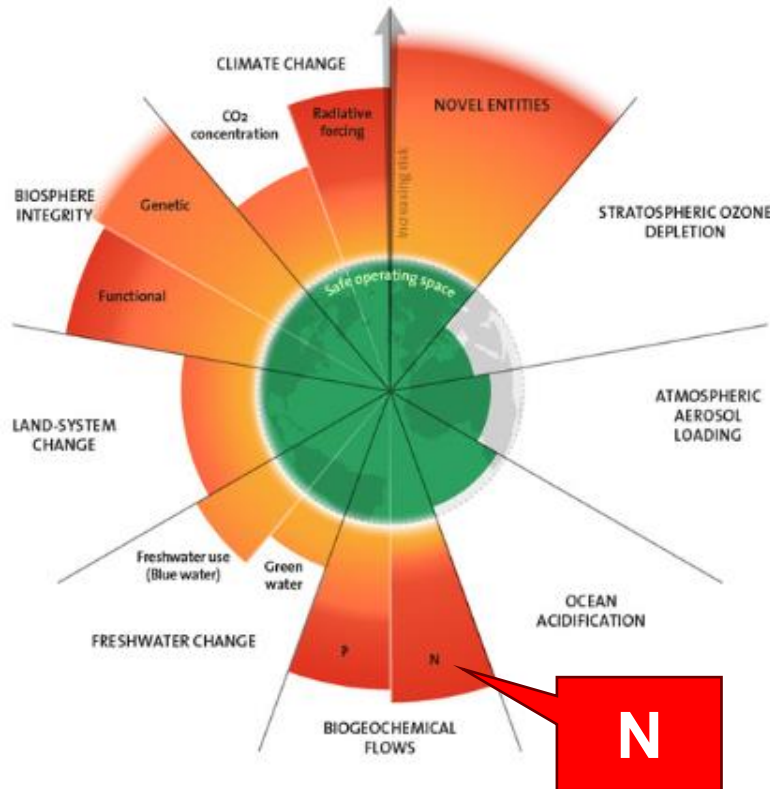


Way to the Sustainable Nitrogen Management, an issue in the Planetary Boundary

Principal researcher, AIST, Japan
Director, Nanoblue, Inc., Japan

Tohru Kawamoto
October 9th, 2024

Nitrogen emissions : one of the most serious issues on Planetary Boundaries
Problems, political trends and technical solutions are introduced



Facts about Nitrogen Pollution (from UNEP HP)

- Each year, 200 million tonnes of reactive nitrogen is lost to the environment
- 100 Billion USD could be saved by setting an ambitious goal to reduce nitrogen waste.

Climate change

- Nitrous oxide(N_2O) is 300 times more potent carbon dioxide as a greenhouse gas.

Biodiversity

- Nitrogen pollution is the biggest driver of biodiversity loss on the planet.

