

[PRACTICE]

D8.1 IDENTIFICATION OF THREAT SCENARIOS

PRACTICE WP8 DELIVERABLE

DISSEMINATION LEVEL: PUBLIC

NATURE: OTHER

UNCLASSIFIED

Title:	D8.1 Identification of threat scenarios	
Date:	June 21, 2012	
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Summary of Work Package 8

The objective of WP8 is to improve public knowledge and awareness of CBRN incidents by providing a toolbox of information, procedures and processes to understand the human and societal factors that influence the impact of and response to CBRN incidents, as well as reduce the impact of CBRN incidents on society and individuals. The effectiveness of the 'human and societal' toolbox will be tested (via WP6) with members of the public and professional responders in an exercise at a conference/shopping centre in Birmingham in August 2013.

The output will include tools and measures (i) to inform, educate and prepare the mindset of the EU citizen for a CBRN event, (ii) to provide guidance about protective behaviour and to aid the identification of relevant information sources during events, (iii) to mitigate the societal impact on communities and individuals post event, and (iv) to identify solutions aimed at recovery.

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Contents

Summary of Work Package 8	3
Contents	4
Figures	4
Executive Summary	6
Abbreviations	7
1. Introduction	8
2. Long-listing of scenarios.....	9
2.1 From Work Package 2	9
2.2 Other sources	11
3. Shortlisting	12
3.1 Scope	12
3.2 UK Validation Exercise.....	12
3.3 Injects	13
3.4 Ethics.....	13
3.5 Criteria.....	13
3.6 Scoring	14
4. Stakeholder meeting	15
5. Combined scenario	16
6. Selected scenario.....	16
7. Conclusion	17
8. Literature.....	18
Appendix 1: Minutes of Stakeholder Meeting.....	19
Appendix 2: Selected Scenario (reduced for security reasons).....	24
Appendix 3: IED dispersion of Sarin	24
Figures	
Figure 1: PRACTICE work package structure.....	8
Figure 2: Hall 5 at the ICC, Birmingham	17



Executive Summary

The document describes the process of selecting a threat scenario to take forward to the stakeholder workshop (D8.4) in January 2012, and the UK Validation Exercise (D6.5) in the summer of 2013.

The Project meeting held in October 2011 discussed the scenarios developed in work package 2 and reviewed the methodology for ranking their suitability. It was decided to use a combination of the two highest ranked scenarios, but further analysis showed that a double threat of this type would be unrealistic. A further scenario was therefore developed in which the threat arises from the deliberate release of Sarin at a conference.

The rationale for the choice, and its ramifications, are presented.

This Document forms deliverable D8.1 of Project PRACTICE.

Abbreviations

Abbreviation	Meaning
ASSRBCVUL	ASSESSment of the VULnerability of modern societies to terrorist acts employing Radiological, Biological or Chemical agents
BICC	International Convention Centre, Birmingham
BPS	British Psychological Society
CBE	Commander of the British Empire
CBRN	Chemical, Biological, Radiological and/or Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive
CIE Toolkit	Chemical Incidents Emergencies Toolkit
EHEC	Enterohemorrhagic escherichia coli
EU	European Union
FFI	Forsvarets Forskninginstitut
FP	Framework Programme
GSCT	Generic Scenarios on Release of Chemicals by Terrorists
GWt	GigaWatt thermal
HPA	Health Protection Agency
IMPACT	Innovative Measures for Protection against CBRN terrorism
MASH	Mass casualties and health care following the release of toxic chemicals and radioactive material
MS	Member State
MWe	MegaWatt electrical
NBC	Nuclear Biological Chemical
PRACTICE	Preparedness and Resilience against CBRN Terrorism using Integrated Concepts and Equipment
PWR	Pressurised Water Reactor
SAS	Société par Actions Simplifiée
STEC	Shiga toxin-producing escherichia coli
UK	United Kingdom
US	United States
USA	United States of America
WP	Work Package
WTC	World Trade Centre

1. Introduction

The seven operational Work Packages of Project PRACTICE are shown in Figure 1. The work carried out in Work Package 2 (CBRN event parameters and scenarios) has provided a reference set of threat scenarios for the Project and a template for representing them. The present Document, which benefits from this work, has the following purposes:

- To deliver D8.1 – a range of threat scenarios through which knowledge of public understanding and behaviour can be gathered
- To provide, from that range of threat scenarios, one suitable for input to an open stakeholder workshop to gather information from relevant stakeholders, including members of the public, representatives of public bodies, welfare groups, communities and disability groups, as part of D8.4
- To provide a possible scenario for the UK Validation Exercise (D6.5), consisting of a simulated CBRN event at a UK public building or site

