

Sub-basin scale modelling of nutrient export by rivers to coastal waters of China

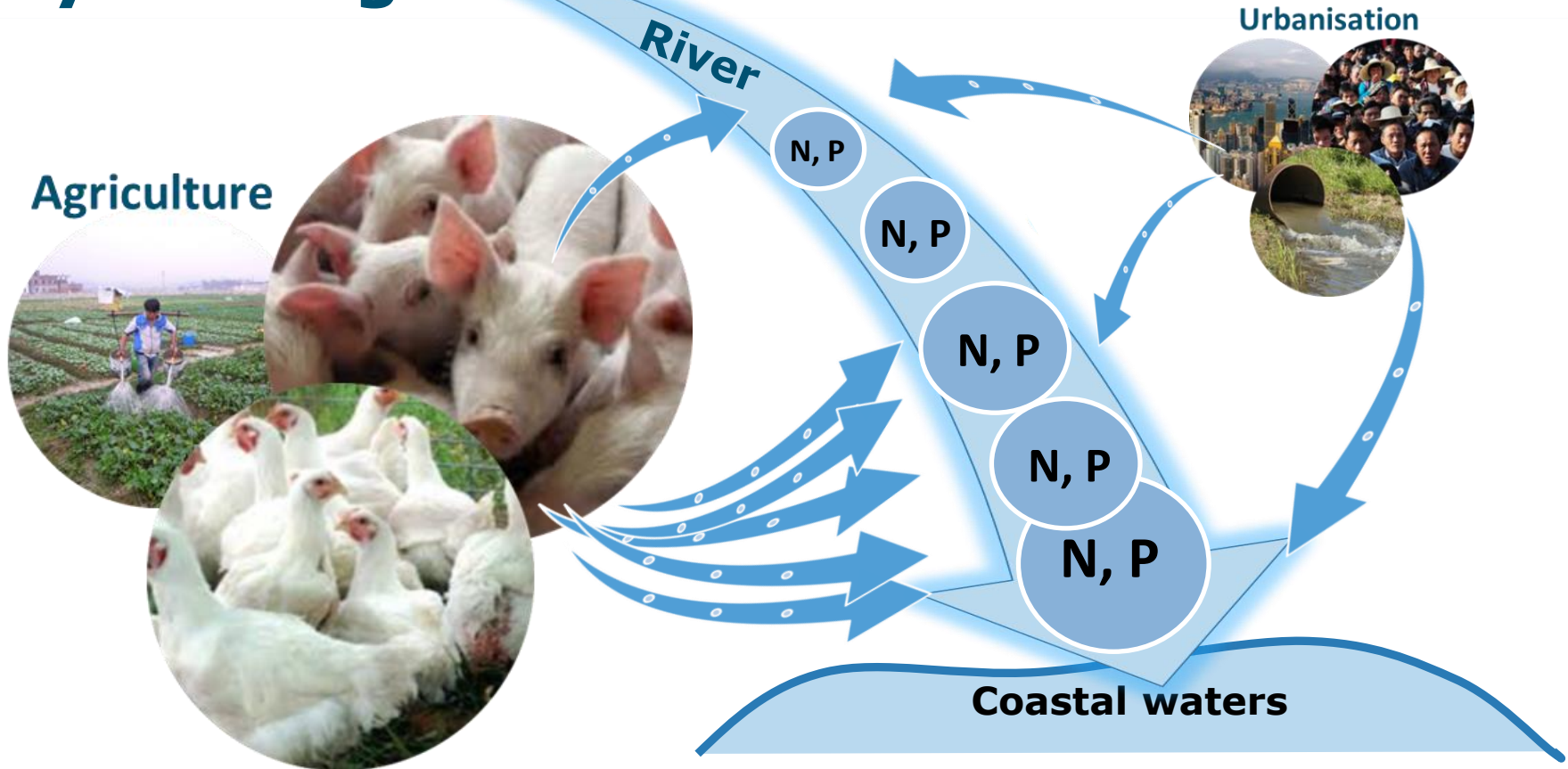
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Key messages for China:



1. Rivers transport **too much nutrients**, causing coastal eutrophication

2. **Animal production** is the main reason of coastal pollution by nutrients

3. **High risk** for coastal eutrophication in the future

Nutrient pollution of coastal waters in China

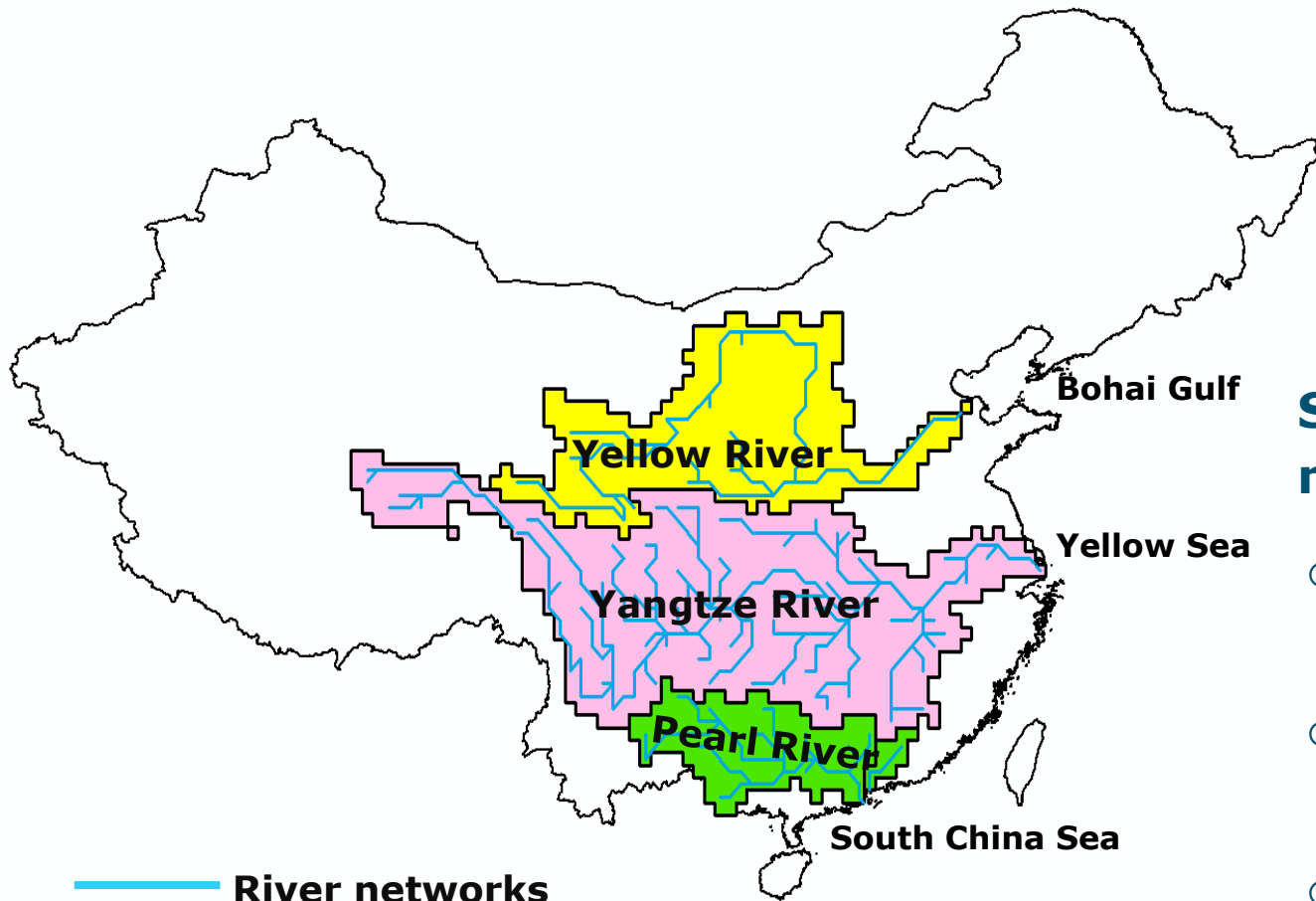


The Qingdao beach



Research objective

