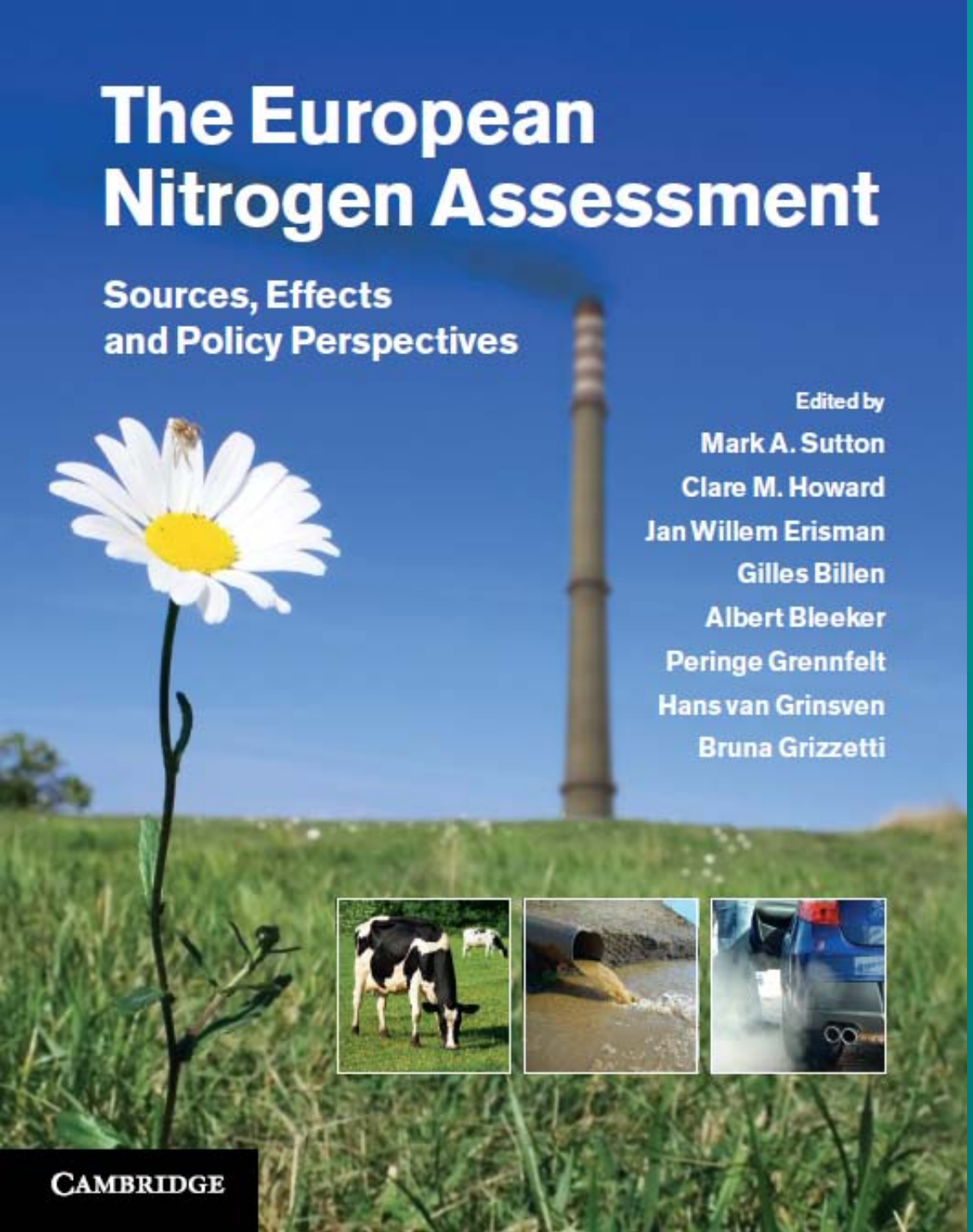
European Nitrogen Assessment

Mark Sutton
Centre for Ecology & Hydrology, Edinburgh

Stakeholder Expert Group,
EU Air Policy, 7 June 2011



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

Nitrogen in the News

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

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

