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DAREnet

D4.4 – Report of Topic Working Groups: Knowledge Base for Assessment and Roadmapping Cycle 2

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Abstract: This deliverable contains the findings from the DAREnet Topic Working Groups during the second DAREnet roadmapping cycle. These findings are based on the results from the 2nd Topic Working Group Workshop, which was held in Vienna in September 2019, combined with the results from a survey that was conducted before the workshop. The second cycle of the DAREnet road mapping process followed a scenario-based approach focussing on training aspects of diverse domains of flood management during the entire disaster management cycle.

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Dissemination Level
PU Public

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Glossary

Abbreviation / acronym	Description
3D	Three-Dimensional
4D	Four-Dimensional
APP	Application
ARC	Austrian Red Cross
CCC	Coordination, Command and Control
CMT	Community Management Tool
CP	Civil Protection
DNC	DAREnet National Contact
Dx.y	Deliverable x.y
EMS	Emergency Management Service
EUCPM	European Civil Protection Mechanism
FEMA	Federal Emergency Management Agency [United States]
GIS	Geographic Information System
ISO	International Standardisation Organisation
KB	Knowledge Base
PDF	Portable Document Format
PFA	Psychological First Aid
PFA-CE	Psychological First Aid in Complex Emergencies
PPDR	Public Protection and Disaster Relief
PPP	Public Private Partnership
PSS	Psychological Support Services
RDI	Research, Development, Innovation
SM	Social Media
SV	Spontaneous Volunteers
TWG	Topic Working Group

1 Executive Summary

The overall objective of the H2020 project DAREnet is to identify and analyse gaps and potentials for improvement with regard to flood and disaster management in the area of the Danube river basin. A key instrument to achieve this goal is a knowledge base (KB) that contains user expertise and know-how of actors of disaster management along the Danube. The deliverable D4.4 describes the current status of entries within the KB at the end of the second DAREnet roadmapping cycle.

The contents of the KB are based on the work of WP4 deriving relevant topics within the fields “Solutions from Research and RDI Projects”, “Solutions on the Market”, “Best Practices and Lessons Learnt” as well as “Flood History and Background Information”. In the second DAREnet roadmapping cycle, we decided to follow a new approach. Therefore, we defined four holistic RDI topics that are related to training aspects of diverse domains of flood management during the entire disaster management cycle. These topics are “Coordination, Command and Control”, “Alerting and Communication”, “Rescue Operations and Emergency measures” and “Logistics and Assistance”. The expertise within the TWG was collected through intensive research and with the help of the DAREnet National Contacts (DNC) through expert interviews with national actors of disaster management using a survey as well as during a workshop were those topics were intensively discussed. The collected data were subsequently reviewed and analysed under the aspects of “Relevance of the RDI Topic”, “Practitioner Needs”, “Available Solutions”, “Innovation Opportunities” and “Lessons Learnt”. Reports describing the related findings of each TWG are part of D4.4 as well.

2 Introduction

The mission of the DAREnet project is to support flood management practitioners across the EU Danube River basin and from different disciplines to deepen and broaden their research, development and innovation (RDI) related collaboration. Therefore, a multi-disciplinary community of practitioners, organisations operating in the field of civil protection, and stakeholders from policy, industry and research is being built up in order to establish a trans-national and interdisciplinary ecosystem to foster synergies, innovations and to ensure the continuity of the DAREnet innovation process after project end.

A main outcome of the project is the RDI Roadmap, which will be a direct result from the dialogue in the DAREnet Community and Network. The RDI Roadmap aims at shaping future research and innovation policies for the Danube region and the research programmes implementing them. Specifically, the Roadmap will foster innovation opportunities that:

- Match practitioner needs and gaps experienced in the daily practice of flood management,
- Significantly improve nowadays flood management and/or enable practitioners to cope with upcoming flood events (e.g. due to climate change),
- Comply with regional strategies for flood prevention and risk management,
- Create synergies with modules and facilities of the European Civil Protection Mechanism (EUCPM),
- Strengthen exchange and collaboration between practitioners beyond borders and different disciplines,
- Have a promising perspective for industrialisation and market-entry.

The RDI Roadmap is the result of an iterative process of identifying, assessing and prioritising potential innovations as well as mapping important RDI requirements and gaps.

DAREnet is divided into four roadmapping cycles and during each cycle, practitioners bring forward and discuss potential solutions for innovating flood management with respect to the specific RDI Topic of the Working Groups. The discussions are fed with information about innovative solutions from the industry, research and best practices. In the next step, the identified innovation opportunities are taken up by the Innovation Assessment (cf. WP5) to benchmark the relevance of each innovation for practitioners from a holistic perspective.

For the **2nd DAREnet Roadmapping Cycle** we decided to follow a new approach providing potential innovations within a demarcated area. Therefore, the second cycle followed a scenario-based approach focussing on training aspects of diverse domains of flood management during the entire disaster management cycle.

In the second cycle we defined the following RDI subgroups:

- Coordination, Command and Control,
- Alerting and Communication,
- Rescue Operations and Emergency measures,
- Logistics and Assistance.

In the present deliverable, we present the current status of entries within the KB at the end of the second DAREnet roadmapping cycle. Moreover, this deliverable contains reports of the final findings of the TWG from the selected RDI subtopics within the second roadmapping cycle.

The expertise within the TWG was collected through intensive research and with the help of the DAREnet National Contacts (DNC) through expert interviews with national actors of

disaster management using a survey (cf. questionnaire in ANNEX 1). These data were subsequently reviewed and analysed under the aspects of:

- Relevance of the RDI Topic,
- Practitioner Needs,
- Available Solutions,
- Innovation Opportunities and
- Lessons Learnt.

The results from these analyses are presented in detail within the present deliverable as well. A key role plays the subsection “Innovation Opportunities” from each TWG since these findings are direct input for the next process step of the roadmapping cycle “Innovation Assessment” (cf. WP5) where the relevance of each innovation opportunity is benchmarked for practitioners from a holistic perspective.

Deliverable D4.4 is structured as follows:

- **Section 1** “Executive Summary” provides a brief overview of the content of the document.
- **Section 2** “Introduction” describes the purpose and scope of the document, placing the results described in the document in the specific context of the project and explaining how they contribute to the objectives of DAREnet.
- **Section 3** “Current Status of the Knowledge Base” presents the current state of entries within the DAREnet KB at the end of the second roadmapping cycle.
- **Section 4** “Scenario-based Approach” explains the new approach of providing potential innovations that focus on training aspects of diverse domains of flood management within the second roadmapping cycle.
- **Section 5** “Reports from the Topic Working Groups” present the findings from each TWG related to the selected RDI Topics of the second roadmapping cycle.
- **Section 6** “Conclusion” completes the deliverable by summarizing the major outcomes and describes the further use of the results within the project, including contribution to other work packages.

3 Current Status of the Knowledge Base

After the first cycle of the DAREnet project, the status of the Knowledge Base war critically reviewed by the work package leader DLR. It was agreed in the consortium to restructure the entire DAREnet Knowledge Base to better support further in-depth analyses. The following figure shows the basic structure of the revised DAREnet Knowledge Base.

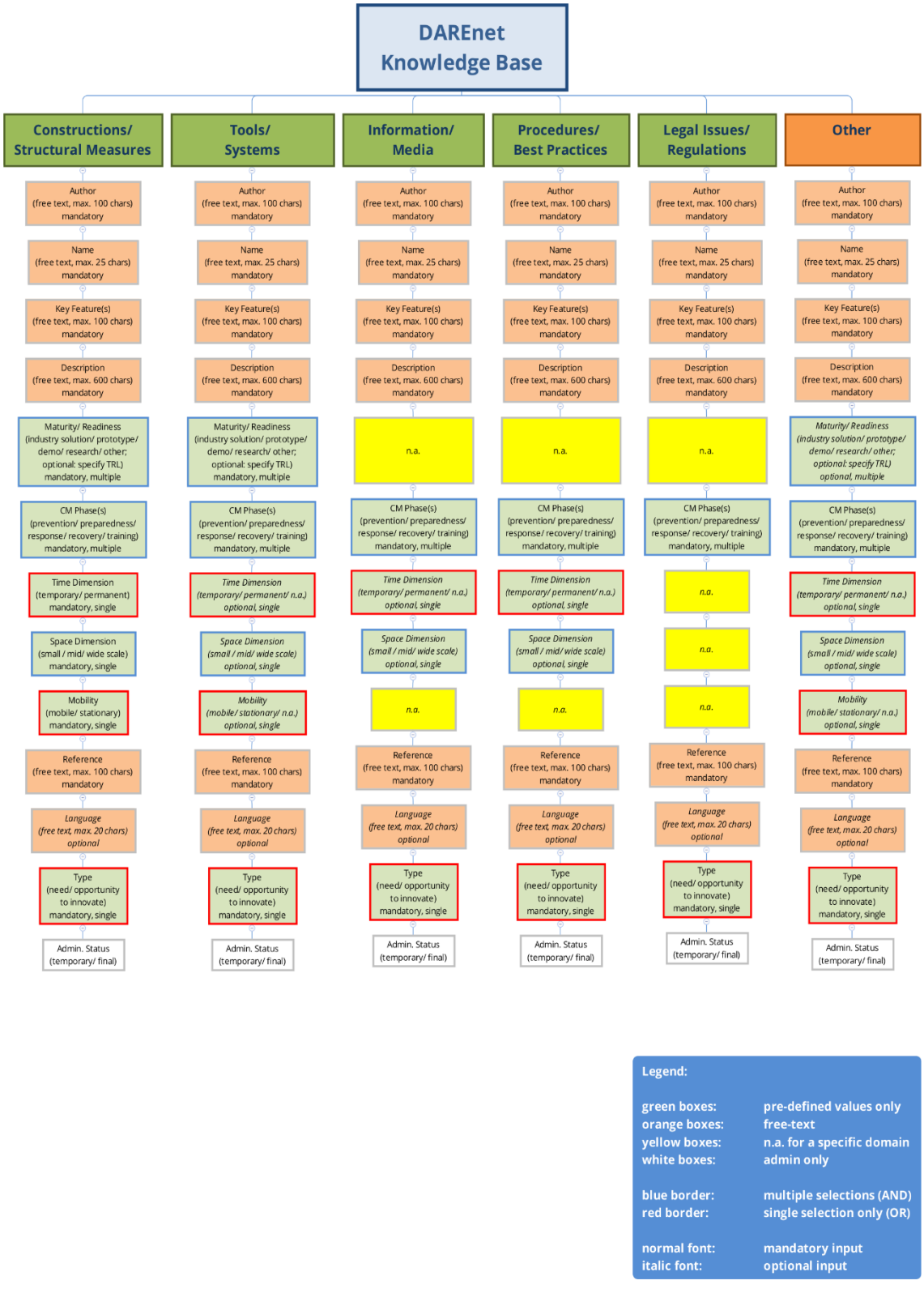


Figure 1: Revised DAREnet Knowledge Base for the 2nd Roadmapping cycle.

Due to its format and the greater degrees of freedom, the Knowledge Base that emerged from the first Roadmapping cycle did not support a structured in-depth analysis of the content properly. Therefore, the revised Knowledge Base largely consists of pre-defined boxes to ensure a maximum comparability of the entries. In addition, the time and space dimensions and, if applicable, the degree of maturity and mobility must be specified.

Another major deficiency was found in the sometimes insufficient level of aggregation of the content. Therefore, a limitation of the number of characters was introduced as well as a mandatory field indicating key features or other special characteristics.

Additionally, it was agreed on a peer-review-process initiated by the DLR as task leader. This process, together with clear guidelines concerning e.g. the length or the level of aggregation of the content, will guarantee uniformity and traceability as well as comparability of the individual entries. In this way, the Knowledge Base will better support the DAREnet Roadmapping process.

The authors of the original content were encouraged to rework their former input according to the guidelines defined. This process is still ongoing due to the large amount of data (some authors had delivered more than 180 entries to the old DAREnet Knowledge Base). By the end of M27 a total of 364 solutions were either reworked from the content of the former DAREnet Knowledge Base or were completely new entries. In addition, 89 further solutions were identified through research in the context of the second DAREnet Roadmapping cycle. These entries the Knowledge Types presented in the table below.

Table 1: Entries in Knowledge Base.

Knowledge Type	Amount of entries
Research and RDI Projects	149
Technologies and Solutions on the Market	153
Lessons Learnt and Best Practices	53
Flood History and other Background Information	9

Roughly 80 % of the entries represent solutions from ‘Research and RDI Projects’ and ‘Technologies and Solutions on the Market’. 15 % of the current content of the Knowledge Base deal with ‘Lessons Learnt and Best Practices’, whereas the share of ‘Flood History and other Background Information’ is below 5 % currently. As indicated in the analysis of the first cycle, these quantities are - with respect to the relatively small number of actual events in comparison to the severity of those events – not are poor or insufficient outcome.

4 Scenario-based Approach

The evaluation of the first DAREnet roadmapping cycle revealed challenges and shortcomings. The establishment of national networks throughout the countries of the Danube region was more time consuming than envisioned prior to DAREnet. Moreover, the selection of the challenges for the first cycle was rather broad and not equally distributed. Therefore, two aspects have been discussed in a very specific and detailed manner (Data Management and Communication), while discussions for other aspects remained on a more generic and broader level. For these reasons, the current 2nd cycle followed a different approach: To narrow down broad discussion in diverse fields of crisis management beforehand it was agreed in the consortium to exclusivity focus on *training aspects*. In order to help creating a common mental image, a realistic flooding scenario was developed that represents different levels of escalation in the crisis management cycle (ref. Figure 2). In this way, the scenario-based approach supports the entire process of gathering and evaluating practitioner needs and analysing gaps. Specifically, it helps to:

- focus on distinct actions and tasks only,
- address distinct groups of actors,
- ask specific questions,
- collect specific knowledge, and
- ultimately create a roadmap that truly reflects practitioner needs.

The scenario consists of a fictional setting with a complex fluvial flood situation developing over multiple stages (receiving flood, flooding, post-flooding situations). During this evolution, tasks as well as challenges are varying in its intensity of different groups of actors.

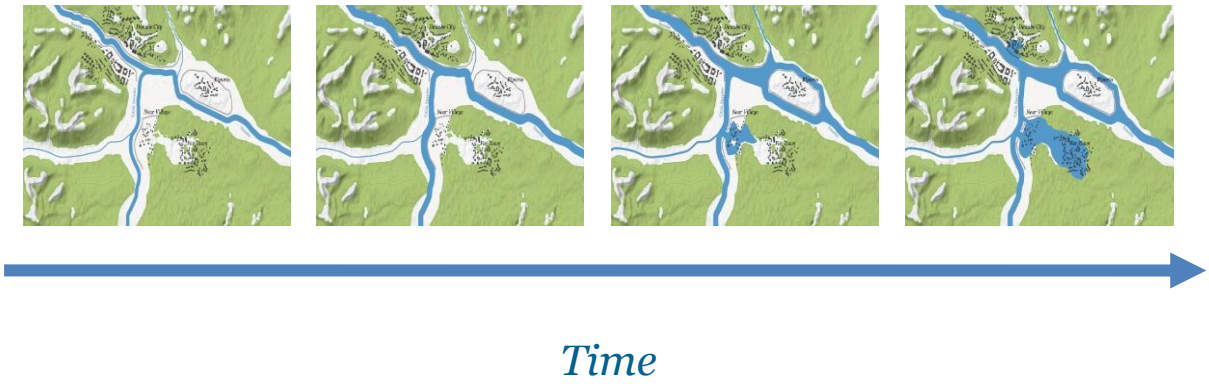


Figure 2 : Phases of escalation in the chosen scenario.

In the course of the discussion of the scenario, different activities should be separated and evaluated in isolation, as an integrated consideration of all related tasks often leads to very general observations that are well known and not really questioned by the community. For example, communication and exchange of information are always seen as a bottleneck. As the first cycle showed, there might be a tendency to devote considerable resources to a discussion of these aspects, while detailed analyses and discussions on other activities could be suppressed.

A better focus could also be influenced by the choice of participants, e.g. senior firefighter officers are usually closer to CCC than to the actual preparatory work and thus are more closely associated with these issues. In this approach, the DAREnet project tries to address these problems by separating tasks and focusing equally on each activity.

Error! Reference source not found. above is only providing a rough overview of the r ange of tasks and activities caused by flooding. It does not reflect all the necessary tasks assessed with this approach (cf. ANNEX 2). However, the scenario reflects the entire system "civil protection" with all its elements which could influence the success or failure of any task or activity the practitioners might be faced with. The main influencing factors are seen in:

- the scenario itself consisting of geographical, environmental, hydrological, etc. conditions;
- the involved actor and organisations, and
- external factors, medial pressure for example.

This resembles a complex system, consisting of multiple parts influencing each other. Any task within the scenario – e.g. Levee Defence – can be further subdivided (into) different elements: e.g.

- concepts,
- training, and
- equipment.

Additionally, related activities can be assigned to each of these tasks. **Error! Reference s ource not found.** symbolises this principle for the example of the "Involvement of Spontaneous Volunteers". This activity could be directly linked to "Levee Defence" measures.

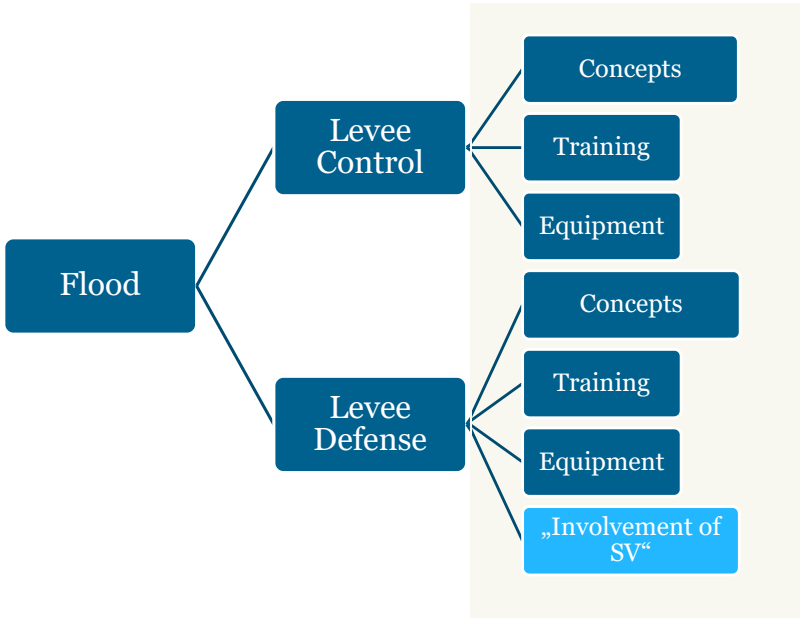


Figure 3: Example of activities and task in the scenario.

The scenario was introduced to practitioners and stakeholders from different countries in the Danube region during a webinar[1] held on 3 July 2019. In close connection to the scenario, a questionnaire was designed for gathering data and practitioners view towards innovation potentials towards training in specific sub-domains of crisis management (cf. ANNEX 1).

[1] Available via https://youtu.be/jTkzvXrR74g

5 Reports from the Topic Working Groups

For the second DAREnet Roadmapping Cycle we decided to follow a new approach providing potential innovations within a demarcated area. Therefore, the second cycle followed a scenario-based approach (cf. chapter 4) focussing on training aspects of diverse domains of flood management during the entire disaster management cycle.

In the second cycle we defined the following RDI subgroups (some broken down into further subtopics) with respect to the training aspect:

- Coordination, Command and Control;
- Alerting and Communication:
  - Alert Concept,
  - Early Warning,
  - Social Media handling,
  - Integration of spontaneous volunteers,
  - Preparation of the public (citizens);
- Rescue Operations and Emergency measures:
  - Air rescue,
  - Water rescue,
  - Boat operations,
  - Flood Protection Measures (Preinstalled protective measures),
  - Levee Control,
  - Levee Defence,
  - Evacuation,
  - Pumping operations,
  - Removal of flotsam / log jams,
  - Hygienic measures;
- Logistics and Assistance:
  - Supplying,
  - Sheltering,
  - Stocking/Warehousing,
  - Supply/restoring infrastructure,
  - Psychological support,
  - Social care,
  - Securing evacuated areas.

The expertise within the TWG was collected through intensive source research, expert interviews at the 2nd TWG Workshop in Vienna from September 24th to 25th and with the help of the DAREnet National Contacts (DNC) using a survey (cf. questionnaire in ANNEX 1). Afterwards, these data were subsequently reviewed and analysed under the aspects of:

- Related challenges,
- Training Measures pointing to innovation opportunities,
- Relevance of the RDI Topic according to the following ranking schema:

A	high innovation potential
B	medium innovation potential since promising (national) solutions already exist
C	low innovation potential as it was not seen as relevant task by the practitioners

In the following chapter, the results from these analyses are presented in detail. One should keep in mind that the findings from the survey are outcomes derived from a sample. Thus, the survey responses just indicate a trend, but do not represent robust results.

5.1 TWG "Coordination, Command and Control"

5.1.1 Relevance of RDI Topic

In the event of an emergency or serious incident, it is necessary to set up a dedicated command structure. The command and control structures in disaster management are based on strategic, tactical and operational commands. The principles of command and control are scalable and can be applied at different levels from the national to the local level and in a multi-agency environment. In detail, "coordination" refers to the bringing of forces and other resources to ensure effective response to and recovery from emergencies. "Command" is related to the internal direction of personnel and resources of an agency, operating vertically within the agency. "Control", finally, is the overall direction of response activities in an emergency, operating horizontally across agencies.

With respect to the specific flooding scenario (cf. chapter 4) this topic sums up general Coordination, Command and Control (CCC) questions once it is known that the respective area will or might be hit by a disaster. In the scenario a significant flood is impacting an extend area and will challenge the exchange of information, situational awareness and cooperation of different CCC structures, as well as an efficient resource management.

5.1.2 Practitioner Needs

The following table summarizes the results from the conducted survey as well as the outcomes from the 2nd RDI Workshop in Vienna where practitioners from different fields discussed several challenges within the defined domains. The third column indicates practitioner needs, which represent a first impression on potential innovation opportunities with respect to the training aspect. The ranking given in the fourth column is an indicator for the importance of each topic derived from the practitioner discussions at the 2nd RDI Workshop in Vienna. Thus, this ranking is not statistically reliable. Matching the practitioner needs with available solutions from research and RDI projects (cf. 4.1.3.1), products and solutions on the market (cf. 4.1.3.2), best practices and lessons learnt by practitioners (cf. 4.1.3.3) as well as experiences from flood history, external factors, risk management and prevention (cf. 4.1.3.4) will result in the actual innovation opportunities (cf. 4.1.4). These innovation opportunities will be the input for the RDI assessment and roadmapping done in WP5, which will generate the foundation for the 2nd DARENet RDI roadmap.

Domain	**Challenges**	**Practitioner Needs with respect to 'Training'**	**Ranking**
CCC	Lack of realistic tasks in exercises for professional DM	More efficient training by **realistic, yet unpredictable scenarios**, **"professional" role player** (at any stage, victims, stakeholders, political actors)	A
	Lot of information loss in large exercises	Discussion-based exercises to limit information loss	
	Table-top exercises are not sufficient in terms of realistic training situation	Training must be improved in terms of realistic situations	A
	Encouragement to coordinate amongst themselves for NGOs → targeting operational level	Training for NGOs should be improved; preparation of key personnel	A
	Command protocols and their integration in DM	No discussion	

	Preparation and implementation of public private partnership (PPP) in disaster management plans	No discussion	
	Responsibility: No capability for autarky for more than 48 hours	No discussion	

Results from Questionnaire:

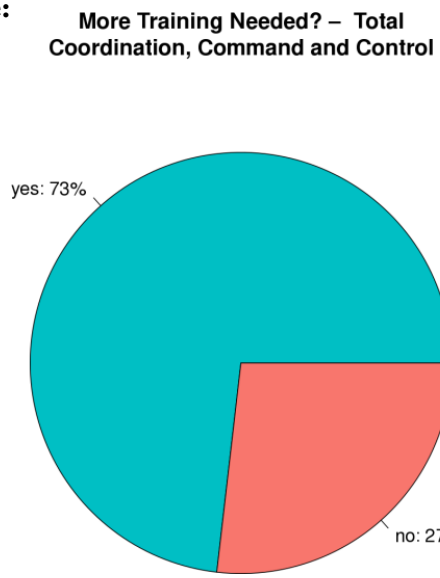


Figure 4: High percentage (3/4) of requests for more training needed.

