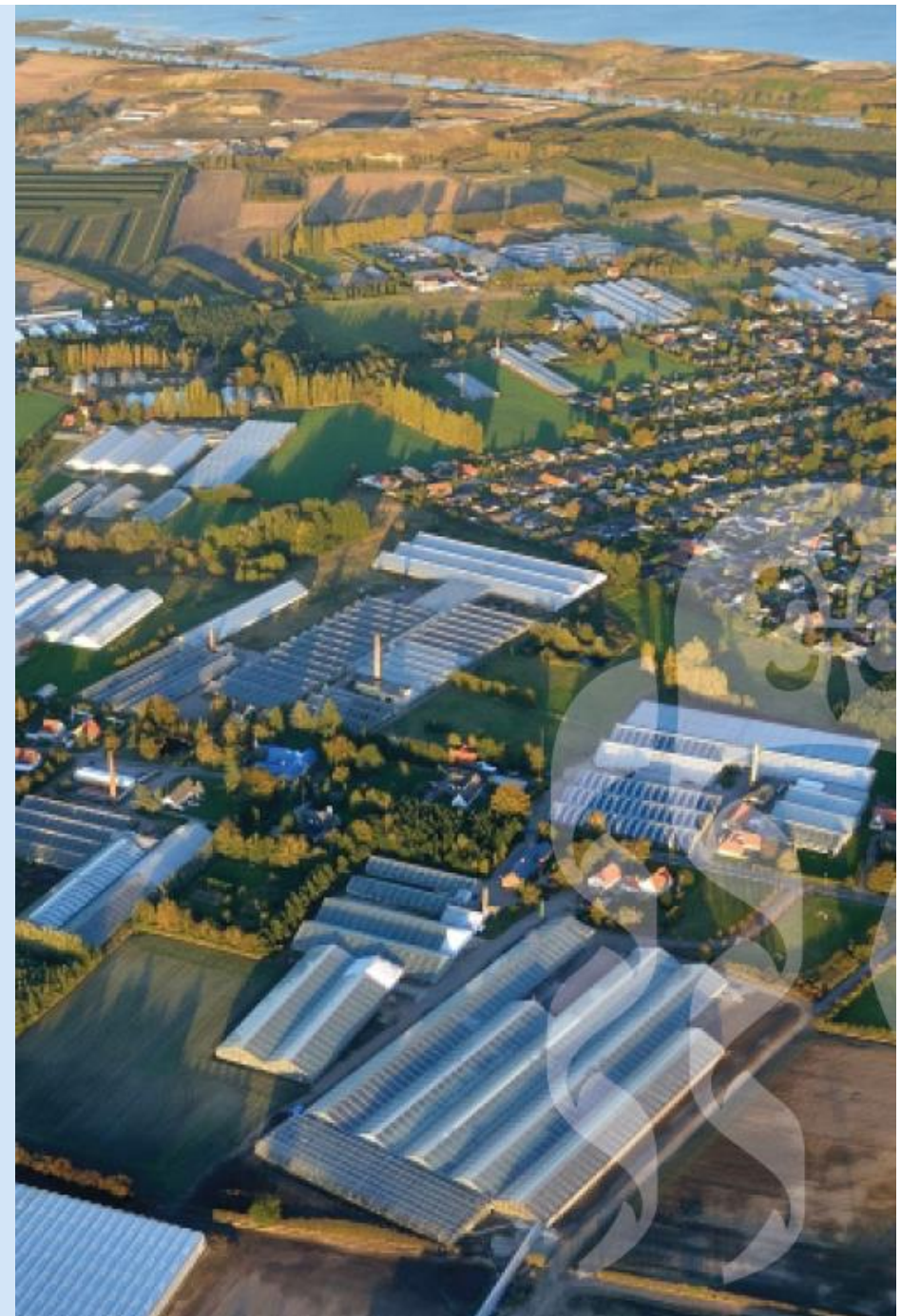


ENVIRONMENTAL PERSPECTIVES ON GREENHOUSE PRODUCTION IN THE MUNICIPALITY OF ODENSE - MONITORING PESTICIDES

Agenda

- **Figures and numbers**
- **Environmental issues important to the municipality of Odense / Denmark**
- **Emission routes of pesticides and fertilizers in focus**
- **Any discharge needs permission**
- **Monitoring pesticides**
- **Actions: - Source tracing and leakage / drainage via soil – water accounts**



FIGURES AND NUMBERS ABOUT GREENHOUSE PRODUCTION IN THE MUNICIPALITY OF ODENSE

- **Hosting: ~ 45 % of total area of greenhouse production in Denmark**
- **110 active production sites**
- **Production area ~ 1.700.000 m2**
- **Trend: older units is demolished and new has been applied for**
- **25 % Vegetables + Cannabis (45% organic production)**
- **75% Potted plants**



Unit sizes	Odense 2017	Denmark 2017
	Units	Units
<1000 m2	5	136
1000-1999	4	59
2000-4999	24	90
5.000-9.999	24	62
10.000-15.000	23	32
15.000-19.000	8	9
>= 20.000	22	48
I alt	117	436

