SMART
MATURE
RESILIENCE

SMR Smart Mature Resilience

FOR MORE RESILIENT CITIES IN EUROPE

# CITY RESILIENCE DYNAMICS
## USER MANUAL

www.smr-project.eu

# CITY RESILIENCE DYNAMICS TOOL

The City Resilience Dynamics tool is a training tool that helps cities explore different strategies regarding the implementation of resilience policies, simulate the results of each strategy and learn about the resilience building process that the cities need to follow to improve their resilience level in the most efficient way. The City Resilience Dynamics encapsulates the most important aspects of the Resilience Maturity Model (RMM) and it helps to better understand the functioning of the RMM.
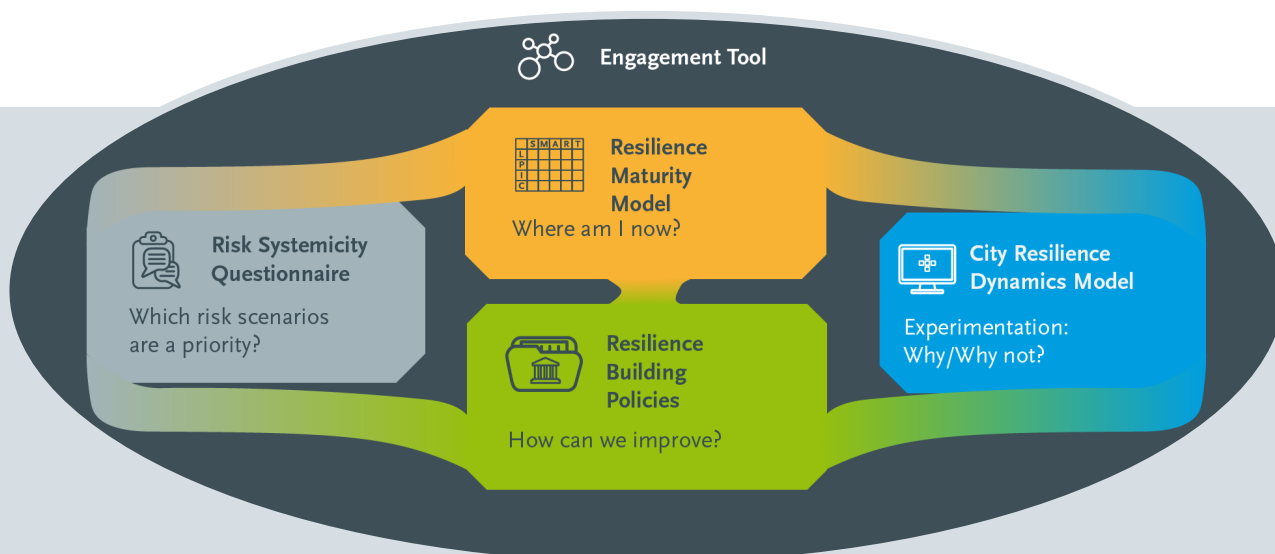
## 1. WHAT IS THE CITY RESILIENCE DYNAMICS FOR?

THE CITY RESILIENCE DYNAMICS CAN...

- Be used as part of a strategic planning
- Help cities to identify suitable policies to implement to develop resilience based on diagnosis and assessment
- Provide a point of reference for self-assessing the effectiveness of the resilience development
- Help cities assess their current resilience level
- Provide cities to justify the funding needed for specific measures related to resilience
- Help cities to prioritize the policy implementation
- Provide a holistic point of view of the policy implementation process
- Support cities to train and learn about the resilience building process

WHAT DO YOU NEED TO PROPERLY USE THE CRD

- A computer with internet access
- Access to the CRD tool: www.smr-project.eu/tools
- Tutorial video: www.youtube.com/watch?v=64YCYe2QU8o&t=211s



