



**SEC-2010.4.1-1**  
**AFTERMATH CRISIS MANAGEMENT – PHASE I**  
**- ACRIMAS -**

**D4.1 INVENTORY REPORT**

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# **Background information on ACRIMAS - Aftermath Crisis Management System-of-systems Demonstration, Phase I**

## **ACRIMAS objectives**

ACRIMAS is a 15 months Support Action with 15 partners from 10 European countries, which shall develop a roadmap for an upcoming Demonstration Project (in Phase II) within Crisis Management (CM).

This roadmap will elaborate a systematic development process for CM systems, procedures and technologies in Europe, to be implemented within the demonstration project.

The process aims for gradual evolvement of CM capabilities through demonstration and experimentation (DE) activities, transfer of related knowledge between stakeholders and by promoting an environment for co-development of CM technology and methodology where users, providers and researchers work together.

ACRIMAS further emphasises community-building which will be considerably supported by the execution of the subsequent Phase II, bringing together the various key stakeholders and the available DE infrastructures in a case-by-case demonstration or experimentation activity.

## **ACRIMAS work approach**

Large-scale incidents (man made and natural) inside and outside the EU require a coordinated response from crisis managers and first responders across Europe and with resources from all levels of government. Currently, CM in the EU can be regarded as a highly diversified 'system-of-systems' integrating organisations and components with different cultures, policies and assets, and various stakeholders and procurement schemes.

To identify the critical areas and topics within this current CM 'system-of-systems' which need to be addressed by the demonstration programme in Phase II, ACRIMAS follows a scenario-based and user-centric work approach.

ACRIMAS is scenario-based in the sense that characteristic CM scenarios will be identified, selected and developed to constitute a sound basis for ensuring the work of posing user needs and requirements, identifying current weaknesses and gaps in CM in Europe, looking at potential solutions and documenting corresponding demonstration topics and R&D needs to be integrated in a roadmap for Phase II. The scenario approach embraces an all-hazard view, including the EU external dimension.

ACRIMAS is user-driven in the sense that users and other stakeholders in terms of first responders, authorities and governmental bodies as well as the supply side are actively involved throughout the project process, some of them as full partners, most of them linked to the project through a supporting Expert Group and dedicated project workshops. They play a central role in complementing and validating the scenario analysis by expressing their needs and requirements regarding the identification of relevant CM topics, which should be addressed by DE activities in Phase II, and the demonstration concept to be elaborated.

## **ACRIMAS expected results**

ACRIMAS will prepare a roadmap setting out the main areas and relevant topics of CM to be addressed by the Phase II. In addition, ACRIMAS will deliver a demonstration concept for Phase II, describing how and where the DE activities in Phase II should be conducted.

## Terms used and their understanding in ACRIMAS

According to the call text of SEC-2010.4.1-1 “Aftermath crisis management – Phase I”, the ACRIMAS project has to focus on ‘aftermath crisis management’ as it was outlined, i.e. that it covers the response to large-scale disasters (man-made and natural) inside and outside Europe. However, the ACRIMAS project felt the need to briefly state its common understanding of the relevant terms used to achieve a common understanding, as in particular in the scientific community the term “crisis management” not necessarily need to be understood as “disaster response”. Consequently, the ACRIMAS project referred to terms and definitions as provided by ISO in its TC on Societal Security (TC 223):

- **crisis:**  
incident affecting a society with the potential to cause loss or damage to persons, property or the environment which requires extraordinary coordination, resources, and skills in response
- **crisis management:**  
process of planning and implementing measures aimed at preventing, reducing, responding and recovering from a crisis
- **disaster:**  
situation where losses have occurred which exceeded the ability of the affected organization, community or society to cope using its own resources
- **(disaster) response & recovery:**
  - *Response:* measures taken during or immediately after a disaster to meet the immediate needs of the affected and minimising the impact on the incident
  - *Recovery:* activities designed to return conditions to an equivalent level acceptable to society
- **“aftermath crisis management” (ACRIMAS understanding):**  
the response to & recovery from large-scale disasters (man-made or natural) inside and outside Europe

## Executive Summary

D4.1 (Inventory Report) is the first deliverable associated with the ACRIMAS Work Package 4 (WP4): “Gaps and Requirements Analysis”; more specifically D4.1 is associated with Task 4.2 – Organisations, capabilities and procedures.

The objective of this deliverable is to provide an overview and high level description of the tasks performed by the key organisations involved in Crisis Management (CM) and their procedures; D4.1 will be used as a reference frame for the gap analysis that will be carried out in Task 4.3 (the main task of WP4).

The overview is provided by summarizing:

- the main responsibilities of the different emergency and support services in case of a major accident;
- the emergency services’ current capabilities on those critical areas where a gap is likely to be identified.

The information provided by the deliverable has been collected from the literature and from the content of presentations and discussions at ACRIMAS workshops focusing on problems, challenges or opportunities that the end-users have identified and for which some improvement in the present capabilities and procedures is expected in the future; the information has been organised identifying, for each topic, the current situation and the required improvements.

The main results arisen from the analysis can be summarised as follows:

- having adopted this gap-driven approach, besides providing the reference frame for the gap analysis, the content of this deliverable represents also a first preliminary high level picture of such gaps and needs. Such picture will be detailed in task 4.1 “Baseline User Requirements” and task 4.3 “Gap Analysis” that are the next steps of the ACRIMAS project and which represent the main tasks of the Work Package.
- although each one of the 27 Member States (MS) has its own issues and within a MS, the situation can be different in each region and for the different services (Civil Protection, Firemen, Police, Health Services, etc.), it is possible to focus on situations/gaps that appears to be common throughout the various nations and that have been experienced and reported in different situations (scenarios).
- it is evident from the information collected that the most relevant problems/opportunities concern the coordination of the multitude of activities performed for Crisis Management, rather than the support of specific tasks.

# 1 Introduction

## 1.1 Context description

D4.1 (Inventory Report) is the first deliverable associated with the ACRIMAS WP4: “Gaps and Requirements Analysis” whose delivery is planned in month 6 (July 2011).

WP4 has been divided in 4 tasks:

- Task 4.1 – Baseline User Requirements
- Task 4.2 – Organisations, capabilities and procedures
- Task 4.3 – Gap analysis
- Task 4.4 – Synthesis and prioritisation

More specifically D4.1 is associated with Task 4.2 – Organisations, capabilities and procedures. The objective of this deliverable is to provide an overview of CM organisations to be used as a reference frame for the gap analysis to be carried out in Task 4.3 (the core task of WP4).

Starting from the clarification of the objective, approach and scope of the analysis, the crisis management context is briefly introduced and the CM organisation overview is provided by summarizing:

- the main responsibilities of the different emergency and support services in case of major accident;
- the emergency services’ current capabilities on those critical areas where a gap is likely to be identified.

