How pesticides used on hard surfaces end up in drinking water

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Outline of presentation

- Problem
- From hard surface to drinking water extraction point
  - Runoff at field scale
  - Runoff at neighbourhood scale
  - Runoff at town scale, including waste water treatment
- Developments in risk evaluation
- Conclusions

Problem

- Drinking water standard pesticides 0.1 μg/L
- Nine extractions in NL
- Monitoring shows exceeding of standard
- Contribution of pesticide use on hard surfaces to exceeding of standard ?

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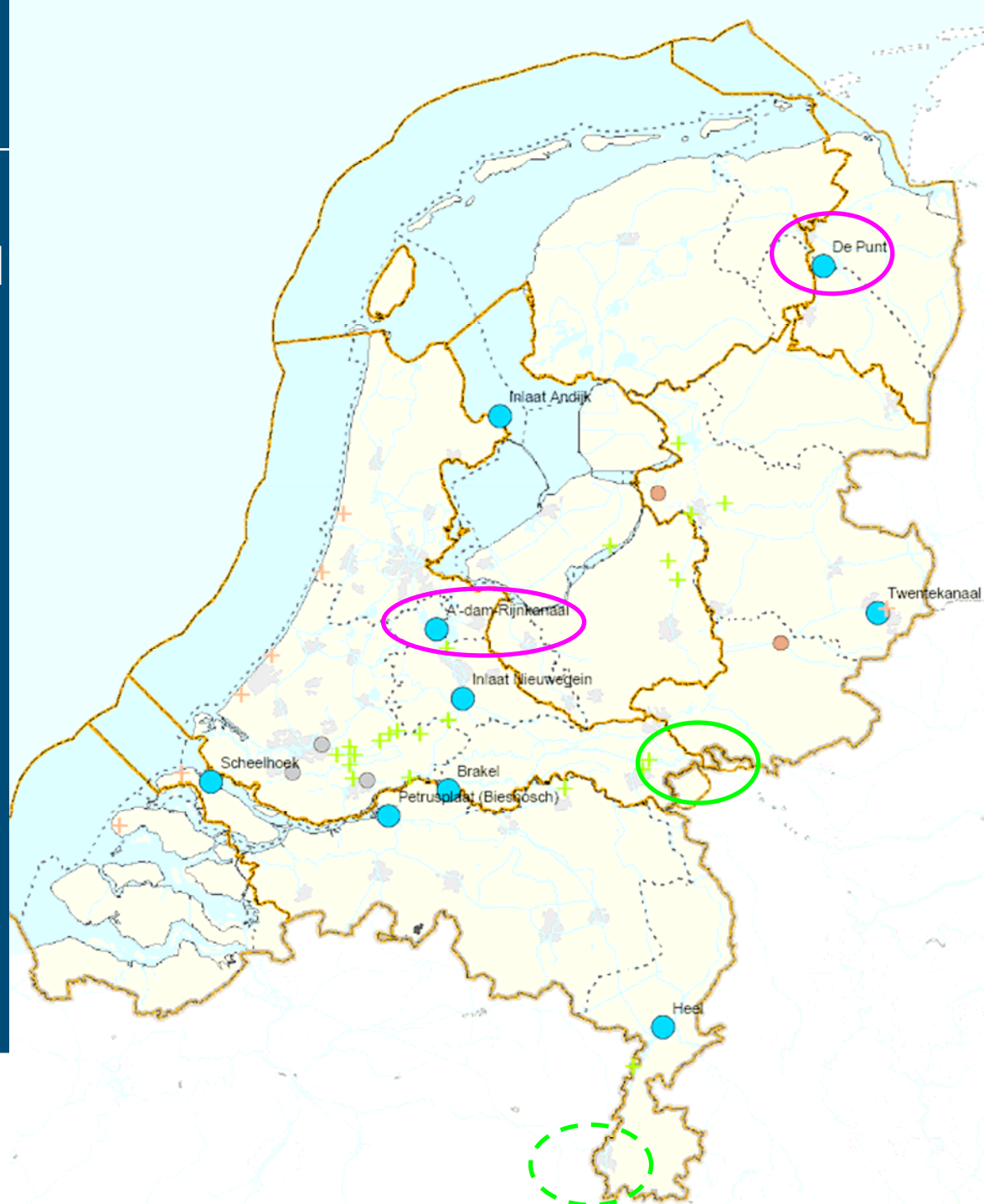

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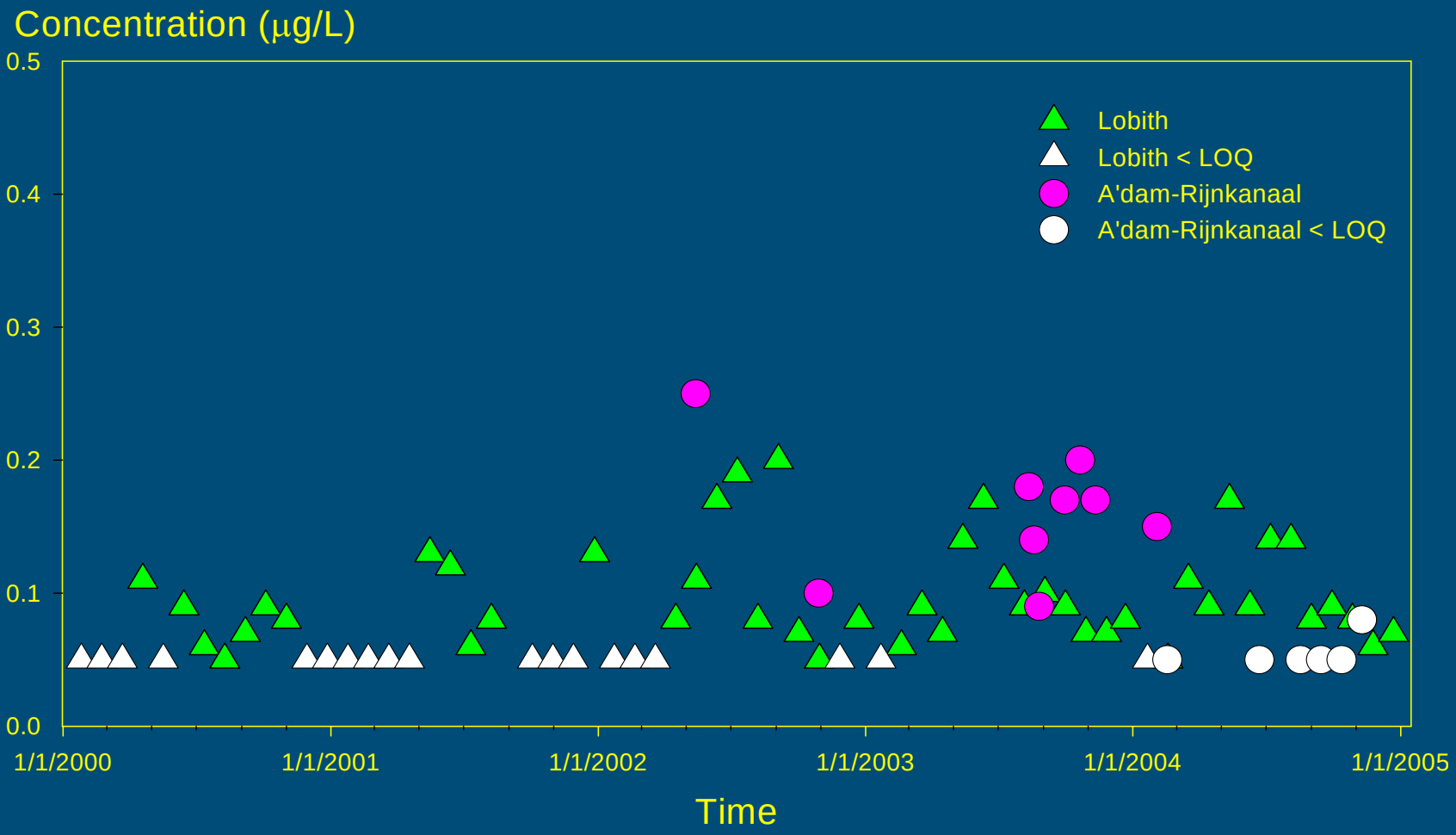
Glyphosate in Rhine at Lobith (entry to NL) and in extraction A'dam Rijnkanaal in period 2000 – 2005