**Engagement Tool**

**Resilience Maturity Model**
Where am I now?

**Risk Systemicity Questionnaire**
Which risk scenarios are a priority?

**Resilience Building Policies**
How can we improve?

**City Resilience Dynamics Model**
Experimentation: Why/Why not?

## 2. WHO IS THE CRD FOR?

- Decision makers as part of strategic management cycle: politicians and high level strategic planning staff involved in drafting and approving long term plans such as city resilience strategies and integrated city development plans.
- Practitioners implementing policies: technical staff, desk officers and employees in public-private companies working with critical infrastructures and risk management.
- Other city stakeholders such as citizen, volunteer, academic and scientific entities and media to raise awareness of the importance of resilience and engage them in the process.
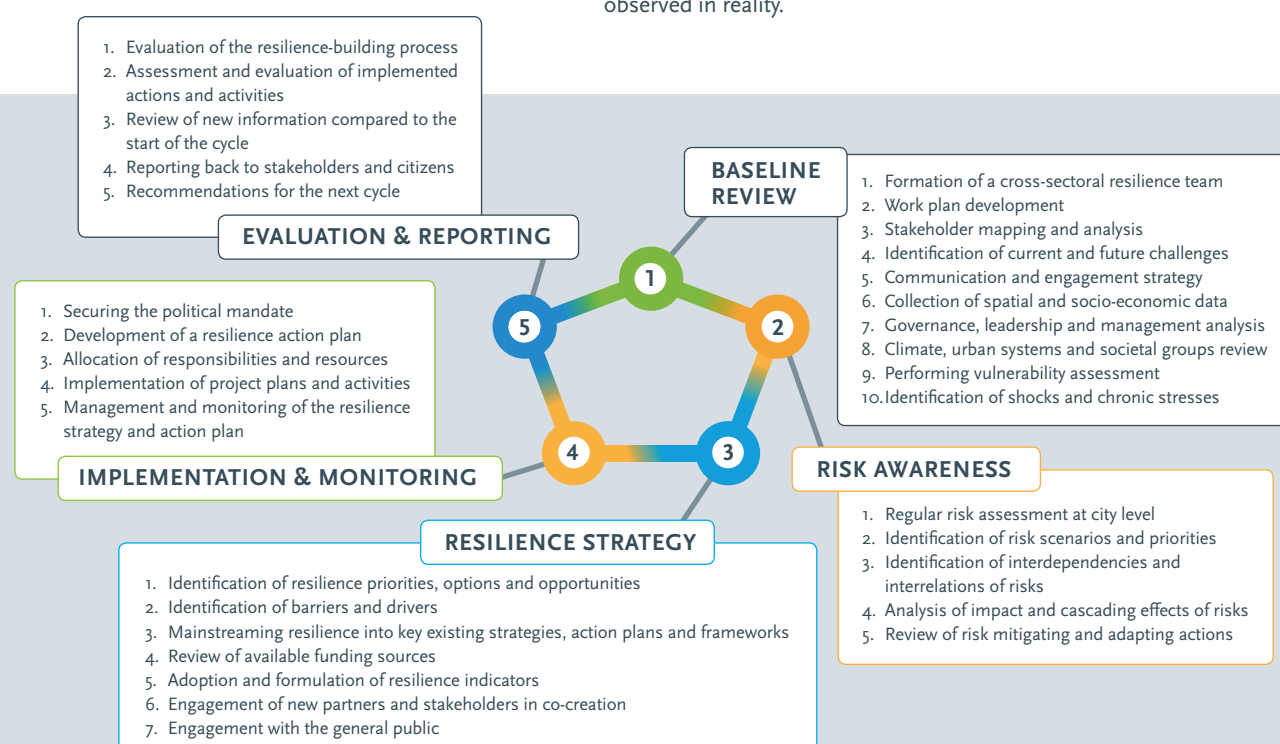
## 3. HOW CAN THE CRD BE USED?

- Parametrize the tool to your own city's characteristics: establish the main parameters of the model assessing the magnitude of the resilience building process.
- Plan, simulate and implement your resilience building strategy: define the strategy you are going to implement to improve the resilience level and re-evaluate the results obtained. Depending on how the budget is used and the implementation order of the policies the efficiency level of the resilience building process will vary.

RELATIONSHIP WITH OTHER SMR TOOLS

- Supported by the Resilience Maturity Model
- Supported by the Policy Tool
- Supported by the Resilience Information Portal

WHEN THE CRD IS APPLIED DURING WITHIN THE OPERATIONAL GUIDELINE?

