



Less, better and circular use – how to get rid of surplus nitrogen without endangering food security

Webinar, November 15, 2023

Adrian Muller

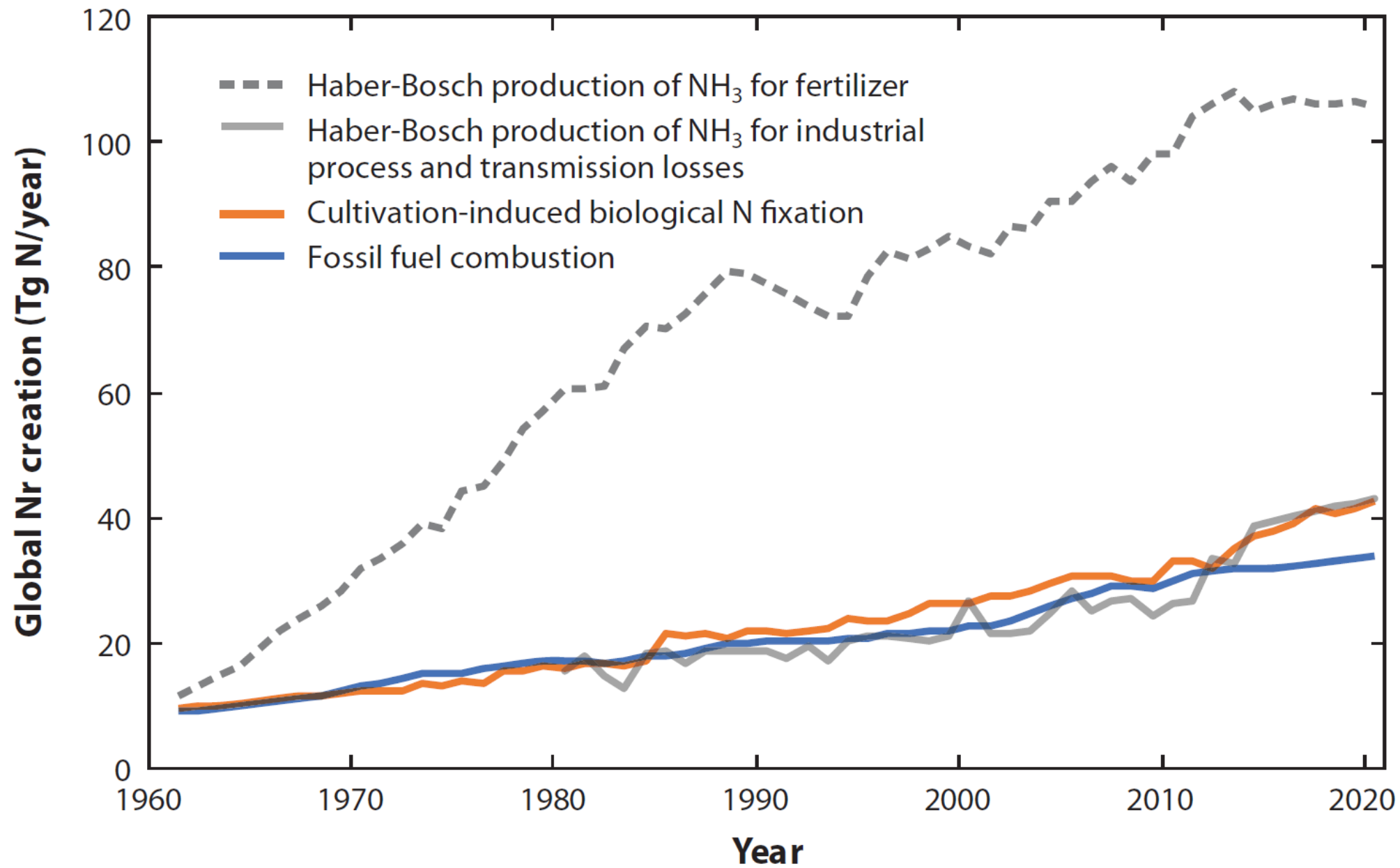
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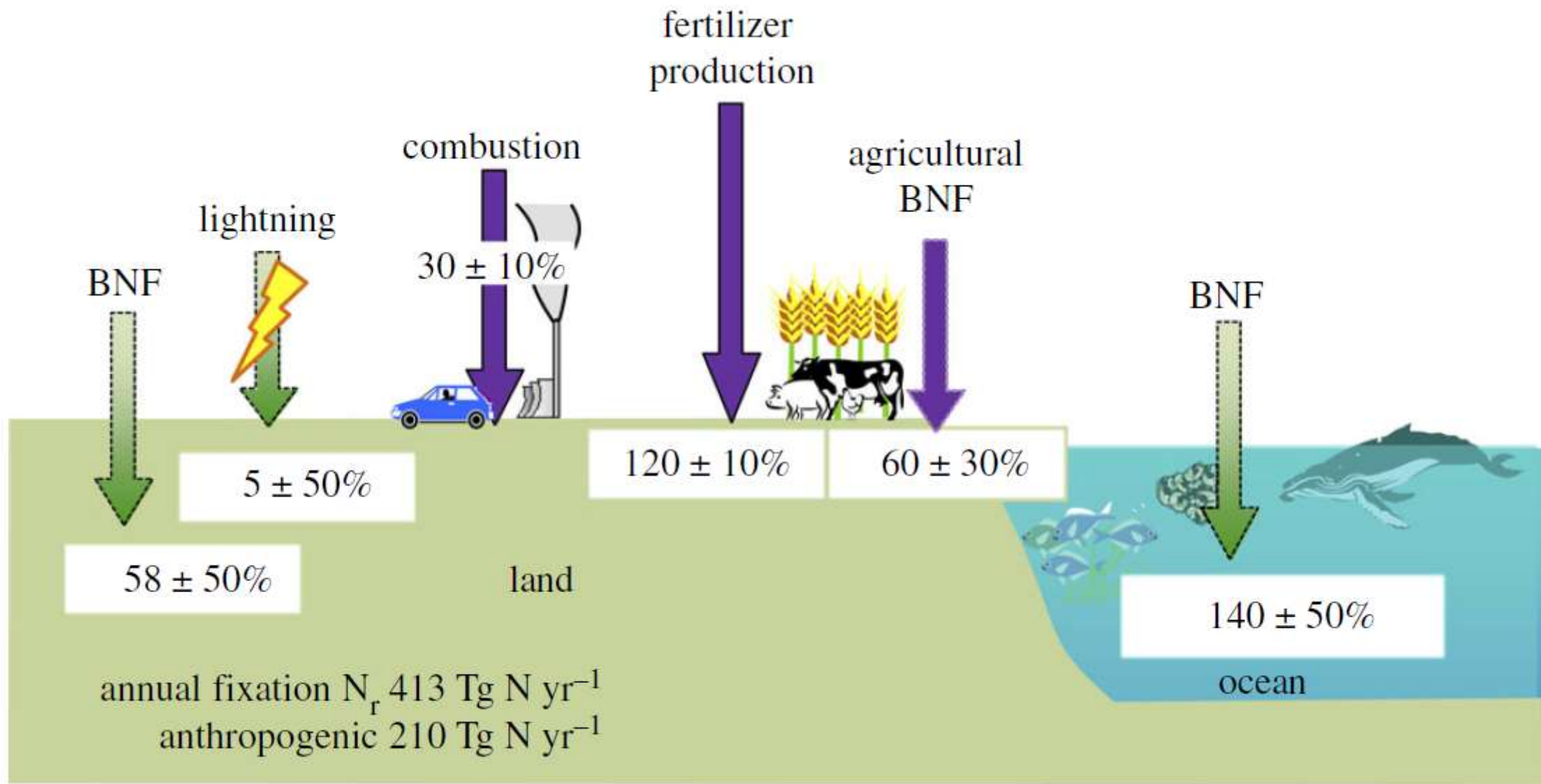


