Integrated Reactive Nitrogen Activities in Germany

Markus Geupel & Gabriele Wechsung
Federal Environment Agency
Air Quality Division

Air Pollution Control and Terrestrial Ecosystems

markus.geupel@uba.de
gabriele.wechsung@uba.de
8th TFRN - Copenhagen
Integrated Reactive Nitrogen Activities in Germany

Outline

- Setting the scene since 2009/2010
- Environmental Background – examples
- Policy support
- Research activities
- Public relation activities
NH₃-Emissions in Germany [Gg yr⁻¹]

IIR 2013 – German Informative Inventory Report (www.iir-de.wikidot.com)
8th TFRN - Copenhagen
Integrated Reactive Nitrogen Activities in Germany

NO\textsubscript{x}-Emissions in Germany [Gg yr\textsuperscript{-1}]

![Graph showing NO\textsubscript{x} emissions from various sources in Germany from 1990 to 2011]

IIR 2013 – German Informative Inventory Report (www.iir-de.wikidot.com)
NEC-Directive - Emissions

<table>
<thead>
<tr>
<th></th>
<th>2010 objective</th>
<th>status quo (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH₃</td>
<td>550 Gg</td>
<td>563 Gg</td>
</tr>
<tr>
<td>NOₓ</td>
<td>1051 Gg</td>
<td>1288 Gg</td>
</tr>
</tbody>
</table>

Even stricter targets resulting from revised GP (-5%; 39 % compared to 2005)
Policy Support – national level

- Nitrogen Budget as a concept
- Cross-sector analysis of most promising measure, including pollution swapping
- Public and scientific interest
- Implementation within ministry not successful
Policy Support – national level  Nitrogen Budget as a concept
Policy Support - internationally

**TFRN EPMAN: Revision of the FC GAP (2001)**

→ elaboration of the first draft, harmonizing the FC GAP with Guidance / Annex IX GP and where possible with IRPP BREF (IED)

**Industrial Emission Directive (IED, 2010/75/EU), Revision of the IRPP BREF (2003)**

→ Information exchange in TWG for revising the Best Available Techniques (BAT) in the sector of Intensive Rearing of Pig and Poultry (IRPP) for the BAT REFerence Document (BREF),

→ Harmonizing the requirements with UNECE GP, Annex IX, GD and FC GAP

**objectives:**

→ integrated approach to prevention and control of emissions, to waste management, to energy efficiency (Nitrogen, PM, GHG, Resources)

→ BAT conclusions as a legal basis for permit conditions of installations
Policy support - Integrated agricultural Nitrogen indicator on a national level

Nitrogen Surplus as a Gross Nutrient Balance (farm gate)
Indicator for the German Sustainability Strategy

Activity that was taken
Methodological approach jointly developed and refined by BMELV und BMU (connected institutes); http://www.bmelv-statistik.de/index.php?id=139&stw=D%C3%BCngemittel
Policy support - Integrated agricultural Nitrogen balance on a farm level

Requirement of the national “fertilizer ordinance”
Obligation of yearly nutrient balance for the agricultural area (field balance)
- not included:
  - nitrogen losses in housing systems
  - nitrogen deposited on a field
- average of 60 kg ha\(^{-1}\) over 3 years
- no obligation of reporting to the institution in responsibility (in the federal state)

Activity that was taken
Working Group consisting of partners from the federal government and the Several federal states gave a proposal for revision of the “fertilizer ordinance” to possibly meet the goals of the NEC-Directive or of the future GP
- Incorporation of fertilizer into soil
- Farm gate balance

Good proposals – no implementation
Research in relation to integrated N-Emission abatement

A nitrogen footprint model to help consumers understand their role in nitrogen losses to the environment

Allison M. Leach\textsuperscript{a, c}, James N. Galloway\textsuperscript{a}, Albert Bleeker\textsuperscript{b}, Jan Willem Erisman\textsuperscript{b}, Richard Kohn\textsuperscript{c}, Justin Kitzes\textsuperscript{d}.

http://dx.doi.org/10.1016/j.envdev.2011.12.005

Online Personal N Footprint Calculator

http://www.n-print.org
Research in relation to integrated N-Emission abatement

A nitrogen footprint model to help consumers understand their role in nitrogen losses to the environment

Allison M. Leach\textsuperscript{a,}, James N. Galloway\textsuperscript{a,}, Albert Bleeker\textsuperscript{b,}, Jan Willem Erisman\textsuperscript{b,}, Richard Kohn\textsuperscript{c,}, Justin Kitzes\textsuperscript{d}.

http://dx.doi.org/10.1016/j.envdev.2011.12.005

London-Workshop in late 2011

• Organised by N-Print Team and UBA
• Promote the idea of N-Print calculator in other European countries
• Improve, discuss methodology

- Finland
- France
- Germany
- Italy
- Netherlands
- Portugal
- Spain
- Slovenia
- Sweden
- UK
- USA

Workshop report nicely sums up the nitrogen situation of the participating countries
Research in relation to integrated N-Emission abatement

2012-2014:
Sustainable national N management in agriculture:
Balances and mitigation measures (Döhler et.al)

Objectives:
→ Development of two modules (plant production & dairy farming) for a comprehensive agricultural model

→ Better evaluation of N emissions in the production chain and to optimize N management on farm level

→ conclusions for policy makers
Public relation to inform the interested public of the issues of reactive nitrogen

8th TFRN - Copenhagen
Integrated Reactive Nitrogen Activities in Germany

Air and Air Pollution Control
Reactive nitrogen in the environment

Forms of reactive nitrogen
Forms of reactive nitrogen which are especially relevant to the environment are:
- gases (NO, NO₂, N₂O, ammonia (NH₃)), nitrogen dioxide (NO₂),
- aerosols (PM₁₀), and nitric oxide (NO), which occur in dissolved form in
  the different forms of reactive nitrogen are very mobile and can influence air
  between soil, water, and organisms.

Sources of reactive nitrogen
Some 50% of the planet’s nitrogen supply is atmospheric nitrogen (nitrogen
not readily reactive; nitrogen), a chemical form that is not readily used by most organisms. Nitrogen not directly reactive is nitrogen required by
nitrogen fixation, which is a biological process.

Effects of reactive nitrogen
The excessive release of reactive nitrogen compounds leads to several ecological disadvantages, which result in considerable negative consequences for our society:
- Atmospheric deposition of reactive nitrogen compounds contribute to ozone
damage, acid precipitation, loss of biodiversity, etc.
- Nitrogen compounds contribute to eutrophication processes in water bodies.
- Higher emissions of nitrous oxide promote global warming.
- Increased emissions of greenhouse gases, as well as human health.
- High atmospheric ammonia and ozone concentrations cause respiratory
  diseases in farms and respiratory tract and human health.

Reduction strategies
Because of the instability of nitrogen, reduction measures on an environmental
level are only effective on a local scale. Effective reduction of reactive nitrogen
compounds is particularly problematic as the concentration of reactive nitrogen
in the air or soil is not directly visible or perceivable.

Nitrogen pollution in the environment
The agricultural sector is responsible for the majority of reactive nitrogen
emissions. A reduction of agricultural emissions would significantly contribute
to reducing reactive nitrogen emissions.

More information
Publications in German
- Link to German

Weitere Informationen
- Link in German

Federal Environment Agency Germany – Air Quality Division - Markus Geupel, Gabriele Wechsung
26.04.2013
Public relation to inform the interested public of the issues of reactive nitrogen