RESIN Project – Climate Resilient Cities and Infrastructures

CRITIS 2017 – Lucca, Italy, October 12, 2017

Erich Rome, Fraunhofer IAIS + RESIN team

www.resin-cities.eu

This project is co-funded by the Horizon 2020 Framework Programme of the European Union.
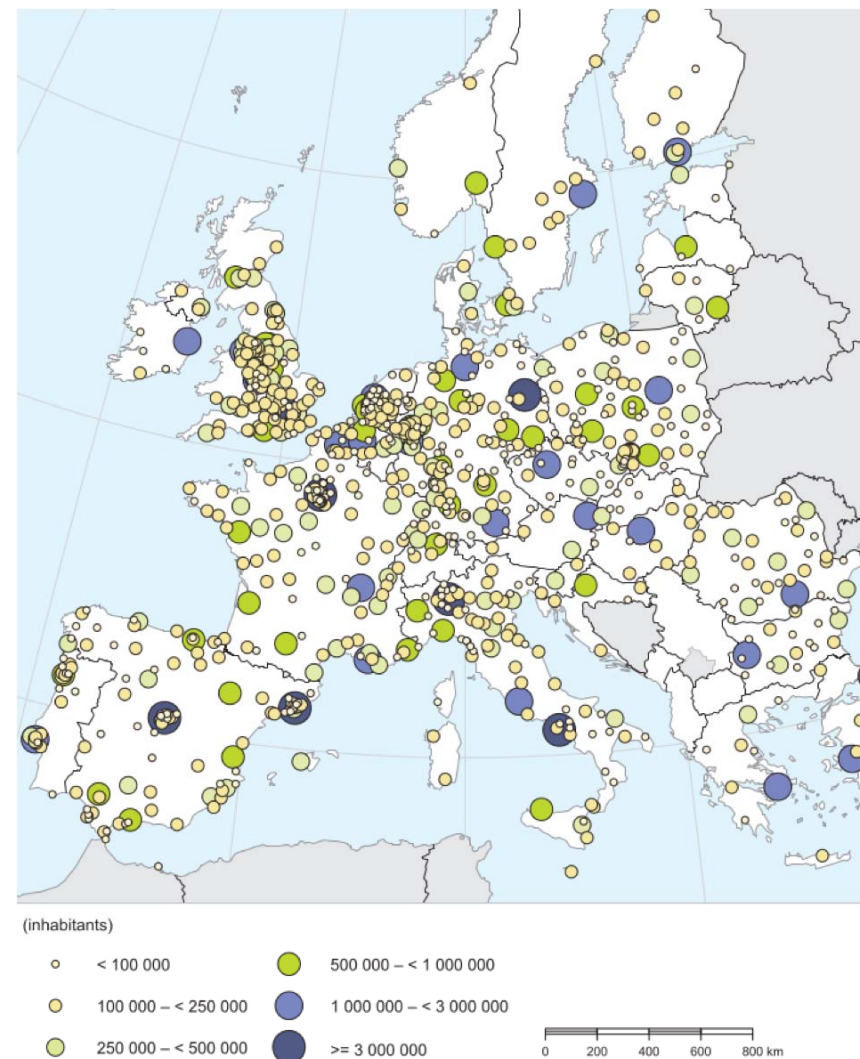
Project RESIN

Climate Resilient Cities and Infrastructures

- Co-funded by: EU H2020 research framework programme
- Type: Research and Innovation Action (RIA)
- Start date: May 1, 2015
- Duration: 42 months
- Planned effort: 866.75 PM
- Partners: 17
- Coordinator: Peter Bosch, TNO
- Website: **http://www.resin-cities.eu**

How important are cities for Europe?

- *"Built-up areas — defined as cities, towns and suburbs — provide a home to almost three quarters (72.4 %) of the EU-28's population."* (EUROSTAT)

- By **2050** it is expected that **82%** of the population in Europe will live in urban areas

- *"Cities generate up to 80% of a country's GDP"* (BMZ, Germany)

- Cities are central to a well-functioning European economy and society

(inhabitants)

○ < 100 000	🟢 500 000 – < 1 000 000
○ 100 000 – < 250 000	🟣 1 000 000 – < 3 000 000
○ 250 000 – < 500 000	🔵 >= 3 000 000

0 200 400 600 800 km

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Source: Eurostat

Effects of Climate Change and extreme weather …

… threaten Cities and Infrastructures in Europe

- The concentration of people and assets in cities also renders them extremely **vulnerable to the effects of extreme weather events and climate change.**
- Disasters threaten people's lives, **critical infrastructure** systems, and **value chains**.

