CRISMA

CRISMA Report on Market analysis

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18.3.2013

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 284552.

The research leading to these results has received funding from the European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 284552 "CRISMA"

Deliverable No.		D63.1	
Subproject No.	SP6	Subproject Title	Dissemination, user awareness and exploitation
Work package No.	WP63.1	Work package Title	Exploitation strategies
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Status (F = Final; D = Draft)		F	
File Name		CRISMA_D631_final.doc	
Dissemination level (PU = Public; RE = Restricted; CO = Confidential)		PU	

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Keywords	
Deliverable leader	Name: Bernard Stevenot Partner: SPB Contact:
Contractual Delivery date to the EC	28/02/2013
Actual Delivery date to the EC	18/03/2013

Document Revision History

Version	Date	Who	Comments
0.1	12.01.2013	Armonie Cossalter/ Marc Erlich	Draft Chapter 1
0.2	21.01.2013	Bernard Stevenot	Skeleton of the deliverable Review chapter 1
0.3	23.01.2013	Martin Scholl	Incorporation of Chapter 3 (CRISMA Offer)
0.4	25.01.2013	Holger Braker, Tero Karppinen, Bernard Stevenot	Review comments and modifications; all sections concerned
0.5	27.01.2013	Marc Erlich	Additional contribution to section 2.3.1 Relevant policies
0.6	06.02.2013	Martin Scholl	Revision of section 3.2.2 and 3.2.3
0.7	08.02.2013	Hanna-Miina Sihvonen	Update section 2.3.2.1
0.8	11.02.2013	Tero Karppinen, Oren Deri, Bernard Stevenot	Revision of chapter 4
0.9	12.02.2013	Bernard Stevenot	Drafting chapter 5
0.10	19.02.2013	Bernard Stevenot	Revision of section 4.2 and drafting chapter 6
0.11	21.02.2013	Tero Karppinen Johannes Sauter Holger Braker	Update section 4.1 Review and comments
0.12	25.02.2013	Martin Scholl Bernard Stevenot Miguel Almeida	Update section 3.4 Update section 2.3.3 Final review
1.0	25.02.2013	Bernard Stevenot	Editing
1.1	27.02.2013	M.C. Bonnamour	Review by SP6 leader
1.2	27.02.2013	Bernard Stevenot	Final editing
1.3	05.03.2013	Bernard Stevenot	Update Executive Summary (missing)
final	18.03.2013		SSA approved and styles corrected by the Coordinator

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Executive summary

This document, the “Market Analysis Report” is the first deliverable of the Exploitation task of the CRISMA project, under the Grant Agreement FP7-SECURITY – 284552 (Modelling crisis management for improved action and preparedness). The Exploitation activities rely heavily on the progress of the different technical tasks of the project, such as the user’s requirements (SP2) and the architecture and the specifications of the services (SP3). These activities are mainly performed by the industrial partners (SPB, CISMET, INSTA, ARTELIA, CASSIDIAN, NICE).

The document “Report on Market Analysis” is dedicated to the preliminary investigation of the market. Although this market analysis will remain quite imprecise, due to the availability of partial results only from other CRISMA Work Packages, it is a unique opportunity to build tentatively a global picture of the final goal of the project, in the perspective of addressing the crisis management market.

The work performed so far on the market analysis is focused on the following aspects of the market:

- Identification of the stakeholders, their needs, and the drivers in the market, using mainly the information provided by the Pilots;
- Identification of the CRISMA possible “offer” i.e. what CRISMA is expected to deliver;
- Identification and classification of the competitors and their competing solutions;
- Potential position of CRISMA on the market;

During this market analysis, it became clear that it is important to understand, what will be the “offer” of the CRISMA Consortium in terms of future products or solutions, in order to be able to raise the interests of the potential users and to discriminate CRISMA from other offers on the market. At this stage of the architectural work, the scope of the offer is not precise enough to define a realistic CRISMA offer. However, there are competing products and solutions for crisis management and further investigations will be required to identify their strengths and weaknesses, in order to position CRISMA on the right market segment.

The result of the work is the production of a preliminary report on market analysis (deliverable D63.1), which should be a strategic input for the review of the CRISMA project at the end of the first year and give the CRISMA Consortium the opportunity to discuss the priorities for the further development of the project, taking into account preliminary conclusions and recommendations:

- The technologies anticipated for the development of CRISMA should ensure a large coverage of crisis management simulation needs as well as the flexibility, connectivity and openness of the implementation.
- Innovative business models have to be proposed on the market, taking advantage of the open source community and the “Software as a Service” paradigm.
- The support services and the data value chain should be included in a global CRISMA offer, in the perspective of offering a sustainable solution for crisis management simulation needs.

1. Introduction and Methodology

The Exploitation work package extends for the whole duration of the project and its major deliverables are only due at the end of the project (M42). However, the work plan must take into account the need to deliver at the end of year 1 (M12) the "Report on Market Analysis" (D63.1). In this context, a first phase in the project (until M12) is dedicated to the preliminary investigation of the market. Although this market analysis will remain quite imprecise, due to the availability of partial results only from the other Work Packages and the very limited budget available for the Exploitation activities, which does not allow for a detailed market investigation, it is a unique opportunity to build a tentative picture of the exploitable results of the project.

This report on market analysis (deliverable D63.1) is an input for the internal review of the CRISMA project at the end of the first year and should give the CRISMA Consortium the opportunity to confirm or adapt the priorities for the further development of the system.This deliverable D63.1 issued at the end of the first year should be considered as a draft document, for the reasons exposed above; it will be complemented and hopefully delivered in its "final" version at the end of Year 2, when the first iteration of the system architecture and dissemination activities towards the users (users' workshops) have been achieved.

The CRISMA project targets the market of large natural and industrial crisis management, with a special focus on the modelling and simulation tools to support the strategic decision making, the training and exercise and the management of resources during the preparation phase.

The present report will successively address the key points of the market analysis:

- The identification of the stakeholders and their needs
- The offer resulting potentially from the CRISMA project
- The identification and analysis of the competition
- The position of CRISMA in the market

The Deliverable D63.1 will be organized as follows.

Chapter 2: Stakeholders, their needs and expectations

This chapter will provide a general picture of the market, analyzing stakeholders, from national civil protection institutions in large countries down to small entities involved in public safety. It will comprise a description of the users' practices, their problems and their expectations and will propose a characterization of the actors. The chapter will also identify the critical improvements required.

Chapter 3: the CRISMA offer

This chapter will provide the definition of the CRISMA exploitable results (= the CRISMA "Offer"), i.e. what CRISMA will deliver in terms of exploitable results and what are the main innovative value brought by the CRISMA solution. It will address more specifically:

- The inventory of functional and technological capabilities that will be impemented by the CRISMA results.
- The scope and limitations of the CRISMA intended components.

Chapter 4: the Competition and the position of CRISMA on the market

This chapter will identify the potential competitors on the market targeted by CRISMA, their products or solutions and their position on the market, segmenting the competition according to two possible sources of competition:

- The competitors offering applications oriented products or solutions, including the Users, who develop their own proprietary solutions tailored to their specific needs
- The competitors offering technological frameworks with similar capabilities as those targeted by CRISMA with its “Infrastructure Framework”

This chapter will also provide the likely position of the CRISMA offer on the market, addressing the following issues:

- Opportunities and threats for CRISMA in the market
- Strengths and weaknesses of the future CRISMA offer

Chapter 5: Conclusions and recommendations

The Market Analysis Report will provide recommendations to the CRISMA consortium about the improvement and other adjustment of the CRISMA project and define the roadmap for the future work on the exploitation strategy.

2. Stakeholders Analysis

The stakeholders' analysis is necessary in order to estimate the potential market for CRISMA products and tools. Therefore, in a first part of this chapter, we will identify the stakeholders in crisis management in Europe. In a second part, based on the stakeholders' identification and analysis, we will describe the user's practices, their problem and their expectation.

2.1. Identification of the stakeholders in crisis management

The aim of this part is to provide a short description of a representative sample of stakeholders, using the work already performed in each CRISMA pilot and potentially in other geographical areas where the pilot business extends. To define the stakeholders' profile, we use a classification and identify relevant characteristics.

