

Towards a sustainable water cycle



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Sustainable development: a hype?



“Meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

(Brundtland commission, Our Common Future, 1987)



Sustainable development is prerequisite to sustain **human life** on this planet:

- Mental needs
- Physical needs:
 - Healthcare
 - Secure shelter
 - Breath (clean air)
 - Eat (sufficient food)
 - Drink (safe H₂O)



*(UN Sustainable Development Goal 6;
OECD: Securing water, sustaining growth)*

Water: a human right and most intimate public service

Knack Nieuws

Bestuursvoorzitter Nestlé: 'Water is geen mensenrecht'

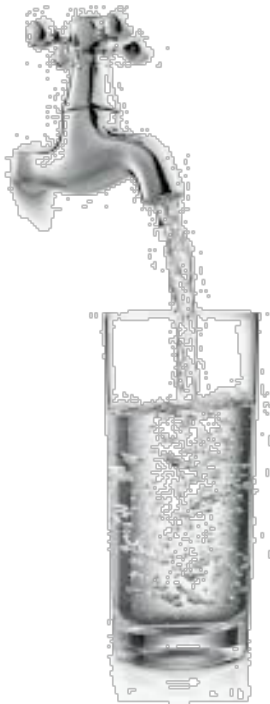
19/04/13 om 14:16 - Bijgewerkt om 14:16

In een openhartig interview deed de bestuursvoorzitter van Nestlé Peter Brabeck, de opmerkelijke uitspraak dat water geen mensenrecht is.



Nestlé en het recht van de mens op water

Nestlé erkent en staat volledig achter de beslissing van de Algemene Vergadering van de Verenigde Naties om de toegang tot water als een mensenrecht uit te roepen



Leidingwater - **Kraan(tjes)water** - Drinkwater - Stadswater - 'Gemeentepils'

- **Direct contact** onto and into our bodies
- Probably the **most intimate** interaction between **a government and its citizens**

-> **Managing risks** (quality/quantity) is at highest stake

How much water is a Belgian person (directly + indirectly) consuming?



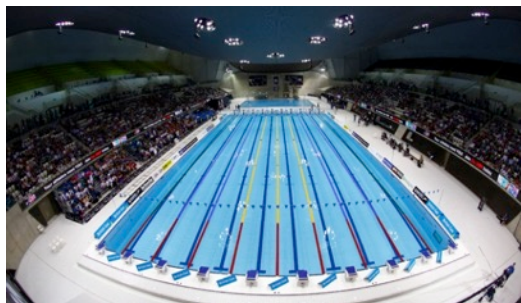
1. $\approx 70 \text{ L/IE/d}$

Per year:
 $\approx$ a large water truck (23 m^3)



2. $\approx 700 \text{ L/IE/d}$

Per year:
 $\approx$ a storage tank (250 m^3)



3. $\approx 7000 \text{ L/IE/d}$

Per year:
 $\approx$ an olympic swimming pool (2500 m^3)

