

3. Nährstoffsymposium Nährstoffmanagement & Gewässerschutz

Hannover - 12. Mai 2016

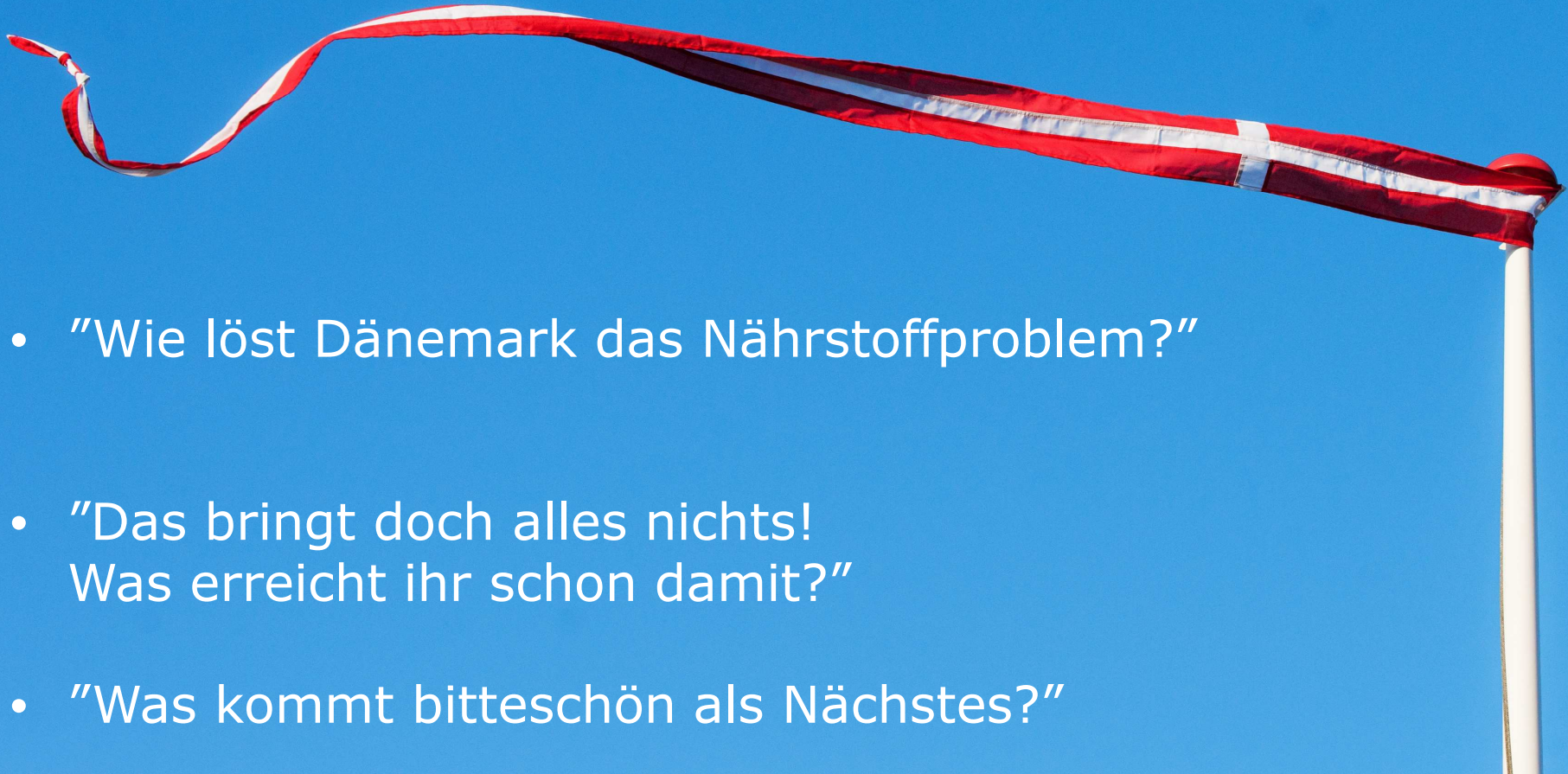
Ministry of Environment and Food



"Ein Blick zum Nachbarn"
oder
Wie löst Dänemark das Nährstoffproblem?

In 15-20 Minuten durch Dänemark

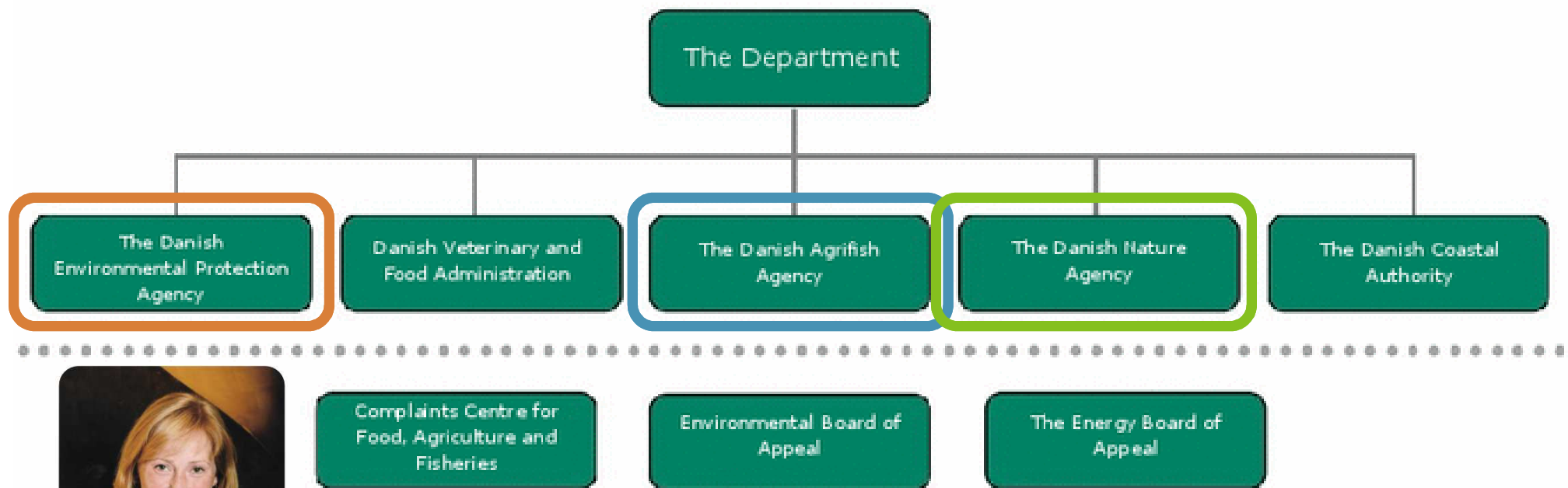
- "Wer bin ich und was mach' ich (hier)?"
- "Das lässt sich doch alles nicht vergleichen!"
- "Wie löst Dänemark das Nährstoffproblem?"
- "Das bringt doch alles nichts!
Was erreicht ihr schon damit?"
- "Was kommt bitteschön als Nächstes?"



"Wer bin ich und was mach' ich (hier)?"

Organisational structure

Ministry of Environment and Food of Denmark



Wibke Christel
<http://eng.mst.dk/>

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"Das lässt sich doch alles nicht
vergleichen!"

