



Task Force on Reactive Nitrogen (TFRN)

Update on activities and discussion on options for
revision of Annex IX of the Gothenburg Protocol

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WGSR-44, 22 April 2009



General objectives of TFRN:

To provide technical information to be able

- to develop an integrated vision and approach to abatement of reactive nitrogen emissions and effects;
- to improve coordination on the development of integrated reactive nitrogen policies;
- to search for synergies between policies on air pollution and other policies;



Work plan agreed in TFRN-1 in May 2008

- a) Expert Panel on N Budgets (Lead: Austria)
- b) Expert Panel on Mitigation of Agric. N (Lead: Canada)
- c) European Nitrogen Assessment (Lead: ESF-NinE)
- d) Analyse the linkages across (other) Conventions,
- e) ***Develop options for revision of Annex IX and its Guidance Document of the Gothenburg Protocol***
- f) Explore consequences of changes in human diets on the nitrogen cycle



Annex IX of Gothenborg Protocol

MEASURES FOR THE CONTROL OF EMISSIONS OF AMMONIA FROM AGRICULTURAL SOURCES

Advisory code of good agricultural practice:

1. Nitrogen management, taking account of the whole nitrogen cycle;
2. Livestock feeding strategies;
3. Low-emission manure spreading techniques;
4. Low-emission manure storage systems;
5. Low-emission animal housing systems; and
6. Possibilities for limiting ammonia emissions from the use of mineral fertilizers

Findings of the review on Annex IX & Guidance Document

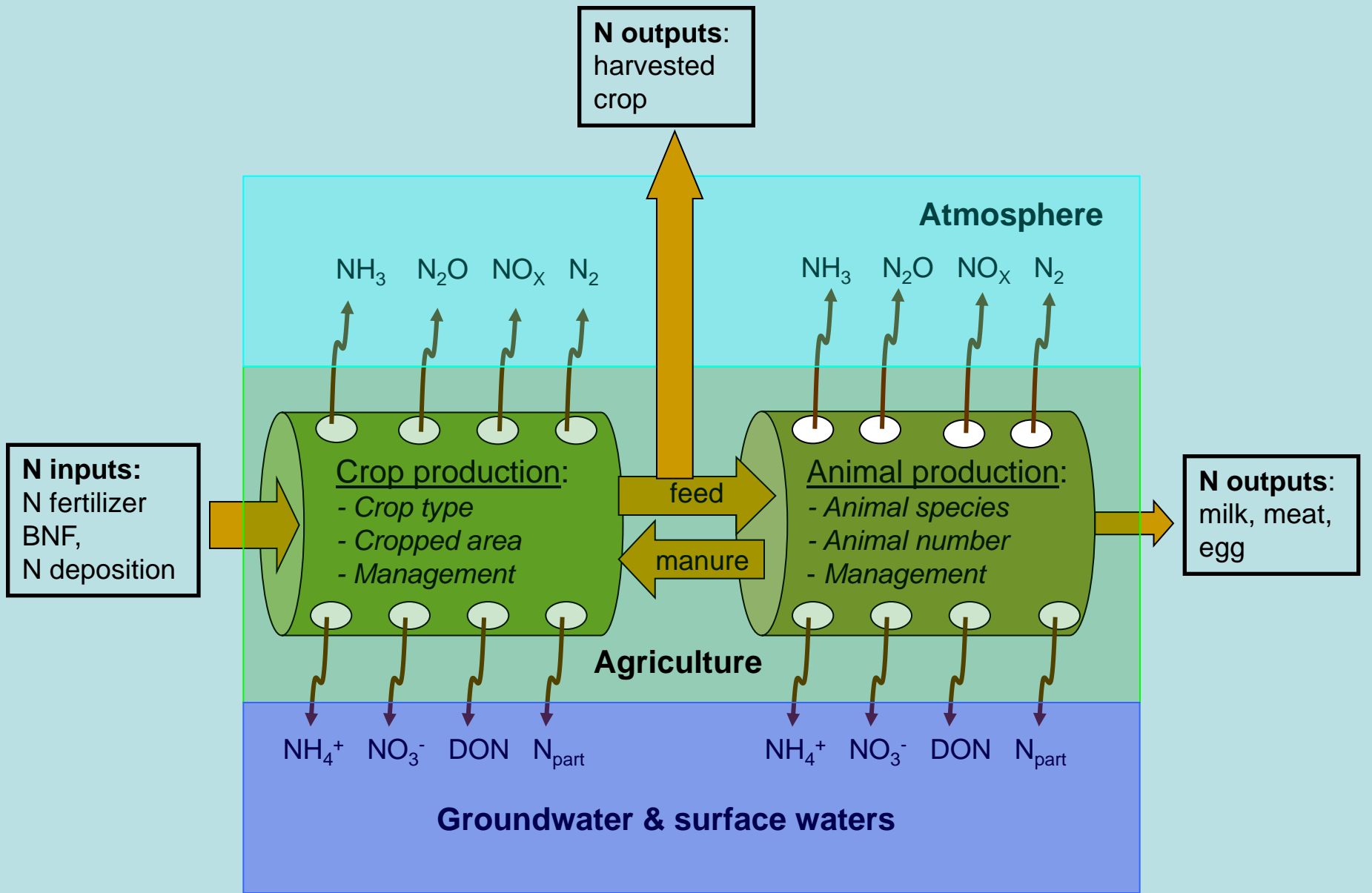
- New information on developing an integrated view for the whole N cycle
- New information on livestock feeding strategies (reducing N intake per unit produce)
- Update on information of land-spreading of solid and liquid manures
- Update on emissions from livestock housing and storage systems
- Update of techniques to reduce ammonia emissions from urea based fertilizers