(data from RIZA & RIWA Rijn)

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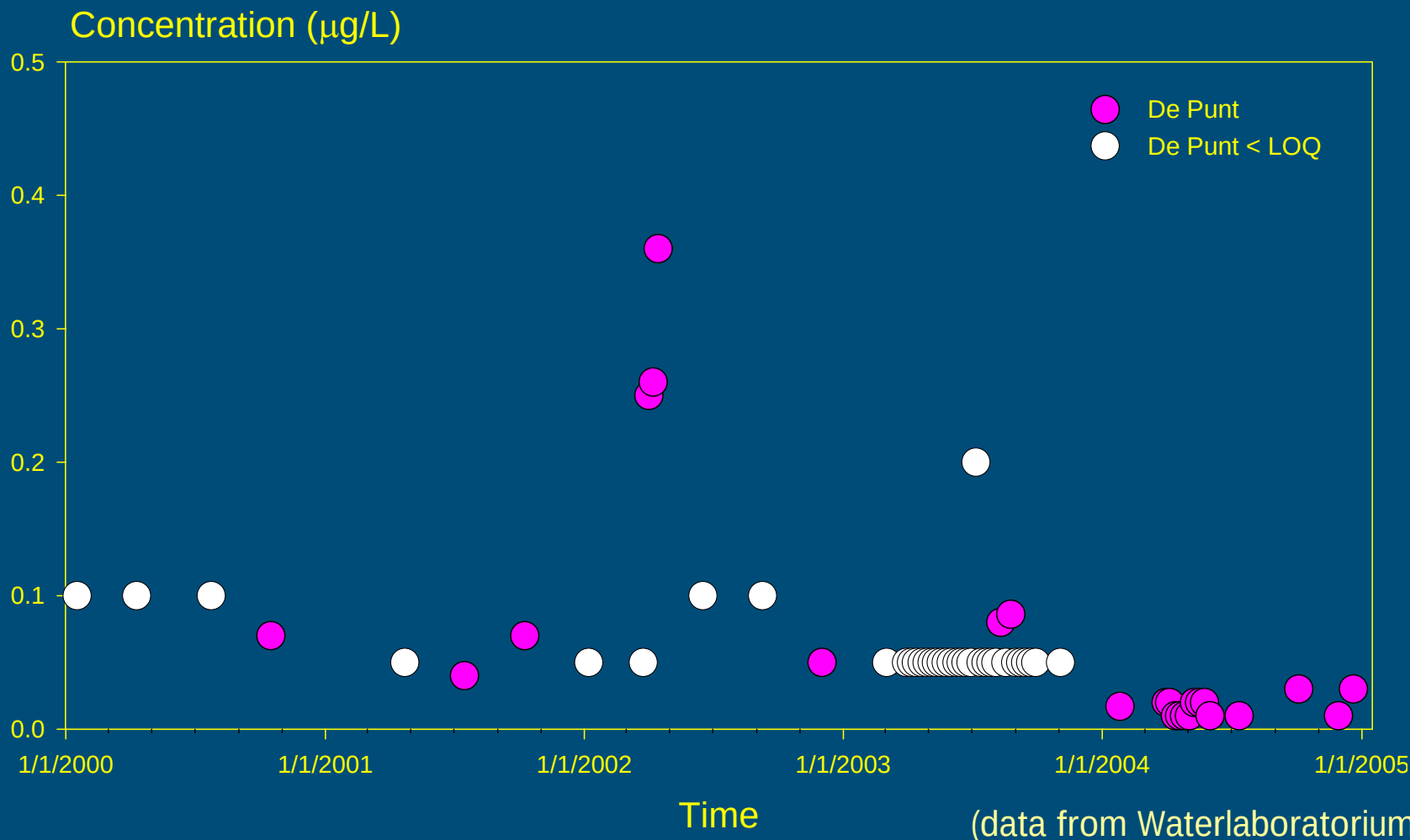
Glyphosate in Drentsche Aa, in extraction De Punt in period 2000 – 2005



(data from Waterlaboratorium Noord)

