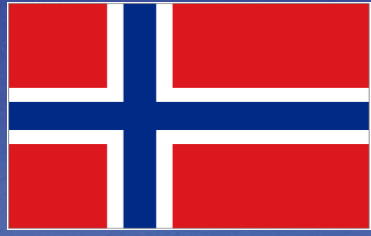


På jakt etter den ukjente vannkvalitet: pressfaktorer, tilstand og integrert vannressursforvaltning i Myanmar

Tor Erik Eriksen, Phyo Wai, Phyo Thet, Andreas Ballot, Ingrid Nesheim & Nikolai Friberg
Norwegian Institute for Water Research, NIVA

Tor.Erik.Eriksen@NIVA.No

NIVA

The recent past explains todays lack of knowledge on assessing water quality

Clear gradients in impact

New area – new challenges

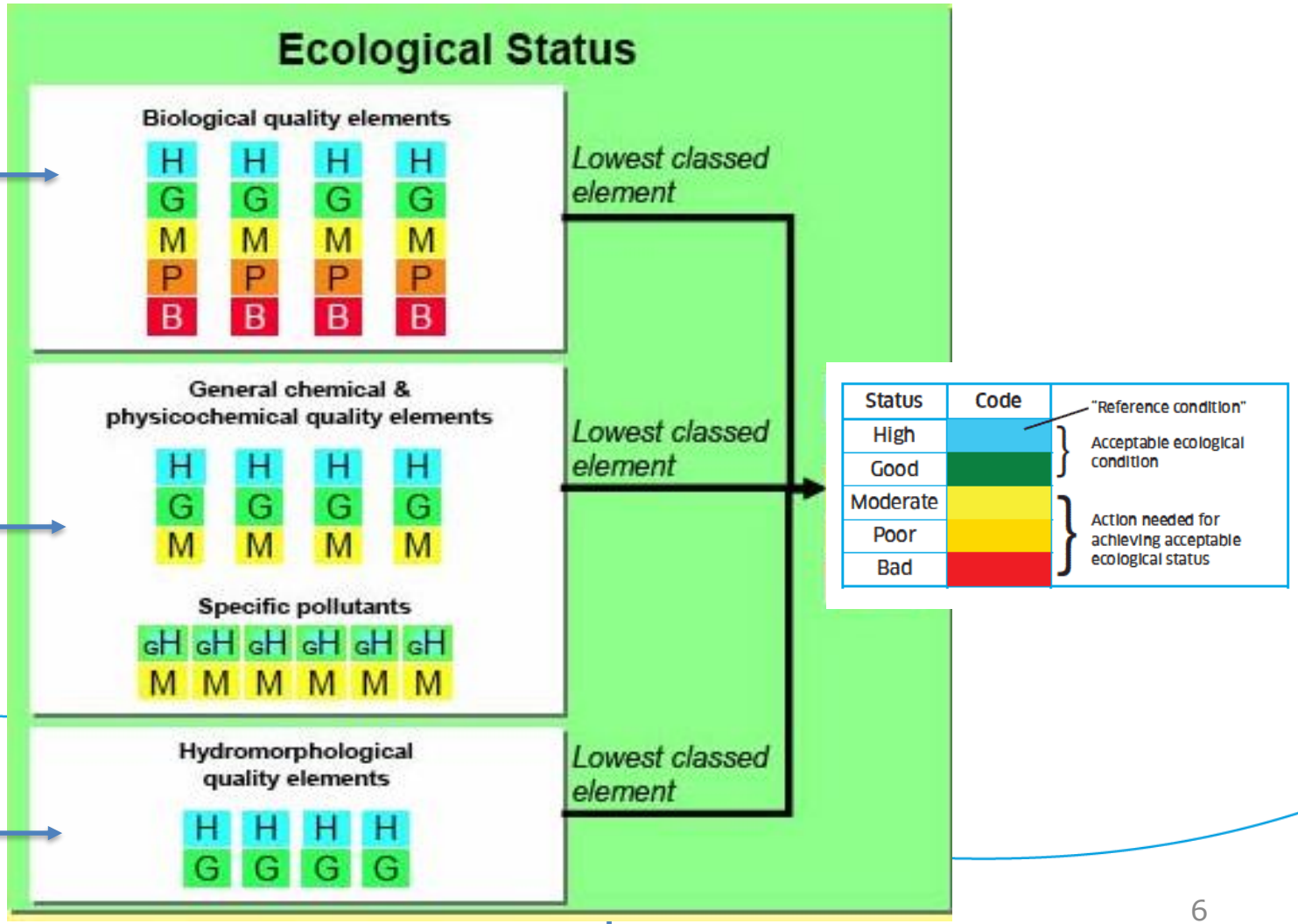




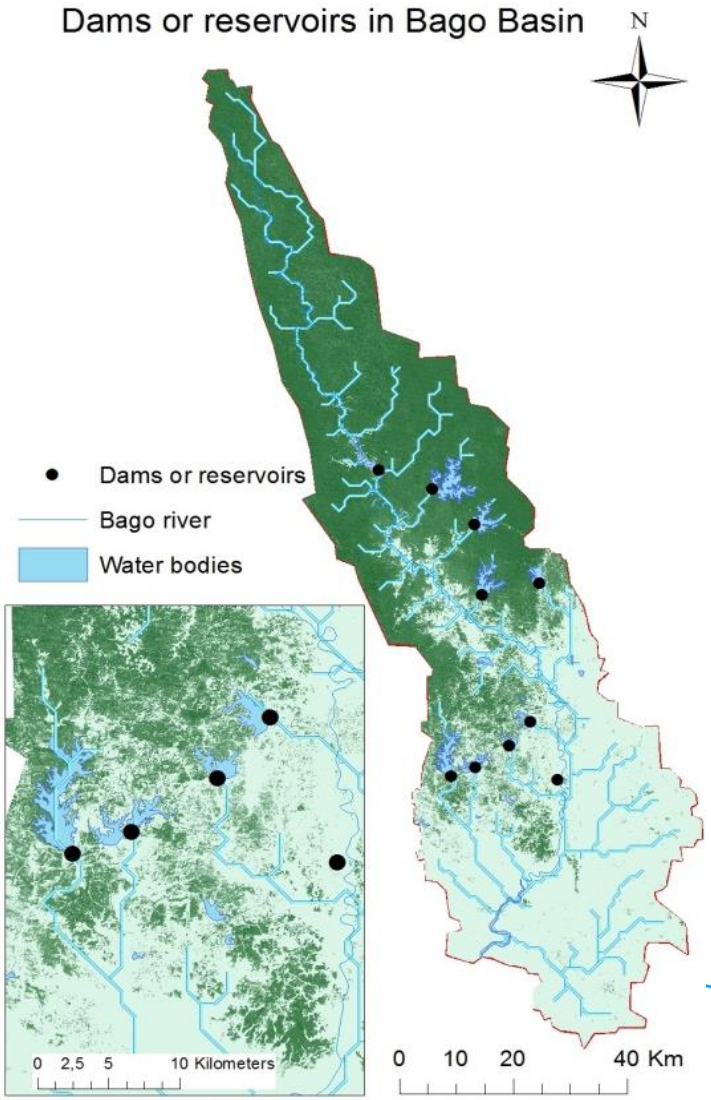

Aim of our work

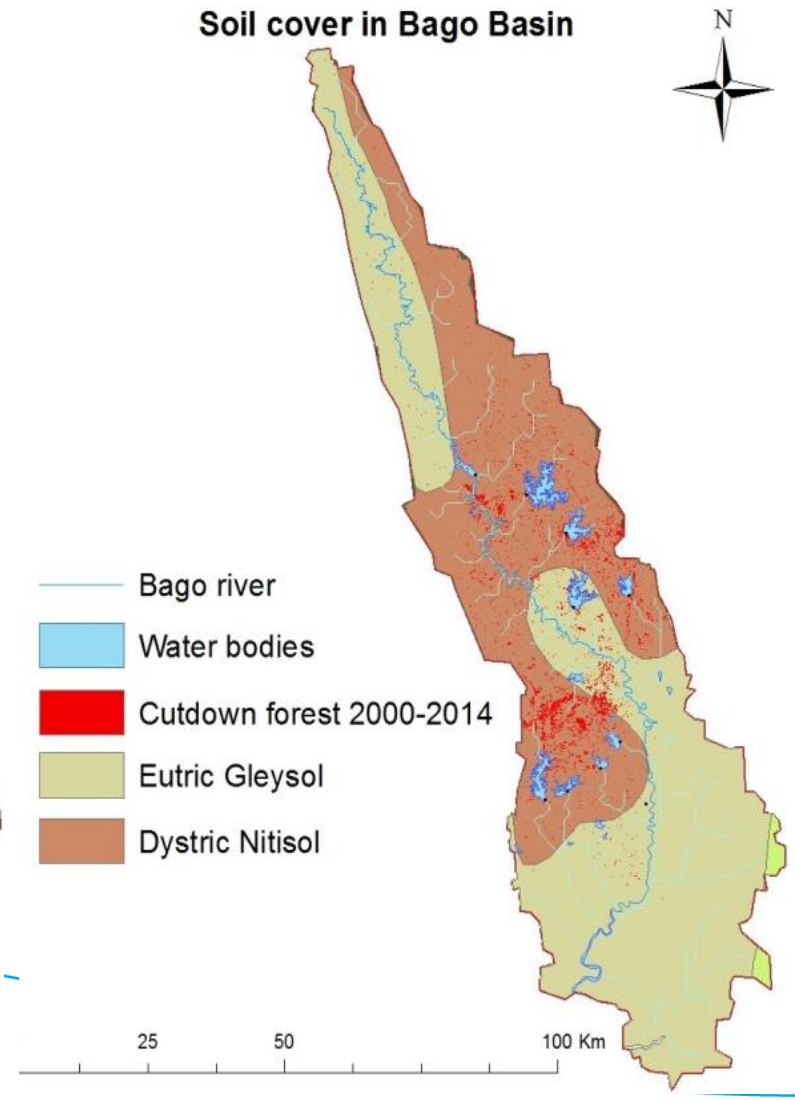
Create an ecological status evaluation system that integrates antropogenic degradation of streams in Myanmar.

