Spatio-Temporal Assessment of Urban Sprawl in Sheikhupura, Punjab

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Location: SATEYE Company Headquarters, Lahore, Pakistan.

Executive Summary

SATEYE Company carried out a detailed spatio-temporal study of urban sprawl in Sheikhupura, a district in Punjab, Pakistan, covering the years 1976 to 2014. By using satellite images and geographic information system (GIS) tools, SATEYE mapped how the city expanded over time, how built-up land replaced vegetated and agricultural areas, and assessed the environmental, economic, and social impacts of this growth. The analysis revealed that significant portions of fertile agricultural land were converted into urban zones, particularly during the period 2000–2014. This rapid expansion has implications for resource management, infrastructure planning, and sustainable development. Based on the findings, SATEYE recommends policy changes and planning strategies to curb unchecked urban sprawl, safeguard green spaces, and ensure balanced growth for Sheikhupura's future.

Introduction:

SATEYE Company recognized that Sheikhupura, a rapidly growing city in Punjab was facing serious socioeconomic and environmental challenges due to increasing urbanization. With its industrial development, proximity to Lahore, and growing population, the city has been expanding very quickly. However, little systematic information was available about how this sprawl was affecting the land-use patterns, agricultural areas, and natural resources of the region over decades. To address this, SATEYE took the lead in using remote sensing and GIS methods to document and analyze the changes from 1976 to 2014. By doing so, SATEYE aimed to provide accurate, data-driven insights to support sustainable planning, resource management, and policy formulation in Sheikhupura. The company also sought to highlight the broader social relevance of urban sprawl: how population migration, industrial growth, and land conversion threaten farmland, open spaces, and the well-being of local communities.

Methodology:

SATEYE Company employed a multi-step methodology combining historical satellite imagery, image processing, GIS, and spatial analysis. First, SATEYE obtained four Landsat images from EarthExplorer corresponding to the years 1976, 1994, 2000, and 2014. These images were carefully processed: the spectral bands were stacked to form multispectral data, and geometric corrections removed image distortions from sensor effects and Earth curvature. To make the features clearer, SATEYE enhanced each image, improving contrast and detail so that built-up areas and vegetation were more distinguishable.

Next, SATEYE used supervised classification to categorize each image into two primary land-cover classes: built-up area and vegetated land. Using expert-selected training sites, SATEYE analysts digitized different urban and vegetative features, then converted the raster data into polygons to create shapefiles in a GIS environment. This allowed the company to calculate precisely how the areas of built-up land and vegetative cover changed over time. Throughout this process, SATEYE used ERDAS Imagine software for image processing and ArcGIS for spatial analysis. Finally, SATEYE compared the land-use maps for each time period to detect patterns of urban sprawl and measure the rate of change in both built-up area and vegetation.

Outcomes:

As a result of its analysis, SATEYE Company produced clear and compelling maps showing the growth trajectory of Sheikhupura over nearly four decades. The built-up area increased from about 45.42 km^2 in 1976 to approximately 83.36 km^2 in 2014, while vegetated land including agricultural fields, orchards, and open spaces, decreased from 83.06 km^2 to around 44.97 km^2 over the same period. The most dramatic increase in high-density urban land occurred between 2000 and 2014, during which fertile agricultural plots were steadily replaced by housing, industry, and infrastructure.

SATEYE's study also highlighted serious environmental and social consequences associated with the sprawl. The conversion of productive land into urban zones has resulted in reduced green spaces, greater environmental pollution and increased demand for infrastructure such as roads, water supply, and sanitation. The company's findings warn that uncontrolled urbanization places immense strain on local resources and degrades the quality of life. Socially, the expansion has altered community dynamics: longer commutes, reduced neighborhood interaction, and the erosion of traditional social bonds are emerging challenges.

To address these issues, SATEYE recommends that decision-makers adopt sustainable urban planning strategies, strengthen zoning regulations, and invest in green space preservation. By using its detailed spatio-temporal data, SATEYE calls for policies that guide future growth more responsibly, prioritizing infrastructure development, ecological protection, and social well-being. The company believes that this approach will help Sheikhupura manage its rapid urban growth while maintaining its agricultural heritage and environmental health.