Global imbalance in nutrients and need to change nutrient management

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Date:	May 30th 2018
Time:	08:30 - 17:30
Venue:	**Committee of the Regions** (Belliardstraat 99-101, 1040 Brussels, BE) Room: **JDE 52** Please register before May 25: LINK

08h30 Registration and Coffee

09h00 **Setting the scene: the role of water technology in unlocking the circular economy**

Welcome by Klaas Kielstra (NL/ ALDE), CoR-Member, Province of Fryslân

Jan Weijma, LEAF and WUR, introducing the global imbalance in nutrients and need to change nutrient management. (20 min) (questions 5 min)

Hans Stielstra, Deputy Heaf of Unit Clean Water, DG ENV, EU Water legislation supporting drinking water, water reuse and circular economy. (20 min) (questions 10 min)

Cees Buisman, Wetsus, High-risk research transforming new ideas into breakthrough innovations and start-ups. (20 min) (questions 5 min)

(10 min for late arrivals, or more time for questions or coffee later)

~~10:30 coffee break, cake~~

11h00 **Research and Scaling up Inventions: Barriers and Financing**

Stephan Bocken, CEO Paques BV (NL), CEO, transforming waste water into biogas and bioplastics (30 min) (questions 5 min)

Marc Feyaerts, Ecoloro (NL, SME), innovative waste water treatment for textiles sector (10 min) (questions 5 min)

Erik Pijlman, CEO KNN Cellulose (NL, start-up), cellulose recovery from waste water (10 min) (questions 5 min)

Leon Korving, Green Water Solution (USA, start-up), nutrient removal and recovery. How to win the George Barley Water Prize and cash 10 million dollars? (10 min) (questions 5 min)

(5 min for changes and 5 minutes for extra questions)

~~12:30 lunch~~

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Why are nutri portant?

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Estimates of increase in food demand

	2050	2100
Alexandratos & Bruinsma (2012)	55 %	
Tilman et al (2011)	100 – 110 %	
Bijl et al (2017)	55 – 80 %	40 – 175 %
OECD (2016)	25 – 85 % (cereals) 0 – 90 % (animal)	

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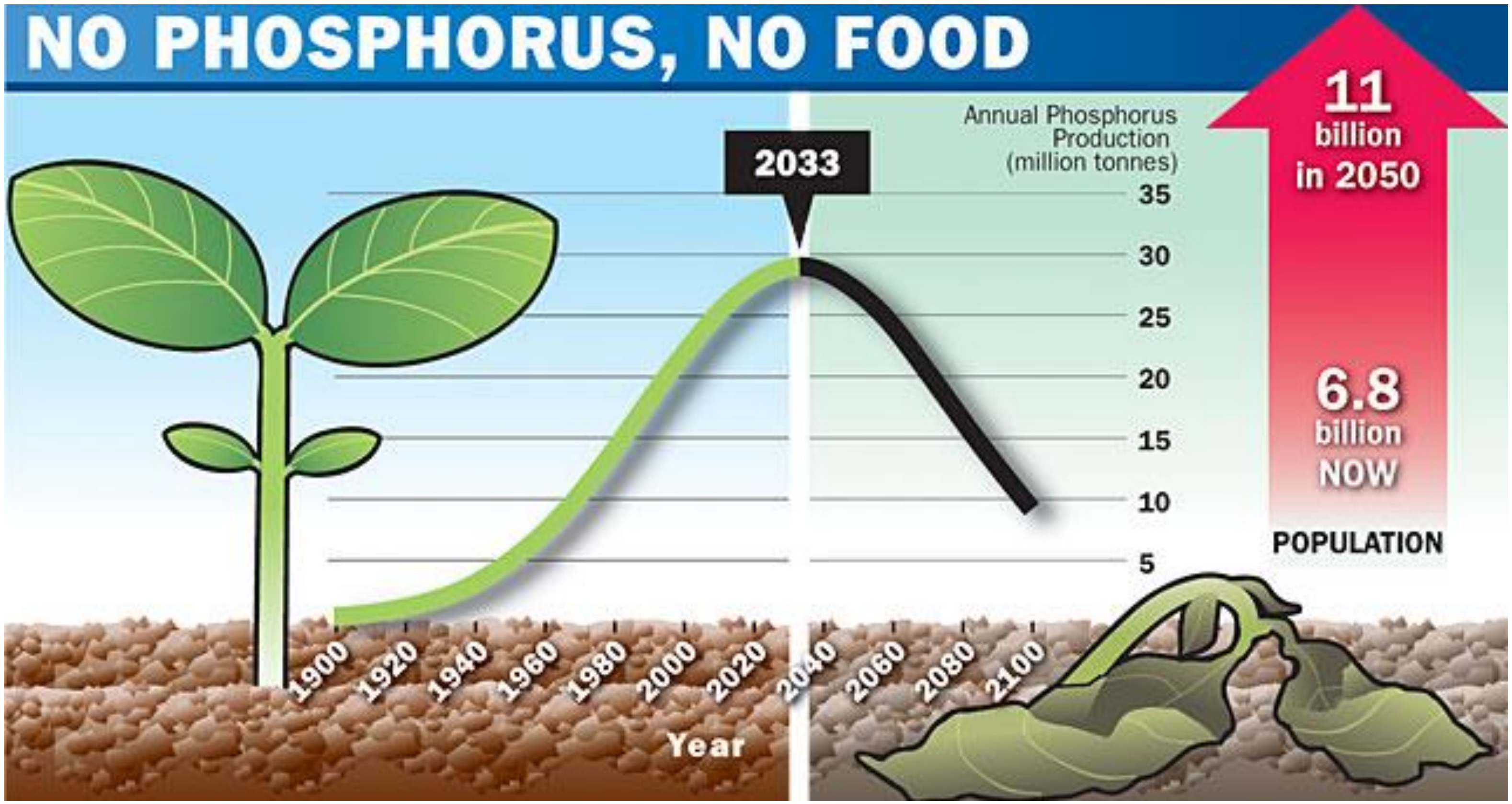
More food, more fertilizer needed

