

# REVIEW PAPER ON GIS FOR SMART CITIES

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**ABSTRACT:** GIS (Geographic Integrative System) integrates software, hardware and data capturing, managing, analyzing and displaying all forms of geographically referenced information for smart city. GIS technology allows a city to view and understand given data in many ways. GIS is only tool to integrate data from different resources. It helps in understanding the pattern and relationship between these data and this is very helpful while converting a city into smart city or in green city.

This paper explain the way GIS can help in planning, designing execution and management of various functions of smart city.

**Keywords:** Smart Urban Planning, Land Use Planning, Smart Utilities, Smart Transportation

## INTRODUCTION

A city, by definition, is a geographic entity and hence using GIS as one of the key “system of records” for a city would help various city agencies to work in tandem and collaboratively at all stages – planning, design, engineering, construction, asset management, operations and development, managing outage situations and during emergencies

A GIS based framework can track a set of indicators including total energy use, water demand, waste produced, vehicle miles traveled and total greenhouse gas (GHG) emissions that can be modeled to show the impact of a single building, block of buildings or entire community. Various energy or water conservation strategies can be recombined and modeled to show the immediate carbon or water footprint, as well as initial development costs or ongoing maintenance and management costs of a given scheme for any point in the future.

GIS is also being increasingly used in the construction of Smart, Green Buildings as GIS easily interfaces with BIM solutions

While GIS can be used in many areas of a Smart City, some areas where the benefits of unique capabilities of GIS can be quickly leveraged are

- Smart Urban Planning
- Smart Utilities
- Smart Transportation
- Smart Public Works

## SMART URBAN PLANNING

The urban plan and design of a city, including land use and circulation patterns—has the largest impact on a city’s energy use and GHG emissions. A city organization seeks to identify the best mix of urban form, land-use density, and transportation network to achieve the reduction in carbon emissions at the lowest cost.

GIS can be used by planners as a platform – to help them reach their goal of creating livable “smart” communities and improving the overall quality of

life while protecting environment and promoting economic development. GIS can provide the necessary planning platform for visualization, modeling, analysis and collaboration

### Land Use Planning

Traditionally, GIS has been used for land use management – to keep track of zoning and related data on building, taxes and occupancy. For a Smart City, however, it would be essential to use GIS for land use planning to support and enhance community viability. A GIS used for classic planning activities will help planners consider, understand and manage the following:

- The amount of land to be left undeveloped so as to provide green space, cluster development and storm water drainage
- The density of development in relation to the existing and planned infrastructure
- The amount of land needed for parking, given a particular land use
- The proportion of land set aside for various uses, zoning classifications or design standard requirements
- Land uses within zoning classifications (e.g. amount of green or open space per residential unit within residential zones)
- The minimum/maximum size for parks and their ideal locations with regard to encouraging use
- The length of city blocks and the buffering of sidewalks (e.g. so as to encourage sidewalk use)

GIS can help evaluate and identify lands meeting these contradicting criteria by integrating data from different sources and selecting suitable lands based on following criteria:

- Avoid flood plain designated areas and areas having high runoff rates
- Avoid soils with low bearing strength or poor drainage

- Avoid sites having steep terrains
- Select sites connected to existing residential areas
- Sites well connected by transport network – existing or planned
- Sites those are a minimum distance away from landfill and industrial sites
- Sites those are a minimum distance away from airports to reduce noise pollution

### CONCEPTUAL AND MASTER PLAN

GIS is an invaluable tool for creating strategic land use and transportation plan which would be analyzed at regular interval to ensure that there will be sufficient land to meet the anticipated population and economic growth, and provide a good living environment. This can be used to ensure that the future development- -will balance economic growth with environmental stewardship and social progress. Likewise, GIS would be extremely useful in creating smart master plans guiding development for 10 to 15 years into the future translating the broad long term strategies of concept plan into detailed plans.

### SMART UTILITIES

GIS can help ensure meet current and future utility demands of a city – water, waste disposal, electricity, gas etc. A GIS for utility management affords managers the opportunity to advance community viability and environmental quality through the use of the system to:

- Reduce waste of water or energy resources
- Check inflow and infiltration of rainwater and groundwater into sewer systems
- Improve emergency responses to leaks, breaks and downed power lines

### SMART TRANSPORTATION

The ability to visualize assets and the surrounding environment - while building, upgrading or repairing transportation infrastructure - helps

transport organizations prioritize their work and make the right decisions.

#### PLANNING:-

Transportation agencies face an enormous challenge in keeping their infrastructure operating smoothly and efficiently. Increasingly, transportation planners are integrating land-use, environmental and greenhouse gas considerations, along with energy consumption factors, into their planning processes. In doing so, they have discovered that GIS can bring all these factors together in the type of comprehensive planning models that will be required to help effectively plan the future.

#### CONCLUSION

GIS as an enabling technology forms the core of design, development, execution and management of smart cities, whether green-field or brown-field. GIS can be the platform for various departments and services to exchange information and interact with the citizens. Modern technologies including a variety of sensors and high-speed networks can provide the realtime data to the GIS for better management of smart cities. Examples of GIS Applications in Smart Cities Land Use Planning

- Parcel inventory of zoning areas, floodplains, industrial parks, land uses, trees, green spaces etc.
- Analysis of percentage of land used in each category, density levels by neighborhoods, threats to residential amenities, proximity to unwanted land uses
- Modeling of expected residential, commercial and industrial population growth for land use plan, evaluation of land use plan based on demographic characteristics of nearby population Utilities and Infrastructure
- Inventory of roads, sidewalks, bridges and utility networks with all utility assets • Attribute information including name, location, condition, most recent maintenance

- Analysis of infrastructure conditions by demographic variables such as income, population change
- Use of analysis to plan and schedule proactive maintenance and expansion based on estimated future load Transportation and Solid Waste Management
- Identification of bus, MRT and LRT routes, road capacity and condition, signaling system equipment etc.
- Identification of accident sites
- Identification of sanitation truck routes, capacities, and staffing by area
- Identification of landfill and recycling sites
- Analysis of potential capacity strain considering development in certain areas
- Analysis of accident patterns by type of site
- Analysis of sanitation truck routing in relation to area pickup needs, routing efficiency, and destination sites
- Use of analysis to identify ideal high-density development areas based on criteria such as established transportation capacity
- Use of analysis to identify potential alternative traffic flow mechanisms 13 Conclusion Whitepaper – GIS for Smart Cities 14
- Use of analysis to decide where recycling programs or sites should be located

#### REFERENCES:

1. International Journal of Industrial Electronics and Electrical Engineering ISSN: 2347-6982 Volume-3, Issue-5, May-2015
2. GeE 2008: Indo Italian conference Green and Environment March 20-21, MAEER's MIT College of Engineering, Pune

3. Municipal Solid Waste Management in Emerging Mega Cities: A case study of

Pune City IndoItalian conference2012.  
4. www.thinkmind.org

