



The use of multi-proxy sediment fingerprinting to explore changes in sedimentation rate and sediment sources with rotational selective logging and oil palm conversion in the Segama Catchment, Malaysian Borneo

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Enhanced suspended sediment transport, sedimentation, channel change and flooding are downstream consequences in large tropical catchments affected by upstream logging and land use change and recent increases in rainstorm magnitude-frequency. Sediment fingerprinting is based on comparisons of sediment properties of downstream transported material with hypothesised upstream sources. This paper uses a multi-proxy sediment fingerprinting approach to reconstruct changes over the past 50 years in sedimentation rate and the relative contributions of different sub-catchments to the downstream sediment budget of the large Segama catchment in eastern Sabah. The catchment has been subject since the 1970s to rotational selective logging and conversion of part of the lower catchment to oil palm plantations. Downstream evidence is derived from a sediment core on a high lateral bench protected by a bankside tree on the Lower Segama below the confluence with the Urik tributary. A lateral bench site was preferred to a floodplain site because it receives sediment from a wider range of high flows. A 1.6 m sediment core cores and sediment samples taken at 2.5 cm intervals from a pit dug when the core was excavated were taken for radionuclide and geochemical analysis respectively. Bed-sediment samples were taken from channel-margin sites at low flow for the major upstream tributary catchments (the hypothesized sediment sources) of the Segama. A second lateral bench core, 0.6 m depth and 10 cm in diameter, had been taken for the Upper Segama at Danum in an earlier phase of the project and results reported elsewhere. All sediment samples, both from the Lower Segama pit and the upstream sub-catchments, were dried and sieved to obtain the fine ($<63\mu\text{m}$), inferred suspended sediment fraction and analysed using a portable Niton XRF elemental analyser to obtain the elemental composition. Distinct down-profile changes in individual elements are evident and some of these are relatable to distinctive geochemical signatures of upstream tributaries, allowing changes in their relative contributions to the downstream sediment budget through time to be inferred. Comparisons are made with the results of the Upper Segama core which was affected by selective logging alone and tentative estimates are made concerning the relative importance of erosion from oil palm, logged forest and primary forest.