Drivers for implementation of landscape scale measures

By Tommy Dalgaard & Morten Graversgaard, Aarhus University, Dept. of Agroecology

International workshop/expert meeting on filters in the landscape for reducing nitrogen and phosphorus losses to the aquatic environment. Thursday 20th April 2017, Vilcon Hotel, Slagelse, Denmark

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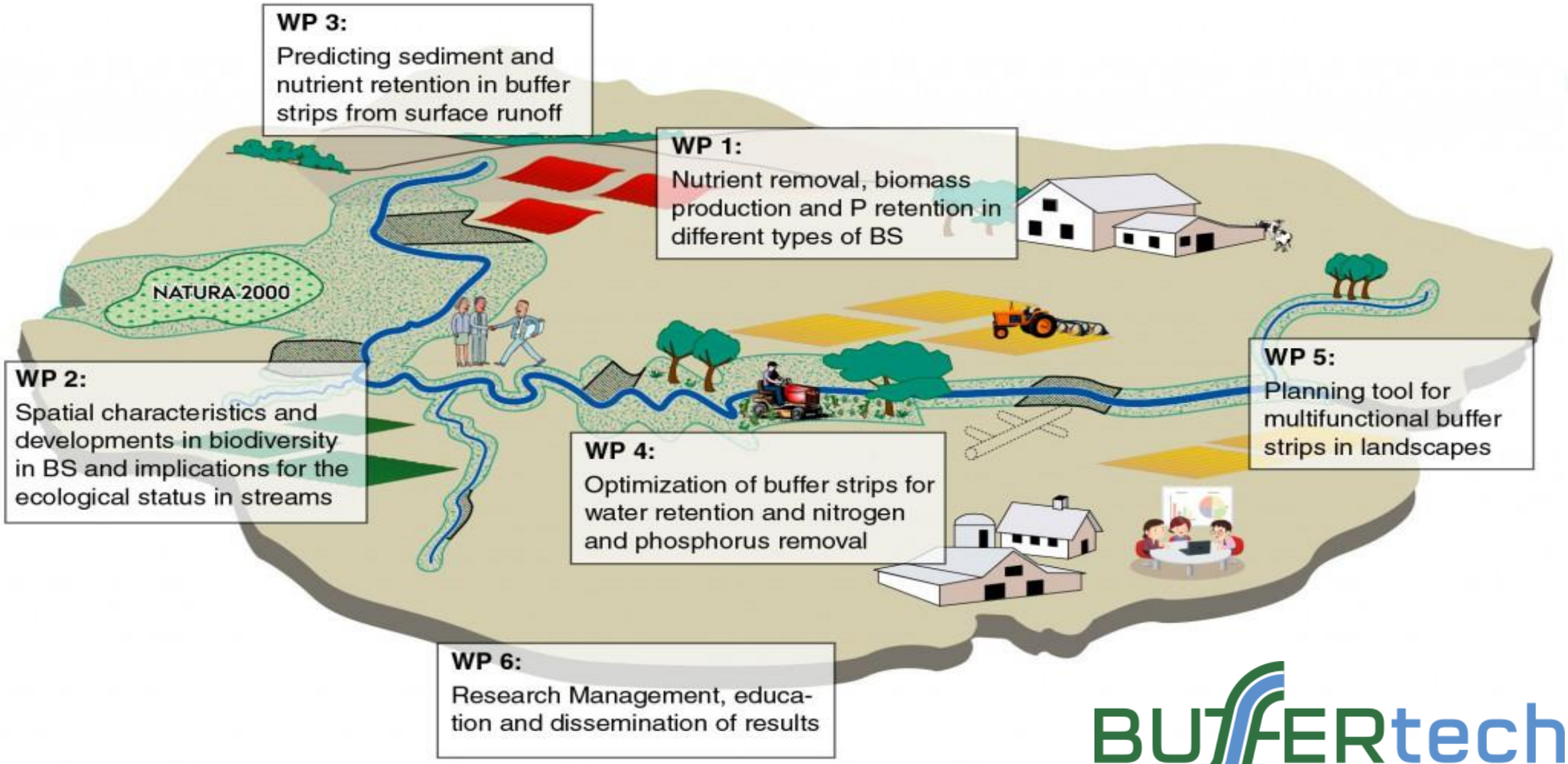
Program

- **Research on implementation of landscape scale measures**
  - Buffertech.dk
  - ENA, the dNmark.org Research Alliance and the UN-TFRN
- **Drivers and barriers**
  - Experiences from
    - The Buffertech national questionnaire
    - The Danish buffer zone act implementation
    - Water co-governance in Water Councils
- **Summary**


WP 3:
Predicting sediment and nutrient retention in buffer strips from surface runoff
WP 1:
Nutrient removal, biomass production and P retention in different types of BS
NATURA 2000
WP 2:
Spatial characteristics and developments in biodiversity in BS and implications for the ecological status in streams
WP 4:
Optimization of buffer strips for water retention and nitrogen and phosphorus removal
WP 5:
Planning tool for multifunctional buffer strips in landscapes
WP 6:
Research Management, education and dissemination of results

