

GEOSPATIAL INFORMATION: Infrastructure Renewal Best Practices

A Paper of the National Geospatial Advisory Committee

Introduction

Geospatial information and technologies are powerful tools that can help drive smart decision-making on infrastructure priorities and investments. Geospatial data and tools address infrastructure issues by 1) mapping and illuminating infrastructure needs in the context of population, economy, jobs, and impacts; 2) driving smart project design and execution; and 3) tracking, monitoring, and communicating progress and results of the investments. The National Geospatial Advisory Committee has developed a suite of documents describing the vital role geospatial tools play in supporting infrastructure renewal, including a paper, "[Geospatial Information: The Key to Smart Infrastructure Investments](#)" and a set of use cases on [Permit Streamlining](#), [Underground Renewal](#), [Pavement Management](#), and the [New York Cultural Resource Information System](#). This paper summarizes best practices for successful geospatial support in infrastructure programs. The best practices have some overlap, but generally build on each other.

Top 10 List of Best Practices

- 1. Data Requirements.** Determine geospatial data requirements for infrastructure renewal or rehabilitation. As with every project or program, one of the first steps is determination of requirementsⁱ ...in this case, determining what data are required to support infrastructure renewal or rehabilitation. Data collection to support infrastructure renewal and rehabilitation is a large percentage of the total cost. The vast majority of the required data for any infrastructure project is geospatial data regarding the relationship of the project to the surrounding environment and to other existing infrastructure. Additional data to consider are the condition of the asset, the consequence of failure, the likelihood of failure, and remaining useful life.
- 2. Crawl-walk-run Approach.** Prove out and fine-tune geospatial data needs and workflows with a few small projects before scaling the projects up. Even the best data requirements gathering tends to miss something on the first iteration. Field-test the solution and gather feedback from stakeholders. Field testing is a chance to eliminate unnecessary steps, streamline workflows and validate data quality. This will safeguard against finding problems after a large project is well into implementation.
- 3. Policy Framework.** Identify policies that are needed or that need to be changed to support interrelated infrastructure renewal or maintenance. A policy framework can be very beneficial and conducive to efficient infrastructure renewal and maintenance. In particular, policies should encourage transparency, collaboration, performance management, asset management, professional project management, open data, and portfolio management with respect to geospatial data.
- 4. Governance Structure.** Identify stakeholders and form a governance structure to make collaborative decisions, about infrastructure and the geospatial data needed to support infrastructure, that will save time and money. Collaborative governance is an organizational structure within which partners can make decisions together. Such a governance structure is essential for making decisions when projects involve stakeholders that have no authority over one another and do not fall under the purview of the same governing body.ⁱⁱ Infrastructure projects are typically constructed or renewed in areas where other infrastructure already exists or is being planned, and in areas where natural hazards or environmentally

sensitive areas must be avoided or mitigated. Geospatial data about these projects is typically managed by multiple bodies and it is essential to manage that data holistically.

5. **Programmatic Approach.** Consider a programmatic, place-based approach to infrastructure renewal or rehabilitation, rather than a one-off project approach. Almost all public infrastructure projects in the same geographic area will have an impact on other projects, current or planned. Managing the geospatial data about all projects as an infrastructure program or portfolio and engaging a variety of owners and stakeholders will save time and money. This approach will also result in better support from the public.
6. **Align Workflow and Strategy.** Align operational workflows with strategic initiatives for the infrastructure portfolio of the region. Often, geospatial data about work activities like maintenance tasks, equipment, labor, and materials are collected only to measure operations performance. Aligning these operational activities with capital planning strategies creates an integrated infrastructure management system. Demonstrating a vision that everyone in the organization is an infrastructure manager will help build a coalition based on capital program strategy and operations management, ensuring that maintenance and operations are an integral part of the infrastructure management strategy. Geospatial data can then be used to help manage the regional infrastructure portfolio in a more effective manner.
7. **Common Narrative.** Create a common narrative with collaborative stakeholders when addressing decision makers. Geospatial data and services can be used to develop and visualize a holistic approach to infrastructure development or renewal. Because most infrastructure in a region or jurisdiction is inextricably linked, planning for new infrastructure or renewing existing infrastructure as a commonly held investment is the most efficient approach. Describing this approach using a common narrative that all stakeholders share will typically result in better understanding for decision makers, resulting in successful investment requests.
8. **Performance Management.** Determine outcome-based tracking indicators before the work begins and measure performance against indicators. Measuring performance is critical to project management and requests for future investment. It has been said that it is difficult to manage a project unless the results can be measured. To measure results of a project, tracking indicators must be determined prior to project initiation. Establishing a working group comprised of stakeholder representatives to oversee the performance measurement process is a good first step.ⁱⁱⁱ Geospatial data comprise the essential measurement information, and geospatial services can help determine indicators and visualize outcome results of interrelated infrastructure projects in a region.
9. **Service Level Goals.** Understanding the difference between reality and expectations of the serviceable life of infrastructure is challenging for practitioners and decision makers. Too often, fiscal decisions drive levels of service. It is difficult to change the conversation without additional information. Developing a geospatial asset inventory, condition assessment, and forecast for the consequence and probability of failure is paramount to solve the puzzle. Information presented in this fashion, along with calibrating against available funding, is a powerful method to visualize reality. For example, an analysis of this type may show water main replacement lifecycles are at a 200-year interval, whereas the recommended industry standard is 100 years.
10. **Data Management.** Make geospatial data accessible, useable, and authoritative. Among the top concerns are deciding up front which interoperability standards will be followed, designating which party will collect which data, and defining how changes to data will be managed.

ⁱ **A Guide to the Project Management Body of Knowledge** – Sixth Edition, Project Management Institute Inc., 2017

ⁱⁱ **Collaborative Governance Regimes**, Emerson & Nabatchi, 2015

ⁱⁱⁱ **Performance Measurement; Getting Results** – Second Edition, Harry P. Hatry, Urban International Press, 2006