Case nitrogen

Study	Baseline year	Fertilizer use in baseline yr Tg/y	2030	2050
Alexandratos and Bruinsma (2012)	2005/ 2007	95	132	150
Tilman et al. (2011)	2000	87		100-225
FAO (2017) Fertilizer outlook	2015	110	119	

+15 to 158%

Scarcity of Phosphorous threatens food supply on human times scales



Cordell et al. 2009, 2011

Not only P nutrient reserves are limited

Element	R/P 1)	Econ. 2)	Supply Risk 3)	Use in Agric. (%)	Recycling (%)
B	49	5.0	0.6	12	0
Co	77	7.2	1.1	<1	24
Cu	43	5.7	0.2	<1	32
Mo	40	8.9	0.5	<1	30
Se	47	?	?	10	0
Zn	20	9.4	0.4	<1	27
P	40-400	?	?	90	10-50

1) R/P = Reserves (known) / Production (annual)
2) Economic importance, with 10 most important
3) Supply risk is high if value >1 and low when value is <1

Chardon & Oenema, 2013

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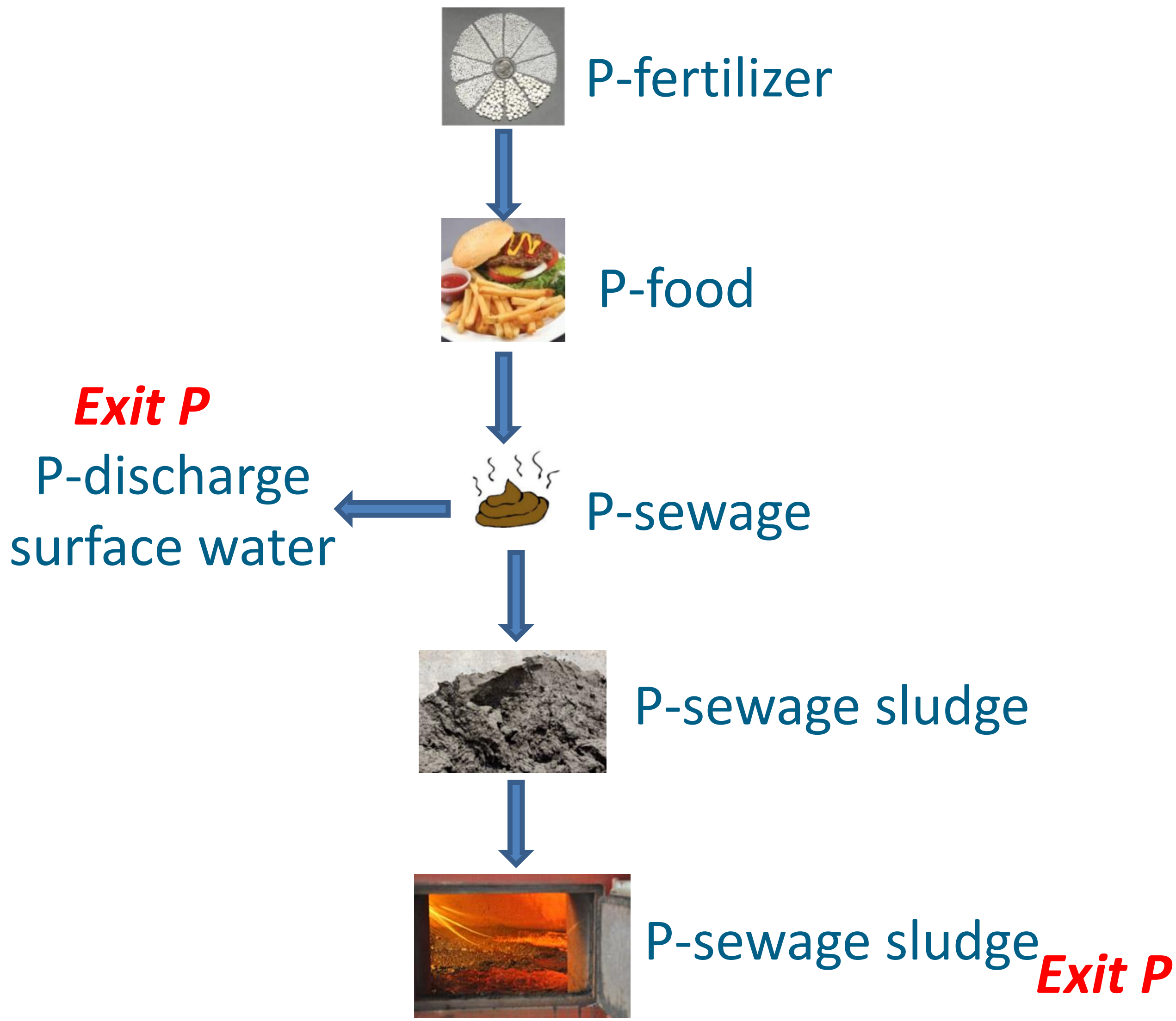
Wastewater now: “dead end” for nutrients



Nutrient losses from wastewater are large

2011

chemical
214 Mkg N
7 Mkg P

human excreta
89 Mkg N
14 Mkg P

CBS. http://statline.cbs.nl/StatWeb. (2017).

