AFGHANISTAN Nitrogen Policy Report Summary:

Scientific Evidence, Current Initiatives and Policy Landscape

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

Farmer spraying the field, Afghanistan.
Photograph: Z. Safi/SANH

INTRODUCTION

- **Nitrogen is essential for life, but nitrogen in its reactive form (N_r) in excess can causes severe harm to people and the environment.** Excess reactive nitrogen (N_r) is a significant issue globally, for South Asia and Afghanistan.
- 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.
- **Managing nitrogen is essential for international climate change mitigation with nitrous oxide (N_2O) x 300 more warming potential than CO_2.**
- **South Asia is global hotspot for N_r emissions** for the main nitrogen compounds: nitrogen oxide (NO_x), nitrous oxide (N_2O) and ammonia (NH_3), 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 on nitrogen policies at national levels is scarce.**

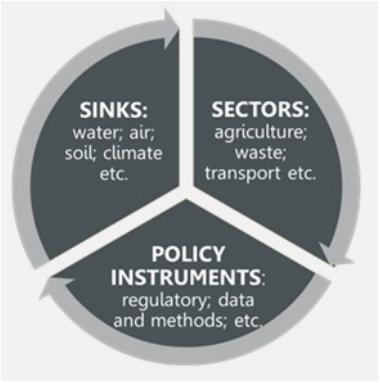
UKRI GCRF SOUTH ASIA NITROGEN HUB (SANH)

- **SANH aims to 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 Afghanistan**. The country report is the first of its kind to provide a national overview on the extent of nitrogen-related policies for Afghanistan.

ENVIRONMENTAL IMPACT OF REACTIVE NITROGEN IN AFGHANISTAN

- **In Afghanistan, many of the critical environmental and health impacts from N_r pollution are linked to poor air and underground drinking water quality.**
- **Both nitrogen oxides (NO_x) and ammonia (NH_3) are air pollutants that contribute to inhalable particulate matter ($PM_{2.5}$). An estimated 26% of all deaths in Afghanistan are due to environmental risks** (WHO, 2022).[1] Household air pollution causes over 27,000 deaths per year, whereas ambient air pollution (outdoor) causes over 11,000 deaths annually.
- **Water scarcity and water pollution are both serious issues in Afghanistan.** Only about 27% of the population have access to safe drinking water.[2] Diarrhoeal diseases were estimated to cause 10,000 deaths per year.
- **Climate change, influenced by reactive nitrogen emissions, directly impacts arable agriculture on which most of the population is dependent.** The frequency, scale, duration, and impacts of drought are increasing in the country. In 2018, 22 out of 34 provinces were affected severely by a drought putting the food security of 13.5 million people at crisis point (FAO, 2020).[3]
- **Soil quality has been affected by** deforestation, de-shrubification, irrigation, salinization and other drivers of desertification, with severe erosion by wind and water also occurring. The CBD (2021) reports that desertification in the country affects more than 75% of the total land area.[4]
- **Nitrogen levels in soil are reported to be generally low in Afghanistan. Inputs of chemical fertilizers, while commonly used in Afghanistan due to subsidies provided for wheat production, are insufficient to increase crop yields (Hashimi et al., 2020).**[5]