"Did you know that
your daily water
footprint is 7400 l?"
Dries Seuntjens

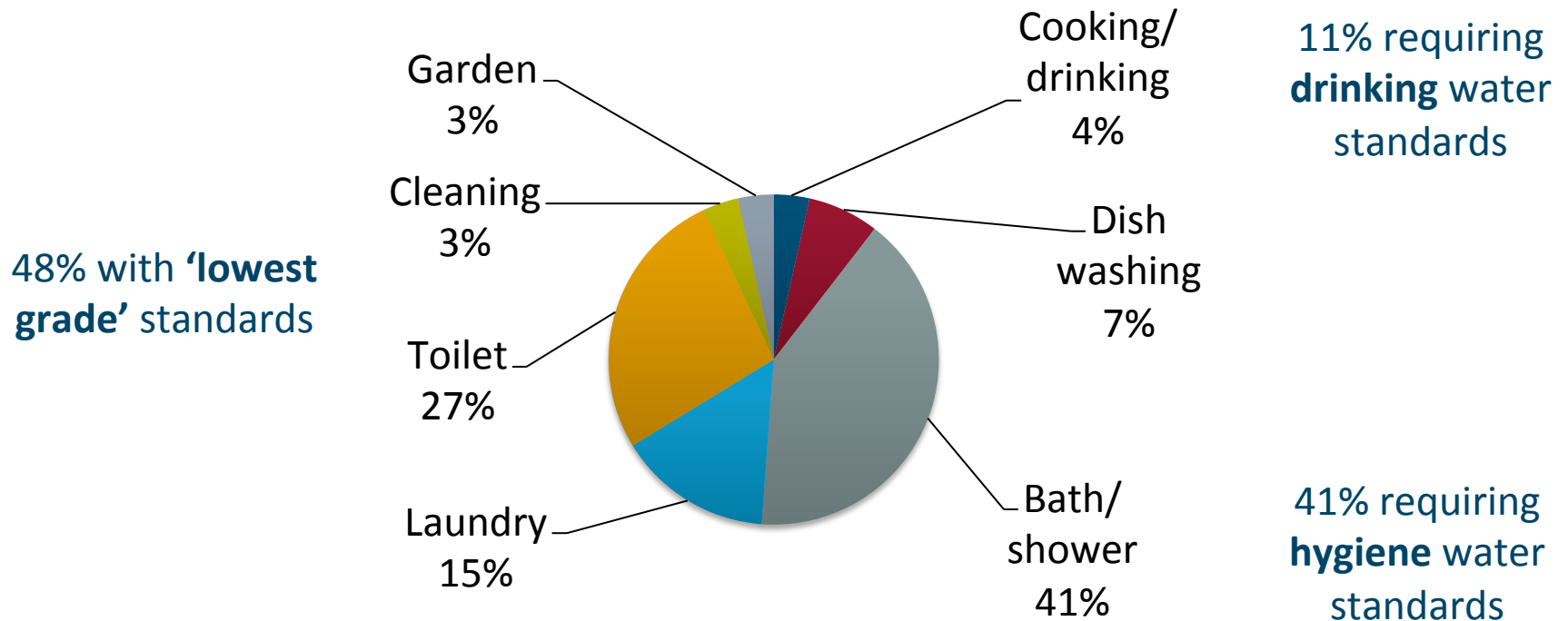


Water footprint Belgian citizen: $\sim 7400 \text{ L/IE/d}$ $\sim 2700 \text{ m}^3/\text{IE/jaar}$

- 16% above average world citizen: 6400 L/IE/d
- **Direct** water use (domestic): 120 L/IE/d -> **1.6%**
- Indirect/virtual water use (agriculture, industry): 98.4%

