Open architecture for Smart and Interoperable networks

In Risk management based on In-situ Sensors

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Integrated Project - Contract Number 033475

WORKPACKAGE 2000 Deliverable D2100:

Users Requirements

ISSUE 01

Prepared for the:

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1. INTRODUCTION

1.1 GENERAL

This document produced under the OSIRIS project (Contract number 033475) constitutes the deliverable number D2100.
It reports on the activities and results of Work Package 2100 End-Users Requirements.

The WP2100 objective is to realise a user-driven approach by conducting interviews in order to specify the end-users requirements. These requirements are defined in an open manner in terms of demands of sensors, network of sensors, sensors services as well as the demands in term of added value processing.

1.2 DOCUMENT STRUCTURE

This paragraph gives an overview of the document structure and the relationship between the different chapters.
Chapter 2 describes the Scope of Work for WP2100 and its relationship with other Work Packages within OSIRIS.
Chapter 3 presents the process that was used to achieve the stated objectives for WP2100 and the working approach and schedule for WP2100. This was based on an agreed process and on the overall schedule for OSIRIS.
Chapter 4 describes the results of WP2100.
The document body finishes with:
Chapter 5 which summarises the document and concludes the findings. It also describes lessons identified while performing WP2100.

One Annex is also provided including questionnaires, which were the framework for leading the interviews of the users.

1.3 GLOSSARY OF TERMS AND ABBREVIATIONS

Term	Meaning
APS	APS GmbH
AUVASA	Autobuses Urbanos de Valladolid S.A
DoW	Description of Work
ESYS	ESYS PLC
FP6	6th Framework Program
FWA	Stadt Aachen (Feuerwehr Aachen)
GMV	GMV SA
HGT	Hydrogeotechnika SP.ZOO
IfGI	(Institute for Geoinformatics)
LAMMA	Laboratorio per la Meteorologia e la Modellistica Ambientale
OSIRIS	Open architecture for Smart and Interoperable networks In Risk management based on In-situ Sensors
PM	Parts per Million
REMIFOR	Réseau Euro-Méditerranéen d'Information et de FORmation à la gestion des risques
RT	Regione Toscana
TCF	THALES Communications SA
TRT	Thales Research & Technology (UK) Ltd
VITO	Vlaamse Instelling voor Technologisch Onderzoek n.v.
WP	WorkPackage

1.4 APPLICABLE DOCUMENTS AND REFERENCES

Document	Title
Annex 1 of the OSIRIS contract	Description of work

2. SCOPE OF WP2100: END-USERS REQUIREMENTS

2.1 SCOPE OF WP2100

2.1.1 SCOPE OF WP

The scope of the WP2100 is to get a better understanding of the requirements and "state of the art" strategies of end-users by driving interviews with the end user organisations.

In order to achieve this goal, the following tasks have been identified:

- Make a list of possible end-users.
- Interview these end-users and those involved in this project.
- Extract common OSIRIS needs from specific ones.
- Write the users requirements report (this document).

2.1.2 SCOPE OF THE DOCUMENT

This document identifies the requirements regarding both natural and industrial hazards, elements to monitor, particular constraints, data needs and data presentation needs. The intention is to identify and justify the direction which the OSIRIS project will take.

2.2 WP2100 RELATIONSHIP WITH OTHER WP

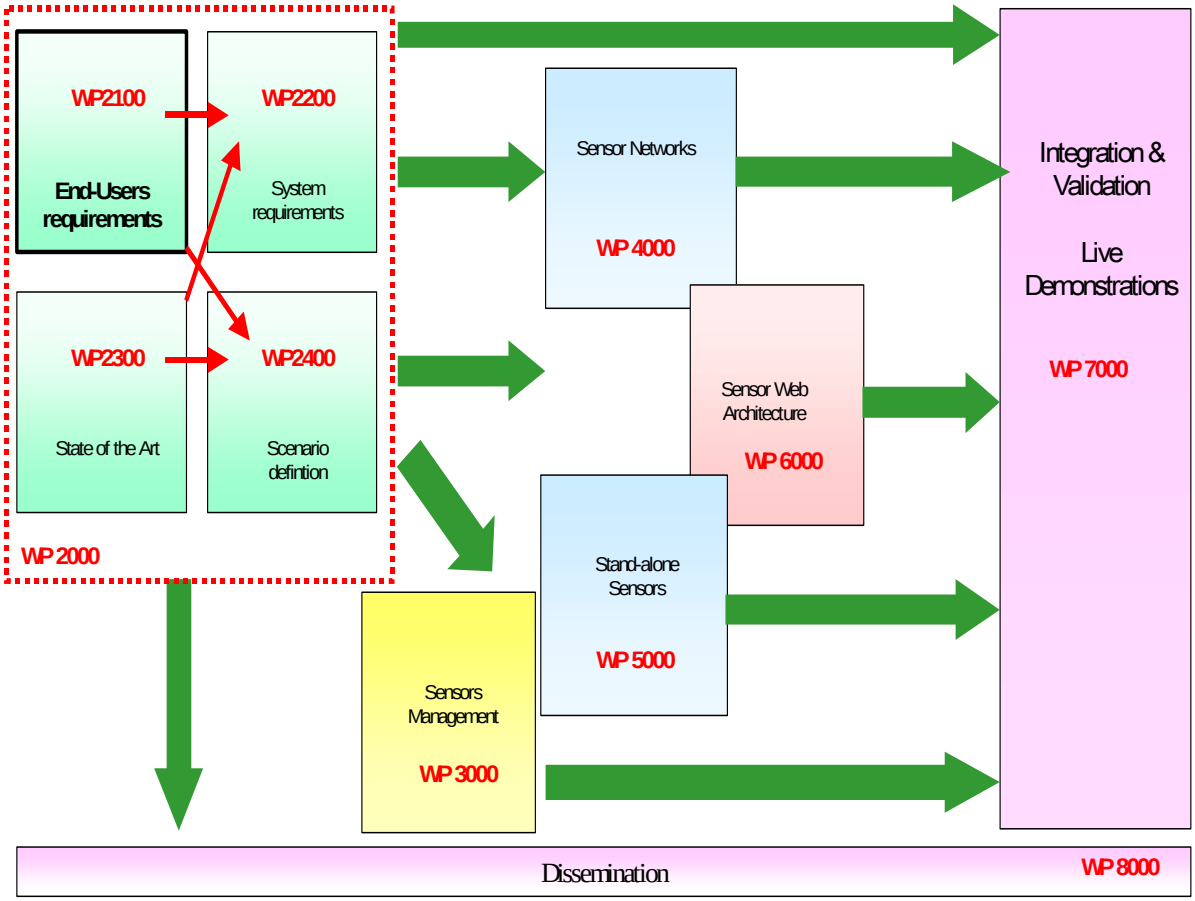
WP2100 is the input of the global OSIRIS project, clarifying top level requirements, and has particular inputs to:

- WP2200: System Requirements, refining the User requirements for the GMES thematics addressed by the OSIRIS project
- WP2400: Scenario Definitions for the experimental validations of the OSIRIS project.

The WP is also linked with the WP 2300 State of the art, held in parallel, so that users interviewed were also asked about elements of the "state of the art" .

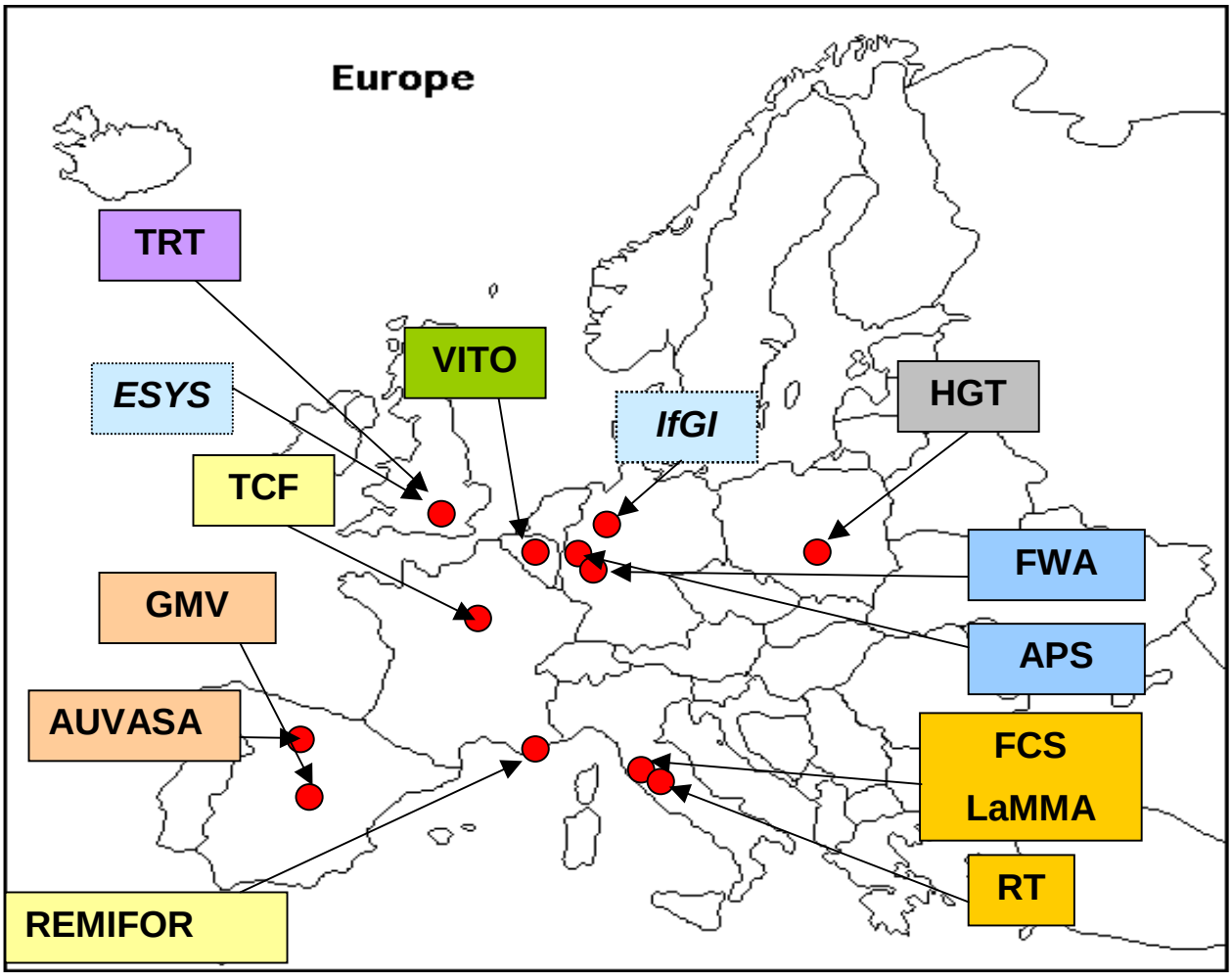
This WP must be considered as a whole with WP2200, WP2300, and WP2400, all of them forming a consistent activity.