The CRISMA stakeholders can be sub-divided into four main categories:

- The Authorities
- The crisis management professionals
- The data and service providers
- The public stakeholders

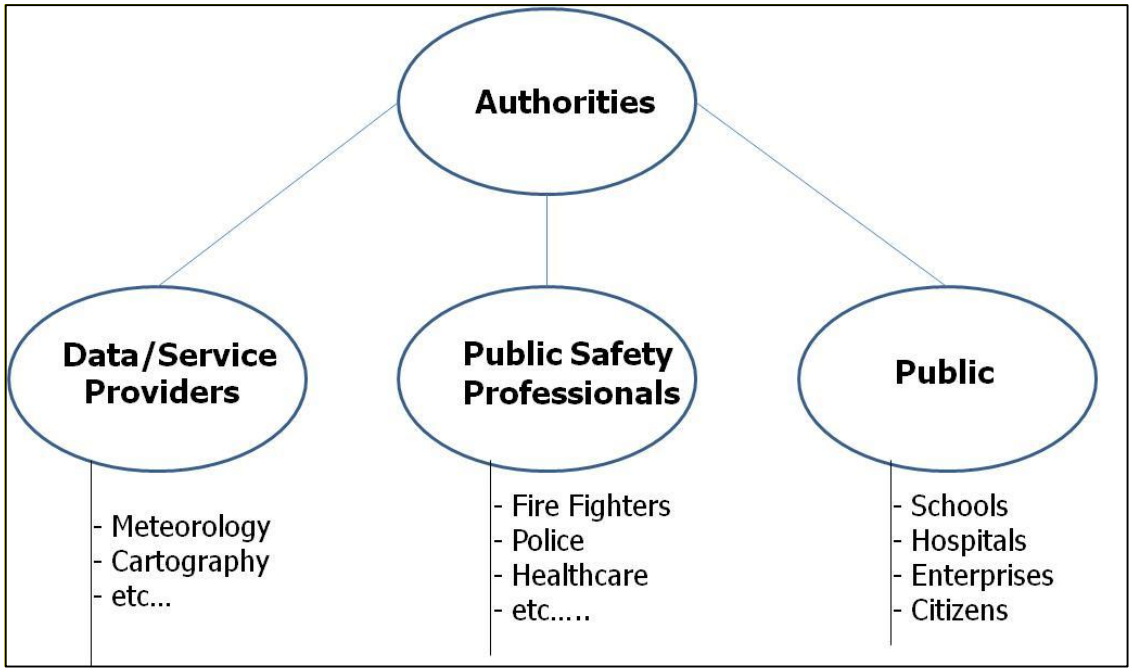


Figure 1: Stakeholders classification.

For each type of stakeholders, it is interesting to characterize their role in crisis management, the hazards addressed and their current resources for crisis management.

2.1.1. Authorities

The Authorities have the political mandate to ensure the Public Safety for the population. The Authorities, forming altogether the Government, are divided into four geographical scales (national, regional, district and local).

The summary, presented in the tables of this section and the following ones, is primarily based on the analysis of the CRISMA pilot cases and the consultation of official web sites of national crisis management centres in Europe. During the next phase of the WP63, the conclusions drawn from the limited sample used here will be validated or adapted on the basis of a wider sample of stakeholders in Europe. In particular, the first CRISMA end-users workshop, scheduled in Bruxelles on May 30th, 2013, will gather the potential community of the CRISMA end-users involved in the crisis management. Organised in conjunction with the Public Safety Communications Europe (PSCE) conference, which is taking place during the previous two days, the workshop will bring together delegates from national authorities, research institutes and companies including IT specialists. It is expected that the workshop will allow to increase the knowledge on the expectations of crisis management stakeholders, not limited to CRISMA pilot end-users and provide a representative feedback to CRISMA technical and technological orientations.

Table 1: Examples of Governmental stakeholders organization.

Countries	National	Regional	District	Local
Austria	Federal Governement (Federal Chancellery)	Federal Provinces (9)	Districts	Municipalities
Belgium	Federal Government (Ministry of Interior)	Regional Government	Provinces	Municipalities
Finland	National Government (Ministry of Interior)	-	Provinces	Municipalities
France	National Governement (Ministry of Interior)	Defence Areas (CIRCOSC)	Prefectures	Municipalities
Germany	Federal Governement	Länder (16)	Districts	Cities
Spain	Country Governement	Autonomous Communities	-	Municipalities

Table 2: Missions vs Governmental levels.

Missions	National	Regional	District	Local
Prepare, vote and publish the laws, regulations, decrees supporting preparedness, etc	Y	N	N	N
Ensure the international coordination in cross-border crisis	Y	N	N	N
Ensure the coordination mechanisms between the Authorities and the Public Safety professionals	Y	Y	N	N
Secure the Public Safety resources (people, equipment, funding, etc)	Y	Y	Y	Y
Organize, Control and Review real-life exercises	Y	Y	Y	Y
Organize the training of the public stakeholders (authorities and professionals)	Y	Y	N	N
Establish the emergency plans for potential hazards	Y	Y	Y	Y
Conduct impact analysis and decide on short/long term measures concerning Land Use, Environment and protective measures (e.g. dikes)	Y	Y	N	N
Control the effective implementation of safety measures	Y	Y	Y	N
Secure the capacities of the first responders and the logistics support	Y	Y	N	N
Establish the Crisis Control & Command Centre	Y	Y	Y	N
Decide on response measures in the emergency situation	N	N	Y	Y
Ensure that the citizens have access to relevant information on risks and preventive/emergency procedures	Y	Y	Y	Y

2.1.2. Professional stakeholders

The professional stakeholders are people or institutions that take part in the crisis management due to their profession. They are public and para-public services (such as fire brigades, medical emergencies etc.) the NGO's, the utility managers, the industrials (SEVESO sites).

These professional stakeholders are identified in the following table. this part of the analysis is relevant for all type of hazards and for all pilots. These services and types of companies are common in each related country and have similar characteristics such as their role in crisis management, their scope of action, their link with the authorities.

Table 3: Professional stakeholders characteristics.

Type	Role in crisis management	Scale	Link with authorities	Current resources for management
Fire brigades	Prepare to the organization of crisis management; Manage and coordinate the operational response; Secure and rescue the population	local	Inform the authorities about the situation; Receive orders from the authorities	training
Medical Emergency	Rescue the population	local	Inform the authorities about the situation	training
Police	Inform the population of the hazards ; Give instructions to the population; Participate to the operational response	national, regional, local	Inform the authorities about the situation; Receive orders from the authorities	training
Military forces	Participate to the operational response	national	Inform the authorities about the situation	training
NGO's	Participate to the operational response	international, national	Inform the authorities about the situation	training
Utility Managers	Manage utilities surveillance; Repair utilities	local	Inform the authorities about the situation	
Security Officer in Industrial sites	Ensure safety of operations; Develop the security plan	local, regional	Inform the authorities about their security plan (if something happen in the building, what would be the impacts etc.)	Security plan / Training
Media	Inform the population of the hazards and instructions	local, regional, national	Fulfill the link between authorities and population	Tv,radio, newspapers, etc.

2.1.3. Service and Data providers

Another category of stakeholders with a significant importance in crisis management are the data and services providers. These stakeholders are specific in each country for each type of hazard. The institutions taking part in the different types of crisis provide data or services relevant for a specific hazard.

From the CRISMA point of view, the interest is focused on the data and service providers supporting the Authorities and the professional stakeholders in all the phases of the crisis, by supplying information, which will help the stakeholders to better perform their missions. A list of Data and Services Providers with their main contributions is given in Table 4 below.

Table 4: Data and Service Providers in crisis management.

Provider (data/service)	Added-value	Hazard	Crisis phase
Meteorological service	Weather forecast Warning to Authorities Warning to the public Atmospheric parameters	Storm Flood Submersion pollution	Prevention Preparation Intervention
Seismic monitoring service	Warning to Authorities Earthquake parameters	Earthquake	Prevention Preparation Intervention
Hydrological monitoring service	Warning to Authorities Water flow parameters (water height, water velocity)	Flood	All phases
Atmospheric dispersion experts	Dispersion plume calculation	Chemical accident	Prevention Preparation Intervention
Cartographic services	Maps (national to local scales) DEM Land Use/Land cover etc	All hazards	All phases
Chemical product Experts	Warning on danger Instructions for handling and precaution	Chemical accident	All phases

2.1.4. Public stakeholders

The last type of stakeholders is the public stakeholders, which comprise the citizens, the enterprises and the vulnerable public organizations. They are mostly important in the response phase of the crisis management and they are common to each type of hazard (Table 5).

Table 5: Public stakeholders' characteristics.

Type	Role in crisis management	hazards addressed	link with authorities
Schools	Can be used as shelters ; Vulnerable sites	All	authorities should know the census and localisation
Hospitals, health centres, nursing houses	Vulnerable sites	All	authorities should know the census and localisation
Enterprises	Organize safety measures to protect assets and prevent cascading accident	All	authorities should know the census and localisation
Vulnerable individuals	be aware of the risk; be prepare to an eventual evacuation	All	authorities should know the census and localisation

2.2. Stakeholders' practices, problems and expectations

2.2.1. Relevant policies

The organization, missions, practices and requirements of the crisis management stakeholders in Europe are mostly governed by European Directives, National Laws and

Decrees and local practices. This section intends to highlight such regulations governing the crisis management in two specific cases..

Flood and Coastal Submersion

With respect to floods and coastal submersions in particular, the Directive 2007/60/EC on the assessment and management of flood risks, which entered into force on 26 November 2007 is the major regulatory reference in Europe.

Given the subsidiarity principle, this Directive requires all Member States to assess if all water courses and coast lines are at risk from flooding in order to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. This Directive reinforces the rights of the public to access this information and to participate in the flood protection planning process.

