before each pilot. In occasion of the second pilot, dedicated training sessions were organized for the different roles established during the pilot (i.e. there were training sessions specifically for the citizen, others for the control room operators, others for the civil protection teams, etc.)

P1 focused mainly on the pre-emergency phase and on the monitoring of the escalation of the crisis, providing information about the forecasts and real time measurements, in addition to the capability to spread public alert.

This provided indeed a great decisional support, especially in the pre-emergency phases and in the initial stage of the crisis. However, the visualization of the data in the PSAP, in particular, the map and the dashboard, was often difficult and not easy to understand. Moreover, the P1 does not allow any functionality for the operative emergency management, like task assignment or team monitoring.

Starting from this basis, the P2 improved the data visualization, integrating also various kinds of new data (like GIS layers in the Sensor Thing Server or the streaming from drones and fixed video cameras).

Moreover, the P2 Crisis Classification tool developed very important features for the real time risk assessment, further enhancing the decision support process. Finally, P2 almost fully incorporated the user requirements for the rescue teams' management and task assignment, features that were absent in the P1.

In terms of the evaluation methodology, the evaluation of the 1st prototype highlighted that the observers found it difficult to note down of all the actions performed and their timing, since most of them were performed in rapid succession. For that reason, the observation forms were revised. The new forms provided a list of the main expected actions to be performed during each session (both with the legacy tools and with beAWARE), whereas in the old version it had been the observer the one who had to write down the action performed; this modification prevented the users to the need to take notice of each performed actions and facilitated the non-native observers to understand what was supposed to happen, since most of the interactions between the stakeholders were in Italian.

2.2 From the Second to the Final Pilot

Comparing with the evaluation results of the first pilot (D2.4) to the second (D2.6), it's clear that the improvements, in the platform, in the pilot set-up and evaluation procedure, led to a larger involvement of the end users and stakeholders, that is reflected in the more detailed and specific outputs coming from the various evaluation tools used (questionnaires, observation forms and hot debriefing).

Globally, the 2nd pilot has been evaluated as successful by the end users, while the platform itself has been rated good. Most of the stakeholders agreed that beAWARE is indeed a helpful tool for the management of the emergencies; this support comes both from a 'decisional' point of view (Support to the decision maker and the COC) and from an 'operative' point of view (support to the control room operators and Civil Protection volunteers' tool).

The structure of the pilot (three sessions repeated twice) has been considered adequate to properly present and test the platform features, confirming the results obtained even from the first pilot.

The evaluation report indicated, towards to the final prototype, the need to have a more user-friendly interface for the end-user tools of the platform (the mobile app and the PSAP). In detail, End users who experienced beAWARE tools in the 2nd pilot not only reported with a high detail all the small bugs occurred during the pilot (crash of the app, GPS connectivity issues etc), but also provided very useful suggestions for the improvement of the interface of the various tools, in particular the mobile app

In addition, it has been highlighted that beAWARE system should be meant as integration, not a replacement, of the current tools used by municipality and by the Civil Protection (like the VHF).

Based on these results, the implementation of the final setup of the beAWARE system is pushing in these three directions:

- 1) Fully implementation of all the User Cases and User requirements;
- 2) Further integration of the beAWARE platform with the current tools;
- 3) Provide an even simpler and immediate user experience, in particular improving the mobile app and PSAP interface, according to the very specific feedback provided after the 2nd pilot (see D2.6).

Additionally, one of the key changes that the third pilot will implement in order to fulfil the requirements gathered in the evaluation forms and during the first and second prototype testing, is the creation of a third session, called “blended”, which will be tested besides the previous sessions “with beAWARE” and “with Legacy Tools”. This blended session will manage the emergency by a mixture of the beAWARE platform and the legacy tools, taking the best of each other session and providing an optimal interaction between the beAWARE platform and the legacy tools. The implementation responds to an issue shown in some evaluation forms answered by first responders in the second prototype testing, where it was noted that “the mobile app should not be meant to replace totally the radio, but it should be used in parallel to the legacy tools”, and that “some actions are better performed with the radio whereas others are better performed with the mobile app”. These comments have been taken into account in order to decide the addition of a “blended” session.

The operational scenario for the third pilot has included a new phase to the pre-existing pre-emergency phase, emergency-phase and fade-out phase shown in the second prototype testing. The emergency phase now is subdivided into “emergency part A” and “emergency part B”. The inclusion of part B has been decided due to the need for implementing a worsening of the situation. In this particular case, the worsening of the situation will lead to the evacuation of an educational center.

Another important incorporation to the pilot testing of the final prototype is the incorporation of stress situations which will provide a more realistic environment and testing outcomes. For this purpose, it has been included a power outage issue and an internet connection failure. These eventualities will help further testing the beAWARE usability and interoperability in situations which are likely in emergency situations such as the ones tested in beAWARE, proving the usefulness of the platform even in the most challenging environments.

Language became another topic of discussion highlighted in the evaluation forms of the previous prototype. The use of English instead of the mother tongue to perform the pilot has

proved not to be efficient and feasible. In fact, the stakeholders pointed out that, in the middle of a real emergency, when they are required to perform many simultaneous actions, it is spontaneous for them to interact in their mother tongue instead of English. While this requires a translation from the mother tongue observers to the rest in order to better understand the development of the situation, it lets the end user interact freely in their mother tongue, instead of forcing them to speak in English, thus adding a very high degree of likeliness and more fluidity to the pilot.

In terms of the evaluation methodology, the second prototype showed the need to add a new format for the final prototype. Specifically, according to the end users' feedback, Google form would be a more suitable format instead of a paper version, since it would facilitate the task of data collection. Regarding the answers of questionnaires (especially the explanations) they are crucial; so the consortium should take into account the improvements or deficiencies detected by the people who completed the questionnaires. For this reason, some questions should bear the possibility to include suggestions about the improvements, shortcomings or relevant information not reflected, or even information that could be omitted because it is irrelevant.

Concerning the observation forms used in the second prototype, they have overcome most of the issues that the observers found in the first prototype testing, and they provided very useful qualitative results. However, the observers sometimes found it difficult to indicate the timing of the actions, as requested in the form, due to the fact that a lot of events happened in rapid succession or even in contemporary. For this reason, the forms didn't provide enough information about the timing of the performed action to make a quantitative comparison between beAWARE and the legacy tools session. Hence, the form has been further revised, now providing a list of the main expected actions to be performed during each session to facilitate observers in following the script. It is worth noting that the third session "blended" will allow further gathering of quantitative information, delivering more outcomes when a direct comparison between "with beAWARE" session and "with Legacy Tools" session may not provide enough quantitative data.

Finally, after the delivery of the final system, an online demo will be provided in which all the use cases and user requirements of the beAWARE platform will be presented, for demonstration purposes.

3 Flood Scenario

The list of the final Use Cases and User Requirements represents the final step of the elicitation process, started at the beginning of the project (with the D2.1) and continued through the beAWARE platform development and the intermediate prototypes, in parallel with the technical development.

As explained in D2.10, a better understanding of the beAWARE platform and the end user's needs, led to the update of the initial list of use cases and user requirements, listed in the D2.1, when the beAWARE platform was at a very initial stage.

However, the elicitation of the URs in technical requirements was gradually realized through the previous prototypes, as an incremental process to the final version of the system, which is finally complete to satisfy all the requirements (original or refined in D2.10); in fact, it should be considered that the first and second prototypes of the beAWARE platform didn't reach a level of maturity to fully cover the entire list of UR and UC,

This consideration explains why, in the previous prototypes (see D2.4, D2.5, and D2.6) some of the UCs a URs for the flood pilot had been not implemented at all, or only partially

Now the final system of the beAWARE platform is going to implement all the features for cover the final User Cases and User Requirements, which are briefly summarized in the next paragraphs (while they had been described more in detail in the D2.10).

3.1 Final Flood Scenario Use Cases

The following table shows all the final Use Cases for the flood scenario that will be satisfied by the final version of the system. In Appendix A, subchapter 7.1 each Use Case is analyzed in detail. Moreover, the table explains also which UC has been modified, updated or added in the D2.10 than the initial list or UC (provide in D2.1); more specifically: the UCs that have been updated from D2.1 are highlighted in blue, while the ones added in D2.10 are highlighted in green.

Table 2. Flood scenario, Final Use Cases

FINAL FLOOD USE CASES	REASON OF MODIFICATION FROM THE INITIAL FLOOD USER SCENARIO
UC_101: Declaration of the attention status and continuous monitoring of flood forecasting	No updates

UC_102: Management of new flood emergencies	This Use Case has been updated after D2.1 in order to include measures taken by the sensors that have been integrated into the platform.
UC_103: Monitoring river water level and assignment of tasks to first responders	This Use Case has been updated after D2.1 in order to include the measurements taken by the sensors that have been integrated into the platform, the visual analysis results from static cameras installed by the river, and that, according to the Municipal Civil Protection Plan, are one of the main parameters that trigger a set of pre-defined tasks. In fact, the Plan imposes some specific preventive measures when the water level recorded by the sensors in the Bacchiglione River exceeds some fixed thresholds. Furthermore, it has also updated with respect to the possible sources of water level video capturing (e.g. a static camera instead of arbitrary videos from citizens through the mobile application).
UC_104: Evaluation of the execution of tasks	No updates
UC_105: Monitoring rainfall	The Use Case has been updated after D2.1 in order to include the measurements taken by the sensors that have been integrated into the platform.
UC_106: Monitoring river breaking/overtopping and assignment of relative tasks	The Use Case has been updated after D2.1 so as the monitoring of river overtopping is being done by static surveillance cameras, located in the river sections of interest. The cameras continuously record water level inside the river. The videos are being analysed, aiming to timely and accurately detect water level rising, which potentially can cause the river's overflow. Furthermore, the analysis module will take under consideration messages from the citizens' mobile applications concerning the river breaking/overtopping.
UC_107: First responders monitoring	No updates
UC_108: Sensor and Flood forecasting alerts	This UC has been updated to take into account the inclusion of the observations from the weather stations in beAWARE's SensorThings Server and the enhancement of the Crisis Classification Module with the ability to analyze those data, this UC has

	been updated by adding the feature to provide automatic alerts based also on the real-time measurements.
UC_109: Acquiring images and video from drones and static cameras for flood risk management	This Use Case has been specifically added after the introduction of drones and static cameras in the flood scenario in the beAWARE Grant Agreement and after discussion with one of the main stakeholders of the flood pilot, “Alta Pianura Veneta” Land Reclamation Consortium, who made available the area for executing the drone flight in beAWARE.
UC_110: Management of the sand packs distribution points and of Safe Places	This UC has been added after the implementation of the 1 st prototype, the technology for the management of the place of relief (UC_305) was developed and successfully tested during the heatwave pilot. As a consequence, it has been decided to create a similar UC for the management of the safe waiting areas and of the sand packs distribution points that are established during the flood in Vicenza

For completeness' sake in the appendix can be found the block diagrams of the use cases together with a comparison from their first definition to their final refinement and implementation in the final system.

3.2 Final Flood Scenario User Requirements

After the delivery of D2.1, requirements development and implementation continued to evolve throughout the program, with the completion of intermediate prototype versions and the final version.

As for the Use Cases, some User Requirements have been added or more detailed to take into account new features of the platform which were proposed after the submission of the D2.1 and that regarded mainly the integration of the real-time measures from the weather stations in Vicenza (i.e. for the UR_101 and UR_103 and to the addition of UR_141), the new activities related to the integration of the drone platform(update of UR_111, UR_114, UR_115 and to the addition of UR_132, UR_136 and UR_137)

Moreover, the initial requirement about the mobile application was quite generic; so, after many discussions with the technical partners and due to development of other tools that are

strictly linked to the mobile app (such as the crisis classification module), new clarifications and specifications have been added to the URs list.

The following table shows all the Use Requirements for the flood scenario, the ones that have been updated from D2.1 are on blue rows, while the ones added in D2.10 are in green rows; in addition, it has been clarified the reasons that led to the update/addition of the URs from the D2.1 to D2.10. Finally, some of the requirements are reverted back to their initial status and are colored in orange, bringing back some of the features that were excluded in the D2.10.

Table 3. Flood pilot User Requirements Modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_101	Type of visualization	Display information to authorities in a web-gis platform (citizen and first responders reports by calls, apps, social media)	Display information to authorities in a web-GIS platform (citizen and first responders' reports by calls, apps, social media, Sensor measurements, etc.)	The UR has been updated in order to include the measurements taken by the sensors that have been integrated into the platform.
UR_102	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)		No Modification

UR_103	Flood warnings	Provide authorities/citizens with automatic warnings on river levels overtopping some predefined alert thresholds, based on forecast results	Provide authorities/citizens with automatic warnings on river levels overtopping some predefined alert thresholds, based both on forecast results (pre-emergency phase) and on real-time measurements by the sensors visual analysis results from static cameras	The UR has been updated in order to include the measurements taken by the sensors and static cameras that have been integrated into the platform.
UR_104	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		No Modification
UR_105	Send task reports	Allow First Responders to send reports about their assignments from their mobile phone to local authorities		No Modification
UR_106	Visualize video cameras	Display streamed video from video cameras to the authorities/citizens		No Modification
UR_107	Localize video, audio and images	Provide authorities with the ability to localize videos, audio, and images sent by citizens from their mobile phones		No Modification

UR_108	Localize task status	Provide authorities with the ability to localize first responders reports regarding the status of their assigned tasks		No Modification
UR_109	Localize tweets	Provide authorities with the ability to localize Twitter messages concerning a flood event		No Modification
UR_110	Localize calls	Provide authorities with the ability to localize Phone Calls to an emergency number concerning a flood event	Provide authorities with the ability to localize Phone Calls (mobile application) to an emergency number concerning a flood event	Emergency calls received through the call center, are being transcribed and analysed by text analysis and potential locations are extracted from the transcribed text. Moreover, the caller location is cross-checked and corrected whenever information through the GPS is provided for calls coming through the mobile application. This requirement will be fully covered and is reverted to its initial content.
UR_111	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	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, social media and taken by drones	The UR has been updated because of the new features added after the integration of the drones' platform.
UR_112	Detect element at risk from reports	Provide authorities with the ability to detect the number of elements at risk and the degree of emergency from a	Provide authorities with the ability to detect the number of elements at risk and the degree of emergency by filling	The UR has been further specified than the initial version, according to the development during the second prototype of the Crisis Classification algorithm, which

		text sent by the mobile app and by social media	specific fields on the mobile app or from a text sent by the mobile app and by social media	prioritizes the various incident reports and assigns them a level of risk according to Flood Risk Management Plan (AAWA, 2017); in particular the user is allowed to specify details about the incident report, such as an estimation of the water level or an indication of the elements at risk.
UR_113	Detect element at risk from calls		Provide authorities with the ability to detect the number of elements at risk and the degree of emergency from emergency calls	No Modification
UR_114	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	Provide authorities with the ability to detect water level and water velocity from video and images sent by static cameras	The term 'water depth' has been replaced by 'water level' because the point of interest is on the level of the water and if it is near overtopping. However, the water depth is easily estimated by subtracting a fixed point of river floor from water level.
UR_115	Real-time flood mapping	Display flooded areas in real time to authorities/citizens	Display flooded areas in real time to authorities/citizens coming from different sources (such as pre-defined risk maps, images taken by drones, etc.)	These UR has been updated with more specification about the different sources of the data about the flooded areas, according to the development of the two prototypes.
UR_116	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		No Modification

UR_117	Manage assignments in case of new emergencies	Provide authorities with the ability to manage first responder assignments		No Modification
UR_118	River overtopping	Provide authorities/citizens with the ability to know if the river level is overtopping predefined alert thresholds		No Modification
UR_119	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		No Modification
UR_120	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		No Modification
UR_121	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)	Provide authorities with the ability to detect rainfall volume and duration from videos (static cameras)	The rainfall is impossible to be detected explicitly through visual analysis, because the resolution of the camera does not allow the rain drops to appear on video footage. However, rainfall is implicitly estimated by visual analysis, by estimating the outcome (water level) of the rainfall inside the river. Additionally, it is explicitly measured by as rainfall precipitation by Crisis Classification module.

UR_122	Rainfall warnings	Provide authorities/citizens with the ability to know in real time if the rainfall intensity is overtopping predefined alert thresholds		No Modification
UR_123	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/or breaking	Provide authorities with the ability to detect from video, automatically, if a river embankment is overtopping and/or breaking. The module will detect overtopping in certain locations from static cameras. It requires a dedicated camera and feature for the specific location	This requirement is reverted to its initial state. Monitoring of river overtopping is being performed by static surveillance cameras, located in river sections of interest. The cameras continuously record water level inside the river. The videos are being analysed, aiming to timely and accurately detect water level rising, which potentially can cause the river's overflow. Furthermore, the analysis module takes into consideration messages from the citizens' mobile applications and social media concerning the river breaking/overtopping.
UR_124	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	Provide authorities/citizens with the ability to know in real time if a river embankment is overtopping by employing static cameras which are calibrated to the characteristics of the specific locations	This UR has been modified because the development of the image analysis algorithm highlighted that, in order to achieve this goal, a fixed framing is required. While the second part of the requirement resulted to be too complex to be satisfied through the visual analysis. Nevertheless, the breaking detection can be achieved through citizens' reports and the flow via the text analysis and the report generation components. This UR will be fully covered by the final version of the beAWARE.
UR_125	Traffic warnings	Provide authorities with the ability to		No Modification

		send warnings to citizens in order to avoid interferences inside the area involved by civil protection activities		
UR_126	Map of Satellite data and weather forecasts	Display updated satellite images and weather forecasts	Display updated satellite images in case they are fed to the system and weather forecasts.	Crisis Classification module's interoperability is one of its many strengths. The module is capable to collect and combine data and generate metrics from various resources. For the final system the lack of satellite data will impact the demonstration of this UR.
UR_127	Filters	Provide advanced filters in the data management platform (visualize and list information selected by filters/query)		No Modification
UR_128	Evaluation of the level of risk	Provide authorities with the ability to evaluate the forecasted level of risks (based on all the available dataset)	Provide authorities with the ability to evaluate the level of risks associated to the Citizens' and/or first responders' incident reports, based on all the available dataset, in particular on the information sent by citizen through mobile application	The UR has been further specified than the initial version, according to the development in the second prototype of the Crisis Classification algorithm, which prioritizes the various incident reports and to assign them a level of risk according to Flood Risk Management Plan (AAWA, 2017);
UR_129	Automatic translation from a foreigner applicant	Make easy the communication between people with different languages	Make easy the communication between people with different languages. This feature refers to an automatic language detection, by performing speech recognition using	This UR has been updated in order to further specify it according to the system development since the initial version was very generic. The multilingual report generator facilitates the reporting in any language supported by the project (English, Greek, Italian and Spanish)

			all language models and then by comparing the scores	
UR_130	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 routes to avoid		No Modification
UR_131	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid a certain area that is jammed with traffic		No Modification
UR_132	Map of Drone images		Display updated images taken by the drone.	This User Requirement has been specifically added after the introduction of the drones platform in the beAWARE system
UR_133	Send water level estimation from the mobile app		Provide the Citizen and first responders with the ability to estimate roughly the river water level by choosing a pre-defined water level category from a specific list in the mobile app.	The UR has been added, according to the development in the second prototype of the Crisis Classification algorithm, which prioritizes the various incident reports and to assign them a level of risk according to Flood Risk Management Plan (AAWA, 2017); in particular the should be allowed to specify some details about their incident report, such as an estimation of the water level or the indication of the elements at risk.
UR_134	Send the specific type of incident reports		Provide citizens and first responders with the ability to use their mobile applications so as to specify the type of	This requirement has been added because, after discussions with the technical partners and the stakeholders, new features of the mobile app have been outlined.

			incident report from a pre-defined list of incidents.	The first version of this UR has been integrated into the second prototype.
UR_135	Specific mobile app for first responder and citizen		Provide different versions of the mobile app for citizens and first responders based on their different roles	This requirement has been added because, after discussions with the technical partners and the stakeholders, it has been highlighted the need to develop two versions of the mobile: one, simpler and more intuitive, for the Citizen and the other one for the first responders, which allows to specify more types of incident reports and to receive and manage task assignments. The first version of this UR has been integrated into the second prototype
UR_136	Detection of obstacles		Provide authorities with the ability to detect objects in the river (such as trunks, debris, etc.) that can impede the flow (in particular near bridge's openings, sluices, etc.) from video cameras and drones. The analysis module requires an extended amount of video samples to enable the robust detection of some types of obstacles.	This User Requirement has been specifically added after the integration of fixed video cameras in the beAWARE platform. The diversity of the potential obstacles and the inability of collecting a sufficient visual dataset of possible obstacles in order to train a detection model leads to the inability of the system to automatically detect obstacles. Nevertheless, stream footages from points of interest are forwarded to the PSAP for surveillance purposes.
UR_137	Detection of the boundary of the flooded area		Provide the authority the ability to visualize the extension of a flooded area from video taken by Drones. The analysis module requires extended samples to enable the image	This User Requirement has been specifically added after the introduction of the drones platform in the beAWARE system. However, the detection and mapping of the whole flooded area would require an accurate estimation of the whole flooded area, the creation of an orthomosaic of the flooded area and the

			registration method and also the geo-location of every pixel in the image should be provided.	localization of every point in the image, in order to map the detected boundary on a real map. However, the detection of water boundaries from RGB images is not very accurate and this task would require a thermal camera. Additionally, the localization of points in a drone image is a very difficult task since we know only the position and orientation of the drone camera, but there are no reference points in order to calculate distances. Thus, this UR cannot be implemented.
UR_138	Backup		Allow the authority to access and download in every moment, even after the occurrence of the flood, all the measurements, and the forecasts, the text of all the incidents reports send by a citizen or first responders, the list of the tasks assigned to the rescue teams and the texts of all the public alerts.	In occasion of the international conference on Citizen Observatories for natural hazards and Water Management (COWM 2018, organized by AAWA from November 27th to 30th 2018) both national and international Stakeholders of the flood pilot were gathered together, starting from delegates of Vicenza Municipality, to international expertise on risk management. These stakeholders provided to AAWA many feedbacks about the pilot and the Update of Use Cases and User requirements. It was highlighted that the Authorities in charge to the emergency management has to provide data gathered during the crisis even after its occurrence if requested; for that reason, a system of backup of all the raw data should be improved in beAWARE
UR_139	The capacity of the safe areas		Provide to the authority the current level of crowding of the safe areas.	The management of the shelters through beAWARE, implemented in the 1 st prototype and tested in the heatwave pilot, has been an

				inspiration for translating a similar technology to the Sand Pack distribution points and to the safe waiting areas that are established during the flood in Vicenza, according to the Municipal Civil Protection Plan
UR_140	Available resources at the sand packs distribution locations		Provide to the authority the current level of availability of the resources in all the sand-packs distribution points.	The management of the shelters through beAWARE, implemented in the 1 st prototype and tested in the heatwave pilot, has been an inspiration for translating a similar technology to the Sand Pack distribution points and to the safe waiting areas that are established during the flood in Vicenza, according to the Municipal Civil Protection Plan
UR_141	Map of the Sensors measurements		Display the measurements taken from the available sensors of the weather stations.	The UR has been added because of the integration of the sensors network in the beAWARE platform.

