

# Developing an integrated approach for Reactive Nitrogen

## Work of the Task Force on Reactive Nitrogen

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(co-chairs TFRN, with support from UK & NL Govnts)

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19 September 2012



## General objectives of TFRN:

To provide technical information to

- *support the WGSR and the wider CLRTAP* with evidence, options & tools
- *develop an integrated vision* and approach to abatement of  $N_r$  emissions and effects
- *search for synergies* between policies on  $N_r$  air pollution and other policies

## Examples of TFRN inputs to WGSR

1. Task Force reports, inc. recent N in EECCA countries
2. Options for Gothenburg Protocol Annex IX on  $\text{NH}_3$
3. Guidance Document for preventing  $\text{NH}_3$  emissions
4. Framework Code of Good Agric Practice to reduce  $\text{NH}_3$  emissions (now starting)
5. Options for treating N budgets in GP revision and associated Guidance Document.
6. European Nitrogen Assessment; Summary for Policy Makers to EB; Costs-benefits; N & climate etc
7. Information on N pollution and our food choices

# The European Nitrogen Assessment

Sources, Effects  
and Policy Perspectives

Edited by

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## 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

- International TV & Press Coverage
- ENA summary in *Nature*
- ENA 4-minute video on “*Youtube*”



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

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>]

Substantial input from both EMEP and WGE Communities

2050

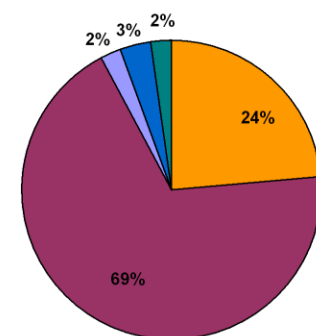
5980

200

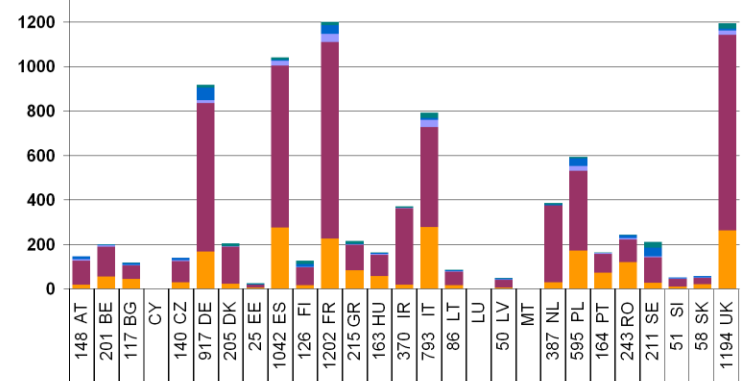
290

190

8710



systems by country [Gg N year<sup>-1</sup>]