Member States shall furthermore coordinate their flood risk management practices in shared river basins, including with third countries, and shall in solidarity not undertake measures that would increase the flood risk in neighbouring countries. Member States shall take into consideration long term developments, including climate change, as well as sustainable land use practices in the flood risk management cycle addressed in this Directive.

The Directive shall be carried out in coordination with the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy), notably by flood risk management plans and river basin management plans being coordinated, and through coordination of the public participation procedures in the preparation of these plans. All assessments, maps and plans prepared shall be made available to the public.

The Directive 2007/60/EC sets out clear deadlines for each of the requirements.

The key milestones are listed below.

Issue	Deadline	Reference
Entry into force	26.11.2007	OJ L 288, 6.11.2007 Art 18
Transposition	26.11.2009	Art 17
Reporting format Preliminary Flood Risk Assessment	22.12.2009	Art 11
Administrative arrangements to be in place and to be notified to the Commission	26.5.2010	Art 3
Cut-off date transitional measure (availability of existing tools)	22.12.2010	Art 13
Preliminary flood risk assessment	22.12.2011	Art 4 & 5
Public participation process starts (publication of mechanism and timetable for consultation)	22.12.2012	Art 9.3 & 10
Flood hazard and risk maps	22.12.2013	Art 6
Flood risk management plans	22.12.2015	Art 7
2nd Preliminary Flood Risk Assessment, specific requirement on climate change Commission's first implementation report due.	22.12.2018	Art 14.1 & 4
2nd Flood hazard and risk maps	22.12.2019	Art 14.2
End of 1st flood risk management cycle 2nd Flood Risk Management Plans, specific requirement on climate change. 3rd Water Framework Directive River Basin Management Plans.	22.12.2021	Art 14.3 & 4

As the market for the availability of appropriate tools for the preparation of the flood risk management plans clearly coincides with CRISMA time schedule the impact of the regulations in the domain of coastal submersions is an opportunity for CRISMA.

Industrial risks

Following the industrial accident that occurred in Seveso (pesticides and herbicides manufacturing plant) in 1976, The European Commission issued successively two Directives:

- SEVESO I: the Council Directive 82/501/EEC on major accident hazards of certain industrial activities
- SEVESO II: the Council Directive 96/82/EC on the control of major accident hazards, replacing the existing SEVESO I Directive.

Recently, the European Commission has adopted the SEVESO III Directive 2012/18/EU, which replaces the existing SEVESO II Directive.

The European Directives SEVESO (1982) and SEVESO II (1996) have been transposed into the national legislations to provide a framework for the control of industrial and technological risks. The new Directive SEVESO III shall be translated into national legislations not later than June 2015.

The main objective of the Directive is to enforce in the European Member States the operators to put in place a policy to prevent major accidents. The obligations depend on the quantities of dangerous substances present in an establishment; consequently, the operators are classified according to “upper-tier” and “lower-tier” establishments, where the “upper-tier” establishment, detaining larger quantities of dangerous substances, is subject to stricter rules and controls than the “lower-tier” establishment.

The Directive addresses both the measures aimed at the prevention of major accidents and the measures aimed at the limitation of the consequences of major accidents. Depending on the classification of the establishment with respect to the thresholds (“upper-tier” and “lower-tier”), the following rules may apply.

- The operator must notify the Authority and establish a “major accident prevention policy”
- When required, the operator must provide a “safety report”, a “safety management report” and an “emergency plan”; the operator establishes the internal emergency plan, delivered to the local Authority; the local Authority must prepare the external emergency plan. These plans must be revised and tested regularly.
- The Authority must control the potential impact of the accident on the surroundings (public and residential areas in the vicinity of the establishment, as well as the consequences for the environment) through land-use planning.
- The operator and the Authority have the obligation to give the public access to information and to inform the public about the behaviour in case of an accident.
- The Authority is obliged to organize Inspections of the site of the establishment and ensure effective enforcement of safety.

The Directive does not cover the transportation of dangerous substances, nor the pipelines.

Other European regulations may have an impact on the crisis management requirements, such as:

- *Council Regulation (EC) No 2012/2002 of 11 November 2002 establishing the European Union Solidarity Fund (EUSF)*
- *Council Decision 2001/792/EC, Euratom of 23 October 2001 establishing a Community mechanism to facilitate reinforced cooperation in civil protection assistance interventions (Civil Protection Mechanism)*
- *Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (IPPC Directive)*
- *Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (EIA Directive)*
- *Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (The SEA Directive)*
- *Aarhus Convention and related Community legislation on public participation and the access to environmental information.*

2.2.2. Learning from the CRISMA pilots ...

The main potential users of CRISMA are stakeholders in crisis management. The potential users may be different from one pilot to the other. The Table 6 below summarizes the stakeholders concerned in each pilot. Their interest and needs are briefly discussed hereafter.

In order to define the place of CRISMA in the market, it is important to consider what the potential users need. Consequently, based on the previous part, the current practices and resources in crisis management have to be evaluated for each pilot,stressing the priorities for each pilot users. It will help defining the main improvements that CRISMA could offer.

2.2.2.1. Pilot A – Cross-border emergency in Finland

The CRISMA system in Pilot A is focused on improving the preparedness planning. The two main stakeholders to CRISMA are regional administratrative agencies who coordinate and adjust regional preparedness of different organizations and rescue departments coordinating, supporting and training for preparedness planning. Secondary stakeholders are different authority organizations, e.g. police, municipalities and emergency medical services.

In order to manage threats against the population, society and the state, modes of operation that are known and exercised by all actors who participate in the preparedness and management of disturbances need to be in place.

The principle of legality and the established division of administrative duties are observed to manage disturbances which jeopardise the security of society and the population. Both in normal situations and emergency conditions the same principles for the management of disturbances are followed. The divisions of duties as well as operational models customary under normal conditions are retained as long as possible. Situations are proactively managed and sufficient resources are immediately put into use. The competent authority empowered by the law to do so leads the operational side and intersectoral co-operation bodies support the responsible authorities. Whoever is responsible for situation management is also responsible for communications.

On the Government level, the ministry empowered by the law to do so leads activities and co-ordination among ministries, when required. Permanent Secretaries bear the primary responsibility for the organisation of work at the ministries, and therefore the meeting of Permanent Secretaries may be necessary when first addressing the management of a disturbance. Possible disagreements on which ministry bears the responsibility for a matter or handles a far-reaching issue will be solved at the Government plenary session, if necessary. Intersectoral cooperation bodies can be used to support the preparations to manage a disturbance. The meeting of Heads of Preparedness is a central co-operation body which supports ministries in security matters. There can be steering groups at the ministries or civil service departments, which convene together with representatives from interest groups if required for the management of a disturbance.

It may be necessary to bring a disturbance to the knowledge of the Government as soon as possible so that all members of the Government have an opportunity to receive, at the same time, an accurate and correct understanding of the matter. This is essential for the work of the members of the Government and for bearing ministerial responsibilities. Apart from situation awareness also preparation responsibilities and further handling can be discussed. Further handling includes, for example, organising sufficient cooperation between ministries and handling at Cabinet Committees.

The Government and the ministries are supported by the Government situation centre, which comprises the high-level leadership as well as the situation centre and the information centre run by the Prime Minister's Office. The high-level leadership can assemble on the following levels: Heads of Preparedness, Permanent Secretaries or members of the Government (Cabinet Committee, Government meeting, Government plenary session). The situation centre maintains contacts with actors on different levels of the administrative sectors.

The stand-by duty personnel in the ministries and the situation centres of different administrative sectors form the base on the Government level from which to respond to disturbances. The Government situation centre acts as the contact point for the stand-by duties of the ministries, keeping the administrative sectors informed of observed events and convening, when necessary, the co-operation bodies and experts from different administrative sectors to secure up-to-date access to information. Supported by the authorities and other actors who contribute to the management of a disturbance, the situation centre also co-ordinates the compiling of the situation picture, if necessary.

The CRISMA is expected to provide better preparedness planning so that different organizations can plan and run through different scenarios and see gaps in preparedness with respect to resources (e.g. equipment, personnel, number of stations, supplies) and see gaps also in crisis management processes (e.g. if some decision is made by another organization, how it affects the others and are their plans/resources adequate). The CRISMA tool is expected to support preparedness planning with long term impacts rather than "right this moment" impacts. The tool is expected to be used in preparedness and exercise planning, to go through a scenario and test its weaknesses and gaps. The focus in CRISMA pilot A is on a northern winter storm, in which better simulations of what happens in case of storm to critical infrastructure are needed, e.g. heating of buildings, electricity network, accessibility of locations, road and, telecommunication networks vulnerability, location of population.

