



SMART MATURE RESILIENCE

DELIVERABLE 2.2: CLIMATE CHANGE WORKSHOP

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EXECUTIVE SUMMARY

The second workshop of the SMR (Smart Mature Resilience) project took place from the 25th to the 28th of January 2016 in Bristol, UK, and focused on policies, indicators and barriers associated to Climate Change. In this workshop, experts from the cities of Bristol, Donostia, Glasgow, Kristiansand, Riga, Rome and Vejle had the opportunity to exchange information and knowledge related to the risks associated to Climate Change and to provide material for the development of the Resilience Management guidelines.

The aim of this report 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 the risks associated to climate change. Finally, the evaluation and lessons learnt from the workshop are presented.

A general result of the workshop is that a high number of policies, indicators and barriers about climate change and resilience were found. In addition, the results from the exercises have provided the first indication on the dynamics of building resilience. Therefore, this workshop has allowed to identify the evolution of the main policies and also to identify which policies need to be implemented first. Following steps regarding the development of the maturity model will consist of reaching consensus to agree in which specific stage the different policies need to be implemented. Furthermore, the workshop resulted in an engaging exploration of new areas of city resilience, whilst simultaneously further elaborating on a number of risk themes. These results are planned to be merged with the data obtained in two forthcoming WP2 workshops, and it is expected that they will provide rich material the systemic risk assessment questionnaire.



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1. INTRODUCTION

This deliverable reports about the second workshop on Climate Change in course of the SMR project, which is the acronym for “Smart Mature Resilience”.

The workshop was organised by the council of Bristol and took place from the 25th to the 28th of January 2016 in Bristol, UK.

On the 25th of January SMR partners assisted an introduction session in which the director of the Cabot Institute (University of Bristol) made a presentation about climate change risks; so all the participants had the same vision of climate change. Then, Linköping University (LIU), the leader of work package 1 (WP1) of the SMR project, summarized the results of the first deliverable (D1.1) of WP1, which was an overview of current practice in urban resilience and EU sectorial resilience approaches, identifying, synthesizing and assessing the main challenges and best practice of today. In addition to the presentations, a preparation meeting regarding the organization of the workshop was carried out by the academic partners (TECNUN, CIEM, and LIU), ICLEI and DIN. Afterwards, participants of the workshops were invited to a welcoming dinner. The 26th and the 27th of January were the de facto workshop days with external experts and SMR partners. Finally, on the 28th of January a debriefing meeting to evaluate the execution of the workshop and obtain lessons learnt for the next ones was performed by all partners of the SMR project.

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 the risks associated to climate change. The first exercise, on the 26th of January, was led by TECNUN and a collaborative methodology called Group Model Building was used to carry out the activities which results will be useful to develop the resilience maturity model in Work Package 2 (WP2). The second exercise, on the 27th of January, 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). Finally, the evaluation and lessons learnt from the workshop are presented.

2. WORKSHOP PREPARATION

The main objective of this second workshop, which took place in Bristol, was to gather useful information from experts regarding resilience policies, indicators and barriers associated to climate change in order to be able to develop the tools proposed in the project proposal such as the resilience maturity model and systemic risk assessment questionnaire.



Figure 1. Steps for the workshop development

The steps followed up for the workshop development (Figure 1) were first to prepare the whole workshop requesting to the cities some materials in advance. Then, the workshop was carried out with the GMB and GE sessions and the final debrief. Finally, the deliverable 2.2 was developed with all the information taken during the workshop.

PREPARATION ACTIVITIES

Several duties and activities were performed to prepare the workshop. Information useful to improve the organisation and the correct implementation of the workshop was provided in advance with the aim to have a clear 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 26th of January, 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).
- Cities were requested to prepare some materials in advance for the Group Model Building session held on January 26th. City representatives received three exercises (See Annex III) and were



asked to identify the most relevant policies/actions, indicators to measure those policies and finally barriers to implement those policies/actions. This previous reflection was essential to have successful workshop outcomes.

The setting of the agenda for the second workshop consisted of an iterative process in which the project partners participated. The agenda for the second workshop about climate change that took place in Bristol included the following steps:

- Periodic teleconferences were arranged among the workshop partners to prepare the structure and the exercises of the workshop and to identify the adequate experts that would participate in the workshop.
- The SMR partners from the City Council of Bristol developed a list of suitable climate change experts that could contribute to gathering information to accomplish the objectives of the workshop.
- TECNUN with the help of Strathclyde developed, based on the comments and suggestions received from the project partners in several weekly telephone conferences, the workshop agenda. This agenda included the main building blocks of the workshop with a rough time plan.
- The final version of the agenda for the workshop was approved one week before the workshop took place. This final version of the agenda (Annex IV) included the description of the activities of the workshop, the timetable of the activities and the objectives of each activity.



3. WORKSHOP EXECUTION AND RESULTS

Participants of the workshop included scientific committee (LIU, TECNUN, CIEM, STRATHCLYDE, DIN and ICLEI) and experts in climate change from the cities of Bristol, Donostia, Glasgow, Kristiansand, Riga, Rome and Vejle. Table 1 presents the profiles of the experts that participated in the workshop and Figure 2 is a photo of all the workshop participants. The list of the workshop participants can be found in Annex I.

Table 1. Experts profiles.

Profile
Climate Change Adviser (Environment Agency)
Director (Schumacher Institute)
Flood Risk Manager (Bristol City Council)
Deputy Civil Protection Manager (Bristol City Council)
Project Manager (Bristol City Council)
Transport Asset Manager (Bristol City Council)
Assistant Manager of Sustainability (Glasgow City Council)
Project Manager(Kristiansand City Council)
Security and Crisis Manager (Kristiansand City Council)
Head of the Fire Brigade (Vejle City Council)
Engineer (Vejle Spildevand)
Head of European projects Office (Rome City Council)
Natural Hazard Assessment Expert (Rome City Council)
Technical assistance of Strategic Planning (City Council of Donostia-San Sebastian)
Management Board Member (Riga Sustainable Energy Action Plan) and a Member of the Riga City Advisory Council of Energy



Figure 2. Photo of the workshop participants.

INTRODUCTION TO THE WORKSHOP (25TH OF JANUARY)

On the 25th of January, the partners of the project met at 14.00 on the Architecture Centre of Bristol. The partners from the Council of Bristol in charge of organizing the workshop welcomed the SMR project partners. The objective of the first day was to attend presentations of current experiences, best practices and difficulties concerning climate change. The director of the Cabot Institute and the Chief Resilience Officer from the city of Bristol were invited to make those presentations.

The director of the Cabot Institute (University of Bristol)¹ was the first guest speaker from the workshop. Cabot Institute works on sustainability and future of cities and in close collaboration with the Council of

¹ <http://www.bristol.ac.uk/cabot/>



Bristol. During the presentation, the director of the Cabot Institute highlighted the importance of research on climate change to look for solutions that will help to solve other issues such as poverty, health or food. Furthermore, the important role of the community in the improvement of the cities' resilience was emphasized. Communities need to be supported by local and national government so that they are able and have resources to make their own resilience. For instance, in the city of Bristol citizens are provided with smart technologies so that they are to empowered and have the opportunity to share their knowledge. As conclusion, the director of the Cabot Institute highlighted the three main objectives for Cabot Institute regarding resilience. The first one is to identify what a resilient individual needs to have. The second is to identify what is required for a community to be resilient. For instance, trust with each other and freedom to initiate action are some of the requirements. Finally, the third objective is to build resilient systems and by breaking the existing silos.

After the presentation of the director of the Cabot Institute, the Chief Resilience Officer from the City of Bristol, presented the current activities and projects regarding the improvement of Bristol's resilience and climate change adaptation. As the Chief Resilience Officer from the City of Bristol explained, the City of Bristol has been working with the Rockefeller foundation in the 100 Resilient Cities program². During this time, the Council of Bristol has identified, with collaboration of the stakeholders of the city, which are the main actions that need to be prioritized to improve the city resilience. On the one hand, the city of Bristol aims at developing confidence, skills and trust among people and families. In this regard, the city of Bristol wants to promote the use of the Open data Bristol which is a public webpage that most of the people do not know that exists and that can help to provide and receive real time information of the city. Furthermore, the city aims at promoting collaborative working between the academic, public and private, and community sectors to foster shared ownership on the development of resilience. On the second hand, the city of Bristol needs to ensure that its assets meet future demand and are resilient to the effects of climate change and other shocks. Finally, the city aims at promoting prosperity and wellbeing through innovative forms of financing employment and sharing resources that value local social and natural capital.

Afterwards, LIU (University of Linköping) made a presentation on the main concepts and the results obtained in work package 1 of the SMR project. Work package 1 is focused on analyzing the worldwide

² <http://www.100resilientcities.org/>



approaches for building cities' resilience. During the presentation, the main different definitions of resilience and the most known frameworks and scorecards to improve cities' resilience were presented.

Finally, the scientific committee (TECNUN, STRATHCLYDE, LIU, CIEM, DIN and ICLEI) carried out a meeting to organize the Group Model Building Session. For this session, the 16 participants of the workshop needed to be divided into four groups. Furthermore, in each group representatives from two different cities had to be together. During this meeting the scientific partners decided the participants of each group and reviewed the roles that each of them had to perform during the group model building session (see Annex I and II).

GROUP MODEL BUILDING SESSION (26TH OF JANUARY)

On Tuesday 26th, the Group Model Building (GMB) session started with a brief welcome and an introduction section. Afterwards, the exercises of the GMB session were explained, and the experts started to work in small groups. During the morning, the first two exercises were carried out: identification of resilience actions and policies related to resilience and climate change and the identification of the indicators to estimate the evolution of resilience. After the third exercise, which consisted of identifying barriers to resilience development in cities, was carried out. Following, the fourth exercise was developed. This exercise served to identify which policies from exercise 1 should be implemented in each phase of the preliminary resilience maturity model of the SMR project (Table 6). Finally, to conclude the session, a brief analysis of the obtained results was done.

WELCOME AND INTRODUCTION TO THE GROUP MODEL BUILDING SESSION

The coordinator of the project from TECNUN welcomed the participants to the second workshop of the SMR project. He made a brief presentation about the objectives of the exercises that were going to be carried out during the GMB session. After the presentation, TECNUN indicated to which group each participant belongs to (see Table 2).

Methodology for the exercises of the GMB

The same methodology was used for all the exercises carried out during the GMB session: first, the experts were split in small groups and after (see Figure 3); the results of the discussions of each small group were presented in a plenary session. Each group consisted of two representatives of two different cities. Furthermore, a group facilitator and a recorder, from the scientific partners, were assigned to each group. On the one hand, the facilitator was responsible for ensuring the quality of the group discussion and clarifying any question about the goal of each activity. On the other hand, the group recorder was responsible for gathering all the information that appears in small group discussions.



Figure 3. Small group exercises.

Once the experts were divided into small groups, they started working together commenting and explaining the information related to their cities for completing the first exercise. After the participants worked in small groups, all the group participants attended a plenary session (see Figure 4) in which the small groups put in common their results from the first exercise. During the plenary session, each group had to choose a representative to present the results obtained in their groups.



Figure 4. Plenary session.

Table 2. Roles and participants of the different groups.

Roles	Group 1	Group 2	Group 3	Group 4
Experts city 1	1 from Riga & 1 from Donostia	2 from Vejle	2 from Rome	Glasgow
Experts city 2	2 from Bristol	2 from Kristiansand	2 from Bristol	2 from Bristol
Group facilitator	TECNUN	LIU	DIN	ICLEI
Group recorder	TECNUN	1 from LIU & 1 from Strathclyde	TECNUN	Strathclyde

FIRST EXERCISE: IDENTIFICATION OF POLICIES

The objective of this first exercise was to identify the policies and actions that cities have already implemented, are planning to implement and should implement concerning resilience and climate change.

Participants of the workshop were also asked to classify the policies and actions according to five categories of resilience: Cooperation, Preparedness, Leadership & Awareness, and Robustness (for explanation of the dimensions see Annex III). In addition to the different dimensions, participants identified the stakeholder in charge of leading the implementation of each policy as well as the stakeholders involved in its implementation. For this exercise, representatives from the cities of Bristol,



Donostia, Glasgow, Kristiansand, Riga, Rome and Vejle had been asked in advance to collect the most relevant policies and actions occurred in their cities (for explanation of the exercises see Annex III).

Results

As a result of this exercise, a variety of policies that the different cities have implemented or are planning to implement to improve their resilience level was obtained (see Table 3 and Figure 5). In many cases, similar policies had been identified by different cities, so four categories to group similar policies were identified: leadership and awareness, preparedness and robustness, cooperation within the city, and integration of the city with other cities. Some of the new categories were different from the ones that were used in the exercises that were completed by the cities prior to the workshop (Cooperation, Preparedness, Leadership & Awareness, and Robustness). On the one hand, based on the feedback provided by the experts of the cities in the plenary session it was identified the importance of splitting cooperation category into two new categories: cooperation within the city and integration of cities. On the other hand, it was identified that preparedness and robustness categories could be integrated in one category preparedness and robustness. The reason for this was that robustness is a result of the implementation of the policies included in the preparedness category.

