

Relevance of nitrogen co-benefits for GP Review

- GP review: the need to **go further on NH₃**
- Sustainable Nitrogen Management helps reduce **all forms of wasted N simultaneously**, inc. NH₃, NO_x, N₂O, NO₃⁻ & N₂ losses
- **Example: NO_x emissions from agricultural soils** excluded from Revised GP. These need to be included, offering opportunities to go further.
- Although environmentally benign, **reducing N₂ emission saves N_r resources, so saving money**. Halving total nitrogen waste globally offers a resource-saving worth US\$100 billion annually.¹
- **Win-wins-wins can help overcome the barriers to change**.

¹ “UNEP Frontiers 2018/2019: Chapter 4: *The Nitrogen Fix*”

Recommend WGSR take note of the UNEA5.2 resolution on Sustainable Nitrogen Management

New thinking to inform
Gothenburg Protocol review/revision



United Nations Environment Assembly of the United Nations Environment Programme

UNEP/EA.5/L.12/Rev.1

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United Nations Environment Assembly of the
United Nations Environment Programme
Fifth session
Nairobi (hybrid), 22–26 February 2021
and 28 February–2 March 2022*

Draft resolution on sustainable nitrogen management

The United Nations Environment Assembly,

Noting with concern that excessive levels of nutrients, in particular reactive nitrogen and phosphorus, have significant impacts on species composition in terrestrial, freshwater and coastal ecosystems, with cascading effects on biodiversity, soil, water and air quality, ecosystem function and human well-being,

Noting with concern also that global-economy-wide nitrogen use is currently inefficient, resulting in a large proportion of anthropogenic reactive nitrogen being lost to the environment,

Noting the benefits that reducing nitrogen waste would bring to atmospheric, terrestrial, freshwater and marine environments and to human health, ecosystem services and efforts to combat pollution, climate change and biodiversity loss, ensuring food security while offering the potential to save billions of United States dollars annually,¹

Recognizing the need for coherent action to address the multiple global challenges posed by

UNEA5.2

Resolution on Sustainable Nitrogen Management

UNEP/EA.5/L12/Rev 1: (26 February 2022)

*“1. Encourages Member States to accelerate actions to **significantly reduce nitrogen waste globally by 2030 and beyond** through the improvement of sustainable nitrogen management;*

*2. Also encourages Member States to share information on **national action plans**, as available, according to national circumstances;”*

The resolution is already helping to:

- **raise awareness globally** on the need to take action on nitrogen (NGOs etc)
- **address the need for better coordination** of nitrogen policies, such as through an *interconvention nitrogen coordination mechanism*
- Developing a conversation about **‘nitrogen waste’**

Defining 'nitrogen waste'

ECE/EB.AIR/149 Guidance Document on Integrated Sustainable Nitrogen Management

- **Summary for Policy Makers as agreed at EB-40 (Dec 2020)**
*“A distinction is made between unreactive atmospheric dinitrogen (N₂) and reactive nitrogen forms (N_r), which represent valuable resources. Around 80 per cent of anthropogenic N_r production is **wasted** as air and water pollution and through denitrification back to N₂.”*
- **Para 78:** *“Although emission of gaseous N₂ does not lead directly to adverse environmental effects, its release can be considered as a waste of the energy used to produce N_r as well as a lost resource of useful nitrogen, indicating the need for N₂ emissions to also be addressed.”*
- **Para 113, Box III.1 on Metrics** **“total ‘nitrogen waste’, this being the sum of all nitrogen losses to the environment (including N₂ and all N_r forms)”.**

$$\text{Reduction in total N waste} = \frac{(\text{Reference N waste} - \text{Revised N waste})}{\text{Reference N waste}} \quad (\text{percentage})$$

(Variant option:
reduction in share of N wasted)

Way forward?

- **Transforming our thinking for the circular economy**

- Updating our language: From 'solid waste' & 'wastewater' to the new resource
- Identifying what is truly wasted...

