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

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Motivation

- Complex interaction between soil erosion and deposition may shift the contribution of upland and channel bank erosion with increasing catchment size.
- Limited information is available on share of sources which makes it difficult to target mitigation measures reducing sediment loads at the catchment scale.
- Information needed for management decisions.

Objectives

- Collect a global dataset for percent share of river bank and surface erosion using fingerprinting approach.
- To investigate the relationship (or shift) between river bank and surface loads with increasing catchment size.

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Methodology

- 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.
- This worldwide database revealed that the UK (n = 84), USA (n = 14) and Brazil (n = 10) had the highest number of catchments ranging in size from 0.31 to 15000 $km^{2,}$ with predominately agriculture landuse.
- In total, database comprised research investigations conducted in 117 catchments.
- Different tracers i.e. ERNs, Elemental geochemistry, mineral magnetism, spectral measurements and CSSIs have been used for sediment fingerprinting approach.
- 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.

Global fingerprinting studies

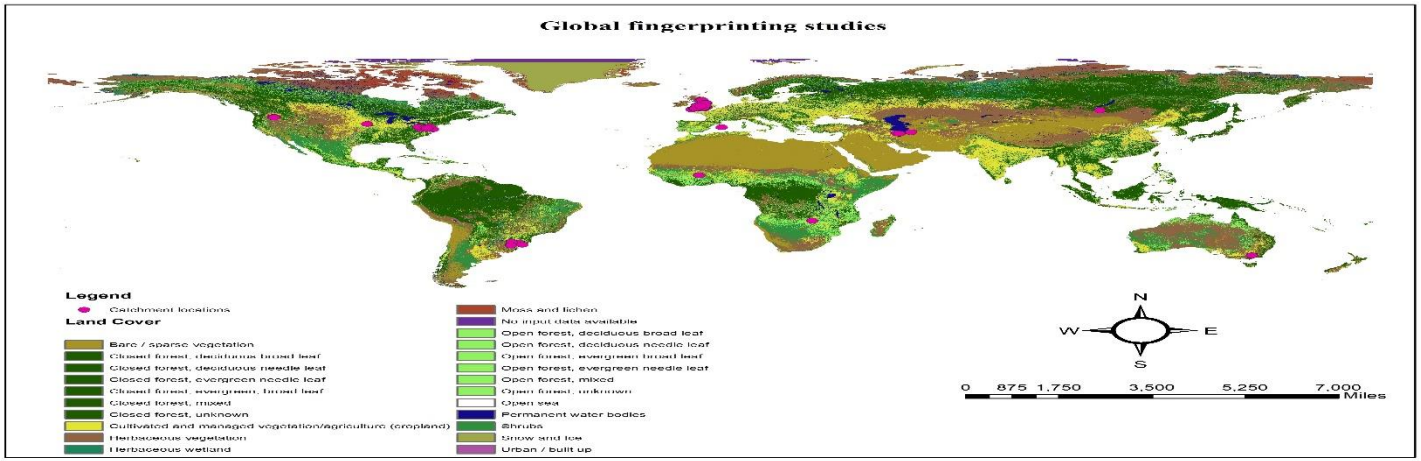

Figure 1: Global fingerprinting studies with spatial distribution of the sites included in the database.

Sr. No.	Country	No. of catchments
1	UK	84
2	USA	14
3	Brazil	10
4	Iran	4
5	Australia	1
6	Mongolia	1
7	Spain	1
8	Burkina Faso	1
9	Southern Zambia	1
Total	9	117

Table 1: Database summary for fingerprinting investigated catchments

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Results-Sources load with catchment size worldwide