- **Leadership and awareness.** This category can be considered as the starting point as it includes generic policies related to fostering awareness and leading resilience activities. Thus, the policies included in this category do not only affect climate change but are also related to the development of plans for the city resilience.
- **Preparedness and robustness.** This category includes policies related to climate change but also other risks and challenges. This category is composed of two subcategories: A subcategory for general plans for the city and a subcategory for specific plans for risks. The reason for this distinction is that there are some plans that are generic for the city, while there are others focused on particular risks such as flooding, climate change, etc. Furthermore, it is important to highlight that the plans for specific risks may affect different infrastructures such as energy, water, mobility, insurance, or buildings. Moreover, within robustness and preparedness category it was distinguished the existence of tools that can be used for implementing all kind of plans.

- **Cooperation within the city.** This category includes a series of policies to increase cooperation and integrate different stakeholders in the resilience building process. Stakeholders range from citizens and neighbourhoods to business and critical infrastructures.
- **Integration of cities.** This category refers to existing mechanisms for grouping cities. Thus, the policies included in this category are related to the participation of cities in networks for exchanging information and knowledge with other cities such as 100 Resilient Cities funded by the Rockefeller Foundation or becoming a European Green Capital.



Figure 5. Identified policies classified into categories (exercise 1).



Table 3. Identified policies classified into categories (exercise 1).

<p style="text-align: center;">1. LEADERSHIP & AWARENESS</p> <p>1.1 Connecting responsibility</p> <p>1.2 Develop a local plan for the city</p> <p>1.3 Wider plan for the city not specific to climate change</p> <p>1.4 Public awareness</p> <p>1.5 Actions regarding ICT, emergency production, efficiency</p>	<p style="text-align: center;">2. PREPAREDNESS & ROBUSTNESS</p> <p>Subcategory 1: Plan for the whole risk (at the city level)</p> <p>2.1 Development of adaptation plans at city and regional level</p> <p>2.2 Risk analysis</p> <p>2.3 Improve understanding on climate change and its impact</p> <p>2.4 National board on adaptation</p> <p>2.5 Development of emergency plans (at city and regional level)</p> <p>2.6 Connectivity and responsibility (how to connect up and down the government).</p> <p>2.7 City regional level are carrying out benchmarking of what is happening</p> <p>Subcategory 2: Plan for specific risks within the city</p> <p>2.8 Training for emergency response at different levels (government, volunteers...)</p> <p>2.9 Conduct theoretical simulations</p> <p>2.10 Insurance against major natural risks</p> <p>2.11 Flood prevention plans and flood defence</p> <p>2.12 Energy production and efficiency (CO2 reduction)</p> <p>2.13 Early warnings to identify what may happen.</p> <p>2.14 Sustainable mobility (car sharing, electro mobility)</p> <p>2.15 Software to analyse past experiences</p> <p>2.16 Share relevant information to citizens, first responders...</p> <p>2.17 Local legislation on construction</p> <p>2.18 Building resilience in water system</p> <p>2.19 Developing business continuity resilience</p> <p>2.20 Building standard and legislation on climate impacts</p> <p style="text-align: center;">Tools for implementing plans</p> <p>2.21 City planning processing and checklists on risk analysis</p>
<p style="text-align: center;">3. COOPERATION WITHIN THE CITY</p> <p>3.1 Neighbourhoods develop cooperation to involve all stakeholders.</p> <p>3.2 Make citizens more resilient</p> <p>3.3 Workshops to the public on resilience</p>	<p style="text-align: center;">4. INTEGRATION OF CITIES</p> <p>4.1 Mechanisms for grouping cities around.</p> <p>4.2 Bristol Green Capital</p> <p>4.3 100 Resilient Cities</p>



Table 3 shows the list of policies that were identified by the different cities. As explained above, categories were defined to group together similar policies that had been proposed by the different cities. Taking into account that some policies were very similar, a list of sixteen policies that aggregated most of the identified policies was obtained.

Awareness and preparedness

1. Identify stakeholders and roles (1.1 and 1.2)
2. Raise public awareness and understanding (1.4)

Preparedness and robustness

3. Develop a long term adaptation plan (1.3, 1.5, 2.1, 2.3, 2.4, and 2.6)
4. Develop emergency plans (2.5)
5. Screen for existing strategies (2.7)
6. Conduct practical training with stakeholders (2.8)
7. Conduct theoretical simulations (2.9)
8. Save your assets through insurances (2.10)
9. Develop strategy for CO2 reduction (2.13)
10. Set up early warning tools (2.14)
11. Develop business plans for companies (2.19)
12. Identify potential risks for the city (2.2, 2.3 and 2.21)
13. Develop solutions for the potential risks (2.8 - 2.20)

Cooperation within the city

14. Connect local stakeholders to coordination groups (3.1)
15. Make citizens more resilient (3.2 and 3.3)

Integration across cities

16. Take part in international networks (4.1, 4.2 and 4.3)

SECOND EXERCISE: IDENTIFICATION OF INDICATORS

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 in order to measure the policies or actions 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 taking into account the four categories presented in the first exercise.

Results

During the plenary session all the indicators that were identified by the different groups were put together on the wall (see Figure 6) presents the list of indicators that were identified.

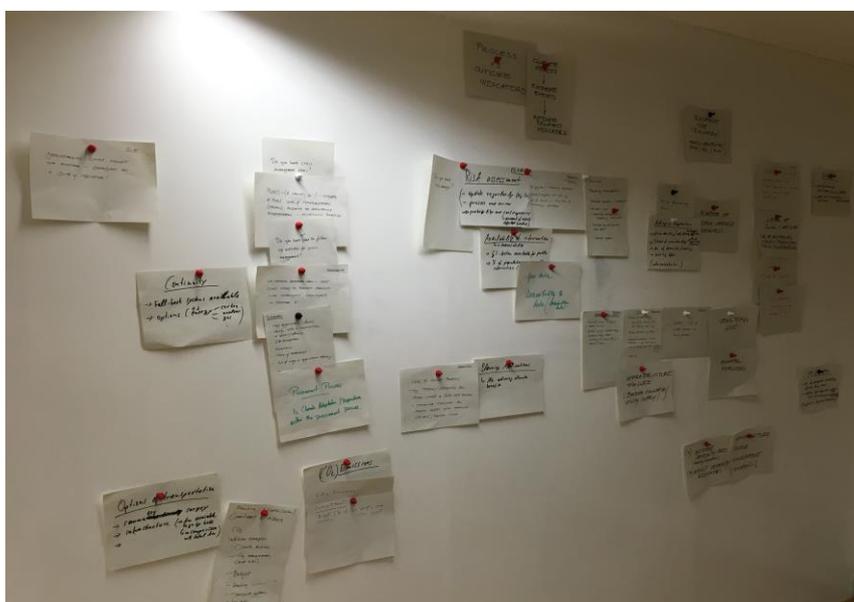


Figure 6. Identified indicators classified into categories (exercise 2).

Each representative from the small group presented the indicators that had been identified in their groups. As a result of grouping the different indicators according to their similarities nine categories were identified: benchmarking, formal plans, climate change (results of implementation), measuring risk, infrastructure design, training, education, Critical Infrastructures (CI's) and citizen's engagement.



Finally, the relation between the most relevant indicators within each category was exposed. A brief explanation of each of the category is given below.

- **Benchmarking** refers to comparing cities among each other.
- **Formal plans** refer to the formal or general plans of a city to improve their resilience, not only the ones focused on climate change plans.
- **Climate Change** refers to the actions of a city to prevent or recover from risks related to climate change.
- **Measuring risks** refers to the risk analysis and the information availability.
- **Infrastructure design** refers to the design of the infrastructures combining the process and the outcomes.
- **Training** refers to the training activities in cooperation with professionals.
- **Education** refers to awareness programs dedicated to stakeholders, not only training.
- **Critical Infrastructure** refers to assets that are essential for the functioning of a society and economy.
- **Citizens' engagement** refers to the citizens' satisfaction and collaboration with the city resilience.



Table 4. Identified indicators classified into categories (exercise 2).

<p>1. BENCHMARKING</p> <ul style="list-style-type: none"> Benchmarking cities against one another. Dependent on a suite of indicators 	<p>2. FORMAL PLANS</p> <ul style="list-style-type: none"> Existence of emergency plans Existence of management plans Reviewing and implementing plans Follow up activities for crisis management UK national adaptation plan Procurement process (climate adaptation /preparedness within the procurement process). Roles and responsibilities clearly defined Preventive: Proactive commitment to reduce CO2 emissions. Continuity plans 	<p>3. CLIMATE CHANGE</p> <ul style="list-style-type: none"> CO2 emissions Climate actions Heating systems in use Heating waves Floods Temperature Sea Level Commitment (budget) Options of transportation
<p>4. MEASURING RISK</p> <ul style="list-style-type: none"> Risk analysis, Risk assessment, Availability of information Vulnerability assessment, Extreme events, Measuring vulnerabilities (sea level, snow) Open data (accessibility to data) 	<p>5. INFRASTRUCTURE DESIGN</p> <ul style="list-style-type: none"> Planning applications, Level of climate proving Planning the future of building (level of climate) Design and monitoring policies regarding planning applications (number of applications with climate benefits). Systems resilience 	<p>6. TRAINING</p> <ul style="list-style-type: none"> Perform exercises Result from training: Response time (Recovery) N° of people informed N° of people warned Multiagency coop. (Interconnectivity) Forums
<p>7. EDUCATION</p> <ul style="list-style-type: none"> School University Curriculum N° of classes Social Media Advertising 	<p>8. CRITICAL INFRASTRUCTURE</p> <ul style="list-style-type: none"> Security of supply (energy, gas, transportation, water) Infrastructure failure (bridge collapse, utility supply, closed roads) Hospital Admissions, work day lost 	<p>9. CITIZEN ENGAGEMENT</p> <ul style="list-style-type: none"> Citizen survey (level of satisfaction with the city) People brining ideas Level of social cohesion (number of neighbourhoods known, participation in volunteering) Volunteer network Idea generating (integration of all stakeholders)

The general conclusion obtained in this second exercise of the GMB session is that first, there are general or generic indicators that are not specific for climate change. Then, there are specific indicators that measure climate change actions like emissions, floods, sea level. In parallel, there are indicators



that focus on integrating stakeholders in the development of resilience such as training, education and citizen's engagement. Furthermore, there are indicators related to measuring risk, and data accessibility. Finally, there are critical infrastructures and infrastructure design categories related to assets that are essential for the functioning of a society and economy.

It can be highlighted from this exercise that most of the identified indicators are general ones. Therefore, it should be taken into account that the use of these indicators in a particular city will require to adapt them to the specific characteristics of the city.

THIRD EXERCISE: IDENTIFICATION OF CHALLENGES

In the third exercise, participants were asked to identify the barriers that hamper the implementation of the identified policies identified in the first exercise.

Results

Table 5 presents a list of the barriers that were identified by the participants. Each representative from the small group presented a barrier, and afterwards, similar barriers were grouped together based on their similarities (see Figure 7) into eight categories: resilience concept, variety of stakeholders, legal and technical barriers, resources, budget and revenue, short term vs long term results, citizens' reluctance, communication and cooperation, and cultural aspects. A brief explanation of each of the category is given below.

- **Resilience concept** refers to the existing problems to develop resilience due to the complexity of the concept and the difficulty of defining and explaining it.
- **Variety of stakeholders** includes the difficulties of involving and coordinating the variety of stakeholders within a city.
- **Legal and technical aspects** refer to problems related to the ownership of critical infrastructures by private entities and the lack of regulatory frameworks for managing this type of issues.
- **Resources, budget, and revenue** refers to the lack of funding and resources for investing in resilience and the difficulty to clearly receiving an economic return.

Table 5. Identified barriers classified into categories (exercise 3).

<p>1. RESILIENCE CONCEPT</p> <ul style="list-style-type: none"> • Complexity of resilience • Perceived uncertainty • Nobody owns resilience (lacking ownership) • Uncertainty 	<p>2. VARIETY OF STAKEHOLDERS</p> <ul style="list-style-type: none"> • Scientists interface with politicians • Media interface with society • Reactive priorities and lacking of commitment
<p>3. LEGAL AND TECHNICAL ASPECTS</p> <ul style="list-style-type: none"> • Public private institutions owning critical infrastructures • Lack of legal framework for adaptation • Conservation of the status and restoration of buildings • Legal and technical barriers • Fragmentation of critical infrastructures 	<p>4. RESOURCES, BUDGET, AND REVENUE</p> <ul style="list-style-type: none"> • Lack of funding and resources for investing in resilience • Not clear payback or economic return for investing in resilience • Cost of monitoring (Money spent on monitoring technology).
<p>5. SHORT TERM VS LONG TERM PLANNING</p> <ul style="list-style-type: none"> • Short term problems get priority. • Long term planning occurs in short term political terms. • No consistent time frame and assessment for planning. 	<p>6. CITIZENS' RELUCTANCY</p> <ul style="list-style-type: none"> • Low commitment for engagement and cooperation
<p>7. COMMUNICATION AND COOPERATION</p> <ul style="list-style-type: none"> • Difficulty of sharing information • Different interest, lack of common ground • Communication (appropriate language and level of detail) • Knowledge sharing • Lack of leadership commitment to resilience • Interference (coordination of entities, too many entities, similar responsibilities). • Silos defining responsibilities • Confidentiality and trust • Lack of synergies • Lacking inclusiveness/ participation and involvement of specific actors 	<p>8. CULTURAL ASPECTS</p> <ul style="list-style-type: none"> • Political decision making: media focus on short instead of long term • Reactive priorities and lacking for commitment • Culture (human way of thinking) • Turning data into useful information

As experts realized during this exercise, there are many barriers that hamper the implementation and improvement of resilience. Among these problems, the complexity of resilience concept itself is a relevant barrier since it is a complex process. The lack of resources or funding to invest in the resilience development is also a main barrier since, as the experts commented, it is difficult to justify the return of



investments in resilience. In fact, if events do not take place it is very difficult to test the effectiveness of the investments made. For this reason, experts stated that the occurrence of events is “helpful” for the resilience building process, since these events increase the awareness of the stakeholders and help to analyze the level of the city resilience towards these events based on the suffered impacts.