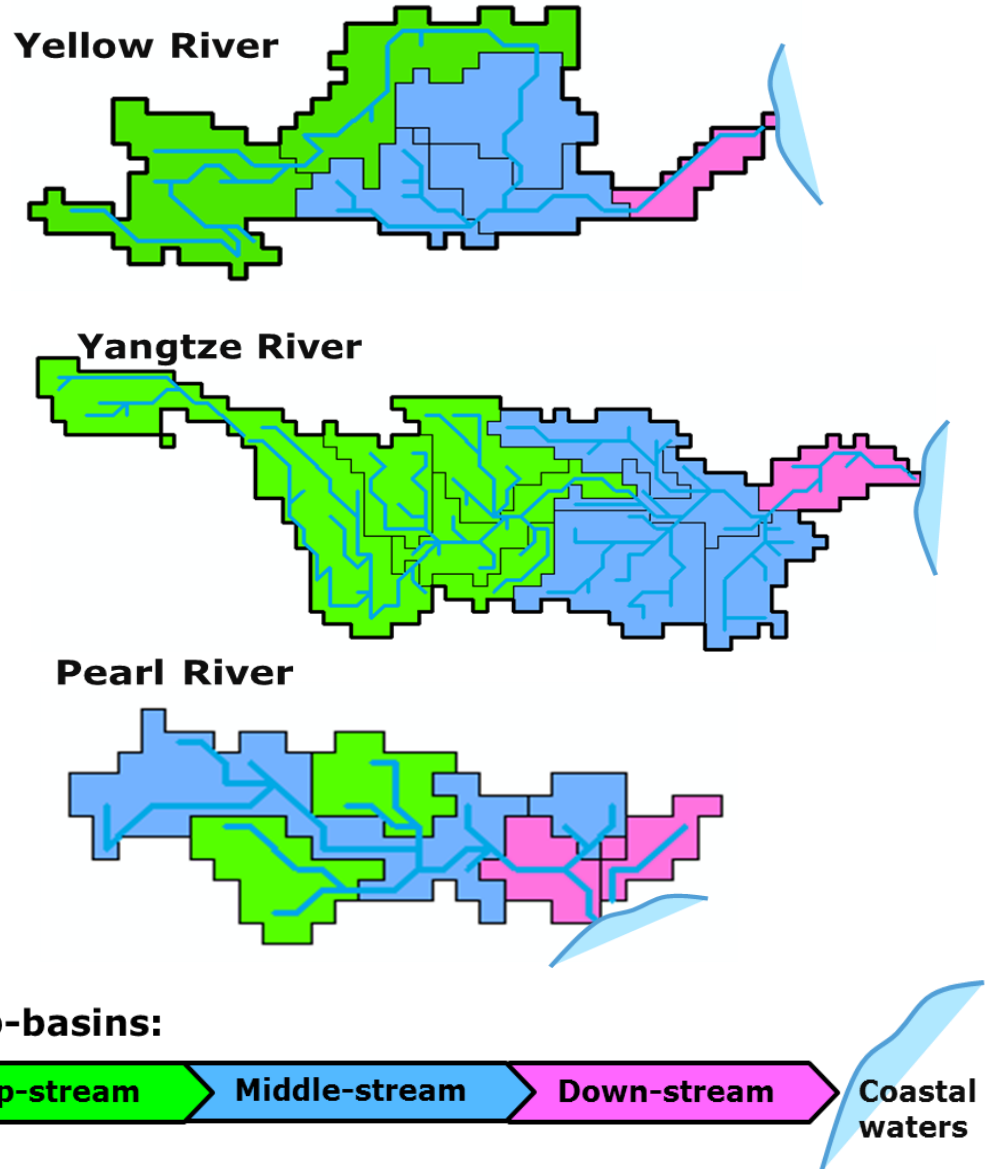
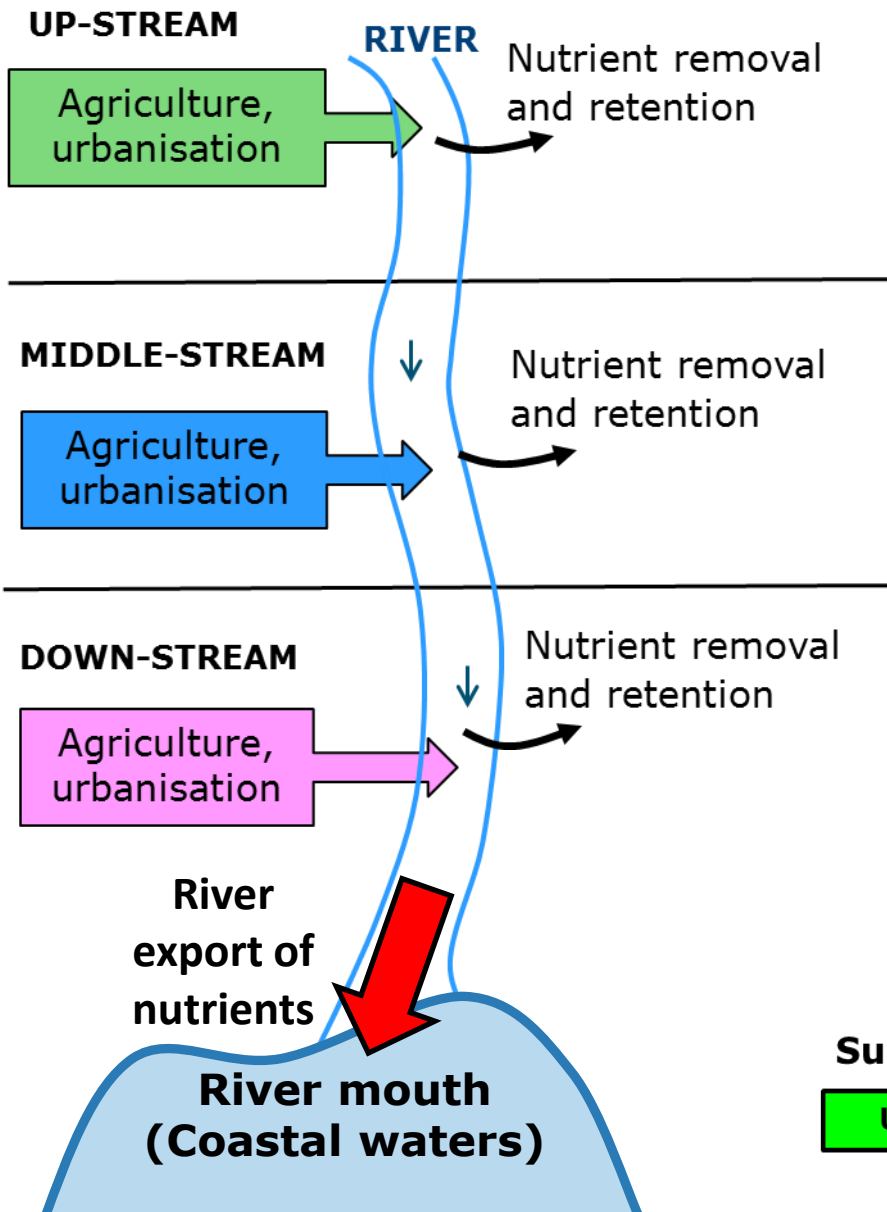
To quantify nutrient export by large Chinese rivers to coastal waters by source from sub-basins