2.2.2.2. Pilot B – Coastal submersions in Charente-Maritime, France

Potential future users of the CRISMA system in the case of coastal submersion are clearly localised in every coastal zone of Europe. The governments and administrations at a regional scale (the Civil Protection authorities, the counties self-governments etc.) and at a local scale (the urban communities, the council of a significant city, etc.) should be interested by such a system. Indeed, these stakeholders are the main crisis managers and they might need a support to rely on for their decisions in crisis management.

Moreover, the safety professional services such as fire brigades, medical emergencies etc. could be other potential users. Indeed, simulations could be useful to prepare the actors (manage the staff, buy equipment, organise specific training etc.) for a better operational response during a crisis.

However, we want to remind that within the framework of the pilot B, the CRISMA system is expected to support the preparedness phase only. The tools will not be developed for the use of CRISMA in a real-time event. Indeed, the partners from the pilot sites are not willing to develop the response and restore phases.

Considering that the pilot B is developed for the preparedness, we will only focus on this phase for the following analysis.

In France, the main practices for the preparedness in crisis management are the evaluation of hazards. Indeed, the lack of tools does not allow a full risk evaluation. Therefore, the need of a simulation based system (such as CRISMA) is stressed.

Nonetheless, the strength of the crisis managers is the availability (no public diffusion, only for governmental services) of the main needed data. Indeed, the census of the population, their location, the census of vulnerable individuals or buildings is stored. Besides, the data on operational resources is relevant and available.

In a scope of preparedness for crisis management, the mitigation of the risk tends to be significantly necessary. The main purpose is to re-organise the region for a better preparedness (e.g. land use management to minimize the impacts). In the framework of coastal submersions, we would need to simulate the event in order to evaluate the vulnerability of the area, the different impacts, and the risk. It could also be useful to simulate the coastal submersions to evaluate the potential propagation of impacts and the cascading effect such as the propagation of pollution (using pilot C) due to a flooded SEVESO site. These estimations should help potential users to adjust the appropriate response while sharing common potential impacts evaluation results. However, the current resources of the potential users do not have the necessary tools for this complete analysis. Another significant expectation from CRISMA is to optimise the dike surveillance. To avoid numerous damages on coastal defences such as dike failures, a tool needs to be developed. It would help determining which dikes are the most vulnerable to occurrence of. In the scope of preparedness, the potential results of such a tool might indicate which dikes have to be strengthened and closely watched.

Furthermore, in France, some damage functions are available through a national Cost Benefit Analysis guide. They are used to evaluate the costs of impacts due to floods in several domains (agriculture, public equipment, economic activities and dwellings). They are also relevant to evaluate the vulnerability of the area to a given event. Even if the functions were reviewed last year (2012) to include more parameters (salinity for

example); the majority of them were elaborated for river floods in a specific river basin. In the scope of coastal submersions, nothing was specifically elaborated to evaluate the impacts. Indeed, the water level as well as the water velocity and the salinity are important factors of damages.

Therefore, the improvements expected by the users are in the availability of relevant models such as:

- Social and physical vulnerability models (including dike vulnerability)
- Impacts models for coastal submersions
- Multi-risk assessment models (for cascading effects)

2.2.2.3. Pilot D – Geophysical hazard in L'Aquila, Italy

In Italy, the civil protection is organized in a "National Service", a complex system that includes all the structures and activities put in place by the state to protect the integrity of life, property, settlements and the environment from damage or the danger of damage resulting from natural disasters, catastrophes and other disasters. The activities of the system are the forecast and prevention of various scenarios of risk, to rescue people and all activities aimed at overcoming the emergency.

For what concerns the laws that regulate the roles of Italian Civil Protection there are mainly two:

1. The law 24/02/92 n. 225 establishes the institution of the National Civil Protection Service and defines the events, duties and levels of intervention as a function of the size of the events.
2. The law 09/11/2001 n. 401 deals with the urgent provisions necessary to guarantee the operative coordination of the Civil Protection and to upgrade logistics in the Civil Defense sector.

The activation scheme of civil protection considers three different levels of event:

a) Events (either man-made or natural) that can be managed by the responsible administration at the local level (municipal level).

In this case, the Major is the municipal civil protection authority responsible for the direction and coordination of the local emergency response. An Operative Centre may be established in each affected town to direct local response activities and for coordination with other towns and higher level organization.

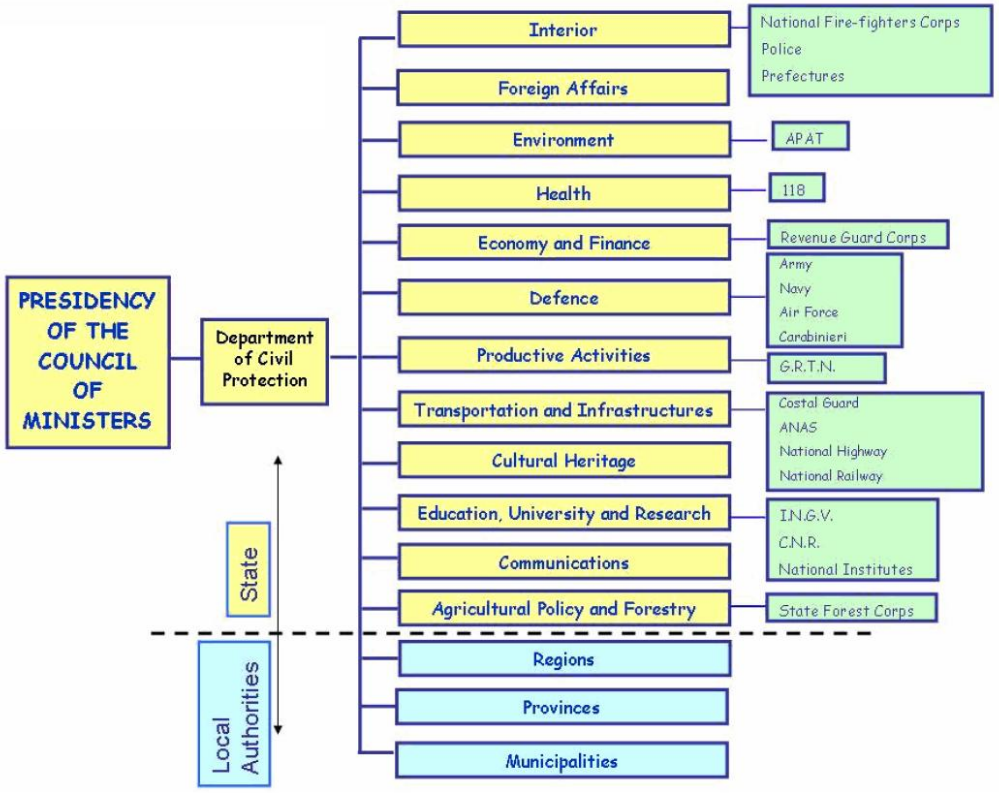
b) Events requiring the coordinated intervention of several administrations, each one responsible for a specific aspect; the responsible administration is at an intermediate level (province and or regional level).

When the event is managed at the provincial level, the Major requests assistance from the Prefect (province), who declares a local emergency, and serves as the delegate of the Minister of Civil Protection. A Mixed operative centre is established to direct emergency response activities within the province and to provide a central point of coordination and communication with the National Civil Protection.

c) Events requiring extraordinary means and powers, with the need for a direct intervention of the State

When this kind of event occurs, the Ministry Council declares a “State of Emergency”, giving to the Prime Minister the power to issue special Ordinances to manage the disaster. In this case the National Civil Protection coordinates the intervention.

Depending on the magnitude of the crisis some specifics support functions (described in the Augustus Method) are activated within the established operative centre.The Civil Protection Department, which is anchored in the Presidency of the Council of Ministers, directs the activities of components and operational structures of the National Civil Protection Service and in case of declaration of a state of emergency, coordinates, in agreement with the regional governments. Indeed, the civil protection only cares for the determination of the fundamental principles while the legislative power lies with the regional governments.



Structure of the Civil Protection in Italy.

Civil protection planning is carried out according to the "Augustus" method established in 1997 to face complex emergencies through a standardized and easy-to-implement approach. This method is currently employed as a guideline to set up emergency coordination centres at all (local, provincial, regional and national) civil protection levels. The methodology envisages the setting up of up to 14 (regional and national) "support functions", which can be organized on a flexible basis: *F1: Planning and technique; F2: Health, social and veterinary assistance; F3: Media and information; F4: Volunteers; F5: Means and materials; F6: Transportation and viability; F7: Telecommunications; F8: Essential services; F9: Damage assessment; F10: Operative structures; F11: Local authorities; F12: Dangerous materials; F13: Assistance to the population; F14: Coordination of operational centres.*

In Italy, the lack of tools for the simulation of a crisis is stressed; in particular there are lack of tools for capacity resources allocation, identification of optimal sheltering and definition

of evacuation costs. Nevertheless, an environment to support the civil protection and the authorities in securing viability by helping in manage roads to be closed, alternatives search and rescue paths and provisional interventions to grant safe viability is wished.

