

INDICATORS OF THE TRENDS AND PRESSURES FRAMEWORK

		0	1	2	3	4	
Trends and pressures	Social	1. Urbanization rate	█				
		2. Burden of disease	█				
		3. Education rate	█				
		4. Political instability	█				
	Environmental	5. Water scarcity	█				
		6. Flood risk	█				
		7. Water quality	█				
		8. Heat risk	█				
	Financial	9. Economic pressure	█				
		10. Unemployment rate	█				
		11. Poverty rate	█				
		12. Inflation rate	█				

0	No concern	1	Low concern	2	Medium concern	3	Concern	4	Great concern
---	------------	---	-------------	---	----------------	---	---------	---	---------------

Key publications

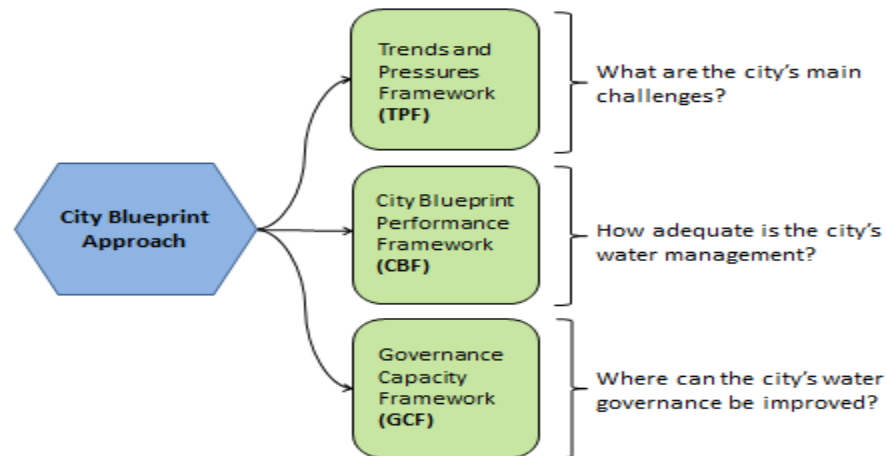
Koop, S.H.A. and C.J. Van Leeuwen. (2015a). Assessment of the Sustainability of Water Resources Management: A Critical Review of the City Blueprint Approach. *Water Resources Management*. 29:5649–5670 ([open access](#))

Koop, S.H.A. and C.J. Van Leeuwen. (2015b). Application of the Improved City Blueprint Framework in 45 municipalities and regions. *Water Resources Management*, 29(13), 4629-4647 ([open access](#))

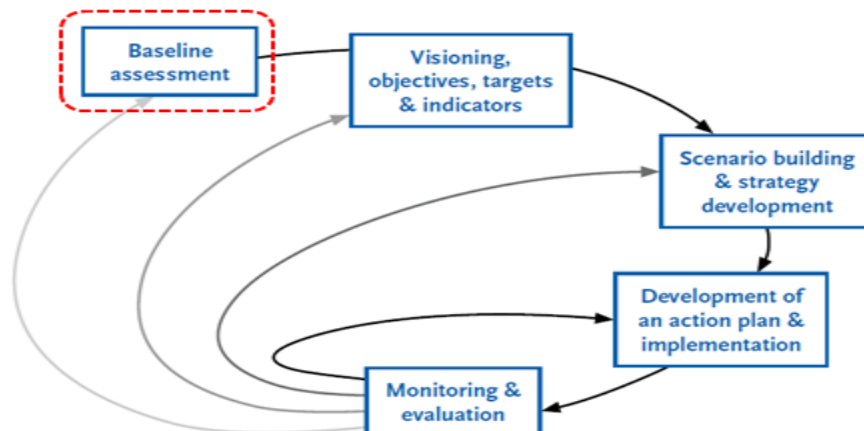
Koop, S.H.A. and Van Leeuwen, C.J.(2016). The challenges of water, waste and climate change in cities. *Environment, Development and Sustainability*, DOI :10.1007/s10668-016-9760-4. ([open access](#))

1. Introduction City Blueprint Approach

The **City Blueprint Approach** is a diagnosis tool and consist of three complementary frameworks. The main challenges of cities are assessed with (1) the *Trends and Pressures Framework (TPF)*. How cities are managing their water cycle is done with (2) the *City Blueprint Framework (CBF)*. Where cities can improve their water governance is done with (3) the *Governance Capacity Framework (GCF)*.



The City Blueprint Approach is a method to assess the sustainability of Integrated Water Resources Management (IWRM) in municipalities and regions. It is a baseline assessment and a first step in the strategic planning process in cities, depicted in the red box below.



Further information:

A short introduction of the City Blueprint Approach -including two videos - is provided in the newest **E-Brochure** that can be downloaded from the website of the European Innovation Partnership on Water (EIP Water): http://www.eip-water.eu/City_Blueprints (*click on documents*).

Other websites:

<http://www.watershare.eu/>

<http://www.bluescities.eu/>

<http://www.power-h2020.eu/>

2. The Trends and Pressures Framework (TPF)

The Trends and Pressures Framework indicators consist of a total of 18 indicators (including the sub-indicators) and are divided over the following broad categories: social pressures, environmental pressures and financial pressures.