3.3 Final Flood Operational Scenario

According to the philosophy adopted for the previous prototypes, after the fire pilot a video-based demonstration of the final version of the platform for the flood scenario will take place. In addition, an online demo environment will be launched to stress-test the final system and to demonstrate platform capacities. There and together with the dissemination activities within the beAWARE project, small sessions will be arranged to exhibit and promote the beAWARE system to a wide range of stakeholders.

Regarding the flood scenario, a complete description of the context, the sites, the roles division, the equipment, and the general storyline has been already provided in the previous WP2 deliverables (in particular D2.10 and D2.6); for that reason, this paragraph is going to provide only the script for testing the final system, remanding to the previous deliverable to the other details about the flood scenario.

The script for testing the final version of the beAWARE platform has a similar structure of the ones defined for the previous prototype; however, as stated before, the final version of the system is going to fully cover all the final UC and UR; for that reason, the script defined for the

previous prototype has been enriched with additional steps and actions to include the complete list of requirements and to validate the whole set of UCs.

More analytically for the flood scenario, in green are the new ones and the white are with no changes. Those changes were made in order the final system fully covers all UCs and all URs.

Session A: Pre-emergency: these two main aspects have been introduced/updated in the final prototype:

- Access to socio-economic data (in addition to the already implemented forecasts data, risk maps, historical flooded areas maps, various useful GIS layers like the maps of hospitals), as provided by UR_126 and UR_102, in order provide to the decision maker a complete overview of the situation from the initial stages of flood;
- Monitoring of rainfall, taking advantage of sensors installed and the crisis classification algorithms integrated in the CRCL module.

Session B: initial phase of the flood (Before the river overtopping) – this session was fully developed in the 2nd prototype, since the beAWARE platform already allowed to manage rescue teams and task assignments, show real time measurement, detect water level and traffic from fixed video camera. However, from the second prototype to the final one, many improvements have been done regarding the User interface and User Experience of the mobile app and the PSAP, according also the results of the 2nd prototype evaluation.

Session C: Emergency phase (after the river overtopping): these two main aspects have updated/Improved in the final prototype, since they were both at a basic level in the second prototype and, for that reason, they were not tested in occasion of the flood pilot:

- Collect and analyse audio recordings and phone call about the emergencies. In fact, in the previous prototype the audio analysis tool was tested together with the beAWARE call center that was deployed to support the pilot. However, the 2P version of the Text Analysis module didn't support the extraction of the locations from the transcribed audio messages.
- Monitoring of the resources and of the crowding in the waiting areas.

Session D: de-escalation - In the storylines of the previous prototypes de-escalation wasn't a separate phase, but it was included in the final part of the session C. Since it is conceptual different and similar to the other scenarios, we decide to split the session C in two. The main addition about the de-escalation added in the final version of the platform regards the capability to download the main data about the emergency and create wrap-up reports. It should be specified that formally this feature was already inserted in the D2.5 but not fully developed in the second prototype and, for that reason, not tested in the flood pilot (see D2.6).

Table 4. Final version script of flood pilot

Description	Legacy tools	beAWARE	Trigger	Expected behavior	Players
Session A – Pre-emergency GOAL: early warning, understand the problem, send the first alerts					
AMICO produces a forecast indicating a possible flood event in the next day, with predicted water level above all the thresholds in the section of Bacchiglione river near the Bridge 'Ponte degli Angeli'	E-mail, internet	The results of the forecasts are presented in PSAP's dashboard and event map. The section of 'Ponte degli Angeli' has a red colour in the map	AMICO's result collected by beAWARE system and Crisis Classification Run	Consider all the forecast and decide to activate the COC (Operational Centre),	The actor who play as 'decision maker',
The streaming of the fixed video camera at 'Ponte degli Angeli' and in the Joint between Cordano Channel and Retrone River shows an intense rainfall. The data is also confirmed by the sensors in Vicenza	Internet, phone calls to the video camera manager	The streaming of the video camera and the sensors measurements are presented in the PSAP	Sensor measurements collected by beAWARE platform and Crisis Classification Run	Understand the current rainfall in Vicenza from the static camera and the sensors' data	The actor who play as 'decision maker', The actors who play as 'Control room Operators';

Check for the pre-defined flood risk map from the Flood management risk plan, the maps of the historical flooded area and the satellite data	Papers, web site	Flood risk map, satellite data and historical maps of the flooded areas in the previous floods are presented as GIS layer in the SensorThingServer (FROST)		Check for the maps in order to better understand the possible incoming scenario	The actor who play as 'decision maker',
Sent a General alert to the Population about the activation of the COC, the results of forecasted scenario, information about how to behave in case of flood	E-mail, sms, web site	Provide a pre-defined set of public alert and specific automatic warnings on the forecasted river levels overtopping the 3 rd threshold		Send public alerts	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizen, the actors who play the roles of 'First responders')
Accreditation of the civil protection teams	VHF, papers	PSAP allows to see the position of each teams of the map, their status and the accreditation forms that each teams sends trough the mobile app	Teams log in in the mobile app and send the accreditation forms	Registration of rescue teams to the system trough the mobile app	The actors who play as 'civil protection team leaders'

Some groups of volunteers are requested by the control room to accomplish preventive measures like check the sand-pack available in the warehouse	Phone calls, VHF	PSAP allows task assignment to the rescue team		Assign to the rescue teams their locations and tasks	The actors who play as 'Control room Operators', the actors who play the roles of 'First responders')
Session B – initial phase of the flood (Before the river overtopping) GOAL: river monitoring, trigger pre-defined set of measures, spread alerts					
The Decision Maker is informed that water level at Ponte degli Angeli river section exceeds the first threshold	Phone call	The PSAP will show in the emergency map a yellow light in the section of Ponte Angeli, while the dashboard will display the real time measurements taken by the water level sensors along the Bacchiglione River in Vicenza	Sensor measurements collected by beAWARE platform and Crisis Classification Run	Consider the sensor's measurements and understand the current level of crisis	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'
The vide analysis of the streaming of the fixed video camera in Ponte Angeli confirms the	Phone calls from the Video	There's a streaming from the video Camera to beAWARE platform; the results		Understand the water level and the traffic level from the video analysis recordings from the static	The actors who play as 'Control room Operators'

threshold exceeding and calculate the traffic level over the bridge and in the surroundings	Camera Manager	of the video analysis are shown on the PSAP		video camera of Ponte degli Angeli	
The Decision Maker sends public alert about exceeding of the 1 st threshold	sms, web site	Provide specific automatic warnings on river levels overtopping the 1 st threshold		Send public alert	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of 'Citizens', the actors who play the roles of 'First responders')
Because of the exceeding of the 1 st threshold at 'Ponte Angeli' a set of specific measures, defined in the civil protection plan, have to be taken. For that reason, a certain number of rescue teams is sent in the city centre with specific tasks assigned	Phone calls, VHF	PSAP presents all the pre-defined tasks that, according to the Civil Protection Plan, have to be performed after the exceeding of the 1st threshold at the river section 'Ponte degli Angeli'		Assign to the rescue teams their locations and tasks	Actors who play the roles of 'First responders', Control Room operators
The leaders of each rescue team communicate first when they arrived in the proper location; then they inform the control	Phone calls, VHF	Provide in the map the position of the rescue team, the location of the sand-		Understand the location of the rescue teams in the city centre, the level of accomplishment of their assigned task and the number of available resources	Actors who play the roles of 'First responders', Control Room operators

room about their tasks and resources.		<p>packs distribution point.</p> <p>Provide in the dashboard adequate metric about the status of the assigned tasks and the available resources</p>			
The Decision Maker is informed that water level at Ponte degli Angeli river section exceeds the second threshold	Phone call	The PSAP, in the emergency map, will present an orange light in the section of Ponte degli Angeli. In the dashboard will display the real time measurements taken by the water level sensors along the Bacchiglione River in Vicenza	Sensor measures collected by beAWARE platform and Crisis Classification Run	Consider the sensor's measurements and understand the current level of crisis	The actor who play as 'decision maker'; The actors who play as 'Control room Operators';
The vide analysis of the streaming of the fixed video camera in Ponte Angeli confirms the threshold exceeding and calculate the traffic level	Phone calls from the Video Camera Manager	There's a streaming from the video Camera to beAWARE platform; the results of the video analysis		Understand the water level and the traffic level from the video analysis recordings from the static video camera of Ponte degli Angeli	The actors who play as 'Control room Operators'

over the bridge and in the surroundings		are shown on the PSAP			
Because of the exceeding of the 2 nd threshold at 'Ponte degli Angeli' a set of specific measures, defined in the civil protection plan, have to be taken. For that reason, a certain number of rescue teams is sent in the city centre with specific tasks assigned (for example monitor Palazzo Chiericati and the Olimpic Theatre or place the aqyadike)	Phone calls, VHF	PSAP shows all the pre-defined tasks that, according to the Civil Protection Plan, have to be performed after the exceeding of the 2 nd threshold at the river section 'Ponte degli Angeli'		Assign to the rescue teams their locations and tasks	Actors who play the roles of 'First responders', Control Room operators
The leaders of each rescue team communicate first when they arrived in the proper location; then they inform the control room about their tasks.	Phone calls, VHF	Provide in the map the position of the rescue team, the location of the sand-packs distribution point. Provide in the dashboard adequate metric about the status of the assigned	Status of the tasks provided through first responders' mobile app	Understand the location of the rescue teams in the city centre, the level of accomplishment of their assigned task and the number of available resources	Actors who play the roles of 'First responders', Control Room operators

		tasks and the available resources (i.e sand packs)			
The Decision Maker sends public alert about exceeding of the 2 st threshold and the list of the sand-packs distribution points	sms, web site	Provide specific automatic warnings on river levels overtopping the 2 st threshold; provided alert which contains the list of the sand packs distribution point, and about the status		Send public alert	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens, the actors who play the roles of 'First responders')
Streaming from the video Camera highlights that there is a traffic jam near 'Ponte degli Angeli'	Phone calls from the Video Camera Manager	There's a streaming from the video Camera to beAWARE platform; the results of the video analysis are shown on the PSAP		Understand the traffic level from the video analysis recordings from the static video camera of Ponte degli Angeli	The actors who play as 'Control room Operators'
The Decision Maker sends public alert about the traffic jam, indicating to avoid the area if possible	sms, web site	Provide specific automatic warnings based on the traffic analysis from the vide camera		Send public alert	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens, the actors who play the roles of 'First responders')

The Decision Maker is informed that water level at Ponte degli Angeli river section exceeds the third threshold	Phone call	The PSAP will show, in the emergency map, a red light in the section of Ponte Angeli. The dashboard will present the real time measurements taken by the water level sensors along the Bacchiglione River in Vicenza.	Sensor measurements collected by beAWARE platform and Crisis Classification Run	Consider the sensor's measurements and understand the current level of crisis	The actor who play as 'decision maker'; The actors who play as 'Control room Operators';
The vide analysis of the streaming of the fixed video camera in Ponte Angeli confirms the threshold exceeding and calculate the traffic level over the bridge and in the surroundings	Phone calls from the Video Camera Manager	There's a streaming from the video Camera to beAWARE platform; the results of the video analysis are shown on the PSAP		Understand the water level and the traffic level from the video analysis recordings from the static video camera of Ponte degli Angeli	The actors who play as 'Control room Operators'
The Decision Maker sends public alert about exceeding of the 3 rd threshold	sms, web site	Provide specific automatic warnings on river levels overtopping the 2 st threshold; provided alert which contains		Send public alert(s)	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of

		the list of the sand packs distribution point, and about the status			Citizens, the actors who play the roles of 'First responders')
Session C – Emergency phase (After the river overtopping) GOAL: understand the ongoing situation, management of the rescue teams, management of the resources					
Receive tweets from Citizens who are worried because the water level in the rivers of Vicenza seems very high and close to over top	Municipal Tweeter account	Show on the PSAP the result of the social media analysis	The system collect a bunch of tweets	Understand from the social media report that the rivers are close to overtop	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens
Video from fixed video camera in Ponte Angeli confirms that the Bacchiglione is going to over top	Phone calls from the Video Camera Manager	There's a streaming from the video Camera to beAWARE platform; the results of the video analysis are shown on the PSAP		Understand the water level from the video analysis recordings from the static video camera of Ponte degli Angeli	The actors who play as 'Control room Operators'
incident reports about flooding areas are provided by citizen trough mobile app and social media. The incident reports contain	Phone calls, sms, social networks	The platform clusters Incident reports from the various sources (social media, images, mobile App etc).	Incident report sent Mobile app (Citizen's version), Crisis classification of the reports	Consider all the clustered incident report and the attachment. Understand what is happening and where; understand in what areas of the city centre the situation is most critical	The actors who play as 'Control room Operators'; the actors who play the roles of 'Citizens'

<p>also multimedia like vide, image, voice calls.</p> <p>Moreover, the citizen provide an estimation of the water level and of the impacted elements, filling the proper fields of the mobile app</p>		<p>The PSAP shows on the map all the incident report, with different icons based on the type of incident and with different colors based on the evaluated risk level or severity. The PSAP allows also to see all the multimedia attached (video, image, audio recordings) and the analysis</p>			
<p>Thanks to the real time and dynamic flood risk mapping provided by the PSAP the decision maker understand that the most critical area is the one nearby Matteotti square and send a public alert for warning the people approaching that area,</p>	Sms	<p>Provide the risk level associated to the incident report, allow to compose a local public alert centered on the area where the maximum risk is estimated</p>		Send public alert (s)	<p>The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens, the actors who play the roles of 'First responders')</p>

Report about specific type of incidents are provided from first responders (i.e. bridge obstruction due to trunks, river breaches, etc.), with attached multimedia (video and image)	Phone calls, sms, VHF	The PSAP shows on the map all the incident report, with different icons based on the type of incident and with different colors based on the evaluated risk level or severity. The PSAP allows also to see all the multimedia attached (video, image, audio recordings) and the analysis	Incident report sent Mobile app (First responders version), Crisis classification of the reports	Consider all the incident report and the attachment. Understand what is happening and where; understand in what areas of the city centre the situation is most critical	Actors who play the roles of 'First responders', Control Room operators
Receive tweets from Citizens who are worried because the river wall is start breachings	Municipal Tweeter account	Show on the PSAP the result of the social media analysis	The system collect a bunch of tweets	Understand from the social media report that there is a river breach	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens
Receive a phone call/audio message about the presence of trunks that are obstructing the bridge	telephone	Localize the call/audio message, show the results of the audio analysis	the system receive a call/audio message	Understand from the audio analysis report that there is a bridge obstruction	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens

Control room operators assign to a first responder team the tasks firstly to monitor status of embankment that is going to breach and secondly to remove obstruction from a bridge	Phone calls, sms, VHF	PSAP allows the user to insert a set of new tasks and to assign them, with new locations, to some of the available rescue teams		Assign to the rescue teams their locations and tasks	Actors who play the roles of 'First responders', Control Room operators
Receive update about the number of available sand packs in the sand distribution point	Phone calls, sms, VHF	The dashboard shows the current and updated availability of sand packs in the various distribution point	Mobile App	Understand the current availability of the resources	Actors who play the roles of 'First responders', Control Room operators
Receive update about the capacity of the safe areas	Phone calls, sms, VHF	The dashboard shows the current and updated capacity of the safe areas	Mobile app	Understand the current level of crowding of the waiting areas	Actors who play the roles of 'First responders', Control Room operators
Specific instructions are sent to the sand distribution points that are running out of sand packs and to the safe areas that are going to reach their full capacity	Phone calls, sms, VHF	PSAP allows the user to insert a set of new tasks and to assign them, with new locations, to some of the available rescue teams		Assign to the rescue teams their locations and tasks	Actors who play the roles of 'First responders', Control Room operators

Receive a Video by drone from the S.Agostino districts which shows that the Retrone River is flooding, there are a lot of trunks and obstacles at the joint with Cordano River and that there are people in danger here.		There's a streaming from the drone to beAWARE platform; the results of the video analysis are shown on the PSAP	New Video from the drone	Understand the situation from the video analysis of the drone's recording	The actors who play as 'Control room Operators'
Control room operators assign to a first responder team the task to go to in S.Agostino River district	Phone calls, sms, VHF	PSAP allows the user to insert a set of new tasks and to assign them, with new locations, to some of the available rescue teams		Assign to the rescue teams their locations and tasks	Actors who play the roles of 'First responders', Control Room operators
Session D – de escalation					
AMICO produces a forecast indicating that the next day the situation of the rivers in Vicenza is going to get better	E-mail, internet	The results of the forecasts are shown in PSAP's dashboard	AMICO's result collected by beAWARE system and Crisis Classification Run	Consider all the forecast and understand the situation of the next days	The actor who play as 'decision maker'; The actors who play as 'Control room Operators';
The Decision Maker is informed that water level at Ponte degli Angeli is progressively going	Phone call	The PSAP will show the new forecast both in the event map, as colourer river section,	Sensor measurements collected by beAWARE	Consider the sensor's measurement and understand the current level of crisis	The actor who play as 'decision maker'; The actors who play as 'Control room Operators';

down, above the alert threshold		both in the dashboard	platform and Crisis Classification Run		
The Decision Maker sends public informing about the ending of the emergency	sms, web site	Allow the Composition a public alert		Send public alert	The actor who play as 'decision maker'; The actors who play as 'Control room Operators'; the actors who play the roles of Citizens, the actors who play the roles of 'First responders')
After the Public alert, the Decision Maker wants to download all the forecast, measures, incident reports from citizen and first responders in order to prepare a report to the Government		Allow the download of the requested information from PSAP and Sensor Things Server		Successfully download	Actors who play the roles of 'Decision Maker',

4 Fire Scenario

4.1 Final Fire Scenario Use Cases

The following table shows all the final Use Cases for the fire scenario that will be satisfied by the final version of the system. In Appendix A, subchapter 7.2 each Use Case is analyzed in detail.

Table 5: Fire scenario Use Cases

USE CASES FIRE
UC_201: Management of forest fires emergencies
UC_202: Activation of first responders
UC_203: Pre-emergency level 3 activation
UC_204: Evacuation management during an emergency

4.2 Final Fire Scenario User Requirements

As for the Use Cases, some User Requirements have been added or more detailed to take into account the new features of the platform which were proposed after the submission of the D2.1 and that regarded mainly:

- New activities related to the usage of drones in the flood pilot: this led to the update of UR_207, and the addition of UR_226.
- The addition of UR_227 to clarify that two versions of the mobile app are required (one for citizens and another one for first responders).
- The addition of UR_228 to provide data input of socio-cultural factors that might increase the pre-emergency levels.