ENVIRONMENTAL IMPACTS FROM LEAKAGE OF PESTICIDES AND FERTILIZERS - OUR FOCUS AND OBLIGATION

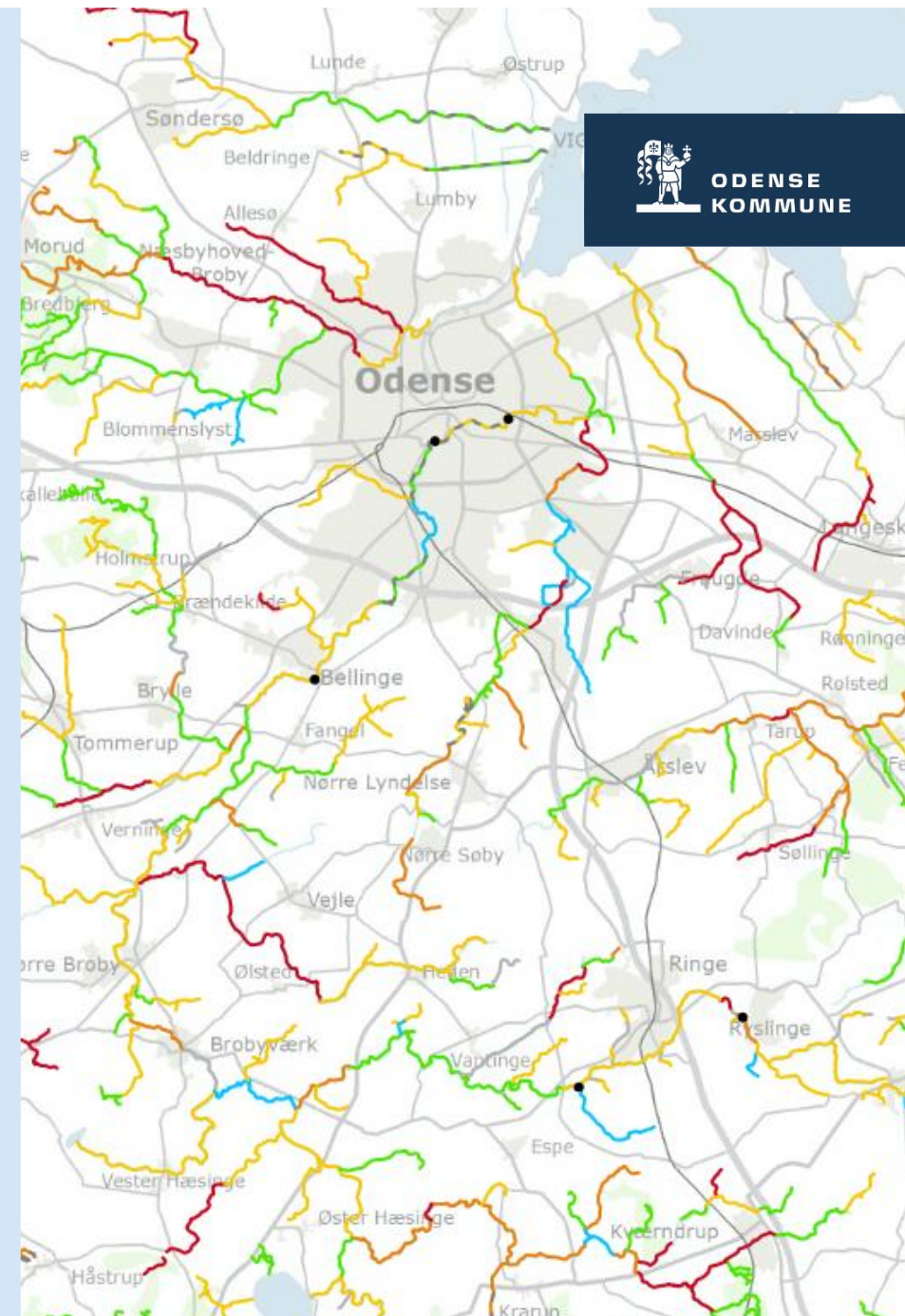
Groundwater - primary source of drinking water, "needs no purification"

Soil contamination – when a greenhouse area turns into new use, eg. private garden, recreational or kindergarden; moving contaminated soil

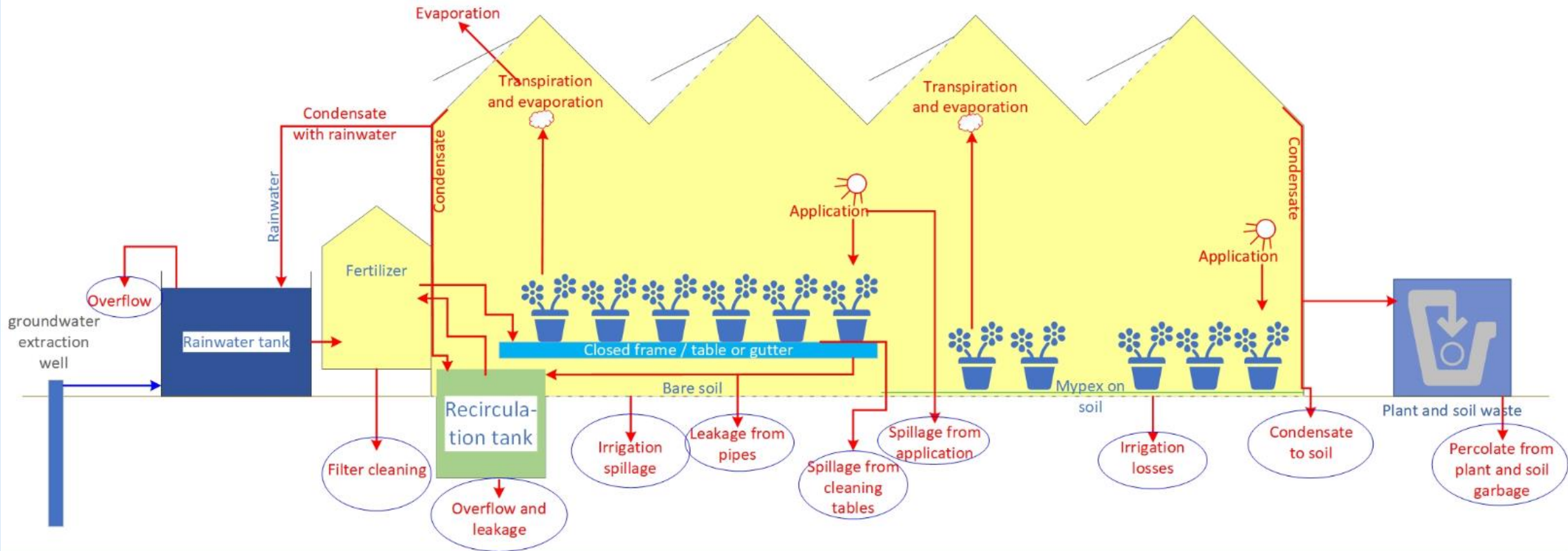
Streams (and lakes) – aquatic macrofauna and meiofauna are vulnerable to insecticides and fungicides – EU Waterframework Directive