Sub-basin scale modelling:

- Dissolved inorganic nitrogen
- Dissolved inorganic phosphorus
- 1970, 2000, 2050

Sub-basin scale modelling: a new approach



Gridded database (0.5 by 0.5 degree cell)



Bouwman et al., (2009); Van Drecht et al., (2010); Fekete et al., (2010)

Information for China and its provinces



Ma et al., (2012); Mor  e et al., (2013)

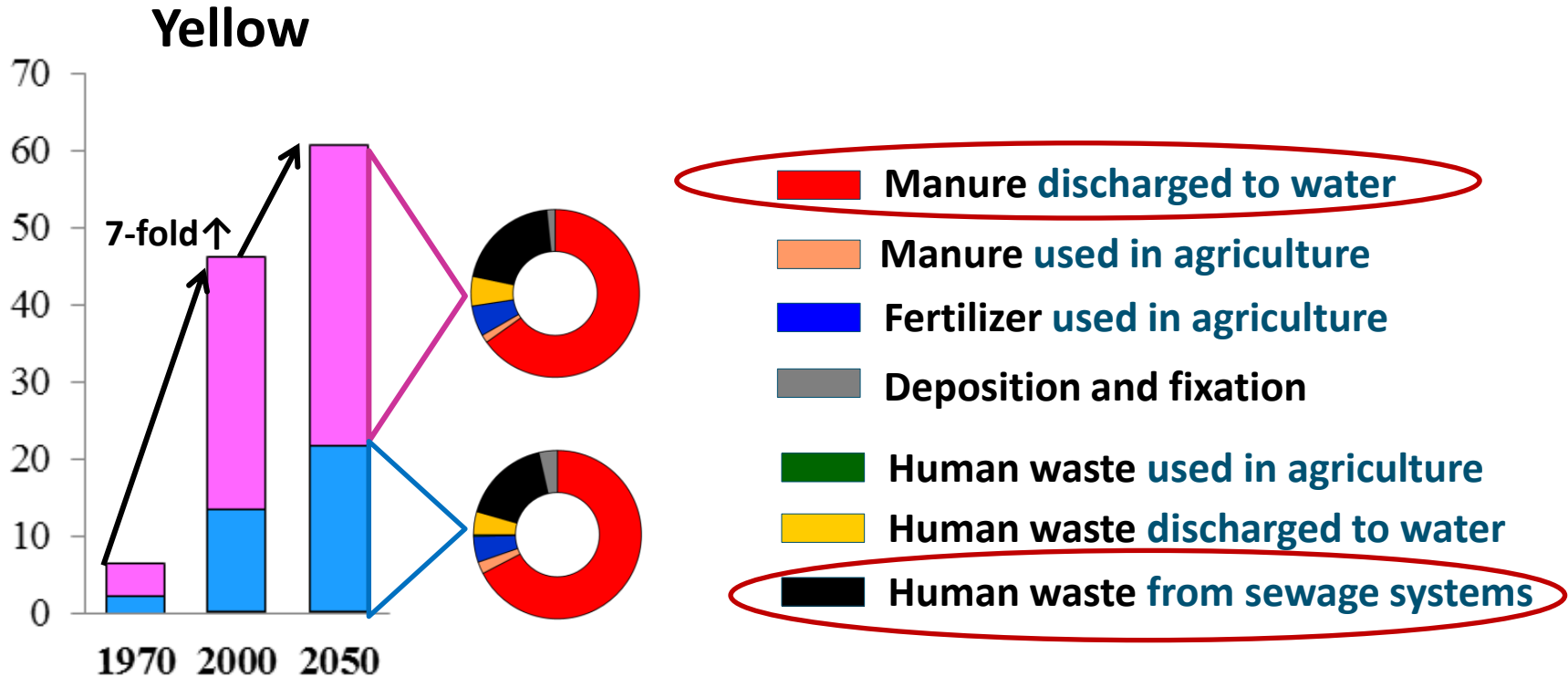
Global Reservoir and Dam Database



Lehner et al., (2010)

River export of dissolved inorganic nitrogen

kton year⁻¹



2050: a globalized world with fast economic development

(Alcamo et al., 2010; Seitzinger et al., 2010)

