DARE net

Practitioner Network to Strengthen Flood Resilience in the Danube Region

Public Report

Research, Development and Innovation Roadmap 1st Edition

Based on internal project deliverable
D5.1 DAREnet RDI Roadmap (V1)

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Executive Summary

General aim of the DARENet project is improve flood resilience in the Danube River region. One of the main goals is to collect needs of practitioners, to analyse identified gaps, to specify challenges and prepare initiatives for next steps, everything with focus to innovations and state of the art in particular areas.

The key-document summarising these activities is the present Research, Development and Innovation (RDI) Roadmap, which is filtering most promising opportunities, assessing them from different perspectives and provides a first selection of recommended innovation opportunities.

This document contains the main findings and outputs from the first DARENet roadmapping cycle, addressing the fields of

- Civil Protection Training
- Civil Protection Methods, Procedures and Technology
- Spontaneous Volunteers
- Resilience of Citizens
- Communication and
- General Data Management.

For each RDI topic, three to four innovation opportunities were selected and elaborated further regarding type of innovation opportunity as well as regional relevance, budget efforts, time constrains, usability and risks, as well as the stakeholder groups are envisioned to address the opportunities.

This document represents the first edition of an RDI roadmap. Over the course of the DARENet project there will be 3 following editions publishing innovation opportunities which are expected to improve flood resilience in a sustainable way.

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1. Introduction

Based on the European Commission's findings from the time before this project, in Europe, practitioners interested in the uptake of security research and innovation are dedicated to performing their duty and to focusing on their operation. In general, practitioners' organisations have little means to free workforces from daily operations, and to dedicate time and resources to monitor innovation and research that could be useful to them. They have little opportunities to interact with academia or with industry on such issues. All stakeholders – public services, industry, academia – including those who participate in the Security Advisory Group, recognise it as an issue.

The DAREnet project reflects these gaps and is to support flood management practitioners across the EU Danube River Danube River region and from different disciplines to deepen and broaden their Research, Development and Innovation (=RDI) related collaboration. DAREnet is building a multi-disciplinary community of practitioners, operating in a network of civil protection organisations, and supported by a broad range of stakeholders

Figure 1: The DAREnet Roadmapping cycle

from policy, industry and research. Together they are building a transnational and interdisciplinary ecosystem to foster synergies, innovation and its uptake.
The overall objective of the H2020 project DAREnet is to analyse future challenges and needs (see DAREnet Public Report Challenges and RDI Topics). In a next step gaps and innovation opportunities are identified with regards to flood and disaster management in the area of the Danube River basin. Therefore, a cyclic approach was chosen, as visualised in figure 1.
One of the key-results of DAREnet is a regularly updated RDI Roadmap highlighting promising innovation opportunities to strengthen flood resilience of the region. The Roadmap is the collaborative result of a systematic assessment and prioritisation of identified gaps, innovation opportunities as well as promising innovations, including standardisation.

This is the first edition of the DAREnet RDI Roadmap. This document summarises the innovation opportunities or gaps identified by the six topic working groups installed in the first DAREnet cycle.

These six working groups focussed on the topics:

- Civil Protection Training
- Civil Protection Methods, Procedures and Technology
- Spontaneous Volunteers
- Resilience of Citizens
- Communication and
- General Data Management

In each working group various aspects have been discussed, resulting in three to four aspects per working group in this roadmap. In total 20 innovation opportunities varying in types of innovation (e.g. comparative studies or development of new technical solutions) are listed, here.
The Roadmap presented here also builds the base for the “DAREnet’s Call for Practitioner Initiatives”, leading to a portfolio of innovation ideas formulated by practitioners within and beyond DAREnet communities. These practitioner initiatives will be widely disseminated by the DAREnet project, promoting this essential project outcome to competent policy makers and funding programmes from national to European level, and aiming at their translation into concrete innovation projects.