http://www.waterfootprint.org/?page=cal/waterfootprintcalculator_indv

Tap water use in Flanders



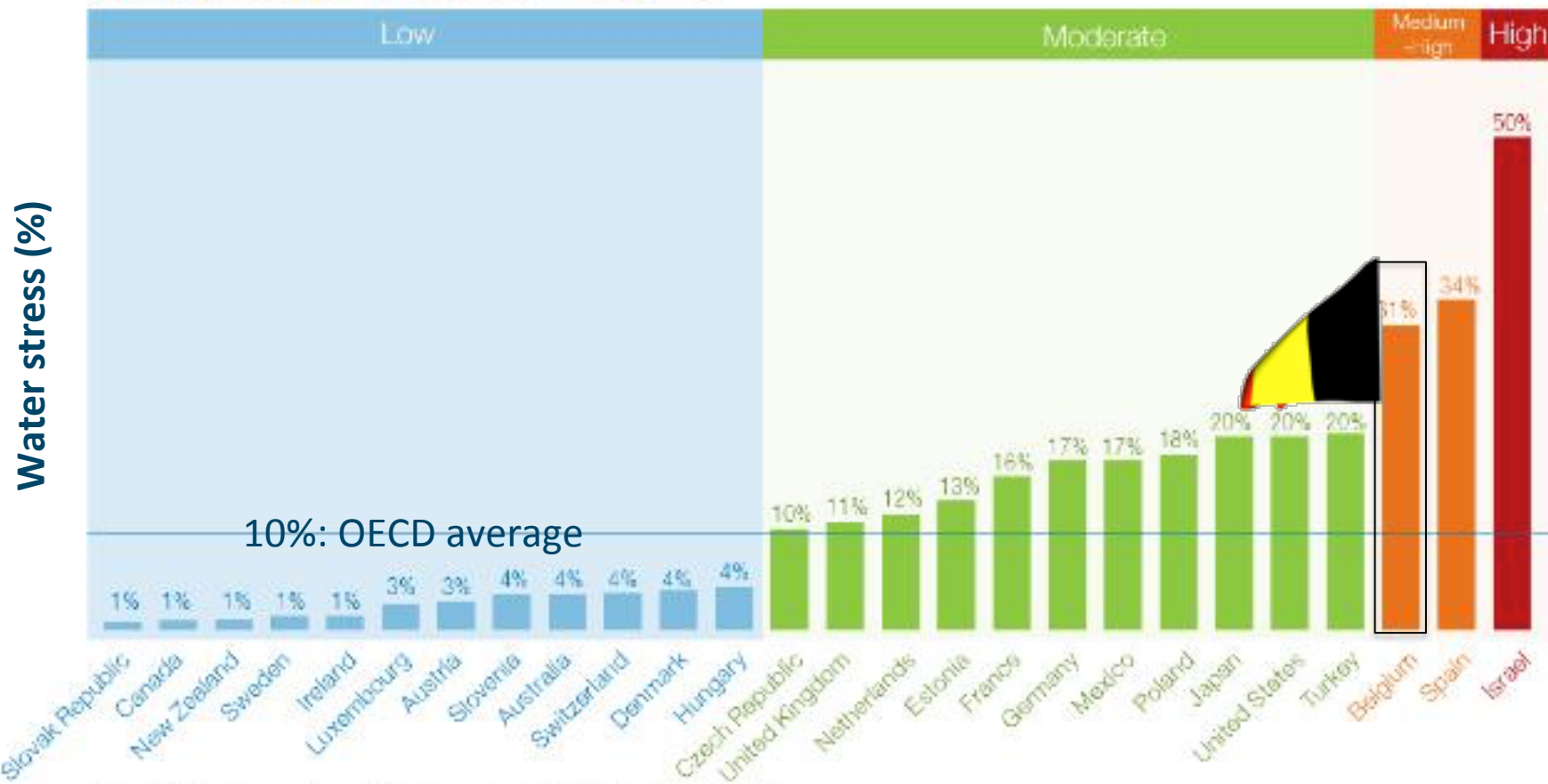


Do we have enough water in Belgium?

1. Not at all
2. Medium
3. Yes!

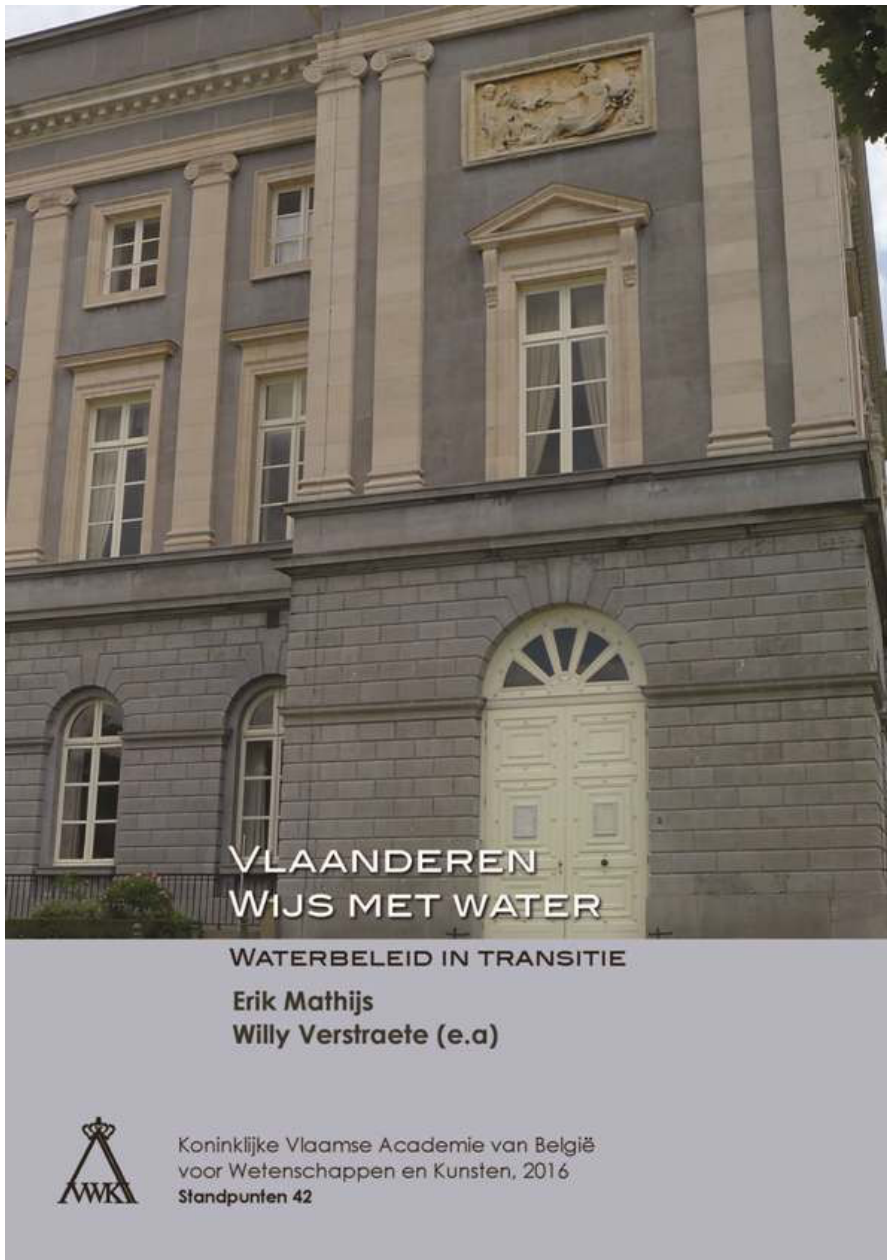


Water stress in OECD countries



Water stress: total freshwater abstraction/total renewable resources

(Environment at a Glance 2015, OECD indicators)



