



Reconstructing sacred landscapes from soils-based records

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From soils- and sediments- based records we reconstruct development of the sacred landscape at Lumbini UNESCO World Heritage Site in the central Nepalese Terai, the birthplace of Buddha, a world religion and now a major place of pilgrimage to its temple site. The Terai is a plain less than 100 m above sea level with incising rivers that originate in the Churia Hills and flow to the Ganges. Alluvial sediments on the Terai plain, originating as laterite soils within the hills, are characterised by a range of textural classes rich in iron oxides and manganese, with sandier sediments near water sources and finer textures near the distal ends of alluvial reaches. Our objectives are to establish a chronological framework for occupation, identify influences of alluvial environments on site occupation and determine the process of secular and sacred site formation within the World Heritage Site.

A set of key stratigraphies are the basis for our analyses and are located in a palaeo-channel adjacent the temple site, within the temple site itself, and within the mound of the original Lumbini village. Optically stimulated luminescence (OSL) measurements of soils and sediments together with supporting single entity radiocarbon measurements provide robust chronological frameworks. Assessment of field properties, thin section micromorphology and organic biomarkers offer new insight into the intimate and complex relationships between natural, cultural and culturally mediated processes in landscape development.

Integration of our findings allows a detailed narrative of cultural landscape development at Lumbini. The area was occupied from ca. 1,500 BC first of all by a transient community who used the area for product storage and who were subject to persistent flooding with periodic major flood events. Subsequent occupation deliberately raised a permanent village settlement above the level of flood events flooding and which had associated managed field cultivation. Village life was well established by the time of the Buddha's birth. Dating of the early and previously unknown temple site indicates a birth date of ca. 550 BC. Reconstruction of the early temple site indicates an enclosed open space with tree cover that was further elaborated with a surrounding walkway and cover during a later phase of construction. Triterpenoid and wax ester soil biomarkers indicate that the tree cover was most likely *Ficus religiosa* (Pipal). The study offers the first geoarchaeological investigation of Lumbini and the implications this carries for the understanding of international heritage and its conservation.