BlueSCities

Blueprints for Smart Cities

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BlueSCities

Why do we need the project?

1. Water – too much or too little is a local problem and should be solved locally

   – cities are in a key position!

2. Water infrastructure is the most expensive infrastructure in the city

3. Cities need to start working on the adaption measures

4. Cities can learn from each others

BlueSCities

Concept and objective:

- Integrate water and waste in the Smart City agenda

- Aim for technological improvements

- Raise awareness and wider learning experiences on increased energy and water efficiency
- Raise awareness of the motivation for recycling material and water flows.

- Produce baseline assessment of the sustainability of water management in a city

The analysis builds upon the **City Blueprint** –tool which can be used as a quick-scan to benchmark the sustainable water cycle in cities

Bluescities

1. Bluecities

18 partners in 9 countries

4 case studies:

Genoa
Istanbul
Athens
Helsinki

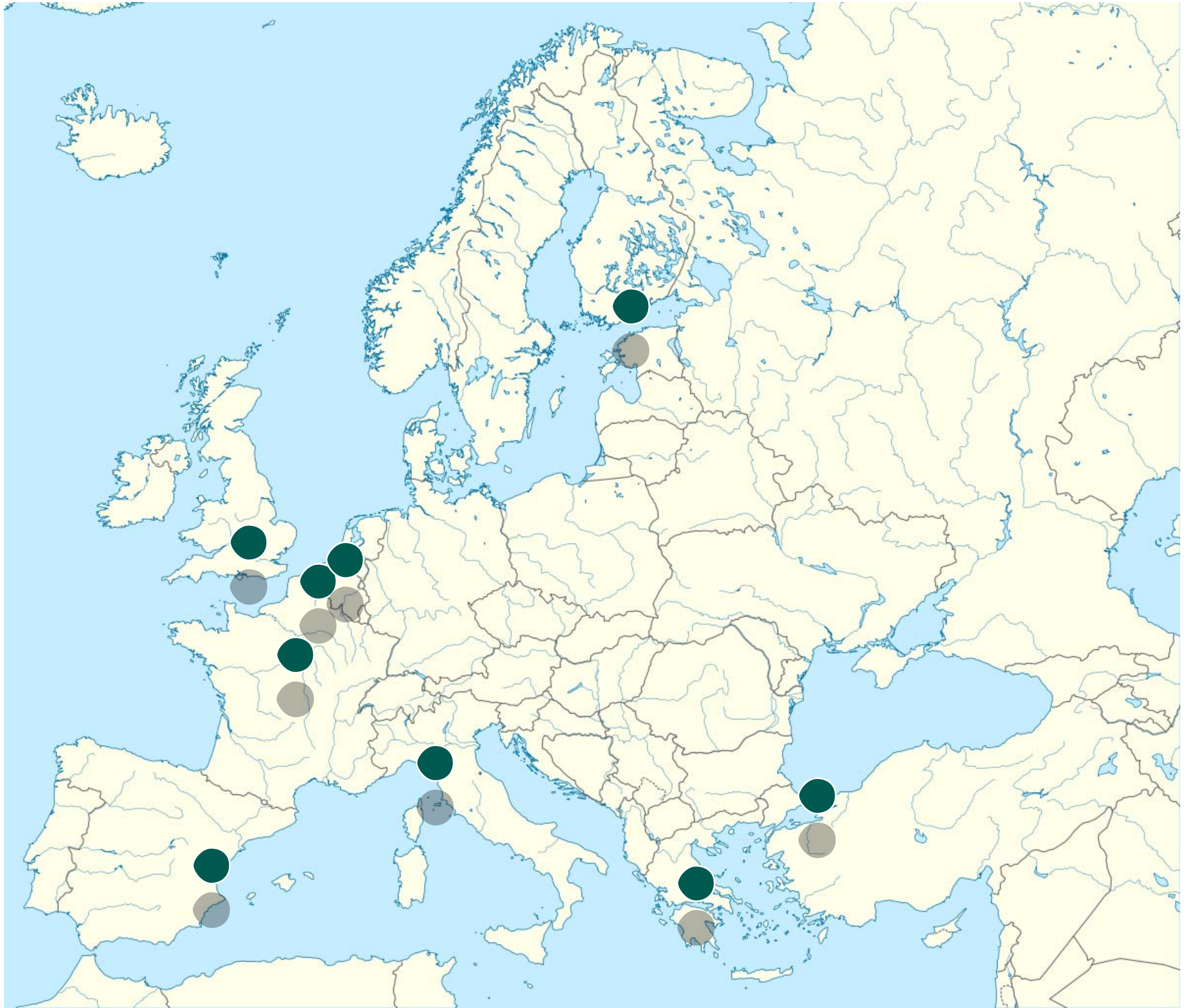

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Table 1: Ten Global Risks of Highest Concern in 2014

No.	Global Risk
1	Fiscal crises in key economies
2	Structurally high unemployment/underemployment
3 ▲	Water crises
4	Severe income disparity
5 ▲	Failure of climate change mitigation and adaptation
6 ▲	Greater incidence of extreme weather events (e.g. floods, storms, fires)
7	Global governance failure
8 ▲	Food crises
9	Failure of a major financial mechanism/institution
10	Profound political and social instability

Source: Global Risks Perception Survey 2013-2014.
Note: From a list of 31 risks, survey respondents were asked to identify the five they are most concerned about.

World Economic Forum, 2014

CITIES PROVIDE LOCAL SOLUTIONS FOR OUR GLOBAL WATER CHALLENGES

1. Cities are the major problem holders
2. Active civil societies incl. the private sector with visionary local government can cope with water challenges
3. It requires a long-term strategy, a bottom-up approach and collaboration among cities and regions by sharing best practices (implementation)
4. Time window to do this is narrow and rapidly closing

Megatrends in Cities

Urbanization

Urban areas of the world are expected to absorb all the population growth expected over the next four decades.
By 2050, urban dwellers will likely account for 86 % of the population in the more developed regions and for 64 % of that in the less developed regions.

Climate change

Climate change may worsen water services and quality of life in cities.

Water use & water scarcity

Water withdrawals have tripled over the last 50 years. In 2030, there will be a 40% supply shortage of water.

Sanitation

Currently, 2.5 billion people are without improved sanitation facilities.

Human health

Currently, 3.4 million people - mostly children – die from water-borne diseases every year.

Hazards

Water-related hazards account for 90% of all natural hazards.

