

Policy effects, challenges and future solution scenarios for improved N management and N efficiency in Denmark



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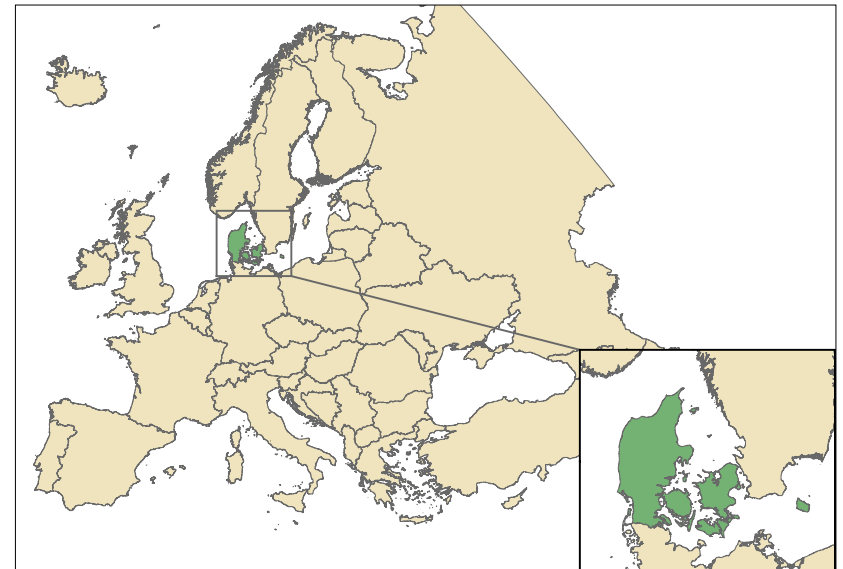
Program

- **Introduction**
- **The Danish Nitrogen Alliance**
- **Policy effects, challenges and future solutions for improved N management and N efficiency**
- **Conclusions**

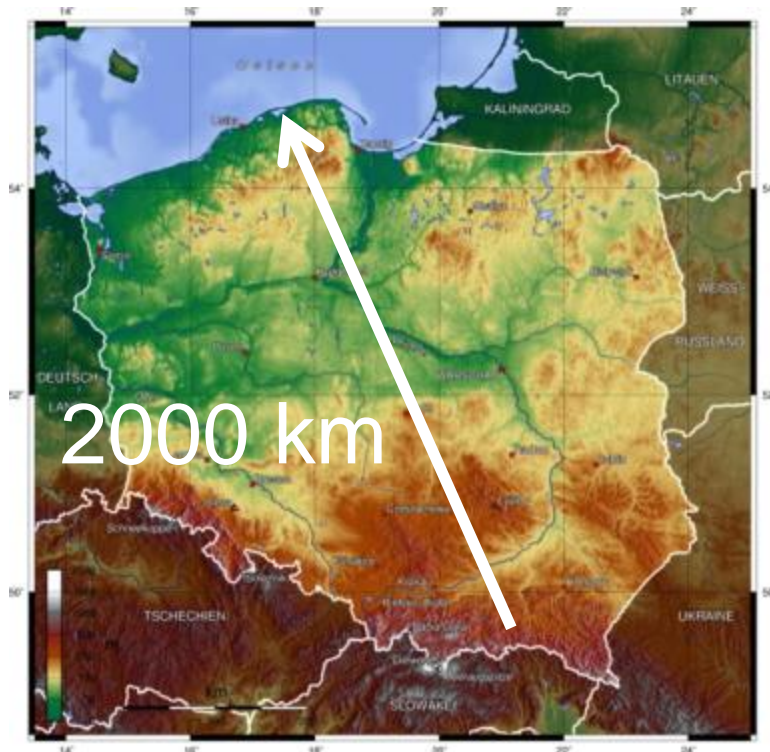


Agriculture in Denmark

- **2.6 mio ha agricultural land (62% of total area)**
- **5.5 mio people – 4.5 mio t milk - 29 mio pigs/yr**
 - 9.7 t milk/cow/yr
 - 30 piglets/sow/yr
 - 7.5 t wheat/ha/yr
- **7500 km coastline**

