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Task Force on Reactive Nitrogen (TFRN)

Update and
Proposals for revision of Annex IX
of the Gothenburg Protocol

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WGSR-47, 30 August – 3 September 2010



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;

TFRN documents to WGSR-47

1. **Report of TFRN-4**, with Annex
(ECE/EB.AIR/WG.5/2010/13)
2. **Draft revised technical Annex IX of GP**
(ECE/EB.AIR/WG.5/2010/14)
3. **Clean copy of draft revised technical Annex IX;**
Informal Document 2
4. **Draft Guidance document for preventing and abating NH₃ emissions:** Informal Document 4
5. **Cost and benefits of nitrogen in the European Environment:** Informal Document 7
6. **Nitrogen and Climate; Draft executive summary**
Informal Document; hard copies distributed here

Report TFRN-4

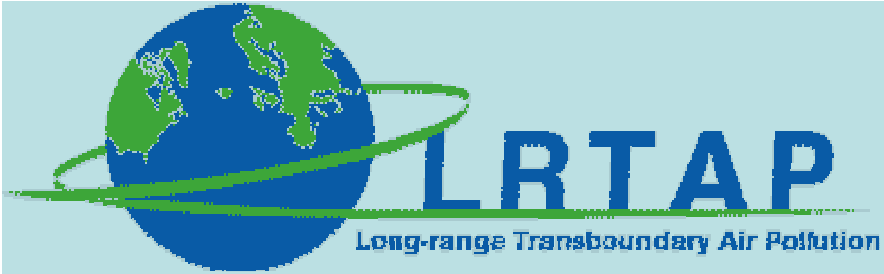
11-13 May 2010, Prague

1. Up-dating Annex IX and Guidance Doc.
2. Reports on National Nitrogen Budgets.
3. Report on Nitrogen & Food.
4. Report on Nitrogen & Climate
5. Reports from other conventions
6. National experiences on abating nitrogen emissions policies.



Nitrogen & Climate (i)

- Draft Executive summary available
- Main messages:
 - Nitrogen emissions to air and waters contribute to both air pollution and climate change.
 - Nitrogen management measures affect air pollution, climate change, food production and biodiversity simultaneously.
 - The relationships between nitrogen management and climate change mitigation are complex and not fully understood.



Nitrogen & Climate (ii)

Main messages (continued)

- However, there are opportunities: e.g., measures improving nitrogen use efficiency can lead to win-wins, with benefits for both air pollution and climate mitigation.
- Cost-benefit analyses of abatement policies on NH_3 and NO_x emissions should include also climate change effects.
- It is recommended that the Convention should collaborate with IPCC to further explore the policy opportunities for linking nitrogen, air pollution and climate.



Nitrogen and Food

- The Expert Panel suggest to focus on the European part of the UNECE region, but including the potential effects on feed production outside of Europe, and of import and export of meat and dairy products.
- Suggest to focus on the consequences of dietary changes and not on how to achieve such changes.



Ongoing work TFRN

- Launch of European Nitrogen Assessment & Policy workshop (11-15 April 2011);
- Finalization of Report “Nitrogen & Climate”;
- Continue the work on ‘Nitrogen budgets’ and ‘Nitrogen & Food’
- Further work on Guidance Document, Annex IX
- TFRN-5: Focus on costs (Paris, 25-28 October 2010)
- TFRN-6: Full meeting (10-12 May 2011, Italy)



End first part of this report

Comments, Questions?

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Current Annex IX of Gothenburg Protocol addresses a fraction of the total emissions of NH_3 from agricultural sources

- A. Advisory code of good agricultural practice;
- B. Ban on ammonium carbonate fertilizers; limit emissions from urea fertilizers, when feasible;
- C. Manure application: target of >30% emission reduction, when feasible;
- D. Manure storage: large pig & poultry farms: target of >40% emission reduction for new stores; and 40% for existing stores when feasible; and
- E. Animal housing: target > 20% emission reduction for new housing of large pig & poultry farms.