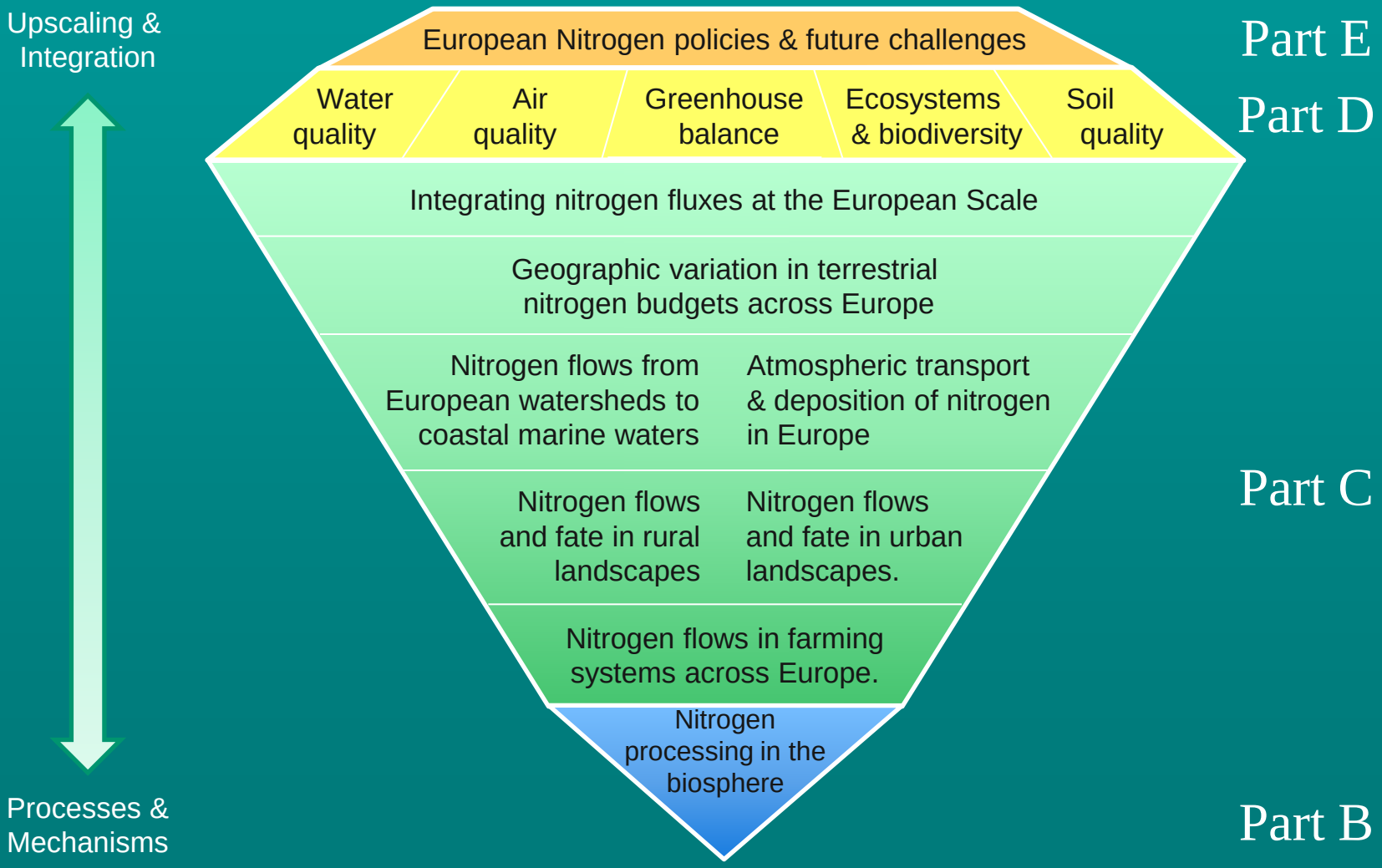
International Nitrogen Initiative

UNECE Task Force on Reactive Nitrogen

Linking UN Conventions

Global Partnership on Nutrient Management

Scaling up of issues through the European Nitrogen Assessment



Total NO_x emissions [kg N $km^{-2}yr^{-1}$]

Split of total NO_x emissions for EU27 [Gg N $year^{-1}$]

