

# The Nutrient Challenge – way forward

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**LOUIS BOLK**  
I N S T I T U T E

# Where are we?

- Nutrients are essential for sustainable development
- The nutrient challenge: *to produce more food and energy with less pollution*
- Global Partnership on Nutrient Management (GPNM) to facilitate and help implement
- Manila Declaration: mandate and guidance
- GEF project(s): infrastructure, toolbox and implementation
- Supporting policies and Best management practices are needed

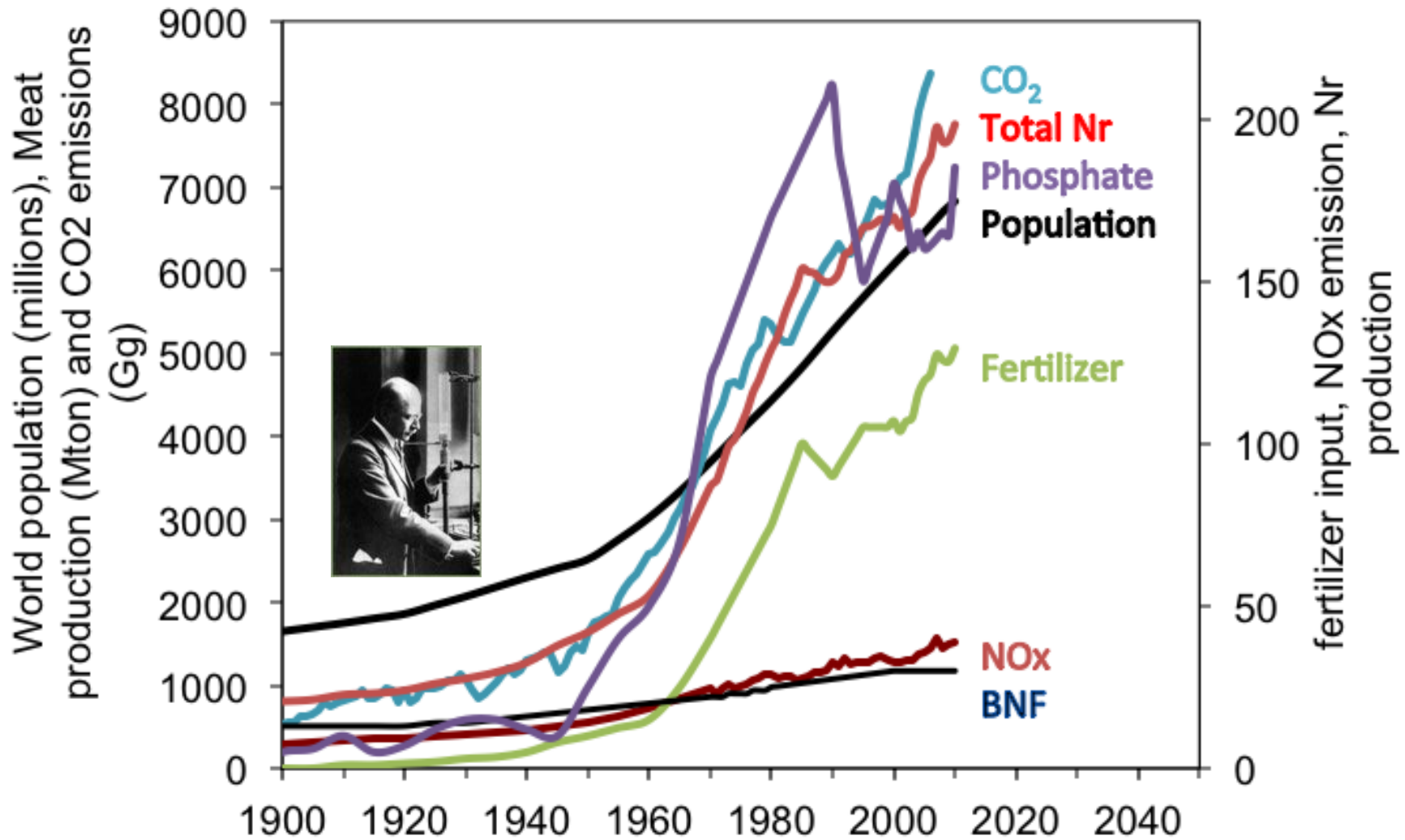


# Nutrients are essential for sustainable development

- Nutrients - nitrogen and phosphorous – are key for maintenance of soil health to grow crops and thus ensuring world food security
- Managing nutrients to meet sustainability goals:
  - Improve profitability
  - Increase productivity
    - Reduce hunger
    - Prevent land use changes
  - Minimize nutrient losses to the environment



# Global trends in human population, N and P use and CO<sub>2</sub> emissions



~50% of the global population eats because of fertilizers

# Uneven distribution

- More than 2 billion people in the world suffer from (micro) nutrient deficiency, especially in developing countries. Most critical are protein-nitrogen, phosphorus, calcium, zinc, iron, iodine
- An increasing number of people is obese



