

THE INTERNATIONAL NITROGEN INITIATIVE AND ITS RELEVANCE TO AFRICA

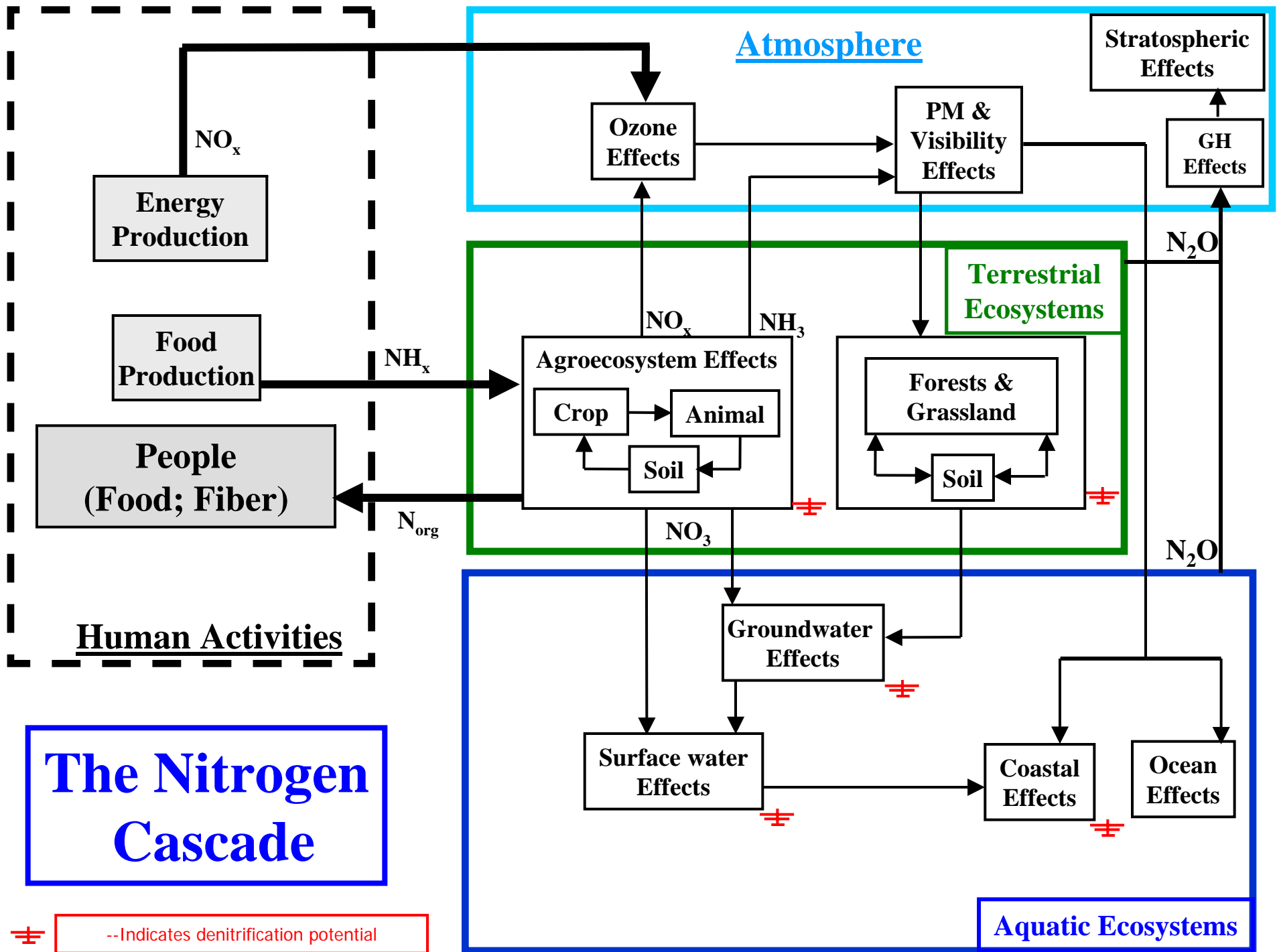
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The Issues Relating to Nitrogen

- ◆ We need food; we need energy
 - ◆ How do we obtain these without Nr accumulation?
- ◆ Create less Nr by:
 - ◆ Increasing N use efficiency in food production
 - ◆ Reducing NO_x emissions from fossil fuel combustion
- ◆ Convert Nr to N₂ before environmental release