- STEP 4: Implementation and monitoring: the City Resilience Dynamics Tool is used to test and validate the relationships between the different policies that could, potentially, be included in the resilience strategy of a city and their impact in building local resilience.
- STEP 5: Evaluation and monitoring: the CRD is used to evaluate the effectiveness and performance of the implemented policies and to provide a simulation of the results to compare with those results observed in reality.

**EVALUATION & REPORTING**

1. Evaluation of the resilience-building process
2. Assessment and evaluation of implemented actions and activities
3. Review of new information compared to the start of the cycle
4. Reporting back to stakeholders and citizens
5. Recommendations for the next cycle

**IMPLEMENTATION & MONITORING**

1. Securing the political mandate
2. Development of a resilience action plan
3. Allocation of responsibilities and resources
4. Implementation of project plans and activities
5. Management and monitoring of the resilience strategy and action plan

**BASELINE REVIEW**

1. Formation of a cross-sectoral resilience team
2. Work plan development
3. Stakeholder mapping and analysis
4. Identification of current and future challenges
5. Communication and engagement strategy
6. Collection of spatial and socio-economic data
7. Governance, leadership and management analysis
8. Climate, urban systems and societal groups review
9. Performing vulnerability assessment
10. Identification of shocks and chronic stresses

**RISK AWARENESS**

1. Regular risk assessment at city level
2. Identification of risk scenarios and priorities
3. Identification of interdependencies and interrelations of risks
4. Analysis of impact and cascading effects of risks
5. Review of risk mitigating and adapting actions

**RESILIENCE STRATEGY**

1. Identification of resilience priorities, options and opportunities
2. Identification of barriers and drivers
3. Mainstreaming resilience into key existing strategies, action plans and frameworks
4. Review of available funding sources
5. Adoption and formulation of resilience indicators
6. Engagement of new partners and stakeholders in co-creation
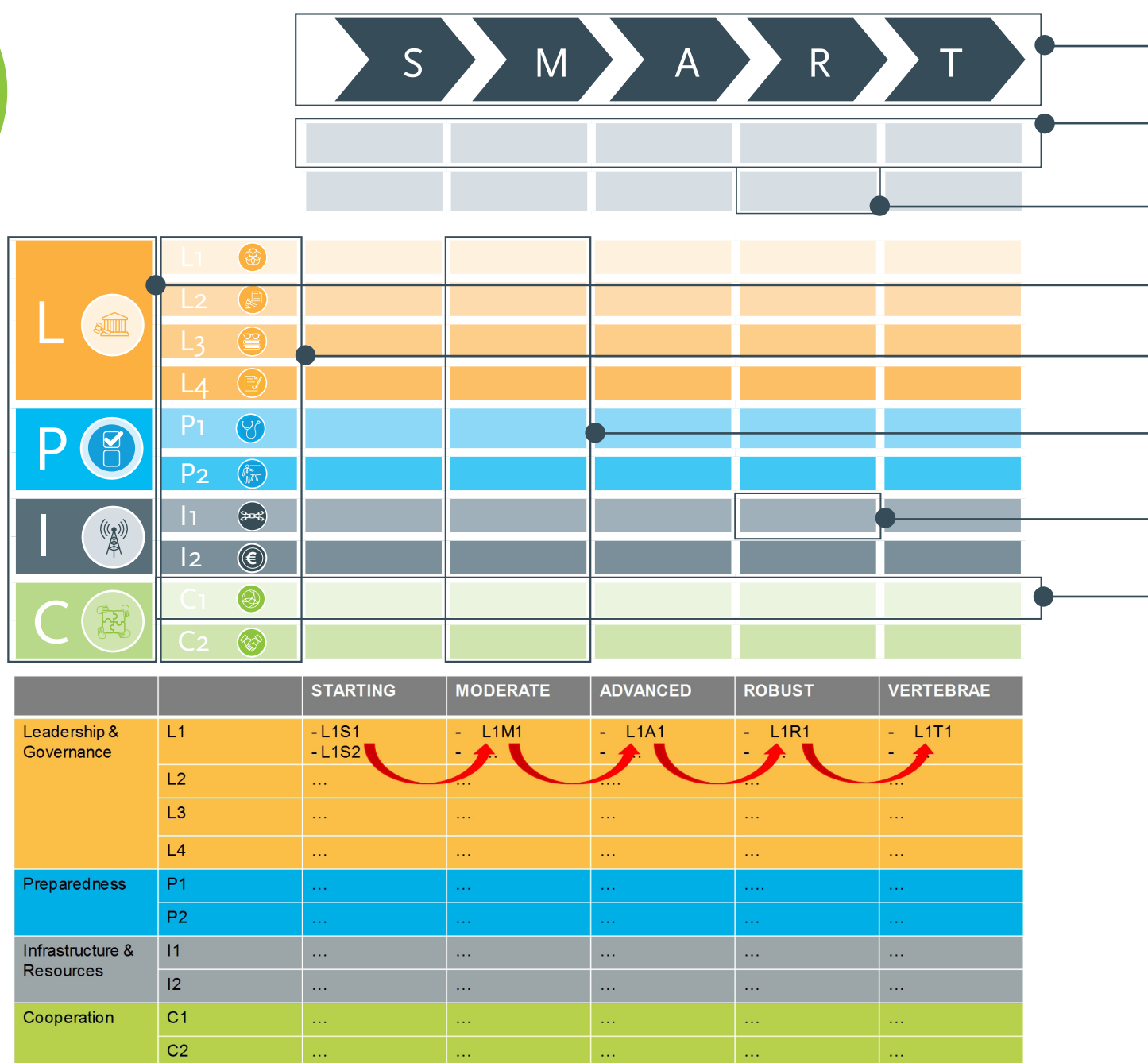7. Engagement with the general public

