



End-User Driven Demo for CBRNe D83.3 Impact on vulnerable groups

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Executive Summary

The Report describes Task 83.3 of the EDEN Project, a consideration of the impact of the EDEN Toolbox of Toolboxes on vulnerable groups.

A distinction is drawn between direct and indirect impacts, with examples being provided of each type. The discussion in the Report is focused on direct impacts, while acknowledging that social and cultural impacts are likely to be indirect.

The definition of vulnerability is discussed in detail, with its component concepts of integrity, self-perception and contingency. Sixteen groups of vulnerable people are identified and described.

Neither the contents nor the design of the EDEN Toolbox were finalised at the time of reporting (22% of project duration). Therefore, the impact assessment is based on an indicative inventory, and a protocol is provided (in the form of an embedded Excel workbook) for assessing Tools yet to emerge.

The protocol was used to assess sixteen of the Tools proposed for the Toolbox – those with direct effects. For various reasons, the impact of four of them was found to be negative, detrimental to the interests of vulnerable people. These deficiencies (or ‘gaps’) have been reported to the Tool designers for consideration.

The Report also describes the human rights issues raised by the application of the Tools to vulnerable people in a CBRNE incident. The mitigation of any detrimental effects of the Tools is discussed.

The Report constitutes deliverable D83.3.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive
CEBOX	Chemical
CROM	Crowd Management
DECOTESSC1	DEmonstration of COunterTERRORism System-of-Systems against CBRNE phase 1
ECHR	European Convention on Human Rights
EDEN	End-user driven DEMo for cbrNe
ENEA	Agenzia nazionale per le nuove tecnologie, l'energia e lo Sviluppo Economico Sostenibile
EU	European Union
FFI	Forsvarets Forskningsinstitut (Norwegian Defence Research Establishment)
FP7	Framework Programme 7
GPS	Global Positioning System
HAZID	Hazard Identification
IFREACT	Improved First Responder Ensembles Against CBRN Terrorism
MIUN	Mittuniversitetet (Mid-Sweden University)
OIEA	Office of Integrated Environmental Analysis
PPE	Personal Protective Equipment
PRACTICE	Preparedness and Resilience against CBRN Terrorism using Integrated Concepts and Equipment
RAID	Rapid Alarm and Identification Device
SAMU	Service d'Aide Médicale Urgente
SIMP	System d'Information pour les MArchés Publics
TEDAS	Terror Event Database Analysis Software
TNO	Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (Netherlands Organization for Applied Scientific Research)
VITRUV	Vulnerability Identification Tools for Resilience Enhancements of Urban Environments
VTT	Technical Research Centre of Finland

1 INTRODUCTION

1.1 Background

The EDEN project is intended to improve the resilience of European societies, countries and institutions against incidents involving Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) agents. Previous EU research projects with the same purpose have delivered 'Toolboxes' containing equipment, procedures and systems. Project EDEN will adapt and integrate these Toolboxes to create a Toolbox of Toolboxes (ToT) for use by those responsible for dealing with CBRNE emergencies. Bringing the Tools together in this way will provide a single source of updated advice, solutions and expertise, thereby enhancing the health, safety and security of EU citizens.

EDEN Task 83.3 explores the impact of the ToT on 'vulnerable groups' – that is, people especially vulnerable to the effects of a CBRNE incident [Ref 1]. It considers the causes, nature and extent of the impact, and examines whether it is possible to predict its social and cultural aspects.

This Report is delivered in month 8 of a 36 month Project, so the understanding of the composition and design of the ToT is inevitably incomplete. The analysis is based on the 'initial inventory' of Tools [Ref 2]. It is hoped that there will be an opportunity to update the Report when the final inventory is available. However, an advantage of the present timetable must be acknowledged: it allows the findings of this Task to be reflected in the delivered ToT.

The Report sets out the findings of an analysis of the impact on vulnerable people of Tools in the initial inventory, and a protocol for analysing the impact of Tools as yet unknown.

1.2 Purpose of document

This document is Deliverable D83.3. Its purpose is:

- To report the results of Task 83.3.
- To describe the effects of the EDEN ToT on vulnerable people.
- To provide recommendations, where necessary, for mitigating any negative effect of the ToT on vulnerable people.
- To describe how first responders and authorities should behave with regard to fundamental human rights and the dignity of the members of vulnerable groups.
- To inform the needs and gaps analysis for EDEN Task 22.
- To present a protocol for determining the effect of a Tool on a vulnerable groups.

1.3 Direct and indirect impact

The EDEN ToT contains many types of Tools: recommendations, standards, protocols, guidance, equipment, sensors, software and simulated environments. As such, the impact of an EDEN Tool might include the following:

- To reduce the probability of an incident (e.g. by improving detection capability),
- To mitigate the severity of an incident (e.g. by enhancing personal protection),
- To safeguard the health of those exposed to toxicity (e.g. by improved decontamination techniques),
- To protect property (e.g. by identifying structural weaknesses)
- To assist evacuation (e.g. by providing clear instructions),

- To raise public awareness of the risk of CBRNE incidents (e.g. by the use of social media)

These impacts will be experienced by some of the people involved in the incident, whether casualties, bystanders, crime prevention officers, evacuees, first responders, observers, emergency services, medics, local landowners or civic authorities.

Some of the impacts of a Tool can be described as direct. For example:

- A Tool consisting of breathing apparatus provides direct help to someone in an enclosed space.
- A protocol for conducting a mass evacuation has a direct impact on the people being evacuated.
- A personal detector of air-borne chemical toxicity will provide immediate protection to the first-responder.

But effects that are more indirect can also arise. For example:

- A software package used by emergency services to support a judgement of the seriousness of a threat affects the victims only through the actions taken as a result of that judgement.
- Landowners who derive income from land that has become polluted, or from tenants who have been displaced, will be affected by a Tool that determines the quarantine period. But the effect will be considerably delayed and subject to many extraneous factors.
- People who consider themselves ill-treated during an emergency might take civil action for negligence against those who chose to deploy a particular Tool because of its alleged deficiencies. For example, prisoners who develop radiation sickness might sue the emergency services because the evacuation protocol did not include specific actions to be taken for incarcerated people.
- In an extreme case, a Tool consisting of a drug (perhaps given to treat radiation sickness) might affect only the unborn children of those who take it.
- A Tool that is not deliberately targeted at a vulnerable group might nevertheless benefit one as a consequence of its application. As an example, a Tool for rapidly evacuating the able-bodied from a building will allow more of the available effort of the emergency services to be devoted to rescuing disabled people, reducing the time this vulnerable group spends at risk.

In general, the impact of a Tool will fall somewhere between the clearly direct and the clearly indirect. Any inequality in the response to a crisis can contribute to indirect effects in the long term. People whose human rights under the European Convention on Human Rights are seriously affected by the use of a Tool have recourse to the European Court of Human Rights.

1.4 Scope of document

The Report is focused on the direct impacts made by the EDEN Tools on vulnerable people involved in a CBRNE incident. Indirect effects are considered outside the scope, except where it is useful to acknowledge them, because the cause, nature and extent of any long-term impact (particularly in the social and cultural area) cannot meaningfully be discussed in the absence of data and case studies relating to the Tools.

Clearly, many of the Tools can be expected to affect people in the same way, irrespective of their personal vulnerability. Decontamination equipment, for example, will function equally well for people with and without hearing loss. This Report does not discuss the general efficacy of the EDEN Tools, nor their operability. Rather, the focus is on the nature and extent of the differences between the impact of the Tools on vulnerable people and their impact on the majority of those involved in a CBRNE incident.