Kevin De Luca and Adrian Muller (2023)

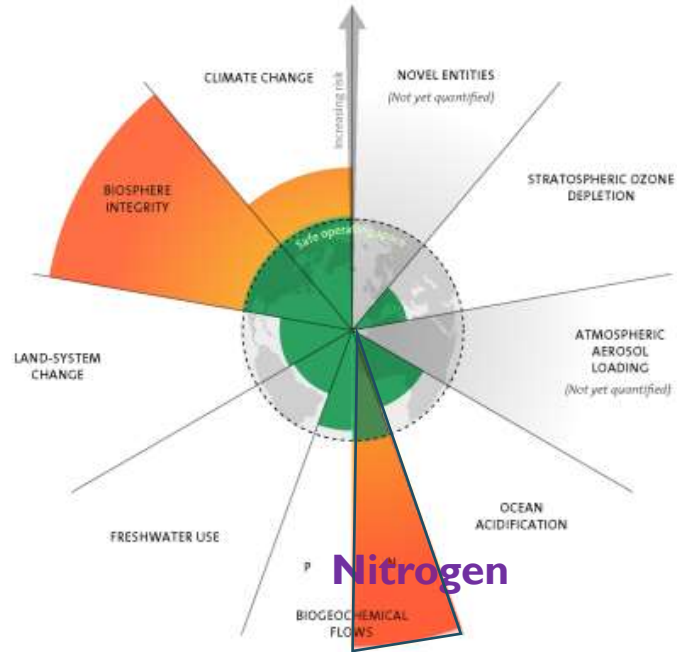
Less, better and circular use –
how to get rid of surplus nitrogen
without endangering food security,

Research Institute of Organic Agriculture FiBL,
<https://orgprints.org/id/eprint/51833/>