How well are cities prepared for this?

- The **development** of urban climate change adaptation strategies has been **slow**.
- A report of the EEA notes the **poor integration** of different domains, such as housing, sanitation, water management, and traffic management, within urban adaptation strategies.
- Urban adaptation strategies are **imbalanced** in how they address vulnerable sectors.

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Bilbao

Paris

Resilience: For whom?

Bratislava

Manchester

RESIN partners and tier-2 cities

research & development partners	TNO	Fraunhofer	ITTI	Siemens	Arcadis

dissemination & standardisation partners

academic & research partners	Tecnalia BC3	University of Bratislava	University of Manchester	Engineering School Paris

				Uniresearch

tier-1 cities

Bilbao	Bratislava	Greater Manchester	Paris	NEN

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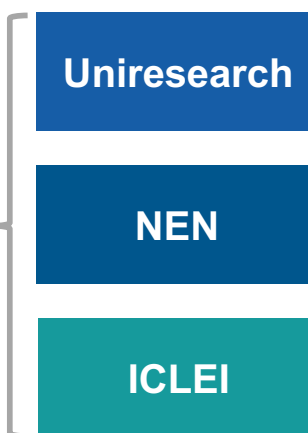
mentoring

tier-2 cities	Padova Alba Almada Zadar	Burgas Vilnius Radom Sfantu Gheorghe	Lahti Newcastle Reykjavik Ghent Nijmegen	London Athens Warsaw Strasbourg

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Resilience: How?

RESIN Conceptual Framework

Climate Risk
Hazards and Drivers
Urban System
Resilience Building
Implement and Monitor Adaptation Actions

Develop Implementation Plan
Prioritise Adaptation Options
Adaptation Planning System
Develop Adaptation Objectives
Assess Climate Risk

Next Iteration VA
Baseline VA

Vulnerability Assessment (VA / IVAVIA)
Adaptation Options
Implementation Plan

Decision Support: eGuide

Work approaches in RESIN

Co-creation, case studies and dissemination

- Develop methods and tools in a **co-creation**al way (research partners and cities)
  - Risk-based Vulnerability Assessment
  - Adaptation options
  - Decision support (eGuide)
- Perform **city case studies**
  - For all methods and tools
  - For all tier-1 cities
- **Disseminate** knowledge and methods **to a wider audience**
  - Tier-2 cities and beyond
 - Concrete standardisation activities (ISO, NEN, DIN)

Vulnerability – IPCC AR5 Schema

Intergovernmental Panel on Climate Change – Assessment Report 5 (2014)

