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Unlocking the Power of Big Data: How Remote Sensing and Land Zoning Data are Revolutionizing Urban Planning

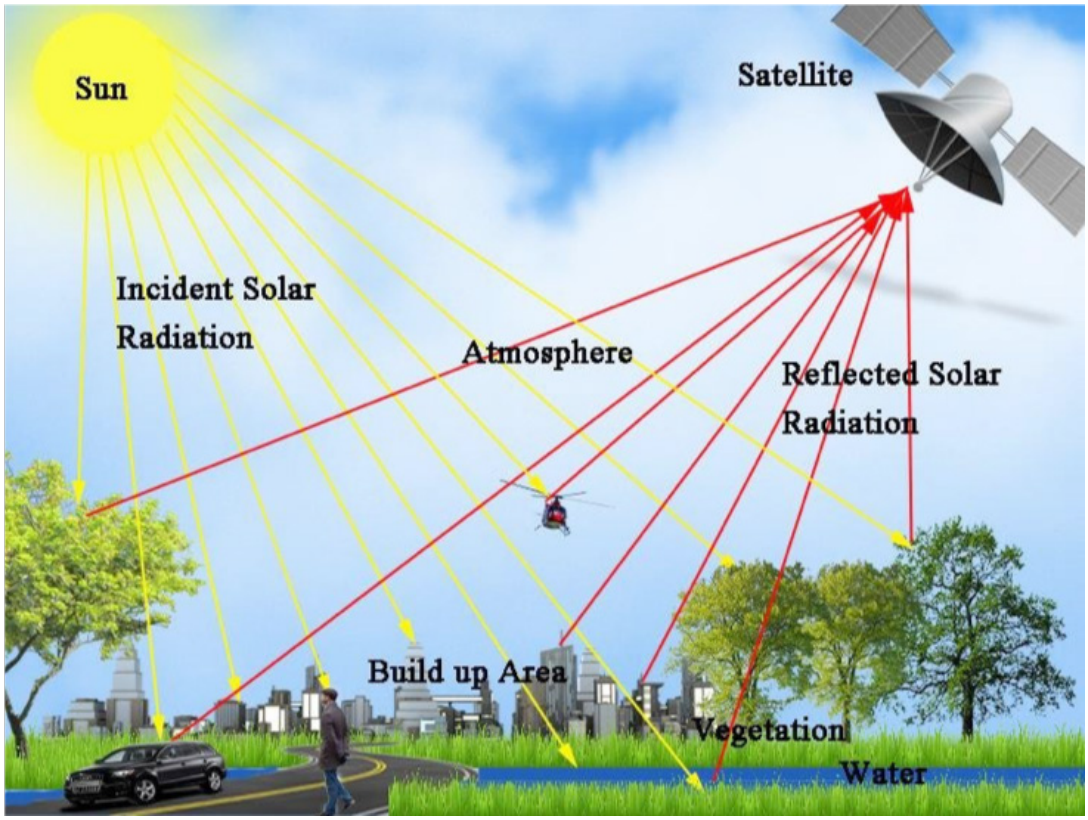

Figure 1: Satellite Imaging of Land Use and Land Cover Patterns

Urbanization is a rapidly growing trend, and cities are facing unprecedented challenges in managing growth, ensuring sustainability, and promoting social equity. Urban planning is a complex and challenging process, as it involves the coordination of various stakeholders and the management of different resources. So, utilizing conventional methods for urban planning can lead to limited data availability, inaccurate data, and a lack of stakeholder engagement, which can affect the quality and effectiveness of the planning process for highly populated areas. There-

fore, with the advent of big data and remote sensing technology, urban planners now have powerful tools to tackle these challenges. Remote sensing is the use of satellites, aerial imagery, and other sensor-based technologies to gather data about the earth's surface. Land zoning data, on the other hand, provides information about the designated use of land in each area. When combined, these two types of data can provide a comprehensive view of land use, environmental conditions, and social dynamics. One of the main benefits of remote sensing and land zoning data is their ability to provide real-time monitoring of urbanization patterns. By tracking changes in land use and environmental conditions, urban planners can make informed decisions about infrastructure development, environmental protection, and social equity. This information can also be used to anticipate future trends and respond proactively to emerging challenges.

