

Increasing nitrogen use efficiency in agriculture reduces future coastal water pollution in China

Ang Li (ang.li@wur.nl)

Maryna Stokal, Carolien Kroeze, Mengru Wang, Lin Ma

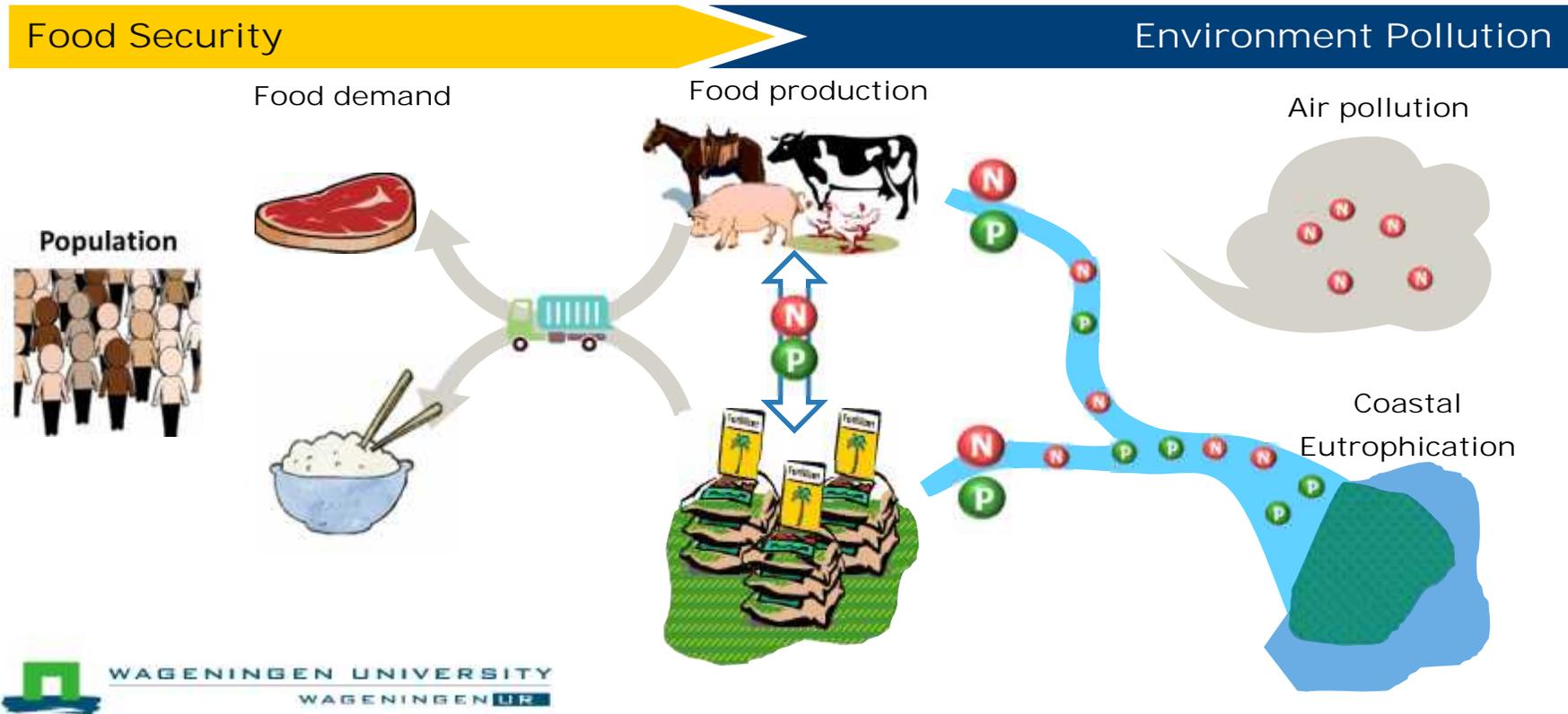
Water Systems and Global Change Group, Wageningen University



7th December, 2016



Background



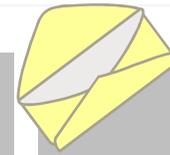
Take home messages



- Current policy –
'Zero Fertilizer
Growth 2020' is
not enough.