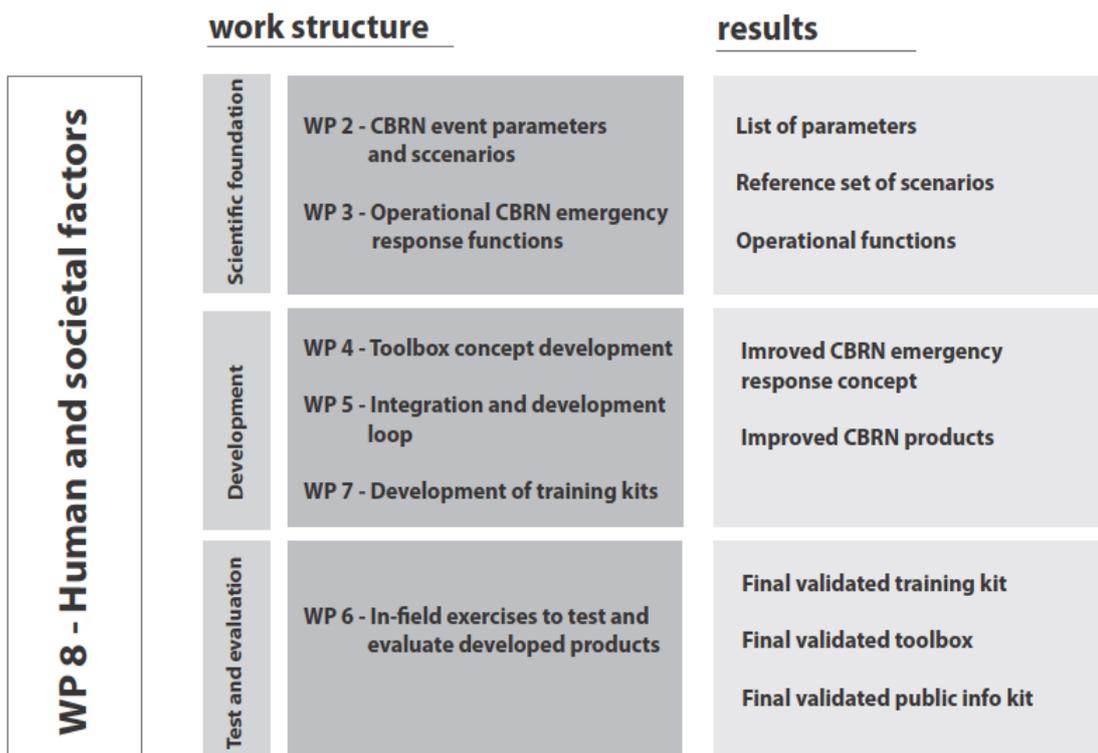


Figure 1: PRACTICE work package structure

The deliverable reference numbers used in this Document are set out in the project description of work [Ref 1].

2. Long-listing of scenarios

2.1 From Work Package 2

Under Task 2.1 of WP2, PRACTICE partner FFI has developed a template for storing the details of threat scenarios. As described in deliverable D2.1 [Ref 2], the template was validated against a large number of real and artificial scenarios:

- 91 threat scenarios used in earlier EU Projects (IMPACT, ASSRBCVUL, GSCT, MASH, CIE Toolkit and others),
- 11 chemical accidents
- 4 biological accidents or natural incidents, and
- 18 radiological, nuclear or criticality accidents.

Deliverable D2.2 is a Reference Set of scenarios, presented in the developed template [Ref 3]. Table 1 summarises the eleven scenarios in the Set.

Table 1: The Reference Set of scenarios

	Code	Title	Abbreviated description
1	R1	Radiological dispersal in urban area	A fire occurs accidentally in a hospital radiological clinic and spreads quickly. The risk of exploding gas tubes prevents proper fire-fighting and an explosion occurs minutes later. A Caesium-137 source is blown up, the powder is transported by the blast and the smoke and dispersed in the neighbourhood.
2	R2	Radiological embedded device on train	A strong gamma-emitting source is stolen from a shipyard by an employee and placed unshielded under a seat on a local train. When it is removed as trash the cleaner develops blisters on his hand. Combined with his report of handling a small metal object, this triggers suspicion of radiation damage. Radiation experts sent to the trash collection area remove the source safely. The next day, the perpetrator anonymously claims responsibility for the event.
3	B1	Flu pandemic at international airport	A junior scientist steals a vial of H1N1 suspension from an animal source kept at a biosafety level 3 facility. His objective is to infect the passengers of a flight to a middle size European capital and provoke a pandemic flu across Europe. During preparation of the device, the scientist accidentally infects himself. Despite the development of the first symptoms, he passes the airport gate and sprays the viral suspension in different toilets of the aircraft during the flight.
4	B2	Large scale mail-borne anthrax attack targeting governmental buildings	A radical group of terrorists mails 54 letters containing anthrax spores to civil servants at the Ministry of Defence and the main municipal buildings in EU capital cities. The letters reach their targets in day 1 to 5. Each letter threatens a mass release of aerosolized anthrax in urban areas if any EU MS joins a global military intervention. Official buildings where envelopes are detected are partly or completely evacuated. One envelope arrived damaged with only residual traces of anthrax powder, suggesting that contamination events occurred along the distribution route. The public postal services are paralyzed. After a postal clerk is diagnosed with anthrax disease, the most likely contamination source is identified as a mail sorting machine at a major

