



# European Nitrogen Assessment

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Stakeholder Expert Group,  
EU Air Policy, 7 June 2011



# The European Nitrogen Assessment

Sources, Effects  
and Policy Perspectives

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CAMBRIDGE

## ENA Launch

11-15 April 2011

Edinburgh

International Conference

“Nitrogen & Global Change”

## ENA Authorship

200 experts,

21 countries &

89 organizations

Scientifically independent  
process

[www.nine-esf.org/ENA](http://www.nine-esf.org/ENA)

# Nitrogen in the News

- ENA summary in *Nature*
- International TV & Press Coverage
- ENA video on “*Youtube*”

**COMMENT**

**Nitrogen taint alert**

**ENVIRONMENT** Worse than Deepwater was Arctic oil

**ECOLOGY** Libyan revolution might protect bluefin tuna, with trawlers grounded p.169

**OBITUARY** Simon who enabled the disc of W and Z particles p.170

**Farming**  
**Union defends use of nitrogen in high-octane climate change debate**

**Warning over nitrogen footprint**

**Vervuiling met stikstof kost miljarden**

**Pollution à l'azote : une lourde facture pour l'Europe**

Applying liquid manure more precisely than this would be cleaner, reduce odour and emit less ammonia.

## Too much of a good thing

Curbing nitrogen emissions is a central environmental challenge for the twenty-first century, argue Mark Sutton and his colleagues.

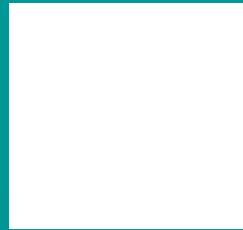
*The Sun, Scotsman, Guardian, La Monde, VOK, Nature*  
14 April 2011

# Objectives of the European Nitrogen Assessment

- To review current scientific understanding of nitrogen sources, impacts and interactions across Europe,
- Taking account of current policies and the economic costs and benefits, as a basis to
- Inform the development of future policies at local to global scales.



# ENA Inputs and Authorization



N and the European  
GHG balance (EC)



Nitrogen in Europe  
Science network (ESF)



Managing N at the  
biosphere atmosphere  
interface



**ENA**  
European  
Nitrogen  
Assessment



*Workshop:  
Nitrogen  
deposition  
& Natura 2000*



International  
Nitrogen  
Initiative



Linking UN  
Conventions



UNECE  
Task Force  
on Reactive  
Nitrogen

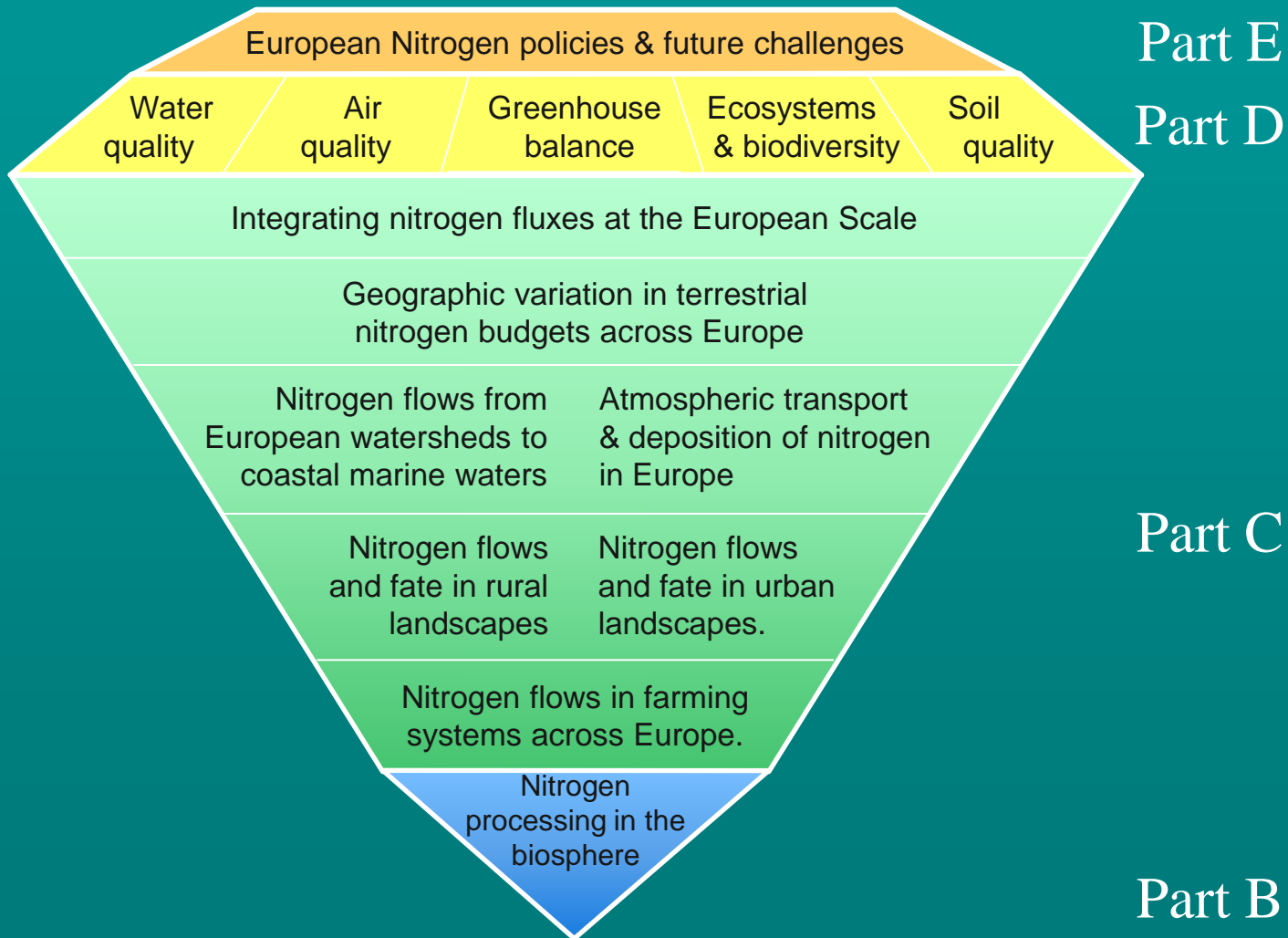
Global  
Partnership  
on Nutrient  
Management

