RiskPACC

INTEGRATING RISK PERCEPTION AND ACTION TO ENHANCE CIVIL PROTECTION-CITIZEN INTERACTION

RECOMMENDATIONS FOR DIFFERENT AUDIENCES

Deliverable D6.3

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ABOUT RISKPACC

Increasingly complex and interconnected risks globally highlight the need to enhance individual and collective disaster resilience. While there are initiatives to encourage citizen participation in creating a resilient society, these are typically fragmented, do not reach the most vulnerable members of the communities, and can result in unclear responsibilities for building disaster resilience.

New technologies can also support preparedness and response to disasters, however, there is limited understanding on how to implement them effectively. Both awareness of risks and levels of preparedness across Europe remain low. The risk perception of citizens does not necessarily align with their actions and may also diverge from the risk perception of Civil Protection Authorities (CPAs).

The RiskPACC project seeks to further understand and close this Risk Perception Action Gap (RPAG). Through its dedicated co-creation approach, RiskPACC will facilitate interaction between citizens and CPAs to jointly identify their needs and develop potential procedural and technical solutions to build enhanced disaster resilience. RiskPACC will provide an understanding of disaster resilience from the perspective of citizens and CPAs and identify resilience building initiatives and good practices led by both citizens (bottom-up) and CPAs (top-down). Based on this understanding, RiskPACC will facilitate collaboration between citizens, CPAs, Civil Society Organisations, researchers and developers through its six (6) case studies to jointly design and prototype novel solutions.

The “RiskPack” toolbox/package of solutions will include a framework and methodology to understand and close the RPAG. It will be a repository of international good practice and tooled solutions based on new forms of digital and community-centred data and associated training guidance. The RiskPACC consortium is composed of CPAs, NGOs, associated organisations, researchers and technical experts. It will facilitate knowledge sharing and peer-learning to close the RPAG and build disaster resilience.

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Executive Summary

This deliverable presents recommendations for different audiences, namely citizens including volunteers, civil protection authorities (CPAs), and policy makers. They have been obtained based on the insights as generated during the RiskPACC project. At the beginning of RiskPACC, specific gaps were identified, which, in sum, build the "Risk Perception-Action Gap". These specific gaps were clustered along "Communication gaps", "Theory and practice gaps", "Governance gaps", "Operational and implementation gaps", and "Data and technology gaps". Recommendations are derived that specifically address these different types of gaps. In addition, the recommendations are related to the RiskPACC collaborative framework, which is included in this deliverable in a summarised version.
The recommendations will be integrated in the RiskPACC platform. The recommendations for citizens and CPAs will be presented specifically depending on the type of user – citizen or CPA – as citizens and CPAs also have different authorisations on the platform. The recommendations for policy makers will be integrated in the platform as well, but since policy makers are currently not actively involved with the platform, they will be included as a link within the recommendations for users that have logged in as CPAs.

Glossary and Acronyms

ACRONYM	DEFINITION
AEOLIAN	Aeolian AR Mobile Application
APP	Application
AR	Augmented Reality
CPA	Civil Protection Authority
D	Deliverable
DoA	Description of Action
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
HERMES	HERMES Application
RPAG	Risk Perception Action Gap
VGI	Volunteered Geographic Information

TABLE 1 GLOSSARY AND ACRONYMS

1 INTRODUCTION

1.1 Overview

This deliverable is part of Task 6.3 "Recommendations and White Paper Development", the task that brings together the insights generated during the RiskPACC project, building on the experiences of the co-creation lab sessions (D3.5, D3.6), their evaluation and impact assessment (D3.7) as well as on testing the RiskPACC platform and the solutions in Efus member cities and regions (D6.1, D6.2). The goal of this recommendations' deliverable is to bring together the knowledge generated within the course of the RiskPACC project and summarise it in recommendations for different target groups, namely citizens, volunteers, CPAs, and policy makers. The Description of Action describes it as follows:

"D6.3 Recommendations for different audiences to be made available in an interactive manner on the RiskPACC platform".

Thus, the recommendations as included in this report are also made available on the RiskPACC platform. They target specifically the potential users of the platform on local level, i.e., citizens including volunteers (chapter 5.1) and civil protection authorities (CPAs) (chapter 5.2), but also policy makers (chapter 5.3). Deliverable D6.4, i.e., the white paper, mainly addresses the EU and national level.

1.2 Structure of the deliverable

This document includes the following chapters:

Chapter 1 (the present) provides an overview of the purpose and scope and the intended readership.

Chapter 2 provides an overview on technical and conceptual solutions as developed in RiskPACC.

Chapter 3 introduces the RiskPACC platform and explains how the recommendations as included in this report are integrated in the platform.

Chapter 4 provides a summary of the RiskPACC Framework, which is referred to continuously in the recommendations in chapter 5.

In Chapter 5, the recommendations for different audiences are described. Chapter 5.1 includes the recommendations for citizens incl. volunteers, chapter 5.2 addresses CPAs, and final 5.3 the policy makers.

2 THE RISKPACC SOLUTIONS

The following table lists and briefly explains the technical and conceptual solutions that have been developed and refined within the RiskPACC project, to give users a brief, concise overview. The contents of this table are also available on the platform.