- The latest report of the IPCC (AR5, 2014) brought a change of paradigm
- Vulnerability assessment is now risk-oriented
- This harmonises Climate Change related vulnerability assessment (**VA**) with risk assessment in other areas, including
  - disaster risk reduction
  - critical infrastructure protection
- Lacking: suitable methods
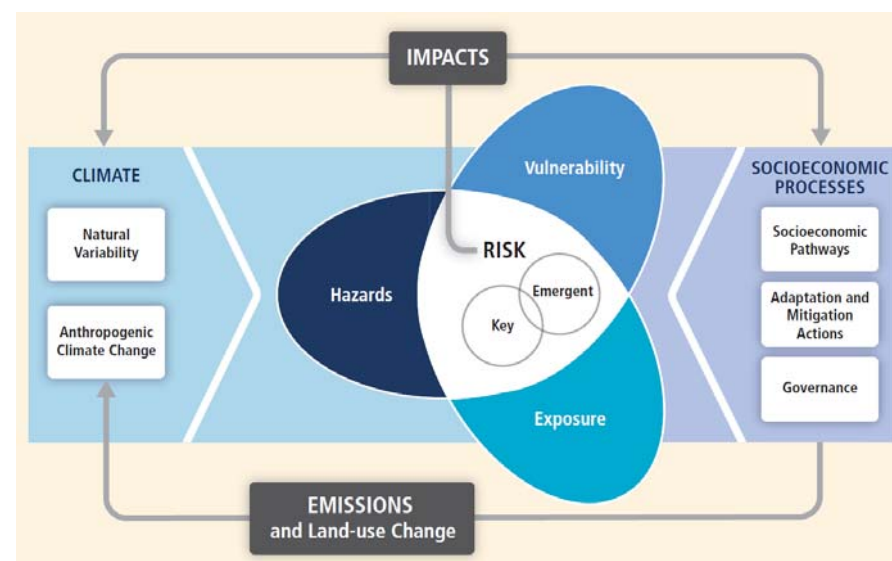
*Vulnerability is the propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including **sensitivity** or **susceptibility to harm** and **lack of capacity** to cope and adapt'* (IPCC 2014).
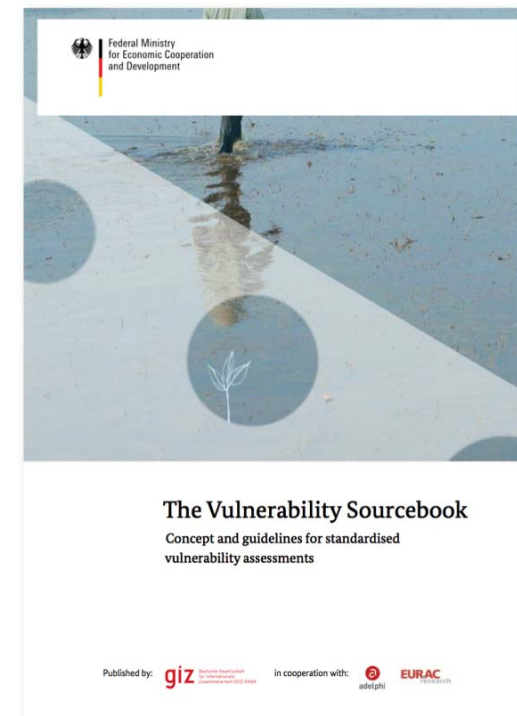
Elements of risk-based VA in RESIN / IVAVIA