Specifically, the Report considers the differential impacts of the Tools listed in Section 7 on members of the groups identified in Section 6 in the scenario discussed in Section 3.

2 METHODOLOGY

2.1 Authorship

The Report was written by Dr David Usher (CBRNE). Section 12 was contributed by Elisande Nexon (FRS). The Report was peer-reviewed by Dr Irina Stănciugelu (CBRNE) and Dominic Kelly (CBRNE).

2.2 Data gathering

An initial inventory of the ToT was supplied by Derek Jordan (BAE). Items within it that comprised a Toolbox were expanded to include their current contents, insofar as they could be ascertained.

The suppliers of the Tools with a direct impact (as defined in Section 1.3) were asked to provide as much information as possible on the Tool, particularly regarding vulnerable people.

2.3 Impact analysis

Using this information, the impact of the selected Tools was scored according to the protocol set out in Section 9. Their social and cultural impact was also considered.

2.4 Requirements analysis and gap analysis

In parallel with the primary thrust of the Task, consideration was given to the functionality vulnerable people might require of the ToT. Section 11 describes the gap analysis then carried out to identify Tools with missing capability (i.e. a requirement that is met insufficiently or not at all by the Tool) and to determine whether the ToT overall provided comprehensive support for vulnerable groups. The requirements and the gaps were reported to WP22 in early March 2014.

3 SCENARIO

The analysis in this Report is concerned with incidents in which hazardous CBRNE agents are released into populated areas in quantities sufficient to pose a threat to life. Some form of disaster relief is triggered and the victims require evacuation, triage, decontamination, medical treatment, hospitalisation, quarantine or rehousing. The dead must be treated with respect. News media must be informed. The release might follow an industrial accident, a natural disaster or a deliberate act such as sabotage or a terrorist attack.

The evolution of incidents of this type is usually described in terms of the 'security cycle' [Ref 3, 4]:

- **Threat assessment.** In the first phase, procedures are undertaken to monitor the activities of suspected terrorists, or to assess the risk associated with industrial processes. The capabilities and possible targets of (potential) perpetrators are analysed.
- **Prevention.** Next, measures are taken to prevent an actor from becoming a threat. These might include restrictions on obtaining and producing CBRN agents and dispersion equipment.
- **Preparedness.** The next phase includes attempting to prevent the execution of an attack, preparing and training responders, providing national-specific plans and promoting awareness and resilience within the general public in case of an incident.
- **Response.** This phase includes the first response – assessing the threat and establishing the exclusion zone – and subsequent actions such as removing the victims from the scene of the incident, triage, decontamination and medical treatment, according to the nature of the threat.
- **Recovery.** The final phase is the process of restoring a state of normality. It includes the medical (and psychological) treatment of the casualties and the repair of damage to property. The position eventually achieved might not match exactly the *status quo ante*, because of the victims' willingness to accept permanent injuries or to take advantage of what were intended to be temporary arrangements.

Examples of the type of incidents under consideration are:

- the Bhopal chemical factory disaster, in December 1984
- the disaster at the nuclear reactor at Chernobyl, Ukraine on 26th April 1986
- the radioactive contamination accident that occurred on September 13, 1987 in Goiânia, Brazil
- the release of the nerve agent sarin on the Tokyo subway on 20th March 1995
- the anthrax attacks in the USA in September 2001
- the Madrid (11 March 2004) and London (7 July 2005) bombings on public transport
- the nuclear accident at Fukushima power station on 11th March 2011

4 HUMAN RIGHTS

Human rights can be used as a framework to examine the effect of the Tools on vulnerable groups. If the response to a disaster neglects some groups, or exposes them to excessive risk compared with other groups, their human rights are affected. If governments and other disaster responders do not integrate human rights into their responses to disasters, inequalities and social vulnerabilities can be exacerbated in the long term. International human rights principles should guide the way that the Tools are used.

Given that the EDEN project is focused on European societies, the human rights principles of most relevance are the European Convention on Human Rights (ECHR) [Ref 5] and its 'parent', the Universal Declaration of Human Rights [Ref 6]. Each country's own human rights legislation will also be applicable in a time of crisis, and people do not lose, as a consequence of their being affected by crisis or disaster, the rights to which they are entitled as citizens. Obligations imposed by other international instruments and conventions continue to apply.

Of especial relevance in a time of crisis are:

- rights related to physical security and integrity (e.g. protection of the right to life and the right to be free from assault, rape, arbitrary detention, kidnapping, and threats concerning the above);
- rights related to the basic necessities of life (e.g. the rights to food, drinking water, shelter, adequate clothing, adequate health services, and sanitation) [Ref 7]

It is of paramount importance to vulnerable groups that responses to disaster are in accordance with Article 14 of the European Convention, which prohibits discrimination on the grounds of sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or other status. Article 4 of the ICCPR also specifies that responses must be non-discriminatory.

Another relevant multinational instrument is the Convention on the Rights of Persons with Disabilities and its Optional Protocol [Ref 8], which entered into force in 2008. According to its Article 1, "*persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others*".

Article 11 of the Convention dictates that in situations of risk and humanitarian emergency:

States Parties shall take, in accordance with their obligations under international law, including international humanitarian law and international human rights law, all necessary measures to ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters.

However, calibrating responses to the needs of certain groups is not a violation of the principle of non-discrimination, since some people might not need as much assistance following an incident as others. To prioritise is an appropriate safeguard of victims' human rights and reflects the fact that vulnerable groups have particular needs.

Article 15 of the ECHR provides for derogation from certain rights during times of crisis – times of war or other public emergency threatening the life of the nation. Article 4 of the United Nations International Covenant on Civil and Political Rights (ICCPR) [Ref 9] also allows derogation in the event of '*a public emergency which threatens the life of the nation and the existence of which is officially proclaimed.*' However, practitioners must remember that the European court allows individuals a presence on the international stage to protest their rights.

Derogation is generally used in instances of terrorism. Most recently, the United Kingdom invoked derogation from the ECHR in the aftermath of the 9/11 attacks. In *A. and others vs. United Kingdom*, a legal challenge was made against the preventative detention in custody of suspected terrorists

without charge [Ref 10]. In that instance, the European Court of Human Rights did not challenge the UK government's declaration of a state of emergency. However, challenges to the lawfulness of derogation will always invite a deep examination of context.

5 SOCIAL AND CULTURAL IMPACT

It was noted in Section 1.4 that this Report is focused on the direct impacts of the EDEN Tools on the victims of a CBRNE incident.

However, the human dimension of a CBRNE crisis must also be considered, and the Report also contains an examination of the social and cultural impact of the Tools, insofar as it can be predicted. As social and cultural effects are likely to be felt in the longer term, the indirectness of their impact is acknowledged.

5.1 Human response

Given that human behaviour does not exist in a vacuum and is always social, decisions will be made by emergency services personnel and others regarding the vulnerability or importance of the person affected by the incident. Human characteristics, both physical and cognitive, combined with human interactions with the overall environment, will have an incidence on the response.

It must be acknowledged that each operator, regardless of the extent of their training, will have a unique history, background and world view. This is inherent in all human beings. The decisions they take cannot therefore be fully rational or objective. Hence, it is useful to consider:

- the nature of human response to a crisis situation, and
- the impact of that response over time.

While a Tool can provide the protocol for making a judgement, the judgement itself is a human response, which brings with it the potential for wide-reaching and harmful social effects.