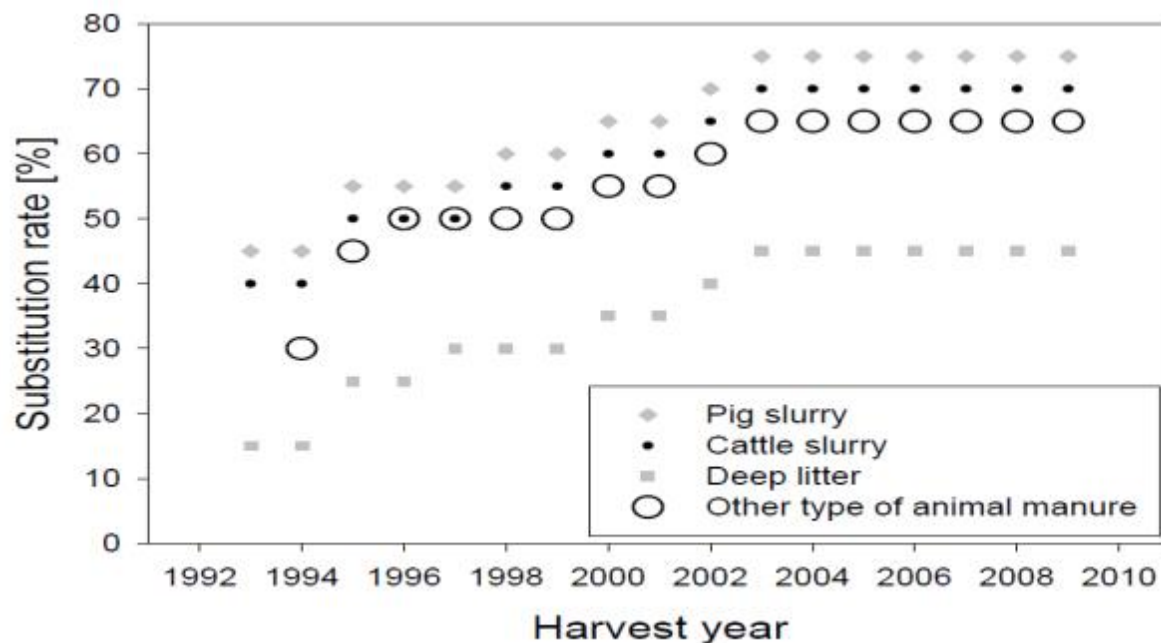


Intensive agriculture near to the coast

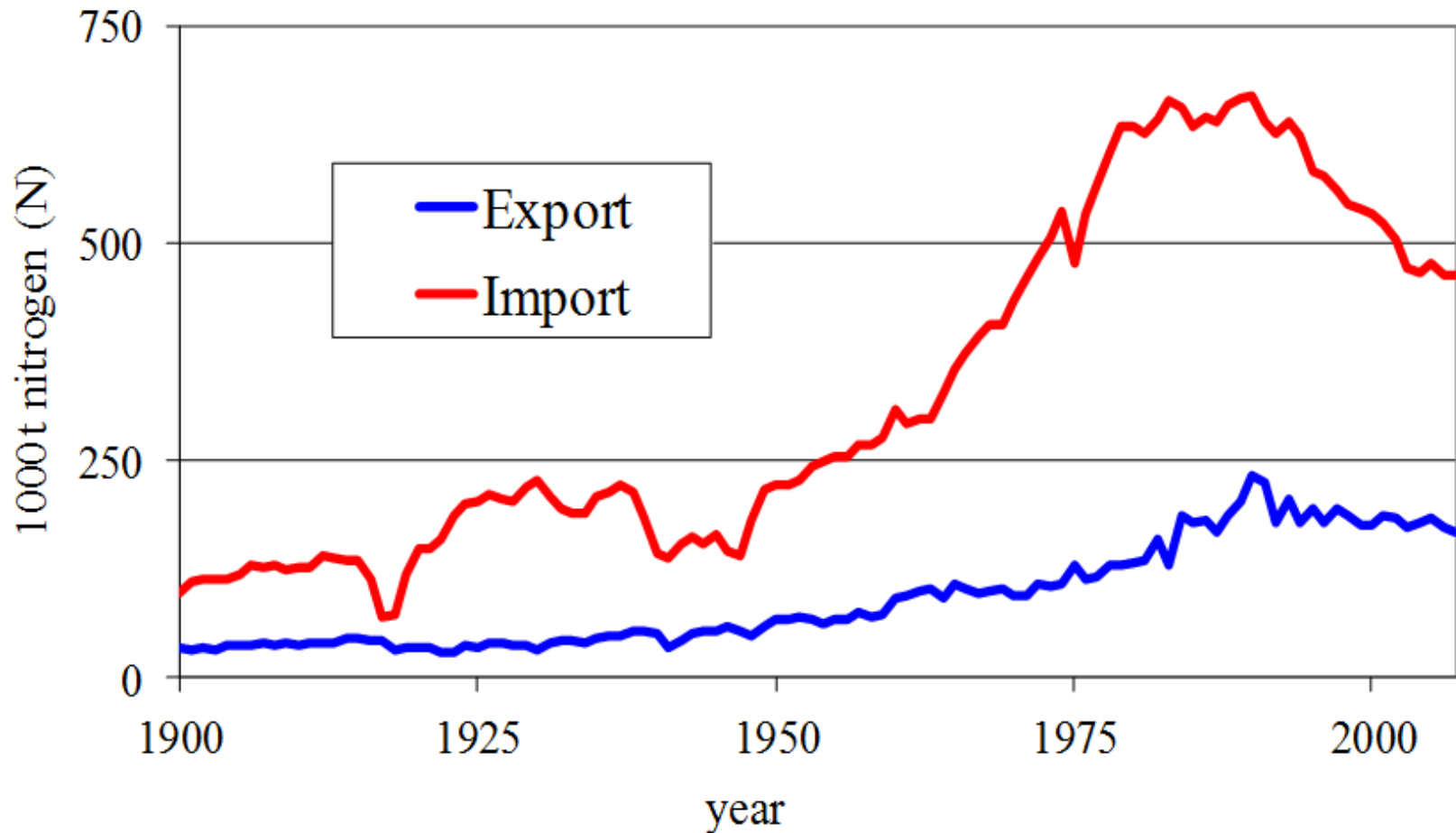


Action plans

- The 1985 Action Plan
- AP-I for the Aquatic Environment (1987)
- Action Plan for Sustainable Agriculture (1991)
- AP-II for the Aquatic Environment (1998, 2000)
- Ammonia Action Plan (2001)
- AP-III for the Aquatic Environment (2004)
- Green Growth (2009)
- EU Water-Framework Directive implementation (2010+)