Water and climate

Flanders Wise With Water
(Available on www.kvab.be)

- “Climate change means that water supply will become more irregular and unreliable.”
- “..., the Region is at present certainly not properly prepared for challenges associated with various aspects of water and climate change.”
- “... more commitment is needed, particularly from the Flemish citizen. <...> The citizen must become convinced that a clever water management <...> assures not only economic advantages but also brings forward social advantages <...>.”

9 priority sectors for water sensitivity in Flanders

Based on an increase in water cost (based on ratio overall water costs/gross added value)
(Vlakwa, Socio-economic importance of water in Flanders, 2013)



Staal



Landbouw



Energie



Textiel



Chemie



Tank cleaning



Voeding



Horeca



Drinkwater

Who drinks bottled water (as opposed to tap water)?



Households: value for money?

dS+ VRIJDAG 18 NOVEMBER 2016 - BIZ

De waterfactuur is de jongste jaren al fors gestegen. Straks volgt een nieuwe opstoot. Ook de prijs van het **drinkwater** zelf gaat omhoog.

Waterfactuur lijkt hogere wiskunde

≡ dS De Standaard 🔍

HOME > NIEUWS > BINNENLAND

Schrijver roept op tot burgerlijke ongehoorzaamheid: 'Betaal uw waterfactuur niet'

17/11/2016 om 18:42 door adm



(De Standaard, 30/12/2015)

≡ dS De Standaard 🔍

HOME > BIZ

Tot 169 euro prijsverschil voor hetzelfde kraantjeswater

22/09/2016 om 07:30 door bart moerman, kristof simoens

Average water price

- For average use (100 L/IE/d) and average family size (2.5 IE/connection), incl. 6% VAT:

	Production & delivery DW	Municipal (WW transport)	Supra-municipal (WW transport + treatment)	Sum
EUR/year	175	164	117	456
EUR/m ³	1.92	1.80	1.27	5.00



- Conclusions:
 - Price **production/supply** < Price **sewerage/treatment**
 - Total water price 5 EUR/m³ = 0.005 EUR/L = about **100x cheaper than bottled water**
 - Budget of a Belgian family:
 - Average spending of 36,000 EUR/year (FOD Economie, 2015)
 - Hence, water cost: **1.25% of a family's budget**
 - For comparison: about **10x more** goes to **food and non-alcoholic beverages** – about the **same** goes to **alcoholic** beverages

Drinking water volumes and sources

Water-maatschappij	Totaal	Uit grondwater in Vlaanderen	Uit grondwater buiten Vlaanderen	Uit oppervlaktewater in Vlaanderen	Uit oppervlaktewater buiten Vlaanderen
Water-link	137.224.457	0	0	137.224.457	0
De Watergroep	119.970.772	85.957.982	0	34.012.790	0
ISWa leden	6.030.804	6.030.804	0	0	0
IWVA	3.678.481	3.678.481	0	0	0
IWVB	0	0	0	0	0
Pidpa	61.682.836	61.682.836	0	0	0
Farys	9.992.421	744.456	9.247.965	0	0
VIVAQUA	2.289.432	191.760	1.351.560	0	746.112
Vlaanderen	340.869.203	158.286.319	10.599.525	171.237.247	746.112

- ≈ **50%** from groundwater
- ≈ **50%** from surface water
- Water-link and De Watergroep:
 - Largest producers
 - The only ones producing from surface water
- 340.9 Mm³/year -> about 1 Mm³/d
- 1 Mm³ storage capacity -> **if all production stops, only enough water to bridge 1 day**

(<https://www.vmm.be/publicaties/drinkwaterbalans-voor-vlaanderen-2014>)