## 1.2 Approach

The information is presented in this deliverable according to the following structure:

- Chapter 1: “Introduction”, provides the Work Package Contractual Definition that foresees the production of the present document, defines its purpose and scope, its structure and correlations with other Work Packages;
- Chapter 2: “The Inventory: objective approach and scope”, clarifies the approach, constraints and scope of the analysis;
- Chapter 3: “Crisis Management Context”, gives an overview of the crisis management context in terms of an high level crisis management structure and a description of the role usually played by the different organisations in the different phases of the disaster;
- Chapter 4: “Crisis Management Organisations”, provides a description of the main responsibilities and current capabilities of the emergency services by focusing on those critical areas where existing gaps are more likely to be identified;

Finally, the document includes the following Appendix:

- Appendix A: Abbreviations and Acronyms.

### 1.3 Results & Applicability

This document provides a high level description of CM organisations to be used as a reference frame for the gap analysis to be carried out in Task 4.3.

The information provided by the deliverable has been collected from the literature and from the content of presentations and discussions at ACRIMAS workshops. It is focused on problems, challenges or opportunities that the end-users have identified and for which some improvement in the present capabilities and procedures is expected in the future; moreover the information has been organised identifying, for each topic, the current situation and the required improvements. Having adopted this gap-driven approach, besides providing the reference frame for the gap analysis, the content of this deliverable represents also a first preliminary high level picture of such gaps and needs.

Such picture will be detailed in task 4.1 "Baseline User Requirements" and task 4.3 "Gap Analysis" that are the next steps of the ACRIMAS project and which represent the core tasks of the WP 4 "Gaps and Requirements Analysis".

### 1.4 Dependencies

#### Applicable Documents

- [GA] Grant Agreement Number 261669 – "ACRIMAS - Aftermath Crisis Management System-of-systems Demonstration" between the European Community and Fraunhofer
- [DoW] Description of Work - Annex I to the Grant Agreement Number 261669

#### Reference Documents / Sources of information

- [PMP] ACRIMAS deliverable D1.1 "Project Management Plan"
- [MIMSM] Major Incident Medical Management and Support, The Practical Approach at the Scene, Advanced Life Support Group
- [DM] Disaster Management, Gestione dei soccorsi sanitari extra e intra-ospedalieri in caso di catastrofe, Protezione Civile
- [DMCM] "Disaster and Mass Casualty Management", Eric R. Frykberg
- [PNM] "Procedure nelle Maxi-emergenze", Unità mobile e fasi del soccorso – Sez. IV
- [EBFR] Meeting the challenge: the European Security Research Agenda – A report from the European Security Research Advisory Board [ESRAB Final Report] – September 2006
- [EFR] ESRIF Final Report – December 2009
- [UFR] SICMA D2.3 "User Feedback report - System Evaluation"
- [RCM] "Reduction in critical mortality in urban mass casualty incidents: analysis of triage, surge, and resource use after the London bombings on July 7, 2005", C.Aylwin, T.C.Konig, P. Shirlev, G. Davies, M. Walsh, K. Brahi
- [NTB] "National Teleconference on Bioterrorism", Health Policy Monitor, Summer 2002 – Vol. 7. N 1
- [AW1] First ACRIMAS Workshop – Bonn, 30 June 2011

## 2 The Inventory: objective, approach and scope

### 2.1 The objective

As anticipated in [PMP], to be able to address all dimensions of Crisis Management (CM), the ACRIMAS work packages (WPs) have been structured to match a top-down with a bottom-up approach.

While in WP2 "Political & Legal frame-work" and WP3 "Scenario-based missions and tasks analysis" the focus moved from policies and scenarios down to challenges and user needs (top-down), the aim of WP4 activities is to start from the analyses of the CM organisations and move up towards the identification of the gaps and needs (bottom-up). In this way, the gaps are identified and a sensible and cost-effective roadmap towards the implementation of a continuous CM integration process is determined.

In line with the above approach, the objective of this deliverable is to provide an overview of CM organisations to be used as a reference frame for the gap analysis to be carried out in Task 4.3.

It is worth highlighting that the main aim hence, is not to provide a full inventory of all the capabilities of any service (civil protection, police, fire fighters, health services, military, local authorities, private services) for every, individual task in disaster response and recovery in EU-27, but rather to provide an overview in terms of a high level description of:

- the main responsibilities of the different emergency and support services in case of major accident;
- the emergency services' current capabilities on those critical areas where a gap is likely to be identified, based on ACRIMAS knowledge and expert views.

### 2.2 The "gap driven" approach

To reach the above objective the "gap driven" approach composed of the steps summarised hereafter has been followed:

1. The first step was the definition of a structure to gather partners' input. Taking into account that the shortcomings and gaps reflecting the present situation can result mainly from technological issues (e.g. lack of supporting systems), organisational issues (e.g. policy, procedural, coordination, interoperability problems) or lack of personnel (e.g. number of resources or resources with adequate skills/training), the following categories and sub-categories for the analysis were identified:
  - a. Individual/Personnel (Number of resources, Skills available, Training level);
  - b. Technology (Positioning and tracking systems, Personnel protection equipment, other Specific Equipment, Communications, Sensors, Decision Support Systems, Situation Awareness, Command & Control Systems, SAR, Transportations, Technical Interoperability, Affordability);
  - c. Organisation (Doctrine, Procedures, Best Practice, Preparedness, Planning, Logistics, Coordination at service, national, EU level, Procedural Interoperability, Communication with the citizens);
2. Once defined the baseline structure for each of the emergency services, it was populated with the current capabilities information collected from the literature, the

content of presentations and discussions at ACRIMAS workshops by making use of the "GAP driven" approach i.e.:

- a. First evaluating if any gap is present or is likely to arise in the short term in any of the categories listed in the structure;
- b. Then providing, for those categories where a gap has been identified, a brief description of :
  - a. the current status/situation;
  - b. the required improvements.

Such an approach did not only allow to reach the objectives reported in section 2 but also provided a first preliminary draft, high level picture of gaps and needs. Such picture will be detailed in task 4.1 and task 4.3.

### **2.3 The scope of the analysis**

Each one of the 27 Member States (MS) has its own issues and within a MS, the situation can be different in each region and for the different services (Civil Protection, Firemen, Police, Health Services, etc.). An in-depth/exhaustive analysis addressing the thousands of different particular cases would have requested years to be carried out. As a consequence, the consortium decided to focus this analysis on a limited number of relevant ("characteristic") cases, in terms of Member States and types of organisation. For obvious reasons of access to the information, the choice of the Member States and agencies has been made in accordance with the origin countries and organisations of the partners and associated end-users of the consortium.

From the results gathered through this sampling, a representative European situation will be established (major variations would have been highlighted if relevant).

In the next chapter, the results of the analysis are reported.