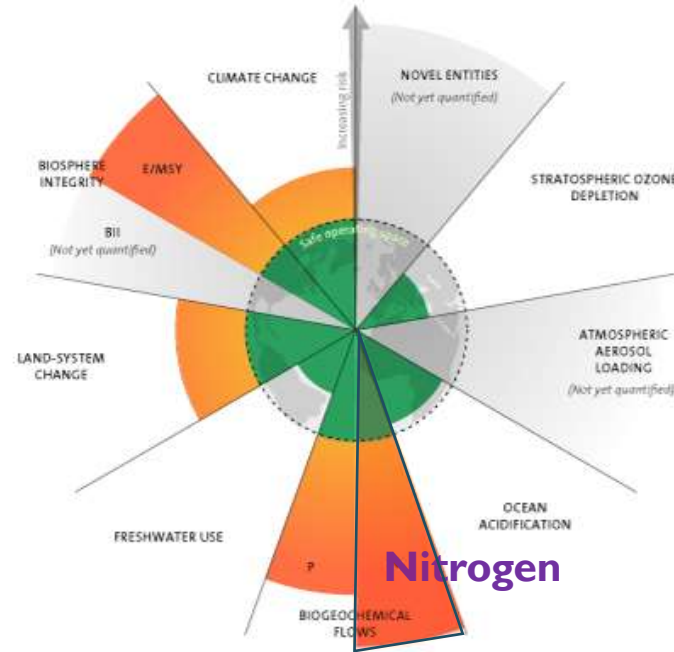


2009



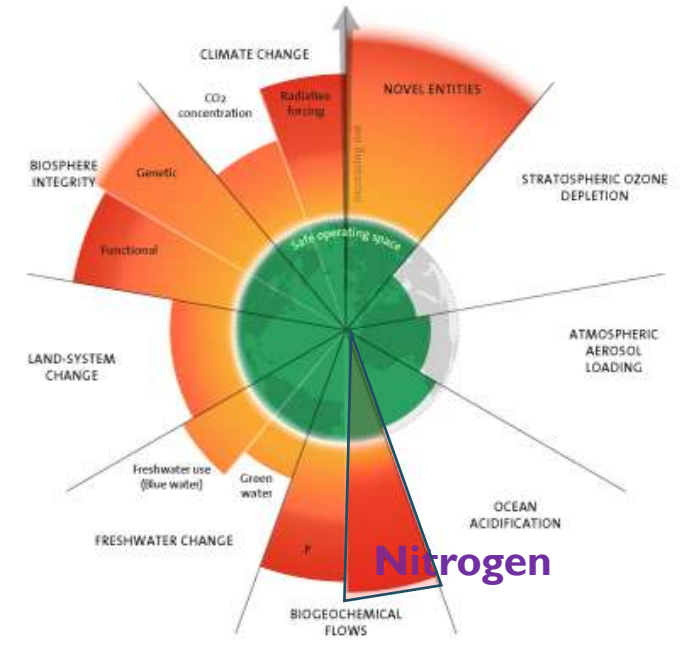
3 boundaries crossed

2015

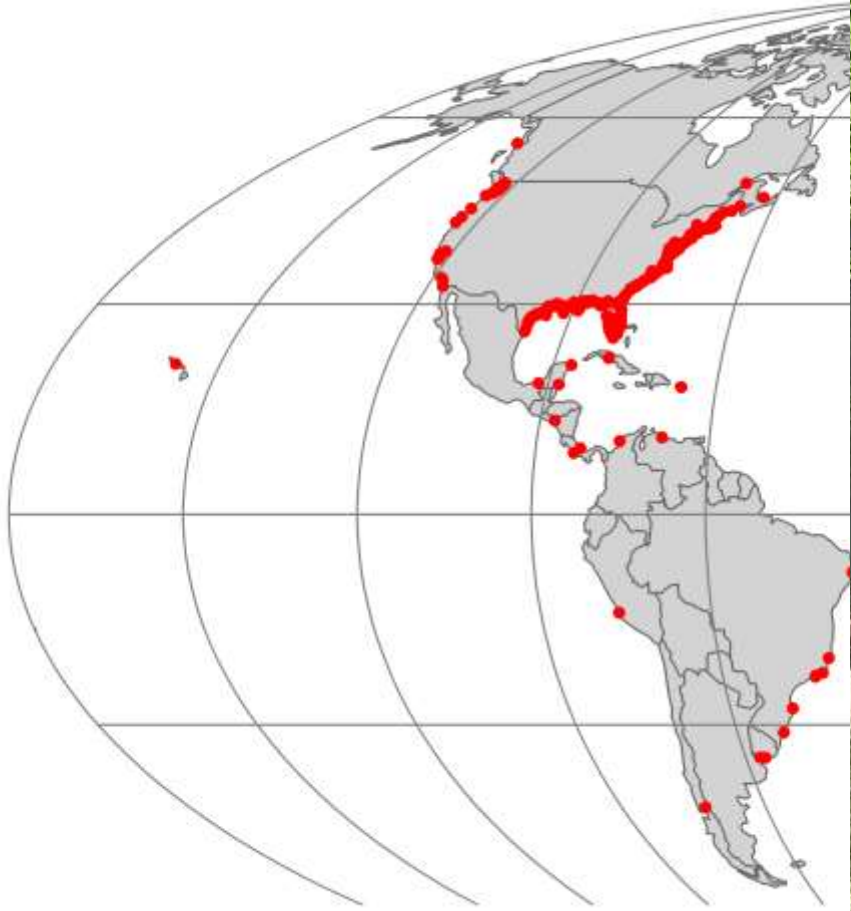


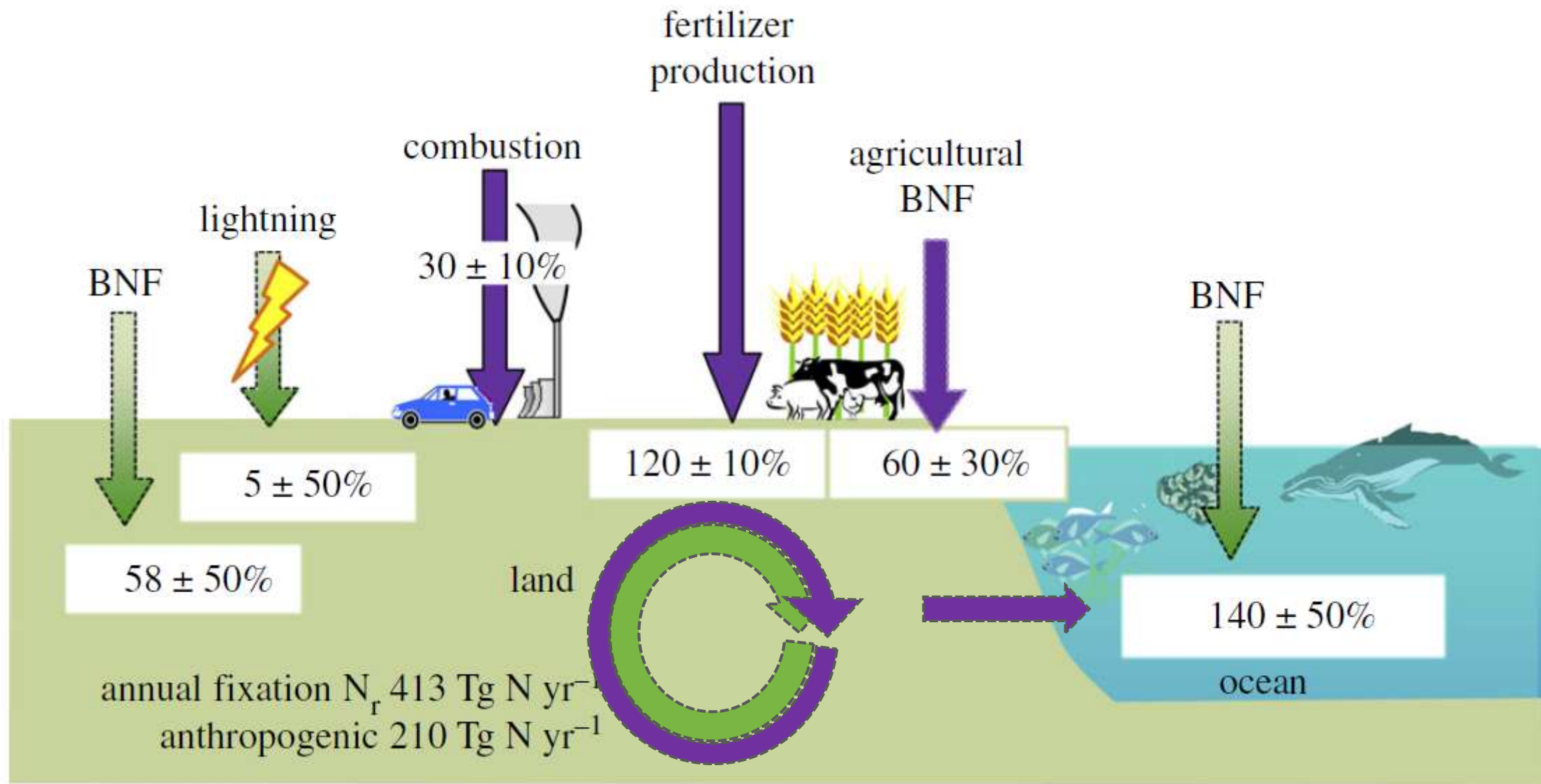
4 boundaries crossed

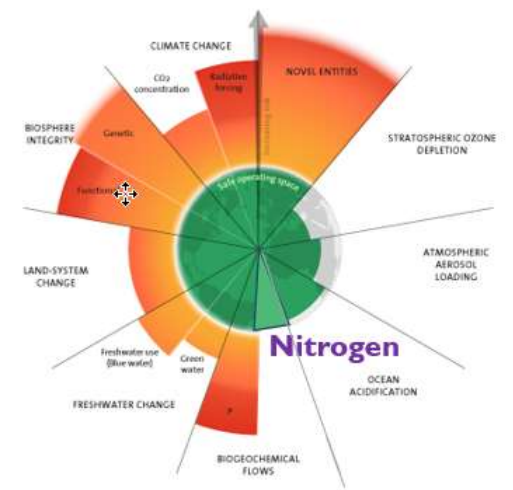
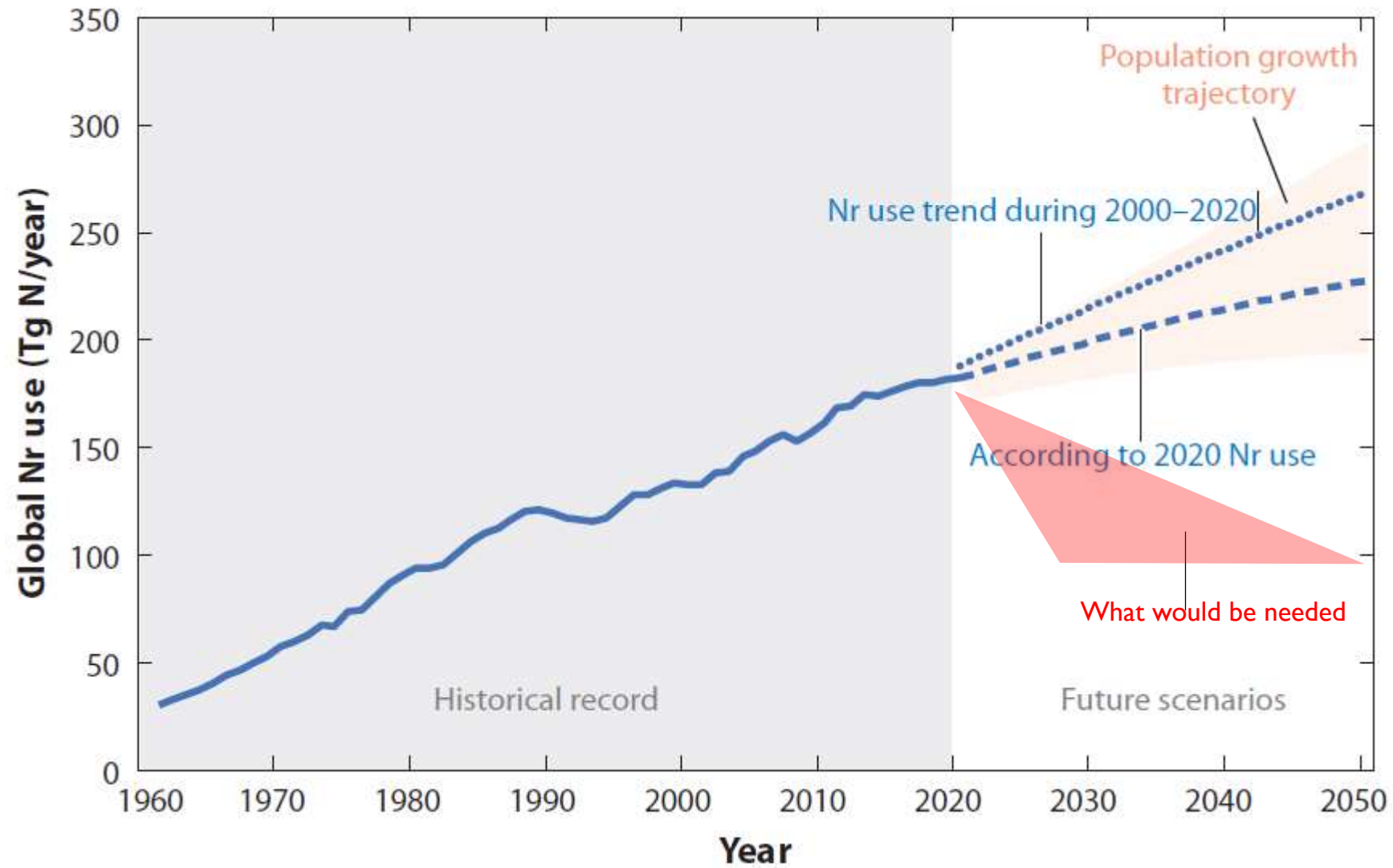
2023



