SMART MATURE RESILIENCE

DESIGN PRINCIPLES FOR THE USE OF SOCIAL NETWORK SERVICES TO PROMOTE CITIZEN ENGAGEMENT

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EXECUTIVE SUMMARY

This report was prepared in the framework of Work Package (WP) 4, i.e. the WP that is developing the Resilience Engagement and Communication Tool, and in particular a toolbox and a prototype. Specifically, this report is the third deliverable (D4.3) of this work package. It presents design principles for the use of social network services to promote citizen engagement. This is facilitated by the task of integrating social media communication with citizens as part of the Resilience Information Portal that is also currently finalized. Overall, WP4 provides a collaborative environment that facilitates awareness and engagement among key stakeholders and partners in resilience building activities.

This report takes into account the feedback from the partner CITIES on the specific functionalities and qualities of the Resilience Information Portal, developed by CIEM (Center for Integrated Emergency Management), Universitetet i Adger, in collaboration with TECNUN, University of Navarra.

The report is divided into eight sections: after an introduction, Sections 2 and 3 jointly focus on providing information on context, background and methods used. Section 4 discusses the relevance and importance of social media integration for increasing citizen engagement in cities. Section 5 focuses on the design principles and Section 6 provides the functional specification of the tool based on the identified design principles and the specification presented in D4.2. Section 7 summarizes testing scenarios for utilizing the functional specification and for aiding implementation and usage of the Resilience Information Portal, referring back to the interactive exercises that were conducted during the project´s review workshop in Kristiansand, September 2016. The eighth and final Section of this document summarizes the deliverable report in brief and provides general conclusions touching upon the important issue of the tool's integration with the Resilience Maturity Model.

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1. INTRODUCTION

Delivery 4.3 (D4.3) is the third of four deliverables in Work Package 4 (WP4). The overall goal is to present *design principles for the use of social network services to promote citizen engagement*. This is facilitated by the task of integrating social media communication with citizens as part of the Resilience Information Portal[1]. In parallel, D4.4 – the portal prototype – is finalized. Overall, WP4 provides a *collaborative environment in order to facilitate awareness and engagement among key partners in resilience building activities*.

This third deliverable complements the design principles proposed in D4.2 by integrating social media services and their usage by and for cities. It contributes to three[2] of the objectives of WP4[3]:

- The identification of communication and engagement needs of partner CITIES (O4.2).
- Development of a platform (i.e. the portal) that supports information and knowledge sharing (O4.3).
- Develop guidelines for integration of social networking services as part of a shared platform (O4.4).

Therefore, with this deliverable, the picture is completed and WP4 can be concluded at the end of project month 18. This does not mean conclusion in the sense of the SMR project as a whole, though; in fact, D4.3 – and also D4.4 – serve a particular role in handing over work to WP5, within which work related to the pilot implementation of the tool is ongoing. WP5 is responsible for implementation, validation, and integration of the SMR tools, including the Resilience Information Portal. Moreover, interplay with WP6 for standardization is required.

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[1] Following the approach in D4.2 (Majchrzak & Sakurai, 2016), we use *communication platform* to describe an information system but *Resilience Information Portal* to describe the information system that is actually developed as a prototype for WP4 and that CITIES will implement, following the WP's work. When speaking about the portal from a non-technological perspective, Resilience *Engagement and Communication Too*l is also used in the project to align it terminologically with the other tools that are currently developed. Thereby, *Resilience Engagement and Communication Tool* can be understood as *Resilience Information Portal* plus the *relevant processes* plus the *required ecosystem*.

[2] O4.1 – surveying worldwide approaches – has been described in the prior deliverables already. It has also been done in exchange with WP1.

[3] For more details on the WP's objectives and deliverables, please refer to D4.1 (Majchrzak & Sakurai, 2015).

This deliverable continues based on the work with the CITIES. Relying on the input we already had, we have designed informal interviews in which we learned about the strategies and practices CITIES employed with regard to social media services. This is complemented by literature work as well as an analysis of the results of other EU projects.

Since D4.3 is the last textual deliverable in WP4, it poses some redundancy when comparing it to D4.2. Any such redundancy is due to giving a full picture, i.e. D4.3 is self-contained. However, to keep redundancy to a minimum we do not repeat rationale and explanation already given in D4.2, e.g. regarding the justification of the set of design principles derived in the second task of WP4. To serve this purpose, we have chosen a structure that will allow a comprehensive presentation of WP4's main findings. This is realized by splitting them up into three parts.

At first, we present the extended set of design goal and principles. These design principles and goals have not only been enriched to integrate social media as a mean to communicate with stakeholders and citizens but have also undergone significant revision. In particular, we have scrutinized how cities can increase the level of trust their citizens have in their resilience-related services and how cities can build a form of collective intelligence. Moreover, we have investigated how cities can empower citizens concerning their role in resilience.

Secondly, the completed functional specification is given. For this purpose, the specification presented in D4.2 has been revised and extended by requirements for the integration of social media services into the Resilience Information Portal. Moreover, the full set of functions is presented.

Thirdly, we extract the testing scenarios from the functional specification and present them in a section of their own. This has been done since they provide value beyond the pure technical nature of serving as the basis for test cases. This is a finding from the SMR workshop in Kristiansand, where we worked with CITIES on the scenarios.

As a remark to terminology, D4.3 has two particularities. First, we use both *CITY* and *city*. CITIES in caps denote the seven tier-one and tier-two cities that are members of the SMR consortium. Cities otherwise refer to any number of cities, irrespective of involvement in the project. Second, due to the different topics covered in this deliverable, terminology changes between some of its sections. Most notably, the functional specification uses technical wording. This includes a different purpose of *stakeholder* compared to usage throughout the document (and in the SMR project as a whole). We have

sought to make all parts equally comprehensible and we have avoided jargon whenever possible, yet particular wording was *not* avoided at the cost of precision.

The remainder of this document is structured as follows. Section 2 provides background information for this deliverable. In Section 3 we present the method that led to the creation of this deliverable. Section 4 introduces social media as a concept to engage citizens. Then, the three core Sections follow. Section 5 presents the design principles; Section 6 contains the functional specification; Section 7 proposes testing scenarios. Eventually, in Section 8 we draw a conclusion and give an outlook. In addition to the main part of this document, a comprehensive Appendix is given, starting on page 107.

2. CONTEXT AND BACKGROUND

2.1. GENERAL

This section introduces the context and background of the third deliverable of Work Package 4. Therefore, it starts by explaining how D4.3 and D4.4 conclude the work in WP4 and which consequences this has for the remaining 18 months – the second half – of the SMR project. Then, we explain how the work on D4.3 has drawn from D4.1 and D4.2 before mentioning the interrelations with other work packages. Eventually, we sketch the relationship between D4.3 and D4.4.

2.2. CONCLUDING WORK PACKAGE 4

Similar as with Task 4.1 (T4.1) and T4.2, T4.3 is rather open. While it is captioned with *social media communication with citizens*, the description of actions leaves much room for shaping D4.3. However, all activities are built around the proposed *focus on the evolving role of social media to promote social awareness, collective intelligence and community empowerment*.

We found it to be useful to extract inputs from other EU projects, in which more details in this regard are given; results are presented in Section 4. While noticing the importance of reviewing these projects, our main source of input has been the CITIES, as the field of social media utilization and analytics evolves too fast to base work on prior activities. In this sense, we continuously strived to maximize WP4's contribution to their needs.

A central aspect to be kept in mind for this deliverable is its positioning within the project. WP4 started with the project as a whole but is concluded after 18 months. Therefore, it must supply all its input to the further project at this time. Moreover, the Resilience Information Portal needs to be integrated with the other tools (developed in WP3) and – to facilitate overall cohesion within the project – with the Maturity Model as the project's "middleware" and foundation. This has had several ramifications and also leads to a need for ongoing involvement until the end of the project's lifespan:

WP4 duration

WP4 took a while to fully set off. The hen-egg problem we faced has been described in D4.1 and D4.2 before.

Parallelism of WP4 and 5

WP4 had to provide input to WP5 for purpose of implementation and validation of its results, before it actually was finished. This kind of parallelism is unavoidable in relatively short-running projects such as SMR[4], although it required much flexibility.

There are activities within WP5 that will take place following project month 18 and are strongly connected with WP4. These particularly include the organization of training workshops with relevant stakeholders in the tier-one CITIES, focusing on the utilization and functionality of the Resilience Information Portal. This should allow broadening the scope of stakeholder involvement even further.

Evaluation of the work

Theoretical work leading to the two existing deliverables and the one at hand, and work on the portal was parallelized. While this provided the change for an interactive, incremental and evolutionary development process, it also required us to assume requirements, anticipate needs, and in general to “try out” possibilities. We believe that this serves a better overall solution, but it also meant that work has not been as efficient as it might have been with a less tightly coupled approach.

Development of the portal toolbox

Trying to be agile with several factors that hamper agility did not impede our effectiveness, though: coming up with a portal toolbox rather than with a fixed portal is going beyond the SMR proposal and provides a value that will become apparent in the second half of the project.

Further coordination with WP5

Both owed to our approach of agile developed and to the fact that we propose a toolbox rather than fixed software, ongoing work is mandated. This ongoing work is already anticipated in the

[4] Admittedly, three years are a medium-long project duration, but three years are a relatively short time for the variety of heavily interlinked tasks and the novelty of problems tackled by SMR.

SMR proposal, within WP5 that implements, integrates, and validates the project's outputs, namely the tools. Thereby, WP4 is concluded with this deliverable and with D4.4, yet activities regarding the portal will continue as the work with the CITIES in WP5 might mandate changes. Covering this work under the umbrella of WP5 and putting particular emphasis on the integration with the other tools is not a risk or even a shortcoming, but rather an opportunity and a change to keep the Resilience Information Portal functional and scale it to the specific needs of the cities. This also poses chances to unify topics, e.g. regarding stakeholder analysis.[5]

Outcomes from WP4 – Design principles and the portal toolbox

Strictly speaking, work on the portal does not even end with the SMR project. Both the design principles and the portal are assets that are meant to outlive the project and take on an individual life after its end. It can already be observed that this is viable, and the shift in direction to a portal toolbox well serves this purpose. Some of the CITY partners have already told us that their work in SMR not only increased stakeholders' interest in resilience as a concept but that they also shared ideas with other, non-partner cities. This is regardless of these cities falling into tier-three or tier-four as envisioned in the SMR proposal. If CITIES use the portal toolbox to improve their own IT systems as well as to enrich the Web solutions, they use internally and that they provide to their citizens, it is likely that this will create further interest. Due to adaptation, parameterisation, and customization, the portal will evolve further. Other cities are likely to adopt ideas, adapt concepts or even technological assets, and contribute to the ongoing revision of the proposition of a Resilience Information Portal.

Outcomes from WP4 – Standardization of the function

Plans for a standardization of the functional specification (as will be motivated later in this document) have ramification of their own, both because our work needs to achieve a form that allows formal standardization and because the standard needs to align with the post-WP4 consequences sketched above. Details are given in Section 3.3.

[5] Ongoing work includes creating a consistent definition of *stakeholders*. Throughout WP4 activities, the term stakeholder holds various meanings depending on CITIES and stresses they need to endure. This is a part of the agile approach and, thus, WP4 is missing involvement of *some* emergency service providers such as ambulance services. What WP4 has focused on was to extract as much information as possible from CITIES regarding communication practice for building city resilience. Therefore, selection of stakeholder was at their discretion; for details please refer to D4.2.

2.3. BUILDING ON D4.1 AND D4.2

The three successive phases of WP4 rely on each other. Thus, D4.1, D4.2, and D4.3 are no separate summaries of insights but have to be rather seen in the light of continuous revision and extension. Whereas D4.2 already built on D4.1, D4.3 builds on D4.2, particularly considering the following results:

- The initial set of design goals and principles has served as input for the revised and extended set presented in this deliverable. The rationale and details on how design principles derive from CITIES' input are not repeated here, though.
- The functional specification is based on the one proposed earlier. However, it underwent revision and extension regarding social media. Moreover, it now is presented along with a full list of functions as well as with testing scenarios.

Moreover, the work on the portal – which will be concluded with D4.4 – has been intertwined with the work that led to the three textual deliverables of WP4, as sketched in the process presented in D4.1 (p. 34).

2.4. INTERRELATIONS WITH OTHER WORK PACKAGES

Extending the discussion of interrelations with other work packages as presented in D4.1 and D4.2, D4.3 in particular relates to three other work packages. The same is true for the interrelations of portal development, or, in summary, for the last six months of work on WP4 as a whole.

With the start of WP3 and the development of the non-technological tools, WP4 must provide results and assets that are ready for integration. This requires good collaboration and very tight coordination. As described before, the Maturity Model is used as a tool to provide a holistic view in the SMR project.

Even more profound as for the work towards D4.2 was the integration with WP5. We have taken the seeming contradiction of starting WP5 with WP4 not yet finished as an opportunity to realize heavy interlinkages. During the six-month period leading to D4.3 (and D4.4), there was not only constant exchange between WPs 4 and 5 but also joint work e.g. on exercises and co-hosted events such as activities with the CITIES (in particular informal interviews lead by WP4 and the kick-off workshops lead by WP5). Moreover, since WP5 and WP7 are both hosted by ICLEI European Secretariat and

WP7 eventually should serve as integrator of the Resilience Information Portal and the SMR Web site[6], we have further intensified the WP4/WP7 bonds. We will also support WP7 is linking up the tool development efforts of the whole project.

Work with WP6 has also been intensified, guiding the way to a standardisable WP4 functional specification. More details are given in Section 3.3. Additionally, much work of WP6 regarding applicable standards has found its way into this document and into the portal prototype; in particular, the functional specification (Section 6) links to several well-established standards. Along these lines, it should also be mentioned that WP4 has drawn from WP1 work, as highlighted in D4.1 and D4.2, as well as input regarding applicable standards, most notably from D6.1.

2.5. PARALLEL WORK ON D4.4

As proposed in the first two deliverables, the theoretical work on WP4, the activities with the CITIES, and the actual development of the portal went hand-in-hand. The shift to providing the portal as a toolbox did not change this mode of work; in fact, it even went very well along it. Therefore, the parallel development of the portal is reflected both in the ideas conveyed in the design goals and principles and in the technical detail described in the functional specification.

In the last months, work on the portal prototype has led to numerous refinements and the successive implementation of all MUST criteria outlined in D4.2. They have proven to be a feasible.

As already sketched, portal development has switched focus over time. Originally, we set out to create a project-based portal, probably even a portal of portals that would integrate project-specific portals of the single CITIES. Moreover, it was intended to provide a kind of off-the-shelf product that would be *installable* (as a stand-alone tool) by further cities. While we enabled a social networking platform with help of WP7, namely in form of the SMR Web site and the integrated LinkedIn group, and also tried out different channels of communication between cities, their stakeholders, and us (i.e. CIEM and TECNUN) as scientific stakeholders, work on the portal was pending.

Non-uniform and not readily applicable results from the work with literature hinted to the fact that an off-the-shelf portal might be hard to realize; at the same time, the rapid technological progress sug-

[6] In fact, the “communication platform […] as a shared resource in the project” (SMR proposal, p. 38) has already been provided based on the SMR web site and the LinkedIn group with the support of WP7.

gested that to simply fulfil the requirements of the SMR proposal, namely to provide a social networking platform that would enable communication, knowledge sharing, and engagement needs, would be no profound challenge. In fact, the same functionality – even including the adequate social media integration demanded in T4.3 – is provided by available systems. An example for a category of such systems are e-learning tools[7] mainly used by universities to provide an electronic link between teachers and students. While designed for a different purpose, comparing requirements given in the SMR proposal to the functionality of such tools provides a surprisingly good match.

However, it became apparent during the work with CITIES at the first SMR workshops, and it became fully evident after the T4.2 interviews that an off-the-shelf portal would not serve the CITIES[8]. Firstly, all cities use existing IT; even if this IT was to be renovated, it is very unlikely that it arbitrarily can be replaced. Such IT landscape changes are extremely hard to implement. In addition, cities typically face dependencies such as long-running contracts, non-open and non-uniform third-party systems, a multitude of interfaces to internal and external systems, incompatible or hard-to-access stakeholder systems, and government- (or other level) mandated IT. Thus, following the original outset of the proposal would not have served the CITIES and would likely have had little value beyond the SMR project, for an artificial yet not implementable solution would not have been taken up by other cities.

Therefore, we took this opportunity to make a shift in direction and to propose the development of a *portal toolbox*. With the toolbox approach, the portal provides a more basic yet much more powerful and versatile functionality. It becomes possible to build arbitrary resilience *portals* that can be tailored to city needs. In fact, specific toolbox functionalities can be used by cities as well as any other potential user group. Thereby, the portal becomes much more versatile and more generally applicable. In particular, the portal can be used by CITIES to try out new functionalities, to experiment with features, and to showcase possibilities. This should also help to mitigate the risk of CITY systems becoming obsolete due to new developments: rather, the can be kept update with what are determined useful addition. It thereby also facilitates discussion within a city, between the city and its stakeholders, the scientific community as well as citizens, and between cities. Portal developments that are considered reasonable and valuable can successively be integrated into the IT systems maintained by a city.

[7] These are also referred to as Learning Management Systems (LMS).
[8] According to the CITIES, it would even be justified to say that an off-the shelf portal would have been impossible to establish. No all ideas discussed before the SMR project started and during its first months were actually producible.

3. METHOD

3.1. GENERAL CONSIDERATIONS

As we have already done in Deliverables 4.1 and 4.2, we take the opportunity to explicate our method. We deem this a particularly important activity since WP4 has to provide results that are not only to be used in the ongoing project but should provide value beyond the project. Therefore, we need to make them repeatable and also explain how non-partner cities can conduct similar activities to come to results of their own. The methodological approach described in the following seeks to combine scientific rigour with practical requirements. Discussion is structured by the main activities followed in the preparation of this deliverable.

As before, the method had to take into account two particularities of WP4. Firstly, we maintained the iterative and incremental nature of it. With the decision to provide the portal as a toolbox, this is mandated more than ever. Again, we could particularly draw from input provided by WP5 activities, most notably the kick-off meetings and webinars with the CITIES. Actually, in the six months leading to D4.3 and D4.4, several activities fall into the intersection of WPs 4 and 5 and can be considered as *joint endeavours*. Secondly, we had to keep the balance between working concrete and abstract. Social media is an emerging phenomenon with no ripe theory yet developed; nonetheless, for the design principles we need to describe it abstractly. Setting up a functional specification for a toolbox requires abstracting from *one* concrete portal; it yet needs to allow setting up *many* concrete portals that are adaptable to the requirements of the CITIES (and cities eventually).

The general methodological considerations have been covered extensively in D4.1 and D4.2. This section summarizes the particularities met during the third task of WP4. Therefore, the following subsections discuss the integration of social media, particularities of the work on the functional specification and particularly the way towards its standardization, and the considerations behind the testing scenarios.

3.2. SOCIAL MEDIA INTEGRATION

Based on the design principles identified in D4.2, information regarding social media integration was provided by the CITIES. The process of integration is divided into three phases, i.e., informal interviews, creation of an action list, and an exercise (cf. Figure 1). It started with informal interviews in July and August (partially in September) 2016, in which we asked CITIES about their own social media strategy. Based on input from CITIES, CIEM created a 35-element set of actions for social media integration (details will be shown in the next chapter). We had a one-and-half hour exercise in September at the Kristiansand review workshop (see D5.3 for details on the workshop) and participants mapped these actions to the Maturity Model.

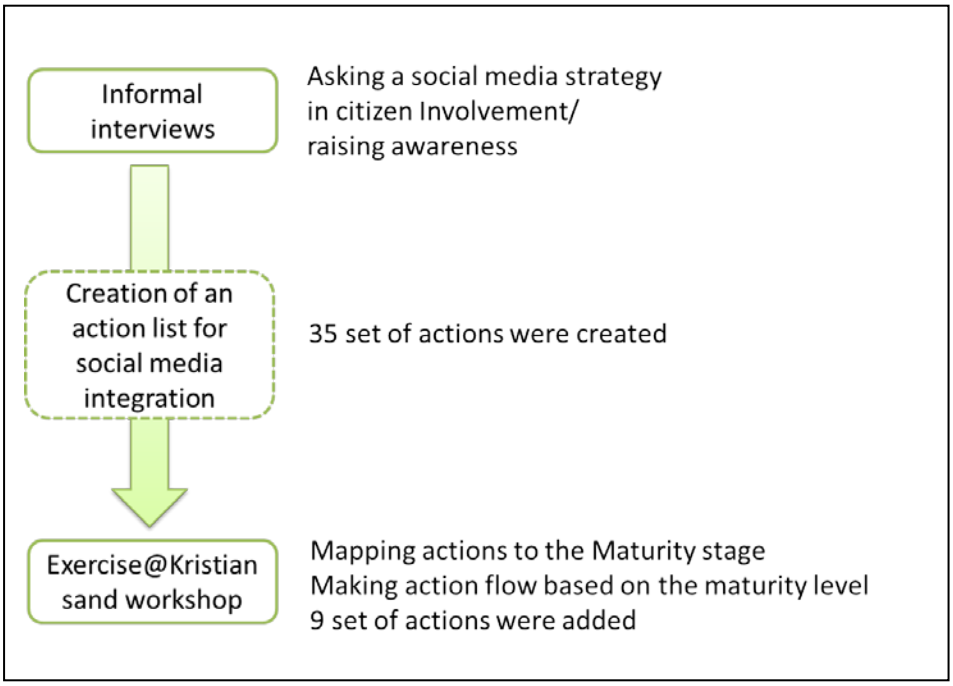

Figure 1. Process of social media integration to design principles

The informal interview asked of the following two issues, thereby also following up the WP5 webinars (Appendix A shows details).

