Mitigation options implementation: from science to agri-environmental policy

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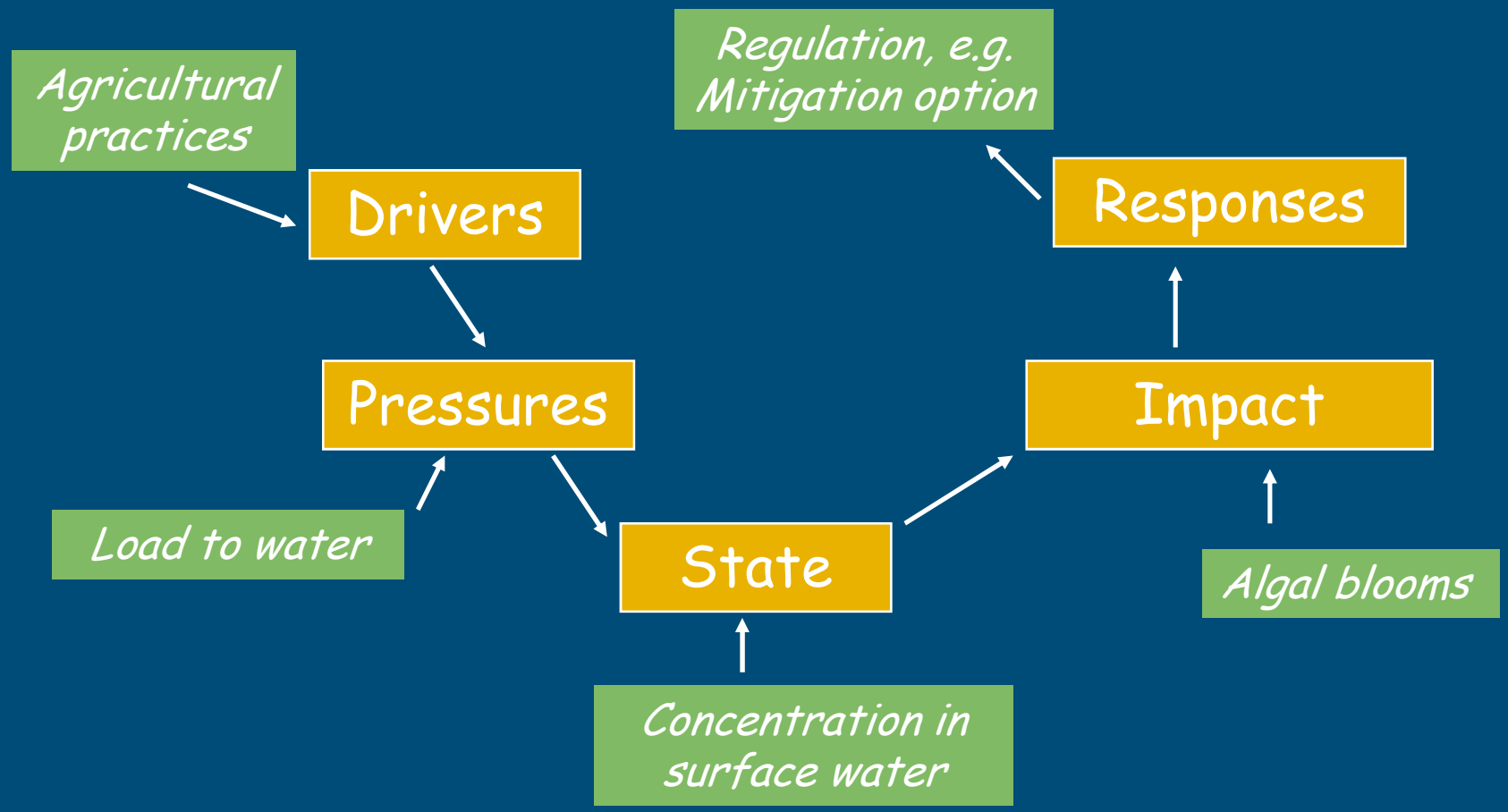
DPSIR, Agriculture and Mitigation options



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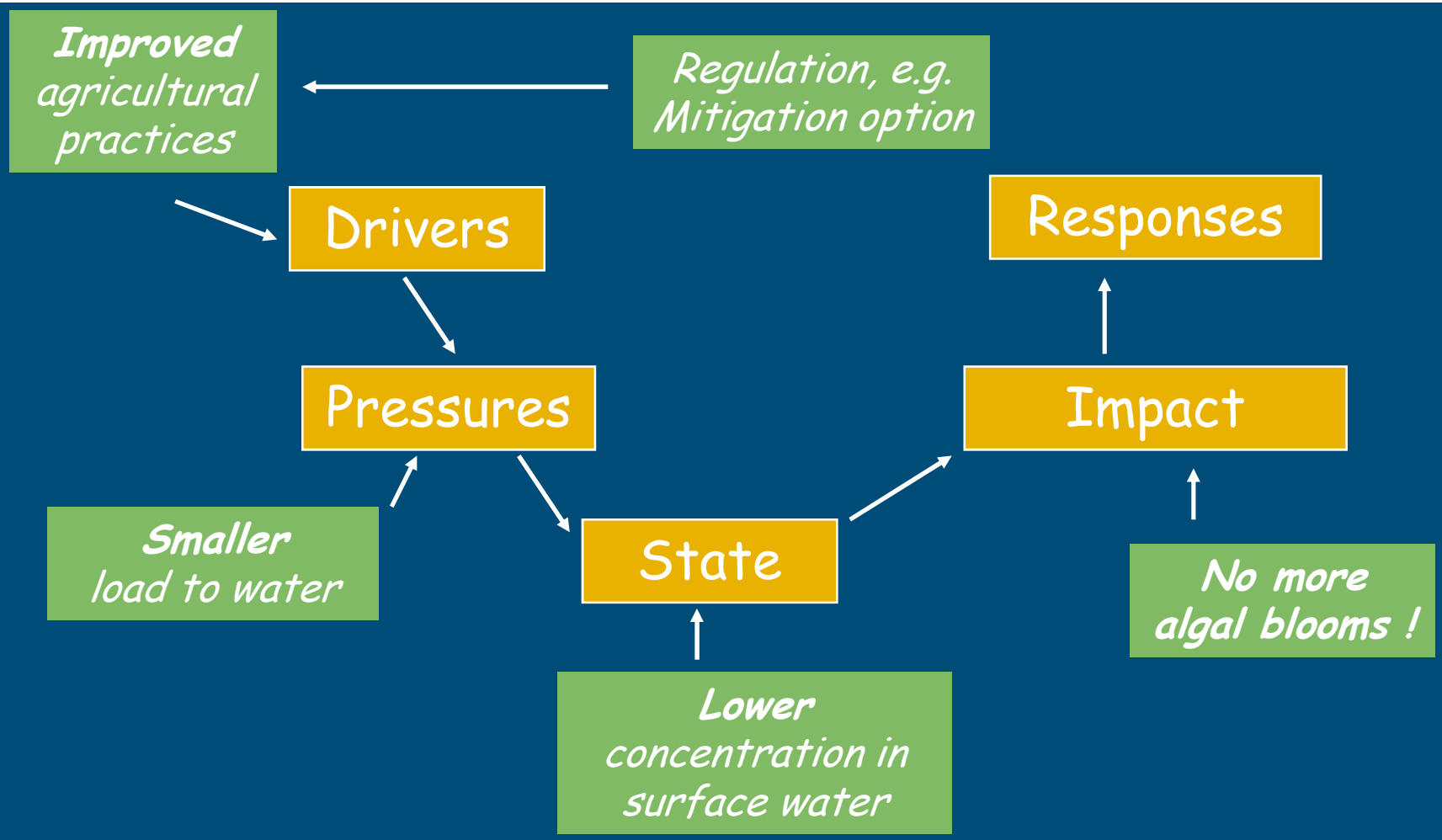
DPSIR, Agriculture and Mitigation options