Up-dating Annex IX, because:

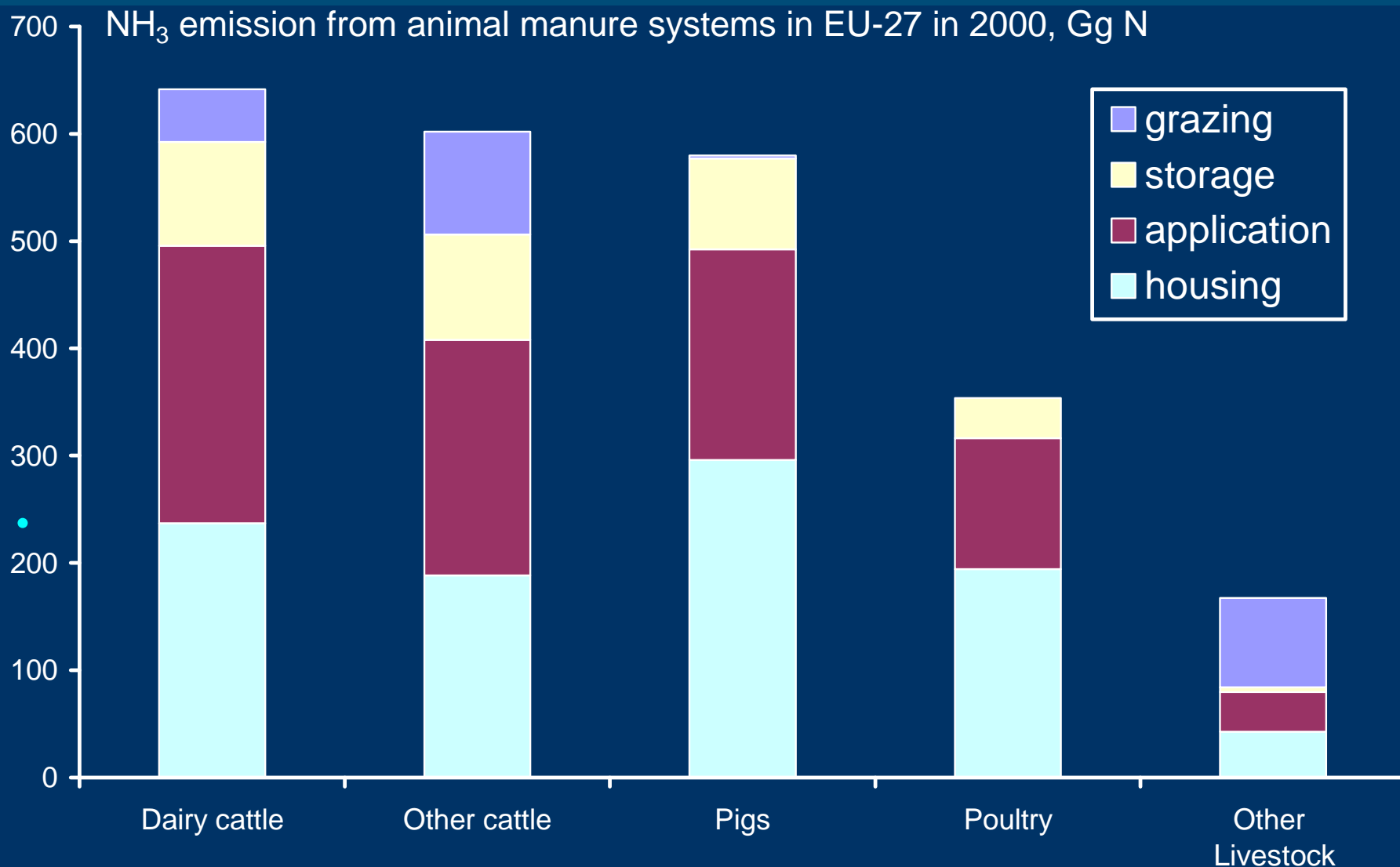
NH₃ emissions contribute to:

- Decrease of human health
- Biodiversity loss
- Soil and water acidification
- Climate change (positive & negative effects)
- Indirect effects (nitrate leaching, etc.)

