

CULTURAL HERITAGE SITES ON COLLAPSIBLE LOESS IN NORTH CHINA

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Disasters arising from landsliding are frequent in NW China, an extensive mountainous region. The effects of high relative relief, intensive seasonal (monsoonal) rainfall, and active seismicity, together with a considerable thickness (up to 300m) of uncemented wind-lain silts (loess) overlying steeply-sloping weak, but impermeable, claystone, yield a landslide concentration scarcely matched anywhere elsewhere on earth. Here, nearly half a million people have been killed in this century alone. So far, the sites of more than 40,000 landslides have been determined. Many landslides are triggered by earthquakes. Dramatic rises in population numbers and densities since 1950 have greatly increased the hazard to both modern and ancient structures. Yet loess landslides remain poorly understood: current landslide classifications take little account of silt-dominated materials such as loess. Partly for this reason, but also because of economic constraints, remedial measures are still not widely applied in China. Urban settlements, including the 'millionaire' cities, are affected. Many important heritage sites are found in or near long-established towns and cities, and some of these are threatened by ground failure to varying degrees. Some of these sites are in need of action designed to ameliorate the severest effects of these processes. We present case studies illustrating approaches to this problem recently adopted in north China. These involve extension of accepted landslide classifications to include failures in weak siltstones such as loess; analyses of several heritage sites threatened by slope failure; and application of remedial schemes to urban landslides.