SMART MATURE RESILIENCE

DELIVERABLE 2.5: REQUIREMENTS OF CITIES REGARDING RESILIENCE

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EXECUTIVE SUMMARY

One of the main aims of the SMR project is to develop a Resilience Management Guideline able to help in the operationalisation of the resilience building process of any European city. To be able to successfully develop the Resilience Management Guideline it is necessary to gather as much relevant information as possible. The first step of the project included the revision of available literature regarding this topic as well as reviewing other projects on resilience in order to obtain current best practices on resilience. However, apart from the theoretic approach the SMR consortium has paid special attention to the practical requirements CITIES have regarding resilience. The participation of seven different cities in the project gives us the possibility to use their expertise to understand the benefits they expect to obtain from the SMR project. In this vein, four workshops have been conducted (Riga, Bristol, Rome and Vejle) within the scope of this project whose main aim was to gather practical requirements from CITIES regarding resilience and its operationalization process.

The aim of this report is to analyse and synthetize all the information gathered during these workshops to make explicit the practical requirements CITIES have regarding resilience as well as validating them with city representatives from the seven cities participating in the project.

The fulfilment of these requirements will set the basis to develop the European Resilience Management Guideline and its five supporting tools. Meeting the requirements identified will be compulsory to develop a usable Resilience Management Guideline compatible with the current managerial procedures within the city and the CITIES' expectations regarding resilience.

The requirements identified during the four workshops have been divided into two groups. The first group includes all the general requirements related to the management level approach and the versatility to adapt the Resilience Management Guideline to any city context or existing standards. The second group describes the particular requirements each of the five tools composing the Resilience Management Guideline need to fulfil so that they can be adapted and used in different cities to deal with different types of shocks and stresses.

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1. INTRODUCTION

Worldwide there have been twice as many disasters and catastrophes in the first decade of this century than in the last decade of the 20th Century. The 21st Century has been named "the century of disasters" [1], and some examples of the most devastating ones are the Haiti Earthquake in 2010, the Indian Ocean Tsunami in 2004 or the hurricane Katrina in 2005. Europe is no exception since it is affected directly and indirectly, and the trend continues, being escalated by climate change and social dynamics. During the aftermath of these disasters, the need for improving our ability to manage and assess the cities' resilience emerges. However, how to best deal with already known risks and prepare for the unexpected ones is an enormously complex activity and still nascent.

Resilience management expands the scope of risk management, in addressing complexities that characterise the operation of large integrated systems, considering known as well as unforeseen threats [2]. In this respect, the creation of more resilient cities or communities involves to withstand and recover from shocks and stresses, being able to adjust plans and procedures prior to, during and following new or unexpected disturbances, so that they can maintain their function as needed throughout the disruption [3].

Current literature and international initiatives such as the Rockefeller Foundation and the United Nations Office for Disaster Risk Reduction (UNISDR) provide a broad set of frameworks, which include characteristics and priorities for building resilient cities [4] [5] [6] [7] [8]. However, there is still the need to provide guidance for the operationalization of resilience providing a practical application of resilience concepts in decision making and planning. Operationalization entails making resilience concepts useful and useable beyond their theoretical context to policy makers and managers. In order to find a way to address this need, the SMR project is developing and validating the Resilience Management Guideline. This Resilience Management Guideline consists of five different tools that will enhance the anticipation and the coordination across different stakeholders and will enable addressing risks and opportunities in order to facilitate planning and decision-making process.

This document makes explicit the current requirements of CITIES regarding resilience. These requirements are being considered in the development of the tools and the Resilience Management Guideline. The identification of the proper requirements for the development of these tools and the Resilience Management Guideline will guarantee that these project outcomes fit the end users' needs and expectations. For this reason, the SMR project has involved within the SMR consortium city representatives and four workshops have been arranged where they

were implicitly asked about their current experiences, problems, and needs. Collaborative methodologies such as Group Model Building and Group Explorer have been used during these workshops to gather information from different perspectives and integrate experts' fragmented knowledge. See deliverables 2.1, 2.2, 2.3 and 2.4 for further details about the exercises that were developed in each workshop.

In the following sections, we will firstly, give a brief overview of the key concepts of the SMR project (Section 2) and secondly, explicitly demonstrate the general requirements gathered from CITIES regarding the Resilience Management Guideline and the particular requirements for its five supporting tools (Section 3).

2. THE SMR APPROACH

In order to understand in detail which are the requirements of CITIES regarding resilience and which are the main outcomes of the project, it is important to bear in mind its overall goal. In this section, the key concepts of the SMR project will be explained in more detail to clarify the SMR approach and its expected outcomes.

2.1 CITY RESILIENCE DEFINITION

Since the project began, partners have been working on developing a specific definition on City Resilience, which would include all the relevant identified particularities of the project and the involved cities. Within the SMR project scope, City Resilience has been defined as follows, although this is a working definition that could evolve in order to consider the insights generated through the project.

The SMR City Resilience Definition

"is the ability of a CITY or region to resist, absorb, adapt to and recover from acute shocks and chronic stressed to keep critical services functioning, and to monitor and learn from on-going processes through city and cross-regional collaboration, to increase adaptive abilities and strengthen preparedness by anticipating and appropriately responding to future challenges"

In the context of this definition, the development of the Resilience Management Guideline and its five tools should enhance the anticipation, response, and recovery from shocks and chronic stresses, improve the collaboration across different stakeholders in order to increase adaptive capabilities with the aim of improving the respond capacity of future challenges.

2.2 THE CONCEPT OF CITY

Building city resilience is a complex process that requires the commitment and engagement of numerous stakeholders [9] [10] [11] [12]. City stakeholders are the individuals, groups or organizations from various disciplines and with different needs, responsibilities and resources that are involved in the resilience building process. These stakeholders range from local government, emergency services, and simple citizens to the representatives of public and private

organizations and critical infrastructures [4] [13] [14]. Local governments are recognized as the key drivers in carrying out effective policies and tools for ensuring the development of resilient cities and preparing them to face disaster risks [10] [15].

Cities are commonly considered as large and permanent human settlements. The SMR project though, considers a CITY (in capital letters) as an environment that involves all the relevant stakeholders in the resilience building process (Figure 1).


Figure 1: CITY concept - a city that involves all the relevant stakeholders in the resilience building process

Therefore, the CITIES that are involved in this project not only demand tools that provide help in operationalizing the resilience building process but also tools that assist them in improving the coordination and the cooperation between the various stakeholders' groups (Annex I).

Apart from the importance of involving all the relevant stakeholders, it is also relevant to mention the complex landscape, which affects the city resilience building process, such as politics, geography, legacy infrastructure and regulatory framework among others.

2.3 EUROPEAN RESILIENCE BACKBONE

The high level of interconnectedness and interdependencies among cities and their systems may lead to cascading effects and crisis escalation from local level to regional, national or even international level. This is the main reason that cities should not be considered as isolated entities in the resilience building process. Furthermore, it is evident that no city, any municipal or regional authority has complete jurisdiction, control or ownership over resilience; this is mainly due to the city's multifaceted nature and the complexity of its systems. In this context, the SMR project presents a holistic approach where cities are not considered as isolated entities, but rather as interconnected and interdependent units of a variety of structures, systems and communities. Within the SMR approach, cities are considered as vertebrae in a strong and solid European resilience backbone (see Figure 2).
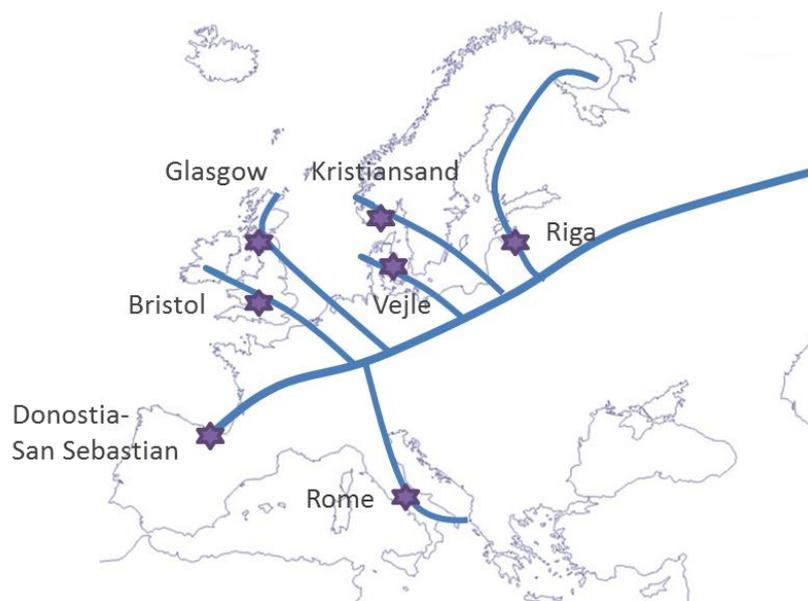

Figure 2: SMR European backbone concept

The aim of this 'Backbone' is to maximize the impact of the Resilience Management Guideline by involving as many cities in Europe as possible. In order to create a strong European Resilience Backbone a four-tier process has been considered aiming to reach and engage more cities within the SMR circle of Sharing and Learning (Figure 3). Donostia, Glasgow, and Kristiansand (Tier-1) will be the cities in which the pilot implementation of the Resilience Management Guideline will be conducted, therefore, these three cities will be the ones testing and validating the Guideline and the five tools that will be developed throughout the SMR project lifespan, through five different pilot implementation processes. Riga, Bristol, Rome and Vejle (Tier-2) will be engaged in the pilot implementation of the tools as peer reviewers. Cities that are already members of resilience networks (Tier-3) will also have access to all the knowledge generated in the SMR project. Finally, other European cities (Tier-4) will also be further involved in the process of creating the "European Resilience Backbone", participating in the final conference of the project or by being recipients of the project's updates and results through communication and dissemination activities.