### 3 Crisis Management Context

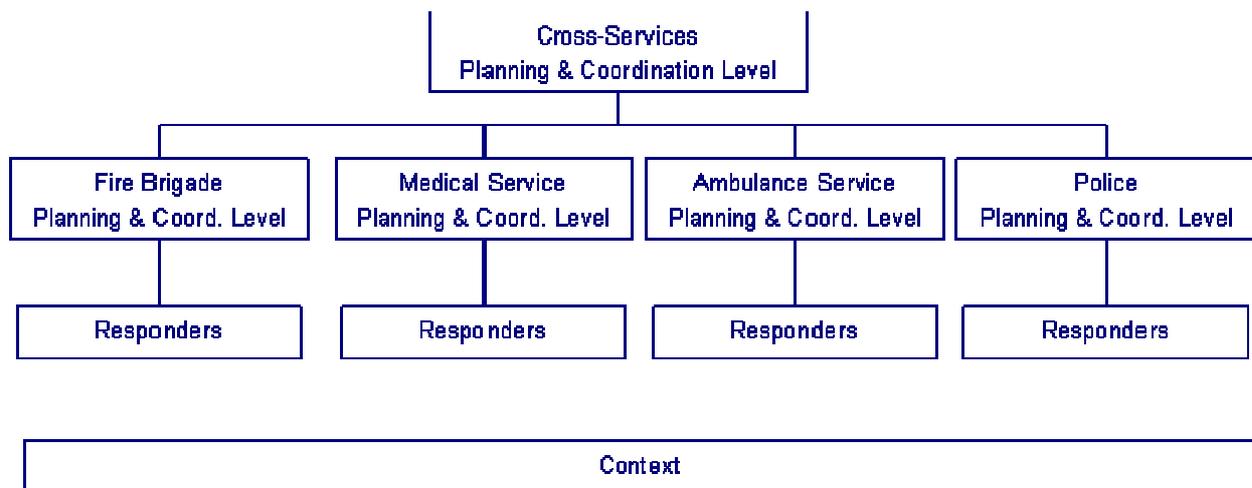
#### 3.1 Crisis Management Structure

The crisis management community comprises many different entities including emergency services (e.g. fire, law enforcement, health etc), the government at distinct levels (e.g. state, provincial/regional and local levels) and the support services (military, industry and non-governmental organizations). Each of these entities has its own focus, unique missions and responsibilities, varied resources and capabilities, and operating principles and procedures.

To maximise the effectiveness of the whole response, ensure non-duplication and improve shared understanding, all of these entities have to work together since before an incident occurs in order to develop plans for managing and employing resources in a variety of possible emergency circumstances.

Even if different nations may have different crisis management structures, the following decision making levels are foreseeable (while the respective level of government, where the planning & coordination role can be found, may vary from MS to MS):

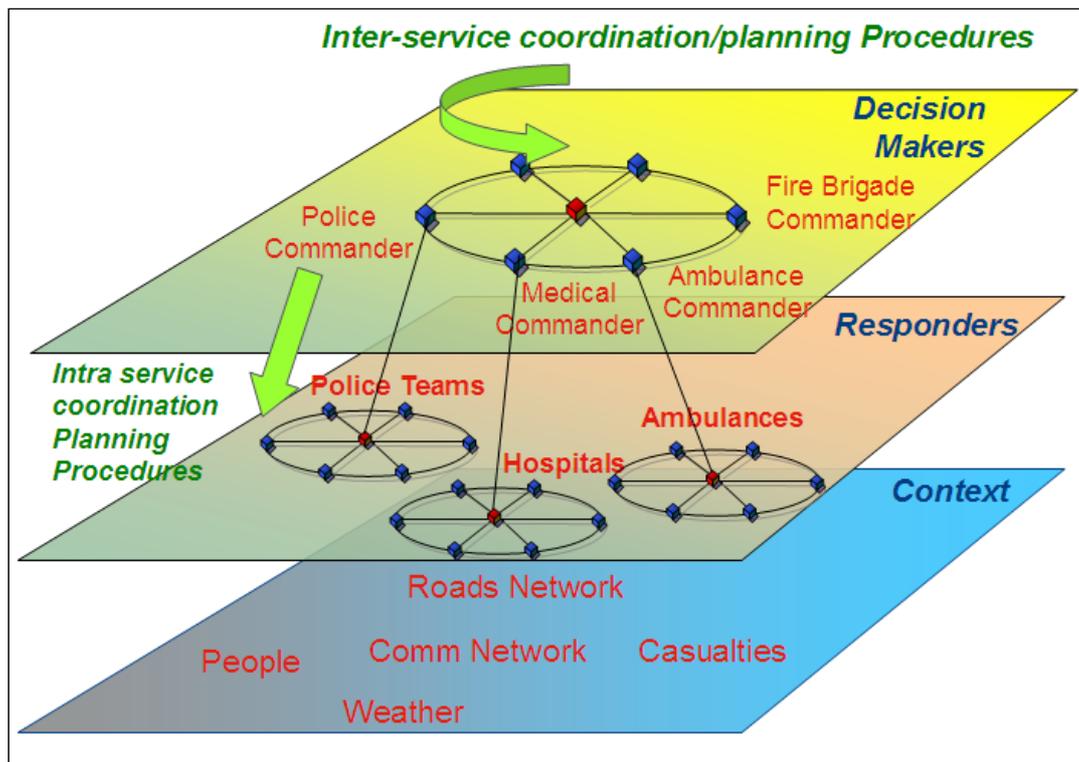
- a cross-service planning & coordination level (usually the Civil Protection)
- a planning and coordination level for each of the emergency services



**Figure 3-1: Crisis Management Structure**

Within its area of responsibility, the decision making process of each decision level can be schematically represented as composed of the following steps:

1. Develop options for appropriate response;
2. Identify the preferred option;
3. Identify the resources required to implement that option;
4. Define an implementation plan: identifying roles and responsibilities, prioritizing actions to be taken (as well as schedule for completion), defining procedures to be applied and the process for managing the communication and flow of information,
5. Forward problems that cannot be solved by the level itself (e.g. budgetary or other constraints) to the higher level of authority;



**Figure 3-2: Crisis Management - Layered View (exemplary)**

The objective of the planning and coordination activities at different levels is the same but applied to different kind of resources. As a matter of example:

- the cross-service level will have to optimize the overall response to the accident acting on the roles/responsibilities/actions-priority of each of the subordinate services as well as the most suitable resources allocation;
- the Medical Service level will have to optimize the medical response to the accident acting on the roles/responsibilities/actions-priority of each of the medical resources as well as the most suitable allocation of the available medical resources.

Within the planning process, the resource management is, of course, of paramount importance. It requires:

- an assessment of the capabilities of the available resources and the identification of the resources required in terms of:
  - quantity and kind of personnel, equipment, facilities etc
  - quality (i.e. level of expertise) of the personnel resources
- the definition of:
  - procedures to activate/dispatch those resources during the incident
  - contingency plans to overcome any shortfall of resources

One option to overcome shortfall of resources, especially in case of major incidents, is represented by mutual aid/assistance agreements between entities (neighbouring countries, private organizations etc). These agreements are the means for one entity to provide resources, facilities, services, and other required support to another entity during an incident.