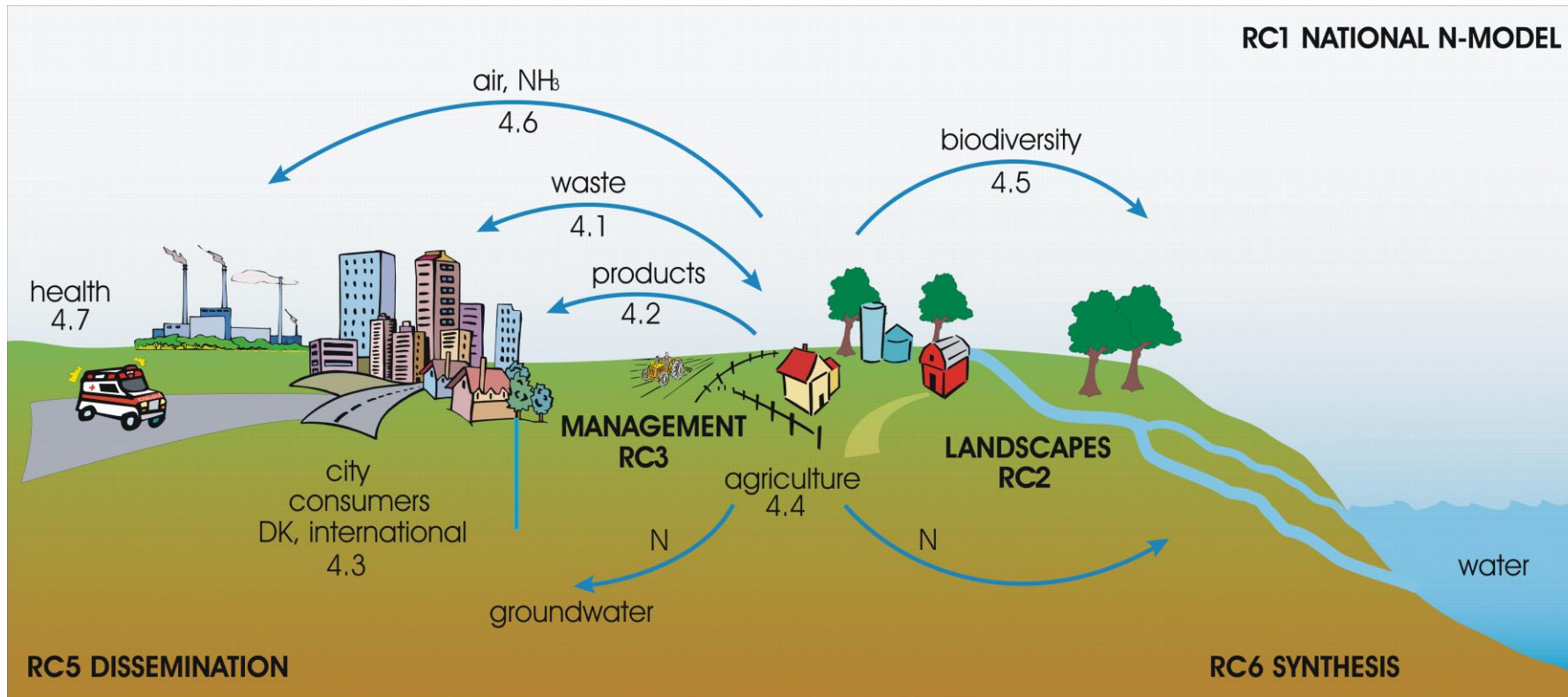


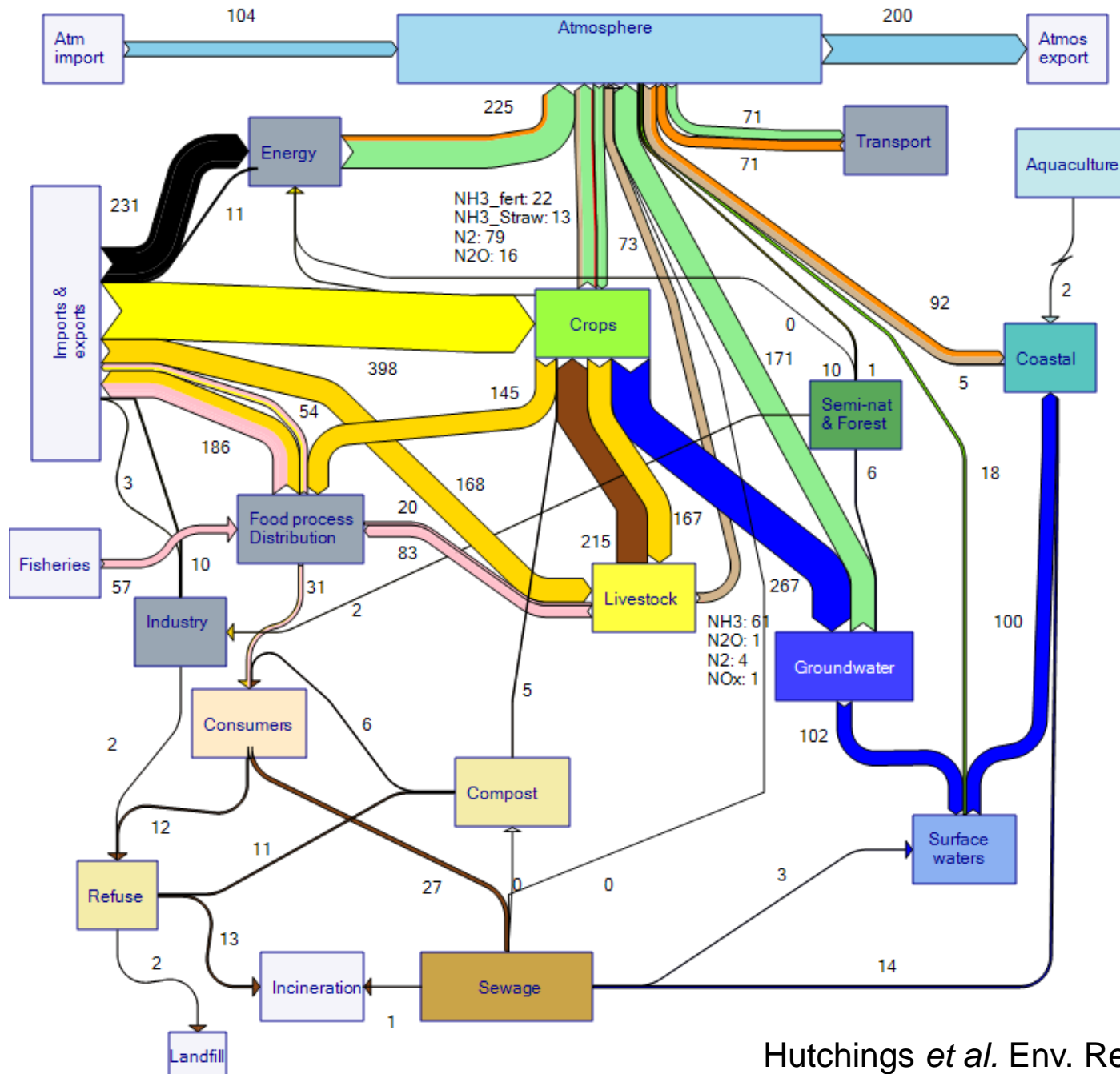
N-efficiency in Danish Agriculture

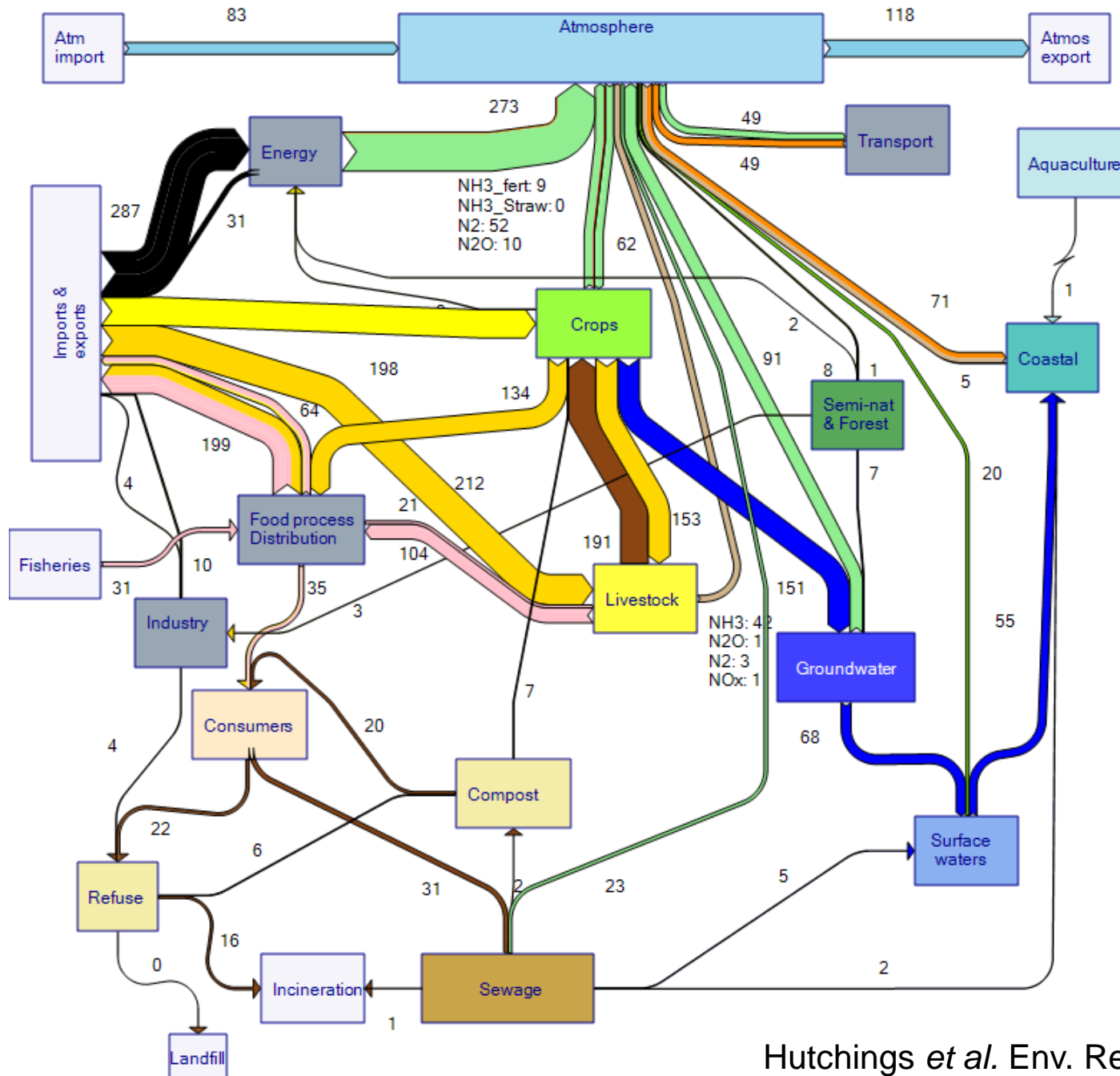


