driver+

Driving Innovation in Crisis Management for European Resilience

SUMMARY OF TRIAL 3, EISENERZ, AUSTRIA

12-14 SEPTEMBER 2019

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The DRIVER+ project

Current and future challenges, due to increasingly severe consequences of natural disasters and terrorist threats, require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
    a. Develop a common guidance methodology and tool, supporting Trials and the gathering of lessons learnt.
    b. Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
    c. Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
    d. Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
    e. Facilitate the usage of the Portfolio of Solutions.
    f. Ensure the sustainability of the Portfolio of Solutions.
3. Facilitate a shared understanding of Crisis Management across Europe:
    a. Establish a common background.
    b. Cooperate with external partners in joint Trials.
    c. Disseminate project results.

In order to achieve these objectives, five Subprojects (SPs) have been established. **SP91** ***Project Management*** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on Crisis Management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment are part of **SP91** as well. **SP92** ***Test-bed*** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93** ***Solutions*** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in **SP93**. **SP94** ***Trials*** will organize four series of Trials as well as the Final Demo (FD). **SP95** ***Impact, Engagement and Sustainability***, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardisation.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties, and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities. Most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange of lessons learnt and best practices between Crisis Management practitioners as well as technological solution providers.

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1. Background

A Trial is an organised and systematic process of searching for innovation in Crisis Management. A Trial should be tailored for finding innovations that show potential to limit or cover identified Crisis Management Gaps related to Crisis Management Functions. However, to achieve this ambitious goal in a manner which enables relevant and representative results, it is important to organise a Trial in conditions as realistic as possible in order to minimise research biases.

The Trial Guidance Methodology (TGM), as a systematic and research-based method, assists Trial Owners in this challenge. Further, the Test-bed Technical Infrastructure (TTI) facilitates creating a realistic set-up for that purpose. A Trial Owner is also actively supported by a Trial Committee which consists of experts supporting the TGM and Test-bed infrastructure implementation, coordination of solution providers and practitioners. The Trial Committee is permanently working with the Trial Owner through the entire process of the Trial organisation.

Therefore, a Trial aims to actively involve Crisis Management practitioners in the search for innovation which meets their expectations. Gaps are revealed and defined by them on the basis of their experiences and problems they face in the realisation of their missions. These expectations and gaps are to be met and covered (partially or completely) by solution providers who address them with their solutions.

By the inclusive approach of the DRIVER+ Trial organization it is possible to reach out to external organisations (solution providers and CM practitioners) to enhance external cooperation and shared understanding. Broad involvement of these two groups at a relatively early stage of a Trial organization facilitates building a common platform. Furthermore, it enhances the understanding between those groups, which provides positive prospects for fulfilling their expectations, as well as achieving the main aim, to find and adopt innovation in Crisis Management.

It is important to underline that the briefly described process of the Trial implementation during the project period is being done in order to test, verify and improve the project outputs, i.e. the Trial Guidance Methodology (TGM), the Test-bed Technical Infrastructure (TTI) and the Trial Guidance Tool (TGT). This will assist to make these outcomes ready for an effective and sustainable utilization after the project's end.

From **12 to 14 September 2019**, the third Trial organized as part of the DRIVER+ project (Trial 3) took place in Eisenerz, Austria. It was organised by the Austrian Institute of Technology and hosted by the Austrian Red Cross in the Community Centre of Eisenerz/Münichtal. This event involved more than 100 persons from 8 countries, including Trial staff, commanders from the different branches of the Austrian Red Cross, national/international observers, and volunteering students from the nearby Business School (Bundes Handelsakademie, Eisenerz).

Figure 1.1: Community centre in Münichtal/Eisenerz in which Trial 3 was hosted

The Trial was conducted as a multi-day combined table-top and field Trial run in parallel to the large-scale European Civil Protection field exercise IRONORE2019, that involved around 1,000 participants and

numerous emergency vehicles and ambulances. IRONORE participants came from the Red Cross of Styria, Bavaria and Hungary, Fire Service, Police, Government Styria, Austrian Army, Mountain rescue and cave rescue organisations.

