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Next Generation Damage and Post-Crisis Needs Assessment Tool for Reconstruction and Recovery Planning Capability Project

Proceedings of the First Workshop

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ABBREVIATIONS AND ACRONYMS

Abbreviation	Description
BMUB	Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, Germany
DGSCGC	Ministry of the Interior/ France
DLR-ZKI	Center of Satellite Based Crisis Information (ZKI) at German Aerospace Center, Germany
DPC	Italian Department of Civil Protection, Italy
EC	European Commission
UN	United Nations
GEA	mother earth search and rescue, NGO, Turkey
GIES	General Inspectorate for Emergency Situations, Romania
GFZ	Research Center for Geoscience, Potsdam, Germany
GDACS	Global Disaster Alert and Coordination System
ITHACA	Association for Information Technology for Humanitarian Assistance, Cooperation and Action, Italy
MDA	Magen David Adom (Red Star of David), Israel
NGO	Non-governmental organisation
PDNA	Post Disaster Needs Assessment
PSP	The State Fire Service, Poland
SEEBA	Rapid Deployment Unit Search and Rescue, THW / Germany
UAV	Unmanned Aerial Vehicle
UN	United Nations
USAR	Urban Search and Rescue
WG	Working group

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GLOSSARY OF TERMS

Term	Definition		
Damage or Limit State	For a particular component, or the building as a whole, a range of damage conditions associated with unique consequences.		
Functional Requirement (FR)	An FR is a statement of an action or expectation of what the system will take or do. It is measured by concrete means like data values, decision making logic and algorithms.		
Nonfunctional Requirement (NFR)	An NR is a low-level requirement that focuses on the specific characteristics that must be addressed in order to be acceptable as an end product. NRs have a focus on messaging, security, and system interaction.		
Nonstructural Components	In this work these are components that are a permanent part of the building and are not part of the structural system.		
Scenario	A scenario is a sequence of steps taken to complete a user requirement, similar to a use case.		
Structural Components	Building components that are part of the intended gravity, seismic, blast/impact or fire forces resisting system, or that provide measurable resistance to these forces.		
User Requirement (UR)	A UR is a statement of what users need to accomplish. It is a mid-level requirement describing specific operations for a user (e.g., a business user, system administrator, or the system itself). They are usually written in the user's language and define what the user expects from the end product.		

Public

EXECUTIVE SUMMARY

The 1st "END-USER WORKSHOP ON RECONASS SYSTEM USER REQUIREMENTS", took place in Berlin, Germany, 24th & 25th of March 2014.

The workshop aimed at defining how potential End-users proceed with damage and needs assessment and at evaluating the preliminary requirements emerged from the "RECONASS end-user requirements questionnaire" which is included in the first deliverable [1]. The central objective was to obtain as much input as possible from potential End-users. The requirements correspond to two main categories, functional and non-functional, thus assisting the process of producing a solid basis for the RECONASS system development.

An internationally diverse group of major End-users has been set up during the first months of the project. Six different user groups have been identified which will be presented in section 1.2. Two RECONASS flyers have been produced, in order to attract and inform potential End-users. The original scope of the workshop in terms of the attending End-users was to invite at least two representatives for each "End-user group category". Within the workshop, End-users were divided into two mixed groups in order to discuss, evaluate and consolidate the preliminary requirements. The results are documented within the workshop minutes and three power point presentations. The outcomes' presentations are included as Annexes, while the minutes are summarised in Chapter 3.

At first sight, although the two groups covered different scenarios, and although each group presented some specific findings, the main outcome is characterised by a significant level of congruity, mainly due to the fact that End-users wish to receive the data and the information in a simple and robust way, easy to handle and the RECONASS system should be open for a broader detection of e.g. hazards (gas, etc.), temperatures (fires, etc.), flooding, and allow interoperability with other monitoring systems as well. Furthermore, one could already detect at this stage that some general outcomes of both working groups confirm the findings of the RECONASS end-user requirement questionnaire, e.g. the importance of a monitoring and alarm function of the RECONASS system.

INTRODUCTION

The proceedings of the 1st RECONASS End-User Workshop are closely related with the deliverable D1.1, which is on the description of current assessment methods and the extraction of preliminary user requirements for the RECONASS system. Therefore, the "storyboard", namely content structure, working group templates, etc., of the workshop was fundamentally based on the outcomes of the RECONASS end-user requirements' questionnaire [2]. The end-user requirements are crucial for the corresponding design of the technical requirements, which are the basis for the proper and accurate design of the RECONASS system. As such, the outcome of the 1st end-user workshop will be, again, the data basis for the final RECONASS end-user requirements which will be produced in the scope of D1.3. The 1st RECONASS End-User Workshop aimed at defining how potential End-users proceed with damage and needs assessment, and at evaluating the preliminary requirements that emerged from the questionnaire [2]. Effort has been made to bring major End-users with different professional background as well as the RECONASS project partners together, in order to develop a common understanding of the functioning and objectives of the RECONASS system.

This document uses the following inputs:

- 1. D1.1 State of the Art of Assessment Tools and preliminary user requirements
- 2. RECONASS end-user requirements Questionnaire

1 INNOVATION AND CONTRIBUTIONS TO RECONASS

1.1 Objectives

The 1st RECONASS End-User Workshop aimed at defining how potential End-users proceed with damage and needs assessment and at evaluating the preliminary requirements that emerged from the "RECONASS end-user requirements questionnaire" [1]. The objective was to trigger the End-users through active discussions and detailed description of the envisaged RECONASS system focused on the different cognitive domains and fields of operation, from which the end users are originating. A primary goal has been to involve the end users as much as possible in the functional and non-functional attributes along the actual operational chain of the RECONASS system, from design to implementation and operation.

1.2 Methodology

The Workshop was planned in such a way that the outputs would be tangible and visible. Therefore, a methodology was designed to ensure a smoothly running Workshop, minimising the occurrence of delays or input that is considered to be out of the scope, and thus obtaining the desired input or information from the end users as accurately and efficiently as possible.

The Methodology that is presented in the following sections includes the topics below:

- Setting up a RECONASS end-user group
- The conceptual design and the proceedings of the RECONASS workshop
- RECONASS procedure of the working groups

1.2.1 Setting up the RECONASS End-User Group

The main challenge had to do with the heterogeneous composition that the description of work of the RECONASS project is introducing. This is highly desirable, since the requirements to be retrieved will be reflecting different needs coming from different fields of operation or cognitive domains dealing mainly with the structural assessment and related needs, as well as the derivatives affecting various domains such as the crisis mapping, crisis communications, local positioning, etc.

The following six end user categories were identified for the RECONASS End-User Group:

- A) Governmental Emergency / Disaster Response Organisations
- B) Non-Governmental Emergency / Disaster Response Organisations
- C) Public Operators of Critical Buildings
- D) Private Operators of Critical Buildings
- E) Organisations involved in the development of remote sensing based damage maps
- F) Organisations involved in synoptic damage prediction based on acceleration measurements, insurance companies, etc.

More than 50 individuals originating from more than 30 organisations matching the above end user categories were contacted. A set of informative dissemination material have been provided. The dissemination material included the following documents:

- a short description of the RECONASS project (abstract)
- the RECONASS workshop flyer and
- the RECONASS end-user requirement questionnaire (the data basis of deliverable D 1.1) [2]

In parallel when submitting the RECONASS end-user requirement questionnaire document, the End-users were requested to inform the RECONASS Consortium whether they are generally interested to

join the RECONASS End-User Group and what will be the possible interaction that they are willing to have during the project's lifecycle (participation to Workshops, dissemination material, participation to Pilot, etc.). The intention was to invite major End-users, at least two representatives for each "user-group category", reflecting the entire group of possible stakeholders of such a system.



Figure 1-Map of Europe presenting the End-User Group

1.2.2 The conceptual design and proceedings of the RECONASS workshop

The Workshop began with an introduction round of all participants, with focus on their expertise, of their organisation, their specific interest and contact points with RECONASS, as well as their expectations of the RECONASS end-user workshop. ICCS (RECONASS Project Coordinator) and ITC (RECONASS partner) gave a concise and comprehensive overview of the RECONASS concept, the needs, objectives, main challenges, expected results and impacts as well as the processes to be realised for the validation and demonstration phase. The introduction was followed by two key-note presentations by Prof. Mauro Dolce from DPC's (ITALY) and Dr. Stefan Voigt from DLR's (GERMANY) on RECONASS related activities respectively.

A key point that proved to be effective and at the same time strengthened the Workshop process was the participation of most of the RECONASS partners in the workshop. ICCS, ITC, GeoSIG, TUD, TECNIC and DBA, all involved in WP1, attended the meeting and participated actively in the two working groups. Furthermore, it resulted in useful outcomes from the End-users since the technically involved partners were able, whenever needed, to provide the end users with additional details on functionalities of the features that the RECONASS system will address.

Finally, all participants were informed about the next steps and the processes of the RECONASS project, as well as about the following RECONASS end-user workshop in month 29 of the project.

1.2.3 RECONASS Workshop procedure of the working groups

Within the workshop, the basic concept and proceedings of the RECONASS workshop working groups was initially presented to the participants, together with current challenges and the state of play of the design of the RECONASS system end-user requirements.

The End Users were divided into two smaller mixed groups where they were asked to discuss, evaluate and consolidate the preliminary requirements and to provide their perspective on these as well.

The work programme of the two separate working groups took place on both days of the Workshop and lasted approximately 3 ½ hours. The participants and specifically an appointed end users' representative were asked to directly fill in the main outcome of the discussions, main input and results into a circulated power point template. After the breakout sessions their final outcomes and results were presented to the whole Workshop's audience, followed by a final discussion with all attendees.

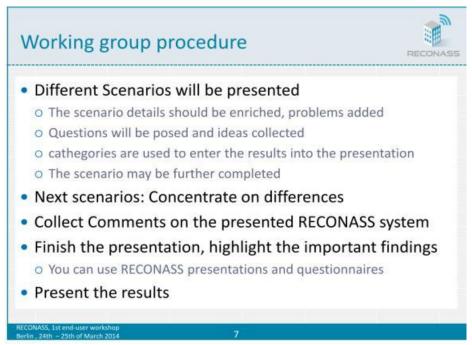


Figure 2-Chart taken from the workshop power point presentation: RECONASS presentation user requirements WS introduction THW only for internal.pdf; see workshop documentation in the ANNEX

In the context of the working groups both end users and RECONASS partners were asked to collaborate and provide their inputs on the basis of five different realistic scenarios. The respective scenarios are exemplarily presented below:

- Scenario 1: Fire, limited fire spread
- Scenario 2: Earthquake/ one public building not collapsed, persons inside, some damaged parts of the building may lead to collapse
- Scenario 3: Earthquake/ partly collapsed public buildings
- Scenario 4: Earthquake disaster/ a large area is affected, many buildings are collapsed or partly collapsed, persons are trapped
- Scenario 5: Large explosion, public building partly collapsed, persons are trapped.

Scenario 1: A fire; in an administrative building with public access; limited fire spread/no disaster environment



Figure 3-Scenario 1: Fire, limited fire spread

Scenario 2: An earthquake; an administrative building with public access; partly damaged and persons still inside; damaged parts may lead to collapse/disaster environment



Figure 4-Scenario 2: Earthquake/ one public building not collapsed, persons inside, some damaged parts of the building may lead to collapse

Scenario 3: An earthquake; an administrative building with public access; some parts partly, some completely damaged and persons are trapped/ disaster environment



Figure 5-Scenario 3: Earthquake/ partly collapsed public buildings

Scenario 4: An earthquake; several administrative buildings with public access, damaged and persons trapped inside/ large scale disaster environment

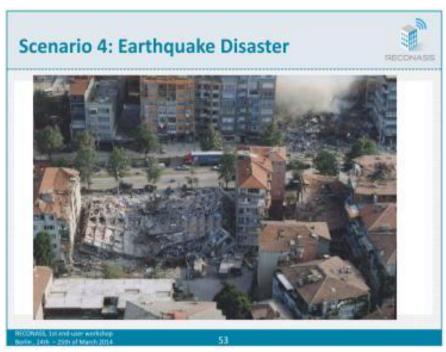


Figure 6-Scenario 4: Earthquake disaster/ a large area is affected, many buildings are collapsed or partly collapsed, persons are trapped

Scenario 5: A large explosion; an administrative building with public access; partly collapsed/damaged and persons trapped; damaged parts may lead to collapse/disaster environment



Figure 7-Scenario 5: Large explosion, public building partly collapsed, persons are trapped

End-users were asked to refine each scenario by providing further descriptions or assumptions that should be considered, and to address a set of indicative "key questions" that had been generated from the first outcome of the end-user requirement questionnaire.

This process allowed the end users to enrich the scenarios and to provide their expected requirements or features of the RECONASS system.

In the Figures to follow this process is schematically presented:

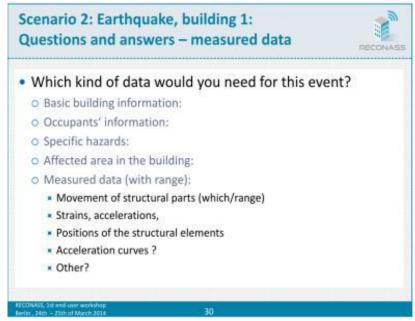


Figure 8-Predefined questions for each scenario

In addition to these scenario descriptions and key-questions, first results acquired from the questionnaire were processed and visualised with graphs in order to provide a visual statistical stimulation and better assess the outcome within the working groups.

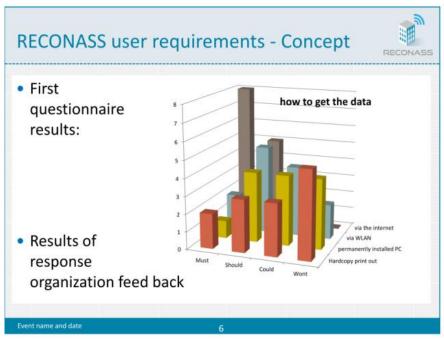


Figure 9:-Statistics of RECONASS system's requirements from Questionnaire

2 WORKSHOP ACTIVITIES

2.1 RECONASS workshop flyer

Two RECONASS flyers were produced prior to the event, one of those prepared already at the very beginning of the project to create visibility of the project and interest amongst End-users in the project. The second RECONASS flyer was designed, produced and published for the purposes of the RECONASS End-User Workshop in Berlin to provide further information mainly on the needs, objectives, expected impact and the overall system.

2.1.1 RECONASS Workshop Flyer No.1

The RECONASS Workshop flyer No.1 has been produced as a "fact-sheet" in order to provide interested End-users a first insight of the aim, scope and challenges of the RECONASS project and to inform them at a glance about the upcoming end-user workshop as well as about the relevant contacts. The flyer was distributed via e-mail to a total of 50 potential End-users and was one of the main processes followed during the End-User Group formation. In addition, a printed hand-out version was distributed during the UN USAR D-A-CH-L Meeting where a RECONASS partner, THW, has been actively participating. (Working group within the UN INSARG/ United Nations International Search and Rescue Advisory Group consisted of urban search and rescue teams and organisations originating from German speaking countries (Germany, Austria, Switzerland and Luxemburg). This particular meeting was held in Mainz/Germany on 20th – 23rd of January 2014.

The respective flyer No.1 is presented in the ANNEX.

2.1.2 RECONASS Workshop flyer No.2

The RECONASS information flyer No.2 was produced mainly for the scope of the 1st RECONASS End-User Workshop in order to inform the workshop participants on the RECONASS system and to disseminate the project. The flyer was distributed during the workshop meeting. It has been part of the final workshop documentation distributed to all participants.

The respective flyer No.2 is presented in the ANNEX.

2.2 List of Participants

The 1st RECONASS End-User Workshop in Berlin gathered a diverse group of End-users. The overall participants list is presented in the following table:



Figure 10-RECONASS 1st end-user workshop Berlin, 24th – 25th of March 2014, participants

Table 1-list of participants

	Name	Company/Organization - Country	User type
1.	Evangelos SDONGOS	ICCS (RECONASS)/ Greece	Partner of RECONASS
2.	Bastian LINDNER	TUD (RECONASS)/ Germany	Partner of RECONASS
3.	Emmanuel BAIRAKTARIS	DBA (RECONASS)/ Greece	Partner of RECONASS
4.	Corrado SANNA	TECNIC (RECONASS)/ Italy	Partner of RECONASS
5.	Talhan BIRO Isaiah SAIBU	GeoSIG (RECONASS)/ Switzerland	Partner of RECONASS
6.	Norman KERLE	ITC (RECONASS)/ Netherlands	Partner of RECONASS
7.	Katrin VIERHUSS-SCHLOMS Klaus-Dieter BÜTTGEN Michael MARKUS Niels DECKER Angelika DUNG	THW (RECONASS)/ Germany	Partner of RECONASS/ A): Governmental Emergency/ Disater Response Organisa- tion
8.	Harun MARKOPCUOGLU	GEA , mother earth search and rescue/ Turkey	B): Non-Governmental Emergency/ Disater Response Organisation
9.	Peter JUNNE	BMUB , Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety/ Germany	C): Public Operators of Critical Buildings
10.	Chaim RAFALOWSKI	MDA, Magen David Adom/ Israel	B): Non-Governmental Emergency/ Disater Response Organisation
11.	Mauro DOLCE	DPC , Italian Department of Civil Protection/ Italy	C): Public Operators of Critical Buildings
12	Stefan VOIGT	DLR , Center of Satellite Based Crisis Information (ZKI) at German Aerospace Center/ Germany	E): Organisations involved in the development of remote sensing based damage maps
13.	Zygmunt LATKA	PSP , The State Fire Service/ Poland	A): Governmental Emergency/

	(registered-did not attend) Dariusz RUCHALA (registered-did not attend)		Disater Response Organisation
14.	Ioan-Cristian CONSTANTIN	GIES, General Inspectorate for Emergency Situations/ Romania	A): Governmental Emergency/ Disater Response Organisa- tion
15.	Fabio Giulio TONOLO	ITHACA, Association for Information Technology for Humanitarian Assistance, Cooperation and Action/ Italy	E): Organisations involved in the development of remote sensing based damage maps
16.	Frank BLOCKHAUS	THW , Rapid Deployment Unit Search and Rescue (SEEBA)/ Germany	A): Governmental Emergency/ Disater Response Organisa- tion
17.	Tanja RABE	Working for the State capital of North Rhine-Westphalia Düsseldorf/ Germany	C): Public Operators of Critical Buildings
18.	Tom VAN ESBROECK	State Fire Service Gent/ Belgium	A): Governmental Emergency/ Disater Response Organisa- tion
19.	Émilie CROCHET (registered-did not attend)	DGSCGC , Ministry of the Interior/ France	C): Public Operators of Critical Buildings
29.	Stefano PAROLAI (registered-did not attend) Marc WIELAND	GFZ , Research Center for Geoscience Potsdam/ Germany	E): Organisations involved in the development of remote sensing based damage maps

During the Workshop a live streaming connection (audio and video) was set up to allow End-users and other RECONASS partners that were not able to attend to follow the proceedings.

Mr. Albrecht Broemme, President of THW, also joined the Workshop on the 2nd Day to discuss with the end users and thank them for their active participation.

The internal minutes of meeting document were circulated among all participants via e-mail shortly after the finalisation of the Workshop. On top of this the overall workshop documentation was compiled on a CD and distributed by mail. In addition, a report of the workshop proceedings and outcomes has been published on RECONASS website, http://reconass.eu/.

2.3 Agenda of the Workshop

Please find the agenda of the workshop showing the overall scheduling of the meeting, the several sessions and the presentations that have been held by the respective partners and End-users within the workshop documentation in the ANNEX.

3 WORKSHOP OUTCOMES

In this section the sequence of the several sessions held is presented, describing in parallel the main outcomes and the key points that have been discussed. A summary of the requirements that were extracted is included.