Taking into account that potential crises happening in a European city can affect others through cascading effects, being part of the 'European resilience backbone' subsequently means that cities are confronted with the potential of affecting the overall resilience building process in Europe. All cities involved in this project will become leaders within sectors directly or indirectly related to resilience. Furthermore, these cities will be in charge of sharing their experiences and affecting other ones that try to enhance their resilience level.
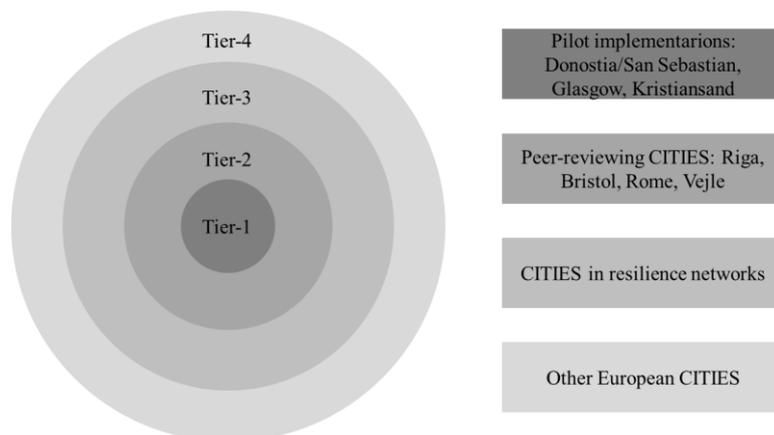

Figure 3: Circle of sharing and learningThe four tiers of cities will interact with the tools with different degrees of engagement during the second year of the project. More information on the different tier involvement can be found here:

TIER 1: PILOT CITIES

Glasgow, Kristiansand and Donostia/San Sebastian are active project partners and serve as a testing ground for the pilot tools. These cities are actively involved in co-creating the SMR tools and participating in 5 different pilot implementation processes throughout the project; each pilot implementation focusing on one of the SMR tools. In more detail: *1st Pilot Implementation of the Community Engagement and Communication Tool (M11-M16); 2nd and 3rd (joint) pilot implementation of the Resilience Maturity Model and the Risk Systemicity Questionnaire (M17-M22); 4th and 5th (joint) pilot implementation of the Resilience Building Policies and the System Dynamics Model (M23-M28)*

TIER 2: PEER-REVIEWER CITIES

Bristol, Rome, Riga and Vejle are also active project partners, included in the second circle of cities and are each paired with one of the pilot cities according to common levels of resilience maturity. The Tier 2 cities will learn together with their partner Tier 1 cities and will act as peer-reviewers or critical friends evaluating each pilot implementation process and providing with advice. In respect to this, it could be considered that the tier-2 CITIES are assigned with an observer role in each pilot implementation process, monitoring the progress of the assigned Tier-1 cities and providing feedback and insights, which will ensure that the final tools are widely replicable and applicable to other cities in Europe.

TIER 3: ENGAGED CITIES

The third Tier of cities refers to European cities that are already active with regard to resilience through their participation in networks like the 100 Resilient Cities, pioneered by the Rockefeller Foundation or ICLEI members working on resilience. These cities will be invited to join the project activities by participating in the Stakeholder Dialogue and Stakeholder Workshop, while they will be able to receive training on using the SMR tools throughout the pilot implementation and validation of the Resilience Management Guideline as a whole. These cities can provide with representatives or workshop participants that are active in international resilient cities projects, conferences and networks or are collaborating with project partners on resilience-related activities.

TIER 4: INFORMED CITIES

The fourth Tier of cities is consisted of cities potentially interested in the project results and outcomes. These can be cities that are already participating in resilience networks or not. Tier 4 cities will be informed through communication activities and by invitation to events organized by SMR, like the final conference of the project.

2.4 SMR RESILIENCE MANAGEMENT GUIDELINE

The SMR project aims to develop and validate a European Resilience Management Guideline. This Guideline integrates five tools that enhance significantly the ability of the European region that is exposed to natural and other hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including the preservation and restoration of its essential basic structures and functions. Below, a brief description of the tools that will be developed within the scope of this project is presented:

1. **The Resilience Maturity Model** provides an optimal sequence of five maturity stages that can guide CITIES in the resilience building process over time. A CITY will start from one stage, and from there move on to a more advanced stage implementing the policies and actions that are defined in each maturity stage. At the earliest and least advanced stage, performance may be rather incipient but, as the stages progress, policies are performed more systematically, and they are better defined and managed.

2. **The Risk Systemicity Questionnaire** is a dynamic questionnaire that analyses the risk triggers and the ramifications of those risks. The Risk Systemicity Questionnaire, in addition, to assessing the risk and the risk awareness of each CITY's, determines its resilience level, locating the CITY at a specific stage in the Resilience Maturity Model.

3. **The Portfolio of Resilience Building Policies** describes the goals that the cities need to achieve in order to increase their maturity level; the implementation of these goals makes the CITY move towards higher stages in the Maturity Model.

4. **The System Dynamics Model** is a computer simulation model that embodies the Resilience Maturity Model, allowing to understand the dynamic behaviour of complex systems and explore the CITY's resilience trajectory determined by resilience building policies.

5. **The Resilience Engagement and Communication Tool** is a platform to integrate as many agents of the resilience community as it is possible, including public-private cooperation. This tool ensures an active user participation.

The five tools are not independent but complementary. Figure 4 shows the relationship between these tools. The Maturity Model is the central element of the guideline. It will provide with an optimal path towards resilience, identifying a set of aggregated policies that help CITIES to move to more advanced maturity stages. Each CITY needs to know in what maturity stage it is currently in order to start with the resilience improvement path. Thus, the Systemic Risk Questionnaire helps cities to assess themselves and classify them in their corresponding maturity stage depending on their awareness level regarding resilience. Thus, the Systemic Risk Questionnaire answers the question 'Where are we?'.

Once each CITY knows its current maturity stage, it needs to implement policies that allow it to move from one maturity stage to the following one. The Portfolio of Resilience Policies defines specific policies that CITIES need to implement to enhance their resilience level, providing answers to the question: 'How can we move from one stage to another?'. The Portfolio of Policies will contain specific policies for each CITY assessing the main problems they have to deal with. In such complex systems as in the case of CITIES, the implementation of some policies can have unintended consequences in the long term difficult to anticipate. The System Dynamics model will enable the policy makers checking and analysing the consequences of the policies they are designing and implementing. This simulation model will be, therefore, a testing and a training tool that allows to identify some side effects or unintended consequences of seemingly rational policies, that otherwise will be difficult to detect. This System Dynamics model will also enable carrying out different scenarios analysis, testing the behaviour of policies under different context situations.

Finally, the Resilience Engagement and Communication Tool will allow the involvement of the relevant stakeholders depending on the maturity stage of each CITY. Moreover, it will open channels of communication and share with other European cities to expand the impact of the outcomes of the SMR project.

Additional connections also exist between the five tools. For instance, the interdependencies and cascading effects among relevant variables in addition to specific policies identified and used to develop the Risk Systemicity Questionnaire will also be included in the development of the System Dynamics model. At the same time, these policies will be also added to the Portfolio of Resilience Building Policies. Moreover, some of the policies included in the Portfolio will

