beAWARE

Enhancing decision support and management services in extreme weather climate events

700475

D2.6

Evaluation report of the 2nd prototype

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Abstract

This document contains a report of the 2nd beAWARE pilot, which took place in Vicenza (Italy) on 7th March 2019 with the aim to test the beAWARE 2nd prototype against a flood scenario, and a report on the demonstration of the 2nd prototype for the fire and heatwave scenarios. The report includes also the evaluation of beAWARE 2nd prototype based on the interaction of the users with the developed technology during the pilot. The goal of this activity is to evaluate if the 2nd prototype of the platform meets end users' requirements and to address in that direction the technical development and the implementation of the final prototype.

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Executive Summary

The deliverable 2.6 presents the evaluation results of the 2nd beAWARE prototype from the end user's perspective based on the outcomes of 2nd pilot (Vicenza, 25th of February - 7th of March 2019). During that occasion, the main stakeholders of the flood pilot tested the beAWARE platform in the context of their scenario.

The 2nd prototype was evaluated also through the Fire and Heatwave scenarios which were not physically executed, but the platform was presented to the main stakeholders of these two scenarios during demonstrative sessions. After each of these sessions, a user-centred evaluation was utilised based on standard questionnaires and a think-aloud-process; the user partners PLV, HRT, and FBBR have conducted the evaluation itself, under the coordination of CERTH.

Describing more in detail the contents of this document, the first section of the deliverable provides a short summary of the functionalities of each beAWARE tool developed for the 2nd prototype and tested during the pilot.

Then, the deliverable starts to describe the flood pilot's structure, its context and its organization; whereas for the other two scenarios these contents are related to the demonstrative sessions.

The second part of the document focuses on the evaluation of the 2st prototype, from the perspective of the end users who participated in the flood pilot as active players or as observers. In fact, the beAWARE Consortium collected feedback from the stakeholders about their interaction with the platform, both during the pilot (through the 'observers forms') and after it, thanks to the questionnaires and the debriefing session. These data had been analysed with the procedure described in the final part of this deliverable, which provides also the results emerged from the evaluation.

Finally, the results of the evaluation for the Fire and Heatwave scenarios, based on the questionnaires that were compiled by the end-users after the demonstrative sessions, are also presented.

It is worth to mention that the results of the 1st prototype evaluation (subject of the D2.4) provided an important contribution to the development of the 2nd prototype - starting from the end user tools of the platform, the global user experience and the organization of the pilot, but also the evaluation procedure itself. In particular, the 2nd pilot evaluation procedure and the pilot structure encompass the positive aspects outcome from the 1st pilot evaluation (for example the division in roles as 'player and observers' or the differentiation between the sessions with beAWARE and with the legacy tools), improving the weak points identified in the D2.4 (for example, the observation forms had been revised after the 1st pilot).

In turn, the outcomes of the 2nd prototype evaluation presented in this document will be the reference point to address the technical development of the platform towards the final prototype and to improve the organisation of the 3rd pilot and its evaluation procedure.

Abbreviations and Acronyms

AAWA	Alto Adriatico Water Authority
AIM	Multi-utility of the Vicenza Municipality which provides services like energy, water supply
AMICO	AAWA's flood forecasting model
ANA	Italian national association of the Alpine trooper
ANC	Italian national association of the Carabineers trooper
ASR	Automatic speech recognition
COC	Municipal Operational Center (in Italian: 'Centro Operativo Comunale')
EWS	Early Warning System
HMOD	Hellenic ministry of defence
KB	Knowledge base module of beAWARE
KBS	Knowledge base services
MTA	Multilingual Text Analyzer
PCIV	municipal association of the italian civil protection volunteers
PSAP	Public-safety answering point
REA	Research Executive Agency of the EC
SMA	Social Media Analysis
UC	Use Case
UR	User Requirements
VHF	Very High Frequency
VRS	Visual River Sensing
WEOBSERVE	EU project WeObserve

Glossary

Term	Meaning in beAWARE
A	
Affected	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.
Audio Item	Audio recording.
B	
Building	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	
Capacity	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
Crisis	Situation with high level of uncertainty that disrupts the core activities and/or credibility of an organization and requires urgent action.
Crisis Management	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 programe through training, rehearsals and reviews to ensure the preparedness, response and continuity.
Crisis Classification Component	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.
Critical infrastructure	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
Classification	The action or process of assigning a class, a category, a type, a level or rating to something
Communication	Any type of (tele) communication infrastructure.
D	
Damage	Combination of exposure and vulnerability
Data Analysis	A type of a task involving data analysis.
Disaster	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.
Drone	an unmanned aircraft or ship guided by remote control or onboard computers
E	
Early warning	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.
Early warning system	The set of capacities needed to generate and disseminate timely early warnings.
Energy	Any type of energy-generating infrastructure.
Exposure	The presence of people, livelihoods, environmental service and resources, infrastructures, economic and social and cultural assets located in hazard-prone area
F	
Forecast	Definite statement or statistical estimation of the likely occurrence of a future event or conditions for a specific area.
Forecasting model	Numeric representation of a physical phenomenon, which - starting from input data (other forecasts, measures, etc.) - solves trough numerical techniques its internal equations and provides forecasts as output data.
Flood	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, ...)
Flood forecasting model	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
Flood map	Hazard outcome in case if flood, expressing the spatial distribution of the intensity of the flood in terms of depth, persistence or velocity
H	

Term	Meaning in beAWARE
Hazard	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.
Heatwave	A period of abnormally and uncomfortably hot and usually humid weather
Human	Human beings in danger.
I	
Image Analysis	The task of extracting useful information from still images.
Image Item	Captured image.
Impact	The impact of natural disasters and incidents.
Impact Type	The various types of impacts, like human, economic, and environmental impacts (e.g. injuries, damage to properties etc.)
Incident	An incident of various kind, which takes place during a natural disaster.
Incident Types	The various types of incidents, like e.g. floodings, blocked streets etc.
L	
Living Being	Any living being that is in danger during a natural disaster.
Location	A location (point or area), indicated by latitude, longitude, and radius.
M	
Mission	A mission assigned to a rescue unit during a crisis.
Mitigation	The lessening or minimizing of the adverse impacts of a hazardous event.
Monument	A structure or building to honour a special person or event.
N	
Natural Disaster	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).
Natural Disaster Type	The various types of disasters, like e.g. floods, forest fires, storms or earthquakes etc.
P	
Police	Law enforcement infrastructure and services.
Preparedness	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
Prevention	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.
Priority	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
Property	Any type of private property.
Public awareness	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.
Public information	Information, facts and knowledge provided or learned from f researches or studies, which available for dissemination to the public.
R	
Recovery	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
Relief Place	a place giving temporary protection in case of natural disaster
Resilience	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.
Responder	A first responder unit, (e.g. a firefighter, police officer or emergency medical physician).

Term	Meaning in beAWARE
Response	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.
Risk	The combination of the probability of certain hazard to occur and of its potential negative consequences.
Risk assessment	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.
Risk management	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.
Risk map	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
River Section	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	
Scenario or operational scenario	environmental and ecological context of the natural disaster, including also its impacts, the elements at risk and the stakeholder assets
Sensor	an instrument that observes a property or phenomenon with the goal of producing an estimation of the value of a reference parameter.
Severity	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.
Stakeholder	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.
Street	The road network infrastructure.
Subway	Subway infrastructure.
T	
Text Analysis	The task of analysing textual corpora.

Term	Meaning in beAWARE
Text Item	A piece of text.
Transportation	Transportation services and infrastructure.
Technical requirement	formalization, standardization and elaboration of the user requirement specification and allocation in the beAWARE subsystems
U	
Use Case	conceptual description of intended or expected utilization of the beAWARE system to prepare for, respond to, or act upon the occurrence of the scenario.
User Requirement	expectation, request and guidelines for functionalities, capabilities, conditionalities and features that would facilitate the successful completion of an use case
V	
Video Analysis	The task of extracting useful information from video sequences.
Video Item	A video recording.
Vulnerability	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	
Water depth	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
Water Level	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)
Weather station	A place equipped with sensors for measure weather, meteorological, hydrological or hydraulic variables

Table of Contents

List of Figures

List of Tables

1 Introduction

The beAWARE Second Prototype focuses on improving established services, developing and performance optimisation, meeting the requirements of Milestone 4 (second prototype: "*stands for the successful completion of the second SW development cycle of the project. It includes the 2nd version of beAWARE platform integrating: advanced techniques social event detection, multimedia concept extraction and decision support module.*"). Significant improvements in the platform's modules have been made in comparison to the First Prototype, by advancing the technologies previously presented in their basic form. Furthermore, new services are being introduced, such as the drone platform and the analysis module, in order to analyse the input of this platform.

In order to achieve these requirements, the platform had to be tested against real life conditions, which had been demonstrated through the 2nd beAWARE pilot and evaluated based on the interaction with the technology that the end users experienced during the pilot itself. This allowed the Consortium to gather precise feedback and indications from the end user's prospective, in order to incorporate them in to the design modifications.

The 2nd pilot, focused specifically in the flood scenario and was carried out by AAWA with the involvement of many other main stakeholders, included several activities that took place from the 25th of February to the 7th of Marc 2019 (the latter was the day of the pilot execution itself).

Concerning the other two beAWARE scenarios (fire and heatwave), the second prototype was presented to the main stakeholders during face to face meetings and online demonstrative sessions.

For this reason, the report provided in this deliverable addresses the evaluation of the 2nd prototype based on: 1) the 2nd beAWARE pilot for the flood scenario, in particular focusing on the feedback reported by the stakeholders about their user experience in suitable evaluation forms; 2) on the results of the online demonstration for the other two scenarios.

Dealing more in detail about the flood pilot, it was organized in a similar way with the 1st pilot (heatwave) simulating some emergency and pre-emergency situations both with beAWARE and with the current available equipment (called also 'legacy tools' in this document). In that way, the end users could make a direct comparison between the platform and the legacy tools, understanding precisely the benefits provided by beAWARE.

Based on the results of this evaluation, the technological development of beAWARE will be carried on until the final Prototype, which will be tested during the third Pilot in Valencia (November 2019), focusing on the fire scenario; then, the final evaluation cycle will take place.

2 beAWARE 2nd Prototype

In this chapter a brief overview of the beAWARE second prototype and its features that have been tested by end users during the 2nd pilot (flood pilot) is presented. Since this document focuses on the second prototype from the end users' point of view, technical details are not being discussed, as they are instead the main objective of the work package 7 deliverables.

The table below (Table 1) contains a list of the main functionalities of the beAWARE system developed for the second prototype and that have been tested during the pilot; a more detailed descriptions of each tool is provided in the subchapters below.

Table 1. Description of the status of the beAWARE component at the 2nd prototype.

beAWARE components	Second Prototype
KB	✓ KB fully implemented ✓ First Implementation of dashboard to analyse incoming tweets and incidents ✓ Improved UI to navigate through the data inside the KB ✓ Enhanced visualization of sensor data from SensorThingsServer ✓ Integrated visualization of risk maps ✓ Extended ontology to match the use case specific needs for the 2nd pilot ✓ Enhanced Reasoning and clustering support
SensorThingServer (FROST)	✓ Integrated water level measurements and thresholds ✓ Integrated water level forecasts ✓ SensorThings-Server fully implemented and deployed. ✓ Basic visualization available in WebGenesis
Crisis Classification	✓ Early Warning component: o Analyse forecasting data (meteorological and hydrological forecasts) so as to assess the crisis level of an upcoming crisis event. o Integrate flood hazard/risks maps for flood risk assessment ✓ *Real-Time Monitoring and Risk Assessment* component: o Identify crisis event's severity level based on sensing data ✓ Assess the Flood Crisis Risk based on inputs from mobile application via the Incident Reports of the citizens
Visual Analysis (Image and Video Analysis)	✓ Detection of flood and fire events in multimedia ✓ Flood and fire dynamic texture localization ✓ Traffic monitoring through object detection and tracking ✓ Face counting for indoor shelters ✓ Sensitive content blurring ✓ Visual water level estimation through static cameras and creation of alerts in case of threshold exceeding (New feature)
Drone Analysis	✓ The component, at the current version, receives drone footage from Drones Platform, detects and tracks people and vehicles and informs Drones Platform and PSAP about the detected objects and their position. (New feature)
Automatic Speech Recognition (ASR)	✓ All four language models up and running ✓ Deployment of a call center solution and integration with ASR
Social Media	✓ Real-time crawling of tweets for all predefined use cases and languages ✓ Three-step validation of tweets:

beAWARE components	Second Prototype
	1. Verification (real or fake) 2. Checking emoticons 3. Visual and text classification (relevant or not) ✓ Spatiotemporal clustering of tweets (still depending on predefined coordinates) and creation of corresponding Twitter reports
Text analysis	✓ Extraction of key incidents, impacted objects and locations for the four languages ✓ Deep linguistic analysis with wide coverage, not constrained to beAWARE pilots. ✓ Basic strategy for mapping linguistic analysis to ontological representations.
Report generator	✓ Linguistic generation for the four languages ✓ Separate content selection strategies for short situational updates and wrap-up summaries. ✓ Coverage tailored to first prototype UCs
Mobile application	✓ Separate versions for citizens and first responders ✓ First responders can send reports using a more sophisticated scheme ✓ Team position is reported continuously ✓ First responders can receive tasks and report the status of those.
PSAP	✓ Displays metrics on the map. ✓ Displays teams on the map. ✓ Displays incidents on the map. ✓ Sends public alerts from a fixed list of texts.

2.1 Knowledge Base

The Knowledge Base (KB) is the central place where all sematic information of the beAWARE platform is stored, integrated and evaluated. The KB hosts the beAWARE ontology, which describes the whole domain in a well–defined formalism (OWL – Web Ontology Language). The data contained covers all the related information starting from the type of crisis, risk and impact, as well as results from analytic components and context information like climate and environmental conditions. By applying query mechanisms and deduction rules this forms the foundations for decision support.

In addition to machine readable APIs, the KB contains a user interface. This allows to easily navigate through the semantic data before, during and after a crisis event to get a deeper understanding of the situation. The available risk maps as well as the measurements stored in the SensorThingsServer can be visualized in this component, too.

A more detailed description about the user interface will be provided in the upcoming deliverable D7.7.

2.2 FROST

FROST (previously called SensorThings API Server) is the single-point for storing and retrieving time-series data (like most sensor data) within the beAWARE project. The first prototype already contained some sensor data. For the second prototype, additional sensors were integrated. Water level measurements and data from weather stations are automatically collected and stored in the FROST-Server. These are enriched with other available time-series data like water-level forecasts provided by AMICO and weather forecasts.

Like already mentioned, the user interface of the Knowledge Base can be used to analyse and display the data available in the SensorThingsServer.

2.3 Mobile Application

The mobile applications divided into two versions – one for citizens and one for first responders – are the main point of interaction for the people in the field.

The focus for citizens is to provide up to date information to the authorities. To ease this, the report can be provided in a multimodal way, such as sending text messages, pictures, videos or speech recordings. Due to the well-defined interface, this data is analyzed automatically. Each of the messages contains the GPS position, which allows a fine grade localization of the reported event.

In contrast to the citizens, the mobile app for the first responders contains advanced functionalities. For example, the messages can be enriched with a more precise categorization scheme to improve the upcoming analysis. This version of the mobile application also supports to send the own position periodically to the authorities. In addition, with the available possibility to receive tasks and report the team and task status, the mobile application offers an effective way to manage the teams of civil protection volunteers and first responders in the field.

A more detailed description about the mobile applications will be provided in the upcoming deliverable D7.7.

2.4 Social Media Monitoring

Social Media Monitoring includes two separate modules: Social Media Analysis (SMA) for crawling and validating social media content and Social Media Clustering (SMC) for spatiotemporal grouping of tweets.

SMA exploits Twitter's Streaming API[1] to crawl tweets in four languages (i.e.: English, Italian, Greek, and Spanish) that contain predefined keywords related to flood, fire, and heatwave events. The second prototype introduces a three-step validation process after the crawling procedure, aiming to filter out tweets that are not real or relevant to the use cases. The first step is an automatic detection of fake tweets, in order to deal with the hoax news. The second step takes into consideration the emoticons/emojis used in the posts; e.g., a tweet with a wink face is not useful. The final step is the automatic visual and textual classification of tweets as relevant or not. All collected social media data is stored in a MongoDB, but only the real and relevant tweets are sent to the Knowledge Base Service (KBS) to populate corresponding incidents and to the Multilingual Text Analyzer (MTA) for concept and conceptual relation extraction.

The second module, SMC, collects relevant tweets and performs a spatiotemporal clustering technique. The resulting groups form summaries (Twitter Reports) are sent to the KBS to be handled as new incidents. Clustering currently depends on predefined coordinates of tweets, but in the final prototype extracted locations by MTA will be used.

2.5 Crisis Classification Module

The main objective of the Crisis Classification module is to support the emergency management process in both phases, pre-crisis and during crisis, by providing estimations regarding the severity of the extreme natural event in case of flood, forest fire, and heatwave. It consists of two main components: the *Early Warning* component that provides estimations and alerts for upcoming crisis and the *Real-Time Monitoring and Risk Assessment* component that is triggered during the crisis in order to monitoring the evolvement of the hazardous natural event. During the 2nd prototype of the beAWARE system, some functionalities of the Crisis Classification were improved and others are appeared for the first time. Specifically, these are:

- In the content of the Early Warning component the process consists in the estimation of the crisis level in local scale based – for the flood scenario- on the comparison between the data from the flood forecast model AMICO to the real alert threshold defined by the Civil Protection; the exceeding of each of this threshold is associated to a different scale of the so called 'Crisis Level'. Namely, the whole Region of Interest (which, for the flood pilot, are the rivers network in the Municipality of Vicenza) is divided into a number of smaller districts (which, for the flood pilot, are the different river reaches in Vicenza) and the crisis level in each one of those areas are estimated.

[1] [1] https://developer.twitter.com/en/docs/tweets/filter-realtime/overview

- The Early Warning component is enhanced by the integration of the flood hazard/risks maps. The appropriate information is processed and forwarded to PSAP.
- During the emergency phase, the *Real-Time Monitoring and Risk Assessment* component obtains, apart from Water Level, the precipitation observations from Weather stations located in the Region of Interest. The goal is to enhance the traceability capabilities of the authorities concerning the flood crisis evolvement.
- In this version of the *Real-Time Monitoring and Risk Assessment* component an innovative approach of the estimation of the risk of the ongoing flood crisis event is provided by the exploitation of the information which obtained by Mobile Application of the citizens via incident reports. The risk algorithm is based on the AAWA's Flood Risk Management Plan of the Eastern Alps Hydrographic District[2];
- New metrics are developed in order to enhance the functionalities of the beAWARE visualization component (dashboard) in both phases (pre-Emergency and Emergency).

2.6 Visual Analysis Module

The Visual analysis module's main objective in the beAWARE project is concept extraction from visual content (image/video), and it is supported by two separate components, namely IMAGE ANALYSIS and VIDEO ANALYSIS. The two components are considered to be two separate entities by the system so as to not interfere with each other's media processing queues. Both components make use of a shared library of developed computer vision techniques but at the integration level there exist two different ports for communicating with each one and two processing pipelines that work simultaneously.

As far as functionality, an assembly of various computer vision techniques that have been developed or upgraded from the previous version completes the 2nd prototype VISUAL ANALYSIS arsenal. Together with the 1st prototype techniques those are:

- Emergency classification, so as to determine which images/video frames contain an emergent event or not (i.e. a fire of flood event). Moreover, this function is also the core of the internal VISUAL ANALYSIS validation mechanism.
- Traffic monitoring through object detection and tracking.
- Face counting from images/videos inside places of relief using face detection.
- Dynamic texture localization so as to localize fire or flood dynamic textures in images and videos.
- Sensitive content blurring, so as to protect the privacy of targets inside images/videos.

[2] [2] Decree of the President of the Italian Council of Ministers of October 27, 2016. published in the Official Gazette n. 29, of February 4, 2017 in actuation to the European flood directive 2007/60

2.7 Visual River Sensing

Visual River Sensing is a new component that was added during the development of the 2nd prototype, in order to integrate visual information from static surveillance cameras. The purpose of the new component is to visually monitor the river stage in order to create alerts, in case of water level exceeding. This module has been calibrated for a surveillance camera installed next to Bacchiglione river in the centre of Vicenza (Angeli Bridge) and can easily be adjusted to other cameras. VRS streams video frames directly from the IP address of the camera and creates a short video file, which is subjected to analysis. The water level estimation module uses an edge detection algorithm in order to detect a marker (rod) of known length, which is placed in the river. After detecting the marker, the algorithm estimates the length of the visible part of the marker in pixels and translates this length into water level in meters, by using calibration data. If the water level exceeds some predefined thresholds, three different types of alerts are generated respectively: 'Moderate', 'Severe ', 'Extreme'.

2.8 Drones Analysis

Drones Analysis is a new component that was added during the development of the 2nd prototype. It is responsible for analysing drone footage with the aim of detecting people and vehicles in danger and inform the PSAP and Drones Platform. Drones Platform, in turn, by using the provided information regarding the position of the victim, can navigate the drones back to the victim, for monitoring purposes. Drones Analysis is using deep-learning object-detection techniques and models trained by CERTH on drone footage, in order to detect the objects of interest. Additionally, Kernelized Correlation Filters[3] are used in order to track the object's trajectory. Analysis is performed on frame sequences of 10secs duration, sent by Drones Platform with a rate of 1fps. Analysis results contain information such as: whether an 'object' is detected, its type, location, corresponding frames. During the Flood Pilot, in order to demonstrate the whole functionality and communication between the involved components, an autonomous drone flight was performed on the district of S. Agostino in Vicenza, by using as a target object, a dummy that was laid on the ground by the river.

2.9 Automatic speech recognition

The automatic speech recognition (ASR) component is responsible for analyzing audio files coming into the beAWARE platform, either as audio messages through the mobile app or as recorded phone calls. The purpose of this module is to transcribe speech in four languages

[3] https://arxiv.org/abs/1404.7584

(English, Spanish, Italian, Greek) and forward the transcribed text to the text analysis (MTA) module for semantic extraction. It is based on open source language and acoustic models that have been adapted to the needs of the project, by collecting and creating audio recordings containing phraseology related to emergency incidents. Additionally, corresponding dictionaries are being evaluated in order to remove erroneous or rare words, that could possibly affect recognition accuracy. This is a continuous process, throughout the whole duration of the project, in order to improve recognition accuracy, emphasizing emergency related content.

Additionally, in order to address reviewers' comments, during the development stage of the 2nd prototype, ASR has been extended in order to also include emergency phone calls, apart from audio files. A call center solution has been deployed able to handle and record calls or voice messages by civilians. A dedicated listener captures recorded files and forwards them to the ASR component.

2.10 Multilingual Text Analyzer (MTA)

Text analysis detects mentions of concepts and relations between them. The text analysis component can process inputs in any of the project languages (English, Greek, Italian and Spanish) and produce ontological representations that capture relevant parts of the information conveyed in the input text. It uses a wide-coverage linguistic analysis pipeline capable of processing any type of texts, even those beyond the scope of beAWARE. The pipeline comprises surface and deep syntactic parsing, NER, concept extraction, EL and geolocation. NER is addressed using Stanford CoreNLP, while UPF own solutions and models are used for deep syntactic parsing, concept extraction, entity linking and geolocation. The last three are being developed within the scope of beAWARE.

The annotations produced by each of the pipeline components are integrated into a single deep linguistic structure, a semantic graph for each sentence in the input text where nodes correspond to concepts or entities, and edges are deep syntactic relations produced by the deep parser. Nodes can be associated with references to BabelNet or Open Street Maps produced by the entity linking and geolocation components. The creation of this integrated structure is addressed by a retokenization component that reconciles potentially overlapping annotations produced by other components in the pipeline.

Semantic graphs resulting from the wide-coverage linguistic analysis are then used as the basis for a simple relation extraction strategy that simplifies and maps them to a representation based on the project ontology. This final representation constitutes the output of the text analysis module and contains instances of incidents/events connected with the objects impacted by these events, and the locations associated with them.

2.11 Multilingual report generation

Starting from contents in the knowledge base, the report generation module produces multilingual texts providing to the users of the platform with relevant information about an emergency.

The module can produce short reports that provide situational updates to authorities. These reports, one or two-sentence long, describe recent incidents detected by the system along with a description of the impacted objects. In addition, the module can also generate wrap-up summaries at the end of a crisis scenario. These summaries are addressed to authorities and are longer than situational reports. In them the most important incidents detected by the system during an emergency scenario are described. Summaries are organized chronologically into separate sections that correspond to one-hour time periods. Within each section, the system produces an account of the incidents detected during that time. Linguistic aggregation methods are used to reduce repetition and produce a more concise and fluent description. Thus, incident descriptions are grouped by common traits, i.e. event type, type of impacted of object or location, and a single mention is produced to the common trait instead of repeating it for each incident.

2.12 PSAP

The Public Safety Answering Point (PSAP) is beAWARE's central command and control system, provided by Motorola Solution Israel (MSIL), which is intended to oversee the entire emergency preparedness and management processes.

The PSAP in general is dedicated to be deployed in city councils, emergency authorities, or law enforcement agencies, and is meant to provide critical information to decision makers, emergency managers, and operators before and during the emergency.

PSAP receives information that is originated by first responders in the field and from the public regarding reported or sighted incidents associated with the evolving or ongoing emergency. The information is processed through automatic reasoning engines and analytics services that generate automatic incident reports or enrich field reports with additional information based on multimedia (video, audio, image, text), social media, and sensor analytics.

In addition, PSAP receives metrics related to early warning (based on weather forecasts and social reasoning), crisis classification, indicator status, and overall emergency statistics (e.g. number of incidents).

PSAP provides information about incident and task assignments to first responders (and expects them in-turn to provide updates regarding the progress of the incident handling and closure). In addition, PSAP provides alerts to the public and to more focused target populations (senior decision makers, first responders, volunteers, etc.)

For the Flood pilot in Vicenza, four main modules had been used in PSAP. Firstly, there is the Dashboard, a module which visualizes various metrics based on incoming streams of data from external sources (e.g. weather data, crisis classification data, statistics, etc.);

For the second pilot it has been separated into 2 main phases:

1. Pre-emergency phase: for the early warnings coming mainly from EWS and forecasting models based on same of the real flood of the 1st November 2010 with an adequate time-scaling to fit the pilot strictly timing
2. Emergency phase: monitoring the river by getting real information from sensors about the water level including 3 main thresholds and triggering events when exceeding them. (also based on the big flood from 2010)

The Map visualization module provided the indication about the various events, together with further related information.

Operation manager module to handle an incident by assigning tasks to available units in the field both pre-defined templates and free texts, to monitor the tasks status and get the availability of the units

Finally, there is the Public Alert module, which allows sending alerts notifications to the mobile app by decision makers before and during the event.

3 General approaches

3.1 Flood scenario

This chapter discusses the general approaches followed both for the pilot set-up and organization and for its evaluation from the end user's prospective. These approaches had been shared and deeply discussed among the Consortium partners in the previous months.

3.1.1 Approach for the pilot

The pilot for testing and evaluating the 2nd beAWARE prototype was organized based on the following steps, with the active involvement of the Stakeholders in each of them:

- Training of the end users to the beAWARE technologies: separate sessions of training were organized according to the roles assigned to the "players" during the pilot, from the 25th of February 2019 to the 6th of march 2019;
- General test of the beAWARE pilot (6th of March 2019 in the morning): this activity was intended as preparatory training for all the actors who used the technologies during the pilot;
- Pilot execution on the 7th of March 2019 in the morning: performed by the end user and stakeholders of the flood scenario
- Debriefing of the pilot for its evaluation (7th of March 2019 in the afternoon);

During the phases of the pilot, the following roles had been assigned:

- **Decision maker**: Role performed by the designed delegate of the Mayor (Assessor), who remained in the control room (the room of the COC) and took the all the decision for the emergency management,
- **Support of the decision makers (members of the COC):** Role performed by delegates of various offices of the Municipality, AAWA, AIM, Genio Civile and Soil reclamation Consortium.
- **Control room operators**: they used the PSAP to receive forecasts, real time monitoring of the outcome of the crisis, to send global alerts to the citizen and to establish a bidirectional communication to/from the first responders (equipped with the mobile app). During the pilot, the participants who played these roles remained in the control room. This role was performed by members from the Municipality of Vicenza and AAWA
- **Civil protection volunteer teams:** the leader of each of these teams used the beAWARE mobile app to communicate with the control room, providing incident reports (text and/or video, photos) and receive from the control room tasks to be performed; during the pilot there were five teams of first responders, placed in

different locations according to storyline. This role was performed by Volunteers of various Civil Protection associations (Municipal group of Civil Protection, ANA, ANC…), members of Soil Reclamation Consortium and AAWA.

- **Citizens**: they used the beAWARE mobile app to send incident reports (text and/or video, photos) and to receive public alerts from the Decision Makers. During the pilot, the participants who played the role of 'Citizen' were located in specific areas of the city, according to the storyline. This role was performed by AAWA and ANC.
- **Observers,** who had the role to watch the end user's interaction during the pilot and to take notes regarding the performed tasks, their timing, if there had been difficulties of any kind etc. During the pilot, the observers were located either in the control room (observers of the control room) or they followed one of the various teams of first responders and citizens. This role was performed by AAWA, beAWARE Consortium and Civil Protection volunteers.

The first five roles (all apart from the observers) participated actively to the training and to the pilot execution therefore, they will be called generically '**actors**' or '**players**' of the pilot in this document.

The main interactions between the different active roles that took place during the pilot are summarized in the following figure.

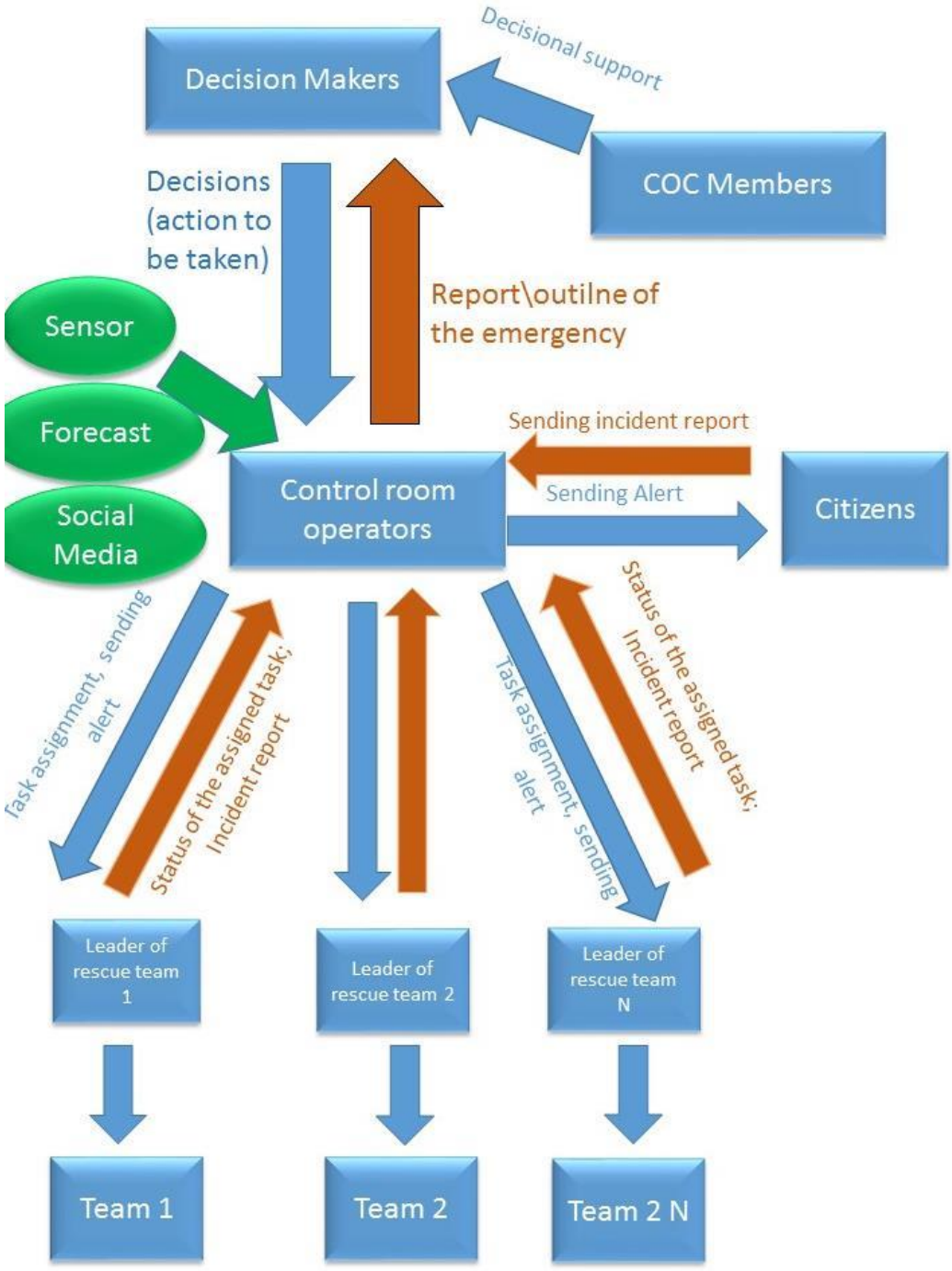


Figure 1. Roles and flow of information during the pilot

The 'observers' performed a passive role during the pilot, watching the 'actors' using beAWARE technologies and taking notes and observations about the execution of the pilot in the so called 'observations sheets', that are one of the main pillars for the evaluation process. This role was performed both by consortium's members and by stakeholders. During the pilot the interactions between the 'observers' and the 'actors' were very limited.

For each role covered by the pilot, at least one dedicated training session was organised by AAWA during the two weeks before the day of the pilot itself, more specifically:

- two training sessions were organized for the PSAP operators and the respective observers: the first took place the morning of the 26th of February 2019 in the Municipal hall of Vicenza, the second took place the morning of the 5th of march 2019 in the Conference Room of the 'Chiostri di S.Corona' in Vicenza;
- two training sessions were organized for the Civil protection volunteers who used the first responders version of the beAWARE mobile app; the first took place the 25th of February 2019 in the Civil Protection Head Office in Vicenza (Debba), while the second took place the 5th of march 2019 in the Conference Room of the 'Chiostri di S.Corona' in Vicenza . Both sessions were evening activities, after the standard Italian working day, in order to allow a large participation;
- one training session was organized for the end users one for the end users who used the beAWARE mobile app as 'Citizens'; this session took place the 28th of February in the AAWA's headquarters in Venice;

As stated above, the beAWARE 2nd pilot was executed on the 7th of March in Vicenza with the aim to test the 2nd prototype applied to the flood scenario.

The pilot followed the structure, organization and storyline discussed among the consortium members in order to cover the list of the final Use Cases and User Requirements of the heatwave scenario expressed in D2.5.

The storyline was divided in **three main Sessions** of different timing, one related to the pre-emergency phase (30 min), the second (1h30min) related to the rising of the water level in the river during the first phase of the flood, the latest was about the river overtopping and (in the final part) to the de-escalation (1h).

Each of these sessions **was executed twice**:

- the first time without the beAWARE platform, using only **legacy tools**
- the second time **with the beAWARE** platform.

Therefore, a total of **six different sessions** had been performed for about 6h of continuous activity.

After the pilot, both the 'observers' and the 'actors' played a crucial role in the evaluation by compiling the questionnaires prepared by the Consortium, based on the criteria expressed in D2.2.

3.1.2 Approach for the evaluation

The evaluation of the 2nd prototype is based on the flood pilot results, following the criteria and methodologies explained in the D2.2 and successfully tested for evaluating the previous

prototype in occasion the 1st pilot (see D2.4). More in detail, the main pillars for this process are:

- **Observers sheets**: these sheets collected the feedback and notes taken by the 'observers' in each of the six sessions. Every observer was assigned to a specific type of 'actor' (i.e. there were some observers in the COC room, others followed the civil protection teams, etc.) with the aim to take note of every performed task, its timing and occurred problems. The observers were also advised to note any useful comment about the interaction of the 'players' with the beAWARE technology. Therefore, the observer goal was to record both qualitative and quantitative (the timing) information taken during the pilot, that can help to compare the sessions executed with the legacy tools with the respective performed with the beAWARE-platform.
- **Questionnaires:** created according to the criteria expressed in the D2.2 and provided to all the 'observers' and 'players' after the pilot. Each questionnaire contained a series of questions about how the 'observers' and 'players' evaluated the pilot organization and structure, the easiness to perform specific tasks with and without beAWARE; there were also questions about the rating of specific functionalities of the system and the clearness of the provided instructions.
- **Feedbacks collected in occasion of Debriefing:** the debriefing session (in Italian) took place immediately after the pilot, where the participants share opinions and provided useful feedback about their experience with the beAWARE technology, with respect to their roles, about what they liked, the difficulties they faced, suggestions for the future improvements etc. All the end users' contributions had been translated by AAWA staff at the presence of the beAWARE Consortium.