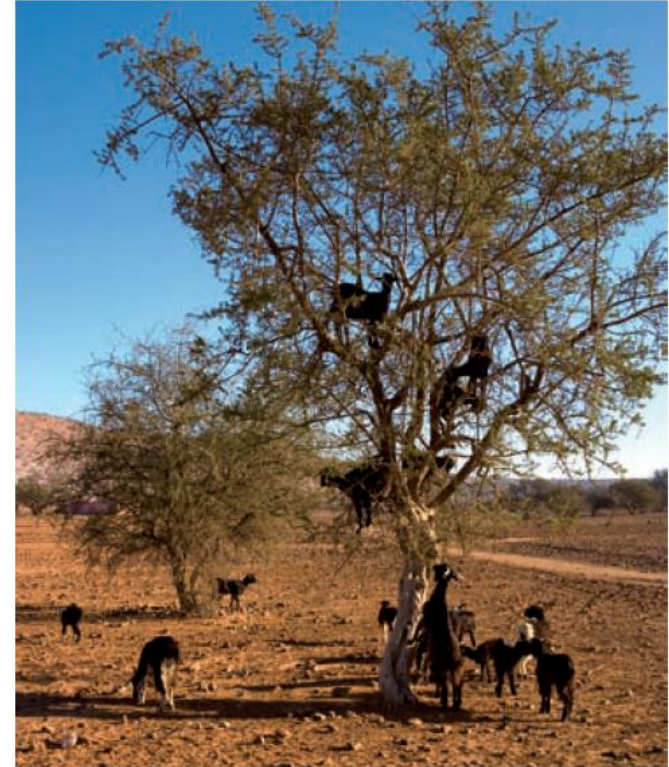
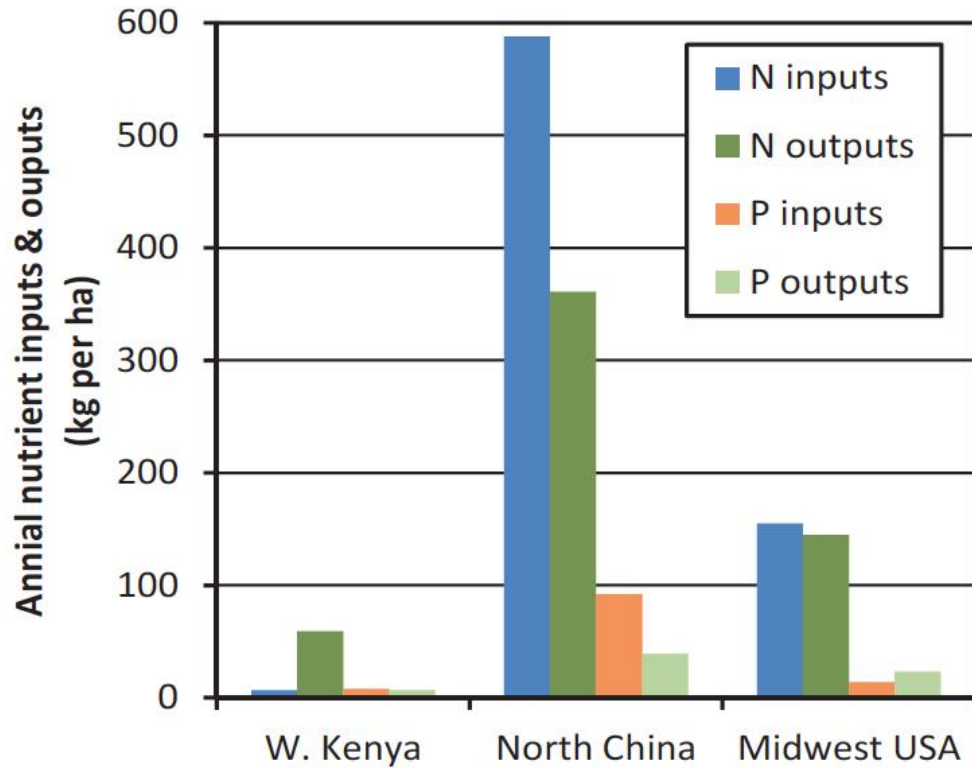
United States, The Revis family  
\$341.98/week



Chad The Aboubakar family  
\$1.23

Photo's: Peter Menzel, Faith D'Aluisio

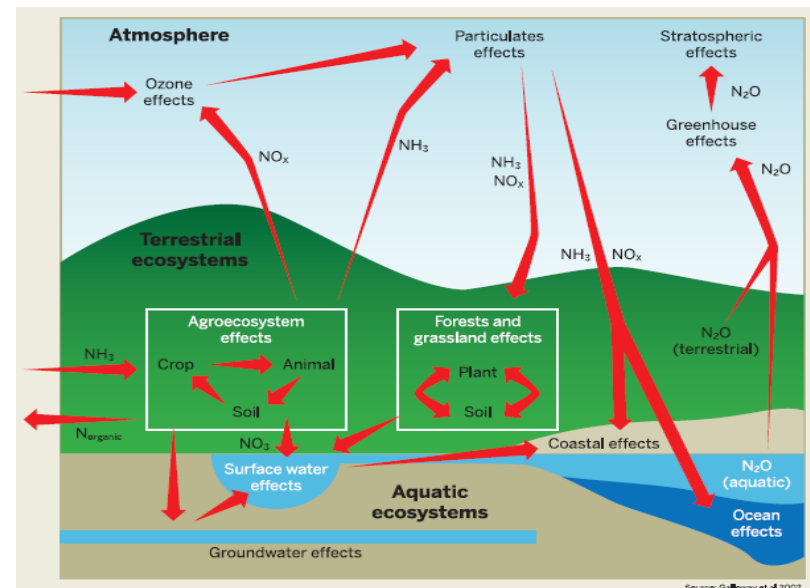
# Illustration of regional nutrient differences



# The 'nutrient costs' of food

- In total, 4 to 12 kg of “new” nitrogen and 4 to 12 kg of “new” phosphorus are needed to get 1 kg of nitrogen and/or phosphorus in food of consumers. Ma et al., 2010, 2012
- Nearly 75% of added nutrients end up lost to the environment wasting the energy used to produce them, and causing pollution through emissions of the greenhouse gas nitrous oxide ( $N_2O$ ) and ammonia ( $NH_3$ ) to the atmosphere, plus losses of nitrates ( $NO_3$ ), phosphate and organic N and P compounds to water:

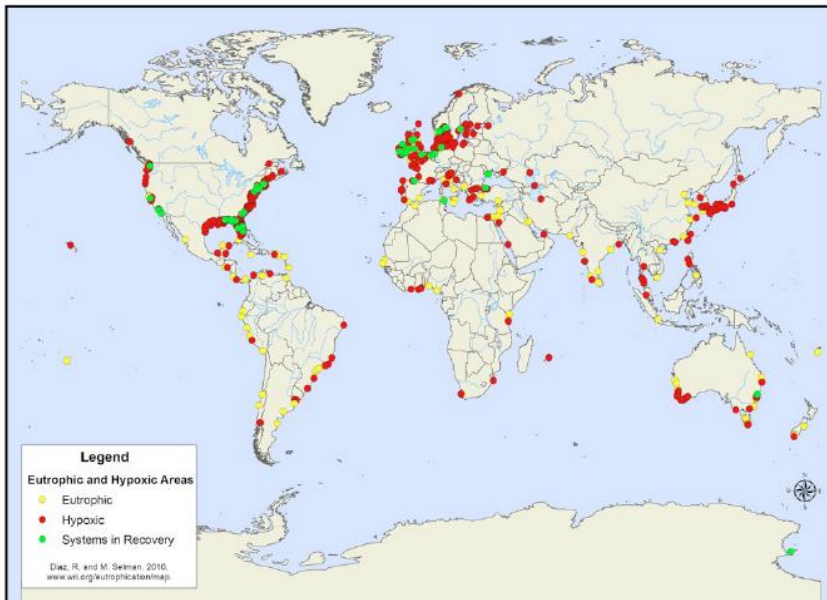
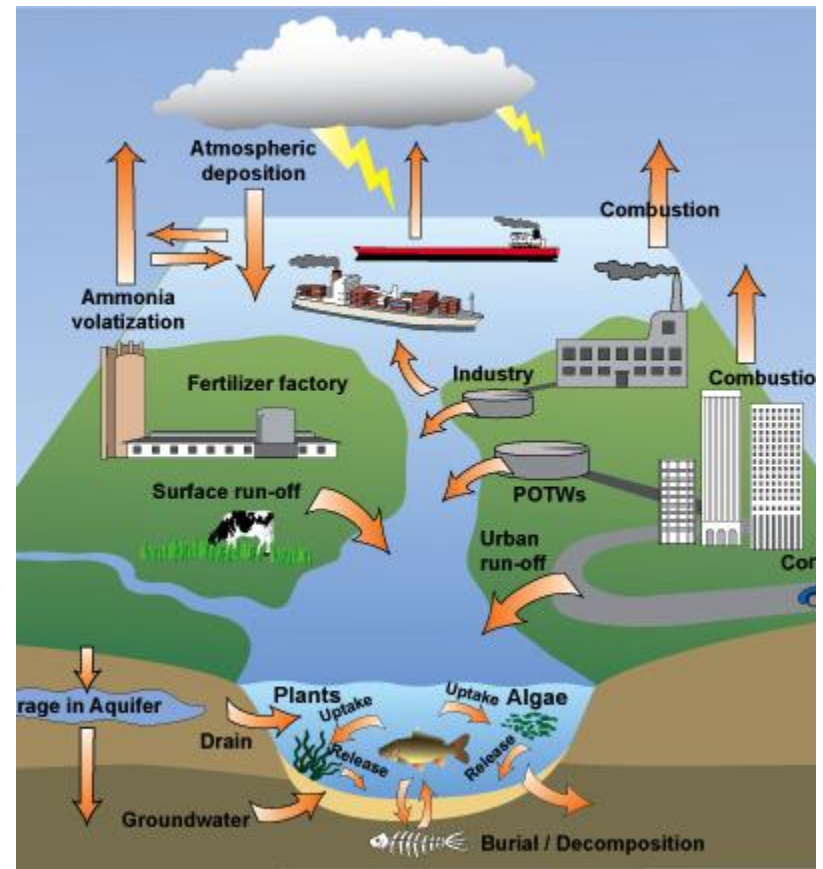
- Biodiversity loss
- Soil degradation
- Water pollution, shortages and erosion
- Air pollution
- Human health
- Greenhouse gas emission
- Climate change



Cascade through the environment

# Impacts: coastal systems

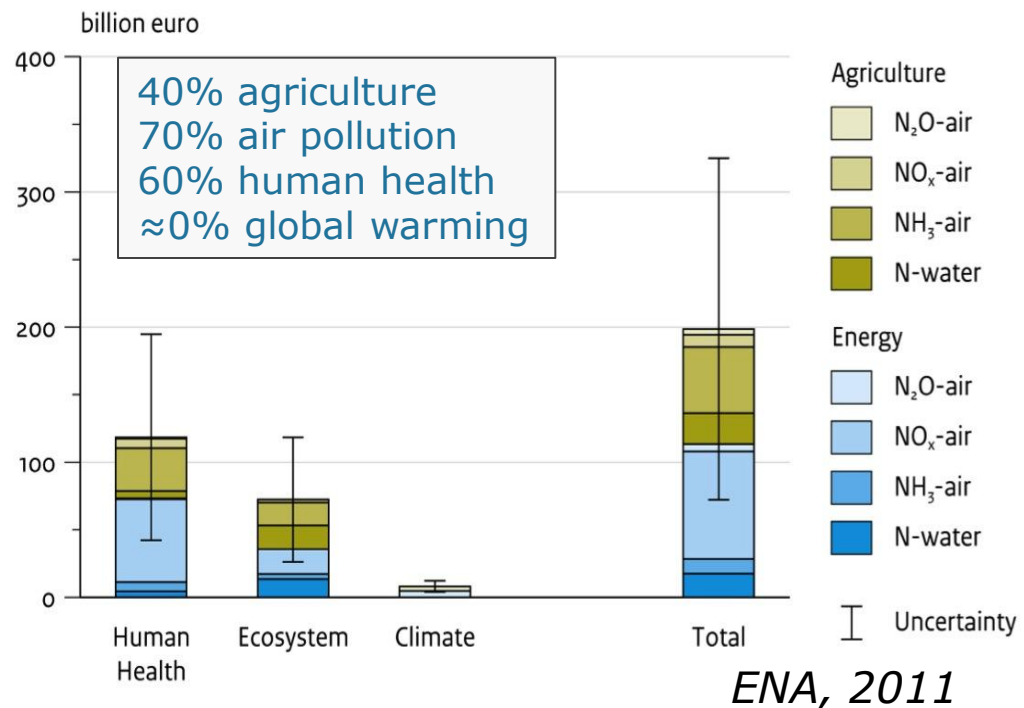
- >500 eutrophic/hypoxic coastal systems;
- >245,000 km<sup>2</sup> water area worldwide
- Fisheries and ecosystem services due to nutrient driven hypoxia: 170 bln US \$ (Diaz et al. 2013)





