For the last 30 years, government, business, and academic organizations have been building a geospatial fabric that incorporates parcel, transportation, and other information. Although tremendous progress has been made in this endeavor, it is a fabric rent with gaping holes. These holes in the geospatial fabric represent building footprints, and they are cause for concern.

Urban areas constitute a man-made ecosystem that has a profound effect on the natural landscape surrounding it. Buildings are also where more of the population spends its time and where capital is most concentrated.

Why has geospatial information stopped at the building footprint level? In part, this was a by-product of how many organizations created basemaps. Many relied on aerial photography and/or GPS, which are data capture methods blind to building interiors.

However, understanding the urban ecosystem is becoming increasingly important. According to the United Nations Population Fund, in 2008—for the first time in history—more than half the world's population lived in towns and cities. The trend toward urbanization is accelerating, and in densly developed places like Manhattan, the extent of the floor space in its buildings far outstrips the land area encompassed by the borough's boundaries.

Facilities management (FM) is the interdisciplinary profession that integrates support for people, places, processes, and technology used to manage the built environment. *Facilities* is a broad term that covers airports, university campuses, military bases, and commercial campuses. By considering the interactions of all processes, FM allows building systems to be managed strategically. An abundance of data about buildings exists in CAD and building information modeling (BIM) formats.

Increasingly, FM professionals are turning to GIS, with its tremendous capacity for integrating this detailed data from disparate sources. Instead of looking at facilities as a collection of parts, GIS lets managers see these subsystems holistically as parts of a whole, integrated based on commonality of location, which enables analyses. GIS is a complementary, not competitive, technology that brings data on the built and natural environments together and spans scales from the global to a building interior.

GIS can be used to follow a building through its entire life cycle from site selection, design, and construction to use, maintenance, and adaptation, through closing, repurposing, and reclamation. The challenge is managing each step of the process so a building's benefits are maximized and its short- and long-term impacts on the natural environment minimized.

The Next Great

The ability of GIS to assess the relationship between a building and the landscape that surrounds it can be analyzed with respect to effects on both the building and its environment. Through simulation, a building can be placed in specific environments to evaluate its performance and determine how location changes the structural requirements for that building. Aspects of design, such as energy efficiency or resistance to effects of climate change, can be incorporated into this simulation testing. By running the analysis from a geodesign perspective, the effect of the building on the landscape can be modeled, measured, and modified where necessary. By relating existing structures and systems on a campus or military base to the requirements for new infill, buildings can optimally sited.

The GIS tools available for these analyses are rapidly improving. With the recent acquisition of Procedural by Esri, the technology in its CityEngine 3D cities and buildings modeling software will be integrated into ArcGIS, providing full 3D design in geographic space.

3D visualization is a vital aspect of GIS use for FM because it provides the multiple views at the level of detail needed not only to construct the building but also to identify possible conflicts before construction starts. In addition, some problems, such as line of site, collision detection, containment, skyline, and shadow analysis, can only be solved with 3D.

The ability to model virtual cities on scales down to the contents of individual rooms benefits not only design and construction but also facility and space management within buildings. GIS-based analysis at the building level supports decisions related to allocation and monitoring of fixed resources such as printers in an office or crash carts in a hosptial. This same capability can address emergency preparedness issues such as determining the best route for evacuating not only the building but the vicinity. By adding the fourth dimension, time, GIS can more effectively manage maintenance activities. Work orders can be consolidated based on both location and time frame.

The incorporation of GIS into FM continues to be driven by many factors. For many organizations, rising facility overhead (especially as related to energy costs) remains the largest operating cost item after personnel expense. Sustainability is becoming important to many organizations, particularly educational institutions. The need for a more effective method of addressing the vulnerabilities of public places to security threats remains pressing. Finally, in the current adverse economic climate, the need for buidlings that are compliant, competitive, safe, and sustainable is greater than ever. Consequently, the urban landscape is the next great frontier for GIS.

GIS Frontier