Categories	Indicators	Sub-indicators
Social pressures	1 Urbanization rate	
	2 Burden of disease	
	3 Education rate	
	4 Political instability	
Environmental pressures	5 Flooding	Urban drainage flood River peak discharges Sea level rise Land subsidence
	6 Water scarcity	Fresh water scarcity Groundwater scarcity Salinization and seawater intrusion
	7 Water quality	Surface water quality Biodiversity
	8 Heat risk	Heat island effect
Financial pressures	9 Economic pressure	
	10 Unemployment rate	
	11 Poverty rate	
	12 Inflation rate	

3. Application of the Framework

The 18 Trends and Pressures indicators are standardized to a scale of 0-4 and divided in ordinal classes expressed as a 'degree of concern' and shown below.

TPF indicator score	Degree of concern
0 – 0.5	no concern
0.5 – 1.5	little concern
1.5 – 2.5	medium concern
2.5 – 3.5	concern
3.5 – 4	great concern

KWR Watercycle Research Institute will provide the scores for all Trends and Pressures indicators.

4. Assessment method

Category 1: Social Pressures

Indicator 1: Urbanization rate

Principal: Percentage of population growth either by birth or migration. The percentages are annually averages per country. Urbanization increases the pressure on IWRM.

Calculation method

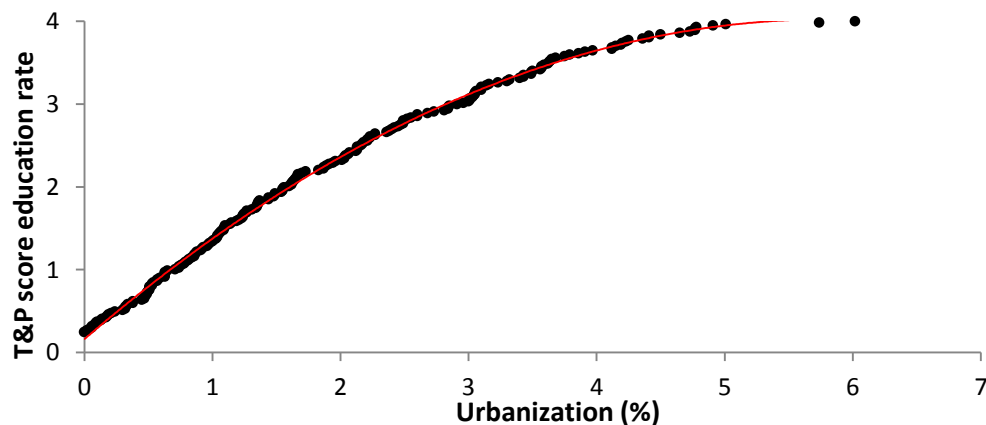


Fig. 7.2.1 Equation fit for urbanization rate (%). The score for trends and pressures is based on the country rankings. Correlation coefficient is $r=0.9993$.

X = Urbanization rate (%)

$$\text{Score urbanization rate} = -0.114X^2 + 1.3275X + 0.1611$$

For urbanization rates lower than 0% the score is also zero and the above formula is not applied.

Where to get the data

CIA (2014) Central Intelligence Agency: The World Factbook. Urbanization.

<https://www.cia.gov/library/publications/the-world-factbook/> Accessed 27 February 2017

Data available in

Netherlands	EU	Worldwide
Yes	Yes	Yes

Scale: National scale.

Example Kilamba Kiaxi: Kilamba Kiaxi has a urbanization rate of 4.3% growth per year. Applying the formula results in: $-0.114 \cdot [4.3]^2 + 1.3275 \cdot [4.3] + 0.1611 = 3.76$ points. Urbanization rate is a great concern for the city of Kilamba Kiaxi.

Indicator 2: Burden of disease

Principal: The gap between current health status and an ideal situation where everyone lives into old age, free of disease and disability (WHO, 2004). The average DALY per 100.000 people is a strong tool to indicate the burden of disease.

Calculation method

The indicator measures the age-standardized disability-adjusted life years (DALY) per 100.000 people. DALY is the quantification of premature death, burdens of disease and disability in life years. It is a time-based measure that combines years of life lost due to premature mortality and years of life lost due to time lived in states of less than full health, e.g. disease, injuries and risk factors (WHO, 2004). The WHO subdivided these DALY's per 100.000 people into 5 classes. These classes are used to standardize this indicator to a score of 0 to 4 in the TPF analysis as shown in the Table below.

DALY = Years of premature death + Years lost due to disability

Years of premature death: Sum of, the number of deaths at each age * [global standard life expectancy for each age - the actual age].

Years lost due to disability: Number of incident cases in that period * average duration of the disease * weight factor.