5.2 Vulnerability and prioritisation

As discussed above, victims are vulnerable both to the incident itself and to the response. In the first instance, the vulnerability might be physical. For example, in the 1984 Bhopal factory disaster, children and people of shorter statures inhaled more of the toxic gases. In the second instance, the vulnerability might be exacerbated by the response of the authorities. In the Bhopal case, deliberate obfuscation by the plant's owners led to inappropriate treatments being administered in poorly-equipped hospitals. The company also alleged that sabotage by Sikh extremists had caused the disaster [Ref 11]. Given the nature of human responses there is the potential for the decisions taken in the aftermath of a crisis to reflect prejudices and pre-existing tensions.

In circumstances such as these, there may be an inherent disregard or lack of respect for poorer people in any given society, which is both *reflected in* the decision and *exacerbated by* it. Such people are likely to be further disadvantaged in the long term by a lack of access to important information. The way other people react to this group (perhaps viewing it with indifference or dismissing it) is at the root of the group's vulnerability.

Human decision-making can also create a vulnerable group in a slightly different way: through the *perception* of vulnerability. It is one of the objectives of this Report to examine the social and cultural factors that can contribute to the perception of vulnerability of a given person. A key example is that of a pregnant woman, whose vulnerability might be mitigated by other people's behaviour towards her and the preferential treatment she is afforded. Children are also typically prioritised for assistance in times of crisis, being *made less vulnerable* to the disaster itself (through the actions of others) because of their perceived *greater vulnerability* to it.

Some vulnerable groups may come into existence at a time of crisis. For example, if it is not possible to evacuate everyone from the affected area at the same time, some people must be prioritised, and the prioritisation will be done by members of the emergency services. Those who remain behind

might thereby become a 'vulnerable group'. That is, their vulnerability only comes into existence as a result of the decision on prioritisation.

Some vulnerable groups may go on to have long-term societal disadvantage, for example if they are exposed to radioactive material or chemical weapons that cause physical harm to them or to their children. Although a group of victims might not have had an identity prior to the incident, they could in later years become a political force. Such groups can have social and cultural relevance and credibility, with the capacity for bringing about positive change. The human rights framework is often used by such groups, in some cases with the assistance of Amnesty International and other organisations, to seek justice and to pursue changes in the law. For example, in 1994 the Permanent Peoples' Tribunal in Bhopal concluded that human rights had been grossly violated in the gas disaster [Ref 12].

To help minimise the negative impact of unavoidable human decision-making processes, the Toolbox should include an additional Tool for victim prioritisation, to include guidance for:

- preventing additional casualties resulting from inadequate planning for the needs of vulnerable groups,
- preventing the creation of new groups of vulnerable people (as described above) by taking into account associated challenges during the preparedness and response phases, and
- adhering to international human rights standards to ensure that the needs of vulnerable groups are met.

In creating such a Tool, it must be remembered that action is taken as a result of a human judgement. Social and cultural impact is rarely immediate, and, although they are not always possible to anticipate, it is important to consider the indirect and long-term effects that can result from the first response to a CBRNE incident.

6 VULNERABILITY

6.1 Vulnerable groups

People can be described as vulnerable for various reasons:

- **Reduced mobility.** A person who is unable to follow an evacuation or decontamination procedure because their movement is confined, obstructed or impeded will be at increased risk.
- **Lack of autonomy.** Safety can depend on taking independent action, such as deciding to follow an emergency exit route from a building. A person unable to do this is disadvantaged. Children are the primary example.
- **Ignorance.** Someone unaware of important information is more vulnerable than otherwise.
- **Poor health.** Illness, whether acute or chronic, can bring with it an increased susceptibility to biological agents as well as reduced mobility. Every human being has the right to health and it is the duty of responders to try to prevent exacerbation of health conditions.
- **High public profile.** People in the public eye, especially if they are unpopular or believed to hold extreme views, will be at elevated risk.
- **Societal marginalisation.** Some people may be abandoned, neglected or deliberately overlooked by others, thereby increasing their vulnerability.
- **Obligation towards others.** Someone in a position of responsibility towards others might thereby be made more vulnerable through their increased exposure to hazard.

Although people within each group are diverse and heterogeneous, on this basis, the following groups of vulnerable people can broadly be defined:

- **Minors.** People below 18 years of age are classified as minors by the UN [Ref 13]. Young children are vulnerable by virtue of their physical and emotional fragility; all children by their lack of awareness of the consequences of their actions.
- **Older people.** Members of this group (which is not clearly defined) might be less agile and slower to react to audible or visual warnings. The possibility of dementia must also be considered.
- **Women.** In some societies, women are marginalised and can be disproportionately affected by disaster. They can also face gender-based violence and discrimination in disaster response.
- **Pregnant women.** Pregnancy brings with it two forms of vulnerability. The first is reduced mobility, at least in the third trimester. The second is an enhanced concern for the ingestion of toxins, such as smoke or poisonous gases. As indicated in Section 5.2, the generally preferential treatment given to pregnant women in society might reduce their vulnerability in a time of crisis.
- **Migrants.** The association of vulnerability with migrant people primarily arises from language differences, which complicate the communication of needs, instructions and eye-witness accounts. Different attitudes to risk or to persons in authority might perhaps also exacerbate exposure to hazard. Migrants' low status in a society might adversely affect the reaction of native citizens when deploying aid or assistance.
- **Displaced people.** People who have been displaced, either by this or by a previous incident, might be forced to leave their homes, becoming disadvantaged, overlooked or neglected.
- **People with low incomes.** The lack of resources this implies might inhibit the use of computerised media such as the internet or mobile phones for disseminating information. The low status of people with low incomes is likely to exacerbate their vulnerability.

- **Illiterate people.** Those who cannot read written signage or instructions will be disadvantaged in an emergency.
- **Isolated people, including homeless people.** People in this group, who lack human support networks, might remain unaccounted for following a CBRNE incident.
- **Institutionalised people.** This group includes hospital patients and prisoners because their confinement restricts their ability to evacuate an area. People who are bedridden, whether in hospices or at home, are also important members because of their reduced mobility.
- **People with physical disabilities.** Impaired hearing, sight, speech or the use of limbs will all reduce the ability to respond to instructions and follow emergency procedures. Wheelchair users also fall into this group.
- **People with learning difficulties,** and those who are mentally ill. Depending on the nature of their disability, they may not fully understand the situation or take the appropriate decisions regarding their own safety.
- **People with medical conditions,** including immunocompromised people, such as those with HIV. Conditions such as asthma or allergy can be exacerbated by airborne pollutants. Illness will also reduce mobility and physical resilience.
- **Carers.** People who are responsible for the welfare of others are made vulnerable through their concern for their charges and their reluctance to be physically separated from them. Their charges might include babies, children, older people or animals (such as pets or guide dogs). Carers might prioritise the safety of their charges over their own. Single parents can be especially vulnerable.
- **Emergency service personnel.** As a result of their role in the incident – approaching the hazard, assessing it, containing it, removing the early casualties – the first responders will be exposed to greater risk than the majority of victims. They are vulnerable in this sense.
- **Politicians.** A public figure generally held responsible for an unpopular policy (foreign or domestic) might become a target for a terrorist attack, and hence vulnerable.

Table 1 shows the above groups and the reasons for their vulnerability. It should be noted that the Table does not indicate some groups are more vulnerable than others, in any numerical sense, or that everyone within a certain groups will be vulnerable in the same way. People react to CBRNE incidents in different ways, according to their personal and contextual circumstances.

