

Skejby 27th of May 2016

Kristoffer Piil

TARGETED REGULATION IN DENMARK - WHAT CAN WE DO AND CAN WE MEASURE LOSS AT THE FARM LEVEL?

STØTTET AF
promilleafgiftsfonden
for landbrug



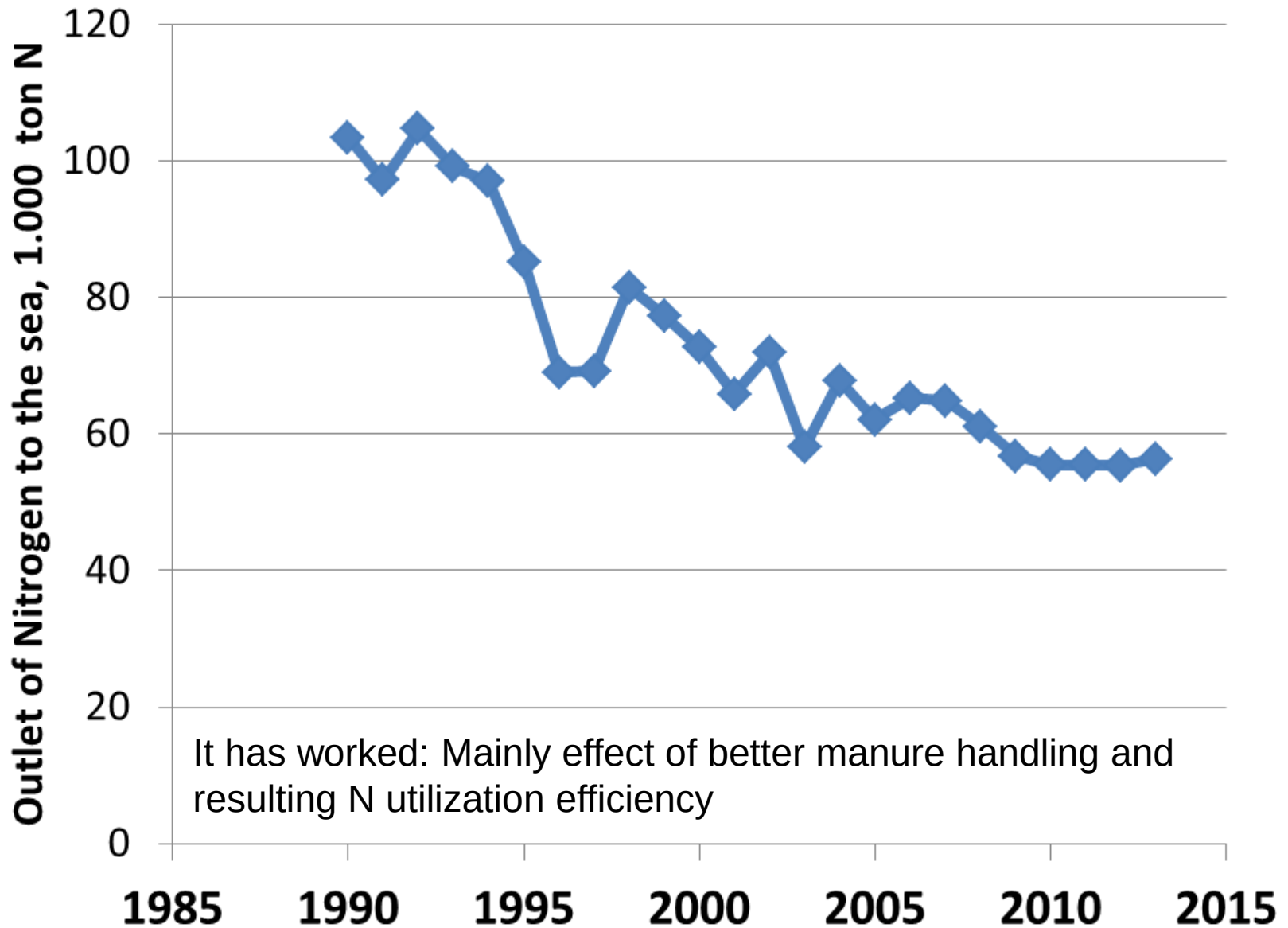
TOWARDS A TARGETED REGULATION IN DENMARK

- How Danish regulation has worked
- What type of data is available
- Suggestions for making a targeted regulation