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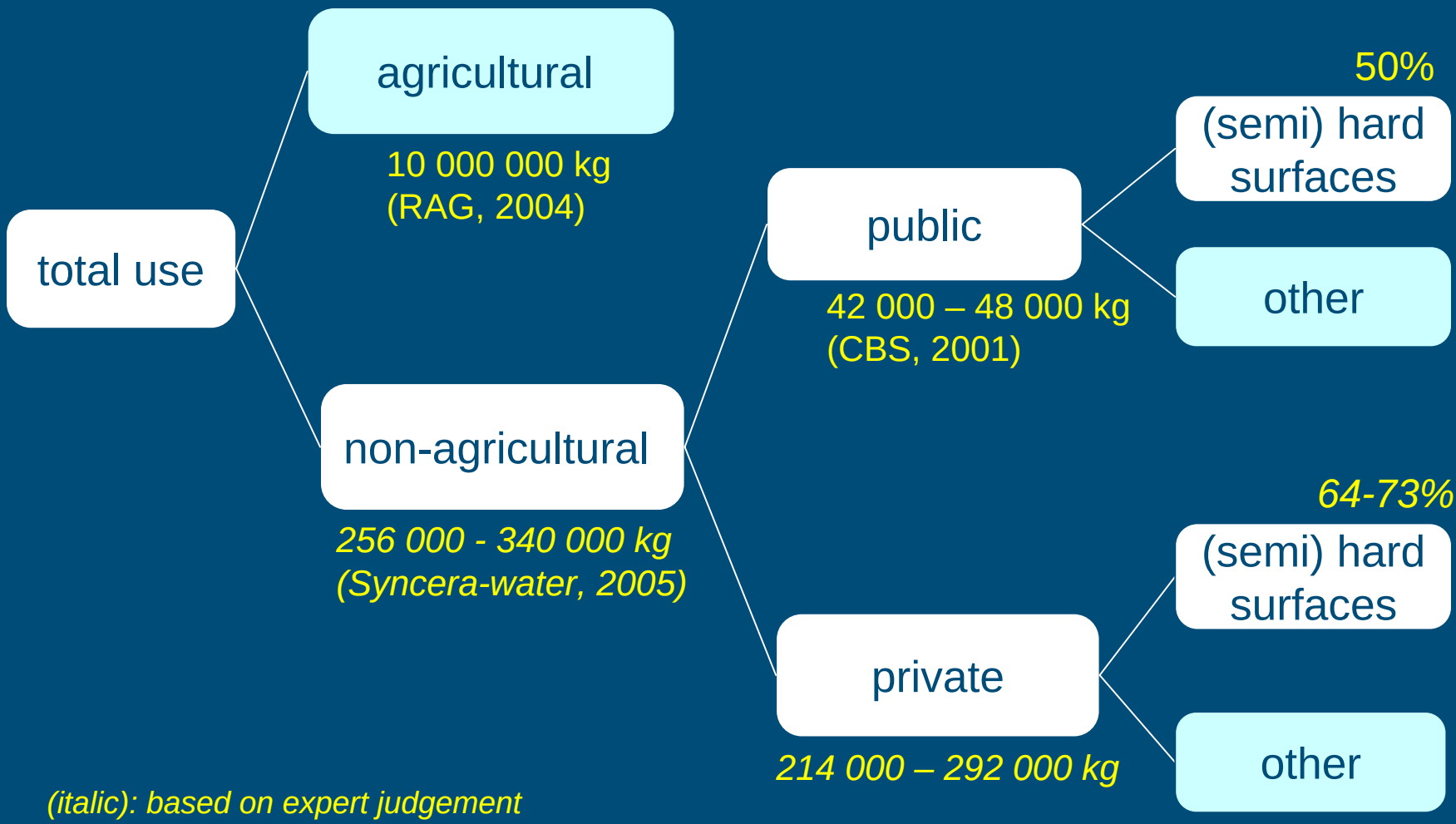
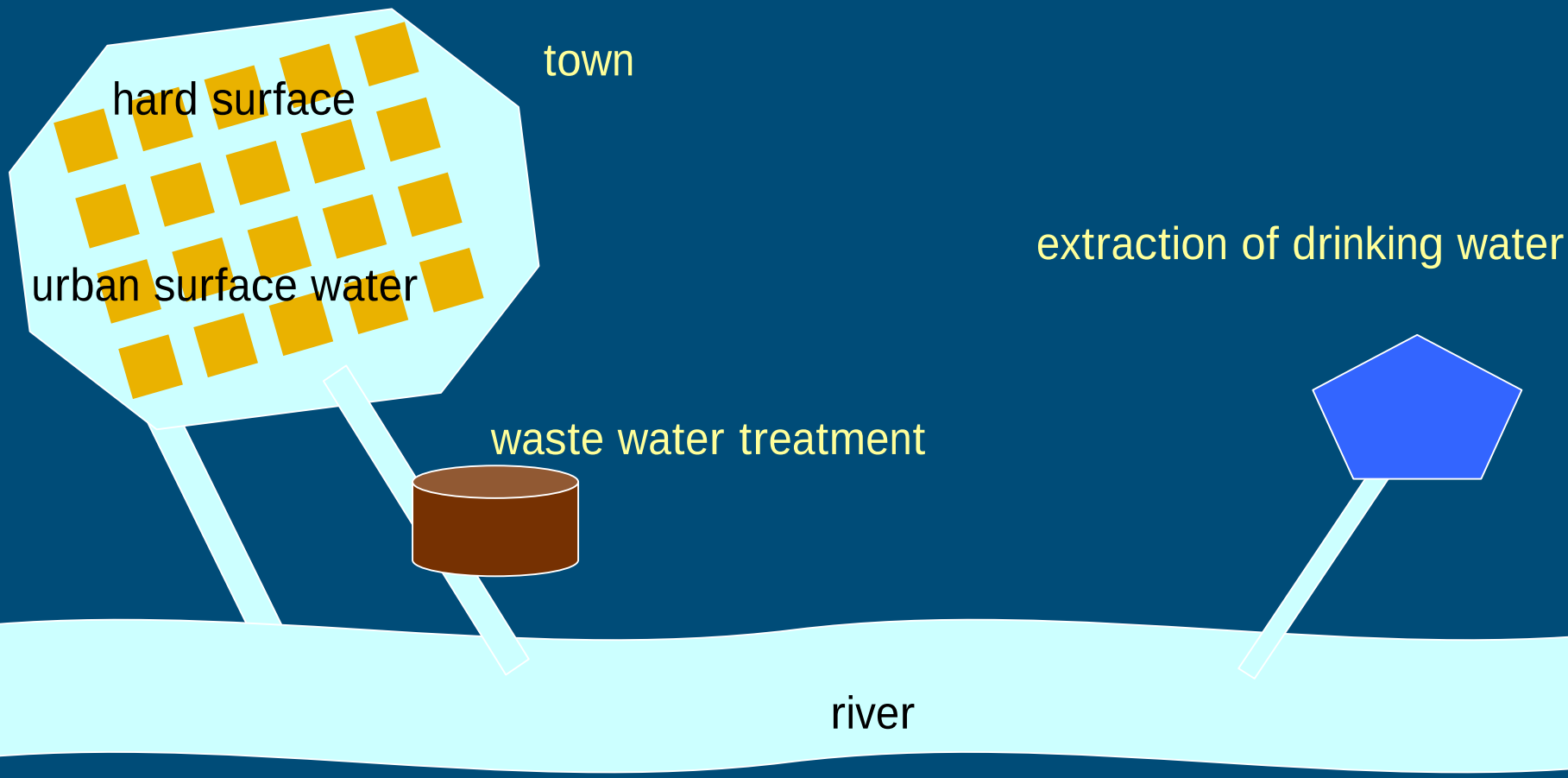
Pesticide use in the Netherlands (2004)