The cooperation between DRIVER+ and IRONORE, and the participating national emergency organisations allowed to share the exercise area as well as various resources (e.g. volunteers, cars, commanders) and contributed to a shared understanding in disaster and crisis management. The **general purpose** of both, IRONORE and the DRIVER+ Trial 3 was to strengthen the preparedness and response to an earthquake disaster within Austria in an alpine region.

2. Context

This section presents the practitioners' needs (gaps) which the selected solutions aimed to address, the research questions guiding the Trial overall process, as well as the scenario on which the Trial realisation is based.

2.1 Crisis Management Gaps

In DRIVER+, a capability gap is understood to be "the difference between a current capability and the capability considered necessary for the adequate performance of one or more disaster management tasks."[1] The list of Crisis Management capability gaps proposed by Trial 3 practitioners is presented below.

- Volunteer Management: Insufficiencies in the management of spontaneous and affiliated volunteers on the crisis scene in terms of location, tasking, capabilities, and shift duration.
- Real-time data and information fusion to support incident commander decision-making: Limitations in the ability to merge and synthesise disparate data sources and models in real time to support incident commander decision making.
- Incorporating information from multiple and non-traditional sources: Insufficiency in the ability to report dangerous areas and situation overview from multiple and non-traditional sources (e.g. crowd- sourcing and social media) into response operations.
- Psycho-social support: Lack of having the capability to measure stress and/or improving the communication and the awareness of psychological stress of those affected, especially spontaneous and affiliated volunteers.
- Interaction with the population: Improving the process of communicating with the population.

All these gaps have been discussed and validated during the DRIVER+ gaps assessment workshop[2] in January 2018 and subsequently prioritized by the Trial 3 Committee.

2.2 Main Research Questions

The main research questions driving the Trial 3 process are the following:

I. How to improve volunteer management, and in particular the process of managing spontaneous volunteers in terms of tasking, monitoring and locating volunteers working on the scene?

II. How to improve real-time data and information fusion to support incident commander decision making?

[1] ECORYS and TNO for European Commission DG HOME. First Responders - Identifying capability gaps and corresponding technology requirements in the EU. January 2016.

[2] DRIVER+ PROJECT. D922.11 List of CM gaps. March 2018.

III. How to incorporate information from multiple and non-traditional sources (e.g. social media) so that this is of added value for decision-making, in particular for search and rescue operations in an earthquake crisis situation?

IV. To which extent is psycho-social support (PSS) improving the awareness on psychological stress by crisis managers dealing with volunteers?

V. How to improve the interaction with the population / communication with the public during a large crisis?

2.3 Scenario outline

The Trial 3 overall scenario is that the central area of Austria has been struck by a severe earthquake and subsequent heavy rain. The local region of Eisenerz (in Styria) is one of the most affected with missing persons, casualties, collapsed buildings, blocked roads, and endangered industries working with hazardous substances. Inhabitants have left their houses for fear of aftershocks and collapsing buildings. Lifelines such as water, food, shelter, transportation and medical care have been disrupted. Electricity and mobile networks have been severely damaged.

