Project acronym:	COSMIC
Project title:	The Contribution of Social Media In Crisis management
Grant number:	312737
Programme:	Seventh Framework Programme – Security Research
Objective:	SEC-2012.6.1-3
Contract type:	Coordination and support action
Start date of project:	01 April 2013
Duration:	24 months
Website:	www.cosmic-project.eu

Deliverable D1.3:
Report on the role of main stakeholders in crisis situations

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Dissemination level:	Public
Deliverable type:	Final
Version:	1
Submission date:	Due 30th November 2013

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Change Records

Issue	Date	Description	Author (Company)
0.1	17/09/2013	Chapter 2,4,5	Manfred BLAHA (PSCE) Marie-Christine BONNAMOUR (PSCE) Robert MISKUF (PSCE)
0.2	2/11/2013	Chapter 2,4,5 updates	Manfred BLAHA (PSCE) Marie-Christine BONNAMOUR (PSCE) Robert MISKUF (PSCE)
0.3	13/11/2013	Chapter 3 Introduction chapter	David de Vries (RUN) Jelle Groenendaal (RUN) Ira Helsloot (RUN)
0.4	24/11/2013	Internal review, revised structure, draft conclusions	David de Vries (RUN) Marie-Christine BONNAMOUR (PSCE)
0.5	26/11/2013	Executive summary, revision of Chapter 3 and conclusion	David de Vries (RUN) Jelle Groenendaal (RUN) Ira Helsloot (RUN)
0.6	27/11/2013	Final check	Marie-Christine BONNAMOUR (PSCE)
0.7	27/11/2013	Introduction – revision	Marie-Christine BONNAMOUR (PSCE)
0.8	27/11/2013	Final copy	David de Vries (RUN)

EXECUTIVE SUMMARY

The purpose of deliverable 1.3 "Report on the role of main stakeholders in crisis situations" is for COSMIC to examine the role of the different emergency response agencies before and during crisis situations, and to focus on the communication challenges they face during those situations. The presentation of two case studies illustrates the differences between various services throughout the European Union and identifies common challenges. This is followed by an examination of the different emergency services – the fire department, health services, and the police – as well as other organisations (such as private companies, NGO's and volunteer organisations), in which the aims of the COSMIC project are considered. The central question in this deliverable is: how can emergency agencies as well as the general public benefit from new and emerging information technologies and applications in the event of a crisis?

The report shows that new and emerging communication technologies may benefit the safety and security of EU citizens in two different ways:

- First, new and emerging communication technologies and applications may be used to improve the communication with EU citizens and news media before crises (risk communication) and during crises (crisis communication).
- Second, new and emerging communication technologies and applications may be used to assist communication and information gathering for emergency response agencies as well as information sharing between those who respond at the scene of the event (first responders).

Though emergency response agencies differ in organisational structure, funding and tasks throughout Europe, partners have investigated several common communication challenges. These challenges are:

- Understanding of disaster management among the public
- Evolved management of information to the media and the public
- Early warning capabilities
- Acquisition of information from external sources
- Efficient ways to gather data from responders
- Volunteer management
- Harmonization of language and terminology
- Sharing and implementing lessons and best practices
- Interagency information sharing
- Responder communications in remote areas
- Retention of information and log-keeping
- Psycho-social support, intervention strategies
- Coordination challenges

Aside from the organisation and tasks, these challenges are more or less relevant for every emergency response agency. However, for every agency, several specific challenges can also be distinguished. This particularly applies to the fire department, as this service is often regarded in European member states as the key player in crisis and disaster management. Specific challenges that are emphasized in the chapter on the fire department include communication with citizens located within buildings, communication with citizens in areas

that are difficult to access and communication with citizens during specific types of disasters, such as major fires or forest fires. Examples of the use of new technologies and applications show how the fire department tries to handle communication challenges.

After all, particular conclusions are drawn for the different agencies and organisations involved in, on the one hand the preparation phase of crisis management, while on the other hand the response phases:

- Police, fire department and health services are organised differently throughout the European Union. Differences in legal shapes and forms of governments affect what emergency response agencies can actually do in the event of a crises. Furthermore, the communication challenges they face depend on the tasks they have.
- Despite the differences, the opportunities for improvement for the emergency response agencies are quite comparable, both between different types and different EU member states. New technologies and applications can improve risk communication, crisis communication as well as prediction capabilities of crisis situations in different member states.
- The effectiveness of risk and crisis communication is often unrelated to the device or technology that is utilised, but rather related to how it is used. Often, the speed with which messages and information are made and communicated is essential.
- Challenges that emergency response agencies need to overcome in order to benefit from new and emerging technologies and applications are quite universal for EU member states and between different emergency response agencies.

1   INTRODUCTION

In D1.3, partners will define and characterise the role of the typical emergency response agencies in crisis management. The reason we describe the emergency response agencies is to get a better understanding of the (sometimes contrasting) ways these agencies, together with the general public, may benefit from information technology and applications in the event of a crisis. When relevant, the roles of these actors are examined in relation to the types of crises (inside and outside of the European Union) that are outlined in the previous tasks of this work package. Crisis management is subdivided into different phases. In general: preparation, warning, response and recovery.[1] This chapter will describe the different phases, including possible communication challenges. After the coupling of actors and phases within crisis management, we will look at the way in which communication takes place in several phases. This concerns both the communication between operational professionals and different agencies, as well as between emergency workers and citizens. In the report outline (section 1.3) partners briefly describe the content of the different chapters in this report.

1.1   TYPES OF CRISES, PHASES OF CRISIS MANAGEMENT AND COMMUNICATION CHALLENGES

The emergency response agencies that we have distinguished are the police, the fire department, health care services and other actors (such as voluntary organisations and utility companies). For each of these emergency agencies the following questions are answered:

- What are the specific characteristics, considering the aims of the COSMIC project?
- What are the differences in organisation, tasks and structure of the specific emergency response agency, between different countries in Europe?
- Which challenges rise regarding the communication, both internally (between workers) and externally (between different agencies and between workers and citizens and otherwise).
- Which new and social media can solve problems and challenges and which technologies are used by the several emergency response agencies?

Often times when disasters occur, they are a 'flash crisis' in the sense that they were unexpected and could not be anticipated. Similarly, the classical 'flash disaster' can be described as an unexpected and immediate occurrence of an accident, where at least some 10 victims emerge.[2] When the first symptoms of a crisis are visible beforehand, it's called a 'creeping crisis'. A flood is a typical creeping crisis. The difference between these two kinds of crises has an impact for the expectations from citizens of emergency services and otherwise. Some examples are:

- During a flash crisis, an almost inevitable shortage of emergency capacity and personnel is visible; victims have to rely on themselves to survive. This information has to be communicated; however, it's difficult to predict and expect a flash crisis.

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[1] Watson, Hayley, Kush Waswha, Rachel Finn, Ioannis Kotsiopoulos, Angelos Yannopoulos, Jelle Groenendaal, Arjen Schmidt, David de Vries, and Ira Helsloot, "Deliverable D1.1: Report on security crises with high societal impact", *Deliverable 1.1 of the COSMIC project,* 31 July 2013.
[2] Helsloot, I. and, A. Ruitenberg, "Citizen Response to Disasters: a Survey of Literature and Some Practical Implications", *Journal of Contingencies and Crisis Management,* Vol. 12, Issue 3, September 2004, p. 107.

- If the capacity of medical aid is limited, medically trained individuals can play a role in first aid. When the assessment is made that citizens can be the first responders after a flash crisis, it's important to implement this information in training and exercises.
- During disasters with a warning period, personalised advise and appeal to citizens response whenever possible and necessary.[3] If threats are communicated well, citizens will understand the situations and take the appropriate actions. In the period before a disaster, the scale of the disaster can depend on the actions of citizens.
- In general: during flash crises sufficient risk communication is difficult. Citizens can be better prepared in the period before a creeping crisis.

Implications of the difference between flash and creeping crises for risk and crisis communication	Flash crises	Creeping crises
Emergency services	Capacities will be relatively low; communication and cooperation between services has to be efficient for an optimal utilization of capacities.	Emergency services have time to prepare themselves for a crisis. In cooperation with citizens, they can determine which procedure is the best to cope with the challenges of a crisis.
Citizens	Citizens have to be informed about the importance of self and familial reliance during flash crises. Preparation for crises in general is possible, preparation for specific crises isn't.	More preparation and risk communication is possible. Providing sufficient information to citizens and the communication of perspectives for action can reduce the impact of a disaster.

In most situations, actors involved (such as emergency agencies) can prepare themselves for the consequences of a crisis, even when it's a flash crisis. General preparations have to be made. However, during the startling London Attacks in 2005, this was relatively more difficult than during storm Xynthia in France (2010), in which the first symptoms of the upcoming disaster were culminating for days.[4] Furthermore, even when professionals are sufficiently prepared, the same may not be true for ordinary citizens. For members of response agencies it's one of their core tasks to evaluate risks and be adequately prepared, but for a lot of citizens the first time they think about risks is the moment a disaster or crisis occurs. This knowledge has large implications for the impact risk and crisis communication can have. Citizens have to be informed about risks, preparations of emergency services and perspectives for action. It is for this reason, besides internal planning, that the different agencies have to keep in mind the importance of external communication. Improper risk and crisis communication can make the situation significantly worse. In every phase of a crisis, described below, precise attention is needed to the impact and the consequences of the level and quality of crisis communication. The different phases are:

1) *The preparation phase.* During this phase, plans are established and systems are developed. For every emergency agency, it's important to get in touch with the community, which should not only be informed, but also can be used in crisis management. As D1.1 revealed, the community is a dynamic place during crises, including the self-resilience of citizens. In a resilient society, citizens can help themselves often, thus risk and crisis communication have to be focused on that knowledge.

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[3] Ibid.
[4] Watson, Hayley, Kush Wadhwa, Jelle Groenendaal, David de Vries, and Alex Papadimitriou, "Report on search and rescue actions", *Deliverable 1.2 of the COSMIC Project,* 30 September 2013.

2) *The warning phase.* This phase is the first that occurs after a disaster strikes. An emergency call comes in via 112, or alternatively through social media.[5] Several actors have differing roles. First responders and volunteers arrive at the disaster scene and they can deliver the first help. These first responders can be citizens, in which informative new applications that deliver information to citizens can be a useful instrument to facilitate and accelerate first help. The development of new 'emergency technologies' – like 112 by social media – and technologies by which first responders can communicate can be useful in this phase.

3) *The response phase.* In this phase emergency services are busy with search and rescue operations and medical care is provided to the victims that need that service the most. For the different agencies described in this deliverable, the communication between each entity is important. Duplication should be avoided and services must be able to spread to be effective. In addition, communication with citizens can be usefully for managing expectations. After all, not everyone can be helped in the first hours after the chaotic phase; that knowledge has to be communicated and because *traditional* communication technologies fail sometimes during crises, new technologies and applications can solve this problem.

4) *The recovery phase.* This is the period in which the society has to be rebuilt. As citizens are still affected by the disaster period, a dialogue should be conducted, between government and emergency services and the public. Line by line, the period of preparation and awareness and the matching challenges will be actually again.

1.2   COMMUNICATION DURING DIFFERENT PHASES OF A CRISIS

The core aim of the COSMIC project is the identification of the most effective ways to utilize new information and communication technologies in crisis situations for the protection of ordinary citizens. It's important to distinguish communication types in different phases of crisis management from each other. To stress the difference between these two forms of communication, we present two frequently referenced definitions:

- Risk communication is 'the flow of information and risk evaluations back and forth between academic experts, regulatory practitioners, interest groups and the general public'[6].
- Crisis communication is 'the collection, processing, and dissemination of information required to address a crisis situation'[7].

Robert R. Ulmer distinguishes crises and risks, along with risk communication and crisis communication, 'while risk is a natural part of life, crisis can often be avoided'[8]. Coombs on the other hand describes the communication in the pre-crisis phase as 'crisis communication': In pre-crisis, crisis communication revolves around collecting information about crisis risks, making decisions about how to manage potential crisis, and training people who will be involved in the crisis management process. The training includes crisis team members, crisis spokespeople, and any individuals who will help with the response. While risk

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[5] If an emergency is reported via social media, there might be a problem with the identification of the caller.
[6] Leiss, William, *In the Chamber of Risks: Understanding Risk Controversies.* McGill Queens's University Press, Montreal, 1996, p. 388.
[7] Coombs, W. Timothy, "Parameters for Crisis Communication", in W. Timothy Coombs, and Sherry J. Holladay (eds.), *The Handbook of Crisis Communication,* Wiley-Blackwell, Chichester, West Sussex, 2010, p. 20.
[8] Ulmer, Robert R., Timothy L. Sellnow and Matthew W. Seeger, *Effective Crisis Communication. Moving From Crisis to Opportunity,* Sage Publications, Thousand Oaks, 2011.

communication initially was a top-down process, nowadays it's a "two-way risk communication", a dialogue between public, stakeholders and experts about what to do when a crisis occurs. The 'two-way property' is visible in the scheme below, during the preparation and warm phases. Thus, when the emergency response agencies have to act in their preventive roles, the communication is focused on the investigation and distribution of the information about risks. This can be communication between crisis management professionals as well as communication between professionals and citizens to inform them about perspectives on action. Or, as Coombs formulates: crisis communication includes the collection and processing of information for crisis team decision-making along with the creation and dissemination of crisis messages to people outside of the team (the traditional definition of crisis communication).[9]

Phase of crisis management	Prevention or repression?	Form of communication	Internally or externally	Communication between which actors?
Preparation	Prevention	Risk Communication	Internally	Professionals ⮀ Agencies ⮀
			Externally	Professionals ⮀ Citizens
Warning			Internally	Professionals ⮀ Agencies ⮀
			Externally	Professionals ⮀ Citizens
Response	Repression	Crisis Communication	Internally	Professionals ⮀ Agencies ⮀
			Externally	Professionals ⮀ Citizens
Recovery			Internally	Professionals ⮀ Agencies ⮀
			Externally	Professionals ⮀ Citizens

1.3   REPORT OUTLINE

This deliverable contains seven chapters and will proceed in the following manner. After this introduction, several chapters will detail the various emergency agencies, all of which take into consideration the aims of the COSMIC project. Firstly in chapter 2, partners have examined two case studies (Italy and Germany), to illustrate differences in legal forms, structure and organisation of agencies throughout the European Union. Despite these differences, emergency agencies often face the same communication challenges. These challenges are described in chapter 3. In chapter 4, partners have examined the role of the fire department in crisis management. As the fire department is often regarded in European member states as the key player in crisis and disaster management, most attention is devoted to describing the organisation of the fire department as well as the challenges they face with risk and crisis communication. In chapter 5, 6 and 7, specific communication challenges for the police, health services and other actors (such as humanitarian organisations, NGO's and volunteers) are described. For every emergency agency examples are shown as to how they handle these challenges with the utilisation of new, emerging technologies and applications.

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[9] Coombs, W. Timothy, "Parameters for Crisis Communication", in W. Timothy Coombs, and Sherry J. Holladay (eds.), *The Handbook of Crisis Communication,* Wiley-Blackwell, Chichester, West Sussex, 2010, p. 20.

This report will conclude in chapter 8, where partners will provide a summary of key findings in the area of communication challenges.

2   CM: DIFFERENCES IN THE EUROPEAN UNION

The extremely rich diversity that Europe enjoys in language, culture, and traditions, is also a pattern that can be found when assessing first responders´ institutional set-ups and legal framework systems within the variety of member states that shape the EU. Different national views on how to organize first responders, different types of hazards affecting the countries, and historically diverse bilateral or multilateral relations with neighbouring countries, are only some of the components that contribute to this diversity.

The ways the European countries organize their institutions and forms of government exercise direct effect on the organisation of their first responders' legal and political framework systems. **The different legal shapes and forms of governments existing in the EU member states play a relevant role within the legal and institutional European *first responders' diversity*.**

In addition to the forms of government, the frequency, quantity, and types of hazards that can strike a country, as well as its practice of receiving or donating assistance, are crucial elements that influence how national legal and institutional systems of civil protection are to be organized.

Federal States, such as <u>Germany</u>, in which power is divided between regional/provincial and federal structures [the *Länders* (states) and the central government), tend to decentralize the attribution of competences and power share in civil protection. The decentralization of the German civil protection system is based on subsidiary principle and has its legal basis in the German constitution. The states possess a high degree of autonomy and receive revenues from taxes. **In case of a disaster, the first authority in charge is the lowest administrative level, e.g. the municipality**. Only if boundaries of this authority are exceeded or the capabilities are not sufficient, the next highest hierarchical authority takes the coordination.

In contrast, countries such as <u>Italy</u>, in which the power tends to be more centralized and regions are less autonomous (especially from a financial perspective), are more suitable to retain the legislative competence in civil protection matters in a central institution (can be a Ministry or a Department) conferring only residual competence to the remaining regions. In countries where the regions or states do not enjoy fully constitutional autonomy are also generally ruled by subsidiarity principle; however, **the first and final saying (decision power) within the chain of command is rather more centralized.**

It would be presumptuous to suggest that the countries exemplified here cover all legal systems that exist in Europe; rather the decision to choose these countries seeks to assess common legal features and synergies that these civil protection systems possibly share with other countries of the Union.