Smit, A., Van Middelkoop, J., Van Dijk, W. & Van Reuler, H. A substance flow analysis of phosphorus in the food production, processing and consumption system of the Netherlands. *Nutrient Cycling in Agroecosystems* **103**, 1-13 (2015).

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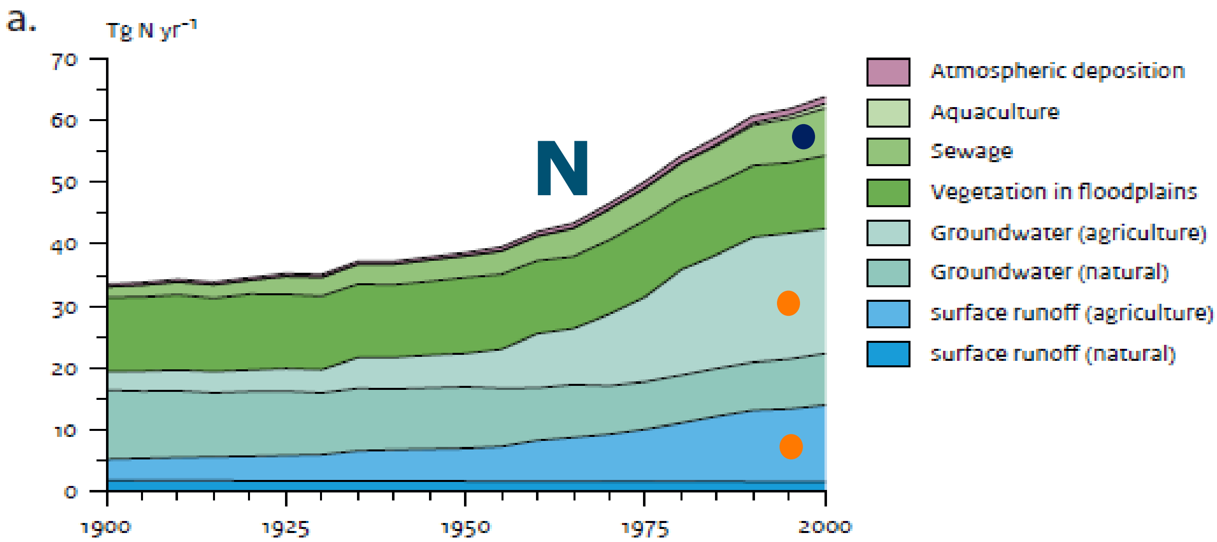
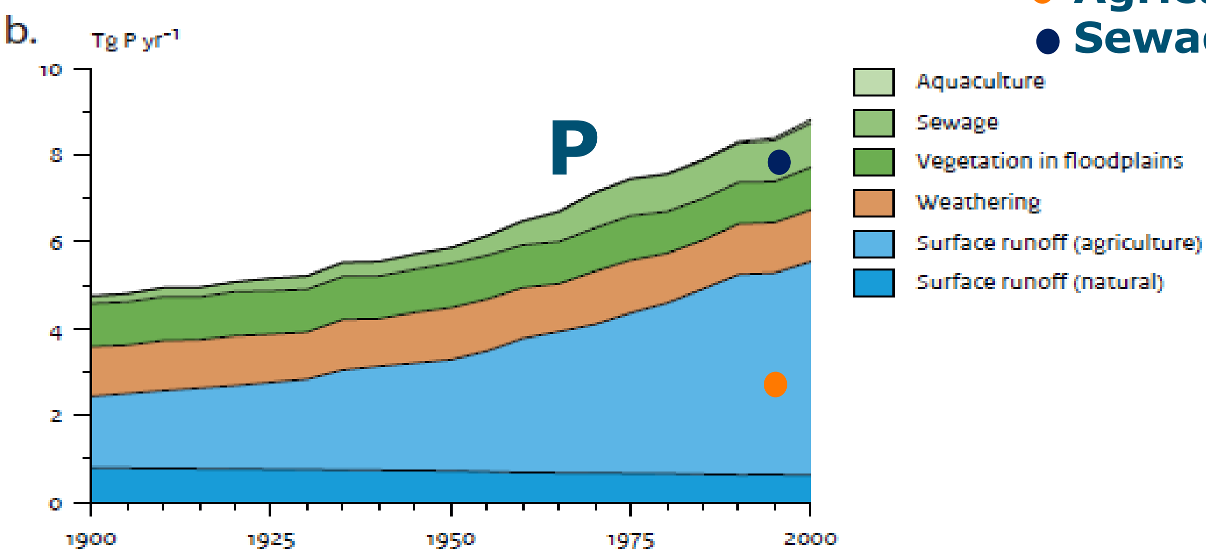
Global N and P delivery to surface waters



● **Agriculture/aquaculture**
● **Sewage**



(Beusen et al 2016).