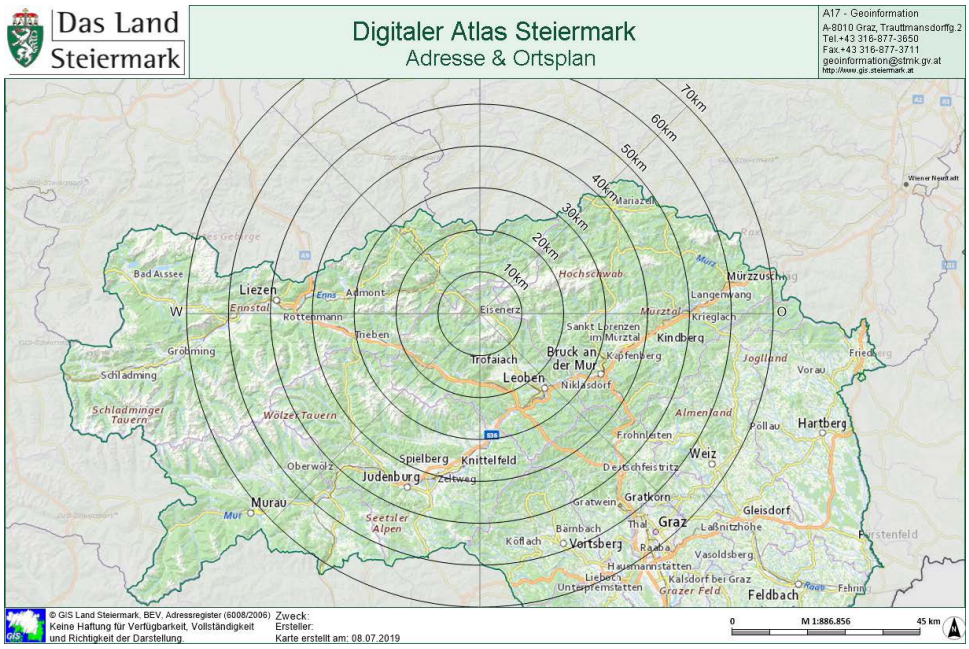

Figure 2.1: Earthquake Epicentre (Trial 3 scenario)

All local and national emergency response organisations have been deployed on site (Austrian Red Cross, fire brigades, police and the army). However, due to the extension of the affected area and overwhelmed national response capacities, the Union Civil Protection Mechanism was activated. A request of international assistance was made with regards to medical treatment, water purification and search and rescue. Due to the difficulty of accessing the affected area and considering the impact of the disaster, there is an urgent need for humanitarian assistance and assessment. A large number of volunteers and rescue equipment is needed to cope with the increasing number of affected people i.e. for search and rescue operations, making shelter, providing medical care, water, food and transportation.

Figure 2.2: Spontaneous volunteers bringing water to shelters

In Trial 3, various blocks comprising the Trial were aligned with IRONORE exercise in order to efficiently share resources, staff and participants.