Similar concepts exist – ecological status sensu the WFD

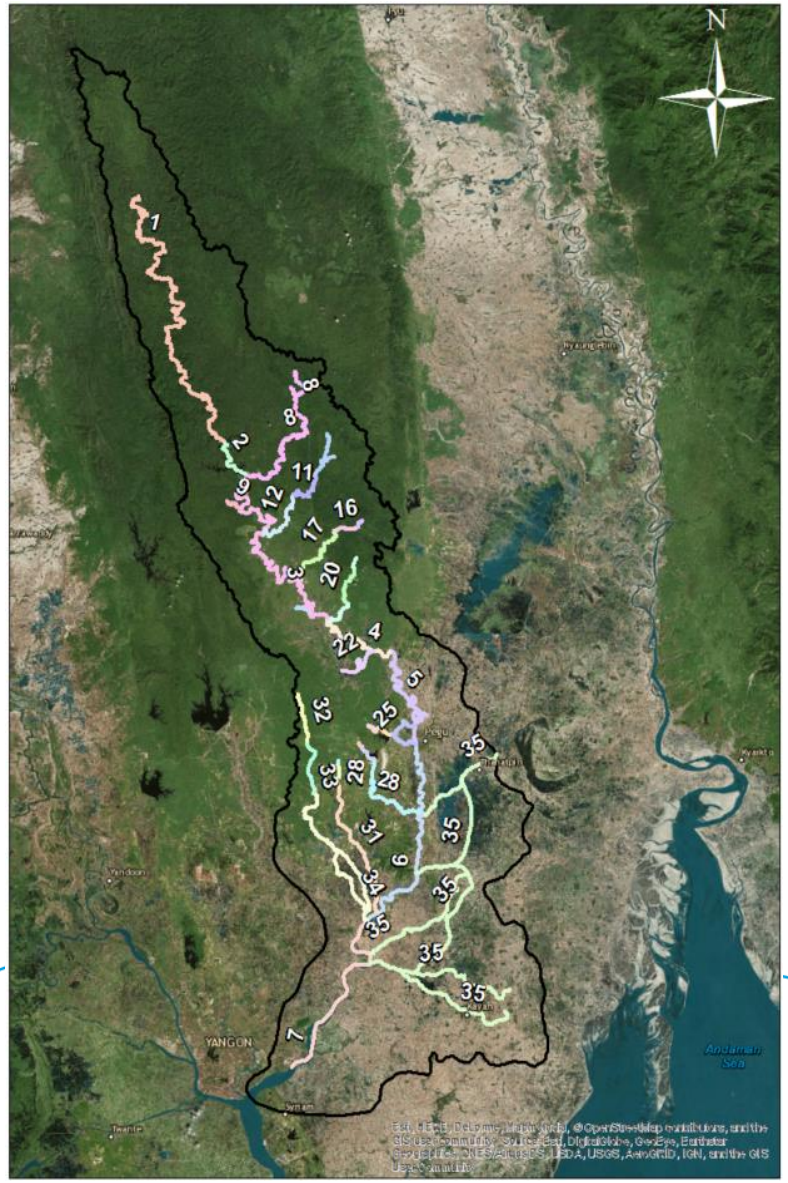


Characterization





Water body division



Criteria:

- have similar geology type, altitude and catchment area.
- not consider political boundaries.
- be exposed to similar types of pressures.
- have similar ecological status (*we do not know this yet*).

35 water bodies were created in the Bago River basin.

Data collection points

* Macroinvertebrates and hydromorphology (circles)

* Monthly water chemical monitoring (stars):

<u>Specific pollutants (metals)</u> - mercury (Hg), copper (Cu), nickel (Ni), lead (pb), chromium (Cr), zinc (Zn), Manganese (Mn), Cadmium (Cd), Iron (Fe) and arsenic (As)

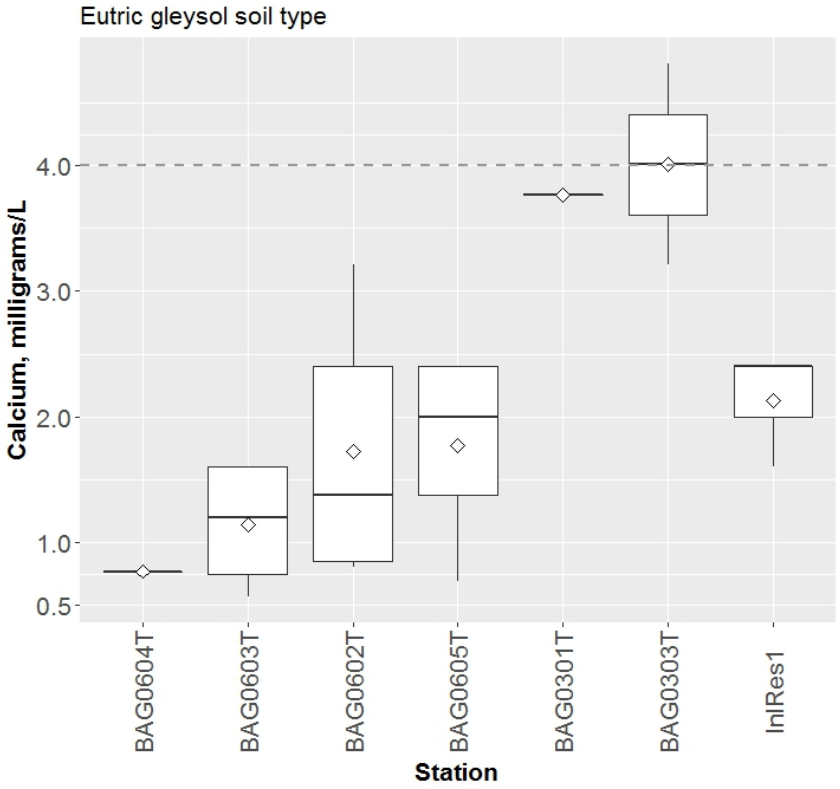
<u>Physico-chemical</u> – pH, turbidity, suspended solids alkalinity, calcium (Ca), potassium (K), chloride (Cl), magnesium (Mg), sodium (Na) and sulfate (So), nitrate, phosphate, phosphorous, ammonia