Marine environment - Odense Fjord (river bassin) – WFD

EU habitats directive - habitats and species of special concern – eg. Thick-shelled river mussel (*Unio crassus*), Odense River and Odense River Basin



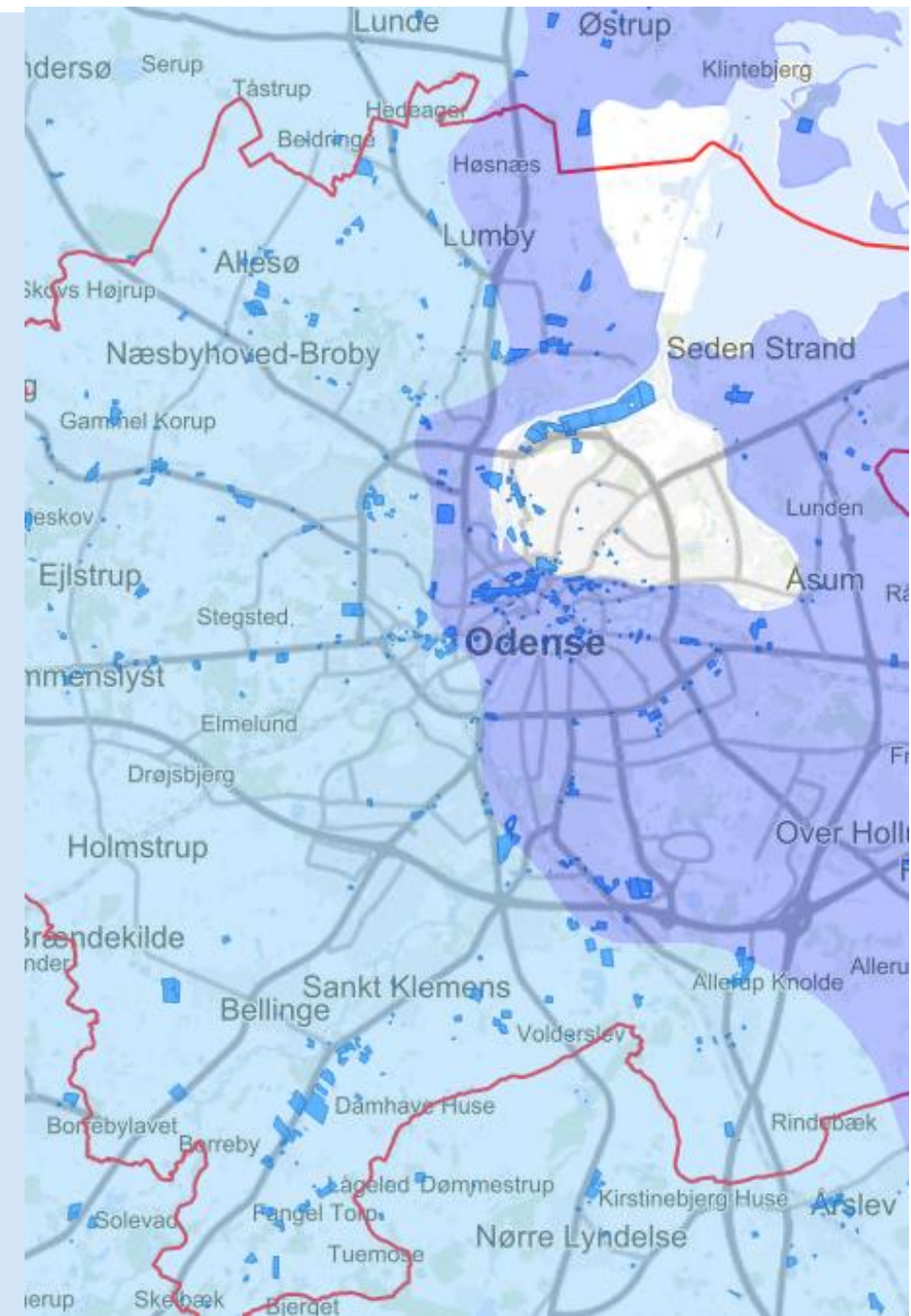
SPILLAGES, LOSSES AND LEAKAGES OF PESTICIDES AND FERTILIZERS



PERMISSION TO ANY DISCHARGE / LEAKAGE

You need permission to:

- any discharge / leakage of polluted water from the production area
- establishment of tanks / bassins for recycled water containing pesticides and fertilizers
- plant and soil waste / "compost" has to be stored in a closed container and disposed of to inceneration plant or special permission
- removal of soil with pesticides (classified areas)