BUFFERtech

Involving the farmer to improve the ecological status in surface waters

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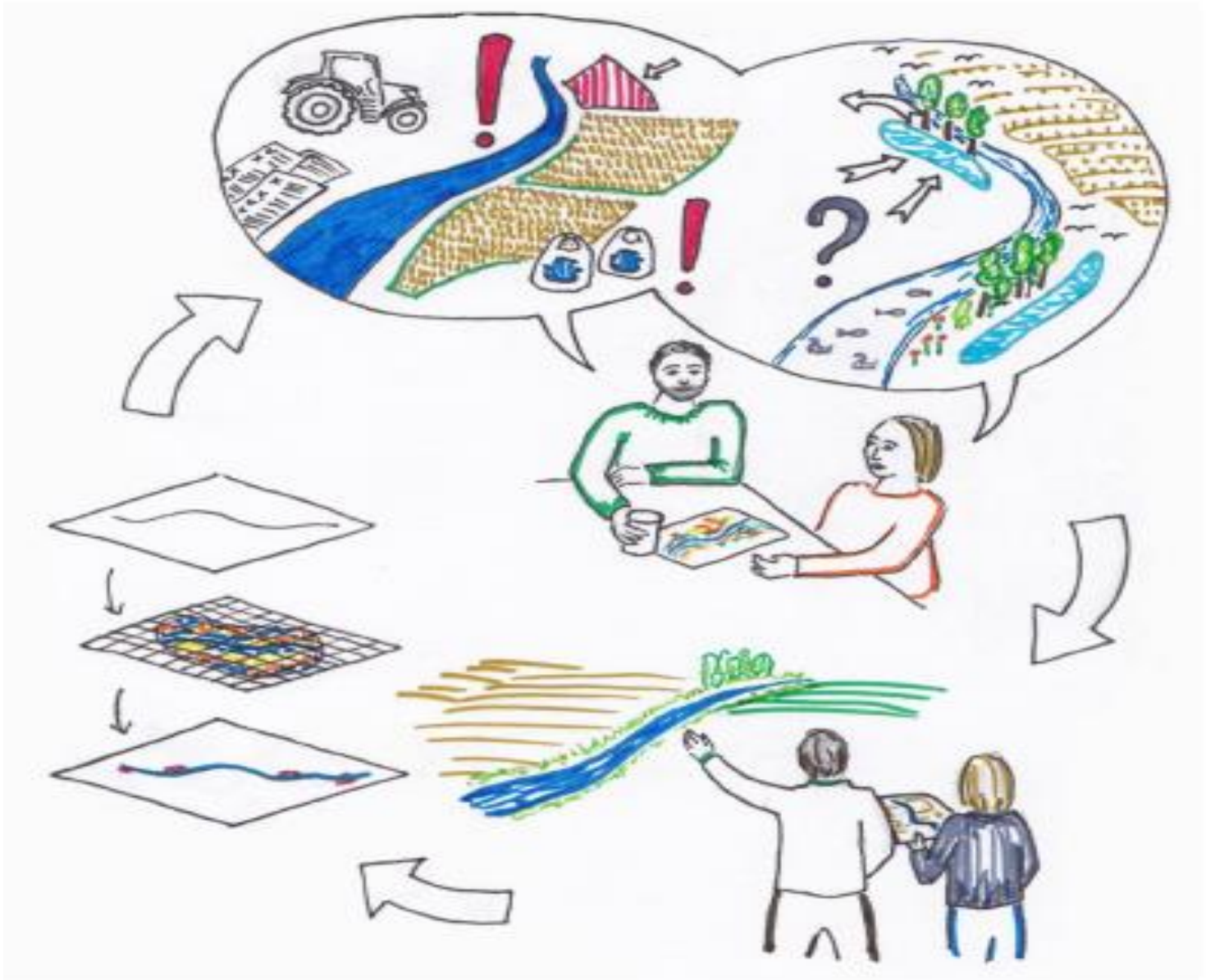
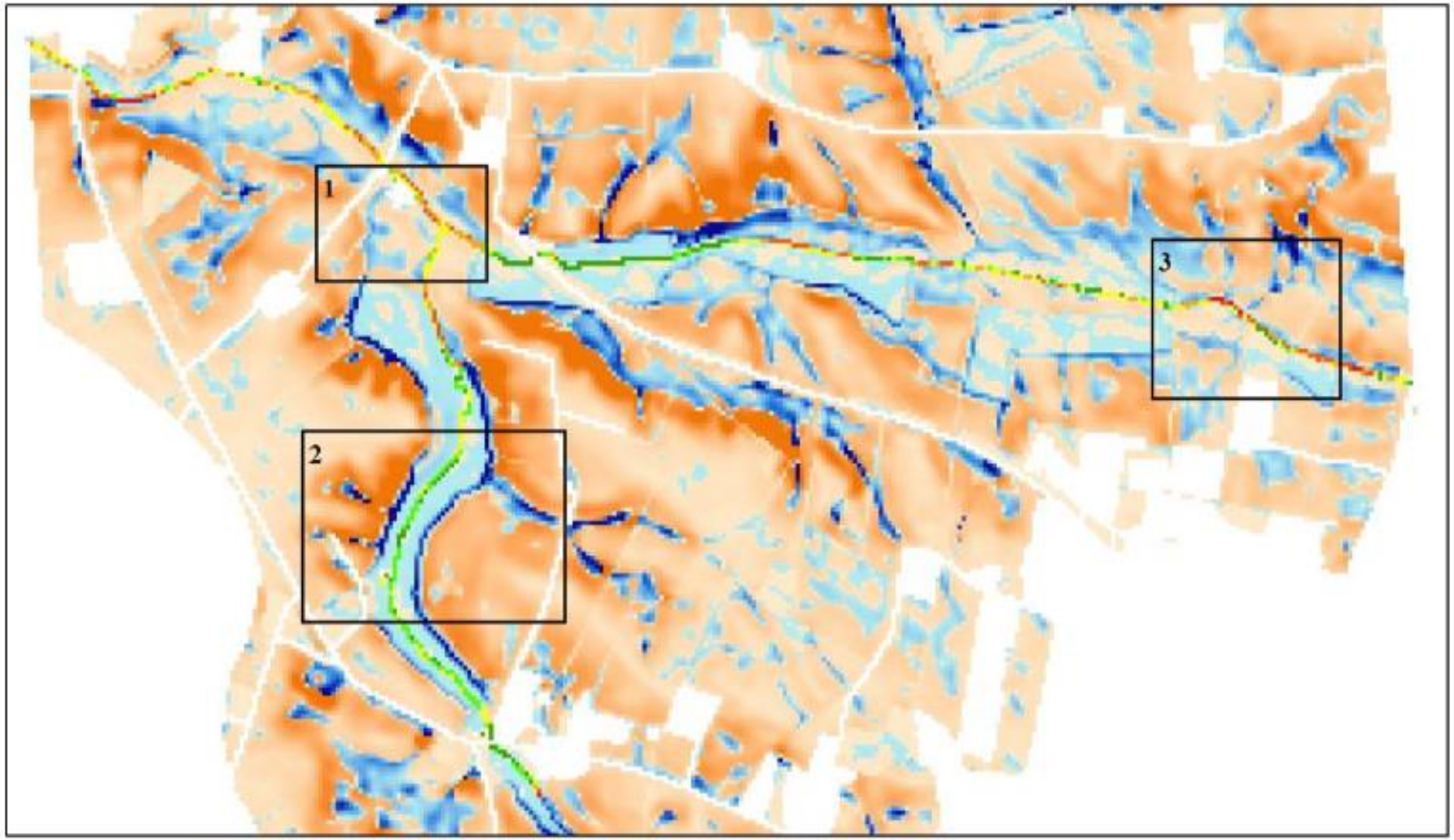
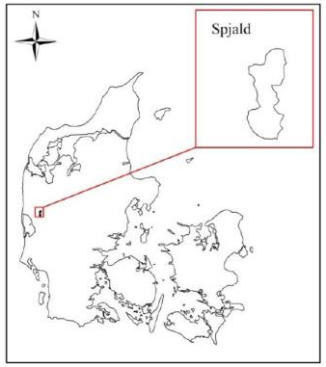


BUFFERtech

Skjellerudsveen (2016)





WExport
Kg/100 m2
< 5
5,1 - 15
15,1 - 50
50,1 - 100
100,1 - 250
250,1 <

Erosion
Low
High

Deposition
High
Low

0 0,2 0,4 0,8 1,2 Km

(Watem export)

Skjellerudsveen (2016)

Mapping farmers perceptions

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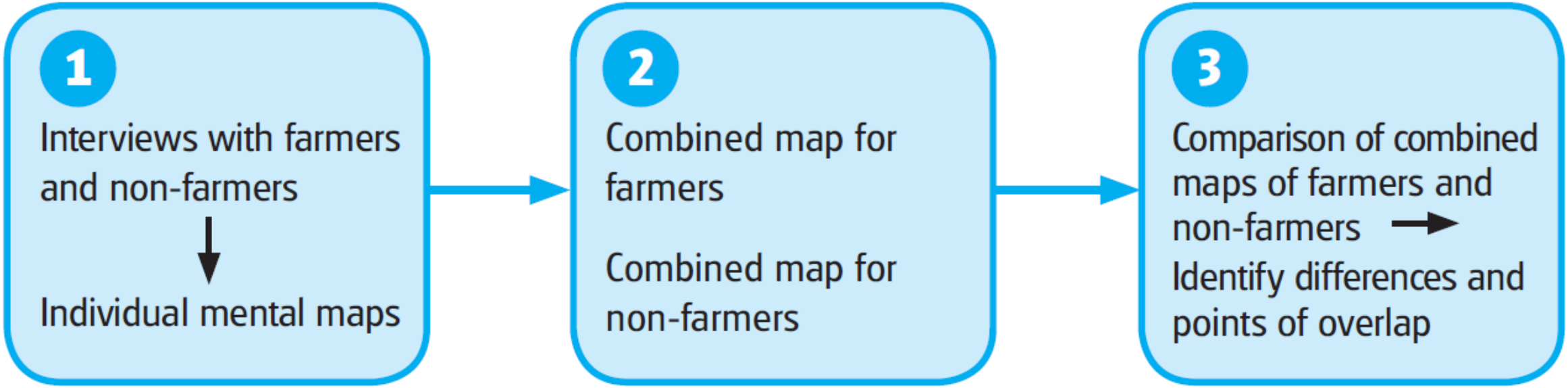
Figure 1. *The research process*



Martin-Ortega, J., Kjeldsen, C., Dalgaard, T. and Christen,B. (2015); Christen et al. (2015)

Fuzzy Cognitive Mapping (FCM)

