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NILE BASIN INITIATIVE

INITIATIVE DU BASSIN DU NIL

Integrated modelling of nutrient dynamics in the Nile River basin

NBDF7 Webinar

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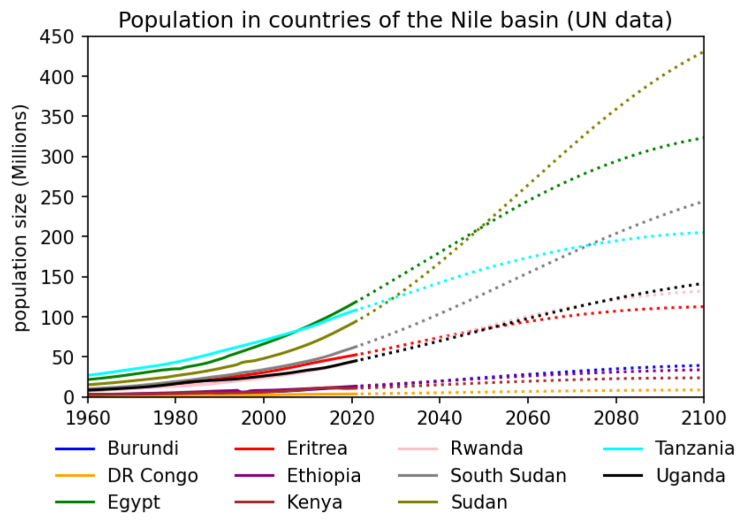
The Nile basin status

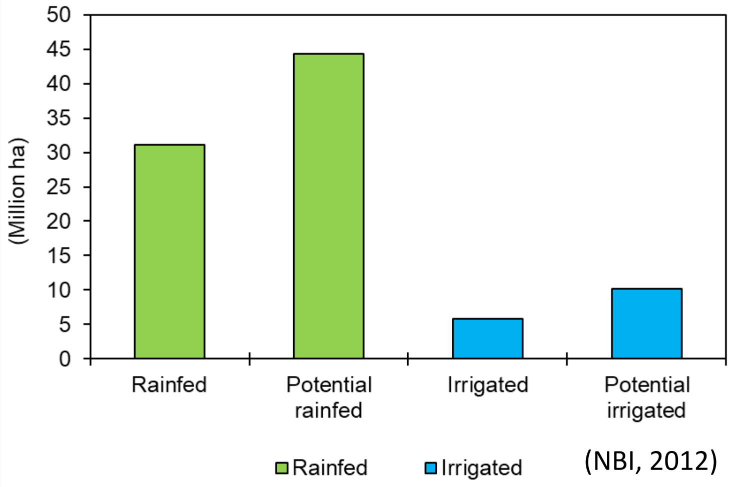
Driving forces:

- Population growth
- Urbanization
- Agricultural intensification
- Industrial development
- Dam development
- Climate change

84 km³/year

6700 km & 3.2 million km²





567/272 million people

11 countries

Nutrient pollution in the Nile basin

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Eutrophication

(Inland & coastal waters)