	Code	Title	Abbreviated description
			postal hub.
5	B3	Bio-attack on food supply	Using a freeze-dried cocktail of EHEC/STEC bacteria with unexpectedly high levels of pathogenicity, a small group of ultra-nationalist European natives contaminates the equipment used in two Northern European plants to weigh and package salad from Southern Europe. The terrorists do not claim the first series of attacks, but intend to repeat the attacks on a regular basis and hope that the geographical origin of the contaminated products will jeopardise the relationship between Northern and Southern Europe.
6	H1	B/C false alert at congress centre	The night before a political meeting at a congress centre in the middle of a large city, a group of activists installs three improvised dissemination devices inside the conference rooms under the bodywork of common mobile air conditioner units. The facility manager receives a phone call claiming that the devices have released toxic and infectious agents. Security staff find a device in a mobile air conditioner in an unusual location. It contains a yellow powder.
7	C3	Train derailment followed by release of chlorine in open space	On a spring evening in early May, a freight train hauling 325t of chlorine derails and collides with a parked locomotive. One of the chlorine wagons is punctured and the contents are released within 50 minutes. The main wind direction is towards the local village where many people are in their gardens.
8	C4	Toxic industrial chemical spill in large European river	A large chemical factory is located close to a town with 50,000 inhabitants. A reservoir wall breaks down and highly toxic waste hits the major river, gushes over nearby houses and buildings, sweeps away people, livestock and possessions and crushes a storehouse for agricultural chemicals. The toxic chemicals form a 20-mile long yellowish plume in the river and move downstream at 2mph.
9	N1	Accident in nuclear power plant	A commercial 3GWt/900MWe PWR experiences a loss of coolant accident when a feed-water pump fails and steam builds up in the reactor. The fuel overheats and the encapsulation bursts, releasing volatile substances to the reactor building. Only gases vent to the environment outside. The reactor is situated in a populated area, close to two cities. The event starts in the early morning when most people are in their homes.
10	C1	Chemical attack inside building – Sarin dispersal through ventilation system	Individuals break into a conference hall during an event attended by 1200 persons and empty a bottle of the highly toxic nerve agent Sarin into a ventilation shaft downstream of the heat exchanger. The Sarin evaporates, mixes with air and is transported into the hall through ventilation inlets situated close to the ceiling. Mild intoxication effects occur within minutes, while serious injuries and fatalities occur approximately 20 min after the release.
11	C2	Chemical attack in city centre – Explosion and dispersion of sulphur mustard	A detonation is heard close to a small square in the centre of European city, as a concert attended by hundreds of spectators is about to start. The bomb blast and fragments causes about fifty casualties, with several fatalities. The detonation also disseminates about 5kg of sulphur mustard in the form of small droplets, which are carried across the square by the wind, and cause eye irritation, inflammation of the respiratory tract and rash and blisters on the skin.

The template has a field for storing a 'justification' for the scenario. An insight into the rationale for the composition of the Reference Set can be obtained from the justifications provided in this field:

- To illustrate the feasibility of a particular type of incident (R1)
- To illustrate the complexity of dealing with a particular type of incident (R2, B1, B2)
- To assess the current capability to manage the threat (B3, H1, C3, C4, N1, C1, C2)

It should be noted that the practicality of mounting an exercise based on the scenario is absent from the justifications offered. Selection criteria are discussed further in Section 3.5.

2.2 Other sources

There are other sources of data on threats to the public. Among them is the spreadsheet maintained by the Health Protection Agency (HPA) [Ref 4], which contains information on 682 chemical incidents of all types over the past 12 years. However, the format of the information on the 31 terrorist-related incidents it contains is not always compatible with the D2.1 template designed in Work Package 2.

There are of course many events that could also be used as valid sources of data on human behaviour in emergency situations. For example:

- the Chernobyl nuclear power plant meltdown in 1986,
- the fire at King's Cross underground station in 1987,
- the 9/11 attack on the World Trade Center (WTC) in 2001, and
- the Fukushima meltdown following the tsunami in 2011.

FFI considered some of these events during Task 2.1 but found that insufficient data were available in the public domain.

In a demonstration of the integration of the work packages of Project PRACTICE, an additional scenario was created as part of D8.1 (as shown below) and stored in the D2.1 template. The code R2-2 arises because the scenario has been based on R2, but orientated more closely to the Birmingham International Convention Centre (BICC) location which is the proposed site of the UK Validation Exercise (D6.5). R2-2 can be regarded as another member of the Reference Set.

12	R2-2	Dirty bomb under seat at BICC	A small package has been left in the middle of Hall 5 of the ICC. It contains Caesium-137 and explosives that have a timer set to explode during the start of a conference on religious harmony. A terrorist group opposed to religious harmony planted the dirty bomb the day before the conference started through the services of a sympathetic security guard.
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3. Shortlisting

3.1 Scope

Insofar as Project PRACTICE is concerned with terrorist attack by Chemical, Biological, Radiological and Nuclear agents, purely explosive attacks (such as a suicide bomber in a crowded area) are outside its scope.

