National Geospatial Advisory Committee

Geospatial Technology and Infrastructure Use Case:

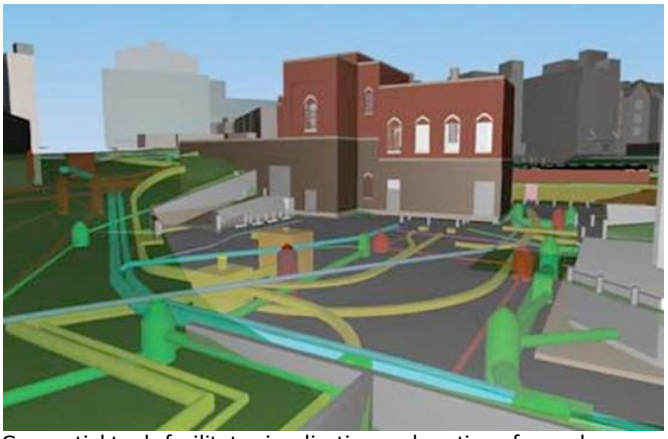
UNDERGROUND RENEWAL

Modern society is made possible by a vast network of underground infrastructure – water, power, telecommunications, sewers and more. That infrastructure in turn relies upon geospatial technology at every point in its life from the earliest days planning an infrastructure project, through design and construction, and into the decades-long operations and maintenance phase.

Benefits of Geospatial Technology

Geospatial technology is a crucial tool to address the needed renewal of subsurface infrastructure. It supports every step of the process including:

- **Project planning**. Geographic Information Systems allow pipelines to be routed to avoid other utilities, geo-hazards such as landslides, and environmentally sensitive areas such as habitat for threatened species. GIS also allows data to be shared by various stakeholders so that everybody's planned work is visible to all.
- **Design**. State of the art surveying methods such as GNSS, drones and LiDAR save time and allow data to be gathered with less traffic disruption.
- **Construction**. Geospatial technology records the precise location of buried infrastructure so that it can be located later, and so that costly "dig-ins" do not occur.



Geospatial tools facilitate visualization and routing of complex subsurface infrastructure at Duke University.

SOURCE: RMF Engineering

- **Operations and maintenance**. GIS tools have become an essential tool for operations and maintenance, as GIS provides much more than just a map. With GIS, infrastructure operators can quickly model and visualize system changes, both planned and unplanned. GIS also enables maintenance personnel to quickly locate and schedule repairs, identify impacted customers, and identify potential problems before they occur.

Description

Beneath the surface of nearly every urban roadway lies a network of essential infrastructure including pipes and conduits to deliver drinking water, natural gas, electrical power and telecommunications signals, as well as pipes to remove stormwater and sanitary sewage. Society's reliance on this network of essential infrastructure has grown over the past several decades, to the point where a day without essential infrastructure services such as drinking water or electric power is considered a serious issue.

Many infrastructure systems are approaching the end of their economic life and require replacement or rehabilitation to maintain high reliability. The American Society of Civil Engineers estimates that approximately $5 trillion of investment will be required between now and 2040 for renewal of infrastructure.[1] That renewal is in general a far more complex task than was the original construction. For example, the original construction of a water main 100 years ago may have involved essentially digging a ditch and placing a pipe in it. Today, renewing that same pipe requires navigating a subsurface that is now congested with other utilities, and working on a street that carries several times more traffic than it did 100 years ago.

Challenges

Geospatial technology, like any tool, is an investment that requires resources. A long-term perspective is needed since data gathered today into a GIS may yield dividends over the entire 100-year life of a buried asset.

Tips

Recognize that the biggest geospatial investments are not software and hardware, but people and data.

Crawl-walk-run. Geospatial technologies cover a wide domain of application. While a long-term perspective is needed, it's also important to look for incremental benefits.

[1] ASCE Failure to Act 2016, Table 2, at https://www.infrastructurereportcard.org/wp-content/uploads/2016/10/ASCE-Failure-to-Act-2016-FINAL.pdf