Reductions of NH₃ emissions have been very modest since 2000:

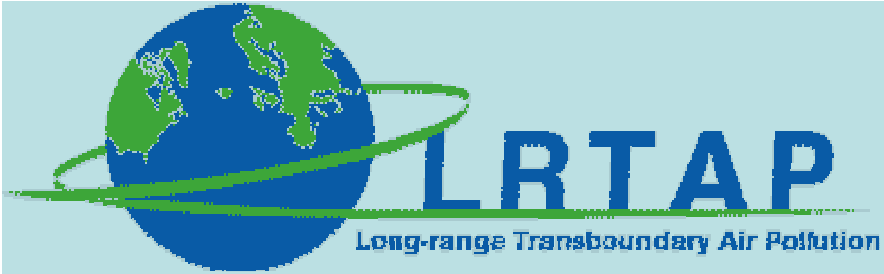
- On average ~5% (UNECE) to ~10% (EU)
- In some countries ~50%
- Changes in NH₃ emissions due to:
 - Structural changes in animal agriculture
 - Implementation of low-emission technology
- “Maximum” feasible reduction ~40-50%

Animal manures are main sources of NH₃ emission



Plus 10% from fertilizers + 10% from other sources

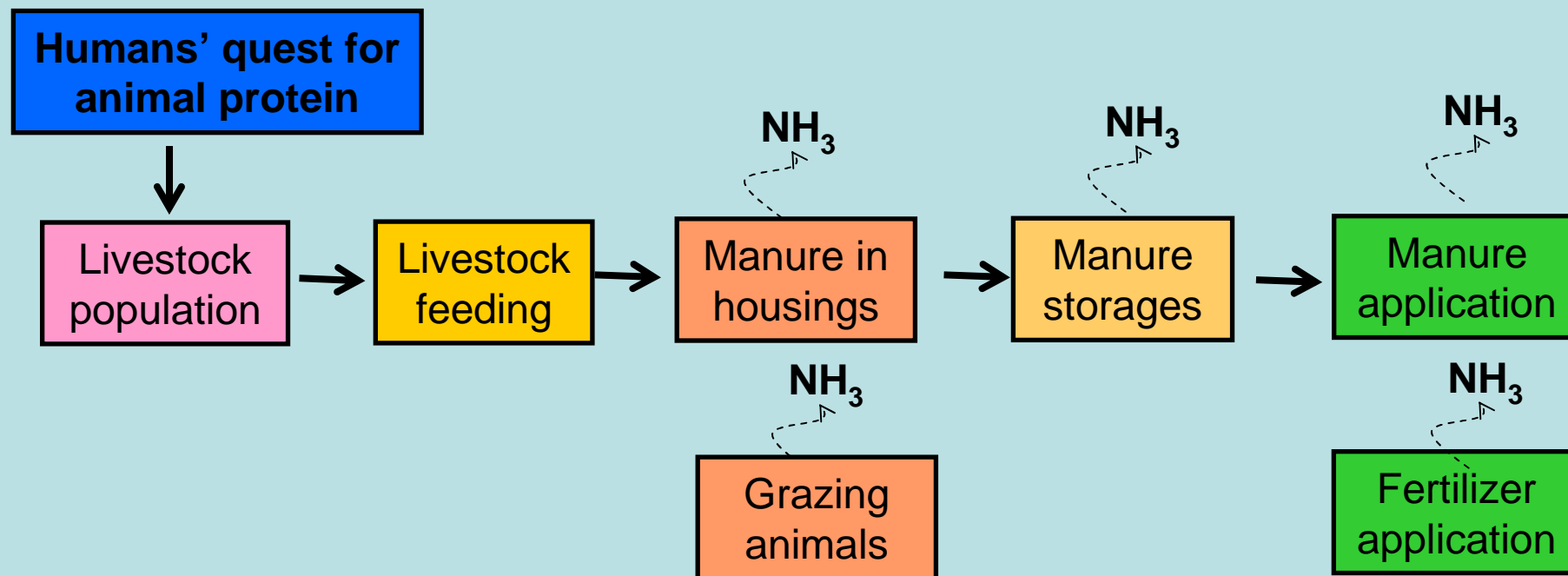
Oenema et al., 2008



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, **ammonium phosphate and ammonium sulphate**

Sequence of processes that affect total NH₃ emissions



Measures of proposed/revised Annex IX

- | | |
|----------------------------------|--|
| 1. Nitrogen management: | affect all sources |
| 2. Livestock feeding strategies; | affect all manure sources |
| 3. Animal housing systems: | affect one source |
| 4. Manure storage systems; | affect one source |
| 5. Manure application | affect one source, but cumulative |
| 6. Fertilizer application: | affect one source |



Three ambition levels

- A. Technically feasible options that reflect a high level of ambition in reducing NH_3 emissions, while remaining cost effective
- B. Technically feasible options that reflect a moderate level of ambition, as well as being cost effective;
- C. Technically feasible options that reflect a modest level of ambition, as well as being cost effective;