Solution	Description
Aeolian Application	The Aeolian AR mobile app enables dissemination of timely bi-directional information (e.g., warnings) and media (e.g., photos, videos) between citizens and CPAs, supporting preparedness against and response to natural and man-made hazard events. This tool is designed to enhance inclusivity, knowledge generation and exchange. More information can be found in D5.1.
HERMES Application	HERMES is a social-network-like web-application where different communities of citizens can be created and receive useful emergency information. HERMES supports the communication between citizens and CPAs via a two-way communication channel, disaster information communication, alerting, and disaster knowledge communication. More information can be found in D5.1.
VGI Mapping Damage Tool	The VGI Mapping Damage tool enables citizen participation in post-disaster damage mapping, providing valuable insights for both citizens and CPAs to comprehensively assess the extent of physical impacts and identify community recovery needs. More information can be found in D5.3.
VGI Thermal Comfort Tracker Tool	The VGI Thermal Comfort Tracker tool enables CPAs to conduct controlled experiments to understand citizen perceptions of heatwave situations, their experiences on heatwave and non-heatwave days, and the relationship between subjective perceptions and objective thermal indicators. More information can be found in D5.3.
Public Sonar	Public Sonar uses artificial intelligence (AI) and natural language processing (NLP) to analyse big data on social media websites to filter out important and relevant information in the event of risks, crises or incidents. AI-generated insights, which are easy to adjust to the situational needs, can support in early warning and comprehensive situational awareness. More information can be found in D5.2.
Co-Creation workshops	Co-creation is a methodology adapted from rather practical, instead of scientific environments. The co-creation approach employed in RiskPACC serves a two-fold objective: A horizontal approach for the whole project and a vertical approach for structuring the workshops. The core idea of co-creating solutions

	is involving all key stakeholders, including citizens, in the process to develop solutions together. More information can be found in D3.4.
Participatory Mapping (lite)	Participatory mapping is mostly referred to the representations and visualization of spatial information that have been produced with the application of 'participatory' processes and with the direct involvement of community groups or individuals. It is fundamentally established upon the ideas of dialogue and participation, while producing physical maps, or digital geospatial datasets generated by citizens, researchers, public authorities, and other interested parties through a process of participatory co-production. More information can be found on the RiskPACC platform under "Training".
Risk Communication Exercise	The risk communication exercise we designed aimed to provide a flexible solution for case study partners to address the *Building* module of the RiskPACC framework within their own specific context. The risk communication exercise has several overarching objectives, one of which is to enable CPAs to communicate an identified risk to citizens and to provide a structured space for dialogue to do so. Furthermore, the best forms of risk communication should be identified to help citizens take the appropriate risk reduction measures and, moreover, the needs to co-create a trusting relationship must be met. More information can be found on the RiskPACC platform under "Training".
Nudging	Nudging is a concept in behavioural sciences such as psychology or communication science. A nudge is an instrument to influence people's behaviour without forbidding an option or forcing a change. It can be used to persuade a person to behave in a socially desirable way. We consider nudging to be integrated in a conceptual storyboard User Story (see below) to be a good fit to give a technological solution an additional aspect. More information can be found on the RiskPACC platform under "Training".
Storyboard User Story	A story board user story is a method to simulate the implementation of a technical tool. It is written before the workshop/exchange with participants by looking at the functionalities of technical tools and writing a story about a (hazardous) situation in which it might be used. It is kept neutral and only describes the features of the tool. It is then evaluated by participants of a workshop to derive advantages and disadvantages of the concerned technical tool. More information can be found in D3.4.
Repository of Good Practices	The RiskPACC Repository of Good Practices presents solutions that municipalities in Europe have found useful to address disaster resilience in the past. They range from technical risk

	communications tools to legal frameworks and policy briefs that help municipalities to prepare themselves and their population for potential disasters and thus enhance the municipal resilience significantly. The solutions have been professionally assessed, i.e. for each solution that municipalities did find useful, experts have assessed the solutions along various categories, ranging from more technical to conceptual aspects of the solution. This helps end users to identify solutions that not only address their identified issues, but also ensures that they are applicable and feasible to implement for them. More information can be found in D4.2.

TABLE 2: DEVELOPED AND REFINED TOOLS AND SOLUTIONS

3 INTEGRATION OF RECOMMENDATIONS ON THE RISKPACC PLATFORM

The RiskPACC platform, which was developed and continuously improved during the course of the project, is intended to offer different users the opportunity to deal with the various components of risk perception, communication and prevention. Information about the project, the background and the tools and methods developed during the project is displayed in a clear and structured way on the platform. As a result of the project, it offers CPAs, volunteers, and citizens the opportunity to inform themselves, to enhance communication, and to better prepare for possible risks.

Depending on the affiliation of the user, i.e., whether the user is a CPA representative, a volunteer, or a citizen who intends to deal with risk prevention, there are different access permissions. Anyone can create an account as a citizen, but while/when having this role, one does not have access to all functions of the platform. As a CPA representative, one can use additional functions, while the developer of the platform (ICCS) must manually grant the additional rights. This assignment is done manually to avoid unauthorised use and thus potentially incorrect information on the platform.

A short video, available on the landing page, explains the background and objective of the platform, followed by an explanation of its functionalities.

The recommendations as included in this report will be presented specifically depending on the type of user – citizen or CPA – on the platform, i.e. users logged in as citizen will see the recommendations for citizens (incl. volunteers), and users logged in as CPA will see the recommendations for CPAs.