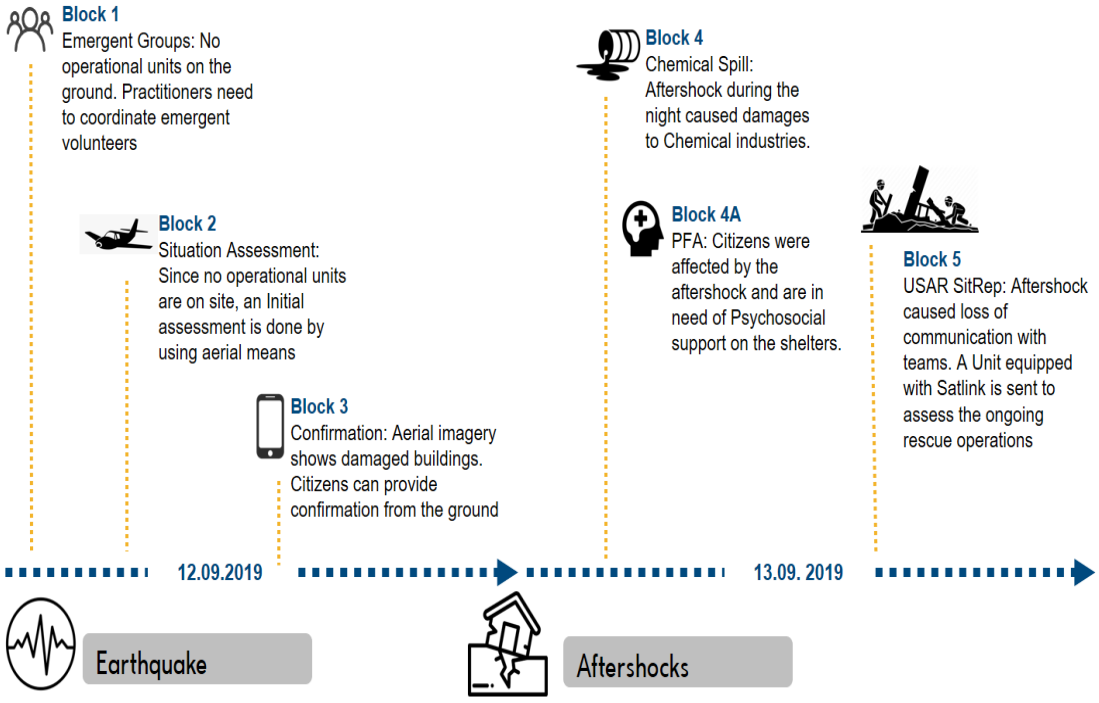

Figure 2.3: Trial 3 scenario blocks

3. Solutions

After passing the Call for Application and the selection process, and after being tested during Dry Run 1 and Dry Run 2, five solutions were implemented in Trial 3. Two of them (vieWTerra Evolution and ASIGN), were

provided by non-DRIVER+ partner companies while the other three (CrowdTasker, Airborne and Terrestrial Situational Awareness and PFA) were from DRIVER+ partners.

CrowdTasker (provided by AIT, Austria)

This is a solution for citizen involvement and community interaction. It supports informing citizens, eliciting contributions to the common operational picture by pre-registered parties and integrating efforts of self-organisation. This is achieved by issuing assignments and situational information to a selected crowd of citizens based on their location and skillset, as well as offering a chatbot interface for emergent groups to participate using their own organisational infrastructure (such as social media groups).

Figure 3.1: CrowdTasker

Airborne & Terrestrial Situation Awareness (provided by DLR, Germany)

This solution is comprised of four modules to provide real-time aerial imaging to enhance situational awareness during major and large- scale disasters. Module 1 is the ground control station U-Fly, used to plan, engage and monitor aerial missions. The full-size research aircraft D-CODE executes the missions. Module 2 is the 3K aerial camera system, specifically developed to acquire and evaluate aerial photographs in near real-time. In addition, it can transfer aerial imagery via data link directly from the aircraft to a mobile ground station to provide the data to decision makers and rescue forces immediately. Module 3 is the Center for Satellite based Crisis Information, which analyses aerial imagery and generates crisis information maps. Module 4, called KeepOperational, has traffic analysis and route planning capabilities. The solution can be applied as a complete system or the individual modules can stand alone.

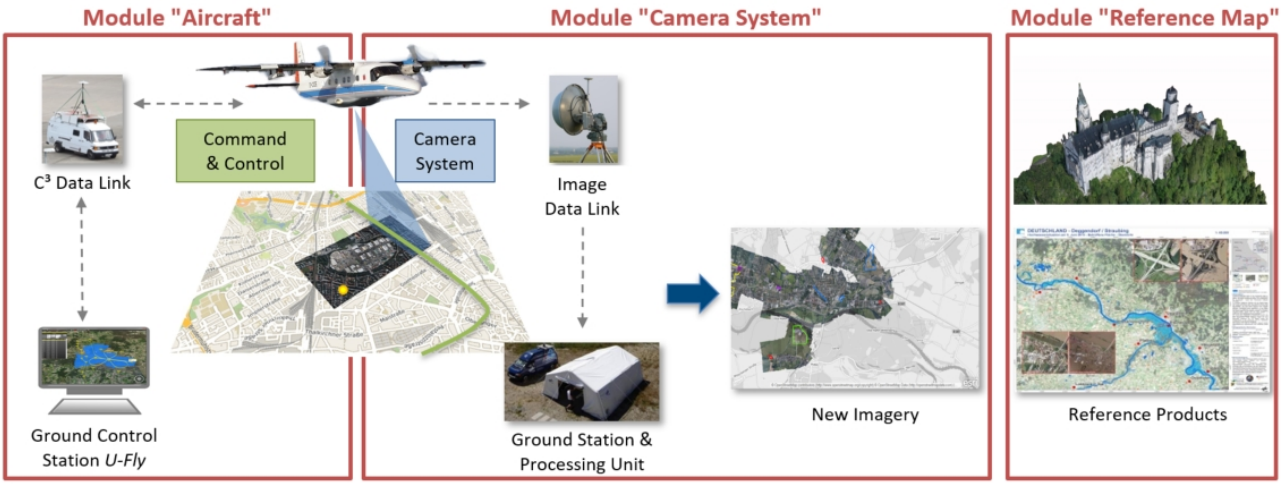

Figure 3.2: Airborne & Terrestrial Situation modules

vieWTerra Evolution (provided by VWORLD, France)