The following figure shows the relationships of this WP with the others ones.



3. PROCESS OVERVIEW AND WORK SCHEDULE

This document is the result of the collaboration of most of the partners of the OSIRIS project, whose contribution was established according to Annex 1 of the contract ("Description of work" document).



This figure shows the locations of the OSIRIS Partners. Two partners are not involved in this activity – but they participated to the advance meetings of this WP – and they appear in italics.

The following partners act as users in the OSIRIS project:

- REMIFOR (Réseau Euro-Méditerranéen d'Information et de FORmation à la gestion des risques)
- FWA (Feuerwehr Aachen)
- Valladolid Town and AUVASA (Autobuses Urbanos de Valladolid S.A)
- RT (Regione Toscana).

3.1 PROCESS OVERVIEW

The process to establish the users requirements was based on debates and discussions during common meetings. Its steps were the following:

1. Establishment of two questionnaires (Q1 and Q2) as decided on the 2nd day of the kick-off meeting (19th September 2006). They aimed at:
   - Identifying the state of the art in the use or delivery of sensors for the partners involved in OSIRIS (Q1)
   - Identifying the list of users to be interviewed (Q1)
   - Identifying the questions for users (involved in the project, or from outside of the project), subject of Q2.
2. Each partner had to answer to Q1, identifying the users to be interviewed.
3. The Q2 was used by all partners as support to drive interviews with the users identified.
4. Several questions on the questionnaires were raised after a first revision, which led to a common modification of the questionnaires during a session in the second OSIRIS meeting (Brussels, 20th October 2006). During this session, additional specialised technical questions were also identified, to be exploited within this document, but also and principally in the WP2200 System Requirements. The resulting questionnaires are provided in the Annex of this document.
5. A new set of interviews were held on the basis of the resulting Q2.
6. During the 3rd common meeting (Florence, 14th and 15th November 2006), a complete day was dedicated to the cross-reading of the document which was completed after that.
7. A summary and analysis of the results was then established and is the subject of the present document.

3.2 WORK SCHEDULE

Giving the process defined in the previous section, the work was scheduled across the participants of this work package.

The work was performed using a number of workshops and 'homework' between workshops.

The workshops were organised around the steps of the process and the plan was as follows:

WP2100 Workshop #1		
Paris-Massy 19th September 2006		
Inputs	**Workshop Objectives**	**Homework/schedule**
Workshop members brought thoughts on requirements.	Re-draw the objectives of the WP. Agree on the sharing of the work.	REMIFOR had to initialise the questionnaires Q1 and Q2 Each partner had to answer to Q1 and start interviews for Q2
WP2100 Workshop #2		
Brussels 20th October 2006		
Inputs	**Workshop Objectives**	**Homework/schedule**
Partners' contributions on Q1 and Q2 and questions about them. Summary of received contributions	Modifications of the Q1 and Q2	To update both questionnaires Q1 and Q2 To update and complete users interviews
WP2100 Workshop #3		
Florence 14th-15th November 2006		
Inputs	**Workshop Objectives**	**Homework/schedule**
All contributions from interviews Summary of inputs	Review of preliminary D2100 document	Analyse the questionnaires, Complete and finish the document

In the next workshops, conclusions and reviews of the document were performed.

4. PRESENTATIONS OF THE RESULTS

The following presentation of the results is done according the questionnaire 2 (given in Annex).

4.1 LISTS OF THE END-USERS ENTITIES INTERVIEWED BY THE OSIRIS ORGANISATION

This paragraph lists the entities which were interviewed by the different OSIRIS organisations. It also presents their level of intervention, if local/regional/national.

	ACRONYM	LOCAL	REGIONAL	NATIONAL
REMIFOR FRANCE				
Etat Major de Zone	EMZ		X	
Entente Interdépartementale	CEREN		X	
Entente Interdépartementale	ET		X	
Service Départemental d'Incendie et de Secours des Bouches du Rhône	SDIS 13	X		
Service Départemental d'Incendie et de Secours du Var	SDIS 83	X		
Ecole d'Application de la Sécurité Civile	ECASC		X	
Pôle Nouvelles Technologies	PôNT		X	
Université de Nice Sophia Antipolis	UNSA		X	
Private company	ACRI		X	
TCF FRANCE				
Office International de l'eau	OIEAU			X
Service NRBC de la Gendarmerie Nationale	GN			X
TRT ENGLAND				
Hampshire Fire Brigade (Answers were received too late for being analysed in this delivery)			X	
HGT				
Police state Environmental				X
VITO BELGIUM				
Federal Police Belgium – Crisis intervention	CIC			X

	ACRONYM	LOCAL	REGIONAL	NATIONAL
Center				
Belgian Interregional Environment Agency	IRCEL		X	
Agency Federal Belgium nuclear	FANC			X
Federal Belgium Crisis Centre (Answers were received too late for being analysed in this delivery)	*CELEVAL*			*X*
LAMMA ITALIA				
Environment Protection Agency for Region Toscana	ARPAT		X	
Civil Protection Authority for the Province of Grosseto	PC		X	
Fire Brigades of the Province of Grosseto	VVF		X	
GMV SPAIN				
Environment agency for Region of Valladolid city		X		
FWA GERMANY				
Feuerwehr Aachen - Fire and rescue service	FWA	X		
APS GERMANY				
Freiwillige Feuerwehr Eschweiler	FFE			X
Federal Agency for Technical Reliefs (2 interviews)	THW			X
TOTAL		4	11 (+1)	7 (+1)

Some interviews were performed later than the deadline fixed for the delivery of the inputs. They have been added to the table, but their interviews could not be taken into account in the analysis and statistics provided in this chapter. **However, the data will be used in the System Requirements and Scenario definitions.**

Most of the 22 users interviewed act at a national and regional levels.

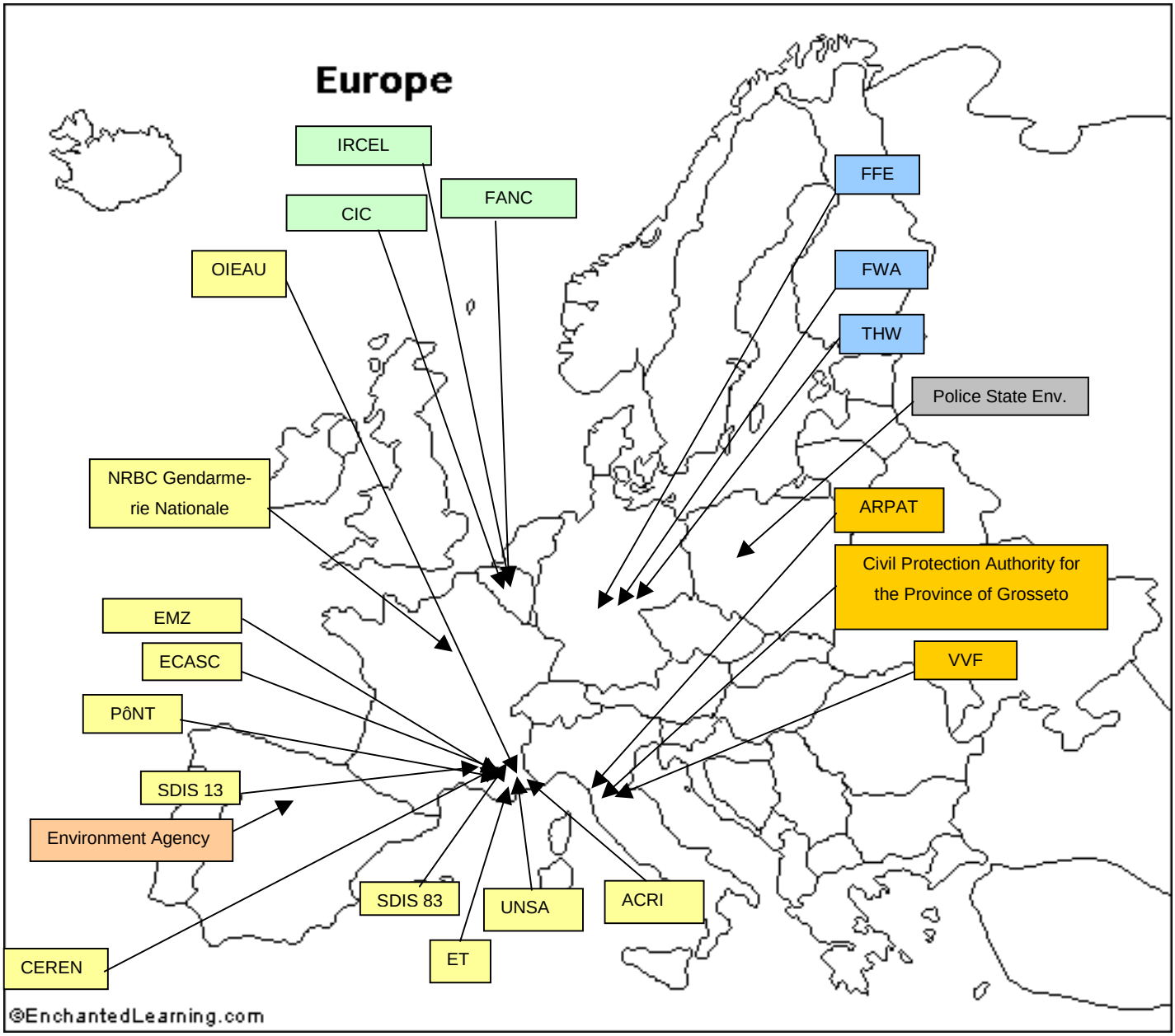
Many interviews involved Forest Fire domain actors. This potential bias was taken into account during the analysis of the results.

The OSIRIS Consortium is aware that the sample of users interviewed is not sufficiently extended in order to establish statistics. However, an analysis with statistics has been

realized, assuming that the answered received were representative of similar institutions of the same areas of interest.

4.2 SETTLEMENT OF THE USERS

Partners have interviewed the users principally in their own countries as shown in the following figure.