# Scaling up of issues through the European Nitrogen Assessment

Upscaling & Integration



Processes & Mechanisms



Total NO<sub>x</sub> emissions [kg N km<sup>-2</sup>yr<sup>-1</sup>]

Split of total NO<sub>x</sub> emissions for EU27 [Gg N year<sup>-1</sup>]

Total NH<sub>3</sub> emissions [kg N km<sup>-2</sup>year<sup>-1</sup>]

Split of total NH<sub>3</sub> emissions for EU27 [Gg N year<sup>-1</sup>]

Total N<sub>2</sub>O emissions [kg N km<sup>-2</sup>year<sup>-1</sup>]

Split of total N<sub>2</sub>O emissions for EU27 [Gg N year<sup>-1</sup>]

N-input to aquatic systems [kg N km<sup>-2</sup>yr<sup>-1</sup>]

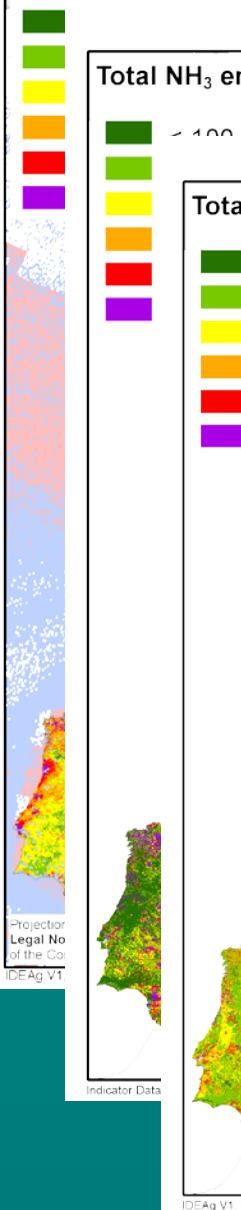
Split of N-input to aquatic systems for EU27 [Gg N year<sup>-1</sup>]

