



# SMART MATURE RESILIENCE

DELIVERABLE 2.1: CI DEPENDENCIES WORKSHOP REPORT

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## EXECUTIVE SUMMARY

*The first workshop of the SMR (Smart Mature Resilience) project, took place from the 26th to the 29th of October 2015 in Riga, Latvia, and focused on Cities' dependency towards Critical Infrastructures (CIs). In this workshop, experts from the cities of Bristol, Donostia, Glasgow, Kristiansand, Riga, Rome and Velje had the opportunity to exchange information and knowledge on the management of CIs and provide material for the development of the Resilience Management guidelines.*

*The report includes the preparation process, the explanation of the exercises carried out during the workshop and the results of the exercises. Moreover, the evaluation and the lessons learnt from the first workshop are summarised.*

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## 1. INTRODUCTION

*This deliverable reports about the first workshop on Cities' dependency towards Critical Infrastructures (CIs) in course of the SMR project which is the acronym for "Smart Mature Resilience".*

*The workshop was organised by the council of Riga and took place from the 26<sup>th</sup> to the 29<sup>th</sup> of October 2015 in Riga, Latvia.*

*The 27<sup>th</sup> and the 28<sup>th</sup> of October were the de facto workshop days with external experts and SMR partners. Participants were also invited to take part in a welcoming dinner – hosted by the SMR project – the evening before. In addition, on the 26<sup>th</sup> of October, a preparation meeting was carried out where the academic partners and ICLEI and DIN took part and on the 29<sup>th</sup> the debriefing meeting to evaluate the execution of the workshop and obtain lessons learnt for the next ones was performed by all partners.*

*The aim of this deliverable is to explain the execution of the workshop, explaining the activities carried out and the obtained results. First, the organisational and preparation issues which took place in relation to the workshop are presented, including the invitation to the workshop, the agenda setting and associated issues. Second, the main results from the exercises developed within the workshops are presented. These exercises were developed in order to identify the challenges and promising approaches related to cities dependency on Critical Infrastructures. Finally, the evaluation and lessons learnt from the workshop are presented.*

## 2. WORKSHOP PREPARATION

### IDENTIFYING WORKSHOP OBJECTIVES

The main objective of this first workshop in Riga was to gather useful information from experts regarding Critical Infrastructures (CI) and their dependencies to be able to develop the tools proposed in the project proposal. The attendees of the workshop included sixteen participants from seven partner cities, and also a number of observers from academic-partner institutions.

The workshop in Riga was arranged in four days. On Monday 26<sup>th</sup> October there was time for discussion and preparation for the following days; the main exercises of the workshop ran from Tuesday 27<sup>th</sup> to Wednesday 28<sup>th</sup>.

On Tuesday 27<sup>th</sup>, the workshop was led by TECNUN and a collaborative methodology called Group Model Building was used to carry out the activities. The first objective of these exercises was to identify the dependencies of cities on CIs, analyse the most relevant milestones (events, crises, activities, actions, laws established, etc.) occurred in the history of the cities related to the CI dependency. The second objective was to identify the most relevant indicators in order to assess the resilience level of the cities regarding their dependency towards CIs. Finally, the last objective was to develop Behaviour Over Time (BOT) graphs of the most voted indicators in order to understand the evolution of the main variables in an ideal scenario. All the information gathered during this day will be used to develop the Maturity Model, which will be developed in WP3.

On Wednesday 28<sup>th</sup> the workshop session was led by the University of Strathclyde focusing mainly on gathering information to develop the Systemic Risk Questionnaire (SRQ), which will be developed in Work Package 3 (WP3). The development of SRQ draws on the findings obtained from a series of planned WP2 workshops, and its focus is placed on the systemic interdependence between risks. Consequently, on the second day of exercises of the workshop in Riga, the facilitators were particularly interested in investigating complex ramifications of events, portfolios of risks, stakeholder responses, and feedback loops between risks. These concepts were explored in the context of the workshop's main field i.e. the resilience of cities on CI.

Finally, on Thursday 29<sup>th</sup> there was a debrief session to summarise the main results of the workshop and extract lessons learned about future steps that need to be done within the project schedule.

## PRIOR TO THE WORKSHOP

To prepare the workshop several duties and activities were performed. Information useful to improve the organisation and the correct implementation of the workshop was provided in advance with the aim to have a clearer view of the expected role of each participant.

The following information was given in course of the planning period:

- Draft and final workshop agenda (extended and summarised) as well as the list of the workshop participants.
- During the exercises carried out on the 27<sup>th</sup> of October, each of the workshop participants was asked to assume a specific role. The description of the roles and the list of participants assigned to each role were provided to each participant in advance. (See Annex I and Annex II).
- The first exercise prepared for the 27<sup>th</sup> of October was explained prior to the workshop dates to all the participants since it required that cities prepared relevant materials in advance. City representatives were asked to identify the most relevant milestones (events, actions...) that have influenced the crisis management procedures within their respective cities. This reflection was essential to have successful workshop outcomes.
- To ensure good preparation participants were advised that communicating in English was essential to collect useful information during the workshop. Furthermore, on day 2, all participants were asked to contribute to the activities by typing brief statements using a laptop about their opinion about a given problem. This was essentially expected to be done in real-time (the contributions could not be translated afterwards because the idea of the activities was that the participants' statements became networked with causal relationships, which then served as a resource for further contributions). Preventatively, the participants who may not feel fully confident to engage in this task due to language constraints were advised to have another person with them acting as an interpreter.
- Directions from the airport/train station to the hotel in which the workshop participants stayed were provided by the city of Riga as well as information about the meeting point and directions to the welcoming dinner.

## AGENDA SETTING

The setting of the agenda for the first workshop consisted of an iterative process in which the project partners participated. The agenda for the first workshop about cities dependency towards CIs that took place in Riga (Latvia) included the following steps:

- Periodic teleconferences were arranged among the workshop partners to prepare the exercises that would be carried out in the workshop.
- Partners of the project developed a list of suitable CI experts that could contribute to gathering information to accomplish the objectives of the workshop.
- TECNUN with the help of Strathclyde developed a draft of the agenda. This draft included the main building blocks of the workshop with a rough time plan. This first draft was sent out to SMR project partners.
- Based on the comments and suggestions received from the project partners a second version of the workshop agenda was deduced which, in turn, was further developed in several weekly telephone conferences.
- The third and final version of the agenda for the workshop facilitators was approved one week before the workshop took place. This final version (Annex III) included the description of the activities of the workshop, the timetable of the activities and the objectives of each activity. In addition to this extended agenda, a more summarised one was also provided to the other workshop participants with the aim to have a better overview of the main schedule of the days.

### 3. WORKSHOP EXECUTION AND RESULTS

The workshop in Riga was arranged over four days from the 26<sup>th</sup> to the 29<sup>th</sup> of October. As previously mentioned, the main exercises of the workshop ran from Tuesday 27<sup>th</sup> (Group Model Building Session) to Wednesday 28<sup>th</sup> (Group Explorer Session). The list of the participants can be found in Annex II. Participants were divided into two main groups: academic representatives and city representatives. Not all the city representatives were part of the project consortium, four Critical Infrastructure experts from Riga were also invited by the city council of Riga to participate in the workshop.

#### PREPARING THE WORKSHOP (26<sup>TH</sup> OF OCTOBER)

On the 26<sup>th</sup> of October, the academic partners, as well as ICLEI and DIN, had a meeting at the city council of Riga to review in detail the following issues:

- The agenda.
- The exercises that were organized for the Group Model Building and the Group Explorer sessions.
- The roles that were assigned to the project partners.
- The materials needed during the workshop.

## GROUP MODEL BUILDING SESSION (27<sup>TH</sup> OF OCTOBER)

The session started at 8:45 a.m. with a brief welcome and an introduction section. This was followed by a presentation of the relevant concepts for the SMR and the workshop. Afterwards, the exercises were explained, and the experts started working in small groups. During the morning the first two exercises were carried out: milestones identification and definition of the indicators. After the lunch break, the third exercise, developing behaviour over time graphs, was carried out. Finally, to conclude/finish the session, a brief analysis of the obtained results was made.

### WELCOME AND INTRODUCTION TO THE GROUP MODEL BUILDING SESSION

The coordinator of the project welcomed the participants of the workshop (city representatives and academic partners) to the first workshop of the SMR project. He made a brief presentation about the objectives of the project, the expected outcomes of the project and the distribution of the work packages of the project.

After the brief presentation about the project, the coordinator of the project asked all the workshop participants to introduce themselves and explain the organization briefly they were representing to. Photo 1 shows the workshop participants. Furthermore, the list with the names of all participants of the workshop is included in the Annex II.



**Photo 1: Photo of the participants in the workshop**

Then, LiU explained and gave the definition of the most relevant concepts of the project to ensure a unified/common understanding of the main concepts that would be used during the workshop.

## FIRST EXERCISE: IDENTIFICATION OF MILESTONES

On Tuesday 27<sup>th</sup>, the GMB session was led by TECNUN. TECNUN presented the first GMB exercise. The objective of this first exercise was to identify the milestones or any other event related to dependencies in CIs that have produced a significant change in the actions and ways in which their cities manage crises. Examples of milestones could be the development of a local/regional plans for CIP; the participation in collaborative networks such as 100RC (100 Resilient Cities), a major flood occurred in the city... Furthermore, experts from the cities were also asked to identify the scope of the actions (local, regional, national and international) as well as the agents or stakeholders involved in the implemented actions. For this exercise, representatives from the cities of Bristol, Donostia, Glasgow, Kristiansand, Riga, Rome and Vejle had been asked to identify the most relevant milestones (such as floods, firestorms, fires...) occurred in their cities in advance.

### Methodology

In order to develop the first exercise, representatives from the cities were divided into five small groups. Each group was formed by four people. Furthermore, a group facilitator, from the academic partners, was assigned to each group. The facilitator was responsible to ensure the quality of the group discussion and that the group understood the activity. Further, the facilitator was also in charge of guiding the group needed help.

- Group 1 was formed by two representatives from Riga and two from Bristol (group facilitator ICLEI)
- Group 2 was formed by two representatives from Vejle and two from Donostia (group facilitator DIN)
- Group 3 was formed by two representatives from Rome and two from Kristiansand (group facilitator Strathclyde).
- Group 4 was formed by two representatives from Glasgow and two from Riga (group facilitator Dr. Strathclyde).
- Group 5 was formed by four representatives from Riga (group facilitator LIU).

After defining the groups, post-it notes of different colours and a big white sheet that could be hanged in the wall were provided to each group. The name of the cities that worked together was written in the heading of the big blank sheet. Further, the different meanings for each post-it colour were also explained:

- Yellow post-its were used to represent the main events that occurred in the city as well as the year in which they took place.
- Green post-its' were used to represent the actions or policies carried out by the cities in the process of building resilience.

Once the experts were divided into small groups (see Photo 2) and provided with the necessary material, they started working together setting the main milestones that they had identified for their cities in a timeline graph drawn in the big blank sheet. Each group was free to decide the time horizon of the timeline graph. Consequently, the timeline graph could differ from one group to the others. Finally, the consequences of the implemented actions were also explained in a plenary session by one representative from each group.



**Photo 2: City representatives from Kristiansand and Rome working together in Exercise 1**

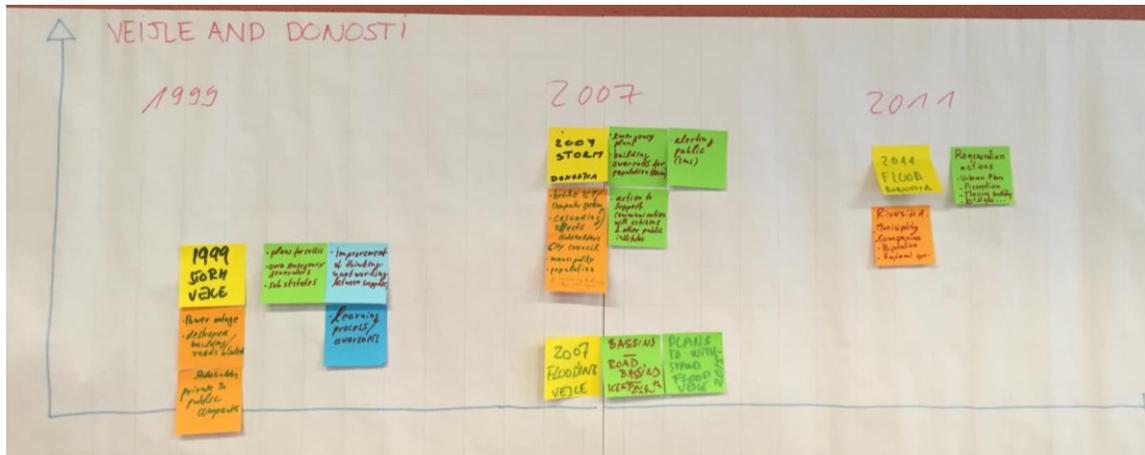
### Results

After working in small groups, a plenary session took place. In this plenary session, all city partners and all academic partners participated. The aim of the plenary session was to put in common the time-line graphs developed in small groups. One or two representatives from each small group presented the main milestones identified for the cities in the group.

Group 1, which was composed of representatives from Bristol and Riga, focused on similar events related to flooding (see Photo 3). Bristol started to talk about the flooding that occurred in 2007. Due to this event, many services such as power and water supply were affected. Consequently, the government increased its awareness and recognised the need to develop a set of recommendations to be better prepared for floods. Moreover, in 2010 a new legislation about floods and water management was introduced. This legislation provided new responsibilities and duties to city councils and local coordinators to make decisions regarding flooding.



directly involve neighbourhoods. Moreover, companies and industries located in flooding prone areas have been moved to less risk prone areas.



**Photo 4: Results of Exercise 1, timeline and milestones of Group 2**

Group 3, which was composed of representatives from Rome and Kristiansand, focused on very different types of events (Photo 5). In 2007, a heavy snowfall affected Kristiansand. During the first day the responsibility was taken by the police and after the first day it was taken by the municipality of Kristiansand. People were locked and could not move from one place to another. The impact of the event was so high that actions at the regional level were needed. Volunteer teams' help was also necessary to deal with the crisis. One year later the city bought new equipment to improve their ability to respond to snowfalls. Moreover, in 2010 a new highway that was better prepared to deal with the similar type of crisis was built. It was not a direct consequence of the event itself as it was planned to be built in the future. However, the heavy snowfall of 2007 speeded up its building process.

The city of Rome presented the problems produced by the unexpected high affluence of people visiting Rome in 2005 because of the Pope's funeral. 4 million people arrived at the city during those days, and that caused that approximately 8.5 million of people used the underground system only in one week. Numerous volunteers provided their help to organise this event. This event also produced the overuse of some basic services like telecommunication and hotspots. To solve this, the city needed to increase the amount of infrastructures to ensure the provision of these basic services was founded. Therefore, local authorities delegated the responsibility to deal with this event to national authorities.

Several lessons were learnt from of these two events: first, the important role of the volunteers. Second, the importance being prepared for similar circumstances although they cannot be previously expected. Finally, the importance of information and knowledge sharing among stakeholders.