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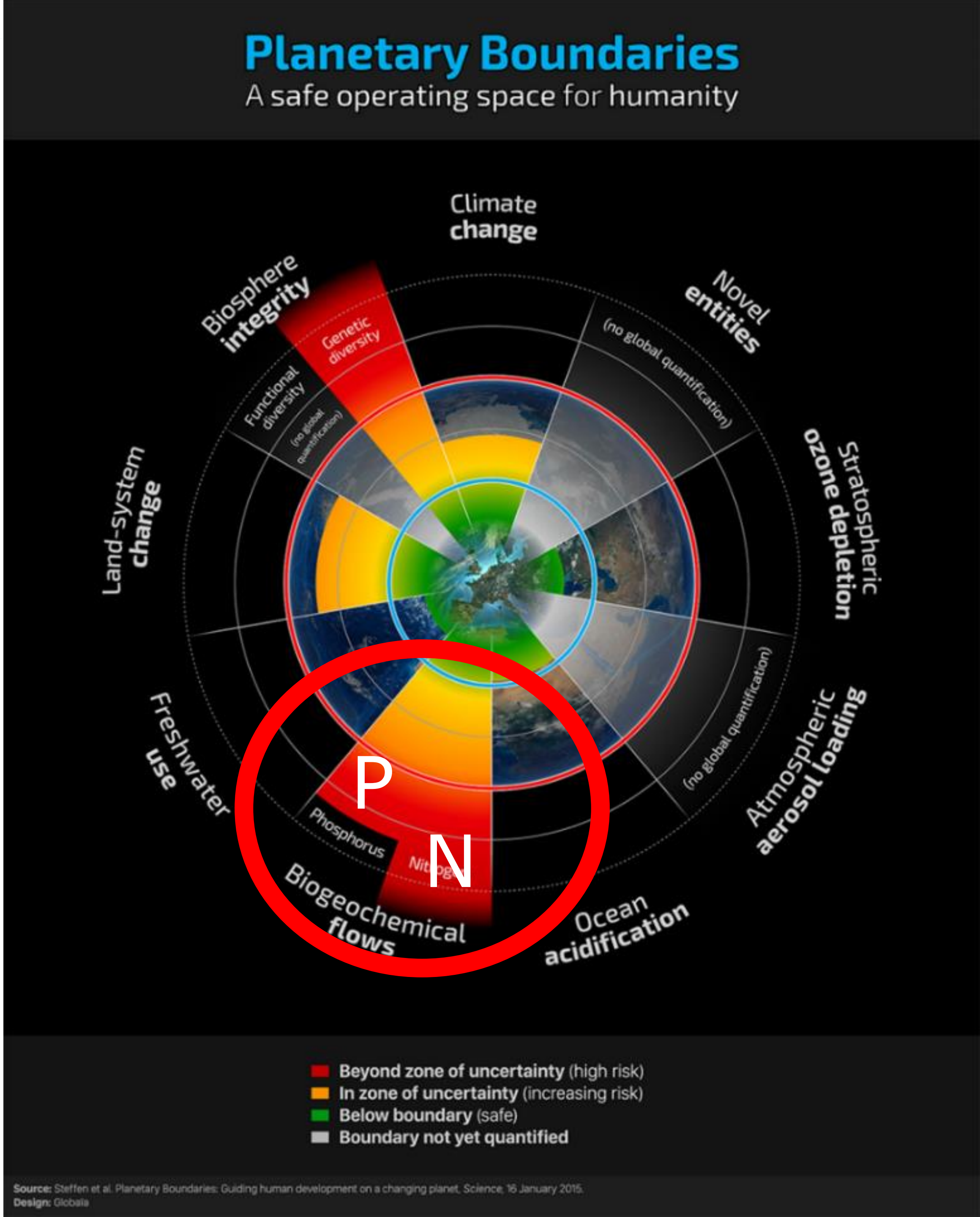
Nutrient losses from food systems are too high



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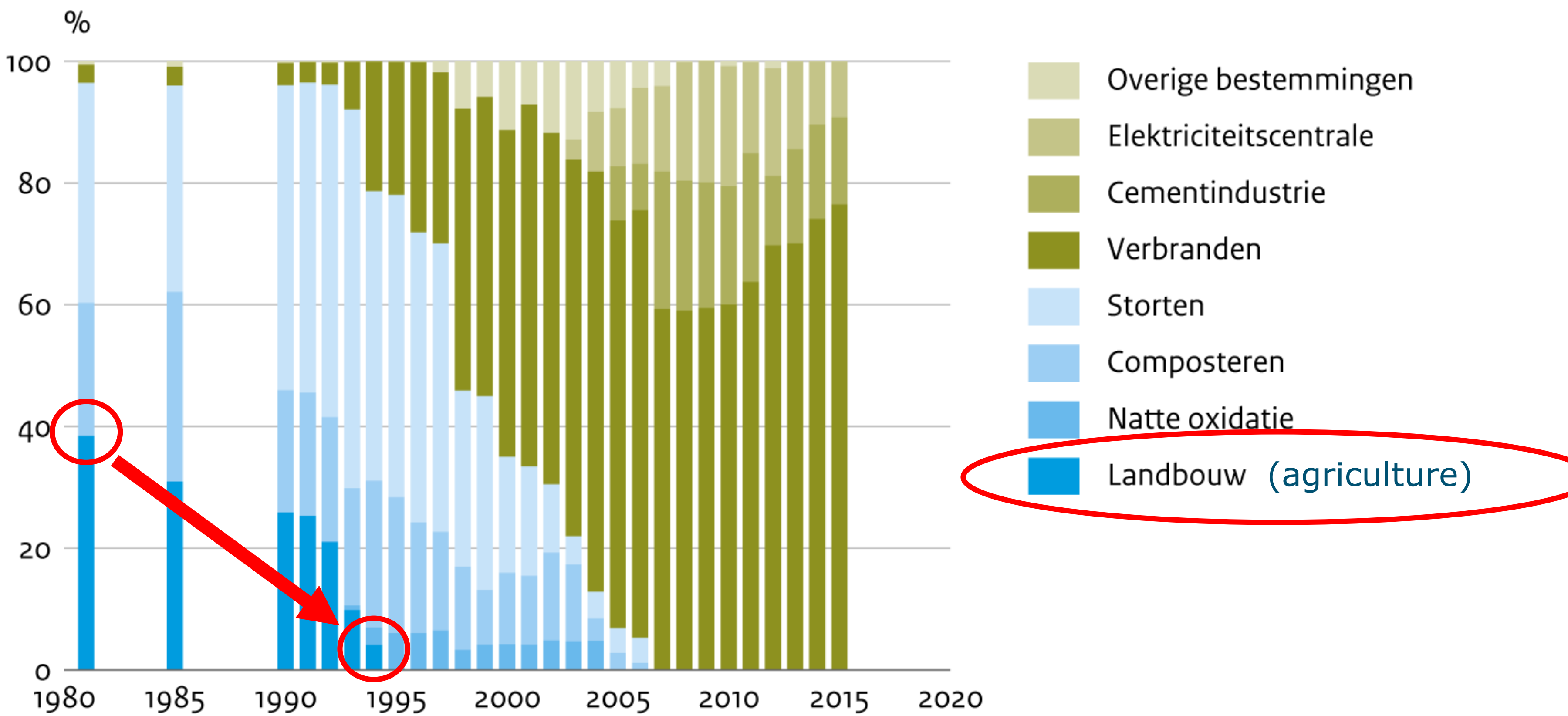
Sewage sludge contains up to 90% of P and up to 30% of N in sewage