3.2 Heatwave and fire scenarios

3.2.1 Approach for the Heatwave Demonstration

The continuous development of the beAWARE platform and application after the 1st pilot that took place in Thessaloniki based on the Heatwave scenario, gave the opportunity to technical partners and end users to communicate and make the proper adjustments and changes in order to have a complete and successful second pilot based on a flood scenario. For the demonstration of the 2nd Prototype, a video based on the flood pilot was created. HRT, as the partner responsible for the heatwave scenario, used the Use Cases, the User Requirements and the storyline of the heatwave scenario in order to demonstrate the use of the beAWARE system in a heatwave. More specifically, having on the one hand the video presenting the platform functionalities and tools from the flood pilot and on the other the UCs, the URs and the storyline of the heatwave scenario, HRT attempted to explain and simulate the use of the platform in the case of the heatwave to the stakeholders that participated in the demonstration.

The storyline that was used to perform the demonstration of the 2nd prototype for the Heatwave scenario is the same that is reported in D2.10, table 24. As a reminder, during the heatwave pilot that took place at Thessaloniki, in November 2018, the storyline of the scenario that was implemented was based on the maturity level of the beAWARE platform at the time. At the respective table (see Appendix D), the blue boxes marked actions that would be tested in future demonstration prototypes based on the maturity level of the platform. For the heatwave demonstration of the second prototype members of HRT as also members from the Civil Protection authorities of the Region of Central Macedonia were invited to evaluate it, express their opinion and proposals and finally to fulfill the dedicated Questionnaire (see Appendix E).

3.2.2 Approach for the Heatwave Evaluation

The evaluation of the 2nd prototype for the Heatwave scenario was based on the demonstration that was made, presenting the same functionalities that were tested during the flood pilot. Several members of HRT, acting as internal stakeholders, who had limited prior involvement with beAWARE project were asked to watch the video and then evaluate its tools and functionalities in the scenario of a heatwave. In order to support the evaluation during the demonstration, a questionnaire, based on the criteria that were presented and analyzed in D2.2 was developed and the procedure that was followed is presented in D2.4.

The execution of the evaluation carried out after the demonstration was a three-step process. More specifically:

1. A presentation of the video based on the 2nd prototype and the storyline behind it was carried out in order to allow the participants to familiarize as much as possible with the system and its functionalities.
2. An analytical discussion followed between beAWARE members and the stakeholders that participated in the evaluation in order to discuss the potential use of the system in the case of a heatwave and how its functionalities could support the management of a heatwave event.
3. Finally, the participants were asked to complete a questionnaire (see Appendix E) that was developed in order to support the evaluation of the demonstration. More specifically, the questionnaire, as previously mentioned, was created according to the criteria described and analyzed in the D2.2 and provided to all the experts that participated in the demonstration. Each questionnaire contained a series of questions in order to evaluate specific tasks that were presented in the video of the 2nd prototype as also questions about the evaluation of specific functionalities of the system.

3.2.3 Approach for the Fire Demonstration

In order to evaluate the beAWARE 2nd prototype for the Fire scenario, the beAWARE platform was presented to internal staff of PLV/FBBR and main stakeholders related to fire emergencies through online demonstrative sessions.

The aim of these sessions was to evaluate the beAWARE 2nd prototype for the Fire scenario as it was described in D2.10. Thus, participants were asked to watch a video presenting the functionalities of the 2nd prototype and rate the efficiency of the platform in case of a fire scenario covering all phases of the emergency that included the pre-emergency phase, the emergency activation, the escalation of the situation (evacuation) and the fade out.

3.2.4 Approach for the Fire Evaluation

The evaluation of the 2nd prototype for the Fire scenario was based on the demonstration described above.

After the demonstration, the participants were asked to complete a standard questionnaire (see Appendix E) that was developed in order to support the evaluation of the demonstration. This questionnaire was created according to the criteria expressed in the D2.2.

4 Flood Pilot in Vicenza

The following chapter deals about the flood pilot, which took place in Vicenza from the 25th of February 2019 until the 7th of March 2019, aimed to test the 2nd prototype of the beAWARE platform involving actively the stakeholders for the flood scenario.

AAWA, as the partner of the consortium responsible for the flood scenario, organized the training sessions and the pilot, provided the requested equipment, involved volunteers and coordinated the contact to the municipality of Vicenza and the other stakeholders. In the following paragraphs is described the general context where the training day and the pilot took place.

4.1 General context

4.1.1 Description of the site

The pilot involved different areas of the city of Vicenza:

- **Control Room (or COC Room):** where the COC is established in case of a crisis that involves the Municipality. In this room, for the entire duration of the pilot, the Decision maker was settled, together with the COC delegates, the control room operators and the relative observers.
- **Vicenza City centre**: First responders and Citizen were divided in teams deployed in the most critical points (in terms of flood risk) along the Bacchiglione River, in order test the mobile app. Those places were defined with the constant communication with the Municipality of Vicenza, since some of these chosen points are the location where the Municipal Civil Protection plan defines some preventive actions that have to be taken by Civil Protection Volunteers when the water level in the Bacchiglione River exceeds the alert thresholds.
- **The S.Agostino district**: this area is located in the southern of the Municipality of Vicenza, Crossed by the River Retrone. In this district, one of the rescue team was deployed and, after the pilot, here was executed the autonomous drone flight.

In the following sub-chapters, a description of each of these areas, of the participants and of the required equipment is provided.

Control Room

The Room of the COC (Municipal operative command centre) is located at the highest floor of the AIM Palace in Contrà Pedemuro S. Biagio, 72, 36100 Vicenza VI.

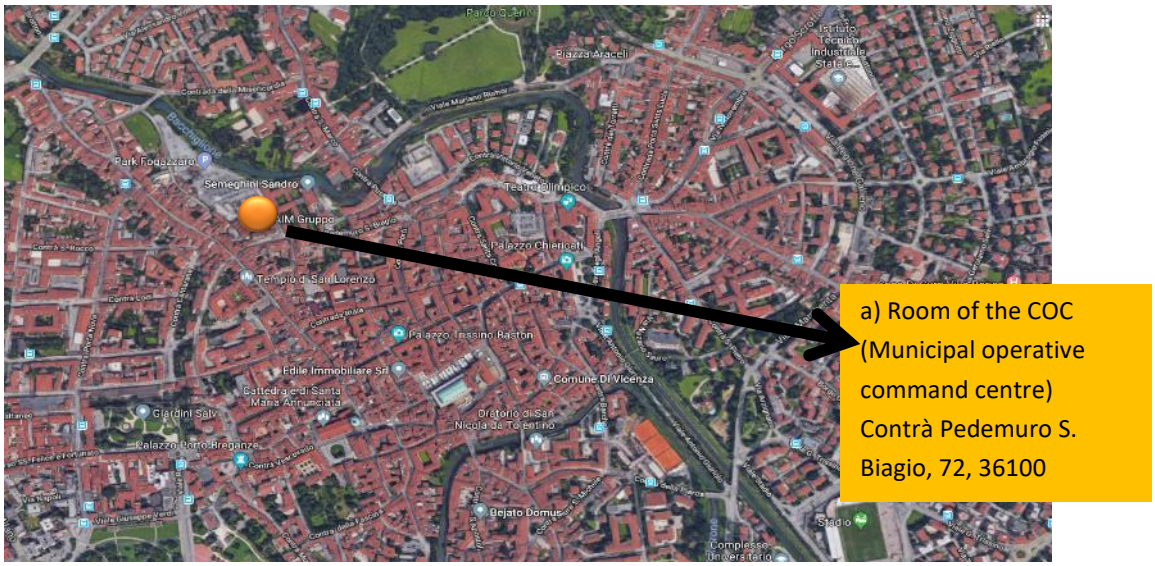


Figure 2. Position of the AIM Palace in the Vicenza City Centre

Figure 3. COC room.

In the COC room the beAWARE Platform was installed to support all three sessions of the pilot. In particular there were based the PSAP and KB Stations (3 different stations, one for the PSAP's Map, one for switching from the dashboards and the KB interface, one for switching from the incident manager to the operations manager and for issuing the public alerts). During the session without beAWARE, the PC and the projector in the control room were used for connecting to the websites usually monitored during a flood emergency.

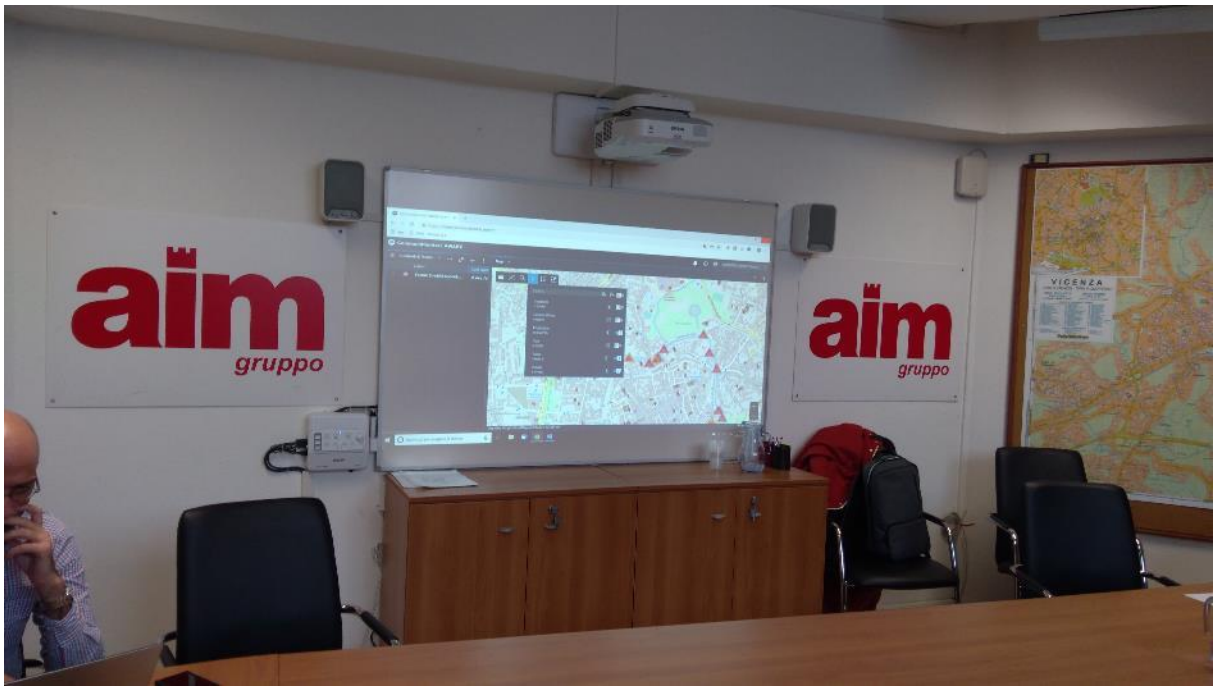


Figure 4. Set-up of the COC room – projector with PSAP's map

Figure 5. Set-up of the COC room – PSAP's dashboard (the screen of the left) and Incident manager (the screen of the Right)

The legacy-tools sessions took advantage also of the COC antechamber, since in this small room the Radio station and the telephone were based.

Figure 6. Radio station in the COC ant chamber

City Centre

During the pilot, in the city centre areas four teams of Civil protection volunteers and two teams of citizens were deployed, with the respective observers.

During sessions 2 and 3 of the pilot, each team of volunteers performed certain tasks in specific locations in the Vicenza City centre, according to the assignment from the control room; more details regarding the involved areas of the city centre, which represents some of the most critical points in case of flood and where the Civil Protection team performed their tasks, were:

- The bridge 'Ponte degli Angeli'
- The square 'Piazza Matteotti'
- The Olympic theatre and Goethe street
- The street 'Contra Torretti'
- The Querini Park
- The Stadium

Regarding the two teams of Citizens, a specific zone of the city centre was assigned to each of them. Inside of these two areas, different paths were defined for each 'Citizen' member of the team (there were four Citizens for each team), where he/or she send a specific flood incident report in session 3 of the pilot; these two main areas were:

- zone 1: the area Around the Pusterla Bridge and the Querini Park

- zone 2: tThe reach of the Bacchiglione river (both sides) between Ponte degli Angeli Bridge, the Matteotti Square and the Stadium,

The figure below summarizes the above-mentioned points and areas.

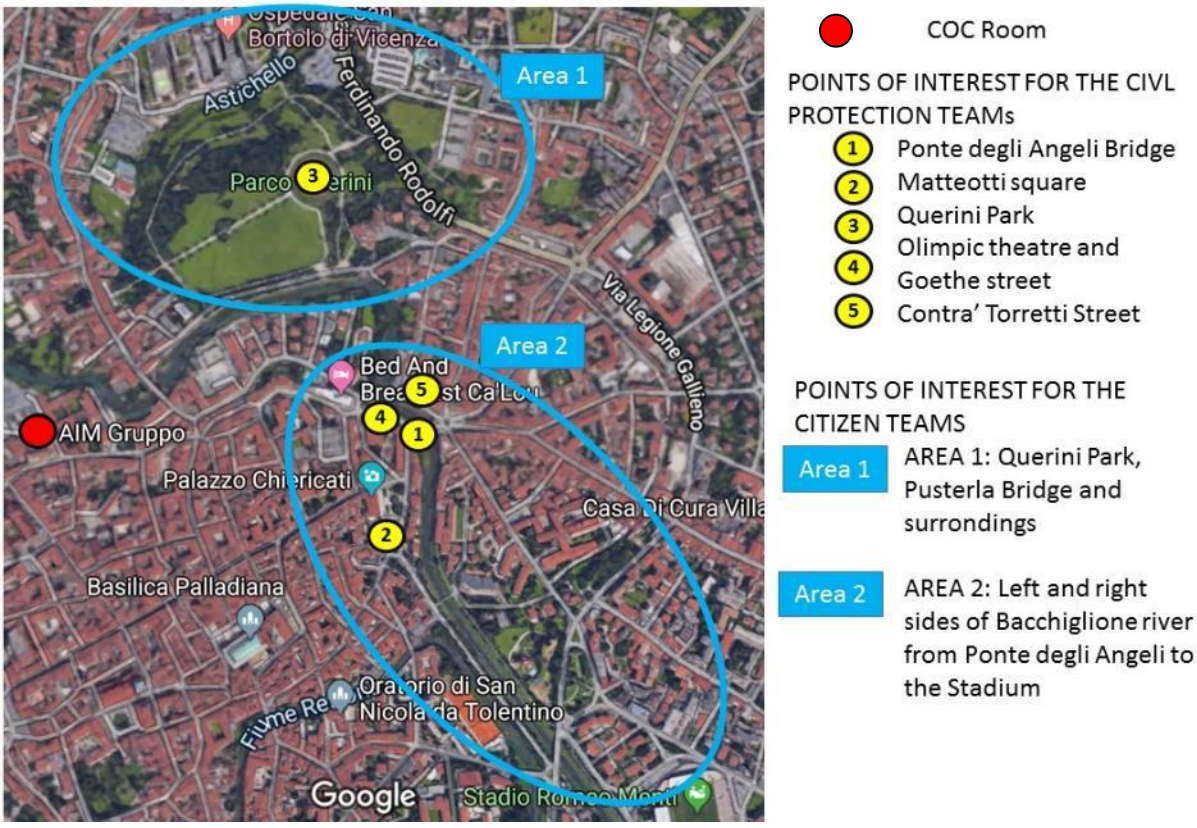


Figure 7.Main Points of interest in the city Centre for the teams during the Pilot

More details about the path followed by the two teams of citizens during the pilot are represented in the following pictures.

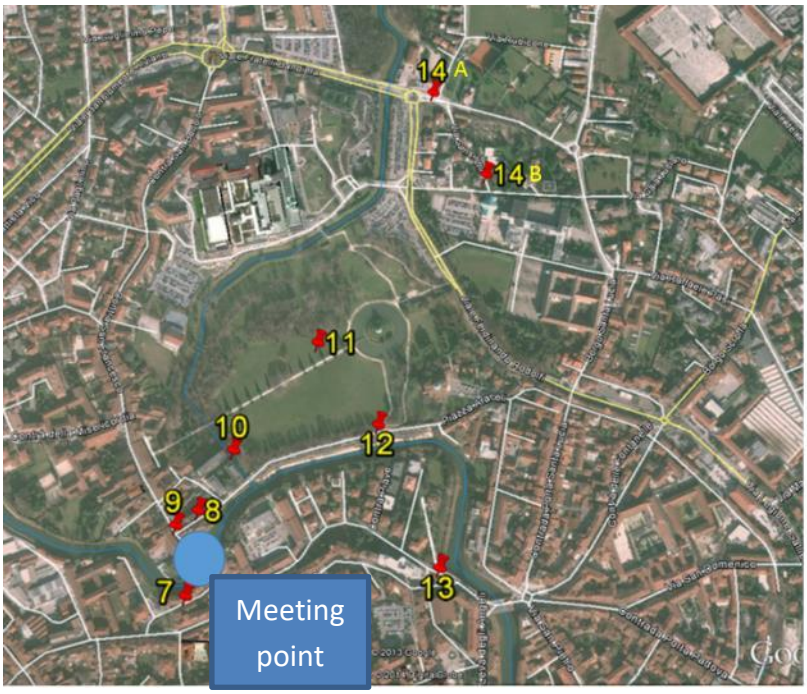


Figure 8.Details of the 'Area 1' in Figure 7. The points of the maps represent the point of interest in this area for the teams of citizens.

Figure 9.Details of the 'Area 2' in Figure 7. The points of the maps represent the point of interest in this area for the teams of citizens.

St. Agostino District

In the district of St.Agostino (southern part of the Vicenza Municipality) one team of volunteers (named Team S.A and composed by volunteers Alta Pianura Veneta Soil reclamation consortium) was deployed. Moreover, after the pilot, there took place the demonstration of the autonomous drone flight.

The area, located at the joint between the Retrone River and the Cordano Channel, is property of the "Alta Pianura Veneta" Soil Reclamation Consortium, one of the stakeholders for the flood pilot, and it is about 7km far away from the City Centre. Additionally, due to the Italian regulation about drones, the area for the flight test had to be located outside the city center.

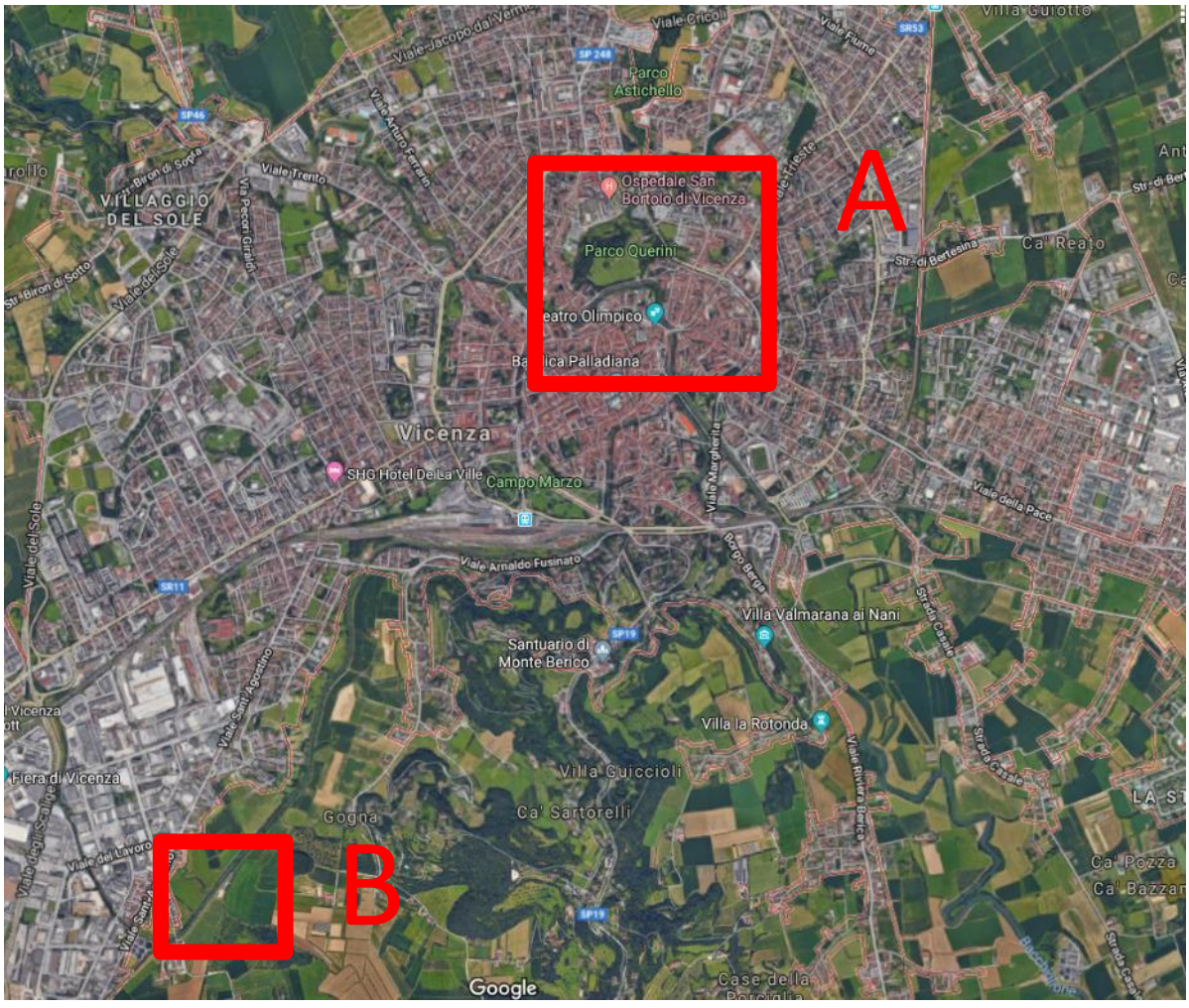


Figure 10. Flood demonstration Site: A-The Vicenza City centre; B- the S.Agostino district of Vicenza.

In this area also one of the weather stations is located, part of the sensor's network included in beAWARE, allowing a real-time monitoring of the water level from the PSAP in the Control Room, together with two of the old measure rods.

Moreover, inside the beAWARE project, in this area has been installed a new fixed video Camera, with the purpose to monitoring the water level of the River Retrone.

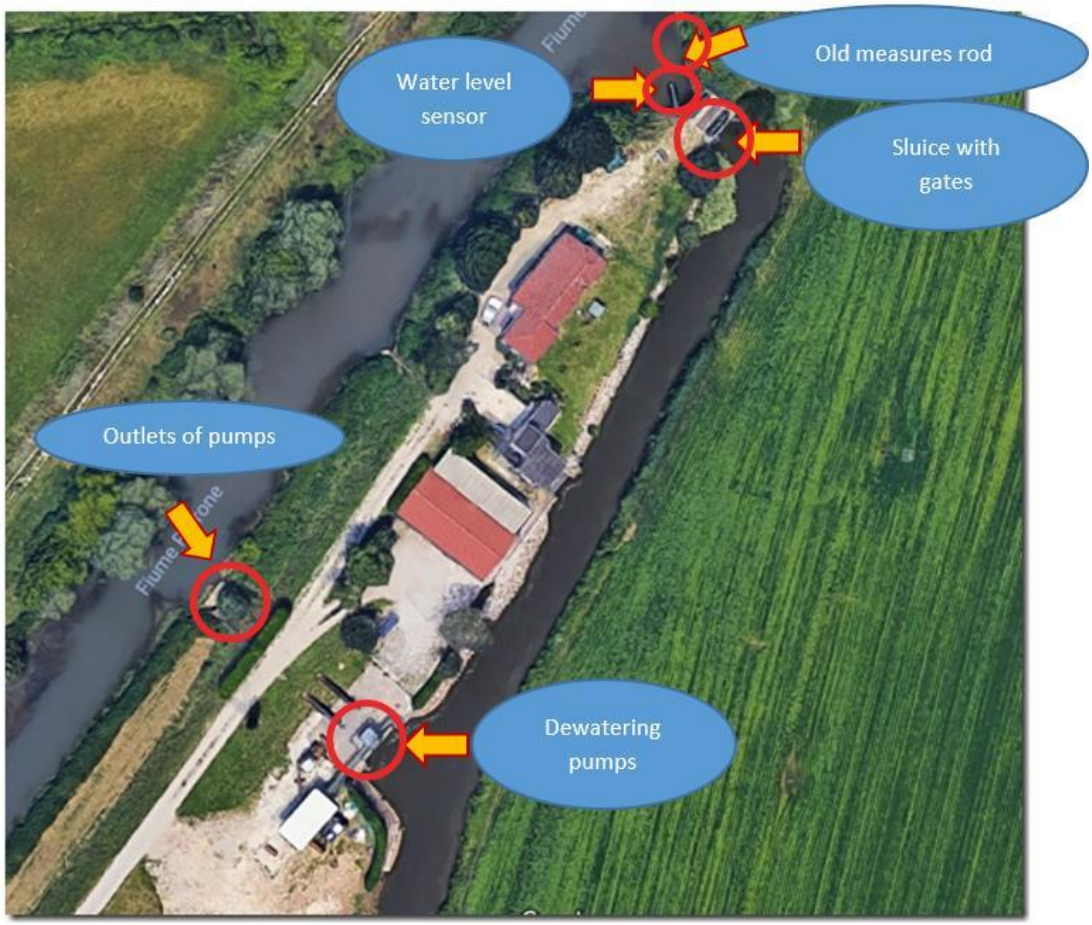


Figure 11. The Drone's flight area in the S.Agostino District of Vicenza.

4.1.2 **Agenda of the Activities**

In the following table is provided the official agenda of the flood pilot and of the related activities

Table 2. Agenda of the flood pilot related activities

Day	Activity	Location	Timing
Monday 25 February 2019	Press Conference	Sala Stucchi: Municipality of Vicenza	12.00
	Training:volunteers	Civil Protection Protection Head Office in Vicenza (Debba)	20:00-22:00
Tuesday 26 February 2019	Training: Decision Makers and PSAP operators	Municipality of Vicenza	9:00-12:00
Thursday 28 February 2019	Training: Citizens and observers (Mobile App)	AAWA headquarters in Venice	13:30-17:00
Monday 4 March	Technical check	Municipal Operative Centre (AIM Palace)	9:00-11:00

2019	beAWARE Internal Meeting	Conference room "sala dei Chiostri di Santa Corona"	11:00-18:00 (lunch 13-14, Bar Panineria del Centro, Contrà Daniele Manin, 22, 36100 Vicenza VI)
	Drone activity	S.Agostino - Consorzio di Bonifica	9:00-17:00
Tuesday 5 March 2019	Training: Decision Makers and PSAP operators	Conference room "sala dei Chiostri di Santa Corona"	9:00-13:00
	Lunch	Antica Casa della Malvasia, Contrà delle Morette, 5, 36100 Vicenza VI	13-14
	beAWARE Internal Meeting	Conference room "sala dei Chiostri di Santa Corona"	14:00-18:00
	Training:volunteers	Conference room "sala dei Chiostri di Santa Corona"	20:00-22:00
Wednesday 6 March 2019	General test	Municipal Operative Centre (AIM Palace) and City Centre	9:00-12:00
	Lunch	Antica Casa della Malvasia, Contrà delle Morette, 5, 36100 Vicenza VI	12-14
	beAWARE Internal Meeting	Conference room "sala dei Chiostri di Santa Corona"	14:00-18:00
Thursday 7 March 2019	Pilot	Municipal Operative Centre (AIM Palace) and City Centre	8:00-14:00
	Lunch	Conference room "sala dei Chiostri di Santa Corona"	14:10-15:00
	Debriefing (observers group + operators group)	Conference room "sala dei Chiostri di Santa Corona"	15:00-17:00
	Transport	from Vicenza to S.Agostino	15.00 - 15.30
	Drone Demonstration (drone group - max 30 persons)	S.Agostino - Consorzio di Bonifica	15:30-17:30
	Transport	from S.Agostino to Vicenza	17.30 - 18.00
	Social Dinner	Tonazzo 1888 (Corso S. Felice Fortunato, 98, 36100 Vicenza VI)	20.00
Friday 8 March 2019	beAWARE Review	Conference room "sala dei Chiostri di Santa Corona"	9:00-17:00 (lunch 13-14, Conference

			room "sala dei Chiostri di Santa Corona")

4.1.3 **Storyline**

The story line for the flood pilot is divided into three sessions that altogether cover all the flood Use Cases. During the pilot, each session was performed twice: the first time the management of the situation relied only on the use of the legacy tools (which are: telephone - stable and mobile lines, VHF, email and press releases); the second time, the same session was executed with the beAWARE platform and the end-user's tools (PSAP, mobile app and Sensor Thing Server).

The timing of each session was the following:

- Session 1: - **pre-emergency phase**: this session was divided in:
  - Session 1a - legacy tools: from 8:00 CET to 8:30 CET of the 7TH March 2019
  - Session 1b - beAWARE tools: from 8:30 CET to 9:00 CET of the 7TH March 2019

- Session 2: - **Monitoring the river (threshold exceeding) and triggering of the pre-defined task of the civil protection plan**: divided in:
  - Session 2a - legacy tools: from 9:00 CET to 10:30 CET of the 7TH March 2019
  - Session 2b - beAWARE tools: from 10:30 CET to 12:00 CET of the 7TH March 2019

- Session 3: - **Management of the Emergency:**
  - Session 2a - legacy tools: from 12:00 CET to 13:00 CET of the 7TH March 2019
  - Session 2b - beAWARE tools: from 13:00 CET to 14:00 CET of the 7TH March 2019

The first session was the pre-emergency phase, before the occurrence of the flood, which focuses on the EWS and forecasting models, taking the data from a real past event (the flood of the 1st November 2010), with and adequate time scaling to fit the current date time and the duration of the session. More in detail, the story-line starts when the flood forecast model AMICO produces a forecast indicating a possible flood event in the next days, with predicted water level above all the alert thresholds in the section of the Bacchiglione River near the Bridge 'Ponte degli Angeli'. Promptly the beAWARE platform informs the Decision Maker about the situation that derives from this forecast.

After this point the session 2 starts, when the situation was constantly monitored by the Decision Maker from the PSAP, focusing now on the real-time measurements taken by the water level sensors along the Bacchiglione River in Vicenza.

In fact, as forecasted, the flood started and the level in Bacchiglione River at Vicenza was constantly growing higher. As consequence, the observed water level at Ponte degli Angeli river section exceeded gradually all the three alert thresholds.

In this phase, the Civil Protection had a set of pre-defined tasks to assign to the volunteers teams; more in detail, every exceeding of a different threshold at the bridge Ponte degli Angeli triggered a set pre-defined tasks in the Civil Protection plan in all the 'critical point of the city. Moreover, specific public alerts were spread through the citizens.

During the emergency the Decision Maker is also constantly updated by the teams about their location in the city and the status of accomplishment of their tasks,

The third phase started when the Bacchiglione river in Vicenza overtopped the embankments and started to flood the nearby areas; in a real emergency, this situation occurs shortly after the exceeding of the third threshold defined at the Bridge 'Ponte degli Angeli'. As consequence, Citizens and volunteers sent incident reports to signal to the authorities that there were flooding in various areas of the city centre. While the tasks that the volunteers had to perform are not pre-defined ones, as in the previous phase, they depend strictly on the ongoing situation and on the flood reports provided inside the city.

In this phase, the system collected a large amount of information about the current emergency from different areas of the city, such as: incident reports, video from fixed video cameras and drones, images and videos taken by the mobile app, Tweets etc.

Regardless of the various sources and their format, the incoming data were analysed by the proper tool of beAWARE platform. The outcomes of the analysis were presented in an efficient and meaningful manner to the PSAP and the Dashboard assisting the Decision Maker to consider useful information concerning the incident, such as its location, its level of risk etc.

4.1.4 **Equipment**

The required equipment for the control room set-up was:

- 1 projector
- 2 screens for the PSAP and Sensor Thing Server
- 1 PC
- 2 Laptops
- 1 Mobile device with the beAWARE mobile app
- VHF station
- 1 telephone
- Cables for the various connections

- Yellow jackets with the caption 'beAWARE Test' for all the people in the control room

Each team of volunteers was equipped with:

- One mobile device (assigned to the rescue team leader), with the First responder version of the beAWARE mobile app installed
- One VHF device for each rescue team's leaders
- Yellow jackets with the caption 'beAWARE Test' to all the observers
- Observation sheets for each observer (in Italian or English according to the observer's nationality);

Additional equipment for specific teams, according to their task performed during the pilot, that had been provided by the Vicenza Municipality, ANC and ANA was:

- 1 truck with a crane "Iveco Strails" (team 1)
- 1 veichle 'Land Rover Defender' (team 1)
- 2 veichles "Nissan Cabstar" (team 2 and 3)
- 1 veichle "Opel Vivaro" (team 3)
- 1 veichle "Ford Ranger" (team 4)
- 1 Laptop (Team 4)
- Aquadikes (hydraulic plastic barriers, Team 3)
- Sandpacks (Team 1)

Figure 12. Some of the vehicles of the Civil Protection office of the Municipality of Vicenza assigned to the volunteers' team during the Pilot

Figure 13. On the left: Aquadike placed during the pilot; on the right example of sand packs placed by the team

Each team of Citizens was equipped with:

- mobile devices assigned to each member of the team (four citizens for each team), with the Citizen version of the beAWARE mobile app installed;
- Yellow jackets with the caption 'beAWARE Test' for each team member and for all the observers;
- Informative sheets, with the indication of the path, for each 'Citizen'
- Observation sheets for each observer (in Italian or English according to the observer's nationality);

For the drone's test, this additional equipment was required:

- One dummy to simulate people in danger
- One drone type DJI Mavic Pro, with its remote control and supply batteries
- 2 Mobile routers
- Laptop and mobile phone with the drone's software installed
- Laptop (for running the PSAP)
- 1 screen

AAWA organized a shuttle service for transferring the beAWARE partner and the EU commission delegates from the Vicenza City center to this district (about 7km)

Figure 14. Part of the equipment required in occasion of the drone flight of the 7th of March 2019.

Figure 15. The drone (type DJI Mavic Pro)

4.1.5 **Role Division**

During the training and in occasion of the pilot, the following division of roles was established:

In the control room (COC room):

- Decision Maker (Municipality of Vicenza)

- N°9 Support to the Decision Maker and members of COC (AAWA, Veneto Region, Municipality of Vicenza, Genio Civile, Soil reclamation consortium)
- Control Room operators:
    - N°1 Operator of the PSAP Map (AAWA)
    - N°1 Operator of the PSAP Dashboard and KB (AAWA)
    - N°2 Operators of the PSAP's Incident manager and Operator Manager screen (AAWA, Municipality of Vicenza)
- N°4 Control room observers (beAWARE)

In the field:

- Team 1 (Civil Protection of Vicenza) : 5 Volunteers (1 with the mobile app)
- N°3 Observers of Team 1 (Civil Protection of Vicenza ,AAWA, beAWARE)
- Team 2 (ANA): 5 Volunteers (1 with the mobile app)
- N°2 Observers of Team 2 (AAWA, beAWARE)
- Team 3 (Civil Protection of Vicenza) : 5 Volunteers (1 with the mobile app)
- N°4 Observers of Team 3 (PCIV, AAWA, beAWARE, WEOBSERVE)
- Team 4 (ANC) --- 3 Volunteers (1 with the mobile app)
- N°3 Observers of Team 4 (ANC,AAWA, beAWARE):
- TEAM SA (Alta Pianura Veneta Soil Reclamation Consortium): 5 Volunteers (1 with the mobile app)
- N°1 Observer of Team SA (AAWA)
- Team Citizen 1: 4 citizens (AAWA, ANC)
- N°4 Observers of team Citizen 1 (AAWA, beAWARE)
- Team Citizen 2: 5 Citizens (AAWA, ANC)
- N°4 Observers of team Citizen 1 (AAWA, beAWARE)

4.1.6 **Use cases tested during the pilot**

The following table shows the Use Cases for the flood scenario depending on their maturity. Specifically, the UCs that will contain beAWARE technologies fully implemented are shown in green, while in blue those that have been partially implemented in the second prototype. About the latest, a more detailed description of all the differences with the final Use Cases (D2.10) is not provided here, but referred to the deliverable D2.5.

Table 3. Flood scenario Use Cases Modification

USE CASES FLOOD
UC_101: Declaration of the attention status and continuous monitoring of flood forecasting
UC_102: Management of new flood emergencies
UC_103: Monitoring river water level and assignment of tasks to first responders
UC_104: Evaluation of the execution of tasks
UC_105: Monitoring rainfall
UC_106: Monitoring river breaking/overtopping and assignment of relative tasks
UC_107: First responders monitoring
UC_108: Sensor and Flood forecasting alerts
UC_109: Acquiring images and video from drones and static cameras for flood risk management
UC_110: Management of the sand packs distribution points and of Safe Places

4.1.7 User Requirements tested during the pilot

The final full list of flood user requirements, defined in D2.10 as result of the elicitation process started at the beginning of the project with the D2.1, is reported in the table below. It should be noticed that, since the flood pilot tested the 2nd prototype of the beAWARE platform, not all the URs mentioned in D2.10, have been fully implemented during the second version of the system and thus tested during the flood pilot. More specifically, the URs fully implemented in the 2nd prototype of the platform are in green box in the table below, while the URs only partially implemented are listed in yellow and finally the URs which were not tested during the pilot are highlighted in orange.

