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Sediment fluxes in transboundary Selenga river basin

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Gathering reliable information on transboundary river systems remains a crucial task for international water management and environmental pollution control. Countries located in the lower parts of the river basins depend on water use and management strategies in adjacent upstream countries. One important issue in this context is sediment transport and associated contaminant fluxes across the state borders.
The mass flows of dissolved ions, biogens, heavy metal concentrations, as far as suspended sediment concentration (SSC, mg/l) along upper Selenga river and its tributaries based on the literature review and results of field campaigns 2011-2012 were estimated. Based on the water discharges measurements Q, suspended load WR (t/day) and dissolved loads WL were calculated. In the Selenga basin the minimal WR (1,34−3,74 t/day) were found at small rivers. Maximal sediment loads (WR = 15 000 t/day) were found at the upper Orkhon river during flood event. The downstream point (Mongolia-Russia border) was characterized 2 220 t/day in 2011. Generally the prevalence of the accumulation is found through calculating sediment budget for all rivers (ΔW = WR (downstream) – WR (upstream) < 0). Downstream of Orkhon river (below confluence with Tuul) ΔW = – 1145 t/day. Below Selenga-Orkhon confluence sediment yield reached 2515 t/day, which is corresponded to transboundary sediment flux. Silt sediments (0,001 – 0,05 mm) form the main portion of the transported material. The maximal value of sand flux (302 t/day) was reported for middle stream station of Selenga river (upstream from confluence with Orkhon). The increase of human activities (mining and pastures) increases the portion of clay particles in total sediment load (e.g. at the downstream point of most polluted Orkhon river it reached 207,8 t/day).
The existed estimates are compared with distribution of the main matter sources within basin: mining and industry, river-bank erosion and slope wash. The heaviest increase of suspended and dissolved matter transport is indicated along Tuul-Orkhon river system (right tributary of the Selenga river where Mongolia capital Ulaanbaator, gold mine Zaamar and few other mines). The results provide evidence on a connection between increased heavy metal concentrations in water-sediment systems of transboundary rivers and pollutant source zones at industrial and mining centers, both as in-channel erosion and land use.