# The unintended costs of nutrients to society

- WTP to prevent N damage 70-320 bln € (EU, 2000)
- Added value for the primary sector (agriculture) similar to external cost
- Global extrapolation: 200 – 2000 bln US \$



# Fossil fuel dependence of agriculture

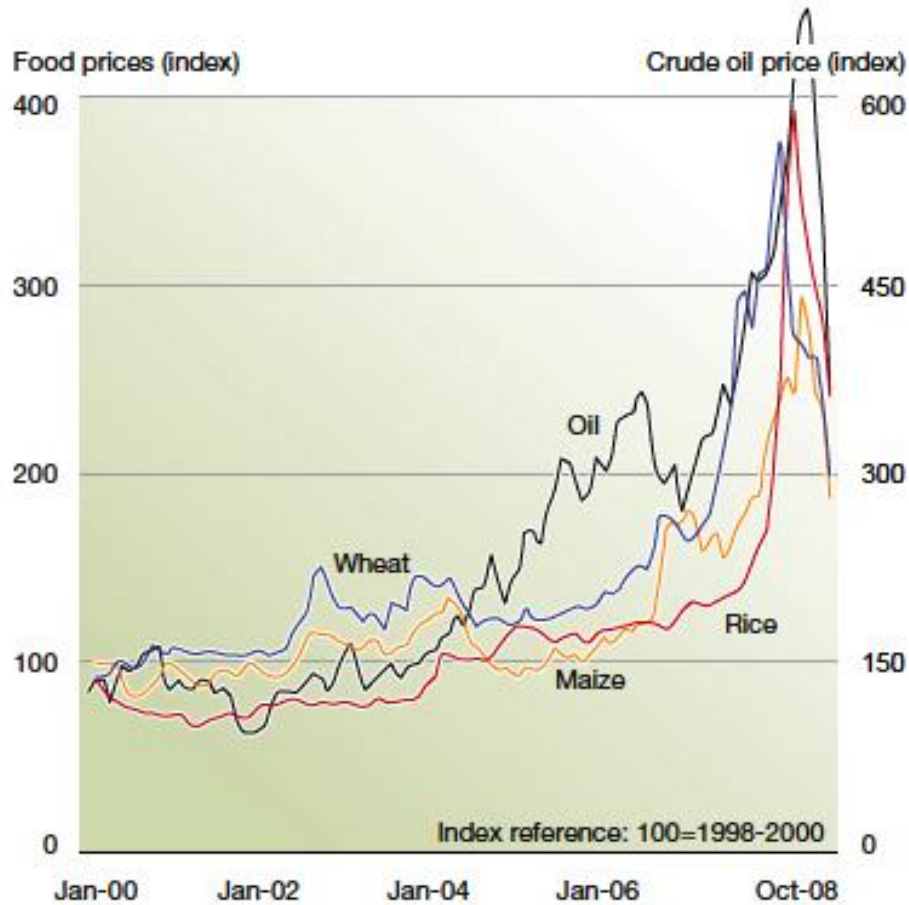
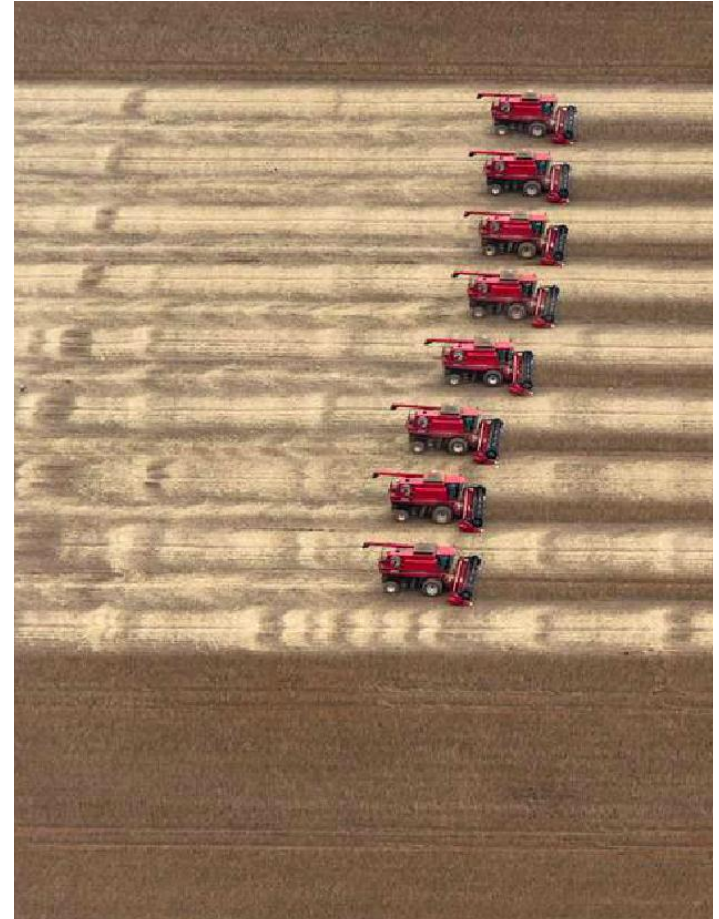


