

# SuPeRBE Training Material

Macro Area of Expertise:

**2 RBE Assessment System - RNTool - RBTool**

Area of Expertise:

**2.3 RNTool-CE**

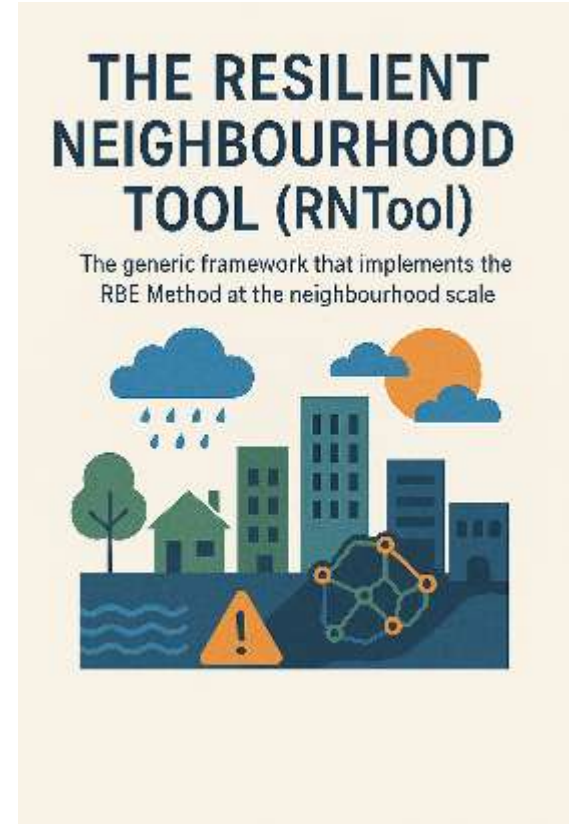
**Level of competence: 3**

# What is the RNTool?

The Resilient Neighbourhood Tool (RNTool) is the generic framework that implements the RBE Method at the neighbourhood scale. It translates the methodological structure of the RBE Method into a tool capable of assessing the overall level of climate risk across hazards, urban sectors, and exposed elements.

## Key points RNTool

- Modular and adaptable structure.
- 7 Hazards, 84 Risk Categories, >1000 assessment criteria.
- Goal:** provide cities with a customisable and operational tool for climate adaptation.



# Structure of RNTool

## ISSUES

The RNTool Central European version supports climate risk assessment in relation to the following 7 Issues:



A Heavy precipitation



D Droughts



B Floods



E Storms



G Mass Movement



C Extreme heat



F Wild-fire

# Structure of RNTool

## Macro categories

Representing key Urban Sectors (8), addressed in RNTool for Central Europe are:



Buildings (Heavy precipitation, Floods, Extreme Heat, Storms, Mass Movement)



Water (Floods, Drought)



Emergency Services (Heavy precipitation, Floods, Extreme Heat, Drought, Storms, Wild-Fire, Mass Movement)



Energy (Heavy precipitation, Extreme Heat, Storms)



Environment and Biodiversity (Extreme Heat, Drought)



Tourism (Heavy precipitation, Extreme Heat, Mass Movement)



Transport (Heavy precipitation, Floods, Extreme Heat, Storms, Wild-fire, Mass Movement)

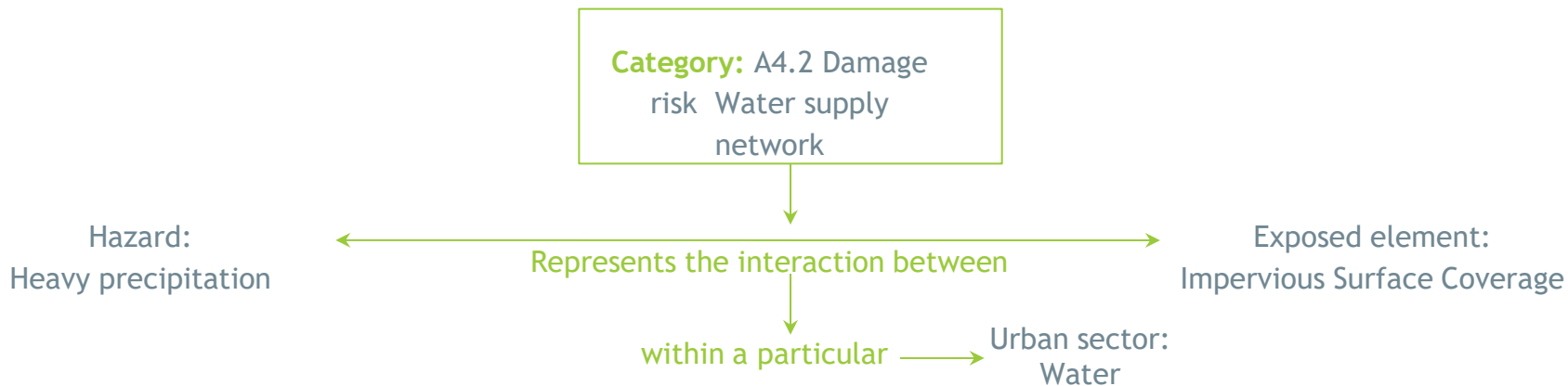


Health (Heavy precipitation, Floods, Extreme Heat, Drought, Storms)

