Water Management:

Nutrient solution recirculation techniques and regulations in Europe

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For quality of life

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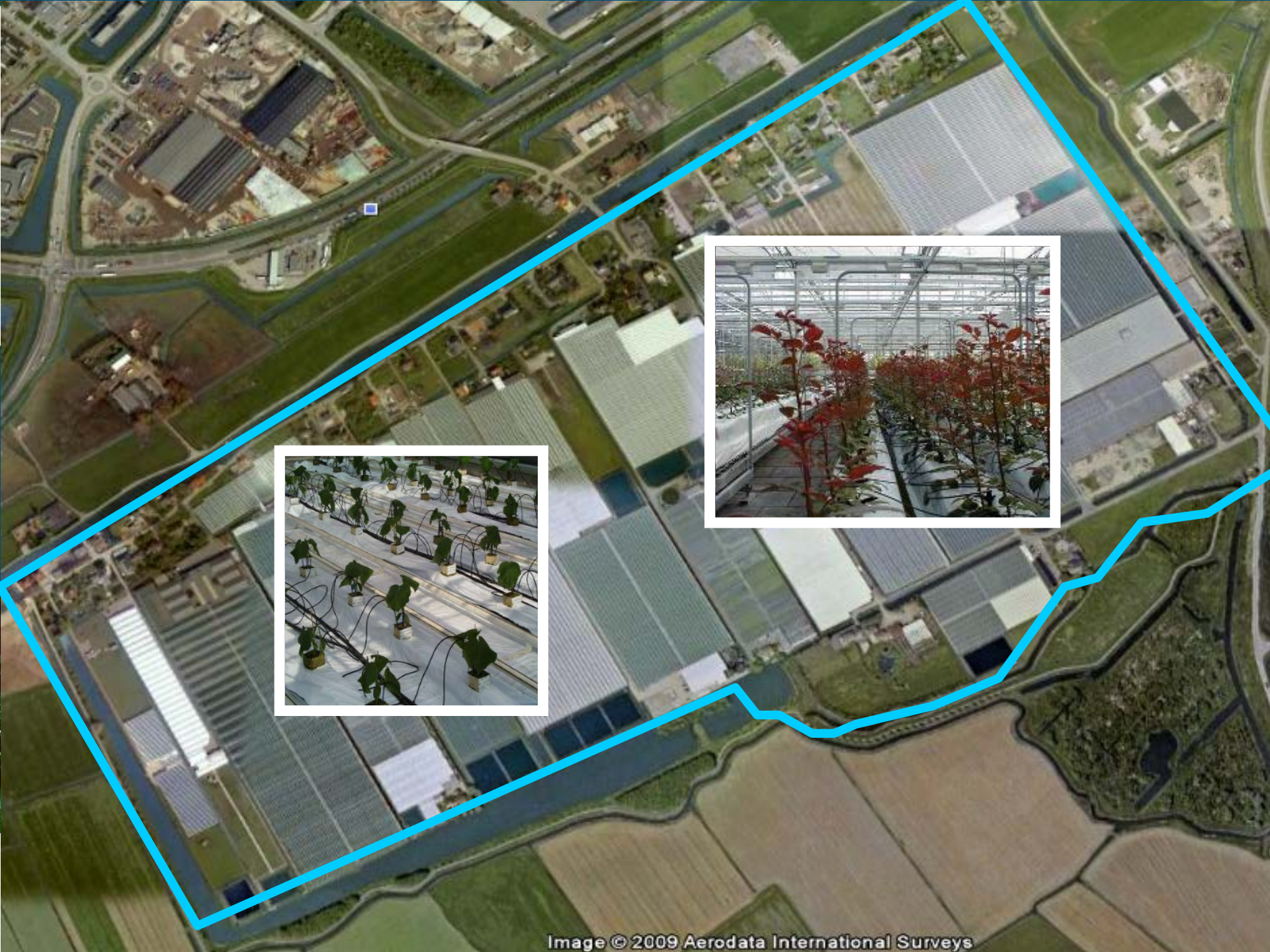
Outline

- Why re-use of nutrient solutions?
  - Legislation
  - Surface water quality
- Emission routes and reasons to discharge
- How to increase re-use
  - Easy solutions
  - Research

Why re-use of nutrient solutions?