(Ground)Water contamination

Loss of biodiversity

Health concerns

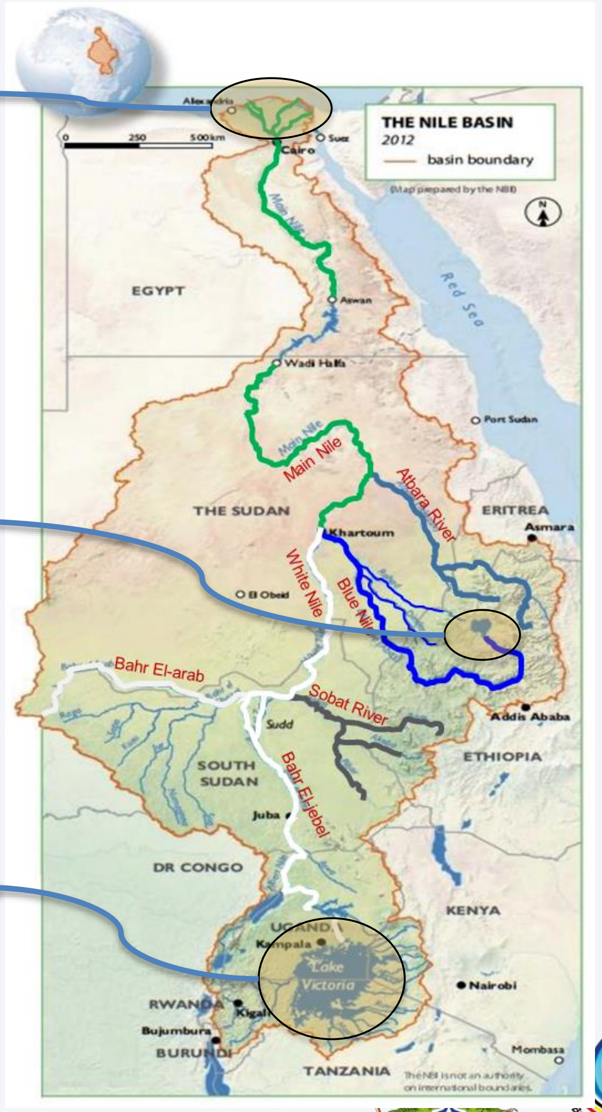
Lack of comprehensive studies

on nutrient in the Nile basin

Eutrophication in drains at Nile Delta

Eutrophication in Lake Tana

Eutrophication in Lake Victoria



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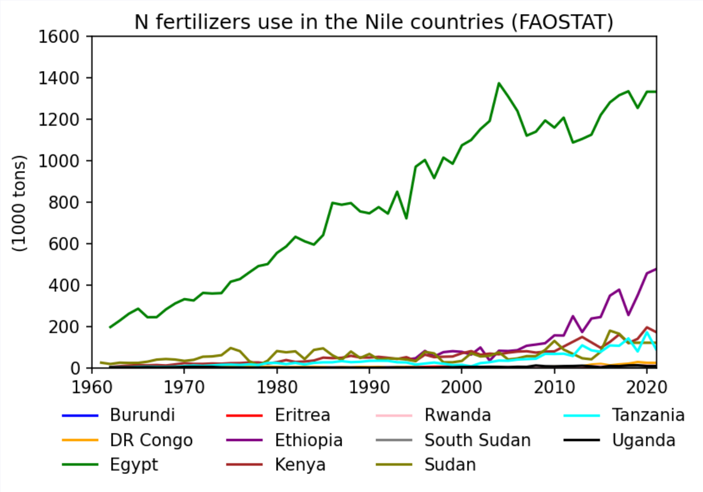
Sources of nutrient pollution

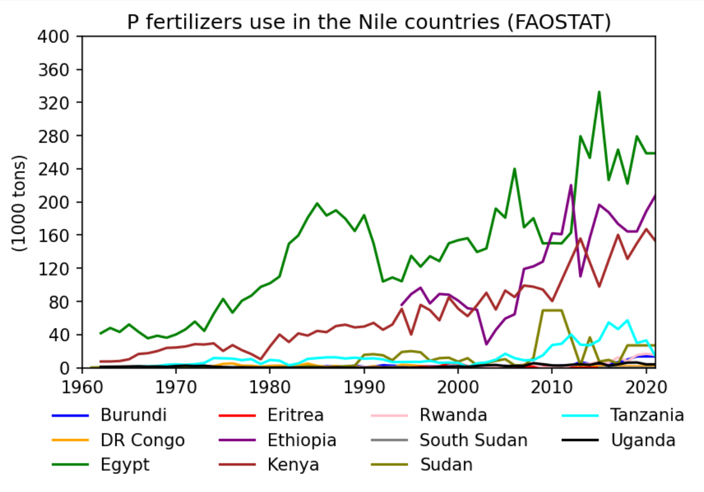
- **Point source**

  (e.g., domestic and industrial waste)

- **Non-point source**

  (e.g., agricultural runoff)





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Modelling framework

Spatial resolution of 0.5° x 0.5°

Integrated Model to Assess the Global Environment – Dynamic Global Nutrient Model

(IMAGE – DGNM)