specifically refer to the gradual involvement of city stakeholders in the resilience building process. Therefore, these policies will closely feed the Resilience Engagement and Communication tool.
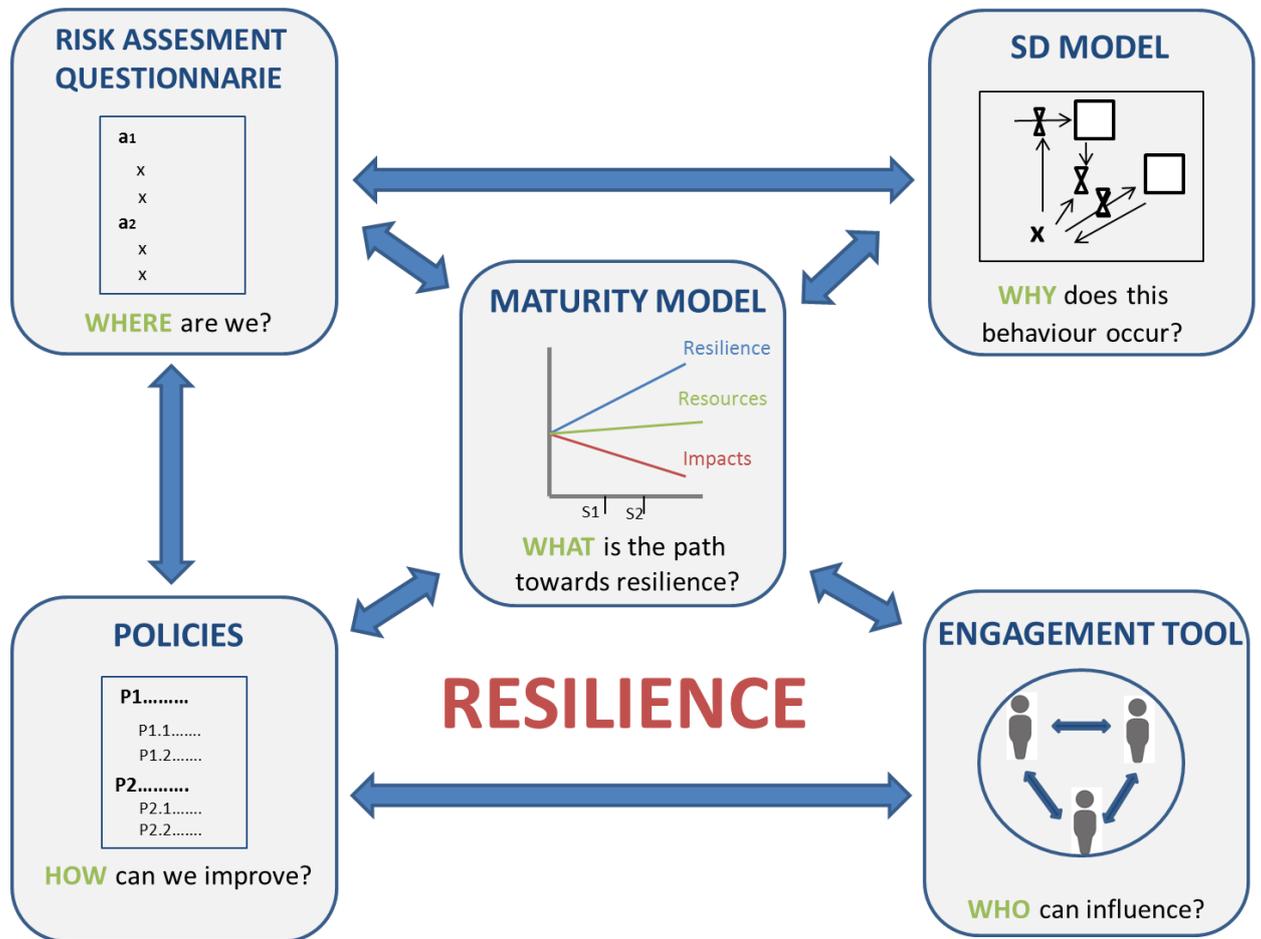

Figure 4: Relationship between the five tools included in the Resilience Management Guideline

3. REQUIREMENTS OF THE RESILIENCE MANAGEMENT GUIDELINE

To successfully develop the Resilience Management Guideline it is necessary to gather relevant information from the CITIES, as they are the end-users. The first step of the project included the revision of available literature regarding this topic as well as a revision of other projects dealing with resilience. This revision provided with a theoretic approach of the state of the art so far, which are the gaps and what the SMR project contribution would be. Moreover, the participation of seven different cities in the project gives us the possibility to use their expertise to understand which are the benefits they expect to obtain from the SMR project. Therefore, gathering information about the requirements that cities have regarding resilience and making them explicit set the basis to develop the Resilience Management Guideline and its five supporting tools. In the following sections, the general and specific requirements of cities regarding resilience are presented.

3.1 BACKGROUND OF THE FOUR WORKSHOPS

The four workshops conducted in the first year of the project provide relevant insights to better understand what cities require and expect from the Smart Mature Resilience project and the European Management Guideline. The first workshop was held in Riga and was the starting point of the discussion between cities regarding resilience. At that point, some city partners were used to work with this concept while others were not familiar with it. Therefore, one of the general outcomes obtained from this workshop was the need to align existing views and perspectives about the concept of resilience to develop a common understanding between all the partners. This enabled to establish a fluent discussion on topics related to resilience between partners in which every city could share their views and experiences. At this point, cities started to be interested in what other partner cities were doing regarding resilience to learn from them and to take advantage from it (policies they were implementing, activities they were conducting, tools they were using…). In the first workshop the most relevant events/milestones occurred in the cities related to resilience were identified in order to define what kind of problems they faced and what kind of solutions they have implemented so far. Most of the solutions proposed by the participants were oriented towards implementing physical systems in order to improve the safety level of the CIs and towards developing plans, procedures and laws to improve the response

capability. They also highlighted the importance of having a good learning system through the implementation of lessons learned into the day to day activities of the companies and making the society aware and informed about the crisis situations to make the most of them when shocks occur.

As the project made progress, cities also started to be concerned on the need to monitor and assess their resilience building process. They started to be aware that there was a need to evaluate what they were doing to assess whether their efforts and investments were having sufficient benefits or not. In the second workshop held in Bristol, the need to develop indicators that served to measure the efforts and outcomes of the resilience building process were identified. As a result of the Bristol workshop a set of policies and indicators to measure resilience were identified (see further info in Deliverable 2.2). Furthermore, a number of barriers that hamper the implementation and improvement of resilience were identified.

In the third workshop in Rome, the need to establish an optimal path emerged. In this workshop a set of policies regarding resilience were identified. As the resources are limited, these policies were arranged in chronological stages considering their priority and their effectiveness to implement future policies. Based on this idea of having an optimal path for building resilience, the Maturity Model proposes five progressive stages to help cites in the resilience building process, including policies and indicators to move forward in those stages. During this workshop, the definition of these stages were validated establishing the main goals to achieve in each of them. A set of indicators has been also identified for the need of measurement in some way the fulfilment of these goals. Cities started to be concerned on the importance of using their time and resources in the most effective manner. They required a guideline that would help them prioritizing what activities, policies, procedures, and methods they should implement.

At this point, they also started to be interested in the possibility of being able to visualize future scenarios and how they would change depending on their current decisions. They also started to be aware of the relevance of cooperating with other cities, sharing best practices and lessons learnt.

Moreover, as the first tools started to take shape, cities that were more familiar with the concept of resilience showed their concern on the importance of aligning the outcomes of this project with the existing tools, methods and procedures that they are using at this moment in their own cities.

Finally, the most difficult challenge identified during the workshops, is the complexity of the resilience concept itself. Apart from developing the European Resilience Management guideline,

this three-year project will enable to establish discussions related to resilience between different stakeholder groups (academic entities, cities, critical infrastructure operators, NGOs, volunteers…). These discussions will generate a common perspective and understanding on what resilience is and consequently, will set the basis for future collaboration. Therefore, this common understanding will establish the first step to create the European Resilience Backbone.

Furthermore, the tools that will be developed within the scope of the SMR project will help local governments to increase the awareness of stakeholders such as citizens, public and private companies, Critical Infrastructure providers, emergency services.... These tools will also allow local governments to analyze the level of the city resilience (systemic risk questionnaire) and identify areas in need of improvement (portfolio of policies and maturity model) as well as new bi-directional communication channels with citizens (engagement tool).

3.2 GENERAL REQUIREMENTS

This section describes the general requirements the SMR Resilience Guideline needs to fulfil so that it can be adapted and used in different cities to deal with different types of shocks and stresses. These requirements relate to the management level approach and the versatility to adapt to any city context or existing standards.

DIFFERENT PLANNING APPROACHES

The resilience building process of a CITY directly depends on the engagement level of relevant stakeholders. However, it is important to note that each group of stakeholders has its own needs and requirements regarding resilience. Consequently, the outcome they expect from the project is not the same. Some stakeholders will require tools that will help them in strategic planning activities while others will require tools that provide extra support in tactical and operative level activities. For this reason, the set of tools included in the SMR Resilience Management Guideline has been designed having in mind these different approaches and being able to provide support from the three management-planning levels. Table 1 describes what level of management activity supports each tool as well as the expected end-users for each of them.

Name of the Tool	Strategic Level	Tactic Level	Operative Level	Expected End Users
Maturity Model	■			Multi-level Governance authorities

Risk Systemicity Questionnaire		Multi-level Governance Authorities, Emergency Services and Critical Infrastructure providers
Portfolio of Resilience Building Policies		All city stakeholders included in the CITY concept
System Dynamics model		Multi-level Governance Authorities, Emergency Services and Critical Infrastructure providers
Engagement and communication tool		All city stakeholders included in the CITY concept

Table 1: **Tools and management-planning levels they support**

VERSATILITY TO ADAPT TO PARTICULAR NEEDS OF CITIES

Another explicit requirement mentioned by city representatives is the need to design a set of generic tools that are flexible enough to be able to adjust to the particular needs and environment of each CITY. Therefore, city representatives are asked about the specific problems they have to deal with in order to adapt the SMR Resilience Management Guideline to each CITY. Offering tangible outcomes to the CITIES is important to engage the relevant stakeholders in the resilience building process.

COMPATIBILITY WITH EXISTING STANDARDS

One of the main objectives of the SMR project is to promote project results and transfer generated knowledge into standardization activities. In this context, it is important to consider other management procedures and standards that are being already used by CITIES. Therefore, one important requirement within the scope of this project is the need to develop tools that are compatible with existing management procedures or standards. The deliverable D6.1 is providing more information on existing standards and standardization activities.

In this respect, the PDCA cycle is one of the most used methodologies to implement continuous improvement processes in organizations. Standards such as ISO 9001 for Quality Management Systems uses this PDCA cycle as a fundamental principle for the continuous quality improvement.

In the SMR context, the well-known PDCA cycle[1] and the Integrated Management System developed in the CHAMP Project[2] are going to be adapted and extended to implement the continuous improvement management process that allows adapting to new situations.

