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# 1 INTRODUCTION

## 1.1 PROJECT SCOPE

The CHORIST project will propose solutions to increase rapidity and effectiveness of interventions following natural hazards and industrial accidents, in order to enhance citizens' safety and communications between rescue actors.

## 1.2 PURPOSE OF THE DOCUMENT

This document provides the results of the assessment of the potential impacts of the solutions proposed by the CHORIST project. These impacts are assessed in the social, environmental and economical fields.

## 1.3 DOCUMENT VERSIONS SHEET

Version	Date	Description, modifications, authors
1.0	19/06/09	Year 2 report (SP0.D18-V1.0) amended with: - the results of the field trials and of the questionnaires analysis. - Minor updates - Corrections of typos

Table 1 : Document versions sheet

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## 2 REFERENCE DOCUMENTS, DEFINITIONS AND ABBREVIATIONS

### 2.1 REFERENCE DOCUMENTS

- [1] Principles and guidelines for social impact assessment in the USA (by IAIA, the International Association for Impact Assessment)  
[http://www.iaia.org/Members/Publications/Guidelines\\_Principles/US\\_principles\\_final\\_IAPA\\_version.pdf](http://www.iaia.org/Members/Publications/Guidelines_Principles/US_principles_final_IAPA_version.pdf)
- [2] Principles of Environmental Impact Assessment best practise (by IAIA, the International Association for Impact Assessment)  
[http://www.iaia.org/modx/assets/files/Principles\\_of\\_IA\\_web.pdf](http://www.iaia.org/modx/assets/files/Principles_of_IA_web.pdf)
- [3] International Association for Impacts Analysis (IAIA) web site  
<http://www.iaia.org/>
- [4] Environmental and social assessment for large dams  
<http://www.dams.org/>
- [5] CHORIST Description of Work
- [6] CHORIST project web site  
<http://www.chorist.eu/>
- [7] European Commission – Environment Assessment  
<http://ec.europa.eu/environment/eia/home.htm>
- [8] European Commission – Guidance on Environmental Risk Assessment – Scoping  
<http://ec.europa.eu/environment/eia/eia-guidelines/g-scoping-full-text.pdf>
- [9] Report on user practices and telecom state-of-the-art  
CHORIST – SP1.D3 deliverable  
available at: <http://www.chorist.eu/index.php?page=3&sel=3>
- [10] Report on user requirements and initial supporting cases  
CHORIST – SP1.D4 deliverable  
available at: <http://www.chorist.eu/index.php?page=3&sel=3>

### 2.2 DEFINITIONS

Impact Assessment                      The processes of analysing, monitoring and managing the (intended and unintended) social, biophysical and economical consequences (both positive and negative) of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. its primary purpose is to bring about a more sustainable and equitable biophysical and human environment.

### 2.3 ABBREVIATIONS

CAP	Common Alerting Protocol
CB	Cell Broadcast
DAB	Digital Audio Broadcast
DVB	Digital Video Broadcast
ERM	Environmental Risk Management
EU	European Union

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GSM-A	GSM Association
IAIA	International Association for Impacts Analysis
ICT	Information and Communications Technologies
IP	Internet Protocol
IPR	Intellectual Property Rights
LOS	Line Of Sight
MAC	Medium Access Control
QoS	Quality of Services
SMS	Short Message System
TEDS	TETRA Enhanced Data Service
TETRA	Terrestrial Trunked Radio
TSO	Tactical Situation Object
TV	Television
UAB	Users Advisory Board
US	United States
USA	United States of America
WiMAX	Worldwide Interoperability for Microwave Access

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### 3 EXECUTIVE SUMMARY

#### Methodology

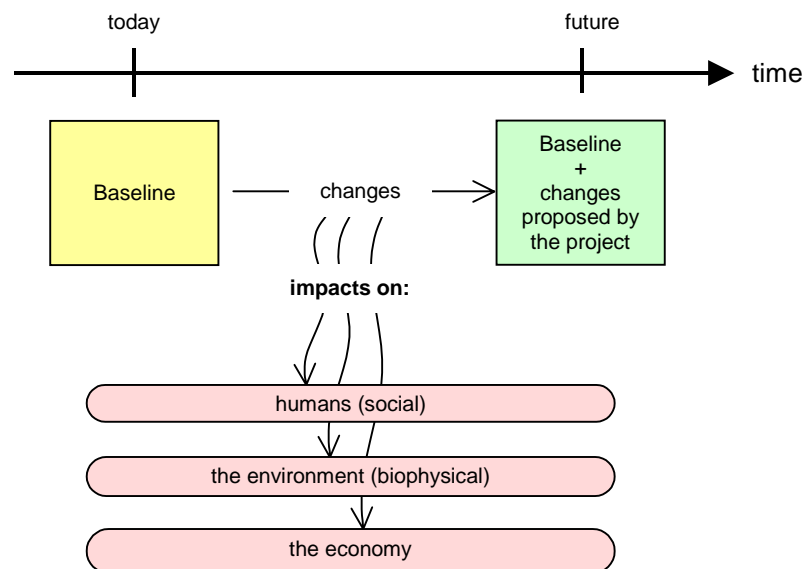
In a general way, the "impacts assessment" is the process of "*analysing, monitoring and managing the impacts of a project on the environment*". The environment, in this study, shall comprise everything that the project has potentially impacts on. Elements will be categorized in:

- the social field (i.e. human) (including cultural and health aspects),
- the environmental field (i.e. "environment" relates to biophysics or ecology: fauna, flora, air, soil, water, landscape) and
- the economic field.

Impacts consist of the effects of changes made by the CHORIST project as well as a CHORIST system. These changes and the associated effects are made for a set of stakeholders and situations that are in the area of CHORIST.

- The involved stakeholders are the end users of a CHORIST system (authorities, general public), the members of the project consortium, the industry, the European Commission, the governmental entities (national, regional, local), the standardisation bodies, the education system (universities...).
- The envisaged situations are in the field of natural hazards (earthquake, forest fire, tsunami, drought, floods...) and technological hazards (rail accident, nuclear product transportation, chemical plant accident...).

