

GEOSPATIAL INFORMATION: The Key to Smart Infrastructure Investments

A Paper of the National Geospatial Advisory Committee



Introduction

As the Nation begins prioritizing infrastructure renewal, accurate and reliable information of myriad types will help ensure that scarce dollars are spent in the most efficient and effective manner possible. Geospatial information and technologies facilitate awareness and understanding of the precise location of every facet of our Nation's infrastructure – from underground to airborne. These resources are critical to the infrastructure renewal effort. Fortunately, tremendous advances in geospatial technologies, many driven in the commercial sector, have made these tools far more powerful, accessible, and useable. Knowing where features are located and how they relate to one another, including critical dependencies, is a required first step to making good decisions about infrastructure investments.

Utilization of public and private expenditures on infrastructure development is currently inefficient. For example, the current practice for the construction of roadways is often poorly coordinated among affiliated infrastructure operators. The result is often a newly paved road torn apart multiple times for the installation and/or repair of sewer, water, gas, cable, and electric systems. Holistically prioritizing, planning, and executing such infrastructure projects is a best practice for avoiding such waste. Use of geospatial technologies, such as intelligent maps, are the key to efficiently prioritizing, planning, and executing related infrastructure projects and optimizing public and private investments. Intelligent maps contain detailed information about current and planned infrastructure improvements, such as pothole locations coupled with traffic flow, pavement type, etc. These maps can be digitally shared across sectors to improve infrastructure project planning and operations. Intelligent maps are just one example of the many geospatial technologies that can effectively inform infrastructure renewal.

This paper highlights the crucial role of geospatial technologies in support of infrastructure planning and development and suggests approaches to maximize return on investment.

The Problem

Our rapidly aging infrastructure is already creating safety hazards and diminished quality of life, heightening vulnerability to natural disasters, and impairing economic growth. Renewal of our infrastructure is a national imperative and requires cooperative and coordinated action by the private sector and all levels of government.

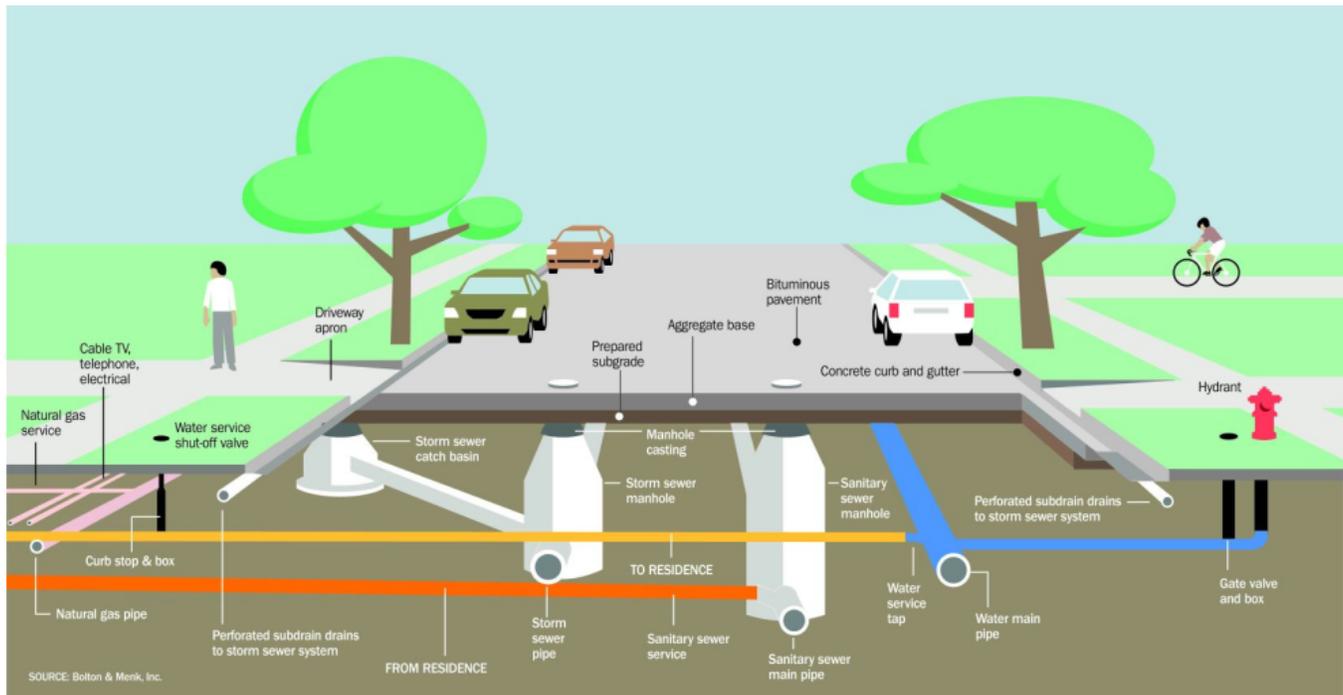
Prioritizing the allocation and expenditure of limited funds requires smart, timely, data-driven, and efficient investments to ensure that the many elements involved work in a coordinated fashion. Such investments must account for society's current and future needs, using a sustainable approach. Economic factors such as job creation and innovation are important downstream benefit considerations which must be part of the construction and rehabilitation process.