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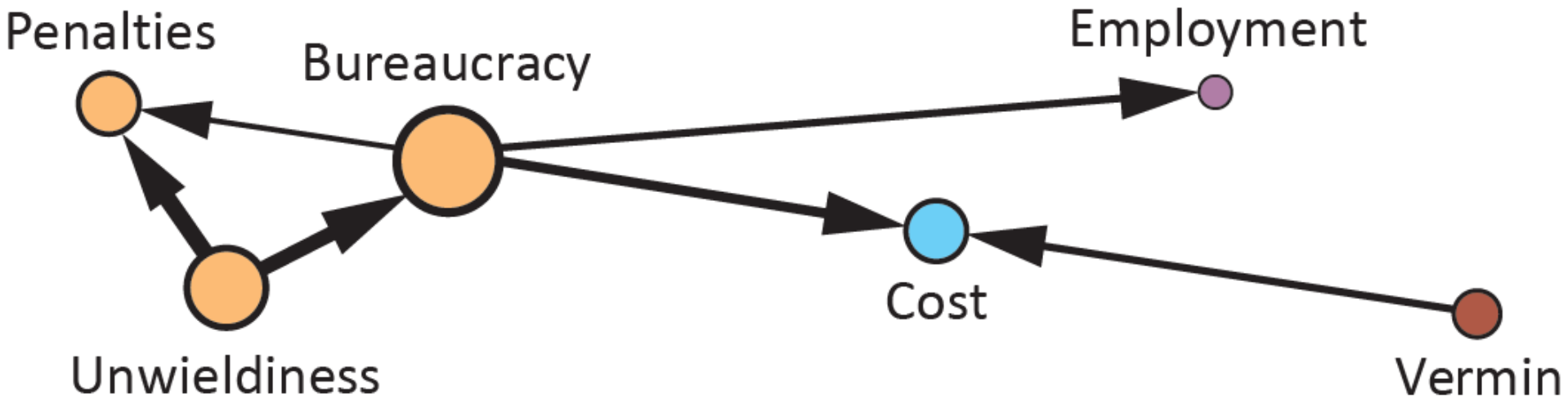
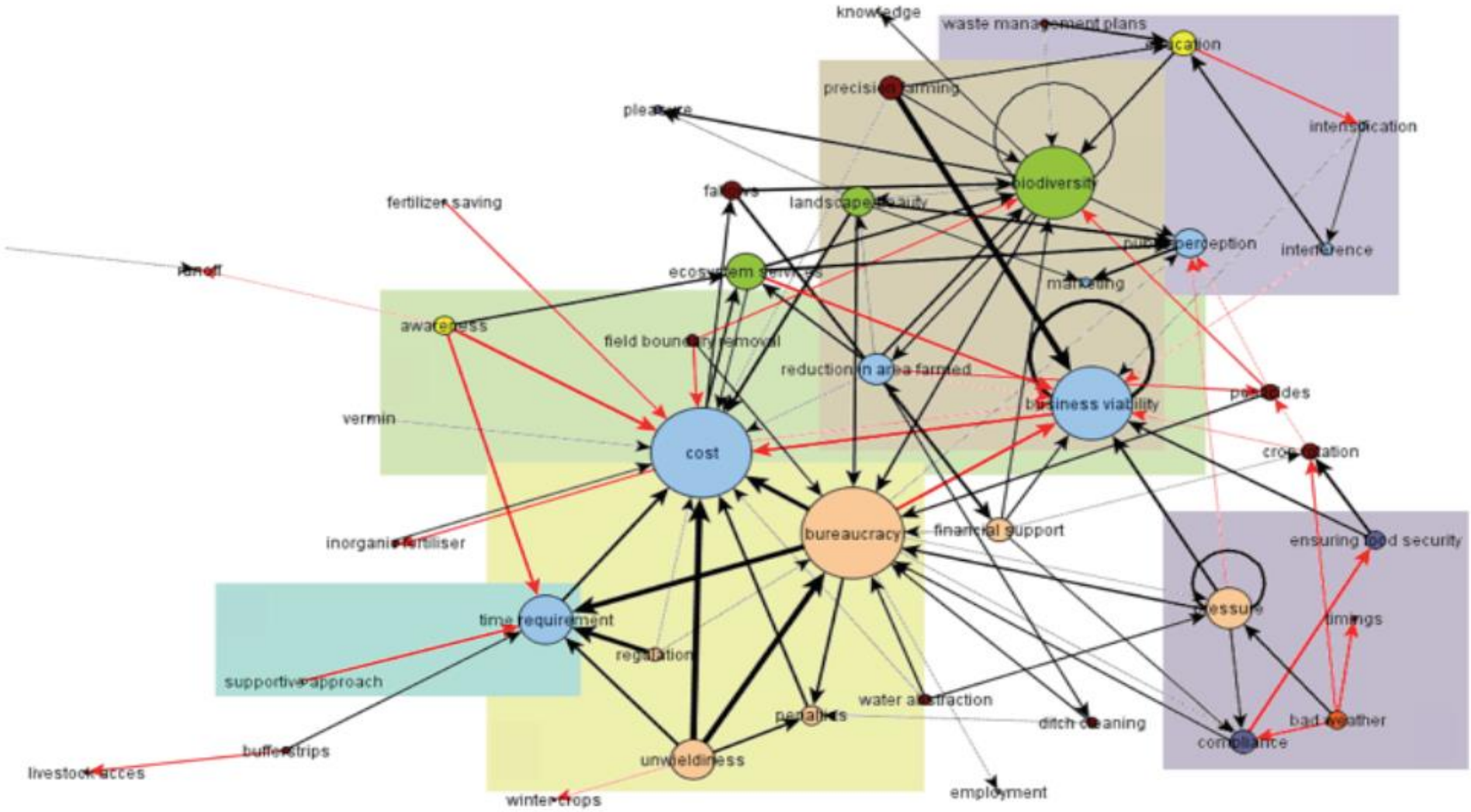
Figure 2. *Example of a mental map of an arable farmer when thinking about compliance with DP GBR*



Diffuse pollution, General Bindng Rules

Anchor point identification

Figure 3. The result of combining the maps of all the farmers in the study



Multiple functions of new wetlands

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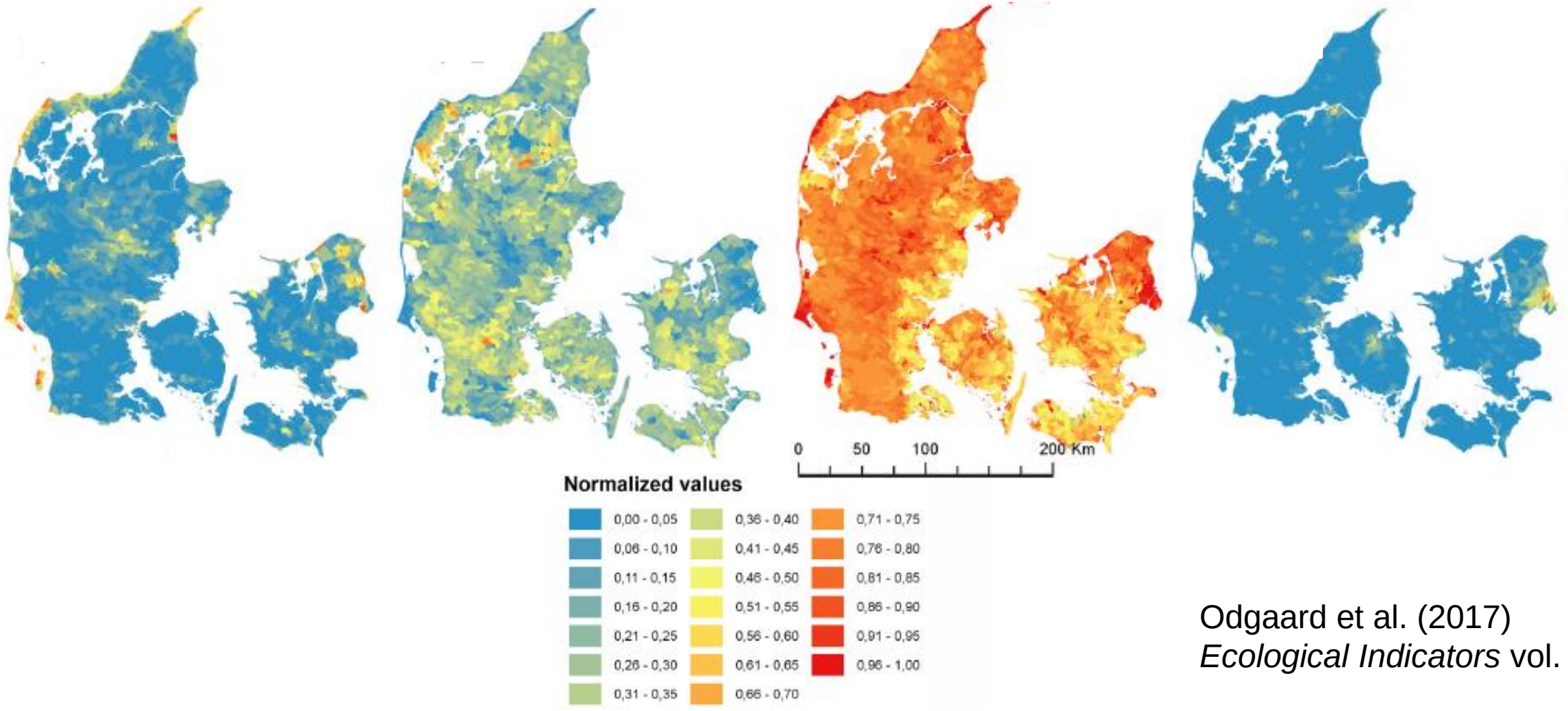
Biodiversity

