INMS Component 1: Tools and Methods for Nitrogen Assessment

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Activity Leads

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First e-briefing for the Nitrogen Working Group of the United Nations Environment Programme

Component 1

Tools

Multiple Impacts

Activity 1.2

Driven by N-flows

Activity 1.3

Described by Indicators

Activity 1.1

Weights to Prioritize

Activity 1.4

Global Models for base yr and 2050

Activity 1.5

Solutions meet Barriers

Activity 1.6

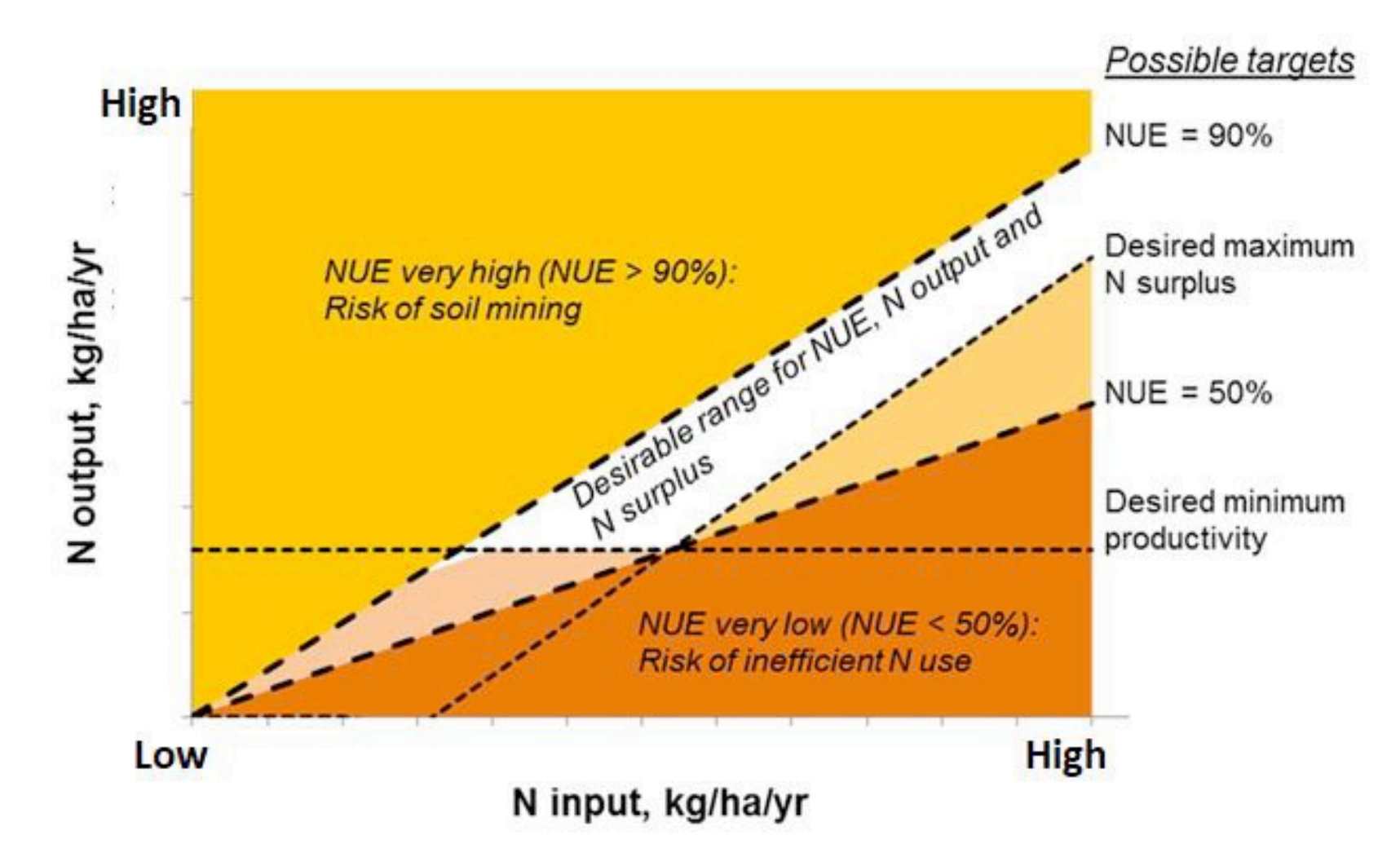
Component 1

Tools

Some highlights per activity

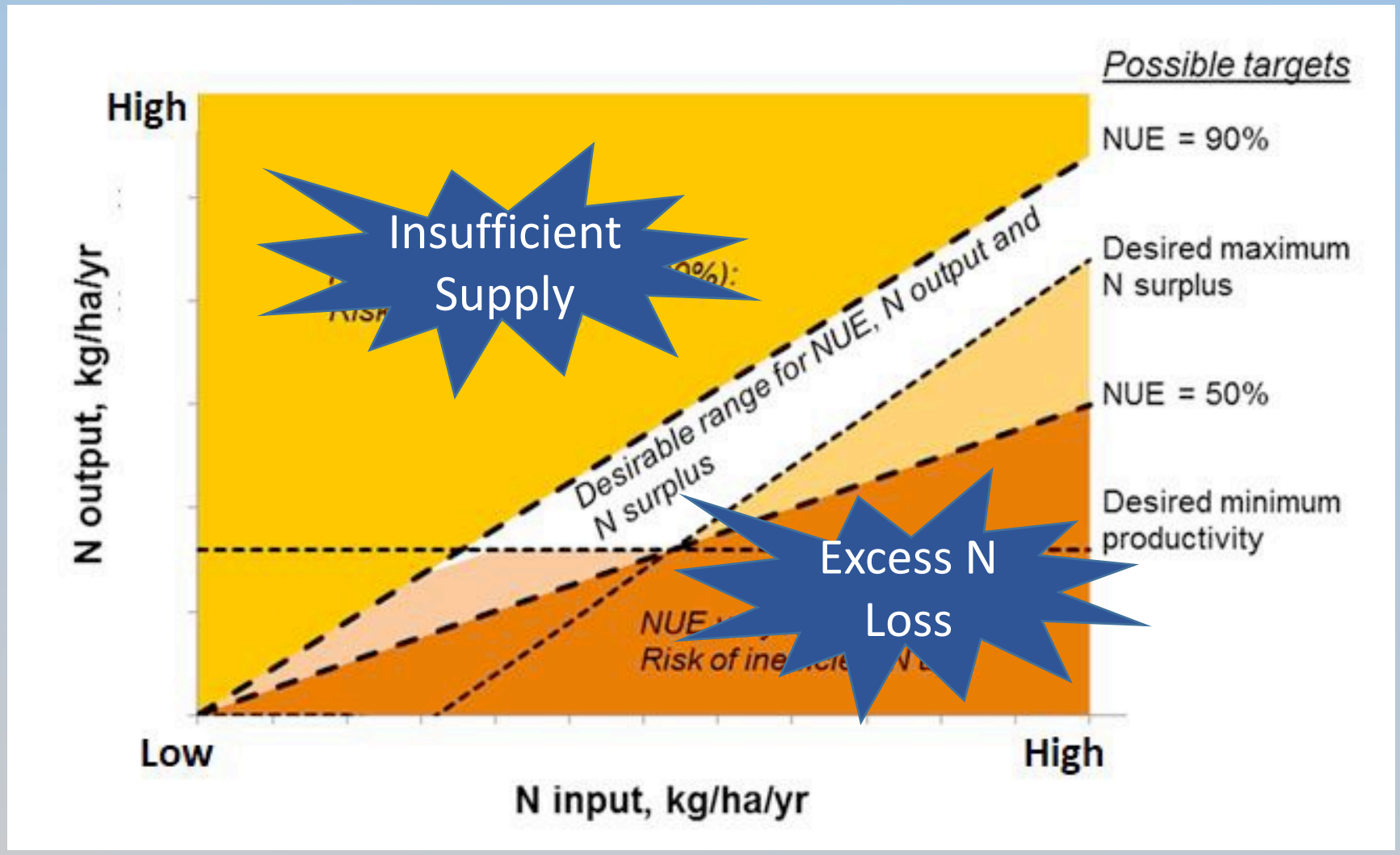



1.1 INDICATORS
Nitrogen Use Efficiency (NUE) at farm level