- **Investing in recovery technologies**

- 'Wastewater' Treatment Plants
 - These currently waste nitrogen by denitrifying to N_2 (& expensive too)
 - Fertilizer production facilities of the future
- Opportunities to recover & reuse NO_x as fertilizer

- **Reflection for Gothenburg Protocol revision**

- A focus on reducing overall nitrogen waste offers flexibility and emphasizes the win-wins to help overcome barriers & accelerate action

GP Review: Which guidance & annexes need to be revised for nitrogen, agriculture & food?

• Ammonia Guidance Document

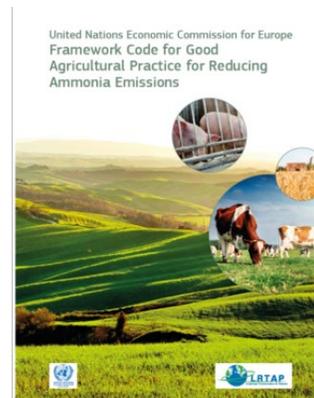
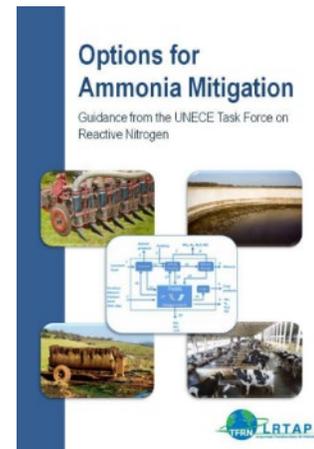
- 1999/2012 : “Guidance document on preventing and abating ammonia emissions from agricultural sources” (ECE/EB.AIR/120).
- Published 2014 as Bittman et al. “*Options for Ammonia Mitigation*”
- **Action:** Start revision process October 2022 (complete by 2024?)

• Ammonia Framework Code

- 2001/2015: “Framework Code for Good Agricultural Practice for Reducing Ammonia emissions” (ECE/EB.AIR/129).

Actions

- *Parties publish **National Ammonia Codes**, as required by Annex IX*
- Start revision process Framework Code in 2024 (based on revised GD).



Other Guidance Documents

- **Guidance Document on Nitrogen Budgets**

- Guidance from 2013 (ECE/EB.AIR/119)

Actions

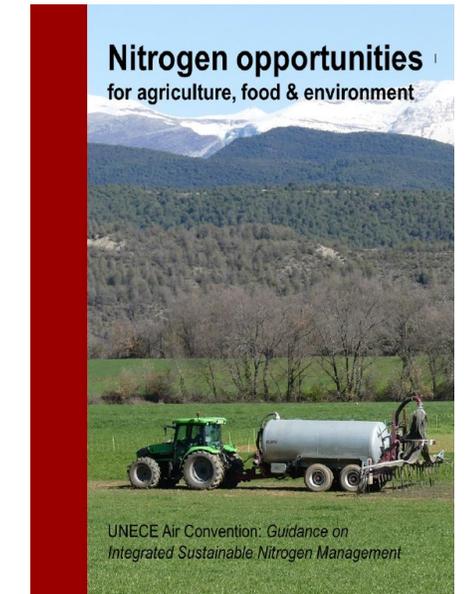
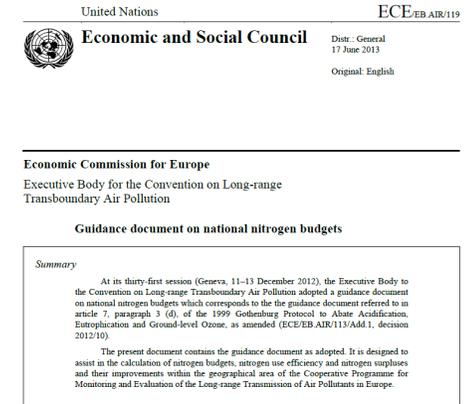
- Review current contents including technical annexes
- Publish authored version.
- Start process October 2022 (complete by 2024?)
- Mobilize visibility including use of INMS Visualization Tool

- **Guidance Document on Integrated Sustainable Nitrogen Management**

- Document adopted Dec 2020 at EB-40 (ECE/EB.AIR/149).