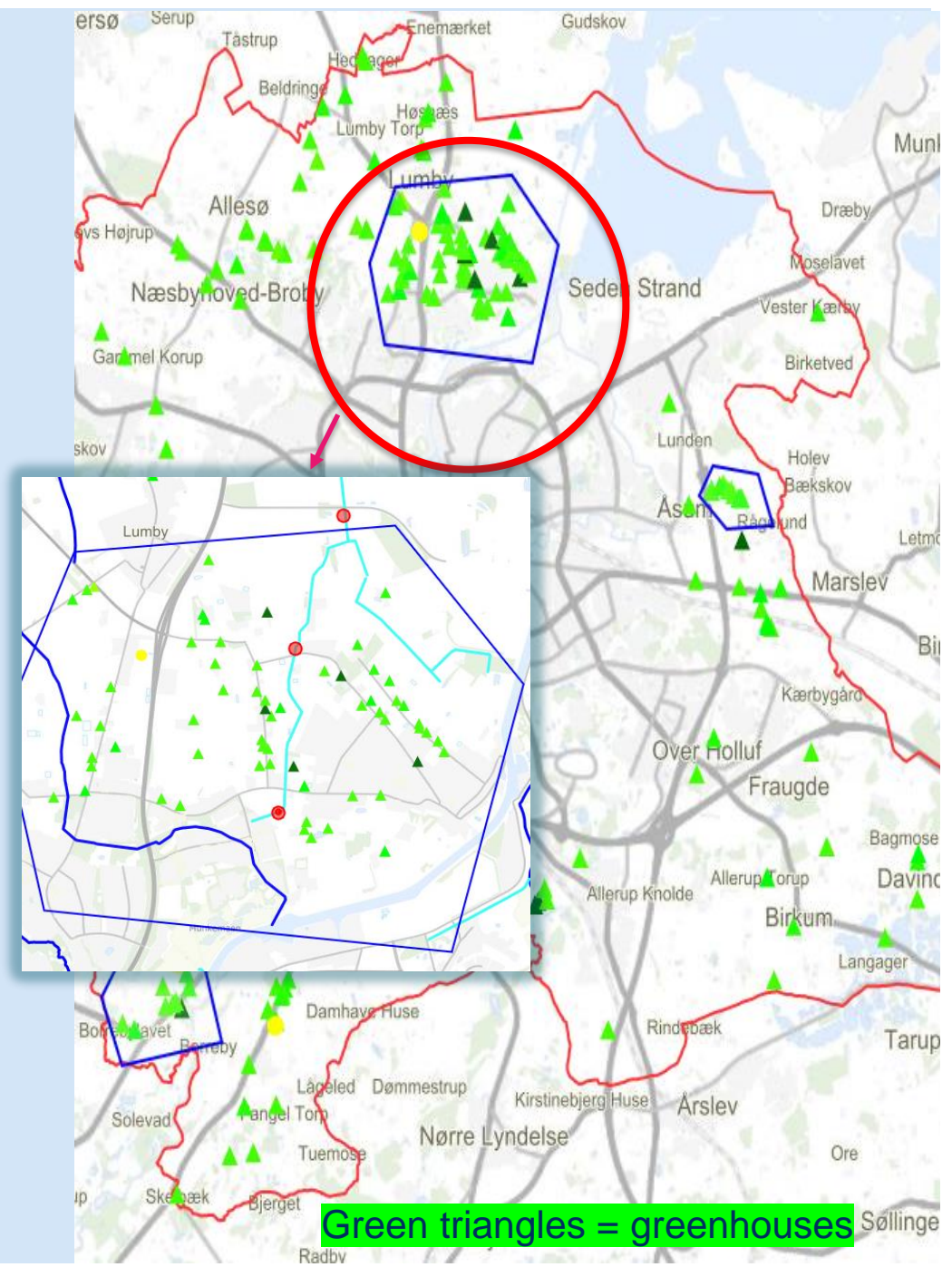


MONITORING PESTICIDES, N AND P DOWNSTREAM GREENHOUSE AREAS

- Sampling up- and down-stream in 2-3 streams +/- 1 stream in agricultural land since 2011
- Timeproportional sampling - 24 hours
- Screening package from Agrolab XXL (415 pesticides + a few metabolites) + N & P
- Purpose: monitoring pesticides, nitrate and ortho-phosphate

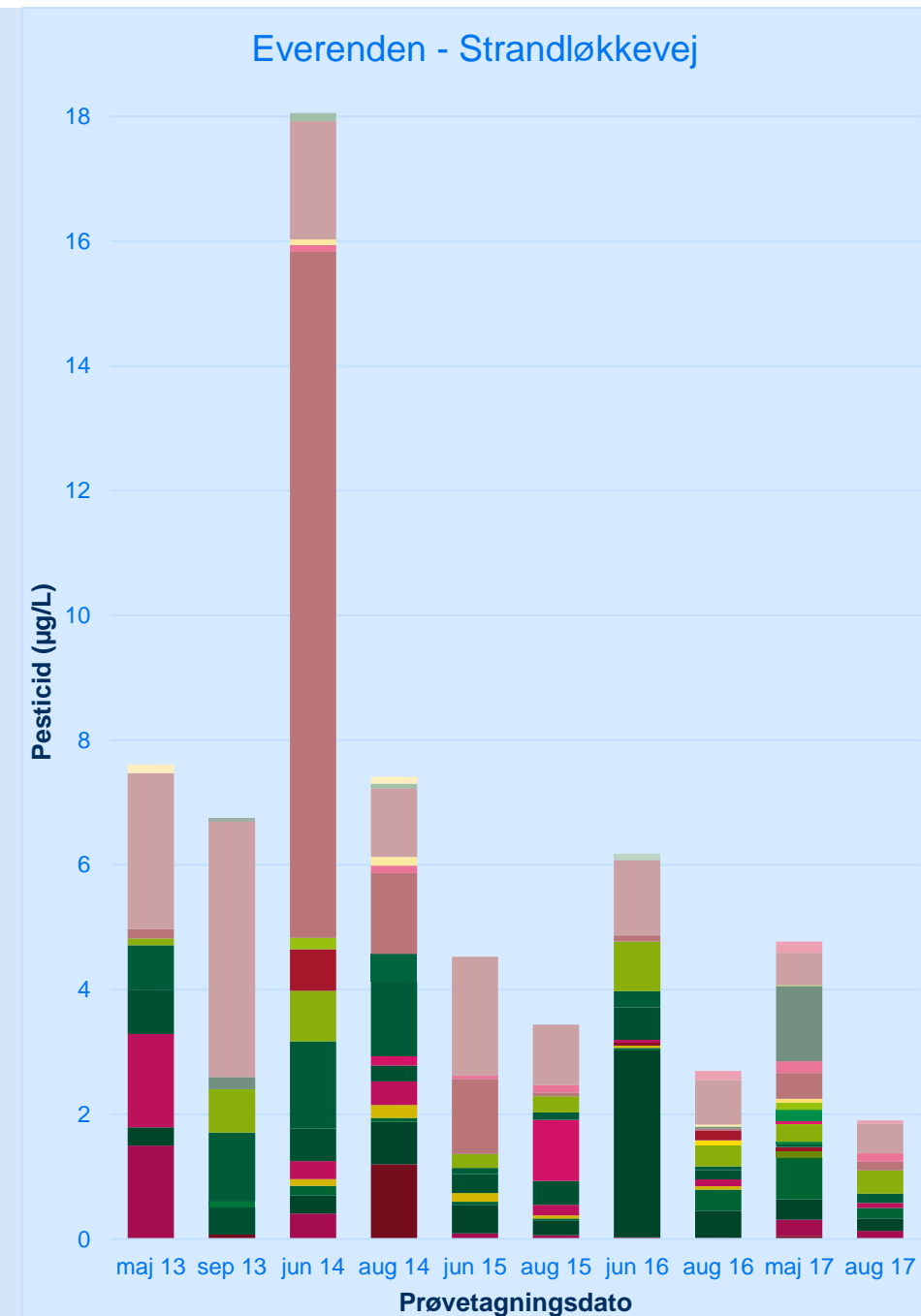
Example

- Area in northern Odense, greenhouses around the stream Everenden
- Water course catchment with ~ 36 companies ~ 600.000 m2 greenhouse area.

