

# India Nitrogen Policy Report Summary:

## Scientific Evidence, Current Initiatives and Policy Landscape

This summary provides an overview of the full UKRI GCRF SANH policy report for India (2022). This report is the first of its kind providing a necessary step to understand the current nitrogen policy landscape for India within the broader South Asian context. It highlights the issues and challenges around nitrogen pollution and management, with recommendations for action.

### INTRODUCTION

- **Nitrogen is essential for life, but nitrogen in its reactive form ( $N_r$ ) in excess can cause severe harm to people and the environment.** Excess reactive nitrogen ( $N_r$ ) is a significant issue globally and for South Asia.
- Multiple sectors including agriculture, transportation, industry, and energy sectors have increased their share of nitrogen pollution and related greenhouse gas (GHG) emissions due to growing anthropogenic demands.
- **Five principal threats of nitrogen pollution** are to water quality, air quality, greenhouse-gas balance, soil quality, ecosystems and biodiversity.
- Addressing climate change by reducing greenhouse gas (GHG) emissions is a key priority in international politics. **Managing nitrogen is essential for international climate change mitigation: nitrous oxide ( $N_2O$ ) has x 300 more warming potential than  $CO_2$ .**
- **South Asia is a global hotspot for  $N_r$  emissions** for the main nitrogen compounds: nitrogen oxide, nitrous oxide and ammonia, with emission levels above global averages.
- **Nitrogen pollution can be managed directly or indirectly** by legislation, financial or regulatory measures taken by governments.
- Government and non-government measures can support and encourage efficient nitrogen management, and hence, minimize the negative impacts.
- **The management of nitrogen is a major issue of international policy, yet information about nitrogen policies at national levels is scarce.** There is a limited understanding of the policies, the issues addressed, and the types of instruments used, and how existing policies might impact nitrogen pollution.

### UKRI GCRF SOUTH ASIA NITROGEN HUB (SANH)

- **SANH aims to tackle the nitrogen challenge by bringing together experts from leading research organizations from across South Asia and the UK.** The hub focuses on four main areas: i) building the nitrogen policy arena for South Asia; ii) finding nitrogen solutions; iii) improving understanding and awareness of key nitrogen threats; iv) integrating data on regional nitrogen flows and impacts in south Asia.
- The South Asia Co-operative Environment Programme (SACEP) and SANH undertook an initial **South Asian regional assessment of nitrogen emissions and policy and created [a database of 966 nitrogen-relevant policies from South Asia](#).**
- **Drawing on that database, this SANH national report outlines the implications of these findings for India.** The country report is the first of its kind to provide a national overview on the extent of nitrogen-related policies for India.

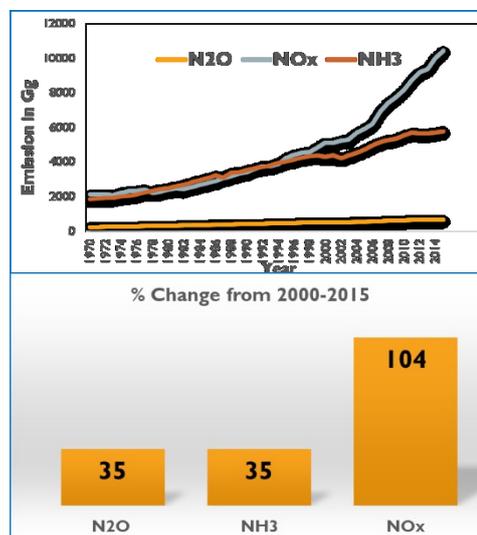
## NITROGEN-RELATED POLICY ANALYSIS FOR NEPAL

- For India **306** directly and indirect nitrogen-related policies, were collected, contributing 28% of the SANH South Asia policy database.
- **All nitrogen-related policies collected were classified** based on certain characteristics. Classifications include: environmental sink<sup>1</sup>; sector; sub-sector; policy type; pollution source type; impact direction; relevance; and impact scope.
- **The policy type classification indicates the type of policy instruments that are incorporated within a particular policy.** A single policy may have multiple policy type characteristics, which indicate a more comprehensive approach. **For India, there were 531 classifications from the 306 policies, 172 policies (56%) of which had more than one policy type identification.**
- **Sector-wise the most common classification of policies was for agriculture and multiple sectors at 19%.** This is an advantageous policy characteristic indicating an understanding that multiple sectors have roles to play in N<sub>r</sub> management.
- **For environmental sinks, the most common classification was where ‘no sink’ had been included in the policy text (40%), and the policy was therefore purely sector oriented.** This could be regarded as an unfavorable policy characteristic, indicating that N<sub>r</sub> environmental impacts have been overlooked.
- **Policies classified as having low relevance and/or low impact scope were omitted (109 policies, 35%), leaving 197 policies for further assessment** and were assumed to have a greater potential impact on how N<sub>r</sub> enters the environment. Those policies identified to have a lower relevance and/or impact scope should not be considered as irrelevant; via amendments they could be better adapted to mitigate N<sub>r</sub> waste.
- **Over half the policies (70%) were identified as having a potentially positive impact on N<sub>r</sub> management,** as mostly are environmentally orientated policies. Policies classified as mixed/neutral (20%), indicate to varying degrees dual goals for economic development and the environment. **Policies with a potentially negative impact direction (2%) include those that risk promoting N<sub>r</sub> waste.**
- **Policies that address multiple sinks and/or sectors (with integrated objectives), identify pollution sources, and contain multiple policy types are well placed to confront the multidimensional challenges of nitrogen management.**