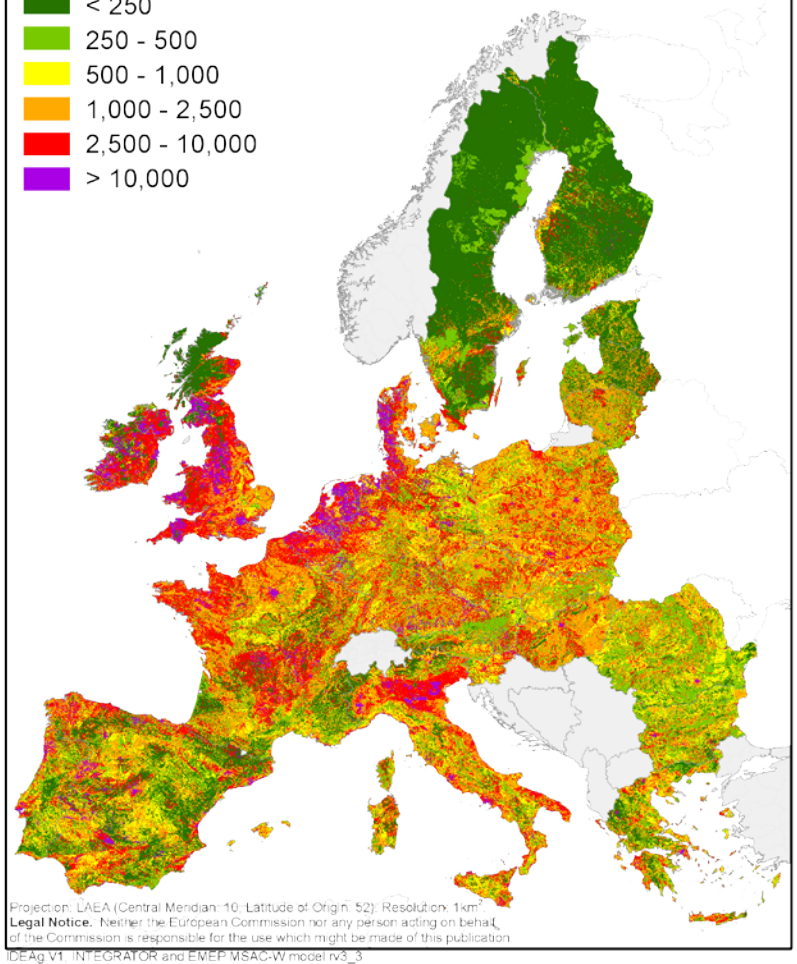
Total NH_3 emissions [kg N $km^{-2}year^{-1}$]

Split of total NH_3 emissions for EU27 [Gg N $year^{-1}$]

Total N_2O emissions [kg N $km^{-2}year^{-1}$]

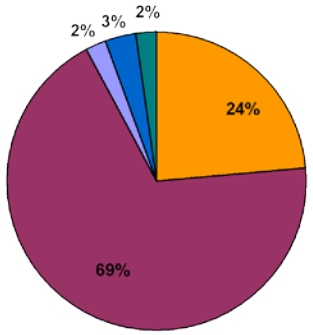
Split of total N_2O emissions for EU27 [Gg N $year^{-1}$]

N-input to acquatic systems [kg N $km^{-2}yr^{-1}$]

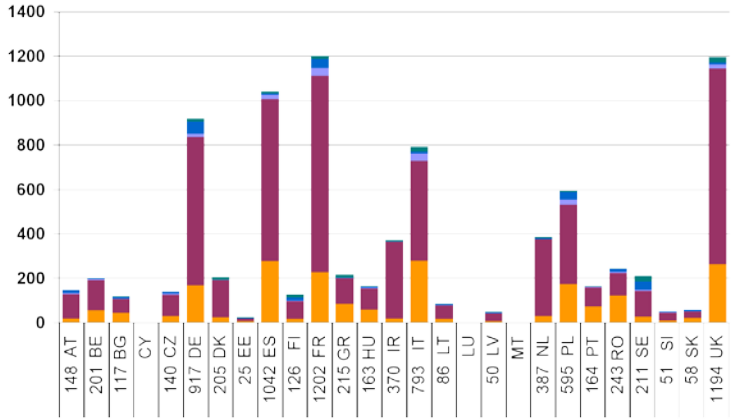


Split of N-input to acquatic systems for EU27 [Gg N $year^{-1}$]