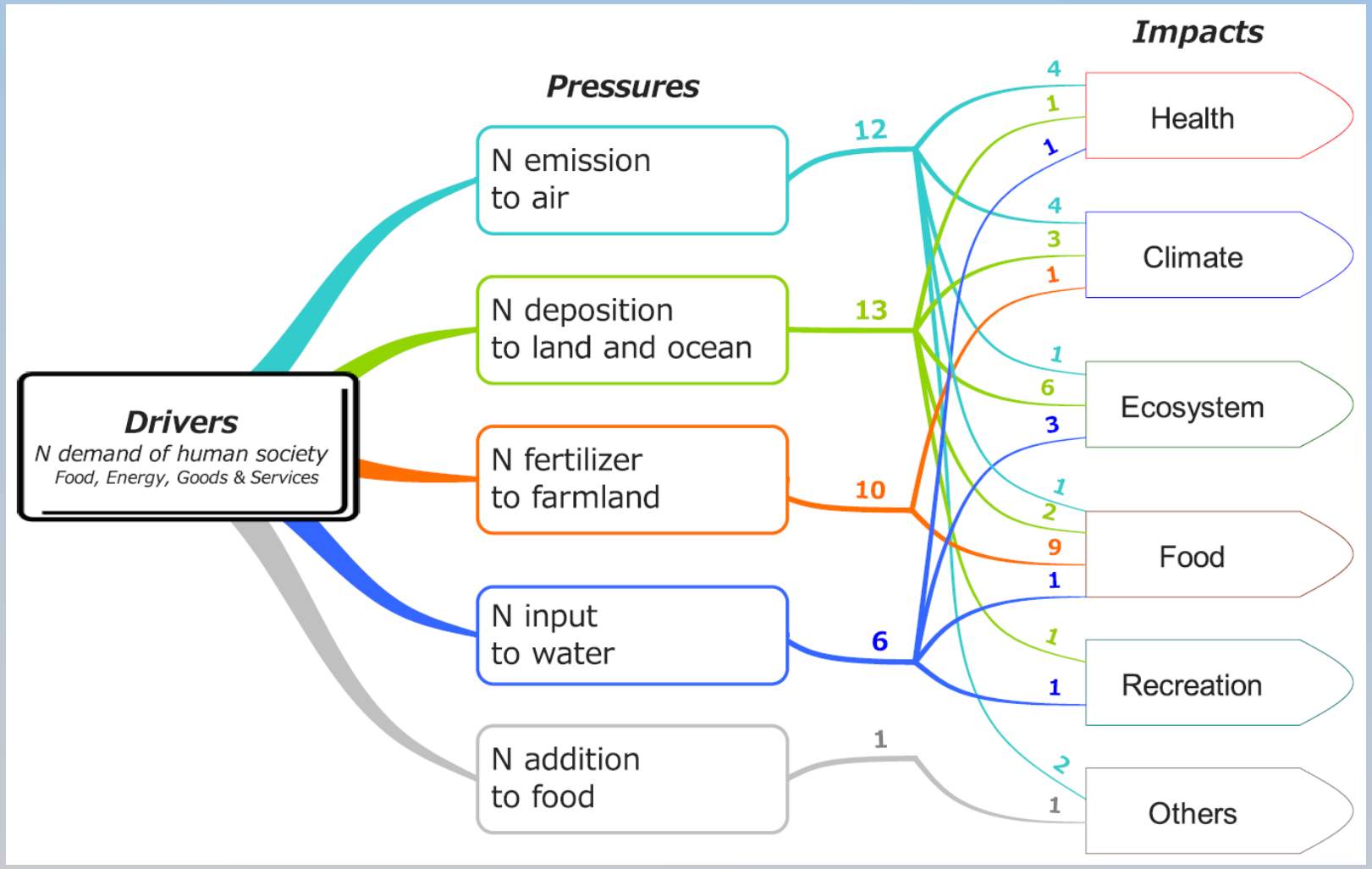
Framework of the Nitrogen Use Efficiency (NUE) indicator (*EU Nitrogen Expert Panel. 2016.)*

1.1 INDICATORS
Nitrogen Use Efficiency (NUE) at farm level



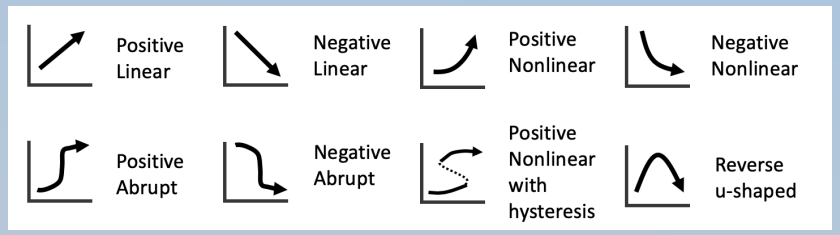
Framework of the Nitrogen Use Efficiency (NUE) indicator (*EU Nitrogen Expert Panel. 2016.)*

