

Bank stability as a risk factor for pipeline infrastructure: a Scottish example

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Bank erosion is a spatially variable process controlled by a number of factors that are interrelated (e.g. grain size, moisture content, organic content, vegetation, bank gradient). As a risk factor, bank erosion has been strongly connected to the failure of infrastructure that crosses or is adjacent to morphologically dynamic rivers. To manage this risk, comprehensive infrastructure asset management programs should include risk assessment of all structures that cross or are near a river.

In Scotland, a significant proportion of cross-river infrastructure is pipe bridges, for both clean and waste water. These river crossings are maintained and managed by Scottish Water, a supplier responsible for a 48,000 km long drinking water pipe network and a 52,000 km long wastewater pipe network. Recently, Scottish Water began a comprehensive pipe bridge asset inspection program, which incorporates the acquisition of data to assess riverbank stability. The first step in the development of this database is the use of a prototype software application (a tablet app) which simplifies the surveying process by framing specific geomorphological questions and surveying tasks. As a result, the surveys can be conducted by inspectors with no specialist training in bank stability assessment and then reviewed by those with more expertise.

Here, results are presented of a review of survey data, enabling the identification of the assets that are most at risk from bank erosion. The assessment focuses on assets from catchments in two contrasting areas of Scotland; the Hebrides and Glasgow. The uncertainty analysis focuses on input data quality and the variability of information available for desk based risk assessments using Geographic Information Systems (GIS). In parallel, considerations regarding the extension of this framework towards a unified strategy for assessing bank erosion are discussed such as the selection of a statistical framework and the catchment classification process. Finally, we discuss the process of knowledge exchange, where an industrial organization benefits from the scientific input and the academic organization benefits from the access to rapid surveying input at a country scale.