In addition to these barriers, the high number of stakeholders involved in the cities’ resilience building process is another important barrier. The lack of commitment of some stakeholders and the difficulty of communication and cooperation among them makes difficult the creation of synergies and the knowledge sharing that can improve the resilience building process. Further, the collaboration between public and private institutions also presents a problem due to the legal and technical issues, especially when private organizations are managing critical infrastructures.

Apart from the previous barriers, the cultural aspects also affect the resilience development process. Changing individuals’ way of thinking and developing citizens’ commitment is not an immediate process and takes time. In this vein, although we are able to gather a lot of data that makes us be aware that we need to change some customs, it is difficult to put it into practice.

Finally, the experts differentiated between the short and long term planning. They assured that there are more barriers to develop plans for the long term than for the short term. On the one hand, when immediate shocks such as huge storms, snow, or health waves occur, money, resources, and collaboration among stakeholders is more easily achieved than for long term issues. On the other hand the politicians and administrations tend to develop policies where the results can be visible in the short term based on their political interests and election timelines.

FOURTH EXERCISE: EVOLUTION OF THE POLICIES

The fourth exercise of the GMB session consisted of presenting the stage of some of the principal policies that were identified in Exercise 1. Participants were asked to identify the stage of those principal policies/actions taking into account the preliminary resilience maturity model of the project (Table 6). The maturity model represents the trajectory of cities that mature from low resilience to high resilience through five stages: Starting (S), Moderate (M), Advanced (A), Robust (R) and Vertebrate (T). The Table 6 shows the tentative description of each stage.



Table 6. Resilience Maturity Model.

	Maturity Level	Tentative Description
S	Starting	The city has launched policies regarding resilience development. The risk assessment is still fragmented and incomplete with regard to hazards affecting critical infrastructures and man-made threats. The community involvement and the private-public cooperation are incipient. The approach is mainly city centred. A multi-governance approach with a European dimension is dormant. The city is not part of a larger resilience network.
M	Moderate	The city manages resilience development policies, using control measures. The risk assessment with regard to hazards affecting critical infrastructures and man-made threats are been operationalized in cooperation with critical infrastructure providers. Plans to involve communities and develop private-public cooperation have been developed. The city recognises the relevance of a multi-governance approach with a European dimension and acts to invigorate the approach. The resilience management is still fragmented and siloed. The city has started planning for networking with other European cities with regard to resilience and sustainability.
A	Advanced	The city has developed a framework to manage resilience within an explicit holistic approach that integrates critical infrastructure providers, expertise on man-made disasters and sustainability. Community resilience and private-public cooperation is part of the approach. The nodes in a multi-governance approach with a European dimension are well-linked in the plans, but not yet fully operationalized. The city is member of a major network of European cities with regard to resilience and sustainability.
R	Robust	The city has engaged all relevant agents to its resilience holistic approach. Agents perceive value added by resilience. The multi-governance approach with a European dimension is well developed and operationalized. The city is a member in a major network of European cities with regard to resilience and sustainability, with a proactive posture regarding interdependencies and potential cascading effects. In the sense of this project one can speak of a CITY.
T	Vertebrate	The CITY excels with its resilience as part of the ecosystem (regional, national, European) resilience. The CITY acts as a vertebra in the European Resilience backbone

The objective of this exercise was to classify the policies in those given stages as well as to ask the participants to interpret and discuss the effect that each policy has into other policies/actions. Moreover, in this exercise it was possible to split some actions in more than one if participants thought it was necessary to clarify or concretize its scope.



Results

Following, Table 7 presents the list of policies classified by stages and by all the small groups. Each representative from the small group presented their policies classification.

Table 7. Classification of policies/actions in the maturity stages.

POLICIES/ACTIONS	Group 1	Group 2	Group 3	Group 4
Take part with international networks	M(General) to A (Specific)	A	M	
Connect local stakeholders to coordination groups	A to R	M	A	
Develop a longterm adaptation plan	M	M	M	M
Develop emergency plans	S	M to A	S	M
Screen for existing strategies	S	S	S	S
Conduct theoretical simulations	M to T	M to A	R	
Conduct practical training with stakeholders	A	M to A	S	A
Develop strategy for CO2 reduction	S	R	A	M
Identify potential risks (for your city)	S	S	S	S
Develop solutions for the potential risks	M to T	M(Quantify) to R (develop)	M	M to T
Identify stakeholders and roles	S	S	M	S
Set up early warning tools	S to A	A	M	S to A
Save your assets through insurances	M	M	S	
Raise public awareness and understanding	A to R	S to T	A	S to T
Develop business plans for companies	R	A	T	M to T
Make citizens more resilient	R	M to T	R	T

As it can be observed (see Figure 8), there are many differences between the classifications of each policy. There are some policies, in green, that should be implemented at one specific stage. Other ones, in orange, are among different stages due to the lack of consensus between the groups. Finally, there are other policies, in blue, which should be implemented progressively through different stages.



S	M	A	R	T
	Take part with international networks (General)	Take part with international networks (Specific)		
	Connect local stakeholders to coordination groups			
	Develop a longterm adaptation plan			
	Develop emergency plans			
Screen for existing strategies				
				Conduct theoretical simulations
				Conduct practical training with stakeholders
				Develop strategy for CO2 reduction
Identify potential risks (for your city)				
				Develop solutions for the potential risks
	Identify stakeholders and roles			
				Set up early warning tools
				Save your assets through insurances
				Raise public awareness and understanding
				Develop bussiness plans for companies
				Make citizens more resilient

Figure 8. Classification of the policies into the resilience maturity model.

As defined in the Starting (S) stage, policies regarding resilience development with a city centred approach should be launched. In this case, two of the policies clearly identified in this stage are “Screen for existing strategies” and “identify potential risks”. In the Moderate (M) stage, the city should develop resilience policies using control measures and start planning for networking. Therefore, between S and M stages due to the lack of consensus, policies to “identify stakeholders and roles”, “develop emergency plans” and “save your assets through insurances” are essential. For the M stage, it was identified as important the policy related to “develop a long term adaptation plan” and “take part with general international networks”. In the Advanced (A) stage, the city should develop a holistic framework that integrates stakeholders in resilience building. Thus, the policies related to “connect local stakeholders to coordination groups” and “conduct practical training with stakeholders” were identified as necessary in between M and A stages. However, “take part with specific international networks” policy was identified clearly into stage A. From S to A stages, and “develop strategy for CO2 reduction” policies was identified due to a lack of consensus, nevertheless “set up early warnings tools” was defined as a policy which should be implemented progressively through S and A stages. In the Robust (R) stage agents should perceive value added by resilience and are engaged to the city resilience holistic approach. Furthermore, the city has a proactive posture regarding interdependencies and potential cascading effects. Finally, in the Vertebrate (T) stage the city should excel with its resilience as part of the ecosystem resilience. Taking into account the characteristics of the last four stages (from M to T stages) one policy should be carried out progressively: “develop solutions for the potential risks”. However, “conduct theoretical simulations”, and “develop business plans for companies” policies generated a general discussion due to the different stage proposals (from M to T stages) defined during the plenary session. In addition, between R and Vertebrate T stages, the policy “make citizens more



resilient” should be implemented. Finally, there is a policy that should be developed through the entire maturity model stages and its aim is “to raise public awareness and understanding”.

Summary of the results

The first conclusion related to the results obtained from the exercises is that a high level of consensus was reached between each small group. Another important conclusion is that a high number of policies, indicators and barriers about climate change and resilience were found. In addition, the results from these exercises have provided the first indication on the dynamics of building resilience. Furthermore, as Figure 7 shows, there is a similar path that shows how policies start to be implemented and continue improving in the different stages. Therefore, these exercises have allowed to identify the evolution of the main policies and also to identify which policies need to be implemented first. Following steps regarding the development of the maturity model will consist of reaching consensus to agree in which specific stage the different policies need to be implemented.

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. It could be observed that cities are working on building their resilience process but, due to its complexity and the lack of guidance on how to improve resilience, cities have difficulties to implement policies in a logical and efficient way.

Finally, the conclusion related to the organisation of the GMB session is the necessity to provide the experts with the possibility of preparing the exercises that will be carried out in the workshop in advance. During the GMB session the usefulness of having prepared in advanced the exercises was reveal. Furthermore, having one group recorder per small group was useful to better understanding of the whole GMB session.



GROUP EXPLORER SESSION (27TH OF JANUARY)

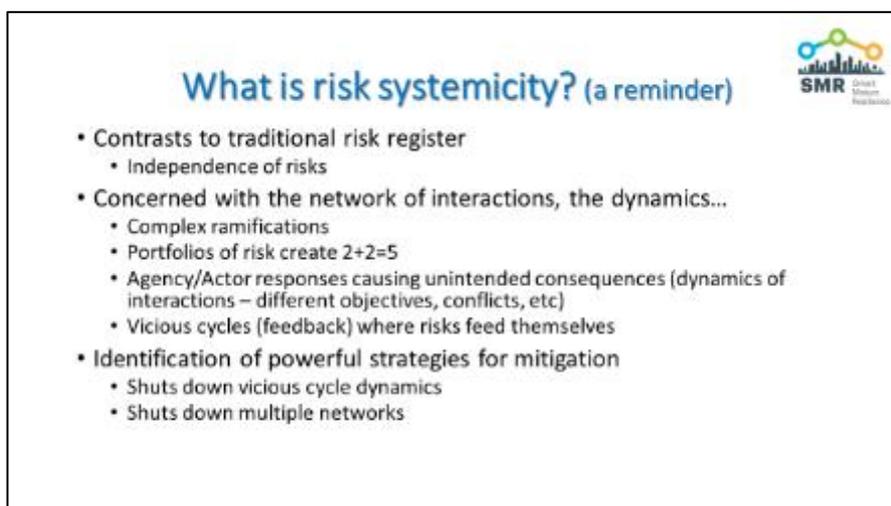
INTRODUCTION: UNDERSTANDING THE SYSTEMICITY RISK QUESTIONNAIRE

The third day of the workshop was run by the University of Strathclyde and it took place on the 27th of January 2016. The participants included 13 representatives from seven partner cities, as well as 6 representatives from non-city partners who were contributing at different stages of the session. Four of these participants had not been present at the Riga workshop and were attending because of their specific expertise in climate change. Furthermore, the workshop was observed by a number of SMR partners. Similarly, as was the case in the previous Work Package 2 (WP2) workshop in Riga, **the main goal of the session was to inform the Systemic Risk Questionnaire (SRQ)** falling under Work Package 3 (WP3) with respect to the main theme of the workshop which was **climate change resilience**.

At the start of the session the facilitators introduced to participants further detail about the construction and the purpose of the SRQ (Figure 9 and Figure 10). The SRQ was contrasted with more traditional risk registers. For example SRQ was seen as unique with its focus on interdependent networks of risks which can lead to complex ramifications, unintended consequences, and vicious loops. A better understanding of such negative impacts is understood as potentially very useful for devising effective strategies that would allow cities to mitigate against their impact and to recover from them. It was then explained that a computerised system Group Explorer (GE) would be used during the session to help capture causality between the events, their ramifications, and the policies implemented to address those negative impacts (see the Methodology sub-section for more information on GE).

