

River channel response to short-term human-induced change in landscape connectivity in Andean ecosystems

Veerle Vanacker Institute for Mineralogy, Universitaet Hannover, Callinstrasse 3, D-30167 Hannover, Germany¹

Armando Molina Physical and Regional Geography Research Group, Katholieke Universiteit Leuven, Redingenstraat 16, 3000 Leuven, Belgium

Gerard Govers Physical and Regional Geography Research Group, Katholieke Universiteit Leuven, Redingenstraat 16, 3000 Leuven, Belgium

Jean Poesen Physical and Regional Geography Research Group, Katholieke Universiteit Leuven, Redingenstraat 16, 3000 Leuven, Belgium

Gerd Dercon International Institute of Tropical Agriculture, Oyo Road, Ibadan, Nigeria

Seppie Deckers Laboratory for Soil and Water Management, Katholieke Universiteit Leuven, Vital Decosterstraat 102, 3000 Leuven, Belgium

The drainage basin of the Deleg River (88 km²), located in the southern Ecuadorian Andes, was studied to assess the geomorphic and hydrologic response of a fluvial system to human-induced environmental change in its contributing area. Historical data on land use, channel morphology and sedimentology were collected, based on a spatial analysis of aerial photographs (1963–1995) and a field survey (2002). Analysis of channel cross-sectional profiles and sedimentological data revealed a major change in morphology and sedimentology of the Deleg River during the past four decades: (i) the active river channel narrowed by over 45%, (ii) the riverbed incised on average by over 1.0 m and (iii) the median grain size of the bed surface decreased from 13.2 cm to 4.7 cm. The spatial pattern of land cover within the Deleg catchment also changed considerably: highly degraded agricultural land in the low-lying areas was abandoned and partially afforested for timber and wood production, whereas secondary upland forest was increasingly cleared for expansion of cropland and pastures.

Notwithstanding large changes in the spatial organization of land use within the catchment, the overall land use did not change significantly during the past four decades. This suggests that the response of the Deleg River to land-use change not only depends on the overall land-use change, but also on the spatial pattern of land-use/cover change within the catchment. Although forestation and regeneration of bare gully slopes and floors throughout the catchment only represented a minor part of the total land-use change, these land-use/cover changes had a major impact on the hydrological and sediment connectivity in the landscape.

Geomorphology 72 (2005) 340– 353

Elsevier 2005 www.elsevier.com/locate/geomorph

¹ E-mail address: v.vanacker@mineralogie.uni-hannover.de (V. Vanacker).