Projector  
Legal No  
of the Co  
IDEAg V1

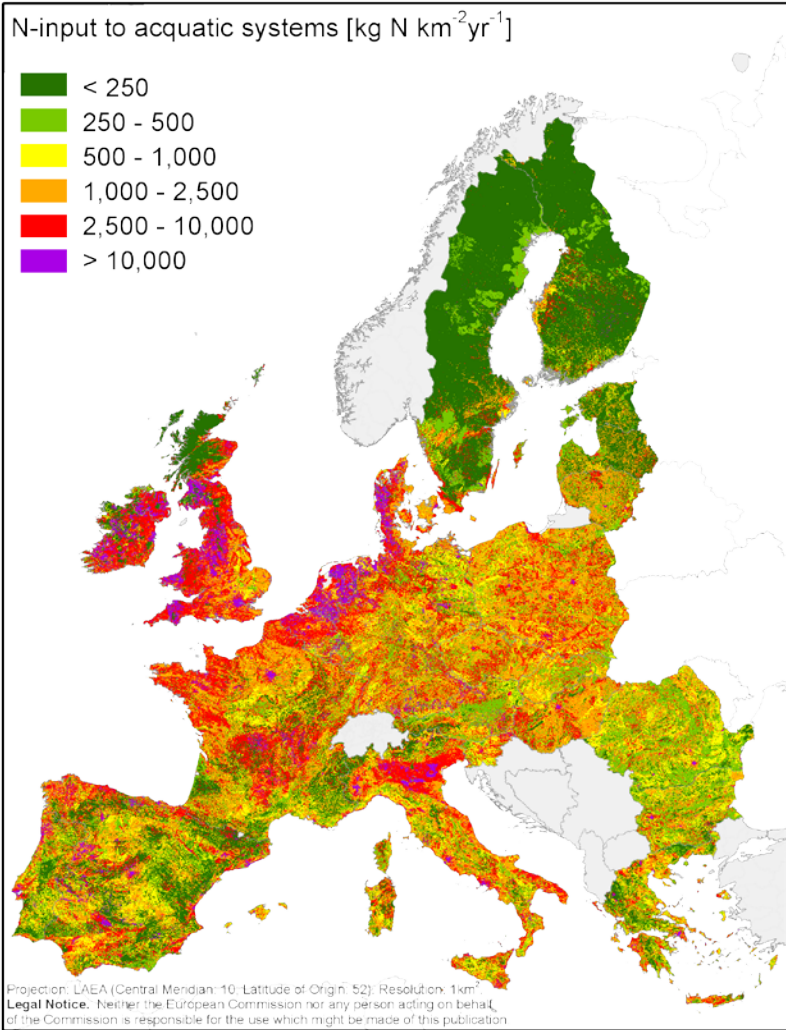
Indicator Data

IDEAg V1

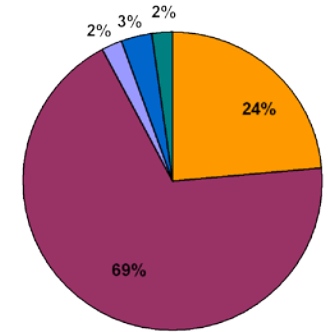
Projection: LAEA (Central Meridian: 10; Latitude of Origin: 52); Resolution: 1km  
**Legal Notice:** Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication  
 IDEAg V1 INTEGRATOR and EMEP MSAC-W model rv3\_3



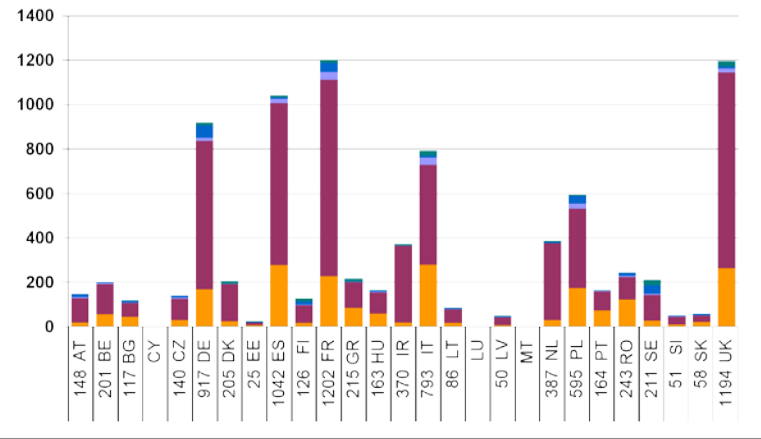
- < 250
- 250 - 500
- 500 - 1,000
- 1,000 - 2,500
- 2,500 - 10,000
- > 10,000



Direct sewage	2050
Diffuse agric. soils	5980
Diffuse agric. livestock	200
Diffuse - forests	290
N-deposition	190
<b>Total</b>	<b>8710</b>



Split of N-input to aquatic systems by country [Gg N year<sup>-1</sup>]