### 3.2 The Phases of Disaster Response

The response phase can be split, in its turn, in different phases (see Figure 3-3):

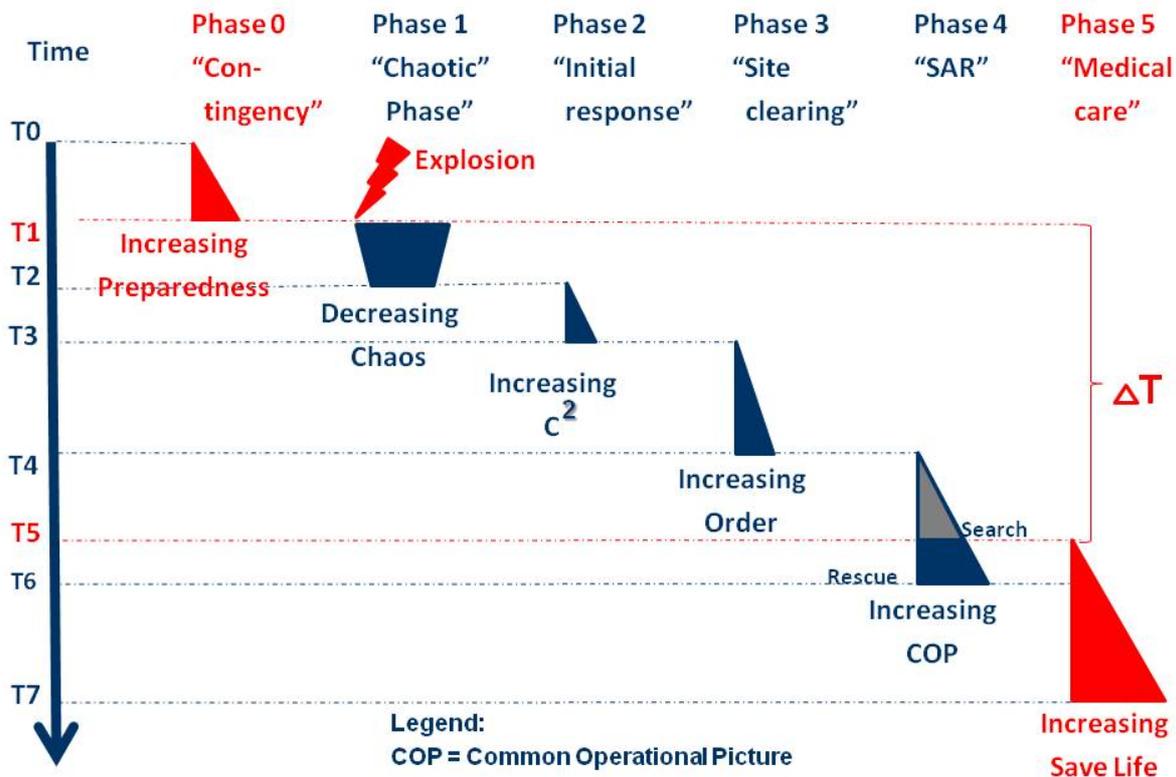


Figure 3-3: Sequence of the different disaster phases

- **Chaotic phase**

This phase is the period of disorganized confusion in the initial minutes to hours after a disaster strikes and is characterized by panic, fear, lack of leadership over those at the immediate scene and in the general population.

This is most prominent in disasters involving unexpected major disruptions such as bombings, airplane crashes etc. In urban settings it generally lasts less than 1 hour. The most critically injured casualties are at great risk of death during this phase. The least severely injured casualties generally walk themselves to the nearest hospital, sometimes overwhelming them if there are too many.

The large number of arriving volunteers, emergency service personnel, police and fire service added to the various victims on the disaster scene may usually cause gridlock.

- **Initial response and reorganization**

This phase begins when professional first responders arrive at the disaster scene to assume command and control and proceeds to:

- needs assessment. This involves two major processes:
  - situation analysis that is the collection of information about the extent and character of the disaster itself and the problems that have to be tackled;

- resource analysis that involves the collection of information about the resources needed to tackle the problems;
- decision on whether the disaster plan should be activated;
- establishment of a command centre that interacts with the central command authority.

The first responders typically include: Fire Service, Police and pre-hospital emergency health services

The earlier that firm leadership and command authority is instituted at the scene to end this phase, the less risk there is that further injury and damage will occur.

If needed, traffic lanes are opened in this phase to ensure adequate flow of resources and casualties.

- **Site clearing**

Once the organization of the chaotic response is established, a thorough examination of the damage at the disaster scene must proceed and the plan for clearing debris, rescuing casualties etc. is executed. Generally the firemen have the responsibility to secure the area in order to prevent immediate dangers. This emphasizes the importance of strict control of access to any disaster scene by the command authority, allowing only those personnel who are trained to address these dangers to enter the area.

- **Search and Rescue**

Once the disaster scene is reasonably secure, a search for casualties is undertaken.

Surviving casualties should immediately be assessed for the nature of their injuries and the urgency of treatment needs after being rescued from the disaster site.

In many disaster scenes, extensive extrication must be carried out to safely free these victims from collapsed rubble.

- **Medical Care**

The medical care of disaster victims begins at the first moment of rescue and extends for hours, days, weeks, or longer through all phases of definitive care and rehabilitation. This requires early and rapid rescue, evaluation, and evacuation of casualties to hospital facilities. It is within the first minutes and hours following a true mass casualty disaster that the major differences in medical management from the normal everyday care of injured patients become evident.

The role played by the different organisations in the different phases of the disaster is summarized in the table hereafter.

<b>Phases</b>	<b>Situation</b>	<b>Actors</b>	<b>Activities</b>
<b>Phase 0</b>	<b>Preparedness:</b> Preparation for a potential disaster	Crisis and emergency managers of civil protection, police, fire brigade, medical service, ambulance service, local authorities	Risk management Contingency planning and training Community preparedness and participation

Phases	Situation	Actors	Activities
<b>Disaster strikes</b>	<b>Emergency call</b> comes in via 112	Police, fire brigade, medical service, ambulance service	Dependent on the emergency, the actors alert and mobilise their resources
<b>Phase 1</b>	<b>Chaotic Phase:</b> confusion, panic, fear, crowd behaviour, lack of leadership	Disabled casualties	wait for help, they are at great risk of death
		Ambulant casualties	Uncoordinated inflow into the nearest hospitals and absorption of resources
		Volunteers	Arrive at the disaster scene; relief efforts of the emergency services may be hindered and delayed.
		First responders	arrive at the disaster scene; fire; debris caused by explosions, casualties on the roads, arriving volunteers, and emergency services can cause gridlock.
<b>Phase 2</b>	<b>Initial response and reorganisation</b>	Phase 2 is mainly devoted to the analysis and assessment of the current situation and aims at establishing the chain of command.	
		First responders	First responders <ul style="list-style-type: none"> <li>• analyse the situation concerning size and character of the disaster</li> <li>• analyse the needed resources to respond</li> <li>• establish their chain of command</li> </ul>
		Medical service	Based on the current assessment of situation, the medical service has to pre-estimate the potential amount of casualties and to activate its surge capacity, to expand hospital resources to accommodate casualties in a mass casualty situation, to increase the number of beds and patient care staff.
<b>Phase 3</b>	<b>Site clearing</b>	After command authority on the spot has been established, a thorough inspection and assessment of damage have to be done and the plan for removing of debris, rescuing casualties etc has to be executed. The earlier a strong leadership and command authority is installed at the scene and in hospitals, the less risk exists for injuries and damages.	

