

Research Needs and Applications to Reduce Erosion and Sedimentation in Tropical Steeplands (Proceedings of the Fiji Symposium, June 1990): IAHS-AISH Publ. No.192, 1990.

Sediment sources and their evaluation in the Upper Konto watershed, East Java, Indonesia

A. RIJSDIJK, L.A. BRUIJNZEEL, C.N. BREMMER,
E.G. KAATEE & C. KUKUH S.
Eco-hydrology Section, Konto River Project,
DHV Consulting Engineers, P.O. Box 85,
3800 AB Amersfoort, the Netherlands.

The Konto River drains 233 km² of upland plateau surrounded by steep volcanic mountains and feeds an artificial lake established in 1973. Although 67% of the basin is covered by forest or dense scrub, the quality of the forest is declining rapidly as a result of high population pressure and concern has been voiced about the consequences of adverse land-use practices for the river's regime and the useful life of the lake. Within the framework of the Konto River Project, a combined effort of the Indonesian Ministry of Forestry and the Government of the Netherlands through DHV Consulting Engineers, an attempt was made to quantify contributions of sediment from various sources. A streamflow, suspended sediment, and bedload measuring programme was run between December 1987 and April 1990 involving intensive observations at (eventually) 11 stations, supplemented by measurements of surface erosion (Wischmeier plots) in forest and scrubland, coffee plantations, and dry-land fields. Sediment production associated with roads, villages, and gullies was determined using micro-catchments, whilst a general survey was made of mass wasting intensity. Finally, limited observations were made of bank retreat rates. Total sediment yields for intermediate-sized forested catchments (530-1200 ha) varied strongly with age of volcanic substrate, with bedloads making up less than 5% of total sediment load in the case of solidified deposits and over 30% in the case of soft lahar deposits prone to riparian slumping. Mean rates of surface erosion over two consecutive rainy seasons (November through March) were 0.03-0.11 t ha⁻¹ per season for forest and scrubland, 0.15-0.5 t ha⁻¹ for coffee plantations and 2-54 t ha⁻¹ for maize fields, depending on the intensity of weeding. Newly cleared and poorly terraced fields on steep slopes planted with cabbage and eucalypt seedlings eroded at only 0.12 t ha⁻¹ per season, but the associated trails produced some 68 t ha⁻¹. Similarly, built-up areas (villages) produced 150-420 t ha⁻¹ per season, depending on the fraction occupied by home gardens, whilst cobble stone roads typically yielded about 2 kg m⁻² per season. Gully erosion assumed local importance in areas with an impermeable B-horizon which facilitated sliding of the walls. Mass wasting contributed little away from roadsides and gully walls but occurred occasionally on irrigated rice fields. Further work on sediment delivery ratios is in progress. The results suggest that more attention may need to be paid to (1) the proper discharge of runoff and sediment from built-up areas and roads, (2) to the introduction of minimum tillage practices on already terraced agricultural fields, and (3) to the protection of riparian zones in areas underlain by soft lahar deposits.