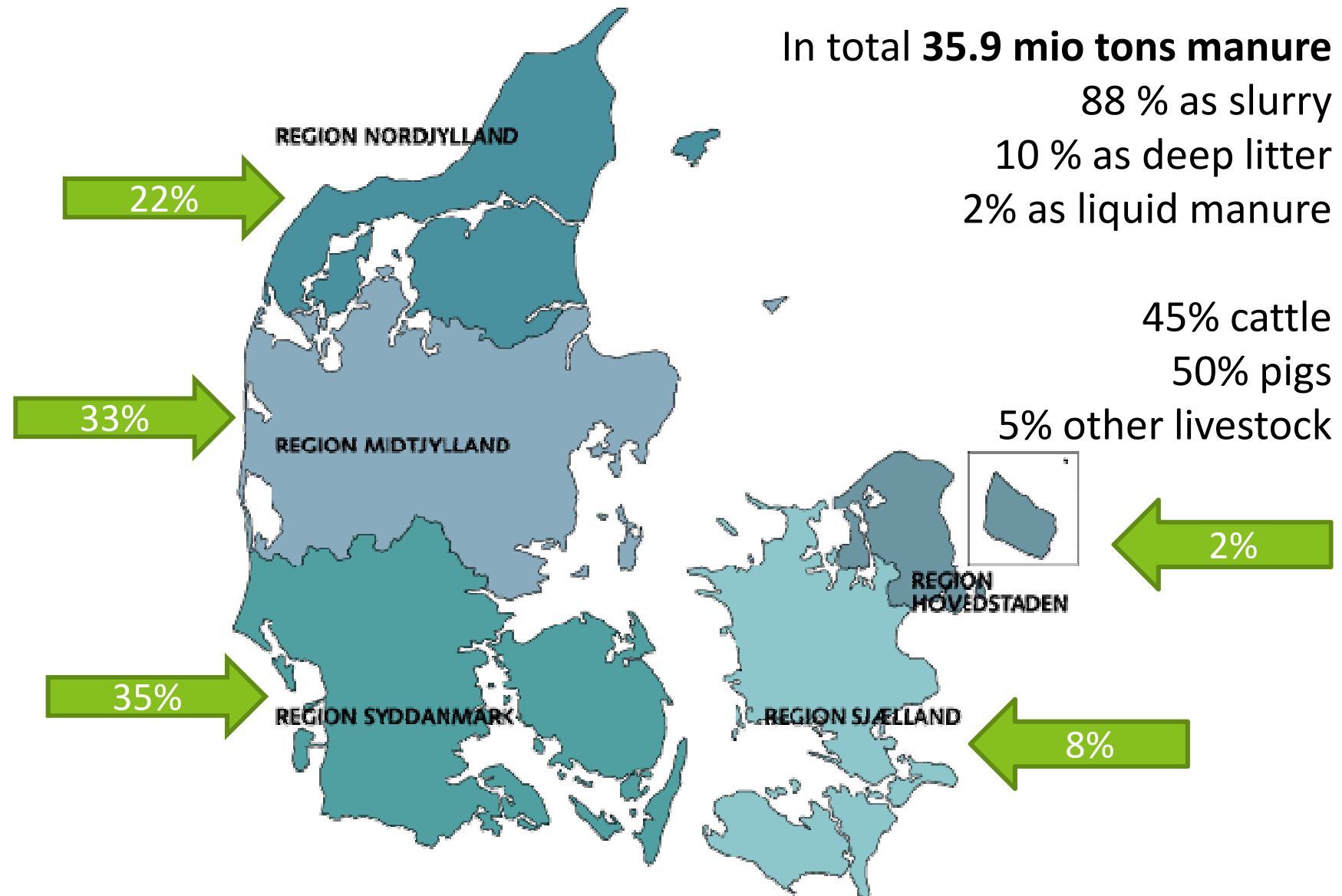
Landwirtschaft in Zahlen

Ein Vergleich: Dänemark - Niedersachsen

				
(National) territory		4.31 mio. ha		4.76 mio. ha
Population		5.71 mio.		7.86 mio.
Agricultural area (share)		2.6 mio. ha (60%)		2.6 mio. ha (55%)
Number of agricultural holdings		42,000		41,700*
Number of livestock holdings (excl. poultry)		16,300		28,300
- Cattle holdings		12,500		21,700
- Pig holdings		3,800		6,600*
production of slaughter pigs		19 mio./a		16 mio./a
Number of dairy cattle		580,000		865,000

*Daten der letzten Agrarstrukturerhebung 2010

Distribution of Manure in Denmark



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“Wie löst Dänemark das
Nährstoffproblem?”

Das dänische Aktionsprogramm

Good Agricultural Practice & Nitrates Action Programme

Hannover - 12. Mai 2016

Overview on the elements of the Danish Implementation of the Nitrates Directive

- **No application of liquid animal manure or digestate after harvest & until Feb 1**
- Extension of application period in autumn until Oct 1 or 15 under certain conditions (e.g. seeding of winter rape, grass, sugar beets, etc or in case of heavy local summer rainfalls)
- **No application of solid manure, silage liquor or mineral fertilizer from Nov 15 – Feb 1**



- **No application of animal manure, digestate or mineral fertilizer on slope areas with a gradient >6 degrees & within 20 meters from a water course, lake (>100 m²) or coast line.**
- Allowed application of liquid mineral fertilizer & injection of liquid animal manure in parallel direction to the bank/shore/coast on slope areas with a gradient >6 & <12 degrees



- **No application of animal manure, digestate, silage liquor, processing waters or mineral fertilizer to water-saturated, flooded, frozen or snow-covered grounds**



Good Agricultural Practice & Nitrates Action Programme

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Overview on the elements of the Danish Implementation of the Nitrates Directive

- **No application of animal manure**, digestate, silage liquor, processing waters or mineral fertilizer within **2 meters broad buffer strips** around natural **lakes** (with tributary/outflow or $>100 \text{ m}^2$) **and along** open, natural **water courses** as well as around artificial lakes & watercourses, which according to the river basin managements plans should reach good ecological potential or higher



- Minimum **100 meters distance of slurry tank** to open **water courses or lakes** ($>100 \text{ m}^2$), etc.
- **Capacity of the storage tanks** corresponding to **no less than 6 months production**
- Solid, impermeable floors & well-functioning drainage system in animal stables & other similar constructions on farm
- **Requirements for storage of solid manure/compost/silage liquor, etc.**



- **Ban on slurry broad spreading** – liquid animal manure & digestate has to be applied with **trail hose/shoe or injected** (since 2001)
- **Injection obligatory on bare soil & fodder grass fields** (technologies listed by the EPA can substitute slurry injection, e.g. acidification)
- **Incorporation of solid manures as soon as possible**, but at the latest 6 hours after application



Good Agricultural Practice & Nitrates Action Programme

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Overview on the elements of the Danish Implementation of the Nitrates Directive

- **Obligation for all farms** (>10 ha) to establish **catch crops** on at least **10% of their fields' area** over the winter season
- Obligation for **farms with high livestock density** (> 0.8 LU/ ha) to establish **catch crops** on **14%** of their fields' area
- **N** in incorporated catch crops is **accounted for with up to 25 kg N/ha** in the following year



- **Obligatory fertilizing planning** in the national (IT-based) **Fertilizer Accounting system** for all farms with a annual gross turnover > DKK 50.000 (= approx. 6700 €) &
 - livestock of > 10 livestock units (1 LU=100 kg N ex storage)
 - animal density > 1.0 LU/ha
 - reception of > 25 tons animal manure or other organic fertilizer within one planning period
 - **voluntarily for other farms** to avoid tax on N-fertilizer
- → **approx. 38.500 holdings (=90%) registered with fertilizer accounts**



- Nationwide fixed **nitrogen application standards** depending on:
 - crop,
 - soil type,
 - irrigation scheme etc.