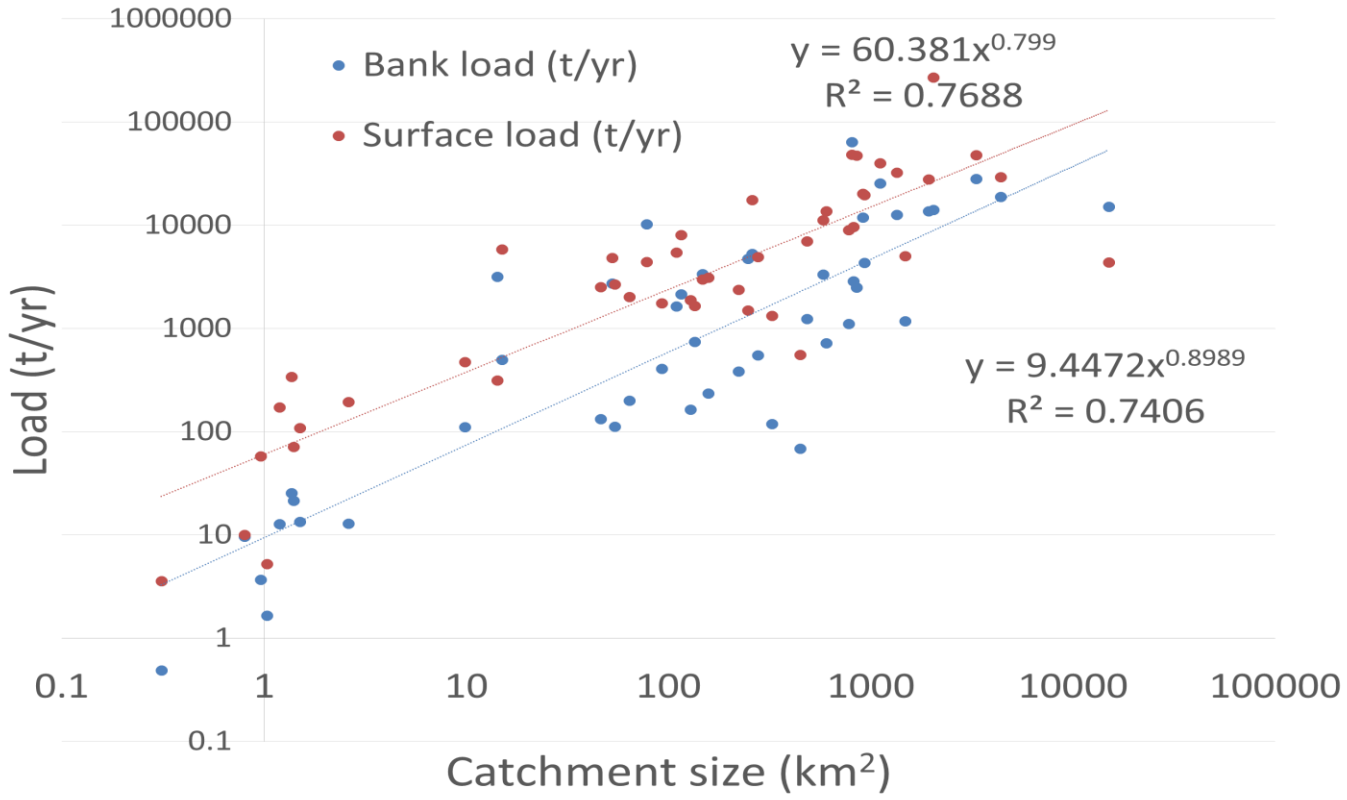

Figure 2. Bank and surface load with catchment size worldwide.