The PDCA cycle begins with the Plan step that involves identifying a goal or purpose and putting a plan into action. This step is followed by the Do step, in which the activities designed in the plan are implemented. Subsequently, during the Check step, the outcomes are monitored to test the validity of the plan for signs of progress and success, or to identify problems and areas for improvement. Finally, the Act step closes the cycle, integrating the learning generated by the entire process, which can be used to adjust the goal. These four steps are repeated permanently as part of a never-ending cycle of continuous improvement.
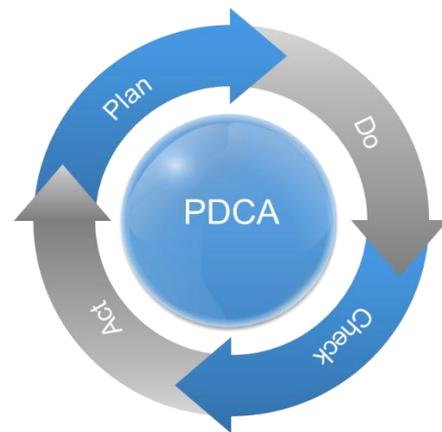
Figure 5: PDCA cycle

3.3 PARTICULAR REQUIREMENTS FOR EACH TOOL

This section describes the particular requirements each tool needs to meet so that they can be adapted and used in different cities to deal with different types of shocks and stresses.

MATURITY MODEL

The SMR project is developing a Maturity Model with incremental stages that serves to guide CITIES through the optimal path for building resilience. A CITY will start from one stage, and from this one move on to more advanced stages, passing through a number of intermediate stages. In fact, the CITIES will define specific resilience building policies for each of the maturity stages taking into consideration the descriptions and requirements of the maturity stages. Note that the implementation of these policies will allow the CITY to move forward from one stage onto the next, i.e. while the policies defined in one maturity stage are not completely developed CITIES cannot move to the next maturity stage. On the other hand, it should be highlighted that when

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[1] http://www.hse.gov.uk/managing/plan-do-check-act.htm
[2] http://www.localmanagement.eu/index.php/cdp:home

one CITY progresses to the next stage, it does not mean that it has to forget about previous stages, but that it should at least maintain what it has already achieved.

Our maturity model uses the following five stages (see Figure 6): Starting, Moderate, Advanced, Robust, and verTebrate (SMART). So, for a CITY that starts the resilience building process in the first stage (Starting) it will be necessary to implement the policies specified in the maturity model for that stage to move on to the second stage (Moderate). The same process will continue until achieving the requirements specified in the fifth stage (VerTebrate).
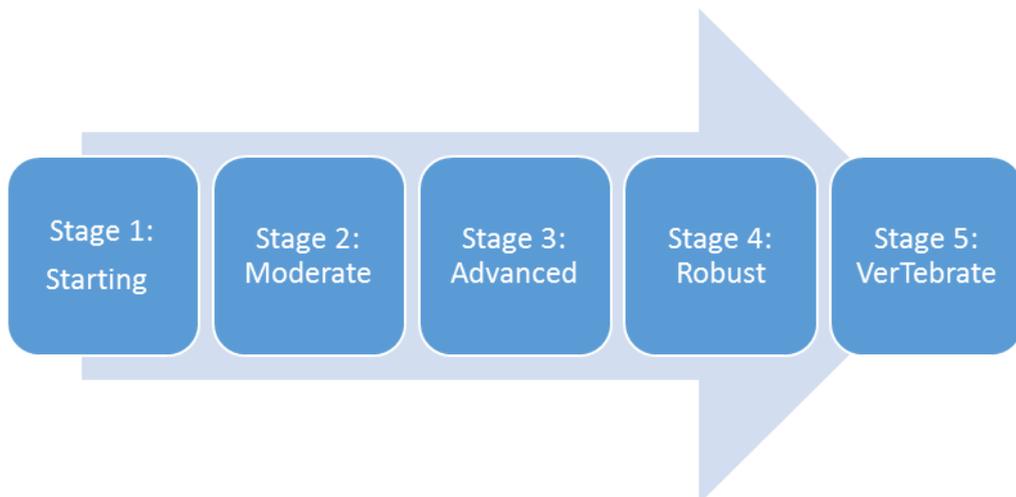
Figure 6: Stages of the maturity model

For each of these stages, the current version of the Maturity Model presents:

- Description: the model presents a description of what the objective of each of the stages is, so the CITIES have clear idea about where to focus on.

- Involved stakeholders: the progression of the involvement of the agents in the resilience building process.

- Policies: the actions that CITIES should implement to complete each of the stages to improve their resilience level.

As the Maturity Model is defined at a strategic level, each stage represents a generic characterization of the resilience building process and could be applied to any CITY, and the policies are described using a high-level approach. Policies for each CITY will be particularized in the Portfolio of Resilience Building Policies tool, whose aim is to provide support at a tactic or operative level.

These policies have been classified considering the following five resilience dimensions (see Figure 7):

1. **Robustness of Infrastructure & Resources:** The CITY infrastructure requires robustness to resist and absorb hazards through the preservation and restoration of its essential functions. This requires redundancy, risk assessment and continuous work on decreasing vulnerabilities apart from the deployment of resources. The resources include all assets, people, skills, information, technology (including plant and equipment), premises, and supplies and information (whether electronic or not) that an organization needs to have available to use, when needed, to operate and meet its objectives.

2. **Preparedness:** It refers to anticipation of future needs and adapting the city functions accordingly. Preparation can be developed at all levels of society, from individuals and communities to leaders and governments. It also includes being prepared for the unexpected, by increasing flexibility and the CITY's adaptive capacity.

3. **Leadership & Governance:** Leadership and Governance affect the decision-making process of the CITY. Commitment by the leaders is essential for promoting effective strategies, inclusive decision-making and the engagement of city relevant stakeholders. This dimension involves also the concept of multi-level governance that requires understanding the dynamic inter-relationship within and between different levels of governance and government. The transfer of competencies upwards to supra-national organizations and downwards to sub-national authorities has arguably transformed both the structure and capacity of national governments.

4. **Cooperation:** Cooperation means working or acting together for a common purpose or benefit. Cooperation is developed within the city and at a cross-regional level. The necessary stakeholders across city and regional sectors including European cities will be considered. Cooperation is also developed at community level involving different stakeholders such as volunteer groups and citizens that show the ability to self-organise.

5. **Learning:** It refers to acquiring knowledge, behaviour, skills, values, preferences or understanding. Learning is achieved through monitoring of past events and on-going processes to make predictions about future needs. The CITY has a set of best practices, which can help to guide new knowledge and learning activities.
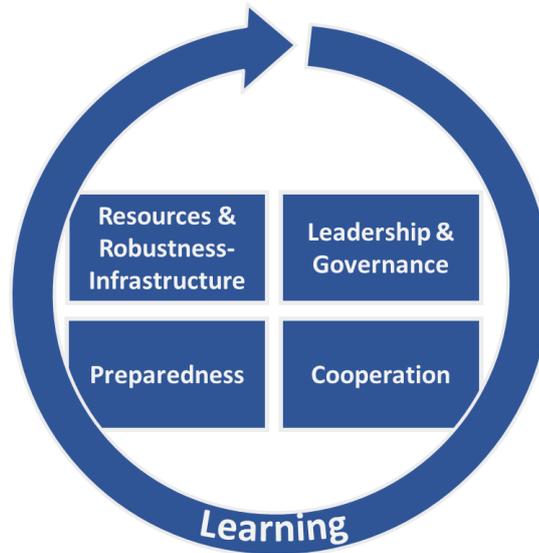
Figure 7: Dimensions to classify the Maturity Model policies

Requirements gathered for each stage of the Maturity Model

During the first three workshops arranged in WP2 the Group Model Building methodology was used to facilitate the task of gathering practical information about what CITIES require regarding resilience. It is important to note that European cities have been performing specific actions towards resilience in different ways. Some of them have been working for several years on the concept of resilience while others have just started. Therefore, the requirements each of the CITIES have are not the same. In fact, a CITY that has been developing resilience building activities for several years will require different activities than a CITY that has just started the path of developing this concept. Thus, the Maturity Model will guide these CITIES through their optimal path in the resilience building process depending on their current maturity stage.

Making explicit the requirements is a way to help to clarify the order in which needs arise during the whole resilience building process of a CITY. This reflection will help to raise the optimal path any CITY should follow in order to reach the final stage of the maturity model. Using the instructions provided by the Maturity Model and following the suggested implementation order, CITIES will find the most effective way to advance in the resilience building process. Below, requirements gathered for each of the maturity stages are presented.