Table 4: Flood Pilot User Requirements

UR#	UC#	Requirement name	Requirement description
UR_101	All	Type of visualization	Display information to authorities in a web-GIS platform (citizen and first responders' reports by calls, apps, social media, Sensor measurements, etc.)

UR_102	101, 102, 103 104, 105, 106, 108	Map of the AMICO Flood EWS results	Display reliable and trustful flood forecasts, potentially dangerous situations and the forecasted level of risk to the authorities, based on the results of the Early Warning System AMICO (improved with the assimilation of Satellite data (snow cover, soil moisture, etc.) and Meteorological forecasts data with a finer spatial resolution provided by FMI)
UR_103	101, 102, 103 104, 105, 106, 108	Flood warnings	Provide authorities/citizens with automatic warnings on river levels overtopping some predefined alert thresholds, based both on forecast results (pre-emergency phase) and on real-time measurements by the sensors
UR_104	102, 103, 104, 105, 106	Send/receive emergency reports	Allow citizens to send text, images, audio and video messages from their mobile phone (for the different operative systems) and from their social media account to the authority during bad weather conditions when the GPS signal is low
UR_105	104	Send task reports	Allow First Responders to send reports about their assignments from their mobile phone to local authorities
UR_106	103,106	Visualize video cameras	Display streamed video from video cameras to the authorities/citizens
UR_107	102,103, 104, 105,106	Localize video, audio and images	Provide authorities with the ability to localize videos, audio and images sent by citizens from their mobile phones
UR_108	104	Localize task status	Provide authorities with the ability to localize first responders reports regarding the status of their assigned tasks
UR_109	102	Localize tweets	Provide authorities with the ability to localize Twitter messages concerning a flood event
UR_110	102	Localize calls	Provide authorities with the ability to localize Phone Calls (mobile application) to an emergency number concerning a flood event

UR_111	102, 109	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, social media and taken by drones
UR_112	102	Detect element at risk from reports	Provide authorities with the ability to detect the number of elements at risk and the degree of emergency by filling specific fields on the mobile app or from text sent by the mobile app and by social media
UR_113	102	Detect element at risk from calls	Provide authorities with the ability to detect the number of elements at risk and the degree of emergency from emergency calls
UR_114	102, 103, 106, 109	Detect water depth and velocity	Provide authorities with the ability to detect water level and water velocity from video and images sent by static cameras
UR_115	all	Real time flood mapping	Display flooded areas in real time to authorities/citizens coming from different sources (such as pre-defined risk maps, images taken by drones, etc.)
UR_116	102, 103, 105, 106, 108	Warning people approaching flood areas	Provide authorities with the ability to warn people in danger with warning messages, once they are approaching a flooded area
UR_117	102	Manage assignments in case of new emergencies	Provide authorities with the ability to manage first responder assignments
UR_118	106	River overtopping	Provide authorities/citizens with the ability to know if the river level is overtopping predefined alert thresholds
UR_119	103	Manage assignments based on river level overtopping	Provide authorities the ability to assign task to first responder teams related to the overtopping of predefined river level thresholds
UR_120	107	Map of rescue teams and task evaluation	Display to authorities the location in time of first responder teams in all the municipality and provide the ability to evaluate in real time the execution of the assigned tasks with a global visualization of the activities performed

UR_121	105	Detect rainfall volume and duration	Provide authorities with the ability to detect rainfall volume and duration from videos (static cameras)
UR_122	105	Rainfall warnings	Provide authorities/citizens with the ability to know in real time if the rainfall intensity is overtopping predefined alert thresholds
UR_123	106	Detect embankment exceeding	Provide authorities with the ability to detect from video, automatically, 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
UR_124	106	Embankment warnings	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
UR_125	102,106	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid interferences inside the area involved by civil protection activities
UR_126	101	Map of Satellite data and weather forecasts	Display updated satellite images in case they are fed to the system and weather forecasts.
UR_127	all	Filters	Provide advanced filters in the data management platform (visualize and list information selected by filters/query)
UR_128	101, 102, 103, 105, 106	Evaluation of the level of risk	Provide authorities with the ability to evaluate the 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 trough mobile application
UR_129	all	Automatic translation from a foreigner applicant	Make easy the communication between people with different languages. This feature refers to an automatic language detection, by performing speech recognition using all language models and then by comparing the scores

UR_130	all	Traffic Status	Display to the authorities the current traffic situation so that they can decide where to direct the first responders or inform them which roots to avoid
UR_131	all	Traffic warnings	Provide authorities with the ability to send warnings to citizens in order to avoid a certain area that is jammed with traffic
UR_132	109	Map of Drones images	Display updated images taken by the drone.
UR_133	102	Send water level estimation from 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.
UR_134	102	Send specific type of incident reports	Provide to the Citizen and the first responders the ability to use their mobile applications so as to specify the type of incident report from a pre-defined list of incidents.
UR_135	All	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
UR_136	103	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.
UR_137	109	Detection the boundary of 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 registration method and also the geo-location of every pixel in the image should be provided.
UR_138	All	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 citizen or first responders, the list of the tasks assigned to the rescue teams and the texts of all the public alerts.

UR_139	110	Capacity of the safe areas	Provide to the authority the current level of crowding of the safe areas.
UR_140	110	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.
UR_141	,102,103, 108	Map of the Sensors measurements	Display the measurements taken from the available sensors of the weather stations.

4.2 Training activities

One of the main results of the 1st prototype evaluation (D2.4) was that the training session organized for the 1st pilot was not enough to train adequately the participants to the beAWARE technologies. For that reason, AAWA organized many sessions of training for the end users, differentiating them according to the roles established during the pilot.

4.2.1 Training activities for the volunteers

The aim of this activity was to provide to the civil protection volunteers a general overview of the beAWARE platform, to train them on the main features of the beAWARE app required for the pilot and to explain their role in the pilot itself.

This activity has been specifically addressed to the people who participated in the pilot as Civil protection teams and, since they were all volunteers, the training sessions had to be organized in the evening, after the Italian standard working day.

Two training sessions were organized, each of them involved about 25 volunteers and was performed totally in Italian.

Training session n°1: 25th of February - from 20:00 CET to 22:00: First day of Mobile app training for the volunteers, that took place in the headquarters of the civil protection volunteers in the District of Debbia in Vicenza;

Figure 16. First training session for the Civil Protection volunteers

The milestones of this training session were:

- provide the volunteers a general overview of the beAWARE platform and of the goal of the Pilot;
- explain to the volunteers the features of the beAWARE mobile app
- Install the beAWARE mobile application in each device (the compatibility of each mobile phone had been checked by AAWA in advance, requesting to each participant to specifiy the model of his\her device)
- basic settings of the mobile application (set the language, update the map. Clear the cache etc…)
- explain to the volunteers how to send incident reports and attach multimedia like photos and videos

Training session n°2: 5th of March - from 20:00 CET to 22:00: Second day of Mobile app training for the volunteers; the training took place in the conference room of S.Corona in the Naturalistic and archeological Museum of Vicenza. During that session, the participants had been separated in two groups. The first group, that included the person for each team in charge for using the mobile app during the pilot, was trained to the more advanced features of the first responders' version of the mobile app; this included the login as first responder, the accreditation, the features for receiving or refusing tasks and for updating the status of

the team and of the assignment. At the same time, the other group discussed some logistical and practical issues concerning the pilot itself and the tasks of each team.

Figure 17. Second training session for the Civil Protection volunteers

4.2.2 **Training activities for the citizens**

On Thursday 28th of February from 13:30 CET to 17:00, AAWA organized a session of training in its headquarters in Venice. The training was addressed to the AAWA's staff who used the mobile app as Citizen during the pilot and to the relative observers. This activity involved about 20 people and was performed in Italian.

Figure 18. Training session for the citizen.

During that activity, AAWA provided to the 'Citizens' a general overview of the whole beAWARE platform, of the goals and organization of the Pilot. Then a more detailed explanation of the mobile app and its features followed, while AAWA helped the participants to download and install the mobile application on their devices.

After this, the 'Citizen' started to test the application, sending incident report and various type of attachments.

Finally, It was explained to all the Citizens their roles and paths during the pilot and to all the observers how to fill their forms.

4.2.3 Training activities for the control room operators

The targets of this training activity were the staff of the Vicenza Municipality and AAWA who were in control room as operators during the pilot; more in detail, this training focused on the PSAP.

Two training session were organized, each of them involved about 10 persons and was performed totally in Italian.

Session 1: 26th of February - from 09:00 CET to 12:00CET: First day of PSAP training for the staff of the Vicenza Municipality; the training took place in a room of the Muncipality in Vicenza;

Figure 19. First training session for the control room operators

During that session, a general overview of the beAWARE was provided, followed by a more specific explanation of the PSAP and its features.

AAWA presented to the staff of the Muncipality the main capabilities of each PSAP screens (the map, the dashboard, the incident and operation manager, the public alert screen) and how they were supposed to be used during the pilot.

Then, the set-up of the COC, regarding specifically the PSAP (the number of workstations and screens) was detailed, and a division of roles in the control room established

Session 2: 5th of March - from 09:00 CET to 13:00: second day of PSAP training for the staff of the Vicenza Municipality, at the presence of the whole beAWARE Consortium; the training took place in the conference room of S.Corona in the Naturalistic and archeological Museum of Vicenza

Figure 20. Second training session for the control room operators

During this session, the set-up of the control room was reproduced in terms of number of workstations, PSAP's and KB's screens and roles division. Then the end users were specifically trained to the actions that would have to be performed during the pilot (for example: make filters in the map, receive and comprehend forecasts from map and dashboard, receive and comprehend sensor measurement from map and dashboard, receive and comprehend incident reports; see the attachment of the incident reports, receive tweets, manage the incidents, assign task to the teams, manage the volunteers team etc..).

4.2.4 General Rehearsal

The 6th of March 2019 from 9:00 CET to 12:00 CET a general rehearsal of the pilot took place, activity meant as a final training session of the beAWARE technologies for all the different active roles (Volunteers, Citizen and Control room operator) together.

During this activity a script similar to the one for the pilot was reproduced, trying to perform with the beAWARE technologies all the main actions required for the following day. The PSAP was established in the COC room in the same configuration of the pilot and with the same operators.

Regarding the volunteers and the Citizens, since this activity was performed during the working hours, only some delegates for each team were present. However, for each team of

civil protection volunteers there was one representative for each team trained in the use of the mobile application.

It should be mentioned that, in that occasion only the sessions with beAWARE was reproduced; moreover, since the goal was to test the beAWARE technologies, in particular the communication between the COC room and the Citizen and volunteers, the assignment of the various task has been simulated. In other words, unlike what happened during the pilot, in this training session the script was reproduced without the real execution of the assigned task by the Teams.

Figure 21. Photo of the COC room during the rehearsal.

4.3 The flood Pilot (7th of March 2019)

4.3.1 Pilot Execution

The second beAWARE pilot took place on the 7th of March in Vicenza from 8:00 CET to 14:00 CET at the presence of more than 90 participants.

The detailed timetable of the pilot can be found in the Appendix A: Timetables for the Flood Pilot. To summarize, as already described, the procedure that was followed was divided in the 3 main sessions, each of them performed first with the legacy tools used usually during emergency and then with the support of beAWARE platform.

The first session dealt with the pre-Emergency phase, which occurs before the crisis, when the weather forecasts predict conditions favourable to a flood in the next 54 h.

The main pillars of this phase are:

- Arrival of the results of the flood forecast model which predicts a possible flood (with the exceeding of the 3rd alert threshold) in Vicenza in the next 54 hours. In the legacy tools session, the bulletins about the forecasts were provided by e-mail, while the beAWARE platform totally integrates the flood forecast model AMICO with more detailed results.

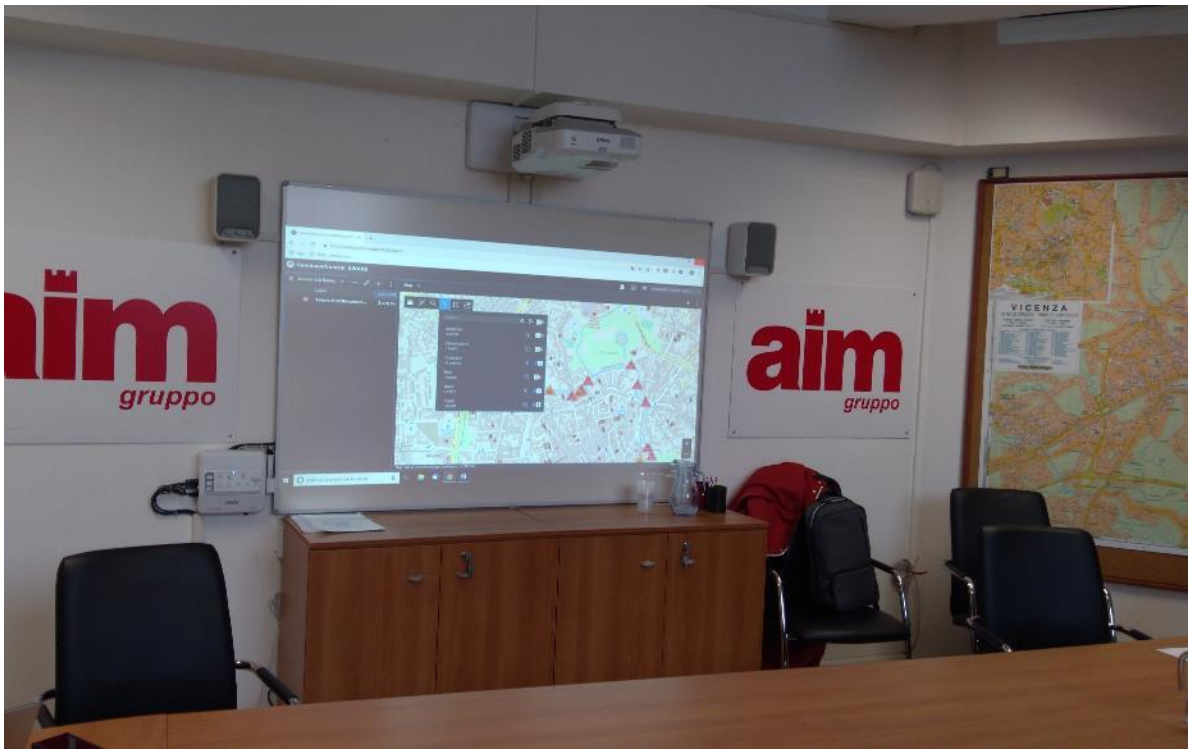


Figure 22. PSAP map in the COC room showing the arrival of new forecast with the predicted exceeding of the 3rd threshold

- Consultation of the flood risk maps for different scenarios. During the legacy tool session, the maps are on paper, while beAWARE platform integrates them inside the KB.
- Accreditation of the civil protection teams: this is a standard procedure for the municipality of Vicenza in case of flood. The leader of each team of volunteers has to go in the COC room antechamber and communicate the availability of the team, the members and the equipment of the group. During the beAWARE session, this procedure doesn't require to the team leader to be physically in the COC antechamber, because the login as first responder and the sending of the accreditation form can be done everywhere, take advantage of the beAWARE mobile app.

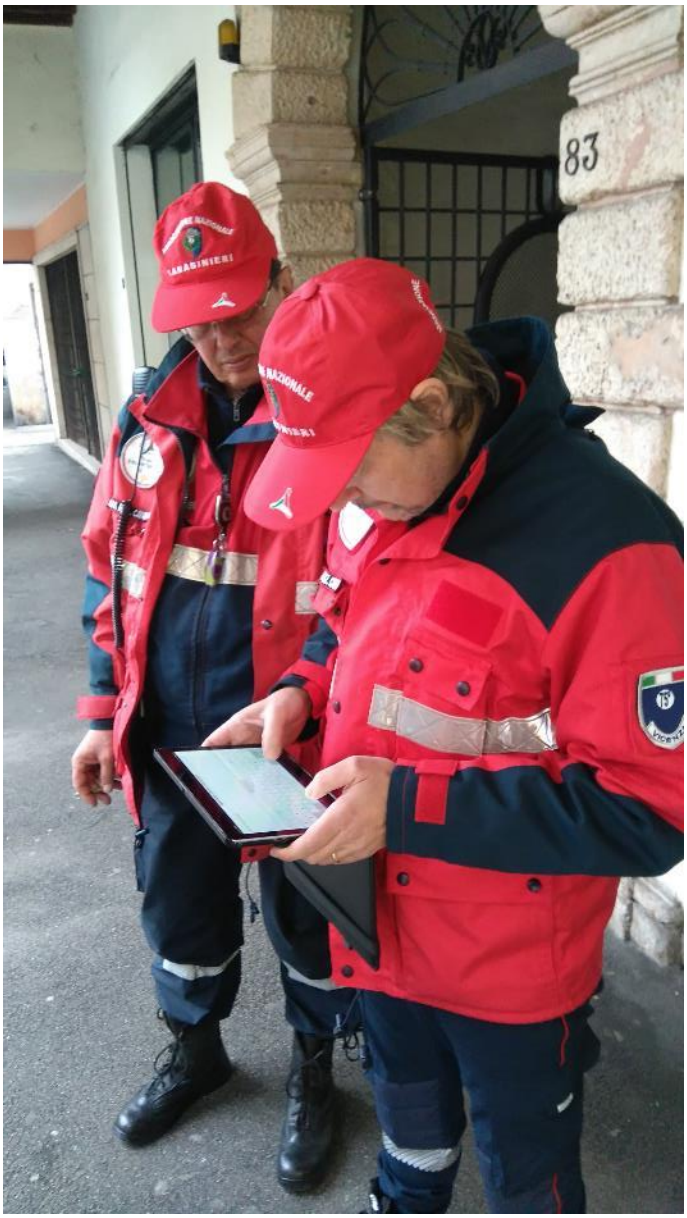


Figure 23. Accreditation of the team 4 with the beAWARE mobile app.

The second session deals about the Monitoring (threshold exceeding) in the rivers and triggering of the pre-defined task of the civil protection plan; the key points are:

- Arrival of the real time measurement of rainfall and water level from the physical sensors in Vicenza. During the legacy tools session, the measurements are provided by mail or by the proper provider websites, while the beAWARE platform integrates the measurements of the whole sensor's network of the Veneto Region stored in the SensorThingServer and shows them through the PSAP.
- Ddetection of water level threshold exceeding and triggering of the tasks provided in the civil protection plan. During the legacy tools session, the Decision Maker has to compare the latest measure of water level from the sensors with the threshold values

and check in the municipal civil protection plan (a paper copy of this plan is available in the COC room) which tasks have to be assigned to the various teams. The beAWARE's Crisis Classification module automatically identifies every threshold exceeding and notifies it to the control room operators; moreover, the platform integrates all the pre-defined task in the civil protection plan, so they can be rapidly assigned to the teams trough the PSAP

- Management of the civil protection teams. During the legacy tools session all the communications are performed trough the radio by the operators in the COC antechambers, who take notes of the position of every team. Instead, during the beAWARE session, the control room operators can assign the selected tasks trough the PSAP, while teams communicate to the control room their status trough the mobile app and receive the assignment directly on their devices.

Figure 24. Photo in the left: Volunteer with the legacy tools (radio); in the right: volunteer using beAWARE mobile application

- Issue public alerts. At the present state, the Municipality of Vicenza publishes important notices to the citizens in its website or send SMS. The beAWARE platform allows to compose a public alert in the PSAP or to choose from a list of pre-defined ones, that can be received by the Citizen trough the mobile app. Moreover, the platform allows to specify the radius and the center of the alert, so it's possible to send different types of public alerts in different districts or areas of the city.

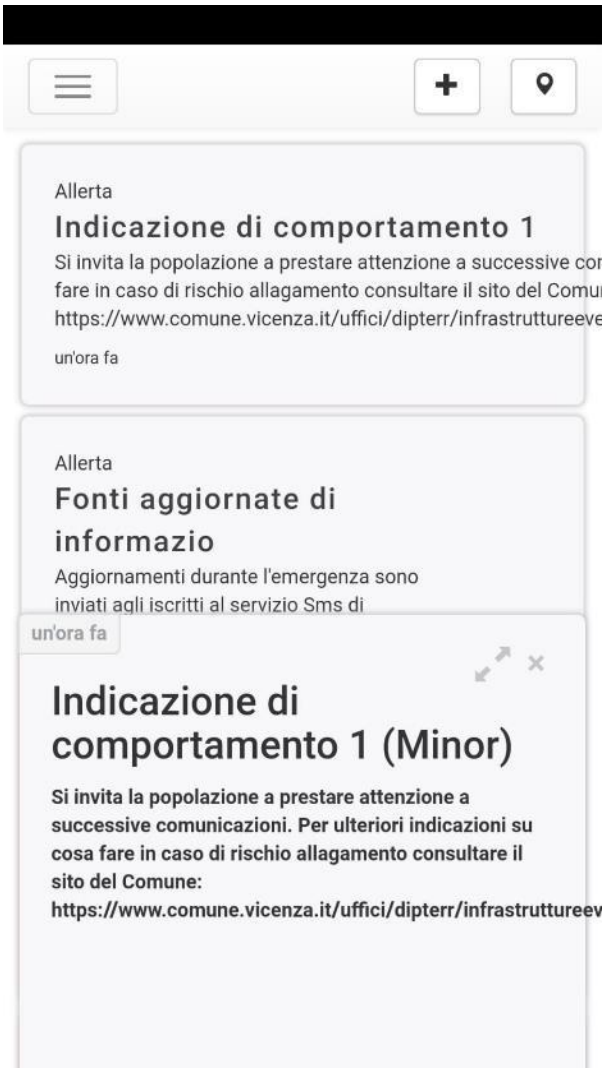


Figure 25. Example of public alerts sent during the session 2 (with beAWARE)

- Receive tweets relevant to rising of the water level in the rivers. At the present state, it is possible to collect tweets only if they are sent to the Municipality's tweeter account and this requires an operator to check if every incoming tweet is relevant to the flood or not. During the beAWARE sessions, the platform itself collected all the relevant tweets from many different accounts.
- Data from the fixed surveillance camera of Ponte degli Angeli. These data are available in the beAWARE session, since the platform has been linked to the camera and the recordings were analysed by the video analysis tools, which estimates the water level and detects threshold exceeding.

It is worth mentioning that every task assigned to the civil protection teams during the pilot had been really performed by the volunteers, both in the beAWARE sessions, and the ones with the legacy tools.

Figure 26. Examples of the tasks execution during the pilot. The phot above shows the team 3, the photo below the team 1.

Figure 27. Examples of the tasks execution during the pilot. The phot above shows the team 4, the photo below the team 2.

The third session deals about the management of the situation which occurred in the city centre after the overtopping of the Bacchiglione River. The milestones of this phase were:

- Arrival of the real time measurements of rainfall and water level from the physical sensors in Vicenza
- Task assignment to the teams based on the current situation (while the tasks in the last session were mainly pre-defined actions from the civil Protection Plan)
- Teams management;
- receive tweets relevant to the flood;
- receive incident reports about the floods. During the beAWARE session, the teams of 'Citizens' and Volunteers send the incident reports trough the beAWARE app and they were visualized, in real time and georeferenced, on the PSAP's map. During the legacy tools session, the reports about flood were provided through phone calls to the control room operators in the antechamber. The control room operators took notice of each call in a paper log and periodically report to the control room.

Figure 28. A citizen (the man on the left) is reporting a flood trough a phone call during the session 3 without beAWARE, while the observer (the man on the right) is taking notice in his observation form.

- Evaluation of the level of risk from the incident reports of flooding. This is a new, key feature, provided by the beAWARE platform which could not be reproduced in the legacy tool session, since nothing similar is currently available. The Crisis Classification module is able to evaluate the risk level associated to each flood incident report,

implementing the flood algorithms of AAWA's Flood Risk Management Plan of the Eastern Alps Hydrographic District. Based on these results, the PSAP provided to the COC a real time and dynamic risk map.

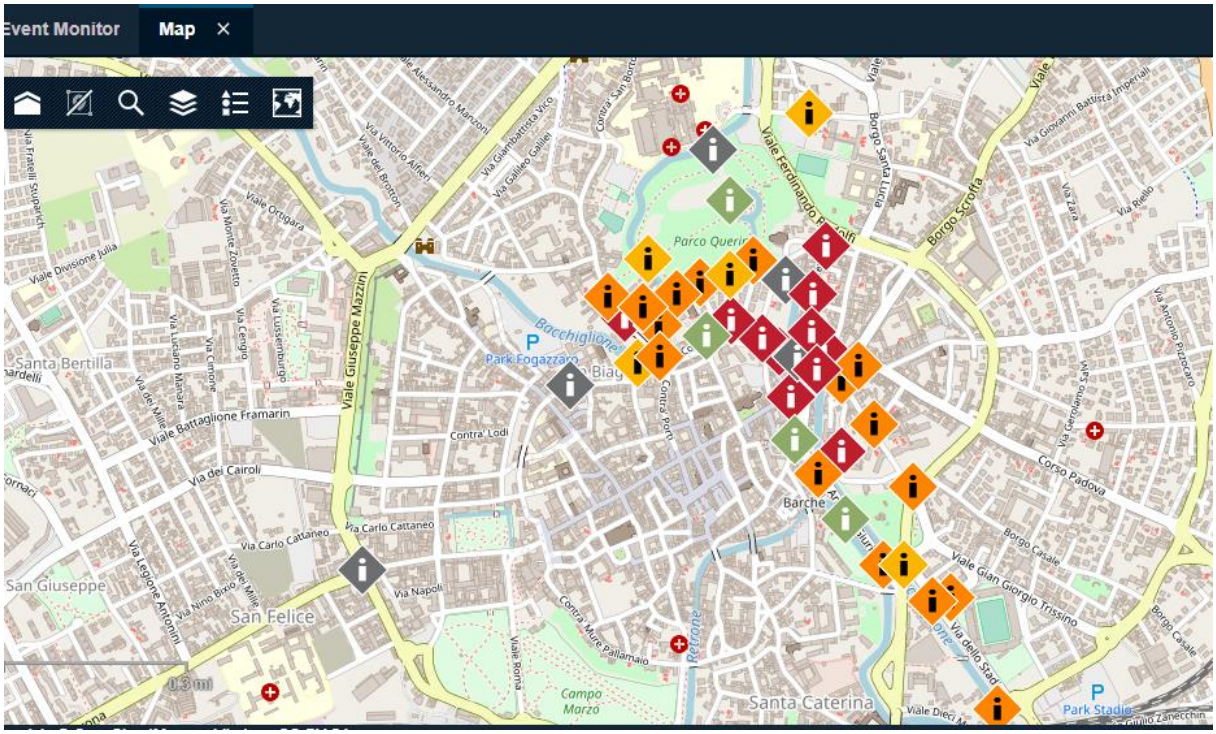


Figure 29. Example of the real time flood mapping obtained from the incident report of the Citizen during the pilot and shown in the COC room trough the PSAP's map

- Integration with Drone. During the beAWARE session, the control room operators are able to see through the PSAP the result of the video analysis applied to a recording taken by a drone in the S.Agostino district of Vicenza. More in detail, the algorithm detects the presence of people in danger (dummy) in the Retrone river. This feature is totally innovative and could not be reproduced during the legacy tools session.

As the previous phase, every task assigned to the civil protection teams during the pilot had been actually performed by the volunteers both in the beAWARE sessions and in the one with the legacy tools.

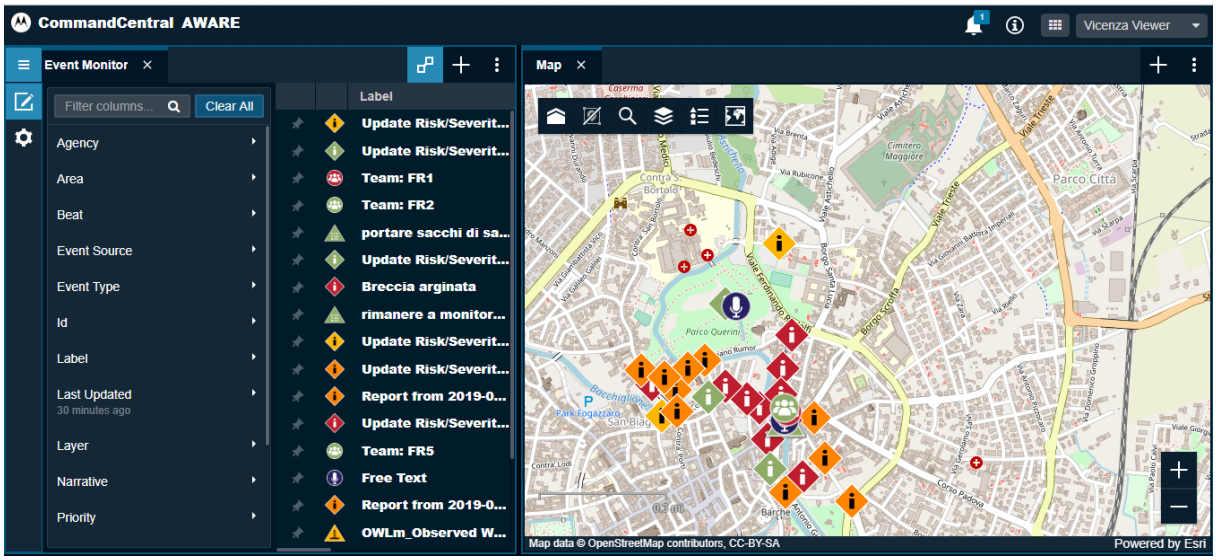


Figure 30. Screenshot of the PSAP's map taken in the middle of the session 3b

4.3.2 Pilot Timetable

The detailed timetable of the flood pilot can be found in the Appendix A: Timetables for the Flood Pilot.

4.3.3 Participants and roles

The pilot of the 7th of March 2019 involved more than 90 participants; the full list can be found in the following table, together with the role and position during the pilot of each person.

Table 5: List of participants to the pilot of the 7th of March

Role	Name	Surname	Organization
COC ROOM			
Decision Maker	Matteo	Celebron	Municipality of Vicenza
Support to the decision mker /COC member	Carlo	Andriolo	Municipality of Vicenza
Support to the decision mker /COC member	Francesco	Baruffi	AAWA
Support to the decision mker /COC member	Gianpaolo	Bottacin	Veneto Region
Support to the decision mker /COC member	Luca	Fabris	Municipality of Vicenza
Support to the decision mker /COC member	Michele	Ferri	AAWA
Support to the decision mker /COC member	Gianfranco	Battistello	Alta Pianura Veneta soil reclamation Consortium
Support to the decision mker /COC member	Giovanni	Terzo	Genio Civile of Vicenza
Support to the decision mker /COC member	Silvia Elena	Trevisan	Municipality of Vicenza
Support to the decision mker /COC member	Paola	Sperotto	Municipality of Vicenza
PSAP operator (Map)	Francesco	Zaffanella	AAWA
PSAP Opertator (KB + Dasboard)	Daniele	Norbiato	AAWA
PSAP Operator (Alert, incident task)	Francesca	Lombardo	AAWA

PSAP Operator (Alert, incident task)	Marco	Sinigaglia	Municipality of Vicenza
Operative personal/ support	Massimo	Cappelletto	AAWA
Operative personal/ support	Paolo	Brunello	Municipality of Vicenza
Operative personal/ support	Stefania	Tessari	PCIV
Operative personal/ support	Doria	Ricci	PCIV
Operative personal/ support	Stefania	Piccoli	PCIV
technical support	Itay	Koren	MSIL
technical support	Ilias	Koulalis	CERTH
technical support	Philipp	Hertweck	IOSB
technical support	Jan	Blume	IOSB
technical support	Jurgen	Moßgraber	IOSB
technical support	Dmitri	Pikus	IBM
technical support	Benny	Mandler	IBM
Observer (filled the observation form)	Spyros	Kintzios	HMOD
Observer (filled the observation form)	Cath	Cotton	WEOBSERVE
Observer (filled the observation form)	Carmen	Castro	PLV
Observer (filled the observation form)	Kim	Lintrup	FBBR
Observer	Guillaume	Lapeyre	REA
Observer	Marcello	Marzoni	REA
Observer	Mirko	Hama	REA
Observer	Clements	Liher	REA
Observer	Ansatasios	Karakostas	CERTH
Observer	Ioannis	Kompatsiaris	CERTH
Observer	Stefanos	Vrochidis	CERTH
Oberver	Leo	Wanner	UPF
TEAM1 (PCIV)			
Civil protection volunteer (Mobile app operator)	Andrea	Catelli	PCIV
Volunteer	Giorgio	Casaro	PCIV
Volunteer	Michele	Quaglieri	PCIV
Volunteer	Franca	Maran	PCIV
Observer (filled the observation form)	Concetta	Bonelli	PCIV
Observer (filled the observation form)	Roberto	Fiorin	AAWA
Observer (filled the observation form)	Thomas	Danholm	FBBR
TEAM 2 (ANA)			
Civil protection volunteer (Mobile app operator)	Igor	Pecoraro	ANA
Volunteer	Dino	Dalle Ave	ANA
Volunteer	Francesco	Antoniazzi	ANA
Volunteer	Giancarlo	Lorenzetti	ANA
Volunteer	Giodana	Lovison	ANA
Observer (filled the observation form)	Lorenzo	Nerantzis	HRT
Observer (filled the observation form)	Irma	Bonetto	AAWA
TEAM3 (PCIV)			

Civil protection volunteer (Mobile app operator)	Pierangelo	Carlassara	PCIV
Volunteer	Orazio	Azzolini	PCIV
Volunteer	Luigi	Damian	PCIV
Volunteer	Piergiorgio	Combet	PCIV
Observer	Guido	Cunico	PCIV
Observer (filled the observation form)	Marco	Fabbiani	PCIV
Observer (filled the observation form)	Giorgio	Gris	AAWA
Observer (filled the observation form)	Gerard	Casamayor	UPF
Observer (filled the observation form)	Mohammad	Gaharesihard	WEOBSERVE
TEAM 4 (ANC)			
Civil protection volunteer (Mobile app operator)	Dario	Stevan	ANC
Volunteer	Gianluca	Peruzzi	ANC
Volunteer	Mimmo	Apolloni	ANC
Observer (filled the observation form)	Claudio	De soghe	ANC
Observer (filled the observation form)	Ari	Karppiner	FMI
Observer (filled the observation form)	Matteo	Bisaglia	AAWA
TEAM SA			
Mobile app operator	Davide	Marchetto	Alta Pianura Veneta soil reclamation Consortium
Volunteer	Simone	Peruffo	Alta Pianura Veneta soil reclamation Consortium
Volunteer	Lionello	Giordan	Alta Pianura Veneta soil reclamation Consortium
Observer (filled the observation form)	Marco	Gamba	AAWA
TEAM CITIZEN 1			
Citizen	Federica	Moretti	AAWA
Citizen	Roberta	Longhin	AAWA
Citizen	Claudio	De Soghe	ANC
Citizen	Mimmo	Apolloni	ANC
Observer (filled the observation form)	Anna	De Carlo	AAWA
Observer (filled the observation form)	Jordi	Bellver	PLV
Observer (filled the observation form)	Miriam	Ballerin	AAWA
Observer (filled the observation form)	Daniele	Rossi	AAWA
TEAM CITIZEN 2			
Citizen	Filippo	Bianchi	AAWA
Citizen	Andrea	Betterle	AAWA
Citizen	Matteo	Bisaglia	AAWA
Citizen	Dario	Stevan	ANC
Citizen	Gianluca	Peruzzi	ANC
Observer (filled the observation form)	Ole	Hermansen	FBBR
Observer (filled the observation form)	Jasper	Marcussen	FBBR
Observer (filled the observation form)	Jorge	Hernandez	PLV
Observer (filled the observation form)	Giuseppe	Fragola	AAWA

4.4 Outcomes of the system during the pilot

In this subsection, the outcome of the pilot for the sessions using the beAWARE platform is presented, from a more technical point of view. The following report includes details of the system on each session followed by screenshots taken in the different phases.

4.4.1 Session 1b: Pre – emergency phase

During the pre-emergency the forecasting system generated periodically a prediction based on the most recent weather forecast and the water level sensors The AMICO provided hourly estimations of the river water level over specific river sections in forecasting period 55 hours ahead. From the total 304 river sections Early Warning component obtained forecasts and analysed the 60 most significant river sections; these sections were grouped in 6 main groups.