# The five key threats of excess Nitrogen

The WAGES of  
too much nitrogen

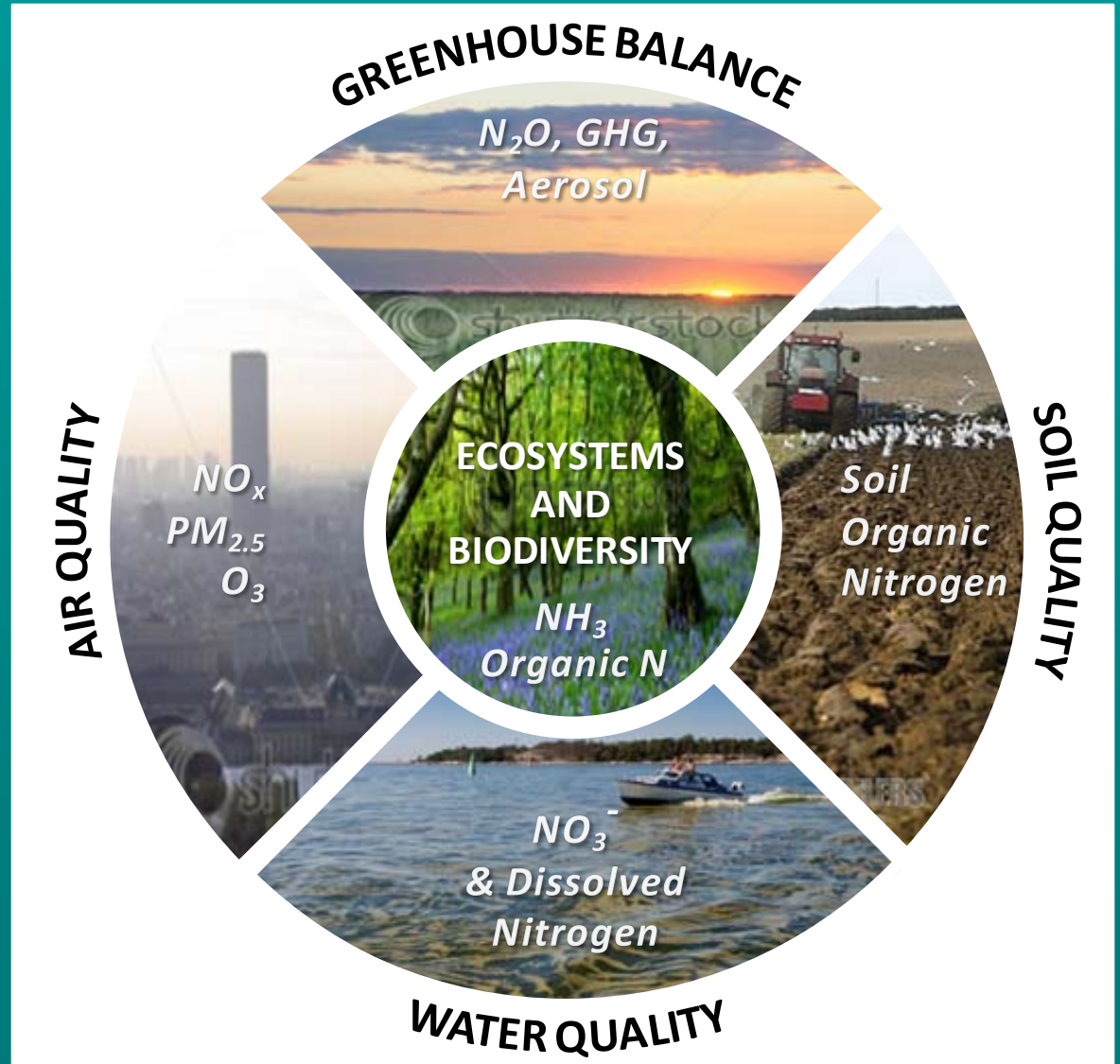
Water quality

Air quality

Greenhouse balance