Why an integrated approach to abatement of ammonia emissions?

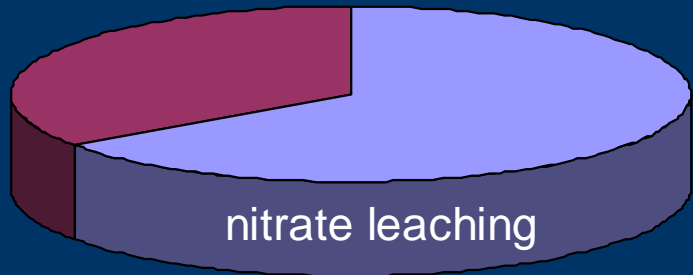
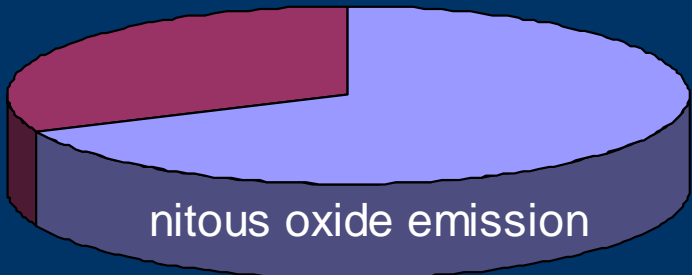
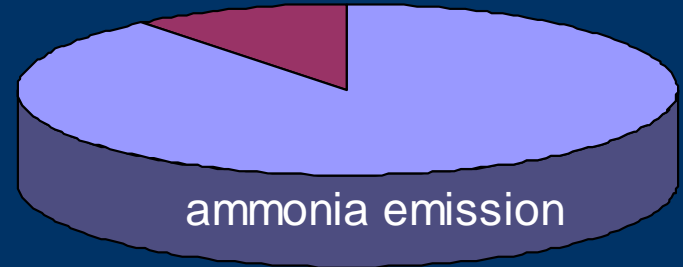
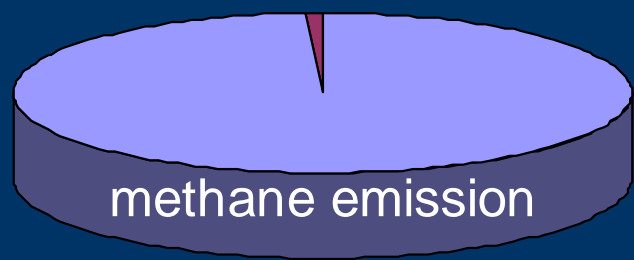
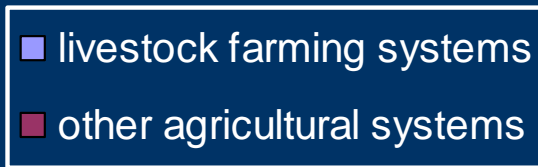
Because of the linkages and interactions in the N cycle and the effects of the Nr emissions:

- Human health effects, due to NH_3 and NO_x induced formation of $\text{PM}_{2.5}$ and smog,
- Plant damage through NH_3 and NO_x induced ozone formation;
- Loss of biodiversity due to atmospheric deposition of NH_3 and NO_x ;
- Acidification of lakes and soils because of deposition of NH_3 and NO_x
- Pollution of ground water and drinking water due to nitrate leaching;
- Eutrophication of surface waters due to N enrichment,
- Global warming because of emission of N_2O ;
- Stratospheric ozone destruction due to emissions of N_2O ;
- etc

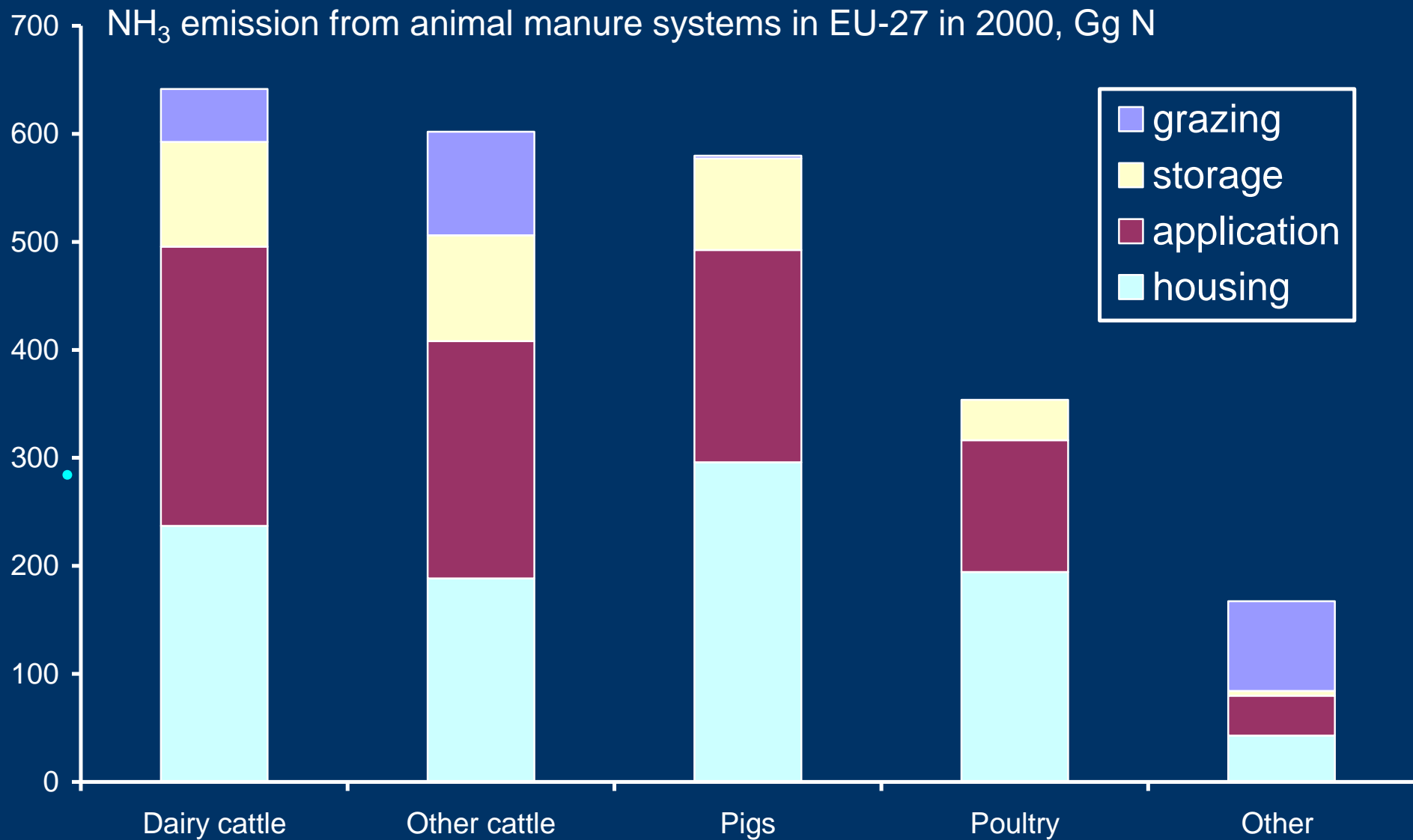
and most NH_3 originates from agriculture