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



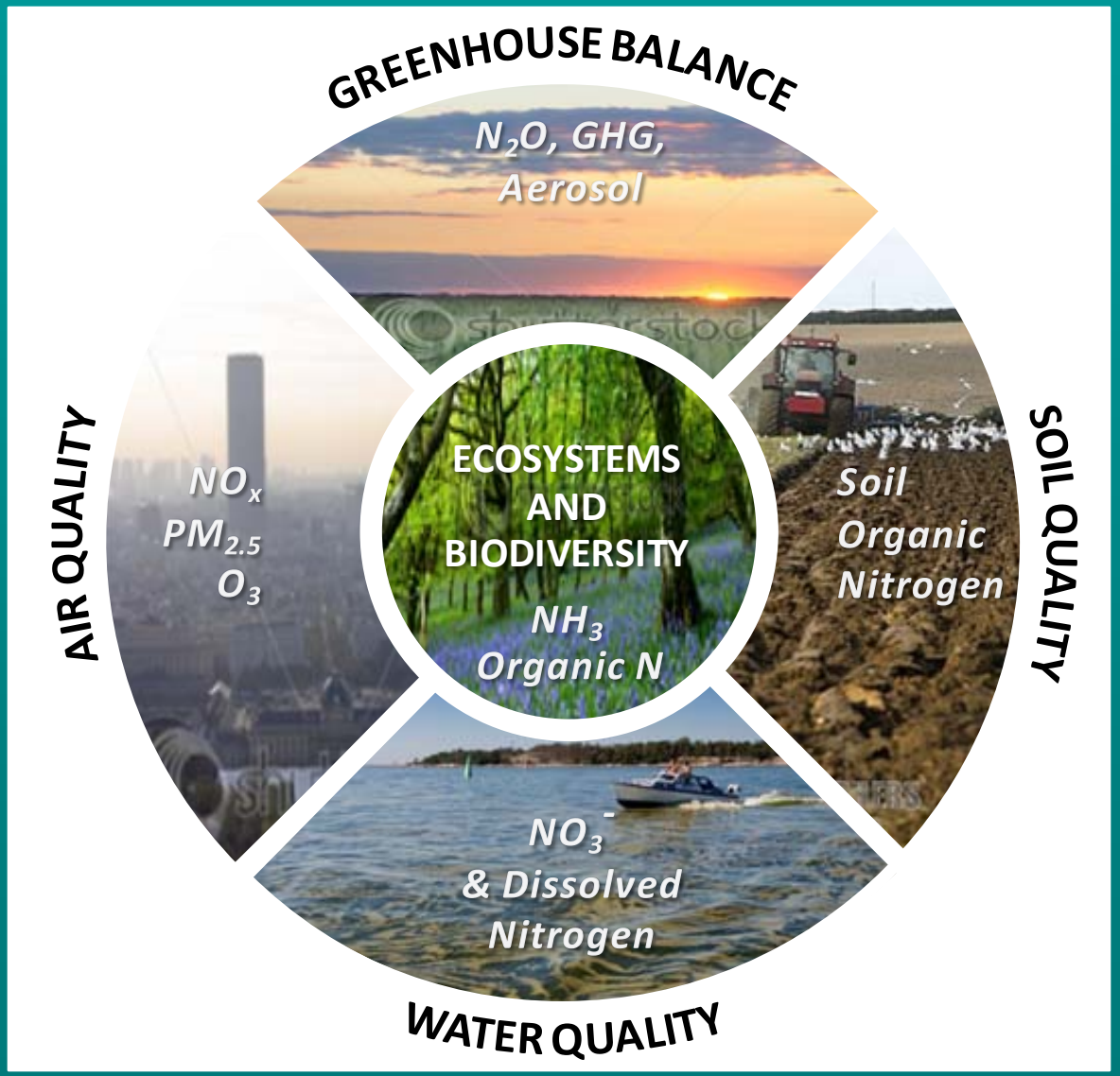
Split of N-input to acquatic systems by country [Gg N $year^{-1}$]