**Photo 5: Results of Exercise 1, timeline and milestones of Group 3**

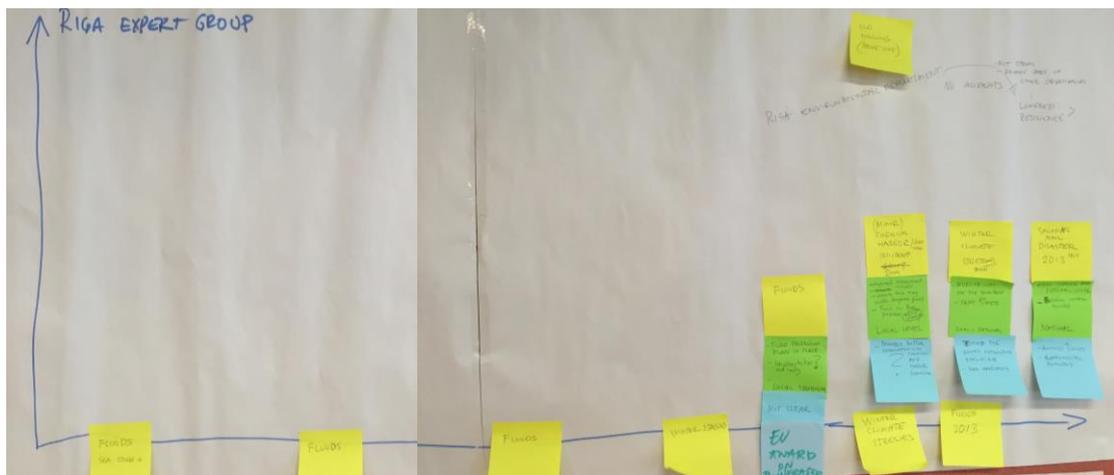
Group 4 which was composed of representatives from Glasgow and Riga, presented as milestones several different small events that occurred in each of the cities, such as, blackouts and flooding (Photo 6). Riga faced a blackout in electricity supply in 1980 and consequently the consumers were switched off the grid. After this event, they increased the number of electric supply infrastructure to prevent this from happening again.

In 1994, Glasgow was affected by flooding that had an economic impact on the city. This disaster led the authorities to think collectively at a strategic level and to develop risk plans to mitigate the flood impacts. Moreover, partnerships were created among private consultancies, private companies, and the Scottish water agency. In 2011, engineering works were developed to prevent flooding and these risk plans have been improved over the last years.



**Photo 6: Results of Exercise 1, timeline and milestones of Group 4**

Group 5, which was composed of representatives from Riga, explained the disastrous consequences of a heavy snowfall in Riga during November 2013 (Photo 7). The roof of a popular shopping mall collapsed due to the snow accumulated on its roof. Fifty-seven people died because of this event. Since this event, the societal awareness increased because it was realised that it was necessary to take care of the maintenance of every building structure. Consequently, a new construction department was created in charge of analysing buildings and deciding which ones should not operate anymore.



**Photo 7: Results of Exercise 1, timeline and milestones of Group 5**

### Summary of the results

The first general conclusion obtained after finishing the first exercise of the Group Model Building session was that all the actions taken by authorities after a crisis occurrence to increase the overall resilience level of the city could be classified in two types:

- The actions taken to improve the resilience level of the Critical Infrastructures. For instance, the implementation of sensors, the provision of new crisis response equipment or the need to get infrastructures prepared before a crisis occurs.
- The actions taken to develop new plans, procedures or law to help improving the response capability of the city towards a critical event.

To implement these actions, city representatives pointed out the importance of the lessons learnt regarding crisis management and the sharing of best practices to help reducing the impact of upcoming crises. All of them also found important to have well-trained volunteers, to increase the awareness level of society and to develop and improve information channels to inform citizens about any problem.

Moreover, some similarities in the events most relevant for cities were identified. Most of the examples of events given by cities were related to flooding. One of the reasons for this to happen could be the

proximity of the cities to the sea (Donostia, Vejle, Riga and Glasgow). Therefore, it is normal that the management of this type of events worries them.

## SECOND EXERCISE: INDICATORS AND VARIABLES

After explaining which are the most relevant events that have influenced the development of new procedures to deal with crises TECNUN introduced the second exercise of the GMB.

In this second exercise, the city representatives were asked to identify the indicators that could be used in their cities to evaluate the resilience of the city after the occurrence of the events that were identified in exercise 1. Thus, the objective of this exercise was to propose representative indicators that could be used by the different cities to assess the resilience level and the effectiveness of the actions carried out within city.

### Methodology

The methodology for this exercise was the same than in the previous exercise. Experts from the cities were divided into the same small groups as in exercise 1. Firstly, they worked in small groups and afterwards the results were presented in a plenary session. During the plenary session all the indicators that were identified by the different groups were put together on the wall. Afterwards, each of the participants had to vote on the five more relevant indicators using a round robin approach.

### Results

Following, we present the list of indicators that were identified by the all the small groups. Each representative from the small group presented an indicator, and afterwards, this indicator was classified according to the following four categories: community culture, tangible/hard resources, intangible/soft resources, expected impacts or real impacts. This process was repeated until the indicators were exhausted. Finally, the most relevant indicators within each category were voted by city representatives. Each city representative had five votes to distribute among the list of identified indicators (Photo 9). A brief explanation of each of the category is given below.

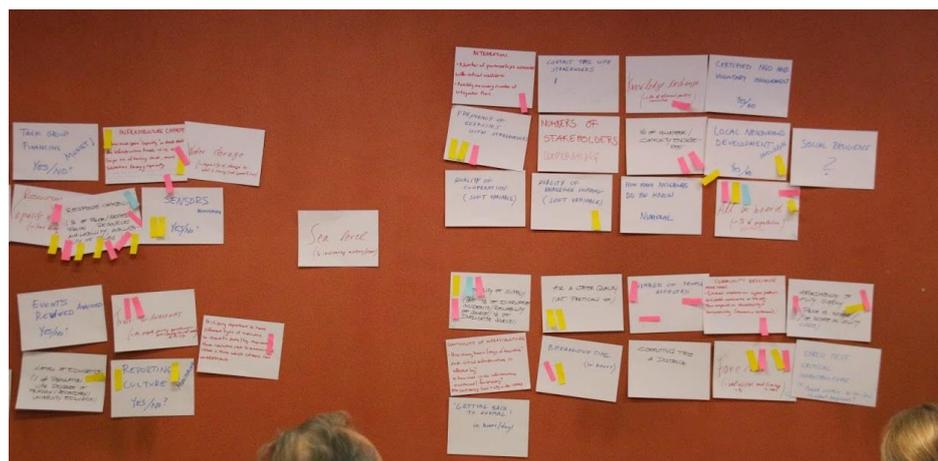
- Community culture: This category refers to the ability of a system to cooperate and share efforts between different members of a community.
- Tangible/Hard Resources: This category refers to the tangible resources a system has to reduce the recovery time and the impact of a crisis.

- **Intangible/Soft Resources:** This category refers to the extent of knowledge and training that helps reducing the recovery time and mitigating the impact of a crisis.
- **Expected/Real Impacts:** This category refers to the available resources to assess the impact of a crisis and how the impact affects the whole system.

According to the votes given by the experts, the most relevant indicator within each one of the categories was selected. In Table 1 the most relevant indicators selected by the experts are highlighted in bold letters.



**Photo 8: City representatives voting the most significant indicators**



**Photo 9: All the indicators displayed on the wall**

|   |  |
|---|--|
| <p><b>CATEGORY 1: COMMUNITY CULTURE</b></p> <ul style="list-style-type: none"> <li>• <b>Community culture (all in board)</b></li> <li>• Social resilience</li> <li>• Local neighbourhood development inclusion</li> <li>• How many neighbours do you know</li> <li>• Number of stakeholders cooperating</li> <li>• Certified NGO and voluntary involvement</li> <li>• Number of volunteer/Community engagement groups</li> <li>• Integration of stakeholders (number of partnerships)</li> <li>• Contact time with stakeholders</li> <li>• Quality of cooperation (soft variable)</li> <li>• Frequency of exercises with stakeholders</li> <li>• Knowledge exchange</li> <li>• Social resilience</li> </ul> | <p><b>CATEGORY 2: TANGIBLE/HARD RESOURCES</b></p> <ul style="list-style-type: none"> <li>• <b>Response capability (number of policies, arm forces needed, resources and plans available)</b></li> <li>• Sensor</li> <li>• Capital/ resource</li> <li>• Mix of water types</li> <li>• Task group financing (yes/no)</li> <li>• Infrastructure capacity (how flexible the CI is)</li> <li>• Capacity to response (how much time and resources)</li> </ul>  |
| <p><b>CATEGORY 3: INTANGIBLE/SOFT RESOURCES</b></p> <ul style="list-style-type: none"> <li>• <b>Level of reflectiveness or learning (what kind of actors are involved) are there mechanisms for connecting municipality and citizens)</b></li> <li>• Monitoring the resilient culture by HRO “high-reliability organization”</li> <li>• Resilience acknowledging in planning document (yes/no)</li> <li>• City staff training (raising the knowledge)</li> <li>• Events analysed reviewed</li> <li>• Level of education</li> <li>• Trust and awareness</li> <li>• It is very important to have communication to citizens</li> <li>• Reporting and monitoring culture in cities</li> </ul>                   | <p><b>CATEGORY 4: EXPECTED/REAL IMPACTS</b></p> <ul style="list-style-type: none"> <li>• <b>Security of supply (number of disruptive elements, number duplicated sources)</b></li> <li>• Community time and distance</li> <li>• Number of people affected by given crisis</li> <li>• Affordability of utility supplies (price vs income/ % of income on utility costs)<br/>Percentage of income spent in</li> <li>• Stress test critical infrastructure (power supply-30%-50%) (simulating scenarios)</li> <li>• Time for getting time to normal (hours, days)</li> <li>• Air and water quality</li> <li>• Continuity of infrastructure</li> </ul> |

**Table 1: Indicators obtained in Exercise 2**

An explanation of the most voted indicators is given below.

- **Community culture “All in board”** indicator was the most voted indicator for the **“Community culture”** category. This category refers to the importance of involving the different actors of a city such as citizens, NGOs, volunteer organizations, etc. in the resilience building process of a city. Another important aspect that includes this indicator is the development of community culture among the actors of a city.

- **“Response capability”** indicator was the most voted indicator for **“Tangible/Hard resources”** category. This indicator refers to the capability of a system to invest time and resources in order to respond quickly and recover from a crisis.
- **“Level of reflectiveness”** indicator was the most voted indicator for **“Intangible/soft resources”** category. This indicator includes the education, training, as well as awareness and trust of the society. Furthermore, it also involves the learning capacity of the city.
- **“Security of supply”** indicator was the most voted indicator for **“Expected/real impacts”** category. This indicator includes the available resources such as the number of disruptive elements and the number of duplicated sources that allows the infrastructure to continue in case it suffers a crisis.

### Summary of the results

The general conclusion obtained in the second exercise of the Group Model Building session is that the most voted indicators were also the most general ones. On the one hand, the advantage of using these general indicators is that they include different concepts also mentioned in each category. On the other hand, the disadvantage of selecting these general indicators is the difficulty to assess them and to assign them a concrete value.

Therefore, these indicators will need to be particularized for each city and situation in order to be able to implement them more easily in the future.

### THIRD EXERCISE: BEHAVIOUR OVER TIME GRAPHS

The third exercise of the GMB session consisted of presenting the evolution over time of the four indicator categories that were identified in Exercise 2. Furthermore, it was explained that a different colour had to be used in order to plot the evolution of each indicator category.

| CATEGORY                   | INDICATOR                        | COLOR |
|----------------------------|----------------------------------|-------|
| Tangible/Hard Resources    | Response Capability              | Black |
| Intangible /Soft Resources | Reflectiveness and learning      | Green |
| Community Culture          | Community culture “All in board” | Red   |
| Expected/ Real Impacts     | Security of Supply               | Blue  |

**Table 2: Classification of the four indicators chosen**

This third exercise was closely related to Exercise 2. Participants were asked to graph the behaviour over time of the four representative indicators chosen in Exercise 2. The objective of this exercise was to obtain the reference behaviour of the indicators as well as to ask the participants to interpret and discuss the effect that each indicator has into the other indicators. Moreover, in this exercise it was not specified the conditions in which the indicators evolve. This allowed some groups graphing the evolution of the indicators in a best-case while other groups graphed the expected evolution of indicators.

### Methodology

To carry out this exercise participants were divided into the same small groups as before. Each group was provided with a blank panel in which they had to plot the evolution of the indicators. After the groups had time to think and plot the evolution of the indicators, one representative from each group presented their graph in a plenary session.

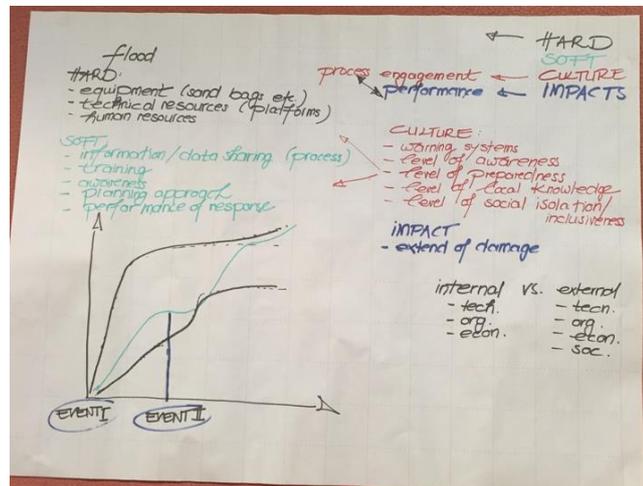


**Photo 10: TECNUN explaining Exercise 3**

### Results

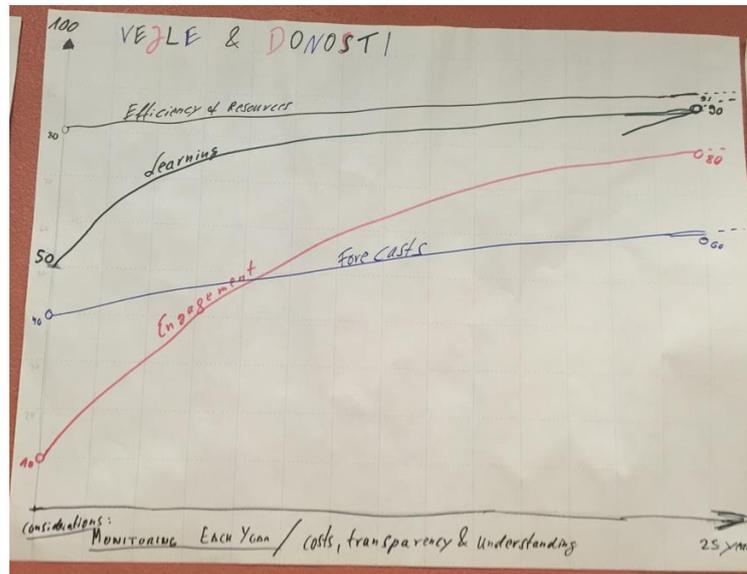
- The first graph was presented by the group formed by Bristol and Riga. To think about the behaviour over time of the indicators, this group first tried to get a better understanding of the meaning of the identified indicator categories. For this group, "community culture" was interpreted as a set of process-related indicators and "impact" indicator as an outcome-related ones. The graph presented by this group represented the evolution of the indicators based on the occurrence of an event (such as a flood). Due to the occurrence of this event, indicator "reflectiveness and learning" increased. Afterwards the group assumed that a second event

would occur and as a result of this event, the “reflectiveness and learning” indicator would improve even more. As a consequence of the occurrence of the events “security of supply” and “response capability” indicators would also increase.



