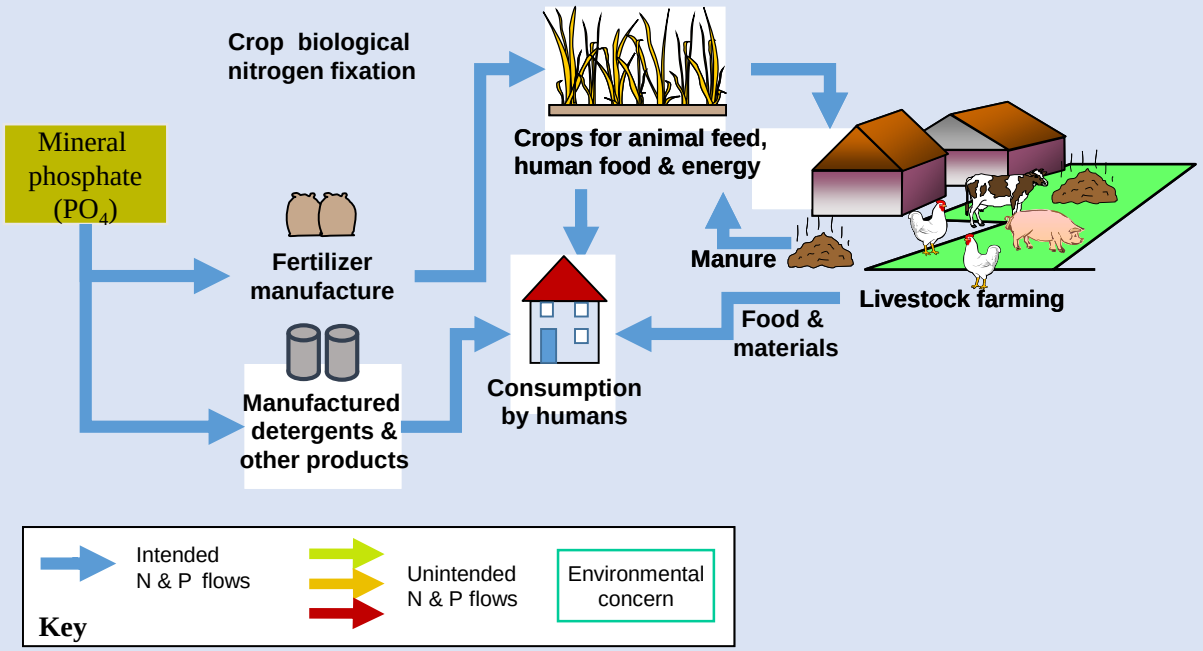
Global policy experience with nitrogen … why not also phosphorus?

Will Brownlie on behalf of Mark Sutton
NERC Centre for Ecology & Hydrology, Edinburgh

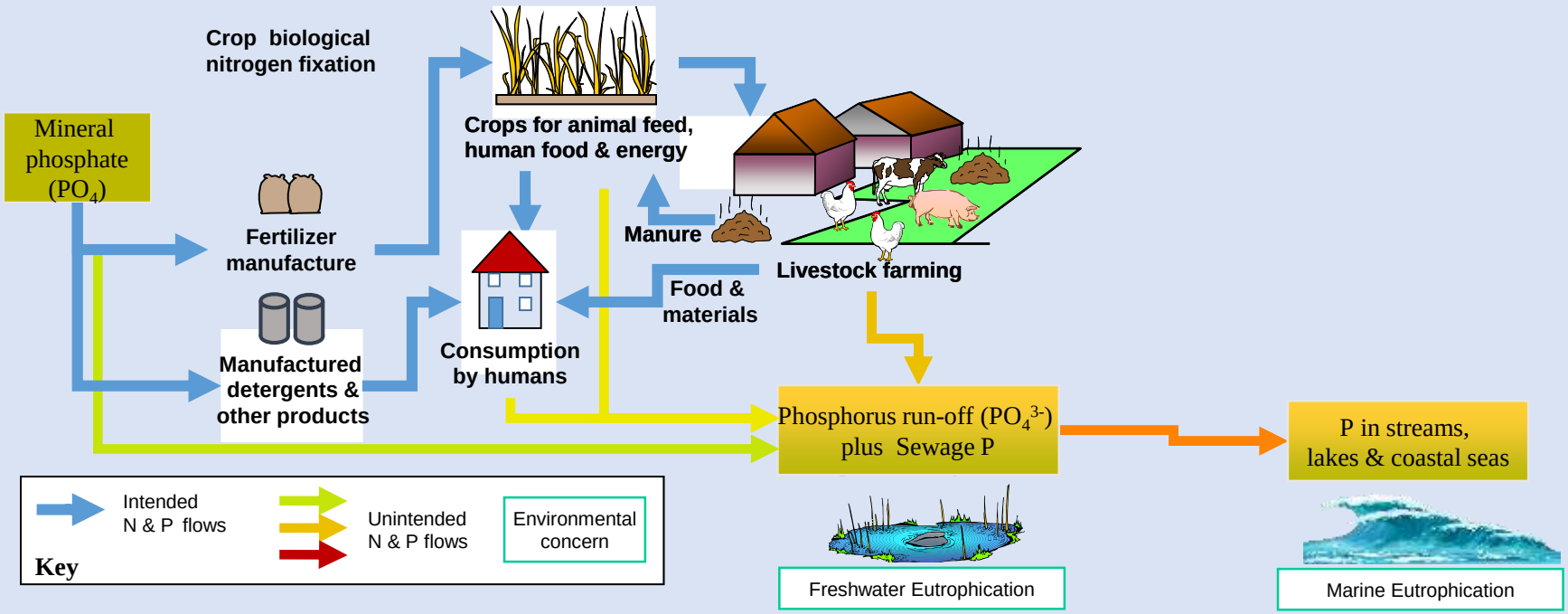
Talk outline

- An overview of the differences and overlaps between the P and N cycles
- Where we are in developing the INMS (international nitrogen management system)
- The importance of identifying our P story for policy development

