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Challenges and opportunities for the integration of geomorphological principles in flood protection design

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Increasingly, the need to take a more holistic approach into flood risk assessment has been recognised. Scientific research has highlighted the importance of catchment geomorphological controls, and their interaction with other factors on both fluvial and surface water flooding. In addition, EU Water Framework Directive (WFD) regulations require that river interventions, including flood protection works, do not impact negatively on hydromorphological aspects and the ecological status of the relevant water body, whilst not hindering either the objective of achieving good ecological status.

This shift has led to a need to translate this scientific understanding and policy requirements into real life implementation of flood protection design and construction, to effectively integrate such wider drivers into traditional engineering solutions.

This paper explores a series of case studies in which geomorphological drivers have considered to various extents during the flood protection design and construction process, including impacts of historical channel modification on geomorphological processes, effect of in-channel and riparian structures, changes to catchment connectivity and sediment transfer processes, etc. Challenges encountered when attempting to integrate geomorphological principles with other more traditional drivers of flood risk management are presented and discussed. Opportunities to make improvements to modified river systems, whilst making flood protection more resilient, are also identified.