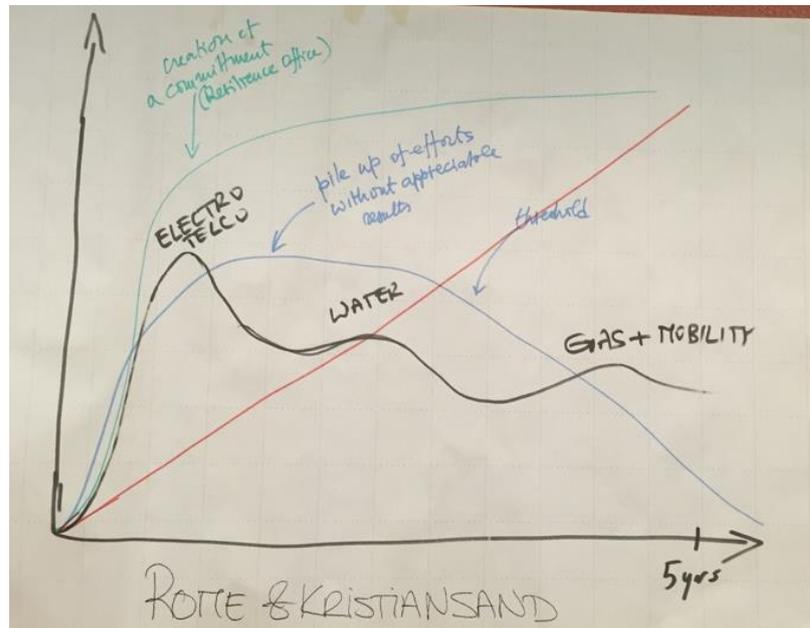
**Photo 11: Results of Exercise 3 obtained by city representatives from Bristol and Riga**

- The second graph was presented by the group formed by the experts from Vejle and Donostia. This group presented the expected evolution of indicators. This group considered that each indicator measures the percentage of the fulfilment of an expectation. Ideally, these expectations require to be accomplished at a 100%. However, in reality this is not feasible. Therefore this group explained how the fulfilment level of these indicators could be increased starting from now in 25 years' time. The first indicator “reflectiveness and learning”, plotted in green, has currently a 50% of fulfilment level. However, it could potentially be improved until reaching a 90% fulfilment level in case efforts are invested. The second indicator “Response capabilities”, plotted in black has currently a 50% of fulfilment level. Even if it is decided to invest time and efforts to improve it this improvement has a limitation. This indicator could eventually reach to a maximum of a 90% fulfilment level. The third indicator “Community engagement”, plotted in red, currently has a fulfilment level of a low 10% and could eventually get improved until reaching a 80% of fulfilment level. The fourth indicator “security of supply”, plotted in blue they found it difficult to improve the fulfilment level of this indicator. Its current fulfilment level is of a 40% and it is expected to improve just to reach a maximum of a 60% of fulfilment level. Moreover, the group also commented that the amount of events we could forecast, particularly over a long period of time, is limited. That is why the maximum fulfilment level is low (60%). They also said that the behaviour of “community engagement” and “reflectiveness and learning” indicators follow a similar curve.



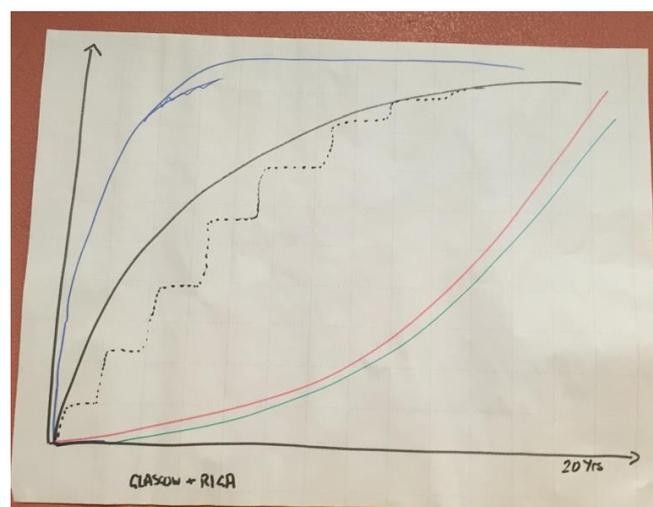
**Photo 12: Results of Exercise 3 obtained by city representatives from Vejle and Donostia**

- The third graph was presented by the group formed by the experts from Kristiansand and Rome. This group presented the expected evolution of the indicators and not the evolution in a best case. They explained how all the indicators will react if an important investment is done in the “level of reflectiveness” indicator. They defined “level of reflectiveness” as the capability of the government to deal with the problem of resilience. Therefore, they explained how investing efforts in creating a resilience office could eventually have a positive effect in the rest of the indicators. For instance, at the beginning this office will make a lot of effort to increase the “security of supply” indicator. For this group the curve of “security of supply” is referring to the number of disruptive events that occur over time in CIs. As time goes by the investment made in creating a pro-resilient culture will reduce the amount of events that affect the CIs. The red one “community engagement” is very important for them because this indicator is important to improve the resilience and its global quality. For them, this indicator increases linearly over time. In terms of the black indicator that refers to the “response capability”, they said that all CIs need to improve their response capability to deal with crises at the same time. For instance, electrical and telecommunication CIs should improve at the same time. Otherwise, cascading effects could take place.



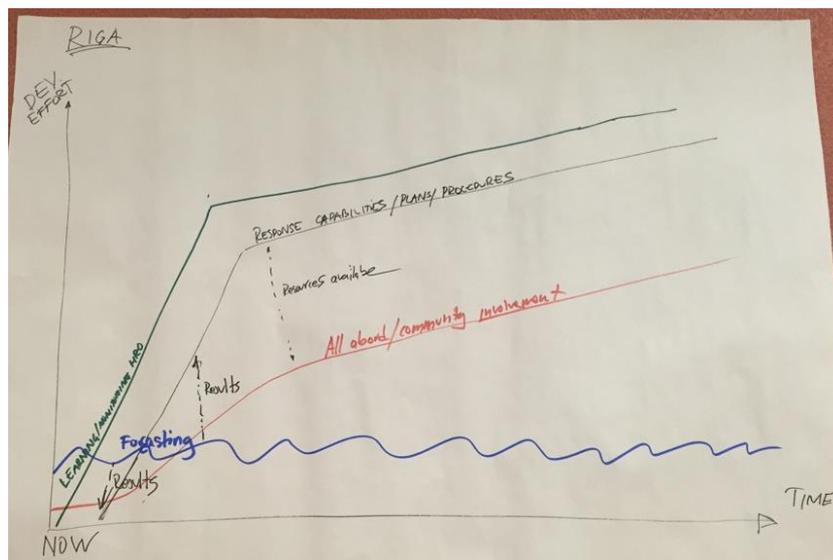
**Photo 13: Results of Exercise 3 obtained by city representatives from Rome and Kristiansand**

- The fourth graph was presented by the group formed by the experts from Glasgow and Riga. This group presented the evolution of indicators for a best case. For this group, the increase of “response capability” and “security and supply” indicators was higher at the beginning and at one point they stabilised. On the other hand, the increase of “learning and reflectiveness” and “community culture” indicators was slower at the beginning but they increased exponentially over time. To be resilient these indicators take time to develop at the beginning but once they have begun to be embedded, they will exponentially increase.



**Photo 14: Results of Exercise 3 obtained by city representatives from Glasgow and Riga**

- The fifth graph was presented by the group formed by the experts from Riga. This group presented the evolution of the indicators for a best case. For this group “learning and reflectiveness” indicator was the first influencer. This group considered that the increase of this indicator will led to the increase of “response capability” and “community culture” indicators. “Security and supply” indicator does not increase nor decrease over time, it more or less remains constant. In their opinion, being prepared against unexpected events is not something we can control.



**Photo 15: Results of Exercise 3 obtained by city representatives from Riga**

### Summary of the results

As it was expected from the third exercise, the cities proposed different paths on the way to improve their resilience based on the defined four indicators. This confirms our hypothesis that there is not a unique pathway to achieve resilience and therefore, each city has to follow a different path according to its specific circumstances.

Furthermore, this exercises served us to confirm the complexity of the concept of resilience and the need to develop resilience from a variety of approaches in a simultaneous and complementary way. During the Group Model Building Session, four different categories that need to be taken into account to improve the resilience of cities were identified.

As mentioned above, these categories are community culture, tangible/Hard resources, Intangible/soft resources and expected/real outcomes. On the one hand, resilience needs to be developed taking into account the importance of fostering community culture and involving the different agents that make a city function. Furthermore, intangible/soft resources include vital aspects such as training, awareness,

reflectiveness that need to be developed by the agents of a city to achieve the city resilience. On the other hand, for achieving resilience, expected/real impacts also need to be taken into account. Expected/real impacts include the available resources, the security of supplies and the number of duplicated resources that allow cities to function in crisis situations. Finally, tangible/hard resources such as the capacity of the system to invest time and resources are essential requirements to improve the resilience of the cities and enable them to recover from crises.

## GROUP EXPLORER SESSION (28<sup>TH</sup> OF OCTOBER)

### INTRODUCTION: TOWARDS INFORMING THE SYSTEMIC RISK QUESTIONNAIRE

The Group Explorer session was run by the University of Strathclyde and it took place on the 28<sup>th</sup> of October 2015. The attendees included sixteen participants from seven partner cities, and a number of observers from partner institutions (most of the non-city partners were contributing during that time to the parallel activities taking place in other rooms of the Riga City Council). **The aim of the session was to gather information for the Systemic Risk Questionnaire (SRQ)** falling under Work Package 3 (WP3). The development of SRQ draws on the findings obtained from a series of planned WP2 workshops, and its **focus is placed on the systemic interdependence between risks**. Consequently, on the second day of exercises of the workshop in Riga, the facilitators were particularly interested in investigating **complex ramifications of events, portfolios of risks, stakeholder responses, and feedback loops between risks**. These concepts were explored in the context of the workshop's main agenda, i.e. the resilience of cities with respect to Critical Infrastructure (CI).

Furthermore, prior to Group Explorer Session, the facilitators from the University of Strathclyde used their experiences of attending the exercises of the Group Model Building session to modify their pre-prepared script. This allowed elaboration of the participants' CI-related stories and ideas, which they had shared during the first day's activities. More specifically, a number of observations were taken in terms of what topic areas could have been covered to a larger extent on the Group Explorer session.

- Stronger emphasis on CI rather than discussing the topics *related to* CI (which in many ways appears inevitable due to interconnectedness of risks).
- Talk about things that did not go well rather than ground the discussion in *good* stories.
- Consider future problematic events and scenarios, and their impact on resilience.
- Think about priorities and resource constraints in terms of becoming a more resilient city.

As a result, a number of objectives for the day were presented to the participants (Figure 1).

### Objective today

- Elaboration of yesterday, but with focus on the responses of stakeholders
  - Through construction of 'model' of systemicity in real time and on the screen
- (1) Systemic reactions to example events from yesterday
  - Based on i) experience, and ii) possibilities in a changing world
  - Impact assessment (consensus?)
- (2) Role of an event elsewhere in your country (eg flooding implications for Bristol)
- (3) Systemic reactions to a EU wide event

And for each: What organisational structure/ systems/ policies might need to be in place to "prevent/ absorb/ recover from/ learn from these consequences?

- Are risk ramifications dependent on typology of events?
- Are risk ramifications dependent on typology of city? Eg heritage (sewage systems)
- Recurring themes?

**Figure 1: Objectives for day 2 – a slide from the workshop**

**Methodology: The 'Group Explorer' approach**

In the Group Explorer Session a computerised group decision support system, *Group Explorer* (GE), was used to support the facilitation process. Following this approach, the representatives from seven cities were asked to form city pairs. As an exception to this rule the city of Riga, being hosts of the workshop, were allowed to form two city pairs (Photo 16). The eight city pairs (hence 16 participants in total) were seated in small tables with a laptop computer allocated to each pair. Participants were also instructed that they would use their laptops to enter brief statements so that they could express what they thought in relation to a given problem or question. Furthermore, they were also encouraged to link the statements thus forming a sense of causality (as in 'A' leads to 'B'). While participants were able to type their contributions in real-time, the emerging causal map was being continuously projected onto a public screen, thereby becoming a *transitional object* and a point of reference for group discussion. This entire process was facilitated in order to meet the objectives of the session, and so that the participants could focus their attention on various questions of possibly high relevance at different stages of the workshop.



Photo 16: The Group Explorer session

## EXERCISES: BUILDING A SHARED CAUSAL MAP

### Example of a causal map – looking back to the first day of exercises

Once the participants were introduced to the objectives of the session and to the process, which would be undertaken, the facilitators projected on the public screen a simple causal map depicting a risk event of a violent storm which was an event that was discussed during the first day of exercises of the workshop. The reason for this was to familiarize the participants with causal mapping. This was also used to remind the participants that it was important to focus on the ramifications of the discussed risks, as well as on the possible policies which could help in their prevention, absorption, and recovery by the cities.

### Gathering statements: city overwhelmed by protestors

During the first stage of the Group Explorer Session, participants were asked to imagine a scenario in which their city was suddenly overwhelmed by a massive influx of protestors across all age ranges. With respect to this scenario, the participants were asked to consider: i) What other CI events follow, and then subsequently ii) how do organisations (businesses, voluntary groups, media, public, communities) respond?

By the first coffee break, i.e. after 30min of adding contributions, the participants created the initial causal map consisting of 63 statements and 80 links. At this stage, three ramifications appeared the most central to the map: risk of violent riots, vandalism on CIs, and mobile communication network being overwhelmed. Those three statements were therefore explored more deeply using separate views (one can imagine the views being similar to opening different tabs in a Web browser). The participants were given a printout of each key *theme* as a form of accomplishment, to make it easier to follow the map, and to provide further *food for thought*.

Rating activity: the impact of busy statements on the city

Participants were then asked to engage in a voting activity with regard to the statements on the map, which appeared to be particularly *busy* (i.e. these were statements with many links and hence they were strongly connected to other parts of the map). Thus the participants were asked to rate the impact of those potentially significant statements on their respective cities (Table 3). Each statement could be rated with a score from 0 impact to 100 impact and at least one statement should be allocated a score of 0 and one statement a score of 100. The results of the exercise suggested that the statements with the strongest impact were: city affected by violent riots, mobile communication network overwhelmed, and public and private transport not able to function. The lowest scores were allocated to: closed shops and stores, and electrical network overwhelmed with respect to faults and outages.

| First rating activity: Rate the impact of the statements on your city | Average | St dev |
|---|---------|--------|
| 2 insufficient room for that many people                              | 61      | 37     |
| 4 everything will be blocked  | 66      | 35     |
| 11 city affected by violent riots                                     | 68      | 29     |
| 12 mobile communication   | 78      | 25     |
| 19 hospitals and emergency medical aid struggling with workload       | 54      | 32     |
| 21 CIs vandalised   | 54      | 33     |
| 29 public transport and private transport not able to function        | 76      | 24     |
| 32 closed shops and stores  | 39      | 27     |
| 35 electrical network overwhelmed with respect to faults or outages   | 39      | 36     |
| 39 collapse of use SMS, social media                                  | 65      | 31     |

**Table 3: Rating activity**

\*The highest average scores are highlighted in green colour, and the lowest average scores are highlighted in orange colour. The numbers before statements refer to the order in which they were added on the map.

