Danube Water Forum, October 28, 2020

Data driven decision and policy making in drinking and urban water - a Dutch perspective

Dr. Peter van Thienen

Senior researcher & Chief Information Officer

KWR

Bridging Science to Practice

KWR Water Research Institute

- in Nieuwegein, The Netherlands
- shareholders: 10 Dutch and 1 Flemish water utilities
- ~180 employees, ~135 researchers
- covering the full water cycle
- joint research programs (BTO, DPWE), EU funded research projects, consulting projects, ...
- participating in many international networks and collaborations
- "Bridging science to practice"
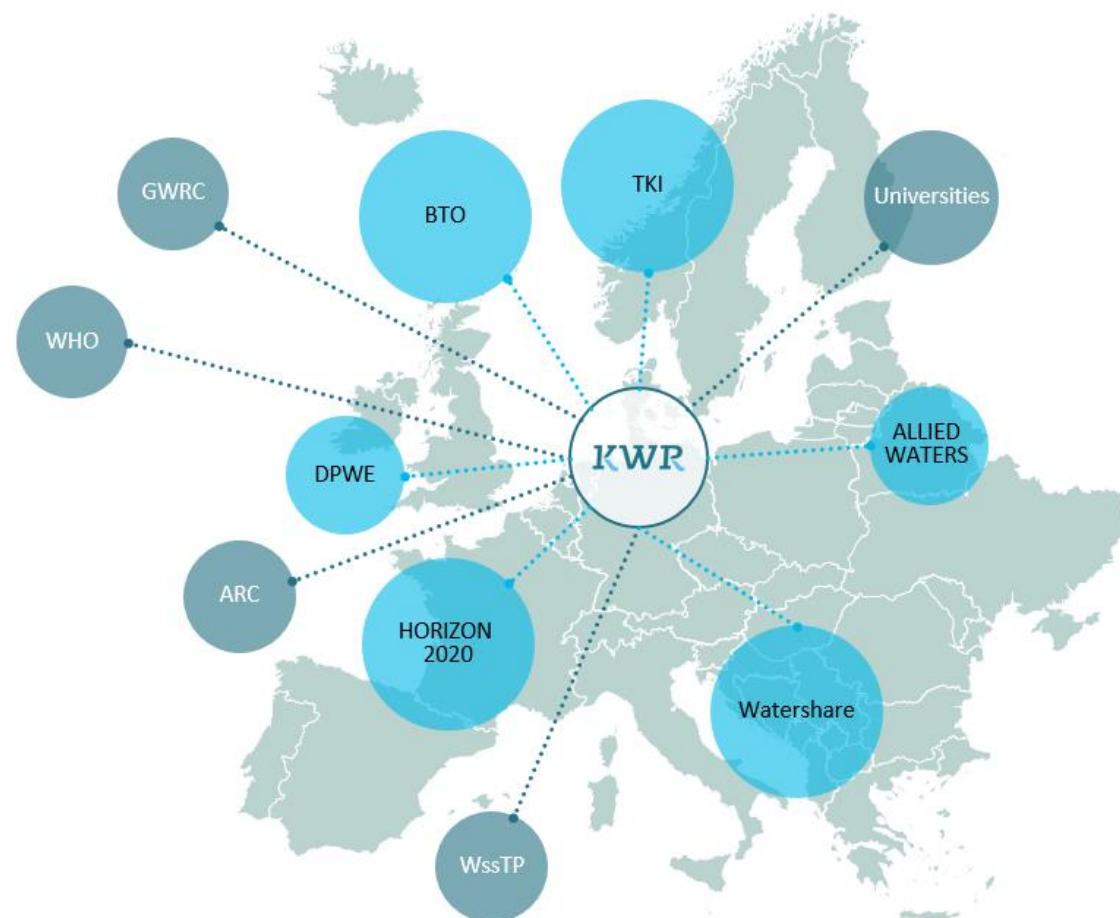
Drinking water in the Netherlands

Topics:

1. The Benchmark   (drinking water data & policy)

2. Non-Revenue Water (drinking water data & decision making)

3. City Blueprint (urban water data & policy)

4. Uncertainty in data

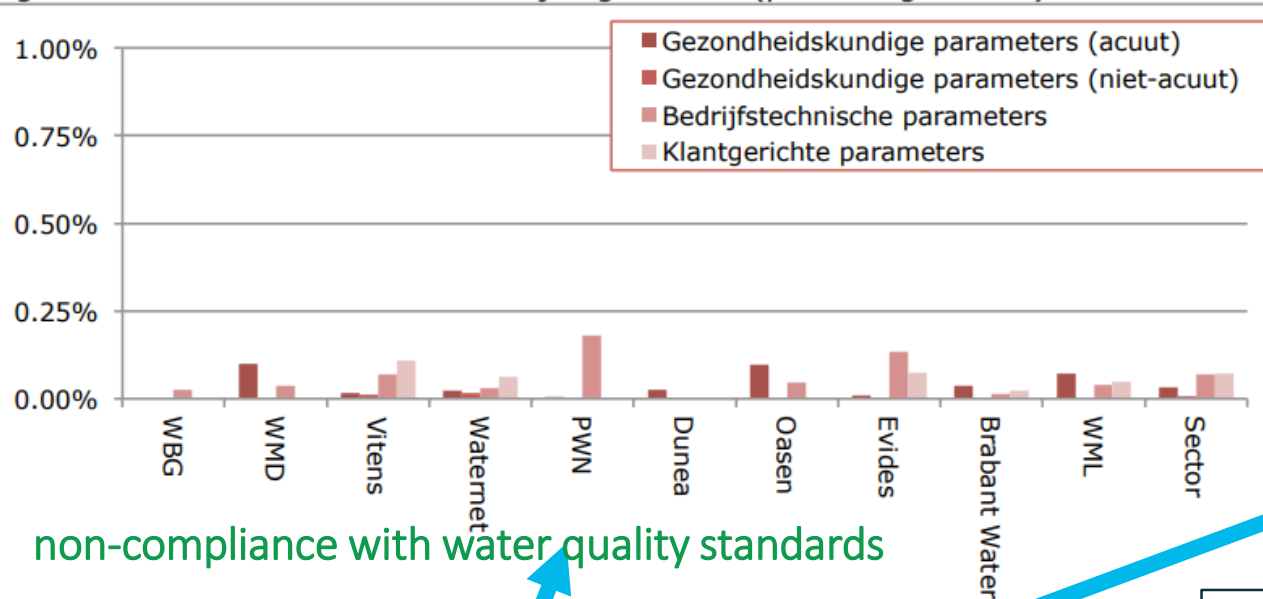# Benchmark of Dutch drinking water utilities

