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Task Force on Reactive Nitrogen

European Nitrogen Assessment Annex IX & the Guidance Document & the Economic Costs

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(co-chairs TFRN)

WGSR-49, Geneva
13 -15 September 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

Nitrogen in the News

COMMENT

Nitrogen taint alert

ENVIRONMENT Worse than Deepwater would 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

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



Total NO_x emissions [kg N km⁻²yr⁻¹]

Split of total NO_x emissions for EU27 [Gg N year⁻¹]

Total NH₃ emissions [kg N km⁻²year⁻¹]

Split of total NH₃ emissions for EU27 [Gg N year⁻¹]

Total N₂O emissions [kg N km⁻²year⁻¹]

Split of total N₂O emissions for EU27 [Gg N year⁻¹]

N-input to aquatic systems [kg N km⁻²yr⁻¹]

Split of N-input to aquatic systems for EU27 [Gg N year⁻¹]

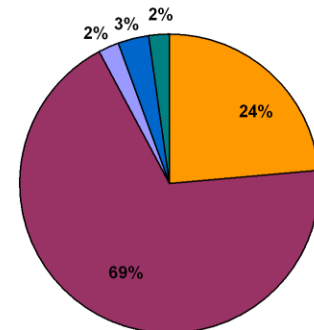
Projector
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IDEAg V1.

Indicator Data

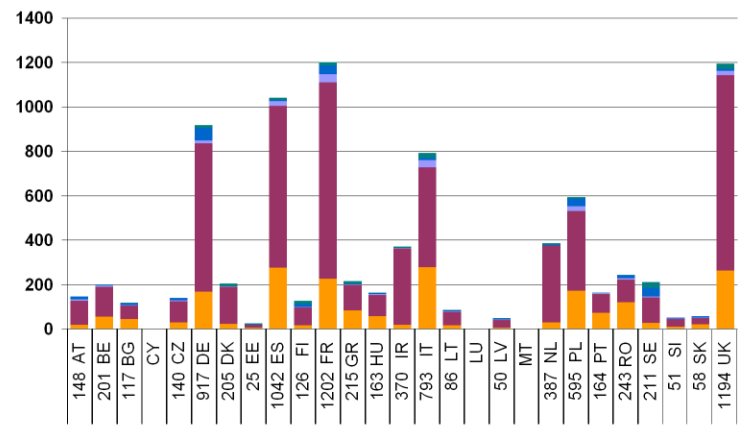
IDEAg V1.1

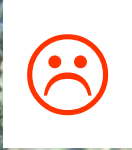
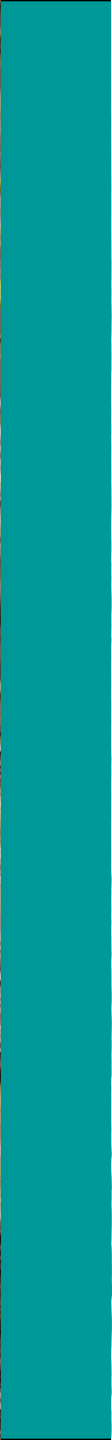
Projection: LAEA (Central Meridian: 10; Latitude of Origin: 52); Resolution: 1km.
Legal Notice: Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of this publication.
IDEAg V1.1, INTEGRATOR and EMEP MSAC-W model rv3_3

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



Split of N-input to aquatic systems by country [Gg N year⁻¹]

