

## 3



## Assess Risks and Opportunities

The changing climate conditions lead to an increasing number of risks but also offer opportunities. Their assessment is based on the results of the vulnerability check (Module “Check Vulnerability”) and the projected climate change trends, which were described in module “Understand climate change impacts”.

The current vulnerabilities in your city are combined with the future climate change trends projected: By means of an evaluation matrix you can classify future risks for your city (see below).

The following questions will be answered in the module:

- What types of future risks and opportunities exist?
- Which receptors of the city are the most affected in future?

### 3.1 Purpose of the module and proceeding

The principal objective of adaptation is to moderate the impacts of climate change in cities and take advantage of opportunities that may arise. The identification of the risks and opportunities within this module helps you to get there.

The future problems identified (i.e. risks) will be the basis for the selection of types of adaptation measures in the module “Determine the Need for Action and Select Measures”.

For the assessment of future risks and opportunities regarding your identified receptors the Adaptation Compass provides two steps:



### Key terms

#### Risk

In the FUTURE CITIES Adaptation Compass risk is the combination of the current vulnerability (high, medium, low) and the climate change impact (balancing, indifferent, reinforcing) and is categorised in the classes very high, high, medium, low.

#### Opportunities

In combination with climate change the term opportunities is used to describe the positive aspects of climatic changes for certain regions (see climate change impacts), e.g. hotter summer can influence the tourism sector positively.

## Step 1: Assess the future risks and opportunities

This step is the automatic summary of the results from the previous modules.

You should start by checking these results:

Remember the receptors, their sensitivities and vulnerabilities of your city. If you want

- to add new receptors or sensitivities because you feel that the receptors do not cover all physical and socio-economic features of your city or
- to change the vulnerability class of certain receptors

you should go back to Module “Check Vulnerability”. There you can reconsider, add or edit your choices. Also, you might want to read again through the climate change information you received in Module “Understand Climate Change Impacts”. Go back to the module and go through the pages once again or use the link lists to learn more.

Now, being sure all collected results are correct, you can read through the given future risks and future opportunities that are collected in the table.

Furthermore, the risks are evaluated for each receptor and the corresponding weather sensitivity. Categories are given regarding winter and summer:

*very high – high – medium – low*

The categories of risks are assessed with the evaluation matrix, which brings together the results of the Vulnerability Check (Vulnerability classes high, medium, low) and the module “Understand Climate Change Impacts” with the climate change impact (balancing, indifferent, reinforcing).

The classes are determined with the following **evaluation matrix**:

	Climate change impact		
Current vulnerability	balancing	indifferent	reinforcing
High	medium	high	very high
Medium	low	medium	high
Low	low	low	medium

## A classical risk approach?

In classical risk approaches the term risk is defined as the combination of the probability of occurrence and the magnitude of the consequence or hazard (Metcalf et al. 2009).

For the Adaptation Compass the FUTURE CITIES partnership decided not to evaluate the probability of occurrence – in this case of a climate change impact – for the following reasons:

→No climate change data is used, only tendencies and qualitative descriptions are given. Therefore, it is hardly possible for a user to determine a probability of occurrence without having quantitative data at hand.

→The uncertainties of climate change projections are, at least for some parameters very high. A reasonable rating of probabilities seems therefore impossible.



### R1 – Assess the future risks and opportunities

In this module the future risk for the selected receptors regarding their weather sensitivity is determined.

To achieve this, the results of your vulnerability check and the climate change trends are put together automatically in the evaluation matrix, from which the future risk can be followed. Furthermore, opportunities are named, as far as they are apparent.

Receptors	Weather sensitivity	Future risk (not comprehensive)	Future risk Summer	Future risk Winter	Future opportunity (not comprehensive)
Public health / vulnerable groups	Heat wave	<ul style="list-style-type: none"> <li>- Increasing number of deaths</li> <li>- Reinforcement of heat stress</li> <li>- Increasing spread of new vector-borne and infectious diseases</li> <li>- Altered allergic patterns</li> </ul>	high	n/a	
	Extreme cold	n/a	n/a	low	<ul style="list-style-type: none"> <li>- Decrease of typical winter illness because of the warmer temperature</li> <li>- Less spread of respiratory and infectious diseases</li> </ul>
	Drought	<ul style="list-style-type: none"> <li>- Increased allergic reactions through pollen flight and others</li> </ul>	high	low	

**Be aware** that the collected risks and opportunities are not comprehensive; they may not be suitable for every location and must not definitely occur as described! It might also be possible that for your situation further risks and other opportunities arise. That is why it is important to read through the information given carefully. Changes can be made in the previous modules, as described in the side column. In this table there is no possibility to change the risk categories as they are composed by the previous results (see chapter “Evaluating risks and opportunities”).