> “Land zoning data provides a comprehensive view of land use, aiding planners in creating efficient, liveable cities”

There are several studies carried out all around the world to monitor the revolution of urban planning development using different types of remote sensing techniques such as aerial imagery [2], hyperspectral imagery [3, 4] light detection and ranging (LIDAR) and satellite imageries [5]. This research will investigate the integration of remote sensing and urban land zoning data in the Colombo district using satellite images (Landsat 8 & 9) to overcome the difficulties and restrictions of urban plan monitoring. To verify the already existing land zoning data, this study will examine a collection of changes in land use and cover over a chosen period as well as spectral indices including Normalized difference vegetation index (NDVI), Normalized Difference Built-up Index (NDBI), and Land Surface Temperature (LST). The validation will be done by overlaying the existing data and remotely sensed data to identify the places where unplanned urbanization was taken place. The findings of this study will indicate how combining these two data sources can promote evidence-based decision-making in urban planning and imply that doing so can lead to more effective and efficient management of urban plans.

The methodology involves in this study follows this specific flowchart (Figure 2). Initially, satellite images will be obtained from the USGS EarthExplorer website. These images will be then subjected to a Maximum Likelihood supervised classification to identify various classes, such as vegetation cover, built-up areas, barren lands, and water cover. Concurrently, spectral indices will be assessed to examine environmental conditions like temperature variations and their causes. Subsequently, land zoning data for the Colombo district will be acquired and converted into a shapefile. This shapefile will be overlaid onto the classified image. To ensure the accuracy of the land zoning data, a minimum of 100 random points will be generated. A comparison will be made between the land zoning data and the classified images. Any deviations observed will be further analysed by referring to the spectral indices images. This analysis aimed to identify any zones of concern arising from the improper implementation of urban planning. If any discomfort zones will be identified, appropriate solutions will be proposed to address the identified problems.

Therefore, this proposed framework can be utilized to promote decision-making in urban planning that is supported by data, resulting in more equitable and sustainable development results. This study intends to contribute to the continuing conversation about the use of land zoning and remote sensing data in urban planning and to offer a workable strategy for putting such integration into practice in a real-world setting.

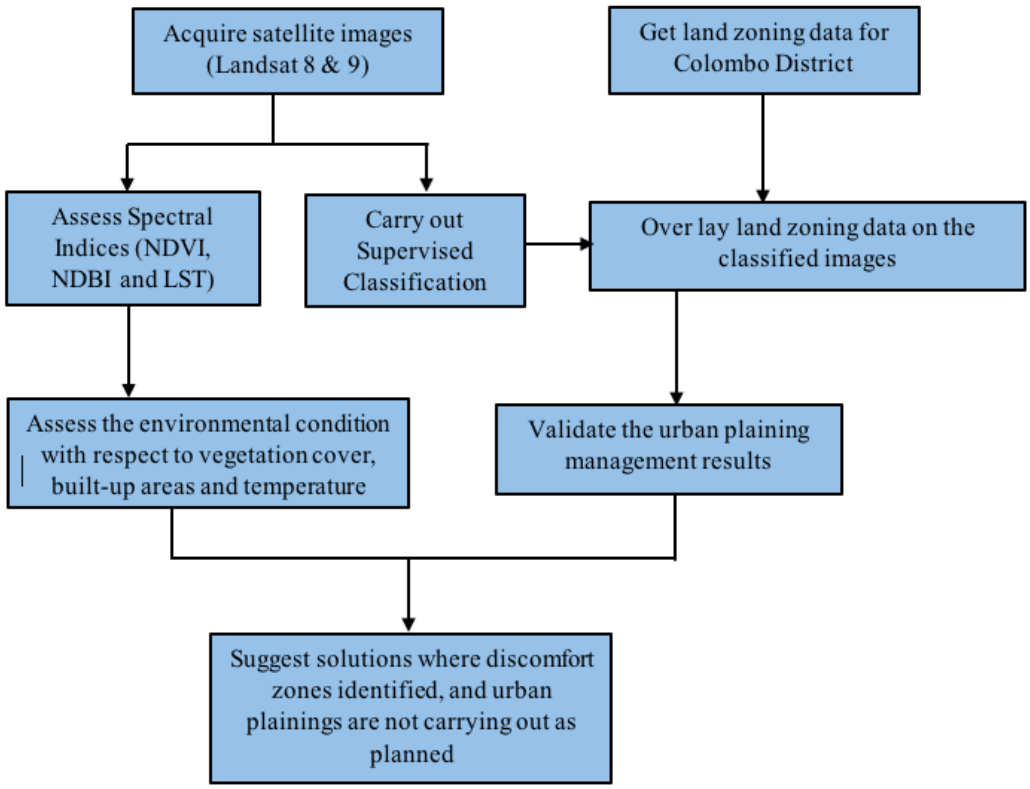

Figure 2: Flowchart of the Methodology

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