# Structure of RNTool

## Risk categories

A Risk Category represents the specific risk arising from the interaction between a Hazard (Issue) and an Exposed Element within a particular Urban Sector (Macro Category).



**84** Risk Categories have been defined in the Central European version of the RNTool. These categories cover all seven Issues (Hazards) addressed in the tool and span across the key Urban Sectors most relevant for neighbourhood-scale climate adaptation.

## **A Heavy precipitation**

### **A1 BUILDINGS**

- A1.1 Damage risk for residential buildings
- A1.2 Damage risk for public buildings
- A1.3 Damage risk for commercial buildings
- A1.4 Damage risk for industrial buildings
- A1.5 Damage risk for historical and cultural sites

### **A2 TRANSPORT**

- A2.1 Damage risk for public transit infrastructure
- A2.2 Damage risk for road transport network
- A2.3 Damage risk for rail transport network
- A2.5 Damage risk for bicycle and pedestrian paths
- A2.6 Damage risk for water transportation network

### **A3 ENERGY**

- A3.4 Damage risk for Renewable Energy Installations

### **A4 WATER**

- A4.1 Damage risk for water treatment plants
- A4.2 Damage risk for water supply network
- A4.3 Damage risk for sewage system
- A4.4 Damage risk for waste water treatment plants

### **A8 HEALTH**

- A8.1 Health risk for population
- A8.2 Damage risk for healthcare facilities

### **A9 EMERGENCY SERVICES**

- A9.1 Efficiency risk for civil protection service
- A9.2 Efficiency risk for fire brigade
- A9.3 Efficiency risk for emergency medical service

### **A10 TOURISM**

- A10.1 Damage risk for hotels and resorts
- A10.5 Damage risk for touristic attractions

## **B Floods**

### **B1 BUILDINGS**

- B1.1 Damage risk for residential buildings
- B1.2 Damage risk for public buildings
- B1.3 Damage risk for commercial buildings
- B1.4 Damage risk for industrial buildings
- B1.5 Damage risk for historical and cultural sites

### **B2 TRANSPORT**

- B2.1 Damage risk for public transit infrastructure
- B2.2 Damage risk for road transport network
- B2.3 Damage risk for rail transport network
- B2.5 Damage risk for bicycle and pedestrian paths

### **B4 WATER**

- B4.1 Damage risk for water treatment plants
- B4.2 Damage risk for water supply network
- B4.3 Damage risk for sewage system
- B4.4 Damage risk for waste water treatment plants

### **B8 HEALTH**

- B8.1 Health risk for population
- B8.2 Damage risk for healthcare facilities

### **B9 EMERGENCY SERVICES**

- B9.1 Efficiency risk for civil protection service
- B9.2 Efficiency risk for fire brigade
- B9.4 Efficiency risk for Emergency medical services

## **C Extreme heat**

### **C1 BUILDINGS**

- C1.1 Damage risk for residential buildings
- C1.2 Damage risk for public buildings
- C1.3 Damage risk for commercial buildings
- C1.4 Damage risk for industrial buildings

### **C2 TRANSPORT**

- C2.2 Damage risk for road transport network
- C2.4 Damage risk for bicycle and pedestrian paths

### **C3 ENERGY**

- C3.4 Damage risk for Renewable Energy Installations
- C3.6 Damage risk for district heating and cooling systems

### **C7 ENVIRONMENT & BIODIVERSITY**

- C7.3 Damage risk for Street Trees

### **C8 HEALTH**

- C8.1 Health risk for population
- C8.2 Efficiency risk for healthcare facilities

### **C9 EMERGENCY SERVICES**

- C9.1 Efficiency risk for civil protection service
- C9.2 Efficiency risk for fire brigade
- C9.4 Efficiency risk for Emergency medical services

