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UNEP-WHRC Nitrogen Policy Workshop, Paris 8-10 March 2006
Chairs' Summary of Proceedings and Next Steps

Introduction

This UNEP-Woods Hole Research Center workshop was held at UNESCO, Paris during 8-10 March 2006, with the support and technical guidance of the International Nitrogen Initiative (INI). The workshop brought together members of the scientific and policy making communities to take stock of scientific understanding of the effects of reactive nitrogen in the environment and to explore what policy measures may be necessary to address surpluses and deficiencies of Nr in the environment. This note provides a summary of discussions, analysis and recommendations, on evaluating and managing the impacts of reactive nitrogen ("Nr") in the environment, drawn from the workshop, and prepared by the Chairs of the meeting.

This summary draws on the formal presentations of participants, subsequent discussions and more detailed notes from three breakout groups. While a range of negative impacts of Nr in the environment was recognised, and some of the existing policy responses were discussed, opinions differed on the extent and type of new policy responses required. Proposed next steps were identified during the workshop, including the production of a "non-technical review" on reactive nitrogen to help communicate the issues and raise the awareness of policy makers and other key audiences. That document, combined with further contacts and consultation with national governments, is intended to increase the engagement of policy makers at the Fourth International Nitrogen Conference that will take place in Brazil in October 2007, organized by the International Nitrogen Initiative, a joint Scientific Committee on Problems of the Environment/International Geosphere-Biosphere Programme (SCOPE/IGBP) exercise. Consultations carried out prior to and at the conference are expected to focus future activities to assess Nr impacts, assess the costs, benefits and trade-offs of policy responses, and examine capacity building needs to support these activities.

Objectives of policy-oriented work on reactive nitrogen

- *Determine* the specific, geographically defined environmental and developmental challenges posed by Nr, relating to both excess and deficiency, and their distribution in the environment.
- *Catalogue* the effectiveness of existing policy instruments, and analyze their costs and benefits.
- *Advance* the economic, human health, and environmental rationales that help developing countries learn key lessons from developed country experiences on Nr management, to convince stakeholders of the policy needs.
- *Determine* the extent to which Nr management objectives are incorporated into existing policies, identify gaps requiring policy reform such as enhancing synergies between existing policies that influence Nr management.
- *Explore* approaches to integrate existing Nr-related policies into a framework that will provide a comprehensive approach to managing Nr.

The quantity of reactive nitrogen introduced in the environment has doubled since the middle of the nineteenth century. The workshop began with presentations by scientists involved in INI assessments of the broad scientific consensus that has developed, supported by numerous commission reports and peer-review papers that excess Nr in many regions of the world is significantly contributing to detrimental eutrophication of coastal embayments and near-shore zones of hypoxia, acidification of soils and lakes with concomitant effects of regional biogeochemistry and biotic diversity, reductions in air quality, and increases in radiatively active atmospheric gases. Serious concerns have also been raised about the effects of Nr on human health, although the direct effects are not yet well documented. While there has been a clear global increase in Nr, the fact remains that there are localities, countries and even regions where more problems are created by a deficiency of Nr than by an excess. Thus it is not simply the accumulation of Nr that should be the focus of stakeholders – it is necessary to define the nature and location of problems it creates. It is also important to determine the costs, benefits and trade-offs incurred by society from Nr use, to engage key stakeholders, including those responsible for economic and development policies.

Within policy circles, the nitrogen debate also needs to be framed in such a way as to avoid division between those dealing with scarcity and those dealing with excess amounts. A "common table" needs to be maintained where all policy makers can discuss the issue as part of an integrated system.

Approach

The workshop was convened because the analysis conducted through the INI shows that there are specific problems with Nr in many parts of the world, suggesting that appropriate policy responses are required. At the same time the organizers are cognizant of the fact that it is necessary to base responses on relevant experience of stakeholders, and to ensure that those responses are effective at the appropriate geographic level.