1.2 IMPACTS
Matrix of N impacts

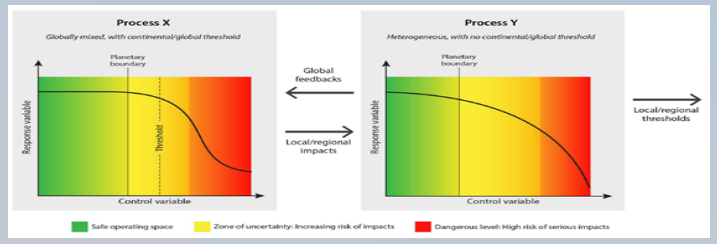


1.2 IMPACTS
Integrated Methodologies

DPSIR
Drivers, Pressures, State, Impact, Response

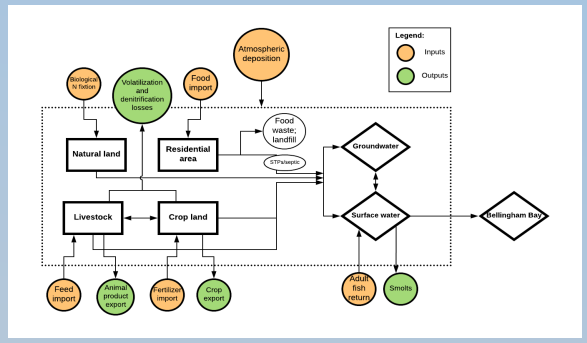


Planetary Boundaries

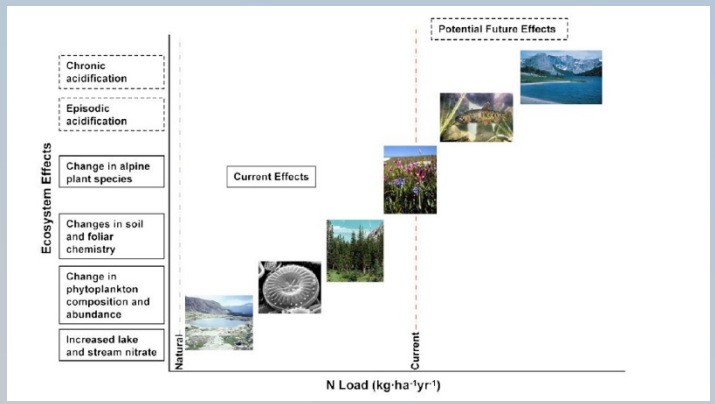


N footprint approaches

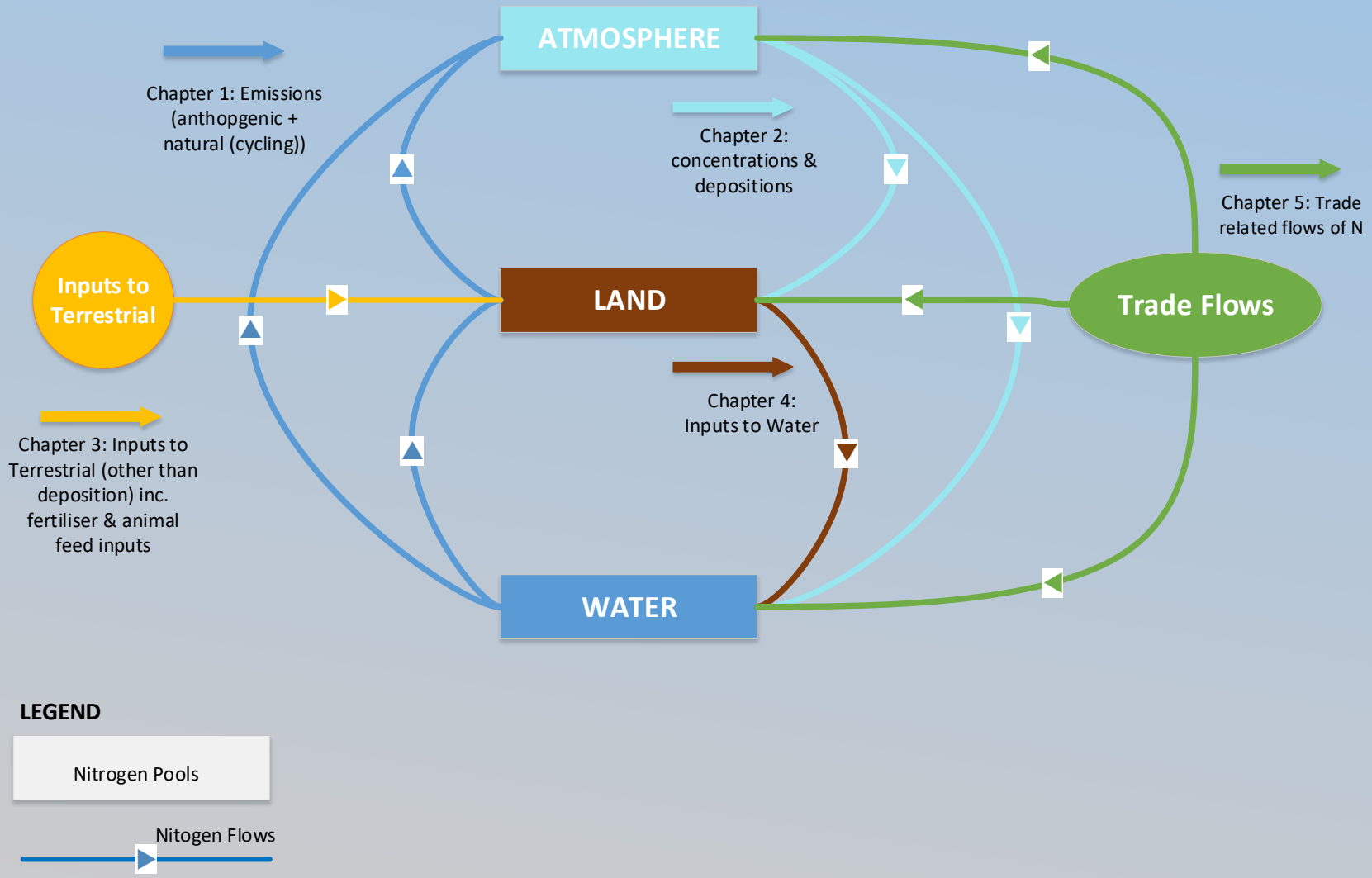
Input-Output N budgets



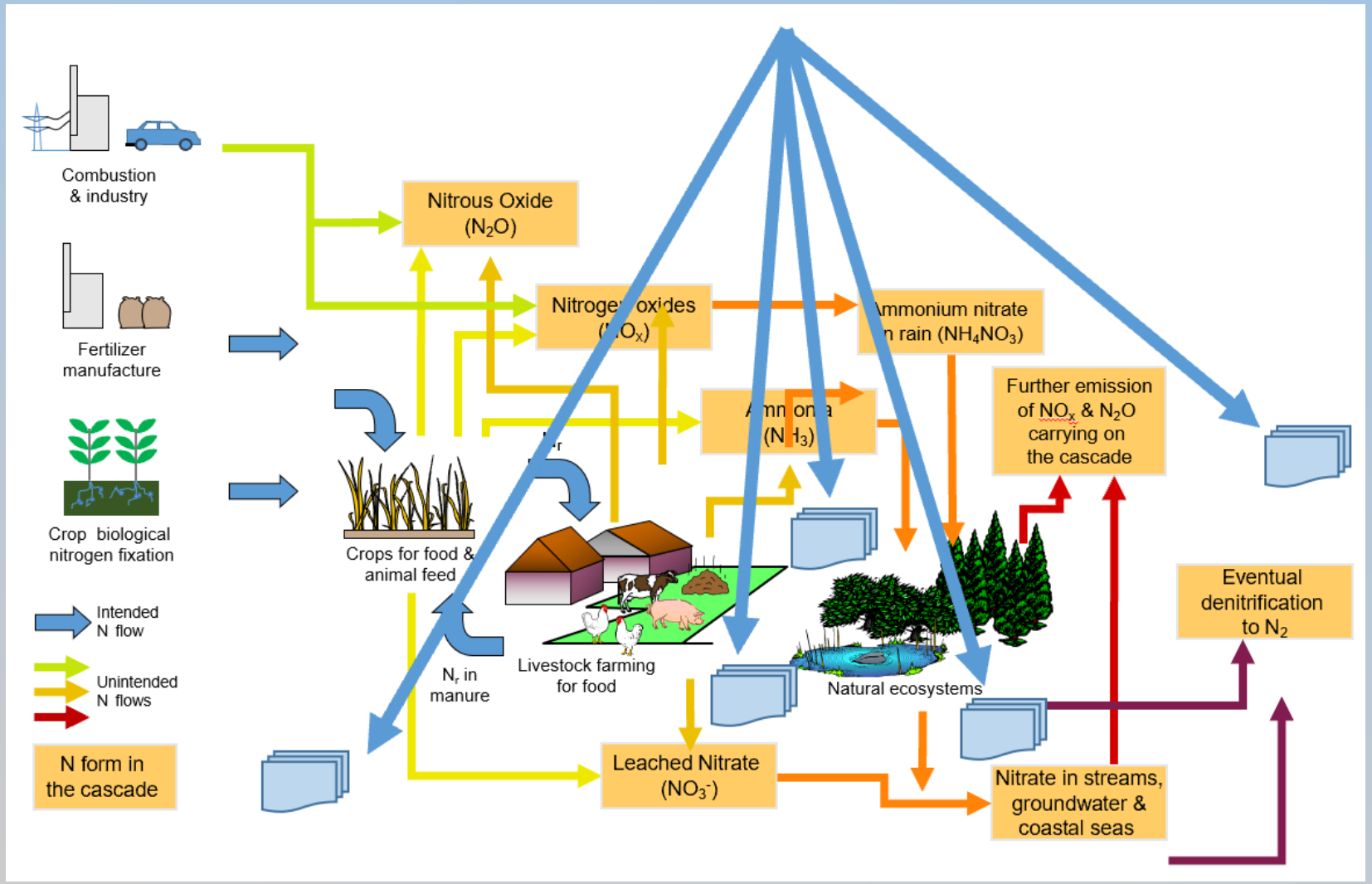
Critical Loads



1.3 N FLOWS


ATMOSPHERE
Chapter 1: Emissions (anthopgenic + natural (cycling))
Chapter 2: concentrations & depositions
Chapter 5: Trade related flows of N
Inputs to Terrestrial
LAND
Trade Flows
Chapter 4: Inputs to Water
Chapter 3: Inputs to Terrestrial (other than deposition) inc. fertiliser & animal feed inputs
WATER
LEGEND
Nitrogen Pools
Nitogen Flows

1.3 N FLOWS
Searchable tool for
N flux methods across N cycle



1.4 WEIGHTS TO PRIORITIZE Societal Benefits and Costs

1. N fertilizer use and crop production and regional food security-sufficiency (benefit),
2. NH_3 and NOx emission to air and human health loss,
3. N runoff and marine eutrophication/HABs,
4. N deposition and terrestrial biodiversity loss,
5. N deposition and C-sequestration (climate benefit) / wood production (economic benefit).