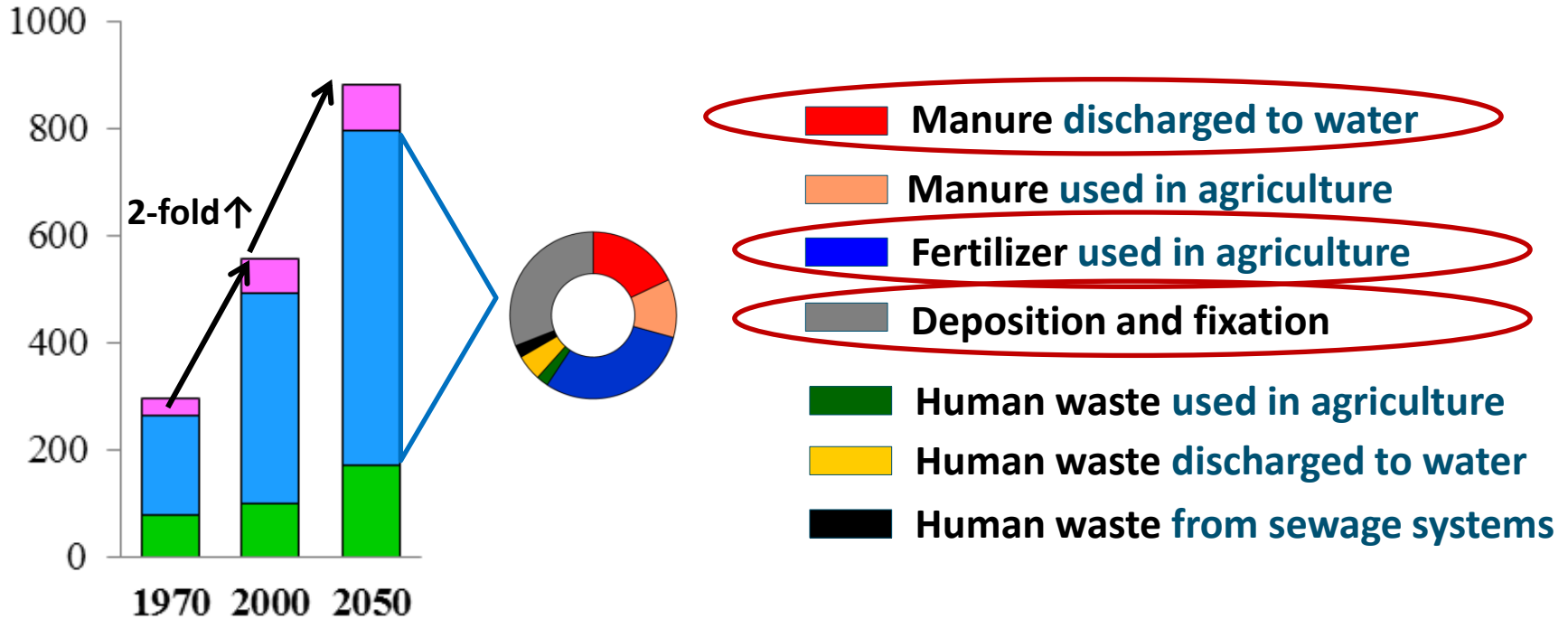
Sub-basins:



River export of dissolved inorganic nitrogen

kton year⁻¹

Yangtze



2050: a globalized world with fast economic development

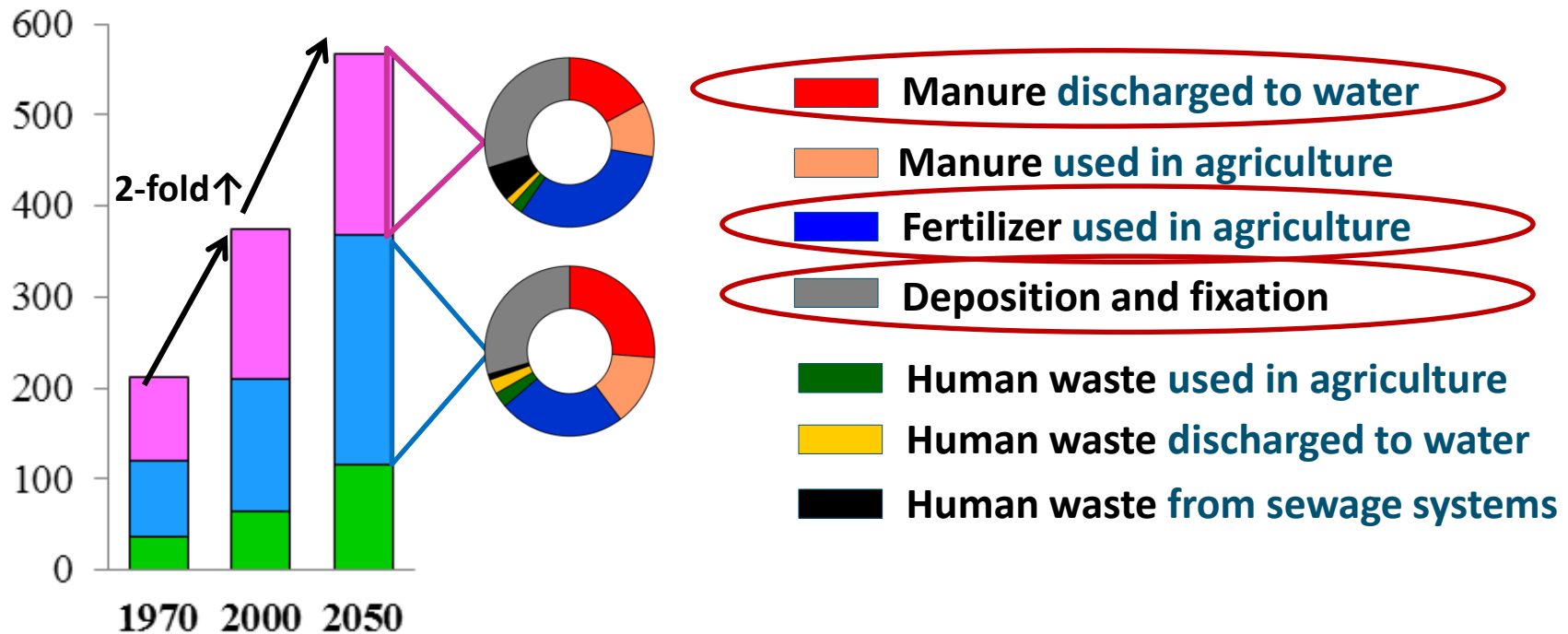
(Alcamo et al., 2010; Seitzinger et al., 2010)

