

GIS for Smart Cities

As urban areas are getting more crowded and falling increasingly short on future development potential, development of new self-sustaining cities are emerging as an alternate solution to these problems. Technology is at the heart of these new self-sustaining cities enabling automation and real-time integrated city monitoring and management through a network of sensors, cameras, wireless devices and data centers. Also referred to as smart cities, these new self-sustaining cities are a developed urban area that creates sustainable economic development and high quality of life by excelling in multiple key areas like economy, environment, energy efficiency, mobility, governance, people and living conditions.

Smart cities, on one hand present a substantial growth opportunity in the coming years while on the other offers various challenges as well. Smart city projects are rather complex with residential and commercial spaces supported by an infrastructure backbone for power, roads, water, drainage and sewage i.e. a virtual living and breathing city. A critical success factor is a need for a common technology platform to enable integration, coordination and synergistic functioning of different participants of the smart city ecosystem.

A centralized information system based on GIS (Geographical Information System) provides an IT framework which integrates not only every stakeholder but also every aspect of smart city processes – starting from conceptualization, planning, and development to maintenance.

Acquire

Planning
& Design

Construct

Sell

Maintain



↑ 3D visualization by space classification

GIS – A platform for Smart Cities

A centralized information system based on GIS provides an IT framework for maintaining and deploying data and applications throughout every aspect of the city development life cycle.

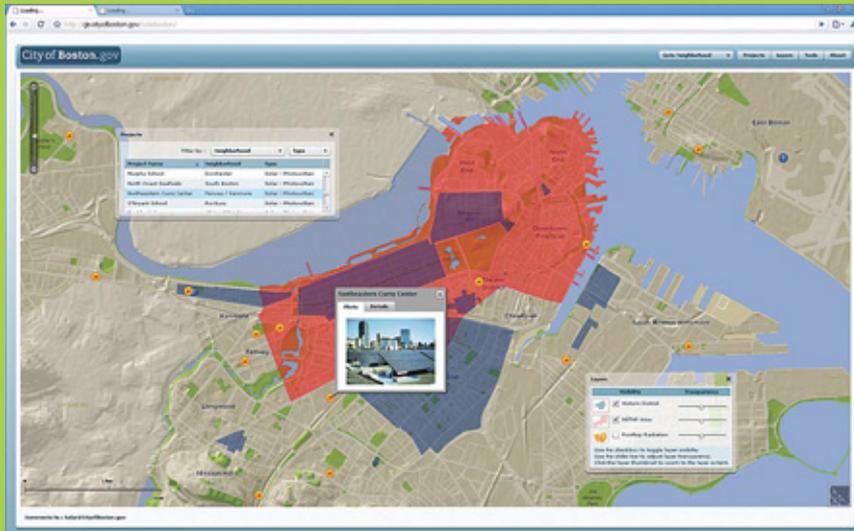
Acquire: Find the right sites for city development, view legal boundaries, arrive at right valuation of your existing / new sites

Planning & Design: Identify deficiencies and determine optimal solutions. Integrate GIS with most design tools, including Computer Aided Design (CAD), Building Information Modeling (BIM) bringing greater analytics and cost-estimation capabilities to your infrastructure design process

Construct: Integrate project and financial management software with GIS to better manage projects. GIS can provide a single point of entry for all construction-related documents and files

Sell: Understand where and how to market city developments, attract buyers and tenants, and improve retention rates. Analyze demographics and market conditions to provide a more accurate picture of a property's suitability to needs

Maintain: Easily manage disparate assets. Integrate your asset inventory with inspection history and work order management to maintain your critical investments in a cost-effective manner.



↑ Calculate the solar energy potential of building rooftops

GIS Applications for Smart Cities

Site Selection & Land Acquisition: GIS can combine and integrate different types of information to help making better decisions and also provides high quality visualization tools that can improve the understanding and enhance decision making capability w.r.t to site identification, valuation and finally selection. By analyzing location data – proximity to road network, fertility of soil, land use, soil bearing capacity, ground water depth, and vulnerability to disasters such as floods, earthquakes - the real estate organizations can arrive at the right property valuation. By analyzing, mapping, and modeling the merits of one site or location over another can be evaluated. In addition, this can also be used for arriving at appropriate market linked compensation to owners based on valuation parameters and in rehabilitation and resettlement planning