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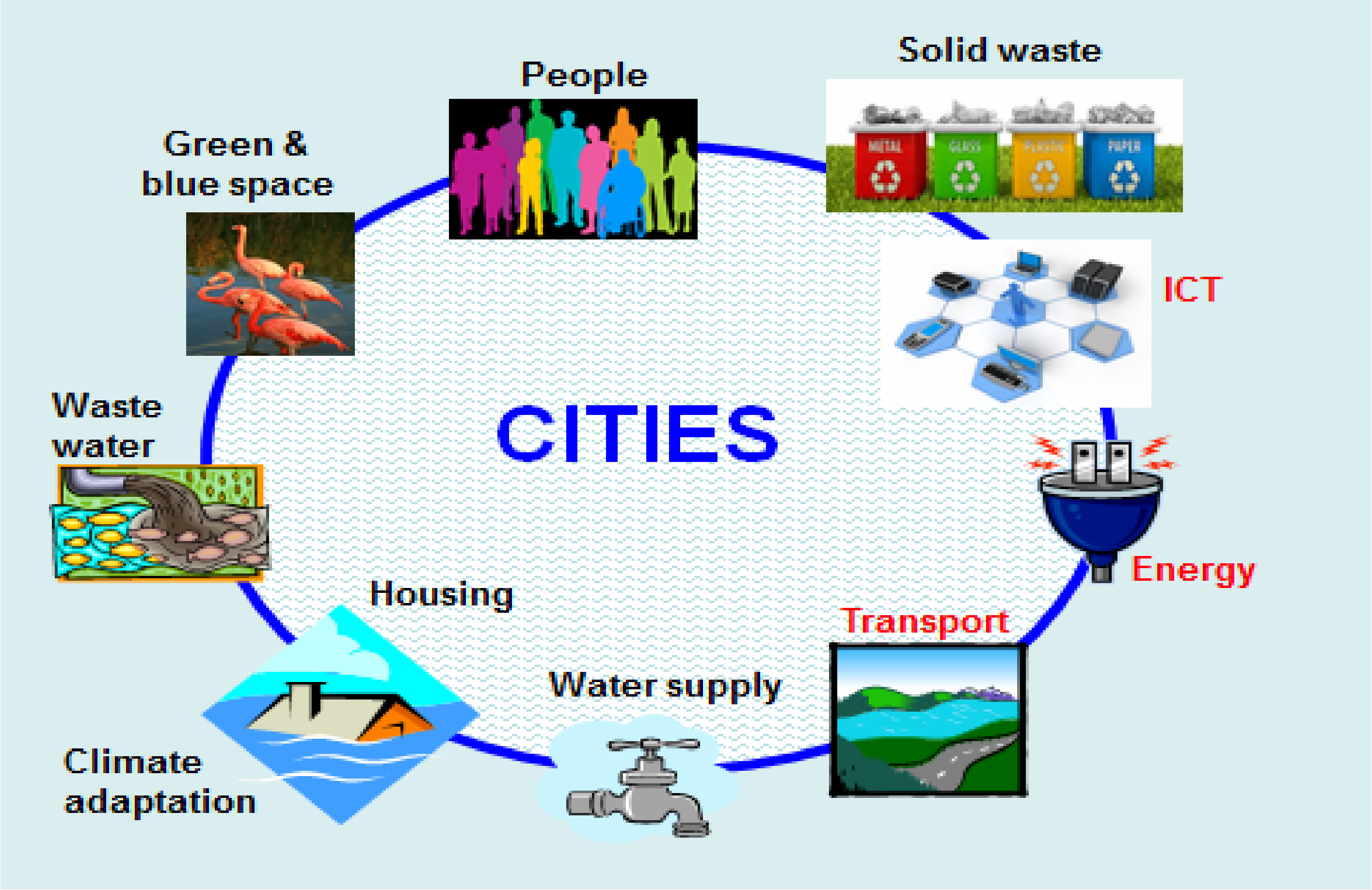


People
Solid waste
Green &
blue space
ICT
CITIES
Waste
water
Energy
Housing
Transport
Water supply
Climate
adaptation

INTERACTIONS ARE OPPORTUNITIES

Number of interactions in 'Smart' cities
n=3 (Energy, Transport and ICT)
Total number of interactions = 3

Number of interactions in 'smarter' cities
n = 10 (number of topics in cities):
Total interactions: $\frac{1}{2}n \times (n-1) = (10/2) \times (10-1) = 45$

Result: currently 45-3 = 42 interactions (potential win-win's) are not explored. This is >>90%!!!

Box 2.10 Flooding in Copenhagen, Denmark on 2 July 2011

After a substantially hot period Copenhagen was hit by a huge thunderstorm on 2 July 2011. During the afternoon clouds and thunder had been building up over the southern part of Sweden. During a two hour period over 150 mm of rain fell in the city centre. This constituted the biggest single rainfall in Copenhagen since measurements began in the mid-1800s.

The city's sewers were unable to handle all of the water and as a result many streets were flooded and sewers overflowed into houses, basements and onto streets thereby flooding the city. The consequences were quite drastic as emergency services had to close roads and attend to people trapped in their cars. The emergency services were within minutes of having to evacuate the city's two biggest hospitals because of flooding and power cuts.

Insurance damages alone were estimated at EUR 650–700 million. Damage to municipal infrastructure not covered by insurance, such as roads, amounted to EUR 65 million.

That the city's sewers could not handle the huge amounts of rain water was no surprise — they are designed to handle much smaller amounts of precipitation. The city's sewage system combines rainwater and sewage together thereby making the city vulnerable if the amount and intensity of rainfall increases.

The fact that Copenhagen over the last year has experienced a number of torrential rain falls has caused the city to really take notice. The city has prepared and approved a climate adaptation plan with the principle aim being to separate as much rain water from sewage water as possible. The city has estimated that it is currently not an option to expand the sewage system to handle the predicted larger amounts of rain water.

Photo: © Risager

Source: European Environment Agency (2012)

CLIMATE CHANGE MITIGATION & ADAPTATION

Cost of Floods in EU (IIASA 2014):

€ 4.9 billion a year on average from 2000-2012 and € 23.5 billion by 2050
Frequency of larger events increase from once in 16y to once in 10 y

⟶ damage per year will increase 5 times

Cost of Katrina (USA):

† 1,836 and US$ 81 billion

Benefits of Climate Change Mitigation and Adaptation may exceed the property damage and economic cost.

Cities need to be prepared!