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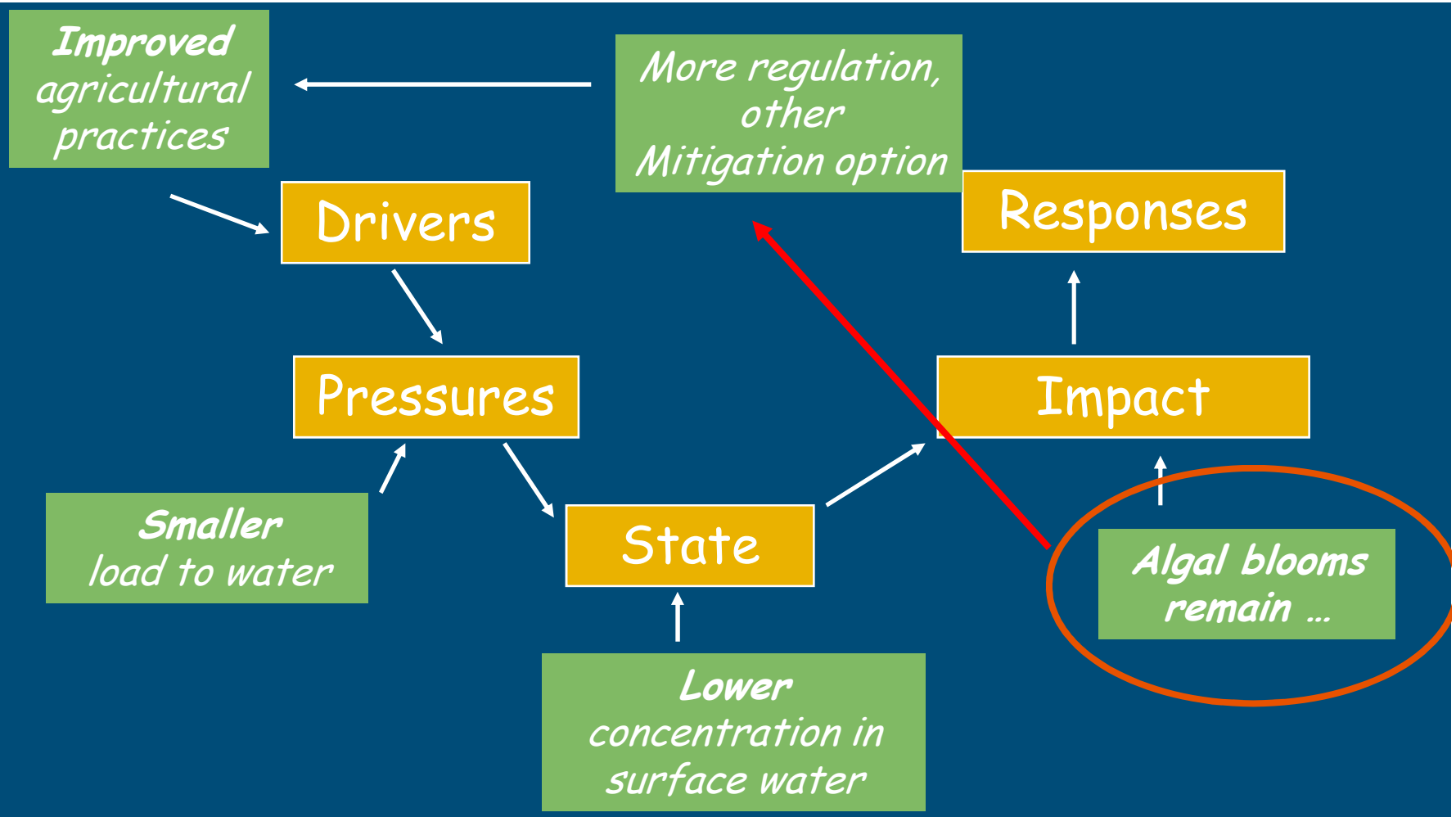