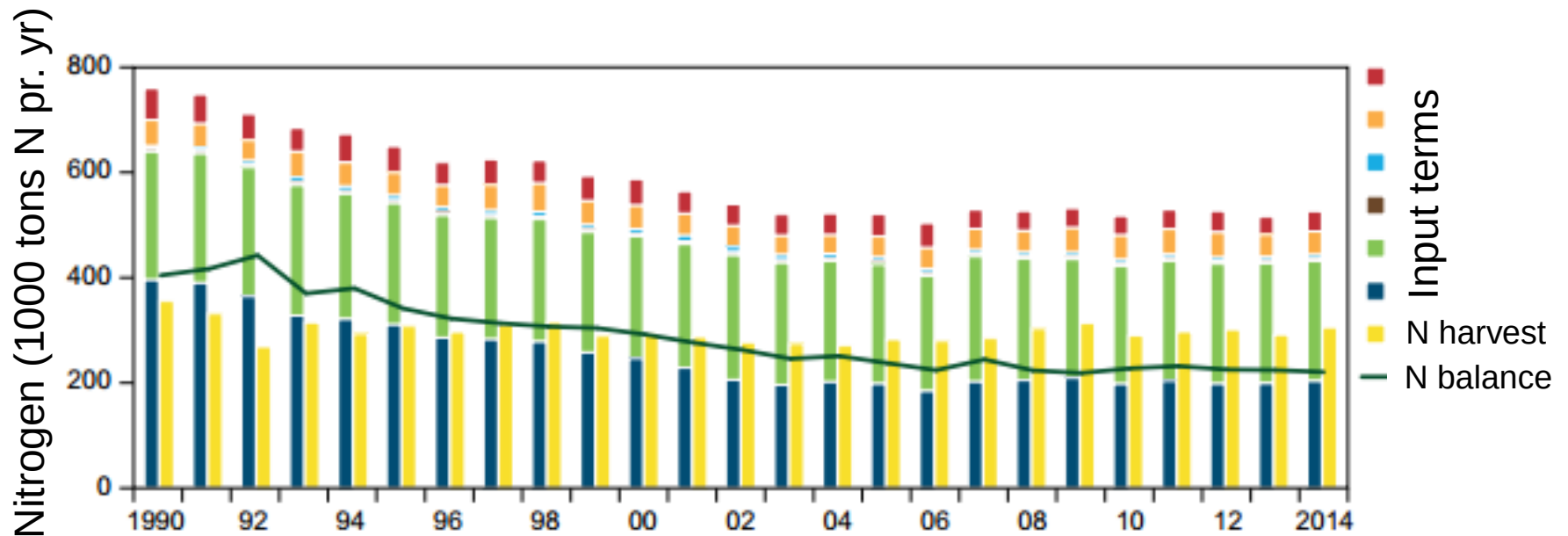
REGULATION IN DENMARK

- Currently: Same regulation everywhere
 - Statuary N fertilization rates for each crop
 - Cover crops
- Future: Targeted regulation – implementing measures and restrictions where they have maximal effect
 - Different emission targets for each fjord
 - Placing measures where the effect is maximal

