Community Based Comprehensive Recovery

Grant Agreement Nº 313308

D5.1 Performance assessment indicators

WP 5 Experimentation and evaluation

Version: 1.0
Due Date: 30 september 2013
Delivery Date: 27 September 2013
Nature: R
Dissemination Level: PU
Lead partner: TNO
Authors: Kees van Dongen, Jan Willem Streefkerk
Internal reviewers: Matthias Max, Francisco Fornes

www.COBACORE.eu

The research leading to these results has received funding from the European Community's Seventh Framework Programme [FP7-SEC-2012-1] under grant agreement n° 313308

Deliverable Title	Performance assessment indicators
Deliverable Number	D5.1
Keywords:	performance indicators, evaluation, experiment

Executive Summary:

The objective of Work Package 5 is to organise experiments and evaluate the COBACORE system and its parts, to:

1) draw conclusions about its operational value in practice for future end-users and stakeholders, and

2) provide the project team with advice on (new) requirements and features for refinement and further development.

This document describes the results of task 5.1: Development of the evaluation agenda and performance criteria.

The *evaluation agenda*, performance assessment indicators and approach for partial evaluations, intermediate evaluation and final evaluation are described.
To be able to test whether COBACORE supports damage, needs and capacity assessment for recovery activities of the 'whole of community' we use the concept of multi-team system to identify performance assessment indicators. A multi-team system is a system of interacting teams, in this case teams from governmental organizations, NGO's and the community that are involved in post-crisis damage and needs assessment. A range of *conditions* that affect the performance of these teams and their interactions have been identified. To test the operational value of the COBACORE platform, information models, functionality and interfaces, some of these conditions need to be manipulated by the COBACORE platform and others need to be controlled within evaluations. To be able to test whether COBACORE's information models, functionality and interfaces fit with the procedures and working habits of these teams, the activities performed need to be further specified. Similarly to evaluate performance of COBACORE and to test whether different teams and user-groups are satisfied with the damage, needs and capacity assessments supported by COBACORE and satisfied with information-sharing gaps and collaboration gaps that are closed, further specification is needed.

A *framework of performance assessment indicators* is provided that can be used for further specification. We distinguish performance assessment indicators for the following categories: 1) performance at whole of community level, 2) relief effectiveness indicators, 3) functional performance, 4) usability, 5) information quality, 6) system performance. Also measures of agility and interoperability are specified.

To provide a meaningful and systematic manner to gather evaluation results, analyse them and use them to influence the iterative design process, COBACORE employs a *Cognitive Engineering methodology*. It describes how work domain, envisioned technology and human factors analyses can be used to provide a sound design rational for the COBACORE system.

Table of Contents

1 Summary

The objective of *Work Package 5* is to organise experiments and evaluate the COBACORE system and its parts, to:

1) draw conclusions about its operational value in practice for future end-users and stakeholders, and
2) provide the project team with advice on (new) requirements and features for refinement and further development.

This document describes the results of task 5.1: Development of the evaluation agenda and performance criteria.

The **evaluation agenda**, performance assessment indicators and approach for partial evaluations, intermediate evaluation and final evaluation is described below.

WP	Month 0-6	Month 6-12	Month 12-18	Month 18-24	Month 24-30	Month 30-36
1		Feedback & partial evaluation 1.1	**Intermediate evaluation (M15)**			**Final evaluation (M32)**
2		Feedback & partial evaluation 2.1		Feedback & partial evaluation 2.2		
3		Feedback & partial evaluation 3.1		Feedback & partial evaluation 3.2		
4		Feedback & partial evaluation 4.1		Feedback & partial evaluation 4.2		
5	Specifying agenda and performance indicators	General conclusions on partial evaluations		General conclusions on partial evaluations		

To be able to test whether COBACORE supports damage, needs and capacity assessment for recovery activities of the 'whole of community' we use the concept of multi-team system to identify performance assessment indicators. A multi-team system is a system of interacting teams, in this case teams from governmental organizations, NGO's and the community that are involved in post-crisis damage and needs assessment. A range of **conditions** that affect the performance of these teams and their interactions have been identified. To test the operational value of the COBACORE platform, information models, functionality and interfaces, some of these conditions need to be manipulated by the COBACORE platform and others need to be controlled within evaluations. To be able to test whether COBACORE's information models, functionality and interfaces fit with the procedures and working habits of these teams,

the **activities** performed need to be further specified. Similarly to evaluate **performance** of COBACORE and to test whether different teams and user-groups are satisfied with the damage, needs and capacity assessments supported by COBACORE and satisfied with information-sharing gaps and collaboration gaps that are closed, further specification is needed.

A framework of performance assessment indicators is provided that can be used for further specification. We distinguish performance assessment indicators for the following **categories**: 1) performance at whole of community level, 2) relief effectiveness indicators, 3) functional performance, 4) usability, 5) information quality, 6) system performance. Also measures of agility and interoperability are specified.

To provide a meaningful and systematic manner to gather evaluation results, analyse them and use them to influence the iterative design process, we employ a **Cognitive Engineering methodology**. It describes how work domain, envisioned technology and human factors analyses can be used to provide a sound design rational for the COBACORE system.

Concerning the approach to evaluations the initial idea about the goals of and approach for the first set of partial evaluations is described. For each partial session the goal, participants, scenario, snapshots, approach, input, performance criteria, output and expected outcome are described. The framework of performance assessment indicators can be used to specify **support claims** and **requirements** in scenario's and use cases together with end-users, experts and stakeholders. This will result in more specific and measurable performance assessment indicators for COBACORE's information models, functionality, interfaces and platform. Together with work package leaders these ideas will be further detailed in task 5.2.

When parts of COBACORE's information models, functionality, interfaces and platform meet performance assessment indicators in partial evaluations, these parts can be integrated and tested in the intermediate evaluation. Initial ideas about intermediate and final evaluation are described. To be able to test COBACORE both evaluations need to be further specified in task 5.3 and task 5.4.

The evaluation agenda, performance assessment indicators and cognitive engineering method and approaches to partial, intermediate and final evaluation are intended to enable COBACORE project partners to further specify and organise evaluation sessions and further specify and test COBACORE functionality.

As the COBACORE project progresses the evaluation agenda and set of performance assessment indicators are refined and adapted to goals and opportunities in intermediate and final evaluations. In evaluations COBACORE project partners can observe, interpret and evaluate experiences of users and draw conclusions about the operational value of functionality. Together with future end-users and stakeholders, the WP 5 project team will provide advice on (new) requirements and features for refinement and further development.

2 Introduction

This document constitutes Deliverable 5.1, "Performance Assessment Indicators" within the COBACORE project. It is a product of Work Package 5 *Experimentation and evaluation.*

Objective
The objective of *Work Package 5* is to organise experiments and evaluate the COBACORE system and its parts, to:
3) draw conclusions about its operational value in practice for future end-users and stakeholders, and
4) provide the project team with advice on (new) requirements and features for refinement and further development.

Experimentation and evaluation tasks consist of:
1) Developing an evaluation agenda for the COBACORE project
2) Developing performance assessment indicators
3) Assisting in organisation of interview and feedback sessions, evaluation sessions in a controlled environment and evaluation sessions in an operational setting.

Structure of this deliverable

This document describes the results of task 5.1: Development of the evaluation agenda and performance criteria. This deliverable is structured as follows. Firstly, it provides an overview of the evaluation agenda that will be adopted in the COBACORE project for organising partial evaluations (task 5.2), the intermediate evaluation (task 5.3) and the final evaluation (task 5.4). Secondly, it documents the relevant performance assessment indicators that will be used to ensure that COBACORE is effectively developed and useful for end-users. We describe the evaluation methodology in Chapter 4. In Chapter 5 we describe how evaluation methodology and performance assessment indicators are applied in partial evaluations. In Chapter 6 and Chapter 7 the approach to the intermediate and final evaluation is described. Approaches to partial, intermediate and final evaluations will be updated as task 5.2 starts. The ideas presented here are preliminary and based on insights available at month 6 of the project. New insights will arise and will be used in the tasks and deliverables to come.

Evaluation agenda
The evaluation agenda task sets:
1) The experimentation and evaluation agenda for the COBACORE project.
2) Detailing the significance of evaluations to the overall system development
3) An overview of the evaluation process and parties involved.

Performance assessment indicators

An overview of relevant performance assessment indicators for the COBACORE toolset is provided below. The performance assessment indicators are to be used in 1) the partial evaluations, 2) the intermediate evaluation and 3) final evaluation experiment. In addition these indicators can be used by other WPs to assess their work

and progress. Additional performance assessment indicators will be developed during the project as new insights emerge.

3 Evaluation agenda

The goal of the COBACORE Evaluation Agenda is to provide a systematic and structured approach to the evaluation moments in this project. The agenda specifies the various evaluation moments, detailing the research questions addressed, methods, measures and expected outcomes. By following this agenda, the COBACORE system and its features will be evaluated at the right moment and with the right methods, ensuring that WP5 adheres to its objective (see also Introduction): to draw conclusions about the operational value of COBACORE in practice and provide feedback to the WPs so as to improve the system.

3.1 General evaluation agenda

Evaluation moments must be timed appropriately to project activities and milestones (see also the DOW). In addition, COBACORE employs an iterative design and evaluation approach that evaluates features and functions in an early stage or in a preliminary form (partial evaluation) and refines them based on the outcomes of these evaluations (see also Chapter 4). Consequently, the evaluation agenda consists of four periods in time: 1) first feedback & partial evaluation sessions, 2) intermediate evaluation session, 3) second feedback & partial evaluation sessions and 4) final evaluation session.

Please note: development of evaluation agenda and performance assessment indicators is the responsibility of WP5. The organisation and planning of evaluation session is a (joint) responsibility of WP leaders that have COBACORE (parts) evaluated in those sessions.

Figure 1. General evaluation agenda (time in months, after project start)

WP	0-6	6-12	12-18	18-24	24-30	30-36
1		Feedback & partial evaluation 1.1	**Intermediate evaluation (M15)**			**Final evaluation (M32)**
2		Feedback & partial evaluation 2.1		Feedback & partial evaluation 2.2		
3		Feedback & partial evaluation 3.1		Feedback & partial evaluation 3.2		
4		Feedback & partial evaluation 4.1		Feedback & partial evaluation 4.2		
5	Specifying agenda and performance indicators	General conclusions on partial evaluations		General conclusions on partial evaluations		

3.2 Feedback & partial evaluation sessions

The goal of the feedback & partial evaluation sessions is to give feedback to the design efforts for the COBACORE platform, by testing the application of COBACORE principles, assumptions about activities and user requirements and hypotheses about the usefulness and usability of COBACORE.