The following diagram present a synthesis of the impacts analysis process for CHORIST:



The methodology used to assess the impacts of CHORIST involves the phases of scoping, profiling, prediction (identification of changes, identification of impacts), assessment, and definition of recommendations.

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## **Changes**

The main changes that a CHORIST system offers are:

- a risk assessment modelling, simulation and training subsystem
- a subsystem sending warning messages to citizens through DAB, DVB, cell broadcast, sirens, SMS and web sites.
- two rapidly deployable networks for the public safety users, one based on the WiMAX technology, the other based on the TETRA TEDS standard

The main changes that the CHORIST project offers are those of any project of the like, i.e.:

- market opportunities
- Intellectual property rights
- New fields of research
- Definition or enhancement of standards

## **Impacts**

There are 40-50 identified positive impacts for CHORIST, the most relevant and important being in the following areas:

- For authorities, in their work to address environmental risks:  
increased response, efficiency, speed of response, safety, cooperation,
- For the people (incl. health, fears...) in their bearing and view of environmental risks:  
increased protection, efficiency of response to Authority's warnings, confidence,  
reduction of lost lives  
including people who have visual and/or hearing impairments.
- For the community & political system:  
increased responsibility, need for a common policy in Europe,
- Environment:  
limitation of polluted areas and consequences
- Economy:  
new markets, new jobs, new fields of research

## **Assessment & recommendations**

Most anticipated impacts are positive and are supported by similarly positive assessments. However, in order to fully realise the benefits, a number of recurring themes have been identified, for example:

- Training of authorities is necessary to use the new tools
- Education and training of populations are necessary to properly react to warning received by authorities
- Implementation at European level is necessary
- EU and Local Governments should implement well documented trials with EU Citizen, in order to learn quickly how Citizens can benefit most from advanced risk management systems.

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## 4 METHODOLOGY

The methodology to assess the impacts of the CHORIST project is derived from the general knowledge of the international community in this domain. This knowledge mainly comes from documents provided by the International Association for Impacts Analysis (IAIA) – see [1][2] and [3]. Other sources were also used, but in a lesser extent, as they were derived from the IAIA work.

It must also be mentioned that here are several approaches proposed by the international community: Some refer to social impacts, some to environmental impacts and other to economical impacts; some merge social and environmental impacts. Moreover, as for any other principle and methodology, several variants are available. So, for CHORIST, a common methodology had to be elaborated; please find it below.

### 4.1 WHAT DOES "IMPACTS ASSESSMENT" MEAN ?

In a general way, the "impacts assessment" is the process of "*analysing, monitoring and managing the impacts of a project on the environment*". Three elements from this sentence are analysed here below: "environment", "impacts" and "Analyse, monitor and manage".

#### → environment

The environment, in this study, shall comprise everything that the project has potentially impacts on. Elements will be categorized of:

- the social field (i.e. human) (including cultural and health aspects),
- the environmental field (i.e. "environment" relates to biophysics or ecology: fauna, flora, air, soil, water, landscape) and
- the economic field.

#### → changes and impacts:

The word "impact" means "the effects of changes". One must not mix-up "change" and "impact": A "change" consists of a modification proposed by the project, so the analysis starts from a baseline (e.g. today), and then, it defines all the modifications proposed by the project on humans, the environment and the economy. An "impact", however, is an effect of these changes on humans, the environment and/or the economy resulting from one or more changes. As an example, [4] considers that the relocation of a community in case of a large dam building is a "change", whereas stress, disruption to daily living, change of family structure... are social "impacts".

Only direct impacts are studied in this document. For instance, the fact that social, environmental and economic impacts are inter-related are not addressed in this document, for simplification purposes.

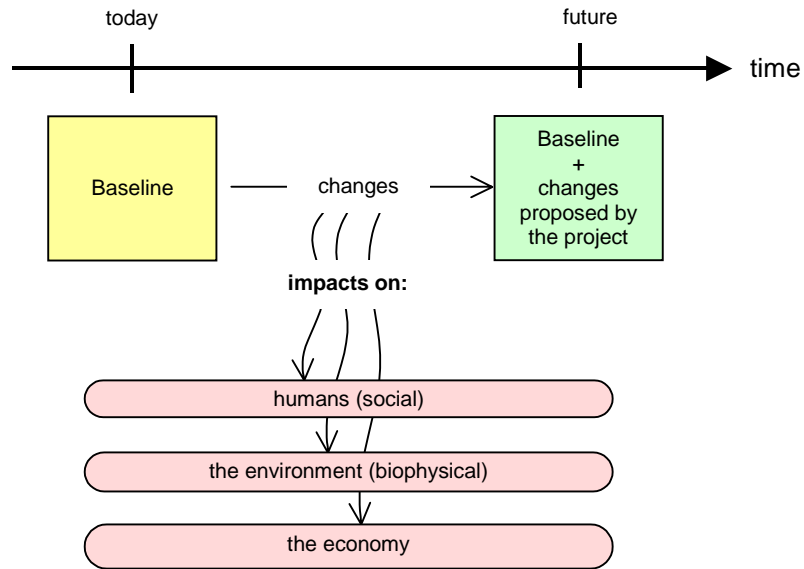
#### → Analyse, monitor and manage:

"Analysing, monitoring and managing" means first evaluate the impacts arising from the changes proposed by a project, and second, modify the project itself to reduce the negative impacts and increase the positive impacts. So, this process starts by monitoring some key factors onto which the project has potential impacts, and then goes on by modifying the project itself, so that this process can start once more with new proposals, new impacts assessment...

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→ **Synthesis of the approach in CHORIST:**

The following diagram present a synthesis of the impacts analysis process for CHORIST:



**Figure 1 : Impacts assessment process**

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## 4.2 PROPOSED METHODOLOGY IN CHORIST

The methodology to be followed in the CHORIST project is derived from a general methodology proposed by the IAIA. It was adapted as well -more exactly, simplified- considering the fact that the project objectives are well defined and are not supposed to be changed drastically in the frame of its three-year duration, but also that the planned workload of this activity is reduced (about 7 person.months of budget over the whole project duration) (see T031 in [5]).