- Available Integrated
Soil-Crop System
Management may
help.



There is a hope:
- Animal manure
recycling
- Wise use of
synthetic fertilizer



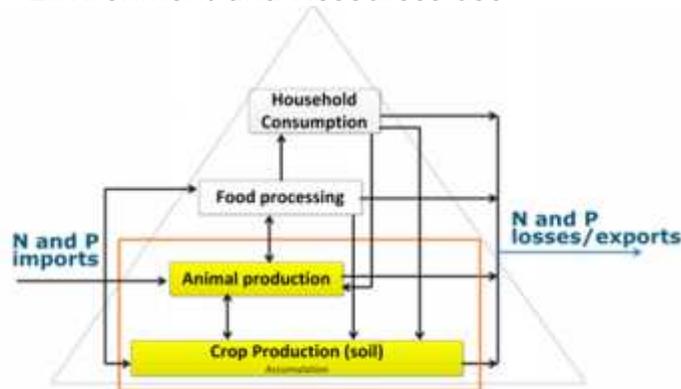
Modelling Framework

Nitrogen Use Efficiencies food chain

Nitrogen fluxes from land to sea

NUFER model

NUtrient flows in Food chains,
Environment and Resources use



Future
projection



Global NEWS model
Global Nutrient Export from
WaterSheds

MARINA

Model to Assess River Inputs of
Nutrients to seAs



WAGENINGEN UNIVERSITY
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Scenarios

	Scenarios	Abbreviation
Worst case	Business as usual	BAU
	Global Orchestration	GO
Current policy	Zero Fertilizer (ZF) growth after 2020	ZF
Improved practices	Improved Nutrient Management	INM
	Integrated Soil-Crop System Management	ISSM
	ISSM with improved manure management	ISSM-MR
Best case	Optimistic	OPT

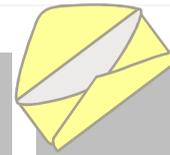
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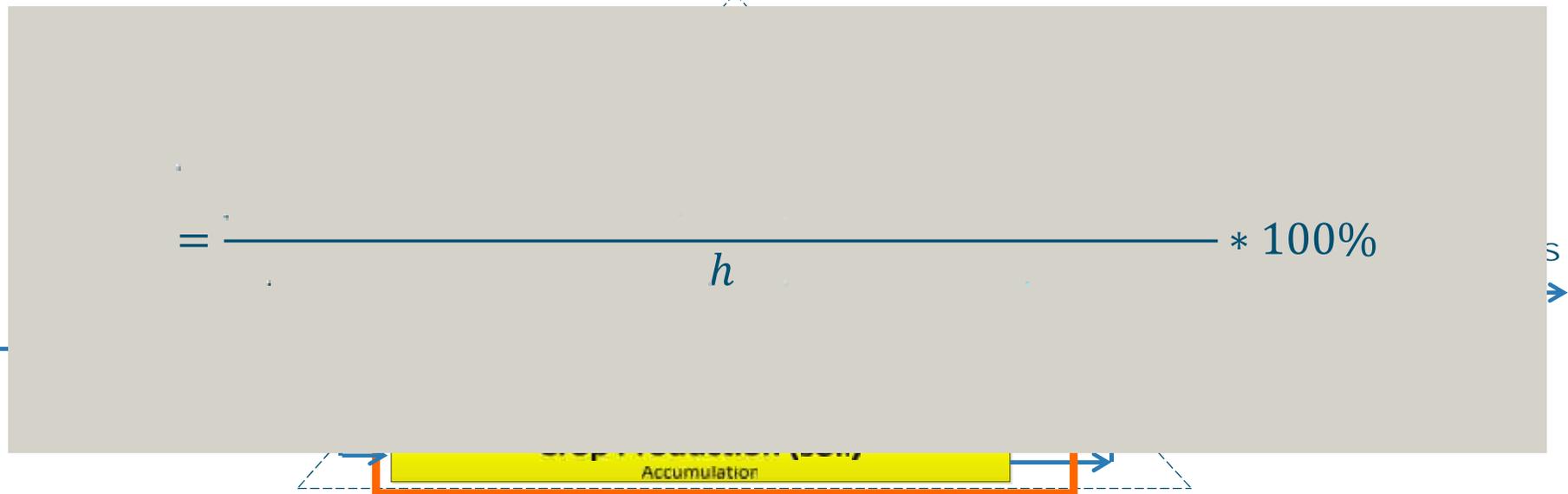