1.4 WEIGHTS TO PRIORITIZE
Nitrogen is the most important pollutant and farm nutrient on Earth

N-share:

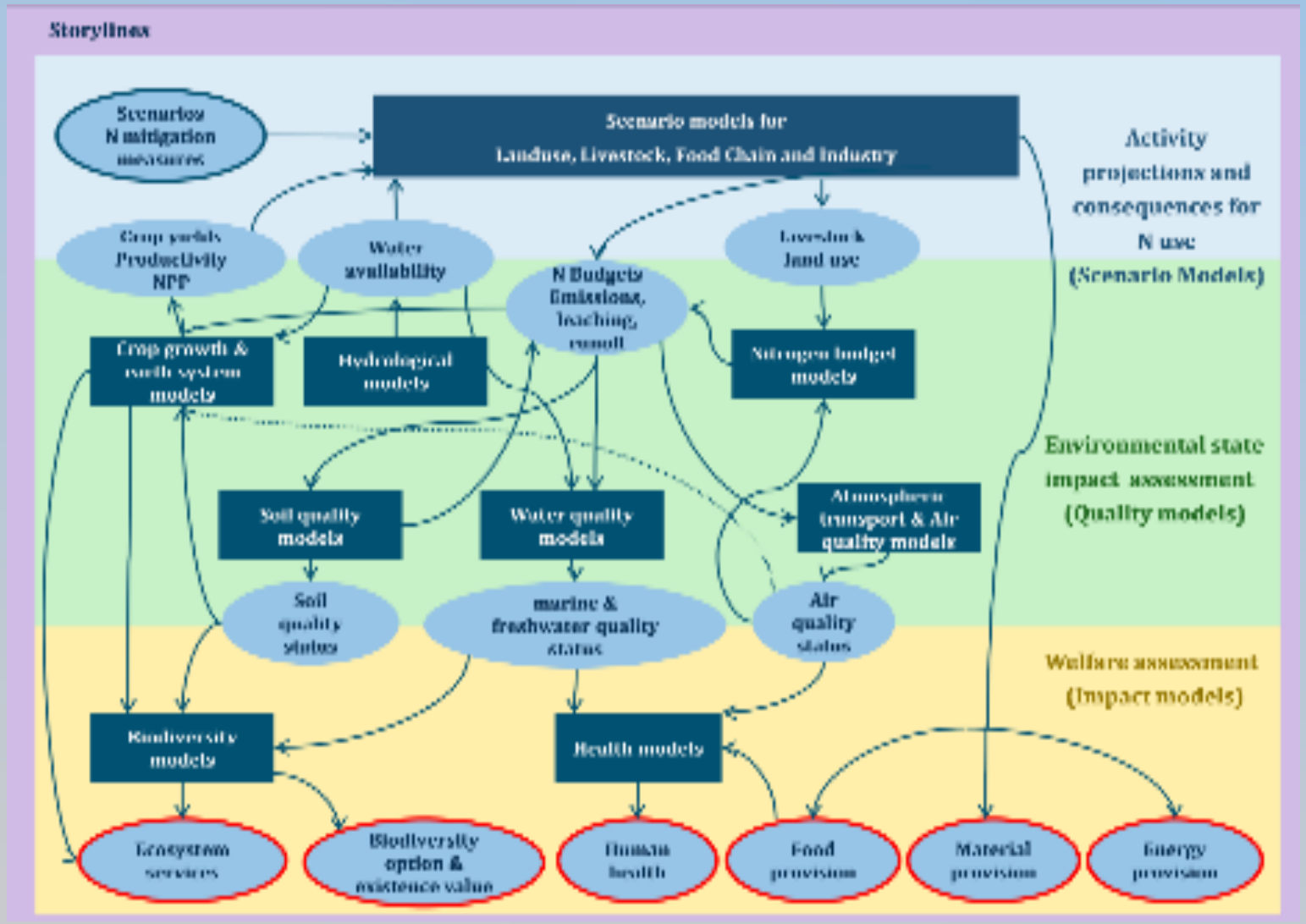
The contribution of N use or impacts from N