- comparison of water utilities' performance to improve efficiency, increase transparancy
- voluntary benchmark since 1997 -> 21% improvement (according to Vewin)
- included in the Drinking Water Law in 2006-2007
- parameters included:
  - water quality
  - quality of service
  - environmental aspects
  - cost efficiency, R&D, investments

DATA

interruptions of supply per connection

Resultaat
Tabel 3.2: Leveringsonderbreking per administratieve aansluiting per jaar (in minuten en seconden)

Drink-water-bedrijf	Door Onderhoud	Door storingen	Totaal	Door storingen veroorzaakt door derden
WBG	10:49	5:21	16:10	1:12
WMD	10:06	6:28	16:34	0:39
Vitens	5:23	8:28	13:51	1:07
Waternet	14:38	3:10	17:48	0:51
PWN	10:16	6:39	16:55	1:22
Dunea	9:58	1:26	11:24	0:07
Oasen	13:29	3:21	16:50	0:50
Evides	11:31	5:07	16:38	0:31
Brabant Water	9:50	7:58	17:48	0:39
WML	7:45	8:43	16:28	0:32
Sector	9:01	6:33	15:34	0:50

Resultaat
Figuur 2.3: Gemeten normoverschrijdingen 2015 (percentage totaal)

Legend:
- Gezondheidskundige parameters (acuut)
- Gezondheidskundige parameters (niet-acuut)
- Bedrijfstechnische parameters
- Klantgerichte parameters

non-compliance with water quality standards

- water quality
- quality of service
- environmental aspects
- cost efficiency, R&D, investments

We'll get back to this aspect.

5

total costs of drinking water supply per connection

Resultaat
Figuur 5.4: Ontwikkeling totale kosten drinkwater (€) per administratieve aansluiting (gecorrigeerd voor inflatie)