Studying all components of Danish nitrogen landscapes

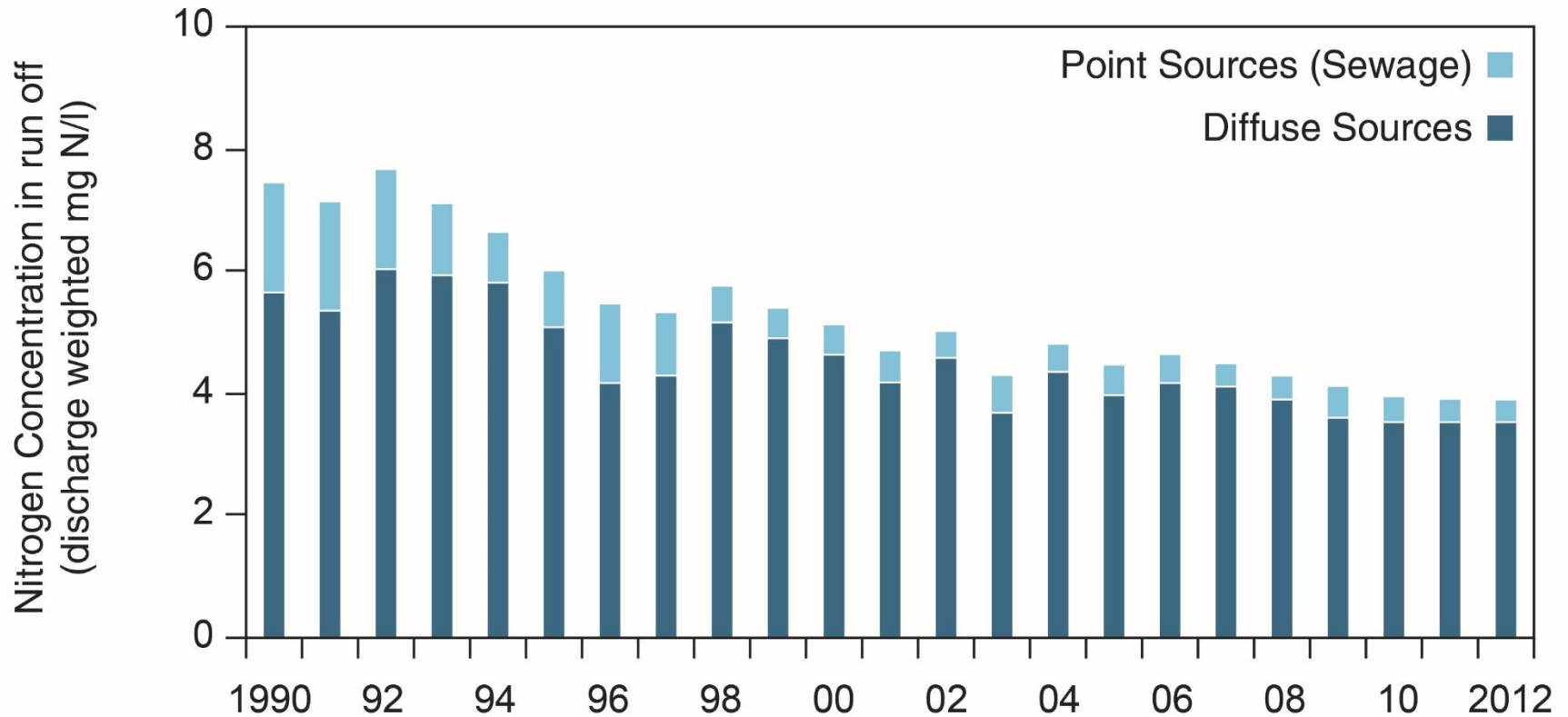
Research components:



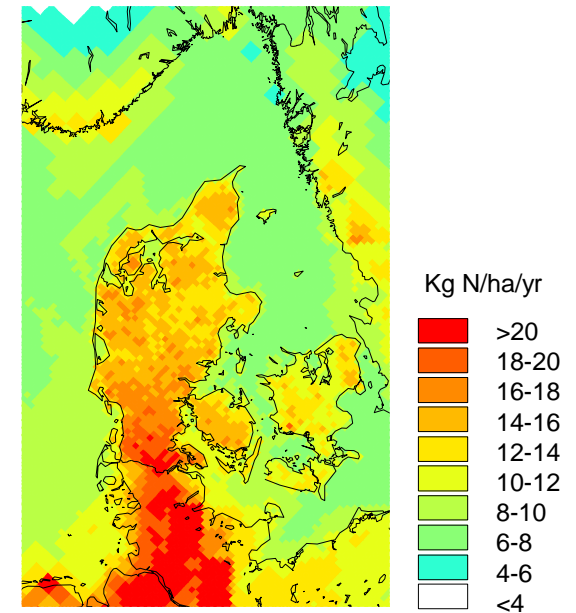
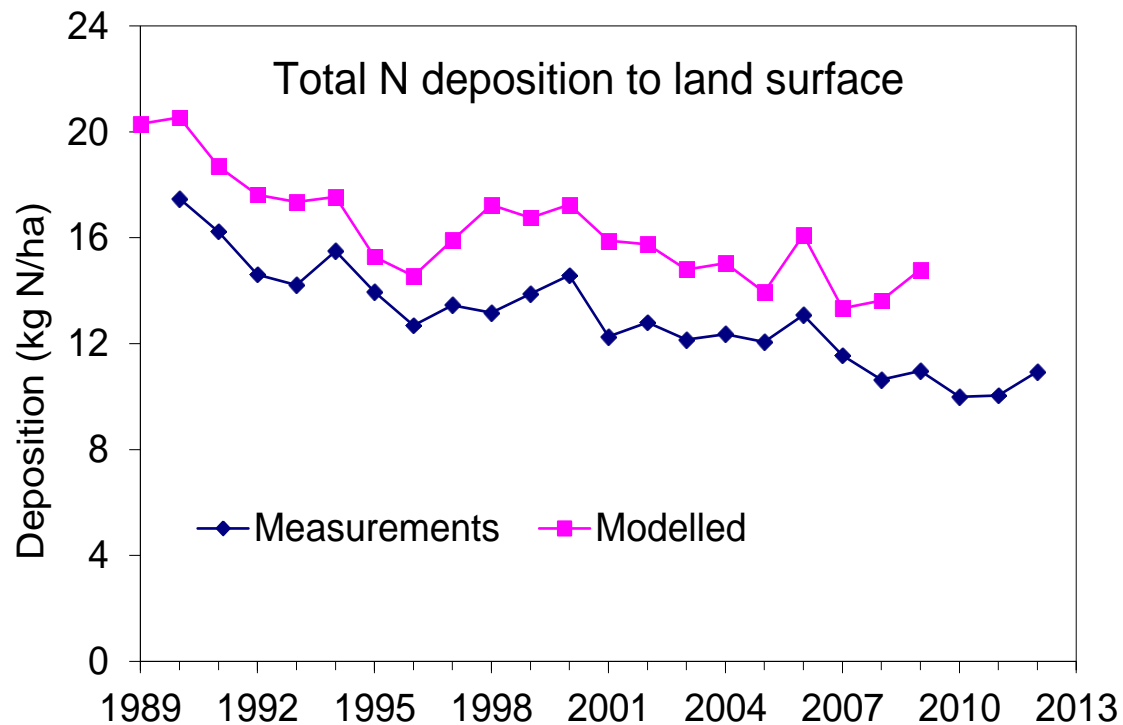




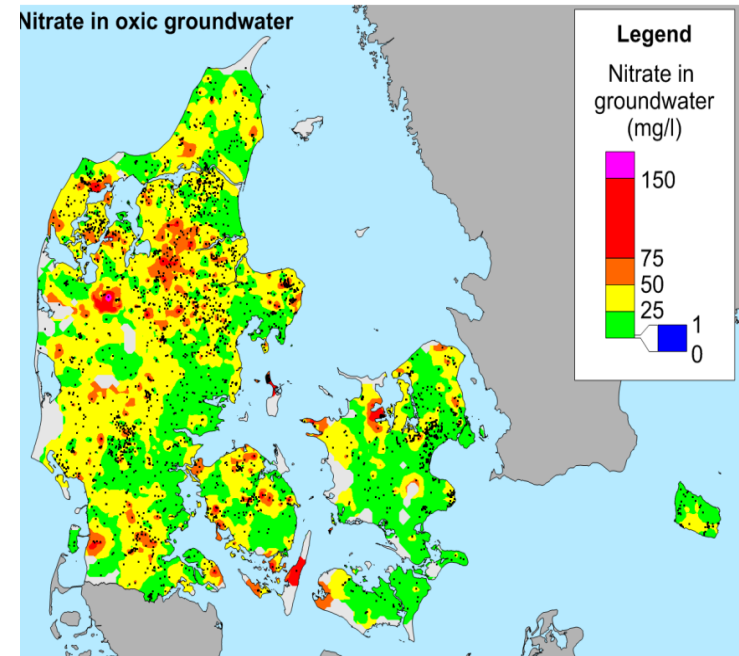
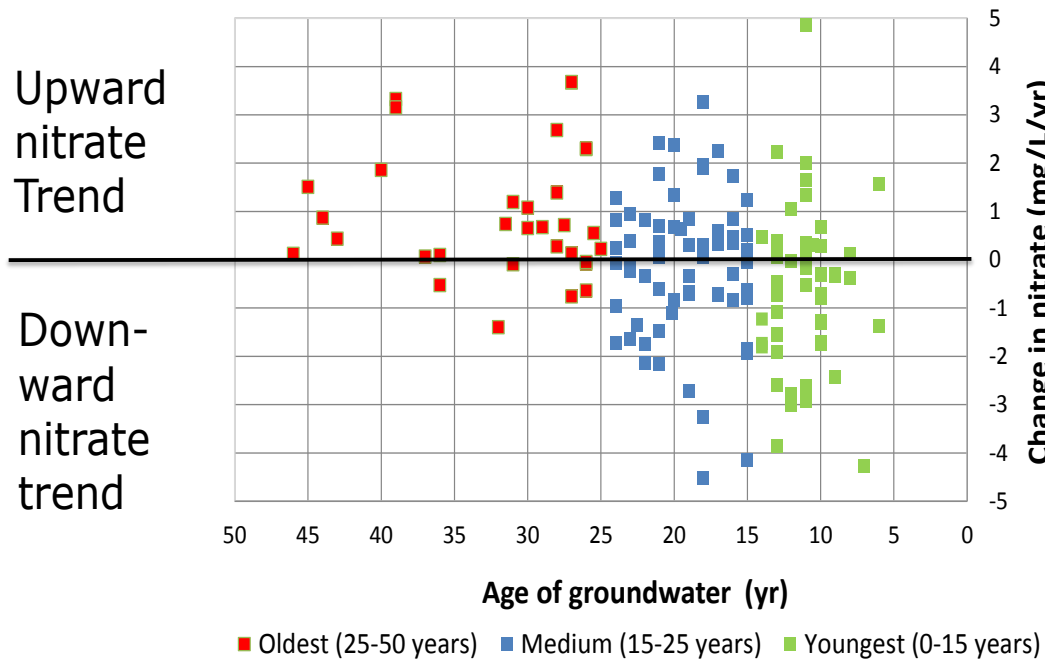
Surface water outflow to the sea