Micropollutants

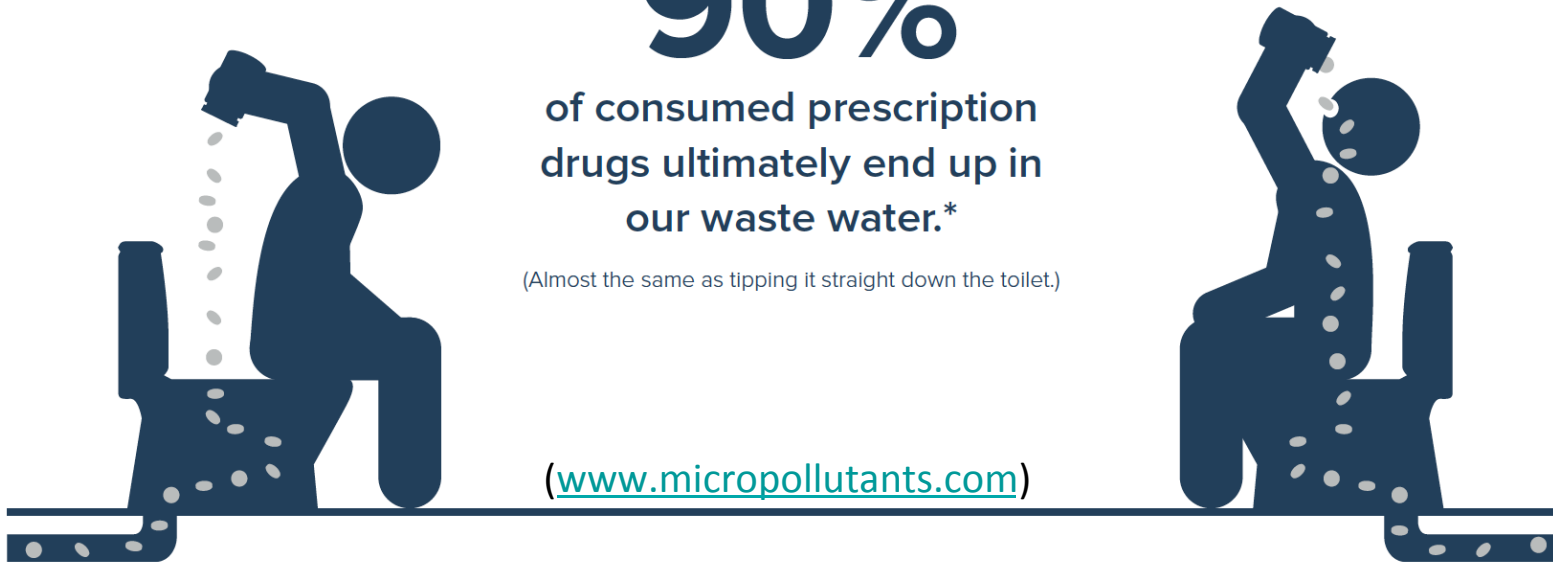
- An umbrella term for a large group of organic and/or mineral substances that are persistent, bioaccumulative and toxic @ low concentrations
- More than 100,000 compounds are commercially registered in Europe
- Micropollutants include groups such as:
 - Heavy metals
 - Pharmaceutical and Personal Care Products (PPCPs)
 - Pesticides
- Can bioaccumulate with unknown consequences for animal and human health
- They are often not or insufficiently removed by current wastewater treatment plants

90%

of consumed prescription
drugs ultimately end up in
our waste water.*

(Almost the same as tipping it straight down the toilet.)

(www.micropollutants.com)



'Micro'pollutant



- Carbamazepine concentration in drinking water: 5-500 ng/L (Luo et al., 2014)
- Weight of 1 sugar cube: 6 g (tiensesuiker.com)

⇒ Dissolve **1 sugar cube** in **5-500x** Olympic swimming pools (30,000 m³)