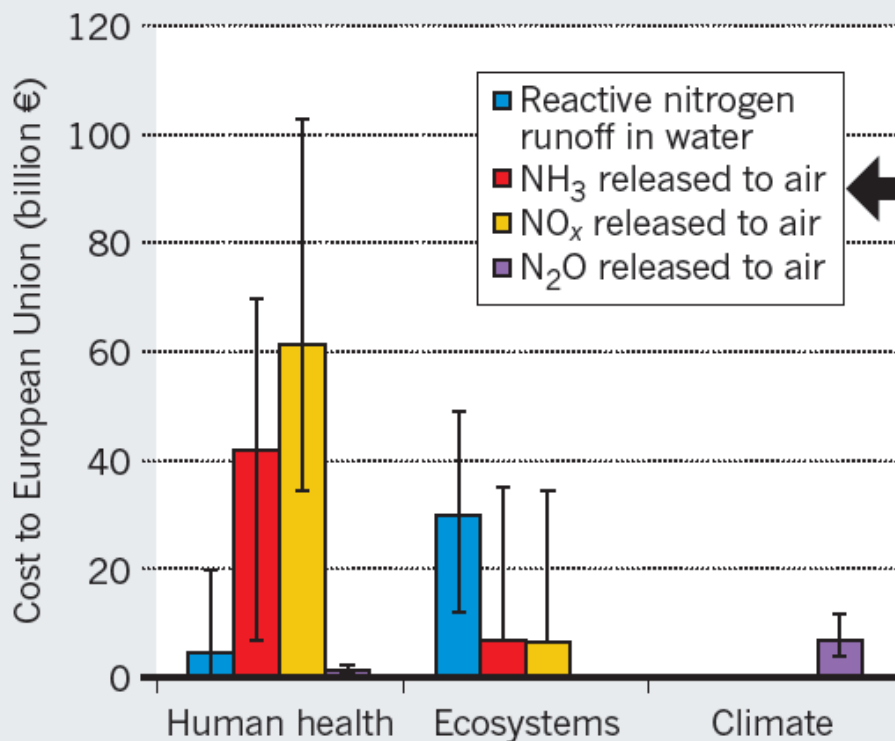




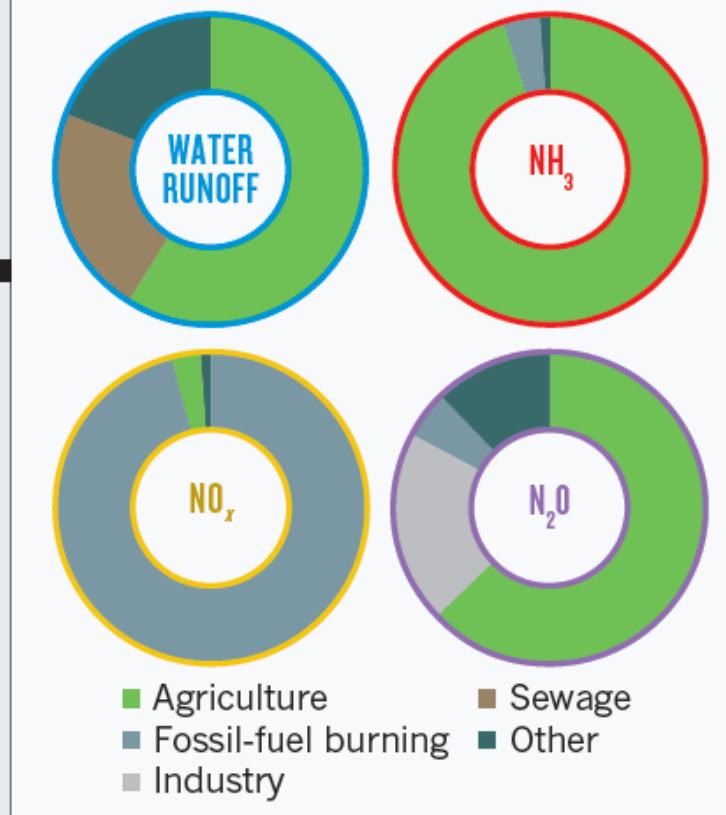
Nitrogen Damage Costs & Sources

DAMAGE COSTS OF NITROGEN POLLUTION

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



MAIN NITROGEN SOURCES

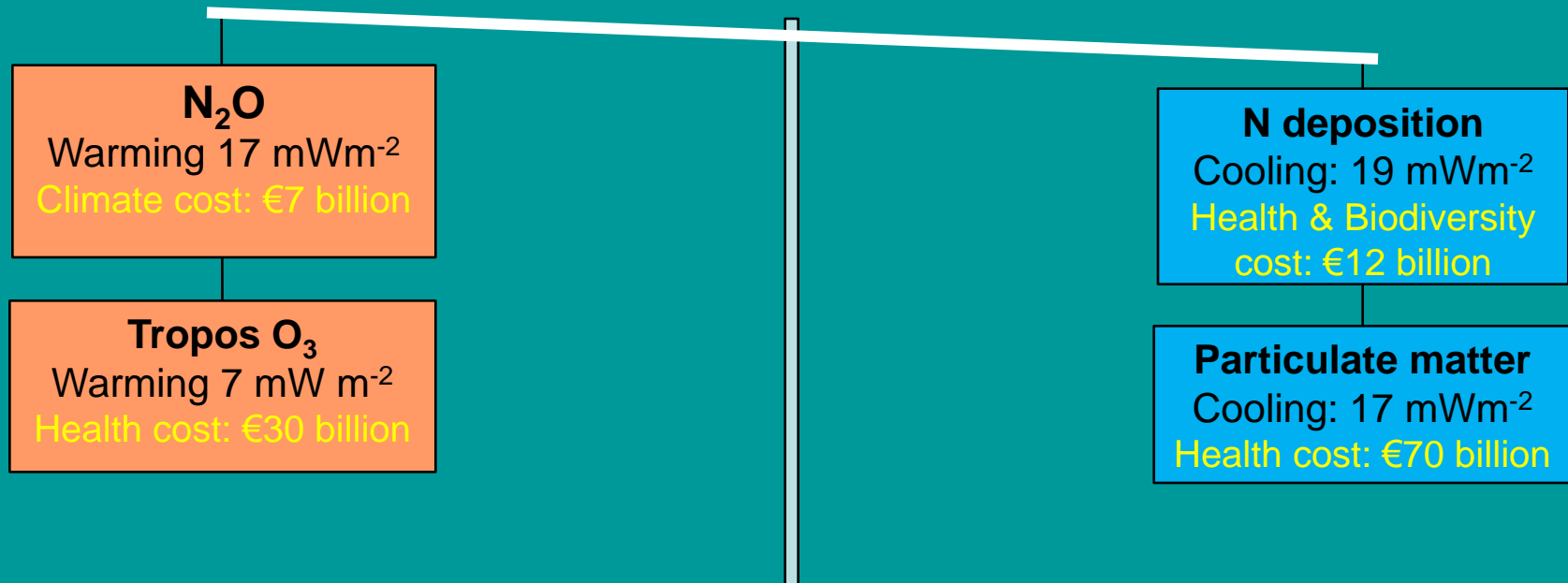


EU Damage cost: 70 - 320 billion € / year

Nature 14 April 2011

Weighing up Nitrogen & Climate

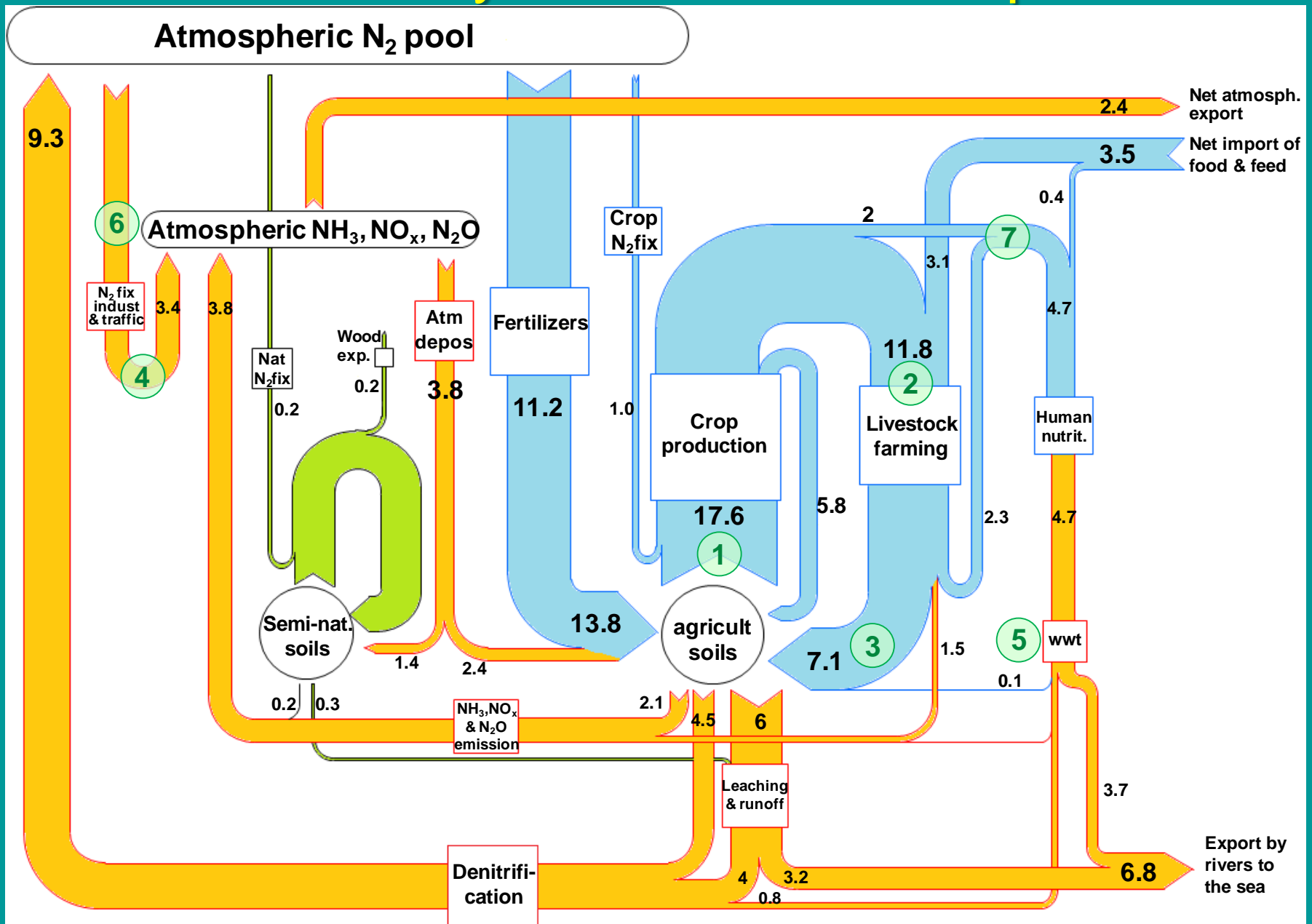
Climate balance for EU27: -16 [-47 to +16] mW m⁻²



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

Seven key actions for better nitrogen management

Agriculture

1. Improving nitrogen use efficiency in crop production
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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



TFRN documents to WGSR-49

- 1. Report of TFRN-6 in Rome, including a further amended, draft revised technical Annex IX (ECE/EB.AIR/WG.5/2011/16)**
- 2. Revised Draft Guidance Document for preventing and abating NH₃ emissions (Informal Document No. 21)**
- 3. Draft Guidance Document for National Nitrogen Budgets (Informal Document No. 20)**
- 4. European Nitrogen Assessment; Summary for Policy Makers (Informal Document No. 11)**

Report TFRN-6

11-12 May 2011, Rome

TFRN-6 discussed:

- Feedback from WGSR-48
- Economic costs of ammonia abatement measures, further on to TFRN-5 in Paris, 2010.
- Proposals for slight modifications to draft Annex IX, also in response to comments of WGSR-48 - **consistency**
- Draft Guidance Document
- Work of Expert Panels on Nitrogen & Food (EPNF) and on Nitrogen Budgets (EPNB)
- TFRN-7 in St Petersburg, spring 2012 - **budget**