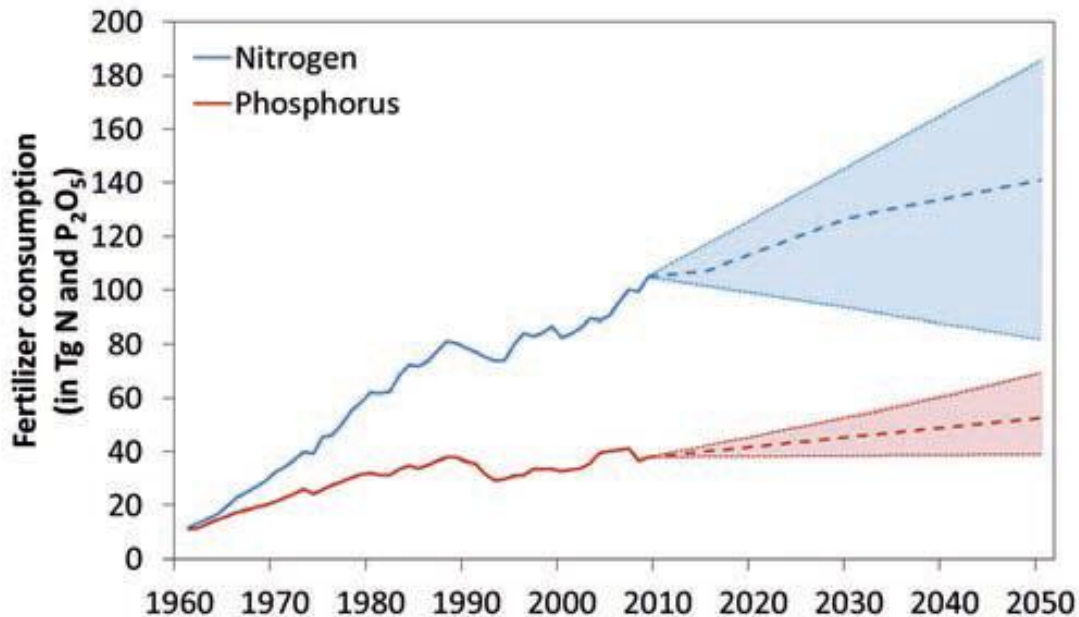
Figure 3: Changes in commodity prices in relation to oil prices. (Source: FAO, 2008; IMF, 2008).



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# Global trends and risks for 2050

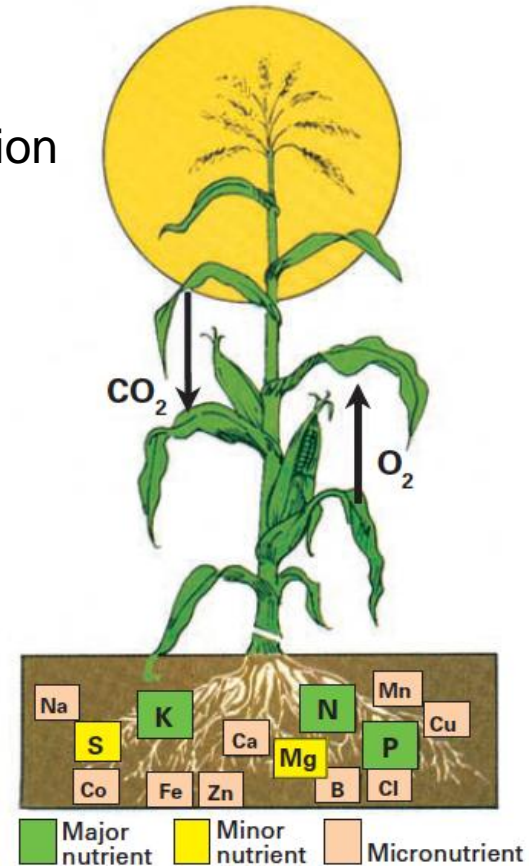
>9 billion people:	+30%
Meat consumption:	>50% increase?
Agricultural production	+60-70%
Required increase of cereal production	1%/yr
Extension of agricultural land	10-20%
Loss of biodiversity (MSA)	10%
Increase of N discharge into sea	+20%
Temperature rise	>2 degr?



Source: PBL Rio+20  
ONW, 2013

# The Nutrient Challenge

- Nutrient inputs will increase coming years
- Uneven distribution of nutrients on the globe:
  - Shortages lead to poor growth & development
  - Surpluses lead to pollution & ecosystem degradation
  - Easy accessible reserves are depleted
  - Huge regional and local variation in practices
- Inappropriate fertilizer practices are widespread:
  - Shortage leads to nutrient mining
  - Blanket recommendations
  - Unbalanced fertilization (fertilizer subsidies)
- Often responsible for:
  - large yield gaps
  - poor fertilizer use efficiency
  - nutrient leakage to the environment



- **Produce more, safe food/feed/fiber with less pollution**

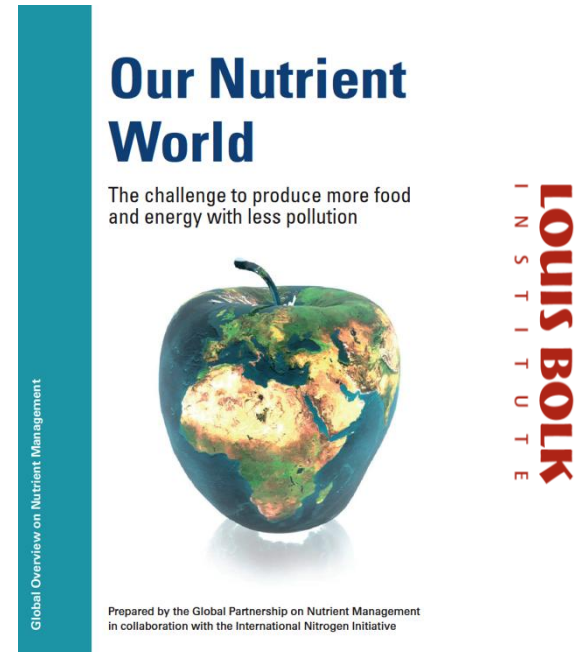
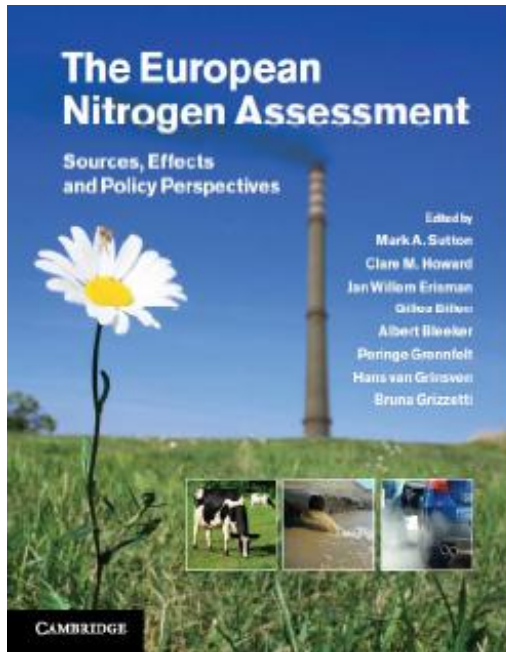
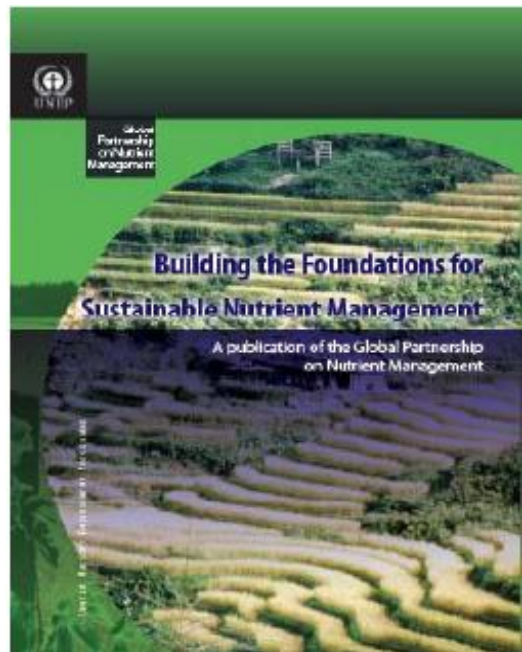
# Manila Declaration (2012)