Legend: 1997 2000 2003 2006 2009 2012 2015
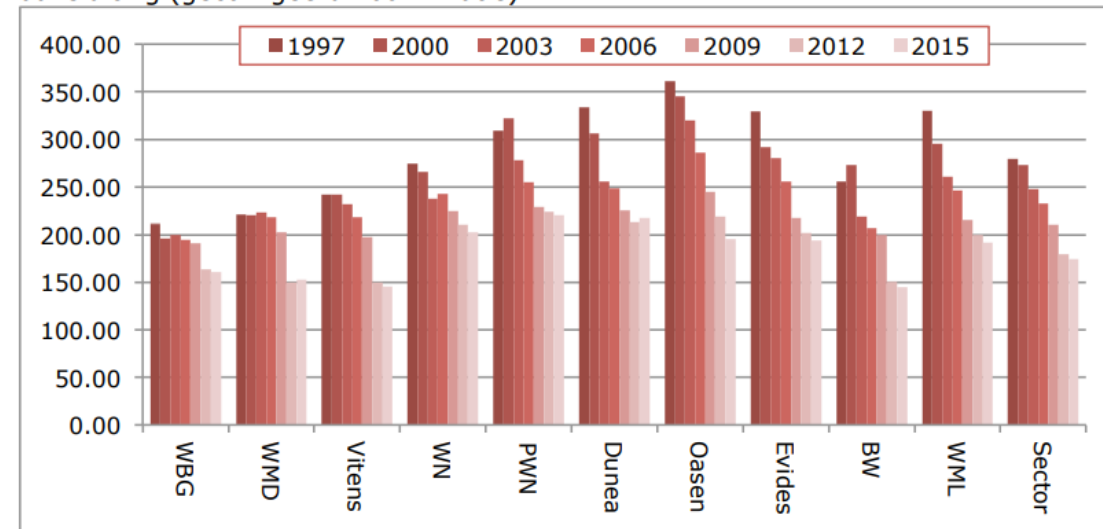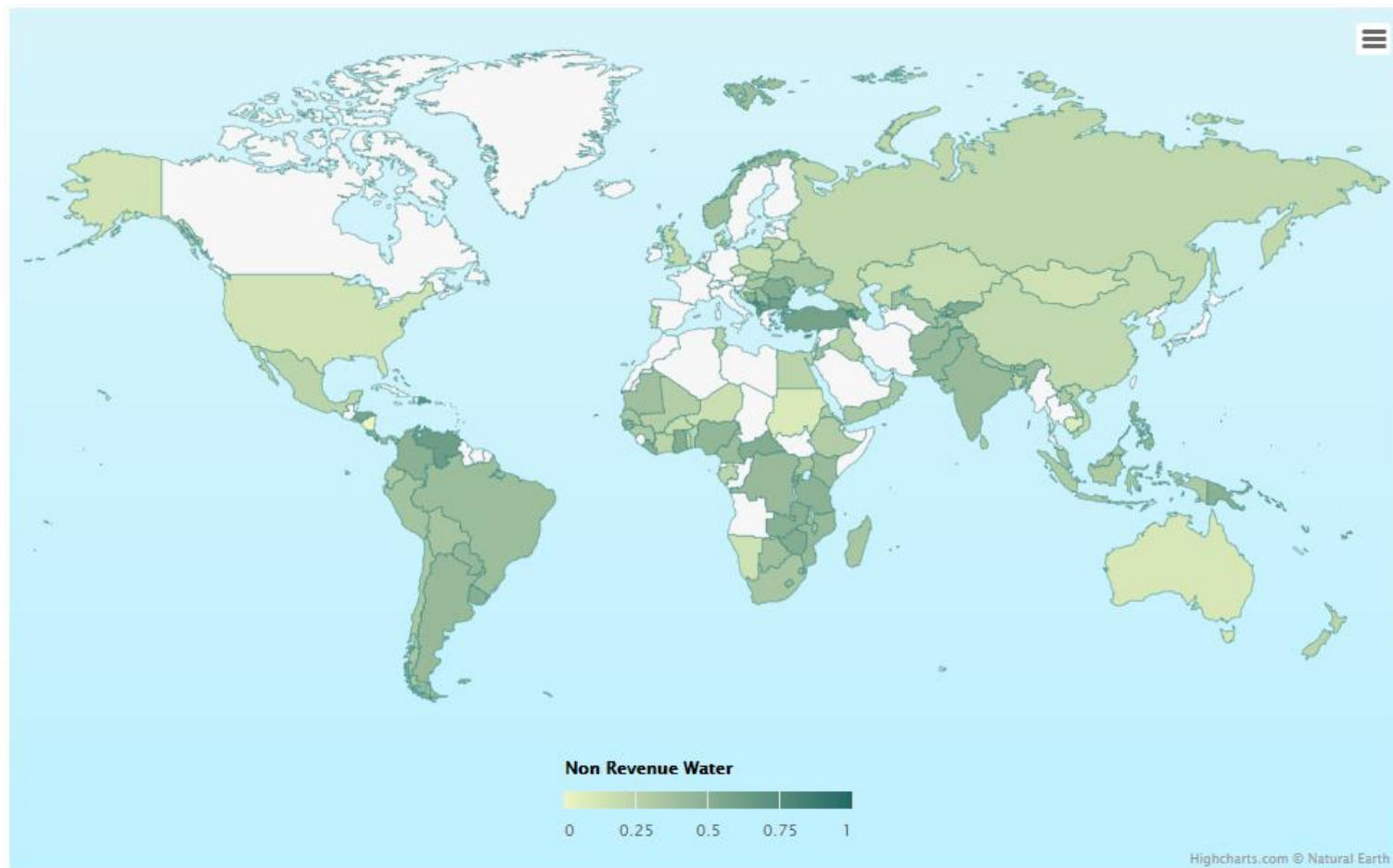
Benchmark outcome

- Water utilities are sensitive to their ranking in the benchmark

    => drive to improve costs/efficiency and performance

- Risk of too much focus on the financial aspects
  (https://www.vewin.nl/nieuws/paginas/Column_Doelmatigheid_en_kwaliteit_1132.aspx?source=%2fnieuws%2fPaginas%2fdefault.aspx)

1. Initiative from the sector turned into policy
2. Data at the basis of improvements in terms of efficiency and performance

Non Revenue Water reduction

Non Revenue Water

0   0.25   0.5   0.75   1

Highcharts.com © Natural Earth

https://database.ib-net.org/Reports/Indicators/HeatMap?itemId=27

NRW in The Netherlands

~5.5%

- leakage
- flushing
- unbilled water
- measuring issues

How come?
- Rolls Royce approach?
- flat topography, low pressures
- soil stability (well, not everywhere)
- careful design, planning, and asset management?
- publicly owned?