Outlet of Nitrogen to the sea, total



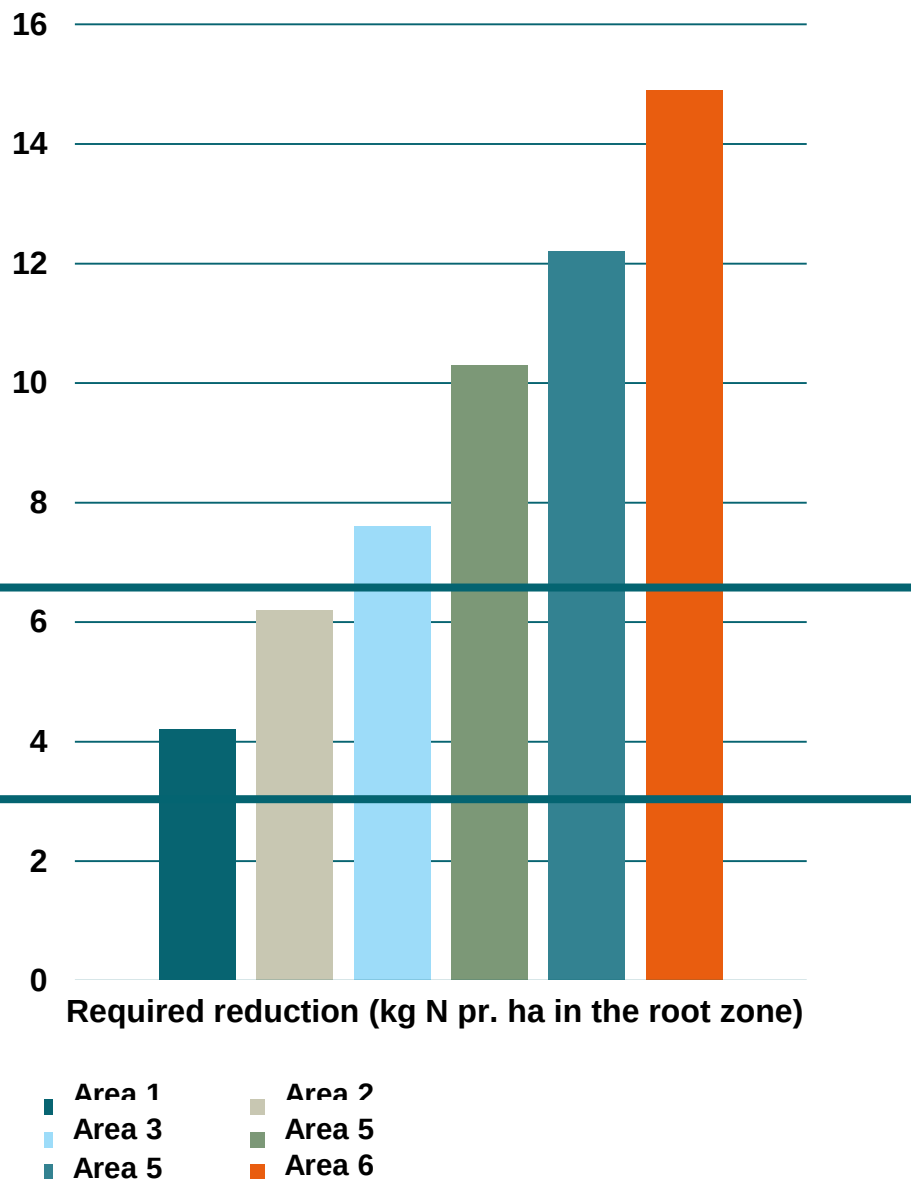
BALANCES



Future targeted regulation suggested by the ministry

Catagory	Measure	Effect, Tons N
Postponed	-	Ca. 6.200
Targeted regulation	Farm measures: cover crops, early drilling, etc.	Ca. 3.800
Collective measures	Wetlands, constructed wetlands, aforestation, etc.	Ca. 3.800

Anmærkning: Der tages forbehold for en endelig konsolidering af datagrundlag forud for offentliggørelsen af kommende vandområdeplaner.



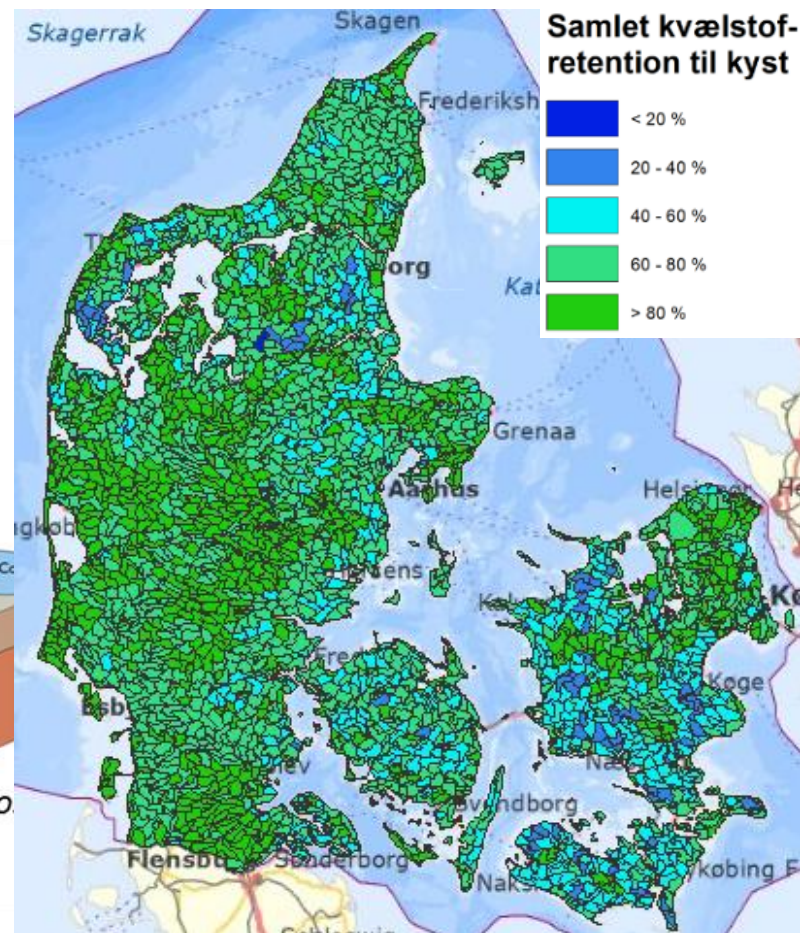
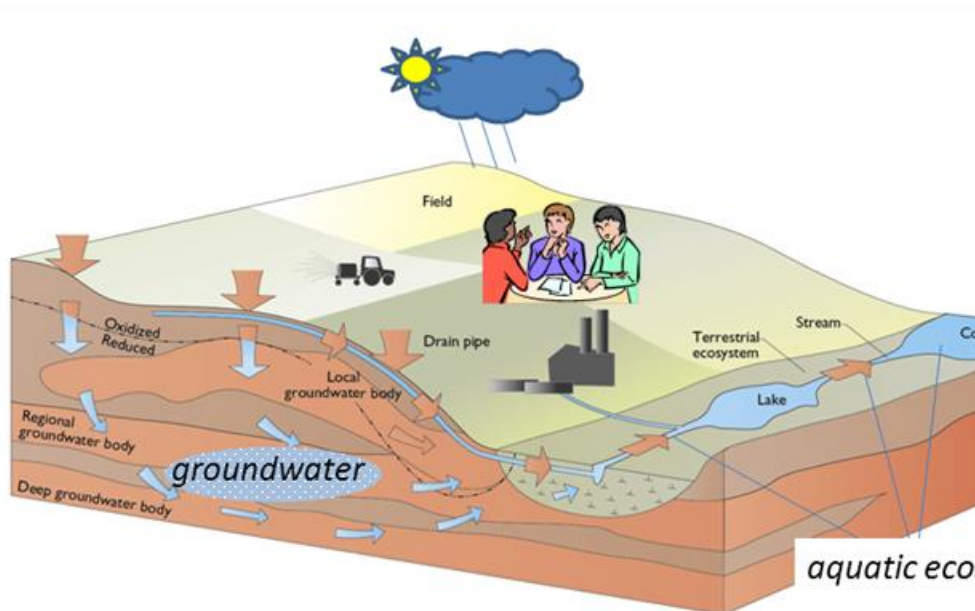
Part of new regulation: WFD nitrogen target, retention on catchment level

Not part of new regulation: Soil type, farm type, croptype, Etc.