1 Expectations for using social media in resilience building activities.

2 The process of social media strategy to meet above expectations.

Since the interview was (deliberately) less structured than the one we had before, we accepted open discussions. For this reason, the interview methodology varied, depending on CITIES' situations. We took a face-to-face approach with Kristiansand City, and Skype and WebEx teleconferences with others (see Table 1).

Table 1. Schedule of informal interviews

CITIES	Date	Participants (within the City council)
Kristiansand	August 25th	3 participants from emergency office and communication department (face-to-face)
Donostia	September 29th	3 participants from strategy department, IT department and TECNUN (via WebEx)
Glasgow	July 26th	1 participant from sustainable Glasgow department (via WebEx)
Vejle	August 26th	2 participants from VIFIN (via Skype)
Bristol	July 26th	1 participant from sustainable city team (via WebEx)
Rome	July 25th	2 participants from Risorse per Roma (via Skype)
Riga	July 21th	2 participants from Energy Agency Riga (via Skype)

Based on the interview results, a 35-element set of actions for social media was created. This action list was used in the Kristiansand workshop as material for an exercise. Participants to the workshop were divided into three groups and each group discussed one design principle. Group division followed the same structure as of Webinars for WP5. We applied a case simulation methodology by that participants were given a specific situation, concerns, and questions for discussions (Figure 2). These concerns were derived from problems identified in D4.2.

Please note that the second group got a list of stakeholders since their work had a particular focus on communicating with stakeholders.

Group 1 (Kristiansand and Vejle): Citizen Engagement and Raising Awareness

Case: You are in charge of using social media in your department. Your main responsibility is to raise awareness of important issues and engage citizens to your daily operations. Here your main concerns are…

- ✓ Increasing interactions w/citizens
- ✓ Being partner for co-creating value w/citizens (necessary because of limited official resources)
- ✓ Growing social capital (a strong relationship) among citizens

How do you set up actions with social media to approach your goal?

Group 2 (Donostia and Bristol): Establish a Communication Structure

Case: You are in charge of using social media in your department (XXX). Your main responsibility is to establish strong communication structure mainly with stakeholders listed below. Here your main concerns are…

- ✓ Visualization of live communication (you want to know who contacts whom)
- ✓ Building a report scheme (in emergency you want to know how they react)
- ✓ Visualization of resource capability (you want to know who is available in time of actual communication is needed)

How do you set up actions with social media to approach your goal?

___Stakeholder list___ (Exclude citizens since it is discussed on Group 1)

Donostia: Civil security, fire fighters, local police, (citizens), mobility services, health system, energy, construction, ICT and security companies

Bristol: Police, fire, ambulance, health partners, (community groups), environment agency, charity and volunteer sector, social care providers, utility and transport companies, local businesses, neighbouring local authorities, central government

Group 3 (Glasgow, Roma and Riga): Knowledge Sharing

Case: You are in charge of using social media in your department. Your main responsibility is to increase the available knowledge and expand access to it. The scope of sharing knowledge is to local, national and European level. Here your main concerns are…

- ✓ Enhancing learning opportunity on the Resilience portal (assume that the portal has online learning functions)
- ✓ Collecting best practices of resilience building activities that consequently are provided to the portal
- ✓ Building a higher level of trust among different partners (city stakeholders and external partners) for further knowledge sharing

How do you set up actions with social media to approach your goal?

Figure 2. Exercise structure and contents

In this exercise, each group discussed the question for the five stages of the Maturity Model respectively. For instance, Group 1 first had a discussion on concerns regarding citizen engagement and raising awareness. Then they mapped given actions to each stage (Start, Moderate, Advance, Robust, and Vertebrate) for approaching discussed concerns. Through this exercise, we understood which actions should be taken in which stage and how these actions are structured within the Maturity model. Photos from this session are provided in the SMR deliverable D5.3.

3.3. FUNCTIONAL SPECIFICATION AND STANDARDIZATION

The functional specification presented as part of this deliverable is *final* in the sense of WP4, yet it is not necessarily a fully stable document in the sense of *static*. As argued in the previous deliverables of WP4, we have employed an agile development process. Moreover, our work is based on the CITIES' input in conjunction with industry best practices concerning software engineering. Therefore, the functional specification is the final result of work package 4 but it is meant to *evolve* further – both as part of SMR, and beyond the project. The evolvement will be beneficial for all cities that use it, since it will allow including:

- best practices regarding portal design and usage that only can be learned by mid- to long-term utilization of such a portal,
- future development regarding resilience and the technological support for resilience-related activities of cities,
- new possibilities regarding social media inclusion and usage, and
- general technological progress.

To revise the functional specification presented in D4.2, we needed to include aspects of social media. As before, this work goes hand in hand with the work on design goals and principles. Besides the inclusion of social media, a general revision has been done based on additional work with the cities, experiences gained through the WP5 activities, exercises (particularly at the Kristiansand workshop) and the inclusion of standards as a source of best practices for developing IT systems.

Moreover, while we had decided to present criteria (i.e. aims) for portal development in D4.2 only, the full set of functions has been expanded in this version of the functional specification. Consequently, each aim is represented by one or – usually – several functions. This makes the functional specification more accessible to IT and non-IT personnel alike. Moreover, the detailed list of functions allows for easier assessment whether functionality is already given in a city.

The presentation of functions is given in the form of *user stories*, as common in agile development (Agile Alliance, n. Y.; Ambler, n. Y.). User stories typically follow the format:

As a *<role>*, I want *<goal / desire>* so that *<benefit / purpose>*.

The “so that” part is optional. It is used only if the benefit of a function is not directly clear or if a hidden rationale might go unnoticed. Example user stories are:

As a *user leaving the portal*, I want *to be prompted to save anything that I have changed in a textbox* so that *I can preserve useful work and discard erroneous work*.

As a *user with sufficient rights*, I want *to be able to post news*.

As an *administrator*, I want *to edit users’ roles* so that *their access rights are adjusted*.

The decision to prefer user stories over other means of documenting functional requirements has not only been made based on the decision to work agile. We have requested CITIES to connect us to their IT personnel to assess the verbosity they would expect for a functional specification that would prove

useful to them. We deemed this step to be important because the toolbox approach can only be met if cities have the chance to actually implement the parts of the portal into their own IT systems that they consider useful; adaption should be straightforward[9]. Moreover, we need to give both the staff responsible for resilience and for IT the means to argue for changes that need to be applied to the existing IT.

Even though functional requirements presented as user stories are by far more detailed (and thereby verbose) than the mere collection of aims, other – in parts much further detailed – possibilities exist. We learned that verbosity would be counterproductive and that user stories with a reasonable level of detail and explanation would be most helpful. After all, technological understanding can be estimated for any addressee of the functional specification and the form it is presented now makes it already accessible to city staff with no pure IT background.

The appeal for IT personnel along with the general process of considering the exploitation of process results led to the idea of standardizing the functional specification. By its proposal, the SMR project has been set out to propose a standard for resilience management. Resilience management should be guided by the tools that are developed as part of the project. However, the tools have different addressees in specific, particularly if considering their implementation by cities. Thus, providing one *large* standard would impede efficiency of usage, make it harder to keep an overview, and might slow down adoption. While it without question is necessary to have a *central* standard, which should be the most tangible outcome of the project, providing additional, finer-grained standards could be a huge plus and an extension of the SMR project's usefulness. In fact, it could even contribute to the producibility of SMR's results by tier-three and tier-four cities.

This idea became apparent during WP4 progress and has been discussed between CIEM and DIN before being seeded as an idea that should be scrutinized for the project as a whole. The rationale for WP4 can be described by looking at its results. The design principles are abstract and thereby useable (and useful) for city personnel working on the topic of resilience as a whole. They address key personnel concerned with resilience-related decision-making (such as Chief Resilience Officers) and staff that have *some* role in the resilience strategy of a city alike. The portal toolbox is relevant for IT staff but also for any city personnel and any stakeholder that uses it for the intended purposes of experimentation, trying out functionality, and showcasing ideas. The functional specification, however, is

[9] The consequences of this approach for actual integration with the CITIES' IT will be scrutinized in the ongoing work of the SMR project.

the precondition and building-block for cities to extend their own IT systems by means to provide a Resilience Information Portal, or rather *the* Resilience Information Portal of the respective city.

Therefore, standardizing an asset of the SMR project in the form that is most useful to a group of users provides additional value. Rather than providing them a high-level standard and a general functional specification, a standardized functional specification has more weight and also proposes higher stability. After all, changes to IT, the underlying landscape, IT processes, IT-enabled processed, and data are investments that can have huge impact. Therefore, reliability is vital. While a standardized functional specification does not safeguard form ill-usage or even from the failure to meet a city's demands, a well-acknowledged standard is a strong argument when striving for a IT strategy that *will* support resilience-related activities.

We, thus, believe that standardization of the functional specification not only extends the value of exploitable SMR results but also helps cities to better argue for the need of a Resilience Information Portal, or the extension of their existing city Web site or portal to become one. Moreover, it should better serve as a document that will be the foundation of own requirement analyses by cities, for the design of IT assets, and for contractual work. Since the functional specification also contains links to other standards, its standardization should further provide cities support in tackling connected IT issues, such as security and privacy. In a few years' time, the standard should then be revised to take into account the recent development. Thereby, it can be honoured that the standard on the one hand provides stability, but the field will be evolving on the other hand.

Formal standardization of the WP4 functional specification has been initiated as a joint effort between CIEM and DIN already[10], thereby contributing to WP6. The functional specification as presented in this deliverable has been optimized for this purpose. However, it will undergo further revision and shaping to meet the form most suitable for the standard. This will also include some changes necessary due to the differences in presentation; for example, as part of D4.3 some explanations and details are given that would be omitted in a standard document. Finalization of the standardization will be addressed in conjunction with the SMR standardisation workshop hosted by DIN in Berlin in April 2017.

[10] The formal process of standardization has been initiated in September 2016. The first discussions between CIEM and DIN regarding standardization go back to spring 2016.

3.4. SCENARIO DEVELOPMENT

It is advisable to include the means to assess a software system directly in the functional specification. Thereby, it becomes possible both for principal and agent[11] in a software development project to scrutinize the progress, determine the quality, and decide upon completion of the software. Criteria for assessment are helpful for both sides: the principal can check whether the delivered software adheres to what it has been specified for; the agent has a safeguard against unwarranted demands. Both sides are provided with a tool to better understand the software. Technically speaking, they are given the means to *verify* the software, i.e. to assess it against the specification.

Assessment typically is done as part of the acceptance test. This test typically concludes development (or a development iteration, such as a *Sprint*). It is contradicting the technical nature of prior tests (such as component, integration, and system tests) and typically involves the customer and possibly also future users of the software under construction. To ease this test, and to also keep it objective and actually suited to determine whether the software *can* be accepted, or not, it can not only be based on the functions and the quality requirements proposed in the functional specification but also on test cases already lied out there.

Test cases have a rather low level of abstraction. They describe conditions, input, and expected output to a system, possibly along with guidelines for manual steps to be taken. Depending on how they are presented and described, they are meant for (semi-) automated testing, usage by testing experts, or as guidance for testers who do not have a technical background. Particularly in the latter case, it is very helpful to also provide testing scenarios. These scenarios describe comprehensive use cases of the software in typical settings. Test cases can either be based on these scenarios or be embedded in a scenario setting. In the latter case, they ideally can be directly derived from the scenarios.

We have decided to provide testing scenarios due to the complexity of the tasks and aims of the SMR project. While the basic functionality and the general aims of the Resilience Information Portal are easily described and rather straightforward to understand, the actual usage of the portal, and in particular its merits and limitations are not. As argued in the previous deliverables, WP4 needs to be balanced between the high-level, theoretical, very abstract work on design principles, and the low-level, technological, very concrete work of implementing an IT system.

[11] This means software developer and software user in non-contractual terms.

Testing scenarios can be one mean to bridge between these two worlds. While both design principles and the portal itself (and thereby also the functional specification) need to be applicable to arbitrary threats, risks, stakeholders etc., the testing scenarios can (and must) be rather concrete. Therefore, they can provide a more profound understanding of the portal and its possibilities and help cities, their stakeholders, and citizens to better grasp what *their* portal might do for them.

Providing these scenarios is also useful in answering the following questions.

- What information should be provided through the portal?
- Who (which stakeholders) are the users?
- How are general roles actually filled by the possible stakeholders?
- What is the purpose of usage?
- Which kind of activities can be supported by utilizing of the portal?
- How (and in which situations) can the portal prove useful?
- What functionality is provided by the portal directly, what functionality is included, and what functionality is to be considered external (i.e. used in parallel).

Given these considerations, we deem testing scenarios to be very valuable beyond their mere use as part of the functional specification. This impression has been confirmed by the second interactive exercise we held during the Kristiansand Review workshop in September 2016. We have, thus, decided to move the testing scenarios into a Section of their own in this document. They still serve their purpose for the functional specification; at the same time, they can be read as a guide to the possibilities a Resilience Information Portal can offer to the cities and provide ideas of what might be tried out. Moreover, they could prove useful for WP5 activities concerning the pilot implementation and training workshops on the use of the portal and the integration of the SMR tools. In this role, they can even serve beyond the verification of the functional specification. In fact, they can aid the process of validating it, which further contributes to their usefulness.

The development of testing scenarios is definitely no simple task. In general, it is not hard to imagine potential uses of the portal. Particularly with the list of functions at hand, and having witnesses the ideas proposed and wishes uttered by the cities, *artificial* scenarios can be made up. However, the validity of such artificial, ad hoc scenarios need to be doubted. They at least must critically be scrutinized to determine if they *just* seem to reflect realistic incidents and the reaction to them, or if they actually do. *This* makes their creation very demanding.

We have thus conducted an exercise at the workshop in Kristiansand. The aim of this exercise was to develop scenarios with the help of the CITIES. CITY representatives were asked to propose how the portal in general and social media in particular can be used to mitigate the risks included and threats originating from each scenario. To ensure integration in the project, the proposals were to be categorized by maturity stages. Therefore, CITIES not only had to consider what could be done, but also to which of the five levels the actions could be attributed. The other way around, the results should then be readable as what kind of portal and social media support should be encountered in a city of a given level of maturity.

We proposed two scenarios. The short-term scenario refers to an actual incident (*flooding*); it depicts a situation of *shock*. The long-term scenario takes a long-term resilience topic (*refugee crisis*) as motivation; it depicts a situation of *stress*. We have chosen these topics since they are different in handling but relevant for most cities. The revised version of these scenarios is included in Section 7. The actual work in the exercises was divided into three steps. Firstly, CITIES should revise the scenario. Secondly, CITIES were asked to revise and add mitigation step for the two categories (Resilience Information Portal and complementary usage of social media). Thirdly, if time remained in the exercise session, CITIES were asked to add an additional scenario and to propose mitigation steps for the new one.

We learned from CITIES that creation of a fully-fledged scenario was considered to be highly non-trivial, as they would try to make it realistic and would strive for a level of detail that would surpass what was needed for the assessment of the functional specification. In fact, some CITY representatives had experience with creating such scenarios that would be used in training (e.g. of fire fighters) or emergency practices (such as the TRIPLEX humanitarian simulation exercise, in Norway[12]). Such a scenario would take at least a full week of work for a crisis manager to set up, and it would also include input from a wide variety of stakeholders, both from those who would be involved in the scenario and those whose responsibilities would be affected by the scenario. Fortunately, while CITY representatives felt that they would need to work very arduously to come up with scenarios, they were content with the ones we had proposed. In fact, they acknowledged that they were quite realistic and suitable. Actually, we have based the scenarios of what we had discussed with the CITIES in interviews, which thereby proved to be a proper foundation.

[12] http://www.ihp.nu/index.php/training

Nevertheless, CITIES made some proposals for amendments to the scenarios. Moreover, some simple additional scenarios were proposed for which no detailed description were worked out. An example for this was the spread of the Zika virus, i.e. taking up a current topic of global concern.

The work on the mitigation step then was the most detailed one, leading to much input by the CITIES. In conclusion, many insights were gained in the exercise, and the above described method has proven suitable. Details on the results are given in Section 7 of this report. We have used the results to extend them into scenarios and also as inspiration for creating additional ones. They are kept in the style of the two example scenarios (which are also included in this document in their revised form).

4. SOCIAL MEDIA FOR CITIZEN ENGAGEMENT

4.1. RELEVANCE OF SOCIAL MEDIA

To fulfil the objective of including social media in design principles, functional specification, and portal development, we discuss the required foundations in this chapter. It provides both a theoretic assessment of the topic as well as results from citizen engagement based on social media.

Social media plays a particularly important role for WP4. Many of the goals formulated for WP4 align with aims, possibilities, or at least discussed prospects of social media. To understand the implications of social media usage, it needs to be stressed that it differs fundamentally from established general-purpose telecommunication services. According to the CITIES, they so far have typically relied on broad-casting services such as radio and TV on the one hand, and on professional telecommunication services such as direct radio on the other hand. Therefore, social media must be scrutinized for its potential in replacing and emending existing services. At the same time, comparison to established services underlines the needs to assess social media in terms of reliability, particularly in situations of crises.

Potential of social media is not only true for the general task of citizen engagement, social media may also be used to increase the trust of citizens into the services of *their* city, and eventually to empower them in term of the resilience-building framework of the city. Social media brings many possibilities to CITIES in general, for example, the literature (Carmen Leong Mei et al. 2015) points out that social media services enable communities:

- ✓ to attain collective participation,
- ✓ to attain shared identification, and
- ✓ to attain collaborative control through structural empowerment.

All above elements support CITIES to grow social capital with citizens as well as to build trust. In using social media, CITIES also can join already established relationship (e.g., neighbourhood associations) among citizens. Growing social capital is essential for CITIES in resilient building activities since as already discussed in the deliverable D4.2, issues that CITIES have to deal with are getting more complex and it is necessary to get support from citizens through engaging them to the real practices.

Thus, in the following pages we introduce the topic of social media. We take a specific focus on citizen engagement. For this purpose, the first have a look at other EU-funded projects. We then assess possibilities for citizen engagement enabled and facilitated by social media. Eventually, we conclude by proposing how the trust of citizens can be increased and how they can be empowered to participate in joint resilience building efforts.

Please note that CITIES are also facing challenges in terms of utilizing social media. There have been concerns raised by CITIES during the informal interviews as follows. Examples are that “social media is not effective in case of electric outage” and “social media can enhance diffusion of incorrect information.”

- ✓ Social media is not effective in case of electric outage.
- ✓ Social media can enhance diffusion of incorrect information.
- ✓ Utilization of social media requires resources (human).
- ✓ The field and practices of social media changes quickly.

Noting these concerns, our work regarding development of the portal has premised that basic infrastructure is available when the portal is in use.[13] In respect to diffusion of incorrect information and resource capabilities, we already discussed this issue in the previous deliverables as a principle of *information quality* and *visualization of resource capability*. As the final point, the trend of social media is changing quickly; thus, keeping updated to the latest fashion is important. Currently, Facebook is quite popular among public and private organizations to approach citizens, respectively customers; however, other new types of social media may arise in the near future. We note this point as a chal-

[13] Reliability can be increased by hosting the portal in a high-reliability data-centre or even in multiple data centres with sufficient distance to each other. Moreover, mobile device access allows using the portal as long as *some* communication network is available, even though there might be a shortage of or unstable power for household usage.

lenge to make clear that the information shown in the following sections are based on the current (2016) practices and it does not mean to provide generated perspective and solutions to utilization of social media for citizen engagement.

4.2. INPUT FROM EU PROJECTS

There are four EU projects considered particularly relevant for providing input for our work. They focused on using social media for communication platforms, and on empowering and engaging citizens. In the following subsections, POP-ALERT, TACTIC, COSMIC, and PEP are introduced. We focus on aspects relevant for WP4 of the SMR project; for more details on the projects please refer to the cited publications and to the project Web sites, which typically contain a list of publicly disseminated deliverables including the possibility to download them.

4.2.1. POP-ALERT PROJECT (APRIL 2014 – MARCH 2016)

The POP-ALERT[14] project intends to create a framework for assessing the population's capacity to absorb and prepare to make use of different crisis management strategies and technologies developed at the EU level. It conducts a series of empirical studies, taking into account new issues related to targeting both local populations and visitors such as expats and tourists (considering cultural differences, language barriers, etc.). POP-ALERT also links crisis communication and individual or community resilience projects, identifies specific target success stories within existing and past community preparedness programs, and puts together a portfolio of case studies on social networking and community self-reliance initiatives. The latter could be replicated in case of a crisis with a European dimension and to crossborder disasters.

The project explores the methods to combine contemporary tools with the existing to create flexible and easily deployable toolkits for preparing and alerting citizen in a crisis. The project approach for improving the current practices revolves around the use of messaging and cultural sharing technologies to create awareness using technologies and approaches that offer the best form of accessibility and penetration by citizens and authorities.