*Developing the map: focusing on ramifications and policies*

As participants were getting used to the process, the pace of their their contributions seemed to accelerate. Before going for lunch, their shared causal map had grown to 161 statements and 233 links. This helped identifying more complex networks of ramifications stemming from the discussed event. Moreover, participants created new “busy” statements with many causal links around them: public transport and private transport not able to function, electrical network fails with respect to faults or outages, impact on business infrastructure, and collapse of use of SMS and social media. Those statements represented negative impacts on the city, i.e. undesirable consequences to which the city had to respond to.

Another type of statements which could be identified were policy statements. While the impact statements could be seen as the consequences of the discussed event, policies referred to the actions that the city would take to counteract those negative ramifications. Examples of policies that were gathered from participants included: quick reaction of politicians, strong city brand, mobilizing garbage collectors for rapidly restoring urban decor, emergency food distribution plan, and understand the reasons for the violent riots. Out of those policies, the politicians’ reaction could be seen as a very busy statement with many links around it – thus signifying its possible potency in addressing the negative impacts.

**Preferencing activities: prioritising things that can be done to improve resilience**

After the group returned from lunch break, two preferencing activities were performed (but not immediately one after another). For the preferencing activity the participants were given digital dots which they would use to prioritise the given statements (Tables 4 and 5). Participants were asked to express their preference in terms of the viability of different policies which had been voiced on the map. Two types of digital dots were allocated to the participants; green dots meant that ‘we could do this and it would be a priority’ – thus signifying policies which should be considered in the near future or as soon as possible. Meanwhile the meaning of red dots was that ‘it may be a good idea, but it is too problematic or politically infeasible’ – and so the participants would use them to mark policies which in their understanding had little priority.

The highest priority was given to: mobilise police forces, identify rendezvous points, and use public building school libraries as temporary shelters. Meanwhile the biggest number of red dots was given to: the police will activate the total defence organization, and emergency services deliberately close down communication channels. These policies were causally linked with the following negative impacts: mobile

communication network overwhelmed, electrical network overwhelmed, and social media populated with false information.

| First preferencing activity  | Green | Red |
|--|-------|-----|
| Dark green= we could do this, and it would be a priority   |       |     |
| Red= maybe a good idea, but too problematic or politically infeasible                            |       |     |
| 38 mobilise police forces  | 7G    |     |
| 45 the police will activate the total defence organisation                                       | 2G    | 5R  |
| 46 identify rendezvous points-crowd control  | 7G    |     |
| 72 set a reliable information channel  | 5G    | 2R  |
| 74 call volunteers for support   | 4G    | 3R  |
| 81 establish distribution channels   | 3G    |     |
| 84 use a car with a loudspeaker  | 1G    | 2R  |
| 87 emergency services deliberately close down communication channels to prevent organizing riots | 1G    | 6R  |
| 89 revert to old school communications   | 3G    | 3R  |
| 92 bring in enough generators to supply energy   | 3G    | 3R  |
| 94 enforce call centres  | 3G    | 1R  |
| 103 use public buildings school libraries as temporary shelters                                  | 7G    | 1R  |

**Table 4: First preferencing activity - prioritising policies**

| Second preferencing activity   | Green | Red |
|--|-------|-----|
| 146 show strong leadership commanding trust and giving impression of control | 10G   | 5R  |
| 148 assign strong police force to control the riots                          | 12G   |     |
| 149 politicians react quickly  | 9G    | 2R  |
| 150 implement emergency food distribution plan                               | 3G    | 2R  |
| 151 understand the reasons for the violent riots                             | 3G    | 3R  |
| 152 build a strong city brand  | 4G    |     |
| 153 support businesses to protect properties and staff                       | 6G    | 2R  |
| 154 deploy additional resources to protect local infrastructure              | 7G    | 1R  |
| 155 put a strong positive spin (communications/ media policy)                | 7G    | 1R  |
| 156 empower governance politically   | 1G    | 2R  |
| 157 local figure/celebrity to motivate and inspire confidence                | 5G    | 3R  |
| 158 ensure unified multi-agency media response                               | 12G   | 1R  |
| 159 mobilize garbage collectors for rapidly restoring urban decor            | 10G   |     |

|  |    |    |
|--|----|----|
| 162 establish negotiations with the leaders of the riots | 3G | 3R |
| 163 conduct staff training policies for emergencies      | 6G |    |
| 164 ask army for help                                    | 3G | 3R |
| 165 prepare Business Continuity plans                    | 9G | 1R |
| 167 deploy Mobile Electrical Generators on MT lines      | 4G |    |

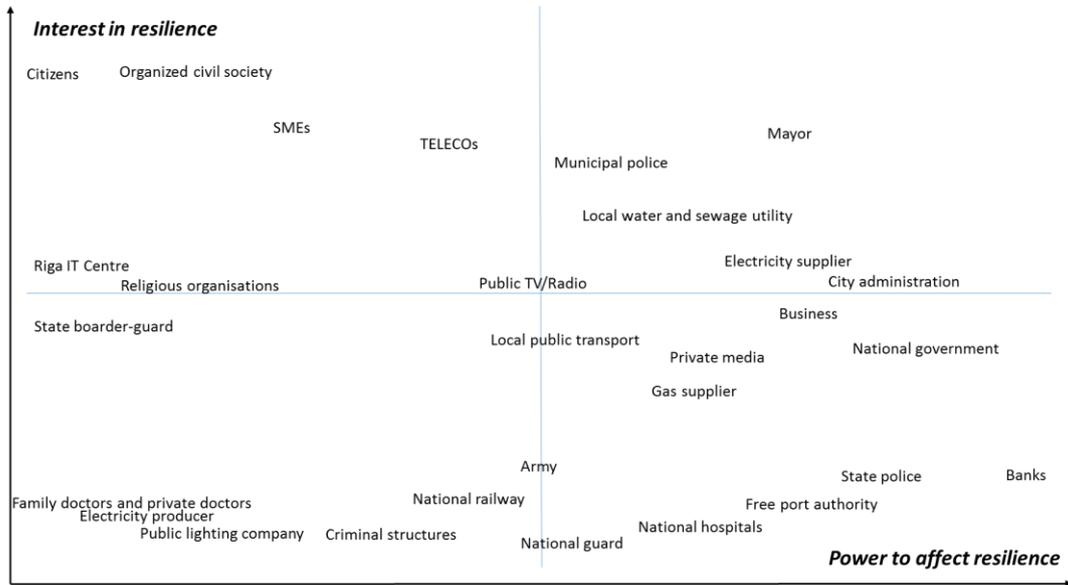
**Table 5: Second preferencing activity – prioritising policies**

\* Statements with the highest number of green dots are highlighted in green colour, and the statements with the highest number of red dots are highlighted in orange colour. The numbers before statements refer to the order in which they were added on the map.

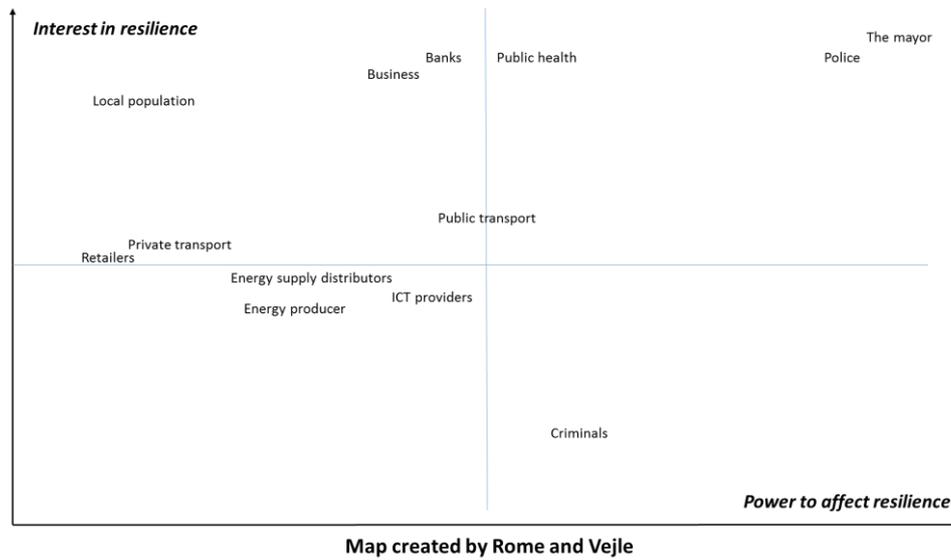
The second preferencing activity included a different set of policies covering statements which were added later in the session, and which were mainly addressing the negative impacts of violent riots, city reputation being damaged, and business infrastructure under pressure. For this activity the highest priority was assigned to these policies: show strong leadership, assign strong police force to control the riots, politicians react quickly, deploy additional resources to protect local infrastructure, put a strong positive spin (communication and media policy), ensure unified multi-agency media response, mobilize garbage collectors for rapidly restoring urban decor, and prepare business continuity plans. In terms of red dots, in the second activity, the biggest number of dots was allocated to: show strong leadership, understand the reason for violent riots, establish negotiations with the leaders of the riots, and ask army for help.

Stakeholder mapping exercise: what parties it takes to develop resilience

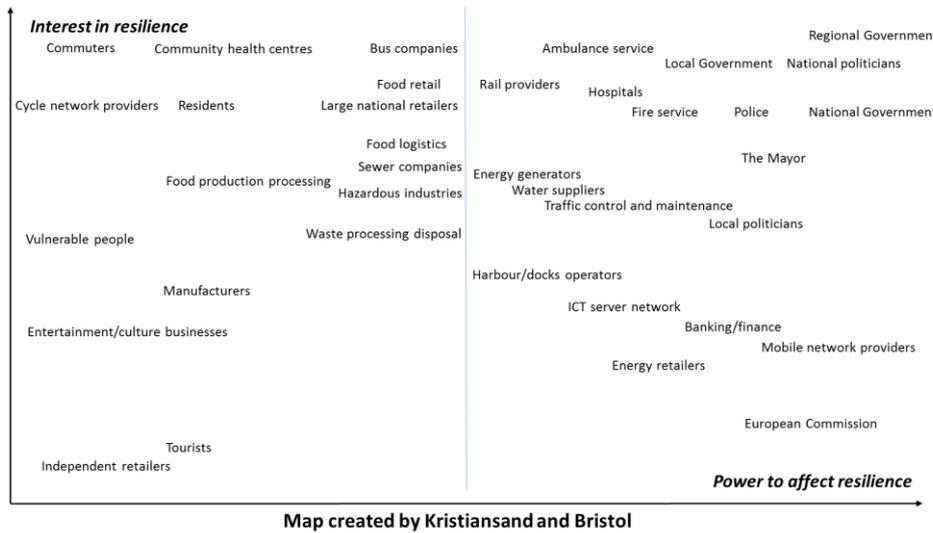
During the second half of the Group Explorer Session, a stakeholder mapping exercise was undertaken. Two city pairs were joined (with an exception of Riga who already had two pairs) to form four groups and each group worked on large sheets of paper rather than on the laptop computers. Each group was asked to consider the importance of different key people/organisations which can be essential for becoming a resilient city. The facilitators asked the groups to use their sheets of paper to map relevant stakeholders in terms of their interest and power in developing city resilience (Figures 2, 3, 4, 5). Of particular interest was the upper right quadrant of the stakeholder maps where the participants include stakeholders holding both high power and high interest. While there was some variance in terms of the different groups’ results, the groups found a fair level of agreement with regard to positioning in that key quadrant the city mayor, police, energy/water suppliers, and public healthcare providers.



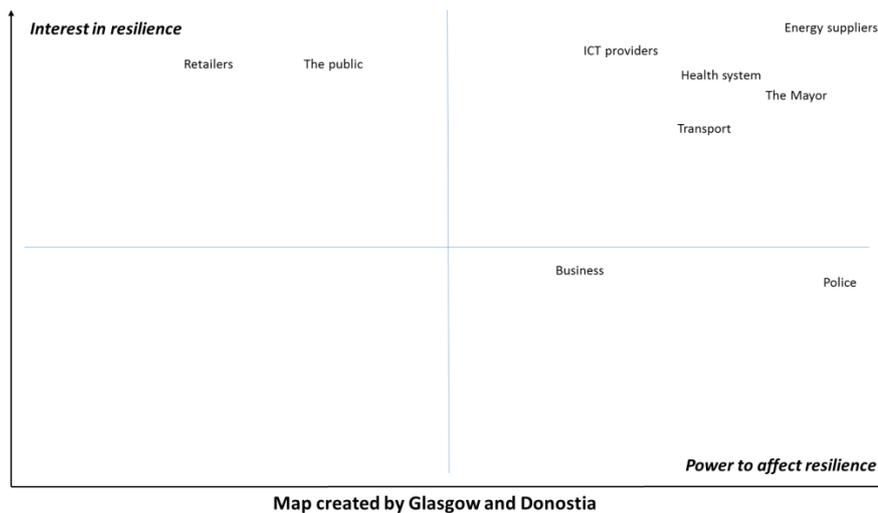
**Figure 2: Stakeholder map - Riga**



**Figure 3: Stakeholder map – Rome and Vejle**



**Figure 4: Stakeholder map – Kristiansand and Bristol**



**Figure 5: Stakeholder map – Glasgow and Donostia**

Finalising the map: thinking about resilience in the EU context

After completing the stakeholder exercise, the city members were invited back to the room for a final hour of the workshop and were presented with a new scenario. Whilst the previous scenario had considered events at the city level, participants were now asked to consider an EU-wide event. Participants should now consider the implications of ‘a significantly increasing migration of refugees to the EU’. In one hour, the city members co-created a map consisting of 59 statements and 92 links. The key themes in this EU-level map included: the integrity of European Union threatened, xenophobe political group/parties being empowered, and experiencing language barriers. Moreover, some of the suggested policies for countering those impacts included: involve the refugees in finding the solutions, set

up a good system for volunteers to assist in the integration process, and implement national/international political strategies. As a result, by the time the workshop ended, the city-level map and the EU-level map combined consisted in total of 195 statements and 331 causal links which were subsequently further analysed by the University of Strathclyde.

### **Results: analysing the findings**

#### **Tidying the shared causal map**

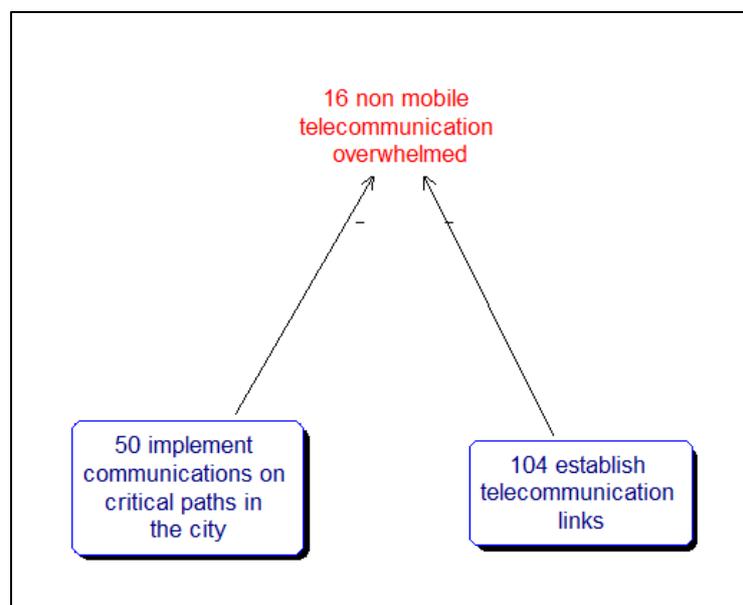
The analysis of findings from the Group Explorer session began with tidying the shared causal map. This included correcting statements with spelling mistakes and merging synonymous statements. Some of the statements were also rephrased without changing their meaning, but with the purpose of emphasising their intended role in the map. Thus, policies were rephrased so that they included a verb – this helped to stress their actionable character in countering negative impacts. In addition the impacts were rephrased as consequences with an evaluative word so that they could better express their negative impact on the city (e.g. ‘impact on electricity’ gets changed to ‘electricity supply overwhelmed’ depending on what was intended based on reading the map’s context). Furthermore, some statements had been originally phrased as questions which were adding little value to the map and hence they were broken down into actionable statements (e.g. question ‘will all protesters congregate in one city?’ was changed to a policy ‘find out whether the protestors congregate in one area of the city’).