FROM THE MINISTRY FOR FOOD AND ENVIRONMENT



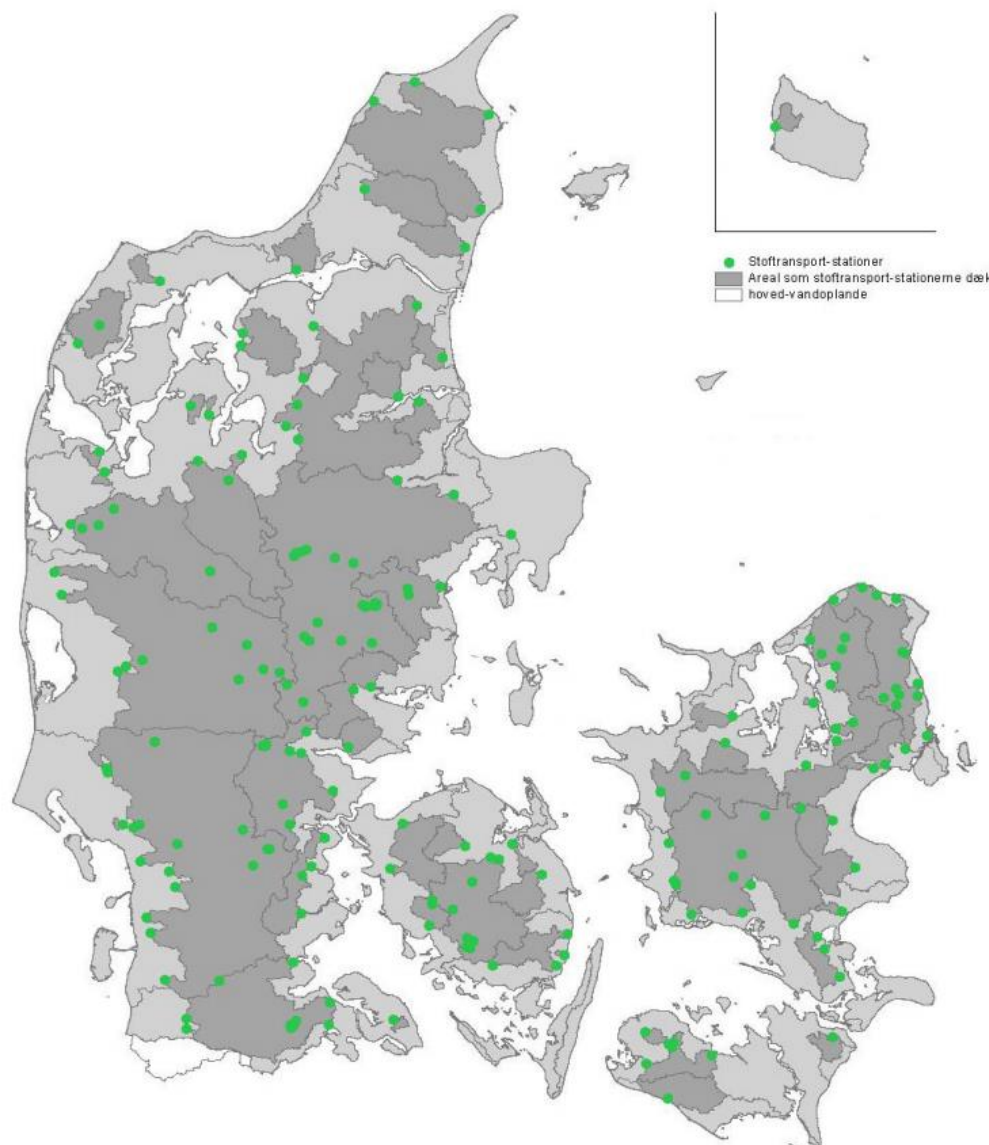
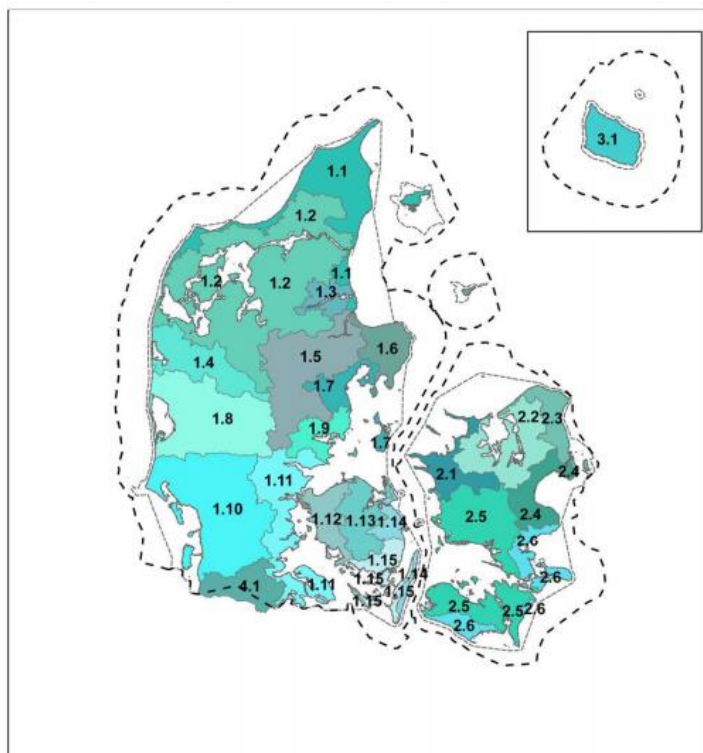
AVAILABLE DATA