### **C10 TOURISM**

- C10.5 Damage risk for touristic attractions

## **D Droughts**

### **D4 WATER**

D4.1 Damage risk for water treatments plants

D4.2 Damage risk for water supply network

### **D7 ENVIRONMENT & BIODIVERSITY**

D7.1 Damage risk for Urban green spaces

D7.3 Damage risk for Street Trees

### **D8 HEALTH**

D8.1 Health risk for population

### **D9 EMERGENCY SERVICES**

D9.2 Efficiency risk for fire brigade

D9.4 Efficiency risk for Emergency medical services

## **E Storms**

### **E1 BUILDINGS**

E1.1 Damage risk for residential buildings

E1.2 Damage risk for public buildings

E1.4 Damage risk for industrial buildings

### **E2 TRANSPORT**

E2.1 Damage risk for public transit infrastructure

E2.2 Damage risk for road transport network

E2.3 Damage risk for rail transport network

E2.5 Damage risk for bicycle and pedestrian paths

E2.6 Damage risk for water transportation network

### **E3 ENERGY**

E3.4 Damage risk for Renewable Energy Installations

### **E8 HEALTH**

E8.1 Health risk for population

### **E9 EMERGENCY SERVICES**

F9.1 Efficiency risk for civil protection service

F9.2 Efficiency risk for fire brigade

## **F Wild-fire**

### **F2 TRANSPORT**

F2.2 Damage risk for road transport network

### **F9 EMERGENCY SERVICES**

F9.1 Efficiency risk for civil protection service

F9.2 Efficiency risk for fire brigade

## **G Mass Movement**

### **G1 BUILDINGS**

G1.1 Damage risk for residential buildings

G1.2 Damage risk for public buildings

G1.4 Damage risk for industrial buildings

### **G2 TRANSPORT**

G2.1 Damage risk for public transit infrastructure

G2.2 Damage risk for road transport network

G2.5 Damage risk for bicycle and pedestrian paths

### **G9 EMERGENCY SERVICES**

G9.1 Efficiency risk for civil protection service

G9.2 Efficiency risk for fire brigade

### **G10 TOURISM**

G10.1 Damage risk for hotels and resorts

G10.2 Damage risk for Beaches and Coastal Areas

# Structure of RNTool

## Criteria and indicators

Each Risk Category in the RNTool is assessed through a structured set of criteria, which are operationalised via indicators. These indicators serve as the fundamental units for measuring the level of vulnerability, exposure, and hazard at the neighbourhood scale.

The RNTool Central European version includes a total of 1,022 assessment criteria, distributed as follows:

952 vulnerability and exposure criteria (directly associated with Risk Categories)

70 hazard criteria (associated with the Issues)

The number of vulnerability and exposure criteria per Hazard (Issue) is:



Heavy Precipitation: 240



Floods: 300



Extreme Heat: 157



Droughts: 36



Storms: 124



Wildfire: 15



Mass Movement: 80

# Structure of RNTool

## Criteria and indicators examples

| G10           | TOURISM                            |                                                                                     |                                                                    |
|---------------|------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| G10.1         | Damage risk for hotels and resorts |                                                                                     |                                                                    |
| VULNERABILITY |                                    |                                                                                     |                                                                    |
| Code          | Criterion                          | Indicator                                                                           | Unit                                                               |
| G10.1.1       | Slope crest or toe                 | Distance from Slope Crest or Toe                                                    | Meters (m)                                                         |
| G10.1.2       | Drainage Systems on Site           | Presence of drainage system within the area                                         | Capacity in liters per second (L/s);<br>Condition (Good/Fair/Poor) |
| G10.1.3       | Retaining Structures               | Presence of Retaining Structures or Slope Stabilization Systems                     | (Yes/No)                                                           |
| EXPOSURE      |                                    |                                                                                     |                                                                    |
| G10.1-E1      | Hotels and resorts density         | Total built volume of hotels and resorts divided by the extension of the urban area | m3/m2                                                              |

# Structure of RNTool

For each indicator, the RNTool provides:

1

Description of the indicator and its unit of measure (if applicable)

2

Direction of performance: Higher is Better (HiB), Lower is Better (LiB), or Qualitative

3

Benchmark values:  
benchmark 0, optimal condition (normalized score = 0)  
benchmark 1, critical condition (normalized score = 1)

4

The assessment method, a guideline on how the indicator value should be calculated or determined

5

Data sources, suggestions on where to find or how to collect the data required

6

References: scientific literature, technical standards, or institutional sources that validate the indicator.

**Note:** Benchmarks are defined in the RNTool but are intended to be adapted to local contexts for effective use.

# Contextualisation of RNTool

The RNTool is a generic assessment framework, providing a comprehensive structure for evaluating climate risks at the neighbourhood scale.

However, **to become an operational** tool the RNTool must undergo a contextualisation process. This process transforms the generic framework into an operational assessment tool.