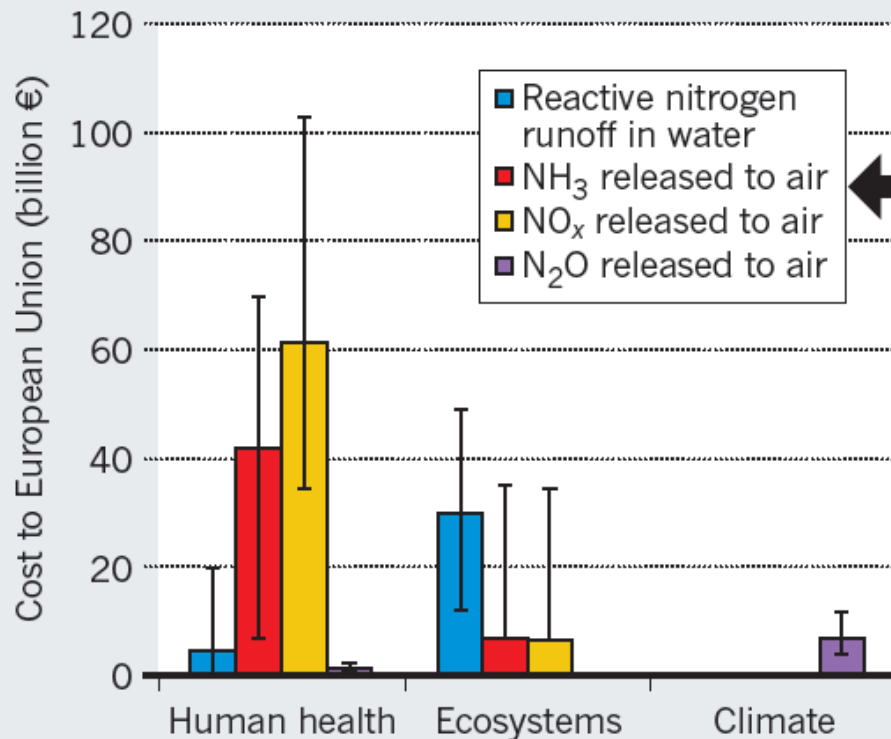




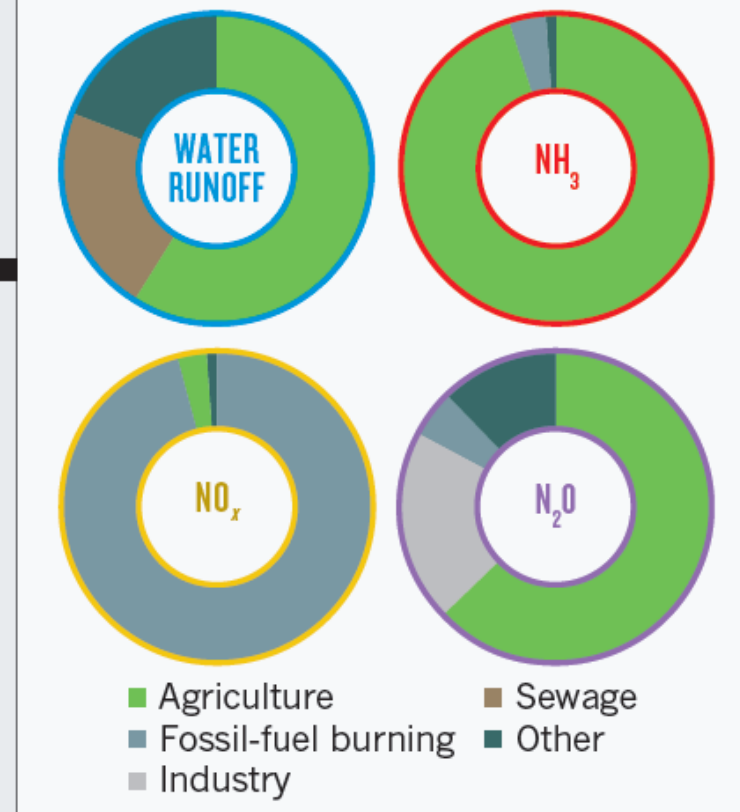
# Nitrogen Damage Costs & Sources

## DAMAGE COSTS OF NITROGEN POLLUTION

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



## MAIN NITROGEN SOURCES

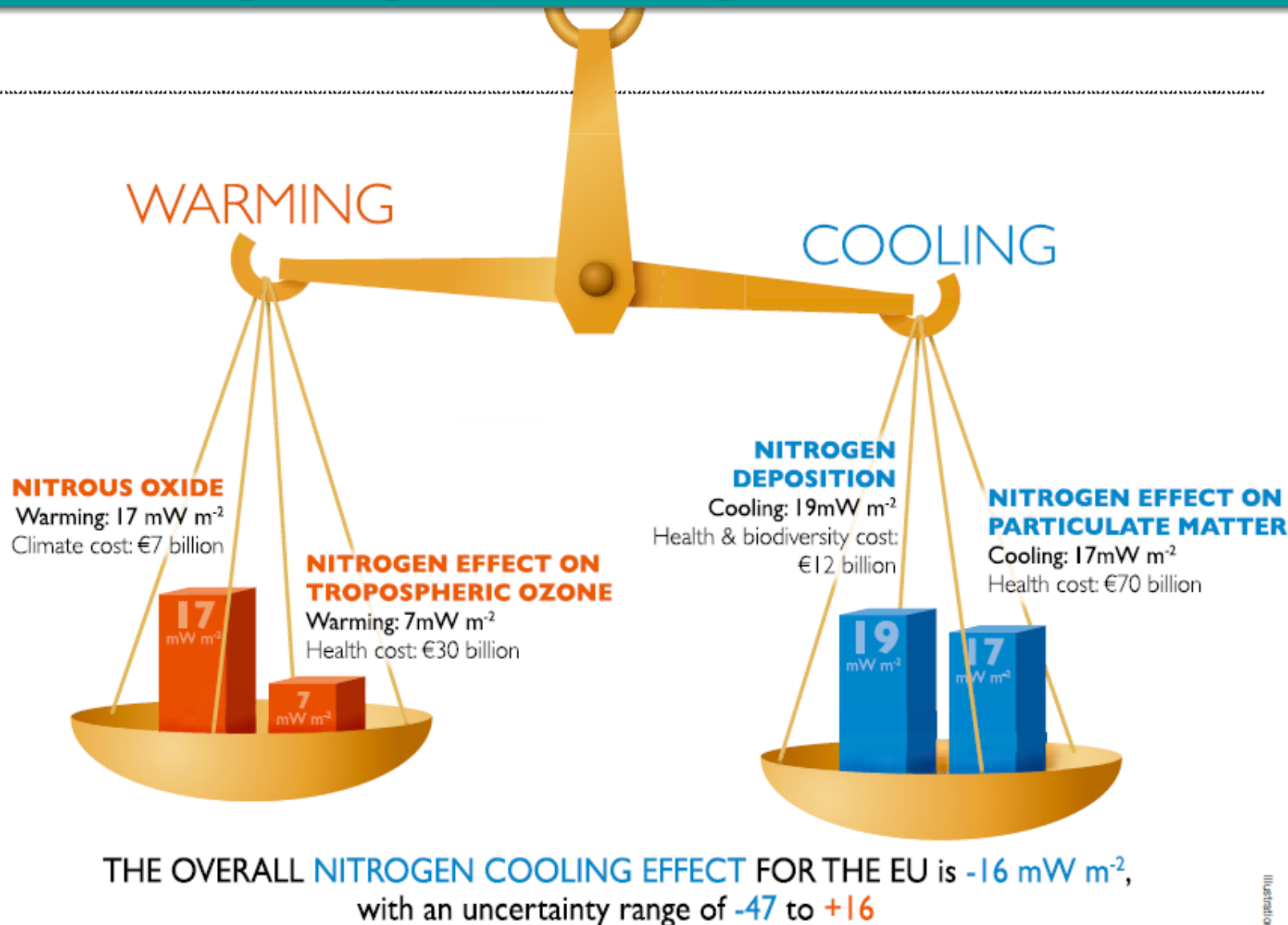


EU Damage cost: 70 - 320 billion € / year

Nature 14 April 2011



# Weighing up Nitrogen & Climate



Sutton and Howard (*Planet Earth*, Winter 2011) based on ENA, 2011

## Atmospheric N<sub>2</sub> pool



# 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

### **The Way Forward:**

More efficient N use saves farmers money  
reducing nitrogen air pollution,  
while being needed to meet Parties'  
commitments for climate and water pollution



# TFRN inputs for Gothenburg Revision



## Proposals for Updated and **New** measures in Annex IX

- **Nitrogen management, considering the whole N cycle**
- **Livestock feeding strategies**
- Animal housing, **including cattle housing**
- Manure storage, **including those for cattle manure**
- Manure spreading
- Mineral fertilizer use, including urea and **other fertilizers**

Ambition levels (A, B, C) vary in targets, thresholds and implementation dates

➤ **Targets**

- Emissions reduction targets (% decrease from reference)