Figure 5: High demand for more training for untrained and trained personnel (left), peak for tactical command level (right).			
(technical and organizational) Interoperability	Inter-organizational cooperation + interfaces of systems (different systems for professional and volunteers)	Joint trainings	A
	Communication: All services communicate on their selves, specialists need for inter-organizational communication	Training in interagency communication (also cross-border)	A
	Lack of interoperability, standards, open interfaces	No discussion	
Decision making	Lack of or retarded (slow) political decisions	No discussion	
	how to present to decision makers (data security, interfaces)	No discussion	
	Decision processes → lot of negotiations needed	No discussion	
Involvement of public	Interactivity between DM and population: data collections via social media, warning with geo-fenced calls → technical and organizational barriers	No discussion	
Data / information management	Lacking current information about "troops"/ capacities and their competencies/ knowledge/ skills/ training	No discussion	
	Monitoring: not fast/ wide enough; plans are not monitored	No discussion	
	Social media, rumours, fake news and information	See SM	
	Evaluations on interagency level, international level, EU-level missing, no political will for establishing joint knowledge data base	No discussion	
	No overview which data are collected by whom and how to aggregate data	No discussion	
Innovation management	knowledge about existing innovations	No discussion	
Volunteers	Lack of volunteers / no "culture" of volunteering	No discussion	
	no training, no knowledge about skills, competencies; extra effort for volunteer needed	No discussion	
	Coordinating spontaneous, un-educated persons	No discussion	
(psychological) support	Supply for responders	No discussion	

5.1.3 Available Solutions

Review on available solutions was made for the following practitioner needs as these were higher ranked by the practitioners:

1. Training on **unrevealed scenarios** with „professional" role players.
2. Training improved in terms of **realistic situations** (not table-top exercises).
3. Training improved for **key personnel of NGO's**.
4. **(technical and organizational) Interoperability** (inter-agency communication and cooperation; interoperability of systems)
   - Joint training,
   - Training in interagency communication (also cross-border).

5.1.3.1 Solutions from Research and RDI Projects

Practitioner Need	Existing Solution	Location	Short description	Link
Realistic training	**PANDORA - Advanced Training Environment for Crisis Scenarios**	Europe	PANDORA will bridge the gap between table-top exercises and real-world simulation exercises, providing a near-real training environment at affordable cost. In a real-time, physics-based environment, PANDORA authentically simulates all the dynamic elements of the entire disaster environment. PANDORA will emulate a complete crisis room: realistic 3D visuals and audio create a truly immersive, chaotic and stressful environment. PANDORA realistically responds to actions taken to enable real individual training value and the development of complete skill sets. Pandora will train at all levels of response, from management and control to all the on-scene activities for emergency organizations. Furthermore, different crisis room will be able to interact, thus recreating a near-real interconnected cross-borders environment. Outcomes: The Pandora project has developed - A fully functional augmented reality system (and a prototype 3D virtual system) training environment, to provide realistic, affective training, with high levels of realism, to provide more effective training scenarios and public outcomes. - The PANDORA system "Pandora Advanced Training Environment" (PATE), was designed to bridge the existing training styles. The training takes place in a crisis training	Link Link[2]

[2] Official website is not maintained anylonger

			room realised through a software client that can be downloaded and installed locally. A prototype system using a 3D virtual room, delivered via a web browser, in which trainees are represented using avatars has also been partially implemented. - Trainees would normally interact using separate workstations all in the same room, and only occasionally meet face to face. A portable mode is also possible, as is another where all participants are geographically dispersed. - Apart from illustrating real-life contingencies, PATE is also designed to stress the trainees emotionally through its realism and various crisis elements (such as garbled communications). PATE was tested over a three-day period at the United Kingdom's Emergency Planning College, a government site in York. The trials involved an immersive simulated crisis, and 13 gold-level commanders of varying levels of experience. Participant feedback was positive, all saying that the training was exceptionally realistic. Trainers and trainees enthused about the system being made available to them for practical use.	
	ASSISTANCE – Adapted Situation Tools and Tailored Training Scenarios for Increasing Capabilities and Enhancing the Protection of First Responders	Europe	The main purpose of ASSISTANCE project is twofold: On the one hand to help and protect different kind of first responders' (FR) organizations that work together taking into account the type of disaster/crisis they are mitigating in each moment and on the other hand, to enhance their capabilities for facing complex situations providing them advanced training based on Virtual Reality (VR), Mixed Reality (MR) and Augmented Reality (AR), tailored to their real needs depending on the type of incident.	Link Link
	INDIGO - Innovative Training & Decision Support for Emergency operations	Europe	The INDIGO project aims to research, develop and validate an innovative system integrating the latest advances in Virtual Reality, Simulation and Artificial Intelligence in order to homogenise and enhance both the operational preparedness and the management of an actual complex crisis. It will enable: * the 3D interactive and realistic visualisation of the complete crisis environment, including data coming from	Link Link

			the field, simulation results, and building interiors. * the simulation of different evolving scenarios for planning, training, and anticipating future states and impending developments during operations, and analyse events after the crisis. * the simultaneous training of decision makers, crisis managers as well as first responders and emergency field units that will be influenced by the simulated scenario and that will reciprocally influence its evolution. * the simultaneous involvement of multiple participants, thanks to its distributed architecture, while offering a unique pictorial way of sharing and communicating complex knowledge across organisation boundaries. Outcomes: - A crisis training and crisis management system has been developed that enables public authorities to better plan and train organisations and crisis managers for emergency situations. - The system can provide 3D interactive visualisation of the disaster scene, including information from the field, simulation results and the interiors of buildings. - The system also enables different scenarios to be created for planning, training and anticipating future conditions and impending developments during the operation. It can also be used for conducting post-event analysis. Furthermore, INDIGO allows the simultaneous training of decision makers, crisis managers and first responders using simulated scenarios to communicate and share complex information between different organisations. - The INDIGO system offers an essential and integrated tool for training personnel, planning operations, and facilitating crisis management and co-operation across organisations and nations.	
	Project "REPKA: Regional evacuation – planning, control and adaptation"	Germany	One of the main rescue measures taken in an attack, threat of an attack, major accident or natural disaster is evacuation of the buildings, areas and regions affected. The primary objective is to	Link[3]

[3] Only available in German

			evacuate people as quickly and as reliably as possible, i.e. to remove them from danger and get them to safety. This research project concentrated on regional evacuation in a scenario in which a large group of people had left a building and had to be moved to safety. The project included virtual evacuation exercises in the form of simulation games. In the project's solution, people are located using existing (private) wireless networks (including secured ones). Their devices can be used as individual guidance systems to help them escape.	
	Project "VoTeKK: Preparation for terrorist attacks, crises and disasters"	Germany	The goal of this project was to prepare the German healthcare system for disasters, crises and terrorist attacks. The intention was to perform continuous quality management on existing solutions and identify weak points. The project also sought to set up a disaster medicine online academy and other e-learning platforms. Outcomes: • Development of an E-Learning-Platform (+ simulation-based and VR-based means) for more efficient training. • Differentiation between necessary knowledge at different command levels --> content reduction/ adaptation necessary • Training material: filming of e.g. lectures for knowledge transfer / training in e-learning with restriction of teaching content to approx. 10 - 15 minutes, direct visual contact to the addressed audience, change of perspective (e.g. between "totals", "portrait", "presentation area"), and provision of "smartphone-compatible" content	Link[4]
Unrevealed scenarios			No solutions identified	
Training for key personnel of NGO's	**Training Curriculum**	Europe	**Project "DITAC - Disaster Training Curriculum"** The DITAC project aims to develop a holistic and highly structured curriculum for first responders and strategic crisis managers that are tasked in dealing with disasters on a national and international scale. The curriculum tackles dynamic challenges facing disaster incident managers in order to enhance the efficiency, efficacy, coordination,	Link Link[5]

[4] Only available in German

[5] Official website is not maintained any longer

			coherence and appropriateness of their response efforts. The curriculum aims to establish a standard practice among European disaster and crisis managers in order to pool resources and expertise by cultivating a network of dedicated professionals. Educational integration of crisis managers from national, regional and international authorities, NGO's and existing training institutions from around the world shall lead to a more concerted effort in disaster response.	
			Project "CAST – Comparative Assessment of Security-Centered Training Curricula for First Responders on Disaster Management in the EU" Security-centered training course curricula on disaster management for first responders (FR)* in EU member states will be comparatively assessed with a specially developed matrix-based software: (1) for all EU member states (2) as derived from international best practices in the US, Russia, and Israel as countries with extensive experience in this field. The comparative assessment will cover: (a) Didactic areas (electronic and hardcopy teaching materials used, computer modelling, field exercises); (b) Subject areas (terror threats to FR; risk assessment and -management; catastrophic terrorism; weapons of mass destruction, -mass killing, -mass disturbance; synchronization of response staff; (c) comparative evaluation of training course curricula by virtual reality safety training with biofeedback. Representatives of FR organisations and SME's in security technology will be involved throughout the assessment. This new integrative approach reflects the necessity of the integrative operation of end-users and representatives of the research and development community to enhance European joint security capabilities. The results of the assessment will be used to: (1) Establish an EU- security curricula database; (2) Identify potentially existing gaps in the EU training curricula; (3) Recommend an Action Plan for eliminating training deficiencies; (4) Develop a standardized security-centered training curriculum for first responders on disaster management; (5) Enhance the implementation of technology-based security programs into FR organisations. Outcomes:	Link Link

			- Virtual Reality Security Training System (VRST), with biofeedback, permitting the simulation of even extreme threat situations, such as catastrophic terrorism with WMD deployment. - A standardised curriculum for training of first responders for disaster management, reflecting the assessment of organisational and institutional framework as well as the demands resulting from the assessment of threats, and implementing best-practice strategies and technologies.	
	European Resilience Management Guidelines (ERMG)	Europe	**Project "Smart Mature Resilience (SMR)"** will develop and validate Resilience Management Guidelines, using three pilot projects covering different CI security sectors, as well as climate change and social dynamics. The Resilience Management Guidelines will provide a robust shield against man-made and natural hazards, enabling society to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of essential structures and functions. A set of tools operationalize crucial interdependent supporting structures of the Resilience Management Guidelines: 1) a Resilience Maturity Model defining the trajectory of an entity through measurable resilience levels; 2) a Systemic Risk Assessment Questionnaire that, beyond assessing the entity's risk, determines its resilience maturity level; 3) a portfolio of Resilience Building Policies that enable the entity's progression towards higher maturity levels; 4) a System Dynamics Model allowing to diagnose, monitor and explore the entity's resilience trajectory as determined by resilience building policies, and, 5) a Resilience Engagement and Communication Tool to integrate the wider public in community resilience, including public-private cooperation.	Link Link
			Project "RESILENS: Realising European ReSiliencE for CritIcaL INfraStructure" Moving resilience from a conceptual understanding to applied, operational measures that integrate best practice from the related realm of risk management and vulnerability assessment is the focus of the RESILENS project.	Link Link

			RESILENS (Realising European Re-SILiencE for CritIcaL INfraStructure) will develop a European Resilience Management Guideline (ERMG) to support the practical application of resilience to all CI sectors. Accompanying the ERMG will be a Resilience Management Matrix and Audit Toolkit which will enable a resilience score to be attached to an individual CI, organisation (e.g. CI provider) and at different spatial scales (urban, regional, national and transboundary) which can then be iteratively used to direct users to resilience measures that will increase their benchmarked future score. Other resilience methods including substitution processes and measures to tackle cascading effects will also be developed. The ERMG and resilience management methods will be tested and validated through stakeholder engagement, table-top exercises and three large-scale pilots (transport CI, electricity CI and water CI). The ERMG and accompanying resilience methods will be hosted on an interactive web-based platform, the RESILENS Decision Support Platform (RES-DSP). The RES-DSP will also host an e-learning hub that will provide further guidance and training on CI resilience.	
			Project "DARWIN - Expecting the unexpected and know how to respond" DARWIN will improve response to expected and unexpected crises affecting critical infrastructures and social structures. It addresses the management of both man-made events (e.g. cyber-attacks) and natural events (e.g. earthquakes). The main objective is the development of European resilience management guidelines. These will improve the ability of stakeholders to anticipate, monitor, respond, adapt, learn and evolve, to operate efficiently in the face of crises. Guidelines will be presented in formats for easy usage and maintenance to avoid them being dust-collectors on a shelf. To enable dynamic, user-friendly guidelines the project will adapt innovative tools (e.g. serious gaming, training packages), test and validate the guidelines, and establish knowledge about how organisations can implement guidelines to improve resilience.	Link Link

			To teach players about resilience concepts, DARWIN developed a serious game based on virtual reality.	
	Project "TEAMWORK: Crisis simulation for collaboration between emergency services and the public"	Germany	The River Elbe and River Saale floods are examples of complex crises in which a wide variety of emergency services worked together. Around 1.7 million helpers volunteered during the most recent extreme flooding, underlining the special role played by the public in these situations. The TEAMWORK project was looking to develop a software-based training system for disaster management personnel and volunteer helpers. It would then be made available to emergency services and volunteers so that they can practice working together to respond to unfamiliar crises. Outcomes: • Development of a software-based training system (serious gaming) for disaster management with spontaneous volunteers -> (collaborative) scenario editor	Link[6] Link[7]
Interoperability (technical and organizational), Training in interagency communication (also cross-border)	**IMPROVER - Improved risk evaluation and implementation of resilience concepts to critical infrastructure**	Europe	The overall objective of IMPROVER is to improve European critical infrastructure resilience to crises and disasters through the implementation of combinations of societal, organisational and technological resilience concepts to real life examples of pan-European significance, including cross-border examples. This implementation will be enabled through the development of a methodology based on risk evaluation techniques and informed by a review of the positive impact of different resilience concepts on critical infrastructures. The methodology will be cross sectoral and will provide much needed input to standardisation of security of infrastructure. Outcomes: IMPROVER's cooperation with the European Reference Network for CI Protection has yielded a series of CI operator workshops on CI resilience to ensure that practitioners both inform and benefit from the project's work.	Link Link
	EPISECC - a Collaborative Project which will Establish a Pan-European Information Space to Enhance	Europe	The project EPISECC is aiming at developing a concept of a common "European Information Space". This information space is dedicated to becoming the key element in a future integrated pan-European crisis and disaster	Link

[6] Only available in German

[7] Only available in German

	seCurity of Citizens		response capacity. Besides the development of a common Taxonomy and an ontology model, aimed at addressing the Semantic Interoperability issue, EPISECC will focus on the establishment of Interoperability at Physical (i.e. network) and Syntactical (i.e. automated information exchange) levels. One of the main purposes of the EPISECC approach, is to allow analysis of interoperability at all levels.	
	Project "LAGE: Integration of existing information systems for joint crisis management"	Germany	The overarching goal of this project was to bring about a collective understanding of the events, structures and processes in operations by means of report data mediation. To this end, an information pool and integrated processes were used, taking into account all connected systems, to generate an overall situation report to facilitate a networked operation command structure. The scenario was an accident/attack at a city-centre major event (World Cup or Love Parade, for example) with huge numbers of injured persons and particularly included Dortmund Central Station. The aim was to draw up a comprehensive strategy to ensure organisational, semantic and technical interoperability between the emergency services.	Link[8]
	Project "PRIKATS: Priority setting for rescue measures"	Germany	The research project focused on two main areas. In terms of government and organisation, it analysed the cooperation between and coordination and control of the various authorities and organisations at the national, federal state and local level in the event of major incidents involving more than one federal state. This research pinpointed weaknesses, revealed and took on board the experiences, standpoints and priorities of the various stakeholders and developed options for solutions. In terms of legal issues, the project's work was aimed at reviewing the different legal standards and any potential conflicts with principles and provisions of constitutional law and procedures. In particular, this part of the project asked which procedures and standards should serve as the basis for setting and implementing priorities with regard to rescue measures to be taken.	Link[9]
Interoperability (technical and			No solutions identified	

[8] Only available in German

[9] Only available in German

organiza-tional), Joint trainings				

5.1.3.2 Solutions on the Market

Practitioner Need	Existing Solution	Location	Short description	Link
Realistic training	**HumLog Suite**	Europe	**HumLog Suite** is a performance assessment platform that serves logistic processes in crisis management. It can operate on both current operational logistics network and fictional (planned) network configurations.	Link
	SIM-CI	Europe	**SIM-CI** provides a clear overview of what critical infrastructures (electricity, gas, water, telecom, internet, road, traffic networks) will be affected in the case of a disruptive event such as a flooding or a cyber-attack.	Link
	Scenario building tool	Europe	**Scenario building tool** – a dynamic tool regarding multiple hazard scenarios simulation for the training civil protection actors. Tool was developed in the frame of the H2020 IN-PREP project.	Link
	SE-Star: THALES Crowd Simulation	Europe	**SE-Star: THALES Crowd Simulation** is a life simulator managing: internal variables, motivations & emotions, stimuli, personality and behaviours.	Link
	Preparedness for Decision Making in Crisis	Europe	**Preparedness for Decision Making in Crisis** – a software platform that enables creating and running all kinds of simulation applications and can be used as an interactive decision-making game, as well as a for multi-variant analysis.	Link
	PROCeed Laboratory	Europe	**PROCeed Laboratory** supports decision makers in choosing the best solutions by simulating the consequences of decisions and events that are based on predefined cause-effect rules.	Link
Unrevealed scenarios			No solutions identified	
Training for key personnel of NGO's	**Journal Article: Flood Hazard Prevention Appraisal in Europe: Training Key Stakeholders on the Benefits and Costs of Efficient Protection and Response**		Fatima Navas, Gonzalo Malvárez, Edmund Penning-Rowsell, and Dennis J. Parker "Flood Hazard Prevention Appraisal in Europe: Training Key Stakeholders on the Benefits and Costs of Efficient Protection and Response," Journal of Coastal Research 85(sp1), 1546-1550, (1 May 2018). https://doi.org/10.2112/SI85-310.1	Link

Interoperability (technical and organizational), Joint training	**IO-DA**	Europe	**IO-DA** – enables a user to input responsibilities and tasks of different agencies and applying different strategies to automatically deduce collaborative process models.	Link
	INTERREG: Danube Transnational Programme, JOINTISZA	Europe	**Project JOINTISZA** – Strengthening Cooperation between River Basin Management Planning and Flood Risk Prevention to Enhance the Status of Waters of the Tisza River Basin.	Link
Interoperability (technical and organizational), Training in interagency communication (also cross-border)			No solutions identified	

5.1.3.3 Best Practice and Lessons Learnt by Practitioners

Practitioner Need	Existing Solution	Location	Short description	Link
Realistic training	**Full scale Exercise ,"Cascadia Rising", 2016 (one of the largest in the USA and the World)**	USA	*This push for more realistic exercises is echoed by University of Washington professor Hans Scholl, who looked at the Cascadia Rising 2016 Exercise that was one of the largest ever held in the United States:* *„Currently in a lot of cases we are doing just training exercises that we estimate we can handle. This old-fashioned training strategy needs to be changed by stressing the systems and use methods that will limit our ability to respond to the unusual conditions - we'll better prepare for realistic situations."*	Link
	Serious games for disaster management	Norway	A recent game, which is developed by a Norwegian team, developed a serious game as an alternative to table-top exercises. The game scenario is based on the extreme weather event Synne happened in the west coast of Norway in 2015. The game is designed for a single player, while the mechanics are framed in such way that the player should deal with limited resources, and elevated event pressure over time to manage. *„The advantages of gaming approach are numerous. It is a less costly alternative for training activities that can complement field training or alternative to the table-top exercise and allow intended trainees (e.g. emergency*	

			management personnel and decision makers) to train more often than they otherwise would be able to do in field-based exercises." Well-made training games can replicate conditions in various scenarios; allow organizations to record the exercises and logging the actions for later review, debriefing or repetition. **Article:** Radianti J., Tronslien M.N., Moland M.E., Kulmus C.A., Thomassen K.K. (2017) A Crisis Management Serious Game for Responding Extreme Weather Event. In: Dokas I., Bellamine-Ben Saoud N., Dugdale J., Díaz P. (eds) Information Systems for Crisis Response and Management in Mediterranean Countries. ISCRAM-med 2017. Lecture Notes in Business Information Processing, vol 301. Springer, Cham	
		Europe	Some studies consider serious games as complementary learning tools for disaster management, especially helpful in acquiring soft skills (ex.: communication, team management etc.). There are already many serious games available for different scenarios (ex.: hazmat incident, terrorist attacks a.s.o.). See more: **Article:** I. Di Loreto, S. Mora and M. Divitini, "Collaborative Serious Games for Crisis Management: An Overview," 2012 IEEE 21st International Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises, Hammamet, 2012, pp. 352-357. doi: 10.1109/WETICE.2012.25.	
Unrevealed scenarios	**Unpredictable scenarios in emergency exercises**	Norway	The study evaluates how learning objectives are fulfilled during 3 full scale exercises based on a scenario of onshore hydrocarbon pipeline leaks. *„Repeating (practically) the same scenario, with (practically) the same participants after some of the identified lessons have been assimilated (learned), as in the studied series, is recognized to motivate participant organizations by providing evidence of learning" [p.9]* **Article**: Metallinou, Maria-Monika. (2017). Single- and double-loop organizational learning through a series of pipeline emergency exercises. Journal of Contingencies and Crisis Management. 26. 10.1111/1468-5973.12214.	
Training for key personnel of NGO's	**CIPROVOT - CIVIL**	Europe	CIPROVOT is an Erasmus+ project aiming at developing an online training course developing knowledge and skills on the Integrated Disaster	Link

	PROTECTION VOLUNTEERS TRAINING		Management Systems (IDMS) among Civil Protection volunteer organisations (including NGOs). Starting from late October 2019, the CiProVoT online platform on Emergency planning and Disaster Risk Reduction is being available in English, Italian, Greek and Portuguese. Also one of the project outputs is a DESIGN OF METHODOLOGY FOR FORMAL AND INFORMAL CIVIL PROTECTION VOLUNTEERS AND ASSESSMENT CRITERIA, available at https://ciprovot-project.eu/media/ciprovot-io2-en.pdf.	
Interoperability (technical and organizational), Joint Training	**THE EUROPEAN COMMUNITY CIVIL PROTECTION MECHANISM TRAINING PROGRAMME** (Module field exercise organised under the supervision of the European Commission)	Europe	*Civil protection exercises: contributing to enhancing collaboration in disaster preparedness across borders, providing opportunity for testing specific response capacities, as well as the self-sufficiency, interoperability, coordination and common procedures of response teams and equipment.* *The training programme is an essential part of the Community Mechanism. It is crucial in preparing experts for international civil protection assistance interventions inside, as well as outside the European Union. It also provides an excellent platform for experience-sharing and networking between national experts from participating countries. The programme involves training courses, joint simulation exercises and an exchange programme, where experts can learn first-hand about similar responsibilities under different national systems.* *https://www.igsu.ro/documente/SAEARI/Training_brochure.pdf*	Link
	EXCHANGE OF EXPERTS		Another approach to facilitate inter-organizational cooperation is the **EXCHANGE OF EXPERTS**. For example such exchange opportunities are offered by the Union Civil Protection Mechanism.	
	Study: From Discussions to Games: Facilitating Interactions Between Experts from Aviation and Humanitarian Aid		It is important to facilitate discussions between different organisations implicated in disaster management to ensure the identification of „problem areas". The authors of the study propose a tree step approach: (1) discussion rounds with experts, (2) gaming-related method and (3) simulation game in order to identify crosscutting issues as an indicator of a mutual understanding. The game helped to illustrate the interdependencies between the	

			various elements within and between their lines of work. In addition to the two complex systems benefitting from an improved awareness and understanding of each other, the game session also provided valuable insights for research. **Article:** Freese M., Meesters K., Van de Walle B. (2019) From Discussions to Games: Facilitating Interactions Between Experts from Aviation and Humanitarian Aid. In: Hamada R. et al. (eds) Neo-Simulation and Gaming Toward Active Learning. Translational Systems Sciences, vol 18. Springer, Singapore	
Interoperability (technical and organizational), Training in interagency communication (also cross-border)	**Flood Awareness and Prevention Policy in border areas: Joint approach to cross-border flood management. Practical solutions to improve cooperation in border regions**	Europe	East Flanders (Belgium) Provincial Safety Cell involves representative from Zeeland (Netherlands) The East Flanders Provincial Safety Cell (the coordination centre of the Governor) in Belgium organises monthly formal meetings to discuss current issues in the field of public safety and contingency planning. As well as the Belgian partners, a representative of the adjoining Dutch province of Zeeland also participates in these meetings. The East Flanders Provincial Safety Cell also operates when there are major incidents and disasters. The Zeeland representative will be alarmed and called to the meeting if cross-border issues arise or cross-border communication is needed. If there are emergency situations in Zeeland with cross-border effects, the representative starts the contacts with East Flanders immediately. As well as the contacts in the Safety Cell, the chairman of the Safety Cell and the Zeeland representative cooperate in a number of cross-border and European projects. They have each other's mobile phone numbers and contact each other weekly. Both East Flanders and Zeeland organise introductory internships for operational officers of the emergency services on both side of the border. This is a good example of how knowing each other in advance is a big advantage for working together in a crisis.	Link

5.1.3.4 Experiences from Flood History, External Factors, Risk Management and Prevention

Practitioner Need	Experiences from Flood History, External Factors, Risk Management and Prevention
Realistic training	Training for official responders and other stakeholders should include dissemination and communication of knowledge with respect to the potential for disasters. Methods and materials should be based on the preliminary data of the risk assessments. Both on-the-job learning and training refresher courses may be appropriate to update skills when there is a gap in time between the training and the opportunity to apply the training content. Exercises exist in a wide variety, ranging from table-top scenarios to full-scale disaster simulations, offering participants different learning experiences. However, these exercises can be overwhelming to newcomers, especially when involving large scale simulations, reducing the effectiveness of the learning experience. In order to make the learning experiences more effective to newcomers, researchers or professionals, a new exercise is proposed. This exercise, designed as a serious game, provides a new way to introduce people to the field of disaster management in general and information management in particular. Training content must highlight the importance of external experts listening to and empowering the local community to take charge of the recovery process. Therefore, wide consultation is indicated for any intervention or training program privileging the local perspective and adopting a strengths approach. How do we best use the community's resilience? Training content needs to highlight the critical importance of supporting existing social support frameworks—families, neighbourhoods, social groups, schools, workplaces, and gathering places.
Unrevealed scenarios	We must learn how to design and carry through exercises should become a professional occupation. There are many kinds of exercises. In hospitals one very useful method is to divide the plan into subsections, and to exercise various portions separately. Films, videos and computers all have their uses. Without the exercises, we might not even have realized the deficiencies in the routines, nor been able to demonstrate the practicality of the changes. Some more economical yet effective method must be used. The method which it has been using in the past of couple of years is the 'Talk-through' exercise. Talk-through exercises were designed for those who carry responsibility, those who have to make decisions, it is unlikely that they will be let down by the ordinary rank and file. Successful exercises can enhance perceptions of teamwork, training adequacy, response network effectiveness, job risk, and equipment adequacy. The link between exercise participation and perception of planning adequacy was found to be equivocal. In general, there are five principal benefits attributed to disaster exercises. First, they permit inferential testing of the adequacy of a disaster plan. That is, since an exercise represents an event response designed using premises and resources described in a plan, the extent to which the exercise is successful demonstrates the efficacy of the plan. Second, exercises allow ± again by inference ± testing of the adequacy of training of personnel. Exercises involve incident scenarios that are intended to replicate the demands on knowledge, skills and abilities posed by real events, and which an effective training program should create. To the extent that exercise performance uncovers gaps in participant knowledge, skills and abilities, the relevant training programs can be deemed to require revision. Third, exercises may be publicized in the community consequently enhancing the visibility of the agencies involved (demonstrating their readiness and possibly increasing their public credibility), and similarly reassuring the public that emergency authorities are aware of dangers and prepared to take measures to reduce negative impacts. Fourth, exercises provide hands on checks of communication systems, equipment, and other materiel. Finally, a well-designed exercise tests the viability of the emergency response network relative to the threat exercised.