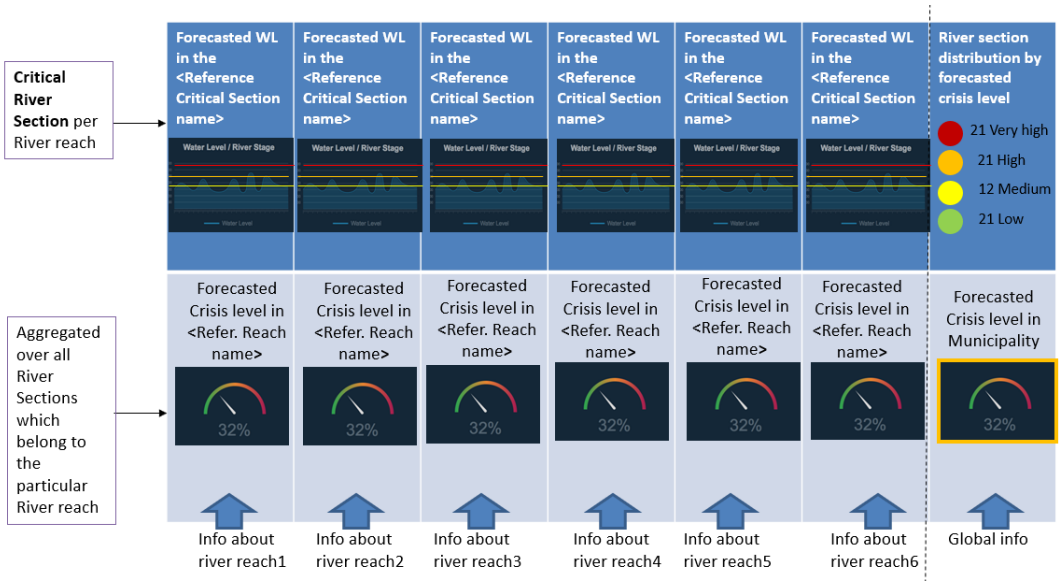


Figure 31: Dashboard overview for the Pre-emergency phase (FLOOD Pilot)

The exceeding of each of the predefined thresholds was associated to a different scale of the so called 'Crisis Level'. The results were sent to the PSAP where, upon users' request, a metric map and a dashboard interface are displayed allowing to the Users several ways of interaction.

For the Flood pilot, the pre-Emergency module was fed by simulated data that were acquired and stored by a real dataset from the period between 31-10-2010 to 03-11-2010. The module transformed the previous date/times to current ones so as to consider the data as new forecasts.

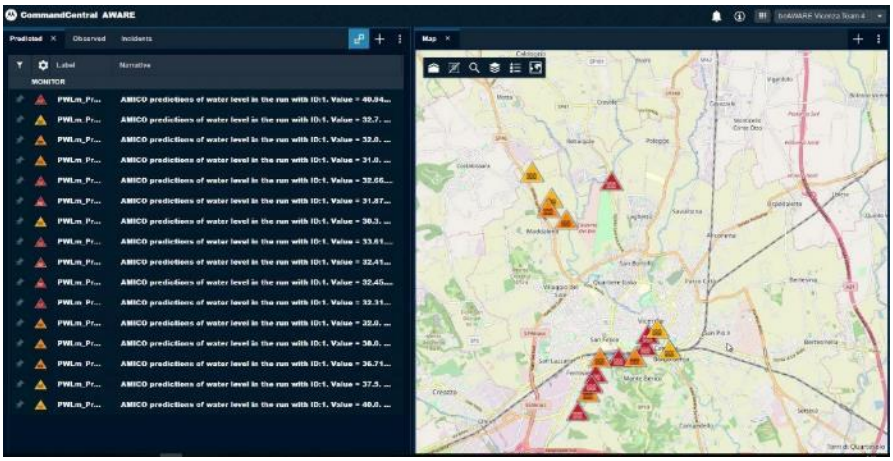


Figure 32: Screenshot of the PSAP's event map during the pre-Emergency phase

Figure 33: Screenshot of the pre-emergency dashboard

Furthermore, the integrated mechanism to display Flood Hazard maps and Risk/Impact maps was demonstrated. During the flood scenario, those maps were created and provided by the AAWA in the shapefile format, which is a digital vector storage format for storing geometric location and associated attribute information. This data is stored in the GeoServer, that offers standardized interfaces which are used by the crisis classification module to access the available data.

Additionally, this data can be visualized via the KBS visualization interface. Through the synthetisation of internal knowledge and the location of external information from WikiData (like hospitals' location) valuable knowledge is provided to the decision makers. For example, figure shows places of interest being in endangered zone.

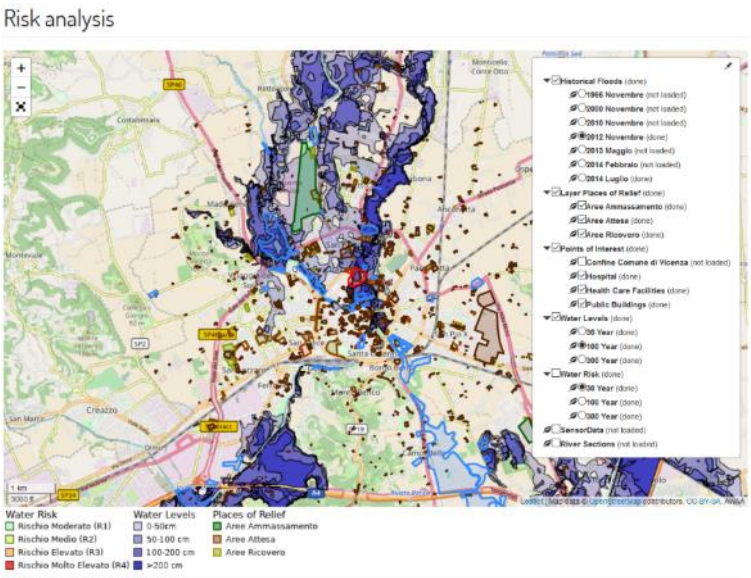


Figure 34: Visualizing the available GIS data.

In this phase and according to the prescribed scenario, the authorities, after receiving indications about a forecasted crisis event, evaluated the situation and issued a general alert informing the general public about the forthcoming event. beAWARE system provides a channel for issuing general alerts. (Figure 35)

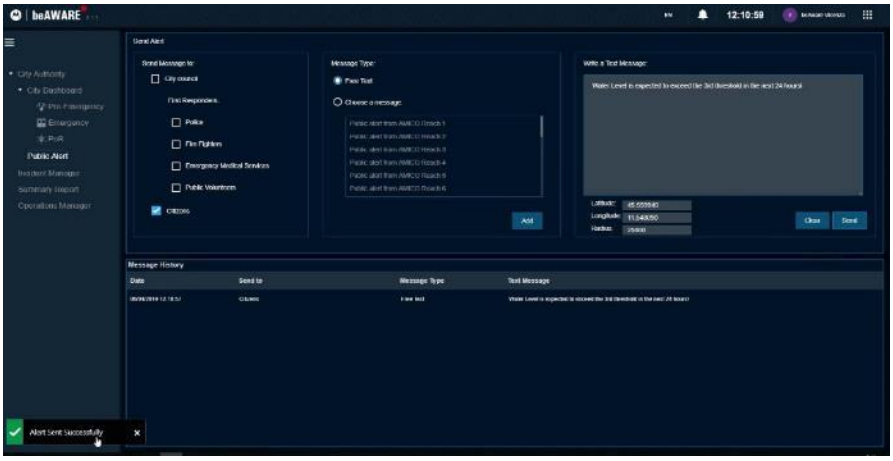


Figure 35: beAWARE system provides a channel for issuing general alerts informing the public about forthcoming crisis.

Public alert functionality allows the authorities to warn the public and FR about hazards before or during an emergency by sending notifications directly on their mobile devices and only if they are located within the given radius of the alert (see Figure 36).

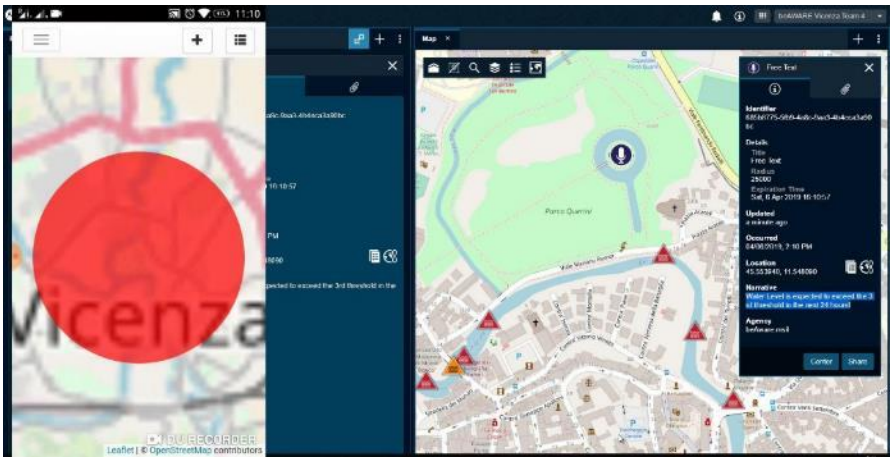


Figure 36: Public alerts

Subsequently, the rescue teams were instructed to log in the platform after receiving the alert and declare availability through their mobile devices via the beAWARE application which is the principal interface that users, first responders or citizens can use to interact with the beAWARE platform, sending incident reports. These reports can contain photos, videos and audio recordings as well as textual messages.

According to the protocol that is applied in Flood emergencies and was followed during the pilot, the first reports that were fed to the system after the login of the rescue teams were the accreditation forms (Figure 37). Even the fact that these forms contained irrelevant content to the hazards that the visual analysis module is built to detect, they weren't filtered out of the system. Specific categories are foreseen in the mobile app, related to specific modalities such as to allow users to flag correctly the information sent and selectively to override the validation mechanism.

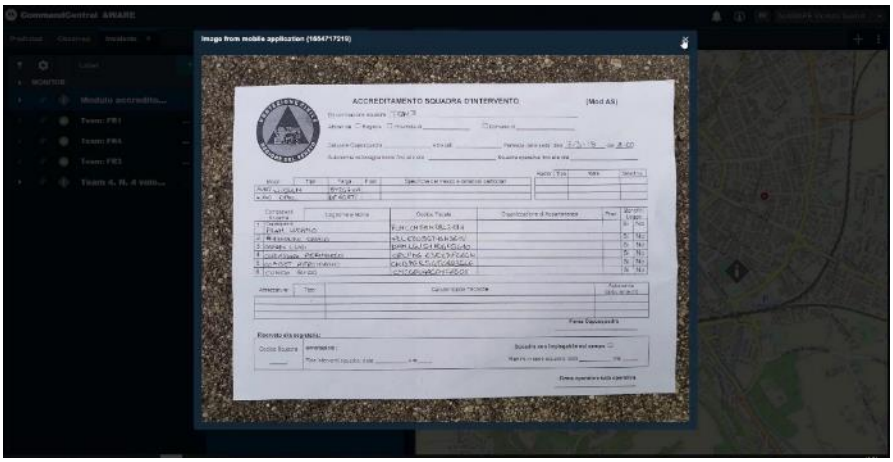


Figure 37: Accreditation form sent to the system by a civil protection team.

Finally, the position of the teams can be constantly tracked through the GPS connection of the mobile application. Teams and their position in the field was continuously located on the map

tracked by the authorities and helping them to make the right management of their resources. (**Error! Reference source not found.**)

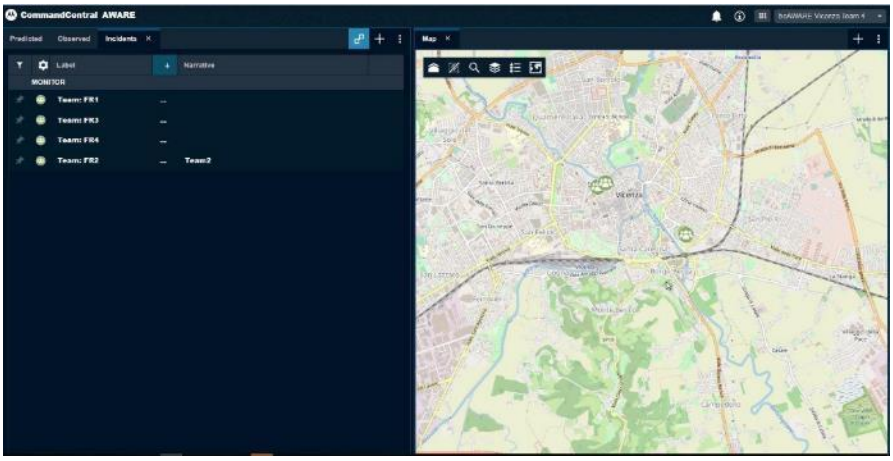


Figure 38: Teams can be constantly tracked through the GPS connection of their mobile devices

4.4.2 Session 2b: Monitoring the river and triggering of the pre-defined task of the civil protection plan

This phase is to help authorities to monitor the situation and take preventive actions to reduce threads. It involves tasks like the management of the rescue teams and the resources.

In this phase the Real-Time Monitoring and Risk Assessment component was activated to estimate the risk of the ongoing crisis event. The Fusion Module within the component fuses the information acquired from sensors together with the outcome of the analysis of the Data Analysis and Processing components of the beAWARE platform, in order to provide a total risk assessment of the crisis event. The estimated factors are forward to the PSAP to support the constant monitoring of the emerged hazard.

For the Flood pilot, in the Emergency phase, the Crisis Classification module employs simulated data based on the real-time observations iterated in five steps. At every iteration, the phenomenon escalates. Automatic incident alerts were created whenever measurements that were sent exceeded specific thresholds. Pop-up notifications bringed alert timely to the notice of the users who could view the notification and perform available actions from the notification popup windows, such as to compile quickly public alerts (Figure 40).

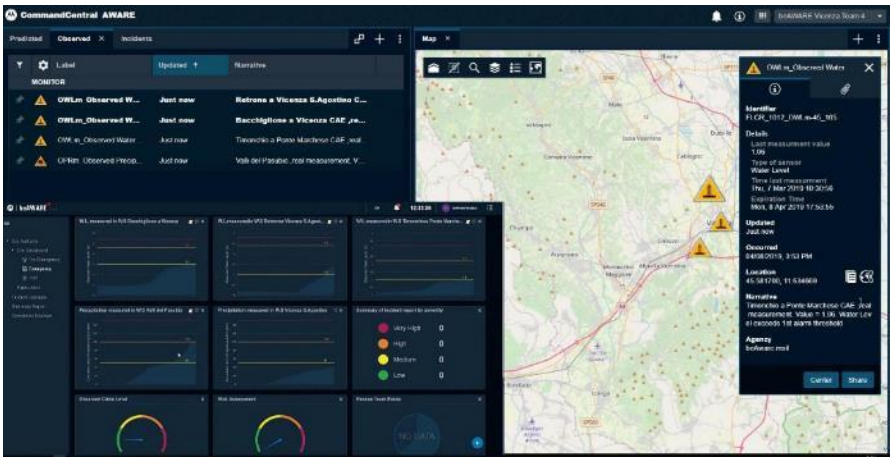


Figure 39: Screenshot of the PSAP during the Emergency phase

At the same time, suitable icons to descibe the event based on event properties, the category, the priority/ severity of the event are appeared on the Map of the PSAP.

On the Dashboard of the PSAP there are several indicators illustrating the information received. For example, traffic light indicators are illustrating aggregated information taken by the sensors and visualised on the platform and are one of the main parameters that triggers a set of pre-defined tasks. For example, in the flood scenario the plan imposes some specific preventive measures when the water level recorded by the sensors exceeds some fixed thresholds.

Figure 40: Pop-up notifications brings alert timely to the notice of the PSAP operator

In this phase, as part of the Real-Time Monitoring layer, VRS module was also activated in order to integrate visual information from static surveillance cameras. The purpose of this module is to visually monitor the water level and to validate visually the alerts coming from the water level sensors at the location of the Angeli bridge. For the purposes of the pilot a series of video captures was used from 2016, when there was a flooding event. Figure 41 depicts Angeli bridge, a part of the Bacchiglione river and an old rod that is used for measuring the water level determining the level of water boundaries via an edge detection algorithm.

Apart from water level estimation, the video chunk was also forwarded to Traffic Analysis component, in order to obtain information about the traffic on the bridge.

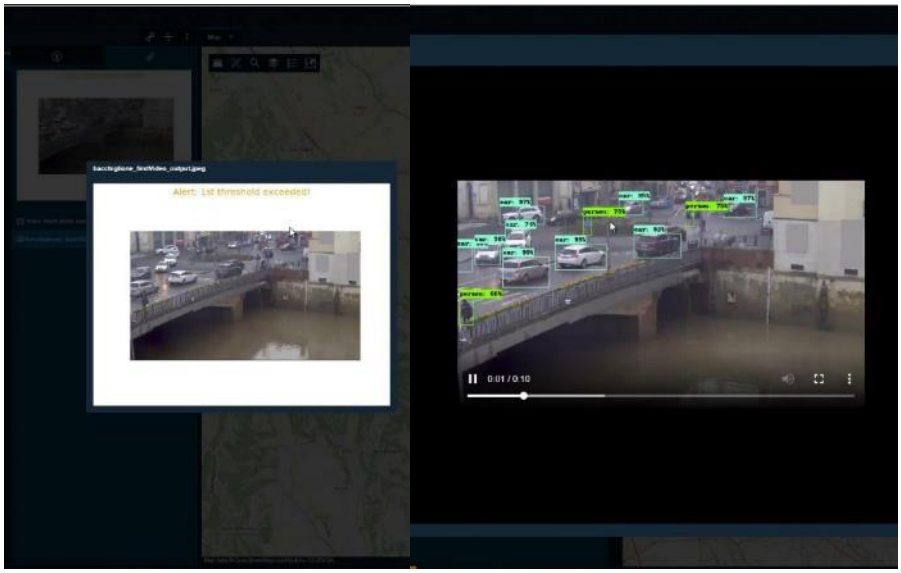


Figure 41: Incidents automatically generated by the surveillance camera at Angeli bridge

For this session of the pilot, a number of tasks were assigned to the rescue teams realising the prescribed scenario of the flood emergency through the standard operating procedure that was followed by the civil protection Office in Vicenza.

The task manager (Figure 42) is an extension to the incident view of the PSAP interface, which allows the operation manager to assign tasks to one or more response teams. The sequence was the following: i) Select a team from the available teams, ii) Write the instruction text or use predefined instructions from the box iii) Associate the mission with a specific incident followed by the incident location and relevant incident attachments iv) Assign the mission to the selected team by sending the message, v) Receive a verification when the message is successfully released.

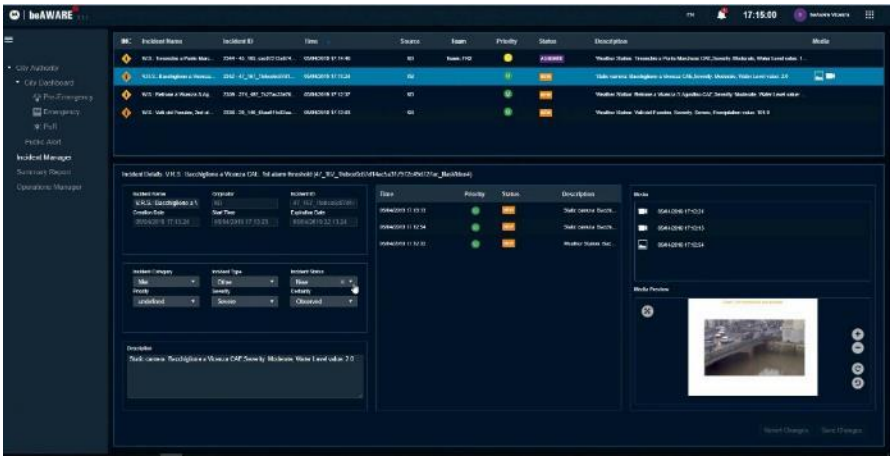


Figure 42: Task Manager

The Tasks that were successfully assigned to teams were tracked on the Tasks Table through a list of assignments given by the PSAP operator to the rescue teams (Figure 43). Each task had important attributes such as title, category and type, instructions given, assignment time, priority, severity, expected completion time.

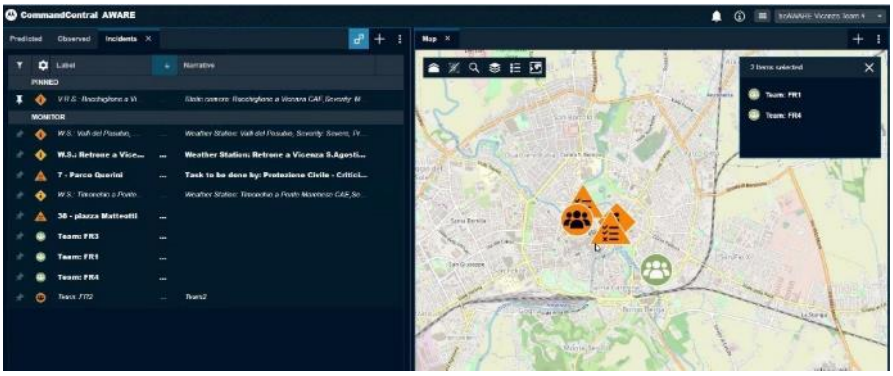


Figure 43: Screenshot of the PSAP's event map depicting the tasks together with the teams that operates to the region.

Tasks notifications were received by the mobile application of the FR's notifying them about newly issued tasks and the location of the confined area in which that operation will take place (Figure 44). In turn, the mobile applications of the FRs are reporting continuously their position and the status of the mission they have undertaken. The information is illustrated on the incident map with a team icon in the given location, colored accordingly based on the status of the assigned task.

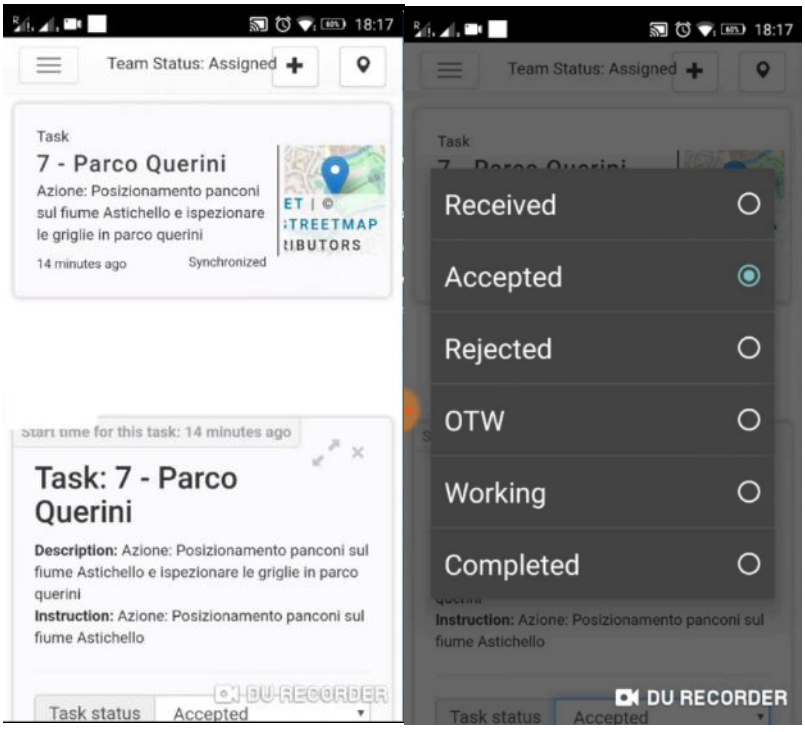


Figure 44: Tasks are received on the mobile applications of the users and can be either accepted, rejected or flagged as working or completed.

Within this session three bunches of tweets were sent to simulate mass emergency from citizens. The beAWARE Social Media Analysis collects continuously posts. A three-step validation process is being followed by the crawling procedure that eventually classifies the posts as relevant, fake or irrelevant (Figure 45). The real and relevant tweets are sent to the Multilingual Text Analyzer for concept and conceptual relation extraction. During the pilot the text analysis component failed to perform successfully due to memory allocation limitations. Nevertheless, the problem didn't seriously affect the execution of the pilot. The allocation of resources within the platform has been reviewed and, the component has been reviewed to optimize its memory requirements.

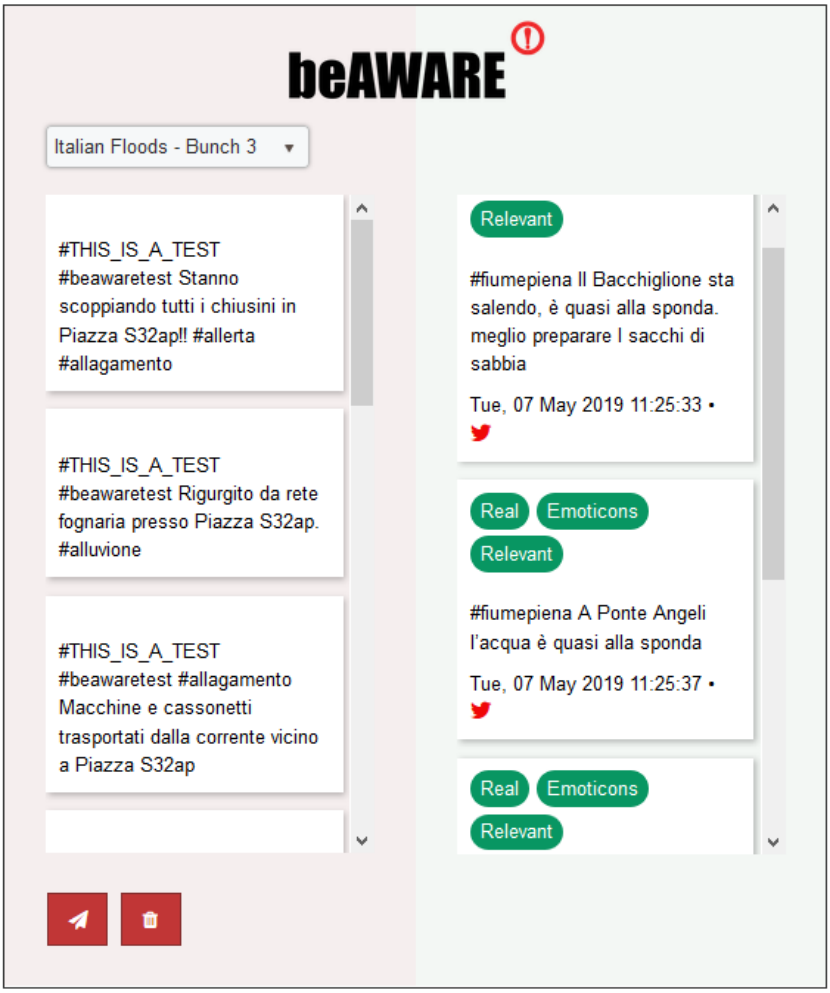


Figure 45: beAWARE Social Media Live Crawler.

Throughout this session and along with receiving tasks, the rescue teams continuously interacted with the system through their mobile phones, sending progress updates on the task they were operating on (Figure 46).

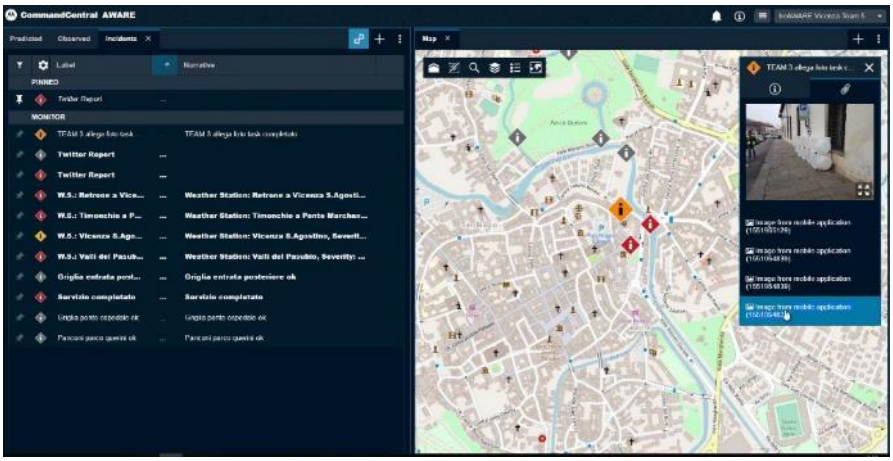


Figure 46: Images from Completed Tasks clustered together with the incident reports.

Except of this type of interaction, the mobile application provides also a channel to first responders to interact with the risk assessment process by inserting into the system valuable observations from the field (e.g. estimation about the water level). The obtained data is analysed and weighted in the estimation of the local level crisis risk.

4.4.3 **Session 3b: Management of the Emergency**

This phase is a continuation of the previous emergency phase and aims to demonstrate the mechanism of aggregation and semantic integration of emergency information. The third phase starts when the Bacchiglione river in Vicenza overtopped the embankments, this situation occurs shortly after the exceeding of the third threshold defined at the Bridge 'Ponte degli Angeli' that is verified both by the Real time monitoring module and the VRS.

In this phase, beAWARE system collected a large amount of information about the current emergency from different sources, such as: footages from drones, images and videos taken by the mobile app, Tweets etc. The beAWARE analysis components analysed the content of all the reported incidents to extract conceptual information.

For the purpose of the pilot, a set of approximately twenty predefined images from the Great Flood of 2010 were fed into the system. Visual Analysis module performed successfully by detecting and categorising them (Figure 47).

The integrated call center was also used to collect a call automatically, record it and forward it to the ASR module. During the call, the caller had to determine his spoken language, through an Interactive Voice Response, in order for the call to be forwarded to the correct ASR channel. The call eventually received on the PSAP and was played over the speakers in the CoC.

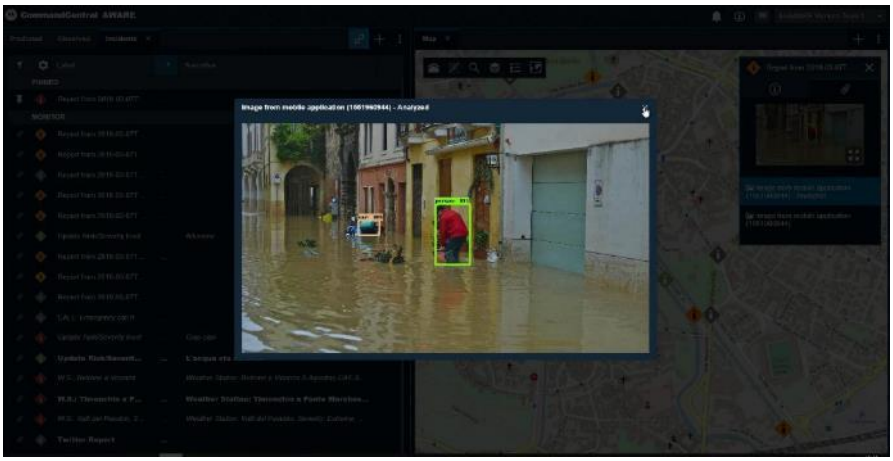


Figure 47: Visual analysis module automatically classifies the emergency and detects entities in danger.

Another important service that demonstrated through the pilot was the drones platform. This service is to connect drones activities of autonomous piloting, data sharing in real-time, and dynamic operation of the flight with the beAWARE analysis tools. The main capability demonstrated by the image analysis component in this case is the identification of a person in danger (Figure 48- represented by a dummy lying on the ground).

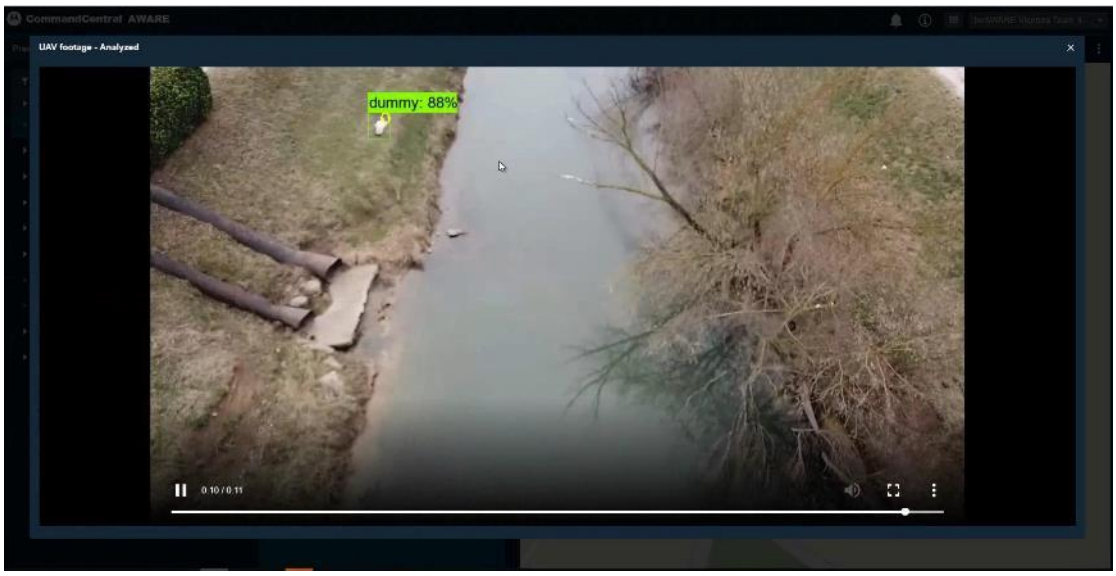


Figure 48: Incident reported from Drones Platform and analysed by the visual analysis module.

Overall, the system performed as expected (Figure 49) with no efficiency issues for the scale of this scenario. Technically, the most notable shortcoming of the pilot was the memory overhead of the MTA component that caused the module to crash[4]. Nevertheless, the platform, all the existing functionalities, and the established services worked combinedly to

[4] While the MTA couldn't be demonstrated during the pilot, the component was reran and evaluated using the exact same inputs used during the pilot, as reported in D7.6

provide a real-time risk mapping based on the reports of the citizens and FRs which was the main challenge of the beAWARE technology.

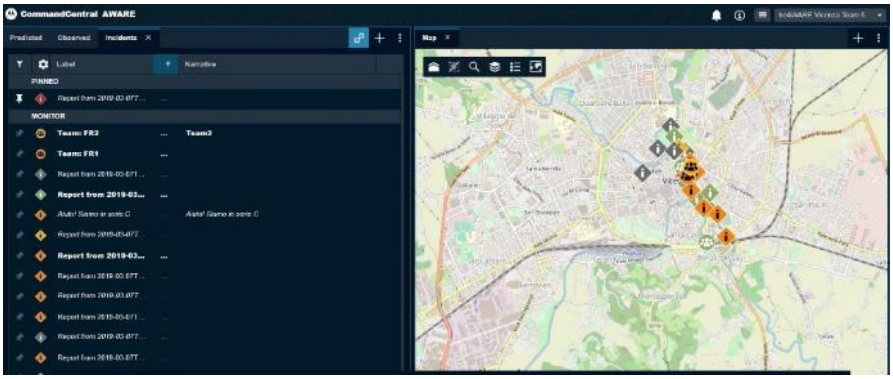


Figure 49: Proximity based clustering of incidents

4.5 Drones Activity

After the pilot, in parallel with the debriefing session, the autonomous drone flight live demonstration took place in the S. Agostino district, located in the southern part of the Municipality of Vicenza, Calongthe River Retrone and about 7km away from the City Centre. Due to the Italian regulation about drones, the areas for the flight test had to be located outside the city centre. For that reason, the joint between the Retrone River and the Cordano Channel was chosen. Moreover, this area is owned by the “Alta Pianura Veneta” Land Reclamation Consortium, one of the stakeholders of the flood pilot.

During the real time drone flight demonstration, a dummy simulated the presence of a person in danger in the Retrone River. The drone acquired video of the river with the dummy inside and, through the beAWARE platform infrastructure sent it to the video-analysis module for the identification of the target.

The autonomous fight that took place on the 7th of March 2019 as the last of a series of activities that took places in the last months. More in detail, test flights also took place on the 26th and 27th of November 2018 and the 4th of March 2019.

Figure 50. Photo of the autonomous drone flight of the 7th of march: the drone

The drones flight demonstration focused on autonomous piloting, real-time integration with the image analysis component, and dynamic operation of the flight (for example, changing route during the flight due to information received from the image analysis component). During the entire flight relevant information was made available via the drone platform dashboard. The information included the route of the current stage of the flight and imagery transmitted by instruments on the drone.

The first part of the demonstration consisted of a scan of a pre-defined area. The demonstration started with the drone going up to the designated flight height of 15 meters, and flying to the starting point of the scanning of the area. The route was calculated for the drone to cover the designated area which was 130 meters by 68 meters. The speed of the flight during the scan was configured to 3 meters per second. Images were captured by the drone and sent to the platform every 1 second.

The drone platform was listening for information coming from the image analysis component indicating a person in danger at a specific location (see **Error! Reference source not found.**). owards the end of the mission the drone flew back to the location in which a person in danger was identified and took a closer look (going down to an altitude of 10 meters), highlighting the dynamic capabilities of the autonomous flight component.

Once the scan of the area was completed, the drone was directed to inspect several pre-defined points of interest: (Pipes of a pump, Pump, Gate). In all the points of interest the

drone reached the designated point and lowered its altitude to 10 meters, to send more detailed images.