1. EU legislation “Water Framework directive” (KRW):
   - “Good chemical and ecological quality of surface water and groundwater by 2015 (or 2027)”

How does this look in glasshouse areas in the Netherlands?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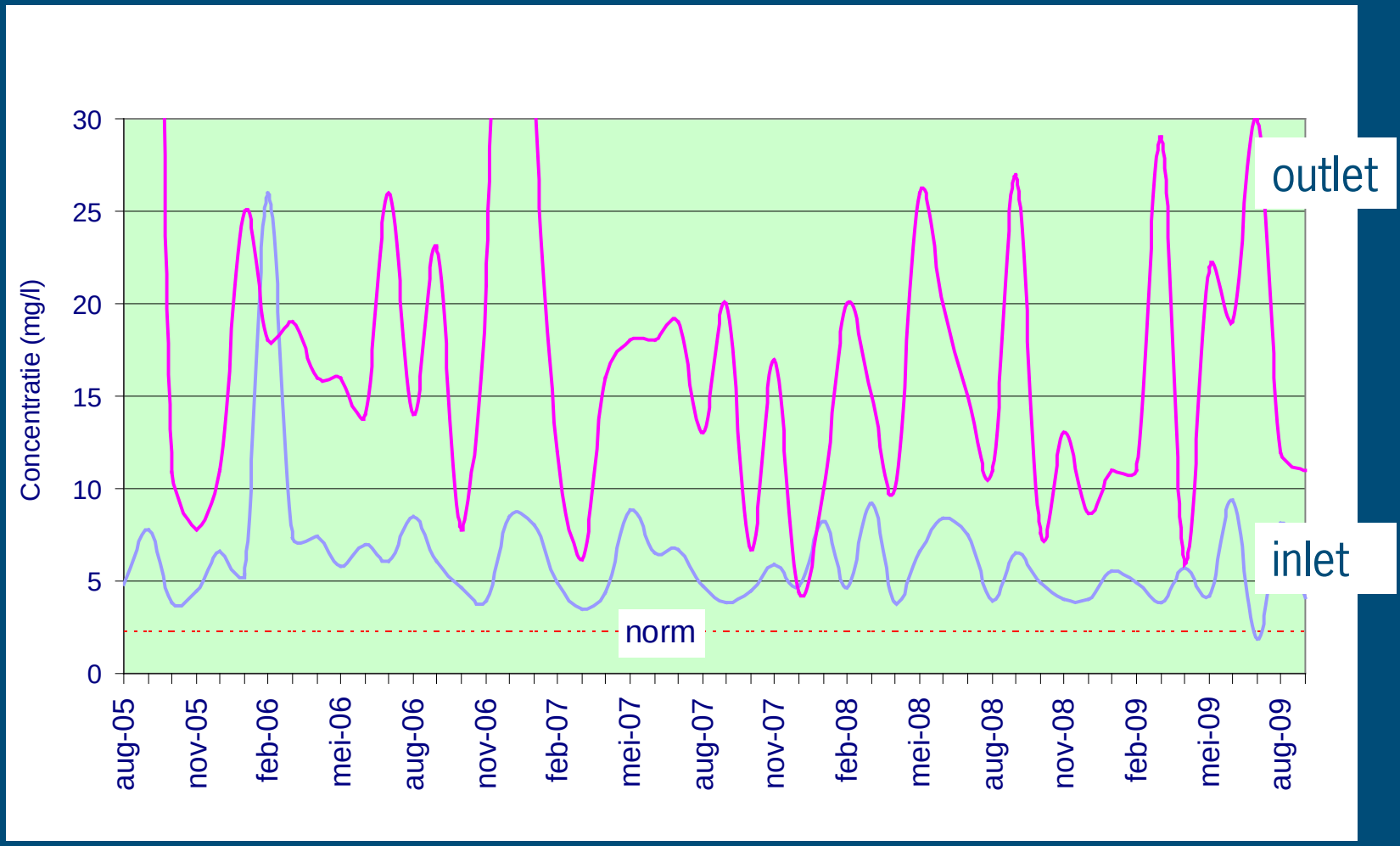
N (mg/l) in surface water glasshouse polder