Table 1: Categorisation of groups by vulnerability

Vulnerability Groups	Reduced mobility	Lack of autonomy	Ignorance	Poor health	High public profile	Societal marginalisation	Obligation towards others
Minors		✓	✓				
Older people	✓	✓		✓			
Women						✓	
Pregnant women	✓						✓
Migrants			✓			✓	
Displaced people						✓	

Vulnerability Groups	Reduced mobility	Lack of autonomy	Ignorance	Poor health	High public profile	Societal marginalisation	Obligation towards others
Low-income people			✓			✓	
Illiterate people			✓			✓	
Isolated people						✓	
Institutionalised people		✓				✓	
Physically disabled people	✓	✓		✓		✓	
People with learning difficulties		✓	✓			✓	
People with medical conditions	✓	✓		✓		✓	
Carers		✓					✓
Emergency services personnel							✓
Politicians					✓		✓

The Table shows that societal marginalisation is a factor in the vulnerability of the greatest number of groups. This finding reinforces the view discussed in Section 5 that the vulnerability of certain people depends on the responses of others towards them.

6.2 Personal integrity

The Universal Declaration on Bioethics and Human Rights [Ref 14] discusses the concept of human vulnerability. Its Article 8, 'Respect for human vulnerability and personal integrity', states:

In applying and advancing scientific knowledge, medical practice and associated technologies, human vulnerability should be taken into account. Individuals and groups of special vulnerability should be protected and the personal integrity of such individuals respected.

Personal integrity is a strongly held sense of commitment to openness, honesty, inclusiveness and high standards in oneself. Therefore, the groups of vulnerable people addressed in this Task must include those whose personal integrity is compromised by the incident.

6.3 Self-perception

It is important to note that people might or might not ascribe themselves to a particular group. Indeed, they can actively resist acknowledging any such membership. Groups will not be homogeneous and victims might not be psychologically allied to them. For example, a person might see themselves as very strong, capable and upstanding, and not 'psychologically' elderly. If such a person were placed

in a group for the elderly, their response could be counterproductive. This complicates the protection of the human rights of the members of these groups.

Vulnerable groups might emerge consisting of those who deliberately resist the instructions of first responders, for reasons of personal conviction or because they have taken offence (see 'Disaffection' in Section 8 below). Articles 9 and 10 of the European Convention on Human Rights provide for freedom of thought, conscience, religion and expression. Accommodating such rights in times of disaster can be difficult, but should be attempted unless detrimental to the human rights of others.

The way in which people perceive their own vulnerability is strongly linked to their personal integrity, discussed in Section 6.2. This self-perception will influence their conscious or unconscious reactions to the incident.

6.4 Contingent vulnerability

As discussed in Section 4, the impact of a Tool depends on who uses it, and the way a Tool is used can reflect the user's beliefs regarding the vulnerability or importance of the person affected. This in turn can make people more vulnerable.

7 CATEGORISATION OF TOOLS

The initial inventory of the EDEN Toolbox categorises the Tools as shown in Table 2.

Table 2: EDEN Tools (initial inventory) by category

Category	Number of Tools
1. Recommendations	4
2. Standards	2
3. Protocols	11
4. Equipment	114
5. Simulated environments	1
6. Emulators	1
7. Toolboxes	4
8. 'Eden Store'	15
Total	152

It can be seen from the Table that four of the Tools are themselves Toolboxes. These are:

- The Toolbox from Project PRACTICE [Ref 15]. This is an important forerunner Project of EDEN, dealing with resilience to CBRNE incidents at a local, regional and national level. The latest information on the contents of the PRACTICE Toolbox [Ref 16] is shown in Table 3.
- The Toolbox from Project D-BOX [Ref 17]. The inclusion of Tools from Project D-BOX is questionable since its subject matter is humanitarian demining rather than resilience against CBRNE attacks.
- CEBOX [Ref 18]. No information on CEBOX could be obtained at the time of writing.
- A catalogue of the EDEN Toolbox itself.

Table 3: PRACTICE Tools by category

Category	Number of Tools
1. Equipment	3
2. Software	16
3. Guidelines	7
4. System	1
5. Services	2
6. Protocol	5
Total	34

Inspection of the expanded inventory (i.e. including the component Toolboxes) indicates that the impact of majority of the Tools on the people involved in a CBRNE incident is indirect, as defined in Section 1.3. For example, most of them perform functions such as providing information on threat levels to the emergency services, helping to choose the right PPE, supporting long-term response planning or modelling the movement of toxicity through a building.

The Tools with direct impacts are listed individually in Table 7 in Appendix 1.

8 IMPACT OF TOOLS

The initial CBRNE incident might have caused injury, death and the destruction of property, and the Tools in the ToT are intended to ameliorate the suffering of the people involved.

In addition to their physical injuries, the victims might be experiencing some of the following psychological states:

- **Fear.** Most of the victims will be frightened by the initial incident and by their subsequent inability to obtain information about it or about the risk to which they are exposed.
- **Anger.** All victims will be angered by the danger, disruption and inconvenience associated with the incident. Vulnerable people might have a grievance regarding their perception of the way they were treated by first responders.
- **Stress.** In psychological terms, stress is defined as ‘a state of mental or emotional strain or tension resulting from adverse or demanding circumstances’ [Ref 19]. It is a likely state for a victim of a CBRNE incident.
- **Disempowerment.** Victims are often disconcerted by the loss of control involved in committing their fate to rescuers. Given that vulnerable people may already be those with less power in society, CBRNE incidents can be seen to exacerbate feelings of disempowerment.
- **Grief.** The Kübler-Ross model of grief has the following stages: Denial (shutting out the reality of the situation), Anger (see above), Bargaining (hoping to alter the situation), Depression (becoming numb, with a sense of hopelessness) and Acceptance (coming to terms with the reality of the situation) [Ref 20].
- **Disaffection.** A disaffected victim might ignore the first responders, insult them and refuse to co-operate. For some vulnerable people (for example, those of low social status) refusal to co-operate is one of the very few strategies for protest available.
- **Alienation.** This is characterized as estrangement from the self and from society as a whole [Ref 21]. It is an unsurprising outcome of suddenly becoming a victim.
- **Victimisation.** This feeling will occur almost by definition, because the people involved in the incident might feel targeted.

It is likely that everyone involved in the incident will experience such feelings to some extent. Vulnerable people might be expected to experience them more strongly. The principal effect of the EDEN Tools should be to moderate this strengthening, so that vulnerable people are no more badly affected by the incident than others. However, a Tool might have unintentional consequences such as:

- **Increased physical hazard.** A person with a particular vulnerability might be harmed by a Tool that is harmless to others. For example, potassium iodide tablets for counteracting radiation poisoning might cause hyperthyroidism in those with sensitive thyroid glands.
- **Enhanced psychological distress.** Someone who is especially sensitive or nervous might be disproportionately affected by a Tool. For example, a decontamination process that involved undressing in public might prove traumatic for someone with a physical deformity. Or an otherwise valid and effective evacuation procedure might adversely affect someone susceptible to paranoia.
- **Compromised infrastructure.** Tools comprising procedures for evacuating and isolating an affected area might involve deliberately reducing components of the infrastructure on which modern society depends – roadblocks or telephone network restrictions, for example. People who require electricity for life support (such as users of kidney dialysis machines) will be especially

vulnerable to interruptions in supply. Women in the late stages of pregnancy require reliable transport to hospital. Communications depend on a reliable internet connection.

Other Tools might be targeted specifically at providing assistance to vulnerable people – their purpose is to benefit a vulnerable person more than the general victim. A physiological model of an older person, for example, would be helpful in assessing the risk attaching to a proposed evacuation plan. Mobile prison cells would provide secure but safe shelter for prisoners.

These complex phenomena can be analysed by analogy with the Hazard Identification (HAZID) process used in safety engineering. Table 4 provides examples of impacts, effects and outcomes, to act as prompts for the analyst and to ensure completeness, as for HAZID keywords. Direct impacts are considered and possible effects in the long-term are acknowledged. The process is described further in Section 9 below.