3.1 RECONASS End-User Workshop Presentations

The presentations occurred in their actual time order according to the Workshop's Agenda are summarised below. All presentations can be found in the workshop documentation in the Annex

- At start, ICCS and ITC gave a comprehensive overview of the main objectives, challenges and state of play of the RECONASSS project.
- The next part was about all partners to introduce their organisations and expertise and provide some further details on their interest and expected results.
- MDA to follow made a short introduction. MDA is a national organisation and works in cooperation with other emergency and security authorities (Israeli police, IDF, Fire fighters etc.). More details can be found at the official homepage: http://www.mdais.com/271/
- GeoSIG, DBA and TECNIC (partners of RECONASS) were next to follow providing some introductive information on their profile and the effort that they are going to undertake in the RECONASS project.
- GFZ to follow, inter alia, interlinked during its profile presentation the EU FP7 "SENSUM" project with the RECONASS project. SENSUM will deliver innovative methodologies and software tools for dynamic, multi-resolution monitoring of pre-disaster vulnerability and preparedness and post-disaster recovery planning and monitoring, based on current and future space-based products and a novel approach to in-situ observation for data rich and data poor countries, more information at http://www.sensum-project.eu/
- BMUB, which is responsible for building safety at the Federal level in Germany, made an introduction on its profile and activities carried. More information can be found at the official homepage: http://www.bmub.bund.de/en/
- TUD gave a brief introduction of their role within RECONASS and the research activities that it will be undertaking during the project's lifecycle.
- Ms. Tanja Rabe, THW building expert adviser and working for the Municipality of Düsseldorf, being also competent for building assessment and building permission at local level gave a short introduction the results expected from RECONASS and on current methodologies dealing with structural assessment. More information can be found at the official homepage http://www.duesseldorf.de/de/eng/index.shtml /
- During the next session two key note speeches were given. The first presentation made by DPC "Technical Management of Earthquake Emergency by the Italian Civil Protection". Prof. Mauro Dolce, Director General of Civil Protection Dept.-DPC, Italy being also a Professor of Structural Engineering at University of Naples Federico II, gave a comprehensive and clear overview of the competences and challenges of the activities of DPC related to the field of structural assessment and damage detection/monitoring being of particular interest for RECONASS Project. Prof. Mauro Dolce, concentrated at first on the technical management activities in post-earthquake emergency situations, referring to the experience gained during and after the l'Aguila Earthquake that occured on 6th of April 2009.

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- Additionally, Prof. Mauro Dolce, described in more details the SIGE system used by DPC which is an Information System for Emergency Management and simulated scenarios. In case of an earthquake of magnitude 4 or more, an automatic procedure is immediately activated by DPC to produce data, maps, and information concerning the description of the area (anthropic, physical and administrative aspects; characteristics of buildings and infrastructures; monitoring networks), the vulnerability (building stock, schools, hospitals), and hazards (seismogenic zones, catalogue, isoseismals, attenuation) in order to get a preliminary evaluation of damage and losses.
- In a second part, Prof. Dolce switched over and presented the seismic monitoring strategies of DPC which is based on the following activities:
 - 1) Seismic surveillance INGV-CNT, The velocimetric National Seismic Network which is managed by INGV CNT (National Institute of Geophysics and Volcanology National Earthquake Centre). It provides DPC with quasi-real-time information on location and magnitude of earthquakes that occur in Italian territory.
 - 2) Ground motion monitoring (DPC-RAN), utilizing on permanent basis acceleration data interconnecting a wide network of accelerometers, called Italian Strong Motion Network (RAN). By using this system DPC is recording strong motion accelerations produced by earthquakes. Data are transmitted to DPC and processed in near-real time RAN Permanent network, RAN Mobile network.
 - 3) Structural monitoring (DPC-OSS). Through the Seismic Observatory of Structures (OSS), DPC records in quasi-real time the dynamic response of structures (schools, hospitals, city halls, bridges, dams...) especially in the epicentral area of earthquake affected regions.
- Mr. Dolce finally introduced the DG ECHO/Civil Protection financed "Build Safe DrHOUSE"
 (Project Development of Rapid Highly-specialized Operative Units for Structural Evaluation)
 within the framework of "Preparatory action on a EU rapid response capability " (2010-2013).
 The project aims at the implementation of a European Civil Protection "Macro module" for building damage and safety assessment and building propping and shoring. With regard to the RECONASS project he pointed out that monitoring and assessment of earthquake-prone areas still poses a significant challenge.
- In the scope of the second key note speech from DLR, "Challenges in Rapid Mapping of Earthquake Damages from Space" by Dr. Stefan Voigt employed by Center for Satellite Based Crisis Information (ZKI) at the German Aerospace Centre, gave a short overview of the activities of DLR related to the field of interest of RECONASS. DLR is a German research institution, space agency and project management agency connected with the Center for Satellite Based Crisis Information (ZKI), providing 24/7 service for rapid mapping and damage assessment, monitoring crisis situations and reference mapping for disaster preparedness. ZKI furthermore supports the "International Charter on Space and Major Disasters" and carries out substantial research and development activities. ZKI is working on the basis of scenarios such as e.g. earthquakes, evacuation and preparedness, accidents, tsunami and severe weather phenomena (hurricanes, storms, etc.)
- Dr. Stefan Voigt described additionally the main challenges of mapping earthquake damages from space by referring to the big earthquake events in Iran, December 27, Pakistan in 2003, and on 8th of October 2005, Indonesia on 27th of May 2006 and in Italy on 29th of May 2012.

Since these events occurred in the time frame of nearly a decade he underlined the development processes of the underlying data and mapping technologies which are introducing new research fields and are pushing innovation for providing critical services to the public and the related with crisis incidents organisations. On top of this, Dr. Stefan Voigt, highlighted the common phenomenon of "overflow of mapping information" which is occurring due to the lack of common standards, the existence of "inconsistent, at least largely diverging" maps with "even partially contradicting information" for one and the same disaster, shown up e.g. during the Haiti crisis 2010. As a result, he stated, users are confused and often frustrated with respect to satellite maps/analysis.

- Dr. Stefan Voigt finally concluded, that the mapping of earthquake damages from space "remains a challenge": In particular the below key points remain of special interest:
 - "ground-truth" and "ground-reference" are important to aid/calibrate
 - Different representations of damage grades are used
 - Automation of damage assessment is hardy possible
 - Optical image analysis dominates AR only used experimentally
- Dr. Voigt finally stated, "That there will be "still quite a way to go in order to "link" sensors atattached to buildings with tress/damage patterns mapped from space". To conclude, it will be interesting from DLR's side to follow the RECONASS project to stay in line with the developments and the outcomes of the research activities on the above mentioned directions.

3.2 End-users Feedback and Requirements

In the last session of the Workshop, the participants divided into two working groups

The participants of the Working Group No.1 were:

Michael Markus (chair), Norman Kerle, Bastian Lindner, Talhan Biro, Harun Markopcuoglu, Peter Junne, Stefan Voigt, Ioan-Christian Constantin, Tom Van Esbroeck, Marc Wieland

Working group No.1 mainly focused on scenario 1, 3 and 5, which were presented in section 1.2.1. The subtasks of the working group No.1 are shown below:

- o To further describe the scenario and provide assumptions to be considered
- To discuss on the basis of the indicated questions To directly fill in the main points / outcomes in the end-user requirement workshop template.

The working group focused in the first scenario (fire) and on the thermic damage to construction. The first statements included that it would be of great value, if RECONASS could provide data for temperatures in the structure/ of the reinforcing bars, of movements of structural parts (which/range) and of strain of reinforcement bars (correlating with temperature).

Furthermore it would be of high importance for the End-users, especially for those being the first ones at the place of deployment as e.g. fire brigades to get more information about the distribution of temperatures (ceiling + floor), the movement/circulation of heat through the building, changes of temperature in different parts of the building, temperatures in the structure/ of the reinforcing bars, movement of structural parts (which/range) as well as smoke development / density, movement/ circulation flow of smoke through the building and the concentrations of gasses in the smoke as e.g. oxygen, C, CO, CO₂, e.g. via (optical) sensors provided by the RECONASS system, in order to prepare their tactical decisions.

Based on this, it would be extremely helpful if RECONASS could provide a 3D model of an intervention plan with the possibility of indicating potential localisation/position of first responders.

In addition it was stated that data of the precise movement of structural parts need to be available, Detailed information of strains, accelerations, positions of the structural elements, acceleration curves and structure of the collapsed building indicating voids/caves would be preferable.

On top of this, the group emphasized the importance of the potential use of the sensors to detect victims via sound or other detection possibilities. Additionally, the users in working group No.1 stated that it would be useful to detect hazards, as e.g. NRBC contamination etc.

Mr. Harun MARKOPCUOGLU from GEA added that his organisation is currently using a 100m range 14Mp, Phantom II, quadrocopter that provides a live link of video streaming for the operations deployment. More to this, photos are needed when End-users are on the spot during rescue activities as well as when they are on the way to the area in order to prepare their intervention. The best way to get the information from RECONASS would be through internet connectivity utilising secure links to avoid misuse or malicious attacks. A solution to enable an additional storage of specific data as well for these to be available under any circumstances (e.g. total collapse) in the form of a "black box" will be highly appreciated from the End-users.

⇒ Please find the complete outcome of group 1 in the respective presentations within the workshop documentation (ANNEX).

The participants of the Working Group No.2 are presented below:

Katrin Vierhuß (chair), Evangelos Sdongos, Corrado Sanna, Isaiah Saibu, Klaus-Dieter Büttgen, Nils Decker, Chaim Rafalowski, Mauro Dolce, Fabio Giulio Tonolo, Frank Blockhaus, Tanja Rabe, Emmanuel Bairaktaris

Working group No.2 mainly focused on scenario 2, 4 and 5, which were presented in section 1.2.1 The subtasks of the working group were identical to those of WG1.

Working group No.2 began by focusing on the fifth scenario. The importance of timeline and the level of specification were highlighted in two aspects: how detailed is the information and which part is involved. The level of accuracy varies with time required to perform an assessment.

During the discussion that followed it was stressed that the RECONASS system shall be designed as a "warning system", where the output can be used for immediate decision planning (e.g. for a doctor in charge to take a decision on a possible hospital evacuation). Therefore, the system needs to cover also non-structural damages and indirect environmental risks (gas, explosion, fire, water, NRBC detection).

With respect to the above mentioned statement on the "warning system" functionalities, the RECONASS system should deliver not (only) RAW data, but information "ready-to-be-used", such as one sight / "traffic light" colour code (green / orange / red).

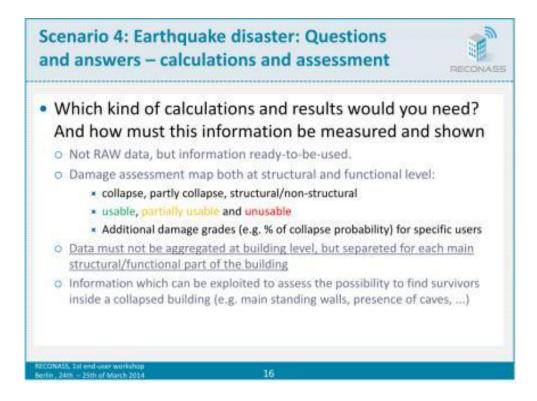


Figure 11-Chart taken from the workshop power point presentations: working group 2 outcomes/ RECONASSWSBerlin14outcomegroup2.pdf; see workshop documentation in the ANNEX

Based on these requirements, a possible damage assessment map should contain information at structural and functional level. Some indicative examples of information required are presented below:

- Not only information on the building but also status of the surrounding areas (road blocks, debris)
- o Information about the building: collapse, partly collapse, structural/non-structural, usable, partially usable or unusable
- Additional damage grades (e.g. % of collapse probability)
- More detailed information if needed (part by part)
- o If required / for experts: raw sensor data / model output

In order to get more precise and real- time information on spots that are of special interest inside a disaster affected building, SAR teams should potentially be able to install additional RECONASS tags or sensors, provided that a plug and play function is feasible and that the additional materials/equipment is easily attached and is light enough to be carried.

The RECONASS system should broaden its scope of application and e.g. take into consideration damages due to flood events. This could be an extension to be foreseen while designing the RECONASS system for future developments and research, and after the finalisation of the project.

The development of the RECONASS system should be driven by the need of easiness of handling and cost-efficiency. The system should be as robust as possible and easy to maintain. Therefore, the RECONASS system should allow the integration with existing building management systems (e.g. security cameras, information on the elevators, etc.)

Another important aspect of the RECONASS system relates to the various costs (equipment, maintenance, operation, etc.). For the functionality of the system and for the cost identification there should be a distinction between "old" and "new" buildings:

- For new buildings: a certain percentage of the total construction raw costs (e.g. for a smoke detection sensor network, the cost is about 3%)
- o For existing buildings: to be included in the maintenance and running costs
 - ⇒ Please find more detailed information in the presentation of the working group 2 within the workshop documentation in the ANNEX.

4 CONCLUSIONS

The workshop proved to be highly productive and efficient as well. An important argument on this is the fact that the majority of the WP1 RECONASS consortium has been attending the Berlin end-user meeting; so the partners could directly start with their respective following tasks on the basis of the outcomes of the two working groups. The partners will closely consider the results and collaborate with the end users where needed, disseminating the outcomes during the duration of the project. A first analysis of the data shows the following preliminary results:

In a timeframe of 6 weeks, in total 50 persons coming from different types of End-users have been contacted and got the RECONASS workshop flyer as well as the RECONASS end-user questionnaire. The contacted End-users are coming from 34 organisations, from 16 countries (within EU, from the US, Turkey and Israel).

- 23rd questionnaires have been returned.
- 24 persons/organisations have taken an interest in joining in the RECOONASS user-group and 14 have been registered (at least two per end-user group) and 11 of them have been finally attending the 1st RECONASS end-user workshop.

The outcome of the two working groups can be summarised as followed:

At first sight, although the two groups assembled different user-groups and covered different scenarios and even though each group presented some specific findings, the main outcome showed quite a lot of congruities. For example, both groups stated that End-users wish to receive the data in a simple and robust way, easy to handle and the RECONASS system should be open for a broader detection of e.g. hazards (gas, etc.), temperatures (fires, etc.), and additional crisis incidents such as floods.

Furthermore, some general outcomes of both working groups confirm the findings of the RECONASS end-user requirement questionnaire, as e.g. the importance of a monitoring and alarm function of the RECONASS system or the transfer of data preferably via internet.

Table 2 shows a compilation of the requirements of the end-user derived from the workshop. User type means:

- A) Governmental Emergency / Disaster Response Organisations
- B) Non-Governmental Emergency / Disaster Response Organisations
- C) Public Operators of Critical Buildings
- D) Private Operators of Critical Buildings
- E) Organisations involved in the development of remote sensing based damage maps
- F) Organisations involved in synoptic damage prediction based on acceleration measurements, insurance companies, etc.

The meaning of the MSCW value is "M": Must, "S": Should, "C": Could and "W": Wont

"ws1-t1" means workshop 1, team 1; ws1-t1+2 means workshop 1, team 1 and team 2.

Table 2: user requirements derived from the first RECONASS end user workshop (5 pages)

. 🗾 User requirement	Value	Description/comments/links	User typ	MSCN	Source S
003 The system shall tolerate power break down for some hours Pass/Fail Statement: At least:	72h-1 week	for immidiate response	ABCD	M	ws1-t1+2
006 The sensor network/monitoring system shall support the user (engineer and untrained personnel) to assess the damages			ABCD	M	ws1-t1+
010 The damage assessment sub-system is reliable because human lifes depend on it		Central processing unit (required to run the model) could be outside the building (RECONASS centre), and then serve the information to the end-users. But a smaller processing unit could be installed in each monitored building for performance reasons (federated approach).	ABCDF	M	ws1-t2
011 The damage assessment sub-system shall assess information in near real time	<30 min	depending on the user such as local fire brigades, international	ABCDF	М	ws1-t1+
012 The damage assessment sub-system shall assess structural damages			ABCDF	M	ws1-t1+
013 The damage assessment sub-system shall assess repair needs			CDF	M	ws1-t1+
014 The damage assessment sub-system shall assess generated debris			ABCDF	M	ws1-t1+
015 The damage assessment sub-system shall assess building functionality			ABCDF	M	ws1-t1-
016 The system shall be designed for reinforced concrete buildings			ABCDEF	M	ws1-t1-
019 Sensor units are small enough to be integrated into the building structure during construction			CD	M	ws1-t1+
023 If cables are used, the units are functional (measurement and communication) for:	>72 h	all backup	CD	M	ws1-t1+
025 The system shall deliver a simple post-event building status of the monitored building with the status usable, partially usable and unusable			ABCDEF	M	ws1-t1+
026 The system shall provide a maintenance interface to read out actual measured data and calculation results			ABCD	S	ws1-t1+
027 The system shall show the position of the sensors and the measured events in a 3D model		ITC can provid a 3D modelling (of the exterior) This is used to show more detailed data on request, collapse structure, amaged areas, collapse hazard must be shown	ABCD	S	ws1-t1+
028 The system shall provide aerial photos of the undamaged structure			ABCDEF	S	ws1-t1-
029 The system shall provide aerial vertical imagery of the damaged structure	georeferenced	interface to PCCDN may be investigated	ABCDEF	S	ws1-t1-
030 The system shall provide oblique imagery of the damaged structure		rgeoreferenced, angle of view, Req 28-31 useful for first responders to enter the area, see hazards	ABCDEF	S	ws1-t1-
031 The system shall provide detailed imagery of details of the damaged structure	1 cm resolution	detailed photos of collapsed and damaged areas, and of specific areas on user request	ABCD	S	ws1-t1
032 The system shall provide thermal imagery to detect persons and fire/heat		To be discussed	AB	S	ws1-t1

Nr.	User requirement	Value	Description/comments/links	User typ	MSCW	Source 🔽
033	The system shall priovide damage maps with a higher accuracy than the actual standard	0.5 m resolution?	What should damage maps contain? Before and after the earthquake Temperatures (fires); Hazards (gas,); (floods) Occupancy, building types, storeys, Pre event satellite images ++; 3D model of the area +	ABCDEF	М	ws1-t1
034	The system shall provide GIS-ready data			ABCDEF	S	ws1-t1
035	The system shall generate pdf reports		To be discussed, AB-users: Pdf: too many documents, you need a specialist to read this, need somebody to interpretate the data real time information needed, no time for print out and	ABCDEF	С	ws1-t1
036	The system shall provide hard copy print-outs		To be discussed; AB-users: NO!	ABCD	С	ws1-t1
	The system shall include a permantly installed PC / monitor at the building to view data and calculation results		Not necessary	ABCD	W	ws1-t1
038	The system shall deliver data and results via WLAN		Mini Version for PCCDN	ABCD	S	ws1-t1
	The system shall continuously update damage assessments and the probability of further collapse after the initial damaging event and during and after following damaging events			AB	S	ws1-t1+2
040	The system must be designed for different operators	building operator, f	ast response personnel, architects and engineers, maintenance	p ABCD	М	ws1-t1+2
041	The monitoring system for response personnel must be reliable because otherwise human losses will occur			AB	М	ws1-t1+2
	The result of the damage assessment sub system in regarding the further usability of the building must be reliable because otherwise human losses may occur			CDF	М	ws1-t1+2
	The Post Crisis Needs Assessment Tool (PCCDN) shall assess shoring and demolition needs for affected areas		not necessary for single buildings (for the first responders)	ABCDEF	S	ws1-t1
	The Post Crisis Needs Assessment Tool (PCCDN) shall assess needed manpower for repair and reconstruction for affected areas		not necessary for single buildings (for the first responders)	ABCDEF	S	ws1-t1
	The Post Crisis Needs Assessment Tool (PCCDN) shall provide detailed maps with information for single buildings for affected areas		should be a WebGIS Application (dynamic map) Satellite / aerial pictures -> Optional Height information _> No Assessed damages -> Yes Hazardous areas (land slides, flooding,) -> Yes Different standard maps -> update maps with new/more reliable information (highlighting the differences wrt the previous version) GIS ready data - Pdf export capability	ABCDEF	S	ws1-t2

Nr. User requirement	▼ Value	Description/comments/links	User typ	MSCN	Source 🔽
051 The Post Crisis Needs Assessment Tool (PCCDN) shall assess damages to lifelines	roads, water supply	, electricity	ABCDEF	С	ws1-t1+2
052 The PCCDN overview maps shall be available after:	8h-24h	depending on the level of detail	ABCDEF	S	ws1-t1+2
053 The PCCDN detailed maps shall be available after:	24h - 72h	depending on the level of detail	ABCDEF	S	ws1-t1+2
054 The system shall be able to exchange data with:	open source interfa	c PCCDN, other gateway=ICCS	ABCDEF	M	ws1-t1
055 Building damages shall be cathegorized additionally after EMS98 scale			ABCDEF	S	ws1-t1
056 The monitoring system shall provide a local alarming capability (sirens, flash light) function			ABCD	S	ws1-t1+2
057 The data exchange shall not be accessed by others		between PCCDN and gateway	ABCDEF	S	ws1-t1+2
058 The data to be exchanged must be classified in different security levels		Take into account cyber-security as well as privacy issues especially for critical infrastructures, Probably depends on the manager of the critical infrastructure as well as the intended use	ABCDEF	M	ws1-t1+2
060 If installed after construction: Prior damages or deterioration shall be determined by the system	1		CD	С	ws1-t1+2
061 The sensor network/monitoring system shall be connected with other monitoring systems. Which:	Fire detecting instal	lout of the scope?	ABCD	S	ws1-t1+2
062 The GUI shall be user friendly and easy to understand			ABCDEF	M	ws1-t1+2
063 The trainig for the different sub systems and users shall not exceed:		different numbers for different users and sub systems must be defined, 1 week may be realistic for persons using many of the RECONASS system functions such as assessment team engineers, maintenance teams		M	ws1-t1+2
064 The probability of the assessment results must be indicated (error bars)		first structural assessments	ABCD	М	ws1-t1+2
065 The possible further collapse of the damaged building must be indicated			ABCD	М	ws1-t2
079 Standardized interfaces for communication and data exchange with actual common data exchange platforms such as GDACS and VirtualOSOCC		Post earthquake response and recovery	ABCDEF	М	ws1-t1
085 Sensor networks and damage assessment must be applicable to already existing buildings (after the construction phase)		Sensor networks, and assessment of structural damages	ABCD	М	ws1-t1
086 Structural damage assessment based on sensor measurements enhances credibility and assessment quality		Assessment of structural damages	ABCD	М	ws1-t1
087 The nonstructural elements must include unreinforced non-load bearing masonry walls		Assessment of nonstructural damages	ABCD	М	ws1-t1
104 The possibility to extend the building sensor network with disaster/emergency relevant chemical and biological sensors has to be investigated		Sensor network extension	ABCDEF	М	ws1-t2