However, despite the rich legal diversity, all these systems are united by two clear trends. The first is clearly recognized at <u>European Level</u> and lays its foundations at the Commission Communication adopted with the main goal of strengthening European Disaster Response Capacity[10]. The second trend is <u>global</u>, being followed by the various countries worldwide, wanting to achieve better and more efficient risk and disaster management mechanisms due to the increasing magnitude and frequency of the natural catastrophes.

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[10] http://europa.eu/legislation_summaries/environment/civil_protection/ah0007_en.htm

There is also a trend which seeks for a balance between sovereignty and subsidiary. This constant struggle shared by the legal systems of all the EU Member States is also reflected in their national disaster response institutional organisation. It exercises different effects on their political system and their positions on the role of the EU. **The two case studies below provide examples of models of first responders' organisational architectures in EU, which directly impacts how the police, fire brigades and emergency medical teams work during crisis situations.**

2.1   CASE STUDY: GERMANY

Background: Germany and its federal structure

Germany is a federal republic consisting of 16 constituent states (*Bundesländer* or *Länder)* (see figure 1). States have their own government and parliament and possess a high degree of autonomy, especially in the areas of education, **police**, local administration, transport, some medical measures. They receive income gained through taxation (revenues). The states participate in legislation through the constitutional organ "Bundesrat", along with administration and European Union activities. Subsequent governmental levels are the administrative counties or county boroughs, combined with administrative districts and the municipalities[11]. The municipalities administrate *inter alia* local transport and road construction, electricity, water and gas supply, sewerage and daily life protection[12]. The principle of subsidiarity has to be applied wherever possible. As given in the German Basic Law (*Grundgesetz*, comparable to a constitution) and in the Treaty of Lisbon, the states play an active role in the decision making process regarding the German EU policy[13,14].
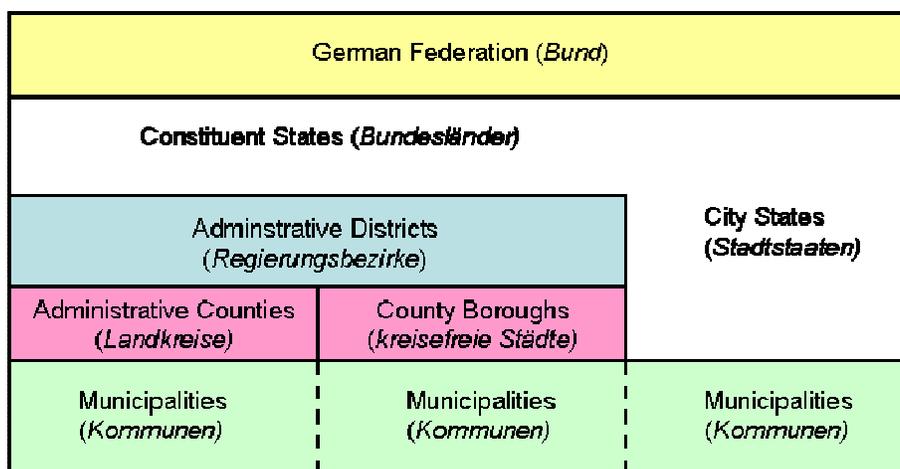
Figure 0-1: Administrative organisation Germany

Crisis Management Institutional Set-up

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[11] International CEP Handbook 2009, Civil Emergency Planning in the NATO/EAPC Countries: Swedish Civil Contingencies Agency, pp. 99-104

[12] http://ec.europa.eu/echo/civil_protection/civil/vademecum/de/2-de-1.html#over

[13] Grundgesetz für die Bundesrepublik Deutschland (German Basic Law), 23 May 1949.

[14] Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, 3 December 2007.

In Member States with decentralized CM systems, responsible institutions are established at the national and sub-national level. As mentioned above, the most relevant sub-national level in Germany is at the state level.

Crisis Management at national level

"Highest" authority on a national level is the Federal Ministry of the Interior (BMI), assisted by the Federal Office of Civil Protection and Disaster Assistance (BBK) and the German Federal Agency for Technical Relief (THW). For crisis abroad, the Federal Foreign Office is the institution in charge.

During a peacetime disaster in which several states are affected, or during a long term crisis, the BMI may set up an inter-ministerial coordination group consisting of representatives of the BMI and other Federal Ministries, depending on the type of disaster (typically the contact person for CM and counter-terrorism). The Federal Ministries are prepared to request specific task forces at short notice, especially the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), in the event of serious threats that involve the illegal use of radioactive materials, and the Federal Ministry of Health (BMG), in the event of pandemics or bioterrorism.[15]

The BBK conducts conceptual work on fundamentals in crisis management, including the evaluation of missions, exercises and findings in research. In addition, the BBK provides operational instruments:

- **A Joint Information and Situation Centre (GMLZ) for efficient coordination of large area disasters**
- **An Emergency Prevention Information System deNIS I + II**
- **A warning centre with a satellite based warning system (SatWaS)**
- **A Centre for the coordination of aftercare and for support of victims and their relatives (NOAH)[16]**

During a military crisis the states are responsible for coordination within their respective areas, the BBK gives respective orders. The federal planning in this case consists of measures to ensure continuity and social functions (continuity of government, civil protection, supply of goods and services, support of the armed forces).

The capability for Civil-Military Cooperation (CIMIC) has to be ensured at all ministerial levels, including planning, training, and exercises. The BBK's Academy for Crisis Management, Emergency Planning and Civil Protection provides obligatory education for CIMIC personnel of the Armed Forces. Regular discussions of preparations for peace and war times between civilian and military authorities are conducted.[17]

Crisis Management at sub national level

In Germany, the first authority in the event of a local peacetime disaster is the rural district, county or municipality. Respective authorities manage local response assisted by (if

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[15] http://www.bmi.bund.de/SharedDocs/Downloads/DE/Themen/Sicherheit/BevoelkerungKrisen/system_krisenmanagement_en.html

[16] http://www.bbk.bund.de/DE/AufgabenundAusstattung/Krisenmanagement/GrundlagenKrisenmanagement/grundlagenkrisenmanagement_node.html

[17] International CEP Handbook 2009, Civil Emergency Planning in the NATO/EAPC Countries: Swedish Civil Contingencies Agency, 2009, pp. 99-104

necessary) representatives of other authorities, services or organisations. **For the technical and tactical execution a director of operation, assisted by a staff composed of the involved organisations and units (e.g. police, fire department, non-governmental organisations or private enterprises) is appointed.** In case a disaster exceeds capacities of the local government or affects several districts, the next highest hierarchical authority ensures coordination.[18]

If needed, a state can call for the assistance of police forces from other states or personnel and facilities of other administrative authorities, from the Federal Police or the armed forces. Furthermore, the THW may also be called upon.

In 2001, it was decided to develop a new strategy for "protecting the population". Amongst others, the states agreed in this strategy on **standardizing recommendations for command and control structures** (e.g. through a common "Fire Services Regulation 100"; guidelines for setting up administrative-organisational task forces).[19]

In general, civil protection and disaster management in Germany to a large extent is based on the availability of people with a honorary post. This leads to a comparatively high degree of basic tolerance and independence.

Figure 0-2: Structure of Civil Protection in Germany (peace times)

2.2   CASE STUDY ITALY

Background: Italian Organisational Structure

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[18] International CEP Handbook 2009, Civil Emergency Planning in the NATO/EAPC Countries: Swedish Civil Contingencies Agency, pp. 99-104

[19] Bundesministerium des Innern (2010): The Crisis Management System in Germany, found at: http://www.bmi.bund.de/SharedDocs/Downloads/DE/Themen/Sicherheit/BevoelkerungKrisen/system_krisenmanagement_en.html

Italy is divided into 20 regions, 110 provinces and about 8,100 municipalities. Provinces are administrative sub-divisions of regions. The Prefect is the civil protection authority at the provincial level, an administrative position, appointed by the Minister of Interior. Since the constitutional reform of 2001, regions have legislative, as well as, administrative powers.

The regions have exclusive legislative power <u>with respect to any matters not expressly reserved to state law</u>. As opposed to Germany, however, their financial autonomy is quite modest: they keep 20% of all levied taxes.[20] The mayor is the responsible authority on local level.

The legal and institutional set-up of the Italian crisis management system depicts that there are gaps to be overcome and challenges to be faced. The civil protection department position is **directly under the Italian government and the Prime Minister, with fully integrated scientific research and technological expertise in its organisation. This gives the national civil protection service the very best conditions and capability for CM for the Italian national territory[21].**

Similar to what happens at the EU level, the evolution of the legislative and institutional set-up of Italy is driven by the numerous events that had stricken the country. While these events have left a trail of fatalities they have also raised key points on lessons learned, adaptation/ implementation of new institutional set-ups that have prompted constant improvements in the preparedness, prevention, response and recovery in the aftermath of a crisis.

The Italian civil protection as it is internally perceived is based on the legislative background: "*Civil protection in Italy is not a structure, but an integrated system that allows the coordinated use of all available state and private resources. The operational structure set-up in case of major disasters takes into account the administrative organisation of the country. The general mission of national civil protection is, both at central and local levels, to protect the lives, goods, properties and environment from damage or threats caused by natural and technological disasters and other calamities.*"[22]

As previously mentioned, the responsibility to decide civil protection policies is assigned to the president of the Council of Ministers, or to the Minister of the Interior appointed by him. In general, when there is a disastrous the department of civil protection within very short time is able to define the significance of the disaster and to assess whether local resources are sufficient to manage the event. In case of necessity, support to provinces, regions and municipalities will be guaranteed. In the most serious situations, the department of civil protection takes over the overall coordination of the operations, while all concerned authorities at regional, provincial and municipal levels perform their specific roles.[23]

Civil protection activities are distinguished according to three basic categories:

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[20] Vademecum for Civil Protection, EU Commission, Humanitarian Aid & Civil Protection, found at: http://ec.europa.eu/echo/civil_protection/civil/vademecum/it/2-it-1.html#over
[21] OECD Reviews of Risk Management Policies: Italy 2010, Review of the Italian National Civil Protection System, DOI: 10.1787/9789264082205-en
[22] Found at: http://www.protezionecivile.gov.it/cms/attach/brochuredpc_eng2.pdf
[23] Vademecum for Civil Protection, EU Commission, Humanitarian Aid & Civil Protection, found at: http://ec.europa.eu/echo/civil_protection/civil/vademecum/it/2-it-1.html#over

- *Forecast and prevention*: According to the identification type and the distribution and probability of risk occurrence. Strong actors in the implementation of these activities are the National Research Community that is part of the operational structure of the Italian civil protection department and the local and regional authorities[24].

- *Rescue and assistance to the population involved*: This phase requires fast and immediate intervention following the breakout of an emergency and requires immediate response by the civil protection. There are important roles of coordination and strong leadership.[25] **The numerous incidents of emergency exposed in Italy the need for centralization of the coordination and leadership.** This was a "must" in order to give immediate and efficient response in the aftermath of a crisis.[26] According to the OECD Reviews of Risk Management Policies: "*There are clear tendencies in different countries of a development toward following the Italian line that focuses on a central government involvement and enhance co-ordination between safety and security government administration even at a common location*".[27]

- *Overcoming the state of emergency and recovery of the socio-economic system*: Refers to the phase that provides welcoming structures and assistance to the affected population, the recovery of essential services, structures and productive activities in order to guarantee as far as possible the return to ordinary living conditions.[28]

The above activities are implemented by the national service of civil protection components and national operational structures, such as the National Fire-Fighters Corps, the police and the armed forces, the State Forest Corps, the Italian Red Cross, the National Health Service, the National Alpine Rescue Corps, the volunteer forces, the state administrations, the regions, the provinces and municipalities, the technical-scientific experts and private institutions and organisations. Intervention activities involving rescue operations are coordinated by the operational committee, including the administrations and institutions involved at national and local levels[29].

Based on the principle of subsidiarity, in each municipality, the first person responsible for civil protection is the Mayor, who organises municipal resources according to pre-established procedures created to cope with specific risks in his/her territory.

However, when a disastrous event occurs, the national authority is the one responsible to define the event's significance in a very short amount of time and must assess whether local resources are sufficient to mitigate the impacts. As determined by necessity, the support of provinces or regions and the assistance of peripheral state administrations will be guaranteed and coordinated by the Prefects.

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[24] Expert interview on the Italian Civil Protection Department.
[25] Vademecum for Civil Protection, EU Commission, Humanitarian Aid & Civil Protection, found at: http://ec.europa.eu/echo/civil_protection/civil/vademecum/it/2-it-1.html#over
[26] Expert interview on the Italian Civil Protection Department.
[27] OECD Reviews of Risk Management Policies: Italy 2010, Review of the Italian National Civil Protection System, p. 104
[28] Vademecum for Civil Protection, EU Commission, Humanitarian Aid & Civil Protection, found at http://ec.europa.eu/echo/civil_protection/civil/vademecum/it/2-it-1.html#over
[29] Vademecum for Civil Protection, EU Commission, Humanitarian Aid & Civil Protection, found at http://ec.europa.eu/echo/civil_protection/civil/vademecum/it/2-it-1.html#over

When realizing that the nature of the crisis is exceeding the limit of the regional and local resources, the status of emergency can be declared per Prime Minister´s decree and follows the illustrated dynamics.
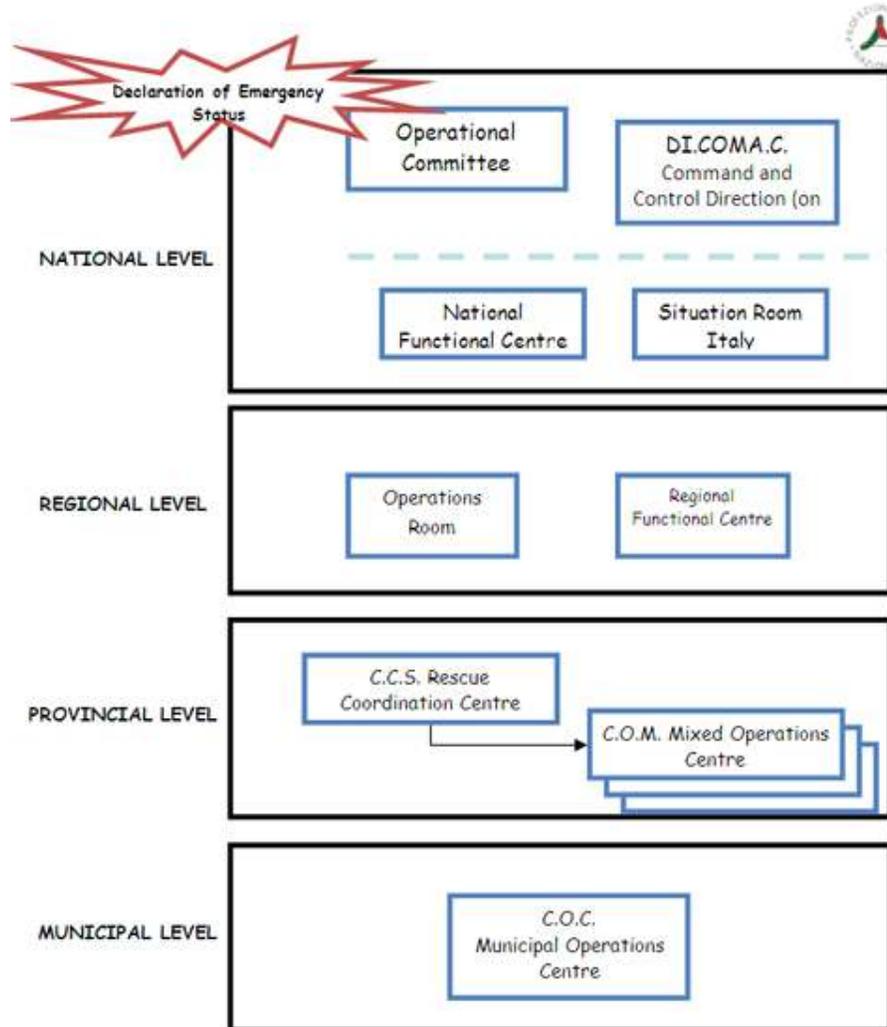
Figure 0-3: CM organisational structure in Italy

3   CM: IDENTIFICATION OF COMMUNICATION CHALLENGES

3.1   UNDERSTANDING OF DISASTER MANAGEMENT AMONG THE PUBLIC

Title:	Understanding of disaster management among the public

Background

The public are imperative actors in disaster response through a variety of roles.

When disaster strikes, it will affect population carrying out significant relief efforts, both independently and in support of the first responders' organisations. The public also plays a major role in preparatory phases, for example as a source of funding. However, more importantly, the legitimacy of official relief agencies derives from the support of the public. An adequate understanding of disaster management will allow the public to play these roles efficiently and efficiently, therefore strengthening **overall disaster management capacity.**

Improvement opportunity:

Develop tools and solutions that **promote better understanding** among the public about:
- Risks and how they can be mitigated
- The characteristics of disasters
- How to act in different types of disaster
- How the public can support the authorities in disaster situations

Develop tools and solutions that promote better understanding with the public about how response agencies work, for example with respect to:
- Policy choices
- Training needs and volunteer policies
- Funding needs for different types of activities

Constraints:

The fact that the legitimacy of public agencies relies on public support needs to be taken into consideration. The public as such is not homogenous, as it is a group of different communities with different backgrounds, cultures, interests, perceptions, etc., which require tailored information.