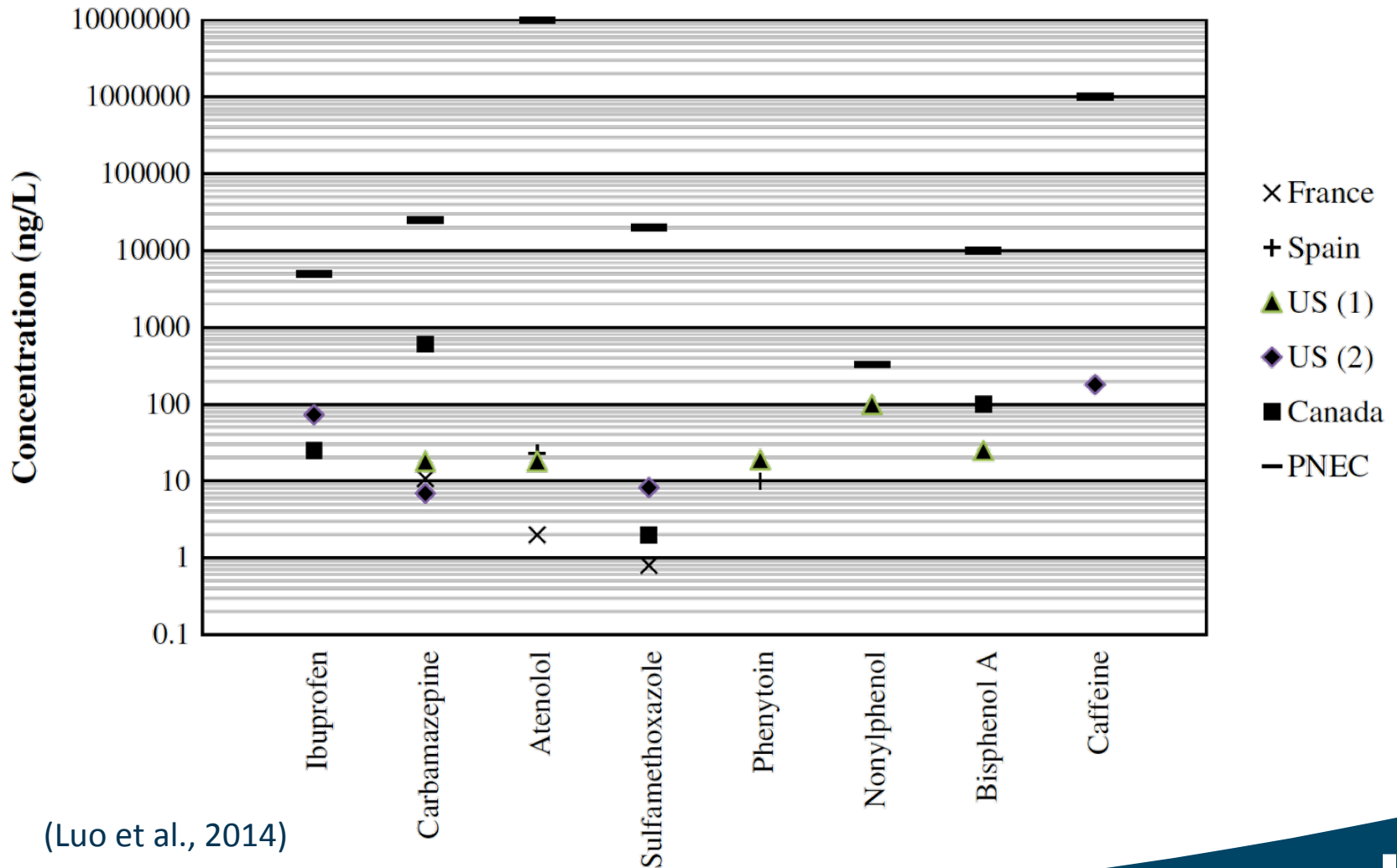
⇒ Highly **sophisticated detection** methods required, available at water-link

- **'Safe level'**, predicted no effect concentration (PNEC) for carbamazepine is 25,000 ng/L (Luo et al., 2014): 1 cube in 1/10 of a pool -> **50-5000x higher** than in water



 water-link

Don't worry,
predicted no effect concentrations (PNEC)
is typically orders or magnitude above
micropollutant levels in drinking water



(Luo et al., 2014)

Savings if you drink from the tap (1/2)

Lower health/safety risk

- Legally well controlled: ca. 60 parameters, including some micropollutants such as pesticides
- Good practice beyond legislation from tap water producers: e.g. **water-link quantifies almost 250 additional organics**, and screens qualitatively for other organics
- Some natural mineral waters are not suitable for regular consumption



Budget friendly

- 1 L/person/d and 2.5 IE/family -> 2.5 L/family/d = 910 L/family/year
- Price difference of 0.495 EUR/L -> **Savings of 450 EUR/family/year = price of the overall average water bill**



More comfort: less effort to carry around heavy bottles




drinKraantjeswater
water met een grote K



Savings if you drink from the tap (2/2)

Lower environmental burden due to production, packaging, transport and waste

- Similar or lower water footprint: 3.63 L/L (due to transportation losses) vs. 3.43-6.92 L/L (not cooled-cooled) (Niccolucci et al., 2011)
- Lower in energy and CO₂
 - US: 18 million barrels of oil to produce 29 PET bottles
 - Unnecessary transport over long distances, e.g. France to US, Iceland to Belgium,...
 - Ca. 300-500x less CO₂ than bottled water (mainly from oil for plastic bottles)
 - Ca. 1000-2000x less energy needed: 0.005 vs. 5.6-10.2 MJ_{th}/L (Gleick & Cooley, 2009)
- Less materials and waste:
 - Around 3-4 million tonnes of plastic/year (9x largest cargo ship)
 - Globally: most of plastic bottles are not recycled (US: 86%; Australia: 64%) -> burned, landfilled or contributing to the marine plastic soup



Water from an Islandic glacier, available in BioPlanet



Marine 'plastic soup'

Let's be critical for...

