

L&T Achieves Excellence in Irrigation Infrastructure Construction with ArcGIS

Client

L&T Construction

Industry

AEC

Organization Profile

L&T Construction is a division of Larsen & Toubro (L&T) a major Indian technology, engineering, construction, manufacturing and financial services conglomerate, with global operations. L&T addresses critical needs in key sectors - Hydrocarbon, Infrastructure, Power, Process Industries and Defense - for customers in over 30 countries around the world. L&T is engaged in core high impact sectors of the economy and integrated capabilities span the entire spectrum of 'design to deliver'. With over 8 decades of a strong, customer focused approach and a continuous quest for world-class quality, L&T have unmatched expertise across Technology, Engineering, Construction, Infrastructure Projects and Manufacturing.

Website

www.lntec.com

Project

GIS-based Progress Monitoring of Irrigation Infrastructure

Highlights

- Esri's GIS system provides up to 90% improved visualization of pipe laying activity and its execution progress.
- GIS-enabled real-time mapping of project advancements helps to identify areas of challenges.
- The GIS system fosters collaboration and transparency among stakeholders.
- End-to-end digital tracking of material tracking from factory to site commissioning.
- More than 95% material utilization.
- Savings of up to 10% of pipe material cost during procurement.

Project Summary

L&T secured orders from the Government of Madhya Pradesh Micro Lift Irrigation Schemes. The intent of the project is to provide water for micro-irrigation to 1 lakh hectares of farmland in the districts of Madhya Pradesh, by lifting 32.04 cusecs of water from Indira Sagar Project reservoir. The scope of work includes survey, design, procurement, construction and installation of pumping systems, transmission and distribution of pipeline networks, electrical power transmission line and automation system by SCADA. For a massive project like this, assessment of construction progress and comparison with the planned progress play a vital role in project management. Effective and timely progress monitoring enables the project team to take effective actions against delays and discrepancies. Esri's Enterprise GIS system is helping to achieve that. Since the construction itself is carried out in some geographic location, adding a location dimension for monitoring progress increases its effectiveness phenomenally. Spatially representing progress information on a map facilitates clear communication and enables efficient decision-making.

Challenges

Construction planners lack a comprehensive spatial understanding of the terrain, making it difficult to identify optimal locations for irrigation infrastructure. This can lead to suboptimal project designs and inefficient water distribution. Without digital and GIS technology, data collection becomes a time-consuming and error-prone process, hindering the accuracy of project assessments.

The lack of GIS hampers effective monitoring and evaluation, impeding the ability to track progress and identify potential issues in a timely manner. Without GIS solutions, communication and coordination among project stakeholders become cumbersome, leading to potential delays and mismanagement. Additionally, the absence of GIS limits the ability to analyze historical data and predict future water requirements accurately. Furthermore, the manual handling of vast amounts of information without digital support increases the risk of errors and inefficiencies in decision-making. Finally, the lack of GIS inhibits the integration of various data sources, hindering a holistic understanding of the complex factors influencing irrigation project success. In essence, the absence of GIS and digital solutions in irrigation projects undermines efficiency, accuracy, and overall project effectiveness.

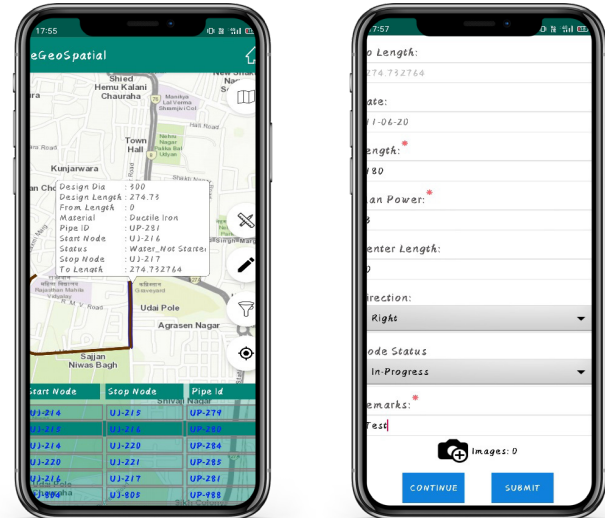
Solution

Progress monitoring using Esri's Enterprise GIS solution encompasses monitoring and viewing the status of construction progress in map-based web portals. This type of browser-based web portal gives L&T Construction an

advantage in customizing the way the progress needs to be shown. Since all the progress information is displayed on the map from a properly structured geodatabase, additional attribute information regarding the progress can also be obtained from the database. This information, if required, can be depicted as charts or percentages. Depending upon the type of structure or feature, the way of representing the progress differs.