	Some emergency managers argue that exercises serve as an opportunity to ``validate'' training and planning. Thus, developing an exercise involves a variety of milestones designed to create or simulate an event or incident that approximates the threat addressed in the planning and training phases. A critical initial milestone is to set the objectives for the exercise. These may be broad or narrow, depending on the scope of testing that is desired. Thus, in exercising a flood evacuation plan, one might devise an exercise built solely around testing the warning phase activity. Consequently, such an exercise might involve tasks associated with: (1) evaluation of threat data by local emergency managers; (2) the decision that evacuation was required in one or more geographic areas; (3) the construction of a warning message; and (4) the notification and mobilization of the agencies involved in disseminating the message to the public. Assuming that the exercise is successful, these effects can be stated as a series of expectations: • exercise participants should perceive higher levels of teamwork; • exercise participants should perceive higher levels of response network effectiveness; • exercise participants should perceive higher levels of training adequacy; • exercise participants should perceive higher levels of planning adequacy; • exercise participants should perceive higher levels of equipment adequacy; • exercise participants should perceive lower levels of job risk. Training professional and volunteer workforces prior to or after a disaster places many demands on training coordinators and facilitators: • Harnessing a range of inputs and coordination; • Communicating; • Ensuring clarity of roles; • Understanding of needs and purpose; • Maintaining a big vision; • Engaging and genuinely involving the affected community to hasten; and • support their recovery. There is also the need for specific targeted inputs of training after impact, as recovery workers need to be equipped to respond to the period ahead, for example, understanding the longer-term recovery issues, service withdrawal, and anniversary reactions. Training could also encompass the community itself—what information might residents benefit from in understanding their experience and planning their recovery in ways that empower the community. Training is required to ensure that capability is sustained, and practices are of high quality. Such training, if based on clearly articulated principles of disaster recovery management and internationally accepted guidelines, will equip participants with best practice approaches to their roles.
Training for NGOs	The dissemination of knowledge should lead to the identification of key people with an interest in participating in disaster prevention and preparedness measures. Basic tasks may require a very brief instruction on how to do the task safely, while complex tasks may require more training to address the associated hazards and determine the point at which training is most appropriately offered.
Interoperability (technical and organizational), **Joint trainings**	The training should use clear language, provide useful information, identify the authoritative agency and provide multiple communication methods to ensure the maximum number of people is reached. Options include training of volunteers before they are accepted and begin their work, during response, or after the event.
Interoperability (technical and organizational),	Creation of international training centres is recommended.

Training in interagency communication (also cross-border)	

5.1.4 Innovation Opportunities

The following table summarizes the matches between practitioner needs and identified solutions derived from the different fields "Solutions from Research and RDI Projects" (short name: research), "Solutions on the Market" (short name: market), "Best Practices and Lessons Learnt" (short name: best practice). Cells that are coloured green indicate that solutions were found. However, it does not give any feedback of the quantity and quality of the solutions. On the other hand, cells coloured in grey signify blind spots in the portfolio of available solutions.

During the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a further prioritisation was done reflecting the potential innovation opportunities. Thus, those practitioner needs that are marked with 'x' are our identified innovation opportunities that will be transferred to WP5 for the assessment. Within the column 'remarks' specifications according to the needs are given.

Table 2: Matches between practitioner needs and identified solutions

Practitioner Needs	Prioritisation from Belgrade Meeting	Remarks	Solutions from		
			Research	Market	Best Practice
Realistic training	-	Not seen as problem for CCC as CCC is table top anyway.			
Unrevealed scenarios	-	See above.			
Training for key personnel of NGO's	(x)	Depending on country			
Interoperability (technical and organizational), Joint trainings	x	• Development Guidelines • Standardisation of terms and definitions (common communication) • Establishment of a law distributing responsibility among organisations on international level • Harmonisation of training curricula (inter-agency, international)			
Interoperability (technical and organizational), Training in inter-agency communication (also cross-border)	x	• Development Guidelines • Standardisation of terms and definitions (common communication) • Establishment of a law distributing responsibility among organisations on international level • Harmonisation of training curricula (inter-agency, international)			

5.1.5 Lessons Learnt

At the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a workshop on the assessment of RDI gaps and requirements of practitioners as identified and presented by the WP4 task leaders of T4.2 – T4.5 was conducted. The assessment was carried out by the participants as defined in WP5 tasks T5.3 – T5.5. The results from this first assessment can be seen as lessons learnt as they include a scoping and maturity check of the innovations opportunities identified in WP4.

Regarding the first topic 'Coordination, Command and Control' the following lessons learnt were highlighted:

- **Situational awareness/ Information sharing**: VR/Serious gaming seems not to be sufficient as this is table top work. However, operational personnel need physical experience. Thus, a combination of VR/real exercise might be useful. Moreover, serious gaming might be suitable as one element for training on psychological support as well as for a better visualisation of cascading effects.
- **Realistic training**: A simulation of real objective events (phenomena) and characterisation would be useful. Moreover, a simulation of consequences, i.e. real interdependencies and sequence of phases would be helpful. In this regard, VR for realistic visualisation as well as serious gaming seem to be key elements for more realism in training. Courses with mixed exercises (some real exercise and some table-top) and in-field training (e.g. also with flooded terrain) as well as reasonable scenarios (probable ones and at least one worst-case scenario) were recommended. However, there was general consensus that the content of the course is more important than the form.
- **Joint Training**: For joint trainings, it was remarked that 'ready-to-hire/use infrastructure (rooms, training grounds, etc.), or at least a catalogue of such infrastructure would be desirable. Also training on how to set-up command posts for each organisation and consistent guidelines (standards) of inter-agency/international cooperation including standardised terms and definitions (common communication) and common exercises were recommended. Moreover, it was desired to establish a law distributing responsibility among organisations on international level and to harmonise training curricula on inter-agency as well as international level.

5.2 TWG “Alerting and Communication”

5.2.1 Relevance of RDI Topic

In general, “Alerting” is used to inform agencies, authorities, and/ or the public about emergencies in order to take up actions. The most important mean in this context is “Communication”. During and immediately after a disaster situation communication is a integral component of response and recovery for data exchange and the continuance of the chain of command. The consideration of “Alerting and Communication” can be sub-divided into different aspects listed below:

Alert Concept

Are there sufficient concepts to alert responders and related other actors in a timely manner?

Early Warning

Are there systems installed to provide timely and accurate warnings to the public and authorities? Who has access to this kind of data?

Social Media handling

During the last couple of years, the importance of self-organized activity of the public as well as the relevance of possible false information becomes obvious. Another aspect of social media would also be crowd sourced information gathering and the effective integration in situational awareness management. Both aspects might be challenging for the responders.

Integration of spontaneous volunteers

Flood events in the last decades demonstrated the willingness of people not associated to responding authorities or organizations to become active and support response measures. For those in charge of the operations, this is a challenging situation, since there are organizational questions which need to be solved as well as the lack of training and equipment. However, in uncritical environments and labour-intensive tasks, these could support the response efficiently.

Preparation of the public (citizens)

Is the public aware of the flood risk? Are there programs to prepare the public? Do evacuation routes exist? Does the public know?

5.2.2 Practitioner Needs

The following table summarizes the results from the conducted survey as well as the outcomes from the 2nd RDI Workshop in Vienna where practitioners from different fields discussed several challenges within the defined domains. The third column indicates practitioner needs, which represent a first impression on potential innovation opportunities with respect to the training aspect. The ranking given in the fourth column is an indicator for the importance of each topic derived from the practitioner discussions at the 2nd RDI Workshop in Vienna. Thus, this ranking is not statistically reliable. Matching the practitioner needs with available solutions from research and RDI projects (cf. 4.1.3.1), products and solutions on the market (cf. 4.1.3.2), best practices and lessons learnt by practitioners (cf. 4.1.3.3) as well as experiences from flood history, external factors, risk management and prevention (cf. 4.1.3.4) will result in the actual innovation opportunities (cf. 4.1.4). These innovation opportunities will be the input for the RDI assessment and roadmapping done in WP5, which will generate the foundation for the 2nd DARENet RDI roadmap.

Domain	Challenges	Practitioner Needs with respect to 'Training'	Ranking
Preparation of the public (citizens)	Lack of knowledge by general public	Strengthen or create formal Disaster Risk Reduction (DRR) education programs (school curricula) to educate citizens from a young age	A
		Strengthen or create informal Disaster Risk Reduction (DRR) educational programs based strongly on interactive concepts → Using games as educational tools or make use of public events to promote DRR education	A
		Include the marginalized communities in the prevention phase (ex.: minority groups, people with low income, people from remote areas etc.) to reduce their vulnerability to flood risk (or other type of risk)	B
		Make tourist, who visit flood prone areas, aware of the flood risk and the measures they should take in case of an emergency situation → including tourist in the early warning system (more linked to technical aspects, not training!)	C
Results from Questionnaire:			
Integration of spontaneous volunteers	Better inclusion of the volunteer units in the alert concept	Identifying 'gatekeepers' (leaders, even if self-appointed, within a group of spontaneous volunteer group who can organize the group) in different regions/communities prior to an emergency situation (during the preventions phase) and train them periodically in how to handle volunteers -	A
	No guidelines for handling spontaneous volunteers	Include the integration of spontaneous volunteers in the existing guidelines, to have a clear picture on what and how the institution should handle these volunteers → Establishing clear guidelines to inform for future activities and recommendations and providing a Training of Trainers material for future use regarding digital volunteers in disaster risk management	A

Figure 6: Medium but constant request for more training for trained and untrained personnel.

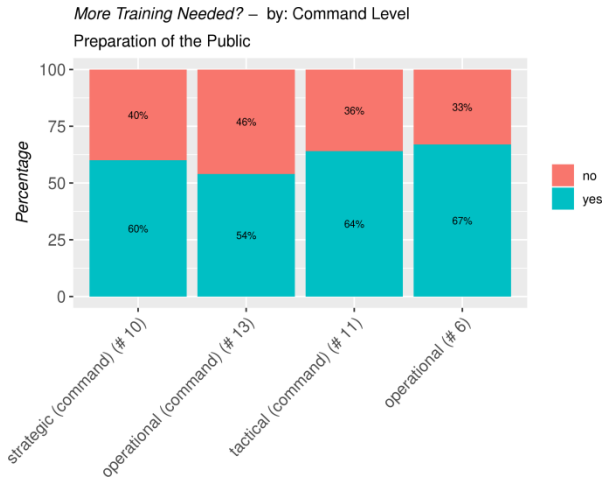


Figure 7: Medium but rather constant demand for more training throughout all command levels.

	Provision of shelter for spontaneous volunteers	training regarding sheltering for the persons in charge would be necessary	B
	monitoring emerging volunteer groups in order to them not to interfere with the activities of the institution	Establishing networks with emerging volunteers in time	C

Results from Questionnaire:

Figure 8: Very high demand for more training especially for trained personnel → improvement potential.

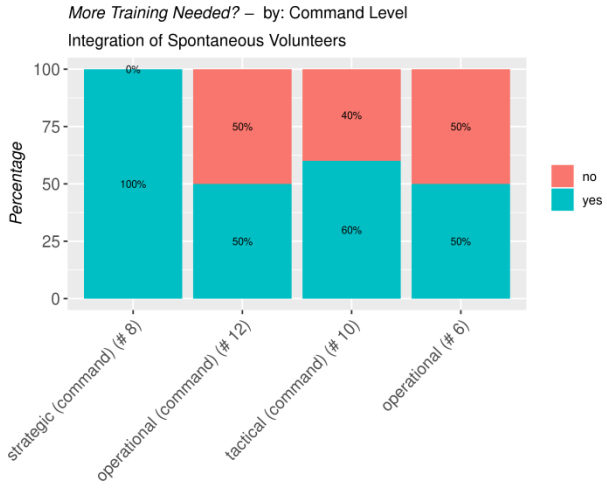


Figure 9: General problem seen on strategic level → integration of (too many) SP in chaotic first phase, missing instructors, (too) less SP in later phases with lack of man power.

Alert Concepts	Usage of different information technologies for information sharing	training of usage of existing technical/conceptual solutions → capability improvements regarding alert concepts are highly reliant of technical / conceptual solutions	C
	Inclusion of volunteers	See Integration of spontaneous volunteers	A

Results from Questionnaire:

Figure 10: Rather high and constant demand for more training also for trained personnel.

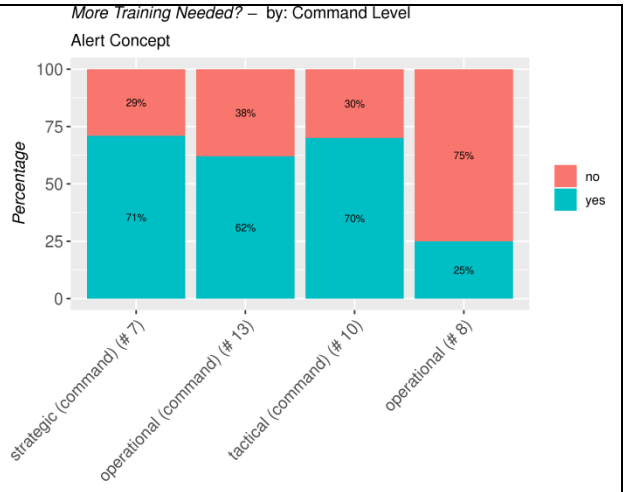


Figure 11: Higher demand on strategic command level.

Early Warning	Involvement of public	Training the public in order to better interpret the warning messages → tailoring warning messages taking into consideration socio-demographic variables of the public in order to maximize message effectiveness and to avoid creating panic	A
	Promotion of already available educational content (ex.: websites, mobile apps etc.)	Training activities could cover Seminars on PR and Advertising for the personal within an institution responsible for such activities in order to understand how to use different information technologies and communication channels to maximize the outcome of the material promotion and to extend promotional campaign reach	B
	How to design message content and form	No discussion	
	With regard to formal education, some countries do not have a strong DRR curriculum	lobbying for a better DRR curriculum	C
	many early warning systems in place in different countries	it is important to have a functioning technical/conceptual model in place before even speaking about training aspects regarding early warning → Test out the systems functionality, Organize periodical exercises to test the system, Training the citizens on how to act during early warning	C

Results from Questionnaire:

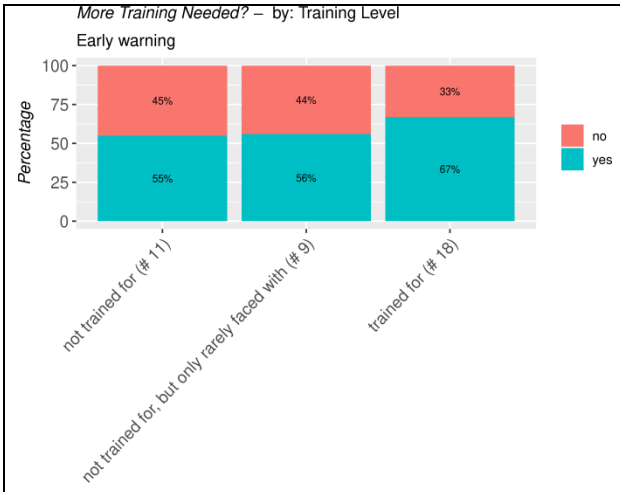


Figure 12: High demand for more training for trained personnel.

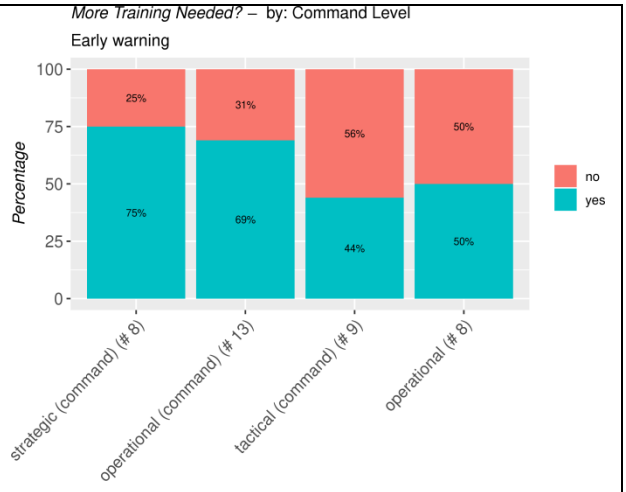


Figure 13: Problems/ demand for more training seen on higher command levels.

Social Media handling	Usage of SM channels for knowledge sharing and public awareness raising	training in usage of SM for public	A
	if the responding authorities or organizations mandate dictates using SM for alarming	clear protocols and the personal in charge with this task should be trained accordingly	A
	Identify other responding authorities or organizations that are present on SM who have good content and you may share each other's content occasionally.	No specific training requirements were identified for these activities	C
	How to publish content on social media to reach maximum effectiveness (Prepare the RIGHT multimedia content, appropriate for different SM platforms, to promote disaster preparedness)	Depending on specific SM platforms (ex: Facebook, Twitter etc.) information has to be presented in a certain way to resonate with its users and to have a greater reach. That is why researchers and practitioners advise to publish mainly multimedia content (ex.: pictures, videos, infographics, interactive maps etc.) in favor to long text messages. Developing/designing/capturing such content can take specific skills. And, while there is no need for emergency personal to be trained to edit videos, making them understand how SM work through training activities already proposed before, they can design communication strategies and campaigns, and materials related to this design can be delivered by advertising agencies or as some of the participants mentioned, digital volunteers	A
		Set up a team of different specialist to handle SM in order to gather and to filter in real time user generated data about an emergency situation during its unfolding, to improve situational awareness and also check information reliability of user generated data regarding an ongoing emergency	A

		situation, considering also information bias → training in data handling	
	Preparation of a code of conduct and a SM strategy plan regarding SM use ("How to use SM" + primary objectives + responsibilities)	training in usage of SM for professionals	A
	obstacles in SM use by different organizations (depending on each organizations code of conduct for SM use, some messages may need approval before they can be posted)	No discussion	C
	in many countries, SM is used mainly for Public Relationship (PR) and not for risk or crisis communication → Use social media also as an alternative channel for alarming	it is important to have a clear code of conduct and a social media strategy in place → once these documents are in place, people involved in social media management can be trained according to the task	A
	Specially trained personnel were seen as a key issue when it comes to social media handling	All people involved in SM handling should be trained to follow a well formulated mandate → SM team should be composed of different specialists coordinated by situational officers who are in constant connection with COP a way to improve existing capacities is to train Public Relationship Officers in Social Media management, Online marketing and Multimedia content management	A
	Dissemination messages regarding DRR through SM was seen as an additional channel to further public education and preparedness	persons in charge should be either trained in online marketing and SM management or work together with advertising agencies or volunteers who have specific skills in this regard	B
	Using/handling user generated data during an emergency situation to raise situational awareness	absolutely necessary to filter and check the information: 1. Request information from the public trough public announcement (no training needed), 2. Filter and proof social media data with the help of preregistered digital volunteers. They should be trained in how to extract SM data easily and how to work with this data (what are the common requirement for data proofing etc.), 3. Use input from `gatekeepers` on site to proof information gathered trough user generated data, 4. Outsource SM monitoring during an emergency situation to institutions who are familiar with social media (training in working together and depending on the form of the presented data end-user might need some training in using it)	A
	data security issues and data protection	training of SM managers in basic data protection law	A

	Create a network of practitioners in the field to share content through in order to widen your message reach on SM	Train the practitioners in the field to handle SM	A
	automatic content monitoring using AI	No discussion	

Results from Questionnaire:

Figure 14: High demand for untrained personnel.

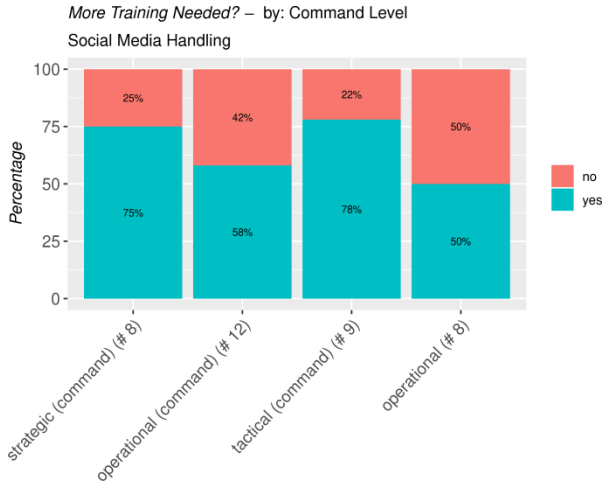


Figure 15: More training needed on higher levels responsible for utilizing Social Media for alarming.