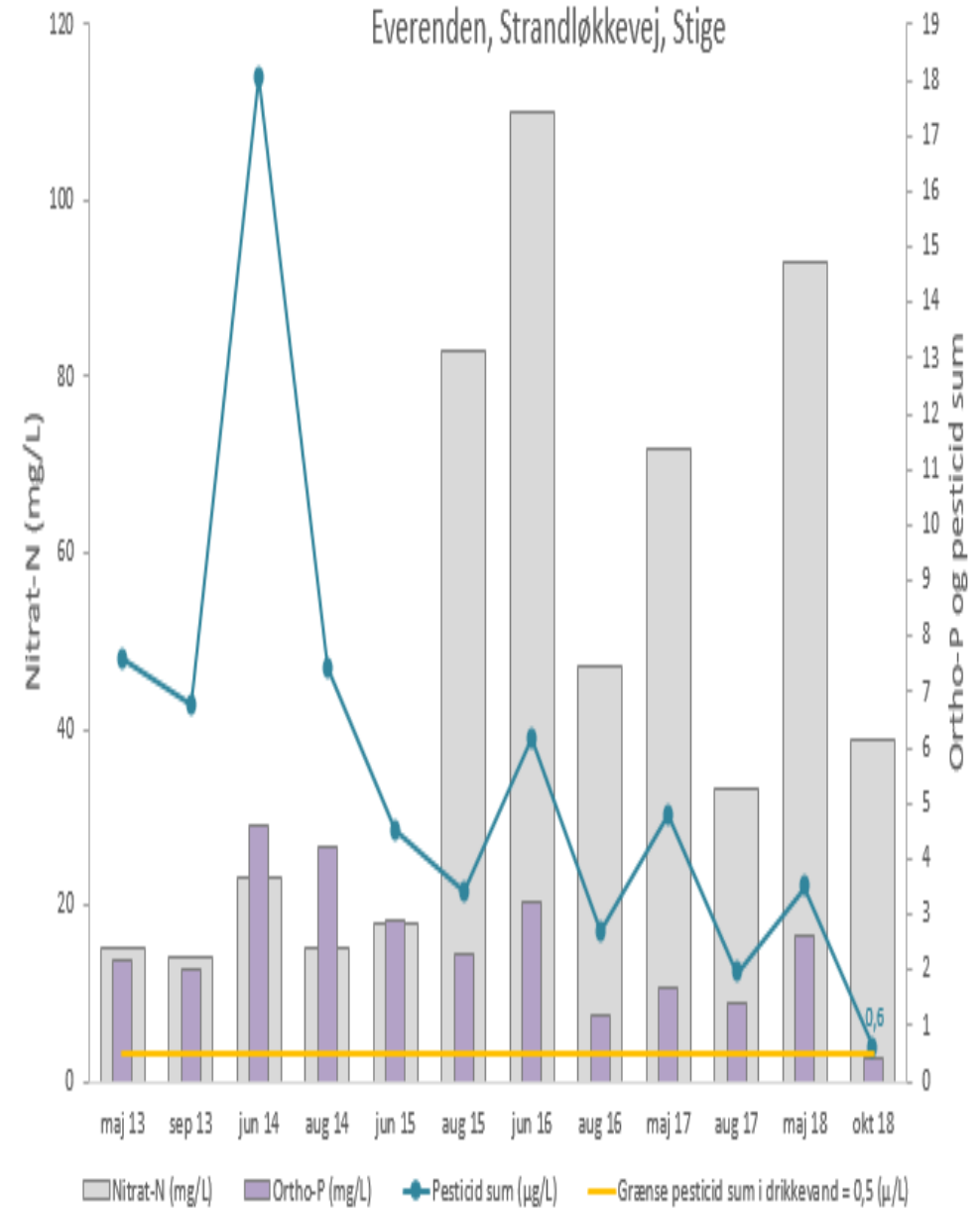
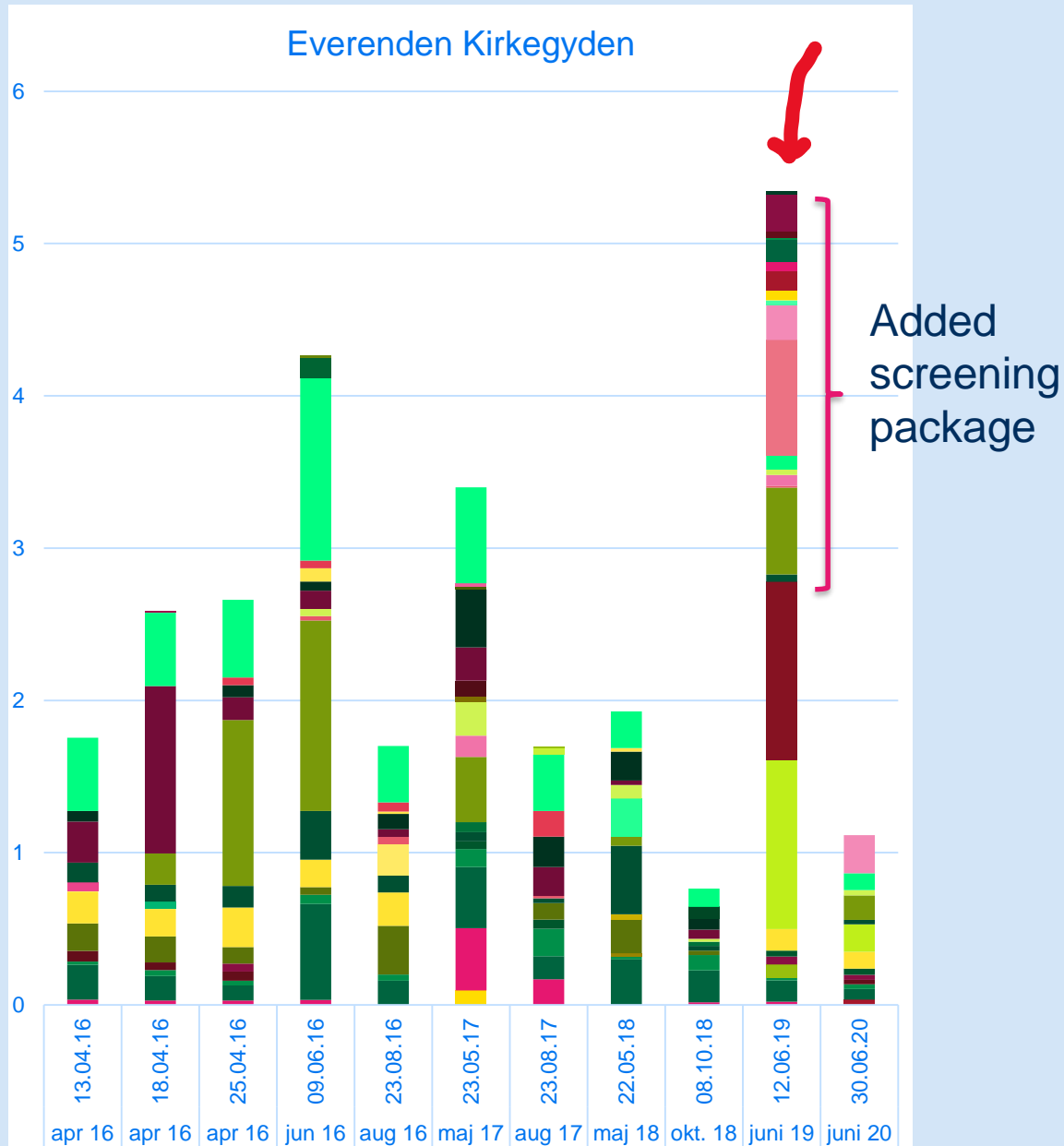