Sub-basins:



River export of dissolved inorganic nitrogen

- River export of nitrogen **increases fast over time**
- **Animal manure** is the main reason of this increase
- **Synthetic fertilizers** are the reason for the Yangtze and Pearl rivers



2050: a globalized world with fast economic development

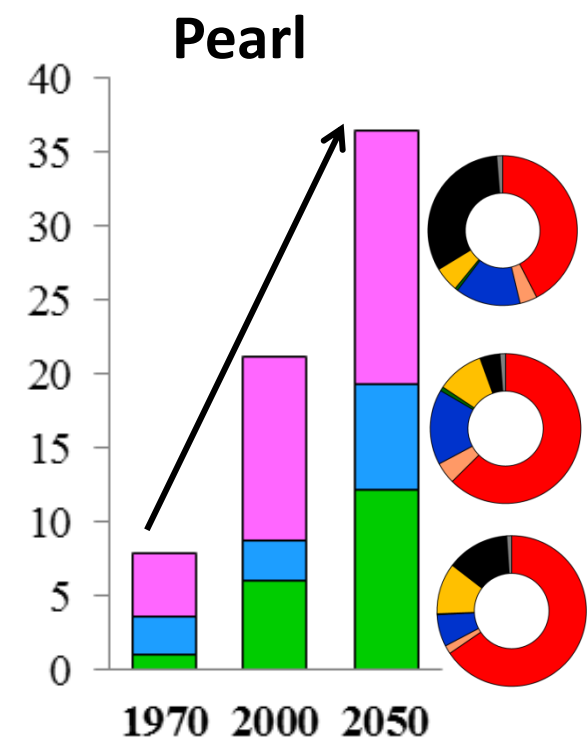
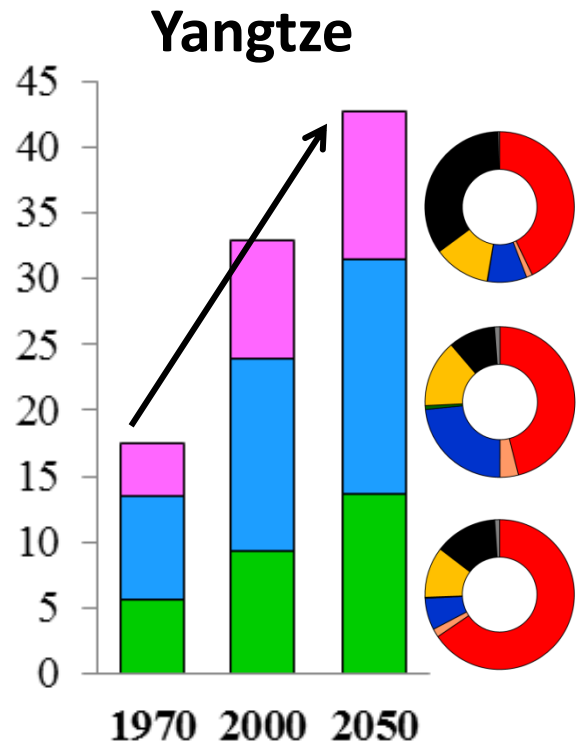
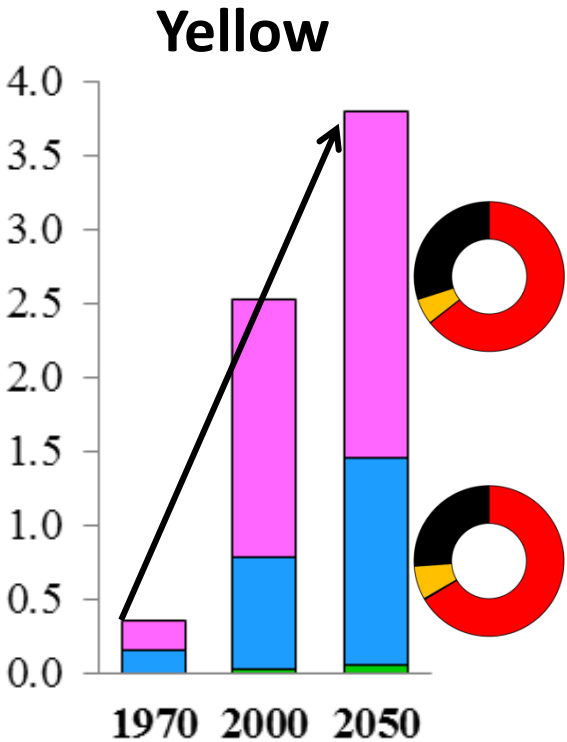
(Alcamo et al., 2010; Seitzinger et al., 2010)