In so doing, it is important to avoid duplication of existing efforts, and evaluate the efficacy of existing policy instruments that address Nr management issues. Another objective should be to utilize fully the opportunities that exist to combine approaches to linked environmental problems. For example, atmospheric Nr is often emitted with CO_2 and particulates, while Nr released to the atmosphere may affect both regional air quality and water quality as the air-borne Nr is deposited onto water bodies. Effective policy responses will have to address these interlinkages and be tailored to local and regional conditions to contribute to effective nitrogen management in a holistic manner.

Discussions during the workshop pointed to the following considerations in evaluating Nr management challenges and developing potential policy responses. These relate to the scale and nature of Nr-related problems, building on existing expertise and policies, efficiency and coherence issues and some potential catalysts for action.

Spatial scale for Nr management

- Spatial scale of the problem should determine what the approach should be. A global approach is only valid if it is required to enable countries to address specific Nr problems which are global in extent. Nr problems within national boundaries may require inter-province/state collaboration, while those at a regional scale require collaboration among nation states.
- Local or regional problems, such as marine hypoxia zones, may also benefit from some attention and coordination at the global level because of their widespread occurrence. However, as the causes are rooted primarily in nitrogen management at the local, national and in some cases regional level, much of the global level activity should relate to information exchange and dissemination.
- If N_2O impacts are of concern mainly for their greenhouse effect, they may be effectively covered by the UNFCCC.

- Important transboundary effects should be identified, and the focus placed on these, such as those currently addressed by the UNECE Convention on Long Range Transboundary Air Pollution (CLRTAP). Examples in developing country regions could include the impacts of biomass burns at the regional level in Latin America, and the combination of these and urban/industrial emissions in South and South East Asia.
- The Secretariat of CLRTAP is interested in increasing interaction with other regional cooperation mechanisms interested in the Nr issue (e.g., Malé Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia, the Acid Deposition Monitoring Network in East Asia (EANET) and the International Union of Air Pollution Prevention and Environmental Protection Associations (IUAPPA)). The question was posed how UNEP and INI could help in establishing links and cooperation.

Combine necessary expertise, build on existing intergovernmental structures

- Ensure that nationally and regionally located scientists with knowledge of economic sectors which are affected by or contribute to Nr management challenges are engaged through relevant institutions and professional bodies.
- Combine science and policy communities in a policy-oriented forum focused on recognized problems – e.g., CLRTAP – as a valuable approach to developing practical policies.
- Engage existing institutions at the regional level, which could incorporate Nr management tools to address recognized problems (as per the UNECE CLRTAP approach), and consider economic and political factors that influence their interest and potential in developing appropriate responses.
- Explore the potential to incorporate Nr policy instruments in regional environmental protocols or related to regional agreements on economic integration; e.g., Association of Southeast Asian Nations (ASEAN), South African Development Community (SADC), Southern Common Market (Mercosur).
- Ensure confidence in data, and increase ownership of research and policy making processes, by promoting international cooperative programmes based on national research into Nr-related issues.
- Engage farmers, business and industry as partners in intergovernmental structures given their expertise and potential to contribute to solutions.

Efficiency and combining environmental, economic and social goals

- European Commission experience shows the need for an integrated approach to management approaches, policy making and controlling Nr sources, otherwise measures addressing atmospheric and aquatic emissions can conflict, especially where Nr moves between environmental media.
- Identify “low-hanging fruit” and win-wins (economic and environmental) such as achieving more efficient fertilizer and feed use and developing uses for N-containing wastes.
- Linking Nr management efforts to a critical environmental resource or service (e.g., freshwater), through the relevant instruments and institutions, can contribute to mainstreaming and efficiency.
- Clearly identify trade-offs associated with management and policy options.

Catalysts for action

- Identify major impacts requiring policy action at all scales to illustrate different types of Nr problems, and stimulate appropriate stakeholder action. One focus could be the evaluation of impacts associated with a rapid intensification of fertilizer use in some arid areas in developing countries.
- Examples of where “first movers” clubs of countries or other legal jurisdictions have catalysed actions to address Nr management problems could usefully be examined. The 30% club on NOx emissions in the CLRTAP is one example showing clear environmental benefits, which may be replicable in other intergovernmental or national fora.