Table 4: Example impact assessment for vulnerable groups

	Impact	Effect	Outcome	Example	Human rights implication
1.	The Tool cannot be used by vulnerable people	Vulnerable people are left exposed to the hazard	More casualties among vulnerable people	Public address systems are ineffective for hearing-impaired people	The right to life has been violated
2.	The Tool causes offence to vulnerable people, or diminishes their self-esteem, dignity or personal integrity	The negative reaction of vulnerable people disrupts proceedings and contributes to disaffection in the longer term	More casualties overall, because the Tool cannot be exercised fully and its benefits are not delivered.	Racist language or images used in information leaflets or public announcements (causing offence among immigrants)	The principle of non-discrimination has been violated
3.	The Tool stigmatises vulnerable people in the eyes of others	The negative reaction of vulnerable people and others prevents the Tool being deployed effectively	More casualties and disaffection among vulnerable people; increased negative reaction by others towards them	An evacuation procedure that appears to favour or disfavour immigrants	Principle of non-discrimination has not been applied
4.	The Tool does not recognise people's vulnerabilities	The Tool injures vulnerable people	More casualties among vulnerable people, both in short and long term	Distributing food rations that cause allergic reaction	Right to health has been violated. The principle of non-discrimination has not been applied

	Impact	Effect	Outcome	Example	Human rights implication
5.	The Tool becomes more difficult to deploy if vulnerable people are among those it affects	The difficulty of using the Tool if vulnerable people are affected means that its benefits are felt by fewer people or later than the optimum time	More casualties overall	A protocol in which decontamination starts only when everyone affected by the incident is accounted for (reduced agility of older people causes delay)	Principle of non-discrimination has not been applied
6.	The Tool provides particular assistance for vulnerable groups	The Tool reduces the effect of the vulnerability	Fewer casualties among vulnerable people	Psychological counselling	The rights of vulnerable groups have been prioritised over others.
7.	The Tool increases the risk to some people affected	A new vulnerability is created: the number of vulnerable people is increased	More casualties among vulnerable people	An evacuation procedure might increase the toxic dose received by those it delays	The right to life has been violated. The principle of non-discrimination has not been applied

9 ASSESSMENT PROTOCOL

9.1 Assumptions

The following assumptions must first be made regarding the Tools and their users:

- The Tool functions correctly and reliably, as intended by its designers. The assessment does not include any physical injury caused by a fault in the Tool or psychological trauma caused by its failure to assist in an emergency.
- Those who deploy the Tool are suitably trained, qualified and experienced in its use. If the designers of a Tool do not expect any training to be necessary, a reasonably competent and well-motivated person will find its operation self-evident. If a Tool requires extensive knowledge and understanding, its impact is likely to be variable in an emergency.
- If the user of a Tool is free to choose the people to whom it is applied, an ethical choice is made based on the Tool suggested in Section 5.2.

9.2 Screening

The first stage of the assessment of a Tool is to determine whether its impact on those involved in the CBRNE incident can be described as direct, as defined in Section 1.3. The impact in all the security phases defined in Section 3 should be considered.

If the Tool has a direct impact in any phase, its detailed effects should be scored, as described below. Otherwise, the Tool can be considered outside the scope of the analysis. It will clearly be difficult in some cases to determine the directness of the Tool's impact and the analyst should err on the side of inclusion.

9.3 Scoring

The scoring process consists of scrutinising the effects of the Tool on each vulnerable group in each phase, using the information in Table 4 for guidance. Scores representing the magnitude of the effect (relative to the general victim) are then entered into a matrix in which the security phases discussed in Section 3 are arranged against the sixteen vulnerable groups identified in Section 6.

To assist the process, Appendix 2 of this Report contains an embedded Excel workbook with a worksheet formatted in this way for each Tool. As an illustration, Figure 1 shows the worksheet for the *Public-facing manual*, a Tool developed by King's College London.

The scoring scheme is as follows:

- **+3.** The Tool provides great benefit to the people in the group in the phase, reducing the risk to less than that of the general victim.
- **+2.** The Tool provides significant benefit or assistance, perhaps eliminating the vulnerability of the people in the group during the phase. The Tool reduces the risk to that of the general victim.
- **+1.** The Tool provides some help to vulnerable people, reducing their relative vulnerability in the phase.
- **0.** The Tool has the same effect on members of the group as it does on the general victims of the incident. Vulnerabilities are not specifically addressed, perhaps because there is no advantage in doing so.
- **-1.** The Tool fails to address the needs of vulnerable people, when it would be valuable and practicable to do so. The risk to members of the group remains higher than the risk to the majority.

- **-2.** The Tool can cause vulnerable people inconvenience, unpleasantness and loss of dignity more acute than that experienced by the majority of people affected.
- **-3.** The Tool can cause harm or injury to members of the group, significantly more than to the majority.
- **N/A.** The Tool has no application in the phase

Group \ Phase	Assessment	Prevention	Preparedness	Response	Recovery	Group Total
Minors	n/a	n/a	1	1	n/a	2
Elderly people	n/a	n/a	1	1	n/a	2
Carers	n/a	n/a	1	0	n/a	1
People with disabilities	n/a	n/a	1	1	n/a	2
Migrants	n/a	n/a	1	2	n/a	3
People with low incomes	n/a	n/a	0	0	n/a	0
Institutionalised people	n/a	n/a	1	0	n/a	1
People with medical conditions	n/a	n/a	1	2	n/a	3
Pregnant women	n/a	n/a	0	1	n/a	1
First responders	n/a	n/a	0	0	n/a	0
Politicians	n/a	n/a	0	0	n/a	0
Women	n/a	n/a	0	0	n/a	0
Displaced people	n/a	n/a	0	-1	n/a	-1
Illiterate people	n/a	n/a	0	-1	n/a	-1
Isolated people	n/a	n/a	0	0	n/a	0
People with learning difficulties	n/a	n/a	0	-1	n/a	-1
Benefit Score: 12			Variance: 0.6			

Figure 1: Impact assessment example – Public-facing manual

The sum of the numbers in each row of the assessment matrix, shown in the right-hand column of the worksheet, represents the effect of the Tool on each group, relative to its impact on the general victim. The sum of all the numbers in the matrix has the following significance:

- Large positive values (maximum +240) imply that the Tool benefits many vulnerable groups in many phases. Tools with high scores reduce the risk to vulnerable people to a level approaching that of the general victim.
- Small values (positive or negative) indicate that the Tool has little differential impact; it mitigates the risk for vulnerable people broadly by the same amount as for general victims. If the mitigation is only partial, the risk remains and will continue to be greater for the vulnerable person than for the general victim. Small scores also imply that the impact of the Tool is limited to a subset of groups or phases. It must be noted that a Tool with a benefit to all victims irrespective of their vulnerability will also attract a small differential score; as will a Tool that is ineffective for everyone.

- Large negative values (minimum -240) imply that the Tool has a particular disadvantage for vulnerable people, raising the risk of physical or psychological harm above the level caused by their vulnerability.

It can be seen that this total indicates the benefit of the Tool for all vulnerable groups and phases – it is the ‘Benefit Score’ for the Tool.

The embedded workbook in Appendix 2 calculates automatically the Benefit Score and its variance. The provision of the variance helps to avoid the loss of detail arising from the summation; the cancellation of negative and positive scores in a simple summation might otherwise obscure important information. A small variance indicates that the Tool has a similar effect on most groups and phases; a large one that its effects are more variable. The worksheet also highlights negative effects, as seen in Figure 1.