To conclude the session the drone flew back home and landed at the point of departure.

Figure 51. Photo of the autonomous drone flight of the 7th of march: the dummy.

5 Evaluation criteria for the flood pilot

5.1 Observation sheets

The observation sheets collected the feedbacks and notes taken by the 'observers' in each of the six sessions in which the pilot was divided. Every 'observer' was assigned to a specific type of 'actor' (i.e. there were some observers in the control room, some others who followed the civil protection teams, some others the citizens) with the aim to take note of every task performed, its timing and the problems occurred, with limited interaction with the 'players' or with the beAWARE technology; the observers were also required to add any useful comment about the experience of the 'players' with the beAWARE technology and the current tools.

The goal of the observer is to provide both qualitative and quantitate information taken during the pilot, that can help to compare the sessions executed with the legacy tools with the ones performed with the beAWARE-platform.

The observation forms created for the 2nd pilot represent an improvement of the one used in the first one; in fact the evaluation of the 1st prototype highlighted that it had been difficult for the observers to take notice of all the actions performed and their timing, since most of them were performed in rapid succession. For that reason the form was slightly revised.

First of all, 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 preformed 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

The list of action reported in each form is taken from the time table of the script, conveniently divided between the various sessions and roles; more in detail, as anticipated before, there were different observation form for each rescue teams, for the different operators in control room, for the citizens etc.

For each of the planned actions that is listed in the form, the observer should then indicate

- If the action has been successfully performed or if it has been performed but partially or with some problem, or finally if it is has not been performed at all (by a cross in one of these three different boxes)
- An estimation of the timing, if is applicable or if the user is able to provide it;
- Eventual notes or comments related to that action.

Before the pilot, each 'observer' was provided with a different observation form, according to the roles of his\her assigned 'actor'; moreover, for each type of observation form, AAWA provided both an Italian version and an English one, for the non native observers (like beAWARE Consortium)

Appendix B: Observation sheet formats for the flood pilot provides the English format of each different observation forms, which are:

- Form for the Control room observers (Session 1a,1b,2a,2b,3a,3b)
- Form for the team1's observers (Session 1a,1b,2a,2b,3a,3b)
- Form for the team2's observers (Session 1a,1b,2a,2b,3a,3b)
- Form for the team3's observers (Session 1a,1b,2a,2b; there is not section about the session 3 since the team3 do not participate to the session 3)
- Form for the team4's observers (Session 1a,1b,2a,2b, there isn't any section about the session 3 since the team4 joined the citizens team during the session 3)
- Form for the team SA's observers (Session 1a,1b,2a,2b,3a,3b)
- Form for the Citizen team1's observers (only session 3a and 3b)
- Form for the Citizen team2's observers (only session 3a and 3b)

5.2 Questionnaires

After the pilot and during the debriefing session, questionnaires were distributed to all the 'observers' and 'players' about various topics, starting from the organization of the pilot itself, to the functionalities of the 2nd prototype that have been tested.

The creation of this questionnaire followed the criteria and guideline expressed in the D2.2, adapting the basic structure proposed here to the pilot.

For each of the questions, a rating scale is provided: the user has to indicate (with a cross in the respective box) how much he/her agrees with a certain statement or how much he/her rates a specific functionality of the system. Moreover, for the most of these questions, the user can insert a comment to explain his/her rating.

Here is briefly explained the structure of the questionnaire.

Part 1 - Explanation of the questionnaire. This part provided general information about how to answer the proposed questions, the goal of the questionnaire and how the Consortium will use these data:

"This questionnaire is used to collect data based on your participation and observations during the pilot.

All participants involved in the Trial are given the opportunity to complete this questionnaire. The results of the completed questionnaires will be collated and will be used to support evaluation of beAWARE.

Within the questionnaire, you will first be asked to fill in personal information, and to answer questions about the Trial.

There are no right or wrong answers.

Participating in this questionnaire is voluntary. You do not have to answer any questions you do not wish to answer, and you may cease to participate at any time.

Your responses to this questionnaire will be used for beAWARE research work which ultimate objective is to improve preparation and response to crisis events.

Your responses will remain confidential and data will always be presented in such a way that your identity cannot be connected with specific published data.

Shall you have any question, please ask the questionnaire administrator."

Part 2– Personal information. In this part are asked the following questions to the end users:

- *What is your professional background?*

☐ Crisis management ☐ Rescue service or Responder ☐ Research ☒ Technical/Technology

☐ Other, please indicate…….

- *Which option(s) best describes you (you can select more than one):*

  ◯ *I am a decision maker/policy maker*

  ◯ *I am a emergency manager*

  ◯ *I am a scientist / data aggregator*

  ◯ *I am a citizen*

  ◯ *Other (please explain)……*

- *How many years of professional experience do you have:*

☐ 1-5 years ☐ 5-10 years ☐10-15 years ☐ More than 15 years

- *What is your Nationality?* _____
- *Gender*

☐ Male ☐Female

- *Age range*

☐< 30 ☐31 – 40 ☐ 42 – 50 ☐ 51+

- *How much would you agree with the statement that You have experience and knowledge regarding cross-border crisis management operations.*

☐ *Strongly Agree* ☐*Agree* ☐*Neutral* ☐ *Disagree* ☐ *Strongly disagree*

- *What was your role in the Trial.*

☐ *Player* ☐*Observer* ☐*Other, please indicate……..*

Part 3– Trial session: In this part is asked to the end user to indicate how much does he/here agree with some statement about the organization of the trial session. There are six possible ratings for every statement:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- Not applicable

The table below provided the full list of the statements that the users has to rate, for each of them he/her can insert a comment to explain his/her rating.

Table 6.List of Sentences to be rated in the part 3 of the questionnaires

The number of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.
The background of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.
The level of involvement of participants of the Trial sessions was adequate and enough to evaluate the solutions and their impact on the crisis management.
There were no organisational or logistics constrains (e. g. time management, infrastructure preparation) that influenced the quality and completeness of the Trial.
There were no external constrains (e.g. missing participants, emergency situation, technical breakdown, indisposition of key personnel) that influenced the quality and completeness of the Trial sessions.
The setup of the Trial was clear and every person involved in the Trial knew their role and responsibilities for all the activities organised.
The safety measures were adequately planned, explained and implemented during the Trial.
The Trial was conducted safely.
The scenario of the Trial was realistic (chosen hazard, its evolution and related cascading effects).

The injects from role players and the story telling were realistic.
Simulation helps in understanding the situation.
I am satisfied with the participation and conduction of the Trial.

Part 4– beAWARE: In this part is asked to the end user to indicate how much does he/she agree with some statement about the sessions of the pilot executed with beAWARE. There are six possible ratings for every statement:

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- Not applicable

The table below provided the full list of the statements that the users has to rate, for each of them he/her can insert a comment to explain his/her rating.

Table 7.List of Sentences to be rated in the part 4 of the questionnaires

The Trial sessions scenario was adequate to evaluate the solution and its impact on the crisis management for **beAWARE.**
The technical setup of solution **beAWARE** was complete, professional and adequate to evaluate the solution and its impact on the crisis management.
How much do you agree with the following statements that an automated exchange of data between different IT solutions leads to: *- Less time needed for practitioners in their search for crisis relevant information.*
- Less time needed for practitioners to read data from one solution and entering data manually into another solution.
- Lower probability for wrong information caused by human errors while reading/entering data from/into a solution.
- More time for practitioners to define, communicate, execute and supervise crisis response actions.
- Higher quality of the crisis management outcome due to the time savings, better data quality and improvement of communication.

Part 5: in this section is asked to the end user answer the following questions regarding the pilot that summarize their experience.

- *What best describes your previous involvement in citizen science or citizen observatory initiatives?*

  ◯ *This is the first time that I heard about citizen science or citizen observatories*

◯ *I have heard about citizen science or citizen observatories, but I have not been actively involved in any initiative so far*

◯ *I have been (actively) involved in one or more citizen science or citizen observatory initiatives*

◯ *Other (please explain).....*

- *How would you explain the role of citizens (the general public) in beAWARE project?*
- *Citizen observatories are not simple 'plug & play' technical solutions, they also have crucial 'social dimensions': they rely on the active and continued involvement of citizens and the general public to succeed. What was the most helpful part today to convey the social dimensions involved in setting up and running a citizen observatory?*
- *When do you think is the best moment to start including citizens in a project like beAWARE?*

◯ *Before designing the platforms, Apps and tools*

◯ *During the design of the platforms, Apps and tools*

◯ *After the design of the platforms, Apps and tools*

◯ *Other (please explain).....*

- *What is your opinion of the following parts of today's event?*

	Were you present in this session?	*Not at all useful*	*Slightly useful*	*Moderately useful*	*Very useful*	*Extremely useful*	*No opinion/ not applicable*
Practical demonstration in the field	*Yes* ☐ *No* ☐	☐	☐	☐	☐	☐	☐
Practical demonstration in the control room	*Yes* ☐ *No* ☐	☐	☐	☐	☐	☐	☐
Plenary discussion (Technical group)	*Yes* ☐ *No* ☐	☐	☐	☐	☐	☐	☐
Plenary discussion (Policy & management group)	*Yes* ☐ *No* ☐	☐	☐	☐	☐	☐	☐
Informal interactions and discussions throughout the day		☐	☐	☐	☐	☐	☐

- *In your view, what was the most valuable part/aspect of today's demonstration?*

- *In your view, what was the least valuable part/aspect of today's demonstration?*

- *How can we improve future events to convey a) the potential of citizen science and citizen observatories for disaster forecasting and management and b) the conditions for their success?*

5.3 **Debriefing**

After the pilot execution (the 7th of March 2019, from 15:00 CET to 17:00 CET) and in parallel with the drone's activity, a debriefing session was organized in the Conference room "Sala dei Chiostri di Santa Corona" involving most of the participants to the pilot (volunteers, the control room operators citizens and relative observers).

The debriefing session was led by AAWA (in Italian), at the presence of most of the beAWARE consortium.

In that occasion, AAWA asked both to observers both to the actors to provide feedbacks (positive and negative aspects) according to their roles during the pilot.

Moreover, during the session the questionnaires (see §5.2) were circulated.

All the end users' contribution had been transcribed and translated in English by AAWA staff in the meanwhile, at the presence of the beAWARE Consortium.

6 Results of the evaluation for the flood pilot

6.1 Observation sheets

After the pilot, the observation sheets had been collected by AAWA, who also translated them (in case of sheets written in Italian) and summarized the main relevant contents, which are going to be reported and discussed in this chapter.

6.2 Results of the observation sheets

6.2.1 Result of the observation sheets in the COC room

Session 1: all the observer's forms agreed that the COC operators succeed to perform all the expected actions (receive forecasts, see the risk map, accreditation of the teams) both with beAWARE and with the legacy tools. The timing required for perform each action was generally less with beAWARE than with the legacy tools, in particular regarding the comprehension of forecasts and the accreditation process.

Session 2: the observer's forms generally agreed that the COC operators succeed to perform all the expected actions; in some limited cases, one of the non native observer wrote that he missed a couple of actions because of difficult to follow some interaction in Italian between the stakeholders. The observers provided also an estimation of the timing for most of the performed actions, which was shorter with beAWARE than during the legacy tools sessions. However, one of the observers commented that the timing wasn't so relevant because often, while performing an action, the COC operators and the COC members made comment and explanations, answered to the decision maker's questions, discussed each other about the current situation; in particular this occurred during the beAWARE sessions. So, this element could have affected the duration of certain actions.

Session 3: the observer's forms generally agreed that the COC operators succeed to perform all the expected actions; in some limited case, one of the non native observer wrote that he missed some actions because of difficulties in following part of interaction performed in Italian between the stakeholders. The observers provided also an estimation of timing for most of the actions. Generally, the timing was quite similar for the actions performed with beAWARE and the ones with the legacy tools. However, it should be noticed that the session with beAWARE contained many actions that were impossible to reproduce with the legacy tools (i.e. the drones, the tweets etc), so generally the session with beAWARE took more time that the one with the legacy tools. Moreover, one of the observers commented that during the beAWARE sessions there had been a lot of discussions and comments about the

technology between the COC members and the PSAP operators. So, this element could have affected the duration of certain tasks performed in the COC room.

6.2.2 Result of the observation sheets for the team1

Session 1: all the observer's forms agreed that volunteers succeed to perform all the expected actions (accreditation of the team) both with beAWARE and with the legacy tools. The observers found that the accreditation procedure was much faster with beAWARE than the legacy tools.

Session 2: all the observer's forms agreed that volunteers succeed to perform all the expected actions (receive the tasks, accept the tasks, communicate the start of work and the end of work) both with beAWARE, both with VHF, requiring similar timing with both kind of tools.

Session 3: all the observer's forms agreed that volunteers succeed to perform all the expected actions (receive the tasks, accept the tasks, communicate the start of work and the end of work) both with beAWARE, both with VHF, requiring similar timing with both kind of tools.

6.2.3 Result of the observation sheets for the team2

Session 1: The accreditation procedure with beAWARE was fast, however one of the observers signalled that initially the mobile app's operator was not aware of that the status of his team set as 'Not Ready'. One other observer noticed that the team was expecting a feedback from the control room after the successful accreditation with the beAWARE mobile app, as occurred with the VHF, a feature not implemented in the app yet.

Session 2: the expected actions in this session regarded basically the reception of task from the control room and the further communication of the status of the assigned task. All the communications with the control room were performed with the VHF in the legacy tool session and then with the beAWARE mobile app. Based on the observer's forms, there had been some initial issues with the radio, while all the communications with the beAWARE app were successfully and rapidly performed. However, the app operators sent to the control room some photos about the completed task, which were received by the COC operators with some delay.

Session 3: During this session, the Team 2 noticed the starting of a river breach in a level near the 'Ponte degli Angeli' Bridge and communicated this information to the control room. Then the control room operators assigned to the team the task of monitoring the wall and waiting for the Team1 to bring the sand packs and then, together with the Team 1, place the sand packs to prevent the increasing of the breach. Both in the session with the legacy tools and in the one with beAWARE, the observers noticed that the Team received incomplete information

from the control room, in particular about the coordination with the Team1, so, in both cases, the team leader had to ask with the VHF for more clarifications. Moreover, one of the observers noticed that the team operator encountered some issues in changing the status of the team at the end of the task. Finally, all the observers reported that the beAWARE mobile app has stopped working while the team was communicating the end of task, so the operator had to re-start the app. For that reason, communicating the end of task was faster during the legacy tool session.

6.2.4 **Result of the observation sheets for the team3**

Session 1: Only one observer was present to the accreditation procedure with beAWARE, since, according to the script, it took place while the team was driving back from the main warehouse to bring the Aquadikes required for the next phase of the pilot. However, the observer wrote down that all the accreditation procedure with beAWARE was very fast (2minutes vs 10 minutes for the 'standard' accreditation in the session with the legacy tools) and performed without any problem.

Session 2: all the observer's forms agreed that volunteers succeed to perform all the expected actions (basically receive the task, accept the tasks, communicate the start of work and the end of work) both with beAWARE and with VHF, requiring similar timing.

Session 3: No action planned for the team 3 during that session (the team was returning the Aquadikes to the main warehouse outside the Vicenza city centre.

6.2.5 **Result of the observation sheets for the team4**

Session 1: all the observer's forms agreed that volunteers succeed to perform all the expected actions (accreditation of the team) both with beAWARE and the legacy tools. The observers found accreditation procedure was faster with beAWARE (about 1min) than with the legacy tools (about 10min).

Session 2: all the observer's forms agreed that volunteers succeed to perform all the expected actions (basically receive the task, accept the tasks, communicate the starting working and communicate the end of working) both with beAWARE and with VHF and with similar timing. However, according to all the forms, during the beAWARE session, an application reboot occurred at the end of the beAWARE session, while the volunteers were communicating the ending of their task, preventing the change of status from 'not available' to 'available'.

6.2.6 **Result of the observation sheets for the teamSA**

Session 1: according to the script, since the team SA was located in the S.Agostino district, thus far away to the COC room, the accreditation procedure was performed only with the

beAWARE mobile application. The observer wrote down that the accreditation procedure with beAWARE was very fast (about 1min) and performed without any problem.

Session 2 and 3: the expected actions in these sessions regarded the reception of task from the control room and the further communication of the status of the assignments. All the communications with the control room were performed with the mobile phone in the legacy tool session and then repeated with the beAWARE mobile app.

Based on the observers' form, the mobile app operator succeeded in communicate the status of the task and of the team, both with beAWARE and with the legacy tools (telephone), but they experienced some issues

6.2.7 **Result of the observation sheets for the team citizen 1 (Session 3)**

Every observer followed a different citizen on his\her -defined path, so every form was slightly different to the others.

Nevertheless, to summarize, all the observers noticed that during the legacy tools session, while the Citizens were supposed to call the COC room with their phones to report flooding along their path, many problems occurred.

In fact, all the citizens called the COC room almost in the same time; as consequence, most of the citizens were not able to communicate the flooding, since they found the line occupied or they had to call many times before receive an answer.

On the contrary, all the observers noticed that the Citizens found much faster and easier to communicate the flooding with the beAWARE mobile app, avoiding any issues related to the overlap of simultaneous reports.

According to the observer's form, none of the Citizen of the team encountered issues using the mobile app.

6.2.8 **Result of the observation sheets for the team citizen 2 (Session 3)**

Like to the team Citizen 1, every observer of the team Citizen 2 followed a different citizen on his\her path, so every form was slightly different to the others.

During the legacy tools session, the observers of this team reported the same issues mentioned above, due to the overlaps of almost simultaneous phone calls. This problem was avoided in the beAWARE session, when all the observers noticed that the Citizens found much faster and easier to communicate the flooding with the beAWARE mobile app.

However, according to the forms, two Citizens found a certain degree of error in the GPS localization during the initial phase of the session. Moreover, one citizen experienced a bug in his mobile app, since he had to exit and re-enter in the application to see his previously sent incident reports on the mobile app's map.

6.3 Analysis of the results of the observation sheets

The observation forms provided meaningful result from both a qualitative and a quantitative point of view; in fact, thanks to the improvement of the observation sheets' form, the most of the issues encountered by the observers during the first pilot (see D2.4) had been overcome.

Dealing more in detail about the notices taken by the observers in their forms, it is possible to say that most of the expected actions in the beAWARE sessions had been successfully performed both by the teams (citizens and volunteers) in the field and by the COC operators.

From a quantitative point of view, the action performed in the Control room were globally faster with the beAWARE platform than the legacy tools, even if is worth mentioning that during the beAWARE sessions there had been a lot of discussions and comments in the control room about the technology. For that reason this element could have affected the duration of certain tasks, so the 'quantitative' data is not so meaningful element of comparison for the control room operations.

With the exception of some limited situation when a user experienced a bug in the mobile app, it took similar timing for communicate the status of the task and assignment with beAWARE and with the radio. This is a very important result since the volunteers have a lot of experience in using the VHF, while they received only a relative short training in the beAWARE app.

All the observers agreed that the accreditation procedure (session 1) was much more faster with beAWARE than the legacy tools. Moreover, it was well highlighted during the pilot that the accreditation procedure in the beAWARE session can be performed from every place (for example, team 3 performed the procedure while driving; team SA sent the accreditation for trough the mobile app from location outside the city centre), while the 'standard' procedure required the presence of a member of the team in the COC room.

The beAWARE platform represents a relevant improvement in the state of art in particular regarding the management of the incidents reports from citizens.

According to the observers of the Citizens, it has been much faster and easier to communicate the flooding reports with the beAWARE mobile app than the legacy tools, avoiding any issues related to the overlap of reports. Instead, during the legacy tools session, many citizens

weren't able to communicate the flooding, since they found the line occupied or they had to call many times before receive an answer.

From the Control room operators' point of view the PSAP represents a great instrument for the management of different kind of data, providing a clear and update overview of the situation.

Dealing now with the 'negative' aspects that stand out from the forms, one of the main issues highlighted during the pilot by an observer was that the civil protection volunteers, accustomed to the VHF devices, were expecting a feedback back from the control room when they were sending an incident report or when they were communicating the status of execution of their task.

Finally, some technical issues and small bugs emerged during the sessions executed with beAWARE. In detail, there were some delays in uploading images, some freezing of the application and some errors in the GPS localization during the initial phase; one citizen had to exit and re-enter in the application to see his previously sent incident reports on the mobile app's map.

6.4 Questionnaires

6.5 Results of the Questionnaires

During the debriefing AAWA collected questionnaires both from the 'observers' and 'actors'. The following graphs provide the percentage distribution of the answers provided by the end users for each question of the questionnaires.

Part 2– Personal information. In this part are asked the following questions to the end users:

Note: in some cases, multiple answers have been provided to the question about the professional background.

The following pictures shows the cake diagrams obtaining from the analysis of the results, while the table below contains the for the various questions, the specifications inserted by the people who selected the voice 'other, please indicate'

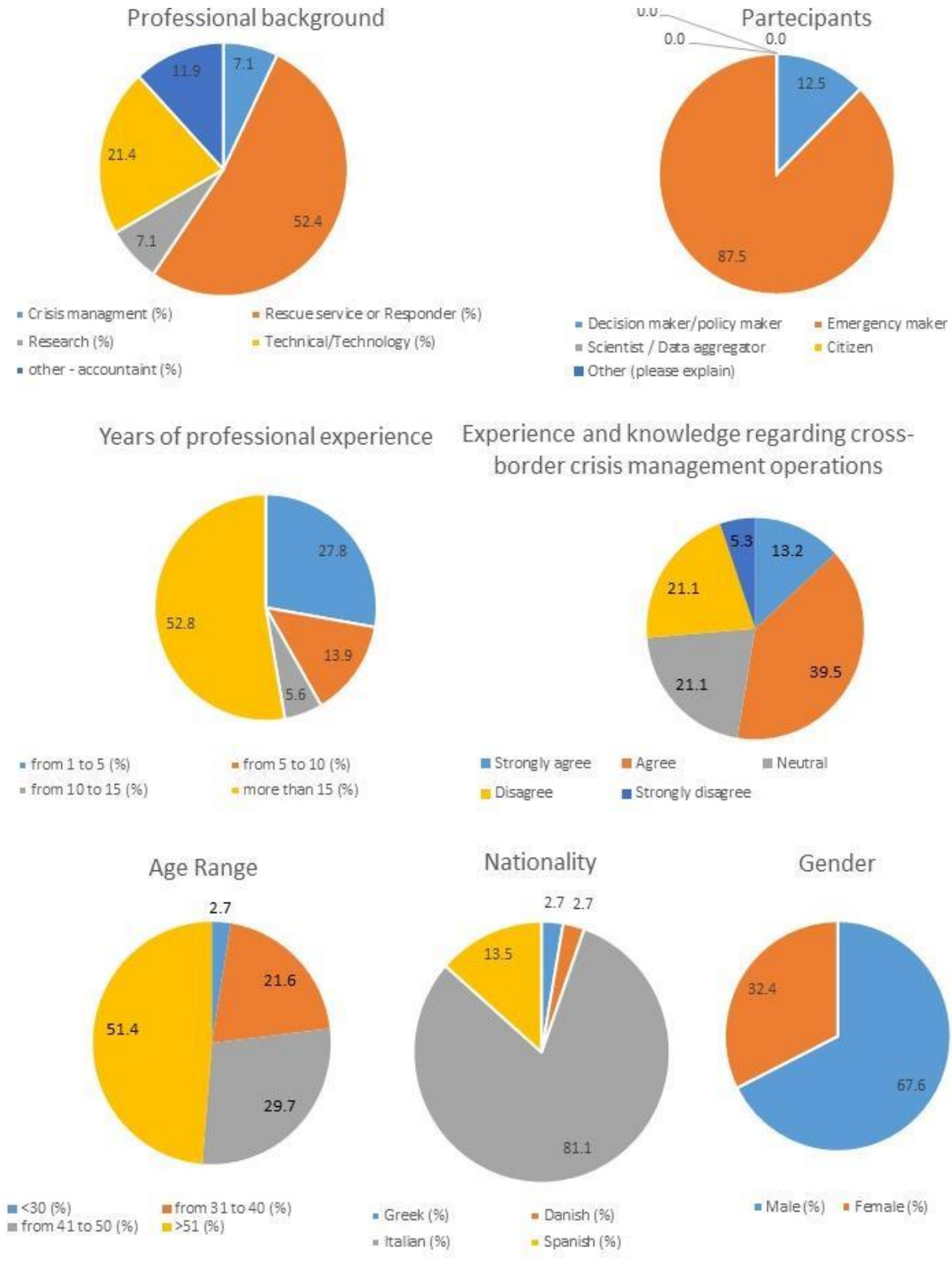


Figure 52: Results of the questionnaires – section 2

Table 8. Specification provided by the Users who selected the voice 'other' in the questions of the section 2

• **Question:** What is your professional background?	
engineer	COC room - communication secretary (3 answers)
aspiring Civil Protection operator	COC room - Support to the decision maker;
Planning / Administration	Citizen (4 answers)
staff assistant - secretary	Municipal Technician
administrative officer	
policeman	

Part 3 – Trial Dimension In this part the end user is asked to indicate how much does he/she agree with some statement about the trial

The following pictures show the result of the questionnaires in terms of cake diagrams, while the table below contains the list of all the comments added by the users to justify their answers.

Table 9. Justification and comment provided by the end Users to the Question of the section 3

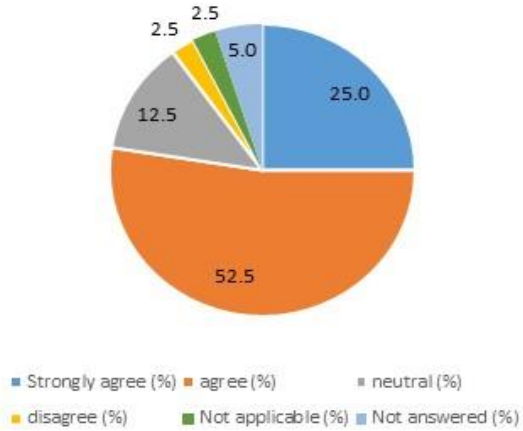
Answer to which user provide justification	Justification/comment provided
The number of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.	For the classification "Strongly Agree" the following justifications were reported in one case: - Consistent with the number of tasks; - suitable number of participants. For the classification "Agree", the following justifications were reported in one case: - The number of participants was perhaps even overabundant because not everyone was always really busy; - Based on the information at my disposal, the number was proportionate to the activity. For the classification "Neutral" the following justification was reported in one case: - I am not able to evaluate it properly, however the involvement of participants seemed appropriate to me

Answer to which user provide justification	Justification/comment provided
The background of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.	For the classification "Strongly Agree" the following justifications were reported in one case: - The participants have given proof of knowing the type of "simulated" situations since they have acted without uncertainties and errors; - there have been Different backgrounds; - Staff was experienced. For the classification "Agree", the following justifications were reported in one case: - The required tasks were simple. For the classification "Neutral" the following justification was reported in one case: - Not all the staff of the individual teams had seemed adequately prepared
The level of involvement of participants of the Trial sessions was adequate and enough to evaluate the solutions and their impact on the crisis management.	the classification "Strongly Agree" the following justifications were reported in one case: - The participants have shown interest in the topic and about the possible repercussions of the test results; - Consistent with the tasks; - Everyone have been involved. For the classification "Agree", the following justifications were reported in one case: - Yes, Thanks to the training and documentation available; - Logistic of the COC room was non functional for the number of involved people; For the classification "Disagree" the following justification was reported in one case: - I learnt my task only during the pilot;
There were no organisational or logistics constrains (e. g. time management, infrastructure preparation) that influenced the quality and completeness of the Trial.	For the classification "Strongly Agree" the following justifications were reported in one case: - The time available was adequate; in most cases the actions were completed in advance of the times set by the organizers; - The Municipality has fully supported the initiative; - Appropriate timing and logistic For the classification "Neutral", the following justification was reported

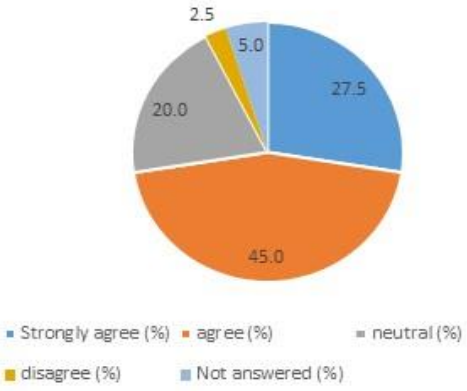
Answer to which user provide justification	Justification/comment provided
	in one case: - I am not able to express a judgment; - there were many interruptions in order to explain the working procedures, so the time is not relevant for the tasks For the classification "Disagree" the following justifications have been reported in one case: - there were Logistic constrains regarding the app; - As an observer, I had to walk long distance in a short period of time to reach locations where participants were;
There were no external constrains (e.g. missing participants, emergency situation, technical breakdown, indisposition of key personnel) that influenced the quality and completeness of the Trial sessions.	For the classification "Strongly Agree" the following justifications were reported in one case: - There were no external constraints; - No inconvenience. For the classification "Disagree" the following justifications have been reported in one case: - Someone with a good knowledge of both Italy and English should have joined our team (team 3);
The setup of the Trial was clear and every person involved in the Trial knew their role and responsibilities for all the activities organised.	For the classification "Strongly Agree" the following justifications were reported in one case: - the training was adequate; - All was well prepared and explained For the classification "Disagree" the following justifications have been reported in one case: - Observers were not provided of enough indications about how to conduct their role; For the classification "Strongly Disagree" the following justifications were reported in one case: - Only at during the pilot I've known my task;
The safety measures were adequately planned, explained and implemented during the Trial.	For the classification "Strongly agree" the following justifications were reported in one case: - the training was adequate; - Individual protection devices have been correctly worn;
The Trial was conducted safely.	For the classification "Strongly Agree" the following justifications were reported in one case: - All security measures have been adopted

Answer to which user provide justification	Justification/comment provided
	For the classification "Agree" the following justifications have been reported in one case: - Yes and in compliance to the current legislation;
The scenario of the Trial was realistic (chosen hazard, its evolution and related cascading effects).	For the classification "Strongly Agree" the following justifications were reported in one case: - yes, because it reproduced the 2010 Flood Event; - yeas, because it dealt about true hydrogeological risk
The injects from role players and the story telling were realistic.	For the classification "Strongly Agree" the following justifications were reported in one case: - yes, because it reproduced the 2010 Flood Event; - Everyone had their role
Simulation helps in understanding the situation.	For the classification "Strongly Agree" the following justifications were reported in one case: - Data was complete; - it helps those who have never participate to an emergency situation;
I am satisfied with the participation and conduction of the Trial.	For the classification "Strongly Agree" the following justifications were reported in one case: - All aspects were analysed - Yes I liked it For the classification "Agree" the following justifications have been reported in one case: - It was the first experience in this kind of activity and I think that it was fully satisfactory

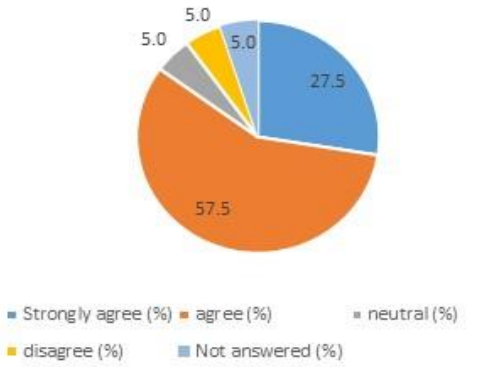
The number of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.



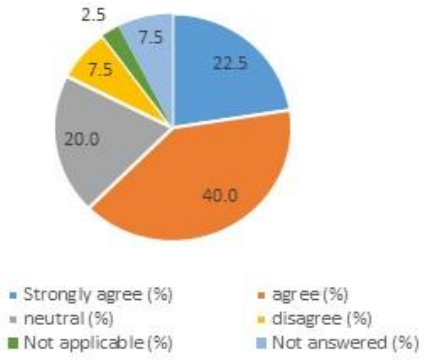
The background of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.



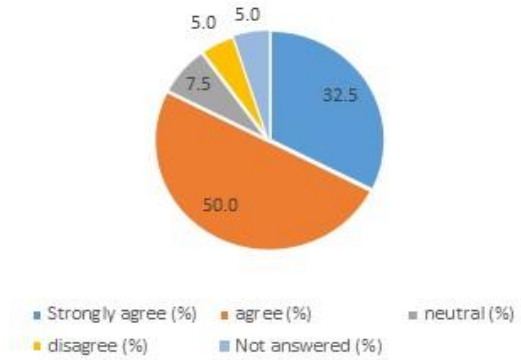
The level of involvement of participants of the Trial sessions was adequate and enough to evaluate the solutions and their impact or the crisis management.



There were no organisational or logistics constrains (e. g. time management, infrastructure preparation) that influenced the quality and completeness of the Trial.



There were no external constrains (e. g. missing participants, emergency situation, technical breakdown, indisposition of key personnel) that influenced the quality and completeness of the Trial sessions.



The setup of the Trial was clear and every person involved in the Trial knew their role and responsibilities for all the activities organised.

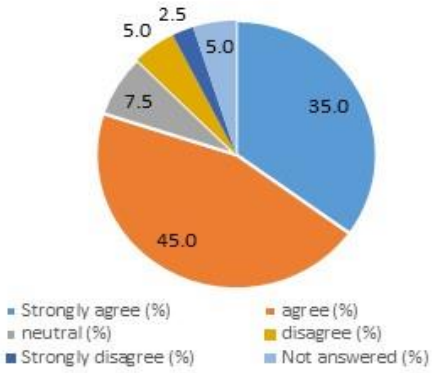


Figure 53: Results of the questionnaires – section 3 (Part 1)

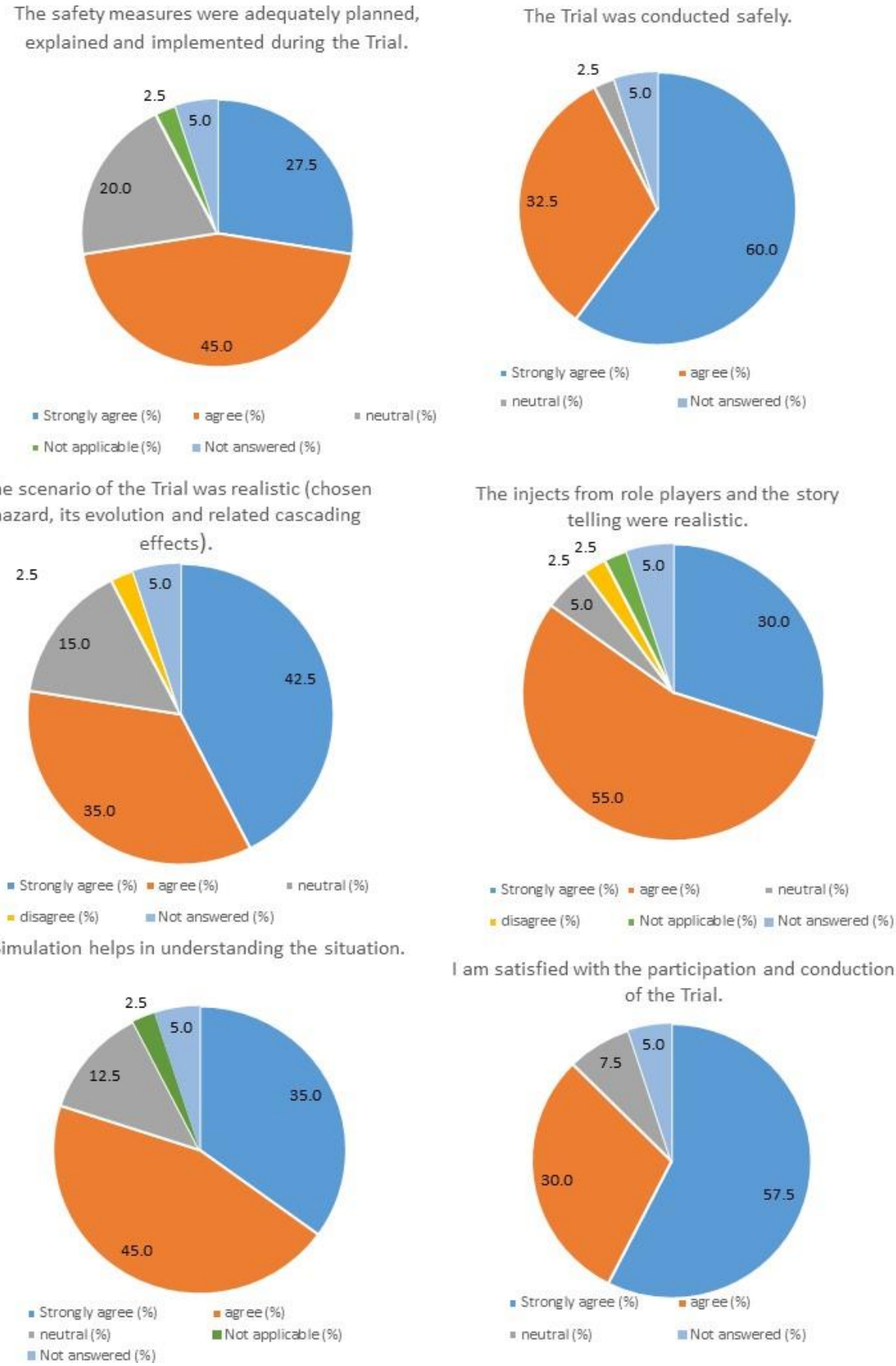


Figure 54: Results of the questionnaires – section 3 (Part 2)

Part 4– beAWARE In this part the end user is asked to indicate how much does he/she agree with some statement about the sessions of the pilot executed with beAWARE.