Bron: CBS

CBS/mei17
www.clo.nl/nl015418

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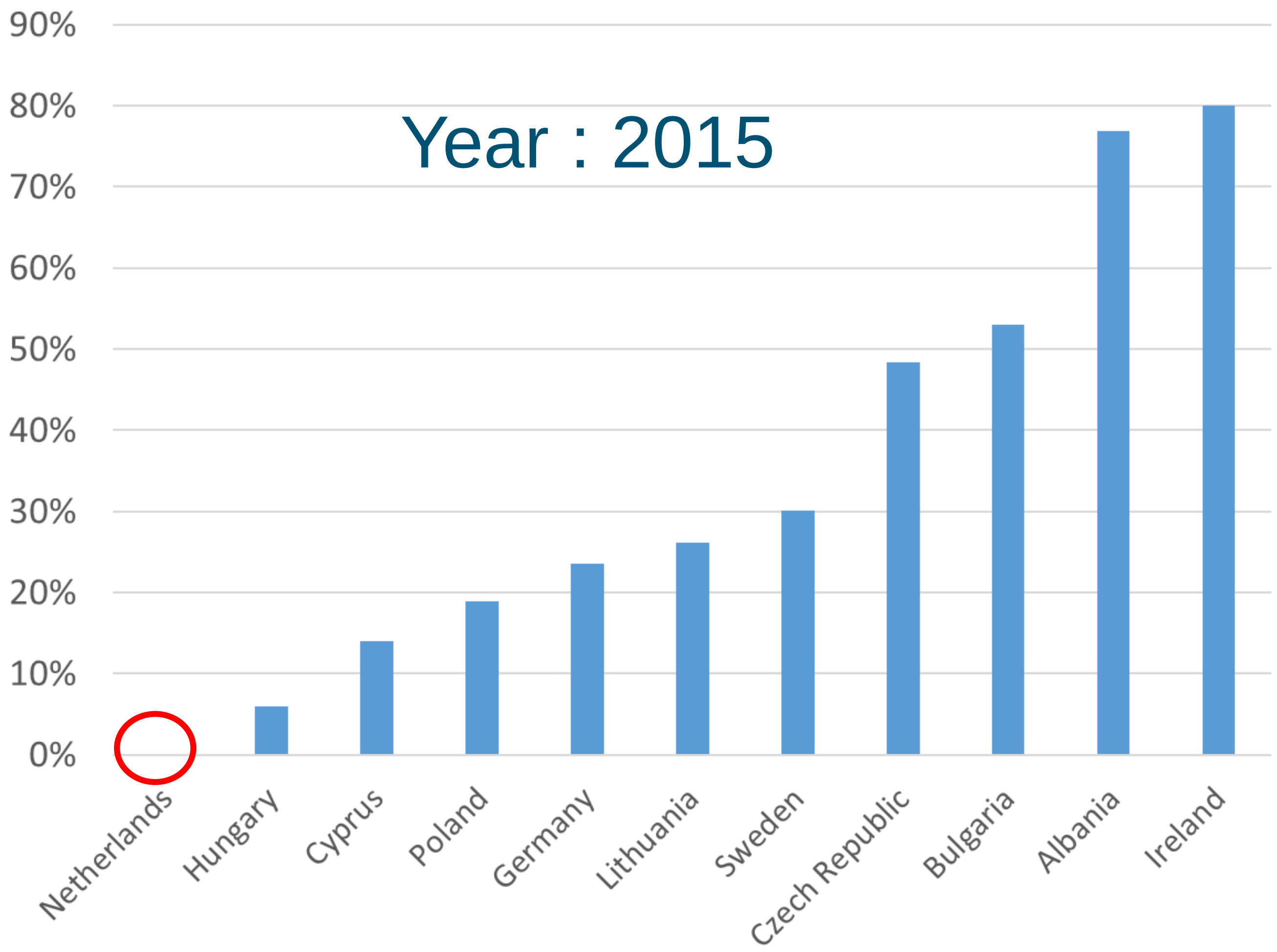
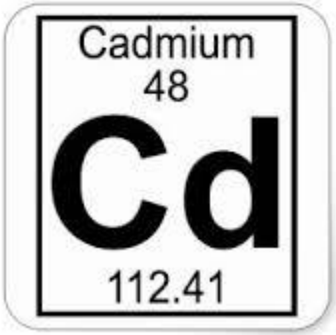
No use of sewage sludge nutrients in Dutch agriculture

