Developing an integrated approach for Reactive Nitrogen

Work of the Task Force on Reactive Nitrogen

Mark Sutton and Oene Oenema
(co-chairs TFRN, with support from UK & NL Govnts)

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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 NH$_3$
3. Guidance Document for preventing NH$_3$ emissions
4. Framework Code of Good Agric Practice to reduce NH$_3$ emissions (now starting)
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
Mark A. Sutton
Clare M. Howard
Jan Willem Erisman
Gilles Billen
Albert Bleeker
Peringe Grennfelt
Hans van Grinsven
Bruna Grizzetti

ENA Authorship
200 experts, 21 countries & 89 organizations
Scientifically independent process

www.nine-esf.org/ENA
Nitrogen in the News

• International TV & Press Coverage
• ENA summary in Nature
• ENA 4-minute video on “ Youtube”
Substantial input from both EMEP and WGE Communities
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.

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

THE OVERALL NITROGEN COOLING EFFECT FOR THE EU is \(-16\) mW m\(^{-2}\), with an uncertainty range of \(-47\) to \(+16\).
Summary of N flows in Europe

Atmospheric N\(_2\) pool

Net import of food & feed: 3.5
Net atmosph. export: 2.4

Crop production: 17.6
Livestock farming: 11.8
Crop \(\text{N}_2\) fix: 11.2
Fertilizers: 3.8

Semi-natural soils: 13.8
Agricult soils: 7.1

Human nutrit.: 7

Export by rivers to the sea: 6.8

Leaching & runoff: 6
Denitrification: 4

\(\text{NH}_3, \text{NO}_x, \text{N}_2\text{O}\) emission: 4.5

Industry & traffic: 3.4

Europe (EU27), around 2000. N fluxes in TgN/yr

ENA, 2011
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

<table>
<thead>
<tr>
<th>Measures</th>
<th>Cost, €/kg NH$_3$-N saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slurry application</td>
<td>-0.5 to 3.0</td>
</tr>
<tr>
<td>Nitrogen management</td>
<td>-1.0 to 1.0</td>
</tr>
<tr>
<td>Feeding strategies</td>
<td>-0.5 to 1.0</td>
</tr>
<tr>
<td>Urea application</td>
<td>-0.1 to 4.0</td>
</tr>
<tr>
<td>Covering slurry storages</td>
<td>0.1 to 4.0</td>
</tr>
<tr>
<td>Animal housing</td>
<td>0.0 to 10.0</td>
</tr>
</tbody>
</table>
Costs per kg NH₃-N of options A, B and C per sector
Results of cooperation with CIAM

Note that cost in cattle sector need further study!
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\(_x\): 29% reduction
- NH\(_3\): 2% reduction
• 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$_3$ and their interaction with other pollutants.
Climate change to 2100 could potentially double NH$_3$ emission in some regions.

Toward a new paradigm for NH$_x$ modelling
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: $\text{NH}_3 >> \text{NH}_4 > \text{NO}_3$
  - 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 NH$_3$ concentration (starting from the critical level, 1-3... $\mu$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 Luxurity
  – 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 $N_r$ co-benefits: climate, water, green economy
  - From Critical Level to Air Quality Target Value for $NH_3$
  - 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.