The opportunity from different perspectives

Procedures and organisation:

- Develop procedures to effectively engage with the public in preparatory activities, including the identification of the appropriate levels of engagement, with regards to risks associated with such engagement (Red Cross USA[30])
- Social media listening tools (2012 opening of a digital operations centre for humanitarian relief)
- Develop procedures for educating and informing the public

Personnel:

Identify training needs

Technology:

Provide dissemination and presentation tools and platforms
Provide tools that support public participation in training and exercises

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[30] http://breakinggov.com/2012/03/07/red-cross-launches-social-media-ops-center-for-humanitarian-reli/

3.2   EVOLVED MANAGEMENT OF INFORMATION TO THE MEDIA AND THE PUBLIC

Title:	Evolved management of information to the media and the public

Background
Reaching out to the public can be an important aspect of CM activities. The purpose of interaction might be to allow people to support the response, to calm people, to avoid interference with the response effort, to minimize the inquiries to active responders, or to encourage desirable behaviour. The media plays an important role in this process, and without active management the information flow from the CM to the public, the situation can become unpredictable and unreliable. This effect has been reinforced by the evolution of the media in the last decade towards a more social, distributed and participative character. Management of the media includes both monitoring the current reporting, to discover possible inaccuracies or misinformation, as well as active provision of information. The management of information with the media and the public has an intrinsic cross-agency character, since conflicting information coming from different agencies can cause serious problems.
Improvement opportunity:
Improve the ability of CM to assure effective flows of validated, balanced information to the public.
Constraints:
– Democratic aspects of the government/media relation must be taken into account – Privacy aspects must be taken into account – Cultural on social differences between countries and regions should be taken into account Significant research is already available within this area, and COSMIC should take into account the latest developments when preparing the corresponding guidelines.
The opportunity from different perspectives
Procedures and organisation:
– Develop agreed (both between agencies and with the media) procedures for media management, including responsibilities, development of information packages and management of dissemination channels – Develop methods and procedures for media monitoring
Personnel:
Identify training needs for public relation (PR) / media relation personnel
Technology:
Provide suitable technical means to distribute information to the public. This could include the use of mobile networks, social media and other forms of information infrastructure. Provide technical means to support the media management process
Related opportunities:
Better understanding of disaster response among the public, Volunteer Management[31].

3.3   EARLY WARNING CAPABILITIES

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[31] See Chapter 5 for more information.

Title:	Early warning capabilities
Background	
In most disasters, time is a critical factor and the earlier response can commence, the less difficult the operation will be. To be able to use response assets as effectively and efficiently as possible makes it increasingly important to obtain warning and information about oncoming crises as early as possible. Early warning will provide better conditions for the response to any disaster, but it is of particular importance in disasters that can be prevented or mitigated by early intervention, such as forest fires.	
Improvement opportunity:	
- Improve prediction capabilities of different disasters, particularly those where early warning can help prevent the disaster or minimise its consequences, such as fires. - Improve the early detection of oncoming disasters - Improve dissemination of disaster alerts and the cooperation between agencies and between agencies and scientific institutes (Hydrology, Seismology etc.)	
Constraints:	
There are numerous early warning systems already in place, both overarching and relating to specific disaster types. Duplication of these should be avoided.	
The opportunity from different perspectives	
Procedures and organisation:	
Develop methods that allow for early detection or prediction of disasters Develop mechanisms for the dissemination of early warnings	
Personnel:	
Methods need to be supported by adequate training	
Technology:	
Develop tools supporting prediction or detection Develop tools that support dissemination of early warnings	

3.4   ACQUISITION OF INFORMATION FROM EXTERNAL SOURCES

Title:	Acquisition of information from external sources
Background	
Command, coordination and awareness in disaster management require information from a range of sources. Key assets are, of course, the resources available of the different first responder organisations, both human and technical ones. However, the importance of external information resources is constantly growing (e.g., the press, the population in an area, or the public at the scene of the disaster area). Social networks, cellular networks, catalogues such as yellow pages, photo and video "crowd sourcing", the respective social media, and (local) government databases providers are other examples of such sources. The main point is the requirement of a solid information management system.	

Improvement opportunity:	

– Understand the ways to quickly access information from relevant sources for CM,
– Provide means to analyse, categorise and draw conclusions from these sources.

Systematic gathering of information from social networks is one example. A potential application of this is to gain knowledge about sentiments. Another example is the information available in cellular network which can be used for instance to monitor mass movement of people. Data from these sources should be used both operationally and for after-action evaluation. Integrate "Big Data" applications into the crisis management procedures.

Constraints:

– Ethical concerns exist with the systematic gathering of personal information ("big data") or the use of information sources which are sensitive from an integrity point of view.
– The possibility of malicious or accidental insertion of misinformation should be taken into account.

The opportunity from different perspectives

Procedures and organisation:

– Develop methodology
– Develop procedures for the interaction with data owners to gain access to their data
– Develop procedures for managing ethical concerns with respect to data gathering.

Personnel:

Tools and methods will require adequate training

Technology:

– Find technical means to connect to adequate data sources
– Develop means to systematize and analyse data / "big data"
– Cross media analysis

3.5   EFFICIENT WAYS TO GATHER DATA FROM RESPONDERS

Title:	**Efficient ways to gather data from responders**
Background	

Getting quality data from first responder organisations is critical both for the command and coordination in the relief phase and for subsequent evaluation. At the same time, responders are often already overloaded with the operational task at hand, and putting further burden on them in the form of requirements to provide data is often not possible. There is therefore a need to find ways to automatically or with minimized burden on the acting first responder in the field to gather necessary information, while still assuring that it has the adequate quality and is appropriately structures. (Shared situation awareness is a necessary enabler for communication common understanding).

Improvement opportunity:

1) Develop guidelines addressing how to effectively gather data on the operation, resources, their location and condition, communications, decisions, etc. This could include extraction of data from different operational systems or the use of different kinds of sensors.

2) Develop methodology that allows for easy gathering of information, while putting minimal burden on the first responders.

Constraints:
- Privacy concerns must be taken into account
- Solutions must put minimal burden on first responders
- Security concerns must be taken into account
- For use in external operations, solutions should not require continuous access to energy

The opportunity from different perspectives

Procedures and organisation:
- Information needs should be clearly identified
- Procedures for gathering information, including priorities, should be developed
- Procedures for the management of data should be identified

Personnel:

Procedures should be enriched.

Technology:

Develop solutions that automatically gather relevant data

Develop solutions that aid easy gathering of structured data at operational and tactical levels

Develop solutions that gather data without exhausting first responder equipment's energy

3.6 VOLUNTEER MANAGEMENT

Title:	Volunteer management

Background

In any crisis, volunteers will offer to provide help to the relief operation. They may do so through organisations dedicated for this purpose but also by offering their help on-scene or even starting their own effort in parallel. Volunteers are an asset with significant potential to support disaster management, but also potentially delaying or disturbing the operation or even carrying out harmful actions. It is usually the role of the crisis management structure to manage these groups.

Improvement opportunity:

Develop procedures for the management of volunteers, particularly spontaneous volunteers that will harvest the potential of this important asset. Aspects to be taken into account should include the planning of volunteer work, communication with the public about needed and not needed volunteers, risks associated with engaging volunteers, ethical and social aspects connected with the use or non-use of volunteers.

Constraints:
- Legal responsibility needs to be taken into account
- Cultural factors need to be taken into account
- Different types of volunteerism (individual, spontaneous, organised, upon request) may require significantly different solutions.

The opportunity from different perspectives

Procedures and organisation:

Tested procedures for volunteer management should be developed.

| *Personnel:* |
| Possible training for organised volunteers should be assessed and if required, curriculums could be developed and improved education for the "interested public" should be sought |
| *Technology*: |
| Technical means could support communication with the public with respect to volunteering |

3.7   HARMONIZATION OF LANGUAGE AND TERMINOLOGY

Title:	**Harmonization of language and terminology**
Background	
Collaborative preparation, execution and assessment of disaster response become significantly more difficult if the crisis management structure and the first responder organisations involved do not use the same terminology. At the same time, language and terminology is affected by the cultural and social context, and attempts to over-standardize may result in terminology that is not rich enough to be applicable in all relevant situations.	
Improvement opportunity:	
- Identify what the priority areas are where a common terminology is needed in order to ensure effectiveness of cross-agency or cross-border collaboration - Develop and devise activities (dedicated exercises etc.) that support the harmonisation of terminology or the mutual understanding of different terminology. - Develop standard terminology in priority areas and further build on research conducted in other sectors for translation of information in case of cross-border cooperation - Develop tools and mechanisms to support the dissemination and implementation of common terminology	
Constraints:	
Existing efforts (also from other FP projects) should be taken into account Cultural differences need to be taken into account The lack of means to enforce terminology should be taken into account	
The opportunity from different perspectives	
Procedures and organisation:	
Map and systematise current efforts within language and terminology harmonisation Develop standardized terminology in priority areas	
Personnel:	
Identify suitable training, including cross-agency and cross-country training, in support of standardised terminology	
Technology:	
Develop technical support to the development, use and management of terminology standards	

3.8   SHARING AND IMPLEMENTING LESSONS AND BEST PRACTICES

Title:	Sharing and implementing lessons and best practices

Background

Lessons based on experience from past missions, together with exercise outcomes, are some of the most important sources of knowledge to develop the disaster relief capacity. Analysing and collecting such lessons can form the basis for identification of best practices, which can guide work of the complete disaster management community.

A key problem in exploiting this knowledge is that it is primarily carried out by those who take part in the operation or exercise, and that each individual carries only a fragmented picture of the full operation.

Other issues concern the dissemination of lessons and practices across agency and country borders. Furthermore, they must make sure they are implemented and stimulate improvement, as well as look at possible measures for a successful implementation and the potential impact on an organisation's performance.

Improvement opportunity:

- Provide mechanisms and supporting tools for identifying, analysing, sharing, disseminating and implementing lessons from operations and exercises.
- Provide mechanisms and support tools for developing, validation and implementing best practices in different domains of disaster management[32]

Constraints:

Sharing of lessons can expose vulnerabilities or weaknesses, which may cause agencies to be hesitant towards this.
Experience shows that more databases do not automatically lead to more and effective dissemination of "lessons learned" or to an effective implementation. Though incident and exercise reports are collected widely, the data compiled is typically structured differently from agency to agency and country to country, considerably handicapping any attempt to identify and share similar lessons and practices across agencies and borders, further complicated through different terminologies and languages used.

The opportunity from different perspectives

Procedures and organisation:

Identifying, sharing and implementing "lessons learned" will require a common process, including.
Gathering of appropriate data, analysis, dissemination, implementation and evaluation. Processes for validating and agreeing on best practices, across agency and country borders are required. Best practices should stimulate the development of future polices.

Personnel:

This opportunity is essentially about efficiently improving personnel communication skills.

Technology:

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[32] See: Use of social media in crisis communication, found atL:
http://www.kortom.be/file_uploads/5069.pdf
and FBI social media criteria for Law Enforcement Use, found at:
http://www.fbi.gov/stats-services/publications/law-enforcement-bulletin/2013/february/social-media-establishing-criteria-for-law-enforcement-use

Technology could support all phases of the lessons learned process, perhaps most importantly the gathering of data, the analysis and the dissemination.

Technology could support the evaluation and implementation of best practices, for example through supporting gaming activities that are used to evaluate and implement practices.

3.9   INTERAGENCY INFORMATION SHARING

Title:	Interagency information sharing
Background	
Information exchange between agencies, which is important both in the preparatory and the operational phases, is currently hampered by a lack of procedures, lack of interoperable information formats and a lack of systematic information management in many agencies.	
Improvement opportunity:	
Develop practices (and tools) **which support first responders** and disaster managers **to identify relevant information, make its content and form sharable, publish and disseminate it and make it possible for other stakeholders to effectively receive it.** Information sharing is required both in the preparation, the response and the recovery phases, and at several levels of management.	
Constraints:	
- Although improvement needs still remain, there are a number of existing initiatives which need to be taken into account. - Standardisation efforts and process development must take into account the heterogeneous structure of disaster management, especially for international relief. - Integrity and information security issues must be taken into account.	
The opportunity from different perspectives	
Procedures and organisation:	
- Identify appropriate procedures and context-based information sharing schemes. - Map available information standards and if necessary, develop new one.	
Personnel:	
Identify suitable training needs connected to information sharing practices and tools	
Technology:	
Provide technical tools and best-practice guidelines that support inter-agency information sharing. This could include dissemination support tools, information gateways, wrappers, accessible repositories and other means.	

3.10   RESPONDER COMMUNICATIONS IN REMOTE AREAS

Title:	Responder communications in remote areas
Background	

While response communications within most parts of the EU territory are fairly well-developed (though some challenges may remain), the situation in remote areas (which could be outside the EU or certain areas inside the EU) is not always satisfactory. In such situations, one needs to rely on local infrastructure or commercial networks, which may be limited to begin with and further damaged by the disaster or congested, or on portable solutions that tend to be limited in bandwidth and reliability.

Improvement opportunity:

- **Provide better / alternative in-field communications methods**, both inside the first responder's and crisis management agencies and cross-agency/ cross-border
- Provide better communications methods from the scene of the disaster to central agencies.

Constraints:

- The Tampere convention should be respected[33]
- Access to power in the disaster area may be limited

The opportunity from different perspectives

Procedures and organisation:

Procedures and agreements that optimize the use of available bandwidth and frequencies should be developed.

Personnel:

Awareness on the limitations in capacity and the consequences of overuse should be created
All equipment needs to be provided together with appropriate training.

Technology:

Appropriate technical communications solutions should be developed

3.11 RETENTION OF INFORMATION AND LOG-KEEPING

Title:	Retention of information and log-keeping
Background	
A vast amount of information is generated in all phases of disaster relief. In the preparatory phase, information is generated on capacities, stocks, organisations, training, or capabilities, etc., which needs to be used in the response phase. In the response phase, flows of relief goods, funds and people need to be captured and stored to allow for evaluation, providing the basis for future preparation.	
Improvement opportunity:	

- **Provide means/guidelines to warehouse information** that allows for easy access across agencies, while still respecting needs for security and privacy, supporting disaster management preparation, response and evaluation
- Provide means / guidelines on how to automatically log relevant information pertaining to the execution of the operation and/or supports commanders' manual log-keeping. **This should include the relevant information on decisions and actions taken, use of different assets, the flow of goods, the tasks and whereabouts of responders and other kinds of operational information.**

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[33] Tampere Convention on the Privision of Telecommunication Resources for Disaster Mitigation and Relief Operations. found at: http://www.ifrc.org/Docs/idrl/I271EN.pdf

Constraints:
- Information is generated in many different forms and within many different systems that will continue to live for a long time (legacy systems). - Information generated is often unstructured - Privacy and information security concerns must be taken into account - Willingness to share information can be low, which should be mitigated through solutions - Several solutions already exist, both within agencies and cross-agencies (Relief Web etc). New solutions must expand or leverage these.
The opportunity from different perspectives
Procedures and organisation:
- Develop principles for information warehousing in terms of what should be retained, where it should be retained, who should be able to access it etc. - Develop procedures for information warehousing
Personnel:
Identify training needs related to information warehousing and develop suitable course curriculums and training material
Technology:
Develop technology that supports information warehousing in distributed, non-centralised organisations. Develop technology that allows for information gathering and log-keeping

3.12 PSYCHO-SOCIAL SUPPORT – INTERVENTION STRATEGIES

Title:	Psycho-social support – intervention strategies
Background	
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, psychosocial support should be provided in a timely and professional way, including the Health Services themselves.	
Improvement opportunity:	
- **Effective intervention strategies and related support should be developed**.	
Constraints:	
The challenge is to provide acceptable psychological and psychosocial support to the affected public and the Health Care teams, which also could suffer from the traumatic effects of the incident.	
The opportunity from different perspectives	
Procedures and organisation:	
- Develop principles and methodology for identification of different actors which are in need of psycho-social support.	
Personnel:	
Identify training needs related to psycho-social support and develop suitable course curriculums and training material.	

3.13 COORDINATION CHALLENGES

Title:	Coordination challenges

Background

The hosting capability of each hospital is provided through a contingency plan provided to the civil protection and stating, in addition to other information, 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.

Large scale disasters and emergency situations expose the lack of integration and collaboration among health care services revealing challenges for effective Decision Support Systems (DSS)[34].

Improvement opportunity:

Develop procedures for the management of hospitals hosting capabilities.

Constraints:

Projects conducted in various European countries on a national basis, but also financed through FP6 and FP7 projects are developing or have developed working prototypes of applications to assist communication and information management in the aftermath of disasters. These applications target tasks, includes disaster scene management (particularly triage), remote monitoring of the condition of victims, transmission of medical images for various purposes including remote diagnosis and identification of victims (via dental records, for example), and decision support. Nonetheless, a recent review of such applications indicates that still, most of the applications rely on paper-based methods to collect information[35].