vieWTerra Evolution, vieWTerra Base, vieWTerra Mobile form a combined "GIS & Simulation" suite of products allowing responders to rapidly build a virtual 4D representation (3D synthetic environment + Time dimension) of any potential crisis area on earth. These solutions provide a Common Operational Picture to both the Crisis Centre and the rescue units out in the field. vieWTerra Evolution is a 4D Earth Viewer as well as a data & assets integration and development platform. It presents an ellipsoidal model of the Earth allowing its users to integrate their own precise datasets anywhere on the Globe, without any area coverage limitations, or to access data streams (imagery, cartography layers).

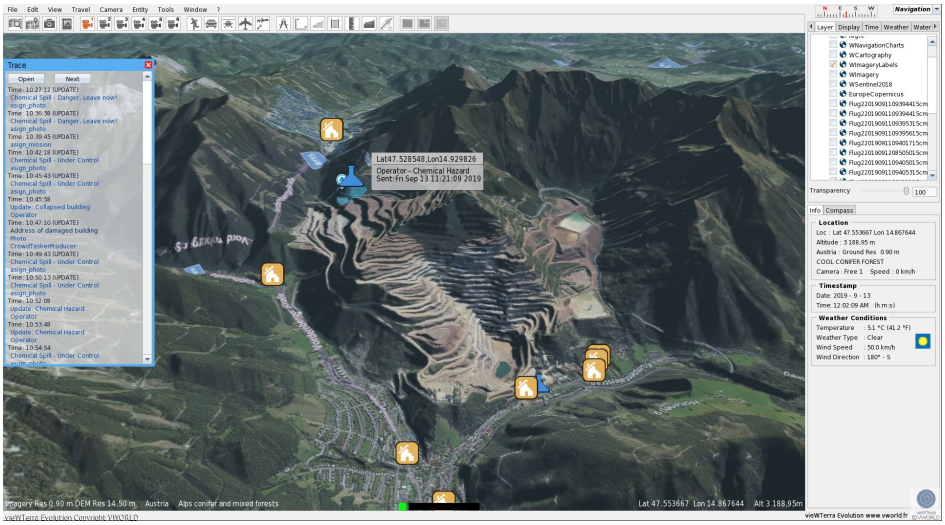

Figure 3.3: vieWTerra Evolution

ASIGN (provided by AnsuR, Norway)

ASIGN supports the collection and communication of photos, videos, geo-texts, tracking, geo-zones, geo-alerts and assessment forms in a very bandwidth-efficient manner. Specifically, it can communicate photos and video with 99% bandwidth reduction, enabling communication even through low bandwidth cellular and satellite communication networks while maintaining full precision and accuracy. While the ASIGN Apps work perfectly with regular mobile networks, they also allow satcom to be used when needed, with a lower cost. ASIGN is comprised of the ASIGN Server, a cloud-based platform from which the incoming information is managed, plus the field user ap- plications ASIGN PRO and UAV-ASIGN, which collect and send information from the field to the Server, all with end-to-end encryption.

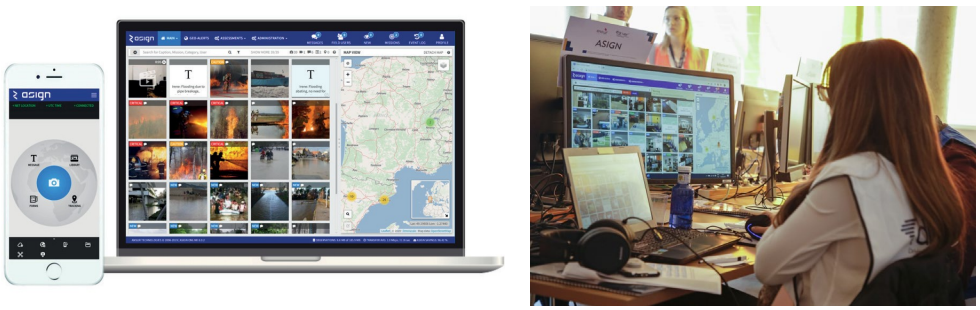

Figure 3.4: ASIGN

Psychological First Aid (provided by the Danish Red Cross, Denmark)