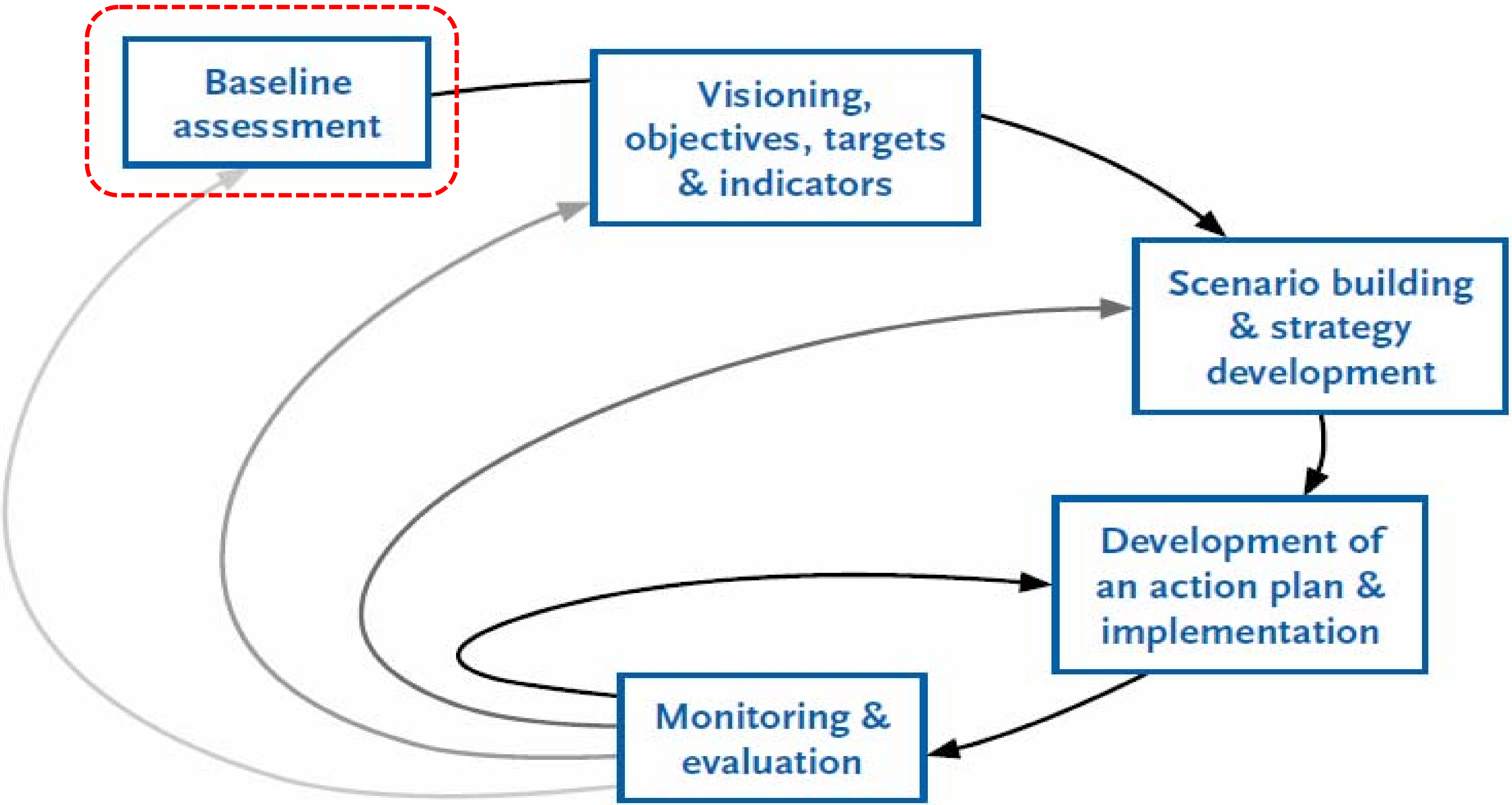
Costs of sustainable urban infrastructures

An estimated US$ 41 trillion is required to refurbish the old and build new urban infrastructures over the period 2005–2030:

- $22.6 trillion for **WATER** systems
- $9 trillion for energy
- $7.8 trillion for road and rail infrastructure
- $1.6 trillion for air- and sea-ports

- 1 trillion means 1 thousand billions (10^{12})

Source: UNEP City-level decoupling, 2013



Source: ICLEI / SWITCH (2009)

Goal	**Baseline assessment** of the sustainability of UWCS of cities
Indicators	Twenty-four indicators divided over eight broad categories: 1.Water security 2.Water quality 3.Drinking water 4.Sanitation 5.Infrastructure 6.Climate robustness 7.Biodiversity and attractiveness 8.Governance
Data	Public data or data provided by the (waste) water utilities and cities based on a questionnaire for UWCS
Scores	0 (concern) to 10 (no concern) **(Blue is good)**
BCI	Arithmetic mean of 24 indicators which varies from 0 to 10 **(in parentheses)**
Stakeholders	Water utility, waste water utility, water board, city council, NGOs
Process	Interactive with all stakeholders involved early on in the process