Workshop participants were then advised that, in the context of the SMR project, the SRQ would be used to help cities evaluate their resilience maturity level. The SRQ would therefore be strongly linked with another SMR tool: the Maturity Model. The respondents of the SRQ will be asked questions about the key areas of risk and about the extent the mitigation of those risk areas have been considered within their city/organisation. Depending on their answers some of the subsequent questions will not be included (due to the interdependence between risks). Also, some risk areas will score differently based on responses to other risks. For example responses to areas which are subject to significant vicious feedback loops will score high. As a result, cities' maturity will not be assessed solely based on their

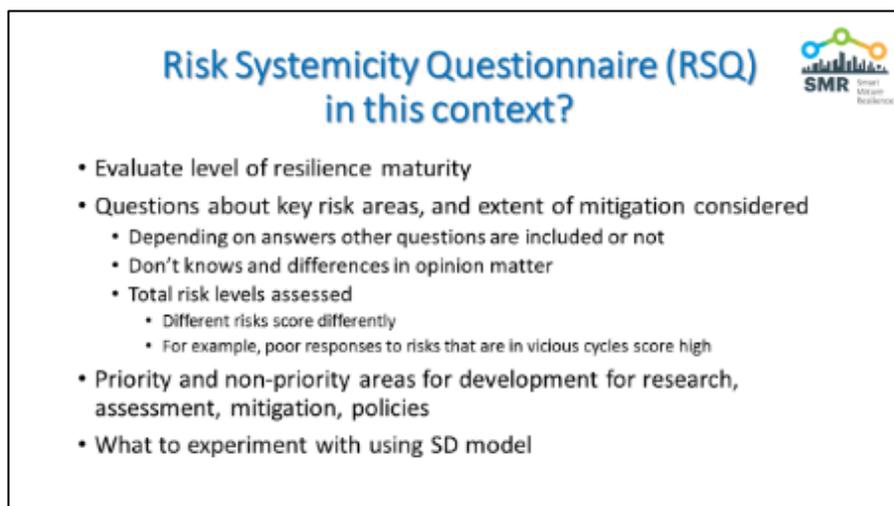
resilience to individual risks, but based on their resilience to the whole networks of risks of high complexity. It is that systemicity of risks which therefore served as the main point of reference for the workshop.



What is risk systemicity? (a reminder)

- Contrasts to traditional risk register
 - Independence of risks
- Concerned with the network of interactions, the dynamics...
 - Complex ramifications
 - Portfolios of risk create 2+2=5
 - Agency/Actor responses causing unintended consequences (dynamics of interactions – different objectives, conflicts, etc)
 - Vicious cycles (feedback) where risks feed themselves
- Identification of powerful strategies for mitigation
 - Shuts down vicious cycle dynamics
 - Shuts down multiple networks

Figure 9. Introducing the notion of Risk Systemicity



**Risk Systemicity Questionnaire (RSQ)
in this context?**

- Evaluate level of resilience maturity
- Questions about key risk areas, and extent of mitigation considered
 - Depending on answers other questions are included or not
 - Don't knows and differences in opinion matter
 - Total risk levels assessed
 - Different risks score differently
 - For example, poor responses to risks that are in vicious cycles score high
- Priority and non-priority areas for development for research, assessment, mitigation, policies
- What to experiment with using SD model

Figure 10. Risk Systemicity Questionnaire in the context of SMR project

BUILDING ON THE WORK FROM THE WORKSHOP IN RIGA

Having described the characteristics of SRQ to participants, the facilitators updated them about the preliminary results from the previous workshop in Riga organised as part of WP2. They listed some of



the key risk themes identified during the session in Riga, which included: violent riots, mobile and non-mobile communication overwhelmed, public transport and private transport not being able to function (Figure 11). Also a number of high impact policies/strategies were identified, such as: ability to mobilise police forces, politicians react quickly, unified multi-agency media response (Figure 12). Building on these results, the facilitators summarised the systemicity of risks on a simplified causal map which was zoomed on the relationships between the key themes (Figure 13). In addition to this, using the dedicated *Decision Explorer* causal mapping software (which is an integral part of GE system), the facilitators are able to explore the details of the map including the policies targeting the specific risk ramifications. These results had been seen as promising from the perspective of the construction of the SRQ and consequently a similar structure for the GE session was followed in the workshop in Bristol.

SRQ development from Riga



- Some of the key ('generic?') risk themes that interact through vicious cycles:
 - They regenerate themselves through positive feedback
 - Violent riots
 - Shops and stores looted
 - Mobile and non-mobile communication network 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
 - Death and serious injury
 - Health services under huge pressures
 - City reputation severely damaged
 - Large increases of garbage

Figure 11. Briefing participants about the progress so far – key risk themes



Riga workshop: example high impact resilience policies/strategies

- Ability to mobilise police forces
- Identification of rendezvous points - crowd control
- Ability to use public buildings school libraries as temporary shelters
- Strong leadership commanding trust and giving impression of control
- Coordinated emergency services
- Politicians able to react quickly
- Unified multi-agency media response
- Mobilize garbage collectors for rapidly restoring urban decor
- Business Continuity plans

Figure 12. Briefing participants about the progress so far - high impact resilience policies/strategies

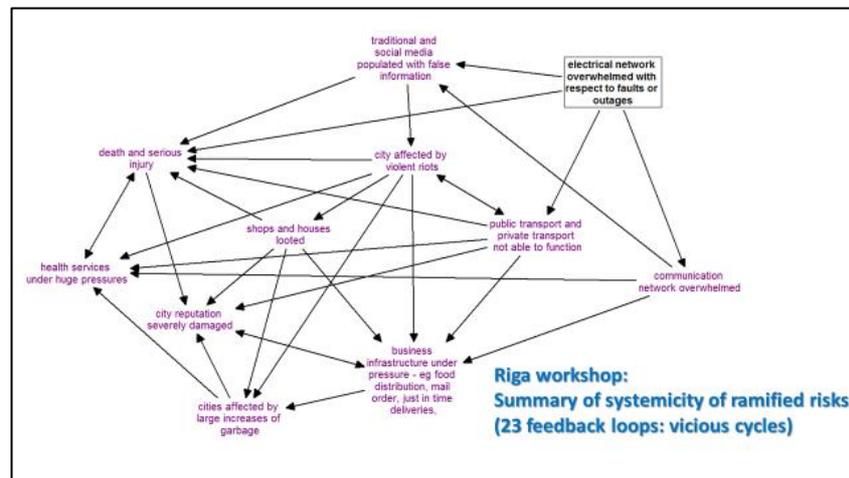


Figure 13. Summary of systemicity of ramified risks from the workshop in Riga

METHODOLOGY: THE ‘GROUP EXPLORER’ APPROACH

Using Group Explorer in the workshop

As in Riga, on the second full day of the workshop a computerised group decision support system, Group Explorer, was used to support the facilitation process (Figure 14). Using this system, the representatives from seven cities and the representatives from the SMR scientific committee were formed into city pairs. Participants were seated in small tables with a laptop computer allocated to each pair. They were instructed that they would use their laptops to enter brief statements to express their

views in relation to a given problem or question. Participants were asked to link the statements thus forming a map of causality (as in 'A' is expected to lead 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 participants could focus their attention on various questions of possibly high relevance at different stages of the workshop. It was helpful that some of participants already had experience with using GE which they had gained in the workshop in Riga, because they could assist those who were new to GE in familiarising themselves with how the system worked.

It must be noted that non-city SMR partners' contributions can be easily excluded from the analysis using the *Decision Explorer* software and by analysing the data-log generated during the session (i.e. a detailed record of all participants' contributions second-by-second). This way city-members' and non-city members' responses can be separated when needed.



Figure 14. Participants developing a shared causal map during the Group Explorer session

Categories of statements in the workshop in Bristol

It is common practice to categorise statements generated during GE-facilitated sessions with the use of colour styles of text. This helps distinguish between different types of statements, and it makes it easier to follow these categories as the map grows bigger (Figure 15). The map construction exercise begins with a starting question which is a trigger risk event that leads to various ramifications which impact the city. Those ramifications are addressed and counteracted, both positively and negatively, by policies that cities and their stakeholders execute. There is also another type of policies called ‘bouncing forward policies’, and these policies may be developed as a result of cities seeking to make the best of a disaster by exploiting new opportunities (they can be seen as opportunities for learning). And lastly, the central statements, which have a strong influence on the other parts of the map through a high number of causal relationships, are categorised as potential risk themes.

Starter question: opening question for the discussed scenario.	1 climate change events that matter?
Trigger event: an event which suddenly triggers a number of negative ramifications which impact the city.	9 city subject to storms and high winds
Creeping event: an event which gradually leads to a number of negative ramifications which impact the city.	33 ocean acidification
Key statement: a busy, strongly interlinked statement, which has strong influence on the map via networks of causality.	40 city subject to increase of air pollution
Impact: negative ramifications of risk events affecting the city.	109 increased demand for energy
Policy: actions which cities take to address the negative ramifications of events.	619 provide media training for crisis communication
‘Bounce forward’ policy: new ways of addressing negative ramifications which cities have opportunity to learn/develop during the course of facing those risk impacts.	606 find alternative solutions to provide medical assistance and medications (such as drones)

Figure 15. Categories of statements used in the session

These categories are used throughout this document therefore Figure 15 acts as a useful point of reference when reading the included causal maps.



ACTIVITIES: BUILDING A SHARED CAUSAL MAP

Rating the climate change resilience policies from the Tuesday workshop session

The first stage of the GE session started shortly after the facilitators' feedback about the preliminary results from the Riga workshop and the general briefing. During the first stage, facilitators displayed a selection of policy development processes which participants identified, during the course of the Tuesday workshop session, as significant with respect to developing climate change resilience. Participants were then asked to rate on a scale from 0 to 100 their respective cities' relative progress with regards to the implementation of the named policies (Figure 16). The policies with the higher average score (and hence with the largest progress on behalf of the cities) were: screen for existing strategies, set up early warning tools, and identify potential risks; whilst the policies with the lowest average score were: develop business plans for companies, make citizens more resilient, and conduct practical training with stakeholders. The GE log recorded the differences in progress between each of the cities (other SMR participants were excluded from this evaluation).

Rating activity: what is the progress of your city with regards to implementing these policies?	Average	St Dev.
screen for existing strategies	78.57	22.12
set up early warning tools	75.00	20.00
identify stakeholders and roles	74.29	19.24
identify potential risks	74.29	28.49
save your assets through insurances	68.57	28.68
develop strategy for CO2 reduction	68.57	26.57
take part in international networks	62.14	17.99
conduct theoretical simulations	55.71	30.47
develop solutions for the potential risks	52.14	30.94
raise public awareness & understanding	47.86	28.70
develop long term adaptation plans	45.00	24.83
connect local stakeholders to coordination groups	41.43	33.26
conduct practical training with stakeholders	37.86	31.74
[empower] make citizens more resilient	36.43	32.37
develop business plans for companies	33.57	33.51

Figure 16. Results of the rating activity - implementation of policies

Gathering statements: climate change resilience trigger-events

In the next stage of the session, participants were invited to discuss the trigger events which could be used as points of reference for the meeting. By 'trigger events' the facilitators referred to possible risk events that could lead to considerable negative ramifications for the city. However, whereas in Riga the



participants were presented with scenarios that had been prepared in advance of the workshop, in Bristol they were asked to contribute a range of triggering events which they regarded as particularly significant.

The exercise lasted for 38 minutes and it resulted in 90 statements and 99 links added to the map. Facilitators then worked with the group to select 13 statements which appeared to be the most central to the map and represented different types of events. Subsequently, participants were asked which of those events were the most interesting and promising for developing complex and significant scenarios of ramifications. They expressed their views using a rating scale from 0 to 100 (Figure 17). The risk events which participants found the most interesting for further discussion were: heatwave, flooding, rising anxiety and depression, air pollution, and storms and high winds.

Rating activity: which of these events are the most interesting to focus on in the session?	Average	St Dev.
flooding	77.14	12.20
heatwave	74.29	22.44
rising anxiety and depression	66.43	32.62
air pollution	61.43	29.68
storms and high winds	60.71	22.07
corruption	57.86	23.07
pest increasing and spreading	55.00	38.30
tropical-like cyclones	50.71	42.86
declining water quality - blue algae	49.29	21.88
gulf stream change from glacier meltdown	45.71	36.11
dramatic, run away climate change beyond modelled projections	34.29	26.52
increased opportunities for local food producers	33.57	31.72
ocean acidification	27.14	23.95

Figure 17. Result of the rating activity - risk events of high interest

Gathering links and statements: the unintended consequences of flooding

After a brief debate on the results of the rating activity it was agreed that the first topic which participants would explore in more detail was *flooding*. Facilitators therefore asked participants to elaborate the multiple scenarios that followed from the risk of flooding, with a particular focus on the unintended consequences (Figure 18).

The stage of gathering links and statements with relation to the flooding risk event took 1 hour and 20 minutes and led to the break for lunch. Participants had created a map of 123 statements and 154 links. Figure 19 presents a simplified view of part of the map. It shows that 'city overwhelmed by severe



flooding' was a strongly interlinked (central) statement, with a high number of links going in (drivers) and going out of it (consequence). Key drivers of 'city overwhelmed by flooding' included: the erosion of soil, power plants/nuclear power stations in danger, permanently damaged properties. Meanwhile key consequences included: rising anxiety and depression, long-term damage to the economy, increased pressure on authorities to act.

Other busy statements that were either drivers or consequences of flooding can be explored separately on different views of *Decision Explorer* in order to see more detail. **Error! Reference source not found.** hows part of the map focused on the outcome of 'permanently damaged properties' which is a driver of 'city overwhelmed by flooding'. By exploring the links around this statement it can be seen that it is directly caused by a trigger-event 'river/sea level rising', as well as by: damaged housing stock, utility failures, damage to cultural heritage, city facing landslide, and urban coastal areas damaged. In turn the policies which can be implemented to address the negative impact 'permanently damaged properties' are: take sustainability into account when rebuilding properties, increase employment in the construction industry, and build floating homes. Furthermore, this statement leads to other consequences in addition to 'city overwhelmed by flooding': increased level of homelessness, increased recovery costs for high value assets, property value may drop, and increased demand for temporary housing.