Guidance Document

- Revised draft version available, which include now information on economic costs;
- The Guidance Document lists 3 categories of techniques/approaches:
 - Category 1: well proven
 - Category 2: sound, but some uncertainties
 - Category 3: with problems and not recommended

Costs of ammonia abatement

Main results:

- Cost of abatement measures are much less than previously reported (often 1/2 or 1/10 !);
- Co-benefits of abatement provide benefits to farmers
 - e.g. , fertilizer savings, less smothering of herbage, increase animal health
- Climate co-benefits can be significant
 - e.g. CO₂ and N₂O emissions associated with fertilizer production

Costs of ammonia abatement

Main results :

- Cost of abatement measures depend on farm size and structure (farm-specific);
- Most measures cost roughly € -0.5 to 2 per kg NH₃-N saved, but some more expensive
- Measures have to be considered from a 'whole-farm' perspective, as a strategic package of measures (which then may lead to innovation and technical change).
- Farmers need time to adjust and learn (also from each other)

Overview of costs of ammonia abatement measures

Measures	Cost, €/kg NH₃-N saved
Nitrogen management	-1.0 to 1.0
Feeding strategies	-0.5 to 1.0
Animal housing	0.0 to 10.0
Covering slurry storages	0.1 to 4.0
Slurry application	-0.5 to 3.0
Urea application	-0.1 to 4.0

Costs of ammonia abatement

- Relatively cheap measures are
 - Slurry application (esp. via contractors)
 - Nitrogen management
 - Feeding strategies
 - Covers on slurry storages

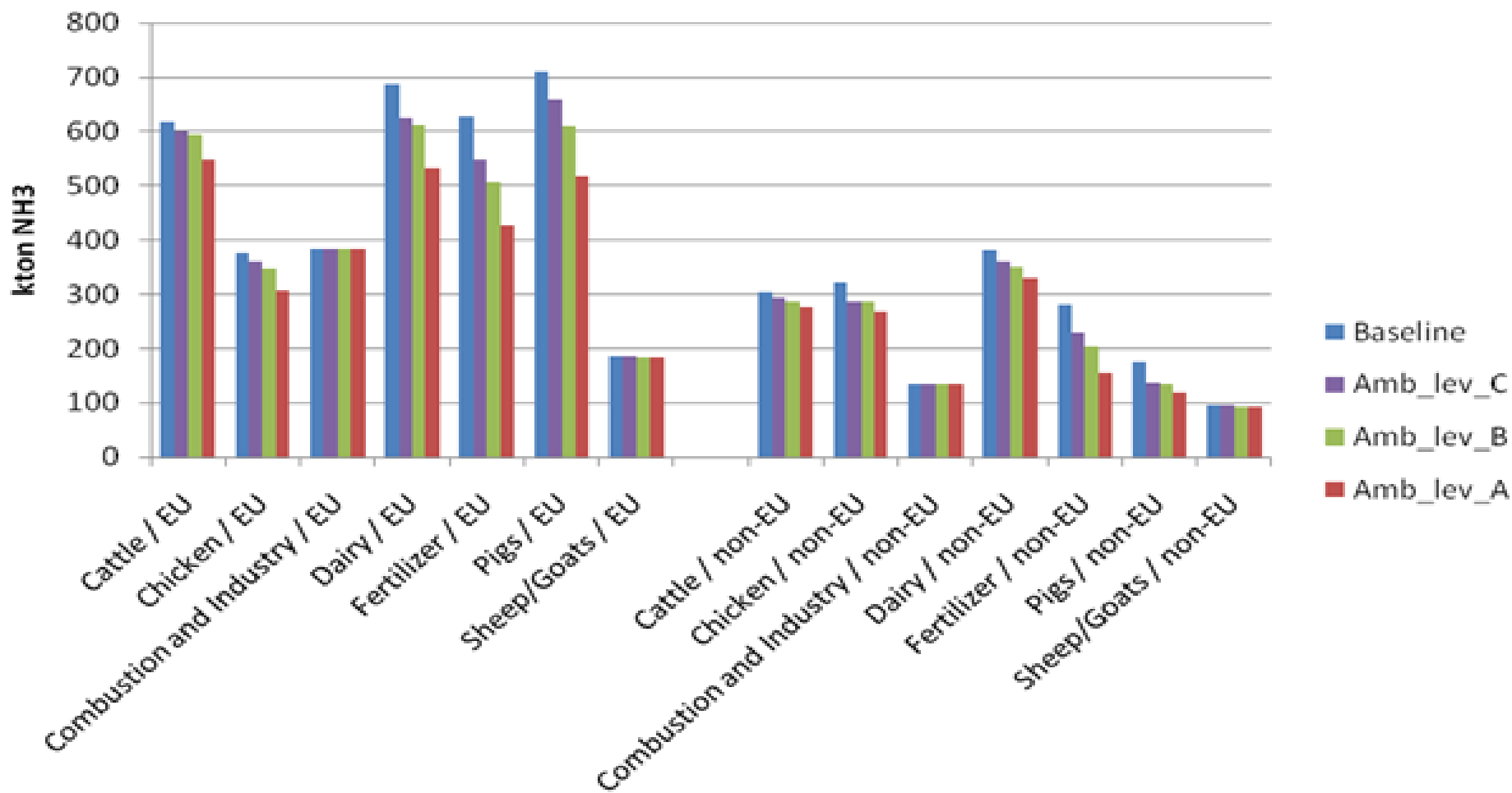
- Expensive measures are:
 - Rebuilding existing housing systems
 - New housing systems when reduction targets are high
 - Go beyond 'minimum thresholds for animal feeding'

