How sustainable is your city water management?

1. The jungle of sustainability indicators
2. Which indicators would Mrs. Brundtland choose?
3. Selecting indicators on the basis of low societal costs and high benefits: the new City Blue Print
4. Blue prints for Amsterdam and Eindhoven
5. Use possibilities for governments and companies
6. Discussion

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What would Mrs. Brundtland choose?

Brundtland, 1987: sustainability = *"a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs"*

In other words: making sure our great grant children can live happily too

More precisely: preserving the welfare generating capacity of our capital stocks

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Welfare= material (income) and well being

Sustainabitily: caring for our capital stocks

Sufficient compensation? That depends on the welfare value!

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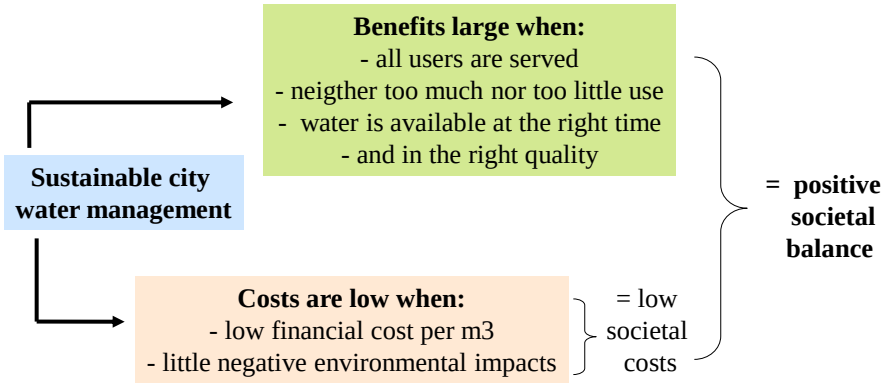
When is your city water management sustainable?



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Sustainability indicators for the water system

Indicatoren

Surface water functions
- **Safety**
- **Shipping**
- **Recreation**
- **Cooling**
- **Etc.**

Grond water functions
- **Buildings & infra**
- **Agriculture**
- **Drinking water**

When are benefits high?
When are financial cost low?
When are environmental cost low?

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Sustainability indicators for the water chain

Indicators

Water supply:
-intake
-treatment
-transport

Water use:
-households
-industry
-agriculture

Waste water:
-collection/ sewage
-treatment
-discharge

When are benefits high?
When are financial cost low?
When are environmental cost low?

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The list of indicators (1)

	Indicator	Unit	Direction of preference
Water supply (intake, treatment, transport, use, waste water: sewage, treatment and discharge)			
1	water supply costs	euro/m^3 drinking water euro/m^3 industrial process water euro/m^3 water for agriculture	the lower, the better
2	contribution to climate change	CO_2-emission/m^3 water supply CO_2-emission/m^3 waste water	the lower, the better
3	future proof water intake	water intake is smaller than available water resource? yes/no	yes= good, no= bad
4	accessibility to water of suitable quality	% of population with reliable drinking water % of industries with suitable process water % of farms with suitable water for live stock and crops	the higher, the better
5	water supply security	number of water supply stops per year	the lower, the better
6	water wasting / over use	m^3 water use/person/year m^3 water use / euro turn over/year in industry m^3 water use/hectare agricultural land/year *(or: yes/no water saving irrigation and crop choice)*	the lower, the better *yes= good, no= bad*
7	waste water costs	EUR/sewage connection/year	the lower, the better
8	access to safe sanitation	% households and industries connected to sewage or comparable sanitation systems	the higher, the better
9	sewage capacity	number of untreated discharge to surface water incidents per year	the lower, the better
10	effluent quality	effluent quality is not worse than desired surface water quality of receiving surface water: yes/no	yes= good, no= bad
11	reuse of effluent	% of effluent reused	the higher, the better

Amsterdam	Eindhoven
0,03	0,10
600	140
-318	-181
0	62
57	75

Etc.

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The list of indicators (2)

Surface- and groundwater system			
12	surface water management costs	euro/person//year	the lower, the better
13	flood risk	expected flood damage (euro/year)	the lower, the better
14	water depth for ships	sufficient depth: yes/no	yes= good, no= bad
15	balance recreational use and natural carrying capacity	balance: yes/no	yes= good, no= bad
16	natural river banks	km nature friendly river banks / total km of river banks	the more, the better
17	frequency of cool water intake stops due to water shortage	number of stops/year	the fewer, the better
18	frequency of thermal pollution (i.e. high water temperature)	number of high temperature incidents/year (or: number of fish dying incidents/year)	the fewer, the better
19	future proof fisheries	over use or bad fishing techniques: yes/no	yes= good, no= bad
20	mining costs**	euro/ton sand, gravel etc.	the lower, the better
21	water quality sufficient for fish and swimming?	sufficient: yes/no	yes= good, no= bad
22	ground water management costs (quantity & quality)	euro/person/year	the lower, the better
23	ground water nuisance (or damage)	% of the city with ground water nuisance (or damage in euro/year)	the lower, the better
24	groundwater quality damage	% of the city with salty water nuisance (or crop damage/year)	the lower, the better

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Results for Amsterdam and Eindhoven

- Agricultural water supply costs (ind. 1) in Eindhoven higher than in Amsterdam, while supply security (ind. 5) is lower: *Eindhoven, what can you do to improve this?*
- In Amsterdam CO2 emissions of drinking water production are 4 times higher than in Eindhoven (ind. 2): *Amsterdam, can you reduce this?*
- Both Amsterdam and Eindhoven consume more ground water than the rain provides (ind. 3)*: both cities, are you future prove? Should you start using surface water?*
- Housholds (and agriculture) in Eindhoven use much more water than in Amsterdam (ind.6)*: Amsterdam, what is your secret? Education?*
- Etc.