The Psychological First Aid (PFA) training for spontaneous volunteers is a one-day training course to practise the main skills needed to give good PFA in a crisis situation. It addresses the internationally recognised principles of Look Listen Link, developed by the World Health Organisation (WHO). The training includes

sessions on these three principles as well as role plays, discussion sessions, and sharing knowledge and experience between participants. Organisations responding to a crisis can implement the training to leverage the resources that spontaneous volunteers bring to a crisis in a positive and safe way. It also has a dedicated Leadership seminar.

Figure 3.5: Psychological First Aid

4. Results

The results are structured along three dimensions: the Trial dimension, the solution dimension and the Crisis Management dimension. The **Trial dimension** relates to the Trial organisation: everything that has to do with the Trial run in very "hands-on" manner is part of this dimension. The **solution dimension** tackles all functionalities as well as the usability of each solution that is trialled. The most important dimension is the **Crisis Management dimension**, since it aims to measure the potential impact of solutions on the selected CM gaps.

4.1 Trial Dimension

The participants' number, background and commitment supported the Trial adequately. Looking at the average of all answers, the respondents rather agreed that they were satisfied with the organisation of the Trial. Most respondents emphasized the aspect of safety and security, communication and division of tasks as particularly positive. However, the scenario set-up was commented to be not very realistic.

Problems were reported with understanding of the project terminology (e.g. difference between Trial and exercise, observing and evaluating) which was most likely caused by limited training time to get the participants more familiar with the DRIVER+ Trial terminology.

All participants valued the high-quality organisation of the Trial.

4.2 Solutions Dimension

The objective of the evaluation in the solution dimension is, for each innovative solution, to provide a detailed answer to the question "Does the selected solution fulfil the expected functions during the Trial?"

In order to focus strictly on the gaps selected for Trial 3, not all of the solutions' functionalities were evaluated. The general feedback from the practitioners was that the solutions provided the trialled functionalities and were rated as innovative having a serious potential to improve Crisis Management activities. However, additional training and improving some interfaces were recommended.

CrowdTasker showed the advantage regarding its full operational services related to supporting operational commanders in interaction with volunteers and also to facilitate volunteers in creating digital artefacts and receiving updates or organizing intra-groups coordination. It showed the ability to share information with

ASIGN as well as with vieWTerra Evolution, and the ability to provide more detailed (in comparison to baseline tools) information to fulfil practitioners' tasks. However, the integration of CrowdTasker into current practitioners' organisational workflows seems to be difficult as well as the functionality to send easy to understand alerts to staff at the entrance of a danger zone.

Airborne and Terrestrial Situational Awareness provided high quality images, facilitated the decision-making process, and was perceived by the practitioners as a useful solution. However, completing tasks by the practitioners using the solution seemed to be not any faster than using baseline tools, which may suggest a need for further development of the solution and/or a better training.

ASIGN showed the advantage regarding its capability to send important messages and its possibility to mark a danger zone. It demonstrated its ability to share geo-imagery with vieWTerra Evolution, to allow the transmission of requests between different users, to display 360° videos, to complete tasks of practitioners faster and more reliable, and finally to manage tasks more easily providing more detailed (in comparison to baseline tools) information to fulfil their tasks.

vieWTerra Evolution demonstrated the ability to present 2D and 3D images without lags and distortions, as well as an improvement in complementarity of information provided to practitioners. However, the ability to clearly present the danger zone as well as to intuitively orient the practitioners in vieWTerra Evolution's 4D Earth landscape was rather difficult. This may suggest a need for further development of the solution and/or better training.