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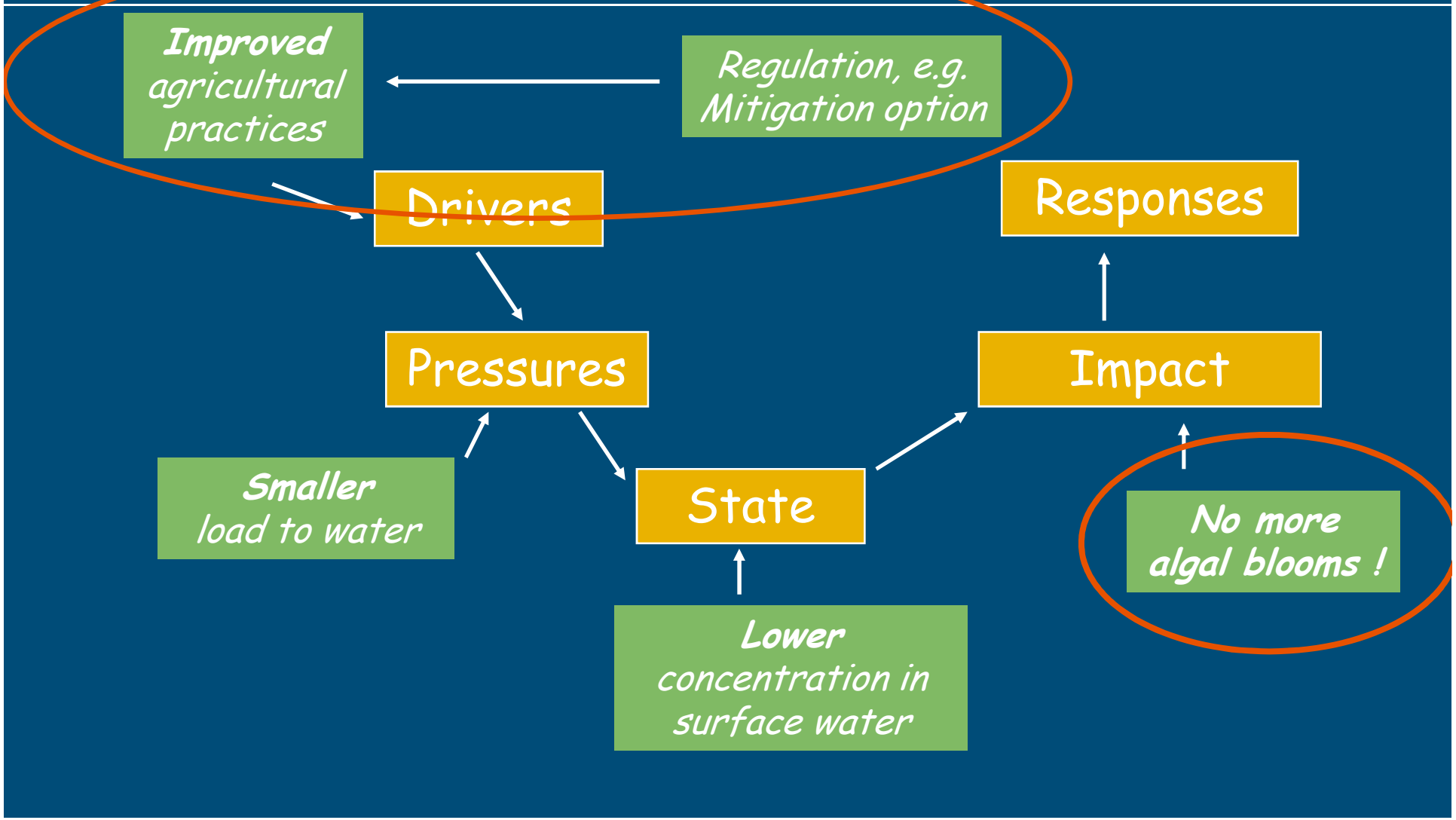

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Actors on Mitigation options and Implementation

Authority, e.g.
* government, from local to EU scale
* water board

Science: develop options, advise

Regulation, e.g. Mitigation option

Farmer

Improved agricultural practices

Advise during implementation

Top-down scheme,

but farmers unions and environmental groups can have an influence on final implementation process

Example - Wetland and River Restoration Denmark

Idea developed by scientists, outcome of research program (1993-1997). Models showed what could be earned on a river basin scale on reducing N and P loss.

Scientists NERI drafted technical guidelines, and were in approval committee for calculations on N removal, leading to funding of restoration projects.

Restoration scheme from 1998-2006 was run by the Danish Counties that made projects using consultants. They sent projects to the Min. of the Environment.

Example - Wetland and River Restoration Denmark

Start was top-down: researchers NERI and Ministry, but implementation is done now much more locally. Wetland restoration schemes had to be introduced together with the farmers in the local area.

Farmers had formed what we now call "stream groups". Today, such groups are important contact points for making negotiations on wetland projects !

Wetland and River Restoration in Denmark as measures in the Second and Third Action Plan on the Aquatic Environment

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Government circular/ departmental circular

Circular no.132, 15 July 1998. The Danish counties were asked to point out areas, i.e. peat soils, low-lying soils, with the potential of being restored as wetlands.
These areas should also be included in the regional planning as an addendum.