(italic): based on expert judgement

From hard surface to drinking water



Runoff at field scale

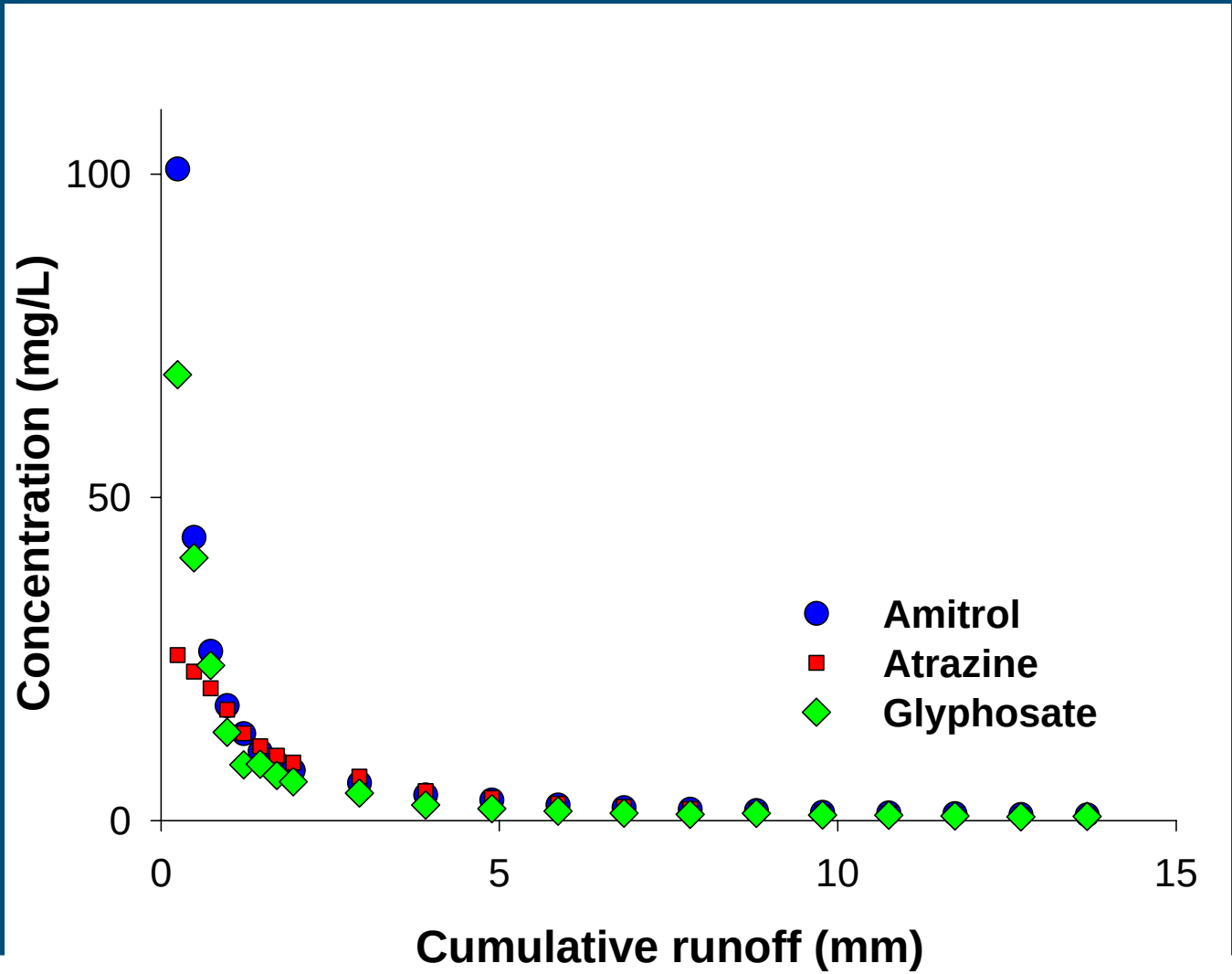
- 100 m^2 paving of concrete bricks treated with herbicide
- sprinkling, and collecting all runoff water
- sampling water in drain (bricks, soil below)