Psychological First Aid (PFA) showed the advantage with applying knowledge of psychological first aid training especially to (spontaneous) volunteers. However, according to the practitioners, PFA has a low usefulness for commanders supporting the decision-making process.

4.3 Crisis Management Dimension

Overall, the results show that the solutions contributed very to rather well to **real-time data and information fusion to support incident commander decision-making.** The accuracy and speed of information transfer was improved considerably.

Furthermore, the solutions showed a high potential to **incorporate information from multiple and non-traditional sources**. The results are limited to the specific conditions of Trial 3, and further testing and demonstrating when using other sources would be recommended.

The **interaction with the population**, including the **management of volunteers**, can be improved with some of the tested solutions. In particular, an improved psychological support to volunteers can contribute to a more effective and responsible involvement of these citizens during crisis management situations.

4.4 Answers to the research questions

I. How to improve volunteer management, and in particular the process of managing spontaneous volunteers in terms of tasking, monitoring and locating volunteers working on the scene?

The management and tasking functionality of the tested solution (e.g. Crowdtasker) with regards to managing of spontaneous volunteers and distribution of tasks generates added value related to the volunteer management with respect to managing an earthquake and heavy rain situation.

It was demonstrated that in case of an urgent need for collecting information from population and including spontaneous volunteers, facilitates getting an operational overview of the actual situation necessary for better decision making.

II. How to improve real-time data and information fusion to support incident commander decision making?

Information provided by the Airborne and Terrestrial Situational Awareness solution (e.g. high-quality photos) as well as information from ASIGN (text, photos, videos) was fused by the vieWTerra Evolution which clearly enhanced the understanding of an ongoing crisis situation.

In this way it was demonstrated that the tested solutions (Airborne and Terrestrial Situational Awareness and vieWTerra Evolution) support the decision-making process. However, independent usage of Airborne and Terrestrial Situational Awareness by commanders in charge would require a special training on how to interpret the photos in order to fully understand the provided information (for example: automatic photo/video analysing system for different types of damages).

Furthermore, the results of Trial 3 prove that ASIGN and CrowdTasker have user interfaces that allow easy information exchange (text, photos, videos) between units deployed in the field and the commanders in the command centre to deal with an earthquake-related crisis situation. Information in the command centre retrieved via the TTI was displayed either in ASIGN or CrowdTasker but was also fused and visualised in vieWTerra Evolution for commanders in the command centre to produce an actual common operational picture to assist them in decision-making.

III. How to incorporate information from multiple and non-traditional sources (e.g. social media) so that this is of added value for decision-making, in particular for search and rescue operations in an earthquake crisis situation?

The tested solution (i.e. CrowdTasker) incorporated the functionality of a social media interface by using Telegram and therefore has the ability to use information from different non-traditional and multiple information sources that enhanced the decision-making process of the commanders in charge in the context of the earthquake scenario. It generates the additional value related to the enhancement and accuracy of the situational and operational picture. In addition, it provides a benefit in bottom-up communication, especially launched by spontaneous volunteers who can provide and enrich the operational picture with their on-sight information (data, observations, etc.).

However, a positive influence on the search and rescue operation itself is minor due to the fact that the current functionality does not provide a feature to task specific individuals or groups (this impacts top-down tasking and as a consequence, the time required for managing volunteers). A legal framework for integrated spontaneous volunteers seems to be required.

IV. To which extent is psycho-social support (PSS) improving the awareness on psychological stress by crisis managers dealing with volunteers?

Psychological First Aid training used to train participants (e.g. team leaders) increases their awareness regarding the stress experienced by volunteers in emergencies. The PFA demonstrates its potential to enhance the key knowledge and skills of its participants. However, exact measuring of added value is difficult due to some other factors that need to be taken into consideration (e.g. age of participants, previous traumatic experiences, previous knowledge in the area, etc.). Overall, the tests before and after the training indicate a change from "low" and "medium" to "high" ability ratings, and thus participants reported that abilities they were asked to assess have improved on the day of training. Participants stated they were able to identify some signs of distress on the persons who were performing the role playing (victims) they would not have been aware before.