Higher expectations for CRISMA are

- procedures to obtain a compared assessment of alternative scenarios
- improved cost-benefit analyses
- tool to support the decision making along the crisis

2.2.2.4. Pilot E – Multi-hazard in Germany

Real-life exercises in the DRK (German red Cross) units on local and municipal level are the current practice at the moment. For real-life experience there is a set of limitations: First there is a lack of possibilities to vary location and condition of injured. Further, it is difficult to achieve realistic time and capacity constraints. Costs in time and money to prepare the exercise, risks of accidents and the impossibility to repeat the exercise in every detail are further major constraints. However, training by using real-life exercises is imperative. In case of a mass casualty incident a normal medical treatment of one patient would lead to deficits in the primer care of other severely injured.

Computer-based training systems allow crisis managers to gain insights they normally gain during real-life experiences without aforementioned limitations. Information gathered during real-life exercises now can serve as crucial input for such simulation systems. As a major benefit, the exercise itself could be supported by reporting, debriefing, evaluation and what-if/forecast functionalities.

Table 6: Stakeholders involved in CRISMA Pilots.

Users	Pilot A	Pilot B	Pilot C	Pilot D	Pilot E
Authorities	national, regional, local	regional and local	local	national, regional, local	national, regional, local
Public Safety professionals	yes	yes	yes	yes	yes
Data/Service Providers	yes	yes	yes	no	no
Public	Yes	yes	yes	yes	yes

2.2.3. The needs and expectations of the crisis management stakeholders in EU

The purpose of this section is to look a bit beyond the CRISMA pilots and collect information about systems or projects that we know about, in order to provide a preliminary, though incomplete picture of the needs of the stakeholders. Table 7 is a tentative provisional summary listing the main features expected from a crisis management system.

Table 7: Stakeholders needs and expectations.

Functional Features	Scope/explanations
Hazard analysis	
Flooding Model	River basin hydrological and hydraulic model/cross-border modelling/flash flood modelling/etc.
Submersion Model	Coastal water modelling/Tide , surge and ocean waves modelling, dikes overtopping, breaching or destructions etc.
Atmospheric dispersion Model	Gas and particle dispersion/topography/etc
Storm Model	Spatial distribution of rainfall intensity
Drought Model	Spatial distribution of water deficit in the surface and subsurface water resources (unsaturated and saturated zones)
Earthquake Model	
Fire behaviour model	Spatial representation of the prediction of the fire spreading based on topography, fuel cover and meteorological data.
Wind distribution model	Calculation and representation of horizontal wind field and vertical wind profile based on meteorological station data, topography and considering convection effects
Vulnerability Analysis and Damage Assessment	
Population	Vulnerability/ resilience/ injured + death toll/ rescue
Buildings	Vulnerability/ resilience/ damage
Infrastructure/Networks and utilities	Vulnerability/ resilience/ damage/ operational capacity evaluation and monitoring
Fuel cover	Fuel cover maps of the area (vegetation cover and age of vegetation stands)
Capacities Assessment	
Human resources	Skills, number, availability/ Allocation plan/ gap identification/ gap solving strategies
Equipment and Vehicles	Types, capabilities, number, availability/ Allocation plan/ gap identification/ gap solving strategies
Shelters	Types, capacity, number, availability/ Allocation plan/ gap identification/ gap solving strategies
Other resources	For example, water to supply the fire trucks, fuel stations, …
Impact Assessment	
Economic impact	Assessment of the effects of a hazardous phenomena on the economy of the impacted zone/evaluation of primary (direct) and secondary (indirect) damages
Ecological impact	Assessment of the detrimental to the environment effects of a hazardous event
Impact on cultural heritage	Assessment of the potential damages to the cultural heritage /museum and private collections, number of UNESCO class “0” monuments affected, etc.
Simulation Support for Preparedness	
Mitigation measures	
Cascading Effects Assessment	
Simulation Support for Training & Exercise	
Training exercise monitoring	
Multi-Agencies/teams collaboration	
Evacuation scenarios	
Resource management	
Crisis management Support	
Decision support tool	e.g. recording/displaying similar past decisions/actions
Alerting/instructions to citizens	

3. The Offer resulting from the CRISMA project

This chapter provides the definition of the CRISMA exploitable results (CRISMA Offer), thus listing properties, functionalities, components that are to be produced during the course of the CRISMA project and may provide a major benefit to any other party willing to use these results. Taking into account the need to deliver a report at an early stage of the project, the description will be focused on the definition of the main features of CRISMA, in the perspective of benchmarking CRISMA with the needs of the Stakeholders and the offer of the competition

Basically the CRISMA System will support:

- multi-organizational short and long term strategic planning,
- impact evaluation of e.g. investment options,
- improving multi-organizational cooperation, and
- flexible training.

However, as the project is still in an early stage, this chapter provides only a preliminary perspective of possible results based on the main CRISMA objectives, pilot expectations and architectural decisions.

3.1. Overall project Objectives

The overall CRISMA project objectives can be summarized as enabling decision makers and crisis managers to:

(1) model possible multi-sectoral crisis scenarios and assess the consequences of an incident:

- Modeling hazards
- Modeling vulnerability
- Modeling losses (economic damages)
- Modeling losses (damages to the ecosystem)
- Providing reference scenarios
- Correlating multiple events
- Integrating multiple sources of heterogeneous data
- Describing in a formal standard way the scenarios
- Managing inter-agencies/teams cooperation

(2) simulate possible impacts resulting from alternative actions:

- Simulating consequences of a decision
- Modeling capacities
- Modeling vulnerability
- Modeling losses (economic damages)
- Modeling losses (damages to the ecosystem)
- Modeling economic impact
- Modeling societal impact
- Updating input for the models (capacities, vulnerability) with real time situational data

(3) support strategic decisions on capabilities, related investments, reserves and inventories:

- Assessing available capacities
- Assessing social vulnerability and resilience of economic systems
- Assessing the impact of hazards on physical infrastructure and environmental assets
- Assessing the impact of hazards to the effected region
- Identify key performance indicators for crisis preparedness and reaction
- Assess economic impacts of preparedness measures in all phases of crisis management (long-term cost/benefit prediction)

(4) optimize the deployment of resources dedicated to crisis response in-line with the evolvement of a crisis:

- Recording the size, availability, use pattern (working hours, effectiveness for countermeasures, etc) of capacities (resources)
- Optimizing the deployment and use of capacities and identifying gaps
- Integrating multiple sources of heterogeneous data

(5) improve action plans for the preparedness and response phases of the crisis management.

- Modeling cascading effects
- Modeling time dependencies
- Monitoring the operations
- Assessing the capability gaps
- Developing time dependent vulnerability data for infrastructures, properties, systems, etc

In order to be able to fulfil the basic CRISMA objectives CRISMA partners will develop a set of tools that can individually be put together to form a CRISMA system suited to the users needs.

3.2. Infrastructure Building Blocks

Any CRISMA system will be based on a common infrastructure. This common infrastructure is necessary to ensure that the individual CRISMA components are able to interoperate. Thus it constitutes a platform that enables the development of CRISMA tools aiming at the fulfillment of user requirements.

The CRISMA infrastructure will be based on a well defined **service-oriented architecture** that will:

- support **interaction with existing** decision support and crisis management **systems**
- allow for **de-centralized development** and management, and **easy integration** of new features;
- assure **timely information flow** to decision makers and relief forces;
- allow for **dynamic exchange of services** providing the **real time data** (e.g., from sensors used in real crisis situations) with services providing faked/modeled data (used in planning and for the training purpose);

- provide data models and services required for crisis management applications that would be capable of **integrating the existing legacy systems** (data, models) used in crisis management today;
- be **compatible with ongoing developments** in the field of environmental monitoring and environmental information management (e.g., SISE, INSPIRE, GMES);
- assure **controlled and secure access** to all data and services (authentication, authorization, data consistency).
- provide a service infrastructure as a basis for the harmonized, standardized and user friendly integration of new and existing simulation models
- support the integration of **sensors** as well as **data sources of various types**
- take into account **electricity and communication infrastructure failures** at the level of the architecture (in case someone wants to adapt the CRISMA framework for crisis management and mitigation later). However, we can safely assume that these issues do not occur in the planning and training phases (reliability requirement).
- support **views depending on the organization and the user's operative role** (user management requirement)
- support the **communication with existing IT tools** for crisis management to address decision making alternatives, perform what-if scenarios**, update system information with real time data**, derive quantitative and qualitative data from existing models and **introduce new features to existing simulation tools** if required.
- consider mechanisms for near-real-time exchange of the information about field workers and other features of interest in the real world, as well as those in the virtual world (**mixing life, virtual and constructive**).
- exhibit the **right level of genericity** to be able to support the very different pilot applications as well as applications beyond in the crisis management context.

These architectural properties will be implemented by so-called infrastructure building blocks. The individual infrastructure building blocks do not necessarily depict a single service (a CRISMA tool) with respect to a service oriented architecture. They may be split up into several services as well as many building blocks could be combined into one. However, each building block covers certain aspects of the architecture but not every building block is mandatory in order to actually compose a CRISMA system Table 8:

Table 8: List of Infrastructure Building Blocks.