As delivered, many of the D2.2 scenarios arise from an accident, rather than a terrorist attack. This need not exclude them from consideration however, since in most cases the initiating event can be readily changed to a malevolent action. Doing so establishes the principle that the D2.2 scenarios can be developed further. Thus the scope of the shortlisting exercise includes modified versions of these scenarios.

Hoax threats are considered within scope, since they cannot reliably be distinguished from real threats in the timescale of an evacuation.

3.2 UK Validation Exercise

The UK exercise (D6.5) is planned for summer 2013. As this is more than a year ahead, few details are yet available. However, to provide a context for considering the merits of the scenarios, it is valuable to set out principles on which it will be based. It is envisaged that the exercise will:

- Take place in a single day
- Simulate a terrorist attack with CBRN materials on a public building
- Require the participants to be evacuated from a building
- Involve at least 50 participants (the evacuees) [Ref 5]
- Involve retail outlets with their (normal) staff
- Involve first responders, fire, police and/or ambulance according to the nature of the scenario
- Be used to test prototypes of all 3 versions of the User Manual (part of the Toolbox being produced in WP8) – (i) for members of the public, (ii) for first responders and (iii) for the media and decision makers.
- Focus on Human Factors and Human Behaviour, as Task 6.1 is linked to the work of WP8.

From the above points it appears that only the immediate consequences of the attack – those occurring in the first few minutes or hours – are relevant to the exercise. Whether the evacuees eventually fall ill does not affect their behaviour immediately after the event. Moreover, the exercise will affect only the First (Health) Tier of the ASSRBCVUL model – people, infrastructure, police etc [Ref 6].

Thus the precise nature of the initiation and development of the incident is of secondary importance, provided that the decision is made to evacuate the premises, and that there are casualties to be dealt with. The choice of venue is, however, crucial.

3.3 Injects

Exercises of this type are profoundly affected by the 'injects' added by the experimenters during the evolution of the scenario. Injects are events introduced to build (or enrich) the mental picture held by the participants. They might represent actions that would normally take place, or confounding events such as the sudden loss of lighting, the abrupt sealing of an exit, or the circulation of spurious information.

Therefore the fidelity and rigour (and consequently the value) of the exercise depend not only on the choice of scenario, but also on what events are injected, when and where.

3.4 Ethics

The treatment of the exercise participants must conform with the British Psychological Society (BPS) Code of Human Research Ethics [Ref 7]. Every person from whom data are gathered for the purposes of research must consent freely to the process on the basis of adequate information [Ref 8]. They should be able, during the data gathering phase, freely to withdraw or modify their consent and to ask for the destruction of all or part of the data that they have contributed.

The way in which consent is sought should be appropriate to the research topic and design, and to the ultimate outputs and uses of the analyses. The principle of proportionality applies: the procedures for consent are compatible with the nature of participation and the risks involved.

No-one will be exposed to physical or psychological harm during the exercise. For health and safety reasons some first responders may restrict activities such as lifting and carrying. Exercise planning meetings will identify areas where this approach may be used without reducing realism.

King's College London (KCL) is required to obtain ethical approval from their internal board for all research involving human participants. While the final format of the exercise has yet to be finalised, KCL will obtain ethical approval for all questionnaires, focus groups, interviews and/or any other form of data collection over which they hold primary responsibility.

CBRNE Ltd will conduct the UK exercise in accordance with the PRACTICE methodology developed under D6.1 and will resolve any ethical issues in the way it describes. Any further ethical issues will be resolved by discussion with KCL and, if necessary, by establishing an *ad hoc* ethics group with competent and experienced members.

3.5 Criteria

The above considerations indicate that the threat scenario should be chosen such that the exercise meets the following criteria, which are listed below in no particular order. The exercise should be:

- c1. Plausible. The threat should be credible and realistic.
- c2. Practical. The time and resources required for an accurate simulation should be consistent with the budget for D6.5.
- c3. Novel. The threat should be unusual, to avoid repeating a frequently rehearsed evacuation process.
- c4. Psychologically valuable. The scenario should maximise the opportunity to observe people interacting with each other, with systems and with their environment.

- c5. Consistent. Minimal alteration of the Reference Set of scenarios should be required.
- c6. Ethical. These issues have been discussed in Section 3.4.

3.6 Scoring

The extent to which each candidate scenario in Table 1 met each criterion in Section 3.5 was scored on a scale of 1 to 10. For example, the N1 scenario was found not particularly plausible or valuable psychologically (giving rise to a score of 4/10 for these criteria) but reasonably practical, ethical and requiring little modification (thus scoring 6/10 for these criteria).

The scores were estimated on the basis that where necessary the initiating event had been changed to an act of terrorism. Moreover, the criteria were not weighted, with the consequence (for example) that ethics is considered as important as practicality.

The scoring process was inevitably a subjective one. However, the effect of the subjectivity was reduced by aggregating the individual scores, and input was invited from the Project stakeholders, as described in Section 4 below.

Table 2 lists the scenarios in order of their aggregated score.

