Bentley
Advancing Infrastructure

CASE STUDY

PT Hutama Karya Adopts Advanced Digital Technology on the USD 3.5 Billion Trans-Sumatra Toll Road Project

Bentley and Seequent® Software Helped Save 120 Days and Avoids USD 180 Million in Losses

MEETING ALL ENGINEERING CHALLENGES

The Trans-Sumatra Toll Road is an immense expressway that will stretch the length of Sumatra, from its northern tip to its southernmost point. It has more than 25 road sections in all, totaling 2,800 kilometers. It is considered crucial to the Indonesian island's economic growth and regional integration, and will cost around USD 3.5 billion. After nearly a decade of work, the toll road is set to be completed by the end of 2024, with roughly half of it operational by 2022.

Unsurprisingly, a highway that spans an entire country has some unique engineering challenges. Not least of these is navigating a constantly shifting and diverse terrain that throws up a wide range of demanding soil conditions. And that means a huge amount of data to process and integrate.

Leading Indonesian construction, toll road developer, and operator firm PT Hutama Karya was given the task of managing the strategic planning, design, and construction management, with specific emphasis on the geotechnical data management that would underpin efficient, durable, and cost-effective construction.

SEEKING ADVANCED DIGITAL TECHNOLOGY

At first, Hutama Karya used traditional data management methods to tackle the scheme. However, the team struggled to cope with the sheer scale of the project.

"We explored various approaches to address these issues," said Deska Adi Pratama, BIM officer on the project for Hutama Karya, "but managing large volumes of geotechnical data and integrating them into design decisions proved too challenging without advanced digital tools."

After several trials, the team realized that they needed digital applications to enhance their project's efficiency.

DELIVERING AHEAD OF DEADLINE AND WITH COMPLEX TERRAIN

Already familiar with Bentley and Seequent applications, Hutama Karya chose them to deliver this complex project. "That decision was driven by the need to streamline data management, enable 3D modeling and support collaborative design processes," explained Pratama. The Bentley ecosystem—including Leapfrog Works, MicroStation, OpenBridge, and OpenRoads—played a "pivotal role" in meeting the highway's engineering challenges. "Leapfrog allowed us to create accurate 3D ground models, optimising road alignments and earthworks based on detailed geological data. MicroStation, OpenBridge, and OpenRoads facilitated a model-based approach to road and bridge design, enabling rapid iteration and adaptation to changing project requirements."

The addition of PLAXIS to the solution set, in tandem with Leapfrog, was also key in providing robust geotechnical analysis of the subsurface. Across its vast and varied 2,800 kilometers, the highway exhibited an ever-changing set of soil conditions, complicating the process of achieving sure and consistent construction. The combination of Leapfrog and PLAXIS greatly simplified the compilation of soil stratigraphy, and supported the implementation of a soil improvement method. This helped avoid potential losses of around USD 185 million that could have arisen from technical failures in the construction.

To tackle the challenge of mapping difficult terrains, the highway team adopted "beyond visual line of

PROJECT SUMMARY

ORGANIZATION
PT Hutama Karya (Persero)

SOLUTION
Subsurface Modeling and Analysis

LOCATION
Pekanbaru, Riau, Indonesia

PROJECT OBJECTIVES
- To navigate constantly shifting and diverse terrain with a wide range of demanding soil conditions.
- To process and integrate data for a 2,800-kilometer roadway.

PROJECT PLAYBOOK
iTwin® Capture, Leapfrog®, OpenBridge®, OpenRoads™, PLAXIS®

FAST FACTS

- The Trans-Sumatra Toll Road is an immense expressway that will stretch the length of Sumatra, from its northern tip to its southernmost point.
- Leapfrog Works, MicroStation®, OpenBridge, and OpenRoads played a pivotal role in meeting the highway's engineering challenges.
- The new roads will encourage regional integration and support social development and community communication throughout the country.

ROI

- Leveraging Bentley and Seequent applications led to a 15% increase in productivity, translating to 6,000 work hours saved over the project duration.
- The enhanced productivity reduced project timelines by 120 days, compared to conventional methods.
- The strategic implementation of cutting-edge technology helped Hutama Karya avoid potential losses of USD 180 million.