## RESILIENCE MATURITY MODEL

The Resilience Maturity Model provides a common understanding of the resilience building process. The Resilience Maturity Model is a strategic tool designed to provide cities with a roadmap towards enhanced resilience through strategic policies. It provides a holistic overview of the resilience building process and helps end users to understand resilience as a multidimensional objective.

To do so, the Resilience Maturity Model presents five maturity stages (starting, moderate, advance, robust and vertebrae) and four resilience dimensions (leadership and governance, preparedness, infrastructure and resources, and cooperation). Resilience policies that need to be implemented in each maturity stage and resilience dimension are defined in the Resilience Maturity Model. The implementation of these resilience policies contribute to improve the resilience level of the city and move to a more advance stage.

For further information look at: www.smr-project.eu/tools/maturity-model-guide/resilience-maturity-model

| | | STARTING | MODERATE | ADVANCED | ROBUST | VERTEBRAE |
|---|---|---|---|---|---|---|
| Leadership & Governance | L1 | - L1S1<br>- L1S2 | - L1M1<br>- … | - L1A1<br>- … | - L1R1<br>- … | - L1T1<br>- … |
| | L2 | … | … | …. | … | … |
| | L3 | … | … | … | … | … |
| | L4 | … | … | … | … | … |
| Preparedness | P1 | … | … | … | …. | … |
| | P2 | … | … | … | … | … |
| Infrastructure & Resources | I1 | … | … | … | … | … |
| | I2 | … | … | … | … | … |
| Cooperation | C1 | … | … | … | … | … |
| | C2 | … | … | … | … | … |

# DYNAMICS OF THE RESILIENCE POLICIES

The resilience policies defined in the Resilience Maturity Model are not independent each other, but they are related through precedence relationships. To improve the effectiveness of some policies it is necessary that others' have already been implemented previously. There are two types of precedence relationships:

○ Linear relationships: within each sub-dimension, the policies in the higher stages are dependent towards the policies in the lower stages. (first figure).