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Results-Sources frequency distribution worldwide

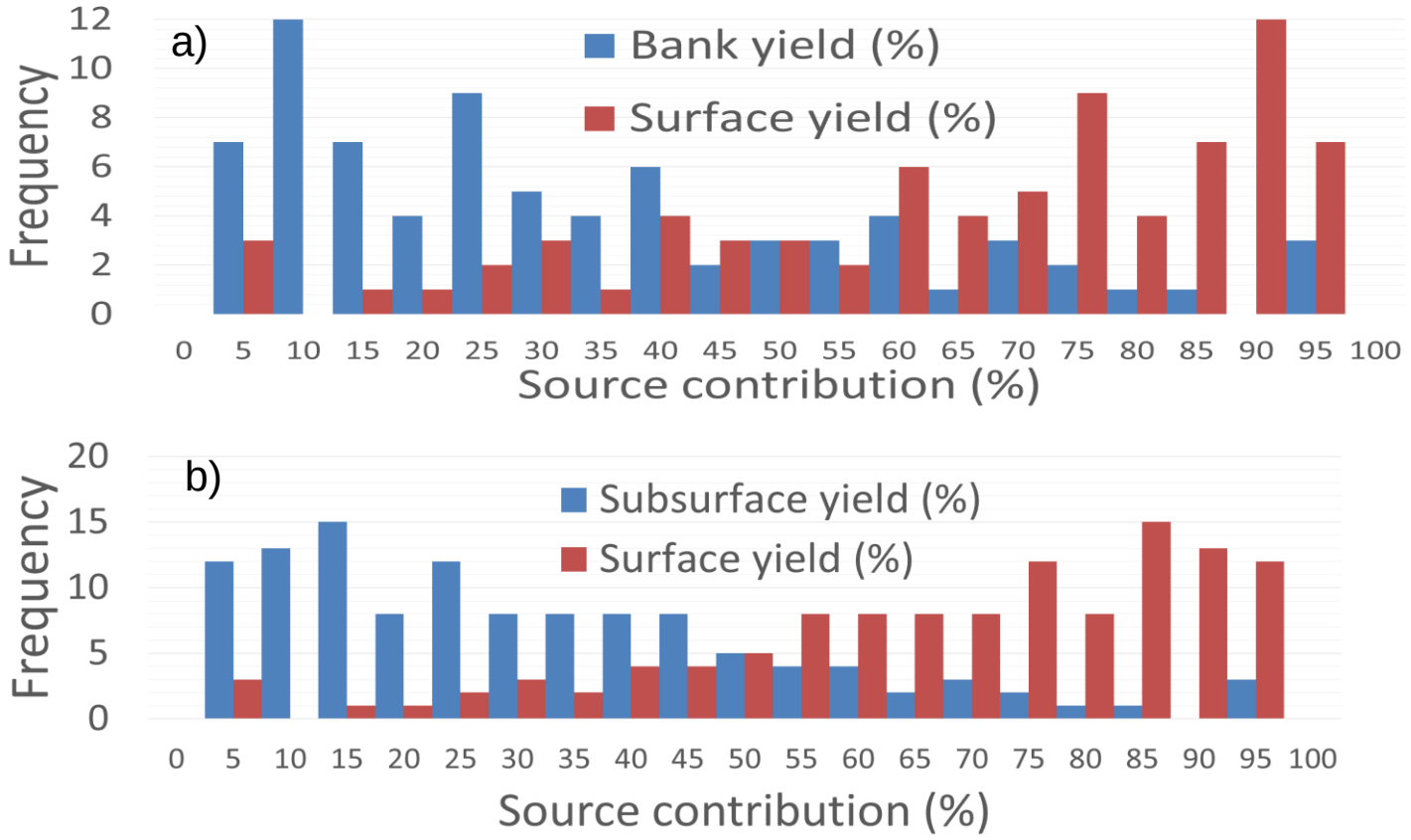

Figure 3: Sources contribution to the total sediment load (a) bank yield (b) subsurface yield with surface sediment sources.