The contextualisation process includes several **key steps**, each of which contributes to tailoring the RNTool to the unique characteristics of the local context.

## Key Steps:

1. Selection of Relevant Issues (Hazards)
2. Selection of Macro-Categories (Urban Sectors)
3. Selection of Risk Categories
4. Benchmarking of criteria
5. Assignment of Weights

# Contextualisation of RNTool

## 5.2.1 Selection of Relevant Issues (Hazards)

To become an operational tool the RNTool must undergo a contextualisation process. This process transforms the generic framework into an operational assessment tool. The contextualisation process includes several key steps, each of which contributes to tailoring the RNTool to the unique characteristics of the local context.

### First step:

The selection of relevant Issues (Hazards) most pertinent to the specific context of the municipality. This selection can be guided by:

Existing SECAPs  
(Sustainable Energy  
and Climate Action  
Plans)

Regional or  
national climate  
adaptation plans  
and strategies

Historical data on  
extreme weather  
events

Consultation with  
local experts and  
stakeholders.

# Contextualisation of RNTool

## 5.2.2 Selection of Macro-Categories (Urban Sectors)

### Second step:

For each selected Issue (Hazard), the next step is to identify the Urban Sectors (Macro-Categories) that are exposed and potentially affected. This selection is based on:

The presence and criticality of urban functions in the municipality (e.g., Mobility, Health, Water)

The dependency of services on exposed infrastructure. If the proper functioning of a sector (e.g., Health) relies on infrastructure that is at risk from a certain hazard, then that infrastructure's sector (e.g., Energy, Water, Mobility) should be included in the assessment even if it's not the primary target of the hazard.

The institutional capacity to implement adaptation measures within each sector.

# Contextualisation of RNTool

## 5.2.3 Selection of risk categories

### Third step:

Once the relevant Urban Sectors are selected, the next step is to determine the Risk Categories representing the specific interactions between hazards and exposed elements that represent tangible and assessable climate risks. Only the most relevant and assessable Risk Categories should be retained, based on:

Availability of data

Strategic relevance for local planning

Stakeholder priorities

# Contextualisation of RNTool

## 5.2.4 Benchmarking of criteria

### Fourth step:

Each Risk Category is assessed through a set of criteria (hazard, exposure, and vulnerability), each linked to a specific indicator. The contextualisation process requires:

Assigning local benchmarks (value 0 for optimal performance and value 1 for critical performance)

Defining or adapting the assessment method for calculating the indicator value.

When localising benchmarks and methods, the following hierarchy of sources should be respected:

- 1** Binding regulations (e.g., building codes, laws)
- 2** Recognised technical standards (e.g., ISO, CEN, national standards)
- 3** Authoritative guidelines (e.g., national planning documents, EU reports)
- 4** Peer-reviewed scientific literature and other technical references.