Nitrogen and phosphorus flows



Nitrogen and phosphorus flows



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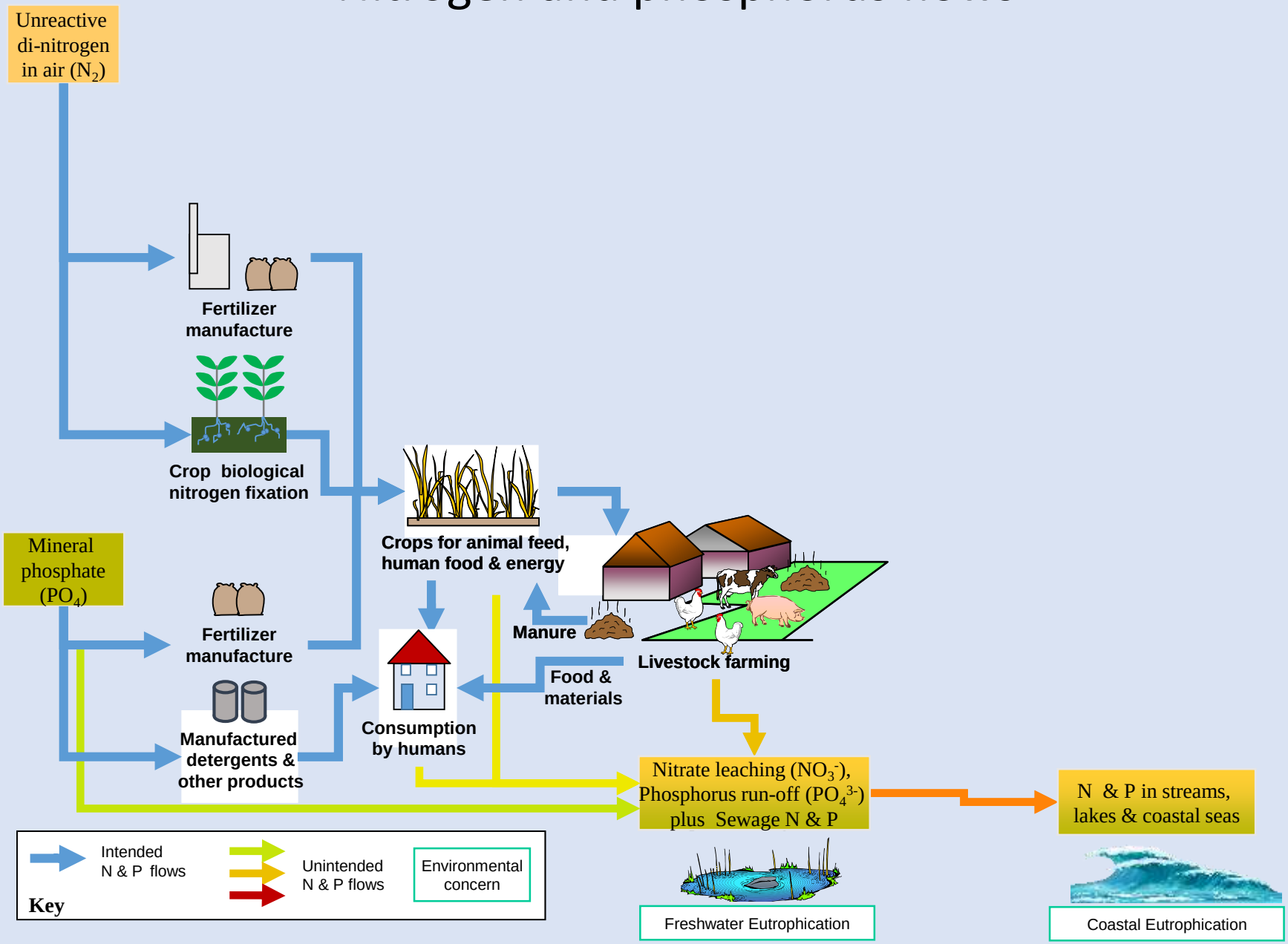

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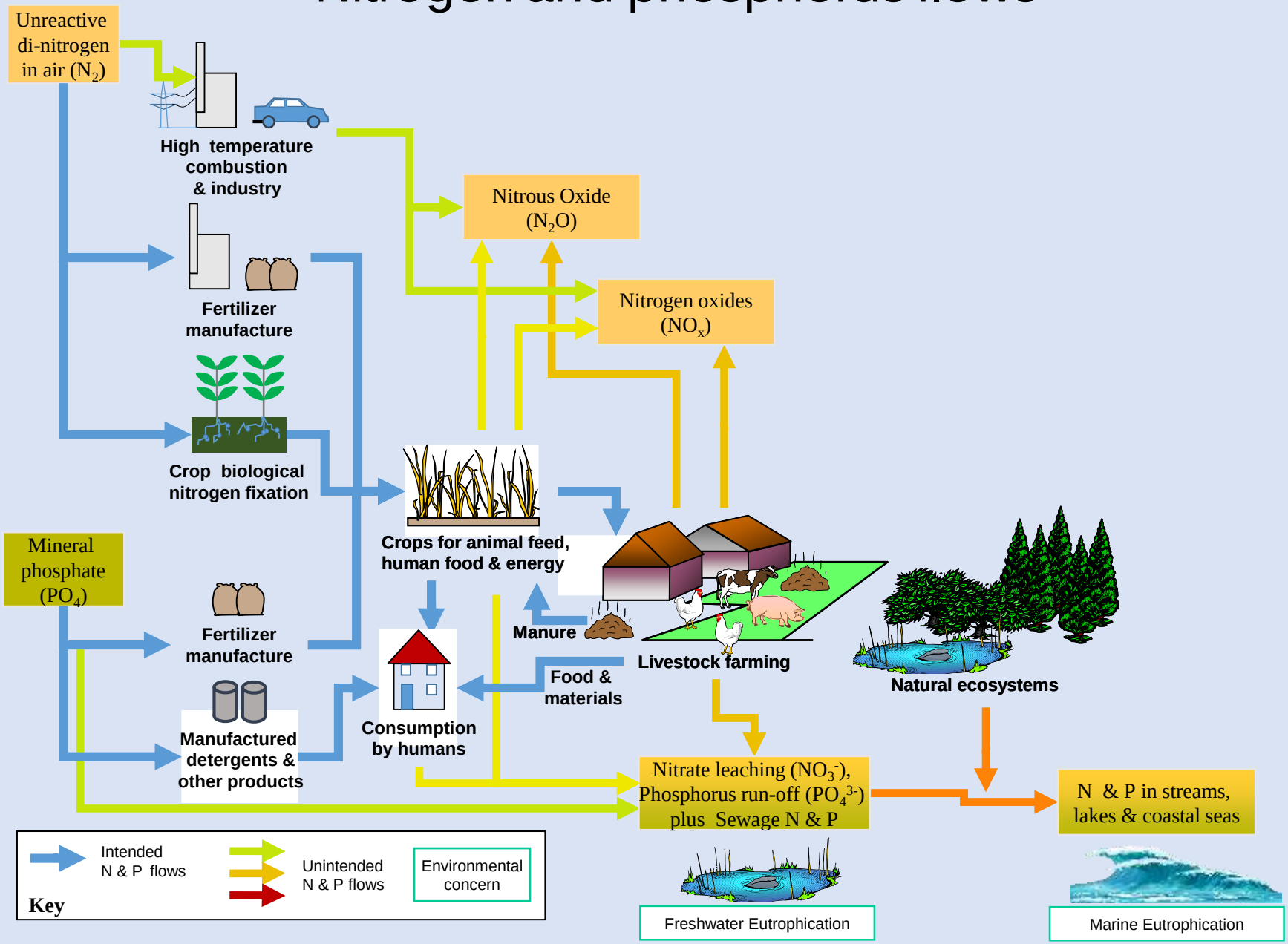