The approach chosen to realise this objective is to conduct dedicated sessions with final users, stakeholders and experts to test the results of each Work Package (1 to 4). Final users, stakeholders and experts are involved in each session to gather their experiences, insights and comments on COBACORE. For the first session – as the project is still in an early stage – mock-ups of parts of the COBACORE platform will be evaluated within the scope of application (i.e. information models, graphical user interface concepts, assumptions behind the support functions, etc.). During these sessions, qualitative and quantitative measures on performance indicators will be gathered (see also Chapter 3), of course depending on the "maturity" of the part under evaluation.

As per Task 5.2, WP5 members from TNO, UU, GRC, TU, FAC, INT, UZ (see DOW for partner abbreviations) will assist each WP leader with the organisation of the evaluation sessions, thereby ensuring assessment of the operational value, validity and dissemination of results. WP leaders are responsible for gathering the results of each session. WP5 members are responsible for advice on performance assessment indicators, evaluation setup and report feedback. Results of evaluations will be distributed to the consortium through the pre-arranged milestones and deliverables. WP5 members will act as impartial evaluators.

In Chapter 5 the aim and approach of each separate partial evaluation session is outlined, as well as the coherence between the sessions. The partial evaluation sessions allow COBACORE project partners to

- observe, interpret and evaluate experiences of end-users, experts and stakeholders,
- draw preliminary conclusions about operational value of COBACORE parts in practice,
- define refinement advice for further development, and
- guide the further design efforts toward the intermediate and final evaluation session.

3.3 Intermediate evaluation

The intermediate evaluation will feature the COBACORE systems in a coarse state. Lessons of partial evaluations are applied in new versions of (parts of) the COBACORE system. The intermediate evaluation provides a first opportunity to test features of COBACORE in an integrated manner, and provides an interface to operational end-users including citizens that is meaningful, fits their working habits and is presented in a scenario that is familiar and befitting their (professional) role.

Concerning methodology, in the intermediate evaluation performance on recovery activities and interaction between user groups is compared between an experimental group that work with COBACORE and a control group that work without COBACORE. This allows the direct comparison of performance assessments and to draw conclusions about the operational value of the COBACORE platform for different user groups (e.g. citizens, NGO and government). It allows us to test whether collaboration gaps and information sharing gaps are closed. For the validity of conclusions the effect of other variables must be controlled in this assessment.

The intermediate version of COBACORE will be evaluated in a controlled environment, for example in a virtual training and experiment centre. The intermediate demonstration and evaluations will most likely make use of such facilities at the TNO Advanced Concept Evaluation environment in The Hague and Soesterberg, The Netherlands, or other suitable environments such as the Hydra Minerva (located in Northern Ireland as well as at 60 other locations around the globe). This will give us the ability to employ COBACORE in an 'exercise' state in a simulated environment with senior emergency planning staff and decision makers. The approach to the intermediate evaluation is further described in Chapter 6.

3.4 Final evaluation

The final evaluation will feature the COBACORE systems in a final state for the duration of this project. This version will contain all the COBACORE system elements in their final version, and will reflect the best achievable state of the system for this project. This version provides an opportunity to test all realised features of COBACORE in an integrated manner. The evaluation will focus on operational value of realised features according to final users, necessitating field testing. Because of methodological limitations in running multiple similar scenarios in a field test, this evaluation will not employ a control group. This version will be evaluated in a realistic operational scenario, in an environment that closely resembles the real-life operational environment. This demonstration and evaluation will be held in the EUREGIO area on the Dutch/German border, with the participation of representatives of the regional humanitarian services, and volunteers under the representation of the Red Cross. The approach to the final evaluation is further described in Chapter 7.

4 Defining the performance assessment indicators

In this chapter we describe a framework for performance indicators and how these can be used in interviews, feedback sessions, the intermediate evaluation and the final evaluation experiment.

4.1 Whole community effectiveness model

To be able to test whether COBACORE supports whole of community recovery the whole of community approach is interpreted as a multi-team system (Zaccaro, Marks & DeChurch, 2011). Multi-team systems describe collections of teams or social networks whose boundaries are not based on the organisation, but based on the shared interdependence of all members toward the accomplishment of a higher-order network-level goal. In recovery multi-team systems can consist of teams from governmental organisations, teams from NGO's and teams of citizens. Multi-team systems are two or more teams that interface directly and interdependently in response to environmental contingencies toward the accomplishment of collective goals.

> In the aftermath of the 2005 Katrina Hurricane different agencies were involved in the response. The American Red Cross (ARC) and Department of Homeland Security (DHS) as established organizations coordinated the response but had difficulty effectively allocating offered resources such as volunteers, charitable organizations, and donations from foreign countries. One of the recommendations was the need to develop a system to coordinate any kind of help (volunteers, charitable organizations, donations from foreign countries) which should strengthen the government's levels.

Performance assessment focusses on performance of the component teams or user groups (e.g. citizens, NGO's, government) that are either on-scene or off-scene. How well are they able to assess damage, needs and capacities for recovery, are all elements that should be considered. Performance assessment also focuses on information sharing and collaboration within teams (e.g. between on scene and off scene NGO's) and between teams and user groups (e.g. between government and citizens) as supported by COBACORE functionality. Test scenarios and COBACORE functionality will be designed such that this can be tested.

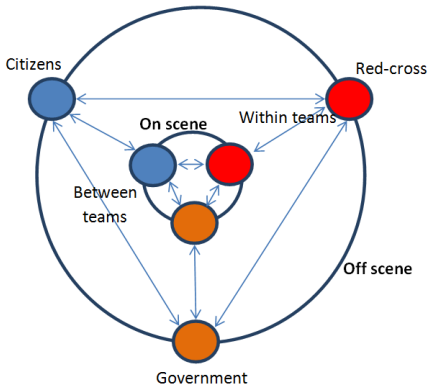

Figure 2. Conceptual model of the three user groups benefiting from COBACORE functionality.

4.2 Closing collaboration gaps

Research on multi-team effectiveness found that interaction between teams predicts performance of the multi-team system as a whole beyond that accounted for by processes within component teams. It was found that contribution of interaction between teams is more important when interdependence between teams is high (Marks, DeChurch, Mathieu, Panzer & Alonso, 2005). Interdependence between teams exists when for instance: 1) resources (information, knowledge, manpower, financial, supplies) need to be shared; 2) activities of teams need to be synchronised; 3) the output of one team is the input for another team; 4) an organisational, political or hierarchical dependency exists (external enforced). Roles of user groups, test scenario's and COBACORE functionality will be designed such that interdependencies can be managed.

During the Buncefield oilfield (England) fires in 2005 the reports illustrate the efforts of many organizations in the response and the great resilience of the local community and businesses in the on-going recovery effort to bring the affected local community back to social normality. The voluntary services were invaluable in their assistance to the emergency responders. The lessons learned show that communities and local government should review options for government support to communities affected by a disaster and produce practical recommendations without delay.

For the whole of community to be effective, a clear understanding is needed of:

a) The **conditions** affecting component teams;

b) The **activities** that are needed for within-team and between-team tasks, given those conditions; and

c) The intended (intermediate and end) **performance** of products and services resulting from these activities, and

d) The **effects** these products and services have on damage and needs assessment and recovery planning.

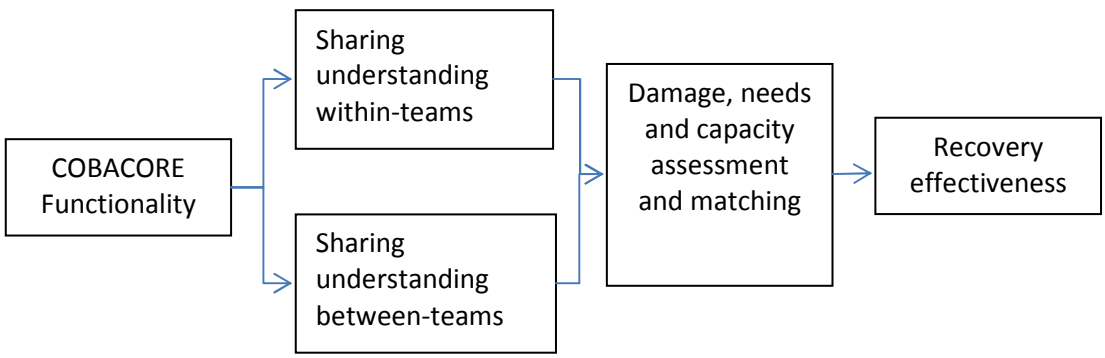

Figure 3. The COBACORE value chain

4.3 The COBACORE value chain

The COBACORE value chain is presented in Figure 3. The hypotheses is that COBACORE functionality supports shared understanding of damage, needs and capacities within and between teams. As a result of this improved shared understanding needs and capacities are better matched. As a result of better needs and capacity matching recovery effectiveness is improved. Evaluations are set to test whether the expected operational value of COBACORE functionality is provided.

4.3.1. Conditions

The effectiveness of a multi-team system (i.e. whole of community) depends on conditions that facilitate or hinder damage, needs and capacity assessment and recovery activities within teams and between teams (see also Figure 2). Conditions can refer to:

Attributes of the different teams

- composition
- size
- goal
- team organisation
- procedures
- expertise
- terminology
- resources
- culture
- political power
- technology

Attributes of the links between teams

- familiarity and trust
- interdependence
- hierarchical arrangement
- power
- information sharing structure
- communication channel
- organisational operability
- semantic interoperability
- technical interoperability

Attributes of the multi team system as a whole

- number of component teams
- distribution in time and space
- cultural, organisational, semantic and technological diversity

Semantic interoperability for instance is critical to information sharing. Teams with different professional and social backgrounds, levels of training, goals, languages, culture, operating in different political contexts and under different legal regulations use different names for the same things or different definitions for the same terms. COBACORE aims to facilitate the ability of teams with different attributes to interact with other teams that are physically or temporally dislocated in performing damage, need and capacity assessment and recovery activities. To test the operational value of

COBACORE some of these conditions need to be manipulated by the COBACORE platform and others need to be controlled for in evaluations.

During the response to Hurricane Katrina, federal, state and local government agencies as well as private organisations were very inefficient in coordinating and interrelating their activities, lacked an overall operational concept and had no proper system at place to track and share information (Wise, 2006). Secretary of Homeland Security Michael Chertoff told the Congress that the response was ''significantly hampered by a lack of information on the ground'' and the White House report on the failures of the Katrina response mentioned it as ''inability to connect multiple communication plans and architectures clearly impeded coordination and communication at the federal, state and local levels''.

