Contemporary challenges for Shoreline Change Analysis

*S.M. Brooks, J.A. Pollard and T. Spencer*

*1Department of Geography, Birkbeck, University of London, Malet Street, London WC1E 7HX, UK*  
(s.brooks@bbk.ac.uk)

*2Cambridge Coastal Research Unit, Department of Geography, University of Cambridge, Downing Place, Cambridge CB2 3EN, UK.*  
(jp646@cam.ac.uk, ts111@cam.ac.uk)

Shoreline change analysis has been deployed across a range of spatio-temporal scales. Accordingly, shoreline change studies have sought to capture shoreline dynamics at a variety of scales, ranging from the local impacts of individual storms to global trends measured over multiple decades. The scale at which we can approach the issue of shoreline change is, to a large extent, determined by the availability of data over time and space. With existing threats from the interactions between accelerated sea level rise, changing storminess and human intervention, shoreline change analysis has never been more relevant or challenging. Historic, centennial-scale shoreline change analysis relies on historic maps where there is normally just a single proxy indicator for consistent shoreline position; the mean water level of ordinary tides on UK Ordnance Survey maps, for example. Occasionally where there are specific coastal landforms that can be mapped, there might be a second proxy such as cliff top position. Shoreline change rates can be determined by extracting these proxies from sequential map surveys, provided the survey dates (ie: not the map publication date) are known.

Shoreline change quantification for more recent decadal-scale periods has been greatly enhanced by increased data availability. This is exemplified by analyses that use widespread coverage available from aerial photographs (past 3 decades). Even more recently on near-annual scales Light Detection and Ranging (LiDAR) data are becoming the norm for capturing storm impacts and shoreline change, enabling volumetric assessments of change in addition to the more traditional linear approaches. LiDAR is enhanced by ground survey Real Time Kinematic (RTK) Instrumentation that can be timed to coincide with storms. As the frequency of dataset capture has increased so has the spatial scale of coverage. Hence the latest shoreline change assessments are global in scale and use Landsat images to focus on hotspots of shoreline change (advance as well as retreat) over the past 30 years. Considering all scales together raises three central questions for shoreline change analysis and these are addressed in this paper.

Firstly, what methodological approach is most suitable for delimiting shorelines and generating the underpinning digitised shorelines for shoreline change assessment?
Secondly, what lessons can be learnt from using an approach that combines both proxy-based (visually discernible signatures) and datum-based (related to a particular water level) shorelines that change differentially with respect to different process-drivers?
Thirdly, given the current state-of-the-art around data availability, what is the most appropriate scale to approach shoreline change assessments?