The following pictures show the result of the questionnaires in terms of cake diagrams, while the table below contains the list of all the comments added by the users to justify their answers.

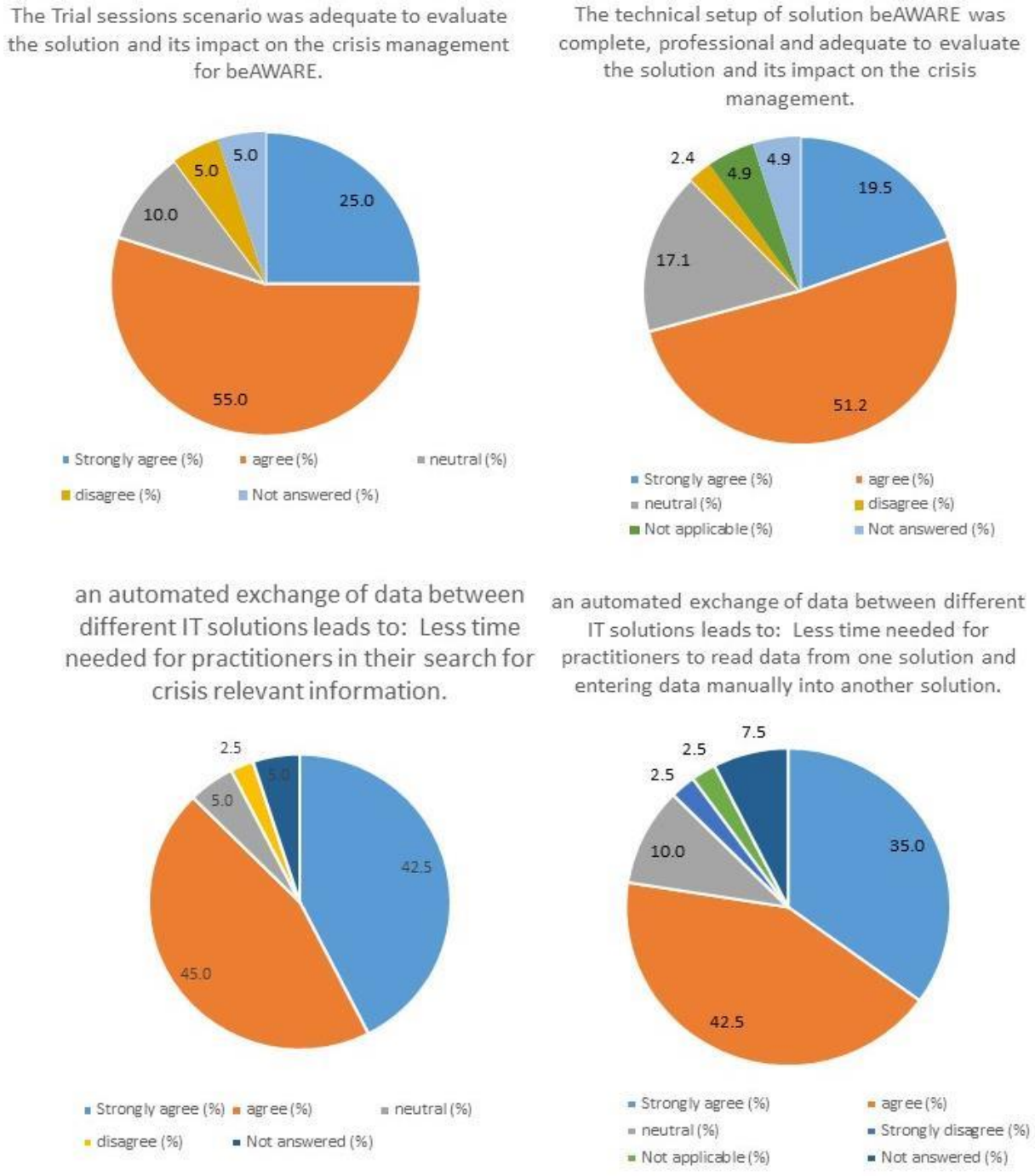


Figure 55: Results of the questionnaires – section 4 (Part 1)

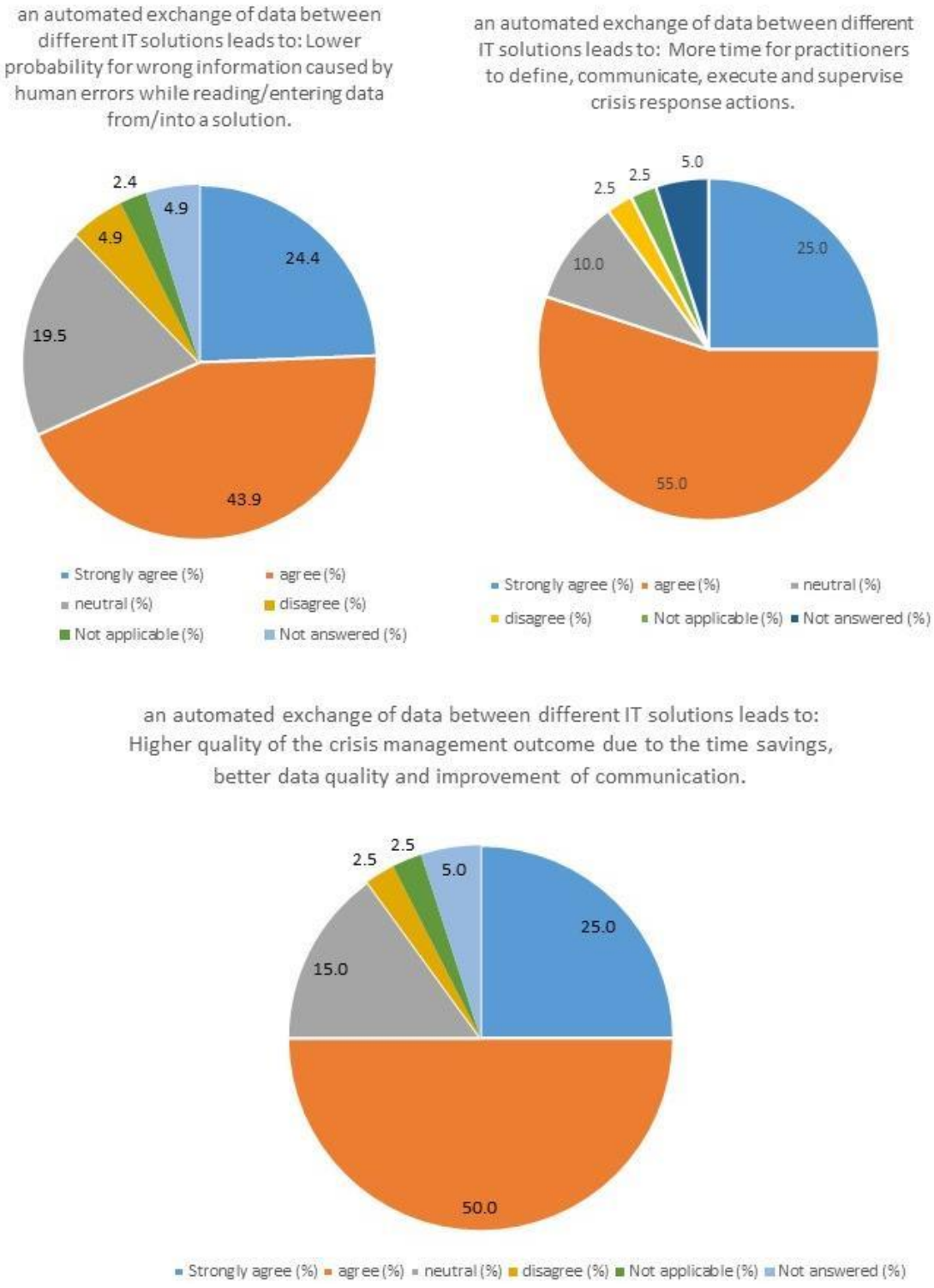


Figure 56: Results of the questionnaires – section 4 (Part 2)

Table 10. Justification and comment provided by the end Users to the Question of the section 4

Answer to which user provide justification	Justification/comment provided

Answer to which user provide justification	Justification/comment provided
The Trial sessions scenario was adequate to evaluate the solution and its impact on the crisis management for **beAWARE.**	For the classification "Strongly Agree" the following justifications were reported in one case: - the simulated event really happened - the App was well structured but it can be improved For the classification "Agree" the following justifications have been reported in one case: - The scenario was adequate to identify strengths and possible weaknesses For the classification “Neutral" the following justifications were reported in one case: - People in the COC room are not familiar with the impact of the citizens reports
The technical setup of solution **beAWARE** was complete, professional and adequate to evaluate the solution and its impact on the crisis management.	For the classification "Strongly Agree" the following justifications were reported in one case: - the App is well structured but it can be improved For the classification "Agree" the following justifications have been reported in one case: - Some aspects can be improved such as making photos and displaying messages read by citizens For the classification "Neutral" the following justifications were reported in one case: - I am not able to express an opinion For the classification "Neutral" and "Disagree" the following justifications were reported in one case: The delay between the communication due to the processing of the algorithm caused furthers delays and decreases in the effectiveness of the operations; however the single teams seemed adequately prepared
How much do you agree with the following statements that an automated exchange of data between different IT solutions leads to:	
an automated exchange of data	For the classification "Strongly Agree" the following justifications were

Answer to which user provide justification	Justification/comment provided
between different IT solutions leads to: Less time needed for practitioners in their search for crisis relevant information.	reported in one case: - yes, the time was reduced - this is the main added value I appreciated the most For the classification "Agreement" the following justifications have been reported in one case: - Of course, if the "IT solutions" are compatible - Radio communications are easier and faster
an automated exchange of data between different IT solutions leads to: Less time needed for practitioners to read data from one solution and entering data manually into another solution.	For the classification "Agree" the following justifications have been reported in one case: - Of course, if the "IT solutions" are mutually compatible; - Radio communications are easier and faster For the classification "Strongly Disagree" the following justifications were reported in one case: - Radio communication is unique and immediate
an automated exchange of data between different IT solutions leads to: Lower probability for wrong information caused by human errors while reading/entering data from/into a solution.	For the classification "Agree", the following justifications were reported in one case: - Radio communication can lead to misunderstandings For the classification "Neutral" the following justifications were reported in one case: -Not necessarily. There may be a measurement error by the responder and the citizen; - I don't think it's always true; For the classification "Disagree" the following justifications have been reported in one case: - Human error is always present
an automated exchange of data between different IT solutions leads to: *More time for practitioners to define, communicate, execute and supervise crisis response actions.*	For the classification "Agree" the following justifications have been reported in one case: - Need more time
an automated exchange of data between different IT solutions leads to: Higher quality of the crisis management outcome due to the time savings, better data quality and improvement of communication.	For the classification "Strongly Agree" the following justifications were reported in one case: - However, it's required to pay attention to the responsibility on the data / reports provided by citizens; For the classification "Agree" the following justifications have been reported in one case: - with BeAWARE there are more detailed information and even time

Answer to which user provide justification	Justification/comment provided
	saving. However, I would like to see how well it works in a real emergency. Maybe the system will block due to the quantity of data that it receives; - Is it desirable? - there are no transmission problems; - It is certainly more standardized For the classification "Disagree" the following justifications have been reported in one case: - The person who use the application is only a guide per group, without an operative role.

Part 5– test information:

The following picture shows the results of the questionnaires in terms of cake diagrams, while the table below contains the distribution (in percentage) of the answers provided to the questions.

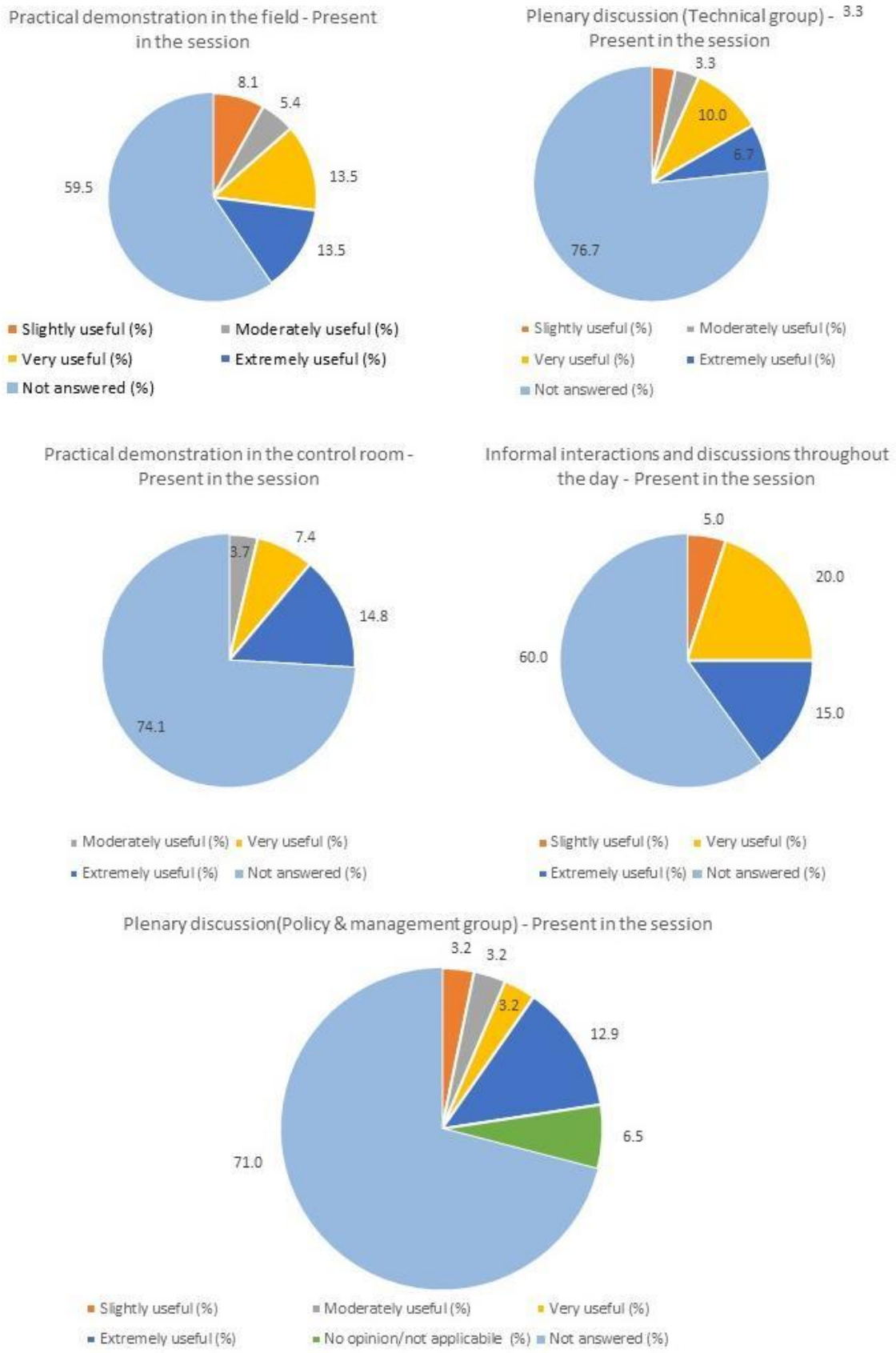


Figure 57: Results of the questionnaires – section 5

Table 11. Percentage distribution to the answers provided in the table in session 5 of the questionnaires

	Not at all useful (%)	Slightly useful (%)	Moderately useful (%)	Very useful (%)	Extremely useful (%)	No opinion/not applicabile (%)	Not answered (%)
Practical demonstration in the field - Present in the session	0.0	8.1	5.4	13.5	13.5	0.0	59.5
Practical demonstration in the field - Not present in the session	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Practical demonstration in the control room - Present in the session	0.0	0.0	3.7	7.4	14.8	0.0	74.1
Practical demonstration in the control room - Not present in the session	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plenary discussion (Technical group) - Present in the session	0.0	3.3	3.3	10.0	6.7	0.0	76.7
Plenary discussion (Technical group) - Not present in the session	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plenary discussion(Policy & management group) - Present in the session	0.0	3.2	3.2	3.2	12.9	6.5	71.0
Plenary discussion(Policy & management group) - Not present in the session	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Informal interactions and discussions throughout the day - Present in the session	0.0	5.0	0.0	20.0	15.0	0.0	60.0

Finally, we end the questionnaires' analysis with the transcription of the comments provided to the open-answer-questions at the end of this section, the contents have been translated in English by AAWA when required

- **How would you explain the role of citizens (the general public) in beAWARE project?**
  - Citizens are becoming an important part of the crisis management
  - The role of citizens is very important in testing the BeAWARE project;
  - Citizen represent a subject who could be difficult to manage;
  - Very useful if the citizenship involved is really virtuous and encouraged. Certainly most of the users - mobile users are not virtuous and encouraged;
  - It's right to involve citizens, if they are properly trained;
  - The presence of citizens should be avoided, if they are not identified;
  - Citizen represent the Data provider and receiver of messages by the Municipality;
  - It's very interesting;
  - It represents the control and verification of the territory;
  - It's a positive thing;
  - Involvement;
  - Communication situations;

- Awareness of risk;
- The citizen is part of the municipal emergency plan, in particular regarding the reporting procedure.

- **Citizen observatories are not simple 'plug & play' technical solutions, they also have crucial 'social dimensions': they rely on the active and continued involvement of citizens and the general public to succeed. What was the most helpful part today to convey the social dimensions involved in setting up and running a citizen observatory?**

  - Their presence of citizens during the pilot;
  - They were evaluators of Civil Protection and therefore they were always active;
  - The form of the information received reflects real situations to cope with;
  - Management of fake-news;
  - Citizens have been interested to the tasks;
  - The part of the test about "citizens"

- **In your view, what was the most valuable part/aspect of today's demonstration?**
  - The real-time testing and good coordination between the civil protection teams and the COC room;
  - The practical test combined with the usual technology;
  - The most relevant aspect of the demonstration was the coordination between the different teams;
  - Collaboration of all groups;
  - The teams involved were heterogeneous;
  - Collaboration between programming teams and volunteers / actors of the exercise
  - It seems that the beAWARE system has not blocked;
  - New technologies and responsibilities for the citizens;
  - Interaction between app and radio;
  - Team coordination;
  - The comparison, in parallel, of scenario "No BeAWARE" and "BeAWARE";
  - Work with volunteers from different groups and different skills
  -

- **In your view, what was the least valuable part/aspect of today's demonstration?**
  - There isn't less valuable aspect
  - Execute the trial with the heavy vehicles
  - None

- **How can we improve future events to convey a) the potential of citizen science and citizen observatories for disaster forecasting and management and b) the conditions for their success?**
  - Organize more frequent pilots in order to get the participants accustomed to the management of emergency situations;
  - Improving safety standards;
  - The Notifications and the communication channels should be common to all the teams and not "private"

- Capability to send photos / videos etc. after the conclusion of the task; capacity to display also the reports from the others teams
- Provide feedback back to the operators when the control room receive the information sent by the team trough the app;
- Implement a ringtone / alarm that will attract the attention of the mobile app operator;
- Delete the pop-up menu about the incident reports with double-clicking on the map;
- Implement a notification about the GPS signal reception;
- The Municipality should introduce rearwards for those who participate with high frequency to this kind of activities;
- Explain to the Citizens the tools which are being implemented;
- Greater involvement of citizens in the tasks;
- By involving citizens

6.6 Analysis Results of the Questionnaires

The results of the questionnaires are aligned with the feedback provided during the debriefing and the notices in the observation forms.

It should be noticed that, in comparison with the results of the questionnaires provided after the 1st pilot (see the D2.4) the end users provided more comments and explanation as 'open answers', allowing to collect useful qualitative information in additions to the multiple choices questions. This result itself is very indicative of the large degree of involvement and interest reached in the 2nd pilot amongst the participants.

Dealing more specifically with the various sections of the questionnaire, most of the users who answered to the questionnaires are Italian and they have multi-disciplinary professional skills, but also a great experience in the emergency management, as more than an half of them declared a background in the rescue service, and moreover a similar percentage declares to have more than 15 years of professional experience. Finally, more than the 50% of the participants indicated experience in cross-border crisis management operations.

These results indicate that the pilot has been addressed to a very competent and professional audience to evaluate the platform's features.

Compared to the heatwave pilot participants, the average age is higher, while the percentage of woman is quite similar (about 1/3 of the participants are females).

About the trial dimension, most of the participants globally agree that the number of involved participants and their background was adequate. There is only a minor percentage of 'neutral' or disagreements with these statements, since a couple of participants feel that the training

was not completely adequate and complained that they had to learn their task only the day of the pilot.

The logistic set-up and organization of the pilot was rated good, with a lot of positive comments about the timing, the support from the Municipality and the total absence of inconvenience. Few disagreement about that matter came from some observers, who complained about the long walk they had to do to follow the 'actors'; one non-Italian observer wrote about some difficult in understanding the interaction between the rescue team.

The 80% of the participants agree or strongly agree that the training was adequate and that everyone knew well what to do, which is also confirmed by many comments. However an observer pointed out that he did not receive enough instructions about his/her role, while another complained that he learned what to do only the day of the pilot.

Globally most of the participants agreed that the pilot was conducted safely, with some explicit reference that all the security measures had been taken according to the Italian regulation and that all the participants wore correctly their individual protection devices.

Finally, there is a very strong agreement about the realism of the training and the storyline and more than 85% of the participants declare to be satisfied withthe pilot, while only 7.5% are neutral about this statement and 5% did not answer; no one declared to be unsatisfied of the flood pilot.

About the answer specifically addressed to the beAWARE technology (section 4), the minimum percentage of "agreement\ strong agreement" to the statement is very positive (70%). The highest rate of agreement is about the statement that the automated exchange of data between IT solutions leads to a reduction of time of searching for relevant information and for define, communicate, execute and supervise the crisis response action. 75% of the participants agreed that an automated exchange of data between IT solutions improves the quality of the crisis management outcomes due to the timesaving and better data and communication. The most of the people that do not agree with the statements of this section are declared neutral, justifying explicitly that they are not able to express an opinion or they don't have enough familiarity with this matter. The few people who disagreed justified their answer writing that the human error is always present and that the communication trough radio is the most immediate. Moreover, as in the debriefing session, someone pointed out that the use of the beAWARE mobile app force one person of the team to be dedicated only to the app and thus to not be real operative. Finally, someone agreed about the more details of information and time saving with the beAWARE solution, but also guessed about the possibility, during a real flood, of a system blocking due to the flow of data.

Finally, regarding the last part of the questionnaire, the participants rated positively the Citizen involvement in the emergency management due to beAWARE, even if someone pointed out that a technology like beAWARE works well only if the users are virtuous and adequately encouraged by the Authorities.

In response to the question about the most valuable aspect of the pilot, the answers are very heterogeneous, according to the different background, roles and age distribution of the participant, that lead to highlight different aspects. For example, some participants value the great coordination between the team and the COC room achieved during the pilot, while others find very interesting the comparison between the legacy tools and beAWARE (in particular the app and the radio). Some others appreciate the heterogeneity of the participants to the pilot and the involvement of volunteers with different skills and groups. Finally, some participants were positively impressed by how well the beAWARE technology worked.

Finally, a lot of suggestions about the future improvement have been provided in response to the relative question. For example, someone hoped for more frequent pilots, while most of the participants provided specific suggestions about the mobile app features and interface (i.e insert a ringtone or alarm, provide the mobile app with the feature to receive confirmation/feedback from the control room to the teams, capability to see in the app the status of the task of the other teams, etc).

6.7 Debriefing

This sub chapter provides a list of the feedbacks, positive and negative aspects collected during the hot debriefing session; these feedbacks had been transcribed by AAWA during the debriefing, as provided by the end users, and then translated, when required, from Italian to English.

It should be mentioned that most of the comments provided concern the beAWARE mobile app since this is the tool of the platform that most of the users experienced in the most direct way.

It is also worth to be mentioned that the debriefing session highlighted more the ‘negative’ aspects of the pilot that the ‘positive’ ones. This is not meant as a failure of the pilot or of the platform; in fact, it’s the common way of thinking of the Italian people that there is more useful point out what has room of improvement than highlight what obviously what is already adequate, because the issues and problems represent the starting point for the future work.

For that reason, the large amount of comments, feedbacks and suggestions collected during the debriefing, even if focused on the issues, are indicative of a very large interest of the people in the beAWARE platform.

6.7.1 Feedbacks form the Leaders of the volunteer teams (PCIV, ANC, ANA)

- The mobile application is generally good and easy to use but some actions are performed faster with radio
- The app should show notifications even when it is closed (i.e. like what app).
- The app should allow the teams to receive feedbacks from the control room. In fact one of the most frequent issue had been that sometimes during the pilot the team weren't sure if the COC had received the incident report or the task status change.
- Unlike the radios, the mobile app could not be used with the gloves, moreover it requires someone to handle it (and this team member could not help with the task, if he is handling the app)
- The app should be simplified. In particular, the users found unintuitive the 'status change option'. They suggested to replace it with buttons (like 'accept' and 'not accept')
- The mobile app behavior depended too much from each device's configuration (android version, technical features etc.)
- The mobile app was overall good. The members of the teams reacted well to the app
- However, the app should not be meant for replace totally the radio, but it should be used in parallel to the legacy tools.

6.7.2 Feedbacks from the Radio/communication operator in the control room (PCIV and Municipality of Vicenza)

- The app is a technology more suitable for young people
- The app is 'less democratic' than the radio because the radio is an economic and collective strument (while the smartphone are expensive devices and they are strictly personal)
- The icons of the PSAP map have a layout and colours that make them barely visible from the background
- The overall background of the PSAP is 'too international'; It should be more focused on the Italian context
- The colour scale for the task should be different from the ones for the rescue teams.
- At the current status, the system requires training to be used. The operator hopes for a more intuitive system that does not require training
- In order to let the volunteers' hands free, the app's features could be integrated in devices like google glasses instead of smartphones

6.7.3 Feedbacks from Citizens and the relative observers (ANC, AAWA)

- The 'sending incident report button' should be placed in the lower part of the screen, not in the upper, because it's confusing
- Some citizens experienced some geolocalization issues when they opened the app
- Some citizens had to exit and re-enter in the mobile app to see their previous sending incident reports
- The water level classes should be sorted by increasing values
- The mobile app will be a very useful tool to make citizens part of the participative process of the emergency management, while now they are almost totally outside from this process. However, to involve in the app a large numbers of citizens they have to be active part of the app technical development.
- The app won't ever be fully representative of the whole citizens, since it's very likely that it be used mostly by young people than elders.
- Develop the mobile app also for non-Android devices
- In order to make the citizens more responsible users of the app (i.e. avoid fake or irrelevant incident reports) there should be a login process for the citizen, similar to the one already existing for the rescue teams

6.7.4 Feedbacks from the Volunteers observers:

- It would be very useful if each notification of new public alert and task assignment has a vibration, because sometimes in the street there could be too much noise to hear the alarm
- The app drained too much battery
- The mobile phone is too 'delicate' to be handled during the emergency, while the radios are sturdy
- The app is a useful tool more for the citizens, who currently have no direct way to communicate with the control room, than for the volunteers that already have the radios. The mobile app could not replace totally the radio.

6.8 Summary of the evaluation results

The outputs of the evaluation procedure of the 2nd prototype during the flood pilot are very positive and indicative of a deep interest in the beAWARE solution of the end users involved in the testing.

Comparing with the evaluation results of the first pilot (D2.4), it's very clear that the improvements, in the platform, in the pilot set-up and evaluation procedure, lead 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).

For example, during the 1st pilot, very few observers added timing information and comments in their forms. Moreover most of the participants responded only to the multiple choices question of the questionnaires, without providing explanations or comments to clarify their answers. In the occasion of the flood pilot instead the consortium collected a large amount of feedback, explanations and answers to the open question of the questionnaires.

The debriefing session itself was a source of very detailed comments and specific suggestions for new improvements, thank also to the great experience and background of the most of the participants.

To summarize the previous paragraphs, the evaluation outputs confirm the great decisional support in the disaster management provided by beAWARE platform to the authorities. Most of the users agreed about the more detailed information provided by beAWARE and about the time saving. It has been particular appreciated by the COC the beAWARE capability to aggregate different kind of information (sensor data, forecast, the recordings of the video camera, the social media data etc.). This information is already available, but is fragmented in different places and provided from different sources, so the access to this information is often time-consuming, when time is a critical factor during a crisis.

However, the end users also pointed out that the exchange of data between IT solutions cannot be totally automatized, since it cannot replace the critical sense and the experience of the users. In that sense, beAWARE is configuring as a great decisional support and as a tool for helping the decision maker to have a clear outline of the situation, totally in line with the Project's goals.

One of the most appreciated features of beAWARE is the capability to create a direct channel between the citizens and the authorities, provided to the first a very simple and intuitive way to provide real time report, avoid the common problem related to the call centers. Moreover, from the control room operators' point of view, the capability to create a real time risk mapping based on the citizen is a totally new a high valuable feature.

In addition, the end users are very interested in the other 'new' features provided by beAWARE, like the video analysis algorithms (in particular for the traffic detection and water level estimation) and the integration with drones.

The civil protection volunteers focused their evaluation on the mobile app, since that was the beAWARE tool, which they experienced more directly. In detail, not only they reported all the small bugs occurred during the pilot (crash of the app, GPS localization errors etc…), but also provided very useful suggestions for the improvement, based on their experience.

One of the most interesting comments in this sense is that the volunteers feel the need to receive a feedback from the control room when they report their task's status or team's position, a feature that the radio allows but the beAWARE system currently does not. More than one team expressed also the desire to see in the mobile app the status and position of the other teams, like with VHF communication.

Moreover, it was well highlighted that, from the volunteers' and first responders' point of view, the beAWARE app could be a great support to the radio but not a total replacement.

Finally, the pilot structure and organization has been rated very well from all the participants, confirming the success of the formula, already established during the first pilot, of comparing the same action with and without beAWARE.

The only complaints about the pilot come from some non-Italian observers that encountered issues in understanding the interaction between the stakeholders. For that reason, the aspect of the coordination between non-native observers and native stakeholders requires further improvement in sight of the third pilot.

7 Evaluation of the other scenarios

7.1 Heatwave Scenario

The heatwave scenario focuses on the management before and during a heatwave event and the management of the relief places.

The storyline for the heatwave pilot had five stages as follows:

- Pre-emergency activation (early warning, understanding the problem, send the first alerts).
- Traffic jam (traffic jam on the streets, electricity problems, traffic lights are off, send alerts to citizens and to rescuers).
- Places of relief (rescuers direct people to relief places).
- Management of places of relief (citizens and rescuers send reports from inside the places of relief).
- Fade out.

This storyline can be summarized in three phases:

- Pre-emergency phase.
- Emergency phase part A (emergency activation).
- Emergency phase part B (worsening of the situation, relief places and fade out).

7.1.1 Demonstration of the 2nd prototype for the heatwave pilot

The storyline of the heatwave is based on the scenario that is already described in table 24 of D2.10 (Appendix D). In the respective table, the scenario was analyzed step by step and divided into Sessions. At each session, a specific script was followed, based on the maturity level of the platform. Finally, the aforementioned table is the updated one from the D2.4 and the blue boxes show the updated steps for each session to be followed in the demonstration of the 2nd version of the system.

The participants were 32 members from HRT and the Civil Protection authority of the Prefecture of Central Macedonia. HRT presented the beAWARE 2nd prototype to those people members, who were asked also to watch the video of the 2nd prototype and evaluate it according to their expertise.

The updated actioned (presented in the blue boxes) in Annex D were tested during the second prototype demonstration and were evaluated with the use of the Questionnaire (Appendix E),

except the "*A risk assessment regarding a forest fire which occurs after a heatwave is provided*" due to maturity level of the platform. At the last pilot where the platform will be at its final stage, the majority of the components and functionalities will be at their final stage of development, all remaining actions will be tested through a demonstration as well

As stated in D2.10, the tested Uses Cases of the first prototype are UC_301, UC_304, UC_305, and UC_306. The "UC_302: Heatwave fire risk assessment" will be tested in the final version of the platform.

For the second prototype, the Use Cases that are presented in the following table, with green color were tested and the red one will be tested in the final version of the platform.

Table 12. Tested Use Cases, 2nd Prototype – Heatwave Scenario

USE CASES HEATWAVE	TESTED AT THE 2nd PROTOTYPE FOR THE HEATWAVE SCENARIO
UC_301: Heatwave forecasting alert	YES
UC_302: Heatwave fire risk assessment	NO
UC_303: First Responder Management	YES
UC_304: Management of traffic emergencies	YES
UC_305: Management of Places for relief	YES
UC_306: Response to Power Outage	YES

As stated in table 23 of D2.10 and due to the maturity level of the platform during the first pilot, some User Requirements were fully met by the maturity level of the platform at the time, some were partially met and some were not met at all.

At the following table for the 2nd prototype the User Requirements that were not tested, based on table 23 of D2.10 are the ones that are marked as red. The blue ones were tested but weren't in full mature level and the green ones were in full mature level and fully tested at the 2nd prototype.

Table 13. Tested User Requirements, 2nd Prototype – Heatwave Scenario

UR#	UC#	Requirement name	TESTED AT THE 2nd PROTOTYPE FOR THE HEATWAVE SCENARIO
UR_301	301, 302, 305, 306	Real time weather forecast	Partially
UR_302	301	Automatic warning	Fully
UR_303	302	Risk assessment for a forest fire	No
UR_304	303, 305	Heatwave intensity	Partially
UR_305	303, 304, 305	Possible locations for incidents	Fully
UR_306	303, 305, 306	Number of people affected	Fully
UR_307	306	Power needs	No
UR_308	303, 306	Infrastructure overload	No
UR_309	303	False Alarms	No
UR_310	303, 304, 305	City-wide overview of the event	Fully
UR_311	301, 302, 303, 304, 305, 306	Information Storage	Fully
UR_312	301, 304, 305, 306	Warning citizens	Fully
UR_313	303	First responders status	Fully
UR_314	303	Assign tasks to first responders	Fully
UR_315	303, 304	Traffic Status	Partially
UR_316	305	Capacity of relief places	Fully
UR_317	303, 304, 306	Areas with power outage	No
UR_318	303, 306	Trapped citizens	Fully
UR_319	303, 306	Trapped elders at home	Fully
UR_320	303, 306	Hospital availability	No
UR_321	301, 306	Affected area	Fully
UR_322	304, 305	Information for incident status from Social Media	Fully

UR#	UC#	Requirement name	TESTED AT THE 2nd PROTOTYPE FOR THE HEATWAVE SCENARIO
UR_323	305, 306	Information for Hospital Status from Social Media	No
UR_324	304	Information for existing situation in the Social Media	Fully
UR_325	305	Suggested places for relief	Fully
UR_326	All	Type of visualization	Fully
UR_327	304, 305, 306	Send emergency reports	Fully
UR_328	303, 304	Send task reports	Fully
UR_329	304, 305	Visualize video cameras	Fully
UR_330	303, 304, 305, 306	Localize video and images	Fully
UR_331	303	Localize task status	Fully
UR_332	304, 305, 306	Localize tweets	Fully
UR_333	304, 305, 306	Localize calls	Fully
UR_334	303	Manage assignments in case of new emergencies	Fully
UR_335	303	Map of rescue teams and task evaluation	Fully
UR_336	304	Traffic warnings	Fully
UR_337	303	Location of vehicles and personnel involved	Fully
UR_338	304, 305, 306	Warnings	Fully
UR_339	303	Evacuation orders	Fully
UR_340	303, 304, 305, 306	Internal sharing of information	Fully
UR_341	304, 305, 306	Twitter analysis and warning	Fully

UR#	UC#	Requirement name	TESTED AT THE 2nd PROTOTYPE FOR THE HEATWAVE SCENARIO
UR_342	303, 304, 305, 306	Coordination and communication between different resources	Partially

7.1.2 Session Evaluation criteria for the heatwave demonstration

The evaluation criteria for the heatwave demonstration were based on the Use Cases and User Requirements of the heatwave scenario. Those are described analytically in previous deliverables. Additionally, evaluation criteria were created based on HRT requirements and there are presented at the Questionnaire that was given after the demonstration of the 2nd prototype at 32 HRT members with large experience in Search and Rescue and Coordination of Rescue Operations.