Furthermore, an obstacle in the utilisation of such applications pertains to the difficulty of mastering their use. This becomes an important issue particularly when the applications are only utilised for rare emergency situations. As such, developing a more comprehensive understanding of user requirements, involving users in the design stage of decision support systems, and promoting more consistent use of such systems can make an important contribution to their efficacy at times of emergencies[36].

The opportunity from different perspectives

Procedures and organisation:

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[34] Pine, J. C., *"Wiley Pathways Technology in Emergency Management"*, John Wiley and Sons, Hoboken, NJ, 2007; Rao, J. E., *"Improving Disaster Management: The Role of IT in Mitigation, Preparedness, Response, and Recovery"*, Committee on Using Information Technology to Enhance Disaster Management, National Research Council, Washington, DC, 2007, National Academies Press.

[35] Case, T, C. Morrison and A. Vuylsteke, "The Clinical Application of Mobile Technology to Disaster Medicine", *Prehospital and Disaster Medicine*, Vol. 27, Issue 5, 2012, pp. 473–80.

[36] Case, T, C. Morrison and A. Vuylsteke, "The Clinical Application of Mobile Technology to Disaster Medicine", *Prehospital and Disaster Medicine*, Vol. 27, Issue 5, 2012, pp. 473–80.; Kindsmüller, M, T. Mentler, M. Herczeg et al. *"Care & Prepare– Usability_Engineering for Mass Casualty Incidents"*, ACM EICS4Med 2011: Proceedings of the 1st International Workshop on Engineering Interactive Computing Systems for Medicine and Health Care, 2011, pp. 30-35.

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
- Casualty Regulation, i.e. which casualty should be sent to which hospital

4   FIRE DEPARTMENT AND CRISIS MANAGEMENT

4.1   INTRODUCTION

In this chapter we analyse how the fire service in European member states are organized and discuss its implication for the possible contribution of new and social media for risk and crisis management, i.e. the aim of the COSMIC project. As the fire department is often regarded in European member states as the key player in crisis and disaster management, most attention is devoted to describing the organisation of the fire department, compared with other services.

Both in functional and organisational characteristics, as we will show in this chapter, the fire department distinguishes itself from other actors in crisis management or emergency response. But how does that affect the communication within the organisation and with citizens? In this chapter, we make the distinction between the repressive tasks of the fire department, that is the tasks that are the most visible for the ordinary public, and the preventive tasks. The difference between these two core tasks determines the actors on which the communication should be focused:

- In the preventive, preparing phase, social media can be used to support risk communication, to strengthen self-resilience, for PR and to recruit new employees and volunteers. Depending on the sort of crisis (e.g., flash crisis or creeping crisis) strategies for risk communication can be made.
- In the repressive phase (during a crisis or disaster) communication at the fire department is about: contact between firefighters during incidents, contact between the fire department and members of other emergency agencies and the information to citizens. People involved need to get information about a perspective for action.

First, partners will describe the special characteristics of the fire department, considering the aims of the COSMIC-project: the possible contribution of new and social media for crisis management in Europe. Then a brief comparison will be made between how fire departments are organized throughout Europe between different systems within the European Union and some of the most special systems will be highlighted. In section 3.3, we will describe how the fire department communicates internally and externally with other emergency services on the one hand and citizens on the other hand and discuss some typical problems related to communication. On the basis of the types of crises, as examined in deliverable 1.2, we will describe possible solutions and ways in which the fire department tried to become ready for the future. New applications and technologies, such as forms of social media and the way in which they are used by the fire department as an organisation or by individual firefighters, will be discussed in section 3.5. In section 3.6 we will summarize the conclusions of this chapter.

4.2   COMMON CHARACTERISTICS FROM THE COSMIC VIEWPOINT

Throughout Europe, the fire department is commonly considered one of the central organisations in crisis management and emergency response. A fire department is defined in American literature as follows: 'A fire department is part of a city or county government, funded through the city or county's general fund budget, derived from sales, property and other taxes.[37] Though it's difficult to find a common European definition about the

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[37] Windsor Fire Protection District, California, found at:

organisation and task of the fire department (as there are many differences between countries, we will show that in the next section), we can present some common characteristics of this emergency agency.

In the European Union, fire departments have several key tasks in common[38]:

- *Fire fighting and fire control*
  Challenges of the fire department during this task are putting out fires, saving lives of people and try to avoid the flash over of fire to other buildings.
- *Role in crisis management*
  Prior to and during large incidents, crises and disasters the fire department has to cooperate with other actors involved in emergency response, which are described in the other chapters of this work package.
- *Assistance during accidents with dangerous substances*
  Because of its expertise with chemicals and highly toxic substances, the fire department is involved in all types of incidents with hazardous materials. An example can illustrate this task: during the example of the train incident in 2009 in Viareggio, Italy, firefighters had not only the task to put out the fire, but also to secure the LPG in the train cars that were not affected.[39]

In most of the European countries, the local or regional government is responsible for fire service. But where in, for instance, Belgium the municipality has the responsibility over the fire department, in France the responsibility is positioned by the highest governor of a *préfet* and in the Netherlands by the safety region, a partnership between different municipalities and with the mayor of the municipality with the highest number of inhabitants as the formal leader.

One of the specific organisational characteristics of the fire department is the relatively large number of volunteers/part-timers within the organisation. In the German region Nordrhein-Westfalen, 90% of all the firefighters work at the fire department on a volunteer basis.

3.2.1   The importance of communication

Regarding the tasks described and the different forms of cooperation in which the fire department is involved, communication is an important issue. Problems in effectiveness and efficiency of the fire department are often attributed to problems with communication.[40] Through different technologies, new possibilities with ICT, or on the opposite thinking beyond technical advanced applications, organisations can organise themselves easier. The same applies for fire departments. A possible way some problems may be solved is the improvement of (communication) systems. That is not to say that all communication problems can be solved by information technology. The human factor should also be taken into account. For instance, during crisis it is known that many communication devices fail due to poor usage. In addition, there is lot of scientific evidence which suggests that information technology specially designed for (large-scale) crisis and emergency situations is unlikely to be effective. In crisis scenarios, front-line responders tend to use the same information

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http://www.windsorfire.net/district_department.htm

[38] Helsloot, I., E.R. Muller, and J.D. Berghuijs, *Brandweer: studies over organisatie, functioneren en omgeving,* Wolters Kluwer, Alphen aan de Rijn, 2007.

[39] Romano, Giuseppe, "Italy: train crash LPG blaze", *Crisis Response,* Vol. 5, Issue 4, 2009, pp. 16-17.

[40] Groenendaal, J., I. Helsloot, and A. Scholtens, "A Critical Examination of the Assumptions Regarding Centralized Coordination in Large-Scale Emergency Situations", *Journal of Homeland Security and Emergency Management*, Vol. 10, Issue 1, 2013, pp. 1-23.

technology and devices they are used to use in smaller, day-to-day incidents. Therefore, in order to be effective, or to improve communication in large-scale emergencies and crises, one should improve the procedures, technology and devices that are used on a daily basis.

4.3 DIFFERENCES IN THE EUROPEAN UNION

In section 3.2 we described the common characteristics of the fire department within the European Union. However, it should be noted that no system in two countries is identical. In this section we examine the differences between several fire departments in the European Union by the next six aspects: key tasks, fire brigade employees, education and training, governmental directing and financing, crisis and disaster management and trends and developments[41]. After a short description of the differences, we look at it from the COSMIC viewpoint and examine what kind of (communication) problems can raise.

Aspect	Differences	Challenges from the COSMIC viewpoint
Key tasks	Besides the tasks described above, some fire departments in Europe have tasks in ambulance services (for example Belgium). In Sweden and Denmark firefighters have the obligation to provide medical assistance, till the ambulance service has arrived on the place of the incident. In the Netherlands some fire departments also provide specific medical services. In addition, the way fires are attacked varies throughout Europe. In Germany for instance most fires are suppressed from the exterior whereas in the Netherlands most fires are attacked from the interior.	When fire departments provide medical assistance, easy information sharing between firefighters and medical personnel may be essential. However, not all medical information may be accessible for firefighters due to privacy concerns. The use of communication devices that are developed for specific tasks like interior firefighting is not useful for fire departments that do not attack fires from the interior.
Employees	In the most European countries fire departments work largely with volunteers. The percentages differ between 33% (United Kingdom) and 90% (Nordrhein Westfalen, Germany).	The activation of volunteers works differently than the activation of full-time employees. New communication technologies and applications can contribute to an alert system and eventually reduce the time of presence at the fire station. In addition, communication technologies may be used to alarm volunteers when an emergency occurs in their neighbourhood.
Education and training	Education and training for firefighters differs between different European countries. The fire officers in France are educated on a national level, while Belgium doesn't have a national education program for firefighters at all.	Especially in countries in which education and training is decentralized, different ways of firefighting may be employed and different service levels may be provided. This may also mean that communication devices are differently used across the EU. In addition, different communication standard operating procedures and

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[41] Wijkhuijs, Vina & Menno van Duin, *Brandweer in Europa. Een vergelijkende verkenning van Europese brandweerstelsels,* IFV, Arnhem, 2013.

		routines may apply between member states.
Governmental directing and financing	In the most countries municipalities are responsible for the performances of the fire department. In most of the countries a 'time of arrival' is rooted in law. For example in Germany: in cities the fire brigade has to arrive within 10 minutes, in rural areas within 30 minutes.	Especially in sparsely populated (often rural) area's and for area's on a longer distance of fire stations, citizens need perspectives for action for the first hours after an incident. Social media may be used to warn and inform citizens about risks and emergencies as well as encourage them to take action.
Crisis and disaster management	The fire department is often a key player for coping with crises and disasters. Among others in Belgium, France, Germany and Sweden the fire department has the lead during crisis management.	There may be different ways in which fire departments share information with other actors: the degree to which actors within member states are willing and able to share information during crises may vary.
Trends and developments	Different scholars focused on crisis management and professionals within the different emergency agencies research possible cooperation between actors to promote efficiency and effectiveness.	Communication can contribute to making cooperation between different actors possible. Specific (emergency) systems can be integrated and by using the same programs and applications, actors – for instance police and fire department – can share information.

To illustrate the differences between fire department organisations in the European Union, below we present two case studies. Firstly, the primarily private fire department in Denmark and secondly, the fire service organisation in Germany, which is organized on a regional scale. After that we will sketch the cooperation between different national organisations in the CFPA Europe.

Case study 1: Denmark
A significant part of the firefighting and fire control tasks in Denmark are subcontracted to private organisations.[42] However, the responsibilities for the quality and quantity of the tasks are for the municipalities. The local authorities can consider if they execute the tasks or outsource them to other parties. In cases of contracts with private parties, a service level agreement (SLA) has to be formed, with the minimum requirements and maximum price. In Denmark, the private company *Falck* is active in more than two third of the 98 municipalities. Since 1926 the Police and Fire fighting law has allowed that local authorities can make their own choices and the fire brigade is privatized more and more. In selecting one of the possible suppliers of the services both the quality and the price are important. Not all of the 98 municipalities have their own fire station; some of them have made agreements with fire stations in areas of the neighbourhood. Because of the system (private versus public) and agreements between municipalities, the efficiency of the Danish firefighting system is relatively high. Besides firefighting, the Danish firefighters have a responsibility in assisting during the first emergency to victims, during the first minutes after an emergency, until the ambulance arrives.

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[42] Ibid.

At a national level the Danish Emergency Management Agency (DEMA) fulfills a special role in providing both the fire department and the police with material support during emergencies. Also the coordination of the development of disaster management plans and training of operational professionals are tasks of the DEMA. So the operational tasks are mostly subcontracted locally, but plans and visions about the future of firefighting and crisis management are national tasks. Crisis management in Denmark, with the fire department as one of the most important and influential agencies, is based on two principles in general.[43] Firstly, the different sectors involved have their own 'playing field' and responsibilities. Thus, the fire department is responsible for the own tasks – also during crises and disasters. Secondly, in Denmark, actors work in accordance with the principle of subsidiarity: problems have to be approached, on the lowest level possible. That's the reason why the responsibility for the performances of fire departments lies primarily at the municipalities.

Case study 2: Germany
The sixteen regions (Länder) within Germany have relatively large autonomy. This applies on the area of politics, but also for crisis management. Regional law registers structure, tasks, competences and responsibilities. The '*Gesetzüber den Feuerschutz und die Hilfeleistung'* (law about the fire department and about help performances) describes the allocation between regions and local authorities, and also the tasks of the fire department. Every region is required to have an effective fire department for firefighting and the response of accidents and emergencies. In some districts the fire department is also responsible for the ambulance services.

96% of the in total 1.1 million firefighters in Germany is a volunteer.[44] Most of them are connected to the *Technisches Hilfwerk (THW),* the German Federal Agency for Technical Relief, an organisation that is only activated during specific types of incidents and crises and is under the responsibility of the national Ministry of Internal Affairs. Their members assist on request in tasks like technical disaster assistance, evacuations; readying the water and technical assistance during waterlogging and flooding. Because of their specific technical abilities the different members of the divisions of the Technisches Hilfwerk are complementary to each other. In the picture below, only the THW divisions in Nordrhein Westfalen (one of the regions) are displayed:

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[43] Found at: http://brs.dk/eng/aboutus/Documents/Emergency%20management%20planning.pdf
[44] Wijkhuijs, Vina & Menno van Duin, *Brandweer in Europa. Een vergelijkende verkenning van Europese brandweerstelsels,* IFV, Arnhem, 2013.

Figure 3-1: Organisation of the German Federal Agency for Technical Relief (THW) in the region Nordrhein-Westfalen

Cooperation of fire department organisations in CFPA Europe

Several national organisations concerned primarily with fire prevention and protection are organised in the CFPA Europe, the Confederation of Fire Protection Association Europe. Those countries are: Belgium, Denmark, Finland, France, Germany, Iceland, Italy, Norway, Portugal, Romania, Serbia, Slovenia, Spain, Sweden, Switzerland and United Kingdom. Founded in the seventies, nowadays the CFPA is an organisation where partners deliberate on recommendations for prevention and protection in case of fires in Europe. The partners have implemented several guidelines. Some examples of those are: a guideline for fire safety in laboratories[45], a guideline about fire safe homes[46] and a guideline about fire safety in restaurants[47]. The agreements are not binding, but give direction to the fire safety policy in the connected countries.

When there is cooperation between organisations, such as between fire department organisations in the CFPA Europe or between different regions in Germany, it can optimize the standards of communication. Best practices in specific situations, can function as examples for other structures or situations, depending on the degree in which the two situations are comparable. Good experiences of, for example, the fire department in whe Netherlands with the use of tablet computers during an incident can provide new opportunities to other similar organisations elsewhere in Europe. The same applies for *worst practices*.

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[45] CFPA, CFPA E Guideline No 28: 2012 F, 2012. found at:
http://www.cfpa-e.eu/wp-content/uploads/files/guidelines/CFPA_E_Guideline_No_28_2012_F.pdf
[46] CFPA, CFPA E Guideline No 24: 2010 F, 2010, found at:
http://www.cfpa-e.eu/wp-content/uploads/files/guidelines/CFPA_E_Guideline_No_24_2010_F.pdf
[47] CFPA, CFPA E Guideline No 9 2012, 2012, found at:
http://www.cfpa-e.eu/wp-content/uploads/files/guidelines/CFPA_E_Guideline_No_9_2012_F.pdf

4.4   IDENTIFICATION OF COMMUNICATION CHALLENGE

The communication among and within the fire department can be examined in different ways. In this section we will describe some challenges, both for internal (among firefighters and between the fire brigade and other emergency services) and external communication (with the general public). In this situation we make the distinction between the repressive and preventive tasks of the fire departments. During the repressive phase (during a fire or a disaster) firefighters have to communicate both internally (with other firefighters) and externally (with members of other emergency agencies and citizens involved). In the phase of preparation (during preventive tasks) the fire department has a role in risk communication.

Communication regarding preventive tasks

4.4.1   Communicating policies for fire department

The NGPR, the Dutch organisation for Public Relations, distinguishes six categories of communication, which are important for organisations.[48] Both the internal and external communication is included. All the categories are illustrated below with a possible example of communication within the fire department organisation.