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NUFER model

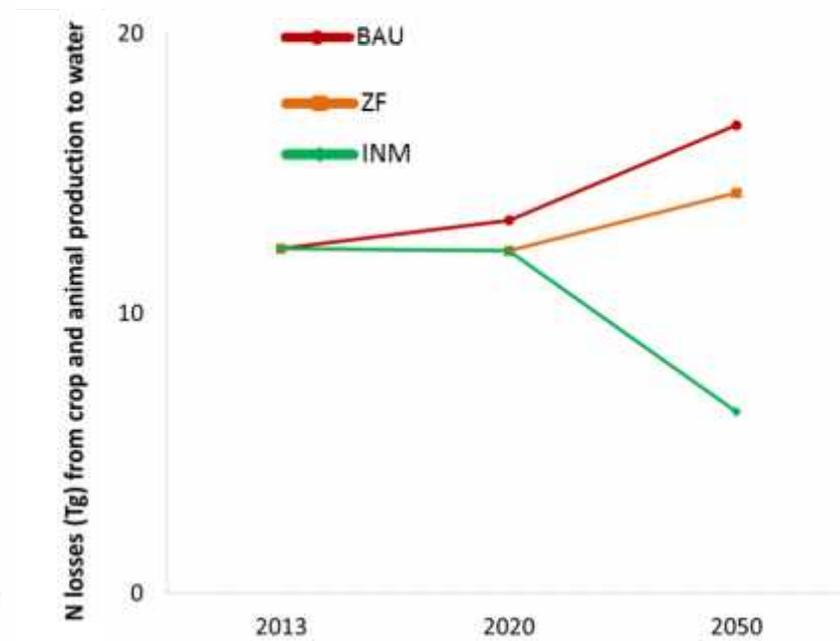
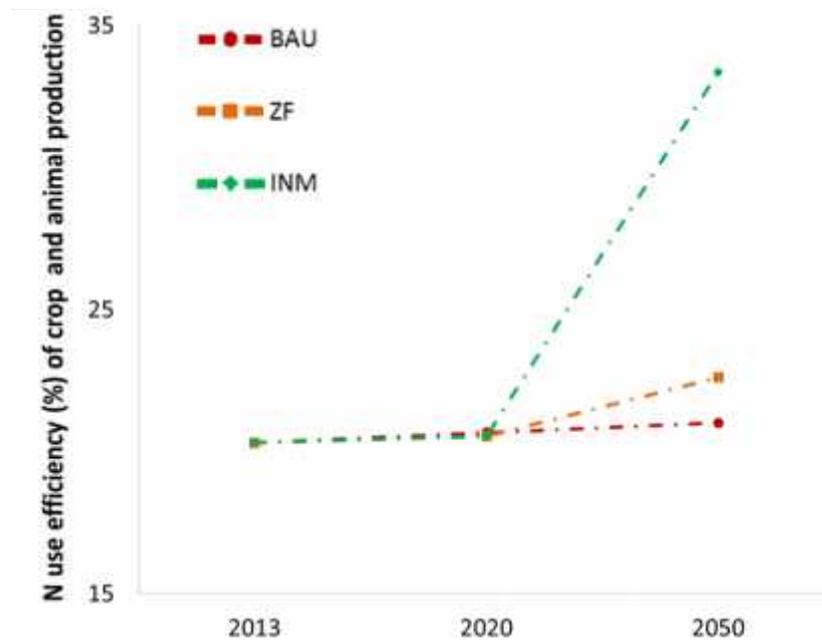
NUtrient flows in Food chains, Environment and Resources use



Scenario analysis: 2013-2020-2050

- Business As Usual (BAU)
- Zero Fertilizer (ZF) growth after 2020
- Improved Nutrient Management (INM)
 - Zero Fertilizer (ZF) growth
 - Balanced Fertilization
 - Precision Feeding
 - Manure Management