9.4 Scrutiny

The final stage in the assessment protocol is to inspect the matrix and to consider practicable measures for making the Tool of greater benefit for the groups and phases giving rise to large negative scores.

Section 10 below shows the results of applying this protocol to the Tools listed in Section 7. A discussion of the shortfalls is provided in Section 11.

10 RESULTS

Table 5 shows the results of applying the protocol of Section 9 to the Tools listed in Appendix 1. The raw data for all of the Tools are given in the Excel workbook embedded in Appendix 2.

The numerical scores for each Tool are given in the Table below in the format -13 ± 0.2 , being the Benefit Score accompanied by its variance, as defined in Section 9.3.

Table 5: Impact assessment

Tool	Comment
1. VITRUV	<p>Benefit score: -13 ± 0.2</p> <p>VITRUV considers the threat to buildings based on their location, their physical condition (e.g. structural integrity) and some environmental conditions such as wind. It is not planned to integrate human factors such as reduced mobility etc.</p> <p>The extent of the injuries sustained by the victims is modelled through a 'standard person'; the vulnerability of (e.g.) children or older people is not modelled.</p>
2. TEDAS	<p>Benefit score: $+2 \pm 0.3$</p> <p>The TEDAS output contains information on the target of the attack – physician, ambassador, diplomat, member of secret service, officer, soldier, state employee, party member, police personnel, engineer, journalist, consul, teacher, minister, missionary, politician, president, student, senator, scientist</p> <p>The Tool accommodates and mitigates the vulnerability of these types of person in the Threat Assessment phase.</p>
3. SIMP	<p>Benefit score: $+1 \pm 0.7$</p> <p>The SIMP software can assign to each agent specific characteristics that determine its "motion ability". An appropriate distribution of these characteristics across the simulated sample allows a representation of the average population of pedestrians. Furthermore, SIMP can simulate "special paths" for people with special needs, i.e. dedicated paths for people with disabilities. Group motions can also be reproduced, in order to represent groups of individuals moving together, like families or people travelling with an accompanying person.</p> <p>The Tool accommodates and mitigates the vulnerability of some people in the response phase.</p>
4. Building occupant protection	<p>Benefit score: $+9 \pm 0.4$</p> <p>The system gives improved protection in mechanically ventilated buildings. It could be installed in critical infrastructure including hospitals, fire and police stations, governmental and administrative buildings.</p> <p>The Tool could provide a beneficial impact on various groups of vulnerable people</p>
5. Radiological detection arches	<p>Benefit score: -1 ± 0.1</p> <p>The arches support rapid and discreet detection of radioactive contamination as people pass through. There is no distinction or advantage for vulnerable people; those who cannot pass through are not assisted.</p>
6. μ RAID	<p>Benefit score: $+2 \pm 0.3$</p> <p>This is a body-worn detector of air-borne toxic chemicals in the environment, which might be of some benefit to the first responders.</p>

Tool	Comment
7. Casualty tracking	Benefit score: -3 ± 0.3 This Tool tracks the location of people involved in the initial incident through the GPS in mobile phones. It does not convey any benefit to those without a mobile phone, and contravenes some ethical principles.
8. CROM Crowd	Benefit score: $+3 \pm 0.8$ The Tool is used to construct scenarios of crowding useful for planning the safety of pedestrians. The suppliers expect that not all pedestrians have the same motor skills and emotional response. The features of individuals who try to save themselves will be a subject of study. Specific invalidating factors could become attributes for class 'pedestrian'. The Tool is of general benefit to vulnerable groups except for those who are unable to move.
9. AWAS Pressure Stretcher	Benefit score: $+5 \pm 0.4$ This medical pressure stretcher has considerable benefit for vulnerable people who are injured.
10. IFREACT	Benefit score: $+3 \pm 0.6$ The aim of the IF REACT project is to lower the burden provided by PPE and increase the safety of the first responders at the same time. The Tool consists of advice on PPE, incorporating skin protection, a head-up display, a biodosimeter, audio/voice technology, a GPS self-localisation device, a smartphone, three types of respiratory protection, heightened situational awareness and agility and protection against chemical, biological and radiological threats and hazards.
11. HAZKEY	Benefit score: $+2 \pm 0.3$ This Tool has a direct effect only on first responders, as it greatly reduces their time of exposure to airborne toxicity.
12. PPE selection Tool	Benefit score: $+4 \pm 2.0$ This Tool has a direct effect only on first responders, as it assists in the choice of the correct PPE.
13. Safe Room Protocol	Benefit score: -10 ± 0.4 This Tool provides recommendations for the design of a safe room as part of the 'planning phase' of the incident. Vulnerable people are not considered in the safe room protocol.
14. Public-facing manual	Benefit score: $+12 \pm 0.6$ The Tool provides the victims with advice and guidance on the safest and most efficient evacuation procedure. Its content is valuable for vulnerable groups in the Preparedness and Response phases.
15. Expert-facing manual	Benefit score: $+4 \pm 1.0$ The Tool provides the emergency services with advice and guidance. Its content is valuable in the Preparedness and Response phases.
16. Leader-facing manual	Benefit score: $+16 \pm 0.4$ This manual considers the communications needs of migrants, minors, middle-aged people, parents, first responders, carers and people with disabilities. As such, it is beneficial to vulnerable groups in two phases.

The Table shows that four of the Tools have a negative impact on vulnerable groups. VITRUV is the most serious case, although it is far from the most severe possible. These results are discussed further in Section 11 below.

11 GAP ANALYSIS

The assessment of the EDEN ToT has illuminated some gaps in functionality – where a Tool falls short or fails completely in respect of its impact on vulnerable people. In early March 2014, before the delivery of this Report, the findings in this Section were reported to FFI for inclusion in the gap analysis being carried out in WP21. This will allow them to be considered by the designers of the ToT.

11.1 Individual Tools

The assessment of the individual EDEN Tools has illuminated the gaps shown in the following Table, as extracted from Table 5.

Table 6: Functionality gaps in EDEN Tools

VITRUV	The extent of the injuries sustained by the victims is modelled through a ‘standard person’; the vulnerability of (e.g.) children or older people is not modelled.
Radiological detection arches	There is no distinction made or advantage given to vulnerable people; those who cannot pass through the arch are not assisted.
Casualty tracking	This tracking Tool does not convey any benefit to those without a mobile phone, and contravenes the ethical principle of privacy.
Safe Room Protocol	Vulnerable people are not considered in the safe room protocol.

11.2 Overall Toolbox

It is important also to consider whether important and valuable Tools for supporting vulnerable people might be missing from the overall ToT. Completeness is of course impossible to achieve, since any system can be enhanced, with sufficient time and funding. The gap analysis carried out for this Task has therefore focused on Tools that:

- might be expected to have a direct, positive impact on vulnerable groups, and
- are readily available or could be developed during the lifetime of the Project, and
- were suggested by the impact analysis of Section 9 or by the end-user workshops [Ref 22, 23, 24 25]

The following gaps in provision were identified from the impact analysis:

- Ethical guidance on applying the EDEN Tools. The provision of such guidance would help to minimise the creation of vulnerabilities.
- Support for incarcerated people. The ToT could for instance include electronic ‘tags’ to be given to prisoners to allow them to be located throughout the post-incident phases and afterwards. The ‘safe room’ design protocol could be extended to include a secure cell.
- Support for carers. A Tool for identifying and linking children with their parent or carer would be very useful in an emergency.

The following gaps were identified from the user workshops:

- A database for shortlisting the chemicals potentially involved in an event, based on signs, symptoms and the specific responses associated with them.
- Decision support for politicians
- A system for information dissemination related to panic management.