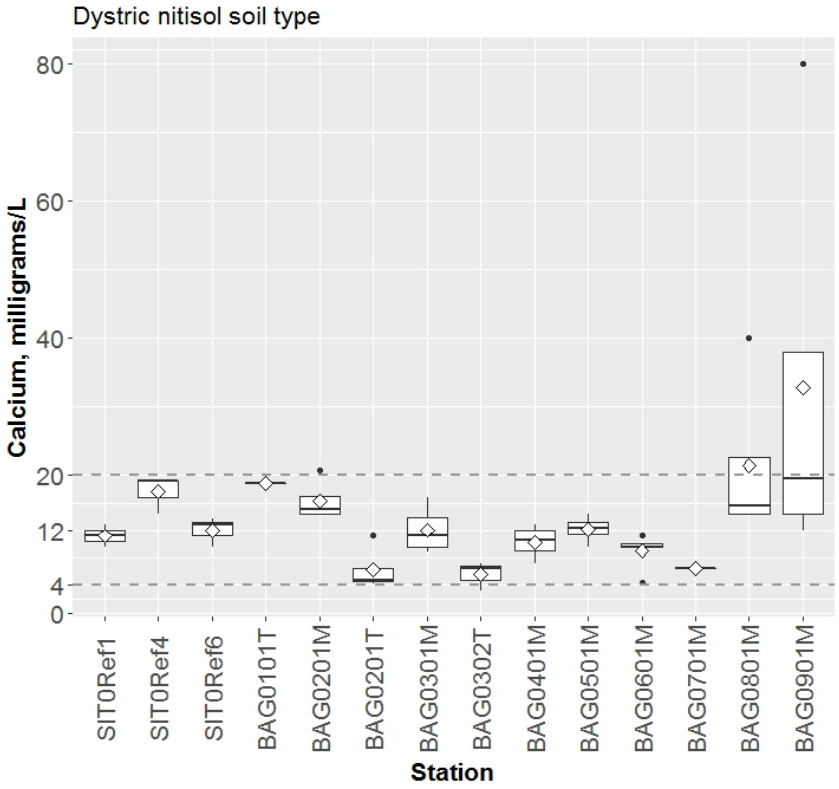
<u>Parameters we will try to include in the future</u> - bacteria (E-coli), chemical and biological oxygen demand

Data collection

- kick-sampling, water chemistry and hydro-morphology

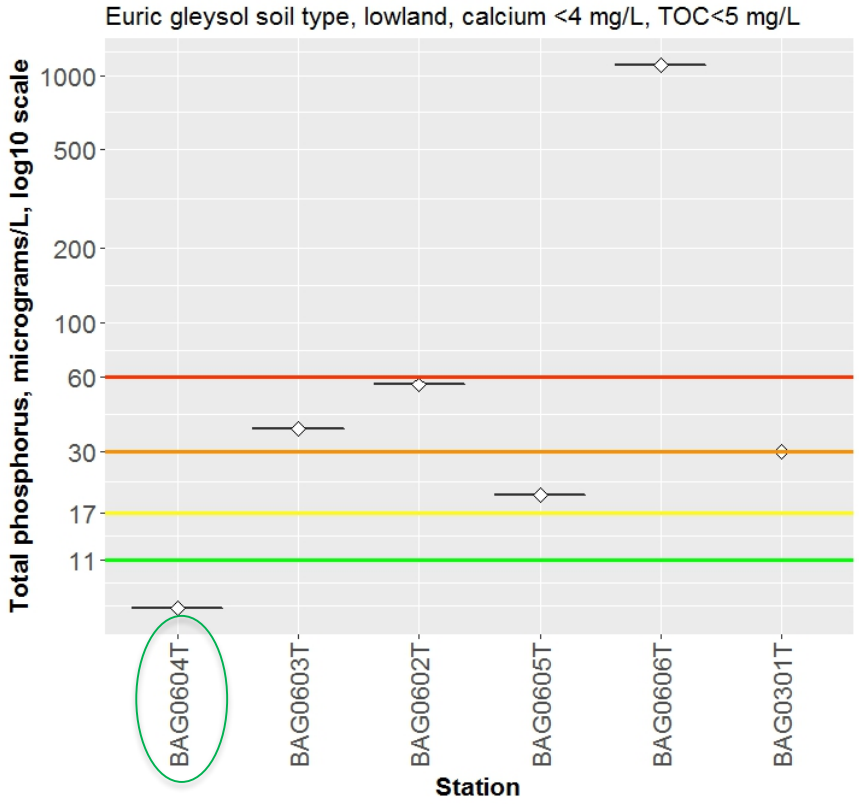
Soil types mirror water chemistry
- supports the water body division