Nitrogen (N) use efficiency and N losses to waters



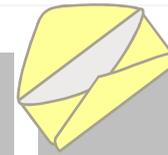
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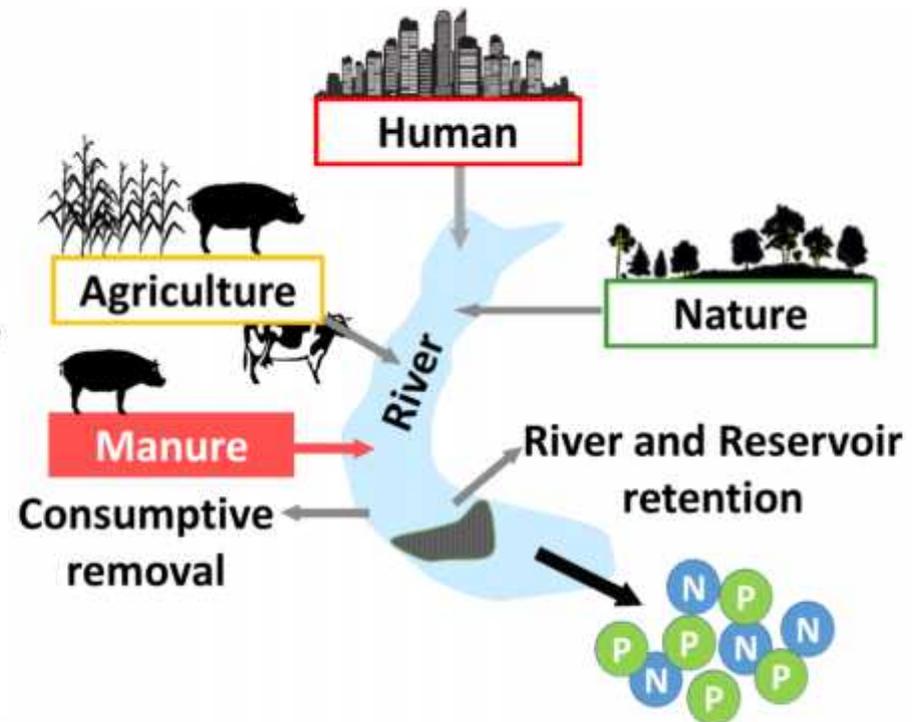




Global *NEWS* model

Global Nutrient Export from WaterSheds

- Basin scale
- 1970, 2000, 2030, 2050



(Sources: Strokal, 2016)

Scenarios : 2050

GO (worst case): Global Orchestration

- Globalization trends in socio-economy
- Reactive approach for environmental problems
- Industrialization of animal production
- Urbanization

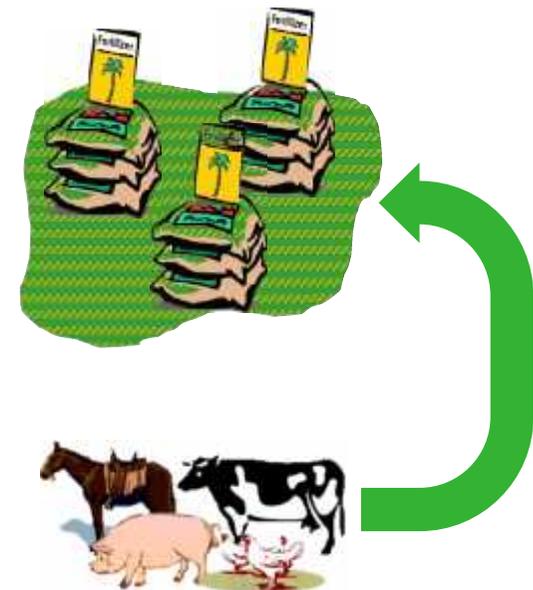
ISSM: Integrated Soil-Crop System Management