Figure 1.12 Development of non-revenue water

VEWIN DRINKING WATER STATISTICS 2017
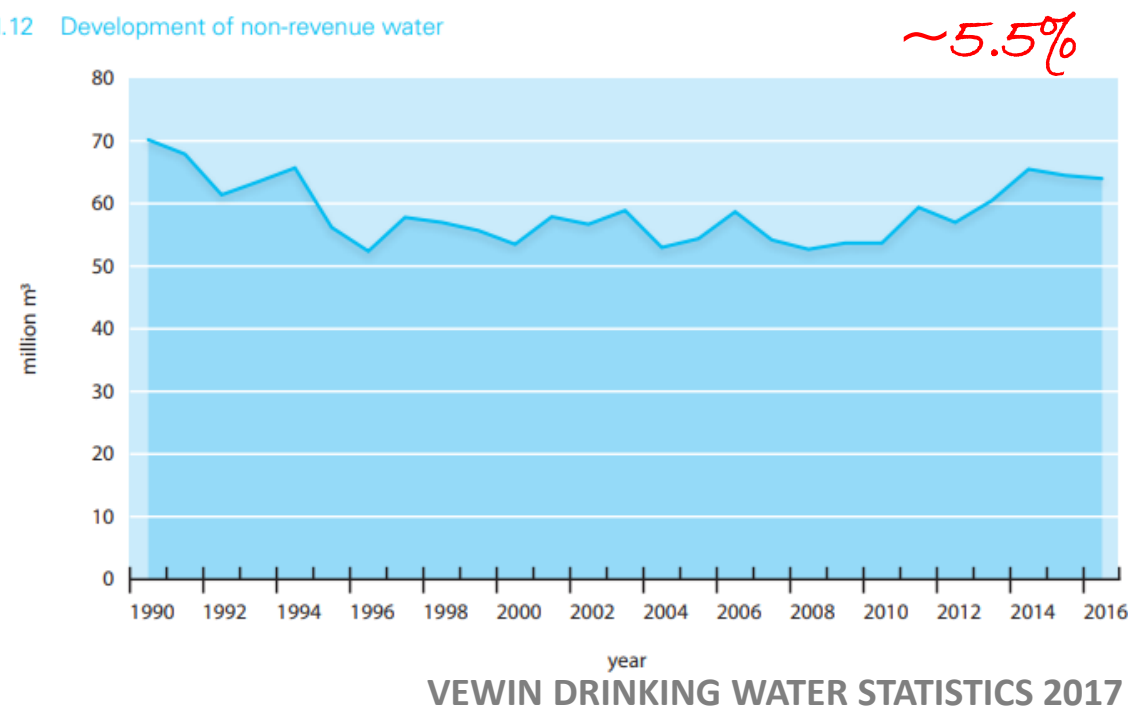
But still aiming for a further reduction, using a data driven approach...

8

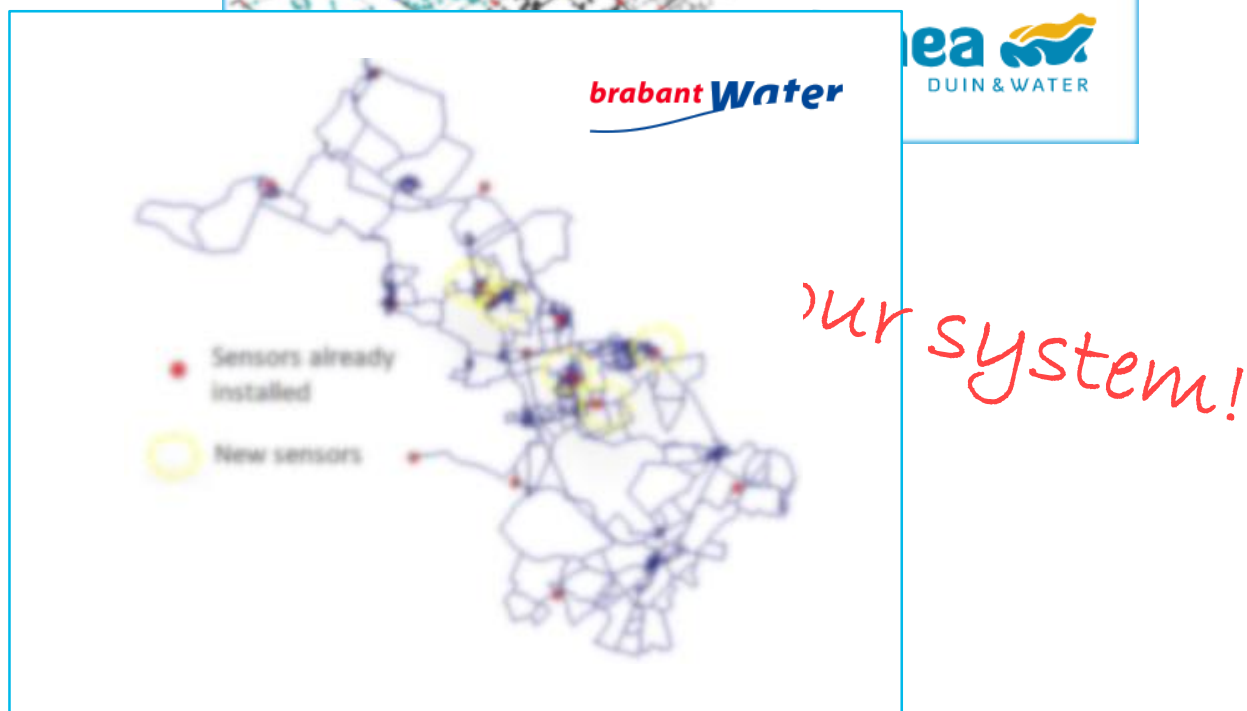# The role of data in NRW reduction

Flow and/or pressure data measured at multiple locations in drinking water networks + appropriate algorithms/tools -> detection, localization, prioritization, fixing of leaks.

But there is a deeper layer!

How and where to measure flow and pressure? Numerical optimization tools help to answer this question - get better performance for a smaller investment.