○ Transversal relationships: within each maturity stage, the policies in different sub-dimensions are related each other. (second figure).

| Stages of resilience maturity |
| --- |

| Main objectives of each Maturity Model stage |
| --- |

| City stakeholders proactively involved in each stage |
| --- |

| Resilience dimensions |
| --- |

| Resilience sub-dimensions |
| --- |

| Policies to be accomplished to advance to the next stage |
| --- |

| Policies per stage and sub-dimension |
| --- |

| Sequence of policies related to a resilience sub-dimension |
| --- |

*Try the interactive online Resilience Maturity Model on the SMR website!*

*smr-project.eu/MM*

| | | STARTING | MODERATE | ADVANCED | ROBUST | VERTEBRAE |
| --- | --- | --- | --- | --- | --- | --- |
| Leadership & Governance | L1 | - L1S1 <br> - L1S2 | - L1M1 <br> - ... | - L1A1 <br> ... | - L1R1 <br> - ... | - L1T1 <br> - ... |
| | L2 | ... | ... | .... | ... | ... |
| | L3 | .. | .. | .. | ... | ... |
| | L4 | ... | ... | .. | ... | ... |
| Preparedness | P1 | ... | ... | ... | .... | ... |
| | P2 | ... | ... | ... | ... | ... |
| Infrastructure & Resources | I1 | ... | .. | .. | .. | ... |
| | I2 | ... | ... | .. | .. | ... |
| Cooperation | C1 | ... | ... | ... | ... | ... |
| | C2 | ... | ... | ... | ... | ... |

## QUICK USER GUIDE

In order to use the tool, you should access to the following web-page: www.smr-project.eu/tools
Go to the City Resilience Dynamics Tool and click to the link "Go to Tool". Immediately you will access the initialization page of the tool.

### STEP 1: INITIALISATION PAGE

When you access the tool, you are oriented towards this initialisation page. In this page we particularize the tool to our own city and adjust the main parameters to our city characteristics. Once you particularize the tool to your own city, you start the simulation by clicking the "START" button. Immediately you will access the simulation page of the tool.



1. "STAGE" button to set your city's stage in SMART model, or you can set individual policies initial implementation level via corresponding sliders.

2. "DEFAULT BUDGET" button to change initial annual budget.

3. "MODEL SETTINGS" button, to change the city name and currency, time, and cost needed to implement certain policy.

4. "LOAD SETTINGS" button, to load save setting file.

5. "SAVE SETTINGS" button to save all initial settings in a file for later usage.

6. "START" button, to start your simulations.

## STEP 2: SIMULATION PAGE

In the simulation page you might introduce the policy implementation strategy. Based on the available budget you are going to decide where the resources are going to be invested in a time period of 1 year to improve the resilience level of the city. To begging the simulation, you need to introduce the values and press the button "ADVANCE ONE YEAR". To evaluate the impacts of the taken decision you need to press "SIMULATION RESULTS" that will take you to the results page of the tool.





1    Enter value for the devoted budget (for the current simulation year) for implementing the individual policies.

2    Follow the simulation time through "Current Year".

3    Follow the available budget through "Annual budget".

4    Follow the budget remaining through "Unbudgeted".

5    Press "ADVANCE 1 YEAR" to progress simulation.

6    "NEW SCENARIO" will stop the current simulation scenario, and start a new one.

7    "SIMULATION RESULTS" takes you to the simulation results page.

8    Click "Help" to access this Quick Guide. The button is available in all pages.

## STEP 3: RESULT PAGE I

The results of the made simulation will appear in this page. Different indicators have been defined to capture the impacts of the made decisions. For instance, the implementation level achieved in each policy, the resilience level obtained after the simulation, and the evolution of the spent budget are some of the results presented in this page. For more detailed information, you should click on "CURRENT SCENARIO DETAILS". To keep making decisions you should click on "DECISIONS" and you will go back to the simulation page (step2).