[14] POP-ALERT is funded from the European Commission's Seventh Framework Programme (FP7/2007-2013) under grant Agreement no 608030. Web site: http://www.pop-alert.eu/

A set of case studies from fifteen countries are identified. They are drawn from across the world but with a concentration in Europe. POP-ALERT tries to achieve a better understanding of the drivers, constraints and complexities of population preparedness and to create a state-of-the-art framework for assessing and understanding the level of community preparedness at the EU level. The individual behaviour is analysed in terms of preparedness, such as reaction, awareness of risks, and willingness to engage in preparedness actions.
With respect to crisis communication, POP-ALERT recommends the following points:

- Be elaborated through cooperation between national and local authorities.
- Include communication with public after the crisis period.
- Include the evaluation plan.

In addition, POP-ALERT provides recommendation with respect to the following aspects: diffusing the message, formulating the message, using social media and traditional media, involving community members and communication delegates. Specifically, on the use of social media, POP-ALERT indicates that social media presents many new opportunities and challenges. It has an advantage as a tool for fast and wide spread of information. It also can be used for gathering and analysing data and trends for situation analysis and forecasting (Caracostas and Tani, 2015).

POP-ALERT highlights the cultural challenges as one important point affecting the disaster preparedness, i.e. tackling cultural components can better promote interaction between citizens and emergency authorities as the induce trust. The cultural dimension of crisis preparedness can be improved through education of citizen, training of authorities and exercises, in addition to a constant communication from authorities to citizens through different media (POP-ALERT, 2015a).

4.2.2. TACTIC PROJECT (MAY 2014 – APRIL 2016)

TACTIC[15] (Tools, methods And training for CommuniTIes and society to better prepare for a Crisis) is a project identified under the secure societies call. It aims to increase preparedness to large-scale and cross-border disasters amongst communities and societies in Europe. The project highlights the im-

[15] TACTIC is funded from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 608058. Web site: https://www.tacticproject.eu/

portance of strategic risk communication between organisations and the general public that is assumed to increase disaster preparedness on community level and reduce disaster-related losses.

For doing so, the project provides a platform called TOSAP (TACTIC Online Self-Assessment Platform). The platform comprises several elements, i.e. the self-assessments for organisations and the general public designed as questionnaires, feedback reports, and a library of good practices (Müller, 2016). The organisational self-assessment feature (OSA) is to encourage the evaluation and revision of an organisation's risk communication strategy in terms of suitability and effectiveness. Central questions related to OSA have been identified:

- What are the context-related conditions that determine risk communication?
- Who communicates what, how, and to whom?
- Who should communicate what, how, and to whom?
- Which communication barriers need to be considered?
- How can the existing risk communication strategy be improved and refined?

The TOSAP provides its users with examples of communication and education practices (e.g., brochures, games and films), which are referred to as "good practices". For a practice to be categorised as "good", it should be suited to the context, aims, and information needs of the community at risk. Good practices will be available in a library on the TOSAP, where users can either directly search the library of good practices, or will receive a link to good practices as part of the feedback from completing the self-assessments.

Information will be provided on each good practice to inspire organisations to improve their risk communication strategy and to provide the general public with information to improve their preparedness to large-scale and cross-border hazards. Each practice included in the library of good practices will include information on:

- The name of the practice.
- A description of the practice.
- The aim of the practice in relation to the four aims that the organisational self-assessment focuses on.
- The communication method (e.g., stakeholder participation, social media).
- The good aspects of the communication.
- The Web site address where the practice is available.

4.2.3. COSMIC PROJECT (APRIL 2013 – MARCH 2015)

COSMIC[16] (the Contribution of Social Media in Crisis management) is a project that studies the most effective ways to use new information and communication technology (ICT) in crisis situations for the protection of citizens. COSMIC will ensure better linkages between prevention, detection, reporting and rescue in crisis situations as well as assist officials and first responders in using new ICT and applications to be more effective and efficient during crises.

The COSMIC project mapped crises, the use of existing ICT and emerging applications in crises. Floods, extreme temperatures, storms, wildfires, earthquakes and man-made disasters were identified, as the six main crises affecting EU Member States were explored. Findings showed that social media had a positive impact on citizens and emergency response organisations. For current ICT, social media was widely used for most crises. However, a high rate of abuse was identified, including misinformation, misrepresentation, propaganda, surveillance, and censorship.

The use of emerging ICT such as citizen journalism, cloud, crowdsourcing, data mining, and big data were investigated before, during and after crises, in addition to their risks and opportunities. COSMIC also analysed the roles of citizens as social activists, first responders or citizen reporters in emergency communications. A database has been set up comprising more than 2 000 crisis management stakeholders from 43 countries.

The project team also produced guidelines for the use of new media by the public before and during crisis situations, as well as the use of new media by public and private organisations. In the guidelines, COSMIC has developed a so-called *AID* as a set of key principles as follow:

- **A**cknowledging the fact that civil society can be trusted;
- **I**ncreasing the ability of civil society to take responsibility for further guarding its own well-being;
- **D**eveloping the capacities of public authorities for adapting to social media use by civil society.

The COSMIC guidelines are split into two sets of tips and tricks for public authorities in different stages of crisis and members of the public. Public authorities are defined as the governmental organizations that carry a prime responsibility for crisis management as well as those organizations that do not focus

[16] COSMIC is an EU-funded project from the European Commission's Seventh Framework Programme FP7-SEC-2012 under grant agreement no 312737. Web site: http://www.cosmic-project.eu/

on crisis management, but that have a responsibility for crisis management in their own domain (e.g. civil society organizations).

The second set of guidance applies to the civil society, i.e. citizens. The central starting point for the tips and tricks for citizens is the fact that the civil society can be trusted during crises. Past crises have shown that citizens are self-resilient and undertake different kinds of activities to aid themselves and others in crisis situations. The COSMIC tips and tricks are formulated to encompass these findings so that citizens can gain insight in how to use social media during crises in a responsible and effective way. If the tips for public authorities are organized based on the development of the crisis, for citizen the tips are organized based on citizens' role. This includes, for example, preparing, seeking aid, seeking information, providing aid, mobilizing, recording, and sharing.

4.2.4. PEP PROJECT (JANUARY 2012 – DECEMBER 2014)

PEP[17] (Public Empowerment Policies for Crisis Management) (Haataja, Rantanen, & Sullivan, 2014; Vos et al., 2014) analyses individual citizen from the empowerment perspective, especially in the crisis communication, so that they are prepared and more resilience in the disaster situation. It covers the role of local communities in crisis preparedness and response, and how to involve the citizens in this task. In sum, the PEP project proposes solutions for enhancing public resilience. Among the issues considered to require further investigation for improving resilience is social media, since there are barriers for the adoption of this mode of organisations. The willingness and motivation to participate as well as the process to participate are equally important.

Table 2. Resilience solutions in different levels of analysis

Unit of Analysis	Outcomes
Individual level	Potential voluntary engagement; organised volunteers, semiorganised individuals, and "non-organised" individuals
Organisation/local government level	Awareness and preparedness
Community level	• Recommendations are specifically developed for involving the public in societal crisis management and thus enhance community resilience • Community empowerment • Potential voluntary engagement; organised volunteers, semiorganised individuals, and "non-organised" individuals

[17] PEP is funded from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 284927. Web site: http://www.crisiscommunication.fi/pep/

The PEP project targets the enhancement of the citizen response especially in the use of social media and mobile service. Thus the proposed indicators focus on public resilience (Vos et al., 2014). The paper explores the role of local communities in crisis preparedness and response, and investigates a way to involve the citizens in crisis situations. The framework used to identify or measure (indicators) the enhancement of community resilience are as follows.

- ✓ Individual responsibility (engage, to act, and to be prepared),
- ✓ Preparedness (education, training and exercises),
- ✓ Collaboration (between the general public, voluntary organisations,and public authorities / local councils),
- ✓ Communication (voluntary organisations-public authorities/local councils),
- ✓ The role of the civil society (e.g. should we expect civil society to be more involved, or involved in alternative ways?), and
- ✓ Real-life experiences (good and bad examples of collaboration, communication).

4.2.5. IMPLICATIONS TO THE SMR PROJECT

In the following, we summarize implication of the other projects to SMR. This is done in respect to communication and engagement.

There are similarities of the TACTIC and POP-ALERT projects, i.e. points that both TACTIC and POP-ALERT focus on:

- The relationship between risk perception and preparedness; how does the public perceive different types of risk and what do these perceptions mean for preparedness?
- The importance of an effective risk communication strategy.
- The use of technologies to prepare both organisations and the general public for large-scale and cross-border disasters; this includes the POP-ALERT *Dashboard* and the TACTIC *Online Self-Assessment Platform* (TOSAP).
- Participatory approaches involving the involvement of stakeholders in the development of preparedness tools through the use of pilots (POP-ALERT) and case study workshops (TACTIC).
- The collection of good practices in community preparedness.

Although they do not refer directly to social media roles but rather how to engage people, the following three implications from related EU-projects can contribute to our work. First, POP-ALERT pointed out

the importance of training (stakeholders) and dialogs to overcome cultural differences among countries. These activities can be supported by our portal. Second, POP-ALERT explores the best practices of an alert system[18] in different countries (Davis, 2015). This finding supports our approach to develop the toolbox, instead of providing the new system to be replaced. Third, TACTIC identified the template to share "good" practices. This can be applied to our portal.

There are also differences between what EU projects introduced in this section proposed and what we are doing. In particularly with respect to the TACTIC project it needs to be mentioned that despite the input that could be gained from the FP7 EU projects, it is not straightforward to re-use artefacts created in these projects. For example, the TOSAP platform designed as part of TACTIC (especially the Online Self-Assessment Platform – OSA) shares some ideas and features with what we intend and implement. In full scope, however, it is different. This makes it hard to use an existing platform as a foundation while not losing focus. Moreover, with the already discussed decision against an off-the shelf portal re-usage would be very hard to realize. Thus, we decided against re-using existing software (fragments) but rather to inform our own work with what has been down before on the theoretical and conceptual level. The COSMIC project concludes that citizens are self-resilient and thus public authorities can trust them in crisis situations. We confirmed this statement by our informal interviews, however, our scope is narrower, i.e. to find the way of how to create trust between CITIES and citizens through social media. The PEP project proposes indicators to measure community resilience while SMR WP4 work proposes design principles which are in abstract level but could guide practical actions to achieve city resilience.

4.3. CITIZEN ENGAGEMENT AND SOCIAL MEDIA

4.3.1. GENERAL OVERVIEW BASED ON CITIES' INPUT

To get a good overview of social media practices in CITIES, informal interviews were conducted with them. CITIES were asked upon expectations for social media and how to set up a strategy to meet the

[18] For instance, USA: The Integrated Public Alert and Warning System (IPAWS); UK: National Mobile Alerting Trials; Spain: Emergency Centre Murcia/ Norway: National Centre for Mountain Slide Surveillance/ Netherlands: Floodex; Greece: Variable Message System and Hercules Shield; France: Population Alert; Israel: evigilo – SMART: Scalable Messaging Application in Real Time; Australia: A Standard Emergency Warning Signal (SEWS); Japan: J-Alert; Canada: CANALERT; Mozambique: The Famine Early Warning System Network (FEWS NET).

expectations[19]. Here we have three main findings. First, for the purpose of communicating with citizens, CITIES put the first priority on their Web sites. Social media are supposed to complement the existing communication tools (mainly the official Web site). Social media does not play an independent role but rather works in collaboration with the existing tools. During an interview, an official said:

"Communication on media is so varied. If you want to get instant message out it is possible but you need to send text messages and send things on Facebook and Twitter. You might still need to send announcement cars to streets and send information to radio and so on. I don't think that goes away."

"Communication becomes complicated. We have to have variety means of communication. In some cases, Facebook would be very effective media but you have to focus on [a] mixture of social media to deliver information physically or so."

For short-term crisis communication, CITIES consider it likely that traditional communication means will not be replaced, particularly if they are based on very robust technology. It is seen as critical that social media services could be unavailable when communication infrastructure is severely damaged.

In the interviews, social media referred mainly to Twitter and Facebook (and, in some cases, YouTube). Other types of social media that are emerging such as Instagram and Snapchat are supposed to be more popular in some years but they were not in official (CITY) use at the time of conversation.

Second, from CITIES' perspective, the biggest expectation for using social media is information exchange. To exchange information with as many people as possible is the primary goal. Another official said, "We use every tool to reach as any people [as possible]."

As the POP-ALEART project found out, social media is a quick and easy way to communicate with people. Communication first starts with provision of information and interactions and close collaboration with citizens comes after.

Third, in terms of collaboration, we can see several attempts of using social media (see section 4.3.4 for examples), but they have just started and it is yet too early to discuss a social media strategy for

[19] Please note that for reasons of confidentiality, no city names are typically mentioned in the following unless both suggested by the respective CITY and conducive to the actual discussion. Typically, speaking of *a* CITY or *a* CITY representative serves the purpose.

citizen engagement. However, several cities mentioned about existing communities in engaging people. An official said,

“There have been several ways to do things for local community knowing what to do and helping each other. They know neighbours and they know where problems are.”

Also, a part of the strategy, cities might consider an appropriate balance of complementing the existing tools.

Practically some cities implement social media protocols that for instance define rules for opening an account. The following is an example of where creation of a social media account takes several steps. In order to secure approval to use social media, an officer will need to clarify in advance: objectives, audience, check whether related stakeholders are using social media to reach same audience, success criteria, frequency of updates, main and back-up contact and whether the account will have a discussion forum or encourage debate. If an account will be used for a specific campaign over a short period of time, officers are asked to use the existing channels (e.g. the central account) rather than opening a new one.

A question arisen from the conversation is how to measure effectiveness of social media usage. Answers have not been established but this is a future issue. Possible criteria for measuring success that are pointed out during the interview are a traffic increase in the existing channel (Web site), the number of followers, and the number of people who read headlines of the post. Establishing an evaluation scheme is indeed necessary for future but officers feel from daily basis operations that social media is a useful mean to inform and engage people.

To utilize social media more effectively, not only to design collaboration with other existing tools is important but also to establish good relationship with media should be stressed. In addition to this, getting balance to disadvantage people of digital tools should not be forgotten.

4.3.2. ACTION LIST FOR SOCIAL MEDIA INTEGRATION

As stated in Section 3.2, the process of social media integration to design principles takes three steps, namely, (1) getting general overview of social media strategy in citizen involvement and raising awareness, (2) creating an action list for social media integration, and (3) mapping actions to the Maturity stage. Based on the findings from informal interviews, the following set of 35 actions was prepared for the exercise in the Kristiansand review workshop.

<Original action list for social media integration>

1 Setting up a central Web site

2 Creating narrative related to city resilience

3 Delivering the story through the Web site

4 Delivering the story through social media

5 Delivering an abstract / teaser through social media

6 Setting up a service centre to respond inquiries from citizens

7 Letting the service centre use social media to respond inquiries

8 Allowing citizens to contact the service centre using social media

9 Starting interactive communication through social media

10 Identifying target groups (first responders)

11 Identifying target groups (local communities)

12 Identifying target groups (individuals)

13 Following a stakeholder's (first responders) account

14 Following a stakeholder's (local communities) account

15 Monitoring social media posts from citizens

16 Getting media followed the cities' account

17 Posting a newsletter through social media

18 Posting Multilanguage messages through social media

19 Posting (providing) official documents through social media

20 Posting videos through social media

21 Posting *XXX* through social media

   a. You can add items "XXX" by yourself <example> general advice, announcements, tips & tricks, current threats, incidents, incident live coverage, …

22 Automating information among different tools (press release, Web site, social media etc.)

23 Analysing pictures posted from citizens through social media

24 Filtering right / correct information from citizen's post

25 Analysing the dynamics of postings to derive threat information

26 Automating social media analytics

27 Using social media in a policy making process (to get citizens opinions etc.)

28 Creating a list of volunteer organizations

29 Having an evaluation scheme for social media effectiveness

30 Using the evaluation scheme regularly or even automated

31 Categorizing followers in purpose of effectiveness analysis

32 Creating a plan for multi-channel communication

   a. How should a strategy for multi-channel communication look like?

   b. How can multi-channel communication actually be set up?

33 Making a strategy how to be a part of exiting FB network

   a. How should this strategy look like?

34 Collaborating with a local community through social media to approach particular issues

35 Starting exercises for social media usage in emergency

Yet the above action list is not exhaustive. Participants of the exercise were asked to add actions based on their experience with social media and / or their perception of important usages of social media for CITIES.

4.3.3. INTEGRATION STRUCTURE TO THE MATURITY STAGE

The exercise was conducted with three groups (Group 1: Kristiansand and Vejle, Group 2: Donostia and Bristol, Group 3: Glasgow, Roma and Riga). Each group had to discuss one design principle (Group 1: Citizen engagement/Raising awareness, Group 2: Establish a communication structure, Group 3: Knowledge sharing) and map the action list to each Maturity stage.

Mapping results from the Citizen engagement/Raising awareness group is shown in the Table 3 (See Appendix B and D5.3 for the original exercise results).

Table 3. Social media actions in the five Maturity stage

Maturity stage	Social media actions
Start	[6] Setting up a service centre to respond inquiries from citizens
	[7] Letting the service centre use social media to respond inquiries
	[8] Allowing citizens to contact the service centre using social media
	[10] Identifying target groups (first responders)
	[11] Identifying target groups (local communities)
	[12] Identifying target groups (individuals)
	[13] Following a stakeholder's (first responders) account
	[14] Following a stakeholder's (local communities) account
	[16] Getting media followed the cities' account
	(Added) Starting an account
Moderate	[2] Creating narrative related to city resilience
	[3] Delivering the story through the web site
	[4] Delivering the story through social media
Advance	[15] Monitoring social media posts from citizens
	[28] Creating a list of volunteer organizations
	[31] Categorizing followers in purpose of effectiveness analysis
	[32] Creating a plan for multi-channel communication
	[33] Making a strategy how to be a part of existing FB network
	[34] Collaborating with a local community through social media to approach particular issues
Robust	[18] Posting Multilanguage messages through social media
	[17] Posting a newsletter through social media
	[20] Posting videos through social media
	[22] Automating information among different tools (press release, web site, social media etc.)
	[27] Using social media in a policy making process (to get citizens opinions etc.)
T/Vertebrate	[9] Starting interactive communication through social media
	[23] Analysing pictures posted from citizens through social media
	[24] Filtering right / correct information from citizen's post
	[25] Analysing the dynamics of postings to derive threat information
	[26] Automating social media analytics
	[29] Having an evaluation scheme for social media effectiveness

[30] Using the evaluation scheme regularly or even automated
[35] Starting exercises for social media usage in emergency
(Added) Share practices with other cities

Summarizing the results of mapping, the following nine categories are created as design principles for citizen engagement through social media. Please note that we do not propose how the office support (e.g. from a service centre) for running these services is set up. Some hints are given in Section 7.

Category 1: Channel setting

[6] Setting up a service centre to respond inquiries from citizens
[7] Letting the service centre use social media to respond inquiries
[8] Allowing citizens to contact the service centre using social media
[13] Following a stakeholder's (first responders) account
[14] Following a stakeholder's (local communities) account
[16] Getting media followed the cities' account

Category 2: Identifying target groups

[10] Identifying target groups (first responders)
[11] Identifying target groups (local communities)
[12] Identifying target groups (individuals)

Category 3: Story making and delivery

[2] Creating narrative related to city resilience
[3] Delivering the story through the web site
[4] Delivering the story through social media

Category 4: Collaboration with local community

[28] Creating a list of volunteer organizations
[34] Collaborating with a local community through social media to approach particular issues

Category 5: Posting videos/Multilanguage message

[17] Posting a newsletter through social media
[18] Posting Multilanguage messages through social media
[20] Posting videos through social media

Category 6: Automating information

[22] Automating information among different tools (press release, web site, social media etc.)

Category 7: Analysis

[23] Analysing pictures posted from citizens through social media
[24] Filtering right / correct information from citizen's post
[25] Analysing the dynamics of postings to derive threat information
[26] Automating social media analytics

Category 8: Exercise

[35] Starting exercises for social media usage in emergency

Category 9: Evaluation

[29] Having an evaluation scheme for social media effectiveness
[30] Using the evaluation scheme regularly or even automated

Based on this categorization, the action flow regarding citizen engagement through social media is shown in Figure 3.

