A framework for nitrogen futures in the shared socioeconomic pathways

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Abstract

Humanity’s transformation of the nitrogen cycle has major consequences for ecosystems, climate and human health, making it one of the key environmental issues of our time. Understanding how trends could evolve over the course of the 21st century is crucial for scientists and decision-makers from local to global scales. Scenario analysis is the primary tool for doing so, and has been applied across all major environmental issues, including nitrogen pollution. However, to date most scenario efforts addressing nitrogen flows have either taken a narrow approach, focusing on a singular impact or sector, or have not been integrated within a broader scenario framework – a missed opportunity given the multiple environmental and socio-economic impacts that nitrogen pollution exacerbates. Capitalizing on our expanding knowledge of nitrogen flows, this study introduces a framework for new nitrogen-focused narratives based on the widely used Shared Socioeconomic Pathways that include all the major nitrogen-polluting sectors (agriculture, industry, transport and wastewater). These new narratives are the first to integrate the influence of climate and other environmental pollution control policies, while also incorporating explicit nitrogen-control measures. The next step is for them to be used as model inputs to evaluate the impact of different nitrogen production, consumption and loss trajectories, and thus advance understanding of how to address environmental impacts while simultaneously meeting key development goals. This effort is an important step in assessing how humanity can return to the planetary boundary of this essential element over the coming century.

Article published in *Global Environmental Change* [1].

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Associated Project:
Understanding dynamic environmental and socio-economic interactions in food systems to support decision-making towards a sustainable and resilient agriculture [4]

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