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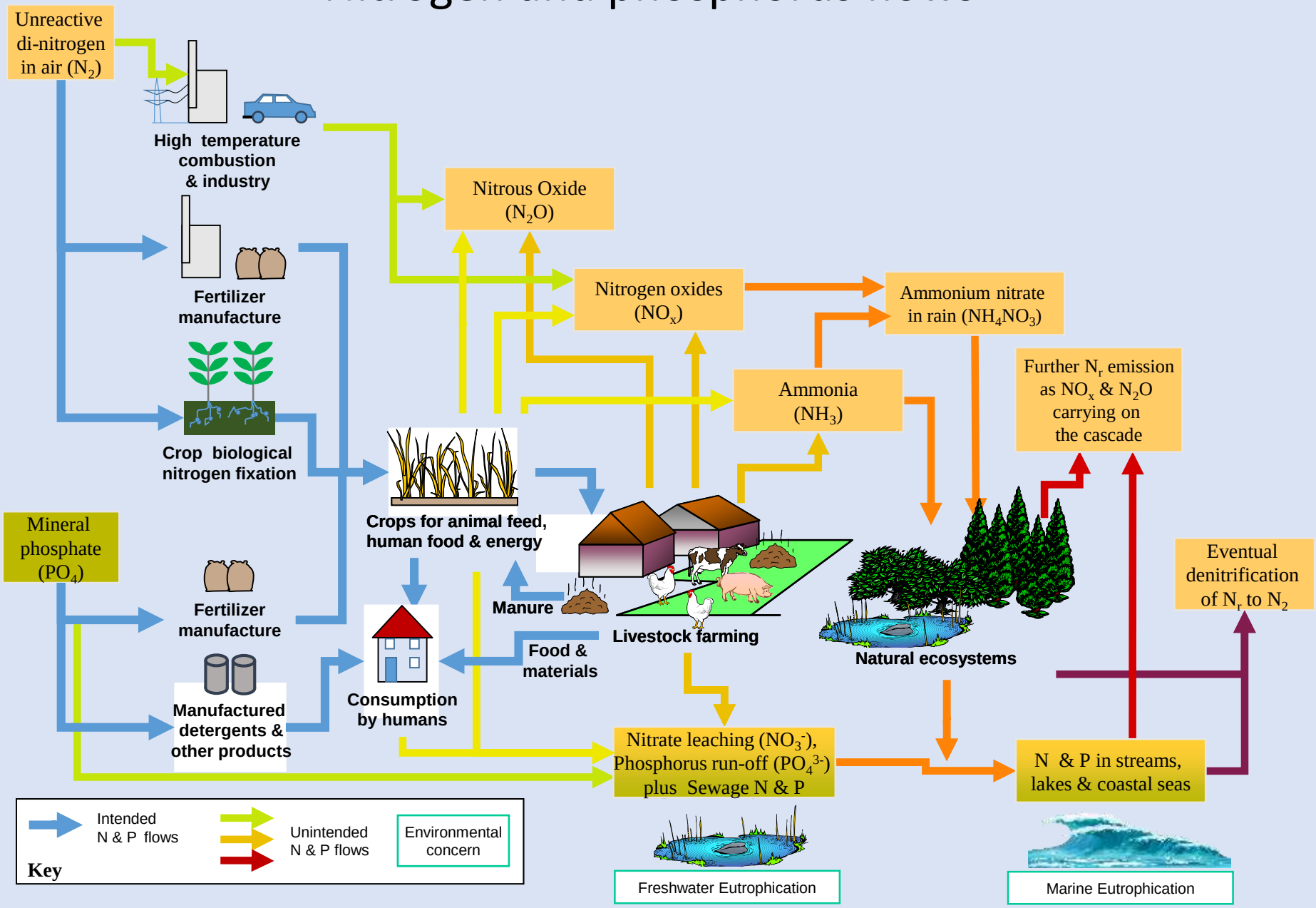

