



The role of reservoirs in global sediment budgets

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Man-made reservoirs are an important sink for sediment eroded from the land and thus constitute an important aspect of the sediment budget. Their impact has mostly been assessed at the scale of an individual river basin but rarely on a continental or even a global scale. Although there are recent estimates of global sediment retention by dams,

these studies have solely focussed on the role reservoirs play in controlling sediment fluxes to the oceans, thus on their net impact for global sediment budgets. However, the net impact of reservoirs is much larger than the gross amount of sediment stored within all reservoirs on the globe. Furthermore, the impact of smaller waterholding structures is mostly neglected. In this paper, we present a first comprehensive assessment of global annual sediment storage within reservoirs based on sedimentation rates obtained from over 3700 reservoirs, representing nearly 25% of the global storage capacity. We argue that at least 27 petagrams (Pg) sediment are stored annually in all larger reservoirs, with possible sediment retention of an additional 27 Pg in smaller man-made water bodies. These values are 2 to 4 times larger than the estimated sediment mass transported annually to the global coastal ocean, and 8 to 15 times larger than the net reduction of sediment flux to the oceans attributed to reservoirs. These estimates provide minimum annual continental erosion rates and comparison with soil erosion data suggest that soil erosion on agricultural land is not the dominant source of sediment deposited in reservoirs or exported to the ocean. In recent decades, reservoir sedimentation has become as least as important as floodplain sediment storage and can nowadays be considered as one of the most important sediment sinks in continental sediment budgets.