Table 2: Scenario scores

Title		Score (out of 10)						Total score
		Criterion:	c1	c2	c3	c4	c5	
C1	Sarin dispersal through ventilation system	8	7	7	7	7	6	42
R2-2	Dirty bomb under seat at ICC	8	7	6	7	5	7	40
R2	Radiological embedded device on train	2	3	5	2	6	7	25
B4	B/C false alert at congress centre	7	6	5	7	8	5	38
B2	Large scale mail-borne anthrax attack	8	8	4	7	4	5	36
N1	Accident in nuclear power plant	4	6	5	4	6	6	31
C2	Explosion and dispersion of sulphur mustard	6	6	4	6	2	6	30
B1	Flu pandemic at international airport	5	5	5	4	3	5	27
C4	Toxic industrial chemical spill in river	4	2	6	3	6	5	26
R1	Radiological dispersal in urban area	5	5	3	2	6	5	26
B3	Bio-attack on food supply	3	7	4	2	3	6	25
C3	Train derailment followed by release of chlorine	4	3	6	5	2	2	22

4. Stakeholder meeting

To discuss the development and selection of the scenarios and the overall progress of the Project, the team invited PRACTICE stakeholders to a meeting at the BICC. The Minutes are provided in Appendix 1: Minutes of Stakeholder Meeting.

Broadly, the meeting endorsed the methodology for selecting the scenarios, but decided to combine aspects of the two highest-scoring examples (C1 and R2-2) to produce a scenario to take forward to the Stakeholder Workshop (D8.4) and the UK Validation Exercise (D6.5).

The Actions taken at the Meeting have been completed, as follows:

1. The combined-threat scenario was developed. For the reasons described in Section 5 below, this scenario was not in fact taken forward.
2. WP8 Project personnel attended Exercise Birmingham Shield on October 30th 2011. It provided considerable benefit in terms of experience and knowledge of emergency evacuation activities and requirements as well as meeting stakeholders (such as the emergency services) important to D8.4 (Stakeholder Workshop) and D6.5 (UK Validation Exercise).
3. The UK exercise was agreed to take place on 15th August 2013.
4. The point of contact at the BICC is Don Cooke (Venue Services Manager).

5. The intention regarding the participation of disabled groups at the Stakeholder Workshop is to focus on the blind and partially sighted.

A report on the conduct of the Workshop (which took place on January 26th 2012 at the University of Birmingham) is currently in preparation.

5. Combined scenario

The combined-threat scenario developed from R2-2 and C1 has the following features:

- A bomb is discovered under a folded seat in Hall 5 of the ICC. It contains caesium-137 ($^{137}_{55}\text{Cs}$), Sarin (in 'bomb spheres') and an explosive device
- The explosion is timed for 09:30 the following morning, when a conference is under way
- It is reported to the authorities by the terrorist organization as strontium-90, to cause confusion
- The Sarin enters the ventilation system, potentially affecting several hundreds of people.

When this scenario had been developed, and comments had been received from stakeholders, a number of technical difficulties emerged:

- The inclusion of two types of threat in one scenario means that the views and reactions of the public to each type cannot be distinguished
- A terrorist attack is highly unlikely to involve two toxic agents because of the difficulty of acquiring and handling them
- The Sarin could in fact be destroyed by the temperatures generated in the explosion, so the threat would reduce to that of R2-2. These issues are discussed further in Appendix 3: IED dispersion of Sarin.
- In order to judge people's needs, uncertainties and perceived vulnerabilities at the Stakeholder Workshop, the period of most interest is immediately following the incident. The combined scenario contains little information about this period.

For these reasons, it was decided to develop the scenario further and reduce the threat to Sarin alone. This, the selected scenario, is described in Section 6.

6. Selected scenario

The title of the selected scenario is *Chemical attack inside BICC – Sarin dispersal*. Its reference is C5.

Appendix 2: Selected Scenario contains the full details, recorded in the D2.1 template. The threat arises from the deliberate release of Sarin by a terrorist during a conference being held in Hall 5 of the ICC, shown in Figure 2. It is a suicide attack: Sarin is an extremely dangerous chemical, classified as a weapon of mass destruction by the UN [Ref 9]. It kills within seconds of ingestion or inhaling its vapour and can also be fatal if absorbed through the skin.



Figure 2: Hall 5 at the ICC, Birmingham

In the ten minutes following the release, five people die and forty show symptoms of poisoning. The terrorist is killed immediately. Hall 5 has been evacuated, albeit in a haphazard manner, at the instigation of the conference organisers. The emergency services have been called. The scenario ends when control has been handed over to the emergency services.

7. Conclusion

D8.1 has reviewed the methodology for creating scenarios generated by D2.1 (Scenario template and requirements), studied the scenarios developed by D2.2 (Reference set of scenarios) and approved them for use in D8.1 (Identification of Threat Scenarios), D8.4 (Stakeholder workshop) and D6.5 (UK Validation Exercise).

After further deliberation it was decided to create another scenario combining the features of the two that scored highest. Following development of the combined scenario, a number of practical problems were recognised and it was decided to focus on the use of Sarin as the single toxic agent. The final scenario, now referred to as C5, was used at the Stakeholder Workshop (D8.4) and will be used at the UK Validation Exercise (D6.5), subject to discussions with the host venue and participating First Responders.