5.2.3 Available Solutions

Review on available solutions was made for the following practitioner needs:

1. **Preparation of the Public**
   - Strengthen or create **formal Disaster Risk Reduction (DRR) education programs** (school curricula) to educate citizens from a young age
   - Strengthen or create **informal Disaster Risk Reduction (DRR) educational programs** based strongly on interactive concepts
2. **Improve coordination of Spontaneous Volunteers**
   - Include the integration of spontaneous volunteers in the **existing guidelines**
   - Integration of spontaneous volunteers in **Alert Concepts**
   - Identification of „**gatekeepers**" (i.e. volunteers leaders)
3. **Early Warning**
   - Training the public to better **interpret the warning messages**
4. **Social Media**
   - Train the **public** in using social media (**raising public awareness**)
   - Training for the **professionals / personal in charge** to handle SM (clear protocols)
   - Training in **data handling**

- Train the people involved in social media management about **SM strategy**
- Train **Public Relationship Officers** in social media management, online marketing, multimedia content management
- Train social media managers in basic **data protection law**
- Train the **practitioners in the field** to handle social media

5.2.3.1 Solutions from Research and RDI Projects

PREPARATION OF THE PUBLIC

Practitioner Need	Existing Solution	Location	Short description	Link
Formal DRR education programs to educate citizens from a young age			No solutions identified	
Informal DRR educational programs based on interactive concepts	**BuildERS - Building European Communities' Resilience and Social Capital**	Europe	To improve the overall resilience of people, communities and thereby the whole society, the BuildERS project focuses on the most vulnerable individuals, groups and communities. Strengthening the social capital, risk awareness and preparedness of the most vulnerable segments of the societies and communities will increase understanding on what societal resilience comprises. BuildERS will develop knowledge and insights that will device recommendations for policies, plans, strategies, and competencies for building partnerships, networks and trust for progressively fortifying the social capital and resilience against future threats, be they natural or man-induced. The special focus on communities and in particular on the most vulnerable groups answers to the so-far unfulfilled needs of these communities. BuildERS uses several research methods such as i) Stakeholder engagement with co-design and co-creation processes, ii) Field surveying and questionnaires, iii) Comparative research, iv) Multiple case analysis.	Link
	RESILOC - Resilient Europe and Societies by Innovating Local Communities	Europe	RESILOC aims at studying and implementing a holistic framework of studies, methods and software instruments that combines the physical with the less tangible aspects associated with human behaviour. The study-oriented section of the framework will move from a thorough collection and analysis of literature and stories from the many approaches to resilience adopted all over the World. The results of the studies will lead to the definition of a set of new methods and strategies where the	Link

			assessment of the resilience indicators of a community will be performed together with simulations on the "what-if" certain measures are taken. These studies and methods will serve for designing and implementing two software instruments: 1. the RESILOC inventory, a comprehensive, live, structure for collecting, classifying and using information on cities and local communities, implemented as a Software as a Service (SaaS). 2. The RESILOC Cloud-based platform for assessing and calculating the resilience indicators of a city or a community, for developing localised strategies and verifying their impacts on the resilience of the community. The Cloud platform, a combination of SaaS and PaaS, includes the inventory as its repository. The project will make use of built solutions in four field trials and includes a high-profile communication plan, heavily based on Social Media platforms.	
	Using games as educational tools	Europe	**Project "RESOLUTE - RESilience management guidelines and Operationalization appLied to Urban Transport Environment"** RESOLUTE is answering resilience management needs (e.g. enhancing resilience in transport systems), by proposing to conduct a systematic review and assessment of the state of the art of the resilience assessment and management concepts, as a basis for the deployment of an European Resilience Management Guide (ERMG), taking into account that resilience is not about the performance of individual system elements but rather the emerging behavior associated to intra and inter system interactions. The final goal of RESOLUTE is to adapt and adopt the identified concepts and methods from the defined guidelines for their operationalization and evaluation when addressing Critical Infrastructure (CI) of the Urban Transport System (UTS), through the implementation of the RESOLUTE Collaborative Resilience Assessment and Management Support System (CRAMSS), that adopts a highly synergic approach towards the definition of a resilience model for the next-generation of collaborative emergency services and decision making process.	Link Link

			Outcomes: RESOLUTE's focus on urban transport resilience has resulted in a game-based training app aimed at improving citizen preparation. Another project outcome is an emergency mobile app to keep citizens updated and advise them on what action to take to stay safe in an emergency.	
	Toolkits for preparing and alarming the European population	Europe	**Project "POP-ALERT (Population Alerting: Linking Emergencies, Resilience and Training)"** The main objective of POP-ALERT is to prepare societies and populations to cope with crisis and disasters in a rapid, effective and efficient way by blending traditional Crisis Preparedness & First-Reaction strategies with the use of innovative contemporary tools. The project will seek to study the best ways to blend contemporary tools with the existing practices identified in order to create flexible and easily deployable toolkits for preparing and alarming the European population in case of a crisis. The approach this project proposes for improving the current practices revolves around the use of messaging and cultural sharing technologies to create awareness using technologies and approaches that offer the best form of accessibility and penetration by citizens and authorities.	Link Link 10
	Interactive application/toolkit that allows communication with citizens in both directions	Europe	**Project "I-REACT: Improving Resilience to Emergencies through Advanced Cyber Technologies"** The proposed system targets public administration authorities, private companies, as well as citizens in order to provide increased resilience to natural disasters though better analysis and anticipation, effective and fast emergency response, increased awareness and citizen engagement. I-REACT integrates existing services, both local and European, into a platform that supports the entire emergency management cycle. Leveraging on innovative cyber technologies and ICT systems, I-REACT will be able to enable early planning of disaster risk reduction actions, achieve effective preparedness thanks to risk assessment and early warnings, and efficiently manage emergency responses by empowering first-responders with up-to-date situational information and by engaging citizens through crowdsourcing approaches and social	Link Link

[10] The official website is not maintained any longer.

			media analysis. I-REACT provides a European-wide platform that integrates a range of data (i.e. Copernicus Earth observation, weather and climate services) coming from multiple sources, including information provided by citizens through social media and crowdsourcing. This multi-pronged approach means critical information can be produced faster. It also allows citizen involvement to be used by civil protection services and policy-makers to effectively prevent and/or react against disasters. Outcomes: The project also developed a mobile application (available on Google Play) that empowers citizens to report on natural events and hazards and to carry out an initial check of community reports. To engage more people with the system, the application features several fun quizzes and a rewards programme. The application is also a powerful tool for alerting citizens of possible risks and providing them with emergency information.	
	Projects **1. "Interkom: Intercommunal concepts to strengthen the resilience of urban areas"** **2. "RescueLab: IT-supported exercise environment for civil protection and rescue forces"**	Germany	Concept for inter-municipal cooperation in risk management and citizen-oriented crisis management Creation of an IT system for (almost) complete reconstruction of complex exercises.	Interkom: Link[11] RescueLab: Link[12]

[11] Only available in German

[12] Only available in German

INTEGRATION OF SPONTANEOUS VOLUNTEERS

Practitioner Need	Existing Solution	Location	Short description	Link
Integration of spontaneous volunteers in the existing guidelines	**Project "WuKAS: Knowledge and competence transfer in occupational health and safety with spontaneous volunteers"**	Germany	Derivation of recommended courses of action for instruction of SV.	Link 13
	Project "KUBAS: Coordination of voluntary helpers to overcome disaster situations"	Germany	After extreme weather events, the professional emergency services are usually supported by thousands of voluntary helpers in the clear-up effort. However, the volunteers' activities need to be coordinated and organised. The KUBAS project aims to research on a software solution in order to help the disaster management authorities register, locate and alert volunteer helpers.	Link 14
	Project "RESIBES: Resilience through networks of spontaneous volunteers for emergency and crisis response"	Germany	In particular, the storms and flooding of recent years have shown that the public are increasingly willing to help respond to crises and disasters. It is precisely that willingness that poses a challenge for incident commanders since the volunteers' work has to be coordinated too. RESIBES was creating a helper network that can be activated quickly in the event of a crisis or disaster and engaged in a coordinated response. Private individuals, business and associations can register as active or passive network members. When a crisis occurs, the emergency services can then issue targeted requests to the helper network.	Link 15
	Project "ALARM: Adaptive solution platform for active technical support when saving human lives"	Germany	This project looked at ways of improving resource deployment in the event of a major incident, particularly in the initial phases. It set out to develop an adaptive IT system for supporting command centres, including RFID patient tagging and telemedical care to minimise fatalities. The scenario used was an explosion on a train at Berlin's Ostbahnhof station. The focus was on care for the injured, use of existing and new communication systems plus mobile devices and information provision	Link 16

[13] Only available in German

[14] Only available in German

[15] Only available in German

[16] Only available in German

			to persons in the affected area via mobile phone.	
	Project "AHA: Automated involvement of volunteer helpers in the case of major incidents"	Germany	In the event of a disaster, the public tends to be very willing to help. To make optimum use of the potential offered by volunteer helpers, it is important that their efforts are closely coordinated with those of the emergency services. The idea behind the AHA research project was to create a smartphone app that will enable volunteers and technical equipment owned by members of the public to be registered, checked and, where required, to be incorporated into rescue efforts directly via the incident command system. AHA helped therefore ensure that appropriate assistance gets to those who need it even quicker in a disaster scenario.	Link 17
	Project "KOKOS: Support for cooperation with volunteer helpers in complex incidents"	Germany	A number of activities are required to provide assistance and clear debris after complex incidents such as storms or floods. Increasingly, members of the public are forming self-help groups to provide assistance independently in parallel with the work performed by emergency service professionals. The partners on the KOKOS joint project were devising strategies and models with which to include the public in crisis management as an active partner. They were investigating how associations or corporate alliances, in particular, can support relief efforts by making technical resources or rooms available or mobilising helpers.	Link 18
Integration of spontaneous volunteers in Alert Concepts			No solutions identified	
Identifying 'gatekeepers'	**Project „ENSURE: Improved crisis management in urban areas through context-related volunteer concepts and warning systems"**	Germany	Project aims: • Identification of special qualified SV • Technical and organizational concepts for recruiting and motivating helpers • Behavioral analyses of general public in major disaster situations • Investigations of acceptance regarding helpers in the general public	Link 19

[17] Only available in German

[18] Only available in German

[19] Only available in German

			• APP for registration, identification of level of competences (physical, social, technical) and current place Outcomes: • noticeable need for coordination between SV and professionals • danger of parallel structures for SV • clear definition of contact person and importance of traceability of the operational structure	

EARLY WARNING

Practitioner Need	Existing Solution	Location	Short description	Link
Training the public in order to better interpret the warning messages	**Project "EDUCEN - European Disasters in Urban centres: a Culture Expert Network (3C – Cities, Cultures, Catastrophes)"**	Europe	EDUCEN is a coordination and support action that will work on the complex interplay between culture(s) and disaster risk reduction, above all in the context of cities, to allow in particular formal and informal emergency responders, risk managers, the military, urban planners and planners at regional and national level to be better equipped to deal with elements of culture, and as a result to ensure highly competent disaster responses and increasing community resilience. Outcomes: A toolbox to support the participating cities, which includes - 'Serious games' to enhance cultural empathy, - Social Network Analysis, to understand the formal and informal "soft infrastructure" that springs into life in a crisis, - Communication and outreach tools: In locations where disaster does not happen regularly, people's awareness can be deficient. Museum exhibitions can help jog people's memory through an exhibition on disaster: earthquake in Volos, flooding in Dordrecht. Disaster educational tools were designed for people with physical challenges in Istanbul, - A handbook, manuals and tools to help planners and responders deal with culture.	Link Link 20
	Project "A4A - Alert for All"	Europe	Alert4All focuses on improving the effectiveness of one element of the People-Centred Early Warning Systems paradigm, namely alert and communication towards the population in crises	Link

[20] The official website is not maintained any longer.

			management. This improvement shall be measurable in terms of cost-benefit ratio, number of affected citizens timely reached by alerts, trust of citizens on alerts and intended vs. actual impact of alert strategies. Alert4All will provide solutions to align alert procedures and processes to contemporary crises (natural or man-made), available and emerging technologies, available information sources and trends in social behaviour. To achieve this goal the Alert4All Project will: - Develop a simulation tool that models the spreading of information and human behaviour according to key influencing factors such as crisis scenario, selected communications plans, social and cultural crowds; - Investigate the role of new media in the citizens' perception of the crisis and develop new media screening tools to allow authorities completing their picture of the situation and adapt their strategies accordingly; - Develop an information management portal through which authorities and first responders can securely share and manage the available information about the crises by means of the aforementioned tools; - Propose new operational concepts (and training material) that allow cooperation between authorities and responders, overcoming regional and national barriers thanks to the tools developed in the project; - Design a communications system architecture and protocols allowing dissemination of alert messages over diverse communications means (terrestrial, satellite, new media) to increase alert penetration, reliability and resilience in front of major disasters; - Validate the concept in critical scenarios. The Alert4All project thus provides an extensive and interdisciplinary framework, covering all key enablers to improve the effectiveness of alert and	

			communications towards the population.	

SOCIAL MEDIA HANDLING

Practitioner Need	Existing Solution	Location	Short description	Link
Train the public in using social media (raising public awareness)			No solutions identified	
Training for the professionals / personal in charge to handle SM	**Project "EMERGENT - Emergency Management in Social Media Generation"**	Europe	EmerGent aims at understanding the positive and the negative impact of social media in emergencies in order to enhance objective and perceived safety and security of citizens before, during and after emergencies. Furthermore, EmerGent aims at strengthening the role of European companies dealing with services and products related to the aimed research and development results. EmerGent will perform studies on the communication behaviour via social media in an emergency situation and its impact on emergency management procedures with citizens and public authorities (emergency management services) involved. The understanding of critical situations, the reactions expressed through social media and the general importance and preferred types of social media will be considered. For this research new methods and tools will be developed to reinforce the communication between weakly connected (via social media) crisis-communities (citizens) and the emergency management services, supported by European associations. To handle the vast amount of valuable and distributed data new methods for Information Mining and Information Quality will be developed to classify and rate publicly available and provided data from users. With developed methodologies and software tools for the routing of mined and classified emergency relevant information from social networks, EmerGent will create a comprehensive concept for Novel Emergency Management. All analysis and impact assessment results will lead to the creation of guidelines. Hence stakeholders will be enabled to understand and get the most benefit out of social media and its integration into their processes.	Link Link

Training in data handling	**Project "ANYWHERE - EnhANcing emergencY management and response to extreme WeatHER and climate Events"**	Europe	The purpose of the ANYWHERE project is to empower exposed responder institutions and citizens to enhance their anticipation and proactive capacity of response to face extreme and high-impact weather and climate events using a pan-European multi-hazard platform. Outcomes: The beAWARE knowledge base is the semantic foundation that provides the classification scheme and deduction rules and also analyses information and distributes outcomes. Information is obtained from local citizens, first responders, social media, local weather forecasts, sensors such as in situ static cameras to monitor water levels and even cameras on drones. Citizens and first responders communicate with the beAWARE platform via the beAWARE mobile application. The social media monitoring module searches for and validates related social media content and then analyses it to perform spatiotemporal grouping of relevant posts.	Link Link
Train people involved in social media management about social media strategy			No solutions identified	
Train Public Relationship Officers in Social Media management, online marketing and Multimedia content management			No solutions identified	
Training of SM managers in basic data protection law			No solutions identified	
Train the practitioners in the field to handle SM			No solutions identified	

5.2.3.2 Solutions on the Market

PREPARATION OF THE PUBLIC

Practitioner Need	Existing Solution	Location	Short description	Link
Formal DRR education programs to educate citizens from a young age			No solutions identified	
Informal DRR educational programs based on interactive concepts	**Scenario Enabled Psychological First Aid (PFA) training**	Europe	**Scenario Enabled Psychological First Aid (PFA) training** – guidelines on how to perform PFA and an experiential training package to build the capacity to deliver quality PFA.	Link
	Project I-REACT	Europe	**Project I-REACT:** The first European app to empower citizens against floods, fires and extreme weather events. The first European-wide platform to integrate emergency management data coming from multiple sources, including that provided by citizens through social media and crowdsourcing.	Link

INTEGRATION OF SPONTANEOUS VOLUNTEERS

Practitioner Need	Existing Solution	Location	Short description	Link
Integration of spontaneous volunteers in the existing guidelines	**ISO Standard: ISO 22319**	Europe	**Standard: ISO 22319** Security and resilience - Community resilience - Guidelines for planning the involvement of spontaneous volunteers.	Link
Integration of spontaneous volunteers in Alert Concepts	**Team Österreich digital**	Europe	**Team Österreich digital** is the digital one stop shop for digital volunteer management. The app has the ability to alert the user in a specific spot.	Link
	CrowdTasker	Europe	**CrowdTasker** enables crisis managers to instruct large numbers of non-institutional (either spontaneous or pre-registered) volunteers with customizable tasks, contextual information, warnings and alerts. The received feedback is evaluated and visualized and provides managers with a detailed overview of the situation, which is used in turn to trigger adequate relief services.	Link
Identifying 'gatekeepers'	**Publication: Examination of citizens' attitudes towards providing support to vulnerable people and**	Europe	**Publication: Examination of citizens' attitudes towards providing support to vulnerable people and volunteering during disaster** the factors influencing citizens' attitudes towards assisting vulnerable people	Link

	volunteering during disaster		and volunteering during natural disasters.	

EARLY WARNING

Practitioner Need	Existing Solution	Location	Short description	Link
Train the public in order to better interpret the warning messages	**Project IMPRINTS - Improving preparedness and risk management for flash floods and debris flow events**	Europe	**Project IMPRINTS** - Improving preparedness and risk management for flash floods and debris flow events. Early warning operational platform based on rainfall predictions using meteorological models and from weather radar networks.	Link

SOCIAL MEDIA HANDLING

Practitioner Need	Existing Solution	Location	Short description	Link
Train the public in using social media (raising public awareness)			No solutions identified	
Training for the professionals / personal in charge to handle SM (clear protocols)	**Rumour Debunker**	Europe	**Rumour Debunker** offers a solution for internet news analytics. It is developed to counteract mis- or disinformation campaigns.	Link
	Social Media Analysis Platform (SMAP)	Europe	**Social Media Analysis Platform (SMAP)** enables to find information relevant to a crisis in Social Media. Social Media contain information which can contribute to situation assessment. This information can concern the incident itself, its impact, or the needs of the population affected by the crisis.	Link
	XVR Crisis Media	Europe	**XVR Crisis Media:** With XVR Crisis Media you can train how to manage and monitor communication from news media, social media and internal communication sources in a crisis situation.	Link
Training in data handling			No solutions identified	
Train people involved in social media management about social media strategy			No solutions identified	
Train Public Relationship Officers in			No solutions identified	

Social Media management, online marketing and Multimedia content management				
Training of SM managers in basic data protection law			No solutions identified	
Train the practitioners in the field to handle SM			No solutions identified	

5.2.3.3 Best Practice and Lessons Learnt by Practitioners

PREPARATION OF THE PUBLIC

Practitioner Need	Existing Solution	Location	Short description	Link
Formal DRR education programs to educate citizens from a young age	**DRR School Curricula in the EU Member States** **Best practices:** **Training of trainers** Project "Raising Young People's Awareness on Preparedness and Self-Protection – YAPS"	Europe	In a recent project analysing the existing DRR curricula for primary school reviled the absence of a standardized approach regarding the information included in the educational curricula related to DRR at EU level. Approach: **Training of trainers:** prepare educators to include DRR topics in their teaching activity. It is important to offer them teaching materials adapted to local context. **Example:** **Max & Flocke / Andrei şi Rex** Training materials developed within the project "Raising Young People's Awareness on Preparedness and Self-Protection – YAPS" were disseminated to educators. The training materials were translated from German to Romanian language and adapted to national context.	Link
	Disaster Risk Reduction in School Curricula: Case Studies from Thirty Countries	Worldwide	To effectively reduce disaster risks for communities, the United Nations Children's Fund 'UNICEF' and the United Nations Educational, Scientific and Cultural Organisation 'UNESCO' recognise the important role education plays in reducing vulnerability and building resilience. Education can be instrumental in building the knowledge, skills, and attitudes necessary to prepare for and cope with disasters, as well as in helping learners and the community to return to a	Link

			normal life. This report is a mapping of countries that have included elements of disaster risk reduction into their education system. It captures national experiences whilst noting key challenges in countries where disaster risk reduction is less clearly prioritised or where specific teacher training doesn't exist.	
	Disaster Risk Reduction through School Learners' Awareness and Preparedness	World-wide	In 2006, the ISDR (International Strategy for Disaster Reduction) (2007) initiated a campaign called Disaster Risk Reduction Begins at School to encourage the integration of disaster risk education into school curricula in countries vulnerable to disaters.	Link
	DRR School Curricula in the EU Member States	Europe	In a recent project analysing the existing DRR curricula for primary school reviled the absence of a standardized approach regarding the information included in the educational curricula related to DRR at EU level. DRR topics are scattered through various subject matters in most of the member states. This approach can have benefits when learning objectives are linked among subjects. But for this, teachers have to understand the complexity and multidisciplinary of the subjects. **Article:** Meltzer M., Ştefănescu L., Djonko A., Martonos I., Bican-Brişan N., Ozunu A., 2017 Disaster risk reduction curricula in primary and secondary schools across the European Union: a review. ECOTERRA 14(3), pp.17-27:	
Informal DRR educational programs based on interactive concepts	**Using games as educational tools**	World-wide	**Game-Based Education for Disaster Prevention** Taiwan experiences typhoons on a yearly basis, and the accompanying heavy rain often causes flooding and damage. Local decision makers invest heavily in flood prevention measures and thus need to allocate resources wisely to minimize the destruction caused. To educate future decision makers, was developed a flood game to encourage players' active learning by exploration. The game design is based on "Shikakeology" and "game-initiated learning" methods. Through the design of the game, a change in behavior is initiated by allowing players to face real-world flooding problems and discuss problems related to flood disaster management. Following gameplay, the instructors will introduce information useful in solving flood-related problems. From the feedback of review meetings, game-initiated learning was	Link

			recognized as an educational method with great potential in teaching disaster management. This indicates that game-initiated learning is able to stimulate learning for the participants.	
			Children in disasters Games and guidelines to engage youth in risk reduction The purpose of this guideline is to provide guidance to Red Cross and Red Crescent National Societies on effectively engaging in informal Disaster Risk Reduction (DRR) educational initiatives. This publication is meant, in relation to DRR and education, to promote relevant initiatives in the region, identify the current roles and responsibilities of National Society at different levels, and encourage the promotion of effective child and youth-centered DRR educational activities. Adult involvement with informal DRR education initiatives can also be encouraged by appropriately adapting guideline content. Informal educational activities can also be used in support of formal activities, such as promoting school safety campaigns.	Link
			Using games to foster empathy, experience, and learning Successful attempts at Disaster Risk Reduction are hardly possible without engaging endangered communities into informational and educational activities. We can use simulations and serious games to overcome such obstacles. For example, we can make participants take on the same roles that they play in real-life. Such activity is called policy exercise. This gives them an opportunity to describe the situation from their point of view and share their knowledge, opinions and concerns with others. Such activity is also a useful tool for researchers and policy-makers since it helps them understand endangered communities and learn more about the people they want to protect. On the other hand, we can make participants play roles different from those which they assume on a daily basis. This activity is called a serious game or simulation. In this case, the participants are given the opportunity to understand positions and actions of other actors.	Link
			Playing games to better prepare for natural disasters This educational game teaches children and parents on how to behave in	Link

			case of a natural disaster and how to mitigate risks. Composed of 65 boxes, and based on the snake and ladders game, the game tackles topics such as flooding, deforestation, Emergency Family Plan, solidarity during emergencies and the like which is adapted to the Haitian context. For instance, the box 13 informs that the community contributes to deforestation. The player must therefore move back a few squares. After the game ended, children and parents expressed their satisfaction and enthusiasm at the knowledge they gained on disaster preparedness and mitigation, thanking the organizers of the activity.	
			Using VR technologies for DRR education There are many approaches to create innovative games as DRR educational tools. For example the Asia Pacific Disaster Resilience Centre together with the Republic of Korea National Red Cross developed a VR-based disaster resilience training simulation: *`This method (VR) has completely modernized theoretical learning and provides, in addition, a practical dimension and realistic scenarios that make the understanding and learning easier and more efficient `*. However the developing team identified some challenges regarding this learning tool: (1) issues regarding game licensing (2) high expenses and (3) confusing controls.	Link

INTEGRATION OF SPONTANEOUS VOLUNTEERS

Practitioner Need	Existing Solution	Location	Short description	Link
Integration of spontaneous volunteers in the existing guidelines	Australian Institute for Disaster Resilience, Handbook Collection **Handbook: Communities Responding to Disasters: Planning for Spontaneous Volunteers**	Australia	This handbook outlines nationally agreed principles in planning for spontaneous volunteers in disasters. It provides guidance on planning for and supporting communities responding to disasters by providing general guidance on ways to incorporate the principles into plans and activities. The handbook recognises the important role spontaneous volunteers can play in emergencies and disasters.	Link
	Joint Flood and Coastal Erosion Risk Management Research and Development Programme	UK	The report presents findings which show that national non-statutory guidance is required to inform the official involvement of spontaneous volunteers during a flood. Although responsibility	Link

	on behalf of the Department for Environment, Food and Rural Affairs, UK **Report: Spontaneous volunteers: Involving citizens in the response and recovery to flood emergencies**		for the involvement of spontaneous volunteers during emergencies is the responsibility of Local Authorities many emergency managers seemed unaware of this. It details the aspects that emergency managers need to consider when developing a local plan for how to manage spontaneous volunteers. The project was commissioned by the Department for Environment, Food and Rural Affairs (Defra).	
Integration of spontaneous volunteers in Alert Concepts			No solutions identified	
Identifying 'gatekeepers'			No solutions identified	

EARLY WARNING

Practitioner Need	Existing Solution	Location	Short description	Link
Train the public in order to better interpret the warning messages	**A Best Practice Statement of the American Meteorological Society**	USA	Best practices for the dissemination of weather warnings to the public.	Link
	Certified online learning courses related for campaigne/message design	Worldwide	In recent years online certificate courses are on the rise. There are some online learning tools available for disaster management practitioners, which address risk communication for at risk population. For example the Columbia Regional Learning Centre for Preparedness and Emergency Response offers 40 free of charge online certificate courses for their registered users, one of which addresses exactly *Risk Communication for High Risk and At-Risk Populations (COM 2302).*	Link
	Workshops organised/promoted by PSCEurope (Public Safety Communication Europe)	Europe	On the website of PSCEurope there are listed upcoming workshops regarding Public Safety in Europe. For example in December there will be a 1 day workshop in Paris on Public Warning, "How to implement Article 110 of the Electronic Communications Code getting it right first time", where participants will benefit from the shared operational experiences of colleagues about implementing an effective PWS.	Link

SOCIAL MEDIA HANDLING

Practitioner Need	Existing Solution	Location	Short description	Link
Train the public in using social media (raising public awareness)	**Guidelines for Citizens: using Social Media in Emergencies**	Europe	**Project EmerGent** (Emergency Management in Social Media Generation): Based on literature review and survey in 2017 within the project EmerGent, a simple guideline for citizens regarding the use of SM use was proposed. The two page documents consist of concise and easy to remember objectives starting with general aspects regarding SM use to the use of SM before/during/after an emergency. There is also an infographic with the most important objectives identified: http://www.fp7-emergent.eu/wp-content/uploads/2017/07/EmerGent_Citizen_Guidelines.png	Link
			Project COSMIC A more detailed set of guidelines, which include also examples of examples of best practices during past emergency situations, was proposed by the project COSMIC - Contribution of Social Media in Crisis Management.	Link
		World-wide	**ISO/CD 22329** "Security and resilience - Emergency management - Guidelines for the use of social media in emergencies"	
	Training Courses regarding SM use targeted for citizens/community volunteers **(FEMA certified training courses)**	USA	The National Disaster Training Center at the University of Hawaii offers 2 training courses regarding SM use targeted also for citizens/community volunteers: **Social Media for Natural Disaster Response and Recovery**: The course defines social media and its uses and identifies the tools, methods, and models to properly make use of social media in the context of disaster management and provides the information and hands-on experience necessary to help the participants' create social media disaster plans. **Social Media Tools and Techniques**: The courses are designed to provide practitioners to use intermediate SM tools and techniques for situational awareness during an emergency. Participants will learn to use tools such as mapping applications, data analysis, and data mining for research and management. It aims to reach public and private sector organizations who have responsibility for conveying disaster-related information to the public or	Link

			who are responsible for gathering information during and after a disaster.	
Training for the professionals / personal in charge to handle SM (clear protocols)	**Joint workshop with emergency management personnel and system providers**		It is also important, that the personal in charge of social media handling understands how SM can add value to disaster risk communication. In this sense it is important that end-users (crisis managers) have the chance to talk to/work with system providers. For example, such an event was the 7th JRC ECML Crisis Management Technology Workshop on Social Media for Crisis Management", held at the Joint Research Centre in Ispra, Italy in 2016. Thirty-three participants attended the event. At the meeting there was a good mixture of JRC and External system providers and end-users, along with European and non-European systems providers and users. Participants were actively involved in the workshop through presentations, discussions and demonstrations on multiple topics.	Link
	Online courses	Mainly USA	There are some online or offline courses available on the subject. For example: 1. **`*Welcome to Social Media Analysis During Disasters*`** offered by the U.S. National Library of Medicine. The purpose of this course is to help you develop and implement a plan that will help you effectively monitor and analyze disaster information on social media. 2. Courses listed above at **training in usage of SM for public** are also available for emergency management personal.	Link
	Social Media implementation methods – proposed by FEMA	USA	The report provides samples of emergency management organizations' implementation of social media, operational uses of social media during disasters in the United States and abroad, and innovative social media strategies used to engage interactively with the public through all phases of emergency situations. However, while there are interesting case studies and a good overview of implementation methods the study may be outdated.	Link
	Guidelines for practitioners (EU)	Europe	Within the project EmerGent and Cosmic, already mentioned above at **training in usage of SM for public**, a detailed guideline for emergency management personal regarding SM use for disaster management was also established.	

