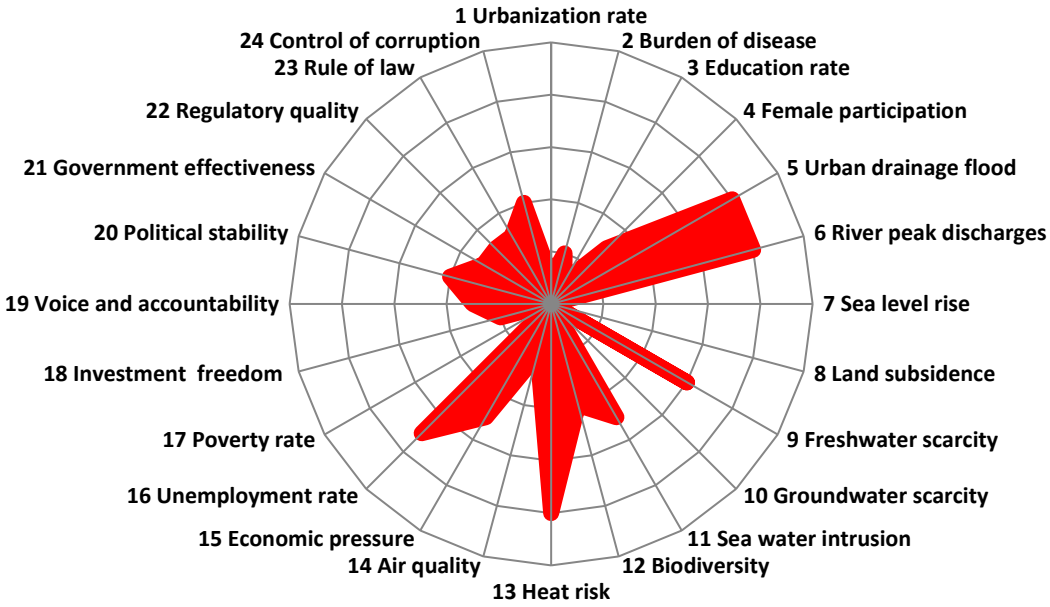
INDICATORS OF THE TRENDS AND PRESSURES FRAMEWORK

(Version June 2021)



Spiderweb of the Trends and Pressures indicators of Seville (Spain)

Key publications

Van Leeuwen, C.J., Frijns, J., van Wezel, A., van de Ven, F.H.M. 2012. City Blueprints: 24 indicators to assess the sustainability of the urban water cycle. Water Resources Management 26: 2177–2197 (open access)

Koop, S.H.A. and Van Leeuwen C.J. (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)

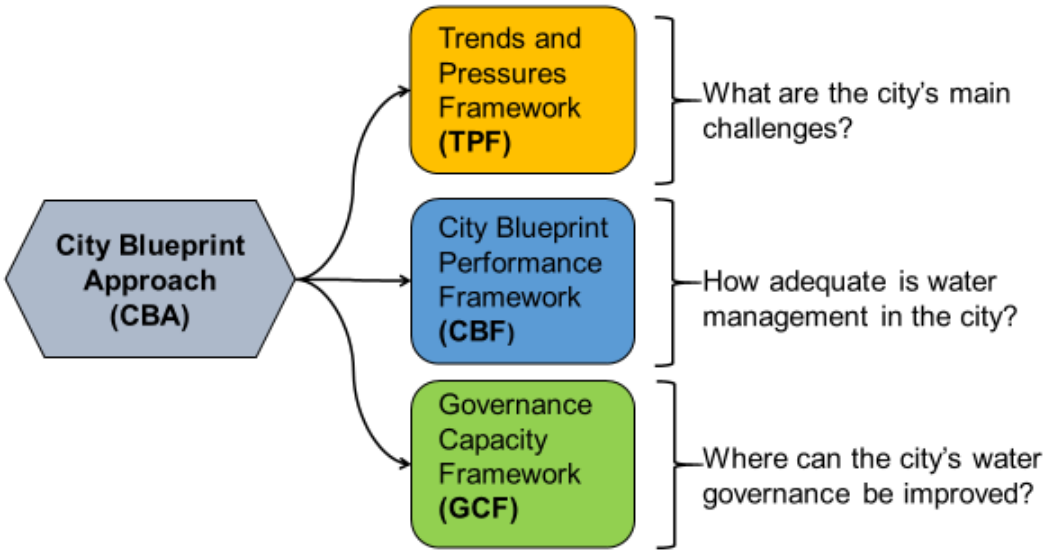
Koop, S.H.A. and Van Leeuwen C.J. (2015b). Application of the Improved City Blueprint Framework in 45 municipalities and regions. Water Resources Management, 29(13), 4629-4647 (open access)

