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Understanding human-driven ecosystem change in a tropical Southeast Asian wetland: a multi-proxy lacustrine record from Tasik Chini, Malaysia

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Tropical areas are becoming increasingly vulnerable to rapid environmental change as a combined result of climate change and human impact on the landscape, which significantly threatens the quality and biodiversity of freshwater ecosystems. Tasik Chini, a flood pulse wetland ecosystem located on the Malaysian Peninsula, is a critically endangered site that consists of twelve interconnected lake basins. The natural vegetation of the lake's catchment and surrounding area has become increasingly influenced by rubber and oil palm plantations, mining, fruit farms, logging, and tourism in recent years, which has resulted in pollution, soil erosion, and external nutrient loading to the lake. In addition, the main outflow river was dammed in 1995 to help stabilise the lake's water level. These activities have collectively changed the hydrological balance of the lake, influenced biodiversity through species and habitat loss, and affected the sustainability of the ecosystem due to eutrophication. To understand the influence of anthropogenic catchment change on the lake and to investigate the key drivers of ecosystem change, gravity cores were recovered in 2015 from three sub-basins of Tasik Chini. The first core is from a site adjacent to a tourist resort, the second core is from a basin situated close to mining activity and rubber plantations, and the final core was retrieved from a site furthest from major catchment disturbance. An established chronology based on 210Pb dating shows that each gravity core dates back to the late 19th century and covers the transition to enhanced human impact within the catchment. Organic geochemistry (%C, C/N, δ13C, Rock-Eval pyrolysis), diatom assemblage, and sedimentary pigments have all been analysed on each of the three cores to reconstruct past environmental conditions within the basin. Data show how past variability compares to recent anthropogenic-induced environmental change and define how different catchment disturbances have contributed to ecological change at this internationally important wetland site. This information is vital to assess ongoing human impacts at the site as a means to provide future science-based management and conservation strategies and thereby counter the main drivers of ecosystem degradation.