Legislation

- Presently: re-use of water is obligatory
  - No discharge below Sodium threshold value
  - Residual discharge water on sewage system
  - Obligatory 500 m3/ha rainwater storage
- From 2012: agreement between government and grower's organisation LTO
  - Zero discharge of N and P in **2027** to be reached step by step …

Proposed emission norms N (kg/ha/year)

up to year:	2014	2017	2020	2023	2026	2027	
1	25	25	25	12,5	6	Ca. 0	anthurium, other vegetables
2	50	33	25	17	8	Ca. 0	sweet pepper, orchids
3	75	50	38	25	13	Ca. 0	
4	100	67	50	33	17	Ca. 0	
5	125	83	67	42	21	Ca. 0	tomato
6	150	100	75	50	25	Ca. 0	cucumber, potted plants, other ornamentals
7	200	133	100	67	33	Ca. 0	
8	250	167	125	83	42	Ca. 0	gerbera, rose
9	300	200	150	100	50	Ca. 0	phalaenopsis

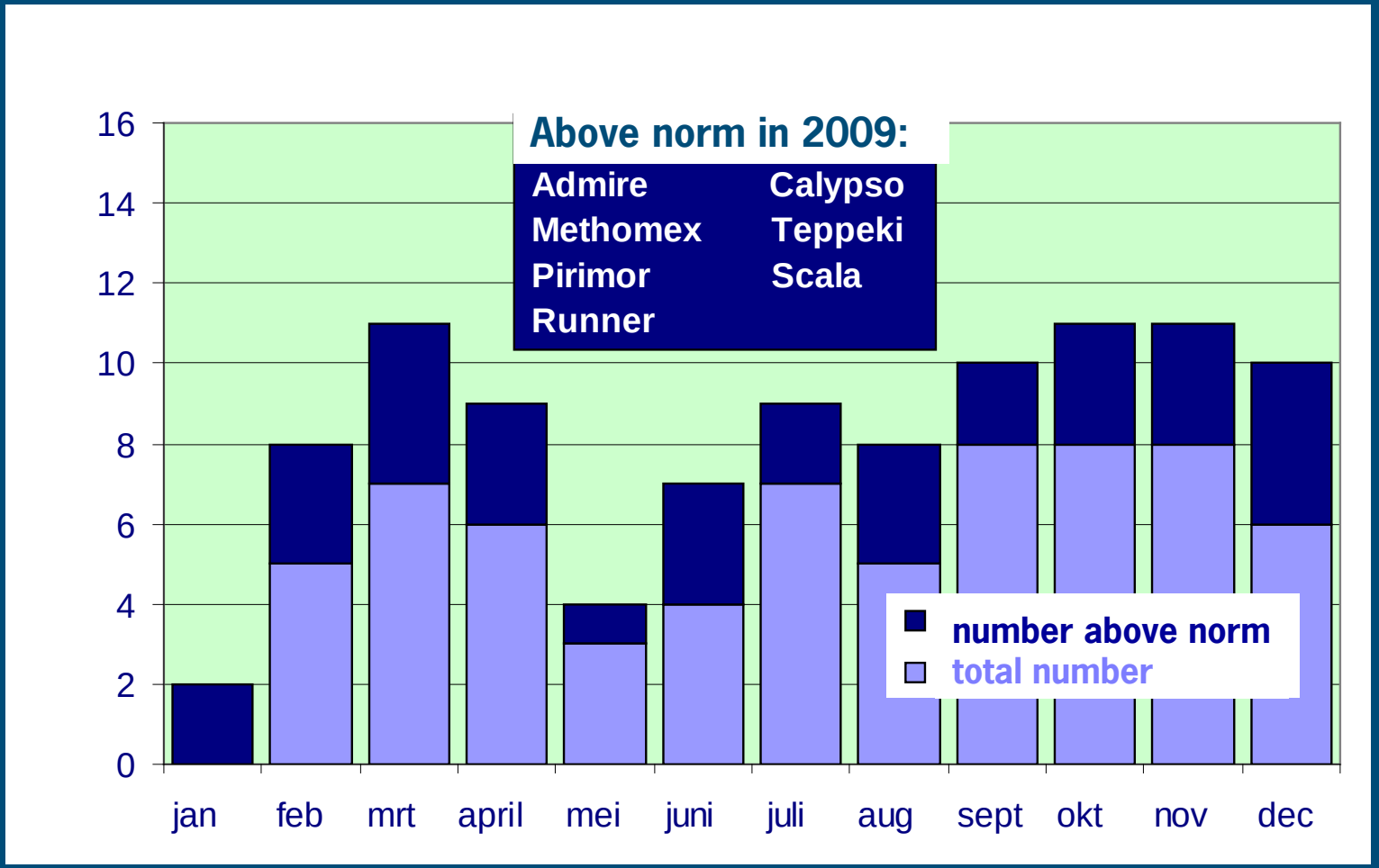
Why re-use of nutrient solutions?