Besides this, the user requirements UR_208 “Access to road traffic cameras”, UR_218 “Automatic detection system” and UR_220 “Improvement of the signal for telephones and emergency communication” have been discarded because of being out of the scope (see D2.10 for further justification).

The following table shows the full set of User Requirements for the fire scenario that are covered by the system. A column to justify the reason for modification from their initial

content is provided. As it can be seen, some of the requirements are reverted to their initial status.

Table 6. Fire pilot User Requirements Modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason for modification
UR_201	Detection of people and goods in danger	Display information authorities/first responders to detect people, cars and buildings in danger.	Display information authorities/first responders to detect people and cars in danger.	The video analysis module is able to automatically detect people and cars. The detection of buildings in danger is performed by the crisis classification component based on information taken from the geoserver and calculating the risk.
UR_202	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.		No modifications
UR_203	Study of the smoke behavior	Provide information authorities/first responders with a study of the smoke behavior (vertical/inclined, column, smoke color...).	Provide information authorities/first responders with a study of the smoke behavior (vertical/inclined,	Requirements made by technical partners have been taken into account in order to partially provide UR_203. More

			column, smoke color). Extensive data samples are required for each specific type of smoke behavior for the training of the model.	specifically, the image/video analysis can detect the presence of smoke, but the behavior analysis of the dynamic texture of smoke would require a lot of data to train a dedicated model.
UR_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	Provide information to authorities/first responders to know the type of fuel being burned by the color and the shape of the smoke. Extensive data samples are required for each specific type of fuel and various illumination changes due to daylight conditions, for the training of the model.	The image/video analysis can detect the presence of smoke but not the fuel that's being burned. A robust technique for fuel material recognition can only be based on smoke color. Images/videos taken from a mobile device are subject to hard illumination changes caused by daylight conditions which may alter dramatically how the smoke is captured. To tackle this problem, only an extensive collection of data showing various types of smoke in various daylight conditions would provide a feasible way of

				training a dedicated model.
UR_205	Analysis of advancing fire	Provide authorities/first responders with an analysis of the the advancing fire (flame progression, height and length).	Provide authorities/first responders with an analysis of the advancing fire (flame progression, height, and length). The analysis module requires extensive prior knowledge of the area of interest, such as maps of vegetation and combustible materials, terrain morphology, accurate weather forecast and study of the microclimate caused by the fire, along with geo-location and characteristics of the fire and the burned area.	Requirements made by technical partners have been taken into account in order to successfully provide UR_205. Technically, is not possible to estimate the height of the fire because there are no elements of known dimensions in the forest in order to be used as reference, especially in the case of drones. The progression of fire is visualised on the map by the pins created on the map from user reports and drones feedback.
UR_206	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.		No modifications

UR_207	Aerial images/video (drone)	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)	Display authorities/first responders to visualize aerial images of the fire and the trajectory of the flames. It will provide information about the extension (in case where we can detect the fire in sequential video frames) and the track of the fire, vehicles and people around the spot, in order to indicate candidate suspects or victims. The coordination is difficult in the forest especially when a fire is in progress. Thus, the aerial images could assist coordination between authorities and first responders by providing more information about forest fires evolution.	The user requirement has been updated to the drone specifications, thus not having a thermal camera and omitting this part of the UR_207. This user requirement contains several parts. Some of them are fully covered, such as the visualization of aerial images with smoke, the tracking of fire and the detection of people and vehicles around the spot). The extension of the fire is also being estimated, since the drones scan a predefined area and they create different incidents on the map. The detection of damages cannot be performed since there are not available detection models and the creation of such models would require manual annotation and extensive datasets.
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UR_209	Electronic traffic panels	Display authorities/first responders to display in electronic traffic panels useful information and evacuation instructions in the case. In the last year, Valencia Local Police has received a new car fleet which is equipped with led traffic panels that can display messages and useful information such as evacuation instructions and traffic information to citizens.	Display authorities/first responders to display in electronic traffic panels useful information and evacuation instructions in the case. In the last year, Valencia Local Police has received a new car fleet which is equipped with led traffic panels that can display messages and useful information such as evacuation instructions and traffic information to citizens.	This UR has already been covered with equipment upgrades of our organization (traffic panels mounted on cars)
UR_210	Mobile application	Provide citizens to communicate a fire alert, detected neglects or other risk situations and even send visual data through a mobile application.		No modifications
UR_211	Location of personnel involved	Display authorities/first responders to visualize GPS location and/or real-time footage of personnel on the incident site. Transmitted to an online map where the coordination centers can follow both the development of the incident and the location and amount of resources.		No modifications

		The online map will also provide the possibility of interacting with the police and other agencies involved.		
UR_212	Traffic warnings	Sending warnings to citizens in order to avoid interferences inside the area.		No modifications
UR_213	Recommendations	Sending recommendations to citizens.		No modifications
UR_214	Warnings	Sending warnings of pre-emergency alerts to citizens by authorities		No modifications
UR_215	Evacuation orders	Ordering evacuations of citizens at risk.		No modifications
UR_216	Internal sharing of information	Sharing data (images, videos, geolocation, reports) regarding the forest fire among authorities & first responders		No modifications
UR_217	Twitter analysis and warning	Warning authorities/first responders about Twitter messages concerning the forest fire event.		No modifications
UR_219	Coordination and communication between different resources	Provide communication between authorities and first responders, in order to improve their coordination.		No modifications

UR_221	Geolocalization 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.		No modifications
UR_222	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	Transfer emergency voice messages sent with mobile app by writing (only minor emergencies or only information call). The aim is to save time operator and do not lose emergency calls.	The UR was initially narrowed down to voice messages coming from the mobile application. However, in the second prototype a call center was integrated able to receive emergency calls. The filtering is being made through the transcription, analysis and classification of the call. This UR is fully covered.
UR_223	Automatic selection of the level of emergency	This can be done only with the operator's supervision. The aim is to save time and do not lose emergency calls sent through the mobile app.	This can be done only with the operator's supervision. The aim is to save time and do not lose emergency messages sent through the mobile app.	The UR was initially narrowed down to emergency messages only. Eventually, it is fully covered with the integration of the call center.
UR_224	Automatic translation from a foreigner applicant through mobile app	Make easy the communication between people with different languages	Make easy the communication between PSAP operator and people with different languages.	This UR was more precisely defined in D2.10. The multilingual report generator facilitates the reporting in any language supported

				by the project (English, Greek, Italian and Spanish)
UR_225	A quick search of events and applicants	Data storage, in order to improve indexation of information relative to events and applicants.		No modifications
UR_226	Video/image analysis		Detect people and vehicles in danger of the received video/images from the drone and/or mobile application, and provide these inputs to our PSAP. Furthermore, if drone aerial images/video provides 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.	New UR has been added due to the drone implementation in the pilot.
UR_227	Specific mobile app for first responder and citizen		Provide different versions of the mobile app for citizen and first responders based on their different roles and knowledge.	Due to the needs of management capabilities from the Advanced Command Post, a profile for first responders on mobile systems is required.

UR228	Socio-cultural factors inputs		Provide with data input of socio-cultural factors that might increase the pre-emergency severity levels.	The emergency response would take benefit of KB having this data input.
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4.3 Final Fire Pilot Operational scenario

The storyline made in the D2.10 has suffered several mayor changes, therefore it is convenient showing the updated version, which takes into account these changes. The main difference between this operational scenario and earlier versions of it is that the script will be triplicated (instead of duplicated) adding a third scenario called “blended” to the already existing “legacy tools” and “with BeAWARE”.

The storyline for the fire pilot has three stages as follows:

1. Pre-emergency activation (level 3, extreme risk of fires).
2. Emergency part A (spotting the fire).
3. Emergency part B (worsening of the situation, evacuation management and fade out).

The pilot will be developed taking into account three different scenarios:

- Legacy tools: The emergency will be managed as usual, without the beAWARE platform.
- With beAWARE: The emergency will be managed using every module of the beAWARE platform.
- Blended: The emergency will have tasks developed by a mixture of the beAWARE platform and the legacy tools.

The above mentioned three stages, combined with the three scenarios are described in short with their main differences:

PRE-EMERGENCY LEVEL 3 ACTIVATION

Session 1a – with legacy tools.

- State Meteorology Agency (AEMET) forecast.
- Public alerts issued by Emergency Coordination Center (CCE): fax, phone, email.
- Task assignments to first responders issued by walkie-talkie (TETRA standard).

Session 1b – with beAWARE.

- FMI forecast. Incident report (crisis classification module).
- Public alerts issued by the beAWARE platform.
- Check of the GIS layers in the KB (flammable areas and fuel model maps)
- Task assignments to first responders issued by beAWARE platform.
- Bunch of tweets nº1.
- Drone deployment.

Session 1c – blended.

- Public alerts issued by the beAWARE platform + CCE.
- Task assignments to first responders issued by beAWARE platform + walkie-talkie.
- (TBD) FMI forecast, a bunch of tweets nº1, drone deployment.

EMERGENCY - PART A

Session 2a (1st part) – Spotting a fire without beAWARE

- Citizen call to PSAP
- Task assignments to first responders issued by walkie-talkie (TETRA standard).
- Public alert of confinement issued by phone call/intercom/mobile megaphone system.

Session 2b (1st part) – Spotting a fire with beAWARE

- Drone video spots a fire + image/audio/video through mobile app + bunch of tweets nº2.
- Task assignments to first responders issued through beAWARE platform.
- Public alert of confinement issued through beAWARE platform.

Session 2c (all) – Spotting a fire blended

- Drone/citizen issues fire warning through mobile app + task assignment by walkie-talkie.
- Public alerts issued by beAWARE platform + phone call/intercom/mobile megaphone system.

Session 2a (2nd part) – Spotting a fire without beAWARE

- Task assignments to first responders issued by walkie-talkie

Session 2b (2nd part) – Spotting a fire with beAWARE

- Task assignments to first responders issued through beAWARE platform

EMERGENCY - PART B

Session 3a (1st part) – Worsening of the situation without beAWARE

- State Meteorology Agency (AEMET) forecast.
- Task assignments to first responders issued by walkie-talkie.
- Traditional communications (no people inside evacuated center).
- Incident reports issued by walkie-talkie.
- Public alert of evacuation issued by phone call/intercom/mobile megaphone system.

Session 3b (1st part) – Worsening of the situation with beAWARE

- FMI forecast. Incident report (crisis classification module).
- Drone video (no people detected inside).
- Task assignments to first responders issued by beAWARE platform.
- Incident reports issued by beAWARE mobile app.
- Public alert of evacuation issued through beAWARE platform.

Session 3c (all)– Worsening of the situation, evacuation and fade out blended

- Task assignments to first responders issued by beAWARE platform + walkie-talkie
- Drone video.
- Incident reports issued by walkie-talkie + beAWARE mobile app
- Public alerts issued by mobile app + phone call/intercom/mobile megaphone system.

WORKSTATIONS

Depending on the scenario which is being tested, there will be different workstations (WS) provided to the incident managers and technicians. These will be described before each storyline, with the acronym WS followed by a number. It has to be noted that WS will be treated like actors, understanding that these will be operated by a manager and/or technician.

STORYLINE OF THE PILOT

Pre-emergency (legacy tools)

- WS1 (PLV): 3 screens and phone.
- WS2 (PLV): 3 screens and radio.
- WS3 (Firefighters): 2 screens, phone and radio.

Below, the full scenario with the timeline, the locations, the description of the steps, the communication channel as also the participants is described.

Table 7. Pre-emergency (legacy tools)

Time	Location	Description	Communication channel (legacy tools)	Actors
From 0:00 to 0:10	CISE, CECOM	Registration of first responders and citizens. Visualization of first responders		CISE & CECOM incident manager, teams 1,2,3,4,5,6,8
0:10	CISE, CECOM	CISE and CECOM receive pre-emergency level 3 alert (extreme risk of fire) according to a forecast that shows that in the next 48 hours there will specific values of temperature, wind and humidity (+30º, +30km/h, -30%)	Phone/Fax	PLV Workstation (WS) 1 and Firefighters WS3. Teams 1,2,3,4
0:12	CISE, CECOM	Instructions to the first responders to perform preventive surveillance in La Devesa del Saler.	Radio	Teams 1,2,3,4,5,6,8
0:14	CECOM	CECOM informs Forest Guards about the pre-emergency level 3 alert	Phone/Fax	Teams 9,10
During all day	CISE	Mass media and social networks inform the citizens about pre-emergency level 3 (extreme risk of fire)	Mass media/social media	CISE Incident Manager. Citizens 1,2,3,4

Table 8. Emergency Part A with legacy tools

Time	Location	Description	Communication channel (legacy tools)	Actors
0:00	CISE	Calls to CISE warning about fire in La Devesa del Saler	Phone	WS1. Citizen 1, 2 3
0:00	CISE	CISE informs to CECOM (Firefighters) about the fire in La Devesa	Phone	PSAP incident manager
0:01	CECOM	CECOM (Firefighters) alert a first crew of firefighters who must move towards the fire	Phone	WS3. Team 1,2,3
0:01	CISE	CISE assigns task to TEAM 5, TEAM 6 and TEAM 8. A first crew of police officers must move towards the fire area	Radio	WS2. Team 5,6,8
0:02	CECOM	CECOM (Firefighters) alert Forest Guards who must move towards the fire area. The boss of forest guards is informed too.	Phone	WS3. Team 1,2,3
0:05	Fire spot (La Devesa)	TEAM 1 Assigns tasks to TEAM 2 (right flank of the fire) and TEAM 3 (left flank of the fire)	Radio	1,2,3
0:07	Fire spot	TEAM 1 communicates that they have reached the location and that they have started working and inform about the fire (location and condition)	Radio	CECOM. Team 1

0:07	PMA (Advanced Post)	TEAM 1 communicates their location as PMA Advanced Command Post location	Radio	CECOM. Team 1
0:09	Fire spot	TEAM 2 and TEAM 3 communicate that they have reached the location and that they have started working	Radio	CECOM. Team 2,3
0:13	CECOM	Tasks to the first responders, a first crew of forest guards must move towards the fire area to cut paths	Phone	CECOM. Team 9, 10
0:14	Fire spot	PLV TEAMS are in the fire area, The commander of TEAM 8 will collaborate with Director of PMA, and TEAM 5 and TEAM 6 are sent to the two roundabouts in CV500 road, to cut the access to the fire area if is needed	Phone/radio	Team 5,6
0:14	PMA	The Boss of Forest Guards arrives to the PMA	Phone	CECOM, Team 1
0:14	Fire spot	TEAM 9 communicates that they have reached the location and that they have started working	Radio	CECOM, Team 9
0:15	CV500	TEAM 5 and TEAM 6 communicate that they have reached the location and that they have started working	Phone	PSAP incident manager. Team 5,6

0:17	Fire spot	TEAM 10 communicates that they have reached the location and that they have started working	Phone	Team 10
0:17	Fire spot	TEAM 9 informs to PMA there is someone asking for help in the path possibly injured runner or biker	Phone	Team 9
0:17	Fire spot	PMA sends TEAM 8 to rescue the person injured, the commander remains in PMA (now TEAM 8: two police officers). The PLV commander asks to CISE for an ambulance	Radio	PSAP incident manager. Team 1, 8
0:20	Injured person spot	TEAM 8 communicates that they have reached the location and that they have started working	Radio	WS2. Team 8
0:23	Injured person spot	TEAM 8 Communicates the execution of the task. TEAM 8 takes the the person injured to the PMA where the ambulance is waiting for him	Radio	WS2. Team 8

Table 9. Emergency – Part B with Legacy Tools

Time	Location	DESCRIPTION	Communication channel (legacy tools)	Actors
0:00				

0:01	Fire spot	TEAM 2 informs to PMA the situation is worsening (increase in wind speed and a change of wind direction)	Radio	Teams 1,2
0:02	PMA	PMA Advanced Command Post request to CECOM one extra team of Firefighters to support the task	Phone	CECOM Incident Manager, Team 1
0:05	PMA	PMA Advanced Command Post updates task of TEAM 4 (point of firefighting)	Radio	Teams 1,4
0:07	PMA	Considering the new situation, PMA indicates to CECOM the Educational Center must be evacuated.	Radio	CECOM Incident Manager, Team 1
0:08	CECOM	CECOM call to the educational center and gives the order of evacuation	Phone	CECOM Incident Manager
0:10	Fire spot	TEAM 4 communicate that they have reached the location and that they have started working	Radio	Teams 1,4
0:10	PMA	PMA assign to TEAM 8 the task of coordinating the educational center evacuation, using loudspeaker system if needed	Radio	Teams 1,8
0:13	Educational Center	TEAM 8 communicate that they have reached the location and that they have started working	Radio	Team 8

0:15	Educational Center	TEAM 8 informs that in the educational center there is one handicapped student using wheelchair to bear in mind	Radio	Teams 1, 8
0:21	Educational Center	TEAM 8 Communicate the execution of the task (Evacuation completed)	Radio	Teams 1, 8
0:25	Fire spot	TEAM 2, TEAM 3 and TEAM 4 Communicate the execution of the task (fire under control)	Radio	Teams 2,3,4
0:35	PMA	PMA determines the end of the emergency	Phone/radio	Team 1
0:35	Educational Center	Teachers and students come back to the educational center		

Pre-emergency (with beAWARE)

- WS1 (PLV): 2 screens (map and dashboard).
- WS2 (PLV): 2 screens (switch between Operational Manager, Incident Manager, alerts & KB)

Table 10. Pre-emergency with beAWARE

Time	Location	DESCRIPTION	Communication channels (with beAWARE)	Actors
From 0:00 to 0:10	CISE, CECOM	Registration of first responders and citizens and visualization of first responders	PSAP workstation, mobile app	All
0:10	CISE	A forecast that shows that in the next 48 hours there will specific values of temperature, wind and humidity (+30°, +30km/h, -30%). According to this, pre-emergency level 3 (extreme risk of fire) is established and public alerts are sent	PSAP dashboard, mobile app	PSAP incident Manager
0:10	CISE	Public alert informing of pre-emergency level 3 (extreme risk of fire)	Mobile app	All
0:12	CISE	Check of the GIS layers in the KB (inflammable areas and fuel model maps)	PSAP workstation	WS 2
0:15	CISE	Tasks to the first responders, drone must be deployed to perform preventive surveillance flights in La Devesa del Saler.	Mobile app	PSAP incident Manager. Team 7
0:20	CISE	Public alerts (specific instructions to first responders and citizens)	Mobile app	All
0:25	CISE	TEAM 7 communicate that they have reached the location and that they have started working (Drone deployment)	Mobile app	WS 2. Team 7
0:30	CISE	Receive tweets confirming dangerous weather conditions	Social media	WS 1

Table 11. Emergency Part A (with beAWARE)

Time	Location	Description	Communication channels (with beAWARE)	Actors
0:00	CISE	Receive Image/video/voice record of citizens who have spotted smoke in La Devesa del Saler (close to El Saler, zone 1)	Mobile application	WS 1, WS 2. Citizens 1, 2, 3.
0:00	CISE	Receive Drone video from TEAM 7 (smoke detected close to El Saler, zone 1)	Tablet/laptop	WS 1, Team 7
0:00	CISE	Receive tweets warning about fire in La Devesa del Saler (close to El Saler, zone 1)	Social media	WS 1
0:01	CISE	Fire in La Devesa del Saler. Public alerts are sent to first responders/citizens (Fire in La Devesa del Saler, zone 1/ Fire in La Devesa del Saler)	Mobile app	all
0:01	CECOM	Fire in La Devesa del Saler. Tasks to the first responders, a first crew of firefighters must move towards the fire automatically (Fire in La Devesa del Saler, zone 1, move towards the fire)	Mobile app	WS 1, WS 2 Teams 1,2,3
0:02	CECOM	Task update to TEAM 1, TEAM 2, TEAM 3 (the fire is close to El Saler)	Mobile app	Teams 1,2,3
0:03	CISE	Tasks to the first responders, a first crew of police officers must move towards the fire area (go to the fire area and wait for instructions, close to El Saler)	Mobile app	PSAP incident Manager. Teams 5,6
0:04	CISE	Tasks to the first responders, a first crew of forest guards must move towards the fire area (go to the fire area and wait for instructions, close to El Saler)	Mobile app	WS 2. Teams 10,11
0:05	CISE	Public alerts to the citizens, specific instructions: keep at home or avoid the area of La Devesa while the forest fire is in process	Mobile app	WS 2. Citizens 1,2,3,4