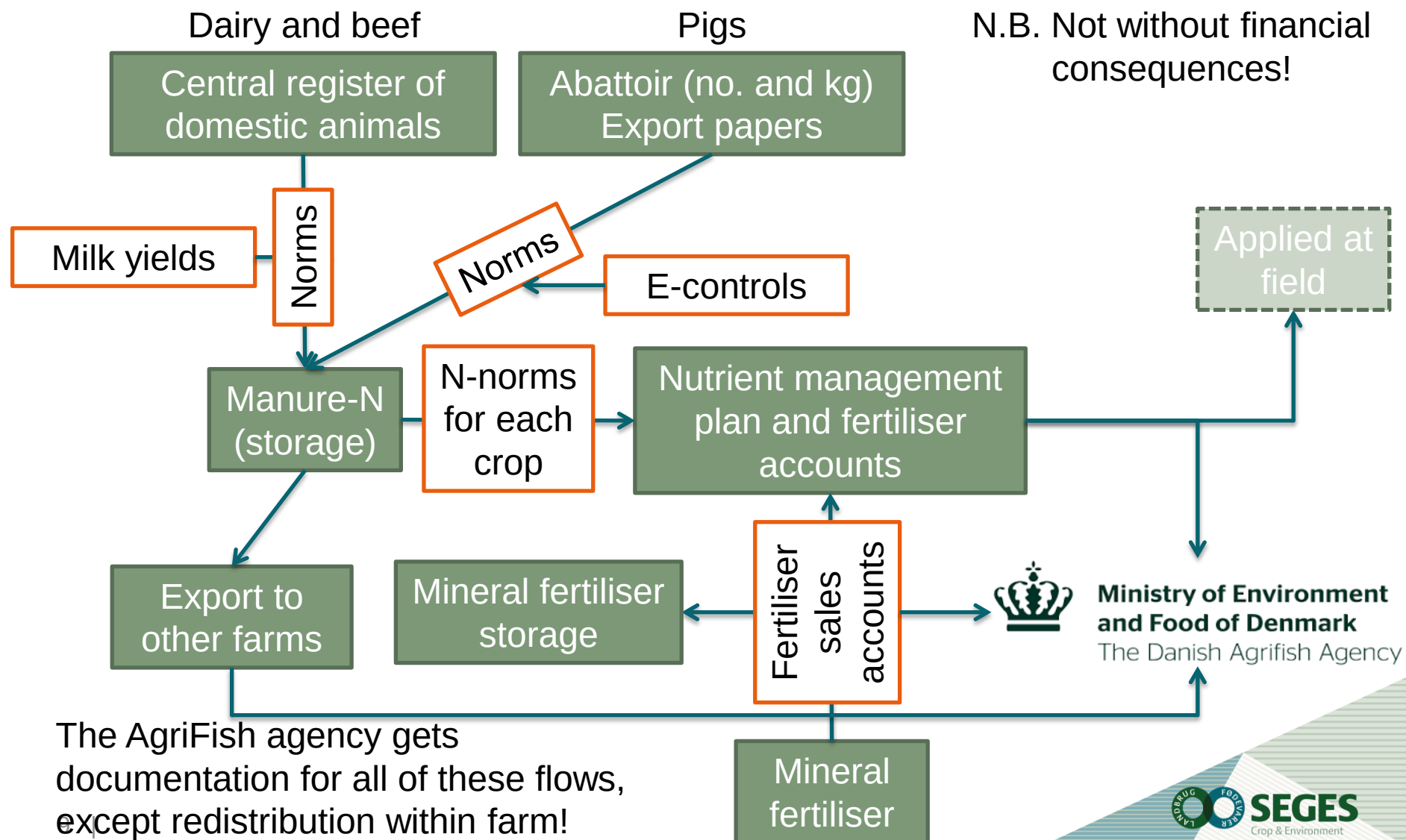
- Retention at ~1500 ha size
- Split in groundwater and surface water retention

AVAILABLE DATA

- Station net for N loading to costal waters
- WFD target compliance in 90 catchments



AVAILABLE DATA: GOVERNMENTAL ACCESS TO ALL DANISH FERTILISER ACCOUNTS



ARE THERE BETTER APPROACHES?