The obligatory Fertilizer Accounting System

Overview on the elements of the Danish Implementation of the Nitrates Directive

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Registration of information on:

- type of crops & the N standard norm for the respective crops (based on nationally centralized calculation of the economic optimum)
- type of livestock & the N resulting from livestock production
- use of fertilizers – both manure & commercial fertilizer
- delivery of fertilizer & exchange of fertilizer or manure
- establishment of catch crops
- number of livestock units (coupled to the national central animal husbandry register)
- general facts on the holding, i.e. address, stable construction, etc.

A maximum N-quota is automatically calculated for each registered farm on the basis of:

- choice of crops in the planning period
- size of cultivated area with the crops
- pre-crops composition
- soil type (sandy vs. loamy soils)
- expected yields
- irrigation of the fields
- N forecast

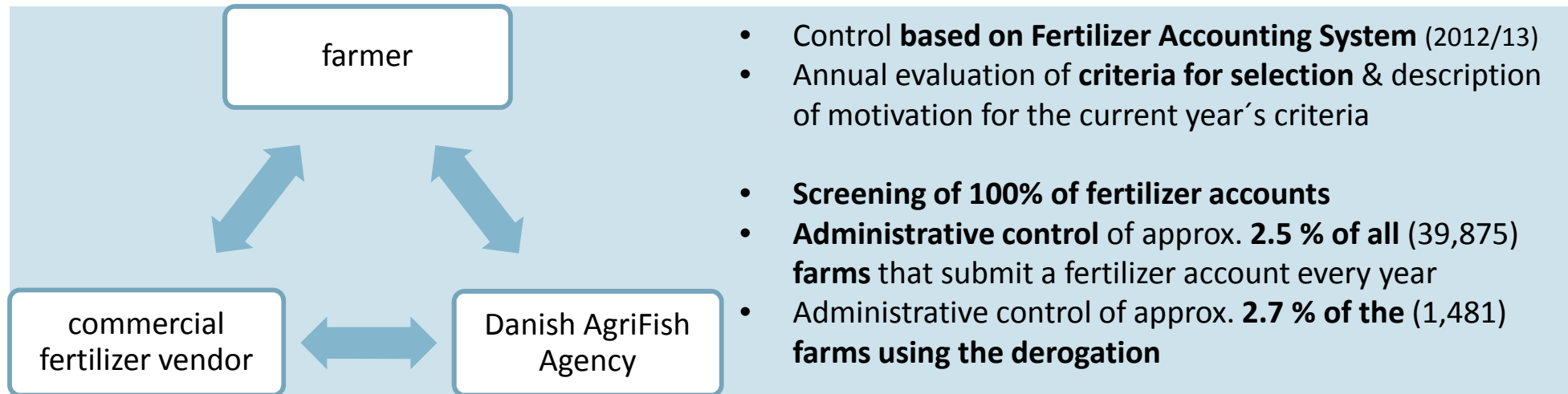
Setting of share of manure-N, to be accounted for:

type of animal manure	efficiency
pig slurry	75 %
cattle slurry	70 %
mink/poultry manure	70 %
deep litter	45 %
liquid fraction after manure processing	85 %

Administrative control & farm inspections

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Overview on the elements of the Danish Implementation of the Nitrates Directive



On-farm inspections by the Danish AgriFish Agency

→ Control of regulations on limitation of the land **application of fertilizers**

- On-farm inspections** on approx. **1.2 % of all farms** that submit a fertilizer account every year
- On-farm inspections on approx. **6.9 % of the farms using the derogation**
 - 50 inspections in january – february
 - 52 general inspections

Examples of other protective measures

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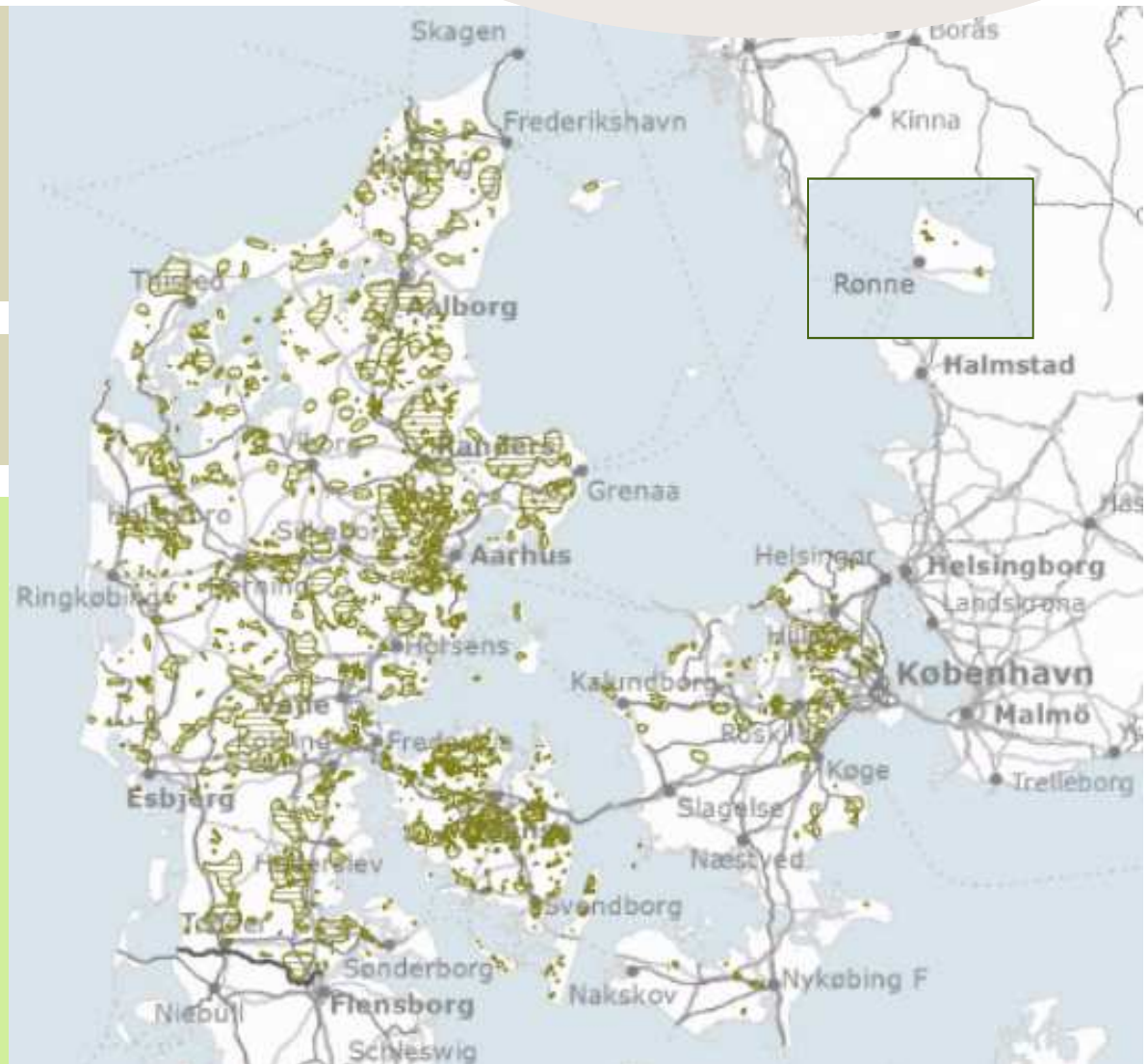
Protection of the aquatic environment in other environmental regulation