N-mitigation

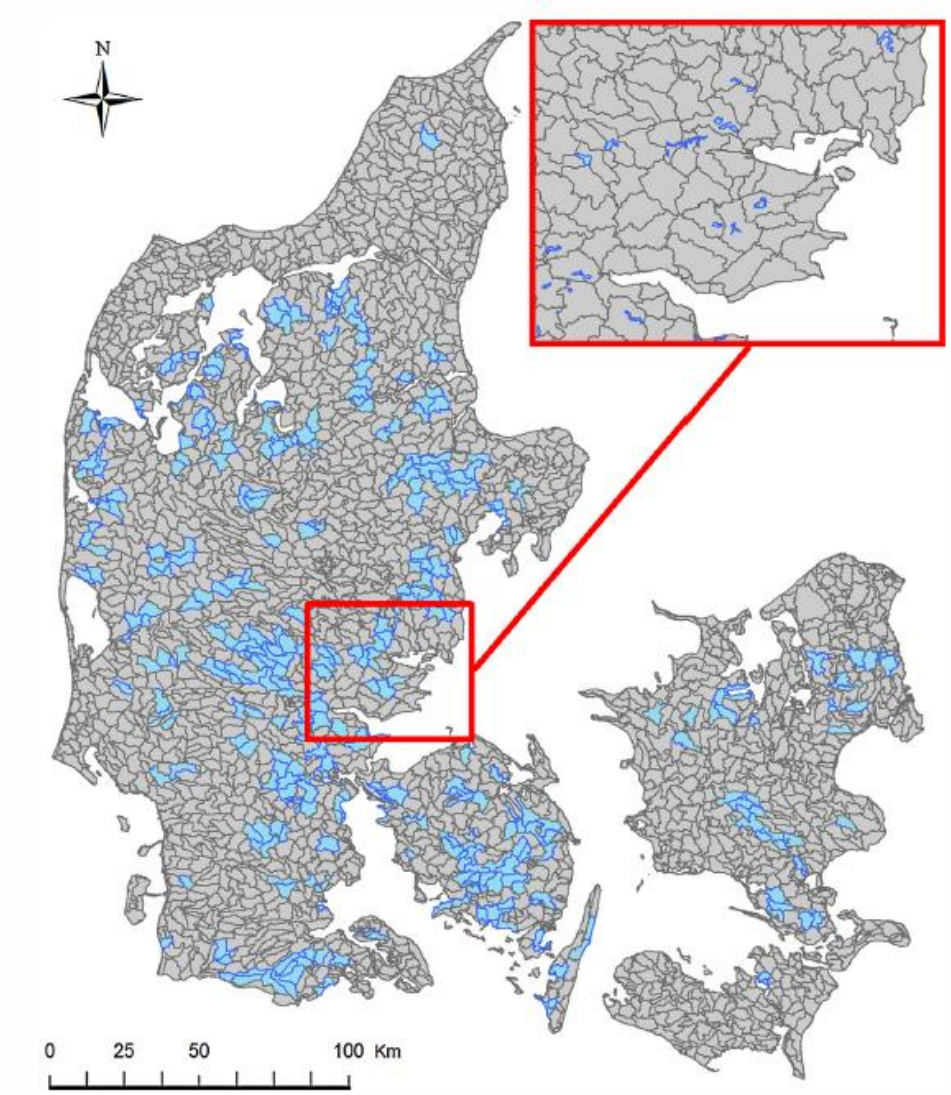
Land Rent

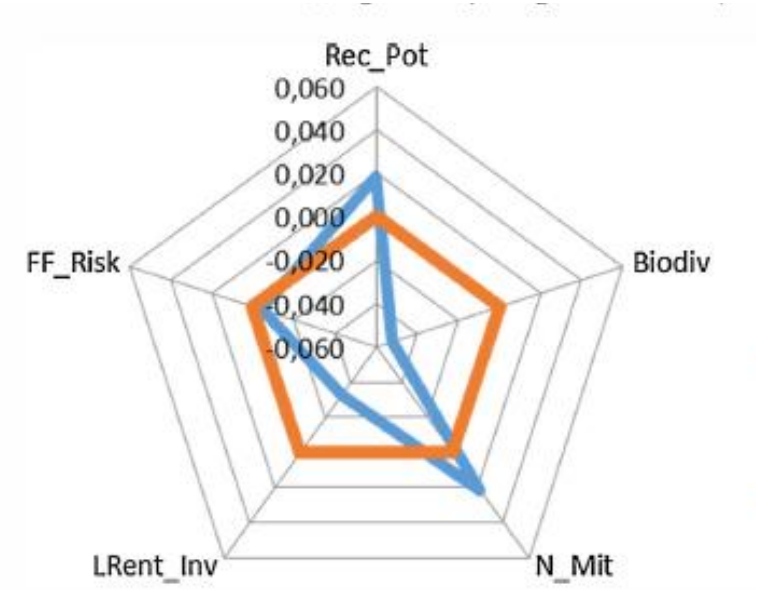
Flood Risk



Odgaard et al. (2017)
Ecological Indicators vol. 77

Multiple functions profile





With Restored Wetlands

Without restored Wetlands

Odgaard et al. (2017)
Ecological Indicators vol. 77

Table 1. Primary buffer strip functions, associated issues, and summaries of the level of knowledge, guidance policy, and funding (for the three EU countries of the authors) and the analysis of these functions across a survey of published buffer strip papers from ISI journals over the last five years.

Function	Issues	State of knowledge†	Guidance, policy, and funding†	References % inclusion‡
Controlling diffuse pollution transport	Nutrients Site specific soil and flowpath factors make placement and prediction of effects difficult. Insufficient knowledge of catchment scale effectiveness, long term P storage, GHG trade-offs. Works best when linked to in-field source control measures.	++ UK§ ++ DK + NL	++ UK ++ DK – NL	56%
	Pathogens and pesticides Issues of residence time and transformations in soils	– UK – DK – NL	– UK – DK – NL	
Habitat improvement and ecological connectivity	Conflict with nutrient retention, best as part of combined in-field and edge of field conservation measures. May require outer buffer to protect inner riparian eco-zone. Requires tools for better landscape planning. Potentially ecological quality and the most intensive food production cannot be reconciled within the same landscapes.	++ UK – DK + NL	++ UK – DK – NL	36%
Stream shading	Should be broad leaved trees. Protects watercourse from temperature extremes. Increases woody debris and C inputs.	+ UK + DK + NL	– UK + DK – NL	5%
Hydrological connectivity	Useful reconnection of waters with their flood plains, conflicts with soil drained for farming. Wetlands are effective bioreactors for N. Stores flood peak flow. Contaminated sediments may pollute the floodplain.	+ UK ++ DK – NL	– UK ++ DK – NL	14%
Carbon sequestration	Potential to sequester C in buffer soils and via tree planting. Potential interaction with DOC leaching and turnover of N and P, or with GHG emissions.	– UK – DK – NL	– UK – DK – NL	12%
Biomass production	May economically offset land taken from food crops (using timber or biofuel production). Needs to be harvested without degradation of riparian zone.	– UK – DK – NL	– UK – DK – NL	8%
Cultural services	Could encourage habitat for hunting species (fishing, deer, game birds). Use for public access, recreation and education. May harbor crop pests such as rabbits.	+ UK – DK – NL	– UK – DK – NL	6%