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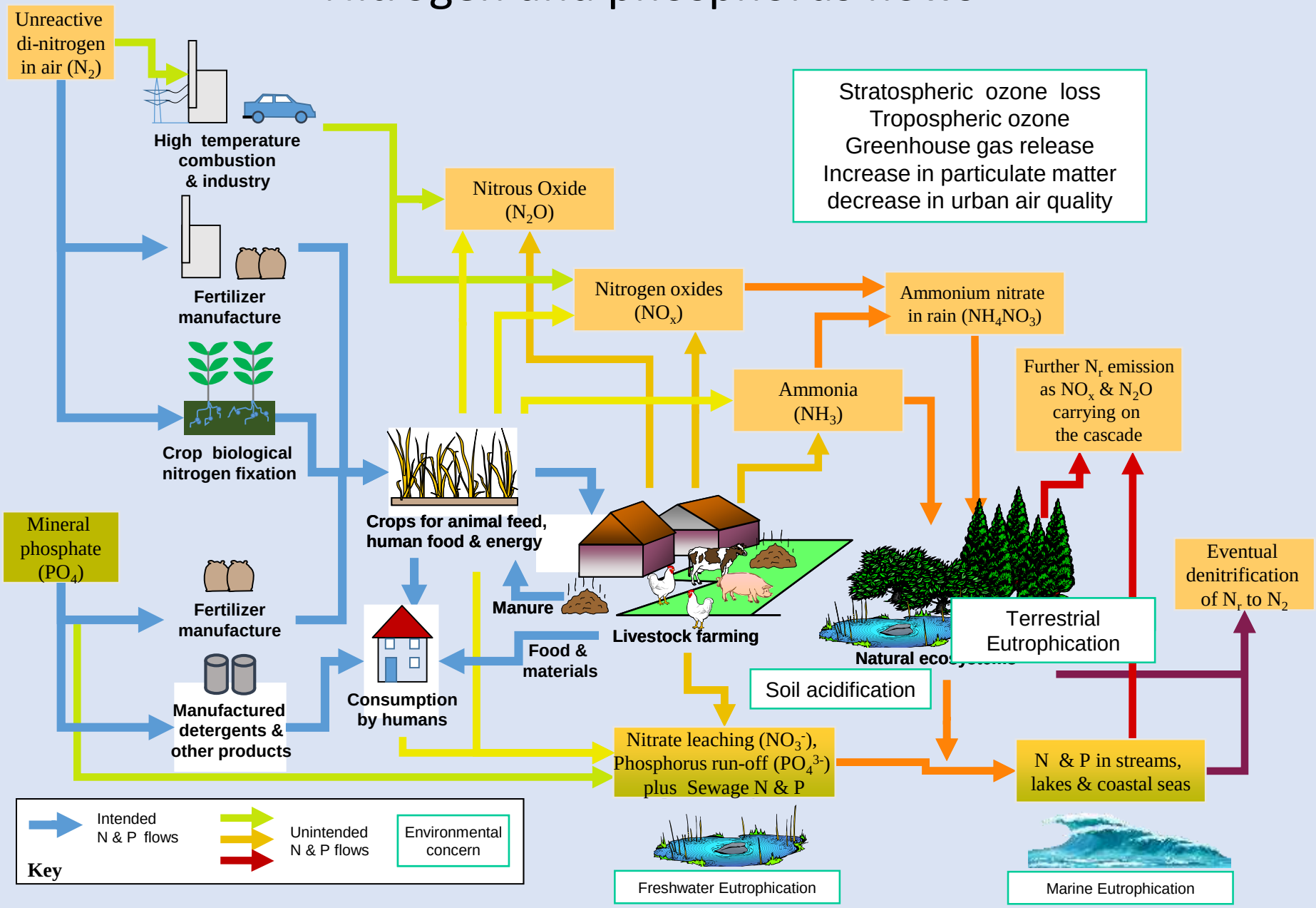


Similarities

- Both vital for food production
- Population growth and increase in meat consumption will cause predicted 40-50% increase of N and P use by 2050.
- Eutrophication
  (P – inland waters, N coastal waters)

Differences

Phosphorus	Nitrogen
No gas phase (minimal)	**Gas phase** • Global movement of N • Impacts climate and human health
3 fold increase in P fertiliser since 1960	**9 fold increase in N fertiliser since 1960**
Finite supply • Potential political and economic impacts	**Limitless supply**

- P Rock are controlled by a handful of countries.
- Morocco has 70%
- China is reducing export to secure domestic supply
- US has <30 years of supplies left
- Western Europe and India are totally dependent on imports

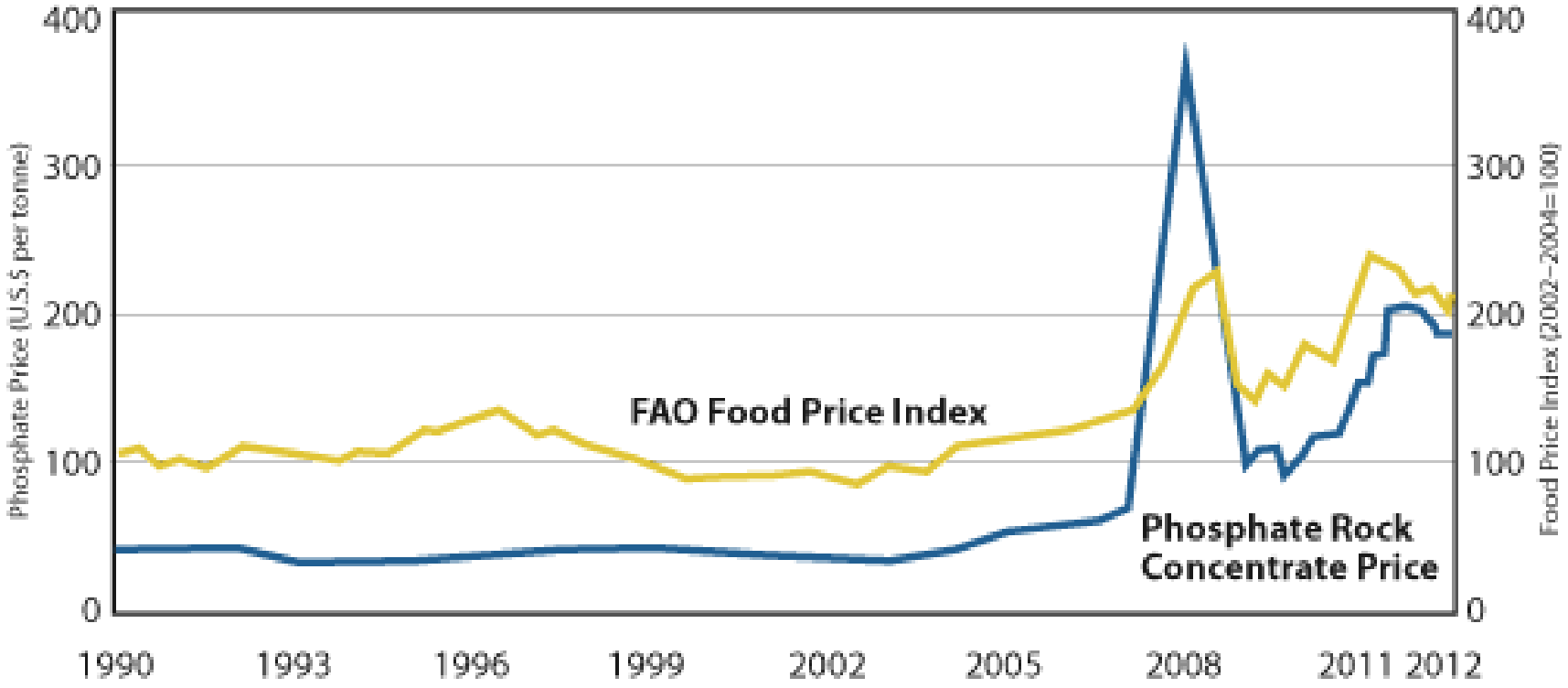


Figure 1. Déry P, Anderson B. 2007. Peak phosphorus. Energy Bulletin. (November 2010)

Where we are in developing the international nitrogen management system

There are no global treaties that links the many benefits and threats of the altered N and P cycle.