2. Methodology behind the Roadmap

Objective of this document are 20 innovative opportunities which have been identified during previous project activities. All 20 opportunities have been put into standardised forms - “opportunity sheets”, described and assessed from many sides and prioritised. Finally, based on these activities, version 1 of the Roadmap has been edited summarising the work in the first DAREnet Cycle.
During this the first cycle of the DAREnet project, the basic infrastructure was established, as well as the National Networks to reach out to the relevant stakeholders and collect needs and knowledge. Therefore, the participation within the working groups was almost limited to representatives of the partners.
The input for the RDI assessment and roadmapping process was generated through working groups, dedicated to specific topics and aspects. During a Topic Working Group workshop in Cluj-Napoca, Romania in May 2018, challenges and needs were matched with existing solutions collected by the DAREnet partners in a project knowledge repository. These results were combined in an extensive report and served as basis for the work on the Roadmap.
This work lead to the list of RDI topics assigned to the six working groups, as follows:

During the work on the DAREnet RDI Roadmap, it was decided to create a separate document for each described aspect (so called “opportunity sheets”). Each opportunity sheet was circulated among the DAREnet partners contributing to the Roadmap to ensure the detailed assessment process. This approach enables DAREnet to collect contributions from many experts and to bring them together in a clear and simple document and creates conditions for systematic work and standardised procedures.

During this process the innovation opportunities were assessed for

- Classes of innovation types
- Practitioner needs
- Their level of maturity and reliability
- Against the DAREnet terms of reference
- Against other external factors

and based on the results of these assessment steps they were finally prioritised within their group (i.e. in the aforementioned table 1 they are ranked with the most important/easiest to achieve being the first one of each group).

T1 - Civil Protection Training
Harmonisation to (multi-)national needs
Interconnection of existing training programmes
Training standards
T2 - Civil Protection Methods, Procedures and Technology
Inter-institutional and transboundary cooperation
Drones (UAVs) in flood monitoring
Levee monitoring operations
T3 - Spontaneous Volunteers
Review of existing concepts/standards
Clarification of open jurisdictional and organizational questions
Interaction with Spontaneous Volunteers - training and preparation of responders
International exchange of lessons-learned and best practices
T4 - Resilience of Citizens
Enhancing communication risk of local communities and local public bodies
Customised education campaigns
International web platform
T5 - Communication
Communication systems based on 3G/4G/5G standards; frequency management
Interoperability for voice and data transmission between different systems
Optimisation of reliability and availability of communication networks and services
Secured non-public communication systems
T6 - General data management
Availability and reliability of information
Interoperability between various (transnational) systems
Standardisation of data formats

Table 1: Table of Innovation opportunities and topic groups

3. Innovation Opportunities

In the following, the 20 identified innovation opportunities are listed and described in the context of the corresponding working group. Besides the individual "ranking" within the topic groups, it is also illustrated which type of innovation opportunity (see tab. 4), regional relevance, budget efforts, time constrains, usability and risks, as well as the stakeholder groups are envisioned to address the opportunities (see tab. 5). The illustrations of tables 4 and 5 reduce the complexity of the result of 20 different working sheets. Tables 2 and 3 provide legends of the applied symbology.

3.1 Civil Protection Training

3.1.1 Harmonisation to (multi-)national training needs

There are numerous specific training programs within the Danube River region, but mostly on national/organizational level. At this point it would be beneficial to identify commonalities and harmonisation potential.
A three-step approach would be needed to harmonise individual training programs:

1. Identifying training programs
2. Comparing addressees and contents
3. Identifying possible aspects for harmonization

The Danube River is the second longest river in Europe and flows through 10 countries, making the cooperation of the countries concerned to protect life, health and property by citizens, as well as the environment more than necessary. In this area the collaborative approach is the most important to reach a harmonisation among all relevant stakeholders.

3.1.2 Interconnection of existing training programs

There are number of specific training programs within the Danube area, but mostly on national/organisational level. To increase the efficiency and interoperability of trained experts, an enhanced exchange and cooperation between training providers would be beneficial.
The establishment of a (virtual) Joint Training Centre for the Danube River region could foster the exchange. This would potentially strengthen common trainings and exercises.