Air

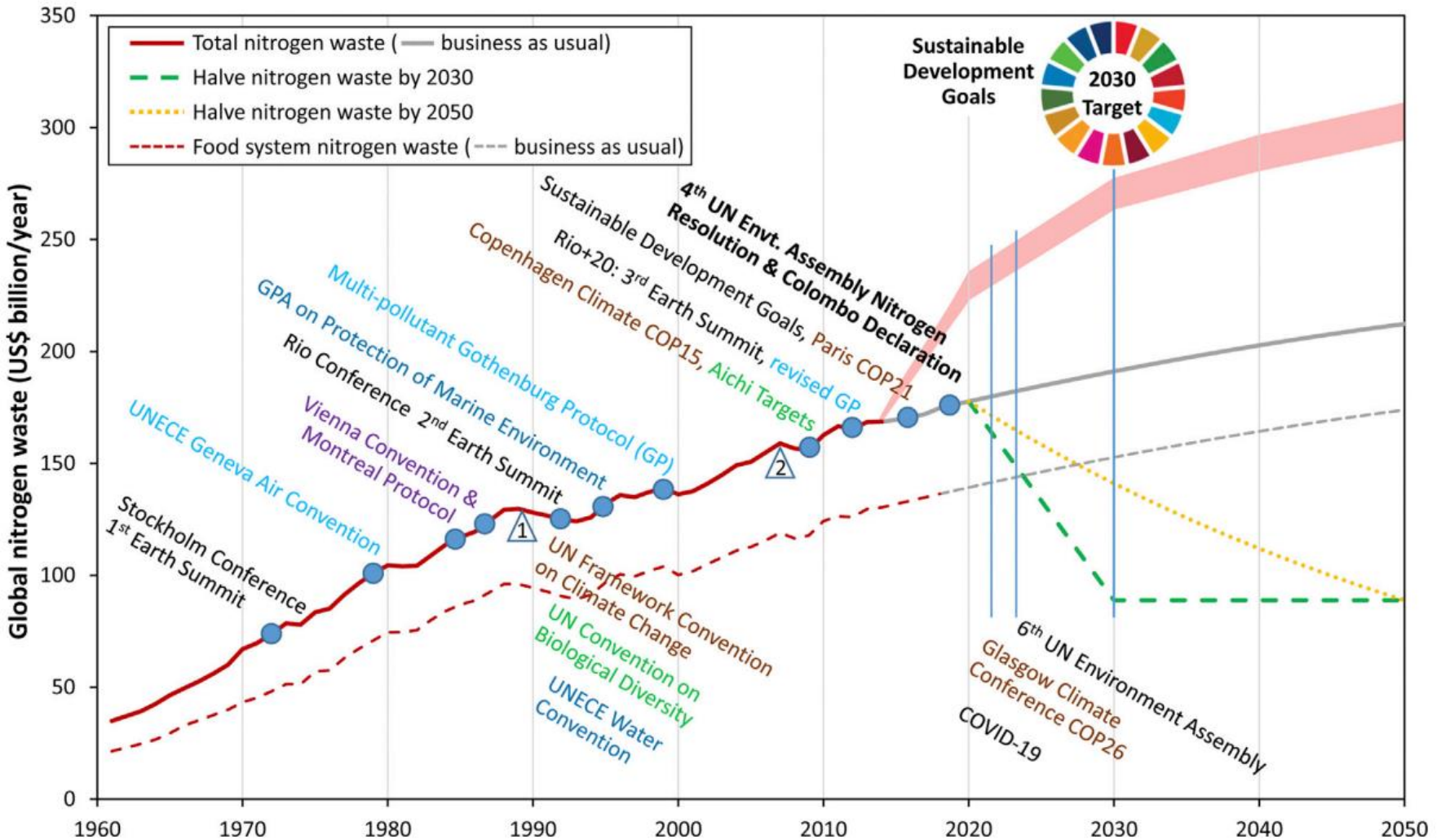
- Nitrogen oxides (NO_x) can lead to smog and ground-level ozone.
- Ammonia (NH_3) emissions create extremely dangerous particulates, e.g. $PM_{2.5}$

Stockholm Resilience Centre, <https://www.stockholmresilience.org/research/planetary-boundaries.html>

Why does nitrogen pollution matter?, <https://www.unep.org/facts-about-nitrogen-pollution>

Global nitrogen waste & UN agreements

As nitrogen waste is increasing, UN has also concluded various agreements.



Sutton, et al., *One Earth*, 2021, 4, 10

Nitrogen waste is increasing, and UN has also concluded various agreements.

Resolutions

UNEA-4(2019) 4/14 :

UNEA-5 (2022) 5/2 : “significantly reduce nitrogen waste globally” and a timeline “by 2030 and beyond”

CBD-COP15(2022) : reducing nutrients lost to the environment by at least half.