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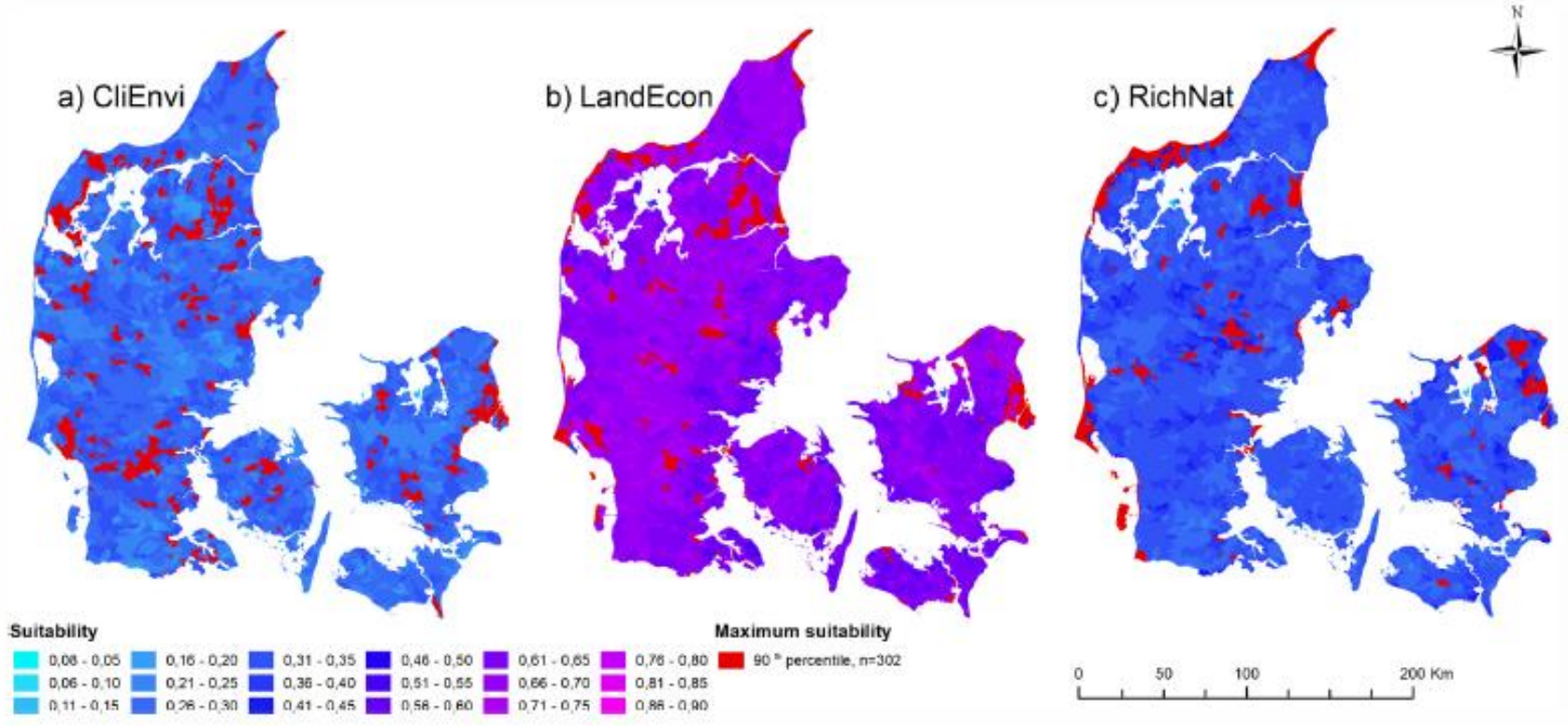
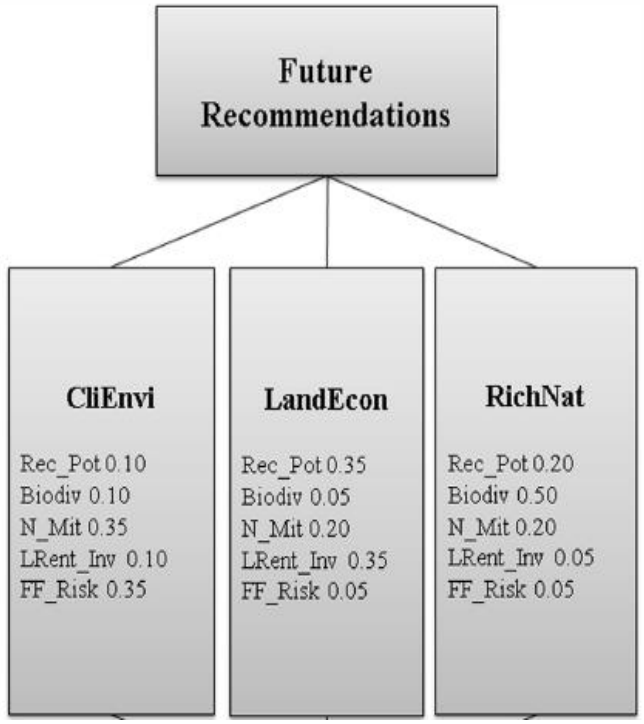
Kronvang *et al.* JEQ vol. 41

Priority landscapes for new wetlands





www.fremtidenslandbrug.dk and

Odgaard et al. (2017)
Ecological Indicators vol. 77

Local workshops

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dNmark
research alliance

www.dNmark.org

Innovative solutions for a SUSTAINABLE MANAGEMENT OF NITROGEN IN AGRICULTURE

SustainableNconference.dNmark.org

International Conference

JUNE 26-28

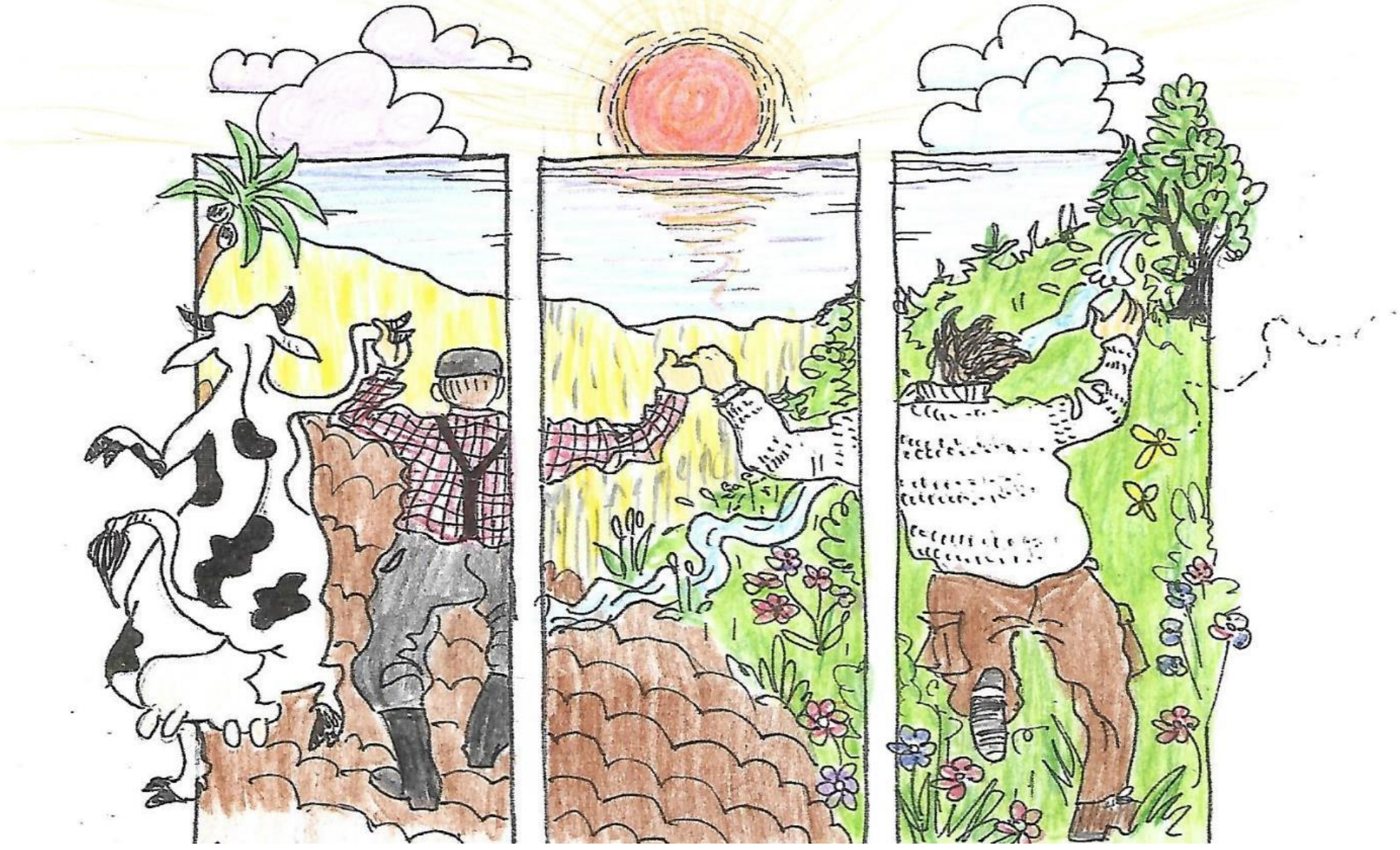
Task Force on Reactive Nitrogen workshop

