Original Research Article

# USE OF GIS URBAN PLANNING SCIENCE

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**Abstract**: The development of the city will bring new opportunities for urban GIS. Urban and regional planners use Esri technology to envision a better future for communities. Take a geospatial approach to create safe, vibrant places where people can live, work, learn, and play. Planners, developers, landscape architects, and urban designers can use Esri maps and spatial analytics to make the case for change, streamline the development process, and engage citizens. GIS has expanded from a niche technology used by specialists to an integrated information technology used throughout an organization. While the demand for staff who specialize in GIS persists, numerous planning and economic development, community development, and public works professionals are embracing GIS as a basic tool for conducting their daily business. ESRI supports both approaches with an array of tools for GIS professionals performing georeferenced tasks and those who use GIS in many disciplines to improve efficiency and productivity and centralize information.

Many planning departments that have acquired mapping systems in the past have since shifted to GIS in lieu of mapping software (French and Wiggins 1990). With the increase in user friendliness and the number of functions of GIS software, and the marked decrease in the prices of GIS hardware, GIS is now an operational and affordable information system for planning. It is increasingly becoming an important component in the planning support system. Recent advances in the integration of GIS with planning models, visualization, and the Internet will make GIS more useful to urban planning. Today, the main constraints on the use of GIS in urban planning are not technical issues, but the availability of data, organizational change, and staffing.

Key words: Urban, regional city, planning, GIS.

**Introduction:** The 40 largest cities in the United States each have their own character and personality. But one thing that they all have in common is the need for a great park system. Some cities are well on their way to achieving this goal, but others have a great deal of work to do.

Parks are important to communities because nearby opportunities to exercise and experience nature is essential for physical and mental well-being. Studies show that parks can encourage physical activity, revitalize local economies, and help bring neighborhoods together.
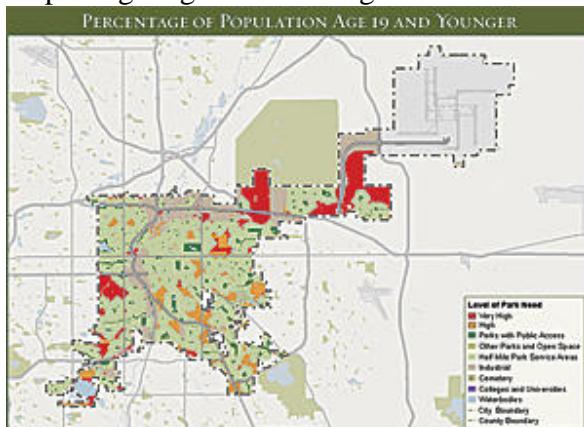


This ParkScore map illustrates the level of park need for Denver's children and adolescents by showing the areas of the city with and without park access.

This is why the Trust for Public Land ParkScore Project was developed. ParkScore is the most comprehensive park rating system ever developed and measures, on a scale of 0 to 100, how well cities are meeting the need for parks. The ParkScore website, ParkScore.TPL.org, is free and fully accessible to all. The goal is to empower communities to put more parks on the ground.

ParkScore serves two categories of users. The first consists of individuals and families. The website provides residents with a quick and easy way of seeing their city's park system in detail and allows them to compare their city with others across the United States. This will provide users with both a national perspective on their local park access and the tools to advocate for park improvements in their communities.

The second audience for ParkScore is city planners, park managers, and other local leaders. The website allows these users to dig deep into their city's park system. This helps leaders better serve their residents by providing them with the tools to jump-start local park system improvement plans. On the website, users can view the following:

- A citywide analysis of park access by age and income level
- Detailed information about each city park
- Data and analysis pinpointing where parks are needed most critically and identifying which improvements would provide the greatest benefit to local park systems

This kind of information is exactly what is needed to support comprehensive park system improvement programs.