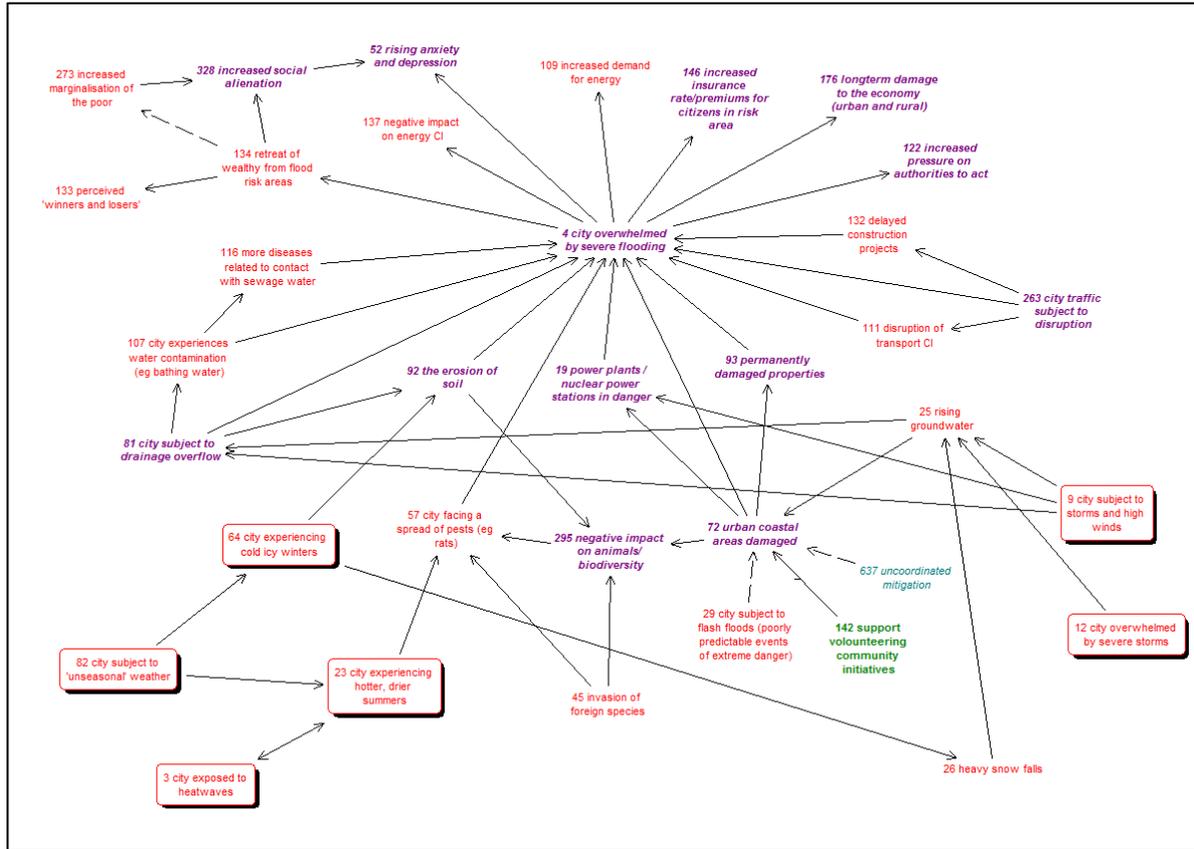


Figure 18. View on the map - the flooding risk event

- Dashed links signify the links added by the researcher based on the broader context of the map at the analysis stage.
- Numbers before statements represent the order in which statements were added on the map by participants.
- Small minus signs next to arrows mean that the action leads to another statement *not* happening. No minus sign indicates that the link means *leads to*.

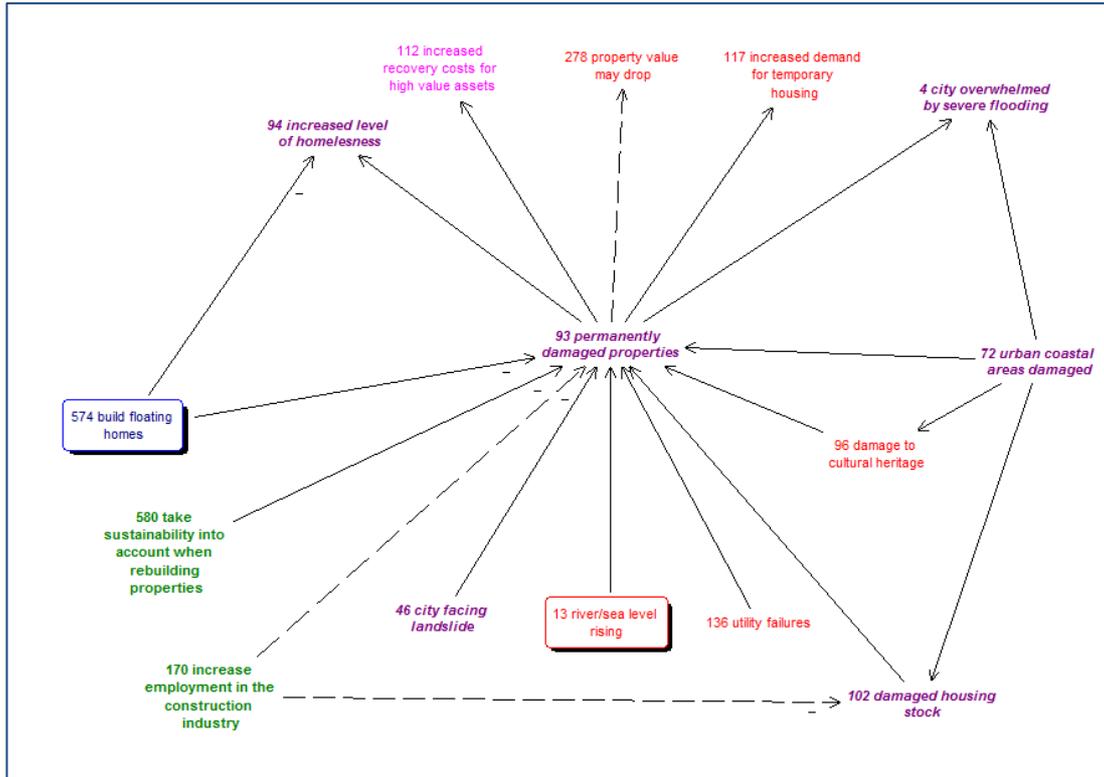


Figure 19. View on the map - permanently damaged properties

After the lunch break: evaluating key risk themes from the session

The lunch break gave the facilitators time to ‘tidy’ the map constructed by participants, and to find out which statements appeared to be the key themes in the session so far. This was carried out in the *Decision Explorer* software with the use of its powerful analytical functions. *Domain analysis* measured the number of immediate in/out links for each statement, *central analysis* rated each statement with regards to their broader impact on the map, *loop analysis* allowed quick identification of self-reinforcing feedback loops within the elaborate networks of connections on the map, and *cluster analysis* broke down the map into a number of interconnected chunks. The execution of these analytical functions led to the identification of 17 key themes. Each pair of participants was then allocated a total of 14 digital blobs which they used to evaluate those key themes (Figure 20). They were given a maximum of 7 red blobs to allocate to the themes which in their opinion had the biggest impact on their respective city. They were also allocated 7 green blobs to mark those key themes for which they were the most prepared



for. It should be noted that participants had full freedom in distributing their blobs and so, for example, it was possible for them to allocate all available blobs to only one or two statements.

The results of this preferencing activity indicated that the key themes with the strongest impact on cities were seen to be: homeless people, traffic disruption due to flooding, city focus on short-term issues, and drainage overflow. In turn the themes for which cities are most prepared to deal with are: drainage overflow, traffic disruption due to flooding, landslide, severe flooding, and long-term damage to economy.

preferencing activity: the impact of key themes on cities	
<i>green blobs = which on their own right have the biggest impact on your city?</i>	total
city focus on short term issues	9
homeless people	7
traffic disruption due to flooding	6
drainage overflow	4
rising anxiety and depression	3
media circus	3
urban coastal areas damaged	2
danger to power plants / nuclear power stations	2
landslide	2
permanent damaged properties, no re building or construction	2
damaged housing stock	2
collaboration/ liaison budgets will be cut	2
severe flooding	1
longterm damage to economy	1
erosion of the soil	0
increased insurance rate for citizens in risk area	0
<i>red blobs = which ones you are most prepared to deal with?</i>	total
drainage overflow	9
traffic disruption due to flooding	6
severe flooding	5
landslide	5
longterm damage to economy	5
media circus	4
homeless people	3
urban coastal areas damaged	3
damaged housing stock	2
danger to power plants / nuclear power stations	2
increased insurance rate for citizens in risk area	2
rising anxiety and depression	2
declining water quality - blue algae	1
city focus on short term issues	0
collaboration/ liaison budgets will be cut	0
erosion of the soil	0
permanent damaged properties, no re building or construction	0

Figure 20. Preferencing activity - the impact of key themes on cities.

*Each user expressed their preference using the allocated 7 red and 7 green blobs, with no constraints imposed on how to distribute them.



Gathering links and statements: air pollution

After the preferencing activity on key risk themes had been completed, the facilitators invited participants to contribute to another activity of gathering links and statements. However, whilst earlier in the session participants had discussed a trigger-event of a sudden nature (i.e. flooding), this time they were asked to consider the impacts of *air pollution* which was a trigger-event that was more gradual in its development – a *creeping* risk event. This stage lasted from 2.30 PM until the end of the session at 5 PM, and during that time participants were asked to look at the consequences of air pollution, as well as the policies that could be implemented to address it.

The final map consisted of 453 statements and 547 links.

Figure 21 presents a simplified view of the issues surrounding the increase of poor air quality. The key consequences include: problems with monitoring systems (CCTV), decline in soil health, declining water quality, exporting of air polluting activities, temporary shutdown of factories, damage to buildings, 'air quality inequality', air traffic disruption, and city traffic subject to disruption. In turn the key drivers include: city exposed to heatwaves, increased demand for air conditioning, high CO₂ levels, changes to urban microclimate and topography, increased use of winter tyres, people increasingly exposed to carcinogenic properties, and increased air traffic. Participants also identified a number of policies addressing the theme of poor air quality, such as: support smart logistics, city invests in more trees and green infrastructure, invest in research into air cleaning solutions at source, and develop best practices knowledge sharing networks, and considerable attention to the role of cars.

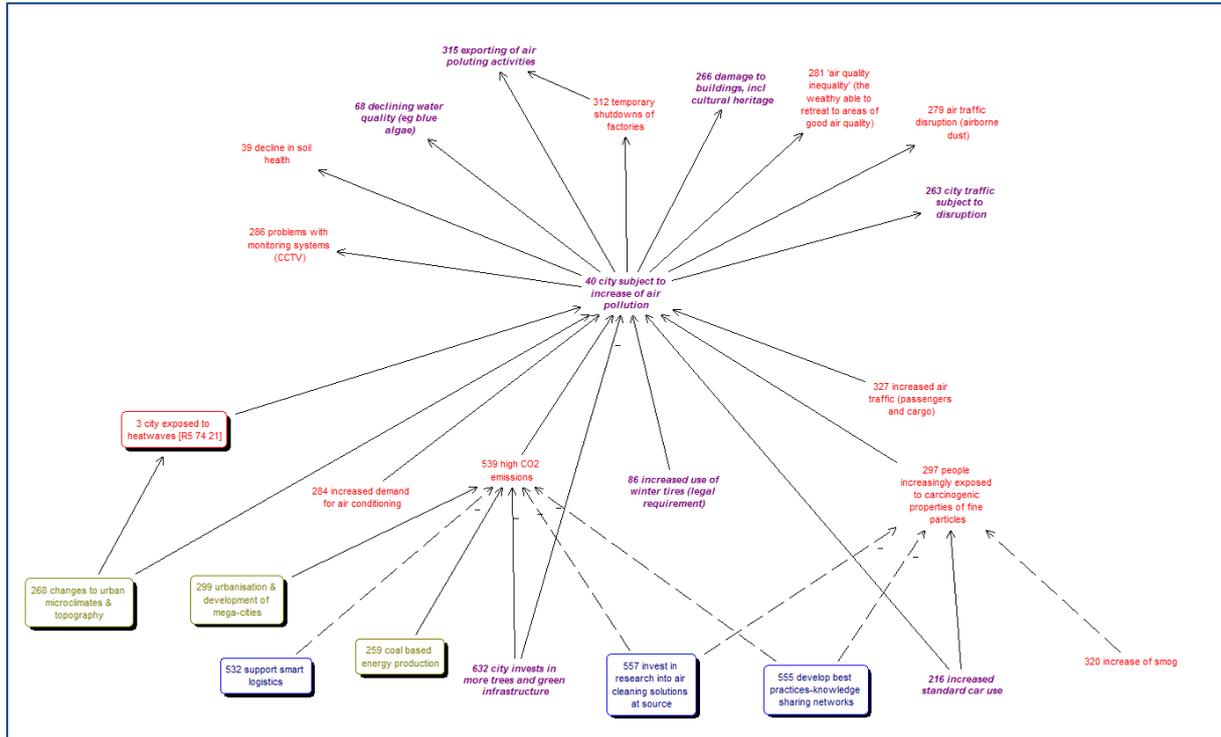


Figure 21. View on the map - air pollution

It was also possible to explore the busy statements falling under the theme of air pollution. For example, Figure 22 shows a more detailed view of one of the consequences of air pollution, i.e. *city traffic subject to disruption*. This statement is addressed by three policies: implement intelligent traffic management networks, find alternative solutions to provide medical assistance, and emergency services divert traffic. In turn the consequences of the *city traffic subject to disruption* are: increase in road accidents, disruption of transport critical infrastructure, city overwhelmed by severe flooding, and delayed construction projects.