Public

. 🗾 User requirement	Value 🔽	Description/comments/links	User typ	MSCV	Source -
105 damage history and detoriation and actual loads must be used for the assessment calculation			ABCD	M	ws1-t2
106 Legal aspects of the assessments must be considered		Reliability of the system, different users (if accessible by all citizens may be dangerous), possible claims due to wrong assessment results	ABCD	M	ws1-t2
107 the 3D user interface must show the user classification of the building areas		e.g. hospital: name of ward, operating room	ABCD	S	ws1-t2
108 non structural damages and environmental risks must be covered in the system output for the instrumented building	t	environmental risks: e.g. gas, explosion, fire, water, nrbc	ABCDEF	S	ws1-t2
109 Level of accuracy varies with time required for assessment - different accuracy levels needed for different time frames			ABCDEF	M	ws1-t2
110 The system shall provide photos from inside the structure			ABCD	S	ws1-t2
111 Social media data should be provided		images and text information	ABCDEF	S	ws1-t2
112 The RECONASS system should identify priority areas to be mapped (UAV)			ABCDEF	S	ws1-t2
113 For rescue activities, the monitoring system allows to survey relevant measured information with a delay of less than	5 sec	such as accelerations and movements	АВ	S	ws1-t1+2
114 The measured data and/or the calculation results shall be stored in a kind of black box or accessible place to be available, even when the building collapsed or the data transfer was interrupted		data such as accelerations during the earthquake	ABCDEF	S	ws1-t1+2
115 The system shall provide measures for partially and totally collapsed buildings to prioritize the first responders interventions		Depending on collapse type, assessed survivors in the buildings and possibility to rescue the victims	АВ	S	ws1-t1+2
116 UAV imagery shall be at daylight and at night and under rainy and windy conditions			AB	S	ws1-t2
117 The possibility to install additional position tags for first responder-teams		team members (Localisation/Position of first responders Bio sensors: physical and psychological behaviour Connection to PSE: BA, sensors integrated in FF-clothes) and points of interest	АВ	S	ws1-t1+2
118 different damge scales must be used	structural, functiona	structural: (collapsed, partly collapsed, structural/nonstructural damage,); functional: (usable, partially usable, unusable), further damage grades (e.g. % of collapse probability)	ABCDEF	M	ws1-t2
119 output must be aggregated on building level and for each structural/functional part of the building			ABCDEF	М	ws1-t2
120 specific areas within the collapsed structures with high probabilities of survival shall be indicated			АВ	S	ws1-t1+2
121 Allow the integration with existing building management systems (security cameras, information on the elevators,)			ABCDEF	SorC	ws1-t2

User requirement	Value	Description/comments/links	User typ	MSCW	Source
122 System costs		a smoke detection sensor network costs 3% of the total construction raw costs; exixting buildings: to be included in the maintenance and running costs	CD	M	ws1-t2
The system shall provide information with the content of standard intervention plans		-basic building information: way in, way out, evacuation areas, evacuation routes, detection systems, automaticle fire extinguishing installations,Occupant's information: how many, how old? What's their mobility (fysicaly, psychologicly, asleep/awake)? What is the spread of the occupants in the building? Do they know the building? Are they trained? -Specific hazards: dangerous goods, gas installations, electrical installations -Affected areas in the building? -Detection systems? Automatical Fire Extinguishing Installations? (Sprinkler) -> time of activation, (intervention plans are already in use (paper or digital), but not for all buildings see BSAHF model (additional information) +construction type stable areas like staircases	ABCD	S	ws1-t1
124 The 3D user interface must show the intervention plan information			ABCD	S	ws1-t1
125 imagery shall make visible the fire spread and the progress of the fire		especially when not reachable with turntable ladders	ABCDEF	S	ws1-t1+
126 The user interface must be Simple robust: has to be fire fighter proof, simple robust, easy to handle			AB	M	ws1-t1
127 The system shall deliver data and results via the internet		for command posts and the crisis center	ABCDEF	M	ws1-t1+
128 The sensor network/monitoring system shall detect victim sounds in collapsed buildings			ABCD	S	ws1-t1+
129 accuracy of movement measurements needed for first resonders	+/- 5-10 mm		ABCD	S	ws1-t1+
130 temperatures shall be measured within the structure to detect fires, damages due to fire		see additional information/heat	ABCD	М	ws1-t1
131 Imagery of collapsed buildings / area before damage event is needed	when on scene (after	er 24 hours) and on the way (after 6 hours)	ABCDEF	S	ws1-t1

REFERENCES

- [1] D1.1 State of the Art of Assessment Tools and preliminary user requirements
- [2] RECONASS End-users Questionnaire

ANNEXES

Entire RECONASS workshop documentation on CD compilation

1. RECONASS workshop agenda and presentations

ITI GEA presentation only for internal use within RECONASS	Windows Media-Audio-/Vide	163.750 KB
RECONASS enduser meeting Berlin march 14 AGENDA final	PDF-XChange Viewer Docum	507 KB
RECONASS enduser WS march14 FOTO	IrfanView JPG File	121 KB
RECONASS enduser WS march14 FOTO	PDF-XChange Viewer Docum	565 KB
RECONASS enduser WS march 14 presentation DPC only for internal use	PDF-XChange Viewer Docum	9.360 KB
RECONASS enduser WS march14 presentation FB GHENT - TVE only for internal use	PDF-XChange Viewer Docum	594 KB
RECONASS enduser WS march14 presentation GIES Romania only for internal use	PDF-XChange Viewer Docum	257 KB
RECONASS enduser WS march 14 presentation ITC only for internal use	PDF-XChange Viewer Docum	1.948 KB
RECONASS enduser WS march14 presentation project ICCS	PDF-XChange Viewer Docum	1.758 KB
RECONASS enduser WS march 14 presentation THW	PDF-XChange Viewer Docum	1.429 KB
RECONASS enduser WS march 14 presentation THW SEEBA only for internal use	PDF-XChange Viewer Docum	336 KB
RECONASS enduser WS march14 presentation Voigt DLR only for internal use	PDF-XChange Viewer Docum	2.453 KB
RECONASS enduser WS march 14 presentation_GFZ_Wieland	PDF-XChange Viewer Docum	785 KB
RECONASS enduser WS march14 presentation_ITHACA_final	PDF-XChange Viewer Docum	579 KB
RECONASS presentation user_requirements WS introduction THW only for internal	PDF-XChange Viewer Docum	3.811 KB
RECONASS presentation_GEA Search and Rescue only for internal use	PDF-XChange Viewer Docum	744 KB

2. RECONASS workshop documents/outcome

RDF-XChange Viewer	RECONASS information flyer page 1	3.034 KB
RDF-XChange Viewer	RECONASS information flyer page 2	3.113 KB
RDF-XChange Viewer	RECONASS_Workshop flyer	656 KB
Microsoft Publisher-D	RECONASS_Workshop flyer	786 KB
RDF-XChange Viewer	RECONASS_Workshop_Agenda_FINAL140402	819 KB
RDF-XChange Viewer	RECONASS_Workshop_participant list_FINAL140402	211 KB
RDF-XChange Viewer	RECONASSenduserWS14berlinparticipan listforinternaluseonly	3.822 KB
RDF-XChange Viewer	RECONASSWSBerlin 14 outcomegroup 2	1.027 KB
RDF-XChange Viewer	RECONASSWSBerlin 14outcomegroup 1, 1	1.790 KB
RDF-XChange Viewer	RECONASSWSBerlin 14outcomegroup 1.2	3.111 KB

RECONASS flyer No 1



Project co-funded by the EU



FP7 Seventh Framework Programme for Research and Technological Development

THEME [SEC-2012.4.3-1]:

[Next generation damage and post-crisis needs assessment tool for reconstructionand recovery planning - Capability Project]

Start: December 1st, 2013

Duration:42 months

Funding: 4.260.240€

Coordinator:

Dr. Angelos Amditis (a.amditis@iccs.gr) Institute of Communication and Computer Systems

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RECONASS

Reconstruction and REcovery Planning: Rapid and Continuously Updated Construction Damage, and Related Needs ASSessment

Summary

The RECONASS project will provide a monitoring system for constructed facilities that will provide:

- near real time assessment of the structural condition;
- enough detail to be useful for early recovery planning;
- assessment of physical damage, loss of functionality, direct economic loss and needs of the monitored facilities;

by focusing mainly on the impacts of earthquakes, blasts/explosions and fire.



Such detailed monitoring is only economical for selected facilities that are essential for response and recovery or facilities that have a high value as a target for terrorist attacks. In case of spatially extended events the detailed assessment of damage in the monitored facilities will be used for the calibration of satellite and aerial photography, supporting the post disaster/crisis needs assessment process and providing base data for reconstruction efforts.

The above will be part of the **RECONASS** next generation **post-crisis needs assessment tool** in regards to **construction damage** and related **needs** (PCCDN). This tool **will enable fusion of external information**, allow for future expansion of the system, provide **international interoperability** between the involved units for reconstruction and recovery planning and **support the collaborative work** between these actors.



Reconstruction and REcovery Planning: Rapid and Continuously Updated Construction Damage, and Related Needs ASSessment





Project co-funded by the EU

Next steps for the following months:

- Compile and compare existing methods for post crisis/disaster construction damage and needs assessment for recovery and reconstruction planning. Identify shortfalls and misfits to be addressed in RECONASS;
- Study the available data regarding various incidents coming from terrorist actions and earthquake events including the impact of timing on the assessment of damage and needs;
- Based on the above, in a preliminary step, assess the end users' requirements.

THW is responsible for these next steps and contacts user communities such as:

governmental organizations at the municipal, regional and country levels including civil protection agencies and owners of buildings (e.g., the Depts. of Health or Education), non-profit relief organizations, including NGOs, UN and WB organizations, the EC itself, organizations developing remote sensing-based damage maps, organizations providing seismic damage predictions based on acceleration measurements, insurance companies, etc.

Participants of the **user group** will be directly informed about project results, invited to workshops and will fill in questionnaires. Traveling cost will be covered **by** the RECONASS project.

Following this, a workshop will be organized in March 2014 in Germany in order to:

- Learn how to proceed with damage and needs assessments;
- Present the user requirements identified and **get feedback**;
- Initiate collaborations during the lifetime of the project;
- Disseminate the project objectives.

Partners:



- Institute of Communication and Computer Systems (ICCS)
- 2. Technische Universität Dresden (TUD)
- 3. Swedish Defense Research Agency (FOI)
- 4. RISA Sicherheitsanalysen GMBH (RISA)
- 5. Technice e Consulenze Nell' Ingegneria Civile SPA, (TECNIC)
- 6. D. Bairaktaris & Associates Structural Design Office LTD (DBA)
- 7. GEOSIG AG (GS)
- 8. University of Twente, Department of Earth System Analysis (ITC)
- 9. Bundesanstalt Technisches Hilfswerk (THW)

RECONASS Flyer No 2



Using the PCCDN Tool the structural and the non-structural components accurate assessment will be possible

The expected results of RECONASS system

- Relief organizations, insurers and banks can begin funding ٥ restoration efforts at a much earlier date
- 0 Emergency response crews will be provided with critical and timely information so that danger can be pinpointed and emergency response directed with precision
- Disaster cost will be reduced by preventing monitored structures from collapsing in order to limit damage to adjacent structures and additional loss of life.
- Knowing the functionality of hospitals immediately after the disaster will help the government transfer injured victims to available hospitals.
- All major recovery stakeholders will acquire a common picture of the situation.
- Communication in case of disaster, guaranteed by the proposed communication gateway, can save lives.
- Early, effective handling of the reconstruction and recovery process will have long term financial repercussions.

The need

Terrorist actions often strike buildings and civil critical infrastructures of strategic interest, such as government buildings or bridges. The same buildings and critical infrastructure can also be damaged in a natural disaster. During such events the above facilities may exceed their functional or structural limits and this can be visible. On the other hand, they can also suffer enormous damage to their capacity without producing any apparent visible signs. Such damage, for instance, in the case of an earthquake. can render the facility incapable of surviving consecutive aftershocks.

The RECONASS system

RECONASS will develop small, inexpensive, wireless, local positioning tags that will be embedded in the structural elements of the monitored buildings and report their position to the base station. Following a disaster, the structural system that has emerged from the disaster will be used to assess the structural response, damage and loss.

A gateway-PCCDN tool for communication will be develend in their words that will enough a still took or the structural response or the st

A gateway-PCLDN tool for communication will be developed in this work that will provide redundancy at situations of access network unavailability by utilizing multiple and different access interfaces, e.g., GSM, JUHS.

Our own Unmanned Aerial Vehicle (UAV-drone) will be operated around the monitored building after the event and the 3D model of the building will be generated using the images and a detailed 3D damage assessment will be carried out. In case of extensive events like earthquake the ried out. In case of extensive events like earthquake, the local UAV based 3D damage assessment on monitored and

local UAV based 3D damage assessment on monitored and neighboring buildings will be used to calibrate and validate the air-and-space-borne imagery based damage maps provided for an extensive area.

A PCCDN Tool will be developed in RECONASS that will provide the recovery stakeholders with near real-time, detailed and reliable data and information on the construction damage, loss and needs of monitored buildings. This will be continuously updated as well as fused with space borne and airborne damage maps (calibrated and validated for the huildings may have a continuously monitored to the space borne and airborne damage maps (calibrated and validated for the huildings means will calibrate and suit calibrated). buildings monitored). The above procedure will reduce as



Objectives

RECONASS aims at providing a monitoring system for constructed facilities that will provide a near real time, reliable, and continuously updated as-sessment of the structural condition of the monisessment of the structural condition of the moni-tored facilities after a natural or manmade disas-ter. This process will be seamlessly integrated with an automated assessment of physical damage, loss of functionality, direct economic loss and needs of the monitored facilities. Yet, another aim of RECONASS is to provide seamless interoperability among heterogeneous networks to secure that the required information will definitely reach the stakeholders.

RECONASS - Reconstruction and Recovery Planning

RECONASS will improve reconstruction and recovery capabilities by providing relief units with an interoperable tool that is faster and technologically improved than available today.

End-Users Involvement

An internationally diverse and functionally proficient group of major end-users will be developed from the beginning of the project in order to:

- Collect internationally applicable end-user requirements.
- Promote a 'buy in situation.' Collaboration with this group will last throughout the life of this project. The partners will invite the members of this group to attend at least 3 workshops. In such a way the RECONASS Consortium will:
- Learn how they proceed with damage

Validation & Demonstration

Early in the project and immediately after user requirements and system specifica-tion, a pilot scheme will be defined for the evaluation of the proposed architecture. The following steps will be performed to this direction:

this direction:

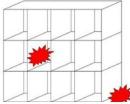
A trial (mock-up) version of the RECONASS system will be built according to the system architecture design in order to illustrate concept.

Single components from the different cognitive domains of the system will be tested in order to obtain an accurate evaluation

Present them with the user requirements and get their feedback.

Disseminate the project objectives and outcomes

The demonstration and the final evaluation pairs will include a multi-storey building in 1:2 scale where high explosive is detonated.









The RECONASS Vision

- Local governments to take the lead to form, before a disaster situation arises, an inventory of buildings and to instru-
- ment these buildings with the RECONASS monitoring system.

 A novel monitoring system for blast/impact loading as well as earthquake.
- Near real-time damage information from the monitored buildings can be used to calibrate the input on physical dam-
- . Calibration and validation of the synoptic damage assessment based on the remote sensing data can provide damage maps of the whole affected area in about a week (as opposed to few months now).

Consortium



Institute of Computer



Dresden



Swedish Defense



GeoSIG ...

RISA Sicherheitsanalysen



D. Bairaktaris and



TECNIC

University of Twente, Department of Earth Systems Analysis



Federal Agency for Technical Relief

Contact Us

Project Coordinator: Dr.Angelos Amditi's a.amditi's@iccs.gr

Technical Manager: Dr. Athanasia Tsertou atsertou@iccs.gr

EU Project Officer: Jana Paskajova

Dissemination Manager: Stefanos Camarinopoulos

Day-to-Day Project Manager: Evangelos Sdongos esdongos@iccs.gr

Project Facts			
9 partners	6 countries		
42 months	4,260,240.00 requested EU contribution		



Reconstruction and **REcovery Planning:** Rapid and Continuously Updated COnstruction Damage and Related Needs ASSessment



www.reconass.eu



This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no [312718]

(Grant Agreement No. 312718)

Workshop AGENDA



7th Framework Programme - FP7-SEC-2012.4.3-1

Next Generation Damage and Post-Crisis Needs Assessment Tool for Reconstruction and Recovery Planning

Capability Project

Agenda for "END-USER WORKSHOP ON RECONASS SYSTEM USER REQUIREMENTS", 24th & 25th of March 2014 Berlin, Germany

Organising partner	Federal Agency for Technical Relief (THW)			
Contact person (name, e-mail,	Michael Markus Phone: +49 7221 407 9546			
telephone)	Mobile: +49 177 738 19 21 <u>markus@baufb.de</u>			
	Katrin Vierhuß-Schloms Phone: +49 228 940 – 18 49			
	Fax: +49 228 940 1520 katrin.vierhuss-schloms@thw.de			
Status	Final			
Issue Date	21/03/2014			

Grant Agreement №: 312718

Start: 01.12.2013 - End: 31.05.2017

Institute of Communications and Computer Systems (ICCS)

Technical University of Dresden (TUD)

Swedish Defense Research Agency (FOI)

<u>RECONASS CON-</u> <u>SORTIUM</u>: **RISA** GmbH

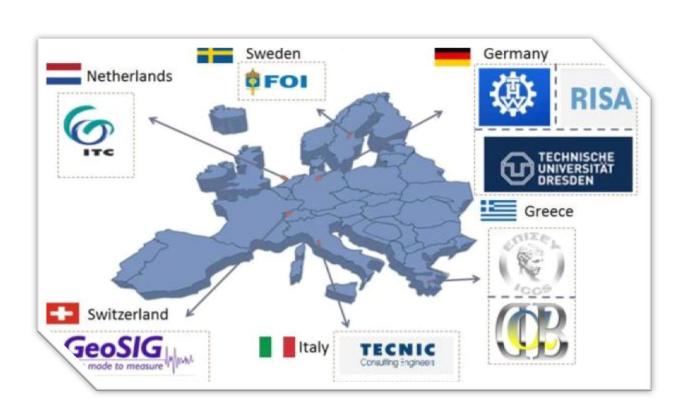
TECNIC S.p.A.