Nationwide mapping of areas of special drinking water interests & catchments to public water supplies → delineation of “**nitrate-sensitive areas for drinking water abstraction**” (NFI)

covering approx. 19% of the Danish territory

→ Farmers can be obliged to use measures, which secure a sufficiently low nitrate concentration in the root zone water, e.g. by

- establishment of additional catch crops, or
- alternative on-site means, which have been proven to reduce nitrate leaching



Examples of other protective measures

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Protection of the aquatic environment in other environmental regulation



"Slurry tank inspections"

- Farmers are obliged to ensure an **inspection of their containers** (with a capacity $>100\text{m}^3$) at least **every 10 years by an authorized inspector**
- applies to **all** open and closed **tanks** for storage of liquid animal manure & silage liquor
- Inspection obligatory **every 5 years**, if slurry tank is located within <100 meters distance to an open water course or lake ($>100\text{m}^2$)

"Authorized inspectors"

- inspectors with **special training & official authorization** check approx. 2,300 tanks annually in terms of **quality, condition & stability of concrete walls**, etc.
- **Immediate repairs & report** to the central inspection secretariat & respective municipality, possibly including some stipulations

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Data & figures from DCE & GEUS:

Bjerring et al., 2015

Blicher-Mathiesen et al., 2015

Hansen et al., 2015

Thorling et al., 2015

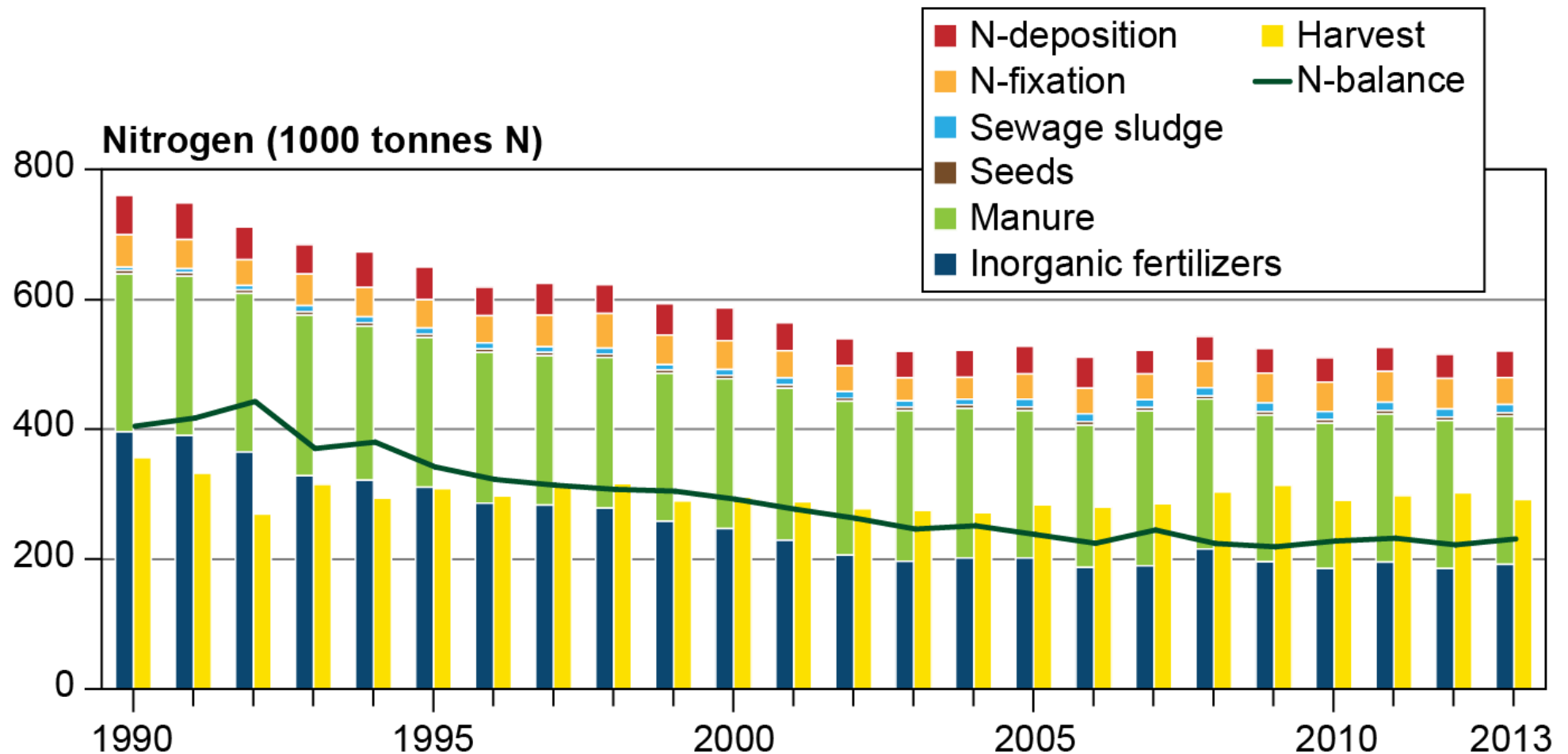
Wiberg-Larsen et al., 2015

“Das bringt doch alles nichts!
Was erreicht ihr schon damit?”

