



## Deliverable D6.6

**Summary report, findings and recommendations following the three field exercises**

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## Project details

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## Consortium – List of partners

Partner no.	Short name	Name	Country
1	UIC	UNION INTERNATIONALE DES CHEMINS DE FER (COORDINATOR)	France
2	CBRNE	CBRNE LTD	UK
3	PPI	POPULATION PROTECTION INSTITUTE (MINISTRY OF THE INTERIOR OF THE CZECH REPUBLIC)	Czech Republic
4	DB	DEUTSCHE BAHN AG	Germany
6	UMU	UMEA UNIVERSITET	Sweden
7	DHPOL	DEUTSCHE HOCHSCHULE DER POLIZEI	Germany
8	RINISOFT	RINISOFT LTD	Bulgaria
9	WMP	WEST MIDLANDS POLICE AND CRIME COMMISSIONER	UK
10	ETICAS	ETICAS RESEARCH AND CONSULTING SL	Spain
11	SESU	STATE EMERGENCY SERVICE OF UKRAINE	Ukraine
12	UKHSA	UK HEALTH SECURITY AGENCY (DEPARTMENT OF HEALTH – PUBLIC HEALTH ENGLAND)	UK
13	SPL	STATE POLICE OF LATVIA	Latvia
14	AGS	AN GARDA SÍOCHÁNA – NATIONAL POLICE FORCE IRELAND	Ireland
15	FFI	FORSVARETS FORSKNINGINSTITUTT	Norway
16	NPH	KOMENDA GŁÓWNA POLICJI	Poland

## List of Acronyms

Acronym	Definition
CBRNe	Chemical, Biological, Radiological, Nuclear, and explosive
CCS	Crisis Communications System
CEPOL	European Union Agency for Law Enforcement Training
CSAB	Civil Society Advisory Board
CSO	Civil Society Organisation
EEAB	External Ethics Advisory Board
FTX	Field Training Exercise
GDPR	General Data Protection Regulation
GUI	Graphical User Interface
IPA	International Police Association
PSAB	Practitioner Stakeholder Advisory Board
SAB	Security Advisory Board
SOP	Standard Operating Procedure
WCAG	Web Content Accessibility Guidelines
WP	Work Package

## Executive summary

The PROACTIVE project (Preparedness against CBRNE threats through cOmmon Approaches between security praCTitioners and the Vulnerable civil society) has sought to enhance preparedness for, and response to, a CBRNe incident through a better understanding of the needs of vulnerable citizen groups, and through an exploration of procedures between various categories of practitioners for CBRNe incident management. During the lifetime of the project, the partners have conducted a range of applied research activities, have developed new technologies to support first responders, and delivered three high profile international field exercises in collaboration with the eNOTICE project and a range of practitioner and stakeholder organisations. This deliverable brings together the findings and recommendations from across the project work packages, upon conclusion of the three field exercises, into one summary report.

In this report we set out the key outcomes from the project activities, organised by work package, and activity. The PROACTIVE project has generated a myriad of recommendations for action at all levels, and importantly has demonstrated, through research and practice, the utility of a range of policy and practice improvements captured within these recommendations. Initially in this report, we organise these recommendations by research-focused work package, outlining the key findings and deliverables, before describing the WP activity-specific recommendations. The PROACTIVE work packages included are: WP1 a human factors analysis of CBRNe preparedness and response; WP2 the engagement of Law Enforcement Agencies (LEAs) and other practitioners; WP3 describing engagement of the civil society including vulnerable citizens; WP4 & WP5 which summarise the creation of the PROACTIVE CBRNe Crisis Communications System (web platform and PROACTIVE Mobile Apps; WP5 the toolkit for civil society organisations; WP6 an overview of the three joint exercises, evaluation and validation of the tools, and finally WP8 describing the legal, ethical and acceptability requirements of the project activities.

Following the work package specific sections, we bring together overarching superordinate recommendations arising from the project, organised into key areas of activity, summarised here.

### Area 1: Pre-incident communication

Our research has highlighted the importance of policy makers and responder organisations implementing information campaigns and education to build public knowledge about CBRNe threats (Recommendation 1) before they occur. Further, pre-incident information should be presented and delivered by policy makers and / or responders in a way that makes it accessible to all members of the public, including those who may be more vulnerable (Recommendation 2). The PROACTIVE project has included a demonstration of the potential positive impact of pre-incident information materials on CBRN incident response.

### Area 2: Guidance documents and SOPs, and best practice towards more inclusivity and co-creation

The PROACTIVE project has demonstrated the value and importance of including representatives of vulnerable groups together with practitioner organisations in CBRN incident preparedness and response. Further, creating opportunities for multi-agency partners to work together, and alongside civil society organisations is vital, and should inform the development of enhanced SOPs, guidance, and training. There is now an established and growing applied research literature that can inform the

development of protocols and procedures, and the PROACTIVE project has captured and summarised this growing evidence-base. As a result, first responder organisations should develop SOPs that facilitate interagency cooperation (Recommendation 3), and first responder guidance documents, training, and SOPs should provide evidence-based advice to help responders communicate with the public (Recommendation 4). The project activities, including representatives from vulnerable groups and civil society organisations in multi-agency live field exercises and workshops, have demonstrated how inclusivity and co-creation can be achieved and can be used to inform the development of new materials for first responders and the public. As such, first responder guidance documents, training, and SOPs should provide details for responders concerning how to identify and address the needs of vulnerable groups during a CBRNe incident (Recommendation 5). Finally, we recommend that where possible, first responder SOPs and guidance should be consistent – or harmonised – between documents and countries wherever possible (Recommendation 6). Whilst technical aspects of SOPs and guidance may necessarily vary due to differences in personnel, equipment and procedures, the PROACTIVE project has highlighted a range of recommendations for the management of vulnerable groups which transcend country-specific variations and should appear in all SOPs and guidance.

### **Area 3: Development of the PROACTIVE Crisis Communication System (CCS)**

The PROACTIVE Crisis Communication System (CCS) includes new tools developed and tested during the lifetime of the project, for first responder organisations and the general public. Critically, the iterations that have led to the development of these tools have shown that exercise organisers and developers should adhere to design principles (set out in the PROACTIVE project deliverables), to facilitate the creation technologies (e.g., Mobile Apps) that are optimised for use by the target audience (Recommendation 7).

### **Area 4: Communication with the public during an incident**

We have appraised both the applied research literature on communicating with the public during CBRN incidents and evaluated the performance of first responder communicators during live field exercises that have tested the acute response to three different CBRN incident scenarios. These experiences have demonstrated that effective communication serves not only to warn and inform the public during incidents; it can result in the success or failure of first responder objectives, such as saving life and minimising harm. Therefore, we have developed a range of actionable recommendations for first responders, policy makers and communicators. Firstly, official sources should communicate accurately, honestly, and regularly with members of the public throughout a CBRNe incident (Recommendation 8), and that first responders should provide information to members of the public in an accessible format during a CBRNe incident (Recommendation 9). There are a range of practical and interpersonal barriers to communication in an incident response that first responders must contend with. We provide a range of suggestions for how interpersonal communication between emergency responders and members of the public should be facilitated during a CBRNe incident (Recommendation 10). Finally, the PROACTIVE project has identified how first responders should ensure that vulnerable groups receive the information they need and that they are provided with adequate support during a CBRNe incident (Recommendation 11). Whilst first responder organisations must apply these recommendations to their local circumstances, the PROACTIVE project has ensured that the outcomes and recommendations are broadly applicable across EU Member States.

## **Area 5: CBRNe training and exercising**

Preparedness and response activities for CBRN incidents occur regularly across the EU, but rarely do training and exercises incorporate consideration of the needs of vulnerable members of civil society. Given the potential challenge and complexity of a response involving a diverse population and those with additional needs, CBRNe training and exercises should occur regularly and should incorporate best practice relating to exercise organisation to facilitate shared outcomes (Recommendation 12). The PROACTIVE project has identified and set out best practice principles for these preparedness activities, and further, we have shown that CBRNe exercises should regularly include members of the civil society, including vulnerable groups. Furthermore, where possible members of the civil society should be involved in the design and organisation of these exercises (Recommendation 13).

Overall, the PROACTIVE project represents a substantial success story – identifying best practice and associated gaps in CBRNe preparedness, and developing tools, products, and recommendations to amplify the best practice and address the gaps. These were further developed through rigorous stakeholder involvement, taking into account perspectives from across both professional and lay audiences, before being tested in rigorous exercise conditions. However, this project should only represent the beginning of this endeavour – now that these recommendations and best practice have been identified, and several gaps addressed, the work of embedding these findings into the daily practice of first responder organisations must continue.

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## 1. INTRODUCTION

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The PROACTIVE project was established to enhance societal CBRNe preparedness. It aimed to do this in two main ways: first, by increasing understanding of current and best practice for practitioners' ability to manage large, diverse groups of people during a CBRNe emergency, with a specific emphasis on groups within the civil society who may be more vulnerable and have more pronounced needs; second, by developing tools and outputs (including pre-incident information and an online Crisis Communication System (CCS), reports, recommendations, briefing documents) designed to help increase practitioner's ability to successfully manage large groups of diverse populations during an emergency.

Specifically, the project aimed to achieve these objective through: identifying existing knowledge, challenges, and opportunities relating to management of the general public during a CBRNe incident (both in the research literature and practitioner guidelines/ Standard Operating Procedures [SOPs]) (Work Package 1); fostering collaborative relationships between the project and representatives from both practitioner organisations and the civil society (and between practitioner organisations and the civil society more directly) to ensure that the needs of a diverse range of professional and lay groups are considered (Work Packages 2 and 3); co-developing a suite of digital crisis communication tools that are accessible and useable by diverse populations (Work Packages 4 and 5); co-developing effective and accessible pre-incident information designed to provide the public with information that could save lives during the early stages of a CBRNe incident (Work Package 5); developing a framework to ensure the ethical conduct both of exercises and during CBRNe incident response (Work Package 8); and, conducting large-scale international field exercises to both examine responder and civil society behaviour and to test outputs and tools developed through the lifetime of the project (Work Package 6).

Across the lifetime of the project, a broad range of gold standard research has been conducted across the activities and Work Packages listed above, which has served to advance the state-of-the-art for CBRNe incident response. This deliverable serves to provide a summary of the wide-ranging findings from the PROACTIVE project, collating evidence and insight generated across the research-focused Work Packages to demonstrate the efficacy of the project tools and outputs. Within the sections below, there is a high-level summary of each of the relevant Work Packages, with a snapshot of the relevant findings and recommendations focused on how to use and implement these findings. Following the Work Package level summaries, we provide a synthesis which draws together the overall narrative running through the PROACTIVE project. Finally, the findings and overall narrative are developed into a series of recommendations regarding the usability of the project outputs, public perceptions of the outputs, and potential ways that the outputs can be further developed and implemented in the post-project phase.

## 2. OVERVIEW OF PROACTIVE WORK PACKAGES

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In the following sections we provide an overview of the background, activities, outcomes and resulting key recommendations from each of the substantive, research-focused Work Packages.

Namely, Work Packages 1, 2, 3, 4, 5, 6, and 8, excluding Work Packages focused on dissemination, exploitation, management, and ethics requirements (Work Packages 7, 9 and 10). These key summaries are subsequently synthesised into an overall account of the PROACTIVE project, with resulting recommendations (operationalised for use based on the outcomes of the project) for both the conduct of similar projects involving field exercises (FTXs), and the development and use of both the PROACTIVE tools and similar tools in the future.

## **2.1. Overview of WP1 CBRNe Terrorism in Europe and Beyond: Human Factors Analysis of Preparedness and Response**

### **2.1.1. Background**

The main objectives of this WP were to: (1) identify factors that are associated with effective pre-incident public information campaigns for CBRNe terrorism, (2) understand factors that may increase public compliance with both recommended prevention measures (prior to an incident occurring) and recommended protective measures (during an incident), (3) understand public perceptions of security measures that are in place to prevent and mitigate the effects of CBRNe terrorism, (4) understand current policy and practice in the preparation for and management of CBRNe terrorism in different organisations and across different countries, (5) identify gaps and requirements, to develop an optimised strategy for terrorism mitigation and management, including development of effective pre-incident information materials. Outputs of this WP were subsequently used in WP2, WP3 and WP5, and formed the basis for the PROACTIVE tactical objectives used across the three FTXs.

### **2.1.2. Overview of activities**

In order to achieve the aims of WP1, two literature reviews and one evidence synthesis were conducted in the first year of the project. The first review, D1.1 (Hall et al., 2021a), presents the findings from the review of academic literature relating to public perceptions of, and responses to, mitigation and management strategies for CBRNe terrorism. This review involved conducting a synthesis of data and outcomes from 41 papers, which enabled the authors to identify the 'state of the art' and extract common themes to answer the key questions associated with Task 1.1 Analysis of current status on CBRNe preparedness. Specifically, this review details:

- the baseline level of knowledge and understanding of CBRNe prevention and management strategies within the general population,
- the identification of factors that are associated with effective pre-incident public information campaigns for CBRNe terrorism,
- the understanding of factors that may increase public compliance with both recommended prevention measures (prior to an incident occurring) and recommended protective measures (during an incident).

While D1.1 (Hall et al., 2021a) focused on providing an overview of the state of the art in the research literature, D1.2 (Davidson et al., 2021) conducted a thorough review and synthesis of current tools, SOP's, guidance, and policy documents, to identify current policy for mitigation of CBRNe terrorism, across different countries and organisations. As a result of this comprehensive review, 95 documents were identified and used within the review. Specifically, this review details:

- current policy and practice in the preparation for and management of CBRNe terrorism in different organisations and across different countries,
- current guidance and strategies for communicating with members of the public about CBRNe preparation and management,
- the potential impact of current policy and practice in the preparation for and management of CBRNe terrorism on members of vulnerable groups.

Finally, D1.3 (Hall et al., 2021b) (outcome of Task 1.3 Synthesis of published research, policies and guidance regarding CBRNe incidents), synthesises the findings and key recommendations for best practice from across the two preceding reviews (one focused on academic literature and one on policy and practice) to provide guidelines and recommendations for the mitigation and management of CBRNe terrorism, considering current policy and human factor insights alongside the current state of the art. The findings in this deliverable are synthesised using a Realist framework Approach and include: state of the art data from academic literature (D1.1 [Hall et al., 2021a]), current guidance documents (D1.2 [Davidson et al., 2021]) findings from other related projects (i.e., PRACTICE, PIRATE, TOXI-TRIAGE, CascEff, PROJECT MILO, RE(h)STRAIN, IMPACT & BESECU), input from subject matter experts (e.g., research specialists, public health practitioners, emergency responders, and representatives from other health and security-related organisations).

Altogether, Work Package 1 provides a thorough synthesis of current practice and state of the art evidence relating to both the public's understanding of CBRNe incident preparedness and management, and practitioners' understanding of how to manage and mitigate CBRNe incidents. These findings and accompanying recommendations provide the bedrock on which the research outputs and tool development conducted throughout the PROACTIVE project are built.

### **2.1.3. Key Outcomes**

D1.1 (Hall et al., 2021a) findings related to the current level of knowledge and understanding of CBRNe prevention and management strategies indicated that initial levels of preparedness among the public vary between populations used within research. Results also suggested that the general public's current understanding of CBRNe prevention and management strategies is very low. There was a consensus toward management and prevention strategies (e.g., Shelter-in-Place, The Homeland Security Colour System and KI distribution campaigns) being viewed by the public as confusing, and often without meaning. Across the literature there was consensus that official protective and preventative recommendations are often misunderstood, complex and confusing to the public. Effective pre-incident communication was characterised by being easy to understand with the use of non-complex language, disseminated across multiple platforms, delivered by a credible source, and incorporating psychological constructs that aim to reduce threat and anxiety. Factors

which have the potential for increasing willingness to engage in pre-incident and preparedness information, included: demographics, prior knowledge, and psychosocial factors. Demographic factors include gender (females reported to be more compliant in comparison to males); education level (those with a higher level of education are more likely to engage in the uptake of preventative measures); and location (those who are in closer proximity to a site which has the potential to cause a CBRNe incident are more likely to have higher levels of concern and knowledge of incidents). Prior knowledge is essential in ensuring the public can understand, remember, and recall information. Factors which have the potential to increase compliance with official instruction during an incident, included: trust; provision of information; emotional responses; efficacy and relationships. A good example of how to influence compliance with official communication during an incident is to provide a reliable source. The more information made public following an incident, the higher the rate of compliance. Fear and anxiety, as emotional reactions to an incident, have an impact on public compliance; fear indicates greater compliance while anxiety indicates greater non-compliance. If instruction is paired with fear of sickness, contamination or death, members of the public are more willing to engage in various protective measures (Pearce et al., 2012; Carter et al., 2014; Savoia et al., 2015). Moreover, for example, people are more willing to comply with shelter-in-place strategies when they are in their home in comparison to an unfamiliar environment (Pierce et al., 2013). Self-efficacy, response-efficacy, and coping skills were all linked to following instructions given by authority figures. Ensuring the safety of loved ones was also suggestive of low levels of compliance with official instruction.

Moreover, D1.2 (Davidson et al., 2021) findings show that across guidance documents, there is a heavy reliance on practical and physical aspects of CBRNe management, yet documents tend to lack recognition for the psychosocial aspects. Therefore, although it is important to provide practical and physical recommendations to responders to enable them to manage the incident, psychosocial aspects and interactions with the public should not be overlooked. In addition, there seem to be discrepancies in the information that is provided in guidance documents both within and between countries. Another interesting observation across the documents is that there seems to be no standardised method of response to a CBRNe incident both within and between countries. Although most documents propose some type of decontamination (e.g., dry, wet, showering, interim), there doesn't appear to be much uniformity in how documents advise carrying out these procedures. There appeared to be agreement that life-saving medical care should come first over decontamination in 15 documents from ten different nations (the United Kingdom, Czech Republic, Germany, Australia, Latvia, France, USA, and Sweden), as well as in a document from the World Health Organization. Although it is encouraging that these nations have reached a consensus, only about 15% of documents include this instruction. This crucial recommendation may go unheeded in the 79 texts that do not advocate that life-saving measures be prioritised.

There seems to be around a 50/50 split between documents that discuss communication strategy and those that don't. However, when it is stated, there doesn't appear to be any uniformity in the amount of information given across documents. Documents that only provide short sentences would benefit greatly from providing more details about what to communicate to the public and also how to communicate this. The need for concise, accurate, and true communication is emphasised throughout documents, and it is advised that the public receive regular updates (e.g., Bundesministerium des Innern, 2016). Across the documents that discuss a communication strategy, eight of these documents discuss practical information that should be provided to those at the scene of the incident. However, the practical information that is provided is very generic and there is no

clear practical communication strategy in any document. Furthermore, the results indicate that countries seem to understand the importance of using different media channels to communicate with their citizens. Documents from the United States, Australia, Austria, France, Germany and Latvia recommend using television, radio, internet and social media to reach the public. However, the recommended methods for communicating with people at the scene of an accident seem to be less consistent.

Finally, D1.3 (Hall et al., 2021b) details 18 recommendations for effective policy and practice in the mitigation and management of CBRNe incidents. These recommendations span the range of human, social, organisational, and societal factors that are critical for the effective mitigation and management of CBRNe incidents. All final WP1 recommendations are provided in the next section.

## 2.1.4. Recommendations for implementation

Recommendations for implementation outlined in D1.3 (Hall et al., 2021b) focused on the areas of guidance, knowledge, dissemination, communication and pre-incident information. These recommendations are presented below.

**Guidance** - Based on the results of the studies, recommendations for CBRNe practitioner organisations suggested improvements to guidance documents:

- Guidance documents should provide evidence-based advice on communicating with the public which can be followed by authorities in the event of a CBRNe incident.
- Guidance documents should provide evidence-based advice about public behaviour, emphasising that the way in which practitioners manage an incident will affect the way in which members of the public behave.
- Guidance documents should provide evidence-based advice on strategies to increase public compliance in the event of a CBRNe incident.
- Guidance documents and SOPs should inform responders about the needs of vulnerable groups and include plans for dealing with such groups in the case of a CBRNe incident.

**Knowledge** - Recommendations for implementation in respect to knowledge were:

- Information campaigns and education to build CBRNe public knowledge should be implemented.
- Messages should be pitched at an appropriate level (in terms of language and complexity).

**Dissemination** – With regard to dissemination of material the following suggestions were put forward:

- Official communication should be honest, empathic, assertive and reliable.
- Information should be available in writing (i.e., print form), where possible, using non-complex language.



- Multiple platforms should be used to communicate with the public, with consistent information being provided across platforms.
- Information provided by authorities should be pre-planned, where applicable, to ensure prioritisation and consistency, provide uniformity and advocate cohesion.

**Communication** – Recommendations for communication were divided into recommendations for first responders and recommendations for authorities.

*Responders* should communicate effectively and demonstrate respect for public needs. Communication should:

- To the extent possible, inform the public about loved ones' whereabouts in relation to family, friends and pets,
- provide information about active police and security efforts to apprehend terrorist,
- provide information on the importance of complying with instruction (including health specific information to address public health concerns),
- and be delivered by a credible spokesperson (e.g., local resources, hazard groups and health departments).

Recommendations were made for communication throughout the incident:

- Communication should focus on ensuring the protection of the public's health and should aim to influence the perceived efficacy of recommended behaviours.
- Effective communication with the public in the event of a CBRNe incident, officials should utilise a trusted spokesperson, whilst tailoring the spokesperson to what is preferred by the population at hand (e.g., local sources).
- Accompany information with facts or proof to provide robustness (e.g., mechanisms through which someone could be affected by radiation and the known geographical spread of any risk).
- Communication should meet the needs of the intended audience (e.g., publish information in more than one language to reach those who may not speak the majority language).
- Information should incorporate answers to popular questions regarding CBRNe incidents, for example: what to do when driving in a car, and [if applicable] what the incident or contaminant was.

Recommendations for *authorities* communicating with vulnerable populations included:

- Information should be provided in multiple languages, pictographic form, and sign language.
- Policy and procedure for the management of CBRNe incidents should remain culturally appropriate and be respectful of religion and religious values.

- More consideration should be given to developing policy and procedures to assist those with mobility issues (e.g., relating to service animals and essential mobility aids) during CBRNe incidents.

Official sources should communicate honestly and accurately in detailing risks associated with an incident, as this will allow the public to make an informed decision as to whether they wish to comply with official instruction or recommended behaviour. Communication should aim to reduce anxiety, by providing information to enhance self-efficacy.

#### **Pre-incident information – Recommendations for implementation were:**

- Pre-incident information should be delivered to the public using multiple sources.
- Pre-incident information should be culturally appropriate, easy to understand, and non-complex, thereby allowing the information to be accessible for all.
- Pre-incident information should meet the needs of the intended audience, incorporate factual proof and use a credible spokesperson (e.g., a specialist) to account for the preference for information received via higher sources.
- Novelty (e.g., using a cartoon character) may be effective in disseminating pre-incident information.
- Effective educational programs and public information campaigns can be used to reduce anxiety, improve knowledge, and to allow members of the public to effectively attend to, and remember, information.
- When circulating pre-incident information regarding CBRNe incidents, policy makers should be mindful that there is a possibility of provoking worry in members of the public.
- Remember that pre-incident information is not a substitute or replacement for real-time information for an ongoing incident.

## **2.2. Overview of WP2 Engagement of Law Enforcement Agencies (LEAs) and other practitioners**

### **2.2.1. Background**

The objective of WP2 was to identify current practice by CBRNe practitioner organisations in the management of CBRNe incidents (preparedness and response phase). One focus was to identify commonalities and differences between countries (mainly in Europe) as well as differences between CBRNe practitioner organisations (LEAs, Firefighters, Emergency Medical Services, etc.). Furthermore, recommendations for CBRNe practitioner organisations to improve their CBRNe management were developed. This involved building on the work outlined in D1.2 (Davidson et al., 2021), with a special focus on the analysis of CBRNe SOPs, which are important for a successful coordinated response to CBRNe incidents, with subsequent recommendations for improving CBRNe SOPs.