4.3 NATURE OF ACTIVITIES OF USERS INTERVIEWED

	ACRONYM	Competences	Nature of Activity
FRANCE			
Etat Major de Zone	EMZ	Rescue Services	Decisional Centre for Fire Brigade & Rescue Services
Entente Interdépartementale	CEREN	Research Centre	Applications for Fire Brigade & Rescue Services Inter regional cooperation
Service Départemental d'Incendie et de Secours des Bouches du Rhône	SDIS 13	Rescue Services	Fire Brigade & Rescue Services
Service Départemental d'Incendie et de Secours du Var	SDIS 83	Rescue Services	Fire Brigade & Rescue Services
Ecole d'Application de la Sécurité Civile	ECASC	Rescue Services	School of Fire Brigade
Pôle Nouvelles Technologies	PôNT	Rescue Services	Experiments in GIS Service (Geographic Information System)
Université de Nice Sophia Antipolis	UNSA	Search & Development	Simulation & development for Fire Brigade & Rescue Services
Society ACRI	ACRI	Simulator & Monitoring	Water & Meteo Quality
Entente Interdépartementale	ET	Regional Organism	Rescue Services
Office International de l'eau	OIEAU	Information & training	Water management
Service NRBC de la Gendarmerie Nationale	GN	Rescue Services	Detection & characterisation of NRBC elements
POLAND			
Police State Env.		Information & Monitoring	Water Quality
BELGIUM			
Federal Police Belgium – Crisis intervention Center	CIC	Rescue Services	Decisional Centre
Belgian Interregional Environment Agency	IRCEL	Monitoring	Air Quality
Agency Federal Belgium nuclear	FANC	Monitoring	Nuclear Activities
ITALIA			
Environment Protection Agency for Region Toscana	ARPAT	Monitoring	Water & Air Quality
Civil Protection Authority for the Province of Grosseto	-	Rescue Services	Decisional Centre
Fire Brigades of the Province of Grosseto	VVF	Rescue Services	Fire Brigade & Rescue Services
SPAIN			
Police state Environmental	-	Monitoring	Water & Air Quality

	ACRONYM	Competences	Nature of Activity
GERMANY			
Feuerwehr Aachen	FWA	Rescue Services	Fire Brigade & Rescue Services
Freiwillige Feuerwehr Eschweiler	FFE	Rescue Services	Fire Brigade & Rescue Services
Federal Agency for Technical Relief	THW	Information & Monitoring	GIS Services

Three main types of activities are identified in the table:

- Fire and others Rescue Services
- Water and Air Quality Monitoring
- NRBC monitoring.

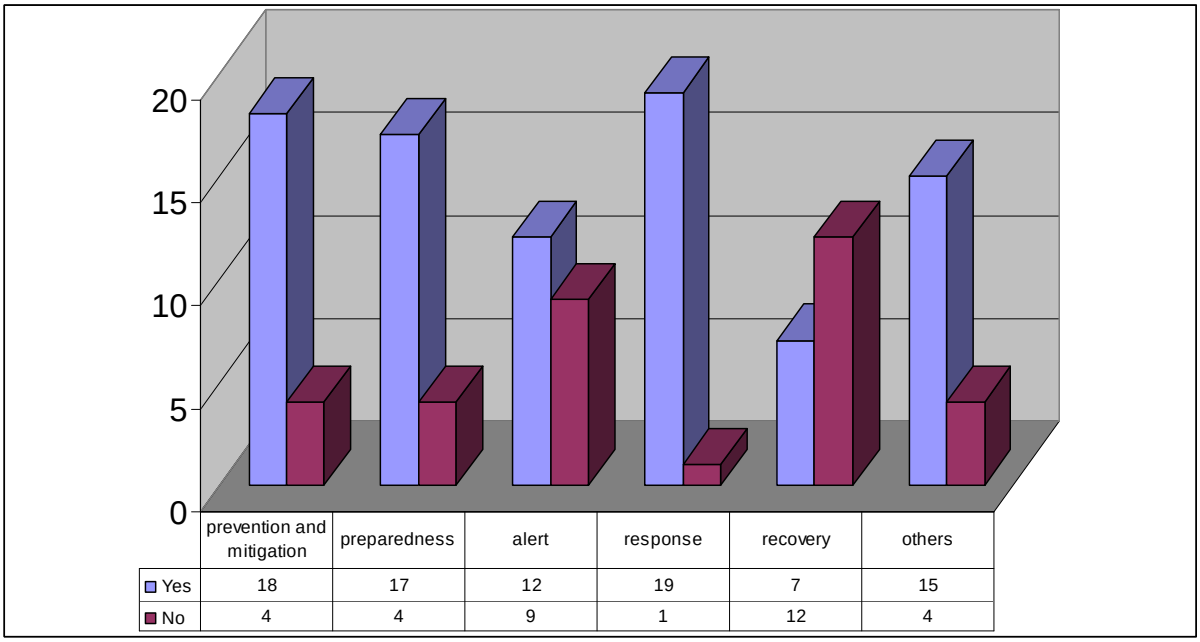
The main skills are the use of services or systems linked to Decisional Centres.

When leading the interviews, the following questions were asked to the users:
“Do you wish to be informed about the work? “
“Do you wish to observe the practical demonstration? “
Both questions received a positive answer from the majority of users.
During the project life, there could be new contacts with the users in order to refine their requirements (for the scenarios or system requirements, when necessary), provide them with a progress update on the project or invite them to participate in the workshops and/or demonstrations.

4.4 QUESTIONS AND ANSWERS

In the following, answers to the different questions are presented graphically, with additional comments emphasizing the major results.

1) Do you know the existence of sensors system?



	prevention and mitigation	preparedness	alert	response	recovery	others
Yes	18	17	12	19	7	15
No	4	4	9	1	12	4

- The answers showed a knowledge of in-situ systems for data acquisition, for the following phases listed in decreasing order of interest: Prevention and Mitigation, Preparedness and Response,
- Alert which must be connected to the alarm systems
- Recovery.
- Others making reference to Post disaster phases.

The answers also show which features are known and/or used:

- Stationary services within public premises
- Portable devices for rescue
- NRBC
- Weather forecast stations
- Satellite imagery

- GIS
- Reconnaissance alert to local authorities
- Local crisis units
- Telecommunications links, radio links, GPS
- Emergency planning
- Damage assessment measurements.

2) Do you use sensors systems?

Most of the users interviewed know and use sensors systems (86% answered yes, 14% answered no).

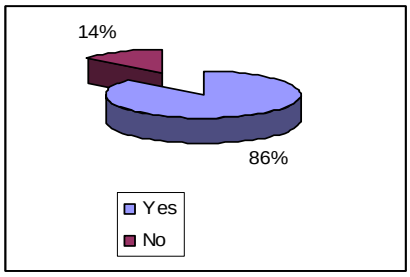
The frequency of use of the sensors is given in the following table, in which:

4: means a daily use

3: means a regular use

2: means an occasional use (for tests or studies)

1: means an exceptional use (in case of crisis for instance)



	ACRONYM	Prevention	Crisis / operation phase
FRANCE			
Etat Major de Zone	EMZ	4	2
Entente Interdépartementale	CEREN	4	2
Service Départemental d'Incendie et de Secours des Bouches du Rhône	SDIS 13	4	2
Service Départemental d'Incendie et de Secours du Var	SDIS 83	4	2
Ecole d'Application de la Sécurité Civile	ECASC	4	2
Pôle Nouvelles Technologies	PôNT		
Université de Nice Sophia Antipolis	UNSA	4 and 3	2
Society ACRI	ACRI	4	2
Entente Interdepartementale	ET	4	2
Office International de l'eau	OIEAU	2	1
Service NRBC de la Gendarmerie Nationale		N/A	N/A
POLAND			
Police State Env.		0	0

	ACRONYM	Prevention	Crisis / operation phase
BELGIUM			
Federal Police Belgium – Crisis intervention Center	CIC	4 (GPS)	3 (GPS) and 2 (imagery from ground helicopter)
Belgian Interregional Environment Agency	IRCEL	4	4
Agency Federal Belgium nuclear	FANC	4 (acquisition every 10 minutes)	4 (acquisition every 10 minutes)
ITALIA			
Environment Protection Agency for Region Toscana	ARPAT	4	4 and 3
Civil Protection Authority for the Province of Grosseto	-	4	4
Fire Brigades of the Province of Grosseto	VVF	4	3
SPAIN			
Police state Environnemental	-	4	1
GERMANY			
Feuerwehr Aachen	FWA	0	3 (training) and 2 (interventions)
Freiwillige Feuerwehr Eschweiler	FFE	3	3
Federal Agency for Technical Relief	THW	Without opinion	Without opinion

This shows that system of sensors are frequently used for monitoring and surveillance, but less during crisis situations.

However, the results of question 5 show that, during crisis situations, there is a real need for sensor systems. The reasons why such systems are not so much in use are analysed in the question 4 and 6.

3) For the realization of your missions, would you be interested in connecting another sensor system with your system of information?

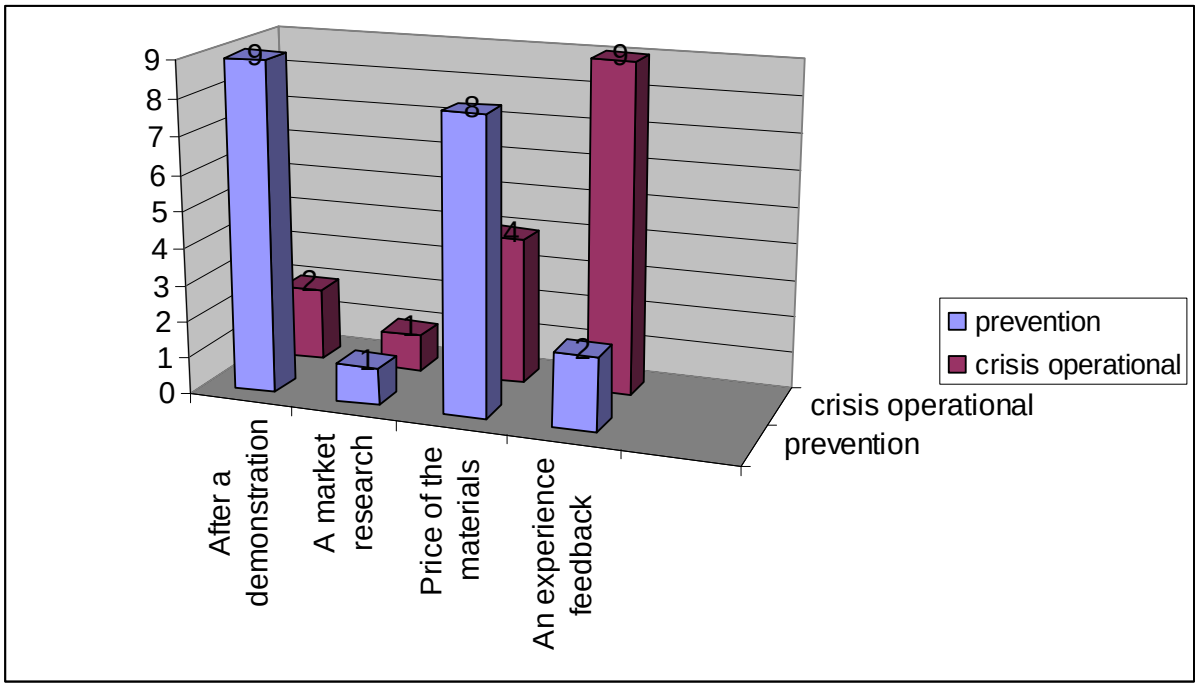
89% of the answers reflect a requirement for integration of multi-source data into a system. This shows a need for an OSIRIS solution.