The Opportunity

Renewal of infrastructure throughout the Nation presents a historic opportunity. Collaboration across infrastructure sectors provides a unique possibility to shape infrastructure that meets future needs. The effective use of technology to create "smart cities" through thoughtful and coordinated infrastructure planning of mass transit, low-impact development, and public spaces that help build resilient communities will significantly reduce expenditures while improving quality of life. Geospatial technologies are vital to effective management of infrastructure assets over their entire lifecycle (design, construction, operation, and maintenance).

Anytown, USA Example

A “smart city” illustrates the power of geospatial technology to improve infrastructure renewal. Imagine the City of Anytown, USA, a city that, like most in the United States, relies for its prosperity upon multiple interrelated infrastructures, above ground, on the surface, and underground, as shown in the figure below.



Geospatial technologies empower planning, design, construction, and maintenance for a variety of infrastructure assets, such as storm drains, water mains, gas pipelines, tunnels, bridges, the electrical grid, broadband, and more. Geospatial technology also enables 3D infrastructure modeling. Use of such models enables the visualization and validation of projects during the planning process, allowing investors and operators to better understand costs and benefits. The use of geospatial technology during design and construction helps to identify and resolve conflicts, such as competition for limited space underground.

Challenges

While geospatial technologies are already being used to support infrastructure development, there is significant room for improvement, particularly for coordination among government agencies and private entities. For example, a city may plan roadway improvements based on road condition, while a utility may plan pipeline renewals based on pipeline condition. Each plan makes sense in isolation but could result in missed opportunities to gain efficiencies. Constructing new pipelines prior to paving a road is ideal, as is routing those same pipelines to avoid future planned pipelines. The use of sophisticated geospatial technologies applied to time and space management greatly enhances the toolset available to infrastructure planners and operators coping with highly complex and intricate projects. Creating and maintaining geospatial data and models to feed these powerful new technologies is a key challenge which requires financial resources and intergovernmental coordination.

The Path Forward

All levels of government and private entities have a role to play in using geospatial technologies to enhance the efficiency of infrastructure renewal. The Federal government’s role includes:

1. Support foundational data such as remotely sensed imagery, address data, and other National Geospatial Data Assets.
2. Promote data sharing standards to reduce duplicated effort and enhance data sharing.
3. Utilize geospatial data and tools, including the GeoPlatform (www.geoplatform.gov), to plan, manage, track, and communicate the results of a national infrastructure initiative.
4. Ensure that infrastructure grant funds may be applied to geospatial data, systems, and services. Such investments are as important as investments in steel and concrete, but with a far greater return.
5. Modernize governance of geospatial data and programs nationally to reduce duplication and capture increased efficiencies.