### 2.2.2. Overview of activities

The Practitioner Stakeholder Advisory Board (PSAB) established in WP2 was designed to provide a source of expert practitioner advice across the PROACTIVE project. In addition to contributing to the aims of WP2, the PSAB also provided valuable feedback in the context of other WPs (e.g., development of the PROACTIVE CCS, development of the PROACTIVE pre-incident information, and evaluation of the three FTXs) via workshops, surveys, interviews and focus groups. PROACTIVE was able to recruit 99 members from 25 countries for the PSAB. These were mainly European countries. However, experts from the USA, Canada, Israel and Lebanon were also recruited. The members represent a variety of different groups (LEAs, Firefighters, Defence/Military, Emergency Medical Services, Civil Protection, Laboratories, Industry, Railway, Psychological Services and Research and Academia), which enabled PROACTIVE to include a comprehensive overview on the field of CBRNe from a practitioner perspective within the project. Due to time constraints, PSAB members were sometimes unable to participate in project activities. However, overlaps in the profile of PSAB members ensured that a broad profile of PSAB members was included for each activity. In order to facilitate this high impact work across PROACTIVE, the project adopted a Collaboration Agreement in lieu of a Non-Disclosure Agreement when recruiting PSAB members. This successfully served to lower the administrative hurdles for potential PSAB members, thus facilitating effective engagement.

As described above, a primary focus of WP2, alongside the establishment and management of the PSAB, was to identify current patterns of managing CBRNe incidents among CBRNe practitioner organisations with a special focus on the extent to which vulnerable groups are considered in CBRNe management. To answer this question and to identify similarities and differences in CBRNe management in different countries, a quantitative and a qualitative study were conducted. The quantitative study included an online survey of CBRNe practitioner organisations (LEAs, Firefighters, etc.). While the focus of the survey was on Europe, there were non-European respondents to provide an overview of CBRNe management outside of Europe. In total, 405 individuals from 47 countries representing their respective organisations participated in the study. Volunteers were recruited through various channels (PROACTIVE partners, PROACTIVE social media channels, PROACTIVE PSAB, EU partner projects, CEPOL, IPA, conferences, etc.). Almost half of the volunteers (43%) assigned themselves to a LEA. Other important groups were Firefighters (20.1%), Emergency Medical Services (16.9%), and Civil Protection (8%). Volunteers represented different management levels (Operational level, Tactical level, Strategic level) and organisations active at various levels (international, national, regional, and local).

In addition, a qualitative study was conducted alongside the quantitative study to provide benchmarking and suggestions of best practice/ improvements to practice. Specifically, the benchmark rating was conducted on six topics:

- (joint) threat assessment by CBRNe practitioners with regard to CBRNe incidents,
- legal and policy framework for inter-agency collaboration,
- (joint) training,
- evaluation and capacity building,

- security measures and,
- communication with the public.

The benchmark rating included five pre-written statements for each topic, with volunteers being asked to tick the statement that most closely described the CBRNe management in the respective country for which they were responding. In subsequent interviews, the classifications were discussed with the volunteers. In addition, best practice and suggestions for improvement in the individual areas were discussed. A total of 48 people from 22 countries participated in the qualitative study. The focus was again on Europe; however, interviews were also conducted with respondents from Canada, Israel, Lebanon and the USA. The majority of interviewees were from LEAs (n=26). In addition, other important groups were Civil Protection (n=8) and Firefighters (n=3).

Many of the findings and recommendations resulting from the above-mentioned activities, were also confirmed / extended through a closer analysis of CBRNe SOPs (checklists, aide memoires, flowcharts, etc.), which are important for the successful coordination of a CBRNe incident. CBRNe SOPs were collected via project members and through the PSAB. However, as CBRNe SOPs often contain confidential information, only a few SOPs could be collected through these channels. The searches were supplemented by literature searches on the internet. CBRNe SOPs were searched for in the following areas: hazard detection and location, threat assessment, sampling plan, identification of CBRN agents, decontamination, scene management, victim care and victim management including crisis communication with the (vulnerable) public. Finally, information on CBRNe SOPs was collected through another online survey with practitioners. This survey was complemented by a workshop with 26 PSAB members (including a live online survey), which enabled the collection of information relating to CBRNe SOPs without the need for direct access to the SOPs. The online survey of practitioners in three thematic areas (incident management, taking evidence and victim management) was conducted between December 2020 and February 2021. Volunteers were recruited through the PSAB, PROACTIVE's social media channels, PROACTIVE project members and EU partner projects. In total, 37 people from 16 countries participated in the online survey. The focus was again on Europe (Belgium, Germany, Greece, Latvia, Norway, UK, etc.), but perspectives from non-European countries (Canada and Israel) were also included.

The PROACTIVE 'Workshop on Standardisation Potential' was held online on March 24 2023 between 10:00-12:00 CET. The workshop was organised by UIC with support from CBRNE Ltd and DHPol. In order to see which PROACTIVE outputs might have good standardisation potential as part of the post-project exploitation strategy, the project created a subgroup of their advisory board consisting of experts in standardisation. The workshop was held with the six standardisation experts who came from Finland, France, Greece, Ireland and the UK. They represented International, European, or National standardisation bodies as well as two EU-funded projects focusing on standards ([PEERS](#) & [STRATEGY](#)) with which PROACTIVE developed synergies. The workshop was designed to collect feedback from experts on the PROACTIVE recommendations. Overall, the experts found the Core PROACTIVE Recommendations to be a valuable output of the project, and several pathways forward to standardisation were examined, while acknowledging that standards were not necessarily the best way forward for all project results. The experts also informed the PROACTIVE project about existing standardisation efforts of relevance and encouraged PROACTIVE to leverage such initiatives. Indeed, sharing the PROACTIVE recommendations with

the larger standardisation community could eventually lead to the results being integrated into a new or existing standard, which would be a great legacy for the project.

### 2.2.3. Key Outcomes

The results from the quantitative and qualitative studies showed that more than two-thirds of respondents reported having been involved in at least one CBRNe incident in their career. Firefighters were the most likely to report having been involved in CBRNe incidents. In terms of the type of incidents experienced, a large majority of respondents indicated accidents and/or technical malfunctions in factories that have led to a CBRNe incident. In contrast, terrorist attacks were reported by less than one-fourth of respondents. Closely linked to the area of experience with CBRNe incidents is the area of familiarity with the topic of CBRNe. In this regard, more than three quarters of respondents stated that they are very familiar or rather familiar with the topic. Firefighters are again the most familiar with the topic followed by Emergency Medical Services, Civil Protection, and LEAs. Overall, there is not much variation among the groups. This also applies to the different countries in the study sample. The key outcomes from this Work Package can broadly be split into considerations relating to CBRNe preparedness and CBRNe response.

#### *CBRNe Preparedness*

In addition to experience with previous incidents, the field of CBRNe preparedness also includes the area of CBRNe threat assessment. This area is significantly influenced by previous incidents as well as other factors (geographical factors, industrial factors, culture-specific factors, etc.). During the interview study, a mixed picture emerged regarding the area of CBRNe threat assessment as no uniform pattern can be identified for Europe. However, it is striking that in the interview study, a large majority of stakeholders rated the probability of a CBRNe incident due to an accident / technical emergency as much higher than a CBRNe incident due to a terrorist attack.

In order to deal with such incidents, Standard Operating Procedures (SOPs) are required for CBRNe practitioner organisations. In the online survey it was shown that more than three quarters of respondents stated that their organisation has specific SOPs for CBRNe incidents. Such SOPs include, among other things, regulations that define the responsibilities of practitioner organisations in the event of a CBRNe incident. However, in the online study less than half of the respondents who were involved in a CBRNe incident stated that the responsibilities between the organisations involved in the respective CBRNe operation(s) were very clear or rather clear; it can therefore be assumed that many SOPs lack clarity and detail. Furthermore, inter-country comparison in the context of the benchmarking study revealed a mixed picture. For example, respondents from Belgium, the UK<sup>1</sup> and Japan indicated that in their countries protocols comprehensively describe

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<sup>1</sup> A best practice example is the Joint Emergency Services Interoperability Program in the UK (JESIP).

responsibilities during a CBRNe incident. On the other hand, there are countries like Germany, Ireland and Turkey where respondents indicated that this was not the case.

In addition to CBRNe SOPs, education and training are critical to CBRNe preparedness. Nearly three-quarters of respondents to the online survey indicated that their organisation provides training in CBRNe. Moreover, briefing notes and online learning platforms were mentioned as important educational channels in the area of CBRNe. The focus of educational materials differs among the professional groups surveyed. For example, LEAs are primarily prepared for terrorist attacks and accidents rather than for CBRNe incidents due to natural hazards. In contrast, natural hazards play a larger role in Firefighter training as well as Civil Protection training. The quantitative study with CBRNe practitioner organisations showed that mainly the areas of decontamination, building of a safety zone and medical care are trained. In contrast, contact with people affected by a CBRNe incident is trained only very rarely, and training with people who are particularly vulnerable is almost not included at all. There is, therefore, a significant gap in terms of training practitioners in how to interact with the civil society during incidents.

Regarding the frequency of training, more than 60% of respondents to the online survey indicated that their organisation conducts CBRNe training at least once a year. This was particularly frequently stated by Firefighters (almost 90%). In contrast, just over half of the LEAs surveyed indicated that their organisation holds CBRNe training at least once a year. In addition to their own organisation, other organisations (LEAs, Fire brigades, Medical staff, etc.) often take part in such training where it is available. The importance of such training was highlighted in the interview study; indeed, interviewees pointed out that joint FTXs help to get to know the skills and equipment of other organisations better. Furthermore, interviewees remarked that joint FTXs enable better coordination between CBRNe practitioners in case of an emergency. In a comparison of countries, the benchmark rating showed that in countries such as Germany, Ireland and Turkey, specific training in CBRNe is carried out only very rarely. In contrast, countries such as Belgium, Latvia, Norway, Portugal and Slovenia conduct CBRNe (joint) trainings more regularly.

When asked about equipment for CBRNe incidents, about half of the respondents to the online survey stated that they consider their CBRNe equipment to be completely sufficient or rather sufficient. However, the equipment for CBRNe responders can vary greatly depending on the professional category (e.g., LEA, Firefighter, Emergency Medical Service), the type of operation (underlying CBRNe agent), the location (e.g., outdoor public space, indoor ventilated space, railway station) and the object of operation (e.g., explosives, aerosol). Firefighters and Emergency Medical Services stated that they are satisfied with their equipment, while Civil Protection organisations and LEAs reported lower satisfaction. Finally, it is also to be noted that the kind of equipment or "level" of protective equipment should vary with tasks and responsibility.

In summary, there is a mixed picture among the volunteers of the quantitative and qualitative study regarding their organisation's level of preparedness for a CBRNe incident. This is also reflected in the answers to the question about the organisation's overall level of preparedness for a CBRNe incident. About 40% of the volunteers in the quantitative study see a very high or rather high level here. In contrast, about a quarter of the respondents rated the level as very low or rather low. A country comparison does not show any major differences.

As mentioned above, there is a general lack of training to educate practitioners in how to best engage with civil society members (including those from vulnerable groups) during a CBRNe emergency. Consistent with this, there is little evidence of the consideration of vulnerable groups within CBRNe SOPs. A comparison of the occupational groups reveals that the Emergency Medical Services most consistently consider vulnerable groups in their CBRNe SOPs. The most likely groups to be included in SOPs are children, people with mobility restrictions and older people. In contrast, SOPs typically do not include details concerning individuals with visual or hearing impairments, or those with mental health condition. However, these findings do vary considerably across countries; a large proportion of respondents to the online survey from Austria, Germany and Norway stated that their organisation's CBRNe SOPs do not consider vulnerable groups, while respondents from the UK and Ireland did mention consideration of those with mobility restrictions, children and older persons in their CBRNe SOPs<sup>2</sup>. Overall, however, the firm conclusion is that vulnerable groups are rarely considered by practitioners in their CBRNe preparedness work; indeed, this is further reflected in the fact that only about 15% of the respondents to the online survey stated that their organisation cooperates with organisations representing vulnerable groups to address the issue of CBRNe incidents.

### *CBRNe Response*

In addition to the field of CBRNe preparedness, the topic of CBRNe response was also covered within the activities in Work Package 2. Findings from the work suggest that LEAs often take over the following tasks: containment and evacuation of affected citizens, detection of CBRNe agents, criminal investigation, crime scene investigation and ensuring of public order and safety. In contrast, Firefighters and Emergency Medical Services often perform the main tasks of disaster control (triage, rescue, decontamination, medical treatment, recovery, etc.)<sup>3</sup>. However, findings from the data collection revealed that there is no consistent pattern concerning the distribution of response tasks to specific organisations across countries. Furthermore, the distribution of tasks and the involved practitioners (blue-light organisations, military, laboratories, etc.) depend on the respective identified substance (C, B, R, N) as well as on the trigger of the CBRNe incident (accident / technical emergency, terrorist attack, etc.). For example, in the case of a terrorist attack, the coordination is often taken over by LEAs.

Another important task in the event of a CBRNe incident is the area of communication. Effective communication with those affected by a CBRNe incident is essential to minimise the effects of an incident. As evidence from WP1 shows, communication from CBRNe practitioner organisations following a CBRNe incident should be consistent, quick, clear, trustworthy and honest. In the online survey with CBRNe practitioner organisations, about three quarters of respondents stated that their organisation has a communication strategy for major emergencies. These respondents further

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<sup>2</sup> Furthermore, the benchmarking study for the non-European region has shown that in countries such as Canada and Japan, CBRNe SOPs partly address the specific needs of vulnerable groups. However, this is not nationally consistent.

<sup>3</sup> In some countries there are dedicated CBRNe coordination centres, for example in the UK there is a national CBRNe centre that is available to emergency services 24 hours a day. Similar CBRNe centres exist in Belgium, Canada, Cyprus and Norway.



indicated that the communication strategy focuses on general communication and evacuation in about three quarters of the cases. In about half of the cases, decontamination, medical care, and pre-incident information are addressed. Regarding the question of which channels are used to communicate CBRNe information to the public, the quantitative study showed that CBRNe practitioner organisations prefer official websites, social media (especially Facebook and Twitter), radio and TV. Warning apps such as KATWARN and NINA in Germany and BE-Alert in Belgium were also identified as good practice for communication.

As in the case of CBRNe preparedness, the question also arises as to what extent vulnerable groups are considered in response measures. The online study with CBRNe practitioner organisations showed that vulnerable groups are rarely considered in organisational communication strategies for major emergencies. As for CBRNe SOPs, people with mobility restrictions, children and older people are the most likely to be considered. In addition, most respondents in the interview / benchmarking study stated that vulnerable groups are not at all or are hardly considered in CBRNe response measures. This is also reflected in the fact that less than half of the respondents to the quantitative study indicated that their organisation provides CBRNe-related information to the public using pictorial methods (38.1%) or audio-recordings (21.1%), and that the provision of information in sign language (12.9%) and Braille (4.1%) is very rare. On the other hand, it is encouraging that about three quarters of respondents stated that their organisation provides CBRNe information in plain, easy-to-read language. Moreover, slightly more than half of the respondents indicated that their organisation provides CBRNe-related information for the public in at least one language other than the national language(s).

Finally, the results of a PSAB workshop showed that most respondents (n=16) find their organisation's CBRNe SOPs easy to understand. However, and consistent with findings reported throughout this summary, a majority of respondents (n=21) stated that their organisation's CBRNe SOPs do not include information on how to communicate with members of the public in the event of a CBRNe incident.

#### **2.2.4. Recommendations for implementation**

Based on the results of the studies, several recommendations were developed to help CBRNe practitioner organisations improve their CBRNe management. Firstly, there is a very clear need for the provision of additional guidance and training to assist practitioners to know how to communicate with the public during a CBRNe incident. Furthermore, CBRNe SOPs should incorporate further detail concerning the needs, expectations, and challenges of vulnerable groups in the event of a CBRNe incident to enable practitioners to provide optimal support to these groups. This greater focus on vulnerable groups could be facilitated by enhanced co-operation with, and input from, civil society organisations representing vulnerable groups. In addition, CBRNe practitioner organisations can include translators, psychologists, etc. in their networks to facilitate interaction with specific vulnerable groups in the event of a CBRNe incident. When establishing cooperation, it should always be ensured that clear cooperation goals are formulated at the beginning of the cooperation and that measures are taken to achieve these goals. Furthermore, evaluations can be useful to check the effectiveness of the measures. The inclusion of representatives from the civil society (and particularly vulnerable groups) could help to further address their needs ahead of any CBRNe incident. Indeed,

frequent joint CBRNe FTXs (incorporating representatives from blue light organisations, municipal authorities, private security companies, staff working in critical infrastructures such as railways, etc) involving representatives from the civil society should be conducted more frequently to harmonise procedures and train the clear distribution of responsibilities in case of a CBRNe incident. To ensure that such exercises are safe for vulnerable groups, representatives of civil society organisations can be involved in the development of exercise scenarios. In addition, civil society organisations, schools, retirement homes, etc. can be consulted to recruit exercise volunteers. Furthermore, international exchange of best practice solutions for engaging and communicating with the civil society for both CBRNe preparedness and response should be encouraged.

Moreover, there is still a clear need for further development in CBRNe communication by practitioners. In general, more information should be provided to the public before, during and after a CBRNe incident. This applies especially to the areas of decontamination, medical care, and pre-incident information. Where possible, information campaigns should inform the public about CBRNe-related aspects. Furthermore, the communication strategies of CBRNe practitioner organisations should focus more on the needs of vulnerable groups. This concerns, among other things, the formats in which CBRNe-related information is offered. Organisations should increasingly use pictorial language, audio language, sign language and Braille. Cooperation with civil society organisations can be established to help facilitate the preparation of CBRNe information in appropriate formats. In addition, the information should be offered in at least English alongside the national language(s), and all websites should be optimised for e-accessibility.

Finally, the results from WP 2 also suggest that CBRNe SOPs should be clearly structured, use simple language and make the organisation's individual obligations clear. Regarding CBRNe communication, communication templates with key messages should be established. This includes templates for communication with vulnerable groups such as visually impaired people.

## **2.3. Overview of WP3 Engagement of the civil society including vulnerable citizens**

### **2.3.1. Background**

The main objectives of this WP were: (1) Initiation and coordination of the CSAB, (2) Identify the most vulnerable categories and representatives to be involved in the project, (3) Assure active involvement of citizen organisations, vulnerable citizens etc. in key events along the project, especially in the three exercises (WP6), (4) Identify public expectations and needs of the most vulnerable citizen categories in preparedness and response against CBRNe incidents, and (5) Identify how SOPs and tools may better consider the expectations and needs of the vulnerable categories so that they could improve cooperation during an incident. Outputs of WP3 have been used in WP5 and WP6.

### **2.3.2. Overview of activities**

The task to establish the Civil Society Advisory Board (CSAB), one of WP3 main objectives, started even before the project began and was an ongoing effort throughout the duration of the project. 11 organisations signed Letters of Intent during the application phase and these organisations were the

first to be contacted and asked to sign the Non-Disclosure Agreement (NDA) and formally join the board once the project was launched. Only 3 out of the 11 signed the NDA. To grow the board, WP leader UMU set a two-part goal, focusing on quantity in terms of numbers of members as well as range in terms of different categories of vulnerable groups represented. There was also a clear ambition to target recruitment efforts on the three countries where the FTXs would be conducted. This ambition did eventually come to fruition, but it was a challenge in part since no consortium partners were based in either Italy or Belgium.

The subgroups, or categories, within the CSAB were identified to show the range of vulnerabilities represented. This was important both to show new potential members what the board looked like and how they could contribute to their respective field, and to assure recruitment efforts were not skewed or overlooking any vulnerable groups or regions. Some overlap between certain groups of vulnerabilities, for example old age and visually impaired, or children and parents of deaf children, was inevitable.

At the end of the project, the CSAB consisted of 53 member organisations divided into 18 different categories, representing 20 countries.

As outlined in the Description of Action, the CSAB was actively involved in key events during the project, including the three FTXs. The first main activity was a workshop held online in October 2020, of which the results are detailed in deliverable D3.3 (Nicholson et al., 2021). The aim of the workshop was to ensure the PROACTIVE CCS and upcoming FTXs would encapsulate the needs, views, and requirements of vulnerable groups. Initially, the workshop was planned to be held in a physical format in Sweden, but as the pandemic changed the working environment for most of Europe during this time, it was rescheduled as an online event. 16 volunteers from 14 organisations representing vulnerable groups participated in the workshop along with 19 project partners. Besides the two main discussions focusing on the upcoming FTX scenario as well as the outcomes of WP1, the workshop was also a way to introduce the CSAB to other upcoming PROACTIVE activities. The forthcoming survey inquiring about civil society organisations' (CSOs) CBRNe preparedness and response was introduced by DHPol, the PROACTIVE Mobile App was introduced by RINISOFT and CBRNE Ltd, as the leader of WP6 clarified some key aspects of the inclusion of vulnerable volunteers in the upcoming FTXs.

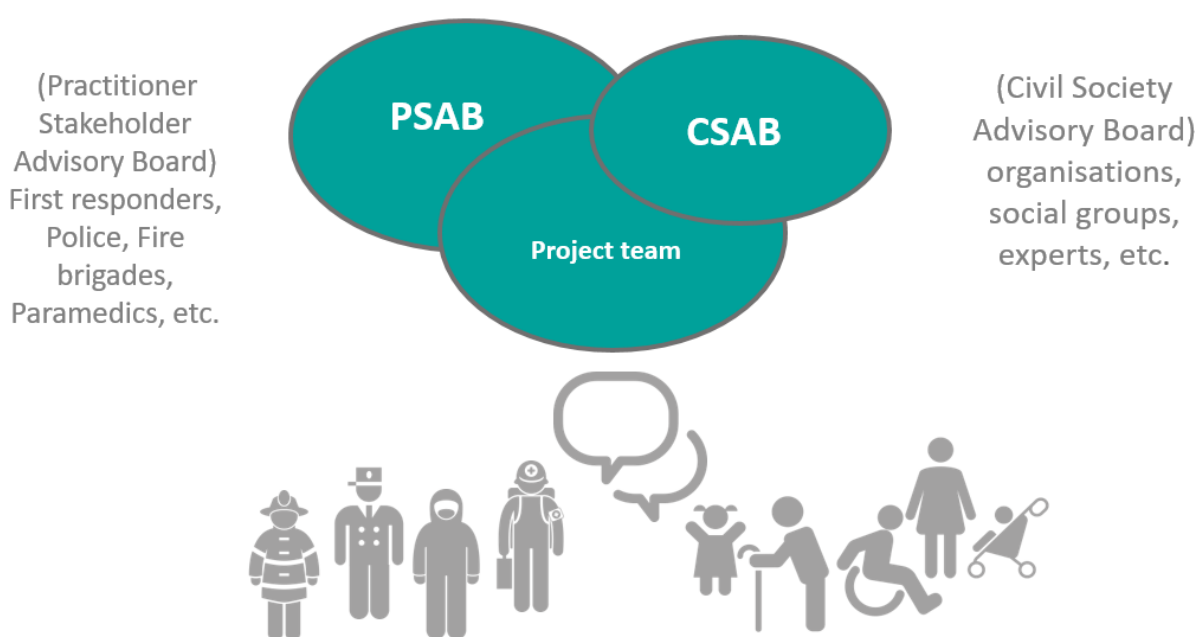
Not long after the workshop, DHPol launched the study aiming to identify the specific needs, expectations, and challenges of especially vulnerable citizens prior, during and after a CBRNe incident. The survey covered aspects such as accessibility of CBRNe related information and the different processes of a CBRNe incident including evacuation, medical triage, undressing, decontamination, and after-care. These aspects had previously been identified in a quantitative and qualitative study with LEAs and first responders across Europe. Consequently, the study involving representatives of vulnerable citizens sought to identify and address the gaps between first responder actions and vulnerable citizens' needs.

A total of 91 volunteers from 20 different European countries responded. The study is presented in detail in D3.4 (Carbon et al., 2021) and resulted in 15 recommendations for law enforcement agencies, first responders, and relevant civil society organisations. The recommendations include more general messages such as encouraging increased cooperation between first responders and the vulnerable civil society, and increase attention paid towards vulnerable individual's specific



needs. More explicit recommendations include not to separate significant others, parents and children, caregivers and the person they are caring for in the event of a CBRNe incident, and for first responders wearing hazmat suits to wear a name badge with a photograph of themselves so as not to appear as anonymous and possibly frightening.