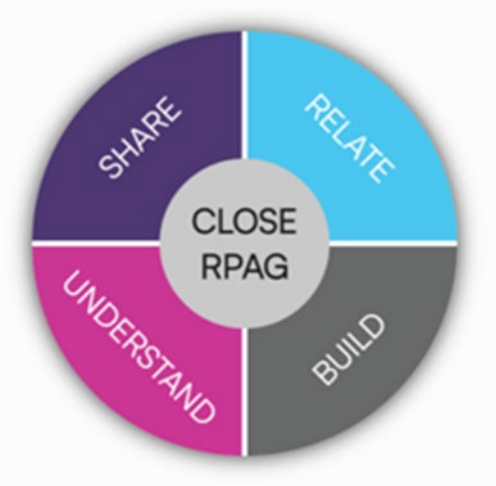
The recommendations for policy makers are integrated on the platform as well, but since policy makers are currently not actively involved with the platform, they will be included as a link within the recommendations for users that have logged in as CPAs. This way, CPAs can easily access, download and present them to policy makers.

The summary of the RiskPACC Framework as presented in Chapter 3 will be included in these policy recommendations document to be uploaded to the RiskPACC platform. For the integration of recommendations for citizens and CPAs however, this will not

be required since the platform itself includes a comprehensive, interactive presentation of the framework.

4 CLOSING THE RISK PERCEPTION-ACTION GAP THROUGH COLLABORATIVE GOVERNANCE

RiskPACC has developed a framework for closing the Risk Perception-Action Gap (RPAG), i.e. misalignments among citizens and civil protection authorities in risk perceptions, related actions, as well as mutual expectations. It provides guidance on how professionals and citizens can relate to each other, in order to develop the shared understanding needed to build effective risk communication tools and strategies. Collaborative governance plays a central role in facilitating the implementation of this framework. It is defined as a mode of governance that "brings multiple stakeholders together in common forums with public agencies to engage in consensus-oriented decision making" (Ansell & Gash, 2008). It helps different stakeholders in Disaster Risk Reduction (DRR) —i.e., government agencies, non-governmental organisations, volunteers, citizens, and the private sector—to share knowledge and resources for collective action, thus improving the effectiveness of risk communications and actions (see D3.4, D4.4). The four modules of the RiskPACC framework are *Understanding, Sharing, Relating,* and *Building*. The four modules are described below, along with the role that collaborative governance plays in their effective implementation. The next section provides concrete guidance for local policy makers on how to support collaborative governance for DRR at the local level. It helps address the gaps identified (see D1.3, D2.3), summarised in Chapter 3.2.



Understanding

The *Understanding* module within the RiskPACC framework centres on the need to understand the local context in order to develop effective risk communications. This involves learning about the specific characteristics of an area, including its local risks and the people who live there. Collaborative governance supports bringing together of

diverse perspectives and expertise. The approach emphasises on the inclusion of local knowledge, ensuring that risk communications are based on understanding of local risks and communities (Larruina et al., 2019; Kapucu & Garayev, 2011). This leads to more thorough, effective, and innovative disaster risk communications. Additionally, it helps establish shared goals and aligns participants on the objectives and methods of disaster risk communication (Kapucu & Garayev, 2011; Kalesnikaite, 2019; Daswati, 2020).

Sharing

The *Sharing* module within the RiskPACC framework emphasises the importance of dialogue between CPAs and citizens in order to develop effective risk communications. This involves authorities and residents regularly discussing their views on risks and what they expect from each other. Through these ongoing shared conversations, they can come to understand each other better and bridge the RPAG. Collaborative governance supports *Sharing* by improving communication channels, encouraging open dialogue, and pooling of insights. This approach leads to more innovative and effective disaster risk communications. It also promotes joint assessments and the development of timely and accurate information, which are crucial for DRR (Kuo et al., 2015; Daswati, 2020; Kalesnikaite, 2019).

Relating

The *Relating* module within the RiskPACC framework centres on the need to develop strong, positive relationships around DRR, characterised by trust, mutual understanding, and collaboration. These relationships are key to co-designing and implementing effective risk communications in partnership with societal stakeholders. Collaborative governance facilitates the development of long-term relationships between a diverse range of stakeholders, enhancing mutual trust and understanding. It is an inclusive approach that ensures that different viewpoints are considered. This fosters a sense of ownership and commitment among a broad range of societal stakeholders, which helps communities to be better prepared and more resilient (Kapucu, 2014; Kuo et al., 2015; Kalesnikaite, 2019).

Building

The *Building* module within the RiskPACC framework emphasises the importance of co-creation in risk communications. This involves CPAs and citizens working together to develop risk communication strategies and tools. Co-creation is more effective when it occurs within the context of established positive relationships, characterised by regular dialogue and a shared understanding of the local context. Collaborative governance supports the collaborative process that underpins the *Building* module by facilitating the modules *Understanding*, *Sharing*, and *Relating*. It leads to more numerous and holistic solutions that are better aligned with local needs. Additionally,

it results in solutions that are more flexible and adaptable to changing conditions (Kalesnikaite, 2019; Kapucu & Garayev, 2011).

5 RECOMMENDATIONS FOR DIFFERENT AUDIENCES

5.1 Recommendations for citizens (including volunteers)

The major focus of the RiskPACC project has been the bridging of the Risk Perception-Action Gap (RPAG), i.e. misalignments among citizens and civil protection authorities in risk perceptions, related actions, as well as mutual expectations. In the context of RiskPACC we acknowledge that people don't prepare or respond correctly to risks because they're missing the right information. However, a more substantial issue emerging here relates to the misalignment of risk perceptions and accompanying citizens' actions from a public and civil protection authorities' perspective. These differences in views and expectations usually aren't talked about between the public and the authorities. Because of this, risk communication often doesn't consider or solve these differences, which means a gap remains between what the public and authorities think and expect.