> "By utilizing digitally synchronized tools—and ensuring a single source of truth—the entire geotechnical process became more structured and integrated."
>
> *– Deska Adi Pratama, BIM Officer, PT Hutama Karya (Persero)*

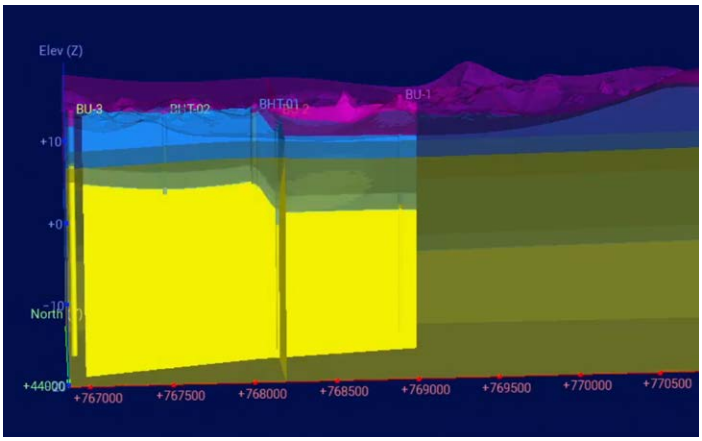
sight" technology that used drones to scan the topography, especially in the most inhospitable areas. MicroStation and iTwin Capture processed lidar point cloud data and orthophotos, respectively, providing precise digital terrain models for accurate planning and design. "By utilizing these digitally synchronized tools—and ensuring a single source of truth—the entire geotechnical process became more structured and integrated. […] We could leverage lean construction principles to minimize reworks and reduce waiting times due to efficient data sharing," said Pratama.

TURNING GEOTECHNICAL DATA INTO A MAJOR INFRASTRUCTURE SUCCESS

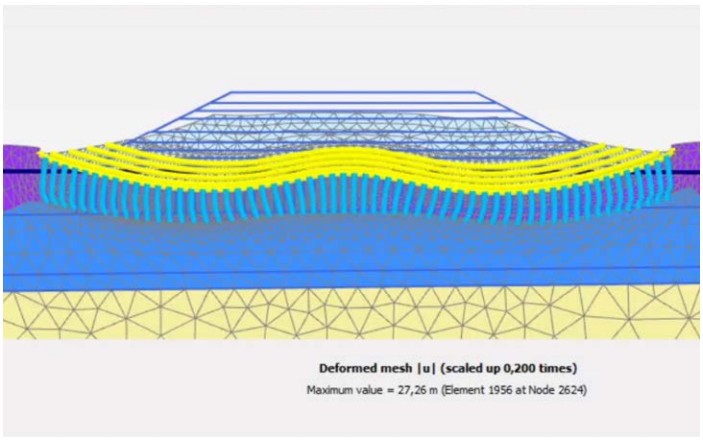
The Trans-Sumatra Toll Road will have far-reaching benefits for the island and its population. Many of its 60 million people still live in small towns, effectively off the grid. As well as stimulating economic growth, the new roads will also encourage regional integration and support social development and community communication throughout the country. By reducing travel time and congestion, they will promote safer and more efficient mobility, extra trade, and tourism, as well as improve access to essential services.

The strategic implementation of cutting-edge technology has proven transformative for Hutama Karya, helping the construction giant avert potential losses of USD 180 million on the ambitious Trans-Sumatra Toll Road project. "Leveraging Bentley applications led to a 15% increase in productivity, translating to 6,000 work hours saved over the project duration. […] This enhanced productivity ultimately reduced project timelines by 120 days, compared to conventional methods," said Pratama.

The adoption of Seequent and Bentley applications was instrumental in delivering the Trans-Sumatra Toll Road efficiently and cost effectively. Being able to bring together the highway's varied multidiscipline teams for real-time sharing of ideas and data sped up decision-making and kept everyone better informed. "They empowered us to navigate complex engineering scenarios, optimize designs, and address the project's unique challenges through advanced 3D modelling and collaborative design capabilities," said Pratama.



Leapfrog Works, MicroStation, OpenBridge, and OpenRoads played a pivotal role in meeting all engineering challenges.



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