2. Levels of plant protection products (PPP) above norms
   - Consequences for registration (NL/EU) to be expected from 2013 onwards (banning of many PPP)

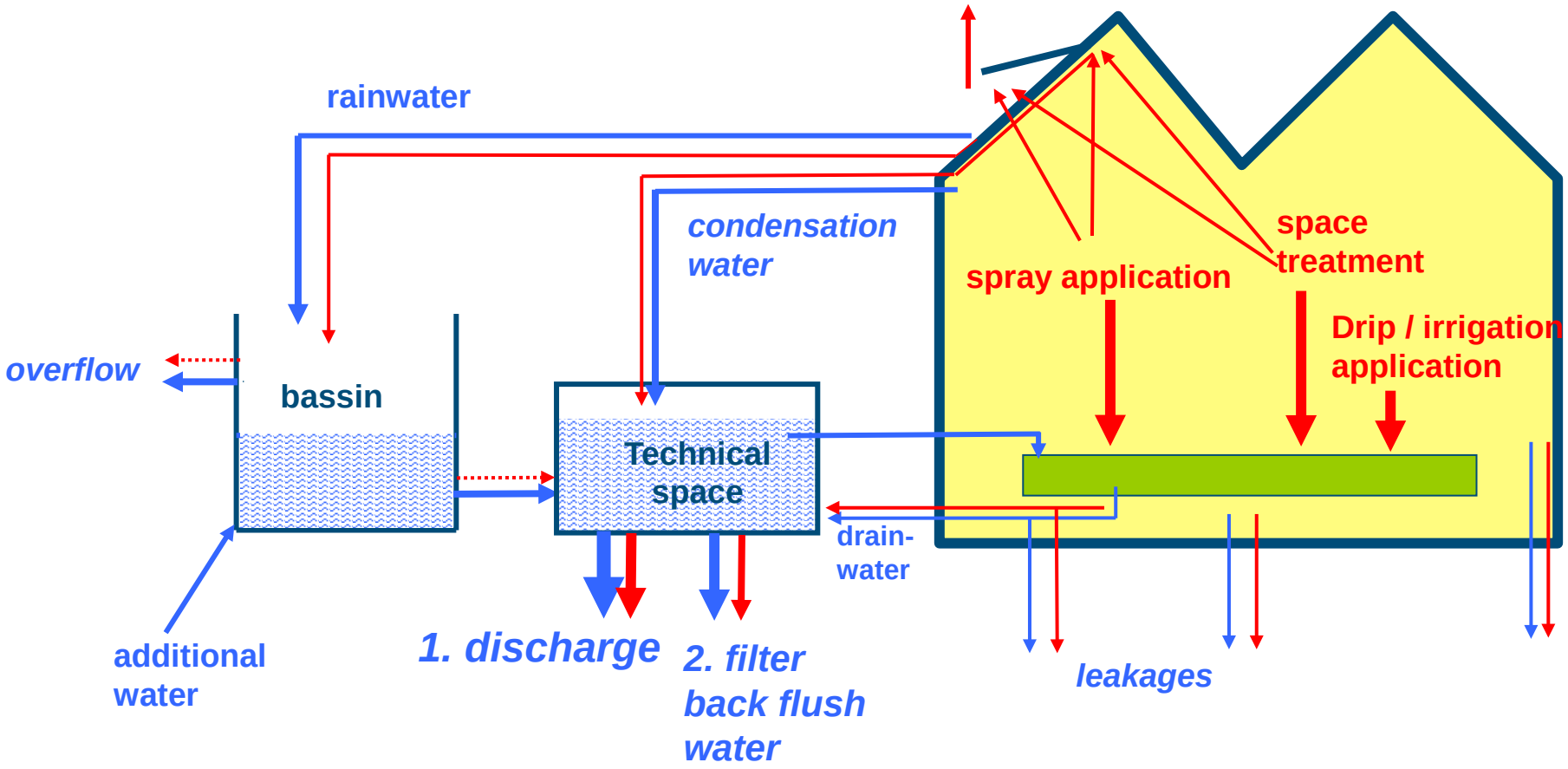
→ Extra effort on top of the agreed emission norms is needed