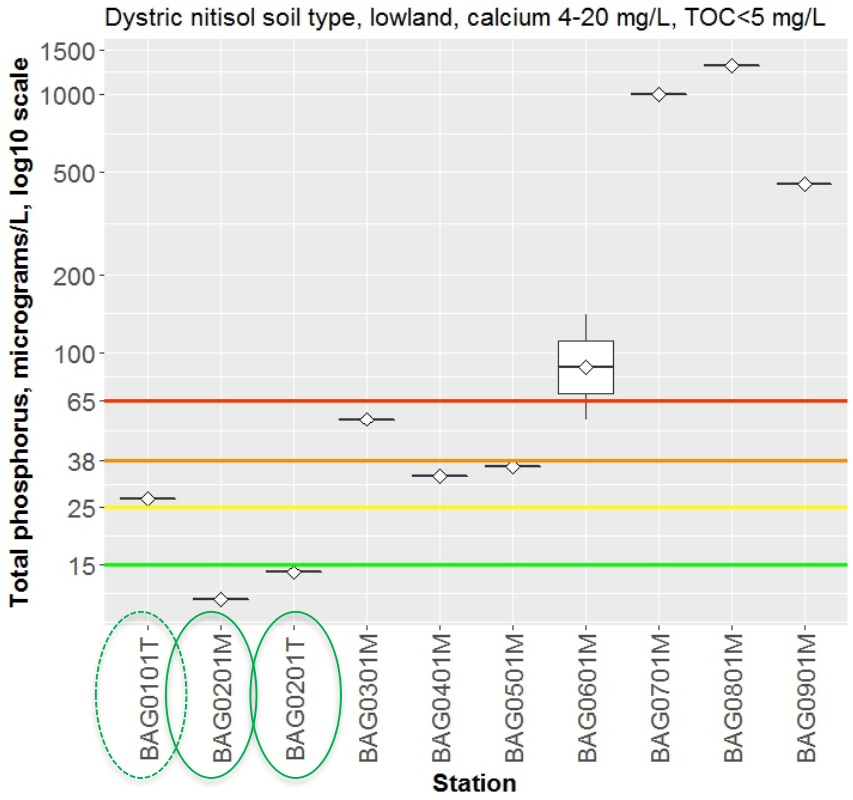




Preliminary results for nutrients

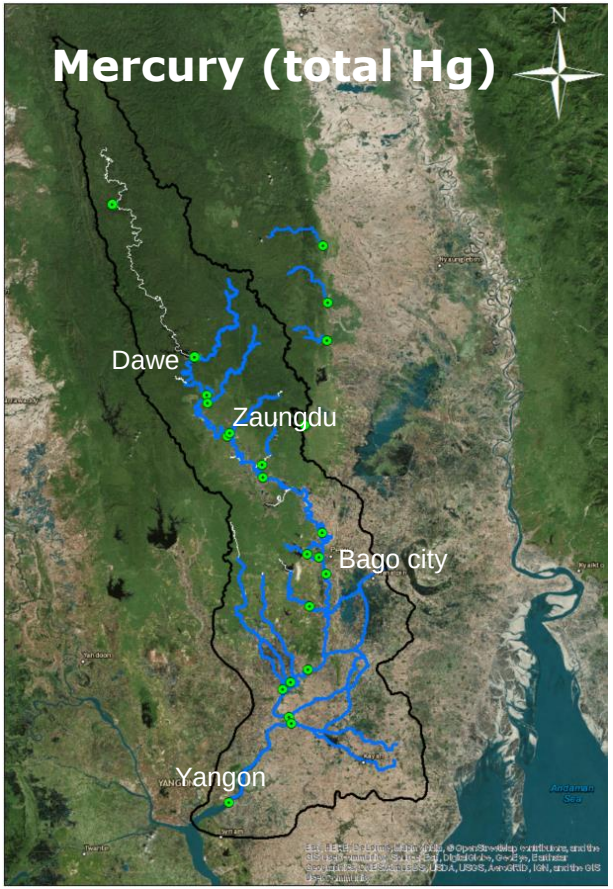
- We try to cover a gradient of P-pollution. Norwegian class boundaries for total P are shown.