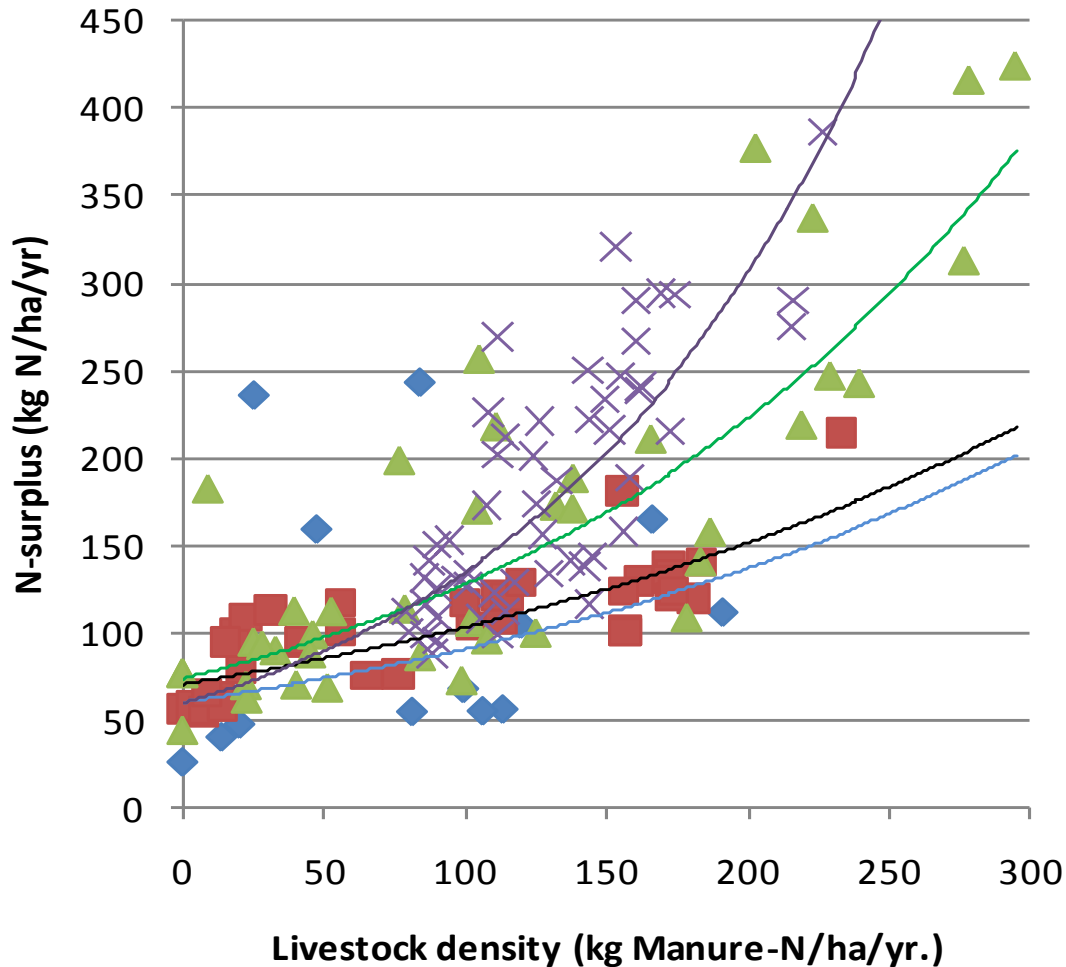
Atmospheric N deposition



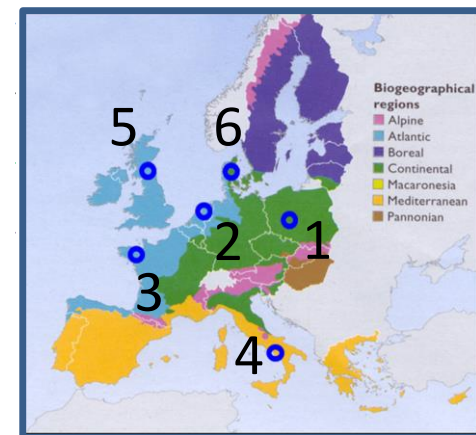
Groundwater concentration



Danish Farm N surplus Development and Variation

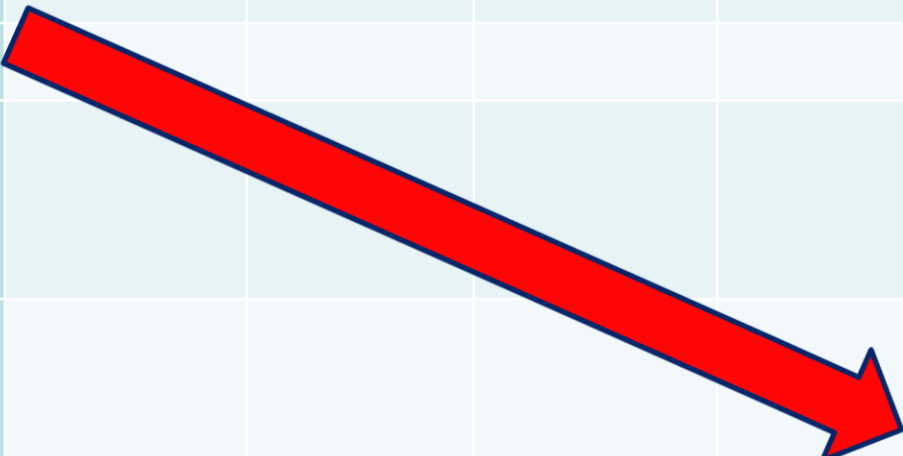


- ◆ Nsurp2008
- Nsurp2002
- ▲ Nsurp1996
- × Nsurp1990

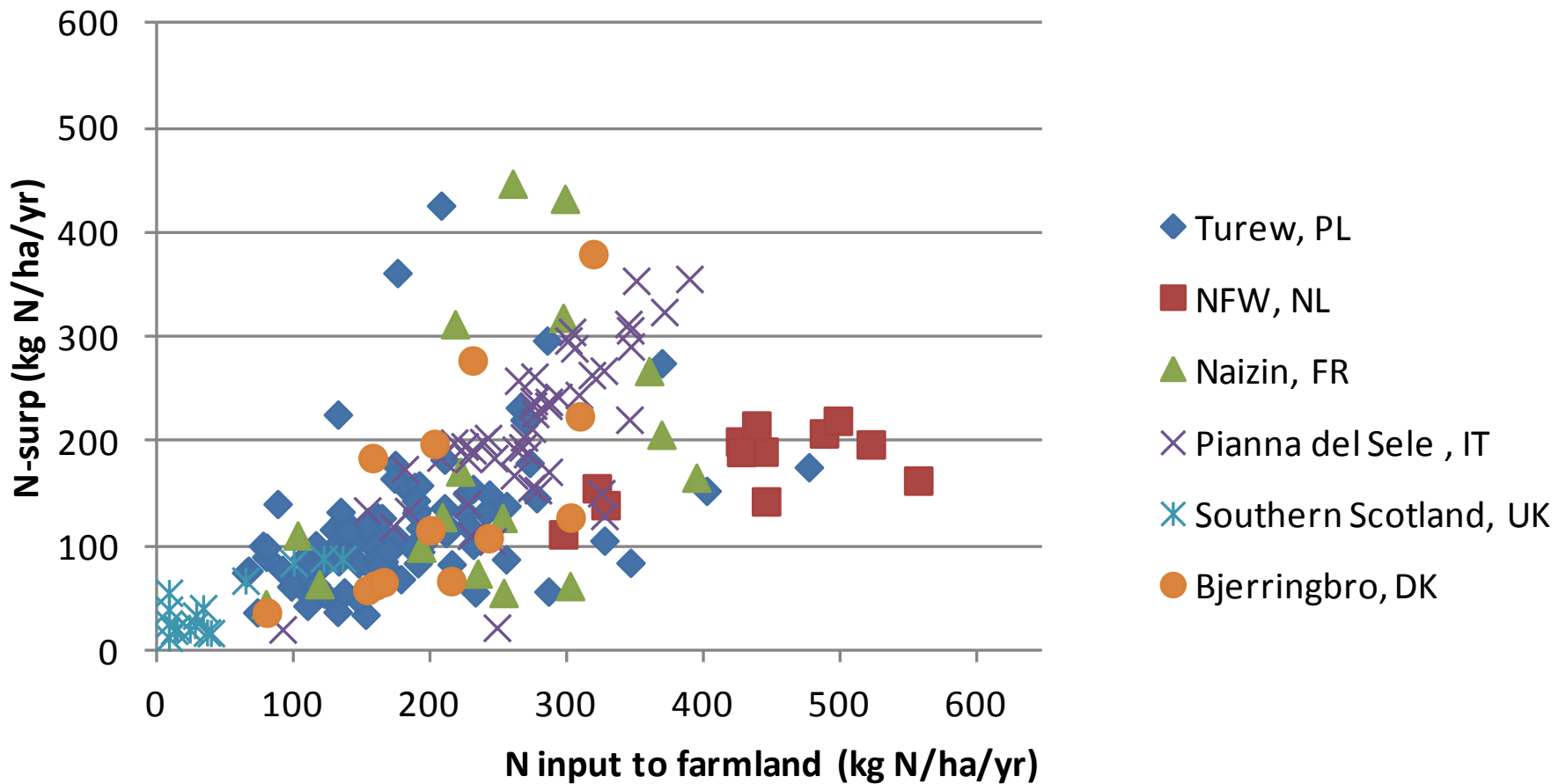