1) Creating a communication policy and a communication program. The general board and employees have to be advised about communication within and outside the organisation. *It's important that the board of the fire service organisation and the employees do not spread different information. In case of risk communication about the risks of fire, citizens can get uncertain about what to do in specific situations.*
2) Keeping abreast of developments and things that matter, both in the organisation and in the society, this can affect the position of the organisation. *New structures as centralisation or decentralisation, or technologies like the development of new social media applications can affect the role in which the fire services have to act in society.*
3) Finding out what the relevant target groups of the organisation are. Which groups in society have to be informed and can be contacted by the information program? *Considering the tasks of fire services, both preventive and repressive, it's important that it's clear which citizens need their help mostly. Elderly people need other attendance than students during the informing of risks and hazards.*
4) Presentation of the organisation. Which types of communication are effective to reach the target group and let them act as you would want? *Which image do you wish to have as an organisation? If the fire services have the ambition to be an open organisation, they have to be visible for their target group. Special days on which they show their buildings and can inform people about their tasks and challenges, can contribute to the acceptation of the organisation and its people in the society.*
5) The entire organisation has to understand and subscribe the communication line of the organisation; otherwise the information by media and other channels won't sort the intended effect. It's important that tasks, structure, policy and activities are well known through the organisation. (See the first point above)
6) Representation of the organisation, for example by advising the management about the presence of representatives on events. *To acquire extra funds for their tasks, the fire services organisation has to be visible in the media.*

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[48] Keikes, S., *Basisboek Public Relations,* tweede druk aangepast aan de nieuwe NGPR-A exameneisen. Keikes, Diepenheim, 1992.

4.4.2   Risk communication to citizens

Though sufficient communication will not lead directly to the acceptance of strategies and actions of the fire department, risk communication can reduce the vulnerabilities of a society. When citizens know what they have to do if a crisis occurs, the act for emergency services can be simplified. Steelman and McCaffrey identify six points that can, to a certain extent, be useful and effective in risk and crisis communication. As their research focused on communication before and during wild fires, these factors especially apply for the fire department:

- Engagement in interactive processes or dialogue to understand risk perspectives of citizens and how they might be addressed
- Strive to understand the social context so that message and content can fit the appropriate circumstance
- Provide honest, timely, accurate and reliable information
- Work with credible sources who have local legitimacy, including authority figures where appropriate
- Communicate before and during crisis to leverage established relationships[49]

Communication regarding repressive tasks

4.4.3   Communication under time-pressure

One typical challenge is the exchange of information during firefighting. When time constraints are high, firefighters often have very little time to exchange or share information. Communication is hampered because firefighters might find it difficult to describe the environment or situation in which they are engaged. For instance, it may be hard for a firefighter within a building to explain the exact location of the fire to a colleague outside the building. A core challenge is therefore to raise situational awareness among firefighters and to create a common ground so that each fire fighter has a similar view on the scene of the event.

4.4.4   Communication between the fire service and other emergency agencies

Though the efforts of both the police and the fire services after the attacks on the World Trade Centre in New York, on September 11th 2011 were praised, the 9/11 Commission Report mentioned a lack of cooperation between these two emergency agencies. The response suffered from the lack of "integrated communication and command".[50] This conclusion was one of the main reasons for research in the United States to the possibilities of uniting police and fire services to one organisation or, at least, to promote the cooperation between them. The discussion resulted in a merge between a large sheriff's office and a fire-rescue department in one county, so all the calls for service – from traffic incidents to terroristic attacks and bombings – were collected at one point, which improves the first reaction possibilities after incidents. Before it's possible to create such a merge, it's important that the

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[49] Steelman, Toddi A., and Sarah McCaffrey, "Best practices in risk and crisis communication. Implications for natural hazards management", *Natural Hazards.* Vol. 65, Issue 1, 2013, pp. 683-705.
[50] National Commission on Terrorist Attacks, *The 9/11 commission report: Final report of the national commission on terrorist attacks upon the United States*, Norton, New York, 2004.

circumstances are favourably. In the United States the police and fire service were already using the same building and the sheriff and fire chief had a common vision for the future.[51]

4.4.5   Communicating between the fire service and citizens located within buildings

One of the developments in fire safety and with involvement of fire departments is new technologies for communication within buildings. These technologies may improve the communication between emergency responders (in particular firefighters) and the public. Several factors can determine the degree in which communication is effective. Some of these factors, described by the British Standard 5839 are: the manner in which messages should be delivered, message duration and the importance of an alert tone.[52] In emergency communicate on the most important factor is that it is effective: it has to facilitate the desired response of the public. From that approach, a distinct difference has to be made between alert messages and warnings.

- Alert messages have the intention to get the attention of people that an emergency is taking place and that there is important information to follow. Kuligowski[53] describes some different recommendations for using alerts. They should be significantly different from ambient sounds, the background noises in buildings have to be reduced during an alert and an alert should be tested in a non-crisis phase to get the attention of people in the event of an emergency. Furthermore it's recommended to use flashing lights instead of static lights, new methods of messaging have to be considered and it's necessary to follow up an alert with 'a clear, consistent, concise and candid warning message'.

- Warning messages include that important information. Scientific literature suggests that firstly an alert has to be disseminated before people show the attention for a warning message. So: 'Regardless of whether the warning message is provided audibly, visually, or via tactile means, an alert is necessary to gain people's attention and should be provided separately from the warning message.'[54] During warnings five topics have to be realised to give occupants of buildings the sufficient information in order to let them do what the original sender would want them to do.[55] Firstly, the sender and the source of the information has to be clear. Secondly, the warning message has to provide information about what people should do in that particular situation. Also, key questions such as 'when do people need to act?' and 'where is the emergency taking place?' have to be answered during useful warning messages. Summarized: it's important to be fair and transparent in crisis communication; two of the aspects of crisis communication, which are highlighted by Coombs.[56]

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[51] Stinchcomb, Jeanne B., and Francisco Ordaz, "The Integration of Two "Brotherhoods" into One Organisational Culture: A Psycho-social Perspective on Merging Police and Fire Services", *Public Organisation Review,* Vol. 7, Issue 2, 2007, pp. 143-161.

[52] BS 5839-8. *Fire Detection and Fire Alarm Systems for Buildings – Part 8: Code Of Practice For The Design, Installation, Commissioning and Maintenance ff Voice Alarm Systems*. British Standards Institution, London, 2008.

[53] Kuligowski, Erica, "General Guidance on Emergency Communication Strategies for Buildings", Technical Note 1779, National Institute of Standards and Technology, Gaithersburg, MD, 2013. Found at: https://www.hsdl.org/?view&did=731434

[54] Kuligowski, Erica, "Emergency Communication in Buildings: General Guidance for Message Providers", *Emerging Trends,* Issue 67, Found at:

http://magazine.sfpe.org/issue-67-emergency-communication-buildings-general-guidance-message-providers

[55] Ibid.

[56] Coombs, W.T. & S.J. Holladay, *The Handbook of Crisis Communication,* Wiley Blackwell, Chichester, West Sussex, 2010.

4.4.6 Communication between fire services and citizens located in hard accessible areas

The different countries in Europe apply for different times of arrival for the fire services. Although regularly, in Denmark, firefighters are within fifteen minutes at the place of the emergency, it's not required by law. A difference is visible between big cities and small municipalities, because of the complexity of problems the most cities hold a professional fire service, while in small municipalities most fire departments are depending on volunteers. In informing citizens in rural areas, new forms of communication can be a solution. Applications with specific information of the risk of fire in particular cities or municipalities can provide citizens in perspectives on action. People should know what they can expect of the fire department, if they have an own responsibility for their safety, it's an issue that should be communicated.

4.5 DEALING WITH COMMUNICATION CHALLENGES

Risk and crisis communication can help in creating perspectives for action. As the level of expertise of fire services in matters of fire risks, prevention and repression are higher than the expertise of other actors; citizens will accept information and guiding from this organisation. This is especially the case in the phase of risk-communication fire services, as they can warn and prevent. In the cases of the examples described above: if there are indications for the threat of wildfires, inhabitants can be activated to be careful and talk to other people. As we see in Greece in 2007, weather indicators are good in predicting wild fires. Higher than average temperatures, heat waves and only a little snow or rain in winter and spring can predict an upcoming wildfire. During those circumstances people have to be more alert than usually. By reaching inhabitants by traditional channels or social media, fire services can get another than their usual role: they become more a preventing actor than only firefighters. The example below shows that communicating by social media with citizens isn't the only new 'trend'.

Example: Using figureheads for risk- and crisis communication
The fire department in the municipality of Amsterdam has figureheads to make citizens in different districts familiar with the risks of fire.[57] On the one hand, the project has the intention to make people aware of the risks of fire. On the other hand, people get information about unsafe activities like particular ways of cooking, in house smoking and the usage of electrical devices. One of the ways to reach citizens is communication and instruction, by posters at bus stops and on fire trucks. The fire department tries to reach people by using 'ambassadors', which have influence in their neighbourhood. It seems to be an effective way to communicate with citizens, which are normally unreachable for official actors.

4.5.1 Public safety systems and fire services

In the last decades fire departments have increased interest in the development and implementation of new public safety radio systems. Several reasons form the basis of this trend. Firstly the reasons of utility: radio communication can make the way of working safer

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[57] Brandweer Amsterdam Amstelland, *Samen Brandveilig,* 2012, found at:
http://www.brandweer.nl/amsterdam-amstelland/actueel/samen-brandveilig/

and can enlarge the possibilities of working together. Secondly, new technologies make it possible to create applications that can be used within buildings and that withstand extreme temperatures. Because of the need of more integration between different emergency services, all the possible technologies have to be utilized. By sharing communication systems the costs can also be shared and the communication between different agencies during an emergency that needs an integral approach will improve.[58] The final important reason for the new sense of urgency for developing communication systems by the fire services is that new technologies have to be utilized. Wireless data, the tracking of personnel and citizens and applications like Google Glass and Google Maps give new opportunities for better, safer and more integrated work. Fire departments feel the urgency to utilize those new technologies to improve their performances. Furthermore, the pressure from the politics on the one hand and the community on the other hand plays an important role.

4.5.2   New forms of communication for and between firefighters

Two examples out of the Netherlands show how new/social media can contribute to the improvement of communication and services of the fire department. The Twente Fire Department at Enschede, about two hours from Amsterdam, is piloting a project in which some fire officials carry iPads. The devices provide information about buildings in their response area. It allows them to see visuals shot by ordinary people at the scene, who load the images and send them to off-site command posts. The officers can view the images on their iPads immediately. They can then respond appropriately, rather than seeing them for the first time on the six o'clock news or on YouTube. Additionally, the Amsterdam-Amsterdam Fire Service has a special app build on electronic devices insight fire engines in which real time information is provided about the target location. For instance, information is provided about the fire prevention measures taken in the building, how many times the fire service has responded to that particular building, what the most typical risks are when responding to that building, etc. Even information is provided about the inhabitants of the building (self-reliant or not self-reliant) as well as typical causes of fire that commonly occur in that kind of buildings.

In Amsterdam, every emergency service (also the fire department) has its own social media channel. This initiative took place in 2011 after the public sent more than 200,000 tweets about the way the fire service and the government responded to an industrial fire. The major goal of the fire department is of course not only to get citizens involved but also to change attitudes of emergency personnel.[59]

4.5.3   Examples of fire departments and social media use

To cope with different communication problems, as described in the former sections, more and more emergency agencies make use of new developed technologies and applications. Social media, the core issue of the COSMIC project, is one of those technologies. Below we present some examples of the (possible) usage of social media by fire departments to make contact with citizens. Two non-European and two European cases show the differences in attitude to social media (some actors are afraid of the hazards, some enthusiastic about the

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[58] Radio Communications for the Fire Service, 2005. Found at:
http://www.everyonegoeshome.com/resources/firedecisionmanual120905.pdf
[59] Groenendaal, Jelle & Joseph Scanlon, "Focusing on 'ordinary people' – the 'first' first responders", *Natural Hazards Observer"*, Vol. 38, Issue 2, November 2013. pp. 9-11.

multiple possibilities) More general these examples give a look into the possibilities (and threats) of social media for crisis management.

Case study 1 – Twitter instead of calling (United Kingdom)

The London fire service (UK) is looking into the possibilities of allowing people to tweet emergencies instead of calling.[60,61] One year ago the policy of the fire service was to advise citizens about not to tweet emergencies, because the account @Londonfire wasn't constantly monitored. 'With over a billion people now using Facebook and half a billion using Twitter, it's quite clear that social media is here to stay', said Rita Dexter, deputy commissioner of the Fire Brigade in London to the BBC.[62] 'The London Fire Brigade, is the biggest fire service in the country and we think it's important to look into ways to improve how we communicate with the public and how they can get in touch with us.' One of the ways in which the fire service uses social media is asking Twitter followers in the vicinity of a large fire to send photos, descriptions and other relevant information. Dexter said social media can be 'quickly and efficiently' to report emergencies.

Case study 2 – Development of the emergency number (Canada)

Canadian emergency responders – under which the fire department – are looking for modes to improve and modernize the 911 emergency number services (the most common European emergency number is 112). Possibilities for the future are sending videos to 911, sending photographs of emergencies to 911 or involve social media as Twitter, Facebook and Instagram to the emergency number. However, critics emphasize that it's important to solve the problems with the 'old 911' first, such as accurately locating cell phone callers, before implementing new technologies such as social media.[63]

Case study 3 – Doubts about social media (The Netherlands)

In the winter of 2010 the commander of the fire department in the Dutch region Flevoland decided to prohibit firefighters from using social media during their work hours. He said: 'In their own time, everyone has the permission to use Facebook and Twitter, but as an emergency worker it is inappropriate to distribute information about an incident. Social media is no task of firefighters.'[64] Direct reason of this statement was an accident with a Polish touring car. During the accident three people died, and after his activities, one of the firefighters placed photos and texts on social media.

Case study 4 – Firefighters as Facebook-friends (United States)

In the United States, the Los Angeles Fire Department is one the pioneers in the use of social media. Employees of the Fire Department use Facebook, Twitter and Flickr and write short articles on a blog. Firemen don't only work in shifts during their firefighting tasks, but in

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[60] Mogg, Trevor, *London Fire Department may offer option to tweet emergencies instead of just calling. Digital Trends,* 2012. Found at:
http://www.digitaltrends.com/international/tweeting-emergencies/
[61] Safety, Health & Environmental (SHE) Regulatory Department, *Hlp! My house is burnindwn! London Fire Brigade plans to take 999 Twitter calls,* Clyde & Co, 2013.
[62] BBC, *Twitter could be used to take 999-style emergencies, fire brigade says,* 2012, Found at:
http://www.bbc.co.uk/news/technology-20754978
[63] LaSalle, LuAnn, "*New technologies won't address current problems in 911 system: CRTC",* The Canadian Press, October 10, 2013, found at:
http://winnipeg.ctvnews.ca/new-technologies-won-t-address-current-problems-in-911-system-crtc-1.1491975
[64] Binnenlands Bestuur, *Brandweer Flevoland mag niet meer twitteren,* 2010, Found at:
http://www.binnenlandsbestuur.nl/openbare-orde-en-veiligheid/nieuws/brandweer-flevoland-mag-niet-meer-twitteren.571972.lynkx

addition to their core tasks, they work in shifts to control the different social media accounts. Firefighters connect citizens, inform them about risks, hot-topics of the day and give perspectives for action. This exemplifies how the system has a role in ensuring that the message of the organisation will be displayed and controlled.[65]

Figure 3-2: Examples of the usage of social media by the Los Angeles Fire Department

4.5.4   Solutions during specific types of crises

Several types of crises can be distinguished in which the role and importance of new media technologies for fire services can be emphasized. The common element in these crises is the involvement of citizens and the importance of a perspective for action. Below we describe two types of crises in which the fire brigade is (one of) the most important emergency response actors. After describing the characteristics of the crisis, we illustrate with examples which communication problems for the fire department can raise.

- Big fires which cause heavy smoke clouds with extraordinary amounts of toxic substances.
- Forest fires with implications for the civilization

One type of crisis in which the fire services can take the lead is wildfires. As partners examined in D1.2, most of the forest fires occur due to human beings (via arson, accident or due to inattention). To avert such situations, risk communication is a very important instrument and fire services are the right organisations to take responsibility for that communication. Fire services have the knowledge and capabilities to present the right information on the right times and are involved with crisis situations that are related to fire like wild/forest fires. Furthermore, in the days and weeks previous to a forest fire, men can find out some indications and anticipate on them. Citizens can be informed about the risks in their area and can get advices for perspectives for action.

Recent examples show the added value that new communication technologies can have for communication strategies of fire services:

- During the October 2007 Southern California wildfires a lot of members of the public gathered information by non-official channels. 'Community information resources and other backchannel communications activity' had a prominent place in the disaster area. Officials (by government or fire services) had concerns about and objections to the use of social media as communication utility, as there was no legitimacy of the information and

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[65] See: http://lafd.org for further information.

senders can be unknown. During the wildfires a real problem in communication became visible. People that were asked about their experiences during the disaster, spoke about an 'information dearth'. Though some official information sources (under which the website of the Orange County Fire Authority, the regional fire brigade) people complained about the slowly updated information. Furthermore, the information aimed to inform at-risk or evacuated communities was 'simply overwhelmed and stymied by on-line traffic.'[66] One of the critics said: 'What we learned in the Cedar fire is that there is no "they". "They" won't tell us if there is danger, "they" aren't coming to help, and "they" won't correct bad information. We (regular folks) have to do that amongst ourselves.'[67]

- In the summer of 2011 Twitter was being used by preventing heath fires in Dorset in South West England.[68] 'Arson and criminal damage are a constant threat to the heaths', said the National Trust's Laurie Clark. 'We know more and more of our visitors carry smartphones so we think Twitter could be a useful new tool in the battle against arson.' A new Twitter account, @NTPurbeck was created for the summer months, during which the threat of heath fires is the highest. Another actor involved: 'We would encourage anyone who witnesses any suspicious activity, either on National Trust land or anywhere else across Dorset, to contact Dorset Police and report it immediately.'