The process -which can be iterated- is made of several steps and sub-steps as described in the following table:

Steps		Description
1. Scoping		Define the <u>scope</u> of the study of impacts: - identify issues - identify affected interest groups (stakeholders) - identify study boundaries (situations)
2. Profiling		Establish " <u>baseline</u> " data against which changes and impacts can be identified and assessed. So, this activity is not linked to the project actual achievements, but rather to its boundaries.
3. Prediction	a. Changes identification	List all the <u>changes</u> proposed by the CHORIST project in the social, environmental and economical fields.
	b. Impacts identification	Propose a list of indicators (a.k.a variables) of the <u>impacts</u> which arise from the identified changes in the social, environmental and economical fields.
4. Assessment		Assess these <u>impacts</u> by quantitatively or qualitatively measuring each indicator with consultation from experts, consortium representatives, users from the UAB, during dissemination activities...
5. Recommendations proposals		Identify technical guidelines/ <u>recommendations</u> for the project and for future other projects to decrease negative impacts and increase positive impacts.

**Table 2 : Impacts assessment process**

Note: "scoping" sometimes means steps 1 to 3 in some approaches, but this is considered just as a matter of wording.

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## 5 IMPACTS ASSESSMENT

### 5.1 STEP 1: SCOPING

#### 5.1.1 Issues

Our study the impacts of CHORIST is divided into:

1. the impacts of the changes proposed by the CHORIST project itself (proposed concepts, proposed standards...) and,
2. the impacts of the changes proposed by a CHORIST system, as available at the end of the project's lifetime (i.e. May 2009).

The CHORIST project, as described in the Description of Work (see [5]) and on its web site (see [6]):

*"[...] will propose solutions to increase rapidity and effectiveness of interventions following natural hazards and industrial accidents, in order to enhance citizens' safety and communications between rescue actors".*

This tenet itself contains most of the elements of the scope that the CHORIST project will have impacts on.

So, the study of the impacts of the changes proposed by CHORIST will be limited:

- in terms of involved stakeholders (people directly or indirectly involved in the incident)
- in terms of situations (nature, geographical area and time aspects) or kinds of events

#### 5.1.2 Stakeholders

The following list identifies the potential stakeholders who could be impacted by the changes proposed by both the CHORIST project and a CHORIST system:

<ul style="list-style-type: none"> <li>• end-users of the system: <ul style="list-style-type: none"> <li>○ authorities (responsible for managing disasters) <ul style="list-style-type: none"> <li>▪ in command centres</li> <li>▪ on-field users</li> </ul> </li> <li>○ general public. Several factors apply: <ul style="list-style-type: none"> <li>▪ type: residents, workers, tourists and homeless.</li> <li>▪ subject to impairment (mental, physical, visual, hearing)</li> <li>▪ age: young, medium-age and old</li> <li>▪ location where the event occurs (or where the warned people are): <ul style="list-style-type: none"> <li>• from the individual point of view: <ul style="list-style-type: none"> <li>○ fixed (e.g. at home, on job spot, at school, in a shop or a mall, in a hospital)</li> <li>○ moving (e.g. in a car, walking in the countryside, in public transportation (train, bus, subway...), on the sea)</li> </ul> </li> <li>• population density (large metropolitan areas, low density areas, ...)</li> </ul> </li> </ul> </li> </ul> </li> <li>• other stakeholders: <ul style="list-style-type: none"> <li>○ members of the CHORIST consortium</li> <li>○ industry (and more generally all software, system, telecommunication... companies)</li> <li>○ European Commission</li> <li>○ governmental entities (national, regional, local)</li> <li>○ standardisation bodies</li> <li>○ education system (universities...)</li> </ul> </li> </ul>
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**Table 3 : Stakeholders**

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### 5.1.3 Situations

The following list identifies the potential situations and their associated parameters which are of CHORIST interest:

- type of situation:
  - natural hazard:
    - related to the ground:
      - avalanche
      - earthquake
      - forest fire
      - volcanic activity
      - landslide
      - tsunami
    - related to the atmosphere:
      - drought
      - extreme temperatures
      - storm surges, tornados
      - winter storm
      - floods
      - asteroid impact
  - technological hazard:
    - transportation accidents:
      - road accident (bus and car)
      - rail accident
      - airplane accident
    - Energy/chemical resources transport, storage and handling:
      - oil
      - gas
      - chemical products
      - nuclear
    - Industrial accidents:
      - biological labs
      - chemical plants
      - nuclear power plants
      - dam or dike failure
  - other hazards:
    - urban fire
- multi-hazard situations (or not)
- predictability:
  - unpredictable,
  - short time before the actual event,
  - long time before the actual event
- geographical area:
  - extent (e.g. city, region, countries)
  - political constraints (e.g. multi-country or not, with or without agreements between countries...)
  - topological constraints (e.g. sea, plain, mountain, city)

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- time:
  - limited to: early warning and alert (no preparedness phase, no after event recovery phase)
  - duration
  - frequency
  - evolution of the situation and its parameters along with time:
    - type evolution: e.g. one hazard, followed by another one
    - geographical area evolution

#### **Table 4 : Situations**

Note: Diseases (epidemics), political unrest (war, terrorism...) and economic events (recession) are not in the scope of CHORIST and are not considered in this impacts study.

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## 5.2 STEP 2: PROFILING

This step identifies the various solutions/contexts which already exist today and which are potentially impacted by both the CHORIST project and a CHORIST system.

- The functional analysis performed in [10] and the analysis of existing systems provided in [10] were mainly used to perform this task concerning the current situation for the CHORIST system;
- [5] was used to perform this task concerning the current situation for the CHORIST project.

### 5.2.1.1 Profiling the system

Here is the list of contexts of interest of the CHORIST system extracted from [10].