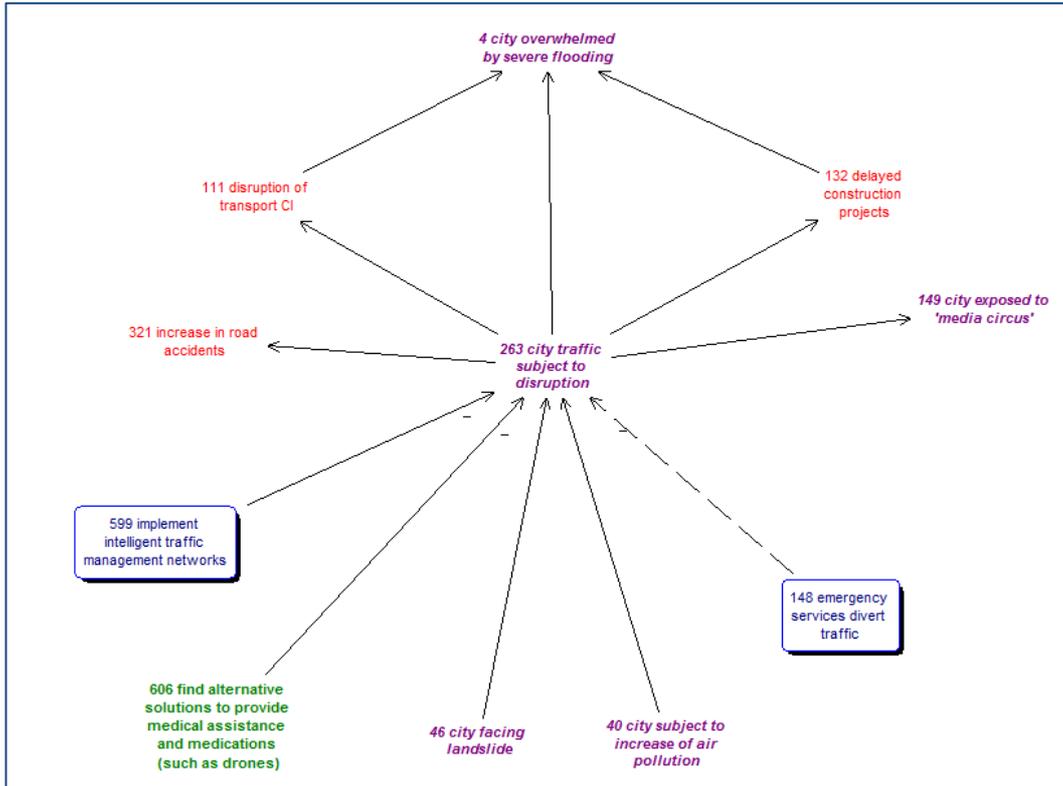


Figure 22. View on the map – city traffic subject to disruption

There was also one more consequence of *city traffic subject to disruption* which attracted a lot attention of participants, and that statement was *city exposed to media circus* (Figure 23). The risk of a media circus had been seen as a significant risk from the workshop on critical infrastructure. Risk of a media circus had one consequence (increased pressure on authorities to act) and a number of drivers in this workshop: people’s death and injury, social media populated with false information, city traffic subject to disruption, lack of coordination among emergency actors, traditional media populated with false information, and increased level of homelessness. It was also supported by two policies: work on city resilience reputation before crisis, and work on good communication with citizens. Moreover, the driver *social media populated with false information* was addressed by five additional policies: use official channels to counter propaganda, give social media legal duties in emergencies, increase direct use of social media by public authorities, invite social media to have a role in the response, and invite social media to become resilience champions.

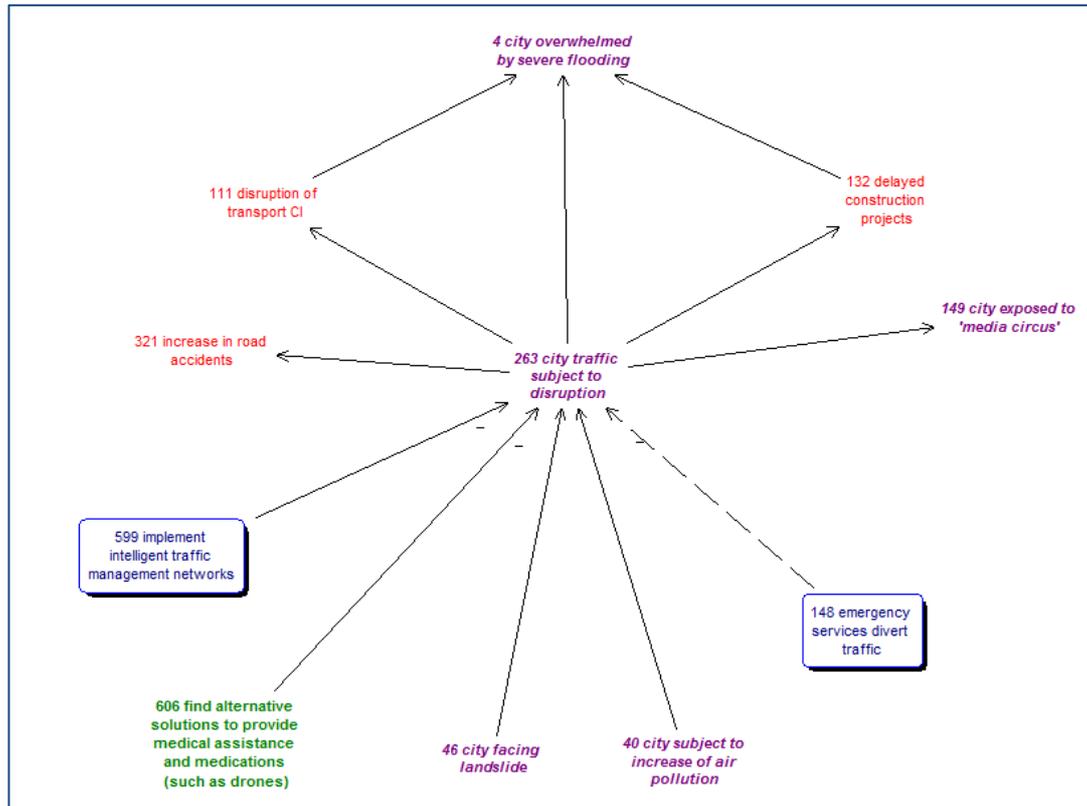


Figure 23. View on the map – city exposed to ‘media circus’

ANALYSING THE DATA

Tidying the map

The analysis of findings began with tidying the shared causal map. This involved:

- Every statement and link was inspected individually, e.g. the directions of causal links were checked to make sure they made sense with regards to the context of the map and the intentions of participants.
- Each key theme was explored and displayed on a separate view of the map.
- Statements with spelling mistakes were corrected and synonymous statements were merged.
- Policies were rephrased so that they included a verb – this helped to stress their actionable character in countering negative impacts.
- It was ensured that policies lead to impacts and not the other way round.



- Impacts were rephrased as consequences with an evaluative word so that they better expressed negative impact on the city.

Analysing the map and the data log

GE-facilitated sessions generate two types of data sets: causal maps and data logs. Each of these data sets obtained from the workshop in Bristol were carefully analysed. The analysis of causal maps had been explained in throughout this document, with functions such as cluster analysis, central analysis, or loop analysis, being used to manage the complexity of the map and to identify interesting patterns, themes, and feedback dynamics. Data logs, on the other hand, are saved in *Excel* format and contain a detailed record of the entry of each link and statement by each user. Data logs contain some information which is not available in the corresponding causal maps, for example the detailed results of preferencing activities, or the authorship of contributions. As a result, the analysis of data logs can be seen as supplementary to the analysis of causal maps and help to gain a better understanding of different stages in the session. Furthermore, the facilitators' notes taken during the session serve as a valuable source of information.

Finding the loops

From the perspective of SRQ construction, a particularly useful analytical function of Decision Explorer is loop analysis. This is because responses to question areas that have the potential to create vicious loops will result in high risk scores. Such loops typically emerge organically as participants develop the shared causal map. However, they can be difficult to untangle and to identify, especially for large maps – thus this is when the software proves helpful. For example, in Figure 24 two simple loops identified in the workshop are shown. The first loop from the left side of the picture states: an increase in people's health problems leads to increased pressure on health services, which leads to reduced quality of health services, which in turn leads back to an increase in people's health problems. It is therefore a self-reinforcing loop which requires action to break the vicious cycle. Moreover, the other loop states: population subject to higher rates of obesity leads to increased social alienation, which leads to less time spent outdoors on training/physical activity, which in turn leads back to population subject to higher rates of obesity. It is therefore clear that this loop is also vicious and self-reinforcing, and it requires action

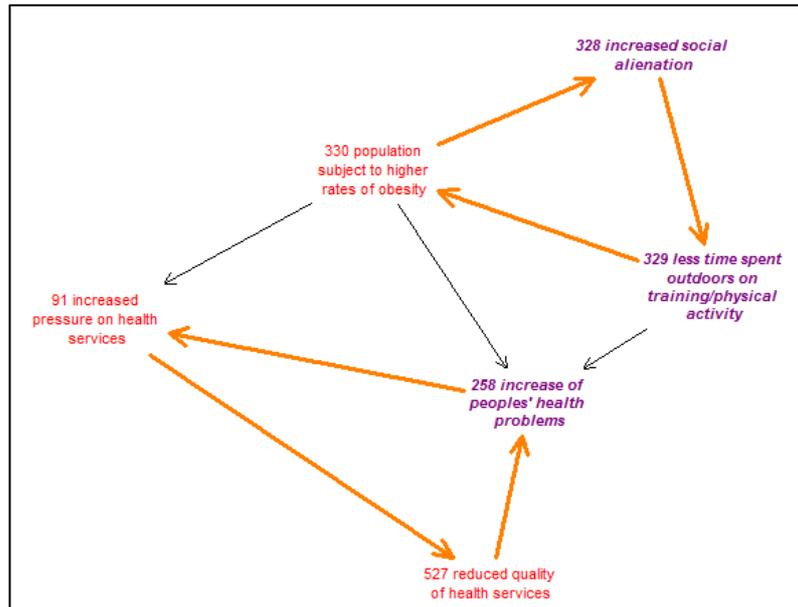


Figure 24. Example of loops which emerged during the session

*Bold, orange links mark the presence of feedback loops.

Key themes and policies

Based on the analysis 16 key statements (themes) were identified in the session:

- city overwhelmed by severe flooding
- city subject to increase of air pollution
- city facing landslide
- rising anxiety and depression
- declining water quality (e.g. blue algae)
- urban coastal areas damaged
- city subject to drainage overflow
- permanently damaged properties
- increased level of homelessness
- damaged housing stock
- increased pressure on authorities to act
- city exposed to 'media circus'

- city traffic subject to disruption
- negative impact on animals/ biodiversity
- increased social alienation
- less time spent outdoors on training/physical activity

As seen in Figure 25 and Figure 26, the key statements are strongly interconnected through networks of causal relationships.