International Nitrogen Management System (INMS)

The development of a better coordinated science-policy support process – gathering evidence to support decision makers

$6M core funding from GEF
+ $40 M co-financing target

- ***INMS project preparation grant phase***

The big message is to count the co-benefits of a joined-up nitrogen approach; with the believe that joined up management of the nitrogen cycle would strengthen the common cause of international waters & other global challenges:

Questions to be answered by INMS

- What would a global science policy support process for nitrogen look like?
- What are the issues to connect?
- Who are the players that need to be involved?
- What are the main, research, demonstration and communication challenges?

Opportunities of INMS

-Indicator refinement, moving to operational delivery to support countries, inc benchmarking

-Sharing and development of mitigation and management practices – understanding barriers

-Understanding the context specific nature of nutrient threats via regional demonstration on 4 contrasting challenges

Developing countries: Excess nitrogen

South Asia
India, Nepal, Sri Lanka, Bangladesh
Lead: INI South Asia
Policy: SACEP

East Asia
(western Pacific seaboard)
China, Japan, S. Korea, Philippines
Network: INI East Asia, GPNM, OECD
Policy: PEMSEA, GPA

South America
Brazil, tbc
Implementation: INI South America
Policy: Links to GPA

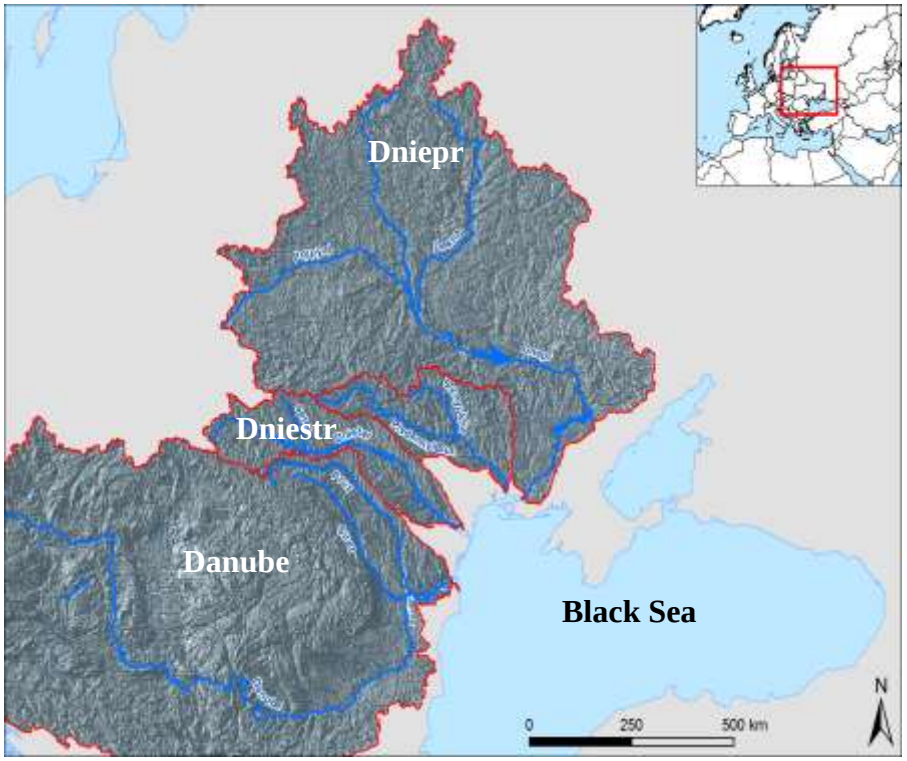
Dniester. Dnieper, (part of) Danube

Ukraine, Moldova, Romania, Belarus

Implementation: EPN-EECCA, TFRN

Policy: UNECE -CLRTAP & Transboundary Waters, Black Sea Commission, Danube River Basin Commission

		Dniestr	Dniepr	Danube
basin area	km²	71 442	503 988	785 306
runoff	mm/yr	107	119	259
pop density	inhab/km²	102	61	102
%agricultural area	%	75	63	58
Net Inputs to wtshd	kgN/km²/yr	2 264	2 660	3 605
N delivery at outlet	kgN/km²/yr	132	99	468



Economies in transition

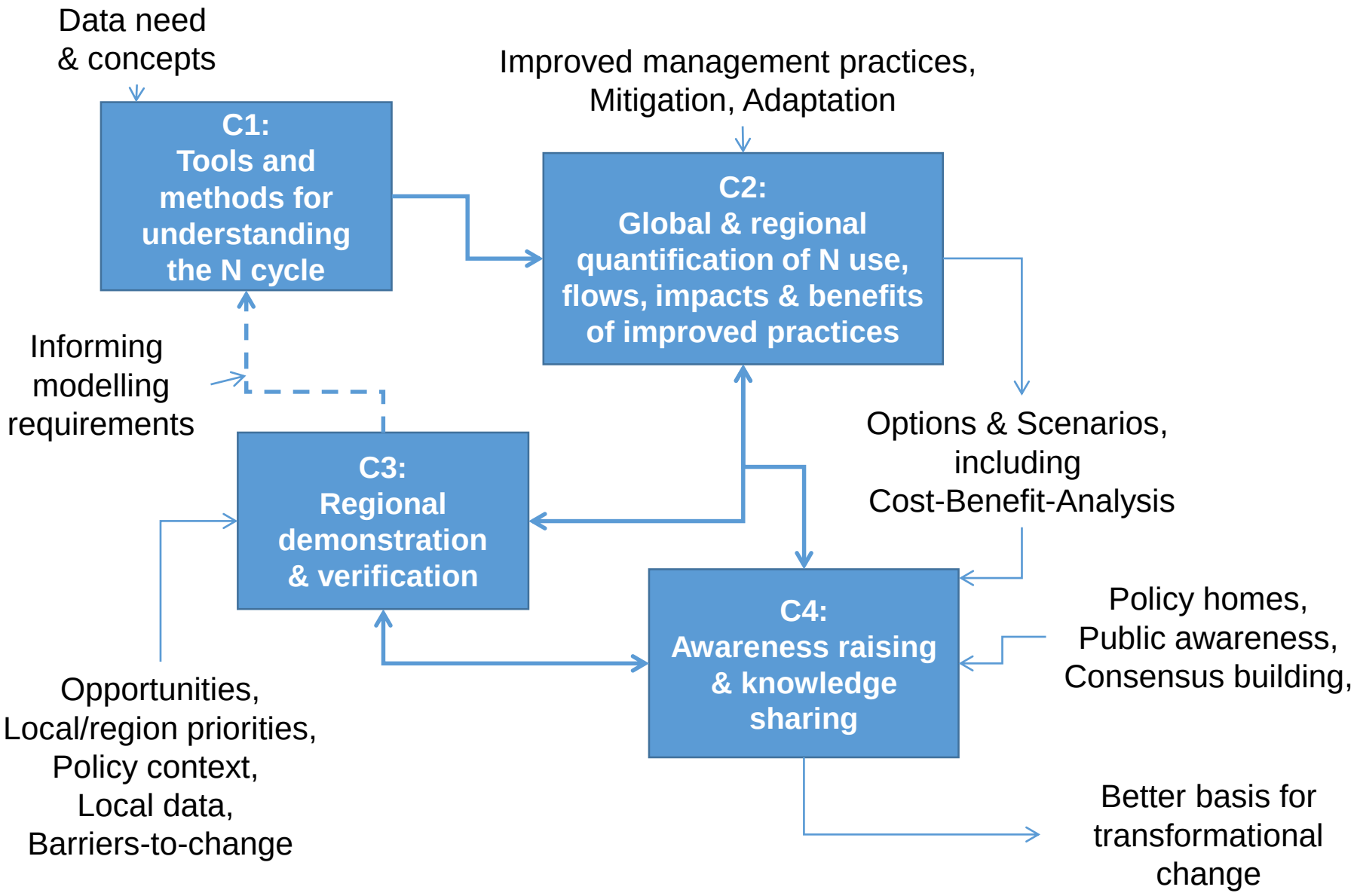
Lake Victoria
Kenya, Tanzania, Rwanda, Burundi
Lead: INI Africa
Policy: Lake Victoria Commission