Actions

- Publishing authored version currently in press (for 2022)
- Mobilizing its actions with Parties, including on concepts



Where to do we stand with Annex IX?

Annex IX

- Reflects thinking from mid-1990s. Its now c. 25 years old
- Was a first position in a climate of fear about action on ammonia

Past Review

- 2008-2012 TFRN offered many options for revision of Annex IX (See Inf Doc *“Considerations on Ammonia...”* to EB-40, Dec 2020)
- 2012 Revision of GP did not revise Annex IX: lack of consensus; unable to go beyond existing 1990s legislation of some parties (e.g. EU).

Present Context

- More parties are taking action, e.g. EU NERC Directive inc. their Annex III
- Wide recognition that NH₃ emission reduction is “low hanging fruit”: low-cost measures with multiple benefits.
- Emerging recognition of NH₃ saving as part of the win-wins in reducing nitrogen waste across nitrogen cycle.

Ammonia & PM: UNECE in Global Context

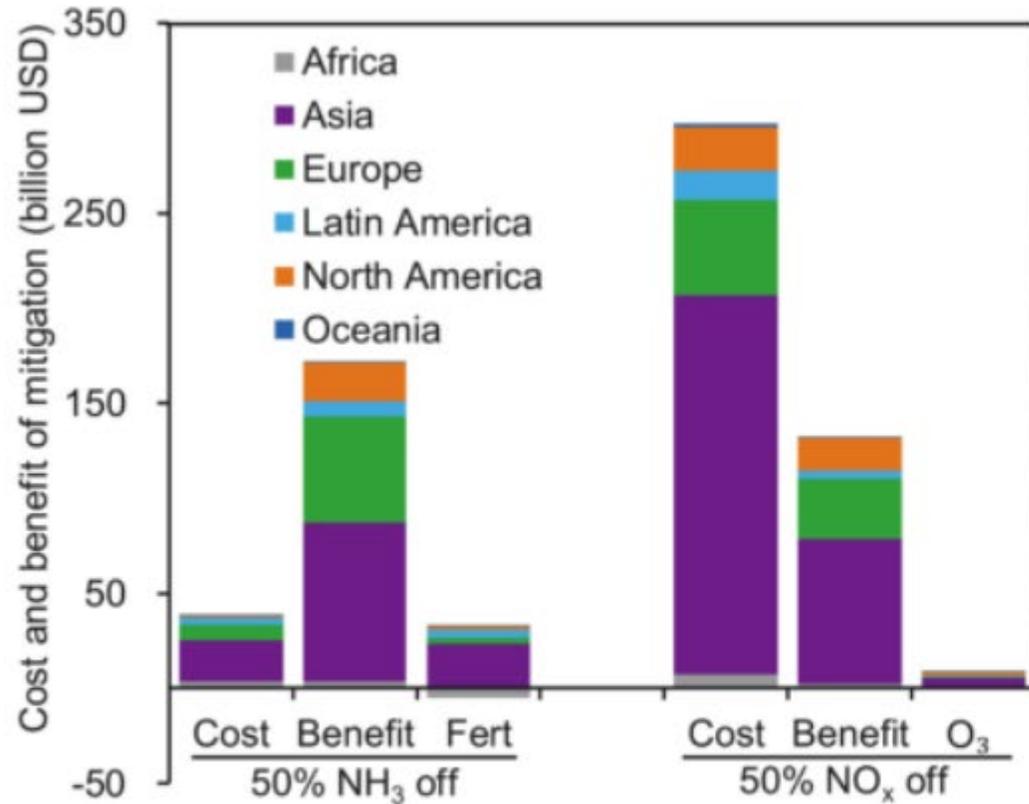
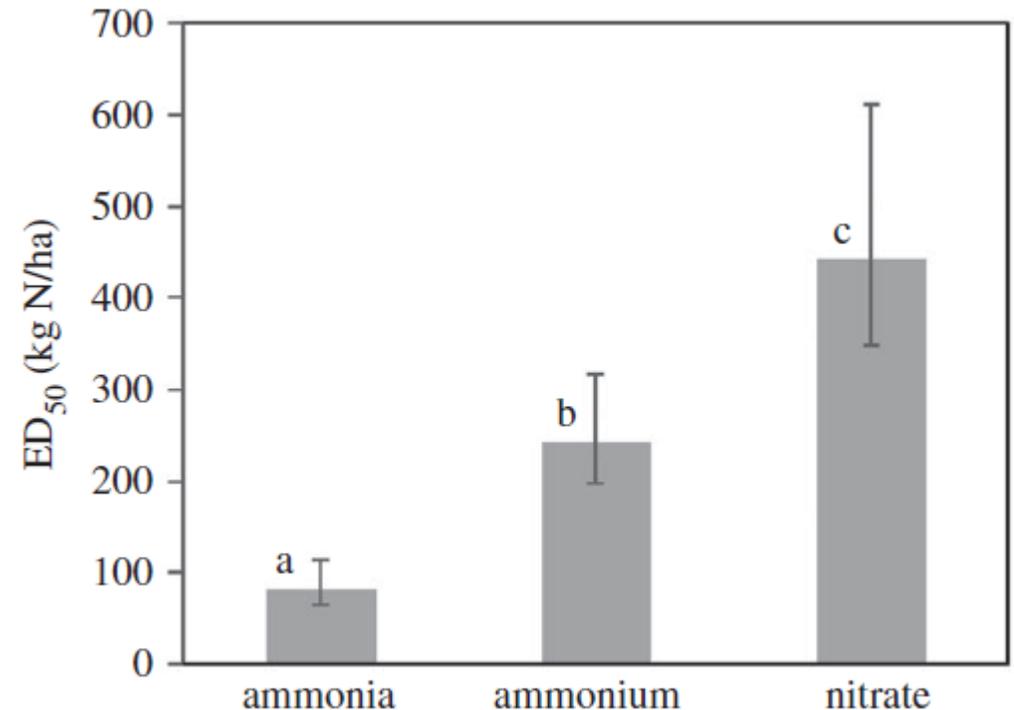