Runoff at field scale

- Spraying herbicide

- Sprinkling 10 mm/h
- Starting within 3 h after application

Concentration of amitrol, atrazine and glyphosate in runoff water



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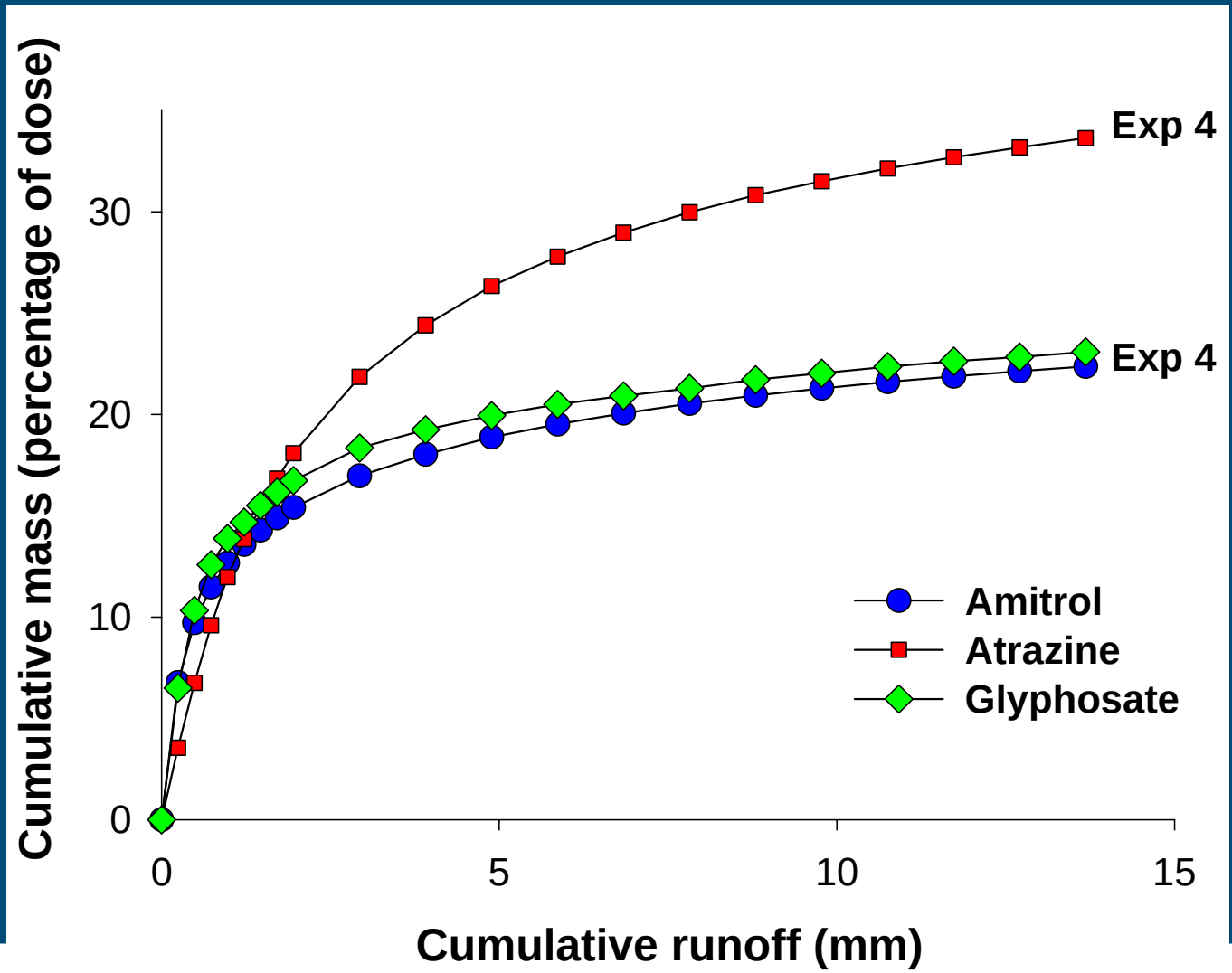
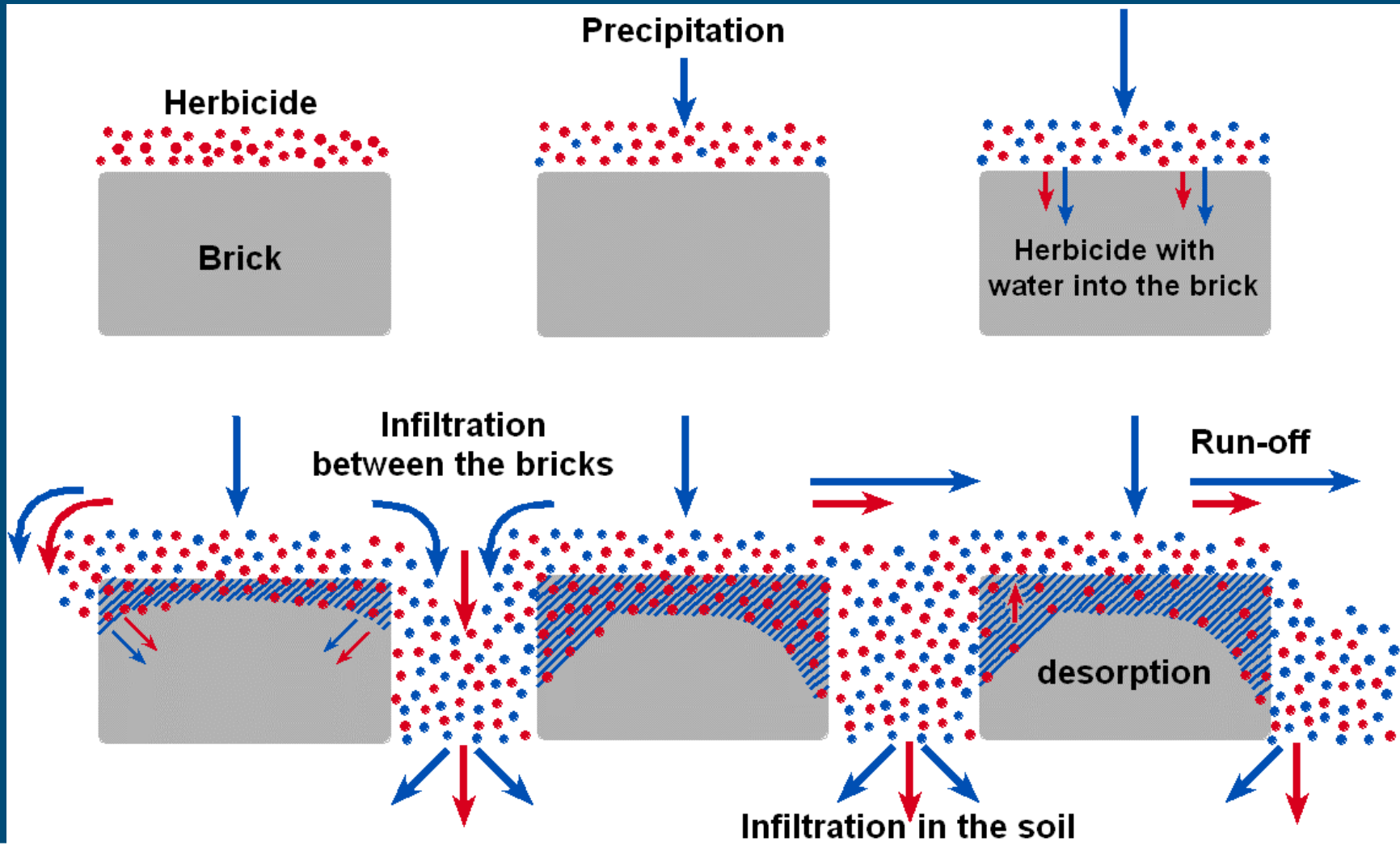
Cumulative mass in runoff