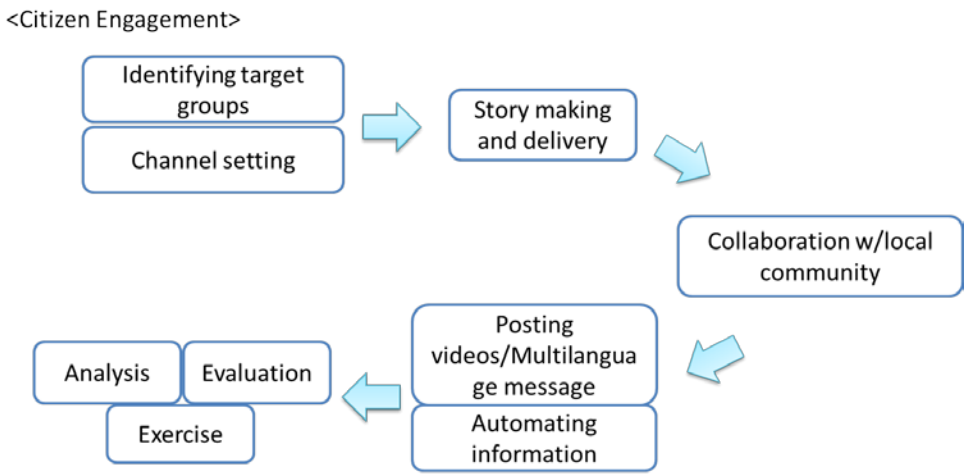

Figure 3. Action Flow in Citizen Engagement

First of all, CITIES need to identify target groups. Target groups are varied, i.e., first responders, local communities, and social groups / communities of interest. These groups are supposed to work especially in an emergency situation while the channel setting is based on daily-basis operations. Among several targeted groups, finding out individuals or groups who have good engagement with local peo-

ple should be most effective. In this sense, CITIES do not build trust and relationship from scratch with everyone living in the area but rather could take advantage of using existing local relationships (for instance, a housing association is supposed to be a good target since they have a contact list with local communities and people, and that list is updated by them).

Channel setting starts with opening a service centre, and by setting up a Web site and social media accounts. These settings include to follow stakeholder's accounts as well as to get followed by them. Involvement of media is necessary in this stage. Once target groups are defined and channels are set, story making comes as a next step. This is an important step for getting citizen engaged since they need a common understanding of issues and problems. For instance, CITIES create a narrative, which tells how global warming influences people's everyday life (e.g., global warming promotes sea level rise that results in increasing flood risk in the city). This process can be done in the other way around, which means target groups can be identified both policy-driven and issue-driven. In case they are picked up by an issue-driven approach, story making should come first. The story is delivered through social media as well as a city's Web site. Future analyses by the CITIES will be needed to understand which share of a city's population can be effectively reached by this way.

Such information provision has already been done by most CITIES. Collaboration with local communities or other related stakeholders starts with daily-basis dialogs. Actual examples of collaboration through social media will be shown in the next section. An automated information functionality that enables information from different sources (Facebook and Twitter, as well as other services) to be collected is desirable in this stage. In addition, information through social media should be provided in multiple languages, yet the way of implementation still remains a matter of discussion. Since an automated translation often does not provide good quality (i.e. interpretation-free results), it depends on available resource if CITIES translate message by humans. Since translation services can be expensive and time-consuming, cities need to decide to which degree manual translation should be provided.

Since social media are relatively new, the time being is an *under-experimentation* phase. However, as city's maturity level is getting higher, schemes for analysis, evaluation and exercise should become available. An analysis scheme includes filtering function to select correct information from citizen's post.

4.3.4. EXAMPLES FOR COLLABORATION WITH LOCAL COMMUNITIES THROUGH SOCIAL MEDIA

In this section, we introduce *four* examples of social media practice for collaboration with local communities. Case description follows the structure of *action flow in citizen engagement* which was shown in Figure 3 (p. 44).

CASE OF KRISTIANSAND

Activity name: “Fritidsetaten”: Youth clubs (as one of the services)

It is a service provided by the municipality in the main urban districts. It is a place where children and adolescents can socialize, learn new things, eat, do activities like play station, photography, play board games, play instruments and play in a band, be around dedicated and engaged adults, and have some tasks assigned to them to mention some of it. It is all about taking the children seriously and let them be in front and decide what the club should be and do.

Who has taken the initiative?

By the director of the culture department, his staff as the leading group in the municipality in 1990.

What were reasons/issues behind?

The main reasons are to give children and adolescents an opportunity, a safe and accessible arena to be social, learn new things, talk and be around engaged and dedicated adults that participates, listens to them, and have trust in them. Also, the activity envisions letting children and adolescents grow and develop skills and talent. It is a public initiative, and is a low-cost activity so every child can participate. Many of the sports activity initiated by private actors are often very expensive, and not always accommodated to children with disabilities. Actively encourage children and adolescent to participate in cultural activity, growth and development.

Which social media were used?

Facebook and YouTube (another club does also use snapchat).

What is a narrative for enhancing understanding of the issue?

The story is that children should have a place to develop and grow. It is an opportunity that involves activities for them, their interests and the fact that there are engaged adult staff and junior staff that pay attention, listen to them, and participate with them. The kids are in the front seat of what the club should be like and of activities. The story is also about how the city tries to implement the cultural politics towards children and adolescents with them in the front and on their terms.

Ultimately, it is to empower children and adolescent as they are user of the services. We need input from them to succeed in developing a club for them.

How was the narrative distributed?

The narrative was distributed through several channels on Facebook. One official Facebook page for each urban area and the staff has their own page so they can directly communicate with the parents and children.

How was collaboration with a local community going?

The city listens to them – asks for their (both the kids, the staff in each club and other stakeholders) opinion and takes it into account when developing policies.

Especially the Facebook pages where the staff members (employers of the municipality) have their own page is quite a bit a trust builder. The communication line is as short as possible; they personalize the communication – something that feels good to the receiver of the messages. The staff and their personal dialogue is a proactive approach to reach out to the users of the services and gain engagement and participation, and not only one way dialogue from the municipality and out. That is a really good start to build trust – they show interest and engagement. They use if for quick messages, and general greetings to the followers. This sends a message that they as person working there really care about the club and the children. The staff participates, learns them new things, learns from them, listens to them and are there for them – and not everyone else. The cell phone “steals” a lot of time – and at this club, the attention is on the children. They want to see every one of them for who they are. It all about lets them run the show – give them trust and responsibility.

Events information, regular activities and specific activities and news relevant to the club and the urban area are provided through the respective Facebook pages.

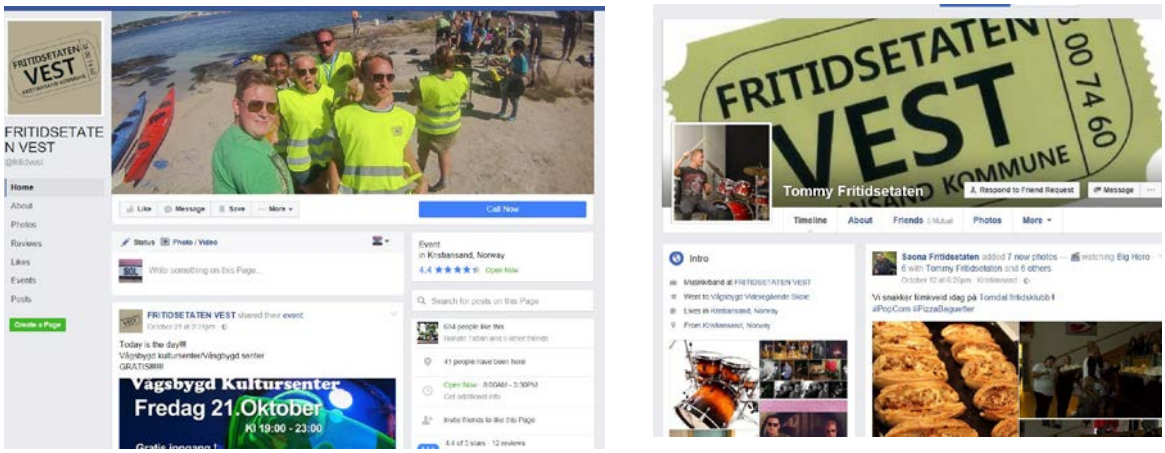

Figure 4. The official page for the Youth club in one specific urban area (left) and the staff's personal page (right). This makes it more personal, where both children and parents can see the faces to the staff.

How did the activity empower a local community and citizens?

This is one of the purposes of the initiative, and the city believes it empowers its citizens. The service has expanded a lot the last 20 years and does renew itself with societal changes in accordance with the user (kids and adolescents). The way of empowerment can be described as follows.

- ✓ The children are being listen to – mutual respect and understanding
- ✓ Direct and short communication line
- ✓ They are given tasks and responsibilities
- ✓ It contributes to increase social cohesion among the children and the local society
- ✓ Parents and communities trust the municipality and appreciate the services
- ✓ The club is participating in many different activities
- ✓ It is a low-cost activity – for everyone, no exclusion
- ✓ Activities during longer holidays
- ✓ Let them decide and be in front of club development

CASE OF GLASGOW

Activity name: Green Year 2015

The Green Year initiative was a year-long programme of coordinated communication and events designed to raise awareness of green issues amongst Glasgow's citizens and young people, as well as our businesses and those who visit the city.

Who has taken the initiative?

The initiative was driven and facilitated by the *Sustainable Glasgow* team, within Glasgow City Council, with significant assistance from other council departments as well as a wide range of city partners. Green Year partners ranged from public sector, private sector, and the third sector.

What were the reasons/issues behind?

Green Year originated from Glasgow's bid for the European Green Capital (EGC) 2015 award. Whilst Glasgow was not successful in this bid, the process created a great deal of momentum across city partners and the City Council therefore decided it would still hold a green themed year in 2015. Another reason to host a Green Year was to continue Greener legacy from the 2014 Commonwealth Games, which Glasgow had just recently hosted. The main aim of Green Year was to build upon the lessons learned from the European Green Capital (EGC) bid process and comments provided in the EGC jury panel's technical assessment, as well as provide a series of activities across the year to showcase Glasgow's green ambitions. One of the particular issues raised by the EGC jury was the lack of a clear communications channel on green issues. As a result, Green Year was designed with a heavy emphasis on communication.

Some of the many objectives of Green year included:

- Enhancing Glasgow's green profile.
- Positively engaging, involving and empowering Glasgow's communities.
- Developing a strong communication strategy expressing the transformation message.
- Developing and strengthening partnerships within the city and across other European cities.

Which social media were used?

In order to deal with the challenge of communications, we enlisted the help of Glasgow City Council corporate Communications to devise a full and collaborative city-wide set of activities promoting Glasgow to residents, young people, visitors, and businesses alike. Key to this challenge was identifying a brand and creating a communications channel in the form of a web site and Twitter account (@greenglasgow). In addition to this we fully capitalized on the smart city agenda by creating an interactive *Green Year App*, which demonstrated various events and points of interest across the city.

These interactive social media channels played a key part in engaging citizens throughout the year. As mentioned above, the city's target audience was clearly defined: citizens, young people, tourists, and businesses. A range of events were devised to engage these target groups.

What is a narrative for enhancing understanding of the issue?

The first step in this process was developing a strong brand and identity for Green Year. In advance of 2015, Sustainable Glasgow worked very closely with corporate communications on the Green Glasgow web site (see Figure 5), producing a recognizable green "**G**" and strapline "***from steam to green***" which accompanied all that we done across 2015.

The narrative associated with Green Year was the transformational journey that the city is currently on from «steam to green». The strapline «**from Steam to green**» was designed to demonstrate how Glasgow has transformed since the Industrial revolution. From the birth of the industrial revolution and the heavy industry associated with this period through to Glasgow's cultural reinvention in the 1990's, Glasgow has never stood still. Green year was designed to demonstrate that Glasgow is now taking part in the most important transformation in its history – to become a truly sustainable and green city within Europe. Glasgow's Green Year 2015 was a celebration of our historic strengths in engineering and education, and promoted our *Dear Green Place* as a leader in green science and innovation.

How was the narrative distributed?

The narrative was described via the strapline «**from Steam to green**» and distributed through every event and communication that was held in 2015. Wherever possible the story was told in relation to the specific event. Each month had a different theme, designed to raise awareness of different green issues, ranging from energy awareness, climate change, biodiversity and noise and air quality.

How was collaboration with a local community going?

Throughout 2015, various communities were engaged in events. Communities were often brought on board via third sector groups such as local activity groups, volunteering groups, Housing associations, etc. Events were advertised via social media so that any citizen could attend. If the event was specifically targeted at young people, the City linked with schools or community groups in order to raise the profile and ensure maximum attendance.

Throughout 2015 the City built up a better relationship with the community by providing a common channel for them to raise awareness of their local issues or events (by re-tweeting). We also created great links with local people who regularly provided photographs of their favorite green views in the city.

Which kind of information is provided through social media?

Our social media channels provided a range of information. Each month had a different theme in order to raise awareness of a range of issues from energy to noise to transport.

Each month the City had a preset list of tweets – providing links to interesting documents, events or interesting facts on the particular theme. For examples, cf. Figure 6 and Figure 7.

In addition, the web site provided a list of city partners – along with contact details and more information about what assistance they can provide. The City also provided a calendar of events so that everyone can get involved in what was happening across the city.

Figure 5. Green Glasgow web site

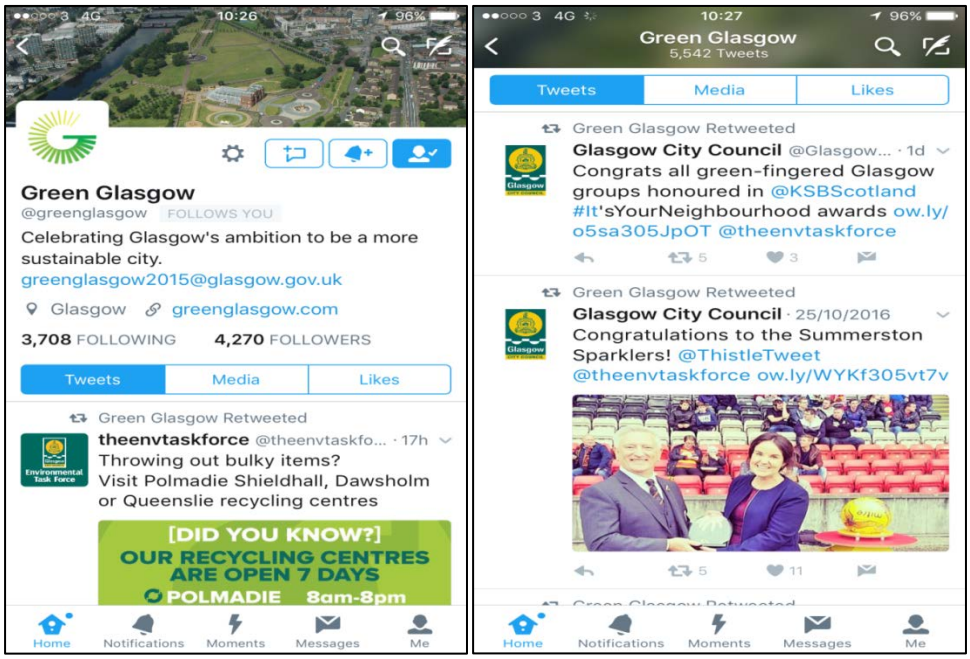

Figure 6. Tweets by the City Council and the Green Glasgow accounts

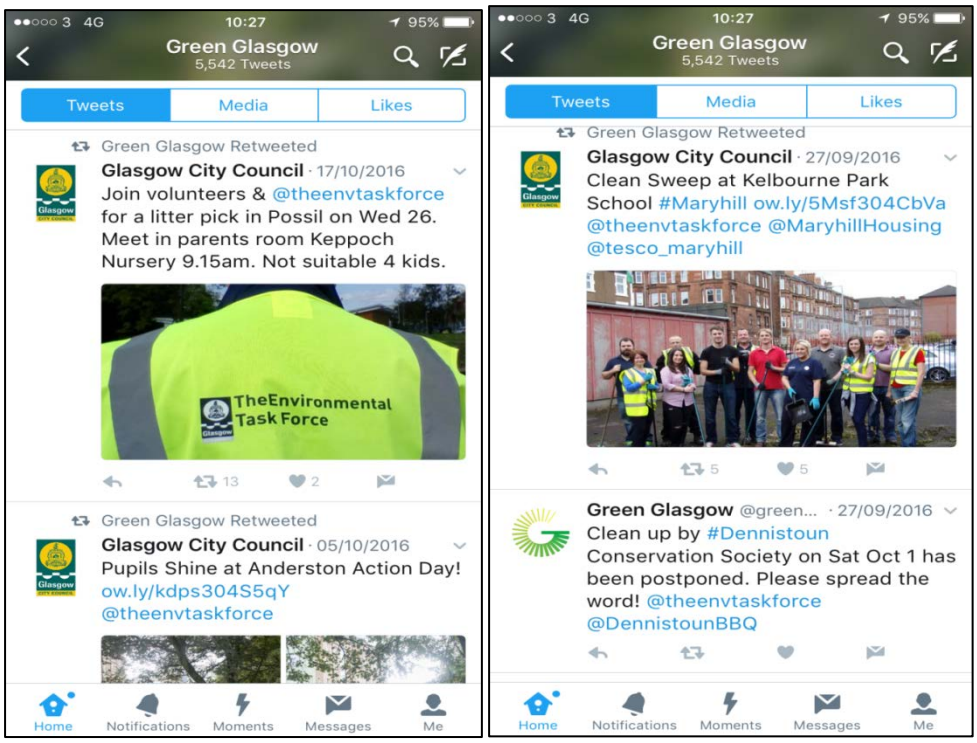

Figure 7. More tweets by the City Council and the Green Glasgow accounts

How did the activity empower a local community and citizens?

The Green Year initiative supported and empowered both citizens and community groups as it allowed citizens to learn more about green issues, showed citizens where to go for further support and how to link with others in their area. In terms of local communities, their participation in Green Year often allowed another reason to attract funding through funding bids; it also allowed them an avenue to advertise what they were doing to others across Glasgow.

How it could be evaluated?

In order to describe the positive outcomes of Green Year the City undertook an evaluation of the success of the project in terms of "reach" i.e. how many people viewed a tweet, accessed our web site or attended a Green year event.

Results were positive, as the city gathered the following information (note that Glasgow has a population of around 600,000):

- A tweet per day on the Green Glasgow twitter account
- Tweets regularly viewed by over 55,000 people (due to re-tweets)
- Over 1,000 hits per day on the web site in summer months
- Over 20,000 people attended a green Year event in 2015
- Over 70 city wide partners

CASE OF VEJLE

Activity name: Ny Rosborg – New City Development District

Who has taken the initiative?

Vejle municipality

What were issues behind?

To make a new kind of city development, where the city involves both the users of the area, the neighbours and others, who are interested in city development in Vejle

Which social media were used?

Facebook (primary) and twitter/Instagram (secondary)

What is a narrative for enhancing understanding of the issue?

You as a citizen can influence the future of the city.

How was the narrative distributed?

By making workshop, “citywalks” in the area and a *City Development Exhibition*. The city invited people through advertisements in the papers, event on Facebook (see Figure 8), and on the project web site[20] (see Figure 9Figure 8).

How was collaboration with a local community going?

An ongoing dialogue (Mails, by phone, meetings, invites to events etc.). Information about events – and pictures from participants were posted through social media. Main purpose was to make people show up and guide them to the homepage of the project.

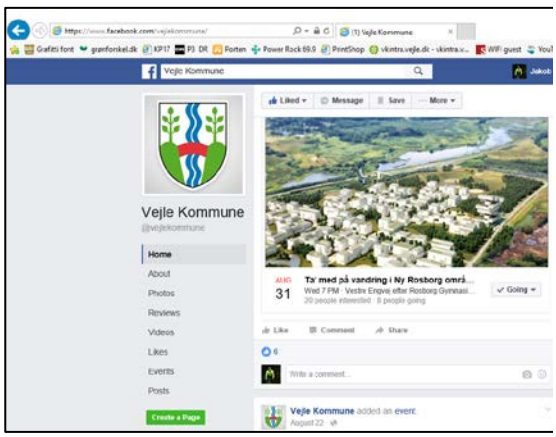

Figure 8. Facebook event page

[20] http://www.nyrosborg.dk/

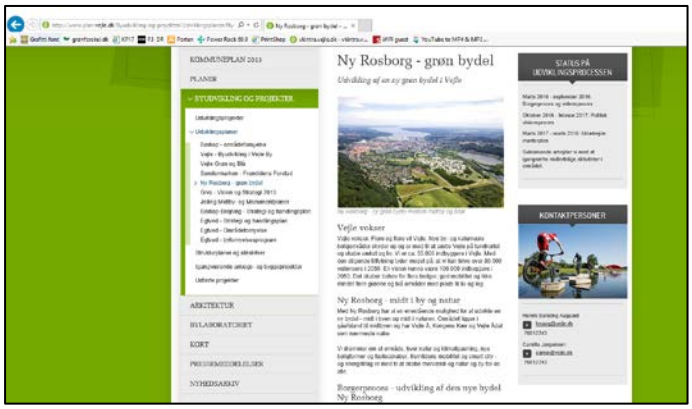

Figure 9. Project web site

Figure 10. Local newspaper reporting the activity

How did the activity empower a local community and citizens?

The municipality of Vejle received a catalogue with ideas and wishes on how to create facilities and meeting places in the area – which could benefit both the existing inhabitants and future citizens.

The established work group has taken the initiative to start the city development – and the attitude has changed from being sceptic and against the development to accept and embrace it.

CASE OF BRISTOL

Activity name: Social media strategy for Neighbourhood Management

Who has taken the initiative?

The *Neighbourhood Management* service delivers 14 Neighbourhood Partnerships (NP) across the city. These neighbourhood partnerships are the local devolved decision making bodies, made up of locally elected councillors, local residents, businesses and representation from the Voluntary sector. Each NP, which has between 30,000 and 60,000 residents, has an amount of funding devolved each year (between £40k – £62) plus 15% of any Community Infrastructure Levy (a tax charged to new build developments). These funds are then allocated by the NP to deliver priorities as set out in their local NP Plan.