State & trends in Danish water quality
1990-2013

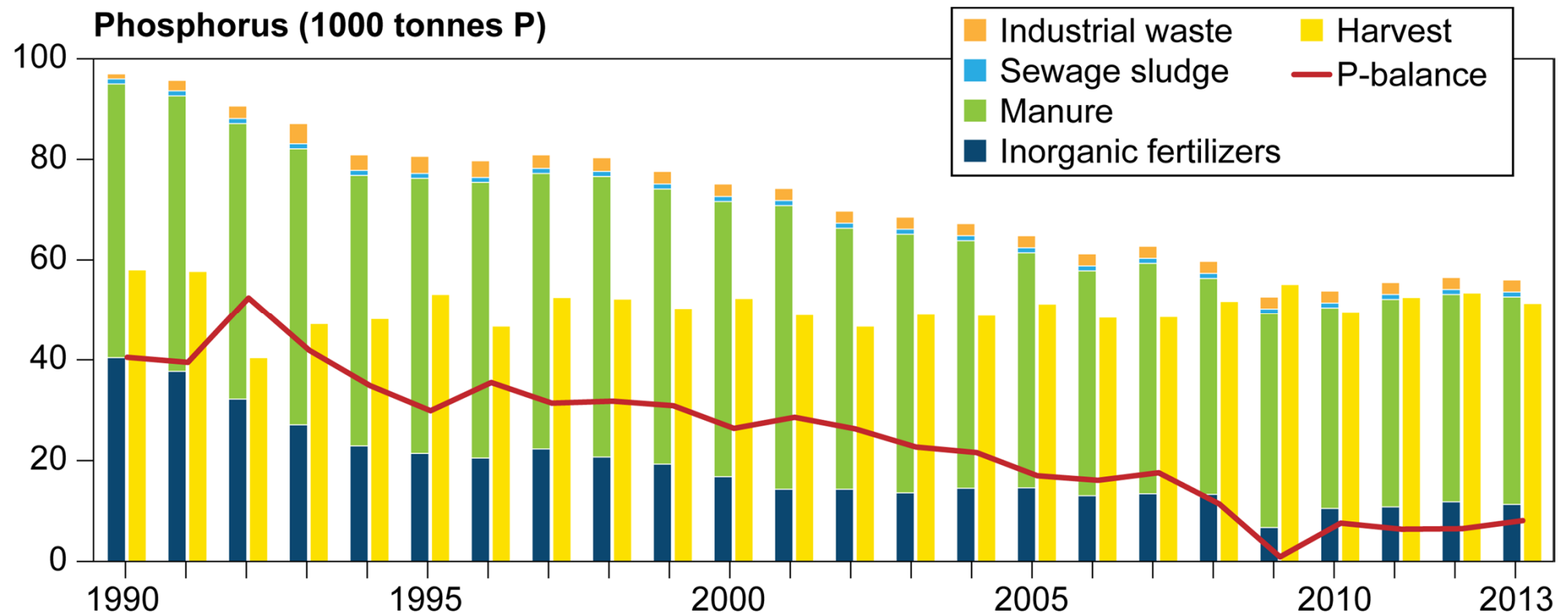
Danish field balances for nitrogen

→ Reduction of 43 % in the field balance 1990-2013

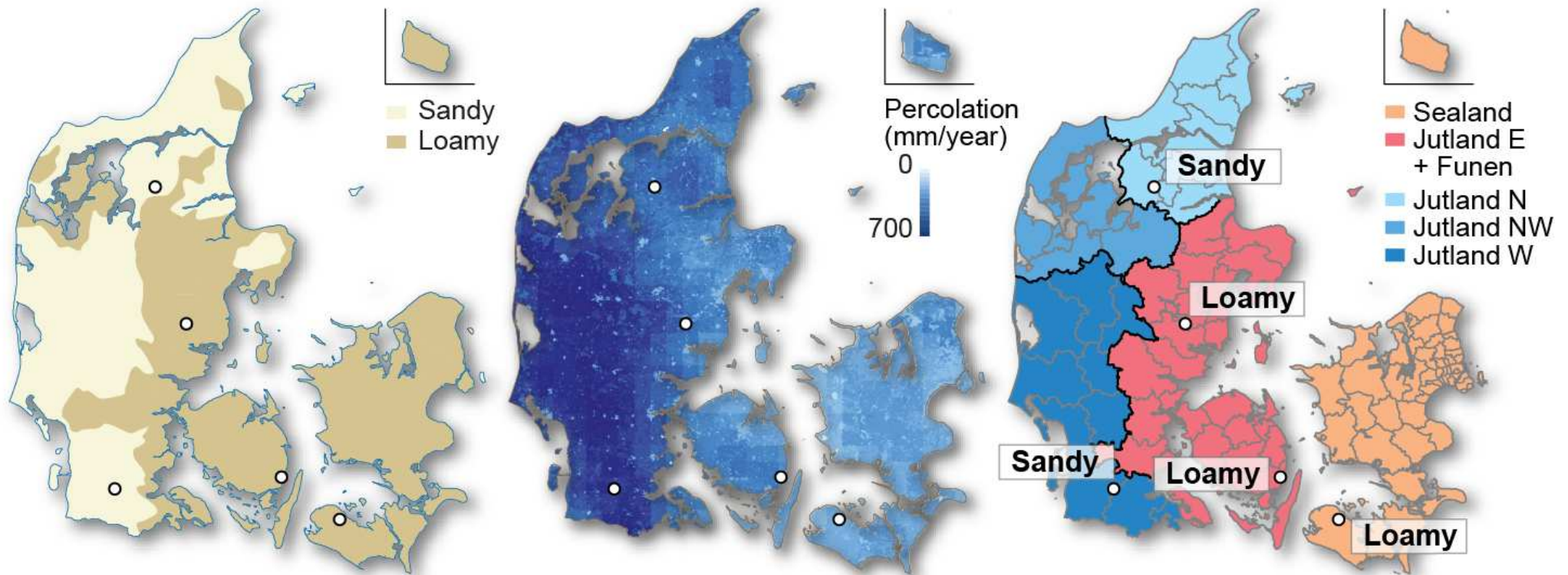


Danish field balances for phosphorus

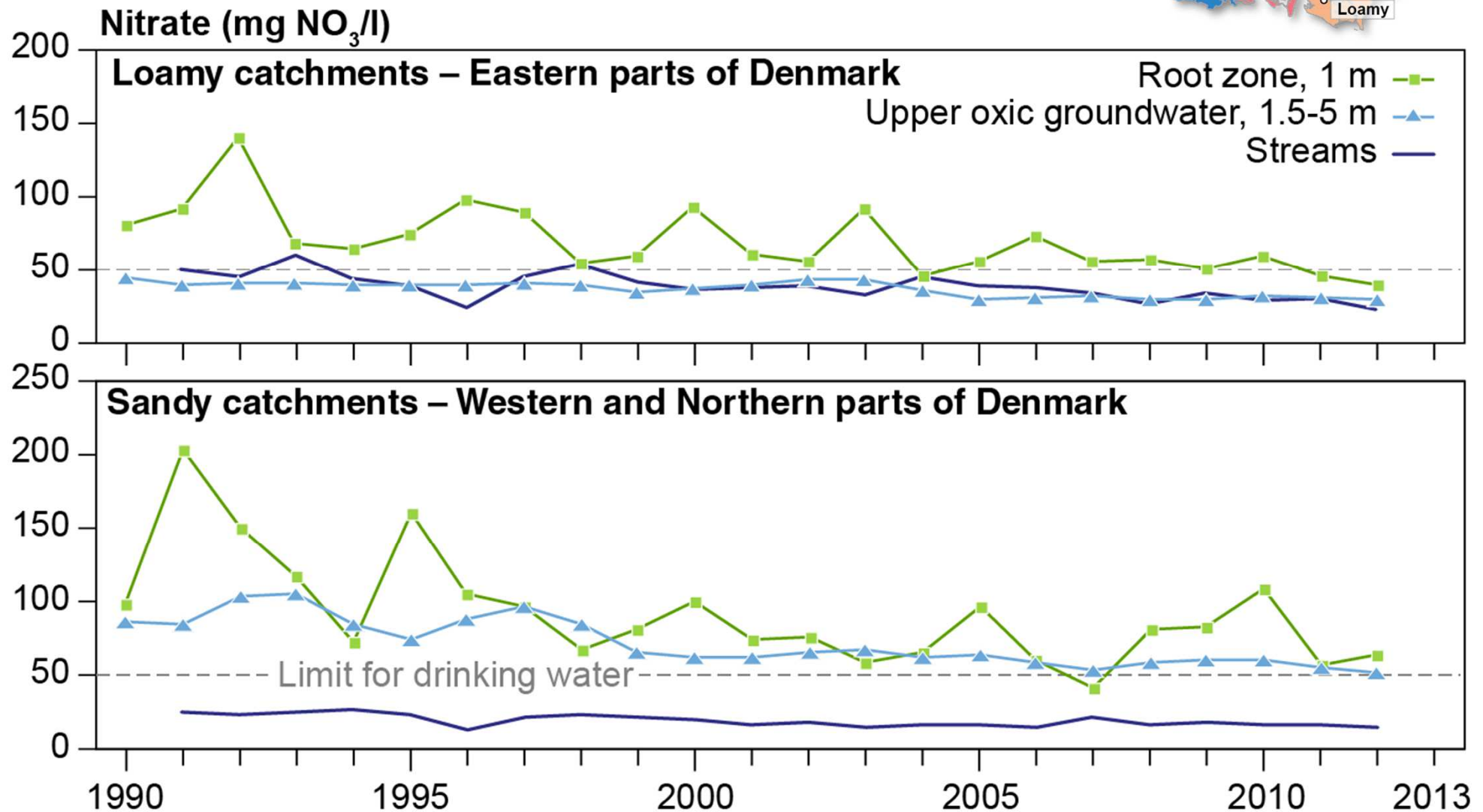
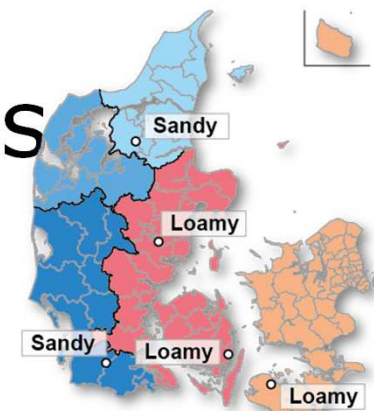
→ Reduction of 80 % in the field balance 1990-2013