#### **Categorising statements**

The process of analysis then continued with categorising statements from the causal map. In the workshop much attention was dedicated to possible ramifications of events and to policies that could be implemented to address negative impacts. Those types of statements were allocated into separate categories, which on the map could be distinguished by different font colours (Table 6) – that helped in following the networks of interactions between statements, and effectively it could support managing and understanding the complexity of the map. For example, by categorising statements it became easier to see how policies can causally *link into* ramifications, thereby addressing their negative impact (Figure 6).

|   |  |
|---|--|
| <b>Starter question:</b> opening questions for the discussed scenarios.                                     | 1 City overwhelmed unexpectedly by a massive (1m) influx of protestors across all age ranges |
| <b>Impact:</b> negative ramifications of risk events affecting the city.                                    | 33 normal city functioning affected  |
| <b>Proactive policies:</b> actions which the cities can take to counteract negative impacts of risk events. | 104 establish telecommunication links  |
| <b>Ramified policies:</b> policies which implementation is triggered by ramifications of risk events.       | 17 activate the crisis management organisation   |
| <b>Uncontrol:</b> anything of potential relevance over which the city has no control.                       | 191 identification of 'real refugees' at the EU border                                       |

**Table 6: Categories of statements from the session**



**Figure 6: Policies counteracting a ramification of an event**

\*Small minus signs next to the arrows mean that the action leads to another statement *not* happening. If there was no minus sign then the link would mean *leads to*.

During the analysis it was decided to break down policy statements into two separate categories. *Proactive policies* were policies that had been prepared to be implemented in the case of possible risk events and their ramifications. In contrast, *ramified policies* referred to situations where it was the

negative impact that drove the policy and not the other way round. Thus ramified policies differed from proactive policies in that they appeared to be less grounded in gradual preparation for resilience, but instead they were strongly reactive to the ongoing crisis and hence possibly rushed. Additionally, *uncontrol* category was included which referred to events that were uncontrollable by any decision maker with regards to the given scenario, e.g. identification of *real refugees* at the EU border was considered as something beyond the power of the cities.

In the shared causal map there could also be observed situations in which statements were closed in loops of dynamic interactions. For those situations links were colour coded in a similar way to categorisation of statements: green and pink links signified causal links which were parts of a loop, with pink links meaning positive relationships *leads to* and green links meaning negative relationships *does not lead to* (the same way as in non-loop links the minus signs next to the arrows meant negative relationships *does not lead to*). The main purpose of colour coding the loop links was to make it easier to spot similar loops across different parts of the map. For example in Figure 7 there is a simple loop where *city affected by violent riots* leads to *Critical Infrastructure being vandalised* (pink link: positive relationship), which leads to *ask army for help* (pink link again), which in turns leads back to *city not affected by violent riots* (green link: negative relationship).

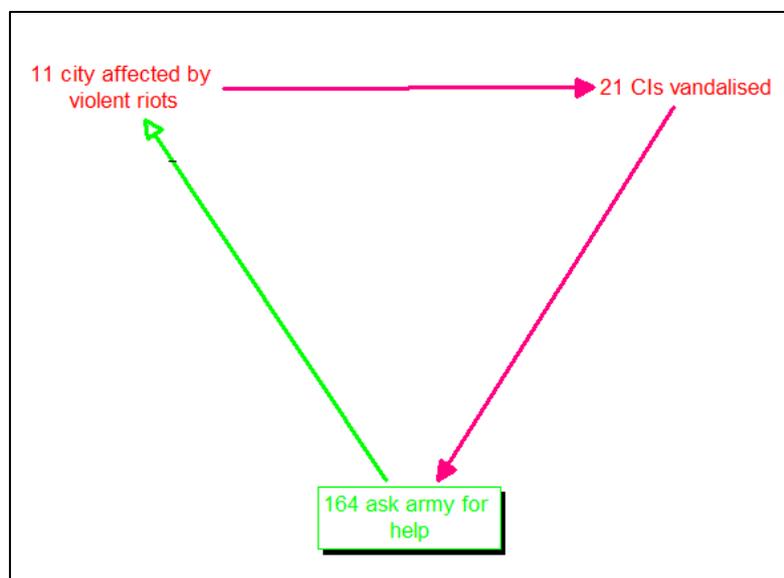


Figure 7: Example of a loop

Key themes and policies

After tidying the map and categorising statements, an important stage in the analysis was to identify key themes and corresponding policies stemming from the session. Such themes were of interest because they were able to potentially represent at a general cross-city level what types of ramifications Critical

Infrastructure (CI) could be exposed to, and what sort of actions could be taken to improve the cities' resilience in that respect.

A mixture of analytical functions of Decision Explorer<sup>1</sup> software were used in identifying key themes and interesting patterns. *Cluster analysis* was used to identify closely connected parts of the map. *Central analysis* ranked the statements in terms of their busyness, i.e. the extent of their impact on the map through networks of causal links. *Domain analysis* ranked the statements by the number of immediate in/out links. *Loop analysis* identified those areas on the map which were subject to self-reinforcing dynamics thus forming closed loops.

Consequently, 16 key themes were identified all of which were clustered around impact statements:

- City affected by violent riots
- Mobile communication network overwhelmed
- Non mobile telecommunication overwhelmed
- Public transport and private transport not able to function
- Electrical network overwhelmed with respect to faults or outages
- Traditional and social media populated with false information
- Business infrastructure under pressure
- The number of calls about loved ones safety increased
- Crowd death and serious injury
- City reputation severely damaged
- Health services under huge pressures
- Cities affected by large increases of garbage
- Shops and stores looted
- EU faced with political tension regarding willingness to help
- Xenophobe political groups/parties being empowered
- The integrity of European Union threatened

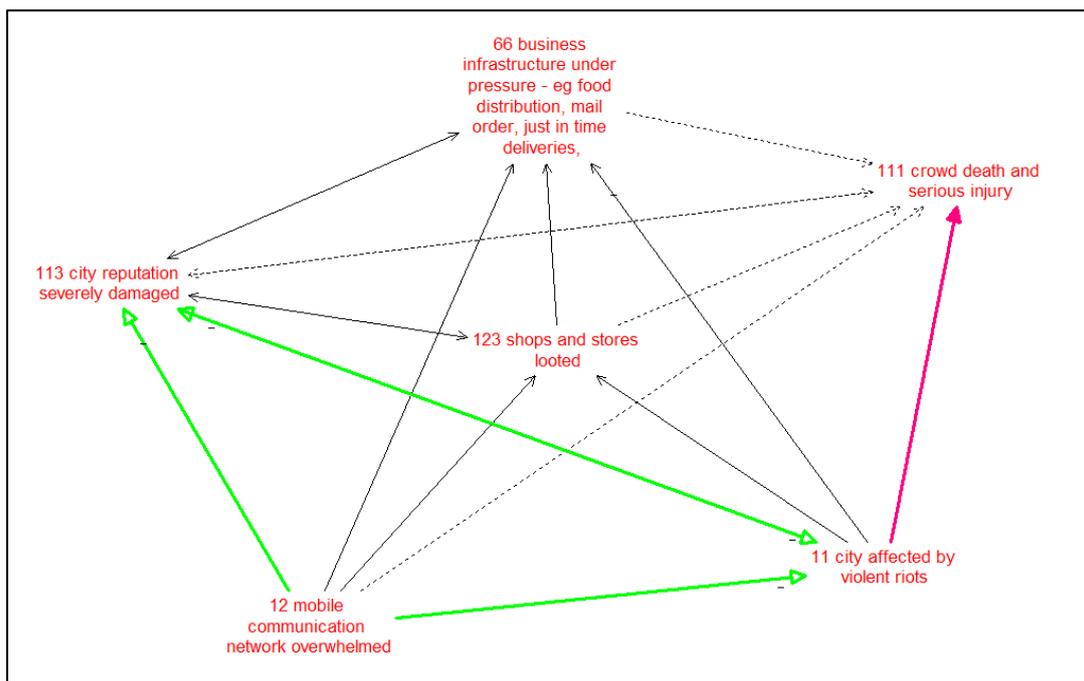
The listed themes are linked to each other through complex networks of causal links. By comparing those themes, various observations can be made in terms of systemicity of ramifications, the need for developing more policies for the respective ramifications, and which ramifications should be addresses as a matter of priority considering how ramifications affect each other.

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<sup>1</sup> *Decision Explorer* is a causal mapping software which is a part of Group Explorer system.

For example, the key themes (from the list of 16 themes provided) which are most connected to other key themes through the network of ramifications are: city affected by violent riots (12 connections), business infrastructure under pressure (11 connections), and public transport and private transport not able to function (9 connections). Furthermore, some themes are connected with other themes only through links directed *into them* rather than *out of them*: city reputation severely damaged (5 connections, all of which are *in links*), or the integrity of European Union threatened (8 connections, all of which are *in links*). In addition to this, some themes are supported by a much larger number of policies than other themes: city reputation severely damaged (11 policies), city affected by violent riots (8 policies), crowd death and serious injury (2 policies all of which are ramified policies), and xenophobe political groups/parties being empowered (0 policies).

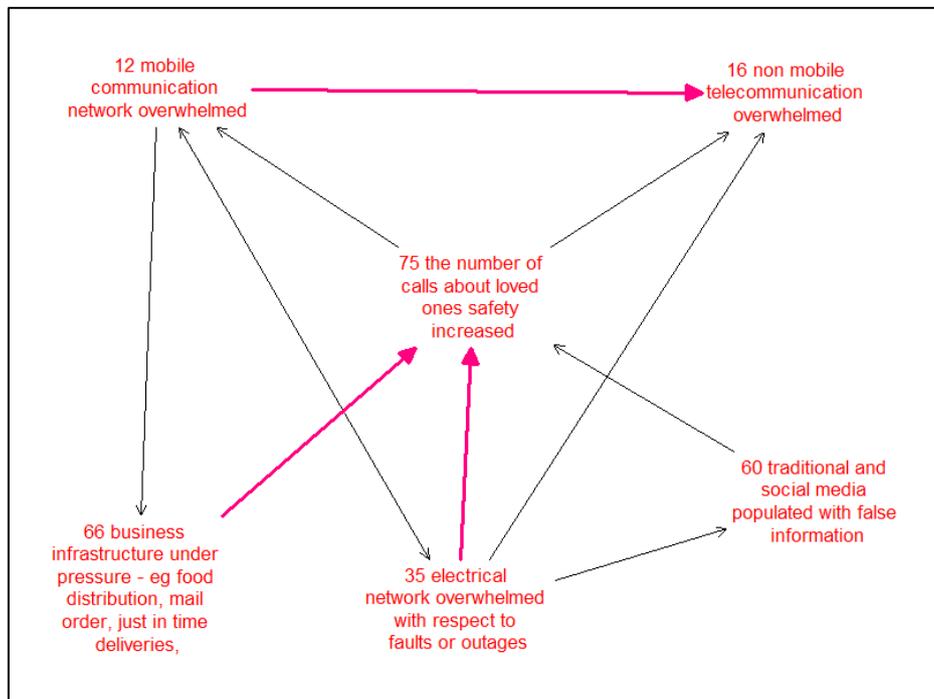
In Figures 8, 9, 10 the simplified interactions between key themes are depicted in causal maps. They are simplified in the sense that the more detailed statements and links between key themes are hidden from the views so that it is easier to focus on their direct relationships. The meaning of some of those relationships is elaborated in the following discussion.



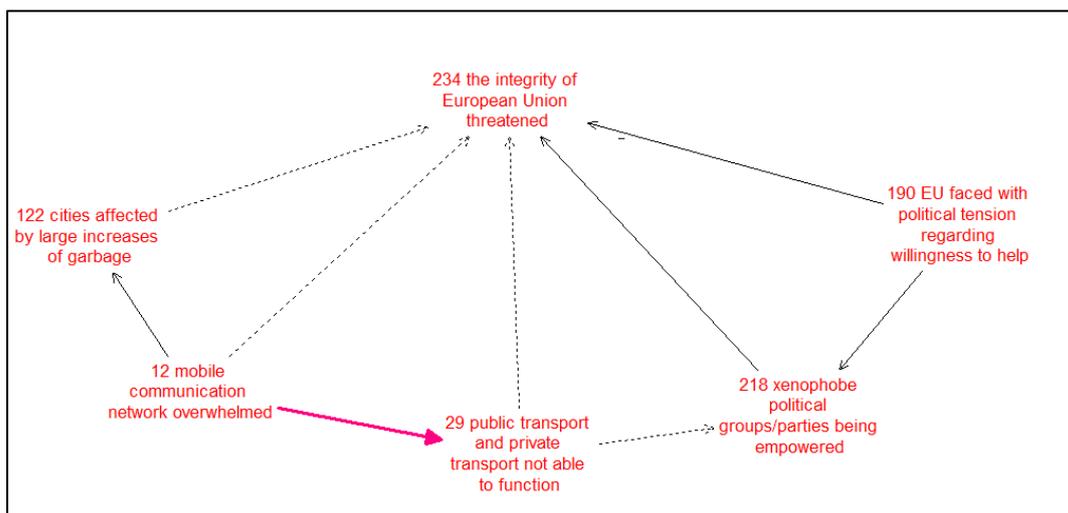
**Figure 8: Interactions between key themes – view 1**

\*Pink and green arrows signify links which are parts of closed loops that extend beyond this view (see Figure 7). Minus signs next to arrows signify negative relationship *leads not to*. Dashed arrows signify links that were added by the researchers at the analysis stage based on the map’s context. The numbers before

statements signify the order in which they were added to the map. For the description of styles used for statements (i.e. font colours, borders) go back to Table 6.