Actions

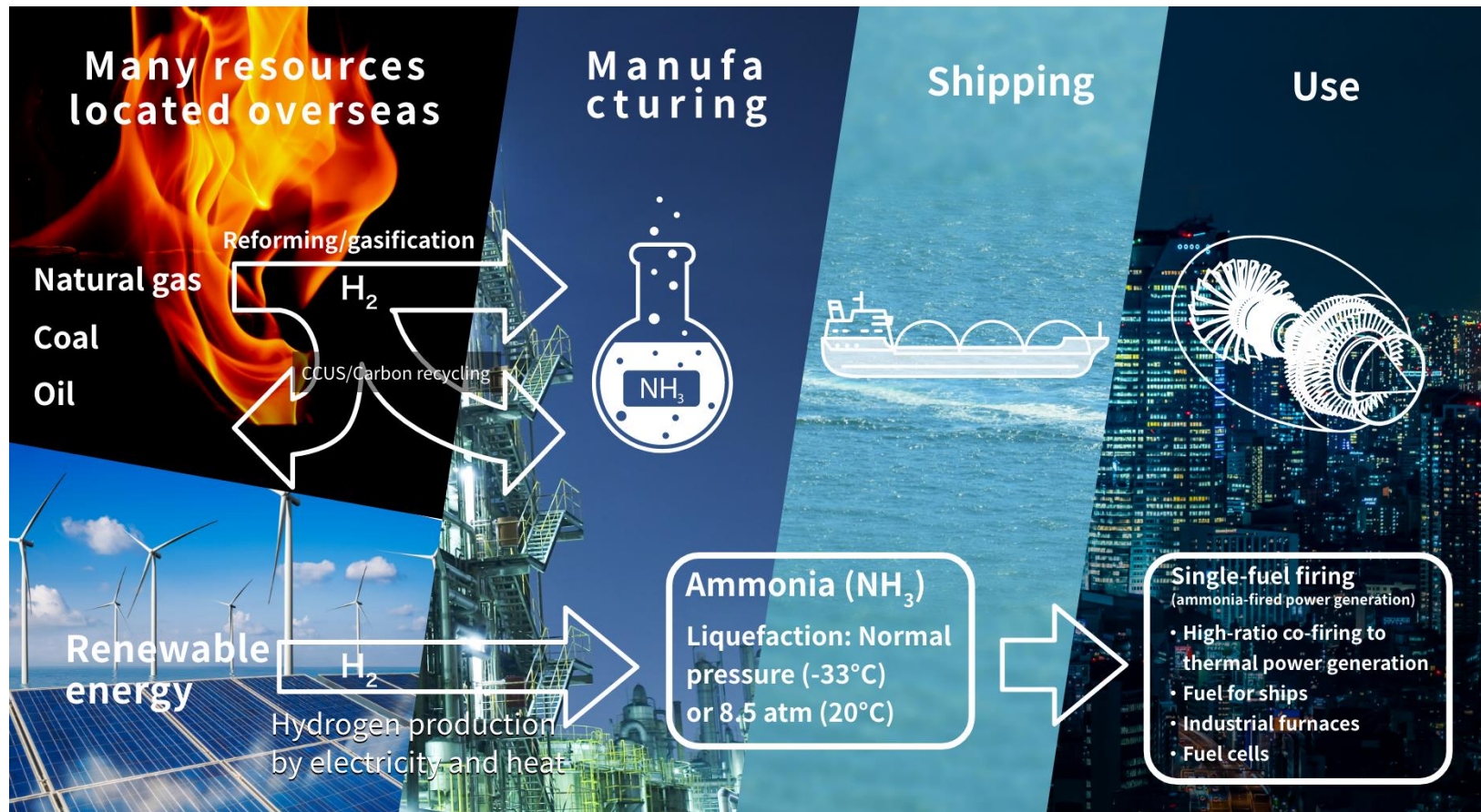
INMS(The International Nitrogen Management System, 2016-), developing international process, providing science-based support to policy makers globally.

UNEP WG on Nitrogen (2020-) The focal point of 95 countries has been nominated.



UNEA-4: <https://www.unep.org/resources/resolutions-treaties-and-decisions/UN-Environment-Assembly-4>
UNEA-5.2: <https://www.unep.org/resources/resolutions-treaties-and-decisions/UN-Environment-Assembly-5-2>

Fuel ammonia is attracting attention to achieve carbon neutrality.
The generation of nitrogen waste should also be controlled.