3.1.3 Training standards

"Training standards" can strengthen civil protection organisations and increase the overall quality of their training. Experience showed that even existing programmes are usually not "interconnected" in a way that they are harmonised ("tuned") to (multi-)national needs. In multinational events differences within the organisation of the civil protection framework might also add difficulties. On the scene, in case of a real event, that kind of disharmony (incapability and different level of professional competence) can be hindering towards fast and efficient response and create "weak points (links)" especially in cross border operations.

However, developing internationally accepted standards also requires a well-established system of cooperation. The aforementioned aspects could prepare the grounds for any standardization activity.

3.2 Civil Protection Methods, Procedures and Technology

3.2.1 Inter-institutional/-organisational and transboundary cooperation

Effective frameworks need to be established to enable efficient cooperation in the Danube region. Therefore, necessary core information needs to be identified and easy to use protocols need to be developed, to ensure an easy exchange of all information relevant to practitioner safety and the mission's success.

The first step would be a Memorandum of Cooperation, like most countries installed bilaterally with their neighbouring countries. However, these political documents still require the establishment of common procedures.

For mutual cooperation and for future development like most identified aspects, but this one in particular is highly relevant for the entire European Union.

3.2.2 Drones (UAVs) in flood monitoring operations

Taking into account that flood situations are usually events which effect wider areas, fast and reliable reconnaissance is needed. Especially, if the disaster scene spreads multiple kilometres which need to be monitored (e.g. the condition of levee structures). Further, a highly damaged dyke might also pose a risk to those inspecting it. Therefore, automated Unmanned Aerial Vehicles (UAVs), able to identify and monitor weakness and damages would be a great addition to common approaches.

Therefore, drones could improve flood monitoring operations as the general situation, dam/levee condition, or search for missing persons. Additionally, this technology could be used for environmental questions (such as ship accidents) or the general monitoring of the Danube. While this topic addresses promising technological needs, certain other aspects like jurisdictional or training questions arise.

3.2.3 Levee monitoring operations

As of now, levee monitoring is a physical task performed in person by responders on-site. They search for damages or observe the wetness/water saturation of the structures. Since a high-water saturation in the main levee body influences the levee stability and could lead to significant damages if not breaches, some kind of remote or automatised monitoring would be a significant improvement to modern levee defence operations.
This is a highly technical innovation opportunity that requires dedicated research but could enhance the safety and efficiency of future operations.

3.3 Spontaneous Volunteers

3.3.1 Review of existing concepts/standards

The universal common understanding of the term "spontaneous volunteers" (SV) as defined by ISO 22319:2017[1] should be clarified, since there is no universal understanding of the term yet. Distinct concepts, based on the standard or other projects, are available. It should be thoroughly reviewed if they are fully applicable to individual responding agencies and organizations or if there are adaptations from the practitioner side needed.

3.3.2 Clarification of open jurisdictional and organisational questions

These might be questions on liabilities and responsibilities of the agencies and organizations involved, as well as general open jurisdictional and organizational questions, such as, who is in charge to interact with Spontaneous Volunteers (SVs), or who pays for required infrastructures (such as mobile phone applications) etc. An important aspect might also be the question of insuring and covering SV while involved in response measures.

3.3.3 Interaction with Spontaneous Volunteers (SV) - training and preparation of responders

Training and preparation of responders to interact efficiently with SVs should be broadly implemented. Due to the unknown state of SV health, mental, physical status or the training received, nor the (protective) equipment available their involvement is challenging for the practitioners. engaging actively with them. To create a safe and effective working environment integrating SVs, it is necessary to develop training programs for management capacities of responders. However, besides these generalised topics, country or organisation specific aspects need to be evaluated and respected in future approaches.

[1] ISO 22319:2017, Security and resilience -- Community resilience -- Guidelines for planning the involvement of spontaneous volunteers (https://www.iso.org/standard/66951.html)

3.3.4 International exchange of lessons-learned and best practices

International experiences regarding SV involvement and training concepts should be exchanged as of lessons-learned and best practices. This should also include a synthesis of latest research results and identification of innovative and practicable approaches. Given the various difficulties in SV involvement this could also increase the international acceptance, as well as strengthening the common understanding of the SV concept.