# Contextualisation of RNTool

## 5.2.5 Assignment of Weights

### Fifth step:

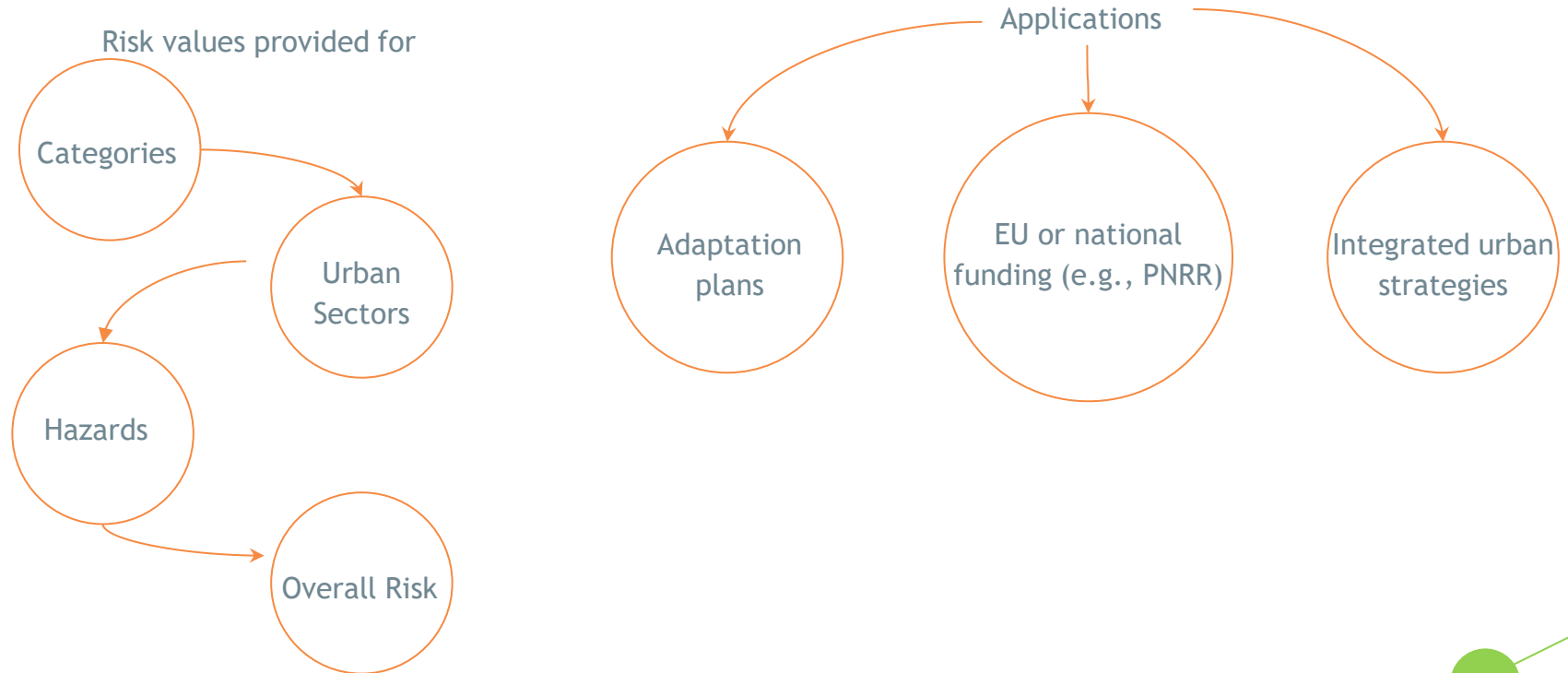
Assignment of weights at multiple levels of the risk calculation process. Weights influence the relative importance of different criteria and risk components, affecting how final risk values are calculated and interpreted. To ensure transparency, consistency, and relevance, the following general principles should be followed when assigning weights in the RNTool:

Purpose driven. Weights should reflect local policy priorities, the perceived severity of impacts, and the reliability of available data.

Participatory. Weights should ideally be defined through consultation with local experts, stakeholders, and cross-sectoral teams (e.g. urban planners, emergency services, environmental agencies).

Transparent: The rationale for each weight must be documented to allow future updates or audits.

# Assessment Outputs of RNTool



# Practical Example of RNTool

## Step 1 Assignment of Hazard Values to Issues

### Option 1

1.1 The value of likelihood of Hazard is assigned (HV)

| Code | Hazard               | HV  |
|------|----------------------|-----|
| A    | Heavy Precipitation  | 0,8 |
| C    | Extreme Temperatures | 0,9 |



HV value ranges from 0 to 1. HV answers the question: how severe is the hazard ?

# Practical Example of RNTool

## Step 1

### Option 2

In alternative, climatic indicators can be used to determine HV. The following is an example for Hazard A Heavy Precipitation

| Code | Hazard criteria | Hazard indicator                                       | Unit of measure | Value |
|------|-----------------|--------------------------------------------------------|-----------------|-------|
| H.A1 | R20             | Number of Days with Precipitation $\geq 20$ mm         | number          | 2     |
| H.A2 | SDII            | Simple Daily Intensity Index                           | mm/day          | 8     |
| H.A3 | RX1DAY          | Maximum total precipitation that falls in a single day | mm              | 60    |

# Practical Example of RNTool

## Step 1

### Option 2

The value of climatic hazards is normalised in the interval (0-1) - Example for H.A3

| Code | Hazard criteria | Hazard indicator                                       | Unit of measure | Value |
|------|-----------------|--------------------------------------------------------|-----------------|-------|
| H.A3 | RX1DAY          | Maximum total precipitation that falls in a single day | mm              | 60    |

Type: Lower is better

|                        |      |     |
|------------------------|------|-----|
| Benchmark 1 - Critical | Xmax | 100 |
| Benchmark 0- Optimal   | Xmin | 20  |
| Value of the indicator | Xi   | 60  |
| Normalised Value       |      | 0,5 |

$$Nv = \frac{Xi - Xmin}{Xmax - Xmin}$$

# Practical Example of RNTool

## Step 1

### Option 2

The value of climatic hazards is normalised in the interval (0-1) - Example for H.A3

| Code | Hazard criteria | Hazard indicator                                       | Normalised Value | Weight | Weighted value |
|------|-----------------|--------------------------------------------------------|------------------|--------|----------------|
| H.A1 | R20             | Number of Days with Precipitation $\geq 20$ mm         | 0,7              | 0,33   | 0,23           |
| H.A2 | SDII            | Simple Daily Intensity Index                           | 0,7              | 0,33   | 0,23           |
| H.A3 | RX1DAY          | Maximum total precipitation that falls in a single day | 0,5              | 0,33   | 0,17           |

