Task Force on Reactive Nitrogen

Implementation and emerging opportunities

Lead countries: UK and Denmark

Mark Sutton and Tommy Dalgaard (co-chairs TFRN)

WGSR-52, Geneva
30 June 2014
“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.
- 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.
Ammonia mitigation in agriculture – Guidance Doc

- Expert Panel on Mitigation on Agricultural Nitrogen (Canada: Bittman; Czech Republic: Dedina)

- **Ammonia Guidance Document (>100 pp)**
  - Coordinated with GP Annex IX

- **Annex IX: left unchanged in GP review**
  - Efforts needed from 2015, 2016...?
  - Support to EU as key options enter NEC Annex III.
Options for Ammonia Mitigation

Guidance from the UNECE Task Force on Reactive Nitrogen

ANNEX III

Content of National Air Pollution Control Programmes

PART 1

MEASURES WHICH MAY BE INCLUDED IN THE NATIONAL AIR POLLUTION CONTROL PROGRAMME


A. Measures to control ammonia emissions

1. Member States shall establish a national advisory code of good agricultural practice for reducing ammonia emissions, based on the 2001 UNECE Framework Code for Good Agricultural Practice for Reducing Ammonia Emissions, covering at least the following items:
   (a) nitrogen management, taking into account the full nitrogen cycle;
   (b) livestock feeding strategies;
   (c) low-emission manure spreading approaches;
   (d) low-emission manure storage systems;
   (e) low-emission manure processing and composting systems;
   (f) low-emission animal housing systems;
   (g) low-emission approaches for mineral fertilizer application.

2. Member States shall establish a national nitrogen budget to monitor the changes in overall losses of reactive nitrogen from agriculture, including ammonia, nitrous oxide, ammonium, nitrates and nitrites, based on the principles set out in the UNECE Guidance Document on Nitrogen Budgets.

3. Member States shall reduce ammonia emissions from inorganic fertilizers by using the following approaches:
   (a) use of ammonium carbonate fertilizers shall be prohibited;
   (b) urea-based fertilizers shall be replaced by ammonium nitrate-based fertilizers;
   (c) where urea-based fertilizers continue to be applied, methods shall be used that have been shown to reduce ammonia emissions by at least 30% compared with the use of the reference method, as specified in the Ammonia Guidance Document.

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1 Decision 2011/11, 2CE/EB AIR/113/Add.1
3 Decision ECE/EB.AIR/75, paragraph 28
4 Decision 2011/10, 2CE/EB AIR/113/Add.1
Ammonia mitigation – Updating the Framework Code

• Basis for Countries to establish their **own national Codes** of Good Agric Practice for Ammonia (required under GP Annex IX)
• Framework code last updated 2001. Accelerated revision to be useful also for NECD review.
Revised Framework Code

• Follows same paragraph structure as 2001 version – for easy comparability
• Updated with new technical information
• More balanced now (less pessimistic)
• Contains a range of ambition: not a common standard code
• Mentions an indicative 30% benchmark for good practice achievable for many techniques.
What is Good?

Para 10 bis. A wide range of options to reduce ammonia emission is described in the following sections, where the effectiveness is mainly described as a percentage reduction compared with a reference method. **In general, while all emission reductions represent helpful contributions, achievement of a 30% reduction in emissions from a component source can be considered as a suitable performance benchmark for good practice.** Many methods are available that offer more ambitious reduction opportunities.
Sections of the Framework Code (and the 5 key ammonia priorities)

A. Nitrogen management, taking account of the whole nitrogen cycle; [farm N balances]
B. Livestock feeding strategies;
C. Low-emission manure spreading techniques;
D. Low-emission manure storage systems;
E. Low-emission animal housing systems; and
F. Possibilities for limiting ammonia emissions from the use of mineral fertilizers.
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…
Way forward on Framework Code?

• WGSR discussion now. (re: Ambition level)
• Until 30 Aug (Technical points)
• Updated version submitted for translation (start Sept)
• *Possible Workshop* linking Countries & Experts (November) to build consensus
• *Target*: sign-off Framework Code at EB-33 (Dec 2014)
Nitrogen Budgets

• Expert Panel on Nitrogen Budgets (Austria: Winiwarter; NL: Bleeker)

• **Guidance Document on Nitrogen Budgets**
  - Preparing annexes & delivering training
  - Publish and disseminate glossy ‘authored’ version during 2015.