**Figure 9: Interactions between key themes – view 2**

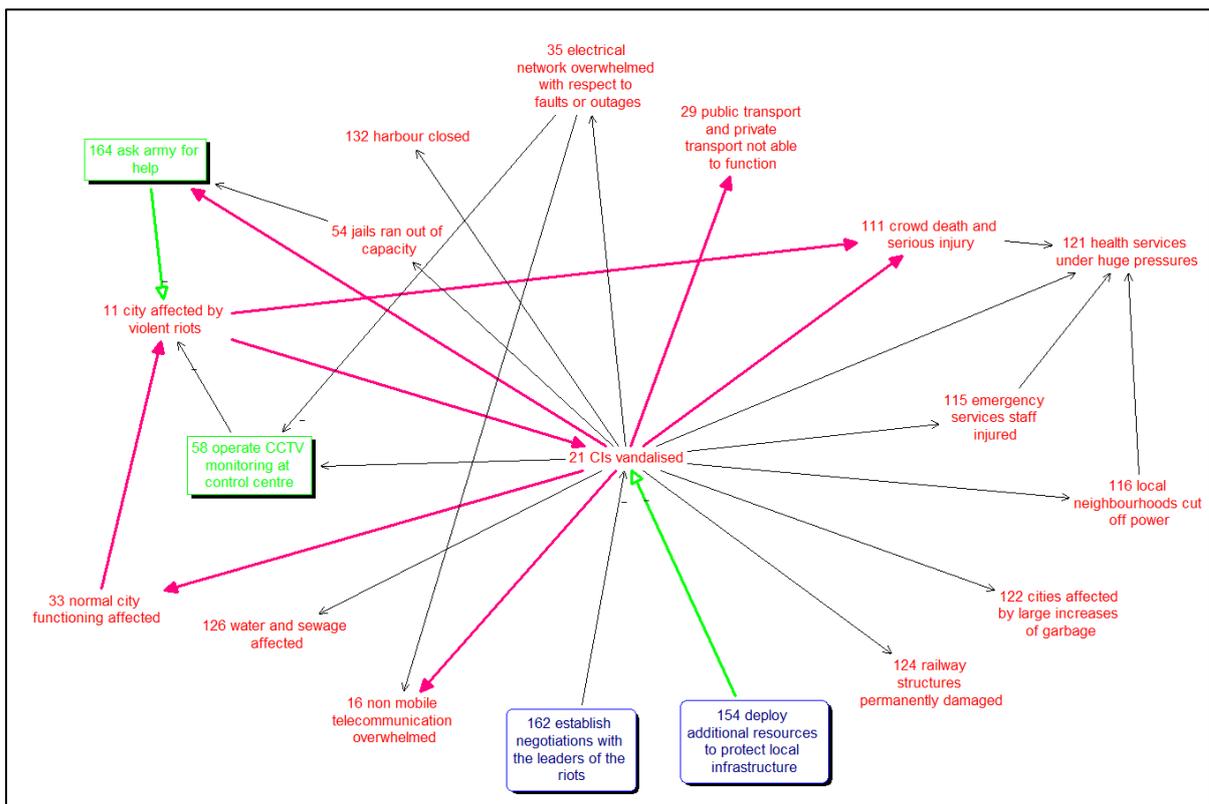


**Figure 10: Interactions between key themes – view 3**

*Inspecting causal maps*

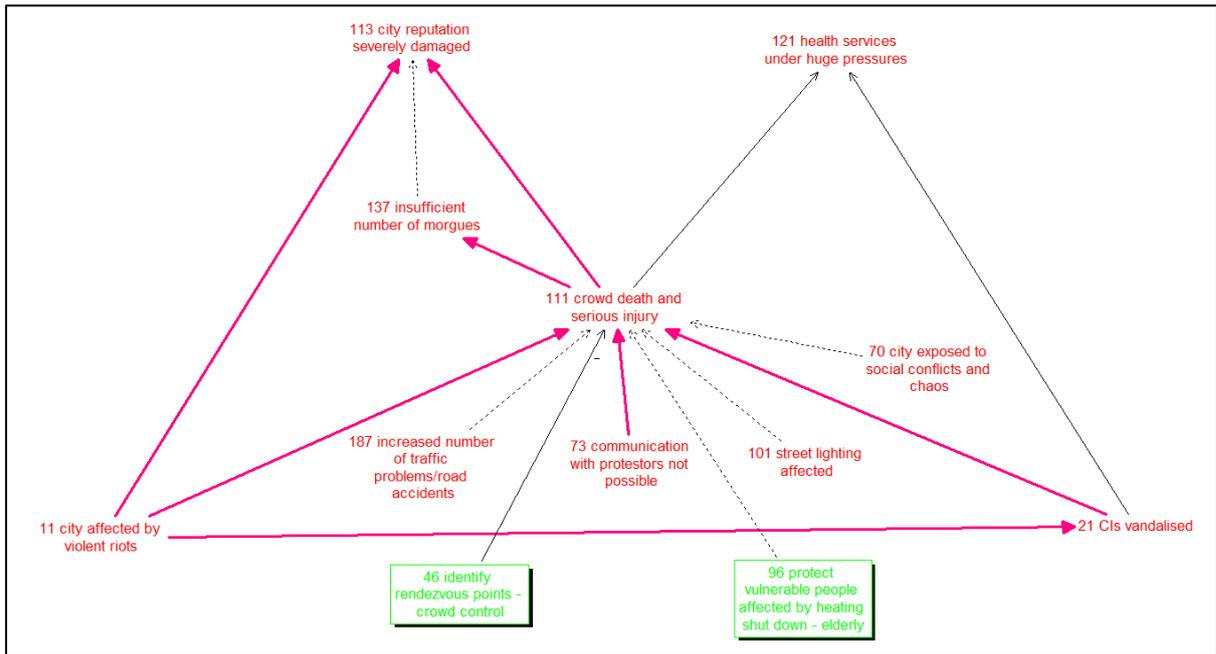
The discussed findings can also be explored visually by inspecting the causal maps which were co-produced by participants – these map provide a useful representation of systemicity of risks and their ramifications. In Figure 11 there can be seen one of the key themes which describe Critical Infrastructure

(CI) being vandalised. An interesting observation is that statement *CIs vandalised* has a very high number of links going out of it (15 out links), meaning that it leads to an array of ramifications which can be followed on the map. Furthermore, two of the four policies are ramified policies (green font - ask army for help, operate CCTV), i.e. policies that are suddenly triggered by a negative impact rather than be gradually prepared in advance. Thus, given this picture one might consider whether the ramified policies could be integrated into a more coherent and intentional resilience strategy, and also if any further relevant policies could be suggested.



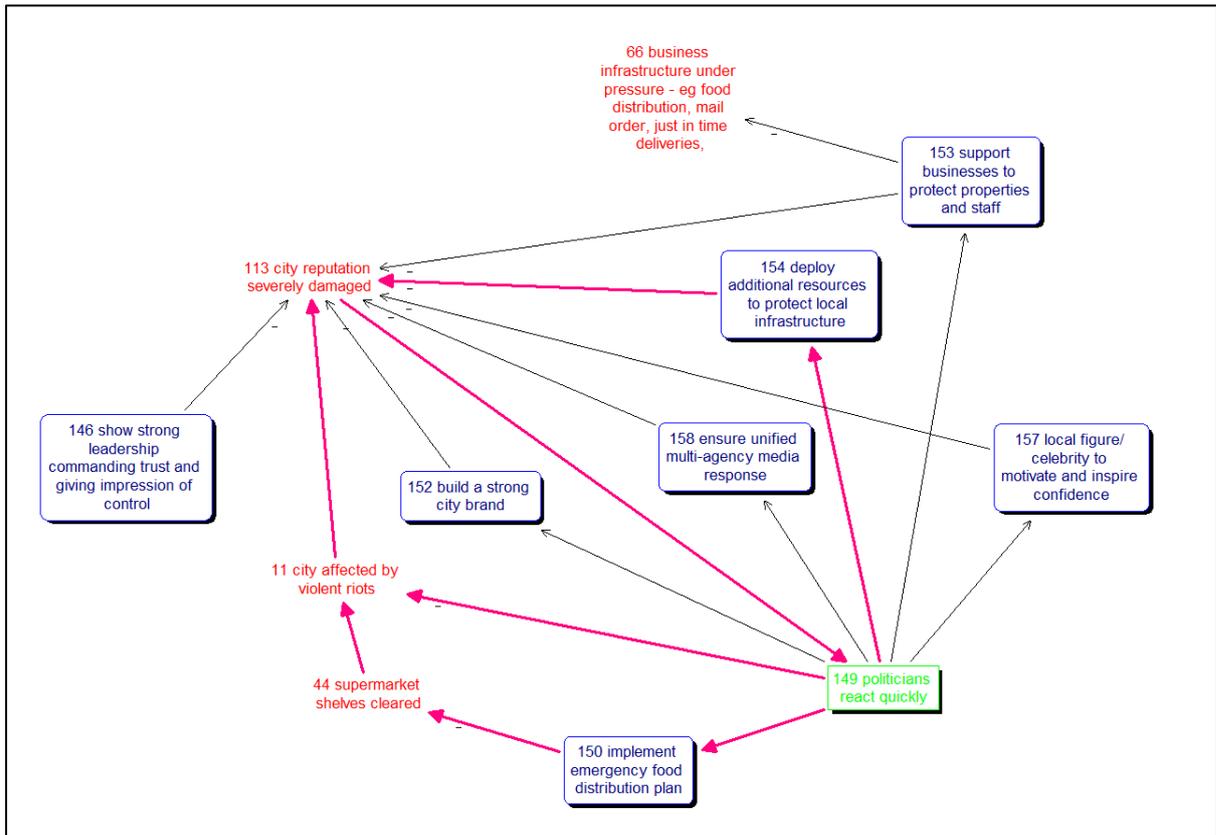
**Figure 11: Causal map – Critical Infrastructure vandalised**

In addition to this, in Figure 12 one of the key themes affected by *CIs being vandalised* is explored in a separate view, namely *crowd death and serious injury*. This picture outlines other possible causes of peoples’ death and injury in the context of the discussed event: city affected by violent riots, communication with protesters not possible, street lightning affected, city exposed to social conflicts and chaos, and increased number of traffic problems/car accidents. There are also three implications (i.e. *out links*) of *crowd death and serious injury*: city reputations severely damaged insufficient number of morgues, and health services under pressure. What is particularly worth noting is that this ramification is supported by only two policies (protect vulnerable people, identify rendezvous points) and therefore it might be recommended to develop new policies that would be able to address it.



**Figure 12: Causal map – crowd death and serious injury**

Whilst the two previously discussed maps are centred on ramification statements, the map in Figure 13 centres around a highly *potent* policy *politicians react quickly*. Potency in this context refers to the extent in which a given statement leads to (and thereby affects) key themes on the map through networks of causality. Of particular interest in this picture can be the fact that *politicians react quickly* hits on many other policies which are dependent on it, i.e.: implement emergency food distribution plan, build a strong city brand, ensure unified multi-agency media response, deploy additional resources to protect local infrastructure, support business to protect properties and staff, and local figure/celebrity to motivate and inspire confidence. This therefore suggests that similar networks of policies need to be understood with respect to developing resilience of cities.



**Figure 13: politicians react quickly**

In summary, this section of the report has described the activities from the second day of exercises of the workshop, which included building a shared causal map with respect to cities resilience at city and EU level, engaging in preferencing activities, and stakeholder mapping. Subsequently the analysis of findings was outlined, which focused on key themes identified in the causal map and their corresponding networks of ramifications and policies. This discussion will now be summarised with regard to how these findings meet the requirements of the Systemic Risk Questionnaire (SRQ), which will need to be developed as part of Work Package 3 (WP3).

## 4. DEBRIEF AND CONCLUSIONS OF THE WORKSHOP

### WORKSHOP EVALUATION

#### EVALUATION OF THE GROUP MODEL BUILDING SESSION

To evaluate the Group Model Building Session, a questionnaire was handed out to the workshop participants. The questionnaire aimed at gathering information to reach conclusions and to identify lessons learnt (Annex IV).

The questionnaire was composed of 12 different statements or questions, which covered:

- General aspects of the first day of the workshop,
- The contents, the environment and the first day workshop setting
- Possible improvements and lessons learnt for future workshops.

For answering the questions, an ordered rating scale from 0 to 5 was offered being 0 low level and 5 high level. In addition, respondents were also asked to make some comments on any further issues about the workshop in an open answer format if needed. The questionnaire form and the average result obtained per each question is provided in the Annex V, Annex VI and Annex VII.

The survey was given to 33 participants in the workshop (20 city representatives and 13 academic partners) and 22 responded. This represents a response rate of 67% of which 14 belong to the city representatives and 8 to the academic partners.

#### IMPROVEMENTS AND LESSONS LEARNT ON THE GROUP MODEL BUILDING SESSION

According to the comments received from academic and city representatives (Annex VIII), exercise 1 was the most useful and the easiest to understand the first day of the exercises of the workshop. On the other hand, exercise 3 was the most difficult to understand for all participants. As this comment suggests: “Exercise 3 was confusing to do I wonder about the value of the variables. I appreciate what it was trying to achieve but perhaps more guidance or collective working was needed, otherwise excellent”.

As improvement for future workshops, participants found necessary to focus more on the main topic of the workshop, in this case Critical Infrastructures, and try to prevent the discussion follows other paths that are not closely related to the main topic, such as, climate change or social dynamics.

Furthermore, some city representatives claimed that more guidance was necessary to increase the usefulness of the information gathered in the first days of the exercises. Taking this into account, in future workshops, the academic partners will need to be more explicit explaining the goal and the methodology of the exercises. However, as this was the first workshop in which the partners were able to work hand by hand it is understandable that the experts found the exercises difficult to accomplish. As in next workshops the majority of participants will be the same, they will have experience doing this kind of exercises and consequently, it is expected that everything will be easier for the experts.

## EVALUATION OF THE GROUP EXPLORER SESSION

Regarding the Group Explorer Session, findings were promising in terms of their potential for informing the Systemic Risk Questionnaire (SRQ). Before the session, it was decided to invite participants to work on generic scenarios and to focus on ramifications of risks rather than concentrate on *risks in their own right*. This led to an original view on dynamic interactions of ramifications and policies in the context of risk events to which Critical Infrastructure could be exposed to, taking into account the essential notion of prioritising the limited city resources, and thereby being in line with the requirements of SRQ.

## IMPROVEMENTS AND LESSONS LEARNT ON THE GROUP EXPLORER SESSION

Moreover, despite the fact that for all participants it was their first experience with the Group Explorer (GE) approach, a rich and complex causal map was co-produced that represented their thinking and understanding of the discussed topics. It can be assumed that as some of the participants are likely to attend the GE session again, their gained experience will help them in achieving even more productive contributions. Furthermore, based on participants' positive feedback (Annex IX, Annex X and Annex XI), it can be expected that they will be encouraged to participate in the forthcoming workshops.

## WORKSHOP OUTCOMES

As described above, this workshop was focused on identifying the cities' dependency on Critical Infrastructures with representatives from different European cities and experts from different Critical Infrastructures. Nevertheless, during the workshop ideas related to the relationships between Critical Infrastructures and climate change and social dynamics were also present. Thus, the results and

conclusions obtained in this workshop will serve as a useful input for the upcoming project's workshops on climate change and social dynamics.

In addition to the results and conclusions obtained in the workshop, consortium partners (CIEM, Strathclyde and TECNUN) in charge of organizing the workshops have found very useful the suggestions and commentaries received from the participants in the workshop as improvement points and lessons learned to organize the upcoming workshops.