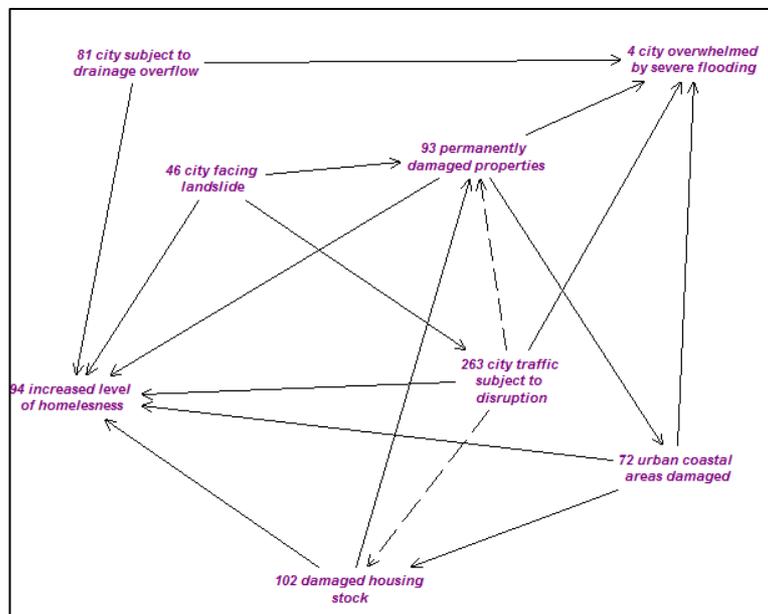


Figure 25. Network of causal relationships between key statements – part 1

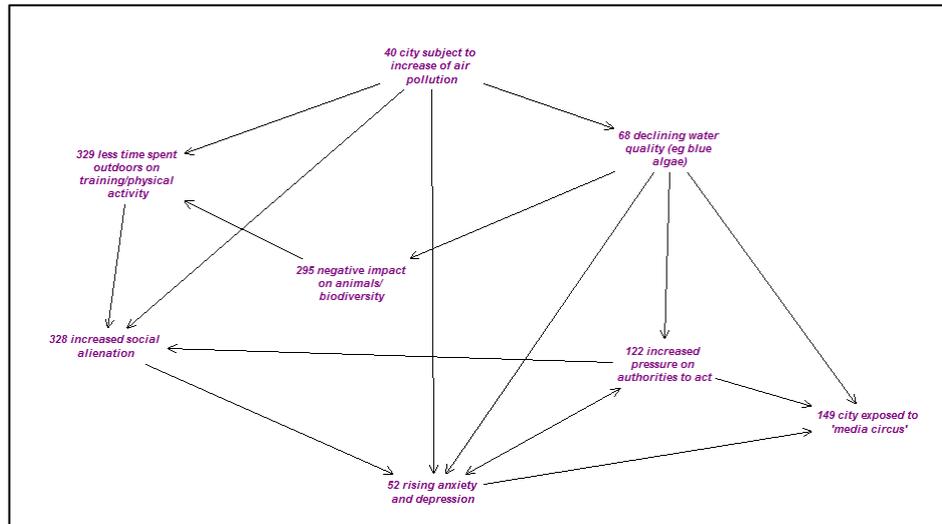


Figure 26. Network of causal relationships between key statements – part 2

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 V).

The questionnaire was composed of 15 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 are provided in the Annex V and VI.

The questionnaire was given to the 17 experts that participated in the workshop and 14 responses were obtained. This represents a response rate of 82%.

IMPROVEMENTS AND LESSONS LEARNT ON THE GROUP MODEL BUILDING SESSION

According to the answers received from the experts, the exercises carried out during the first day of the workshop were very productive and experts enjoyed them. As an expert commented, “This was a very productive + thought provoking day”.

Regarding the usefulness of the exercises, experts believed that exercise 2 (identification of indicators) was the most useful exercise (see Annex VI). A reason for this can be that having identified and put together a series of policies in the previous exercise (exercise 1) helped experts to clearly identify relevant indicators for measuring those policies. Regarding the easiness of the exercises, exercise 3 (identification of barriers) was the easiest exercise to understand for the experts.

An important lesson learnt from this workshop is the necessity to provide the experts with the possibility of preparing the exercises that will be carried out in the workshop in advance. The responses of the questionnaire reveal the usefulness of having prepared in advanced the exercises. Furthermore, it can be concluded from the comments received in the questionnaire that experts were very satisfied with the execution and the results of this workshop. Thus, for the following workshops, participants will be asked to prepare the exercises in advance.

EVALUATION OF THE GROUP EXPLORER SESSION

At the end of the workshop, participants were asked to provide feedback on their experience and the usefulness of the session for the project. For this purpose a similar questionnaire was used to the one which had been distributed to participants in Riga (see Annex VII). Overall, as (seen in Annex VIII), the results of questionnaire can be seen as very positive, with the average score for 7 out of 12 questions being over 4.5 on a 0-5 scale, and only one question getting an average score below 4 (the average



score for 'Question 9: the workshop helped me to change my understanding of the resilience issues in relation to climate change' was 3.71). Moreover, the average scores for all but one question have improved since the workshop in Riga. As a result, it can be concluded that participants in general enjoyed the session and they thought that it could deliver a possibly valuable contribution.

IMPROVEMENTS AND LESSONS LEARNT ON THE GROUP EXPLORER SESSION

Whilst the Group Explorer session in Bristol built on the results obtained in Riga, it also gave many opportunities to explore new areas of city resilience, effectively enriching the material that is expected to inform the SRQ construction. Firstly, although in Bristol the main topic of the workshop was different to the topic considered in Riga, there are a number of overlaps and commonalities between the causal maps created by participants. Once the forthcoming workshops have been completed, it will therefore be an important and challenging task to consolidate the obtained models. Secondly, it is clear that since many of the participants in Bristol already had experience of using Group Explorer, it allowed them to achieve more results in the same amount of time. As a comparison, the final map from Riga consisted of 195 statements and 331 links, whereas the final map from Bristol had 453 statements and 547 links. Moreover, although the results of the participant questionnaire in Riga was positive, as evidenced in this report, the questionnaire results from the Bristol workshop were further improved. This is encouraging in terms of ensuring participants' engagement in the forthcoming workshops in Rome and Vejle. And thirdly, the produced causal maps have proved useful for dealing with complex topics surrounding city resilience. The visual representation of risk events, their ramifications, and policies which address those ramifications, help to communicate and share city experts' understanding of those issues. In the future sessions the existing categories of links and statements, such as the 'bouncing forward policies', can be further refined. Overall, the achieved empirical material from the Group Explorer sessions so far is rich and relevant, and will be valuable for the development of the SRQ.

WORKSHOP OUTCOMES

The first outcome of the workshop is the high number of policies, indicators and barriers about climate change and resilience proposed. In addition, the results from the GMB session have provided the first indication on the dynamics of building resilience. Therefore, these exercises have allowed to identify the evolution of the main policies and also to identify which policies need to be implemented first. Following



steps regarding the development of the maturity model will consist of reaching consensus to agree in which specific stage the different policies need to be implemented.

Finally, the GE session in Bristol resulted in an engaging exploration of new areas of city resilience, whilst simultaneously further elaborating on a number of risk themes already covered in the previous workshop. These results are planned to be merged with the data obtained in two forthcoming WP2 workshops, and it is expected that they will provide rich material for the RSQ construction to draw on.

SUMMARY OF MAIN CONCLUSIONS

- ✓ A high number of policies related to resilience and climate change were identified
- ✓ A high number of indicators related to resilience and climate change were identified
- ✓ A high number of barriers related to resilience and climate change were identified
- ✓ The evolution of the main policies according to the stages of the preliminary version of the maturity model
- ✓ New areas of city resilience and climate change for the systemic risk assessment questionnaire
- ✓ A number of risk themes for the systemic risk assessment questionnaire

ANNEX I ROLES AND PARTICIPANTS OF THE WORKSHOP

Institution	Role
TECNUN	Facilitator
TECNUN	Group facilitator
TECNUN	Group recorder
TECNUN	Group recorder
STRATH	Observer
STRATH	Group recorder (in the afternoon)
STRATH	Group recorder
CIEM	Gatekeeper
CIEM	Facilitator
CIEM	Modeller of Tool 4
ICLEI	Group facilitator
DIN	Group recorder/Group facilitator
DIN	Standardization activities
LIU	
LIU	Group recorder (in the morning)
LIU	Group facilitator
BRISTOL	Expert
BRISTOL	Expert
KSAND	Expert



KSAND	Expert
VEJLE	Expert
VEJLE	Expert
GLASGOW	Expert
ROME	Expert
ROME	Expert
SAN SEBASTIAN	Expert
RIGA	Expert
BRISTOL	Expert

ANNEX II DESCRIPTION OF THE ROLES

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 modeling support team to structure the sessions, and participates as a member of the group.



Recorder/Group recorder: it strives to write down or sketch the important parts of the group proceedings. Together with the notes of the modeler/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.

Modeler 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 modeler: 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 modeler; such a person can observe unwanted impacts of jargon in word and icon missed by people closer to the field.

WP1 related activities modeler: 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 modeler: 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 III EXERCISES FOR THE EXPERTS TO PREPARE IN ADVANCE OF THE WORKSHOP

Workshop in Bristol: preparation exercises

Based on the exercise developed during the last day of the Riga Workshop we have classified the resilience concepts in four clusters: Cooperation, Preparedness, Leadership & Awareness and Robustness. Table 8 shows the classification of these concepts.

COOPERATION	PREPAREDNESS	LEADERSHIP & AWARENESS	ROBUSTNESS
Holistic /Inclusive/ integrated	Capability	Change/ Transition	Continuity/ Bouncing back
Information sharing/Communication	Training	Adaption/ Flexible	Sustainable
Partnership/ Collaboration/connected	Learning/ Continuous improvement	Governance	Stable
		Commitment	Safe

Table 8: Classification of concepts in four resilience clusters

Below the definitions of these concepts are explained.

Cluster 1: Cooperation

- **Holistic/inclusive/integrate:** it refers to the idea that problems and systems should be analyzed as a whole and not just only as a sum of their parts. It is important to have the big picture of the problems or difficulties in order to develop or improve the resilience level. To do that the inclusion of all relevant stakeholders' experiences is of paramount importance.
- **Information sharing/ Communication:** It is essential to establish communication channels and share information among different stakeholders involved in the resilience development process. This will allow stakeholders to have a holistic view of the problems and to foster collaboration agreements between them.



- **Partnership/ Collaboration/Connected:** It refers to the relationships and arrangements between several stakeholders, representing different sectors and levels that come together to address a common goal and produce shared results.

Cluster 2: Preparedness

- **Capability:** it refers to the skills that stakeholders need and/or have in order to deal with crisis. These skills are improved through training exercises and the learning process.
- **Training:** it refers to the activities that stakeholders need to carry out in order to learn how to deal with crises. They can be either theoretical or practical activities such as: table-top exercises, seminars or emergency drills, etc.
- **Learning/Continuous-improvement:** Learning from previous experiences allows organizations to avoid past mistakes and improve their knowledge and preparation for future events. Therefore, organizations should seek the ideal conditions to create a culture of continuous improvement in their organizations.

Cluster 3: Leadership & Awareness

- **Change/transition:** a transition is a change from one state or condition to another in order to adapt to a new situation of crisis or recovery.
- **Adaptation/Flexibility:** It refers to the ability and ease of adopting alternative strategies in response to changing circumstances or sudden crises. Organizations can be made more flexible through adopting new technologies and knowledge, including recognizing traditional practices (100 Resilient Cities).
- **Governance:** It is the process of making decisions, and establishing policies and monitoring them to ensure the proper management of the resilience building process.
- **Commitment:** Willingness to make an effort and spend time working and supporting the resilience building process.

Cluster 4: Robustness

- **Continuity / bouncing back:** it refers to the processes of response and recovery after a major disaster. The aim is to restore the normal functioning of the vital systems as soon as possible and to achieve a better and a more improved state after the major disaster.
- **Sustainable:** It refers to a system that manages its resources in a way that guarantees welfare and promotes equity of current and future generations.
- **Stable:** It refers to a highly resistant system able to resist/absorb external fluctuations/shocks.
- **Safe:** It refers to the ability of a system to sustain its basic functions and structures despite the impact of disasters.



In order to prepare for the activities that we are going to develop during the Bristol workshop, we would like you to prepare the following exercises with your colleagues in climate change.

- **Exercise 1: Identification of policies/actions**

Please, identify the actions or policies that you have already implemented in your city and the ones that you would like to implement, in order to develop or improve each cluster considering the stakeholders in charge of developing them and the stakeholders involved in the development. The stakeholders that you may consider are the following:

- Critical Infrastructures: logistics, health, energy, telecommunications etc.
- Multi-level governance (local, regional, international)
- First responders: firefighters, police, civil protection etc.
- Public-private companies
- Citizens
- Academia
- Media

If it is possible, identify the actions or policies to develop each concept within the clusters. There is an example in blue that you can use it as a reference.



3.1 Cluster 1: Cooperation

Concepts	Policies	Already implemented or to be implemented in the future?	Stakeholder who leads the policy/action development	Stakeholders involved in the policy/action development
Holistic/inclusive/integrate	<i>In May 2010, a coordination group was created to improve the integration of all response and emergency agents. Since then, a weekly coordination meeting is carried out to analyze the incidents that have occurred, to evaluate the implemented measures and to discuss about new policies that should be established.</i>	<i>Already implemented</i>	<i>Resilience chief officer of the city</i>	<i>Main responsible of each emergency agent: firefighters, health sector, logistic sector, civil protection, local police, national police, energy sector, telecommunication sector, citizen wellbeing sector.</i>
Information sharing /Communication				
Partnership//Collaboration/Connected				



- Cluster 2: Preparedness

Concepts	Policies	Already implemented or to be implemented in the future?	Stakeholder who leads the policy/action development	Stakeholders involved in the policy/action development
Capability				
Training				
Learning/ improvement	Continuous –			

- Cluster 3: Leadership & Awareness



Concepts	Policies already implemented	Already implemented or to be implemented in the future?	Stakeholder who leads the policy/action development	Stakeholders involved in the policy/action development
Change/ Transition				
Adaption/ Flexible				
Governance				
Commitment				

- Cluster 4: Robustness



Concepts	Policies	Already implemented or to be implemented in the future?	Stakeholder who leads the policy/action development	Stakeholders involved in the policy/action development
Continuity/ Bouncing back				
Sustainable				
Stable				
Safe				



- **Exercise 2: Identification of indicators**

Please, identify the indicators that can help to measure each cluster. There is an example in blue that you can use it as a reference.