0:07	PMA	TEAM 1 communicate that they have reached the location and that they have started working (PMA, Advanced Command Post)	Mobile app	WS 2. Team 1
	PMA	TEAM 1 communicate their location (Casa Forestal) as PMA Advanced Command Post location and inform about the location and condition of the fire	Mobile app	WS 2, Team 1
0:08	CISE, CECOM	First responders receive the location of PMA Advanced Command Post (Casa Forestal)	Mobile app	all
	Fire spot	TEAM 2 and TEAM 3 communicate that they have reached the location and that they have started working	Mobile app	WS 2. Teams 2,3
0:09	CISE	Task to TEAM 9 (Go to location of PMA Advanced Command Post, Casa Forestal)	Mobile app	PSAP Incident Manager, Team 9
0:09	CECOM	Task to TEAM 12 (Go to location of PMA Advanced Command Post, Casa Forestal)	Mobile app	Team 12
0:10	CISE	Task update to TEAM 7 (drone deployment point the same as PMA Advanced Command Post location)	Mobile app	WS 1, WS 2, WS 3. Team 7
0:10	PMA	PMA Advanced Command Post updates tasks of TEAM 5 and TEAM 6 (traffic regulation points: TEAM 5 cut the traffic in avenida Pinares roundabout; TEAM 6 cut the traffic in Tallafo de la Rambla roundabout)	Mobile app	Teams 5,6, 7
0:11	PMA	PMA Advanced Command Post updates task of TEAM 10 and TEAM 11 (path cut points: TEAM 10 cut the south access to Camí Vell de la Devesa from Tallafo del Saler; TEAM 11 cut the north access to Camí Vell de la Devesa from Tallafo de la Rambla)	Tablet/laptop	Teams 1, 10,11

0:12	Avenida Pinares	TEAM 5 and TEAM 6 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3 Teams 5,6
0:13	Cami Vell de la Devesa	TEAM 10 and TEAM 11 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3 Teams 10, 11
0:14	PMA	TEAM 12 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3 Team 12
0:15	PMA	TEAM 7 communicate that they have reached the location and that they keep working (drone deployment point the same as PMA Advanced Command Post location)	Mobile app	WS 2, WS 3 Team 7
0:17	PMA	TEAM 9 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3 Team 9
0:20	CISE	Receive Drone video from TEAM 7 (detected a possibly injured runner or biker close to the affected area)	Tablet/laptop, PSAP workstation	WS 1, Team 7
0:21	CISE	Compose a task (rescue person) and assign it to TEAM 8	Tablet/laptop, Mobile app	PSAP Incident manager, Team 8
0:25	Injured person spot	TEAM 8 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3 Team 8
0:30	Injured person spot	TEAM 8 Communicate the execution of the task	Mobile app	WS 2, WS 3 Team 8

Table 12. Emergency Part B (with beAWARE)

Time	Location	DESCRIPTION	Communication channels (with beAWARE)	Actors
0:00	CISE	A forecast that shows an imminent increase in wind speed and an imminent change of wind direction	PSAP dashboard	PSAP Incident Manager
0:02	PMA	PMA Advanced Command Post request one extra team of Firefighters to support the task	Tablet/laptop	WS 1, 2, 3. Team 1
0:05	CISE	Compose a task (move towards the fire and follow PMA Advanced Command Post instructions) and assign it to TEAM 4	Mobile app	PSAP Incident Manager, Team 4
0:07	PMA	PMA Advanced Command Post updates task of TEAM 4 (point of firefighting)	Tablet/laptop	WS 1,2,3 Teams 1, 4
0:10	Fire spot	TEAM 4 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3. Team 4
0:15	Fire spot	Incident sent by first responder reporting worsening situation	Mobile app	WS 2, 3, 4 Team 4
0:16	CISE	Receive tweets informing that the situation has worsened (the smoke goes to the educational center)	Social media	WS 1 WS 3

0:16	CISE	Public alert to citizens, evacuation order: Educational centers must be evacuated	Mobile app	PSAP Incident Manager. WS 2 WS 3
0:17	PMA, CISE	Compose a task (educational center evacuation) and assign it to TEAM 8	Tablet/ laptop	PSAP Incident Manager, Team 8
0:22	Educational Center	TEAM 8 communicate that they have reached the location and that they have started working	Mobile app	WS 2, WS 3, Team 8
0:24	PMA, CISE	Update task of TEAM 7 (Drone, oversee educational center evacuation)	Mobile app	PSAP Incident Manager, WS1,2,3 Team 7
0:26	Educational Center	TEAM 7 communicate that they have started working (Drone oversight)	Mobile app	WS 2, 3 Team 7
0:30	Educational Center	TEAM 8 Communicate the execution of the task	Mobile app	WS 2, 3 Team 8
0:32	CISE	A forecast that shows an imminent decrease in wind speed	PSAP dashboard	WS1,2,3
0:35	PMA, CISE, CECOM	Receive Drone video from TEAM 7 (no person detected inside educational center)	Tablet/pc	WS 1, WS 3 Team 7
0:45	PMA, CISE, CECOM	Incident sent by first responders reporting that the situation has gotten better	Mobile app	WS 1,2,3 Teams 2,3

0:50	PMA	TEAM 2, TEAM 3 and TEAM 4 Communicate the execution of the task	Mobile app	WS 2, 3. Teams 2,3,4
0:55	PMA, CISE	Public alert to citizens, end of evacuation order	Mobile app	PSAP Incident Manager

Pre-emergency (blended)

- WS1 (PLV): 2 screens (map and dashboard).
- WS2 (PLV): 2 screens (switch between Operational Manager, Incident Manager, alert & KB)
- WS3 (PLV CISE) 3 screens & phone (legacy tools).
- WS4 (PLV CISE) 3 screens & radio (legacy tools).
- WS5 (Firefighters CECOM) screens & phone & radio (legacy tools).
- WS6 (2ND PSAP)- laptops/radio (beAWARE/legacy tools) held by TEAM 1 (PMA, Advanced Command Post)

Table 13. Pre-emergency (blended)

Time	Location	Description	Communication channels (blended)	Actors
From 0:00 to 0:10	CISE, CECOM	Registration of first responders and citizens and visualization of first responders (both through legacy tools and beAWARE)	Mobile app	all
0:10	CISE	A forecast that shows that in the next 48 hours there will specific values of temperature, wind and humidity (+30º, +30km/h, -30%). According to this, pre-emergency level 3 (extreme risk of fire) is established and public alerts are sent	PSAP dashboard	PSAP incident manager

0:10	CISE, CECOM	CISE and CECOM receive pre-emergency level 3 alert (extreme risk of fire) according to a forecast that shows that in the next 48 hours there will specific values of temperature, wind and humidity (+30º, +30km/h, -30%)	Fax/phone	WS1,2
	CISE	Public alert informing of pre-emergency level 3 (extreme risk of fire)	Mobile app	all
0:12	CISE	Check of the GIS layers in the KB (flammable areas and fuel model maps)	PSAP workstation	WS 2
0:15	CISE	Tasks to the first responders, drone must be deployed to perform preventive surveillance flights in La Devesa del Saler.	Mobile app	PSAP incident manager. Team 7
0:20	CISE, CECOM	Public alerts (specific instructions to first responders and citizens)	Mobile app	all
0:25	CISE	TEAM 7 communicate that they have reached the location and that they have started working (Drone deployment)	Mobile app	WS 1. Team 7
0:30	CISE	Receive tweets confirming dangerous weather conditions	Social media	WS 1
During all day			Mobile app, mass media	

Table 14. Emergency - part A (blended)

Time	Location	Description	Communication channels (blended)	Actors
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0:00	CISE	Calls to CISE warning about fire in La Devesa del Saler (close to El Saler, zone 1)	Phone	PSAP incident Manager, WS3
0:00	CISE	Receive Image/video/voice record of citizens who have spotted smoke in La Devesa del Saler (close to El Saler, zone 1)	Mobile app	PSAP incident Manager, WS1 WS2
0:00	CISE	Receive Drone video from TEAM 7 (smoke detected close to El Saler, zone 1)	Tablet/pc	PSAP incident Manager, WS1 . Team 7
0:00	CISE	Receive tweets warning about fire in La Devesa del Saler (close to El Saler, zone 1)	Social media	WS1
0:01	CISE CECOM	Fire in La Devesa del Saler. Public alerts are sent to first responders/citizens (Fire in La Devesa del Saler, zone 1/ Fire in La Devesa del Saler)	Mobile app	WS2 Teams 1-12 Citizens 1-4
0:01	CISE CECOM	Fire in La Devesa del Saler. Tasks to the first responders, a first crew of firefighters must move towards the fire automatically (Fire in La Devesa del Saler, zone 1, move towards the fire)	Mobile app	PSAP incident Manager, WS1 WS2
0:02	CISE CECOM	Task update to TEAM 1, TEAM 2, TEAM 3 (the Fire is close to El Saler)	Mobile app	WS1 WS2 Teams 1,2,3

0:03	CISE	Tasks to the first responders, a first crew of police officers must move towards the fire area (Go to the fire area and wait for instructions, close to El Saler)	Mobile app	WS1 WS2 Teams 5,6
0:04	CISE CECOM	Tasks to the first responders, a first crew of forest guards must move towards the fire area (Go to the fire area and wait for instructions, close to El Saler)	Mobile app	WS2 Teams10,11
0:05	CISE	Public alerts to the citizens, specific instructions: keep at home or avoid the area of La Devesa while the forest fire is in process	Mobile app	PSAP incident Manager, WS2 Citizens 1-4
0:05	PMA	TEAM 1 update tasks to TEAM 2 (go to right flank of the fire) and TEAM 3 (go to left flank of the fire)	Mobile app	Teams 1,2,3
0:07	PMA	TEAM 1 communicate that they have reached the location and that they have started working (PMA, Advanced Command Post)		WS2, Team 1
0:07	PMA	TEAM 1 communicate their location (Casa Forestal) as PMA Advanced Command Post location and inform about the location and condition of the fire	Mobile app	Team 1
0:08	PMA	First responders receive the location of PMA Advanced Command Post (Casa Forestal)	Mobile app	all
0:09	Fire spot	TEAM 2 and TEAM 3 communicate that they have reached the location and that they have started working	Mobile app	Teams 1,2,3

0:09	CISE	Task to TEAM 9 (Go to location of PMA Advanced Command Post, Casa Forestal)	Mobile app	PSAP incident Manager, WS1 WS2 Team 9
0:09	CISE	Task to TEAM 12 (Go to location of PMA Advanced Command Post, Casa Forestal)	Mobile app	PSAP incident Manager, WS1 WS2 Team 12
0:10	CISE	Task update to TEAM 7 (drone deployment point the same as PMA Advanced Command Post location)	Mobile app	WS1 WS2 Team 7
0:10	PMA	PMA Advanced Command Post updates tasks of TEAM 5 and TEAM 6 (traffic regulation points: TEAM 5 cut the traffic in avenida Pinares roundabout; TEAM 6 cut the traffic in Tallafof de la Rambla roundabout)	Tablet/pc	WS1 WS2 Teams 1,5,6
0:11	PMA	PMA Advanced Command Post updates task of TEAM 10 and TEAM 11 (path cut points: TEAM 10 cut the south access to Camí Vell de la Devesa from Tallafof del Saler; TEAM 11 cut the north access to Camí Vell de la Devesa from Tallafof de la Rambla)	Tablet/pc	WS1 WS2 Teams10,11
0:12	Fire spot	TEAM 5 and TEAM 6 communicate that they have reached the location and that they have started working	Mobile app	WS2 Teams 5,6

0:13	Fire spot	TEAM 10 and TEAM 11 communicate that they have reached the location and that they have started working	Mobile app	WS2 Teams10,11
0:14	PMA	TEAM 12 communicate that they have reached the location and that they have started working	Mobile app	12
0:15	PMA	TEAM 7 communicate that they have reached the location and that they keep working (drone deployment point the same as PMA Advanced Command Post location)	Mobile app	WS2 Team 7
0:17	PMA	TEAM 9 communicate that they have reached the location and that they have started working	Mobile app	WS2 Team 9
0:20	CISE PMA	Receive Drone video from TEAM 7 (detected a possibly injured runner or biker close to the affected area)	Tablet/pc	PSAP incident Manager Team 1, 7
0:21	CISE	Compose a task (rescue person) and assign it to TEAM 8	Tablet/pc	PSAP incident Manager Team 8
0:25	CISE Injured person spot	INTERNET CONNECTION FAILURE: TEAM 8 communicate that they have reached the location and that they have started working through radio instead of through beAWARE	Radio	WS1 WS2 Team 8

0:30	Injured person spot	TEAM 8 Communicate the execution of the task	Mobile app	WS2 Team 8
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Table 15. Emergency - part B (blended)

Time	Location	Description	Communication channels (blended)	Actors
0:00	CISE	A forecast that shows an imminent increase in wind speed and an imminent change of wind direction	PSAP dashboard	PSAP incident manager WS1 WS2 WS6
0:02	PMA	PMA Advanced Command Post request one extra team of Firefighters to support the task	Tablet/pc	WS2 Team 1
0:05	CISE	Compose a task (move towards the fire and follow PMA Advanced Command Post instructions) and assign it to TEAM 4	Tablet/pc	PSAP incident manager
0:07	PMA	PMA Advanced Command Post updates task of TEAM 4 (point of firefighting)	Tablet/pc	WS6 Team 4
0:10	Fire spot	TEAM 4 communicate that they have reached the location and that they have started working	Mobile app	WS2 Team 4

0:14	Fire spot	TEAM 4 communicates that the situation is worsening	Mobile app	WS6 Team 4
0:15	Fire spot	Incident sent by first responder reporting worsening situation	Mobile app	4
0:16	CISE	Receive tweets informing that the situation has worsened (the smoke goes to the educational center)	Social media	
0:16	PMA	POWER OUTAGE in PMA Command Advanced Post: PMA communicate through radio that it is necessary to send an alert in order to evacuate the educational center	Radio	WS4 Team 1
0:16	PMA	POWER OUTAGE in PMA Command Advanced Post: PMA request through radio a Local Police TEAM to evacuate the educational center	Radio	WS2 Team 1
0:16	CISE	Public alert to citizens, evacuation order: Educational centers must be evacuated	Mobile app	PSAP incident manager WS6
0:17	CISE PMA	Compose a task (educational center evacuation) and assign it to TEAM 8	Tablet/laptop	PSAP incident manager WS1 WS2 Team 8
0:22	Educational center	TEAM 8 communicate that they have reached the location and that they have started working	Mobile app	WS2 Team 8

0:24	PMA	Update task of TEAM 7 (Drone, oversee educational center evacuation)	Mobile app	WS2 Team 7
0:26	PMA	TEAM 7 communicate that they have started working (Drone oversight)	Mobile app	WS2 WS6 Team 7
0:30	Educational center	TEAM 8 Communicate the execution of the task	Mobile app	WS1 Team 8
0:32	CISE	A forecast that shows an imminent decrease in wind speed	PSAP dashboard	WS1 WS2 WS6
0:35	CISE PMA	Receive Drone video from TEAM 7 (no person detected inside educational center)	Tablet/laptop	WS1 WS6 Team 7
0:45	Fire spot	Incident sent by first responders reporting that the situation has gotten better	Mobile app	WS1 WS2 WS6
0:50	Fire spot	TEAM 2, TEAM 3 and TEAM 4 Communicate the execution of the task	Mobile app	WS2 WS6 Teams 2,3,4
0:55		Public alert to citizens, end of evacuation order	Mobile app	WS2 WS6 Citizens 3,4

4.4 Final Fire Demonstration site

Fire spot location: 39°22'46.3"N 0°19'42.2"W

Access:

- North (urban): C/ Carrera del Riu
- South (main road): CV500

Features:

- Close to the urban spot
- Good access
- Dense biomass



Figure 1. Area of the fire pilot

- Yellow: autonomous drone flight during pre-emergency
- Orange (emergency part A) -big: fire spot location, -small: injured person.
- Red: Emergency part B (evacuation of the educational center).

4.4.1 Emergency protocols and communication procedures

The main communication channels with the legacy tools are walkie-talkie, fax, phone, and email. The beAWARE platform provides messages through the mobile app as an extra channel, being those able to attach image/audio/video files.

Concerning the pre-emergency protocol and communication procedures, 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 once considered 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-emergency, which is sent via fax or email to the different councils.

In this particular case, pre-emergency level 3 will be issued to our PSAP and depending on which of the three scenarios is being tested, the communication procedures may vary. For instance, with legacy tools fax and email is the established medium for these communications, but when using the BeAWARE platform, message through the mobile app is the most common medium, as shown in the point 4.3 (operational scenario). In the beAWARE platform, the forecast that will trigger the pre-emergency level 3 activation will show that in the next 48 hours there will specific values of temperature, wind, and humidity (+30°C, +30km/h, <30% humidity).

Moreover, there also exists an annual regional Plan for Deterrent Surveillance, which states as level 3 of pre-emergency certain days of the year, holidays and weekends, due to socio-cultural factors. This calendar is issued to the authorities on a yearly basis. This data will be introduced to the KB for the pre-emergency phase.

In the legacy tools scenario, the declaration of pre-emergency level 3 is received by the Mayor, as the head of the Civil Protection in the Municipality, via the Regional Coordination Center (CEE). It will mobilize local resources, with a view to establishing Deterrent Surveillance Services in the most vulnerable areas of the municipality, so the CECOM (Municipal coordination Center) of the Fire Brigade will alert their own and other local resources (local forest guards, civil protection Volunteers).

When the pre-emergence 3 is activated, other resources will be also alerted, Guardia Civil, autonomous police, forest brigades of the Valencia Provincial Council, for the preventive surveillance of forest fires. Moreover, the Mayor will issue an edict, in which the situation will be reported, indicating that it has been declared a level pre-emergence 3, and reminding about the preventive compulsory measures referred to in Decree 98/1995, of May 16.

PMA (Puesto de Mando Avanzado) - Advanced post.

The PMA's leadership will be exercised by the highest-rank officer in the Fire Brigade, who will determine the place to locate it. This will be the place where those responsible for acting services will be heading. Each performer will carry a radio station to communicate with their resources. The main Transmissions Centre will stay in touch in real time with the provincial CCE, where the emergency occurs. Communication will take place through the Director, who will request the necessary resources. In the event of a disaster, the traffic management in the area will be carried out by the Local Police and the Civil Guard. In the event that the precautionary evacuation of some area is necessary, it will be held with local resources. The head of the Advanced Post will order the evacuation. The Local Police and Traffic Civil Guard establish safe evacuation routes, each in their jurisdiction. If there is a threat of imminent danger, the protective measures will be ordered by the head of the Security Basic Unit, who will notify immediately to the Technical Director of PMA. The Civil Protection volunteers will collaborate with the local police in the evacuation tasks.

4.4.2 Equipment and participants

Equipment to be used:

- screens in the control room
- 1 big screen and projector in the control room
- PC's in the control room
- 1 tablet with the app installed for Fire-fighters.
- 1 tablet with the app installed for Local Police.
- 15 mobile phones with the app installed for first responders and volunteers.
- 1 laptop with the app installed for the PMA.

Participants (approximately):

- Fire-fighters: 20
- Police officers: 12-14 (3-4 patrol, 3-4 PSAP operator, 2 drone pilots)
- Forest Guards: 2-4
- Citizens: 450 students, 50 teachers, 5 citizens/neighbours

5 Heatwave Scenario

The final Use Cases and User Requirements represent the final steps of beAWARE, started at the beginning of the project (with the D2.1) and continued with the development of the beAWARE platform, alongside with the test, prototypes, and pilots.

As it was mentioned in D2.10, the heatwave Use Cases remained the same, as initially described in D2.1, due to the fact that those fulfil HRT requirements. Additionally, the development of the platform and the mobile app as also the continuous discussion and the evaluation after each pilot, helped HRT and technical partners, to fulfil the requested requirements for the heatwave scenario, by updating the User Requirements that are marked blue in Table 17 in section 5.2.

It is worth to mention, that in the previous prototypes (see also D2.4, D2.5, and D2.6) some of the Use Cases and User Requirements of the heatwave pilot had been implemented partially.

For the final system of the beAWARE platform, all the features of Use Cases and User Requirements will be fully implemented, and are briefly summarized in the next paragraphs, while they had been described more in detail in D2.10.

5.1 Final Heatwave Scenario Use Cases

For the Heatwave Scenario, all the Use Cases were created based on HRT's requirements and upon discussion with the technical partners. In Appendix A, subchapter 7.3, each Use Case is analysed in detail. All the Use Cases which are presented in the table below have no modifications and will be tested in the final system.

Table 16. Heatwave scenario, Final Use Cases

FINAL HEATWAVE USE CASES
UC_301: Heatwave forecasting alert
UC_302: Heatwave fire risk assessment
UC_303: First Responder Management
UC_304: Management of traffic emergencies
UC_305: Management of Places for relief
UC_306: Response to Power Outage

5.2 Final Heatwave Scenario User Requirements

For the final system, all the User Requirements will be tested. In the table below, all User Requirements are presented and also if changes/modifications were made from D2.1 up to D2.10. In case changes were made, the box of the particular User Requirements is marked blue.