3.4 Resilience of Citizens

3.4.1 Enhancing risk communication of local communities and local public bodies

Enhancing local risk communication before, during and after a flood event will improve the public understanding of risk. Also, effective risk communication increases the susceptibility towards further measures, such as preparatory trainings. Therefore, it could significantly enhance the citizens' resilience and reduce damages and losses. Especially during an event efficient and well conducted communication could improve the effectiveness of any measures.

3.4.2 Customised education campaigns

Education material to educate citizens (e.g. for schools and teachers to educate children and teenagers) about flood related risks and ways to protect and help themselves could significantly increase the resilience of the public. Thus, it could be an innovation opportunity to offer solutions in terms of the education curriculum. In terms of reducing the risk of flood disasters, schools should become increasingly important subjects for creating and improving the safety culture of young people, which also refers to their enabling for responding to natural disasters caused by floods.
Gaps have been identified mainly in preparation of educational material for elementary and secondary schools and in the field of civil protection (in general), both at international and local level. Attractive information campaigns could also set incentives for (self) education.

3.4.3 International web platform

Linked to the topic of "Resilience of Citizens" it has to be taken in account that internet is the first source, where citizens are searching for answers to their questions. The quality level of the accessible information is crucial to attract people and to support them with useful information. One basic requirement is to keep the information up to date.
It would be beneficial to provide citizens with a reliable international web platform (site) as an "one-stop-shop" in which all relevant materials to educate and prepare citizens for flood disasters.

3.5 Communication

3.5.1 Communication systems based on 3G/4G/5G standards; frequency management

Since communication is a crucial element in disaster response, enhancement of existing solutions to available state-of-the-art technologies in relation to information transfer is desired.

Especially during spatial events, like floods the exchange of information between various stakeholders and over large distances is a constant requirement. This covers voice as well as data exchange in good quality, e.g. clean audio transmissions and sufficient bandwidths for data exchange.

3.5.2 Interoperability for voice and data transmission between different systems

Nowadays the number of communication tools is rapidly increasing. There is a demand for a tool, which can cumulate multiple sources of communication (voice, chat, image transfer, screen sharing, internet connection, remote access, etc.) and make it as easy as possible for practitioners to access them.

These issues leave space for scientific and innovative approaches to address it.

3.5.3 Optimisation of reliability and availability of communication networks and services

The most important and immediate need is to improve the quality and reliability of the signal to avoid outages and connection failures. Responders who understand and trust their communication networks feel safer and more confident. Therefore, highly reliable and available communication networks and services, are needed. For example, uninterruptible power supply / back-up for more than 30 hours and improved quality and reliability of the signal to avoid outages and connection failures, but also the possibility to enlarge capacities quickly if needed.

This reflects a very technical innovation opportunity. But it would also be necessary to identify obstacles why state-of-the-art technologies are not used.

3.5.4 Secured non-public communication systems

In emergency situations, such as flood events, it is highly desirable to have communication tools not accessible for the public. It can significantly ease work of responders and to avoid further potential of damage or harm to peoples' life or livelihoods, for example due to self-organised actions (using social media, etc.) based on intercepted radio calls. Therefore, separate communication systems where information transfer is possible only for approved persons / organisations is needed.

3.6 General Data Management

3.6.1 Availability and reliability of information

In general, the availability and reliability of information, but also access to relevant information (targeted exchange) is a topic which has been raised regularly by responders. Regarding the access to information, open-source solutions are likely to grow significantly as a viable alternative to proprietary suppliers. The open source geospatial community, for instance, already has a well-established infrastructure through the Open Source Geospatial Foundation (OSGeo). The drive by governments towards greater acceptance of open-source solutions may remove many of the perceived barriers to wider adoption, as the value will grow as more users adopt these solutions and will feed back improvements. Special interests are in software/algorithms to develop and share a common operational picture.