Ecosystems

Soil quality







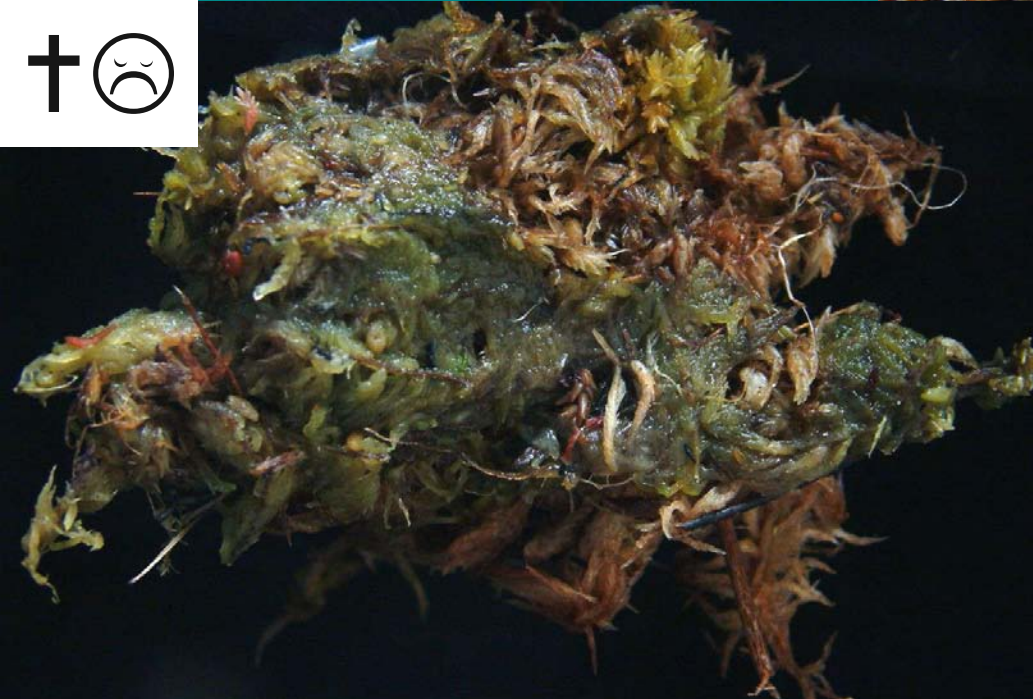
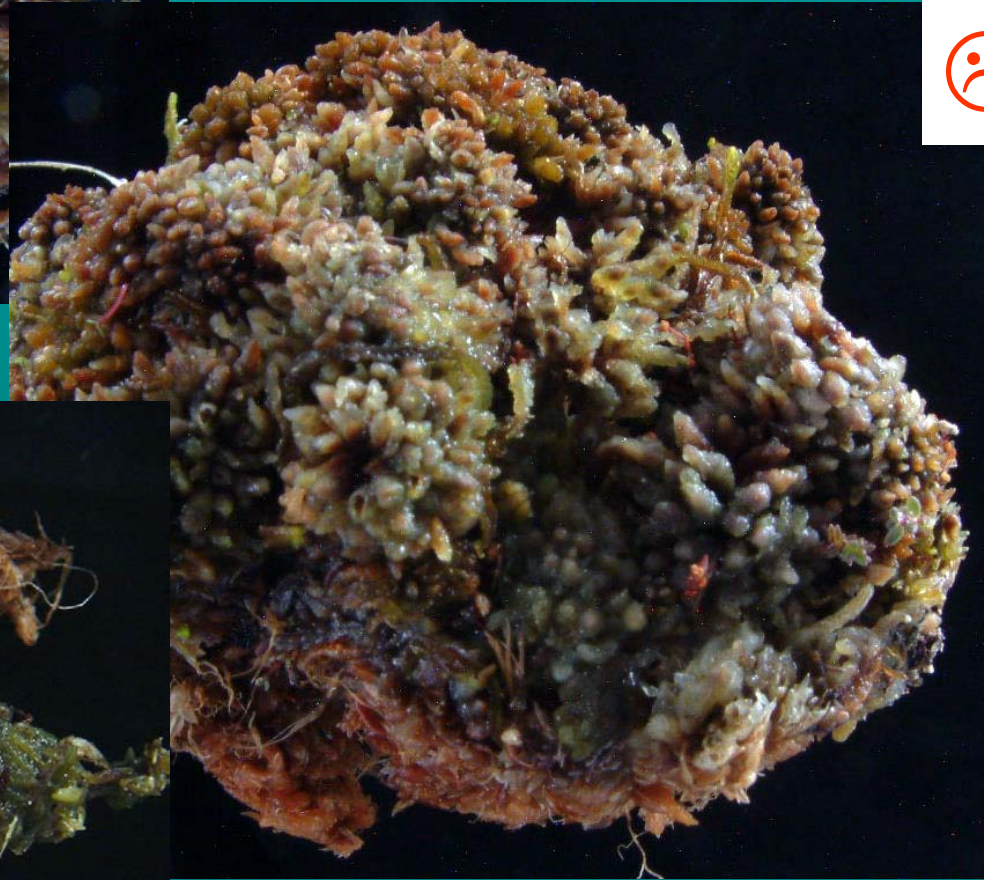
**Detrimental effect of N deposition on  
Natura 2000 sites**