4) Did it sometimes happened to you to give up the use of the sensor system ?

In which case did it happen?

The following cases were proposed, also distinguishing prevention and operation use:

- After a demonstration,
- For a market research (technological survey)
- Due to the price of the material
- A bad operational experimentation (experience feedback).



The answers globally show that:

- For prevention,
  - during a procurement process, some users have been disappointed by technical features of the systems and the associated prices.
  - Under operational use, the chosen systems are globally satisfactory.
- For the management of a crisis, the most important figures are those given for an operational use which is not satisfactory.

Thus, the dedicated systems seem to adequately satisfy the monitoring requirements for the domains of activities of the users, however they may not correspond to a global management of a crisis.

This shows the need for an OSIRIS solution.

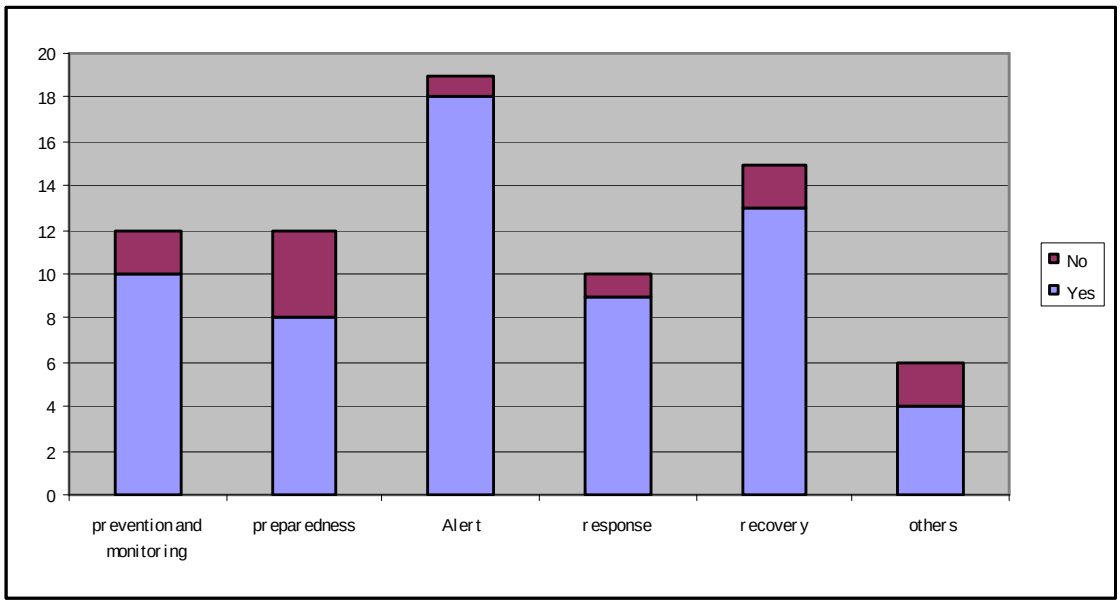
Details of the reasons for unsatisfactory experiences with sensor systems are given in question 6, below.

5) Which system of in-situ data acquisition do you think that it would be necessary to develop or to acquire by your entity for the realization of its missions?

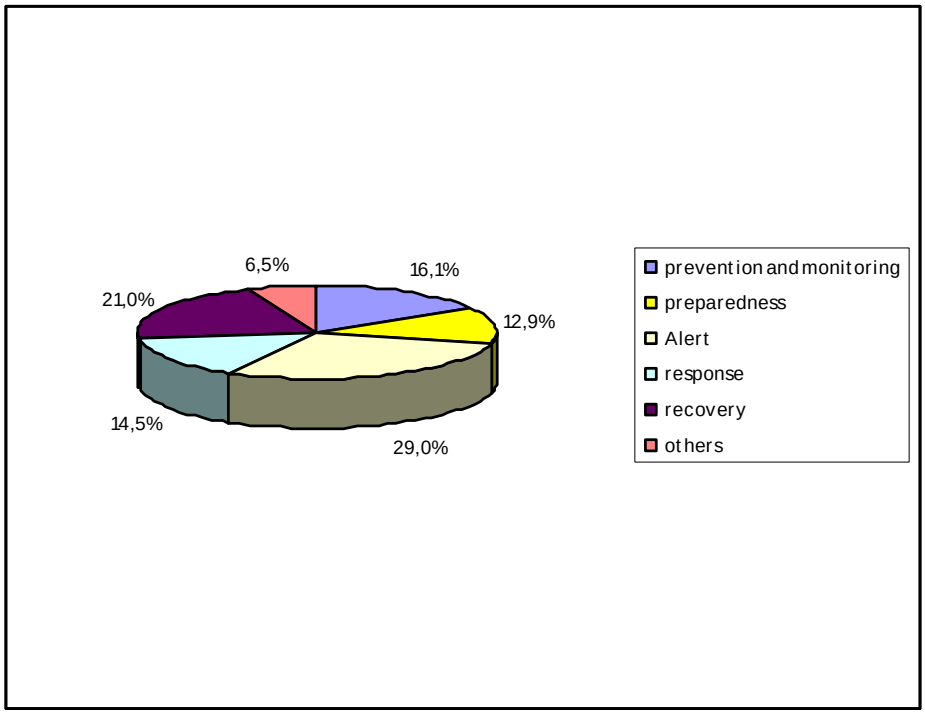
Users were asked to detail in which phase data acquisition would be necessary :

- Prevention and mitigation
- Preparedness
- Alert
- Response
- Recovery
- Others.

The majority point out a need of in-situ data acquisition for nearly all the phases (answers "yes" predominant), as shown below:



Once expressed as a percentage of the total answers, the most important phases of interest are shown in the diagram below:



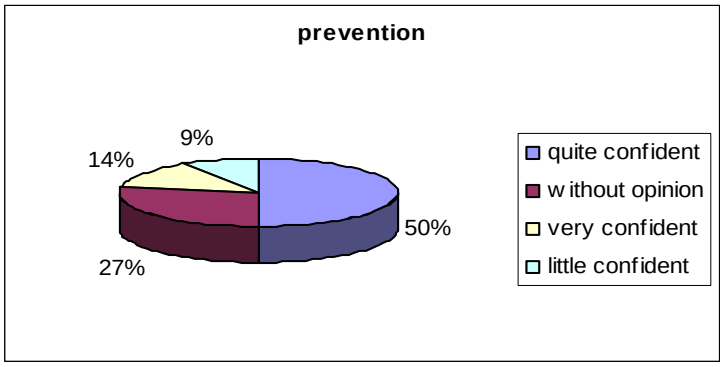
These answers consolidate the necessity of having systems for alert.

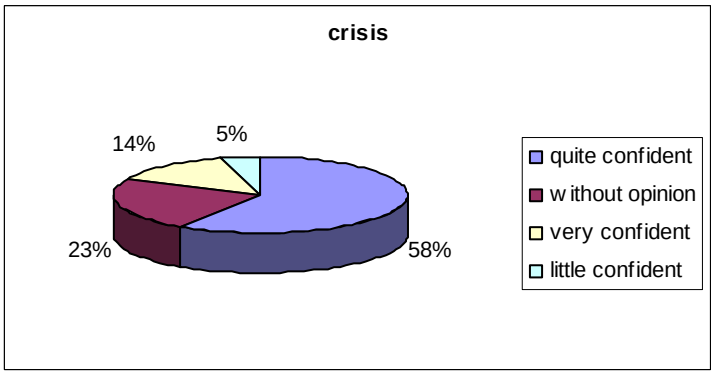
In addition to these answers, the following extra details have been provided, however they are broad and cannot easily be grouped except for one main requirement about **the necessity of accessing a large quantity of information through a GIS and easy accessibility (Web). This reflects a need for an OSIRIS solution.**

The other areas which are considered important by users are::

- GPS positioning of the fire-fighters for the forest fire scenario
- Optical Imagery resolution 1m (NRBC), typical areas from 100x100 meters up to few square km² and Thermal imagery
- For Air pollution, localisation in a town, street by street.
- Follow-up monitoring and alarms for NRBC and pollution (ground, water, air)
- For Water management, basic GIS application presenting parameters of composites pollutants, % of salt, content of hydrocarbon. Prediction parameters for the levels of water
- Forecasting the evolution of a scenario

6) Which degree of confidence do you have in the sensors systems which are known by you?





The results show that the users have a good level of confidence in the information provided by the existing systems. Comparing these results with those of the question 4, it appears that even if the data is of good quality (good degree of confidence), the operational systems do not comply with the users' needs in the crisis phase. This may be due to a lack of cooperating sensors in crisis, insufficient processing (fusion, correlation), access and presentation services. **This reflects a need for an OSIRIS solution.**

Explanations have also been provided about the degree of confidence, they are grouped by domains.

The bullets of the list have the following meaning:

- Very satisfactory/satisfactory: ++
- Rather satisfactory: +
- Little satisfactory: -

Global items:

-	Interoperability between sensors and system should be improved (cost reduction and global data availability). **This is a need for an OSIRIS solution.**
-	Data quality and sufficient for international reporting
+	Good network for NRBC
-	Improvement of forecast (meteo, water, imagery, simulator, monitoring,..)

Fire & rescue services

+	Forest Fire: quite good meteo and GIS maps for the potential risk (analysis of the vegetation, the dryness)
-	**Forest Fire: Improvement by better links with the local meteo. This is a need for an OSIRIS solution.**
-	Problems with false alarm (smoke detection).
-	Forest Fire: Improvement by vehicles positioning- GIS. **This is a need for an OSIRIS solution (coupling of data with GIS)**
-	Forest fire: system I/R video camera and geo referenced image coupled with GIS. **This is a need for an OSIRIS solution (coupling of data with GIS)**
+	For gas detection
-	Temperature: useful but improve the range to greater than 400 degree Celsius
-	Toxicity: little because you need to know what to measure
-	Inflammability: % of limit of inflamability (LIE – LSE)
+	Radiation: rather necessary to have a set of tools to been trained to
+	Meteo: rather because limited by the local place
+	GPS position for Police cars, try to have at most 10 seconds update intervals (30 seconds now)
- -	Poor resolution of satellite images Bad stability of helicopter for video