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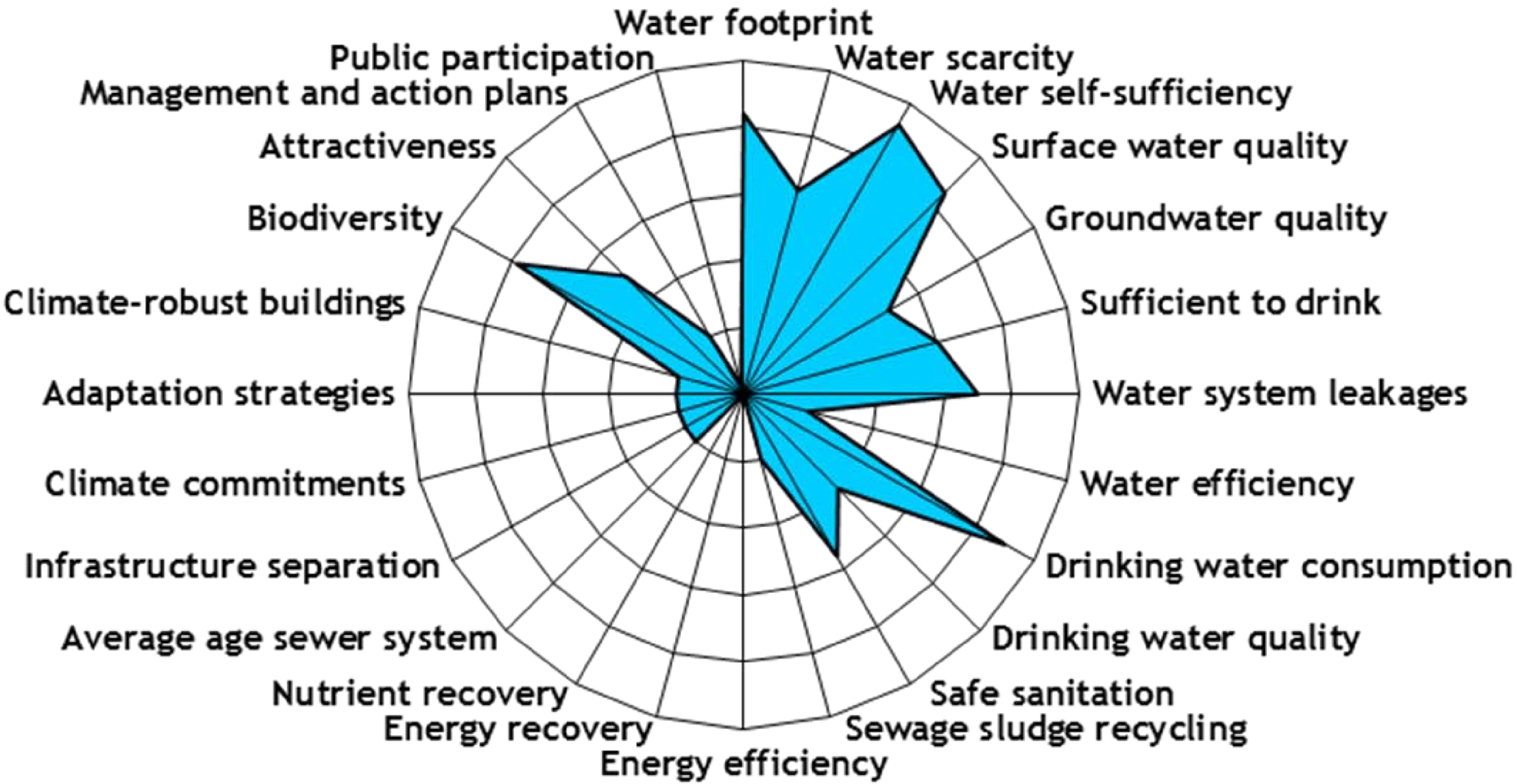
Four cities with increasing BCIs:

1. ***Dar Es Salaam (*****Tanzania, BCI of 4.1)**
2. ***Istanbul*** **(Turkey, BCI of 5.2)**
3. **Manresa (Spain, BCI 6.2)**
4. ***Copenhagen*** **(Denmark, BCI of 7.0)**
5. ***Malmö*** **(Sweden, BCI of 8.0)**

Dar es Salaam (4.1)



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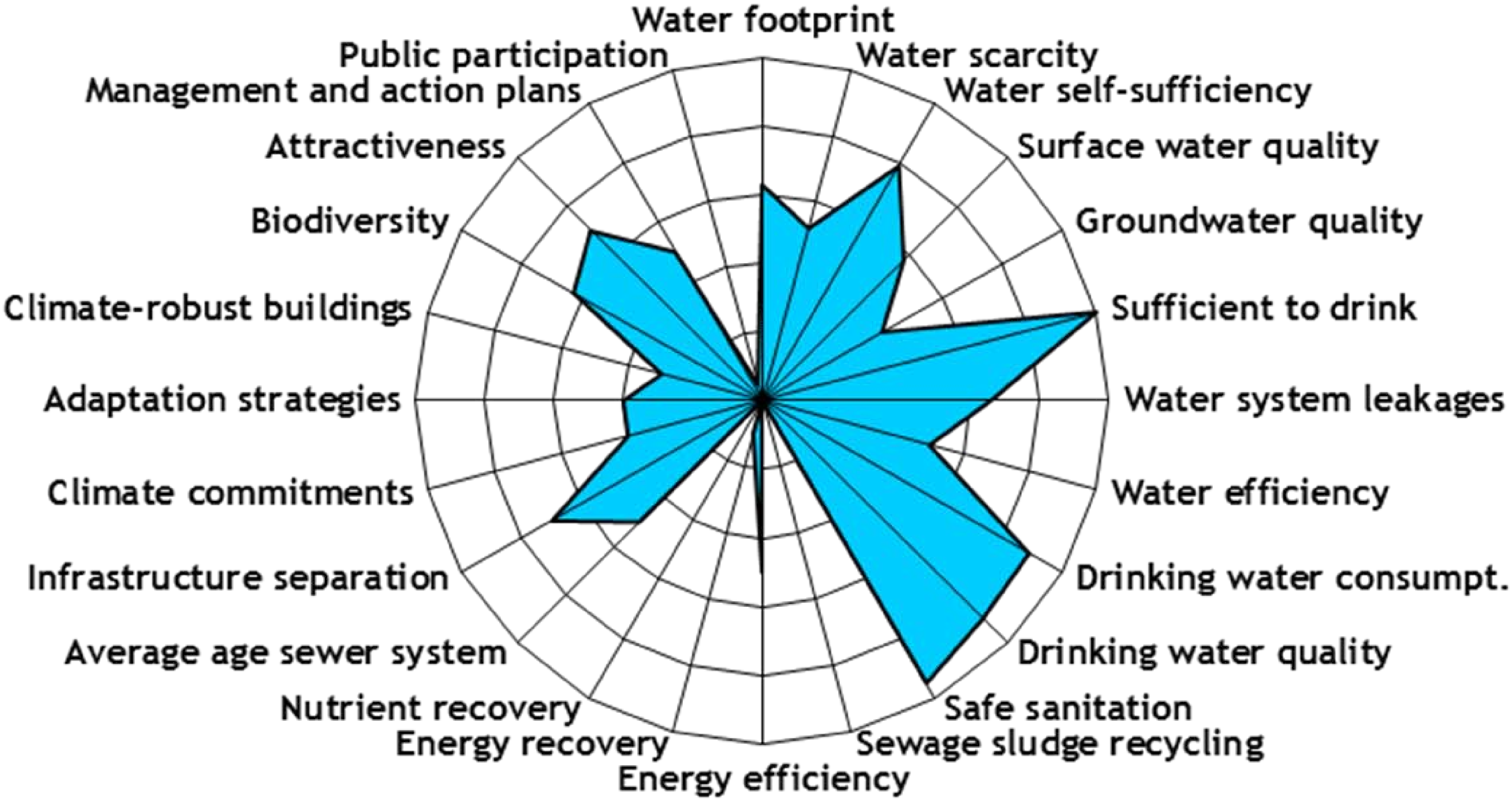
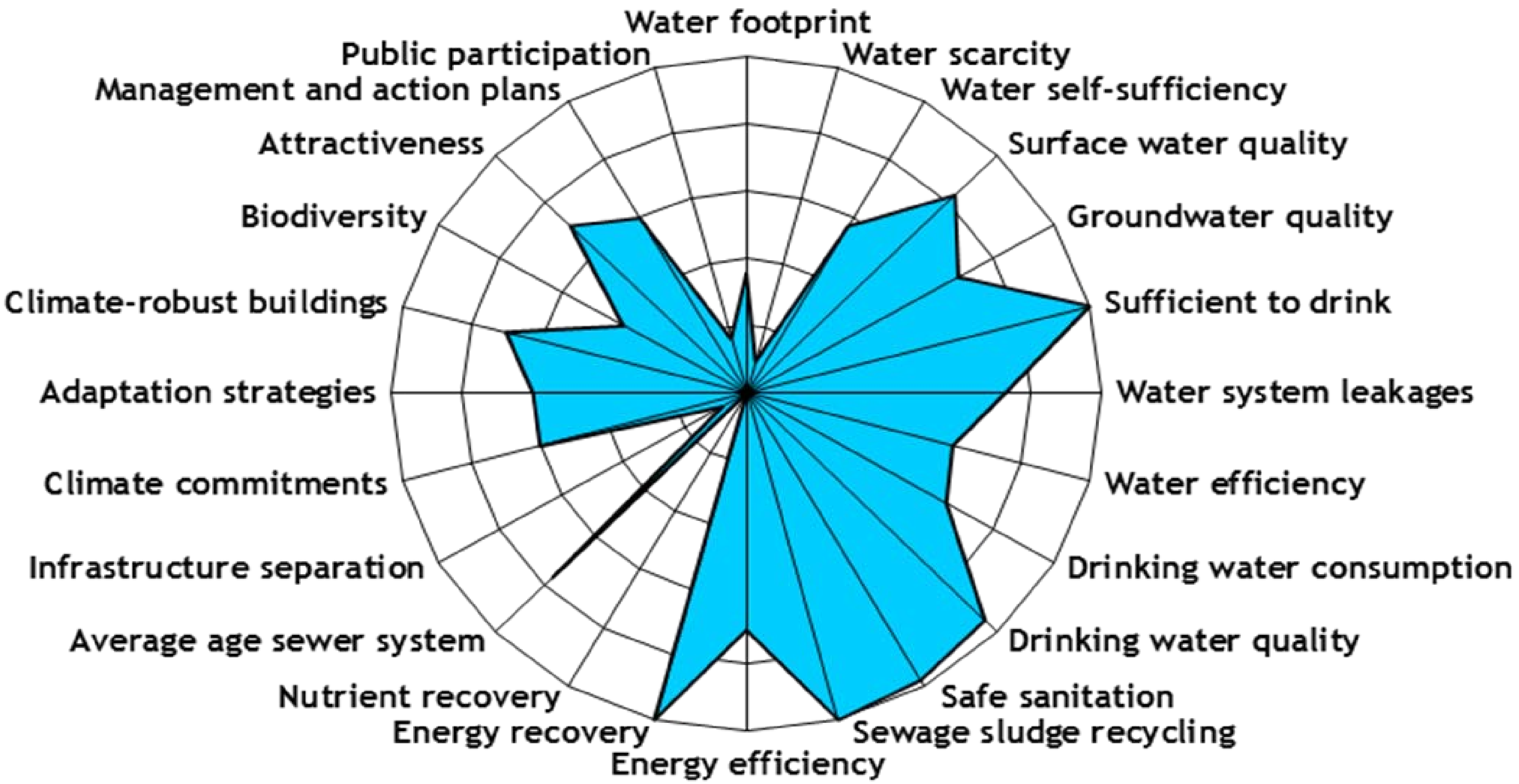
Istanbul (5.2)