“*Decide* actively to engage ourselves and step up our efforts to develop guidance; strategies or policies on the sustainable use of nutrients so as **to improve nutrient use efficiency** with attendant economic benefits for all stakeholders; including farmers; and to mitigate negative environmental impacts through the development and implementation of national goals and plans over the period 2012-2016; as necessary; and ... to support the further **development of the Global Partnership on Nutrient Management** and associated regional and national stakeholder partnerships; *as well as* their activities; including assessments as agreed by the partnership; and sharing of best practices using extension and advisory services for policy makers and farmers” (Manila Declaration Para 4 and 5a).

# Global Partnership on Nutrient Management (GPNM)

- Strategic advocacy and co-operation at the global and regional levels to build consensus in promoting nutrient use efficiency and work with stakeholders to develop guidance, strategies or policies on sustainable use of nutrients
- Enhancing the capacities of various stakeholders to design and implement effective management policies
- A knowledge platform to support science policy interaction and translating science for policy makers
- Positioning of nutrient issues as part of international sustainable development agenda

# Key products



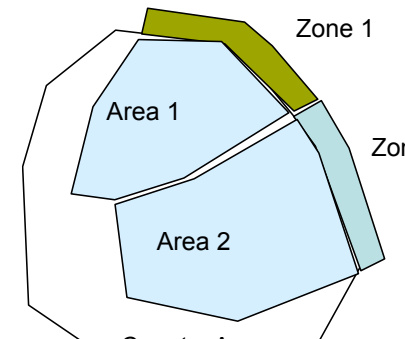
# UNEP/GEF Nutrient Projects

- 12 nutrient related funding: 100 M\$ GEF grant, 1,641 M\$ co-financing
- “Global foundations for reducing nutrient enrichment and oxygen depletion from land based pollution, in support of Global Nutrient Cycle”
- “Targeted Research for improving understanding of the Global Nitrogen Cycle towards the establishment of an International Nutrient Management System” (under development)



# Policy Toolbox with BMP, policy options and its effects

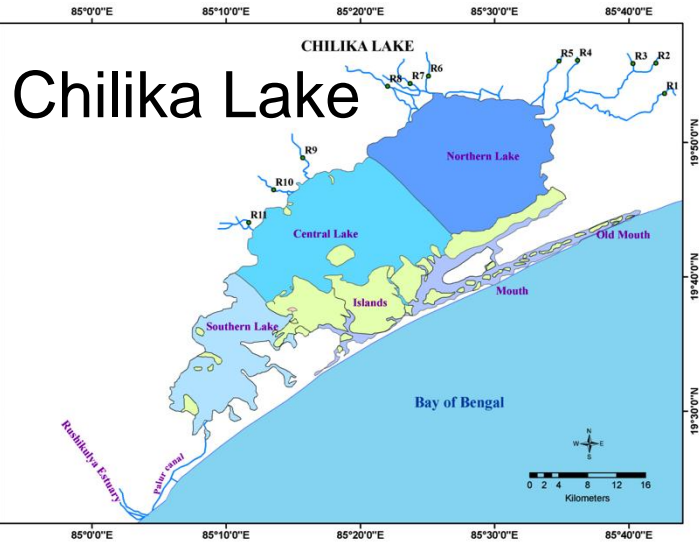
- intended to offer the decision-makers informed and **interactive access**, to cost effective, replicable tools and approaches to develop and implement nutrient management strategies
- WRI hypoxic areas, Global News2Use modeling system and BMP database
- Identify, review and compile nutrient best management practices (s.a. cost-effective and sustainable technology and policy options) under different socio-political settings