**Moninea Bog**

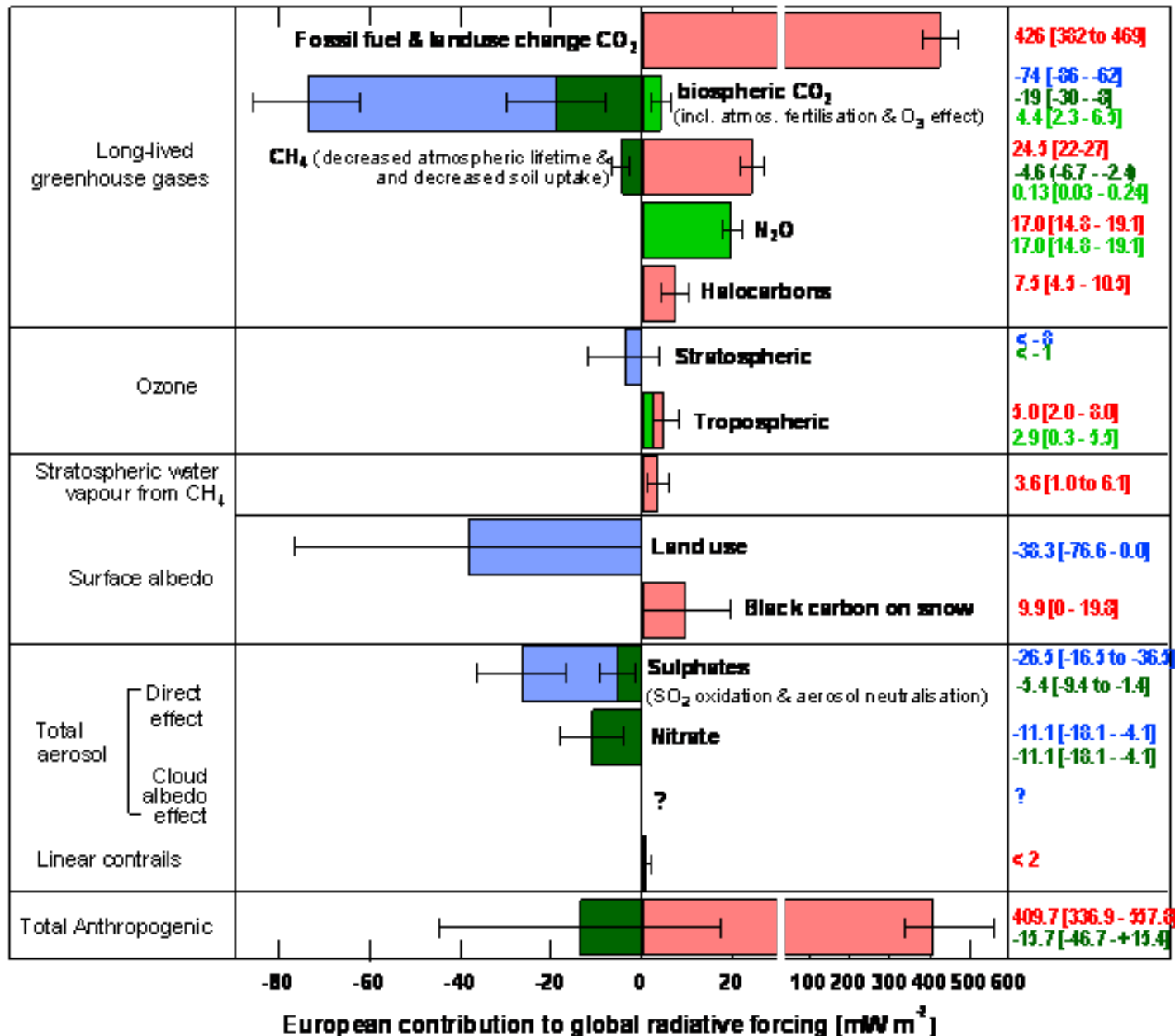




Effect of Ammonia deposition  
on peatland  
*Sphagnum imbricatum*



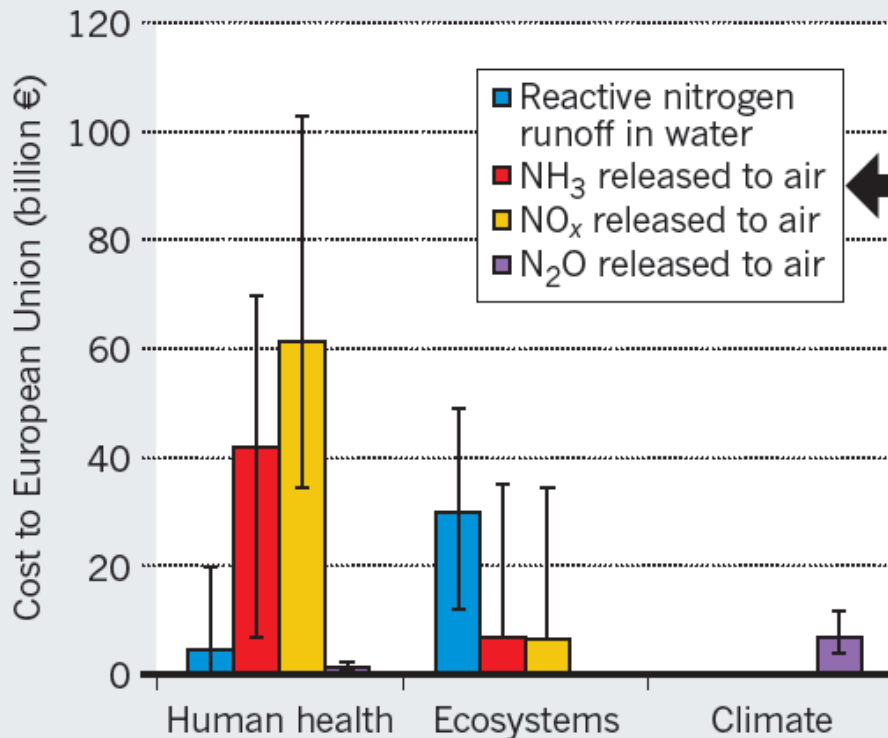
# Nitrogen & European Radiative Forcing



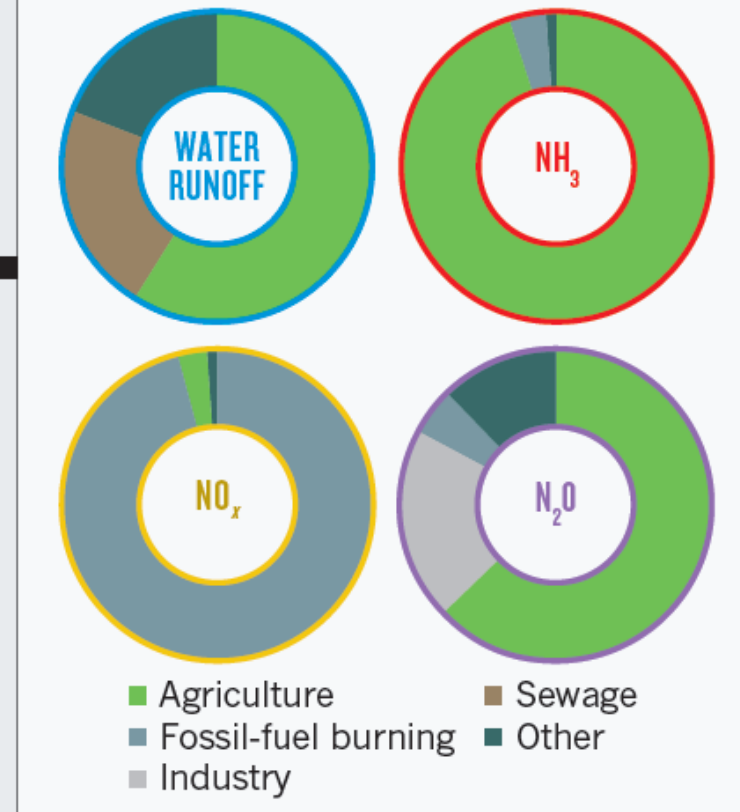
# Nitrogen Damage Costs & Sources

## DAMAGE COSTS OF NITROGEN POLLUTION

Agriculture and fossil-fuel burning load the environment with reactive nitrogen, affecting water, soils and air.