Most NH3 emissions from animal agriculture



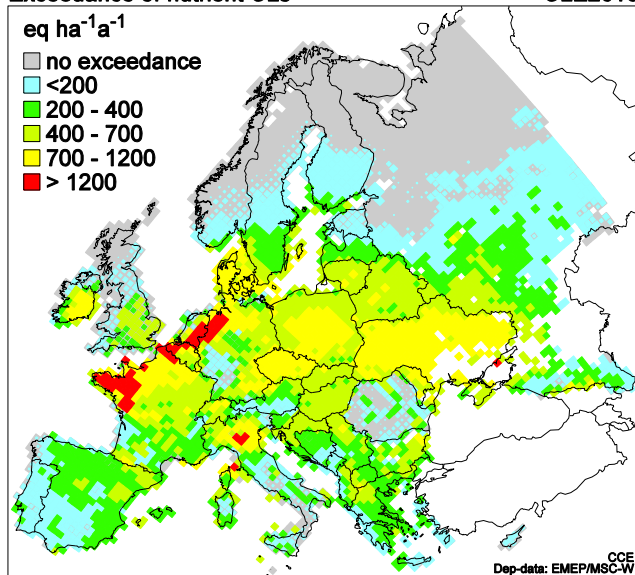
NH₃ emissions from animal manures in EU-27



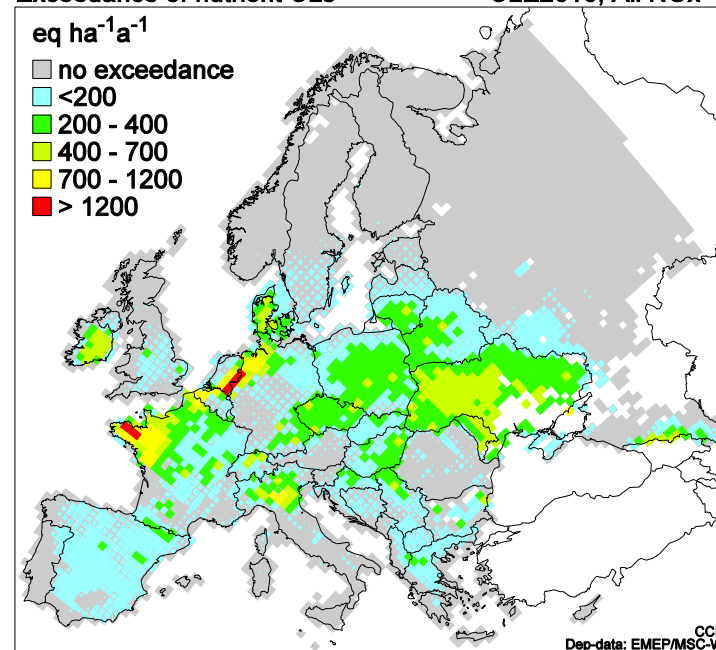
Role of NH₃ versus NO_x in critical load exceedance