Infrastructure Building Block	*Description*
Meta-Information Management (RO-MIS)	This building block is capable of managing the actual structure of and dependencies between meta-information (**R**esource-**O**riented **M**eta-**I**nformation **S**ystem). This meta-information also enables the data discovery and data exchange between components.
Access Control	This building block is responsible for dealing with user management and users' access control such as Authentication and Authorization.
Event Management	This building block handles messaging amongst different building blocks including notifications.
Model Integration	This building block takes care of the way how models are CRISMA enabled and how other components are able to interact with them.
Workflow Management	This building block enables the development, management and monitoring of workflows. It also provides a workflow engine that support the execution of model chains.
Simulation Case Repository	This building block is a repository for the management of simulation cases and simulation templates and provides cataloguing and search functionalities as well as functionalities to subscribe to simulation case state changes.
Wirecloud Mashup Platform	This building block constitutes a framework that allows end-users to compose service front-ends in order to create their own composite applications.
Versioned Reality Repository	This building block is capable of managing versioned meta-information. However, it does not actually store the information itself but merely keeps track of changes and provides links to the different datasets. This enables the managing of decision points and the comparison of different simulation cases.

3.3. Applications Building Blocks

The aforementioned architecture building blocks allow for the implementation of various application building blocks (Table 9) that will be used to fulfil certain tasks in the Preparedness, Response and Restoration phases.

Table 9: List of Applications Building Blocks.

Application Building Block	*Description*
Training and Simulation	This building block offers means to teach responsible parties how to react in certain (simulated) crisis situation.
Capacities Assessment	This building block supports the assessment of capacities and their availability that can be used to respond to upcoming resources.
Vulnerability Assessment	This building block enables actors to assess the vulnerability of their critical infrastructure and human population in case of a crisis.
Impact Assessment	This building block supports the assessment of crisis impacts on diverse sectors.
Crisis Management	This building block offers means to respond to a crisis situation.
Recovery Management	This building block supports the recovery from a crisis.

For the different Application Building Blocks (ABB), modules will be available to support the actor in the accomplishment of his tasks to successfully mitigate the impact of possible crises. However, it is important to keep in mind that CRISMA only focuses coverage of the different phases of a crisis within the Preparedness Phase.

3.4. Models

Many of the aforementioned applications have to depend on one or more model components in order to produce adequate results. CRISMA plans to provide different kinds of models that are classified in the following way:

- Hazard models
- Vulnerability and losses models
- Capacity and resources models

At this early stage, CRISMA has identified some existing hazard models that cover some of the pilots' needs and thus will be used in the project. Hence CRISMA will either provide expertise in best practices about the use of the models or even come up with ready-to-use solutions to integrate the respective models into a CRISMA-aware system. The identified hazard models (Table 10) are:

Table 10: Hazard Models.

Model Name	Description
TELEMAC / MASCARET	The water velocity and water level are the only outputs that can reproduce a submersion. TELEMAC-2D is able to model the transport of a diluted tracer (accidental waste) . Thus, this model tends to be relevant for a simulation of plume diffusion in water for potential use in several pilots.
INGV Model	The main output of the INGV Model are seismic hazard maps providing the spatial distribution of pick ground acceleration on rigid soils with an assigned exceeding probability in a given timeframe. These maps represent one of the main tools for supporting the seismic risk reduction decision-making to clearly know the spatial distribution of seismic hazard. The INGV seismic interactive maps represent one of the main input for vulnerability and impact models as well. In fact, these maps provide the PGA value (or Spectral acceleration) usually representing the intensity measure (IM) for seismic vulnerability curves used in seismic impact models.
Fire Station (with NUATMOS & CANYON models)	The FireStation tool is a deterministic integrated system for the spatial simulation of forest fire behaviour over complex topography and wind flows in areas with heterogeneous vegetation cover. Its main components are the fire behaviour predictions at local scale and wind field prediction at local and large scale. FireStation is a standalone application that runs on any windows machine.
SILAM & FAS	SILAM (System for Integrated modeLling of Atmospheric composition) is a dispersion model operated by FMI. The model computes and displays the dispersion of several types of pollutants. There are several versions available. There is an online version available producing daily projections at three spatial scales, being Europe, the Nordic-Baltic region, and the Gulf of Finland (see: http://silam.fmi.fi/). Projections are made for the dispersion of NO, NO2, SO2, CO, O3, PM10, and PM2.5 at ground level, 500m, 1000m, and 3000m. Anthropogenic emission data are taken from the TNO-MACC dataset (based on detailed information of stationary and mobile emission sources and satellite monitoring), whereas meteorological information is taken from the ECMWF IFS forecasts[1].

Vulnerability and losses models will also be needed and thus adopted in the CRISMA project but it is not decided yet which ones.

The same is true for capacity and resources models except for an all new "*Logistics Model*" that will be an outcome of the project efforts:

Model Name	Description
Logistics Model	The Logistics Model is capable of simulating the vehicle based evacuation of casualties to sheltered and secure places (e.g. hospitals). It takes into account the number, speed, capacities and position of rescue vehicles, the number, degree of injury and position of casualties, the number capacities and position of sheltered places and a road model. As a result it will provide the time required to evacuate all casualties. However, it will not do any algorithmic optimizations.

4. Analysis of the competition and position of CRISMA

This chapter intends to identify the potential competitors on the market targeted by CRISMA, their products or solutions and their position on the market. In this perspective, there are two possible sources of competition:

1. The competitors offering thematic, applications oriented products or solutions, including the Users, who develop their own proprietary solutions tailored to their specific needs
2. The competitors offering technological frameworks with similar capabilities as those targeted by CRISMA with its “Infrastructure Framework”

The analysis of the competition is based on the following sources of information and focus the identification of the main competing organizations and their products and services::

1. The available documents produced by CRISMA partners concerning the existing products/solutions (D21.1 “Technology inventory”)
2. The documentation concerning the past and on-going research projects in the domain of Security
3. The search for information through Internet (“google” search, consultation of websites, etc)

An important source of potential competition or partnership is constituted by the projects developed under the umbrella of the EU Framework Programmes.

4.1. Competition on the Thematic, Applications-oriented products/services

In this first phase of the project, 15 potential competitors have been identified. Their geographical coverage and size are summarized in Table 11 the below. The products and services marketed by these organizations have been analyzed. The scope of the most interesting products and services are presented in Table 12 below, in correlation with the intended CRISMA offer.

Table 11: Main CRISMA competing organizations.

Organizations	Type of Organization	Size	Geographical coverage
Buffalo Computer Graphics	Small/private	40 employees, revenue 4.5M$	Worldwide. USA focused.
CAE	Large/private	6000 employees Revenue 1.800MCND	Worldwide.
C4i Consultants	Small/private	11-50 employees	Worldwide. CANADA and USA focused
Deltares	Nonprofit independent research institute	880 employees, revenue 151M$	Worldwide
DIGINEXT	medium/private	51-200 employees	Europe (France) and in UAE (Abu Dhabi).
ELBIT Systems	Large/private	10,001+ employees	Worldwide
EmerGeo	Small/private	11-50 employees	Worldwide with focus on US and Canada and United Arab Emirates.
E-Semble	Small/private	11-50 employees	Worldwide with focus on Europe
FlexSim	Small/private	11-50 employees	Worldwide with focus on USA
Federal Emergency Management Agency	Governmental Body	7 500 employees, revenue/budget 5.8B$	USA and territories of the USA, such as Puerto Rico
IBM	Large/private	~4.4K employees	World wide
IFAD	Small/private	11-50 employees	Worldwide with focus on Europe
Insight Maker	Small/private	11-50 employees on-profit organization	World wide
MASA Group SA	Medium/private	60 employees, revenue 5.1M$	Worldwide. The company operates from Paris, Munich, Virginia Beach VA, and through reselling agreements in Europe, Latin America and Asia.
Ternion Corporation	lSmall/private	26 employees, revenue 2.7M$	Worldwide

Table 12: Main competing Products/Services.