Table 17. Heatwave pilot User Requirements Modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_301	Real time weather forecast	Provide the authorities with real time weather forecast in relation to the progression of the heatwave phenomenon		No modifications
UR_302	Automatic warning	beAWARE system to generate and provide the authorities with an automatic warning when an imminent heatwave phenomenon is forecasted		No modifications
UR_303	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		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_304	Heatwave intensity	Provide the authorities with a risk assessment regarding the intensity of the phenomenon in the city	Provide the authorities with a risk assessment regarding the intensity of the upcoming and/or ongoing phenomenon in the city. Provide an estimation of the heatwave impact on the population by assess the Discomfort Index	The modification was made in order to add more data in the processing information of the awareness due to an extreme weather event.
UR_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		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_306	Number of people affected	Provide the authorities an estimation of the people that might be affected from the phenomenon and in which areas	Provide the authorities an estimation of the people that might be affected from the phenomenon and in which areas. Also, the assessment of the Discomfort Index of the upcoming and/or ongoing heatwave extreme event is provided	The modification was made in order to add more data in the processing information of the awareness due to a extreme weather event.
UR_307	Power needs	Provide the authorities an estimation on the power needs during a heatwave based on its foreseen progression		No modifications
UR_308	Infrastructure overload	Provide the authorities an estimation of damage/overload to the city's infrastructure (phone lines, electricity, water, etc)		No modifications
UR_309	False Alarms	Provide to the authorities a procedure to confirm the 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.		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_310	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		No modifications
UR_311	Information Storage	Provide the authorities 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		No modifications
UR_312	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		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_313	First responders status	Provide to the authorities the current status and location of all first responders when they are performing their tasks		No modifications
UR_314	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		No modifications
UR_315	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 roots to avoid	Facilitate the authorities by providing monitoring capabilities of the current traffic situation from installed surveillance (static) cameras, so that they can decide where to direct the first responders or inform them which roots to avoid	Static cameras gives the ability for better and more accurate information for the general management of an event
UR_316	Capacity of relief places	Provide to the authorities the current state of the available capacity of all relief places provided to the public	Provide to the authorities the current state of the available capacity of all relief places that are available to the public. The assessment is performed by the analysis of the video from static or mobile camera	The analysis from video is made more flexible since it can be used except static and mobile cameras in order to be more flexible in data acquisition.
UR_317	Areas with power outage	Display to the authorities the areas where there is a power outage.		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_318	Trapped citizens	Allow authorities to know if there are people trapped (e.g. in an elevator) and display where		No modifications
UR_319	Trapped elders at home	Allow authorities to know if there are elder people trapped in houses without an A/C and display where		No modifications
UR_320	Hospital availability	Show to the authorities the current availability of the hospitals.		No modifications
UR_321	Affected area	Provide to the authorities with a prediction of the affected area	Provide to the authorities an assessment for the forecasted or the observed Crisis Level which indicates the impact of heatwave crisis event in the region of interest	Crisis Level and the impact of heatwave crisis will provide more detailed and dedicated data analysis
UR_322	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		No modifications
UR_323	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		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_324	Information for existing situation in the Social Media	Provide to the authorities information regarding existing traffic conditions all over the city grid gathered from social media		No modifications
UR_325	Suggested places of relief	Provide citizens with information regarding the suggested places of relief through an app.		No modifications
UR_326	Type of visualization	Display to the authorities/citizens all the information in a web-gis platform		No modifications
UR_327	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.		No modifications
UR_328	Send task reports	Allow First Responders to send reports about their assignments from their mobile phone to local authorities		No modifications
UR_329	Visualize video cameras	Display streamed video from video cameras to the authorities/citizens		No modifications
UR_330	Localize video and images	Provide authorities with the ability to localize videos and images sent by citizens from their mobile phones		No modifications
UR_331	Localize task status	Provide authorities with the ability to detect the location of first responders		No modifications
UR_332	Localize tweets	Provide authorities with the ability to localize Twitter messages		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_333	Localize calls	Provide authorities with the ability to localize Phone Calls to an emergency number concerning citizens who are trapped	Provide authorities with the ability to localize voice messages sent with mobile app by writing to an emergency number concerning citizens who are trapped. The aim is to save time operator and do not lose emergency calls	The modification was made in order to save time for the operator and not to lose emergency phone calls. Additionally, the beAWARE app can provide more localized data than a phone call.
UR_334	Manage assignments in case of new emergencies	Provide authorities with the ability to manage first responder assignments		No modifications
UR_335	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		No modifications
UR_336	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid a certain area that is jammed with traffic		No modifications

UR#	Requirement name	Initial Requirement description (D2.1)	Final Requirement description (D2.10)	Reason of the modifications
UR_337	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		No modifications
UR_338	Warnings	Allow authorities to send warnings of pre-emergency alerts to citizens.		No modifications
UR_339	Evacuation orders	Allow authorities to order evacuations of citizens at risk.		No modifications
UR_340	Internal sharing of information	Allow authorities and first responders to share data (images, videos, geolocation, reports)		No modifications
UR_341	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		No modifications
UR_342	Coordination and communication between different resources	Provide communication between authorities and first responders, in order to improve their coordination.		No modifications

5.3 Final Heatwave Operational scenario

Based on experienced gained from the previous beAWARE pilots, the developed prototypes, and the interaction with the pilot-participants, the final Heatwave Operational Scenario was updated, in order to meet all Use Cases and User Requirements, thanks to the continuous interaction between technical partners and end-users. The final setup of the beAWARE platform will be able to support all the requirements and after the final pilot, as before-mentioned, there will be an online demo version of the beAWARE platform which will demonstrate all the system's capabilities for the heatwave scenario.

The final heatwave operational scenario, as firstly presented in table 6 of D2.5, is divided into 4 sessions, in order each one to address specific User Requirements which are based on the Use Cases of the scenario. Those sessions are tackled through various actions with the use of the legacy tools on the one hand and the beAWARE platform and mobile application on the other. As mentioned earlier, in the final pilot, the scenario will be based on all the Use Cases and User Requirements. The majority of them remained unchanged, but as presented in Table 17, there were updates on several User Requirements with a result of several new steps on the heatwave scenario that will be tested on the final pilot and are presented in Table 18.

More analytically for the heatwave scenario, in white are the unchanged ones and in green are the new steps which will be tested in the final pilot in order to include the full set of Use Cases and User Requirements.

For “*Session A – Pre Crisis*”, the new test step of the operational scenario is:

- “*A risk assessment regarding a forest fire which occurs after a heatwave*”. The expected behaviour will be “More specific and detailed information and data will be analyzed and the PSAP, based on those, will take actions (eg inform Rescue Teams, Authorities, etc)”. This step will be checked in the final system of the beAWARE platform along with all the others that already been tested in the previous prototypes, and is covering:
 - UR_303: Risk assessment for a forest fire
 - UR_304: Heatwave intensity
 - UR_321: Affected area.

For “*Session B – Traffic Jam*”, the new test steps of the operational scenario in the final pilot are the following ones:

- “*Authorities track 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”, with expected behavior “to map of rescue teams and task evaluation”. This step is covering:

- UR_310: City-wide overview of the event
- UR_314: Assign tasks to first responders
- UR_315: Traffic Status
- UR_334: Manage assignments in case of new emergencies
- UR_335 Map of rescue teams and task evaluation.
- *“Give specific evacuation orders to First Responders of people trapped inside a building/elevator etc”* and its expected behaviour will be “specific instructions are sent through the beAWARE mobile app to the rescuers to rescue people in danger”. This step is covering:
 - UR_305: Possible locations for incidents,
 - UR_306: Number of people affected,
 - UR_318: Trapped citizens,
 - UR_319: Trapped elders at home and
 - UR_333: Localize calls.
- *“Another incident occurs near the first one and PSAP send part of the active team in the area to deal with the new incident”* and its expected behavior will be “specific instructions are sent through the beAWARE mobile app to the rescuers to assist in the new danger”. This step is covering the
 - UR_305: possible locations for incidents
 - UR_306: Number of people affected
 - UR_314: Assign tasks to first responders
 - UR_334: Manage assignments in case of new emergencies
 - UR_335: Map of rescue teams and task evaluation.

For “*Session C – Places of Relief*”, the new test steps of the operational scenario are:

- *“Assign task to first responder to go from one relief place to another to help the situation”* and the expected behaviour will be “specific instructions are sent through the beAWARE mobile app to the rescuer to go from one relief place to the other”. This step is covering:
 - UR_313: First Responders status
 - UR_314: Assign tasks to first responders
 - UR_316: Capacity of relief places
 - UR_327: Send emergency reports
- *“Give specific evacuation orders to First Responders”* and the expected behavior will be “specific instructions are sent through the beAWARE mobile app to the rescuers to evacuate the relief place”. This step is covering:

- UR_313: First Responders status
- UR_314: Assign tasks to first responders
- UR_316: Capacity of relief places
- UR_325: suggested places for relief
- UR_327: Send emergency reports.

As it is shown above, each step is not related to only one User Requirement but to multiple ones which are connected to each other. Of course, those are not the only User Requirements that will be tested but they are the core related to the new test steps of the heatwave scenario.

To summarize, since this will be the final version of the system, a full-scale test will take place answering all the Use Cases and User Requirements in order to use all the components of the platform and the mobile application of the beAWARE, so as to evaluate their operational status. Finally, the final updated heatwave scenario is presented below.

Table 18. Heatwave updated scenario

Description	Legacy tools	beAWARE	Trigger	Expected behavior	Players
Session A - Pre-crisis GOAL: early warning, understand the problem, send the first alerts					
According to the weather forecast there is an estimate that a severe heatwave is coming in 3 days.	Email, phone call, VHF	Crisis classification - <ul style="list-style-type: none"> > PSAP o forecast data o highest temperature value o Average value from 4 places 	Crisis Classification run	See all the metrics and decide if there is a heatwave or not	3 PSAP operators (these roles will be there the whole time of the pilot in all sessions)
Authorities are issuing a warning informing the general public, public authorities and first responders to be prepared for high temperatures for the next days.	Email, phone call, VHF	Public alert -> mobile app		Send three alerts <ul style="list-style-type: none"> • Message for public • Message for authorities • Message for first responder 	4 end users with app 4 citizens with the app
General instructions are given to the general public through the press, social media and public releases.	Email, phone call, VHF	Public alert->mobile app		More specific instructions based on location and age group are given through the beAWARE	4 end users with app 4 citizens with the app

				mobile app base on age location	
<i>A risk assessment regarding a forest fire which occurs after a heatwave</i>	<i>Email, phone call</i>	<i>Crisis classification - > PSAP o forecast data o highest temperature value Average value from 4 places</i>		<i>More specific and detailed information and data will be analyzed and the PSAP based on those will take actions (eg inform Rescue Teams, Authorities etc)</i>	<i>3 PSAP operators</i>
Session B - Traffic Jam GOAL: understand the status of the heatwave, the problem of the electrical supply and the streets that are blocked					
The day of the heatwave starts with 39°C at 11.00 AM. The alert system changes to yellow. All public authorities agencies related with the heatwave are in a state of alert.	no extra information	Crisis classification - > PSAP o forecast data o highest temperature value o Average value from 4 places	Crisis Classification run	See all the metrics and decide if there is a heatwave or not	3 PSAP operators (these roles will be there the whole time of the pilot in all sessions)

The day of the heatwave starts with 39°C at 11.00 AM. The alert system changes to yellow. All public authorities agencies related with the heatwave are in a state of alert, and a dedicated warning is issued by the beAWARE platform to all its users.	Email, phone call, VHF	Public alert->mobile app		All public authorities agencies related with the heatwave are in a state of alert, and a dedicated warning is issued by the beAWARE platform to all its users.	2 end users with app 2 citizens with the app
At 12.30 PM the temperature rises to 42°C. Due to the extreme temperatures and extensive AC use, the electrical supply system is overcharged and there is a power outage.	Call	Mob app, text report	inform them about the black out	End user send a report	2x(2 end users in the field)
	Email, phone call, VHF	Public alert->mobile app		The alert system changes to orange. The first responders are notified on the first cases that need to intervene through the platform and VHF	4 end users with app
Due to the power cut, the roads are blocked with heavy traffic. The places of relief are beginning to accept	Email, phone call, VHF	Public alert->mobile app	inform the authority the places of relief are open	Public is advised with updated instructions through the beAWARE mobile app and guided to the nearest place of relief.	4 citizens with the app

people who are seeking shelter there.					
<ul style="list-style-type: none"> At 14.30 the temperatures rises further to 45°C. The alert system is upgraded to red. The authorities issue a warning through press releases, mass media and through posts on social media accounts. 	Email, phone call, VHF				
	Email, phone call, VHF	mob app report 4 images 4 videos from the street	inform them when to send the reports (every 5 minutes)	report about the traffic	2 end users in the field
	Email, phone call, VHF	Public alert->mobile app	inform the authority the places of relief are open	Due to the power cut, the roads are blocked with heavy traffic. The places of relief are beginning to accept people who are seeking shelter there. The platform notifies the public of the nearest available location.	4 citizens with the app

<i>Authorities track 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</i>	<i>Email, phone call, VHF</i>	<i>mobile app</i>	<i>inform the authorities with the position of the rescuers</i>	<i>Map of rescue teams and task evaluation</i>	<i>2 rescuers with the mobile app</i>
<i>Give specific evacuation orders to First Responders of people trapped inside a building/elevator etc</i>	<i>Email, phone call, VHF</i>	<i>mobile app</i>	<i>inform the rescuers after a call or at tweet that a person asks for help</i>	<i>specific instructions are sent through the beAWARE mobile app to the rescuers to rescue people in danger</i>	<i>2 rescuers with the mobile app</i>
<i>Another incident occurs near the first one and PSAP send part of the active team in the area to deal with the new incident</i>	<i>Email, phone call, VHF</i>	<i>mobile app</i>	<i>new incident from phone call, tweet which is near the active team on the field</i>	<i>specific instructions are sent through the beAWARE mobile app to the rescuers to assist in the new danger</i>	<i>2 rescuers with the mobile app</i>
At 14.30 the temperatures rises further to 45°C. The alert system is upgraded to red.	Email, phone call, VHF	Public alert->mobile app		The public is advised through the beAWARE platform and mobile app to stay at home, in cool areas or seek shelter to air-conditioned places.	

			The call centers of public authorities are receiving numerous calls of elderly with health people who are stuck in their houses without AC and elevator, and require immediate attention.		
All the main roads are blocked due to the jam and lack of traffic lights.					
Some of shelters are beginning to arrive to the critical 80% of capacity and specific		social media	live tweets		
Some of shelters are beginning to arrive to the critical 80% of capacity and specific		social media	dataset		
Some of shelters are beginning to arrive to the critical 80% of capacity and specific	Email, phone call, VHF	Mob-app		Reports from shelters with images and videos	
<i>Assign task to first responder to go from one relief place to another to help the situation</i>	<i>Email, phone call, VHF</i>	<i>mobile app</i>	<i>Second place of relief, needs assist, request from mobile app</i>	specific instructions are sent through the beAWARE mobile app to the rescuer to go from one relief place to the other	<i>1 rescuer with the mobile app</i>

specific instructions are sent through the beAWARE mobile app to the public to show which relief place is still open and easier to access	Email, phone call, VHF	Public alert->mobile app		specific instructions are sent through the beAWARE mobile app to the public to show which relief place is still open and easier to access	
<i>Give specific evacuation orders to First Responders</i>	<i>Email, phone call, VHF</i>	<i>mobile app</i>	<i>After an incident evacuation orders are given from mobile app to the rescuers for a specific place of relief</i>	specific instructions are sent through the beAWARE mobile app to the rescuers to evacuate the relief place.	<i>3 rescuers with the mobile app, 10 citizens</i>
Session C(2) - fade out					
Report from the team in the field	Email, phone call, VHF	Public alert->mobile app		Using the analysis with media from traffic of the platform and by notifying the general public to avoid taking cars, the traffic is progressively decreasing in the road and by 16.00 the roads are clearer. The temperature for the first time drops to 43°C.	

Gradually, the phenomenon is managed, the temperature drops below 36 °C, power is restored and people return to their homes from the shelters. Nevertheless, to the weather forecast for the next days, authorities are on alert to manage any event that might rise during the duration of the phenomenon.	Email OR phone call OR VHF	Crisis classification - > PSAP o forecast data o highest temperature value o Average value from 4 places	Crisis Classification run		
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6 Conclusions

In this deliverable, an in-depth analysis of the final use cases and user requirements for the three scenarios was made. Initially, the first and the second prototype (P1 and P2) evaluation outcomes were presented, which lead beAWARE consortium to the final Use Cases and User Requirements that will be tested in the final pilot in Valencia. In the next three chapters, a thorough analysis of each scenario was made where the final Use Cases, User Requirements and all operational scenarios were presented. Furthermore, regarding the Fire Scenario, a more in-depth presentation was offered. Since it will be the last pilot of the project, the demonstration site that the pilot will take place was presented as well along with all supporting activities, protocols and equipment that will be used during its execution.

The successful completion of the heatwave and flood pilots, where the P1 and P2 were introduced, gave a very significant boost to the consortium through participation and observation and in full cooperation between technical partners and end users. In addition, based on their evaluation, the positives findings and those that are needed to be modified, or to be updated, a methodological upgrade of the system has taken place, in order to have the final set up of the beAWARE system that will be presented in the fire pilot in Valencia. In this pilot the final Use Cases, User Requirements and operational scenarios will be tested and have a full and functional system based on the needs of the end users.

The process that was followed from D2.1 up to this Deliverable gave the opportunity to the consortium to take into account information from all the steps (internal tests, pilot executions, and evaluations) which were gathered and categorized based on the scenario of each pilot. The findings, from the steps, have been recorded, thanks to the iterative and gradual approach which guided the technical partners and end users to ensure that the URs and UCs will be thoroughly fulfilled. After the third pilot, the final evaluation will take place, which will evaluate the final beAWARE system.

To sum up, the finalization and success of the project are based on the methodological evolution of the beAWARE system, which will unfold its final version in the third pilot and will be presented in D7.8 Final beAWARE system.

7 Appendix A

7.1 Flood Scenario

UC_102 - Management of new flood emergencies

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

This Use Case has been updated after D2.1 in order to include measures taken by the sensors that have been integrated into the platform.

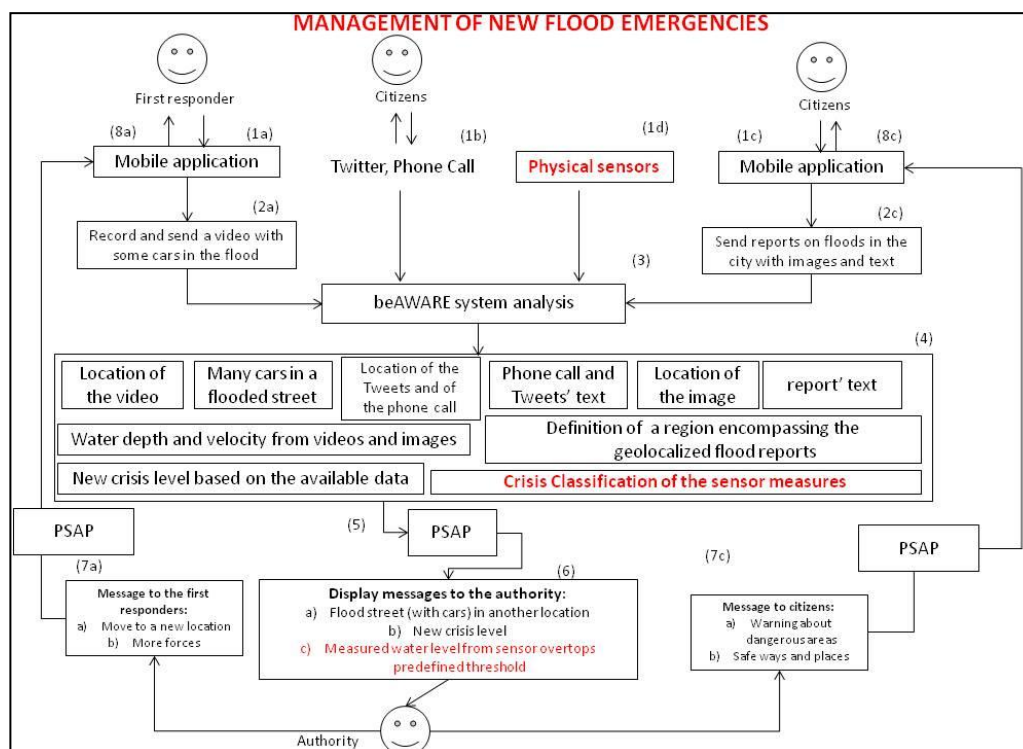


Figure 2. Block Diagram of the updated UC_102

The table below provided a comparison between the updated version of the UC and the initial one.

