



Land use transformation and the estimation of sediment budgets in small tropical catchments, Singapore

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A field-based monitoring programme has been conducted in forested and urbanized catchments in Singapore to elucidate the nature of sediment budgets and to define sediment and carbon flux. There have been relatively few studies of sediment budgets in tropical environments and these have mostly focused on disturbed systems. Here results from investigations of a headwater catchment in a remnant primary forest and in a freshwater swamp forest environment provide a context for examining the impact of land use change. Two centuries ago, the island Singapore was dominated by lowland Diterocarp forest, extensive estuarine mangroves and lowland freshwater swamp forest. Within 30 years of European arrival, less than 10% of the forest cover remained, although subsequently many areas which were cleared for plantations were reafforested to protect water supply reservoirs. Large scale engineering works in the urban drainage system have largely obliterated fluvial sedimentary archives, posing challenges for the reconstruction of longer term sediment budgets. Current concerns about the vulnerability of biodiversity to hydrological and water quality related impacts, coupled with the demands of water resource management and a turn towards river restoration, dictate the need for better understanding of sediment and nutrient fluxes. Very low sediment yields of less than 10 t km⁻² yr⁻¹ in the primary forest, comparable with other regional studies from undisturbed forest, can in part explain the poorly defined channel morphology of forest streams. However, both forest and urban streams exhibit flashy responses to rainfall events and a large proportion of the annual sediment load can be transported in a single event. Preliminary estimates of sediment and carbon fluxes for Singapore streams will be presented and approaches to the difficult task of reconstructing the impact of past land use change on sediment budgets discussed.