Koop, S.H.A. and Van Leeuwen, C.J. (2017). The challenges of water, waste and climate change in cities. Environment, Development and Sustainability, 19, 385–418 (open access)

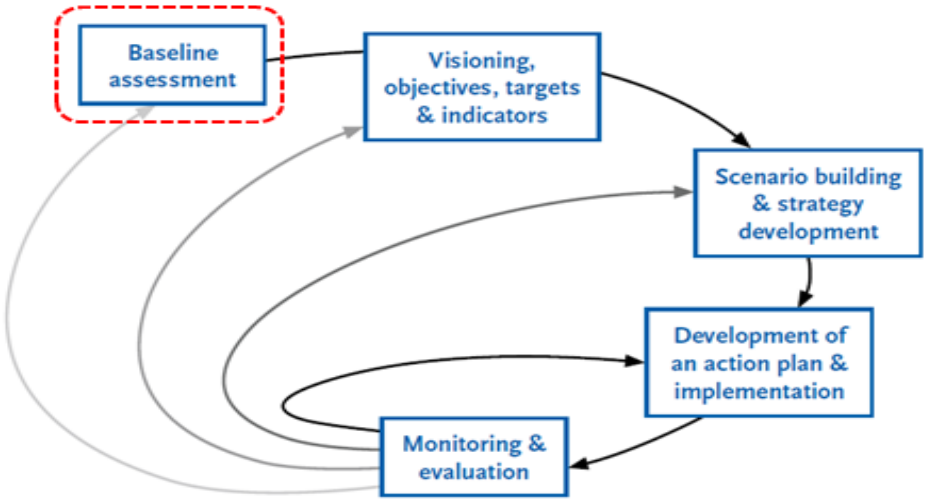
Koop, S.H.A., Koetsier, L., Doornhof, A., Reinstra, O., Van Leeuwen, C.J., Brouwer, S., Dieperink, C., Driessen, P..P.J. (2017) Assessing the Governance Capacity of Cities to Address Challenges of Water, Waste, and Climate Change. Water Resources Management. 31(11), 3427-3443 (open access)

1. Introduction of the 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.



2. The City Blueprint Approach

Short history: The City Blueprint Approach has been developed in a learning-by-doing fashion. The first version of the City Blueprint Framework (CBF) was published in 2012. A first review and update was published in 2015 leading to two separate frameworks, i.e. the Trends and Pressures Framework (TPF) and the first revision of the CBF (Koop and Van Leeuwen 2015a). In 2017 Koop et al. (2017) developed the Governance Capacity Framework (GCF). In 2019 further discussions about the need to include the World Bank Governance indicators, air pollution, female participation, investment freedom and updating the data base with 2018 and 2019 data in the TPF led to a revision and further simplification of TPF as provided in this document. As a consequence a minor revision was introduced in the CBF (regrouping and deletion of one indicator).

The Trends and Pressures Framework (TPF) The Trends and Pressures Framework indicators consist of a total of 24 indicators (including the sub-indicators) and are divided over the following broad categories: social, environmental and financial pressures and also include a 4th category, i.e. the World Bank governance indicators.

Category	Indicators		Indicator number	Score
I SOCIAL	Urbanization rate		1	
	Burden of disease		2	
	Education rate		3	
	Female participation		4	
II ENVIRONMENTAL	Flood risk	Urban drainage flood	5	
		Sea level rise	6	
		River peak discharges	7	
		Land subsidence	8	
	Water scarcity	Freshwater scarcity	9	
		Groundwater scarcity	10	
		Sea water intrusion	11	
	Water quality	Biodiversity	12	
	Heat risk	Heat island	13	
	Air Quality	PM2.5/10	14	
III FINANCIAL	Economic pressure		15	
	Unemployment rate		16	
	Poverty rate		17	
	Investment freedom		18	
IV GOVERNANCE	Voice and accountability		19	
	Political Stability		20	
	Government effectiveness		21	
	Regulatory quality		22	
	Rule of law		23	
	Control of corruption		24	

3. Application of the Framework

The 24 Trends and Pressures indicators are standardized to a scale of 0-10 and divided in ordinal classes expressed as a 'degree of concern' and shown below.