Table 19. Updates from the UC_102

D2.1	D2.10
Name	Name
Management of new flood emergencies	Management of new flood emergencies
Diagram	Diagram

<p>MANAGEMENT OF NEW FLOOD EMERGENCIES</p> <p>The flowchart illustrates the initial phase of the scenario. It starts with three main data sources: a First responder (8a), Citizens (1b), and a Mobile application (1c). The First responder (8a) sends a video (2a) to the Mobile application (1a), which then records and sends it (2a) to the beAWARE system analysis (4). Citizens (1b) send reports (3) to the Mobile application (1c), which also records and sends them (2c) to the beAWARE system analysis (4). The Mobile application (1c) also sends reports (3) to the beAWARE system analysis (4). The beAWARE system analysis (4) processes the data and outputs a new crisis level based on available data (5). This crisis level is then used to display messages to the authority (6) and to citizens (7c). The authority (6) sends messages to the first responders (7a) and to citizens (7b). The first responders (7a) then move to a new location (7a) and send more forces (7a). The citizens (7b) receive warnings about dangerous areas and safe ways and places (7b).</p>	<p>MANAGEMENT OF NEW FLOOD EMERGENCIES</p> <p>The flowchart illustrates the initial phase of the scenario. It starts with three main data sources: a First responder (8a), Citizens (1b), and a Mobile application (1c). The First responder (8a) sends a video (2a) to the Mobile application (1a), which then records and sends it (2a) to the beAWARE system analysis (4). Citizens (1b) send reports (3) to the Mobile application (1c), which also records and sends them (2c) to the beAWARE system analysis (4). The Mobile application (1c) also sends reports (3) to the beAWARE system analysis (4). The beAWARE system analysis (4) processes the data and outputs a new crisis level based on available data (5). This crisis level is then used to display messages to the authority (6) and to citizens (7c). The authority (6) sends messages to the first responders (7a) and to citizens (7b). The first responders (7a) then move to a new location (7a) and send more forces (7a). The citizens (7b) receive warnings about dangerous areas and safe ways and places (7b).</p>
<p>Explanation</p>	<p>Explanation</p>
<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> During the flood <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Location of the flooded area <p>What is happening</p> <ul style="list-style-type: none"> 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 <p>Outcome</p> <ul style="list-style-type: none"> 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 	<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> During the flood <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Location of the flooded area Sensors of the weather stations <p>What is happening</p> <ul style="list-style-type: none"> 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 The system compares the measured data with the fixed thresholds and detects a threshold exceeding [New] The system defines a new crisis level based on the available data [New] <p>Outcome</p> <ul style="list-style-type: none"> 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

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 river water level both by the installed sensors and the results of visual analysis from cameras.

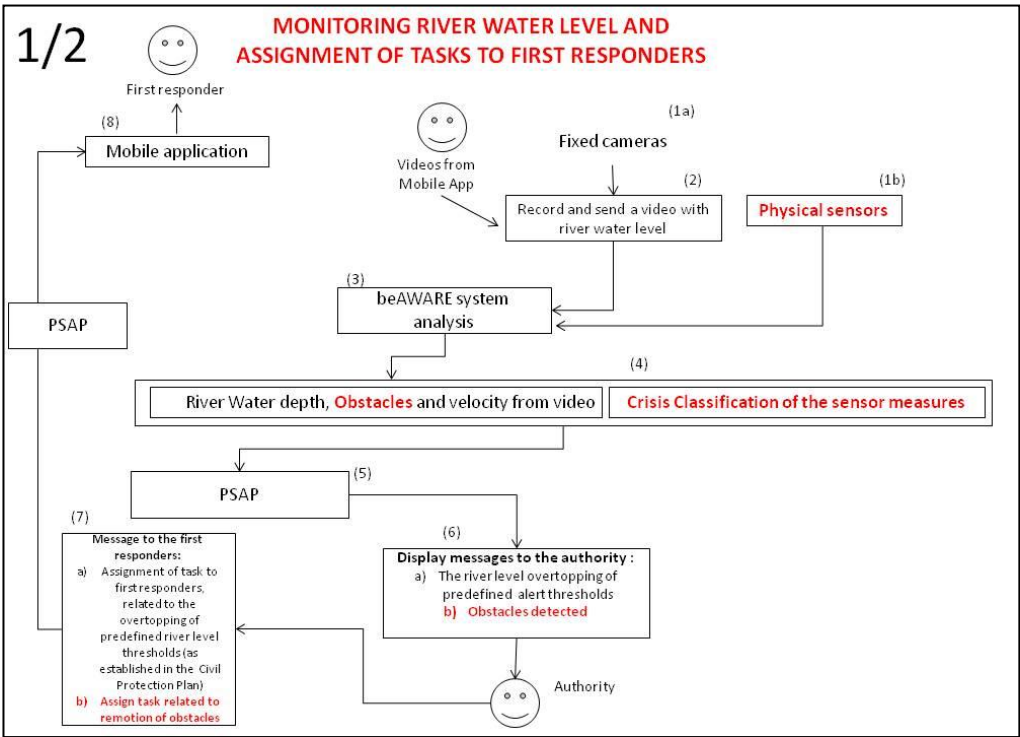


Figure 3. Block Diagram of the updated UC_103

The table below provided a comparison between the updated version of the UC and the initial one.

Table 20. Updates from the UC_103

D2.1	D2.10
Name	Name
Monitoring river water level and assignment of tasks to first responders	Monitoring river water level and assignment of tasks to first responders
Diagram	Diagram
Explanation	Explanation
<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before the flood <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Predefined alert thresholds of river level Location of the forecasted flooded area <p>What is happening</p> <ul style="list-style-type: none"> 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 <p>Outcome</p> <ul style="list-style-type: none"> Once the river water level overtops predefined alert thresholds, the 	<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before the flood <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Sensors of the weather station for water level measures <i>[New]</i> Predefined alert thresholds of river level Location of the forecasted flooded area <p>What is happening</p> <ul style="list-style-type: none"> A fixed camera, located in correspondence of a river section of interest, records continuously water level inside the river The system compares the measured data from sensors and the estimated water level from video analysis with the fixed thresholds aiming to detect a threshold exceeding <p>Outcome</p>

authority (e.g. mayor) assigns tasks to first responders	<ul style="list-style-type: none"> Once the river water level overtops predefined alert thresholds, the authority (e.g. mayor) assigns tasks to first responders Once the video analysis detects the presence of obstacles in the river (i.e trunks) that can create an obstruction to the flow and increase the water level, the authority (e.g. mayor) assigns tasks to first responders
Omitted tasks	Explanation
<ul style="list-style-type: none"> A citizen records video continuously of water level inside the river 	<p>This task should be omitted due to the following technical limitation:</p> <ul style="list-style-type: none"> It is very challenging to estimate the river's water level from arbitrary viewpoints due to algorithmic calibration requirements

UC_105: Monitoring rainfall

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

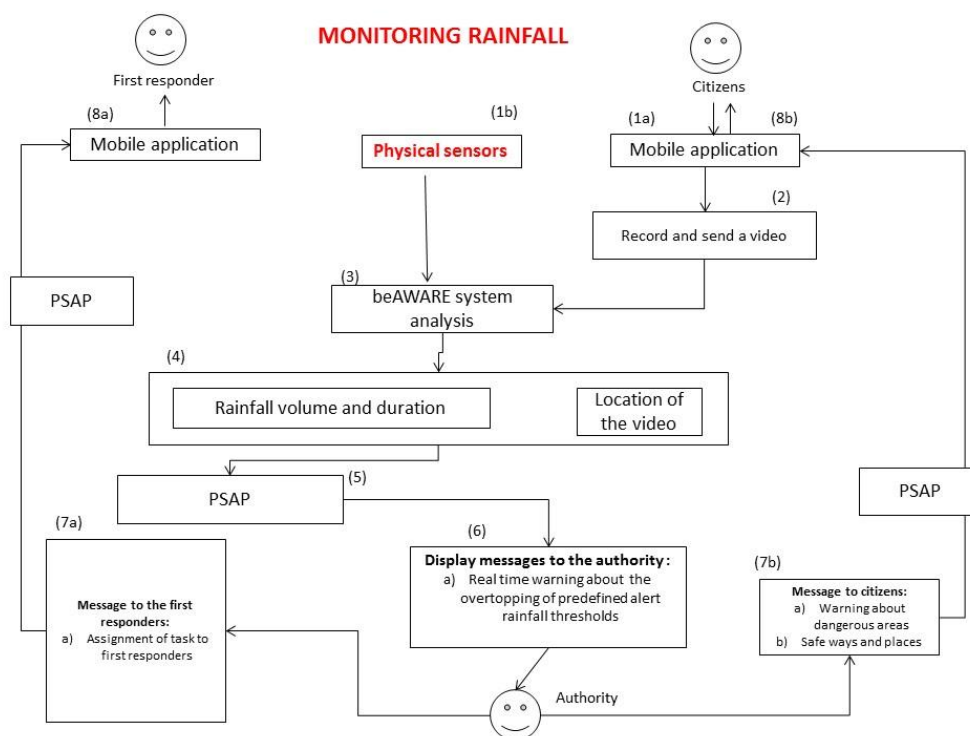


Figure 4. Block Diagram of the updated UC_105

The table below provided a comparison between the updated version of the UC and the initial one.

Table 21. Updates from the UC_105

D2.1	D2.10
Name	Name
Monitoring rainfall	Monitoring rainfall
Diagram	Diagram
Explanation	Explanation
<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> During an intense rainfall event <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Land use Soil moisture Location of the forecasted flooded area Predefined alert rainfall thresholds <p>What is happening</p> <ul style="list-style-type: none"> Citizens are recording a video about a rainfall event <p>Outcome</p> <ul style="list-style-type: none"> 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 	<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> During an intense rainfall event <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather observations Land use Soil moisture Location of the observed flooded area Predefined alert rainfall thresholds <p>What is happening</p> <ul style="list-style-type: none"> Sensing data regarding weather observations (temperature, precipitation) are obtained and analyzed Citizens are recording a video about a flooded area impacted after a rainfall event <p>Outcome</p> <ul style="list-style-type: none"> Video analysis confirms that the area is flooded 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
--	---

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.

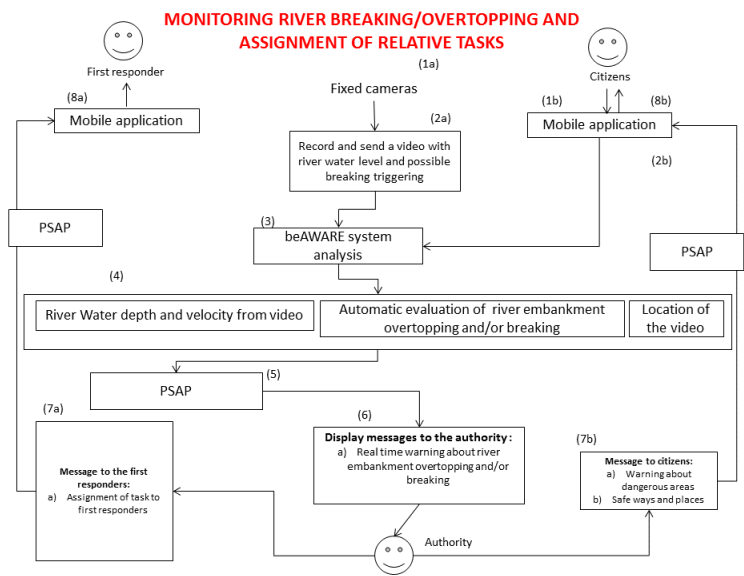


Figure 5. Block Diagram of the updated UC_106

The table below provided a comparison between the updated version of the UC and the initial one.

Table 22. Updates from the UC_106

D2.1	D2.10
Name	Name
Monitoring river breaking/overtopping and assignment of relative tasks	Monitoring river breaking/overtopping and assignment of relative tasks
Diagram	Diagram
Explanation	Explanation
<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before the flood <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Location of the forecasted flooded area <p>What is happening</p> <ul style="list-style-type: none"> 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 <p>Outcome</p> <ul style="list-style-type: none"> 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 	<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before the flood <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Location of the forecasted flooded area <p>What is happening</p> <ul style="list-style-type: none"> Static surveillance cameras, located in the river sections of interest, record continuously water level inside the river and the possible overtopping triggering Citizens are sending messages via mobile application concerning the river embankments and overtopping <p>Outcome</p> <ul style="list-style-type: none"> Once the water level rises and it's close to overflow the authority (e.g. mayor) assigns tasks to first responders Once the water level rises and its close to overflow the authority (e.g. mayor) sends notifications to citizens approaching the

	dangerous areas and suggests alternative ways
--	---

UC_108: Sensor and Flood forecasting alerts

This Use Case concerns the automatic creation of alert based on the detection of threshold exceeding both from the forecast (alert for future flood event) and from the real-time measurement of the sensors (incoming flood events).

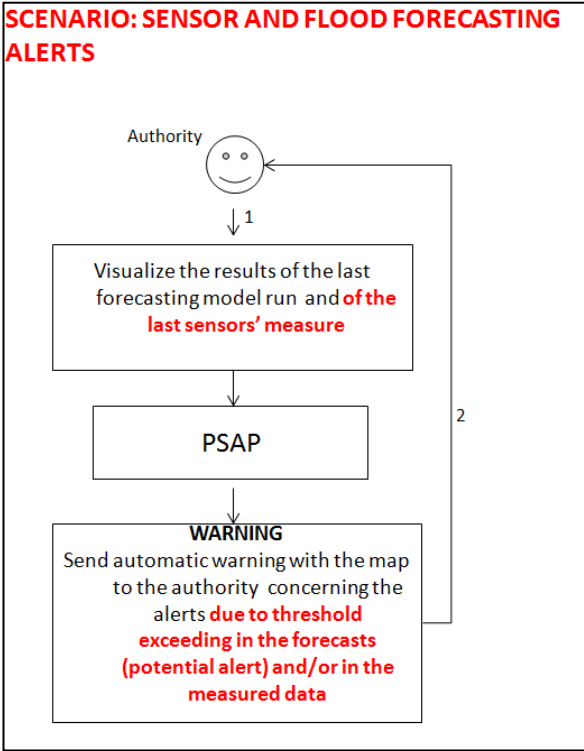


Figure 6. Block Diagram of the updated UC_108

Table 23. Updates from the UC_108

D2.1	D2.10
Name	Name
Flood forecasting alerts	Sensors and flood forecasting alerts
Diagram	Diagram

<pre> graph TD Authority((Authority)) -- 1 --> QUERY[QUERY Visualize the results of the last forecasting model run] QUERY --> PSAP[PSAP] PSAP --> WARNING[WARNING Send automatic warning with the map to the authority concerning the potential alerts (red point in the map)] WARNING -- 2 --> Authority </pre>	<pre> graph TD Authority((Authority)) -- 1 --> QUERY[Visualize the results of the last forecasting model run and of the last sensors' measure] QUERY --> PSAP[PSAP] PSAP --> WARNING[WARNING Send automatic warning with the map to the authority concerning the alerts due to threshold exceeding in the forecasts (potential alert) and/or in the measured data] WARNING -- 2 --> Authority </pre>
Explanation	Explanation
<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before a flood event <p>What is happening</p> <ul style="list-style-type: none"> Intense rainfall event is forecasted <p>Outcome</p> <ul style="list-style-type: none"> 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 	<p>Current Status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before a flood event and/or in its initial phase <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Sensors of the weather stations for water level measurements Predefined alert thresholds of river water level <p>What is happening</p> <ul style="list-style-type: none"> Intense rainfall event is forecasted The system compares the forecasted data with the fixed thresholds and detects a possible threshold exceeding [New] The system compares the real-time measured data with the pre-defined alarm threshold and detects a threshold exceeding [New] <p>Outcome</p> <ul style="list-style-type: none"> The Mayor can visualize if there are overtopping of alert thresholds in the modeled river cross sections The Mayor can visualize if there are overtopping of alert thresholds in the sensor's measures Warnings are sent automatically to the authority concerning the threshold exceeding

	(both regarding forecasts and/or measured data) <ul style="list-style-type: none"> The authority can decide if sent these warning to Citizen as public alerts.
--	---

UC_109: Acquiring images and video from drones and static cameras for flood risk management

This use case is related to the images and videos taken by drones and installed static cameras as well as their visual analysis in order to:

- Detect the water level (Low/Medium/High)
- Detect the extension of the flooded area
- Detect the presence of people/car in the river

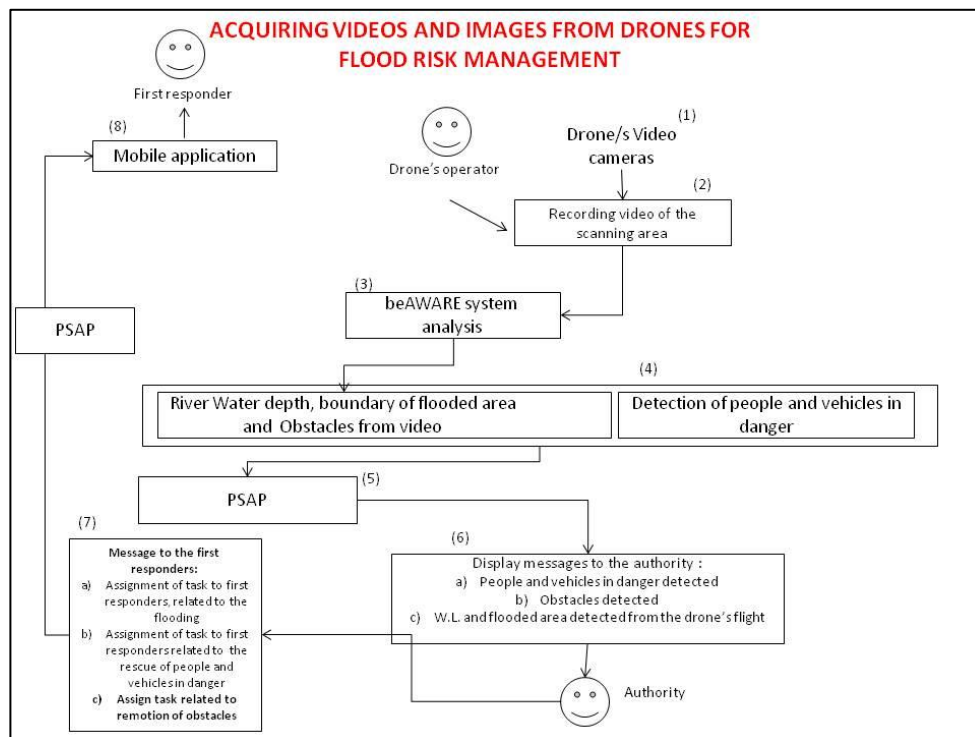


Figure 7. Block Diagram of the updated UC_109

Current Status (initial phase of the scenario)

- During the flood

What will happen:

- Video and images from drones and installed surveillance (static) cameras arrive at the beAWARE system.
- Visual analysis is applied to media files in order to detect the water level, the extension of the flooded area and the potential presence of people and vehicles in the river.

Outcome

- Once the presence of people and car in danger is detected, the authority (e.g. mayor) assigns tasks to first responders

UC_110: Management of the sand packs distribution points and of Safe Places

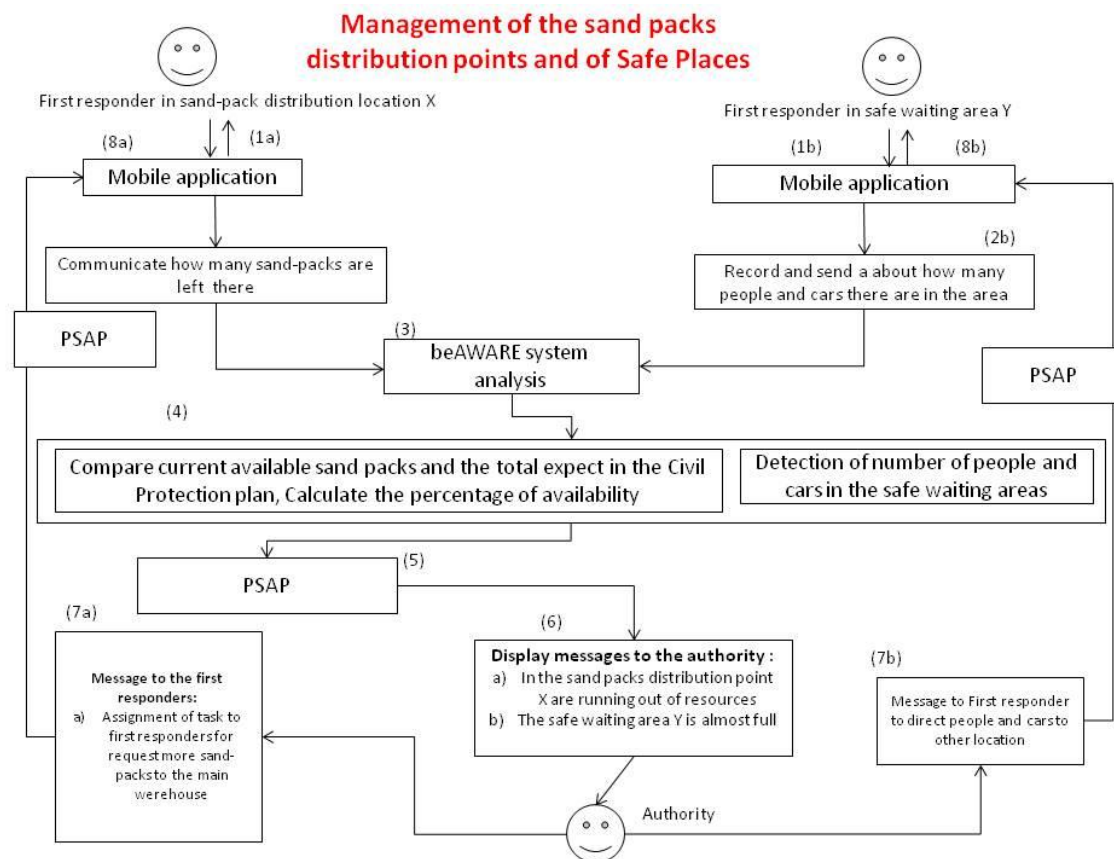


Figure 8. Block Diagram of the updated UC_110

More in detail, the Use Case 110 concerns the monitoring of the safe places and the points of distribution of Sand Packs during the flood, when first responders are sending to Authority continuous updates about the capacity of the safe waiting areas and of the availability of resources (sand packs) in the distribution points; the Authority is able to real-time monitor this information from the dashboard of PSAP and requests to the rescue teams, if necessary, to bring more resources from the main warehouse or to direct people in other safe waiting areas.