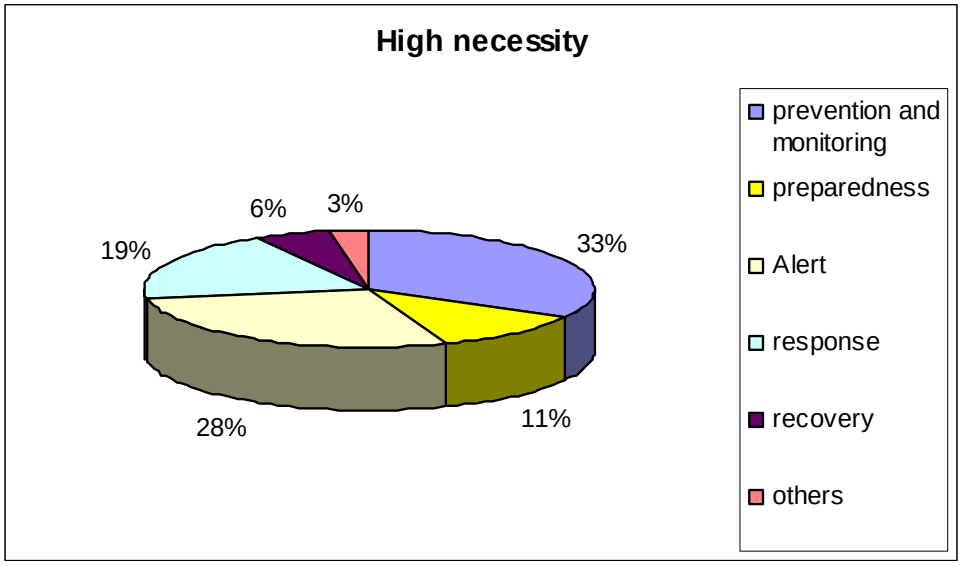
Water management:

-	Poor robustness of sensors for water (acid water and alga)

Air pollution:

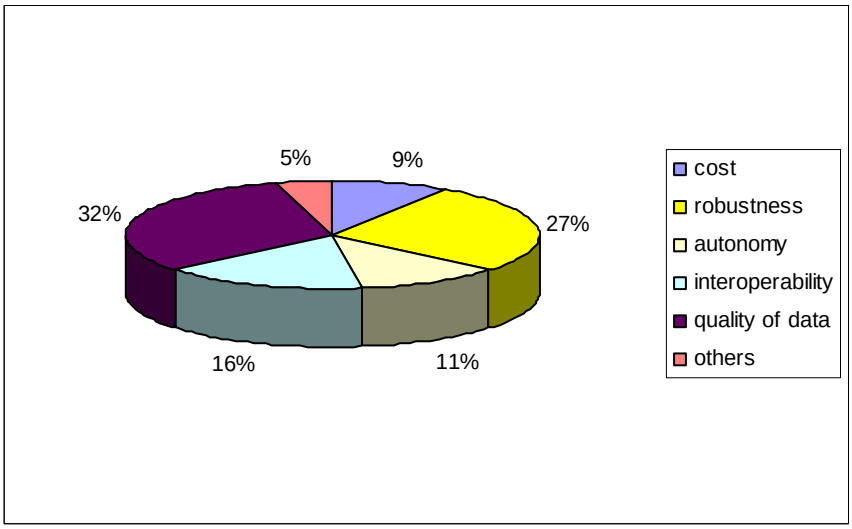
-	For the air department enhance detection capability (from PM10 to PM1 particles matters)

7) Please rank the necessity of using such a system in the different phases



These answers consolidate the ones of the previous questions, and emphasise the necessity of having systems for prevention and alert.

8) Please evaluate your criteria of choice of a sensor system?



Ranking the answer by decreasing order of importance, one can observe that:

- Quality of data and robustness of the system or sensors, considered to be significantly more important compared to all others choices.
- Autonomy and interoperability of the system or the sensors are also considered being important
- Cost has the lowest priority requirement.

The two first items show a need for an OSIRIS solution: the quality of data can principally be obtained by reliable sensors but also by correlation and data fusion between multiple sources of data. Autonomy and robustness within an operational theatre can also be provided by the substitution of a sensor by another one in the system. Interoperability and treatment of the data (fusion/correlation) at a system level are other major key aspects addressed by OSIRIS.

9) Which test scenario can you imagine to evaluate your requirements?

The test scenarios imagined are representative of the constitution of the consortium.
The main types of scenarios are:

- Forest fire (crisis and monitoring)
- Water management (flood, pollution)
- Air pollution.

Additional information on other scenarios of interest to them was also provided by those interviewed, as follows :

- Simulation of an operation in a Mediterranean forest
- Flood situation: information coming from all the sensors of a region could be collected, and analysed. The water level, rate of flow, rain intensity, meteo forecast…are parameters of the analysis.
- Case of water pollution (industrial accidents): pollution level all along the river, forecast
- Air, Water, Inundation, TMD, Pollution atmospheric
- Major incident (fire, explosion,…) followed by a massive evacuation
- Gathering ~100.000 people at a place not dedicated to that (e.g. music festival)
- Air pollution detection, using micro UAV which could be used for NRBC detection
- Image or video taking, using UAV or which could be used for damage assessment
- In situ dropped Wireless Sensors which could be used for NRBC measurement after a disaster for evaluation of the disaster area progress.

Those scenarios imagined by the users interviewed will be useful for improving the definition of the validation scenarios (Delivery D2400), providing information on realistic operational scenarios.

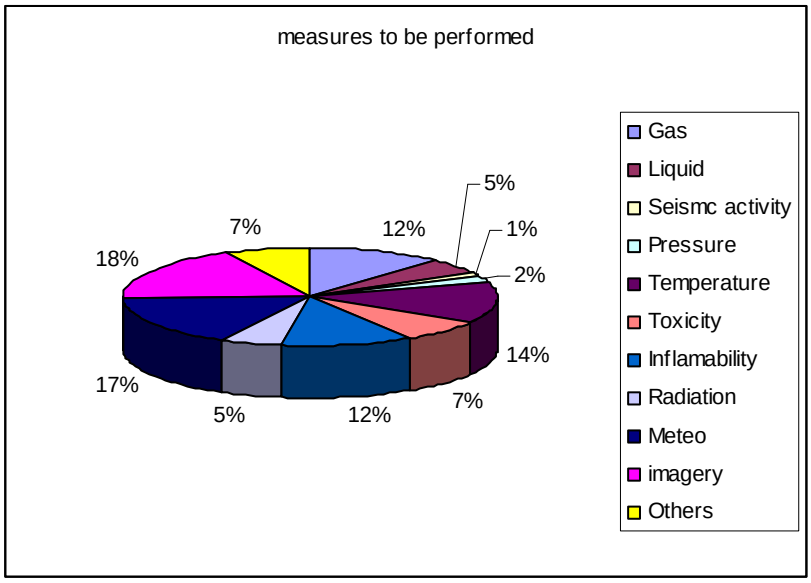
10) Technical Requirements

This question permits collection of information on the different type of sensors already used, or foreseen to be used.

The most important answers cover:

Meteo – imagery - temperature –toxicity –gas – liquid

The 3 first parameters (meteorology, imagery and temperature) cover almost the half of the request (49 %).



The diversity of the answers is representative of the diversity in the type of information that the users need. From basic data (temperature) to complex images, needing processing, forecasting, models, the diversity is the source of the in-situ data collection problem. By defining common types of data, the diversity may be reduced at user level, but will still exist. The questions behind that diversity are: how could a user retrieve one kind of data in this diversity, how to present the information in a generic way ? **This is a need for an OSIRIS solution.**

11) In situ data acquisition and technology requirement

The following questions were asked during the interviews:

- Are there specific local regulations to satisfy concerning the confidentiality of the information?
- What is the frequency of use? *(precise H24 7/7, daily , weekly, monthly, working hours)*
- Where will be the end-users authorised to use the sensors information (field, decision center) ?
- Are there possibilities of interference with other activities ? *(please explain)*
- Today, how is the activity achieved concerning the feedback information from the field? *(please explain)*
- Is there an environmental constraint to use the system ?
- Does the user want to interconnect the all sensor network to a telecommunication network for the decision? *(please explain)*
- What will be the nature of the in-situ data acquisition system exchange ? (phone exchange, video conferencing, please describe also medical documents types : text files, video, procedure, remote sensing data, web pages, etc)
- What are the technical local support available to regularly maintain, test and verify the in-situ data acquisition system (operability) ?
- What is the hotline system available for an end-user? In which delay ?

The answers provided by the users give guidance either on existing models or on the architecture to be envisaged in the design of systems (architecture of capture and transmission of information).

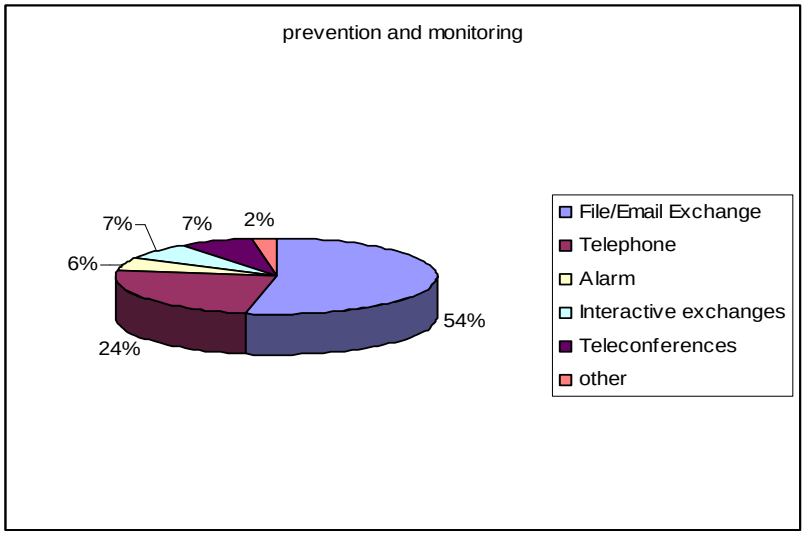
In particular, they identified the following main requirements:

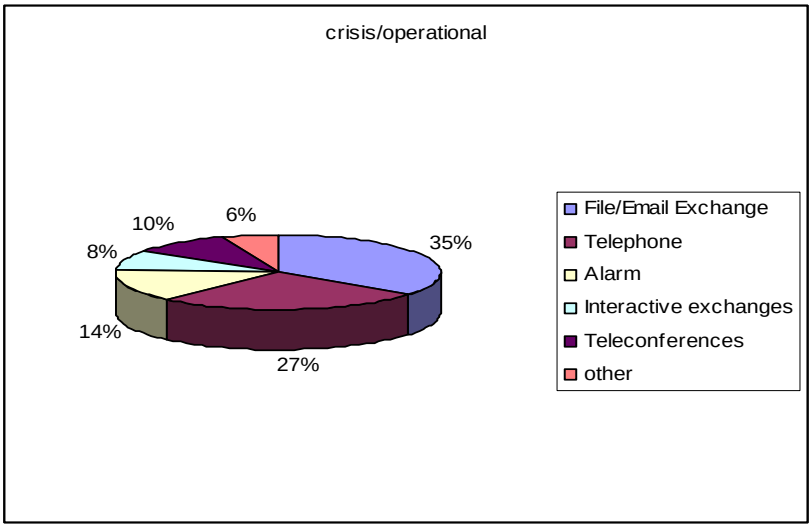
- permanent Monitoring (H/24)
- information must be provided to the Decision Centre after data validation
- relevant information must be provided to the citizen
- data can be available at an operational centre level, which can be a mobile vehicle or a building
- Access to the data through: Telecom (IP phone, telephone, GSM, radio, SMS), Web, GIS servers, video servers,

- Sensors packaging : according to the environment of deployment, and conditions of use (specific equipment for human, for vehicles), packaging may be adapted.
- According to the environment of use of the end user applications, human interfaces (Man Machine Interfaces) may be adapted (due to gloves, helmets, insufficient lighting, etc)

12) Technical requirements for OSIRIS communication link

In this question, users were asked if they had some requirements on the communication links that should be used in a prevention/monitoring system, and in a crisis/operational system.