RESILIENCE DIMENSION	STARTING	MODERATE	ADVANCED	ROBUST	VERTEBRATE
ROBUSTNESS OF INFRASTRUCTURE & RESOURCES	Make a strategic reflection to implement redundancy measures and periodical maintenance procedures to guarantee the correct level of performance of Critical Infrastructures Consider the allocation of funding needed for the city resilience action plan in the municipality budget	Define policies to guarantee that the Critical Infrastructures are able to deliver essential services in case of disaster.	Make a strategic reflection of how to increase the flexibility of city infrastructures to deal with unexpected events and to adapt to on-going circumstances.	Make a strategic reflection of possible penalties and incentives applicable to public and private entities depending on their contribution level to the resilience building process.	Establish a legal framework including incentives and penalties for public and private entities depending on the fulfilment level resilience activities

RESILIENCE DIMENSION	STARTING	MODERATE	ADVANCED	ROBUST	VERTEBRATE
PREPAREDNESS	Identify the potential risks affecting the CITY Define a resilience action plan to deal with the risks found	Identify the role and responsibilities of the stakeholders on the resilience action plan Reflect on the need to involve not only emergency services but also other stakeholders in training, emergency drills and exercises.	Monitor the effectiveness of the resilience action plan using indicators	Involve all relevant stakeholders in regular training, emergency drills and exercises	Encourage a full integration and high-level participation of all the stakeholders in the preparedness activities Encourage the ability of communities to self-organise in case a crisis occurs

RESILIENCE DIMENSION	STARTING	MODERATE	ADVANCED	ROBUST	VERTEBRATE
LEADERSHIP AND GOVERNANCE	Increase the awareness level of all the different municipality departments regarding the resilience action plan	Incentivize the commitment level of all the different municipality departments in the resilience action plan Incentivize the awareness level of all the other CITY stakeholders in the resilience action plan Establish the organisational structure to manage the resilience action plan	Incentivize the commitment level of all the other CITY stakeholders in the resilience action plan Adapt the local resilience action plan to the regional and national resilience approach (multi-governance approach)	Consider the citizens' initiatives regarding resilience to include them in the city resilience action plan	Standardize the resilience action plan (policies and indicators) Adapt the local resilience action plan to the European resilience approach (multi-governance approach)

RESILIENCE DIMENSION	STARTING	MODERATE	ADVANCED	ROBUST	VERTEBRATE
COOPERATION	Establish the basis for the community involvement	Get informed about existing networks of cities that are working on topics related to sustainability and resilience Create contact with cities with similar risks. Involve the CITY in existing networks of cities that are working on topics related to sustainability and resilience	Reflect on possible communication channels to facilitate the communication and collaboration of the relevant stakeholders Promote active participation of the CITY in existing networks of cities that are working on topics related to sustainability and resilience	Organise public sessions between stakeholders to facilitate a shared understanding and discussion on the resilience building process Develop a public platform to share lessons learnt, best practices and information about resilience activities carried out in the CITY.	Play the role of leaders in existing networks of cities that are working on topics related to sustainability and resilience

RESILIENCE DIMENSION	STARTING	MODERATE	ADVANCED	ROBUST	VERTEBRATE
LEARNING	Reflect on the relevancy of the post-crisis learning process.	Incentivize the arrangement of internal meetings including all the municipality departments to analyse past crises and obtain best practices and lessons learnt.	Implement procedures to formalise the arrangement of internal meetings prior to, during and after emergencies including all the relevant stakeholders to analyse past crises and obtain best practices and lessons learnt.	Implement procedures to improve the resilience action plan based on the lessons learnt and best practices	Operationalise the whole learning process

RISK SYSTEMICITY QUESTIONNAIRE

The idea of the Risk Systemicity Questionnaire (RSQ) is grounded in the perspective that risks are not independent from one another, but instead they are inevitably interconnected, thus possibly mutually reinforcing the risks' impact on cities. In line with this systemic perspective on risks, during the first three WP2 workshops a Group Explorer group decision support system was used to facilitate group conversation among cities about the relationships between risks, which they are likely to face. The workshops explored the ramifications of the risk events, resulting portfolios of risks and potential stakeholders' responses. City participants were also asked to evaluate the impact and likelihood of the discussed risks.

The obtained data from the WP2 workshops consisted of over 2000 links and concepts in the form of causal maps which were co-created by city representatives. In each of the workshops, a different general topic was discussed, including: critical infrastructures, climate change/environmental issues, and social problems/social dynamics. After merging the maps from the three workshops, a number of recurring themes in the obtained data were identified, such as: immigration, social cohesion, and health. Furthermore, there were identified numerous vicious loops within the causal maps, that is self-reinforcing cycles of risk events which can possibly lead to powerful negative ramifications. Importantly, many of the identified vicious loops can be addressed, and possibly broken, by sets of policies generated by city participants (272 policies were generated at the workshops). Some of those policies were labelled as 'bounce-forward' policies, that is policies that a CITY may create in response to the ramifications of risks, i.e. after the risk event has triggered other risks - and so enabling the CITY to improve its resilience. As a result, it could be concluded that the data obtained from WP2 workshops was rich and promising with regards to the forthcoming work on the SMR project.

The gathered input from CITIES in the WP2 workshops was used to draft an early version of the RSQ which was demonstrated to city participants at the workshops in Donostia (WP5) and Vejle (the final workshop of WP2). During those two workshops, participants were asked to complete the draft questionnaire and to provide their judgment with respect to: 1) the usability of the early version of the RSQ and the overall user experience, 2) the weights attributed to a number of risk scenarios within the RSQ which contribute to calculating an overall risk score, and 3) the potential of the RSQ to be used by European cities. This feedback would inform future development of the RSQ as part of WP3.

During the next stages of developing and testing the RSQ in WP3 and WP5, CITIES will be asked to actively contribute by providing further feedback on future versions of the RSQ. Furthermore, as part of WP5, CITIES will participate in implementing the tool in their own contexts.

PORTFOLIO OF RESILIENCE BUILDING POLICIES

The stages defined in the Maturity Model represent a generic characterization of the resilience building process that could be applied to any CITY, that is why the policies included in this model are described using a high-level approach. However, each CITY has its particular characteristics depending on politics, geography, legacy infrastructure and interdependencies among others. The Portfolio of Resilience Building Policies tool will provide insights to adequate the generalist policies presented in the Maturity Model into more specific policies designed for the context of each CITY, in addition to include the policies already identified in the RSQ. To do that, Tier 1 CITIES will be asked to choose one specific critical sector they have to deal with. Therefore, the policies included in this repository will be adapted for the characteristics of each CITY and to the critical sectors they have decided to address. Actually, the Tier 1 CITIES have already chosen one specific problem related to the topics related to resilience, Kristiansand has chosen water and sewage, Donostia/San Sebastian energy and telecommunications and Glasgow water and flooding. Therefore, the SMR consortium will implement the Portfolio of Resilience Building Policies to cover these issues and afterwards, these policies will be validated through the pilot implementation activities planned in WP5.

SYSTEM DYNAMICS MODEL

The plan for the development of the System Dynamics model starts on month 13 and ends up on month 28, after having been reviewed by the participants in the three pilot implementations. The main use of the simulation level will be oriented towards providing reasonable explanations for the logic underlying the Maturity Model. That is, after the first year of the project that a complete prototype of the Maturity Model will have been designed and it will be implemented in the three pilot CITIES (Glasgow, Kristiansand and Donostia) aiming to its validation.

During the implementation process, a significant amount of stakeholders should be involved. These stakeholders may initially have different perspectives (or mental models) about the evolution of resilience; so the simulation model will be used to analyse the potential consequences of implementing or not implementing policies included in the Maturity Model, in the right order, or temporal sequence.

The main requirement from CITIES, which are the final end users of the simulation model, is that the model should include some parameterisation functionalities so that, it could be better adapted

to particular characteristics of every CITY. These particular characteristics could be sociocultural aspects of population, the economic structure of the city or region, types of Critical Infrastructure.

The variables included within the simulation model should be closely linked to the indicators that are currently used by the CITIES or to the indicators that will be used by the CITIES once the Maturity Model has been implemented.

ENGAGEMENT AND COMMUNICATION TOOL

The involvement of key stakeholders and communication activities play an essential role in the resilience building activities. Therefore, the SMR project will develop an engagement and communication tool to facilitate the different levels of communications and engagement.

In order to achieve this purpose, several semi-structured interviews have been carried out with the representatives of the SMR Consortium cities to identify the information systems each city is using currently, their communication challenges and their needs. Further, information about the results of these interviews is described in deliverable D4.2. As a summary, the main communication challenges identified by the CITIES have been: the fragmentation of information among different stakeholders, the lack of integrated information sources and communication channels, confidentiality issues, the lack of bi-directionality in the communication process and the lack of resources to update the communication channels continuously.

Based on these needs, the SMR project has identified the requirements for the development of a collaborative environment to facilitate awareness and engagement among key partners in resilience building activities. The engagement and communication tool portal will particularly serve two purposes: support communication within the city, between the city and its stakeholders, and between the city and its citizens, and enable knowledge sharing as a long-term communication activity. Therefore, this portal will include, among others, social media channels to support the bidirectional communication between stakeholders, an adaptive role management to distinguish between city personnel, stakeholders and citizens to guarantee the confidentiality of some information. In addition, it will integrate Newsfeeds, Weblogs, Wiki pages, and Forums functionalities to share information among the stakeholders.

The development of this tool is following an agile methodology, so different prototypes are being developed and improved with the CITIES feedback as a way of ensuring the final tool meets their requirements.

4. CONCLUSIONS

The SMR project has conducted in WP1 a survey of worldwide approaches on how to define, develop, implement and evaluate resilience concepts, including relevant EU-sectoral and urban resilience approaches, as well as approaches to create networks of resilience ("resilience backbones") across cities, regions and nations. Although important progress has been made in the resilience building research, as it has been highlighted in deliverables 1.1, 1.2 and 1.3, there is still the need to provide guidance for the operationalization of resilience providing a practical application of resilience concepts in decision making and planning. Operationalization requires making resilience concepts useful and useable beyond their theoretical context to policy makers and managers.

