Identifying trade-offs of changing land use for aquatic environmental and socio-economic health and facilitating sustainable solutions



About the project:

Malaysia's aquatic environments are integral to its key industrial sectors of fishing and tourism and thus to its whole economy and welfare. Ongoing socio-economic pressures to convert forest to commercial crops or use them for logging are resulting in increased soil inputs to rivers, degrading 'downstream' aquatic ecosystems with detrimental consequences for the dependant industries and ecosystem services. Malaysia is particularly at risk from climate change due to flooding and sea level rise, and yet the clearance of its peat swamp forests contributes significantly to its CO_2 emissions. Our project seeks to quantify the environmental impacts of shifting land use patterns in Sarawak, Borneo on aquatic ecosystem health, in relation to the magnitude of perturbation of dissolved and particulate matter inputs. We will constrain the amount of peatland-derived organic carbon released into rivers, and determine how much of this is mineralised to CO_2 or exported to the oceans. The project will employ

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the ‘two ways of knowing’ philosophy by combining scientific data with the valuable observations of indigenous communities about the ways their aquatic environments have been impacted by changing land use. These knowledge streams will be brought together in a vulnerability assessment to determine the socioeconomic trade-offs. The impact of our findings will be realised through a stakeholder engagement programme, with a view to enabling sustainable commercial activity to continue whilst finding solutions to safeguard the environment.

The NOC will bring to the project key expertise in carbon cycling, along with world-renowned skills in the communication of science, and outreach and engagement. Cutting-edge analytical platforms will be used to fingerprint the organic matter profiles of river systems over continuums of fresh to marine waters, as well as at point source inputs.

The percentage transfer of terrigenous matter reaching the marine environment for each river will be estimated using statistical analysis of the variability in the matter makeup and a mathematical model. We will also employ state-of-art experimental systems to determine the rate of processes relevant to organic matter cycling. Specifically we will examine levels of respiration, photolysis and primary production which are intimately linked to parameters such as oxygen concentrations, nutrient load and clarity of the water and thus the ‘health’ of aquatic habitats. This will facilitate the comparison of organic matter fluxes and processing in rivers with pristine, partly degraded and mostly degraded catchments. The NOC will also facilitate the translation of scientific knowledge into socioeconomically relevant data by participating in the design of the focus-group lead engagement with indigenous communities. Finally the NOC will coordinate and run the stakeholder engagement programme geared towards public and private sector institution and relevant trade bodies.

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