MONITORING PESTICIDES - RESULTS

- Northern Odense: 1 stream, 3 sampling units, in total 63 pesticides incl. 17 metabolites
- 3 streams in total: 81 pesticides and metabolites during 9 years
- An extra package in 2019 => 13 additional pesticides not measured for previously
- Hit rate: Agrolab package rediscover 50% of the 33 pesticides applied for approval 2020/21
- ?% match-rate for pesticides in imported plantmaterial / plants



RESULTS: PESTICIDES, N AND P



PESTICIDES IN SOIL AND UPPER GROUNDWATER

Monitoring pesticides in soil and upper groundwater carried out by the regional authority of soil pollution Region Syddanmark in 2018 – 2019 in 10 greenhouses



Results from the report by DMR and Region Syddanmark*:

- Pesticide-screening package - soil - 98 pesticides / metabolites approved in DK from ~1950- now. Hit rate 29 out of 98
- Pesticide-screening package - groundwater - pesticides/metabolites approved in DK from ~1950- now. Hit rate 50 out of 232

*Opsamlingsrapport vedr. ny strategi for pesticidundersøgelser på gartnerier ved indledende undersøgelser, September 2019, DMR and Region Syddanmark

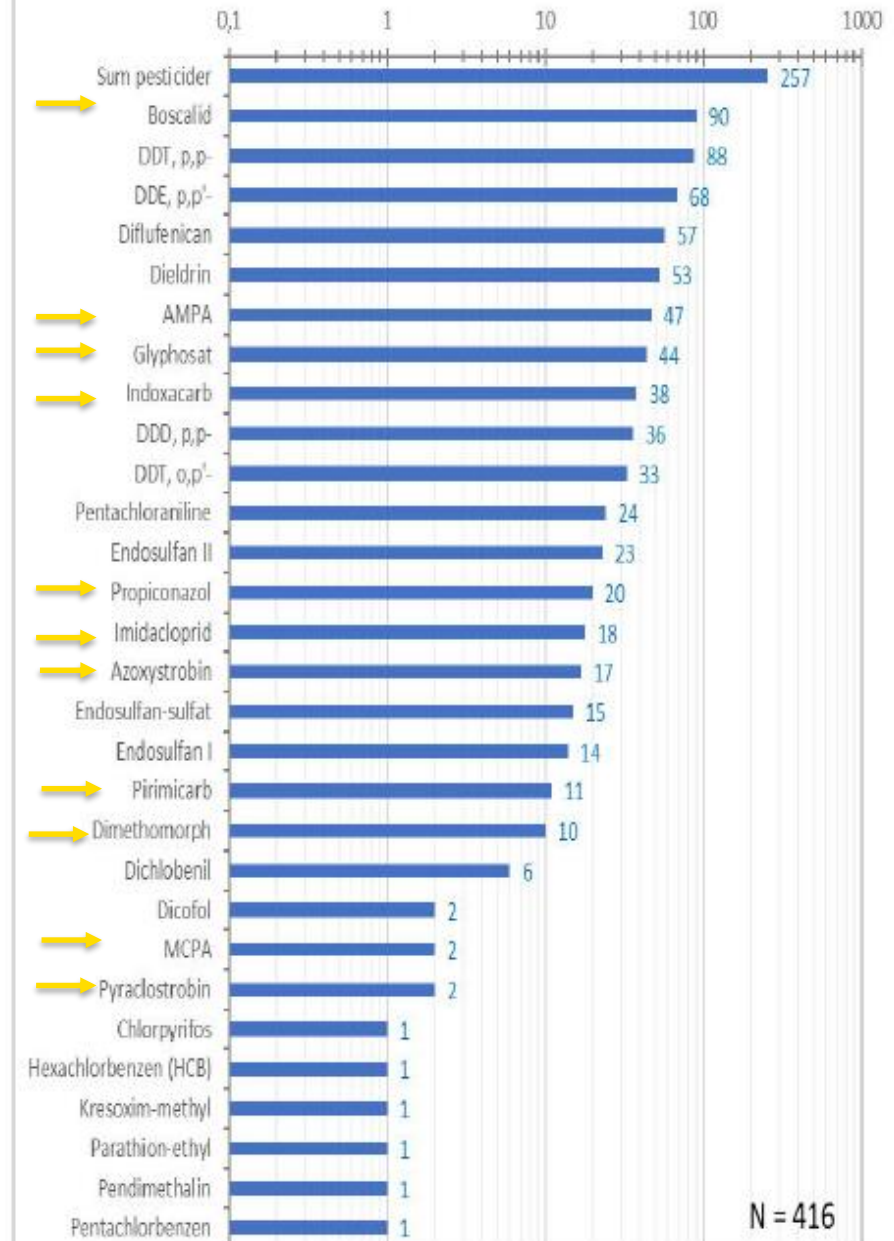
PESTICIDES IN SOIL AND UPPER GROUNDWATER