## ANNEXES

### ANNEX I: DESCRIPTION OF THE ROLES FOR EXERCISES DURING 27TH OF OCTOBER

- **Facilitator:** it functions as group facilitator and knowledge elicitor. This person presents the activities that will be carried out during the workshop and pays constant attention to group process, the roles of individuals in the group, and the business of drawing out knowledge and insights from the group.
- **Gatekeeper:** it is responsible for ensuring that the objectives of the workshop are fulfilled. It is a person related to the client group who carries internal responsibility for the project, usually initiates it, helps frame the problem, identifies the appropriate participants, works with the modelling support team to structure the sessions, and participates as a member of the group.
- **Recorder:** it strives to write down or sketch the important parts of the group proceedings. Together with the notes of the modeller/reflector and the transparencies or notes of the facilitator, the text and drawings made by the recorder should allow a reconstruction of the thinking of the group.
- **Assistant:** it is responsible for helping the facilitator during the workshop execution. It is also responsible for taking photos of all the activities developed and the obtained results.
- **Group facilitator:** it is responsible for facilitating the group discussion when experts are working in small groups. It is also in charge of ensuring that the group understands the activity and in case the group needs some help it can provide some guidance to work on.
- **Expert:** it is a person who will participate in the activities that will be developed during the workshop. It is the person who has the expertise and can contribute to the activities of the workshop.
- **Modeller of Tool X:** it is responsible for gathering and sketching the information from the experts in order to develop the model. This person should be constantly looking for evidences and crystallize important aspects that could be used afterwards in the tool development process.
- **Dissemination activities modeller:** it is responsible for gathering information about what kind of dissemination activities cities carry out and what kind of activities SMR should do in order to disseminate the results obtained in the project at different levels: city level, Europe level, in the scientific community etc.
- **The process coach:** a person who focuses not at all on content but rather on the dynamics of individuals and subgroups within the group. It has been both useful and annoying that our

process coach is not a system dynamics modeller; such a person can observe unwanted impacts of jargon in word and icon missed by people closer to the field.

- **WP1 related activities modeller:** it is responsible for gathering all the information regarding WP1 that is mentioned during the workshop in order to complete the different resilience approaches that exist.
- **Standardization activities modeller:** it is responsible for gathering information about the different standards and norms that experts mention during the workshops so this information can be used afterwards for developing the CWA.

## ANNEX II: ROLES OF THE PARTICIPANTS OF THE WORKSHOP FOR DAY 1

| Institution | Role  |
|-------------|---|
| TECNUN      | Goal Keeper - Modeller of Tool 5                  |
| TECNUN      | Facilitator - Modeller of Tool 3                  |
| TECNUN      | Facilitator -Modeller of Tool 3                   |
| TECNUN      | Recorder  |
| TECNUN      | Modeller of Tool 1 - Assistant                    |
| STRATH      | Modeller of Tool 2                                |
| STRATH      | Group facilitator                                 |
| STRATH      | Group facilitator                                 |
| CIEM        | Goal Keeper - Modeller of Tool 5                  |
| CIEM        | Recorder  |
| CIEM        | Modeller of Tool 4                                |
| ICLEI       | Group facilitator                                 |
| ICLEI       | Process coach - Dissemination activities Modeller |
| DIN         | Group facilitator                                 |
| DIN         | Standardization activities Modeller               |
| LIU         | WP1 related activities Modeller                   |
| LIU         | Recorder  |
| LIU         | Group facilitator                                 |
| BRISTOL     | EXPERT  |
| BRISTOL     | EXPERT  |
| KSAND       | EXPERT  |
| KSAND       | EXPERT  |
| VEJLE       | EXPERT  |

|               |        |
|---------------|--------|
| VEJLE         | EXPERT |
| GLASGOW       | EXPERT |
| ROME          | EXPERT |
| ROME          | EXPERT |
| SAN SEBASTIAN | EXPERT |
| SAN SEBASTIAN | EXPERT |
| RIGA          | EXPERT |
| RTU           | EXPERT |
| RTU           | EXPERT |
| IPE           | EXPERT |
| CGE           | EXPERT |
| GLASGOW       | EXPERT |

ANNEX III: FINAL AGENDA OF THE WORKSHOP

## SMART MATURE RESILIENCE RIGA WORKSHOP, OCTOBER 26-29<sup>TH</sup> 2015

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The workshop in Riga will be arranged in four days. On Monday 26th October we will have half a day for discussion and preparation; the workshop itself will run on the 27th-28th, and on the 29th we will have half a day to summarise/reflect on what will have happened in the workshop. TECNUN will lead day 1 (27<sup>th</sup>) and Strathclyde will lead day 2 (28<sup>th</sup>) of the workshop.

Apart from TECNUN and Strathclyde leading the activities, there will be representatives from all consortium partners who will act as observers (on day 1 TECNUN may involve the consortium partners in running some of the activities, but on day 2 only Strathclyde will lead the activities). Furthermore, all present consortium partners will have a wrap-up at the end of each day to work out the implications for other WPs.

The objectives for these two days are not independent of each other as the findings from day 1 will feed into day 2 activities. The participants will discuss their experiences of Critical Infrastructure (CI)

management on the first day. Subsequently on the second day of exercises, and working in a broader group of participants coming from the seven partner cities, they will build on their experiences to collectively focus on the possible ramifications of risks and how these can be prevented, absorbed, and recovered from.

There will be 7x2 people from cities + extra from Riga. IDEAL: One with CI expertise + one with general focus. On day 2 the participation will be limited to 16 participants working in 8 pairs (each pair will include people from the same city/organisations). It is expected that the participants attending day 2 activities also participate in day 1 activities.

It is important to advise the participants that in the workshop everyone will be asked to communicate in English. Furthermore, on day 2 all participants will have to be able to contribute to the activities by typing brief statements of what they think about the given problem using a provided laptop – this will essentially be done *in real-time* (the contributions cannot be translated afterwards because the idea of the activities is that the participants' statements become networked with causal relationships which then serve as a resource for further contributions). As a result, the participants who may not feel fully confident to engage in this task due to language constraints are advised to have another person with them acting as an interpreter.

Before the workshop it may be very useful to have profiles of experts, brief summaries of what they do and their experiences with respect to managing CI risks. Also their motivation to participate in the workshop.

A provisional agenda for the workshop is presented below.

## Arrival: October 26th, 2015

| Time             | Venue                              | Script/Public Agenda   | Activities  |
|------------------|------------------------------------|--|---|
| 15:00 –<br>17:30 | Riga City Council,<br><br>Room XXX | Scientific committeea<br><br>at meeting<br><br><i>(CIEM, Strathclyde, Linkoping, ICLEI, DIN and Tecnun)</i><br><br><i>Riga</i> | <ul style="list-style-type: none"> <li>• Revision of the description of the main concepts</li> <li>• Review the agenda</li> <li>• Review the materials needed during the workshop</li> <li>• Organise groups of experts (at least for the first day of the workshop)</li> <li>• Assign roles during the workshop (facilitators, recorders, moderators...)</li> <li>• Group reporting templates</li> <li>• Any other issues</li> </ul> |
| 18.00            | Start from hotel “Radi un draugi”  | Guided tour of the city<br><br><i>(representatives of cities)</i>  | Riga will arrange a guided tour of Riga for the representatives of cities<br><br>(Kristiansand, Donostia, Glasgow, Vejle, Bristol and Rome)   |
| 19.00            |                                    | Welcome dinner   |   |

## Session 1: October 27th, 2015

**Participants:** Representatives from cities and academic partners including DIN and ICLEI

| Time          | Script/Public Agenda                                | Description and methodology   | Results  |
|---------------|---|---|--|
| 08:30 – 08:45 | Welcome/Coffee ice breaker                          |   |  |
| 08:45 - 09:15 | Project introduction: SMR objectives<br><br>(Sarri) | (1) Present SMR objectives. (2) Explain the objectives of the workshop  | The goal is that practitioners have a general idea about the project and the purpose of the workshop |
| 09:15 – 09:30 | Presentation Round                                  | Each participant will introduce himself/herself providing information about their background and expertise (2 minutes each) | The goal is that everybody knows general information about the rest of participants.                 |

|                             |  |  |   |
|-----------------------------|--|--|---|
| <p><b>09:30 – 10:00</b></p> | <p>Presentation of the relevant concepts for the SMR Project and the workshop</p> <p><i>(Magnus)</i></p> | <p>Describe the main concepts that will be used during the workshop such as <i>resilience, critical infrastructure, dependencies and interdependencies, cascading effects, maturity model...</i></p>   | <p>The goal is that everybody has the same mental model for the concepts that are going to be used in the project and during the workshop. Some of these concepts might be new for the practitioners.</p> |
| <p><b>10:00 – 10:15</b></p> | <p>Presentation of the exercise 1: Milestones</p> <p><i>(Leire &amp; Josune)</i></p>                     | <p>Introduce the first exercise.</p> <p>Every city or represented CI will present the 3/5 main milestones implemented, obstacles identified and main events occurred during their resilience development process. We will ask cities to prepare this in advance.</p> <p>Examples of milestones could be: the development of a local/regional plan for CIP; the participation in networks as 100RC, major disaster occurred in the city,...</p> | <p>The objective of this exercise is to identify key information about the evolution of resilience on cities, and time scales.</p>  |

|                      |                                    |   |  |
|----------------------|------------------------------------|---|--|
|                      |                                    | <p>We will ask about the description of the milestone, the cost/ investment/ effort needed to implement it and the generated results.</p> <p>Other relevant questions that we can make are about: when?<br/>Who was in charge? Why?</p>   |  |
| <b>10:15 – 10:45</b> | Work in small groups in exercise 1 | <p>Divide the experts into small groups. Groups will be composed of four people, two representatives from two cities. In total there will be around 4-5 groups.</p> <p>Small group activity: the members of the group will place all the previously identified milestones, obstacles and major events in a timeline graph. They will use two different colours to differentiate between the two cities.</p> |  |
| <b>10:45 – 11:00</b> | <b>Coffee Break</b>                |   |  |

|                             |  |   |   |
|-----------------------------|--|---|---|
| <p><b>11:00 – 11:45</b></p> | <p>Presentation of the results in a plenary session (10 min for each group – ¿4 or 5 groups?)</p>        | <p>Each group will present the timeline graph to the rest of the groups.</p>  | <p>The objective of this exercise is to identify obstacles, major events, milestones and best practices that have been carried out in different cities and critical infrastructures</p> |
| <p><b>11:45 – 12:00</b></p> | <p>Discussion and consolidation of the results of exercise 1<br/><br/><i>(Sarri &amp; Jose J.)</i></p>   | <p>The experts would have some time to discuss the results of the exercise and finally, the facilitator will summarize the main conclusions of the exercise 1.</p>  | <p>The goal is to find common activities carried out to build resilience and identify a common evolution path of cities towards improving resilience.</p>                               |
| <p><b>12:00– 12:10</b></p>  | <p>Presentation of the exercise 2:<br/>Indicators and variables<br/><br/><i>(Leire &amp; Josune)</i></p> | <p>Identify the indicators and variables used to assess the resilience level of critical infrastructures.</p> <p>The facilitators will explain the kind of indicators we are expecting to obtain: performance indicators, process indicators, awareness and commitment indicators,...</p> | <p>The goal is to have a list of indicators and variables that can help us to assess and to describe the evolution of the resilience level of CIs</p>                                   |

|                      |   |   |   |
|----------------------|---|---|---|
|                      |   |   |   |
| <b>12:10– 12:40</b>  | Work in small groups in exercise 2                              | <p>Small group activity: Work in small groups to identify the resilience indicators and variables.</p> <p>Initially, we are not going to provide them with any example. However, if after 15 minutes we see that they are not able to come up with any or the ones defined by them are not suitable for the maturity model we will provide a list with some examples.</p> |   |
| <b>12:40 – 13:15</b> | Presentation of the variables and voting of the main indicators | Each group will present the results obtained in the discussions of small groups.  | The objective of this exercise is to identify indicators and variables that CIs use to assess the resilience level. |

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|--|--|--|--|
|  |  | <p>Using a round robin approach the facilitator asks for one indicator from each group, going around as many times as it is required to exhaust the set.</p> <p>Sometimes, same indicators with different names will come up; these should be clustered on the fly. The facilitator puts the indicator on the wall in preparation for the ranking exercise.</p> <p>Then, in 10 minutes, indicators should then be ranked. Give the participants six stickers of one color. Adjust the no. of stickers according to the number of indicators. The participants then vote on the indicators by distributing their stickers between the indicators.</p> <p>The facilitator or another person from the modeling team then counts the stickers and organizes the sheets with the indicators in a table.</p> |  |
|--|--|--|--|

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|----------------------|---|---|---|
|                      |   |   |   |
| <b>13:15 – 14:15</b> | <b>Lunch Break</b>  |   |   |
| <b>14:15 - 14:30</b> | Discussion and consolidation of the results of exercise 2<br><br><i>(Jose J. &amp; Sarri.)</i>  | The experts would have some time to discuss the results and the facilitator will summarize the main conclusions of the exercise 2.  | The goal is to agree on the most relevant indicators and variables that help to assess the resilience level of CIs  |
| <b>14:30 – 14:45</b> | Presentation of the exercise 3:<br>Behavior Over Time Graphs<br><br><i>(Leire &amp; Josune)</i> | The objective of this exercise is to define the interrelations of the variables identified in the previous exercise, such as cause and effect relations, time delays, ...<br><br>Small Group activity: The workshop participants should work together in small groups for 30 minutes to depict the behavior of the indicators (and units) identified in exercise 2. | (1) Develop reference modes for critical variables. (2) Get consensus on timeframes and dynamics<br><br>Remind them to use large block letters. We want stories! Admonish the participants to focus on why the behavior is like they draw it. |

|  |  |  |  |
|--|--|--|--|
|  |  | <p>Suggest that they can work on a best case and a worst case in the context of scenarios (as they did earlier)</p> <p>They should also write down some keywords describing why the indicator behaves like it does.</p> <p>They should also decide on an appropriate time horizon for the graph and on a separate sheet of A4 paper, write down a justification for the chosen time horizon.</p> | <p>The facilitator needs to be very clear about graphing behavior over time. Remind the participants about the CRUCIAL need of specifying the time frame.</p> <p>They should graph on sheets of A4 paper. Graph expected behavior in black, best case in blue and worst case in red.</p> <p>We should end up with a best case and a worst case scenario.</p> |
|--|--|--|--|

|                      |  |  |  |
|----------------------|--|--|--|
| <b>14:45 – 15:15</b> | Work in small groups in exercise 3   |  |  |
| <b>15:15 – 16:00</b> | Presentation of the results in a plenary session (10 min for each group – ¿4 or 5 groups?) | After, they should present their graphs in plenary (4 groups x 10 minutes). Tell a story, based on our story, of how they expect the indicators to play out. Best case/worst case. | The objective of this exercise is that each group presents the evolution over time of the most critical variables in the best and worst scenarios.   |
| <b>16:00 – 16:15</b> | <b>Coffee Break</b>  |  |  |
| <b>16:15 – 16:35</b> | Discussion and consolidation of the results of exercise 3<br><i>(Jose J. &amp; Sarri.)</i> | Then we will work on reaching a consensus to decide how the two stories could be realistic (20 minutes).   | The objective of this exercise is to analyze the evolution of each critical indicator in the worst and best scenarios. In that way, barriers that may limit the improvement of resilience can be identified. |
| <b>16:35 – 17:00</b> | Summary<br><i>(Jose J. &amp; Sarri.)</i>   | Goal: (1) Review and congratulate group for hard work. (2) Summarize all obtained results and explain the connection for the second day.   | Experts depart   |

## Session 2: October 28th, 2015

Group Explorer Sessions.