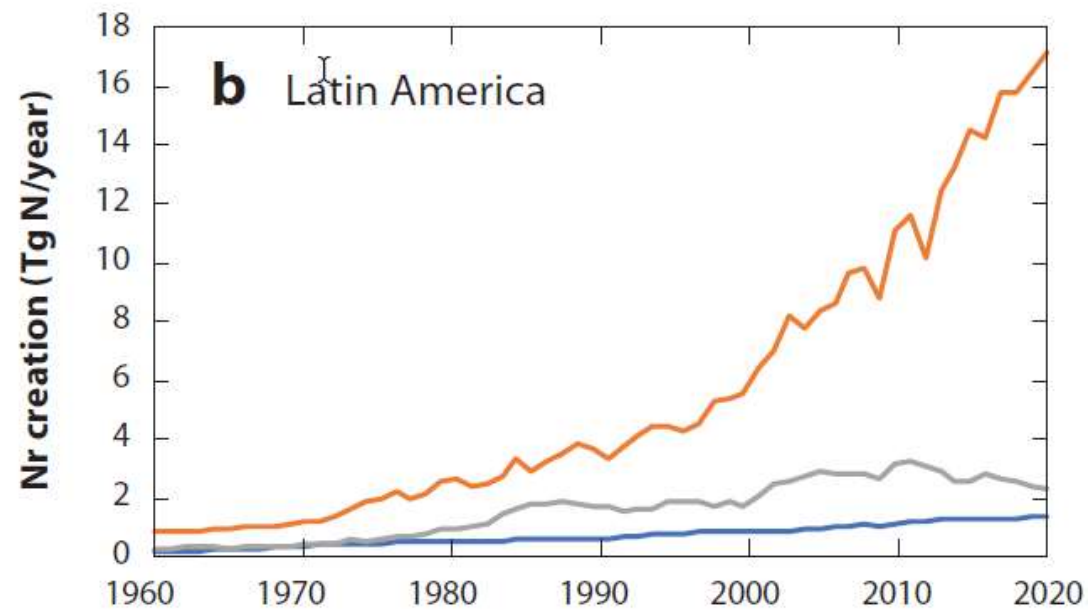
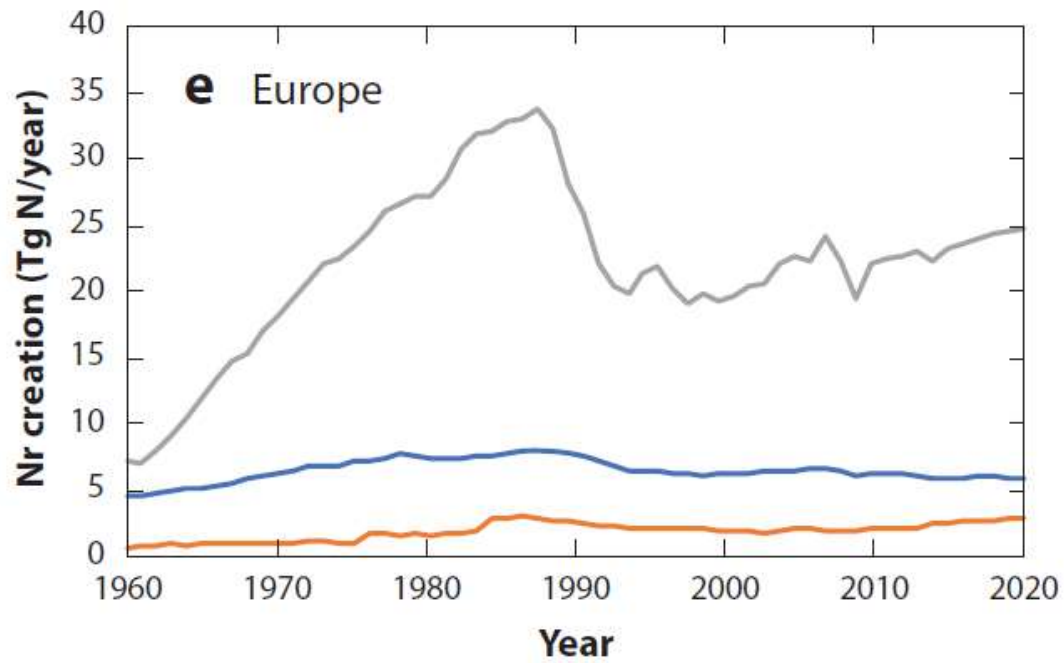
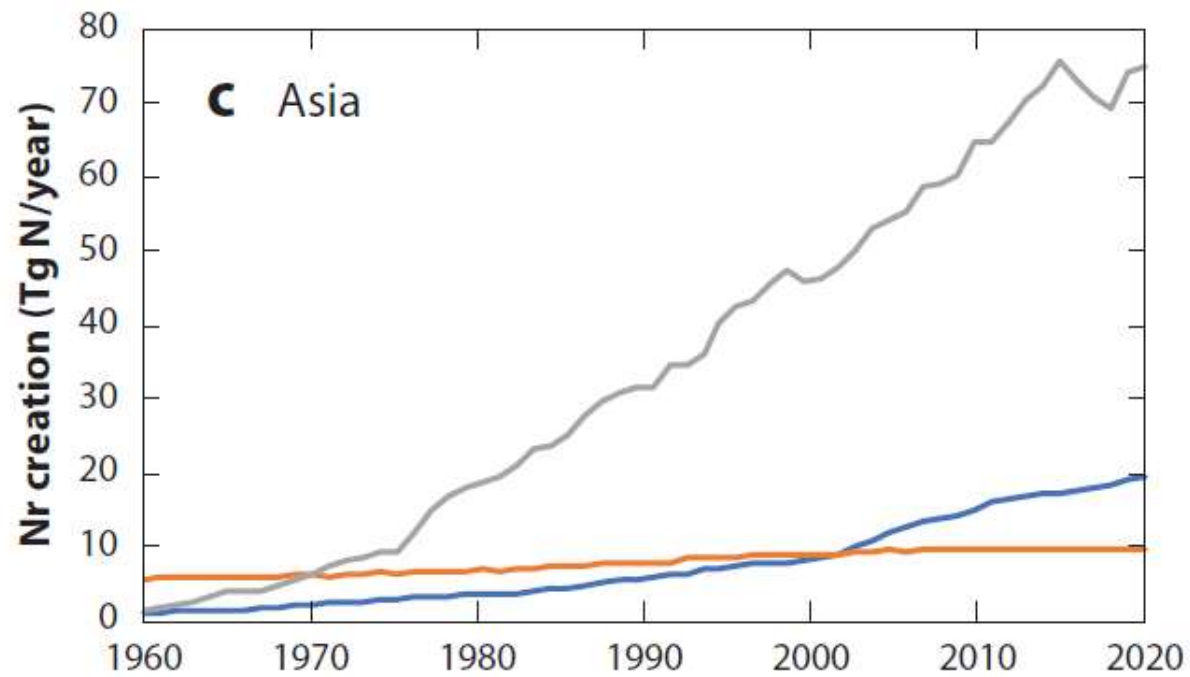
6 boundaries crossed