The ArcGIS mapping technology used for this project identifies which neighborhoods and demographics are underserved by parks and how many people are able to reach a park within a 10-minute walk. The Trust for Public Land selected ArcGIS technology because it provides a robust set of tools and applications for detailed park system analyses and, since it is used by most local governments, allows an easy exchange of information. The ArcGIS platform was also selected because it allowed the creation of walking networks, providing a model for how people walk from their homes and other locations to parks and showing how park access can be increased.

City leaders, such as San Diego mayor Jerry Sanders, are already embracing ParkScore. San Diego's park system ranked 8th among the 40 largest US cities.
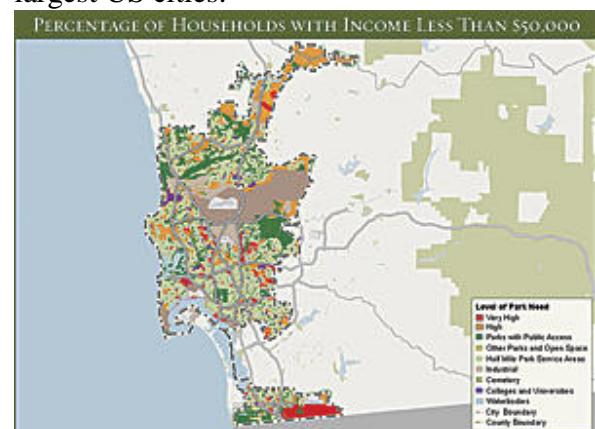


Fig 1: Use of GIS in modern city.

The level of park need in San Diego for those with a household income of less than $50,000 is

illustrated by showing the areas of the city with and without park access.

Says Sanders, "In San Diego, our parks system is a source of immense civic pride. From our community parks to our hiking trails to crown jewels like Balboa Park, San Diegans love to enjoy our famous sunshine in our public green spaces. We're proud that the Trust for Public Land has recognized our parks on a national level. Like all cities, San Diego has experienced tight budgets in recent years, but as we embark on a recovery, I've already tapped our parks as one of the first places to reap the benefits of increasing revenues. We hope to keep our parks among America's best for years to come."

Officials in Denver, whose park system ranked 13th, feel the same way. Lauri Dannemiller, manager of Denver Parks and Recreation, says, "We are proud to be opening parks in parts of Denver that have not seen new parks in a generation, and like most cities operating with strained resources, it is partnerships with groups like the Trust for Public Land that make this progress possible."

Joseph Lovell, a senior GIS analyst with Denver Parks and Recreation, says ParkScore's GIS technology makes it a powerful planning tool for city leaders. He continues, "ParkScore is unique because the GIS analysis didn't just measure park access by distance but also factored in whether there were barriers to access, such as a river or a highway that would hinder park usage. In areas where there is limited park access and land acquisition isn't possible, we're using the ParkScore results to improve connectivity between citizens and existing parks."

The website's ability to offer city leaders a series of solutions and next steps for how to fill the gaps in local park systems that were identified by ParkScore analysis fits in with the Trust for Public Land's four primary services: analyzing local landscapes and identifying where there are gaps in park access, securing funding for land transactions, executing land transactions, and designing and developing parkland once it has been secured.

"You can't have a great city without a great park system," says Christopher Kay, chief operating officer of the Trust for Public Land. "The Trust for Public Land hopes that ParkScore inspires cities to focus on parks, and we're eager to work with municipal leaders and volunteers to help them build the best park systems imaginable."

