Archaeological landscape of Thotlakonda and Bavikonda near Visakhapatnam, Andhra Pradesh: insights from remote sensing and GIS analysis

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India's rapid economic development, marked by industrial growth, expanding transportation networks and urbanization has brought many benefits but also poses a significant threat to the nation's cultural and natural heritage. A recent NIAS Policy Brief highlights the urgent need for clear regulatory boundaries and effective enforcement to protect cultural heritage sites from urban sprawl and degradation. Citing examples such as Nalanda, Halebeedu, Srirangapatna and Bodh Gaya, it emphasizes that unchecked development can erode the historical integrity of heritage landscapes. It advocates for a multi-tiered approach using modern technologies like geographic information system (GIS) and remote sensing, along with community engagement and stricter land-use controls, to ensure sustainable preservation. Thotlakonda and Bavikonda, two significant Buddhist heritage sites in Andhra Pradesh, were declared protected by the Government of Andhra Pradesh on 2nd May 1978. However, imprecise descriptions of the protected area have led to conflicting interpretations, fuelling litigation between parties aiming to preserve the sites and parties pushing for development. This study utilizes remote sensing and GIS to examine these sites and their surrounding landscapes, identifying potential archaeological features and assessing the impact of recent land-use changes in preserving these historically important areas.

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many associated archaeological features lying outside the protected boundaries, leading to recommendations for extending those boundaries to encompass the nearby archaeological remains. Conferring such protection to a site can trigger fresh development activities up to the permitted edges of these boundaries. Hence, these boundaries must be selected with utmost care. The NIAS Policy Brief addresses the challenges of protecting cultural heritage sites in India[3]. It emphasizes the need for clear and enforceable regulation boundaries to safeguard these sites from encroachment, urbanization and other forms of degradation. It advocates for the use of modern technologies, such as remote sensing and geographic information system (GIS) to assess a site's integrity, delineate regulation boundaries and monitor these boundaries effectively.

Absence of clear and enforceable boundaries can lead to one or more undesirable consequences, including the whole or partial destruction of cultural heritage (e.g. Chikkajala near Bengaluru[4]), cost-overruns for development projects (e.g. the doubling of the railway line at the Srirangapatna railway station[5]) and litigation.

Thotlakonda and the nearby site Bavikonda were discovered during an aerial survey by the Indian Navy in the 1970s (ref. 6). Subsequently, the Government of Andhra Pradesh, through a notification dated 2 May 1978, declared Thotlakonda as a protected site under the Andhra Pradesh Ancient and Historical Monuments and Archaeological Sites and Remains Act, 1960 (https://tinyurl.com/y3sb27uu (accessed on 21 August 2024)). The notification describes the boundary as encompassing (Th