4.3.2. Activities

The teams perform assessment activities and develop shared understanding of damage, needs and capacities within their teams. The activities differ between the teams. Citizens have different proximal goals and different scope compared to teams of NGO's or government teams. Procedures, terminology, resources and expertise are different as well. The way in which damage, needs and capacity is assessed, the way needs and capacities are matched and information is shared affects the accuracy and completeness of the information products resulting from these activities. Teams can also share information and understanding with other teams in order to achieve their recovery goals. Different teams can share their views on damage, needs, capacities, goals and recovery activities. For instance about priorities. How to fairly prioritise needs and how to fairly distribute scarce resources and aid? To be able to test whether COBACORE's information models, functionality and interfaces fit with the procedures and working habits of these teams, the **activities** performed need to be further defined.

In the response to the floods in Germany in June 2013, besides the work of educated relief workers of the state associations and relief organisations, thousands of citizens organised themselves on a community level along the Danube and Elbe rivers to rescue their own houses or to help others affected by the floods. This self-organised volunteer work covered measures such as filling sand bags, building sand bag installations, providing shuttle services, material for recovery or food and drinks for the volunteers. In Dresden alone, 5.000 citizens organised themselves via social media such as Facebook and Twitter.

4.3.3. Performance of teams and whole

In multi-team systems it is challenging to find the balance between within-team and between-team activities and to cope with diversity and the complexity. Not only the direct and cascading effects of a disaster can be diverse and complex, also the organisational system that is involved in responding to it. For each team in the multi team system the quality, quantity and timeliness of information products (needs,

damage and capacity assessments) can be assessed as well as the satisfaction with these products. Are different teams and user groups satisfied with damage, needs and capacity assessments? On the level of the multi-team system, contribution of other teams to products is important, as is trust in future joint actions and ability of multi team systems to perform as a whole over time. When governmental teams have good experiences with NGO's and vice versa they are likely to collaborate in the future. As recovery is a long-term process also the relationship dimension of collaboration needs to be taken into account in the evaluation. To evaluate performance of COBACORE and whether different teams and user-groups are satisfied with the damage, needs and capacity assessments and recovery activities supported by COBACORE, further specification is needed.

On 11 March 2011 the area around Fukushima was hit by an magnitude 9 earthquake. In the response many problems arose in terms of providing clear definitions and appropriately implementing the evacuation zones, and the complicated nature of the zones led to confusion among residents. The town of Namie in Fukushima Prefecture was not able to obtain accurate information and, lacking that information, evacuated to a location where the radiation levels were high. The town of Okuma did not receive information when the event had occurred.

4.3.4. Effectiveness

The information services and products of the various teams that make up the multi team system are aimed at achieving the goals set for recovery. Goals like 1) reducing the time for damage, needs and capacity assessment, 2) reducing the time needed for providing relief and recovery of unmet high priority needs, 3) meeting actual rather than inferred needs, 4) meeting needs in a way that is sustainable and 5) recovering to a safer situation. Effectiveness refers to the attainment of the goals with appropriate methods and tools. Effort will be spent on finding the right measures of effectiveness for evaluations.

In the research following the Floods that hit the Czech Republic in 2002, the recovery time for critical infrastructures was examined. According to (Rahman, 2005) Electricity 1 month (full recovery); Gas 2 months (full recovery) and Telephone lines 3 months (full recovery), Metro 6 months (full recovery, first lines operated from August 24), and some roads up to 6-7 months of full recovery. These 'lead-time's could be considered as a performance indicator for the overall performance of the response.

4.4 Framework of performance assessment indicators

Performance assessment indicators are used to test

- COBACORE functionality (e.g. graphical interfaces, support functionality, information models, etc.),
- The effect this functionality has on sharing of understanding about needs, damage and capacities within and between teams so as to support needs and capacity matching,

- Performance of damage, needs and capacity information products and recovery activities of different teams, and
- Recovery effectiveness as a whole.

When COBACORE functionality is ready for evaluations, performance assessment indicators are defined in a SMART way (Specific, Measurable, Attainable, Realistic and Time-defined). They need to be adjusted to the specific goals and context of each evaluation. Below in Table 1, a proposal is made for the whole range and categorisation of performance indicators for COBACORE.

Table 1 List of Performance Assessment Indicators for COBACORE functionality.

Main Category	*Subcategory*	*Indicators*
1. WHOLE-OF-COMMUNITY LEVEL		• Recovery of community wellbeing (safety, liveability, cohesion, sustainability, prosperity) • Number of community groups committed to community vision and goals. Percentage of population engaged or reached • Number of community capacities used for achieving community vision and goals • Percentage of community initiatives supported and participated in by the population • Outside technical and financial assistance coupled to local initiatives *See Appendix 11.2: Measures of effectiveness and community recovery*
2. RELIEF EFFECTIVENESS LEVEL		• Total time required for relief and recovery (faster recovery) • Total duration of unmet needs and unrecovered damage (faster recovery) • Total scale of unmet needs (reduced impact) • Level of risk for similar disaster after recovery (build back safer) • Total number of local capacities built for risk reduction • Sustained recovery and development of capacity (linking relief to development)
3. FUNCTIONAL LEVEL		

Main Category	*Subcategory*	*Indicators*
	3.1. Assessment indicators	Evidence-based community-, situation-, needs-, capacity- and activity assessments: • Timeliness of assessment • Accuracy of assessment • Completeness of assessment • Continuity of assessment • Prioritisation of assessment • Overall quality of assessment
	3.2. Information Gathering	• Speed of information gathering • Continuity of information gathering • Completeness of information gathering • Situational awareness i.e. the percentage of actual world representation by the information gathered. • Quality of information gathering • Quality of feedback of collated information from decision-makers back to local communities • Speed of feedback of collated information from decision-makers back to local communities
	3.3. Decision making	• Completeness of decision making (e.g. what needs are met; how needs are met; by whom needs are met; in what timeframe needs are met). • Number of community groups and actors involved in recovery goal setting • Degree of support for decisions • Fairness of decisions • Timeliness of decisions • Number and types of errors in decision making
	3.4. Action	• Number and diversity of (prioritised) needs that can be matched by capacities and funding • Number and diversity of (prioritised) damage that can be matched by capacities and funding • Number of projects (that can be monitored) directed

Main Category	*Subcategory*	*Indicators*
		at clearly articulated and prioritized community needs. • Percentage of needs met • Percentage of affected community reached • Timing match: speed/timing of resources arriving at desired endpoint • Quantity match: quantity of resources arriving at desired endpoint (% of total resources sent out for the target destination) • Quality match: do the resources delivered match the previously identified needs?
	3.5. Collaboration effectiveness / sharing	• Number of actors that are jointly shaping, executing and evaluating collaborative damage, needs and capacity assessments. • Degree of awareness actors have of collaborators (the groups involved, their goals, tasks, needs and capacities) • Number of interactions between actors from different community/user-groups (e.g. citizen, NGO, government) • Degree to which the information shared between user-groups meets their information requirements. • Added value of these interactions for assessments for these user-groups
4. USABILITY LEVEL		
	4.1. User acceptance *(specific for different user groups)*	• Added value of COBACORE for intended user group / process / phases • Added value of information models, support functions and interfaces for o Damage, needs and capacity assessment o Prioritization o Matching o Progress monitoring • Trust in the COBACORE system as perceived user

Main Category	*Subcategory*	*Indicators*
		group o Information models o Support functions o Interfaces
	4.2. Interaction	• Number of interface actions needed • Speed of activities within tasks • Number of errors for activities *[to be made specific for each function / part-task]*
	4.3. Usability of functions	• Ease of use of function for (team of) user(s) • Satisfaction with function
5. INFORMATION QUALITY LEVEL		
	5.1. Data quality	• Covered area; whether the delivered data covers a defined area. • Accurateness; fitness for using the delivered data in certain fields of application. • Resolution; amount of detail that can be determined in space or time. • Completeness; absence of omissions in the delivered data. • Up-to-Date-ness; whether the delivered data is gathered after a specific date. • Level of detail; whether the delivered data is available to a certain degree of complexity
	5.2. Data sources	• Access to primary and secondary data, specifically: • Base layers • Thematic layers (categories like vital infrastructures, population density, economic centres, etc.)

Main Category	*Subcategory*	*Indicators*
		• Preparative layers (hazard, exposure, vulnerability maps per category) • Interactive layers (real-time information: satellite, damage assessments, needs assessments, location of capacities etc.)
	5.3 information models	• *Acceptability* – End-users (government, citizen, NGO) judge the concepts, properties and relationships in information models to be complete and clear for the purpose of damage, needs and capacity assessment and recovery. • *Clarity* – information models precisely describe the concepts, properties and relationships between them and help to avoid misinterpretation, confusion, contradiction. • *Comprehensibility* – the information models are easy to understand for developers and end-users who might need to update the information models after the project. • *Completeness* – the information models cover all the relevant concepts, properties and relations in the domain of interest without gaps in knowledge. • *Consistency* – the information models are free from logical contradictions in the classes, subclasses, categories, concepts, terms, instances, properties and relationships definition, that might lead to malfunctioning in their use. • *Unambiguity* – each class, subclass, category, concept, term or instance is uniquely named, definite and unequivocal for correct interpretation. • *Expandability* – the information models are open to the introduction of new information classes, subclasses, categories, concepts, terms, instances, properties and their relationships when necessary.

Main Category	*Subcategory*	*Indicators*
	5.4. Security	• Authentication; whether the service consumers should be authenticated. • Authorisation; whether only authorised service consumers should be able to access the service. • Confidentiality; whether data should be treated properly so that only authorized service consumers can access or modify data. • Accountability; whether service providers can be hold accountable for their service provisioning. • Traceability; whether it is possible to trace the history of a service when a request is processed. • Data encryption; whether the communication with the service should be encrypted. • Non-repudiation; whether it is possible to ensure that a service consumer cannot deny requesting the service after the fact.
6. SYSTEM PERFORMANCE LEVEL		
	6.1. Platform	• Computation capacity; available computation capacity for processing a request, e.g., number of CPUs. • Available storage; available storage for storing and creating data in the COBACORE platform. • Speed of data transfer • Number of database look-ups needed
	6.2. Run time	• Average availability; percentage of time a service is capable of processing a request. • Performance of web services, measured in terms of Response time, Latency, Throughput, Transmission

Main Category	*Subcategory*	*Indicators*
		delay and Processing delay. • Capacity; ability of a service to handle a minimum number of simultaneous requests in a given time interval. • Scalability; capability of increasing the computing capacity on-demand to process more requests in a given time interval. • Reliability; whether a service is capable to perform its required functions under stated conditions for a specified time interval. • Robustness; degree to which a service can function correctly even in the presence of invalid, incomplete or conflicting input data. • Accuracy; mean error rate produced by a service. • React quickly on service quality fluctuations
	6.3. Model effectiveness / efficiency	• Matching of input and output from models • Number of calculations
	6.4. Requirements implementation	• Percentage of functional and technical requirements included in the prototypes • Extent to which each requirement (with related priority) is included in the prototypes

4.5 Measures of agility

Crisis recovery activities such as damage, needs and capacity assessments need to be executed in a variety of circumstances, with little time to prepare and respond. Circumstances may not be ideal and may differ from what is expected. The goal of COBACORE is to be as robust, resilient, responsive, flexible and adaptable to these circumstances as possible. The extent to which COBACORE as a whole is agile to these circumstances needs to be determined by the following measures of agility (see

Table 2). Based on the outcomes of evaluations assessments will be made about the degree to which COBACORE meets measures of Agility below.