EXAMPLE WITH COVER CROPS

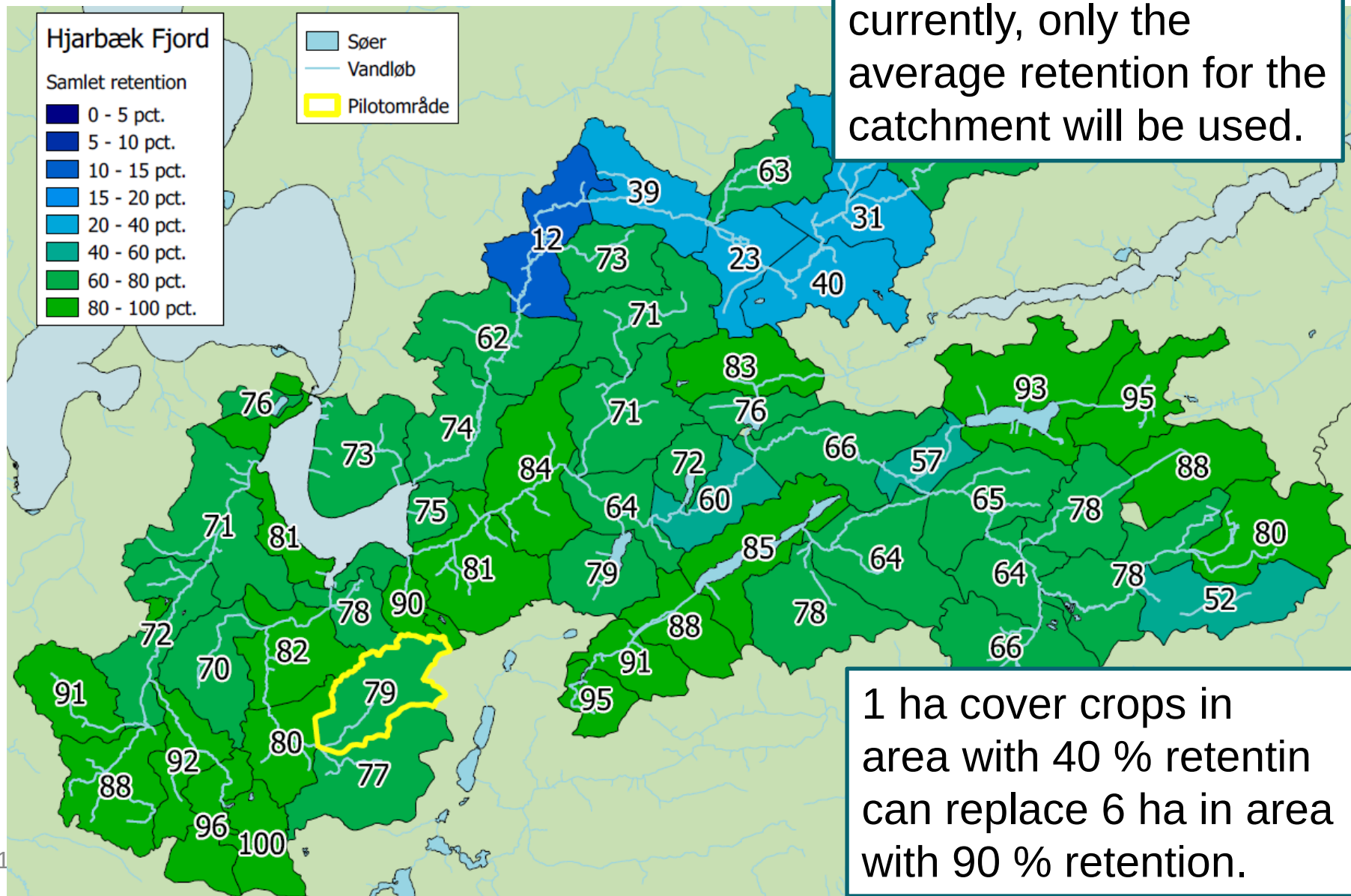
Effect on leaching from root zone pr. ha	Retention %	Effect on loading to costal area	Area to reduce by 10 tones	Price to reduce by 10 tones
30 kg N	30	21 kg N	476 ha	19,00 €*
	60	12 kg N	833 ha	33,000 €*
	90	3 kg N	3333 ha	133,333 €*

*At 300 € pr. ha cover crop. This assumes that there is no changes from winter sown to spring sown crops, as this will increase price to ~300 € pr. ha

- Potential in more targeted regulation!