Results - soil:

- Pesticides in soil outside and inside greenhouses
 - Pesticides in 70-100 % of all samples from "soil" in greenhouses (0-0.2 m.u.t)
 - Highest concentrations in 0-0.2 m.u.t. and 0.4-0.5 m.u.t.
 - Glyphosate and AMPA in 45 and 50 % of all samples 0-0.2 m.u.t. around spraying hotspots (spraying gear)
 - Indications of more pesticides when growing on mypex / bare ground compared to table-growing
- Hotspots around spraying gear



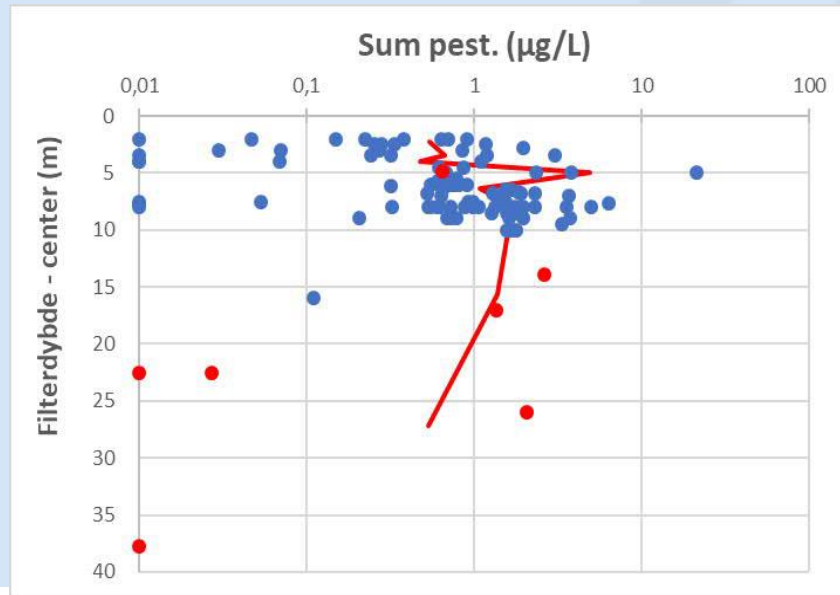
soil findings 0-0,5 m under terrain



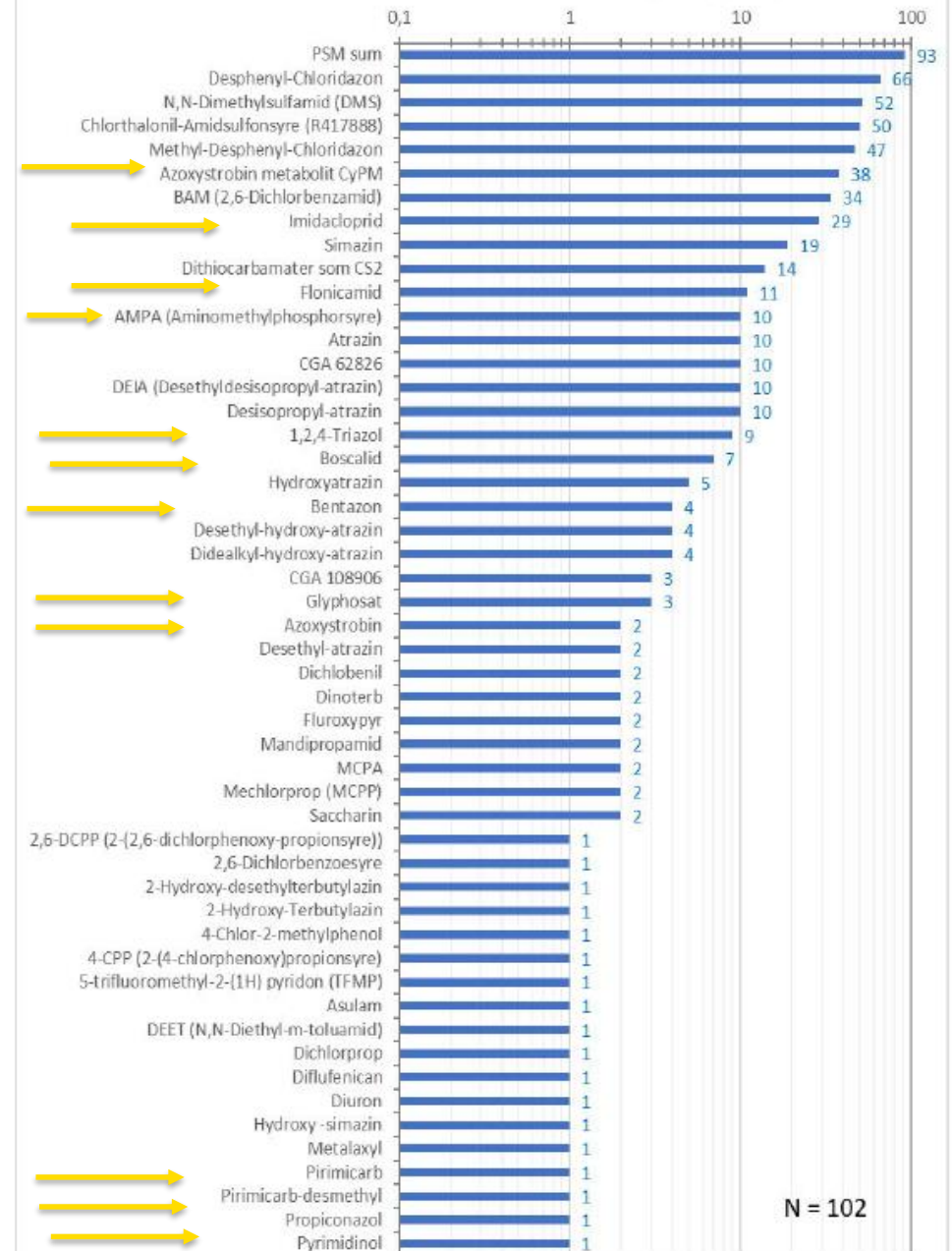
PESTICIDES IN SOIL AND UPPER GROUNDWATER