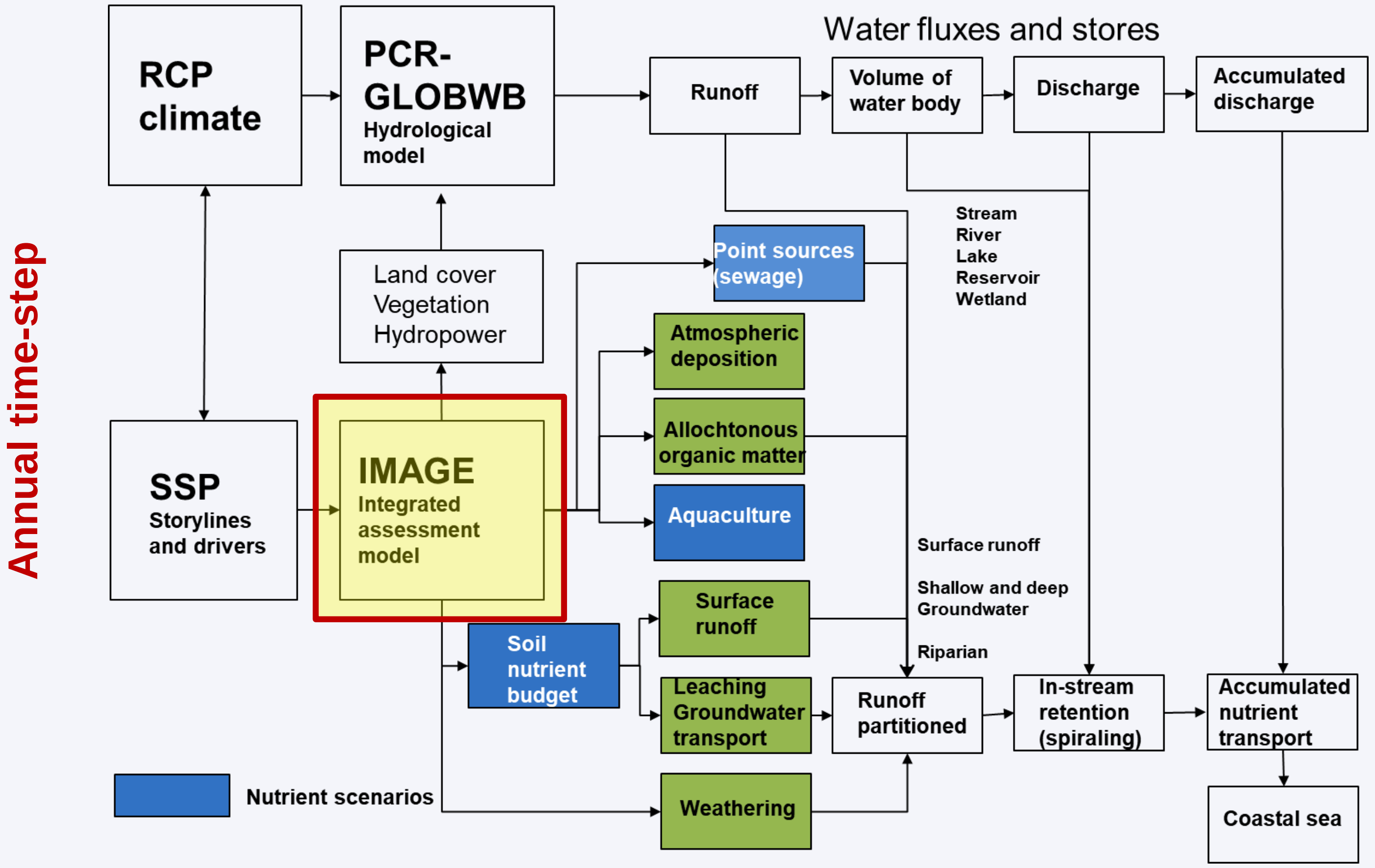


IMAGE – DGNM modelling framework
(Beusen et al 2016, 2022)

Process-based model

▼Inputs

Fertilizer (N/P)

Animal manure (N/P)

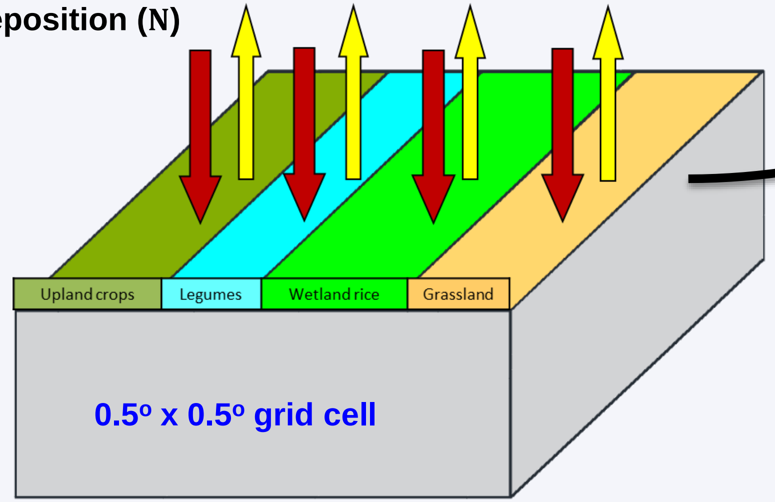
Biological N fixation (N)

Atmospheric deposition (N)