The Neighbourhood Management Teams are embarking on a social media strategy. Each officer will have a professional Facebook page which they will share information, gather interest, market events, get opinion (if you would support a new play area at the location please like this page). Each NP will also have its own Facebook page; these are to be administrated by both our team members and the local NP members.

To date (only 10 weeks into the strategy going live) most NPs have Facebook pages, most have resident administrators and each NP staff team also has a page – this quarter we achieved a reach of 164 179 (this is not 164 179 individual people as some people would have received several messages) and encounter 4 060 interactions (likes, shares comments etc.).

Over the summer months, as the skills of both our team members and the resident NP members improves the city expects to make a massive improvement on these figures, getting information to people that might not normally come out for evening meetings.

In the autumn, the city will be looking at how to best use Twitter and other forms of social media to add value to this.

What were issues behind?

Historically the NPs have done all of their work via public meetings. It has always recognized that holding public meetings, regardless of the time of day (the team often work until 9.30pm including weekends), only a certain sector of the community will engage in this way (a recent equality monitoring across the city found out that Black Minority Ethnic (BME) groups and the under 50s are not engaging with Neighbourhood Partnership to match the local demographic). To compensate this, the Neighbourhood Officers have in the past targeted other groups (young parents, BME, young people etc.) at the places they go to, however with the need to reduce costs, the shrinking team has had to look at time efficient ways to add value to this.

Which social media were used?

Facebook. Some areas are concentrating on their NP Facebook pages (see Figure 11) – using them to find opinion, market ideas and events, encourage conversation etc., whilst other areas (usually the less technical areas) are working from their professional Facebook pages.

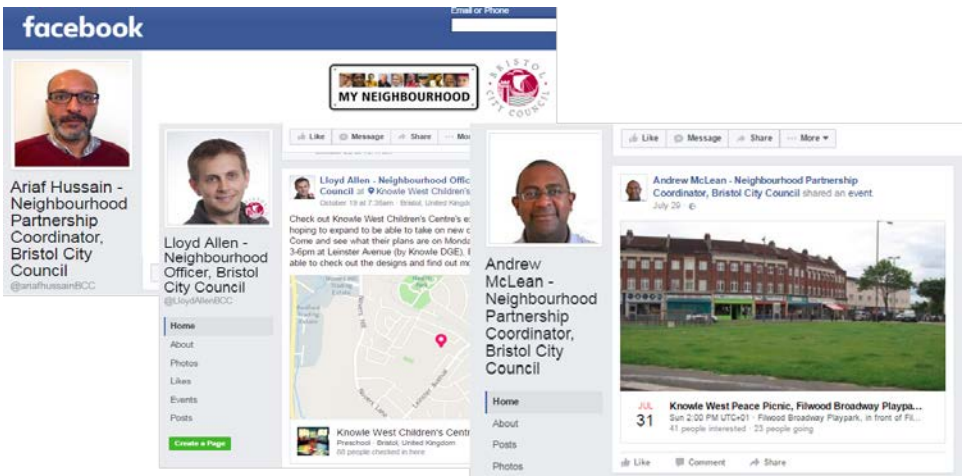

Figure 11. Officials' professional FB pages for the project

Along with the FB pages, the main Bristol City Council web site[21] enables residents to find their nearest Neighbourhood Partnership using the My Neighbourhood search function (see Figure 12). The

[21] https://www.bristol.gov.uk/people-communities/neighbourhood-partnerships

page shows contact persons from the City council, considerations of the area, school and parking information, and potential of solar power generation of the day.

Figure 12. Web site page for the Neighbourhood partnerships

How was the information updated?

There have been regular updates – some officers have taken to this very well, whilst others are still struggling, however the momentum has been very brisk

How was collaboration with a local community going?

Comments, ideas and opinion are gathered as part of the day to day activity and added to the information gathered in the face to face activities. Mostly information regarding local priorities and activities were posted through social media.

How did the activity empower a local community and citizens?

This has definitely increased our engagement spread; however, it will be hard to glean which demographic groups are now participating (the city asked people to complete an equality monitoring form, however only 4 did this). However practical e.g. of how this has empowered communities, the city has been working with a small group of people to set up a *Friends of* a certain area. After only a few meet-

ings, by using Facebook the group is now working nearly independently to organize litter picks, and other parks activity. The city expects that by Christmas we will be able to totally step away.

4.4. TOWARDS INCREASED TRUST AND CITIZEN EMPOWERMENT

CITIES are building trust with its citizen through daily-basis operations. Traditionally, as the example of Bristol indicates, face-to-face meetings with local communities are means to connect CITIES and citizens. Although these physical interactions are key to the operation of a city municipality and its citizens, social media allows CITIES to expand options of information provision as well as reach-out to more variety of people or groups.

Literature points out that social media increases trust of citizens and enables organisations to grow social capital. Citizen engagement and empowerment is a trending topic when we discuss resilience. We reviewed four EU projects, which have its aim in the same domain. Our approach, taking three steps towards engagement related stakeholders (i.e., development of design principles, a functional specification, and the toolbox as a portal prototype) is supported by results from other projects. However, in several ways our approach is different to them. Our purpose is to find the way of *how* the trust of citizens can be increased and *how* they can be empowered to participate in joint resilience building efforts. To answer these questions, we focus on actions and practices which are generated from CITIES' daily-basis operations. First, we show the action flow of social media in citizen engagement. This is based on CITIES' input and the exercise. Main findings are the importance of narrative creation and the involvement of media, not *only* citizen involvement. This even mandates to look for suitable public-private partnerships, that can also contribute to strengthening a city's resilience. Moreover, public-private partnerships might also contribute to a good relationship between the city and its citizens, as for example media can be trusted if provided with reliable information from the city. Although *citizen empowerment* is the major topic regarding social media implementation, we note that stakeholder involvement (also through public-private partnership) is always required to secure a viable long-term relationship with citizens. Second, we show examples of citizen engagement process that are structured in the action flow. Focuses go to the process of narrative creation and local community empowerment (trust building with them).

Kristiansand approaches children. By giving them an opportunity to have social experiences, the city also succeeds in building trust with their parents as well as getting them involved. Officers play an

important role as a trust builder through their own professional Facebook page. Interactive and open communication between officers and children through the page make parents to be relieved. The city tries to make communication lines as short as possible so that dialog can be easily followed. Glasgow uses Twitter to spread their Green Year initiatives. The issue behind is the lack of a clear communication channel on green issues. It collaborates close with the web site of Green Glasgow. It provides citizens and community groups an opportunity to learn more about the initiative and issues behind. Glasgow also collaborate with other city partners (more than 70). Tweets are beneficial to keep them informed about the latest information on the initiative. Vejle utilizes multiple social media like Facebook, Twitter, and Instagram. They combine face-to-face dialogue and try to get citizen involved to the future city development. Social media is supposed to attract people and guide them to the project (Ny Rosborg) web site. Bristol takes a similar approach as what Kristiansand does: each officer uses a professional Facebook page to engage 14 neighbourhood partners for decision making. On the Facebook page, they get partners' opinions as well as spread information. This contributes to reducing costs for getting opinions since sometimes it is not always an efficient way to have a public meeting for this purpose. The city recognizes that these activities support neighbourhood partners to work on issues independently. This is an important step towards city resilience.

As we can see from examples, the issues and approaches varied from city to city. However, they all succeed in creating a good story to attract people and getting target groups involved. There are no statements on the existing media (newspapers, radio and broadcasting) but we should note that trust is also given indirectly through these kinds of media.

An official said,

"In [a] normal situation we put out real information (on the web site and social media) which is valuable to the public so media know that we are working on this way. They will rely on what we put out that is something to build trust in everyday situation. It is important that this (on the web site and social media) is the channel that we can reach the media."

The importance of using traditional media as well as social media was pointed out by the POP-ALERT project, too (see Section 4.2.1). We should notice that social media is not always accessible, and particular for some people it is completely inaccessible.

While social media has advantage for building trust, we should notice that there are challenges as well. As stated in the previous section, it has a high rate of abuse. As the COSMIC project (see Sec-

tion 4.2.3) points out, when we look at information posted from citizens we should be carefully in dealing with misinformation, misrepresentation, propaganda, surveillance and censorship. Resource allocation is also always the challenge to CITIES.

As a concluding remark of this chapter, we go back to the literature again. In regards to citizen empowerment, literature proposed several ways of doing this, such as participation promotion (Boehm et al. 2004), producing a sense of unity (Zimmerman 2000), and sharing problem and role ownership (Conger et al. 1988). Based on these points of view, social media actions and practices submitted by CITIES could be supported towards citizen empowerment purpose.[22] Through social media actions and practices CITIES are creating new knowledge every day. As suggested in Section 4.1, social media services are a growing field; trends are changing all the time. Keeping up with what CITIES are doing could contribute to shaping collective intelligence of a community. Our work towards promoting social awareness and community empowerment does not finish within WP4, but will further develop in WP5 and WP7.

[22] A related literature (Moorhead et al. 2013) also points out the following six advantages as benefits of social media. 1–increased interactions with others, 2–more available, shared and tailored information, 3–increased accessibility and expanded access to information, 4–peer, social and emotional support, 5–increased public surveillance, and 6–the potential to influence policy. These points are also supported by CITIES' examples.

5. DESIGN GOALS AND PRINCIPLES

5.1. GENERAL

This chapter presents the final set of design principles. Firstly, the structure of the design goals as derived in Deliverable 4.2 is summarized and extensions based on the inclusion of social media are explained. Then, they are proposed as the theoretical outcome of Work Package 4 as a whole.

5.2. STRUCTURE OF DESIGN GOALS

Six design goals as the following were set in the previous Deliverable.

[1] Information Sharing
[2] Establish a Communication Structure with stakeholders
[3] Citizen Engagement and Raising Awareness
[4] Knowledge Sharing
[5] Information Sovereignty
[6] Usability

These goals do not stand alone but interrelated each other. The structure of interrelation is shown in the Figure 13.

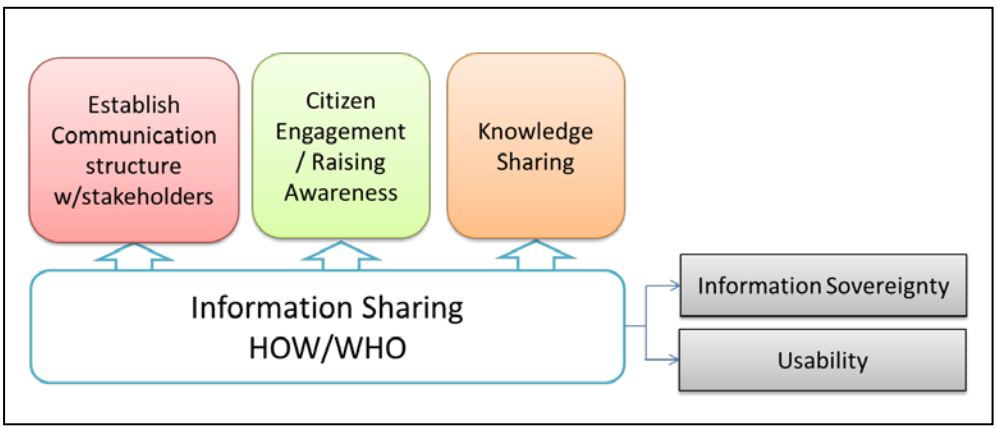

Figure 13. Design goal structure

Information sharing, especially to setting up HOW it is delivered and WHO should be reached is a foundation of communication activities. Beyond this foundation, (a) Establish a Communication Structure with stakeholders, (b) Citizen Engagement and Raising Awareness and (c) Knowledge Sharing are set as operational goals for CITIES to enhance resilience. WHAT information should be shared varies by objectives in each design goal thus we exclude <WHAT> from the foundation. (d) Information Sovereignty and (e) Usability should be considered as foundation of the communication platforms.

Each design goal has a set of principles that show the way of achievement. In the next section, we will show detailed description.

5.3. DESIGN PRINCIPLES AS AN OUTCOME OF WP4

The following is updated principles and its description.

Table 4. Design principle description

Design principle (P)	Description
Goal 1: Information Sharing	
P1-1: Channel setting <HOW>	Communication starts with setting up a physical service centre towards citizens. Platforms (web site, social media, internal systems) to share information with stakeholders are implemented.
P1-2: Identification of targeted groups <WHO>	CITIES identify target groups to enhance engagement. Target groups are varied like first responders, local communities and social groups and communities of interest. Thereby, the population must be reflected.
Goal 2: Establish a Communication Structure with stakeholders	
P2-1: Visualization of live communication (dialog)	CITIES and stakeholders should share objective and issues. Using the same platform among them is desirable. Long-distance communication should be supported by the platform

		as well as face-to-face conversation.
	P2-2: Visualization of resource capability	CITIES acknowledge (or generate) resource capacity for updating information on a certain platform, responding to inquiries from stakeholders, and on translating information into several languages (if applicable in the city).
Goal 3: Citizen Engagement and Raising Awareness		
	P3-1: Narrative creation	Citizen engagement starts with sharing the same issues in each city. Producing a sense of unity is the means to get people involved. A narrative enhances common understanding of issues and roles. Besides, citizens should understand what the city needs them for in terms of resilience.
	P3-2: Collaboration with media and local communities through social media	To promote citizens' participation, CITIES get media and local communities involved. Social media expands the way of information provision. CITIES build trust among them in daily-basis operations through providing correct information.
Goal 4: Knowledge Sharing (local, national, European)		
	P4-1: Setting up a resilience library	CITIES set up a library that stores best practices towards city resilience.
	P4-2: Learning online	Best practices in the library can be shared by neighbouring cities, in national networks and in a European consortium.
Goal 5: Information Sovereignty		
	P5-1: Information quality	Information on any platforms should keep consistency and accuracy. This contributes building trust among related stakeholders and citizens.
	P5-2: Role-based authorization	Portal information is available based on the pertinent role. The same is true for editing the portal. Each user can take

		roles depending on his or her tasks and responsibilities in the portal.
	P5-3: Penetration test	To protect platforms from a cyber-attack, penetration tests should be implemented. In doing so, collaboration with a scientific partner (and possibly IT security companies) is supposed to be useful.
Goal 6: Usability		
	P6-1: Publicity, Dissemination	Information technologies cannot reach everyone whom CITIES should approach. Taking right balance between technologies and disadvantaged people should be considered. Traditional means to contact people (an announcement car etc.) will remain.
	P6-2: Information filtering	The amount of information that can be provided is vast, and it addresses many different stakeholders. Moreover, not all information available on a subject is relevant in a given situation. Thus, the portal must provide means to filter data in order to only show actually relevant information.

It should be mentioned that the design principles do not reflect on how to measure the impact or reach of the Resilience Information Portal. While this is clearly advisable, it is an activity that needs to be followed additionally. However, it is highly city-dependent and independent of implementing the design principles.

6. FUNCTIONAL SPECIFICATION

6.1. INTRODUCTION

This section presents the functional specification based on the identified design principles and the functional specification presented in D4.2. It has been extended and revised based on the interview, informal interviews, and additional exercises with CITIES conducted at the workshops.

Presentation, style and structure follow the IEEE 29148-2011[23] standard (with some amendments, particularly for structure). Thereby, it will be possible to standardize the specification of the Resilience Information Portal: The here presented functional specification will be offered to be formally standardized within the SMR project. The underlying process has already been started as a joint initiative between CIEM and DIN. The process has been described in Section 3.3.

Since the functional specification serves both the basis for portal prototype development and as a result from the project, a distinction is required for some requirements. These are denoted by “For the SMR project:” and “After the SMR project:”, respectively.

Please note that comments that would typically not be found in a functional specification but are here needed for context are put in *italics*. Moreover, please note that this introductory subsection is not part of the functional specification but rather the introduction to how it is represented here.

6.2. AIMS

6.2.1. PURPOSE

Aims set the main goals and profound criteria for the portal software. While it was proposed in D4.2 to distinguishing aims by the maturity stages, i.e. there would be five categories denoting for which level of maturity a certain criterion is required to be fulfilled, this is not done here. Rather, we kept the well

[23] “Systems and software engineering – Life cycle processes – Requirements engineering”, 2011.

acknowledged MoSCoW scheme[24] but applied the maturity stages to the actual functions compiled in the remainder of this document.

6.2.2. PRODUCT DEFINITION

The aim is to build a Resilience Information Portal. It will serve as a collaborative environment to facilitate awareness and engagement among key partners in resilience building activities. The portal will particularly serve two purposes:

- Support communication within the city, between the city and its stakeholders, between the city and the scientific community, and between the city and its citizens. In addition, the integration of a variety social networking services should be supported.
- Enable knowledge sharing and transfer as a long-term communication activity. Similarly, to the short-term communication support, the city, its stakeholder, and citizens should be included.

The portal must be set up to become an entrusted platform that will engage all its stakeholders.

6.2.3. MUST CRITERIA

- A01: The portal must be a publicly available Web application.
  - Note: It should be a fully cloud-based information system.
  - Note: It must be possible to clone instances of the portal as well as to easily create new, “blank” portals.

- A02: The portal must provide the basic functionality of Web applications, most importantly page retrieval.
- A03: The portal must provide functionality to embed static content as well as dynamic content. In particular, it must be possible to have Newsfeeds, Weblogs, Wiki pages, and Forums.
- A04: Contact lists need to be enabled as a special form of technically static, yet frequently updated content.
  - Note: it must be possible to specify arbitrary data sources for these, as long as suitable interfaces can be technically realized. Wrappers or another interfacing functionality need not be provided with the portal.

[24] Must, Should, Could, and Won’t for prioritization.

- A05: The portal must provide the functionality to provide existing dynamic content, both by inlining existing Web sites and by integration (and automatically) updating data from XML-based sources.
  - Note: Easy integration of other data formats should be possible.
  - Note: Particularly integrating data geographic information systems (GIS) is advisable. If the portal stored much data, even a bidirectional exchange to such systems should be sought.

- A06: Extended functionality must be provided to compose pages. Page editing must be supported by WYSIWYG tools.
  - Note: Suitable editing tools for rich text do not require programming or design knowledge but can be used similar to basic Word processing software.

- A07: It must be possible to present complex information.
  - Note: This requires adequate formatting capabilities as well as the possibility to cross-link information.
  - Note: This includes the possibility to log incident information.

- A08: Users must be able to register for portal usage and to log in.
- A09: An adaptive role management must be realized.
  - Note: This is particularly needed to distinguish between city personnel, stakeholders, and citizens.
  - Note: Only relatively coarse functions will be specified for this aim since it is highly city-dependent.
  - Note: It should be possible to form groups as part of the role management. One such group could be a task force for a particular incident or problem.

- A10: It needs to be possible to flag documents as sensitive. Access to such documents must go along with the role management.
- A11: Logged-in users with respective rights must be able to edit pages.
  - Note: This includes the upload of documents.

- A12: Administrators or users with rights for sub-areas of the portal must be able to generate new pages as well as to remove pages from the portal.
- A13: Based on the role concept the portal must facilitate bidirectional communication flows. In particular, feedback from citizens must be a core concern.

- A14: On top of the role-concept, the portal must provide an “emergency mode” in which the homepage shows the for the particular thread most relevant information.
- A15: Social media integration must be provided. In particular, news posting must be linkable to Facebook and LinkedIn. Moreover, unidirectional integration of Twitter is required.
- A16: Accessibility standards[25] as outlined by the W3C must be followed. If applicable, national laws must be followed.
- A17: Search functionality must be provided that allows sorting of results.
- A18: The portal must provide adequate security.
  - Note: This includes adherence to well acknowledged standards as well as good common security practices. Applicable standards are cited in the remainder of this document.
- A19: The portal must provide basic integration of a Web-based video conference tool that fulfils corporate requirements[26].
- “For the SMR project:” The portal must integrate with the SMR project Web site.
- “For the SMR project:” The portal must provide basic means to log its usage in order to better understand how it is utilized.

6.2.4. MAY CRITERIA

- B01: Logged in users should be able to customize pages that are set to be customizable. In particular, the home page should be customizable.
- B03: Mobile device support should to be pursued by designing the portal in a responsive fashion.
- B04: Frequently Asked Questions (FAQ) pages should be provided.
- B05: Tools for interactively measuring the resilience maturity level of a city should be provided.
  - Note: This mandates integration with the other tools developed in the SMR project.
- B06: The portal should provide a reminder-functionality for updating pages. It should be configurable by everyone with editing rights for a page to define whom to remind as well as the reminder interval.

[25] http://www.w3.org/standards/webdesign/accessibility
[26] E.g. WebEx.

- B07: The user interface (UI) should be designed according to international usability standards that have been implemented as European standards (EN ISO 9241-161[27], EN ISO 9241-112[28], EN ISO 9241-125[29]).
- B08: Static pages should provide the means to structure information.
- B09: It should be possible to change roles and rights in this case.
    - Example: Provide people who are normally not eligible but require this information in case of emergencies with information of a certain level of confidentially.

- B10: National guidelines should be observed. Other official guidelines – e.g. on a municipal level – should also be observed.
- B11: The portal should support multiple languages.
    - Note: Moreover, the portal may include translation services.
    - Note: If cities have more than one official language, the portal must have multi-language capabilities.