When Covid-19 restrictions became less of a limiting factor and on-site events was an option again, representatives of the CSAB and PSAB alike were invited to participate in a workshop and tabletop exercise organised in Paris, France in April 2022. Not originally part of the Description of Action, but rather a spontaneous event intended to keep momentum going in times of cancellations and postponing and keeping the two advisory boards engaged, the tabletop exercise ended up one of the most successful events in terms of engaging the CSAB. It was the first time CSAB and PSAB members were able to meet each other, and the project partners, in person. Compared to the FTXs which are large scale, complex events, the tabletop was smaller and more streamlined in terms of agencies involved, objectives to be met, etc. The event allowed for valuable discussions both among and between the two advisory boards. Consortium members were all very pleased with the event, as were the advisory board participants, as was clearly reflected in a participant survey which went out shortly after the event.



**Figure 1 PSAB and CSAB roles in the PROACTIVE project**

The three FTXs were carried out in May 2022, November 2022, and May 2023. For all three FTXs, a number of CSAB members were invited to travel to the exercise site and participate as observers. As observers they were expected to attend an online briefing about the PROACTIVE Mobile App and the observers guide, typically scheduled a week or two prior to the FTX, to download the App and familiarise themselves with its features, and of course travel to the exercise site and observe the duration of the event. Their observations and feedback were collected through the observer guides. The purpose of having representatives of vulnerable groups observe the FTXs was to analyse the involvement and treatment of the vulnerable volunteers in a more nuanced way than by exclusively capturing the experiences of the participating volunteers.

The CSAB members were also asked to provide feedback on deliverable D3.2 (Hale et al., 2023) the Aide Memoire. This deliverable is intended to be put to practical use by exercise organisers and promote and encourage the inclusion of the diverse civil society in disaster planning and preparation. To make sure the document fairly and accurately portrays the needs and expectations of vulnerable groups, members of the CSAB were asked to review the text. The request was extended to all members of the CSAB, but targeted, individual requests were sent in addition to those CSAB members who had previously attended a FTX and thus had more practical experience to draw from. The suggestions and comments provided by the CSAB review greatly informed the final document. The PSAB was also invited to review the Aide Memoire and provided valuable feedback as well.

### 2.3.3. Key Outcomes

Key outcomes from D3.1 (Strand and Johansson, 2021) Formation of the CSAB are summarised in Appendix 3 of D3.2 (Hale et al., 2023) and lessons learned through establishing a Civil Society Advisory Board. Recruiting for the CSAB was a challenge from beginning to end, but some successful strategies were identified through the process. These include clear and concise messaging, FAQs addressed in the invitations, invitations sent through personal connections and recommendations, and keeping the number and length of any legal documents to a minimum.

It was a challenge to grow the CSAB in terms of numbers that could match the PSAB. But the members who did commit to the board were highly engaged, motivated and quick to respond. This may seem contradictory given the fact that it was somewhat problematic to fill the allocated CSAB observer spots for all three field exercises, but several factors should be considered in this regard. First, many CSAB members contributed to the project on their own time, that is they were not engaged through a professional position. Traveling to a field exercise would thus be time spent without pay. Similarly, those CSAB members who contributed to the board without an affiliation, but as individual experts, could not be reimbursed for travel expenses and were thus exempt from the invitations. In addition, even after most restrictions and travel regulations were lifted following the pandemic, some CSAB members expressed concerns travelling due to the risk of infection and yet others had been advised not to travel by their doctors.

As a result of the workshop with the CSAB held in October 2020, needs, views, and requirements of vulnerable groups were captured to subsequently feed into exercise scenario development. The discussions in the workshop centred around alternatives regarding location, time, and weather of the scenario as well as the type of individuals represented in the scenario and the descriptive language used within the scenario. The workshop also provided CSAB feedback on the outcomes of WP1. This discussion helped to identify gaps and to further develop recommendations for onward use within the PROACTIVE project. Specifically, discussions focused on prioritising communications, different communication types, and how best to educate and inform members of civil society about the risks of a CBRNe event.

The qualitative and quantitative study presented in D3.4 (Carbon et al., 2021) resulted in 15 concrete recommendations for CBRNe practitioners and relevant civil society organisations. The recommendations (reported in section 2.3.4 of this deliverable) cover different phases of CBRNe incident management and are in part based on the outcomes of the survey with CBRNe practitioners and the interview study with LEAs. Although naturally there are differences between the different

vulnerable groups, what is perhaps more noteworthy are the many similarities identified in the study. All vulnerable groups: expressed a strong preference for face-to-face and telephone communication; expressed a need for clear and easy to understand instructions; and emphasised the need for sufficient psychological support. It is worth noting that these are all needs that can also be applied to the general public at large during a CBRNe event, and not just applicable to particularly vulnerable groups.

Key outcomes from the observer guides, used to caption the impressions and feedback from CSAB observers at the three FTXs helped inform the identification of good practices and key takeaways in preparation for the next FTX. More detail is provided in the three exercise deliverables (D6.3 [Carbon et al., 2022], D6.4 [Godwin et al., 2023], and D6.5 [Burlin et al., 2023]) and in the Work Package 6 summary below.

Finally, the Aide Memoire was published close to the end of the project and so its impact is anticipated after the project has finished. It captures much of the learning and experience gained by the exercise planners who carried out WP6. It also includes recommendations from WP3. The intention and ambition are that it will be used in a practical way as a complementary tool and guide (alongside existing planning processes) for any one person or organisation as they plan and execute an emergency exercise with the involvement of volunteers from the civil society. The Aide Memoire is intended to be applicable and useful for those who are experienced in working with the civil society as well as those who are more novices. The reader is guided to different sections depending on experience level and intended use. However, it is highlighted that all users can benefit from reading the entire document at least once.

### **2.3.4. Recommendations for implementation**

Disasters are inclusive; therefore, disaster preparedness efforts need to be as well. It's not about accommodating special needs, it's about accommodating basic needs for everybody, regardless of what that may look like.

The intention in PROACTIVE was to structure the PSAB and CSAB in a practically identical manner. This approach makes sense from a strategic point of view as it makes the feedback and outputs from the two boards easy to compare and measure. The vision of the two boards serving the project with equal importance and influence is appealing. However, the CSAB was different from the PSAB in some fundamental ways. A key one being that the CSAB represent individuals, not professional cohorts. So even though the project sought general input from representatives of larger groups, it was always going to be substantially more difficult to differentiate between subjective opinions and objective facts; being a vulnerable individual is not a profession and vulnerable individuals don't act according to standard operating procedures.

One of the key learnings in working with the CSAB has been to remain adaptable and open minded regarding what involvement and contribution should and can look like. In other words, invite everyone on the same premises but allow for flexibility. For example, Umu was in contact with two different women representing Muslim organisations. Neither wanted to sign the NDA and officially join the board because they did not want to speak on behalf of others. But both agreed to interview style conversations which contributed immensely to a better understanding of how to approach this group in recruiting exercise volunteers. Another key learning that has come out of the work with the CSAB

is the importance of acknowledging situational vulnerability, that is that vulnerability is not a fixed state, but always dependent on the situation.

Another aspect or recommendation which can be difficult to implement but worth bearing in mind is that for all the European citizens who don't speak English daily and are less comfortable expressing themselves in a foreign language, alternatives should be made available when possible and practical. In the FTXs, it was imperative that the volunteers understood what was asked from them and what their rights were, and so all consent forms and briefing materials were made available in their native language. CSAB workshops were dominantly held in English, as this was the working language of the consortium. But there was one workshop held in Swedish. Organisers UMU, who is based in Sweden, asked all 11 Swedish CSAB members if they would prefer to participate in mixed sessions, where they would be able to interact and network with CSAB members from all over the world, but have to communicate in English. Or if they would rather participate in an all-Swedish session. All members responded that they would prefer the all-Swedish option. And when comparing levels of interaction and feedback received, the Swedish workshop where all volunteers were allowed to speak their native language far surpassed the others.

As mentioned in section 2.3.3, D3.4 (Carbon et al., 2021) resulted in 15 concrete recommendation for CBRNe practitioners and relevant civil society organisations. These recommendations are as follows:

- The needs, expectations and challenges, especially in regard to vulnerable members of the civil society should be considered more extensively in CBRNe related SOPs.
- Emergency response organisations should increasingly reach out to CSOs to raise awareness for major emergencies in general, particularly CBRNe incidents involving the public.
- Emergency response organisations and CSOs should cooperate to a greater extent in order to better address the specific needs of vulnerable groups in the event of a disaster / CBRNe incident.
- Emergency response organisations should increase the availability of CBRNe-related information prior, during, and after a CBRNe incident in specific language formats (audio language, Braille, sign language, simple language, and pictorial language). In addition, information materials should be offered in languages other than the local language.
- In CBRNe exercises of LEAs and first responders, vulnerable groups should be increasingly included so that their specific needs can be better taken into account in an emergency. In addition to vulnerable persons, their caregivers / companions should also be included, as they can be an important source of information for the respective vulnerable person as well as for the emergency responders.
- In communication with vulnerable persons, increased attention should be paid to these groups' specific needs during a CBRNe incident.

- Significant others should not be separated from each other and/or replacement significant others should be provided as a temporary measure. If possible, caregivers (e.g., parents, guardians) of vulnerable persons should not be separated from the vulnerable person.
- If possible, responders should actively involve caregivers (e.g., parents, friends, guardians, nurses, teachers) of vulnerable persons in the evacuation, the medical triage, the undressing, and the decontamination process to ensure appropriate support for vulnerable persons. If this is not possible, responders should involve other affected persons or step in themselves where necessary.
- When first responders are wearing protective equipment during a CBRNe incident, they are likely to create fear and anxiety among the affected persons. Therefore, they should attach a photo to their clothing that shows them without the protective gear.
- First responder organisations should develop a brief medical triage checklist that can be used to identify potential vulnerabilities among those affected by a CBRNe incident. Such a list should include the major vulnerabilities that may concern those affected by a CBRNe incident. In addition, the list should identify the specific needs that arise from the corresponding vulnerabilities.
- Several strategies should be used as part of the undressing process to meet the special needs of the vulnerable civil society and to increase compliance with the given instructions (for example, if possible, only people of the same sex should undress next to each other, first responders should provide seating areas for the undressing process that would be beneficial for people with mobility limitations, etc.).
- Several strategies should be used as part of the decontamination shower routine to address the special needs of the vulnerable civil society and to increase compliance with the given instruction (for example, first responders should illustrate the decontamination process prior to the shower routine, monitor the effectiveness of the shower routine, etc.).
- When / after leaving the hot zone, several strategies should be used by first responders to facilitate the interaction with vulnerable individuals during the after-care phase (for example, if possible, a quiet and safe place should be created for those affected where they can calm down and ask questions about how to proceed, fresh clothes should be available, etc.).
- The independence of vulnerable persons should be restored as early as possible and as far as possible (for example, if possible, first responders should identify necessary assistant devices in the hot zone, note those devices on the medical triage sheet to inform first responders in the decontamination area and outside the hot zone, etc.).
- Follow-up information material should be provided to address the different information needs of certain vulnerable groups (LEAs and first responders should revise their existing information material to identify insufficiently covered content, prepare adequate information material prior to a CBRNe incident, etc.).



## **2.4. Overview of WP4 & WP5 PROACTIVE CBRNe Crisis Communications System (CCS): web platform and PROACTIVE Mobile Apps**

### **2.4.1. Background**

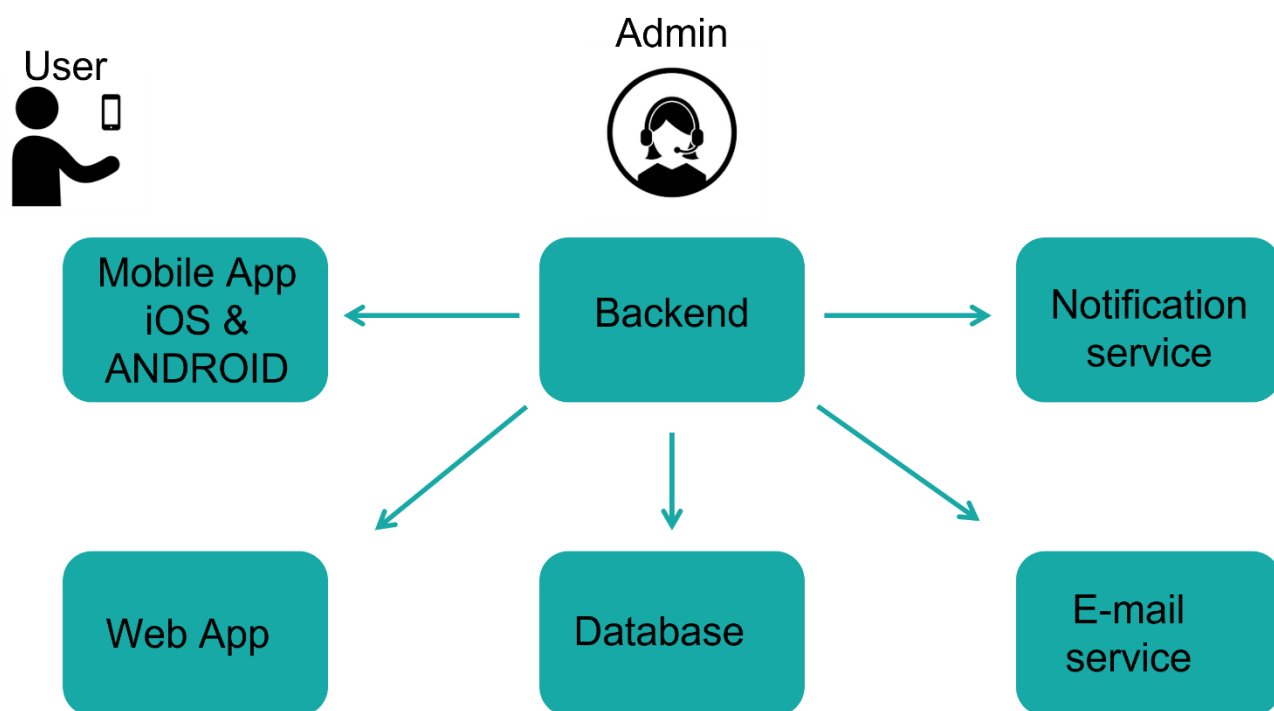
The development of the PROACTIVE CBRNe CCS was completed in WP4 and WP5. More specifically, the main objective of WPs 4 and 5 was to provide a detailed description of the co-creation, testing and verification process used throughout the project to develop the PROACTIVE CBRNe CCS. Although initially conceptualised as consisting of three major components: (1) The PROACTIVE web collaborative platform, (2) The PROACTIVE Mobile App (3) The PROACTIVE Mobile App for Vulnerable Citizens, the decision was taken during development not to design two separate Apps but instead to use one architecture which will suit both user groups. This is discussed in more detail in the following sections.

Full details of each of these components are described in D4.2 (Kolev et al., 2023a), D4.3 (Kolev et al., 2023b) and D5.4 (Kolev et al., 2023c) respectively. The development of the PROACTIVE CBRNe CCS was focused on ensuring that all the requirements, as defined in PROACTIVE policymaking toolkits were met and verified during the live FTXs. This involved facilitating Law Enforcement Agencies (LEAs) and Security Policy Makers ability to select, configure and adapt the system in line with their needs and preferences relative to the scenario they are facing. The developed CCS helps to improve the efficiency of the communication between LEAs, Policy Makers and Citizens, with a particular focus on information sharing and usability by vulnerable groups. The technology, as an enabler, is an efficient and effective way to exploit bi-directional communication capabilities offered by mobile technologies, as well as modern data analytics capabilities to support users in overall decision-making processes. The provision of 'other applications' (such as Twitter, Facebook) has also been implemented, covering potentially any application outside of the PROACTIVE CCS, which may interact by pushing/pulling information to or from the PROACTIVE system.

### **2.4.2. Overview of activities**

The PROACTIVE CBRNe CCS was developed based on an iterative approach in line with the three FTXs completed during the lifetime of the PROACTIVE project. Numerous iterations of the developed system were implemented as a feedback loop for system optimisation. During this process, the initial focus was on the CSAB requirements, followed by the PSAB requirements and then an overall focus on CSAB and PSAB requirements through testing during the FTXs. The final phase of the development was dedicated to incorporation of the currently available content, effectively showcasing the usability and purpose of the system during and post exercises, which produced recommendations for further optimisation, as an integral part of the overall iterative process.

The conceptual design of the overall communications system is shown in Figure 2 below.



**Figure 2 Block Diagram of the PROACTIVE CBRNe Crisis Communication System**

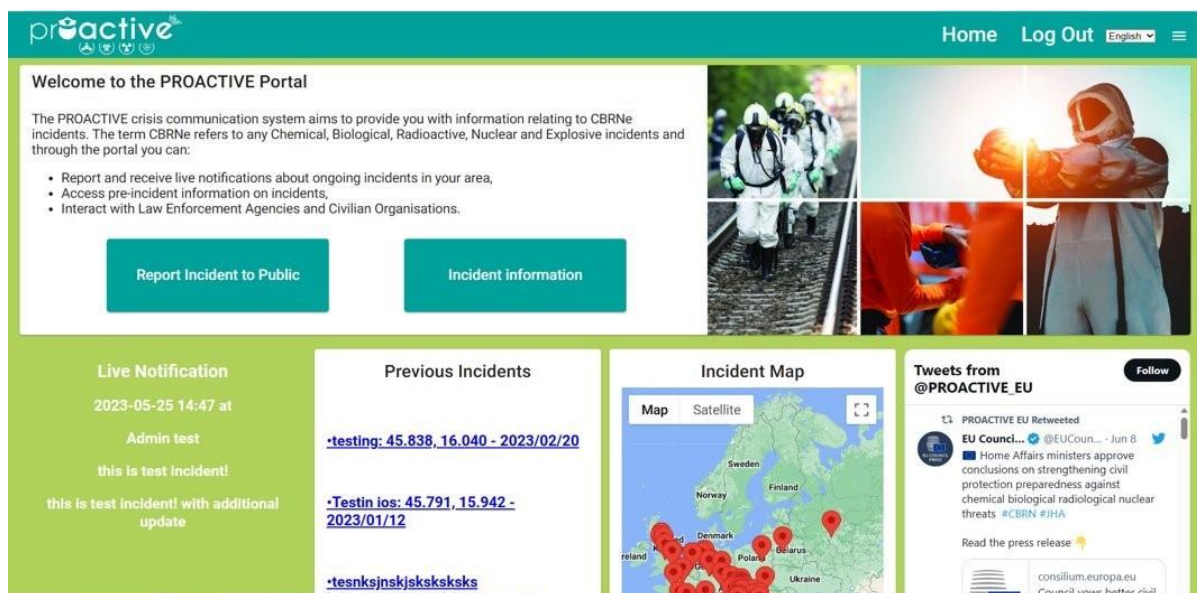
### 2.4.3. Key Outcomes

Developing such a communications system was a complex process. In the core of our development were the following principles:

- User-centric design: The CCS was designed with the needs and preferences of the target audience in mind.
- Usability: The PROACTIVE CBRNe CCS was designed to be easy to use and navigate, with intuitive controls and clear instructions.
- Performance: The PROACTIVE CBRNe CCS was designed to be fast, responsive, and reliable, with minimal latency and downtime.
- Security: The PROACTIVE CBRNe CCS was designed with security in mind, with robust authentication and authorisation mechanisms, data encryption, and protection against common attack vectors.
- Scalability: The PROACTIVE CBRNe CCS was designed to be able to handle a growing user base and increasing traffic, without experiencing performance or functionality issues.

The PROACTIVE CBRNe Collaborative Web Platform (D4.3 [Kolev et al., 2023b]) is one of the key components of the PROACTIVE CCS. The developed collaborative web platform managed and coordinated data flow between the stakeholders. When developing the CBRNe CCS we envisaged the worst-case scenario when no public communications infrastructure will be available during a CBRNe incident. In this scenario, no legacy communications platform which is relying on cellular, or Wi-Fi connectivity can be used. Furthermore, all legacy tools which utilise existing social media apps (e.g., Facebook, WhatsApp or Telegram) also cannot be used as they require internet access to connect with the centralised server. Considering that the probability of no communications infrastructure during a CBRNe event is quite high (for example this happened during terrorist attacks in London, Paris, Brussels, when public communications infrastructure was switched off deliberately to avoid remotely controlled bomb explosions [JESIP, 2006]), the developed platform is designed with unique features to support the reliable and robust operation of PROACTIVE CBRNe CCS over private and restricted networks, such as mesh networks established by the First Responders as an integral part of incident response. This feature makes the developed CCS unique in comparison with the possible existing solutions (WhatsApp, Facebook, etc), which require INTERNET connectivity for their operations.

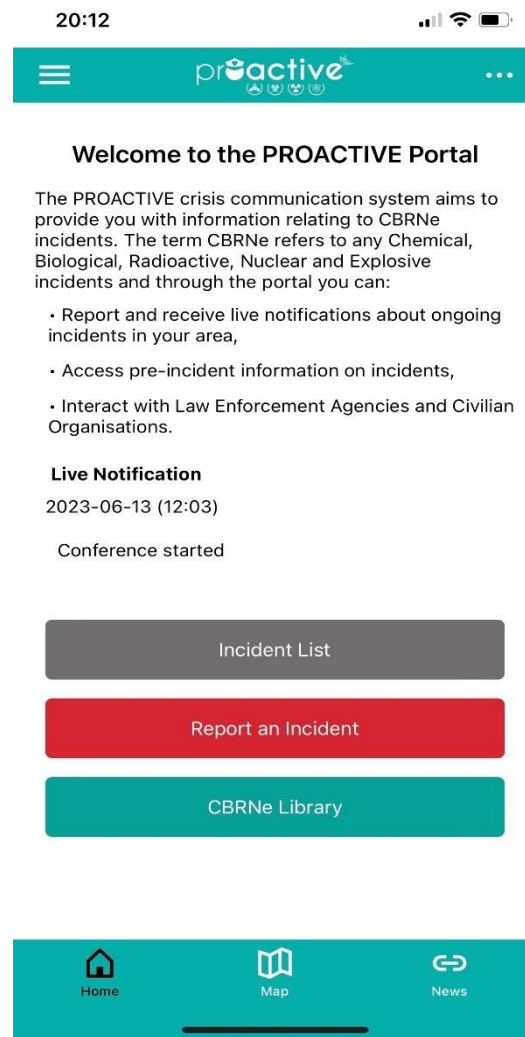
The collaborative platform is designed with security and interoperability in mind (D4.2 [Kolev et al., 2023a]) and meets all the requirements specified by the CBRNe practitioners. The figure below (Figure 3) illustrates the homepage of the developed platform.



**Figure 3 PROACTIVE CBRNe Communications Web Platform Screenshot**

The homepage acts as the central hub for the technology, enabling users to navigate to the relevant areas of interest. This page also acts as a main notification page, providing users with live updates either directly through the PROACTIVE Mobile Application or through link to national systems and news channels. The development of the Mobile Application was closely correlated with the development of the overall communications toolkit.





**Figure 4 Landing Page for PROACTIVE Mobile App**

## PROACTIVE Mobile Application

The PROACTIVE Mobile Application was developed for both ANDROID and iOS and as such, was published on both the App stores. As mentioned in D5.4, the PROACTIVE CBRNe Mobile App for Vulnerable Citizens (MAVC) is an integral part of the PROACTIVE CBRNe Crisis Communications System, therefore the development of App for Vulnerable Citizens was closely correlated with the development of the PROACTIVE CBRNe Mobile App (see D4.3) and the overall PROACTIVE CBRNe Crisis Communications Systems (see D4.2). Given this, and to minimise the complexity of the overall PROACTIVE CBRNe Crisis Communications System, the block diagram of the App for Vulnerable Citizens was selected to be the same as for Mobile App for Practitioners (D4.3). Thus, in practice, the one single architecture was developed to suit both user groups; this aligned with the project's needs, maintainability, scalability, and the development team's familiarity and expertise.

To ensure seamless localisation and installation of the PROACTIVE App on mobile devices, special QR-codes were produced and provided to all users. After downloading the Mobile Application, users

are required to register their email addresses with the PROACTIVE platform. Once the email address is verified, the user gains access to the PROACTIVE Mobile Application. This allows registered users and site admins (LEAs) to access application features not available to unregistered users. The PROACTIVE Mobile Application graphical user interface (GUI) starts with the landing page depicted in Figure 4.

As per the initial requirements, the developed PROACTIVE CBRNe Mobile Application GUI supports:

- Landscape and Portrait aspect ratios,
- Screen sizes from 10cm to 50+cm,
- iOS phones and tablets,
- Android phones and tables,
- Screen readers & accessibility tools.