Results – groundwater

- In 91 % of all samples (N=102) pesticides were detected (> lod)
- In 72 % of all samples, the threshold level for [sum of pesticides] in groundwater was exceeded (0,5 µg/L)
- In 47% of all samples the threshold level per [pesticide] in groundwater was exceeded (0,1 µg/L)
- 12 pesticides exceeding the threshold level was still in use (2019)



findings in groundwater samples



N = 102

ACTIONS

Source tracing in all pipes

→ End of direct emissions



Recycling of water
- some kind of
purification is
needed

Permission to discharge
to:
- special treatment plant or
- sewer / recipient (almost
impossible) in DK



Hole "chopped" in concrete pipe

ACTION: SPILLAGE AND SURPLUS OF WATER

Greenhouse

Stop spillage from

- Leaking tables and gutters
- Pipes and fittings

Keep soil dry

Minimize surplus of water

Traditionally high water consumption in the whole production

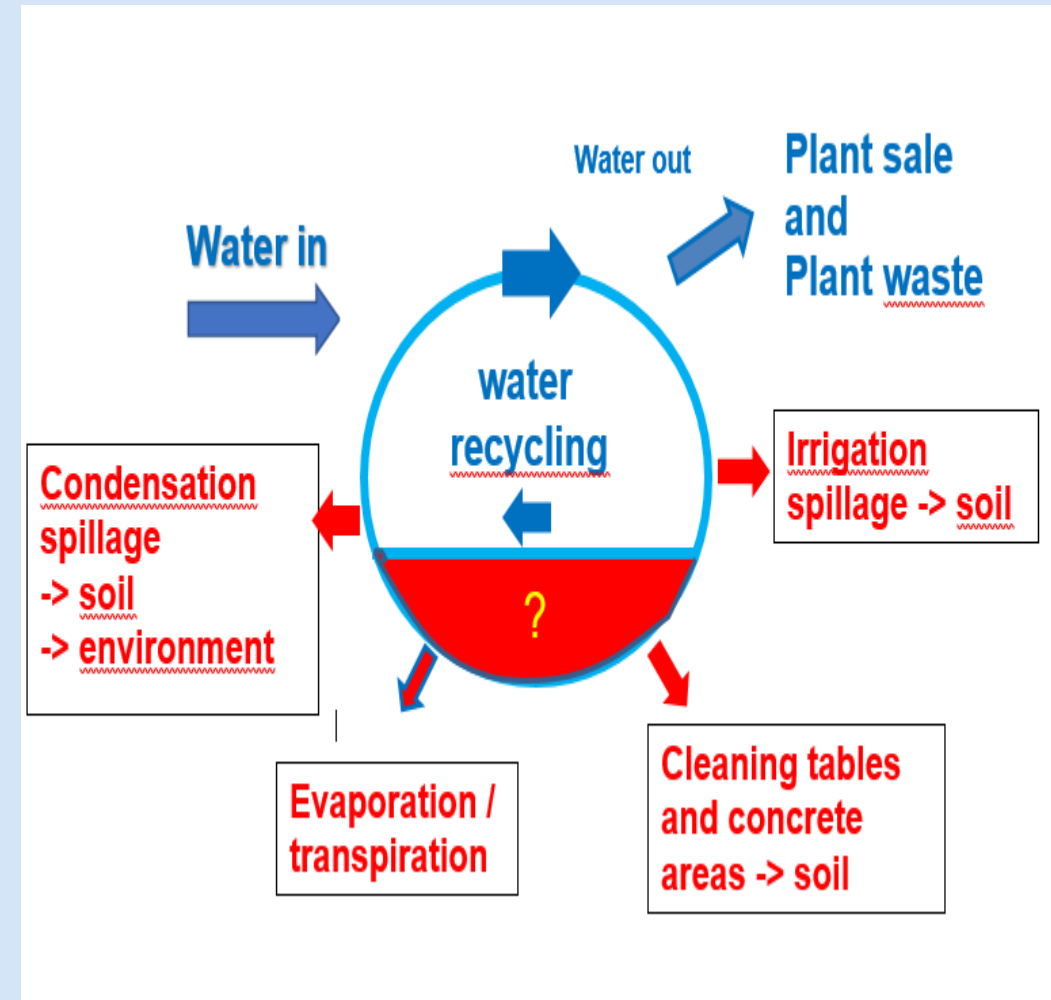
- new cleaning procedures
- humidity regulation / collection

Water accounts

Water in = water out

Good Production management

Outside production area (18 % of total area) – container production areas: Recirculation demands production on membrane





THANK YOU FOR YOUR ATTENTION!