▲Outputs

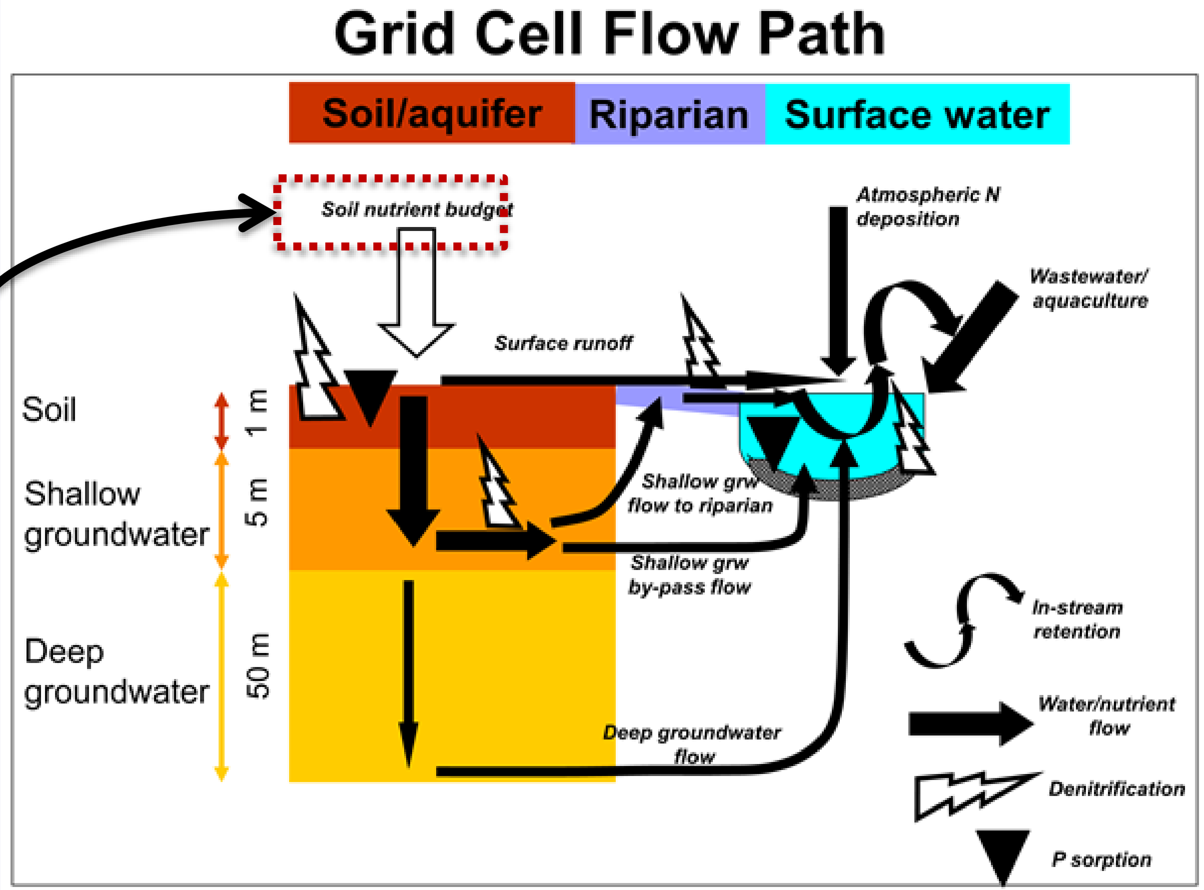
Crop/grass output (N/P)

Ammonia volatilization (N)



Soil (N/P) nutrient budget conceptual model per grid cell

$$Nutrient_{budget} = \sum Inputs - \sum Outputs$$



Beusen et al. (2015)