D. Bairaktaris and Associates Ltd. (DBA)

GeoSIG Ltd (GS)

University of Twente, Department of Earth Systems Analysis, Faculty of Geo-Information Science and Earth Observation (ITC)

Federal Agency for Technical Relief (**THW**)



Project Coordinator: Dr.Angelos Amditis A.Amditis@iccs.gr	EU Project Officer: Jana Paskajova jana.paskajova@ec.europa.eu		
Technical Manager: Dr. Athanasia Tsertou atsertou@iccs.gr	Dissemination Manager: Stefanos Camarinopoulos s.camarinopoulos@risa.de		
Day to Day Project Manager: Evangelos Sdongos esdongos@iccs.gr			

(Grant Agreement No. 312718)

11:45 - 12:00	Arrival, Registration		
12:00 - 13:00	Lunch		
	Welcome: Mr. Albrecht Broemme, President THW (not confirmed)		
13:00 - 13:05	Opening and Welcome (5')	THW	
	Vatria Vianhu (C/Miahaal Markus TII)		
	Katrin Vierhuß/Michael Markus, THW		
13:05 - 13:55	RECONASS Project Presentation (20')	ICCS, ITC	
	 Concept, Need, Objectives, Main Challenges Expected Result and Impact Validation and Demonstration 		
	Evangelos Sdongos, ICCS		
	Synergistic Damage Assessment with Air and Spaceborne Remote		
	Sensing (20') - Concept,		
	- Concept, - Objectives,		
	- Main Challenges		
	Norman Kerle, ITC		
	(+ 10' discussion/ questions)		
13:55 - 14:55	Round of Introduction (60')	All	
	(approximately 2-5' each participant, including main interest in the RECONASS project and expectations in the workshop)		
14:55 – 15:15	Keynote speech (20')		
	Prof. Mauro Dolce, DPC		
	(Activities of DPC related to the field of interest of RECONASS)		
15:15 – 15:35	Keynote speech (20')		
	Dr. Stefan Voigt, DLR		
	(Activities of DLR related to the field of interest of RECONASS)		
15:35 – 16:00	RECONASS end-user requirements Presentation (15')	THW	
	Concept,State of play,		
	- Challenges		
	- Introduction in working group proceeding		

	Katrin Vi	erhuß /Michael Markus, THW		
(+ 10' discussion/ questions)				
16:00 – 16: 15	Coffee-break			
16:15 – 18:00	Working groups, 1st Session (105')		THW	
	Katrin V	ierhuß/Michael Markus, THW		
	(scenario based assessment and developments)	opment of end-user require-		
18:00	Closing of Day 1 Katrin V	ierhuß/Michael Markus, THW	THW	
End of Day 1				
19:15 - SOCIAL EVENT				

Day 2 (Tuesday, March 25th 2014):

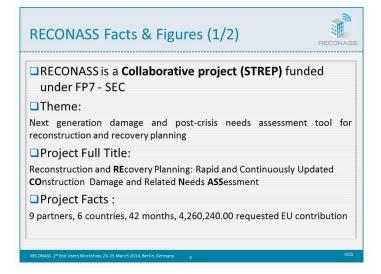
08:30 - 08:40	Introduction to Day 2	THW	
08:40 – 10:30	- 10:30 Working groups, 2 nd Session (110') Katrin Vierhuß/Michael Markus, THW		
	(follow-up: scenario based assessment and development of end-user requirements and preparing a presentation of working group results)		
10:30 – 11:30	Working Groups Outcomes (60') - Wrap-Up/Summary - Actions - Results - Any Other Action Katrin Vierhuß/Michael Markus, THW	THW, all	
11:30 –12:00	Coffee break		
12:00 – 12:15	Next steps and Closing	THW	
	Katrin Vierhuß/Michael Markus, THW		
End of Day 2			
	&		
	END OF THE WORKSHOP		

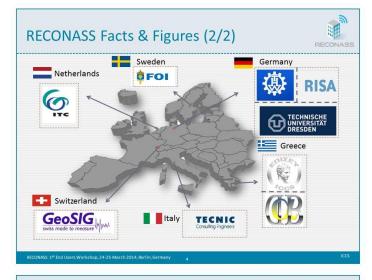
RECONASS Project Presentation

The presentation was held by Mr Evangelos Sdongos, ICCS.













Wireless sensor network each node monitors its local environment and locally processes and stores the collected data each node shares this information with the other neighboring nodes by using a wireless link Sensor data and features of interest to the end-user are provided to a gateway for subsequent communication to the control center Civil engineering SW inputs from the strain sensors installed calculate the axial forces and bending moments developed calculate possible differential settlements and the percentage of the design live loads applied Earth observation Satellites: (i) overall damage extent to be determined, (ii) the coverage and extend of debris to be mapped and blocked roads to be determined Airborne data: allowing validation and adjustment of the satellite-based damage estimates. Finely-tune nested integration of information layers (space-borne, air-borne, ground-based)









- The RECONASS monitoring system will combine civil engineering software to provide structural assessment of both structural components and system after a disaster
- Development of methodology and software for estimating nonstructural damage, structure's functionality and volume of debris
- RECONASS middleware logic to support seamless interoperability among heterogeneous networks by using sensor-based damage assessment
- Provide PCCDN tool that will cooperate, calibrate and validate with space and air – borne equipment
- Extend the RECONASS work to cover additional materials, infrastructures and loadings

S 1st End Users Workshop, 24-25 March 2014, Berlin, Germany

Scientific & Technological Objectives (1/3)



- 1. SotA analysis for post-crisis damage and needs assessment tools
- Development of an indoor, automated, real-time, wireless, local positioning system by using 3D localization of tags for information gathering
- To specify the embedded in structural elements tags' location and to correlate the data gathered with the structure emerged from a disaster
- 4. To assess the residual strength, condition and safety of the structure and elements emerged from a disaster



RECONASS 1st End Users Workshop, 24-25 March 2014, Berlin, Germany

IC

Scientific & Technological Objectives (2/3)



- Development of method and software for assessment of economic loss, building functionality, volume of debris, duration of repairs and needs in manpower and materials
- Design of robust, resilient, seamless and interoperable communication platform to secure that the tags and sensors information will reach the base station at any circumstances
- Use of sensor-based damage assessment of the monitored buildings for calibrating and validating the remote sensing methods



 Development of PCCDN tool for providing recovery stakeholders with detailed, accurate and updated information

ECONASS 1st End Users Workshop, 24-25 March 2014, Berlin, Germany

IC

Scientific & Technological Objectives (3/3)



 To produce an integrated system of the tags, sensors (accelerometers, strain, temperature), the communication platform and the PCCDN tool



- 10. Demonstration of the RECONASS system in a 1:2 scale 3-storey r.c. building for evaluating and comparing the theoretical methods with actual data
- 11. Deployment of UAV for data analysis and evaluation
- RECONASS system further evaluation in pilot scenarios and by performing cost/benefit analysis

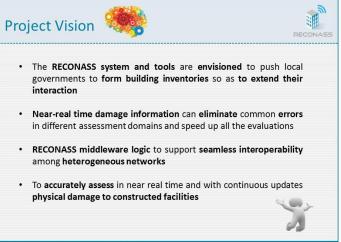


13. To provide conceptualization of the ability that sensor-equipped buildings can be used to create a sensor network for additional threat detection (e.g. chemical or biological contamination)

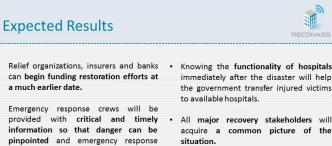
CONASS 1st End Users Workshop, 24-25 March 2014, Berlin, Germany

ICC

Project Challenges (2/3)



Indoor, Real-Time, Continuous, Wireless, Local Positioning: To minimize the indoor positioning accuracy degradation caused by multipath propagation phenomena To ensure that placement, sampling rate and amount of sensors suffice for structural assessment and data integrity. To ensure wireless interconnections functionalities at all times



- situation. Communication in case of disaster,
- the bv guaranteed proposed communication gateway, can save lives.
- effective handling reconstruction and recovery process will have long term financial repercussions.

Disaster cost will be reduced by

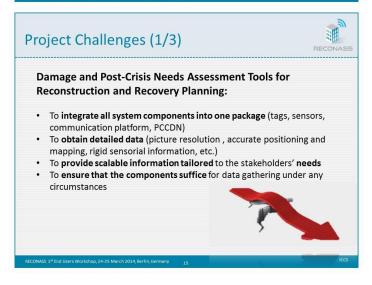
preventing monitored structures from

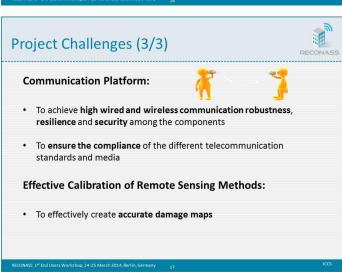
collapsing in order to limit damage to

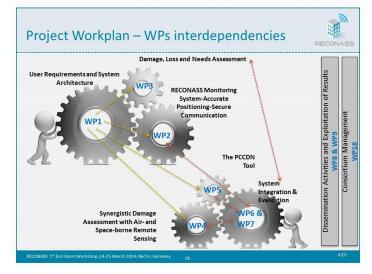
adjacent structures and additional loss of

directed with precision.

life







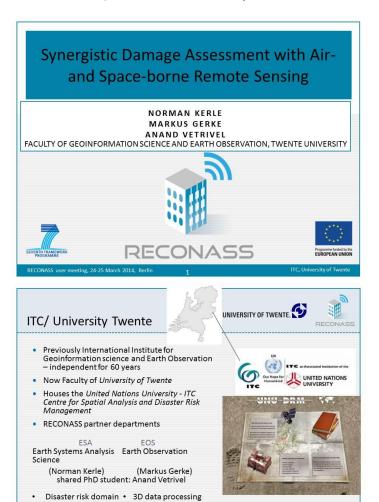


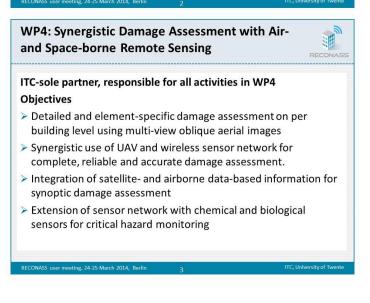




Synergistic Damage Assessment with Air- and Space- Borne Remote Sensing

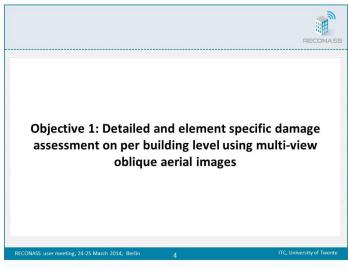
The presentation was held by Dr Norman Kerle, ITC.

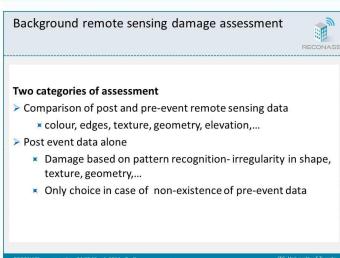


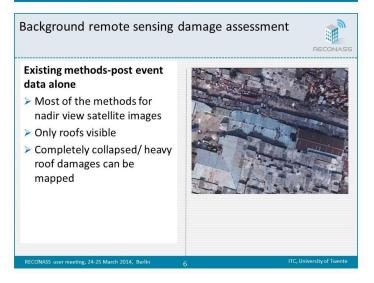


www.unu-drm.nl

Damage mapping • Photogrammetry



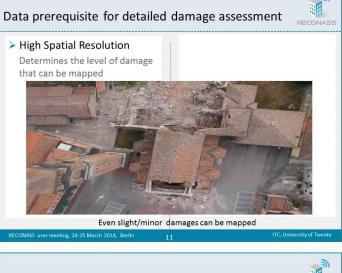


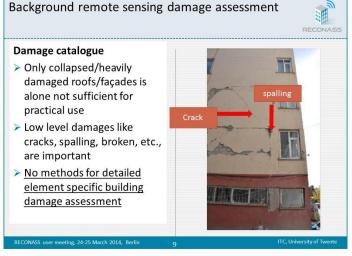


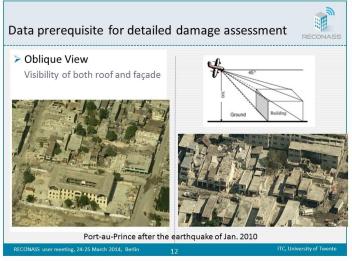


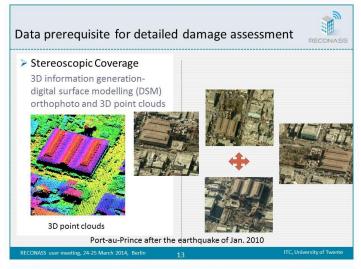


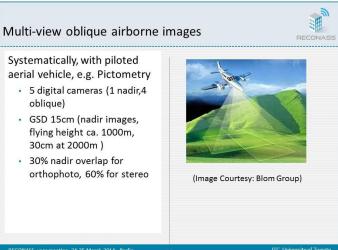


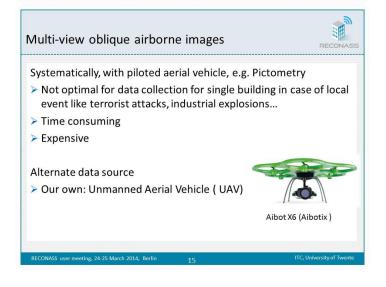


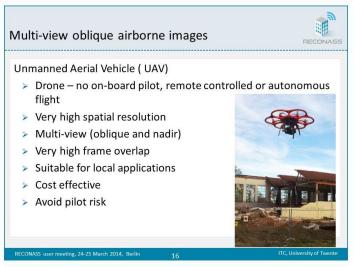


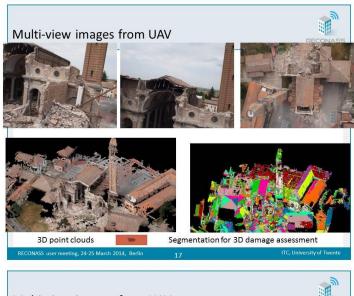


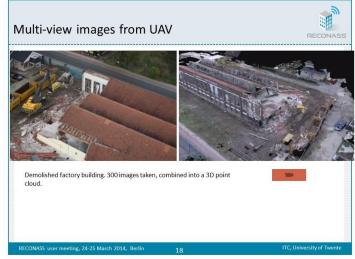


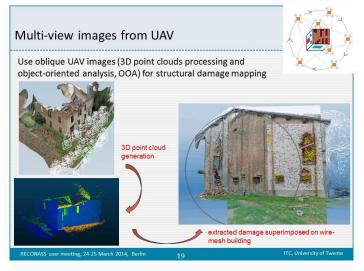












Damage assessment from oblique air-borne images



Development of an automatic methodology for element specific damage assessment at per building level using multi-view airborne oblique imagery

- Semantically-rich inventory for the building from the images and 3D point clouds
- · Damage assessment along all visible elements of the building
- · Mapping and quantification of debris
- Ontology-based comprehensive and objective damage score
- · Comparison of solutions: manned airborne vs UAV

RECONASS user meeting, 24-25 March 2014, Berlin

ITC, University of Twente



Objective 2: Synergistic use of UAV and wireless sensor network for complete, reliable and accurate damage assessment.

RECONASS user meeting, 24-25 March 2014, Berlin

C, University of Twente

Synergistic use of UAV and WSN for damage assessment



Maximize the synergistic advantages of both image and wireless sensor for damage information

- · Information integration to improve damage assessment
- Complimentary data for calibration and validation of damage assessment based on each technology
- Filling the gaps of one technology with the other
- Proxy for sensor information loss

CONASS user meeting, 24-25 March 2014, Berlin

TC. University of Twente

Synergistic use of UAV and WSN for damage assessment



Challenges:

- > Locating the position of sensors in the image
- · Registration sensors annotated 3D CAD model with images
- > Correlation of UAV data and WSN based damage assessment
 - · Identification of visible structural elements in the image
 - Assumption damage index from the WSN can be related to the visual damages like cracks, cover spalling, broken, etc.

CONASS user meeting, 24-25 March 2014, B

ITC Heliversity of Twenty

RECONASS

Objective 3: Integration of satellite- and airborne databased information for synoptic damage assessment

RECONASS user meeting, 24-25 March 2014, Berlin

ITC, University of Twente

Satellite- and airborne data-based information for synoptic damage assessment



Satellite based damage maps

Pros

Extensive area damage assessment

Potential to map the debris coverage, road blockages/site accessibility

Rapid availability, different sensor types (optical, radar)

Cons

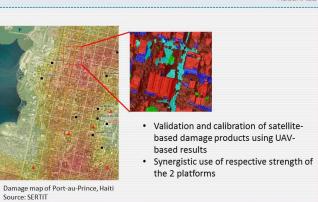
Nadir view: limited visibility- inaccurate damage assessment Lack of ground data for validation and calibration

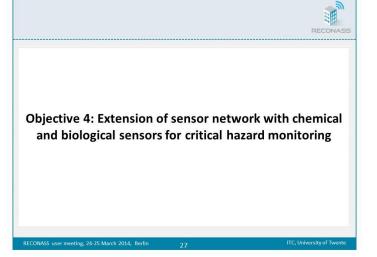
RECONASS user meeting, 24-25 March 2014, Berlin

ITC, University of Twente

Satellite- and airborne data-based information for synoptic damage assessment







Conceptual framework for sensor network extension

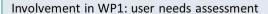


- Release of chemical or biological agents industrial explosion, bomb blast,...
- Measuring the intensity and location of such agents is imperative
- Electro-chemical sensors + auxiliary information like wind speed, direction and population density

Conceptual framework for sensor network extension

A conceptual framework for integration of potential biological and chemical sensors with the existing sensor network to provide time critical information for relevant stake holders.

Hazard map generation
Integration into the Post Crisis Needs
Assessmenttool (PCCDN)





- > Find out how the envisioned information will be useful
- > When, in what format
- Specifically, how can individual damage indicators be associated with overall building state
- Should damage scales such as the EMS98 be modified (or replaced) for image-based damage assessment results?

RECONASS user meeting 24-25 March 2014 Berlin

30

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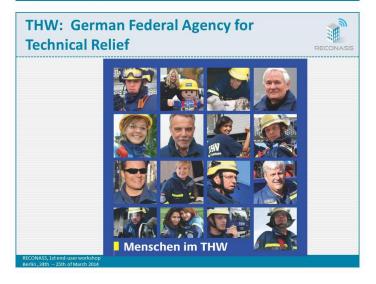
(Grant Agreement No. 312718)

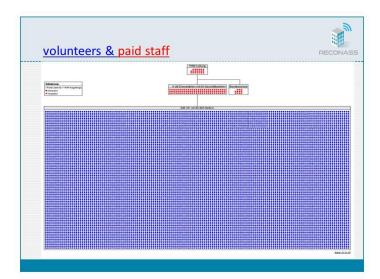
German Federal Agency for Technical Relief

The presentation was held by Dr Katrin Vierhuß-Schloms, THW.



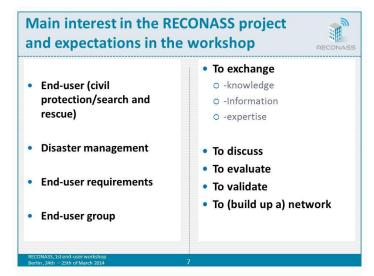










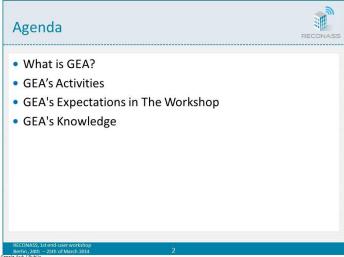




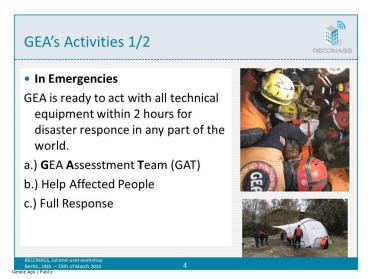
Search and Rescue Group

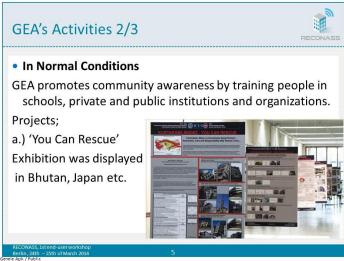
The presentation was held by Mr Harun Markopcuoglu, GEA.



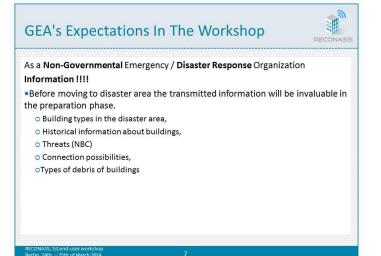


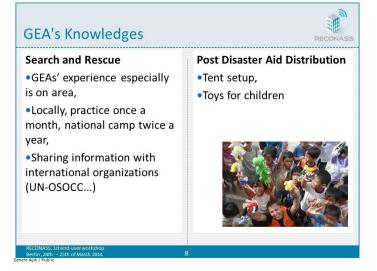
















Fire Brigade Ghent

The presentation was held by Mr Tom Van Esbroeck, FBG.











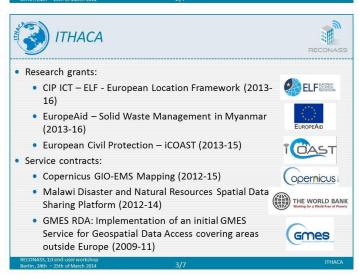


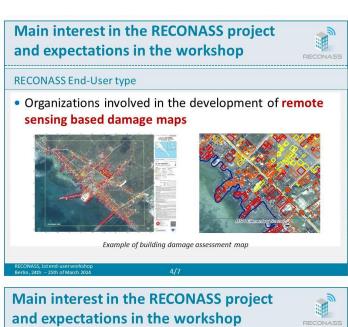
Information Technology for Humanitarian Assistance, Cooperation and Action

The presentation was held by Dr Fabio Giulio Tonolo, ITHACA.