Costs of ammonia abatement

Experiences from practice:

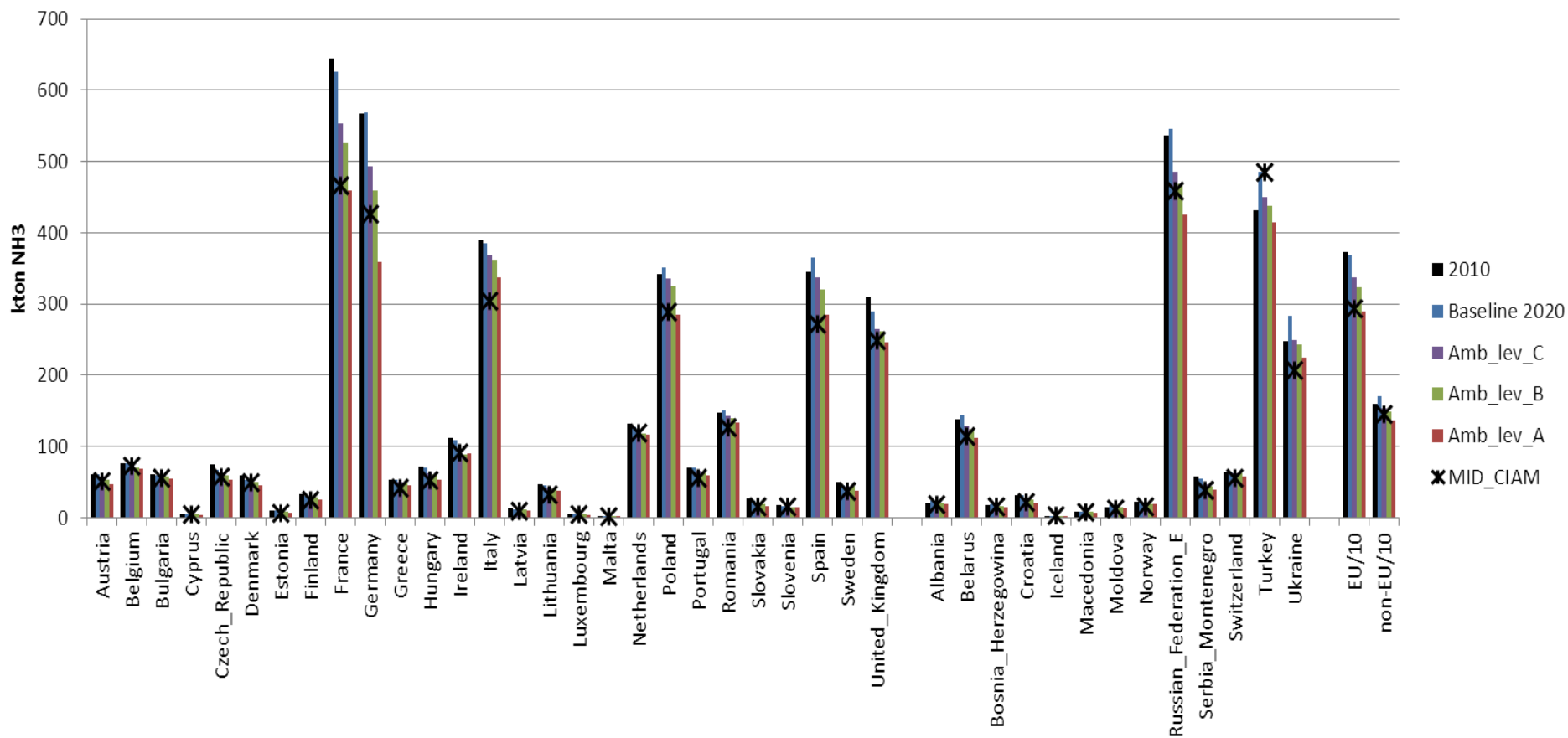
- DK and NL have reduced ammonia emissions by ~50%, yet have competitive animal agriculture
- Overall mean costs of housing and slurry storage measures in pig houses (decreasing NH_3 emissions by >60%) in NL are estimated at 3 euro per kg N saved.