Risk = **<probability of adverse event>** X **<consequences>**
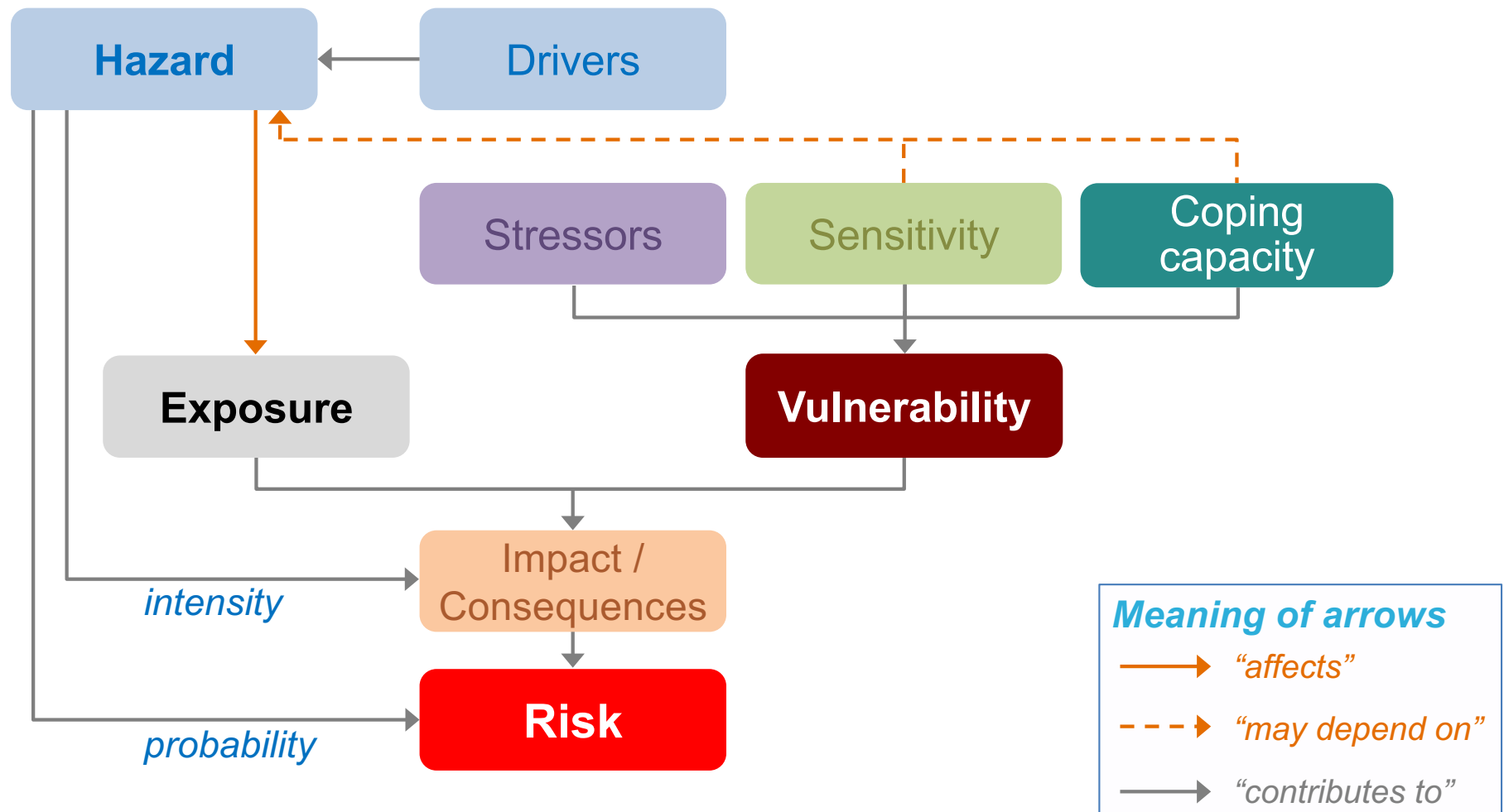
Vulnerability Assessment in RESIN

Risk-based VA for complying with concepts in IPCC AR5

- Novelty:

  Impact and **V**ulnerability **A**ssessment for **V**ital **I**nfrastructures and built-up **A**reas (**IVAVIA**)

- Modified Vulnerability Sourcebook (VSB) method

  – modular approach

  – originally developed by German society for international collaboration GIZ

  – **BUT risk-based** (complies to newer IPCC AR5 concepts)

- Collaboration and exchange with authors GIZ and EURAC

Federal Ministry for Economic Cooperation and Development

The Vulnerability Sourcebook
Concept and guidelines for standardised vulnerability assessments

Published by: giz   in cooperation with: adelphi   EURAC

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The IVAVIA Modules

M1–M6 correspond to the 8 modules of the VSB but are adapted to AR5

new M0 Selecting hazards and drivers

M1 Preparing the Vulnerability Assessment (VA)

M2 Developing Impact Chains

Qualitative

Quantitative

M3 Identifying Indicators and Data Acquisition

M4 Normalisation, Weighting and Aggregation of Indicators

M5 Aggregating Components to Vulnerability / Risk

M6 Presenting the Outcomes of your VA

What is an Impact Chain?

(Source: RESIN glossary)

- Impact chains permit the structuring of cause-effect relationships between drivers and/or inhibitors affecting the vulnerability of a system

- Impact chains

  – allow for a visualisation of interrelations and feedbacks,

  – help to identify the key impacts and on which level they occur, and

  – allow visualising which climate signals may lead to them

- **They further help to clarify and/or validate the objectives and the scope of the vulnerability assessment and are a useful tool to involve stakeholders**