Runoff process



Runoff at field scale

Results of field experiments

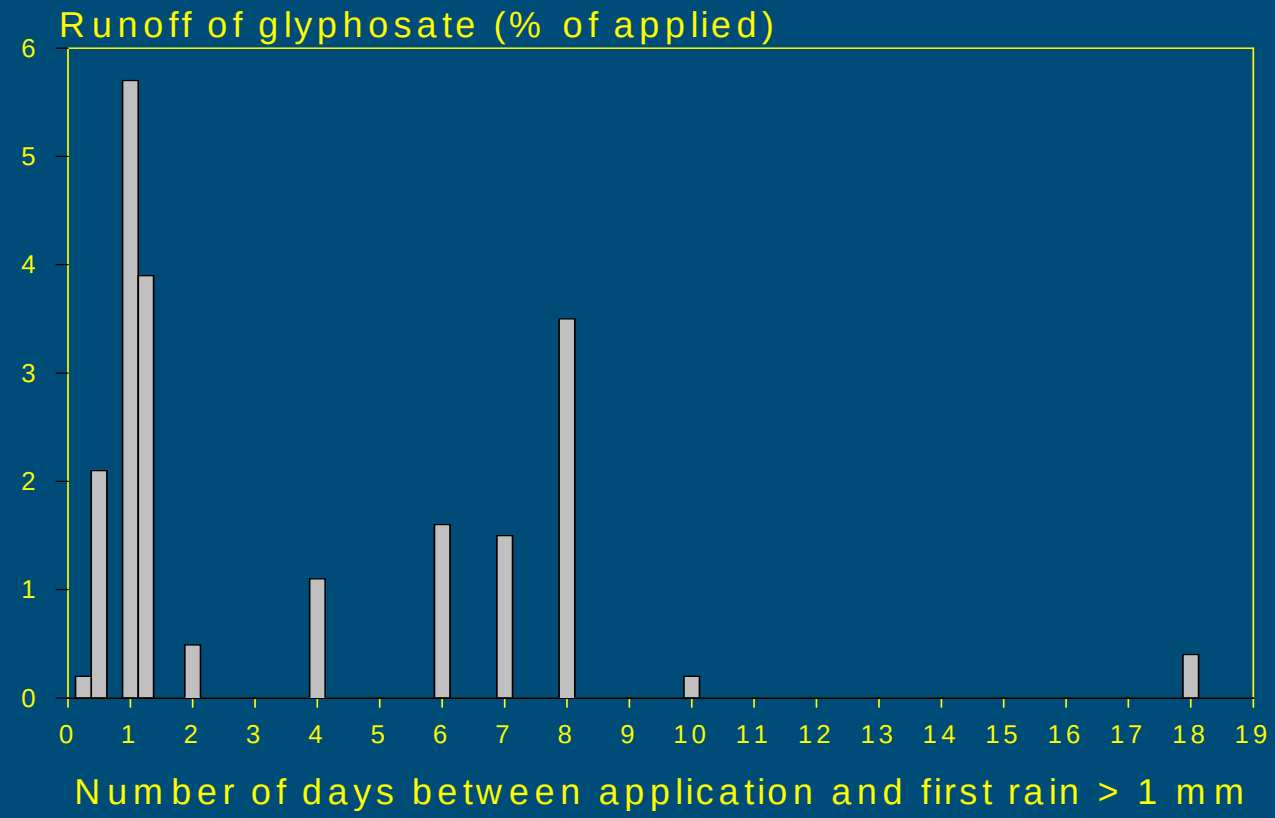
Khuelflgh	\hdu	Wuhdwp hqw	(#ri#grvh
Atrazine	2000	4 replicates	18, 34, 43, 44
Amitrol	2000	4 replicates	7, 7, 9, 22
Glyphosate	2000	4 replicates	11, 12, 12, 23
Glyphosate	2002	2 m around sewer not treated	19
Glyphosate	2002	no buffer zone around sewer	22
Glyphosate	2003	dry surface, 2 replicates	14,18
Glyphosate	2003	wet surface, 2 replicates	9,17

The runoff varies from 7 to 44 %, with an average for all three herbicides of 19%.

The average runoff of glyphosate is 16%.

Runoff at neighbourhoud scale

Runoff at neighbourhoud scale



Runoff between 0.2 and 5.7%, average 1.9 %

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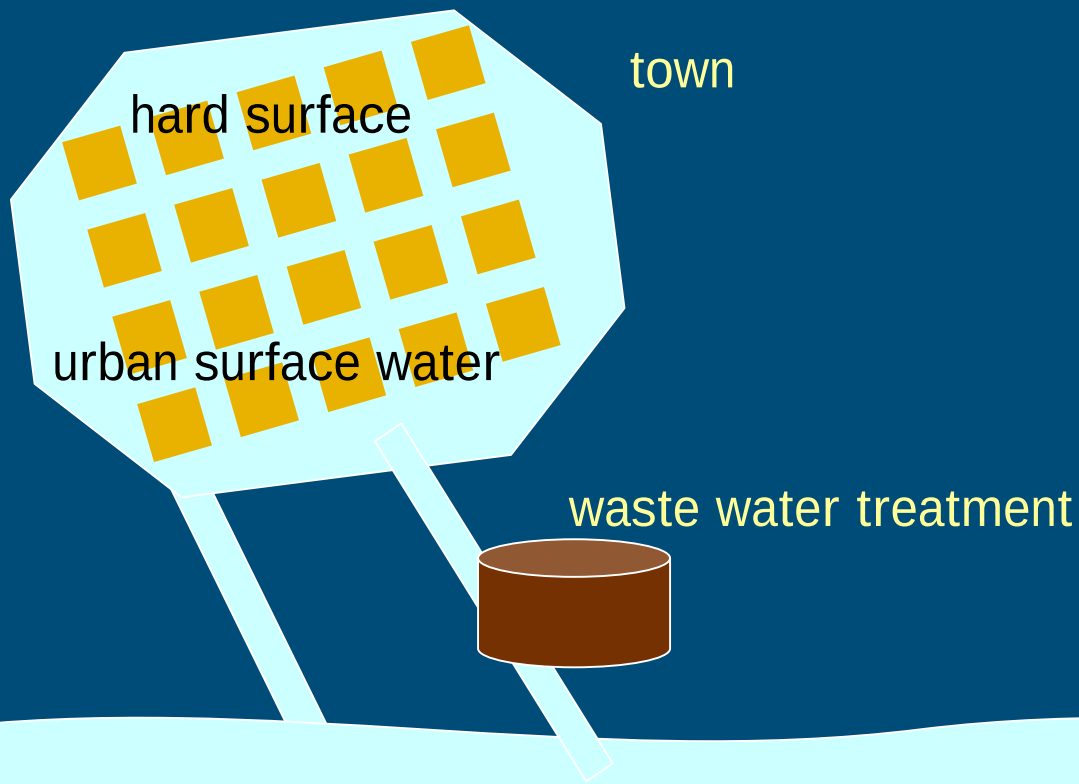
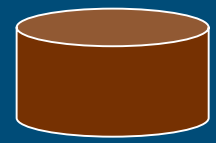
Runoff at town scale