DALY per 100.000 people	Score
0 - 20.000	0
20.000 - 40.000	1
40.000 - 60.000	2
60.000 - 80.000	3
80.000 <	4

Where to get the data

WHO (2014) World Health Organization: Burden of disease. Age-standardized disability-adjusted life year –DALY- rates per 100 000 (population): 2012

http://gamapsver.who.int/gho/interactive_charts/mbd/as_daly_rates/atlas.html

Accessed 9 January 2015

Data available in

Netherlands	EU	Worldwide
Yes	Yes	Yes

Scale: National scale

Example Bélem: Bélem is a city in Brazil which has on average 31.632 Disabled Adjusted Life Years (DALY's) per 100.000 people. This is between the 20.000 – 40.000 DALY's per 100.000 people and therefore receives a score of 1. This score implies a low concern for disease burden in Bélem.

Literature

WHO (2004) World Health Organization: The Global Burden of Disease 2004 Update

http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf

Accessed 7 September 2017

Indicator 3: Education rate

Principal: Education rate expressed as percentage of children completing their primary education.

Calculation method

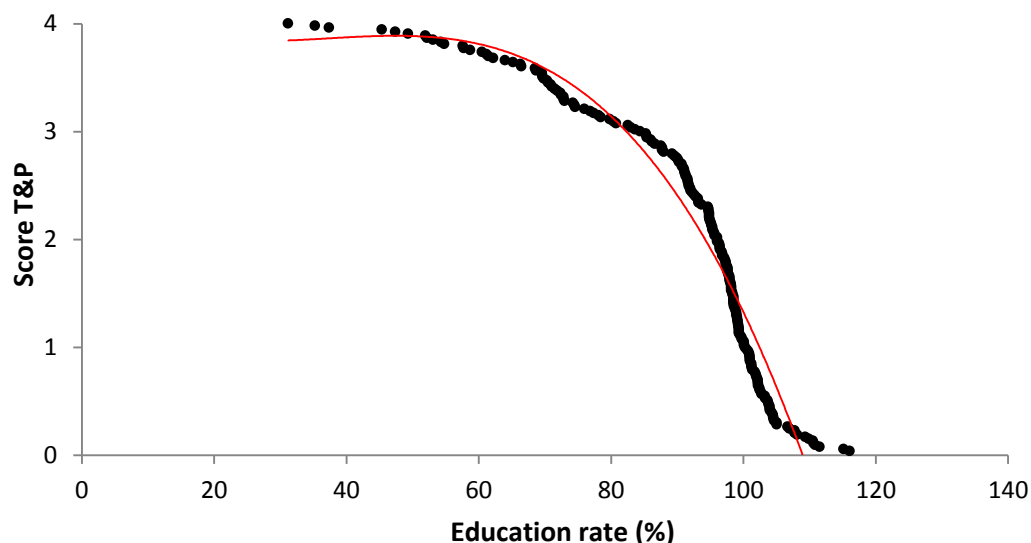


Fig. 7.2.2 Equation fit for education rate (%). The score for trends and pressures is based on the country rankings. Correlation coefficient is $r=0.9738$.

X = Education rate (%)

$$\text{Score education rate} = -10^{-5}X^3 + 0.0012X^2 - 0.0426X + 4.3057$$

Where to get the data

World Bank (2014C) Primary completion rate, total (% of relevant age group)

<http://data.worldbank.org/indicator/SE.PRM.CMPT.ZS/countries/1W-AO?display=default> Accessed 13 April 2015

Unicef (2017) Statistics. https://www.unicef.org/infobycountry/brazil_statistics.html
Accessed 7 September 2017

Example Belém: Belém is a city in Brazil. In Brazil 87.6% of the children have completed their primary education in 2013. Applying the formula results in:

$$-10^{-5} \cdot [87.3]^3 + 0.0012 \cdot [87.3]^2 - 0.0426 \cdot [87.3] + 4.3057 = 3.08$$

Education rate is a concern for the city of Belém.

Indicator 4: Political instability (and absence of violence)

Principal: The estimated likelihood that the government will be destabilized or overthrown by violent means such as terrorism and politically-motivated violence.

Calculation method

Political stability (and absence of violence) is part of the set of governance indicators developed by the World Bank. The estimates of the indicator are aggregates of sub-indicators normalized by a standard normal distribution ranging from -2.5 to 2.5. The sub-indicators used by the World Bank to develop this indicator are:

Orderly transfer; Armed conflict; Violent demonstrations; Social Unrest; International tensions/terrorist threat; Cost of Terrorism; Frequency of political killings; Frequency of disappearances; Frequency of tortures; Political terror scale; Security Risk Rating; Intensity of internal conflicts: ethnic, religious or regional; Intensity of violent activities of underground political organizations; Intensity of social conflicts (excluding conflicts relating to land); Government stability; Internal conflict; External conflict; Ethnic tensions; Civil unrest: How widespread political unrest is, and how great a threat it poses to investors. Demonstrations in themselves may not be cause for concern, but they will cause major disruption if they escalate into severe violence. At the extreme, this factor would amount to civil war;

Terrorism: Whether the country suffers from a sustained terrorist threat, and from how many sources. The degree of localization of the threat is assessed, and whether the active groups are likely to target or affect businesses (World Bank, 2014).