In this context, the SMR project will develop and validate a Resilience Management Guideline to address this gap in the resilience operationalization process. This Resilience Management Guideline will consist of five different tools that will enhance the anticipation and the coordination across different stakeholders and will enable addressing risks and opportunities in order to facilitate planning and decision-making process. These five tools are the following: 1) a Resilience Maturity Model that provides an optimal sequence of five maturity stages that can guide CITIES in the resilience building process over time, 2) A Risk Systemicity Questionnaire that analyses the risk triggers and the ramifications of those risks, 3) A Portfolio of Resilience Building Policies that describes the goals that the cities need to achieve in order to increase their maturity level; 4) A System Dynamics Model that allows to understand the dynamic behaviour of complex systems and explore the city's resilience trajectory determined by resilience building policies, and 5) A Resilience Engagement and Communication Tool to integrate as many agents of the resilience community as it is possible.

The identification of the proper requirements for the development of these tools and the Resilience Management Guideline will guarantee that these project outcomes fit the end-users' needs and expectations. For this reason, the SMR project has involved within the SMR consortium city representatives. Four workshops have been arranged during this first year of the project to gather relevant information about CITIES' current experiences, problems, and needs. These workshops have mainly focused on gathering requirements for three of the tools: the Maturity Model, the Risk Systemicity Questionnaire and the Resilience Engagement and Communication Tool since they are the tools to be developed during the first year of the project.

General and particular requirements have been identified for the tools that will constitute the Resilience Management Guideline so that it can be adapted and used in different cities to deal

with different types of shocks and stresses. The set of tools included in the SMR Resilience Management Guideline will be designed considering the diversity of end-users who will use these tools and the different management approaches (strategic, tactical and operative), ensuring that they will be able to provide support from the three management-planning levels. Furthermore, these tools will be compatible with existing management procedures or standards.

These tools will be tested and validated through a pilot in three CITIES (Donostia, Kristiansand and Glasgow) with different levels of resilience maturity. Every CITY has selected a particular critical sector. Thus, the SMR project outcomes will be tested in an operational environment which will enable to improve the tools development.

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ANNEXES

ANNEX I: STAKEHOLDERS OF THE CITY AND THEIR ROLES IN BUILDING CITY RESILIENCE

Stakeholder	Roles in building city resilience
Local Government	Local government includes the different departments of the city council and all the municipal agencies. It is considered as the institutional level closest to citizens. It provides a strategic planning vision to better prepare the city to respond to disaster risks and improves health, well-being and education. Furthermore, local government is responsible for ensuring the continuity of some services in the city which may include highways, energy, water and telecoms infrastructure.
Regional Government	A regional government is a government entity that has a control on a specific area that may include different cities.
National Government	A national government is the political authority that controls a nation. The national government is responsible for maintaining security and stability and for establishing national laws and enforcing them.
European Legislative Body	The European Legislative boy is made up of the governments of the EU Member States and it is the highest political authority in the EU. It is responsible for setting the overall EU policy.
Sectoral Regulators	Bodies that set and enforce regulations for the sector over which they have responsibility –which may include utilities, aviation, transport, finances, legal and healthcare.
Emergency Services	The emergency services include entities that manage emergencies such as civil protection units and managers, as well as entities that are on the front line of emergencies such as police, firefighters, military forces and

	health care services. The role of these entities is to provide security and safety to citizens by reducing, preparing and responding to disaster risks.
Critical Infrastructure Providers, Owners & Operators	Critical infrastructures provide essential needs to the citizens and economy, including transportation, water, energy, communications, information technology, space, nuclear, defence, waste, health care, , food, finance system, , , , chemicals, and government . The adequate functioning of these assets, networks, and systems (including distributed networks) is crucial during emergencies as is their continued ability to deliver services in the longer-term.
Media	Media includes the local newspapers and radio and television channels. They play an important role disseminating hazard information and early warning measures in an easy to understand and accessible manner.
Academic and Scientific entities	Academic and scientific entities include universities and research centers as well as other wider educational establishments such as schools. They contribute to increasing the knowledge and the development of methodologies and technologies to better mitigate and prepare for, respond to, and recover from emergencies.
Public and Private Companies	Public and private companies include consultancies, insurance companies, SMEs and businesses. Many services depend on city structures, and thus companies need to be engaged in awareness raising and training programs so that they are able to prepare and respond to emergencies. This companies are sometimes represented by professional networks and associations. This are membership organisations representing professionals in specific sectors influencing current best practice, policy development, industry standards, and responding to government consultations, sometimes with accredited membership.
Citizens	Citizens play a vital role in initiating action by advocating for change and influencing decisions from the local government. Citizens need to be empowered to act responsibly in emergencies. This stakeholder group could be subdivided into neighbourhoods, communities of interest etc.

Professional Volunteers	Professional Volunteers are people that due to their professional background are well prepared to provide help in crises and emergencies. Professional Volunteers are doctors, nurses, fire fighters, policemen, and so on, that offer their help in a voluntary basis in case it is required.
Volunteers	Volunteers include people involved in organizations such as youth organizations, churches, day centers, community emergency response organizations that have not received professional training but have been trained to accomplish specific duties such as, cleaning, organizing, and so on. These organizations may be funded by governments, business or private persons and provide support such as food and shelters.
NGOs	An NGO is an organization that is neither a part of a government nor a conventional for-profit business. Usually set up by ordinary citizens, NGOs can act as support or lobbying bodies, encouraging others to be prepared or plan ahead in case of emergencies. NGOs are usually related to special interest groups on the environment, equalities or civic heritage.
International organizations and networks	Apart from all levels of governances, nowadays there are international organizations committed to building resilience. These organizations lead and participate in research projects in order to achieve this objective. Examples of these organizations are the Rockefeller foundation and UNISDR, among others. There are also international city networks that support the sharing of best practices and lessons learnt.

ANNEX II: QUESTIONNAIRE SENT TO CITIES

RESILIENCE MANAGEMENT GUIDELINE REQUIREMENTS

The aim of this exercise is to explicitly identify the requirements of the partner cities regarding resilience. These requirements will serve as a basis to increase city resilience and address problems derived from Critical Infrastructure dependency, Climate Change and Social Issues.

Therefore, the question we would like to answer is the following:

Which are the requirements for the Resilience Management Guideline to increase the resilience of your city against CI disruption/ Climate Change/ Social Dynamics?

4.1 EXERCISE

In order to do so we have already identified a set of requirements gathered during the four workshops conducted within WP2. However, we would like you to help us gathering more information about these requirements. Therefore, we would like you to complete the table below following these instructions:

- To complete the first column of the table identifying which are the areas addressed (CI dependency, Climate Change, Social Issues) by each of the requirements.
- To complete the second column of the table identifying the stakeholders that will be specifically interested in each particular requirement (see the Table 2).
- To complete the third column of the table specifying which tool would be the most suitable to address each requirement (Maturity Model, Risk Systemicity questionnaire, Repository of Resilience Building Policies, System Dynamics model, Engagement Tool).
- To remove the requirements, you do not agree with.
- To include any missing requirements (if there is any) in the last blank rows of the table.

List of requirements	Area addressed (CI Disruptions, Climate Change and Social Issues)	Stakeholder	Tool
1. Repository of policies to guarantee that the CIs are able to deliver essential services in case of a disaster	CI disruptions	Critical Infrastructure providers, emergency services, professional volunteers, volunteers, NGO, local government	Repository of Resilience Building Policies
2. A guideline to help in the allocation of efforts needed and steps to take to effectively implement the resilience action plan	All	Local government	Maturity Model

3. Tool or method to increase the awareness level of different municipality departments regarding the resilience action plan	All	Local government	SD Model
4. Communication platforms and channels to facilitate communication and collaboration of relevant stakeholders	All	All	Engagement tool
5. Guideline to adapt the local resilience action plan to regional, national and international approach	All	Local government, Regional government, National government and European legislation body	Out of scope
6. List of roles and responsibilities of the stakeholders regarding the development and implementation of the resilience action plan			

7. List of indicators to measure the effectiveness on the resilience action plan			
8. Guideline to gradually involve all the relevant stakeholders in regular training, emergency drills and exercises			
9. Need to incentivize the commitment of CITY stakeholders regarding the resilience action plan			
10. Need to involve citizens and their initiatives in the resilience action plan			
11. Need to standardize the resilience action plan			WP6

12. Guideline to stablish the organisational structure to manage the resilience action plan			
13. List of existing networks of cities working on topics related to resilience			
14. Guideline to establish contact with networks of cities working on topics related to resilience			
15. Guideline including the steps needed to be followed to operationalise the learning process in the context of resilience.			