The five key threats of excess Nitrogen

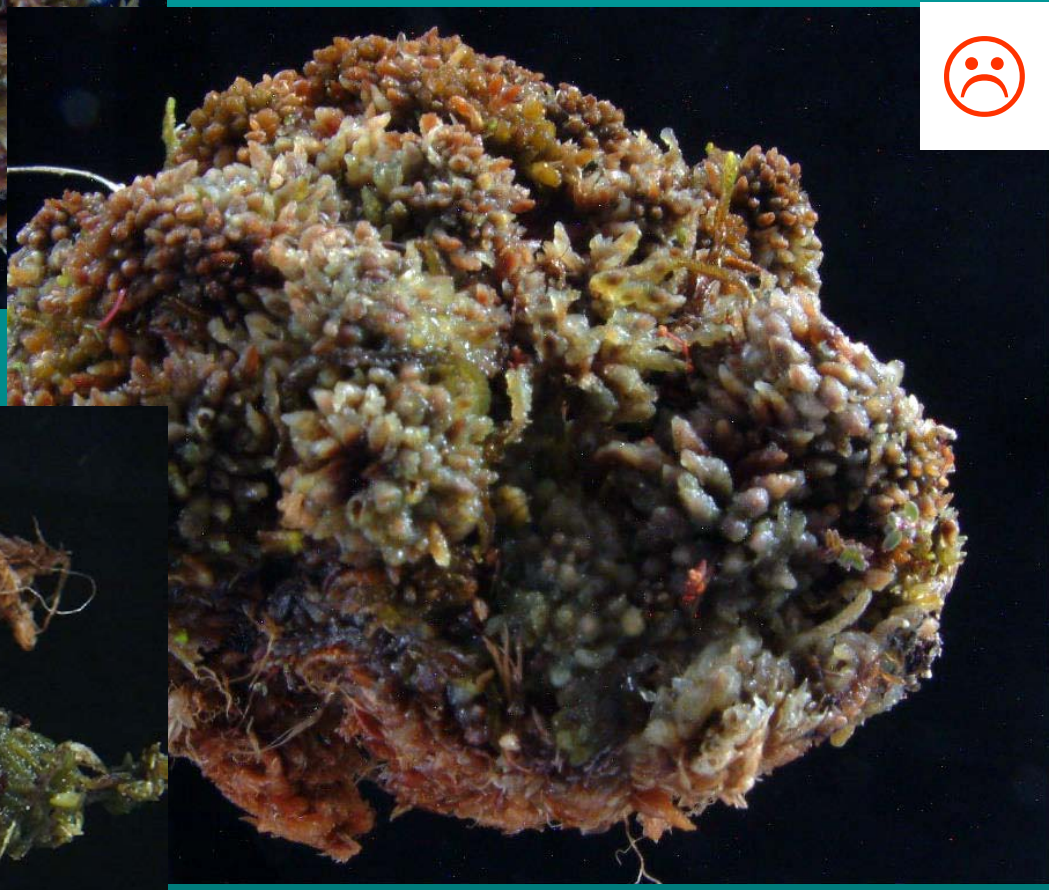
The WAGES of too much nitrogen

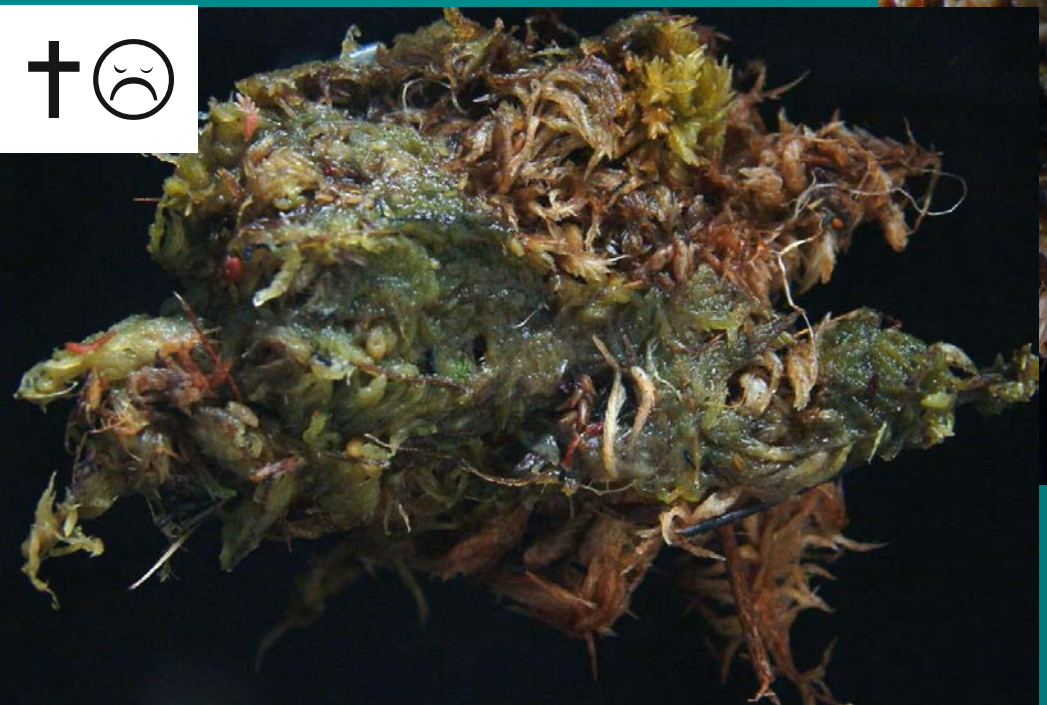
Water quality
Air quality
Greenhouse balance
Ecosystems
Soil quality