Total emissions in options A, B and C per sector Results of CIAM-GAINS

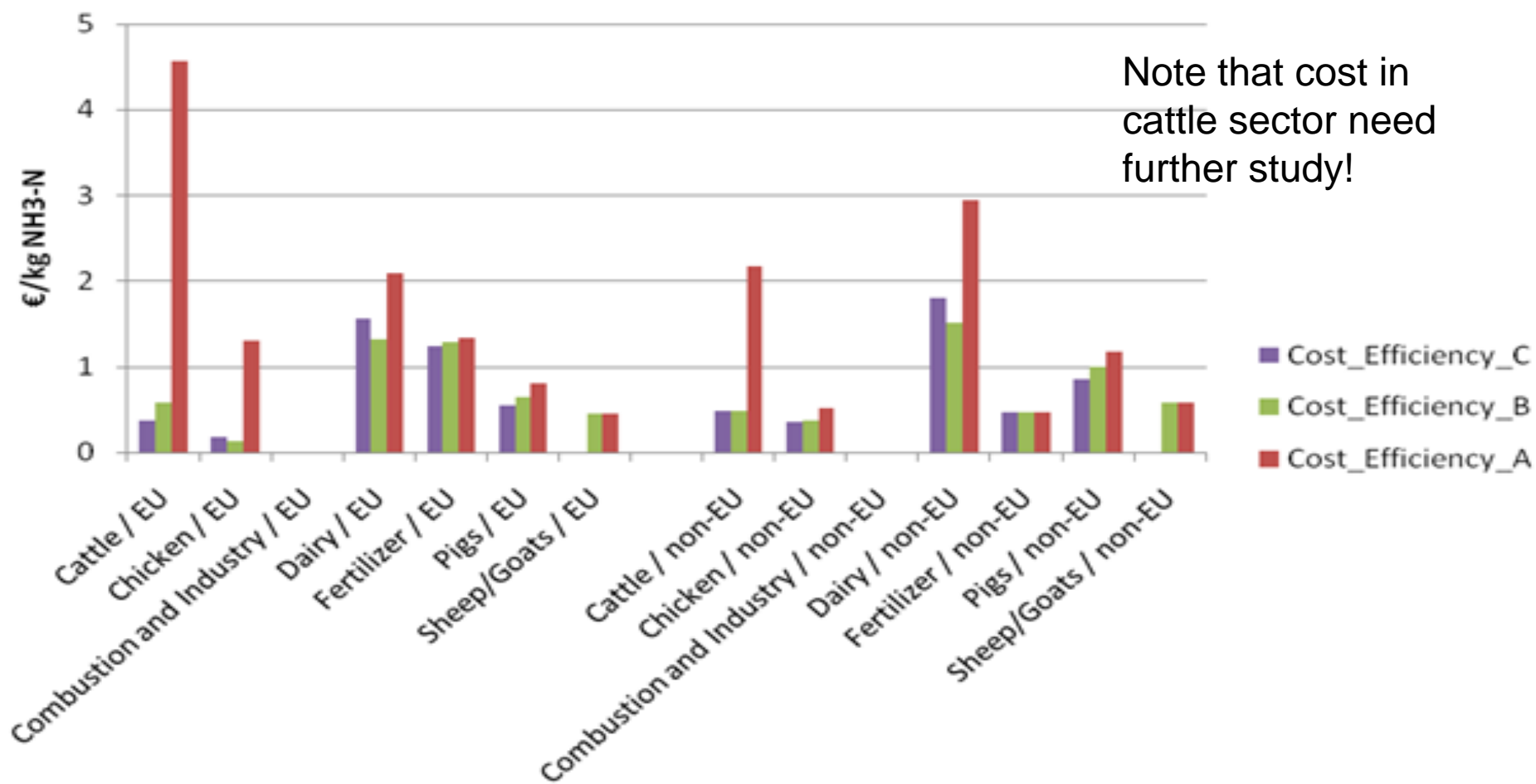


Total Costs of options A, B and C per country

Results of CIAM-GAINS



Costs per kg NH₃-N of options A, B and C per sector Results of CIAM-GAINS



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, **ammonium phosphate and ammonium sulphate**

Three ambition levels; all technical feasible

- A. High level of ambition in reducing NH_3 emissions,
- B. Moderate level of ambition, as well as being cost effective;
- C. Modest level of ambition, as well as being cost effective;



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

Identifying Priorities to Support WGSR negotiation

Criteria for Priority Setting:

- a) availability and applicability of the measures across the UNECE region;
- b) being cost neutral or have a low cost to farmers, especially when considering their co-benefits;
- c) measures which give a big contribution to NH_3 emissions reduction & N cycle efficiency;
- d) long-term capacity-building.

If you committed to only 5 things what would they be?

5 top priorities for commitments in Annex IX

1. Low-emission land application of manure & fertilizer:
 - a) Application of cattle, pig & poultry slurry & solid manure
 - b) Low emission use of urea fertilizer (ban is not proposed)
2. Animal feeding strategies to reduce N excretion, from cattle, pig & poultry.
3. Low-emission techniques for all *new* stores for cattle and pig slurries and poultry manure.
4. Strategies to improve N use efficiencies and reduce N surpluses, with N balances on *demonstration farms*,
5. Low-emission techniques in new and largely rebuilt pig & poultry housing.

Concluding remarks

- Many options are available for decreasing ammonia emissions, at relatively low cost.
- The options have been described in detail in the draft Annex IX and the draft Guidance Document.
- Ammonia abatement is part of improving N use efficiency in farming, helping meet climate & water pollution targets.
- 5 key priorities have been identified on a technical basis to support WGSR negotiation of the commitments.
- Final polishing of Guidance Document after decisions have been made about final version on Annex IX.

4-minute
video of the ENA
for public stakeholders

<http://www.youtube.com/watch?v=uuwN6qxM7BU>