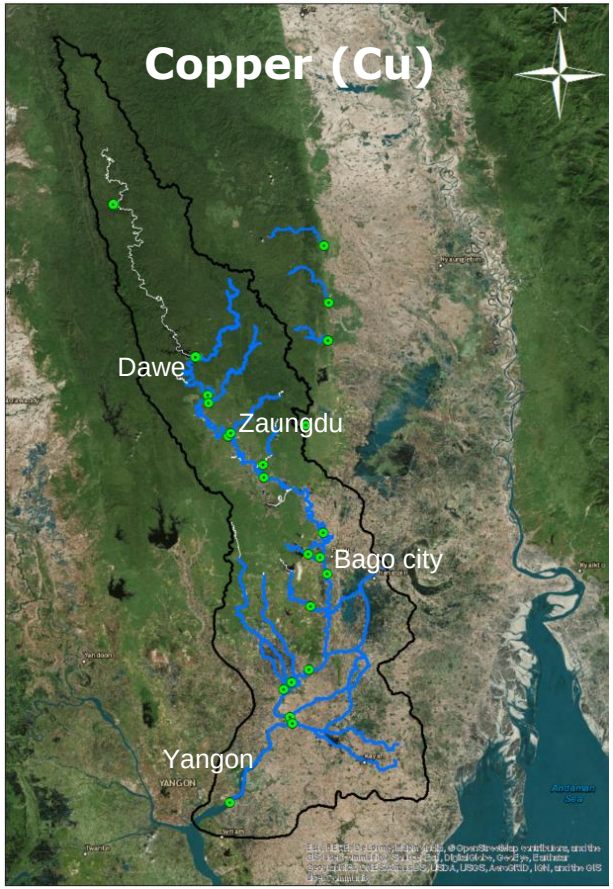


Preliminary results – no signs of heavy metal pollution

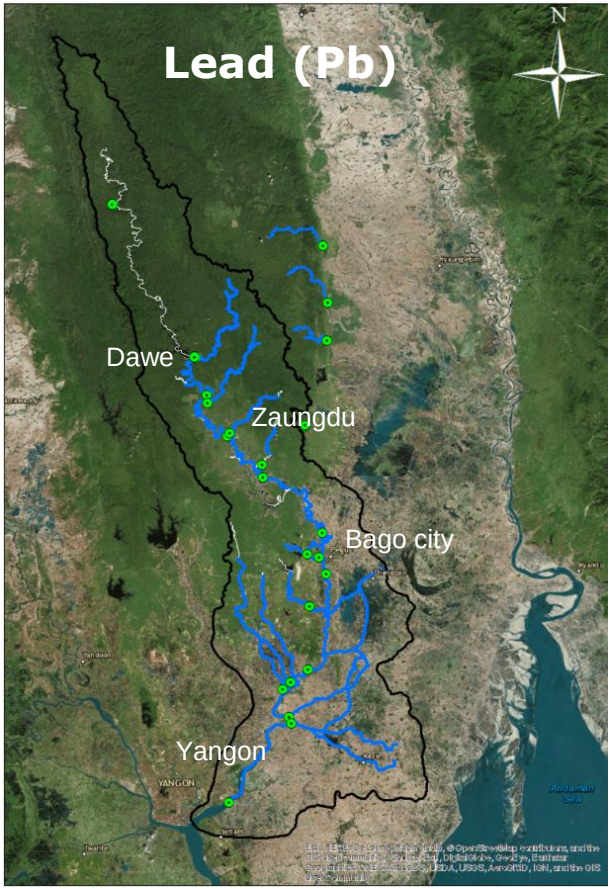
Status	Code	
High		"Reference condition"
Good		Acceptable ecological condition
Moderate		Action needed for achieving acceptable ecological status
Poor		
Bad		



No signs of mercury pollution. Background levels < 0.001 µg/L (filtrated samples).



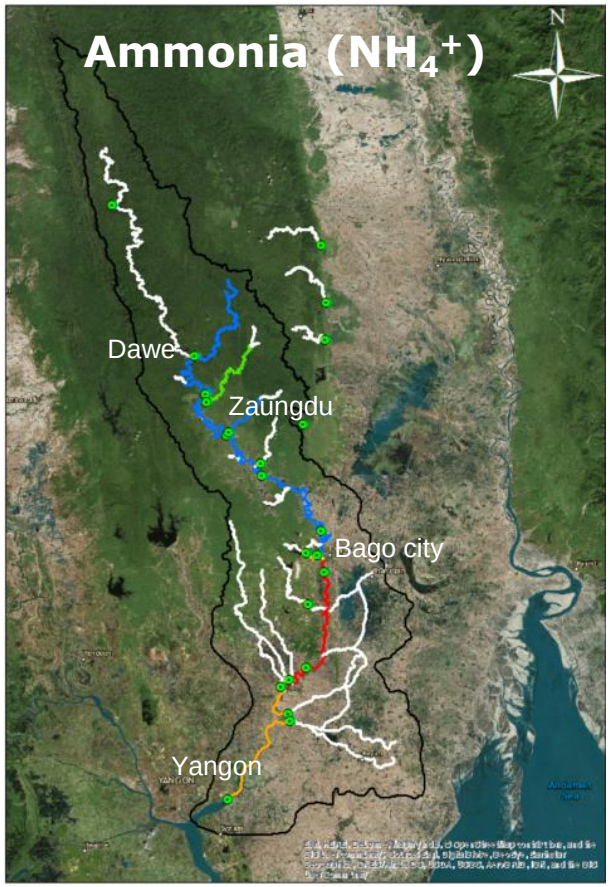
No signs of copper pollution. Background levels < 0.10 µg/L (filtrated samples).