Detrimental effect of N deposition on Natura 2000 sites
Moninea Bog

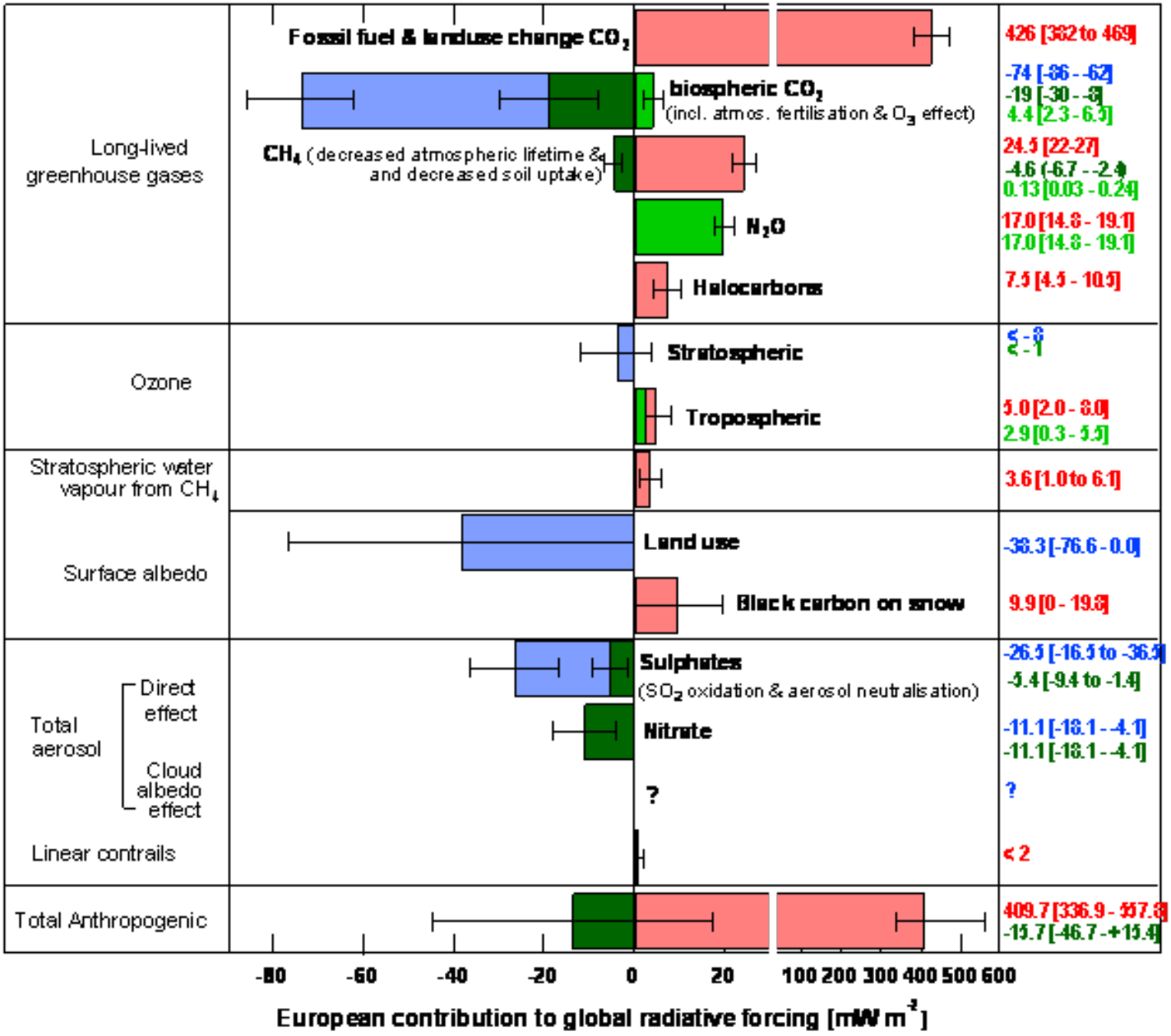
Effect of Ammonia deposition on peatland *Sphagnum imbricatum*





