Delhi Declaration on Reactive Nitrogen Management for Sustainable Development

1. The participants of the 5th International Nitrogen Conference on Nitrogen Management for Sustainable Development- Science, Technology and Policy", held in New Delhi, India, 3 to 7 December 2010, co-hosted by the Indian Nitrogen Group and the International Nitrogen Initiative,

2. REAFFIRM the Nanjing Declaration on Nitrogen Management (2004) that reactive nitrogen is a critical nutrient for food, feed and fiber security. However, inefficient management of all sources of reactive nitrogen has negative effects on the environment and human health and therefore, improved management is required for sustainable development,

3. AFFIRM the scientific findings that the global nitrogen cycle is one of the most anthropogenically altered nutrient cycles on earth, that the adverse consequences of unabated accumulation of reactive nitrogen compounds (in our soil, water, air and upper atmosphere) are real, for our health, environment and climate change, and that it is possible to reduce them by concerted (local, regional and global) action through science-based practices and policies,

4. RECOGNIZE that the anthropogenic realeases of reactive nitrogen vary hugely between countries of the world, between regions within countries and between different economic sectors, and that the responsibility to mitigate the damage varies proportionately,

5. AFFIRM that nitrogen from fertilizers, biological nitrogen fixation and recycling of organic residues is necessary for food security. However, leakage of reactive nitrogen from crop, animal, aquatic and industrial production systems into the environment is a cause for concern. This is regardless of whether the leakages are of chemical, biological or organic origin. It is possible to minimize these leakages through scientific and technical solutions and enabling policies. This includes ways to optimize the efficient use of inorganic and organic fertilizers world-wide, and to facilitate enhanced access and sustainable use of N inputs in the predominantly N-deficient soils of Africa and parts of Latin America and Asia,

6. RECOGNIZE that nutritional inequities, whether due to overnutrition among some populations (especially from protein-rich animal products) or undernutrition in a significant fraction of the world, affect the health and sustainable development of both populations, as well as exacerbate disturbances in the nitrogen cycle. This necessitates better management of food chains and food security, particularly, intensively managed livestock production systems, which cause excessive losses from nitrogenous excreta (urine, dung and other biological wastes) unless properly recycled,

7. ACKNOWLEDGE that while fossil fuel and biomass combustion are currently necessary to meet demands for electricity, transportation and energy, reactive nitrogen by-products from these sources are a serious cause for concern,

8. CONCERNED that in a business-as-usual scenario, the problems associated with inefficient production and use of reactive nitrogen will multiply in the coming years, as the demand for food, especially animal proteins, and bio-fuels increases, fossil fuel and biomass burning increases, and growing urban populations produce more waste,

9. ENCOURAGE coordination for interdisciplinary research, capacity building and policy within and between countries, intergovernmental bodies, the International Nitrogen Initiative and civil society: a) to ensure adequate N availability for food and nutrition security in different regions and b) to understand and mitigate the adverse impacts of accumulation of excess reactive nitrogen,

10. CALL upon the UN bodies such as UNEP, FAO, UN-Habitat, WHO, UNDP, UNFCCC, CBD, CLRTAP and other regional organizations, national governments, scientific communities, including CGIAR, industries, policy makers, International Nitrogen Initiative and the civil society to address nutrient deficiencies, move towards increased efficiencies in each segment of nitrogen cycle management, in order to reduce the adverse effects. Approaches should consider the use of incentives, make full use of re-cycling and ensure the treatment of discharges,

11. Since the Nanjing Declaration, progress has been made in understanding and managing reactive nitrogen, but several key issues need attention. These issues have been organized into the following five pillars of integrated nitrogen management:

a. Food security: Enhancing nitrogen use efficiency from all sources could meet much of the projected increase in global food demand by over the next two decades. Better animal feeding and manure management could decrease nitrogen releases substantially. The advances in technologies for improved management of reactive nitrogen in crop and animal production systems must be accompanied by better understanding of the social and economic factors that may limit or provide incentives for adoption of these technologies. Similarly, minimizing the release of nitrogen and other nutrients into estuarine and near-shore habitats would help protect the world's fisheries, which depend on these habitats;

b. Energy and industry: Progress has been made in decreasing nitrogen oxides (NO_x) emissions, but ammonia (NH_3), which is primarily from the agriculture sector, is becoming increasingly important for effects on the environment, health and climate. The potential role of biofuels in increasing reactive nitrogen emissions could offset any gains in carbon emissions;

c. Human health: In many parts of the world, human health continues to be profoundly affected by inadequate protein nutrition indicating a need for more nitrogen availability for farmers in those regions. Conversely, too much reactive nitrogen affects health through elevated exposure to ozone, nitrogen oxides and particulate matter. Debate continues on health impacts of nitrates in drinking water and diet; more epidemiological studies are needed. Direct engagement with the health community is essential for progress in this pillar;

d. Ecosystem services and Biodiversity: Atmospheric deposition to terrestrial ecosystems is confirmed to be a major source of above and below ground biodiversity reduction in temperate and boreal ecosystems and is likely to be so across many world regions with excess nitrogen. At the same time, only a small fraction of the nitrogen from humans and livestock systems entering water systems is treated, leading to serious losses of biodiversity in freshwater, esturine and coastal marine systems. Nearly all of our information on the effects of reactive nitrogen on biodiversity is derived from studies on temperate ecosystems. More studies on tropical terrestrial and aquatic/marine ecosystems are needed. The impacts or thresholds of this biodiversity reduction on the function of ecosystems are not always clear. Links with the planned Intergovernmental Science-Policy Platform on Biodiversity and

Ecosystem Services (IPBES) should be established to highlight the role of nitrogen. Improved nutrient use can prevent loss of natural areas, which would otherwise have to be converted into agricultural land, leading to benefits for both biodiversity and climate management;

e. Climate: Nitrous oxide is a powerful greenhouse gas – estimated to be responsible at current levels for about 10% of the net anthropogenic global warming potential from such gases, most which is emitted from plant and animal production systems. Losses of other reactive nitrogen forms into the environent also alter the greenhouse gas balance, acting as indirect sources of nitrous oxide, altering amounts of carbon sequestration and air chemistry, including effects on aerosol and methane balance. Due to the combination of both warming and cooling effects, smart approaches to nitrogen management are needed that give co-benefits for the management of climate and other threats;

12. Integration and action: Policies need to be 'nitrogen proofed' to maximise benefits and minimize negative effects of reactive nitrogen. There is a pressing need for national governments to develop more-integrated, rigorous and multi-disciplinary approaches for the management of sources, sinks, flows and effects of nitrogen and other nutrients at the local and national level. These approaches must be based on consolidation and synthesis of existing data, identification of gaps to undertake necessary research, and the use of information to promote appropriate practices and technologies, with the accompanying polices encouraging adoption of 'nitrogen proofed' best practice;

13. Regional assessments such as the European Nitrogen Assessment are required to frame issues of nitrogen deficiencies and excesses and mitigation options in policy relevant contexts, based on expert judgement of scientific knowledge and uncertainties. These regional assessments should lead to a similar framing of issues and options in a comprehensive global assessment for policy makers;

14. Identification, communication, and promotion of best practices require collaboration among many stakeholders including governments, scientists, practitioners, and policy makers at global, regional and national levels. The formation of the Global Partnership on Nutrient Management (GPNM) facilitated by UNEP is a welcome development in this regard. Nitrogen is one of the most important nutrients already identified by GPNM. In close partnership with INI and its regional centres, GPNM offers scope for further expansion of partnerships to address the issues of managing reactive nitrogen as a part of comprehensive plans for sustainable development.

New Delhi, India.
7 December 2010