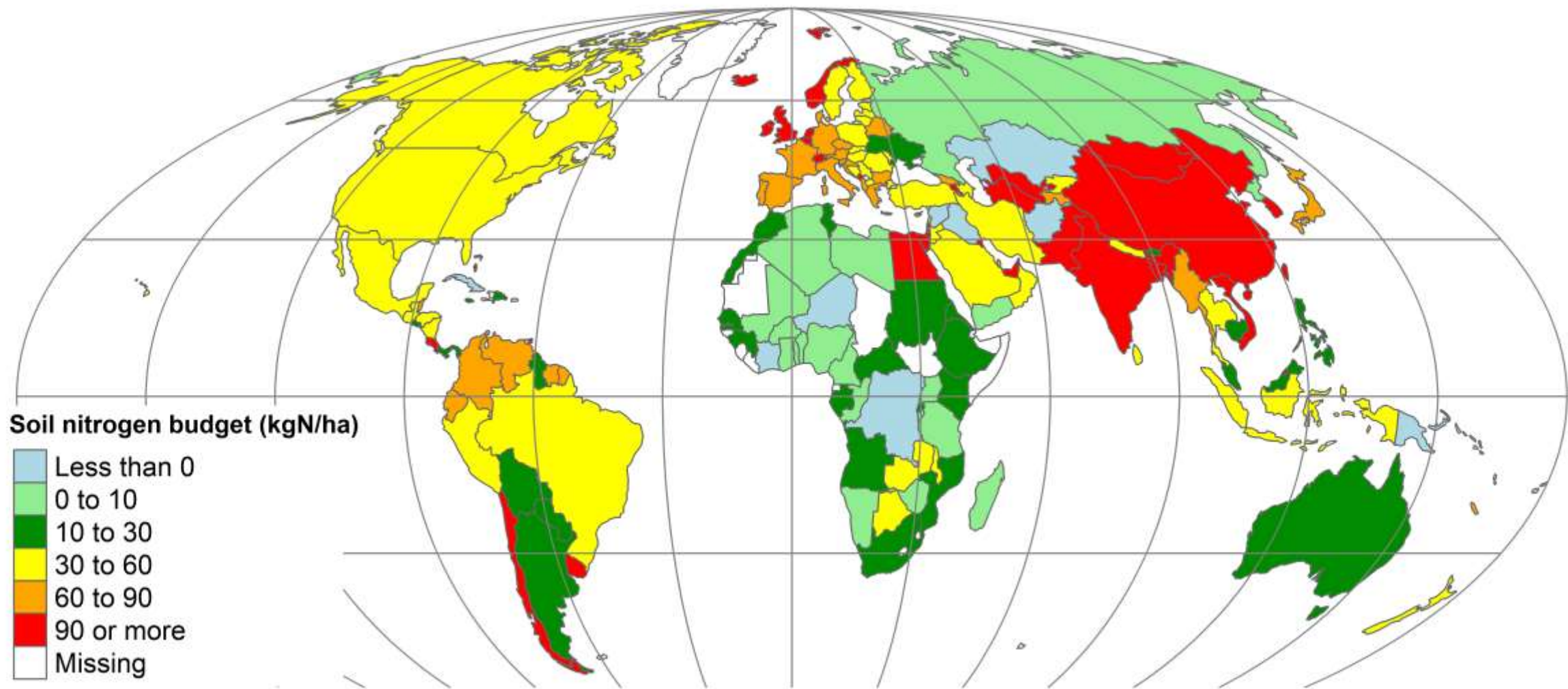






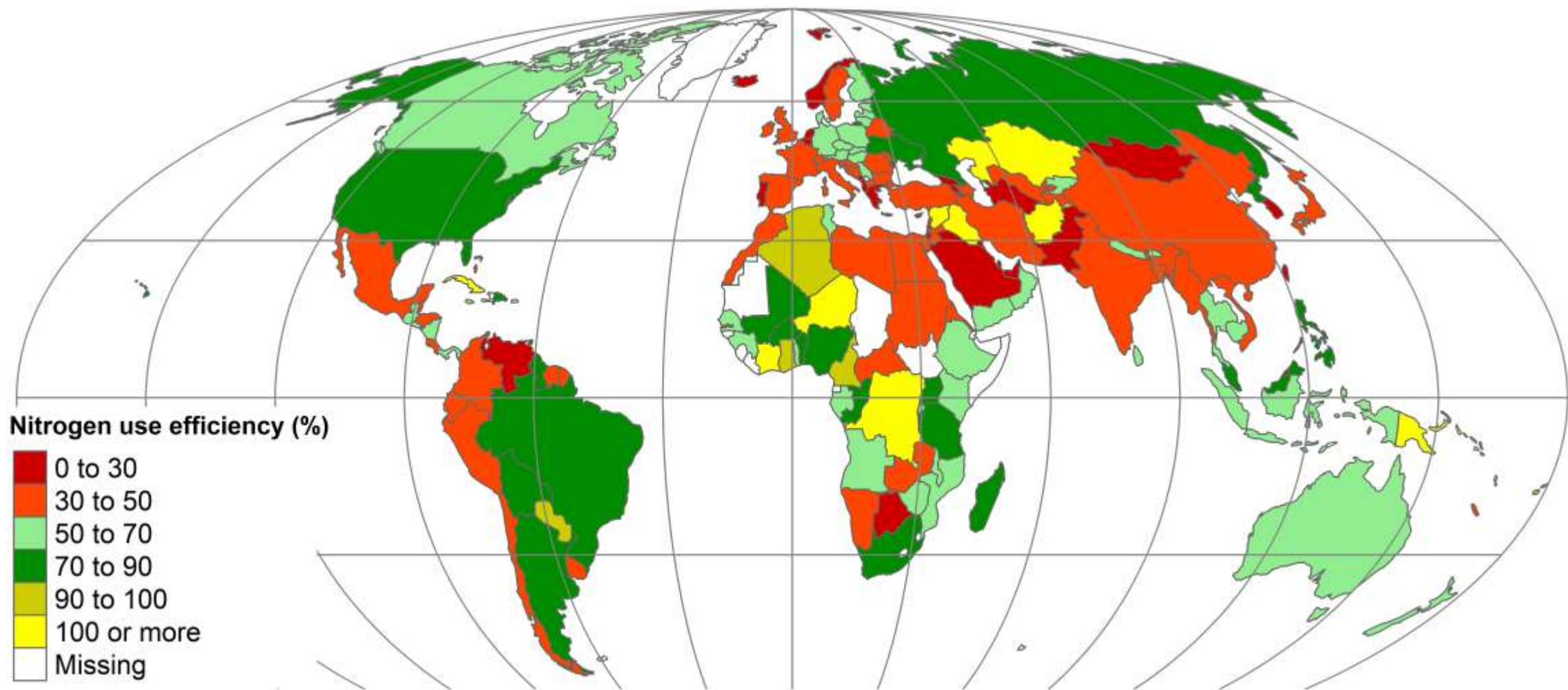
- Haber-Bosch production of NH_3 for fertilizer
- Cultivation-induced biological N fixation
- Fossil fuel combustion