Traditionally the methods used to communicate are phone, mail, files. In crisis systems, direct links are available to certain privileged users.

The additional comments provided by the users show that the trend is to have interactive alarms (on screen, on phone, on GIS) and mobile means of communications. Web access in a Control Centre was highlighted as a favoured option.

4.5 ADDITIONAL ASPECTS OF INTEREST

The users (including those involved in OSIRIS) interviewed have shown a significant interest in a system like OSIRIS.

They have suggested the use of the OSIRIS system in a lot of different configurations.

In particular they identified :

- a lot of different types of sensors that could be plugged into the system
- different operational use
- a need for increasing the forecast activity, in particular by coupling it to real data coming from in-situ sensors
- additional GMES activities that could benefit from this type of system

The following chapters lists those suggestions.

4.5.1 FORECAST AND SIMULATION

- Modelling process to predict the potential propagation routes of seismic waves (propagation, waves directions, amplitude, forces)
- Modelling process to predict potential courses of moving material during a landslide (stones, earth, mud, aggregate…)
- Modelling process of blast effect propagation (propagation corridor, damages caused –total or partial)
- Elaboration of possible hazard maps 1/ 25 000 (actual reference scale).
- Elaboration of possible hazard maps 1/ 10 000 (actual reference scale).
- Appraisal of the damage likely to be caused to public premises (schools, hospitals….)
- Appraisal of the damage likely to be caused to public infrastructures (roads, bridges, tunnels, railways, telecommunication network, electricity network)
- Appraisal of the damage likely to be caused to private premises (homes, factories, commercial establishment, high risks establishment, SEVESO…)
- Appraisal of the damage likely to be caused to private infrastructures (electrical supplying, incinerators, …)

4.5.2 OPERATIONAL USES

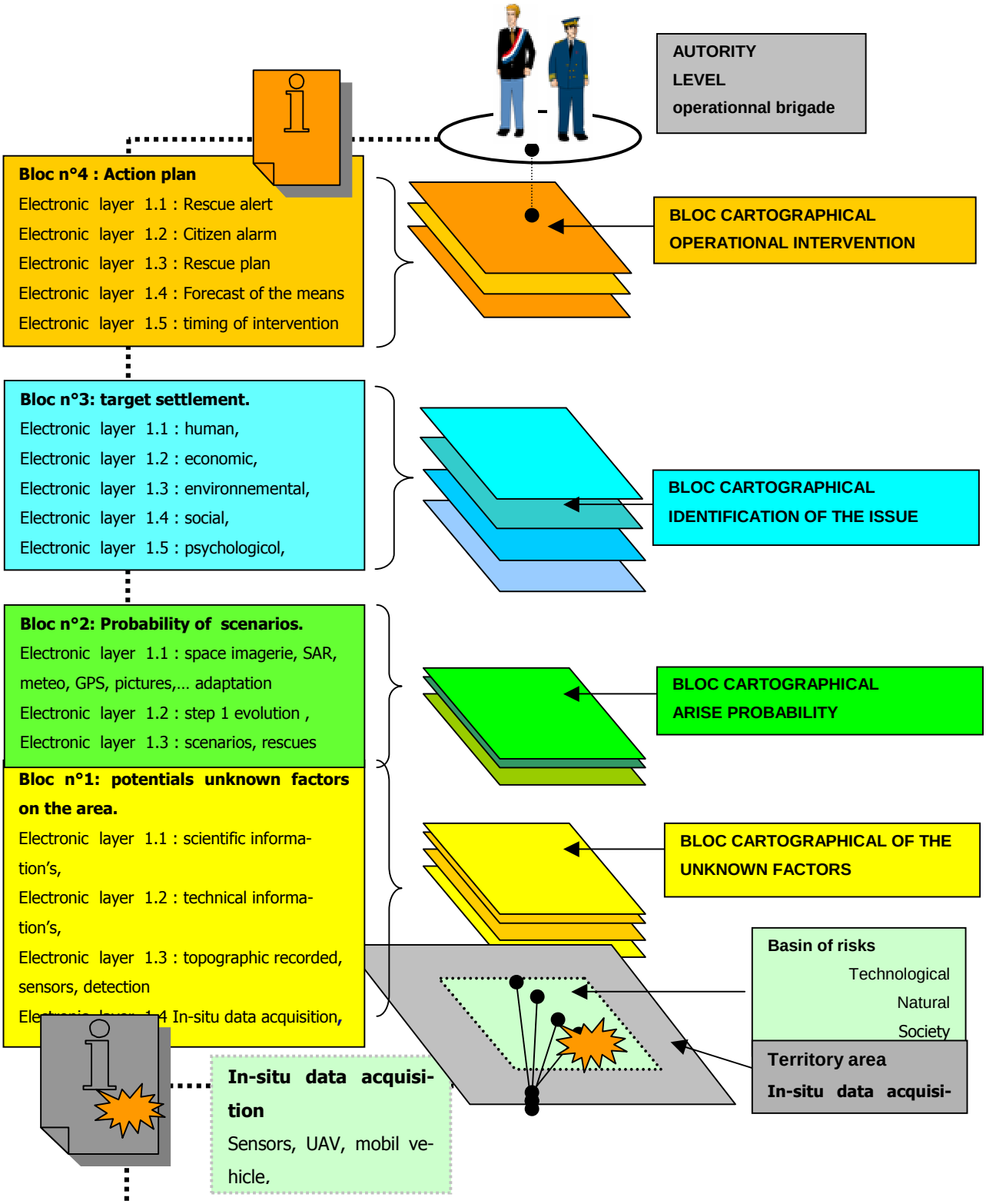
- Evaluation of new potential areas of intervention (delimitation of the concerned areas, high risk areas, taking into account of the new risk cover…)
- Geographical information system, inter-services
- Update local definition of the maps, example: identifying seismic and landslide risk coupling
- Interaction in the decision chain as regards to the risk (prevention, forecast, planning, risk management)
- Operational inter service exercises on the theme of the foreseeable result studied in the scope of Earthquake and Landslide coupling (file study phase, operations planning, link between crisis management and scientists, transmission of information aspects…)
- Naturals hazards direct and indirect effects
- Real seismic data network and pre seismic analysis coupling
- Identify Seismic hazard areas and evaluate the *occurrence* level (mapping of seismic areas and secondary landslide areas)
- Procedure of scientific validation for each thematic and problematic
- Information linkage with the State services.
- Foreseeable risk information dispatching, in a decision making help form (steps: prevision, forecast, planning, operational management…)
- Permanence of the telecommunication network (phone, secured satellite transmission, GPRS, Wifi, etc…)
- Scientific Information transmission on reusable and certified electronic interface.
- Use and integration of data coming from spatial acquisition (earth observation, interferometers, INSAR,…)
- elaboration of inter operable and matching standards between services (for instance: scanner scale 1/25 000 of IGN).
- Number of occurrences of a phenomenon in an area, and data in relation that could help in similar cases
- Evaluation of multi risk scenarios by superposition of maps.
- Give in-situ data acquisition, in a decision making help form, in an electronic format, adaptable to the different administration and territorial communities)

- Elaboration of scientific contents in a profitable form (add studies in the legal and administrative measures).Transmission of relevant information in relation to the target service (service proposal: request, study, validation, answer, integrating in-situ data acquisition)

4.5.3 PREVENTION

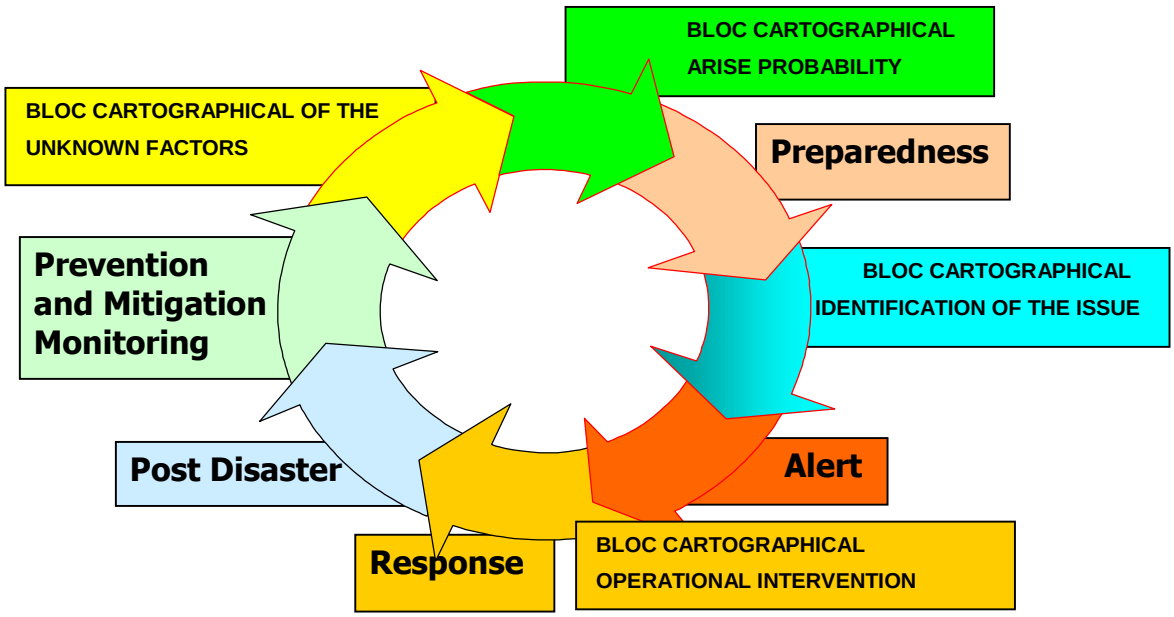
- Simulation of the possible operational scenarios
- elaboration and standardization of the information messages delivered through the media
- elaboration of message with an awareness signification
- reinforcement of the support with play activities aspects adapted to the citizens languages
- awareness information campaign (medias).

4.5.4 PRESENTATION OF THE DATA USING A GEOGRAPHIC INFORMATION SYSTEM (GIS)



The previous diagram is a proposal for presenting the data (coming from in situ data acquisition) to the users, at different levels of interest.
It is based on the possibility of integrating a set of specific layers , in a user information system, benefiting from actual GIS capabilities.