3.6.2 Interoperability between various (transnational) systems

The participating countries have their own systems with a wealth of useful information. Identification of distinct gaps from bottom-up is needed to develop a smooth collaboration of related data management systems. Development of ways and tools to reach their interoperability from all perspectives would enhance practitioner capabilities.
Further, the ability to use national experience and information is the first and essential step in international and interinstitutional cooperation and mutual exchange of information between states.

3.6.3 Standardisation of data formats

The aim should be to provide common standards for better use with legacy systems as well as solutions under development and to the future actions. Common standards create conditions for effective collaboration of different data management systems and on different levels as well as from regional / national point of view. It can directly affect level of usefulness of different databases. Standardization is crucial for interoperability and data transmission, but also creates conditions for growth and quality raise as well as its quantification.

3.7 Summary of the RDI topics

This section offers a summary of the mentioned RDI topics (see tables 4 and 5). The tables illustrate which type of innovation opportunity as well as regional relevance, budget efforts, time constrains, usability and risks, as well as the stakeholder groups are envisioned to address the opportunities. These tables reduce the complexity of the result of 20 different working sheets.
Since not all identified opportunities are of the same type, e.g. academic studies or pure technical solutions, opportunity types were introduced to mark the expected types after the assessment process. To provide an easy understanding of the approach they will be explained upfront to the summarizing tables. Of course, innovation opportunities are not limited to the expected type. The innovation opportunity types are defined as follows:

Comparative study
Comparative study means an in depth meta study of existing solutions, concepts or procedures, to identify commonalities and differences.

Academic research and development
This type of study goes beyond a meta study and aims at a full R&D project on academic level.

Conceptual work
This means the development of new concepts addressing practical issues.

Development of new solutions
Here development of any type of solution is meant without the necessary need for a full-on academic study. This could be for example the development of a demonstrator or even a prototype.

Realization of technical solutions
Here the realization of existing concepts (going beyond the state of a prototype) is meant, this could be the next step of an R&D project.

Strategic alliances
This could be institutionalised agreements between organisations or authorities.

Exchange of good practices
This summarises all endeavours to exchange experiences or lessons identified.

Training concepts
This could be new concepts or as a result from an exchange of lessons-identified, making them lessons-learned.

Joint training /Exchange programs
This goes beyond the aforementioned points since it requires collaboration of two or more parties.

Common exercises
Here exercises of more than two parties are meant, mainly to train and test collaboration and interoperability.

Standards
This is not limited to full standards, but includes also pre-standards

Political support
Some innovation opportunities will require political support and decisions (e.g. legal adjustments.

To create an easy to understand and access ranking, as well as a list of the evaluated factors, a simple symbology was chosen. It is explained in the following two tables.

✔	Main group / highest priority
✔	Relevant group / type
✔	might be a relevant group or type
	Not relevant

Table 2: Legend explaining the symbology used in tables 4 and 5.

Relevance Indicators

	Regional relevance	Budget efforts	Time constrains	Usability	Risks
●	local	high	long term	low	high
●	national	medium	intermediate	medium	medium
●	multinational	low	immediate	high	low
●	international				

Table 3: Legend explaining the symbology used in table 5. The categories are chosen as a representative qualitative approach.

Innovation Opportunity Types / RDI Topics	Comparative study	Academic research and development	Conceptual work	Development of new solutions	Realization of technical solutions	Strategic alliances	Exchange of good practices	Training concepts	Joint training /Exchange programs	Common exercises	Standards	Political support
Civil Protection Training												
Harmonisation to (multi-)national needs	✓											
Interconnection of existing training programmes	✓					✓	✓		✓	✓		
Training standards	✓						✓		✓		✓	
Civil Protection Methods, Procedures and Technology												
Inter-institutional and transboundary cooperation	✓					✓	✓					
Drones (UAVs) in flood monitoring operations		✓		✓	✓			✓			✓	
Levee monitoring operations		✓		✓	✓			✓				
Spontaneous Volunteers												
Review of existing concepts/standards	✓										✓	
Clarification of open jurisdictional and organizational questions	✓		✓									✓
Interaction with spontaneous volunteers - training and preparation of responders	✓		✓				✓	✓				
International exchange of lessons-learned and best practices	✓				✓	✓	✓					
Resilience of Citizens												
Enhancing risk communication of local communities and local public bodies	✓		✓									
Customised education campaigns			✓				✓	✓				
International web platform					✓		✓					
Communication												
Communication systems based on 3G/4G/5G standards; frequency management		✓	✓	✓	✓						✓	
Interoperability for voice and data transmission between different systems		✓	✓	✓	✓						✓	
Optimisation of reliability and availability of communication networks and services		✓	✓		✓							
Secured non-public communication systems				✓	✓						✓	
General data management												
Availability and reliability of information		✓			✓							
Interoperability between various (transnational) systems		✓		✓	✓						✓	
Standardisation of data formats			✓								✓	