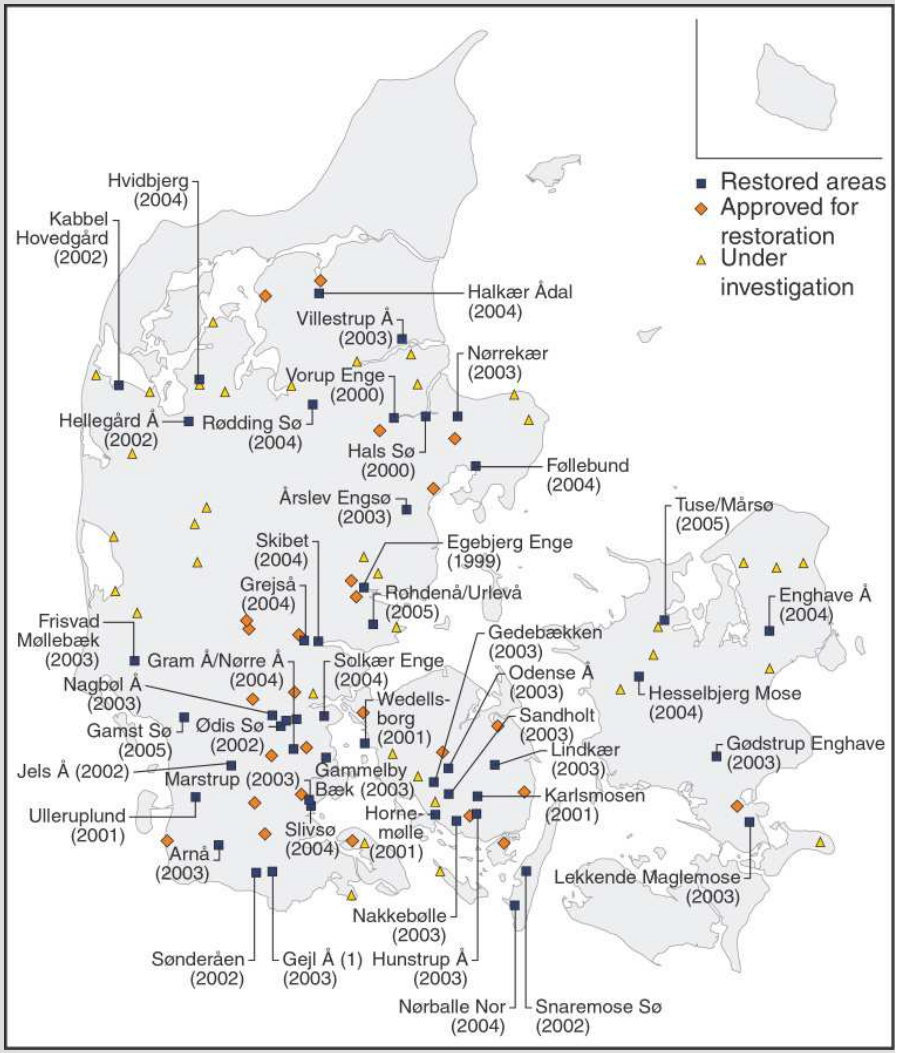
Guidance (to governmental circular)
No. 133, 15 July 1998

Approximately 120.000 ha pointed out

Implies that

- Project areas (restored wetlands) are situated in catchment areas discharging to vulnerable fjords, waters, and lakes, where an improvement in the environmental condition can be expected as a consequence of a reduction of the nitrogen load
- The project areas lie in areas (catchment areas/subcatchments) with streams/rivers with high nitrogen load (i.e. agricultural catchment areas) or in areas where groundwater is influenced by agricultural activity
- Project areas have to lie in areas where the natural hydrological and topographical conditions will lead to formation of wetlands with a watertable fluctuating around the soil surface
- **Nature quality must be enhanced**
- The project areas shall **retain phosphorous**, i.e. on an annual basis there must be no net liberation or discharge of phosphorous to down stream recipients

Wetland restoration – DK in the forefront



Second Action Plan on the Aquatic Environment

4000 ha lakes and 5000 ha wetlands

Exception on scheme: advise not adopted

Authority ← Science: develop options, advise

Regulation, e.g. Mitigation option

Example of advise that was not adopted (NL)

Scientists advised: no more P (=manure) on soils with P-status "very high".

Consequence would be: very large surplus of manure on national scale.

Alternative was chosen, P addition slightly less than offtake by crops (+manure handling). Consequence: P leaching will continue much longer than necessary.

Irish grasslands can have:
Patchworks of intensive and low-intensity agriculture
Wet soil surfaces – overland and near-surface flow
Greater drainage density
High risk of P loss

Implementation Nitrates Directive via National Action Programme :

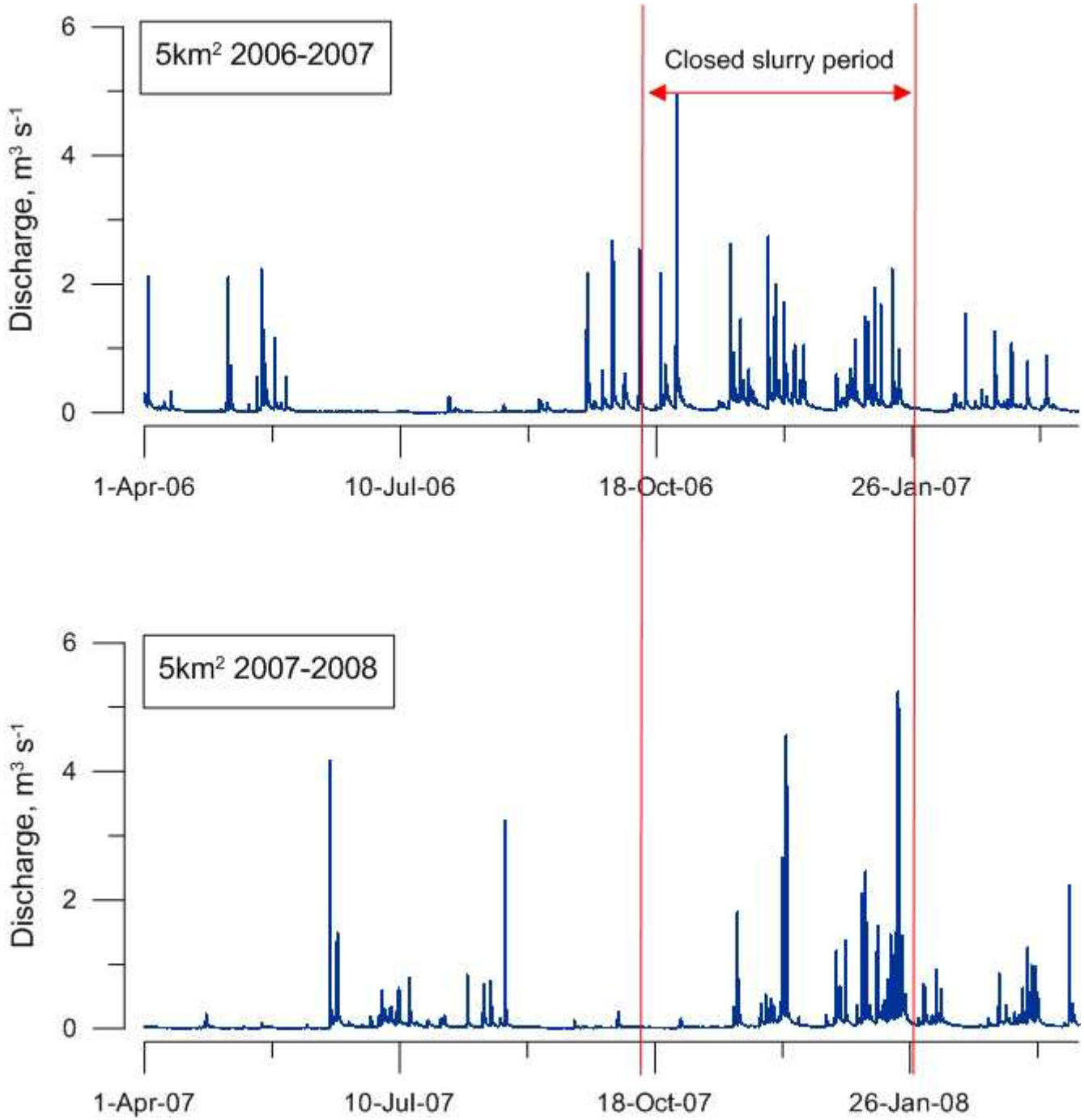
Fertiliser/slurry spreading closed period varies based on regional rainfall only:

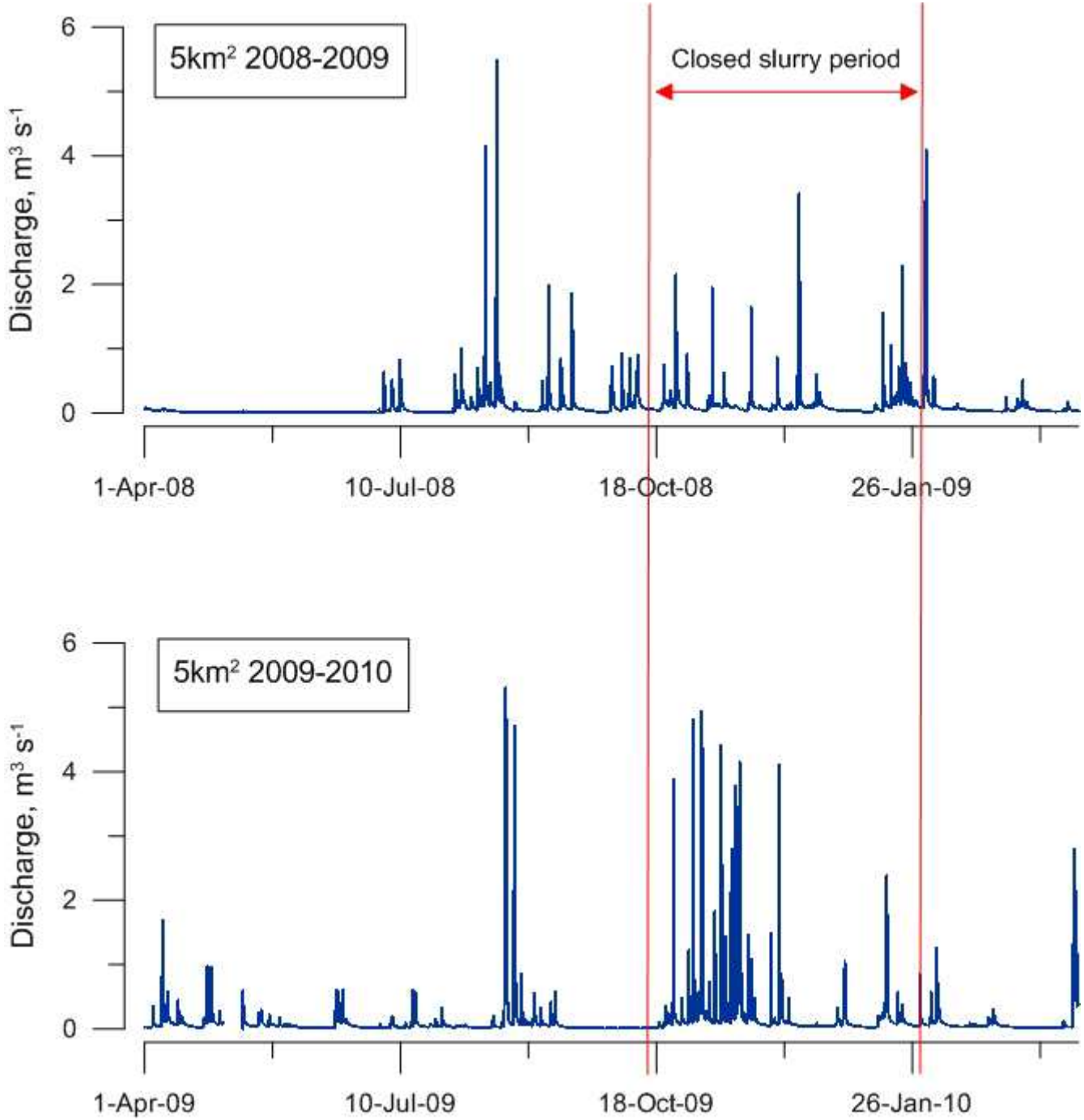
- South
  15 Sep to 12 Jan
  15 Oct to 12 Jan