TPF indicator score	Degree of concern
0 – 2	no concern
2 – 4	little concern
4 – 6	medium concern
6 – 8	concern
8 – 10	great concern

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

Further information:

- https://www.ipr.northwestern.edu/our-work/research-tools-apps/water-insecurity/
- http://www.watershare.eu/

4. Assessment method

Category I: 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

X = Urbanization rate (%)
Score urbanization rate = [(**X**– 0.0) / (4.6 – 0.0)] * 10
(For urbanization rates lower than 0% the score is also zero and the above formula is not applied).

Where to get the data
CIA (2020) Central Intelligence Agency: The World Factbook. Urbanization.
https://www.cia.gov/library/publications/the-world-factbook/ and select country.
Accessed 17 June 2020

Data available in

Netherlands	EU	Worldwide
Yes	Yes	Yes

Scale: National scale.

Example Kilamba Kiaxi: Kilamba Kiaxi (Angola) has a urbanization rate of 4.3% growth per year. Applying the formula results in: [(4.3 – 0.0) / (4.6 – 0.0)] * 10 = 9.4 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	Degree of concern
0 - 8.000	0	No concern
8.000 - 16.000	1	
16.000 - 24.000	2	
24.000 - 32.000	3	Little concern
32.000 - 40.000	4	
40.000 - 48.000	5	Medium concern
48.000 - 56.000	6	
56.000 - 64.000	7	concern
64.000 - 72.000	8	
72.000 - 80.000	9	Great concern
➢ 81.000	10	

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://gamapserver.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 24.000 – 32.000 DALY's per 100.000 people and therefore receives a score of 3. This score implies a little 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: Tertiary Education

Principal: Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

Gross enrollment ratio for tertiary school is calculated by dividing the number of students enrolled in tertiary education regardless of age by the population of the age group which officially corresponds to tertiary education, and multiplying by 100. Data on education are collected by the UNESCO Institute for Statistics from official responses to its annual education survey. All the data are mapped to the International Standard Classification of Education (ISCED) to ensure the comparability of education programs at the international level

Gross enrollment ratios indicate the capacity of each level of the education system, but a high ratio may reflect a substantial number of overage children enrolled in each grade because of repetition or late entry rather than a successful education system. The net enrollment rate excludes overage and underage students and more accurately captures the system's coverage and internal efficiency. Differences between the gross enrollment ratio and the net enrollment rate show the incidence of overage and underage enrollments.

Calculation method

TPF Score = [1- (X - min)/(max - min)]*10
X = World Bank value
Min = 6.4% (average of the lowest 10% of the countries)
Max = 96.6 % (average of the highest 10% of the countries)
NB All values of x > 96.6% score 0. All values < 6.4 % score 10

Where to get the data

World Bank http://wdi.worldbank.org/table/2.8
Accessed 17 June 2020

Example Belém:

Belém is a city in Brazil. In 2020, 51.3% of the people in Brazil have completed tertiary education. Applying the formula results in:

TPF Score = [1- (51.3 – 6.4)/(96.6-6.4)]*10 = [1- (44.9/(90.2]*10 = 5.02

Indicator 4: Female participation

Principal:
Labor force participation rate %, female (% of female population ages 15-64) (modeled ILO estimate) of women 15-64 ILO estimate. The labor force participation rate is the proportion of the female population ages 15-64 that is economically active: all people who supply labor for the production of goods and services during a specified period. The range of data for 2020 is from 5.9% - 85.8%. A low indicator score is given where female participation is high.

The labor force is the supply of labor available for producing goods and services in an economy. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Not everyone who works is included, however. Unpaid workers, family workers, and students are often omitted, and some countries do not count members of the armed forces. Labor force size tends to vary during the year as seasonal workers enter and leave. The series is part of the ILO estimates and is harmonized to ensure comparability across countries and over time by accounting for differences in data source, scope of coverage, methodology, and other country-specific factors.