Although the underpinning architecture was the same, designing a PROACTIVE CBRNe Mobile Application which could be used by vulnerable citizens required careful consideration of their specific needs, challenges, and abilities, even though the purpose of the Mobile Application remains the same as described in D4.3 (Kolev et al., 2023b). Vulnerable populations include elderly individuals, people with disabilities, those with limited literacy or digital skills, or individuals facing various socioeconomic difficulties. To ensure that the Mobile Application is accepted and used by this community, Table 1 outlines the most important design principles which RINISOFT applied when developing this Mobile Application (see D4.2 (Kolev et al., 2023a) and D4.3 (Kolev et al., 2023b) for more information).

An important component of the design process was testing various releases of the developed Mobile Application with representatives from vulnerable groups. Testing the PROACTIVE CBRNe Mobile App required a thoughtful and comprehensive approach to ensure that the App is accessible, user-friendly, and meets the specific needs of the target audience. Like in all application testing, we required testing and verification criteria to act as a benchmark for assessment of the developed Mobile App and we collaborated closely with all PROACTIVE project advisory groups. This process is described in more detail in D4.2 (Kolev et al., 2023a) and D4.3 (Kolev et al., 2023b).

Despite all the restrictions imposed by Covid-19, the developed Mobile Application for vulnerable people was tested during the final FTX (D6.5 [Burlin et al., 2023]). This involved testing the App with representatives from vulnerable populations, a process which proved invaluable for identifying issues and making the PROACTIVE Mobile App more effective and inclusive. When developing the Mobile Application, we took a challenging but rewarding approach whereby we engaged with the different groups asked for their feedback as an integral part of the PROACTIVE iterative development approach. By iterating and improving the App based on user input and emerging accessibility standards, we are pleased to report that it was well accepted by the vulnerable groups participating the final FTX (see section 2.6.4 for more detail).

Following this development and testing, the final stage involved the Mobile Application for vulnerable people being integrated with the PROACTIVE CBRNe web platform. This required a thoughtful approach to ensure a seamless and inclusive user experience for all users. In addition, RINISOFT wanted to ensure that the developed PROACTIVE CCS can be easily supported during the commercial exploitation phase. Therefore, at the core of our technical development we adopted Universal Core Functionality (UCF) where we commenced our development with the core App with universal functionality that caters to the needs of both vulnerable users and the general population.

**Table 1. Design principles for PROACTIVE CBRNe Mobile Application development**

Principle	Implementation
Accessibility	Ensure that the App is accessible to users with disabilities. This means providing support for screen readers, offering adjustable font sizes and colour contrast, and implementing keyboard navigation for those who may have difficulty using touch gestures.
Simplicity and Intuitiveness	Keep the App design simple and intuitive, with clear and straightforward navigation. Avoid cluttering the interface with unnecessary elements and use easily recognizable icons and symbols. Developing MA for Vulnerable People.
Clear and Readable Text	Use plain language and clear, easy-to-read fonts. Avoid jargon and complicated terminologies. If the App provides important information, ensure it is presented in an easy to read and understandable format.
Large Tap Targets	Consider users who may have motor skill impairments or use larger touch targets that are easy to tap. This reduces the risk of accidental taps and improves overall usability.
Flexibility in Input Methods	Accommodate different input methods, such as touch, voice commands, or keyboard input, to cater to users with varying abilities.
Feedback and Confirmation	Provide clear and concise feedback when users perform actions, such as button clicks or form submissions, to assure them that their input has been received.
Personalisation	Allow users to customize the App to their preferences, such as font size, colour schemes, or settings for notifications. This helps accommodate individual needs.
Safety and Security	For vulnerable users, data privacy and security are crucial in view of personal data that might be considered as sensitive data according to GDPR (General Data Protection Regulation). Clearly explain how user data will be used and stored and implement robust security measures.
Offline Functionality	Consider users who may have limited access to the internet or face connectivity issues. Ensure that essential features of the App can be accessed offline when possible.

Testing with the Target Audience	Involve the target audience in the design and testing process. Conduct usability testing with representative users to gather feedback and make improvements.
Training and Support	Include clear instructions and onboarding processes to help users understand how to use the App effectively. Additionally, offer accessible customer support channels if users encounter issues.
Collaboration with Advocacy Groups	Collaborate with organisations and advocacy groups that focus on vulnerable populations. Their insights and feedback can be invaluable in improving the App's design.

#### **2.4.4. Recommendations for implementation**

Through the process of review undertaken during the development of the CCS, several suggestions for improvements and new features to improve accessibility and utility were made. These included:

- Redesign of the App GUI (specifically the Home Page) to include three large buttons and less text.
- Customizable localisation for Incidents to enable the user to manually set a boundary around their location for notifications.
- Provision of public contact details (which should be optional), by requesting that the citizens provide a contact number on registration. This would only be visible to the LEAs for the intention of quickly contacting a user should they report an incident where further information is needed (however, ethical considerations apply here).
- Statistics for LEAs to be available monthly/annually for data analysis based on geographical parameters.
- The development of a Heat Map for LEAs whereby a push notification is sent to LEAs if more than 10, 20, 30 people report an incident within a specified parameter. However, this would require clarity on a single point of contact and a discussion around multi-agency working in a given jurisdiction.
- The provision of both contact details of organisations and points of interest via a map (which could use already existing layers in Google Maps). For more details on these recommendations see D6.3 (Carbon et al., 2022).

Furthermore, during the FTXs volunteers listed design improvements which could be made to improve the app:

- Improve the visuals by including more videos / photos / icons / symbols.
- Have the map be better integrated.

- Volunteers listed additional features such as: translation, location facility and recommendations to improve accessibility.

Specifically, volunteers recommended using voice commands, keeping the App simple to ensure a user-friendly experience, and the provision of zoom and high contrast for those with visual impairments, as suggestions to improve accessibility (Petersen et al, 2022).

Finally, based on the experience of developing the CCS within the PROACTIVE project, two clear recommendations for good practice can be made for future projects and efforts to create similar platforms. The first is to take the lead from the PROACTIVE project and minimise the different types of architecture required to underpin the system, and the second is to undertake a thorough process of user testing and review. In the view of the PROACTIVE consortium, these steps help to ensure the development of a platform that is fit for purpose and aligns with the needs of both the project stakeholders.

## **2.5. Overview of WP5 Toolkit for civil society organisations**

### **2.5.1. Background**

In a CBRNe emergency, rapid decontamination is essential to protect the health of casualties; if contaminants (for example, sulphur mustard) are not removed quickly it can lead to irreversible cell and tissue damage (Davis & Aspera, 2001; Garcia et al., 2011). Indeed, within the field of UK CBRNe response there has been a programme of work to establish methods of decontamination that can be taken prior to the set-up of specialist response capabilities to minimise the effects of contamination; this is known as the Initial Operational Response (IOR) programme (NARU, 2013). This involves steps that can be taken by non-specialist first responders and includes removal of outer layers of clothing and improvised dry (e.g., using towels/ absorbent materials) or wet decontamination (NARU, 2013; Amlôt et al., 2017, see also Carter et al., 2019 for more information). Furthermore, the provision of information to educate the public about what to do during a chemical incident (hereafter referred to as pre-incident information) has also been advocated as a method of increasing the speed of decontamination by providing the public with the knowledge and understanding of initial steps that can be taken to minimise their risk (Carter and Amlôt, 2016; Cibulsky and Kirk, 2010; see also Carter et al., 2019).

In the UK, the REMOVE campaign developed pre-incident information to inform members of the public on three specific actions that they can take in the immediate stages of a chemical incident: remove themselves from the hazardous area, remove their outer layers of clothing, and remove the contaminant from their skin (NARU, 2018). Research into public perceptions of REMOVE shows that the information significantly increased public knowledge and confidence associated with taking action during a CBRNe incident (Carter et al., 2019; Carter et al., 2021), and that members of the public wanted to receive this type of information in advance of a chemical incident occurring (Carter et al., 2021). In a systematic review of pre-incident information, Carter et al. (2020) found that pre-incident information was effective at increasing preparedness, particularly public knowledge of actions to take. However, within this review, Carter and colleagues acknowledged that most of the studies reviewed focused on the impact of pre-incident information over the short term (e.g., one month or less), and that further work was needed to examine the long-term effects of pre-incident information.

Similarly, work conducted in WP1 of the PROACTIVE project included both a review designed to examine the level of public preparedness relating to CBRNe incidents (Hall et al., 2021a) and a set of recommendations for the mitigation and management of CBRNe terrorism (Hall et al., 2021b). Across the research activities contributing to these deliverables it became clear that the general public's current understanding of how to manage CBRNe incidents is very low, and that there is a consensus that preventative recommendations are often misunderstood and perceived as confusing by the public (Hall et al., 2021a); given this, a series of recommendations were made during Work Package 1 around how to present pre-incident information in order to maximise its effectiveness (Hall et al., 2021b). These recommendations were used to inform the development of the initial PROACTIVE pre-incident information, which was reported and preliminarily evaluated in Deliverable 5.1 (Nicholson et al., 2021).

### **2.5.2. Overview of activities**

The PROACTIVE pre-incident information detailed within Deliverable 5.1 provided actions for members of the public to take during a CBRNe incident, such as moving away from the hazard, removing outer clothing, and removing the substance from the skin. The initial pre-incident information was evaluated through eight public focus groups (with 36 volunteers in total). As reported in Deliverable 5.1 (Nicholson et al., 2021), volunteers completed a pre-survey, participated in focus groups in which they were shown the pre-incident information, and then completed a post-survey. Follow up surveys at 3- and 6-months post being shown the pre-incident information were also conducted. Outcomes from this process resulted in several recommendations to iterate and improve the pre-incident information across the remainder of the project lifetime.

Following the initial development of the pre-incident information detailed in D5.1 (Nicholson et al., 2021), a more extensive and wide-ranging stakeholder engagement process was conducted, incorporating views from both practitioners and the civil society across a range of qualitative and quantitative data collection methodologies. These methods included regular feedback from the PROACTIVE consortium (through progress meetings), a longitudinal survey, CSAB focus groups, implementation in two PROACTIVE FTXs, and several cross European public focus groups. The results from this process are detailed in D5.2 (Dennis et al., 2023), and the end product was a final version of the pre-incident information materials that was experimentally tested in the final FTX (see D6.5 (Burlin et al., 2023) and the WP6 summary section of this report).

### **2.5.3. Key Outcomes**

The results from the initial evaluation outlined in D5.1 (Nicholson et al., 2021), demonstrates that reading the pre-incident information and participating in the focus groups reported in D5.1 (Nicholson et al., 2021), provides individuals with self-reported knowledge and confidence of actions to take in an incident that last at least 6-months. Specifically, the survey results show that the pre-incident information increased volunteers' knowledge and confidence in which actions to take from the pre-survey to the post-survey. Furthermore, individuals were able to recall, without prompting, significantly more actions recommended for decontamination for up to six months after reading the pre-incident information; this demonstrates an effect not only on self-reported knowledge and confidence but on actual knowledge which could prove invaluable during a chemical incident.



However, while the findings were broadly positive concerning the initial pre-incident information, there were several recommendations for how to iterate the materials for future versions. For example, findings from the focus groups indicated that the content of the instructions themselves could be improved. Volunteers reported uncertainty around some of the actions, specifically for leaving the scene and using tissue to blot their clothes. Additionally, volunteers reported that the instructions were too long, and suggested that colour and graphics may help reduce information overload and increase engagement.

These suggestions were used to provide an iterated version of the pre-incident information which, through a comprehensive process of stakeholder input and review underwent a further seven iterations. This process included focus groups with representatives of the CSAB, focus groups conducted by consortium members across the EU, and regular discussions with LEAs and consortium members at PROACTIVE project progress meetings. The analyses and stakeholder engagements reflected within D5.2 (Dennis et al., 2023) provide crucial data concerning the effectiveness of pre-incident information materials, and public perceptions of their usefulness. Specifically, across data collected through focus groups and exercise analysis we can see that, although there is also an acknowledgement that the need for such materials may make some feel uncomfortable, there is a broadly positive view of pre-incident information and a desire to receive these ahead of any incident. In addition, we see that the pre-incident information provides improvements to both perceived and actual knowledge and understanding of the recommended behaviours which persists over the long term (e.g., at least six months). These findings concerning the value and effectiveness of pre-incident information are consistent with those identified by Carter and colleagues (Carter et al., 2019; 2021), and provide longitudinal data to help address the research gap identified in Carter et al., (2020). In summary, across the work conducted in developing these materials, we have identified substantial further evidence to support both the positive perceptions of pre-incident information, and their effectiveness at influencing knowledge, understanding and confidence in undertaking recommended behaviours.

The insights gained through this process also have far-reaching implications beyond the PROACTIVE project. Indeed, insights from the project have been fed into workshops conducted as part of the Horizon 2020 STRATEGY project to develop a CEN Workshop Agreement (CWA) concerning standardisation of early warning social media messages for use in crisis management. The initial draft of CWA guidelines for effective messaging have recently been released for public comment (see CEN-CENELEC, 2023) and the PROACTIVE pre-incident information is already consistent with many of the key aspects included therein (including clarity, simplicity, accessibility, and the importance of carefully designed graphics).

## **2.5.4. Recommendations for implementation**

Through this comprehensive process, eight different iterations of the pre-incident information materials were developed, with a variety of different options for pictograms and wording. While the final version represents the evidence-based, stakeholder-led best practice version of the materials which we recommend using, we concede that these may not be exactly fit for every purpose or context. Indeed, we reflect that differences in procedure across countries did come up throughout the review process; this emphasises the impracticality of creating one set of guidelines that will work

for all countries and contexts. We therefore strove to create a version of the pre-incident information that was agnostic to procedural differences across Member States (i.e., that was generic enough to fit a broad range of contexts), and we will make a copy of previous versions of the pre-incident information materials available online for practitioners and stakeholders to access and modify in order to fit the needs of their respective settings (e.g., incident type, fitting with specific SOPs for practice). In this way, the suite of pre-incident information materials developed through this process really does go above and beyond in terms of delivering against the requirements of PROACTIVE Work Package 5 and ensuring the applicability of PROACTIVE outputs in a wide range of contexts.

Feedback provided across the different iterations of the pre-incident information has been incorporated into each version. This has resulted in a range of different structures and content of the pre-incident information material. While this has been a critical part of the iterative drafting and review process, it may, at times, have made the material confusing or harder to follow in terms of the ordering (some points of which are reflected in the feedback from stakeholders). This has included occasional errors in ordering where instructions have been paired with different pictograms than those intended. Relevant recommendations from WP1 D1.3 (Hall et al., 2021b) (which related mainly to communication, education, dissemination and vulnerable populations, and can be found in Table 1 in D1.3 [Hall et al., 2021b]) and subsequent workshops were incorporated into the initial draft of pre-incident communication material. In general terms, looking across the data collected from the civil society through this process, we can see generally positive views concerning the clarity and understandability of the pre-incident information; this is likely attributable, at least in part, to the addition of the pictograms. Furthermore, the potential utility of an App for disseminating information has also been investigated. While there were some variable perceptions as to the usefulness of an app, there was a strong emphasis throughout the civil society engagements on accessibility and providing methods of engagement for individuals with visual impairments. These included recommendations for audio versions, which we know can be incorporated into an app. This, therefore, provided support for the App as a method of making information accessible to a broader range of groups. Nevertheless, recommendations for revisions have been made throughout and remain from the last round of stakeholder engagement for incorporation into the final version of the materials. Specifically, recommendations include further simplifying and condensing the written text (making the behaviours more explicit), reconsidering the colour of the contaminant, the use of pictograms and the inclusion of a female within pictogram 1, a resolution of the contradiction between being told to leave the scene but also remain close, and modifications made to (specifically) pictogram 4, 5 and 6 to aid clarity (see D5.1 [Nicholson et al., 2021], and D5.2 [Dennis et al., 2023]).

## **2.6. Overview of WP6 Joint exercises, evaluation and validation of the tools**

### **2.6.1. Background**

Work Package 6 set out to address several objectives: (1) Carry out three joint exercises in collaboration with project eNOTICE, (2) Evaluate civil society perceptions of the processes and procedures used in CBRNe incidents, including consideration of their effectiveness, (3) Evaluate practitioners ability to manage the public and vulnerable citizens, and (4) Evaluate the effectiveness of the CCS and pre-incident information developed within the project. WP6 has used input from WP1 (the recommendations), WP2 (PSAB), WP3 (results of workshops with members of the CSAB), WP4



(the development of tools), WP5 (Pre-incident event information) and WP8 (ethical issues). WP6 has also provided input to WP7 (dissemination and exploitation).

## 2.6.2. Overview of activities

First, this WP was responsible for the planning and administration of the three FTXs coordinated in conjunction with H2020 SEC-21–GM-2016-2017 Project eNOTICE which facilitated the use of existing sites provided by the European Network of CBRN Training Centres. Every exercise used a base standard format for planning, execution and evaluation, with methodological evolution occurring based on best practice and lessons learned between exercises. The baseline methodology comprises the Exercise Action Plan encapsulating the Main Events List, Technology Availability List, Scenarios, Logistics, Communications, Risks and Exercise Readiness Reviews (Status Reviews) that are delineated in D6.1 (Godwin and Hale, 2021).

Secondly, through a process of iterative review and stakeholder engagement involving:

- a one-day workshop with experts from emergency service, health, and government organisations,
- an online survey with the PSAB to ensure active engagement of practitioners, EU LEAs and policy makers,
- a pre-exercise workshop with PSAB representatives from 18 organisations, and
- a workshop with representatives of the CSAB; PROACTIVE developed an initial prototype scenario, complete with communication strategies representing both poor and optimised communication.

Alongside this prototype scenario, a series of recommendations for key components have been provided to be included in future scenario development discussions with eNOTICE to ensure that:

- the requirements of PROACTIVE were met;
- the FTXs represented a reasonable worst-case scenario, thus demonstrating maximum value for participating practitioners, and;
- opportunities to maximise learning from the FTXs were taken.

The prototype scenario and these recommendations were intended for use to inform ongoing discussions and scenario development between PROACTIVE and eNOTICE in relation to all FTXs. Moreover, following a process of rapid evidence review and synthesis with subject matter expertise, PROACTIVE developed an initial plan for exercise evaluation, which, as outlined in the preceding paragraph, evolved to incorporate best practice and lessons learned between exercises. For more details on the above-mentioned activities see D6.2 (Hall et al., 2021c).

Finally, a summary of the specific processes around the planning and execution of the three FTXs is provided in section 2.6.3 below and more details can be found in D6.3 (Carbon et al., 2022) (FTX1

in Dortmund), D6.4 (Godwin et al., 2023) (FTX2 in Rieti) and D6.5 (Burlin et al., 2023) (FTX3 in Ranst).

### 2.6.3. Key Outcomes – Evaluation of the Exercises

After intensive preparations and delays due to the Covid-19 pandemic, the three PROACTIVE CBRNe FTXs in Dortmund (FTX1), Rieti (FTX2) and Ranst (FTX3) could be respectively conducted on May 7th, 2022, November 16th, 2022, and 13th May 2023. During the FTXs, emergency forces were able to train a CBRNe scenario with civilians (including representatives from vulnerable populations).

The FTXs were a joint activity with another Horizon 2020 project, eNOTICE, which has within its consortium several CBRNe training facilities situated across Europe. The 1st FTX took place with the participation of 150 firefighters and 18 volunteers (including particularly vulnerable persons such as hearing-impaired persons and visually impaired persons) at the training centre of Dortmund Fire Department. The 2nd FTX included the participation of 32 volunteers of which almost half (15 volunteers) were categorised as vulnerable. Seven older persons (65+) and one person under 18 (accompanied by her mother during the FTX) were also included. The 3rd FTX engaged close to 60 volunteers, of which approximately 70% were considered vulnerable. The different scenarios trained involved the leakage of a chemical substance (simulated by disco fog) from a freight wagon (FTX1), an urban train station where an explosion occurred (FTX2), and an incident involving potentially biological or chemical agents at a university gathering (FTX3).

The exercises' evaluation assessed volunteers' experiences during the FTXs through a mixed-method design with three methods: pre- and post-exercise questionnaires, observational data, and focus groups. The questionnaires were completed on the day of the FTX, one before the exercise and one after the exercise. Observational data were gathered during the exercise. Then focus groups were conducted immediately after the volunteers had finished the FTX.

Questionnaire data was collected from all volunteers both pre-exercise and post-exercise, including both quantitative and qualitative questions. Measures evolved over the course of the three FTXs, but included: confidence and knowledge, perceived responder legitimacy, expectancy of help, expectancy of helping others, identification with volunteers, identification with responders, levels of anxiety, impact of vulnerabilities on interactions and decontamination, perceived responder legitimacy, collective agency, perception of responder communication, perception of communication messages, perceptions of practical information, perceived responder competence, perceptions of privacy, co-operation among volunteers, engagement in the exercise, expectations of compliance were the exercise to have been a real incident, perceptions of the ethics of the exercise, perceptions about the PROACTIVE App, and perceptions of the pre-incident information. All items were rated on a scale from 1 (Strongly disagree) to 7 (Strongly agree).

Focus groups were carried out with volunteers immediately after they completed the post-exercise questionnaire. These were conducted in the native language of the FTX host country, and contained questions relating to volunteers' experiences and perceptions during the exercise, including; the pre-incident information; perceptions of responders' ability to understand and respond to vulnerabilities; perceptions of responders' ability to manage the decontamination process; perceptions of responders, interactions with volunteers; and experiences of the decontamination process in general. Innovative methods of conducting focus groups using interpreters and translators, native

speaker facilitators, sign language experts, and combinations of the above, were undertaken in order to maximise participation from volunteers who might typically not be able to participate in focus groups.

Trained evaluators collected observational data on behaviour and interactions during the exercises. The observational evaluation involved a mixed coding framework - structured elements to observe were identified for each element of the exercise as far as possible in advance (based on the PROACTIVE Tactical Objectives for the exercise). However, free-text writing of observational notes for each of the evaluators was conducted to ensure that late changes to exercise conduct and any unexpected behaviours or occurrences could be observed. At all stages of the exercises, multiple evaluators were independently observing each aspect of the exercise in order to ensure that all relevant behaviours and interactions were observed.

Results from the evaluation can be seen in detail across D6.3-D6.5 (Carbon et al., 2022; Godwin et al., 2023; Burlin et al., 2023); the following sub-sections provide a summary synthesis of the key findings across all FTXs for each of the evaluation methodologies (questionnaires followed by observations and focus groups).

## **Questionnaires findings**

### *Pre-incident information*

Pre-incident information, as also mentioned in section 2.5, was developed and distributed to all individuals ahead of the first two FTXs. Findings from across the questionnaires, focus groups, and evaluator observations are included here to minimise repetition across sections.

Volunteers from FTX1 and FTX2, who had read the pre-incident information indicated that they would be comfortable, willing and able to take the actions in the pre-incident information and perceived actions in the pre-incident information to be an effective way to decontaminate (through a comparison between the mean scores and the scale mid-points).

For FTX3, an experimental methodology was applied; half of the volunteers (pre-selected randomly prior to the exercise day) received a pre-incident information briefing before the exercise, led by Campus Vesta, the host organisation of the third FTX. This briefing lasted approximately 5-10 minutes and ran through the steps outlined in the pre-incident information, informing volunteers that they could use anything they heard during the exercise if they thought it would be useful. The other half of the volunteers were taken immediately to the exercise start and did not receive this information. For FTX3, pre-incident information was not found to impact on self-reported: responder legitimacy, expectancy of help, willingness to help others, identification with volunteers, identification with responders, or anxiety. However, those who received the pre-incident information did report higher confidence and knowledge to take appropriate actions to protect themselves and their loved ones were the exercise to have been a real incident than did volunteers who did not receive the pre-incident information (though this was only found in the larger, more inclusive dataset analyses). Similarly, focus group responses indicated positive attitudes towards the information and self-reported sharing of the information with others during the exercise. Furthermore, during the initial stages of the exercise, the evaluators saw some volunteers engaging in behaviours that were

consistent with the pre-incident information (such as removing top layers of clothes and using both tissues and water to remove contaminants). While there are limitations associated with these findings (see D6.5 [Burlin et al., 2023] for more details), taken together they provide further evidence concerning the utility of pre-incident information in CBRNe preparedness

Overall, then, across the three FTXs a consistent pattern emerges concerning the pre-incident information. It was generally well received by volunteers, had some potential impact on knowledge and confidence concerning willingness, comfort, and perceived ability to undertake the recommended behaviours, and, in the case of FTX3, may even have been the most effective protective measure deployed to volunteers. These positive findings are also consistent with the findings from the surveys and focus groups conducted as part of WP5 (D5.1 [Nicholson et al., 2021]), and D5.2 (Dennis et al., 2023) and previous research (Carter et al., 2019; 2020; 2021), thus demonstrating the substantial potential role for pre-incident information in advancing CBRNe preparedness and response.