HV: 0,63

**Note:** Weighted value = normalised value \* weight

# Practical Example of RNTool

## Step 2 Exposure Value (EV) calculation for Risk Categories

The value of the Exposure Indicators associated with Risk Categories is calculated

| A    | Heavy Precipitation                           |                   |                                           |                                                                          |                     |       |
|------|-----------------------------------------------|-------------------|-------------------------------------------|--------------------------------------------------------------------------|---------------------|-------|
| A2   | Transports                                    | Exposure Criteria |                                           | Exposure Indicator                                                       | Unit                | Value |
| A2.1 | Damage risk for public transit infrastructure | E.A2.1            | Public transport density                  | Total length of public transport routes per unit area of the urban area. | km/k m <sup>2</sup> | 2     |
| A2.3 | Damage risk for bicycle and pedestrian paths  | E.A2.3            | Extention of bicycle and pedestrian paths | Meters of bicycle and pedestrian paths per inhabitant                    | m/inh abitan t      | 0,8   |
| A2.4 | Damage risk for road network                  | E.A2.4            | Road density                              | Total road length divided by the urban area.                             | km/k m <sup>2</sup> | 2,8   |
| A3   | Energy                                        | Exposure Criteria |                                           | Exposure Indicator                                                       | Unit                | Value |
| A3.1 | Damage Risk for Power Lines                   | E.A3.1            | Exposed power lines                       | Share of exposed power lines                                             | %                   | 90    |

# Practical Example of RNTool

## Step 2

The value of the Exposure Indicators associated with Risk Categories is calculated

| C    | Extreme Heat                                        |                   |                            |                                                                         |                     |       |
|------|-----------------------------------------------------|-------------------|----------------------------|-------------------------------------------------------------------------|---------------------|-------|
| C3   | Energy                                              | Exposure Criteria |                            | Exposure Indicator                                                      | Unit                | Value |
| C3.1 | Damage risk for Electrical Grid Infrastructure      | E.C3.1            | Grid Density               | Total length of transmission and distribution lines per unit area.      | km/km <sup>2</sup>  | 5,2   |
| C3.2 | Damage risk for Renewable Energy Installations (PV) | E.C3.2            | Photovoltaic power density | Photovoltaic power density per unit area                                | kWp/km <sup>2</sup> | 50    |
| C8   | Health                                              | Exposure Criteria |                            | Exposure Indicator                                                      | Unit                | Value |
| C8.1 | Health risk for inhabitants                         | E.C8.1            | Population density         | total number of inhabitants divided by the total area of the urban zone | n/km <sup>2</sup>   | 6590  |

# Practical Example of RNTool

## Step 2

The value of the Exposure Indicators is **normalised** in the interval 0-1 to calculate the Exposure Value (EV)

| C8   | Health                      | Exposure criterion | Exposure indicator                                                      | Unit  | Value |
|------|-----------------------------|--------------------|-------------------------------------------------------------------------|-------|-------|
| C8.1 | Health risk for inhabitants | Population density | total number of inhabitants divided by the total area of the urban zone | n/km2 | 6590  |

Type: Lower is better

|                        |      |       |
|------------------------|------|-------|
| Benchmark 1 - Critical | Xmax | 10000 |
| Benchmark 0- Optimal   | Xmin | 1000  |
| Value of the indicator | Xi   | 6590  |
| Normalised Value       |      | 0,6   |

$$Nv = \frac{Xi - Xmin}{Xmax - Xmin}$$

# Practical Example of RNTool

## Step 2

Table with the Exposure Values calculated for all Risk Categories

| A    | Heavy precipitation                           |     |
|------|-----------------------------------------------|-----|
| A2   | Transports                                    | EV  |
| A2.1 | Damage risk for public transit infrastructure | 0,8 |
| A2.3 | Damage risk for bicycle and pedestrian paths  | 0,6 |
| A2.4 | Damage risk for road network                  | 0,7 |
| A3   | Energy                                        | EV  |
| A3.1 | Damage Risk for Power Lines                   | 0,8 |

# Practical Example of RNTool

## Step 2

Table with the Exposure Values calculated for all Risk Categories

| C    | Extreme temperatures                           |     |
|------|------------------------------------------------|-----|
| C3   | Energy                                         | EV  |
| C3.1 | Damage risk for Electrical Grid Infrastructure | 0,9 |
| C3.2 | Damage risk for Renewable Energy Installations | 0,7 |
| C8   | Health                                         | EV  |
| C8.1 | Health risk for inhabitants                    | 0,6 |