Calculation method

TPF Index score = (100 – X) /10

Where to get the data
and the data can be found here:
https://databank.worldbank.org/indicator/SL.TLF.ACTI.FE.ZS?id=2ddc971b&report_name=Gender_Indicators_Report&popularitype_=series#

Example Belém: Belém is a city in Brazil. In 2020 3, 61.6 % of the women in Brazil participated in work. Applying the formula results in:

TPF Score = (100-61.6)/10 = 3.84

Category 2: Environmental pressures

Flooding

Indicator 5 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.

For non-EU cities: google City Name Satellite Map; e.g. Kampala Satellite Map. Zoom in and estimate the green space surface (%). This is often visible by the trees and greens (parks). The sealed surface is the total surface (100%) minus the green space (x %). So normally this is all space occupied by buildings, streets, parking places, railway stations, etc., where water cannot penetrate the soil and subsoil.

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:

$$\frac{45.4-31.7}{69.6-31.7}\ x\ 10 = 3.6\ ;$$

A score of 3.6 implies that urban drainage flooding is of medium concern for the city of Amsterdam (Table 7.2.2).

NB All values of x > 69.6% score 10. All values < 31.7% score 0

Indicator 6: 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	Level of concern
0 – 5	0	No concern
6 – 10	2.5	Little concern
11 – 20	5	Medium concern
21 – 40	7.5	Concern
40 – 100	10	Great concern

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 10.

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

Indicator 7: 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	Level of concern
0 - 5	0	No Concern
5 - 10	2.5	Little concern
10 - 20	5	Medium concern
20 - 40	7.5	Concern
40 - 100	10	Great concern

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 10.

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

Indicator 8: Land 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
2.5	Low/medium infrastructure damage expected, no major increase in flood risk expected
5	Experienced infrastructure damage and medium infrastructure damage expected or <0.50m subsidence by 2100 in a substantial area of the city.
7.5	Serious experienced infrastructural damage or < 1m subsidence by 2100 in a substantial area of the city
10	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 7.5 implying that flood risk due to subsidence is a concern.

Water scarcity

Indicator 9: 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	No concern
2 – 5	1	
5 -10	2	
10 – 15	3	Little concern
15 – 20	4	
20 – 25	5	Medium concern
25 – 30	6	
30 – 35	7	Concern
35 – 38	8	
38 – 40	9	Great concern
>40	10	

Where to get the data
Aquastat:
http://www.fao.org/nr/water/aquastat/data/query/index.html;jsessionid=B022D1C2732DF571D2A384B57E0128D6
Click on Water use → Pressure on water resources → MDG 7.5 Fresh water withdrawal as % of total actual renewable water resources. Select one or all countries and select latest values only.

Example Manresa: Manresa is a city in Spain where 28 % of the total renewable water resource is used. It therefore receives a score of 6 meaning that fresh water scarcity is a medium 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 (2020 World Resources Institute: Aquaduct global maps 3.0. https://www.wri.org/resources/data-sets/aqueduct-global-maps-30-data [Accessed 18 August 2020]

Indicator 10: 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	No concern
2 - 20	2.5	Little concern
20 - 50	5	Medium concern
50 - 100	7.5	Concern
>100	10	Great concern

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 5 implying that groundwater scarcity is of medium concern for Ankara.

Indicator 11: Seawater intrusion (and/or salinization)

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	2.5
No seawater intrusion reported but city is prone to intrusion in the near future	5
Seawater intrusion reported	7.5
Seawater intrusion reported and city is particularly prone to intrusion	10

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

Description	Score
No concern	0
Low concern	2.5
Medium concern	5
Concern	7.5
Great concern	10

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 5. Moreover, the city has reported seawater intrusion and thus receives even a higher score of 7.5. 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 5. 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 7.5 stating that seawater intrusion and salinization is a concern for the city.

Water quality

Indicator 12: 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 12 value (for EU countries)	Level of concern
<10%	0	No concern
10 to 30%	2.5	Little concern
30 to 50%	5	Medium concern
50 to 70%	7.5	Concern
≥ 70%	10	Great concern

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).

Where to get the data

EEA (2012) European Environmental Agency: Percent of classified water bodies in less than good ecological status https://www.eea.europa.eu/data-and-maps/figures/proportion-of-classified-surface-water-3 accessed 17082020. More recent EEA data are available too: https://www.eea.europa.eu/data-and-maps/figures/proportion-of-classified-surface-water-6 (and click on the gif download for a bigger map). This new info allows for a scoring from 1 (light blue; good ecological status) to 10 (dark blue; bad ecological status).

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.