1. ... the **commercially driven** creation of fear (and market)
2. ... the lack of fact checking from **sensation driven journalists**
3. ... the pseudo-expert creating buzz on **health blogs**



Seller of activated carbon/
ion exchange filters
(www.brita.be)

Aqua Claro PURE

Onze omgekeerde osmosesystemen

Seller of reverse osmosis units
(<http://www.aquaclaro.be>)



Gewoon leidingwater
(na electrolyse)



Gezuiverd leidingwater
(na electrolyse)

ALKAVIVA

Seller of 'water ionizers'
(water electrolyzers)
(<http://teamalkaviva.com>)

What's in YOUR Water?
*The Truth About Contaminants
in Your Water*

EXPLORE

- CHOOSE THE CLEANEST
- LIVE THE HEALTHIEST



Good examples



BoomBar: Kraantjeswater (evtl. met biologisch siroopje) in herbruikbare bekens voor festivals
(www.boombar.be)



kriwtr: Waterkoelers, kannen,...
(www.boombar.be)



Water coolers and
reusable bottles
(University of Antwerp)

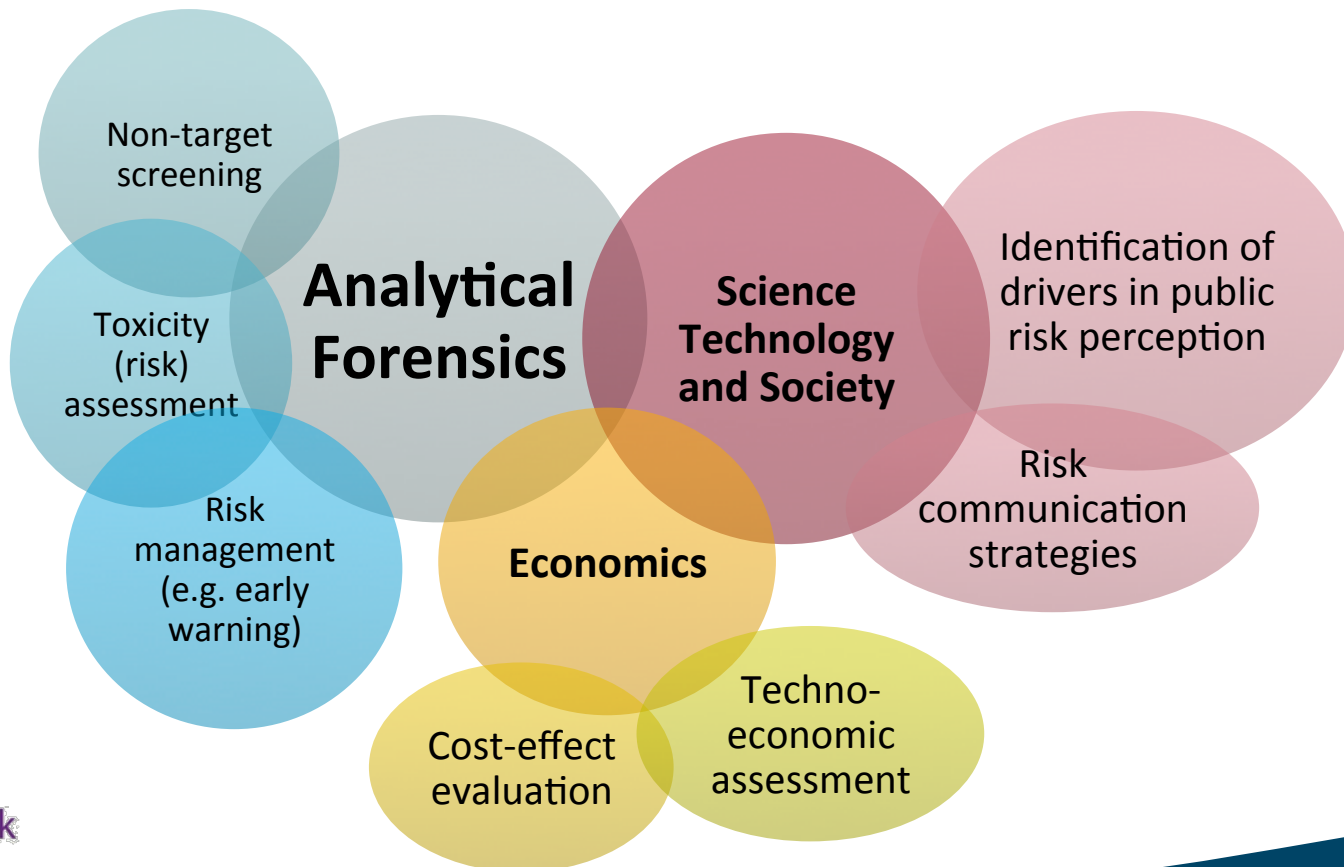


Beer from recycled water:
'From sewer to brewer'
(www.dewildebrouwers.be)