SMR - City Resilience Dynamics - Example City
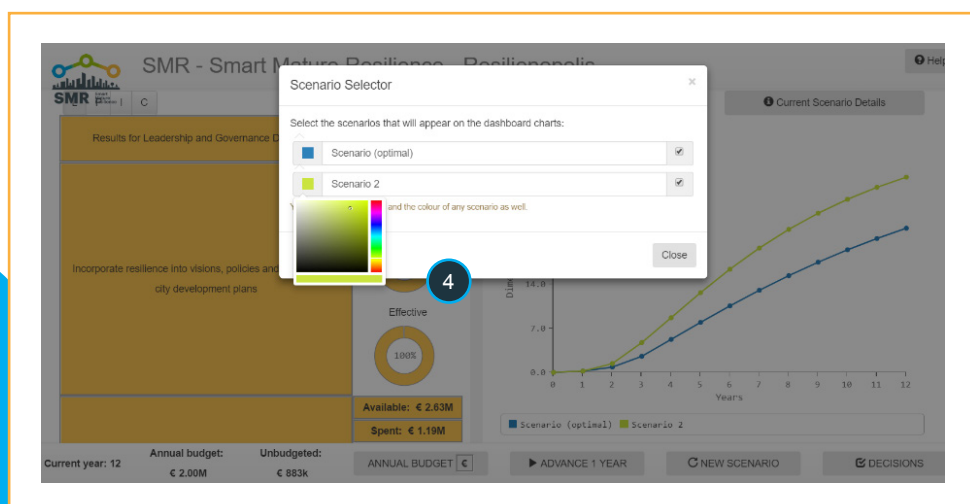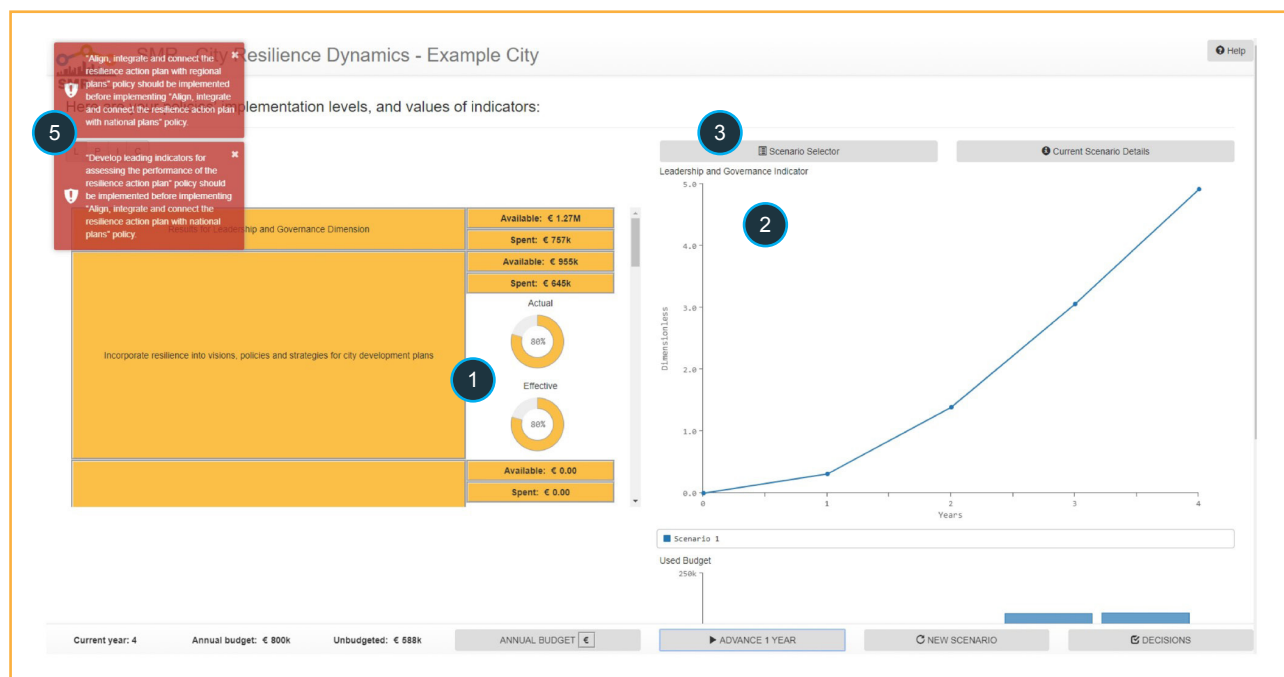
1. You can see the individual policies' current actual and effective implementation levels.

2. You can see the time-behaviour graphs of SMR dimensions' indicators.

3. You will be able to see maximum of three different scenarios. "Scenario Selector" to select which scenarios to show, name them, and select their colours, via "Scenario Selector" dialogue-box.

4. The graph only shows the scenarios with their respective selected checkbox. Overwrite the scenario name to change it. To change its color press on the small colored box and pick a new color.

