Nepal 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 Nepal (2022). This report is the first of its kind providing a necessary step to understanding the current nitrogen policy landscape for Nepal within the broader South Asian context. It highlights the issues and challenges around nitrogen pollution and management, with recommendations for action.


Farmer in Nepal Photo: Sp Pradhan (SANH)

WHY FOCUS ON NITROGEN?

- **Nitrogen is essential for life, but nitrogen in its reactive form (N_r) and in excess can cause severe harm to people and the environment.**
- Multiple sectors including agriculture, transportation, industry, and energy have increased contributions to nitrogen pollution and related greenhouse gases (GHG) 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.
- **Managing nitrogen is essential for international climate change mitigation with nitrous oxide (N_2O) x 300 more warming potential than CO_2.** Addressing climate change by reducing GHG emissions is a key priority in international politics.
- **South Asia is global hotspot for N_r emissions**, nitrogen oxide, nitrous oxide and ammonia, with emission levels above global averages.
- **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.**

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; iv) assessing regional nitrogen flows and impacts.
- 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 Nepal**. The country report is the first of its kind to provide a national overview on the extent of nitrogen-related policies for Nepal.

NITROGEN-RELATED POLICY ANALYSIS FOR NEPAL

- For Nepal 109 directly and indirect nitrogen–related policies, were identified and collected, contributing to 11% of the SANH South Asia policy database.
- **All nitrogen-related policies collected were classified** based on certain characteristics. Classifications include: environmental sink[1]; 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

[1] Sinks reflect the environmental aspect at risk (under threat) from N_r

indicate a more comprehensive approach. **For Nepal, there were 174 classifications from the 109 policies, 65 policies (59%) of which had more than one policy type identification**.

- **Sector wise the most common classification of policies was for multiple sectors at 43%.** This is an advantageous policy characteristic indicating and understanding that multiple sectors have roles to play in N_r management.
- **For environmental sinks, the most common classification was where 'no sink' had been included in the policy text (40%) therefore purely sector oriented**. This could be regarded as an unfavourable policy characteristic, indicating that N_r environmental impacts have been overlooked.
- **Policies classified as having low relevance and/or low impact scope were omitting (43 policies, 39%), leaving 66 policies for further assessment** and assumed to have a greater impact on how N_r enters the environment. Policies with lower relevance and/or impact scope are not irrelevant, as via amendments could be better adapted to mitigate N_r waste.
- **Over half the policies (54%) were identified as having a potentially positive impact on N_r management,** as mostly environmentally orientated policies. Policies classified as mixed/neutral (41%), indicate to dual goals for economic development and the environment. Policies with a potentially negative impact direction (5%) including those that risk promoting N_r 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 from all three nitrogen compounds, ammonia, (NH_3), nitrogen oxides (NO_x), and nitrous oxide (N_2O), have been increasing over time in South Asia and Nepal**.
- **Nitrogen oxides (NO_x) in Nepal are the fastest rising N_r compound,** particularly since the year 2000 increasing by +67% from 2000 and 2015.
- **For ammonia (NH_3) and nitrous oxides (N_2O) the emission levels in Nepal have been increasing steadily,** and at a somewhat similar pace since the 1970's.
- **There was a +43% increase in nitrous oxide (N_2O), and emissions were higher than the other N_r compounds in total amounts**.
  The emissions for NH_3, NO_x, and N_2O were, respectively, 150, 87 and 6166 Gg/year in 2015).
- **Road transportation accounts for one of the major sources of nitrogen emissions.** The transportation sector has grown significantly in recent decades, causing emissions of nitrogen oxides (NO_x) to rise (+165% from 2000 to 2015).
- **Agriculture is a common emission source for all three N_r compounds.** Agriculture contributes to ammonia (NH_3) emissions by 64%, nitrogen oxides (NO_x) 15% and nitrous oxides (N_2O) 76%.
- **In Nepal, the industrial sector is expected to expand significantly in the coming years yet it is already a significant source of air and water pollution**. As of 2015, manufacturing industries and construction contribute 32% to nitrogen oxide (NO_x) emission.
- **The Building sector is another major contributor to all three N_r compounds** with contributions of 35% to ammonia emissions (NH_3), 25% to nitrogen dioxide (NO_x), and 12% to nitrous oxide emissions (N_2O).

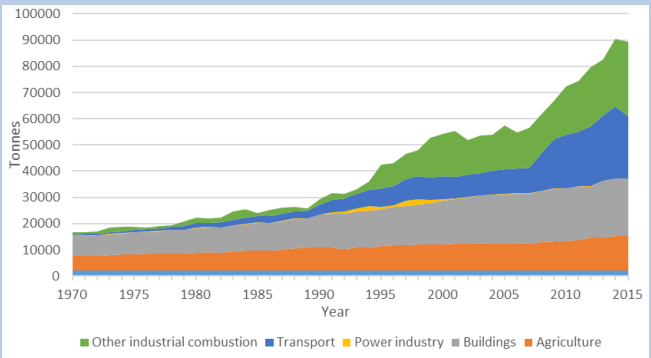

Fig. 1: Trend in Nitrogen oxide (NOx) emission by main sectors in Nepal Source: EDGAR v5.0 Global Air Pollutant Emissions data sourced from Crippa et al (2019a)

NEEDED ACTIONS

- **The rising N_r emissions rates for Nepal highlight that current policy efforts so far have not yet been able to stabilise or reduce N_r emissions.** N_r emission levels will continue to increase unless further policy action is taken at international, national, and local levels.
- **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.** In Nepal, 59 policies were highly related to nitrogen, but only a few specifically referenced nitrogen. Setting quantifiable and enforceable constraints on N production and consumption in nitrogen-related policy is further recommended.
- **Existing policies can also be adapted to deal more directly/effectively to deal with nitrogen management by referring explicitly to nitrogen pollution itself, and ideally to specific relevant N_r 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 of directly nitrogen relevant policies number (5% from 29) determined the pollution sources type. Such policies indicate potentially useful examples for N_r 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_r impacts referring to one or more environmental sink.**
- **To deal with N_r pollution better, it is necessary to have policies that consider multiple sectors and sinks and policy instruments.** Currently, four policies meet this criterion to some degree. Not all policies would need to be integrated like this, nonetheless a policy gap is visible.
- **Action is needed in emerging sectors, considering relative changes in N_r emissions. Different sectors contribute to the emission of N_r compounds in various ways and are growing at different rates.** The overlap in contributing sectors to different compounds indicate areas where integrated policies are necessary to avoid pollution swapping and promote coordinated actions.
- **Agriculture is one of the main contributors to Nepal's Gross Domestic Product (GDP) and a core contributor to national N_r 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, and maintain soil and human health.
- **The development of National Action Plans are advised in the United Nations Environment Assembly (UNEA-5) new resolution on sustainable nitrogen management**. Nepal 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_r 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_r 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 to** help strengthen Nepal's contributions to address N_r both nationally, regionally and beyond.

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Full report: Joshi et al. (2022) Nepal Nitrogen Policy Report: Scientific Evidence, Current Initiatives and Policy Landscape, SANH Policy Paper PP2. Kathmandu

Funders: UK Research and Innovation GCRF In partnership with: SACEP

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/