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The importance of scale in understanding wind and rain as drivers of deterioration at earthen heritage sites

Jenny Richards (1), Guojing Zhao (2), Heather Viles (1), and Hong Zhang (1)

(1) Oxford University, School of Geography and the Environment, Oxford, United Kingdom , (2) Dunhuang Academy, Dunhuang, 736200, China

Earthen heritage is one of the oldest and most universal forms of heritage with earthen heritage sites constituting 10% of the World Heritage List. The majority of these sites are exposed to wind, sediment laden wind and rain and previous studies have found both wind and rain to cause deterioration with having a highly erosive impact. As effectively minimising deterioration is an ongoing challenge for the heritage community, this study applies the concept of scale, commonly used in geomorphology, as an alternative framework to assess the impact of environmental conditions on earthen heritage deterioration.

A multi-method approach was used to capture deterioration over range of spatial (centimetre to kilometre) and temporal (minute to millennia) scales at a case study site of Suoyang Ancient City located in semi-arid northwest China. Results found that rain was an important cause of deterioration over small spatial and short temporal scales but over larger scales its importance decreased. In contrast, wind and sediment laden wind were found to have a limited impact on deterioration over small spatial and short temporal scales but became increasingly important with increases in scale. Consequently, this study suggests i) using interdisciplinary concepts, such as scale, can provide useful frameworks for addressing challenges within earthen heritage research, ii) the importance of wind in causing deterioration at earthen sites may have previously been underestimated and ii) that earthen heritage conservation strategies cannot aim to tackle deterioration caused by environmental conditions over all scales. Instead, strategies need to focus on a given spatial and temporal scale and develop strategies that specifically target the drivers of deterioration at those scales.