Phases	Situation	Actors	Activities
		Fire brigade	Fire brigade <ul style="list-style-type: none"> <li>• clears the disaster area in order to facilitate search and rescue operations</li> <li>• secures the area in order to prevent immediate dangers represented by               <ul style="list-style-type: none"> <li>○ secondary structural collapse</li> <li>○ biological, chemical, radiation (CBRN)contamination</li> <li>○ second (terrorist ) bomb attack</li> </ul> </li> </ul>
		Police	Police <ul style="list-style-type: none"> <li>• restricts access to the disaster area,</li> <li>• sets cordon around the disaster area,</li> <li>• grants access routes for ambulance service</li> <li>• maintains order among first responders, casualties and volunteers as well as</li> <li>• ensures security of victims and first responders and securing of evidence</li> </ul> Strict control of access to the disaster area by the command authority is needed. If needed, traffic lanes will be opened to ensure adequate flow of resources and casualties
<b>Phase 4</b>	<b>Search and rescue of casualties</b>	Fire brigade	Fire brigade <ul style="list-style-type: none"> <li>• removes rubble in order to retrieve victims</li> <li>• searches for victims and</li> <li>• rescues the detected victims</li> <li>• might be supported by volunteers</li> </ul>
		Medical service	After the search phase: assessment of health state of victims after rescue.

Phases	Situation	Actors	Activities
<b>Phase 5</b>	<b>Medical Care</b>	The medical care of victims begins at the first moment of rescue. In a mass casualty situation, the affected hospitals will get a call-in event as early as possible in order to increase the number of beds and patient care staff according to their surge capacity.	
	<b>(a) Initial Phase</b>	Ambulance service	First triage performed at the disaster area: A highly abbreviated assessment to separate life-threatening injuries that require immediate care from those requiring less urgent attention. In a mass casualty scenario, assessment of the health status of the victims has to be done within seconds
		Medical service	<ul style="list-style-type: none"> <li>• Second level of triage and treatment (urgent stabilising care) will be carried out at the casualty clearing station (CCS) that is located in a safe area between the disaster scene and hospital</li> <li>• Casualty regulation: Medical Service determines in liaison with Ambulance Service at which hospitals casualties should be transported and treated</li> <li>• Treatment at the hospital</li> </ul>
		Ambulance service	Evacuation: After various assessments and first care have been done, the casualties will be properly distributed to the different hospitals according to the resources available at the hospitals. The aim is, not to overwhelm the individual hospitals with casualties
	<b>(b) Definite Phase</b>	Medical Service	Once the casualty flow in the hospital has stopped, more time can be devoted to casualty care and distribution as order is restored to the situation

**Table 3-1: Phases of disaster response (focus on the scene)**

## 4 Crisis Management Organisations

According to the gap-driven approach described in chapter 2, this chapter provides the description of the main responsibilities and current capabilities focusing on those critical areas where existing gaps are more likely to be identified, based on ACRIMAS knowledge and expert views.

### 4.1 Emergency Services

#### 4.1.1 Civil Protection

##### 4.1.1.1 Responsibilities

The main responsibilities of the Civil Protection are to:

- maintain a full overview of risks and vulnerability in society in general;
- undertake risk analyses and risk management on national level, or provide guidelines for these tasks to be executed on levels of government responsible;
- promote measures, which prevent accidents, crises and other undesirable incidents;
- ensure sufficient emergency planning and efficient management of accidents and crises

In a few words the civil protection is the “above-single-service-level” in charge of coordinating the single services levels during all of the Crisis Management phases i.e. Mitigation, Preparedness, Response and Recovery.

##### 4.1.1.2 Current Capabilities

###### Individual

- *Availability of scientific/technical advisors*

Fast response depends often on understanding the consequences of a disaster immediately, which requires expert scientific advice. While in some MS (e.g. in Italy), the Civil Protection has the authority to task scientific organisations to provide information in near-real time, in other countries, civil protection does not have this power. In some MS (e.g. Germany) the civil protection authority include own, but limited R&D capabilities, still requiring external support.

- *Best Practice*

Europe has responded to a number of (natural) disasters over recent years. During those events the crisis response forces gathered crucial information through their work on the best/most adapted practices. In many cases the responders are confronted with recurrent issues encountered previously during a similar situation by other responders.

However best practice exchange among actors in Crisis Management has been performed so far in an unstructured and unprofessional way.

The existing knowledge of EU responders should be gathered and evaluated through a structured exchange of information, thus creating a “lessons learned database”.

- *Training*

- First Responders and Crisis Managers

First responders (FR) and crisis managers need to be competent, well prepared and trustworthy on several challenging tasks, in order to be able to cope with many different situations, in particular because any new crisis most likely contains a lot of uncertainties, which may influence any decision making process. Nowadays training is mainly performed with the organisation of very expensive field exercises. Realistic modelling and simulation tools (M&S, multi-hazard) are required to enhance readiness through training and exercises. Such a need for training is especially relevant when considering non conventional disasters. An assessment of the preparedness and resilience of European nations with respect to CBRN attacks shows a fragmented situation and the need for significant improvements.

- Public

Target audiences should not be limited only to crisis managers and first responders but should also be extended to citizens in order to enhance their ability to assist themselves, and consequently reduce the burden on authorities, during a crisis. While a lot of efforts are made in strengthening professional crisis response forces on how to react in crisis situations, training of the people usually is performed only during critical periods (e.g. war time). Also, the 'conventional' understanding of the professional response forces that the public is only a victim/burden/constraint in a crisis situation, and not the probably most powerful resource to draw from, need consequently to be developed

Volunteer's management, education and training on how to react is also an issue.

- *Protection*

Personnel protection equipment (PPE) is usually available for first responders only, not for civilian involved in crisis management (e.g. volunteers, NGO' personnel).

Moreover, in case of a CBRN crisis, individuals and particularly first responders need some specific protection. Various forms of protective clothing exist already but are e.g. difficult to use, of limited protection or too expensive.

### Technology

- *Special Equipment*

- Equipment for the detection, identification and authentication of people (wounded, buried alive, ill, deceased or infectious) and dangerous substances (explosives, CBRN, contamination, germs or viri, pollution) do not provide the required performance and cannot assure safety operations of first responders.

- Current decontamination materials and methods used by specialised civil (e.g. fire fighters, civil protection units) and military decontamination units are particularly suitable for limited decontamination activities, (e.g. groups of persons, vehicles, buildings), but lack of a fast treatment for larger areas or larger quantities of people. Furthermore, current decontamination systems have limitations, do not fully neutralize all agents, and are not completely safe and are not appropriate for sensitive equipment (i.e. computers, radio links etc). Strong neutralizers tend to destroy parts of the items decontaminated, including

forensic evidence. Some decontaminants have shelf-life or storage issues, some are flammable, and most are not friendly to the environment and health, which need to be improved by research on novel or alternative materials and methods for an appropriate usability in public areas.

- *Quotations*

The agencies involved in aftermath crisis management have limited budget. Chartering aircraft, in particular for long-range ('strategic') transport often is a matter of finance. In order to decrease the response time while meeting the budgetary constraint it is important to be able to receive different quotations from flight charter companies.