8. Literature

- 1 Seventh Framework Programme Theme [Sec-2010.4.2-2]
Annex I - "Description of Work"
Project acronym: PRACTICE; Grant agreement no: 261728
Date of preparation of Annex I (latest version): 22-Dec-10
- 2 Scenario template and overview of some existing CBRN scenarios and historical incidents
PRACTICE WP2 deliverable D2.1
Monica Endregard, Hanne Breivik, Hege Schultz Heireng, Elin Enger, Therese Sandrup, Dominic Kelly
Forsvarets Forskninginstitut (FFI)
August 2011
- 3 Reference set of CBRN scenarios
Endregard M, Breivik H, Heireng H S, Sandrup T, Fonteyne P-A, Eriksson H, (2011)
PRACTICE WP2 deliverable D2.2, Norwegian Defence Research Establishment (FFI)
- 4 ChaPR_CIR_index.xls
Health Protection Agency
www.hpa.org.uk
- 5 Ref 2, section 6.1
- 6 Assessment of the vulnerabilities of modern societies to terrorist acts employing radiological, biological or chemical agents with the view to assisting in developing preventive and suppressive crisis management strategies
Deliverable #9. Final report (ASSRBCVUL), 2007-05-04, EU Restricted.
M W Leeuw (Project Coordinator) 2007
- 7 Code of Human Research Ethics
British Psychological Association, 2010
- 8 Code of Ethics and Conduct
Guidance published by the Ethics Committee of the British Psychological Society, August 2009
- 9 Sarin
NATO STANAG code GB
en.wikipedia.org/wiki/Sarin

Appendix 1: Minutes of Stakeholder Meeting

The meeting was held at the International Convention Centre (ICC) in Birmingham on 7th October, 2011.

Attendees

	Name	Affiliation
1.	Eleanor Ballard (EB)	Head of Operations, ICC and host
2.	Don Cooke (DC)	Venue Services Manager, ICC
3.	Dominic Kelly (DK) (Chair)	CBRNE Ltd Managing Director
4.	Dr Dave Usher (DU) (Sec)	CBRNE Ltd Researcher and Lead for Deliverable 8.1 Identification of Threat Scenarios
5.	John Astbury CBE (JA)	CBRNE Ltd WP6.1 UK exercise Coordinator
6.	Hans-Christian Gran (HCG)	Norwegian Defence Research Establishment (FFI) – Chief Scientist
7.	Dr Brooke Rogers (BR)	WP8 Lead, King's College, London
8.	Kristian Krieger (KK)	Researcher, King's College London
9.	Mariola Smallman (MS)	Principal Partnership Emergency Planning Officer, Birmingham Resilience Team
10.	Glen Curry (GC)	CBRNE Officer, Birmingham Resilience Team
11.	Rob Mitchell (RM)	West Midlands Fire Service, Hazardous Materials Advisor, Technical and Operational Support Directorate
12.	Dr Richard Amlôt (RA)	Health Protection Agency

Welcome, Introductions

Dominic Kelly (DK) welcomed everyone to the meeting and thanked Eleanor Ballard (EB) for her willingness to host it. DK was also grateful to Derek Gallagher (EU Framework Programme 7 UK National Contact Point) for helping introduce Project PRACTICE to the Birmingham International Conference Centre.

Each attendee introduced themselves and gave a brief account of their role.

Background

Hans-Christian Gran (HCG) described the beginnings of the Project in 2009, before FP7. In August 2010 two initiatives led to recognition that the EU needed to clarify its approach to handling CBRNE terrorist attacks. There are currently considerable differences between member states, particularly post-incident. Project PRACTICE (Preparedness and Resilience against CBRN

Terrorism using Integrated Concepts and Equipment) would develop a 'Toolbox' (a term introduced by the European Commission) to provide a unified EU approach: one that included social sciences, hard technology and human factors, and which covered events before, during and after a terrorism incident.

DK listed the four groups of users of the Toolbox: the public, the planners, the first responders and wider industry. HCG acknowledged the other toolboxes developed separately by fire, police and ambulance services, but said Project PRACTICE would determine their parameters, tools, instruments, people, procedures and functions and reduce the disparities by combining and integrating them. The Toolbox could be used for guidance, education, training and planning.

DK presented slides showing the 23 organisations and 11 countries involved in the Project. He introduced its 9 Work Packages (WPs), pointing out that the function of the overarching WP8 (Human and Societal Factors) is to ensure that user characteristics, behaviours, abilities, ethics and morality are considered at all stages. HCG added that it would be over-ambitious to populate the Toolbox completely – it should have a life after the Project.

Brooke Rogers (BR) described the experience and expertise of her group at KCL in the area of people's behaviour in emergencies. They had carried out a number of Projects, notably Public Information Requirements after Terror Events (PIRATE), in which they had studied the type of information people needed, what they did and who they trusted. The 'worried well' were of particular interest: how, why and when do they follow advice? BR went on to describe the finding that panic is very unlikely to occur in emergency situations, despite the impression given in the news media. The interest lies in developing ways of encouraging positive health behaviour and engendering trust in various authorities.