→ Purification of discharge water from PPP

Number of PPP in water of typical glasshouse polder

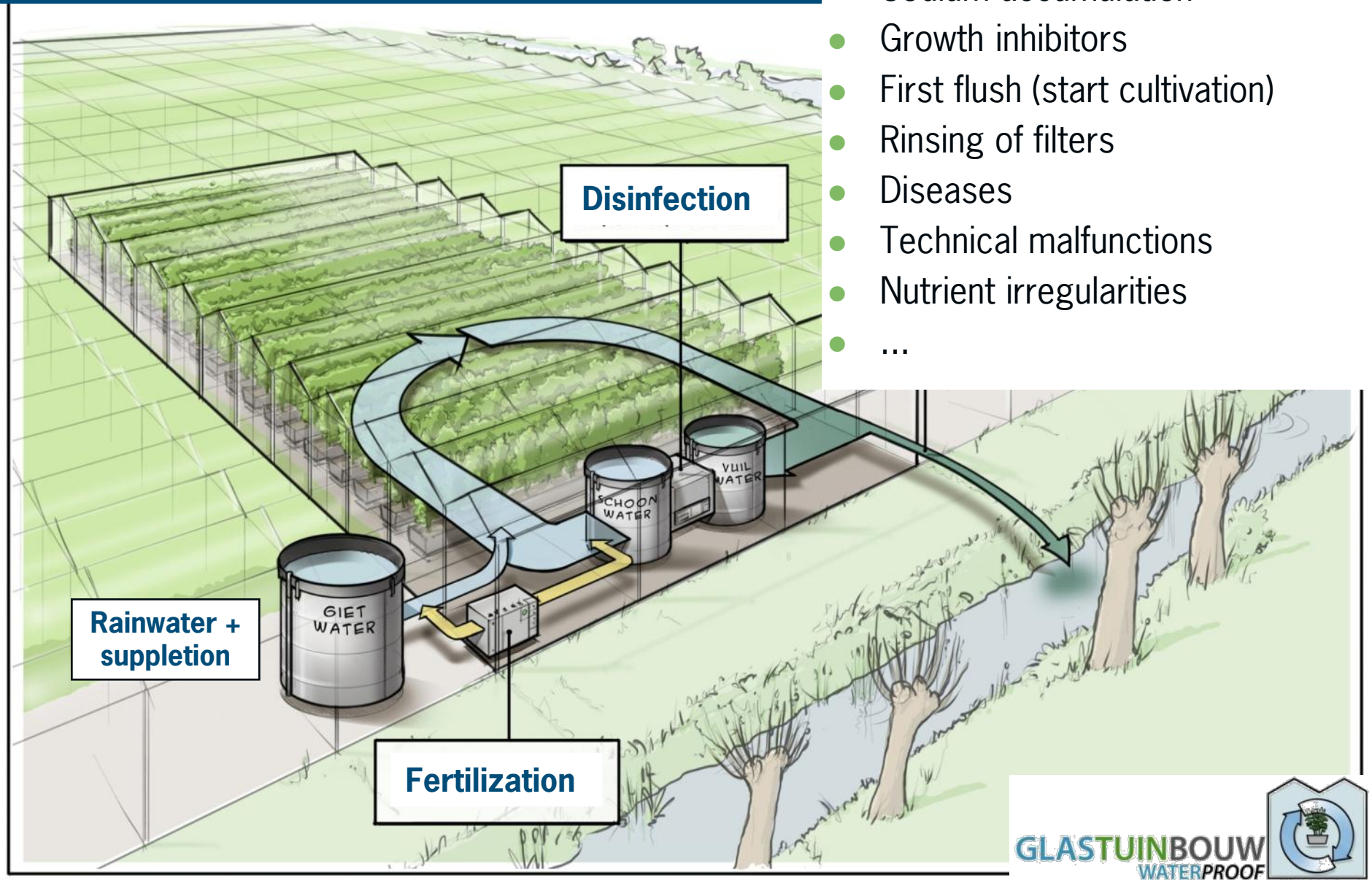


Emission routes



Reasons for discharge

- Sodium accumulation
- Growth inhibitors
- First flush (start cultivation)
- Rinsing of filters
- Diseases
- Technical malfunctions
- Nutrient irregularities
- ...



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Increasing re-use

- Sodium accumulation
  - Maximise low-sodium water intake (rainwater and additional water, i.e. RO)
  - Use low-sodium fertilizers

Increasing re-use

- Growth inhibitors
  - Organic: root exudates, PPP, microbes?
  - Fytotox bioassay

→ Break down inhibitors with Advanced Oxidation (H_2O_2 + UV)

Increasing re-use

- First flush at start of cultivation
  - Re-use is possible (Grodan)

Increasing re-use

- Rinsing of (sand-)filters
  - Approx. 1.3 m^3 / day/ ha. = 400 m^3 / year / ha.
  - Rinsing with rainwater in stead of water with nutrients
  - Re-use back flush water (+ deposition of dirt)

Increasing re-use

- Diseases (or: fear of)
  - Good hygiene
  - Good disinfection system (heater, UV)
    - Regular checks
    - Capacity

Increasing re-use

- Technical malfunctions
  - pump
  - burst pipe
  - breakdown of disinfector

→ Maintenance plan

→ Spare parts in stock

→ Maximum level in drain water silo 80% or an extra buffer silo (e.g. to take care of water to be disinfected)

Increasing re-use

- Nutrient irregularities
  - Imbalanced nutrient ratios
  - Rapid depletion or accumulation