$\frac{100 - Water\ (impact\ on\ ecosystems)}{10} = score$ 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] / 10 = 3.72. 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 10. Aquatic biodiversity is of great concern for London.

Indicator 13: Heat risk

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

Calculation method
1. Number of combined tropical nights (>20 ºC) and hot days(>35 ºC) in the period 2071-2100, where the maximum is set on 50 days. The number is standardized using the following formula: [Number of combined tropical nights and hot days / 50] x 10 = 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 can be obtained by applying satellite map [city name] via google satellite map or 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:
score = 10 - [(% green and blue area – 16) / (48 -16) x 10]
Values of 16 or lower score as 10; values > 48 as 0.

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 ºC and days above 35 ºC is higher than 50 days. Athens has the lowest green coverage resulting in a maximum score of 10.Combined tropical nights and hot days: for Athens this is the maximum of the 10 point score which means: (10+10)/2= 10.

Indicator 14: Air Quality

Principal: The measurement of air quality consists of the measurement of particular matter.

Calculation method
$\mathbf{X_1}$ = PM2.5
$\mathbf{X_2}$ = PM10

If there is only a value for X_1 than use:

$$\left[\frac{X_1 - 5.1}{63.6 - 5.1}\right] * 10$$

If there is only a value for X_2 than use:

$$\left[\frac{X_2 - 9.5}{118.9 - 9.5}\right] * 10$$

If X_1 and X_2 are both available use:

$$\left[\frac{X_1 - 5.1}{63.6 - 5.1}\right] * 5 + \left[\frac{X_2 - 9.5}{118.9 - 9.5}\right] * 5$$

Where to get the data
Main database: World Health Organization (2018) WHO Global Ambient Air Quality Database (update 2018) https://www.who.int/airpollution/data/cities/en/
If the data of the city is not available here, please calculate the average PM2.5 and PM10 of all the cities in the same country.
If your city or any other city in this country is not listed in this database, than use the following database:
World Bank (2017) PM2.5 air pollution, mean annual exposure (micrograms per cubic meter). https://data.worldbank.org/indicator/EN.ATM.PM25.MC.M3

Category 3: Financial pressures

Indicator 15: 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. We use the Gross national income per capita Atlas method in USD

Calculation method
TPF score = 10 – [(X – min) / (max – min)*10]
where:

X = GDP per capita per year (US$)

min = 583 US$/cap (average of lowest 10% of the values)

max = 61327 US$/cap. (average of highest 10% of the values)

NB All values of x > 61327 score 0. All values < 583 score 10

Where to get the data
International Monetary Fund: World economic outlook database:

http://wdi.worldbank.org/table/WV.1

Accessed 17 June 2020

Example Ho Chi Minh City: GDP per capita per day for Viet Nam (2018) is 2360 US$ per capita per year. Applying the formula results in:

10- [(2360-583)/ (61327-583)*10] = 10- [(1777)/ (60744)*10] = 9.71

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

Indicator 16: Unemployment rate

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

Calculation method

TPF Score = [(**X** - min)/(max - min)]*10

X = Unemployment rate (%)

min = 1.4% (average of lowest 10% of the values)

max = 18.2% (average of highest 10% of the values)

NB All values of x > 18.2% score 10. All values < 1.4 % score 0

Where to get the data
World Bank (2018) Unemployment total (% of total labor force) (modeled ILO estimate) https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS. Accessed 17062020

Example London: London is the capital of the United Kingdom which has an unemployment rate of 3.9 %.

TPF Score = [(**X** - min)/(max - min)]*10 = [(3.9 – 1.4)/(18.2 – 1.4)]*10
= [(2.5)/(16.8)]*10 = 1.48

Unemployment is no concern for the city of London.

Indicator 17: Poverty rate

Principal: Percentage of people that is below the poverty line of 1.9 *US$* a day.

Calculation method

TPF Score = [(**X** - min)/(max - min)]*10

X = Poverty rate (%)

min = 0 % (average of lowest 10% of the values)

max = 59.9 % (average of highest 10% of the values)

NB All values of x > 59.9% score 10.