Mainstreaming Nr solutions vs. new Nr-focused instruments

- In developing policy approaches it is necessary to consider whether Nr is a primary factor or a contributing factor to environmental or development problems.
- If Nr is a *contributor*, focus on existing instruments which address these problems and see how the response to Nr could be better integrated in them.
- If Nr is a *primary* factor, i.e., is the main or only cause of a particular problem, then consider developing a stand-alone Nr instrument.
- Some participants suggested the establishment of an International Nitrogen Fund, but this was opposed by others.

Data, research, monitoring and assessment requirements

The workshop relied on the preliminary assessment on the subject prepared by the International Nitrogen Initiative, and came to the conclusion that while it should be commended, more work needs to be done to understand fully the scope and scale of Nr problems (excess or deficiency) that exist in some localities and regions. In some cases, such as sub-Saharan Africa, the lack of sufficient Nr for productive agriculture is clear even though sufficient data to construct regional N budgets are lacking. In other regions, such as North America and Europe, data on N cycle budgets are reasonably well developed, allowing areas where excess Nr is problematic to be identified. This has led to the design and implementation of an array of policy measures to address Nr problems in these regions, with varying degrees of success. Even in developed countries, the links between excess Nr in the biosphere and specific problems of environmental degradation and human health frequently have not been stated in sufficiently clear and compelling ways to convince many policy makers of the severity and urgency of these problems. While some participants accepted the scientific rationale for concern about excess Nr, others expressed confusion and doubt.

One presentation did make it clear that even in these regions, there are still considerable uncertainties as regards the scope of the problem, with important implications for any policy response. Additional scientific information would therefore further inform the effectiveness of existing policy instruments as well as providing a clearer rationale for any necessary reforms or augmentation of those instruments. Data collection, research on Nr effects and how it moves in the environment, and better monitoring and assessment are still desirable to enhance the effectiveness of Nr policies. Improved scientific understanding of the problems, however, is not the only, and perhaps not the main need for advancing policy considerations. The wide range of opinions expressed by the non-scientist participants of this workshop demonstrates the need for improved communication of the existing scientific consensus to non-specialists and for more compelling statements of the scientific case for policy actions regarding Nr.

Data and research needs

- Continue to engage scientists in relevant sectors (e.g., agriculture, water, energy, transport) using, producing or receiving Nr to identify and evaluate options to address impacts.
- Clarify quantities and flows in the Nr cascade – to better understand movement between media and evaluate impacts and potential policies, especially in the developing countries where fewer data are available.
- Develop indicators beyond those of fertilizer production and consumption, to take into account the important influence of agricultural management practices, agro-climatic conditions, and other factors in creating Nr-related problems.
- Improve quantification and understanding of the negative impacts of excess Nr, also as a prerequisite for valuing those impacts. These should be set against the positive economic impact of food, fibre and energy production associated with the use of nitrogen fertilizers.
- Review epidemiological and toxicological studies to identify and quantify direct and indirect human health effects.

- Undertake research on monetary and non-monetary values of ecosystem services that are compromised by too much or too little Nr.
- Undertake more research on impacts of changes in Nr levels (whether raised or diminished) on biodiversity, nutrient interactions, and rates of denitrification in various ecosystems and situations.
- Undertake cost-benefit analyses of technical options to address problems of Nr deficiency or excess.

Assessment and monitoring needs

- How should we augment existing assessments for sectoral analysts, stakeholders and policy makers interested in Nr?
- How can we make better use of existing monitoring infrastructure, networks and assessments already in place or underway, and link them effectively to the relevant policy makers and institutions, on an ongoing basis?
- Build capacity to collect environmental data including Nr for use by policy makers at the local, state and regional level and to contribute to broader assessments.
- Use assessments to highlight new information and policies, with evaluations of costs and benefits of various instruments to improve Nr management.
- Ensure integration of Nr issues in the International Assessment of Agricultural Science and Technology for Development (IAASTD), UNEP's Fourth Global Environmental Outlook (GEO 4), and the Millennium Ecosystem Assessment follow-up (e.g., with respect to valuation of ecosystem services).
- Engage Nr experts directly in GEO 4 production and the sub-regional assessments being conducted as a follow-up to the Millennium Ecosystem Assessment.
- Carry out Rapid N Assessments in sectors beyond agriculture, which engage the scientists with relevant expertise, to fill data and assessment gaps.
- What are the specific regional or global issues that deserve an immediate focus for increased monitoring and assessment activities?
- A first step could be to update INI's preliminary assessment of "Changes in the Global Nitrogen Cycle as a Result of Anthropogenic Influences" (October 2004), exploring the links between excess or deficiency of Nr and the specific environmental, economic, social, and health impacts created. It should be directed to laypersons and governmental officials who have little background in biogeochemistry.