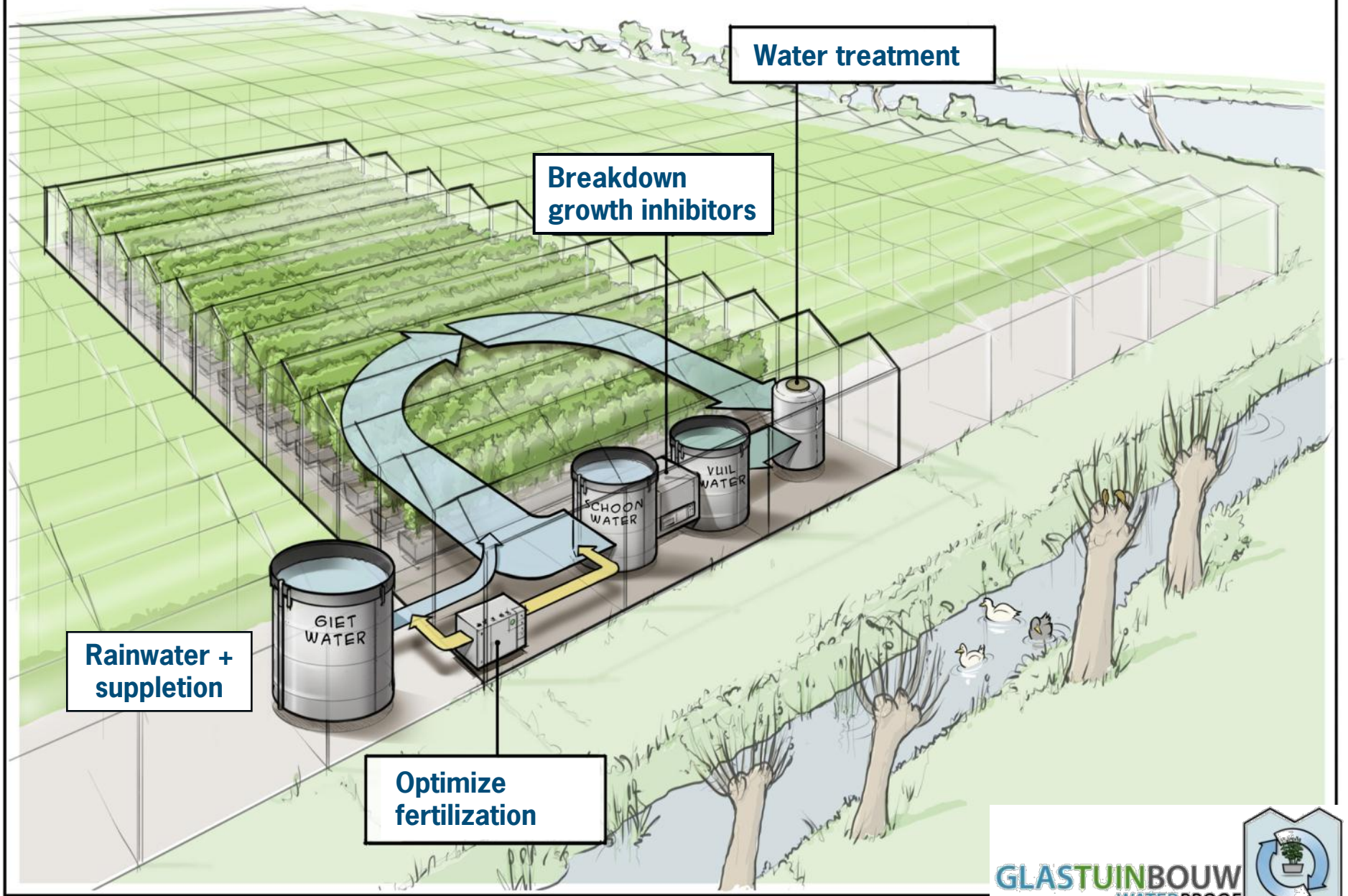
→ Proper nutrient management
→ Frequent lab analyses
→ Optimise re-use of water

→ Ion-selective electrodes

Emission of PPP

- Use alternatives for PPP
  - biological control
  - integrated pest management
- Optimal spray & drip applications of PPP

Towards a zero-emission in substrate crops



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Thank you for your attention!

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