➤ **Thresholds**

- Farm size, size of tankers for manure spreading

➤ **Implementation dates**

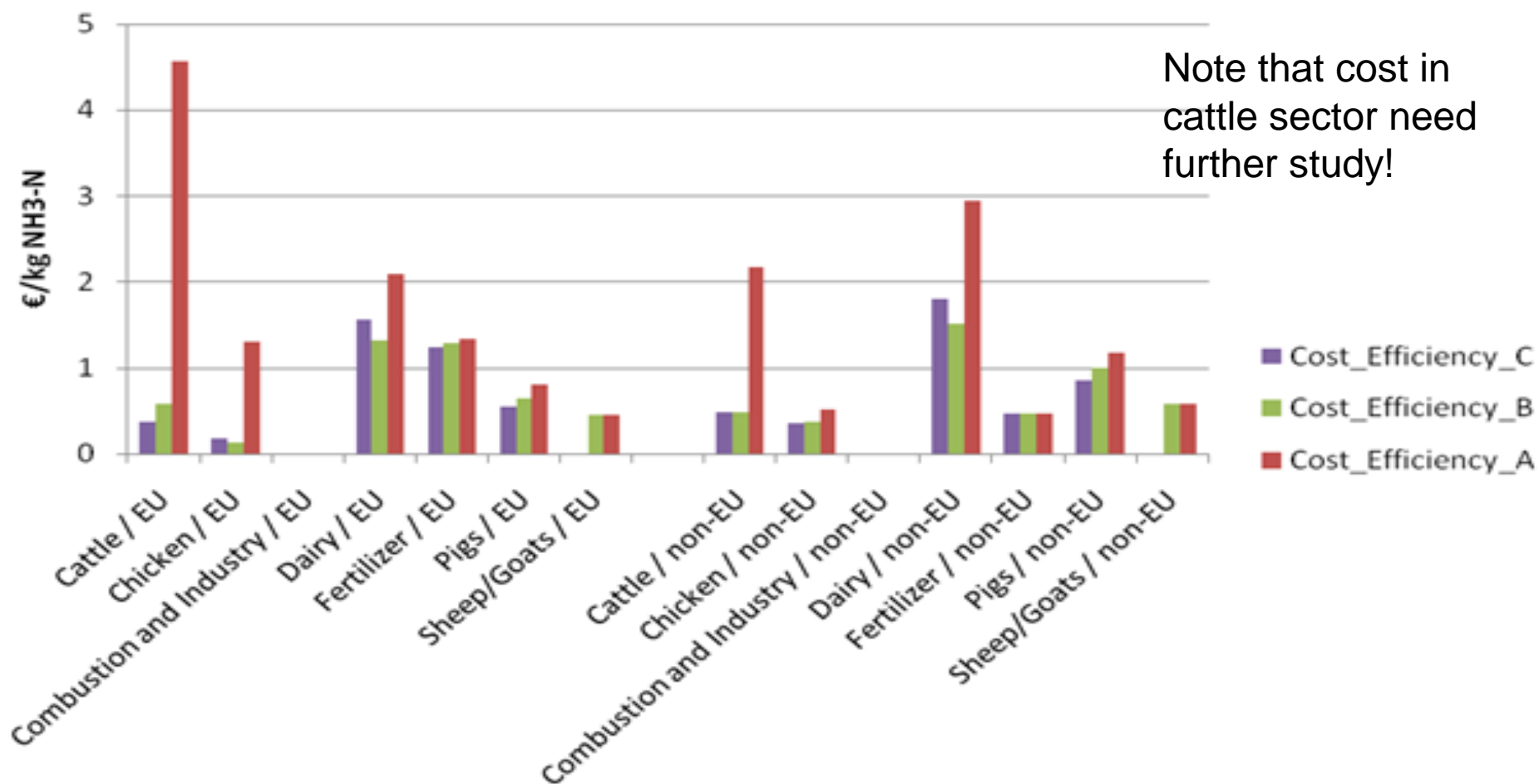
- Delayed implementation for countries in transition