Broadening stakeholder engagement and communications

Broadening stakeholder engagement, and particularly that of policy makers, will be critical in accurately identifying Nr-related problems and designing and implementing responses to them. More effective communication of the nature of these problems, including their environmental, economic and social aspects and trade-offs associated with them, is in turn critical to securing that engagement. The workshop advanced the following ideas in this regard.

Engaging stakeholders

- Use the Fourth International Nitrogen Conference in Brazil in October 2007 to enhance stakeholder engagement, and particularly that of relevant national policy makers and inter-governmental officials.
- The conduct of assessments of the Nr problem, on an appropriate scale to the specific problem, is a key to stakeholder engagement. A participatory approach is required to maximise that engagement, ownership of the results and ultimately their influence on policy-making.
- Map the INI, IGBP and SCOPE networks – to identify in the first instance where the expertise is clustered, where it is most needed and where gaps in the networks exist.

- Develop governmental linkages, information exchange and engagement through these networks immediately.
- Explore why policy response has developed faster in some countries and regions – for example the UNECE region and more recently China. What lessons are there for enhancing broad stakeholder and policy-maker engagement? Does this relate purely to the scale of Nr-related problems, or have other factors accelerated the policy response?
- Work in appropriate fora to engage sectors associated with the use and production of Nr, such as the FAO and the CSD during its next cycle dealing with agriculture and land use. The World Water Fora and the Quadrennial Review of UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) are also relevant as sectors receiving Nr.

Communications – getting the Nr message across

- Build on the outcomes of previous meetings, such as the three International Nitrogen Conferences in order to use latest knowledge and to target efforts where most needed, or most effective.
- In many developing countries the scientific community is already tracking problems related to Nr, but often finds that suggested policy responses are rebutted with the argument that development must come first. Making the economic and development case for Nr management is therefore critical, including a cost-benefit analysis of solutions and trade-offs proposed.
- Quantifying and wherever possible valuing the impacts of the Nr "cascade" on ecosystem services is critical for putting the problem in the context of the internationally agreed Millennium Development Goals (MDGs).
- Illustrate poverty linkages with, for example, Nr impacts on health, food production, forests, and tourism in coastal areas.
- Human health issues are very successful in engaging policy makers and the general public. When justified by sound science, these can be woven into the economic and development case for action. However, it is important to undertake rigorous analysis and to frame the issues in such a way as not to be alarmist.
- Unpack the different issues and impacts of Nr – an integrated treatment of them is confusing for some audiences.
- Explore the full potential of the 2004 Nanjing Declaration on Nitrogen Management as a communication tool.
- Produce a "non-technical review" of the Nr issue for a broad audience, including relevant (non-scientific) policy makers, before the end of 2006. Distribute extensively during the preparations and invitation process for the Fourth INI Conference.
- Achieve a balance between effectively communicating negative Nr impacts in plain language, and avoiding the impression that Nr in the environment is always a problem.

Policy making issues

A review of existing instruments that addresses Nr-related issues will help in answering the question whether current policies adequately address negative environmental, economic and social impacts of Nr distribution. This review will help governments, international agencies and other stakeholders in taking any necessary further action. Workshop participants highlighted that problems stemming from Nr excess and deficiency should be treated separately, given the different nature of policy responses required. It should be noted that a substantial proportion of these fall largely within the remit of governmental and intergovernmental agencies responsible for agricultural policies.

Nr excess

- What tools fit best in current regulatory systems – especially at national levels?
- Evaluate which policies on Nr have worked, which haven't, and for what reasons.