Types of regulation

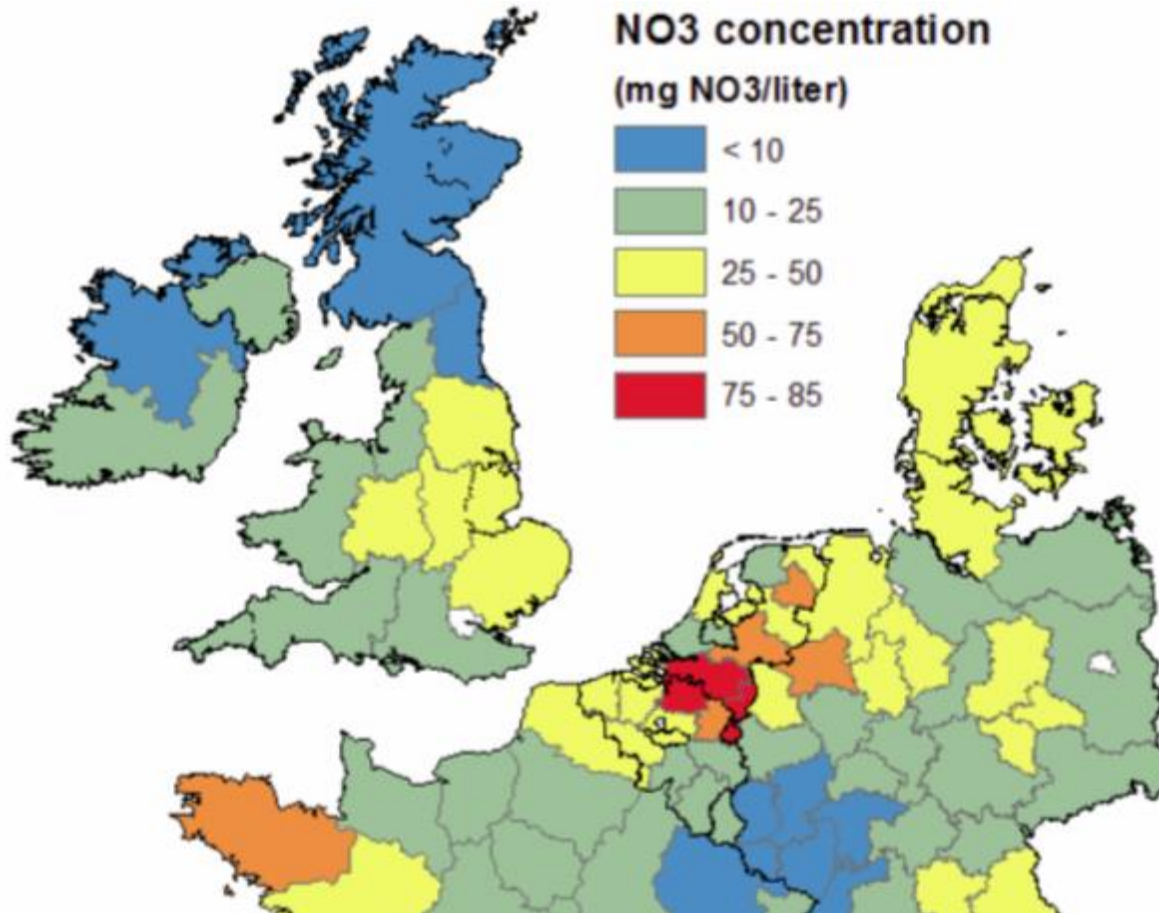
	General regulation		Geographically targeted regulation	
	Input based	Output based	Input based	Output based
Command and Control (C&C)				
Market-Based Regulation and Governmental Expenditure (MBR)				
Information and Voluntary Action (IVA)				