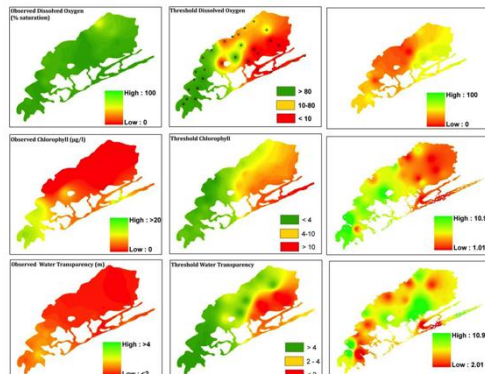
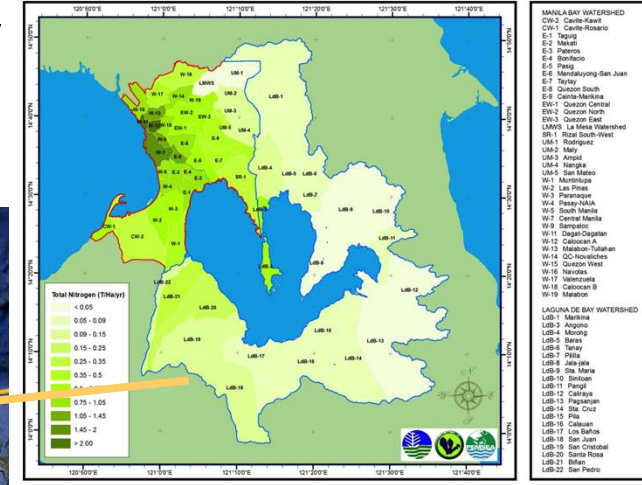
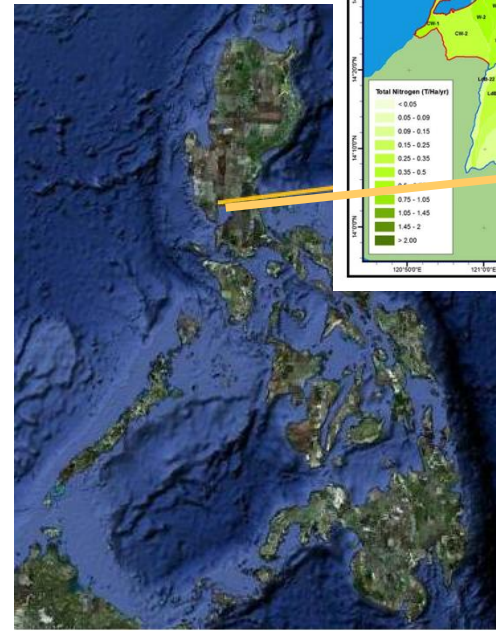
Site Name	Manila Bay	Region	East Asia
Country	Philippines		
Some Statistics			
Population	1356750	Present load (N)	25000
Water area (km2)	3575	Present load (P)	3500

# Case studies

Philippines (Manila Bay), India (Chilika lake)



## Manila Bay



**Unhealthy Habitat**

**Healthy Habitat**

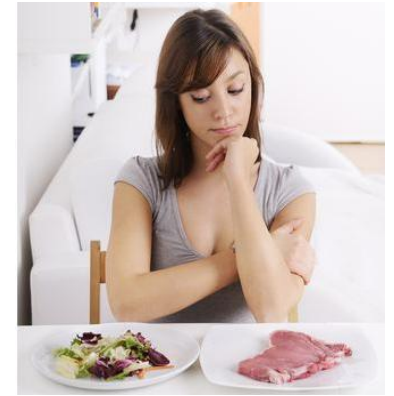


**Water Quality Index**

100

# Policies and Best management practices

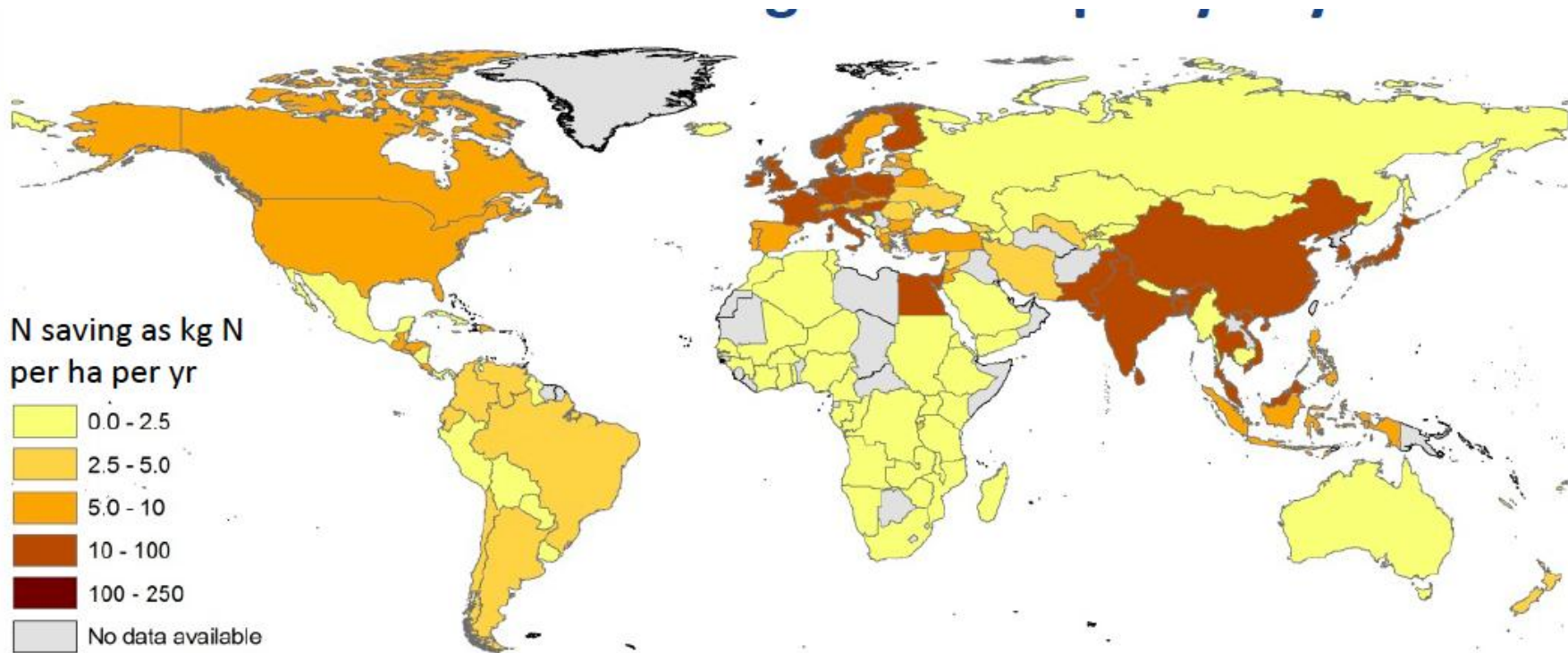
- Consumption: food (diet) and energy
- Food waste; sewage
- Energy and climate
- Agricultural policies (subsidies, biofuels, land use, etc.)
- Food quality and health
- Alternative (industrial) food production
- Agricultural production, recognizing the huge difference in agricultural practices:
  - Agro-ecological intensification;
  - 4R approach;
  - Closing the nutrient loop;
  - Technology
- Setting stringent ceilings to stimulate transitions; international agreements?