# Overview of costs of ammonia abatement measures

Measures	Cost, €/kg NH <sub>3</sub> -N saved
Slurry application	-0.5 to 3.0
Nitrogen management	-1.0 to 1.0
Feeding strategies	-0.5 to 1.0
Urea application	-0.1 to 4.0
Covering slurry storages	0.1 to 4.0
Animal housing	0.0 to 10.0

# Costs per kg $\text{NH}_3\text{-N}$ of options A, B and C per sector Results of cooperation with CIAM



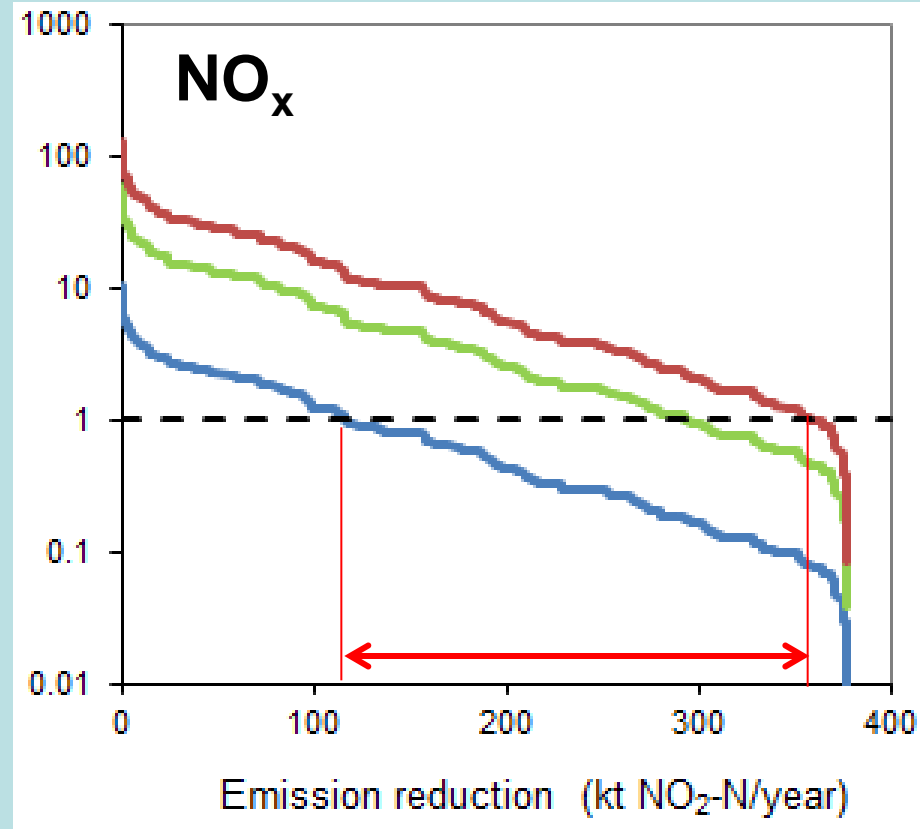
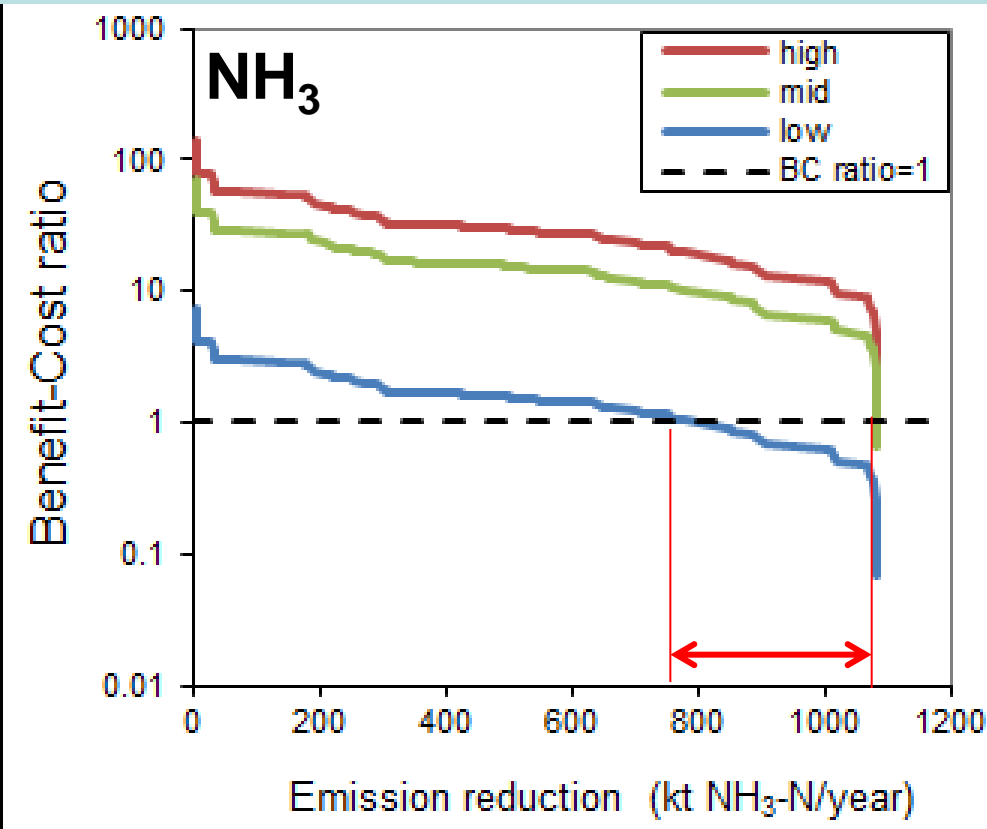
# 5 top priorities for commitments in Annex IX

