Task Force on Reactive Nitrogen

Achievements through 10 TFRNs

Lead countries: Denmark…

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(co-chairs TFRN)

TFRN-10 Lisbon
29 April 2015
TFRN Goal (EB decision 2007)

“the long-term goal of developing technical and scientific information, and options which can be used for strategy development across the UNECE to encourage coordination of air pollution policies on nitrogen in the context of the nitrogen cycle and which may be used by other bodies outside the Convention in consideration of other control measures”
TFRN Key Topics

• Mitigation of agricultural nitrogen, with special attention to ammonia. (*Ammonia Framework Code*)
• Development of regional nitrogen budgets to inform full N optimization strategies
• Assessment of the relationships between nitrogen and food choices
• Awareness and knowledge building on nitrogen in EECCA countries.
• Catalytic activity on nitrogen for use by other bodies outside the convention.
• European Nitrogen Assessment, ONW, INMS
The European Nitrogen Assessment
Sources, Effects and Policy Perspectives

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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
Summary of N flows in Europe

Atmospheric N\textsubscript{2} pool

- Atmospheric NH\textsubscript{3}, NO\textsubscript{x}, N\textsubscript{2}O
- Crop production
- Livestock farming
- Human nutrit.
- Export by rivers to the sea

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

Crop N\textsubscript{2} fix
Fertilizers

- 11.2 TgN/yr
- 3.8 TgN/yr

NH\textsubscript{3}, NO\textsubscript{x}, N\textsubscript{2}O emission

- 6.8 TgN/yr
- 4.7 TgN/yr
- 3.7 TgN/yr

Leaching & runoff

- 0.2 TgN/yr
- 0.2 TgN/yr
- 0.8 TgN/yr

Denitrification

- 2.1 TgN/yr

Human nutrit.

- 7.1 TgN/yr

Semi-natural soils

- 0.2 TgN/yr
- 0.3 TgN/yr

Export by rivers to the sea

- 11.8 TgN/yr

Atmospheric N\textsubscript{2} pool

- 9.3 TgN/yr

Net import of food & feed

- 3.5 TgN/yr

ENA, 2011
Weighing up Nitrogen & Climate

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

- **N₂O**
  - Warming: 17 mW m⁻²
  - Climate cost: €7 billion

- **Tropos O₃**
  - Warming: 7 mW m⁻²
  - Health cost: €30 billion

- **N deposition**
  - Cooling: 19 mW m⁻²
  - Health & Biodiversity cost: €12 billion

- **Particulate matter**
  - Cooling: 17 mW m⁻²
  - Health cost: €70 billion

Total economic cost of N emissions:
€70 billion – €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.

ENA, 2011
EPN-EEECA

• St Petersburg Workshop
• Proceedings volume
• Building critical mass in eastern Europe
• Engagement and linking between conventions
UN says fertiliser crisis is damaging the planet

Scientists urge rich world to halve its meat consumption

The shape of nitrogen to come

An analysis reveals the huge impact of human activity on the nitrogen cycle in China. With global use of Earth's resources rising per head, the findings call for a re-evaluation of the consumption patterns of developed societies.

Mark A. Sutton & Albert Bleeker

Although Earth's atmosphere consists of nearly 80% dinitrogen (nitrogen), NO, to the formation of ground-level ozone, which causes crop losses; increased emissions of nitrous oxide (N₂O), a greenhouse gas; and extreme levels of water pollution by nitrates and ammonia.

Nature doi:10.1038/nature11954

Prepared by the Global Partnership on Nutrient Management in collaboration with the International Nitrogen Initiative

18 Feb 2013: Independent, Guardian, Herald Tribune, Times of India and 300 articles worldwide
Two documents to know:

1. UNECE Ammonia Guidance Document
   New
   Russian language version

2. UNECE Ammonia Framework Code

Options for Ammonia Mitigation
Guidance from the UNECE Task Force on Reactive Nitrogen
Ammonia mitigation in agriculture – Guidance Doc

- Expert Panel on Mitigation on Agricultural Nitrogen (Canada and Czech Republic)

- **Ammonia Guidance Document (>100 pp)**
  - Coordinated with GP Annex IX
  - Living document – the field develops
  - Publish and disseminate glossy ‘authored’ version during 2014.

- **Annex IX: left unchanged in GP review**
  - Efforts needed from 2015, 2016...?
Ammonia mitigation – Updating the Framework Code

• Basis for Countries to establish their own Codes of Good Agric Practice for Ammonia (required under GP Annex IX)

• Framework code last updated 2001. Update rescheduled to take account of GP revision.

• **Framework Code Plans:**
  – Contract for support from Germany. Main document revised during 2013. (c. 20 pages)
  – Plus Glossy Leaflet Executive Summary (2014)
  – Plus longer version with pictures for internet (2014)
5 top priorities for ammonia mitigation

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**.
Slurry spreading: a wide range of low-emission techniques are available

Splash Plate Spreader - 1950s technology

Trailing Hose

Trailing Shoe

Slot Injector

The car and the exhaust pipe...
### 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>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>Animal housing</td>
<td>0.0 to 10.0</td>
</tr>
<tr>
<td>Covering slurry storages</td>
<td>0.1 to 4.0</td>
</tr>
<tr>
<td>Slurry application</td>
<td>-0.5 to 3.0</td>
</tr>
<tr>
<td>Urea application</td>
<td>-0.1 to 4.0</td>
</tr>
</tbody>
</table>
EU benefit-cost ratios for NH$_3$ and NO$_x$ mitigation

Van Grinsven et al. (Environmental Science and Technology, 2013)
Halving EU meat and dairy intake would reduce N emission by 40%.
Climate and global ammonia emissions

Counting the co-benefits of better nitrogen management

- **Climate:** UNFCCC
- **Biodiversity:** CBD
- **Air Quality:** LRTAP + regional
- **Marine:** GPA + regional
- **Stratosphere:** Montreal Protocol
- **Economy:** INMS (International Nitrogen Management System)
  
  More food and energy with less pollution

**UNEA?**
Can we think bigger?

• How would we attract our Ministers?
• Jobs, Green Economy, Overcoming the Barriers
• Joining up across the N cycle, with better ‘Economy-Wide’ Nitrogen Use Efficiency can help with all these
• Public communication: “Nitrogen Top Ten”