Progress update via mobile app

Enterprise GIS solutions are flexible enough to be integrated with almost any system. Data acquired from a mobile app is displayed on the map in real time. The status and progress of the field construction are updated in a mobile app by the field engineer. That data is received as a map service and shown on the portal. Apart from displaying just numbers and colors, additional statistical information can also be calculated and shown if required. This will enable the office personnel to track the progress in real time. Besides, the progress of the features is shown on top of satellite and drone photos. This gives the user a real-world feel of the structure status.

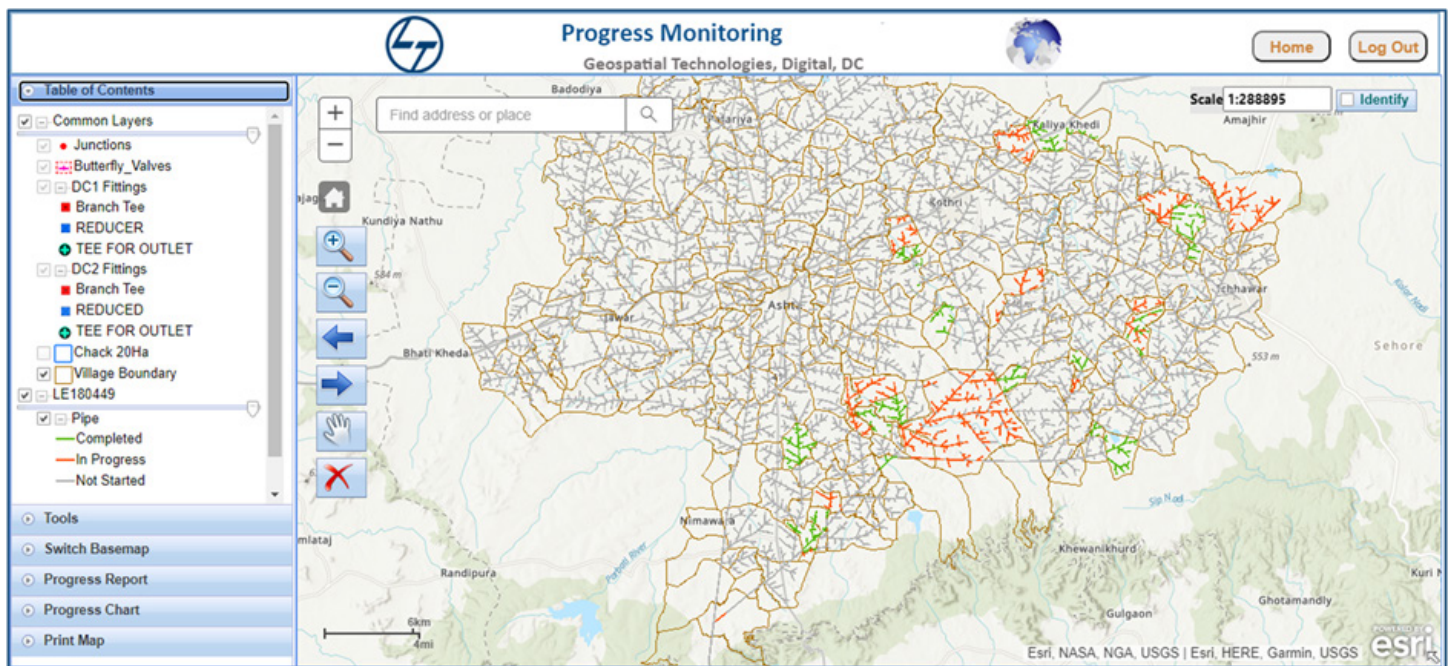


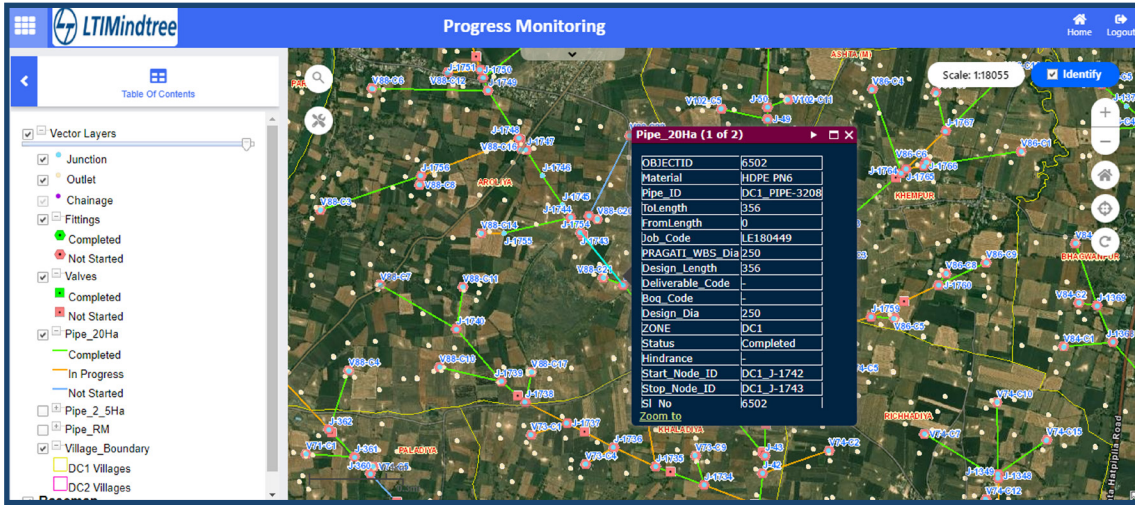
Progress update via web portal

Design progress can be updated directly in the browser-based web portal. The user can view the progress results on the map right away. Forms are given in the web portal where the user selects and enters a few projects related information based on which the design progress is monitored. Then these details are updated on the map. Since the features on the map are published as a service from our own server, along with the feature, the corresponding attribute table also gets updated. This is a major advantage of maintaining feature and design information as geodatabase.

Progress Visualization

The construction progress of the laying pipes is shown on the map below. The green features represent the completed and the red ones show the work in progress. The progress statistics can also be seen. There is a provision to view the progress via charts.






SPRINT – Spatial solution for Pipe Reconciliation & Inventory Tracking

The primary objective of this module is to first identify instances of pipe theft at the node level, ensuring a granular approach to detecting and addressing this issue. Additionally, the focus extends to pinpointing the location-wise unused inventory, allowing for more efficient management and utilization of resources. Another crucial aspect involves reconciling the pipe inventory with the actual pipe issuance, aiming to streamline the tracking process and reduce discrepancies in the supply chain. To enhance operational transparency, the initiative incorporates the use of mobile technology to monitor and report progress in pipe laying activities. The mobile-based approach facilitates real-time updates, ensuring accurate and timely information on the execution progress of pipe laying tasks. Altogether, these objectives collectively contribute to a comprehensive strategy for improving efficiency, minimizing losses due to theft, optimizing inventory usage, and enhancing the overall progress monitoring of pipe laying activities.