Table 2. Measures of agility

Goal	Description
Robustness	Total number of disaster phases (e.g. pre; early and late recovery) and user groups (e.g. citizens; government officials; NGO's) for which COBACORE is useful
Resilience	Gracefully degradation of COBACORE functionality and recover from loss of connectivity and data share-ability.
Responsiveness	Ability of COBACORE to react to changes in the environment in a timely manner despite suboptimal circumstances
Flexibility	Ability of COBACORE's information models and support functions to support users in multiple ways depending on circumstances.
Adaptation	Ability of COBACORE to support changing participating users, work processes.

4.6 Measure of Interoperability

COBACORE is intended to function as a connecting link between various user groups or (multi-)teams (see also Figure 2). One of the challenges in information technology development for collaborative applications is lack of interoperability. Interoperability issues arise when various heterogeneous user-groups and technologies are used to share information, and usually tackles three aspects: (a) technical: compatibility of sharable information formats (b) semantic: aligning the use of terminology and definitions, and (c) organisational: aligning standards, best practices and procedures. In the context of cross-border recovery interoperability legal and political interoperability can also be an issue (see Figure 4). For the current project, we focus on organisational, semantic and technical interoperability, while legal and political are in scope but out of focus.

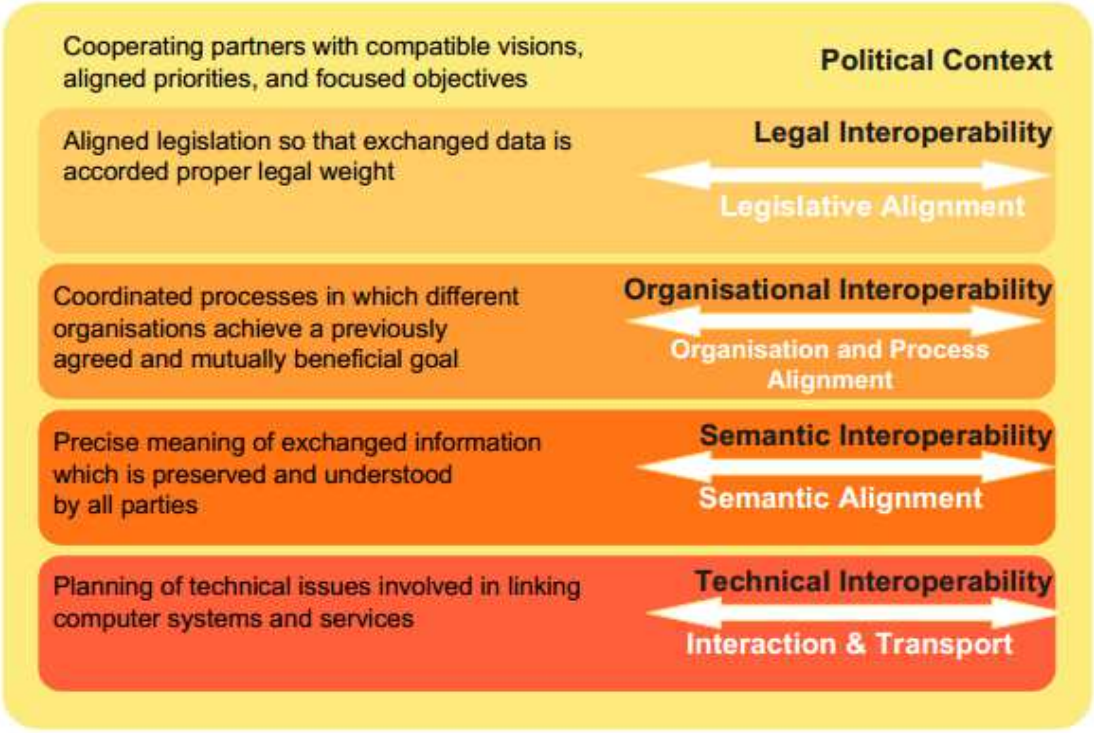

Figure 4. Levels of interoperability

Organisational interoperability	*Capable of organisational collaboration* • Degree to which the use of COBACORE is aligned with standards, best practices and procedures of intended end-users. • Degree to which end-users and their organisations are willing and able to align their standards and procedures to effectively and efficiently use COBACORE.
Technical interoperability	*Capable of technical interaction* • Degree to which COBACORE technology (software, hardware, information formats) is compatible with technology of end-users and their organisations.
Semantic interoperability	Capable of shared understanding. • Degree to which the terminology and definitions in COBACORE's information models are compatible with terminology and definitions of end-users and their organizations.

5 Cognitive Engineering methodology

To provide a meaningful and systematic manner to gather evaluation results, analyse them and use them to influence the iterative design process, we employ a Cognitive Engineering (CE) methodology, which incorporates scenario-based design (Carroll, 2000; Neerincx et al., 2008). Analogous to "classical" CE methods (Hollnagel & Woods, 1983; Norman, 1986), design solutions are based on knowledge from cognitive psychology and Human Factors and evaluated in an iterative fashion. In addition, the Situated CE (SCE) method employs work domain and envisioned technology analyses, to provide a sound design rationale for the intended work domain. The main benefit of this approach is that it incrementally refines the requirements baseline and design solutions, based on knowledge about user needs gathered from evaluations. The framework of performance assessment indicators can be used to specify support claims and requirements for scenario's and use cases together with end-users, experts and stakeholders. This will result in more specific and measurable performance assessment indicators for COBACORE's information models, functionality, interfaces and plaform.

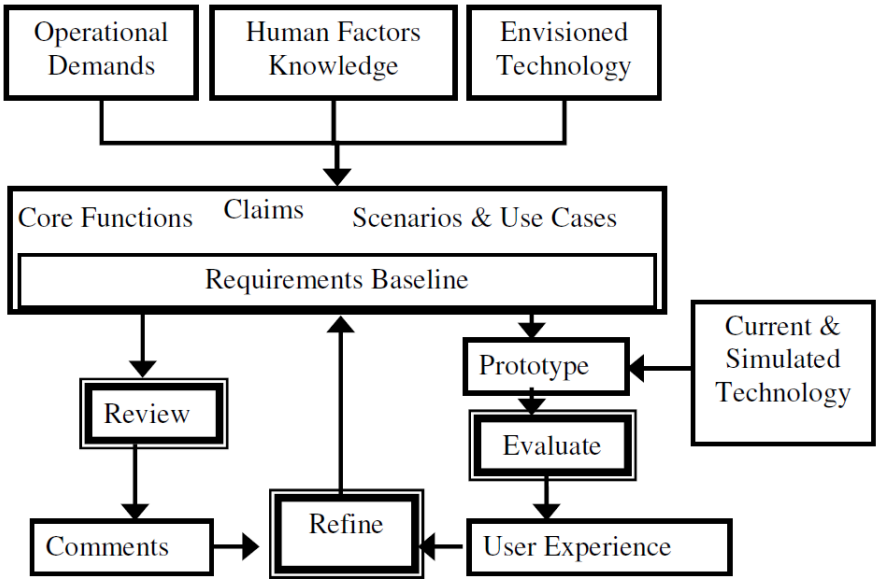

Figure 5. Situated Cognitive Engineering methodology (Neerincx et al, 2008).

The SCE method consists of an analysis, specification and evaluation part (see Figure 4). Contrasting to classic "waterfall" methods for software engineering, these parts are not strictly separated and may be addressed in parallel. Work domain and support analysis focus on the operational demands within a specific work domain, knowledge about envisioned technology that could be useful for COBACORE and Human Factors research. This analysis forms the input for the design rationale, consisting of the specification of a concept for the COBACORE platform with its core functions, usage and problem scenarios, and claims. The concept is a broad description of the proposed system. Scenarios are drafted from the relevant application domain, describing users, their tasks and context in a comprehensive, narrative style. Scenarios are not meant to give a complete and exhaustive picture; instead they focus on the intended use,

associated problems and illustrate design solutions. From the scenarios, core functions and claims are specified, describing the expected operational effects of the support that various user groups will get from COBACORE. The claims form the basis for testable hypotheses, which are assessed in the evaluation cycle. Combining the concept, scenarios, core functions and claims, the process of user interface design results in functional specification of system features.

Evaluation of the claims and features is done by 1) having HCI experts, end-users or software engineers review and comment on them (lower left cycle in Figure 1) and 2) by implementing these features in (semi-functional) prototypes and evaluating them on objective and subjective HCI and user experience metrics (lower right cycle in Figure1).

During evaluation, human participants (end-users, representatives of end-users, experts, stakeholders) work with prototypes in a specific task setting. Depending on the goal of the evaluation, the maturity of the prototypes and the evaluation setting, performance assessment indicators are selected from the table in Chapter 3. It is important to note that the SCE method is an iterative process, with a full cycle including the assessment of system features on the performance assessment indicators, and further refinement of the scenarios, core functions and system features based on this assessment. It is not necessary to evaluate the whole system at once; specific features or parts of the system can be evaluated separately in partial evaluation sessions (see Chapter 5). The end products of this cycle are validated system features, models and methods for the COBACORE platform, validated within the application domain of crisis recovery.

To implement this methodology in this project, three major steps need to be taken:

1) Importantly, we need to define the scenarios and use cases outlining the added value of COBACORE for specific user groups (civilians, NGO's and local government). Within these use cases, how COBACORE facilitates 1) damage, needs and capacity assessment, 2) needs-capacity matching and 3) collaboration and information sharing between the various user groups should be made apparent.
2) The relation between the claims for COBACORE functionality and performance assessment indicators should be made SMART (Specific, Measurable, Applicable, Realistic and Time-driven). An example of a claim could be "COBACORE will improve the needs assessment of the affected community by reducing the time needed to identify needs by 20%".
3) The three design and evaluation iterations within the COBACORE project should be tied closely together. The results from the partial evaluations (evaluation of claims and use cases) should feed into the design of the features of the "coarse version" COBACORE platform for the intermediate evaluation. Also, the results from the intermediate evaluation should influence the further design refinement and partial evaluations and features of the 'final version" COBACORE platform for the final evaluation. WP5 will track and evaluate to what extent the design knowledge is propagated through the various iterations. These are project activities within Task 5.2 and 5.3.