The development review process ensures that plans for development adhere to federal, state, and regional requirements as well as protect citizens from environmental or public safety hazards and support progressive economic development. Planning agencies are integrating ESRI$^{®}$ Software solutions as a central component in the development review process. The functionality of ESRI's GIS software streamlines design review activities such as mapping, site review, notification, analysis, and environmental review. GIS integrates and streamlines processes among different departments. ESRI's GIS software, the next step in the evolution of information technology, streamlines the development review process by sharing data. Using a central information base eliminates problems caused by conflicting data.
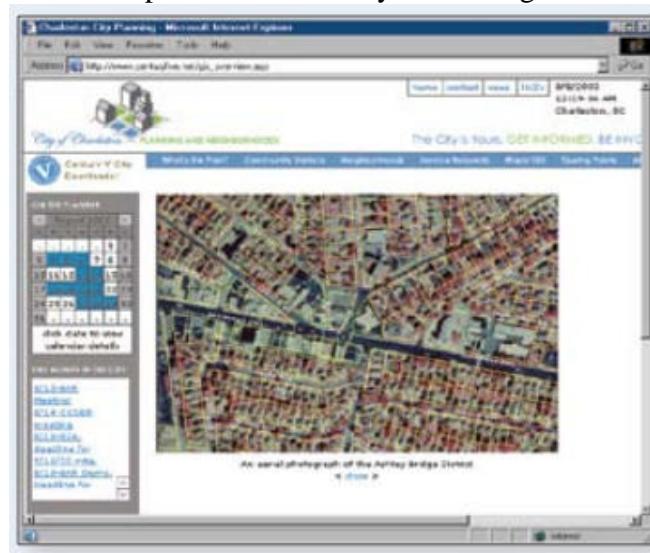


Fig 2: Different level of GIS

The final report and image maps were made available to the public on a CD –ROM. The BCDCOG incorporated the imagery and change data into its Arc View database to assist local

planners in identifying land use trends and developable land and to create more accurate basemaps. The project successfully produced the first multitemporal image database for use by local and regional planners in the area.

**Results:** A geographic information system can have an impact on your life without you ever knowing it. A GIS is a computer system designed to capture, store, manipulate, analyze, manage, and present a variety of spatial and geographical data. GIS technology is often used in urban planning, and impacts people living in the area in many ways

Urban planning requires including many layers of detail on a single map, and one of the features of a GIS is multilayered mapping. Each of these layers has different types of information and data associated with it. A municipal planning committee can use a GIS to see a variety of different things, including prime agricultural land, surface water, high flood frequency, and highly erodible land. This multilayered capability can make a big difference when developing an area, for example places with high flood frequency could lead to high flood insurance premiums for residents, which may detract from people wanting to live there.
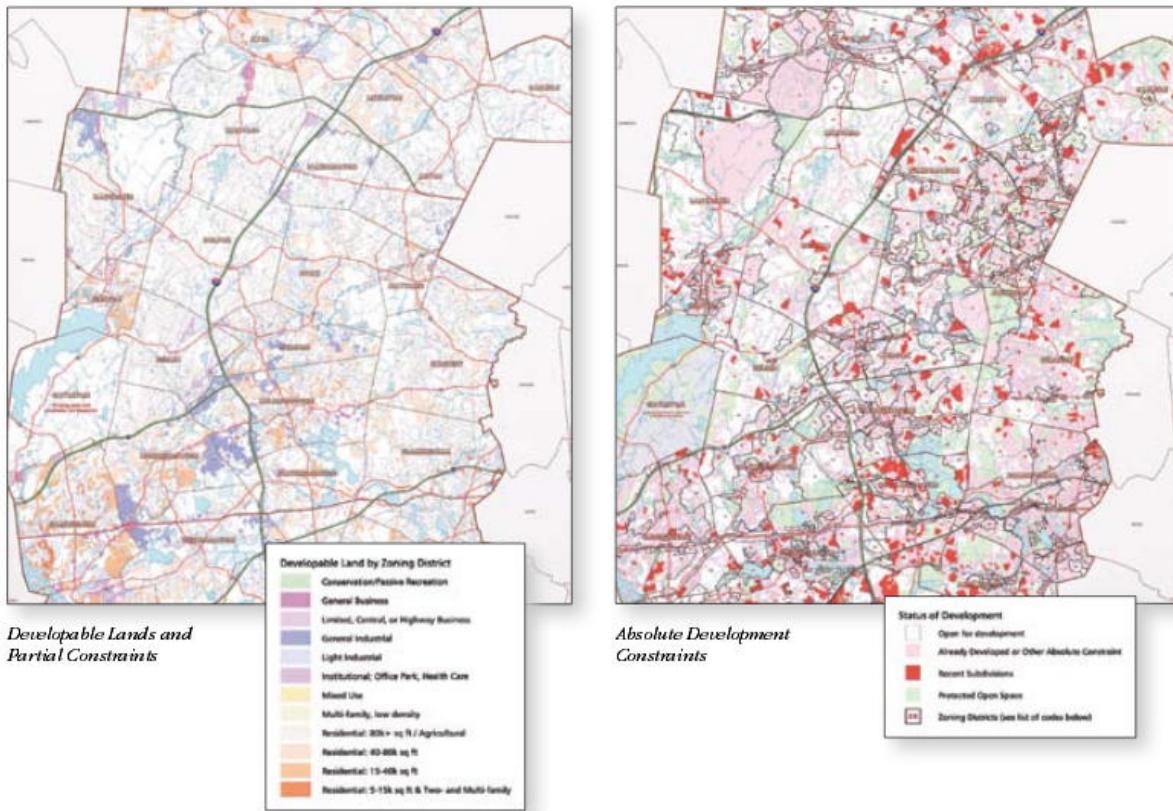