### *Pre- and post- exercise findings*

Looking at the change in volunteer scores from pre- to post- exercise reveals a mixed picture concerning the impact of the exercise for volunteers. Firstly, across FTX1 and FTX2, volunteers reported higher knowledge and confidence to take appropriate actions to protect themselves and their loved ones were the exercise to have been a real incident following the exercise as compared to before the exercise. However, this finding was not replicated for FTX3. Furthermore, in FTX2 volunteers reported that they would experience lower levels of anxiety if the incident were real following the exercise than they did before the exercise (though this was not replicated in FTX1 or FTX3). This therefore suggests some positive consequences of participating in an exercise for volunteer preparedness.

However, there were also some negative consequences of participating in the FTXs observed through our analyses. Specifically, across both FTX1 and FTX3 we observed lower levels of identification with responders and lower perceptions of the responders' behaviour as legitimate following the exercise than were observed before the exercise (though the finding for responder legitimacy was only found in FTX3 in the smaller dataset analyses). These findings suggest that the nature of the interactions and communication between responders and volunteers were sub-optimal through at least FTX1 and FTX3, thus impacting on perceptions of the responders and the relationship between volunteers and responders.

For FTX1, we were also able to analyse questionnaire data concerning volunteers' perceptions of how communication from first responders could be improved. Nine volunteers responded with answers revolving around three areas for improvement: improved support for those with vulnerabilities, improved communication, and more information. Regarding vulnerabilities, it was reported that responders could have adjusted communication with people with vulnerabilities better. This included allocating one responder to a person with impairments for the whole exercise as each time the responder changed, they had to adjust to the volunteer's vulnerability. Second, improved communication was reported as an area for improvement. Volunteers stated it was difficult to hear the first responders with background noise, and that it was also difficult to accept what responders

said as they appeared to not know what was going on. Third, volunteers stated responders needed to give more information about what would happen and why this would be happening.

In short, therefore, while there were some potentially positive consequences of participating in the exercise for volunteer preparedness (for real incidents), there were also some potentially significant consequences for the nature of interactions and the relationship between volunteers and responders. These findings are explored through further quantitative and qualitative data analysis in the subsequent sections.

### *Compliance*

Perceived responder competence, responder communication, practical information, and identification with responders did not predict expected compliance with responders or decontamination showers in FTX1. In FTX2, perceived responder competence and practical information did predict expected compliance with responders or decontamination showers. However, unexpectedly, the direction of effect for both perceived responder competence and perception of practical information were negative, implying that a lower perceived responder competence and perception of practical information predicts higher compliance during real emergencies. Responder communication, identification with responders, perceived responder legitimacy and identification with volunteers did not predict expected compliance with responders or decontamination showers.

While further work is needed to understand these non-significant and inconsistent findings, there was some discussion of these in the context of methodological limitations in the questions concerning compliance used across FTX1 and FTX2 (see D6.4). Within FTX3, the compliance measures were extended, and the analytical strategy was modified to try and establish a relationship with compliance; following this, we identified significant relationships with compliance were found such that volunteers indicated they would be less likely to leave the treatment area if they felt that the recommended behaviours were effective, the responders were trustworthy, and the information they received was sufficient and of high enough quality. In other words, there was a strong association between responder behaviour and information provision and predicted future compliance. This is consistent with previous literature highlighting that communication and/or responder behaviour can have an impact on compliance during an incident. Specifically, that a lack of shared identity, low perceived responder legitimacy and poor responder communication impedes compliance of staying on the scene (Carter et al. 2013; Carter et al. 2015), and that issues around poor communication from responders during exercises can influence experiences of volunteers (Carter et al., 2012).

### **Observational data and focus groups findings**

A meta-synthesis of results from focus groups and evaluators observations, used thematic analysis to establish four main themes that emerged from the narrative; accessibility, communication, responder behaviour and exercise artificiality. For FTX1 and FTX3, the evaluators were able to include full analysis of the focus group data within the report. For FTX2, time constraints meant that



the full analysis was not included (instead a summary was reported). As discussed in D6.4, the full analysis is included as Annex 1 within this current deliverable.

The first theme of accessibility references the treatment and care of volunteers with vulnerabilities. All three FTXs reported little assistance and no attempts to prioritise or triage volunteers that needed extra help, resulting in increased anxiety and stress for those impacted. Some volunteers reported a feeling of panic as a result of a lack of communication aimed at vulnerable people, as well as insufficient instructions. The casualty volunteers felt that more could be done to both integrate individuals with vulnerabilities into the exercise plan, but also to recognise and cater to the needs of the casualties - both physical and emotional. Volunteers emphasised some problems with decontamination for those with a catheter or with complex mobility difficulties e.g., “I had started, with the decontamination just thought fine, but after that there were a number of things where it was unclear what they would do with me.”

Several volunteers expressed that they used sensory aids (e.g., glasses, hearing aids) and that after removing these they found it difficult to see and hear any communication from emergency responders. Some also expressed concern about what would happen to any aids they used, once these were removed, and how they would get them back.

The second theme of communication was broken down further into 3 sub-themes; early communication, clear and consistent communication, and trust.

Early communication described the lack of information at the very beginning of the FTX and that this would have helped even when there was not much activity happening. There was a lengthy wait process before contamination began, and that more information provision during this time would have been desirable, according to volunteers.

Clear and consistent communication was commented on in all three FTXs as findings reported that communication was inconsistent, sporadic and confusing, at times resulting in a backlog. Volunteers felt that effective communication was important as it reduced stress and anxiety, and that regular and effective communication creates trust, and that responders failed to do that during the FTX. It was at times, difficult to hear responders especially when wearing full PPE and this was particularly difficult for those with hearing difficulties (though it was reported that responders in FTX3 were not wearing PPE), the use of a megaphone was suggested in all three FTXs to aid clear and inclusive communication. Volunteers reported not knowing what was expected of them or where they should be going and when, and clear and consistent directions were needed. Some volunteers highlighted that they did not understand the information they received from responders and that they used terms they did not understand e.g., CBRNe and felt this easily be addressed.

Finally, the sub-theme of trust, volunteers reported that responders looked unsure, and instructions were not clear. This resulted in volunteers not trusting responders and feeling anxious and vulnerable. This was reported in all three of the FTXs. Volunteers reported that communication early on in the FTX would increase compliance, reduce stress and anxiety, and create a feeling of trust between responders and volunteers. Volunteers reported that responders were slow to communicate initially with no clear voice of authority and no-one taking the lead – this led to volunteers feeling anxious that responders were not sure what they were doing themselves.



The theme of responder behaviour describes the preparedness of responders and has clear overlap with communication and accessibility. Volunteers felt that responders were not prepared, especially for dealing with people with vulnerabilities, often waiting for others to take the lead. There was no prioritisation or planning and this resulted in confusion throughout the process. Volunteers were regularly asking for support and felt that responders were not friendly, and less formal than they would have been in a real incident. Volunteers organised themselves in the decontamination showers, when there was no clear lead from responders and the evaluators noted there was confusion throughout the process.

Finally, the fourth theme of exercise artificiality. Volunteers reported that there were numerous times when volunteers were chatting and laughing with one another, and while it would be inappropriate to create unnecessarily frightening scenarios, this made the FTX feel artificial. Secondly, in FTX3 responders were reportedly not wearing full PPE throughout, this is unrealistic and gave a full impression regarding the ability to communicate freely.

In addition, there were several issues observed which could have increased the likelihood for further contamination. For example, the location of muster point #4 in FTX3, was behind the warm zone, and volunteers were required to walk through it following medical triage, thus leading to an increased chance of contamination. Similarly, very few volunteers underwent decontamination (FTX3) despite the contaminant process (white powder that was airborne).

#### **2.6.4. Key Outcomes - Evaluation of the Exercises based on the Observer Guide**

To collect additional observational data based on the experience of European practitioner stakeholders, civil society agents and ethical experts, PROACTIVE further invited PSAB, CSAB and EEAB members, alongside consortium practitioner partners, to participate in the FTXs as observers. Their observational data was collected through the Observer Guide. This guide included 50 questions and covered 5 sections to fill in:

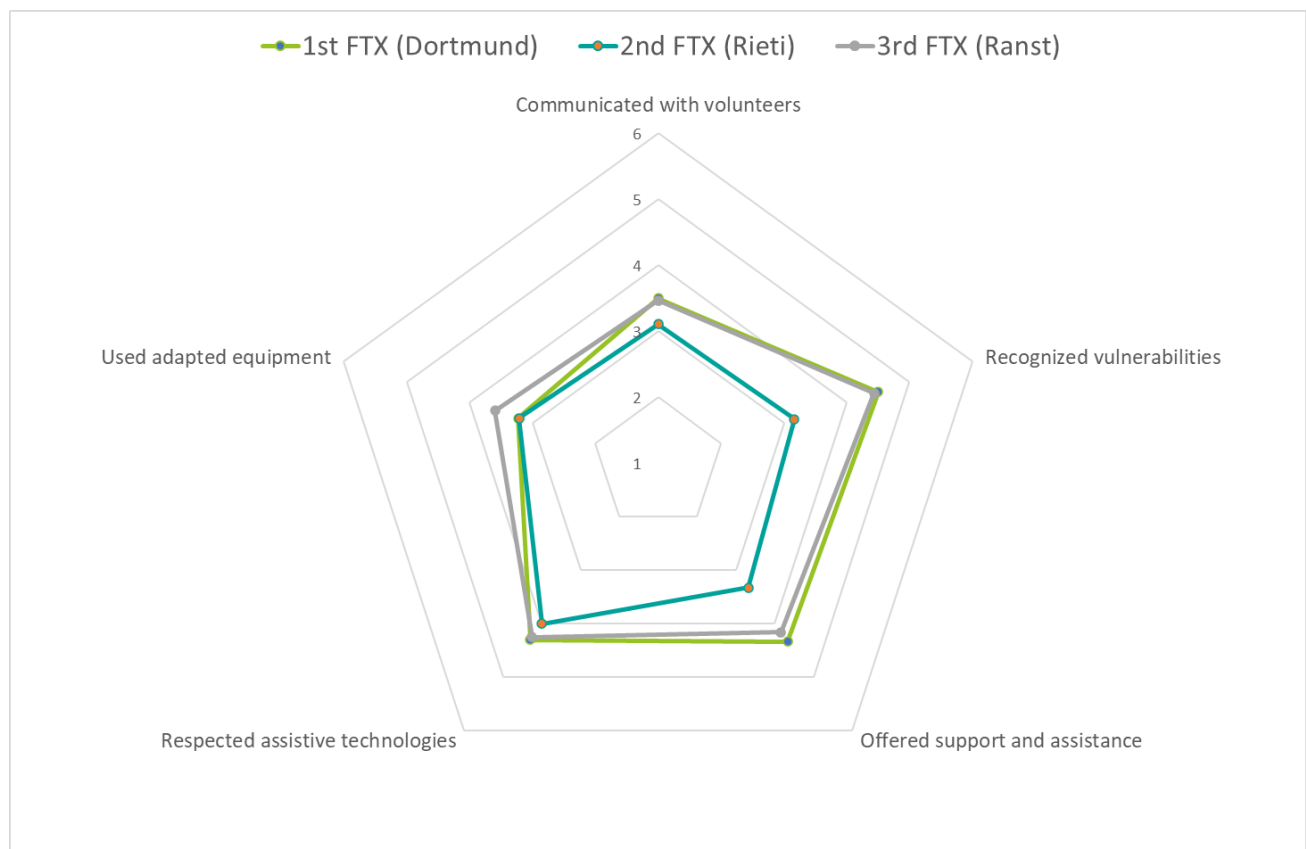
- Information about the observer,
- Questions about the exercise,
- Questions about the App,
- Questions on ethics,
- Questions on the organisation of the event.

Each section was composed of closed and open questions. The answers to the closed questions were provided on Likert-type scales and were accompanied by open questions which gave the observers the possibility to explain their answers and to give examples. The observer guide was similar for all FTXs. It was developed by UIC and was updated based on feedback received throughout the FTXs to clarify certain questions which were perceived as confusing by respondents as well as some slight adjustments to better meet the Tactical Objectives for the FTX3.

The groups of observers who evaluated the three FTXs were quite similar in size (about 20 volunteers each time) and composition (heterogenous coverage of PSAB and CSAB expert categories). There was a slight improvement in the observation quality and overall set-up for observers from one FTX to the next one. For example, in the first FTX (FTX1) most observations were carried out remotely or via drone footage, in the second FTX (FTX2) there were unmediated observations from close distance, and in the third FTX (FTX3) there were direct close observations and narrator presence.

## Responders' attitudes and behaviour

A set of five questions addressed specific dimensions of the interaction between the first responders and the diverse group of volunteers. In all FTXs, the rating of these specific elements was average, therefore indicating that there is plenty of room for improvement (Figure 5). Despite the very different nature of FTX1 and FTX2 in terms of scenario, deployed first responders, and size of volunteer groups managed by first responders, there is quite a similar pattern between their ratings. In FTX2, the interaction dimensions seem to be weaker compared to the other two FTXs.



**Figure 5: Five elements of the responder-volunteer interaction and their average observer score (1=lowest rating; 6=highest rating) across the three exercises (FTX1, FTX2 and FTX3)**

When asked to provide three good practice examples of interactions between first responders and volunteers, in FTX1, the observers misunderstood this question and only reflected on organisational aspects, and not on the interactions. In FTX2 and in FTX3, thanks to question rewording, observers

did share good practice examples. In FTX2, three main good practices were shared: treating the vulnerable volunteers with respect, communicating with the volunteers, and gathering volunteers in a warm zone. In FTX3, observers were more critical of the response with several mentioning that there were no good practices to be found. The only good practice was communication, with several observers specifically pointing out that one of the emergency services responders knew sign language to communicate with deaf volunteers.

When asked to suggest three ways the interactions between first responders and volunteers could be improved, in FTX1, the observers misunderstood this question and only reflected on organisational aspects, and not on the interactions. In FTX2 and in FTX3, thanks to question rewording, observers did share ways in which they thought the interactions could be improved. In FTX2, two main methods of improvement were mentioned. Firstly, most observers thought that communication needed major improvements. Several other observers also mentioned how triage should have included a way to identify vulnerabilities. In FTX3, three main methods of improvement were mentioned. Once again, communication was overwhelmingly listed as a serious gap. Furthermore, this time observers felt that the volunteers were not treated with enough empathy. Lastly, observers suggested that cross contamination should be taken more seriously.

### **Perception of responders interacting with vulnerable people**

The first responders recognised vulnerable people relatively well and relatively quickly, especially when the vulnerabilities were visible e.g., wheelchair users, visually impaired persons. However, hidden disabilities were not easily recognised. In addition, some observers did not notice any clear difference in treatment between vulnerable and non-vulnerable persons. Triage challenges were often mentioned, and the triage process emerged as an important topic. In FTX1 observers reported that no initial triage was performed. Similarly, in FTX2 observers stated that first responders appeared to recognise vulnerable persons on average and opinions were divided as some observers claimed that they could not see triage procedures during the exercise. Finally, in FTX3 observers reported some issues regarding triage, although the views were again polarised. While some observers were satisfied with the triage process as volunteers were correctly evaluated for triage and volunteers with visible vulnerabilities were grouped together, others highlighted that triage and explanations to volunteers were apparently insufficient. Some areas for improvement were identified:

- the identification and triage of people with less visible vulnerabilities.
- the need for clearer communication/explanations to victims on why they are separated and following a certain treatment.
- Improvements to the management of casualties after triage.

In general, the first responders were also seen to be broadly effective in supporting and assisting vulnerable people, especially those with visible vulnerabilities by the observers (scores above 4). Although there was no consistent pattern of observed behaviours across the FTXs, there were both negative and positive examples identified case by case, such as:

- One of the visually impaired casualties was not escorted by the firefighters and was left to walk around with their assistant.

- One first responder spoke sign language.
- One first responder was walking at the pace of the wheelchair user who was at the front of the group.

First responders were also perceived to be respectful of the assistive technologies used by persons with vulnerabilities (scores above 4), although some vulnerabilities appeared to be disregarded sometimes. For example, in FTX2 a pram was not decontaminated but taken around the decontamination area. In FTX3 care and consideration were given to those citizens with assistive technologies such as powerless wheelchairs, prosthetic limbs, canes etc. Further, in FTX3 the service dog did not appear to have been triaged/decontaminated.

Observers felt that the equipment used by first responders appeared to be fairly adapted for persons with vulnerabilities (average scores around 3). While observers reported a neutral position on this topic, they also pointed out the following gaps:

- Need for better decontamination chain for people with reduced mobility, wheelchairs, etc.
- Need of decontamination for animals/pets (e.g., guide dog)
- Need of women first responders who could provide for other women in the decontamination area.

### **Perceptions of communication**

The observers highlighted numerous problems in the way first responders communicated with the affected persons (scores only slightly above the average). This was also the interaction dimension which received the least favourable evaluations. The major communication flaws that were recurrently reported included:

- poor communication from the responders' side towards the volunteers,
- the lack of communication between first responders and the affected persons or communication which occurred too late,
- the overall uncertainty of the volunteers because of the lack of communication.

### **Pre-incident information**

Observers had a neutral to positive attitude towards the pre-incident information materials with a rating well above average in the last two FTXs (MFTX2=4.62; MFTX3=4.83). The neutral position is reflected by some observers who decided to skip this answer or declared that they do not have a clear position on this, because they have not seen the materials or do not know this aspect. However, among the observers who answered the question, there is clear consensus that the materials were of help for those affected. The materials were frequently characterised as “clearly explained,” “easy to read,” “understandable” and “helpful.”

## Feedback about the PROACTIVE CCS

Over the course of the three FTXs, the PROACTIVE Mobile App increased in overall usability and usefulness. Along those lines, so did the number of stars the app received. This helps demonstrate the effectiveness of the iterative, co-creation processes, whereby the written feedback provided by the observers in the Observer Guide was integrated into the version then released/used for the following FTX. By the end of the PROACTIVE project, it can be said that users found the App easy-to-use, were confident when using the App and stated that they would use the App in a real-life incident. Observers overall also agreed that the App enhances situational awareness of the population regarding CBRNe incidents.

**Table 2. Mobile App usability and usefulness average observer score (1=lowest rating; 6=highest rating) across the three exercises (FTX1, FTX2 and FTX3)**

Quality/FTX	FTX1	FTX2	FTX3
Useable	3.99	4.58	5.04
Useful	3.90	4.64	5.01
Rating out of 5 stars, where 5 stars are the best	2.57	3.53	4.17

### 2.6.5. Recommendations for implementation

The recommendations for implementation are drawn from two sources, first best practice identified by the PROACTIVE exercise directors for the conduct of exercises, and second, from the conclusions of the evaluations reported above.

#### *Recommendations from PROACTIVE exercise directors*

In what follows, we provide a list of several key recommendations for best practice made based on the approaches undertaken, and lessons learned, by the PROACTIVE exercise directors across the three FTXs. Many of these are replicated verbatim from D6.3-D6.5 (Carbon et al., 2022; Godwin et al., 2023; Burlin et al., 2023), and so these deliverables should be consulted for more detail:

For the first two field exercises, PROACTIVE exercise management was responsible for the recruitment of all volunteers and utilised various means including newspaper ads, social media, radio, and word of mouth. Overall, contact with civil society organisations (CSOs) representing vulnerable groups proved to be particularly successful during the recruitment process. Based on these experiences, we recommended drawing on the expertise of CSOs representing vulnerable groups when conducting an exercise (including recruitment) with vulnerable people. This recommendation was successfully implemented in all PROACTIVE exercises. Strong relationships with CSOs served to facilitate the recruitment and management of volunteers, helping to overcome language barriers, getting access to the local community, and managing necessary activities like

briefings. Indeed, such strong relationships helped to ensure that the needs of the vulnerable groups were met throughout the planning of all exercises.

In addition, some internal processes proved to be best practice examples during the planning and preparation of the exercises. PROACTIVE implemented an adaptable and flexible plan based on the IIMARCH process which enabled the division of exercise preparations into central areas (method, administration, etc.). As a living document, the IIMARCH process allowed constant adjustments and extensions of the individual areas.

Joint meetings among the planning team and the exercise host were crucial to identify potential challenges early on and implement adaptation strategies. Even though online meetings provide a regular exchange, all field exercises proved how crucial physical meetings are. They facilitated communication and generated greater outcomes. The sense of community among all involved stakeholders also increased dramatically. Therefore, such meetings should be included as fixed milestones in the planning process.

It is possible that the different parties involved in exercise organisation may have divergent aims and objectives (particularly when the exercises are conducted on a large, multi-organisational scale similar to those conducted within this project). It is, therefore, crucial to develop a shared understanding of these aims and objectives to identify and address any issues ideally before they arise. Shared documents, clearly outlining necessary components of the exercise, are useful and should be incorporated early in the planning process. Previously un-identified areas of conflict can be discovered in this process, with enough time for organisers to re-evaluate and/or adapt. Direct dialogue between exercise directors of organising parties prevents misunderstandings and speed up the decision-making process.

To achieve set aims/goals within the exercise, each responsible party should also be able to actively participate in the scenario development process. There is otherwise a risk that scenarios are developed without consideration of the aims and requirements of all parties involved.

For each exercise, an organogram and multiple process maps were created with the central tasks (volunteer handling, catering, etc.) of PROACTIVE within the framework of the exercise. The organogram enabled a quick / clear view on the central exercise tasks as well as the partners responsible for them. Before the exercise, it is helpful to create a living procurement and “to-do” document to facilitate resource planning. It is also important to identify people who speak the local language and people who have local knowledge of the exercise location and procedures. Some of the most valuable assistance can come from unexpected sources. Especially when organising an exercise in a country where the language is not spoken by anyone in the consortium, sufficient translation measures should be considered: involve native speaking colleagues not involved in the project of organisations within your own consortium, collaborate with native speakers from partner projects involved in the exercise, hire translation companies, use online translation tools, etc. A mix of these options proved to be the most effective way to address different requirements. However, the optimum situation would be to ensure that one consortium is local to the exercise site.

A similar approach was taken with a detailed timetable for the exercise day. The timetable contained an overview of the tasks to be done in different time windows from the start of the exercise day to the end of the day. Central aspects of the exercise (briefing of volunteers, catering, property management volunteers, etc.) were summarised in the form of a flow chart. The more people



involved, the more people who can misunderstand, go the wrong direction, need information repeated, etc. While a detailed timeline is important, it is also imperative to expect that the timeline needs some flexibility to deal with the unexpected. This should be communicated to all partners involved in planning and execution. Finally, for all exercises, a detailed risk assessment and contingency planning (for example, for Covid-19, bad weather, etc.) was conducted. Comprehensive contingency planning proved to be the backbone of a flexible exercise management, particularly in complex scenarios.

When planning for an exercise involving (vulnerable) civilians, defining a targeted level of representation of vulnerabilities in volunteer sample (e.g., 15%) helps to tailor the recruitment process and select appropriate measures. It is of utmost importance to establish ways to identify who the volunteers are for administration and evaluation purposes. Sufficient control over the organisation and conduct of the exercise will allow for more comprehensive planning around where to evaluate and observe the behaviours of volunteers, responders, and the interaction between them.

Actors should be incorporated into the exercise not as a separate atmospheric element but as additional volunteers. In doing so, the volunteers are more likely to experience the envisaged exercise situation and the actors are not treated as a special case by the first responders. However, the total number of actors relative to the number of volunteers should be carefully considered. To allow evaluation of volunteers' behaviour, identification such as coloured wristbands can be used to separate actors from volunteers, whereby the colour of the wristband is only known to the evaluators.

Ensuring the well-being of the volunteers was, and should always be, a priority. The exercises implemented the same processes for volunteer handling and welfare, adapting them to the respective conditions on site and the respective vulnerabilities of the recruited volunteers. This was done in collaboration with the exercise host and the involved CSOs in order to ensure that the procedures were fit for the needs of all interested parties.

There is a risk that an overload of information may deter potential volunteers from taking part in an exercise, or that volunteers may overlook important exercise information. Information for exercise volunteers should therefore be as compact as possible and summarised in as few documents as possible.

