Sediment and nutrient budgets can provide a framework for predicting the spatial patterns of erosion across river basins, the transport of material downstream and deposition in floodplains and impoundments. The SedNet model has recently been implemented in a flexible software environment. The benefits and limitations of the model are described, and illustrated with examples from a basin draining to the Great Barrier Reef.

The SedNet model requires input datasets on terrain, soils, rainfall, landuse, vegetation cover, nutrient concentrations in soil and runoff, and stream discharge. Steady-state or time-stepping ‘dynamic’ sediment and nutrient budget models are implemented depending on the modelling purposes, such as identifying source areas, simulating management scenarios, estimating sediment yields associated with large disturbances, or providing input to receiving water quality models. The dynamic model accounts for some, but not all, of the factors determining the temporal patterns of sediment delivery. For example, changes in rainfall spatial patterns are represented but changes in soil erodability are not.

Model comparisons with data from sediment fingerprinting and water quality monitoring are used to identify model limitations and refine model parameters. The model can identify dominant source areas and estimate the extent of sedimentation within river networks. Levels of uncertainty in predicted sediment yield in ungauged parts of river basins can be estimated including the consequences of errors in input data. Further testing will focus on temporal variations in erosion and transport, and compare the benefits and limitations of spatial modelling in ungauged basins with those of empirical river-station load modelling.