Fig 3: Massachusetts Geographic Information System

**Permits:** Zoning permits and building permits are based on a variety of things. While a GIS may not be able to cover all of these factors, it can help in a number of ways. In places that are already developed or had been previously developed and are being revamped, the GIS may

have the area covered already. This means the GIS can provide information about permits issued in the past, including permit type, when permits were issued, and what type of development they were for.

**Business Will Improve**

GIS can serve as an analytical tool to help a business decide if it should open in a certain location. Based on customer-provided data, GIS can help a business see where their potential customers might come from. For example, if a produce store opens, and it is 10 miles closer than the previous store, the business owner can conclude that customers will be likely to try his or her store if the quality and prices are comparable.

**What is in Store for the Future of GIS?**

GIS technology has developed rapidly over the past few decades. 3D mapping has helped in many regards, but in the next decade or so, there will likely be developments that we can't yet imagine. One likely feature is 4D mapping, which will further help in urban planning as well as many other applications.GIS is quite a powerful tool, as can be seen through all of its applications in the field of urban planning. A GIS is not run by computers, but rather by people who have been specially trained and received their degree in the field, as there are large amount of analysis, modeling, and a variety of other skills that need to be taught. Using a GIS is not just important for developing an urban area, it is almost necessary in today's fast-moving and highly technological landscape.
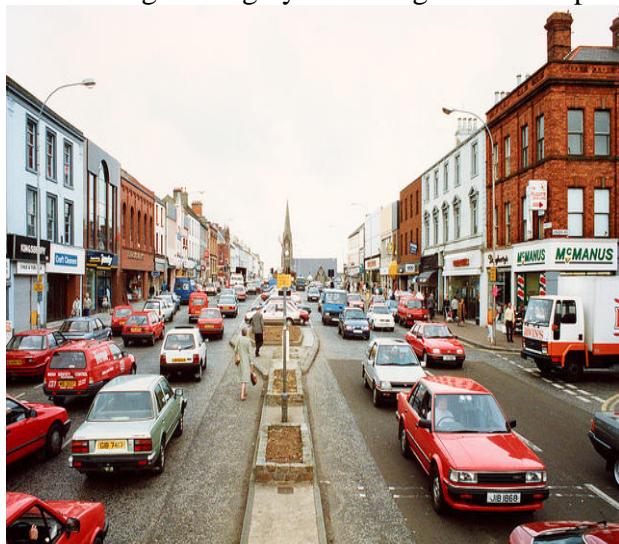


Fig 4: Show GIS in USA

the option of establishing a separate department, with its own staff, while it may help in principle efficiency of the system and to support and coordinate other departments and agencies, can be really productive only if accompanied by a planned transfer of technical know-how through the whole complex of the organization. This is the most difficult challenge for the effective implement action of these systems, which are able to introduce major changes to the functional Environment and the efficiency of the organization and of course to the quality of provided services. Many of the small and rural municipalities lack personnel and capacity to establish operational GIS unit and services immediately or in a near future. It may however be possible after some years. A more advanced municipality may serve a weaker municipality in these issues. GIS will be important for all municipalities. To day in 2008 every municipality can pave the way for future use of GIS in urban planning by ordering these services from the planning agencies in such format which allows easy use of these materials (existing and updated cadastral maps, urban plans) by GIS in the future