JUNE 29-30

/\/\RHUS–2017
EUROPEAN CAPITAL OF CULTURE

in Aarhus *European Capital of Culture 2017*

Solution scenarios



An 8-step guidance for implementation
(of IBZ's or other landscape scale measures)

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Preparatory steps:

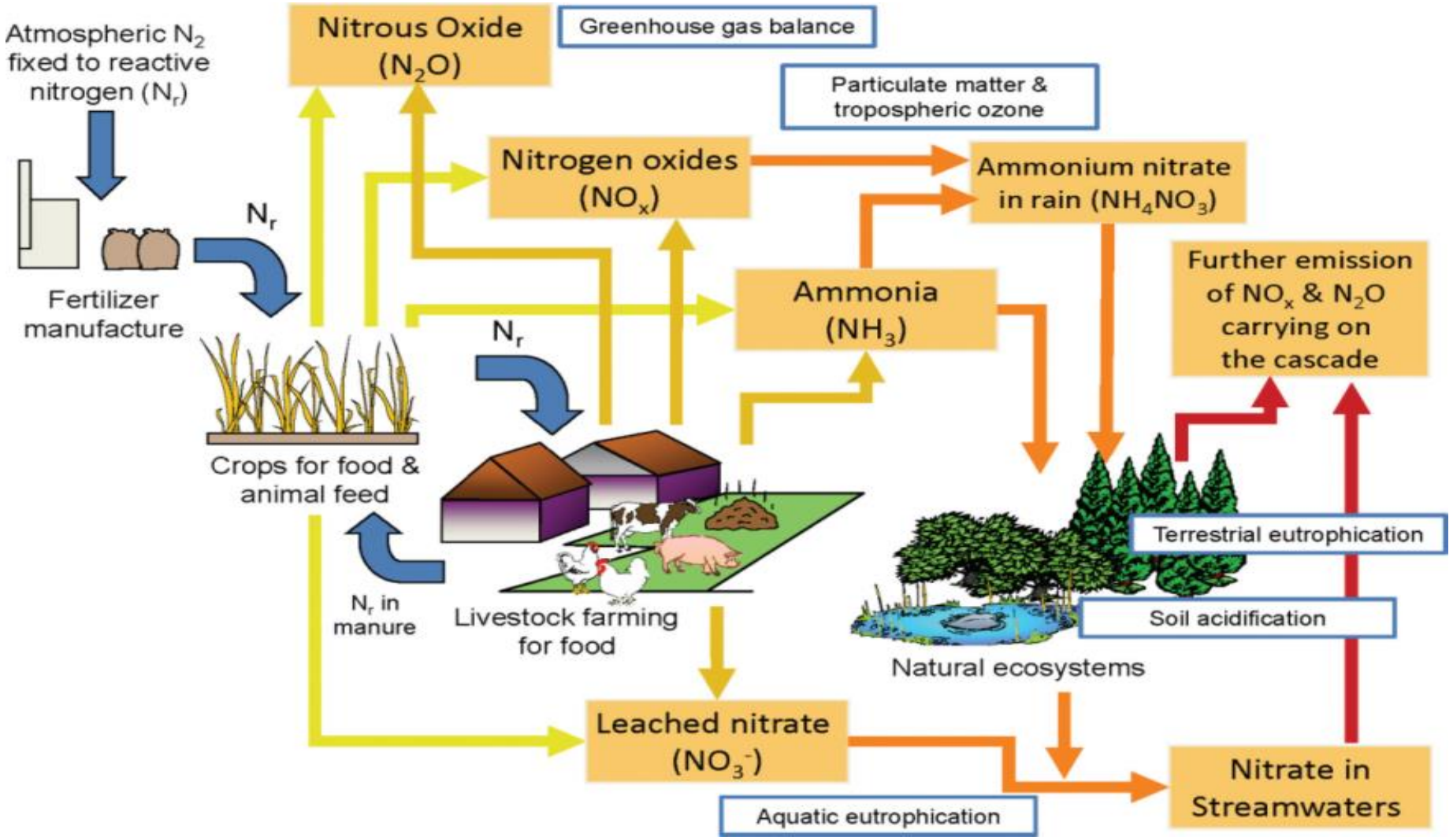
1. Model the risk of N and P losses to streams targeting recipient requirements
2. Map nature values, ecosystem services, the potential for hunting, bird watching and public access.
3. Map the suitable measure locations (for IBZ and other agro environmental measures relevant for targeting recipient requirements).
4. Prepare maps to present to farmers showing critical areas.

Joint steps with the farmers:

5. Farmer meetings by a catchment advisor with "T-shaped skills"
   a. Making inquiries about their values as a farmer, how they view nature, environmental impact and nature related interests (hunting, bird watching, interactions with the public etc.).
   b. Finding out what motivates the farmer, his motivation for collaborating with other farmers, the importance of societal recognition and interests in promoting public access.
   c. Getting the farmer to talk about his land and his observations of soil conditions, erosion, yield differences, drainage and soil nutrient status.
   d. Invite the farmer to express his ideas of enhancing nature value on his land, protecting the watercourse and his motivation for doing this. This can be combined with a walk in his fields.
6. Presentation of maps (Only after the conversation, described above).
   a. Ask if the farmer can recognize the critical areas for nutrient losses.
   b. Use this opportunity to explain the modeled background of the maps, their limitations and possibilities.
7. Summarize information about the farm, and suggest a forward strategy to the farmer (tied to the actual farmers type profile).
8. Evaluate answers from all farmers in the catchment, and form groups of coherent farmers to established a collective strategy with a broad pallet of environmental measures.

After Skjellerudsveen (2016)

International landscape N assessment



Towards joined-up nitrogen guidance for air, water and climate co-benefits.

http://www.clrtap-tfrn.org/content/joint-dg-env-tfrn-workshop-towards-joined-nitrogen-guidance-air-water-and-climate-co

Drivers for implementation of landscape scale measures in Denmark.

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Focus on 3 drivers for the implementation of landscape scale measures:

1. **Public demands for clean and sustainable water resources**

2. **Ensuring and creating legitimacy for landscape scale measures as a driver**
   a) **The role of scientific knowledge and participation**

3. **Regulatory framework and policy instruments as drivers**

#Driver 1- Public demands for clean and sustainable water resources

Results from a national stated preference survey undertaken by Kennet Uggeldahl et al. as part of the BufferTech project.