Following a mixed-method approach of desktop and primary research, including literature reviews, semi-structured interviews with citizens and volunteers across the project's case studies and qualitative data analysis, we have identified a series of gaps in risk perception and action from a citizen perspective. In more detail, 18 gaps were originally identified (with one more being added later on as the project progressed), deriving from our scoping exercise and analysis of qualitative data and were later categorised into five broad categories (see D2.3 for more details). These gaps have been a crucial driver of the following project activities, as they have provided the conceptual foundations upon which RiskPACC has been constructed, ultimately influenced the roadmap of key actions for the entire duration of the project. In fact, the gaps have been creatively transformed into operational goals in the RiskPACC board game (D8.6) that was developed while also inspiring and influencing the different pillars of the RiskPACC framework (see D4.4).

With RiskPACC project progressively reaching its completion, we present some of the solutions to address these gaps, as developed throughout the duration of the project:

Communication gaps:

The major communication gaps identified from a citizen perspective were concentrated around the lack of existing communication channels and the lack of an effective two-way communication between citizens and CPAs. While in some case studies various communication channels between CPAs and citizen/community groups existed (mostly through volunteer groups), an overall inability to have citizens' voices heard had been identified. This lack of communication deprives risk

governance planners and decision-makers of the ability to adjust and tailor risk responses to the changing needs of different communities.

Enhancing two-way communication between citizens and CPAs has been among the fundamental objectives of RiskPACC. Therefore, the **RiskPACC co-creation approach** has been strategically developed and implemented in the different workshops across the project case studies in order to strengthen existing and create new communication channels between citizens and CPAs, as stated in the *Relating* module of the **RiskPACC Framework.** The RiskPACC Framework pays increased attention to the cultivation of trust ties and the development of effective two-way communication channels.

Besides the conceptual solutions, enhancing two-way communication has been at the forefront of the RiskPACC technical solutions as well. For instance, **AEOLIAN App** provides functionality of a direct two-way communication between citizens and CPAs, thus generating a direct platform of communication through field-base mapping and information sharing. Additionally, the **Mapping Damage** tool is designed specifically for volunteer contributions. Although it is not meant to be used in field-based mapping, it allows volunteers to map specific disaster-prone areas, which are pre-defined by the CPAs, thus embedding their latent knowledge and perception of risk and contributing to a more inclusive and effective Disaster Risk Management (DRM).

Theory and practice gaps:

These gaps are predominantly related to ineffective operationalisation of conceptual ideas regarding community resilience and DRM and their actual understanding of such concepts in practice. Concepts such as ‘resilience’, are contested terms and mean different things to different communities. While there is a plethora of resources available on the importance of local knowledge for effective DRM, citizens are largely unaware of the importance and validity of their contextual knowledge and the need for its integration within existing disaster response mechanisms.

It is essential to place individuals within their socio-political and community contexts rather than viewing them solely as isolated entities. Better alignment of these processes will enhance our understanding of the attributes of communities that are more likely to effectively engage in resilience efforts, as well as identify those groups that may need additional support. Furthermore, gathering citizens' perceptions of risk can aid in understanding and also in standardising or even bureaucratising collective visions and resilience imaginaries (Pitidis et al., 2023; Pozek, 2022).

Paying significant attention to the *Understanding* module of the RiskPACC Framework, and working together with CPAs towards clarifying the underlying root causes and the lack of adequate conceptual knowledge of theory or practice that widen the RPAG, is one of our recommendations.

Additionally, the **Repository of Good Practices,** included in the RiskPACC platform, provides a variety of European and international examples of practices and that

attempt to mainstream citizen risk perception and blend it within the existing disaster risk response apparatus.
Finally, through methods employed across RiskPACC **co-creation workshops,** such as **participatory mapping,** citizens can share their latent knowledge on the root causes and perceptions of risk (*Sharing*) and bridge the theory and practice gap first by *Building* a common vernacular of disaster risk in collaboration with the CPAs.

Governance gaps:
Governance gaps are predominantly related to governance traditions, cultures, and structures and the way they manifest in the content of disaster risk management. In several cases a 'responsibilisation' of local citizens through advanced citizen action, but without a subsequent devolution of power, has been identified. Whole citizen engagement is crucial for nurturing and enhancing community and disaster resilience, which needs to be done in an appropriate manner in order to allow for the empowerment and consideration of marginalised groups and the consolidation of a resilience spirit. This dialectic relationship between top-down and bottom-up risk management action is a key objective of RiskPACC and a significant identified governance gap.

In RiskPACC, we have identified that while governance gaps are perpetrated by both citizens and CPAs, the majority of actions need to be focused on the CPA's front, as they are largely responsible for managing the dialectic relationship between top-down and bottom-up governance in our case studies. Thus, although we have identified examples of integrated bottom-up activities to support disaster response and enhance disaster resilience, which we present in the **Repository of Good Practices**, and we actively attempt to provide useful information and 'responsibly responsibilise' citizens through the **Training Material** we have developed, our dedicated recommendations for bridging the identified governance gaps are mostly focused on CPAs. We have therefore detailed these gaps further in Chapter 5.2 and concentrated them around the *Building* module of the RiskPACC Framework.

Operational and implementation gaps:
Operational and implementation gaps refer to the misalignment between aspirational top-down visions of disaster risk management and bottom-up community-focused realities in practice. This includes the lack of community engagement in several of the RiskPACC case studies, the absence of a causal link between risk perception and subsequent mitigation behaviours, the 'reactive' instead of a 'proactive' mindset and inconsistency in the coordination of prevention activities and community actions in phase of a disaster and the need for better training and information for the civil society. In order to address these gaps, active citizenship is needed along with a pre-emptive mindset with citizen groups and volunteers becoming valid and indispensable part of the DRM operational process, in close coordination with the official DRM authorities.