While both are possible, an integrated N management strategy is required



International Nitrogen Initiative

A Brief History: Part 1

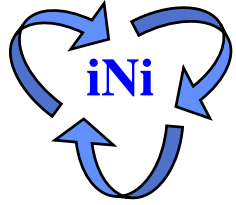
- ◆ **Significant focus on N assessment in last decade**
 - **SCOPE N Project (1994-2002)**
 - **First (The Netherlands, March, 1998) and Second (USA, October, 2001) International N Conferences**
 - **IGBP programs**
- ◆ **The Second International N Conference recommended the establishment of an international body with the following overall goal:**
 - *Optimize nitrogen's role in sustainable food and energy production, while minimizing negative effects on human health and the environment*



International Nitrogen Initiative

A Brief History: Part 2

- ◆ **Following the 2nd Conference, a small group met on a regular basis to design an international program ('the INI')**
- ◆ **A proposal for the INI was submitted to SCOPE in December, 2002**
 - **Officers recommended approval.**
- ◆ **A proposal for the INI was submitted to IGBP in January, 2003**
 - **Science Committee approved INI as a Fast-Track Project**
- ◆ **First meeting of the INI SAC was held in The Hague, NL in May, 2003**



INI SAC and Consultants

Scientific Advisory Committee

- ◆ Mateete Bekunda, Uganda
- ◆ Gilles Billen, France
- ◆ Zucong Cai, China
- ◆ Jan Willem Erisman, The Netherlands
- ◆ Jim Galloway, USA (Chair)
- ◆ Bob Howarth, USA
- ◆ Luiz Martinelli, Brazil
- ◆ Katsu Minami, Japan
- ◆ Bill Moomaw, USA
- ◆ Kiliparti Ramakrishna, USA
- ◆ Henning Rodhe, Sweden

Scientific Advisory Committee (cont.)

- ◆ Mary Scholes, South Africa
- ◆ Sybil Seitzinger, USA
- ◆ Janet Sprent, UK
- ◆ Keith Syers, Thailand

Consultants

- ◆ Ellis Cowling, USA
- ◆ Eric Davidson, USA
- ◆ Paul Fixen, USA
- ◆ Luc Maene, France
- ◆ Rabindra Roy, Italy

Ex-officio

- ◆ Jerry Melillo, USA



International Nitrogen Initiative

Overall Goal

‘Optimize nitrogen’s beneficial role in sustainable food production and minimize nitrogen’s negative effects on human health and the environment resulting from food and energy production’



International Nitrogen Initiative

Approach to be Used

- ◆ **Use** a three-phased approach to work towards the overall goal of INI
 - ◆ Phase I: Assessment of knowledge on N flows and problems
 - ◆ Phase II: Development of region-specific solutions.
 - ◆ Phase III: Implementation of scientific, engineering and policy tools to solve problems.

- ◆ **Establish** Regional Centers for Africa, Asia and Oceania, Europe, Latin America, and North America

- ◆ **Identify** cross-cutting themes to be addressed by all regions



Initial INI Cross Cutting Themes

- ◆ **Biological N fixation**
- ◆ **Fertilizer**
- ◆ **Energy production/use**
- ◆ **Nr distribution**
- ◆ **Animal production**
- ◆ **Human waste**
- ◆ **Denitrification**
- ◆ **Nr management**



The Components of INI

acid rain
troposphere
methemoglobinemia
decomposition
legumes
economics
wetlands
Asia
food production
smog
freshwaters

rivers
Africa
policy
forests
deposition
agroecosystems
denitrification
Oceania

fertilizers
forest productivity
emissions
ocean
Imports/exports
Europe
eutrophication
denitrification
Oceania

cities
politics
estuaries
North America
stratospheric ozone
fossil fuel combustion
human health
nitrogen fixation
haze
stratosphere
Latin America
nitrification
Biodiversity losses