Table 4: List of the envisioned innovation opportunity types for the identified RDI topics. The symbology is explained in tab. 2.

RDI Topics	Relevance Indicators					Stakeholder Groups, thought to address opportunities					
	Regional relevance	Budget efforts	Time constrains	Usability	Risks	Civil Protection Authorities and Organizations	Public	Academia	Industry/Solution Provider	Politics	Standardization Bodies
Civil Protection Training											
Harmonisation to (multi-)national needs	●/●	●(●)	●(●)	●	●	✓		✓			
Interconnection of existing training programmes	●/●	●(●)	●	●	●	✓					
Training standards	●	●	●/●	●	●/●	✓		✓		✓	✓
Civil Protection Methods, Procedures and Technology											
Inter-institutional and transboundary cooperation	●/●	●	●	●	●	✓		✓		✓	
Drones (UAVs) in flood monitoring operations	●	●	●	●	●	✓		✓	✓	✓	
Levee monitoring operations	●	●	●(●)	●	●	✓		✓	✓		
Spontaneous Volunteers											
Review of existing concepts/standards	●	●	●	●	●(●)	✓		✓		✓	
Clarification of open jurisdictional and organizational questions	●-●	●	●	●	(●)	✓		✓		✓	
Interaction with spontaneous volunteers - training and preparation of responders	(●)●	●(●)	●	●	●/●	✓		✓			
International exchange of lessons-learned and best practices	●	●	●	●	●	✓					
Resilience of Citizens											
Enhancing risk communication of local communities and local public bodies	●	●	●	●	●	✓		✓		✓	
Customised education campaigns	●	●	●	●(●)	●	✓	✓	✓		✓	
International web platform	●	●	●	●	●	✓	✓	✓			
Communication											
Communication systems based on 3G/4G/5G standards; frequency management	●	●	●	●	●(●)	✓		✓	✓	✓	✓
Interoperability for voice and data transmission between different systems	●/●	●	●	●	●	✓		✓	✓		
Optimisation of reliability and availability of communication networks and services	●/●	●/●	●	●	●	✓			✓		
Secured non-public communication systems	●	●	●	●	●	✓			✓		
General data management											
Availability and reliability of information	●/●	●	●	●	●	✓		✓	✓		
Interoperability between various (transnational) systems	●	●	●	●	●	✓		✓	✓		
Standardisation of data formats	●	●	●	●	●	✓			✓		✓

Table 5: Overview of the relevance indicators as well as stakeholder groups envisioned to address the innovation opportunities

4. Conclusions and outlook

4.1 Conclusions

As one major outcome of the DAREnet project, this RDI Roadmap indicates innovation opportunities or innovation topics to strengthen the capabilities in dealing with floods and ultimately enhance the resilience towards floods in the Danube River region.
During DAREnet's first cycle more than 100 RDI topics could be identified, and within this first roadmap 20 could be addressed. As a part of the roadmapping cycle they were checked for relevance, compliance with the DAREnet terms of reference as well as prioritised.
The prioritization was done for each category to point out possible innovation "hot spots" in the fields addressed.
Based on the above-mentioned assessment, concrete innovation strands to address the related gaps and requirements have been defined and discussed. At the same time, these strands shall also serve to project timelines for the uptake, describing the varying levels of maturity, further R&D and the time required for industrialisation, standardisation and market-entry.
However, it is important to keep in mind that these strands need careful regional re-evaluation, due to the inhomogeneity across the Danube River region. For example, the concept of spontaneous volunteers is well known in Austria and Germany, but other countries need to agree on a common understanding of the concept.