Ambition levels (A, B, C) vary in targets, thresholds and implementation dates

- **Targets:**
 - Emissions reduction targets
 - Improvement targets for N use efficiency, N balances and feeding strategies

- **Thresholds**
 - Farm size
 - Size of tankers for manure spreading

- **Implementation dates:**
 - Various dates



Selecting farm size thresholds

- **Threshold for cattle farming (~50% agric NH₃)**
 - > 50 livestock units (covering 13% of farms in EU; 72% of cattle)
 - > All new or largely rebuild farms with >5 livestock units

- **Threshold for pig farming (~20% agric NH₃)**
 - > 750 sows & > 2000 fattener pigs (covering ~20% of EU poultry)
 - > 200 livestock units (covering ~70% of pigs in EU)
 - All new or largely rebuild farms with >5 livestock units

- **Threshold for poultry farming (~15% NH₃)**
 - > 40,000 chickens (covering ~70% of EU poultry)
 - All new or largely rebuild farms with >5 livestock units



B. Nitrogen management at whole-farm

- Nitrogen Use Efficiency (NUE) and Nitrogen Input-Output Balances (NIOB) proposed as indicators
- First 5 years establishing baseline values on 'demonstration'/'pilot' farms; thereafter on
 - A: farms > 5 LU
 - B; farms > 50 LU for cattle; >200 LU of pigs; >40000 chickens
 - C: farms > 50 LU for cattle; current thresholds for pigs and poultry
- Improvement targets: relative change of 5 yrs averages
 - A: 30%
 - B: 20%
 - C: 10%



C. Livestock feeding strategies

- Animal feed composition (NH_3 emission potential) as indicator:
 - Protein content;
 - Non-starch polysaccharides content
 - Cation-anion balance

- First 5 years establishing baseline values
 - A: farms > 5 LU
 - B; farms > 50 LU for cattle; >200 LU of pigs; >40000 chickens
 - C: farms > 50 LU for cattle; current thresholds for pigs and poultry

- Improvement targets: relative change of 5 yrs averages
 - A: 30%
 - B: 20%
 - C: 10%



D. Animal housing

- **Existing large pig & poultry farms:** >20% reduction as now;
- **New pig houses with >5 LU;** reduction targets:
 - A: >35% when T in summer >20 C; else >60%
 - B: >25% when T in summer >20 C; else >35%.
 - C: >25%
- **New broiler farms with >5 LU:** >20% reduction;
- **New laying hen houses with >5 LU;** reduction targets:
 - A: >60%
 - B: >60% for non-caged hens and 50% for hens in cages
 - C: >60% for non-caged hens and 30% for hens in cages
- **New cattle farms with >5 LU:** >25% reduction target, when feasible
- **Other livestock with >5 LU;** reduce NH₃ emissions when feasible



E. Manure Storage

- **New slurry stores; reduction targets:**
 - A: 80%; implementation when ratified
 - B: 60%; implementation in 2017/2019
 - C: 40%; implementation in 2017/2019

- **For existing slurry stores: reduction target >40%**

- **Solid manure: reduce NH₃ emissions when feasible :**



F. Manure application

- Low-emission spreading methods, such as band spreading and slurry injection have been shown to be cost-effective.
- Proposed to phase out the unabated, surface application of slurry by 2018/2020: according to three ambition levels.

Targets and Options

- Targets depend on soil & crop conditions, slope, farm size, tanker size (see Tables for levels A, B and C):
 - A: > 60%, with relaxation to 30% for small farms
 - B: > 30% for all farms, with exemptions
 - C: > 30%, with full exemption for small farms
- No requirements for smallest farms (<5 LU)

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...