The indicator political stability and absence of violence in this City Blueprint pressure analysis is normalized using the reversed min-max method:

$$4 - \left[\frac{\text{Estimated political stability score} - -2.5}{2.5 - -2.5} \times 4 \right] = \text{Score}$$

Where to get the data

World Bank (2014A) Worldwide Governance Indicators

<http://data.worldbank.org/data-catalog/worldwide-governance-indicators>

and go to WGI Table, and select the country; or here:

http://www.theglobaleconomy.com/rankings/wb_political_stability/

Example Amsterdam: The estimated political stability for the Netherlands is 1.03. Lowest and highest score possible for this indicator is -2.5 and 2.5, respectively. If we apply the min-max method together with these methodological boundaries we obtain:

$$4 - \left[\frac{1.03 - -2.5}{2.5 - -2.5} \times 4 \right] = 1.176$$

A score of 1.176 is approximately 1 which implies low concern.

Literature

World Bank (2014) Political Stability and Absence of Violence/Terrorism

<http://info.worldbank.org/governance/wgi/pdf/pv.pdf> Accessed 10 April 2015

Category 2: Environmental pressures

Indicator 5: Water scarcity

Indicator 5 consists of three sub-indicators:

- 5.1 Fresh water scarcity
- 5.2 Groundwater scarcity
- 5.3 Salinization & seawater intrusion

Indicator: 5.1 Fresh water scarcity

Principal: The abstracted fresh water as percentage of total renewable resource. This includes surface water and groundwater sources.

Calculation method

The scoring method is in accordance with the European Environmental Agencies classification (OECD, 2004; WRI, 2013).

% of renewable resource abstracted	Score
0 - 2	0
2 - 10	1
10 – 20	2
20 – 40	3
>40	4

Where to get the data

Aquastat: Water use → Pressure on water resources → Fresh water withdrawal as % of total actual renewable water resources.

Aquastat (2015) Select variables

<http://www.fao.org/nr/water/aquastat/data/query/index.html;jsessionid=B022D1C2732DF571D2A384B57E0128D6> Accessed 19 January 2015

WRI (2013) World resources institute: Aquaduct global maps 2.0. *Working paper*

https://www.wri.org/sites/default/files/pdf/aqueduct_metadata_global.pdf

p.8 Accessed 19 January 2015

Example Manresa: Manresa is a city in Spain where 29.02% of the total renewable water resource is used. It therefore receives a score of 3 meaning that fresh water scarcity is a concern in Manresa.

Literature

OECD 2004. OECD key environmental indicators. Paris, France.

<https://www.oecd.org/env/indicators-modelling-outlooks/37551205.pdf> [Accessed on September 7, 2017].

WRI (2013) World resources institute: Aquaduct global maps 2.0. *Working paper*

https://www.wri.org/sites/default/files/pdf/aqueduct_metadata_global.pdf Accessed 7 September 2017

Indicator: 5.2 Groundwater scarcity

Principal: The abstracted groundwater as a percentage of the annual groundwater recharge. This is a measure of the pressure on groundwater resources. Groundwater development stress (GDS) is defined as the current annual rate of groundwater abstraction (A) divided by the mean annual natural groundwater recharge (R), multiplied by 100%: $GDS = A/R * 100\%$

Calculation method

The indicator scoring is in accordance with the classification used by UNESCO.

% abstracted of annual recharge	Score
0 - 2	0
2 - 20	1
20 - 50	2
50 - 100	3
>100	4

Where to get the data

Igrac (2010) Groundwater Development stress

http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/temp/wwap_pdf/Groundwater_development_stress_GDS.pdf p. 15 Accessed 19 January 2015 and <https://www.un-igrac.org/news/igrac-contribution-world-water-development-report> Accessed 7

September 2017

Example Ankara: Ankara is the capital of Turkey. Turkey abstracts 20 to 50% of the annual recharged groundwater and therefore receives a score of 2 implying that groundwater scarcity is of medium concern for Ankara.

5.3 Salinization and/or seawater intrusion

Principal: Measure of the vulnerability of seawater intrusion and salinization of the soil.

Calculation method

This indicator score is based on a quick literature check in which seawater and groundwater intrusion are scored as suggested below.

Seawater intrusion

Description	Score
No seawater intrusion reported and city not prone to (future) intrusion	0
No seawater intrusion reported and city can experience intrusion in coming century	1
No seawater intrusion reported but city is prone to intrusion in the near future	2
Seawater intrusion reported	3
Seawater intrusion reported and city is particularly prone to intrusion	4

Groundwater salinization

Based on literature studies, here the following scheme is applied to determine a score:

Description	Score
No concern	0
Low concern	1
Medium concern	2
Concern	3
Great concern	4

The highest score of the two indicators is used as the final score for salinization and/or seawater intrusion.