Impact chain: Heat waves on health and QoL
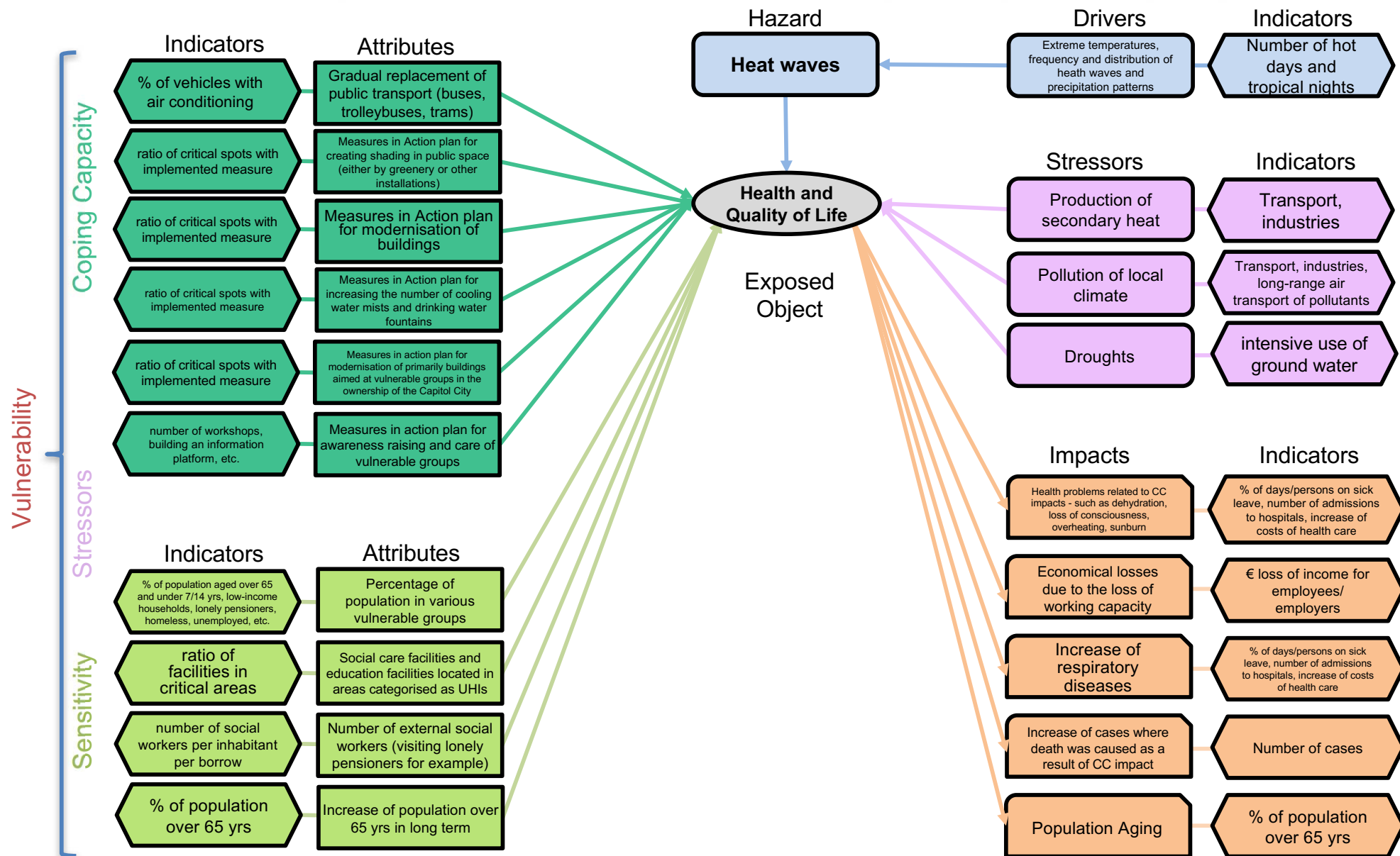
Impact Chain Diagrams …