Developing countries: Insufficient nitrogen

Developed countries: Excess nitrogen

Western Europe, Atlantic Seaboard
France, Spain, Portugal
Unfunded – supported through existing projects, adding value to the global network.

Components diagram for the INMS



The importance of identifying our P story for policy development

The European Nitrogen Assessment

Sources, Effects and Policy Perspectives

Edited by

Mark A. Sutton

Clare M. Howard

Jan Willem Erisman

Gilles Billen

Albert Bleeker

Peringe Grennfelt

Hans van Grinsven

Bruna Grizzetti

CAMBRIDGE

COMMENT

ENVIRONMENT

BIOTECHNOLOGY Biohackers take biology into the garage p.167

ECOLOGY Libyan revolution might protect bluefin tu... with trawlers grounde...

Meer,

Vervuiling met stikstof kost miljarden

Nitrogen taint alert

Warning over nitrogen footprint

Pollution à l'azote : une lourde facture pour l'Europe

...cisely than this would be cleaner, reduce odour and emit less ammonia.

Too much of a good thing

Curbing nitrogen emissions is a central environmental challenge for the twenty-first century, argue **Mark Sutton** and his colleagues.

Nature 14 April 2011

Farming

Union defends use of nitrogen in high-octane climate change debate

www.nine-esf.org/ENA

UN says fertiliser crisis is damaging the planet

Scientists urge rich world to halve its meat consumption

The shape of nitrogen to come

An analysis reveals the huge impact of human activity on the nitrogen cycle in China. With global use of Earth's resources rising per head, the findings call for a re-evaluation of the consumption patterns of developed societies.

Nature doi:10.1038/nature11954

More environment-friendly nutrient use could save $170bn a year

18 Feb 2013: *Independent* , *Guardian*, *Herald Tribune*, *Times of India* and **300 articles worldwide**

Our Nutrient World

The challenge to produce more food and energy with less pollution

Global Overvie Nutrient Management

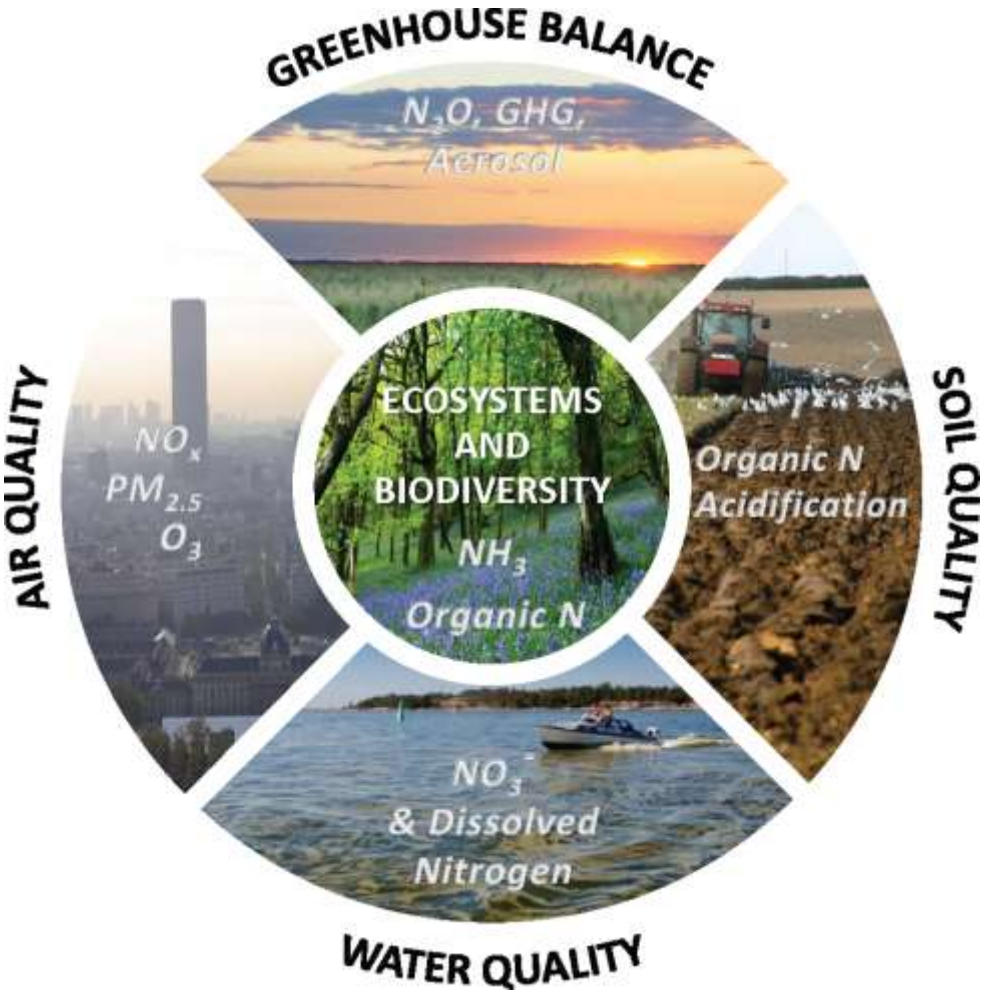
Prepared by the Global Partnership on Nutrient Management in collaboration with the International Nitrogen Initiative