Where to get the data

Seawater intrusion map Europe:

EEA (2003) European Environmental Agency: Indicator fact sheet. Saltwater intrusion <https://www.eea.europa.eu/data-and-maps/indicators/saltwater-intrusion/saltwater-intrusion> and <https://www.eea.europa.eu/data-and-maps/figures/salt-water-intrusions-into-groundwater-in-europe-1999> Accessed 7 September 2017 .Indication of groundwater salinization in Europe: JRC (2015) Joint Research Centre: European soil portal – Soil data and information system <https://esdac.jrc.ec.europa.eu/themes/soil-salinization> & https://esdac.jrc.ec.europa.eu/public_path/salinisation.png Accessed 7 September 2017

Example Melbourne: Seawater intrusion: the city is prone to seawater intrusion and therefore already receives a score of 2. Moreover, the city has reported seawater intrusion and thus receives even a higher score of 3. Groundwater salinization: There are some problems of groundwater salinization given the fact that the climate is unfavorable. Based on a concise literature research this score is set on 2. The overall score for salinization and seawater intrusion is equal to the maximum score which is given to seawater intrusion, i.e., a score of 3 stating that seawater intrusion and salinization is a concern for the city.

Indicator 6: Flood risk

The indicator flood risk consists of 4 sub-indicators:

- 6.1 Urban drainage flood
- 6.2 Sea level rise
- 6.3 River peak discharges
- 6.4 Land subsidence

6.1 Urban drainage flood

Principal: Risk of flooding due to intensive rainfall expressed as the share of urban soil that is sealed.

Calculation method

Sealed soil cover in the city standardized according to the min-max method. The minimum and maximum value are determined by taking the bottom and the top 10% of the 572 European cities assessed (EEA 2015).

Where to get the data

Soil sealing for EU countries:

EEA (2012) European environmental agency: Urban adaptation to climate change.

Annex II. ISBN 978-92-9213-308-5 <http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change> Accessed 7 September 2017. Open the excel file Annex II. City Data sensitivity.

An estimated score for non-EU countries is based on descriptions of soil sealing of the cities (mostly without exact coverage's) found in literature. Lower 10% of all European cities assessed is 31.7%, top 10% has a share impermeable area of 69.6%.

Example Amsterdam: Soil sealing for Amsterdam is 45.4%. Lower 10% of all European cities assessed is 31.7%, top 10% has a share impermeable area of 69.6%. Min-max transformation leads to:

$$\frac{45.4 - 31.7}{69.6 - 31.7} \times 4 = 1.8$$

A score of 1.8 implies that urban drainage flooding is of medium concern for the city of Amsterdam (Table 7.2.2).

Example Porto. The EEA provides a figure of 73% for mean soil sealing [%] of UMZ 2006 of the core city of Porto. This would lead to a score of $(73-31.7)/(69.6-31.7) \times 4$. This is > 4 , so we use the maximum score of 4.

6.2 Sea level rise

Principal: Measure of the vulnerability of flooding due to sea level rise. Percentage of the city that would flood with 1 meter sea level rise. Only environmental circumstances are considered. Protection measures such as dikes, dams *etcetera* are not considered (that would be a performance).

Calculation method

In accordance with the European Environmental Agency (2012) the following classification is used to standardize the area being affected by a 1 meter sea level increase without flood protection on a scale from 1 to 5.

Urban area affected (%)	Score
0-5	0
6-10	1
11-20	2
21-40	3
41-100	4

For non-European cities, the assessment is based on literature available. Classes are in principle the same as for European cities.

Where to get the data

EEA (2012) European environmental agency: Urban adaptation to climate change. Annex II. ISBN 978-92-9213-308-5 <http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change> Accessed 7 September 2017. Open the excel file Annex II. City data sensitivity.

Example Rotterdam: Rotterdam has more than 40% of its city area flooded as a consequence of 1 meter sea level rise if no flood protection measures would be taken. Therefore the city is highly vulnerable to sea level rise and receives a score of 4.

Literature

EEA (2012) European Environment Agency: Urban adaptation to climate change in Europe. Challenges and opportunities for cities together with supportive national and European policies. ISBN 978-92-9213-308-5 <http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change> Accessed 8 January 2015

6.3 River peak discharges

Principal: Measure for the vulnerability of flooding due to river level rise. Also flash floods from outside the city are included in this indicator. Percentage of the city that would flood with 1 meter river level rise. Only environmental circumstances are considered. Protection measures such as dikes, dams etcetera are not considered (that would be a performance).

Calculation method

In accordance with the European Environmental Agency (2012) the following classification is used to standardize the area being affected by a 1 meter river level increase without flood protection on a scale from 1 to 5.

Urban area affected (%)	Score
0-5	0
6-10	1
11-20	2
21-40	3
40-100	4

For non-European cities, the assessment is based on literature available. Classes are in principle the same as for European cities.

Where to get the data

EEA (2012) European environmental agency: Urban adaptation to climate change. Annex II. ISBN 978-92-9213-308-5 <http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change> Accessed 7 September 2017. Open the excel file Annex II. City data sensitivity.

Example Athens: More than 40% of Athens will flood if the river level would increase with 1 meter. The city therefore receives a score of 4.

Literature

EEA (2012) European Environment Agency: Urban adaptation to climate change in Europe. Challenges and opportunities for cities together with supportive national and European policies. ISBN 978-92-9213-308-5 <http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change> Accessed 8 January 2015

6.4 Flood risk due to subsidence

Principal: Land subsidence increases the risks of river and coastal floods and salt water intrusion. The cause of land subsidence is irrelevant for its impact on flooding.