16. Tool to help visualizing future possible scenarios depending on the decisions taken today			SD Model
17. Tool or method to visualize tangible outcomes after investing efforts and resources in the resilience building process			SD Model
18. Information about the pending challenges regarding resilience in our city			SD Model
19. User friendly tools			All
20. Tools able to adapt (parameters) to address particular socio cultural aspects of each city			SD Model

21. Tools developed should complement the tools, indicators, policies and procedures that are currently being used in cities			All
22. Platform to write suggestions and comments about emergencies and crises			Engagement Tool
23. Platform to share information regarding crises among different city departments.			Engagement Tool
24. A platform to share best practices among European CITIES			Engagement Tool

25. Tool to engage a variety of stakeholders to have an opportunity to join the conversation about city resilience			Risk Systemicity Questionnaire
26. Need to better understand risk systemicity			Risk Systemicity Questionnaire
27. Need to better understand existing vicious feedback loops			Risk Systemicity Questionnaire
28. Tool or method to understand the interconnectedness of city systems			Risk Systemicity Questionnaire
29. Repository of best practices from other cities			Repository of resilience building policies
30. Explanation of how is the most suitable way to implement different resilience building policies			Repository of resilience building policies

ANNEX III: EXPLICIT REQUIREMENTS OF CITIES REGARDING RESILIENCE

In order to develop a list of explicit requirements the questionnaire included in Annex II was sent to the seven cities that are partners in the SMR Project. The questionnaire served to validate the requirements implicitly gathered during the four workshops as well as to consider new ones that have not been identified. The end-users of this project's outcomes are European cities, therefore gathering their requirements regarding resilience and their expectations from each tool is an important milestone within this project. The aim of this Annex is to sum up the answers obtained from cities. The questionnaire has used to validate the cities' requirements regarding resilience, the area it addresses and the stakeholders who will be more influenced by them. The requirements that have received the majority of positive answers from the seven cites (4 out of 7) have been considered as validated. On the contrary, those requirements in which cities did not meet a consensus are considered as not validated and consequently are not considered nor included in this document. Moreover, new requirements suggested by some cities have also been considered. Based on the analysis of the results gathered from cities, it can be concluded that most of the requirements are very general and are formulated using an aggregated approach. During the first year of the project, one of the most important challenges has been to familiarize with the concept of resilience and developing a common understanding about this topic. Consequently, the requirements gathered are still defined from a very strategic level and not tool oriented. Moreover, due to the project schedule, the four workshops were more oriented to gather information to develop the Maturity Model, the Risk Systemicity Questionnaire and the Engagement Tool because the deadline to develop the final version of these three tools was earlier. Consequently, more work have been done on these tools and cities have a clearer idea of what to expect from them rather than from the portfolio of resilience building policies or from the system dynamics model.

The pilot implementation of the tools that will be carried out in WP5 will be a good opportunity to obtain more specific requirements from representatives of different stakeholder groups as well as requirements specific to address the three different topics (CI dependency, climate change and social issues) that the project wants to cover.

GENERAL REQUIREMENTS

The following table includes the general requirements identified by CITIES that should be considered in the development of all the five tools.

Requirement	Area Addressed	Stakeholder
Useful user friendly tools tailored to relevant stakeholders	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Public-Private Companies NGO
Tools developed should complement the tools, indicators, policies, methods and procedures that are currently being used in cities	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government
Guideline to enable prioritisation of resilience building policies for CITY with respect to infrastructure resilience, climate adaptation and social issues	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Emergency Services Critical infrastructure providers Public-private companies Citizens Professional Volunteers Volunteers NGO
Need to standardize the resilience building process	Critical Infrastructure dependencies Climate Change	Local Government Regional Government National Government European Legislative Body

USER FRIENDLY TOOLS TAILORED TO RELEVANT STAKEHOLDERS

One of the most important requirements gathered from cities was the importance of developing useful user friendly tools adapted to be usable for all the relevant stakeholders within the city. Consequently, the five tools developed within the scope of this project will only be used in case they are user-friendly and provide useful support to different stakeholders. It is also important to bear in mind that, different stakeholder groups participate in the resilience building process, what makes necessary to develop tools that will provide support at different levels. In fact, some stakeholders will require tools that help them in strategic planning activities while others will require tools that provide extra support in tactical and operative level of activities.

TOOLS DEVELOPED SHOULD COMPLEMENT THE TOOLS, INDICATORS, POLICIES, METHODS AND PROCEDURES THAT ARE CURRENTLY BEING USED IN CITIES

One of the most important requirements gathered from cities was the importance of developing tools that are compatible and complementary to existing management procedures, methods or tools within the city and adapted to tailor relevant stakeholders.

GUIDELINE TO ENABLE PRIORITISATION OF RESILIENCE BUILDING POLICIES FOR CITY WITH RESPECT TO INFRASTRUCTURE RESILIENCE, CLIMATE ADAPTATION AND SOCIAL ISSUES

Cities need help to decide how to prioritize the implementation of resilience building policies with respect to infrastructure resilience, climate adaptation and social issues. This guideline would provide help when deciding which policies should be implemented first and which after.

NEED TO STANDARDIZE THE RESILIENCE BUILDING PROCESS

City representatives think that developing an international standard would help them as well as other cities in conducting the resilience building process.

OUT OF SCOPE

The following table includes the requirements identified by CITIES that are out of the scope of this project.

Requirement	Area Addressed	Stakeholder
Guideline to adapt the local resilience action plan (or de facto plan) to address regional, national and international considerations	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Regional Government National Government European Legislative Body
A way to educate and train officers in the municipality and other relevant stakeholders in the CITY	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government

GUIDELINE TO ADAPT THE LOCAL RESILIENCE ACTION PLAN (OR DE FACTO PLAN) TO ADDRESS REGIONAL, NATIONAL AND INTERNATIONAL CONSIDERATIONS

It is important to bear in mind that the resilience action plan should be aligned, integrated and connected with other regional, national or international plans or guidelines related to resilience. Therefore, cities require guidelines that will provide useful recommendations to be able to align their own plans with others. This project contemplates the importance of aligning the city plan with others. In fact, there are policies related to this topic in the leadership and governance dimension of the maturity model, however it does not provide any specific instruction on how this should be done. The International organizations should be in charge of leading activities with the aim of creating consensus and set the basis for future worldwide legislations of different countries. Then, national governments will be responsible of deciding which is the most effective way of implementing those ideas in their own country.

A WAY TO EDUCATE AND TRAIN OFFICERS IN THE MUNICIPALITY AND OTHER RELEVANT STAKEHOLDERS IN THE CITY

Cities have the need to train staff working in the municipality in topics related to resilience as well as other relevant stakeholders of the city. This project is aware of this specific requirement and will provide instructions on how the tools developed within the scope of this project should be used. However, it is out of the scope of this project to train staff in more general topics related to resilience. Academic and research institutions should respond to these need orienting their research to developing methods, tools or procedures to train staff in topics related to resilience. These could be promoted by funding projects related to this topic.

MATURITY MODEL

The following table shows the specific requirements identified by CITIES for the Maturity Model. This tool provides a guideline from a strategic perspective of the resilience building process that's why the local government has been identified as the end-user of this tool. The Maturity Model will be used as an assessment tool to know what has been done in the city so far and prioritize resources and efforts in the resilience building process.

Requirement	Area Addressed	Stakeholder
Guideline to help in the allocation of efforts needed and steps to take over time, to develop and effectively implement the resilience action plan (or de facto resilience action plan)	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government
List of indicators to measure the effectiveness on the resilience action plan (or de facto plan)	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government
Mapping of key stakeholder's roles and responsibilities with respect to the development and implementation of the resilience action plan (or de facto plan)	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government
Guideline to involve all the relevant stakeholders in emergency preparedness and crisis management through plan preparation, regular training, emergency drills and exercises	Critical Infrastructure dependencies Climate Change	Local Government

GUIDELINE TO HELP IN THE ALLOCATION OF EFFORTS NEEDED AND STEPS TO TAKE OVER TIME, TO DEVELOP AND EFFECTIVELY IMPLEMENT THE RESILIENCE ACTION PLAN (OR EQUIVALENT SUITE OF KEY PLANS WHICH ARE THE DE FACTO RESILIENCE ACTION PLAN)

Cities would like to have instructions about which is the best way of allocating efforts as well as receiving input on which are the steps needed to be taken in order to implement the resilience action plan in the most effective manner.

LIST OF INDICATORS TO MEASURE THE EFFECTIVENESS ON THE RESILIENCE ACTION PLAN (OR DE FACTO PLAN)

Cities need a set of indicators to be able to monitor and assess the implementation process of the resilience action plan within the city.

MAPPING OF KEY STAKEHOLDER'S ROLES AND RESPONSIBILITIES WITH RESPECT TO THE DEVELOPMENT AND IMPLEMENTATION OF THE RESILIENCE ACTION PLAN (OR DE FACTO PLAN)

It is important to define the roles and responsibilities of each stakeholder with respect to the development and implementation of the resilience action plan. Defining roles and responsibilities is necessary to share efforts and to include different perspectives in the resilience action plan.

GUIDELINE TO INVOLVE ALL THE RELEVANT STAKEHOLDERS IN EMERGENCY PREPAREDNESS AND CRISIS MANAGEMENT THROUGH PLAN PREPARATION, REGULAR TRAINING, EMERGENCY DRILLS AND EXERCISES

There is a need to develop a guideline that will give instructions on how relevant stakeholders need to get gradually involved in emergency preparedness and crisis management through plan preparation, regular training, emergency drills and exercises.

RISK SYSTEMICITY QUESTIONNAIRE

The following table shows the specific requirements identified by CITIES for the Risk Sistemicity Questionnaire. This tool is oriented to understand better the risks that the city faces and their consequences in the short and long term. Specific risks related to Critical Infrastructures interdependencies, climate change and social issues have been considered in this tool.