6 Approach to first partial evaluation sessions

This chapter outlines the aim, focus and approach of each of the partial evaluation sessions as defined in the evaluation agenda. To optimise the results gathered from these partial evaluation sessions, we propose the following **order** of the sessions in time (see Figure 2). First, WP1 starts with a session evaluating the concept of COBACORE and its assumptions (for example on scope, added benefit, activities and type of crises). Then, WP2 and WP3 (potentially combined in one session) will focus on the information models (quality, structure, etc.) and on the support concepts (relevance for activities, …). The results from these sessions must define the scope and focus of the WP4 session on software and hardware requirements. Finally, after all sessions are finished, WP5 will perform an evaluation of the methodology and approach.

Below, for each partial session the goal, participants, scenario, snapshots, approach, input, performance criteria, output and expected outcome are specified. Because each session has a different goal and approach, it is recommended that they are organised separately by the WP leaders themselves (i.e. as a workshop with experts). One exception might be to combine WP2 and WP3 sessions into one workshop. As was mentioned earlier, the framework of performance assessment indicators can be used to specify support claims and requirements in scenario's and use cases together with end-users, experts and stakeholders. This will result in more specific and measurable performance assessment indicators for COBACORE's information models, functionality, interfaces and platform.

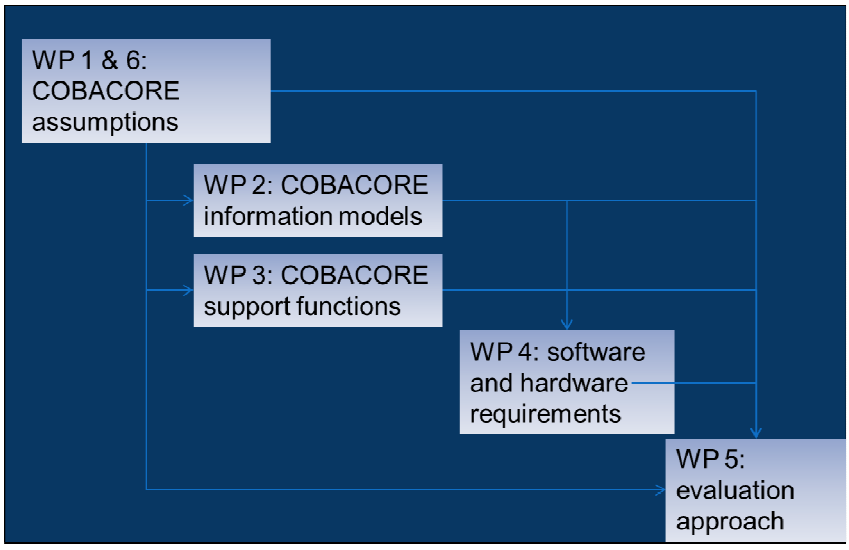

Figure 6. Timeline for partial evaluation sessions.

6.1 WP1/6: General COBACORE principles and assumptions

The main research question is to what extent the general concept of the COBACORE platform provides added benefit to the user groups, and whether the assumptions underlying this concept are valid.

- Goal: evaluating the usefulness of the COBACORE platform for intended users and activities and validity of critical assumptions, scope, content and marketability. (specified in Deliverable1.1)
- Participants: stakeholders from the three user groups (civilians, NGO's & local government); experts/user group representatives
- Scenario: based on selected representative COBACORE use cases from WP1 (after verification that these cases are within scope and focus)
- Snapshots: pre-crisis, early recovery, late recovery
- Approach: table top session; creative session
- Input: critical assumptions and supporting evidence based on theory and earlier crises
- Performance criteria: whole-of-community level; recovery effectiveness level. Added value for user groups, user-incentive.
- Output: SWOT analysis compared to other systems. Based on this analysis support, reject or adjust existing assumptions; establish new assumptions; determine COBACORE success factors (e.g. buy-in from the community)
- Outcome: refinement of scope, lessons learned, conclusions and recommendations for WP2 and WP3 sessions and intermediate evaluation. Position of COBACORE in the currently existing system context

6.2 WP2: Information models

The main research question for this session is whether the information models as used by COBACORE are accurate and complete for the intended use scenarios. This session involves end-users and experts to comment on what information to include and give options for structuring.

- Goal: evaluating the desired **information categories** for all user groups for needs, damage and capacity assessment for early and late recovery on level of aggregation, usefulness, accuracy and completeness across use cases.
- Participants: experts (e.g. specialist teams of construction workers); local end-users (NGO and mayor/chief executive government).
- Scenario: use scenario (see use cases of WP1) involving structural damage assessment. For instance comparing the pre-crisis situation with the post-crisis situation.
- Snapshots: pre-crisis, early recovery, late recovery
- Approach: table top session; creative session;
- Input: INSPIRE (*see Annex 12.1*), basic data, structure of information model; presentations; visualisations (visual demonstrations of structural damage); supporting evidence and examples
- Performance criteria: information quality level (usefulness, completeness, accuracy, model matching); functional level (decision making, exploitation of models, functional use for activities).
- Output: support, reject or adjust existing models; determine need for new models, information structures, information categories and visualisations.
- Outcome: lessons, conclusions and recommendations for WP3 and WP4

6.3 WP3: Support functions

The main research question for this session is whether the designed or envisioned support functions of COBACORE provide added value for the intended user groups in terms of performance and usability.

- Goal: evaluating the usefulness and usability of must have **support functions** for all user groups for needs, damage and capacity assessment for early and late recovery and the initiation and sustainment of **information sharing dynamics** across use cases.
- Participants: representatives from each user group (civilian, NGO, mayor/chief executive government); experts
- Scenario: based on WP1 and WP3 use cases and scenarios
- Snapshots: pre-crisis, early recovery, late recovery
- Approach: focus group setting; creative co-creation session; story board
- Input: concept support functions for actor activities and interactions; mock-ups of graphical user interfaces; scenario storyline
- Performance criteria: functional level (information sharing, empowerment, decision making) and usability level (usefulness and usability of the interfaces), recovery effectiveness level.
- Output: support, reject or adjust existing support functions; develop new support functions or define new activities.
- Outcome: lessons, conclusions and recommendations for WP2 and WP4 and for the design of the “coarse version” of the COBACORE platform.

6.4 WP4: Software and hardware requirements

The main research question for this session is what software and hardware requirements are needed for COBACORE in order to support the general concept, the information models and the support functions.

- Goal: evaluating the must have functional-, performance-, and operational requirements for software and hardware platform based on information models and support functions across use cases.
- Participants: members who attended the WP 1, 2 and 3 sessions; WP 4 members; experts on software, hardware and networks.
- Scenario: to be determined after WP2 and WP3 session.
- Snapshots: pre-crisis, early recovery, late recovery.
- Approach: technical expert review.
- Input: user requirements (WP 1, 2 and 3); functional-, performance- and operational requirements for software, hardware and network in excel lists; implementation criteria.
- Performance criteria: system performance level, information quality level and usability level.
- Output: support, reject or adjust requirements; new technical requirements and implementation criteria.
- Outcome: lessons, conclusions and recommendations for intermediate evaluation.

6.5 WP5: Evaluation methodology

The main research question for this session is whether the evaluation methodology, approach and performance criteria are valid.

- Goal: testing performance criteria, measures of agility, evaluation methodology and re-usefulness of methodology.
- Participants: WP5 members, WP leaders.
- Scenario: not required.
- Snapshots: each partial evaluation moment.
- Approach: discussion.
- Input: expected and observed results, outcome and process of the four partial evaluations.
- Performance criteria: validity of methodology and performance criteria.
- Output: benefits and limitations of methodology and performance criteria.
- Outcome: lessons, conclusions and recommendations for WP5 evaluation of intermediate evaluation (Task 5.3).

In order to further specify the partial evaluations, WP leaders and WP5 team members will jointly answer the following questions during dedicated sessions in the Belfast meeting (September 2013).

- What end-users in what session?
- What claims and hypotheses of COBACORE are we testing in these sessions?
- What parts, functions, processes, interactions are involved?
- What kind of assessment: Interview, expert feedback, workshop, evaluation in controlled environment, operational setting?
- What kind of data do you need to answer your question?
- What specific performance assessment indicators will be addressed? How are we going to use performance assessment indicators in interview and feedback sessions?

7 Approach intermediate evaluation

The goal of the intermediate evaluation is to determine the operational value of COBACORE functionality in an intermediate state.

Among the objectives of the COBACORE platform are:

1. to quickly identify needs in an affected community,
2. to visualise and mobilise community capacity (affected and supporting communities) to directly meet those needs, and
3. to help external actors to target those needs that are not (yet) met by the direct environment.

The intermediate evaluation provides the first opportunity to test developed features of COBACORE in a partially integrated manner. The COBACORE interface at this point is meaningful for operational end-users and fits their working habits and is presented in a scenario that is familiar and befitting their (professional) roles. The scenario, participants, environment, measures and test conditions enable COBACORE project to evaluate the operational value and to formulate advice for improving the system. This section outlines the preliminary specifications for the intermediate evaluation.

Although a specific scenario is used, it is important to be able to judge the degree to with COBACORE functionality (e.g. information models, interfaces and software) can be re-used in other post-crisis scenarios. Further, it is important that the scenario used in the evaluations helps COBACORE to present itself as intended to prospective clients and parties that want to develop and use the system.

7.1 Scenario

The events in the scenario are chosen so that they allow evaluation of operational value of COBACORE. The scenario triggers universal recovery activities (e.g. needs assessment, needs-capacity matching, information sharing, etc.) for each user-group both on scene and off scene. Events in the scenario before the crisis, in the phase of early recovery and in the phase of late recovery trigger needs and damage that common to multiple scenario's in addition to some unique needs and damage. This ensures that information models can be used across a range of scenario's ensuring our goal of comprehensiveness and robustness. For example, the need for shelter, water, food or energy can be triggered by many different kinds of disasters (extreme weather, flood, earthquake, or conflict for that matter). The events in the intermediate scenario are such that recovery activity is possible both with and without COBACORE.

Festival

….Five people have been killed and more than 70 injured at a music festival after a stage collapsed during a heavy storm. Two of the stages are apparently damaged or destroyed when trees were blown over in strong winds and crashed into rigging. Another stage was also damaged but was not thought to have caused any injuries. Some giant TV screens also fell down. An estimated 60,000 people are at the three-day festival when the storm breaks; doubling the regular population of the host municipality. Lots of tweets and social media etc…..