Where to get the data
World Bank (2014D) Poverty gap at $1.9 a day (PPP)

http://wdi.worldbank.org/table/1.2 Accessed 16 June 2020

Example Dar es Salaam: Dar es Salaam is the capital of Tanzania where 49.1% of the people lives below the poverty line of 1.9 US$ a day This results in

TPF Score = [(**X** - min)/(max - min)]*10 = [(49.1 - 0)/(59.9 - 0)]*10 = [(49.1)/(59.9)]*10 = 8.2

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

Indicator 18: Investment freedom

Principal: The Investment freedom index evaluates a variety of investment restrictions (burdensome bureaucracy, restrictions on land ownership, expropriation of investments without fair compensation, foreign exchange controls, capital control, security problems, a lack of basic investment infrastructure, etc.). Points are deducted from the ideal score of 100 for each of the restrictions found in a country's investment regime. High scores are obtained if the investment freedom is low.

Calculation method
TPF Index score = (100 – X) / 10

Where to get the data
Data: https://www.theglobaleconomy.com/rankings/herit_investment_freedom/ Or: https://www.heritage.org/index/ranking?version=439 explore the data, explore this dataset to excel; Also have a look at the interactive heatmap and select investment freedom: https://www.heritage.org/index/heatmap

Example Berlin: Berlin is the capital of Germany and Germany has an investment freedom of 80. Applying the formula results in: (100-80)/10 = 2.0. Investment freedom is a low concern for the city of Berlin.

Category 4: Governance indicators of the World Bank

The Worldwide Governance Indicators report on six broad dimensions of governance for over 200 countries and territories over the period 1996-2018:

- Voice and Accountability
- Political Stability and Absence of Violence
- Government Effectiveness
- Regulatory Quality
- Rule of Law
- Control of Corruption

Literature: http://info.worldbank.org/governance/wgi/

Indicator 19: Voice and Accountability

Principal: Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.

Calculation method
The estimates of the indicator are aggregates of sub-indicators normalized by a standard normal distribution ranging from -2.5 to 2.5. We use a max-min transformation to arrive at a score for the TPF

$$\frac{value - minimum\ value}{maximum\ value - minimum\ value}\ X\ 10$$ = World Bank Score on a scale of 0-10:

So, {(x-(-2.5)}/{2.5 - (-2.5)} x 10

This gives: {(x+2.5)/5} x10 = World Bank Score on a scale of 0 (low) to 10 (high)

A maximum score (very good) will be obtained with a WB Governance score of +2.5. This will lead to a score of 10. A minimum WB score will be 0.

In the TPF, however, we present scores as concern scores. So, a TPF score 0 is no concern and a TPF score of 10 is a maximum concern. So this requires a second transformation. We transform the WB score into a TPF concern score as follows:

TPF concern score = 10 - WB score

Where to get the data
World Bank (2020) Worldwide governance indicators [Accessed 12-02-2020]

- Click on the link: http://info.worldbank.org/governance/wgi/#home
- Click on data interactive data access
- Select Table View
- Select all indicators
- Select country
- Use the most recent time series

Example: Berlin is the capital of Germany and Germany's score for voice and accountability is 1.42. Applying the formula results in:

{(1.42+2.5)/5} x10 =] = 7.84 = WB score on scale of 0-10

TPF concern score = 10 - 7.48 = 2.52; Voice and accountability is of little concern for Germany

Indicator 20: 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 and data

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 calculation is similar to the methodology described for indicator 19.

Example Amsterdam: The estimated political stability for the Netherlands is 0.87 (2018). The TPF concern score is 3.26 This implies little concern. The best way to do the assessments is to do the assessments of all 6 indicators per country, e.g. for the Netherlands

NR	Indicator (year 2018)	WB Value from table	WB Value (0-10)	TPF concern score
19	Voice and accountability	1.60	8.20	1.80
20	Political stability	0.87	6.74	3.26
21	Government effectiveness	1.85	8.70	1.30
22	Regulatory quality	2.02	9.04	0.96
23	Rule of law	1.82	8.64	1.36
24	Control of corruption	2.01	9.02	0.98

Indicator 21: Government effectiveness

Principal: Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

Calculation method and data: The calculation is similar to the methodology to calculate indicator 19

Indicator 22: Regulatory Quality

Principal: Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.

Calculation method and Data: The calculation is similar to the methodology to calculate indicator 19

Indicator 23: Rule of law

Principal: Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Calculation method and Data: The calculation is similar to the methodology to calculate indicator 19

Indicator 24: Control of corruption

Principal: Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Calculation method and Data: The calculation is similar to the methodology to calculate indicator 19