PROPOSED OPTIONS

G. Urea and ammonia-based fertilizers

- Ban on ammonium carbonate fertilizers
- Urea-based fertilizers: emission reduction targets:
 - A: >80%
 - B: >50%
 - C: >30%
- Ammonium sulphate and phosphate based fertilizers: emission reduction targets:
 - A: >80%
 - B: >50%
 - C: >30%

Guidance Document for abatement of NH₃ emissions

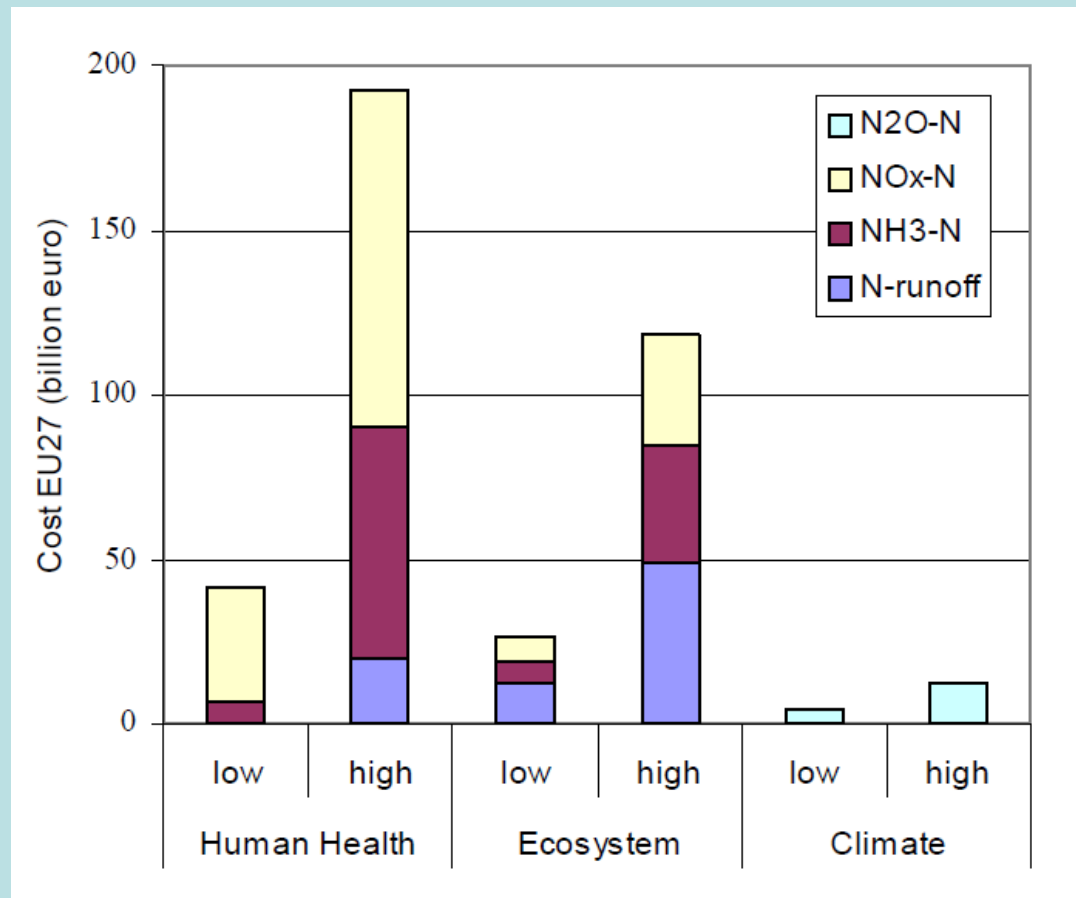
- Revised draft version available; further revision needed, especially on cost-benefit analyses (TFRN-5, Paris, October 2010).
- The Guidance Document lists 3 categories of techniques/approaches:
 - Category 1: well proven
 - Category 2: sound, but some uncertainties
 - Category 3: with problems and not recommended
- Categories 2 and 3 may be used to meet Annex IX commitments, but suitable verification should be provided by the Party.



H. Reporting requirements

- Report quantitative data on the measures as outlined in this Annex, to facilitate the sharing of information and experience of ammonia mitigation.
- Where measures are used, other than those listed as Category 1 in the Ammonia Guidance Document, Parties shall report and provide justification of the verification procedures.

Societal Costs and Benefits: Is it worth it?



European
Nitrogen
Assessment,
(In press)

WGSR-47
Inf. Doc. #7

- Societal costs, €10-€20 damage / kg N emitted for each form
- Major net benefits of mitigating reactive nitrogen
- Paris Workshop TFRN-5: refine costs-benefits for the farmer



Concluding Remarks

- Option A has the potential to reduce NH_3 emissions by 30- 50%:
- Ammonia emission abatement through a more integrated nitrogen management approach is effective & challenging;
- Level playing field of policy measures across European Agriculture is important



Thank you for your attention

Comments, Questions?

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