Water footprint
Water scarcity
Water self-sufficiency
Surface water quality
Groundwater quality
Sufficient to drink
Water system leakages
Water efficiency
Drinking water consumpt.
Drinking water quality
Safe sanitation
Sewage sludge recycling
Energy efficiency
Energy recovery
Nutrient recovery
Average age sewer system
Infrastructure separation
Climate commitments
Adaptation strategies
Climate-robust buildings
Biodiversity
Attractiveness
Management and action plans
Public participation

Manresa (6.2)



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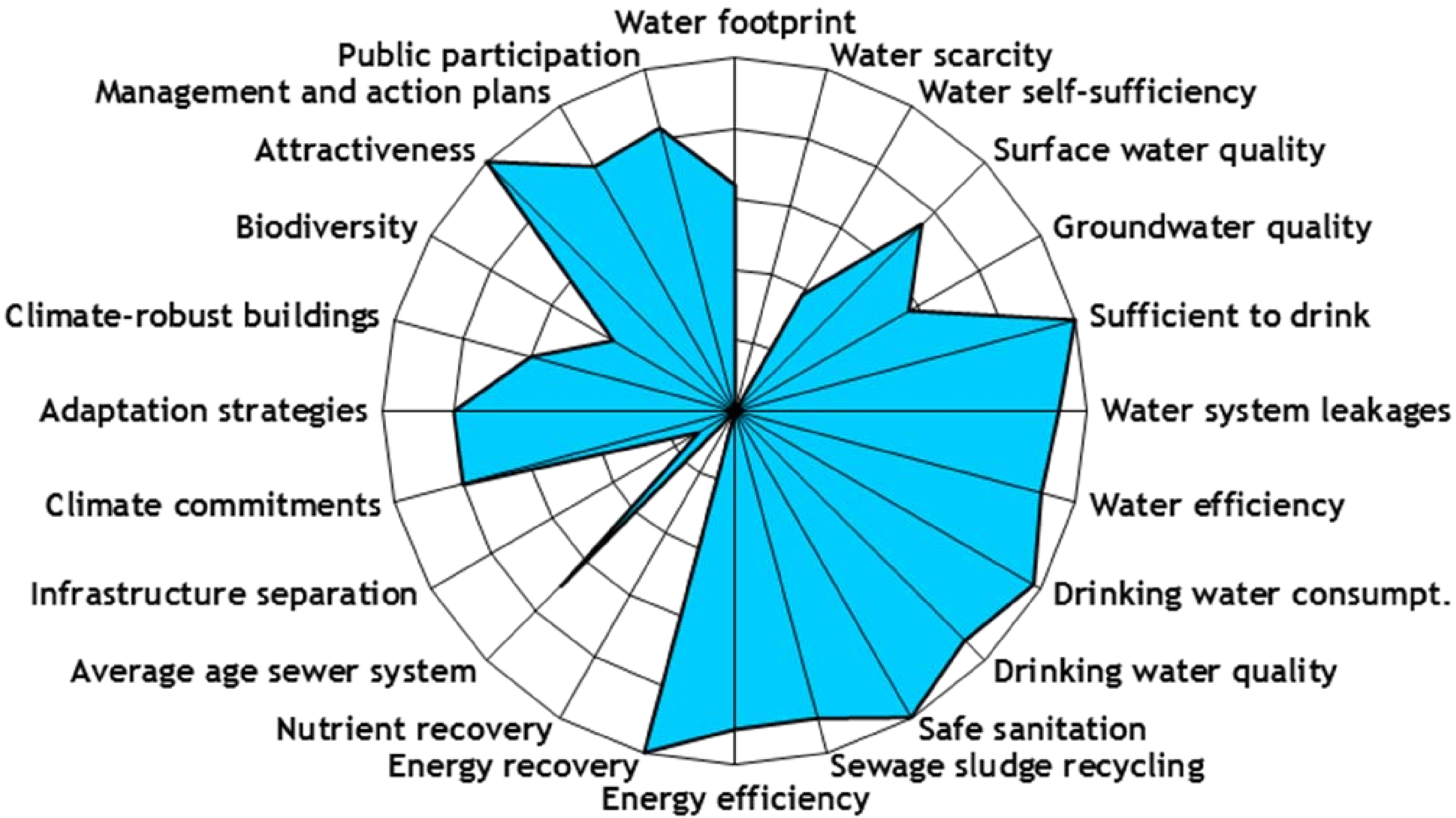
Copenhagen (7.0)



