**Revealing Hidden Spatial Relationships in Urban Areas Using Remote Sensing: Functional Boundary Delineation of Dambulla**

Abeysiriwardhana N.S.1\*, Thashmila S.A.C.1, Warusavitharana E.J.1 and Munasinghe J.N.1

1Department of Town & Country Planning, Faculty of Architecture, University of Moratuwa, Sri Lanka

[nilanshalinda12@gmail.com](mailto:nilanshalinda12@gmail.com)

***ABSTRACT***

Understanding urban functions is hard; understanding them spatially is even harder, particularly when their boundaries extend beyond the original administrative limits. Functional boundary of a city manifests both the configuration of the physical environment and also the socio-economic patterns of human activities. By accurately defining these boundaries, urban planners gain valuable insights into the spatial organization of the city and can effectively strategize for its long-term development. Conventionally, delineating the functional boundary relied heavily on land use/land cover classification using remote sensing data. However, this approach has proven inadequate in capturing the intricate spatial interactions within the urban fabric. Going beyond that, this study proposes a novel methodology for functional boundry delineation using connectivity analysis, Night Time Light Data(NTL), and Normalized Difference Built-up Index(NDBI), through a case study of Dambulla City, Sri Lanka. The connectivity of each node/junction indicates potential agglomeration according to urban theories. NTL is another remotely sensed source of information, indicating night-time light emission which represents activities happening even at night. The final source of information is the NDBI, calculated using Landsat 9 to get built-up area distribution representing existing agglomeration. Overlaying these three sources of information and demarcating the functional boundary of the Dambulla area has been completed. It reflects Dambulla's functional boundary while revealing hidden spatial relationships with the surroundings. According to the findings, Dambulla is the catalyst for five satellite cities, emphasizing the significance of Dambulla city and the impacted area in the event of a modification to the city. Going beyond conventional practices, revealing spatial relationships and the functional cluster will greatly influence the urban planning and development sector. The beauty of this method is that, without a single visit, it is capable of initially revealing hidden relationships that are hard to discover even by living in the area for a few days.

**Keywords:** Functional Boundary Delineation; Connectivity Analysis; Nighttime Light Data; Normalized Difference Built-up Index