Satellite/aerial-based emergency mapping

- Supporting mainly disaster response activities (first hours /days after the event)
- Provide disaster extent information (smaller map scales. lower level of detail) and/or damage assessment information (larger map scales, higher level of detail up to single building) depending on disaster type and input imagery technical features

RECONASS → Focus on building damage assessment

- Current methodology: mainly visual interpretation exploiting pre and postevent imagery
- Known limitations: vertical imagery, cloud coverage (SAR imagery limitations), thematic accuracy (only external visible damages can be detected)

Main interest in the RECONASS project and expectations in the workshop



Main interest in RECONASS project:

- UAV imagery
- PCCDN tool outputs

Expections in the workshop:

- Better understand the UAVrelated activities, especially in terms of spatial and temporal resolution, offnadir angle capabilities, post-processing time, regulation/insurance issues
- Investigate the possibility to extrapolate discrete building structural information to support/calibrate the image visual interpretation process

RECONASS, 1st end-user workshop Berlin, 24th — 25th of March 2014 6/7



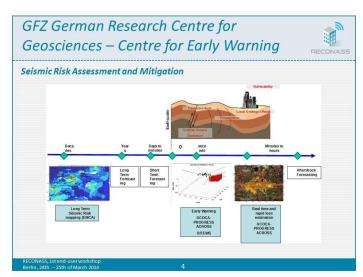
German Research Centre for Geosciences – Centre for Early Warning

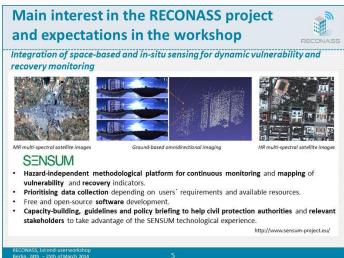
The presentation was held by Dr Marc Wieland, GFZ.



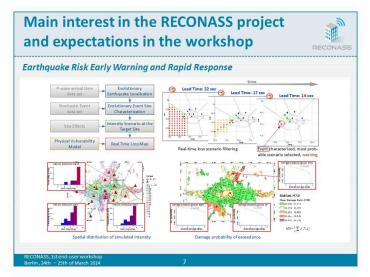










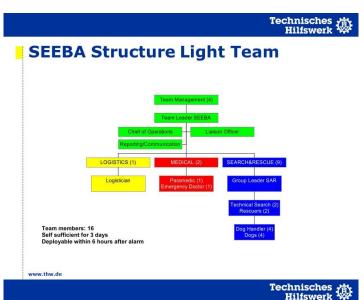




Urban Search and Rescue

The presentation was held by Mr Frank Blockhaus, SEEBA-THW.





SEEBA

"SEEBA" - a specialized rapid deployment unit for Urban Search & Rescue after earthquakes



www.thw.de



Rapid Deployment Unit Urban Search and Rescue (SEEBA)

- Established in 1988
- deployable within 6 hrs
- Team size: up to 68
- build up according INSARAG Guidelines
- Classified as HEAVY Team by **UN-OCHA**
- Self sufficient for 10 days





Structure Medium Team

Structure Heavy Team

General Inspectorate for Emergency Situations

The presentation was held by Mr Ioan-Cristian Constantin, GIES.



General Inspectorate for Emergency Situations



• The main objective of GIES activities targets at rendering more efficient the prevention and management of emergency situations with a view to keep risks under control and provide normal life conditions for communities. This objective is achieved by means of a series of prevention and intervention activities, extrication and emergency medical service (SMURD), rescue and flood damage mitigation, intervention at landslides, earthquakes, epidemics, epizootics, snow-drifts, drought, technological accidents, radiological, chemical, biological and nuclear incidents and other natural or man-made calamities.

RECONASS, 1st end-user workshop Berlin, 24th – 25th of March 2014

General Inspectorate for Emergency Situations



• EMERGENCY INTERVENTION AND RESPONSE - GIES together with its County Inspectorates execute the following missions imposed by an efficient process of emergency management: monitoring, assessment, investigation of motives for the occurrence of emergency situations, information, training and warning of the population, notification of public administration authorities on the possibility / imminence of occurrence of emergency situations, search and rescue, extrication, evacuation of individuals, population or endangered material goods, setting camps for displaced/affected people, transport of the population and various categories of goods, destruction of ice dams and clearance of water courses, provision of emergency medical assistance by means of SMURD modules (which are part of the professional emergency services), provision of logistics exigencies for GIES own structures and if the case, certain types of equipment, materials or technique for different other structures, limit fire spread and fire extinguishing, population/technical/equipment decontamination by means of specialized technical equipment, neutralizing the effects of dangerous materials through disposal of ordnance, remained unexploded after the military conflicts.

General Inspectorate for Emergency Situations



PREVENTION - The prevention concept involves undertaking the following
types of activity: establishment of proper orders / regulations on protection
against fires and civil protection, grant the approval / authorization for
constructions and installations with respect to fire safety and civil protection,
notification of relevant authorities and population warning, disposal of
unexploded ordnance and CBRN protection, grant the specific authorization
for certain public activities, prevention control / inspection, special technical
assistance, public information and training, market surveillance regarding
products' compliance with fire safety demands, coordination, control and
training in terms of prevention of voluntary/private services for emergency
situations.

Event name and date

General Inspectorate for Emergency Situations



• INTERNATIONAL COOPERATION - GIES is focusing on providing Romania a proper representation at European Union (Council and Commission) and NATO (Civil Emergency Planning) levels in the field of civil protection and disaster assistance. Nevertheless, a special importance is also granted to activities organized by United Nations (UN-OCHA), Disaster Prevention and Protection Initiative (DPPI SEE), DKMT Euro-Region (Danube-Cris-Mures-Tisza), Civil-Military Emergency Planning Council for South-Eastern Europe (CMEPC SEE), Black Sea Economic Cooperation (BSEC).

vent name and date

Main interest in the RECONASS project and expectations in the workshop 1-3 slides



Click to edit subtitle

What is your "user type" according the list:

- Governmental Emergency / Disaster Response Organizations
- As integrator of the National Emergency Management System, a concept created in 2004, GIES coordinates all institutions involved in the process of emergency management. It also works as national point of contact for all relevant international governmental and non-governmental organizations.
- Main interest in this project is to create a own bulding monitoring system (20) and medical emergency (17) from Bucharest in the case of an earthquake or another disaster.

RECONASS, 1st end-user workshop Berlin, 24th - 25th of March 2014

Main interest in the RECONASS project and expectations in the workshop



 Please explain the activities and knowledge of your organization in the subject area, RECONASS is adressing

(e.g. disaster management, sensors in buildings, post disaster damage, loss and needs assessment, remote sensing, damage maps)

- In the event of a natural disaster or technological GIES works for:
 - Search Urban Rescue;
 - Fire Fighting;
 - First Aid Trained;
- GIES has no experience in:
 - Sensors in buildings;
 - Post disaster damage;
 - Loss and needs assessment;
 - Remote sensing;
 - Damage maps;

Berlin, 24th – 25th of March 2014

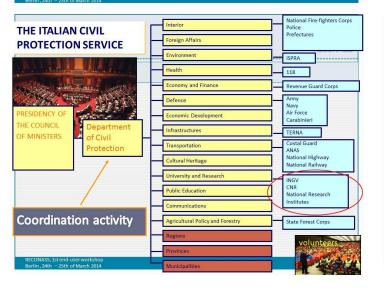


National Department of Civil Protection, Italy

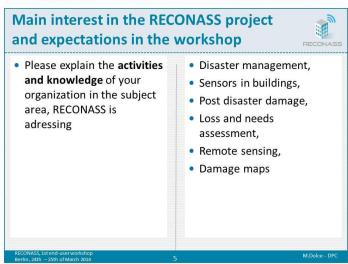
The presentation was held by Prof. Mauro Dolce, DPC.









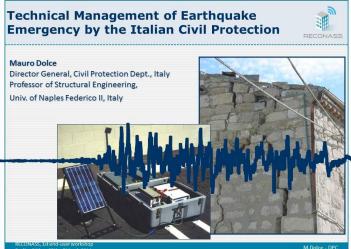




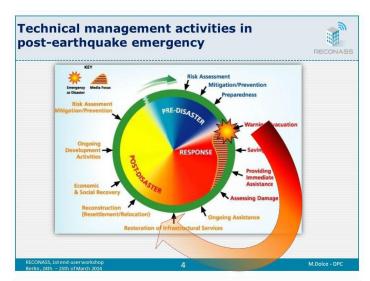
Earthquake Emergency – Monitoring Strategies - DrHouse

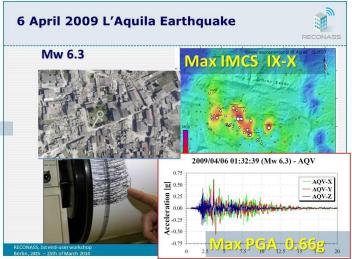
The presentation was held by Prof. Mauro Dolce, DPC as a key note speech.

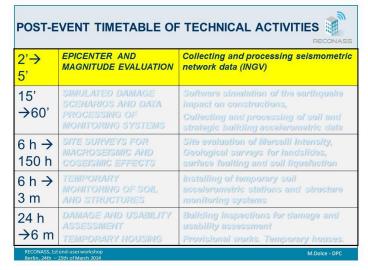




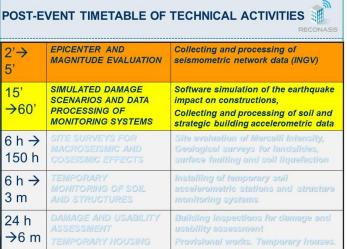


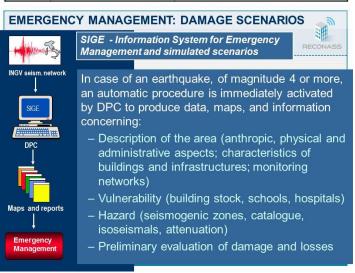




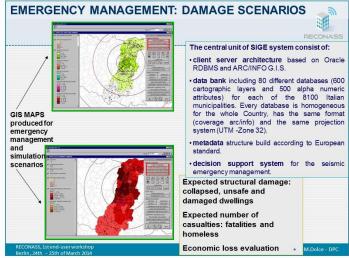


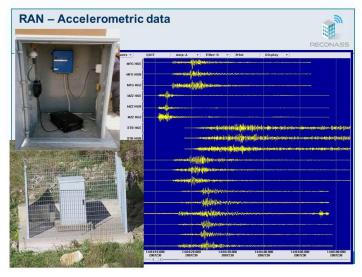




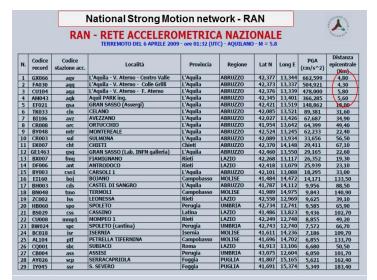








(Grant Agreement No. 312718)

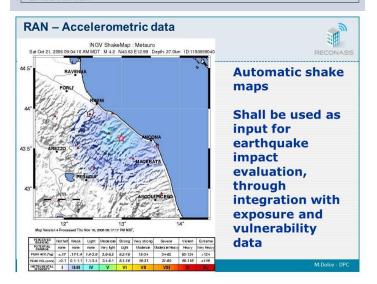


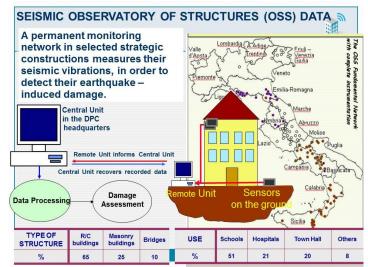
Codice record	Codice stazione acc.	Località	Provincia	Regione	Lat N	Long E	PGA (cm/s^2)	Distanza epicentrale (Km)
AU056	cmr	CASTELMAURO	Campobasso	MOLISE	41,833	14,712	5,286	126,90
AY081	ctl	CATTOLICA	Rimini	EMILIA R.	43,955	12,736	4,371	186,60
BD004	scm	S. CROCE DI MAGLIANO	Campobasso	MOLISE	41,711	14,984	4,230	153,20
CA056	sns	SANSEPOLCRO	Arezzo	TOSCANA	43,567	12,143	3,828	168,00
QX001	vrp	VAIRANO PATENORA	Caserta	CAMPANIA	41,333	14,132	3,531	129,40
BB007	sep	S. ELIA A PIANISI	Campobasso	MOLISE	41,625	14,880	3,514	150,40
GK004	cmb	CAMPOBASSO	Campobasso	MOLISE	41,563	14,652	2,905	138,90
BM444	nap	NAPOLI Ovest	Napoli	CAMPANIA	40,799	14,180	2,609	184,50
F0003	tis	TELESE TERME	Benevento	CAMPANIA	41,222	14,530	2,602	158,50
AY017	ric	RICCIA	Campobasso	MOLISE	41,483	14,838	2,515	156,50
QI081	mnn	MANFREDONIA	Foggia	PUGLIA	41,634	15,911	2,366	227,30
DF032	snm	SAN MARINO		EMILIA R.	43,934	12,449	2,322	191.80
BU012	mng	MONTE S. ANGELO	Foggia	PUGLIA	41,704	15,958	2,315	228,40
AR042	gnl	GENZANO DI LUCANIA	Potenza	BASILICATA	40,843	16,033	2,210	279,40
DM033	vie	VIESTE	Foggia	PUGLIA	41,877	16,165	2,205	239,70
BX001	bne	BENEVENTO	Benevento	CAMPANIA	41,128	14,785	2.040	180,40
EC009	can	CANDELA	Foggia	PUGLIA	41,203	15,475	2.025	218,00
AV122	bdt	BADIA TEDALDA	Arezzo	TOSCANA	43,707	12,188	1,991	178.80
BS035	sdq	S. GIOVANNI ROTONDO	Foggia	PUGLIA	41,709	15,733	1,985	192,00
BO056	cnm	CASALNUOVO MONTEROTARO	Foggia	PUGLIA	41,618	15,105	1.877	166,90
EB150	cer	CERIGNOLA		PUGLIA	41,260	15,910	1.750	245,20
AT182	for	FORLI'	Forli - Cesena	EMILIA R.	44,199	12,042		232,30
AR006	pdm	PIEDIMONTE MATESE	Caserta	CAMPANIA	41,355	14,385	1,509	139,40
BG067	stn	STURNO	Avellino	CAMPANIA	41,018	15,112	1,376	208,00
BA125	avl	AVELLINO	Avellino	CAMPANIA	40,923		1,278	198,10
BM130	pic	PIANCASTAGNAIO	Siena	TOSCANA			1,244	147,10
A0008	bbn	BIBBIENA	Arezzo	TOSCANA			1.002	199,60
EH008	stl	SATRIANO DI LUCANTA	Potenza	BASILICATA		15,642	0,948	277,40
	record AU056 AY081 BD004 CA056 QX001 BB007 GK004 BB007 GK004 BM444 F0003 AY017 Q1081 DF032 BW012 AR042 DM033 BX001 EC009 AV122 BS035 BQ056 EB150 AT182 AR006 BG067 BA125 BM130	record stazione acc. AU056 cmr AV081 ctl BD004 scm CA056 sns QX001 vrp BB007 sep GK004 cmb BB007 sep GK004 cmb BM444 nap F0003 tis AV017 ric Q1081 mnn DF032 smm BU012 mnn AR042 gril DM033 vie BX001 bre EC009 can AV122 bdt BX001 cer AV122 cor AV122 squ BU056 cmm BC007 stn	Record Stazione acc. Localita	Record Stazione acc.	Regione	Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Regione Re	Regione Lat N Long	Regione Lat N Long C(m/s^2)

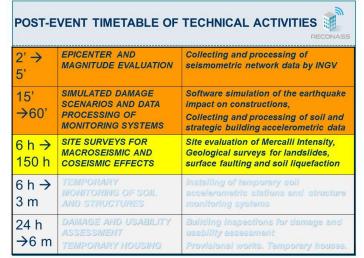
Illies con codice alfanumerico (ses. AX006) si riferiscono a registrazioni accelerometriche di strumenti digitali e sono dati in formato ascii.

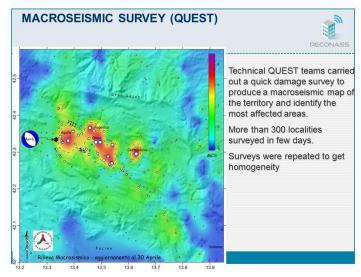
 It e registrazioni digitali, in unità di (cm/s² 2), sono suddivis e pre le re componenti del moto; Longitudinale (YLN), Trasversale (XTE), Verticale (ZUP) più un header (HDR) e sono tutte campionate a 200 campioni al secondo (sps).

Gli strumenti digitali della RAN sono dotati di ricevitore GPS e quindi hanno un riferimento temporale che ne consente l'associazione univoca all'evento sismico.









GEOLOGICAL SURVEY Retaining wall failure Umbria-Marche, Italy, 1997

Technical teams carry out surveys aimed at recognising, mapping and evaluating earthquake effects on the natural environment:

· landslides

 \rightarrow 6 m

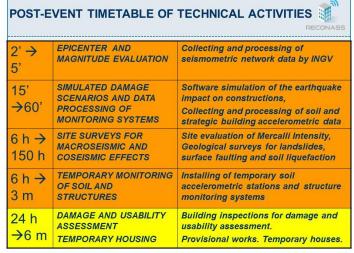
- · surface faulting and fracturing
- · soil liquefactions

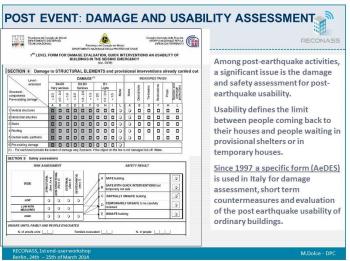


POST-EVENT TIMETABLE OF TECHNICAL ACTIVITIES FPICENTER AND Collecting and processing of MAGNITUDE EVALUATION seismometric network data by INGV 5 SIMULATED DAMAGE Software simulation of the earthquake 15' → SCENARIOS AND DATA impact on constructions, 60 PROCESSING OF Collecting and processing of soil and MONITORING SYSTEMS strategic building accelerometric data SITE SURVEYS FOR Site evaluation of Mercalli Intensity, $6h \rightarrow$ MACROSEISMIC AND Geological surveys for landslides, 150 h COSEISMIC EFFECTS surface faulting and soil liquefaction TEMPORARY Installing of temporary soil $6h \rightarrow$ MONITORING OF SOIL accelerometric stations and structure 3 m AND STRUCTURES monitoring systems 24 h

TEMPORARY STRONG MOTION MONITORING In order to increase the amount of strong motion data of aftershocks, a mobile strong motion network is installed in the epicentral area GPS Serial Modem GSM - serv.SMS ACCELEROGRAMS Acceleration PEAKS Portable instrument (mobile network) BECONASS, Literal-user workshop Bettin, 24th - 25th of March 2014

TEMPORARY STRUCTURE MONITORING To keep under control some fundamental strategic buildings in the affected area (hospitals, etc.) and detect any damage due to aftershocks, 10 monitoring systems are installed after an earthquake The upper floor is monitored with two radio-linked biaxial sensors. surrounding A triaxial is added in the BUILDING surrounding land. Elaborations are made in local roofing floor mode and immediately transmitted. Typical sensor layout for temporary monitoring of buildings



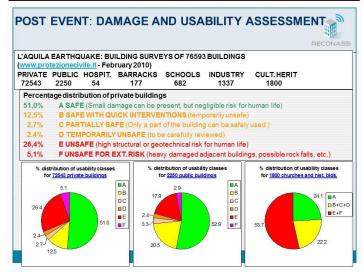


POST EVENT: DAMAGE AND USABILITY ASSESSMENT

JSABILITY

Post-earthquake usability evaluation is a quick and temporarily limited assessment, based on expert judgement of specially trained technical teams, on visual screening and on easily collected data, aimed to detect if, during the current seismic crisis, damaged buildings can be used, being reasonably safeguarded the human life.

being reasonably saleguaraea are numan me.				
A) USASLE	Statistics of the used without researces. Small damage, but negligible tick fel human life.			
B) USABLE WITH COUNTERMEASURES	Building is damaged, but can be used when short term countermeasures are taken			
C) PARTIALLY USABLE	Only a part of the building can be safely used			
D) TEMPORARILY UNUSABLE	Building to be re-inspected. Unusable until the new inspection.			
E) UNUSABLE				
F) UNUSABLE FOR EXTERNAL RISK	Building could be used, but it cannot due the high risk caused by external factors (heavy damaged adjacent or facing buildings, possible rock falls, etc.)			