The layers shown above could also be presented on the GMES cycle, according to their interest:



5. SUMMARY AND CONCLUSIONS

5.1 SUMMARY AND CONCLUSIONS

The analysis realized in this document has been based on a set of 22 questionnaires, filled by the users who have been interviewed by the OSIRIS partners (including the users involved in the project).

The questionnaires are split in two parts:

- The main part was addressed to all the users interviewed, and is the subject of the analysis performed in this document
- The second part was optional, and brings technical information useful for the definition of the four experimental demonstrations. These inputs are thus exploited in WP 2400, which defines the validation scenarios.

The main aspects of the analysis of the requirements are summarised below:

- The users are from public and para-public origin, and would like to have some feedback about the OSIRIS results.
- They cover different environmental thematic (Fire and Rescue services, Water and Air Quality, NRBC monitoring).
- They already own or know about sensors systems, mainly for prevention and monitoring, and thus have a good expertise on sensors or sensors systems.
- Even given that the questionnaires were really biased towards the use of sensors or systems of sensors, the analysis of the answers still showed that **a real need for an OSIRIS solution exists (which was repeated several times and for different questions).**

The main expressed needs for OSIRIS are:

- For *multiple sources* combined at *decision centres level,* and at *local level, during crisis phases*.
- For integration into a user's information system of *multi sourced data*.
- For *global management of a crisis* through an integrated system providing the right level of data fusion.

- The main criteria of choice of a sensor system are: the *quality of data* that can be obtained principally by reliable sensors but also by correlation and data fusion between multiple sources of data, *autonomy and robustness of the sensors* that can also be provided by the substitution of a sensor by another one in the system. *Interoperability* is one of the major key aspects addressed by OSIRIS.
- The necessity of accessing *large quantity of information* through a *GIS* and in an easily accessible way (like *Web*).
- For providing geo referenced *image* and *video* coupled with GIS.
- For coupling the sensors data with *meteorological* information.
- For improving command and control efficiency by *vehicles/rescue teams positioning* coupled with GIS.
- For improving the forecasts, by involving real in-situ data in these activities

This document is only a first step in the capture of the requirements. End users could be asked for more details, if needed when realizing the WP 2200 (System Requirements) and the WP 2400 (Scenario definition).

5.2 LESSONS IDENTIFIED

This WP started the project and initialised the technical activities. It had thus to initialise the work in the Consortium learning to work together.

The project started on 1st September (the Contract was received on 15th September) and the kick-off meeting, initialising all activities, and in particular those of WP2100 was on 17th and 18th September. More time would have been necessary to interview a larger set of users, and to improve their accuracy with complementary information or refine some of them. However, the dedicated time already allowed to initialise as much as possible this process.

Using questionnaires in order to interview users is a good idea:

- It provides a common framework helping in interviewing the users.
- The synthesis of the completed questionnaires is thus simplified.

Its use showed that:

- There is also a necessity to have a state of the art of what the users have presently in order to be able to identify better their need. The question “what do you use currently” and

the information “what we can provide you in the future” can help in defining “what users need”. This is the approach which partners tried to use at the maximum.

- It is not possible to send questionnaires to a lot of users, but to interview personally each user, explaining the objectives of OSIRIS and of the questionnaires, and note the results. That means that a limited set of users can be interviewed, in this tight time schedule.
- Having a generic questionnaire allows the identification of a global picture of users requirements, but does not allow greater detail of specific technical issues to be explored .

The discussions around the production of this document finally showed the difficulty in focusing in the main objective of the OSIRIS project and not on the technological parameters provided by the sensors.

6. ANNEX: QUESTIONNAIRES

6.1 QUESTIONNAIRE 1

1. QUESTIONNAIRE EXPLANATION:

This questionnaire (also called questionnaire 1) aims at having a better knowledge of the activities of the different entities involved in the OSIRIS Project and the solutions these entities can mobilise within the Project.

It is sent to all OSIRIS partners who will fill it.

At the end of this questionnaire 1, a list of end-users can be filled. The Questionnaire 2 intended to help the capture of end-users requirements will be used for each identified end-user of this list.

2. GENERAL INFORMATION

2.1. CONTACT DETAILS

Your institution	
Denomination :	
Acronym:	
Nature of its activities :	
Address :	
Website :	

Project Contact person

Name	
Title :	
Tel. :	
GSM:	
Fax :	
E-mail :	

Project Technical Manager	
Name	
Surname	
Tel. :	
GSM :	
Fax :	
E-mail :	

2.2. MISSION OF YOUR ORGANIZATION

Please describe generally your missions, and your category of activities (Research laboratory, industry, etc.)

Please indicate the involved missions of your organisation, and the category to which your institution belongs:

Other Remarks:

3 STRUCTURE OF YOUR ORGANISATION

3.1. DESCRIPTION OF THE STRUCTURE

Please describe how your organisation is structured (overview) :

Please describe your specific activities in the OSIRIS program (sensors, connecting network, architectures, etc....)

What is, in your opinion, an intelligent sensor?(for example, behaviour, communications, etc.)

Which sensors could you use within the OSIRIS project?

Did you already work in a similar project (yes or no, which one ?)
Do you have conclusions of existing reports including end-user requirements and related to OSIRIS? Please specify which project.

3.2. IN YOUR OPINION, WHERE THE SENSORS AND EARLY NETWORK OF DETECTION COULD BE USEFUL?

Sensors	Localisation	Quantity	Short description of the type	Interest for OSIRIS

Other Remarks: (add in particular, if it is not a direct access to sensors, but to control & command)

3.3. WHERE ARE YOUR SENSORS ALREADY DEPLOYED? PLEASE FOCUS ON THE 3 THEMATICS ALREADY IDENTIFIED FOR OSIRIS.

Current territory covered by the services and volume of use			
*Please specify **country / states or Province/ Town***	***Number of equipped sites***	***number of use /year***	
		in-situ data acquisition	***Sensors network***

3.4. SHORT-TERM VISION

If a short term (T0+30) deployment is already envisaged, please describe it here.

SITES		**SERVICES** **Please specify the nature of the services/activities**	
Sites to be deployed		*Anticipated Volume of use*	*Existing activities and facilities*
Town	*Country*		

Other Remarks:

4.IN-SITU DATA ACQUISITION

4.1. MAIN EXISTING OF THE IN-SITU DATA ACQUISITION SYSTEM ACTIVITIES, FACILITIES AND RESOURCES

Does your institution already benefit from in-situ data acquisition system resources and facilities to support its activities?

Please describe **the service and frequency of use** (H 24 7/7/day/ week /month/…)

Please describe the nature of exchanged data?

Please describe the **nature of the data used for your in-situ data acquisition activities** (nature: files, still images/ data/volume / theme/pressure/ temperature…)

Do you wish to interconnect your network system to an existing network system?

If yes, please specify :

- Connectivity: if you have any technical constraints, please specify them (the tables below are an example).

Internet connectivity	**Bandwidth**	**Monthly charges**
Dial-up		
UMTS		
GPRS		
ISDN		
Leased-line		
xDSL		
WIMAX		
Satellite		
Other (please detail)		

- Resources :

Resources	**Type/number/list**

Servers	
Computers	
Used software	
autres	

*Please specify if there are any **time constraints** to perform a data acquisition (minutes, hours, days, etc.)*
*Please specify if there are any **environmental constraints** in the deployment of the in-situ data acquisition system (temperature, no power line / tropical climate/ weather forecast…..)*
*Please specify if there are any specific **regulatory constraints or necessary procedure** related to the **confidentiality**? (of the data, of the system).*
Please describe the targets (customers addressed) for the information coming from the in-situ data acquisitions systems (elected members, authorities, operational center, public, citizen...)

4.2. FORESEEN APPLICATIONS AND SERVICES OF INTEREST REGARDING YOUR ORGANISATION CONCERNING THE IN-SITU DATA ACQUISITION SYSTEM ACTIVITY:

Please select the operational applications of interest for your activities			
1			
2			
3			
4			
5			
6			
…			

5. LIST OF THE END-USERS IDENTIFIED BY YOUR ENTITY

Please here hereafter the users identified by your organisation, to whom the Questionnaire 2 will be applicable.

Organisation	
Acronym	
Status	
Address	
Tel / FAX / Email	
Competences	

Organism	
Acronym	
Status	
Adress	
Tel / FAX / Email	
Competences	

6.2 QUESTIONNAIRE 2

1). Questionnaire explanation

This questionnaire (also called Questionnaire 2) is intended to help the capture of the users requirements. It is sent to all OSIRIS partners, and will be filled by:

- The Users already participating to the OSIRIS project
- Others potential users identified by the OSIRIS partners (belonging to the list established at the end of Questionnaire 1). In this case, and in order to collect information of quality, it is recommended to interview 2-3 end users, well accompanying the interview, rather than to broadcast the questionnaire to a lot of end users, without any explanations.

2) End-user interviewed

Organisation	
Acronym	
Status	
Address	
Tel / FAX / Email	
Competences	

Which is your category (the nature of your activities) ?

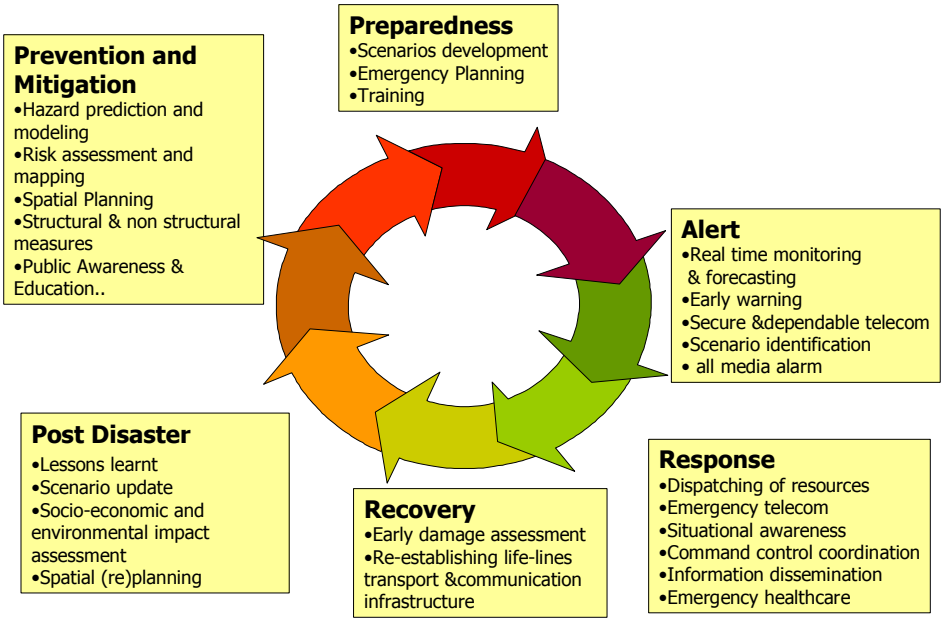
3) Lists of the end-users entities auditioned in the end-user organisation

Organism	
Acronym	
Status	
Role/Function of the person interviewed	
Expectations from OSIRIS Project	
Expectations (but outside of the OSIRIS Project scope)	
What do you use to-day (in situ data acquisition)?	
Which knowledge do you have about in situ data acquisition?	
Any other information	

4) Do you know the existence of sensors system ?

