



# Sediment Transport: Reach Equilibrium Assessment Method (ST:REAM)

## FRMRC2 has produced:

- Development and preliminary testing of ST:REAM as a means of representing catchment-scale sediment dynamics

## Intended readership:

- Practitioners and researchers

## Where to find more information:

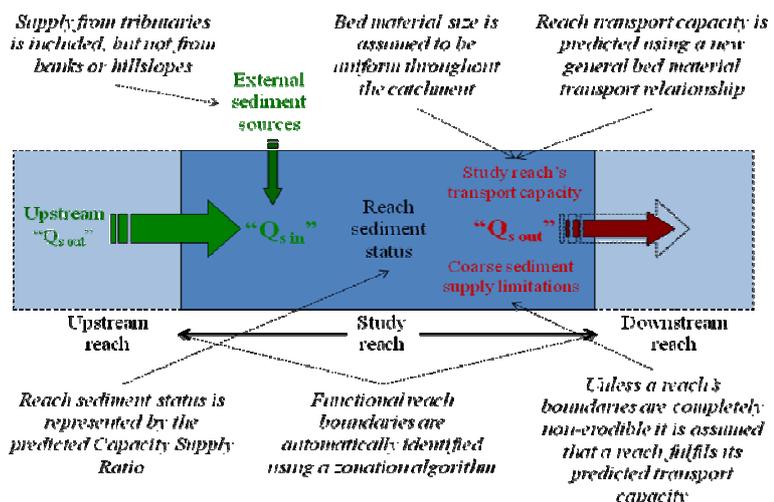
- Parker, C. (2010). Quantifying catchment-scale coarse sediment dynamics in British rivers. Ph.D. Dissertation Thesis, University of Nottingham, Nottingham.
- Dr. Chris Parker, University of the West of England, Bristol. [Chris2.Parker@uwe.ac.uk](mailto:Chris2.Parker@uwe.ac.uk).

## Development of ST:REAM

It was identified during the compilation of FRMRC1's 'Sediment Tool-box', that there was an important gap between the data necessary to run existing quantitative models of the sediment transfer system, and the data that is widely available within British rivers at the catchment-scale. As a result, an effort was made to develop a new approach that can quantitatively account for catchment-scale coarse sediment dynamics within British rivers using widely available data sources.

A review of available data identified that the only data sources widely available within British rivers were: channel widths (via OS Mastermap), channel slopes (via EA/Geomatics LiDAR) and estimated median annual floods (via an ungauged catchment estimation procedure). Based on a review of existing approaches for accounting for coarse sediment dynamics, a reach-based sediment balance approach was identified as the most suitable means of representing the catchment system. Existing examples of this type of approach include the US Army Corps of Engineers' SIAM. The justification for the sediment balance approach is that differences in sediment yields between successive reaches along a river's course should provide a useful measure of discontinuity, or disequilibrium, in geomorphological work available for river channel change.

Given the data input restrictions imposed upon the new approach, a number of compromises were made in the method with which it estimates a reach's sediment balance.



## Overview of ST:REAM

In its current form, ST:REAM is within a MS Excel workbook that has three worksheets within it: '1. Model Input', '2. Model Data' and '3. Model Output'.



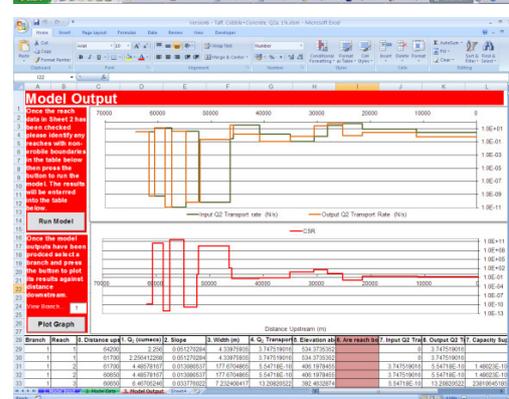
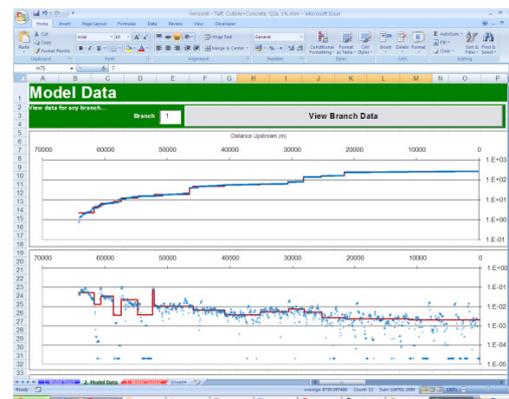
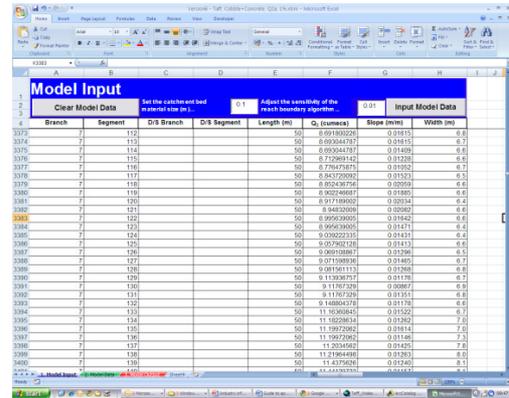
Users must first enter the catchment's network topology and slope, width and  $Q_{med}$  values for points along all of the branches in the catchment network into the 'Model Input' worksheet.

ST:REAM then delineates each of the branches in the catchment network into reaches. This is achieved using a zonation algorithm that identifies reaches as being lengths of channel with relatively homogenous sediment transport capacity. The reach boundaries, and reach characteristics are then presented to the user for approval in the 'Model Data' worksheet.

Finally, ST:REAM calculates a predicted sediment balance for each reach by dividing the sediment transport capacity of the reach by the sum of the sediment transport capacities of reaches feeding into it. The 'Model Output' presents a predicted Capacity Supply Ratio (CSR) for each reach, which compares the annual mass of sediment predicted to enter a reach with the annual mass of sediment predicted to leave that reach. A value greater than 1 suggests that the reach is likely to have more sediment transported out than is supplied to it (potentially degradational) whilst a value of less than 1 suggests that the reach is likely to have more sediment supplied to it than is transported out (potentially aggradational).

Initial assessment of ST:REAM using the River Taff in South Wales and the Afon Eion in mid-Wales has shown that it can produce a useful representation of observed broad-scale sediment dynamics. In general, reaches with high CSRs are associated with evidence of net erosion and reaches with low CSRs are associated with evidence of net deposition.

ST:REAM can provide a broad-scale picture of predicted reach sediment status across a catchment in order to guide catchment management. Outputs from ST:REAM should not be interpreted without an in-depth awareness of the method's simplifications and limitations.



## Availability of ST:REAM

ST:REAM was initially developed at the University of Nottingham. As of 2012 it is under further development and testing at the University of the West of England in collaboration with Jeremy Benn and Associates. Version 6 can be freely accessed through contact with Dr. Chris Parker at the University of the West of England ([Chris2.Parker@uwe.ac.uk](mailto:Chris2.Parker@uwe.ac.uk)).

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