5. Every 4 years, these messages appear, indicating any problems in the sequence of your decisions.

6. The power gauge meters show your SMART stage per individual dimension at the current simulation time.

7. The same buttons in simulation page (Step 2).

8. "DECISIONS" button takes you back the simulation page.

## STEP 3: RESULT PAGE II

A more detailed evaluation of the taken decisions and obtained results are showed in this page.
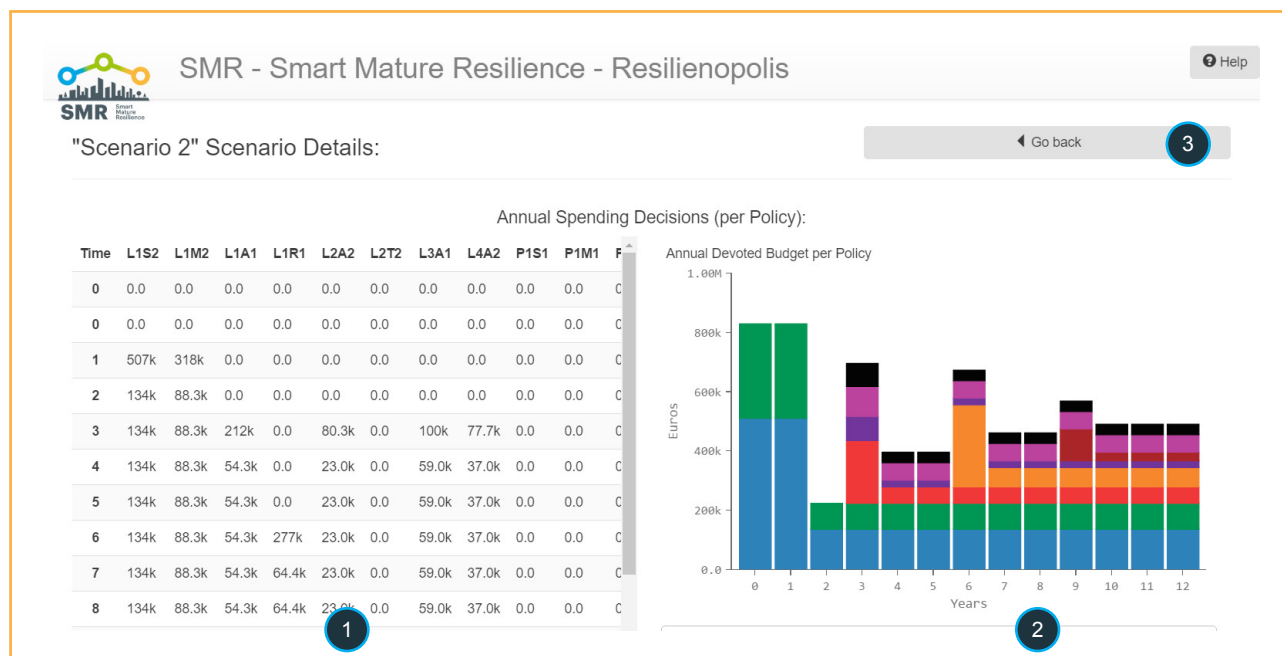


1. Current scenario and decisions history information, generated by clicking "Current Scenario Details" button in the right of the "Scenario Selector".