FIG. 3. Cost and benefit to reduce 50% of NH₃ and NO_x emission in 2013. **(A)** Abatement cost, benefit of prevented mortality from reduced PM_{2.5}, fertilizer saving (Fert), and ground-level ozone pollution (O₃) mitigation.

Ammonia & 'Alkaline Air'

- **Alkaline Air** the original name for ammonia (Joseph Priestley, 1774)
- **Gaseous Alkaline Fraction:** Large reduction of SO_2 and NO_x , leave NH_3 in increasing excess in many areas.
- **Gaseous NH_3 is worse** for natural acid ecosystems than other forms of N deposition
- We must also consider the alkaline air impacts of gaseous NH_3 on sensitive ecosystem



ED₅₀ = Eradication Dose 50: Dose where 50% of certain species eradicated. Data from Whim Bog, field enrichment experiment, Edinburgh.

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**



Three ambition levels; all technical feasible

- A. High level of ambition in reducing NH_3 emissions,
- B. Moderate level of ambition, as well as being cost effective;
- C. 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 (% decrease from reference)

➤ **Thresholds**

- Farm size, size of tankers for manure spreading

➤ **Implementation dates**

- Delayed implementation for countries in transition

Identifying Priorities to Support WGSR negotiation

Criteria for Priority Setting:

- a) availability and applicability of the measures across the UNECE region;
- b) being cost neutral or have a low cost to farmers, especially when considering their co-benefits;
- c) measures which give a big contribution to NH₃ emissions reduction & N cycle efficiency;
- d) long-term capacity-building.

If you committed to only 5 things what would they be?

5 top priorities for commitments in Annex IX

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.



11 years later: These conclusions still stand, with much more evidence and greater stakeholder willingness

Concluding remarks

- Many options are available for decreasing ammonia emissions, at relatively low cost.
- The options have been described in detail in the draft Annex IX and the draft Guidance Document.
- Ammonia abatement is part of improving N use efficiency in farming, helping meet climate & water pollution targets.
- 5 key priorities have been identified on a technical basis to support WGSR negotiation of the commitments.