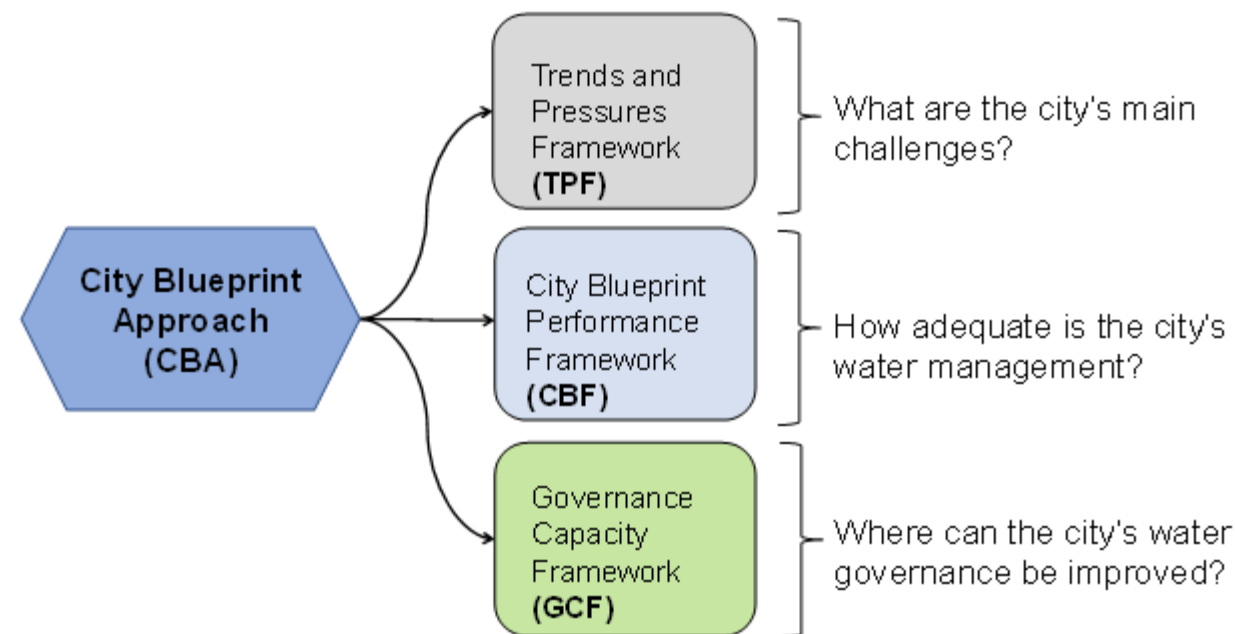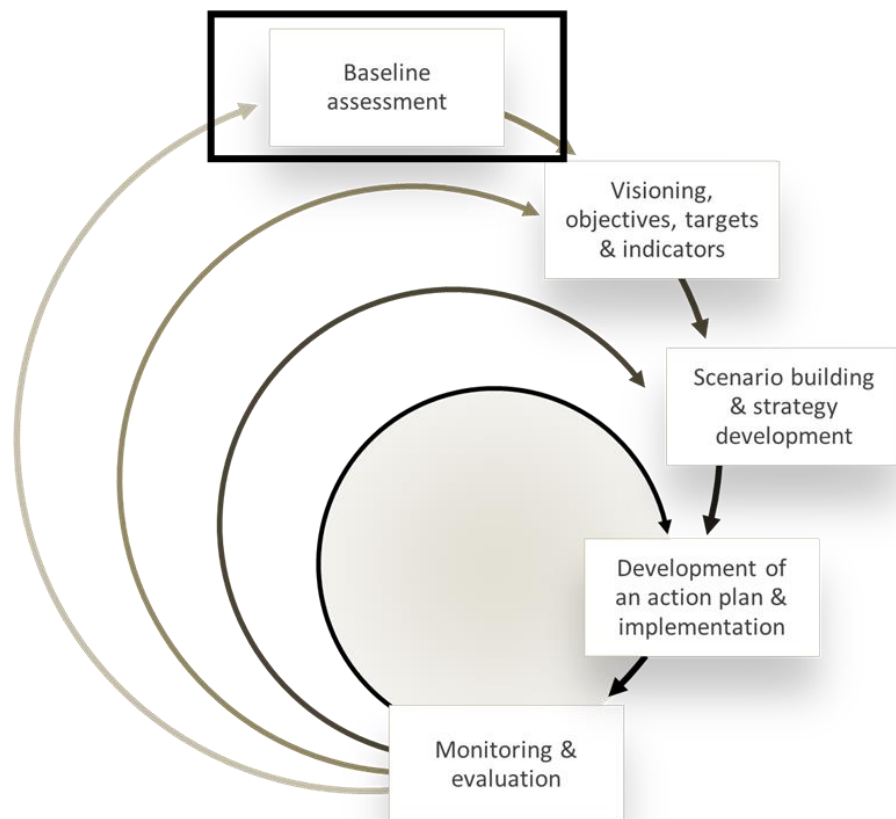And they need data as well!
- network
- demand patterns

Sensors already installed

New sensors

our system!

City Blueprint (very briefly)

Stef Koop   Kees van Leeuwen

City Blueprint Approach (CBA)

Trends and Pressures Framework **(TPF)**	What are the city's main challenges?
City Blueprint Performance Framework **(CBF)**	How adequate is the city's water management?
Governance Capacity Framework **(GCF)**	Where can the city's water governance be improved?

Baseline assessment → Visioning, objectives, targets & indicators → Scenario building & strategy development → Development of an action plan & implementation → Monitoring & evaluation

More information: https://www.watershare.eu/communities/resilient-urban-water-management/

City Blueprint (very briefly)

Stef Koop   Kees van Leeuwen

City Blueprint Performance Framework

Goal	Baseline assessment of the sustainability of Urban Water Resources Management
Indicators	Twenty-four indicators divided over seven categories: 1. Basic water services 2. Water quality 3. Wastewater treatment 4. Water infrastructure 5. Solid waste 6. Climate adaptation 7. Plans and actions
Data	Public data or data provided by the (waste) water utilities and cities based on a questionnaire
Scores	0 (concern) to 10 (no concern)
BCI	Blue City Index, the geometric mean of 24 indicators which varies from 0 to 10
Stakeholders	Water utility, water board, city council, companies, NGOs, etc.
Process	Interactive with all stakeholders involved early on in the process

Trends and Pressures Framework (TPF) — What are the city's main challenges?