- Reduce fertilizer need

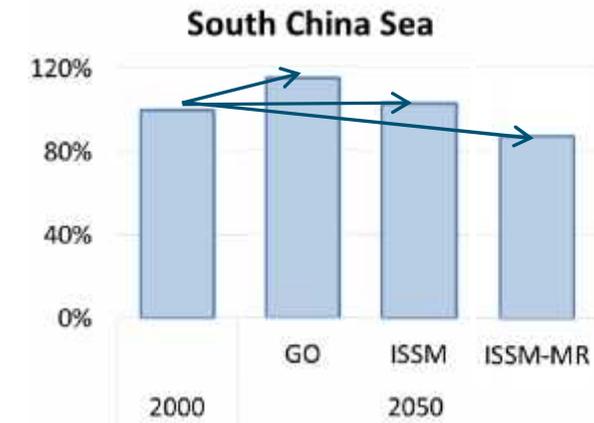
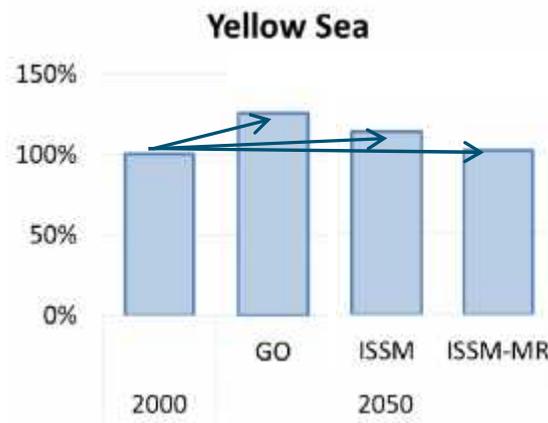
ISSM-MR: ISSM with improved manure management

- Replacing synthetic fertilizer with animal manure

ISSM-MR



Nitrogen export to the Chinese seas (%)



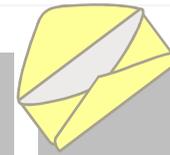
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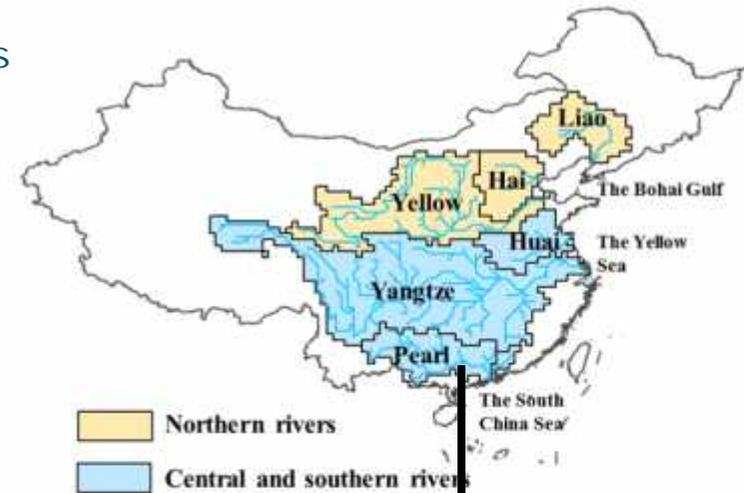
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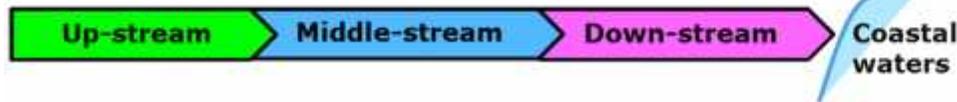


Model to Assess River Inputs of Nutrients to seAs

- Based on Global NEWS
- Sub-basin scale
- 1970, 2000, 2050

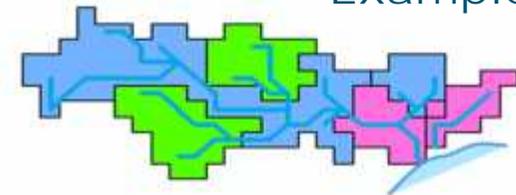


Sub-basins:



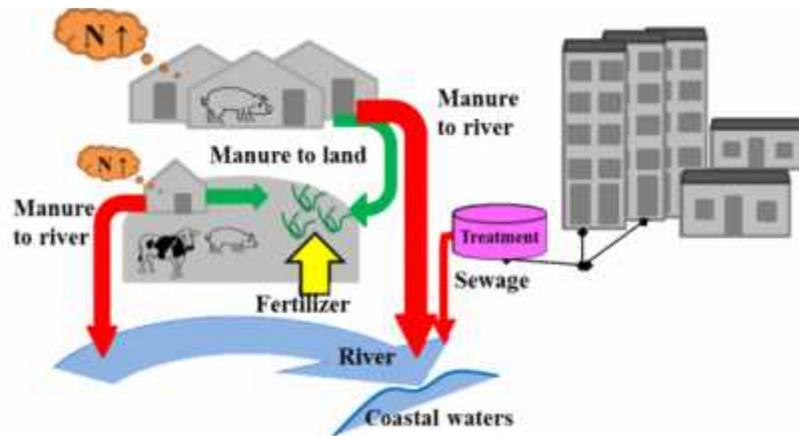
Pearl River

Example



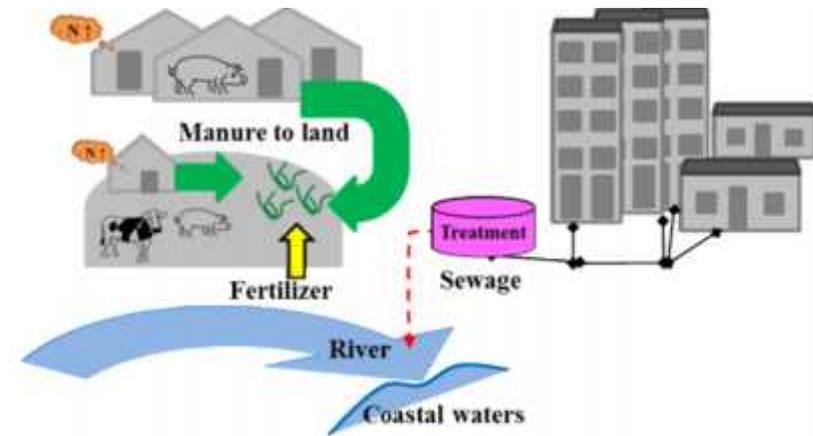
Optimistic Scenarios

GO (worst case)



- Globalization trends in socio-economy
- Reactive approach for environmental problems

OPT (best case): OPTimistic

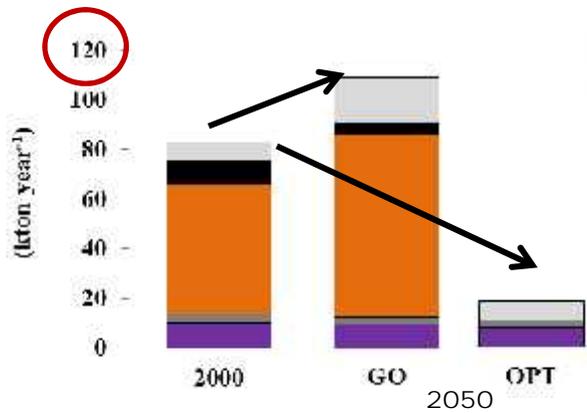


- Manure recycling on land
- Balanced fertilizer use
- Improved sanitation

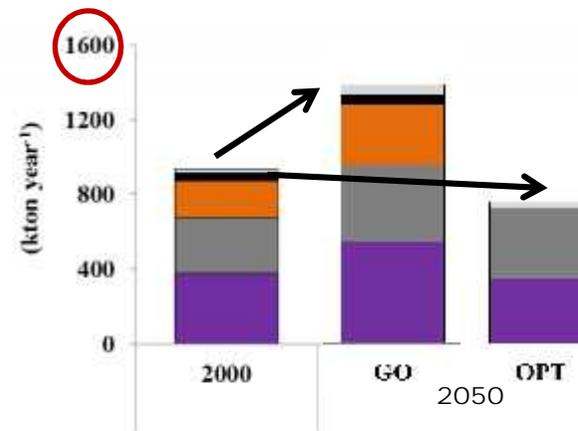
Optimistic Scenarios

Nitrogen export to the Chinese seas (kt/yr)

Northern rivers



Central and southern rivers



- Human waste from sewage systems
- Direct discharge of uncollected human waste to rivers
- Direct discharge of animal manure to rivers
- N fixation and deposition on agricultural and non-agricultural land
- Use of synthetic fertilizers, animal manure and human waste on land

Thank you!

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