- B12: The portal should be well performing.
- B13: The portal should be scalable.
- B14: Feeding Twitter posting back to the portal would be a reasonable addition.
- B15: A backend functionality that scans for redundant information would be a beneficial addition.
- B16: If possible, coupling with video telephony and video conferencing tools should be enabled. In particular, extended bidirectional information exchange is desired.
- B17: An advanced portal may include access to workflow management systems and even dynamically adjust to workflow handling in cases of emergencies.
- B18: The portal's dynamic content may reflect resource allocation done in other systems in real-time and adjust dynamic pages' content accordingly.
- B19: In extension to A14, notification functionality should be added; this allows users to register people to be notified in case of emergencies. They can in such a case use the portal to let these people know that they do not require help and are not directly affected.

[27] "Ergonomics of human-system interaction" - Part 161: "Guidance on visual user-interface elements", 2014-06-06.
[28] "Ergonomics of human-system interaction" - Part 112: "Principles for the presentation of information", 2015-07-24.
[29] "Ergonomics of human-system interaction" - Part 125: "Guidance on visual presentation of information", 2016-05-13.

- Note: This could be realized similarly as the “Safety Check” functionality of Facebook.

- B20: Tools to monitor social media activity of citizens regarding the city and other resilience-related events should be integrated.
  - Note: This can be extended to social media analytics.

- B21: Functionality for the automated dissemination of media through different channels, including social media, should be included.
  - Note: This requires adaptation of content in some cases. For example, to Twitter merely a headline would be fed.

6.2.5. NEED NOT AND MUST NOT CRITERIA

- C01: The portal is specific to the SMR project, even though it should yield generalizable insights.
- C02: The portal is not needed to be optimized for architecture.
- C03: The portal is not needed to be optimized for performance.
- C04: The original idea of a *portal of portals* will not be realized. While CITIES will form a resilience backbone, a close integration of their information systems is out of scope. A portal of portals would pose more challenges than offer benefits. It also would be hard to maintain.

6.3. USAGE

6.3.1. PURPOSE

The usage scope describes the basic condition of provisioning the portal software.

6.3.2. AREAS OF APPLICATION

For the SMR project: The portal will be used as the Resilience Information Portal as defined in WP4 of the SMR project. It will then be used in WP5 until the end of the project. The portal is proposed as a toolbox with rather coarse, yet very versatile functionality that allows CITIES to try out ideas, share best practices, use the portal as a showcase, and to adapt successful practices to their own portals.

After the SMR project: The portal will be used as the Resilience Information Portal of a city.[30]

6.3.3. TARGET GROUPS

For the SMR project: The portal will be used by the seven partner CITIES of the SMR project as well as by the academic partners of the project. Target groups are the municipalities and their emergency managers, civil protection units, first responders (police, health care, fire fighters), critical infrastructure providers, scientists, and citizens (stakeholder and citizens in the usual wording).[31] A possible extension to further target groups is already intended. According to the *pilot implementation guide* developed in WP5, tier-three cities (i.e. cities that are not part of the SMR project but will be drawing results from it) will adopt the design principles and the portal, or at least make them the foundation of their own developments. These cities will further test the Resilience Management Guideline as a whole; therefore, they will have the chance to test and validate again the Resilience Information Portal during year three of the project. Further extensions need to be expected.

After the SMR project: The portal is used by a city and provides services also to the city's stakeholders and its citizens.

6.3.4. STAKEHOLDERS

For the SMR project: Stakeholders are the consortium members of the SMR EU project, along with stakeholders that are relevant for them. This in particular includes all resilient-related stakeholders of the CITIES. For further details, please refer to the concept of CITY (Maraña, Hernantes, & Sarriegi, 2016, p. 7f).

After the SMR project: Stakeholders are a city, its main stakeholders in terms of resilience-related activities, its citizens. Possibly, other cities are stakeholders if they exchange information with the city or even collaborate on the topic of urban resilience.

[30] This of course needs to be done in accordance with each city's specific needs.
[31] Actual target groups need to be determined by cities independently and cannot be fixe das part of the functional specification.

6.3.5. OPERATION CONDITIONS

For the SMR project: The portal will be up and running until the end of the SMR EU project (i.e. May 2018). Usage of the prototype after the project is currently not intended since CITIES plan to implement their own portals. However, source code and documentation will remain available. Instantiations of the prototype could be kept by CITIES after the end of the project's lifespan. It will need to be determined in work with the CITIES how long portal data and related information will be kept. This task needs to be aligned with the IT strategy of CITIES; it at least partly can be discussed as the ongoing WP5 work.

After the SMR project: Upon initial installation and setup, the portal will run indefinitely. Regular maintenance and extension must be expected. The portal needs to be hosted in a way that allows continuous service, even in unexpected conditions such as disasters.

6.4. TECHNICAL PRODUCT ENVIRONMENT

6.4.1. PURPOSE

The technical product environment describes preconditions for successfully running and accessing the portal software.

6.4.2. SOFTWARE

- A current, up-to-date Web browser for clients.
- For the server:
  - For the SMR project: Google AppEngine (GAE)
  - After the SMR project: An appropriate technology for Enterprise Web Applications.

6.4.3. HARDWARE

There are no specific hardware requirements. On the server side, any hardware that supports the required backend software suffices. On the client side, any hardware that can be used to run a modern Web browser suffices. This in particular includes mobile devices such as smartphones and tablets. Since the initial performance requirements are low but the portal will be scalable, no suggestions are proposed at this point. After the SMR project, scalable and reliable hardware will be very important.

6.4.4. INTERFACES

For the SMR project: No interfaces to existing systems will be realized.

After the SMR project: Existing information systems should be integrated with the platform. The level of integration as well as the systems to integrate at all are to be determined by the respective city.

6.4.5. HOSTING

For the SMR project: There are no specific hosting requirements.

After the SMR project: Hosting outside of the city's area is desirable. The infrastructure must allow scalability and reliability. In case of emergencies that effect the whole city, access for the portal should still be possible. A multi-location hosting in the fashion of a highly available distributed system is recommended.

6.5. FUNCTIONS

6.5.1. INTRODUCTION

In the following, the functions for the Resilience Information Portal are proposed. They follow (or rather concretize) the criteria given in Section 6.2. They are grouped by intended maturity level. This grouping follows ideas from the workshop in Vejle in 2016, in which CITIES engaged in an exercise. They mapped criteria to maturity levels. However, it was found that this needs to be done design principles-specific. Replication this on the level of the functions would be hardly reasonable because it would be very hard to be assessed – besides adding a profound double-digit number of pages due to the matrix-like nature of such a mapping.

It has to be stressed that this is a proposal from a generic point of view. Firstly, there will need to be an empirical assessment of this categorization after Resilience Information Portals are routinely used by a number of cities for some years. Secondly, depending on a city's background and its situations, the categorization could slightly differ. This will hardly touch those functions intended for a starting level and most likely also not those only considered at a vertebrate stage. However, slightly different categorization particularly for the middle-tier levels can be expected.

Within each of the following subsections, functions are ordered by user first, and by complexity of the function second.

6.5.2. REGARDING ROLES

The role as part of each user story is kept generic in the following. *Thereby, cities are provided with freedom and responsibility at the same time: how roles are filled according to local stakeholders and the actual prioritisation must be set by each city individually, as it is independent of technological solution and even of design principles.*[32]

In a number of cases – particularly for the advanced maturity levels – we use the term "user with a particular right" for the role of a user story. In each case, this denotes that there should be the possibility to have users on the portal that have particular roles and respective rights assigned that go beyond editing rights but are not administrative right in general. There can be an arbitrary number of such roles; the particular right in one user story must not be the same as in another one. In fact, but for successive usage of similar functionality in more sophisticated form on a successively advanced maturity level, they are *never* the same but distinctive.

6.5.3. STARTING

As a user, I want to access a public portal.

As a user, I want to retrieve Web pages from the portal.

As a user, I want to browse the portal.

As a user, I want to use recognizable URLs to retrieve pages, so that I will not need to remember cryptic character sequences or long numbers.

As a user, I want to be able to access the portal using a PC, smartphone or any Web-enabled device, so that content is displayed responsively.

As a user, I want to be able to create a user account.

As a user, I want the portal to follow generally acknowledged security practices, so that using it is safe for me.

As a user, I want the portal to follow generally acknowledged safety practices, so that using it will compromise my data or pose other harms.

[32] However, it is a good idea to share approaches among CITIES. Moreover, determining the roles could be done as part of the following WP5 activities with CITIES.

As a user, I want the portal to follow generally acknowledged privacy practices, so that storing my data on the portal is safe.

As a user with a user account, I want to be able to log in.

As a logged in user, I want to rely on industry-hard authentication mechanisms.

As a user with editing rights, I want to be able to edit portal pages.

As a user with editing rights, I want to be able to create new portal pages.

As a user with editing rights, I want page editing to be supported by WYSIWYG tools so that creating and changing pages is possible without knowledge in Web technology.

As a user with editing rights, I want to be able to switch page editing to a source code view, so that I can also manipulate pages directly.

As a user with editing rights, I want to be able to create and assign templates so that pages can get a uniform appearance.

As a user with editing rights, I want to provide guidelines to citizens in an easy way, so that I e.g. can provide checklists.

As a user with editing rights, I want to be able to present complex information by suitable means for representation, so that the portal is not limited to prose text.

As a user with editing rights, I want to create a newsfeed.

As a user with editing rights, I want to create a Weblog.

As a user with editing rights, I want to create further dynamic Web 2.0 functionality such as Wikis and Forums, so that the portal can be used for exchange.

As a user with editing rights, I want to assign rights to users.

As a user with editing rights, I want to be delete data posted on Web 2.0 features that I have created, so that I can get rid of inapposite posts.

As a user with editing rights, I want to create contact lists, so I can keep an overview of contacts for particular functions or in particular cases.

As a user with editing rights, I want to link contact lists to data sources with defined interfaces, so that entries are updated automatically.

As a user with editing rights, I want to create FAQ pages, so I can provide collections of frequently asked questions and the respective answers.

As a user with editing rights, I want to embed dynamic Web pages that are external to the portal, so that they can be directly accessed from the portal without a change in context.

As a user with editing rights, I want to be able to link directly to external pages, so that such links can also be integrated in the header and footer, or the menu of a page.

As a user with editing rights, I want to flag documents to only be available to users that are logged in.

As a user with editing rights, I want to flag document to be accessible only for users with a specific role, so that documents can be private.

As a logged in user, I want to be able to post entries to dynamic pages to which I have been granted access.

As a logged in user, I want to log off again.

As a logged in user, I want to access content marked to be only available to log in users, so there can be content that is not available publicly.

As a logged in user, I want to access content marked to be only available to log in users with my rights, so there can be content that is only available privately.

As a logged in user, I want to retrieve information on my roles and right, so I know what I am allowed to do on the portal.

As an administrator, I want to manage data sources for contact lists.

As an administrator, I want to manage data sources for other dynamic content.

As an administrator, I want to create, edit, and delete users from, the portal.

As an administrator, I want to manage users' roles and rights.

As an administrator, I want to define roles, so I have categories that I can assign users to.

As an administrator, I want to create a hierarchy of roles, so that roles can inherit the rights specific to another role.

As an administrator, I want to give limited role and right management right to logged in users, so that they can manage user groups that they are responsible for.

As an administrator, I want to have full control over the editing of templates, so that arbitrary pages can be built using the portal.

As an administrator, I want pages to be based on templates and templates on templates, so that I can build a hierarchy of templates.

As the city running the portal, I want the portal to integrate with the city Web site.[33]

As the city running the portal, I want the portal to be reliable.

As the city running the portal, I want the portal to be hosted on redundant systems, so that a downtime of the portal due to hardware failure is unlikely.

[33] Within the SMR project: As the SMT portal developers, we want the portal to integrate with the SMR Web site, so that we can create one uniform demonstration tool.

6.5.4. MODERATE

As a user, I want to access the portal with arbitrary browsers that follow current standards, so that there are no compatibility barriers for access.

As a user, I want to retrieve pages from the portal following accessibility standard, so that I can use its contents even if I am handicapped.

As a user, I want to be able to search for content on the portal.

As a user, I want that sensitive data on the portal to be encrypted, so that security and privacy are improved.

As a user, I want to switch between languages, so that I can view pages that exist in multiple languages in my favoured one.

As a logged in user, I want to customize the portal home page, so that it shows the elements that are most relevant to me.

As a logged in user, I want to select my preferred language, so that the portal shows pages automatically in that language (if available).

As a logged in user, I want to use predefined forms to report resilience-related issues to the city, so that they learn from me of potential threats, infrastructure problems, and similar issues.

As a user of a specific country, I want the portal to obey national legislation, so that I can trust that style, functionality, and content are in accordance to what I would expect.

As a user with editing rights, I want to switch between a normal user and an advanced user mode that will show otherwise hidden features, so that the portal offers comprehensibility but also versatility when I need it.

As a user with editing rights, I need to be able to create dynamic pages that facilitate bidirectional communication, so that exchange with citizens is enabled.

As a user with editing rights, I want to be able to syndicate content to social media, so that I e.g. can make postings to Facebook and on Twitter while working with the portal.

As a user with editing rights, I want to be able to set reminders for updates, so that the portal will update me when pages are due for updates.

As a user with editing rights, I want to have access to data structures, so that I can base both static and dynamic pages on them.

As a user with editing rights, I want to be able to define data structures, so that I can define registers.

As a user with editing rights, I want to create the same page in multiple languages.

As a user with editing rights, I want to create forms for citizens to report issues.

As a user with editing rights, I want to be notified by email about reported issues.

As a user with editing rights, I want to access reported issues, so that I can open them as cases, edit them, mark than as resolved, and delete them.

As a user with editing rights, I want to give rights to other portal users to open cases.

As a user with editing rights, I want to forward cases to city personnel via email.

As a user with editing rights, I want to include Twitter postings into the portal.

As a user with editing rights, I want to create external data as mashups that are push-updated, so that current data e.g. for the weather is included in the portal

As a user with a particular right, I want to send an alarm to registered users, so that I can inform them of an immediate incident.

As a user with a particular right, I want to use video telephony services, so that I can call other city representatives and main city stakeholders directly from within the portal.

As an administrator, I want to specify social media sources to which content can be syndicated, so that users with editing rights can use them.

As the city running the portal, I want the portal to be very reliable.

As the city running the portal, I want the portal to be hosted in a modern data-centre.

As the city running the portal, I want the portal to integrate other resilience tools.

6.5.5. ADVANCED

As a user, I want to use automatic translation services integrated into the portal.

As a logged in user, I want to customize all kinds of overview pages, so that they show the elements that are most relevant to me.

As a logged in user, I want to use a structured search, so that I have a sophisticated tool with which I can find information.

As a logged in user, I want to use video telephony services, so that I can call city representatives directly from within the portal.

As a logged in user, I want the search to take advantage of portal-defined data structures, so that search results can be presented in a right way.

As a logged in user, I want to be able to send pictures to the portal from my mobile devices camera, so that I have a seamless integration with the portal.

As a logged in user, I want to use location services of my mobile device, so that the portal can adjust its content to my location or I can post my location on the portal.

As a logged in user, I want to notify other logged in users about my status if the portal is in emergency mode, so that they know I am all right even if they cannot reach me.

As a logged in user, I want to configure who will be notified by me in which case.

As a user with editing rights, I want to use social media syndicates in an adaptive way, so that e.g. for a posted article on the portal only the abstract will be syndicated to Facebook and only the title will be syndicated to Twitter.

As a user with editing rights, I want to be able to set reminders for updates also for other users.

As a user with editing rights, I want to use translation services integrated into the portal, so that I am supported in the manual translation of pages.

As a user with editing rights, I want to prepare template for special user groups (such as neighbourhood groups and digital volunteers), so that these groups can form communities on the portal.

As a user with editing rights, I want to prepare template for particular user groups, so that it is easy to set up such groups.

As a user with a particular right, I want to use video telephony services with multiple participants, so that I can form video conferences directly from within the portal.

As a user with a particular right, I want to access functionality measure the maturity level of my city, so that I can make an assessment based on the guidance developed in the Smart Mature Resilience (SMR) project.

As a user with a particular right, I want to form a social media task force, so that in case of an emergency I can keep citizens informed.

As a user with a particular right, I want to syndicate information posted onto the portal to the media, so that I can keep them informed with little effort.

As a user with a particular right, I want to disseminate the alarm to external systems, so that e.g. SMS can be sent to citizens.

As an administrator, I want to assign a particular right to a user, so that the corresponding functionality becomes accessible to that user.

As an administrator, I want to switch to emergency mode, so that the portal only shows a relevant subset of its content relevant to a disaster.

As an administrator, I want to grant the right to enable the emergency mode to users, so that e.g. a crisis manager can enable emergency mode.

As an administrator, I want to add wrappers that provide access to data sources via interfaces not supported by the portal, so that arbitrary data sources can be used.

As an administrator, I want to provide access to non-XML-based data sources, so that arbitrary data sources can be used.

As an administrator, I want to be able to assess the security of the portal, so that I understand if it might be attacked or used in a malicious way.

6.5.6. ROBUST

As a logged in user, I want to create groups for notification, so that the portal can e.g. be used for neighbourhood help in case of emergencies.

As a logged in user, I want to include portal information in a chat box when using the video telephony service, so that exchanging data and discussing particular content is easy.

As a user with editing rights, I want to integrate social media services as data sources into the portal, so that dynamic portal pages are updated with social media content in real time.

As a user with editing rights, I want to use the translation service in a way that allows me to link up with translators, so that I can create pages in other languages and send texts to language expects in one step.

As a user with editing rights, I want to configure dynamic pages to link up with systems for resource allocation, so that they reflect real-time changes in such systems.

As a user with editing rights, I want to be able to use the video telephony functionality to record pictures and videos, so that I can post them on the portal or syndicate them to social media.

As a user with emergency mode rights, I want to define different kinds of emergencies for which the mode can be activated, so that situation-relevant emergency pages can be shown.

As a user with emergency mode rights, I want to be able to define special rights for pages that become active in emergency mode, so that e.g. looser access rights apply in cases of emergencies.

As a user with a particular right, I want to form a social media task force, so that in case of an emergency I can analyse social media activity covering the city.

As a user with a particular right, I want to use video telephony services with multiple participants including those from other cities, so that I can organize international video conferences.

As a user with a particular right, I want to use a tool that scans for redundant information on the portal, so that I am notified of potentially superfluous content.

As a user with a particular right, I want to use a tool that scans for potentially outdates content on the portal, so that I can decide whether it needs to be updated.

As a user with a particular right, I want to provide special access to the portal for representatives of the media, so that they get a tailored yet restricted access to information provided by the portal.

As the city running the portal, I want the portal to be highly reliable.

As the city running the portal, I want the portal to be hosted in a data-centre in sufficient distance to the city, so that a local shock-event will not risk the portal's functionality.

6.5.7. VERTEBRATE

As a user with editing rights, I want issues reported by users to be automatically categorized, so that I get a proposal for who should handle them and for how urgent they are.

As a user with editing rights, I want to use the video telephony functionality to stream videos to social media.

As a user with a particular right, I want to form a social media task force, so that in case of an emergency I can react to social media activity covering the city.

As a user with a particular right, I want to use social media analytics tool from within the portal.

As a user with a particular right, I want to configure social media analytics to feed results automatically to dynamic pages of the portal.

As a user with a particular right, I want to configure specific, incident-tailored contact lists for video telephony, so that I can call in emergency conferences with external experts in case of incidents.

As a user with a particular right, I want to use the workflow management integration to define which data is automatically fed to the portal, so that the porta reflects current crisis mitigation.

As a user with a particular right, I want to define which data from the portal to feed to the workflow management system in case of crises, so that crisis managers are provided with additional information.

As a user with a particular right, I want to configure dynamic pages to embed live data from external systems.

As a user with a particular right, I want to assign users to scenario planning.

As a user assigned to scenario planning, I want to have the same possibilities as a user with editing rights but for a restricted area, so that I can create sub-portals that are used in preparation, steering, supervision, and reflection of a scenario.

As a user assigned to scenario planning, I want to create and use templates for scenarios.

As a user assigned to scenario planning, I want to set up the portal to include life data from external sources in the dynamic pages belong to a scenario.

As an administrator, I want to configure the portal for interlinkage with the city's workflow management system, so that it will be automatically updated with information and automatically provide data in the course of emergency handling.

As an administrator, I want to link the portal to online learning platforms, so that eLearning is also facilitated through the portal.

As an administrator, I want to configure the portal for interlinkage with the portal of other cities for the exchange of best practice documents, so that content from other cities is automatically added and updated on my city's portal.

As an administrator, I want to be able to set up a central repository for best practices, so that our city can create a library of knowledge.

6.6. DATA

The portal will be saving all data for its content but for externally linked content. The portal will keep a user's database including the user right management and the role management. In general, portal data is highly city-specific and will, therefore, only be sketched here.