Calculation method

This score is based on a qualitative assessment according to the following classification:

Score	Description
0	No infrastructure damage, no flood risk
1	Low/medium infrastructure damage expected, no major increase in flood risk expected
2	Experienced infrastructure damage and medium infrastructure damage expected or <0.50m subsidence by 2100 in a substantial area of the city.
3	Serious experienced infrastructural damage or < 1m subsidence by 2100 in a substantial area of the city
4	Serious experienced infrastructure damage, Imminent flooding/ < 2m subsidence by 2100 in a substantial area of the city

Where to get the data

Local websites, government reports, strategic plans *etcetera*.

Example Rotterdam: Substantial parts of Rotterdam are expected to subside by 40-60 cm by 2050. Since Rotterdam is already prone to flood risk, this subsidence imposes an extra flood risk in the future. It therefore receives a score of 3 implying that flood risk due to subsidence is a concern.

Indicator 7: Water quality

Water quality consists of two sub-indicators:

7.1 Surface water quality

7.2 Biodiversity

7.1 Surface water quality

Principal: Measure of relative surface water quality. A lower Indicator score is given for better quality.

Calculation method

A national surface water quality index (WQI) is available as a measure out of 100. Then, the indicator is calculated as follows:

$$\frac{100 - WQI}{25} = score$$

Where to get the data

The WQI data are obtained from the Country Profiles:

EPI (2010) Environmental performance index.

http://www.ciesin.columbia.edu/repository/epi/data/2010EPI_country_profiles.pdf

Accessed 19 January 2015

Example Venlo: Venlo is situated in the Netherlands. The WQI for the Netherlands is 73.2.

$$\frac{100 - 73.2}{25} = 1.07$$

A score of 1.07 implies that the surface water quality that a city receives is of low concern for the city of Venlo.

7.2 Biodiversity

Principal: Measure of the biodiversity of aquatic ecosystems in the city. A low indicator score is given where biodiversity is good.

Calculation method

The calculation is based on national or regional data when city-level data are not available. There are many ways of assessing biodiversity, so there is no globally uniform approach.

For EU countries, it is recommended to use data from the European Environment Agency (EEA) on 'percent of classified waters in less than good ecological status' as shown in this map – for which a high resolution version is available via the link. Then apply the following criteria to determine an Indicator score

% of waters with less than good ecological status or potential	Indicator 21 value (for EU countries)
<10%	0
10 to 30%	1
30 to 50%	2
50 to 70%	3
≥ 70%	4

For non-EU countries, it is recommended to use data from a program called the Environmental Performance Index (EPI), led by Yale University (epi.yale.edu). The latest 2012 update does not include the relevant parameter called '*Water – impact on ecosystem*'. This is available from the 2010 version (see also Indicator 4). The value is obtained from the Country Profiles:

Where to get the data

EEA (2012) European Environmental Agency: Percent of classified water bodies in less than good ecological status of potential http://www.eea.europa.eu/data-and-maps/figures/proportion-of-classified-surface-water/proportion-of-classified-surface-water/image_original Accessed 19 January 2015

EPI (2010) Environmental performance index:

http://www.ciesin.columbia.edu/repository/epi/data/2010EPI_country_profiles.pdf

Accessed 19 January 2015. This is a 327 page document, with 2 pages per country in alphabetical order. On the first page of the country, take the 'Country' value for 'Water (impact on ecosystems)', which is a factor out of 100.

$$\frac{100 - \text{Water (impact on ecosystems)}}{25} = \text{score}$$

score factor out of 100.

Example Istanbul (no data are provided by the EEA): Water (impact on ecosystem) = 62.8. This leads to the following score: $[100 - 62.8] / 25 = 1.49$. This score implies that (aquatic) biodiversity is an issue of medium concern in Istanbul.

Example London (EU country): City-specific information is available for London. Only one of the 47 water bodies in London is of good ecological potential. London therefore receives a score of 4. Aquatic biodiversity is of great concern for London.

Indicator 8: Heat risk

Principal: Prediction of heat island effects severity on human health.

Calculation method

1. Number of combined tropical nights (>20 °C) and hot days(>35 °C) in the period 2071-2100, where the maximum is set on 50 days. The number is standardized using the following formula: $[\text{Number of combined tropical nights and hot days} / 50] \times 4 = \text{score}$

2. Percentage of green and blue urban area. Share of green and blue areas is available for all European cities. The EEA city database presents data for of 367 European cities. From these data the average of the lowest 10% is taken as minimum (16%) and the average of the highest 10% is taken as maximum (48%). The percentages for the EU cities are standardized according to the min-max method. For non-European cities percentages for green and blue area are mostly not available. A best estimate is given by comparing this city to a similar European city. It is important for these cities to provide better information on the share of green area. Formula:
 $\text{score} = 4 - [(\% \text{ green and blue area} - 16) / (48 - 16) \times 4] =$

3. The overall score is the arithmetic average of both standardized scores.

Where to get the data (EU cities)

1. Number of combined tropical nights and hot days for Europe Arcgis (2015)
<http://www.arcgis.com/home/webmap/viewer.html?webmap=d4124af689f14cbd82b88b815ae81d76> Accessed 19 January 2015
 Otherwise best estimate based on the local climate.