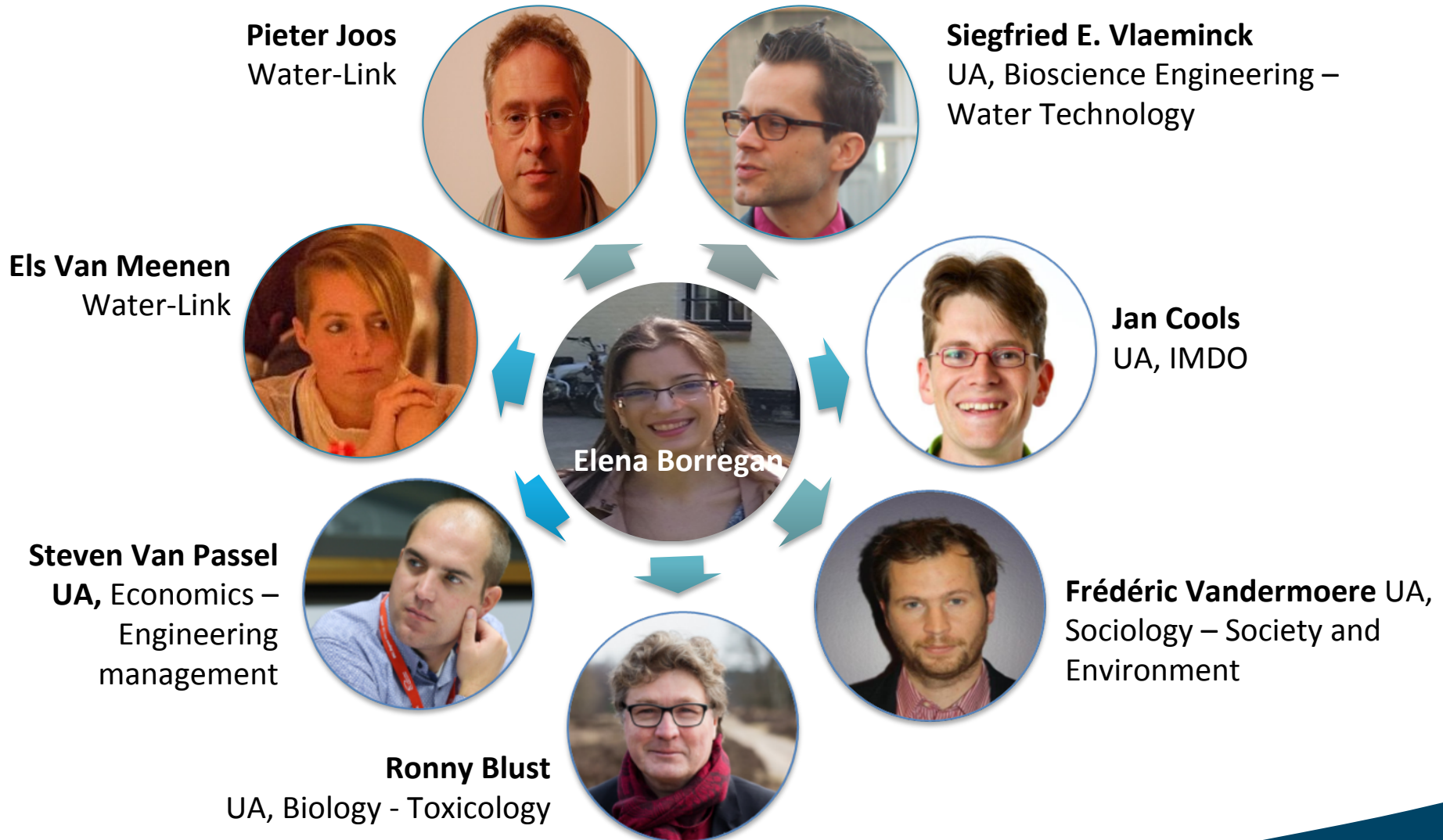
PhD topic of the Water-Link chair: An integrated risk-based approach to micropollutants in drinking water

Case: emerging **organic micropollutants** in (drinking water produced from) **surface water**

Interdisciplinary approach to **manage** associated **risks**:



A multidisciplinary scientific team



UAntwerpen en water-link starten onderzoek naar nog zuiverder drinkwater

 Print

GAZET VAN ANTWERPEN

NIEUWS

WAT TE DOEN

SPORT

SHE.

GVA+



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