- North
  15 Sep to 31 Jan
  15 Oct to 31 Jan

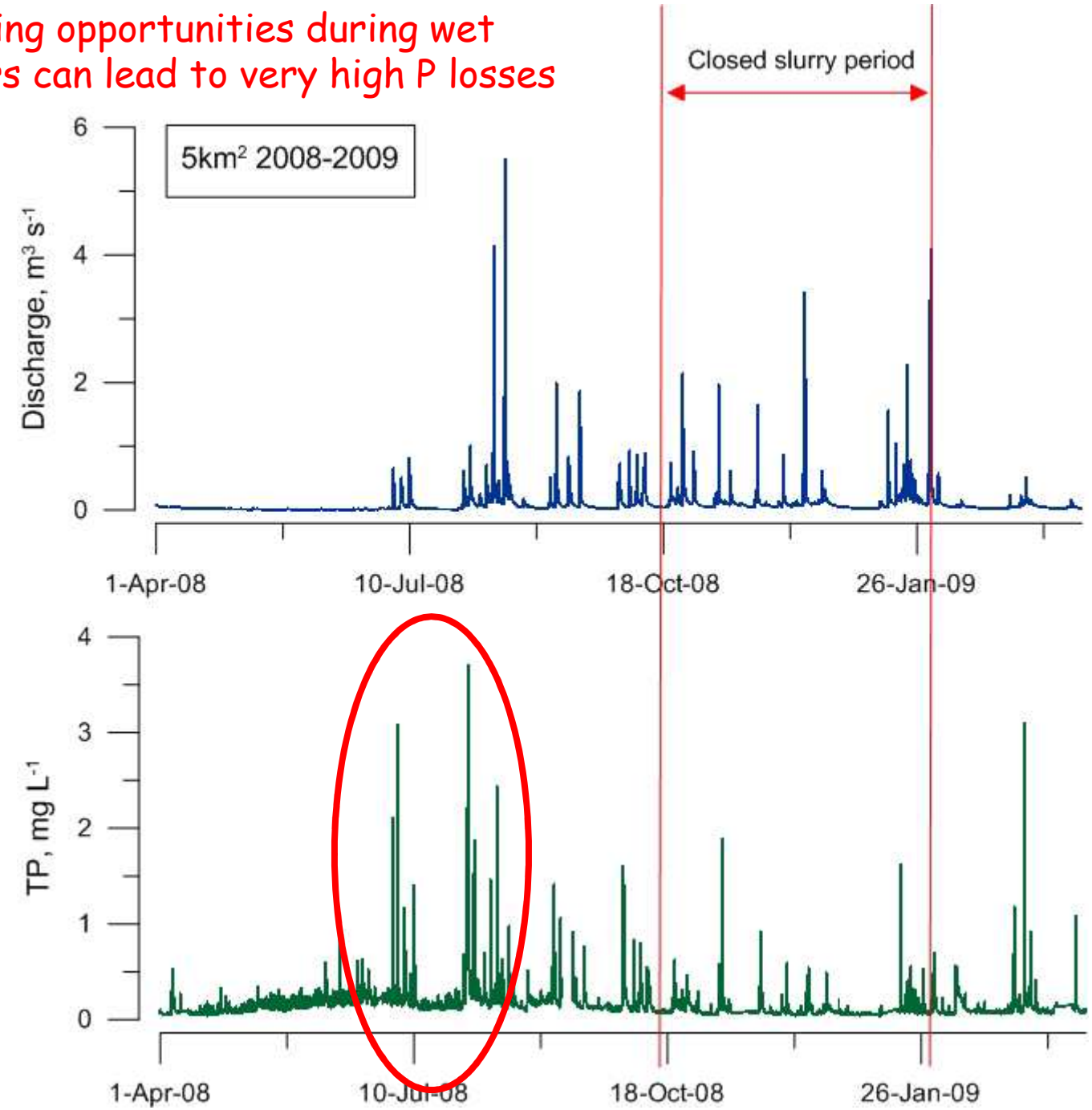
Soil type not addressed
- Runoff risk
- Trafficability

Photo: Dr David Wall, Teagasc


5km² 2006-2007
Closed slurry period
Discharge, m³ s⁻¹
6
4
2
0
1-Apr-06
10-Jul-06
18-Oct-06
26-Jan-07
5km² 2007-2008
Discharge, m³ s⁻¹
6
4
2
0
1-Apr-07
10-Jul-07
18-Oct-07
26-Jan-08


5km² 2008-2009
Closed slurry period
Discharge, m³ s⁻¹
6
4
2
0
1-Apr-08
10-Jul-08
18-Oct-08
26-Jan-09
5km² 2009-2010
Discharge, m³ s⁻¹
6
4
2
0
1-Apr-09
10-Jul-09
18-Oct-09
26-Jan-10

Spreading opportunities during wet summers can lead to very high P losses



Exception on scheme: not enough science (?)

Authority ← ?

? Were scientists consulted before and during implementation ?