V. How to improve the interaction with the population / communication with the public during a large crisis?

Functionality of CrowdTasker demonstrates a potential to be used as a channel for early warning purposes. CrowdTasker has the ability to send out related alarms/warnings as well as getting back alarms/warnings from the population. CrowdTasker enables bottom-up communication (from the spontaneous volunteers to the coordination unit/stakeholder). Based on the opinion of practitioners, an acknowledgement of

information is an issue (functionality to send easy-to-understand alerts to staff when entering a danger zone). CrowdTasker lacks the functionality to properly verify the users who create a risk report to avoid launching of fake communication streams intentionally or unintentionally. Therefore, it seems that the system could easily be compromised. These restrictions result in limited usability of CrowdTasker as a means of communication.

5. EU policy recommendations

Trial 3 findings are mainly addressed to the policies which are naturally related to Crisis Management by definition. These are civil protection and humanitarian aid covering prevention, preparedness and response to disasters. Furthermore, the results could have an influence on the Solidarity Fund which is an instrument dedicated to the recovery phase of EU Crisis Management.

The outcomes of the Trial 3 provide ground to formulate the following recommendations related to EU policies, regulations and mechanisms.

In the context of EU **civil protection policy** (Regulation (EU) No 2019/420 and 1313/2013/EU and 2014/762 and No. 2018/142) The Airborne and Terrestrial Situational Awareness solution as well as vieWTerra Evolution, could be broadly used for improving situational awareness, including needs and damage assessments, particularly in case of limited availability of Copernicus services. This type of support is required mainly in case of major disasters like earthquakes, wildfires and floods due to the wide geographical area affected. There may be several reasons to launch the solutions in a disaster situation, in a need for ad hoc urgent assessment of a specific area or a general need for situation overview in poor weather conditions (which limit the potential use of satellite imagery). The aerial imagery could also improve communication and reporting in horizontal scheme, among the stakeholders involved in the operation, as well as vertical, from the field to HQs (e.g. from EUCPT to ERCC). Supplementing reports and maps with respective images of affected area may significantly improve clarity of communication. Furthermore, availability of the two solutions may facilitate the work of European civil protection assets by providing information on preferable location for a Base of Operation, Reception and Departure Centres and other crucial information which may be obtained from aerial observation and clearly presented in the form of 2D and 3D maps and imagery.

The trialled solutions (Airborne and Terrestrial Situational Awareness solution, vieWTerra Evolution) could represent an additional asset in the European Emergency Response Capacity which is deployed by ERCC on commercial or other bases if needed. It could also be a part of a national capacity offered within the voluntary pool if agreed between the producers and a member state where the company is operating.

In the context of **humanitarian aid** (Regulation (EU) No 375/2014 and No 1244/2014 and No 1398/2014) it is truly visible that training programmes as provided by Psychological Frist Aid (PFA) for volunteers is extremely valuable. Thus, we recommend to use such trainings as training programme for EU Aid Volunteers Corp which ensures that candidates are thoroughly prepared before their departure to a non-EU country. PFA could be introduced as a solution improving quality of their trainings and resulting in better quality of psychological aid offered on site of a humanitarian crisis.

The CrowdTasker solution can be recommended for the communication, collaboration and early warning in humanitarian crises, it can especially contribute to initial phase of a response when high number of NGOs respond, and communication and collaboration structures between the stakeholders are being launched. Airborne and Terrestrial Situational Awareness solution as well as vieWTerra Evolution could improve provision of humanitarian aid by providing information about accessibility of the suitable areas for humanitarian aid transports, geographical and other conditions for IDP and refugee camps settlements, etc.

In the context of the EU **Solidarity Fund** (Article 212 of the Lisbon Treaty the Airborne and Terrestrial Situational Awareness solution as well as vieWTerra Evolution could be used to document the 'major' disaster losses in case the stricken EU member state is applying for a support from the Solidarity Fund. In specific cases it could be considered as a sufficient evidence of the damage and enable assessment of its scale.