The lack of active citizenship as well as inadequate training are the major enablers of the operational and implementation gaps for the civil society. The **Training Material** developed for targeted audiences aims to mobilise citizen groups to engage more

actively in local DRM. Additionally, the **co-creation workshops** attempted to showcase the need for engagement in supporting DRM as well as the need to shift from a reactive to a proactive mindset when dealing with disaster risk. In particular, the **participatory mapping lite** exercise has provided an interesting and relatively different pathway of creatively engaging with disaster risk in a specific context.

Moreover, the augmented reality function included in the **AEOLIAN app** allows citizens to become more proactive in *Understanding* risk and preparing for its impact instead of merely reacting to it. Moreover, the tool is aiming at promoting inclusiveness, since it is being open to both citizens and CPAs, simultaneously *Building* trust ties and addressing communication gaps, as explained earlier. Similarly, the **Mapping Damage** tool provides a desk-based platform that allows citizens to familiarise themselves with their ambient environment and provide invaluable information prior to a disastrous event, thus nurturing a pre-emptive mindset across the citizenry.

Data and technology gaps:

Data and technology gaps refer to identified problems related to the generation, circulation and usage of data and other digital technologies for disaster risk management. Such gaps identified through our desktop and primary research include the lack of contextual sensitivity on existing datasets, which are often top-down generated and lack latent knowledge and perceptions of risk embedded on people's minds, the digital divide, limited utilisation of participatory methods such as citizen science, and lack of tailored and up-to-date digital tools that would allow local knowledge to be embedded into the disaster risk datasets. RiskPACC specifically focused on citizen science and Volunteered Geographic Information (VGI) as a means of enabling the transferring of local knowledge into disaster risk-related datasets.

The focus of RiskPACC on bridging the data and technology gaps through developing, delivering and rolling out a mixture of technical tools and solutions has been quite profound throughout the project's duration. The focus on citizen science and VGI tools has been demonstrated through the development of the **Mapping Damage** tool, which uses the Geocitizen app environment and allows citizens to map the surroundings and critical infrastructure in disaster-prone areas previously designated by CPAs, ultimately generating useful context-specific geospatial information. This app, along with all of the technical solutions (**AEOLIAN App**, **HERMES tool**) developed in the context of RiskPACC are available in the **RiskPACC platform** which is designed to facilitate the interactions between CPAs and citizens (although predominantly directed towards CPAs).
In addition to the technical tools, the conceptual methodologies developed and employed throughout the **co-creation workshops,** including **participatory mapping** and **risk communication** exercises were designed to address issues such as the digital divide and general lack of inclusiveness.

Table 3 provides an overview of the gap groups and RiskPACC recommendations for citizens and volunteers as mentioned above, along with an explicit connection to the RiskPACC framework and its accompanying modules:

Gap group	RiskPACC Recommendations	RiskPACC Framework modules
Communication gaps	Co-creation workshops AEOLIAN App VGI Mapping Damage tool HERMES Tool Risk communication exercise	UNDERSTANDING RELATING
Theory and practice gaps	Co-creation workshops Repository of Good Practices Participatory mapping lite	UNDERSTANDING SHARING BUILDING
Governance gaps	Training Material Repository of Good Practices RiskPACC Framework	BUILDING
Operational and implementation gaps	Co-creation workshops Training material Mapping Damage tool Participatory mapping lite	UNDERSTANDING BUILDING
Data and technology gaps	AEOLIAN App HERMES Tool Co-creation workshops RiskPACC Platform Participatory mapping lite Mapping Damage tool	UNDERSTANDING SHARING BUILDING

TABLE 3: GAPS IN RISK PERCEPTION FROM A CITIZEN PERSPECTIVE AND RELEVANT RISKPACC RECOMMENDATIONS

5.2 Recommendations for Civil Protection Authorities

The public and civil protection authorities (CPAs) often perceive risks differently and expect different actions from each other. RiskPACC aims to understand these different perceptions and actions and devise solutions to narrow these gaps. To do this, alongside the work done to understand the citizen perspective, semi-structured interviews and desk-based research was conducted to determine where the biggest gaps exist in CPA practices and how the RiskPACC can assist in addressing some of these gaps (see D1.3 more for details).

The gaps identified were categorised into five broad categories and used to influence the roadmap of key actions for the entire duration of the project. These gaps were also considered when developing the RiskPACC Framework and the RiskPACC boardgame. Below, the five broad categories of gaps are considered and specific recommendations are provided for CPAs on how to address the gaps and how RiskPACC solutions can be used.

Communication gaps:

The communication gaps identified are rooted in CPA practices in the area of communication being primarily top down, where information is imparted to citizens

without opportunities for feedback or consideration of the needs of different target groups. CPAs are currently typically lacking suitable communication channels and techniques that allow for two-way communication between CPAs and citizens. In addition, CPAs are lacking techniques and practices that assist them in transferring information or warnings in a way that is accessible and understandable to the specific target group.

CPAs need to implement improved communication channels with citizens, to understand their needs and capacities, understand local issues and communicate and gather feedback on CPA activities. This mainly refers to the *Understanding* and *Building* modules of the RiskPACC collaborative framework.

Co-creation approaches (such as the RiskPACC co-creation approach) allow the equal participation of both CPAs and citizens in the identification and development of suitable approaches, and to consider the needs and requirements of both groups. This will help CPAs better understand communication channels used by citizens and how to best transfer information and warnings to different target groups. The dedicated **risk communication exercise** can be used in these co-creation workshops to help to open up a structured space for dialogue and to identify the best forms of risk communication in a specific context.

