

RS and GIS-based Assessment and Modelling of Urban Environmental Conditions for Sustainable Urban Landscape Redevelopment

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Abstract: The concept of sustainable development is widely becoming an integral part of planning and decision making activities as the need to replace current resource-consuming and environmentally straining activities arises. Sustainable development is about ensuring that the needs of the people today and in the future are met without sacrificing the natural systems on which life on earth is dependent. In the context of spatial planning and urban development, sustainability focuses on the appropriate use and conservation of environmental components such as energy, greens, and natural areas, and the promotion of sound environment for the inhabitants. The outputs of spatial planning, however, cause direct and indirect environmental impacts which somehow contradict the criteria for sustainable urban development. This study addresses said concern through the careful assessment of the urban environment and the formulation of appropriate mitigating measures. The aim is to assess the present urban environmental conditions and consequently develop a model which shall aid the redevelopment of urban landscape following the course of sustainability. Urban environmental conditions are described in terms of the urban thermal properties (heat islands), urban greens distribution, and urban form and design, among others. The model developed facilitates the identification of potential redevelopment areas and determination of impacts on the surrounding urban environment. Remote sensing, geographic information systems and geographic visualization tools and applications are used in the assessment and modelling of the urban environment. The study area is a highly urbanized city in the metropolitan region of the country. Spatial information and thermal profiles are extracted from remotely sensed data (Landsat 5 and ETM+). LiDAR-derived digital surface model is used to generate height of urban features. These data together with other geographic datasets are stored in an urban geodatabase for use in subsequent spatial analyses. Urban thermal properties and heat island formation are correlated with vegetation distribution and built-up densities. The influence of urban built form on overall environmental condition is described using sky view factor, visibility, solar radiation, and exposure analysis among others. 3D model of the study area is generated with reference to the outputs of the spatial analyses and the zoning and land use regulations in the study area. The results of the assessment and model development provides for the identification of critical areas for improvement and conservation, determining environmental implications of existing and planned developments, strategic planning for urban redevelopment, and understanding of

possible future scenarios among others. Ultimately, this study is aligned to the overarching goal of sustainable development as it promotes proper management of the urban environment and the welfare of its inhabitants.

Keywords: sustainable development, urban development and planning, thermal remote sensing, 3D geographic information system