City Blueprint Performance Framework (CBF) — How adequate is the city's water management?

Governance Capacity Framework (GCF) — Where can the city's water governance be improved?
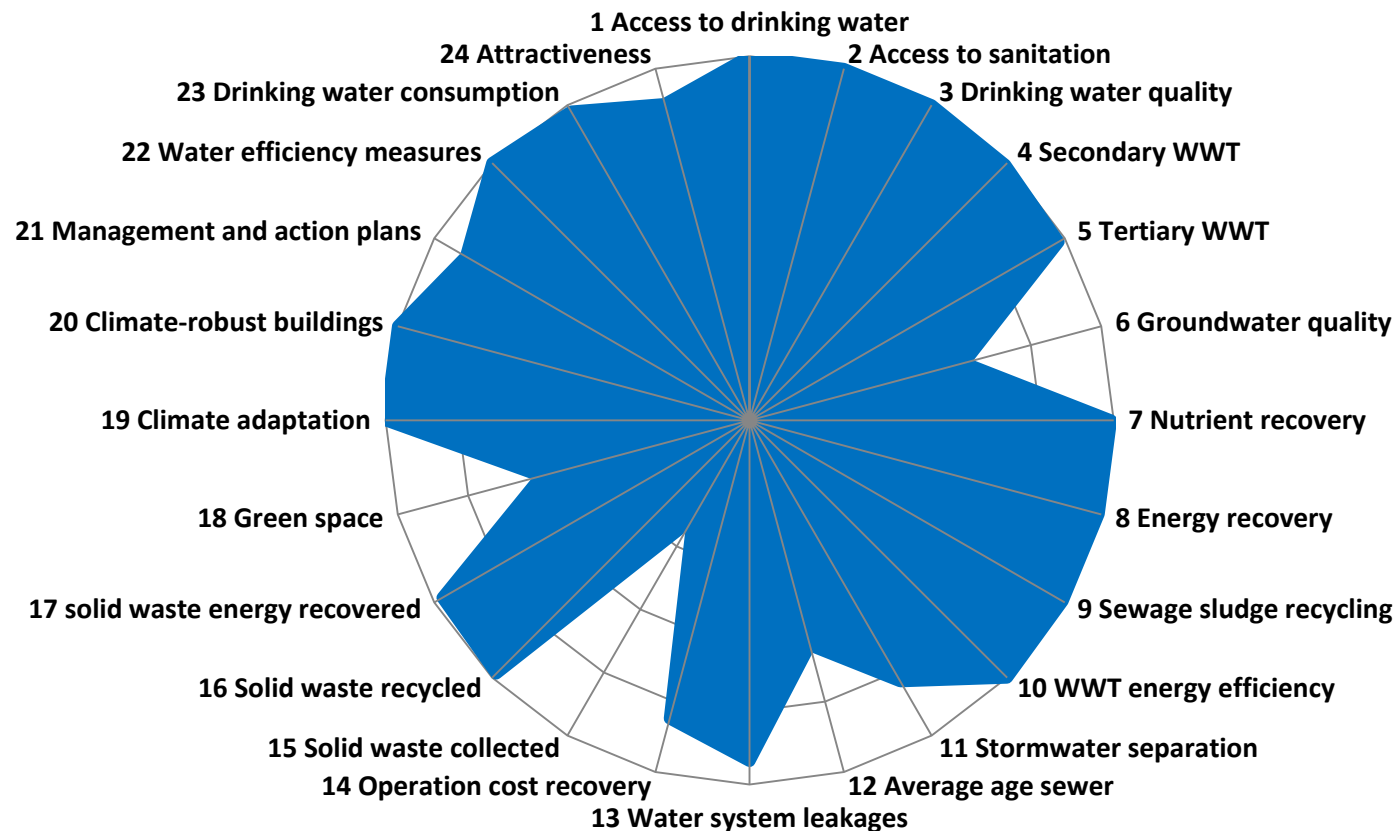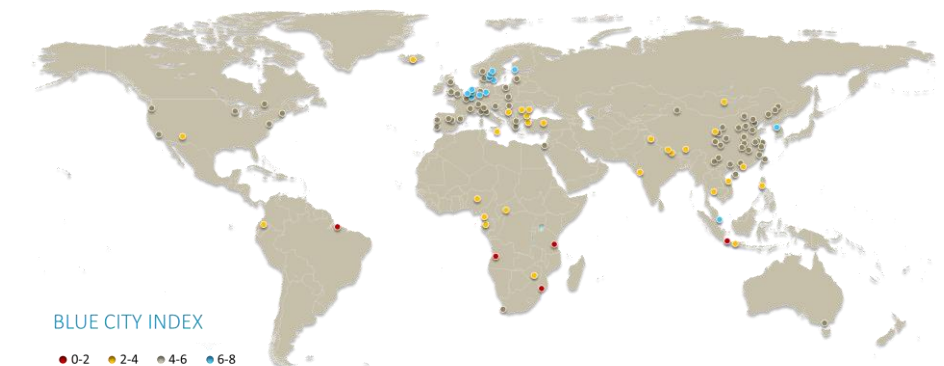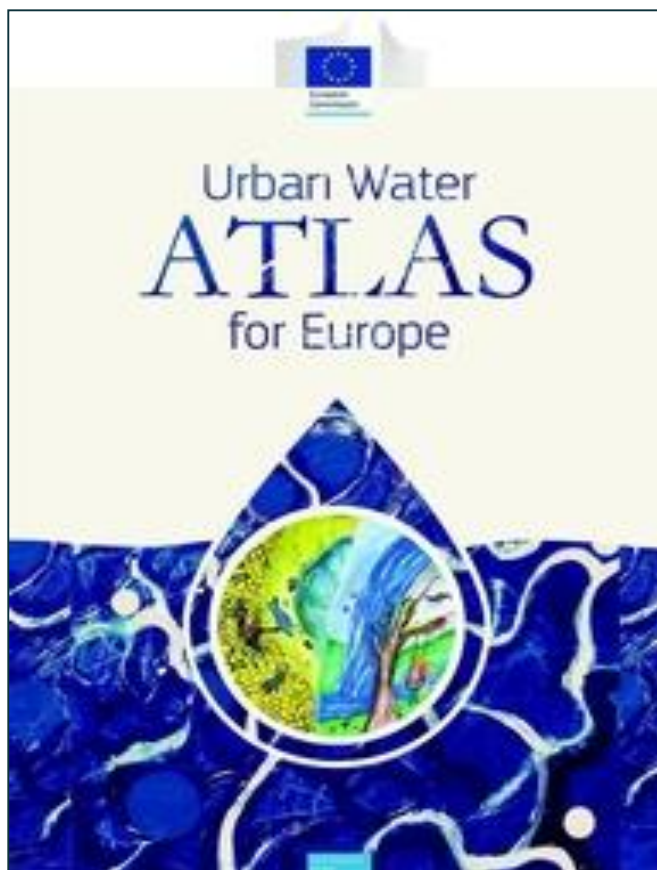
Monitoring & evaluation

