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The connectivity between soil erosion and sediment entrapment in reservoirs

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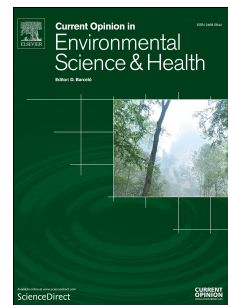
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1 The connectivity between soil erosion and sediment entrapment in reservoirs

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7

8 Abstract

9 Rivers are characterized by their water flow regime and sediment transport. Sediments are crucial for
10 channel morphology, water quality, providing habitat for aquatic organisms and, finally, for
11 sustaining deltas. Rivers are, however, fragmented by dams and will face an additional building boom
12 due to actions to mitigate climate change (with hydropower) and water scarcity. Reservoir siltation is
13 a serious challenge for reservoir management but also entails downstream morphological impacts.
14 However, sediment entrapment is an often neglected element in reservoir planning and
15 environmental assessment. The aim of this study thus is to give an overview on the links between soil
16 erosion and sediment entrapment in reservoirs, its degree on a global scale (reservoirs lose annually
17 1% of their capacity), the driving factors that influence associated processes and the different
18 approaches for reservoir management to reduce siltation and its impacts downstream.

19 Highlights

- 20 • Soil erosion and sediment entrapment in reservoirs are integrated and analysed in relation to
21 driving parameters.
- 22 • The degree of sediment entrapment as annual reservoir capacity loss is illustrated based on
23 worldwide sedimentation data.
- 24 • Sediment transport is a crucial element often neglected in reservoir planning.

25

26 **Keywords:** sediment transport; land-use change; reservoir capacity; dams

27

28 1. Introduction

29 Water availability in time is, and has been, technically fostered by storing water in reservoirs already
30 millennia ago [1]. These reservoirs are mainly created by building a dam that stores the water that is
31 draining from the upstream catchment. According to numbers of the current World Register of
32 Dams, today more than 58,000 large dams (> 15 m high or impounding more than 3 million m³) store
33 in total more than 16,000 km³ of water globally [2]. But not only has water supply fostered dam
34 construction. Global economic growth, an increasing electricity demand, and the need of reducing
35 greenhouse gas emissions to curtail climate change promote an increasing search for renewable,
36 “climate neutral” electricity sources. Currently, 22% of the global electricity production is provided by
37 renewable sources, and 73% of these is covered by hydropower (data for 2014;[3]). In the future
38 decades, we will most likely face an unprecedented boom in dam construction, with about 3,700
39 major hydropower dams already in construction or in planning, especially in countries with emerging
40 economies [4].

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