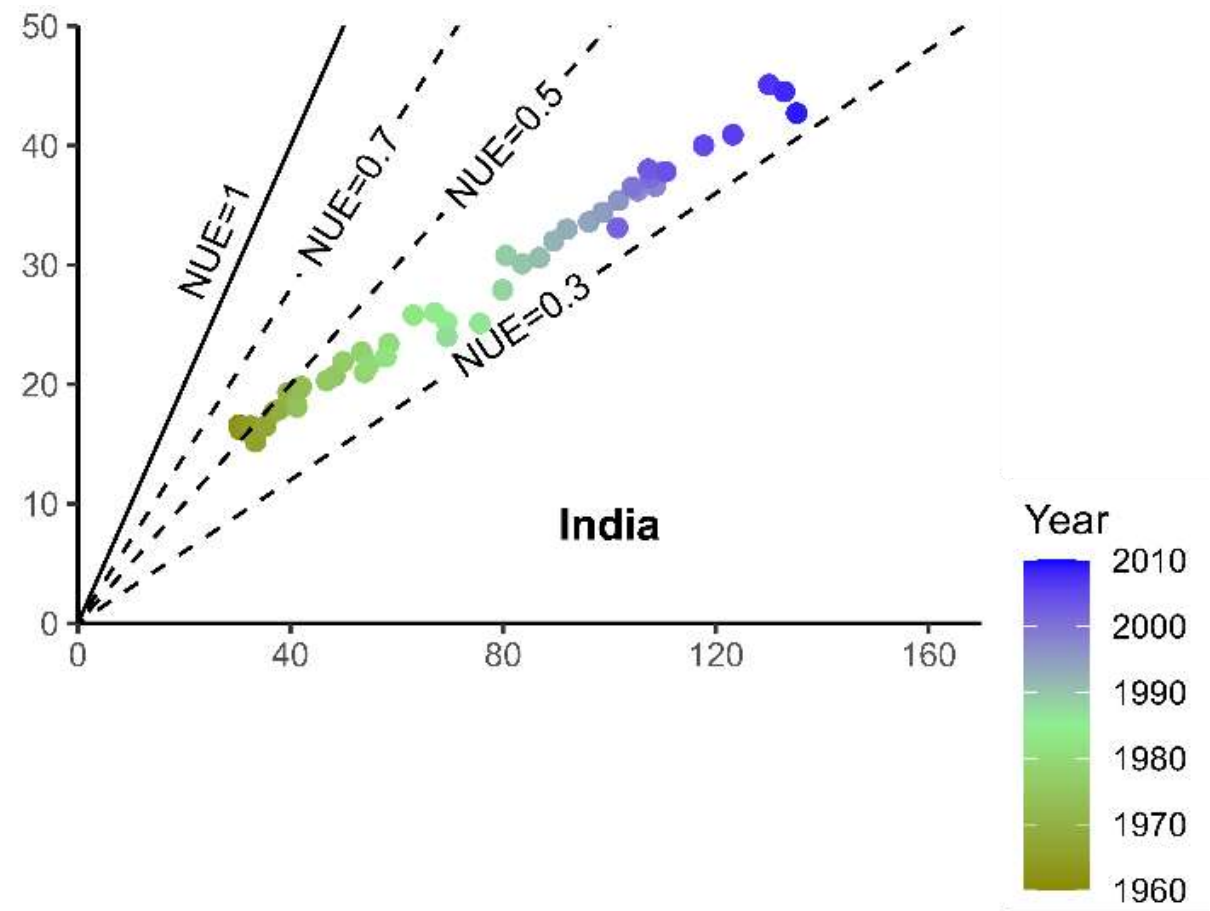


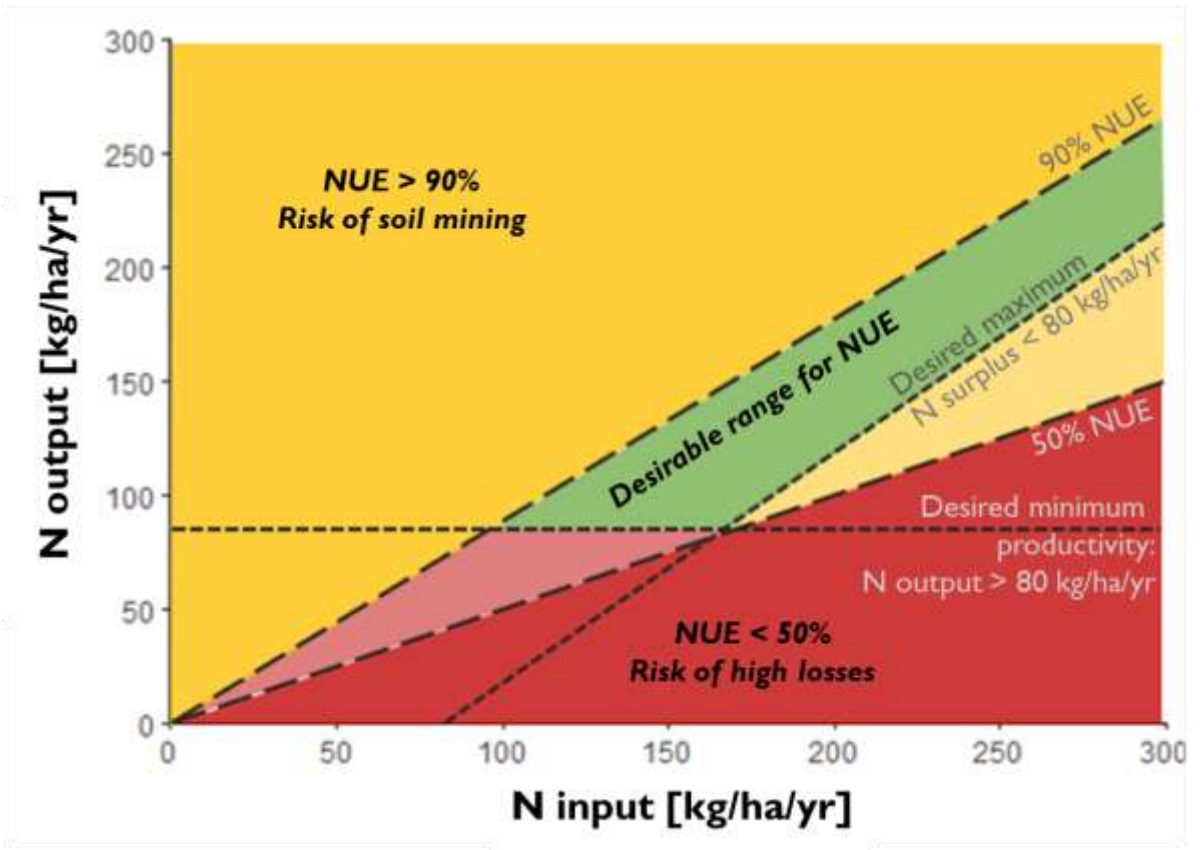
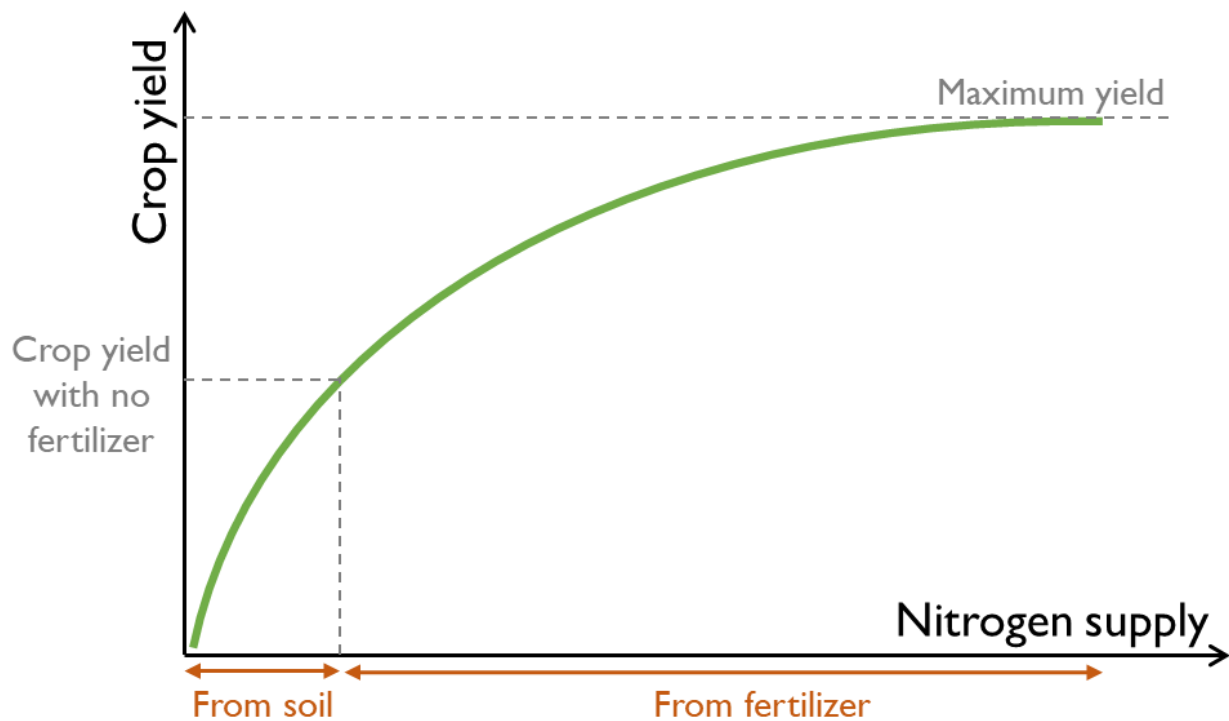