Phase I: Assessment of Science and Identification of Problems

The N Biogeochemical Cycle

Systems

stratosphere

troposphere

cities

forests

grasslands

agroecosystems

wetlands

freshwaters

estuaries

oceans



Phase I: Assessment of Science and Identification of Problems

The N Biogeochemical Cycle

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stratosphere

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freshwaters

estuaries

oceans

Processes

nitrogen fixation

assimilation

decomposition

nitrification

denitrification



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Exchanges

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imports/exports

rivers



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Exchanges

emissions

deposition

imports/exports

rivers

Energy

Food

People





Phase I: Assessment of Science and Identification of Problems

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Energy
Food
People



Impacts

stratospheric ozone
smog
haze
acid rain
human health
eutrophication
biodiversity losses
forest productivity



Phase II: Development of Solutions

Phase III: Implementation of Solutions

Impacts

stratospheric ozone

smog

haze

acid rain

human health

eutrophication

biodiversity losses

forest productivity

These impacts can be lessened by reducing the amount of reactive N created and by converting reactive N to N₂

To achieve these goals, while maintaining food and energy production, requires engineers, policy makers, economists, resource managers, etc. working in a regional context



The Three Phases of INI

Phase I:
Assessment of
Knowledge



The Three Phases of INI

Phase I: Assessment of Knowledge

- What are the controls on N fluxes in the environment?
- How have N fluxes changed due to human action?
- What are the consequences?
- What are the gaps in knowledge?
- How do the answers to these questions vary by region?



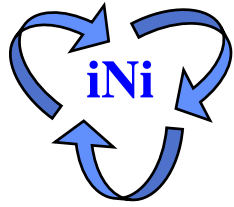
The Three Phases of INI

Phase I:
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Phase II:
Identification of
Solutions

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Phase II: Identification of Solutions

- What research is need to fill identified gaps?
- Which solutions can be used to solve identified problems?
- Which tools are required?
- Which areas of expertise are required?
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Phase III: Implementation of Solutions



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Phase III: Implementation of Solutions

- Which solution is best for a specific problem?
- What are the barriers to solution implementation?
- Are there economic issues?
- How long will the solutions be effective?
- How do the answers to these questions vary by region?



INI Activities: 2003

- ◆ March, N Workshop, Ubatuba, Brazil
- ◆ April, Planning for N Fertilizer Project, Paris, France
- ◆ May, SAC pre-meeting, Woods Hole, USA
- ◆ May, SAC meeting, The Hague, The Netherlands
- ◆ May, Briefing to IGBP, Stockholm, Sweden
- ◆ June, Briefing to SCOPE, Granada, Spain
- ◆ September, Animal Production Planning Group, Stanford, USA
- ◆ October, Invited Paper to ACSS, Nairobi, Kenya



INI Activities: 2004

- ◆ January--N Fertilizer Workshop, Kampala
- ◆ May--Denitrification Workshop, Woods Hole
- ◆ May, Animal Production Workshop, Stanford
- ◆ October, 3rd International N Conference, Nanjing
- ◆ October, Establish INI presence in all regions
- ◆ December, First Assessment Report



INI Funding

◆ INI Secretariat

- SAC Meeting: funded by Dutch, \$25K; SCOPE \$6K
- INI Operations & Assessment: ICSU, \$100K
- Webpage and outreach: Dutch, \$20K, pending

◆ Cross-Cutting Themes

- **N Fert RAP**: IFA will fund \$75K, USDA/ARS \$20K and USDA Foreign Ag. Service \$25K; other requests with USAID Uganda, START/PACOM, US NSF, and AusAid are pending
- **Denitrification Workshop**: \$45K US NSF/EPA; others pending

◆ Regional Centers

- In initial stages of developing a strategy



Next Steps

◆ Regional Centers

- Develop process to identify key people/institutions

◆ Preliminary Assessment

- Establish science and policy subcommittees
- Agree on methodology of assessment
- Work with key people/institutions from above

◆ Outreach activities

- Webpage/brochure
- Develop links with other programs



INI---THE AFRICAN CONTEXT

- ◆ The Kampala Workshop (January, 2004) on Fertilizer N (the entry point of reactive N into environmental systems) is an International Workshop but it will have an African focus
- ◆ We are wanting to select two people from this conference to participate in the Kampala Workshop
- ◆ INI aims to establish an African Regional Centre to address African needs, opportunities, and possible solutions
- ◆ INI welcomes a dialogue on the establishment of this Regional Centre and the work required in Africa at this ACSS meeting