↓

Regulation, e.g. Mitigation option

↓

Farmer

↓

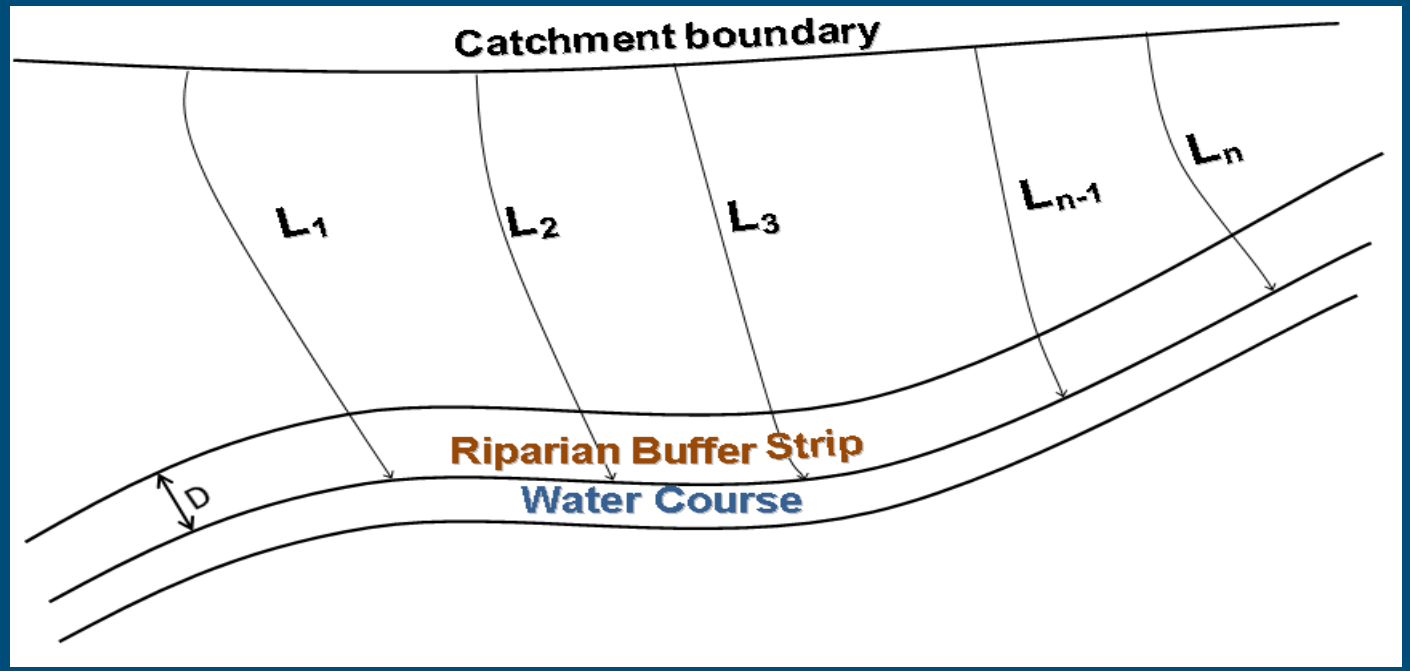
Improved agricultural practices

Example of mitigation option - buffer zone

Direct losses of fertilizers or pesticides can be prevented by a small (and uniform) zone along watercourses that does not receive these agro-chemicals. Such a zone is prescribed within EU.

This principle seems simply copied for preventing nutrient loss via surface runoff: a uniform buffer zone, also called "riparian buffer strip". Its width is independent of the area that contributes to runoff.

Illustration, from J. Antal, COST 869 workshop Ballater, 2010



Length of adjoining area (L) differs, so the volume of surface runoff and the amount of transported sediments will also differ
→ width of riparian buffer strip should also differ.

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Example of mitigation option - buffer zone

Conclusion: with uniform buffer zone, this will be

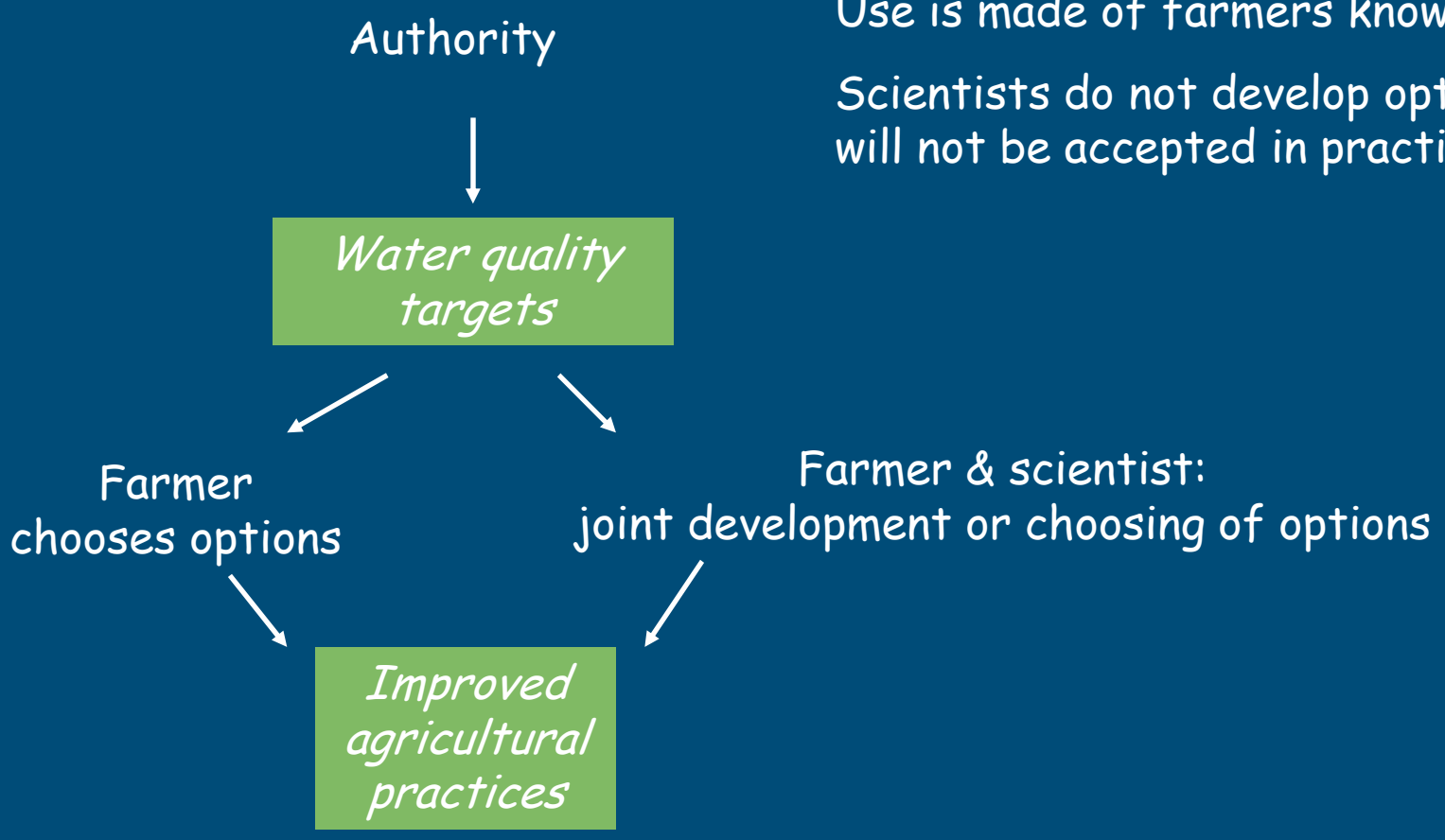
→ too small where it should be wider

→ too wide where it could be smaller

Uniform width is simple for regulators, but the money for mitigation is not spent in the best way, so more science is needed on this point. (Also concluded in Aqaurius project in Sweden).