Area	Status on current context
<b>Environmental Risk Management</b>	- Many organisations involved in ERM often do not communicate via ICT (only via voice/fax).
	- Many different systems (sometimes Decision Support Service) devoted to specialised applications do not interact
<b>Risk assessment, modelling, simulation, training</b>	- Most systems able to manage a single risk.
	- Models tightly linked to a particular case.
	- Systems not configurable for different circumstances
	- Systems not modular for different authorities
<b>Communication to the citizens</b>	<b>Communications channels</b>
	- Sirens with limited capabilities.
	- Analogue radio and TV broadcast bringing emergency events into homes lives as it happens with Breaking News (cutting all TV programming shown to the public but not in a coordination way with the ERM organisations, and not necessarily done by all broadcasters)
	- one emitter/one receiver message transfers in GSM
	<b>Message to the citizen</b>
	- No use of language selection for message composition in an automated system
	- Most of current systems offer geographical discrimination of alert but not automated, requiring human actions to deliver the message to separated areas
- Most existing systems offer no integration of Broadcasting networks (TV & Radio), Public Announcement Networks (sirens) and/or Personal Communication Networks (Telephony).	
<b>Communication from the citizen</b>	No defined protocol between the citizens and the European common emergency number (112). In the USA, awareness campaign towards citizens are done to train citizens, and especially children, to use the 911 number (US equivalent of 112 number).
<b>Emergency telecommunications</b>	<b>Ad hoc broadband hotspots</b>
	- No commercial solution exists today for Public Safety applications.
	- Research activities based on WiFi are currently being carried out. WiFi coverage is limited to several hundred of meters in range and MAC layer presents limitations in term of QoS and radio-resource management.
	<b>Backhaul</b>
	Today, a backhaul between an ad hoc network and an IP network can be based on satellite, LOS links or wired link. This does not fully satisfy current needs: wired links do not support mobility and are limited in data transfer capabilities, satellite are an expensive alternative and do not scale.
	<b>Wideband extended network</b>

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Actual emergency incident communications are implemented by using existing PMR networks in case of having radio coverage in the area of incident or just direct mode terminal-to-terminal communication if no fixed coverage is available. Incident coverage may be extended by a mobile repeater but service is typically for voice: individual calls and group calls, possibly status and SMS.
<b>User services</b>
Voice communications services are covered on crisis field, due mainly to limited radio channel bandwidth.
<b>Interoperability of public safety communications systems</b>
No development has been performed until now in term of interoperability between ad hoc mobile broadband and PMR systems.
<b>Rapidly deployable broadband network</b>
- Network management solutions have been designed for fixed networks.
- Deployable solutions (e.g. movable narrowband TETRA cells) require network planning prior to deployment. Network set-up always requires human intervention.

**Table 1: Today's solutions identified as potentially impacted by a CHORIST system (from [9])**

### **5.2.1.2 Profiling the project**

The field which are studied by CHORIST are mainly technological ones here is the list of those that are taken into account:

- Market
- Intellectual property rights
- Fields of research
- Standards

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## 5.3 STEP 3: PREDICTION

### 5.3.1 STEP 3.a: Changes identification

Here is the list of changes extracted from [10].

Area		Innovation and improvement brought by CHORIST		
System outcomes	Environmental Risk Management (SP2+SP3)	Improvement of all aspects concerning communication among subsystems and from/to Risk Managers and citizens with semantic analysis techniques and standard-based alert messages.		
	Risk assessment, modelling, simulation, training (SP2)	<ul style="list-style-type: none"> <li>- Innovative siren system allowing sensor network easy deployment.</li> <li>- Multi risk prototype development for alerting purpose</li> <li>- Some degree of independency from used risk models.</li> <li>- Capability to manage different disaster scenarios.</li> <li>- Development of a training system for coordination purpose between all stakeholders to prepare the crisis response.</li> </ul>		
	Communication to the citizens (SP3)	<b>Communications channels</b>	<ul style="list-style-type: none"> <li>- Innovative siren systems</li> <li>- DAB/DVB use for alert message applications.</li> <li>- Cell Broadcast testing in real-environment.</li> <li>- Multimedia Broadcast/Multicast Service study (no development)</li> </ul>	
		<b>Message to the citizen</b>	<ul style="list-style-type: none"> <li>- Message composition based on language and cultural issues in an automated system.</li> <li>- Networks offering geographical discrimination of alert, under automated manner.</li> <li>- Design, development and test of a communication channel dispatcher to allow alerting citizens through the most appropriate channel, according to geographical situation and targeted people.</li> </ul>	
		Communication from the citizen (SP2)	Definition of such a protocol in order to enable 112 to gather relevant information on the situation in an optimal way, and propose associated awareness campaign.	
		Emergency telecommunications (SP4)	<b>Ad hoc broadband hotspots</b>	Development of an ad hoc mobile broadband network based on WiMAX instead of WiFi, featuring a better coverage for Public Safety applications over larger crisis areas (several tens of kilometres in range) and overcoming WiFi limitations.
			<b>Backhaul</b>	Definition and implementation of a WiMAX backhaul enabling a compromise between data transfer capabilities (some 10s Mb/s) and range (5 to 10 km).
			<b>Wideband extended network</b>	Application of the TETRA TEDS PMR technology, which can provide both voice and data services (up to 100kb/s services), by keeping some ergonomic benefits (compact base station).
	<b>New Broadband services</b>		Definition of a platform based on enhanced messaging support, differentiated classes of services (data, soft real-time) and localisations. This will be supported by optimised routing capabilities and will provide an answer to scalability and performance problems. The platform will allow for a set of new services (such as geolocalization, status reporting, file exchange (e.g. photography), modern messaging, any database access (e.g. cartographic))	

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		<b>Interoperability of public safety communications systems</b>
		Definition and implementation of a gateway contributing to enhance in-field communications through extension of PMR network coverage and high bit data rate services offering.
		<b>Rapidly deployable broadband network</b>
		Solutions to rapidly create and manage services and applications by developing dynamic addressing, routing and dynamic services discovery.
<b>Project outcomes</b>		Market
		Intellectual property rights
		Fields of research
		Standards