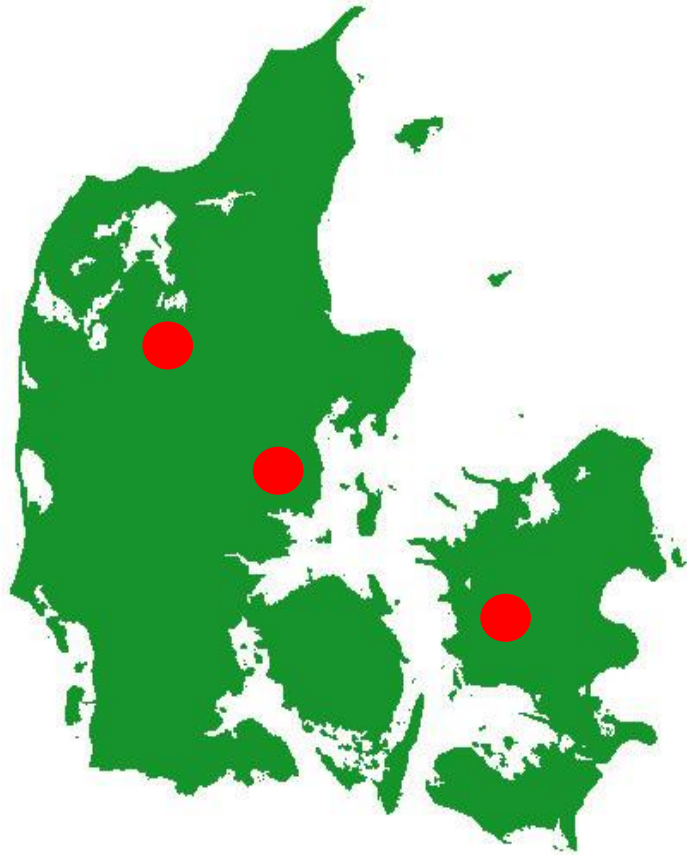
EXAMPLE – COVER CROPS

Large uncertainties makes the retention map controversial and currently, only the average retention for the catchment will be used.



CAN WE DO SOMETHING BETTER WITH DIRECT MEASUREMENTS

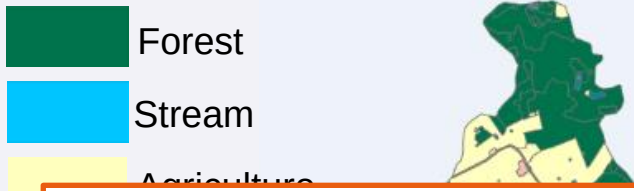
- Can we utilize direct subcatchment or farm level measurements in targeted regulation?



Being tested in three pilot areas differing in geology, precipitation and agricultural practice

Emissions are measured with three different methods, N-min, at the drain pipe and in streams

STREAM TRANSPORT



Climate normalization: Precipitation has a large influence on N transport

+ Direct measure of N loss to sea

- Where does the N come from? Some degree of modelling still involved
- Sub catchment level – how to split N load and economic burden between farmers?

Total N transport
(sub catchment scale)

Split loading between
individual farms and sources

N Retention during
further transport in
the river network

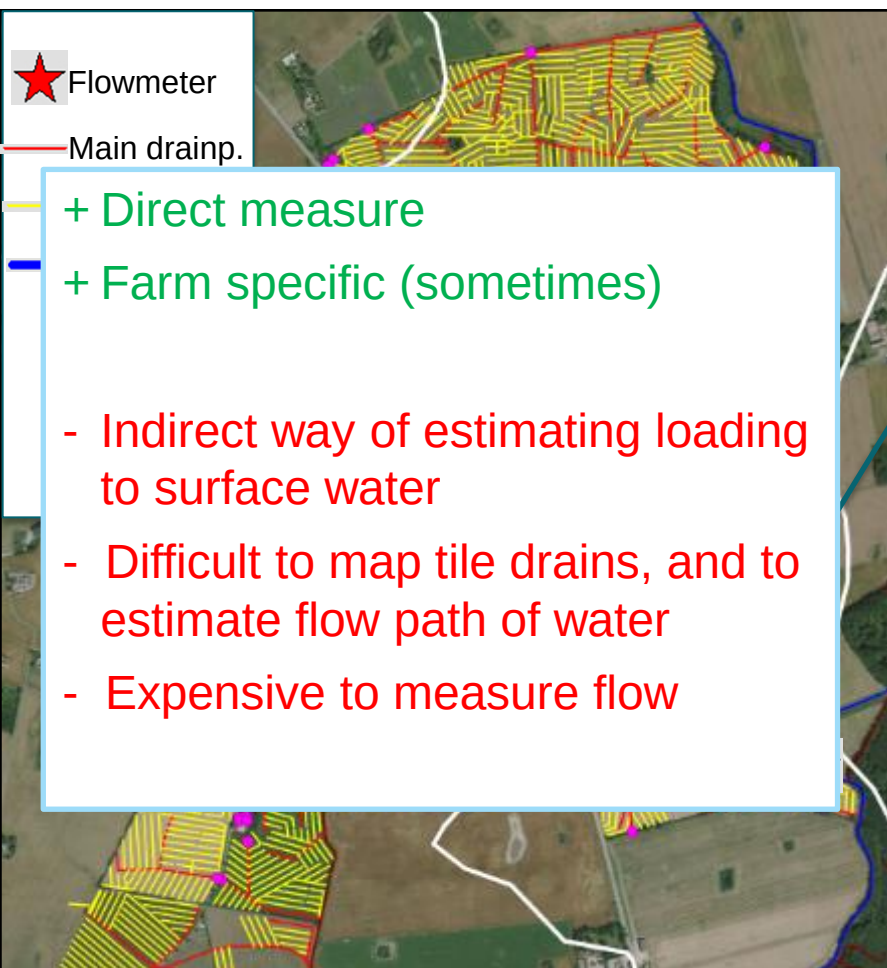
Climate normalization

Threshold value based on
acceptable loss to surface-
water or groundwater

Crop and nutrient management plan



TILE DRAIN TRANSPORT



Tile drain loss



Crop and nutrient management plan

N-MIN METHOD

Mineral nitrogen in the autumn



- + Direct impact of farming practice
- + Farm specific

- Defining the catchment and the fraction of total drainage via tile drains
- Variability in retention within sub catchment
- Cannot handle N reduction measures outside of the field, e.g. mini wetlands