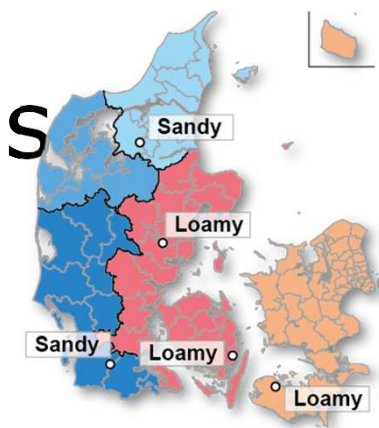
Agricultural catchment monitoring sites in Denmark (mini-catchments)



Measured nitrate concentrations in five agricultural catchments

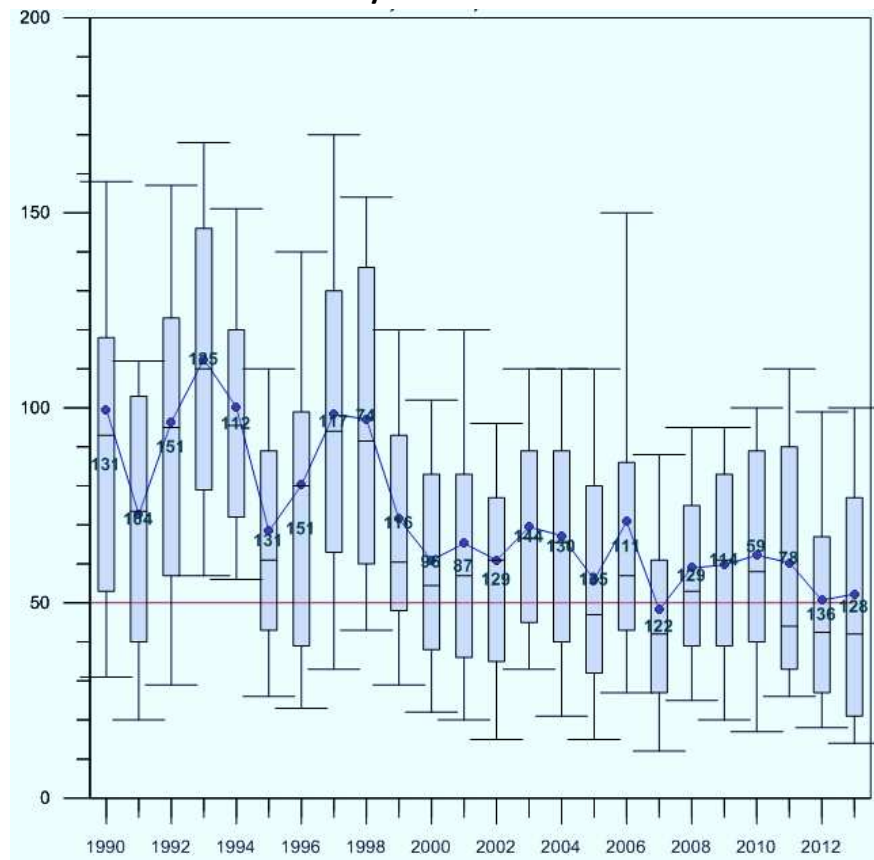


Measured nitrate concentrations in five agricultural catchments

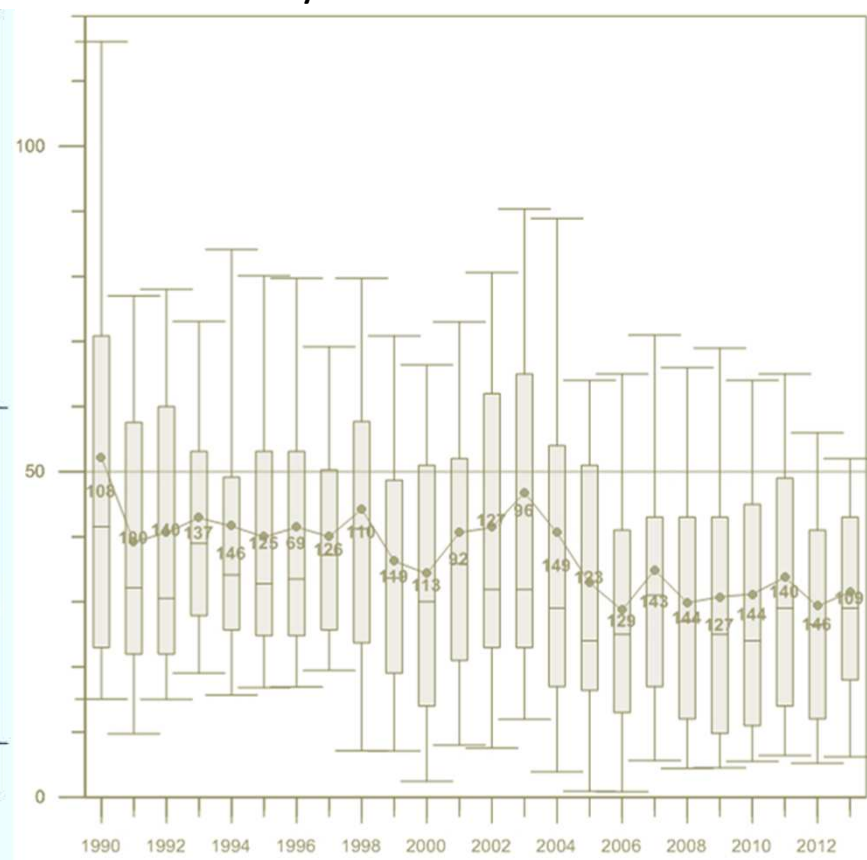


