

From Wetland Methane Signals to Biofertilisers Prototype

Tianxiang Dong¹, Imogen Cunningham², Fernanda Adame³, Stuart Phinn², William Woodgate², Yosephine Gumulya^{1,4}

¹School of Agriculture and Food Sustainability, The University of Queensland, ²School of Environment, The University of Queensland, ³Australian Rivers Institute, Griffith University, ⁴Australian Institute for Bioengineering and Nanotechnology

Significance

Climate-smart biofertilisers offer a promising strategy to reduce agricultural greenhouse gas emissions while improving nutrient use efficiency and plant productivity. Methanotrophs are promising candidates because they consume methane and can contribute to nutrient cycling, but many existing strains require relatively high methane concentrations, limiting their performance in agricultural soils. **This project aims to integrate Earth-observation data, environmental mapping, metagenomics and field validation to identify low-emission wetlands enriched in methanotrophs adapted to low-methane conditions.** By linking methanotroph biogeography and methane-oxidation genes with environmental signatures, the project establishes a targeted discovery pipeline for climate-smart biofertilisers. The resulting microbes could support next generation biofertilisers that reduce methane emissions and reliance on synthetic fertilisers while improving agricultural sustainability.

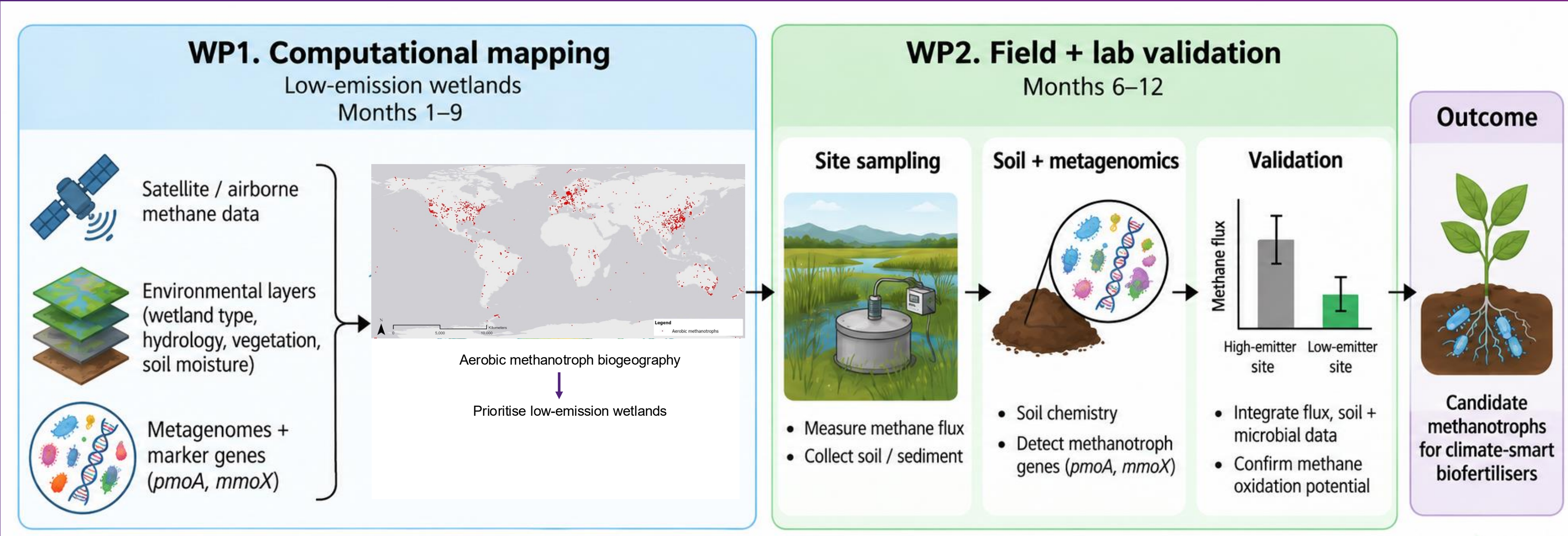
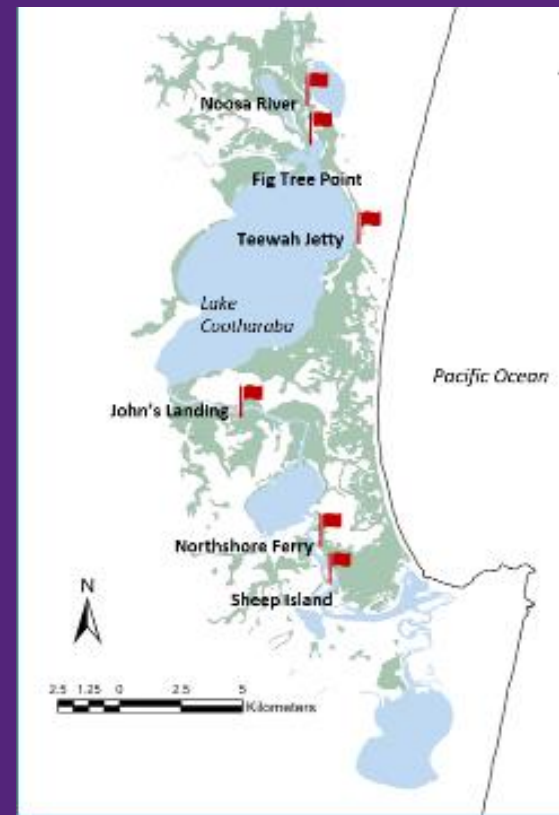
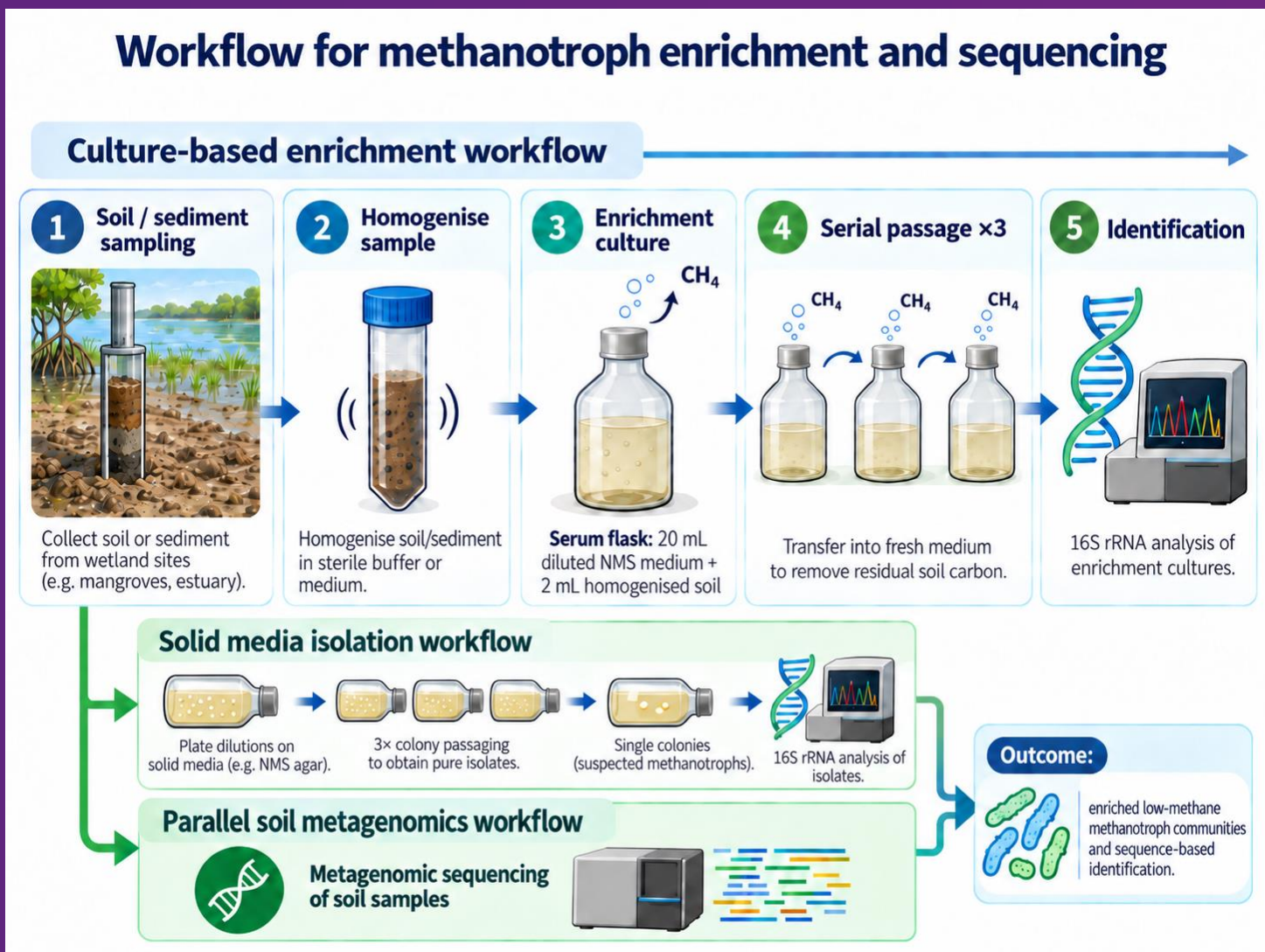
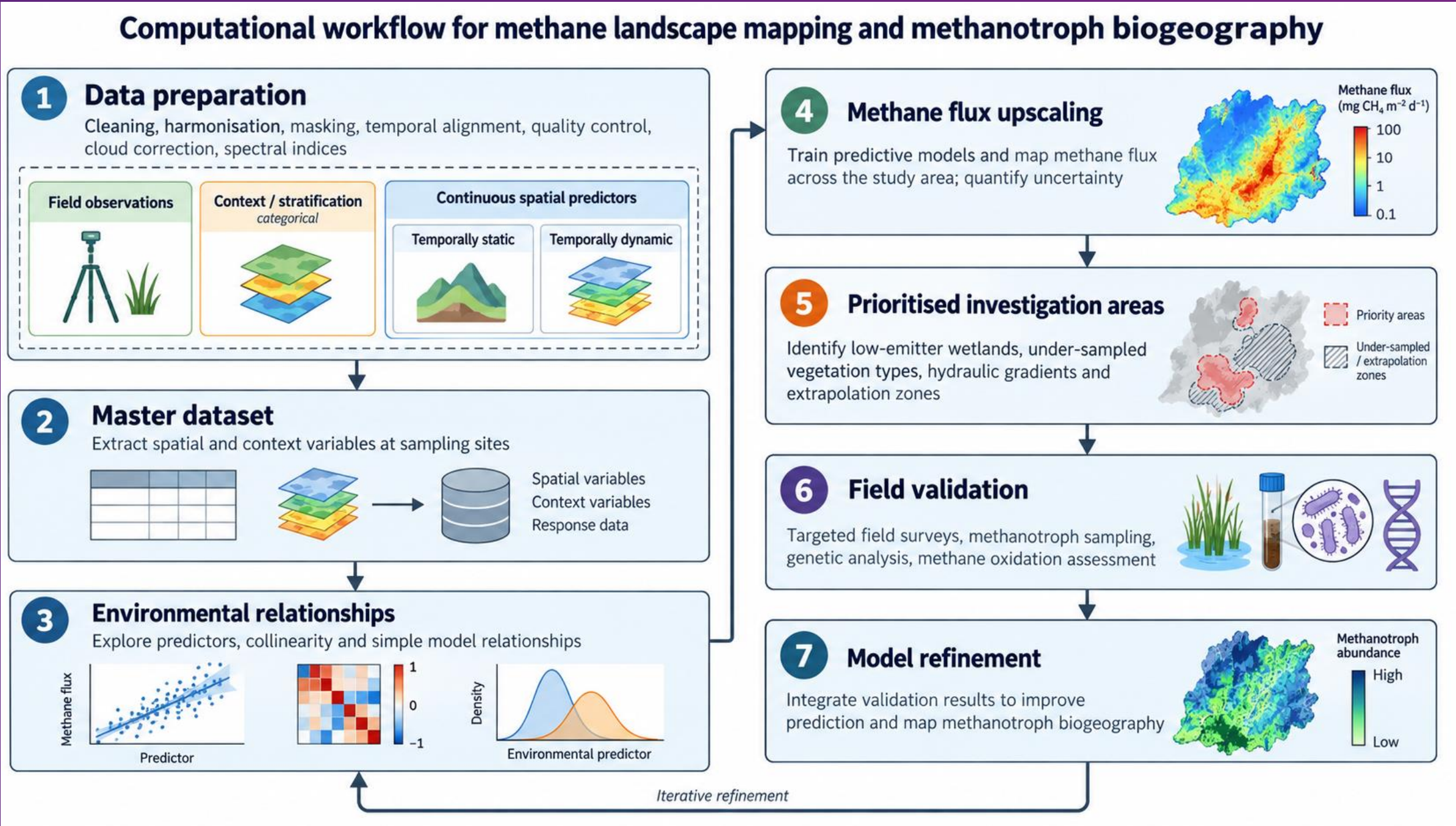
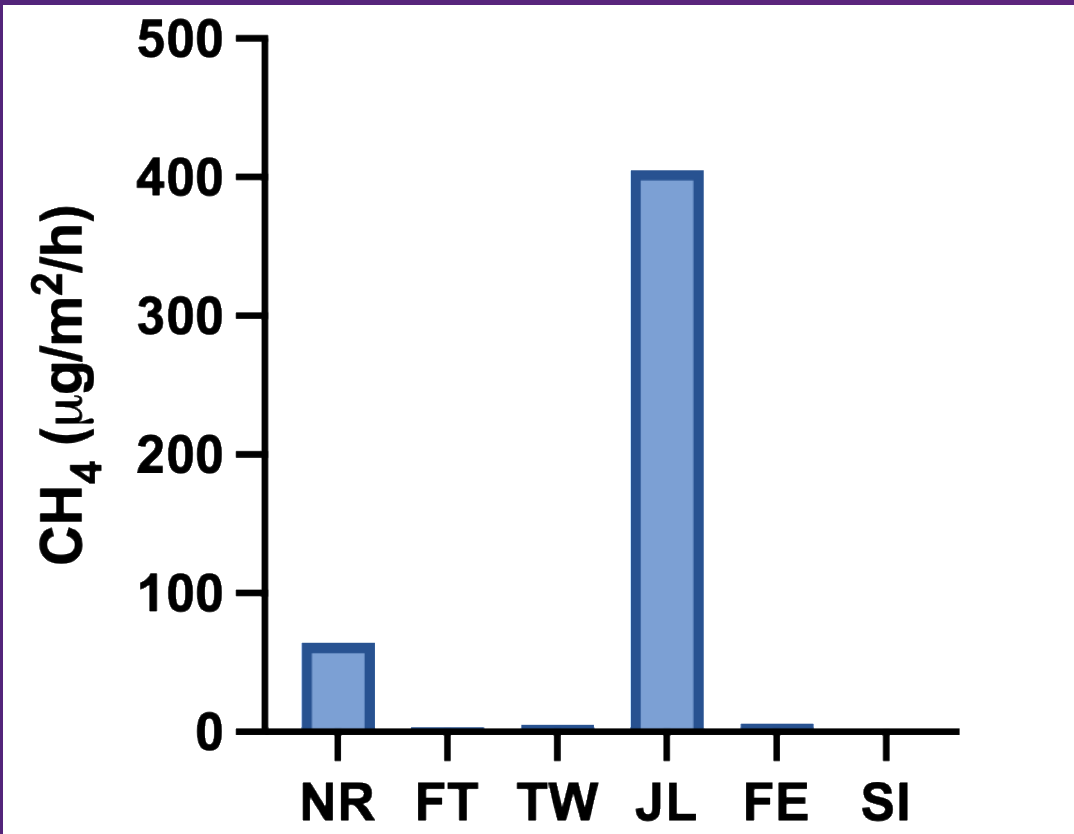
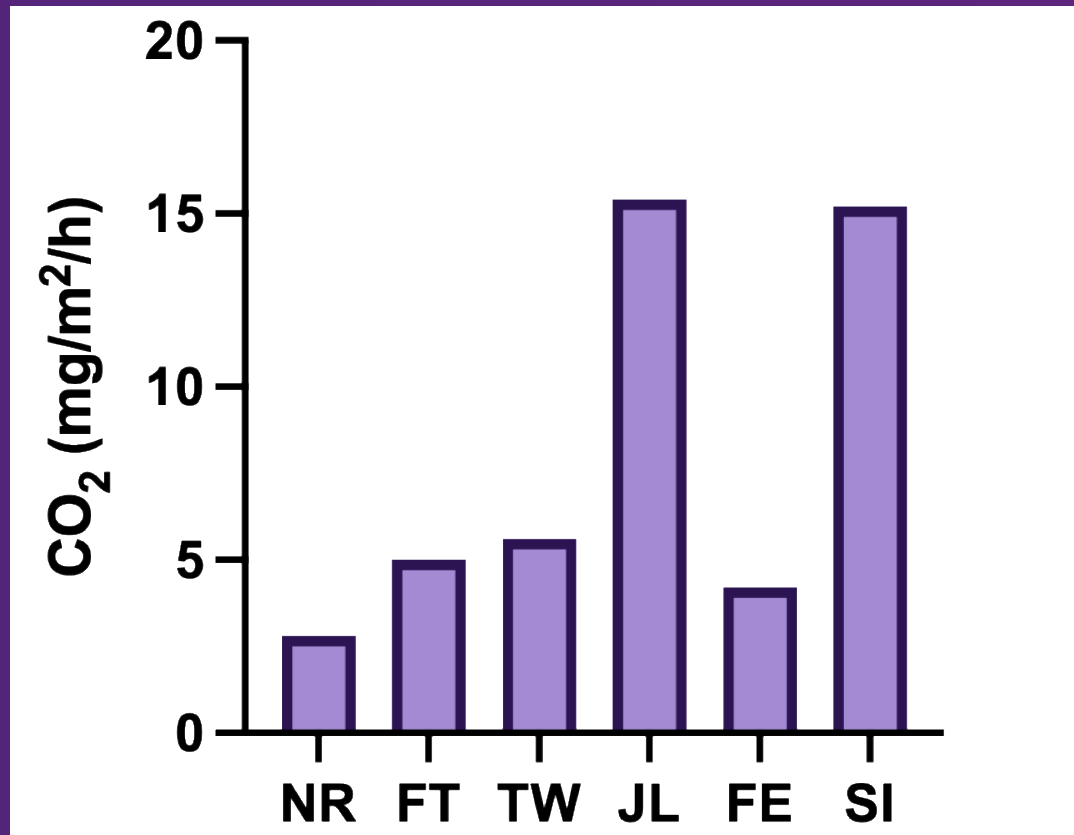


Figure 1. Workflow for discovery and validation of climate smart methanotroph biofertilisers

Results and Discussion



Sampling sites along the Noosa River



Summary

- Preliminary analysis suggest that environmental layers can be linked to methanotrophs biogeography
- Methanotrophs enrichment cultures are currently underway

Future outlook

- Candidate low emission wetland sites could be prioritized for further validation

Wetlands in the Noosa River emit relatively low methane, suggesting they may be promising sites for discovering methanotrophs adapted to oxidise methane at low concentrations.