… and adaptation

- The areas of an ICD **structure** already the possibilities for adaptation

- Adaptation measures could be aimed at

  – reducing the sensitivity of the exposed object

  – increasing the coping capacity of the exposed object

  – reducing the influence of (negative) stressors (non-climatic drivers)
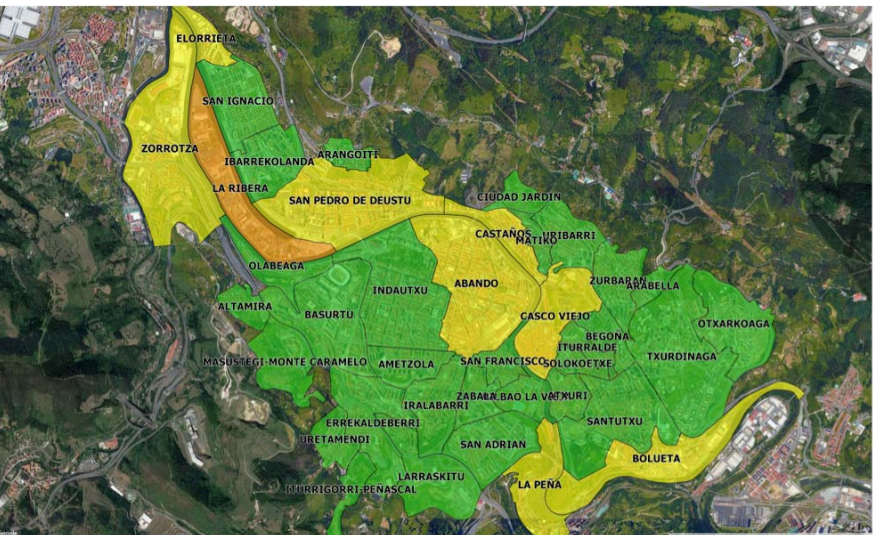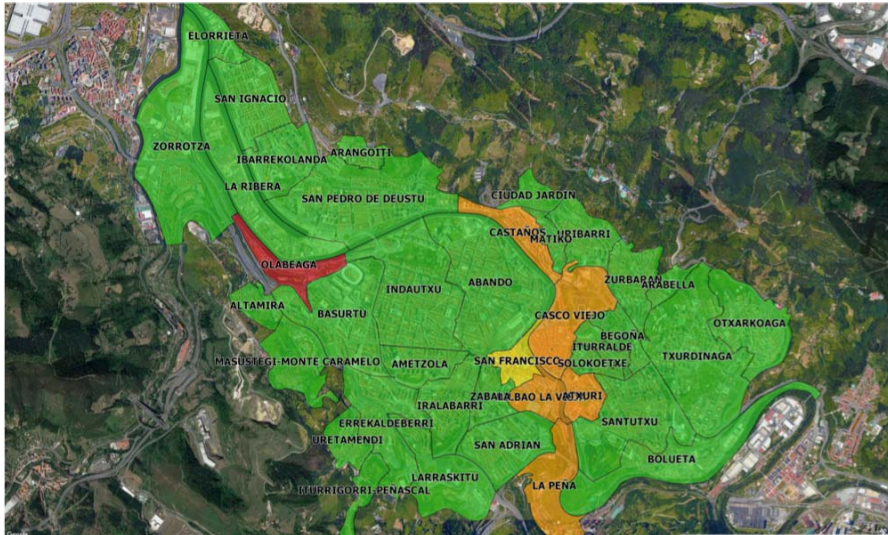
  – reducing the direct and indirect impacts