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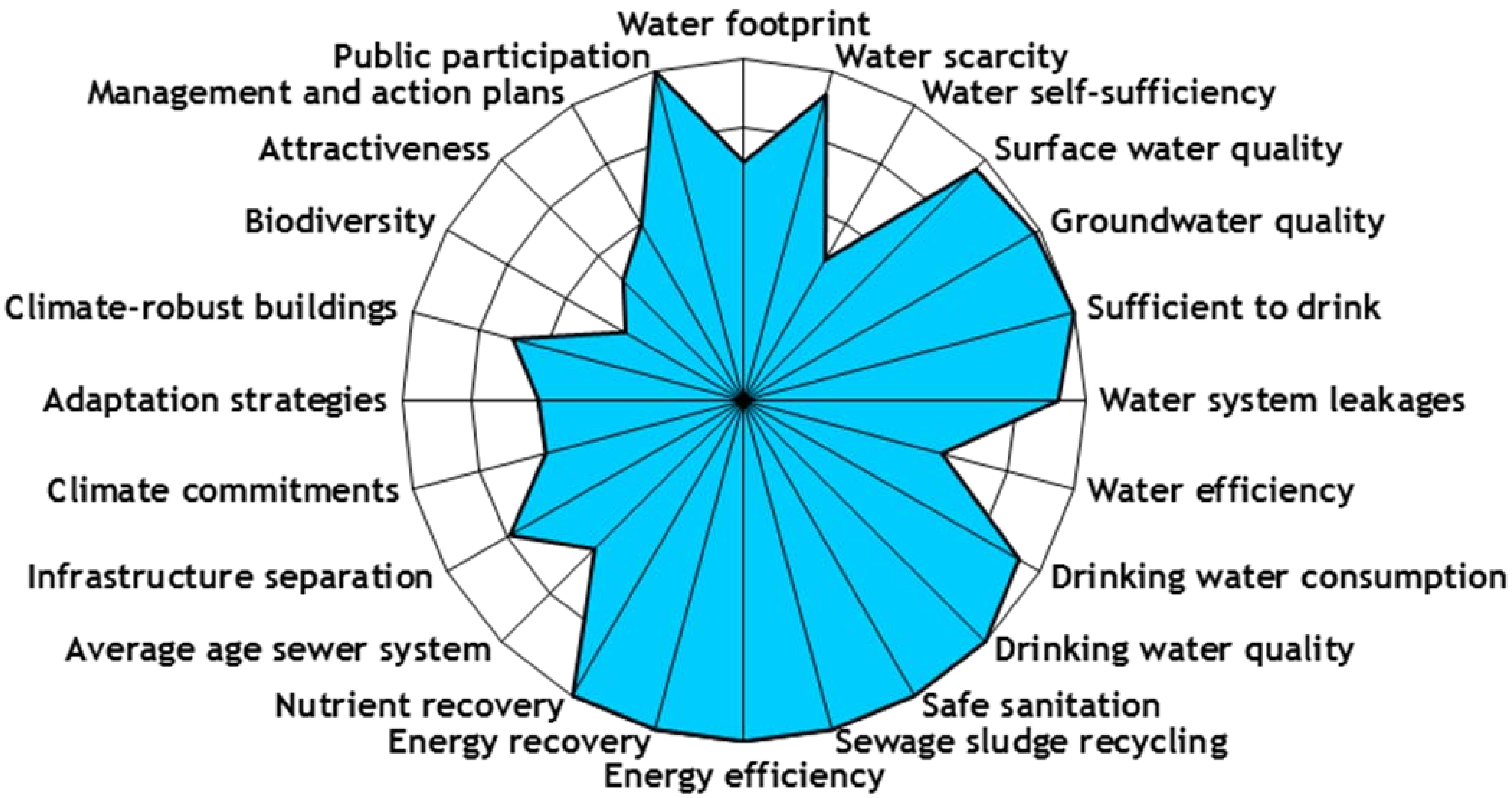
Malmö (8.0)