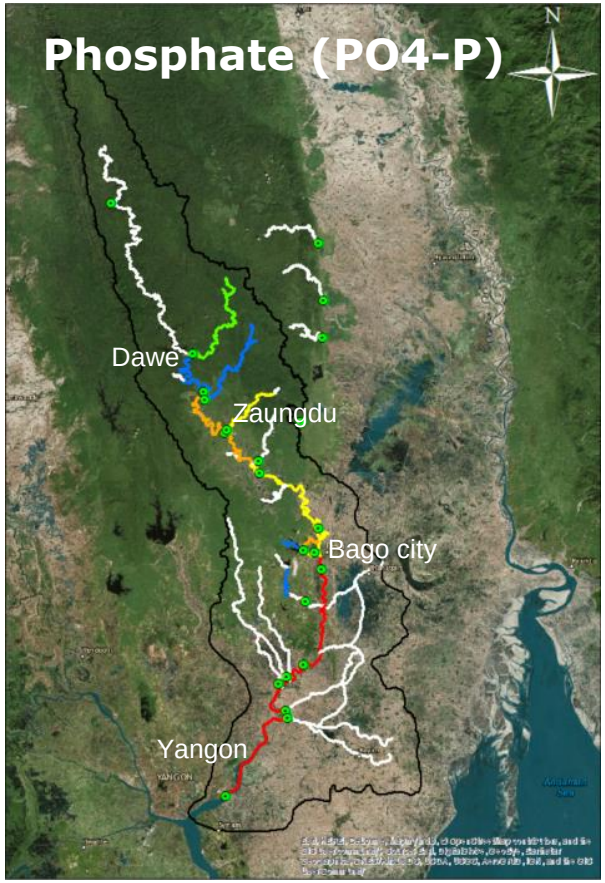


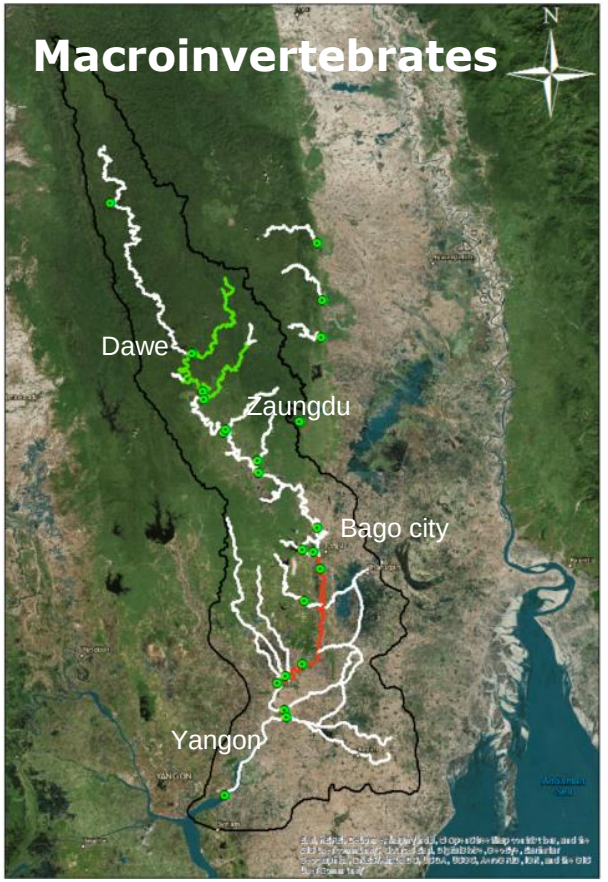
No signs of lead pollution. Background levels are around 0.05 µg/L (filtrated samples).

Preliminary results – signs of nutrients/organic pollution.

Status	Code	
High		"Reference condition"
Good		Acceptable ecological condition
Moderate		Action needed for achieving acceptable ecological status
Poor		
Bad		





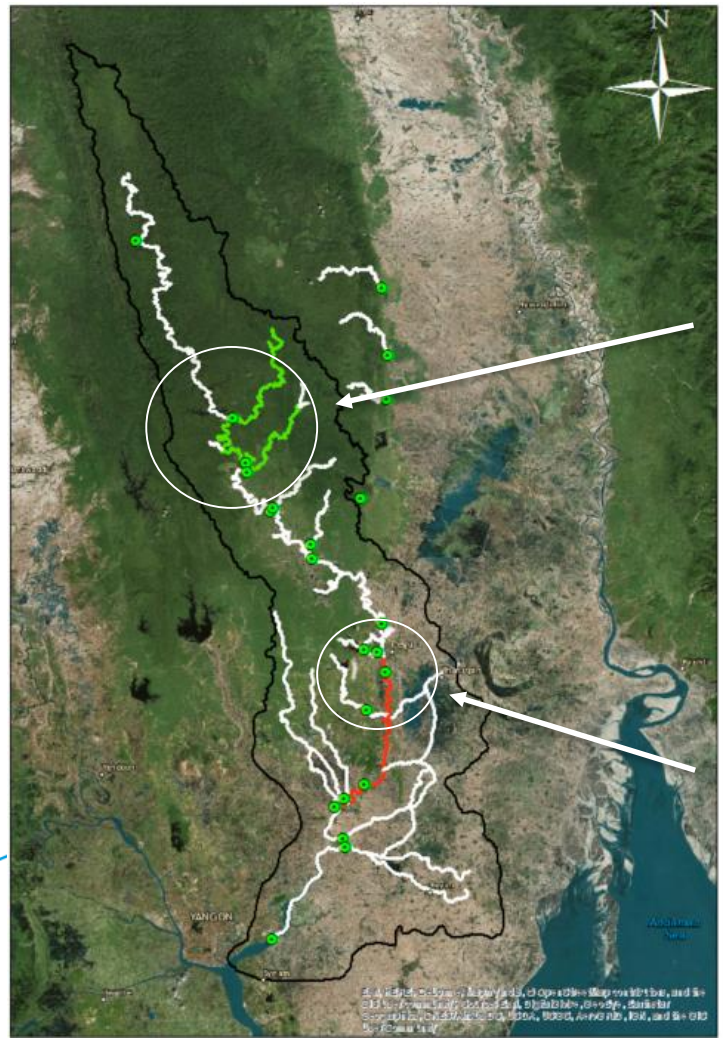


Ammonia (NH_4^+) is a gas that is produced by bacteria and animals when they decompose organic matter.

Phosphate (PO4-P) may enter the river from sewage (toilets), agricultural fields (fertiliser) and animals.

Macroinvertebrates show responses to organic pollution in Bago River

What does a clean site look like in Bago?

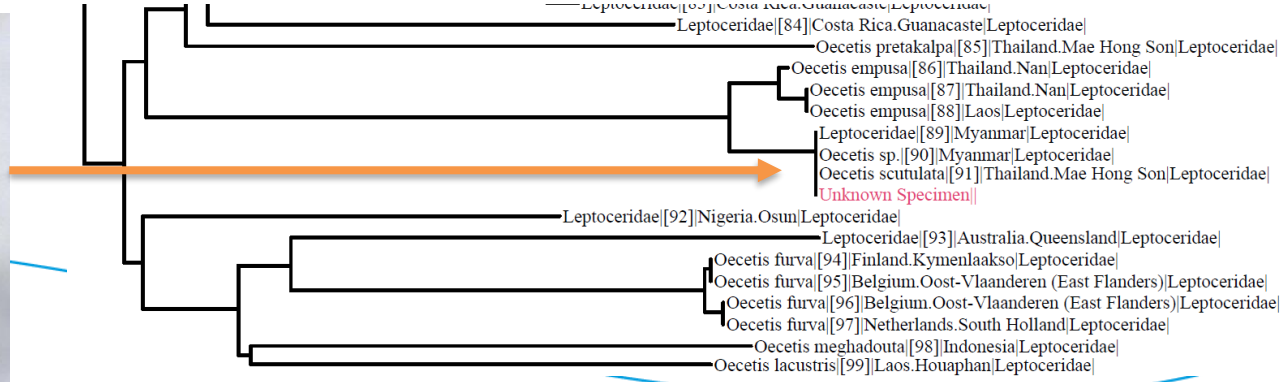


Low P sites are diverse

High P sites have fewer and tolerant taxa

Barcoding – supplement to morfological ID

The lack of availiable morphological identification litterature for juvenile stages makes species determination difficult. However, genetical methods may aid in the process. Our identification *Oecetis* sp. matched genetically with *Oecetis scutulata* from Thailand (adult male, identification by Hans Malicky).