Nitrate concentration in the oxic groundwater 1990-2013

in sandy catchments

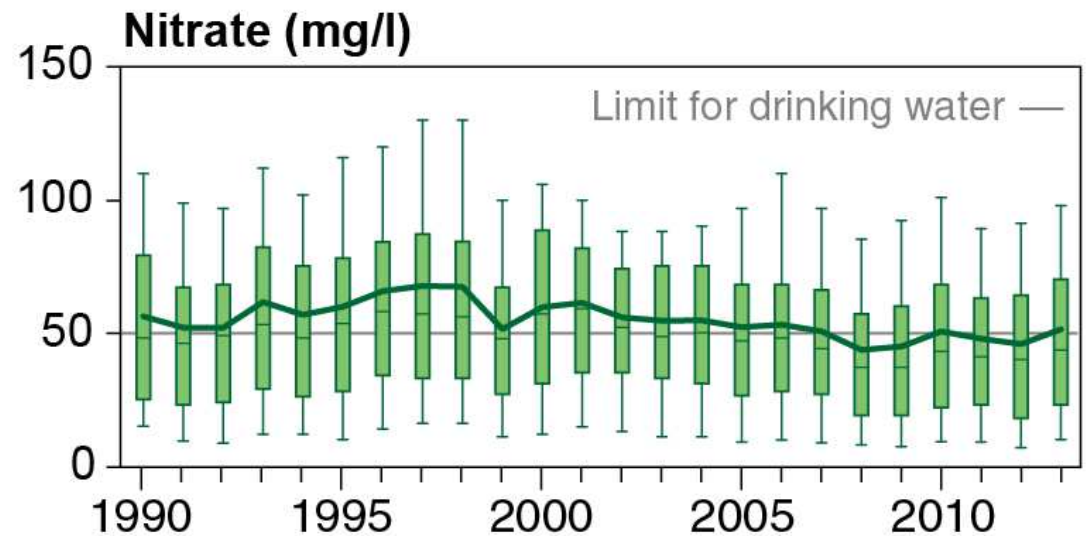
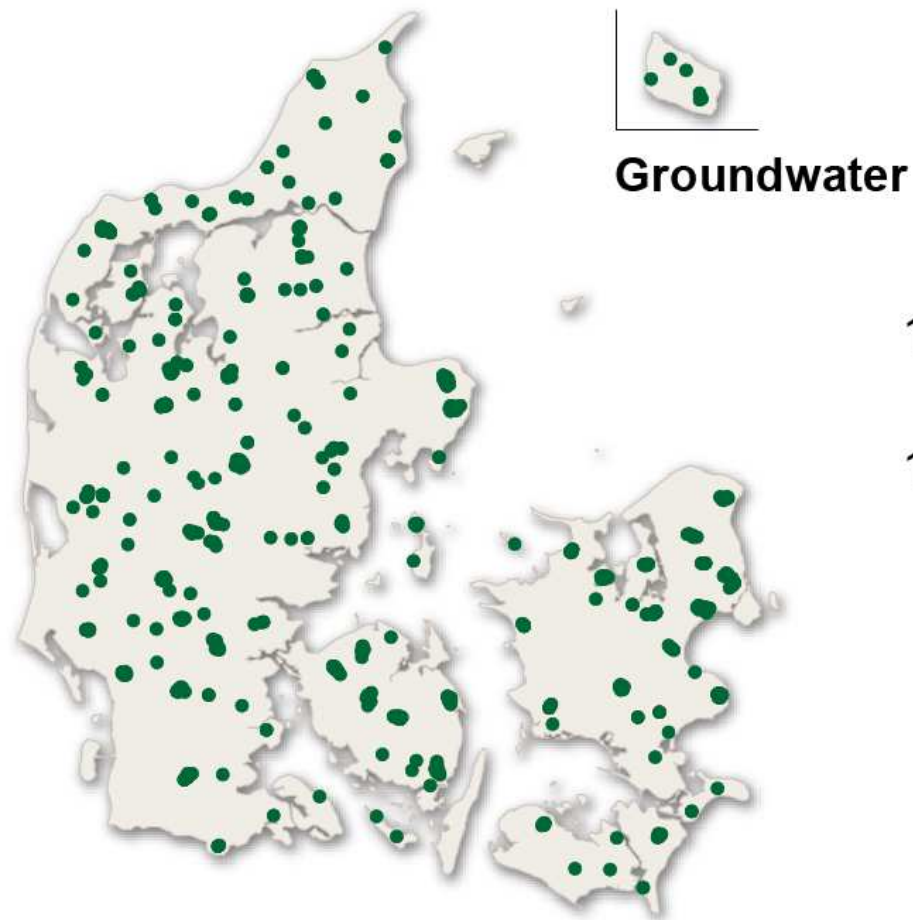


in loamy catchments



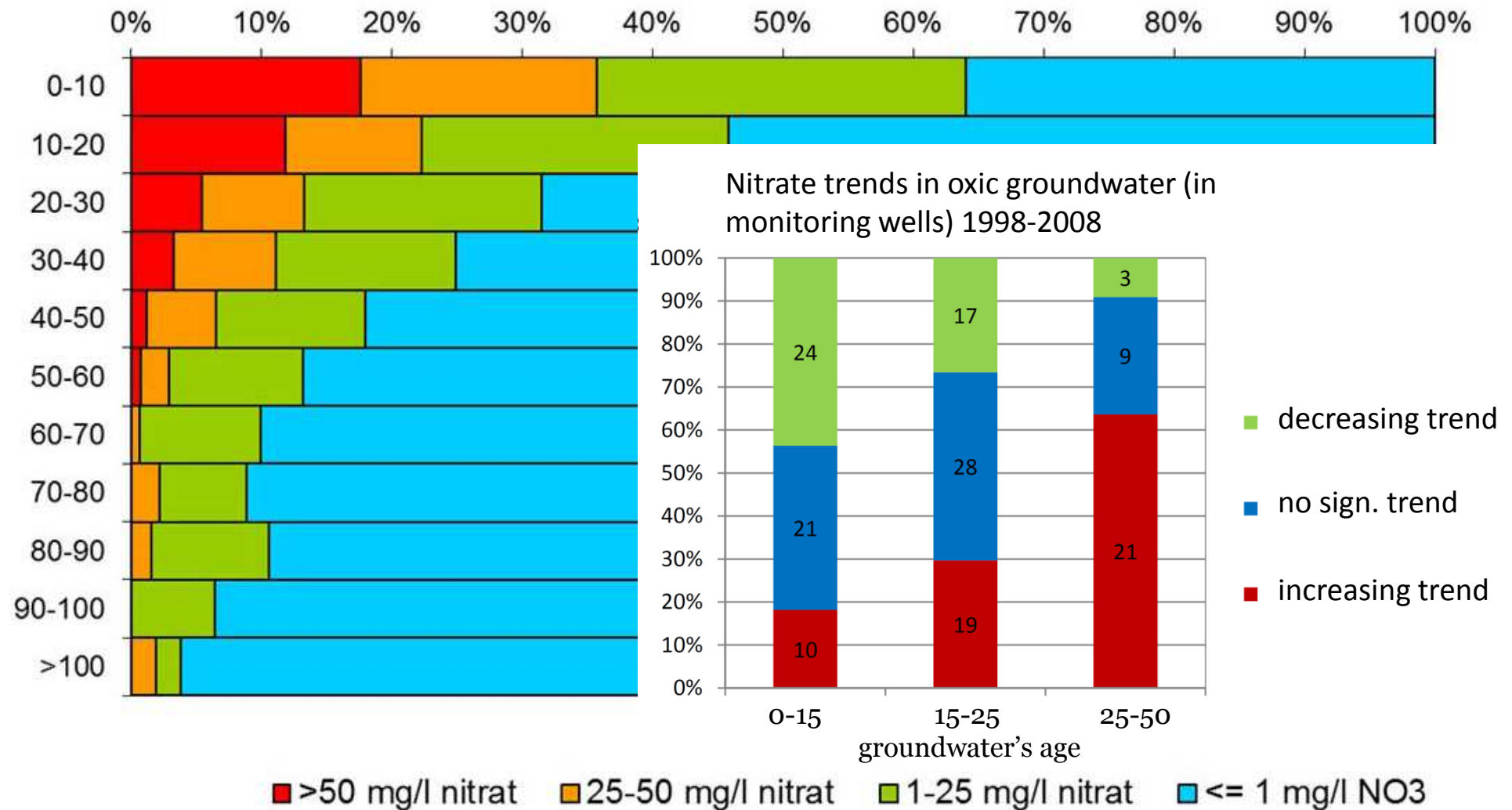
Groundwater throughout whole Denmark

Nitrate concentration in monitored wells in oxic groundwater
(3-100 meter below surface - not drinking water)