The **AEOLIAN** app developed in RiskPACC provides an opportunity for citizens and CPAs to interact, therefore improving communication channels and providing a better understanding of local issues. There is a chat function for direct communication as well as various training material and opportunities for citizens to report hazard damage. Using this tool will allow CPAs to address these communication gaps by establishing new communication channels.

The **HERMES** platform developed in RiskPACC is a social network-like platform for disaster preparedness. It provides a channel for CPAs and citizens to share data, discuss local issues and provide relevant information. It also provides a chat function, where CPAs and citizens have a direct communication channel. More specifically, it enables users to share information within specific groups (e.g., volunteer group, vulnerable group). This tool, if used by citizens and CPAs, will enhance communication, especially considering specific target groups.

Additional, already existing approaches that – depending on the specific context – can support narrowing down communication gaps are stored in the **RiskPACC Repository of Good Practices**, as well as under the *Understanding* and *Building* modules of the **RiskPACC collaborative framework**.

Theory and practice gaps:

The theory versus practice gaps identified were a result of CPAs having limited uptake of the academic research that is available, especially regarding different social and human factors involved in citizens' risk perception. Even when there was in-depth knowledge of these factors, CPAs had limited information on how to address these social factors in the DRM cycle. Many expressed the sentiment that assisting different vulnerable groups was not their responsibility, and that other CPAs are supposed to

address these issues. The lack of integration of theory into practice is a major gap for CPAs in addressing the risk perception action gap.

CPAs should further integrate theory into their day-to-day practices, as it will help them better address and understand different social and human factors that are at play in their interactions with citizens. There are several RiskPACC solutions that can assist in this integration.

The **RiskPACC Framework** modules on *Understanding* and *Sharing* are great starting places for CPAs to better understand the social context in which their activities will take place and therefore better understand local citizens risk perception. The *Understanding* module of the framework will provide a way to gather information on local areas and assist CPAs in framing their work around understanding citizens and the local environment better.

The **Repository of Good Practices** provides a number of good practices and resources provided in the RiskPACC platform, which highlight some prior research and practices that have been developed to understand risk perception. These resources utilise the research that has previously been conducted and some address social and human factors.

The **co-creation workshops** and the methodology developed in RiskPACC will give CPAs a space to discuss different issues with citizens and gain a better understanding of different factors that are impacting local risk perception. This will help address the theory vs practice gap by developing an understanding of how to address these different factors. The **participatory mapping** methodology that was employed in the workshops can provide further insights into these factors.

Governance gaps:

The governance gaps discovered in RiskPACC are a result of how CPAs interact with each other and with their communities. These gaps include a lack of CPA integration, the need to include more bottom-up activities into CPA operations, the need for CPAs to build better trust in their organisations, and better linking perception into their operations. CPAs should focus on integrating more bottom-up activities into their practices. This will allow for more fostering of trust between CPAs and citizens.

In addressing these governance gaps, RiskPACC has created several solutions that aim to improve CPA integration, while others focus more on engaging citizens and incorporating bottom-up activities into CPA practices. These recommendations include both technical and conceptual solutions.

The **HERMES** platform provides a space for CPAs to communicate and share documents with each other through its social networking functionalities. The platform enables users to share information within specific groups (e.g. volunteer groups, CPA groups). This functionality allows CPAs from different departments or different localities to share procedures and information, increasing integration and interoperability. In addition to the HERMES platform, the **RiskPACC platform**, in which it is housed, will also serve to increase CPA integration. It will allow different

CPAs in a local/regional area to have access to the same information and share this information easily between different organisations.

Besides these technical solutions, the **RiskPACC framework** will assist CPAs in engaging with citizens and improving their bottom-up activities. It was created to meet CPAs at their current engagement levels, so no matter how much engagement already exists, the framework will assist in improving engagement. This includes an examination of how citizen engagement can enhance bottom-up activities and integrate them into CPA practices.

The **Repository of Good Practices** provides examples of how CPAs have integrated bottom-up activities into their work and therefore this resource will enhance CPAs' ability to integrate bottom-up activities by adopting these examples to their area.

Operational and implementation gaps:

There are several operational and implementation gaps among current CPA practices when it comes to working more closely with citizens. These gaps include aspects such as the lack of prevention activities among the CPAs in the case study areas, the lack of community engagement noted by both CPAs and citizens, the lack of understanding on the part of CPAs as to the citizens' perspectives and activities, and issues caused by the lack of resources. CPAs should focus activities on prevention and citizen engagement to address these gaps. This will allow citizens' voices and ideas to be heard while focusing efforts on prevention activities that will benefit communities when disasters occur.

Operational and implementation gaps arise in part due to the inability for CPAs to develop constructive relationships, lack of inclusion and transparency, and ineffective resource allocation. This all led to CPAs being unable to fully involve citizens in disaster prevention and preparedness. Several of the RiskPACC solutions, both technical and conceptual are designed to address these gaps and increase citizen participation.

The **AEOLIAN** tool provides a training function which allows citizens to understand how a hazard may impact a local area using augmented reality. This functionality will allow CPAs to focus on prevention and preparedness, allowing citizens to better understand what needs to be done to prevent and prepare for hazards. The tool will also increase inclusion, as anyone will have access to the functionalities and will be able to participate in disaster preparedness. The communication aspect of the tool will also serve to develop stronger relationships between CPAs and citizens. The **HERMES** tool provides a channel for CPAs and citizens to share data, discuss local issues and provide relevant information. It also includes a chat function, where CPAs and citizens have a direct communication channel. Prevention is a focus of this tool, as warnings and other prevention activities can be shared by CPAs.