**Conclusion:**

Urban planning is one of the main applications of GIS. Urban planners use GIS both as a spatial database and as an analysis and modeling tool. The applications of GIS vary according to the different stages, levels, sectors, and functions of urban planning. With the increase in user-friendliness and functions of GIS software and the marked decrease in the prices of GIS hardware, GIS is an operational and affordable information system for planning. It is increasingly becoming an important component of planning support systems. Recent advances in the integration of GIS with planning models, visualization, and the Internet will make GIS more useful to urban planning. The main constraints in the use of GIS in urban planning

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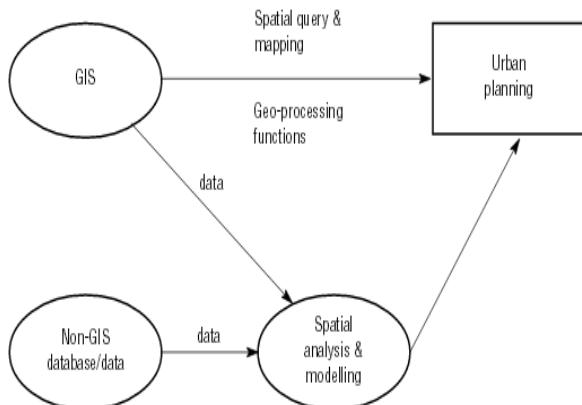


Fig 5: Relation at GIS and urban planning

The use of the GIS in urban planning does not depend solely on the development of new GIS software and hardware. Indeed these considerations may be amongst the least important in influencing whether GIS is used in urban planning in a city (see Campbell, Chapter 44). The status and character of the organization, data, state-of-the-art of planning, and staff are more important factors, and this section considers their importance with particular regard to developing countries.

There are three sets of conditions that are important in effective implementation of GIS:

1 an information management strategy that identifies the needs of users and takes account of the resources at the disposal of the organization;

2 commitment to and participation in, the implementation of any form of information technology by individuals at all levels of the organization;

3 A high degree of organizational and environmental stability (Campbell 1994; Maser and Campbell 1991). GIS that are most likely to be used are those that can deal with identifiable problems. More complex applications are less likely to be developed than simple ones.
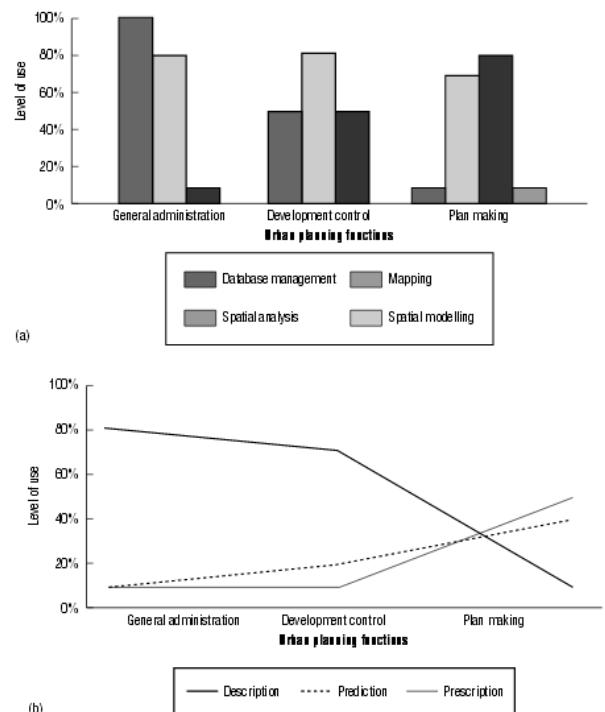


Fig 6. (a) Use of GIS functions in urban planning; and (b) their importance for description, prediction, and prescription functions in three types of urban planning activity.

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