If, on the one hand, a higher budget would help for sure, on the other hand a more efficient use of it would help too (e.g. a system to speed up the reception and comparison of different quotations from flight companies).

- *Positioning/tracking systems*

- Often the actual problem is not the amount of material and personnel but rather the appropriate localization. Each service not only must be able to easily find the resources it needs in the shortest time possible but also those resources that can be available in the shortest time. As a matter of example, it is often difficult to locate chartering aircraft with immediate availability. Taking into account the cross service cooperation, it currently happens that an organization orders material from one of its own facilities although facilities of another organization would be much closer.
- Moreover, available positioning and tracking systems do not provide the required performance (coverage, range, precision) and cannot assure safety operations and effective coordination of first responders.

The availability of effective positioning/tracking system would not only allow to identify in the shortest time the resource able to be employed first but would also facilitate effective command and control of aid relief, emergency services, and personnel movements in devastated areas and to contain the spread of contamination and effect.

- *Situation awareness and command and control (C2) system*

- Every organisation involved in the Management of the Crisis has its own internal structure and chain of command and uses its own legacy C2 and supporting systems. There would be significant benefits by linking together existing (legacy) systems by an "umbrella system" providing all available information (Shared Situation) and support for collaborative planning and decision making to high-level users working in a "Crisis Room" (coordination level)
- The rapidly increasing amount of data (coming from more and more sophisticated sensor systems on the one hand and by means of information sharing with other organisations on the other) needs accurate compilation depending on processes, workflows and most importantly the individual needs of the user.
- When talking of situation awareness, the focus is not only on the crisis managers. Incidents typically involve also reactions of society which are difficult to predict. Persons involved in a crisis suffer from limited situational awareness (SA) as well. Lacking SA or having inadequate SA has been

identified as one of the primary factors causing mass hysteria (which may further and heavily complicate any incident). The fast and uncontrollable spread of information via new forms of social media (twitter, facebook, YouTube, etc.), in parallel to the mass media coverage pose new demands on professional crisis responders and their information policy, which are not yet fully understood.

- *Decision Support System*

- The efficiency and effectiveness of existing Command and Control Systems can be enhanced by intelligent decision support systems. Decision Support tools are needed to:
  - ease the appreciation of the present situation and the prediction of its expected development in the near future to allow to take proper decisions
  - evaluate the impact of a decision (what-if analysis).

- *Communications*

- It can be generally assumed that, after the disaster strikes, the normal communication lines (both terrestrial and mobile telecommunications) are not available due to disruption and/or overload. Till when a communication network is not restored, emergency service resources cannot be effectively fielded and exploited.
- Guaranteed free bandwidth for the Crisis Management teams is required when fixed phone lines have been destroyed and mobile phone networks are overloaded or do not function properly, including interoperability amongst the remaining systems. The quality of transmissions needs to be ensured, as communications may be obstructed by ambient conditions, e.g. environmental restrictions.

- *Interoperability*

Despite it seems there is a great demand for technical interoperability in all of the MS and for all of the services, it is important to separate the operational requirements from the full interoperability utopias. The costs induced by the interoperability are important and increase exponentially with the level of technical interoperability expected. Any Cost Benefit Analysis will show that in a majority of cases, a low level of interoperability ('layered interoperability') is sufficient to perform the tasks and is preferable to the research of complex solutions that are unaffordable.

- *Technological solution affordability*

Currently there is already the widespread awareness that most of the technologies that could be useful in the aftermath crisis management operations are existing and mature. The major (and often the only) problem is that their costs are prohibitive.

- *Search and Rescue (SAR)*

Search and rescue of victims is challenging basically due to the need to assure safety for the responders and the success of the rescue mission, meaning the rescue of a maximum number of people. Existing capabilities for SAR must be improved.

A hazardous environment due to fire, danger of further collapses, contamination, etc. implies the use of unmanned SAR devices (either single or cooperative ones) and their seamless integration into C2/ C4I systems.

### Organization

- *Doctrine and Procedures*

- The leadership structure may require constant adaptation along with the development of the scene. Hand-over procedures together with legal provision controlling the access to information in all phases are required. In particular, as with the growing size of the incident, political considerations are involved.
- Any response force will have to deal with the management of the incident scene. Many different services from several disciplines have to co-operate. An adequate cross-service-shared management of the incident scene is needed to guarantee that all these interests are considered in a best way.
- Due to the unpredictable nature of crisis scenarios, including the possible presence of concurrent triggering events and cascading effect on consequences (e.g. earthquake + tsunami + nuclear incident), procedures must be flexible and adaptable to unforeseen situations.

- *Standardisation*

- *Communication Technology*

The assessment of the current status in Europe shows that interoperability and standardisation of communication equipment is still an open issue, especially when trying to integrate wired and wireless communication systems.

Even if today, there are several technological solution allowing to grant communication in case of crisis, the actual situation is that it often happens that different countries and even different emergency services in the same country make use of different non-interoperable solutions. Harmonization and standardization is very important to allow better crisis communication.

- *Terminology and language barriers*

A big challenge shared among the MS states is the different use of terminology regarding disaster response and recovery.

Examples are:

- a. The definition of zones (hot – warm – cold) changes in the various countries; it can be confusing so that protective equipment and measures used by first responders can result to be insufficient
- b. A category of personnel with the same name (e.g. paramedic) in different countries can correspond to persons with completely different skill and capabilities
- c. An asset (e.g. “field hospital”) can have completely different characteristics in different countries

Establishing lines of communication between public health, law enforcement, private sector partners and others who will be called upon to act in a time of crisis must occur prior to an event. Each partner needs to become familiar with the different cultures of each organisation and the different language spoken by each.

- *Coordination at service, national, EU level*
  - in order to cope with fast developing and changing crisis situations (multidimensional, multi-national, multiagency, spacious or remote, etc.) it is important to improve the ability of all actors to flexibly cooperate with multiple organisations and to identify and develop cross-cultural needs capabilities (e.g. overcoming language barriers) for crisis managers.
  - Differences between the administrative units can cause challenges in collaboration, when a disaster affects more than one administrative unit or cross border assistance is requested. These challenges can, by the way, mirror the situation of the EU with its Member States. Differences between different administrative units can exist e.g. in regard to command and control, training and equipment, and are also due to different exposures to hazards. Moreover, in highly complex civil protection systems (e.g. the Italian one), the coordination matter is often related to the chain of command as sometimes that is not as clear as it should be.
  - One of the most common lesson learned from major crisis is that roles and responsibilities must be identified and must be clear to all the participants before the event as “During a crisis is no time to trade business cards, the best time to make a friend is before you need one”.
  - The coordination with military forces providing security in a crisis is particularly challenging. There is an accepted set of rules for the use of civil protection resources and military assets in response to humanitarian situations, but there is still a large need for constructive development of practical methods of cooperation, especially when the cause of the humanitarian crisis is a conflict, or the crisis takes place in a conflict zone.
  - Credibility and visibility requires the EU and its Member States to respond timely, efficiently and effectively to a crisis situation. The practical implementation of coordinating mechanisms and procedures is a key issue.
  - The coordination of NGOs, or at least the way how ‘coordination’ of NGOs is perceived by professional responders, must be rethought. NGOs are often present on the area of intervention but they are difficult to manage and control, they are not subordinate to any other service. In addition small NGOs usually have no protective or technical equipment and no interpreters for language translation; in addition they are sometimes "fighting" each other.
- *Bureaucracy*

A high level of bureaucracy can prevent immediate actions, e.g. when there are many levels of command and the commands have to pass through all levels.
- *Communication with the citizens*
  - In Crisis Management public acceptance is often a strong political issue; public media have an immense influence on the perception of the performance of the Crisis Management and intervention forces. They may both help and obstruct Crisis Management activities. Communication with the citizen should not only be based on traditional media, but more and more using social media. Authorities need to control the message to population in order to control the emergency situation. Social media is a challenge, since rumours and false

information can spread more quickly, and is picked up then by traditional media.