Current Status (initial phase of the scenario)

- During the flood

What is known to the beAWARE system already:

- Weather forecast
- Current status of occupancy of the safe waiting areas
- Capacity of each place
- Current number of Sand packs in the distribution points
- Number of sand packs for each place indicated by the Civil Protection Plan

What is happening:

- A first responder or the person in managing the place is recording a video of the crowded safe waiting areas
- A first responder sends a report updating about the sand packs available in the distribution point
- The system is able to detect from the video that a safe waiting area is almost full
- The system calculates the percentage of sand-packs available respect to the total requested by the Civil Protection Plan

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 the PSAP's screen
- The authority assigns to the first responders the task to ask for more sand-packs from the main warehouse
- The status of each distribution point is shown on PSAP's screen

7.2 Fire Scenario

UC_202: Activation of first responders

This use case concerns the activation process of first responders from the moment when fire is detected to the moment when first responders receive their tasks. It shows the use of the mobile application as a tool to enter data into the beAWARE system, as well as when the decision for the activation of first responders has been made.

This use case has been updated after D2.1, as some data input that were initially considered have finally been discarded (thermal/fixed camera detecting the fire).

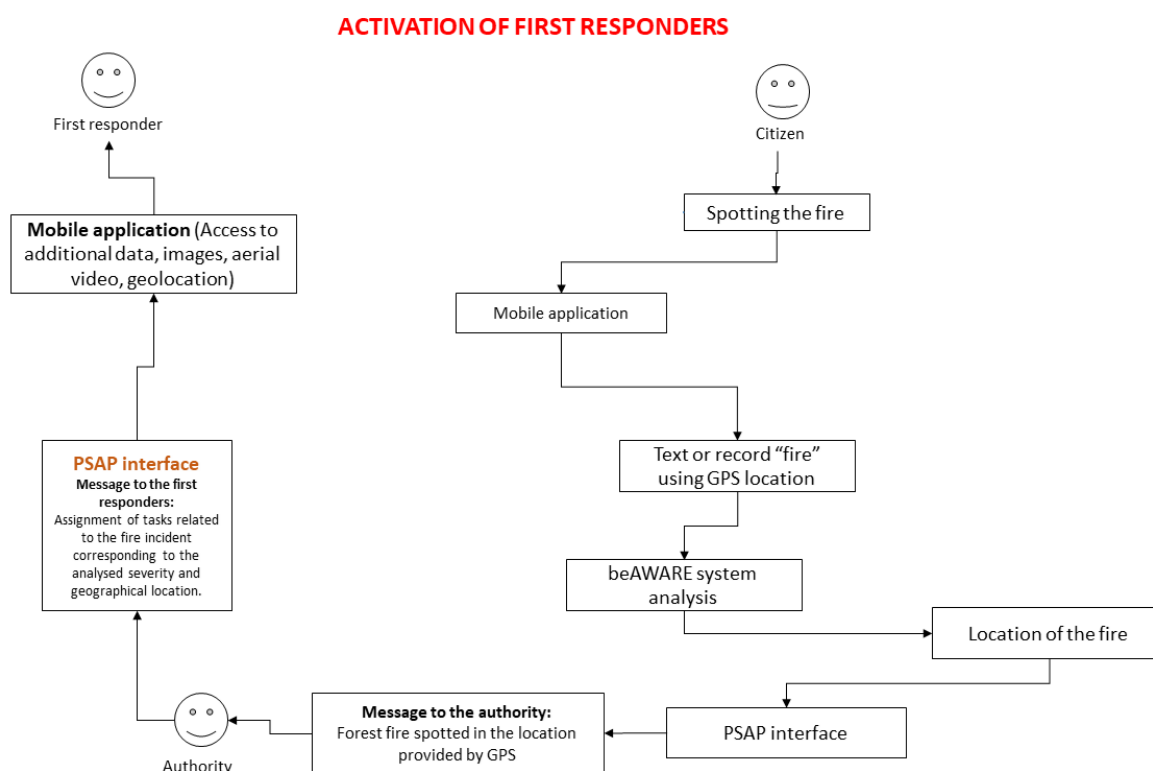


Figure 9. Block diagram of the updated UC_202

The table below provided a comparison between the updated version of the UC and the initial one.

Table 24. Updates from the UC_202

D2.1	D2.10
Name	Name
Activation of first responders	Activation of first responders

Diagram	Diagram
<p>ACTIVATION OF FIRST RESPONDERS</p>	<p>ACTIVATION OF FIRST RESPONDERS</p>
Explanation	Explanation
<p>Current status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before the fire <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Drought index Available resources Access road <p>What is happening</p> <ul style="list-style-type: none"> A citizen spots the fire and alerts by using mobile application. This makes it possible to locate the position in the forest by GPS. <p>Outcome</p> <ul style="list-style-type: none"> By reporting the fire incident, the authorities are alerted and the available resources and first responders are assigned. 	<p>Current status (initial phase of the scenario)</p> <ul style="list-style-type: none"> Before the fire <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Drought index Available resources Access road <p>What is happening</p> <ul style="list-style-type: none"> A citizen spots the fire and alerts by using mobile application. This makes it possible to locate the position in the forest by GPS. <p>Outcome</p> <ul style="list-style-type: none"> By reporting the fire incident, the authorities are alerted and the available resources and first responders are assigned.

UC 203: 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.

This use case has been updated after D2.1, as new data inputs have been taken into account, and other data input that were initially considered have finally been discarded.

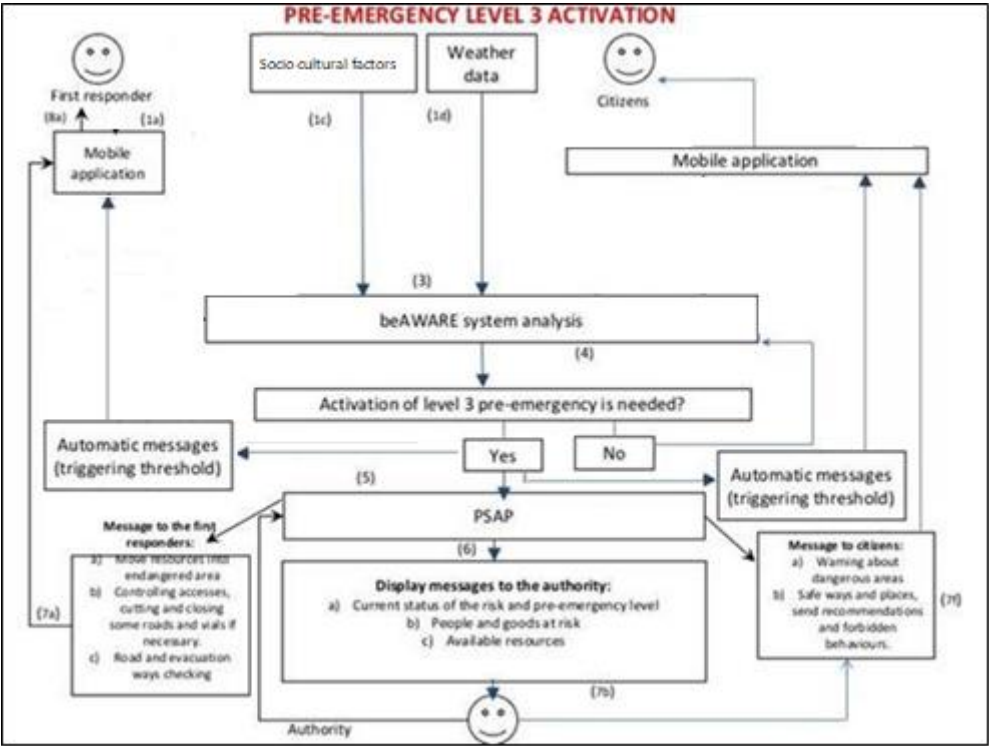


Figure 10. Block Diagram of the updated UC_203

The table below provided a comparison between the updated version of the UC and the initial one.

Table 25. Updates from the UC_203

D2.1	D2.10
Name	Name
Pre-emergency level 3 activation	Pre-emergency level 3 activation
Diagram	Diagram

<p>The flowchart for the left scenario shows inputs from a First responder (1a), Fixed cameras (1b), Drone camera (1c), Weather data (1d), and Citizens (1e) feeding into a Mobile application (2a). The Mobile application sends images, videos, and text (2b) to the beAWARE system analysis (3). The analysis leads to a decision: 'Activation of level 3 pre-emergency is needed?'. If 'Yes', it triggers a PSAP (5) and sends a message to the first responders (7a). If 'No', it triggers automatic messages (5) and sends a message to citizens (7b). The PSAP then displays messages to the authority (6), which include: a) Current status of the risk and pre-emergency level, b) People and goods at risk, and c) Available resources. The authority then sends a message to citizens (7b).</p>	<p>The flowchart for the right scenario shows inputs from a First responder (1a), Socio cultural factors (1c), Weather data (1d), and Citizens (1e) feeding into a Mobile application (2a). The Mobile application sends images, videos, and text (2b) to the beAWARE system analysis (3). The analysis leads to a decision: 'Activation of level 3 pre-emergency is needed?'. If 'Yes', it triggers a PSAP (5) and sends a message to the first responders (7a). If 'No', it triggers automatic messages (5) and sends a message to citizens (7b). The PSAP then displays messages to the authority (6), which include: a) Current status of the risk and pre-emergency level, b) People and goods at risk, and c) Available resources. The authority then sends a message to citizens (7b).</p>
<p align="center">Explanation</p>	<p align="center">Explanation</p>
<p>Current status (initial phase of the scenario)</p> <ul style="list-style-type: none"> There is no fire, and the BeAWARE system is analysing different inputs. <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> It has already received input from weather forecast, and (if available) from fixed cameras, drones and mobile application users. <p>What is happening</p> <ul style="list-style-type: none"> 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. <p>Outcome</p> <ul style="list-style-type: none"> 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. 	<p>Current status (initial phase of the scenario)</p> <ul style="list-style-type: none"> There is no fire, and the BeAWARE system is analysing different inputs (weather data and pre-emergency levels established beforehand). Valencian region pre-establishes certain dates (yearly) which due to festivities and other socio-cultural factors are expected to have more risk than usual, therefore pre-emergency level 3 is activated months before knowing weather conditions of these specific dates. <i>[New]</i> <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> It has already received input from weather forecast, and there is no previously established pre-emergency level 3 in this specific data. <p>What is happening</p> <ul style="list-style-type: none"> The beAWARE system is analysing the convenience of activation of the pre-emergency level 3. This level considers the risk of wildfire as extreme. <p>Outcome</p> <ul style="list-style-type: none"> The beAWARE system determines that level 3 of pre-emergency should be activated, therefore it informs to the PSAP, and send automatic messages to the people and first responders through mobile app. Besides this, authority is able to send specific messages to each one.

Below it is further analysed the UC_204 and how it will be realised during the Pilot. The consortium has determined that this UC (evacuation management during an emergency) is of significant importance for the testing of the beAWARE platform as it consolidates both the pre-emergency and emergency phase. It is worth to note that the UC_203 (Pre-emergency level 3 activation) will be considered as a pre-crisis phase of the UC_204.

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. Additionally, UC_204 focuses on the management of the fire and evacuation of 500 people (460 students and 40 teachers approximately) from a 3-floor building threatened by fire to a safe place. The incident, as previously mentioned, is included within a pre-emergency level 3 (extreme risk of wildfire).

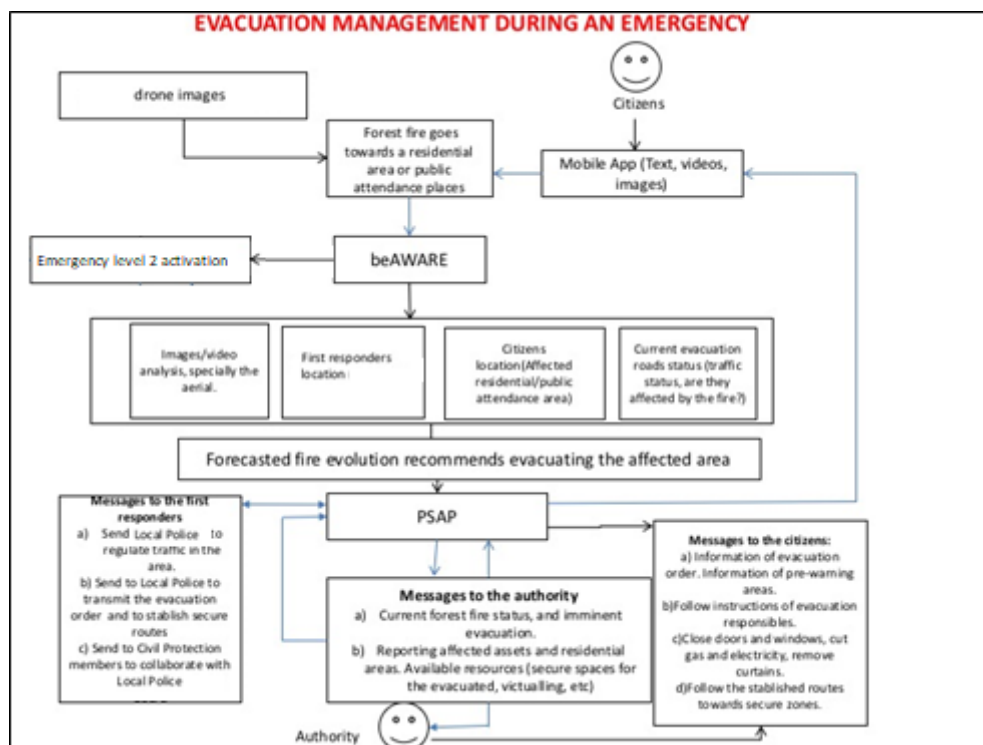


Figure 11. Block diagram of the updated UC_204

It is important to note that triplicating mobilization of personnel or the evacuation of an entire educational center is not feasible, therefore, as it was presented at the subchapter 4.3.

The table below provided a comparison between the updated version of the UC and the initial one.

Table 26. Updates from the UC_204

D2.1	D2.10
Name	Name
Evacuation management during an emergency	Evacuation management during an emergency
Diagram	Diagram
<p>The diagram for D2.1 shows a flow starting from 'Aerial, fixed and drone images' and 'Citizens' (via a Mobile App) sending data to 'Forest fire goes towards a residential area or public attendance places'. This triggers 'beAWARE', which then sends data to 'Images/video analysis, specially the aerial', 'First responders location (Local Police, Civil Guard, Civil Protection)', 'Citizens location (Affected residential/public attendance area)', and 'Current evacuation roads status (traffic status, are they affected by the fire?)'. These inputs lead to a 'Forecasted fire evolution recommends evacuating the affected area', which then triggers a 'PSAP'. The PSAP sends 'Messages to the first responders' (a) and 'Messages to the authority' (a, b). The authority then sends 'Messages to the citizens' (a, b, c, d).</p>	<p>The diagram for D2.10 is similar to D2.1 but includes an additional step: 'Emergency level 2 activation' triggered by 'beAWARE'. The 'Messages to the first responders' list is updated to include 'a) Send Local Police to regulate traffic in the area.' and 'b) Send to Local Police to transmit the evacuation order and to establish secure routes'. The 'Messages to the authority' list is updated to include 'a) Current forest fire status, and imminent evacuation.' and 'b) Reporting affected assets and residential areas. Available resources (secure spaces for the evacuated, virtualizing, etc)'. The 'Messages to the citizens' list is updated to include 'a) Information of evacuation order. Information of pre-warning areas.' and 'b) Follow instructions of evacuation responsibilities.'.</p>
Explanation	Explanation
<p>Current status (initial phase of the scenario)</p> <ul style="list-style-type: none"> During a forest fire <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Location and direction of the fire Location of citizens at risk Location of first responders Road status and secure places locations. <p>What is happening</p> <ul style="list-style-type: none"> 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. <p>Outcome</p> <ul style="list-style-type: none"> The authority informs citizens of evacuation order and the PSAP gives 	<p>Current status (initial phase of the scenario)</p> <ul style="list-style-type: none"> During a forest fire <p>What is known to the beAWARE system already</p> <ul style="list-style-type: none"> Weather forecast Location and direction of the fire Location of citizens at risk Location of first responders Road status and secure places locations. <p>What is happening</p> <ul style="list-style-type: none"> Citizens are sending text, video and images of a forest fire going towards primary and secondary educational centres. Aerial video and images are being sent by the drone as well. <p>Outcome</p>

instructions to first responders in order to facilitate the evacuation.	<ul style="list-style-type: none">• The system updates the crisis level to “emergency level 2” according to the received inputs.• The authority informs affected citizens of the evacuation order and the PSAP gives instructions to first responders in order to facilitate the evacuation.
---	---

7.3 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.

SCENARIO: HEATWAVE FORECASTING ALERTS

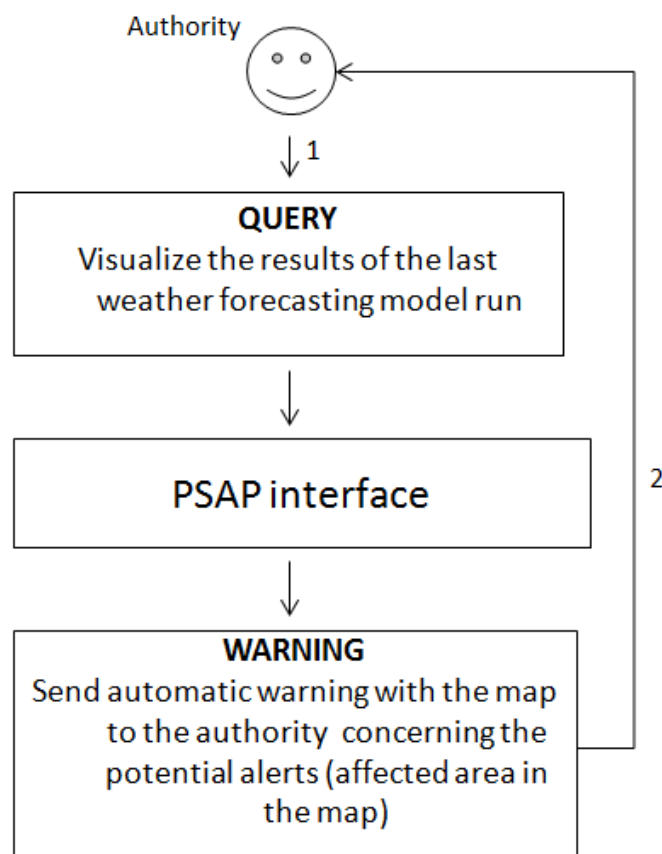


Figure 12. Block Diagram of the UC301

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	35	36	37	38	39	40
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

Figure 13. Heat Index Table¹

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

¹ http://www.eurometeo.com/english/read/doc_heat

- 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

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.