More information: https://www.watershare.eu/communities/resilient-urban-water-management/

City Blueprint (very briefly)

Stef Koop   Kees van Leeuwen

KWR

Amsterdam

Radar chart indicators:
1 Access to drinking water
2 Access to sanitation
3 Drinking water quality
4 Secondary WWT
5 Tertiary WWT
6 Groundwater quality
7 Nutrient recovery
8 Energy recovery
9 Sewage sludge recycling
10 WWT energy efficiency
11 Stormwater separation
12 Average age sewer
13 Water system leakages
14 Operation cost recovery
15 Solid waste collected
16 Solid waste recycled
17 solid waste energy recovered
18 Green space
19 Climate adaptation
20 Climate-robust buildings
21 Management and action plans
22 Water efficiency measures
23 Drinking water consumption
24 Attractiveness

City Blueprint Performance Framework

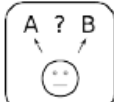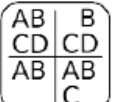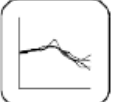|	Goal	Baseline assessment of the sustainability of Urban Water Resources Management
	Indicators	Twenty-four indicators divided over seven categories: 1. Basic water services 2. Water quality 3. Wastewater treatment 4. Water infrastructure 5. Solid waste 6. Climate adaptation 7. Plans and actions
	Data	Public data or data provided by the (waste) water utilities and cities based on a questionnaire
	Scores	0 (concern) to 10 (no concern)
	BCI	Blue City Index, the geometric mean of 24 indicators which varies from 0 to 10
	Stakeholders	Water utility, water board, city council, companies, NGOs, etc.
	Process	Interactive with all stakeholders involved early on in the process

BLUE CITY INDEX
● 0-2 ● 2-4 ● 4-6 ● 6-8

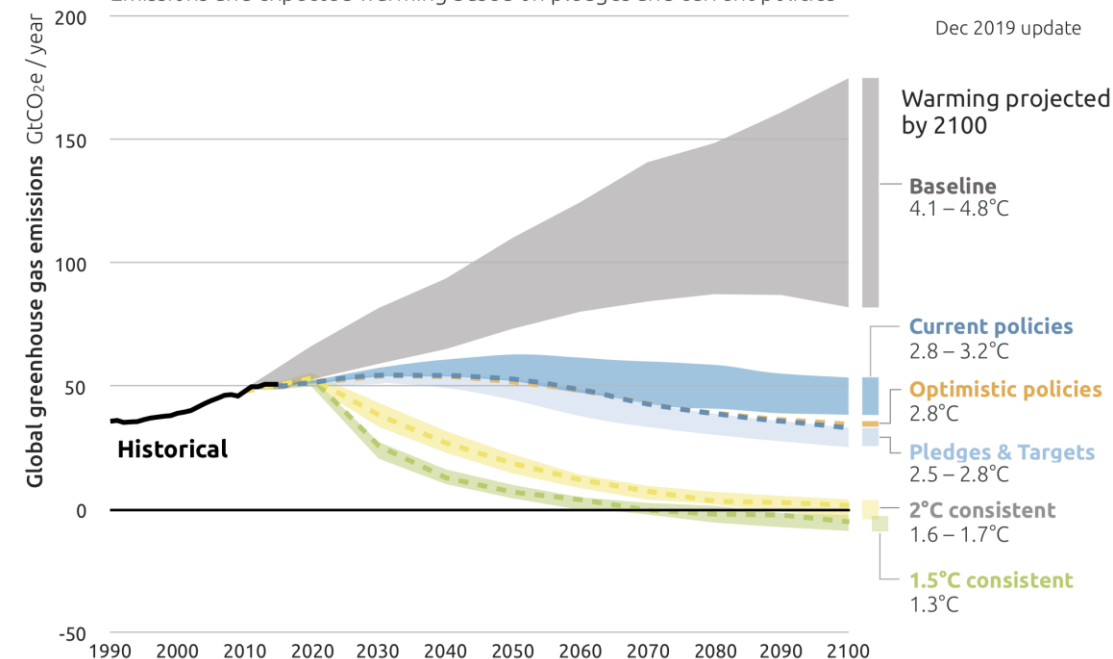# The Urban Water Atlas for Europe

Awareness for water!