- The pages of the portal are organized hierarchically.
- Users are described by surname, name, email-address, affiliation (optional), and password. Additional attributes may be added.
- Roles are described by role name. Roles are organized hierarchically. An example from the portal prototype is given in Figure 14 (only an excerpt is shown).
- Roles are linked to pages to denote access rights. For this purpose, a Boolean denoting read rights, a Boolean denoting write rights, a Boolean denoting administrative rights, and a Boolean denoting the right to grant rights to others are used.
- Depending on national policies and city strategy, it is recommended to check *Open Data* requirements and possibilities in conjunction with using existing data sources and with providing data from the portal.

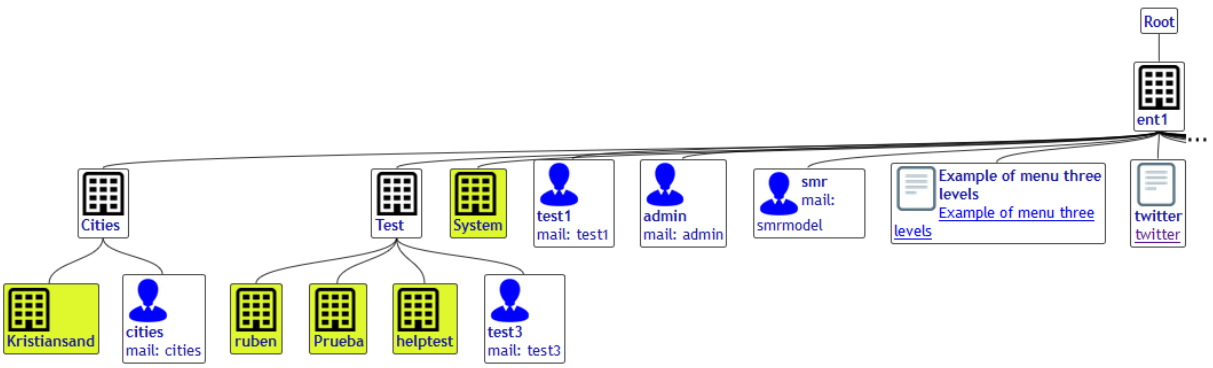

Figure 14. Example of the hierarchical role concept (yellow nodes can be further unfolded)

6.7. PERFORMANCE

- All pages of the portal must be provided without noticeable delay (i.e. less than 500 milliseconds). This particularly concerns pages with personalized dynamic content, such as the portal home page. The reaction characteristics for frontend users should at any time be perceived as seamless.
- Performance, particularly regard to reaction times, need to follow the EN ISO 9241 standard series[34].
- Loading the backend editor for users that edit content should be done within three seconds.
- Posting content should be done within five seconds.
- Search questions should be completed within five seconds.
- Backend management task should not impose major delays.
- Where applicable, technology such as AJAX should be used to partially update views rather than imposing page reloads.
- The portal must not impose unusually high server load. (In other words: it should be efficient.)

6.8. USER INTERFACE

For the SMR project: The aesthetic aspects of the user Interface design, in general, will follow the SMR project Web site's design "SMR :: Home" (cf. Grimes, 2015a; Grimes, 2015b). In addition to this, portal-like features are included in the design. Besides that, there are no specific requirements. However, adherence to EN ISO 9241-151[35] and -161[36] should be given.

After the SMR project: The portal's design is up to the implementing city. It should follow the corporate design of the city. Of course, cities can also adapt a new design or chose a derivative design of the "city style". Full integration with a municipal Web site and adherence to that design is an option.

[34] "Ergonomics of human-system interaction" with several applicable parts.
[35] "Ergonomics of human-system interaction" – Part 151: "Guidance on World Wide Web user interfaces", 2008.
[36] "Ergonomics of human-system interaction" – Part 161: "Guidance on visual user-interface elements", 2016.

6.9. QUALITY REQUIREMENTS

- Extensibility: the portal needs to be extensible both with regard to content and to functionality. Function extension in the form of plug-ins should be supported. In particular, extended usage on mobile devices should be possible to be added.
  - Note: The portal might be used for a longer timespan than initially expected.

- Maintainability: The portal must be highly maintainable. It must allow for further development, customization and adaption.
  - Note: This aligns with the possibility for a lifespan that well exceeds a few years.

- Robustness: The typical robustness of well-tested Web applications should be achieved, i.e. there should be no obvious flaws, and the system should react graceful to improper usage. No particularly high level of robustness is required, though.
  - Note: This explicitly addresses software robustness, not the availability of the portal. The latter is also considered robustness but here mentioned along with Hosting, i.e. the robustness of the system of portal, hardware, and communication infrastructure.
  - Note: Even though mostly a hosting problem, the portal must be robust with regard to extreme traffic e.g. in case of a crisis.
  - Note: Robustness will also be reached by following the before mentioned EN ISO 9241 standards series.
  - Note: In this regard, also EN ISO 22313[37] and EN ISO 22301[38] should be assessed.

- Resilience: After a crash of the server, the portal should resume operation with the last stable state before the crash. No particular resilience is required.
- Compatibility: With relying on current Web technology, high compatibility on the client side is given. Compatibility on the server side relies on the used products (see *Technical Product Environment* above).
  - Note: Compatibility to existing software systems is determined by the desired level of integration.

[37] "Societal security – Business continuity management systems – Guidance", 2016.
[38] "Business continuity management systems – Requirements", 2012.

- Portability: No particular portability must be achieved.
- Usability: The portal should respect EN ISO 26800 and the EN ISO 9241 human-system interaction series. The system should be effective, efficient, and satisfactory for the specified users to achieve specified goals within the specified context of use. Its functions should be easy to understand and to learn. Basic editing functionality needs to be understandable even to technological non-professionals. To avoid a digital divide, basic usage should be possible even for people with hardly any computer experience.
- Accessibility: The portal should be as accessible to people with disabilities as possible.
  - Note: In this regard, EN ISO 9241-171 needs to be followed.
  - Note: In general, adhering to the latest standards in HTML(5) and CSS as well as to best practices in interface design should support accessibility.
- Documentation: A brief handbook for users with editing rights must be provided. For frontend users, the portal should be intuitive enough to make a handbook superfluous. Where needed, explanations should be put onto pages directly.
- Security: ISO/IEC 29115[39] and ISO/IEC 27034[40] should be considered. The portal must not be harmful to the users' computers. The underlying software should be updateable to ensure that potential security wholes are closed. The authentication and authorization mechanisms must employ best practices to prevent breaches.
  - Note: Higher levels of security are mandated if the portal provides access to sensitive or confidential information (even if it resides in integrated systems).

Besides the here mentioned requirements, honouring ISO/IEC 25000[41] is recommended.

[39] "Information technology – Security techniques – Entity authentication assurance framework", 2013-04-01.
[40] "Information technology – Security techniques – Application security", 2011-11-21.
[41] "Software engineering – Software product Quality Requirements and Evaluation (SQuaRE) – Guide to SQuaRE, Common Industry Format (CIF) for usability: User needs report", 2013-08-30.

6.10. ADDITIONAL NON-FUNCTIONAL REQUIREMENTS

- The portal must be scalable. Actual scalability must take into account the number of potential users in a city as well as prospective city growth. Moreover, it should scale seamlessly with a high number of parallel user requests.
  - Note: scalability must specifically take into account that there can be surges in usage during perceived incidents or actual crisis situations.
- EU regulations and national laws regarding public (Web) services need to be respected. This particularly concerns accessibility, privacy, and security.
- It should be changed whether the data to be exchanged must be structured according to existing standards. Such standards e.g. exist for emergency management (ISO/TR 22351[42]).
- Laws and regulations regarding information sovereignty must be obeyed. Since citizen data will be processed, right to information requests (e.g. following UK's *Freedom of Information Act* (FOIA) or Germany's *Bundesdatenschutzgesetz* (BDSG)) need to be expected; processes to react to such requests need to be set up.
- Depending on the actual stakeholders, and also in conjunction with the role concept, an intellectual property (IP) guidelines should be set up. The functional specification must be assessed for adherence to it.
- The authority actually responsible for the portal needs to fix which parts of the portal fulfil statutory duties (e.g. in emergency management) and which provide voluntary services.

6.11. TEST CASES AND TESTING SCENARIOS

6.11.1. BASICS

Test scenarios and test cases enable the assessment of the portal software. In particular, they provide the means for checking adherence of the actual software to this functional specification.

[42] "Societal security – Emergency management – Message structure for exchange of information", 2016.

6.11.2. TESTING SCENARIOS AND TEST CASES

Due to their usefulness for the SMR project as a whole, and in particularly for WP4 and the ongoing WP5, testing scenarios and derived test cases are presented in the section following the functional specification in much detail.

6.11.3. SECURITY

The security of the application might be evaluated according to ISO/IEC 15408[43]. Particularly considering social media, following ANSI/APCO 1.112.1[44] is recommended.

CITIES are urged to consider additional audits in accordance with their regulations and practices for IT security.

[43] "Information technology – Security techniques – Evaluation criteria for IT security", 2015-08-27.
[44] "Best Practices for The Use of Social Media in Public Safety Communications"

7. TESTING SCENARIOS

7.1. OVERVIEW

This chapter summarizes testing scenarios for utilization with the functional specification, and for aiding implementation and usage of the Resilience Portal prototype. Testing scenarios are usually part of a functional specification; for their multi-purpose nature as part of WP4, however, we have decided to introduce them in a section of their own. This section also acts as a bridge to the activities to follow in WP5 in the further course of the project.

7.2. INTRODUCTION

In the following, we present example scenarios for the usage of the Resilience Information Portal. These scenarios would normally be part of the functional specification. As already motivated, we have extracted them as they can be used beyond their function for the functional specification and for the assessment of portal development projects.

We provide scenarios for two general cases of usage that need to be covered by the resilience portal. The first case is an actual incident, i.e. a short-term event that requires a city's resilience in order to avoid harm and to mitigate negative consequences. The second case is a medium- to long-term development, which does not require immediate action. Nonetheless, without proper steps being taken, these cases pose threats to a city and its population. It is needless to say that the portal needs to have some functionality that applies to both general cases. An example is the provision of timely, reliably information. However, due to the time-criticality there are notable differences, too.

For both cases, we provide two scenarios and a joint assessment of mitigating steps. The scenarios are structured in a common form:

Firstly, the scenario is laid out in a short text. It is deliberately in an abstract form, giving enough detail to imagine the case and to allow for sophisticated reactions, but short enough to be also applicable in similar cases. In fact, typically even the kind of threat will be interchangeable, for scenarios try to be archetypical.

Secondly, we provide quotes from cities. These quotes gave us useful inputs in two ways even though some quotes do not refer to the selected scenarios directly (especially for two long-term perspective scenarios, *refugees* and *Zika-like virus spread*). One is to describe situations from which we have built the scenario. Even though it is very hard to come up with scenarios that are models of cases from reality, we strive for realism and want to avoid an artificial character of scenarios. The other one is to justify requirements for the portal in the simulated situations. For these purposes, the city input helps much as it provides the foundation for what actually challenges them. In addition to this, city quotes should also make the scenarios more comprehensible and underline their realism.

Thirdly, we provide a joint table; there are only two tables for all scenarios, as the tables are applied to each general case (short-term and long-term) respectively. Each table shows generalized functionality of a Resilience Information Portal. This is accompanied with a suggestion to which extend this functionality helps in mitigating the risk or threat and how it helps the city to be more resilient. The table also contains a second category, proposing how social media complements requirements. Again, functions and possibilities are highlighted. The table has one row per maturity level from the SMR Maturity Model. Functions are grouped by the level that they are deemed to be applicable to.

Please note that this is a suggestion based on the experience in the SMR project and the work with the CITIES so far. Validation will be required as part of the ongoing work and in particular from other cities implementing the portal principles in the future. Moreover, it needs to be noted that functions can only partly be implemented and that leaving out several functions while implementing other could lead to differing effects on the actual resilience maturity of a municipality.

7.3. SHORT-TERM ACTION IN CASE OF AN INCIDENT

7.3.1. SCENARIO 1: FLOODING

Scenario Setup

Heavy rainfalls have led to swelling rivers. The city's sewage systems can barely handle the amount of water. Meteorological services predict the situation to rather getting worse than better. According to experiences, it is likely that at least flooding of some streets will be unavoidable. It cannot be ruled out that some parts of the city could be severely flooded. To minimize damages, the city might have to consider opening valves, thereby deliberately flooding one part of the city, as this could take pressure

off the system and save most other parts. IT equipment in the city might get damaged by intruding water.

City Quotes

In this scenario, CITIES are supposed to deliver forecast for future flooding, information on vulnerable areas/people and relief stuff. Detailed information on vulnerable areas and people is necessary especially for a rescue team. Relief stuff here refers to sandbags to prevent water coming into their houses which citizens want to know where they could get it. CITIES are also expected to follow what local communities are doing during flooding as they often help each other. It enables CITIES to avoid redundancy of delivering rescues.

“We have issues on storms and floods. It is important to give info to [the] media ([i.e.] traditional media) to inform people about the weather forecast and consequences and so on. Normally, we try to work in advance to prevent people to drive into a dangerous area, take things from garages etc.”

“Rescue services are informed by hospitals or others about people who should be given special attention. They will have a list of some specific persons who need special care in case of crisis in a certain district.”

“Two specific cases in [our country], storms and floods, people are stranded somewhere or people need to get help. We have seen that social media has been used by people who are offering help. They are not organized by the municipality but the municipality should figure out how to follow these things because they could be active in crisis situations. If we know a lot of things are going in this area, we can decide […] [to] focus on another area. Or we can know they need some sandbags and so on.”

“Local community know where the risk is and how to deal with.”

“In [our city], we regularly have flooding problems due to heavy rain and sea coming in preventing water to [drain] the city. It is quite often the same place suffering by floods. In the last flooding, they successfully used Facebook to tell people where [to place] sandbags.”

“[We were] building up reliable information in the last flooding of a wasted water company. They got sick since they weren’t aware polluted water was so dangerous.”

7.3.2. SCENARIO 2: FIRE

Scenario Setup

During the night, a fire broke in an abandoned building in the city centre. Before being noticed, it had already consumed most of the lowest floor. This smoke is rising while the fire spreads to the upper floors; making is clearly visible from a distance. Before the first fire fighters arrive, it already threatens to spread over to adjacent buildings. Rumours quickly spread from people who are wakened by the sirens as well as people living in the distance. People call relatives in the city centre to learn about their safety; on social media, people being suspecting arson. While some Twitter Tweets claim that large areas of the city centre will be destroyed, one person even posts a video titled “Out city in this very hour” on YouTube that shows a devastating fire, which however was recorded long time ago in another incident.

City Quotes

In this scenario, CITIES are supposed to get media involved to spread the incident. Pictures and locational information are also desired to deliver to stakeholders. These are applied to the previous scenario as well.

“In the last incident, we put up on our own web site saying that the accident happened at the school. When newspapers reported this incident, it had 150,000 clicks on it. We don’t have big number of Facebook followers but media follows us. They are good partner to distribute information through their own channels. This is in our strategy.”

“As an example, in [a] fire in the dynamite store, [the] fire department get pictures from different angles and distances which enables [them] to find [the] exact location where the fire is.”

“It is important to distinguish what kind of emergency situation [prevails]. Is it just to inform you where you can have sandbags to prevent water to come in basements of a house? Or is it a fire which risks your life? In former case, there could be rumours for misunderstanding while in the latter case no rumours for that.”

7.3.3. MITIGATION STEPS USING THE PORTAL

	Usage of the Resilient Portal	**Complementary Usage of Social Media**
S	On its resilience portal, the city has provided guidelines, prediction, alarm and advice on flooding and fire risks as well as a checklist for preparation.	This information is also syndicated to social media. CITIES get the media involved.
M	Citizens can use the portal to report problems, e.g. regarding sewers. The city uses the portal to update citizens concerning the overall situation. The city provides stimulated scenario planning. These can be done by making a narrative (showing causes and effects). Most crucial information is provided also in English (where this is not the native language). CITIES and their stakeholders can share best practices through the portal. Photos and videos can be posted to the portal.	This information is also syndicated to social media. Citizens *retweet* what CITIES update on the portal.
A	Even if problems are reported in case of severe events, they will quickly be categorized for importance. If they address the current situation (e.g. a sewage leakage), they immediately are fed to the task force working on the situation. The city provides templates for preparation (for expected situations, e.g. a neighbourhood list) to local communities.	The task force can also issue tweets. The city involves *digital volunteers* as well as local communities.
R	The portal provides areas including forums, wikis and other means of exchange for volunteer groups (including digital volunteers). For example, neighbourhood groups use the portal to scrutinize whether their members have checked all elderly people in the lightly flooded or fire-affected area. The portal provides the mean to form and support such groups. The portal also provides real-time information (i.e., water level, water quality and where people get sandbags and so on etc.).	Videos and pictures showing the situations are posted through social media. CITIES post multi-language messages.

T	Due to prior efforts, the portal has established itself as the main hub for citizens to acquire information in case of city-wide incidents. The plan to flood one part of the city can be made public along with information to calm citizens who might be affected. Moreover, the portal provides means to hold virtual conferences to enhance an online learning opportunity. For the case of flooding: before making the final decision of flooding a part of the city, a conference is held with a partner city that experiences a similar situation a few months ago. Citizen can use the mobile device-optimized version of the portal to keep themselves updated in a live-stream of notices.	A backchannel to the city is provided on social media services.

7.4. LONG-TERM PERSPECTIVE ON CITIZEN ENGAGEMENT

7.4.1. SCENARIO 3: REFUGEES

Scenario Setup

Due to a recent event, a greatly increased number of refugees is arriving at a city. A substantial number of them will have to stay in the city at least for some weeks, probably for months. While the capacities of shelters are yet sufficient and the media has been careful in reporting about the refugees, first doubts have arisen in the population. There have been small protests by right-winged groups and citizens have complained about “the situation at the nearby shelters”. On the other hand, there are also people who are willing to support refugees. The national government build up a portal web site to recruit people who offer supports to them.

City Quotes

In this scenario, long-term involvement of stakeholders is necessary. This involvement can be done by daily-basis dialog. The portal should support dialog between CITIES and stakeholders.

"We could approach stakeholders who have good engagement with people. For example, if we want to talk about a neighbourhood project we would approach Housing association or people who have a good contact list with communities, or people who are responsible emergency responders."

"Earlier we had dialog groups in some parts of town. They do fix the street of the schools [and] make a community better. Then we used groups of neighbourhood to have dialog with them and ask them 'What kind of environment do you want to have to make <<here>> better?', 'You want to have money to make school better or build a new school?', 'Make more community functions in the school?' or something."

"There is the national portal for citizens to register a volunteer organization, to know what kind of resources that they have, and to get relevant information. Also, there is the portal to recruit people who is interested in helping refugees. We use these in refugee crisis to tell citizens where to get used-things and where to ask questions."

7.4.2. SCENARIO 4: ZIKA-LIKE VIRUS

Scenario Setup

A few months ago, a new virus has been described to be spreading quickly in another continent. It is considered to be particularly harmful because it does not typically lead to heavy symptoms and much direct suffering from illness but it can have much impact on unborn children if the mothers contract it. While the virus at first seemed to be a regional problem also bound to the climate, some months later it is reported to spread to other countries. Recently, a first person was treated for typical symptoms in the scenario country's capital. The rests are pending. So far, no vaccination is available and treatments methods only slowly emerge. In particular, it is unknown how the spread can be effectively stopped (but for shutting down long-haul travels completely, which is unrealistic). However, first insights how particularly pregnant women can use precaution are available.

City Quotes

In this scenario, policy set-up with citizens is useful since people should be aware of the risk of virus and thus they could prepare for it. The portal should be selected by people in case the virus spreads. To do so, the portal should provide learning function before the crisis happens.

"Officials in the municipality are an important target group. They have friends and families so we can reach all of these people."

"[The] Culture department does use social media (Facebook and YouTube) to formulate their policy. They target groups of people and stakeholder who know communities in different areas of the city. They use YouTube […] and have a continuous dialog meeting with people interested in culture in [the city]. […] Everybody could join and give their views and opinions which can be presented in the meetings. Also, they formulated cultural strategy for next 10 years which was published online."

"In terms of reliability there are so much misinformed citizens. Thus, use the platform where almost correct information is good [so that] before crises start people get to learn."

7.4.3. MITIGATION STEPS USING THE PORTAL

	Usage of the Resilient Portal	**Complementary Usage of Social Media**
S	The resilience portal is used to keep the public updated with news on arriving refugees respectively the virus spread and how refugees are distributed to shelters. Information spreads to within the city council.	This information is also syndicated to the city's Facebook and Twitter accounts.
M	The resilience portal provides a backchannel where citizens can comment on the situation of the situation as well as on consequences for themselves. Moreover, the portal has at least some of the general information about the refugees respectively virus also provided in English (where English is not the native language).	The City is actively monitoring reposting of Facebook and Twitter postings. A professional social media group is set up, basing its work on citizen's interests.
A	The portal has a link to the national (or regional) portal, which provides people relevant information (relief organizations, recruitment etc.). The portal is supposed to connect (spontaneous as well as already known, possibly even registered) volunteers and local communities that want to help refugees respectively inform about the virus.	The city has a team that keeps track of activities on social media and reports back to the Chief Resilience Officer (or someone in a similar role). Social media can be used in

		the policy making process.
R	The resilience portal is used to facilitate a dialogue between citizens and refugees/people who affected by the virus and rescue teams. It also provides the resources (e.g. forums, private areas) for self-help and support groups to form. This not only strengthens the efforts of citizens who want to help, but also provides the city with a better impression of the general atmosphere. A language typically spoken by the majority of the currently arriving refugees is supposed to be provided (additionally) on the portal. Knowledge shared through the portal will be disseminated on the European level.	Cities' social media accounts employ multi-language communication.
T		The city uses automated tools that monitor social media usage by citizens and refugees to reason from activities and to anticipate problems.