Key messages I

- Excessive use of nitrogen-based fertilizers has severe environmental consequences
- The current annual nitrogen surplus is double the amount compatible with the planetary boundaries for a safe operating space for humanity
- The problem is known since long
- The situation does not improve







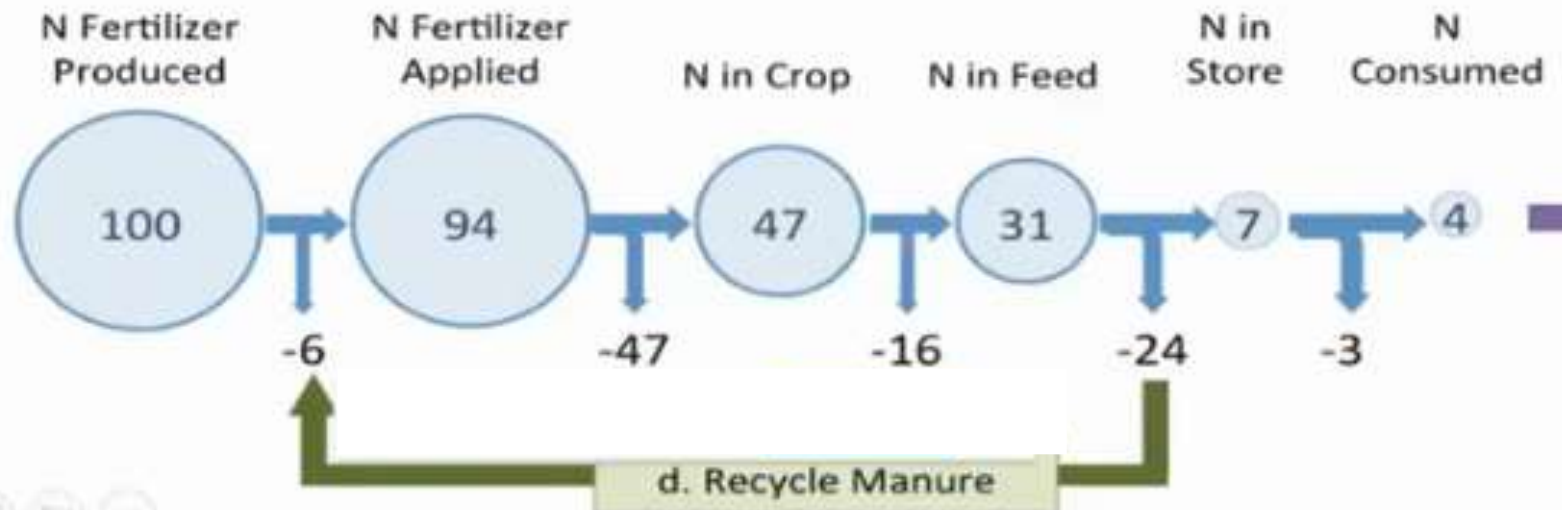
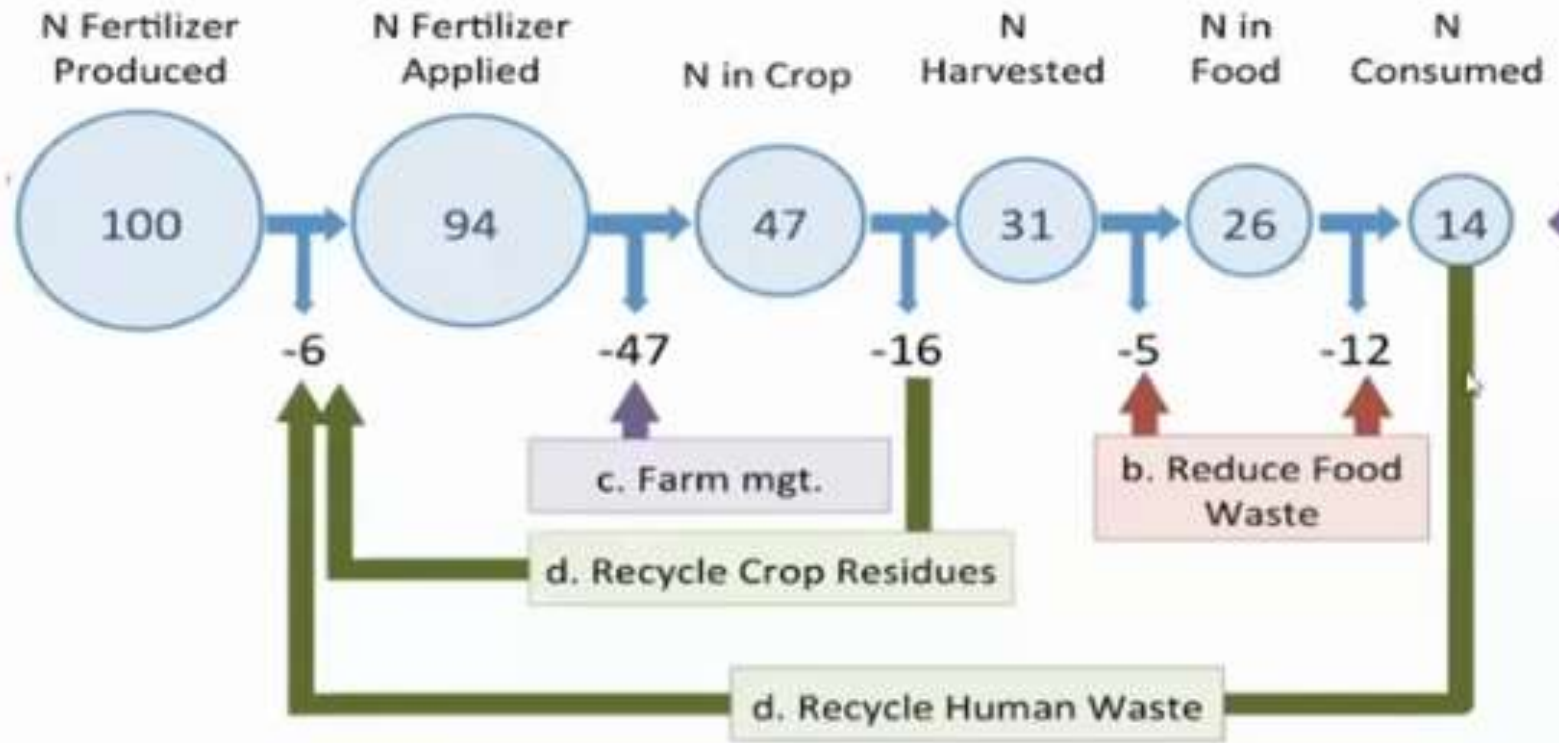
Source: authors and adapted from the EU Nitrogen Expert Panel, 2015



Mineral Fertilizers: Feeding the World.