Five key threats

The WAGES of
too much nitrogen

Water quality
Air quality
Greenhouse balance
Ecosystems
Soil quality

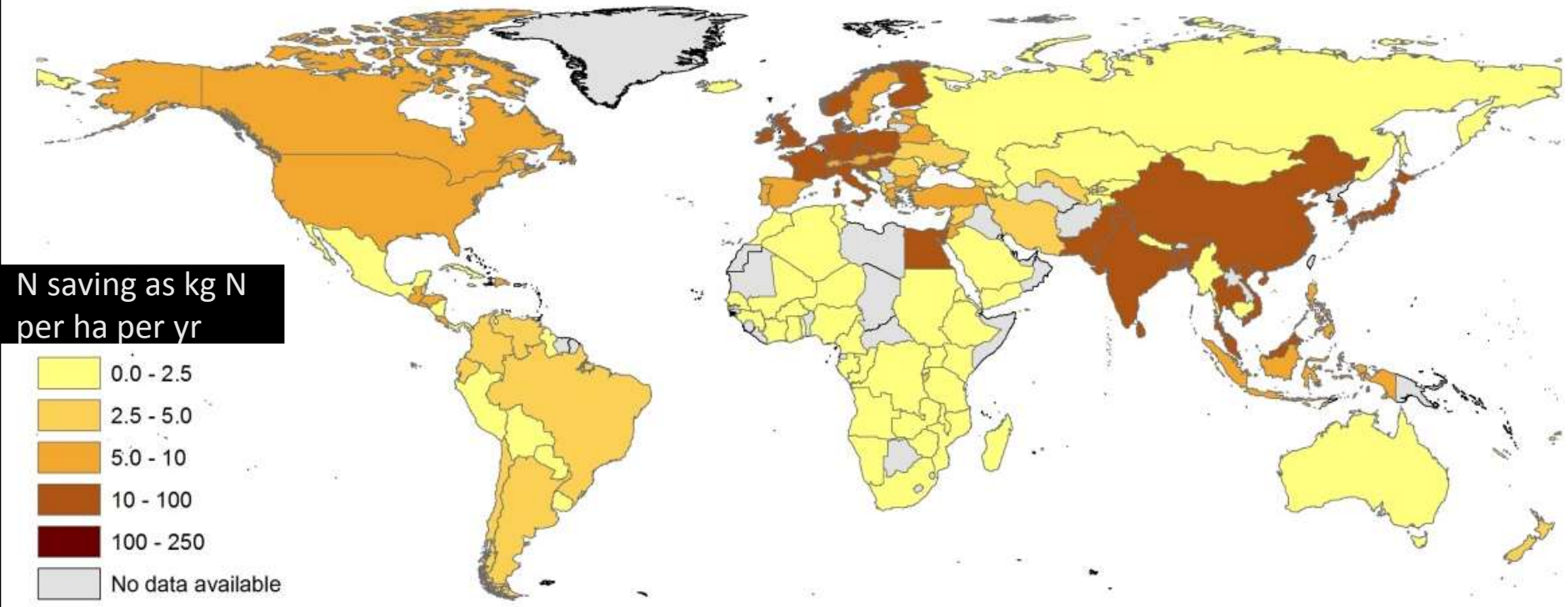
Plus better food &
energy supply



European Nitrogen Assessment, 2011

"20:20 for 2020"

20% better NUE: saving 20 Mt N per yr by 2020



Benefits expressed here as N saving / ha per year (Full-chain NUE)

Bottom line for the Green Nutrient Economy ($billion/year)

Net Benefit 170= Fert Saving 23 + Env+Health 160 – Implementation 12

It is about identifying the audience, distilling the story from the information we have, and tailoring it to capture their interest

What are the key threats?

Eutrophication? Food security? Economy? Geo-Political Stability? Running out?

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What are the impacts?

Starvation? Economic cost? Political tension? Ecosystem damage?

Who does it impact?

Countries that rely on P imports? Countries that can't afford P fertilisers?
Countries that use too much P? Everyone?