The **RiskPACC conceptual tools** can also help address these gaps. The **framework** provides structures that can help CPAs develop more constructive relationships with citizens, especially the *Building* and *Sharing* modules. The **participatory mapping activity**, when used in **co-creation workshops**, will help enhance and develop

relationships between CPAs and citizens. It will also assist CPAs in understanding where resources could be effectively allocated in a local area by communicating with citizens to better understand local disaster impacts and using local knowledge.

Data gaps:

As CPAs take advantage of advancements in technology, different communication tools and other apps have been created. While there is a variety of uses of applications and data used, there are several gaps in current functions of CPAs in terms of data and technology used. These include a lack of interoperability between different CPA data sets and the digital divide that can occur when a set of citizens do not have the same access to and literacy about the internet. To address these gaps, CPAs should work to create standardised data sets that are sharable between organisations. Additionally, while data and technology have many benefits and should be employed where applicable, CPAs must also be aware that some citizens may be left behind in the digital divide.

RiskPACC has focused quite a bit of effort on developing technical tools that can enhance citizen participation in disaster management. This includes the **RiskPACC platform**, which integrates all of the tools and outputs of the project. With everything in one place and the ability to share documents and data, such a platform can assist CPAs in standardising much of the information and data gathered from CPAs.

As a supplement to the RiskPACC platform, a "physical Risk Pack" was created as an offline version that can be used by CPAs to enhance citizen engagement. This **physical Risk Pack** includes a repository of the most relevant research and tools developed in RiskPACC as well as a **RiskPACC game**. This addresses the digital divide by providing the information in an accessible, analogue form.

Gap group	RiskPACC Recommendations	RiskPACC Framework modules
Communication gaps	Co-creation workshops AEOLIAN App Risk communication exercise HERMES Tool	UNDERSTANDING BUILDING
Theory and practice gaps	RiskPACC Framework Repository of Good Practices Co-creation workshops Participatory mapping (lite)	UNDERSTANDING SHARING RELATING
Governance gaps	HERMES Tool RiskPACC Platform RiskPACC Framework	SHARING BUILDING
Operational and implementation gaps	AEOLIAN App Public Sonar RiskPACC Framework	SHARING BUILDING
Data and technology gaps	AEOLIAN App HERMES Tool VGI Thermal Stamp Tool	UNDERSTANDING SHARING BUILDING

	RiskPACC Platform Physical Risk 'pack'	

TABLE 4: GAPS IN RISK PERCEPTION FROM A CPA PERSPECTIVE AND RELEVANT RISKPACC RECOMMENDATIONS

5.3 Recommendations for Policy Makers

The major focus of the RiskPACC project has been the bridging of the Risk Perception-Action Gap (RPAG). In the context of RiskPACC we acknowledge that people don't prepare or respond correctly to risks because they're missing the right information. However, a more substantial issue emerging here relates to the misalignment of risk perceptions and accompanying citizens' actions from a public and civil protection authorities' perspective. These differences in views and expectations usually aren't talked about between the public and the authorities. Because of this, risk communication often doesn't consider or solve these differences, which means a gap remains between what the public and authorities think and expect.
Following a mixed-method approach of desktop and primary research, including literature reviews, semi-structured interviews with citizens and volunteers across the project's case studies and qualitative data analysis, we have identified a series of gaps in risk perception and action both from a citizen and from a civil protection authorities' perspective. These gaps have been a crucial driver of the following project activities, as they have provided the conceptual foundations upon which RiskPACC has been constructed, ultimately influenced the roadmap of key actions for the entire duration of the project. In fact, the gaps have been creatively transformed into operational goals in the RiskPACC board game (D8.6) that was developed while also inspiring and influencing the different pillars of the RiskPACC framework (see D4.4). The gaps were categorised into five broad categories.

The gaps identified are all (in part) the result of suboptimal collaboration between DRR stakeholders.

- **Communication gaps** arise from a failure to build constructive relationships between DRR stakeholders, establish two-way communication channels, transform power imbalances, have regular dialogue, and develop trust and mutual understanding.
- **Gaps between theory and practice** result from weak (or absent) relationships between CPAs and citizens, a failure to address barriers to participation, a lack of inclusion, a lack of dialogue, and a failure to develop trust and mutual understanding.
- **Operational and implementation gaps** arise from suboptimal collaboration due to a failure to develop constructive relationships, unclear ground rules, insufficient transparency, lack of inclusion, and ineffective resource allocation. This undermines citizen participation in prevention activities.
- **Issues related to data and technology**, such as lack of interoperability and failure to address digital divides, result from suboptimal collaboration due to weak (or absent) relationships, insufficient stakeholder engagement, and lack

of dialogue, resulting in diverse needs and limitations not being adequately considered.

Given that all gaps are (in part) the result of suboptimal collaboration, policymakers can facilitate the effective implementation of the RiskPACC framework by supporting collaborative governance around DRR using the following strategies.

Promoting inclusive participatory processes

Effective collaboration around risk communication depends heavily on including a broad and diverse range of local stakeholders who are affected by, or care about, the risks at hand. Inclusiveness is about actively engaging all relevant parties in the co-creation process. It is about ensuring that different viewpoints and interests are considered, making the process more democratic and comprehensive (Ansell & Gash, 2007). It helps in building a stronger consensus and in developing risk communications that are more acceptable and effective because they are informed by a wide range of perspectives. It also increases the legitimacy and sustainability of the decisions made, leading to more enduring and effective solutions to the issues at hand. Policymakers can play an important role in creating an environment where every stakeholder has a legitimate opportunity to participate. They can support DRR stakeholder mapping, form local consortia and networks that bring together a diverse range of local stakeholders, and offer financial and technical resources to support the participation of underrepresented groups.