7.2 End-user groups

The operational value of COBACORE functionality is evaluated during the intermediate evaluation for the following user groups:

- Affected community: festival guests (including artists) and festival organisers.
- Supporting community: surrounding residents, family, friends and others
- NGO's: on and off scene aid workers of the Netherlands Red Cross (NLRC)
- Government: on scene and off scene representatives of municipality and emergency services (police, fire department & ambulances) and partners (critical infrastructure, military).

7.3 Experimental and control conditions

To evaluate the operational value of COBACORE for user groups, performance is compared between:

- An experimental condition with COBACORE functionality, and
- A control condition without COBACORE functionality.

In the experimental condition end-user groups perform recovery activities with the aid of COBACORE. In the control condition end-user groups perform these same activities without COBACORE. By comparing performance assessment indicators between experimental and control conditions the added value of COBACORE can be assessed.

7.4 Performance assessment indicators

To determine the operational value of COBACORE for each user group and for the whole the following performance assessment indicators will be specified:

- Collaboration and information sharing within and between user groups (e.g. community, NGO, government);
- Acquisition and analysis of information about needs, damage and capacities;
- Matching of needs and damage with capacities within and between user-groups;
- Availability and quality of data sources used for needs, damage and capacity assessment and matching;
- Degree of fit of built-in procedures with current practises of user-groups; and
- Usefulness and usability of COBACORE interfaces for users from each user-group.

Three kinds of assessments are combined as the basis for feedback and refinement of COBACORE features:

- Self-assessment of participants from all user groups and groups 1 and 2 of the evaluation groups: usefulness and usability of COBACORE features for recovery activities; match with procedures or working habits; added value of collaboration and information sharing; generalisability of functionality to other scenario's, suggestions about additions and improvements.
- Observations by experts (group 3): effectiveness and efficiency of damage, needs and capacity assessments; needs-capacity matching; information

sharing and collaboration and recovery as a whole, generalizability of functionality to other scenarios.
- Assessments of COBACORE members: Additional performance assessment indicators.

The reactions will be caught on forms – which represent questionnaires based on support claims and performance assessment indicators and are formulated beforehand by representatives of all work packages with the aid of WP5 team members. This way the evaluation experience will produce demand driven feedback to all work packages and allow assessing the overall operational value of COBACORE for all user groups and evaluation groups.

7.5 Evaluation environment

At this time, the precise setting and type of evaluation environment cannot be specified. Two possible options are a virtual environment or a real-world physical environment. Each has is benefits and drawbacks, and the choice depends also on the readiness of the COBACORE functions and features for this intermediate evaluation. Also, a combination of activities in the real world, combined with assessment activities in a virtual environment is still possible.

7.6 Evaluation groups

An additional categorisation in groups is introduced for the evaluation. A distinction is made between 1) on scene group, 2) off scene group and 3) observing group. Below the activities of these different groups for each end user category are detailed.

1. On-scene group (group 1)
    a. NLRC: regular assistance and first aid volunteers (NLRC) present at the festival site
    b. Affected community: festival guests (including artists) and festival organizers
    c. Government: on scene emergency services and representatives of municipality
2. Off-scene group (group 2)
    a. NLRC: digital volunteers activated at the moment of the emergency, working from their own (secluded) stations. Streamlining all available (digital) information and making sense of what is happening on site.
    b. Supporting community: surrounding residents, family, friends aiding the affected community
    c. Off scene emergency services and municipality off scene streamlining all available (digital) information and making sense of what is happening on site.
3. Group of observers (group 3)
    a. NLRC: Emergency aid experts observing and taking notes about within and between team performance
    b. Citizens: community representatives observing and taking notes about within and between team performance
    c. Government: government experts observing and taking notes about within and between team performance

7.7 Activities of teams

For each user group and role in the evaluation instructions for activities will made for the evaluation. Below there is a high level description of these activities for one user-group (Red Cross workers from NLRC and German Red Cross (GRC)) for the response and early recovery phase. Before the intermediate evaluation starts, similar activities will be defined for government and community user-groups.

7.7.1. Needs assessment NLRC

The needs assessment first has to define the disaster impact and how to cope with existing capacities. The most urgent relief needs und most vulnerable groups need to be determined. Also the best methods of relief delivery as well as political, logistical etc. constraints can be identified. First of all it is necessary to understand the crisis and its frame conditions and influences on it. To assess appropriate responses it is necessary to collect, analyse and interpret data. The collected data should include information about the baseline (what used to be there), the context (where are we starting), the situation (what has happened), needs (what assistance is required), the capacity (what resources exist) .

Group 1 NLRC: reacts to event in regular fashion, using COBACORE to report to and get updates from. Group 1 NLRC is an on scene team in which team members can have face-to-face contact with each other.

Group 2 NLRC: reacts to the event by uploading and structuring relevant secondary data available to them to the COBACORE platform. They analyse information acquired from the reports from group 1. They make both primary and secondary information accessible to other teams and answer questions posted on the platform to facilitate needs and capacity matching. Group 2 has no other contact with Group 1 or with other members of Group 2 than through COBACORE.

Group 3 NLRC: observe needs assessment, needs-capacity matching and information sharing with NLRC and with government and citizens at both the on scene and off scene location. Observers form a judgement of the effectiveness and efficiency of the aid provided / needs answered.

By specifying the support claims of COBACORE functionality activities of groups can be further specified.

7.7.2. Damage assessment in international operations (GRC)

To collect damage information different sources can be used, e.g. the affected population directly or through intermediaries, national or local authorities, other international response teams, scientific organizations, the media or internet. The collected data are divided in two groups: primary and secondary data. Primary data are e.g. structured interviews, direct observations, and satellite imagery. Secondary data are written reports, interviews of sources etc. There are different methods to collect data: initial/local self-assessment, visual inspection, sample surveying, key informant interviews, inter-organizational coordination meetings, detailed critical sector analysis by specialists, sentinel and polling surveillance. Subsequently the collected data need to be analysed and interpreted.

7.7.3. Capacity assessment (GRC)

First of all the needs and gaps have to be identified, then the framework and infrastructures should be analysed and possible constraints need to be defined. Summing up, some factors should be considered for an assessment. Thereafter the most reliable or accessible source should be identified. The assessment first should

give an overall picture and then focus on details. Needs and vulnerabilities should be assessed in relation to capacities.

7.8 Timeline of activities in scenario

7.8.1. NLRC Recovery goals

Restore daily life for everyone involved as quickly as possible

- Organise medical treatment for those who need it
- Minimalise economic impact by acting quickly on recorded damage
- Organise mental care for those who need it
- Facilitate guests to get home safely or arrange shelter

7.8.2. Prior to disaster (NLRC perspective)

Regular preparations for the festival: develop an incident management plan and organise the obligated presence of a first aid post (manned by Red Cross volunteers). Before the start of the festival, a final check on emergency planning measures - which include "checking trees for their resistance to high winds, and testing the drainage system".

Data sources (secondary): Finding and uploading background information about the host municipality, neighboring hospitals, available ambulances etc. What information was used for emergency plan of festival organization?

7.8.3. Early recovery - first 72 hours (NLRC perspective)

During and after the storm aid workers/volunteers present on the festival-site are supported by distant colleagues (online) through COBACORE tool. There is a lot of information available through social media; videos, photos, comments etc. However, this is not very coherent, is not validated nor prioritised.

Data sources (primary): Validated information from the community present and 'field visits' by volunteers on site (see image below).

7.8.4. Late recovery - after 72 hours (NLRC perspective)

Reports say organisers have now decided to cancel the rest of the event. Mud-splattered young people, many shoeless, are trudging down the avenue leading from the festival site to bus and train stations. Many had camped on the site overnight, in the vain hope that the festival would continue.

Two cranes are brought in to try to lift the largest tent that collapsed - but the festival grounds appeared to be too swamped to allow them access.

Data sources (secondary): Media report, satellite imagery, sitreps, Social media, videos, photos, etc.

7.9 Conclusion

This section has provided preliminary ideas for the user groups, scenario, performance assessment indicators and activities in the intermediate evaluation. It is important that all WP leaders involved acknowledge and contribute their input to these ideas. For the intermediate evaluation, the following still needs to be determined and further specified: 1) exact methods for data collection, 2) information models and key data for understanding damage, needs and capacities of actors, 3) availability, accessibility, format and source of data (Deliverables WP 2) and 4) type of evaluation environment (as mentioned in 6.5). By delivering MS51 milestone (at M12), these issues will be finalized, the evaluation plan will be completed, including a scenario, evaluation location and form, evaluation criteria and required means.

For the other user groups (community and government) scenario descriptions and recovery goals will be further developed. Events that trigger recovery activities and collaboration and information sharing between user-groups will be added. When support claims of COBACORE functionality are further specified, the activities of these groups can be further defined accordingly.

After the intermediate evaluation a clear idea is expected about the operational value that is desired by user groups and the operational value COBACORE is delivering. Gaps between desired and provided operational value relating intermediate and final evaluation are further closed.

8 Approach final evaluation in an operational setting

The goal of final evaluation is to determine the operational value of COBACORE functionality in its final state. It will be tested whether gaps between desired and provided operational value identified in the intermediate evaluation have been closed. To show the generalisability of COBACORE functionality a more complex post crisis scenario's is used including a focus on late recovery in an urban setting. The final evaluation provides the last opportunity to test developed features of COBACORE in an integrated manner in this project. This chapter outlines the preliminary ideas for the final evaluation.

8.1 Evaluation environment

This COBACORE version will be evaluated in a realistic operational scenario, in an environment that closely resembles the real-life operational environment. During evaluations in an operational setting, end-users take part in an exercise that closely resembles an actual operation. Such an exercise would be held in an actual operational environment (e.g. covering a certain geospatial in the The Meuse–Rhine EUREGIO as specified in the DOW, and including the necessary command and control centers), include multiple participating actors from different organizational levels (e.g. local and regional), actual or well simulated data feeds, and would cover phase before the incident, the early recovery phase and late recovery phase. End users are unaware of the specifics of the scenario, and use the COBACORE system as if it were being used in reality. In such settings, the COBACORE evaluators monitor the participants, assess their actions, and draw conclusions about the effectiveness of the COBACORE system.

Map of the Meuse-Rhine EUREGIO showing the Region of Aachen (red); the southern part of Dutch Limburg (blue); Belgian Limburg (light green); the Province of Liège (mid-green); and the German-speaking Community of Belgium (dark green). This

demonstration and evaluation will be held in the EUREGIO area on the Dutch/German border, with the participation of representatives of the regional humanitarian services, and volunteers under the representation of the Red Cross. The scenario, participants, environment, measures and test conditions enable COBACORE project to demonstrate the operational value to prospective clients and parties that want to further develop and use the system.