**Table 1: Changes proposed by CHORIST**

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### 5.3.2 STEP 3.b: Impacts identification (indicators)

Up to this point, several dimensions for the impacts study have been identified:

- two sources of changes (the project, and a system)
- a set of changes (see section 5.3.1)
- a set of stakeholders potentially targets of the changes (see section 5.1.2.)
- a set of situations that the changes may influence (see section 5.1.3)

Note that only some combinations between these dimensions are possible: For instance, the following table contains the combinations that are realistic between (1) the sources of changes, (2) the areas of changes and (3) the different stakeholders identified in section 5.1.2.

source of change	changes areas potentially impacted these sources	stakeholders			
		end users			other (industry, EC, research sector...)
		authorities		general public	
		command centre	on-field users		
CHORIST system	Environmental Risk Management	X			
	Risk assessment, modelling, simulation, training	X			X
	Communication to the citizens	X		X	
	Communication from the citizens	X		X	
	Emergency telecommunications	X	X		
CHORIST project	Market				X
	Intellectual property rights				X
	Fields of research				X
	Standards				X

**Table 5: Source/changes/stakeholders combinations**

Following the methodology proposed in section 4.2, the following sections provide "social, environmental and economic indicators (or variables) of impacts resulting of changes for stakeholders in predefined situations".

#### **Social impact indicators**

The IAIA (see [3]) defines several fields to investigate when identifying social impacts. They are presented as such:

- *people's way of life – that is, how they live, work, play and interact with one another on a day-to-day basis;*
- *people's culture – that is, their shared beliefs, customs, values and language or dialect;*
- *people's community – its cohesion, stability, character, services and facilities;*
- *people's political systems – the extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose;*
- *people's health and well-being – health is a state of complete physical, mental, social and spiritual well-being and not merely the absence of disease or infirmity;*
- *people's personal and property rights – particularly whether people are economically affected, or experience personal disadvantage which may include a violation of their civil liberties;*

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- *people's fears and aspirations – their perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.*

Note that the IAIA also defines an eighth field in the social field which is classified as an environmental impact in this report.

For the CHORIST project and system, the analysis of the potential social impacts results in the list provided in section 5.4.

### **Environmental impact indicators**

The environmental impacts are limited in CHORIST, as this project proposes solutions mainly aimed at informing the authorities and the population. So, no particular approach is provided for here.

For the CHORIST project and system, the analysis of the potential environmental impacts results in the list provided in section 5.4.

### **Economic impact indicators**

Usual practice in this domain provides method to define quantitative impact assessment. However, in the CHORIST project, the long-term applications of the proposed solutions and concepts make difficult the evaluation of how much it would benefit the Society to have a CHORIST system and how much it would provide economic benefits to the industries providing technical solutions to public safety and to citizens.

For the CHORIST project and system, the analysis of the potential economic impacts results in the list provided in section 5.4.

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## 5.4 STEP 4: ASSESSMENT

This step consists in assessing each indicator provided in section 5.3.2, and to provide as well complements and restriction. Each indicator cannot indeed be evaluated as plain "YES" or "NO", but rather with an answer of the kind: "YES, in case..." and "NO, in case...". What is important is all the potential stakeholders (see section 5.1.2) and the situations (see section 5.1.3) that will alter the answers. Potential ways to investigate in order to switch "NO" case into "YES" is addressed in next section.

This third and last assessment at the end of project's life includes the assessment made by end-users during the field trial held in Spain, in Feb. / Mar. 2009.

Impacts indicators		+ / -	CHORIST system	CHORIST project	Comments
#	Description				
<b>1. Social impacts</b>					
1.1. Way of life					
1.1.1. Authorities work:					
1	Enhancement of the commandment of on-field rescue teams by authorities	+	X		<p><i>The rapid provision of crisis site communications will ensure responders and rescue teams can interoperate when and where required, be provided with relevant information at all times and be directed by authorities as appropriate.</i></p> <p><u>Developed system:</u> TETRA TEDS PMR system, new Gateways for interoperability of public safety communications systems, and new broadband services (SP4).</p> <p><u>Target system:</u> All the last radio digital technologies and capabilities are available to get the best commandment.</p>
2	Increased appropriate operational response taken by authorities	+	X		<p><i>The fusion and handling of information currently held by disparate sources and systems will allow authorities to understand the 'bigger picture' through improved situational awareness, thus improving the speed of decision making and the delivery of the most appropriate response.</i></p> <p><u>Developed system:</u> In that case it is very important to achieve this objective the development of the training system for coordination between all stakeholders to prepare the crisis response (SP2)</p>

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3	Increased efficiency of authorities when dealing with multi-hazard events	+	X	<p><i>Each event and event hazard carries with it its own singular risks and response. The ability to combine information concerning multi-hazard events and events occurring concurrently will increase authorities' ability to make decisions more effectively and efficiently and prioritise response.</i></p> <p><i>However, the risk is that too much information flows the authorities so that they cannot take decisions.</i></p> <p><u>Developed system:</u> multi risk prototype developed and capability to manage different disaster scenarios (SP2).</p> <p><u>Target system:</u> Total adaptation of the stakeholders in order to face any situation of risk or disaster.</p>
4	Increased efficiency of authorities when dealing with regional/national/international events	+		<p><i>The CHORIST system will be able to take information from disparate sources and merge this information regardless of borders. By providing risk awareness and assessment information that is specific to any region or group of regions, nationally or internationally, the nature of incidents and events can be fully understood more quickly allowing authorities to implement mitigating action. Thus through monitoring events as they develop an area will have the ability to take initial action without necessarily needing a formal requirement to do so from a neighbouring region or country, thus speeding up the efficiency of response.</i></p> <p><i>However, agreements between organisations and between countries need to be made before technology is set up.</i></p>
5	Increased speed of response by on-field rescue teams	+	X	<p><i>CHORIST will not necessarily improve speed of response, but it will facilitate the improvement of the most appropriate response, which is often different. The rapid identification of the type of event and its associated risks will improve the ability to make decisions regarding the most appropriate resources to be deployed. This information will also improve authorities' ability to identify the need for resources with other skills and/or equipment that may not be immediately available locally, and take steps to facilitate their attendance.</i></p> <p><u>Developed system:</u> TETRA TEDS PMR, WiMAX, gateways for interoperability with public PMR networks, new broadband services (SP4); all studies from SP2: risk assessment, modelling, simulation, training.</p> <p><u>Target system:</u> All the last radio digital technologies and capabilities are available.</p>
6	Increased reactivity of on-field rescue teams operations to escalation	+	X	<p><i>As (5) above. Inputs to the CHORIST system from on-field teams will provide the capability to enhance risk awareness and assessment in near real time, allowing operational commanders to make quicker and more informed decisions on resource requirements and priority activities.</i></p>