- *Logistics*

The work of first responders is often limited by the lack of basic services and logistic support. Large scale disasters (especially when the infrastructure is damaged or poor before the disaster stroke) and the response required pose an enormous logistical challenge. It requires the mobilisation of large quantities of goods, in some cases over large distances in poor and sometimes dangerous conditions.

The logistics are, sadly, in some cases the reason for delays in the humanitarian assistance to the people in need. Therefore there is an essential need to develop tools and methods that will speed up:

- the (prioritised) deployment of urgent humanitarian assistance following a large scale disaster;
- the restoration of basic services like energy, water/pumps, communication, medical facilities etc

- *Ethical Aspects*

Ethical considerations can represent a constraints for persons involved in the management of an emergency (some remedial actions could not be allowed, rules for triage are often difficult to apply); due to the number of people affected and the political relevance of a crisis it is not unusual to have criticisms and even prosecutions for activities performed by Crisis Managers and first responders; as a consequence actors can give more importance to their personal safety (e.g. collecting and storing evidence of their behaviour) rather than effectiveness of their work.

## 4.1.2 Ambulance Service

### 4.1.2.1 Responsibilities

Ambulance personnel are trained to work in pairs to give care to a single patient, with each crew operating independently but tasked by a central ambulance control. In day-to-day operations the crew will act on their own initiative without the supervision of an ambulance officer, one taking the role of attendant (directing patient care) and the other assisting care and being responsible for driving. As a consequence, at the scene of a major incident, it is likely that half of the personnel arriving in frontline ambulances will have paramedical skills. The rank structure of Ambulance Service will vary both within and between countries.

The main objectives of the Ambulance service at the scene of a major incident are to provide the best possible care for the injured at the scene and to arrange expeditious transport of the right patient to the right hospital.

More specific responsibilities can vary from country to country but generally include

- Establishing a Forward Control
- Saving Life
- Liaising with other emergency services
- Determining the most suitable receiving hospital (in liaison with the Medical service)
- Mobilising necessary additional medical services

- Providing communications for Health Service resources at the scene
- Providing a Casualty Clearing Station (CCS)
- Providing ambulance parking and loading points
- Determining priorities for treatment and evacuation (Triage)
- Arranging means of transporting the injured
- Documenting the movement of casualties

#### 4.1.2.2 Current Capabilities

- *Training*

Referring to its triage responsibility, the lack of well-trained and/or experienced personnel, very often leads to a "prudent" approach which, in its turn, leads to "over Triage".

- *Specific Equipment*

It is necessary to introduce new bio-dosimetric tools (or improve the existing ones) with improved speed of response and applicability to the triage of very large numbers of people and responders exposed to radioactive material.

Given the diversity of potential radiological events, a range of tools is likely to be needed and an integrated approach – both in terms of hardware and software – should be developed.

### 4.1.1 **Medical Service**

#### 4.1.1.1 Responsibilities

Hospital and primary care medical services are most often arranged around clinical teams and services. Their structure provides care at all levels of activity and urgency and consequently the details of delivery vary enormously from site to site and condition to condition.

Planning is a vital part of the preparedness of a provider unit for a major incident and the key element of planning should be the setting up of the command and control elements of the response. The success of major incident plans depends largely on good control. The ability of the staff to treat casualties is not usually a question.

There is a great deal that the medical service can do to support the Ambulance service in pre-hospital casualty treatment, particularly in the case of a major incident.

Even if specific responsibilities can vary from country to country, the areas in which the medical services can supplement the Ambulance service's role at the scene generally are:

- Provide experienced clinicians to perform a more detailed triage (e.g. triage sort)
- Provide additional personnel to perform advanced airway manoeuvres (e.g. intubation) and obtain venous access
- Take care of the surgical management of the airway (e.g. cricothyrotomy) and life threatening chest injuries
- Take care of the administration of analgesic drugs, local and general anaesthesia

- Emergency surgical procedures (including e.g. amputation to facilitate extrication)
- Determine the most suitable receiving hospital (in liaison with the ambulance service)

It's worth highlighting that the medical response at the scene must be closely coordinated with that of the Ambulance Service and to that end it is essential that the Medical and Ambulance commanders liaise frequently.

In addition to the above responsibilities at the incident location, the Medical Service is in charge of the management of the in-hospital response and psychological support.

#### 4.1.1.2 Current Capabilities

- *Special Equipment*
  - Facilities for Intensive Care are often not sufficient in case of large scale epidemics.
- *Decision Making*
  - Currently decisions concerning contingency planning, procedures effectiveness and casualty regulations are made on the basis of experience, statistical data and live simulations.

There is a strong need for decision support aids, especially for:

- Contingency Planning
- New procedures/doctrines evaluation (e.g. scoop and run vs Stay and play)
- Casualty Regulation i.e. which casualty should be sent to which hospital (Response Phase)
- The polonium incident in 2006 has clearly demonstrated that the existing decision support systems (DSS) for radiological emergency management are not able to deal with such an event. Such incidents are often characterised by an unknown source term (nuclide composition, total activity), little information on the location of the source, time and duration of the release, area and number of people affected. Of particular importance is that there might be no warning phase. The assessment for these incidents can only be partly performed with existing DSS. Radiological Dispersal Device and transport accidents can be described with existing models but specific threats such as contamination of buildings or underground stations are out of their scope at present. The most critical aspect, however, is the ability to provide an assessment without knowing much about the contaminant and the close interaction with the commander in chief at the local level.

- *Coordination*

The hosting capability of each hospital is provided through a contingency plan provided to the civil protection and stating, in addition to other info, the number of red codes casualties that could be hosted in case of emergency.

The possibility to have run-time updated information on hospitals hosting capabilities would put the decision makers in a better position to carry out a more effective casualty regulation.

- *Psycho-social support – intervention strategies*

Affected public and crisis responders have to deal with different forms of stress and other psycho-social strains and traumata; in order to reduce the short-, mid- and long-term consequences of the various forms of stress and psycho-social strains, psycho-social support should be provided in a timely and professional way. Effective intervention strategies and related support should be developed. The challenge is to provide acceptable psychological and psychosocial support to the affected public and the Crisis Management teams, which also could suffer from the traumatic effects of the incident.

## **4.1.2 Police**

### **4.1.2.1 Responsibilities**

In many countries the Police have precedence at the scene of a major incident; that is, they retain overall control. Often, in the presence of a specific hazard (such as fire or chemical spillage), the Police will surrender control of the immediate scene area to the Fire Service.