# Practical Example of RNTool

## Step 3/4/5 Vulnerability Values calculation for Risk Categories

The value of the Vulnerability Indicators of Risk Categories is calculated (example for the Risk Category C8.1)

| C8.1 Health risk for inhabitants | Code   | Criterion                                             | Indicator                                     | Unit | Value |
|----------------------------------|--------|-------------------------------------------------------|-----------------------------------------------|------|-------|
|                                  | C8.1.1 | Capacity of paved surfaces to reflect solar radiation | mean SRI                                      | n    | 16    |
|                                  | C8.1.2 | Capacity of roofs to reflect solar radiation          | mean SRI                                      | n    | 37    |
|                                  | C8.1.3 | Urban Area Reflectivity                               | mean albedo                                   | n    | 0,27  |
|                                  | C8.1.4 | Shading of paved surfaces                             | Share of shaded paved areas                   | %    | 20    |
|                                  | C8.1.5 | Visibility of the Sky                                 | mean Sky View Factor                          | n    | 0,74  |
|                                  | C8.1.6 | Availability of green areas                           | Share of green areas of total urban zone area | %    | 19    |

# Practical Example of RNTool

## Step 3/4/5 Vulnerability Values calculation for Risk Categories

The value of the Vulnerability Indicators of Risk Categories is normalised in the interval 0-1 (Example for criterion C8.1.1)

| Criterion                                             | Indicator | Unit | Value |
|-------------------------------------------------------|-----------|------|-------|
| Capacity of paved surfaces to reflect solar radiation | mean SRI  | n    | 16    |

Type: Higher is better

|                        |      |     |
|------------------------|------|-----|
| Benchmark 1 - Critical | Xmax | 58  |
| Benchmark 0- Optimal   | Xmin | 0   |
| Value of the indicator | Xi   | 16  |
| Normalised Value       |      | 0,7 |

$$N_v = \frac{X_i - X_{\min}}{X_{\max} - X_{\min}}$$

# Practical Example of RNTool

## Step 3/4/5 Vulnerability Values calculation for Risk Categories

To calculate the Vulnerability Value (VV) for Risk Categories a weight shall be assigned to Vulnerability Indicators (Example for Risk Category C8)

| C8.1 Health risk for inhabitants | Code   | Criterion                                             | Normalised value |
|----------------------------------|--------|-------------------------------------------------------|------------------|
|                                  | C8.1.1 | Capacity of paved surfaces to reflect solar radiation | 0,7              |
|                                  | C8.1.2 | Capacity of roofs to reflect solar radiation          | 0,36             |
|                                  | C8.1.3 | Urban Area Reflectivity                               | 0,66             |
|                                  | C8.1.4 | Shading of paved surfaces                             | 0,6              |
|                                  | C8.1.5 | Visibility of the Sky                                 | 0,26             |
|                                  | C8.1.6 | Availability of green areas                           | 0,74             |

# Practical Example of RNTool

## Step 3/4/5 Vulnerability Values calculation for Risk Categories

The value of the Vulnerability Indicators of Risk Categories is calculated (example for the Risk Category C8.1)

| C8.1 Health risk for inhabitants | Code   | Criterion                                             | Normalised value | Weight |
|----------------------------------|--------|-------------------------------------------------------|------------------|--------|
|                                  | C8.1.1 | Capacity of paved surfaces to reflect solar radiation | 0,7              | 0,25   |
|                                  | C8.1.2 | Capacity of roofs to reflect solar radiation          | 0,36             | 0,15   |
|                                  | C8.1.3 | Urban Area Reflectivity                               | 0,66             | 0,2    |
|                                  | C8.1.4 | Shading of paved surfaces                             | 0,6              | 0,1    |
|                                  | C8.1.5 | Visibility of the Sky                                 | 0,26             | 0,1    |
|                                  | C8.1.6 | Availability of green areas                           | 0,74             | 0,2    |

# Practical Example of RNTool

## Step 3/4/5 Vulnerability Values calculation for Risk Categories

The value of the Vulnerability Indicators of Risk Categories is calculated (example for the Risk Category C8.1)

| C8.1 Health risk for inhabitants | Code   | Criterion                                             | Normalised value | Weight | Weight value |
|----------------------------------|--------|-------------------------------------------------------|------------------|--------|--------------|
|                                  | C8.1.1 | Capacity of paved surfaces to reflect solar radiation | 0,7              | 0,25   | 0,2          |
|                                  | C8.1.2 | Capacity of roofs to reflect solar radiation          | 0,36             | 0,15   | 0,1          |
|                                  | C8.1.3 | Urban Area Reflectivity                               | 0,66             | 0,2    | 0,1          |
|                                  | C8.1.4 | Shading of paved surfaces                             | 0,6              | 0,1    | 0,1          |
|                                  | C8.1.5 | Visibility of the Sky                                 | 0,26             | 0,1    | 0,02         |
|                                  | C8.1.6 | Availability of green areas                           | 0,74             | 0,2    | 0,1          |