Today, it would be impossible to feed the planet without mineral fertilizers. The nitrogen produced by the Haber-Bosch synthesis process for mineral fertilizers is vital for producing large crop yields. Scientific research published in 2008 estimated that the lives of nearly half of the world's population (48%) are only made possible by Haber-Bosch produced nitrogen. (Erisman et al., 2008)

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Key messages II

- 85 to 95% of nitrogen applied to soil is lost. Thus, overall nitrogen use efficiency in food systems is only 5 to 15%
- High-income countries: huge regional nitrogen surpluses and losses. In lower-income countries, particularly in Africa, lack of access to nitrogen leads to soil degradation.
- Food security is possible with less nitrogen:
 - less N does not in general endanger yields and food security
 - overuse and low use efficiency: spare N without yield losses
 - nitrogen scarcity and soil mining: recycling should be increased before and besides adding new external nitrogen

https://au.int/en/pressreleases/20231008/media-advisory-africa-fertilizer-and-soil-health-afsh-summit-2023

NEWS 27, 2023 to November 28, 2023

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Media Advisory : Africa Fertilizer and Soil Health Summit 2023


United States government [Here's how you know](#)

\$13+ BILLION OF INCREASED INVESTMENTS RAISED FOR 2021-2025

COP28 UAE

15 DAYS 0 HOURS 6 MINS

ABOUT AIM FOR CLIMATE INNOVATION SPRINTS GET INVOLVED MEDIA EVENTS PARTNERS SUMMIT



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Colombo Declaration calls for tackling global nitrogen challenge

Cultural Service AGRICULTURE

REGIONS DATA AND ANALYSIS TOPICS PROGRAMS **NEWSROOM** EVENTS ABOUT FAS

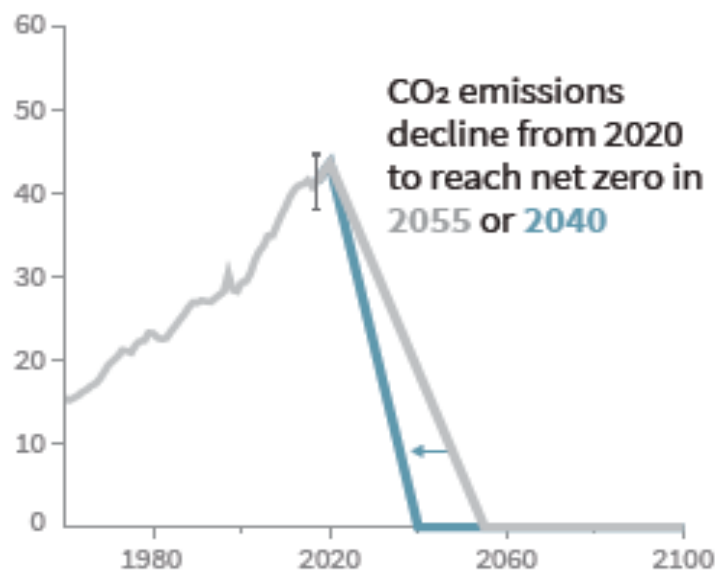
Global Fertilizer Challenge

Strengthening Food Security and Reducing Agriculture Emissions by Advancing Fertilizer Efficiency and Alternatives

Decarbonizing Fertilizer Production. Pathways to Sustainable Food

UNVEILING THE EU FERTILIZER INDUSTRY ROADMAP TO CLIMATE-NEUTRALITY. →

b) Stylized net global CO₂ emission pathways
Billion tonnes CO₂ per year (GtCO₂/yr)



Faster immediate CO₂ emission reductions limit cumulative CO₂ emissions shown in panel (c).

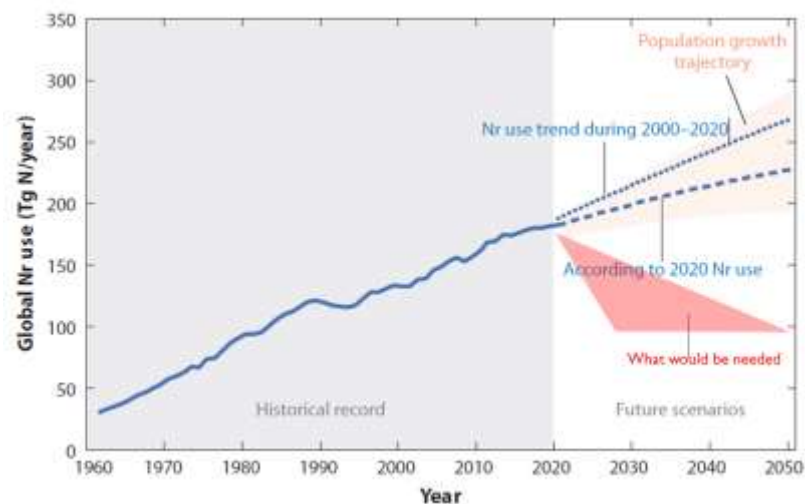
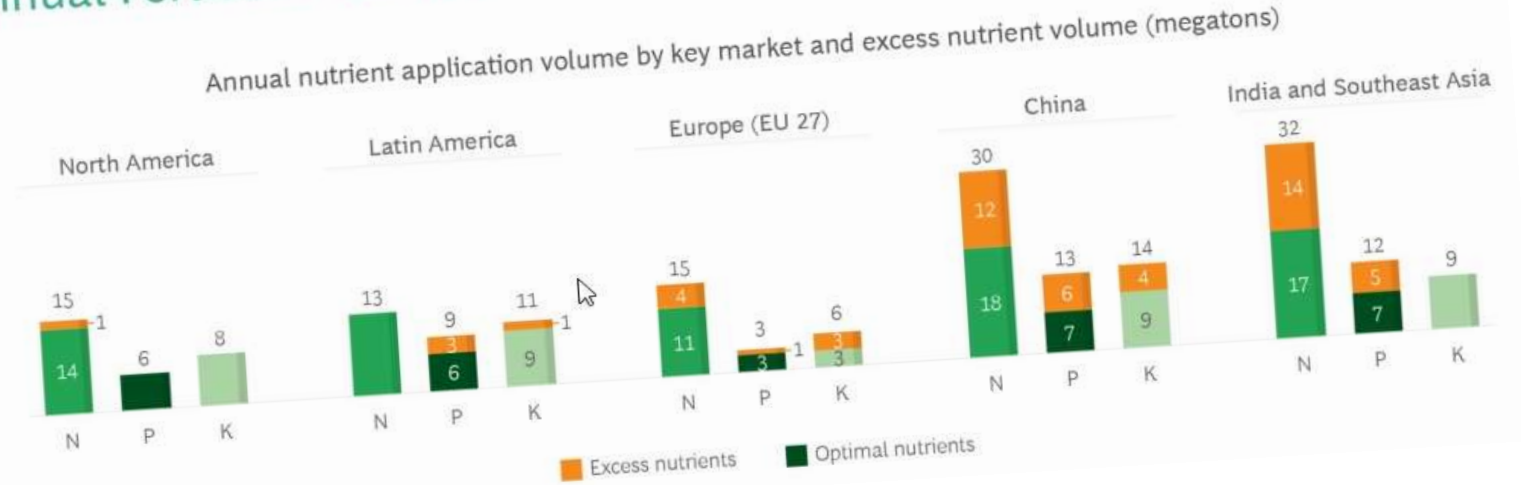


Exhibit 1 - The COP 15 Target for Reducing Excess Nutrients Could Lower Annual Fertilizer Demand by 29 Million Tons in 2020



BCG

New Applications and New Strategies for Fertilizer Companies

Future Supply Disruptions

Aside from the threat of declining demand, fertilizer companies must c

Key messages III

- Solutions need to put food security, the livelihood of the farmers and the poor in the center
- Solutions are known:
 - there are many existing technical solutions, but these are not game-changing
 - information provision, education and training to farmers are needed
 - get the prices right – true cost accounting
 - use less N where too much is used, recycle N wherever possible
 - increase full system use efficiency: less food waste, less animals fed with cropland-based feed

Key messages IV

- Using “green” mineral fertilizers with fewer production impacts will not solve the problem.
- The existing initiatives are ineffective:
 - those with ambitious goals lack power for implementation
 - those with implementation power lack ambition.

Key messages V

- We need
 - credible industry business plans for a future with 50% less human-induced nitrogen;
 - credible commitment from governments to full cost accounting;
 - credible signals from agriculture, the food sector and society for mutual support.

And we need this now!



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