Uncertainty

Type	examples of sources		typical ways of handling	
unpredictability	A ? B	unpredictable expressions of behavior such as the development of political systems	AB CD AB / B CD AB C	use of scenarios with a plausible range with a clear indication of these and assumptions, limitations and subjective judgements
		chaotic processes in complex systems		ensembles of model simulations
structural uncertainty		inadequate models, frameworks or structures	∀	clear specification of assumptions and system definitions
		ambiguous delimitations or definitions		comparison of models with observations for a wide range of conditions
		misrepresentation or neglect of relevant processes or relationships		assessment of maturity of the underlying science
value uncertainty		missing, inaccurate or unrepresentative data		analysis of statistical properties of sets of values (observations, model results, etc.)
				hierarchical statistical tests
		wrong resolution in time or space		comparison of models with observations

2100 WARMING PROJECTIONS
Emissions and expected warming based on pledges and current policies

Dec 2019 update

Warming projected by 2100

Baseline
4.1 – 4.8°C

Current policies
2.8 – 3.2°C

Optimistic policies
2.8°C

Pledges & Targets
2.5 – 2.8°C

2°C consistent
1.6 – 1.7°C

1.5°C consistent
1.3°C

- Data and models
- Understanding of uncertainty in them
- Efficiency and robust/resilient design
- Adaptive decision making

Conclusions & Looking ahead

Illustrations of how data and models are essential for informed decision and policy making on any level - *know your system!*

Looking ahead means dealing with (deep) uncertainty

- Data and models
- Understanding of uncertainty in them
- Efficiency and robust/resilient design
- Adaptive decision making

KWR
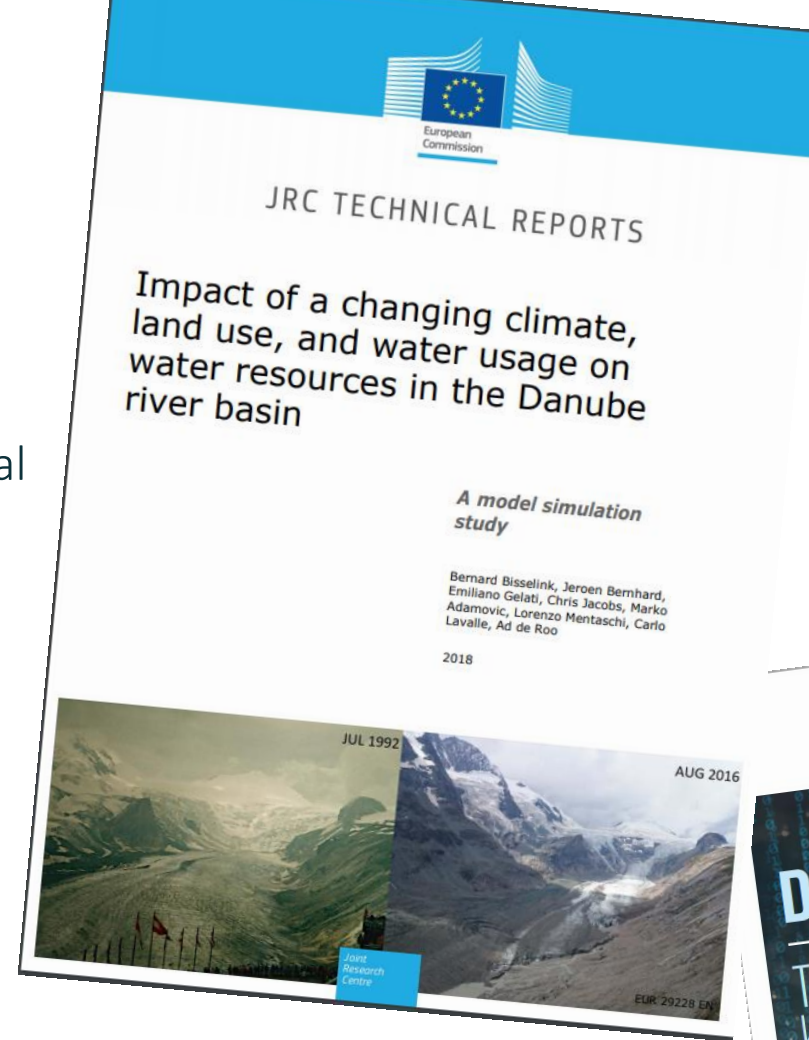
Groningenhaven 7

3433 PE Nieuwegein

The Netherlands

T +31 (0)30 60 69 511

E info@kwrwater.nl

I www.kwrwater.nl

@KWR_Water   KWR   KWR_Water

Dr. Peter van Thienen

peter.van.thienen@kwrwater.nl

+31 30 6069 602

Colofon

KWR | October 2020

Author

Peter van Thienen

Conference

- Danube Water Forum
- Online event
- October 28, 2020

Distribution

A PDF of this presentation is shared with the Forum participants.