Products/services	Company	Profile (*)	
		Scope	Target
CAE Deploy	CAE	Crisis ManagementTool	First responder, Decision Maker
CAPRA	(Open Source SW)	Simulation Tool, Integrated Simulation Framework	Decision Maker, Strategic Planner
EDMSIM + ePlan-GIS + eMerg-GIS	C4i Consultants	Planning tool, Simulation tool	Strategic Planner, Decision maker,
Delft3D	DELTARES	Simulation Tool, Integrated Simulation Framework	Decision Maker, Strategic Planner
DisasterLAN	Buffalo Computer Graphics	Crisis ManagementTool	Decision Maker
EmerGeo FusionPoint + EmerGeo Mapping	Emergeo	Siuational Awareness	First responder, Decision Maker
FLAMES	Ternion Corporation	Simulation Framework	Trainer
FlexSim healthcare	FlexSIM	Planning and Simulation Tool	healthcare managers and planners
HAZUS	Federal Emergency Management Agency	Simulation Tool, Integrated Simulation Framework	Decision Maker, Strategic Planner
(Training & Simulation products)	IFAD	Tactical Training	Crisis Operators, Decision Maker, Strategic Planner
IBM IOC	IBM	Strategic Planning and real-time operations	Decision makers City coordinatior Crisis managers
Indigo	DIGINEXT	Training and Planning tools	Crisis Operators, Decision Maker, Strategic Planner
Insight Maker	Insight Maker	Simulation Platform	Planning, Model developers
SWORD	MASA	Simulation Tool, Integrated Simulation Framework	Decision Maker, Strategic Planner, Trainer
VR FORCES	VT MÄK	Simulation Tool, Simulation Framework	Strategic Planner
XVR + ISEE	E-Semble	Training and Simulation	Crisis Operators, Decision Maker, Strategic Planner

(*) In the "Profile", it is intended to characterize the Product/Service with its scope and target

1. Classification according to the scope:

- Crisis management enterprise tools
- Simulation specialized tools
- Simulation framework
- Integrated simulation framework

2. Classification according to the target:

- First responders
- Decision makers
- Trainers
- Strategic planners

Table 13 below shows the compliance of the selected competing solutions with the intended main CRISMA features. These features are further described hereafter:

- *Multi-hazards simulation: The solution shall afford more than one hazard crisis management and shall at leats cover earthquakes, flood, industry, forest fire and storm.*
- *Management of resources: the solution shall provide the management of information concerning the resources (personnel, vehicules, products, etc), including their allocation and positioning.*
- *Management of elements at risk: the solution shall provide the management of information related to the objects potentially affected by the crisis.*
- *Multiple models: the solution shall allow to use several models and will not be dedicated to a particular model*
- *Integrated simulation framework: the solution shall encompass several models and tasks in order to provide a complete end-to-end crisis management simulation*
- *Multisectoral capabilities: the solution shall address the needs of a wide range of users and accommodate with various use case situations*
- *Legacy systems: the solution shall be capable of connecting with existing systems to exchange information.*
- *User Interaction: the solution shall provide advanced mapping features, multiple languages, role-based views, user's customizable views, 3D representations?, etc*
- *Compliance with International standards: the solution shall comply with the major ICT and geospatial standards, such as OGC, INSPIRE, ISO, etc*
- *Decision support: the solution shall provide tools to allow the user to analyze past decisions, execute "what-if" scenarios, visualize the consequences of a decision, etc.*

Table 13:Characteristics of CRISMA vs competition.

Features	CRISMA	CAE DEPLOY	CAPRA	EDMSIM	Delft3D	DisasterLAN	EmerGeo	FLAMES	IBM IOC	INDIGO	SWORD
Multi-hazards simulation	*2*	2	2	0	0	2	2	0	2	2	2
Management of resources	*2*	2	0	2	0	2	2	0	1	2	2
Management of elements at risk	*2*	1	1	2	0	2	2	0	1	2	1
Multiple models	*2*	1	2	0	2	0	1	2	1	1	2
Integrated simulation framework	*2*	2	2	0	0	1	1	1	1	1	2
Multi-sectoral capabilities	*2*	2	1	1	2	1	2	1	2	2	2
Legacy systems	*2*	2	2	1	1	0	2	2	2	2	2
Users interactions	*2*	2	1	1	1	2	2	1	2	2	2
Compliance with international standards	*2*	1	0	0	0	1	1	1	2	1	1
Decision support	*2*	2	0	2	0	0	2	0	2	2	1

LEGEND	0 means that the product does not fulfil the feature 1 means that the product fulfil the lowest level of the feature 2 means that the product fulfils the feature entirely

The information collected about the competition may be used, as far as it is feasible, to "measure" how large and strong is the competition for future CRISMA products, to evaluate the degree of innovation of the CRISMA products compared with the market and to identify how far the CRISMA products fill the gap between the users' needs and the offer of the market. Up to four solutions/products out of the table above shall be selected in order to perform this "measurement", when the CRISMA solution will be better defined.

4.2. Competition on the Technological Infrastructure

CRISMA foresees to deliver a technological IT platform, which will support the thematic and applications-oriented products, providing the "glue" and the necessary ancillary services like communications with the sources of data, user's management, access security, etc.

A quick review was performed in order to identify products available on the market (mainly in Europe), which could be used to build a CRISMA technological Infrastructure Framework:

- **GeOrchestra**: This is an open-source product developed by a community of developers (mainly from Camptocamp company). The main functions offered are: Viewer, Catalogue, Downloader, Geoserver. The product is available only in French. It does not provide the security features and the service orchestration. A few references in France (academic and regions) (http://www.georchestra.org)
- **easySDI**: This is an open-source product developed by a community of developers in Switzerland, Luxemburg and France. The main functions offered are: Viewer, Catalogue, Downloader, Security. The product is available in English. It does not provide the service orchestration. A few references in France, Switzerland and Luxemburg (public organizations).(http://www.easysdi.org)
- **Constellation SDI**: This is an open-source web platform developed by the French company GEOMATYS (www.geomatys.com). The main functions offered are: catalogue, viewer, Data acquisition (SOS), security. The product is connected to other open-source products, like: Geotoolkit and MapFaces. Constellation SDI is driven by a scientific community and claims references with IFREMER (Fr) IRD (Fr), BRGM (Fr). (http://www.constellation-sdi.org)
- **GI-Cat**: This is an implementation of distributed catalogue services made by ESSI Lab (Earth and Space Science Informatics – Laboratory in Italy); it provides discovery and access services over heterogeneous sources of data, supporting the OGC standards WCS, WMS, WFS, CSW. GI-cat is used in several initiatives (FP6-SeaDataNet, GEOSS, HMA) (http://lab.usgin.org/applications/gi-cat)
- **GeoNode**: This is an open-source platform that allow the creation, sharing and collaborative use of geospatial data; It is based on OSS components: Geoserver, Geonetwork, GeoExt; its major characteristic is the dedication to collaborative approach. It is supported, among others, by the World bank, the UNISDR. (http://geonode.org)
- **GeoConcept**: This is a proprietary Software developed by the company GeoConcept (France), which offers a wide range of tools addressing the manipulation and representation of geographical information (GIS, geocoding, Internet server, publishing, route calculation, 3D visualization, mobile devices).

Geoconcept has a special focus on “cartographic optimization” and is recognized as a leader in the provision of tools for the “geomarketing”.(http://www.geoconcept.com)

Major Software vendors in the GIS world have, to some extent, developed and marketed various Software suites to address partially or in whole the characteristics of the CRISMA Infrastructure Framework:

- ESRI ArcGIS Server, ArcGIS for INSPIRE and Geoportal Server (www.esri.com)
- Intergraph Geomedia SDI (www.intergraph.com/sgi/products)
- ERDAS Apollo (www.erdas.com), recently absorbed by Intergraph.

4.3. RTD projects in crisis management

European and National organizations support RTD projects in the domain of security. Several past and on-going projects address the problem of “crisis management” and may be of interest for CRISMA. The most relevant projects identified are listed in the following Table 14. During the next working period on the exploitation strategy plan, more detailed investigations will be done to understand the status, quality and availability of the results of these RTD projects.

Table 14: RTD projects for crisis management.

Projects	Main objectives	Outcome
MATRIX - New Multi-HAzard and MulTi-RIsK Assessment MethodS for Europe. (FP7)	The main objective of MATRIX is to develop methods and tools to tackle multiple natural hazards within a common framework.	Develop new methodologies for multi-type hazard and risk assessment, with a focus on a) risk comparability, b) cascading hazards and c) time-dependent vulnerability within the framework of conjoint or successive hazards To establish an information technology (IT) framework for test cases analysis in a multi-risk approach
SICMA (Simulations of Crisis Management Activities) (FP7)	Focus on health care services, public behavior simulation and tactical incident management using simulations in order to improve the decision making process. The project aims at improving crisis manager’s decision-making capabilities in the following phases: • **Preparation:** assisting in the identification of: the best way to employ available assets, the limits of the achievable response and the effectiveness of different inter/intra-services cooperation procedures. • **Response:** providing a forecast of scenario evolution, proposing doctrine-based solutions and evaluating the effects of alternative decisions.	Elbit Systems offers commercial software based on SICMA developments. They developed real-time simulation tool as part SICMA project.
Indigo (FP7)	focused on the creation of a tightly integrated tool suite for the reconstruction of urban environments and their real-time 3D visualisation.	integrated tool for training personnel, planning operations, and facilitating crisis management and co-operation across organizations and nations.