# Tasks for an intergovernmental process on the global nutrient challenge

- Global assessment of nutrient linkages, benefits threats and Green Economy opportunities
- Investigate practice options, agree indicators and set targets for improved N (& P) management
- Address barriers to change, fostering education, stakeholder discourse and public awareness
- Quantify the multiple benefits of meeting the targets: inc. How these support other global treaties
- Monitor time-bound achievement of the targets
- GPA can lead this process

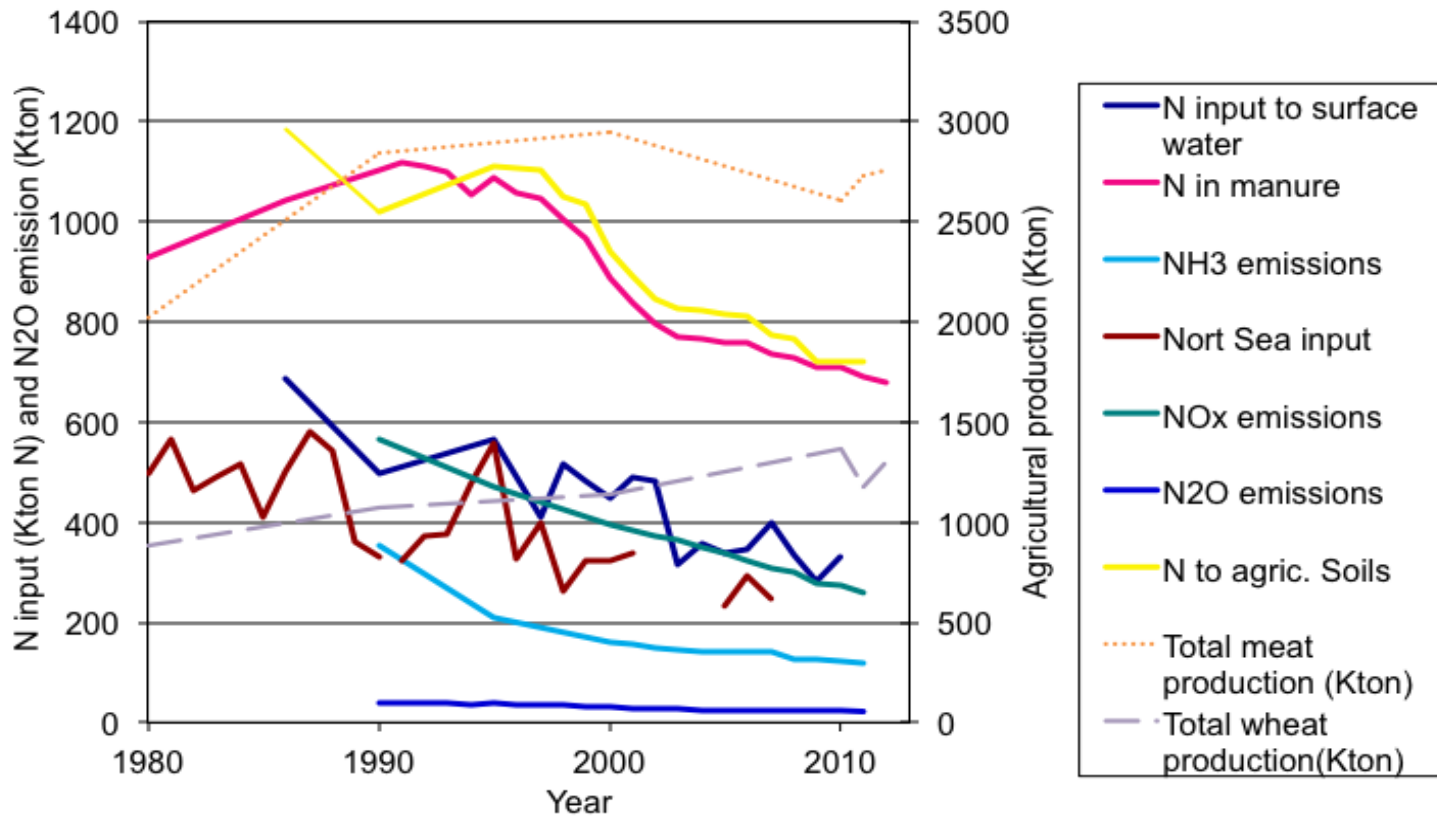
# 20% Nitrogen Use efficiency improvement



Benefits expressed here as equivalent N saving / ha per year from the Full-chain NutUE target

IGR-3 considered (but did not agree) on an aspirational target to improve nutrient use efficiency (NUE) by 20%.

# The Netherlands: increased agricultural production while decreasing nutrient inputs and losses



# Thank you for your attention

The multi-dimensional aspects of nutrient challenge and the possible pathways for addressing the challenge will be further discussed tomorrow during the session on GPNM from 8:30 to 18:00



# The 6<sup>th</sup> Nitrogen conference



## 6TH INTERNATIONAL NITROGEN CONFERENCE - 2013

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### Conference

- ▶ Themes
- ▶ Help to make N2013 N-neutral
- ▶ Program
- ▶ Committee
- ▶ Sponsors
- ▶ Conference Announcements
- ▶ Keynote Speakers

### Participants

- ▶ Registration
- ▶ Venue
- ▶ Abstract Structure and Submission Procedure
- ▶ Important Dates
- ▶ Downloads
- ▶ Hotel Accommodation



### Venue

Speke Resort & Conference Centre, Munyonyo, Kampala, Uganda.

Venue

Announcement

**Nitrogen 2013 Conference 18 – 22 November 2013,  
Kampala, Uganda**

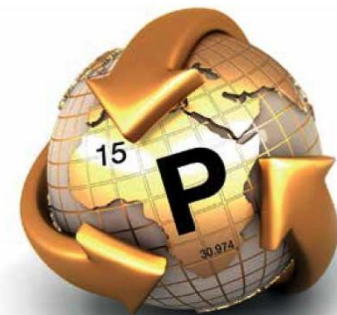
[www.N2013.org](http://www.N2013.org)



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