Food crop yield increase **30-60%**

Mortality from air pollution **≈ 30%**

Loss of ecosystem services **>10%**

1.5 MODELS


Storylines
Scenarios
N mitigation
measures
Scenario models for
Landuse, Livestock, Food Chain and Industry
Activity
projections and
consequences for
N use
(Scenario Models)
Crop yields
Productivity
NPP
Water
availability
Livestock
land use
N Budgets
Emissions,
leaching,
runoff
Crop growth &
earth system
models
Hydrological
models
Nitrogen budget
models
Environmental state
impact assessment
(Quality models)
Soil quality
models
Water quality
models
Atmospheric
transport & Air
quality models
Soil
quality
status
marine &
freshwater quality
status
Air
quality
status
Welfare assessment
(Impact models)
Biodiversity
models
Health models
Ecosystem
services
Biodiversity
option &
existence value
Human
health
Food
provision
Material
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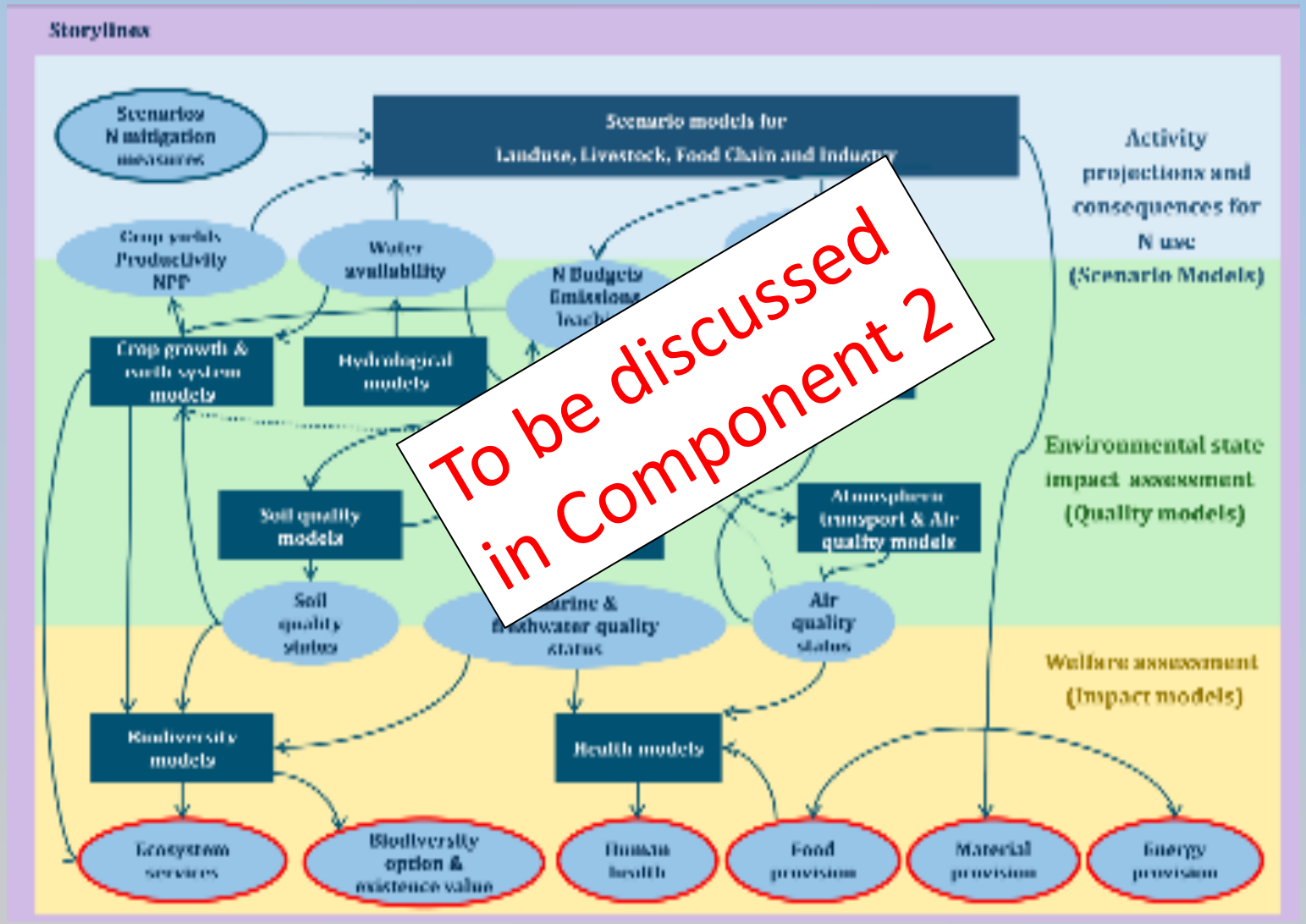
Energy
provision