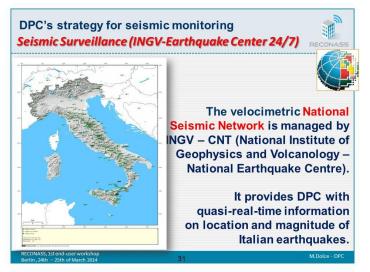


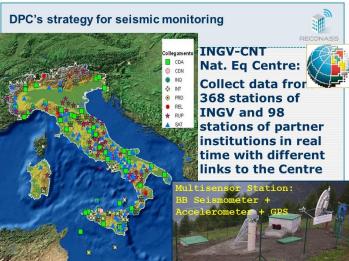
The seismic monitoring strategy of DPC is based on the following activities:

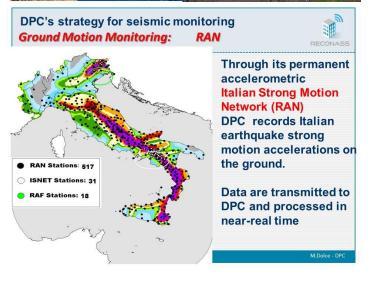
- 1) Seismic surveillance → INGV-CNT
- 2) Ground motion monitoring → DPC-RAN
 - RAN Permanent network
 - RAN Mobile network
- 3) Structure monitoring → DPC-OSS
 - OSS Main permanent network
 - RAMSES Simplified system network
 - OSM Mobile network

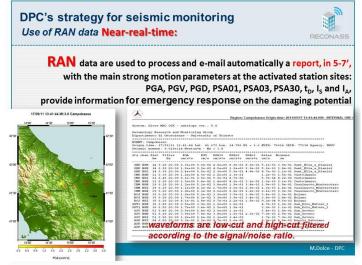
RECONASS, 1st end-user workshop Berlin , 24th - 25th of March 2014 M.Dolce - DPC

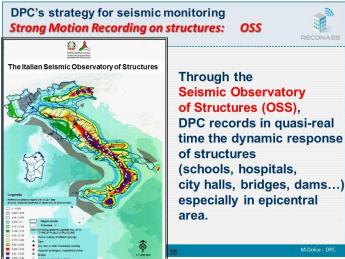
(Grant Agreement No. 312718)

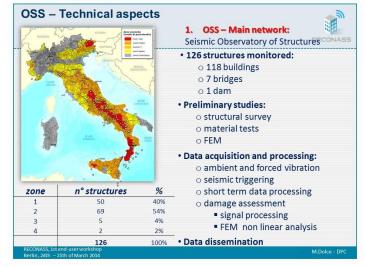


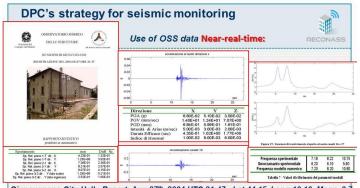












Giuncugnano City Hall: Report Aug.27th, 2004 UTC 21:47 - Lat.44.15, Long.10.16, Magn. 3.

OSS data reach a central server, which processes them to describe both local ground shaking and structural dynamic response. Seismic damage is assessed, and a comprehensive Report is automatically produced and sent via e-mail. Damage can be extrapolated to nearby similar structures.

OSS – Earthquake data processing



Data arriving to the main server are automatically processed by a MATLAB code, developed by DPC. The code carries out the following tasks:

- · checks the arrival of new data;
- · computes strong motion parameter;
- · computes main parameters of strucural response;
- · identifies modal parameters;
- · assesses damage;
- · writes a report
- · saves data and report on DPC FTP server

DATA ARE PROCESSED IN 15 MIN AFTER THE EVENT FOR EACH STRUCTURES

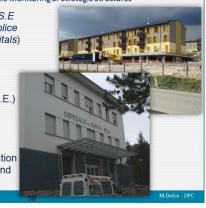
OSS - Technical aspects



2. RAMSES: Rapid Alarm and Seismic Monitoring of Strategic Structures

• 14 buildings (L'Aquila: 8 C.A.S.E project +4 Coppito Financial Police School + Cascia&Branca hospitals) Contract starting for further 8 hospitals in Umbria region

- · Sensors are located only:
 - ♦ at the base ♦ on top
 - ◆ at isolation level (C.A.S.E.)
- Wireless local network
- · Embedded data processing:
 - o daily ambient vibration
 - o seismic response
 - o post-seism ambient vibration
- · Automatic report generation and delivery via GPRS



OSS - Technical aspects



3. OSM: Mobile Seismic Observatory - simplified temporary monitoring systems on public buildings located in the area of the epicenter, to record the dynamic response during aftershocks.

- 10 structures during the L' Aquila seismic sequence (2009)
- · Sensors are located only: o at the base
 - o on the top
- Wireless local network
- Mobile modem connection



OSS - Technical aspects



Regular sensor layout (OSS - Main network)



- · assess the safety of buildings;
- provide data on seismic behavior, useful for theoretical developments and regulatory requirements:
- evaluate the supplementary sample expedition results:
- · provide data to create earthquake scenarios.

Simplified sensor layout (RAMSES and OSM)

It allows OSS to:

- · approximate safety evaluations;
- · extend monitoring to many strategic buildings.

OSS - Earthquake data processing Automatic data processing – an example



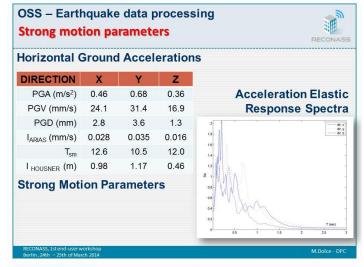
Aftershock: April 7th 2009 17:47 UTC MI=5.3 depth 15.1 km de=22.32 km

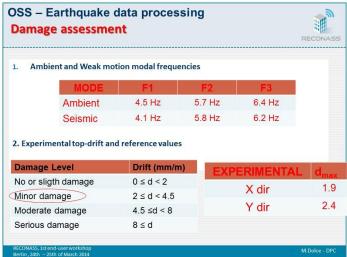


Regular Permanent Monitoring System

Simplified Temporary Monitoring System

(Grant Agreement No. 312718)





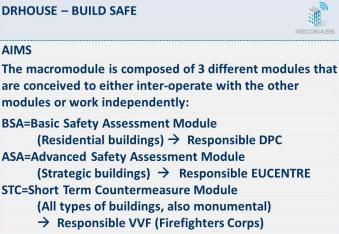




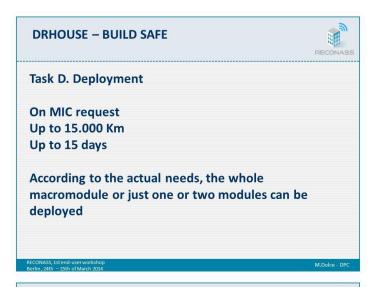


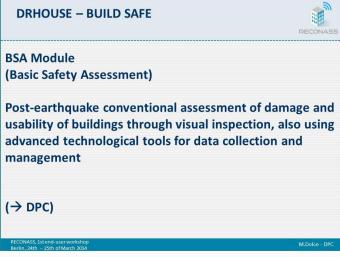


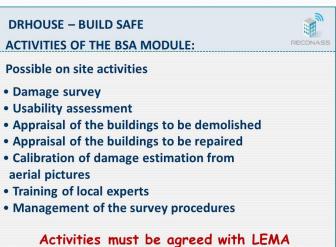


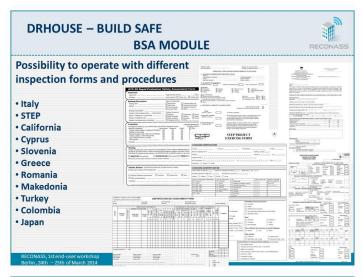




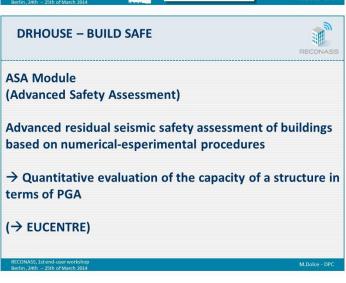


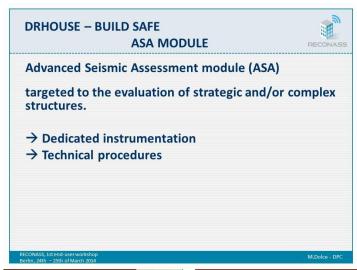






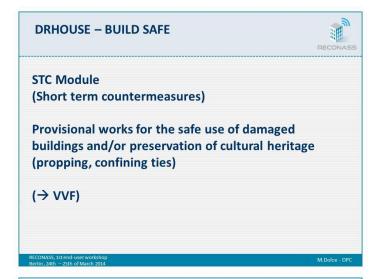


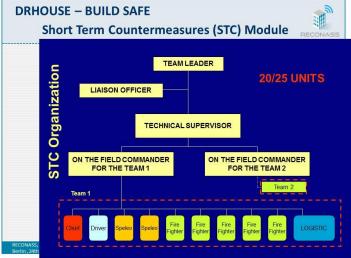












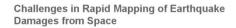






Challenges in Rapid Mapping of Earthquake Damages from Space

The presentation was held by Dr Stefan Voigt, DLR as a key note speech.



Dr. Stefan Voigt, DLR





- Aeronautics
- Space Research and Technology
- Transport
- Energy
- Security



- Research Institution
- Space Agency Project Management Agency

German Aerospace Center



DLR







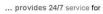
Offices in Brussels, Paris, Tokyo and Washington.



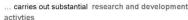




DLR Center for Satellite Based Crisis Information (ZKI)



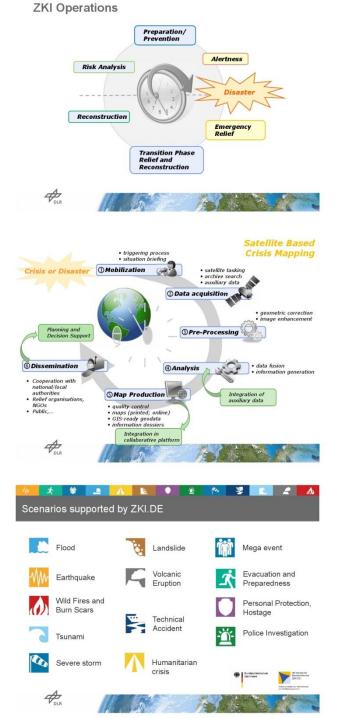
- rapid mapping and damage assessment
- monitoring crisis situations
- reference mapping for disaster preparedness
- ... supports the "International Charter on Space and Major Disasters"



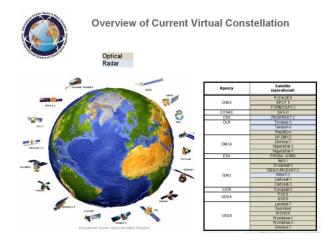


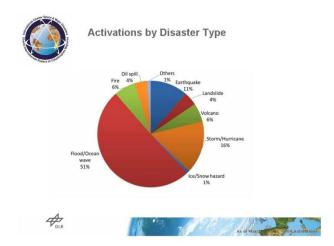
Synergies between Research and Services











The Challenge of Mapping Earthquake Damages from space

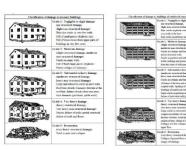
- In most cases optical data used for visual assessment
- Perspective => from top (orthogeometry)
- Resolution => only submeter, every cm counts (currently > 50cm)
- Timeliness => days; still challenging to meet: < 100h
- Automation difficult to achieve for emergency (=> research)
- Synthetic Aperture Radar (SAR) amplitude: only little information content
- SAR coherence can help, if dry environments and recent archives exist
- SAR interferometry=> good for displacement fields
- SAR PS techniques for buildings => experimental





The Challenge of Mapping Earthquake Damages from space



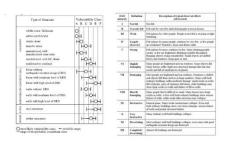






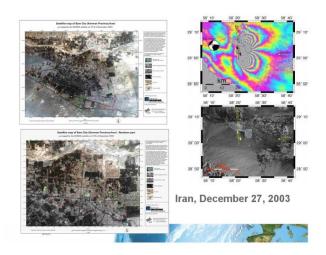
The Challenge of Mapping Earthquake Damages from space







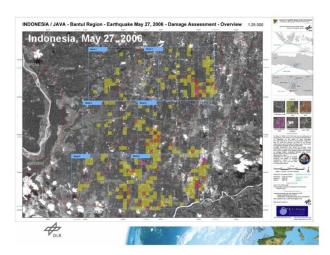


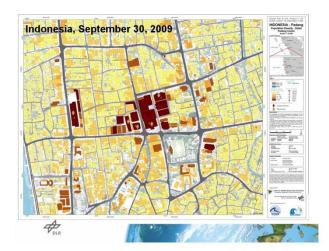


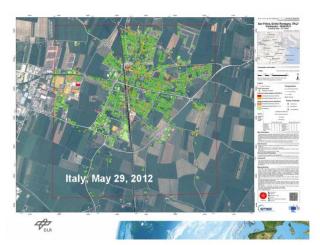
Pakistan, October 8, 2005





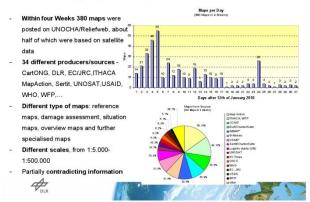








"Haiti Mapping Challenge"



The experience of the recent years has shown that there is a need for structured and coordinated global cooperation in satellite-based emergency mapping - especially during extreme events.

- Scale of: Tsunami 2004, Haiti-EQ 2010, Pakistan-Flood 2010
- Many actors and numerous satellite mapping / analysis efforts, on ad hoc basis...
- Coordination needed on who does what, what is needed and how to better collaborate...
- ... to avoid "mapping challenges"!









Assets (+)

- Various global, regional and national mechanism/services
 Good general availability of space imagery (Charter, Industry, open
- access data...)

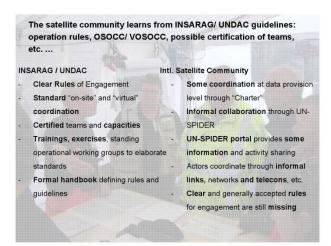
 Ad hoc coordination via individuals and mutual arrangements
- Profile of satellite based emergency mapping is rising globally
- Internet communities are developing

Deficits (-)

- No common rules of engagement
 No guidelines on how to operate and cooperate
 No qualifying and certifying of
- capacities => all is best effort

 No best practices handbook, no common quality assurance or
- validation
 No global coordination scheme
- No common **training and exercising** of procedures and collaboration





International Working Group on Satellite based emergency Mapping – IWG-SEM – initiated in 2011



Conclusions

- Mapping of earthquake damages from space **remains a challenge**
- Every cm of better **spatial resolution helps** to improve analysis results
- "Ground-truth" and $\mbox{\tt "ground-reference}\mbox{\tt ``are important to aid/calibrate}$
- Different representations of damage grades are used
- Automation of damage assessment is hardy possible
- Optical image analysis dominates AR only used experimentally
- There is still quite a way to go in order to "link" sensors attached to buildings with stress/damage patterns mapped from space....

...thus, it will be interesting to follow the RECONASS project to see developments in this direction



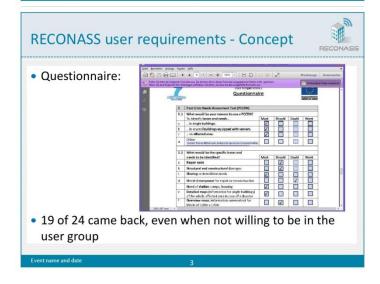


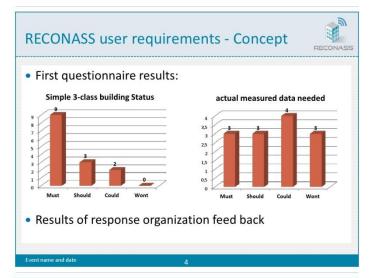
End-user Requirements Working Group 1

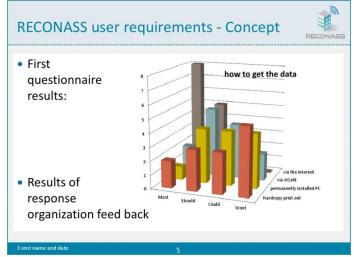
The presentation was created to show the results obtained during the Working Group A session (part a)

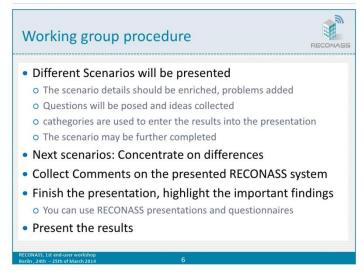












Basic principles for the working groups



- Reinforced concrete buildings to be equipped with sensors
- Different points of views depending on the actors
- · Everybody can contribute

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Scenario 1: Fire, limited fire spread







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Scenario 1: Fire, limited fire spread



- The building is used for administration with public access.
- The fire can be limited to an area inside the building
- There are reports of witnesses, that there was a small explosion at the beginning of the fire
- The local fire impact may have caused structural damages
- No disaster environment, standard procedures are possible, the local fire brigade will handle the event

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Scenario 1: Fire, limited fire spread







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Scenario 1: Fire, limited fire spread





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Scenario 1: Fire, limited fire spread



- The 'Reconass' project provides practical and additional information (real time, fast, crucial):
 - o Intervention planning;
 - o Tactical decision making in firefighting;
 - o Monitoring actions first responder crews.

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



Data intervention planning

- o 3D mapping of complete infrastructure of the building
 - * Basic building information (intervention plans are already in use (paper or digital), but not for all buildings: way in, way out, evacuation areas, evacuation routes, detection systems, automaticle fire extinguishing installations. ...
 - Occupant's information: how many, how old? What's their mobility (fysicaly, psychologicly, asleep/awake)? What is the spread of the occupants in the building? Do they know the building? Are they trained?
 - Specific hazards: dangerous goods, gas installations, electrical installations
 - Affected areas in the building?
 - ➤ Detection systems? Automatical Fire Extinguishing Installations? (Sprinkler) → time of activation

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



Data tactical decision making: BSAHF model

- o Building
- o Smoke
- o Air track
- o Heat
- o Flame

→ SPECIFIC KNOWLEDGE REQUIRED:

Fire Behaviour and Fire Fysics, building construction

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



Data tactical decision making: BSAHF model

- o Building
 - ▼ Complexity of the building's inside structure: evacuation & firefighting
 - Material inside the rooms (fuel)
 - ▼ Thermic damage to construction:
 - Temperatures in the structure/ of the reinforcing bars
 - o Movement of structural parts (which/range)
 - o Strain of reinforcement bars (corelating with temperature)

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



Data tactical decision making: BSAHF model

- o Smoke
 - Smoke development / density(optical sensors)
 - × Lenght of sight
 - Movement/circulation flow of smoke through the building
 - × Concentrations of gasses in the smoke: oxygen, C, CO, CO2, LEL & HEL

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



Data tactical decision making: BSAHF model

- o Air track
 - × Ventilation conditions: underventilated, overventilated, or fuel controled fire
 - × Pressure curve
 - ▼ Flashover/Backdraft risks
 - Movement/circulation of fresh air through the building
 - ▼ Ventilation installations and their effect

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



Data tactical decision making: BSAHF model

- o Heat
 - ▼ Temperature curves (type of burn): Heat Relaese Rate versus FF capacity
 - Measure the distribution of temperatures (ceiling + floor)
 - Movement/circulation of heat through the building
 - Changes of temperature in different places?
 - Intensity of radiation, convection
 - ▼ Thermic damage to construction:
 - o Temperatures in the structure/ of the reinforcing bars
 - o Movement of structural parts (which/range)

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



- Data tactical decision making: BSAHF model
 - o Flame
 - × Colour
 - x Turbulance
 - **x** Behaviour

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



- Data monitoring actions first responder crews
 - x 3D model of intervention plan
 - ▼ Localisation/Position of first responders
 - Bio sensors: fysical and psychological behaviour
 - ▼ Connection to PSE : BA, sensors integrated in FF-clothes

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



- What types of photos do you need?
 - o Spread and progress of the fire
 - O Areas you can not reach with the ladder (detailed and overview)
 - O At large fires, not always for the shown scenario 1

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Scenario 1: Fire, limited fire spread: Questions and answers – measured data



- What types of photos do you need?
 - o Street view
 - o Thermal and visual
 - o Aerial view
 - o Top/oblique/horizontal
 - o Total / details and what resolution (mm cm dm..)
 - o Before/after
- When do you need the photos?
 - o ASAP

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Scenario 1: Fire, limited fire spread: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - Damage assessment / collapse, partly collapse, structural/nonstructural ++
 - o Collapse hazard (how to be measured?) +++
 - o Remaining load capacity: ??
 - o Shoring or demolition needs –not necessary for single buildings
 - o Material losses: fire fighters dont care
 - o Need for repair: –not necessary for single buildings to be calculated by RECONASS system
 - o Repair costs, needed manpower for repair
- o Human losses, needs for medical treatment

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Scenario 1: Fire, limited fire spread: Questions and answers – how and when



- How do you want to receive your data here
 - o At the command post via the internet+ at the crisis centre
 - o Error bars, liability
 - o Standardized, certified because of responsibilty for the team (interface near)
 - o Classified information? Rely on the internet??
 - o Simple robust: has to be fire fighter proof, simple robust, easy to handle

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Scenario 1: Fire, limited fire spread: Questions and answers – how and when



- How do you want to receive your data here
 - o 3D model
 - o Raw sensor data: temperature over time, curves \rightarrow command post
 - o GIS ready data
 - Pdf: too many documents, you need a specialist to read this, need somebody to interpretate the data real time information needed, no time for print out and
 - o Hard copy print out: NO
 - o On a permanently installed PC / monitor in/outside the building: on the screens of our devices we already have
 - o Data and results via WLAN
 - o Data and results via the internet

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Task 5.7 Applications Development, Visualization and User Interface RECONASS RECONASS RECONASS RECONASS RECONASS



Scenario 2: Earthquake, building 1



- Building 1 is used for administration with public access.
- Building 1 is not collapsed, persons are inside the building
- Some damaged parts of the building may lead to collapse
- disaster environment, limited resources, no local response teams
- Further scenario details:
- Persons inside the building, missing people, natural gas, electricity, hazmat
- What construction type

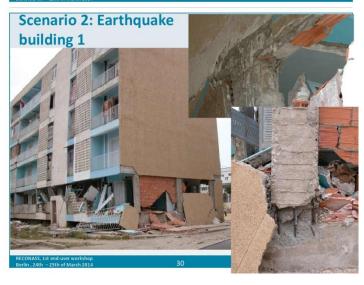
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Scenario 2: Earthquake, building 1











Space to enter further scenario descriptions/challenges:

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Scenario 2: Earthquake, building 1: Questions and answers – measured data



- · Which kind of data would you need for this event?
 - o Relative movements between the floors
 - o Stresses inside the material
 - o Direction of earthquake movements

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Scenario 2: Earthquake, building 1: Questions and answers – measured data



- Which kind of data would you need for this event?
 - o Basic building information: like scenario 1
 - Historical information about the building: parts were added, basement,
 - o Occupants' information: ++ same like fire
 - o Specific hazards:
 - o Affected area in the building:
 - o Measured data (with range):
 - Movement of structural parts (which/range)
 - Strains, accelerations,
 - Positions of the structural elements
 - ★ Acceleration curves ?