Maybe we should not leave it over to the farmer to decide how wide the zone should be, since outcome probably not optimal (Anuschka Heeb, Sweden) .

Exception on scheme: authority only sets targets



Use is made of farmers knowledge

Scientists do not develop options that will not be accepted in practice

Farmer & scientist, develop / choose options

Unfortunately, ideas of farmer are not always effective…

Example: a trench, created for removal of surface runoff on a heavy clay soil. Farmer suggested to install a sedimentation pit of .4 x .6 m, (0.24 m^2), at end of trench, having a contributing area of 1 ha. As might be expected, this did not function that well for retaining particles.

A "small wetland" aimed at particle retention has a size of 25 m^2 for 1 ha (0.025 %; Claire Daisy, UK)

Farmer & scientist, develop / choose options

Ideas from scientist not always received well…

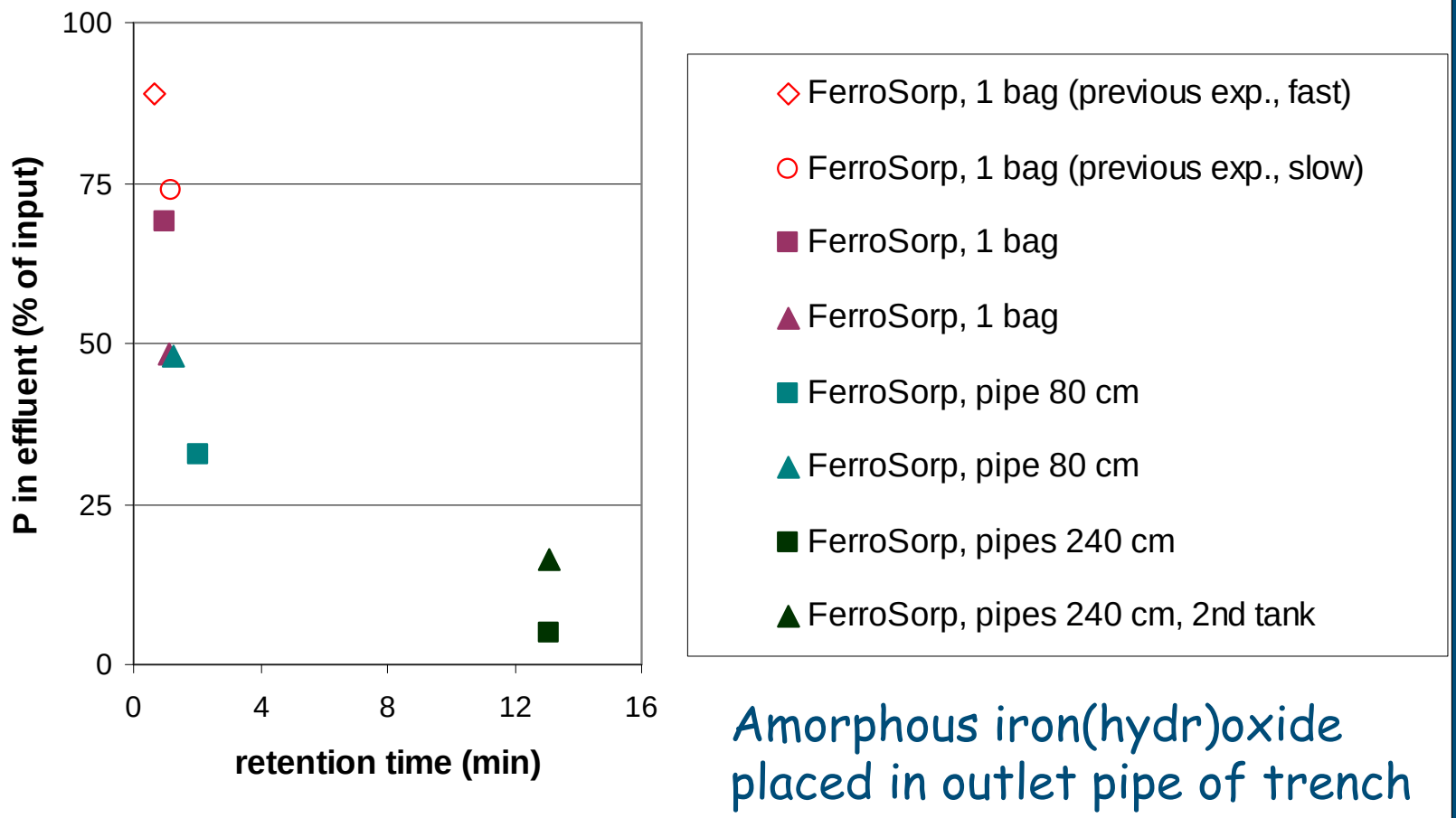
Example: in the bulb growing area with poor sandy soils, we installed this week a new tile drain, with an 'envelope' of iron containing material. This is aimed to capture P from drainage water, which now has 2-4 mg/L DRP (!).

Farmer & scientist, develop / choose options

Last week, a student summarized interviews she had with farmers. One farmer heard about our plans, and said:
"*I would never accept such material around a drain on my land. This may lead to blocking of the drain, and to a too high groundwater level. Bulbs are sensitive for this, and they are costly!*"

His alternative was an iron filter at the end of the drain. Earlier, this was rejected by us because this would have a too short water retention time.

Influence of retention time on P removal



Amorphous iron(hydr)oxide placed in outlet pipe of trench

Thank you for your attention !

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