Requirement	Area Addressed	Stakeholder
Tool to provide an opportunity for a variety of stakeholders to join the conversation about city resilience	Critical Infrastructure dependencies Climate Change Social Dynamics	All
Need to better understand risk systemicity	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Regional Government Emergency Services
Need to better understand existing vicious feedback loops	Social Dynamics	Local Government Regional Government Emergency Services Critical Infrastructure providers Academic Entities Public-Private Companies
Tool or methodology to understand the interconnectedness of city systems including feedback loops, significant causal relationships, interdependencies and potential cascade failures	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Critical infrastructure providers

TOOL TO PROVIDE AN OPPORTUNITY FOR A VARIETY OF STAKEHOLDERS TO JOIN THE CONVERSATION ABOUT CITY RESILIENCE

Cities require a tool that influences the creation of dialogues related to resilience between different relevant stakeholders. This tool should be able to provide sufficient input to start a conversation that may end up producing interesting contents that would be useful in the resilience building process.

NEED TO BETTER UNDERSTAND RISK SYSTEMICITY

There is a need for a tool to enable a better understanding of risk systemicity, the interconnections between risks and their cascading effects.

NEED TO BETTER UNDERSTAND EXISTING VICIOUS FEEDBACK LOOPS

There is a need for a tool to enable a better understanding of existing vicious loops within the city regarding different type of problems related to critical infrastructure dependencies, climate change and social dynamics.

TOOL OR METHODOLOGY TO UNDERSTAND THE INTERCONNECTEDNESS OF CITY SYSTEMS INCLUDING FEEDBACK LOOPS, SIGNIFICANT CAUSAL RELATIONSHIPS, INTERDEPENDENCIES AND POTENTIAL CASCADE FAILURES

There is a need for a tool or a methodology to understand the interconnectedness of city systems including feedback loops, significant causal relationships, interdependencies and potential cascading failures that may end up affecting to the well-being of society.

REPOSITORY OF RESILIENCE BUILDING POLICIES

The specific requirements regarding the repository of resilience building process are shown in the following table. This tool will contain resilience building policies from strategic, operational and tactic level that will be useful for local government, emergency services, Critical Infrastructure providers and volunteers.

Requirement	Area Addressed	Stakeholder
Repository of policies to ensure delivery of vital services by Critical Infrastructure owners and operators during emergencies and in the long-term	Critical Infrastructure dependencies Social Dynamics	Emergency Services Critical Infrastructure Providers Professional Volunteers Volunteers NGO
Repository of best practices from other cities	Climate Change	Local Government
Explanation of how is the most suitable way to implement different resilience building policies	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government

REPOSITORY OF POLICIES TO ENSURE DELIVERY OF VITAL SERVICES BY CRITICAL INFRASTRUCTURE OWNERS AND OPERATORS DURING EMERGENCIES AND IN THE LONG-TERM

Cities would find useful to have a repository of resilience policies or activities in order to ensure the delivery of vital services by Critical Infrastructure owners and operators during emergencies and in the long term. The implementation of these policies will enable to improve the quality of the response phase in case of an emergency as well as to increase the reliability of Critical Infrastructures.

REPOSITORY OF BEST PRACTICES FROM OTHER CITIES

City representatives also require a repository of resilience best practices and lessons learnt gathered from other cities in order to be able to replicate the interesting ones in their own cities.

EXPLANATION OF HOW IS THE MOST SUITABLE WAY TO IMPLEMENT DIFFERENT RESILIENCE BUILDING POLICIES

City representatives will also require an explanation of how different resilience building policies could be implemented in the city in a successful manner. For instance, this explanation could provide input on which city stakeholders should be involved in the policy implementation.

SYSTEM DYNAMICS MODEL

The System Dynamics Model is a tool that will help to test and understand the impact of the resilience building policies in the short and long term. It will be used mainly by local governments and academic entities to analyse the effectiveness of the resources.

Requirement	Area Addressed	Stakeholder
Tool or method to increase the awareness level of different municipality departments regarding the resilience action plan (or de facto plan)	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government
Tool to help visualization of plausible futures which test the impact of key decisions taken in the near-term	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Academic Entities

including those concerning resources and strategic investments		
Tool or method to visualize tangible outcomes after investing efforts and resources in the resilience building process	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Academic Entities
Horizon-scanning of the major European challenges which are likely to affect resilience of our city	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Emergency Services Citizens

TOOL OR METHOD TO INCREASE THE AWARENESS LEVEL OF DIFFERENT MUNICIPALITY DEPARTMENTS REGARDING THE RESILIENCE ACTION PLAN (OR DE FACTO PLAN)

City representatives require a tool or a method that would help them to increase the awareness level of all municipality departments not directly related to resilience. As resilience has a holistic approach, there is a need to find a way to show different departments how investing on resilience could eventually have a positive impact on their work area. For instance, enhancing citizens' participation in the resilience building process could help reducing existing inequalities and improving social cohesion.

TOOL TO HELP VISUALIZATION OF PLAUSIBLE FUTURES WHICH TEST THE IMPACT OF KEY DECISIONS TAKEN IN THE NEAR-TERM INCLUDING THOSE CONCERNING RESOURCES AND STRATEGIC INVESTMENTS

There is a need to develop a tool which enable the visualization of plausible future situations. The tool should also serve to test how different decisions, usually concerning resources and strategic investments, end up causing different type and amount of impacts. Moreover, the tool could also give insights on how the system works as a whole.

TOOL OR METHOD TO VISUALIZE TANGIBLE OUTCOMES AFTER INVESTING EFFORTS AND RESOURCES IN THE RESILIENCE BUILDING PROCESS

There is a need to develop a tool to help visualizing the tangible outcomes obtained after investing effort and resources or implementing policies in improving the resilience building process.

HORIZON-SCANNING OF THE MAJOR EUROPEAN CHALLENGES WHICH ARE LIKELY TO AFFECT RESILIENCE OF OUR CITY

City representatives also require help to identify the major European challenges that are likely to affect the resilience of the city in the short but also in the long term. There is a need to identify pending challenges in order to be able to address them.

ENGAGEMENT TOOL

The engagement tool developed in the SMR Project will be a bidirectional communication channel between the municipality and citizens, giving the last ones the opportunity to provide feedback about the policies implemented by the municipality and overall be involved in the resilience building process. The engagement tool will allow citizens to be continuously informed about volunteering opportunities in the local community and information to be prepared and to deal with shock and stresses.

This tool also will contain useful information such as best practices and tips to deal with shocks and stresses provided by local government, emergency services or Critical Infrastructure providers. Additionally, this tool will be the reference source to visit when any stakeholder seeks information about resilience.

Requirement	Area Addressed	Stakeholder
Communication platforms and channels (new, integrated or improved) to facilitate communication and collaboration of relevant stakeholders during crises and in building longer-term resilience (taking into account commercial confidentiality, data protection and security needs)	Critical Infrastructure dependencies Climate Change Social Dynamics	All
Approaches for involving citizens and integrating/supporting their initiatives in the resilience action plan (or de facto plan)	Social Dynamics	Local Government NGO

Roadmap and terms of reference for key networks of cities working on topics related to resilience	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Academic Entities
Platform to write suggestions and comments about past emergencies and crises	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government European Legislative Body Emergency Services Public-Private Companies Citizens
Platform (new, integrated and/or improved) to share information regarding crises among different city departments.	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Emergency Services Critical Infrastructure Providers
Platform (new, integrated and/or improved) to share best practices among European CITIES	Critical Infrastructure dependencies Climate Change Social Dynamics	Local Government Regional Government National Government European Legislative Body Academic Entities

COMMUNICATION PLATFORMS AND CHANNELS (NEW, INTEGRATED OR IMPROVED) TO FACILITATE COMMUNICATION AND COLLABORATION OF RELEVANT STAKEHOLDERS DURING CRISES AND IN BUILDING LONGER-TERM RESILIENCE (TAKING INTO ACCOUNT COMMERCIAL CONFIDENTIALITY, DATA PROTECTION AND SECURITY NEEDS)

There is a need to develop communication platforms and channels that enable and facilitate the communication and collaboration of relevant city stakeholders during crises and in the long term. During the development of these platforms, it would be necessary to consider, confidentiality, data protection and security issues.

APPROACHES FOR INVOLVING CITIZENS AND INTEGRATING/SUPPORTING THEIR INITIATIVES IN THE RESILIENCE ACTION PLAN (OR DE FACTO PLAN)

Cities need ways to involve citizens in the development of the resilience action plan. There is a need to integrate their initiatives in the resilience action plan in order to institutionally support them.

ROADMAP AND TERMS OF REFERENCE FOR KEY NETWORKS OF CITIES WORKING ON TOPICS RELATED TO RESILIENCE

There is a need to create a list that includes all the reference terms and concepts related to resilience that key networks working on these topics are using as well as their description to help aligning the views and perspectives of different cities and stakeholders about resilience. Moreover, using the same terms and concepts and unifying their description will eventually improve the resilience dialogue ensuring all participants understand what is being discussed. This list should be available and easily accessible for all the stakeholders from the engagement tool.

PLATFORM TO WRITE SUGGESTIONS AND COMMENTS ABOUT PAST EMERGENCIES AND CRISES

City representatives found necessary to develop and implement a platform useful to write suggestions and comments about past emergencies and crises in order to gather best practices and lessons learnt from all the city stakeholders.

PLATFORM (NEW, INTEGRATED AND/OR IMPROVED) TO SHARE INFORMATION REGARDING CRISES AMONG DIFFERENT CITY DEPARTMENTS

Cities require platforms that enable to share information regarding crises among different departments within the municipality in a secure manner.

PLATFORM (NEW, INTEGRATED AND/OR IMPROVED) TO SHARE BEST PRACTICES AMONG EUROPEAN CITIES

Cities require platforms useful to share best practices with other European cities in order to empower the European Resilience Backbone.