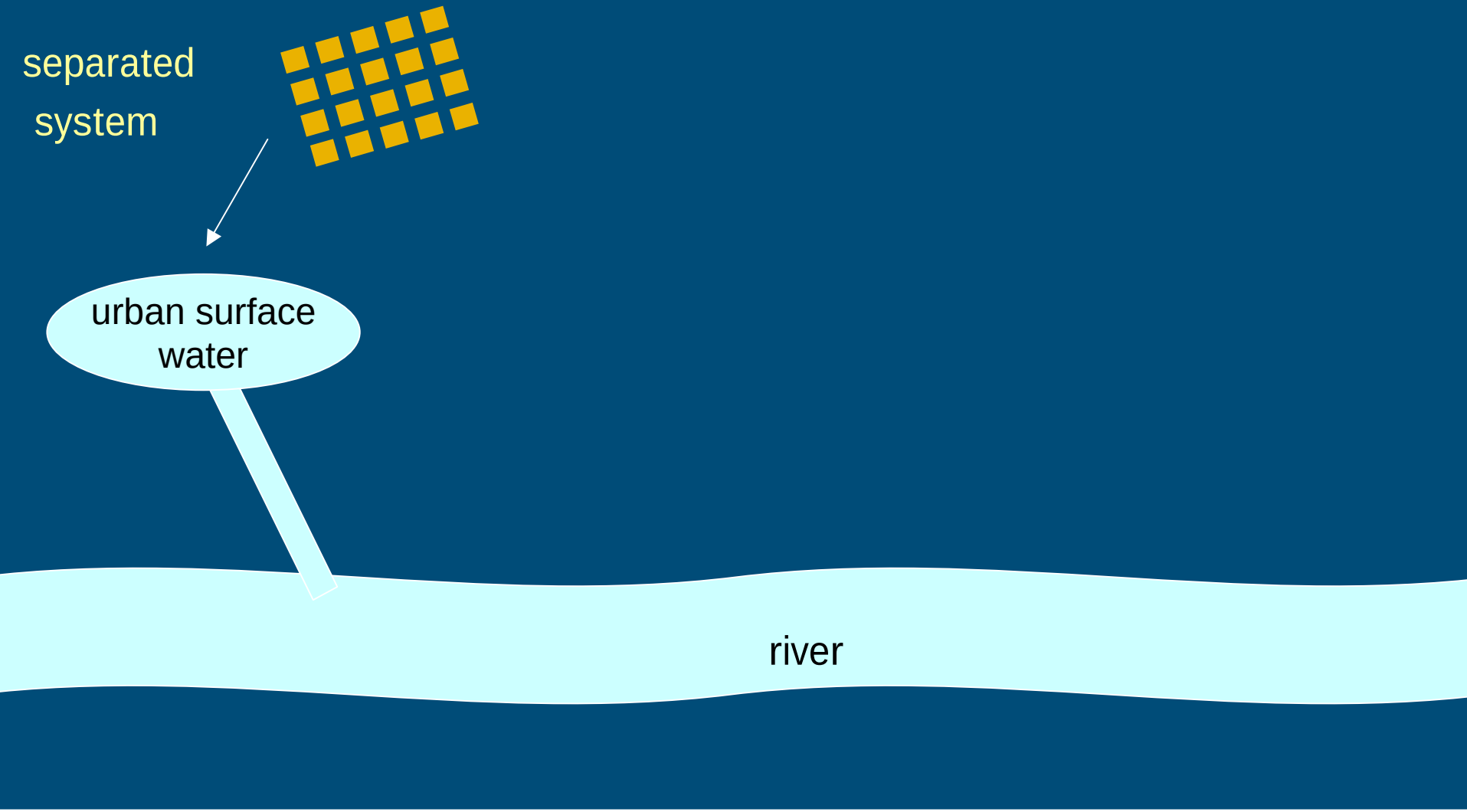


Waste water treatment



- Influent and effluent of two waste water treatment plants sampled discharge proportionally for 4 to 8 days
- Glyphosate was partially transformed in AMPA
- Glyphosate mass in effluent was 36 to 61% of mass in influent
- Sum glyphosate and AMPA in effluent was 66 to 82% of mass in influent