	Prevention and Mitigation	Preparedness	Alert	Response	Recovery	Other (Post Disaster, …)
YES						
NO						
Comments						

The following figure is provided to help in filling this table:



5) Do you use sensors systems ?

YES	
NO	

If yes, what is the frequency of use?

	Daily	Regularly	Occasionally (for tests or studies)	Exceptionally (only in case of crisis for instance)	Without opinion
Prevention					
Crisis/ Operational					

If yes, which satisfaction degree can you give?

	Very satisfy-ing	Rather	Little	At all	Without opinion
Prevention					
Crisis / Op-erational					

6) For the realization of your missions, would you be interested in connecting another sensor system with your system of information ?

YES	
NO	

For the realization of your missions, would you be interested in connecting a system of information with your sensor system (if you have already a sensor system)?

YES	
NO	

7)Did it sometimes happened to you to give up the use of the sensor system?

	After a demonstration	A market research	Price of the materials	An experience feedback	Other
Prevention					
Crisis / Operational					

Why, when and for which reasons?

8) Which system of in-situ data acquisition do you think that it would be necessary to develop or to acquire by your entity for the realization of its missions?

	Prevention and Monitoring	Preparedness	Alert	Response	Recovery	Other (Post Disaster, …)
YES						
NO						
Comments						

Specify and quantify what are your expected technical results

Example: images, dimensions, GIS, technical standard....

9) Your participation to the program OSIRIS could be?

	Main objective	Secondary
To reinforce existing expertise and capacities To Connect with OSIRIS partners		
To participate to the development of new applications		
To know about new tools		
Other		

	YES	NO

Do you wish to be informed about the work?		
Do you wish to observe the practical demonstration ?		

10) Which degree of confidence do you have in the sensors systems which are known by you?

Add a comment if necessary to specify what is confidence for you: relevance of information, availability of the system., etc.

	Very satisfy-ing	Rather	Little	At all	Without opinion
Prevention					
Crisis / Op-erational					

11) Please rank the necessity of using such a system in the different phases

Level of importance: 1 high, 2 medium, 3 low

	Prevention and Miti-gation	Preparedness	Alert	Response	Recovery	Other (Post Disaster, …)
YES						
NO						
Comments						

12) Please evaluate your criteria of choice of a sensor system?

	Cost	Robustness	Autonomy	Interoperability	Quality of data	Other
Ranking						

Level of importance: 1 high, 2 medium, 3 low

13) Which test scenario can you imagine to evaluate your requirements?

14) Technical Requirements

Which services are you interested in? Please indicate the one(s) you have/wish to have.

Speciality	**Comment**	**Technology Required**									
		Gas	**Liquid**	**seismic activity**	**Pressure**	**Temperature (water, air,**	**Toxicity**	**Inflamability**	**Radiation**	**meteo**	**other**

In situ Sensors											

Imageries	
other	

15) In situ data acquisition and technology requirement

User Applications Requirements for OSIRIS network:

Example of additional questions	**Answers**
Are there specific local regulations to satisfy concerning the confidentiality of the information?	
What is the frequency of use? *(precise H24 7/7, daily , weekly, monthly, working hours, ……)*	
Where will be the end-users authorised to use the sensors information (field, decision center,...) ?	
Are there possibilities of interference with other activities ? *(please explain)*	
Today, how is the activity achieved con-	

cerning the feedback information from the field ? *(please explain)*	
Is there an environmental constraint to use the system?	
Does the user want to interconnect the all sensor network to a telecommunication network for the decision? *(please explain)*	
What will be the nature of the in-situ data acquisition system exchange ? *(phone exchange, video conferencing, please describe also medical documents types : text files, video, procedure, telemo-nitoring data, web pages, etc….)*	
What are the technical local support available to regularly maintain, test and verify the in-situ data acquisition system (operability) ?	
What is the hotline system available for an end-user? In which delay ?	

16) Technical requirements for OSIRIS communication link

Example :

Separate existing means from requirements

Existing means Speciality	**files**	**Phone**	**Emails**	**alarm**	**Interactive image with image processing**	**Telecom transmission speed**	**Other**

Prevention & Mitigation							
Preparedness							
Alert							
Response							
Recovery							
Post disaster							

Require-ments **Speciality**	**files**	**Phone**	**Emails**	**alarm**	**Interactive image with image processing**	**Telecom transmission speed**	**Other**
Prevention & Mitigation							
Preparedness							
Alert							
Response							
Recovery							

Post disaster							
Prevention							
Forecast							
Crisis man-agement							

17) Additional questions – 1 – Forest Fires

The OSIRIS project aims to address several different scenarios, one of which is forest fires. One aspect of the demonstrator for this scenario is positioning of fire fighters in forest environments. The following list of questions aims to determine the principal user requirements for this:

1. What is the minimum positioning accuracy which fire fighters would consider to be useful? (for example: ±1m, ±5m, ±50m etc.)

2. What is the maximum number and 'typical distribution' of fire fighters likely to be involved in an operation at any point in time? Information which might help us to determine the 'typical distribution' includes for example:

· Typical team sizes
· How many teams involved in a typical operation?
· How long do fire fighters spend in the 'fire zone' before being relieved?
· What is the command structure

3. What is the expected maximum geographical spread of fire fighters at any stage of an operation?

4. What is the minimum coverage that such a system must provide to be considered useful by the fire fighters? (For example, would it still be useful if it only provided position data in 25, 50, 75 or 90% of the operational area?)

5. What is the likely distribution and maximum number of fire vehicles in an operation?

6. Is height important to the users, i.e. should we aim for 2D or 3D positioning? (2D would increase the coverage.)

7. How fast will fire fighters be moving - on average and maximum? (This relates to the position update rate that we should aim for.)

8. To gain the safety and tactical benefits of fire fighter positioning, would Users be prepared to spend 10 mins, 20 mins or 40mins setting up the system? Would they be prepared to dedicate a small team to this task?

9. The system proposed relies on fire fighters placing extra positioning units as they move into the operating area e.g hanging them from tree or dropping on ground. How acceptable is this (no significant setup effort would be required for the extra units and they are potentially small and light in any final system)

10. Would it be useful to provide an indication of the confidence that can be placed in each position provided by the system?

11. The system proposes that the position of each fire-fighter would be communicated back to a central point. The positions would then be displayed on a map. What sort of map would be best to use? (For example, we could use whatever the fire fighters currently use or we could use the French Topo 25 IGN series.)

12. Is there any need for the fire fighters to have any sort of display of their own and others' positions?

13. Would it be useful to provide an emergency 'button' to fire fighters? This would appear as an alarm on the central control display.

14. How useful would it be if the system also enabled data transmission for other sensors on a fire fighter? (For example, breathing apparatus status, temperature, other....)

15. How important is it to indicate any fire fighters who are outside of positioning/communications coverage to the fire fighters themselves and to the central control?

16. What other radio systems will be operating in the area? (If possible it would be useful to have the frequency, bandwidth and power of these systems.)

17. How useful would it be for the central control to be able to mark the map display with things like the fire boundary etc?

18. What is the minimum duration the system must be able to operate for to be acceptable (for demonstration and also in a final system)?

19. Can you estimate the cost for a system that would be acceptable to users?

20. How much training would users be prepared to undergo to maximise the efficiency of using the system?

21. Finally, have you any further ideas for how the position data could be useful to the Fire service?

18) Additional questions – 2 – Forest Fires

Information required from the end-users with respect to the use of remote sensing data for forest fires.

A) General questions:

1) Do you know what remote sensing is ? If not, remote sensing is the delivery of information (mostly images) acquired from an airborne (airplane, helicopters,..) of from a satellite platform.

2) Did you already uses remote sensing data for forest fires survey ?

If yes please indicate which kind of data.

If not, please indicate why.

3) Do you have the possibility to use remote sensing system operationally for forest fire management?

If yes, which kind of system (airplane, satellite images, helicopters, unmanned systems). Please specify also who is responsible for those systems.

4) Are there some constraints or technical limitations for using remote sensing data in your current system (e.g. low storage capacity -> possible saturation of the system) ?

5) Do you already uses GIS systems for the management of forest fires ?

If yes, please provide some typical examples.

If not, please indicate why.

6) In case of major forest fire, do you have competent people available for managing a GIS system ?

B) Technical questions with respect to the delivery of remote sensing information

Type of data requested :

Video imagery

Digital visual images

Thermal images

Synthetic Aperture Radar data

Other (please specify) ?

Optimal spatial resolution (size of one pixel projected on the ground surface):

30 cm

1-2 meters

5 meters

more than 10 meters

Other (please specify) ?

Spectral resolution desired:

Video

RGB

Multispectral (between 4 and 10 bands)

Hyperspectral (please indicate how much and which bands).

Other (please specify) ?

Typical area to be covered:

3 x 3 km²

10 x10 km²

50 x 50 km²

1 x 50 km²

Other (please specify) ?

Which kind of detail would you like to see:

Fire brigade truck

Road

Fire front

Burned areas

Buildings in the vicinity of the fire

Other (please specify) ?

Which kind of information would you like to receive:

Simple images of the area

Digital terrain maps of the area

Digital surface maps of the area (this includes forest, buildings,…)

Definition of the fire front

Spatial distribution of the temperature

Burned areas

Other (please specify) ?

Which kind of dynamic information have priority :

Movement of the fire brigades

Evolution of the fire front

Evolution of the temperature pattern

Other (please specify) ?

Temporal resolution (frequency of images of the studied area):

One image every minute

One image every 15 minutes

One image every hour

One image every 6 hour

One image every day

One image every week

Acceptable delay for the delivery of the images:

1 minute

10 minutes

30 minutes

1 hour

6 hours

1 day

more than 1 day

Other (please specify) ?

Level of processing of the data:

Just raw images on a screen

Images with possibility of zoom

Geo-referenced images

Images combined with other type of information (e.g. using GIS systems)

Other (please specify) ?

Period of acquisition:

Day only

Night only

Day and night

Other (please specify) ?

For which phase of the disaster would you like to obtain data:

Risk assessment

Prevention and emergency exercises

Real Forest fires

Recovery phase

Combination of phases (please comment)

Other (please specify) ?

Where should the information (processed data) be delivered:

On your mobile command center in the vicinity of the intervention place. If yes, which type of data communication will be available ?

On a fixed control station provided by the image supplier located at the vicinity of the intervention.

At the crisis center in charge of the management of the fire

At different places

Other (please specify)

Output data:

Please indicate in which preferred format you would like to receive the remote sensing information, if any.