At the time of Reporting, the design of the Toolbox itself has not emerged, so its usability cannot be assessed, nor can the extent to which it will be accessible by people (for example) with limited vision or dexterity.

12 MITIGATION OF IMPACT

For the purposes of this deliverable, mitigation of impact can be defined as the inclusion in the ToT of steps to prevent or minimize the damage associated with a CBRNE incident on the population, including vulnerable groups. Mitigating activities can be undertaken before and after the event has occurred, and can encompass three dimensions:

- Mitigation of physical impact;
- Mitigation of psychological impact;
- Mitigation of social impact.

The appropriate implementation of EDEN Tools (see Appendix 1) would directly contribute to the mitigation of the impact and effects of a CBRNE event. However, as discussed in Section 8, under specific circumstances some of them may fail to mitigate the damage or have adverse consequences, hampering the response or causing additional risks for vulnerable people. Implementation of some measures and using some Tools could actually increase psychological distress in an already stressful situation (such as a decontamination process), could physically harm people or could contribute to their societal marginalisation.

The following examples highlight some constraints and impacts that might be associated with the available Tools:

1. **Medical countermeasures** (including antidotes, antivirals, antibiotics, vaccines, serum, antitoxins, etc., depending on the nature of the CBRNE agent).
 - Constraints: The frequency of CBRNE cases is low, and there are ethical issues associated with testing on humans. The posology (branch of medicine concerned with the determination of appropriate doses of drugs or agents) and means of administration (e.g. oral and intravenous administration) have to be adapted for some specific groups (e.g. children, elderly people, people with medical conditions, for example with renal insufficiency). As for any drugs and medicines, there are side effects to the use of medical countermeasures, some of them significant.
 - Impacts: Because of the constraints above, in some cases there are insufficient data on drug toxicity and efficacy, especially in relation to vulnerable groups. This can cause incorrect dosages and inappropriate diagnoses based on flawed information.
 - Mitigation: (a) developing treatments against side effects (b) using alternative therapy, and (c) developing new means to collect data and test safety and efficacy (e.g. animal models, *in silico* methods).
2. **Personal protective equipment**
 - Constraints: The standard issue of Personal Protective Equipment (PPE) does not necessarily fit all members of the group – children and older people, for example, cannot easily use heavy protective helmets.
 - Impacts: PPE can give rise to discomfort, physical and psychological stress (hampered visual and auditory perception, heat stress and dehydration, manipulative difficulty with gloves). It can also compromise communication, reduce mobility and performance levels, with a decline in the individual and group task effectiveness.
 - Mitigation: Improvements in ergonomic or optical properties, the addition of cooling systems or biosensors to monitor physiological markers of stress can help to mitigate these negative effects. Regular training represents another means, ensuring proper use of the Tools and helping to reduce stress and improve performance. The IF REACT project has as its goal to assist in the correct choice of PPE.

3. Decontamination and post-decontamination process

- Constraints: For best results, decontamination must be carried out quickly after the incident.
- Impacts: Depending on the cultural and social background of the victims, and their individual sensitivity, the decontamination process and the subsequent observation phase can generate additional psychological stress if separation between some population groups is not possible (e.g. women and men, disabled people). Moreover, being naked in front of fully equipped responders may increase perceptions of vulnerability and thus psychological stress.
- Mitigation: Some decontamination units and shelters include screens in their design, for patient dignity and gender separation.

The following vulnerable groups could be especially affected:

- **Children**, because a person's size and weight are key parameters when considering (for example) the administration of medical countermeasures or the use of protective equipment. Furthermore, their level of understanding and autonomy are also important factors.
- **People with impaired mobility, vision, hearing or mental ability** (including people requiring assistance). Being able to follow instructions is critical in case of disaster and warning messages must be easily understandable by everybody (e.g. visual alert for hearing impaired). Besides, protective measures may encompass evacuation or sheltering. Escape routes, shelters and evacuation centres must integrate in their design parameters such as the necessity to avoid physical barriers.
- **First responders**, who might need to use the tools directly or to deal with the consequences of the negative impact on vulnerable people. For example, if the physical accessibility of designated escape routes is insufficient for people with mobility impairment using mobility aids, the workload of the first responders is increased and other people remain at risk.

Where possible, it appears necessary to adopt tailored measures to take into account vulnerable groups. The impact of Tools can be mitigated through several approaches:

- Integrating parameters related to vulnerable people in the design of the Tool itself (e.g. the SIMP software could simulate specific paths for people with special needs);
- Raising awareness among disaster planners and first responders. Better information about special needs and the potential consequences of disaster management can lead to a better response organization, integrating the use of Tools in a way that accommodates special needs and does not hamper disaster management.
- Regular education and training of first responders in the special needs of vulnerable people, and the importance of respecting their human rights. Informing and educating stakeholders also has an impact on the decision-making process;
- Providing more upstream (managerial) information, including regarding relevant Tools and the necessary training required to cater for vulnerable people. In this respect, providing decision-makers with guidance regarding crisis communication and public information strategies is a key requirement for the mitigation of psychological impact;
- Dedicated exercises involving Tools, vulnerable groups and their carers, when they require assistance.

To assess the potential impact of Tools on specific vulnerable groups and (when needed) to identify means of mitigation, members of the groups should be involved in the process from the outset – during the development of the Tool and within the response planning phase. Seeking cooperation from associations or bodies representing the interests of vulnerable groups is one possibility. This approach can also help to assess the perception of the Tools by vulnerable people, and thus to

identify if they could perceive the Tool or its applications as harming human dignity or rights. If so, it may be possible to define the conditions of use to ensure that human dignity is respected.

13 LINKS WITH OTHER ACTIVITIES

13.1 Links with other EDEN work packages

As described in Section 11, this Task has informed the WP21 needs and gaps analysis, emphasising the societal factors. The ethical issues raised by the Tools, in respect of vulnerable people, are discussed in Section 6.2.

13.2 Links with other FP7 projects

The intention is to use the Multidimensional Taxonomy System (MTS) developed in the DECOTESSC1 project [Ref 3] as the basis of the structure of the EDEN ToT. The MTS stores information in terms of its coordinates in a space of several dimensions, each with 'aspects' which are sometimes decomposed into 'sub-aspects'. The labelled objects are in turn compiled into a database. The dimensions and aspects that have been defined are:

- Level of Action: This dimension has two aspects: Analysis or Implementation.
- Readiness Level: Here there are four aspects: Research and Development, Actual designated or executed measures, Guarantee of Operational Capability and Training and Education.
- Security Chain: The aspects here are the five phases of the security cycle described in Section 3.
- Means: The activity can be realised by organisational, technological or methodological means.
- Threatening Material: This can be C, B, R, N or E.
- Target: The incident is targeted on transportation, gathering of people, economy, basic services or cult places.
- Perspectives: These may be feasibility, political issues, social and psychological issues, economical issues, legal issues, health issues or environmental issues
- Geographic Location: where the activities take place (any country in the world).

The results described in this Report can be linked with the MTS [Ref 26]. Given the subject matter, the impacts are located in the cell with the following co-ordinates:

- Level of Action: All
- Readiness Level: Research and Development, Actual designated or executed measures
- Security Chain: All.
- Means: All
- Threatening Material: All.
- Target: All
- Perspectives: Social and Psychological and Health
- Geographic Location: All

14 RECOMMENDATIONS

This Section sets out the recommendations derived from this Task.