• **Further development**
  - Refining interpretive indicators
  - Mainstreaming demonstration in example countries.
Nitrogen and Food

• Expert Panel on Nitrogen & Food (NL: Westhoek; ‘Fertilizer Europe’: Palliere)

• Preparation of Report on N & food choice
  – Full report to be published during the summer.

• Future development
  – Scenarios on the interactions between technical mitigation options and behavioural change options.
  – Further linking the evidence on Nitrogen, food choice, environment and health.
Raise taxes on meat to turn us into demitarians, says UN

Ben Webster Environment Editor

Extra taxes could be imposed on meat to deter families from buying it, according to a United Nations task force which recommends halving consumption of meat and dairy products to reduce pollution.

Britain’s livestock farmers would suffer a "severe" loss of income from such a change in diet, but there would be environmental benefits, including less pollution of the air, water and soil, and lower greenhouse gas emissions.

A team of scientists advising the United Nations Economic Commission for Europe (Unec) studied ways of reducing nitrogen pollution from chemical fertiliser and manure.

The task force on reactive nitrogen concluded that if everyone in the EU became "demitarian" — halving the amount of meat and other animal products consumed — it could reduce greenhouse gases from agriculture by 25 per cent to 40 per cent and nitrogen emissions by 40 per cent.

It would also cut the risk of heart disease and cancer by bringing consumption of saturated fats down to within levels recommended by the World Health Organisation.

The task force’s report, published today, will inform negotiations between governments over tightening the EU emissions directive and the Unec’s convention on cross-border air pollution.

The scientists found that beef was the worst meat for environmental impact, causing 25 times more nitrogen pollution per unit of food protein than cereals. For pig and poultry meat, eggs and dairy, the pollution was 3.5 to 8 times that of cereals.

The team questioned whether people would be likely to cut consumption of meat simply by being better informed. They suggested that tougher measures, such as new taxes, might be more successful in changing behaviour.

They conclude: "A more direct policy intervention could be that of making meat and dairy products more expensive, either by direct taxation or by taxing the environmental effects."

The report admits that "the effects on the livestock sector will most likely be severe". Some farmers would be able to switch from rearing animals to planting cereals, but others with land less suitable for crops, particularly in Scotland and Wales, would suffer loss of income.

Reducing meat consumption would free "large areas of agricultural land in the EU" because much less land would be needed for grazing and for growing crops to feed to livestock. The report says the land could be used for growing biofuels to replace fossil fuels. Professor Mark Sutton, from the UK’s Centre for Ecology & Hydrology and co-author of the report, said: "Adopting a demitarian diet across Europe would reduce nitrogen pollution levels by about 40 per cent which is similar to what could be achieved by adopting low-emission farming practices."

He acknowledged that reducing consumption in Britain would have limited impact on global emissions because countries such as China and India were increasing their consumption.

Dr Diane Mitchell, the National Farmers' Union chief environment adviser, said: "Eating less meat is a simplistic solution to what is a highly complex situation. The livestock and dairy sectors are already doing much to tackle their footprint."

"Some of this land can only be used for pasture and goes some way to protecting our wonderful countryside."
## Behavioural change, nitrogen & food choice

**Demitarian scenario: 50% less meat & dairy**

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Unit</th>
<th>Reference</th>
<th>-50% meat, dairy and eggs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average daily intake</td>
<td>g cap(^{-1}) day(^{-1})</td>
<td>83</td>
<td>75</td>
</tr>
<tr>
<td>Proportion of animal origin</td>
<td>%</td>
<td>60%</td>
<td>36%</td>
</tr>
<tr>
<td><strong>Red meat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average daily intake</td>
<td>g cap(^{-1}) day(^{-1})</td>
<td>88</td>
<td>47</td>
</tr>
<tr>
<td>Compared with the RMDI</td>
<td>%</td>
<td>207%</td>
<td>107%</td>
</tr>
</tbody>
</table>