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Scenario 2: Earthquake, building 1: Questions and answers – measured data



- What types of photos do you need?
- When do you need the photos?

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Scenario 2: Earthquake, building 1: Questions and answers – measured data



- What types of photos do you need?
 - o Street view
 - o Aerial view
 - o Top/oblique/horizontal
 - o Total / details and what resolution (mm cm dm..)
 - o Before/after
- · When do you need the photos?
 - o Time after event
 - o Different products at different times?

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Scenario 2: Earthquake, building 1: Questions and answers – calculations and assessment



Which kind of calculations and results would you need?
 And how must this information be measured and shown

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Scenario 2: Earthquake, building 1: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - Damage assessment / collapse, partly collapse, structural/nonstructural
 - o Collapse hazard (how to be measured?)
 - o Do you need a **simple post-event building status** of the monitored building such as **usable**, **partially usable** and **unusable**?
 - o Remaining load capacity:
 - o Shoring or demolition needs
 - o Material losses: Need for repair:
 - o Repair costs, needed manpower for repair
 - o Human losses, needs for medical treatment

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Scenario 2: Earthquake, building 1: Questions and answers – how and when



• How do you want to receive your data here

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Scenario 2: Earthquake, building 1: Questions and answers – how and when



- How do you want to receive your data here
 - o Raw sensor data:
 - o 3D model:
 - o GIS ready data
 - o Pdf
 - o Hard copy print out
 - o On a permanently installed PC / monitor in/outside the building
 - o Data and results via WLAN
 - o Data and results via the internet

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Scenario 2: Earthquake, building 1: Questions and answers – how and when



- When do you need the information
- Do you need a specific monitoring function and what should this include

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Scenario 3: Earthquake, building 2





Scenario 3: Earthquake building 2







Scenario 3: Earthquake, building 2



- Building 2 is used for administration with public access.
- Building 2 is partly collapsed (some parts collapsed completely)
- · Persons are trapped
- Some damaged parts of the building may experience further collapse
- disaster environment, limited resources, no local response teams available

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Scenario 3: Earthquake, building 2



• Space to enter further scenario descriptions/challenges:

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



• Which kind of data would you need for this event?

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



- Which kind of data would you need for this event?
 - o Basic building information:
 - o Occupants' information:
 - o Affected area in the building:
 - o Measured data (with range):
 - Movement of structural parts (which/range)
 - Strains, accelerations,
 - ▼ Positions of the structural elements
 - Acceleration curves ?
 - Other?

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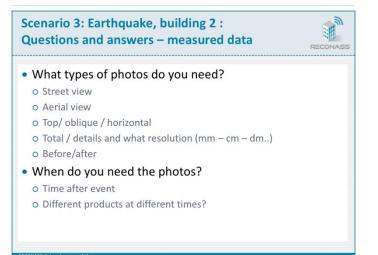
Scenario 3: Earthquake, building 2: Questions and answers – measured data



· What types of photos do you need?

• When do you need the photos?

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Scenario 3: Earthquake, building 2: Questions and answers – calculations and assessment



Which kind of calculations and results would you need?
 And how must this information be measured and shown?

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Scenario 3: Earthquake, building 2: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown?
- Damage assessment / collapse, partly collapse, structural/nonstructural
- o Collapse hazard (how to be measured?)
- o Specific hazards:
- o Shoring or demolition needs
- o Material losses: Need for repair:
- o Repair costs, needed manpower for repair
- o Human losses, needs for medical treatment, shelter
- o Long term / short term

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Scenario 3: Earthquake, building 2: Questions and answers – how and when



How do you want to receive your data here

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Scenario 3: Earthquake, building 2: Questions and answers – how and when



- How do you want to receive your data here
 - o Raw sensor data:
 - o 3D model:
 - o GIS ready data
 - o Pdf
 - o Hard copy print out
 - o On a permanently installed PC / monitor in/outside the building
 - o Data and results via WLAN
 - o Data and results via the internet

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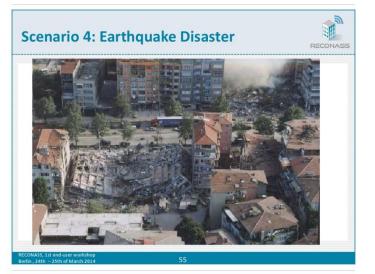
53

Scenario 2: Earthquake, building 1: Questions and answers – how and when



- When do you need the information
- Do you need a specific monitoring function and what should this include

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Scenario 4: Earthquake disaster



- A large area around building 1 and 2 is affected.
- · Many buildings are collapsed and partly collapsed
- · Persons are trapped
- Some buildings may experience further collapse
- Roads are blocked
- disaster environment, limited resources, no local response teams available
- Short term response and first steps for recovery are necessary

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Scenario 4: Earthquake disaster



• Space to enter further scenario descriptions:

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Scenario 4: Earthquake disaster: Questions and answers – measured data



• Which kind of data would you need for this event?

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Scenario 4: Earthquake disaster: Questions and answers – measured data



- Which kind of data would you need for this event?
 - o Basic building stock information:
 - o Occupants' information:
 - o Specific hazards:
 - o Measured data (with range):
 - × Positions of affected buildings
 - Height reduction
 - Acceleration data?
 - Other?

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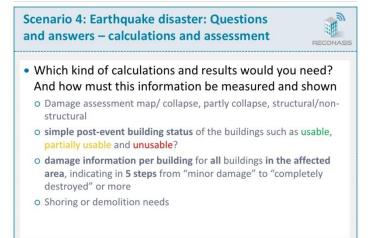
Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



Which kind of calculations and results would you need?
 And how must this information be measured and shown

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(Grant Agreement No. 312718)



Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



Which kind of calculations and results would you need?
 And how must this information be measured and shown

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Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment

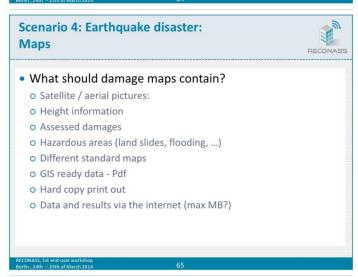


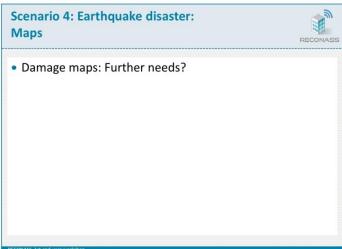
- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - o Material losses: Need for repair:
 - o damages to lifelines (roads, water supply, electricity)
 - o Repair costs, needed manpower for repair
 - o Human losses, needs for medical treatment, shelter
 - o Long term / short term

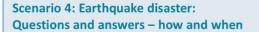
NASS, 1st end-user workshop

Scenario 4: Earthquake disaster:
Maps

• What should damage maps contain?









• How do you want to receive your data here

Scenario 4: Earthquake disaster: Questions and answers - how and when



- How do you want to receive your data here
 - o Raw sensor data:
 - o 3D model:
 - o GIS ready data
 - o Pdf
 - o Hard copy print out
 - o On a permanently installed PC / monitor in/outside the building
 - o Data and results via WLAN
 - o Data and results via the internet

Scenario 4: Earthquake disaster: Questions and answers - how and when



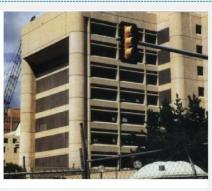
- When do you need the information
- Do you need a specific monitoring function and what should it include



Szenario 5: large explosion, building 3





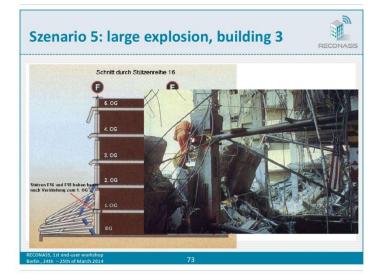


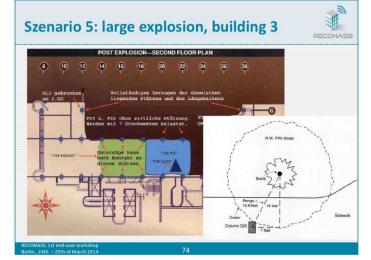
Szenario 5: large explosion, building 3











Szenario 5: large explosion, building 3



- Building 3 is used for administration with public access.
- · Building 3 is partly collapsed
- Persons are trapped
- Some damaged parts of the building may experience further collapse, concrete slabs and other components
- Due to the extent and the damages to the neighbouring buildings, this is a disaster environment
- Local resources start with the intervention, forces from neighbouring areas support the response teams

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Szenario 5: large explosion, building 3



• Space to enter further scenario descriptions / challenges:

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Szenario 5: large explosion: Questions and answers – measured data



• Which kind of data would you need for this event?

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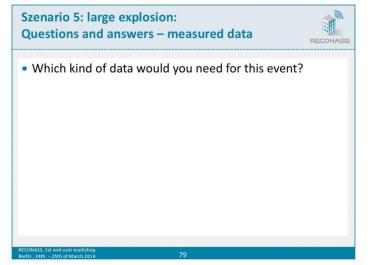
Szenario 5: large explosion: Questions and answers – measured data

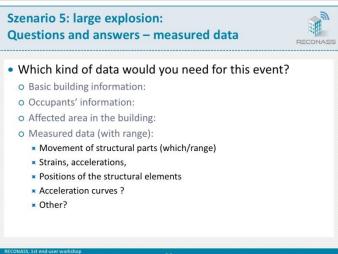


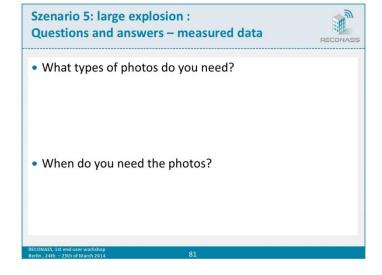
- · Which kind of data would you need for this event?
 - o Basic building information:
 - o Occupants' information:
 - o Affected area in the building:
 - o Measured data (with range):
 - Movement of structural parts (which/range)
 - Strains, accelerations,
 - ▼ Positions of the structural elements
 - ★ Acceleration curves ?
 - × Other?

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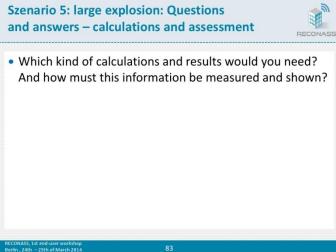
(Grant Agreement No. 312718)

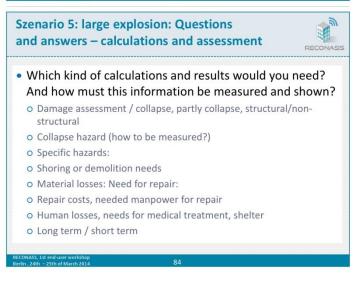




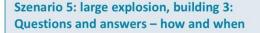








(Grant Agreement No. 312718)





How do you want to receive your data here

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Szenario 5: large explosion, building 3: Questions and answers – how and when



- How do you want to receive your data here
- o Raw sensor data:
- o 3D model:
- o GIS ready data
- o Pdf
- o Hard copy print out
- o On a permanently installed PC / monitor in/outside the building
- o Data and results via WLAN
- o Data and results via the internet

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Szenario 5: large explosion, building 3: Questions and answers – how and when



- When do you need the information
- Do you need a specific monitoring function and what should this include

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Missing scenarios



· If you missed a situation the RECONASS system should

Event name and date

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Requirements



- On Data handling (will you need only the information of the final assessment, all data?, where will you store it? In which format?
- Functional partitioning (would it be helpful for the system to exclude a building's area and provide an assessment of the remaining part?
- Communication bandwidth (what are the different kinds of communication means that you are using at the moment? How the different persons from different layers inside your organisation communicate with each other? Mobile, e-mail?)
- Power demand (not sure if we'll get answers for this!)
- Plugged in function (do you currently have such systems?, do you prefer the PCCDN tool to be working as a portable software? Or an application based one?)
- Training for RECONASS purposes (how much time would you spent for training?)

Event name and date

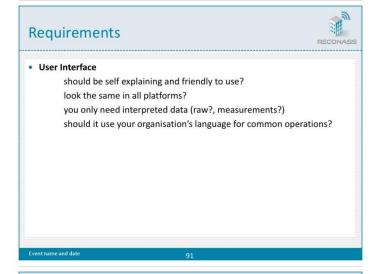
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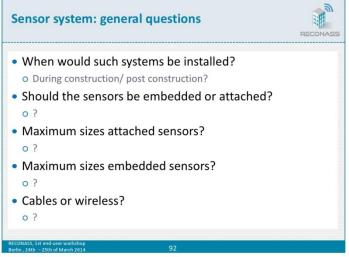
Requirements

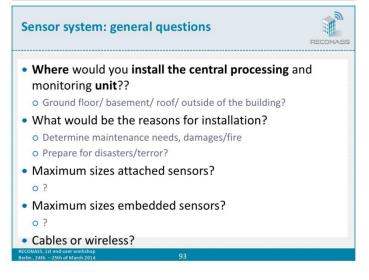


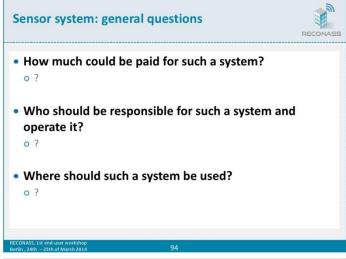
- Maintenance (how much effort would you put in this?) (do you need sensors to be easily installed, will you change/replace them if needed?
- Sorting of data/classification (how many levels of classification would be acceptable?)
- Are the below your needs? Please further elaborate..
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- To implement an automated, practical and cost-effective solution to assess the operational conditions and identify potential structural damage.
- To generate deflection data that provides more accurate guidance as to pinpoint necessary refurbishment, and thus avoid huge unnecessary costs.
- To install a monitoring system that can be integrated with existing monitoring technologies, allowing for cost savings, and wider monitoring potential.
- The need to design data collection and handling with a specific focus on who this data
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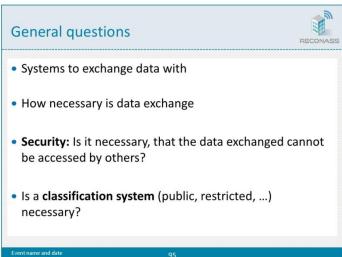
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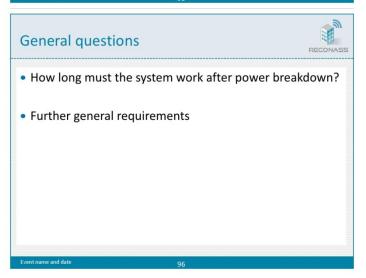


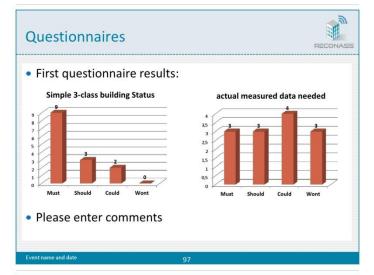


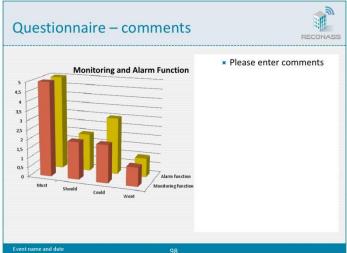


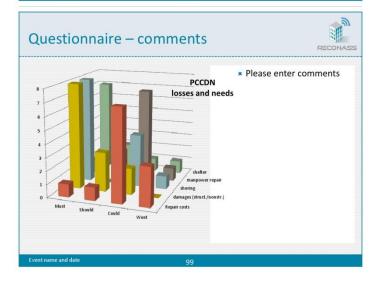


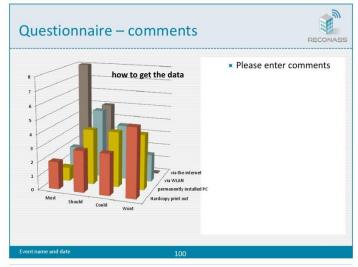


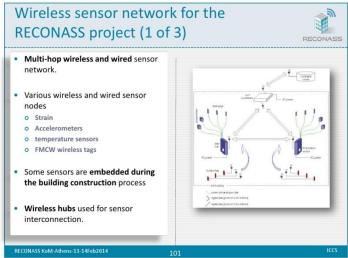


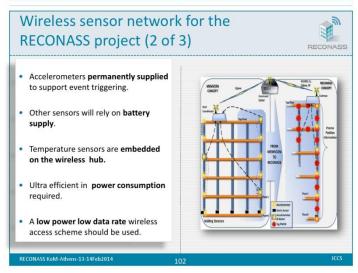


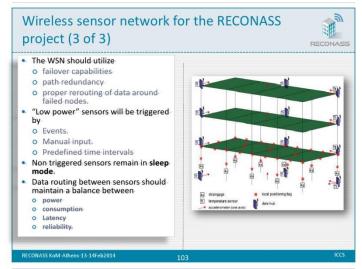


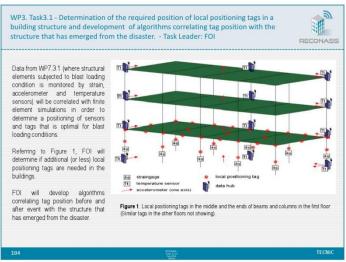


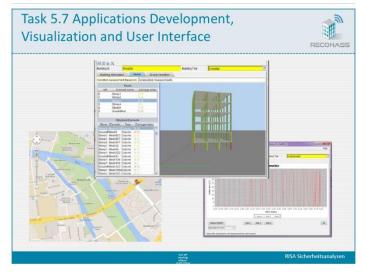


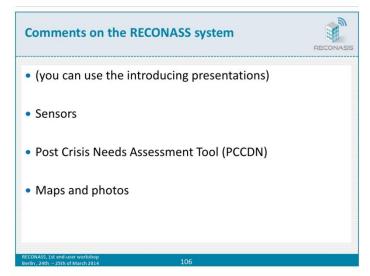












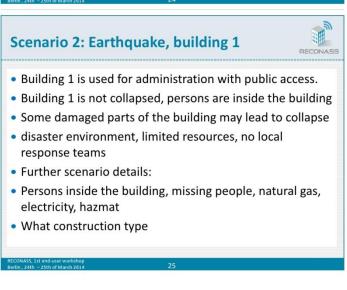


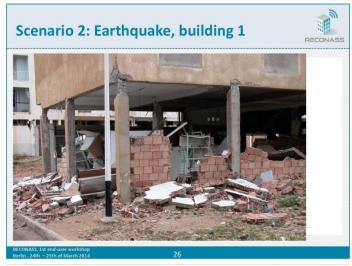
End-user Requirements Working Group 1

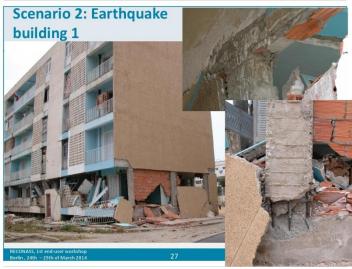
The presentation was created to show the results obtained during the Working Group A session (part b)













Scenario 3: Earthquake building 2 From ITC



Scenario 3: Earthquake, building 2



- Building 2 is used for administration with public access.
- Building 2 is partly collapsed (some parts collapsed completely)
- Persons are trapped
- Some damaged parts of the building may experience further collapse
- disaster environment, limited resources, no local response teams available

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Scenario 3: Earthquake, building 2



- There may be changes and further collapses during the intervention
- Local people are already there trying to rescue victims
- Not sure about prior rescue activities from local LEMA forces
- There may be aftershocks

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



Which kind of data would you need for this event?