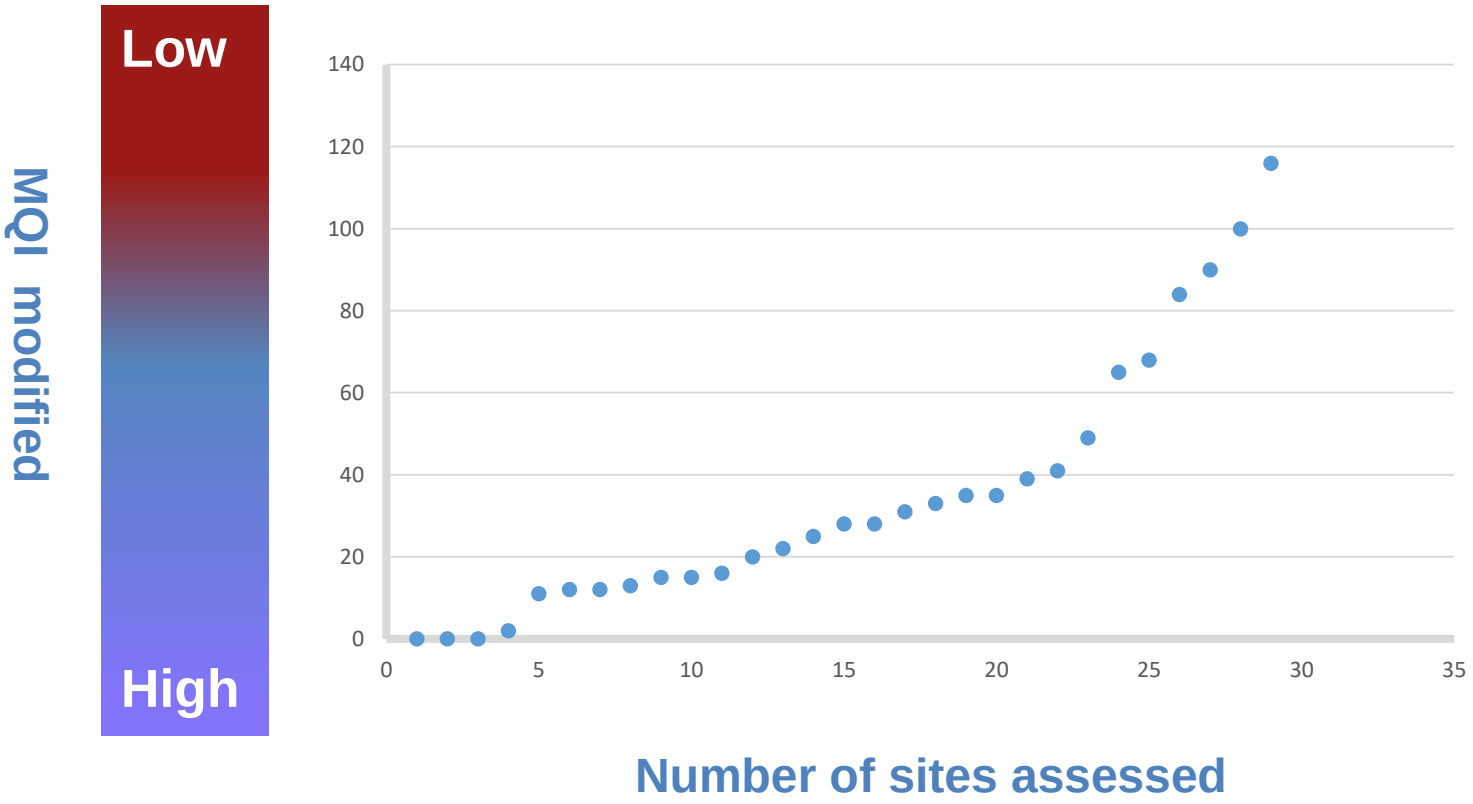


- High and Good status (no or low organic pollution)

- Moderate status (moderate organic pollution)

- Poor and bad status (high organic pollution)

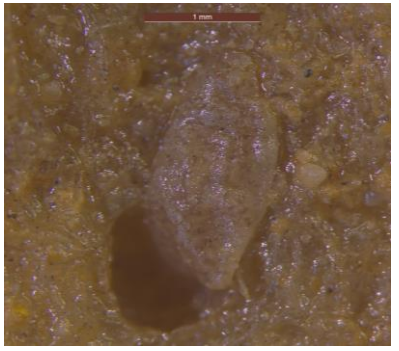
Hydromorphological quality



Leaf packs breakdown experiment
- integrates biochemical activity over time

Leaf pack colonizers

- we see higher breakdown rates in smelly places



Conclusions

1. We see clear signs of nutrient enrichment (mainly phosphorous)- possibly coming from agriculture (fertiliser), animals and humans (sewage inputs). This is especially so from Bago City and downstream. This finding is supported by both chemical and biological data (macroinvertebrates).
2. We find a strong gradient in hydromorphology and impacts of dams. Will interact with the water chemistry and add multiple stress to systems
3. So far, our monitoring data does not support metal pollution in the Bago River basin.
4. We will continue the monitoring activities to increase our knowledge about the ecological status in the Bago River basin. However, already at this point we can start to think about abatement measures.

Thank you!