The data consists of more than 3200 randomly sampled Danes, and was collected during the spring and summer of 2016.

#Driver 2- Creating legitimacy –the role of scientific knowledge and participation

Case study from the implementation of the Buffer zone Act and analysis of prospects for differentiated regulation.

The Buffer zone act was implemented in 2011, but met with opposition from different stakeholders, in particular farmers, and resulted in several lawsuits towards the Danish government and vice versa.

This process has been analysed

Thorsøe, Graversgaard & Noe (2017)

Land Use Policy 62 (2017) 202–212

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

The challenge of legitimizing spatially differentiated regulation: Experiences from the implementation of the Danish Buffer zone act

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ARTICLE INFO

Article history:
Received 15 October 2015
Received in revised form
22 December 2016
Accepted 30 December 2016
Available online 7 January 2017

Keywords:
Differentiated regulation
Legitimacy
The Buffer zone act
Water Framework Directive (WFD)
Agri-environmental measures
Buffer strips

ABSTRACT

Differentiating regulation is a promising approach to agri-environmental regulation that may potentially reduce the environmental impact of agriculture at the lowest possible costs for the farmers and society, but also possesses a number of challenges. In this article, we explore the challenges to the legitimacy of agri-environmental regulation that occurs when the regulatory regime changes from general regulation to differentiated regulation. The analysis is based on a case study of the implementation of the Buffer zone act in Denmark – a regulation that prevents agricultural production in a 10 (later 9) meter fringe around selected waterbodies. We distinguish between two different ways of legitimizing: Producing knowledge and participation. We conclude that to harvest some of the obvious benefits of differentiated regulation a number of challenges must be resolved, 1) ensuring legitimacy of differentiated regulation is crucial, 2) differentiated regulation imply that farmers are also differentiated, 3) differentiated regulation implies new uncertainties, 4) the current knowledge regime need to be reconfigured, 5) stakeholders feel that they are unevenly treated and 6) it is difficult to establish a win-win solution for all farmers on an individual level.

1. Introduction

In theory, differentiated regulation is a promising approach to agri-environmental management that may reduce the environmental impact of farming at the lowest possible cost for the farmers and society, but it is also challenging to implement in practice.

Since the beginning of the 1990's the Danish agri-environmental regulation has become increasingly diversified, but the policy instruments applied today are still primarily based on general measures (Dalgaard et al., 2014). Although the use of national policies and general regulation has been successful, the environmental impact of farming in Denmark is still apparent and beyond the targets set in the European Water Framework Directive (WFD)

agriculture, as there is a huge geographical variation in nutrient loss within the same catchment area and because the effect of regulatory measures differ depending on the geographical location (Christen and Dalgaard, 2013; Tomer et al., 2009).

Based on a cost calculation of a national reduction of 7.773 tons N Jacobsen (2014) notes that differentiating measures will reduce cost by 25% and in a different paper (Jacobsen and Hansen, 2016) find that the average farm would gain approximately 14–21 €/ha/year. Furthermore, Hasler et al. (2015) in a scenario study of a particular catchment find that the cost of reducing N load by 810 and 1016 N pr. year, incur a cost ranging between 2.5–8 €/kg N using general measures whereas differentiated measures only incur a cost ranging between 1.5–2.5 €/kg N. Hence, differenti-

#Driver 2- Creating legitimacy about scientific knowledge and participation

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The study shows the **importance of ensuring legitimacy and that failure to legitimize the regulation/policy on landscape scale measures makes it impossible to establish a win–win situation for farmers and society** and imply that farmers use the courtroom as a battleground rather than complying with the regulation.

Differentiated regulation need a fundamental change in the knowledge regime, requiring more locality specific knowledge and governance.

Furthermore, environmental models need to be supplemented with various types of practical and local knowledge.

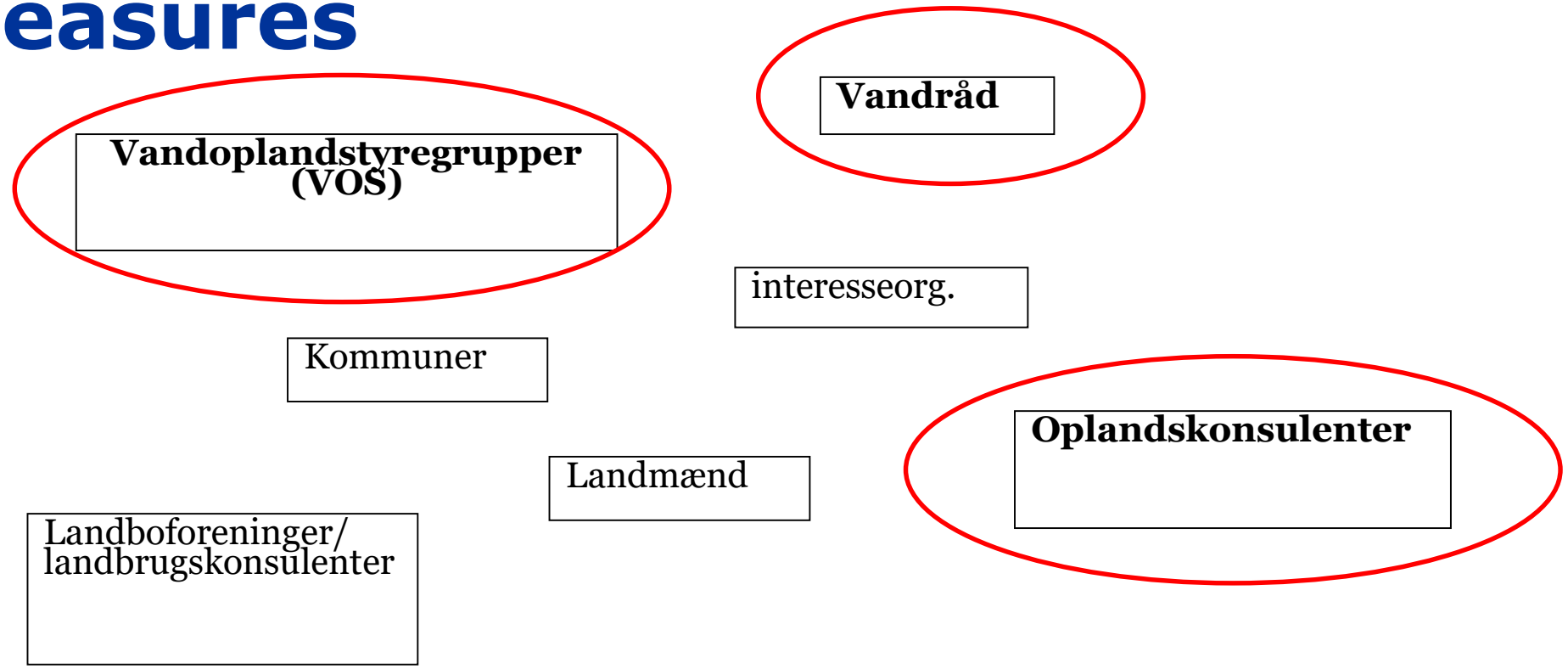
Thorsøe, Graversgaard & Noe (2017)