Training in data handling	**SOTERIA Fusion Center for managing information gaps - Toolbox**	Europe	The toolbox was developed within the project SOTERIA, aimed at developing recommendations and a toolbox to leverage the positive impact that social media can play in emergencies, enabling public safety organizations (PSOs) and citizens to communicate before, during and after an emergency event. Tools proposed within the toolbox reduce information gaps generated by user generated Big Data: 1. The first tool aims at geo-localizing tweets relying on the content of the messages. 2. The second tool provides sentiment analysis and clustering of multi-lingual messages and the third tool provides means for semantic information fusion and hypothesis evaluation relying on the contents and metadata of the tweets reporting about an event.	Link Link
Train people involved in social media management about social media strategy			No solutions identified	
Train Public Relationship Officers in Social Media management, online marketing and Multimedia content management			No solutions identified	
Training of SM managers in basic data protection law	**Project Cosmic (Contribution of Social Media in Crisis management project)** **- Set of recommendations**		As another end-product of the Cosmic - Contribution of Social Media in Crisis management project a set of recommendations were formed to ensure data protection and to address privacy issues. All the recommendations are listed in the research paper Bringing Privacy into the Fold: Considerations for the Use of Social Media in Crisis Management (2018) by Watson H. and Rodrigues R.	Link
Train the practitioners in the field to handle SM			No solutions identified	

5.2.3.4 Experiences from Flood History, External Factors, Risk Management and Prevention

PREPARATION OF THE PUBLIC

Practitioner Need	Experiences from Flood History, External Factors, Risk Management and Prevention
Formal DRR education programs to educate citizens from a young age	According to researches the best approach to educate DRR is the **integration of disaster prevention education into schools curricula** as well as use of mass media capabilities (social networks and media) as an educational approach. The following educational tools are identified as the most important for DDR: school textbooks, interactive online and offline games, the DRR educational advertising on television for increasing the public knowledge and multimedia learning tools for education. Recommendations: • Use a range of communication channels for increasing hazard knowledge and preparedness, including gender-related scenarios or case studies that appeal to people and promote empowerment and working cooperatively together within households and communities; • Include flood hazard education in children's school curricula (e.g., education on gender empowerment and cooperation in the context of creating a current and future population that has resilience and risk management knowledge and skills) with the purpose to prepare for and solve problems linked to a range of risk scenarios in life such as flooding and other natural hazards; • Local knowledge can contribute to safety by giving local advice on safe locations for construction sites (buildings and roads) and if used together with conventional knowledge for hazard mapping; • Local knowledge can also be used in information: in early warning systems, surveys, and other inventories to verify information, as well as to help adapt communication strategies to local understanding and perceptions, and to integrate local values into the decision- making processes. • The incorporation of local knowledge into disaster preparedness and management activities should be made cost-effective, efficient, and sustainable. Lack of knowledge on floods in administration-related sciences results in inadequate **education of municipal experts**, who indeed need to be prepared and to effectively cooperate with water resources and disaster risk management as well as urban planning sectors in order to see the flood problem in an integrated way. Implementation of the learnt knowledge is also missing, because educated people are usually not present in the field. **Flood education** will become increasingly important to help communities adapt to the impacts of flooding related to 'accelerated climate change'. Flood education also has a role, as part of 'education for sustainability', in helping communities move towards sustainability. Recommendations: • Flood education should be delivered in a way that communities are empowered to research, plan, implement and evaluate their own learning activities. There are four functions of community flood education related to the 'flood cycle': (1) preparedness conversion, (2) learning mitigation behaviors, (3) learning how to build adaptive capabilities and (4) learning from flood events. • Flood education should be delivered in communities on a regular basis and not as a one-off 'campaign'. • A 'local community flood education plan' is an effective way to deliver flood education to communities and parts of communities. Local flood education plans should be based on the four functions of flood education and developed by community representatives with authorities. • Flood education planning should be part of floodplain and emergency planning processes.

	• Emergency management agencies should act as 'consultants' to communities in flood education (e.g. as facilitators, resource providers, change agents, co-ordinators) rather than directing the change process in a 'top-down' manner. • Opportunities for the integration of flood education in cross-hazard (and cross-agency) programs and plans should be identified and implemented where possible. • Moreover, flood education programs and plans should be evaluated as they proceed to ensure continual improvement. The evaluation of community education plans and programs should involve the community or its representatives. Participatory evaluation involves local stakeholders in problem identification, evaluation design, data collection, analysis and use of results. **Some examples of education activities** to help communities and emergency agencies learn together from a flood event include: • Social research (e.g. surveys, focus groups) to find out how effective warning systems, evacuation, recovery support, flood education etc. are, and how they can be improved. Social research should be used as an important tool in the planning, implementation and evaluation of flood education programs and plans. • Community de-briefing meetings to identify problems in preparation, response and recovery and possible improvements. The **'traditional approach' of flood education**, still in widespread use, informed the community about floods and their risks through the dissemination of prepared material. The traditional approach is based on the premise that raising individual awareness will lead to preparedness which, as discussed above, is tenuous at best. Moreover, based on several evaluations, the traditional approach to flood education has been shown to be relatively ineffective in initiating appropriate preparedness and response behaviors. **A more participatory approach to community flood and other hazard education** is promoted by Paton (2006b): 'Participation in identifying shared problems and collaborating with others to develop and implement solutions to resolve them engenders the development of competencies that enhance community resilience to adversity'. In this participatory approach, emergency management agencies act more as facilitators to communities rather than directing change in a 'top-down' manner. They also can help the community build its capabilities (e.g. networks, leadership, competencies) for preparedness, response and recovery.
informal DRR educational programs based strongly on interactive concepts	**Educational game "Do not risk it!"**: The goal of the game is to present the basic concepts of natural disasters, mostly present in Serbia, as well as actions which are not recommended in certain situations. It is intended that by moving on the board, through incorrect and accurate answers, every player learns and / or strengthens his / her knowledge and skills, necessary both in daily life and in emergency situations. It is primarily intended for pupils in elementary schools. Although there is an acknowledged **increasing use of the Internet**, several social research studies of flood–affected communities have shown that **people generally use other means to learn about flooding**. Depending on the type of community (e.g. urban, rural, non-English speaking, indigenous), people learn about flooding mainly through word-of-mouth, events (e.g. field days), the media and through their groups and networks (e.g. newsletters). The exception to this trend is the relatively high number of hits on the Australian Bureau of Meteorology website where people are seeking weather forecasts, including flood warnings as an event unfolds. It also should be noted that the use of the Internet for flood information may be limited during floods due to electricity failures and inundation. The Internet should therefore be viewed as a useful repository of flood information and a reference but should not be used as a primary education tool, particularly to engage communities.

INTEGRATION OF SPONTANEOUS VOLUNTEERS

Practitioner Need	Experiences from Flood History, External Factors, Risk Management and Prevention
Integration of spontaneous volunteers in the existing guidelines	Pre-disaster, citizens could develop autonomous networks that would be able to respond in their community. The citizens would receive training to work in a hazardous environment, provide aid, and have access to appropriate equipment and supplies. This strategy is largely that of the **Community Emergency Response Team (CERT) program**. During a disaster, articulate needs and encourage emergence of independent efforts. This strategy is an outgrowth of what has largely occurred in the past. Appeals for assistance are observed or made through the media, and independent organizations work to meet those needs. This type of response was documented after Hurricane Andrew. Uncoordinated efforts can lead to miss-concentration of aid and duplication of resources. To reduce duplication and foster coordination, researchers found it is important to have defined organizational roles, task management, division of labour, and an overarching management system. Develop a system coordinated by the "formal" responders and pre-trained volunteers that can integrate a large number of spontaneous volunteers. This strategy essentially transforms spontaneous volunteers (individuals with or without specialized skills) into an assigned resource. We have seen this strategy implemented by individual organizations, but less often are volunteer needs and resources coordinated across organizations. There are often barriers to inter-organizational coordination such as differences in terminology, procedures, and operating structures. The institution should develop a plan for involving SVs that considers the effort, resource and information required, and provide guidance on how to: • identify risks associated with tasks that are suitable for SVs; • reduce risks associated with tasks that are suitable for SVs (**Guidance on risk assessment can be obtained from ISO 31000 and ISO/IEC 31010**) Associated risks include: minimum age, DBS checks, Insurance, the risks that emergency volunteering poses as untrained individuals**.** As such, many of the policies and guidance documents that consider the involvement of spontaneous volunteering highlight their suitability for low responsibility, low risk tasks. When conducting the risk assessment, the institution should identify the potential risks to the SVs, the persons affected by the incident, other official responders and the reputation of the organizations involved, as well as other risks.
Integration of spontaneous volunteers in Alert Concepts	No solutions identified
Identifying 'gatekeepers'	To use **socio-psychological knowledge** to influence a mental models and drivers of volunteer participation, such us *internal motivation* of SVs based on self-perception (includes the level of impact or control an individual feels they have in a situation) and *risk-perception* as a factor that can compel or constrain political, economic and social action to deal with threats. Also, use **resilience metrics** to assess **social learning** as an **adaptive capacity** to respond (assuming official response is fixed), as more people volunteer after hearing the positive experiences from the first wave.

	The literature proposes that spontaneous volunteers represent a form of hidden social resilience that, if appropriately directed, may help to reduce the immediate and on-going need created by emergencies and help to build more resilient communities in the face of future events. They may have been able to • coordinate a more successful evacuation and transportation effort, where instead thousands were unable or chose not to evacuate; • provide some structure and order in places like the Superdome and New Orleans Convention Center, where instead chaos reigned; • aid in organizing resources for distribution before and after the hurricane, where instead basic needs were left unmet for days; and • decrease some of the isolation and sense. It is time to bring local groups together in a concerted and coordinated effort to prevent future incidents of crisis-related chaos. In the end, facilitating local involvement in disaster preparedness and response is about far more than the provision of basic and logistical needs. It ensures that local voices are heard, local struggles are recognized, and the dignity of local people is respected. With this capacity established, local citizens can respond and recover in a manner that improves local life.

EARLY WARNING

Practitioner Need	**Experiences from Flood History, External Factors, Risk Management and Prevention**
Train the public in order to better interpret the warning messages	One of the clearest and most consistent conclusions of social science research is that the warning message itself is one of the most important factors in determining the effectiveness of a warning system. In large part, it is the **content and style of the actual warning message** that shapes the extent to which an endangered public engages in protective actions. For this purpose, planners might consider how this may affect the way authorities can reach those people with hazard information and emergency warnings. Women generally reported being less confident, but perhaps had more realistic views about being prepared while also reporting more household- and family-level cares, concerns, and preparedness behaviors in selected areas. Such a pattern may be underpinned, at least to some extent, by gender-specific roles linked to the household and to community access, leading to a state of affairs that lead to less ability to connect with active social networks within the community, coupled with being less informed and able to be involved in larger decision-making processes. <u>Recommendations:</u> (1) **Variations in the nature and content of warnings** have a large impact on whether or not the public heeds the warning. Relevant factors include the warning source, warning channel, the consistency, credibility, accuracy, and understandability of the message, and the warning frequency. (2) **Characteristics of the population** receiving the warning affect warning response. These include social characteristics such as gender_ ethnicity and age. social setting characteristics such as stage of life or family context, psychological characteristics such as fatalism or risk perception, and knowledge characteristics such as experience or training. (3) Many current myths about public response to emergency warning are at odds with knowledge derived from field investigations. Some of these myths include the "keep it simple" notion, the "crywolf" syndrome, public panic and hysteria, and those concerning public willingness to respond to warnings. (4) Different methods of warning the public are not equally effective at providing an alert and notification in different physical and social settings. Most systems can provide a warning given three or more hours of available warning time. Special systems such as tone-alert radios are needed to provide rapid warning.

The **public has a limited number of strategies available to use in responding to a warning**:

- One is to go about planned normal activities.
- The second is to seek more information.
- The third is to take some form of protective action.

These alternatives are not mutually exclusive. Persons frequently engage in all or some of these in response to warnings.

Protective actions themselves can also be divided into three alternatives:

- One is to take shelter in a structure or in protective clothing.
- A second is to move away from the area of likely impact.
- A third is to block or divert the impacts, as, for example, by sandbagging a river or using a protective mask in a toxic vapour cloud.

Five topics are important to consider in **assembling the content of a public warning message**. These topics are hazard or risk, guidance, Iocation, time, and source.

Sender factors that research has demonstrated as having an impact on the warning response process. These sender factors have been grouped into four categories. These categories are attributes of (1) the warning messages themselves, (2) the channels through which the messages are given, (3) the frequency with which messages are given, and (4) the persons or organizations that are the sources of the warning messages.

Increasingly **precise warnings** are required by disaster mitigation decision-makers. These require improvements for example in weather warnings as stated by Gunasekera (2004):

(1) extending the lead time of warnings;
(2) improving the accuracy of warnings;
(3) greater demand for probabilistic forecasts;
(4) better communication and dissemination of warnings;
(5) using new techniques to alert the public;
(6) targeting of the warning services to relevant and specific users (right information to right people at right time and right place); and
(7) warning messages are understood and the appropriate action taken in response.

Clear messages containing simple, useful information are critical to enable proper responses that will help safeguard lives and livelihoods. Regional, national and community level communication systems must be pre-identified and appropriate authoritative voices established. The use of multiple communication channels is necessary to ensure as many people as possible are warned, to avoid failure of any one channel, and to reinforce the warning message.

Without the **involvement of local authorities and communities** at risk, government and institutional interventions and responses to hazard events are likely to be inadequate. A local, 'bottom-up' approach to early warning, with the active participation of local communities, enables a multi-dimensional response to problems and needs. In this way, local communities, civic groups and traditional structures can contribute to the reduction of vulnerability and to the strengthening of local capacities.

The **risk assessment based on ISO 31000** should be conducted and should consist of technical, institutional, socioeconomic and cultural surveys of vulnerable communities:

- A **technical survey for risk identification** helps to understand physical conditions of vulnerable area, to classify the types and range of hazard, to collect information regarding the indicators of a disaster, and to determine

	vulnerable and safe zones. These indicators may be used to determine the placement of the early warning system instruments. • The purpose of an **institutional survey** is to understand whether there are established organizations currently responsible for monitoring and mitigating in the disaster-prone areas. • **Socioeconomic and culture surveys** collect information on community demographics, such as population, by age, education and financial situation, the number of households, vehicles and livestock, and cultural considerations. It also provides information on the community's knowledge concerning disasters. This information provides insight into the community's perception of disaster risk and disaster risk reduction means (technology, population preparedness, etc.) that can be used to improve the successful introduction of the early warning system and to gain an understanding of the community's vulnerabilities and complexities. <u>Recommendations:</u> (1) Information on potential vulnerable inhabitants and infrastructure due to disasters are important to determine the level of community vulnerability. (2) The community's eagerness and motivation to actively participate is relevant to design strategies for disaster risk reduction programs that are suitable for the local social conditions. (3) The programs can give knowledge and increase people's capacity to be able to decide what needs to be done in order to prevent and protect themselves from disasters.

SOCIAL MEDIA HANDLING

Practitioner Need	**Experiences from Flood History, External Factors, Risk Management and Prevention**
Train the public in using social media (raising public awareness)	Since social media usage is negatively correlated with age and positively with educational attainment, it is recommended to **identify the principles of communicating with the public**: • if there should be an official 'branded' social media presence to inform the local community, taking account of the public's expectations of receiving information via social media; • if it is desirable to engage early with citizens who establish popular social media channels relating to the incident e.g. to communicate official information; • if the organization will monitor or analyse social media for trends in conversations e.g. to identify shortfalls in response; • whether traditional media monitors and transmits information from social media. Emphasizing the undeniable advantages of using social networks in disaster risk management, decision makers could create certain programs to **improve citizen security and reduce disaster risks by using information platforms of social networks** such as Facebook, Twitter, and Instagram. Social networks (Facebook, Instagram, Twitter) can be used in different ways: listening to public debate, monitoring situations, extending disaster response and management, crowd-sourcing and collaborative development, creating social cohesion and furthering causes (including charitable donation) and enhancing research. Information relevant to emergency services should be identified, for example, from Twitter automatically during and following a natural disaster. In order to do that, an automated method of evaluating whether an individual tweet may be relevant for first responders following a natural disaster was developed and tested. The new algorithm resulted from iterative development and testing that assigns a relevance score to each tweet. **Social media can positively impact disaster relief efforts**. However, it does not provide an inherent coordination capability for easily coordinating and sharing information, resources, and plans among disparate relief organizations. Social Media can help build community disaster resilience. It offers immense potential for interaction with the public and monitoring of the public's concerns. They have greatly increased the scope, volume and speed of information

	exchange. This has not occurred without risks, mostly associated with the propagation of false or inaccurate information, and the potential consequences if this takes place. However, **mass participation tends to rectify some of the inadequacies** associated with the free and unregulated flow of information. The future will probably see a rationalisation of the use of social media and new methodologies for judging the public mood and the utility of information supplied by the public. This will be a challenge that emergency planners and managers must necessarily face. Decision-makers, as well as emergency response officers, should pay much more attention to social media use in reducing disaster risk. It can be ideal for **raising awareness of citizens about the existing dangers** which surround them, as well as for **educating them on preventive measures** in order to mitigate or eliminate the consequences of such events. Social networks can play a key role in **informing citizens**, gathering help for affected people, gathering people to help vulnerable ones. Certainly, the use of social networks can have serious negative consequences, such as spreading misinformation, raising an unnecessary level of fear. For example, it is possible to introduce citizens with risk maps in the areas they live in. In addition, it is possible to develop interactive and online campaigns to improve the readiness of citizens to respond in such situations. On that occasion, it is possible to use educational videos, photos, and text in the context of the hazards' characteristic of the area in which people live. Endangered people can also photograph and record a large number of details important for making final decisions about the treatment of members of the emergency rescue services. The obtained results of the research showed a great interest in the respondents for the use of social networks in order to **share information about disasters**. Numerous factors influence the motivation of people to share information during disasters, and one of them is certainly a concern for the safety of other people. In order to fully exploit the full potential of social networks, it is also necessary to educate citizens how they can help emergency rescue services in the implementation of activities aimed at reducing the disaster risk. In relevant strategies, both national and local, consideration should be given to the ability of social networks to reduce the risk of disasters.
Training for the professionals / personal in charge to handle SM (clear protocols)	There is a strong need for institutions such as civil protection services and emergency warning systems to be adapted to the changing reality of social media, and also to ensure that they have robust plans to tackle any ethical dilemmas that social media usage may produce in the future. Social media can be used by individuals and communities to warn others of unsafe areas or situations, inform friends and family that someone is safe, and raise funds for disaster relief. **Eight categories of social media tools** can be used: (1) social networking; (2) blogging; (3) microblogging; (4) collaborative authoring tools for sharing and editing documents; (5) social tagging and bookmarking; (6) scheduling and meeting tools; (7) conferencing; (8) image or video sharing. **Low level of social media use is likely due to a number of factors**. Emergency management groups may lack official support for the use of social media, and with it, the resources for the necessary staffing. This may take the form of policies and procedures that prohibit the use of social media. It may also be that formal command and control procedures make the use of social media difficult or impractical.

	Without personnel resources that are free during emergencies, groups may be unable to communicate with the audience following they build up during times of peace Additionally, social media practices during emergency response are perceived as sufficiently different than more routine forms of public communication. There are few **role models for how to use social media effectively during an emergency**. <u>Recommendations:</u> • Integration of examination of the ethics of social media usage in emergency management. • Appreciation of the positive side of social media is balanced by their potential for negative developments, such as disseminating rumours, undermining authority, the violation of privacy. Moreover, social media are a robust means of exposing corruption and malpractice. • To handle SM, specialists should heed the ethical warnings and ensure that social media are not abused or misused when emergencies occur.
Training in data handling	No solutions identified
train people involved in social media management about social media strategy	The authorities need to face the trend of using **international standards of using social media in emergency situation** and integrate social media into their work. Relevant International Standard specifies guidelines for a use of social media before, during and after an emergency and how social media can support the work of emergency services. On the one hand, these guidelines are directed to authorities (governmental as well as non-governmental organisations) involved in emergency management. On the other hand, they are directed to citizens who want to use social media in emergency situations. These guidelines shall help social media users to use these new media as efficiently as possible. Starting from some characteristics of disasters (unpredictability, destructive consequences, difficult functioning of critical infrastructure, etc.), social networks enable emergency response services to collect various information directly on the territory affected by the consequences of such events. These can be information on disaster characteristics such as the intensity of danger (water level and speed, soil bursting, etc.) and its impact on people and their material assets.
train Public Relationship Officers in Social Media management, Online marketing and Multimedia content management	No solutions identified
training of SM managers in basic data protection law	No solutions identified
Train the practitioners in the field to handle SM	The **association "Scientific-Professional Society for Disaster Risk Management"** is a Serbian (Belgrade) non-governmental organization that seeks to improve the existing supply of theoretical and empirical knowledge in the field of disaster risk management. It also seeks to conduct quantitative-qualitative research, organize national and international conferences, establish magazines, conducting trainings and other academic activities in the mentioned field.

5.2.4 Innovation Opportunities

The following table summarizes the matches between practitioner needs and identified solutions derived from the different fields "Solutions from Research and RDI Projects" (short name: research), "Solutions on the Market" (short name: market), "Best Practices and Lessons Learnt" (short name: best practice). Cells that are coloured green indicate that solutions were found. However, it does not give any feedback of the quantity and quality of the solutions. On the other hand, cells coloured in grey signify blind spots in the portfolio of available solutions.

During the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a further prioritisation was done reflecting the potential innovation opportunities. Thus, those practitioner needs that are marked with 'x' are our identified innovation opportunities that will be transferred to WP5 for the assessment. Within the column 'remarks' specifications according to the needs are given.

Table 3 Matches between practitioner needs and identified solutions

Practitioner Needs		Prioritisation from Belgrade Meeting	Remarks	Solutions from		
				Research	Market	Best Practice
Preparation of the public (citizens)	Formal DRR education programs to educate citizens from a young age	(x)	Not seen as problem since close cooperation with Ministry of Education or with-spread youth magazines for training on alerting does already exist.			
	Informal DRR educational programs based strongly on interactive concepts	-				
Integration of spontaneous volunteers	Include the integration of spontaneous volunteers in the existing guidelines	x	• In general: Meta-research needed for summarizing outcomes for various projects on SV handling • Better focus on specific target groups: e.g. simple tasks → „living sensors" • Inclusion of SV (or groups of SV with respect to their competences/ skills) in guidelines			
	Integration of spontaneous volunteers in Alert Concepts	x	(see above)			

	Identifying 'gatekeepers'	x	Training on better identification of Gatekeepers (leaders, even if self-appointed, within a group of spontaneous volunteer group who can organize the group).			
Early Warning	Train the public in order to better interpret the warning messages	(x)	Training on tailoring warning messages taking into consideration socio-demographic variables.			
Social Media handling	Train the public in using social media (raising public awareness)	(x)				
	Training for the professionals / personal in charge to handle SM (clear protocols)	x	Preparation of a code of conduct and a SM strategy plan.			
	Training in data handling	x	Set up a team of different specialist to gather and to filter in real time user generated data (information reliability), to create training data etc. Development of guidelines to integrate/ utilize services from VOST (Virtual Organisational Support Teams, kind of specialised digital volunteers) --> indication flash floods by "cloud watchers".			
	Train people involved in social media management about social media strategy	x	Preparation of a code of conduct and a SM strategy plan.			
	Train Public Relationship Officers in Social Media management, Online marketing and Multimedia	(x)				

	content management					
	Training of SM managers in basic data protection law	-				
	Train the practitioners in the field to handle SM	-	-seen as general skill			

5.2.5 Lessons Learnt

At the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a workshop on the assessment of RDI gaps and requirements of practitioners as identified and presented by the WP4 task leaders of T4.2 – T4.5 was conducted. The assessment was carried out by the participants as defined in WP5 tasks T5.3 – T5.5. The results from this first assessment can be seen as lessons learnt as they include a scoping and maturity check of the innovations opportunities identified in WP4.