8.2 End-user groups

The operational value of COBACORE functionality is evaluated for the following user-groups:

- Affected community: Dutch and German citizens and companies in the earthquake/flood/chemical disaster affected area (e.g. South Limburg border region).
- Supporting community: surrounding citizens, family, friends and companies in both Germany and Netherlands.
- NGO's: on scene and off scene aid workers of NLRC and GRC
- Government: on scene and off scene representatives of Netherlands and German municipalities, safety regions/*kreise* (police, fire department, ambulances, critical infrastructure, military, etc.), provincial/federal authorities and national authorities.

In the final evaluation no comparison is made between an experimental and control condition. In field experiments it very hard to apply principles of experimental design (assignment of participants to different conditions, manipulation of one or more variables, measuring the effects of these variables, to control all other variables).

8.3 Performance assessment indicators

In this final evaluation COBACORE is tested with user groups and on scene and off scene teams in two countries. These teams are not used to working together in these circumstances and do not share the same national framework for response and recovery. We evaluate the potential of COBACORE to close information sharing and collaboration gaps between the two countries. To demonstrate the operational value of COBACORE the following performance assessment indicators will be specified:

- Collaboration and information sharing within and between user groups on two sides of the Netherlands and German border (e.g. community, NGO, government);
- Acquisition and analysis of information about needs, damage and capacities by user-groups on two sides of the Netherlands and German border;
- Matching of needs and damage with capacities within and between user-groups on two sides of the Netherlands and German border.
- Availability and quality of data sources used for needs, damage and capacity assessment and matching by user groups on two sides of the Netherlands and German border.
- Degree of fit of built-in procedures with current practises of user-groups on two sides of the Netherlands and German border

- Usefulness and usability of COBACORE interfaces for users from each user group on two sides of the Netherlands and German border

In this stage of development support claims of COBACORE functionality is fully specified. The implementation of functionality has been tested. As a result the performance assessment indicators can be made SMART and demonstrative.

8.4 Evaluation groups

The 1) on scene group, 2) off scene group and 3) observing group have user group representatives from both Germany and the Netherlands.

1. On scene group (group 1)
    a. NLRC and GRC: regular assistance and first aid volunteers (NLRC/GRC) present at disaster affected area.
    b. Affected community: residents affected by earthquake/flood/chemical spill including companies (incl. vital infrastructures) in both Germany and the Netherlands.
    c. Government: on scene Netherlands and German emergency services and representatives of municipalities in Germany and the Netherlands.
2. Off scene group (group 2)
    a. NLRC and GRC: digital volunteers activated in Germany and the Netherlands at the moment of the emergency, working from their own (secluded) stations. Streamlining all available (digital) information and making sense of what is happening on site.
    b. Supporting community: surrounding residents, family, friends and companies in Germany and the Netherland aiding the affected community .
    c. Off scene: recovery teams of municipalities, safety regions/kreise and national level in the Netherlands and German streamlining all available (digital) information and making sense of what is happening on site.
3. Group of observers (group 3)
    a. NLRC and GRC: Emergency aid experts observing and taking notes about recovery activities and information sharing within and between teams and between countries
    b. Citizens: community representatives observing and taking notes about performance within and between affected and supporting community and between countries
    c. Government: Recovery experts of Netherlands and German municipalities, safety regions/*kreise* and national level.

8.5 Activities of teams

For each user-group and role in the evaluation instructions for activities will made for the evaluation. Below is a high level description of these activities for one user-group for response and early recovery phase.

Group 1 NLRC and GRC: reacts to event in regular fashion, using COBACORE to report to and get updates from. Group 1 NLRC/GRC is an on scene team in which team members can have face-to-face contact with each other.

Group 2 NLRC and GRC: reacts to the event by uploading and structuring relevant secondary data available to them to the COBACORE platform. They analyse information acquired from the reports from group 1. They make both primary and secondary information accessible to other teams and answer questions posted on the platform to facilitate needs and capacity matching. Group 2 has no other contact with Group 1 or with other members of Group 2 than through COBACORE.

Group 3 NLRC and GRC: observe needs assessment, needs capacity matching and information sharing with NLRC and GRC and with government and citizens at both the on-scene and off-scene location. Observers form a judgement of the effectiveness and efficiency of the aid provided / needs answered.

For the final evaluation similar activities will be defined for government and community user-groups. By specifying and realizing support claims of COBACORE functionality activities of groups can be further specified.

8.5.1. Needs assessment

- Extent of area affected
- Number of people affected by direct and cascading effects of crisis (fatalities, injured)
- Number of people in need of water, food, shelter, sanitation, clothing, income, mental and physical health and medical and psychological relief, security;
- Number of these people and needs: targeted; reached; covered
- Number of households affected: lack of critical infrastructure services: power supply, tap water, unreachable by roads, ICT/telecom, etc.
- Number of disrupted societal functions (shops, schools, companies, etc.).
- Key priorities

8.5.2. Damage assessment

- Extent of area affected that cannot be used for a period of time as a result of direct and indirect disaster effects.
- Damage to cultural heritage.
- Economic damage for households and companies (recovery of buildings, furniture, stocks, vehicles).
- Indirect economic costs of loss of production, missed income also in upstream and downstream in the supply chain.
- Costs of disabilities and healthcare
- Costs of emergency management, aftercare and recovery (Critical infrastructure)
- Loss of economic vitality and unemployment
- Damage to environment and nature.

8.5.3. Capacity assessment

- Capacity emergency supply: safety and security, water, food, shelter, sanitation, clothing, income, mental and physical care, social security;
- Capacity for: debris management, damage taxation,
- Capacity: recovery of critical infrastructures (roads, dykes, energy, water, ICT/telecom, etc.
- Capacity: recovery of societal functions (schools, housing, economic life)

- Location and capacities (e.g. integration of local maps and geo referenced collection of hospitals in the districts around (150 km), real time data on surgery capacities in the hospitals, real-time traffic data, data on weather conditions, etc.)

8.6 Feedback and method of reporting

Three kinds of assessments are combined as the basis for feedback and refinement of COBACORE features:

- Self-assessment of participants
- Observations by experts
- Assessments of COBACORE members

The reactions will be caught on forms – which represent questions based on support claims, marketing and communication goals. This way the evaluation experience will produce demand driven feedback to all Work Packages and allows COBACORE to communicate demonstrated operational value.

8.6.1. Assessment procedure

The evaluation of the final demonstrator in the operational setting will consist of four evaluation stages:

1) Observation of COBACORE platform and its use during the demonstration and observation recovery activities of user groups both on-scene and off-scene by multiple groups of observers (per user group, per location).
2) Parallel debriefing sessions with respectively all on-scene and off-scene teams who will report on their experiences during the demonstration of the COBACORE platform. Questions also cover:
    - o what was exactly done, when and by whom → description of performed tasks by each team at what point of time during the different phases of the disaster case;
    - o What COBACORE functionality was of added value and why? → successes and key success factors
    - o What COBACORE functionality was of no added value and why? → identification of challenges and limiting factors

    In parallel debriefing sessions, the different teams first report on their work within their own user-groups (e.g. within RC) and report on the work with other teams (e.g. between RC and Citizens, between RC and Government). The sessions will be moderated by a group facilitator also visualizing tasks, key success factors and obstacles. A second person will takes notes which will be integrated in the overall evaluation process of the final demonstrator.
3) A joint feedback session of multiple groups: after the parallel debriefing on-scene and off-scene groups come together for a joint evaluation round. At the beginning, facilitators report on the results of the parallel sessions. Next, excerpts of video recordings are shown demonstrating examples of success factors and of obstacles of the COBACORE platform. The excerpts will be chosen by the organizers/leaders of the demonstration prior to the joint evaluation session. The participants are then asked to report on their experience of the work between on-scene and off-scene groups during the demonstration. The feedback session will be moderated by a facilitator who will visualize the tasks, key success factors and obstacles on a pin board. A second

person will take notes which will be integrated in the overall evaluation process of the final demonstrator.

4) Feedback in written form: Questionnaires to be filled by each participant (per off-scene and on-scene teams) after the debriefing and joint feedback session. In addition items used for validation of "support claims" of the COBACORE system space is available for suggestions about must have features that should be incorporated when COBACORE is to deliver operational value.
5) Overall evaluation by integrating the results of the evaluation stages 1-4 into a final evaluation report.

8.6.2. Instruments and methods for evaluation

- Video cameras for recording the work of the on-scene/off-scene teams during the demonstration of the COBACORE platform
- Video recorders, editing tools and displays for presenting episodes to participants.
- Instructions and persons for debriefing and feedback sessions
- Written documentation:
    - Evaluation sheets to be filled for describing and evaluating the on-scene teams
    - Evaluation sheets to be filled for describing and evaluation the work of the off-scene teams
    - Questionnaire to be filled in by the members of the off-scene and on-scene teams
    - Minutes of debriefing and feedback sessions
    - Final evaluation report

8.7 Scenario

The events in the scenario are such that they allow evaluation and demonstration of operational value of COBACORE. The scenario triggers universal recovery activities (e.g. needs assessment, needs capacity matching, information sharing between teams, etc.) for each user-group on scene and off scene. Events in the scenario before the crisis, in the phase of early recovery and in the phase of late recovery trigger needs and damage that is common to multiple scenario's in addition to some unique needs and damage that are specific for the scenario. This ensures that information models can be used across a range of scenario's ensuring our goal of comprehensiveness and robustness. For instance, the need for water, energy, food as a result of failing critical infrastructure can be triggered by a flood, earthquake or conflict for that matter.

8.7.1. Case of damage and needs

An earthquake, chemical spill, flooding, or other disaster on the border of the Netherlands and Germany, leads to collaborative challenges. The event takes place in an urban setting and is challenging enough to test the regular collaboration between emergency and relief organisations. Now the collaboration has to cross the German-Dutch border as well, leaving room for differences in responsibilities of different organizations, for language barriers and for cultural differences that may hamper effectiveness.

8.7.2. Recovery goals

Short term:
- medical needs and health care
- water supply and sanitation
- nutrition and food aid
- shelter and site planning

Long term:
- Decrease recovery time to 3-5 years
- Minimize displacement of residents and businesses
- Speed economic recovery
- Improve community resiliency and sustainability
- Minimize community disruption
- Serve vulnerable populations

8.7.3. Prior to disaster

The activities prior to the disaster are realistic and meaningful for NLRC/GRC, local/regional governments (including critical infrastructure) and citizens. The scenario must be chosen such that risk profile of the region demands a sufficient level of preparedness.