## MAIN NITROGEN SOURCES

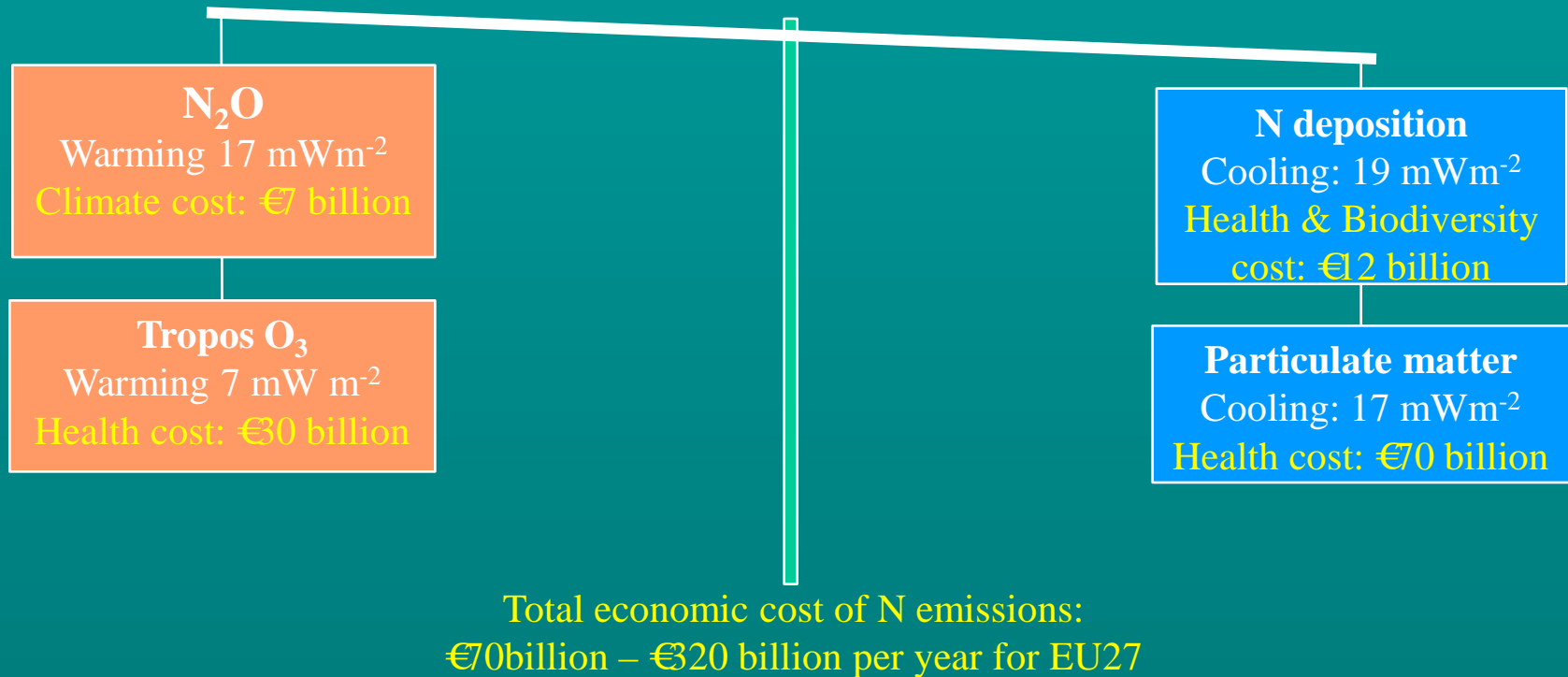


EU Damage cost: 70 - 320 billion €/ year



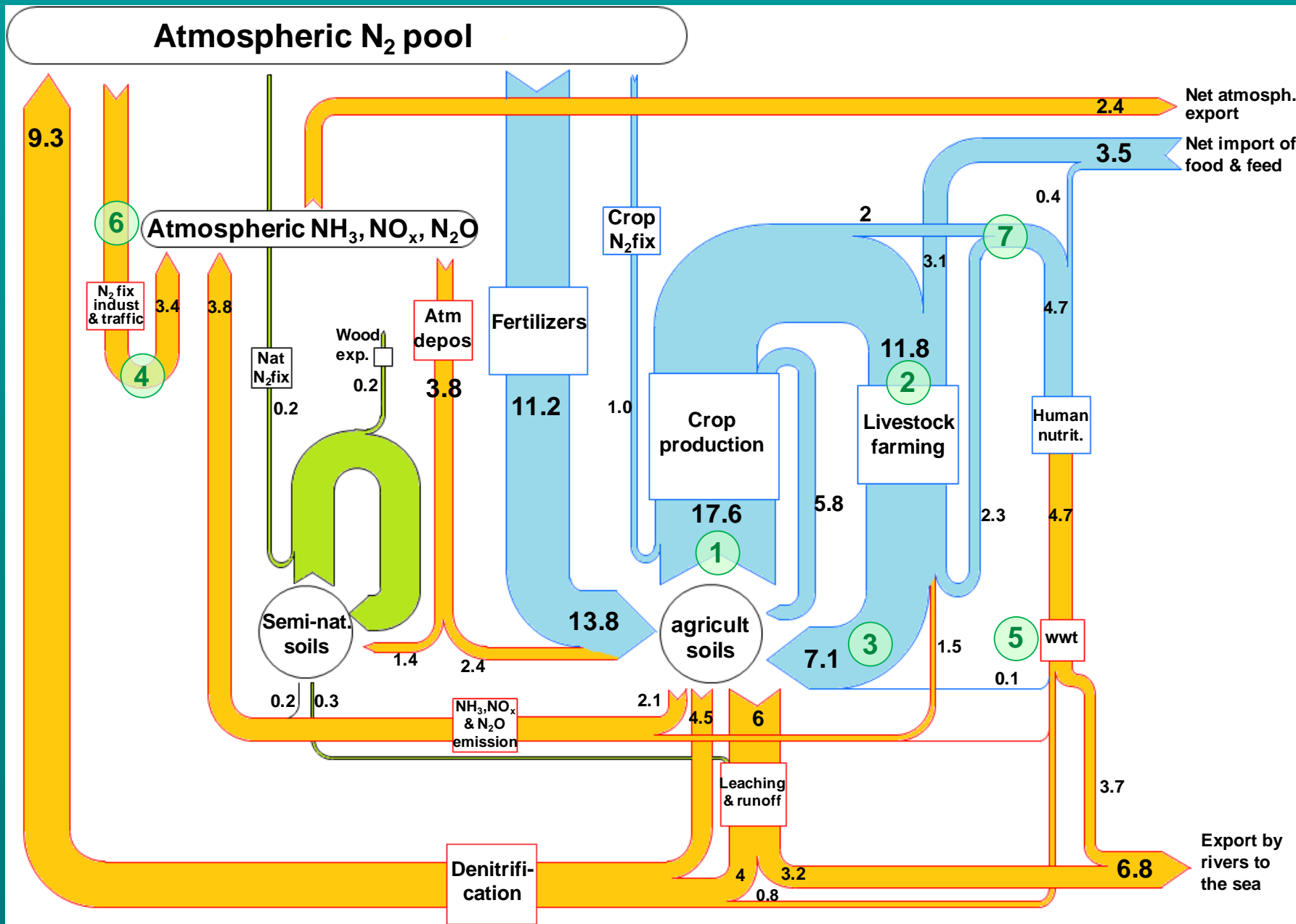
# Weighing up Nitrogen & Climate

Climate balance for EU27: -16 [-47 to +16] mW m<sup>-2</sup>



Nitrogen and climate effects roughly balance, but we cannot count on the cooling effects of particulate matter and nitrogen deposition, which have even larger societal costs for human health and ecosystems.

# Summary of N flows in Europe



# Seven key actions for better nitrogen management

## Agriculture

1. Improving nitrogen use efficiency in crop production
2. Improving nitrogen use efficiency in animal production
3. Increasing the fertilizer N equivalence value of animal manure

## Transport and Industry

4. Low-emission combustion and energy-efficient systems

## Waste water treatment

5. Recycling nitrogen (and phosphorus) from waste water systems

## Societal consumption patterns

6. Energy and transport saving
7. Lowering the human consumption of animal protein

# TFRN input to Gothenburg Protocol

- Placing agricultural  $\text{NH}_3$  in context of the wider N cycle
- Updating 'NH<sub>3</sub> Guidance Document' & abatement costs (many options now <1-2 euro/kg N abated)