Regarding the second topic 'Alerting and Communication' the following lessons learnt were highlighted:

- **Preparation of the public**: The participants agreed that the training of younger children needs close exchange with the Ministry of Education in order to reach schools respectively a majority of children and/or a close cooperation with widespread magazines.
- **Spontaneous volunteers**: In this regard, a lack of generic guidelines was identified. Thus, the creation of training programmes based on findings from concluded projects would be helpful. Deemed important is how to bring this to the hands of practitioners. Regarding the training of volunteers, it seems important that they are trained how to react in different situations. However, the participants agreed that only a limited scope of trainings (only necessary ones) is sensible. A good way to train volunteers might be to create common training sessions with professionals, that assume mentoring and cooperation rules. Moreover, it is important to ensure to train the volunteers how to use the equipment, to train how to self-rescue and to be self-sufficient. For the work of professional responders, it was highlighted that a volunteer monitoring system (smartphone tracking) including volunteers tasking might be useful. In this regard, the implementation of kind of target groups, i.e. pre-organised spontaneous volunteers that assume simple tasks e.g. being „living sensors" was recommended. However, good system (clear policy) for selection of candidates for volunteers for this task would be necessary.
- **Social media handling**: Virtual organisational support teams composed of experts with good access to various sources of information and with reliable filtering functions would be desirable. In the next step, some kind institutionalisation could be envisaged; for flash floods "cloud watchers" could be an idea. Regarding the training on social media, the following points seem to be particularly important: train communication officers how to educate using social media and how to analyse social media (big data) with respect to early warning. Moreover, citizens should be trained how to use social media to detect incidents. In this regard, the training should also encourage people to use social media. However, professionals should be trained how to detect fake messages from volunteers in this context.

5.3 TWG "Rescue Operations and Emergency measures"

5.3.1 Relevance of RDI Topic

"Rescue Operations and Emergency measures" are planned operations or organized procedures to bring affected out of danger, attack, harm, to protect assets and to mitigate damage and impact.

According to the flooding scenario, rescue operations and emergency measures can basically be applied to the following three-time horizons:

- ***Pre-flood*** tasks: one of the most important tasks: If you can train the pre-flood tasks and build up expertise, less investment is needed for 'during and post tasks' and 'the actual rescue operations'.
- ***During and post flood*** tasks: second most relevant tasks: no denying that training is important but trained leadership and good SOP's are equally important.
- **Actual *rescue operations***: *a*t number 3 of most relevant tasks: more and innovative training seems less relevant. These tasks are mostly institutionalised. Without the proper training, you won't be flying a helicopter or steering a boat.

Moreover, the entire subject area can be divided into different sub-topics listed below:

Air rescue

In some cases, air rescue might be needed. Therefore, specifically equipped helicopters need to be deployed, as well as specialized personnel.

Water rescue

Evacuations from flooded areas made via wading with rafts. Rescuing of trapped people, for example in cars or pressed against fences. This task requires special trained and equipped teams.

Boat operations

Besides supplying trapped peoples, or evacuating them or simply rescuing them, also securing of driftwood, or tanks, etc. might be necessary. Additionally, driving a boat through flooded areas also bears high risks that are not comparable with ordinary water rescue operations, standing waves, siphons, or wires could pose multiple threats for boats and their crews.

Flood Protection Measures (Preinstalled protective measures)

These measures have become quite common in larger cities to ensure a nice riverbank without much visual disturbances, but also provide efficient flood protection. Are there temporary/removable systems? Is there a clear plan / distinct responsibility behind these measures?

Levee Control

Levee and embankments are usually the main protective measures to protect lives and material goods. Compared to dams, dykes are not meant for a continuous and long-lasting impounding. Therefore, the control of such structures is needed to identify weakening or possible damages as early as possible.

Levee Defense

If a levee (or dam) is damaged or its structure weakened, it needs to be reinforced. Although building emergency dams could be summarized under this task. These activities involve often sand bags, however big packs and dedicated substitutes have been used more and more over the last years.

Evacuation

Due to failed levees or water levels too high to defend, there might be necessities to evacuate civilians from their properties. This could also mean that livestock needs to be moved to safer grounds.

Pumping operations

Pumping operations might be necessary to empty flooded buildings and structures; however, they are even more important in the aftermath of flooding to support or substitute damaged / malfunctioning sewage systems.

Removal of flotsam/log jams

Floods usually cause a lot of flotsam, which ranges from litter left in the flood plain, to entire trees, or even cars or houses. Besides obvious destructive effect of cars and houses although smaller flotsam can be a threat to infrastructure located at the stream. Particularly, log jams at bridges could cause problems and require fast actions. If not removed, these log jams could lead to further flooding due to the raise of the water level at the jam, or even lead to a failure of the affected bridge. For this scenario log jams and their removal should be in the focus.

Hygienic measures

An important aspect is hygiene in these situations. Primarily for the responders, but ultimately for everyone who might get in touch with the water or when the water sinks the remaining mud. The water during a flood contains often chemicals, such as diesel, or gasoline, and often the sewage systems are also affected leading to spillages of untreated waste water.

Given the fact that flooding bears high hygienic risks, it is important to provide sufficient information to those affected, but especially the inhabitants which have to clear their homes from any debris and might get exposed to any contaminated material. Further, a fast recovery of the sewage and drinking water systems is critical to reduce hygienic risks.

5.3.2 Practitioner Needs

The following table summarizes the results from the conducted survey as well as the outcomes from the 2nd RDI Workshop in Vienna where practitioners from different fields discussed several challenges within the defined domains. The third column indicates practitioner needs, which represent a first impression on potential innovation opportunities with respect to the training aspect. The ranking given in the fourth column is an indicator for the importance of each topic derived from the practitioner discussions at the 2nd RDI Workshop in Vienna. Thus, this ranking is not statistically reliable. Matching the practitioner needs with available solutions from research and RDI projects (cf. 4.1.3.1), products and solutions on the market (cf. 4.1.3.2), best practices and lessons learnt by practitioners (cf. 4.1.3.3) as well as experiences from flood history, external factors, risk management and prevention (cf. 4.1.3.4) will result in the actual innovation opportunities (cf. 4.1.4). These innovation opportunities will be the input for the RDI assessment and roadmapping done in WP5, which will generate the foundation for the 2nd DARENet RDI roadmap.

Domain	Challenges	Practitioner Needs with respect to 'Training'	Rank-ing
Air rescue actual *rescue perations*	Should be proper	Regular institutionalised training	C
	Training very expen-sive	VR(?), simulators (should be realis-tic!!!)	

Results from Questionnaire:

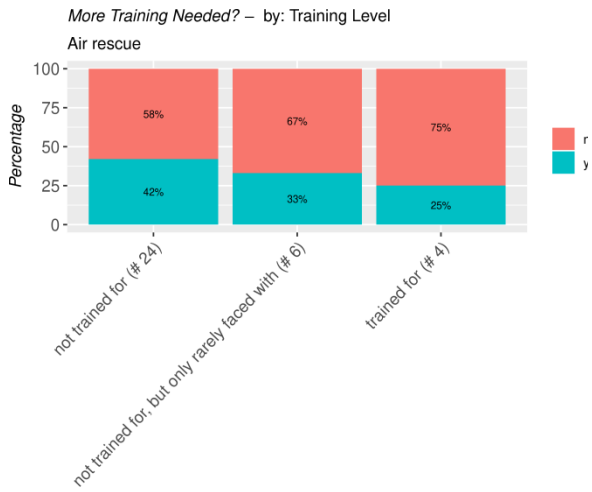


Figure 16: Lower demand for more training for trained personnel → air rescue as special operation.

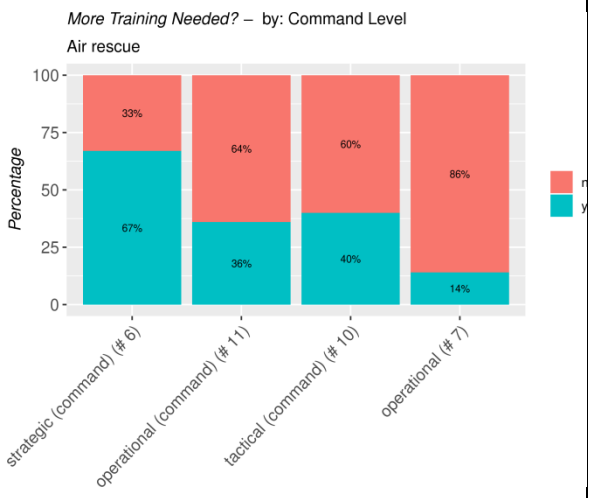
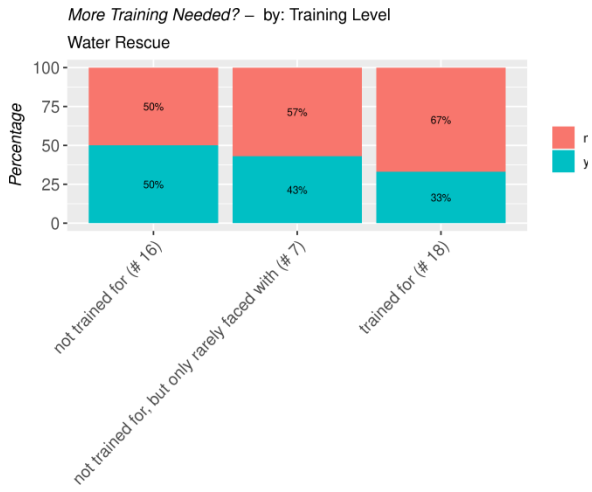


Figure 17: Higher demand on strategic level only.

Water rescue actual *rescue perations*	Should be proper	Regular institutionalised training	C
	Training very expen-sive	VR(?), simulators (should be realis-tic!!!)	

Results from Questionnaire:



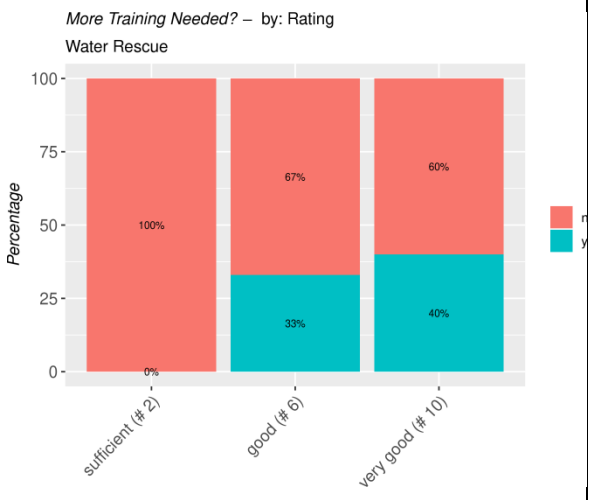
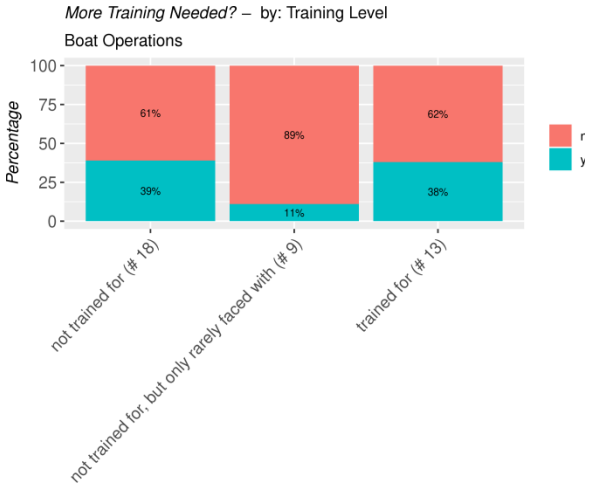


Figure 18: Lower level of demand for more training → less potential.

Figure 19: Improvement potential, only personnel facing good training opportunities demand for more training.

Boat operations actual *rescue operations*	Should be proper	Regular institutionalised training	C
	Training very expensive	VR(?), simulators (should be realistic!!!)	

Results from Questionnaire:



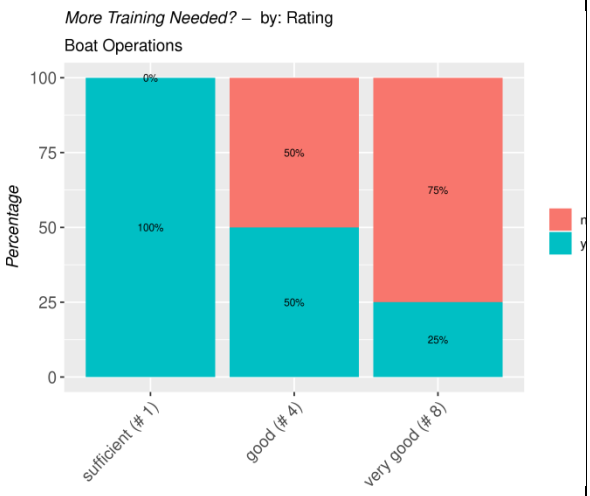


Figure 20: Low demand for more training for trained and untrained personnel.

Figure 21: Low demand for more training due to good quality for training → low potential.

Flood Protection Measures (Preinstalled protective measures) *pre-flood* task	Institutionalise risk assessment, early warning, personnel capabilities at all levels and SOP's. Invest in PPP (public-private-cooperation) with regards to materials, logistics and man power;	No discussion	B
	Spend more money on risk reduction and evaluation;	No discussion	B
	Establish pre-trained communication teams with a clear mandate	most part of the training efforts should be made to establish pre-trained crisis communication teams, with a clear mandate. This must be combined with community training to raise awareness and improve resilience	A
	More focus on evaluation	Evaluation based on debriefing → training (Crucial side effect of training → networking)	A

Results from Questionnaire:

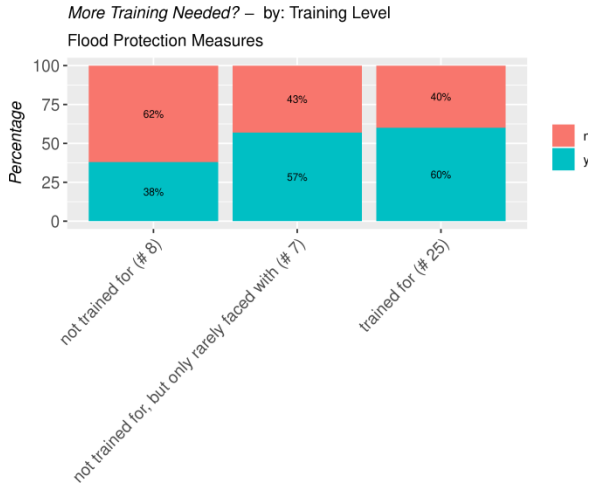


Figure 22: Lower demand for more training.

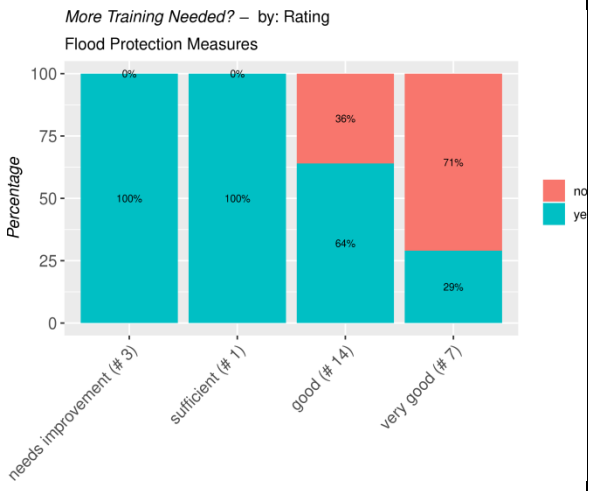


Figure 23: Less potential, rather good training opportunities seem to exist.

Levee Control *pre-flood* task	must happen early enough	Special training	A

Results from Questionnaire:

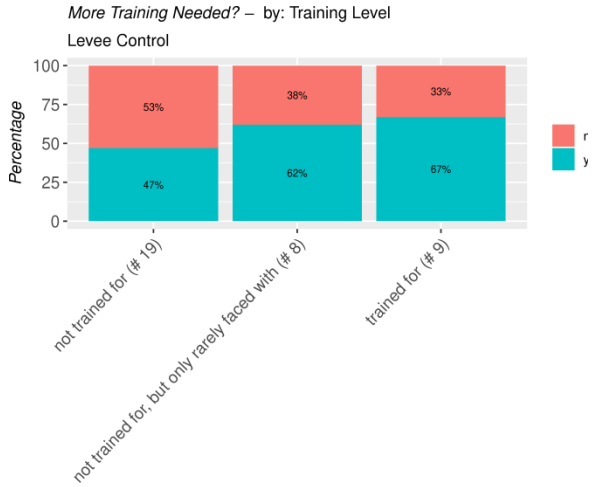


Figure 24: More demand for training for trained personnel.

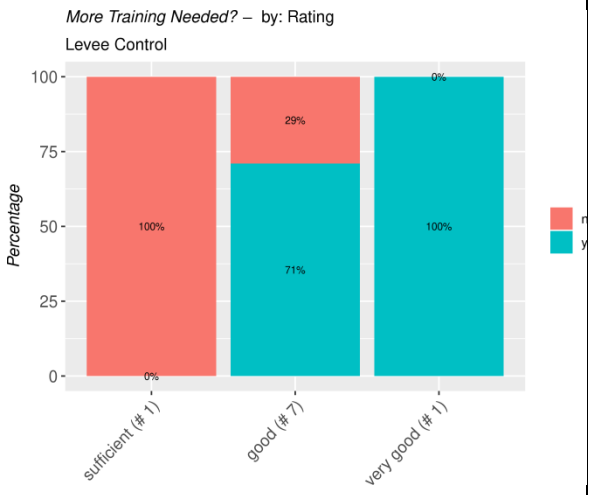


Figure 25: More demand for good quality training.

Levee Defence *pre-flood* task	Experts needed, but general: good SOPs and manager need	Special training	A

Results from Questionnaire:

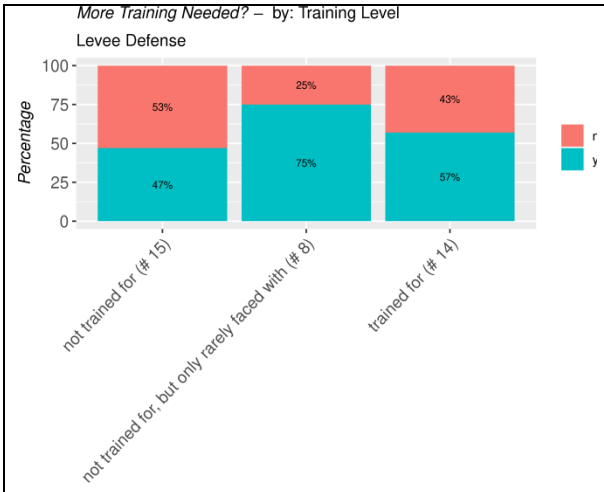


Figure 26: Rather high demand for more training.

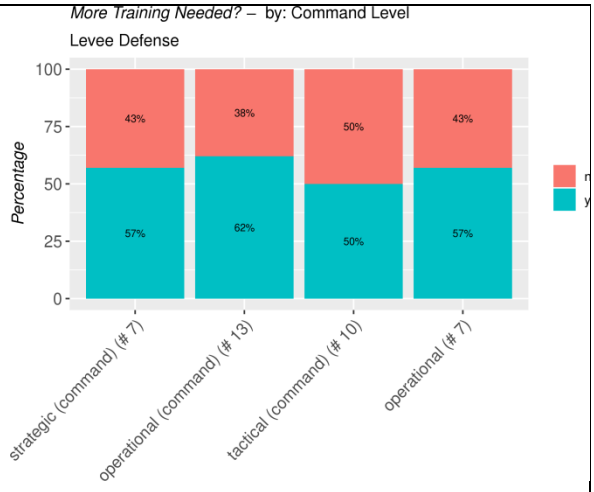


Figure 27: Constant high demand throughout all command levels.

Evacuation *during and post flood* task		No discussion	B

Results from Questionnaire:

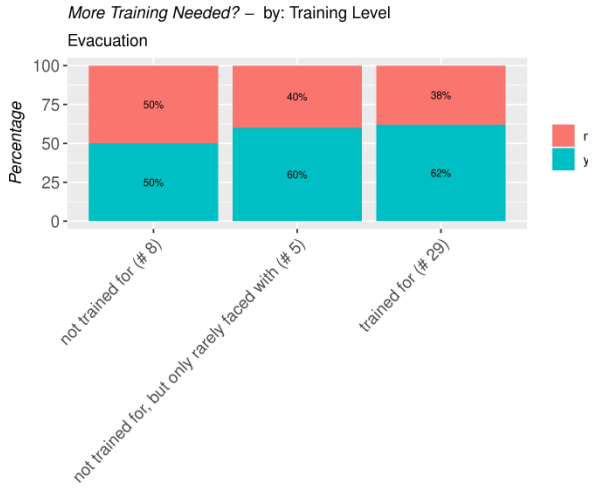


Figure 28: Higher demand for already trained personnel.

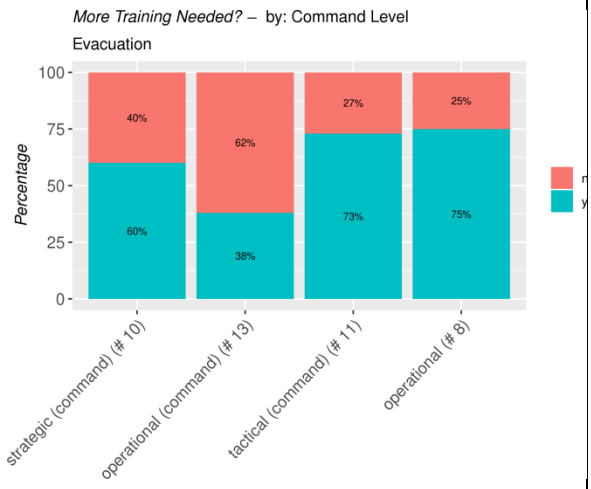


Figure 29: Higher demand for lower command levels.

Pumping operations *during and post flood* task		No discussion	B

Results from Questionnaire:

Figure 30: Low demand for more training for already trained personnel.

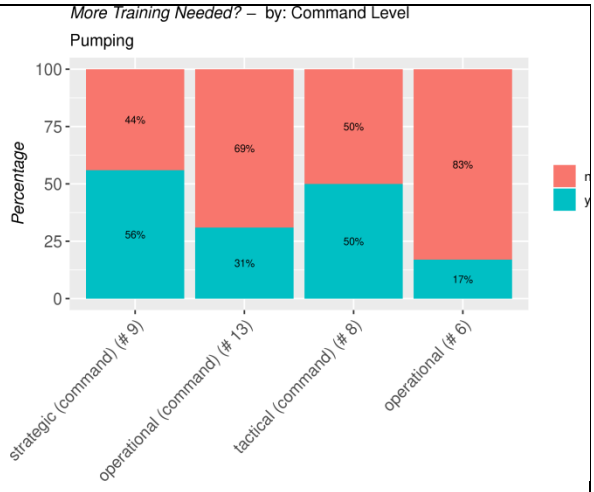


Figure 31: Higher demand for more training on strategic command level.

Removal of flotsam/log jams		No discussion	C

Results from Questionnaire:

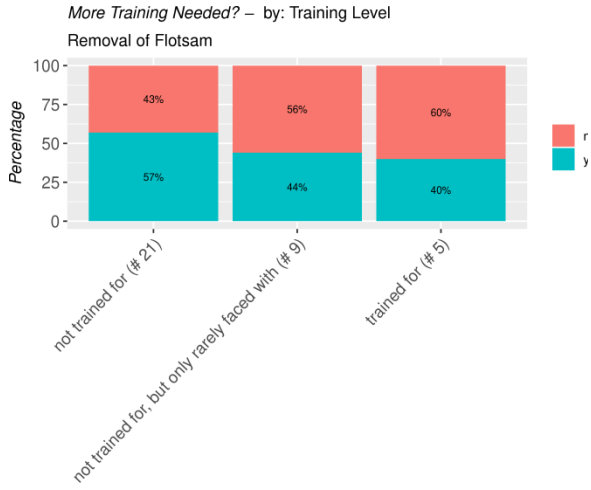


Figure 32: Higher demand for more training for untrained personnel.