- Critical loads for acidification and eutrophication, and critical levels for atmospheric pollution can be useful tools for setting the basic management and policy frameworks.
- Consider how to address the farm/catchment/country specificity within national and regional policy frameworks.
- Address the economic drivers of current Nr management – notably poverty, agricultural subsidies and prices of nitrogen fertilizer.
- Clearly link proposed solutions to the achievement of MDGs.
- How can indicators of Nr presence and impact be developed and packaged for inter-agency use?

N depletion issues

- What management and policy approaches are required to develop the agriculture sectors of developing countries, while also preventing excessive or inefficient application of Nr in some localities?
- How can relevant traditional knowledge of local farmers be integrated with modern nutrient management practices?
- Clearly link proposed policy solutions to the achievement of MDGs.
- What frameworks are needed to ensure that farmers have access to knowledge on the best N management practices for their circumstances?

Capacity building requirements

Capacity to assess and respond to Nr related problems is lacking in many countries. Capacity building activities must be an integral part of efforts to document and communicate Nr problems and responses to governments and other stakeholders. The following preliminary recommendations have been synthesized from the workshop proceedings.

- Define capacity building needs of governments and relevant scientific bodies on data, research, assessment, monitoring and policy design.
- Broaden this needs assessment on inputs from concerned national research bodies and governments, with inputs from related international research and policy-making structures; e.g., Food and Agriculture Organization (FAO), Consultative Group on International Agricultural Research (CGIAR), Convention on Biological Diversity (CBD), Intergovermental Panel on Climate Change (IPCC), Convention on Long Range Transboundary Air Pollution (CLRTAP).
- Examine how UNEP's Division on Early Warning and Assessment (DEWA) does capacity building for assessments, to support such activities on Nr.
- Build capacity of developing country scientists to communicate with their own policy makers, ultimately to ensure scientifically sound tools for Nr management.
- Ensure that extension systems and other frameworks are in place to foster farmers' abilities to be good nitrogen managers.

Next steps

These steps have been synthesized from this summary of the workshop proceedings. They are structured around the immediate high-priority challenge of the production of one publication and preparations for one event – respectively a non-technical review on the reactive nitrogen issue and the Fourth International Nitrogen Conference in October 2007. This will entail collaborative work involving some of those institutions and experts present in the UNEP-WHRC workshop, as well as other stakeholders who were not present.

- Develop the terms of reference and prepare a non-technical review on Reactive Nitrogen in the Environment. This work will be commissioned by UNEP, building on the findings of this workshop and extending consultations on the issues to interested policy makers and experts who were unable to attend the March 2006 workshop.

- Suggested structure of document: Changes in the Global N cycle (based on an update of INI's preliminary assessment of October 2004); the objectives of policy work; approach; data, research, monitoring and assessment requirements; key policy making issues; and capacity building requirements.
- Document to be developed from this workshop report, broader consultation and a review by policy makers, nitrogen and communications experts.
- Launch at a side-event of the Quadrennial Review of UNEP's Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) in October 2006, or at a similar event related to other aquatic or atmospheric releases of N.

- In parallel with preparation of the non-technical review, undertake a mapping of current management and policy approaches to Nr (national, regional and global) and of the SCOPE and INI networks, to identify stakeholders and potential collaborators, existing initiatives, best practices and gaps in knowledge/action.
- Suggest inclusion of Nr-related issues in the IAASTD underway at the World Bank.
- Engage other relevant fora to discuss Nr issues within their mandates and work with governments to include these issues in the next CSD cycle.
- Initiate two national or sub-national projects, and one regional level project (in collaboration with CLRTAP), in countries or regions where governments are seeking to develop policies to address critical Nr management issues. The projects could focus on individual river basins, watersheds or airsheds, and should combine both environmental and developmental objectives. One national project should address Nr excess issues, the other Nr deficit problems, while the regional one should address issues of excess.
- Through these activities and feedback from governments and other stakeholders, determine what other contributions UNEP could make to activities on reactive nitrogen in the environment, including at the Fourth International Nitrogen Conference.

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