In order to have plenty of time for processes as registration of volunteers, briefing of volunteers etc., and to facilitate the travel arrangements of exercise volunteers, PROACTIVE recommends conducting exercises in the weekend late morning hours.

In all exercises, volunteers, first responders and observers were kept separated until the end of the exercise. Separation was managed through different arrival times and use of facilities. This process was deliberately chosen to prevent the groups from influencing each other before the exercise. However, to close the day, a joint closing discussion should give all volunteers brief feedback of the day. This also creates a moment of community for all those involved in the success of the exercise that can be reinforced by a group photo. This proved helpful during the second eNOTICE / PROACTIVE exercise in Rieti but could not be implemented during FTX1 and FTX2. Furthermore, PROACTIVE recommends a subsequent short debrief on-site for initial feedback followed by a social dinner among all planning partners involved to foster the successful partnership.

In the first two exercises (FTX1 and FTX2), volunteers were instructed to change their clothes before the exercise. PROACTIVE provided spare clothing for volunteers to secure personal property and enhance sense of community among volunteers. This prevented the volunteers' clothes from being damaged during the decontamination process (cutting of clothes by the emergency forces to ensure rapid decontamination). Valuable items of the exercise volunteers (e.g., electronic wheelchairs) posed another challenge for PROACTIVE during the exercise. To avoid damage to such items during a decontamination exercise, PROACTIVE recommends the use of cheap substitutes (non-electronic wheelchairs, etc.). In FTX3, unlike the previous two exercises where clothing was provided, all volunteers were informed in advance to wear clothes they did not mind getting wet or dirty with swimming costumes underneath when participating in the exercise. As a contingency strategy, charity clothing was procured to offer volunteers that did not follow the order. No distinction was made between volunteers and actors in this regard.

Involving a professional filming crew that has been pre-briefed about ethics and data handling as it relates to capturing imagery of the volunteers represents good practice for the handling of filming and photography activities. It is important to inform visitors and observers that professional photos/video teams will be present, and that pictures will be made available after the exercise. This could help to decrease the perceived need of observers to take own photos, which both serves to protect the dignity of volunteers and the safety of some secure sites.

Following the first exercise, PROACTIVE adopted a multi-component strategy for the ethical evaluation of exercises. Specifically, this involved expanding the responsibilities of the ethical and data security officer, increasing the involvement of external ethics experts in exercise planning and as observers, and dedicating a separate section of the observer guide to the ethical evaluation of the exercise. The ethics experts feedback and recommendations have been taken into account and integrated throughout the exercises.

Finally, to mitigate unforeseen technical issues when using the CCS during the exercise, PROACTIVE suggests implementing a testing, briefing, support and evaluation phase that involves feedback of project internal and external end users. Furthermore, a technical expert should provide technical support during the day at a dedicated IT desk. As a last step, a technical evaluation of the CCS performance should be conducted to identify lessons learned.

### *Recommendations from evaluation*

Within the evaluations conducted across all FTXs, several recommendations were made by both volunteers and observers concerning best practice for communication/ interactions between responders and the public, and for the management of incidents. Some key recommendations that emerge across FTXs include:

- The importance of early and effective communication from the very start of the exercise or incident, including:
  - Explanations and a clear rationale for each step, even if there was no action at the time – keeping volunteers informed reduces stress and anxiety and creates a feeling of trust between responders and volunteers.

- Sufficient information during the lengthy wait to go through the decontamination process.
- Providing an approximate schedule of timings and expectations.
- The need for appropriate methods of communication to ensure clear and consistent information provision during an exercise. Suggestions included:
  - Use of a megaphone (which was mentioned by volunteers in all three exercises), especially in FTXs 1 and 2 where responders were wearing full protective clothing, and this made it difficult to hear. This is also a particularly pertinent point for those with hearing impairment.
  - Providing information in different formats that were accessible to all e.g., tablets, large format, colour coding.
  - Providing information in a clear, accessible, and simple format. Using easy-to-understand language and avoiding acronyms (e.g., CBRNe).
- Responders should identify those who may be more vulnerable and may require additional assistance; responders should subsequently make adaptation in order to facilitate these representatives from vulnerable groups to undertake recommended action; some suggestions provided during the exercise evaluations included:
  - Responders should introduce themselves and their role and ask volunteers how they could best support them and their needs.
  - Triage should have included a way to identify volunteers with vulnerabilities (especially the less visible ones). Improvements to the management of casualties after triage is needed.
  - Facilitating individuals with similar vulnerabilities to stay/come together. This could provide some social support and opportunities for communication between individuals (which could have an impact on their experience of the event) and may help responders to be able to communicate and address the individuals' needs more effectively.
  - Clearer communication is needed around the need for individuals to separate from aids (e.g., glasses and hearing aids, mobility aids) during the decontamination process. Specifically, communicating the 'why', the 'how' (to navigate decontamination without their aids) and the 'how long for'. As it was, volunteers were left feeling more vulnerable with no indication as to when or if they would get them back and no support through the process for those with limited vision or hearing. More assistance and information as to what was happening to devices and when they could retrieve them would be helpful.
  - A need for greater physical assistance through the decontamination process for those with complex physical needs e.g., those with a catheter and wheelchair users.

Responders should be trained to support those with varying needs through the process. The presence of women first responders who could provide for other women in the decontamination area would help volunteers feel safer and more comfortable.

- Animals/pets (e.g., guide dog) should be decontaminated and cross contamination should be taken more seriously.
- Following on from the preceding point, responders should be provided with detailed training to support them in assisting people with vulnerabilities. For example, how to guide a person with a visual impairment into the shower, keeping people informed of what was happening to the devices e.g., hearing aids, providing assistance to wash and decontaminate.
- More broadly, training is also recommended to help responders to communicate effectively with the public, building on the key principles outlined in the preceding bullet points and throughout the reported findings from the PROACTIVE project. This will help to preserving or enhancing identification with the responders and perceptions of responder legitimacy and could have consequences for both trust in responders and compliance with responder recommendations.

## **2.7. Overview of WP8 Legal, Ethical and Acceptability Requirements**

### **2.7.1. Background**

This WP was aimed at developing the legal framework and establishing the ethical principles to be followed by the consortium throughout the duration of the project. For this purpose, concrete mechanisms to ensure compliance were defined. The main objectives of WP8 were to: (1) point out and frame the ethical and legal aspects of PROACTIVE, (2) examine the legal, ethical and societal aspects in PROACTIVE from both Privacy by Design and post assessment approaches, (3) provide stakeholders and partners with the appropriate guidance on the above aspects, (4) carry out an acceptability study for the proposed CCS in order to assure its sustainability, (5) avoid any negative social impact during the project's execution or in future deployments based on this research.

As part of a continuous process connected to the overall project plan, the legal, ethical, and societal impact assessment has been carried out from the very beginning and has been updated at every new project phase. This method ensured that every issue would be identified as soon as it arose, reducing the chance that important elements of the proposal for optimisation from the citizen perspective would need to be redesigned. Several best practices have also been followed in order to safeguard the volunteers in the project's right to privacy and integrity. Finally, WP8 has evaluated the emergent socio-technical solutions developed by the project from a social perspective, with a focus on assisting human decision-making and also taking the experiences of citizens into account.

## 2.7.2. Overview of activities

First, applicable legislations were analysed during the first 6 months of the project in order to provide the rest of the members of the consortium with a roadmap that enabled them to be acquainted with the legal framework and its logic. This analysis also included a thorough examination of case studies corresponding to different Member States, a review of similar projects and their normative aspects and the description of LEAs best practices. As a result, D8.1 (Clavell et al., 2021) provides a mapping of legal requirements and ethical standards at the EU level. It also includes a section describing the PROACTIVE Ethical framework, which aims to support the consortium partners in identifying ethics requirements regarding CBRNe response at the EU level, focusing on emergency assistance for vulnerable groups. The legal framework tackled the human rights that are the most relevant for the PROACTIVE project, namely the right to integrity, the right to privacy, and the right to data protection.

D8.2 (Zamorano et al., 2021) includes an operationalisation of the legal findings of D8.1 (Clavell et al., 2021). These are concrete recommendations for the PROACTIVE CCS and standards to follow to enhance users' acceptability of the CCS (including vital aspects such as awareness, knowledge and consent). This includes several aspects that can be integrated "by design", such as the data management protocols to be accomplished, evaluations of how the LEAs are proceeding, considerations about the participation and treatment of vulnerable citizens when implementing the system, and a series of technical recommendations based on stipulations imposed by the legal framework. The report has an entire section (6) dedicated to recommendations concerning acceptability and data protection (a summary is included in section 2.7.4). These recommendations feed each of the guidelines proposed by the project, which are targeted to different users and agents according to their concrete needs and interests.

Another WP8 task was to ensure total compliance of PROACTIVE with the EU regulatory framework, as well as with ethical principles. Based on the legal and ethical analysis undertaken in Task 8.1 Legal and ethical state-of-the-art on CBRNe preparedness and response, PROACTIVE established specific measures to guarantee respect for the fundamental rights embedded in the regulatory framework of the EU during fieldwork and the overall development of the project. The guidelines for PROACTIVE consortium, which are mirrored in D8.3 (Marsh et al., 2021), strive to incorporate ethical concepts into fieldwork and ensure legal compliance. As a result, we created a briefing package on research ethics that include instructions for research and FTXs, as well as the steps that must be taken when recruiting volunteers. Through involvement of partners from the eNOTICE project, this process has helped PROACTIVE to addressing two important topics for research ethics in the context of CBRNe preparedness: those connected to data protection and informed consent and those linked to ethical research. The consortium members have received training on how to detect and tackle privacy and ethical issues during the design and deployment of the FTXs.

Finally, the differential impact of the CCS on various religious, cultural, or vulnerable groups needed to be continuously evaluated to provide guidance to the development team. In order to ensure the effectiveness of the system, its proportionality, adaptability to people with additional needs, and the avoidance of any potential risk of discrimination, gender bias, function creep, or misuse, it was crucial to systematically evaluate how various social groups interact with LEAs and CBRNe practitioners in the context of PROACTIVE. As a useful risk management tool, the ethical and societal risk assessment methodology has been utilised in both the technical solutions and methodologies of the WPs 4 and 5 and also the outputs of the FTXs in WP6. D8.4 (Zamorano et al., 2023) details the



social impact assessment of the project outcomes, addressing both the CCS and produced guidelines. Both aspects are examined with the main purpose of analysing compliance with legal requirements and ethical principles defined in WP8. Additionally, Deliverable 8.4 seeks to provide a gap assessment and associated avenues for the future implementation of PROACTIVE and facilitate innovative viewpoints with ethical frameworks for tackling CBRNe incidents.

### 2.7.3. Key Outcomes

In D8.1 (Clavell et al., 2021) a variety of issues were addressed. First, the legal framework pertinent to PROACTIVE was developed, with a focus on data protection and human rights. Second, a CBRNe legal and policy framework was formed at the European level. Finally, a collection of ethical frameworks was presented so that their content could guide D8.2 (Zamorano et al., 2021) and D8.3 (Marsh et al., 2021). The human rights most pertinent to the PROACTIVE project were addressed through the legislative framework, namely the right to integrity, the right to privacy, and the right to data protection. All these rights as well as the data protection rights of research participants and members of the advisory boards were examined in the light of the most relevant international treaties, such as the Universal Declaration of Human Rights, the European Union Charter of Human Rights, and the European Convention on Human Rights. The role that CBRNe preparedness and response performs within the European Union and the position that PROACTIVE holds inside the CBRNe European framework are both clarified by a number of legal and soft law publications. Most of the legal requirements are set down in the privacy and data protection legislative framework, primarily the GDPR. PROACTIVE partners' main obligations concerning privacy and data protection are in regard of the following issues: anonymisation, special categories of data, roles (i.e., processors must be adequately identified, the relationship between them and the controllers has to be regulated through a contract that includes privacy and data protection clauses and controllers must ensure that processors are compliant with the GDPR record keeping), informed consent, data protection principles, security, potential data breaches, the rights of data subjects, and the CCS (i.e., ongoing communications must be established between RINISOFT and ETICAS in order for the applications developed within PROACTIVE to comply with the principle of data protection by design and by default).

As reported in the above section, D8.2 (Zamorano et al., 2021) analysed the legal requirements identified in D8.1 (Clavell et al., 2021) and examined the acceptability aspects to be considered in the development and implementation of the PROACTIVE toolkits. A review of the CBRNe legal frameworks found that Human Rights/Fundamental Rights, Data Protection Law, CBRNe related legislation and recommendations at EU level are largely aligned with the objectives of PROACTIVE. However, analysis showed that many legal requirements need to be translated into new mechanisms, especially in the area of CBRNe preparedness and response, and especially with respect to ensuring data protection. From an acceptability perspective, the analysis showed that both the literature and first responders agree on key factors that define the acceptability of CBRNe guidelines. The main acceptability drivers identified in CBRNe are:

- Public environment and media in CBRNe events: the importance of the environment in determining social understanding of bioterrorism threats and other CBRNe risks has been



stressed. Media events surrounding these events are considered a critical driver for acceptability.

- Knowledge transference and training as acceptability factors: social familiarity with CBRNe events and how to behave when they occur could be increased through systematic preparation (BESECU, 2011). Tactical and planned communication of authorities with communities based on clear and detailed information has been presented as fundamental for increasing both acceptability and resilience to CBRN events (Lucini, 2017).
- Cultural capital and acceptability to CBRNe policies: a critical element for the successful implementation of response measures is the education of the public regarding how to act during CBRNe events. This concerns aspects such as incident management strategies and a shared understanding of existing guidance (Hall et al., 2019; Heath, 2016; Andrade-Rivas, 2015).
- Perceived efficiency of CBRNe policies and acceptability: another essential factor around the acceptability of first response policies is the perceived efficiency of existing policies and regulations by both citizens and first responders (Heirston, 2010). The cognitive and agential dimensions of acceptability are essential in the field of CBRNe. The literature has addressed people's perception of security and related reactions to risks and fear, which would favour more respect for preventative measures adopted (Heath et al., 2017; Andrade-Rivas, 2015).
- Disinformation as acceptability drivers in CBRNe events: knowledge and the institutional and public arrangements to transmit it clearly and adequately are crucial for prevention and response strategies concerning CBRNe events. In the field of crisis management, the extensive dissemination of fake news can significantly affect social dynamics, broadening panic and fostering problems in response. As addressed by the literature, intentional and unintentional distortions in disseminating information can significantly affect such aims. Along these lines, the literature has addressed how fake information online can negatively affect response to terrorist attacks (Vosoughi et al., 2018; Starbird, 2013).
- Effort expectancy is about the level of convenience and usability that affected individuals perceive when experiencing a specific CBRNe policy or information system in this context. Reducing the effort to adopt CBRNe guidelines is highly dependent on the context of applying a particular action.

Finally, as part of Task 8.4 Ethical and Societal Impact Assessment of project outputs, PROACTIVE examined the ethical and social implications of its outputs and the CCS. This examination of PROACTIVE outcomes was organised in three dimensions, ethical, social impact and privacy. According to this analytical structure, findings can be summarised as follows:

- CBRNe policies present several ethical value tensions, where those standards and protocols aimed at protecting safety of “victims” from a physical standpoint are at the core of axiological tensions with other principles to be considered in these contexts (including physiological integrity, protection from discrimination and privacy);
- Along the same lines, it has been identified that PROACTIVE recommendations could contribute to enhancing first responders' action concerning the inclusion of vulnerable

populations through new communication means (between first responders and from first responders towards citizens) and adopted protocols for ensuring their accessibility;

- Both response protocols and the PROACTIVE CCS require the implementation of socioecological measures to supplement privacy by design achieved through SOPs. Specifically, both informational and physical privacy need to be repositioned as part of CBRNe preparedness and response strategies (e.g., SOPs).

Finally, besides suggesting avenues for using PROACTIVE outcomes to fill the above gaps, these findings confirm the relevancy of the project outcomes concerning the potential social impact of current policies to tackle the consequences of these events in the EU.

## **2.7.4. Recommendations for implementation**

D8.2 (Zamorano et al., 2021) produced some key recommendations concerning acceptability and data protection in PROACTIVE.

The main acceptability recommendations regard:

- the participation of affected groups as an essential way of addressing possible gaps or distortions between policy to counteract these events and dominant social perceptions (Mordini, 2004),
- the increase of public understanding of CBRNe incidents by conducting targeted training and the promotion of risk-based training,
- the development and implementation of policies that should be aimed at increasing the level of knowledge of the public in CBRNe events, which has also been related to the effectiveness of response strategies,
- the development of tools and strategies for distinguishing fake news and scientifically based news that should be advanced for framing public acceptability of authorities' policies (BESECU, 2011), (5) the application of strategies to improve communication and language adopted into CBRNe protocols.

In addition, recommendations based on preliminary data protection requirements for the PROACTIVE technologies covered:

- the need for processors to be adequately identified and for the relationship between them and the controllers to be regulated through a contract that includes privacy and data protection clauses,
- anonymisation of data sets that, when applicable, must be carried out as it is established in D10.5 (Clavell et al., 2019),
- procedures that set-in place additional safeguards in storing special categories of data,
- keeping records of processing activities, setting protocols or by design mechanisms to ensure that relevant data can be kept in its system,

- ensuring data subjects' rights by communicating these to the research volunteers before they consent (when applicable) and respecting them at all times,
- carrying out the processing of personal data within the PROACTIVE CCS on the basis of informed consent,
- data protection principles that must inform the development of the different toolkits in PROACTIVE,
- processing personal data in a secure way according to the risks created by them,
- the implementation of technical, organisational and security measures by the CCS controller (UIC) so as to comply with data-protection principles, the respect of the rights of the data subjects and of the requirements of GDPR.

Based on the results from D8.4 (Zamorano et al., 2023), some recommendations are also provided for further integrating the ethics framework in CBRNe preparedness and responses:

- training should be provided for first responders focused on the ethical implications of targeted communication and its associated forms of social inclusion,
- training for first responders regarding technical aspects of proper care and attention should focus on vulnerable victims with specific differential factors for exclusion (disability, culture, etc.),
- there should be greater involvement of organisations representing the local community and vulnerable populations in CBRNe policies, training processes, preparedness strategies and testing.

Moreover, sociotechnical guidelines for LEAs management of the CCS are provided in various aspects: governance, data management, data privacy and CCS data protection monitoring. Regarding governance, LEAs will most likely act as data controllers and managers of the CCS, which entails ensuring a comprehensive set of technical and organisational protocols before the system is operational. Tasks to be conducted by LEAs involve ensuring secure data management, establishing protocols for implementation and ensuring proper personnel training. It is critical for the system's correct functioning that LEAs acting as data controllers ensure prompt and secure communication with corresponding authorities, including public institutions integrated into the system governance and data protection supervisory authorities. This will help to increase the situational awareness of all actors involved. Moreover, the controllers should promote the development of a data management crisis plan, with a focus on information sharing. During the entire CBRNe preparedness process, communication, cooperation, and a multi-agency approach need to be harmonised in order for the plan to remain consistent and coordinated.

From a data management perspective, LEAs effort should focus on:

- securing data exchanges during the event by applying contingency plans,

- how to provide targeted information about data subjects' privacy rights (both first responders and users) to involved groups and a detailed explanation of the personal data to be shared with the App for registration,
- being transparent about the data being collected, how it will be used, and with whom it will be shared.

As for data privacy, relevant issues to be considered are:

- data minimisation: a template with the minimum personal data is needed for achieving the PROACTIVE recommended protocols for prevention, preparedness, response and recovery activities, together with a recommendation to ensure data minimisation,
- data security: instructions to secure personal data integrity and confidentiality, stressing the importance of protecting special categories of personal data,
- data breaches policy: a data breaches response methodology addressing relevant definitions of anonymised or properly pseudonymised records of personal data management,
- data retention policies: establish clear data retention policies that outline how long user data will be stored and under what circumstances it will be deleted.

Finally, CCS data protection monitoring should involve:

- independent audits: regularly subject the App's data handling practices to independent audits to ensure compliance with privacy regulations and industry standards,
- Data Protection Impact Assessments: before using or adding new features of processes to the CCS, agencies should conduct a data protection impact assessment (DPIA) to identify and mitigate any potential data protection risks.

### 3. SUMMARY SYNTHESIS

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As outlined in the introduction, the overarching aim of the PROACTIVE project was to enhance societal CBRNe preparedness. It aimed to do this in two main ways: first, by increasing understanding of current and best practice for practitioners' ability to manage large, diverse groups of people during a CBRNe emergency, with a specific emphasis on groups within the civil society who may be more vulnerable and have more pronounced needs; second, by developing tools and outputs designed to help both increase practitioner's ability to successfully manage large groups of diverse populations during an emergency and increase public knowledge and understanding of CBRNe incidents. As outlined in the above sections, each WP has contributed to the successful completion of these aims through the delivery of a complex pattern of interlinked deliverables and outputs (including the PROACTIVE pre-incident information and the CCS, reports, recommendations, and briefing documents), which, woven together like an intricate tapestry, paint a full picture regarding CBRNe preparedness and response. In this section, we provide an overview

synthesis of the key outcomes of the work packages and present an overarching narrative detailing the success of the PROACTIVE project for achieving its aims.

Firstly, the detailed evidence synthesis work conducted through WPs 1, 2 and 3 comprehensively examined current practice and state of the art, evidence-based best practice, and a series of recommendations to address any challenges and seize opportunities presented by the above syntheses. In brief, across this work we identified that public awareness and understanding of CBRNe prevention and management strategies is very low, as is practitioner awareness of the needs of civil society, particularly when considering groups more likely to be vulnerable to the effects of a CBRNe incident. Throughout the synthesised literature and data, there was a clear emphasis on the role of prompt and comprehensive communication for addressing the needs of the civil society and maximising compliance with responder or authority recommendations, and for the potential role of pre-incident information in improving knowledge and confidence. However, despite the important role of communication identified above, there were very mixed findings concerning guidance for communication in official practitioner SOPs, and a clear need for additional training and experience to support practitioners to engage appropriately with the public in the event of an emergency. Based on this work, the PROACTIVE project identified a series of key recommendations relating to guidance, knowledge, dissemination, pre-incident information and communication. These findings helped to situate the project in the state-of-the-art literature and signposted to key challenges around informing and involving the public in CBRNe preparedness work and ensuring that responders know how to communicate effectively.

Given the findings concerning a lack of mutual understanding between the civil society and practitioners with regard to CBRNe preparedness and response, the PSAB and CSAB represented an excellent medium through which relationships and understanding could be improved. Indeed, the large-scale advisory boards provided input and advice into work from across the PROACTIVE WPs. In this way, the needs and views of both practitioners and the civil society were incorporated throughout the project in ways that served to improve mutual understanding between representative groups, and ensured that the findings, outputs, and tools from the project were clear, precise, actionable and relevant. Indeed, one key tool and output resulting from the work between PROACTIVE is the Aide Memoire which exists to provide a reference guide for those designing an emergency exercise with the involvement of the civil society. While this by no means represents a complete closure of the knowledge and understanding gap identified, the work of the PROACTIVE project, and particularly WPs 2 and 3, provides a blueprint for how best to involve representatives from disparate professional and lay groups into CBRNe preparedness work.

In addition to facilitating and fostering considerable co-production and dialogue between researchers, practitioners, and the civil society, the PROACTIVE project has served to develop tangible tools which contribute to addressing the gaps in CBRNe preparedness identified by the project. Alongside the Aide Memoire mentioned in the preceding paragraph, the project has developed a series of briefing notes and white papers identifying and disseminating the key recommendations and findings to a broad range of stakeholders. Building on these recommendations, the PROACTIVE CCS and PROACTIVE pre-incident information materials represent the culmination of research and co-production designed to address specific concerns around communication, knowledge and understanding. Firstly, the co-developed CCS was iterated across all three exercises to yield a final product with positive ratings for usability, confidence, and intentions to use the Mobile App component in the future. Indeed, the observers who tested the

Mobile App agreed that it served to enhance situational awareness of the population regarding CBRNe incidents, thereby directly addressing a key limitation of current practice outlined in the early stages of the project. Secondly, across a wide range of both quantitative and qualitative data sources, the pre-incident information demonstrably improved knowledge, confidence and understanding in how to respond to CBRNe incidents among the public. This culminated in a successful experimental test within FTX3 which demonstrated that the provision of pre-incident information could lead to actual behaviour that may save lives during an incident. While there are limitations concerning the nature of implementing an experimental test within a complicated exercise environment, it is impossible to overstate the potential implications of the pre-incident information and their findings for informing public behaviour. Considered together, therefore, the tools developed by the PROACTIVE project not only serve to address limitations concerning knowledge, understanding and communication within CBRNe incident response, they may also serve to save lives.