Another type of crisis in which the communication from fire services to citizens can be important to reduce the hazards of a crisis are big fires, which cause heavy smoke clouds with extraordinary amounts of toxic substances.

- Research shows that during the big fire in the chemical company Chemiepack in Moerdijk (The Netherlands), January 2011, there was a lack of communication between authorities, emergency responders and citizens. The national disaster website, www.crisis.nl, didn't function well and the presented information was adverse to each other. One of the most important questions during crisis communication: 'what do citizens want to know?' was surpassed by the questions what the authorities and other actors involved wanted to communicate.[69] Other research to the amount of tweets during the disaster in Moerdijk and the possibilities of a relatively new application as Twitter for communication for authorities shows that it's hard to monitor the flood of messages.[70] The problem of social media as well is the lack of legitimacy of the information; if citizens believe each other, it's hard for official authorities to intervene. By having access on new applications and technologies and creating a visible strategy of communication, fire services can try to become an important and reliable actor on social media.

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[66] Sutton, Jeannette, Leysia Palen, and Irina Shklovski, *Backchannels on the Front Lines: Emergent Uses of Social Media in the 2007 Southern California Wildfires.* The 5th International ISCRAM Conference – Washington, DC, 2008.
[67] Sutton, Jeannette, Leysia Palen, and Irina Shklovski, *Backchannels on the Front Lines: Emergent Uses of Social Media in the 2007 Southern California Wildfires.* The 5th International ISCRAM Conference – Washington, DC, 2008, p. 4.
[68] BBC, *Twitter used to prevent heath fires in Dorset,* 2 August, 2011, Found at:
http://www.bbc.co.uk/news/uk-england-dorset-14373713
[69] De Onderzoeksraad voor Veiligheid, "*Brand bij Chemie-Pack te Moerdijk",* Den Haag, 2011.
[70] Helsloot, I. & J. Groenendaal, "Twitter: An Underutilized Potential during Sudden Crises?", *Journal of Contingencies and Crisis Management,* Vol. 21, Issue. 3, 2013, pp. 178-183.

5   HEALTH CARE AND CRISIS MANAGEMENT

5.1   SPECIAL CHARACTERISTICS FROM THE COSMIC VIEWPOINT

5.1.1   Hospital and medical services

Hospital and primary care medical services are most often organized around clinical teams and services. Their structure provides care at all levels of activity and urgency; as a result, 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 set-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 maneuvers (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 anesthesia
- Emergency surgical procedures (including e.g. amputation to facilitate extrication)
- Determine the most suitable receiving hospital (in liaison with the ambulance service)

It is 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.

5.1.2   Ambulance services

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 their role is:

- to save life together with the other emergency services;
- to provide treatment, stabilisation and care of those injured at the scene;
- to provide appropriate transport, medical staff, equient and resources;
- to establish an effective triage sieve and triage sort system to determine the priority
- evacuation needs of those injured and to establish a safe location for casualty clearing,
- to **provide communication** facilities for health services resources at the scene, with **direct radio links to hospitals**, control facilities and any other agency as required;
- **to nominate and alert the receiving hospitals** from the official list of hospitals to receive those injured and inform the other agencies;
- to provide transport to the incident scene for the Medical Incident Officer (MIO), mobile medical/surgical teams;
- to arrange the most appropriate means of transporting those injured to the receiving and specialist hospitals;
- to act as a portal into the wider health services including in the event of CBRN incident or any other incident requiring the widest possible team of specialists.

5.2   HANDLING OF COMMUNICATION CHALLENGES

The typical **communications systems** which can be used today by health care services (but also police and fire brigades) in an emergency are:

- Emergency radio – private radio systems operated by the emergency services, civil protection agencies or government, designed to be highly available (even in disaster conditions) and optimised for the command-and-control requirements of emergency services.
- Broadcast – radio and television signals transmitted for reception by the public for the purposes of providing situational awareness and general directives to the populace
- Telephony – commercial voice systems (both fixed and mobile) that allow individuals to request aid from the emergency services (using a national emergency number scheme), or to contact each other for information exchange or reassurance
- Internet – commercial data systems used for electronic communication, either person-to-person (email, messaging, voice over IP) or for broadcast purposes **(social media and blogging)**
- Data networking and private IP networks (normally sourced from commercial service providers) are used for electronic exchange of information. Often provide secure gateways to the Internet or other Government networks

These communication systems are used in different ways and can be characterised the following way:

- Centralised dispatch model
- Communication primarily to vehicles rather than officers
- Text information transfer is very important (dispatch addresses, patient details)
- Low level of traffic back to central dispatch

The purpose of the centralised dispatch model is to create a system that causes the entire process of dispatching ambulances (to emergency situations) to be more efficient and more effective; the net result of which is to save lives. An ambulance dispatch system generally involves multiple people, extremely large amounts of timely communications, and immediate decision-making.

Timely communication is a critical issue. Any kind of information transfer that is expedited can save a life. Information must be drawn from the caller and entered into the system by the operator and transferred to the dispatcher. The dispatcher must locate the closest available emergency vehicle, determine availability, and dispatch that vehicle to the proper location[71]. After the ambulance arrives at the proper location, if the subject must be taken to the hospital, an adequate hospital must be located, notified of the arriving new patient, and the shortest, fastest route mapped into the ambulance's map system. Any breakdown in this fragile process can lead to a lost life by consuming excessive time in clearing up confusions or miscommunications. Misinformation can lead to the wrong decision in the rapidly paced environment.

The European Network and Information Security Agency (ENISA) report[72], published in 2012, provides the following findings:

- Terrestrial Trunked Radio (TETRA) is widely used (but is not ubiquitous) across Europe by health care services
- Some emergency services do use data services, often on commercial networks, but **data is not used between the emergency services and the public**
- standards and policies for emergency communications are often developed in vertical silos, making inter-agency communication (e.g. between police and ambulance organisations) difficult
- Inter-agency communication problems are a common issue identified in post-crisis reviews of major incidents
- Integrated inter-agency communications and **aggregated information from the public can improve situational awareness for crisis responders**
- Technology failure is often an issue identified in post-crisis reviews of major incidents, and having broader technical back-up capabilities that anticipate and mitigate such failures is useful; **data services (especially from the public) fit into this model**
- EU treaties set an expectation for cross-member-state crisis responses, if required, and crisis responders need to be prepared to operate in this way.

These findings were summarised into three key objectives:

1. Develop improved inter-agency crisis communications technology and procedures
2. Define standards in crisis communications technology and procedures
3. Encourage the uptake of data services in emergency communications, particularly in the area of public interaction.

There are several projects which address the communication challenges of health services.

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[71] This is valid also for the police and fire brigades
[72] ENISA Report 2012: Emergency Communications Stocktaking Study

MECA[73] is an **emergency ambulance communication system** being developed at University of Massachusetts-Amherst, United States. The goal of MECA is to integrate various hardware and open source software components to rapidly develop an inexpensive and highly usable solution for hospitals. The main purpose of MECA is to provide emergency room to ambulance teleconferencing, allowing doctors to see and hear the EMTs and patient in real-time and provide assistance through voice. Ambulance tracking through GPS is also planned and should give emergency workers an estimated time of arrival to help prepare for an emergency.

The system consists of two separate computer systems working together. One being located the emergency room "command centre", and the other in the back of an ambulance. The ambulance system uses a high-speed 3G cellular connection for a mobile link to the hospital and a webcam, microphone, and speaker for teleconferencing. The ambulance will also have a GPS to send location information to the base station for time of arrival calculation. The hardware requirement for the base station is a microphone and connectivity to the internet.

Another example of the recent project addressing the communication challenges of health services is the *Ambulance Mobile Connect*[74]. The project has equipped all ambulances with Mobile Data Terminals (MDTs) connected to a variety of emergency response and business information systems and linked to the Emergency Operations Centre using a high-speed mobile broadband network.

The MDTs enable the Emergency Operations Centre to provide paramedics real-time and efficient access to details of emergency incidents including critical patient data, mapping functions and en route safety details. This allows paramedics to prepare better and respond quicker to incidents and deliver high-quality ambulatory services and on-the-road clinical care.

With the innovative use of mobile broadband, this project aims to save valuable time in emergencies and in the delivery of ambulatory services to the community, and has laid the foundations for the delivery of sustainable improved health outcomes for patients.

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[73] http://www.ecs.umass.edu/ece/sdp/sdp09/burleson/files/Meca_daveMod.pdf
[74] http://www.archive.dbcde.gov.au/2013/august/digital_regions_initiative/ambulance_mobile_connect_sa

6   POLICE AND CRISIS MANAGEMENT

6.1   SPECIAL CHARACTERISTICS FROM THE COSMIC VIEWPOINT

In many countries the police have precedence at the scene of a major incident, as their duty is to 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[75]:

- Establish a command structure under an overall responsible leader
- **Coordination of the emergency services**, local authorities and other organisations acting in support at the scene of the incident;
- 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 (casualties?)
- Maintenance of traffic flow
- Maintenance of **public order**
- **Communication with the media**
- **Supervision of volunteers**
- Protecting the environment and property
- Criminal investigation and enquiries, securing evidence
- Short-term measures to restore normality after all necessary actions have been taken.

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

- Assist with team transport by providing an escort
- **Provide communications** for the command network at the scene
- Maintain clear transport routes to ensure the uninhibited movement of ambulances
- Supervise the logistics for the rescuers
- Protection of the perimeter

6.2   HANDLING OF COMMUNICATION CHALLENGES
6.2.1   Utøya use case

Although the need is great, the problem of developing and maintaining an effective system of communication is a very difficult task. Communication is an extremely complicated process which is concerned with the interactions of people, individually and in groups, the subject of which is interwoven with semantics, sociology, anthropology, psychology, and administration. Moreover, the problem is further complicated by the ever-present currents of resistance which often inhibit the free flow of information between individuals. Currents of resistance emanate from the use of language, departmental status system, the differences in the background of each individual officer, the attitude and behaviour of top police executives, and the size and structure of most police departments. Fundamentally, the need is for executives who possess an understanding of human problems plus an ability to solve such problems with human tools.

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[75] The activities written in **bold** characters are the most relevant for the COSMIC project.

The communication systems used by police can be characterised by:

- Centralised control of officer and unit dispatch
- Individual officer two-way communication with central control for data access and situation updates
- Group voice messaging (talk groups)
- Officer-to-officer direct communication

To describe how the Police are handling communication challenges in practice, we decided to analyse a case study related to the bombing in Oslo Centre and shooting at Utøya (Norway) which took place on 22-23 July 2011. The step-by-step analysis of undertaken actions is illustrated in the table below. It gives a precise overview of "what" was done by "whom" and "when" and therefore demonstrates how the police proceeded in this type of emergency.

Use case[76]: Bombing in Oslo Centre and shooting at Utøya, Norway Friday 22 July 2011 – The Day of Terror, Norway	
15:13	Surveillance camera captures that Anders Behring Breivik is driving a car (with a bomb inside) into Grubbegata.
15:17	Wearing a homemade police uniform, Breivik escapes Einar Gerhardsens site and the Houses of ministries, unobstructed, waving a pistol in his right hand.
15:25	A car bomb explodes in Grubbegata, Government quarter. The explosion occurs between the building where the Prime minister's office is located and the Department of Justice and R4, which houses the Oil- and Energy Ministry and the Ministry of Industry and trade[77].
15:26	The police in Oslo receive the first message about the explosion. Two minutes later the first police patrol arrives, immediately making a large intervention in the city centre.
15:30	Armed Forces Special Command mobilises their Command Centre.
15:32	The police logs that a security guard saw a person running from a white van before the explosion.
15:32	The head of the Government's Crisis-Advisory Board, Morten Ruud, is formally notified by the Crisis Support Unit on the explosion.
15:34	Head of health and a medical unit is established in the VG-building (a building where the newspaper VG is located).
15:41	Police helicopter crew calls the Oslo police district and offers to come to work.
16: 00	Liaison between the Military/Defense and the Oslo Police District establishes.
16:40	A man in a police uniform – Anders Behring Breivik – parks a civilian car – a Fiat Doblo – at the Mainland Utvika in Tyrifjorden.
16:45	A Sea King helicopter takes off from Rygge.
16:47	The Police emergency squad contacts the closest Air Force base which is set up with hellos (Rygge) to check availability of the military's Bell-helicopters.
16:53	A Sea King-helicopter is sent from Ørland main air station with bomb experts.
16:57	The Captain on the MS Thorbjørn (The Utøya ferry) is notified that a policeman wants transport to Utøya.

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[76] Sources: www.tv2.no, www.dt.no; www.nrk.no
[77] The main fire-station is located in the Government quarter. Windows were blown in by the pressure wave, and it took some time before fire-engines from here could come out. Fire engines from other stations, however, were relegated.

17:00	The police confirm that the explosion in the Governments quarter is a bomb.
17:00	The Air Force base Crisis centre is mobilized at Rygge.
17:04	The Ferry MS Thorbjørnsails from the Mainland to Utøya with Anders Behring Breivik on board as a passenger.
17:08	Breivik chasing young people at the AUF-camp on Utøya and kills those who gets in his way.
17:09	A Sea King helicopter lands on Voldsløkka in Oslo, ready to transport victims to hospitals outside Oslo if necessary.
17:24	The Emergency Medical Communication Centre (EMCC) at Vestre Viken Regional health authorities receives the first message about the shooting on Utøya.
17:27	Message about the shooting on Utøya to Nordre Buskerud Police-district.

"It was very stressful working conditions. At any given time there were at least 40 phones on hold. We also got conflicting messages, between two and five perpetrators with rifles and binocular-aiming and messages about explosives on Utøya", Chief of Staff Magne Rust by Northern Buskerud Police District said.

17:28	EMCC Oslo/Akershus is notified about the shooting on Utøya of relatives through the Health Emergency Number 113. The message is confirmed immediately by EMCC Buskerud. EMCC Buskerud controls the medical assistance with support from EMCC Oslo/Akershus.
17:30	The Police in Oslo receive the first message about the shooting.
17:31	The Police Emergency Squad Delta drives towards Utøya.
17:38	The police in Northern Buskerudask the Oslo police for assistance.
17:41	First message on the community of Twitter*:* ***"There is shooting going on at Utøya, my little sister is there and called home now."***
17:42	The first ambulance helicopter takes off.
17:48	New message on Twitter: ***"There's a shootout on Utøya. The Labor Party youth summer camp is to be evacuated. Complete chaos. Police is on the way. "***
17:52	The first police patrol arrives from Buskerud arrives at Utstranda from on the shore of Tyrifjorden.
17:52	Kjetil Vevle, Central Executive Committee member of the AUF, on Twitter: ***"Somebody is shooting at Utøya. Update the police!! ".***
17:55	The quay at Utvika is formally cleared.
17:57	The first ambulance arrives at Utvika.
17:58	The Joint Rescue Coordination Centre receives notification about the Utøya-shooting from EMCC-Oslo/Akershus.
18:00	The first Bell-helicopter is ready to take off from Rygge, according to the military's operational headquarters.
18:01	Breivik is connected in an emergency phone call.
18:03	The police receive confirmation that "a suitable boat" for the police action is on the way.
18:05	The first patrol from the local police arrives at the pier where the boat Utøya settles from.
18:09	The emergency squad from the Oslo police unites with the local police on the scene.
18:21	The military/defense receives a request from the police for help from Armed

	Forces Special Command.
18:25	Crew from the emergency squad arrives at Utøya by boat from a pier located 3.6 miles away. During the trip to Utøya the motor of the small and overcrowded boat stops.
18:26	Breiviks' phone call to the police.
18:27	The perpetrator is called by the police. He surrenders and is put in handcuffs. He was previously unknown to the police, but has been convicted for a minor road traffic offence.
18:30	Ambulance personnel are on standby to descend on Utøya. They are told to not continue onto the island, because it is unclear whether shooting is still in progress.
18:50	Evacuation of patients from the quay at Utvikastarts after clearance of the area by local police.
18:55	The first Bell-helicopter takes off from Rygge.
19:00	**The situation is chaotic and the police have no overview. Police urge people in Oslo to remain at home and use cellular networks as little as possible. Police helicopter crew is instructed back to work.**
19:20	A physician, an operating Manager, and a paramedic, all from Oslo/Akershus arrives as the first health care personnel on Utøya.
19:20	The other Bell-helicopter takes off from Rygge, en route to Utøya.
19:30	Police confirms that seven were killed at the bomb explosion in the Government quarter.
Approx 19:45	The Bell-helicopter arrives at Utøya.
20:00	Norway receives support statements from heads of States all over the world. Foreign media is showing great interest of the incident.
21:57	Advice from National Guard, the object protection Oslo, granted.
22:00	His Majesty the King's Guard assistance request granted. 700 troops were ready at 22-23, soldiers in place on the object protection Saturday morning.
23:20	Police gives a press conference and state that the person arrested is an ethnic Norwegian man.
23:29	Undetonated explosives are found on Utøya.
Just before midnight	The police are taking action against Breiviks apartment at Skøyen in western Oslo.