For each of the questions, a rating scale is provided: the user has to indicate (with a mark in the respective box) how much he/she agrees with a certain statement or how much he/she rates a specific functionality of the system. Moreover, for most of these questions, the user can insert a comment to explain his/her rating. The rating that was followed is analysed in chapter 5.2 of this deliverable.

7.1.3 Results of the evaluation for the heatwave demonstration

After the video presentation, the questionnaires have been collected and analyzed by HRT members. Finally, from the questionnaires the main relevant contents were summarized, and will be presented in this chapter.

The results of the questionnaires (Annex E) of the participants are presented at the following cake diagrams.

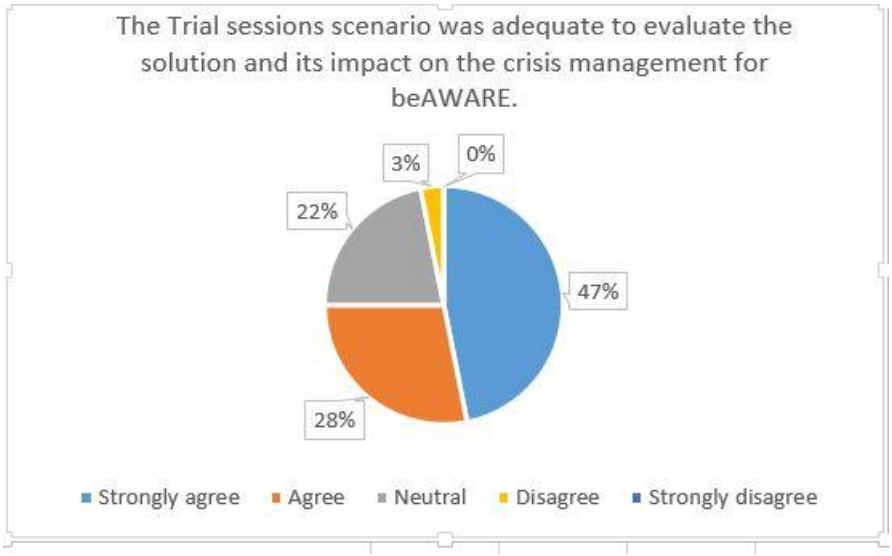


Figure 58: Results of the questionnaires for heatwave scenario (1)

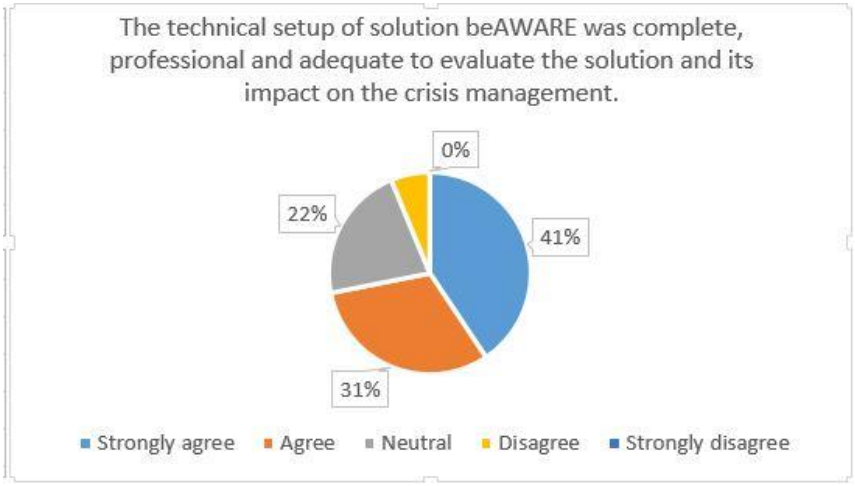


Figure 59: Results of the questionnaires for heatwave scenario (2)

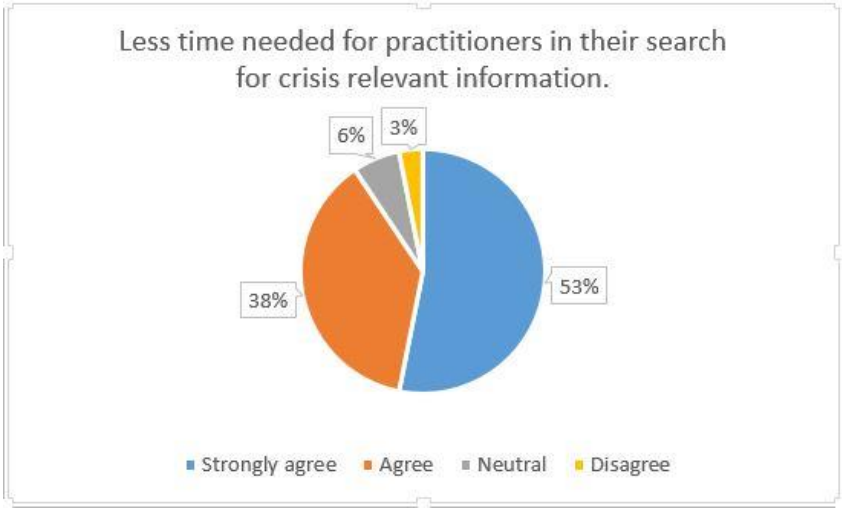


Figure 60: Results of the questionnaires for heatwave scenario (3)

Figure 61: Results of the questionnaires for heatwave scenario (4)

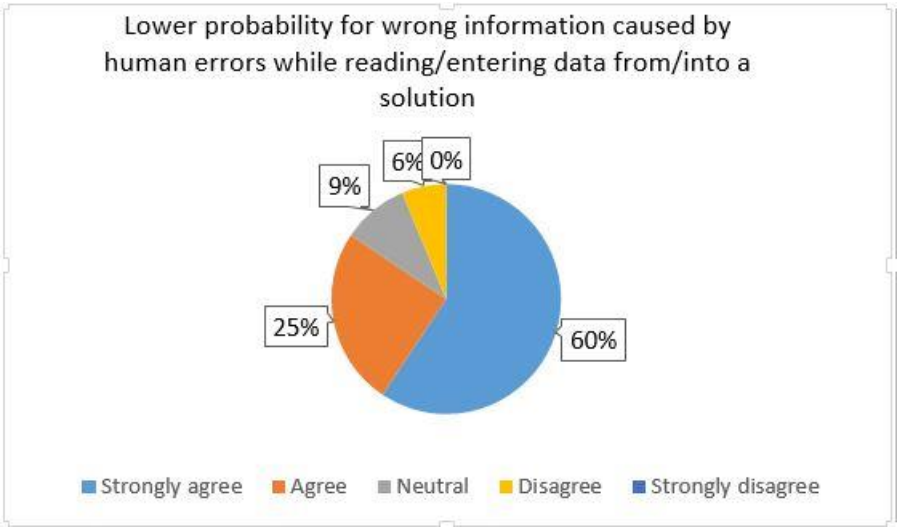


Figure 62: Results of the questionnaires for heatwave scenario (3)

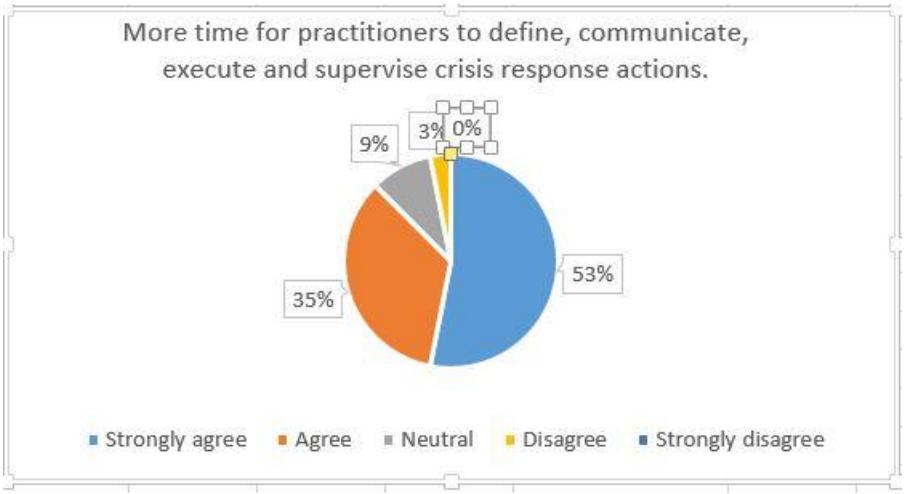


Figure 63: Results of the questionnaires for heatwave scenario (3)

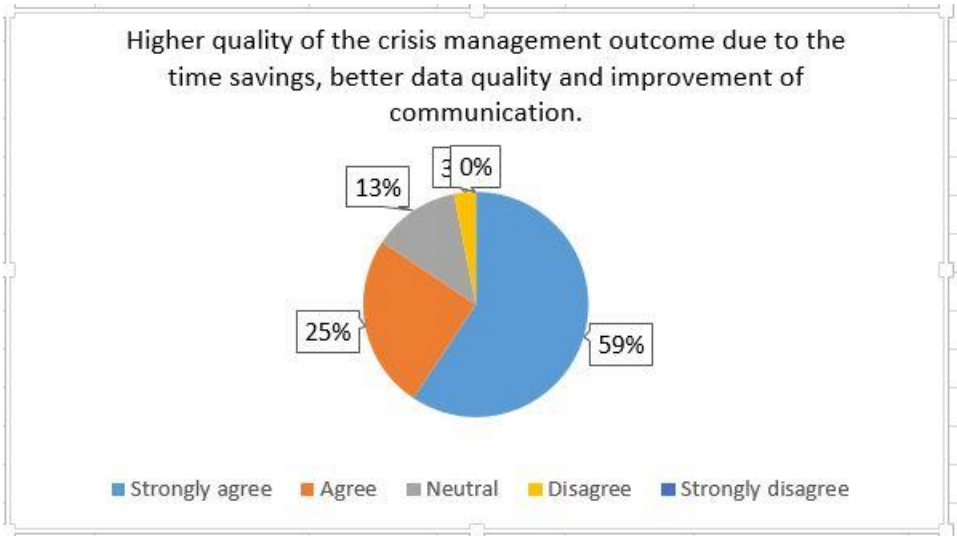


Figure 64: Results of the questionnaires for heatwave scenario (3)

As presented in the chart pies above the majority of the people that participated in the demonstration of the 2nd prototype and the questionnaire that the Trial sessions of the scenario were adequate as also the technical setup of solution beAWARE was complete (47%). Additionally, the majority of the participants (53%) agree that less time needed for practitioners in their search for crisis relevant information, as also less time needed for practitioners to read data from one solution and entering data manually into another solution (50%).

Moreover, there is a lower probability for wrong information caused by human errors (60%), but more time is needed for practitioners to define, communicate, execute and supervise crisis management actions (53%).

Additionally, 59% of the people that have answered the questionnaire found that beAWARE has a higher quality of crisis management due to time savings, better data quality, and improved communication.

It is worth to mention that the majority of the participants mentioned that beAWARE platform offers many solutions to their needs, but it is important a manual be created for the beAWARE due to the complexity and the many abilities that it offers.

Finally, it is important to mention that all rescuers and command operators stated in the discussion that followed, that beAWARE is a very important tool, but the legacy tools should not be removed completely, and as an ideal solution, everyone suggests that both should work together.

7.2 Fire Scenario

The fire scenario focuses on the management of the fire emergency and the evacuation of educational centers threatened by the fire to a safe place. The incident includes a pre-emergency phase.

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

- Pre-emergency activation (extreme risk of fires).
- Spotting a fire (emergency activation).
- Worsening of the situation.
- Evacuation management of educational centers.
- Fade out.

This storyline can be summarized in three phases:

- Pre-emergency phase.
- Emergency phase part A (emergency activation).
- Emergency phase part B (worsening of the situation, evacuation and fade out).

7.2.1 Demonstration of the 2nd prototype for the Fire scenario

In order to evaluate the beAWARE 2nd prototype for the Fire scenario, the beAWARE platform was presented to internal staff of PLV/FBBR and main stakeholders related to fire emergencies.

The beAWARE 2nd prototype was introduced to these participants and they were asked to watch a video that shows their functionalities. The participants could see how beAWARE 2nd prototype worked for the flood pilot that took place in Vicenza and they were asked to evaluate it in case of our fire scenario.

In these demonstrations, 54 participants were involved. FBBR and PLV presented the beAWARE 2nd prototype to some of their members, who were asked also to watch the video of the 2nd prototype and evaluate it according to their expertise in forest fire emergencies. Besides this, FBBR and PLV contacted other main stakeholders related to fire emergencies and they were invited to evaluate the beAWARE 2nd prototype through online demonstrative sessions.

Regarding the fire use cases tested during the demonstrations, the following use cases had been taken into account:

- UC_201: Management of forest fires emergencies
- UC_202: Activation of first responders

- UC_203: Pre-emergency level 3
- UC_204: Evacuation management during an emergency

According to D2.5, the following table shows the user requirements for the fire scenario related to beAWARE 2nd prototype. In green the URs that are fully supported by 2nd prototype are shown and in blue those that will are partially supported in the second prototype.

Table 14. Tested User Requirements, 2nd Prototype – Fire Scenario

UR#	UC#	Requirement name	Requirement description
UR_201	201, 204	Detection of people and goods in danger	Display information authorities/first responders to detect people and cars in danger.
UR_202	201,202,203,204	Detection of critical aspects	Provide authorities/first responders information in order to detect the following kind of situation, process, material or condition that can cause a wildfire or that could intensify its damaging impacts: Namely drought, air temperature and other weather aspects, fuel accumulation spots, crowds, etc.
UR_206	201,202,203,204	Specific weather data	Provide authorities/first responders and citizens with specific weather data of the Devesa place, as it has a specific microclimate that might be different from other places.
UR_207	201,202,204	Aerial images/video (drone)	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 evolvement.

UR_210	201,202,204	Mobile application	Provide citizens to communicate a fire alert, detected neglects or other risk situations and even send visual data through a mobile application.
UR_211	201, 202, 203, 204	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 centres can follow both the development of the incident and the location and amount of resources. The online map will also provide the possibility of interacting with the police and other agencies involved.
UR_212	201, 202, 204	Traffic warnings	Sending warnings to citizens in order to avoid interferences inside the area.
UR_213	201, 202, 203, 204	Recommendations	Sending recommendations to citizens.
UR_214	203	Warnings	Sending warnings of pre-emergency alerts to citizens by authorities
UR_215	201, 204	Evacuation orders	Ordering evacuations of citizens at risk.
UR_216	201, 202, 203, 204	Internal sharing of information	Sharing data (images, videos, geolocation, reports) regarding the forest fire among authorities & first responders
UR_217	201, 202, 203, 204	Twitter analysis and warning	Warning authorities/first responders about Twitter messages concerning the forest fire event.
UR_219	201,202,203,204	Coordination and communication between different resources	Provide communication between authorities and first responders, in order to improve their coordination.
UR_221	201,202,203,204	Geolocalitation of telephone calls	To geolocalize a mobile phone citizen call by sending a request permission message to the citizen, who would accept to be tracked temporarily.

UR_222	201,202	Filter of the emergency messages	Transfer emergency 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.
UR_223	201	Automatic selection of the level of emergency	This can be doing only with the operator's supervision. The aim is to save time and do not lost emergency messages sent through mobile app.
UR_225	201,202	Quick search of events and applicants	Data storage, in order to improve indexation of information relative to events and applicants.
UR_226	201,202,204	Video/image analysis	Detect people and vehicles in danger of the received video/images from drone and/or mobile application, and provide these inputs to our PSAP. Furthermore, if drone aerial images/video 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.
UR_227	201, 202 203 204	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.

7.2.2 Evaluation criteria for the fire demonstration

After the fire demonstration, the participants were asked to fill out the standard questionnaire that they have been provided with. This questionnaire (see Appendix E) was created to support the evaluation of the beAWARE 2nd prototype demonstration according to the criteria expressed in D2.2.

For each of the questions, a rating scale is provided and the participants have to indicate (with a cross in the respective box) how much they agree with a certain statement. Moreover, the participants can insert a comment to explain their rating. The full list of statements is as follows:

- *The Trial sessions scenario was adequate to evaluate the solution and its impact on the crisis management for beAWARE.*

- *The technical setup of solution beAWARE was complete, professional and adequate to evaluate the solution and its impact on the crisis management.*
- *How much do you agree with the following statements that an automated exchange of data between different IT solutions leads to:*

  - Less time needed for practitioners in their search for crisis relevant information.

  - Less time needed for practitioners to read data from one solution and entering data manually into another solution.

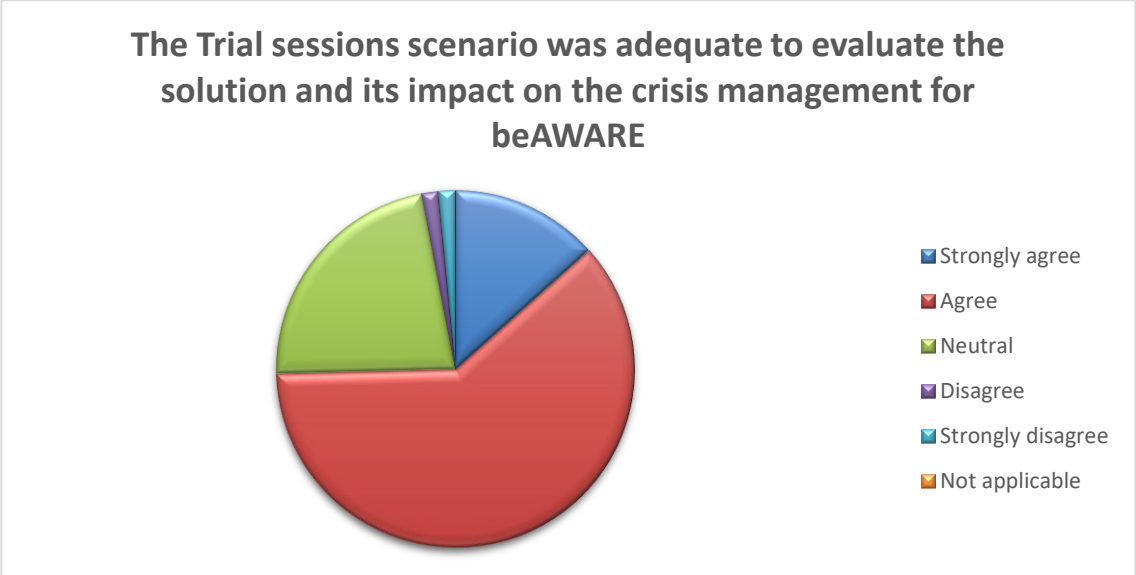
  - Lower probability for wrong information caused by human errors while reading/entering data from/into a solution.

  - More time for practitioners to define, communicate, execute and supervise crisis response actions.

  - Higher quality of the crisis management outcome due to the time savings, better data quality and improvement of communication.

7.2.3 **Results of the evaluation for the fire demonstration**

The questionnaires were collected by FBBR and PLV and their results are presented at the following pie charts.



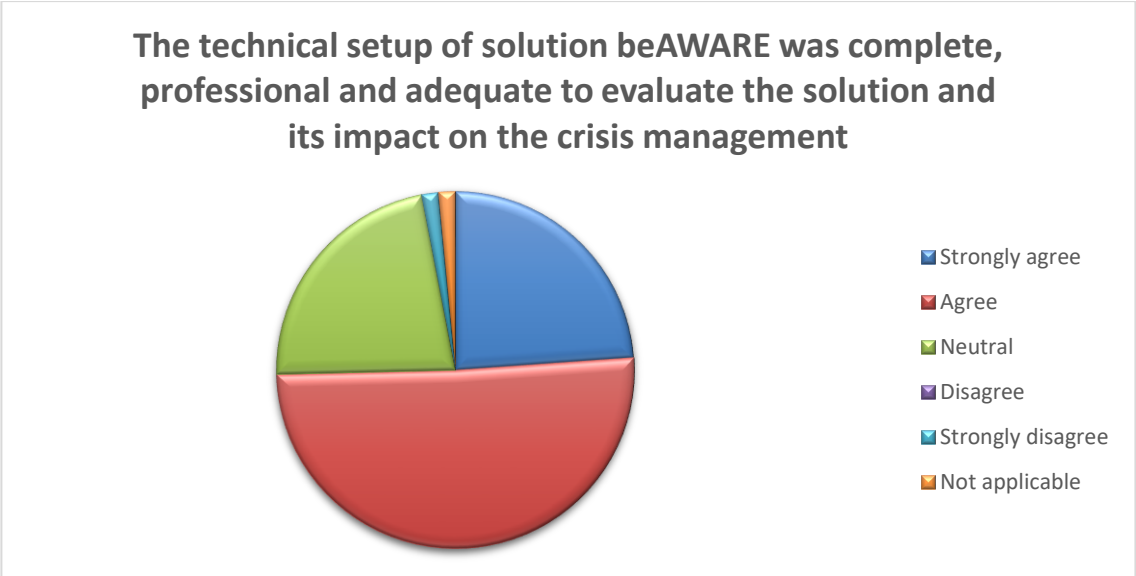
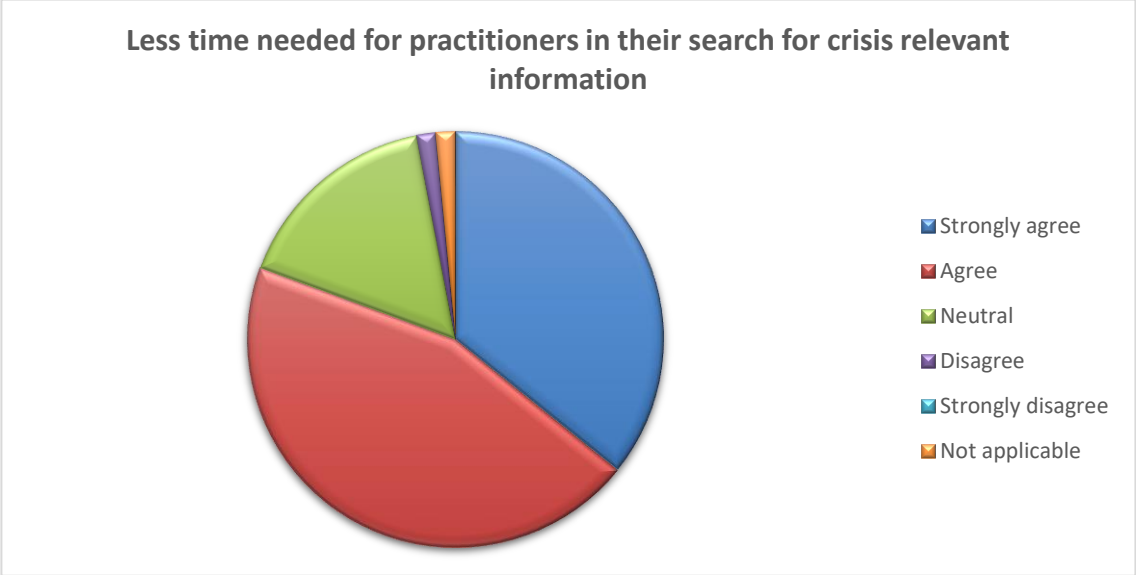


Figure 65: Results of the questionnaires for fire scenario (1)

How much do you agree with the following statements that an automated exchange of data between different IT solutions leads to:



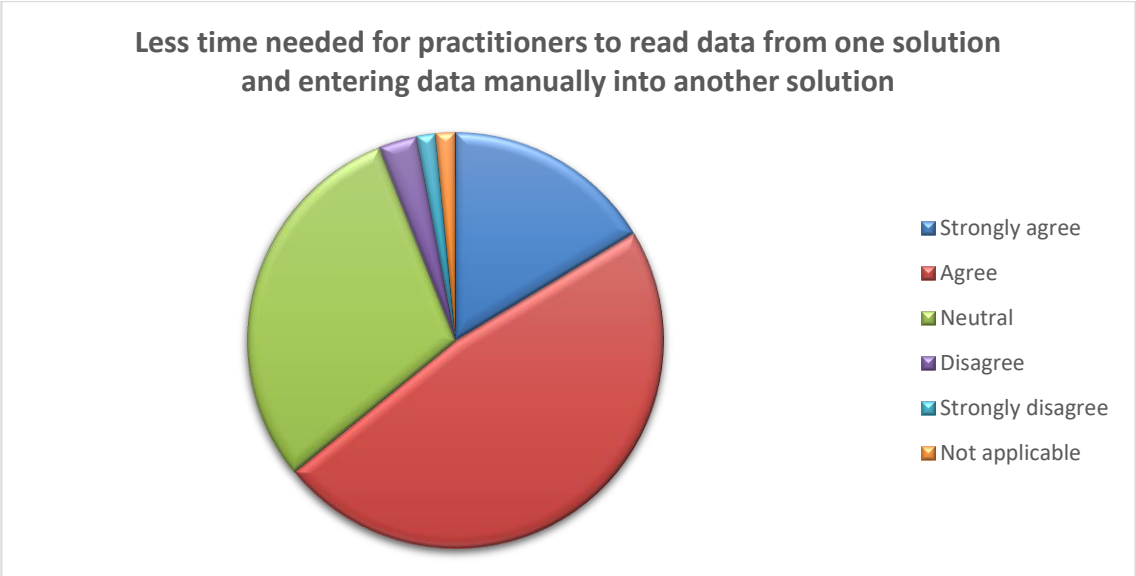
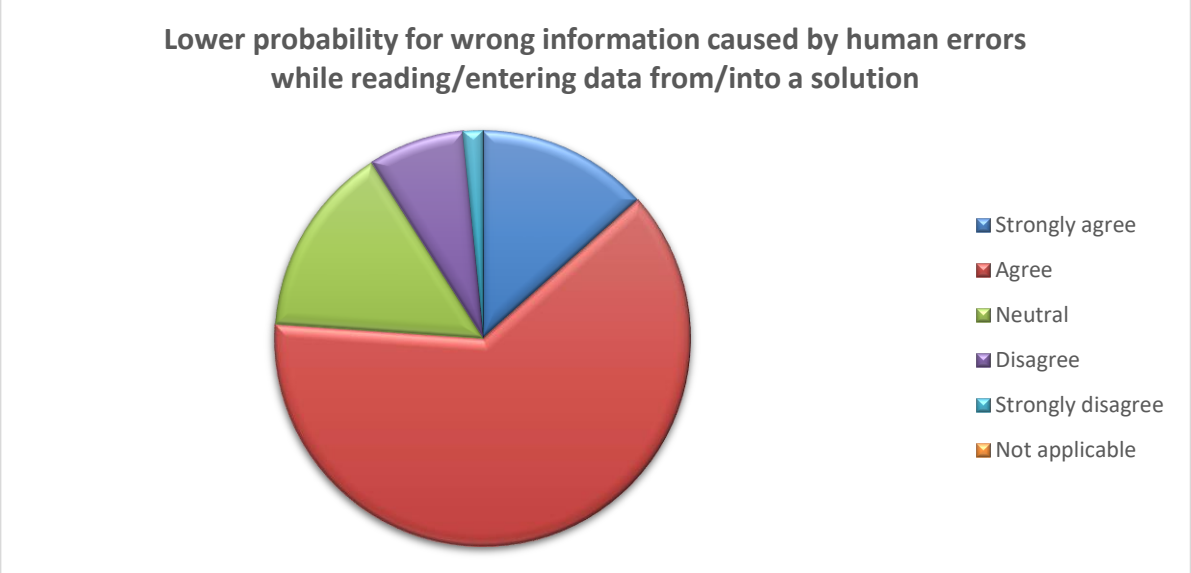


Figure 66: Results of the questionnaires for fire scenario (2)



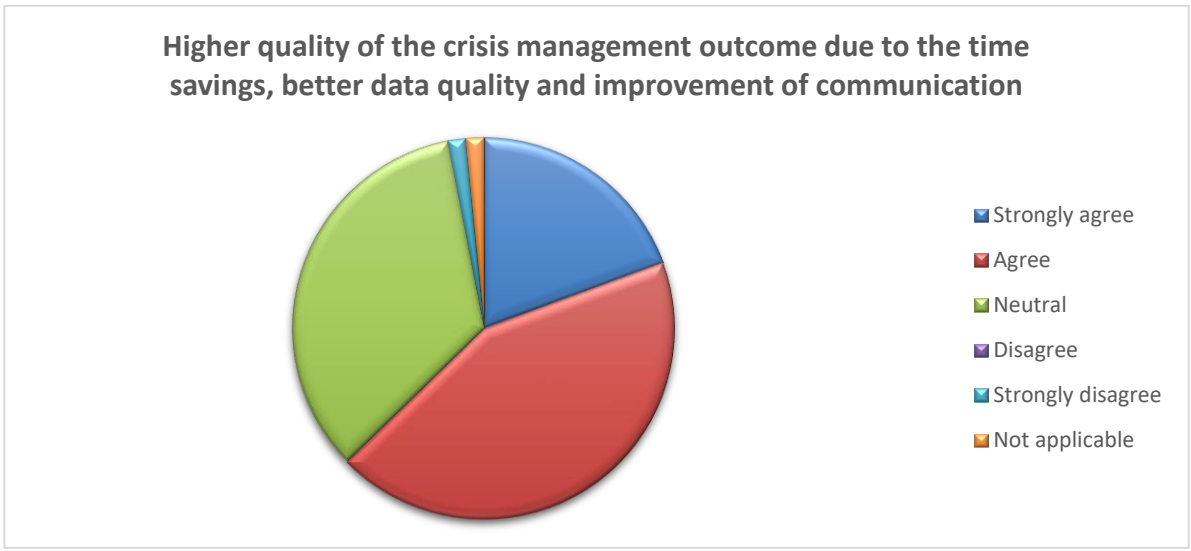


Figure 67: Results of the questionnaires for fire scenario (3)

As shown in the chart pies, the most of the participants in this questionnaire thought that the Trial sessions of the scenario were adequate and that the technical setup of solution beAWARE was complete. Additionally, most of the participants (approximately the 44,8% agreed and the 35,8% strongly agreed) said that less time needed for practitioners in their search for crisis relevant information, as also less time needed for practitioners to read data from one solution and entering data manually into another solution (64,2%).

Moreover, there is a lower probability for wrong information caused by human errors (approximately the 62,7% agreed and the 13.4% strongly agreed) but more time is needed for practitioners to define, communicate, execute and supervise crisis management actions (approximately the 55,2% agreed and the 13.4% strongly agreed).

Finally, 62,7% of the people that have answered the questionnaire found that beAWARE has a higher quality of the crisis management due to time savings, better data quality, and improved communication.

It should be noted that most of the participants said that they preferred to remain neutral because that did not have enough information and they were not sure if the solution could be feasible.

8 Conclusion and addresses for the next prototype

The evaluation results have been different for the three beAWARE scenarios, probably due also to the different contexts where the beAWARE platform had been presented to the relative stakeholders. In fact, the flood scenario's stakeholders directly interacted with the platform in occasion of the 2nd beAWARE pilot in Vicenza, while the other two scenarios' stakeholders attended to a demonstrative video session. However, it should be taken into account that the heatwave scenario's stakeholders already experienced directly the first prototype of the platform in occasion of the first pilot (and the second prototype is configuring as the natural evolution and improvement of the first), while the fire scenario's stakeholders had never had a direct interaction with the platform yet. These different 'backgrounds' lead to different evaluation results of the three scenarios, that are here reported.

For **the flood scenario**, the 2nd prototype had been tested, in occasion of the flood pilot, directly by the end users, who also provided very specific and detailed feedback through the different proposed evaluation forms (questionnaires, observation sheets and debriefing).

Generally, the pilot has been evaluated as successful by the end users. The platform itself has been rated good and most of the stakeholders agreed that beAWARE is indeed a helpful tool for the management of the flood emergencies, 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).

Specifically, the structure of the pilot (three sessions repeated twice) has been considered adequate to proper present and test the platform features, confirming the results obtained from the first pilot. For that reason, we can assume that a similar structure for the third pilot could be a suitable base to evaluate the final prototype.

Moreover, the results of the evaluation indicated, as address for the next 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 addition, it has been highlighted that beAWARE system should be meant as an integration, not a replacement, of the current tools used by municipality and by the Civil Protection (like the VHF).

For that reason, the implementation of the next prototype should be pushed in the direction of the integration of the beAWARE platform with the current tools and to provide an even more simple and immediate user experience.

For the **Heatwave scenario** is worth to mention that the 2nd prototype is a big step forward of the beAWARE and the platform overall will be very helpful in the management of those three

extreme events (heatwave, flood, and fire) as mentioned from all the people that answered the dedicated questionnaires in their discussions with the beAWARE members from HRT.

Finally, it is important to mention that the beAWARE application should be easy to use from citizens and rescuers on the field and the beAWARE platform and the PSAP from the agencies. Finally, it should be easily understandable, and all icons and notifications on the map should be clear without too much data, info and icons overlapping."

For the fire scenario, the evaluation of the second prototype highlighted the need to change the questionnaires format for the next prototype. More in detail, according to the end's user feedbacks, it's more suitable to a google form instead of paper version, since it would facilitate the task of data collection.

Regarding the answers of questionnaires (specially the explanations) they are crucial; so the consortium should take into account the improvements or deficiencies detected by the people, who completed the questionnaires, not only bear in mind the scale. For this reason, some questions of the questionnaires should include the possibility to include suggestions about the improvements, shortcomings, relevant information not reflected or even information that could be omitted because is irrelevant.

About the video of the second prototype, most stakeholders of the fire pilot told to PLV that it was very difficult, rambling, long, repetitive and confused to see and to understand the beAWARE platform, even for people accustomed to dealing with this type of information. In fact, many people have not filled out the questionnaire because they did not understand the content. Consequently, it is difficult to assess the platform through this video.

Regarding the preparation of the next video (3rd prototype) from PLV point of view, it's crucial that the maximum duration should not exceed 8 minutes, in order to obtain a shorter video, and disseminate the information in a more didactic way with simple language and only to highlight the crucial functionalities of the platform.

Finally, according to some received conclusions about the interface, it is perceived as difficult to understand, due to too much information on the screen, excessive colours and excessive graphics. It is not necessary so much information on the screen only the relevant one to make decisions.

Appendix A: Timetables for the Flood Pilot

The following contains the detailed time table for each of the sessionw performed during the pilot, both without and with beAWARE. The blue rows represent the actions that started from the field (I.e. that have to be performed by the teams of Volunteers or by the teams of Citizens, while the others are the actions performed in the COC room.

Regarding the session with beAWARE, a red boxe represents an action that is based mainly on the analysis of the map and/or the dashboard, while a green box represents an action that has to be performed trough the more operative screens of the PSAP (alert, incident manager, operation manager) or through the KB.

Session 1

			Session 1 A		Session 1 B		
Place	**Event**	**Participants**	**Time**	**Legacy Tools**	Time 6th March	Time 7th March	**beAWARE Tools**
			background	in the previous days a notice of adverse weather conditions arrived from the CFD. The available PC staff monitored the evolution of the situation and the Mayor was informed. Following this the COC was activated to ensure security and safety of the citizens	**background**	**background**	in the previous days a notice of adverse weather conditions arrived from the CFD. The available PC staff monitored the evolution of the situation and the Mayor was informed. Following this the COC was activated to ensure security and safety of the citizens
CoC	AMICO forecast detects a threshold exceeding event within the next 54 hours	Decision Makers in the CoC	**08:00**	The available personnel receives the forecast by email evaluates the information and notifies the mayor of the need to activate the CoC	**09:00**	**08:30**	The available personnel receive the forecast on the dashboard, evaluates the information and notifies the mayor of the need to activate the CoC. The decision maker examines the global level of the imminent event following the information of forecast and in more detail the number and te location of the sections that is expected to exceed a certain threshold.
CoC	Detection of floodable areas	Decision Makers in the CoC	**08:10**	Review of PGRA risk and flood maps for different historical times in SIC	**09:10**	**08:40**	Review of PGRA risk and flood maps for different historical times by the use of the KB User interface
In front of the AIM building	Registration of rescue teams to the system	All teams of volunteers & Decision Makers in the CoC	**08:15 – 8:25**	The heads of the rescue teams go to the COC room to receive accreditation.	**09:15 – 9:25**	**08:45 – 8:55**	Each team leader: • logs in his mobile app and creates his own team account. • takes a picture of the accreditation form and sends it via the beAWARE app • declares availability through the Mobile application

Sessione 2

			Session 2 A		Session 2 B		
Place	**Event**	**Participants**	**Time**	**Legacy Tools**	Time 6th March	Time 7th March	**beAWARE Tools**
CoC	First hydrometric and pluviometry threshold exceeded	Decision Makers in the CoC	**9:00**	Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation	**9:30**	**10:30**	- notification about the first level exceeding arrives on the PSAP- Study the sensor graph on the PSAP. - The exceeding of the threshold is further confirmed by the automatic estimation of the water level that emerges from the video analysis of the static camera.
CoC	Task Assigned to a Rescue team	Decision Makers in the CoC	**9:10**	Assignment by radio to team #2 of a task dictated by the protocol.	**9:40**	**10:40**	Assignment through the Task Manager to team #2 of a predefined task from the list dictated by the protocol.
Stradella dei Nodari	Acceptance of the Task	Team 2	**9:10**	The leader of the team confirm he received the task through radio	**9:40**	**10:40**	The team receives and accept the task through the mobile application
CoC	Assignment of a task to a team of rescuers	Decision Makers in the CoC	**9:15**	Assignment via radio to team #1 of a task.	**9:45**	**10:45**	Assignment through the Task Manager to team #1 of a non-predefined task
Stadio	Acceptance of the Task	Team 1	**9:15**	The leader of the team confirms he received the task through radio	**9:45**	**10:45**	The team receives and accept the task through the mobile application
CoC	Assignment of a task to a team of rescuers	Decision Makers in the CoC	**9:20**	Assign via radio to team #4 to help team #1.	**9:50**	**10:50**	Assign the Task Manager to team #4 to help team #1.
Piazza Matteotti	Acceptance of the Task	Team 4	**9:20**	The leader of the team confirm he received the task through radio The team communicates that it is already in position and waiting for team #1	**9:50**	**10:50**	- The team receives and accepts the task through the mobile application
Parco Querini	Arrives at the position and starts working	Team 2	**9:20**	team 2 reaches at the assigned position (Parco Querini) and communicates via radio that has started working on the task	**9:50**	**10:50**	The team reaches at the position and switch the status to working through the mobile application.
Piazza Matteotti	Arrives at the position and starts working	Team 1	**9:25**	team 1 reaches at the assigned position (Parco Querini) and communicates via radio that has started working on the task	**9:55**	**10:55**	The team reaches at the position and switch the status to working through the mobile application.
CoC	Supervise Teams	Decision Makers in the CoC	**9:30**	Check about the progress of the tasks via radio	**10:00**	**11:00**	Check the Position and the Status of the teams: which teams are active, their exact position on the map and the status of completion of the assigned tasks.
CoC	Second threshold crossing at Ponte Angeli	Decision Makers in the CoC	**09:35**	Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation	**10:05**	**11:05**	- notification about the second level exceeding arrives on the PSAP - Study the sensor graph on the PSAP. - The exceeding of the threshold is further confirmed by the automatic estimation of the water level that emerges from the video analysis of the static camera.
CoC	Assignment of a task to a team of rescuers	Decision Makers in the CoC	**09:45**	Assignment of a protocol task to team #3 via radio	**10:15**	**11:15**	Assignment through the Task Manager to team #3 of a predefined task from the list dictated by the protocol.