1.5 MODELS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leach
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earth system
models
Hydrological
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To be discussed
in Component 2
Environmental state
impact assessment
(Quality models)
Soil quality
models
Atmospheric
transport & Air
quality models
Soil
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status
Marine &
freshwater quality
status
Air
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Welfare assessment
(Impact models)
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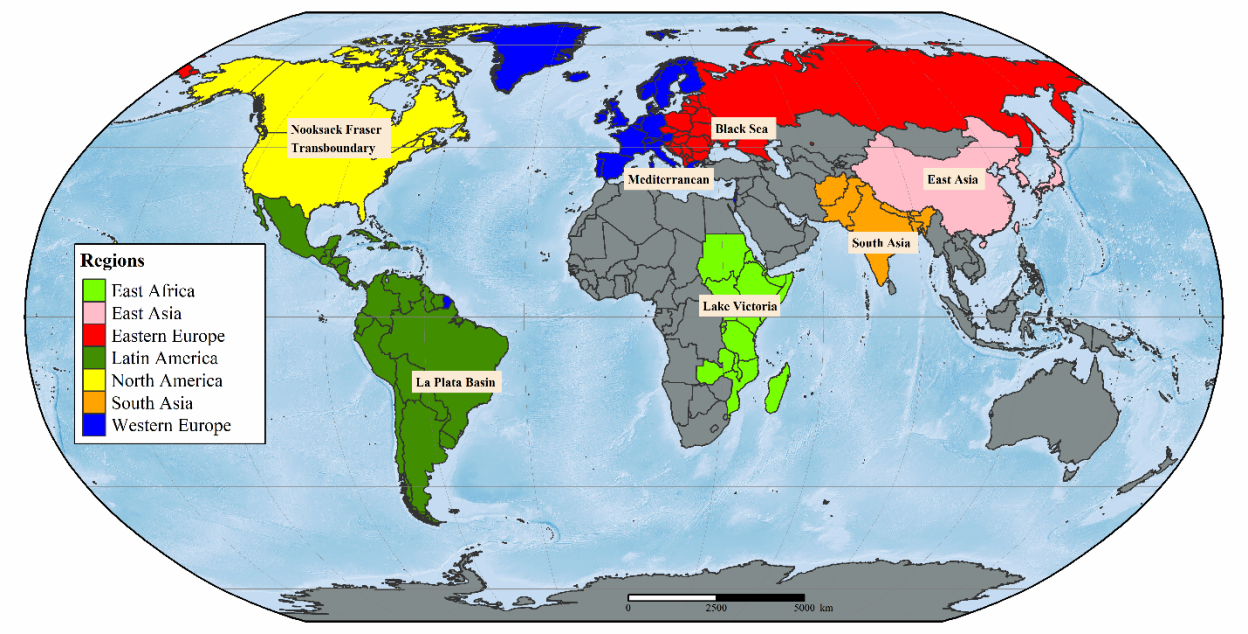
1.6 BARRIERS
for adoption of improved N management



Types of barriers:
Structural, Economic, Social/Cultural, Behavioral, Sectoral, Policy-Related, Environmental

1.6 Barriers for adoption of improved N management

Type of barrier	Barrier weighting factor	Description of sub-barriers	Sub-barrier weighting factor	East Africa	East Asia	South Asia	East Europe	Latin America	West Europe	North America
Structural	0.2	Tenure	0.2	5	2	4	3	4	2	2
		On-farm infrastructure	0.25	4.5	3.5	4	3	4	1.5	1.5
		Farm succession	0.15	4	2	4	3	2	4.5	4
		Existence of Association contract	0.15	4	3.5	4	3.5	4.5	3	2.5
		Off-farm infrastructure/existence of a reliable supply channel	0.25	5	2	4	3	2.5	1	1
Economic	0.2	Lack of financial benefits	0.25	5	2	3.5	2.5	2	2	1.5
		Cost of adoption	0.25	5	3.5	4	2.5	3	2	2
		Access to credit	0.25	5	2.5	4	3	3.5	2	1.5
		Market	0.25	4.5	2	4	1.5	2.5	2	2
Social and cultural	0.1	Cultural capital	0.2	3	3	3	2.5	4	1	1
		Interest	0.2	3	3	3.5	3	3	2	2
		Trust	0.25	4.5	3	4	3	4.5	2	2
		Ethics	0.1	3.5	3.5	3.5	3	4	3	3.5
		Religion	0.05	3	2	4	2	2	2	2
		Personal beliefs	0.2	3	2	4	3	3.5	3	3.5
Behavioural and cognitive	0.05	Beliefs about climate change	0.15	3	4	3.5	3.5	3.5	1	2.5
		Perceived long time horizons	0.2	4.5	4	4	4	4.5	1.5	1.5
		Competing pressure	0.3	4.5	3	4	4	4.5	4.5	4.5
		Knowledge and awareness	0.35	4.5	3	4.5	4	4.5	2	2.5

Strength of barriers to change by region. This is a partial list.

Component 1 in INA

Part B: Foundations for Assessing the Nitrogen Cycle

6. Approaches and challenges to assess nitrogen impacts (**A1.2**)
7. Performance indicators for the global nitrogen cycle (**A1.1**)
8. Approaches and challenges to assess nitrogen pressures and distribution (A**1.3**)
9. Approaches and challenges to value nitrogen benefits and threats (**A1.4**)

Part C: Global integrated assessment across the nitrogen cycle

*11-15 Description of models for N budgets, and N impacts on waters, air quality, greenhouse gas emissions, ecosystems, soils (**A1.5**)*

16. Costs and benefits of nitrogen at global and regional scales (**A1.4**)

Part E: Grasping the future challenge

26. Addressing the barriers to better nitrogen management (**A1.6**)

Component 1 provides the scientific foundation for nitrogen assessment, including methods and indicators for

- Regional and National N budgets
- Causes, threats and benefits of N to humans and environment
- N use, especially in agriculture,
- N flows through society and ecosystems,
- Valuing N threats/benefits to multiple stakeholders
- Barriers to change at all levels of society
- Consequences under different development scenarios