Japan's target of fuel ammonia: 3 Mtons in 2030, 30 Mtons in 2050
(current domestic production: 1 Mton)

<https://green-innovation.nedo.go.jp/en/project/building-fuel-ammonia-supply-chain/>

On September 27th, 2024, the Japanese government formulated an action plan for sustainable nitrogen management.

Ministry of Environment,
Japanese Government



環境省
Ministry of the Environment

ホーム

環境省について

政策

本文へ >

English

キーワード検索

検索

ヘルプ

法令

報道・広報

白書・統計

申請・手続き

報道発表資料

[ホーム](#) > [報道・広報](#) > [報道発表一覧](#) > 「持続可能な窒素管理に関する行動計画」の策定について

この記事を印刷

2024年09月27日

大気環境

水・土壌

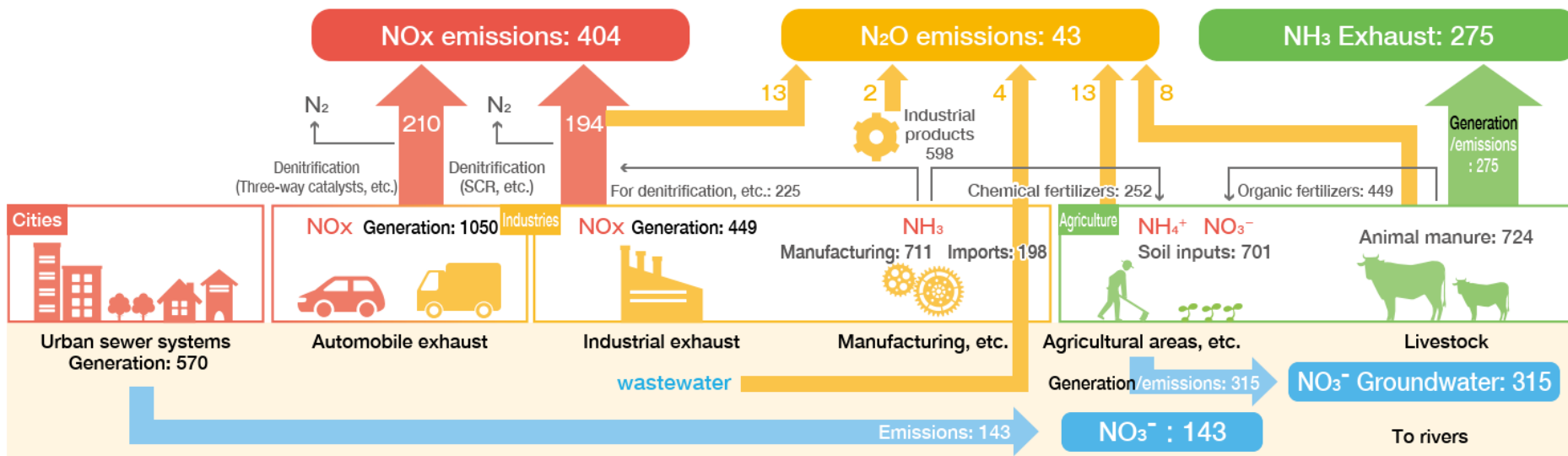
「持続可能な窒素管理に関する行動計画」の策定について

国連環境総会(UNEA)の決議を踏まえ、関係省庁連絡会議と専門家による議論を重ね、今般、「持続可能な窒素管理に関する行動計画」を策定しました。本計画に

https://www.env.go.jp/press/press_03772.html

NO_x, N₂O, NH₃ into air and NO₃⁻ (originally organic-N) is main issues

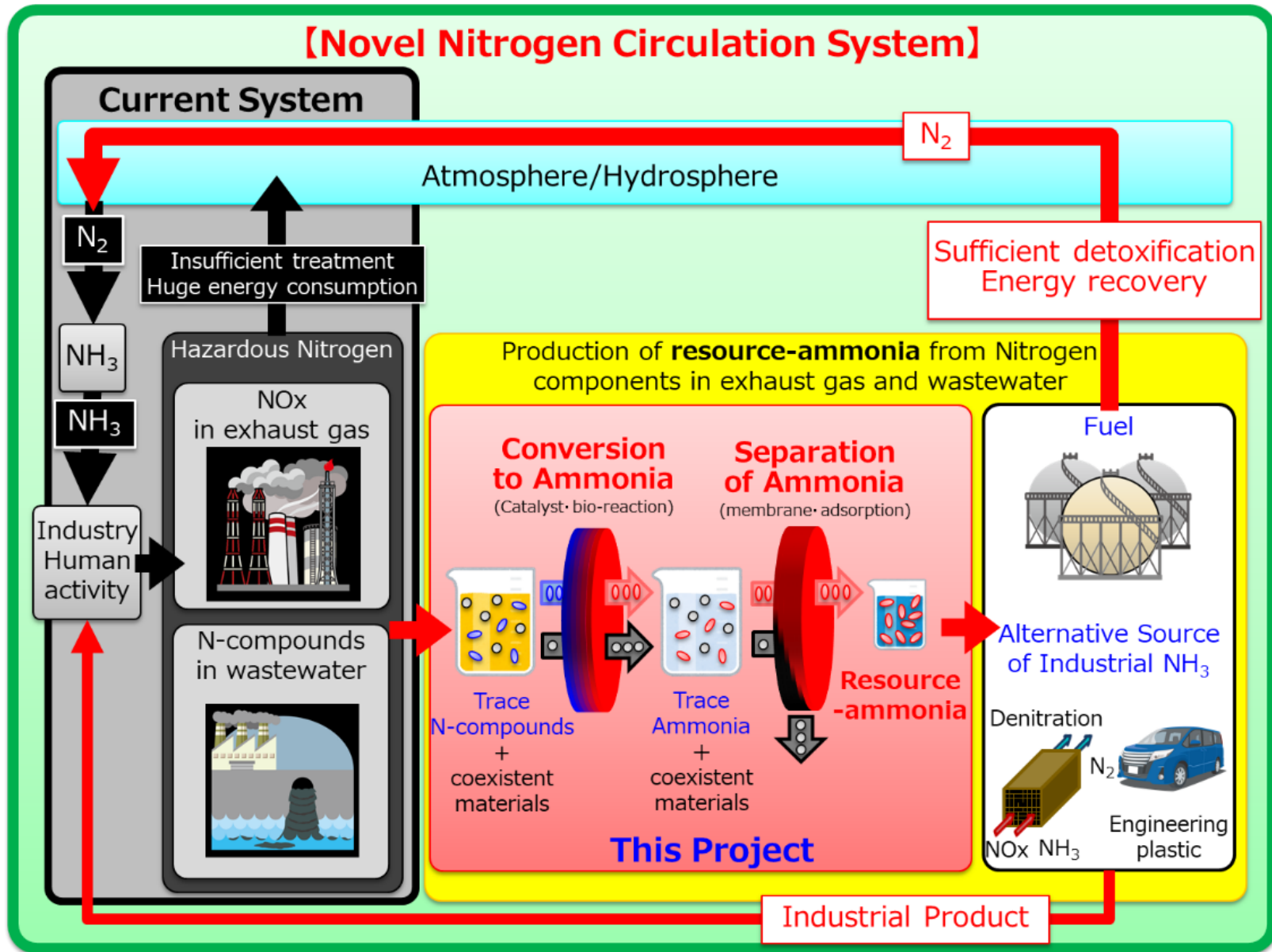
Major sources for the generation and emission of reactive nitrogen in Japan (unit: thousand tons-N/year)