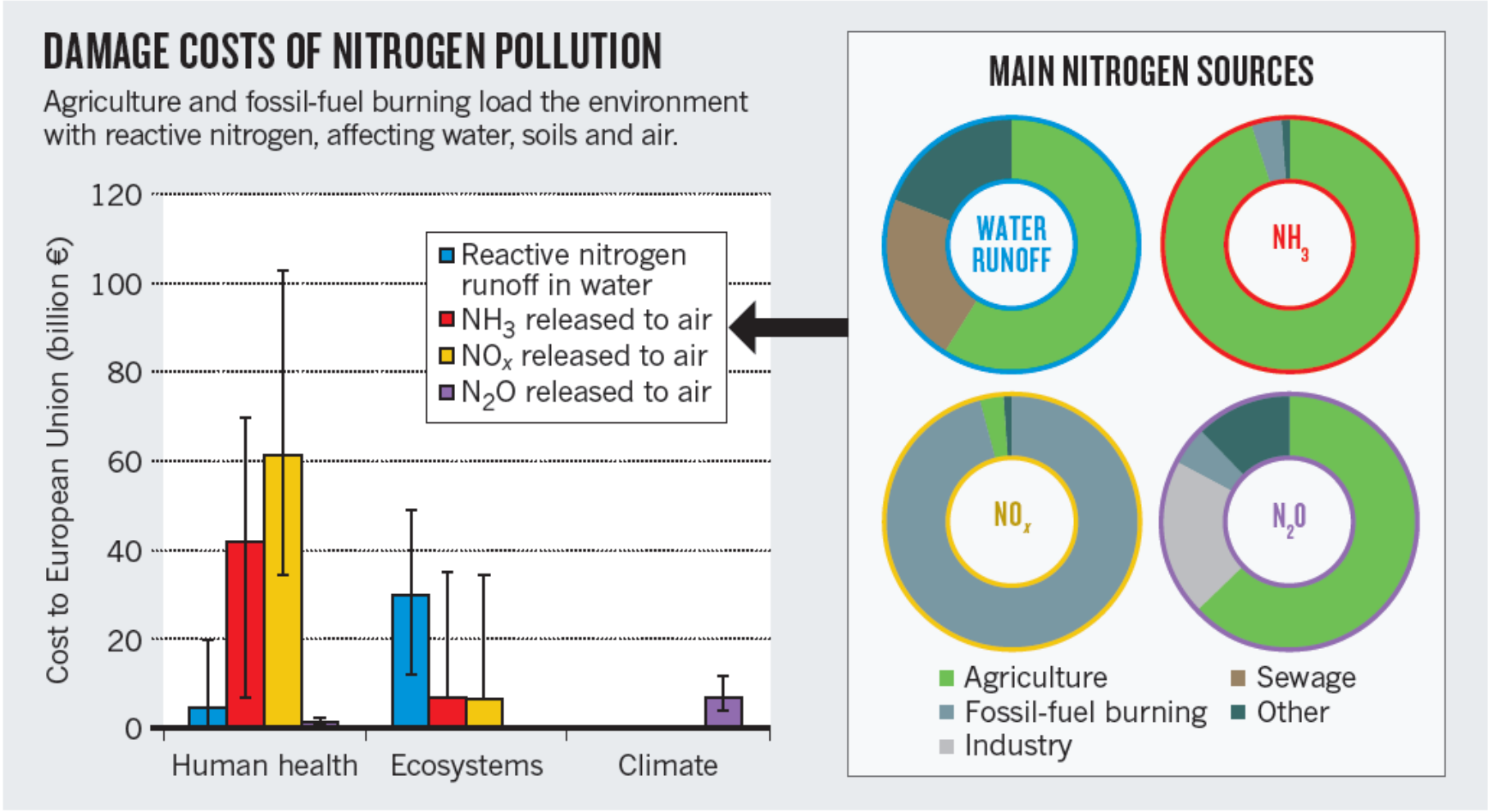
Nitrogen & European Radiative Forcing

NitroEurope IP



ENA, 2011

Nitrogen Damage Costs & Sources

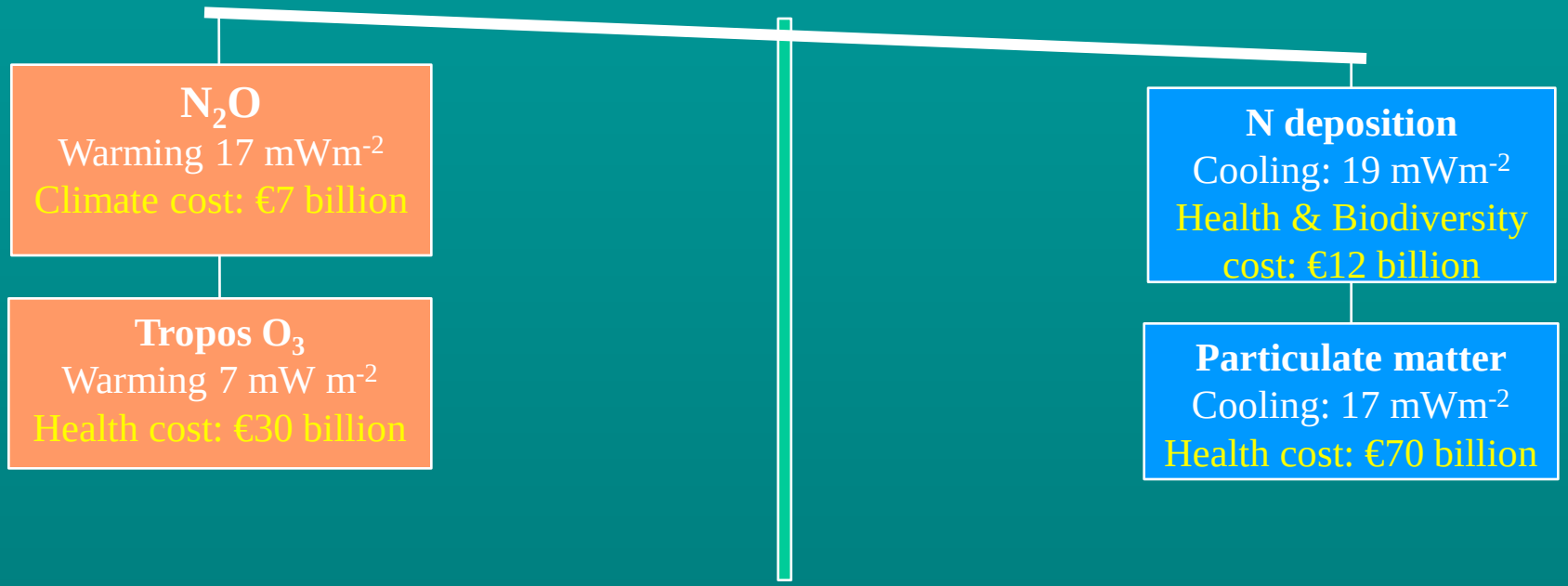


EU Damage cost: 70 - 320 billion € / year

Nature 14 April 2011

Weighing up Nitrogen & Climate

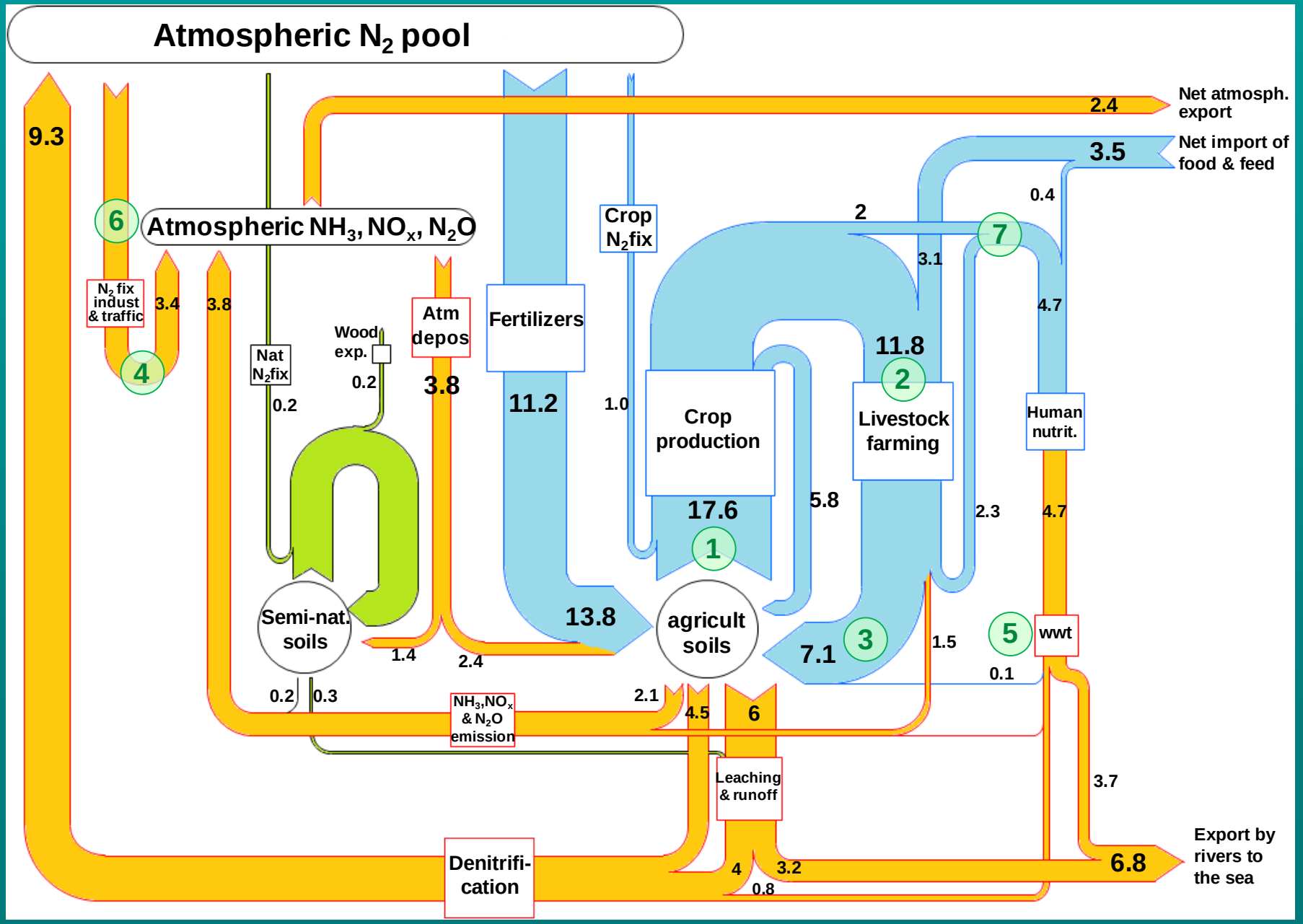
Climate balance for EU27: -16 [-47 to +16] mW m^{-2}



Total economic cost of N emissions:
€70billion – €320 billion per year for EU27

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 NH_3 in context of the wider N cycle
- Updating 'NH_3 Guidance Document' & abatement costs (many options now <1-2 euro/kg N abated)
- Focus on improving NUE with co-benefits for reducing N_2O and NO_3 leaching, while reducing fertilizer bills
- **Options for revison 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

cost 729

Key Messages

- Habitats Directive is not protecting Natura sites; Most effects from 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*"
- NH_3 limit value (1-3... μg m^{-3}) + AQ management for *Natura* sites
- SEA testing of animal-welfare legislation (raising NH_3 emissions)
- CAP: Cross-compliance with Habitats Directive, plus NH_3 measures in RDPs.