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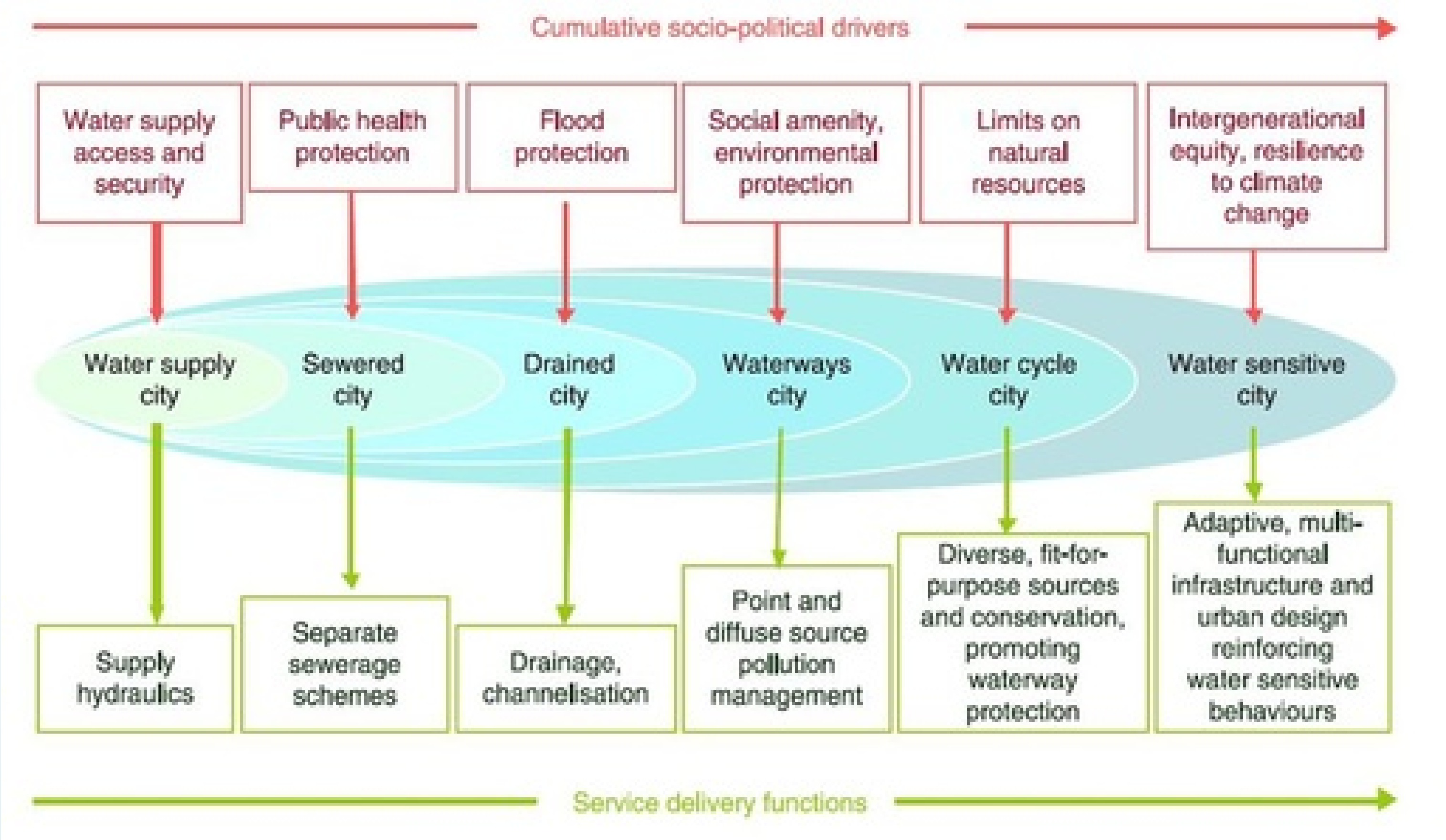
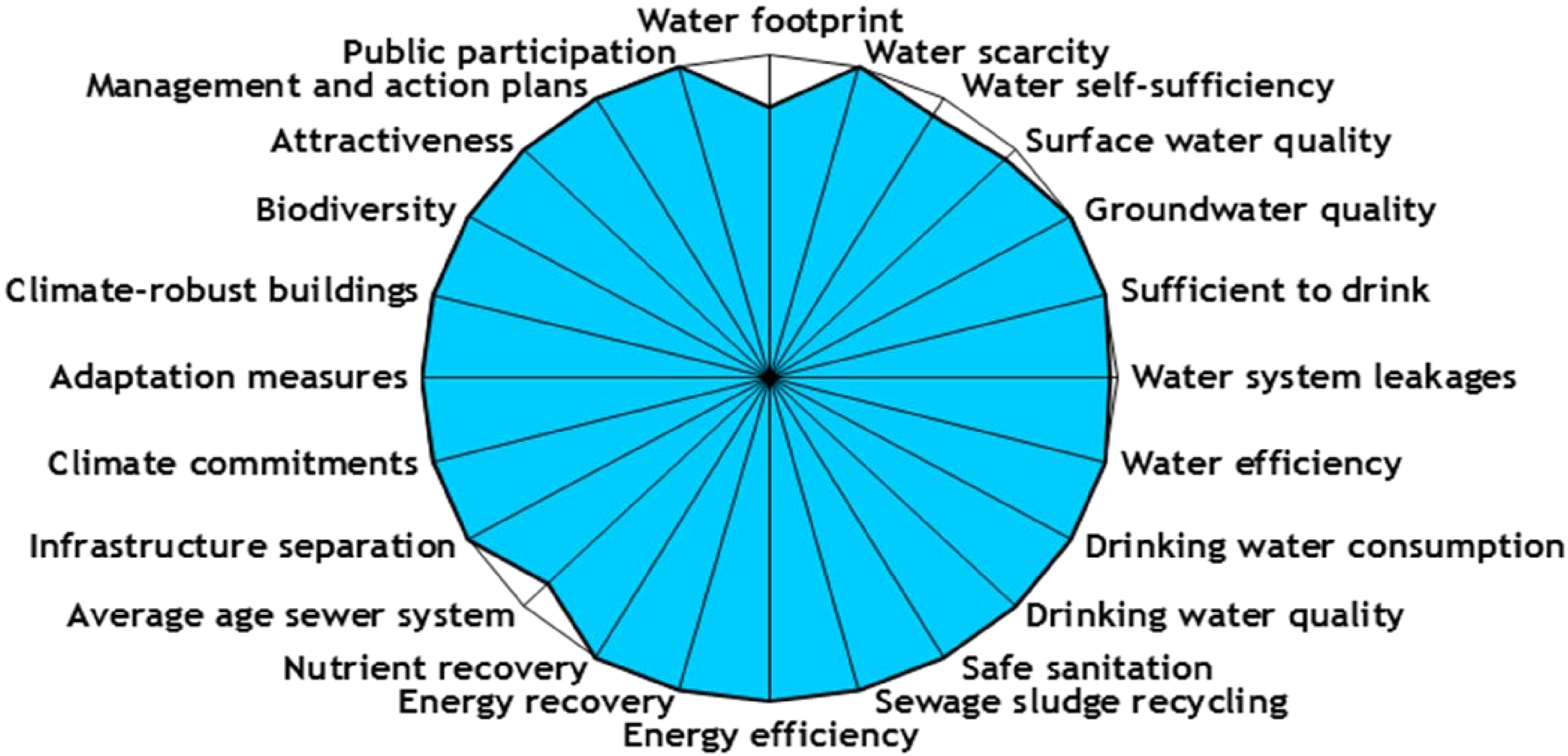
Urban water management transitions framework