N and P fluxes per subbasin

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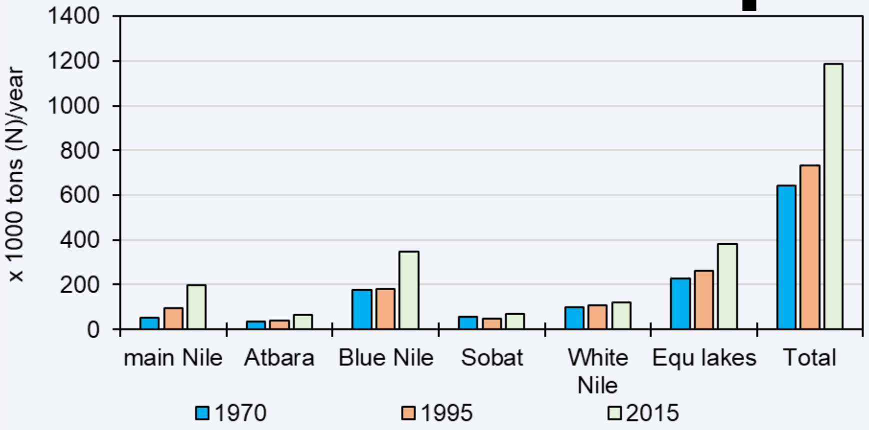
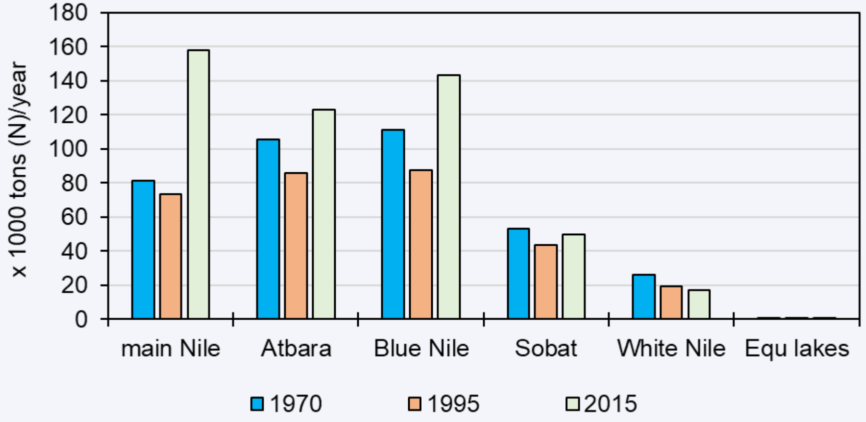
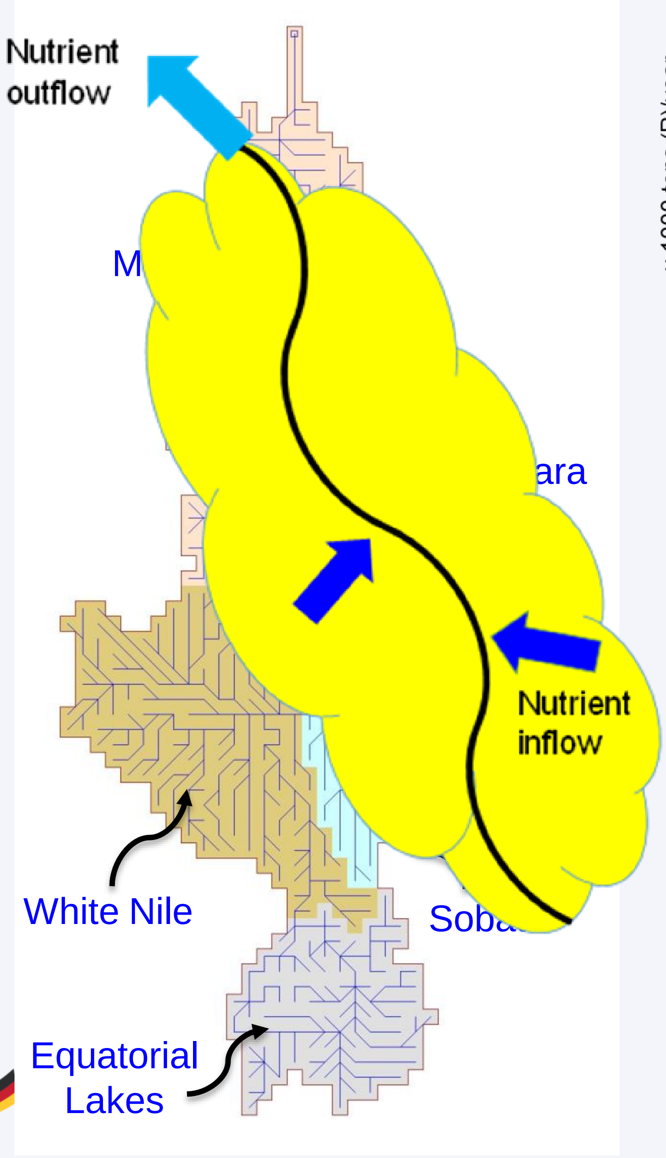
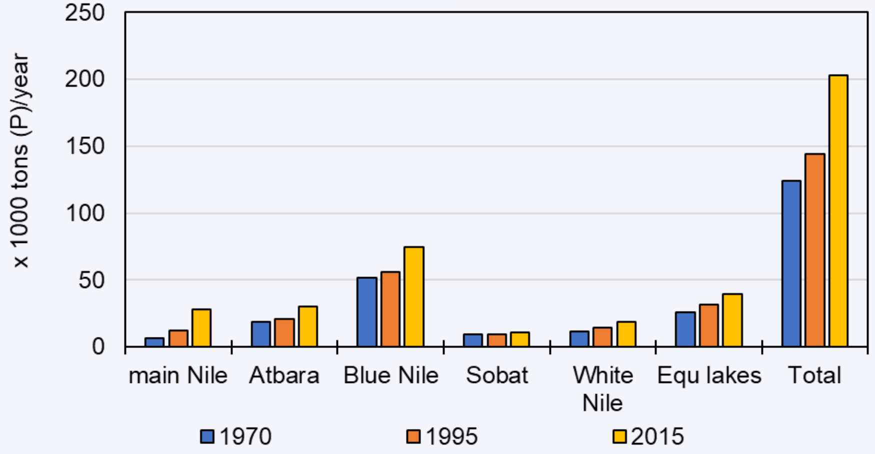