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Use possibilities

- Governments: revealing which aspects of a city's water management can potentially be improved: identifying measures to enhance sustainability

- Companies: revealing the weaknesses of a city's water management and using that information to determine whether:

- the city is a suitable location for building a factory
- the measures production companies can take to ensure future production
- finding out which knowledge / techniques one can sell a city

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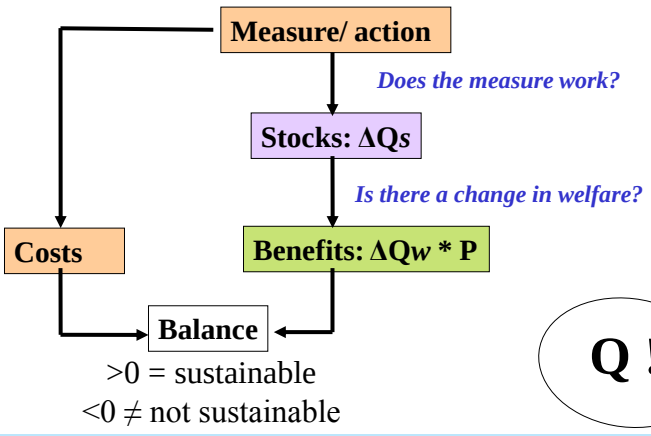
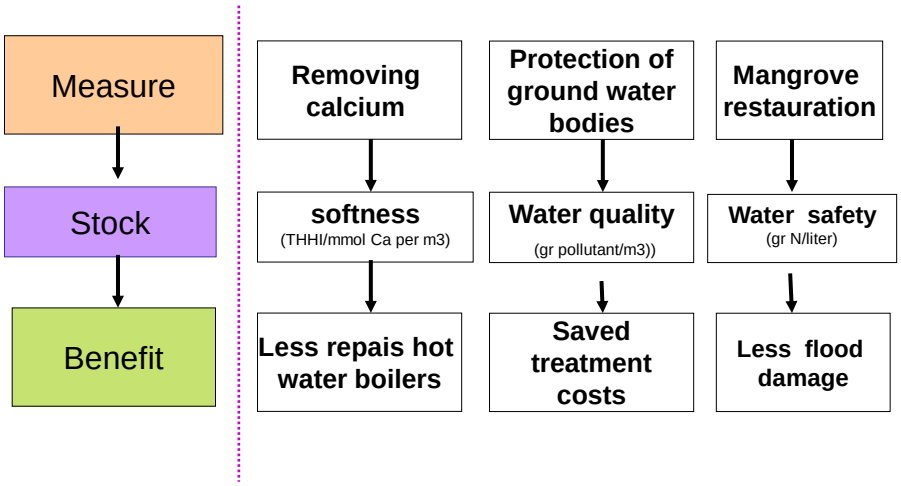
Advantages

- The set of indicators provide a balanced approach of sustainability: a good score on price (i.e. cheap drinkwater), caused by low accessibility or bad quality will be traced
- The set enables us to reveal options for improving a city's water management
- The set allow us to reveal differences between cities in one and the same region
- The set excludes double countings
- The set only includes impacts: no measures or good intentions

Basic scheme of cost benefit analysis



Examples



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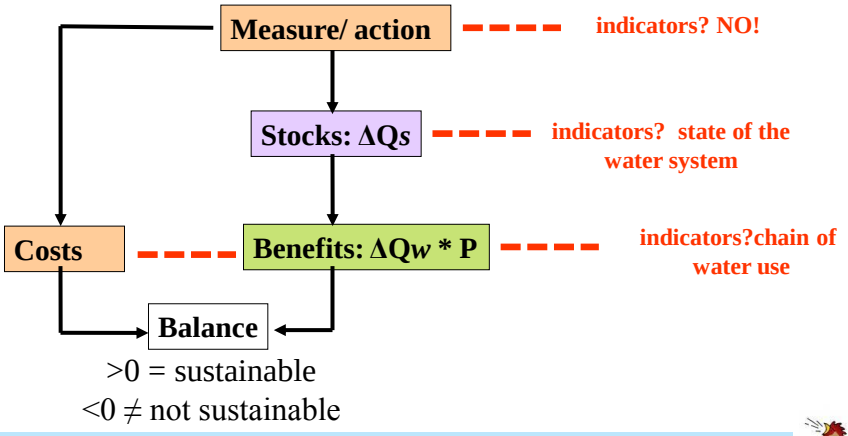
Identifying sustainability indicators with the CBA scheme



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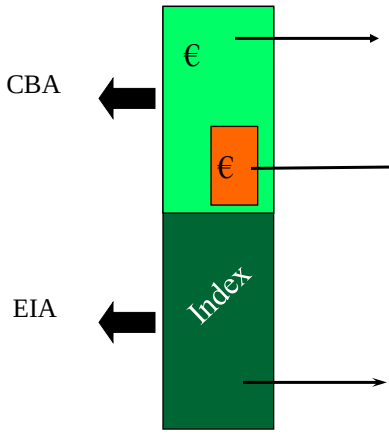
The three values of the natural environment



Socio-economic value:
Nature produces welfare for humans through functions

Financial value:
income for humans

The financial value of not exploited areas is often zero, since nobody makes money on them

Nature has an intrinsic value;
welfare plants and animals

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