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A review on share of river bank erosion to the total sediment load with increasing catchment size

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Information on the share of river bank erosion to the total sediment load at catchment scale by using the fingerprinting approach is important to address our knowledge of erosion processes to better target soil erosion control measures. In particular, river bank erosion is affected by many factors such as spatial and temporal variables and is difficult to quantify the relationship of the share of bank erosion to catchment size and upland erosion rate without extensive fieldwork and data analysis. Potential tracers including geochemical, fallout radionuclides, bulk and compound-specific stable isotopes, and magnetic properties have been used, often in combination with sediment source apportionment. In this worldwide review, the global dataset for percent share of river bank and surface erosion using fingerprinting approach was collected to establish the significance of catchment size and other physical controls on river bank erosion. Google Scholar and Web of Science were used to review research articles that included river bank/subsurface as one of the sediment sources in the study areas. This database showed that the UK (n = 84), USA (n = 14) and Brazil (n = 10) had the highest number of catchments, followed by Iran (n = 4), Southern Zambia (n = 1), Australia (n = 1), Spain (n = 1), Mongolia (n = 1) and Burkina Faso (n = 1) ranging in size from 0.31 to 15000 km², predominately agriculture. Based on published studies, there is a clear shift of sediment sources from surface erosion to river bank erosion with increasing catchment size. The results show the wide range of relative contributions of surface and river bank sources to the catchment sediment yield around the globe. There are a number of catchments with river bank contribution exceeding 25% and surface contribution exceeding 90% of total sediment loss. This diversity highlights the many factors that influence river bank erosion. In addition to the wide range, sediment source contribution in the range 1-25% from river bank is generally representative around the World. We recommend that long term monitoring of sediment load and surface and river bank sources at nested sites within a catchment are indispensable. Furthermore, limited information on the share of sources often makes it difficult to target mitigation measures reducing sediment loads at the catchment scale.

Keywords: Sediment load, catchment size, fingerprinting approach, river bank share