The main goal of this document is to draw and highlight the critical pathways for effective innovation in the region. For this reason, links to concrete, existing solutions have been avoided to ensure ease of access for the reader.

The innovation opportunities compiled in the present document are recommendations for concrete innovation initiatives in the future, which will be further promoted by the "DAREnet Call for Practitioner Initiatives". By this call, practitioners are invited to share their ideas or evolving project concepts with the community to foster exchange or to leverage support for their realisation.

In general, it is important to remember that these 20 Innovation opportunities

- ✔ can make the difference in critical flood events
- ✔ are highly relevant for practitioners
- ✔ should be considered in research activities
- ✔ should be integrated in future funding strategies
- ✔ ready for further elaboration – RDI initiatives
- ✔ will lead to sustainable increase of flood resilience

A general remark in the context of a RDI roadmap for the Danube Region is, that it would be a huge support for the civil protection and disaster relief community, if the future programs push practitioner driven initiatives even more than the current ones.
This means technological as well as methodological initiatives, which should be either new ones or rooted in current or recently finished projects. Further, there might be a new form of projects needed between basic R&D projects and pre-commercial procurement (PCP) projects to bridge the gap between research and operations, especially for non-technical results.
Given the fact that DARENet will call for new initiatives, a stronger linkage to our project (or other Coordination and Support Action (CSA) networks) would be extremely beneficial.

Also calls for capacity building programs should be stronger based on the results of closed or running FP7 or Horizon 2020 projects. This would also support the transition of R&D results into operation.

4.2 Outlook on the next cycle

The findings represented here result from the first project cycle. During this first phase the main goal was to set up optimal processes, develop a methodology and an accepted approach. The here presented outcome will be supplemented during the coming cycles and ultimately lead to a comprehensive final version of the roadmap.

In retrospective the open and discussion-based approach was difficult to communicate to the relevant stakeholders. To address this the approach will be changed to a scenario-based approach. Therefore, a general and fictional scenario will be introduced to create a common mental picture among all stakeholders who will be involved. In this way certain tasks and activities can be named and the three related fields of training, technology and procedures will be the focus of the remaining cycles.

Glossary

Abbreviation / Acronym	Description
2D	Two-Dimensional
3D	Three-Dimensional
4D	Four-Dimensional
CSA	Coordination and Support Action
DMC	Dyke Monitoring and Conditioning system
DMR	Digital Mobile Radio
EUCPM	European Union Civil Protection Mechanism
FEMA	Federal Emergency Management Agency [United States]
GIS	Geographic Information System
ISO	International Standardisation Organisation
KB	Knowledge Base
OSGeo	Open Source Geospatial Foundation
PCP	Pre-commercial procurement
R&D	Research & Development
RDI	Research, Development, Innovation
SoP	Standard Operating Procedures
SV	Spontaneous Volunteers
TWG	Topic Working Group
UAV	Unmanned Aerial Vehicle

Administrative Information

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Important notice

This deliverable is currently under EC review.

Disclaimer

The opinions stated in this document are the result of the collaborative work within the DARENet project consortium and are not necessarily in-line with the innovation strategies and aims of the individual organisations involved.

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The DAREnet Consortium

Federal Agency for Technical Relief

International Commission for the Protection of the Danube River

Austrian Red Cross

International Security and Emergency Management Institute

Hungarian Civil Protection Association

Civil Protection Directorate, Ministry of Interior

Sector for Emergency Management, Ministry of Interior

APELL National Center for Disaster Management

ITTI

Fire Safety and Civil Protection Directorate General

Faculty of Security Studies, University of Belgrade

German Aerospace Center

City of Geel

ARTTIC

National Association of Volunteers in the Republic of Bulgaria