Esri's GIS-based mobile application has been implemented to streamline data collection processes at unloading sites and monitor pipe progress, allowing for efficient tracking and management. The application supports bulk uploading of progress data, facilitating a seamless and time-effective method for inputting information. GeoAI, blend of Artificial Intelligence with Geospatial metrics is employed to accurately count pipes at unloading locations, enhancing precision and reducing the likelihood of errors in inventory tracking. The web application complements these efforts, offering validation reports and a progress dashboard for a comprehensive overview of operations. Additionally, the system incorporates alert notifications via email and provides reports in Excel and PDF formats, ensuring stakeholders are promptly informed and have access to detailed insights for effective decision-making.

WEB PORTAL TO VISUALIZE PROGRESS

REPORT TYPE




Subcontractor




Date & Stretch

ALERT / MAIL NOTIFICATION



Pipe missing



Delay in Laying

REPORTS & DASHBOARD BASED ON PROGRESS

Filters →
Date / Calendar
Subcontractor name
Stretch Start Node
Stretch Stop Node

Subcontractor Name	Supply Date	Supplied Length	Supplied Quantity	Stretch Start Node	Stretch Stop Node	Completed length (laid)	Balance / Unaccounted length
ABC	23/06	100.5	14	A-0-0	A-0-18	27	73.5
ABC	20/06	470	66	F-1-8	F-1-19	210	260

GEO-TAGGED PHOTOGRAPHS

Office Admin Web - Web Dashboard

Benefits

- Esri's GIS system plays a crucial role in the progress monitoring of water projects, offering a powerful tool for data integration, analysis, and visualization. It provides up to 90% improved visualization of pipe laying activity and its execution progress.
- Through GIS, stakeholders can efficiently track and manage various aspects of water projects, including the location of water sources, distribution networks, and infrastructure. The system has saved 10 to 15% of planning engineers' time.
- GIS-enabled real-time mapping of project advancements helps to identify areas of challenges.
- GIS-enhanced communication among project teams, government agencies, and communities fosters collaboration and transparency. Overall, the integration of GIS in water project monitoring has not only streamlined the management process but also enhanced the overall effectiveness and sustainability of water initiatives.
- The GIS system enables end-to-end digital tracking of material tracking from factory to Site commissioning.
- The system enables more than 95% material utilization.
- Since precise information is available to the project team, exact quantifications of material are estimated which results in bulk procurement and cost savings. Up to 10% of pipe material cost during procurement has been saved.

“ Esri provides extensive support throughout the project lifecycle, covering everything from tendering to O&M. Its powerful ArcGIS 3D capabilities not only boost our chances of winning projects but also streamline our workflow. ”

– Dr. Pari, Associate Vice President, Geospatial,
LTIMindtree