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Climate-driven deterioration of long-life, long-linear geotechnical infrastructure

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Long-life, long linear geotechnical assets such as road, rail and flood embankments provide vital transport and flood defence infrastructure. Slope failures can close transport networks and cause delays, or can reduce the protection provided against flood hazards. This creates huge economic cost and can cause a risk to life for those using affected transport networks or resident on the floodplain. Where emergency repair is needed, the estimated cost of this is 10 times that of scheduled maintenance making effective asset management an industry priority (Glendinning et al., 2009).

However, projected climatic changes pose a threat to the stability of these assets. The most recent IPCC report highlighted projected future changes to temperatures and rainfall. These climatic changes alter the natural cycles of wetting and drying experienced by assets, which results in deterioration of asset performance. Deterioration can occur due to a variety of processes, including crack formation and propagation, downslope plastic strain accumulation and geochemical or mineralogical changes. These ultimately influence the strength, stiffness, permeability and water retention of the soil, which can often mean the construction standard of the asset is not maintained (Stirling et al., 2021).

The ACHILLES project aims to improve understanding of how these processes occur and how they may be affected by projected climatic change. Here, we introduce three large-scale field monitoring sites, including a purpose-built trial embankment, flood embankment and highway cutting. These assets are heavily instrumented to measure soil deformation, soil hydrology and local weather conditions, amongst others. Data from these sites are analysed to further understand deterioration processes and inform future design, construction, monitoring and management of these earthworks. We will discuss key insights from this project, including implications for stakeholders.

References:

Glendinning S, Hall J, Manning L (2009) Asset-management strategies for infrastructure embankments. *Proc Inst Civ Eng Eng Sustain 162*:111–120

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