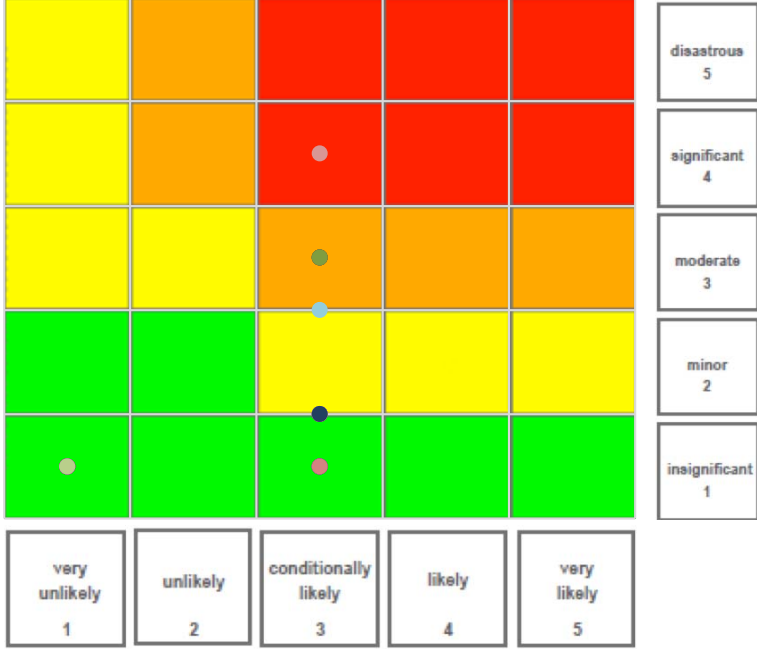IVAVIA Impact Chain Diagrams – for IPCC AR5
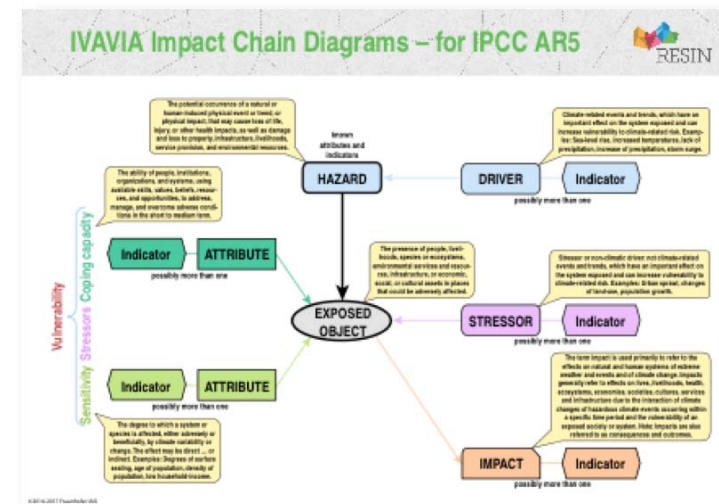
Sample risk maps

Material Impact x Risk   Human Impact x Risk
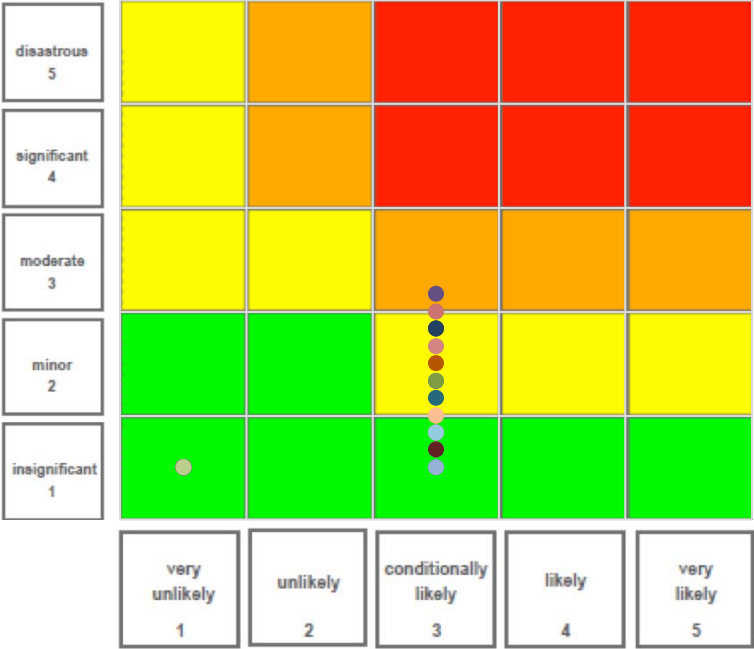
City Case studies for IVAVIA

Co-creation in RESIN

- **Bilbao**:

    Conduct a full vulnerability assessment on district level

- **Greater Manchester**:

    Develop Impact Chain diagrams for vulnerability of selected infrastructures

- **Paris**:

    paired with Greater Manchester

- **Bratislava**:

    Selection and aggregation of indicators (quantitative analysis)

Conclusion

Risk-based vulnerability assessment in RESIN

- The co-creation process allows for more intense collaboration with practitioners and more timely adaptation of developed methods and tools
- Practical application of the method generates impact already during the project
- The qualitative part of IVAVIA is currently the best evaluated one
- Positive feedback, but practitioners' lack of resources limits what could be done
- Expressions of interest for applying IVAVIA from tier-2 cities and beyond
- Several modules of IVAVIA will receive IT tool support
  - a specialised graphical editor for impact chain diagrams
  - a statistics tool for aggregating indicator values

Thank you!

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