2. Used Budget time-behaviour graph to find out how much you have spent each year.
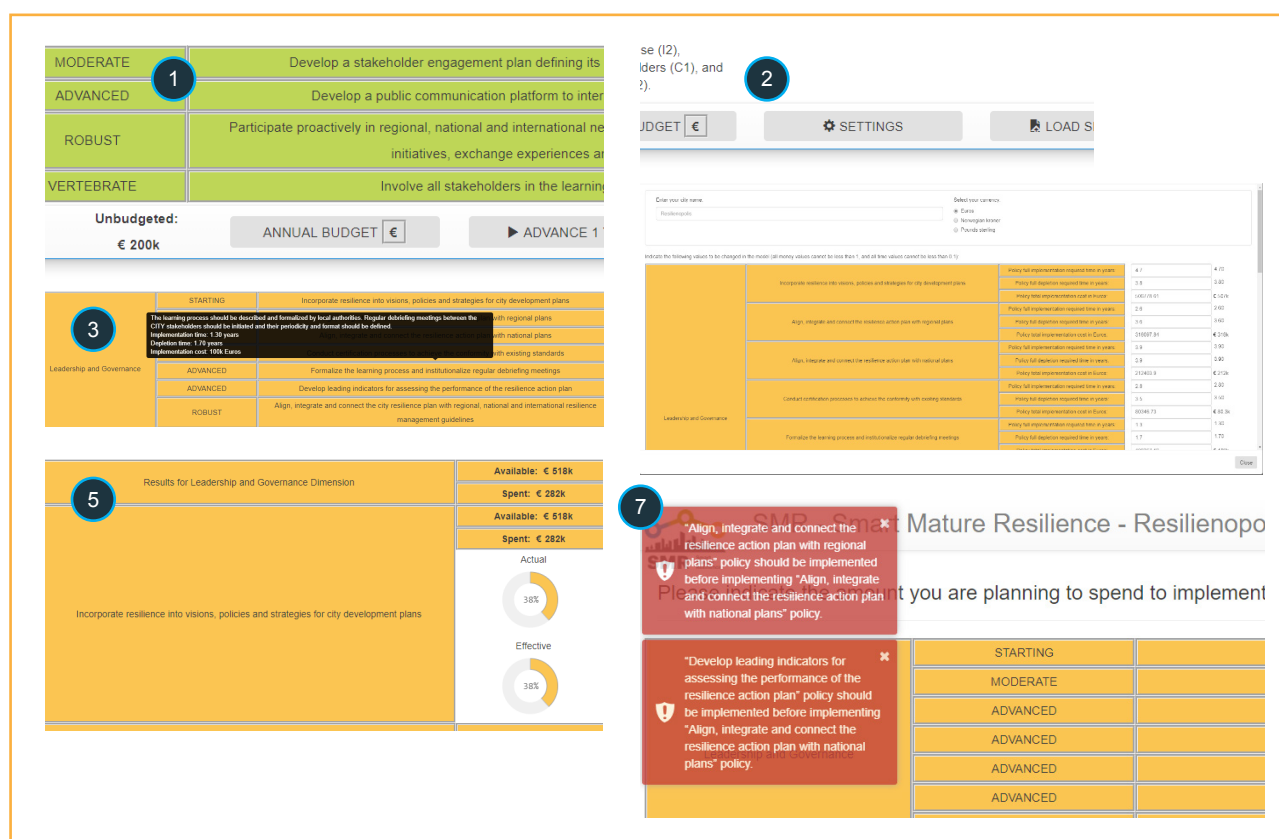
3. "GO BACK" takes you to the result page I.

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# KEY POINTS WHILE USING THE TOOL

**1** You can adjust the annual budget every simulation year, both increase and decrease.

**2** You can parametrise the main parameters of the model to the characteristics of your city: the implementation time of the policies, the implementation cost of the policies and the obsolescence time of the policies.

**3** You can visualise constantly the values of the main parameters of the model when you put the mouse over the resilience policies.

**4** While you are carrying out the simulation, you can analyze your results and improve your strategy.

**5** In the results screen, the actual implementation level of the policies refer to how far the policy has been implemented based on the spent budget. The effective implementation level, however, represents how far the actual implementation level of the policy is effective which depends on whether the precedence policies have been implemented or not.

**6** Iterative process: you should adjust your policy implementation decision and analyze the results going back and forward between screen 2 (Decision screen) and screen 3 (Results screen).

**7** Take into account the pop-up messages appearing every 4 years of simulation. These messages will guide you during the resilience building process. If you do not get any message, it means you are doing well.

**8** The tool only simulates for 40 years.

# PROJECT PARTNERS

tecnun
Universidad de Navarra
www.tecnun.es

UNIVERSITY OF AGDER
ciem.uia.no

University of Strathclyde
Business School
www.strath.ac.uk

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www.bristol.gov.uk

ROMA
www.comune.roma.it

www.riga.lv

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**www.smr-project.eu**

# CONTACT

**Tecnun**

University of Navarra
20018 Donostia - San Sebastián
Gipuzkoa (Spain)

in  Smart Mature Resilience Project

Email: SMRProject@tecnun.es

Twitter: @SMR_Project_eu

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