Runoff at town scale: type of sewage system



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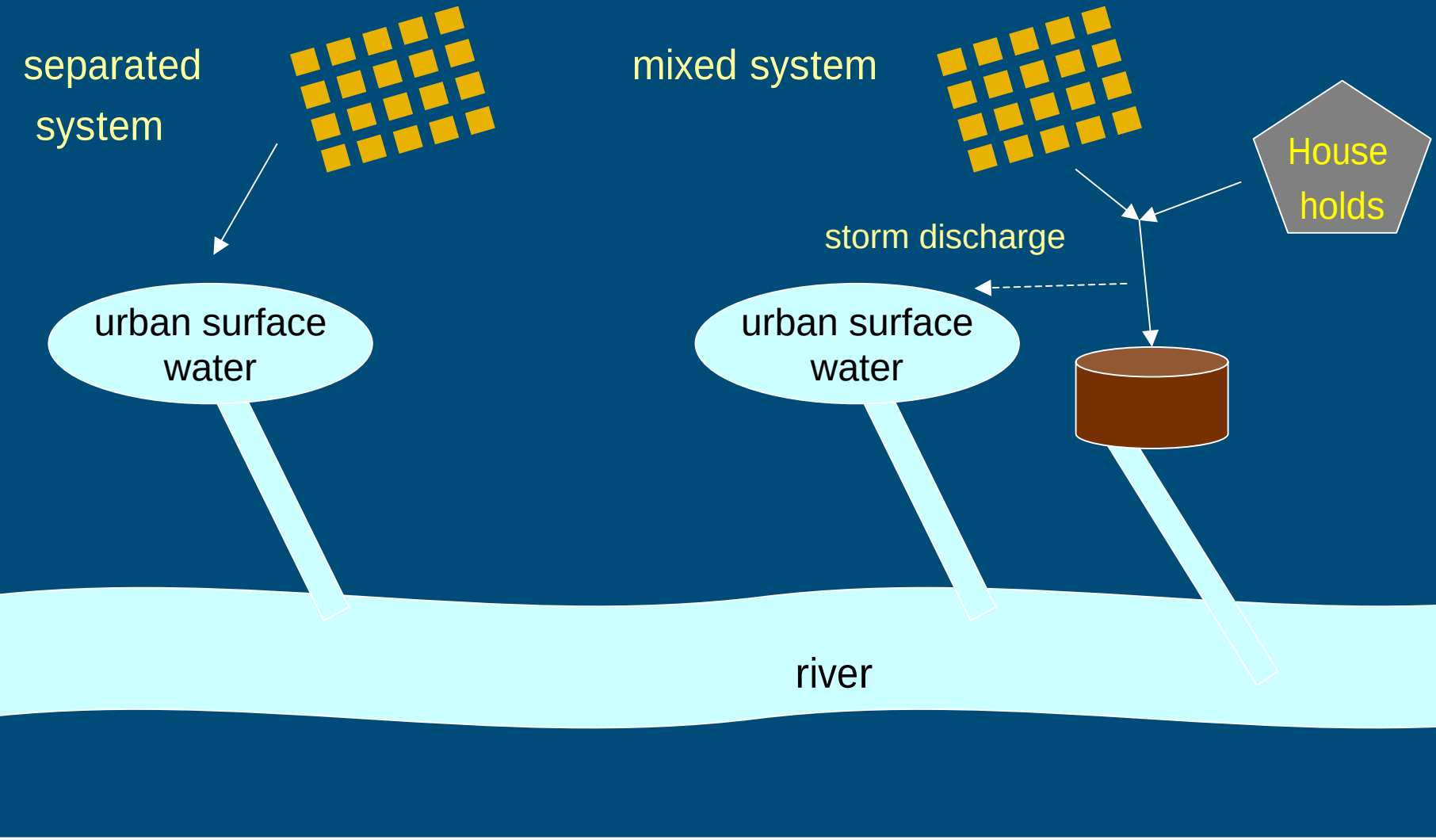
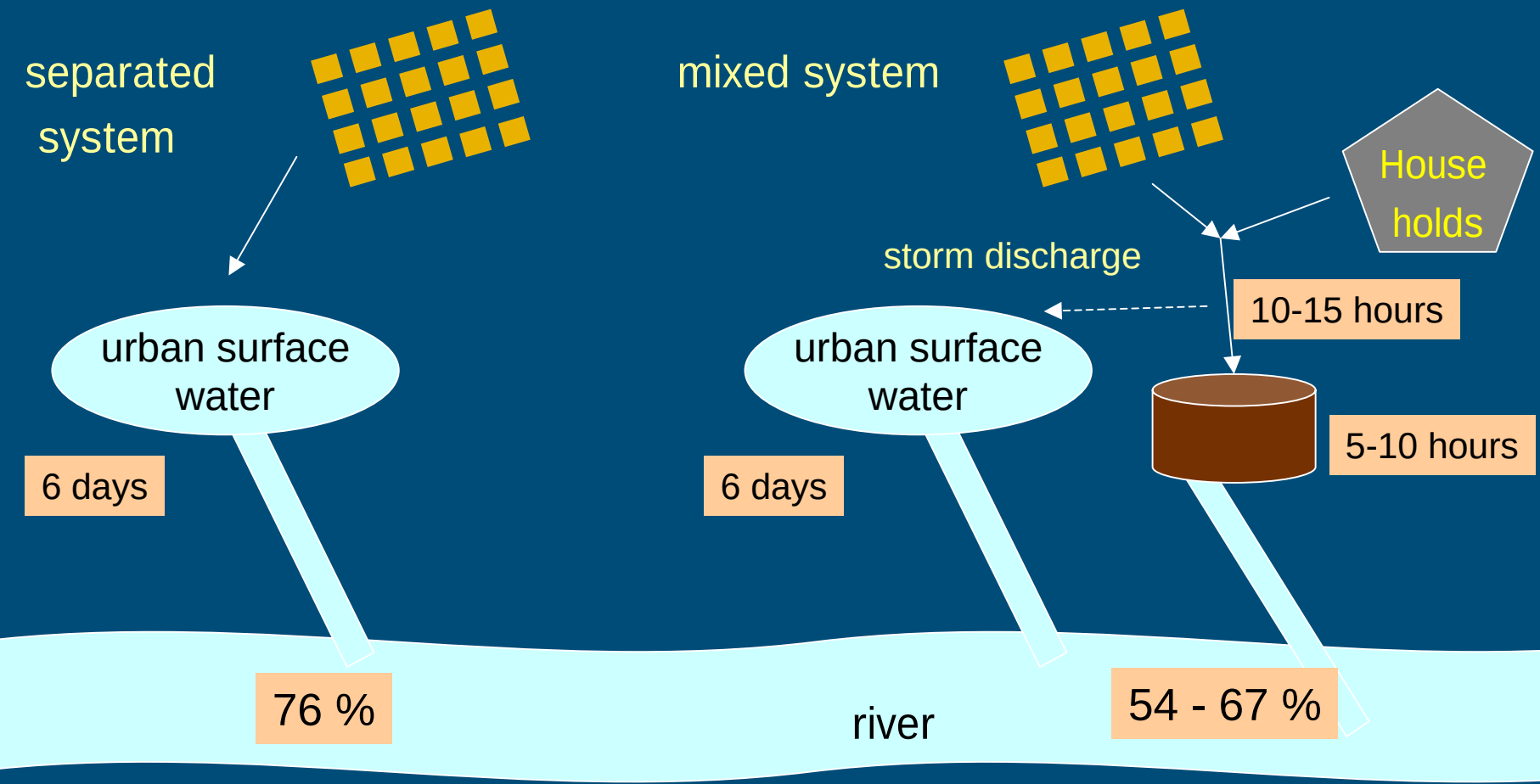


Runoff at town scale: glyphosate + AMPA



Half-life glyphosate in water 15 days

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Registration for use on hard surfaces in NL

- Aim: meeting the drinking water standard of 0.1 µg/L protecting hdfk of the nine extractions in the Netherlands

- Tiered approach:
  - First step: simple calculation with scenario considering factors for area of use and dilution (specific for extraction)
  - ..
  - Last step: monitoring

(under discussion by working group)

Conclusions

- Runoff percentages of pesticides at field scale followed directly by rainfall are 7 to 44%. The average for glyphosate is 16%.
- Runoff of glyphosate at neighbourhood scale (SWEEP conditions) is on average 1.9% of dose.
- Time between application and first rain mainly determines runoff
- Type of urban sewage system hardly affects runoff at town scale
- Use of pesticides on hard surfaces contributes to exceeding drinking water standard in surface water, because of large runoff and little reduction in sewage systems and in surface water

Questions?

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