Alongside the development of these tools and outputs, the ethical and legal frameworks and research developed within the PROACTIVE project have served not only to ensure that the work of the project was conducted in an ethically appropriate fashion, but also to explore a clear and comprehensive assessment of the ethical, legal and societal factors associated with CBRNe exercises and incidents, and also broader considerations concerning the ethical and social outputs of the project itself. Given the nature of CBRNe preparedness and response, this work has enabled the project to make clear recommendations concerning both the conduct of CBRNe exercises and also actions undertaken during CBRNe incidents in order to ensure ethical treatment for all parties throughout.

Finally, one of the most shining examples of gold standard practice undertaken by the PROACTIVE project has been the collaborative conduct of three high profile exercises (with colleagues from the eNOTICE project) involving representatives from the civil society (including those who may be more vulnerable to the effects of a CBRNe incident). This large-scale inclusion of the civil society in CBRNe exercising is uncommon and represents the culmination of considerable collaboration between organising parties, across language barriers and unfamiliar contexts to jointly accomplish shared goals. While the conduct of these exercises did identify several key recommendations for best practice in CBRNe preparedness (explored in more detail in the Aide Memoire and D6.3 [Carbon et al., 2022], D6.4 [Godwin et al., 2023], and D6.5 [Burlin et al., 2023]), they primarily served to provide both practitioners and the civil society with novel opportunities to interact and learn from one another. Given the focus of the PROACTIVE project, the evaluation focused primarily on perceptions and experiences of the civil society. We identified that participation in the exercises typically improved knowledge and confidence (although there were limits to this), and, by the end of the three exercises, we were able to identify several factors associated with compliance and public perceptions/behaviours (both quantitative and qualitative) which are reflected in the overall recommendations resulting from PROACTIVE. These included the identification of both good practice and also areas for improvement across the exercises, particularly in relation to communication from responders and responders' ability to identify and accommodate the needs of individuals who may be more vulnerable. In this way, the exercises served to: highlight opportunities for improvement in practitioner communication and management of CBRNe incidents; improve public awareness and understanding of CBRNe incidents and recommended behaviours; and, also to gather valuable insights to inform recommendations for improved practice in future. The exercises represent a culmination of the achievements of the PROACTIVE project and are an exemplar of what can be



achieved and understood through diligent research, preparation, and co-production between disparate parties both professional and lay.

Considered together, the work delivered across the PROACTIVE project has served to achieve the key objectives to: identify both state-of-the-art and current practice for CBRNe preparedness and response, identify potential shortcomings in existing procedures and tools, and then to both improve and test these tools in CBRNe exercise situations, as outlined in the Description of Action. In addition, the considerable work outlined in all the deliverables and summarised in the above sections does contain a wealth of recommendations for the integration of findings and innovations into CBRNe practice in order to ensure that the knowledge is disseminated to, and received by, those who can most benefit from it. To further advance these aims, the section that follows this one provides a full account of recommendations concerning both the ongoing use and utility of outputs and tools developed through the PROACTIVE project, and recommendations for action at all stages of CBRNe preparedness and response. These recommendations (incorporating views raised directly by the civil society during the FTX evaluations and other engagements) will serve to facilitate the integration of PROACTIVE outcomes into common practice, thus advancing the quality of CBRNe preparedness and response towards the state of the art.

## 4. RECOMMENDATIONS

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### Overview

The table below (Table 3) provides a summary overview of the recommendations resulting from the vast work undertaken across the PROACTIVE project. A full description and operationalisation of these recommendations follows the table; however, the reader should note some key components of the table which speak to the maturity of project outputs and recommendations. First, each objective is presented alongside a list of the WPs and/ or FTXs which contributed to their conceptualisation or operationalisation. This provides a clear overview of the wealth of different components – from desk research, through primary data collection and tool development, all the way to evaluation in an exercise situation – which contribute to the PROACTIVE project recommendations. Furthermore, the recommendations are also listed against each of the PROACTIVE Tactical Objectives. These were developed to help the project meet its Strategic Objectives (see section 4.1 of D6.3 [Carbon et al., 2022], D6.4 [Godwin et al., 2023], D6.5 [Burlin et al., 2023]), and evolved throughout the three field exercises and reflected lessons learned and feedback received. The most mature version of these objectives was those used within D6.5 (included here in Annex 2 as a reminder to the reader). As can be seen from the table, each of the PROACTIVE Tactical Objectives has been related to at least one recommendation. This demonstrates the substantial success of the PROACTIVE project in meeting all of the overall project aims through its lifetime.

**Table 3. List of recommendations and related WPs, FTXs and Tactical Objectives**

Area	Recommendation	WP	FTX	Tactical Objective*
1	Policy makers and responder organisations could implement information campaigns and education to build public knowledge about CBRNe threats.	WP1,WP2, WP5,WP6, WP8	1,2,3	9
1	Pre-incident information should be presented and delivered by policy makers or responders in a way that makes it accessible to all members of the public, including those who may be more vulnerable.	WP1,WP2, WP3,WP5, WP8	1,2,3	4
2	First responder SOPs should facilitate interagency cooperation.	WP1,WP2, WP6	1,2,3	10
2	First responder guidance documents, training, and SOPs should provide evidence-based advice to help responders communicate with the public.	WP1,WP2, WP6	1,2,3	2
2	First responder guidance documents, training, and SOPs should provide details for responders concerning how to identify and address the needs of vulnerable groups during a CBRNe incident.	WP1,WP2, WP6	1,2,3	2
2	First responder SOPs and guidance should be consistent – or harmonised – between documents and countries wherever possible.	WP1,WP2, WP3,WP6, WP8	1,2,3	3
3	Exercise organisers and developers should adhere to design principles to facilitate the creation of a Mobile App that is optimised for use by the target audience.	WP3,WP4, WP5,WP6, WP8	1,2,3	7,8

4	Official sources should communicate accurately, honestly, and regularly with members of the public throughout a CBRNe incident.	WP1,WP2, WP6	1,2,3	9
4	First responders should provide information to members of the public in an accessible format during a CBRNe incident.	WP1,WP2, WP3,WP4, WP5,WP6, WP8	1,2,3	5
4	Interpersonal communication between emergency responders and members of the public should be facilitated during a CBRNe incident.	WP1,WP2, WP3,WP5, WP6,WP8	1,2,3	1
4	First responders should ensure that vulnerable groups receive the information they need and that they are provided with adequate support during a CBRNe incident.	WP1,WP2, WP3,WP4, WP5,WP6, WP8	1,2,3	3
5	CBRNe training and exercises should occur regularly and should incorporate best practice relating to exercise organisation in order to facilitate shared outcomes (for PROACTIVE best practices see D3.2 [Hale et al., 2023], D6.3 [Carbon et al., 2022], D6.4 [Godwin et al., 2023] and D6.5 [Burlin et al., 2023]).	WP2,WP3, WP6	1,2,3	10
5	CBRNe exercises should regularly include members of the civil society, including vulnerable groups. Furthermore, where possible members of the civil society should be involved in the design and organisation of these exercises.	WP2,WP3, WP6,WP8	1,2,3	1

Recommendations included in this document are separated into five overarching areas: (1) pre-incident communication, (2) guidance documents and SOPs, and best practice towards more inclusivity and co-creation, (3) development of the PROACTIVE App (4) communication with the public during an incident, and (5) CBRNe training and exercising. Under each area, key recommendations are provided, followed by a summary of why this recommendation is important and specific recommendations for how the overarching recommendation can be achieved, based on the Work Packages in the PROACTIVE project.

These recommendations have been reviewed by the PSAB and CSAB with recommendations incorporated in line with the overall co-production ethos of the PROACTIVE project. Generally speaking, feedback on the recommendations from the PSAB and CSAB was positive, commenting on the thorough nature of the recommendations.

### **Area 1: Pre-incident communication**

#### **Recommendation 1: Policy makers and responder organisations could implement information campaigns and education to build public knowledge about CBRNe threats.**

##### ***Why***

- A systematic review of academic literature relating to public perceptions of, and responses to, mitigation and management strategies for CBRNe terrorism suggest that the general public's current understanding of CBRNe prevention and management strategies is very low. Across literature there was consensus that official protective and preventative recommendations are often misunderstood, complex, and confusing to the public. For more information see WP1 and WP5.
- Effective educational programs and public information campaigns can reduce anxiety, improve knowledge, and allow members of the public to effectively attend to and remember information. For more details see WP1.
- Pre-incident information is important for informing the public about CBRNe-related aspects. Across the three FTXs a consistent pattern emerges concerning the pre-incident information. It was generally well received by volunteers, had some potential impact on knowledge and confidence concerning willingness, comfort, and perceived ability to undertake the recommended behaviours, and, in the case of FTX3, may even have been the most effective protective measure deployed to volunteers. For more information see D6.3 (Carbon et al., 2022), D6.4 (Godwin et al., 2023) and D6.5 (Burlin et al., 2023).
- Whilst there is an acknowledgement across data collected through focus groups and FTXs in WP5 and WP6 that pre-incident information may make some people feel uncomfortable, results show that there is a broadly positive view of pre-incident information and there is a desire to receive these ahead of any incident.
- But responders should remember that pre-incident information is not a substitute or replacement for real-time information for an ongoing incident.
- Results from WP5 show that reading pre-incident information and participating in the focus groups provided individuals with self-reported knowledge and confidence of actions to take in an incident for at least the following 6 months. In addition, individuals were able to recall, without prompting, significantly more actions recommended for decontamination for up to 6 months after reading the pre-incident information, demonstrating not only an effect on self-reported knowledge and confidence, but also on actual knowledge.
- Results from WP6 demonstrate that pre-incident information can have a real and measurable impact on both cognitive and behavioural outcomes within an exercise scenario.

## How

- PROACTIVE pre-incident materials (WP5) and their development process should be used to inform the development of information campaigns and public education that should be implemented to build public knowledge and increase public awareness regarding CBRNe incidents.
- Whilst pre-incident information should be designed to prepare the public for CBRNe incidents, the information should be agnostic to procedural differences dependent on the incident and should be generic enough to fit a broad range of contexts. Copies of previous versions of pre-incident information materials should be provided online for practitioners and stakeholders to access and modify in order to fit the needs of their respective settings and populations (e.g., incident type, population vulnerability, fitting with specific SOPs for practice). For copies of the PROACTIVE pre-incident information materials see the [PROACTIVE website or the CCS](#).

**Recommendation 2: Pre-incident information should be presented and delivered by policy makers or responders in a way that makes it accessible to all members of the public, including those who may be more vulnerable.**

## Why

- Through the process of stakeholder involvement in the development of the PROACTIVE pre-incident information materials extensive consultation with both practitioners and representatives from the civil society was undertaken. As can be seen across D5.1 (Nicholson et al., 2021) and D5.2 (Dennis et al., 2023), stakeholders made several comments and recommendations designed to improving the ease of understanding and inclusiveness of the pre-incident information materials. These modifications resulted in the final version of the pre-incident information, which successfully demonstrated cognitive and potentially behavioural effects during the experimental trial during FTX3 (D6.5 [Burlin et al., 2023]).
- These recommendations for improving the accessibility of pre-incident information are further consistent with findings from across WP1, WP2 and WP3, and the FTX evaluations concerning best practice methods for communicating and disseminating information to diverse populations. In short, time and again across the PROACTIVE project, findings have demonstrated the critical importance of making sure that information is clear, easy to understand, accessible and understandable, and also useable by the populations to whom you wish to distribute it. Using trusted methods and sources of communication is further critical to achieving this aim.
- Among the observers who participated in the FTXs, there is clear consensus that the materials were of help for those affected. The materials were frequently characterised as “clearly explained,” “easy to read,” “understandable” and “helpful.”

## How

- Language used in pre-incident information should be simple, free from any technical jargon and factually accurate.
- Websites containing pre-incident information and supplementary information should be provided to members of the public, and these websites should be accessible to individuals with specific needs.
- Information should be distributed across relevant channels and via multiple sources – these channels and sources should be identified in collaboration with representatives from civil society organisations.
- Specific behaviours that members of the public are recommended to carry out during a CBRNe incident should be explicitly stated in the pre-incident information, along with clear detail on the how and why of conducting the behaviours.
- Potential sources of confusion or contradiction should be minimised in pre-incident information. For example, clarity should be provided regarding members of the public being told to leave the scene of a CBRNe incident, but also to wait for instructions from first responders.
- Novel dissemination routes may be effective in providing members of the public with pre-incident information, such as the use of cartoon characters.
- The use of different formats, images, visual cues, and colour coding could help to maximise the accessibility of pre-incident information.
- Consideration should be given to ensure that images depicted in pre-incident information campaigns are representative of the public, for example the pictograms should depict a diverse population including women, children and other vulnerable groups.
- Pre-incident information should be provided by a credible spokesperson (e.g., a specialist).
- Pre-incident information should be respectful of religion and religious values.
- Pre-incident information should be provided in multiple formats, including different languages, pictographic form, Braille, and different sign languages (e.g., British Sign Language, American Sign Language, Chinese Sign Language).
- Pre-incident information should be provided in English (as the most spoken language across Europe [Eurostat, 2022]) and the country's national language(s).
- Before pre-incident information is finalised for public dissemination, civil society organisations should be consulted to ensure the information is presented in appropriate and accessible format.
- More details on pre-incident information can be found mainly in WP1 and WP5 but also in WP2, WP3, WP6, and WP8.



## **Area 2: Guidance documents and SOPs, and best practice towards more inclusivity and co-creation**

### **Recommendation 3: First responder SOPs should facilitate interagency cooperation.**

#### ***Why***

- In an online survey conducted in WP2, less than half of the respondents who were involved in a CBRNe incident stated that the responsibilities between the organisations involved in the respective CBRNe operation(s) were very clear or rather clear, suggesting that clarity on roles and responsibilities of responders could be increased. Previous literature has shown the importance of responders understanding each other's roles and responsibilities in order to effectively work together (e.g., Davidson et al 2022; Waring et al., 2018).

#### ***How***

- CBRNe SOPs should provide guidance on how responders from different response organisations can work together cooperatively during a CBRNe incident.
- CBRNe SOPs should clearly outline each organisations key roles in the response in a structured way, using simple, non-organisation specific language.
- Overarching roles and responsibilities of different response organisations should be clear in SOPs both inter- and intra-organisationally. More information can be found in WP1 and WP2.
- At the beginning of a CBRNe response, organisational leads from each response organisation should discuss with each other their specific roles and responsibilities for that incident, as well as establishing clear inter-agency shared goals. Commanders should also share with commanders from other services their individual services sub-goals to achieve that shared goal.
- A formal structure for debriefs after incidents should be established, including a standardised way to share best practice and lessons identified both inter- and intra-organisationally, but also internationally too.

### **Recommendation 4: First responder guidance documents, training, and SOPs should provide evidence-based advice to help responders communicate with the public.**

#### ***Why***

- Effective communication with those affected by a CBRNe incident is essential to minimise the effects of an incident. In an online survey in WP2, about three quarters of respondents stated that their organisation has a communication strategy for major emergencies. These

respondents further indicated that the communication strategy focuses on general communication and evacuation in about three quarters of the cases. In about half of the cases, decontamination, medical care, and pre-incident information are addressed.

- In the PSAB workshops conducted in WP2, the majority of respondents stated that their organisation's CBRNe SOPs do not include information on how to communicate with members of the public in the event of a CBRNe incident.

## **How**

- Guidance should be co-developed with representatives from the civil society (to ensure that they are fit for use), tested within exercise contexts, and should ultimately be implemented for use by responders in the event of a CBRNe incident.
- Guidance documents should provide evidence-based advice on communicating with the public which can be followed by authorities in the event of a CBRNe incident.
- Guidance documents should provide evidence-based advice about public behaviour, emphasising that the way in which practitioners manage an incident will affect the way in which members of the public behave.
- Guidance documents should provide evidence-based advice on strategies to increase public compliance in the event of a CBRNe incident.
- Incorporate up-to-date evidence-based advice in guidance and policy on how members of the public are likely to respond in a CBRNe incident.
- A detailed communication strategy for how emergency responders should communicate with casualties and members of the public during a CBRNe incident should be included in guidance documents.
- Communication templates with key messages should be established and included in SOPs and guidance.
- More details on guidance documents and SOPs are available in WP1, WP2 and WP6.

**Recommendation 5: First responder guidance documents, training, and SOPs should provide details for responders concerning how to identify and address the needs of vulnerable groups during a CBRNe incident.**

## **Why**

- Research in WP2 showed that vulnerable groups are very rarely included in preparation measures for CBRNe incidents and vulnerable groups are only rarely considered in CBRNe SOPs. The most likely groups to be included in SOPs are children, people with mobility restrictions, and general members of the public. In contrast, this is very rarely the case for visually or hearing-impaired people, people with mental health conditions, and for ethnic minorities.
- In a survey conducted in WP2, about 15% of practitioner respondents stated that their organisation cooperates with civil society organisations to address issues of CBRNe incidents.
- Questionnaires findings from WP6 reported that responders could have adjusted communication with people with vulnerabilities better.
- All three FTXs reported little assistance and no attempts to prioritise or triage volunteers that needed extra help, resulting in increased anxiety and stress for those impacted. Some volunteers reported a feeling of panic as a result of a lack of communication aimed at vulnerable people, as well as insufficient instructions.
- The observers highlighted numerous problems in the way first responders communicated with the affected persons. This was also the interaction dimension which received the least favourable evaluations. See WP6 for more details.

## How

- Guidance should be co-developed with representatives from vulnerable groups (to ensure they are fit for use), tested within exercise contexts, and should ultimately be implemented for use by first responders in the event of a CBRNe incident.
- Exchange with CBRNe practitioner organisations from other countries should be sought to discuss challenges in CBRNe management regarding vulnerable groups.
- More consideration should be given to developing policy and procedures to assist those with mobility issues (e.g., relating to service animals and essential mobility aids) during CBRNe incidents. This should include exchange with CBRNe practitioner organisations from other countries to ensure that best practice is being shared across the EU and beyond.
- Templates for communicating with vulnerable groups should be established and included in guidance.
- Policy and procedure for the management of CBRNe incidents should remain culturally appropriate and be respectful of religion and religious values.
- More details on guidance documents and SOPs are available in WP1, WP2 and WP6.

**Recommendation 6: First responder SOPs and guidance should be consistent – or harmonised – between documents and countries wherever possible.**

**Why**

- A systematic review of management strategies for CBRNe terrorism, current tools, SOP's, guidance, and policy documents suggests that there are discrepancies in the information that is provided in guidance documents both within and between countries. Results can be found in D1.1 (Hall et al., 2021a) and D1.2 (Davidson et al., 2021).
- In the PSAB workshops in WP2, respondents were of mixed opinions about whether there should be standardisation across countries due to country-specific differences.

**How**

- Best practice for CBRNe preparedness and response – particularly relating to involvement of, and communication with, civil society – should be shared both inter-agency and internationally. This can be facilitated through the conduct of international exercises and could serve to promote the international harmonisation of SOPs and guidance.
- Ensure that, where possible, CBRNe SOPs and guidance documents are uniform in instruction and evidence-based regarding communication, likely public behaviour and how to enhance public compliance.
- Build on both the sharing of best practice and gold standard evidence, and ensuring uniformity where possible, to develop a template for an EU standard operating procedure concerning communication with the general population during CBRNe response. Evidence for this recommendation can be found throughout the PROACTIVE project, but most notably the outcomes from WP1, WP2, WP3 and the evaluations of all the FTXs (D6.3 [Carbon et al., 2022], D6.4 [Godwin et al., 2023] and D6.5 [Burlin et al., 2023]).
- Review any discrepancies in documents both within and between countries to ensure consistency in recommendations on how emergency response organisations should respond to a CBRNe incident.
- Guidance documents should seek to be uniform in instruction, particularly when released in the same country.
- More details on guidance documents and SOPs are available in WP1, WP2, WP3 and WP6.

**Area 3: Development of the PROACTIVE CCS**

**Recommendation 7: Exercise organisers and developers should adhere to design principles to facilitate the creation of a Mobile App that is optimised for use by the target audience.**

## **Why**

- To ensure that the CCS is accepted and used by members of the public.
- To minimise the complexity of the CCS aligning with the project's needs, maintainability, scalability, and the development team's familiarity and expertise.
- A research cycle of CCS alterations and feedback resulted in an interface that was more straightforward and met the needs of vulnerable populations.
- Over the course of the three FTXs, the PROACTIVE Mobile App increased in overall usability and usefulness. Along those lines, so did the number of stars the app received. This helps demonstrate the effectiveness of the iterative, co-creation processes, whereby the written feedback provided by the observers in the Observer Guide was integrated into the version then released/used for the FTXs.

## **How**

- To ensure that the CCS is accepted and used by this community, Table 1 in section 2.4.3 outlines the most important design principles which RINISOFT applied when developing the Mobile Application. See also D4.2 (Kolev et al., 2023a) and D4.3 (Kolev et al., 2023b) for more information.
- Concrete recommendations for the PROACTIVE CCS and standards to follow to enhance users' acceptability of the CCS (including vital aspects such as awareness, knowledge and consent) are provided in D8.2 (Zamorano et al., 2021).
- The differential impact of the CCS on various religious, cultural, or vulnerable groups need to be continuously evaluated to provide guidance to any ongoing developments. For more details see D8.4 (Zamorano et al., 2023).
- The PROACTIVE CCS require the implementation of socioecological measures to supplement privacy by design achieved through SOPs. See WP8 for more information.
- Recommendations based on preliminary data protection requirements, data monitoring, and data privacy principles for the PROACTIVE CCS are delineated in D8.2 (Zamorano et al., 2021).
- Guidelines are also provided for LEAs management of the CCS in D8.4 (Zamorano et al., 2023).

## **Area 4: Communication with the public during an incident**

### **Recommendation 8: Official sources should communicate accurately, honestly, and regularly with members of the public throughout a CBRNe incident.**

## Why

- Research from WP1 and WP6 demonstrates that effective communication (and factors associated with communication, e.g., perceptions of information, of recommended behaviour/ability to undertake recommended behaviours, and of responders themselves) can optimise the likelihood of the public deciding to comply with official instruction or recommended behaviour and reduce the likelihood of any non-compliance. Indeed, a substantial amount of the suggestions and recommendations made by volunteers during the FTXs concerned methods of improving interactions between the responders and themselves.
- Focus groups findings from WP6 show how volunteers stated it was difficult to hear the first responders with background noise, and that it was also difficult to accept what responders said as they appeared to not know what was going on. Volunteers also stated responders needed to give more information about what would happen and why this would be happening.
- Questionnaires findings from WP6 reveal that there was a strong association between responder behaviour and information provision and predicted future compliance.
- Most observers thought that communication needed major improvements. Several other observers also mentioned how triage should have included a way to identify vulnerabilities. For more information see D6.3 (Carbon et al., 2022), D6.4 (Godwin et al., 2023) and D6.5 (Burlin et al., 2023).

## How

- Communication with members during an incident should include information about the nature of the incident, the manner of the response (i.e., what is happening and what will happen), and recommended behaviours that the public can take to reduce the risk to themselves and/or others (including how to undertake the behaviour and why it is important).
- Communication should focus on ensuring the protection of the public's health and should aim to demonstrate to the public that recommended behaviour is necessary, effective, and important to undertake.
- Communication during an incident should be empathic, assertive, and reliable.
- For effective communication with the public in the event of a CBRNe incident, officials should utilise a trusted spokesperson, whilst tailoring the spokesperson to what is preferred by the population at hand (e.g., local sources).
- Information provided to members of the public during an incident should be accompanied with facts or proof to provide robustness (e.g., mechanisms through which someone could be affected by radiation and the known geographical spread of any risk).
- A list of frequently asked questions (and their answers) during CBRNe incidents should be made available to members of the public, for example: what to do when driving in a car, and [if applicable] what the incident or contaminant was.



- To the extent possible, members of the public should be given the opportunity to find out information regarding the whereabouts of loved ones (including family, friends, and pets).
- Members of the public should be informed about active police and security efforts to apprehend terrorists.
- Members of the public should be provided with information on the importance of complying with instruction (including health specific information to address public health concerns).
- More information on communication with the public during an incident is provided in WP1, WP2 and WP6.