Total exceedance for Nutrient N, 2010

Exceedance of nutrient CLs CLE2010

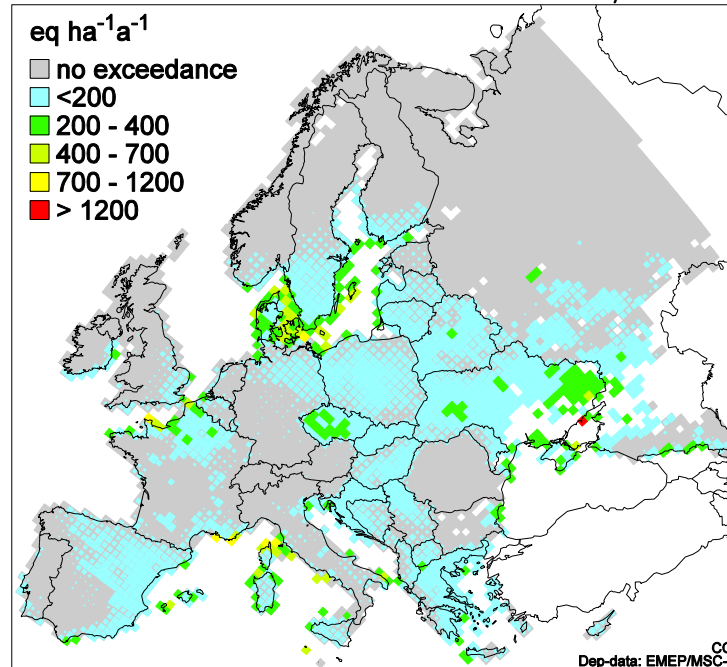


Exceedance of nutrient CLs CLE2010; All NO_x=0



Only NH₃ emissions

Exceedance of nutrient CLs CLE2010; All NH₃=0



Only NO_x emissions

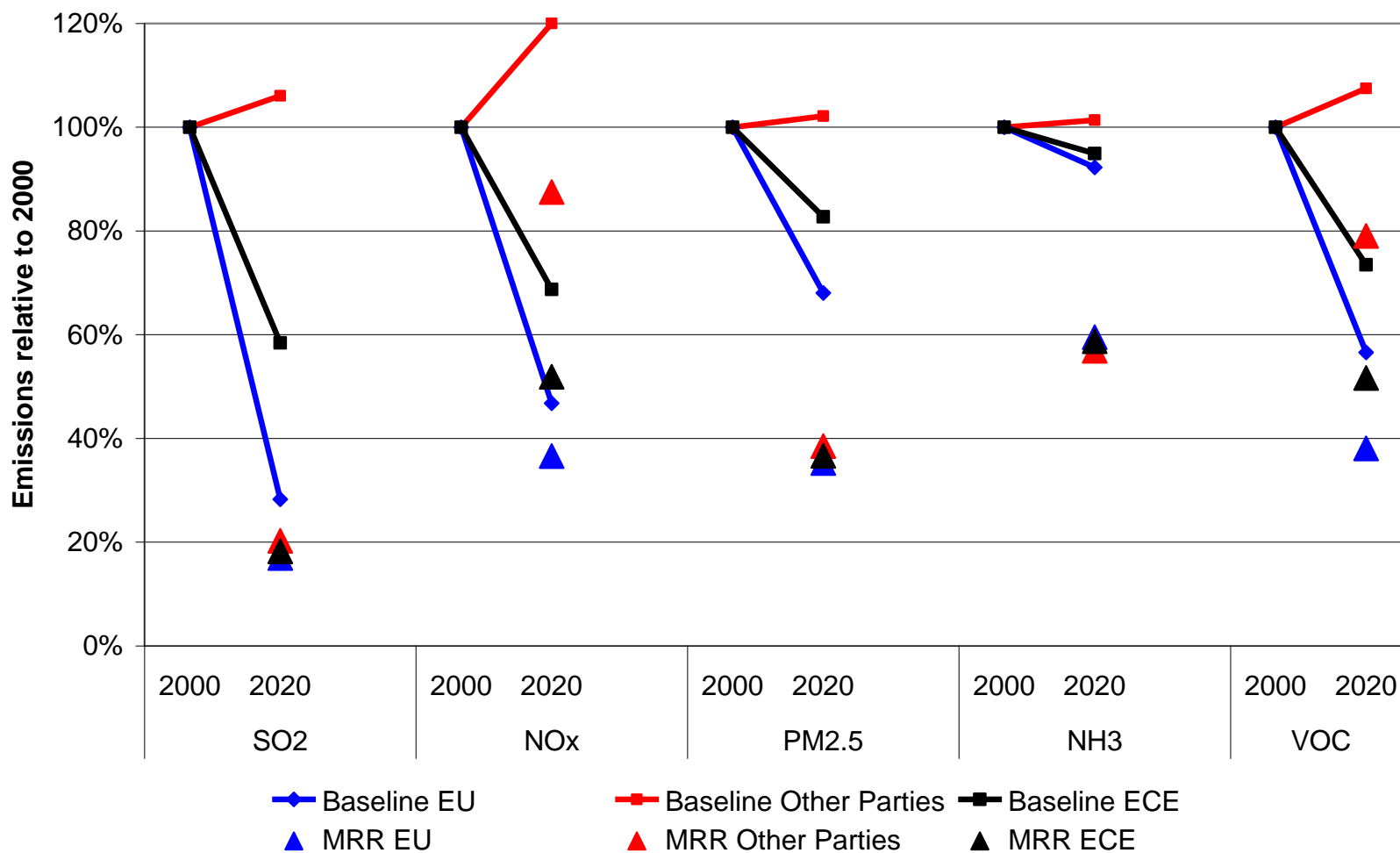


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Baseline and MRR emissions relative to 2000





Proposal for revision of Annex IX and Guidance Document (option A)

Advisory code of good agricultural practice:

1. ***Nitrogen management, taking account of the whole nitrogen cycle;***
2. ***Livestock feeding strategies;***
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5. Low-emission animal housing systems; and
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Ambition levels for mandatory “Advisory codes of good agricultural practice”

- “a Party shall publish and disseminate an advisory code of good agricultural practice to control ammonia emissions. The code shall take into account the specific conditions within the territory of the Party and shall include provisions on...”
- Should there be a requirement to report these Advisory Codes to the Convention?
- Should such a reporting be combined with reporting of mandatory measures implemented in fulfillment of Annex IX?
- Should the TFRN assist the Compliance Committee with reviewing the technical aspects of the Advisory codes?
- Should there be time-dependent and/or country-specific quantitative emission abatement targets in Annex IX so as to meeting various ambitious levels at various dates?

How to handle varying ambitions for NH₃ emissions abatement between Parties?