NITROGEN-RELATED POLICY ANALYSIS FOR AFGHANISTAN

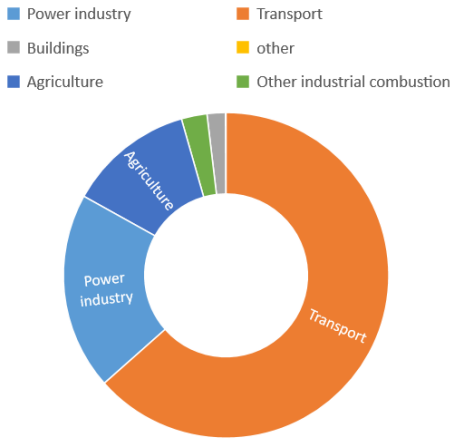


- For Afghanistan 89 directly and indirect nitrogen–related policies were collected, contributing 9% of the SANH South Asia policy database.
- **All the nitrogen-related policies collected were classified** based on certain characteristics. Classifications include: environmental sink;[6] sector; sub-sector; 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 Afghanistan, there were 149 classifications from the 89 policies, 42 policies (49%) had more than one policy type identified**. Framework policies were the most common policy type (48%).
- **Sector-wise the most common policy classification was for 'Multiple' sectors at 43%.** This is an advantageous policy characteristic indicating an understanding that multiple sectors have roles to play in N_r management. Agriculture oriented policies were also fairly common (33%) compared to other single sector focused policies.
- **For environmental sinks, the most common classification was 'No Sink' had been included in the policy text (49%) therefore the policy was purely sector oriented**. This could be an unfavourable policy characteristic, indicating that N_r environmental impacts have been overlooked. 28% of policies were classified as 'Multiple' sinks.

[1] World Health Organisation (2022) http://www.emro.who.int/afg/programmes/eh.html
[2] Bertelsmann Stiftung's Transformation Index (BTI) (2022) https://bti-project.org/fileadmin/api/content/en/downloads/reports/country_report_2022_AFG.pdf
[3] FAO (2020) The Islamic Republic of Afghanistan Soil Atlas: Volume 1: Maps derived from soil survey of twenty-six districts of nine provinces, http://www.fao.org/3/ca6928en/CA6928EN.pdf
[4] CBD (2021) Convention of Biological Diversity (CBD) Afghanistan https://www.cbd.int/countries/profile/?country=af#facts
[5] Hashimi et al., (2020) Effects of Cultivating Rice and Wheat with and without Organic Fertilizer Application on Greenhouse Gas Emissions and Soil Quality in Khost, Afghanistan, *Sustainability*, https://doi.org/10.3390/su12166508
[6] Sinks reflect the environmental aspect at risk (under threat) from N_r

- The most common single-sink orientated policies were for 'Water' (10%). There were no Soil focused policies.
- **Policies classified as having low relevance and/or low impact scope were omitted (31 policies, 35%), leaving 58 policies that had medium-high impact and relevance** and are assumed to be likely to have a greater impact on how N_r enters the environment. Those policies identified to have a lower relevance and/or impact scope should not be considered as irrelevant, however, and via amendments could be better adapted to support mitigating N_r waste.
- **Almost half the policies (48%) were identified as having a potentially positive impact on N_r management,** these are mostly environmentally orientated policies. Policies classified as mixed/neutral (45%), indicate to varying degrees dual goals for economic development and the environment. **Policies with a potentially negative impact direction, i.e., those that risk promoting N_r waste, were small in number (8%).**
- **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.** From Afghanistan there are 12 policies (13%) that met all of these criteria.

Fig 1. Sector contributions to nitrogen oxide (NO_x) emissions in 2015, Afghanistan. Source: EDGAR v5.0 Global Air Pollutant Emissions data sourced from Crippa et al (2019)