Zona stadio	Acceptance of the Task	Team 3	**09:45**	The leader of the team confirms he received the task through radio	**10:15**	**11:15**	The team receives and accept the task through the mobile application
Piazza Matteotti	Completion of a task	Team 4	09:50	The foreman communicates via radio to inform that his team has completed the assigned task and is available for a new assignment	10:20	11:20	The team indicates that the task is completed and declares availability through the mobile application
Ponte degli Angeli	Arrives at the position and starts working	Team 3	**09:50**	team 3 reaches the assigned position (Ponte Angeli) - team 4 communicates via radio that has reached its position but needs help from another team to perform the task (Position Aquadike)	**10:20**	**11:20**	team communicates with the mobile app that has reached its position (Ponte degli Angeli) but is experiencing problems in the execution of the task (Posare Aquadike)
CoC	Assignment of a task to a team of rescuers	Decision Makers in the CoC	**09:55**	The control room operator requests (via Radio) team 4 to support team 3 in the performance of their duties	**10:25**	**11:25**	PSAP operator assigns to team 4 the same task assigned to team 3
Piazza Matteotti	Completion of a task	Team 1	09:55	The foreman of the team communicates via radio to inform that his team has completed the assigned task and is available for a new assignment	10:25	11:25	The team indicates that the task is completed and declares availability through the mobile application
Presso Ponte degli Angeli	Acceptance of the Task	Team 4	**09:55**	The leader of the team confirm he received the task through radio	**10:25**	**11:25**	The team receives and accept the task through the mobile application
CoC	Third threshold overpass at Ponte Angeli	Decision Makers in the CoC	**10:00**	Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation	**10:30**	**11:30**	- notification about the third level exceeding arrives on the PSAP - Study the sensor graph on the PSAP. - The exceeding of the threshold is further confirmed by the automatic estimation of the water level that emerges from the video analysis of the static camera.
Ponte degli Angeli	Team status updated	Team 3	**10:00**		**10:30**	**11:30**	Team status switch to working
CoC	Sending Public Alerts	Decision Makers in the CoC	**10:10**	The authorities issue a general alert informing the general public about the forthcoming event (by SMS)	**10:35**	**11:40**	The authorities issue a general alert through the PSAP
Vari	Receiving alerts	All citizens and rescue teams	**10:15**	Receiving alerts on smartphone	**10:40**	**11:45**	Receiving alerts on the mobile application
CoC	Assegnazione di un task (paratoie e pompe) al team SA	Decision Makers in the CoC	**10:15**	Assignment via Radio or Telephone to Team SA to close the gates and check the status of the pumps	**10:45**	**11:45**	Assign to SA Team via the PSAP to close the gates and check the status of the pumps
S.Agostino - Confluenza Cordano e Retrone	Assignment of a task	Team SA	10:15	The leader of the team confirm he received the task through radio	**10:45**	11:45	The team receives and accept the task through the mobile application

S.Agostino - Confluenza Cordano e Retrone	Arrives at the position and starts working	Team SA	10:20	Team communicate via radio about their position and status	10:45	11:50	team communicates with the mobile app that has reached its position and task
Parco Querini	Completion of a task	Team 2	10:20	The foreman of the team communicates via radio to inform that his team has completed the assigned task and is available for a new assignment	10:50	11:50	The team indicates that the task is completed and declares availability through the mobile application In addition, an image of the completed task is sent through the platform

Session 3

			Session 3 A		Session 3 B		
Place	**Event**	**Participants**	**Time**	**Legacy Tools**	Time 6th March	Time 7th March	**beAWARE Tools**
CoC	Monitoring of the hydrometric situation in Vicenza	Decision Makers in the CoC	**12:00**	Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation	**12:00**	**13:00**	- notification about the third level exceeding arrives on the PSAP - Study the sensor graph on the PSAP.
Centro di Vicenza	Incident reports by citizens with periodic updates	Citizens & Rescue Teams	**12:10-12:50**	Throughout this session the teams of citizens 1 and 2 move along routes established near the banks of the Bacchiglione in the centre and report via telephone calls of flooding - the operators take note of the reports and the place on paper	**12:05**	**13:10-13:50**	- Throughout the session, the teams of citizens 1 and 2 move along routes established near the banks of the Bacchiglione in the centre - Sending through the mobile app periodic reports of flooded areas - some reports sent by citizens have also attached images, videos and voice recordings
CoC	Reports coming from the social media	Decision Makers in the CoC	**12:10**		**12:10-12:50**	**13:10**	Operators receive the results of the analysis conducted by the platform on some posts coming from social media (tweets)
Contrà dei Torretti (mura arginali vicino a P.te Angeli)	Potential risk	Team 2	**12:10**	The team notes that the embankment wall on the Bacchiglione near Ponte degli Angeli in some places is showing signs of subsidence (via VHF)	**12:10**	**13:10**	The head of the team reports with the mobile app an incident of type 'breccia arginale' to the control room and also attaches the photos of the wall

			Session 3 A		Session 3 B		
Place	**Event**	**Participants**	**Time**	**Legacy Tools**	Time 6th March	Time 7th March	**beAWARE Tools**
CoC	Assignment of a task	Decision Makers in the CoC	**12:15**	The control room operator orders the team 2 foreman's radio to stay in position and monitor the wall, wait for the other team to bring sandbags to stem the breach	**12:10**	**13:15**	Assignment via PSAP to team 3 to stay in position and monitor the wall, wait for the other team who will bring sandbags with which to stem the breach
Contrà dei Torretti (mura arginali vicino a P.te Angeli	Acceptance of the Task	Team2	**12:15**	the foreman communicates that he understands and maintains the position, monitoring the wall waiting for sand packs and support	**12:15**	**13:15**	- the team accepts the task via the mobile app - the team leader communicates via the mobile app that the team is already in the correct position and starts working on the task - During the monitoring, the foreman takes photos of the wall with the beAWARE app and sends them to the control room
CoC	Assignment of a task	Decision Makers in the CoC	**12:20**	Assignment to team #1 of the task to support team 2	**12:15**	**13:20**	Assignment through PSAP to team #1 to support team #2
Piazza Matteotti	Acceptance of the Task Reporting	Team 1	**12:20**	the foreman communicates that he has understood and that he is already in position and that he is already taking the bags	**12:20**	**13:20**	the team accepts the task via the mobile app - the team leader communicates via the mobile app that the team is already in the correct position and starts working on the task
CoC	Drone Scanning	Decision Makers in the CoC	**12:25**		**12:20**	**13:25**	- the PSAP operator receives the result of the analysis of the video coming from the drone with the identification of a possible endangered target
CoC	Assignment of a task to a team of rescuers	Decision Makers in the CoC	**12:35**		**12:25**	**13:35**	Assignment through PSAP to SA team to verify the presence of a person in danger in the Cordano
S.Agostino - Confluenza Cordano e Retrone	Acceptance of the Task	Team SA	**12:35**		**12:35**	**13:35**	The team receives and accepts the task
CoC	Local Allert	Decision Makers in the CoC	**12:40**	- The decision-maker or the COC members constantly ask the operators for an update on the reports of the incidents that are coming from the citizens	**12:35**	**13:40**	Thanks to the Dashboard and the map the operator gets a clear picture about the position and the status of the teams
S.Agostino - Confluenza Cordano e Retrone	Confirmation of the presence of a person in danger	Team SA	**12:45**		**12:40**	**13:45**	the team communicates with the mobile app that found a person and completed the task

			Session 3 A		Session 3 B		
Place	**Event**	**Participants**	**Time**	**Legacy Tools**	Time 6th March	Time 7th March	**beAWARE Tools**
CoC	Reports coming from the social media	Team SA	**12:45**		**12:45**	**13:45**	Operators receive the results of the analysis conducted by the platform on some posts coming from social media (tweets)
CoC	Fade out	Decision Makers in the CoC	**12:50**	- Level monitoring via ARPAV sensors (e-mail reception or simulated website control) Understanding that the current hydrometric levels are decreasing and have fallen below the second threshold	**12:45**	**13:50**	update of the sensor measurements to the PSAP The operating personnel look at the graphs of the hydrometer levels in the dashboard in Vicenza.
CoC	The alert is removed	Decision Makers in the CoC	**13:00**	The authorities issue a general alert informing the general public that the event de-escalates (by SMS)	**12:50**	**14:00**	-PSAP operators declare the end of emergency through the platform
Contrà dei Torretti	Completion of a task	Team 1 e 2	**13:00**	The foreman of the team communicates via radio to inform that his team has completed the assigned task and is available for new assignments	**13:00**	**14:00**	- the teams signify through the mobile app the completion of the task

Appendix B: Observation sheet formats for the flood pilot

FORM FOR THE CONTROL ROOMS OBSERVER
Name and surname of the observer:_____

COC operators

Session 1a (8:00 -8:30) : Legacy tools

FORM FOR THE CONTROL ROOMS OBSERVER

Name and surname of the observer:_____

Session 1b (8:30 -9:90) : beAWARE

Expected action	Action correctly executed	Action correctly executed after some issues or the section 'Notices')	Not executed (write the in the section	Time	Time required for performing the action (if is possible	Notices and comments
The available personnel receive the forecast by email evaluates the information and notifies the mayor of the need to activate the CoC	◯	◯	◯			
Review of PGRA risk and flood maps for different historical times in SIC	◯	◯	◯			
The heads of the rescue teams go to the COC room and bring to the control room operator the accreditation form. The control room operators take notice of the forms	◯	◯	◯			

		action partially executed (note the problems in the section 'Notices')	notices the		to evaluate it)	
Name and surname of the observer:_____						
FORM FOR THE CONTROL ROOMS OBSERVER						
Session 2a (9:00 -10:30) :legacy tools						
The available personnel receive the forecast on the dashboard, evaluates the information and notifies the mayor of the need to activate the CoC. The decision maker examines the global level of the imminent event following the information of forecast and in more detail the number and te location of the sections that is expected to exceed a certain threshold.	◯	◯	◯			
Review of PGRA risk and flood maps for different historical times by the use of the KB User interface	◯	◯	◯			
Accreditation of the rescue teams: The psap operator see in the map The position of the rescue team that are logging in trough the mobile app The picture of the accreditation forms of each teams	◯	◯	◯			

Expected action	Action correctly executed	Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')	Not executed (write the in the section notices the reason why)	Time	Time required for performing the action (if is possible to evaluate it)	Notices and comments
Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation (Exceeding of 1st threshold)	◯	◯	◯			
Assignment by radio to team #2 of a task dictated by the protocol.	◯	◯	◯			
Assignment via radio to team #1 of a task.	◯	◯	◯			
Assign via radio to team #4 to help team #1.	◯	◯	◯			
Check about the progress of the tasks via radio	◯	◯	◯			
Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation (Exceeding of 2nd threshold)	◯	◯	◯			

FORM FOR THE CONTROL ROOMS OBSERVER

Name and surname of the observer:

Session 2b (10:30 -12:00) : beAWARE

Azione prevista	Eseguita correttamente	Eseguita ma dopo aver riscontrato problemi o eseguita parzialmente (indicare i problemi nella sezione note)	Non eseguita (indicare le motivazioni nella sezione note)	Orario	Tempo richiesto dall'operazione (se applicabile)	Note e commenti
Assignment of a protocol task to team #3 via radio	◯	◯	◯			
The control room operator requests (via [illegible]	◯	◯	◯			
[illegible] of 3rd threshold)						
The authorities issue a general alert informing the general public about the forthcoming event (by SMS)	◯	◯	◯			
Assignment via Radio or Telephone to Team SA to close the gates and check the status of the pumps	◯	◯	◯			

- notification about the first level exceeding arrives on the PSAP- Study the sensor graph on the PSAP. - The exceeding of the threshold is further confirmed by the automatic estimation of the water level that emerges from the video analysis of the static camera.	◯	◯	◯			
Assignment through the Task Manager to team #2 of a predifined task from the list dictated by the protocol.	◯	◯	◯			
Assignment through the Task Manager to team #1 of a non predefined task	◯	◯	◯			
Assign the Task Manager to team #4 to help team #1.	◯	◯	◯			
Check the Position and the Status of the teams: which teams are active,their excact position on the map and the status of completion of the assigned tasks.	◯	◯	◯			
- notification about the second level exceeding arrives on the PSAP - Study the sensor graph on the PSAP. - The exceeding of the threshold is further confirmed by the automatic estimation of the water level that emerges from the video analysis of the static camera.	◯	◯	◯			

FORM FOR THE CONTROL ROOMS OBSERVER

Name and surname of the observer: _____

Session 3a (12:00 -13:00) :legacy tools

Assignment through the Task Manager to team #3 of a predefined task from the list dictated by the protocol.	◯	◯	◯			
PSAP operator assigns to team 4 the same task assigned to team 3	◯	◯	◯			
- notification about the third level exceeding arrives on the PSAP - Study the sensor graph on the PSAP. - The exceeding of the threshold is further confirmed by the automatic estimation of the water level that emerges from the video analysis of the static camera.	◯	◯	◯			
The authorities issue a general alert through the PSAP	◯	◯	◯			
Assign to SA Team via the PSAP to close the gates and check the status of the pumps	◯	◯	◯			

Expected action	Action correctly executed	Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')	Not executed (write the in the section notices the reason why)	Time	Time required for performing the action (if is possible to evaluate it)	Notices and comments
Monitoring of the Angels Bridge level via ARPAV sensor (reception of the values via e-mail) - comparison using the paper sheets that indicate the thresholds - Understanding the situation	◯	◯	◯			
Throughout this session the teams of citizens 1 and 2 move along routes established near the banks of the Bacchiglione in the center and report via telephone calls of flooding - the operators take note of the reports and the place on paper	◯	◯	◯			
The control room operator orders the team 2 foreman's radio to stay in position and monitor the wall, wait for the other team to bring sandbags to stem the breach	◯	◯	◯			
Assignment to team #1 of the task to support team 2	◯	◯	◯			
- The decision-maker or the COC members	◯	◯	◯			

FORM FOR THE CONTROL ROOMS OBSERVER

Name and surname of the observer: _____

Session 3b (13:00 -14:00) : beAWARE

Expected action	Action correctly executed	Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')	Not executed (write the in the section notices the reason why)	Time	Time required for performing the action (if is possible to evaluate it)	Notices and comments
constantly ask the operators for an update on the reports of the incidents that are coming from the citizens						
- Level monitoring via ARPAV sensors (e-informing the general public that the event de-escalates (by SMS)						

- notification about the third level exceeding arrives on the PSAP - Study the sensor graph on the PSAP.	◯	◯	◯			
- Throughout the session, the teams of citizens 1 and 2 move along routes established near the banks of the Bacchiglione in the center - Sending through the mobile app periodic reports of flooded areas - some reports sent by citizens have also attached images, videos and voice recordings	◯	◯	◯			
Operators receive the results of the analysis conducted by the platform on some posts coming from social media (tweets)	◯	◯	◯			
The head of the team reports with the mobile app an incident of type 'breccia arginale' to the control room and also attaches the photos of the wall	◯	◯	◯			
Assignment via PSAP to team 3 to stay in position and monitor the wall, wait for the other team who will bring sandbags with which to stem the breach	◯	◯	◯			
Assignment through PSAP to team #1 to support team #2	◯	◯	◯			
- the PSAP operator receives the result of the analysis of the video coming from the drone with the identification of a possible	◯	◯	◯			

endangered target						
Assignment through PSAP to SA team to verify the presence of a person in danger in the Cordano	◯	◯	◯			
Thanks to the Dashboard and the map the operator gets a clear picture about the	◯	◯	◯			

FORM FOR TEAM EVALUATION – TEAM 1 session 1a

Expected action	Place	Action correctly executed	Action correctly executed after some issues or action partially executed (write the problems in the section	Not executed (write in the section 'Notices' the reason why)	Time	Time required for performing the action (if is possible to evaluate it)	Notices and comments
PSAP The operating personnel look at the graphs of the hydrometer levels in the dashboard in Vicenza.		◯	◯	◯			
PSAP operators declare the end of mergency through the platform		◯	◯	◯			

Team of volunteers

			'Notices')				
Accreditation: (1/2) The team leader goes to the antechamber of the COC room for accreditation with the form already completed	(COC) Control Room inside the AIM Building	○	○	○			
Accreditation: (2/2) The team leader communicates the names	(COC) Control Room inside the AIM Building						

FORM FOR TEAM EVALUATION Team 1 session 1b

Expected action	Place	Action correctly executed	Action correctly executed after some issues or	Not executed (write in the section	Time	Time required for performing the action (if is possible	Notices and comments

As example, in this section is provided the entire observation form of the Team 1. The forms for the other teams have a similar structure, only differences rely basically on the contents of the task assignment, which are different for each team

			action partially executed (write the problems in the section 'Notices')	'Notices' the reason why)		to evaluate it)	
Accreditation (1/3) The beAWARE mobile app operator login as a rescuers team	In front of AIM palace						

FORM FOR TEAM EVALUATION - Team 1 session 2a

Expected action	Place	Action correctly executed	Action correctly executed after some issues or action partially executed (write	Not executed (write in the section 'Notices' the reason why)	Time	Time required for performing the action (if is possible to evaluate it)	Notices and comments
Ready' to 'Ready'							
Accreditamento (3/3) The mobile app operator takes a picture of the accreditation form and sends it by beAWARE app (category of entries in the app: 'accreditation form')	In front of AIM palace						

			the problems in the section 'Notices')				
Expected action	**Place**	**Action correctly executed**	**Action correctly executed after some issues or action partially executed (write the problems in the section**	**Not executed (write in the section 'Notices' the reason why)**	**Time**	**Time required for performing the action (if is possible to evaluate it)**	**Notices and comments**
understood and accepts the task.							
Communication reaching the position and starting to work on the task The team leader communicates by radio that it is already in position and it is starting to work on the task assigned	Square "Piazza Matteotti"	◯	◯	◯			
Comunication task execution The team leader communicates by radio to the control room that has completed the assigned task and is available for a new assignment	Square "Piazza Matteotti"	◯	◯	◯			

			'Notices')				
Receiving the Task The team leader receives by radio this assignment task (" Go to square "Piazza Matteotti", take the sandbags and bring them to team 2 in street "Contrà Torretti" and help them to stem the breach ") After the team leader communicates that he	Square "Piazza Matteotti"	◯	◯	◯			
understood and accepts the task		**FORM FOR TEAM EVALUATION - Team 1 session 2b**					
Expected action	**Place**	**Action correctly executed**	**Action correctly executed after some issues or**	**Not executed (write in the section**	**Time**	**Time required for performing the action (if is possible**	**Notices and comments**
The team leader communicates by radio that it is already in position and it is starting to work on the task assigned		◯	◯	◯			
Comunication task execution The team leader communicates by radio to the control room that has completed the assigned task and is available for a new assignment	Street "Contrà Torretti" (wall near to bridge "Ponte degli Angeli")	◯	◯	◯			

			action partially executed (write the problems in the section 'Notices')	'Notices' the reason why)		to evaluate it)	
Receiving the Task (1/2) The team receives the task (" need sandbags in Square "Piazza Matteotti (delivery by truck with lorry)") on mobile app	Near Stadium "Menti"	◯	◯	◯			
Receiving the Task (2/2) The team by BeAWARE mobile app change the status of the task in "accept"	Near Stadium "Menti"	◯	◯	◯			
Communication reaching the position and starting to work on the task the team changes its status as 'at work'	Square "Piazza Matteotti"	◯	◯	◯			
Comunication task execution (1/3) The team change its status of the BeAWARE mobile app as "completed"	Square "Piazza Matteotti"	◯	◯	◯			
Comunication task execution (2/3) The mobile app operator sets his team status to 'ready'	Square "Piazza Matteotti"	◯	◯	◯			
Comunication task execution (3/3) The mobile app operator takes an indicative photo of the completed task and sends it by the beAWARE mobile app	Square "Piazza Matteotti"	◯	◯	◯			

FORM FOR TEAM EVALUATION - - Team 1 session 3a							
Expected action	**Place**	**Action correctly executed**	**Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')**	**Not executed (write in the section 'Notices' the reason why)**	**Time**	**Time required for performing the action (if is possible to evaluate it)**	**Notices and comments**
Receiving the Task The team leader receives by radio this assignment task (" Go to square "Piazza Matteotti", take the sandbags and bring them to team 2 in street "Contrà Torretti" and help them to stem the breach ") After the team leader communicates that he understood and accepts the task	Square "Piazza Matteotti"	◯	◯	◯			
Communication reaching the position and starting to work on the task The team leader communicates by radio that it is already in position and it is starting to work on the task assigned	Square "Piazza Matteotti"	◯	◯	◯			
Comunication task execution The team leader communicates by radio to the control room that has completed the assigned task and is available for a new	Street "Contrà Torretti" (wall near to bridge "Ponte degli Angeli")	◯	◯	◯			

assignment							

FORM FOR TEAM EVALUATION – team 1 session 3b							
Expected action	**Place**	**Action correctly executed**	**Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')**	**Not executed (write in the section 'Notices' the reason why)**	**Time**	**Time required for performing the action (if is possible to evaluate it)**	**Notices and comments**
Receiving the Task (1/2) The team receives this assignment task (" Go to square "Piazza Matteotti", take the sandbags and bring them to team 2 in street "Contrà Torretti" and help them to stem the breach ") with beAWARE mobile app.	Square "Piazza Matteotti"	◯	◯	◯			
Receiving the Task (2/2) The team by BeAWARE mobile app change the status of the task in "accept"	Square "Piazza Matteotti"	◯	◯	◯			
Communication reaching the position and starting to work on the task The team changes its status as 'at work'	Square "Piazza Matteotti"	◯	◯	◯			
Comunication task execution (1/3) The team change its status of the BeAWARE mobile app as "completed"	Street "Contrà Torretti" (wall near to bridge "Ponte degli Angeli")	◯	◯	◯			

Comunication task execution (2/3) The mobile app operator sets his team status to 'ready'	Street “Contrà Torretti” (wall near to bridge “Ponte degli Angeli”)	◯	◯	◯			
Comunication task execution (3/3) The mobile app operator takes an indicative photo of the completed task and sends it by the beAWARE mobile app	Street “Contrà Torretti” (wall near to bridge “Ponte degli Angeli”)	◯	◯	◯			

Team of citizens

FORM FOR TEAM EVALUATION – TEAM CITIZEN 1 SESSION 3A							
Expected action	**Place**	**Action correctly executed**	**Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')**	**Not executed (write in the section 'Notices' the reason why)**	**Time**	**Time required for performing the action (if is possible to evaluate it)**	**Notices and comments**
Communication of flooded area - Each member, with its observer, moves to what is the location identified in the table above as its 'step XX' - When it is approximately in the location identified as 'step XX', the citizen communicates by tele= phone (Whatapp or SMS or call) to the control room that in the selected location there is a flooded area If the telephone number is busy, you can call one more time	Step 1	◯	◯	◯			
	Step 2	◯	◯	◯			
	Step 3	◯	◯	◯			
	Step 4	◯	◯	◯			
	Step 5	◯	◯	◯			
	Step 6	◯	◯	◯			
	Step 7	◯	◯	◯			

FORM FOR TEAM EVALUATION - TEAM CITIZEN 1 SESSION 3A							
Expected action	**Place**	**Action correctly executed**	**Action correctly executed after some issues or action partially executed (write the problems in the section 'Notices')**	**Not executed (write in the section 'Notices' the reason why)**	**Time**	**Time required for performing the action (if is possible to evaluate it)**	**Notices and comments**
Communication of flooded area The citizen through the mobile app can send an alert to flooded areas by performing the following actions - Each member, with its observer, moves to what is the location identified in the table above as just 'step XX' - When you are near the location identified as 'step XX', using beAWARE mobile app, you send an alert with Category "Generic flood report" - In the item 'Estimation of water level in the flood area' select the value indicated on the form for citizen team - In the item "Select exposed elements" indicate the appropriate	Step 1	◯	◯	◯			
	Step 2	◯	◯	◯			
	Step 3	◯	◯	◯			
	Step 4	◯	◯	◯			
	Step 5	◯	◯	◯			

item in accordance with the form for citizen team							
If you want you can insert a text as you like and attach a picture or video to the alert	Step 6	○	○	○			
	Step 7	○	○	○			

Appendix C: questionnaire format for the flood pilot

About this questionnaire

This questionnaire is used to collect data based on your participation and observations during the pilot.

All participants involved in the Trial are given the opportunity to complete this questionnaire.

The following questions will help us understand your opinion about today's event, the potential role of citizens and citizen observatories in disaster management and the conditions for their success.

The results of the completed questionnaires will be collated and will be used to support evaluation of beAWARE.

Within the questionnaire, you will first be asked to fill in personal information, and to answer questions about the Trial.

There are no right or wrong answers.

Participating in this questionnaire is voluntary. You do not have to answer any questions you do not wish to answer, and you may cease to participate at any time.

Your responses to this questionnaire will be used for beAWARE research work which ultimate objective is to improve preparation and response to crisis events.

Your responses will remain confidential and data will always be presented in such a way that your identity cannot be connected with specific published data.

Shall you have any question, please ask the questionnaire administrator.

Anastasios Karakostas akarakos@iti.gr

Personal information

- What is your professional background?

◯ Crisis management ◯ Rescue service or Responder ◯ Research ◯ Technical/Technology

◯ Other, please indicate…….

- Which option(s) best describes you (you can select more than one):

◯ I am a decision maker/policy maker

◯ I am a emergency manager

◯ I am a scientist / data aggregator

◯ I am a citizen

◯ Other (please explain).....

- How many years of professional experience do you have:

◯ 1-5 years ◯ 5-10 years ◯ 10-15 years ◯ More than 15 years

- What is your Nationality? _____

- Gender

◯ Male ◯ Female

- Age range

◯ ≤ 30 ◯ 31 – 40 ◯ 41 – 50 ◯ ≥51

- How much would you agree with the statement that You have experience and knowledge regarding
cross-border crisis management operations.

◯ Strongly Agree ◯ Agree ◯ Neutral ◯ Disagree ◯ Strongly disagree

- What was your role in the Trial.

◯ Player ◯ Observer ◯ Other, please indicate……..

Trial Dimension

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
The number of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.	◯	◯	◯	◯	◯	◯
Please, add here justification						
The background of participants involved in the Trial sessions was adequate to the tasks, and to evaluate the solutions and their impact on the crisis management.	◯	◯	◯	◯	◯	◯
Please, add here justification						
The level of involvement of participants of the Trial sessions was adequate and enough to evaluate the solutions and their impact on the crisis management.	◯	◯	◯	◯	◯	◯
Please, add here justification						
There were no organisational or logistics constrains (e. g. time management, infrastructure preparation) that influenced the quality and completeness of the Trial.	◯	◯	◯	◯	◯	◯
Please, add here justification						

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
There were no external constrains (e. g. missing participants, emergency situation, technical breakdown, indisposition of key personnel) that influenced the quality and completeness of the Trial sessions.	◯	◯	◯	◯	◯	◯
Please, add here justification						
The setup of the Trial was clear and every person involved in the Trial knew their role and responsibilities for all the activities organised.	◯	◯	◯	◯	◯	◯
Please, add here justification						
The safety measures were adequately planned, explained and implemented during the Trial.	◯	◯	◯	◯	◯	◯
Please, add here justification						
The Trial was conducted safely.	◯	◯	◯	◯	◯	◯
Please, add here justification						
The scenario of the Trial was realistic (chosen hazard, its evolution and related cascading effects).	◯	◯	◯	◯	◯	◯

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Please, add here justification						
The injects from role players and the story telling were realistic.	◯	◯	◯	◯	◯	◯
Please, add here justification						
Simulation helps in understanding the situation.	◯	◯	◯	◯	◯	◯
Please, add here justification						
I am satisfied with the participation and conduction of the Trial.	◯	◯	◯	◯	◯	◯
Please, add here justification						

beAWARE

The Trial sessions scenario was adequate to evaluate the solution and its impact on the crisis management for **beAWARE.**	◯	◯	◯	◯	◯	◯
Please, add here justification						

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
The technical setup of solution **beAWARE** was complete, professional and adequate to evaluate the solution and its impact on the crisis management.	◯	◯	◯	◯	◯	◯
Please, add here justification						
How much do you agree with the following statements that an automated exchange of data between different IT solutions leads to:						
- Less time needed for practitioners in their search for crisis relevant information.	◯	◯	◯	◯	◯	◯
Please, add here justification						
- Less time needed for practitioners to read data from one solution and entering data manually into another solution.	◯	◯	◯	◯	◯	◯
Please, add here justification						

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
- Lower probability for wrong information caused by human errors while reading/entering data from/into a solution.	◯	◯	◯	◯	◯	◯
Please, add here justification						
- More time for practitioners to define, communicate, execute and supervise crisis response actions.	◯	◯	◯	◯	◯	◯
Please, add here justification						
- Higher quality of the crisis management outcome due to the time savings, better data quality and improvement of communication.	◯	◯	◯	◯	◯	◯
Please, add here justification						

Test information

- What best describes your previous involvement in citizen science or citizen observatory initiatives?
  - ◯ This is the first time that I heard about citizen science or citizen observatories
  - ◯ I have heard about citizen science or citizen observatories, but I have not been actively involved in any initiative so far
  - ◯ I have been (actively) involved in one or more citizen science or citizen observatory initiatives
  - ◯ Other (please explain).....

- How would you explain the role of citizens (the general public) in beAWARE project?

- Citizen observatories are not simple 'plug & play' technical solutions, they also have crucial 'social dimensions': they rely on the active and continued involvement of citizens and the general public to succeed. What was the most helpful part today to convey the social dimensions involved in setting up and running a citizen observatory?

- When do you think is the best moment to start including citizens in a project like beAWARE?
  - ◯ Before designing the platforms, Apps and tools
  - ◯ During the design of the platforms, Apps and tools
  - ◯ After the design of the platforms, Apps and tools
  - ◯ Other (please explain).....

- What is your opinion of the following parts of today's event?

	Were you present in this session?	Not at all useful	Slightly useful	Moderately useful	Very useful	Extremely useful	No opinion/ not applicable
Practical demonstration in the field	Yes ☐ No ☐	☐	☐	☐	☐	☐	☐
Practical demonstration in the control room	Yes ☐ No ☐	☐	☐	☐	☐	☐	☐
Plenary discussion (Technical group)	Yes ☐ No ☐	☐	☐	☐	☐	☐	☐
Plenary discussion (Policy & management group)	Yes ☐ No ☐	☐	☐	☐	☐	☐	☐
Informal interactions and discussions throughout the day		☐	☐	☐	☐	☐	☐

- In your view, what was the most valuable part/aspect of today's demonstration?

- In your view, what was the least valuable part/aspect of today's demonstration?

- How can we improve future events to convey a) the potential of citizen science and citizen observatories for disaster forecasting and management and b) the conditions for their success?

Appendix D: Heatwave pilot storyline (D2.10, table 24)

Description	Legacy tools	beAWARE	Trigger	Expected behavior	Players	Observers - Evaluators	Evaluation
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 -> 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)	4 PSAP (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 • Message for public • Message for authorities • Message for first responder	4 end users with app 4 citizens with the app	2 in each team (total 4) 2 in the citizen's group	
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 mobile app base on age	4 end users with app 4 citizens with the app	2 in each team (total 4) 2 in the citizens group	

				location			
A risk assessment regarding a forest fire which occurs after a heatwave is provided	*Email, phone call*	*Crisis classification -> PSAP o forecast data o highest temperature value Average value from 4 places*		*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)*	*3 PSAP operators*	*2 observers with them*	
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°Cat 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 informatio n	Crisis classification -> PSAP o forecast data o highest temperature value o Average value from 4 places	Crisis Classfication 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)	4 PSAP (these roles will be there the whole time of the pilot in all sessions)	

The day of the heatwave starts with 39°Cat 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	2 in each team (total 4) 2 in the citizens group	
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)	2 observers with them	
	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	2 in each team (total 4)	
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	4 citizens with the app	2 in the citizens group	

people who are seeking shelter there.				the nearest place of relief.			
• 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	2 observers with them	
	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	2 in the citizens group	

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	*Email, phone call, VHF*	*mobile app*	inform the authorities with the position of the rescuers	*Map of rescue teams and task evaluation*	*2 rescuers with the mobile app*	*1 observer with them*	
Give specific evacuation orders to First Responders of people trapped inside a building/elevator etc	*Email, phone call, VHF*	*mobile app*	inform the rescuers after a call or at tweet that a person asks for help	specific instructions are sent through the beAWARE mobile app to the rescuers to rescue people in danger	*2 rescuers with the mobile app*	*1 observer with rescuers*	
Another incident occurs near the first one and PSAP send part of the active team in the area to deal with the new incident	*Email, phone call, VHF*	*mobile app*	*new incident from phone call, tweet which is near the active team on the field*	specific instructions are sent through the beAWARE mobile app to the rescuers to assist in the new danger	*2 rescuers with the mobile app*	*1 observer with rescuers*	
Session C - Place of relief							

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			
Assign task to first responder to go from one relief place to another to help the situation	*Email, phone call, VHF*	*mobile app*	*Second place of relief, needs assist, request from mobile app*	specific instructions are sent through the beAWARE mobile app to the rescuer to go from one relief place to the other	*1 rescuer with the mobile app*	*1 observer with the rescuer*	
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			

Give specific evacuation orders to First Responders	*Email, phone call, VHF*	*mobile app*	*After an incident evacuation orders are given from mobile app to the rescuers for a specific place of relief*	specific instructions are sent through the beAWARE mobile app to the rescuers to evacuate the relief place.	*3 rescuers with the mobile app, 10 citizens*	*2 observer with rescuers*	
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 Classfication run				

Appendix E: questionnaire format for the second prototype demonstration

About this questionnaire	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable

beAWARE

The Trial sessions scenario was adequate to evaluate the solution and its impact on the crisis management for **beAWARE.**	○	○	○	○	○	○

Please, add here justification

The technical setup of solution **beAWARE** was complete, professional and adequate to evaluate the solution and its impact on the crisis management.

○ ○ ○ ○ ○ ○

Please, add here justification

How much do you agree with the following statements that an automated exchange of data between different IT solutions leads to:

- Less time needed for practitioners in their search for crisis relevant information.

○ ○ ○ ○ ○ ○

Please, add here justification

- Less time needed for practitioners to read data from one solution and entering data manually into another solution.

○ ○ ○ ○ ○ ○

Please, add here justification

- Lower probability for wrong information caused by human errors while reading/entering data from/into a solution. *Please, add here justification*	○	○	○	○	○	○
- More time for practitioners to define, communicate, execute and supervise crisis response actions. *Please, add here justification*	○	○	○	○	○	○
- Higher quality of the crisis management outcome due to the time savings, better data quality and improvement of communication. *Please, add here justification*	○	○	○	○	○	○