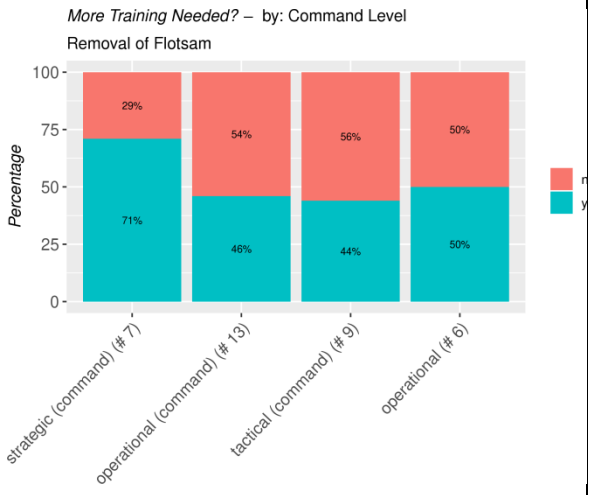


Figure 33: Higher demand for more training for strategic command level.

Hygienic measures *during and post flood* task		No discussion	B

Results from Questionnaire:

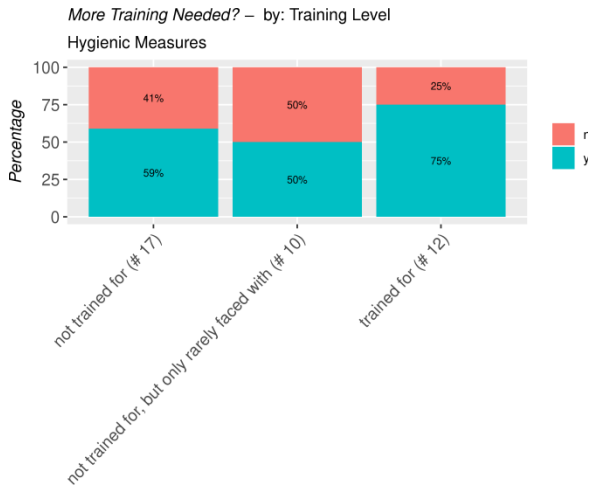


Figure 34: High demand for more training for already trained personnel.

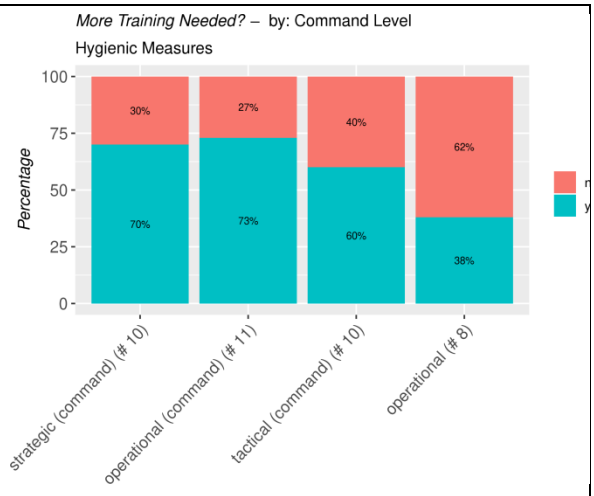


Figure 35: High demand for more training on higher command levels.

5.3.3 Available Solutions

Review on available solutions was made for the following practitioner needs:

1. Flood Protection Measures (Preinstalled protective measures)
   - **Community training for pre-trained crisis communication teams** with a clear mandate to raise awareness and improve resilience
   - Training on evaluations based on **debriefing** (networking)
2. Special trainings in **levee control/defence** (pre-flood task)

5.3.3.1 Solutions from Research and RDI Projects

FLOOD PROTECTION MEASURES (PREINSTALLED PROTECTIVE MEASURES)

Practitioner Need	Existing Solution	Location	Short description	Link
Community training for pre-trained crisis communication teams with a clear mandate	**Project "K3: Information and communication strategies for crises and disasters"**	Germany	Providing rapid, reliable assistance in crisis situations is a demanding task for all decision makers involved. The responding organisations make their decisions based on a wide range of information and they have to coordinate their activities closely. The K3 project was working on an organisational and technical strategy for crisis communication. Its aim was to improve information sharing not only within and between the relief organisations but also with the public. The project would also be the first to analyse how rumors spread and what effect warnings on social media have.	Link [21]
Training on evaluations based on debriefing			No solutions identified	

LEVEE CONTROL/DEFENCE

Practitioner Need	Existing Solution	Location	Short description	Link
Special training			No solutions identified	

5.3.3.2 Solutions on the Market

FLOOD PROTECTION MEASURES (PREINSTALLED PROTECTIVE MEASURES)

Practitioner Need	Existing Solution	Location	Short description	Link
Community training for pre-trained crisis communication teams with a			No solutions identified	

[21] Only available in German

clear mandate				
Training on evaluations based on debriefing			No solutions identified	

LEVEE CONTROL/DEFENCE

Practitioner Need	Existing Solution	Location	Short description	Link
Special training			No solutions identified	

5.3.3.3 Best Practice and Lessons Learnt by Practitioners

FLOOD PROTECTION MEASURES (PREINSTALLED PROTECTIVE MEASURES)

Practitioner Need	Existing Solution	Location	Short description	Link
Community training for pre-trained crisis communication teams with a clear mandate	**Preparing for effective communications during disasters: Lessons from a World Health Organization quality improvement project**	USA	A quality improvement project was undertaken to gather expert consensus on best practices that could be used to improve WHO protocols for disaster communication, prior to an event. The lessons learnt include: - Pre-writing public service announcements in multiple languages on questions that frequently arise during disasters; - maintaining a database of statistics for different regions and types of disaster; - maintaining lists of the locally trusted sources of information for frequently affected countries and regions; - maintaining email list serves of employees, international media outlet contacts, and government and non-governmental organization contacts that can be used to rapidly disseminate information; - developing a global network with 24-h cross-coverage by participants from each time zone; - and creating a central electronic SharePoint where all of these materials can be accessed by communications officers around the globe. **Article**: Laura N Medford-Davis and G Bobby Kapur, Preparing for effective communications during disasters: lessons from a World Health	

			Organization quality improvement project, Int J Emerg Med. 2014; 7: 15.	
	Information Management Course (IMC)	Europe	The overarching aim of the IMC is to facilitate assessment, coordination and decision-making during expert interventions through strengthened information management processes. Specifically, the course objectives are to improve the participants' understanding of how sound information management practices can facilitate the mission, increase and broaden their understanding and ability to apply standard information tools used in emergencies and identify best practices and share experiences in terms of information management. The course is formed around the information management cycle and is composed of theory, group work sessions and practical exercises based on realistic disaster scenarios.	Link
	Head of Team Course (HOT)	Europe	Head of Team Course (HOT) - Diplomatic behavior, political dynamics in disaster affected regions, relations with and between European institutions, relevant international agreements as well as Council and Commission Decisions and their impact on coordination during interventions inside and outside the European Union, the ability to interact effectively with the media in stressful situations as well as internal team management and -psychology and leadership are addressed in the course. These are subjects that demand the full commitment of the participants and extensive preparation.	Link
Training on evaluations based on debriefing			No solutions identified	

LEVEE CONTROL/DEFENCE

Practitioner Need	Existing Solution	Location	Short description	Link
Special training	**Emergency Preparedness Guidelines for Levees, A Guide for Owners and Operators**	USA	Emergency Preparedness Guidelines for Levees, A Guide for Owners and Operators including: **Workshop:** This is a discussion-based exercise often employed to determine objectives, develop scenarios, and define evaluation criteria in support of additional exercise activities. A workshop may also be used to familiarize staff with their roles and responsibilities, develop standard operating procedures (SOPs), or generate	Link

			improvement plans. To be effective, workshops must be highly focused on a specific issue, and the desired outcome must be clearly defined. **Table top Exercise:** This is a discussion-based exercise that typically involves key personnel discussing hypothetical scenarios in an informal setting. Participants are encouraged to discuss issues in depth and develop decisions slowly, avoiding the spontaneous decision making behaviors that often occur under actual or simulated emergency conditions. Players apply their knowledge and skills to a list of problems presented by the exercise facilitator, and the proposed solutions are discussed as a group. **Functional Exercise:** This is an operations-based exercise characterized by an actual response to emergency conditions. This type of exercise, in which movement of personnel and equipment is simulated, replicates operational realities through a scenario that requires rapid and effective response by trained personnel in a time-constrained environment. **Full-Scale Exercise:** This exercise includes all the elements of a functional exercise as well as actual deployment of field resources and engagement by outside parties, such as government agencies. This is an operations-based exercise in which personnel and resources are mobilized and deployed to the scene where they conduct their activities as if a real incident had occurred. This is the most resource intensive exercise format, and must be carefully controlled to ensure that persons who are not part of the exercise are informed and do not believe there is a real emergency.	
	European and US Levees and Flood Defences Characteristics, Risks and Governance	Europe	Implementations of EU Regulations River basin management and flood protection are organized according to the European Water Framework Directive (2000) as well as to the Floods Directive (2007) are the basis for river training measures and the organization of flood protection.	Link

5.3.3.4 Experiences from Flood History, External Factors, Risk Management and Prevention

FLOOD PROTECTION MEASURES

Practitioner Need	Experiences from Flood History, External Factors, Risk Management and Prevention
Community training for pre-trained crisis communication teams with a clear mandate	Crisis communication team members should be selected based on their knowledge and abilities in disaster preparedness, prevention, mitigation and post-disaster management. Crisis communication team should have expertise including knowledge of the disaster-prone area, data and information management, early warning and mass evacuation systems, logistics and security. The additional expertise required on the team should be determined according to the needs of the community. The dissemination of information should lead to the identification of key people with an interest in participating in a disaster preparedness team. The list of objectives for entering a risk communication program includes the following items: • enlightenment function (to improve risk understanding among target groups); • right-to-know function (to disclose information about hazards to potential victims); • attitude change function (to legitimate risk related decisions, to improve the acceptance of a specific risk source, or to challenge such decisions and reject specific risk sources); • legitimating function (to explain and justify risk management routines and to enhance the trust in the competence and fairness of the management process); • risk reduction function (to enhance public protection through information about individual risk reduction measures); • behavioural change function (to encourage protective behaviour or supportive actions toward the communicating agency); • emergency preparedness function (to provide guidelines for emergencies or behavioural advice during emergencies); • public involvement function (to educate decision makers about public concerns and perceptions); and • participation function (to assist in reconciling conflicts about risk-related controversies.
Training on evaluations based on debriefing	No solutions identified

LEVEE CONTROL/DEFENCE

Practitioner Need	Experiences from Flood History, External Factors, Risk Management and Prevention
Special training	No solutions identified

5.3.4 Innovation Opportunities

The following table summarizes the matches between practitioner needs and identified solutions derived from the different fields “Solutions from Research and RDI Projects” (short name: research), “Solutions on the Market” (short name: market), “Best Practices and Lessons Learnt” (short name: best practice). Cells that are coloured green indicate that solutions were found. However, it does not give any feedback of the quantity and quality of the solutions. On the other hand, cells coloured in grey signify blind spots in the portfolio of available solutions.

During the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a further prioritisation was done reflecting the potential innovation opportunities. Thus, those practitioner needs that are marked with 'x' are our identified innovation opportunities that will be transferred to WP5 for the assessment. Within the column 'remarks' specifications according to the needs are given.

Table 4: Matches between practitioner needs and identified solutions

Practitioner Needs		Prioritisation from Belgrade Meeting	Remarks	Solutions from		
				Research	Market	Best Practice
Flood Protection Measures (Preinstalled protective measures)	community training for pre-trained crisis communication teams with a clear mandate	(x)				
	Training on evaluations based on debriefing	x	Better Experience & Failure Management by (mandatory) de-briefing, documentation and identification of lessons learned.			
Levee Control/defence	Special training	(x)				

5.3.5 Lessons Learnt

At the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a workshop on the assessment of RDI gaps and requirements of practitioners as identified and presented by the WP4 task leaders of T4.2 – T4.5 was conducted. The assessment was carried out by the participants as defined in WP5 tasks T5.3 – T5.5. The results from this first assessment can be seen as lessons learnt as they include a scoping and maturity check of the innovations opportunities identified in WP4.

Regarding the third topic 'Rescue Operations and Emergency measures' the following lessons learnt were highlighted:

- **Flood protection measures**: Better experience and failure management, including a mandatory debriefing, documentation and identification of lessons learnt were recommended.
- **Dyke defence**: More universal training needed, e.g. in forms of a strict curriculum (which is to be developed).
- **Special operations**: The participants saw a need for more specialised training centres. Thus, Public Private Partnerships (PPP) might be a potential solution in order to overcome the financial constraints.

5.4 TWG "Logistics and Assistance"

5.4.1 Relevance of RDI Topic

"Logistics and Assistance" refers to supporting processes that are not a direct part of rescue operations. The following processes were considered in the discussions of the second DAREnet Roadmapping cycle:

Supplying

Due to the isolation of certain areas a basic supply with medical assistance, food and other goods might become necessary. This could also include shuttling of those enclosed to get to work, etc. This is a logistic challenge, which could be done using large (off-road) vehicles, or boats.

Sheltering

The evacuation requires also sheltering of the evacuees. And given the fact that most of the belongings had to abandoned, there is also a large need to supply them with clothing and convenience goods.

Stocking/Warehousing

How and where are materials stored? Who is responsible? How will they be made available? Are additional materials available do plans exist to organize sandbags, sand or other materials?

Supply/restoring infrastructure

Potable Water Waste, sewage, energy, but also medical supply or food

Psychological support

For the people affected by the flood, this often resembles a stressful situation, especially the high degree of uncertainty can be traumatic. A fast provision of psychological support can help to reduce later traumas.

Social care

Those who suffered massive losses to their property might require fast (financial) support, to get back into a normal and self-determined routines.

Securing evacuated areas

The evacuated perimeter needs to be secured against plunderers.

5.4.2 Practitioner Needs

The following table summarizes the results from the conducted survey as well as the outcomes from the 2nd RDI Workshop in Vienna where practitioners from different fields discussed several challenges within the defined domains. The third column indicates practitioner needs, which represent a first impression on potential innovation opportunities with respect to the training aspect. The ranking given in the fourth column is an indicator for the importance of each topic derived from the practitioner discussions at the 2nd RDI Workshop in Vienna. Thus, this ranking is not statistically reliable. Matching the practitioner needs with available solutions from research and RDI projects (cf. 4.1.3.1), products and solutions on the market (cf. 4.1.3.2), best practices and lessons learnt by practitioners (cf. 4.1.3.3) as well as experiences from flood history, external factors, risk management and prevention (cf. 4.1.3.4) will result in the actual innovation opportunities (cf. 4.1.4). These innovation opportunities will be the input for the RDI assessment and roadmapping done in WP5, which will generate the foundation for the 2nd DAREnet RDI roadmap.

Domain	Challenges	Practitioner Needs with respect to 'Training'	Ranking
Supplying	Important: "last 100 m" → special transport (boat, air, off-road vehicle) required, ref. rescue operations; everything before → basic warehousing	Combining supplying with: training on effective giving and gaining information in the field from SV, affected population etc.	B
		Empathic communication → ref. psychological support	C
Sheltering	Challenge: Running and deconstruction of shelter areas (esp. long term);	Training for instructors/ multiplications for tent/ field bed setup	A
	Running shelter areas: legal, ethic, security issues, hygienic measures, waste management, etc.	trained managers	
	Own process and long-term planning for deconstruction because of lack of resources (SV) in that phase	No discussion	

Results from Questionnaire:

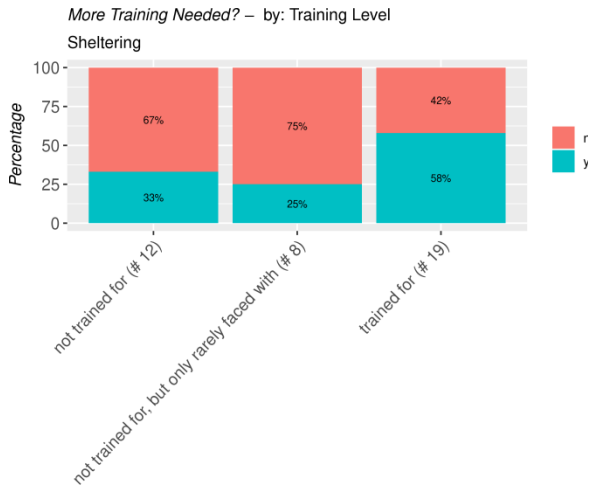


Figure 36: Higher demand for more training for trained personnel.

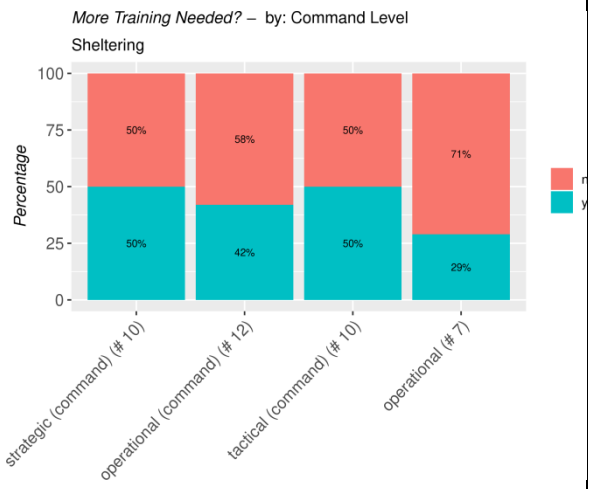


Figure 37: Medium demand for more training throughout all command levels.

Stocking/ Warehousing	Authorities flooded by (useless) in kind donations	Training on communication strategies to politely reject in kind donations, address (current) real	A

		needs and motivate for monetary donation	
	Warehousing aspects for general population	Training for general public with gamified approach/ smartphone app to raise resilience level, preparation aspects (warehousing at home)	B

Results from Questionnaire:

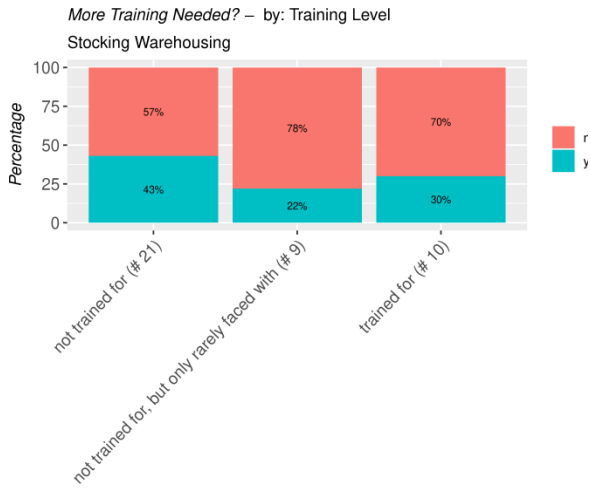


Figure 38: Rather low demand for more training.

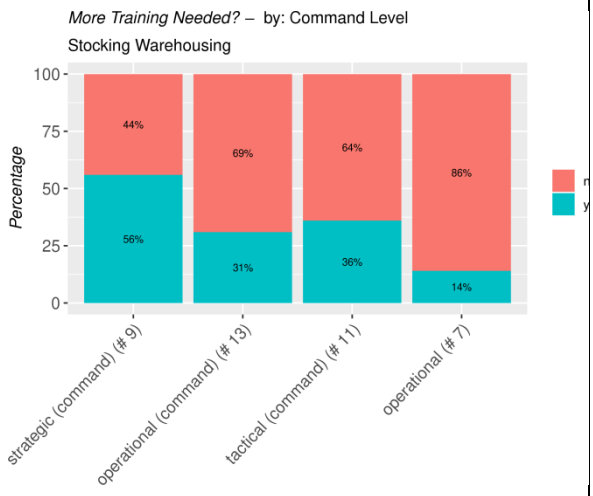


Figure 39: Low demand for more training on lower levels of command.

Supply/ restoring infrastructure	No issue from training point of view	No discussion	
Psychological support	Most relevant sub domain as it is critical for functioning of responses and prevention of long-term problems (suicides, illness, etc.); need more awareness for ethical, religious, cultural issues	Training on dealing with stress situations (for responders)	A
		Training for effected de-briefing and sharing experience → evaluation!	A
		Training on coping with disturbed affected population	B
		Combine psychological aspect with first aid training for general public	B

Results from Questionnaire:

Figure 40: Rather high demand for untrained personnel.

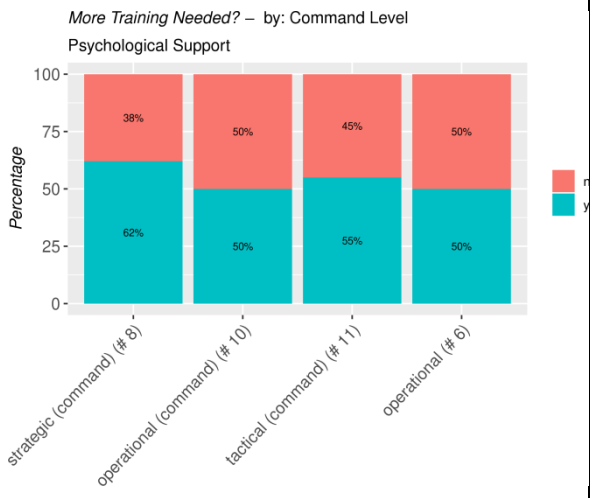


Figure 41:: Rather high demand on high levels of command.

Social care	No issue from training point of view	No discussion	

Results from Questionnaire:

Figure 42: Medium demand for more training.

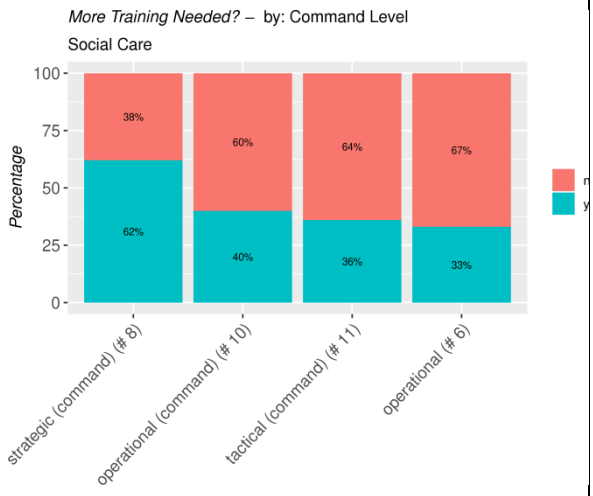


Figure 43: Higher demand for more training on higher levels of command.

Securing evacuated areas	No issue from training point of view; raise awareness for security related issues (information gathering)	No discussion	

Results from Questionnaire:

Figure 44: Medium demand for more training.

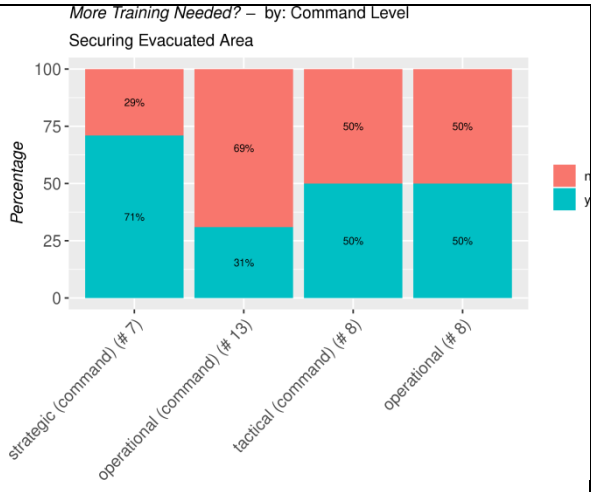


Figure 45: Higher demand for more training on higher levels of command.

5.4.3 Available Solutions

Review on available solutions was made for the following practitioner needs:

1. Sheltering
   - Training for instructors for **tent/ field bed setup**
2. Stocking/ Warehousing
   - **Training on communication strategies** to politely reject in kind donations, address (current) real needs and motivate for monetary donation
3. Psychological support
   - Training for responders on **dealing with stress situations**
   - Training for effected **de-briefing and sharing experience**

5.4.3.1 Solutions from Research and RDI Projects

SHELTERING

Practitioner Need	Existing Solution	Location	Short description	Link
Training for instructors for tent/ field bed setup			No solutions identified	

STOCKING/ WAREHOUSING

Practitioner Need	Existing Solution	Location	Short description	Link
Training on communication strategies to politely reject in kind donations, address (current) real needs and motivate for monetary donation			No solutions identified	

PSYCHOLOGICAL SUPPORT

Practitioner Need	Existing Solution	Location	Short description	Link
Training for responders on dealing with stress situations	**Project "REBEKA: Resilience of emergency service professionals affected by crisis situations"**	Germany	A large share of the people involved in civil protection and disaster management in Germany are volunteers. The BMBF research project REBEKA aimed to investigate and strengthen the resilience of disaster management organisations, based on the crisis scenarios of flooding and a power failure. One key area of the research was an analysis of what happens when the	Link [22]

[22] Only in available in German

			emergency services themselves are affected. A parallel examination of the organisational, social and psychological aspects was also being carried out. The findings would be used to devise structures and processes that will enable, in particular, ad hoc helpers to be integrated into the crisis response measures in an effective manner.	
Training for effected debriefing and sharing experience	**Project "PSYCRIS - PSYcho-Social Support in CRISis Management"**	Europe	With the overall objective to improve psycho-social support in crisis management, the proposed project PsyCris (36-months) has the following goals: (1) status quo analysis of psychological and medical support in crises in European countries, (2) improvement of support strategies for victims and crisis managers, (3) enhancement of psycho-medical preparedness for major incidents (contingency planning), (4) development of interventions to deal with stress and reduce stress related disorders of crisis management personnel and authorities, (4) providing efficient self-help strategies to communities affected by crises and (5) investigation of long-term psychosocial, societal and cultural impact of crises. Outcomes: - Analysis of current psychological and medical support in crises in Europe, improvement of support strategies and enhancing psychosocial preparedness with a particular focus on disaster management. - Toolkits that aim to develop competences and communities of practice. So far, case studies, recommendations and contingency planning have been developed based on common practices and actual experiences of end users. - A demonstrator for an interactive learning and networking platform is also being developed.	Link
	Project "PRAKOS: Practices and communication for active incident response"	Germany	Disasters such as storms or major accidents can affect anyone. The response to such incidents depends on various factors, including how those involved perceive and handle the situation. This can differ considerably from region to region and is mainly determined by previous experience and personal preparedness. By looking at specific incidents, the research partners on the PRAKOS project were identifying the	Link 23

[23] Only available in German

			aspects of risk culture that result in efficient responses. Knowledge about specific risk culture types provides a basis upon which to formulate precise instructions to help ensure an effective response to major incidents.	