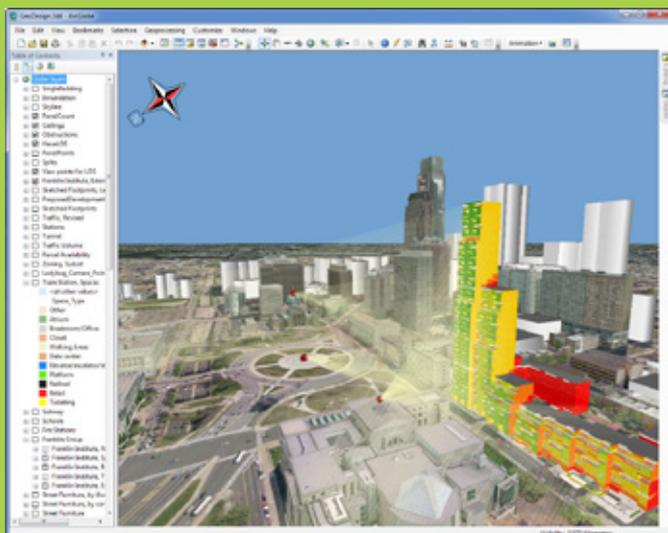
Environmental / Legal Compliance: GIS makes meeting regulatory requirements less time consuming and easier to accomplish by providing a common platform for communication with regulators and public. The existing data can be directly connected to a compliance workflow ensuring adherence. Also, GIS-based graphical outputs can help in quickly generate reports that clearly demonstrate how compliance requirements and building bye-laws are being met.

Planning, Design & Visualization: Geodesign will be the key framework for conceptualizing and planning for smart cities; it will assist at every stage from project conceptualising to site-analysis, design specifications, stakeholder participation and collaboration, design creation, simulation and evaluation. GIS enables planners to integrate a variety of data from multiple sources like road, sewerage and drinking water and to perform spatial analyses and planning. Utilities can manage and map the location of millions of miles of overhead and underground circuits.

By integrating imagery, elevation, and environmental information with the CAD / BIM environment, engineers can continue working with familiar software while gaining access to important GIS data. Design files can be brought into a GIS and linked to financial software for better labor and materials and total project cost estimation. With these types of capabilities, GIS is an essential component of the engineering information systems of the future.

A 3D geographic information system can be used to create a realistic simulation of a project, environment, or critical situation.

GIS can help increase a facility's sustainability by reducing energy and water use, finding better waste disposal, and decreasing a building's carbon footprint. By managing information both inside and outside buildings down to the asset level, GIS can help in for example differentiating the environmental impact



↑ GIS-Based Line of Sight (LOS) / Shadow Analysis to determine desirability of a proposed design

of development, planning and evaluating neighborhood patterns and design, estimate the “walkability” for LEED-ND projects based data on streets, pedestrian routes, bicycle routes, transit accessibility, building entrances, and a variety of other factors.

Construction & Project Management: GIS, integrated with project management and financial software provides a comprehensive view of projects and their current status and helps in tracking performance. GIS helps organize all relevant project information, from soil data, and geotechnical studies to planning, environmental studies, engineering drawings, project maps, inventory and asset control.

Sales & Marketing: With GIS, city developers can win over prospective businesses by creating informative sales tools and marketing reports that highlight the economic potential of a new location or future development. For residents, GIS helps in presenting a visual representation of all the information affecting the desirability and value of a property giving them a far more accurate picture of a property’s suitability to their needs.

Facility Management (FM): A GIS-based information system provides a powerful foundation for better facility management by generating integrated information that helps make better allocation decisions. GIS can integrate with and extend the current facilities management system. By importing and aggregating into a GIS the geometries and tabular data of the multiple BIM and/or CAD files required to accurately represent the built environment, the efficiencies and power of BIM can be leveraged, extended, and connected in geographic space to other relevant site, neighborhood, municipal, and regional data.

Operations & Reporting: GIS can track and analyze assets over space and time and provide insight through visualization of information via maps and easy-to-understand reports. It supports creating an operations view that include maps, lists, charts, gauges, and more based on live geographic data defined in a web map or web service. Multiple operation views can be defined to meet the needs of stakeholders focusing on different aspects of the operation. With this ability to integrate disparate information sources into a common operational picture of all facilities, GIS provides greater power to control township operations and positively impact bottom line.

Conclusion

GIS can be used throughout the life cycle of a smart city – from site selection, design and construction to use and maintenance. GIS is an ideal technology that has the ability to scale across any expanse, from the individual asset within a building to a virtually global context tying all aspects of a Smart City planning and development.