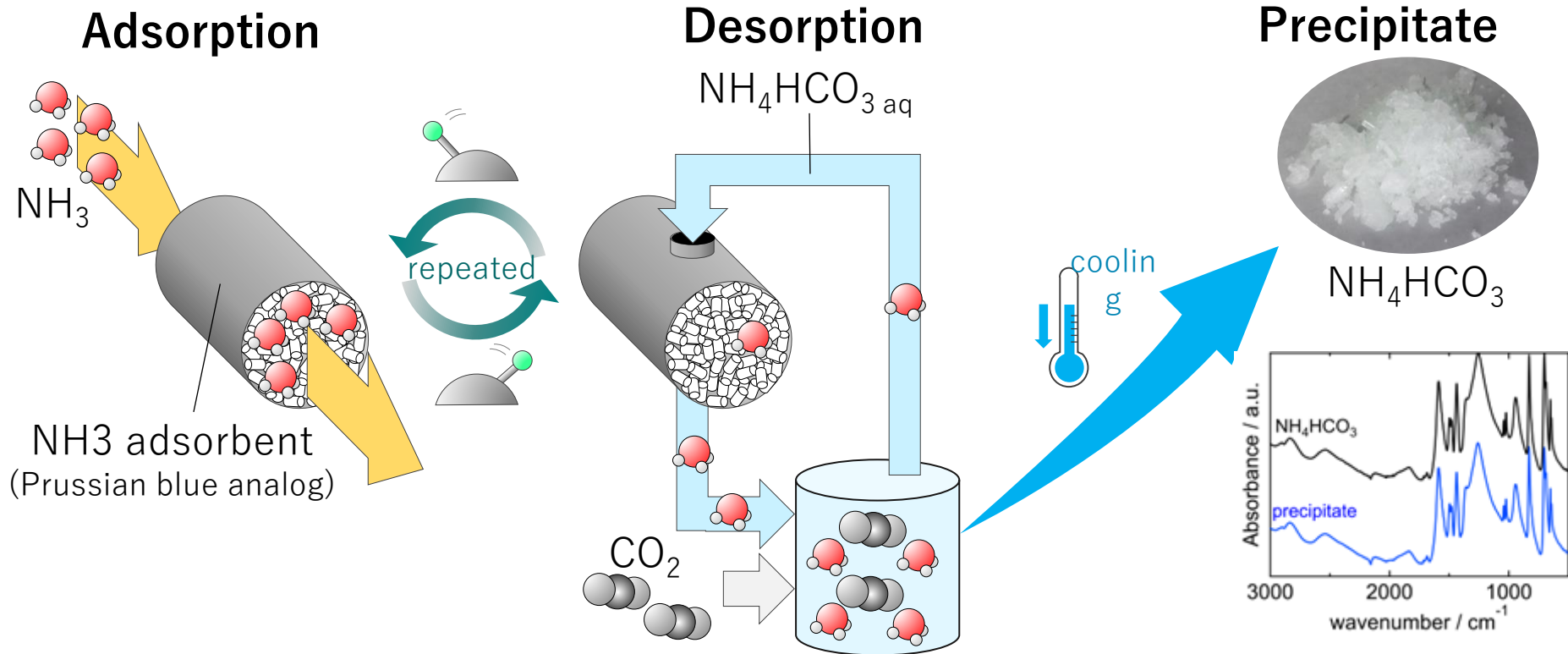


Gas phase: NO_x from industry and NH₃ from agriculture

Water phase: organic-N emitted from cities and agriculture become NO₃⁻

[Novel Nitrogen Circulation System]





- Converts to ammonium bicarbonate solids without heating and with low energy consumption
- Ammonium Bicarbonate is not toxic or deleterious substance. It is also a solid, which is advantageous for storage, etc.
- Ammonium Bicarbonate decomposes at low temperatures ($\sim 70^\circ \text{C}$) and is immediately converted to a gas mixture of $\text{NH}_3:\text{H}_2\text{O}:\text{CO}_2 = 1:1:1$

Usuda, ACS Sustain. Chem. Eng., accepted

NH_3 resource is recovered from the waste from ammonia power plant, factories, livestock farming, etc., contributing to Carbon Neutral, and Circular Economy