1. Low-emission land application of manure & fertilizer
2. Animal feeding strategies
3. Low-emission *new* manure stores
4. Nitrogen balances on *demonstration farms*,
5. Low-emission *new* pig & poultry housing.



# Gothenburg Challenges

## - going beyond 2020



**New EU commitments  
GP for 2010 to 2020:**

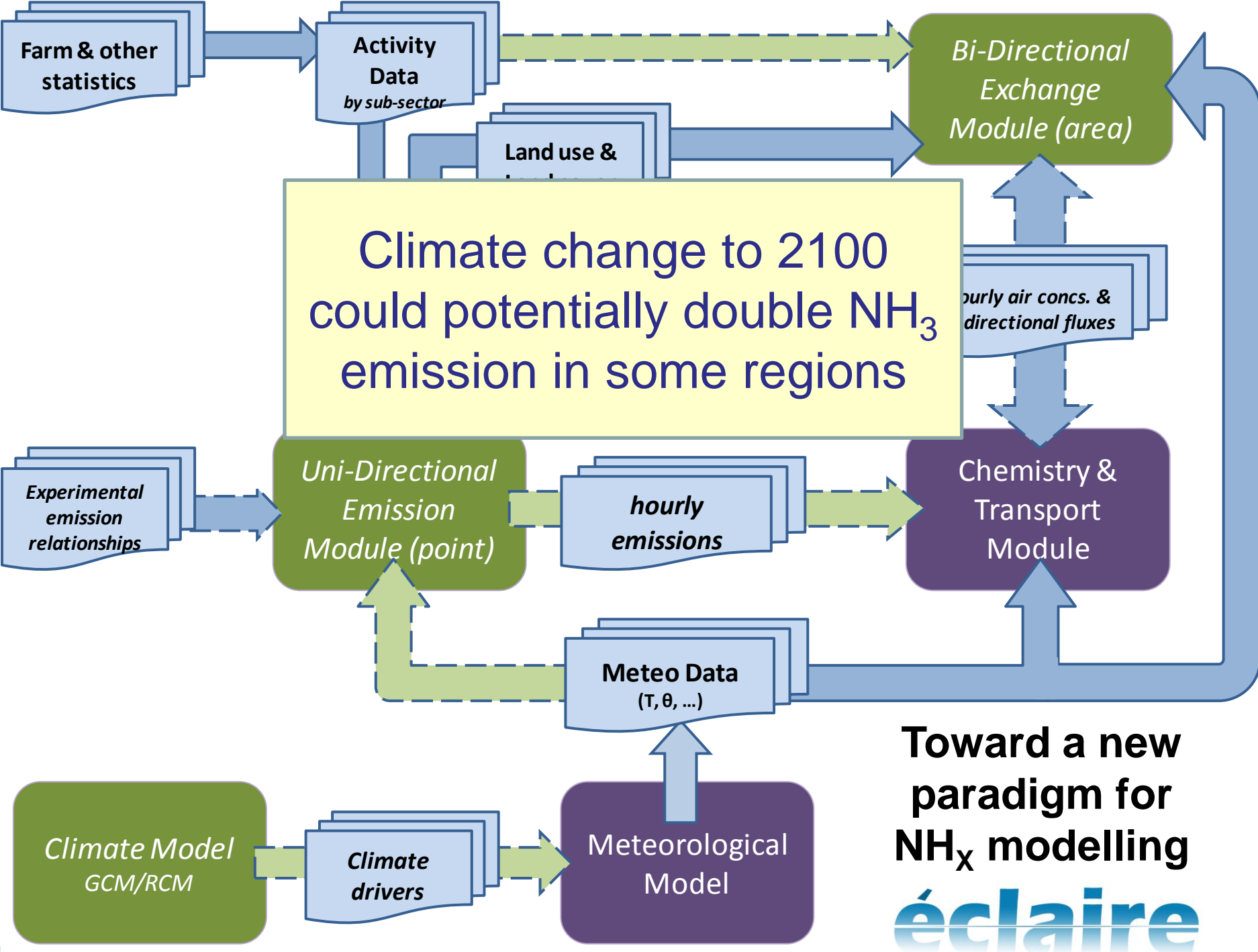
**NO<sub>x</sub>: 29% reduction  
NH<sub>3</sub>: 2% reduction**