0,6

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# Practical Example of RNTool

## Step 6 Calculation of the Risk Value for Risk Categories

Risk Value of Risk Categories is calculated as a weighted geometrical mean of HV, EV and VV (Example for Risk Category C8)

| C8                  | Health | Weight |
|---------------------|--------|--------|
| Hazard (HV)         | 0,9    | 0,25   |
| Exposure (EV)       | 0,6    | 0,25   |
| Vulnerability (VV)  | 0,6    | 0,5    |
| Category risk value |        | 0,67   |

**Note:** Weights are assigned by the user, Total value must be 1

# Practical Example of RNTool

## Step 7 Calculation of Risk Value for the Urban Sector (Macro-Category)

Risk Value of Macro Categories is calculated as a weighted sum of Risk Values of the Categories

| A2                        | Transports                                    | Category risk level | Weight | Weighted value |
|---------------------------|-----------------------------------------------|---------------------|--------|----------------|
| A2.1                      | Damage risk for public transit infrastructure | 0,67                | 0,5    | 0,3            |
| A2.3                      | Damage risk for bicycle and pedestrian paths  | 0,82                | 0,25   | 0,2            |
| A2.4                      | Damage risk for road network                  | 0,65                | 0,25   | 0,2            |
| Macro category risk value |                                               |                     |        | 0,7            |

**Note:** Weights are assigned by the user, Total value must be 1

# Practical Example of RNTool

## Step 8 Calculation of Risk Value for a Hazard

Risk Value in relation to the Hazard calculated as a weighted sum of Risk Values of the Macro Categories (Example for Hazard A)

| A                 | Heavy precipitation | Macro category risk level | Weight | Weighted value |
|-------------------|---------------------|---------------------------|--------|----------------|
| A2                | Transports          | 0,70                      | 0,5    | 0,35           |
| A3                | Energy              | 0,82                      | 0,5    | 0,41           |
| Hazard risk value |                     |                           |        | 0,76           |

**Note:** Weights are assigned by the user, Total value must be 1

# Practical Example of RNTool

## Step 9 Calculation of overall Risk Value

Overall Risk Value calculated as a weighted sum of Risk Values of Hazards

| Code               | Hazard               | Hazard risk value | Weight | Weighted value |
|--------------------|----------------------|-------------------|--------|----------------|
| A                  | Heavy precipitation  | 0,76              | 0,4    | 0,3            |
| C                  | Extreme temperatures | 0,82              | 0,6    | 0,5            |
| Overall risk value |                      |                   |        | 0,8            |

**Note:** Weights are assigned by the user, Total value must be 1

# RISK ASSESSMENT RESULTS BY CATEGORY

## Urban sector: Transport

- The rating system also produces results at the level of the Exposed Elements within an Urban Sector.



**Risk Category**



# RISK ASSESSMENT RESULTS BY URBAN SECTOR

## Hazard: Heavy precipitation



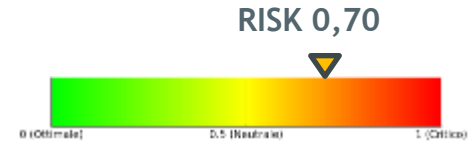
- For each climate hazard, the rating system produces a score that indicates the risk level of the urban sectors included in the assessment.



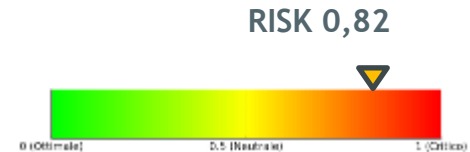
Urban Sectors



Transports



Energy



# RISK ASSESSMENT RESULTS BY HAZARD AND OVERALL

The application of the assessment system produces scores (0,1) that represent:

- the overall risk level of the urban area
- the risk associated with each individual hazard
- the risk by Urban Sector
- the risk concerning specific exposed elements

## RISK PER HAZARD

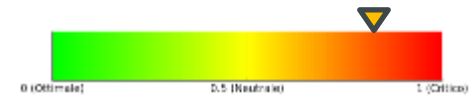
Extreme Temperatures

RISK 0,76



Heavy Precipitation

RISK 0,82



## OVERALL RISK - 0,80