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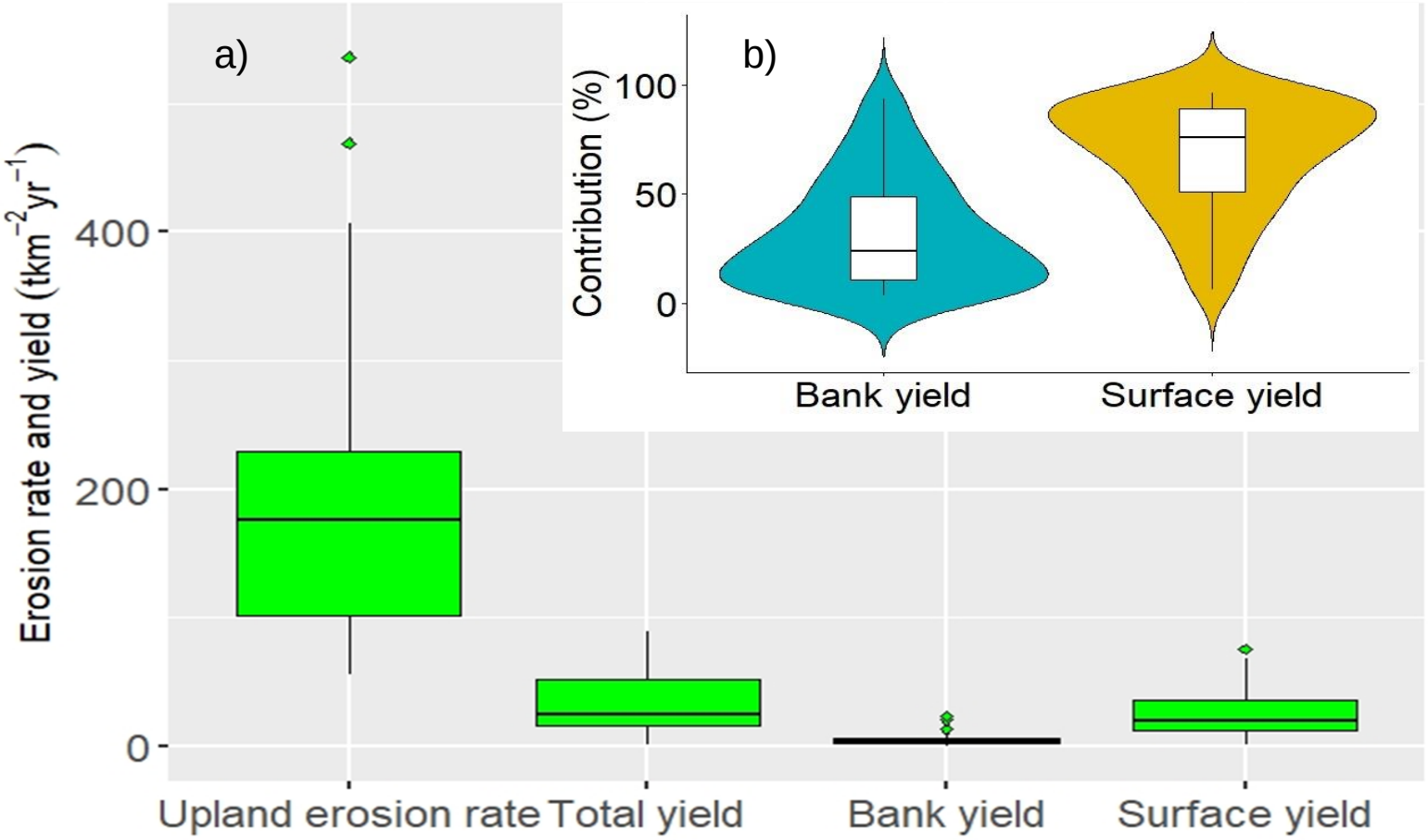

Figure 4: (a) Upland erosion rate and total sediment yield to investigate sediment budget for UK catchments (n=25) and (b) percent contribution of bank and surface yield.

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Conclusions

- Based on published studies, there is a clear shift of sediment sources from surface erosion to river bank erosion with increasing catchment size.
- 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 sources contribution in the range 1-25% from bank/subsurface is generally representative around the World.

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