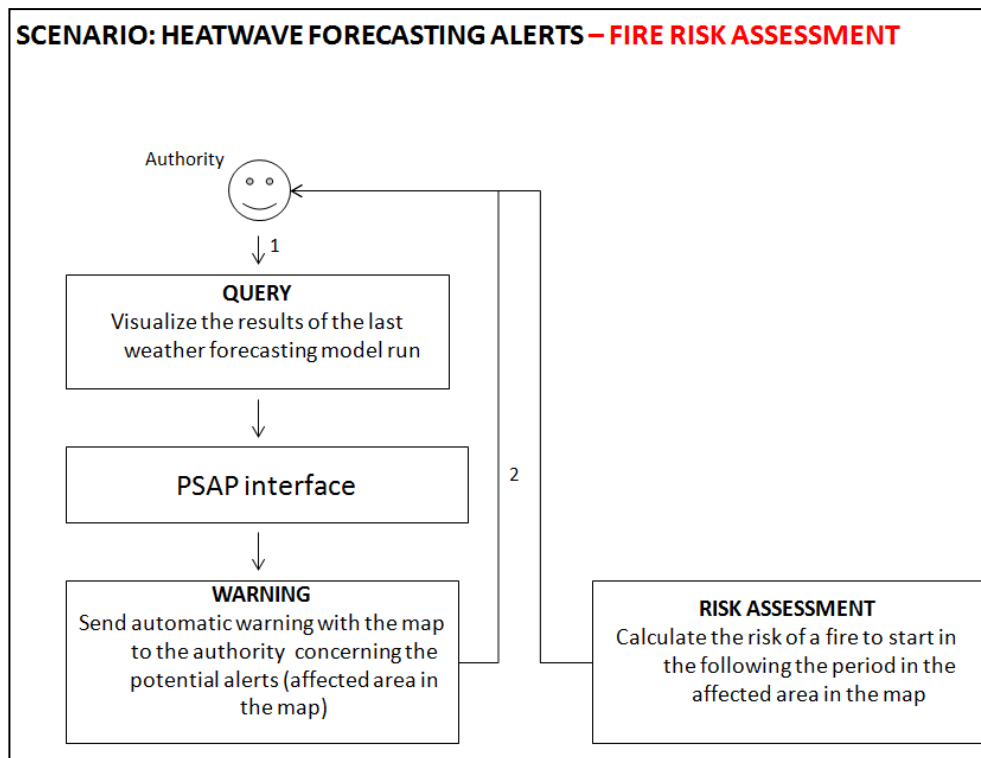


Fig. 7-1. Block Diagram of the UC302

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	

Figure 14. Danger levels for fire exposure²

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

Mobile application equipment

- None

² <http://civilprotection.gr/el/δασικές-πυρκαγιές>

UC_303: First Responder Management

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

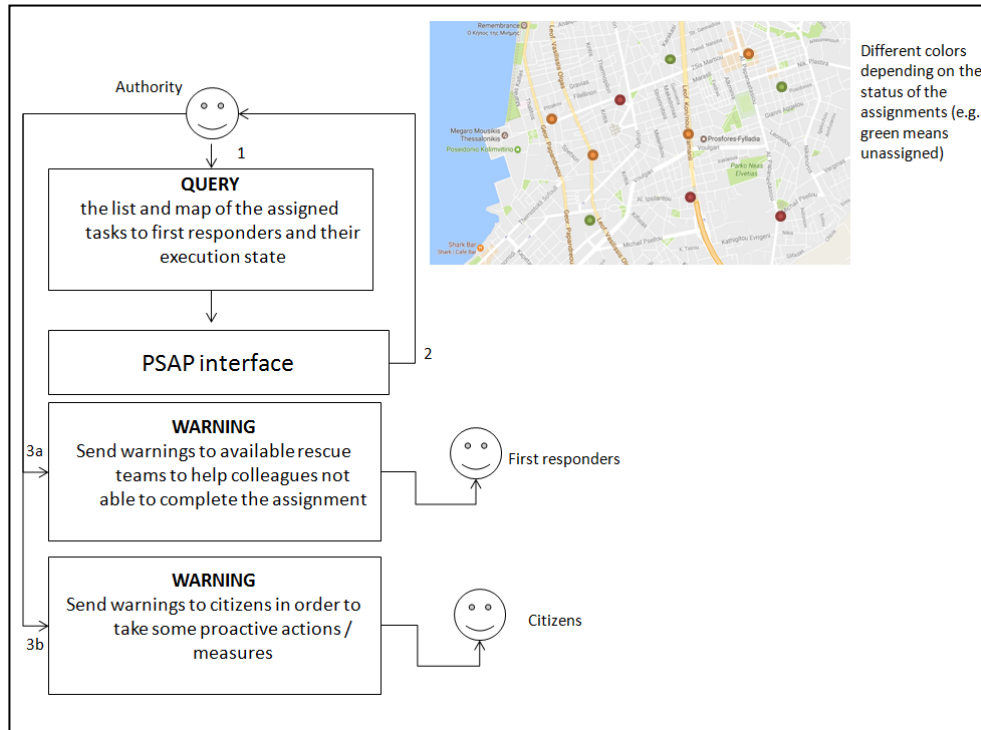


Figure 15. Block Diagram of the UC303

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



Figure 16. 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	Assistance Required
Θέση : Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY	Location : coordinates: North , East Address: Street XX, no. YY
Εργασία Ολοκληρώθηκε	Task Complete
Θέση : Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY	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.

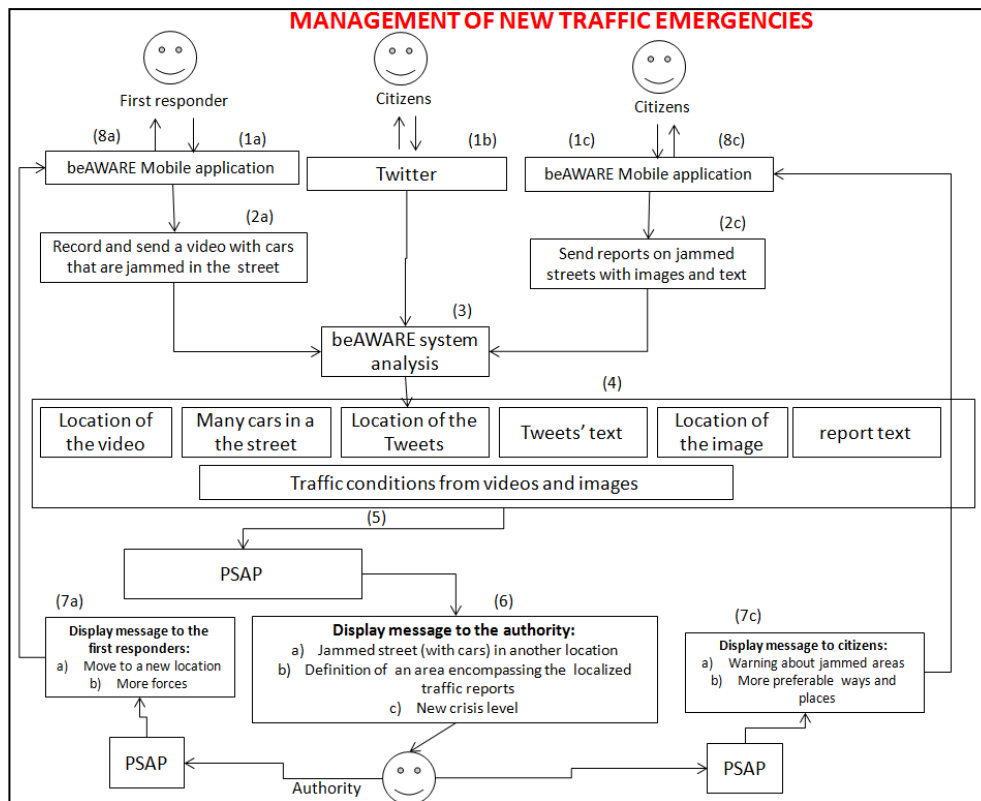


Figure 17. Block Diagram of the UC304

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.)

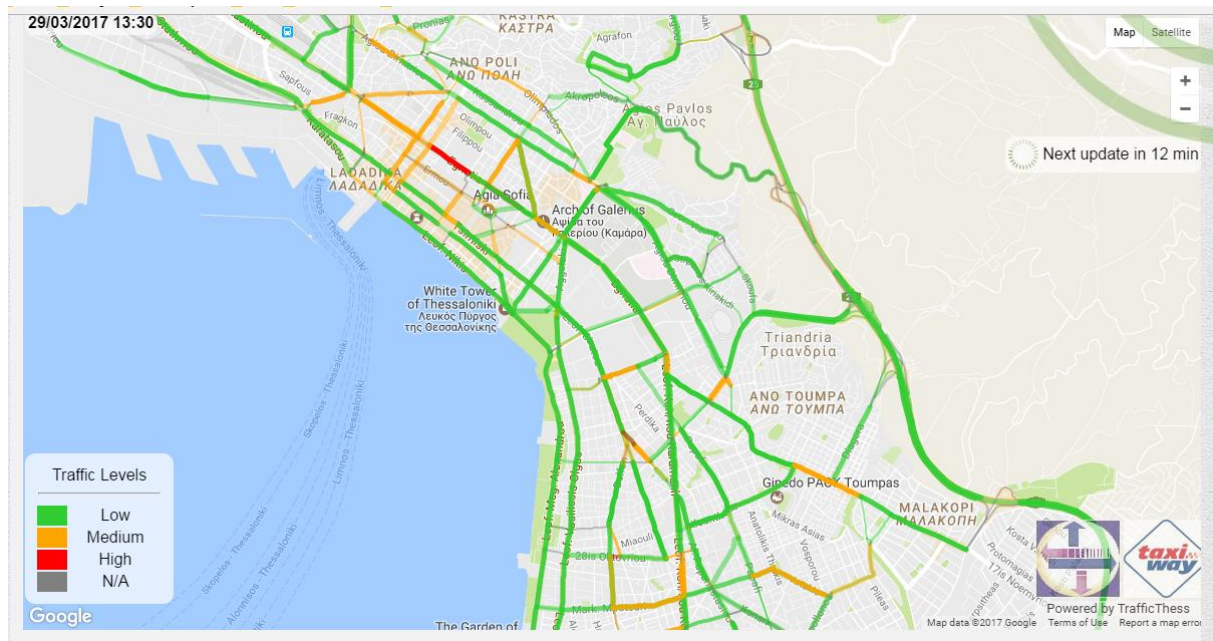


Figure 18. Visualization of real time traffic conditions in the city

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:



Figure 19. Traffic jam in the Thessaloniki ring road



Figure 20. 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.

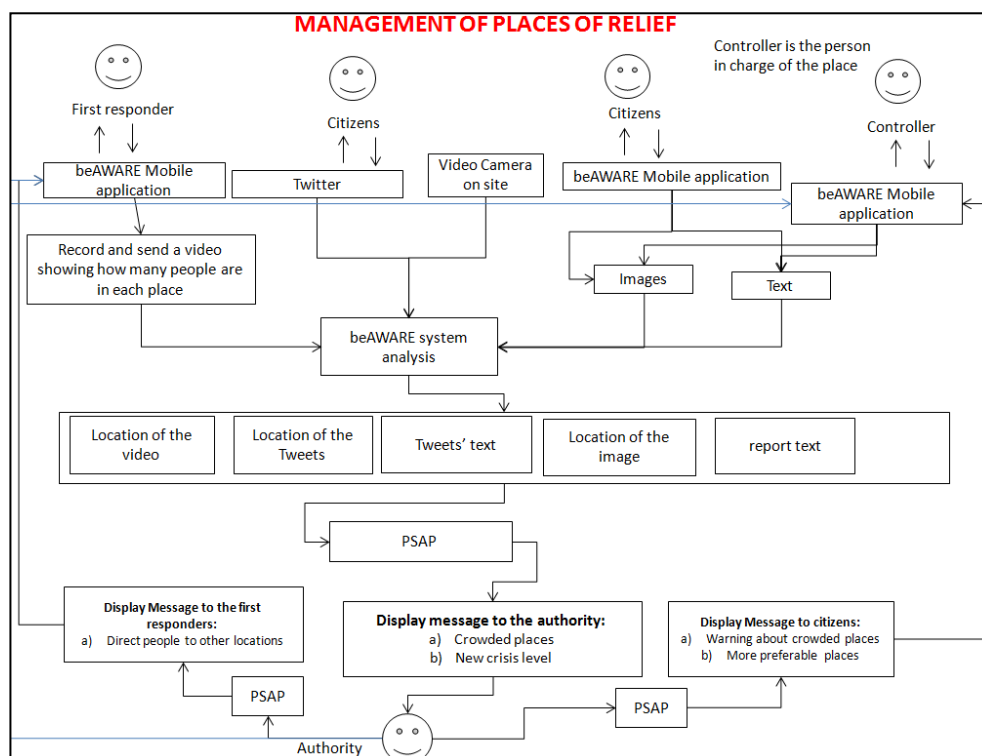


Figure 21. Block Diagram of the UC305

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.)

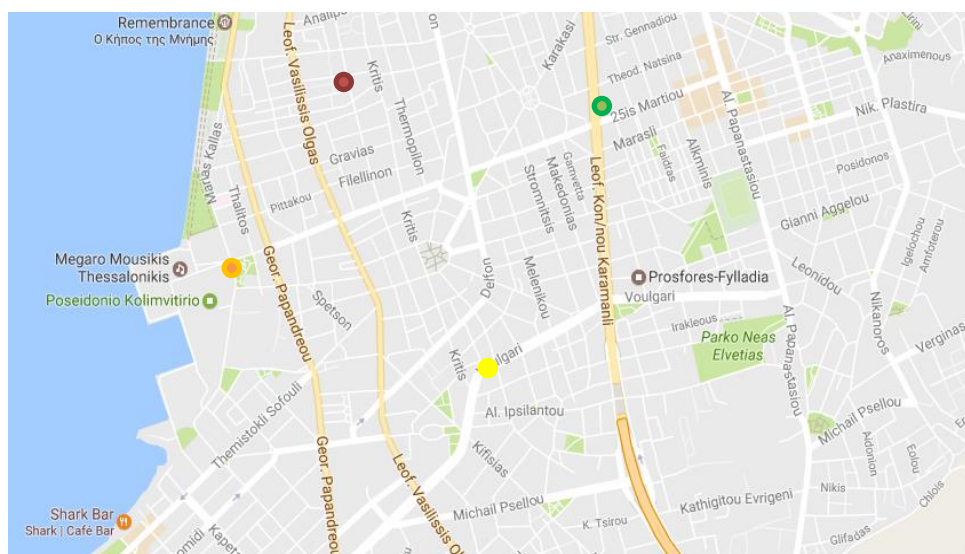


Figure 22. Visualization of the status of places of relief in the city

- 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 «Χ, νο. Υ» έχει φτάσει στο Z% της.	Action: Place in street X, no. Y has reached Z% of its capacity.
Θέση: Διεύθυνση: Οδός Χ, νο. Υ	Location: Address: Street X, no. Y

Example of messages that might be presented to the people

GRE	ENG
Ο χώρος στην οδό «Χ, νο. Υ» έχει φτάσει στο όριο της χωρητικότητας του. Θα σας συνιστούσαμε να μεταβείτε στο χώρο (ή χώρους) που βρίσκεται (ή βρίσκονται) στην οδό ΧΧ, νο. ΥΥ	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 «Χ, νο. Υ» έχει φτάσει στο όριο της χωρητικότητας του. Οδηγήστε τους πολίτες στο (στους) χώρο (χώρους) που βρίσκεται (ή βρίσκονται) στην οδό ΧΧ, νο. ΥΥ	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 «Χ, νο. Υ» έχει φτάσει στο όριο της χωρητικότητας του. Οδηγήστε τους πολίτες στο (στους) χώρο (χώρους) που βρίσκεται (ή βρίσκονται) στην οδό ΧΧ, νο. ΥΥ	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.).

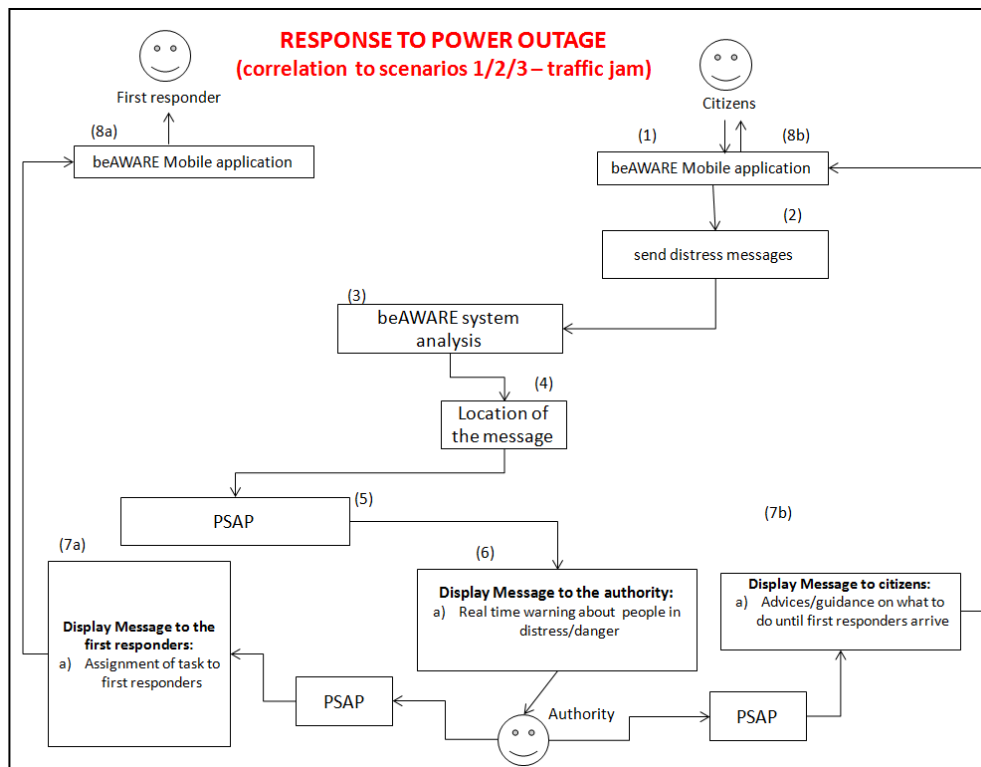


Figure 23. Block Diagram of the UC306

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

- Messages to first responders

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

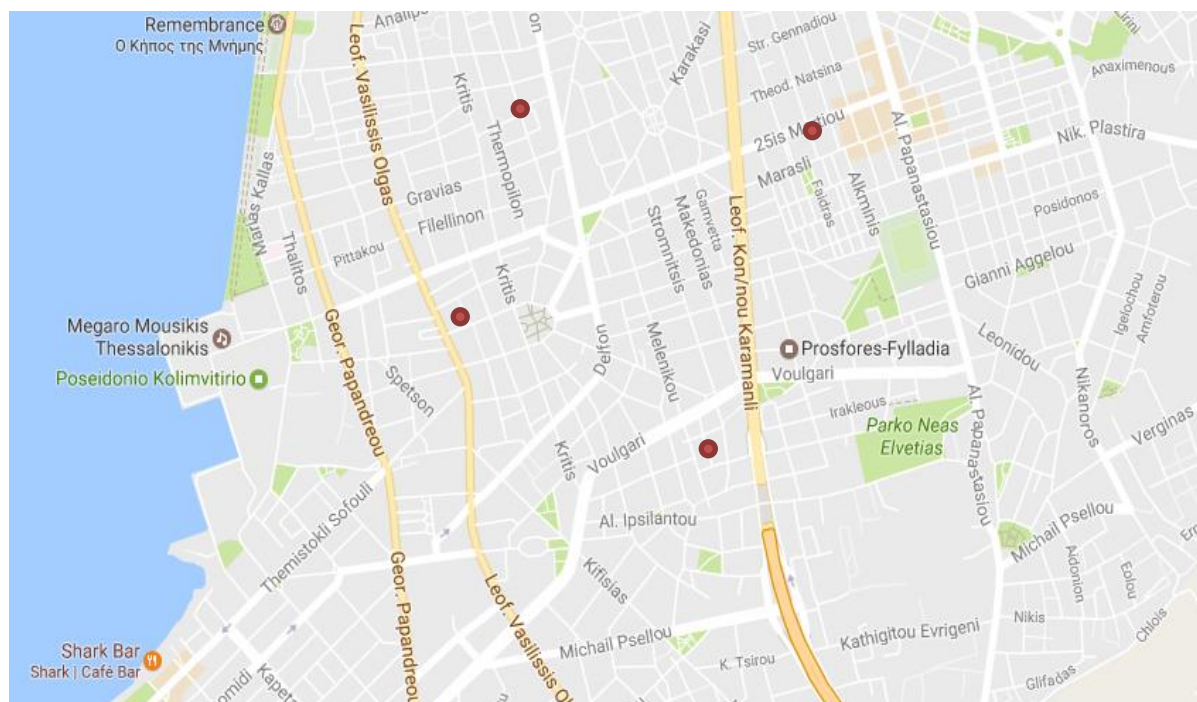


Figure 24. Visual presentation of people in distress

- Dots on a map (e.g. Google Map) in correspondence to the location that the citizen's text was sent
- Dots on a map (e.g. Google Map) in correspondence to the location of available hospitals (green dots) and hospitals that have reached capacity (red dots)

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

GRE	ENG
Υπάρχουν άνθρωποι εγκλωβισμένοι σε ασανσέρ Θέση : Συντεταγμένες: Βορράς , Ανατολή Διεύθυνση: Οδός XX, νο. YY	People stuck in elevators Location : coordinates: North , East Address: Street XX, no. YY

GRE	ENG
Υπάρχουν ηλικιωμένοι εγκλωβισμένοι σε σπίτι 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