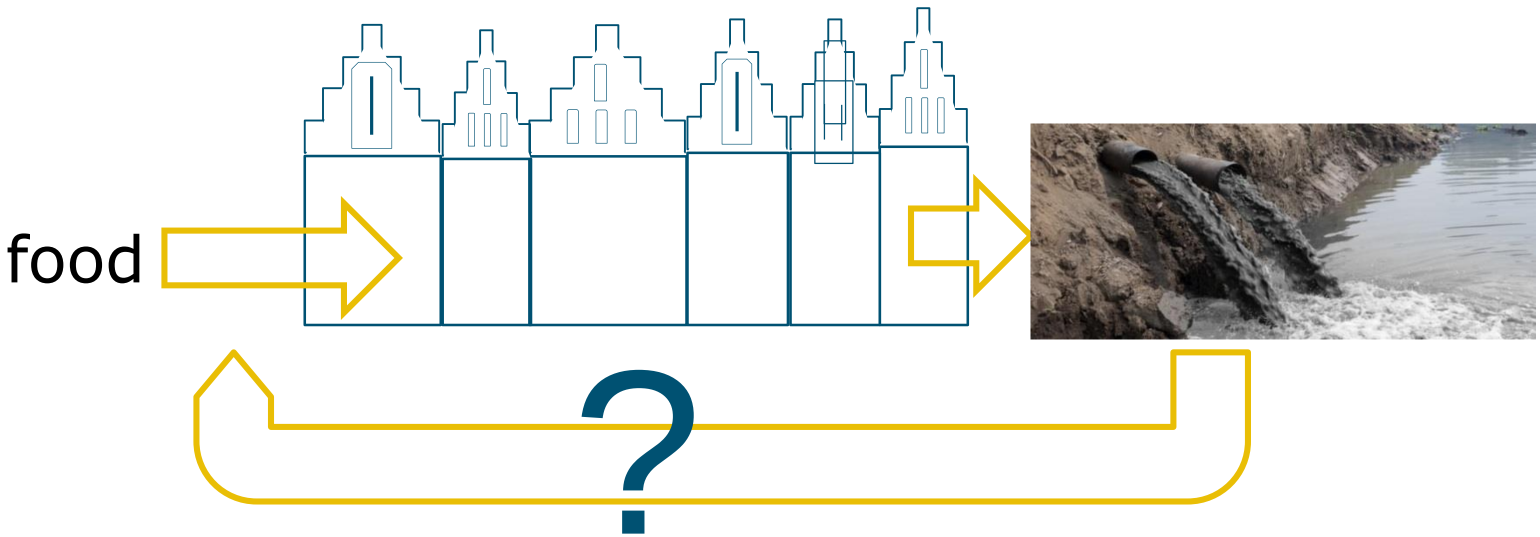


Source: Eurostat

Sewage sludge is a sink for



Breach the nutrient deadlock: short-term strategy



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Breach the nutrient deadlock: short-term strategy

Nutrient extraction from sewage sludge through phase transitions

Digestion and precipitation → P

Digestion and stripping → N

…nposting and horticulture → N, P, etc

Worm … → C, N, P, etc

………………… → ……

Wanted: Innovation

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Nutrient extraction through phase transitions separates nutrients from contaminants