**Tentative assistants:** Representatives from cities, Strathclyde and one representative per academic partners

| Time   | Script   | Description/ Results  |
|--|--|---|
| 08:30 – 08:45<br><br>(times are tentative)   | Welcome/Coffee   |   |
| 08:45 – 09:15  | <p>Introductions</p> <p>Introduction to the objectives, rough agenda, and time allocations for the day.</p> <p>Introduction to the process that will be used, including the computer system (Group Explorer – GE).</p> | <p>The participants are introduced to the forthcoming activities, to the process used, and to Group Explorer (GE).</p> <p>All participants are working in city pairs. Each pair is given a laptop that is connected to the projected screen and to the facilitator’s computer via a local/private network Throughout the duration of the workshop, the participants use their laptops to add contributions to the public screen which gradually becomes a shared causal map with everyone’s ideas interlinked together.</p> |
| <p><i>Stage 1: What are the Critical Infrastructure (CI) “risks” that need to be recognised by organisations in your city/region in order to be resilient?</i></p> |  |   |

|                      |  |  |
|----------------------|--|--|
| <b>09:15 - 09:45</b> | The participants add their statements to the screen with respect the given question (as in the title of this stage).                                   | The participants are asked to type on their laptops brief actionable statements (i.e. what they think is important in the context of the discussed question). Expected result: the first thematic clusters of statements added to the public map (the facilitator will help to cluster the statements).  |
| <b>09:45 - 10:15</b> | Topic: What future risks/issues might become critical for cities in Europe?  | This activity is similar to the previous one, only the topic is narrowed down further.   |
| <b>10:15 - 10:30</b> | Coffee break   | Facilitators analyse results and prepare for next steps  |
| <b>10:30 - 12:00</b> | How do these risks interact with each other? (Both at the city level and at the European level).   | In this activity the participants will link the statements on the map in terms of their causality, e.g. statement X leads to (causes) statement Y. Expected result: initial causal map on the public screen.   |
| <b>12:00 - 12:30</b> | Preference activity: Which clusters of statements are most critical?<br><br>What are the probabilities of the 'stories' occurring over the next 10yrs? | At this stage it will be possible to identify a number of thematic clusters of statements, e.g. these can be different areas of risks. The participants will use the computer system to prioritise which clusters they find as the most important.<br><br>Participants will indicate their judgments about stories/scenarios unfolding in terms % probability. Disagreements will prompt discussion and modifications. |
| <b>12:30 – 13:30</b> | Lunch break.   | Facilitators analyse results and prepare for next steps  |

|   |   |   |
|---|---|---|
| <i>Stage 2: What organisational structures/systems/policies might need to be in place to “prevent/absorb/recover from/learn from” IC risks?</i> |   |   |
| <b>13:30 – 14:00</b>  | Elaborate the most critical risk clusters (as identified in the previous activity) through consideration of structures/systems/policies that could be used to mitigate the risk stories | The participants add new statements and links to the high critical x probability discussed clusters (one cluster at time) in order to better provide answers to the given question. |
| <b>14:00 – 14:15</b>  | Coffee break.   | Facilitators analyse results and prepare for next steps   |
| <i>Stage 3: What are the unintended consequences that derive from these structures/systems/policies?</i>  |   |   |
| <b>14:15 – 15:45</b>  | Consider the possible unintended ramifications of the policies suggested in the above activity  | Links will be created from policies to other risks than those intended to be affected.  |
| <i>Stage 4: Final discussion</i>  |   |   |
| <b>15:45 – 16:45</b>  | The participants discuss the public map within the context of resilience and maturity levels  | Adding any further possible changes to the public map.  |
| <b>16:45 – 17:00</b>  | Wraps-up of the session.  | Printout will be provided throughout when reaching milestones in the workshop   |

## Parallel activities on October 28th, 2015

**Participants:** 4 representatives from Tecnun, 2 representatives from CIEM, 2 representatives from ICLEI, 2 representatives from LiU, 1 representative from DIN.

| Time          | Parallel activities   |
|---------------|---|
| 09:00 – 11:00 | WP 1: Revision of the main concepts. Activities related to WP1. |
| 11:00 – 11:15 | Coffee - Break  |
| 11:15 – 12:15 | WP 4: Activities related to WP 4                                |
| 12:15 – 13:15 | WP 5: Discussion on pilot implementation                        |
| 13:15 – 14:15 | Lunch-break   |
| 14:15 – 15:00 | WP 6: Activities related to WP 6                                |
| 15:00 – 15:45 | WP 7: Activities related to WP 7                                |
| 15:45 -16:30  | Other potential cooperation opportunities                       |
| 16:30 – 17:00 | General issues of the project                                   |

## Debrief: October 29th, 2015

**Attendants:** CIEM, Strathclyde, Linkoping, ICLEI, DIN, Tecnun and the representatives of CITIES (Riga, Kristiansand, Donostia, Glasgow, Vejle, Bristol and Rome)

| Time         | Script/Public Agenda                                  | Activities   |
|--------------|---|--|
| 09:00- 9:45  | Workshop debrief                                      | The results of the workshops will be analyzed to identify the problems and difficulties during the sessions.   |
| 9:45- 10:15  | Workpackage 7 Review<br><i>(ICLEI)</i>                | Review the progress made on the workpackage<br>Review the deadlines of the deliverables<br>Discussion about how to proceed during the following months |
| 10:15- 10:45 | Workpackage 1 Review<br><i>(Linkoping University)</i> | Review the progress made on the workpackage<br>Review the deadlines of the deliverables<br>Discussion about how to proceed during the following months |
| 10:45- 11:15 | Workpackage 4 Review                                  | Review the progress made on the workpackage  |

|                    |   |  |
|--------------------|---|--|
|                    | <i>(CIEM)</i>                               | Review the deadlines of the deliverables<br><br>Discussion about how to proceed during the following months  |
| <b>11:15-11:30</b> | Coffee break                                |  |
| <b>11:30-12:00</b> | Workpackage 6 Review<br><br><i>(DIN)</i>    | Review the progress made on the workpackage<br><br>Review the deadlines of the deliverables<br><br>Discussion about how to proceed during the following months |
| <b>12:00-12:30</b> | Workpackage 2 Review<br><br><i>(Tecnun)</i> | Planning for the 2 <sup>nd</sup> workshop<br><br>Review the deadlines of the deliverables<br><br>Discussion about how to proceed during the following months   |
| <b>12.30-13:00</b> | Workpackage 8 Review<br><br><i>(Tecnun)</i> | Fix the date for the first review meeting with the officer in Kristiansand (5th workshop: tool 4 validation)<br><br>Other issues                               |

ANNEX IV: EVALUATION QUESTIONNAIRE (DAY 1)

## WORKSHOP IN RIGA: DAY 1 QUESTIONNAIRE

Please evaluate from 0 to 5, being 0 low evaluation and 5 high evaluation, the following questions regarding the execution of the workshop and the usefulness of the results obtained for your background.

Please, select one of the following options:

City representative

Academic representative

| Evaluate from 0 to 5...  | Low level                      High level |   |   |   |   |   |
|--|---|---|---|---|---|---|
|  | 0   | 1 | 2 | 3 | 4 | 5 |
| 1. The clarity of the explanations of the exercises provided by the facilitators of the workshop |   |   |   |   |   |   |
| 2. The support provided by the small group facilitators  |   |   |   |   |   |   |
| 3. The time given to develop the exercises   |   |   |   |   |   |   |
| 4. The usefulness level of the exercise 1 (identification of milestones)                         |   |   |   |   |   |   |
| 5. The easiness level of the exercise 1 (identification of milestones)                           |   |   |   |   |   |   |
| 6. The usefulness level of the exercise 2 (identification of indicators)                         |   |   |   |   |   |   |

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
| 7. The easiness level of the exercise 2 (identification of indicators)               |  |  |  |  |  |  |
| 8. The usefulness level of the exercise 3 (developing the behavior over time graphs) |  |  |  |  |  |  |
| 9. The easiness level of the exercise 3 (developing the behavior over time graphs)   |  |  |  |  |  |  |
| 10. The usefulness level of small group exercises                                    |  |  |  |  |  |  |
| 11. The usefulness level of plenary exercises  |  |  |  |  |  |  |
| 12. The overall methodology used in the workshop.                                    |  |  |  |  |  |  |

Comments

## ANNEX V: SUMMARY OF THE ANSWERS OBTAINED IN THE QUESTIONNAIRE (DAY 1)

| Questions   | Academics | Cities |
|---|-----------|--------|
| 1. The clarity of the explanations of the exercises provided by the facilitators of the workshop. | 4         | 3.86   |
| 2. The support provided by the small groups facilitators  | 3.62      | 3.93   |
| 3. The time given to develop the exercises  | 3.75      | 3.71   |
| 4. The usefulness level of the exercise 1 (identification of milestones)                          | 4.25      | 4.07   |
| 5. The easiness level of the exercise 1 (identification of milestones)                            | 3.75      | 4.43   |
| 6. The usefulness of the exercise 2 (identification of indicators)                                | 3.38      | 4.21   |
| 7. The easiness level of exercise 2 (identification of indicators)                                | 3.38      | 3.36   |
| 8. The usefulness level of the exercise 3 (developing the behaviour over time graphs)             | 3.38      | 3.64   |
| 9. The easiness level of exercise 3 (developing the behaviour over time graphs)                   | 2.25      | 2.71   |
| 10. The usefulness level of small group exercises   | 3.75      | 4.21   |
| 11. The usefulness level of plenary exercises   | 3.38      | 4.14   |
| 12. The overall methodology used in the workshop  | 3.63      | 3.93   |

## ANNEX VI: OVERALL SATISFACTION LEVEL OF THE PARTICIPANTS (DAY 1)

|  |             |
|--|-------------|
| Academic representatives' satisfaction level | 3,54166667  |
| City representatives' satisfaction level     | 3,767857143 |
| Overall satisfaction level                   | 3,654761905 |

#### ANNEX VII: AMOUNT OF ANSWERS RECEIVED (DAY 1)

| Group of attendants      | Numbers of total attendants | Number of answer received | Answer percentage |
|--------------------------|-----------------------------|---------------------------|-------------------|
| Academic representatives | 13                          | 8                         | 62%               |
| City representatives     | 20                          | 14                        | 70%               |

#### ANNEX VIII: COMMENTS OF PARTICIPANTS (DAY 1)

|                   |  |
|-------------------|--|
| <b>Comment 1:</b> | Shorter days. Exercise 3 was confusing to do I wonder about the value of the variables. I appreciate what it was trying to achieve but perhaps more guidance or collective working was needed, otherwise excellent.  |
| <b>Comment 2:</b> | I understand the workshop objective to develop the model, however, a chance to see Riga and the existing infrastructure would be useful (Day light hours).   |
| <b>Comment 3:</b> | Thank you, very useful exercise experience.  |
| <b>Comment 4:</b> | It could also be useful to change the small groups. What catches the eye is the gap that exists between the maturity level of academic representatives and the city representatives in resiliency. Therefore I am wondering if the overall methodology used today is really effective, may be more guidance from academic representatives. |
| <b>Comment 5:</b> | Due to the heterogeneity of people involved in exercise the project management should have prepared some basic definitions and concepts (also with the appropriate lexicon) which should have driven the exercises and constituted their founding basis. In this way, it has resulted (at least to me) a bit too chaotic and dispersive.   |
| <b>Comment 6:</b> | Everything is smooth :)  |
| <b>Comment 7:</b> | Lots of different interpretations of the exercises. CI was mixed with other things. It should have been more focus on the topic, CI and not allow anything else.   |

ANNEX IX: EVALUATION QUESTIONNAIRE (DAY 2)

## WORKSHOP IN RIGA: DAY 2 EVALUATION

|   | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|-------------------|----------|---------|-------|----------------|
|   | 1                 | 2        | 3       | 4     | 5              |
| 1. The facilitators appropriately communicated <b>what was expected</b> from the participants <b>at each stage</b> of the session.          |                   |          |         |       |                |
| 2. The facilitators provided an appropriate amount of <b>support</b> throughout the session.  |                   |          |         |       |                |
| 3. The <b>pace</b> of the session was appropriate to the purpose.   |                   |          |         |       |                |
| 4. I had a good opportunity to <b>express my own views</b> so that they could be <b>seen by</b> all others present.                         |                   |          |         |       |                |
| 5. It was useful to see my views in the <b>context</b> of the views of others.  |                   |          |         |       |                |
| 6. It was useful to <b>see the causal network</b> gradually developing on the screen.   |                   |          |         |       |                |
| 7. <b>Anonymity</b> between contributor teams was useful.   |                   |          |         |       |                |
| 8. It was helpful to get copies of a <b>record of the workshop</b> (the network of contributions) as we progressed.                         |                   |          |         |       |                |
| 9. The workshop allowed for the <b>creation of knowledge</b> by the group. New insights were developed through the linking of perspectives. |                   |          |         |       |                |
| 10. The workshop helped me to <b>change my understanding</b> of the resilience issues in relation to critical infrastructure.               |                   |          |         |       |                |

|   |  |  |  |  |  |
|---|--|--|--|--|--|
| 11. The workshop made an appropriate contribution to the development of the <b>H2020 project objectives</b> . |  |  |  |  |  |
| 12. The overall format of the session was <b>useful to me in my organizational role</b> .                     |  |  |  |  |  |

ANNEX X: SUMMARY OF THE ANSWERS OBTAINED IN THE QUESTIONNAIRE  
(DAY 2)

| Questions  | Average | St deviation |
|--|---------|--------------|
| 1. The facilitators appropriately communicated what was expected from the participants at each stage of the session.   | 4.19    | 0.75         |
| 2. The facilitators provided an appropriate amount of support throughout the session.                                  | 4.25    | 0.86         |
| 3. The pace of the session was appropriate to the purpose.   | 4.19    | 0.75         |
| 4. I had a good opportunity to express my own views so that they could be seen by all others present.                  | 4.19    | 0.83         |
| 5. It was useful to see see my views in the context of the views of others.  | 4.44    | 0.63         |
| 6. It was useful to see the causal network gradually developing on the screen.   | 4.63    | 0.5          |
| 7. Anonymity between contributor teams was useful.   | 3.88    | 0.96         |
| 8. It was helpful to get copies of a record of the workshop (the network of contributions) as we progressed.           | 3.94    | 0.85         |
| 9. Creation of knowledge   | 4.19    | 0.83         |
| 10. The workshop helped me to change my understanding of the resilience issues in relation to critical infrastructure. | 3.75    | 0.68         |
| 11. The workshop made an appropriate contribution to the development of the H2020 project objectives.                  | 4.19    | 0.83         |
| 12. The overall format of the session was useful to me in my organization role.  | 4.44    | 0.63         |

## ANNEX XI: COMMENTS OF PARTICIPANTS (DAY 2)

|                   |   |
|-------------------|---|
| <b>Comment 1:</b> | The tool is quite interesting and useful. Facilitators should try to convey the 'plan' to be more focussed on issues (if 'consequeneces' should be produced, only 'consequences' should be accepted etc.) to avoid categories confusion in the graph. |
| <b>Comment 2:</b> | I still miss the goals of this kind of investigation. I am confident that many things will become more clear in the upcoming days/months.   |
| <b>Comment 3:</b> | I would be happy to use the technology and method in my work.   |
| <b>Comment 4:</b> | Really useful and interesting. I can think of lots of applications for the tool. Really well facilitated. A good day.   |
| <b>Comment 5:</b> | The questionnaire was a particularly useful tool. Good to collaborate on a large scale and have immediate sight of comments.  |
| <b>Comment 6:</b> | Thank you all.  |
| <b>Comment 7:</b> | The program should be offered to the participants of the program.   |
| <b>Comment 8:</b> | Really drawn to Group Explorer technique - best collaborative tool I've seen in a while - many future applications.   |