- Victim sounds
- Acceleration curves from the earthquake
- · Accelerations during the intervention
- Structure of the collapsed building with the voids
- •

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



- Which kind of data would you need for this event?
 - Basic building information: what kind of building, purpose, number of storeys..., electricity, gas, stable areas like staircases,
 - o Basement, most time you cant see
 - o Occupants' information: ++
 - Affected area in the building: collapse structure, damaged areas with collapse hazard

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



- Which kind of data would you need for this event?
 - o Measured data (with range):
 - Movement of structural parts (which/range): cm range is sufficient
 - Strains, accelerations, ++
 - ▼ Positions of the structural elements ++
 - Acceleration curves ? ++
 - Temperatures, perhaps use of the sensors to detect victims (perhaps sound)

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



What types of photos do you need?

- Useful to enter the area, to see details, access possibilities, hazards
- GEA: 100m range 14Mp, Phantom II, quadrocopter, live link,

When do you need the photos?

- When we are on scene to rescue victims
- When we are on the way to the area to prepare

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Scenario 3: Earthquake, building 2: Questions and answers – measured data



- What types of photos do you need?
 - Top(satellite as well to prepare) +google maps (bfore may be needed more)/ oblique ++/ horizontal+
 - o Total / details and what resolution (mm cm dm..) cm
 - o Before/after ++
 - o (geo)referenced photos ++ (angle of view)
- When do you need the photos?
 - o Time after event
 - Different products at different times? Overview before to prepare, details later to decide, where to enter...

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Scenario 3: Earthquake, building 2: Questions and answers – calculations and assessment



Which kind of calculations and results would you need?
And how must this information be measured and shown?

Internet++, some kind of a black box+ or standard interface

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Scenario 3: Earthquake, building 2: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown?
 - Damage assessment / collapse, partly collapse, structural/nonstructural ++
 - o Collapse hazard (how to be measured?)++
 - o Specific hazards:
 - o Shoring or demolition needs ++(rapid response and later as well)
 - o Material losses: Need for repair: (USAR teams dont need this)
 - Repair costs, needed manpower for repair (USAR teams dont need this)

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Scenario 3: Earthquake, building 2: Questions and answers – how and when



- How do you want to receive your data here
 - o Raw sensor data: simply processed to curves, some are useful for specialists in the team must be linked to a 3D model or map
 - Even in fire brigades: different types of users (level): most need the easy and short information, some specialists need monitored measurements and curves
 - Can you rely on the calculations? Support needed but decisions will be made by the responsibles.
 - o 3D model: ++
 - o GIS ready data +
 - o Pdf -- Hard copy print out: no

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Scenario 4: Earthquake Disaster





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Scenario 4: Earthquake disaster



- A large area around building 1 and 2 is affected.
- Many buildings are collapsed and partly collapsed
- Persons are trapped
- Some buildings may experience further collapse
- · Roads are blocked
- disaster environment, limited resources, no local response teams available
- Short term response and first steps for recovery are necessary

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Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



Which kind of calculations and results would you need?

And how must this information be measured and shown

- Operational front end direct read out, standard interface
- More detailed long term stored to be used for forensic failure analysis (black box)

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Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - Georeferenced pictures to enhance satellite based damage maps, compare different data sources (UAV, georeferenced photos, ..) for one single map
 - $\circ\,$ Spatial interpolation of the measured data to the damage maps
 - simple post-event building status of the buildings such as usable, partially usable and unusable? ++ SAFETY ASSESSMENT
 - damage information per building for all buildings in the affected area, indicating in 5 steps from "minor damage" to "completely destroyed" or more: damage assessment

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Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - o damages to lifelines (roads, water supply, electricity) ++

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Scenario 4: Earthquake disaster: Maps



What should damage maps contain?

- · Before and after the earthquake
- Temperatures (fires)
- Hazards (gas,..)
- (floods)
- Occupancy, building types, storeys,
- Pre event satellite images ++
- 3D model of the area +

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Requirements



- Communication bandwidth (what are the different kinds of communication means that you are using at the moment? How the different persons from different layers inside your organisation communicate with each other? Mobile, e-mail?)
- Officially TETRA, many problems,
- · Cell phones (only private) satellite phones
- Power demand
- Plugged in function (do you currently have such systems?, do you prefer the PCCDN tool to be working as a portable software? Or an application based one?) dispatching system with GIS, all intervention plans are linked, mobile units in the fire trucks (Ghent)
- Training for RECONASS purposes (how much time would you spent for training?) Different levels, different trainings, but training is mandatory

Table top trainings and exercises should be included

Event name and date

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- · Are the below your needs? Please further elaborate..
- Reduce the cost of building assessment/maintenance by implementing a more targeted approach to inspections.
- To implement an automated, practical and cost-effective solution to assess the operational conditions and identify potential structural damage.
- To generate deflection data that provides more accurate guidance as to pinpoint necessary refurbishment, and thus avoid huge unnecessary costs.
- To install a monitoring system that can be integrated with existing monitoring technologies, allowing for cost savings, and wider monitoring potential.
- The need to design data collection and handling with a specific focus on who this data
 is destined for, and how it will be used.

Event name and date

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- Maintenance (how much effort would you put in this?) (do you need sensors to be easily installed, will you change/replace them if needed?
- Sorting of data/classification (how many levels of classification would be acceptable?)
- Are the below your needs? Please further elaborate..
- Reduce the cost of building assessment/maintenance by implementing a more targeted approach to inspections.
- To implement an automated, practical and cost-effective solution to assess the operational conditions and identify potential structural damage.
- To generate deflection data that provides more accurate guidance as to pinpoint necessary refurbishment, and thus avoid huge unnecessary costs.
- To install a monitoring system that can be integrated with existing monitoring technologies, allowing for cost savings, and wider monitoring potential.
- The need to design data collection and handling with a specific focus on who this data
 is destined for, and how it will be used.

Event name and dat

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Requirements



User Interface

should be self explaining and friendly to use? ++ but training is necessary look the same in all platforms? +

you only need interpreted data (raw?, measurements?) should it use your organisation's language for common operations? ++

Event name and date

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Sensor system: general questions



- · When would such systems be installed?
 - o During construction/ post construction?
- Should the sensors be embedded or attached?

0 ?

Maximum sizes attached sensors?

0?

Maximum sizes embedded sensors?

0 ?

Cables or wireless?

0?

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Sensor system: general questions



- Where would you install the central processing and monitoring unit??
 - o Ground floor/ basement/ roof/ outside of the building?
- What would be the reasons for installation?
 - o Determine maintenance needs, damages/fire
- Maximum sizes attached sensors?

o Prepare for disasters/terror?

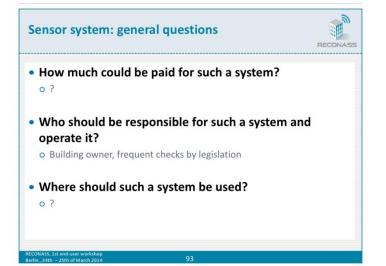
- 2
- Maximum sizes embedded sensors?

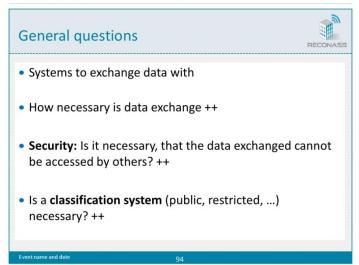
0?

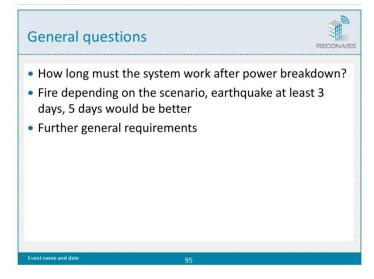
• Cables or wireless?

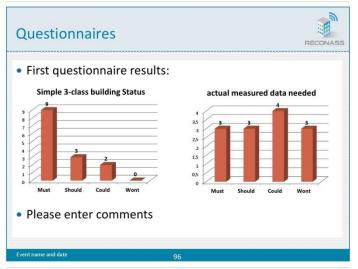
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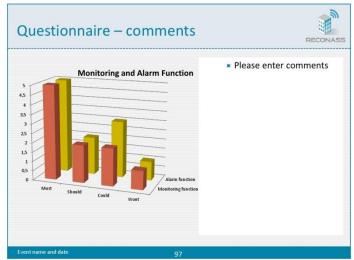
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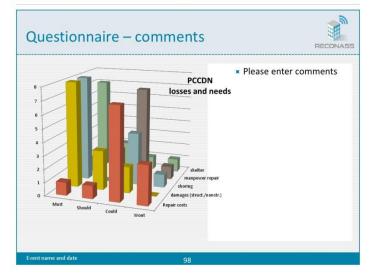


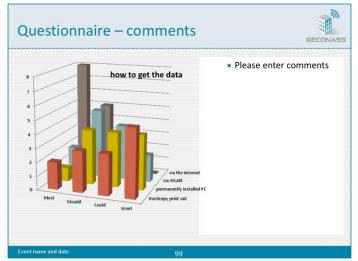


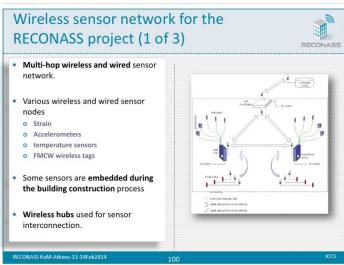


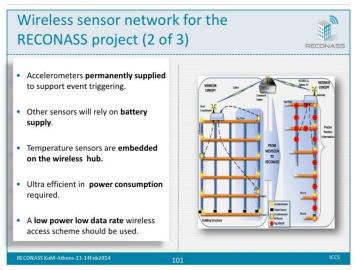


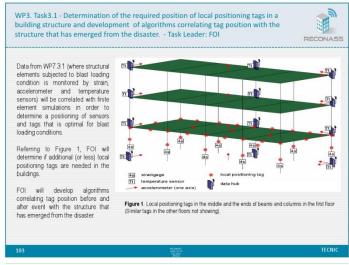


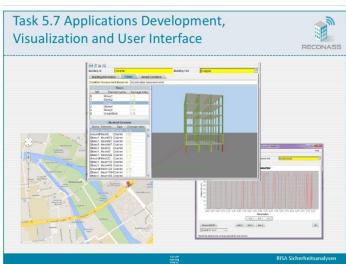


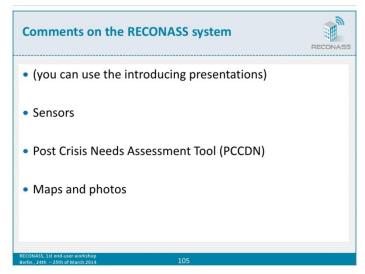








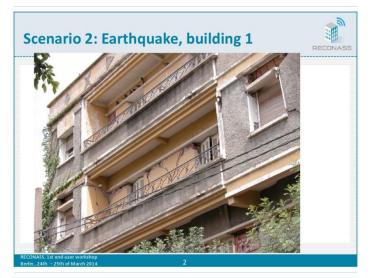






End-user Requirements Working Group 2

The presentation was created to show the results obtained during the Working Group B session



Scenario 2: Earthquake, building 1



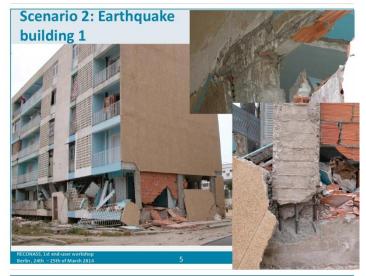
- Building 1 is used for administration with public access.
- Building 1 is not collapsed, persons are inside the building
- Some damaged parts of the building may lead to collapse
- disaster environment, limited resources, no local response teams
- Further scenario details:
 - o Assumption: everybody has left the building. Pictures from mobile phones etc. from damages might exist.
 - o Assumption: Building is standing, but not stable!
 - People might need to go back into building to continue working (eg hospital)

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Scenario 2: Earthquake, building 1







Scenario 2: Earthquake, building 1



- Space to enter further scenario descriptions/challenges:
 - o Timeliness of assessment (eg. timeframe for USAR up to 72h)
 - o To what degree the building is likely to collapse?
 - o Level of specification is important. Two aspects: how detailed is the information and which part is involved.
 - o Timeline is important: first endusers on the spot are firefighters second endusers are SAR teams, third endusers could be
 - o Is the system trustable enough for the end users?

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Scenario 2: Earthquake, building 1: Questions and answers – measured data



- Which kind of data would you need for this event?
 - o System needs to recalculate loadings based on a reference point (building construction) + building history + current status
 - Output used for supporting assessment by experts, not for citizens?
 Legal issues?
 - RECONASS as warning system: output used for immediate decision planning (eg doctor in hospital: evacuate building: yes / no?).
 Highlighting the affected functional parts of building (instead of columns etc.).
 - o System needs to cover non structural damages and environmental risks (gas, explosion, fire, water, NRBC detection)
 - o Level of accuracy varies with time required to perform assessment

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Scenario 2: Earthquake, building 1: Questions and answers – measured data



- What types of photos do you need?
 - o Remotely sensed imagery
 - o Pictures from inside building?
 - o Social media?
- When do you need the photos?
 - o When visual inspection takes place?
 - O As soon as possible?
 - Note: RECONASS could be used to identify priority area to be mapped (UAV)

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Scenario 2: Earthquake, building 1: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - One sight / "traffic light": green / orange / red
 - More detailed information if needed (part by part)
 - o If required / for experts: raw sensor data / model output
 - o Collapse probability should be calculated with respect to an aftershock lower or equal to the main quake

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Scenario 2: Earthquake, building 1: Questions and answers – how and when



- When do you need the information
 - o First responders: from 7min to 72h
 - o Recovery: depends
- Do you need a specific monitoring function and what should this include
 - o Continuous update / recalculation in case of aftershocks

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Scenario 4: Earthquake Disaster





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Scenario 4: Earthquake disaster



- A large area around building 1 and 2 is affected.
- Many buildings are collapsed and partly collapsed
- Persons are trapped
- Some buildings may experience further collapse
- Roads are blocked
- disaster environment, limited resources, no local response teams available
- Short term response and first steps for recovery are necessary

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Scenario 4: Earthquake disaster



- Space to enter further scenario descriptions:
 - Sensors in the collapsed floors are destroyed: any sensor still working in the ground floor? (a sort of black-box?).
 - Note: Anyway it is important to consider also scenarios not only related to disasters, since there is a plethora of end-users with different user needs.

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Scenario 4: Earthquake disaster: Questions and answers – measured data



• Which kind of data would you need for this event?

- Additional information in the days after the main shock (e.g. debris blocking roads)
- Data to prioritize the SAR intervention areas, despite RECONASS will certainly provide all red alerts, e.g. understand partially/totally collapsed buildings, building affected by the pan-cake effect
- Debris estimation on the basis of measured forces? It's indeed complicated to simulate how a building will collapse. Probably this is out of the scope of RECONASS, which is mainly aimed to provide information for still standing building, useful for the recovery phase.
- Data acquired from sensors that can acquire information even during the night time (UAV?)
- o Temperature/Gas/Chemical/... sensors

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Scenario 4: Earthquake disaster: Questions and answers – measured data



- Which kind of data would you need for this event?
- Would SAR team be able to install additional RECONASS tags in realtime? Potentially yes, if easy to be deployed and light to be carried
- o Who can operate the system? In normal conditions, the system is automatically activated on the basis of the accelerometer information, but it can be potentially controlled by authorized user(s). In the latter case, training is required but it is import to highlight that responsible persons are not technical people. Training tailored to the user type (e.g. just minimal training for SAR team to understand the meaning of the traffic light color code, more detailed training for people in charge of the recovery phase)

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Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - O Not RAW data, but information ready-to-be-used.
 - O Damage assessment map both at structural and functional level:
 - x collapse, partly collapse, structural/non-structural
 - × usable, partially usable and unusable
 - × Additional damage grades (e.g. % of collapse probability) for specific users
 - o Data must not be aggregated at building level, but separeted for each main structural/functional part of the building
 - Information which can be exploited to assess the possibility to find survivors inside a collapsed building (e.g. main standing walls, presence of caves, ...)

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Scenario 4: Earthquake disaster: Questions and answers – calculations and assessment



- Which kind of calculations and results would you need?
 And how must this information be measured and shown
 - o Material losses (type of material construction,), need for repair (Yes/No, repair options for structural components)
 - O Repair costs: which is the SOP to define the required funding to cover the restoration costs?
 - Dusseldorf municipality case (normal event, few partial damages): for public buildings, generelly an internal assessment is verified by an external independent entity and, once approved, the costs are covered by the body in charge. The process generally takes 1 week. It would be improtant to have estimations also for different scenarios (50 buildings severely damaged, etc...).

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Scenario 4: Earthquake disaster: Maps



- · What should damage maps contain?
- Not only information on the building but also status of the surrounding areas (road blocks, debris)

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Scenario 4: Earthquake disaster: Maps



- What should damage maps contain?
- It should be a WebGIS Application (dynamic map)
 - o Satellite / aerial pictures → Optional
 - o Height information → No
 - o Assessed damages → Yes
 - o Hazardous areas (land slides, flooding, ...) \rightarrow Yes
 - o Different standard maps → update maps with new/more reliable information (highlighting the differences wrt the previous version)
 - o GIS ready data Pdf export capability

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Missing scenarios



- If you missed a situation the RECONASS system should:
 - o Consider flood events
 - o Allow the integration with existing building management systems (security cameras, information on the elevators, ...)

Event name and date

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Sensor system: general questions



- · When would such systems be installed?
 - o Post construction for existing building
- Should the sensors be embedded or attached?
 - Attached should be the option for additional tags to be installed after a major event. Easiness of handling and cost-efficiency should drive the decision. Robust and maintanable
- · Maximum sizes attached sensors?
 - o If needed to be carried, as light as possible
- · Cables or wireless?
 - Older buildings → Wireless would be cost efficient, but technical feasibility should be assessed.
 - In case internet connectivity is down after the event, could the SAR team potentially share part of an avavailable satellite internet connectivity (which is generally set-up to respond to the emergency)? The required amount of bandwith should be defined!

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Sensor system: general questions



- Where would you install the central processing and monitoring unit??
 - Central processing unit (required to run the model) could be outside the building (RECONASS centre), and then serve the information to the end-users. But a smaller processing unit could be installed in each monitored building for performance reasons (federated approach).
- · What would be the reasons for installation?
 - o Performance balancing

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Sensor system: general questions



- How much could be paid for such a system?
 - For new buildings, a certain % of the total construction raw costs (e.g. smoke detection sensor network about 3%)
 - For existing buildings: to be included in the maintenance and running costs

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General questions



- Systems to exchange data with
 - o Building management systems
- How necessary is data exchange
 - o Could
- Security: Is it necessary, that the data exchanged cannot be accessed by others?
 - Take into account cyber-security as well as privacy issues especially for critical infrastructures
- Is a classification system (public, restricted, ...) necessary?
 - o Probably depends on the manager of the critical infrastucture as well as the intended use

Event name and date