Safe fertilizers, organic products

Sludge residue, chemical waste

But: only a fraction of nutrients maximally recovered

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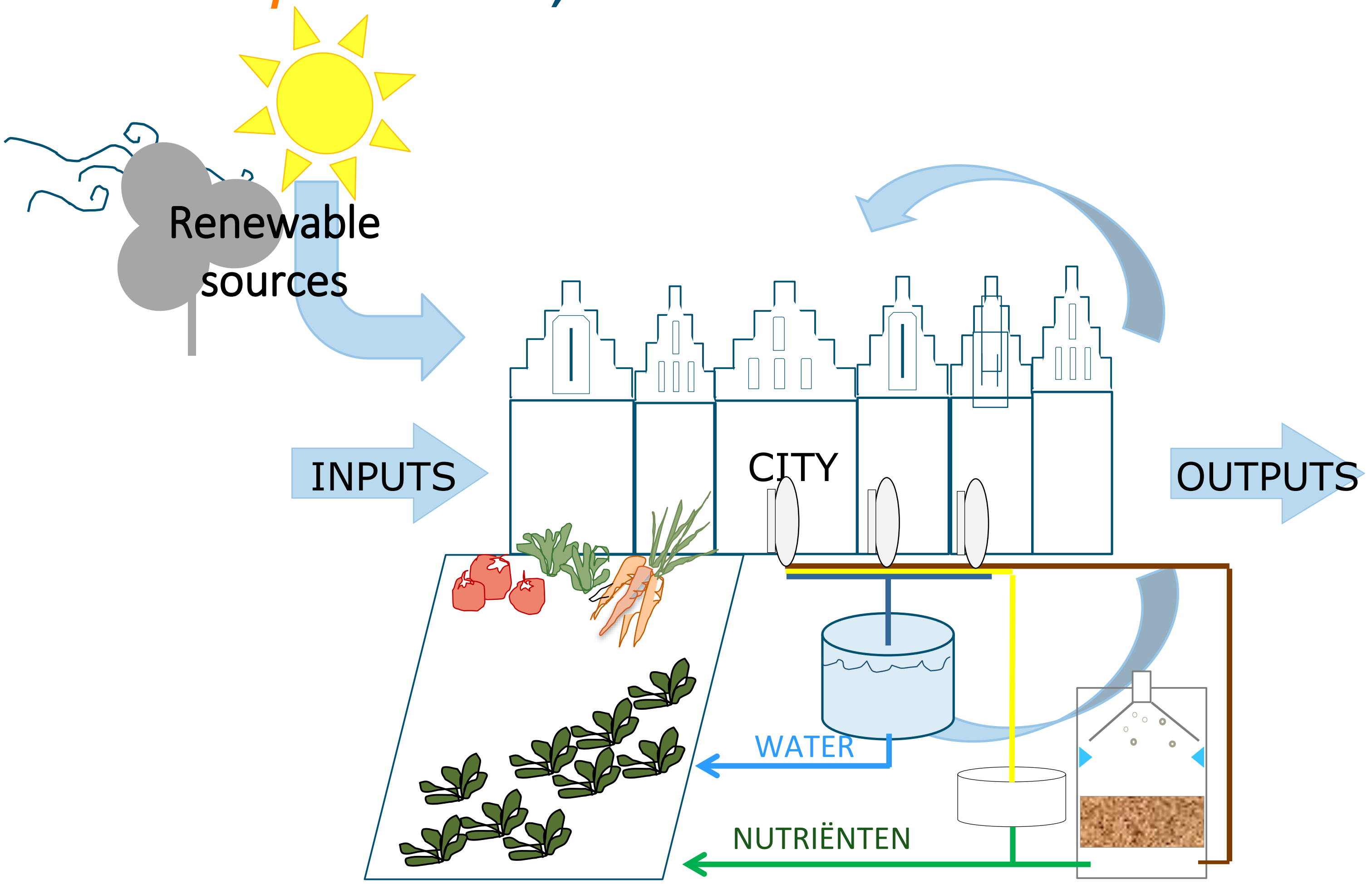
Breach the nutrient deadlock: long-term strategy

Source separation, no mutual contamination



(Wielemaker, 2015)

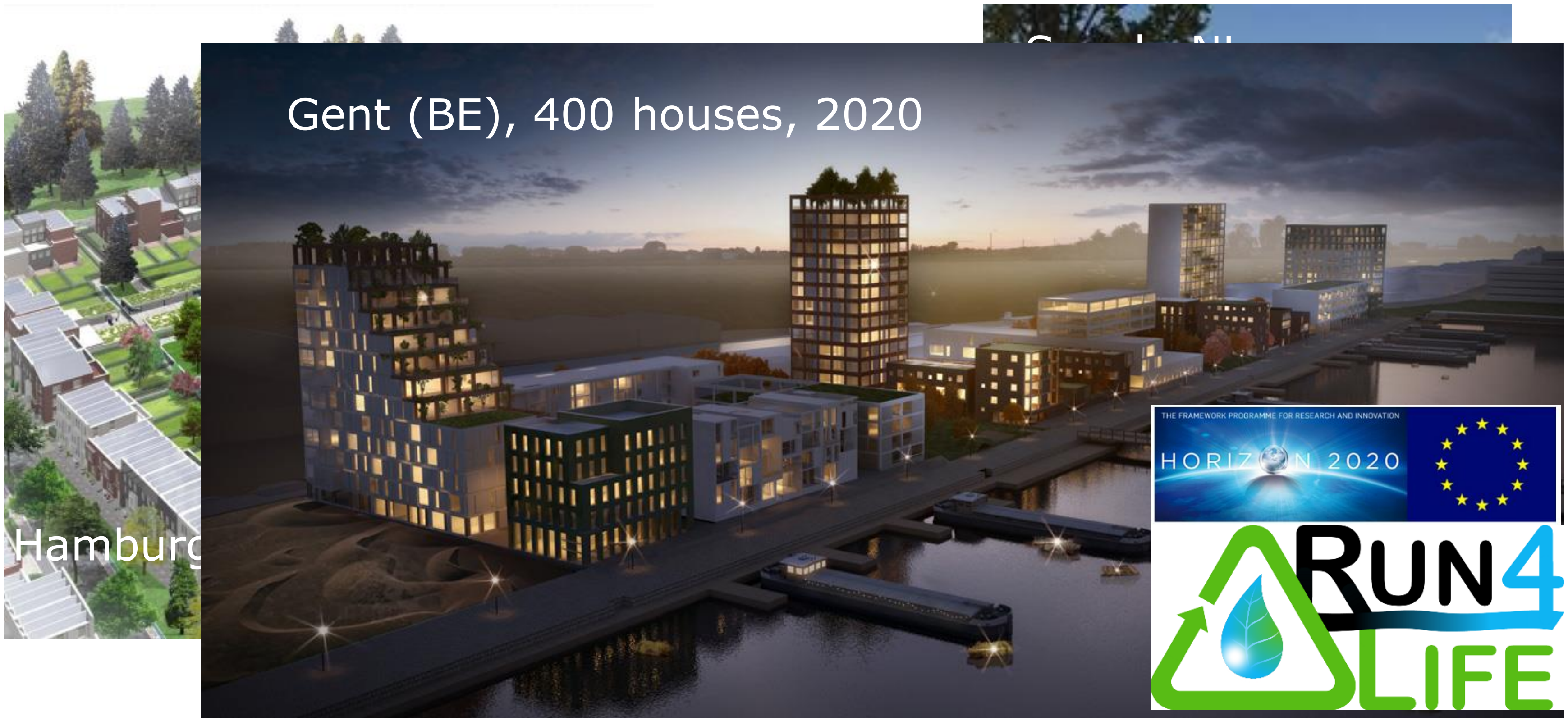
Nutrient extraction from source separated streams prevents contaminants of nutrient products