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7	Increased efficiency of the operation of the on-field rescue teams	+	X		<p><i>Provision of improved information through CHORIST will improve the speed of decision making, and thus improve the capability of authorities to target resources and prioritise their activities, resulting in greater efficiency.</i></p> <p><i>The delivery of information to field rescue teams both in their transit from their headquarters to the area of operations as well as when being deployed in this area gives a better information on the situation and thus enhances the efficiency of the activities to be carried out.</i></p> <p><i>However, rescue teams want to have integrated tools; they don't want to carry multiple telecommunication equipment on top of the other tools they need to perform their mission. They also want that the tools used in day to day situations as well as during emergencies or disasters are the same.</i></p> <p><i>Video for field units showed sometimes to be less valuable than a picture: A large and good quality picture is often better than a small and poor quality video.</i></p>
8	Increased safety of the operation of the on-field rescue teams	+	X		<p><i>Earlier and more accurate identification of risks and hazards will provide authorities with the capability of ensuring enhanced health and safety provision towards responders and rescue services. This will help authorities discharge their legal obligations and fulfil duty of care responsibilities towards their staff. It should also serve to mitigate future litigation.</i></p> <p><i>The real time transfer of critical information in all directions (headquarters to field, field to field, field to headquarters) is also an important solution to limit the impacts of disasters on field rescue teams.</i></p>
9	Enhancement of the cooperation between on-field rescue teams from different agencies, and from different countries	+	X		<p><i>As (4) above. Earlier identification of the impact on other agencies and countries will improve the ability to respond and reduce delays in gathering and deploying appropriate resources. As well as being able to respond to real time incidents and disasters, the CHORIST system can be used as a tool to facilitate training between and across agencies and countries, leading to increased collaboration, confidence and co-operation. The development and availability of multi-lingual information from CHORIST will ensure a common understanding and situational awareness.</i></p> <p><b>BUT</b></p> <p><i>there are issues around consistency of response, terminology and operational procedures that need to be agreed outside of the project. These problems are not technical and they may never be solved.</i></p>

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10	Cost to train public safety people to use new tools	-	X	<p><i>As with any new or improved system there is a cost to authorities to ensure staff are adequately trained on the available functionality. Although this is an overhead that needs to be absorbed, in many cases the CHORIST system will be able to rationalise disparate sources of information that currently can only be accessed through a number of systems. Providing all relevant information via one IT system or interface can thus potentially reduce training costs over time.</i></p> <p><i>The effort to train public safety people shouldn't be important because nowadays many authorities have campaign, conferences, forums, seminars related with public safety. Moreover, the technology in our day to day life is evolving faster than the tools used by the public safety: Mobile phone, Internet... Thus, these tools shall not be difficult to handle for people already using high technology devices at home.</i></p>
11	Ostracism of public safety people not keen on new technologies and new habits	-	X	<p><i>Whilst there is sometimes reluctance to change and embrace new technology, public safety authorities and organisations are now more prepared to adopt new systems when added value and business benefits can be clearly demonstrated and proved in operational situations and scenarios. The successful use of the CHORIST system in one real life crisis will prove compelling in its acceptance by other authorities and agencies. This can be managed and promoted through targeted communication, benchmarking and distillation of good practice.</i></p>
12	Increased risk of mission failure in case of a technical failure	-	X	<p><i>Only in case the protocols are not well adapted to system design and ignore the possibility of a technical failure.</i></p> <p><i><u>Developed system:</u> system designed with redundancies.</i></p> <p><i><u>Target system:</u> redundancy in all emergency telecommunications, and define special protocol if technical failures occur. Have fallback modes with reduced but with high-availability features.</i></p>

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13	More autonomy of authorities to alert populations	+	X	<p><i>The better and more rapid capability to draw the picture of the event and to set up the proper response, as explained in [2][3][4][5], will also increase the autonomy of Authorities to alert population.</i></p> <p><i>IF</i></p> <p><i>the ERM Authorities will make agreements and establish common protocols with telecommunication authorities and/or companies, the set of tools provided by the CHORIST system will allow them to dispatch alert messages directly and to specific population groups in determined areas, as in [19], without depending onto other stakeholders.</i></p> <p><i>This will work in case of alert protocol is well defined (agile and with competences) and all alert systems and involved safety agents have permanent interoperability and communication to act.</i></p> <p><u><i>Developed system:</i></u> <i>networks offering geographical discrimination of alert, in an automated manner. Sirens, communication channel dispatcher, alert message applications with DAB/DVB technologies.</i></p> <p><u><i>Target system:</i></u> <i>more granularity to delimitate the affected zone and to use all media to alert populations correctly.</i></p>
14	Increased efficiency of 112 call centres	+	X	<p><i>The CHORIST system will count on the 112 call centres as one of the data sources, needed to be aware of a hazard event, therefore the implementation of common protocols and procedures, aimed at providing the Authorities with the right and timely information, will increase the efficiency of the centres through a better quality of the service and higher technological standards. In a broader perspective, the efficiency of the 112 centres can be enhanced by the acknowledgement of their role in the alert chain, which will bring stronger investments, in terms of technology and training.</i></p> <p><i>The challenge, however, is to create automated tools or to define human procedures to extract from the huge amount of information the emergency call centres receive what needs to be processed further.</i></p>
15	Increased support of features evolutions	+	X	<p><i>The evolutive modular architecture shall allow to handle a limited type of risks in the frame of the CHORIST project. But, it is expected to be enhanced with other risks later.</i></p>