**Recommendation 9: First responders should provide information to members of the public in an accessible format during a CBRNe incident.**

***Why***

- A survey conducted in WP2 revealed that CBRNe practitioner organisations prefer official websites, social media (especially Facebook and Twitter), radio and TV to communicate information to the public during a CBRNe emergency. Research conducted as part of WP1 and WP2 activities showed that information in an accessible format is needed to reach members of the public.
- The consultation process undertaken in the development of both the PROACTIVE CCS (WP4 & WP5) and the pre-incident information materials further speaks to the importance of making sure that information is accessible, easy to understand, and inclusive.
- Results and recommendations derived from the three FTXs concerning communication, information provision and compliance further highlight the importance of providing information in a clear and accessible format (see WP6).

***How***

- Information should be available in writing (i.e., print form), where possible, using non-complex language.
- Multiple platforms should be used to communicate with the public, with consistent information being provided across platforms.
- Facilitating people with the same disability to group together may assist with communication and procedures and could reduce anxiety for those that have specific vulnerabilities e.g., hearing impairment.
- The use of a megaphone would enable members of the public to hear instructions clearly, particularly in light of responders wearing PPE making it difficult to hear and understand.

- Use of technology such as translation apps and tablets could represent a way of overcoming language and comprehension barriers, facilitating the sharing of information to multiple people.
- An understanding of sign language could improve the ability of responders to communicate efficiently with individuals with hearing impairments.
- More details are provided across all PROACTIVE WPs.

**Recommendation 10: Interpersonal communication between emergency responders and members of the public should be facilitated during a CBRNe incident.**

**Why**

- In an online survey of 91 volunteers from 20 different European countries, respondents emphasised the importance of people affected by CBRNe incidents to be able to see the responder who is talking to them, so they don't appear anonymous and possibly frightening. The study is presented in detail in D3.4 (Carbon et al., 2021).
- The evaluation of all three FTXs revealed some examples of good practice concerning interpersonal communication, but also substantial opportunities to improve the nature of both communication and interaction between first responders and the general public (see D6.3-D6.5)

**How**

- Consider the possibility of attaching a photo to the practitioner's Personal Protective Equipment if it can be done in a way that doesn't jeopardise the protection given by the equipment in order to lower fear level in the affected population.
- Responders could consider introducing themselves to members of the public to both potentially reduce anxiety and confirm their identity.
- Not all responders need to adhere to the same level of communication when having different tasks and responsibilities, as long as the right message is delivered and understood correctly by all members of the public.
- See all other recommendations within this section for further information on how to communicate effectively and deliver a message appropriately.
- For more information see WP1, WP2, WP3, WP5, WP6, and WP8.

**Recommendation 11: First responders should ensure that vulnerable groups receive the information they need and that they are provided with adequate support during a CBRNe incident.**

## Why

- An online study with CBRNe practitioner organisations in WP2 showed that vulnerable groups are rarely considered in organisational communication strategies for major emergencies. Less than half of the respondents in the quantitative study indicated that their organisation provides CBRNe-related information to the public in pictorial language (38.1%) and audio language (21.1%). Very rarely this is the case for sign language (12.9%) and Braille (4.1%). Slightly more than half of the respondents indicated that their organisation provides CBRNe-related information for the public in at least one language other than the national language(s).
- Throughout the evaluation of all three FTXs, clear and consistent findings were observed concerning the lack of support provided to representatives from vulnerable groups (though some instances of best practice were also observed). This was accompanied by a general perception on behalf of the volunteers that the responders were not used to interacting with individuals with additional needs, and so communication was repeatedly reported as lacking (See WP6).
- Volunteers who participated in focus groups described the lack of information at the very beginning of the FTXs and that this would have helped even when there was not much activity happening. Volunteers also highlighted that there was a lengthy wait process before contamination began, and that more information provision during this time would have been desirable.
- In all FTXs, volunteers reported that responders looked unsure, and instructions were not clear. This resulted in volunteers not trusting responders and feeling anxious and vulnerable.

## How

- During a response, try to keep family or caregiving units together and actively involve caregivers in supporting vulnerable persons.
- Develop a brief medical triage checklist that can be used to identify potential vulnerabilities among those affected by a CBRNe incident.
- Responders could consider asking individuals if they have any needs that should be taken into account in the initial stages of a response.
- Information should be provided in multiple languages, pictographic form, Braille, and sign languages (e.g., British Sign Language, American Sign Language, Chinese Sign Language).
- Information should be published in multiple languages to aid vulnerable groups.
- If decontamination is required, clearer and more explicit communication during the process, particularly for those with physical needs e.g., wheelchair user, catheter, should be considered.

- Provide training to first responders to aid them to identify and support individuals with additional needs during an incident. See also Area 2 recommendations.
- More details are available in WP1, WP2, WP3, WP5, WP6, and WP8.

## **Area 5: CBRNe training and exercising**

**Recommendation 12: CBRNe training and exercises should occur regularly and should incorporate best practice relating to exercise organisation in order to facilitate shared outcomes (for PROACTIVE best practices see D3.2 [Hale et al., 2023], D6.3 [Carbon et al., 2022], D6.4 [Godwin et al., 2023] and D6.5 [Burlin et al., 2023]).**

### ***Why***

- Quantitative and qualitative studies conducted in WP2 showed that whilst more than two-thirds of respondents reported having been involved in at least one CBRNe incident in their career, exercises simulating CBRNe terrorist attacks were reported by less than one-fourth of respondents. In these studies, firefighters reported attending the most CBRNe exercises as well as being the most familiar with the topic of CBRNe.
- Regular training and exercising can harmonise procedures and train the clear distribution of responsibilities in case of a CBRNe incident.
- In an online survey in WP2, respondents stated that joint FTXs help responders get to know the skills and equipment of other organisations better. In addition, a joint FTX enables better coordination between CBRNe practitioners in case of an emergency.
- Findings from the FTXs (specifically FTX1 and FTX2) identifies some positive consequences of participating in exercises from the perspective of building knowledge and confidence among the general public (though only to the extent that the exercise is perceived as successful). For instance, in FTX2 volunteers reported that they would experience lower levels of anxiety if the incident were real following the exercise than they did before the exercise

### ***How***

- Insights from exercise directors for all three FTXs across WP6 have been synthesised to provide clear guidance on how to facilitate the organisation of exercises which maximise the input of civil society and facilitate the achievement of shared outcomes (for more details see section 2.6.5 in this deliverable as well as D3.2 (Hale et al., 2023) and section 11 in D6.3 (Carbon et al., 2022), D6.4 (Godwin et al., 2023), D6.5 (Burlin et al., 2023).
- Multi-agency CBRNe training should occur on a regular basis.

- Shared documents, clearly outlining necessary components of the FTX, are useful and should be incorporated early in the planning process. Previously un-identified areas of conflict can be discovered in this process, with enough time for organisers to re-evaluate and/or adapt.
- Sufficient input into the organisation and conduct of the FTX by all organising parties will allow for more comprehensive planning.
- Direct dialogue between exercise directors of organising parties prevents misunderstandings and speed up the decision-making process.
- It is important to ensure that people who speak the local language and people who have local knowledge of the exercise location and procedures are involved in the exercise planning process.
- A detailed timeline is important, it is also imperative to expect that the timeline needs to have some flexibility to deal with the unexpected. This should be communicated to all partners involved in planning and execution.
- Include pre-exercise meetings between all organising parties that include open dialogue.
- The use of professional photographers and videographers can help to limit unauthorised photography by visitors on restricted access sites.

**Recommendation 13: CBRNe exercises should regularly include members of the civil society, including vulnerable groups. Furthermore, where possible members of the civil society should be involved in the design and organisation of these exercises.**

### **Why**

- FTXs should be designed to challenge the capabilities of first responders to manage diverse groups of people.
- As discussed in WP2, vulnerable groups are very rarely included in preparation measures for CBRNe incidents, and training with vulnerable groups is rare.
- The FTXs conducted in WP6 demonstrated the clear benefits of having volunteers in FTXs to provide challenges for responders to manage in their responses to a CBRNe incident. Involvement of volunteers across the exercises also resulted in some self-reported positive outcomes and experiences for the volunteers themselves, thus making it a mutually beneficial endeavour.

### **How**

- Members of the public from vulnerable groups and any support individuals should be invited to participate in CBRNe exercises.

- All parties needed to fully understand the role that the civil society volunteers would adopt. This should be clearly identified, agreed, and documented during the exercise planning.
- Civil society organisations who represent vulnerable groups, schools, and retirement homes should be included in the organisation for CBRNe exercises. This will help to ensure that the FTXs are fit for purpose for the inclusion of the civil society and will also help to facilitate volunteer recruitment.
- Consent forms and briefing materials should be provided in the volunteer's native language.
- Initial contact with volunteers should be overseen by a director, to explain how the process would work and set expectations.
- A suitable time for the FTX should be agreed between volunteers who will be volunteering to take place in the FTX and emergency responders to maximise the number of volunteers and responders that are able to take part.
- An approximate schedule of how long the FTX would take should be communicated to volunteers. In addition, clear communication and direction should be provided to volunteers to help them understand where they need to be and what they should be doing. This could help manage expectations and reduce any feelings of anxiety.
- Appropriate insurance for the loss or damage of personal items to volunteers should be established before the FTX.
- Information sheets should be provided to volunteers in advance of the FTX.
- Efforts should be made to ensure the registration process and obtaining volunteer consent is as streamlined as possible.
- For more information see WP2, WP3, WP6 and WP8.

## 5. CONCLUSION & NEXT STEPS

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This report collates together the work of the PROACTIVE project, integrating the learnings from all three FTXs (in which the PROACTIVE tools were tested and evaluated) alongside the key outcomes from all research-focused WPs (WP1, WP2, WP3, WP4, WP5, & WP8). This overview and synthesis provides a clear picture of the PROACTIVE project as a successful and productive endeavour, drawing together international CBRNe expertise and fusing this with a focus on the needs and experiences of the civil society (including those potentially most vulnerable in the event of a CBRNe threat). In doing so, the work delivered across the PROACTIVE project has achieved the key objectives to: identify both state-of-the-art and current practice for CBRNe preparedness and response, identify potential shortcomings in existing procedures and tools, and then to both improve and test these tools in CBRNe exercise situations.



Following on from this synthesis, and consistent with the aims of the PROACTIVE project to iterate and improve CBRNe tools, a series of recommendations both for the use and implementation of PROACTIVE tools, and for embedding best practice within CBRNe preparedness and response are presented. These recommendations have iteratively developed and matured, from the initial lists provided in the outputs from WP1 (D1.3 [Hall et al., 2021b]), through to the final actionable and operational recommendations reported herein. This process has involved a considerable amount of research (both desk-based and primary) alongside stakeholder engagement and co-production, through tool development and maturation, and finally to the comprehensive assessment of recommendations and tools through the FTXs (which themselves represent a considerable achievement, successfully integrating large numbers of civil society members including those from more vulnerable populations into CBRNe exercising). The final list of recommendations included in this document are separated into five overarching areas: (1) pre-incident communication, (2) guidance documents and SOPs, and best practice towards more inclusivity and co-creation, (3) development of the PROACTIVE App (4) communication with the public during an incident, and (5) CBRNe training and exercising. Under each area, key recommendations are provided, followed by a summary of why this recommendation is important and specific recommendations for how the overarching recommendation can be achieved, based on the Work Packages in the PROACTIVE project. This comprehensive process therefore demonstrates the depth of work that has gone into ensuring that the outcomes from the PROACTIVE project are mature, actionable, and implementable to improve CBRNe preparedness and response.

Despite the considerable successes achieved by the PROACTIVE project, however, the work is never complete. While the recommendations do provide a clear roadmap for improving CBRNe preparedness and response (particularly from the perspective of improving communication with the general public), future work should go further. For example, now that PROACTIVE has demonstrated the potential for pre-incident information to have both cognitive and behavioural consequences for public preparedness, future work should go further, developing and testing more comprehensive pre-incident information campaigns and modules that go beyond simple pre-incident information leaflets. These modules could be embedded into educational curricula and tested to examine their potential to help ensure a skilled and prepared population from an early age. Furthermore, the gold-standard integration of CSOs and representatives from vulnerable groups within the FTXs conducted through the PROACTIVE project should be carried forwards, increasing the co-production of CBRNe exercises and ensuring that the needs of disparate population groups are being met through responder exercising. Similarly, several of the recommendations reported herein refer to best practice concerning communication between responders and the general population, however further work is needed to take these concrete recommendations and develop them into comprehensive training courses focused on upskilling first responders to communicate clearly and effectively with diverse populations during a CBRNe incident. Indeed, providing clear examples of gold standard practice for responders to train and learn from should be a central priority in the continuation of these workstreams moving forwards.

Overall, then, the PROACTIVE project represents a substantial success story – identifying best practice and associated gaps in CBRNe preparedness, and developing tools, products, and recommendations to amplify the best practice and address the gaps. These were further developed through rigorous stakeholder involvement, taking into account perspectives from across both professional and lay audiences, before being tested in rigorous exercise conditions. However, this project should only represent the beginning of this endeavour – now that these recommendations

and best practice have been identified, and several gaps addressed, the work of embedding these findings into the daily practice of first responder organisations must continue.

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## 7. ANNEX 1: PROACTIVE 2ND FIELD EXERCISE - EVALUATION OF FIRST-HAND EXPERIENCE OF VOLUNTEERS BASED ON FOCUS GROUPS

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Four focus groups were conducted with volunteers who had participated in the exercise. All focus groups were conducted in Italian, audio recorded, transcribed, and translated into English. One individual requested to be interviewed in English rather than Italian, so this individual was removed from the focus groups and was instead given a 1-2-1 interview by a member of the UKHSA evaluation team. The conversations in this 1-2-1 interview covers many of the same aspects of the focus groups and no additional information was discussed in this interview compared to the focus groups. As a result, the interview is not reported directly below.

Data was analysed using the Framework Approach. This approach is often used in research that has implications for policy (Pope et al., 2000; Ritchie and Spencer, 1994). The framework consisted of five key themes: (1) perceptions of the exercise; (2) interaction with casualty volunteers with vulnerabilities; (3) importance of clear communication and information provision; (4) decontamination; and (5) spontaneous volunteer-to-volunteer interaction.

### 7.1. Perceptions of the exercise

Overall, volunteers felt like the exercise was run well from a technical perspective. However, across the focus groups volunteers' perceptions of the exercise were broadly separated into two key areas where they felt improvements could be made: (1) simulating more representative emotions that might be present in a real emergency and (2) active participation of volunteers. First, volunteers across all focus groups felt that the exercise was unrealistic, and the focus was to practice technical aspects of the response, rather than trying to replicate realistic emotions and behaviour from volunteers, e.g., "it is obvious that it is a simulation, we were all aware, so reactions to the event were definitely controlled" (Focus Group 1). volunteers in Focus Group 4 said that the unpredictability element of the exercise scenario was missing which also meant that the emotions that volunteers may have felt had the exercise been a real emergency were also missing. One volunteer in Focus Group 2 said that the exercise "needed to be a bit more real" and "a bit more animated."

Second, and related to the first point, volunteers across all focus groups felt like they did not play an active role in the exercise, e.g., "we were not an integral, real part of the exercise" (Focus Group 3). Volunteers in both Focus Group 1 and 4 said that as volunteers they felt more like "spectators" rather than volunteers. In addition, one volunteer in Focus Group 2 said that it did not feel like the volunteers were needed in the exercise because the responders could do everything they did in the exercise without the input from volunteers. According to volunteers in Focus Group 1, this lack of involvement from them as volunteers was not what they were expecting from their role in the exercise: "in terms of expectation, maybe, we expected something more that involved us or gave us a role in some way."

Not only did volunteers feel like they did not have a role in the exercise, but they also felt like they were left on their own by the responders and/or exercise organisers and not provided with any

guidance, e.g., “for me, a bit left on our own [...] in the sense that there was no one to provide us with a situation [...] with instructions” (Focus Group 1). Similarly in other focus groups volunteers discussed that the “human aspect” was missing from the exercise. Whilst one volunteer in Focus Group 4 said they felt safe, another volunteer said they would have liked a designated person to be responsible for their welfare.

## **7.2. Interactions with casualty volunteers with vulnerabilities**

Across all focus groups volunteers were critical of responder’s interactions with casualty volunteers with vulnerabilities. Volunteers said that responders did not interact with or give vulnerable people any of their attention. In Focus Group 3, a volunteer with visual impairments said that responders did not interact with her throughout the course of the exercise: “total inattention to visual impairment. I am severely visually impaired and virtually no one asked me if I had any problems, which should actually be continuous, especially for the visually impaired.” When responders did interact with volunteers with vulnerabilities, volunteers in the Focus Groups 2 and 4 said that empathy was lacking, and responders did not get emotionally involved with vulnerable volunteers. Although, volunteers in Focus Group 2 felt this was as a result of the unrealistic nature of the exercise.

Whilst volunteers said that vulnerable volunteers were not given specific attention from responders, volunteers in Focus Groups 2 and 4 felt like vulnerable volunteers were not able to be properly immersed in the exercise because they were overly protected by exercise organisers e.g., “even the boy who was in a wheelchair, eehhh, the whole situation was handled by the parents” (Focus Group 2). Volunteers in Focus Group 4 said that responders missed chances to learn from the vulnerable volunteers because they were protected too much by the organisers.

Volunteers in Focus Groups 1 and 3 said that responders need more training on how to communicate with vulnerable casualties e.g., “the err...deaf girl came to me to ask, ‘what did he say’ because obviously with the mask she could not read anything” (Focus Group 1). Another volunteer in Focus Group 1 emphasised the importance of other forms of communication as well as verbal: “a deaf-mute with a mask, if you don’t talk to him with gestures, he can’t see your lips.” Volunteers discussed that these communication challenges are exacerbated if responders do not know that casualties have vulnerabilities, therefore the responders must be trained on how to recognise and identify vulnerabilities. On the other hand, one volunteer in Focus Group 3 said that it was not just the responsibility of the responder to identify and communicate with vulnerable people. This volunteer said that vulnerable people should also help responders by communicating to them what their needs are.

## **7.3. Importance of clear communication and information provision**

Volunteers in all focus groups said that communication from the responders was lacking e.g., “no one told us anything about what was going on, no one spoke to us, except that lad from the fire brigade” (Focus Group 4), “the communication aspect was deficient” (Focus Group 2), “but there was no communication” (Focus Group 1). Some groups discussed how there appeared to be one designated emergency responder who was in charge of communicating with the casualty volunteers. However, responders said that this was not sufficient e.g., “there cannot be just one rescuer who speaks to everyone, there should be, if we are 30 or 40 people, there should be 4 or 5 rescuers, one at the front, others in the middle, and above all at the back, saying the exact same thing” (Focus

Group 2). Due to the lack of communication from the emergency responders, volunteers in Focus Group 4 said that they felt like they were requesting information from the emergency responders and that they should not have had to do this: “we interacted, but I have to say that the roles were reversed slightly, in the sense that it was not because they came to give us information, we were bothering them.”

In terms of what volunteers wanted more information on, volunteers in Focus Group 3 said they would have liked more information about what was happening and the timings of activities. Volunteers in Focus Groups 2 and 4 said that communication between responders and the casualty volunteers started out well, but then reduced as the exercise progressed, e.g., “[information provided] was positive until just before entering the carriage” (Focus Group 2), but this volunteer expanded that after this there was little clarity on any instructions provided to them.

Volunteers in all groups discussed that there needed to be more than one mode of communication because several volunteers said that they could not hear what was being said to them during the exercise. Volunteers said their difficulties in hearing responders was exacerbated by the masks that responders were wearing, which made it even harder for them to hear what was being said. Several volunteers recommended the use of a megaphone “to amplify the voices of those who were communicating” (Focus Group 3).

In addition to using additional tools to support with communication, volunteers in Focus Groups 1, 2, and 3 also discussed the importance of the way that responders communicate, both in terms of language, but also in terms of tone. For example, volunteers in Focus Group 2 said that the tone that responders communicated with the casualty volunteers was very soft and should have been more authoritative. In addition, volunteers in both Focus Groups 1 and 4 discussed that responders spoke only in one language when communicating with the casualty volunteers, potentially leaving anyone who did not speak that language in a vulnerable position because they would not be able to understand what was being said e.g., “I think it is now established that not everyone, despite there being this universal language, knows English, and so a rescuer who explains what is happening, what they are doing, how should I behave only and exclusively in the English language puts 70% of people present at a possible scenario in difficulty” (Focus Group 1).

## **7.4. Decontamination**

Volunteers in Focus Groups 1, 3, and 4 expressed confusion around how the decontamination shower worked because no one communicated with them what they needed to do e.g., “there was no one to accompany you to tell you and give you your directions on how to shower, ‘go in’, ‘get out’, ‘do this’, because I saw that there was a first tub there, but I did not understand what I had to do there, the only thing I realised was that I had to take a shower, I took a shower, then just went out” (Focus Group 1). Volunteers in Focus Group 4 spoke about how this confusion was exacerbated with volunteers’ vulnerabilities and explained that one volunteer who was in a wheelchair did not know how to go through the shower and was concerned about getting their wheelchair wet.

Volunteers in Focus Group 4 expressed concerns that responders did not check on their welfare after exiting the decontamination shower e.g., “that scared me, if it were reality, I would feel abandoned.”

However, despite the confusion that several volunteers discussed around the decontamination procedure, volunteers also said that they understood the importance and need for decontamination (Focus Group 4). Volunteers in Focus Group 2 described the decontamination as a positive experience and said that they would be easier to do this in a real situation if they needed to, now that they had done it in the exercise. In addition, volunteers in Focus Groups 2 and 4 said that despite the intimacy of the process (e.g., taking their clothes off) they felt that their privacy was respected by responders. Finally, volunteers in Focus Group 1 said that they were willing to undergo the decontamination shower and remove their clothes because they trusted the responders e.g., “in general, trust in the rescuer is always there, so if he says, ‘you have to take off your underwear’...you take it off.”

## **7.5. Spontaneous volunteer-to-volunteer interaction**

Volunteers in all focus groups discussed volunteer-to-volunteer interactions, but volunteers in Focus Group 1 said that interactions were limited due to the unrealistic nature of the exercise and said that whilst they did communicate with other volunteers, they talked about things not necessarily related to the exercise and discussed “other things.” One volunteer in Focus Group 2 recognised the importance of interactions between casualties in this kind of scenario and volunteers in this group discussed sharing expectations and impressions of the exercise with each other.

Volunteers in Focus Group 4 discussed how volunteer casualties helped each other during the exercise e.g., “then we helped each other, you could see the good among us, it was word of mouth, he said this, and it was all there.” In addition, volunteers in Focus Group 4 also discussed how there was a volunteer who was present during the exercise that spoke English and that translated information and instructions provided by the responders to any of the other volunteer casualties who did not understand what was being said. Similarly, volunteers in Group 1 discussed how a “group leader” was created who was able to help information be passed from responders to the volunteers e.g., “a group leader was created in the end [...] who communicated to us in a strong and clear way so that I managed to understand the speech.”

## 8. ANNEX 2: LIST OF TACTICAL OBJECTIVES FROM FTX3

No	Objective
1	To involve and engage with Civil Society (members of the public as volunteers) in CBRNe exercises with at least 15% of these representing vulnerable groups.
2	To evaluate the effectiveness of First Responders to recognise vulnerable people during a CBRNe incident.
3	To evaluate the effectiveness of First Responders in supporting and assisting vulnerable people during the CBRNe incident phases, through response measures (e.g., tools, equipment, procedures) which are adapted to the needs of vulnerable persons.
4	To conduct an experimental trial of the efficacy of the PROACTIVE pre-incident information for influencing attitudes, perceptions and behaviours during an emergency incident response.
5	To evaluate if communication with the public during the incident is pitched at an appropriate level in terms of language, complexity, and channels.
6	To test the technical aspects of the PROACTIVE Crisis Communication System (App & Web Platform) in a live exercise environment.
7	To evaluate how useable and useful the PROACTIVE Web Platform is for practitioners in a live exercise environment.
8	To evaluate how usable and useful the PROACTIVE App is in supporting the needs of Civil Society in a live exercise environment (e.g., communication needs, better information exchange).
9	To develop the understanding of factors that may increase public compliance during CBRNe incidents.
10	To evaluate the extent to which ethical principles, dilemmas, operational factors, and assessment, as well relevant social issues, are considered by first responders and researchers in dealing with CBRNe incidents