DK felt it was important that the Project should regard human sciences and technology as equally important. HCG agreed: resilience against attack requires an informed public.

Identification of threat scenario options

Dave Usher (DU) described the Reference Set of threat scenarios and the selection methodology described in Section 3 of the main document body. The Meeting broadly agreed with this approach and the selection methodology was approved.

BR pointed out that three different versions of the User Manual will be produced, focused respectively on the public, the experts and the communications.

Discussion of shortlisted scenarios

JA presented further detail on the leading two scenarios from the shortlist:

(R2-2) Dirty bomb under seat at ICC

A bomb is placed by a disaffected security guard under a seat in Hall 5 of the ICC. It explodes at 09:00 when 350 delegates are in the Hall, causing a small flash and bang and a release of Caesium-137. JA mentioned that this scenario was of particular concern to the Police Service: the US Homeland Security web site says that a piece of radioactive material is lost or stolen every day in the USA. BR said that people were (perhaps inordinately) worried about radiation so this would

be a suitable hazard: contamination stigmatises people. JA described the enormously rigorous decontamination effort following the Livinenko ²¹⁰Po scare in 2006. NBC responders had found it difficult to access buildings discretely to carry out decontamination tasks.

Richard Amlôt (RA) raised the question of treating traumatic injuries and the balance between crowd management and medical management. HCG mentioned the difficulty of determining that the bomb had released radiation, but Rob Mitchell (RM) said this would be quickly identified by the first responders. Don Cook (DC) described the current procedures in such an event: the air conditioning would be shut down, everyone would be kept in the room and the emergency services would be called. Eleanor Ballard (EB) pointed out that the approach would be different if the building were structurally damaged.

The Meeting discussed various processes by means of which radioactive contamination is spread in buildings and people. HCG said these matters were at the core of Project PRACTICE.

(C1) Sarin dispersal through ventilation system

JA then described a threat from Sarin in a ventilation shaft in Hall 3. Sarin is a colourless, odourless liquid, which evaporates when released. There would be perhaps a dozen deaths in the first 30 minutes, but no flash or bang, nor focus point for the incident. HCG said the rate of dispersal depends on the droplet size – from the Tokyo metro incident, he concluded that there would be no time for escape.

Conclusion

Scenarios R2-2 and C1 were both seen as having useful features. EB preferred a scenario that was contained within an area of the ICC – such as the dirty bomb scenario – and felt it would be valuable not to warn the participants in advance.

DU felt the scenario chosen should be traceable back to D2.2. The Meeting agreed that this could be achieved by amalgamating R2-2 and C1: a scenario in which Sarin was dispersed by a bomb under a chair in Hall 5. JA agreed to discuss the aims, requirements and objectives with the key players (including BR, DU and DK) and synthesise a scenario from R2-2 and C1 **[Action JA]**.

Availability of ICC as exercise venue in relation to the scenario agreed above

EB stated that the ICC's current emergency procedures require the premises to be evacuated once a year and so the UK exercise could be accommodated within that event. She expressed willingness to allow the ICC to be used as a venue, with a preference for Hall 5.

RM underlined the importance of the liaison with West Midlands police, since a national CBRN exercise was planned for January 2013.

Comments on the involvement and benefit of Regional Stakeholders

Glen Curry (GC) agreed to let the Birmingham Resilience Team take part in the exercise, subject to further details. He and Mariola Smallman (MS) described Exercise Birmingham Shield planned for 30th October 2011 in central Birmingham. Its focus is on decontamination: 15 appliances and 120 casualties will be involved. A report would be produced in early 2012. GC agreed to invite JA, DU and DK to the exercise **[Action GC]**.

Identify high level exercise requirements for planning purposes

RA outlined the advantages of a 'functional needs' approach, in which the various stakeholders would identify their needs. Buddying was an example.

MS pointed out the need for the exercise to be 'equality proof' – the 9 protected characteristics set out in the Equality Act should be respected.

Date of the exercise

The UK exercise is due to take place in 2013. JA pointed out that the emergency services would be 'exercised out' after the Olympics in 2012. EB suggested August as it is a quiet month at the ICC.

JA, EB and DK took an Action to finalise the date [**Action JA, EB, DK**]. DK would establish a point of contact between JA and EB [**Action DK**].

Brief introduction to Stakeholder Workshop (D8.4)

DU presented a discussion of Deliverable 8.4, a workshop to which the wider stakeholders will be invited: representatives of the emergency services, public bodies, welfare groups, disability groups and the general public. The intention is to gather information about their needs, uncertainties and perceived vulnerabilities during the chosen CBRN scenario. This information will feed into the development of the Resilience Matrix (D8.3) and subsequently the User Manuals (D8.11, D8.12 and D8.13). The workshop is due by April 2012 and is currently expected to take place in late January 2012.

The Meeting discussed the issue of which disability groups to involve: those with impairments of sight, hearing, speech or mobility. RA suggested that in the acute phase of an incident, for actions such as rescue and decontamination, much of the guidance for first responders on the management of individual vulnerable groups is applicable to all groups. BR mentioned the importance of considering communications problems (such as foreign language speakers) when designing the Toolbox. HCG emphasised that the Toolbox should support communications and the dissemination of knowledge.