Sub-basins:



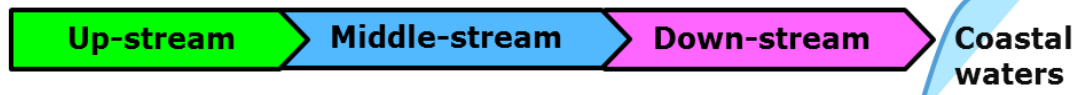
River export of dissolved inorganic phosphorus

kton year⁻¹



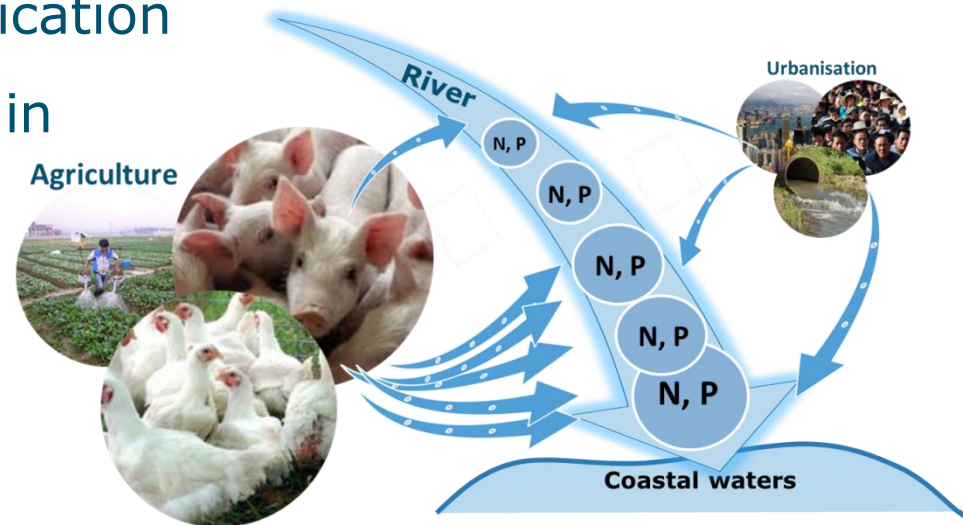
- Manure discharged to water
- Human waste from sewage systems
- Fertilizer used in agriculture

Sub-basins:



Main conclusions

1. Rivers transport **too much nutrients**, causing coastal eutrophication
2. **Human activities at middle- and down-stream areas:**
 - Animal production: responsible for 5-70% of nutrients
 - Synthetic fertilizers: an important contributor for wet basins
 - Urbanisation: an important contributor for deltas
3. **In the future:**
 - **High risks** for coastal eutrophication
 - Efficient nutrient management in agriculture is required



Thank you for your attention!

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