The disaster is unexpected, but German and Dutch emergency and relief organisations are well-trained and well-prepared. Information needed to build a baseline for the COBACORE platform is available, sharable, combinable and useful for all user groups. Relevant datasets are shared between various stakeholders on both sites of the border and the bureaucracy of sharing information might cause challenges.

Data sources (secondary)

For the final evaluation the following is to be determined: 1) methods for data collection, 2) information models and key data for understanding damage, needs and capacities of actors, 3) availability, accessibility, format and source of data. An example of data sources used by GRC during and after a disaster: Official governmental websites, social media platforms - groups, EUREGIO platform, evacuation plans, altering plans and strategies, Monitoring and Information Centre of the European Commission in Brussels, German Joint Information and Situation Centre, German Emergency Prepared Information System (DENIS), European, German and Dutch Meteorological services.

8.7.4. Early recovery - first 72 hours

On-scene group:

The activities in early recovery are realistic and meaningful for NLRC/GRC, local/regional governments (incl. critical infra) and citizens. The scenario must be chosen such that preparedness for early recovery activity is acceptable given risk profile of the region.

Government:

- Collecting meteorological data and forecasting by meteorological services. Collecting hydrological and hydrometrical data by central and regional water management authorities, e. g. flood forecasting centres and central and

regional water management authorities: data collection and interpretation, flood modelling, flood forecast and issuing warnings.

- Receiving forecasts and warnings, interpretation and decision making, forwarding warnings, providing information, cooperation of participants and the media (regional and local decision makers, flood committees and disaster prevention, civil defence, media).
- Coordination of measures and participants, informing the public (e.g. flood committees and disaster prevention, local authorities, civil defence.
- Precautionary building measures.

Citizens:

- Minimising damage risk through preventative measures, flood defence and evacuation endangered people. Spatial planning measures needs to integrate in a comprehensive and convincing concept. Private households need to increase their private precautionary measures. Great need for information on how to provide protection against an emergency situation. Regular information events and thematic exhibitions heighten awareness about earthquakes.

GRC:

- Hazard analysis: For the units and the patients, it is of particular importance that a further treatment after the patients have been rescued happens outside the damage zone. In order to assess the type of danger a hazard analysis must be done. Therefore the implementation of the AAAACEEEE method proved effectiveness. The abbreviations stand for the following terms (German): A temgifte/ Gas (= breathing poision / gas); A ngstreaktion/ Panik (= fear reaction / panic); A usbreitung (= dissemination); A tomar (= nuclear); C hemikalien (= chemicals); E xplosion (= explosion); E rkrankung/ Infektiöses (= affection / infectious); E lektrizität (= electricity); E insturz/ Statik (= collapse / static) ;V erkehr (Straße/Schiene) (= traffic (road / rail)
- Spatial planning: The aim of the planning must be to position the vehicles of all participating organizations with high efficiency while ensuring a high level of security. Due to limited space around the damage zone, in practice this is often a very big challenge.
- Pre-triage and transportation to patient depot: The aim is to identify traumatised patients, to label them and to transport the severely injured ones within the classification I (red) as quick as possible out of the damage zone. This classification I patients are treated first (life-saving measures) on site at a collecting point called “patient depot” and/or in the rescue vehicles on the way to the hospitals. The seriously injured and slightly injured patients (classification II (yellow) and III (green)) are treated after they have been carried out of the damage zone to the patient’s depot
- Transportation to the hospital: As soon as a new patient is ready to being transported, the on-scene commander orders an appropriate vehicle from the vehicle queue area to the patients’ depot in order to implement the departure workflow and carry him/her to the hospital that has adequate capacities. Accident-caused road barriers may hinder a quick departure.

Off-scene group:

- Installation of control and command centre (coordination of and information sharing with on-scene group)

Observer group:

- Emergency aid experts observing and taking notes about recovery activities (Hazard analysis, Spatial planning, Pre-triage and transportation to patient depot, Transportation to the hospital) and information sharing within and between teams and between countries

Data sources:

For the final evaluation the following is still to be determined: 1) methods for data collection, 2) information models and key data for understanding damage, needs and capacities of actors, 3) availability, accessibility, format and source of data (deliverables WP2).

8.7.5. Late recovery (after 72 hrs)

Cleaning and clearing up activities, removal of barriers, stand-by work of tracing service and information centre, resettlement of evacuees, dismantling emergency shelters, returning beds and other material, repairing and restoring further infrastructure

Data sources:

For the final evaluation the following is still to be determined: 1) methods for data collection, 2) information models and key data for understanding damage, needs and capacities of actors, 3) availability, accessibility, format and source of data (deliverables WP2).

8.8 Conclusion

This chapter provided preliminary ideas for the setting, scenario, activities and involved user groups for the final evaluation. Still, much is to be further specified, depending on the progress in the project. For the final evaluation the following is still to be determined: 1) methods for data collection, 2) information models and key data for understanding damage, needs and capacities of actors, 3) availability, accessibility, format and source of data (deliverables WP2).

For Milestone 5.2 (at M24) these issues will be finalized, the evaluation plan will be completed, including a scenario, evaluation location and form, evaluation criteria and required means. Specifically, the MS52 evaluation plan will answer:

- How are we going to use performance assessment indicators in final evaluation?
- How can functionalities and information models for this scenario be re-used for another (potentially larger scale) scenario?
- How does this scenario help COBACORE to present itself to prospective clients / parties that want to further develop and use the system?

9 Conclusions

This document describes the results of task 5.1: Development of the evaluation agenda and performance criteria. An evaluation agenda and approach to partial, intermediate and final evaluation is described in addition to performance assessment indicators.

As described in the evaluation agenda (Chapter 2) a number of partial evaluations will be organized between month 6 (September 2013) and month 12 (April 2014). Following the Cognitive Engineering methodology that is described in Chapter 4 we will operationalize the performance assessment indicators identified in Chapter 3 for these partial evaluations. This will be done in task 5.2. The initial idea about the goal of and approach for partial evaluations is described in chapter 5. Together with work package leaders these ideas will be further detailed in task 5.2. The evaluation agenda and performance criteria enables COBACORE project partners to organize interview and feedback sessions and further specify evaluations and COBACORE functionality. In partial evaluations COBACORE project partners can observe, interpret and evaluate experiences of users and draw conclusions about the operational value of functionality. In Chapter 6 and 7 initial ideas about intermediate and final evaluation is provided. We expect that as the COBACORE project progresses that these ideas will be updated and adjusted. These ideas will be further detailed in task 5.3 and task 5.4.

As the COBACORE project progresses the evaluation agenda and set of performance assessment indicators are refined and adapted to goals and opportunities in intermediate and final evaluations.

10 References

Carroll, J. M. (2000). Making use: scenario-based design of human-computer interactions. The MIT press.

Hollnagel, E. & Woods, D. (1983). Cognitive systems engineering: New wine in new bottles. *International Journal of Man-Machine Studies, 18,* 583-600.

Marks, M.A., DeChurch, L.A., Mathieu, J.E., Panzer, F.J. & Alonso, A. (2005). Teamwork in Multiteam Systems. *Journal of Applied Psychology*, *90(5),* 964-971.

Neerincx, M. & Lindenberg, J. (2008). Situated cognitive engineering for complex task environments. In J.M.C. Schraagen, L. Militello, T. Ormerod, & R. Lipshitz (Eds.), *Naturalistic Decision Making and Macrocognition* (pp. 371-387). Aldershot, UK: Ashgate.

Norman, D. (1986). Cognitive engineering. In D. Norman & S. Draper (Eds.), *User-Centered System Design: New perspectives on human-computer interaction* (pp. 31-62). Hillsdale: LEA.Carroll, J. M. (2000). *Making use - scenario-based design of human-computer interactions.* Cambridge: MIT Press.

Wise, C. R. (2006). Organizing for Homeland Security after Katrina: Is Adaptive Management What's Missing?. *Public Administration Review*, *66*(3), 302-318.

Zaccaro, S.J., Marks, M.A., & DeChurch, L.A. (2011). *Multi team systems: An organization form for complex, dynamic environments.* Taylor & Francis.

11 Acronyms and abbreviations

ARC	American Red Cross
COBACORE	Community Based Comprehensive Recovery
DENIS	German Emergency Prepared Information System
DHS	Department of Homeland Security
DOW	Description of Work
GRC	German Red Cross
HCI	Human-Computer Interaction
NGO	Non-governmental Organisation
NLRC	Netherlands Red Cross
RC	Red Cross
SCE	Situated Cognitive Engineering
SMART	Specific, Measurable, Attainable, Realistic and Time-defined
WP	Work Package

12 Appendices

12.1 ANNEX INSPIRE

The INSPIRE directive aims to create a European Union (EU) spatial data infrastructure . This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe (examples data).

Annex III

- Statistical units
- Buildings
- Soil
- Land use
- Human health and safety
- Utility and governmental services
- Environmental monitoring facilities
- Production and industrial facilities
- Agriculture and aquaculture facilities
- Population distribution – demography

12.2 Measures of Effectiveness of Community Recovery

Measures of Effectiveness (MOE) is a standard against which the effectiveness of COBACORE can be judged. It measures whether COBACORE achieves the mission it is designed for. This mission and standard is defined by current doctrine, lessons learned and principles on the "Whole Community Approach to Emergency Management (FEMA, 2011) and Lessons in Community Recovery (FEMA, 2011).

COBACORE should support the benefits of the Whole Community Approach to Emergency Management and should support users to cope with the challenges of this approach (FEMA, 2011).

Benefits of Whole Community Approach

- Shared understanding of community needs and capacities
- Connection with existing leaders and community exchanges
- Greater empowerment and integration of resources across the community
- Stronger social infrastructure
- Relations that facilitate more effective disaster risk reduction
- Greater resilience at multiple levels

Challenges of Whole Community Approach

- Understanding the complexity of community groups and their interactions
- Understanding the diversity of (unmet) needs, (unused) capacities and (unconnected) networks
- building and maintaining multiple partnerships with a large number of diverse community groups

COBACORE should support lessons learned and principles identified Whole Community Approach to Emergency Management (FEMA, 2011).

Lessons learned

1. Local Ownership and Direction
2. A Common Vision for Recovery
3. Plan for Recovery
4. The Timeline for Recovery is Long
5. Partnerships and Organizing
6. Leadership and Consistency
7. Role of the State Government
8. Federal Operations and Support

Principles

- Are Community Driven
- Build Local Capacity
- Are Project Oriented
- Promote Mitigation
- Build Partnership and Coordination
- Engage the community