### DRIVERS OF REACTIVE NITROGEN EMISSIONS

- Emissions of all three nitrogen compounds, ammonia, (NH<sub>3</sub>), nitrogen oxides (NO<sub>x</sub>), and nitrous oxide (N<sub>2</sub>O), have been increasing over time in south Asia and India. These results highlight that current policy efforts so far have not yet been able to stabilise or reduce N<sub>r</sub> emissions.
- N<sub>r</sub> emission levels will continue to increase unless they are arrested further via tight policy actions taken at international, national, and local levels.
- Nitrogen oxides (NO<sub>x</sub>) in India are the fastest rising N<sub>r</sub> compound, particularly since the year 2000 increasing by +104% from 2000 and 2015.
- For ammonia (NH<sub>3</sub>) and nitrous oxides (N<sub>2</sub>O) the emission levels in India have been increasing steadily, and at a somewhat similar pace since the 1970's.
- There was a 35% increase in nitrous oxide (N<sub>2</sub>O) emissions. N<sub>2</sub>O emissions are the lowest (in total amount) compared to the other N<sub>r</sub> compounds.
- The emissions for N<sub>2</sub>O, NH<sub>3</sub> and NO<sub>x</sub>, were about, 674, 5795 and 10420 Gg/year in 2015) respectively. Ammonia emission grew by 132%, nitrogen oxides (NO<sub>x</sub>) by 65% and nitrous oxides (N<sub>2</sub>O) by 210% in the period 2000 to 2015. Agriculture is a largest source for ammonia (NH<sub>3</sub>) and N<sub>2</sub>O emission.
- industrial combustion (others) and road transportation accounts for one of the major sources of nitrogen oxides (NO<sub>x</sub>) and their contribution increased to +1211% and 457% respectively from 2000 to 2015.
- For ammonia (NH<sub>3</sub>) the main contributor is from agriculture sector with the increase of 35% from 2000-2015
- Power industry and other industrial combustion also contributed to NH<sub>3</sub> emissions, with emission increasing by 507% and 361% respectively between 2000 and 2015.



### NEEDED ACTIONS

- ❖ In India, 132 policies were highly related to sustainable nitrogen management, but only a few of these specifically referenced nitrogen. **As well as addressing nitrogen management systematically, such policies should also be accompanied by direct actions, such as 'core' policies, that contain regulatory and economic policy instruments.** Setting quantifiable and enforceable constraints on N production and consumption in nitrogen-related policy is recommended.
- ❖ Existing policies can also be adapted to deal more directly/effectively with nitrogen management by referring explicitly to nitrogen pollution itself, and ideally to specific relevant N<sub>r</sub> compounds. In order to address nitrogen pollution issues, amendments – ranging from minor to major ones – could be applied to these policies
- ❖ For policies with high nitrogen management relevance, amendments to specify pollution source type and the risk of nitrogen waste would be advantageous. Only a small number (27%) of directly nitrogen-relevant policies (from a total of 197) determined if pollution sources were 'point source' locations or 'non-point source' or both. Such policies indicate potentially useful examples for N<sub>r</sub> management.

- ❖ **Sector-based policies would benefit from ensuring that they directly, or via other connected policies, consider the potential risks, or options to mitigate negative N<sub>r</sub> impacts referring to one or more environmental sink.** A large proportion (40%) of India's nitrogen relevant sector-based policies have not referenced any sinks.
- ❖ **To deal with N<sub>r</sub> pollution better, it is necessary to have policies that consider multiple sectors and sinks and policy instruments.** Currently, 19 policies meet this criterion to some degree. Although not all policies would need to be integrated in this manner, a policy gap is visible.
- ❖ **Agriculture is one of the main contributors to India GDP and also a core contributor to national N<sub>r</sub> emissions.** Fertilizers play a vital role but much of the inputs are wasted. Sustainable alternatives are available. Such methods have the potential to save considerable revenue, maintain soil and human health.
- ❖ **Action is needed in emerging sectors, considering relative changes in N<sub>r</sub> emissions. Different sectors contribute to the emission of N<sub>r</sub> compounds in various ways and are growing at different rates.** The overlap in contributing sectors to different compounds indicates areas where integrated policies are necessary to avoid pollution swapping and promote coordinated actions.
- ❖ **The development of National Action Plans are advised in the United Nations Environment Assembly (UNEA-5) new resolution on sustainable nitrogen management.** India has the ability to strengthen regional/international commitments such as support of UNEA-5.2 and preparing for UNEA-6 to manage nitrogen sustainably.
- ❖ **Further in-depth research on these N<sub>r</sub> relevant policies is necessary, to assess, amongst other aspects, their impact.** SANH will continue to analyse N-relevant policy and engage with SACEP member states to broker a better understanding.
- ❖ **Science-based decision-making is crucial to move towards N<sub>r</sub> sustainability and SANH is supporting this journey to create the scientific evidence of the sources and causes of emissions, and ways to mitigate their impact.** SANH will improve the scientific and technical base and help strengthen India's contributions to address N<sub>r</sub> both nationally, regionally and beyond.

To see the full report please contact [adhyas@yahoo.com](mailto:adhyas@yahoo.com).

The full report is cited as:

Adhya, T., Panda, AN., Kaushik, H., Raghuram, N., Bansal, S., et al. (2022) India Nitrogen Policy Report: Scientific Evidence, Current Initiatives and Policy Landscape, SANH Policy Paper PP2. India.

Funders



The South Asian Nitrogen Hub (SANH) is a UKRI GCRF funded research partnership that brings together 32 leading research organisations and project engagement partners from South Asia and the UK. SANH is working towards enabling South Asia to 'adopt and champion a strategic approach to nitrogen management as a key step towards the Sustainable Development Goals'. SANH aims to provide relevant scientific insights identify barriers to change and demonstrate the economic benefits of tackling nitrogen. <https://sanh.inms.international/>