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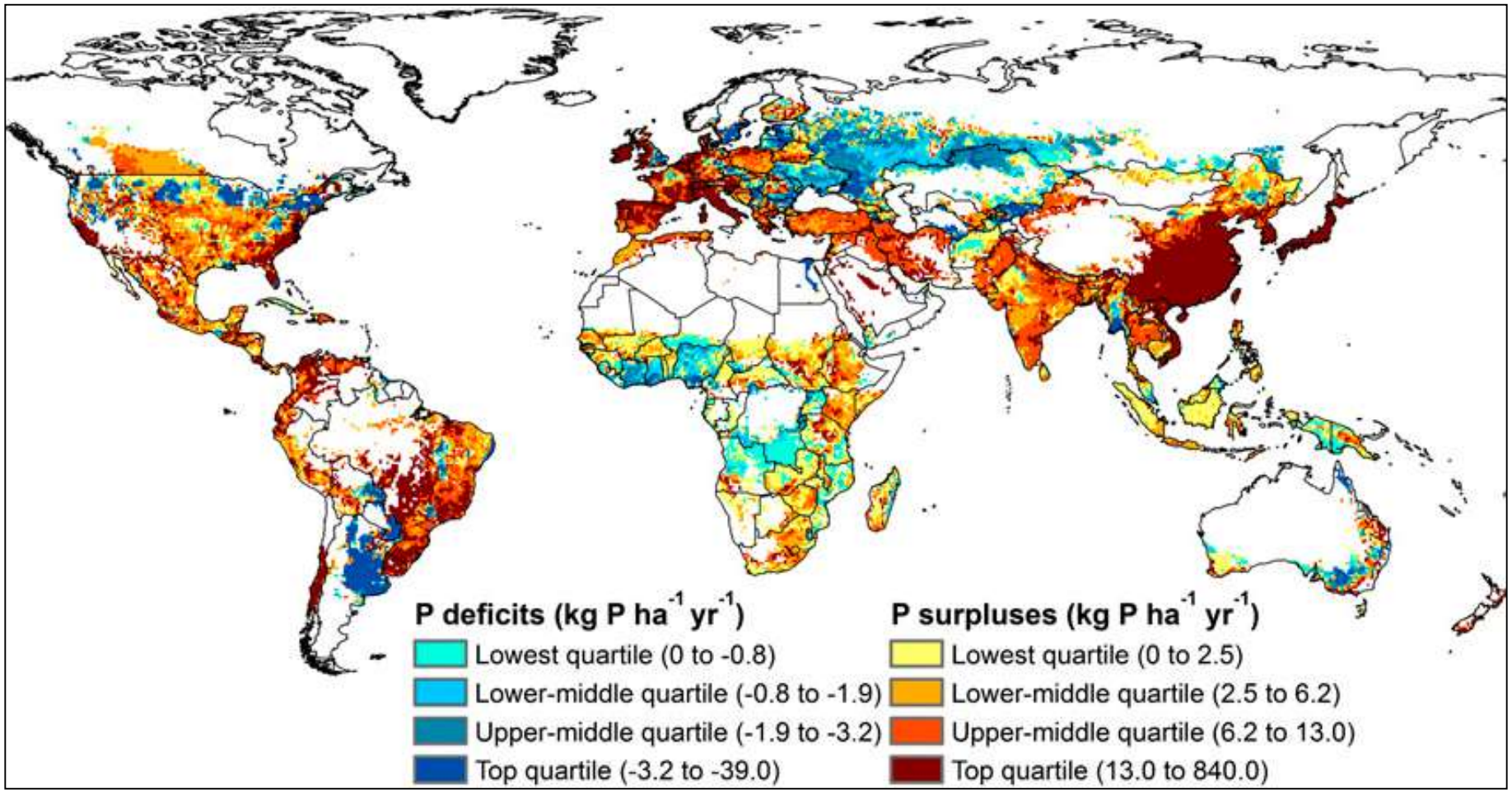
What are the solutions?

Reduced P use? Reduced P mining ? Increased P use efficiency ?
Increased P recycling? Reduced societal dependence on P ?
Fairer distribution of P ?

Who are we talking to?

Who should we be talking to?

Clearly global – but clearly context specific



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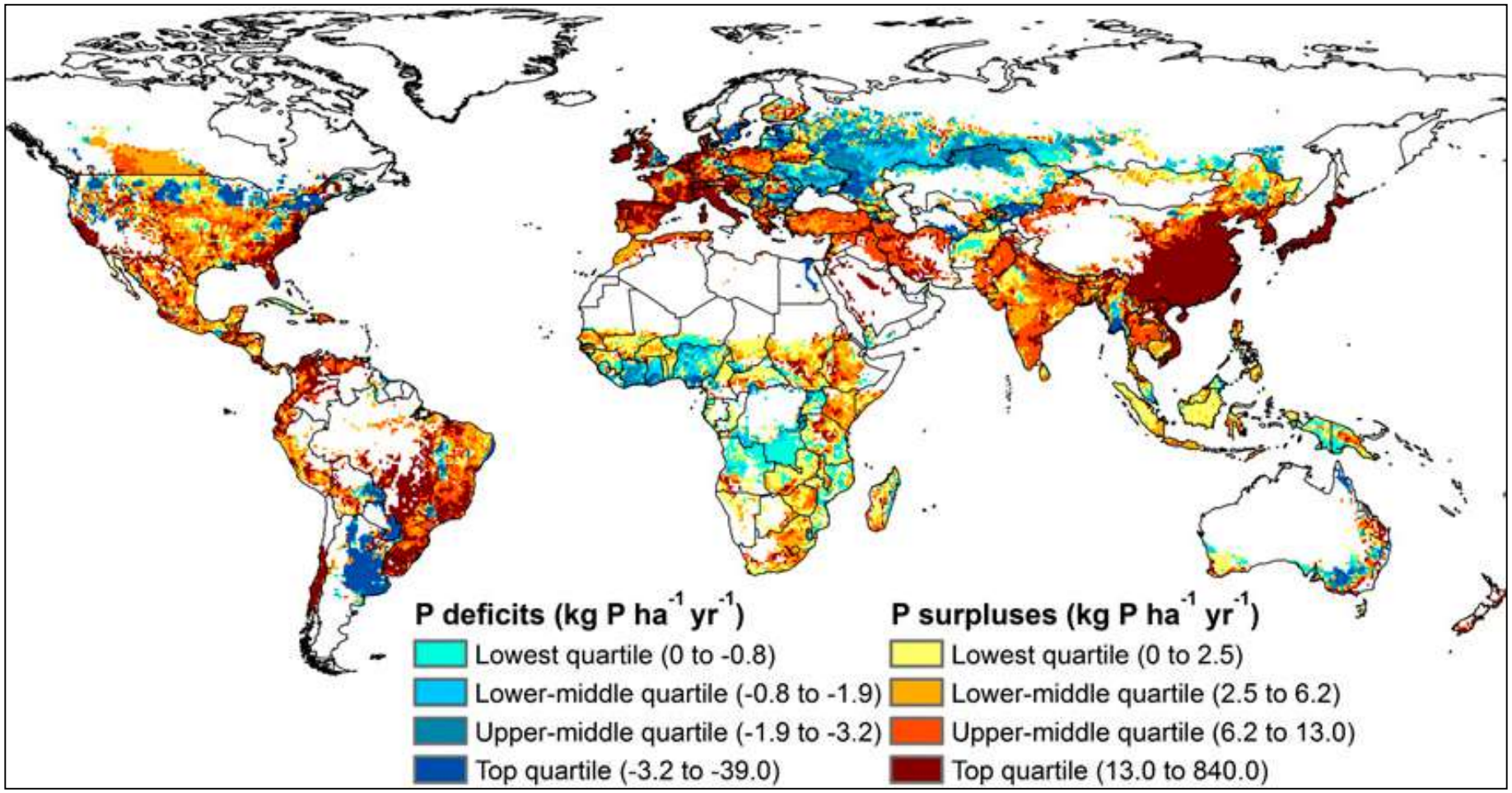

Efficiency and Sufficiency

Tasks for an inter-governmental process on the global P challenge

- Global assessment of nutrient linkages, benefits threats and Green Economy opportunities
- Investigate practice options, **agree indicators** and set targets for improved 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