14.1 Mitigation

The following suggestions emerge from the discussion of mitigation in Section 12:

- Parameters related to vulnerable people should be integrated in the Tool design;
- Awareness of the special needs of vulnerable groups should be raised among disaster planners and first responders.
- First responders should be trained in the special needs of vulnerable people;
- Information should be provided regarding relevant Tools and the necessary training required to cater for vulnerable people.
- Exercises should include Tools, vulnerable groups and their carers
- Members of vulnerable groups should be involved in the assessment of the impact of Tools and its mitigation.

14.2 Future work

The following EU projects have also been carried out in the area of CBRNE resilience and the Tools they delivered should be considered for inclusion in the EDEN ToT:

- CATO <http://www.cato-project.eu>
- CBRNEMAP http://cordis.europa.eu/result/report/rcn/54429_en.html
- MIRACLRE http://cordis.europa.eu/projects/rcn/111244_en.html
- DESTRIERO http://cordis.europa.eu/projects/rcn/110052_en.html
- SAFEWATER http://cordis.europa.eu/projects/rcn/110459_en.html
- IF REACT www.ilFREACT.eu

When the contents of the EDEN ToT are finalised, the Tools should be assessed using the protocol set out in Section 9 and the results should be contained in an update of this Report. Then the EDEN Project should review the design and functionality of the Tools that have a significantly negative impact on vulnerable people, and make modifications to mitigate it. The protocol of Section 9 should be used to assess the effect of the changes.

It would also be beneficial to review the functionality of all of the EDEN Tools and identify areas in which their impact score might be improved, irrespective of its initial value.

14.3 Dissemination

After approval by FP7, the Report should be disseminated as widely as possible throughout the security community and integrated as a Tool in the EDEN Toolbox.

15 CONCLUSIONS

This Report constitutes EDEN deliverable D83.3 (Impact Assessment for Vulnerable Groups). The principal findings of task T83.3 are described: the assessment of the impact of the EDEN Toolbox of Toolboxes on people with enhanced vulnerability to incidents involving CBRNE agents.

There is extensive discussion of the elusive concept of vulnerability, and its relation to susceptibility, integrity and self-perception. Suggestions are made for the mitigation of any adverse effects on the members of vulnerable groups and the enhancement of positive ones. The Tools have also been analysed from the standpoint of human rights.

The Report must be regarded as interim, since the contents of the Toolbox are still uncertain at the time of delivery. Many candidate Tools are still under development and it is probable that before the end of the Project, new ones will be included and others will drop out. For these reasons, the protocol used in the assessments is presented in some detail, so that it can be applied to the Tools eventually to be contained in the EDEN Toolbox.

It is hoped that this Report will support a reduction in the vulnerability of particular groups to CBRNE incidents.

Appendix 1 EDEN Tools with direct impacts

Table 7 lists the EDEN Tools that directly affect the people involved in a CBRNE incident.

Table 7: EDEN Tools with direct impacts on incident victims

Tool name	Description	Status Work Package	Supplier
EDEN Toolbox			
1. VITRUV	Vulnerability Identification Tools for Resilience Enhancements of Urban Environments: Empirical and quantitative analysis software tools for urban planning (plan level and detail level) with the aim of reducing susceptibility and vulnerability with respect to CBRNE terror attacks with focus on explosives. Extension to all CBRNE hazard empirical susceptibility and vulnerability analysis. Focus on planning of urban areas for countering future CBRNE events.	Existing 33, 40-70	FhG EMI
2. TEDAS	Terror Event Database Analysis Software Tool: Empirical statistical analysis of historic terrorist events. Additional categories in the area of terrorist CBRNE events will be generated. CBRNE, all phases, in particular preparedness, scenario prediction, empirical scenario assessment; software	Adaptation 50, 60, 70	FhG EMI
3. SIMP	Software platform able to simulate crowd dynamic in structured environments. SIMP supports the emulation of emergent behaviour starting from that of a single individual.	Existing 32, 63.2, 63.3, 65	ENEA
4. Building occupant protection	Protecting building occupants against airborne CBRN threats: a tool for calculating infiltration, occupant exposure and protection factors based on the building and threat agent characteristics. There are methods to determine the key factors affecting the protection, and cost efficient ways to improve it. The Tool can be integrated with current dispersion modelling and consequence estimation tools.	New 33, 62, 64, 65	VTT

Tool name	Description	Status Work Package	Supplier
5. Radiological detection arches	A radiological detection arch designed for detecting radiation in people (using NaI (TI) detectors) and in heavy/lightweight vehicles (using PVT detectors). It fulfils the OIEA normative for scrap metal.	Existing 60	Indra
6. μRAID	Personal Chemical Detector	Existing 32, 50	Bruker
7. Casualty tracking	Casualty tracking solutions and targeted alert. A Tool to retrieve the calling number of all the mobiles which have been within a given area on request and track them through time. Crisis managers will be able to retrieve from the history who could have been exposed to radiation (hidden source etc.) and alert them	New 33, 65	Astrium
8. CROM Crowd	Theoretical model and software for crowd management when a crisis is occurring	New 33, 65	ENEA
9. AWAS Pressure Stretcher	Mass decontamination, vehicle decontamination, mobile equipment, isolation rooms and isolation stretchers	Existing 32	Supplier Platform
10. IFREACT	Improved First Responder Ensembles Against CBRN Terrorism: first responder equipment	New 52	SAMU Astrium
PRACTICE Toolbox			
11. HAZKEY	The HazKey package monitors airborne concentrations of chemical agents, relays video and calculates the time-development of the plume in three dimensions. It replaces manual monitoring of toxicity at the scene of the incident.		Bruhn NewTech
12. PPE selection Tool	A web application to assist in the selection of PPE, as developed in IF REACT		PROMETECH
13. Safe Room Protocol	Protocol for the design of safe rooms for use in emergencies		CBRNE Ltd

Tool name	Description	Status Work Package	Supplier
14. Public-facing manual	The manual provides members of a multi-cultural public with a strategy for improving knowledge and awareness of possible CBRN threats and information about the processes and procedures at sites affected by CBRN events.		King's College London
15. Expert-facing manual	The manual provides guidance to members of emergency services on information needs and communications preferences in the event of a CBRNE incident		King's College London
16. Leader-facing manual	This manual provides guidance to strategic leaders and policymakers on communications needs and preferences in the event of a CBRNE incident		MIUN

Appendix 2 Impact assessment

Figure 2 below is an embedded Excel workbook containing a worksheet for each of the Tools listed in Appendix 1. The first worksheet is a template for use in assessing future Tools.

Group \ Phase	Assessment	Prevention	Preparedness	Response	Recovery	Group Total
Minors	-1	n/a	n/a	n/a	n/a	-1
Elderly people	-1	n/a	n/a	n/a	n/a	-1
Carers	-1	n/a	n/a	n/a	n/a	-1
People with disabilities	-1	n/a	n/a	n/a	n/a	-1
Migrants	-1	n/a	n/a	n/a	n/a	-1
People with low incomes	-1	n/a	n/a	n/a	n/a	-1
Institutionalised people	-1	n/a	n/a	n/a	n/a	-1
People with medical conditions	-1	n/a	n/a	n/a	n/a	-1
Pregnant women	-1	n/a	n/a	n/a	n/a	-1
First responders	-1	n/a	n/a	n/a	n/a	-1
Politicians	-1	n/a	n/a	n/a	n/a	-1
Women	0	n/a	n/a	n/a	n/a	0
Displaced people	0	n/a	n/a	n/a	n/a	0
Illiterate people	-1	n/a	n/a	n/a	n/a	-1
Isolated people	0	n/a	n/a	n/a	n/a	0
People with learning difficulties	-1	n/a	n/a	n/a	n/a	-1
Benefit Score: -13		Variance: 0.2				

Figure 2: Embedded Excel workbook showing the assessment worksheet for VITRUV

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