# éclairaire

Effects of climate change on air pollution impacts  
and response strategies for European ecosystems



- How will climate change alter the threat of air pollution on ecosystems?
  - Emissions, transport, deposition
  - Ecosystem vulnerability
- Measurements, models, innovative risk assessment and the economic implications
- Focus on N and O<sub>3</sub> and their interaction with other pollutants.





# Nitrogen and Biodiversity

- *Brussels Workshop: “Nitrogen deposition and Natura 2000:”*  
Linking scientists, practitioners and policy makers
- **Key Findings**
  - 60% of Natura 2000 sites across EU exceed critical loads
  - Different effects by N form:  $\text{NH}_3 \gg \text{NH}_4 > \text{NO}_3$
  - Natura 2000 sites not protected from N by current legislation
- **Example Policy Options Explored**
  - 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”*
  - Establish a limit value for  $\text{NH}_3$  concentration (starting from the critical level, 1-3...  $\mu\text{g m}^{-3}$ ) over the area of *Natura* network, combined with local AQ management.

# Nitrogen: Food security or food luxury?

- Often said: “*We need N for food security*”
- European Nitrogen Assessment (2011)
  - 85% of N in EU harvests goes to feed livestock
  - The average European eats 70% more protein than needed for a healthy diet
  - Europe is a net *importer* of N in feed & food
- The reality is *Food Luxury*
  - Society wants “the security of food luxury”
  - The key challenge to optimize (reduce) meat consumption to improve our quality of life
  - Aspiration to quantify the links between environment and health benefits of altered diets

## Future tasks

- Ammonia and N budgets GDs approved by WGSR last week for adoption by EB.
- Ammonia, Annex IX are unfinished business for WGSR
  - Understanding the barriers to change
  - Showing the N<sub>r</sub> co-benefits: climate, water, green economy
  - From Critical Level to Air Quality Target Value for NH<sub>3</sub>
  - Easing the train out of the station...
- Working between TFRN & EMEP on an architecture for national N budget reporting
- Global N Assessment: key roles for CLRTAP, TFRN and Water Convention to work with UNEP, GEF, GPA etc.
- Societal engagement, N and the food supply chain (Workshop: Nov 2012, Edinburgh).