6.2.2   Use case: Creating 10 Real-Time Intelligence Centres in the Netherlands

The Dutch police are currently in the process of reforming as its 26 independent police forces will transform into a single national police force with 10 departments. At this moment there are 23 Command and Control Rooms in the Netherlands. These Command and Control Rooms are co-located with fire department, ambulance and police. These 23 Command and Control Rooms will, also transform into 1 Command and Control Room organisation with 10 facilities. To support this operation a new ICT environment is needed. All Command and Control Room services are in the process of making preparations to buy and implement a brand new Command and Control Room equipment. This process is being done with all services together.

The new Command and Control Room is not only a dispatch-centre but it also has a big role in directing operations in the field. The need to push real-time intelligence to units in the field is required. According to the article[78], units in the field are better prepared in combining information from different sources and reaction is quicker and more adequate and the Police can already see a larger number of arrests. The Dutch police are especially keen on improving the number of 'red-handed arrests'. They see an important role for Real Time Intelligence Centre (RTIC) in monitoring social media. In the short history of RTIC the Police have seen a number of serious incidents (kidnapping, domestic violence, robberies) which were solved in a short amount of time, mainly by the use of intelligence from social media.

On the 1st of November 2013 all Command and Control Rooms in The Netherlands have started with a nation-wide try-out of Real-time Intelligence Centres. On the Command and Control Room floor workstations were being staffed with trained personnel during the busiest moments of the week. On 27th of December 2013 RTIC will be operational 24/7 in all Command and Control Room in the country.

According to the police, technical challenge continues to persist, as the ultimate objective is to connect all the RTIC's in order to be able to monitor all databases used in all police departments. That is still not possible (mainly due to network limitations).

The lessons learned will be shared throughout the country by means of an implementation group. This group consists of all the project managers and they meet every two weeks and will continue to do so. Furthermore, the Dutch police have recently started a Twitter-like medium called "Police+". This makes it possible to quickly share information in a safe environment, both personal and on a community-level.

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[78] http://controlroomcommunications.com/netherlands-police-interview/

7   OTHER ACTORS AND CRISIS MANAGEMENT

7.1   SPECIAL CHARACTERISTICS FROM THE COSMIC VIEWPOINT

During emergency and crisis situations, those at risk may not always be able to access services and humanitarian assistance. This is where non-governmental and other actors can contribute critical assistance in providing various forms of aid, outreach and support during crisis management and emergency situations, when in some cases the capacity of the State to act is undermined. These actors may include independent organisations at the local, national or international level, such as voluntary or non-governmental organisations, media, commercial or utility companies.

Many **international non-governmental organisations (NGOs)** have a large pool of financial and human resources, thus as a result, in complex or emergency crisis situations, much prominence can be placed on them. However, local NGOs have a smaller scale of resources; however, their knowledge of the local landscape and situation can prove equally valuable in terms of delivering services to displaced populations. There are four key characteristics to NGOs that provide them with key advantageous tools in providing aid and support in crisis situations: ability to respond fast, flexibility, maneuverability, and creating public awareness.

1. **Ability to respond fast**: NGOs have extremely low barriers to entry once in the disaster zone. Most major relief-oriented NGOs have established clear procedures on how to respond to all types of emergencies, providing efficiency and organisation. They have capacity to quickly mobilize resources for use, along with readily available human, material and financial resources for use in emergencies.
2. **Flexibility**: Many bilateral and multilateral partners have rules and regulations that sometimes hinder their operations, such as strict security precautions and considering host government concerns, which in some instances may hinder service delivery to populations in great need. NGOs have greater flexibility in terms of protocols and can act as the diplomatic third party to the government.
3. **Maneuverability:** NGOs can access many hard to reach areas and populations. Some highly prominent NGOs have their own air or sea transport capabilities providing them with the resources to target more treacherous locations.
4. **Creating public awareness**: As they are networked to the civil society, NGOs traditionally have good links with the media. This relationship with the media can be utilized to create public awareness and maintain focus on issues they consider important or even encourage donors to provide support. This has especially been the case with social media by sending out emergency alerts or creating crowd funding websites. This cooperation between NGOs and the media was particularly critical in the early stages when the tsunami struck Japan and destruction had not been fully comprehended by many people, including political leaders in the affected countries.

Every year, major natural disasters such as tornados, ice storms, hurricanes, tsunamis and massive fires, cause damage to major critical infrastructures and equipment, resulting in unpreventable large-scale service disruptions. As these events unfold, **utility companies** must provide immediate restoration of services which can be highly complex to manage; it is very costly to have such a rapid response and recovery. There are two ways that utility companies deal with disasters and that is through emergency preparedness and incident management (in that order).

Critical infrastructures (energy, communications, banking, transportation, public government services, etc.) and critical information infrastructures (ICT systems) are now more vital to industrialised economies. Citizens, businesses and governments all rely on an array of interlinked physical and information infrastructures to satisfy their needs and perform their daily operations. Utility and commercial companies play an important role in mitigating and managing potential failures or impacts on these infrastructures as they are mostly responsible for operating them. As we are becoming increasingly interdependent, a failure in one of these areas can often spread and result in a domino effect.

This has been felt in Europe before, when a shutdown of a high-voltage line in Germany in November 2006 led to failures of the electricity grids in Western Europe, resulted in massive power failures in France and Italy, as well as in parts of Spain, Portugal, the Netherlands, Belgium and Austria, even extending as far as Morocco and affecting ten million customers in total. In addition, **some of these infrastructures can also trigger cross-border effects**, due to their intrinsic networked and global nature (such as transport, energy and ICT). Therefore, modern infrastructures failures that don't have sufficient resilience or security standards in one country create high vulnerability and can have a detrimental effect on many others.

The magnitude and heterogeneous causes of these events has led to the development of all-hazard approaches to policy in many countries, in order to account for both natural disasters and man-made attacks when conceiving prevention and remediation measures against the risk of infrastructure failure. It is shown that successfully established utility and commercial-humanitarian collaborations can provide their partners with mutual benefits such as knowledge transfer, sharing of resources and best practices. Furthermore, this can contribute from an improved corporate image and awareness on a broader scale. They often work together with NGO's and other humanitarian aid organisations on capacity building in between disasters with staff training and the provision of readily accessible resources from the partnering company. Global threats such as terrorism, natural disasters, pandemics and cyber attacks require companies to expand their emergency management scope from traditional readiness and restoration to encompass a multidimensional scope to be well-equipped for all emergency management and response capabilities. This includes, but is not limited to, pandemic response plans, special security protocols for protect ICT and critical infrastructures, energy delivery, procedures for collaborating with local, state or federal government entities and communities.

The emergence of **online social media** has been increasing in popularity, particularly in creating a new medium for dissemination of news and information in the event of emergencies. It provides users with an open platform to share information and opinions on diverse topics; however, during real-world events such as earthquakes, elections or social movements, there is a distinct and sudden spike in activity over the Internet. This is especially the case for social network media such as Twitter and Facebook, where people log-on to check for updates about these events and to share opinions or other relevant information. The use of **media, communications and social networks** during Hurricane Sandy, which struck the U.S.' Eastern seaboard last October was exemplified in disaster communications and dissemination. Millions of residents were affected in the surrounding area, with most services cut off. For many, real-time and up-to-date information was provided through independent, citizen-generated Facebook pages like Jersey Shore Hurricane News and Twitter. **Media and social media have four primary functions in emergency situations:**

1. Information dissemination;

2. Disaster planning and training;
3. Collaborative problem solving and decision making;
4. Information gathering.

Media tools can be used in many different ways to enhance crisis communications. More recently, the role that social media plays has impacted the landscape of crisis management considerably over recent years by increasing and broadening dissemination channels, acquiring and analysing information more efficiently and comprehensively, and allowing increased participation by actors as events unfold. **A key example of this was during the UK riots in 2011**. A small protest against apparent police brutality in Tottenham sparked riots and vandalism across the region and showed how social media influenced the spread of the UK riots. This was something that police authorities were not prepared or equipped to manage or anticipate. It acted as a catalyst and allowed broadened methods for the rioters and onlookers to use social media to organize and communicate. Rioters would share with each other where areas were not protected, and would move there in an instance. The speed and impact of the social media initially overwhelmed the authorities.

Alternatively, social media can be used by governments and emergency organisations to alert citizens and residents of possible natural disasters, threats or other crisis situations. Twitter recently launched a service for user notification in the event of emergencies, natural disasters and or during times when other communication services aren't accessible. **Government agencies and non-governmental organisations can participate in the program and send emergency notifications directly to the users' phones, known as "Twitter Alerts"**. However, as will be discussed later in this section, while the openness of social media allows it to function as an effective crowd-sourced crisis management medium used by general public and authorities alike to coordinate efforts during crisis events – this openness can also allow for the viral spread of fake content and rumors very quickly, making it hard for users to distinguish true news and information from fake.

7.2   DIFFERENCES OF ROLES IN THE EUROPEAN UNION

States (or regions such as the EU) are considered to be the primary supporters of protecting fundamental human rights of all individuals living within their jurisdictions or in areas under the effective control of their armed forces, in the event of occupation or intervention. Different exposures to hazards, different national views on how to organize crisis management, and different historical bilateral or multilateral relations with neighbour countries are only some of the various components of this diversity. The ways that European countries organize their institutions and forms of government have a direct effect on the organisation of their humanitarian response's legal and political framework systems and play a relevant role for the legal and institutional European civil protection diversity. In addition to the forms of government (centralized or decentralized), the frequency, quantity and types of hazards that can strike a country, as well as its tradition to receive or donate assistance, are crucial elements that influence the organisation of legal and institutional systems of emergency response at national level. **For example, for countries in the south, such as Greece, they are periodically affected by a variety of hazards, and have thus chosen to advocate for the strengthening of the Union's role in humanitarian aid and civil protection.** They adapted its national legislation in line with EU legislation and encourage every international movement that improves cooperation between countries in civil protection. In Greece, several factors (economic slump, mountainous geography) make the

efficient treatment of crisis incidents difficult resulting in numerous requests for receiving international and more specific European assistance through MIC.

Humanitarian organisations, NGOs and volunteers

It is an intrinsic doctrine of the charters of most humanitarian agencies to safeguard the rights of those affected by catastrophe or armed conflict (as defined by human rights law, International Humanitarian Law and refugee law) are respected, protected and implemented. Thus, humanitarian aid agencies follow two fundamental principles: the responsibility to assist and the responsibility to protect.

In any crisis, volunteers and NGOs provide their services for help during the relief operation; this can take form in offering help directly in the disaster zone or by directing their own effort in parallel. The responsibility to assist, as defined by the code of conduct for the International Red Cross and Red Crescent Movement and NGOs in Disaster Response Programmes rules states "*the right to receive humanitarian assistance and to offer it is a fundamental humanitarian principle (...) As members of the international community we recognize our obligation to provide humanitarian assistance wherever it is needed*" and it forms the foundation on which humanitarian action often stems. In crises where a government entity may block access, there is still the right of intervention to provide assistance.

The responsibility to protect is, on the other hand, a more recent concept within the humanitarian community. The responsibility to protect emerged at the beginning of the 1990s, motivated by a number of conflicts demonstrated significant and systematic violations of human rights, such as Rwanda, Srebrenica, etc. The International Commission on Intervention and State Sovereignty (ICISS) published "*The Responsibility to Protect*" in 2001, reaffirming that States are responsible for protecting their citizens and those under their control in all circumstances. However, it also stated that if a State is unable to assume this responsibility, or in cases of serious violations of human rights, then the responsibility may be transferred to the international community. Therefore, from the point of view of NGOs and other actors, the responsibility to protect means "*all activities aimed at obtaining full respect for the rights of the individual in accordance with the letter and the spirit of the relevant bodies of law (i.e. human rights law, international human rights law and refugee law)*".

While the EU may provide valuable assistance to NGO humanitarian efforts, the roles and responsibilities of NGOs and volunteers organisations can vary from state to state. With organisations such as the *Red Cross Red Crescent Movement*, all EU National Societies develop their own strategies, geographical and sector-related priorities, often coinciding with the objectives of their own governments, with each National Society belonging to a different social, political and cultural system and performing different tasks. The National Societies have a legally mandated auxiliary role to their Governments. This protected and unique status needs to be fully acknowledged by the EU. The capacity of the EU National Red Cross Societies to come to the assistance of the public authorities is predicated on a strong day-to-day role in service delivery, which could be unintentionally undermined were it misunderstood and not integrated by the EU Institutions.

For instance, in Germany, there are five major NGOs that are supporting disaster response primarily involving medical rescue, care and all kinds of help necessary during disasters. The most prominent NGOs involved are the Red Cross (it can be a local entity, such as the Bavarian Red Cross), the Malteser Hilfsdienst, the Johanniter Unfallhilfe, the

Deutsche Lebens-Rettungs-Gesellschaft (responsible for water rescue), and the Arbeiter Samariter Bund. These NGOs have similar organisational structures to optimize collaboration with disaster management authorities. All define a structure with three levels of responsibility at county, regional and state level according to the political management. Nearly all of the NGOs' personnel are voluntary, along with many of the firefighters as well. Around 80% of the German rescue service and 95% of the German disaster medical relief are composed of by these NGO's. Furthermore, NGO's and GO's employ more than 1.2 million volunteers and approximately 100,000 professionals. Rescue service is carried out by professionals, while disaster relief is carried out by volunteers.

In contrast to Germany, the highly diversified and specialized network of actors and institutions involved in risk and crisis management in Italy[79] has resulted in an integrated system that coordinates the use of all available state and private resources. The set-up of the operational structure in case of major disasters takes into account the administrative organisation of the country. The role and involvement of NGOs and humanitarian organisations in Italy is represented by Agire, which was launched by twelve of the largest humanitarian organisations in the country. Agire hopes to equal other European emergency response networks by bringing together the two committees that have, until Agire was created, responded to emergencies: Italia Aiuta and the Agenzia italiana per le risposte alle emergenze. Agire is the only network for response, with key involvement and coordination from NGOs such as ActionAid, Cesvi, Cisp, Coopi, Cosy, Gvc, Intersos, Save the Children, Terre des Hommes, Vis and WWF. They also have close cooperation with strategic corporate partners such as major telecom and phone operators (Tim, Telecom, Vodafone, H3g), the media (Rai, La7 and Sky), the Italian Post (Poste italiane), the Banca Populare di Milano and publishing house Feltrinelli.

Private and commercial companies

More recently, the EU is increasingly turning to the private sector to take the lead in crisis situations. In March 2009, the Commission adopted the CIIP, *Critical Information Infrastructure Protection – "Protecting Europe from large-scale cyber attacks and cyber disruptions: enhancing preparedness, security and resilience"*. The aim of the program is to stimulate and support the development of cyber security at the national and European level. The foundation of the CIIP action plan is built on five "pillars": preparedness and prevention, detection and response, mitigation and recovery, international cooperation and criteria for European Critical Infrastructures in the field of ICT. A year later in 2010, the *European Public-Private Partnership for resilience (EP3R)* was published*,* calling for the establishment of the **European Public-Private Partnership** for resilience*,* proposed in the context of the policy initiative on Critical Information Infrastructure Protection. The proposal to establish the EP3R was to create EU wide public-private partnerships as a means to create incentives with the private sector. The EP3R presents a key opportunity for Europe to engage the local and global industry players in guiding and reviewing important aspects of emerging critical infrastructure policies.

At the national level, CIP policy focuses on resilience and an all-hazards approach, it is centralised in a limited number of bodies, and is inclusive of the digital cyber realm. Several countries have put in place a policy for critical infrastructure and information protection. However, EU member states are still pursuing fragmented national CIP policies, and there is

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[79] For more details see Chapter 2.2.

still a significant lack of cooperation between national governments and EU institutions in setting up a coordinated emergency response to potential threats. In other words, the higher degree of risk to which we expose our daily activities is not mirrored by an increased response potential of EU institutions. Yet, member states are indeed interdependent: even if the internet backbone is not evenly spread throughout Europe, several critical infrastructures are cross-border infrastructures, and for those the weakest links – such as the countries with a weaker emergency response potential – affect the vulnerability of all countries. Even if 99% of EU countries have sufficiently strong policies to protect the ICT networks or challenge the spread of malware, this is not enough to guarantee the resilience of the entire ICT network in the EU, as a single disruption can disrupt the entire system and expose it to threats.

Utility and commercial entities such as BASF, have linked their emergency dispatch centers across Europe to work closely with selected sites, evaluating and processing alarm notifications. In order to ensure that alarm notifications are fast and reliable with response times, companies often belong to networks within Europe to supply information and assist in emergencies. An example of this is the German Transport Accident Information and Emergency Response System (TUIS) and the International Chemical and Environmental Initiative (ICE).

7.3   IDENTIFICATION OF COMMUNICATION CHALLENGES

While volunteers, NGOs and utility companies can be significant assets of support during disaster management, they can also potentially delay or disturb the operation, or even carry out harmful actions. Good communication among government agencies, international organisations and civil society is imperative for effective disaster risk management. In response operations where a large number of organisations, companies and volunteers are present, it is essential to determine that all of those engaged have the necessary background and training to fulfill and carry-out the role they have taken upon them.