TRENDS AND DRIVERS OF REACTIVE NITROGEN EMISSIONS

- **Emissions from all three nitrogen compounds,[7] ammonia, (NH_3), nitrogen oxides (NO_x), and nitrous oxide (N_2O), have been increasing over time in South Asia and Afghanistan,** according to EDGAR data (Crippa et al. 2019ab).
- **A range of sectors can be considered policy priorities in Afghanistan due to the amount of N_r emissions produced and the rate of increases including agriculture, transport, energy, waste and residential.**
- **Nitrogen oxides (NO_x) in Afghanistan are the fastest rising N_r compound,** particularly since 2007, increasing by 655% from 2000 and 2015. Emissions dropped slightly from 2013 – 2015.
- **For ammonia (NH_3) and nitrous oxides (N_2O) the emission levels in Afghanistan have fluctuated from 1970's but began to steadily increase since 2000.** There was a +53% increase in N_2O from 2000 to 2018.
- **Ammonia (NH_3) emissions are by far the highest (86%) for overall N emissions amounts in2015 relative to NO_x and N_2O.** The emissions for NH_3, N_2O, and NO_x, were respectively, 79, 15, and 1.3 Gg/year in 2015.
- **Agriculture is a common emission source for all three N_r compounds.** Agriculture contributed 95% of ammonia (NH_3) emissions, 90% of nitrous oxides (N_2O) emissions and 12% of nitrogen oxide emissions (NO_x) in 2015/2018.
- **Waste, buildings and other sectors where somewhat more minor contributors (relative to agriculture) to ammonia (NH_3) and nitrous oxides (N_2O).** However, emissions from these sectors are increasing rapidly, for example, power industry increased NH_3 emissions by +2781.
- **The transport sector (63%), more specifically road transport, is the main contributor of nitrogen oxides (NO_x).** The transportation sector has grown significantly in recent decades, causing emissions of NO_x to rise by a staggering +3202% from 2000 to 2015.
- **The power industry is also a contributor (by 20%) to overall NO_x emissions, with an increase by +1014% in 2002 to 2015.**

[7] Note: EDGAR v5.0 Global Air Pollutant Emissions data sourced from Crippa et al (2019a); EDGAR v5.0 Greenhouse Gas Emissions data sourced from Crippa, et al. (2019b).

CONCLUSION

- **Emissions from all three nitrogen compound are increasing in South Asia and Afghanistan. These results highlight that current policy efforts so far have not stabilised or reduced N_r waste.**
- **Reactive nitrogen (N_r) emissions from all relevant sectors are increasing for one or more compound**. N_r emission levels will continue to increase unless further policy action is taken.
- **Action is needed in emerging sectors, such as Waste, Buildings and Other, considering relative changes in N_r emissions**. Different sectors contribute to the emission of N_r compounds in various ways and they are growing at different rates.
- **The overlap in contributing sectors (for example, transport and the power industry for NO_x) to different compounds indicates areas where integrated policies are necessary** to avoid pollution swapping and promote coordinated actions.
- **As well as addressing nitrogen management systematically, such highly relevant policies should also be accompanied by direct actions, such as 'core' policies, that contain regulatory and economic policy instruments**. In Afghanistan, 58 policies were highly related to nitrogen, but only a few of these specifically referenced nitrogen. Setting quantifiable and enforceable constraints on N production and consumption in nitrogen-related policy is recommended.
- **Existing policies can also be adapted (with minor to major amendments) to deal more directly/effectively with nitrogen management by referring explicitly to nitrogen pollution itself, and ideally to specific relevant N_r compounds**.
- **For policies with high nitrogen relevance, amendments to specify pollution source type and the risk of nitrogen waste would be advantageous**. Only a small number (31%) of directly nitrogen relevant policies (from 48) determined pollution source types. 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.** A large proportion (49%) of Afghanistan's nitrogen relevant sector-based policies have not referenced any sinks.
- **To deal with N_r pollution better, it is necessary to have policies that consider multiple sectors and sinks and policy instruments.** Currently, twelve policies meet this criterion to some degree such as the Environment Law 2007. Although not all policies would need to be integrated in this manner, a policy gap is visible.
- **The majority of Afghanistan's population (70-85%) rely on Agriculture for their livelihoods. This sector is also a core contributor to national N_r emissions** with the main source as 'Direct N_2O Emissions from managed soils'. Sustainable alternatives are available with economic, environmental and health co-benefits. 'Soil' sink focused policies are further recommended.
- **The development of National Action Plans are advised in the United Nations Environment Assembly (UNEA-5) new resolution on sustainable nitrogen management**. Afghanistan 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.**

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