Establishing clear ground rules and transparency

Have clear ground rules and a transparent process is very important to the collaborative process (Ansell & Gash, 2007). They help ensure that the process is trusted by participants and perceived as fair, legitimate, and equitable (Ansell & Gash, 2007). They facilitate a transparent environment where stakeholders feel confident that their input is valued and that the collaborative process is not a façade for hidden agendas or private deals. Policy makers can play an important role in establishing clear ground rules and transparency around collaborative DRR. For example, they can help establish the objectives and scope of the collaboration, facilitate the development of a procedural framework, develop a code of conduct, establish feedback and accountability mechanisms, and ensure that participants have access to all relevant information, data, and documents.

Developing constructive relationships and regular dialogue

Pre-established relationships enhance trust and mutual understanding, which are crucial for effective coordination before, during, and after a crisis (Kapucu, 2014). Therefore, policymakers should support the development of relationships, protocols, and communication channels during non-crisis periods, which are accessible to all stakeholders (Kapucu & Garayev, 2011; Dwirahmadi, 2015; Russell et al., 2021). Creating dedicated committees or working groups can facilitate ongoing dialogue and collaboration among stakeholders, building long-term trust and networks (Kapucu & Garayev, 2011; Kuo et al., 2015). It enables stakeholders to engage in 'joint fact-finding', integrating diverse types of knowledge (including scientific and experiential)

to develop a common problem definition based on a shared understanding of the local risk context. Focusing hereby on achievable short-term goals strengthens the foundation for more significant long-term outcomes (Ansell & Gash, 2007). Leveraging diverse perspectives, while challenging, presents an opportunity for more comprehensive and innovative solutions (Sullivan et al., 2019; Piazza, 2021). It also helps stakeholders identify common values and develop a clear mission (Ansell & Gash, 2007). This can lead to recognising mutual interdependence, a shared sense of ownership over the process, and openness to exploring mutual gains (Ansell & Gash, 2007).

Addressing power, resource, and knowledge imbalances

Imbalances in power, resources, skill, expertise, time, energy, and liberty among stakeholders can be a critical barrier to effective collaboration (Ansel & Gash, 2007). It can constrain actors' ability to participate effectively or, indeed, at all in the collaborative effort. In addition, it can lead to the process being manipulated by powerful actors, undermining the legitimacy of the collaboration and the effectiveness of its outcomes. To address this, policy makers need to develop strategies to support less powerful actors in DRR, for example through resource allocation, training, addressing accessibility issues, simplifying bureaucratic processes, creating safe spaces, and promoting diverse leadership. Developing targeted strategies for a particular area requires a sound understanding of the local people context to allocate resources efficiently among participants (Nohrstedt et al., 2018).

Addressing incentives for, and constraints on, participation

Participation in collaborative governance is largely voluntary. Therefore, it's vital to understand – and address - the incentives that drive stakeholders to engage in this process (Ansel & Ghash, 2007). In addition to issues described above, they include:

- the potential for achieving meaningful and tangible DRR outcomes
- the perception of a direct relationship between their participation and DRR outcomes
- the exclusivity of the collaborative forum as a venue for decision-making

Policymakers can support point 3 by creating a local DRR network or consortium that includes all key local stakeholders, making it the must-go venue for local DRR decisions. They can support points 1 and 2 by democratising local DRR and reducing bureaucratic hurdles (Larruina et al., 2019).

Facilitative leadership, empowerment, and representation

To develop solutions that meet the needs of all stakeholders, it is crucial to ensure everyone has a voice in the collaborative process, regardless of their power or resources (Sullivan et al., 2019; Larruina et al., 2019). Policymakers can support this by focusing on facilitative leadership, empowerment, and representation (Ansell & Gash, 2007).

- **Representation**: Include civil society organisations representing marginalised groups in local DRR consortia and networks or create advisory councils with their representatives.
- **Facilitative Leadership**: Identify and support effective local leaders who can facilitate dialogue, build consensus, and manage conflicts. Provide these leaders with funding, training, recognition, and access to broader DRR networks.
- **Empowerment**: Facilitative leaders manage power dynamics within the collaborative process, empowering marginalised groups to participate effectively.

Supporting pilot projects

Pilot projects help CPAs and citizens understand the challenges and opportunities involved in collaborative DRR. By supporting pilot projects, policy makers can create a safe space for stakeholders to engage beyond their established operational boundaries, away from the usual policy frameworks. Pilot projects can facilitate dialogue and learning, allowing for experimentation and the development of new approaches, helping stakeholders to transcend traditional roles and collaborate on innovative solutions (Van Popering-Verkerk & van Buuren, 2017).

By implementing these strategies, policymakers can ensure the effective implementation of the RiskPACC framework, and successfully address the Risk Perception-Action Gap.

6 CONCLUSION

This deliverable serves to define and present the recommendations for different audiences, namely citizens, CPAs and policymakers. The recommendations included in this document can also be found on the RiskPACC platform, partly in a slightly modified format. We used a logical sequence in this deliverable to guide the reader through the recommendations.

The deliverable is therefore structured in such a way that the solutions developed in RiskPACC are explained again briefly, as they form an important part for the recommendations. There is also an explanation of the RiskPACC platform in the deliverable, where it is explained where the relevant recommendations can be found.

A brief summary of the framework developed in RiskPACC and recommendations on how it can be implemented through collaborative governance provides concrete guidance for local policy makers on how to support collaborative governance to close the RPAG.

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