- Is there potential for a revised Annex IX to handle more than one ambition level for ammonia?
 - Some Parties agreeing ambitious commitments
 - Other countries e.g. ECCAA given more time or special provisions
- Is there an interest from Parties formerly outside the EMEP domain to adopt Annex IX, for example with special provisions?
- Note also the dynamic changes in the livestock sector (up-scaling, specialization/industrialization)

Slurry spreading methods are key to reducing ammonia emissions



The “Splash Plate Spreader” represents 1950s technology

Today, there are a wide range of low emission techniques available



The Ammonia Guidance Document specifies options for all likely soil conditions

Costs & Benefits Example: Spreading with “trailing shoe” to grassland

• Abatement cost for farmer	€ 1 - € 3	m^{-3}
• Benefits for farmer		
– Value of NH_3 -N saved	€ 0.5 - € 1.0	m^{-3}
– Agronomic flexibility	€ 0 - € 1.0	m^{-3}
• Co-benefits for society		
– Odour mitigation	€ 0 - € 1.5	m^{-3}
– Human health effects	€ 5 - € 10	m^{-3}
– Ecosystem benefits.....	€ 1 - € 5	m^{-3}
• Net benefit	€ 5 - € 15	m^{-3}

Abating NH₃ emissions from slurry spreading: What are the levels of ambition needed?

Current text: Requirement to use spreading methods with **>30%** abatement, **as far as Parties consider them applicable based on agronomic considerations.**

Various ambition levels possible and feasible:

- **Low ambition:** Current text
- **Modest ambition:** the existing text, plus a requirement for Parties to report (as percentage activities) the extent to which the approved methods are used, and to explain the reasons where they are not used.
- **High ambition:** unambiguous requirement to use any one of the low-emission spreading methods that abate emissions by >30...50....70%. Prohibition of the 'splash plate spreader' by e.g. 2020 to allow gradual change in the industry, with possible exemptions.

Abating NH_3 emissions from spreading of Solid Manures

- Current Annex IX text:
 - “a Party shall ensure that solid manure applied to land to be ploughed shall be incorporated within at least 24 hrs. of spreading as far as it considers this measure applicable, taking account of local soil and geomorphological conditions and farm structure”
- Should a stronger approach to such measures be taken?
- Immediate incorporation or <3 hours is scientifically justified

Ambition levels for abating NH_3 emissions from animal housing & manure storages

- Current Annex IX text:
 - “...on large pig and poultry farms...to reduce emissions by 20% or more...”
- Should a provisions be made also for cattle farms?
- Should quantitative emission abatement targets for housing have various ambition levels, i.e., from 20% to ..40 – 80%?
- Should quantitative emission abatement targets for manure storages systems be increased from 40% to ..60 – 80%?
- Scientific and practical evidence suggest that such provisions are feasible

Ambition level for mineral fertilizers

- **Existing:** “a Party shall prohibit the use of ammonium carbonate fertilizers.....and ‘shall take all feasible steps to limit ammonia emissions from the use of solid fertilizers based on urea, through the use of low-emission application techniques.”

Various ambition levels possible and feasible:

- Mandatory low emission techniques for application of urea? (e.g. injection, fertigation, ploughing in, urease inhibitors etc) that reduce emissions by 50,,,,80% to be implemented by 2015...2020...

Summary:

- A more integrated perspective to reduce ammonia emissions in the context of the nitrogen cycle can be outlined in Annex IX and the guidance document.
- Low-protein livestock feeding strategies can be included in Annex IX and the guidance document so as to reduce N consumption per unit produce (integral measure)
- Technical update on abatement efficiencies can be made in the guidance document.
- Technical update of abatement efficiencies can be made in Annex IX?
-etc.

Key questions for WGSR to guide TFRN

1. Does WGSR envisage a more integrated and ambitious approach for the abatement of ammonia emission in the GP revision? If so:
2. Should there be more than one ambition level? (e.g. provisions for ECCA countries, countries formerly outside EMEP; Options A, B, C, D?)
3. Should there be more strict and unambiguous provisions for low emission spreading of slurries, solid manures and urea fertilizers?
4. Should there be more strict provisions for low emission housing and manure storages for large pig and poultry farms?
5. Should there be provisions for cattle housing and manure storages?
6. Should there be a requirement to report and review the Advisory Codes and the implementation of the mandatory measures?