N inflow per subbasin

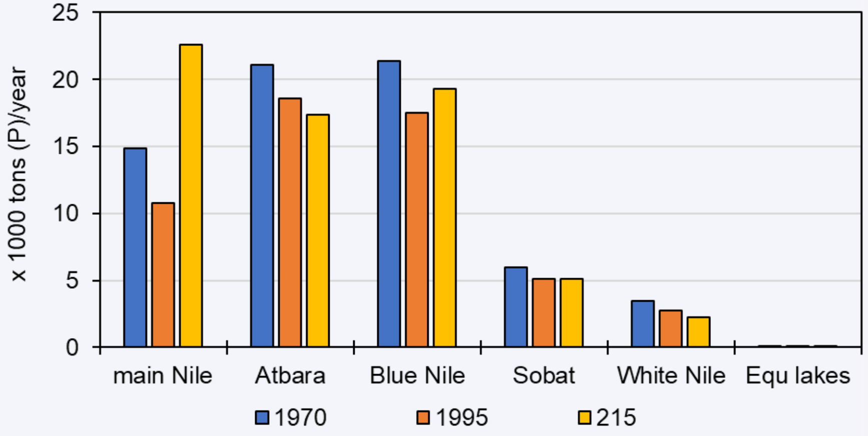


N outflow per subbasin





P inflow per subbasin



P outflow per subbasin

N inflow sources per sub basin & dominant source of N in streams

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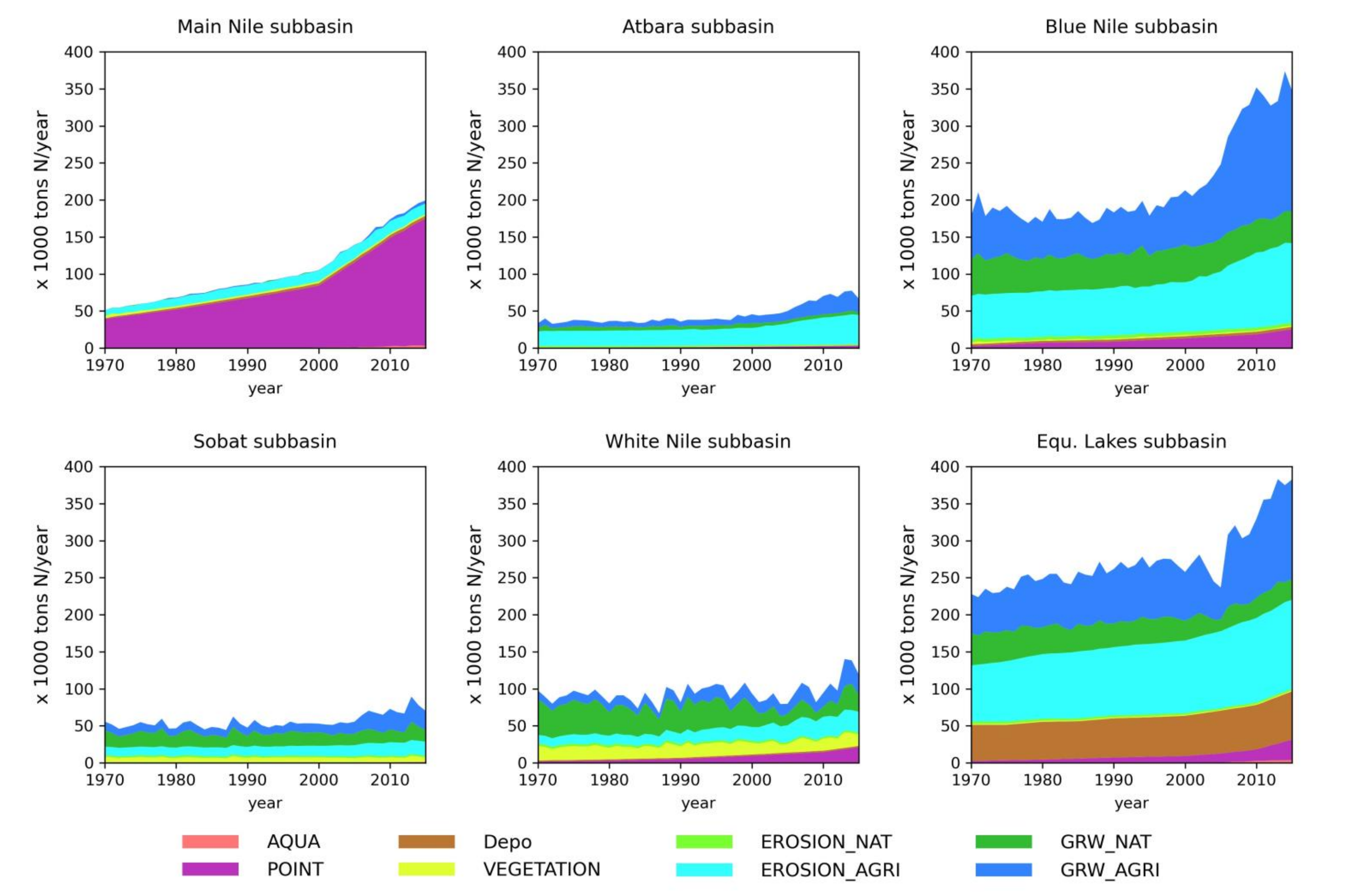
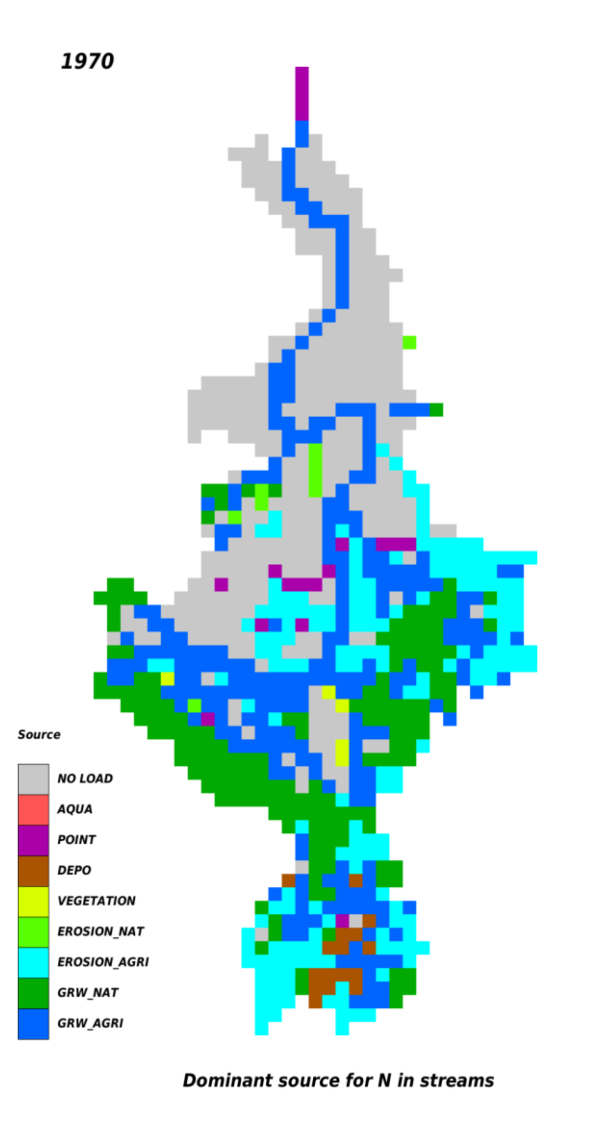