### Step 2: Rank the risk categories

The selected receptors and weather extremes (standing for the problems identified) are sorted according to their risk category (very high-high-medium-low). You can rank the problems either for summer or winter depending on your priorities for adaptation.

The described opportunities are not included in the categorisation. Keep them nevertheless in mind, especially for the selection of an adaptation measure.



### R2 – Rank the risk categories

Here, the risk categories defined in the first step are sorted according to their priority for action. Measures should be prioritised in fields with extreme risk and high risk. For sensitivities with medium or low risk, action could also be taken, but the urgency is little.

Ranking according to risk category		
	Rank Summer	Rank Winter
Receptors - Weather sensitivity	Risk category summer	Risk category winter
Biodiversity / ecosystems - Heavy precipitation / Floods	very high	high
Green spaces - Heavy precipitation / Floods	very high	high
Water resources and quality - Heavy precipitation / Floods	very high	high
Transport - Heavy precipitation / Floods	very high	high

### How to add new receptors:

You need to go back to module “Check Vulnerability”, table “General sensitivities”. There a button can be found adding a new line with your new receptor. Then go on in the module to fill the additional information (necessary: weather sensitivity, vulnerability class). The new line you added here will appear in the other modules as well.

### How to revise the vulnerability class:

You need to go back to the module “Check Vulnerability”, table “Vulnerability Check” and change the class by clicking on it. Or change the “Climate change trend” in module “Understand climate change impacts” by clicking on them.

If you want to revise the ranking order go back to the previous modules to alter the receptors, vulnerability class or climate change variables.

### 3.2 Opportunities of climate change for cities

Climate change offers many opportunities as well. Adaptation aims at both: reducing your risks and take advantage of the opportunities that arise.

In North-West Europe the opportunities are manifold: they result from

- a) less cold spells in the winters or warmer temperatures throughout the year respectively as well as
- b) new market possibilities from a warmer and drier climate and from the need for adaptation and mitigation in general.

Some important examples are given below. More opportunities are collected in table R1 in the Adaptation Compass.

#### a) Warmer temperatures throughout the year

Human comfort is expected to increase in average, except during heat waves. The public space, like green spaces, beaches etc. will probably be used more intensively. Moreover, extreme cold spells are decreasing in the medium- and long-term future. This implies that the sensitivities of the receptors against extreme cold are reduced. For example, less damages and limitations arise in all sectors of transport, as dangerous icy conditions probably occur less often. These conditions decrease also the amount of typical winter health problems and people in hospitals.

#### b) New market possibilities

Several receptors in a city can be counted as “winners” of climate change, this is mainly due to the fact, that with little effort of adaptation new possibilities arise: e.g. for agriculture and forestry. The warmer climate with a longer growth seasons creates better growth conditions and more harvest. More efficient plantations and new products can be established. Furthermore, for the whole economy the opportunities can be great, depending on the economic structure of the city. For tourism, the chances are obvious: more people are willing to spend their summer holidays and leisure time in North-West Europe when the likelihood for warm and dry weather is higher. But also for industry positive effects of climate change can be named: new products and innovations are required for a changing environment, including all technologies for renewable electricity production and mitigation. A specific example is the increasing potential for solar panels due to less cloud cover in the warm season. Furthermore, the building and renovation need in cities is high – local economy can strongly profit from this, if the know-how is available.

## Key terms

### Mitigation

Mitigation is used for actions which reduce the potential impacts of global warming by decreasing or avoiding greenhouse gas emissions.

### 3.3 Experiences from FUTURE CITIES

#### Risks and opportunities in Tiel East

An example for the assessment of risks and opportunities is given by the Dutch city of Tiel. The City has local groundwater problems. These local groundwater problems also create opportunities: By positioning sources and sinks for cold and heat storage in a smart way, local groundwater levels can be lowered in specific problem areas. This mechanism can also be used to tackle groundwater pollution. A business plan will give more insight into the cost efficiency of this combination of water and energy aspects. If possible, the system will be combined with residual heat from nearby factories. That way, climate adaptation will also serve economic and social purposes.

#### Risks and opportunities in Nijmegen

The city of Nijmegen investigated to which courtyards rainwater in the city centre flows. These courtyards have the potential risk of being flooded in case of storm and severe rainfall. The city plans to reduce the risk through adaptation while at the same time exploiting the opportunities: In the same study it was identified which of these courtyards have enough space to add green space in order to increase the potential of water infiltration. In 2012, one of these courtyards was turned from a public parking lot into a green-blue space after a redesign process with involvement of the inhabitants.

#### Key terms

##### Uncertainties

An uncertainty is the degree to which a variable (e.g. the climate condition) is unknown. Uncertainties can result from lack of information or from disagreement about what is known or even knowable. Uncertainty can therefore be represented by quantitative measures, e.g. by modelling and taking assumptions or by a qualitative statement, e.g. reflecting the judgement of a team of experts.