Westhoek and the TFRN-EPNF (under review)
Nitrogen in EECCA Countries

• New Expert Panel on Nitrogen in EECCA Countries (Chairs: Russia: Koslova, Lukin, with support DE & NL)

• Developing the N-EECCA network
  – Translated Ammonia Guidance Doc into Russian
  – Sharing techniques on nitrogen and ammonia mitigation across the EECCA region
  – Building network to contribute to TFRN workplan

• Next Steps
  – Developing the basis to support ratification of the Gothenburg Protocol.
  – *Presentation tomorrow on Success Stories*
TFRN engagement
Global Partnership on Nutrient Management

Our Nutrient World
The challenge to produce more food and energy with less pollution

Global Programme of Action for the protection of the marine environment from land-based activities.

Prepared by the Global Partnership on Nutrient Management in collaboration with the International Nitrogen Initiative
Nitrogen oxides (NO\textsubscript{x})

Nitrous Oxide (N\textsubscript{2}O)

Ammonia (NH\textsubscript{3})

Leached Nitrate (NO\textsubscript{3}–)

Further emission of NO\textsubscript{x} & N\textsubscript{2}O carrying on the cascade

Ammonium nitrate in rain (NH\textsubscript{4}NO\textsubscript{3})

Environmental concern from N\textsubscript{2}
Unintended N fixation in combustion

NOx capture & reuse

NUE combustion

Humans

Nr input by combustion

Energy Consumption & Transport Choices

Full Chain NUE\textsubscript{N,P}

Nutrient Resource

Crop NUE\textsubscript{N,P}

N&Fertilizer & Biological Nitrogen Fixation

N&P

Manure & sewage fertilizer products

Spatial optimization & integration

Unintended N fixation in combustion

NOx capture & reuse

NUE sewage manures

NUE food crop

Feeds harvest

Food harvest

NUE animal

Livestock production

NUE food supply

Humans

Food Consumption & Diet Choices

NUE feed crop

NUE food crop

NUE animal

NUE food supply

Humans

1

2

6

9

Food Consumption & Diet Choices

NUE food supply

Humans

Food Consumption & Diet Choices
“20:20 for 2020”
20% better NUE: saving 20 Mt N per yr by 2020

Benefits expressed here as N saving / ha per year (Full-chain NUE)

Bottom line for the Green Nutrient Economy ($billion/year)
Net Benefit 170= Fert Saving 23 + Env+Health 160 –Implementation 12
Catalytic activity on nitrogen for use outside the convention

- New project: Global Environment Facility & UNEP
- Research on the global nitrogen cycle, toward the establishment of the *International Nitrogen Management System*
  - Sharing CLRTAP experience; linking benefits for intergovernmental processes.
  - Improving indicator development and delivery
  - Sharing mitigation and management practices – understanding barriers
- Case studies: including EECCA (e.g. East Baltic, Black Sea, Central Asia).
Components Diagram for GEF-INMS

**C1:** Tools and methods for understanding the N cycle

**C2:** Global & regional quantification of N use, flows, impacts & benefits of improved practices

**C3:** Regional demonstration & verification

**C4:** Awareness raising & knowledge sharing

Data need & concepts

Informing modelling requirements

Options & Scenarios, including Cost-Benefit-Analysis

Improved management practices, Mitigation, Adaptation

Improved basis for transformational actions on N management

Opportunities, Local/region priorities, Policy context, Local data, Barriers-to-change

Devlpt. of policy homes, Public awareness, Consensus building,
How could INMS help count the multiple co-benefits of improving economy wide nitrogen use efficiency?

OVERARCHING GOALS INCLUDING

- **Climate:** UNFCCC
- **Biodiversity:** CBD
- **Marine:** GPA + regional
- **Stratosphere:** Montreal Protocol
- **Air Quality:** LRTAP + regional

**INMS**
International Nitrogen Management System
(Science Support Process linking threats & benefits)

More food and energy with less pollution
The Search For Champions

• Champion countries
• Key champion individuals
• TFRN has a key catalytic role in INMS

• We now look to identify 8-10 key champion countries for INMS who will to help design the detailed programme over the next year.