This can present communication, organisational and managerial challenges, such as finding appropriate mechanisms to ensure that all of those supporting and assisting are qualified, along with differing training programs, cultural and social norms, and interpretations on required competence. Even for the positions in which professional certifications are available, such as medical doctors, there can be problems with verifying the certificates across borders and in the short time-frame that is often required during emergencies.

The coordination of **volunteers and NGOs**, or at least the way how 'coordination' of NGOs is perceived by professional responders, also faces some difficulties. NGOs are often present on the area of intervention but they can be difficult to manage and control as they are independent of the state and authorities, they are not subordinate to any other service. In addition small NGOs usually have no protective or technical equipment and no interpret for language translation; in addition they are sometimes in competition or "fighting" each other, causing miscommunication and coordination difficulties.

In some cases, however, the help of first responders can be limited due to the lack of basic services and logistics support. In the case of major natural disasters when critical infrastructure can be greatly impacted, this can prove to be a significant logistical challenge for emergency responders. Mobilizing large quantities of services and restoring services is often done is poor and dangerous conditions, which can result in delays in delivering

humanitarian assistance to those in need. **Thus, utility, commercial and government entities must develop tools and methods to prioritize the deployment of humanitarian assistance and fast restoration of basic services such as energy, water and medical facilities**.

While the EU is working on broadening the concept of critical infrastructures through positive initiatives such as the EP3R and participating with member states on expanding what will be prioritized under the definition, it is still a tedious and intricate process, because every state has its own prioritization – meaning that what can be considered critical in one state might not be critical in another. This entails further complicated measures because when a sector is classified as critical, it involves a certain level of obligations and responsibilities, as well as costs. Since there is no harmonized approach in Europe, each country has its own obligations, and this might result in substantial financial costs for the operators if they wish to comply – thus, catching up in Europe in critical information infrastructures is a slow process.

There are several factors that come into play for the EU, Member States and private companies involved. First, member states are at varying degrees of maturity with respect to the development of a comprehensive and effective CIP policy. Second, there are islands of cooperation across the EU member states but no overall concept of operations at the EU level. Third, partnerships and relationships are scattered across countries (each individual country has and will maintain unique relationships with private sector owner operators and global companies that enable them). Fourth, critical EU infrastructure is also scattered across many different countries.

Media and communication organisations should not only be based on traditional media but focus and include social media at a much greater scale. However, this should be done with caution and care as authorities often need to validate the messages to population in order to control the emergency situation. Social media outlets such as Twitter can provide rich information about an event, sometimes giving insightful details about the true extent of the damage during a natural disaster such as tornados or floods – where people may be trapped, height of the water, etc. However, it also present challenges, as rumors and false information can spread very quickly and spiral out of control, and can consequently be picked up then by traditional media.

During crisis and emergency events people have heightened anxiety and more emotional vulnerabilities, this can reflect in their reception and susceptibility to fall for rumors and fake content. In the case of the UK Riots discussed earlier, social media was responsible for spreading and instigating violence amongst people. Many rumors were propagated during the riots that resulted in large scale panic and chaos among the public. This resulted in two people being sentenced for spreading false posts on Facebook during the riots.

In the aftermath of the Boston Marathon Bombings, it was found that a significant amount of fake content and malicious profiles were made and spread via Twitter during the event. The report, carried out by Indraprastha Institute of Information Technology and IBM Research Labs in India, found that approximately **30% of the viral content on Twitter during the Boston marathon blasts was either fake content or rumors**; furthermore, almost half of the content (51%) was generic opinions and comments, while the rest was true or relevant information.[80] Furthermore, over six thousand malicious profiles were created on Twitter

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[80] Gupta, Aditi, Hemank Lamba, and Ponnurangam Kumaraguru. "$1.00 per RT #BostonMarathon #PrayForBoston: Analyzing Fake Content on Twitter", *Precog,* 2013. found at:

right after the Boston attacks (which were later discovered and suspended by Twitter), this shows the increase of spam and e-crime on social media and how it takes advantage of crisis scenarios.

This can have profound impacts on how the mainstream and commercial media represents the events, how first responders manage and react, and how those impacted by the event perceive the crisis and behave. With these results, it means that only a quarter of the information on Twitter during a crisis situation could be accurate or relevant for news, ultimately creating difficulties for mitigating a crisis situation and understanding what is going on as the event unfolds. First responders don't have the time or spare resources to sift through so much information in order to find something useful.

The report identified some of the major challenges that social media faces for real time rumor detection and control on online:

- **Volume of Content**: Most of the popular online social websites have users of the order of hundreds of millions. A huge amount of content is generated every second, minute and hour of the day. Any algorithms or solutions build to detect rumors online social media should be scalable enough to process content and user data up to the order of millions and billions.
- **Short Impact Time**: Impact of malicious activities in online social media, such as, spread of spam, phishing hours of being introduced. Hence, solutions and algorithms built need to be able to solve and detect such content in real-time. Post-analysis may be able to capture concerned criminals, but would not be able to contain the damage.
- **Anonymity**: The Internet, by itself is an anonymous medium. Lack of tracing technologies, distributed framework and private regulations worsens the condition. People can create one or multiple profiles on social media, with little or no verification required. Hence, validation and authenticity of any information source online social media is extremely challenging.

7.4   HANDLING OF COMMUNICATION CHALLENGES

Managing and responding to crises and disasters requires extensive mental and physical capacities from the first responders in what can be a highly uncomfortable environment, thus, the organisational and managerial challenges can potentially add additional stress and difficulties to an already tiring situation. Thus, a key tactic to provide support and bring together different actors is by organizing "tea and sympathy" events, in the sense that emergency workers can come together, rest periodically and have access to food and drink. In the context of the working conditions, this support for the emergency services at the scene should not be undervalued, in circumstances where rest is sporadic and access to food and water can be sparse. These periods of rest also provide great opportunities for coordination and communication as it can be the first time that rescuers and different actors involve can talk to each other and to begin the debriefing process.

Since most of the critical infrastructure is operated by commercial and private entities, it is necessary to ensure the implementation of concrete and effective policy involves close public-private collaboration. **Private suppliers are growing in importance, especially in the ICT field, thus they must be kept in the picture when designing a policy for CIP.** This also

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http://precog.iiitd.edu.in/Publications_files/ecrs2013_ag_hl_pk.pdf

means that, without adequate collaboration between public and private sector representatives, it is virtually impossible to put in place effective CIP policy. The assistance, cooperation and support of **utility and commercial entities** are essential in the event of electrical outages, water management, chemical spills or other breaches or damages to critical infrastructure. Over the past few years, European lawmakers have placed significantly more attention to the issue of critical infrastructure protection. The EP3R has provided a good foundation for cooperation and involvement of private companies in crisis and emergency scenarios; this is likely to result in the application of effective policy levers, ensuring that emerging technologies are well addressed, and ensuring alignment with other similar initiatives outside the EU.

However, some of the core measures in the EU are outdated, thus a comprehensive review was conducted in close cooperation with the Member States and stakeholders during 2012. Based on the preliminary results of the review, together with other elements of the current programme, the Commission adopted a 2013 Staff Working Document on a new approach to the European Programme for Critical Infrastructure Protection. It sets out a revised and more practical implementation of activities under the three main work streams – prevention, preparedness and response. The new approach aims at building common tools and a common approach in the EU to critical infrastructure protection and resilience, taking better account of interdependencies.

It is encouraged that commercial and utility companies follow the specific guidelines that national or regional bodies that established, such as the National Incident Management System (NIMS) which is managed by the Federal Emergency Management Agency in the United States. However, ongoing changes in internal and external standards, assets, people, processes and technology can debilitate response capabilities and upset the business continuity during emergency responses. Prominent organisations have realized that planning and conducting various levels of exercises and drills covering high and medium probability threats are the most effective approaches to implement strategies for sustaining emergency readiness and reinforcing operations continuity. Through preparedness, utility companies have current and accurate records, particular for the personnel – that way in the event of an emergency staff movements will be up-to-date in terms of certifications, availability and capabilities for specialized tasks. More importantly, extra training and extensive training for preparation is imperative so that workers are in the best possible position to address unique situations and help those affected. As mentioned earlier, incident management is the second aspect of utility companies responding to emergencies in disaster or crisis situations. **Utility and commercial companies can access Incident Command System which is part of NIMS that provides a common set of procedures for how organisations should respond and work together in disasters and crisis situations.** It helps to manage and address coordination and communication shortfalls, which is important especially in the event of a large-scale disaster which crosses state or regional boundaries. By provided harmonized and a standard set of protocols and procedures in which different government, NGO, service and commercial entities can follow, it establishes consistency among the different organisations, ultimately creating higher levels of efficiency, coordination and sharing of resources and information.

As mentioned earlier, **social media** has revolutionized the ability of government and private companies to coordinate activities and reach out to civilians much faster in the event of an emergency; furthermore, being able to track and understand emergency situations much faster due to civilian use of social media (sometimes, providing more up-to-date information much

faster than first responders themselves). However, another key tool that is emerging in crisis management are coordinated software systems, which gives companies and governments all of the information that they need to know when emergency situations occur – such as where outages are, how they have to be fixed and what type of responders need to be sent. **These systems provide immediate information in terms of the resources available, destinations and possible inaccessible routes, GIS data on critical infrastructure, feedback from other actors, response times, and more.** This type of software is becoming increasingly sophisticated with the information they provide to utility and emergency response organisations.

The process of detecting and curbing the spread of fake information on social media is still in its infancy, as it is a relatively new and unexplored area. As discussed earlier, social media has become a space on the internet for the presence of e-crimes that creates additional challenges due to anonymity, private settings and large volume of data, which difficult for researchers to build effective solutions. Therefore, in order for first responders to react effectively there needs to be analysis to ensure the reliability in the information. The solutions that need to be built need to function in real-time and also need to be capable of handling large volume and evolving characteristics.

There has been much work done to extract situational awareness information from the vast amount of data posted on online social media during real-world events. Real-time technology is increasingly being used to analyze the content generated on social media to detect fake content and profiles in their early stages but also learn how it can be of assistance to get information and advanced knowledge of events as they unfold during a crisis. Twitter logs for the Oklahoma Grassfires in April 2009 and Red River Floods in March/April 2009 was used for the presence of situational awareness content. This led to the development of an automated framework to enhance situational awareness during emergency situations. They extracted geo location and location-referencing information from users' tweets; which helped in increasing situational awareness during emergency events.[81]

Social media analysis looked at the Twitter stream during the 2008 Mumbai terrorist attacks and showed how information available on online social media during the attacks aided the terrorists in their decision making by increasing the terrorist's social awareness. Furthermore, a team at National ICT Australia Ltd. has been working on developing a focused search engine for Twitter and Facebook that can be used in humanitarian crisis situation. Lastly, in 2013, Bavarian Red Cross set up in set up closed Facebook group (Search and rescue robots) for Teams, Media, Exercise Control (EXCON). The main purpose of this group was to serve as a supporting tool for uploading pictures for the assessment in real-time, and for sharing important information.

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[81] Ibid.

8   CONCLUSION

The purpose of this report has been to investigate the role of emergency response agencies (such as police, fire department and health care professionals) as well as other organisations (such as private companies, NGO's and volunteer organisations) that are commonly involved in the different types of crisis outlined in D1.1 and further described in D1.2.

Before drawing the most significant conclusions of this report, partners first stress the relevance of this chapter and show how it will contribute to the general purpose of the COSMIC project.

Insight into the role of the traditional emergency response agencies as well as some other organisational actors that may become involved is imperative for understanding the extent to which new and emerging communication technologies and applications may be used to promote safety and security of EU citizens in crisis situations. New and emerging communication technologies may benefit the safety and security of EU citizens in two ways.

First, new and emerging communication technologies and applications may be used to improve the communication with EU citizens and news media before crises (that is risk communication) and during crisis (that is crisis communication). As a crisis communication tool, new and emerging technologies can be used for warning citizens as well as inform them about the threat and what to do. As partners have shown in D1.2, risk and crisis communication are of vital importance for enhancing the resilience of citizens before, and during, crisis situations.

Second, new and emerging communication technologies and applications may be used to assist communication and information gathering for emergency response agencies as well as information sharing between those who respond at the scene of the event (first responders).

In this report partners have examined the role of the emergency response agencies as well as other typical organisations involved and described some of the most persistent problems these agencies and organisations face regarding communication before and during crises. Now partners will draw some general conclusions as well as some particular conclusions for the different agencies and organisations involved in the response.

The **first** and perhaps not compelling conclusion of this chapter is that police, fire department, health services and external stakeholders/actors are differently organized throughout the European Union. It was found that the different legal shapes and forms of governments existing in the EU member states play a significant role within the legal and institutional European first responders diversity, whether it be first responders from police, fire department or medical services.

For instance, in Federal States as Germany, in which power is divided among states and a central government, decision-making is largely decentralized. As a consequence, in case of a crisis situation, the first authority in charge is the lowest administrative level, e.g. the municipality. Only if boundaries of this authority are exceeded or the capabilities are not sufficient, the next highest hierarchical authority takes the coordination. In contrast, in other countries as Italy for example, power tend to be more centralized and regions or states are not constitutional autonomous. Consequently, the first and final saying (decision power) within the chain of command is rather more centralized in case of a crisis situation.

In addition, there are differences between EU member states about what emergency response agencies actually do when crisis occurs. For instance, whereas the police in the UK are responsible for the command, control and coordination of the emergency work at the scene of the event, in the Netherlands this task is mandated to the fire department.

However, the **second conclusion** of this report is that despite the differences with regard to the tasks, responsibilities and organisational structure of emergency response agencies, the opportunities for improvement are quite comparable. Both between different types of emergency response agencies (e.g. police, fire brigade and medical services) as well as similar emergency response agencies between different EU member states.

First, in EU member states large improvements can be made with risk communication. Tools and solutions can be developed to promote better understanding among the public about risks and how they are mitigated, how to act in different crisis situations and how the public can support in times of crises. Second, most member states prediction capabilities of different crisis situations, in particular those were early warning may limit the impact of the crisis situation, may benefit from emerging technologies and new applications. Third, regarding to crisis communication, improvements can be made by EU member states to assure effective flows of validated, balanced information to its residents. Fourth, the capabilities by emergency response organisations throughout Europe to gather and analyse information from external sources such as ordinary citizens, NGOs and private companies could be strengthened. Fifth, situational awareness of first responders and higher echelon decision-makers within the same organisation and between different emergency response agencies could benefit from emerging technologies and new applications.

The third conclusion of this report is that the effectiveness of risk and crisis communication is often unrelated to which device or technology was used but rather to how it was used. For instance, to be effective, in crisis situations warning and information messages should be communicated immediately and should preferably be accompanied by guidelines about what can be done to remain self-reliant. In this, it is not relevant what communications channels governments use to communicate with citizens, but the speed with which messages are made and communicated.

The **fourth and final conclusion** of this report is that the challenges that emergency response agencies need to overcome in order to benefit from emerging technologies and applications are quite universal for EU member states and between different emergency response agencies. First, for instance, privacy and security aspects of information exchange within or between emergency response agencies must be taken into account. Second, there are often quite similar concerns in emergency response services to communicate immediately with citizens about possible threats, especially when the threat is highly uncertain. Third, implementing new solutions to improve information exchange between government and citizens as well as between emergency response agencies must put minimal burden on responders' cognitive resources, since it is important that all attention is devoted to the scene of the event. Fourth, regardless organisational configuration or task responsibility, all emergency response organisations face the challenge to make 'sense' of all the data provided by emerging information technologies and applications. Systems should be developed that filter relevant from irrelevant information. Partners found no evidence that the relevance of certain types of crisis information varies between EU member states. In addition, emergency response

agencies need to think about how fake and erroneous information could be detected and removed from information analyses.

9   ACRONYMS

B	
BBK	Federal Office of Civil Protection and Disaster Assistance
BMI	Federal Ministry of Interior in Germany
BMG	Federal Ministry of Health
BMU	Nature Conservation and Nuclear Safety in Germany

C	
CFPA	Confederation of Fire Protection Association (Europe)
CIMIC	The capability for Civil-Military Cooperation
CIP	Critical Infrastructure Protection
CIIP	Critical Information Infrastructure Protection
CORDIS	Community Research and Development Information Service
CM	Crisis Management
CSO	Civil society Organisations

D	
DEMA	Danish Emergency Management Agency

G	
GMLZ	Joint Information and Situation Centre
GSCP	General Secretariat for Civil Protection

M	
MDT	Mobile Data Terminals
MECA	Medical Emergency Communication Assistant
MSB	Swedish Civil Contingencies Agency

N	
NOAH	A Centre for the coordination of aftercare and for support of victims and their relatives
NGO	Non-governmental organisations
NIMS	National Incident Management System

P	
PSCE	Public Safety Communication Europe

R	
RTIC	Real time intelligence centre

S	
SatWaS	A warning centre with a satellite based warning system

T	
THW	German Federal Agency for Technical Relief *(Technisches Hilfwerk)*

W	
WP	Work Package