8. SUMMARY, CONCLUSION, AND OUT-LOOK

8.1. SYNOPSIS

In this report, we have presented the main insights from work package 4 (WP4) of the SMR project. While it compiles many new insights – with a particular focus on social media –, it also wraps up the work on WP4 as a whole. It thereby provides a comprehensive guide to WP4 and the foundation for the ongoing work in WP5, in which the Resilience Information Portal as one of the tools developed in the SMR project will play a profound role.

Before moving on to a discussion of merits, obstacles and limitations, and before giving an outlook, key insights are summarized.

WP4 followed a rigorous method, which was designed during the first months of work on the work package and was continuously improved. A strong methodological approach was mandated due to the nature of the work and the fact that requirements for the portal were unknown a-priori. In particular, they could not simply be identified but rather needed to be *discovered*. Therefore, WP4 took an incremental, iterative, and evolutionary approach. We followed a method similar to *agile* approaches in software development. Particularly for the inclusion of social media, we also drew from project-external sources such as other EU projects and the literature. Key to all activities, however, was a focus on CITIES' insights, wishes, and experiences.

Social media has been found to be undoubtedly important for resilience-related activities, particularly considering the engagement of citizens. They are more than what the hype around them suggests. However, proper utilization by cities is not straightforward and it is very hard to actually measure the effectivity of a social media strategy. Nonetheless, building a resilience portal and setting up a social media strategy should be interlinked. There are already success stories; four of them, all coming from our CITY partners, are included in this document.

WP4 has developed a set of six design goals, which expand to the design principles for resilience-related activities on a Resilience Information Portal. These design principles not only target formal

activities of a city but eventually contribute to the empowerment of citizens for increased urban resilience. Social media add to these activities, and can be employed as a tool that can increase the level of trust citizens have in *their* city, as well as to create a form of *collective intelligence*. The design goals can be subdivided into two categories; the first four are “core” goals, while two additional ones describing surrounding conditions. The design principles are Information Sharing, Establishing a Communication Structure with Stakeholders, Citizen Engagement and Raising Awareness and Knowledge Sharing, as well as Information Sovereignty and Usability.

Based on the social media action analysis, we found public-private partnerships to support Citizen Engagement and Raising Awareness. It also reflects the status of Establishing a Communication Structure. CITIES store experiences from daily-basis operations; Knowledge Sharing is essential to promote urban resilience. Information Sharing is foundation for all four core goals. The other two goals support smooth transition of actions between each goal.

While the design principles present an abstract view on requirements for a Resilience Information Portal, the functional specification compiled in WP4 offer a technical, yet very concrete perspective. It can be used as blueprint for CITIES’ (and cities’) own activities regarding the creating of a portal. The specification thereby contributes to the creation of the SMR portal as a toolbox, which is used by CITIES for experimentation and showcasing. At the same time, they can extend own portals (if present; otherwise, their own Web sites) by the functionality proposed here but not yet implemented. To guide CITIES in this process and to also support work in WP5, we distinguish main criteria into MUST and MAY; moreover, for functions we propose intended maturity levels following the SMR Maturity Model.

In addition to the portal’s functional specification, we propose testing scenarios. Such scenarios are typically part of a functional specification, but have been separated as they provide additional value in non-technological activities (i.e. work beyond development and technical testing). We distinguish between two main cases: a short-term incident, i.e. a shock, as a long-term development, i.e. stress. In total, four scenarios are given. They are followed by two tables with mitigation steps, which show how the portal would support reaction to each scenario.

8.2. MERITS, OBSTACLES, AND LIMITATIONS

WP4 has seen intensive work. Thereby, the work package has contributed to the SMR project and provides insights that should prove useful beyond the project’s scope – both in breadth and in time. It

also had to overcome challenges; ultimately, it moreover is confined by some boundaries. Merits, obstacles and limitations are discussed in the following.

Through its work, WP4 has seen an intensive exchange with CITIES. Many stakeholders were interviewed, and in addition to official interviews, meeting, and exercises, we had much informal intercourse. Thereby, WP4 has stimulated many communication and knowledge exchange activities in the CITIES, contributed to make the project (and the participating CITIES) known, and kept stakeholders thinking about the topic of resilience. This is an accomplishment by itself, even though not discussed or even mandated in the SMR proposal.

Of course, WP4 has ultimately met its goals: we have surveyed approaches for supporting resilience-related activities through information and communication technology (ICT), we have identified communication and engagement needs, we have built a Resilience Engagement and Communication Tool, and we have developed guidelines in the form of design principles. As demonstrated in this document, what WP4 provides in parts goes (clearly) beyond these original objectives. An example is the proposal of testing scenarios. Moreover, fixing the key findings not only as design principles but also as a functional specification is an additional merit. With the functional specification undergoing standardization with the help of DIN as a part of WP6 activities, WP4 will even have a very tangible impact after it officially has been concluded.

WP4 has faced some obstacles, both caused by planning and content issues. It has proven to be very challenging that WP4 was initiated with the project start. Firstly, a clear vision had to be developed both by the WP4 team and by the CITY partners. This was time-consuming and also led to delays, particularly considering that WP4 has very limited opportunities to receive inputs from CITIES since no travel budget on its own and relied on electronic communication as well as on “hooking up” on existing meetings. Particularly challenging was also the fact that WP5 started before WP4 had been concluded. Thus, WP5 required input that WP4 strictly speaking could not yet provide. Reflecting upon this challenge, we interlinked the activities of both work packages heavier than originally intended. Thereby, the obstacle could not only be overcome for WP4 but also WP5 profited; the initial work with the other tools, which are to be integrated in the second year of the project, can be expected to be much smoother due to the experiences gained in the WP4/WP5 joint work. It can thus be summed up that planning obstacles were overcome yet the timing in WP4 not necessarily followed exactly what was proposed initially.

It has been very challenging to provide work that is helpful to a high degree for CITIES and that perfectly adheres to the SMR proposal. The SMR proposal demands "to strengthen cross-sectored information and knowledge sharing among emergency managers and the scientific community" with rather simple functionality. Strictly speaking, typical eLearning platforms such as Moodle would have been enough to fulfil the demands technologically, if accompanying processes for utilizing such tools would have been designed. Moreover, the proposal intended to provide the portal as a kind of off-the-shelf software artefact. However, when working with the cities, we realized that in order to provide them with a truly useful portal, we would need to go beyond the proposal. Not only would the functionality need to be tailored to their requirements but also would they not profit from an off-the-shelf tool. In fact, all cities were running own IT systems, typically including a Web site or even a portal, which could not simply be replaced or not even were allowed to be replaced. Thus, they required custom solutions. We have, therefore, decided to provide the portal as a toolbox. We strongly believe that it offers many additional merits over the initial idea of the portal but it also meant that the overall (technological) development took longer (yet not much more effort). In the end, we also consider this content obstacle to be overcome, yet with deviations in planning.

Some limitations need to be mentioned for the work in WP4. Firstly, the work in WP4 employed scientific methods but it is not scientifically significant in all regards. As already mentioned, we have put much emphasize on a sound methodological choice. Nonetheless, with only seven CITY partners the character of our work is mainly design-oriented and qualitative. We do not have a quantitative justification of our work, and we cannot verify our requirements as part of the WP4 work[45]. Obviously, an EU Horizon 2020 project such as SMR typically aims at providing producible results rather than scientific truth. Moreover, validation activities done in WP5, the adoption of our work by tier-three and hopefully eventually tier-four cities, and future scientific work on the covered subjects will allow gaining knowledge about the effectiveness of our approach. While this limitation does not impede the SMR project in any way, it needs to be kept in mind when employing insights gained from WP4's work. We will also stress this in the scientific publications, on which we will work after WP4 is concluded.

Secondly, WP4 is no *roundtrip* work package but hands over activities to WP5. Thus, only partial result can be presented. WP4 is focused on theory, on principles, on concepts, and on development work. Moreover, as we have taken an agile approach, we left stakeholder selection to CITIES. There-

[45] Although it will at least to some degree be possible in the ongoing activities of WP5.

fore, a clear (and uniform) definition of *stakeholders* also remains open for WP4. This limitation is also deliberate, yet needs to be taken into account when assessing WP4's work.

Thirdly, it has been very challenging to bring together the theory-driven work on design principles and the very concrete work on a portal prototype. Working both on the abstract understanding of a problem and on its concrete solution might not be seen as a limitation in the narrow sense, but at least as a general constraint that we needed to concern.

Fourthly, not all materials that were used to inform the work of WP4 can be published. A Resilience Information Portal may include sensitive information. Moreover, some cities have achieved better results in building information systems for communication and knowledge sharing than others. Thus, information gained by the cities often needed to be anonymized, paraphrased, or even only presented in aggregated form. While this does not diminish the validity of our work, it needs to be kept in mind that not all city sources can be fully produced.

In conclusion, WP4 provides contributions that in parts greatly go beyond the definition of action (DoA) for the SMR project, although the actual work has seen some shifts and arguably was delayed to some degree. All milestones could, however, be met, and all deliverables were delivered on time. WP4 has overcome a number of obstacles and is bound to several limitations; none of these decrease the value of the work, though.

8.3. OUTLOOK

What remains for this document – and thereby for WP4 as a whole – is giving an outlook. There are two parts to describe: the ongoing work in WP5 as well as other following activities in the SMR project, and the general prospect.

As addressed on several occasions throughout this deliverable report, WP4 does not merely conclude its work but it hands over to WP5 activities. The design principles, the functional specification, and the portal prototype will be used as assets in the coming 18 months of the SMR project. In particular, CITIES will be working with the portal and might even start their own portal development initiatives. Moreover, work on the other SMR tools will be integrated with the Resilience Information Portal. The WP4 team both from CIEM and TECNUN will take a share in WP5 and thereby further steer the ongoing live – and, as we hope, prosper – of WP4's results.

Beginning in December 2016 after the immediate conclusion of WP4, we will be working on coaching materials for the portal usage. Then, ICLEI in collaboration with TECNUN and CIEM will organize three coaching visits & stakeholder training workshops that will focus on the utilization and functionality of the Resilience Information Portal. These three workshops will be targeting the most relevant stakeholders of each of the tier-one CITIES and will be tailored to their needs. This will also allow do discuss how to fill the abstract roles provided by the portal, and to ultimately define the relevant stakeholders. These activities should also allow to better understand the usefulness of the portal to CITIES.

In addition to the WP5 activities, the standardization of the functional specification will be an activity carried out in WP6. With the above sketched integration of work in WP5, our work strictly speaking also influences WP3. The WP3 tools will undergo similar activities as partly already carried out in WP5 for the portal; thereby both the experiences gained from the joint WP4/WP5 work and the integration capabilities of the portal as a software artefact will have impact. In addition, we will be working on scientific publications of the WP4 results, which will partly fall into the scope of WP7.

To enable a better interlinkage with the SMR project as a whole, we have taken the idea of the Resilience Maturity Model into the exercises for WP4 and eventually also into this deliverable. We consider the Maturity Model as *the* integration artefact in the project. Thereby, we have not only utilized it but also informed its development. Particularly with the discussion of functions and their categorization along maturity stages, the interlinkage between WP4 and the work on the Maturity Model is not finished. While the Maturity Model has milestones and the work of WP4 is concluded as such, neither the Maturity Model nor the functional specification can (and will) ever be static, for they need to reflect a dynamic nature and an ever-growing base of knowledge. Thus, their evolution will be bound to each other.

In conjunction to the interlinkage with the maturity model, it will need to be discussed how the level of maturity can be measured. We have proposed functions in a fashion that allow such linkage; however, it will hardly be possible to slavishly keep a strict linkage in all cases. Depending on a city's situation, the city might choose to leave out functions or implement others before actually striving for the suggested level of resilience this function belongs to. Moreover, due to existing IT that will be integrated with a city's Resilience Information Portal, perfect matching of functions to maturity stages could be blurred further. Therefore, as part on the ongoing efforts of working on the maturity model, the assessment of maturity stages will be a topic that WP4 also influences after its conclusion.

Looking beyond the SMR project, WP4 has already been successful in engaging the scientific community and non-project stakeholders. The *Nordplus* project "The Learning Society"[46] is no directly dependent project, yet can be seen as a first *offspring* of SMR activities. It takes up resilience concepts from SMR and proposed them for societal education; we might even be able to use concepts of the Resilience Information Portal for this purpose, which would be an exciting development.

As a general outlook, we have to admit that we are curious. Work in WP4 at times has been challenging, and it always has been very demanding. Moreover, we spent long hours on the analysis and design work; our colleagues from TECNUN spent long hours revising and developing. Our CITY partners invested much time; we had close collaboration with arduously working ICLEI, have been in frequent exchange with DIN, and were supported by LiU and Strathclyde. We believe that we have created artefacts that will prove useful to the CITIES, to tier-three, and eventually all cities. Therefore, we look with much interest into the future, as we want to learn how what we have created will be adopted, adapted, and shaped. We look forward to seeing *how* the Resilience Engagement and Communication Tool has actually engaged the communities in *building resilience*. We of course are aware that the creations of WP4, or probably of the whole SMR projects, might be bound to the fate of many projects that propose research results: fall into practical oblivion after a while of interest. However, with the standardization efforts, the outreach to cities on multiple tiers, and the immediate impact throughout the project's runtime, we are confident that we *will* have a lasting effect on increasing cities' resilience.

[46] The Learning Society is funded by Nordplus Horizontal 2016 (NPHZ-2016/10013)

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APPENDIX: INTERVIEW MATERIALS

This appendix compiles materials used in formal and informal work with the CITIES. Firstly, we give the questioned used for informal interviews with the cities. Secondly, the results from the first exercise conducted at the workshop in Kristiansand are summarized.

Please note that the appendix does not contain raw datasets such as interview records or transcripts and photos of exercise results. Such material would increase the verbosity of the deliverable report notably. Moreover, particularly interview material would require prior anonymization and also clearance by the cities, which would mean tremendous effort with questionable value.

A. QUESTIONS FOR INFORMAL INTERVIEWS

Questions for WP4 Informal Interviews

The following questions concern the design goal *Citizen Involvement and Raising Awareness,* while the Webinar for WP5 concerns the design goal *Establish a Communication Structure* and *Knowledge Sharing*. Especially these questions target the use of social media, and how cities manage the co-creation of value and growing social capital among citizen. These are identified as design principles in D4.2.

General questions that apply to all design goals are following the main questions. Technological feasibility should not be considered when answering the questions but if proposals obviously are impossible to realize.

What do cities expect from using social media in resilience building activities? (30 min)

The aim of this question is to break down purposes and goals of using social media in resilience building activities. D4.2 identifies two design principles named *co-creation value* and *growing social capital* among citizen. This question concerns how cities achieve these principles.

For reference, the following is the list of benefits/outcomes from using social media in the health-care and emergency domains.

<Health-care>

1. Increased interactions with others
2. A higher amount of available, shared and tailored information
3. Increased accessibility and expanded access to health information
4. Peer, social and emotional support
5. Public health surveillance
6. The potential to influence health policy

<Emergency>

1. Collective participation
    - Community engages in the decision-making or change effectuating processes.
2. Shared identification
    - Community alleviates the feeling of alienation and sustains activism.
3. Collaborative control
    - Community possess strength and ability in problem ownership and role assumption.

How do cities set up a strategy for using social media to achieve above expectations? (30 min)

The aim of this question is to identify structure and process for cities in integrating social media with the existing communication platform.

<Examples (we will list more on the call)>

- Set up goals and roles?
- Identify target groups? Create a contact list?
    - Business, local communities and individuals (from the Webinar report by Bristol)
- Approach the targeted group?
- Integrate with the existing tools?
- …

Appendix: General Questions for the Webinar (if time allows)

- The portal should provide lists of Frequently Asked Questions (FAQ). For which topics (e.g. threats and "*what* to do *when*" descriptions") should such lists be provided? In which form (structure) should they be provided?
- Is it possible to embed an existing *role and rights concept* into the portal?
- Can you envision how searching for information on a portal should look like?
    - Note: Keep in mind that information on the portal with be heterogeneous and originate from many sources.
- Should translation services be included in the portal even if there is the risk that automatic translation will come at the cost of precision?
- How would you design a situation diary that is included in the portal?
- Does your city have experience in the security assessment of its information systems? How would you adjust security procedures for the portal?

- Note: This question might be considered to be too sensitive and will then need to be discussed directly between key personnel of the city council and the WP4 and WP5 facilitators.

- The portal does not mean to replace existing systems but rather to provide access to them. Are there resilience-related systems that are particularly suited for integration? How should this integration look like?
  - Note: Integration can come in many ways. It is recommended to abstract from the actual technological way of doing it but rather to discuss the desired way it would function.
- Would you use the portal to set up a Wiki (i.e. a user-editable collection of Web pages, each on a topic denoted by a keyword)? If yes, what kind of information should be put into it and who should be users?
  - Examples: A Wiki could be used by stakeholders such as firefighters to share knowledge. It could also be used as a kind of citizen self-help database in which citizens share experiences. The latter would arguably require some form of moderation by the city.

B. EXERCISE RESULTS ON SOCIAL MEDIA INTEGRATION INTO THE MATURITY MODEL

Date: 21 September, 2016

Place: Kristiansand

Table 5. Group2: Establish a Communication Structure

Maturity stage	Social media actions
Start	[1] Setting up a central web site
	[6] Setting up a service centre to respond inquiries from citizens
	[10] Identifying target groups (first responders)
	[11] Identifying target groups (local communities)
	[12] Identifying target groups (individuals)
	[27] Using social media in a policy making process (to get citizens opinions etc.)
	[28] Creating a list of volunteer organizations
	[34] Collaborating with a local community through social media to approach particular issues
Moderate	[7] Letting the service centre use social media to respond inquiries

	[8] Allowing citizens to contact the service centre using social media
	[13] Following a stakeholder's (first responders) account
	[14] Following a stakeholder's (local communities) account
	[15] Monitoring social media posts from citizens
	[22] Automating information among different tools (press release, web site, social media etc.)
	[32] Creating a plan for multi-channel communication
	[35] Starting exercises for social media usage in emergency
	(Added) Create social media strategy
Advance	[2] Creating narrative related to city resilience
	[3] Delivering the story through the web site
	[4] Delivering the story through social media
	[9] Starting interactive communication through social media
	[16] Getting media followed the cities' account
	[17] Posting a newsletter through social media
	[24] Filtering right / correct information from citizen's post
	[33] Making a strategy how to be a part of existing FB network
Robust	[18] Posting Multilanguage messages through social media
	[20] Posting videos through social media
	[25] Analysing the dynamics of postings to derive threat information
	[29] Having an evaluation scheme for social media effectiveness
	[31] Categorizing followers in purpose of effectiveness analysis
T/Vertebrate	[23] Analysing pictures posted from citizens through social media
	[30] Using the evaluation scheme regularly or even automated

Table 6. Group3: Knowledge Sharing

Maturity stage	Social media actions
Start	[1] Setting up a central web site
	[2] Creating narrative related to city resilience
	[3] Delivering the story through the web site
	[10] Identifying target groups (first responders)
	[11] Identifying target groups (local communities)
	[12] Identifying target groups (individuals)
	[27] Using social media in a policy making process (to get citizens opinions etc.)

	[28] Creating a list of volunteer organizations
	[29] Having an evaluation scheme for social media effectiveness
	[32] Creating a plan for multi-channel communication
Moderate	[4] Delivering the story through social media
	[5] Delivering an abstract / teaser through social media
	[6] Setting up a service centre to respond inquiries from citizens
	[7] Letting the service centre use social media to respond inquiries
	[8] Allowing citizens to contact the service centre using social media
	[9] Starting interactive communication through social media
	[13] Following a stakeholder's (first responders) account
	[14] Following a stakeholder's (local communities) account
	[16] Getting media followed the cities' account
	[17] Posting a newsletter through social media
	[20] Posting videos through social media
	[31] Categorizing followers in purpose of effectiveness analysis
	[33] Making a strategy how to be a part of existing FB network
	[34] Collaborating with a local community through social media to approach particular issues
Advance	[15] Monitoring social media posts from citizens
	[18] Posting Multilanguage messages through social media
	[22] Automating information among different tools (press release, web site, social media etc.)
	[26] Automating social media analytics
	[30] Using the evaluation scheme regularly or even automated
	(Added) Highlight (support) social initiatives that build resilience
Robust	[19] Posting (providing) official documents through social media
	[23] Analysing pictures posted from citizens through social media
	[25] Analysing the dynamics of postings to derive threat information
	[35] Starting exercises for social media usage in emergency
	(Added) Engage digitally excluded people in social media
T/Vertebrate	[21] Posting XXX through social media
	(Added) Using social media to build bid ready for consortiums with other cities
	(Added) Transfer the experience of the tool (social media) and best practices to other cities
	(Added) Lessons learned from abroad
	(Added) Institutions responding + addressing with confidence