RA pointed out that the Project should consider people who had been made vulnerable by the event itself. In the acute phase, from the perspective of casualty management, he considered it likely that there would be little difference between the newly injured and other vulnerable groups. BR would prefer to limit the Project to one disability group; DK suggested that all groups could attend the workshop but only one attend the exercise. BR and RA agreed to discuss the inclusion of disabled groups and report back by the end of November 2011.

In the light of the intention to use the ICC for the exercise, BR suggested that the Workshop might also be held in Birmingham rather than at KCL, as originally planned. Savings could be made in travel costs and time. The Meeting adopted this suggestion.

Actions taken

	Detail	Actionee
1.	Consult stakeholders regarding objectives and construct scenario from R2-2 and C1	JA
2.	Invite JA, DU and DK to Exercise Birmingham Shield on 30 th October	GC
3.	Finalise the date for the UK exercise	JA, EB, DK
4.	Establish a point of contact between JA and EB	DK
5.	To decide on the inclusion of disabled groups	BR, RA

Appendix 2: Selected Scenario

The description of the selected scenario C5 has been removed for security reasons.

Appendix 3: IED dispersion of Sarin

Introduction

The main text of this document presents the derivation of a scenario for use in the first PRACTICE demonstration exercise. The first candidate scenario involved the dispersion of liquid Sarin¹ and a radioactive source by a small explosive device. Following comments from various stakeholders regarding the practicality of mounting an exercise based upon such a combined source, and some concerns being expressed about the practicality of such a device, the scenario was changed to the manual dispersion of Sarin.

This Appendix presents a brief assessment which shows that using an IED device for the dispersion of Sarin is possible but that the design of the explosive device would require careful engineering to be effective. It is unlikely therefore to be a method of choice for Sarin dispersal. This is a summary of a more in-depth assessment presented by Astbury and Braybrook.

The difficulties of obtaining or manufacturing Sarin are not addressed directly since they are also relevant to the scenario chosen in the main text and presented in Appendix 2: Selected Scenario.

Discussion

Sarin was first produced in the late 1930's in Germany for pesticide application but shortly afterwards was developed for weapons use as a nerve agent.

History has also shown that Sarin can be delivered using military shells and missiles - the development of the 'Honest John' missile in the USA in 1960 is an example. The missile delivered a warhead which contained spherical bomblets of Sarin that upon impact of the shell were ejected and fractured releasing the material. The device used bursting charges to fracture the spheres (~73g of explosives per sphere). The missiles/warheads were never used in earnest although tests using them were undertaken by the military under the code names of Dew Point and Green Mist in 1967 [M139 Bomblet and Honest John].

¹ The term Sarin is used loosely to refer to a class of chemical which exhibits the same broad properties and effects as the chemical warfare agent and does not necessarily refer to the NATO STANAG code GB.

It is also widely accepted that Iraq used chemical devices containing Sarin in 1991 to quell a growing insurgency. The Sarin component was mixed in R-400 aerial bombs and dropped by helicopter. Around 32 bombs were said to have been used with devastating effect – although numbers of casualties are unknown as the attack was covered up by the Iraqi regime at the time. It is unclear what mechanism was used to release the chemicals following the delivery of the bombs but it is thought that a process similar to that used in the Honest John missiles was likely with the bomb being the method of delivery rather than the method of dispersal.

An attempt to explode an IED based around a shell containing Sarin in Iraq in 2004 was largely unsuccessful as the shell was old (causing chemical degradation). Even so, two US soldiers were treated for Sarin exposure at the Halabja Centre.

It is clear that, under the carefully engineered conditions relevant to military standard devices, the dispersion and delivery of Sarin, including using some explosive force, is practicable. However, effective dispersion depends on many factors, such as:

- the temperatures generated,
- the actual chemical composition of the Sarin (which is likely to be impure based on historical evidence and the technical difficulties of the manufacture of the material)
- the physical arrangement of the Sarin container and the explosive charge, and
- the degree of confinement. It should also be noted that the military devices used explosive charges only as bursting charges.

Furthermore, although the degradation temperature of Sarin commences at approximately 160°C [Crenshaw] (and such temperatures could clearly be achieved near an explosion) impurities in the material could change this temperature significantly. It is also worth noting that the degradation products themselves are toxic, albeit to a lesser extent than Sarin. Complete destruction requires temperatures greater than 1000°C [ibid].

These simple observations suggest that an effective device would require careful engineering and testing, which is unlikely to be practicable for a terrorist organisation. The effects of using an IED to disperse Sarin would be unpredictable.

Conclusions

The dispersal of Sarin by bursting charges is possible and for a time it formed the basis of some military weapons. Effective dispersion, however, is likely to prove to be very difficult for a terrorist to engineer and given the rapidity with which the material will naturally disperse in an enclosed building with people moving around, it is unlikely to exacerbate the consequences of an incident such as that considered in the main text, especially once the addition of a radioactive source is excluded.

References

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Halabja Centre

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