The responsibilities of the Police at the incident location usually include:

- Establish a forward control
- Ensuring the activation of the other emergency services
- Evacuation of the uninjured survivors still in danger
- Care of the uninjured survivors
- Setting up cordons around the scene to limit public access
- Identification and handling of the dead
- Maintenance of free traffic flow
- Maintenance of public order
- Handling of the media
- Supervision of volunteers
- Protecting the environment and property
- Criminal investigation and enquiries, securing evidence

### **4.1.2.2 Police interactions with Health Services**

The Police can assist the Health Services at the scene of a major incident as follows:

- Assist with team transport either directly or by providing an escort
- Provide communications on the command network at the scene
- Maintain clear transport routes to ensure the uninhibited movement of ambulances
- Provide escorts to individual casualties to hospital
- Supervise the provision of food and drink for the rescuers

### **4.1.2.3 Current Capabilities**

- *Protection*

The Police have to act quickly in critical situations where effective protection is needed and where the officer may need to use force. In these cases their equipment must provide them protection and must be compatible with the performance of the activities that are required in such critical conditions.

Currently, the efficiency of Police Officers suffers from wearing the same protection in all conditions resulting in inadequate and inappropriate protection

- *Specific Equipment*

Weapons used by Police and Law-enforcement agents cannot provide a degree of reaction adaptable to the different missions (types of crisis, evolution) and situations (actual violence of the threats); in addition the reaction level is usually fixed and cannot be graduated. Misuse is difficult to prevent. The need here is for less than lethal weapons for adaptable and graduated response to various threats and situations giving a high degree of compliance with human rights requirements and prevention of misuse

### **4.1.3 Fire Service**

#### 4.1.3.1 Responsibilities

The initial responsibilities of the fire service at a major incident generally include:

- Establish a forward control
- Fighting fires
- Detecting, identifying and containing/eliminating hazards
- Rescuing entrapped casualties
- Clearing routes in and out of the wreckage
- Provide specialist equipment such as pumps, rescue equipment, emergency lighting etc)

#### 4.1.3.2 Fire service interactions with the Health Services

Similarly, the Fire Service can be of assistance to Health Service providers. Possible areas are:

- Provide a safe area to work by removing fire, chemical, electrical or other hazards and by clearing routes into and out of the immediate scene
- Provide skills and equipment to extricate entrapped casualties
- Provide personnel to assist medical procedures (thereby releasing medical staff), such as manual stabilisation of the cervical spine, supporting fractured limbs, squeezing infusion bags etc
- Provide personnel to lift and carry casualties from the incident to the Casualty Clearing Station
- Provide first aid when medical resources are limited
- Assist in applying triage labels under the supervision of a doctor, nurse or paramedic when medical resources are very limited

#### 4.1.3.3 Current Capabilities

- *Specific Equipment*

- When working in dangerous environment first responders are subject to injuries or loss of life; their operational effectiveness and capabilities (e.g. mobility, sensing, cognition and cooperation capability, autonomy, ...) are reduced as a consequence of environment hostility for humans. Robotic platforms with the necessary skills to operate in hazardous environments in place of (or in cooperation with) a first responders team would significantly provide support to this issue.
- It is necessary to improve the available means for containing and limiting the effects of terrorist devices, including CBRNE (Chemical, Biological, Radiological, Nuclear agents and Explosives) and firearms, on the environment.
- There is the need to integrate into the fire fighting arena tools such as air and land space observations.

- *Protective Equipment*

Personnel protective systems are designed to be efficient in the worst environment and against all possible hazards; this results in loss of efficiency when such a protection is not required. One option here would be represented by the availability of modular protective systems and/or adaptive protective materials and systems.

- *Communication*

Current communication equipment does not provide the required coverage inside buildings. Experience has shown that first responders working inside building cannot be alerted in case of danger (i.e. building collapsing). There is the need for equipment allowing indoor communications.

- *Situation Awareness / Positioning /Tracking*

Mobility and visibility in harsh environment can be a problem moreover, not enough information is usually available on building where first responders must operate.

- *Interoperability*

Interoperability issues both in equipment as well as in common operations procedures (between countries) should be studied, and standardisation activities suggested.

- *Legal and ethical aspects*

The legal and ethical aspects of the measures used in the management of the incident (e.g. mandatory evacuation, and the use of force to enforce this evacuation) have to be highlighted

## 4.2 Support Services

The support services are those agencies requested to provide assistance at the scene of a major incident that are not part of the Health or Emergency services. They usually include:

- **Coastguard**

The Coast Guard will have a principal role in coordinating the rescue of casualties from an offshore incident.

- **Voluntary ambulance service (relief organisations)**

There are voluntary ambulance services in most developed countries. They may be mobilised as part of the Health Service major incident plan or by the Police following a request from the Ambulance Service. They usually provide not only additional ambulances to transport casualties to the hospital but also staff to man medical aid posts for minor injured

- **The military**

The Armed services are a source of large numbers of organised, trained and disciplined personnel. In addition to this simple manpower resource (e.g. deployed to reinforce weakened dams in flooding with sandbags), the Armed services have skills that are especially useful when the incident is compound (i.e. when the road, communication, hospital infrastructures are damaged). In such cases the Armed Service can take care of building temporary bridges, prepare landing sites, provide field kitchens, shelter, clean water, erect field hospitals etc. Specialist parts of the military can be of specific assistance to the civil community (e.g. Air Force and Navy for offshore and mountain rescue, evacuation operations, expert planners in case of response to specific risks such as CBRN etc)

Their use may depend upon the geographical location of the incident, the time scale

- **The local authority**

In the acute phase of major incident response, the local authority need to provide assistance to the emergency services and support to the community, namely in taking care of the provisioning of basic services (water, food, clothes, shelter, medicine). In the longer term the local authority will have a primary role in the recovery of the community.

More in detail:

- Initially the response may be to provide e.g. the earth-moving equipment to clear routes, additional lighting, public transport for casualties evacuation, shelters for rest centres etc;
- Over weeks or months the local social services will continue to care for survivors. Cleansing, environmental health, housing, public works, and building departments may all be involved in the recovery phase.

- **Voluntary societies**

Many voluntary societies can provide practical support such as "tea and sympathy" and in the context of a major incident this support for the emergency services at the scene should not be undervalued. Staff work more efficiently in an uncomfortable environment when they are rested periodically and have access to food and drink. These periods of rest may also be the first opportunity for the rescuers to talk to each other and to begin the debriefing process. This will be facilitated by the supportive atmosphere these organisations generate.

## I Annex Abbreviations and Acronyms

Abbreviation/ Acronym	Description
AB	Advisory Board
CCS	Casualty Clearing Station
CM	Crisis Management
CP	Civil Protection
FR	First Responder
HS	Health Service
MS	Member State
CBRN	Chemical, Biological, Radiological, Nuclear, ,
NGO	Non Governmental Organisation
PMP	Project Management Plan
PPE	Personnel Protection Equipment
SAR	Search And Rescue
WP	Work Package