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16	Increased preparation of authorities (by training)	+ / -	X		<p><i>Training is an overhead that has to be absorbed by authorities. Much is mandatory and cannot be avoided. Where training is not mandatory it must be prioritised, provide value for money and a measurable return on investment. The CHORIST system must deliver proven operational and organisational benefit and be accepted as adding value to current practices and procedures to deliver increased preparedness to fulfil this objective. There is much work to be done to make training on the CHORIST system universally compelling.</i></p> <p><i>Developed system: training systems for coordination purpose between all stakeholders to prepare the crisis response (SP2)</i></p>
17	Increased stress or pressure level for the authorities representatives (i.e. they are the step that slows the process down, as the technical information chain is more efficient, the human processing time takes a more important part in the whole risk management processing time)	-	X		<p><i>Yes but, the new tools should be considered as helping them, and not showing them their limits.</i></p>
<i>1.1.2. People life:</i>					
18	Increased protection of the populations by authorities	+	X		<p><i>Authorities have a duty of care towards the population they are protecting. Early availability of risk awareness and risk assessment information from CHORIST will enable authorities to make the most appropriate and informed decisions at the most appropriate time, thus enhancing the standard of protection that can be offered.</i></p> <p><i>Moreover, thanks to the multi-lingual aspect of the CHORIST system, such protection will be extended to the foreign people involved in the hazardous event.</i></p>
19	Increased part of the population informed after an event	+	X		<p><i>Current arrangements to provide early post event information to citizens are ad-hoc and inefficient. The ability to target specific population groups and geographic areas through technology will improve the distribution of timely and relevant information to the general public. CHORIST will thus provide a capability to complement existing channels and media through the provision of alternative means of communication.</i></p> <p><i>This variety of media, associated with the multi-lingual aspect, will enable authorities to reach foreigners and disabled people, i.e. visual/hearing impairs.</i></p>
20	Increased efficiency of populations' response	+	X		<p><i>Citizens are entitled to receive appropriate pre and post event advice and information. The ability to provide such information at an earlier stage of a disaster will improve citizens' ability to respond in a more cohesive and organised manner without creating additional panic or increasing risks and hazards.</i></p> <p><b>BUT</b></p> <p><i>it depends on the correct training on appropriate protocols (practical training in risk assessment), that has to be done to the population, to achieve a good response in case of an emergency situation.</i></p>

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21	Decreased time when people hesitate to follow authorities instructions	+	X		<p><i>In case of population high level of preparedness.</i></p> <p><i>IF</i>  <i>the population will be correctly and efficiently trained on CHORIST system, they will be aware of the fact that a certain message, dispatched through a certain channel, will have to be followed by a predetermined behaviour.</i></p> <p><i>IF</i>  <i>the CHORIST system will be implemented at EU level, it will enable citizens, when in a foreign country, to react promptly to the alert messages, for they will know that the alert message comes from the ERM authority and will thus consider it trustworthy.</i></p>
22	Increased proportion of the population who understand alert messages and emergency language	+	X		<p><i>Yes in case of population is correctly trained on appropriate protocols in case of emergency. CHORIST works with some diagrams, audio or text messages typically used in emergency organisations that guide population on actions to be done. The most simple the language used by authorities, the higher the number of people understanding the warning messages.</i></p>
<i>1.2. Culture</i>					
23	More attention and comprehension on natural events and on risky industry. (If the system result in more warnings to citizen (for example for preventive actions due to minor biological pollution or bad weather condition) the population attention to their environment may change)	+	X		<p><i>Good information is really useful, but there should not be too much information provided.</i></p>
<i>1.3. Community</i>					
24	Increased coherence of populations' response	+	X		<p><i>YES</i>  <i>For the same reasons indicated in [20]</i>  <i>IF the population will be correctly trained (emergency protocols; how and when to call 1-1-2 and what they can expect when they called; type of alert messages, etc.)..</i></p> <p><i>NO</i>  <i>IF the CHORIST system will be intended only as a tool for ERM professionals, and will not be supported by a EU-wide training programme.</i></p>
25	Increased responsibility of populations	+	X		<p><i>YES if the CHORIST system is associated to an educational campaign on the correct use of the 112 and other emergency numbers, as well as the importance of following the instruction in case of alert, as a demonstration of social responsibility and indirect participation into the ERM operations. It is clear that these issues are out of the CHORIST project, but are very important to grant the widest positive impact of the system.</i></p>
<i>1.4. Political system</i>					

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26	Increased awareness of the necessity of EU standardized alert messages	+	X		<i>YES if the CHORIST project will underline the necessity of a standard set of alert messages to be sent to the population, and demonstrate that the EU value of the system, especially through its multi-lingual aspects, will be depending on the capability of all the EU citizens to understand the messages they will receive. This issue is out of the project; nonetheless it is strictly linked to its best exploitation. The CHORIST project can include the description of the ideal conditions in which the system can perform at its maximum extent in the recommendations addressed to the European Commission, and disseminate them through the consortium members and their networks.</i>
27	Increased awareness of the necessity of training for the population	+	X		<i>For the same reasons expressed in [above]. The final goal of CHORIST is to save lives through a better alert system, and such goal can be reached only if the population is correctly trained. This issue is clearly a political responsibility, that can be stimulated by the project final recommendations to the European Commission.</i>
<i>1.5. Health and well-being</i>					
28	Reduced lost lives	+	X		<i>In case CHORIST system can predict hazards or minimize the effects in the affected zone reducing time of response and improving the management of emergency organisations.</i>
29	Reduced diseases and injuries to heal	+	X		<i>Same as for (27)</i>
<i>1.6. Personal and property rights</i>					
30	Increased protection of populations goods	+	X		<i>Warning people well ahead of the occurrence of a disaster can better protect their goods so that disasters impacts are reduced.</i>
<i>1.7. Fears and aspirations</i>					
31	Reduced fear of on-field rescue teams during their work in hazardous areas	+	X		<i>As more relevant and timely information will be made available to support their work in hazardous areas through the telecommunication networks designed in CHORIST system.</i>
32	Reduced fear of population to be caught by surprise by a disaster	+	X		<i>In reality the practical training in risk assessment and benefits of the CHORIST system must be clear and convincing for the citizens.</i>
33	Increased confidence of population in the civil protection services	+	X		<i>The extension of services such as those available though weather forecasting today to other risks will certainly be reassuring.</i>
34	Increased confidence of populations in industrial plants (if the CHORIST system is associated to a good preparedness)	+	X		<i>YES but the alerts shall be sent properly and not all the time in case of minor event. Before, the impact is reached, good tuning of the CHORIST system shall be attained.</i>