Safe fertilizers, organic products

Innovation needed

System change for the 21st century

Nutrient extraction from source separated streams



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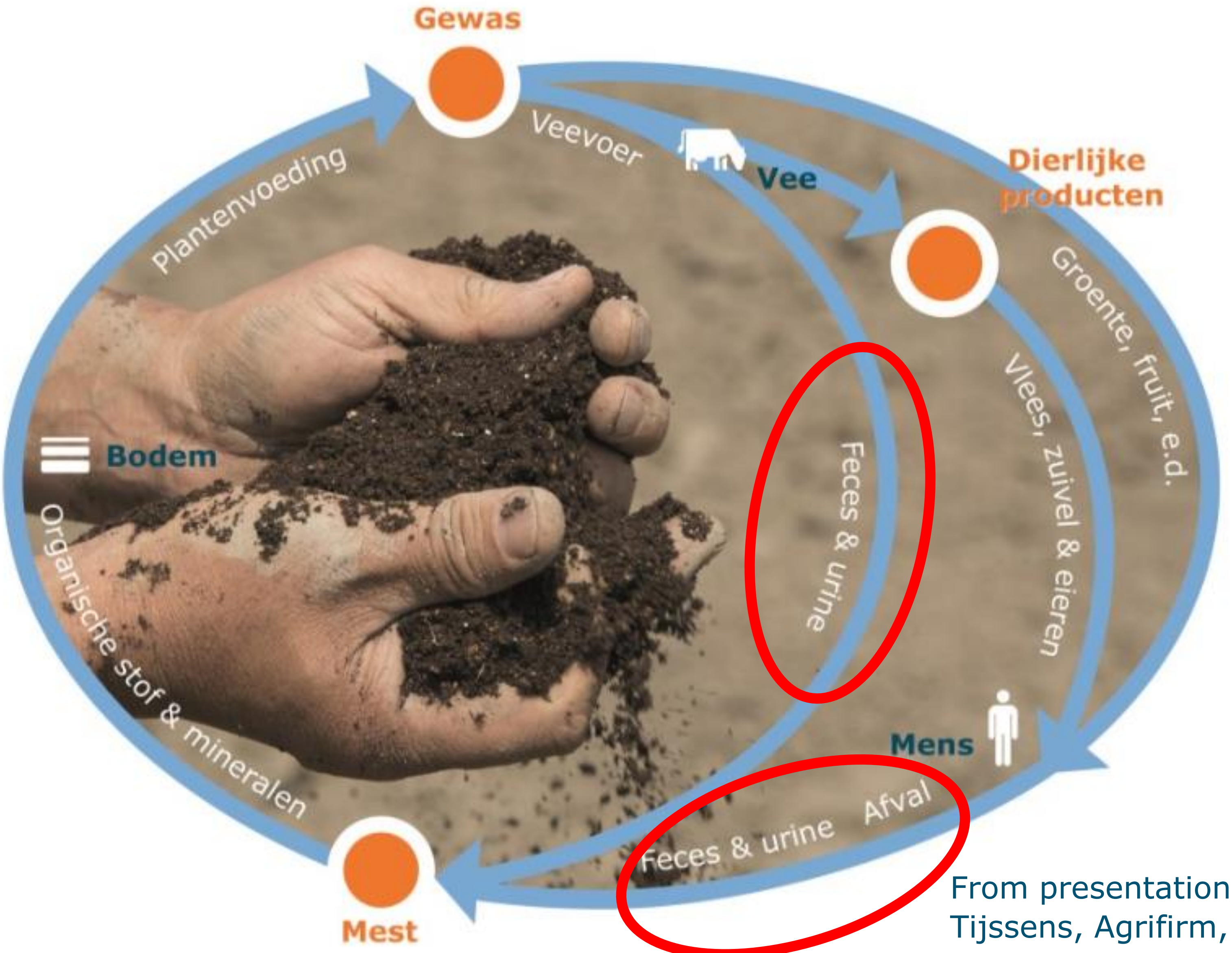
Water technology in the nutrient system



From presentation Ruud Tijssens, Agrifirm, Wageningen, nov 2017

Conclusion

To reconcile growing food demand with nutrient cycling and preventing nutrient emission, a system make over is needed, including waste “side”

Mission

Circular nutrient and water management

2030 ***“Reduce the nutrient losses from EU food system with 25%”***

Now

Wastewater management with massive loss of nutrients

Thank you for your attention

Agile Team
CirculaResource

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Oene Oenema

Theun Vellinga

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