European farm N surplus



A general NW EU challenge

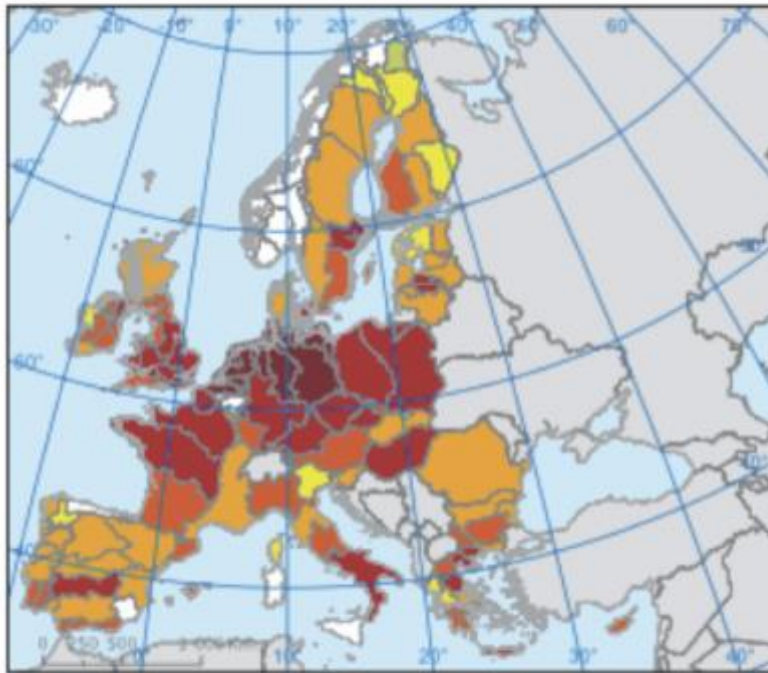


Van Grinsven HJM, ten Berge HFM, Dalgaard T *et al.* (2012) *Management, regulation and environmental impacts of nitrogen fertilization in northwestern Europe under the Nitrates Directive; a benchmark study.* Biogeosciences 9, 5143–5160, 2012.

<http://www.biogeosciences.net/9/5143/2012/bg-9-5143-2012.pdf>

The EU Waterframework directive challenge

(a) Rivers and lakes



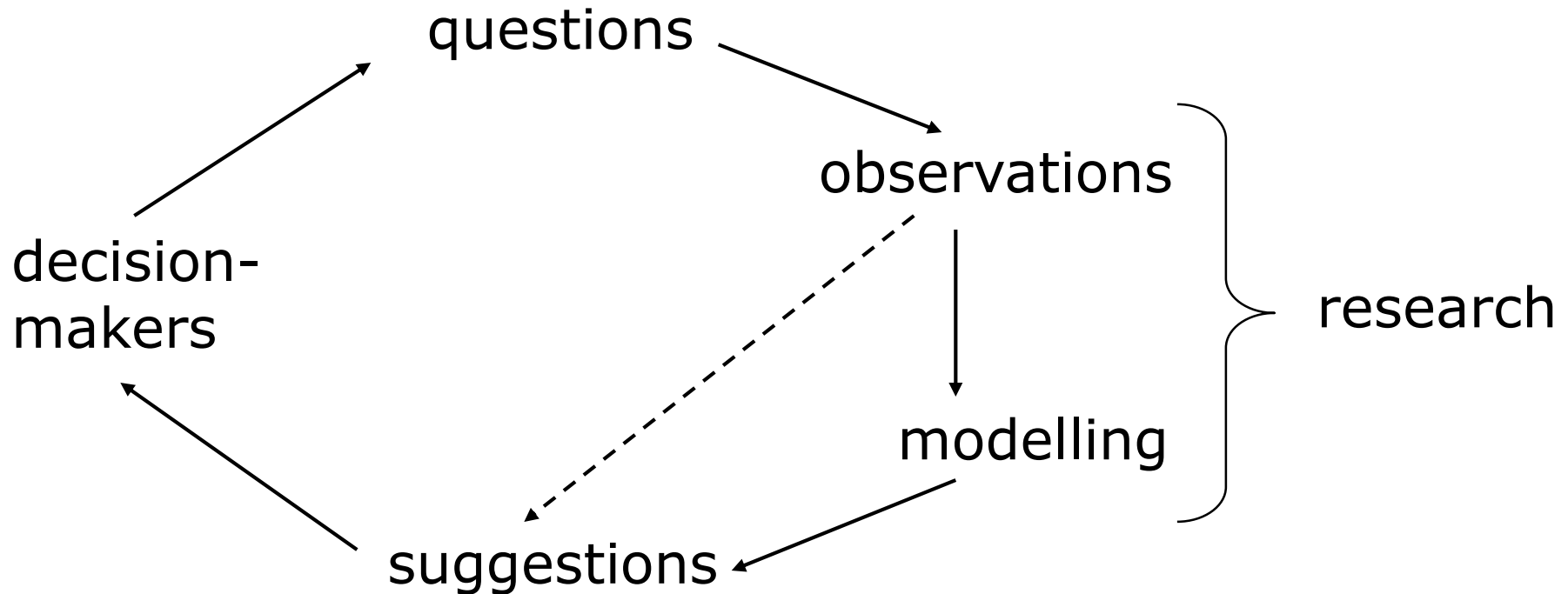
(b) Coastal and transitional waters



Percent of classified water bodies in less than good ecological status or potential



The cycle of applied research



Adapted from Bierkens (2000)

It is all about a balanced approach!



The dNmark.org research alliance

Innovative solutions for a

**SUSTAINABLE MANAGEMENT
OF NITROGEN IN AGRICULTURE**



PhDs and post-docs

- RC 4.2: The Welfare Economics of Environmental and Resource Costs in the Water Framework Directive
- RC 4.3: Philosophical-anthropological Perspectives on the Culture of Food in the City of Horsens, with Special Regard to Diminished Consumption of Meat Products
- RC 4.4a: Stakeholder involvement in sustainable management of nitrogen- a framework for integrated participatory modelling
- RC 4.4b: Methods for Assessing Spatially Differentiated Nitrogen Mitigation in Agriculture
- RC 4.5: Ecosystem services as a framework for sustainable natural resource management in Denmark
- RC 4.7: Groundwater N-pollution and public health effects – The example of gastrointestinal cancer

PhDs and Post-docs

- RC 2: Modelling N reduction effects in Danish agricultural landscapes based on local stakeholder suggestions of future landscape changes
- RC 3: Management strategies – Implementation of N reduction measures by use of policy instruments
- RC 4.1: Urban-rural N recycling for waste
- RC 4.6: Agricultural airborne N-Pollution, particle pollution and public health effects
- RC1/RC6: Geographically Targeted Solution Scenarios and Impact Assessment
- RC2/RC6: GIS platform for landscape scenarios

Policies for agricultural nitrogen management—trends, challenges and prospects for improved efficiency in Denmark

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