5.4.3.2 Solutions on the Market

SHELTERING

Practitioner Need	Existing Solution	Location	Short description	Link
Training for instructors for tent/ field bed setup			No solutions identified	

STOCKING/ WAREHOUSING

Practitioner Need	Existing Solution	Location	Short description	Link
Training on communication strategies to politely reject in kind donations, address (current) real needs and motivate for monetary donation			No solutions identified	

PSYCHOLOGICAL SUPPORT

Practitioner Need	Existing Solution	Location	Short description	Link
Training for responders on dealing with stress situations			No solutions identified	
Training for effected debriefing and sharing experience			No solutions identified	

5.4.3.3 Best Practice and Lessons Learnt by Practitioners

SHELTERING

Practitioner Need	Existing Solution	Location	Short description	Link
Training for instructors for tent/ field bed setup	**MODEX Exercises**	Europe	**MODEX Exercises** where the modules can work together. The emergency temporary shelter can train themselves through these exercises. ***Assessment Mission Course (AMC):*** The Assessment Mission Course (AMC) is a specialised course for experts in the field of emergency management likely to be involved in international civil protection interventions where assessment activities are to be expected. While on mission, experts are engaged by the European Commission to carry out their tasks by assisting local authorities in close cooperation with the UN and other international organisations on site. The core objective of the course is to enhance participants' competences to implement all necessary assessment working steps, by e.g. utilising common assessment tools and collecting, processing and disseminating data in a humanitarian aid and civil protection environment. In addition, the assessment teams will be trained to draft and implement an assessment mission plan.	Link

STOCKING/ WAREHOUSING

Practitioner Need	Existing Solution	Location	Short description	Link
Training on communication strategies to politely reject in kind donations, address (current) real needs and motivate for monetary donation	**Course on Negotiation and Decision-Making (CND)**	Europe	The Course on Negotiation and Decision-Making (CND) aims to strengthen experts' capacities to use appropriate methods for managing decision-making processes both within the team and with external partners, and for interacting and negotiating effectively and professionally with a wide range of actors in the disaster management arena, showing sensitivity to local politics and cultures. The core objectives of this course are to prepare the participants to manage a decision-making process and to negotiate with different stakeholders in challenging and politically sensitive situations, in order to achieve the mission aims defined by the terms of reference.	Link

PSYCHOLOGICAL SUPPORT

Practitioner Need	Existing Solution	Location	Short description	Link
Training for responders on dealing with stress situations	**The SELAH volunteer network**	Europe	**The SELAH volunteer network: a model of outreach** Beside it covers other domain, some of the initiative could be implement in Disaster Risk Reduction context.	Link
Training for effected debriefing and sharing experience	**Assessment Mission Course (AMC)**	Europe	The Assessment Mission Course (AMC) is a specialised course for experts in the field of emergency management likely to be involved in international civil protection interventions where assessment activities are to be expected. While on mission, experts are engaged by the European Commission to carry out their tasks by assisting local authorities in close cooperation with the UN and other international organisations on site. The core objective of the course is to enhance participants' competences to implement all necessary assessment working steps, by e.g. utilising common assessment tools and collecting, processing and disseminating data in a humanitarian aid and civil protection environment. In addition, the assessment teams will be trained to draft and implement an assessment mission plan.	Link

5.4.3.4 Experiences from Flood History, External Factors, Risk Management and Prevention

SHELTERING

Practitioner Need	**Experiences from Flood History, External Factors, Risk Management and Prevention**
Training for instructors for tent/ field bed setup	The evacuation shelter should be located in a place considered safe from disasters based on the technical risk assessment: • Public buildings are encouraged to be used as shelter. • The evacuation route should be accessible to and from the evacuation shelter in all directions on foot and/or by vehicles. • In some situations it might be necessary to shelter in place. According to the situation, immediate evacuation may not be necessary. Shelter in place is only possible if the location is in the safe zone.

STOCKING/ WAREHOUSING

Practitioner Need	**Experiences from Flood History, External Factors, Risk Management and Prevention**
Training on communication strategies	

PSYCHOLOGICAL SUPPORT

Practitioner Need	Experiences from Flood History, External Factors, Risk Management and Prevention
Training for responders on dealing with stress situations	According to literature review there is a **lack of mental health preparedness in the majority of countries**. Valid and reliable tools and context-bound programs should be developed based on the experiences and perceptions of the community. **Psychological First Aid (PFA)** as a disaster intervention tool has demonstrated a positive effect on mental health preparedness in disaster condition. Natural disaster funding needs to include psycho-social retrieval, which is a crucial component of restoring individuals' and communities' well-being and mental health. People should be provided with the information about the probable responses they might have. Some countries have established a national instruction program for mental health interventions both as a tool and strategy for improving preparedness in disasters and for enhanced protection of property, life, environment, improved community safety, physical well-being, mental health, and the ability to sustain the well-being. First responders should be trained to deal with stress when coping with different audience including victims and vulnerable people as well as other actors who respond to emergency, i.e. spontaneous volunteers. All **spontaneous volunteers' involvements** should be considered for psychological support in emergency response regarding their supervision and care. There is an enhanced duty of care towards young volunteers, reflecting their relative immaturity. According to **NATO guidance on "PSYCHOSOCIAL CARE FOR PEOPLE AFFECTED BY DISASTERS AND MAJOR INCIDENTS"** the minimum key actions or objectives that are required of staff that are planning the psychosocial and mental health service responses to disasters include: • Integrating psychosocial and mental healthcare responses within the grand plan for preparing for and responding to disasters; • Fully integrating psychosocial and mental healthcare responses, usually sequentially; • Appointing psychosocial and mental health advisers to commanders of responses to major incidents and disasters; • Empowering communities and people; • Attending to the basic needs of the population first; • Planning and enacting a good public risk communication and advisory strategy that involves the public and the media and which provides timely and credible information and advice; • Ensuring staff are capable of working with diversity of values and cultures; • Ensuring that the psycho-social and mental health responses are comprehensive and stepped according to need, are of sufficient duration and are well co-ordinated; • Allocating and managing roles for mental health professionals; they should be well lead, managed, supervised and cared for; and • Promoting learning by planning and managing knowledge acquisition and its transfer, evaluation and performance management.
Training for effected de-briefing and sharing experience	No solutions identified

5.4.4 Innovation Opportunities

The following table summarizes the matches between practitioner needs and identified solutions derived from the different fields "Solutions from Research and RDI Projects" (short name: research), "Solutions on the Market" (short name: market), "Best Practices and Lessons Learnt" (short name: best practice). Cells that are coloured green indicate that solutions

were found. However, it does not give any feedback of the quantity and quality of the solutions. On the other hand, cells coloured in grey signify blind spots in the portfolio of available solutions.

During the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a further prioritisation was done reflecting the potential innovation opportunities. Thus, those practitioner needs that are marked with 'x' are our identified innovation opportunities that will be transferred to WP5 for the assessment. Within the column 'remarks' specifications according to the needs are given.

Table 5: Matches between practitioner needs and identified solutions

Practitioner Needs		Prioritisation from Belgrade Meeting	Remarks	Solutions from		
				Research	Market	Best Practice
Sheltering	Training for instructors for tent/ field bed setup	(x)	Training for instructors/ multiplications.			
Stocking/ Warehousing	Training on communication strategies	-				
Psychological support	Training for responders on dealing with stress situations	x	VR-/ serious gaming-based exercises for training on psychological support of practitioner → stress/ unplanned situations, cascading effects, information loss, etc.			
	Training for effected debriefing and sharing experience	x	Better Experience & Failure Management by (mandatory) de-briefing, documentation and identification of lessons learned.			

5.4.5 Lessons Learnt

At the DAREnet Consortium Meeting in Belgrade from November 21-22, 2019, a workshop on the assessment of RDI gaps and requirements of practitioners as identified and presented by the WP4 task leaders of T4.2 – T4.5 was conducted. The assessment was carried out by the participants as defined in WP5 tasks T5.3 – T5.5. The results from this first assessment can be seen as lessons learnt as they include a scoping and maturity check of the innovations opportunities identified in WP4.

Regarding the fourth topic 'Logistics and Assistance' no lessons learnt were identified.

6 Conclusions

The present deliverable D4.4 describes the current status of entries within the DAREnet Knowledge Base separated according to the relevant topics “Solutions from Research and RDI Projects”, “Solutions on the Market”, “Best Practices and Lessons Learnt” as well as “Flood History and Background Information” at the end of the second DAREnet roadmapping cycle. Moreover, the deliverable gives the final findings of work from each DAREnet Topic Working Group related to the selected RDI Topics of the second cycle. These topics are “Coordination, Command and Control”, “Alerting and Communication”, “Rescue Operations and Emergency measures” and “Logistics and Assistance” with respect to provide potential innovation opportunities following a scenario-based approach that focus on training aspects of diverse domains of flood management during the entire disaster management cycle. The results are summarized in form of detailed reports that are clustered under the aspects of “Relevance of the RDI Topic”, “Practitioner Needs”, “Available Solutions”, “Innovation Opportunities” and “Lessons Learnt”. The expertise within the TWG was collected through intensive research and with the help of the DAREnet National Contacts (DNC) through expert interviews with national actors of disaster management using a survey. The data were subsequently reviewed and analysed.

Again, a key result from the work of WP4 within the DAREnet roadmapping cycle is the derivation of innovation opportunities, which will provide a direct input for the next step in the roadmapping cycle, where the identified results will be taken up by the Innovation Assessment done in WP5. The main goal of WP5 is to assess and prioritise the innovation opportunities in the DAREnet Knowledge Base and to prepare the first version of the RDI Roadmap.

Annexes

ANNEX 1: Survey for DAREnet's Second Roadmapping Cycle

2nd Research, Development and Innovation Topic Working Group Workshop

Fields marked with * are mandatory.

Welcoming

DAREnet Danube River Region Resilience Exchange network

The DAREnet project aims at strengthening flood resilience in the entire Danube river basin. Therefore, the practitioners' view on needs and innovations is essential. In order to collect this knowledge and allow for collaborative work, we have invited groups of people from different domains, organisations and countries to join this webinar.
The webinar is based on a realistic flood scenario. We would like to concentrate on the aspect of training for different actions and specific tasks. In this context, we want to use this questionnaire to derive requirements or current gaps in the training of practitioners as well as promote discussions on possible (training) solutions. Additionally, we would like to discuss the outcomes with some participants during a workshop on 24 – 25 Sept. 2019 at the "Lagezentrum" of the Austrian Red Cross (ÖRK) in Vienna/ Austria.
The outcome of the entire process will be a set of high-potential Research, Development and Innovation (RDI) opportunities. Finally, this portfolio will form a publicly available road map for exploring the development of common capabilities and support national and European Policy Makers towards future innovation strategies in the Danube River Region.

Personal Information (voluntarily)

Your private details may be helpful when searching for certain needs or solutions. For future DAREnet activities we also plan to involve members of the Community to participate in workshops and meetings, and if we know how to reach out we may get in touch you.
In general, these information will not be shared publically and the statistical evaluation of the data will be fully anonymous.

Here you can provide your name:

1

And your email address:

Please state your nationality for statistical reasons.

- Germany
- Austria
- Slovakia
- Hungary
- Croatia
- Serbia
- Romania
- Bulgaria
- Other

Please specify 'other' country:

Civil Protection Experience

This information will be kept strictly anonymous.
However, for the evaluation of the questionnaire we will need to get an idea of the experience and expertise
of the responding community. Therefore, please provide your personal civil protection, crisis management or flood management background.
Thank you!

Your personal experience

* Indicate your experience as practitioner

- less than 2 years
- 2-5 years
- 5-10 years
- 10-15 years
- 15-20 years
- more than 20 years

* On which command/operational level are you usually serving?

operational - "boots-on-the-ground"
operational (command) - bronce
tactical (command) - silver
strategic (command) - gold

- operational
- operational (command)
- tactical (command)

2

- strategic (command)

*From what angle will you answer the questions?

- from a personal point of view/experience
- from an organizational point of view

Description of your organization

*Please name your organisation

To which group of actors does this organization belong to?

- (Civil Protection) Responders
- Academia
- Industry / Solution Providers
- NGOs
- Public Authorities
- Political Stakeholders
- Public
- International Aid
- Civil Military Cooperation

Importance of tasks and activities you and/or your organization are faced with

How important do you consider the following tasks to be?

Coordination, Command and Control

	high relevance	medium relevance	low relevance	no relevance at all
Coordination, Command and Control				

Alerting + Communication

	high relevance	medium relevance	low relevance	no relevance at all
Alert concept				
Early warning				
Social media handling				

3

Integration spontaneous volunteers				
Preparation of the public (citizens)				

Rescue Operations + Emergency Measures

	high relevance	medium relevance	low relevance	no relevance at all
Air rescue				
Water rescue				
Boat operations				
Flood protection measures				
Levee control				
Levee defense				
Evacuation				
Pumping				
Removal of flotsam/ log jams				
Hygienic measures				

Logistics + Assistance

	high relevance	medium relevance	low relevance	no relevance at all
Sheltering				
Stocking/ warehousing				
Supply/ restoring infrastructure				
Psychological support				
Social care				
Securing evacuated area				

Here you can download a table that elaborates our understanding of the various tasks and activities.

Training of tasks and activities you and/or your organization are faced with

4

What is your level of training regarding the tasks listed below?

Coordination, Command and Control

	trained for	not trained for	not trained for, but only rarely faced with	never faced with
Coordination, Command and Control	○	○	○	○

Alerting + Communication

	trained for	not trained for	not trained for, but only rarely faced with	never faced with
Alert concept	○	○	○	○
Early warning	○	○	○	○
Social media handling	○	○	○	○
Integration spontaneous volunteers	○	○	○	○
Preparation of the public (citizens)	○	○	○	○

Rescue Operations + Emergency Measures

	trained for	not trained for	not trained for, but only rarely faced with	never faced with
Air rescue	○	○	○	○
Water rescue	○	○	○	○
Boat operations	○	○	○	○
Flood protection measures	○	○	○	○
Levee control	○	○	○	○
Levee defense	○	○	○	○
Evacuation	○	○	○	○
Pumping	○	○	○	○
Removal of flotsam / log jams	○	○	○	○
Hygienic measures	○	○	○	○

5

Logistics + Assistance

	trained for	not trained for	not trained for, but only rarely faced with	never faced with
Sheltering	○	○	○	○
Stocking/ warehousing	○	○	○	○
Supply/ restoring infrastructure	○	○	○	○
Psychological support	○	○	○	○
Social care	○	○	○	○
Securing evacuated area	○	○	○	○

Here you can download a table that elaborates our understanding of the various tasks and activities.

Coordination, Command and Control

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning

6

- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Alert Concept

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

7

What is the training style?

- presence
- e-learning
- blended learning

How do you rate the training?

- very good
- good
- sufficient
- needs improvement

What should/could be improved?

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Early Warning

What training does prepare for these tasks/activities?

Where is the training provided?

- centralized facility
- decentralized facility

At what level is that facility located?

- at a regional level
- at a national level
- by your organization

8

☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Social Media handling

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility

9

- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Integration spontaneous volunteers

10

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

11

Anything you would like to add?

Preparation of the public (citizens)

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes

12

- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Air rescue

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

13

What should/could be improved?

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Water rescue

What training does prepare for these tasks/activities?

Where is the training provided?

- centralized facility
- decentralized facility

At what level is that facility located?

- at a regional level
- at a national level
- by your organization
- other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- presence
- e-learning
- blended learning

14

How do you rate the training?

- very good
- good
- sufficient
- needs improvement

What should/could be improved?

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Boat operations

What training does prepare for these tasks/activities?

Where is the training provided?

- centralized facility
- decentralized facility

At what level is that facility located?

- at a regional level
- at a national level
- by your organization
- other (3rd party)

Could you please name the third party?

How long does the program take approximately?

15

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Flood protection measures

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

16

How long does the program take approximately?

What is the training style?

- presence
- e-learning
- blended learning

How do you rate the training?

- very good
- good
- sufficient
- needs improvement

What should/could be improved?

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Levee control

What training does prepare for these tasks/activities?

Where is the training provided?

- centralized facility
- decentralized facility

At what level is that facility located?

17

- [ ] at a regional level
- [ ] at a national level
- [ ] by your organization
- [ ] other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ( ) presence
- ( ) e-learning
- ( ) blended learning

How do you rate the training?

- ( ) very good
- ( ) good
- ( ) sufficient
- ( ) needs improvement

What should/could be improved?

Do you think there is more training needed?

- ( ) yes
- ( ) no

If you think so, what would you wish for?

Anything you would like to add?

Levee defense

What training does prepare for these tasks/activities?

18

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

19

Evacuation

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

20

Anything you would like to add?

Pumping

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

21

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Removal of flotsam/ log jams

What training does prepare for these tasks/activities?

Where is the training provided?

- centralized facility
- decentralized facility

At what level is that facility located?

- at a regional level
- at a national level
- by your organization
- other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- presence
- e-learning
- blended learning

How do you rate the training?

- very good
- good

22

- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Hygienic measures

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence

- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Sheltering

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

24

How long does the program take approximately?

What is the training style?

- presence
- e-learning
- blended learning

How do you rate the training?

- very good
- good
- sufficient
- needs improvement

What should/could be improved?

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Stocking/ warehousing

What training does prepare for these tasks/activities?

Where is the training provided?

- centralized facility
- decentralized facility

At what level is that facility located?

- at a regional level
- at a national level
- by your organization

25

☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Supply/ restoring infrastructure

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility

26

- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Psychological support

27

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes
- ○ no

If you think so, what would you wish for?

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Anything you would like to add?

Social care

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

What should/could be improved?

Do you think there is more training needed?

- ○ yes

29

- ○ no

If you think so, what would you wish for?

Anything you would like to add?

Securing evacuated areas

What training does prepare for these tasks/activities?

Where is the training provided?

- ○ centralized facility
- ○ decentralized facility

At what level is that facility located?

- ☐ at a regional level
- ☐ at a national level
- ☐ by your organization
- ☐ other (3rd party)

Could you please name the third party?

How long does the program take approximately?

What is the training style?

- ○ presence
- ○ e-learning
- ○ blended learning

How do you rate the training?

- ○ very good
- ○ good
- ○ sufficient
- ○ needs improvement

30

What should/could be improved?

Do you think there is more training needed?

- yes
- no

If you think so, what would you wish for?

Anything you would like to add?

Anything you want to add?

Thank you so much for your valuable time!

As the very last part of this long questionnaire, we offer you the opportunity to provide us with any information that you would like to share with us. This might be any need, challenge or even idea to improve flood management in the region for the future...

Your comments:

Confirmation

* By submitting this questionnaire, I accept DAREnet's provisions on privacy and data protection.

I agree that the DAREnet consortium evaluates and discusses the content of the questionnaire. I understand that identified innovation opportunities or proposals cannot be directly implemented or financially supported by the DAREnet project. The mission and budget of DAREnet do not allow this. However, as part of the DAREnet roadmap the project will actively support identified opportunities in

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discussions with regional, national and European policy-makers.

DAREnet_2nd_RDI_TWG_WS_-_Privacy_and_data_protection_-_final.pdf

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ANNEX 2: Brief explanations for the identified tasks and activities of the DAREnet flood scenario

Coordination, Command and Control

Coordination, Command and Control

This sums up general CCC questions once it is known that the respective area will or might be hit by a disaster. In this scenario a significant flood is expected, which will impact an extend area and will challenge the exchange of information, situational awareness and cooperation of different CCC structures.

Alerting + Communication

Alert Concept

Are there sufficient concepts to alert responders and related other actors in a timely manner?

Early Warning

Are there systems installed to provide timely and accurate warnings to the public and authorities? Who has access to this kind of data?

Social Media handling

During the last couple of years, the importance of self-organized activity of the public as well as the relevance of possible false information becomes obvious. Another aspect of social media would also be crowd sourced information gathering and the effective integration in situational awareness management. Both aspects might be challenging for the responders.

Integration of spontaneous volunteers

Flood events in the last decades demonstrated the willingness of people not associated to responding authorities or organizations to become active and support response measures. For those in charge of the operations, this is a challenging situation, since there are organizational questions which need to be solved as well as the lack of training and equipment. However, in uncritical environments and labour intensive tasks, these could support the response efficiently.

Preparation of the public (citizens)

Is the public aware of the flood risk? Are there programs to prepare the public? Do evacuation routes exist? Does the public know?

Rescue Operations + Emergency measures

Air rescue

In some cases, air rescue might be needed. Therefore, specifically equipped helicopters need to be deployed, as well as specialized personnel.

Water rescue

Evacuations from flooded areas via wading with rafts. Rescuing of trapped people, for example in cars or pressed against fences. This task requires special trained and equipped teams.

Boat operations

Besides supplying trapped peoples, or evacuating them or simply rescuing them, also securing of driftwood, or tanks, etc. might be necessary. Additionally, driving a boat through flooded areas also bears high risks that are not comparable with ordinary water rescue

operations, standing waves, siphons, or wires could pose multiple threats for boats and their crews.

Flood Protection Measures (Preinstalled protective measures)

These measures have become quite common in larger cities to ensure a nice riverbank without much visual disturbances, but also provide efficient flood protection. Are there temporary/removable systems? Is there a clear plan / distinct responsibility behind these measures?

Levee Control

Levee and embankments are usually the main protective measures to protect lives and material goods. Compared to dams, dykes are not meant for a continuous and long-lasting impounding. Therefore, the control of such structures is needed to identify weakening or possible damages as early as possible.

Levee Defense

If a levee (or dam) is damaged or its structure weakened, it needs to be reinforced. Although building emergency dams could be summarized under this task. These activities involve often sand bags, however big packs and dedicated substitutes have been used more and more over the last years.

Evacuation

Due to failed levees or water levels too high to defend, there might be necessities to evacuate civilians from their properties. This could also mean that livestock needs to be moved to safer grounds.

Pumping operations

Pumping operations might be necessary to empty flooded buildings and structures. But even more important in the aftermath of flooding to support or substitute damaged / malfunctioning sewage systems.

Removal of flotsam/log jams

Floods usually cause a lot of flotsam, which ranges from litter left in the flood plain, to entire trees, or even cars or houses. Besides obvious destructive effect of cars and houses although smaller flotsam can be a threat to infrastructure located at the stream. Particularly, log jams at bridges could cause problems and require fast actions. If not removed, these log jams could lead to further flooding due to the raise of the water level at the jam, or even lead to a failure of the affected bridge. For this scenario log jams and their removal should be in the focus.

Hygienic measures

An important aspect is hygiene in these situations. Primarily for the responders, but ultimately for everyone who might get in touch with the water or when the water sinks the remaining mud. The water during a flood contains often chemicals, such as diesel, or gasoline, and often the sewage systems are also affected leading to spillages of untreated waste water.

Given the fact that flooding bears high hygienic risks, it is important to provide sufficient information to those affected, but especially the inhabitants which have to clear their homes from any debris and might get exposed to any contaminated material. Further, a fast recovery of the sewage and drinking water systems is critical to reduce hygienic risks.

Logistics + Assistance

Supplying

Due to the isolation of certain areas a basic supply with medical assistance, food and other goods might become necessary. This could also include shuttling of those enclosed to get to work, etc. This is a logistic challenge, which could be done using large (off-road) vehicles, or boats.

Sheltering

The evacuation requires also sheltering of the evacuees. And given the fact that most of the belongings had to abandoned, there is also a large need to supply them with clothing and convenience goods.

Stocking/Warehousing

How and where are materials stored? Who is responsible? How will they be made available? Are additional materials available do plans exist to organize sandbags, sand or other materials?

Supply/restoring infrastructure

Potable Water Waste, sewage, energy, but also medical supply or food

Psychological support

For the people affected by the flood, this often resembles a stressful situation, especially the high degree of uncertainty can be traumatic. A fast provision of psychological support can help to reduce later traumas.

Social care

Those who suffered massive losses to their property might require fast (financial) support, to get back into a normal and self-determined routine.

Securing evacuated areas

The evacuated perimeter needs to be secured against plunderers.