2. City specific:

EEA (2012) European environmental agency: Urban adaptation to climate change. Annex II. ISBN 978-92-9213-308-5 <http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change> Accessed 7 September 2017. Open the excel file Annex II. City data sensitivity.

Country average:

EEA (2015) European environmental agency: http://www.eea.europa.eu/data-and-maps/figures/percentage-of-green-and-blue/percentage-of-green-and-blue/image_original Accessed 19 January 2015

For cities where exact numbers are not available the country average is used. If the country is outside Europe, a best estimate is given by comparing the city with a comparable city in Europe.

Example Athens: Athens has a green coverage of 14.1% and the number of combined nights higher than 20 °C and days above 35 °C is higher than 50 days. Athens has the lowest green coverage resulting in a maximum score of 4. Combined tropical nights and hot days: for Athens this is the maximum of, i.e, 4 point score which means: $(4+4)/2= 4$.

Category 3: Economic pressures

Indicator 9: Economic pressure

Principal: Gross Domestic Product (GDP) per head of the population is a measure of the economic power of a country. A low GDP per capita implies a large economic pressure.

Calculation method

X = GDP per capita per year (US\$)
 $4 - [(X - 514.7) / (59231.2 - 514.7) * 4]$

Where to get the data

IMF (2013) International Monetary Fund: World economic outlook database, 2013
<http://www.imf.org/external/pubs/ft/weo/2013/01/weodata/index.aspx> Accessed 19 January 2015

Example Ho Chi Minh City: GDP per capita per day for Viet Nam is 1705 US\$ per capita per year. Applying the formula results in:

$$4 - [(1705 - 514.7) / (58716.5 - 514.7) * 4] = 3.92$$

Economic pressure is a great concern for Ho Chi Minh City.

Indicator 10: Unemployment rate

Principal: Percentage of population of the total labor force without a job.

Calculation method

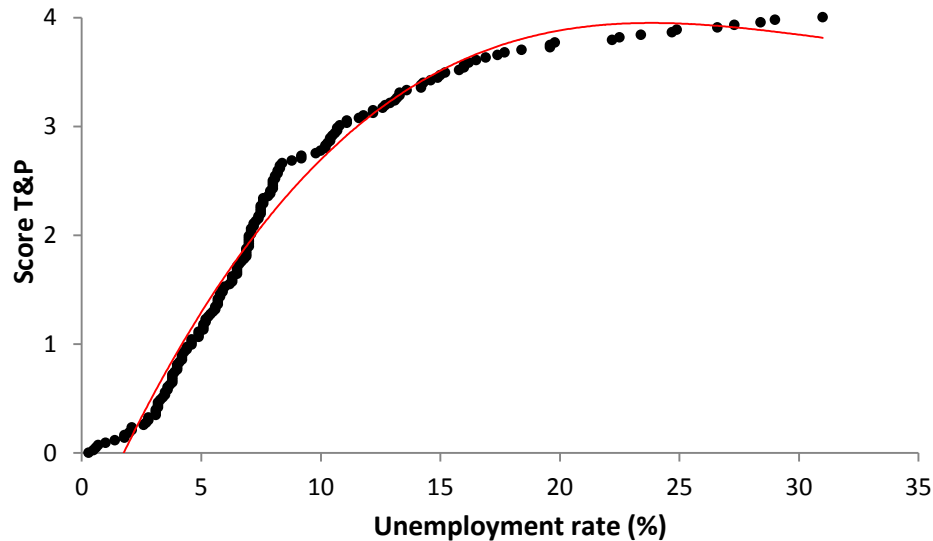


Fig. 7.2.4 Equation fit for unemployment rate (%). The score for trends and pressures is based on the country rankings. Correlation coefficient is $r=0.9886$.

X = Unemployment rate (%)

$$\text{Score unemployment rate} = 0.0002X^3 - 0.0173X^2 + 0.5077X - 0.8356$$

Where to get the data

World Bank (2015) Unemployment total (% of total labor force) (modeled ILO estimate)
<http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS> (Accessed 19 January 2015) or
 here: <http://wdi.worldbank.org/table/2.5>. Total is (male + female)/2.

Example London: London is the capital of the United Kingdom which has an unemployment rate of 7.9% of its labor force. Applying the formula results in:
 $0.0002 \cdot [7.9]^3 - 0.0173 \cdot [7.9]^2 + 0.5077 \cdot [7.9] - 0.8356 = 2.19$
 Unemployment is a medium concern for the city of London.

Indicator 11: Poverty rate

Principal: Percentage of people that is below the poverty line of 2 US\$ a day.

Calculation method

Percentages of the population living from less than 2 US\$ a day.