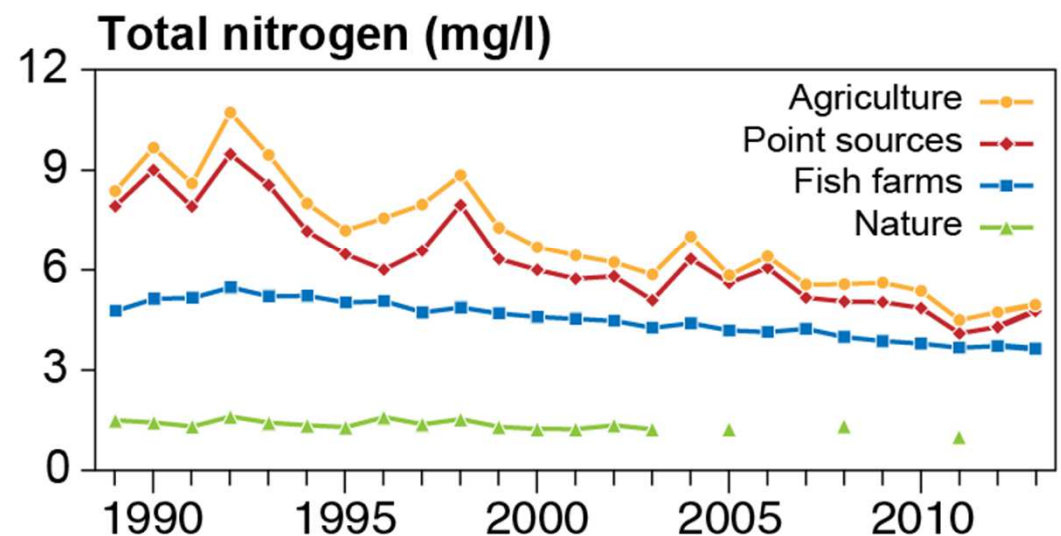
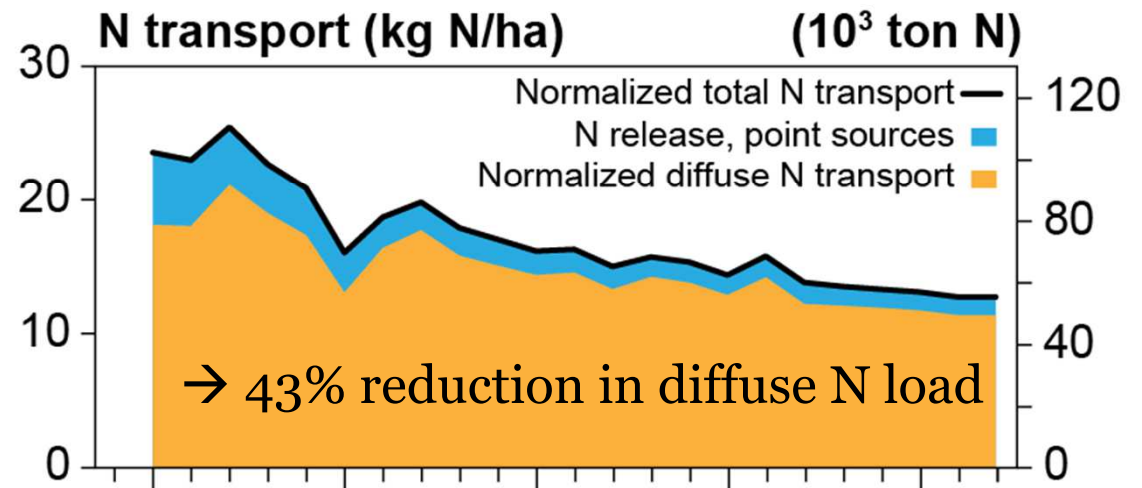
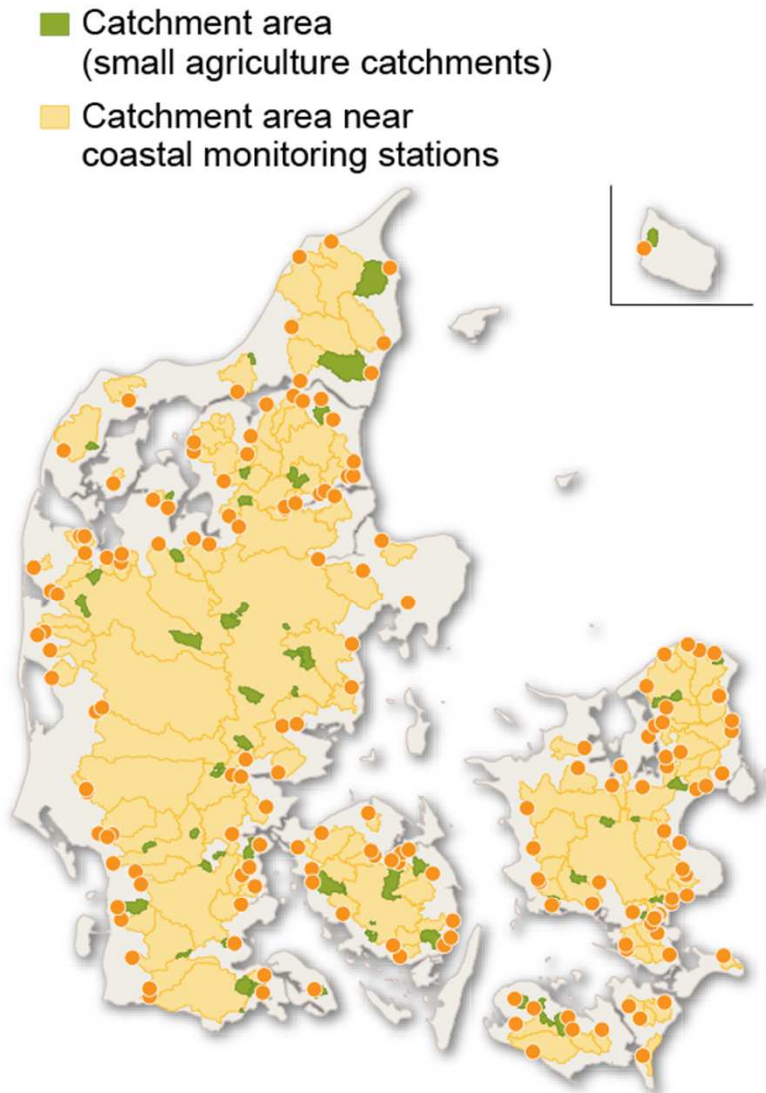
Groundwater throughout whole Denmark

Nitrate concentration in all types of groundwater (2013)
at different depths below surface



State & trends in surface waters

Nitrogen loads from rivers to coastal & marine waters



Es hat was gebracht!

Conclusions - State & trends in Danish water quality 1990-2013

- Reduction of field balance at national level:
 - **Nitrogen: - 43 %**
 - Phosphorus: - 80 %
- Agricultural catchments:
decreasing trends in nitrate concentration in:
 - **root zone** water
 - **upper** oxic **groundwater**
 - **streams**
- Whole territory:
 - low N concentrations in & **decreasing loads to surface waters**
 - **decreasing nitrate concentration** predominantly in **young groundwater**

"Was kommt bitteschön als Nächstes?"

Further development of Danish regulation – focus & priority areas:

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Simplification of rules
& regulation

Coherence of
environmental regulation

Guidance of &
cooperation with
municipalities/
local administration

Effectiveness of
measures

Compliance



Besten Dank!