- Focus on improving NUE with co-benefits for reducing N<sub>2</sub>O and NO<sub>3</sub> leaching, while reducing fertilizer bills
- **Options for revision of Annex IX, inc priority order for measures:** (1=highest priority)
  1. Low emission techniques for **land spreading** of cattle/pig/poultry manures and mineral fertilizers
  2. **Animal feeding** strategies, inc phase feeding
  3. Covers on new **slurry stores**
  4. Farm **N balance** on demonstration farms
  5. Low emission new pig & poultry **housing**



# Policy options emerging from Nitrogen & Natura 2000 Workshop



## Key Messages

- Habitats Directive is not protecting Natura sites; Most effects from  $\text{NH}_3$ , while agric “plans & projects” are often not assessed

## Policy options

- Gothenburg & NECD: national ceilings & mandatory measures (Annex IX, *plus* translating Annex IX into EU+MS legislation)
- High-level target: “A long-term goal to ensure that 95% of Natura 2000 designated sites do not exceed critical loads or levels for reactive nitrogen compounds by 2030”
- $\text{NH}_3$  limit value (1-3...  $\mu\text{g m}^{-3}$ ) + AQ management for *Natura* sites
- SEA testing of animal-welfare legislation (raising  $\text{NH}_3$  emissions)
- CAP: Cross-compliance with Habitats Directive, plus  $\text{NH}_3$  measures in RDPs.