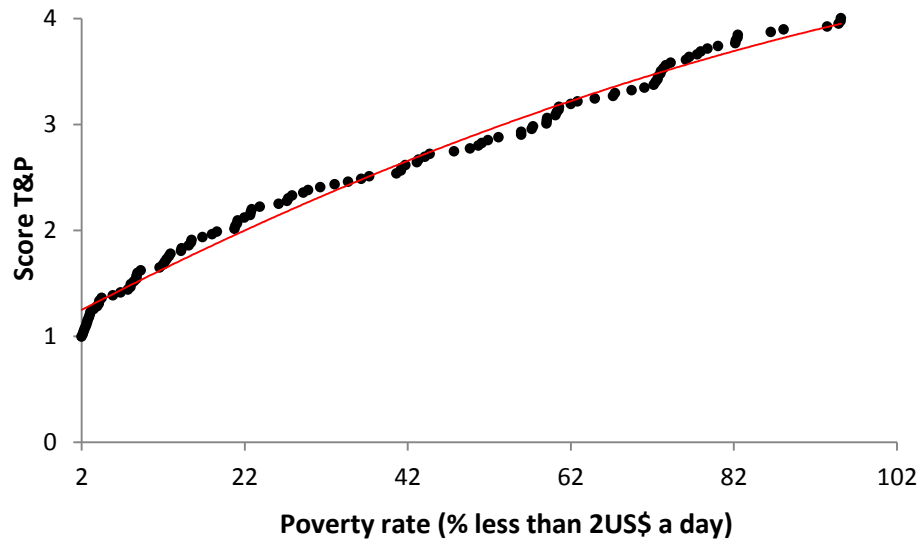


Fig. 7.2.5 Equation fit for poverty rate (% less than 2US\$ a day). The score for trends and pressures is based on the country rankings. Correlation coefficient is $r=0,9941$.

X = Poverty rate (% less than 2US\$ a day)

$$\text{Score poverty rate} = -0.0001X^2 + 0.0404X + 1.1686$$

Where to get the data

World Bank (2014D) Poverty gap at \$2 a day (PPP) (%)

<http://data.worldbank.org/indicator/SI.POV.GAP2/countries/1W?display=default>

Accessed 19 April 2015, and now at \$ 1.9 available here:

<http://wdi.worldbank.org/table/2.8>

Example Dar es Salaam: Dar es Salaam is the capital of Tanzania where 73% of the people live below the poverty line of 2 US\$ a day. With the new info from <http://wdi.worldbank.org/table/2.8> it is 46.6% below USD 1.9 and 76.1% below USD 3.10. Anyhow, using the older information of 73% below USD 2.00 results in

$$-0.0001 \cdot [73]^2 + 0.0404 \cdot [73] + 1.1686 = 3.58$$

Poverty is a great concern for the city of Dar es Salaam.

Indicator 12: Inflation

Principal: Percentage inflation per year. High inflation rates may hamper investments.

Calculation method

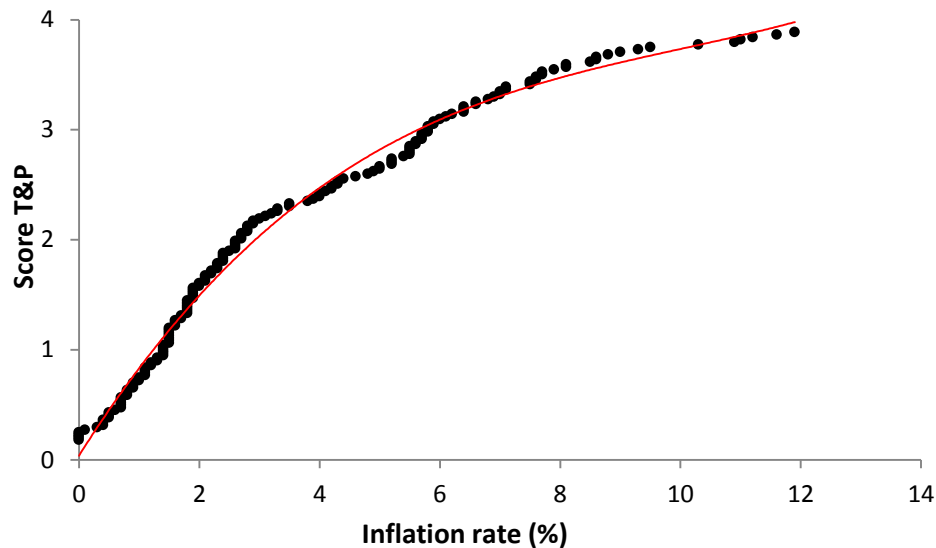


Fig. 7.2.6 Equation fit for inflation rate (%). The score for trends and pressures is based on the country rankings. Correlation coefficient is $r=0,9958$.

X = Inflation rate (%)

$$\text{Score inflation rate} = 0.0025X^3 - 0.0744X^2 + 0.8662X + 0.0389$$

Where to get the data

World Bank (2015) Inflation, costomers price (annual %)

<http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG>

Example Berlin: Berlin is the capital of Germany and Germany has an inflation rate of 0.8% per year. Applying the formula results in:

$$0.0025*[0.8]^3 - 0.0744*[0.8]^2 + 0.8662*[0.8] + 0.0389 = 0.69$$

Inflation is a low concern for the city of Berlin.