#Driver 3- Regulatory framework and policy instruments

- The use of policy instruments/measures
- Stakeholder involvement

Exemplified by wetland implementation

The governance process of implementation of landscape scale measures



Water Councils in 2014

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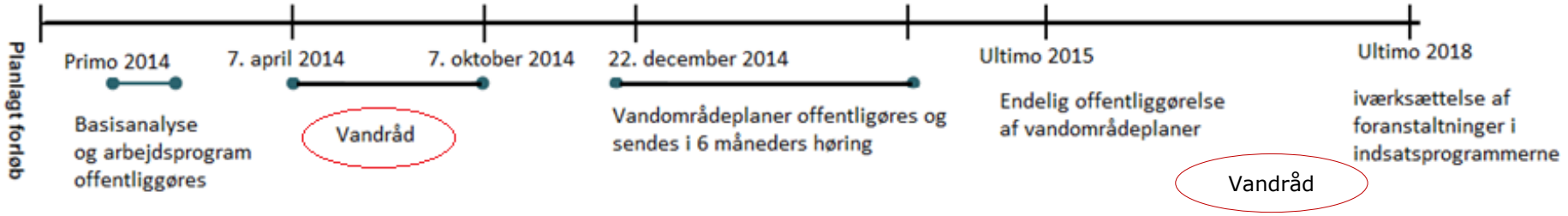
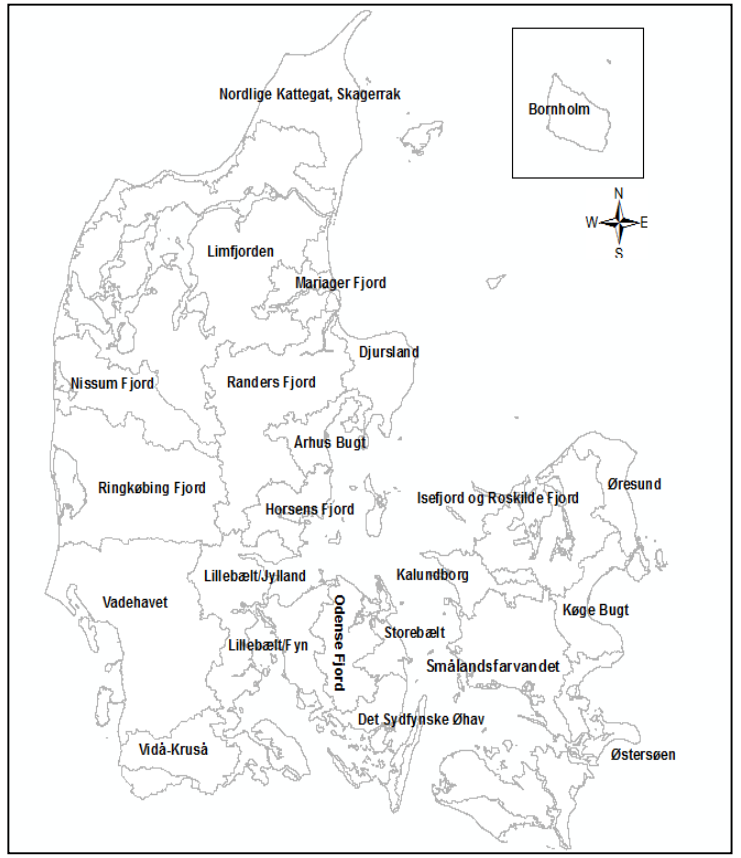
RBMP 2 process



Water Councils in 2014

Task:
Advise municipalities in developing draft Program of Measures for improving the physical conditions in streams.



The water councils were given a “water council package” consisting of:

1. A frame for the minimum distribution of effort and an economic frame per. RBD
2. A guide for municipalities and water councils
3. A priced catalog of 16 measures
4. A GIS-based tool

The institutional arrangements and policy design was beforehand fixed.

Water Councils in 2014

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Outputs	Minimum Requirements Prepared by the Nature Agency	Initial Water Council Proposals for PoMs	Final Water Council Proposals for PoMs (RBMPs 2015–2021)	Water Council Index (PoM 2015/RBD 2014) **
Investments (Million €)	93	96	93	100
Obstacles (No.)	181	222	228	125
Ochre-Removal Basins (No.)	39	42	43	110
Length Streams (km)	1615	3664	3800 *	235

Graversgaard et al. 2017

Conclusions from Water Cou

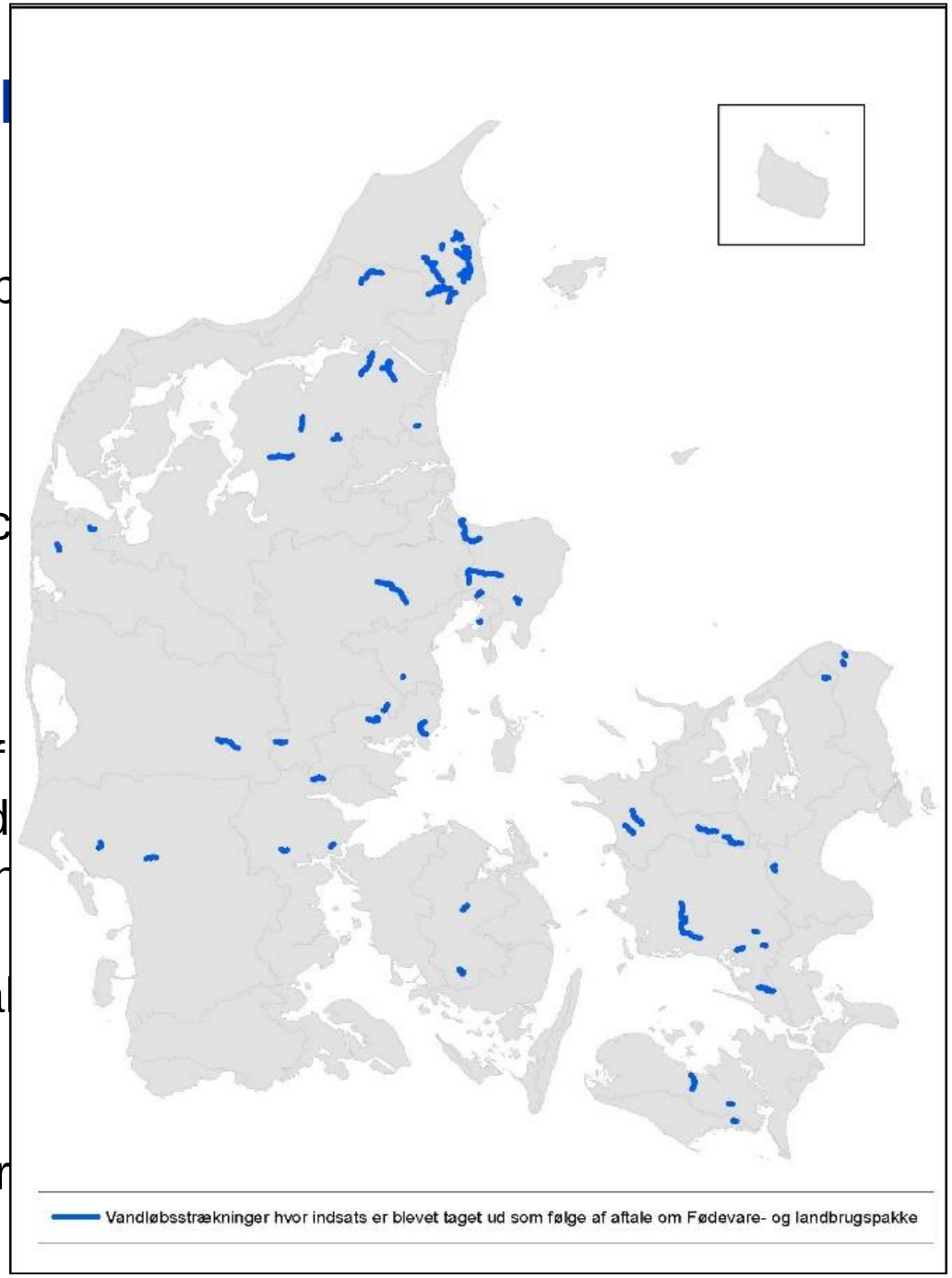
- Having a structured and fixed institutional frame around pub
  up) can produce cost-effective results.

- In all, this means that the length of streams required to reac
  the same amount of money

- However, the policy design and institutional arrangement of
  limitations, and the fixed frame did not allow room for includ
  example integration of climate change concerns and nutrien

- Opportunities to build legitimacy and ownership were not ta

- Implications for Water councils 2.0 - starting today and futur



Drivers for implementation of landscape scale measures in Denmark.

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Concluding remarks:
3 important drivers for the implementation of landscape scale measures:

1. Public demands for clean and sustainable water resources

2. Ensuring and creating legitimacy for landscape scale measures as a driver
   a) The role of scientific knowledge and participation

3. The regulatory framework and use of policy instruments as drivers

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