Cluster	Indicators with units
Cooperation	<i>Number of ordinary coordination meetings per week: this refers to how often the stakeholders involved in crisis management meet together to discuss about past incidents and the implemented measures for improvement.</i>
Preparedness	
Leadership & awareness	
Robustness	

- **Exercise 3: Identification of barriers**

Please, identify the barriers that hamper the development of the identified clusters. There is an example in blue that you can use it as a reference.

Cluster	Barriers
Cooperation	<i>Confidentiality issues: stakeholders are reluctant to share information with the rest of the agents since they consider that part of the information is too sensible in order to be expose in a plenary session.</i>
Preparedness	
Leadership & awareness	
Robustness	



ANNEX IV AGENDA OF THE WORKSHOP

DAY 1: JANUARY 25TH, 2016

Venue: Architecture Centre (16, Narrow Quay, Bristol)

Time	Activity	Description
14:00 -14:15	Welcome	
14:15 -15:00	Keynote speech about climate change Richard Pancost (Attendants: all)	Guest speaker from Cabot Institute.
15:00 -15:30	Keynote speech Sarah Toy (Attendants: all)	Bristol CRO
15:30 -16:15	Resilience concepts Responsible: LiU (Attendants: all)	Review of the concepts related to resilience appeared in WP1.
16:15 - 17:00	Meeting to establish roles for next day Responsible: Tecnun	Only for academic partners, DIN and ICLEI
18.30	Guided tour of the city Responsible: Bristol; (Attendants: all)	



19.45

Evening Meal – Bordeaux Quay (V-Shed,
Canons Way, Avon, Bristol)



DAY 2: JANUARY 26TH, 2016

Venue – OpenSpace (1 St George's Rd, Bristol)

Participants: All

Time	Script	Description
08:30 – 09:00	Welcome/Coffee	
	Overall introduction to the project	The participants are introduced to the project
	Participants' self-presentations	
	Introduction to the objectives, rough agenda, and time allocations for the day.	
<i>Stage 1: What are the actions/policies that cities have already implemented, are planning to implement and should implement concerning Resilience and Climate Change</i>		
09:00 – 09:45	Resilience actions and policies	Work in small groups.
09:45 – 10:30	Plenary presentation of policies/actions	Plenary session.
10:30 – 10:45	Coffee break	
<i>Stage 2: How could we estimate the evolution of Resilience?</i>		
10:45 – 11:30	Resilience Indicators	Work in small groups.
11:30 – 12:15	Plenary presentation of indicators	Plenary session.
12:15 – 12:30	Stage 1 and 2 Wrap up	
12:30 – 13:30		Lunch
<i>Stage 3: What are the barriers to Resilience development in cities?</i>		



13:30 – 14:15	Barriers to resilience development	Work in small groups
14:15 – 15:15	Plenary presentation of barriers	Plenary session
15:15 – 15:30	Coffee break.	
<i>Stage 4 which one is the resilience evolution we might expect</i>		
15:30 – 16:15	Resilience Evolution	Work in small groups
16:15 – 17:00	Plenary presentation of evolution	Plenary session
17:00 – 17:15	Final wrap up.	

Time	Script
20:00	Dinner at Clifton Sausage (7 Portland St, Bristol)

DAY 3: JANUARY 27TH, 2016

Venue – Watershed (1 Canon's Rd, Bristol)

Participants: All

Time	Script	Description
08:30 – 08:45	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 pairs. Each pair is given a laptop that enables a pair to display views on a public 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 picture showing causal links between events.</p>
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Stage 1: What are the risks associated with climate change that need to be recognised by organisations in your city/region in order to be resilient?

09:15 – 09:45	<p>The participants add their statements to the screen with respect the given question (as in the title of this stage).</p>	<p>The participants are asked to type on their laptops brief statements expressing the outcomes they might expect from climate change incidents.</p>
09:45 – 10:15	<p>How do these risks interact with each other? (Both at the city level and at the European level).</p>	<p>In this activity the participants will link the statements on the map in terms of their causality, e.g. event X is likely to lead to (causes) event Y. Expected result: initial causal map on the public screen. The objective is to explore the ramifications of possible climate change events that are expected to impact the running of a city and region.</p>
10:15 – 10:30	<p>Coffee break</p>	<p>Facilitators analyse results and prepare for next steps.</p>
10:30 – 11:00	<p>[continued] How do these risks interact with each other?</p>	<p>As in the previous activity.</p>



11:00 – 11:30	Preference activity: Which clusters of outcomes are most critical to the future of the city/region?	At this stage it will be possible to identify a number of thematic clusters of statements, e.g. these can be different areas of climate change risks. The participants will use the computer system to prioritise which clusters they take to be the most important in terms of their impact on the city/region.
<i>Stage 2: What are the ramifications of the identified networks of risks associated with climate change?</i>		
11:30 – 12:30	The participants add their statements and links to the screen with respect the given question (as in the title of this stage).	Building on the previous preferencing activity, the participants are invited to elaborate the most highly prioritised clusters of events with respect to their ramifications.
12:30 – 13:30	Lunch break.	Facilitators analyse results and prepare for next steps.
<i>Stage 3: What policies can be implemented to both mitigate the risks and to adapt to their ramifications? And Stage 4: What are the unintended consequences that derive from the policies which are aimed at climate change risks?</i>		
13:30 – 15:00	Elaborate the most critical risk clusters (as identified in the previous activities) through consideration of structures/systems/policies that could be used to mitigate the risk stories and to adapt to their ramifications.	In this part of the workshop participants are asked to explore the expected outcomes from possible climate change response policies, with a particular focus on exploring UNINTENDED consequences. The participants are asked to consider the possible trade-offs, synergies and conflicts between the suggested polices.
15:00 – 15:15	Coffee break	Facilitators analyse results and prepare for next steps.
15:15 – 16:45	Continue exploring policies.	
16:45 – 17:00	Wraps-up of the session.	Printout will be provided throughout when reaching milestones in the workshop



Time	Script
20:00	Dinner at Myristica (51 Park St, Bristol)

DAY 4: JANUARY 28TH, 2016

Venue – 100 Temple Street, Bristol City Council

Participants: All

Time	Script	Description
08:45 – 09:00	Welcome	
09:00 – 10:15	Workshop debrief Responsible: Tecnun Attendants: All	Debrief about the workshop
10:30 - 11:15	Steering committee Responsible: WP leaders Attendants: All	Steering Committee meeting. Analysis of WP evolution
11:15 - 11:30	Coffee break	
11:30 – 12:15	WP4 session Responsible: CIEM Attendants: All	Explanation of the survey carried out in WP4
12:15 – 13:00	WP5 session Responsible: ICLEI Attendants: Only Academic Partners and DIN	Explanation of the pilot implementation
13:00	Lunch to eat or take away (for those heading off earlier)	



ANNEX V EVALUATION QUESTIONNAIRE (GROUP MODEL BUILDING SESSION)

WORKSHOP IN BRISTOL: DAY 1 QUESTIONNAIRE

Please answer the follow questions about the workshop. Please evaluate from 0 to 5, 0 being not at all and 5 very good.

Please, select one of the following options based on your role at the workshop

City representative

Academic representative

Evaluate from 0 to 5...	Not at all very					
	0	1	2	3	4	5
1. How good was the clarity of the explanations of the exercises provided by the facilitators of the workshop?						
2. How helpful or useful was the support provided by the small group facilitators?						
3. Was the given time enough to develop the exercises?						
4. How useful was preparing the exercises in advance?						
5. How useful was exercise 1 (identification of policies/actions)?						
6. How easy was exercise 1 (identification of policies/actions)?						
7. How useful was exercise 2 (identification of indicators)?						



8. How easy was exercise 2 (identification of indicators)?						
9. How useful was exercise 3 (identification of barriers)?						
10. How easy was exercise 3 (identification of barriers)?						
11. How useful was exercise 4 (developing the resilience evolution)?						
12. How easy was exercise 4 (developing the resilience evolution)?						
13. How useful were the small group exercises?						
14. How useful were the plenary exercises?						
15. How would you rate the overall methodology?						

Comments:

ANNEX VI SUMMARY OF THE ANSWERS OBTAINED IN THE QUESTIONNAIRE (GROUP MODEL BUILDING SESSION)

Questions	Average	St deviation
1. How good was the clarity of the explanation of the exercises provided by the facilitators of the workshop?	4,31	0,75
2. How helpful or useful was the support provided by the small facilitators?	4,31	0,75



3. Was the given time enough to develop the exercises?	3,71	0,99
4. How useful was preparing the exercises in advance?	4,14	1,03
5. How useful was exercise 1 (identification of policies/actions)?	4,21	0,70
6. How easy was exercise 1 (identification of policies/actions)?	3,86	0,95
7. How useful was exercise 2 (identification of indicators)?	4,29	0,73
8. How easy was exercise 2 (identification of indicators)?	3,93	0,83
9. How useful was exercise 3 (identification of barriers)?	4,21	0,58
10. How easy was exercise 3 (identification of barriers)?	4,07	0,47
11. How useful was exercise 4 (developing the resilience evolution)?	4,00	0,78
12. How easy was exercise 4 (developing the resilience evolution)?	3,57	0,94
13. How useful were the small group exercises?	4,50	0,65
14. How useful were the plenary exercises?	4,29	0,73
15. How would you rate the overall methodology?	4,38	0,65

Comments	
Comment 1	I would have match the cities for every exercise
Comment 2	Well managed + good results
Comment 3	This was a very productive + thought provoking day
Comment 4	Thank you! Also for group selection! I enjoyed my group a lot!
Comment 5	Very good and focused decision
Comment 6	Very good lead facilitator, combining all the many complex inputs into understandable whole. Excellent.



Comment 7 We needed a little more time! To propose info in advanced. Clarity on methodology improved by day progressed. Exercise 1 was a little daunting!

ANNEX VII EVALUATION QUESTIONNAIRE (GROUP EXPLORER SESSION)

Workshop in Bristol: Day 2 Evaluation

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	1	2	3	4	5
1. The facilitators appropriately communicated what was expected from the participants at each stage of the session.					
2. The facilitators provided an appropriate amount of support throughout the session.					
3. The pace of the session was appropriate to the purpose.					
4. I had a good opportunity to express my own views so that they could be seen by all others present.					
5. It was useful to see my views in the context of the views of others.					
6. It was useful to see the causal network gradually developing on the screen.					
7. Anonymity between contributor teams was useful.					



8. The workshop allowed for the creation of knowledge by the group. New insights were developed through the linking of perspectives.					
9. The workshop helped me to change my understanding of the resilience issues in relation to climate change.					
10. The workshop made an appropriate contribution to the development of the H2020 project objectives .					
11. It was helpful to get copies of a record of the workshop (the network of contributions) as we progressed and on request at the end.					
12. The overall format of the session was useful to me in my organizational role .					

ANNEX VIII SUMMARY OF THE ANSWERS OBTAINED IN THE QUESTIONNAIRE (GROUP EXPLORER SESSION)

Questions	Bristol - results		Difference with respect to Riga
	Average (overall questions)	St dev.	
Q1 The facilitators appropriately communicated what was expected from the participants at each stage of the session.	4.57	0.51	0.38
Q2 The facilitators provided an appropriate amount of support throughout the session.	4.71	0.47	0.46
Q3 The pace of the session was appropriate to the purpose.	4.36	0.63	0.17
Q4 I had a good opportunity to express my own views so that they could be seen by all others present.	4.43	0.65	0.24
Q5 It was useful to see see my views in the context of the views of others.	4.71	0.47	0.28
Q6 it was useful to see the causal network gradually developing on the screen.	4.64	0.50	0.02
Q7 Anonymity between contributor teams was useful.	4.57	0.65	0.70
Q8 The workshop allowed for the creation of knowledge by the group. New insights were developed through the linking of perspectives.	4.64	0.50	0.46
Q9 The workshop helped me to change my understanding of the resilience issues in relation to climate change.	3.71	0.61	-0.04
Q10 The workshop made an appropriate contribution to the development of the H2020 project objectives.	4.29	0.61	0.10
Q11 It was helpful to get copies of a record of the workshop (the network of contributions) as we progressed.	4.21	0.70	0.28
Q12 The overall format of the session was useful to me in my organization role.	4.64	0.50	0.21

Following are the participants' comments to the results of the questionnaire (These are the comments, with for example P1 = Participant 1, P2 = Participant 2, etc)



- P6: Fantastic tool and a very good session.
- P9: This was a very productive day - the model is very useful.
- P10: Long coffee breaks without information - especially at the end we were not told what was happening.
- P11: Suggestion for improvement: to find a way to hierarchize the collected information (e.g. leaks from flooding vs traffic disruption).
- P12: Thank you!
- P14: Nice session and very well structured. Sometimes it was difficult to listen to Colin because there were people talking.