SOURCE: BROWN ET AL. 2009

Collaboration between cities matters: blue cities



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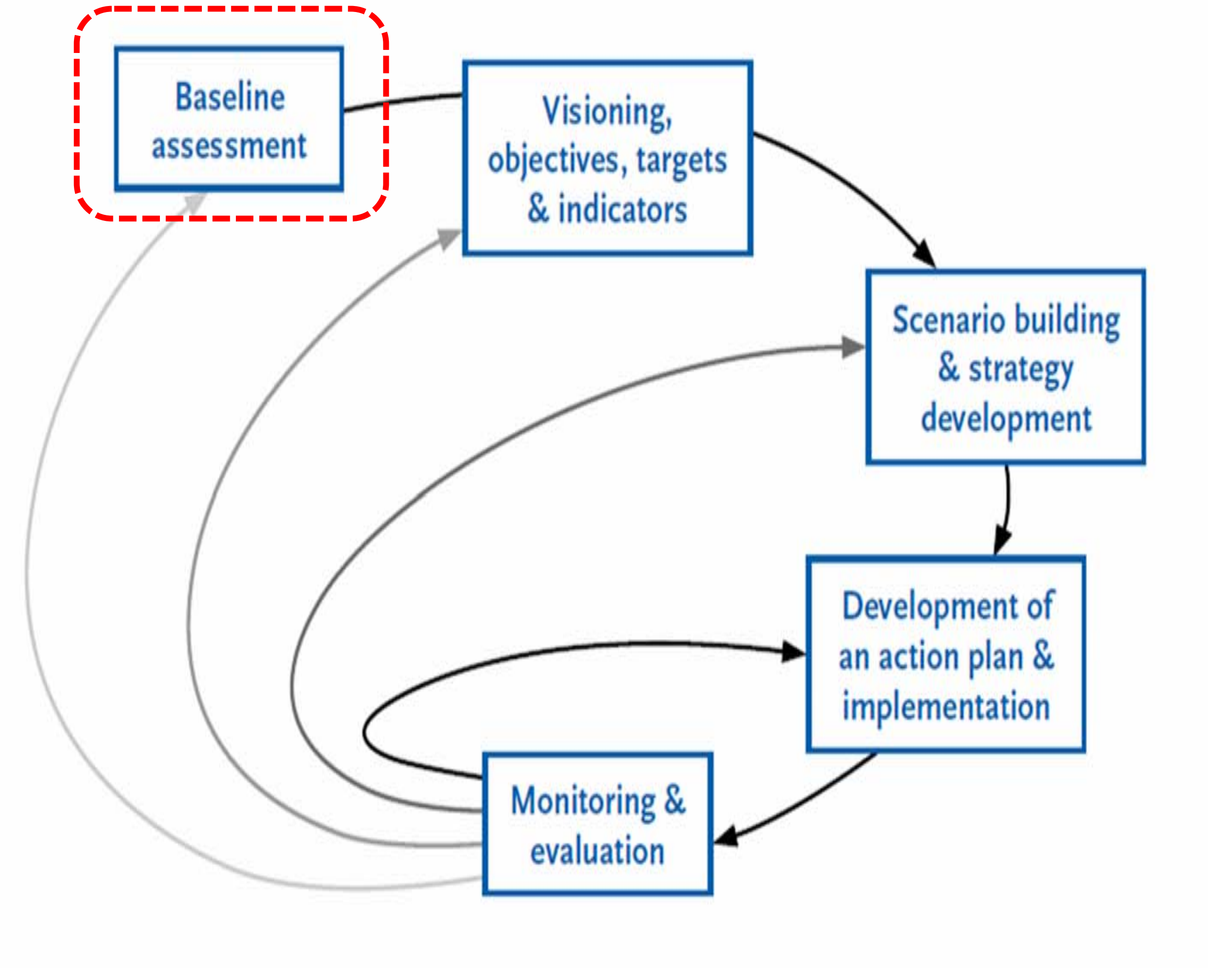
CONCLUSIONS

Cities need to start investing in adaptation measures based on a **long-term vision and strategy and by sharing best practices** *(Van Leeuwen, 2014).*

The longer political leaders wait, the more expensive adaptation will become and the danger to citizens and the economy will increase *(Jacqueline McGlade, former EEA Executive Director).*



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1. Mona Arnold General - Overview of the BlueSCities project

2. Kees van Leeuwen - Background of the project

3. **Bogumil Ulanicki - Case studies of Cities and the Atlas**

Smart city

-Monitor and control utility provision, water, waste, energy, transport
ICT

-Integrate and co-ordinate utility provision

-Friendly for people and dedicated to minimization of required inputs of energy, water and food, and waste outputs

Tasks

- To apply a consistent methodology for a more detailed analysis of the four case study cities
- To carry out the analysis of the four cities, Athens, Genoa, Helsinki and Istanbul
- Extract the best practices from leading smart cities through interviews: Bristol, Copenhagen, Hamburg and Oslo

Methodology

The base-line methodology is based on 25 performance measures which can be satisfied on the scale from 0 to 10 and presented on the web chart.
Each case study is led by a partner with local knowledge and should have access necessary information including technological, regulatory, economic and political aspects of the interactions (dependencies) between water/waste and energy, ICT and transport in the city.

Case-studies

1. Athens, the capital of Greece 5,000,000 inhabitants, water scarcity problems, with a very long water supply system

2. Genoa is a city in Northern Italy, with a population of 600,000, challenged with climate change features: long drought periods and the increased frequency of flash floods.

3. Metropolitan capital area of Finland with a population of 1,200,000. Surface and groundwater quality is good and abundant. Flooding is occasionally a concern.

4. Istanbul, a megacity with over 10mln inhabitants, quickly growing population. Watersheds used currently are threatened by urbanization, pollution and industry.

Extraction of the best practices from leading smart cities through interviews

- The interviews will include European Green Cities such as Bristol, Copenhagen, Hamburg and Oslo.

- A process of how to share the best practices and learn from one another will be started and facilitated during the project

BlueSCities atlas

The City Blueprint Atlas will include:

• a description of the current state of water and waste practices in a number of European cities and regions to raise awareness and to stimulate the discussion on research needs

.

•Formulation of recommendations in order to produce an administrative methodology capable of eliminating cross sector barriers between water, waste and Smart City sectors

•considered case-studies

Need for integratory approach

- To produce energy we need water
- To produce water we need energy
- To produce food we need energy and water
- Consumption of water generate wastewater
- Consumption of food generate food waste

- Reducing food waste save energy and water
- Recycling water save water and energy

- ICT is enabler to implement smart systems

Need for integratory approach

- To provide utility services we are using complex and expensive infrastructures for water supply, water removal, electricity supply, gas supply, for communication cables.

- These infrastructures are often redundant and interact with one another in an unpredictable fashion

- In order to handle this complexity policy makers have to stop working in isolation and adopt integrated policy and infrastructure