Projects	Main objectives	Outcome
Alert4All - Simulation of Human Reactions to Alerts (FP7)	Tool that enables users to estimate the spread of alerts to the population upon given input parameters.	Single Model Simulation Solution, with focuse on preparedness before crisis events
ESS (FP7)	develop a revolutionary crisis communication system that will reliably transmit filtered and pre-organized information streams to the crisis command system, which will provide the relevant information that is actually needed to make critical decisions.	The ESS will provide an open API in order to allow any public authority, if needed, to add more applications customized to its particular needs. ESS data, functionalities and data flow will be based on ISO standards or industrial standards. Each commercial application which adopted or will adopt these standards will be able to connect to ESS.
MOVE - Methods for the improvement of vulnerability assessment in Europe (FP7)	create knowledge, frameworks and methods for the assessment of vulnerability to natural hazards in Europe.	The MOVE project will test and implement the developed conceptual framework in the following case studies, which will target different hazards and different dimensions of vulnerability.
RISK-UE - An advanced approach to earthquake risk scenarios with applications to different european towns (FP7)	RISK-UE will develop a general and modular methodology for creating earthquake-risk scenarios that concentrates on the distinctive features of European towns, including both current and historical buildings.	The resulting scenarios will give concrete figures of direct and indirect damage of possible earthquakes. A European cities network for seismic-risk reduction will be created during a final symposium.
SPIDER - Security system for Public Institutions in Disastrous Emergency scenarios (BMBF)	The Spider-federation-system will provide rescue teams at major incidents an integrated and intelligent communication system that will enable efficient emergency process management.	Specifies a System of Systems which: Enables a transparent exchange of data between the partner-systems on basis of a XML-scheme based language called PRML (Protection and Rescue Markup Language).Ensures privacy-protection and data security. Explores and specifies the interfaces of the connection of the heterogeneous systems
CRISIS– Critical Incident management training System using an Interactive Simulation environment (FP7)	researching and developing a train-on-demand simulation platform for crisis management training. It will train first responder supervisors and Emergency Operations Centre commanders, in real-time decision making and response to simulated critical incidents in virtual world replicas of airport and railway settings.	There will be two major components: The FDX is a fine-grain, first-person shooter style interaction environment where the trainee will directly control the actions of the computer avatar to deal with the emergency in the simulation world. The CPX is a coarse-grain level simulation that corresponds with a command post or Emergency Operations Centre, where the emergency is represented on a computer-generated map display, together with other resource status displays and command and control information artefacts.

Projects	Main objectives	Outcome
BESECU - Human behaviour in crisis situations (FP7)	investigate cross-cultural and ethnic differences of human behaviour in crisis situations in order to better tailor security related communication, instructions and procedures with a view to improving evacuation and protection.	The project will provide evidence that will be useful to first responders, building designers and those involved in the development of emergency operating procedures for buildings.
IDIRA /Interoperability of data and procedures in large-scale multinational disaster response actions (FP7)	In IDIRA we follow the vision of providing a conceptual framework that allows for supporting and augmenting regionally available emergency management capacities (including the existing IT systems) with a flexibly deployable Mobile Integrated Command and Control Structure.	The set of tools, interfaces and procedures developed in IDIRA provides services for data integration, information exchange, resource planning and decision support to disaster response units and decision makers.
PANDORA /Advanced training environment for crisis scenarios (FP7)	PANDORA is a crisis management project developing a training toolset and environment, which aims to bridge the gap between tabletop exercises and real world simulation exercises. The project proposes a global approach to crises management, providing a near-real training environment at an affordable cost.	The project will create an environment that can provide appropriate metrics on the performance of a crisis manager actively engaged in the management of a crisis, with the environment providing :» A realistic and complete scenario with near real-timeaction, coherent with that expected in a real-worldsituation ;» Realistic emotional status, through affective inputs and stress factors ;» The potential to include different crisis managers belonging to different sectors.

4.4. Position of CRISMA on the Market

Before deciding on the exploitation of the CRISMA results, it is vital to answer precisely to three important questions:

- How good does CRISMA fit with the users needs and expectations?
- What are the advantages/disadvantages of CRISMA compared with the competition?
- What are the innovation and added value brought by CRISMA on the market?

The CRISMA consortium wishes to deliver a system that will fully comply with the features listed in Table 13. However, at this stage of the project, the architecture of the CRISMA solution is not yet defined. Therefore, these questions will remain open until the delivery of the first version of the architecture.

The success of exploiting CRISMA results to develop a future business depends on the capacity of the CRISMA partners to leverage the Strengths and Opportunities and minimize the Weaknesses and Threats represented by internal as well as external factors, as indicated in the SWOT Table 15 below.

Table 15: SWOT Analysis.

STRENGTHS	OPPORTUNITIES
• flexibility in access and licensing (most of the components are in open source or have an open source version) • complete and integrated package • ability to integrate existing models	• Disasters are more frequent, more heavy in consequences, costs more • Stakeholders require tools to master the complexity of the risks and counter-measures • Regulations in place (e.g. EU Directives) • Emergence of new stakeholders (e.g. Insurance Companies) • Authorities want “unique selling points”
• no organization supporting CRISMA results yet • altough many components to build CRISMA already exist, the complete solution is still to be developed	• budgetary restriction, in all European countries, on public spendings • several solutions offered on the market by large organizations are potentially strong competitors
WEAKNESSES	**THREATS**

5. Conclusions and recommendations

The current deliverable, a preliminary issue of the D63.1 “Market Analysis Report”, has highlighted several key features that the CRISMA consortium intends to build into the CRISMA offer. These features will give to CRISMA a potential advantage, when addressing the market needs in the domain of simulation in the preparation phase of the crisis management cycle.

- “Holistic” approach: CRISMA will cover all the aspects of the crisis management simulation (hazard modelling, vulnerability modelling, management of capacities)
- Flexibility: CRISMA will be supported by a solid architectural concept implemented in a generic IT infrastructure complemented by a toolkit of building blocks, which enable the creation of customized solutions for the crisis management users.
- Connectivity: CRISMA will be built on existing standards, enabling the access to many sources of information like cartographic data, sensor measurement)
- Openness: CRISMA will provide a wide range of models for most of the hazards, from the CRISMA catalogue, but also from the catalogue of other vendors

From the exploitation point of view, CRISMA is expected to bring challenging opportunities:

- **A wide spectrum of services:**
  - expert services to the users to define, build and use the solution tailored to the real needs,
  - implementation of a scalable system using the CRISMA “Infrastructure Framework” and the buiding blocks,
  - support services to connect to the required sources of data and to the legacy systems around,
  - after delivery follow-up services to ensure the evolution of the Software components in line with the underlying technologies and the international standards.

- **Innovative business models:**

For the exploitation of the CRISMA results, there are, at least, two main approaches.

(1) CRISMA so-called “Building Blocks” can be used to implement and deliver a system, which addresses the specific needs of the customer, providing the Software in a traditional way with proprietary or open source license agreement. This approach has a major disadvantage in the global, interconnected world of geospatial information, where the Software must be continuously adapted to the evolution of the technologies and standards.

(2) Other options are possible to do business in a more effective and sustainable way. In these options:

- the user can access added-value services through a platform (which may be independent and neutral : the broker platform), rather than using the Software under license ;

- the service provider can use the platform to make the service visible by- and available to a potentially large number of users ;
- the platform manages the context of multi-services, multi-users and organizes the security, reliability and financial aspects of the usage ;

This innovative way (Software as a Service) provides the flexibility for the implementation of various modes of financial compensation for the services rendered (Registration, Pay as you use, Subscription to service access, Quotation/Order for expert services);

An interesting business case is the " broker platform " model, which facilitates the trading of information and services, by opening a marketplace to many data and service providers, thus creating the conditions for a better economic sustainability for the crisis management systems. In the broker business, the broker "manages" the marketplace, ensuring the security and the financial flows on top of the service flow. This business model should be investigated further in the context of the exploitation strategy plan

- ***Cost effective operations***:

  the size and complexity of the data sets required for "fueling" the models is a critical issue that needs to be addressed by CRISMA, in order to develop strategies for a data value chain, promoting the sharing and reusing of the information and aiming to create added value services , which could ensure the long term economic viability of the CRISMA implementations.

CRISMA exploitation Roadmap:

The Exploitation activities rely heavily on the progress of the different technical tasks of the project, such as the user's requirements, the architecture, the specifications of the services and the scope of the pilot applications. These activities shall be carried forward, with the purpose of:

- recording the CRISMA results, which have a potential for exploitation after the project;
- identifying the potential markets for the exploitation the results;
- defining the models that can be set up to ensure the exploitation of these results, meeting both the demand of the users in the market and the business strategy of the enterprises involved,
- defining how the partners will organize, on their own and in cooperation with other partners, in order to support the exploitation of the results after the project.

6. References

R1	CRISMA D11.1 V1.2	5/7/2012	“Initial consolidation report on internal workshops”
R2	CRISMA D21.1 V1.10	2/7/2012	“Technology inventory”
R3	CRISMA D23.1 V18	18/1/2013	“Requirements and Use Cases”
R4	CRISMA D41.1 V3.1	28/11/2012	Existing hazards and vulnerability/losses models”
R5		1999	Vade Mecum of the Civil protection in the European Union