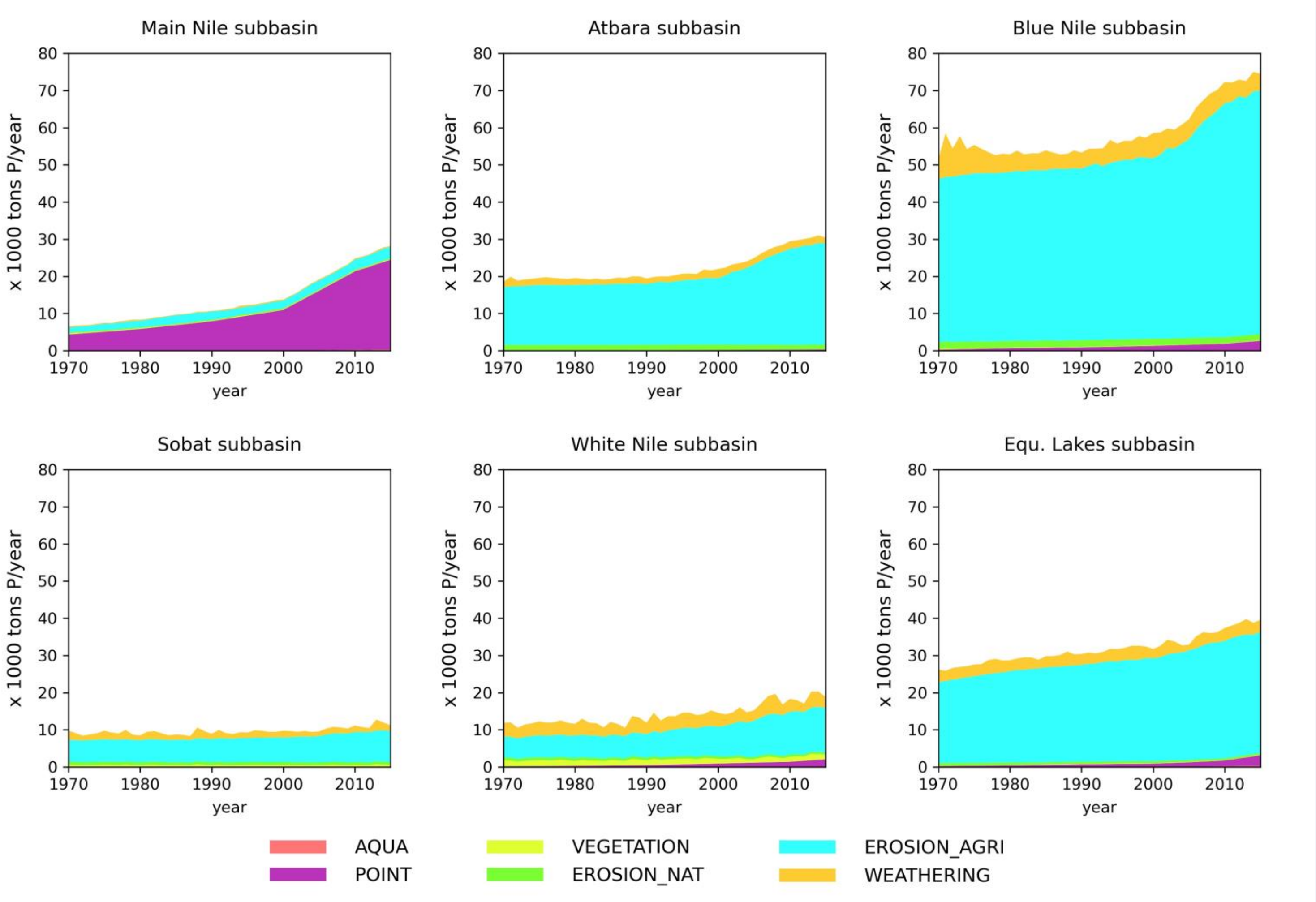
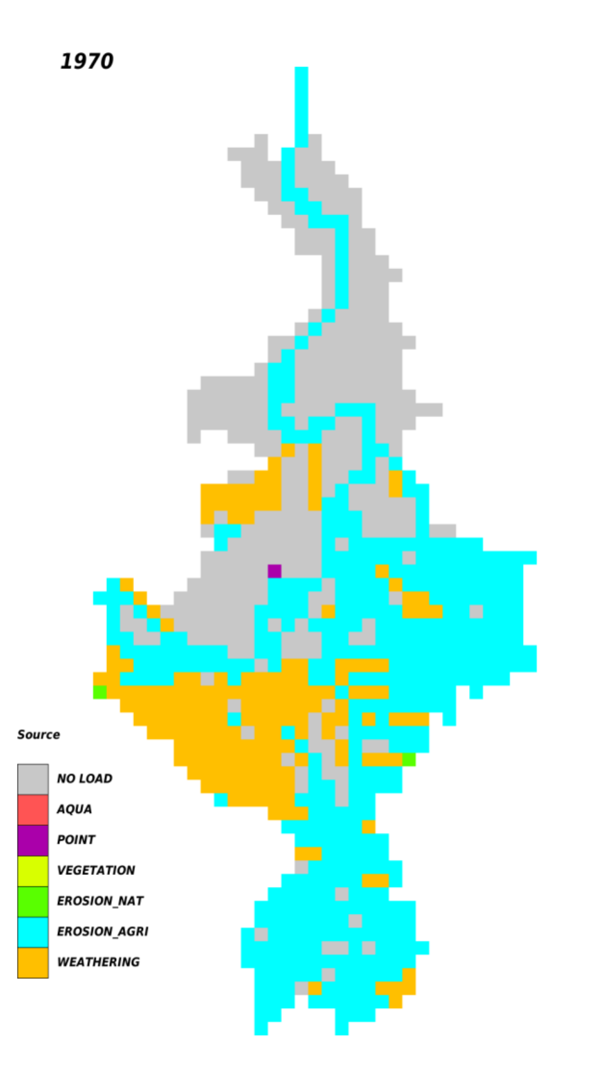




P inflow sources per sub basin & dominant rce of P in streams





Dominant source for P in streams

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Take-home messages

- Nutrient pressure in the basin will increase due to increased food production to feed growing population
- IMAGE-DGNM can be used to quantify anthropogenic influences on nutrient in the Nile River basin
- (Agricultural) Developments plans in the basin should consider the impacts of nutrient on water quality

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THANK YOU!