Soil N-min autumn

N-min and leaching measured in field trials

Leaching = $f(\text{N-min})$

N Retention during transport

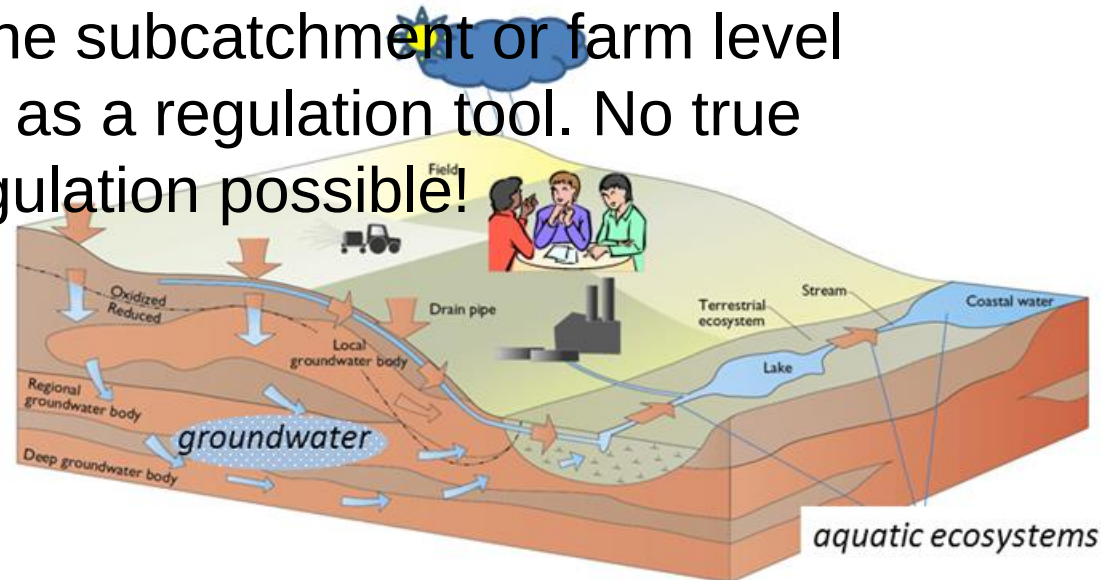
Climate normalization (in odd years)

Threshold value based on acceptable loss to surface-water or groundwater

Crop and nutrient management plan

MEASUREMENTS AS A TOOL

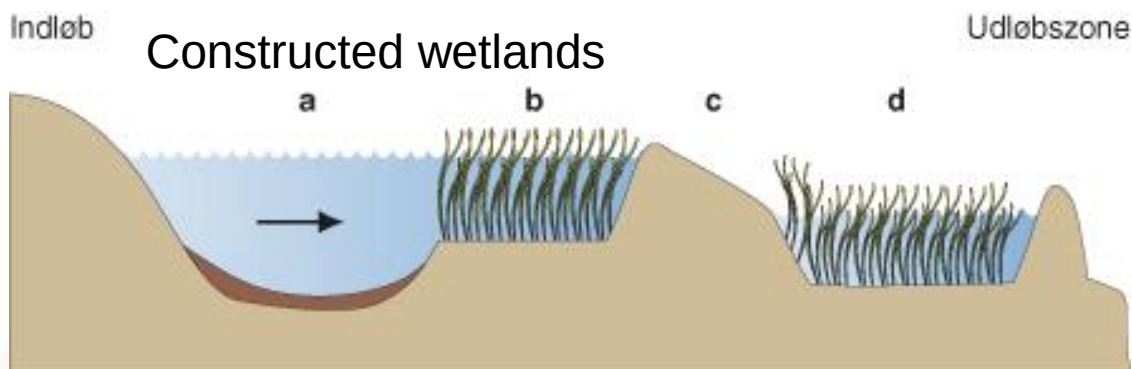
- The uncertainty is unacceptably large
- Where we should measure in this system.
- What is the source of the water/nitrogen that we measure
- Measurements at the subcatchment or farm level cannot stand alone as a regulation tool. No true emission based regulation possible!



FUTURE OF REGULATION

- Measurements can be used to identify hotspots!
- And thus to place measures in a targeted way

Integrated bufferzones



FUTURE OF REGULATION - PERSPECTIVES

- We have a lot of data, but finding a way to utilize this that is both scientifically sound and politically acceptable is difficult!
- Maybe the solution is to do this on a more local scale with the involvements of local stakeholders – but that's for another talk!