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35	Increased feeling of rejection of populations not keen on using new technologies <i>(the message "you can be saved by new technologies" may be understood as "you will not be saved if you are not addicted to new technologies")</i>	-	X		<i>In practice alert messages will be broadcast in different systems including some that don't require an "extra technological knowledge" by the population, like sirens or DAB. Nevertheless clear and convincing training campaigns about the CHORIST system and emergency protocols for citizens are considered highly necessary.</i>  <i>Developed systems:</i> communication to the citizens with sirens and broadcasting systems.  <i>Target system:</i> alert all population, extending the feeling that all citizens are protected with equality.
36	Increased anxiety of population <i>(if they are made aware of more problems than they used to be)</i>	-	X		Counterpart of (32)
<b>2. Environmental impacts</b>					
37	Limitation of the polluted areas	+	X		<i>Knowing what could be the consequences of a particular decision in a multi-hazard environment will help inform the decision-making process. For example, in the case of an industrial hazard such as oil spillage, the early availability of such decision support could potentially limit the area affected by pollution.</i>
38	Limitation of the risks of pollution while transporting energy/chemical resources	+	X		Same as above
39	If more sensors and communication means are deployed for CHORIST, this may have impact on the environment (visible devices in the nature, civil work, electromagnetic pollution...)	-	X		<i>Sensors should be hidden and some studies to reduce the environmental impact in the roll out could be considered. Moreover, most sensors already exist. CHORIST makes a better use of them and make them available for more organisations to improve their effectiveness</i>
<b>3. Economic impacts</b>					
40	New markets for information systems and telecommunication systems providers	+		X	<i>It is expected that the project will lead to other projects, to products developments and to markets. Products are emergency gateways for broadcast systems, new functionalities in Cell Broadcast, new applications related to emergency management to be deployed in broadband networks, etc</i>
41	Job creation to develop information systems and telecommunication systems	+		X	<i>New activities will certainly allow job creation in the software development activities. (information system)</i>
42	Direct benefits from Intellectual Property Rights exploitation	+		X	<i>YES but only if IPR are released.</i>
43	Help to validate standards	+		X	<i>CAP, TSO, WiMAX, DAB... are intended to be extensively used and so to validate them (partially).</i>
44	Proposal of new standards	+		X	<i>Any improvement of standard will certainly be proposed.</i>
45	New fields of research discovered still to be addressed by research institutes, universities...	+		X	<i>In case fields which were not studied in the frame of the project reveal to be interesting, the new fields of research will be proposed: Think of IPv6, think of harmonisation of message dispatching...</i>

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46	Decreased costs to heal population during the recovery phase	+	X		<i>Training of the population on the CHORIST system will instil confidence, and persuade and encourage them to adopt the appropriate behaviour when receiving advice and/or information messages at all phases of the disaster lifecycle.</i>
47	Decreased costs to rebuild/repair industrial equipment, infrastructure...during the recovery phase	+	X		<i>With adequate early warning, steps can be taken to protect and secure goods, resulting in minimised costs for equipment repair and replacement.'</i>
48	Important first investments of governments to provide the minimum reliable CHORIST system (the minimum is already a lot : multi sensors and agencies connection, multi-regional coverage...).	-	X		<i>The concepts proposed by CHORIST need to be enhanced, experimented and validated. A complete CHORIST operational system will certainly cost a lot. Target version of CHORIST to be step by step deployable from low investments to complete investments. For example, a first step would be to install only a software on existing authorities hardware to deploy a first set of CHORIST functionalities. The ultimate step would be to replace or extend all the hardware and networks, both communication and sensor networks.</i>

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## **5.5 STEP 5: RECOMMENDATIONS**

Here is a list of recommendations for the future, to increase the positive impacts and to reduce the negative impacts of a system like CHORIST:

- Limit the amount of information that authorities have to deal with.
- Provide simple versions of CHORIST so that step by step implementations can be made by authorities.
- Train authorities so that they can use new tools
- Educate and train the populations so that they react as necessary to the warning received from the authorities
- The different governments should involve all TV and radio broadcasters in CHORIST solution to coordinate the alert broadcast in all their transmission networks.
- Implementation at European level is necessary for a CHORIST system to be efficient
- For using Cell Broadcast alerts: EU and Local Governments should support the harmonization of Cell Broadcast, using defined channels for different languages.
- For using Cell Broadcast alerts: Governments should also support the harmonization of a standard <Alert and/or Alarm> tone via the ETSI, GSM-A, Cell Broadcast Forum and ITU standards work, in order to let Citizen make full use of the possibilities of Mobile Cell Broadcasting.
- EU and Local Governments should implement trials with Communication to Citizen media channels in order to learn quickly how Citizen can benefit most from advanced risk management and communication to citizen systems.
- Warning systems shall use several means in parallel, one of them at least which should not require the population to use a technical devices (a mobile phone, a TV set...).
- On top of technology deployment, harmonise procedures among countries, and more particularly solve human problems: Technology cannot solve every problem.