Adani Natural Resources Achieves Comprehensive Decision-Making in Mining with ArcGIS

Client
Adani Natural Resources

Industry
Mining

Organization Profile
The scale of Adani Natural Resources (ANR) business assures a steady availability of coal, extracted in the most responsible way, which promises a constant supply of power to both urban and rural geographies of India. Mining Tech Consultancy Services (MTCS) is a leading consulting company under the umbrella of Adani Natural Resources, providing cost-effective & end to end services for mining & exploration projects in India and also exploring global market. MTCS is responsible for digitizing mining related information and providing GIS solutions for Adani Natural resources.

Website
www.adani.com/businesses/natural-resources

Project
Enterprise-wide geospatial application

Highlights
The GIS System has helped in:

- Contiguous acquisition and tracking of land in areas of interest.
- Suggesting suitable infrastructure areas.
- Monitoring large mining landscapes.
- Exploration planning in undulated topography and tracking exploration progress.
- Monitoring safety and environmental parameters in the mining area.
- Effective evacuation and logistics planning.

Project Summary

Mining entails careful planning and periodic assessment of the area during the entire lifecycle of the project. The Geospatial application developed by Adani Natural Resources is a unique initiative providing information on a single platform and giving deep insights. The GIS system developed can be used for quality decision-making based on land availability, forest details to facilitate infrastructure planning and monitoring environmental impact. The GIS application is a solution for significant challenges like different datasets with different stakeholders, complexities of having multiple mining locations, information in different formats, and datasets in different coordinate systems impacting decision-making. Advanced technology involving drones, 2D & and 3D models, and integrating non-SAP sources brought visibility to land use. The technological prowess is being enhanced as a part of Adani Mining's vision of being the leading mining company with the ethos of a responsible miner.

The objective of the project was to create:

1. Integrated database management for decision-making and query.
2. One enterprise-wide geospatial application and dashboard.
3. To ensure mining is carried out in conformance with the set standards as per the mining plan with the highest safety standards.

Challenges

Mining decisions and executions are dependent on multiple spatial and non-spatial databases like mine boundaries, surface features, land, forest details, infrastructure planning, geological report mining plans, etc. To mitigate these problems, the need of the hour was to integrate the entire database and provide a platform that could give easy access to different databases to different stakeholders.

- Different datasets are available with different stakeholders.
- Datasets are in a different coordinate system (National Grid, Modified Everest, WGS 84 Datum, local coordinates).
- Information is available in different formats like Satellite Imagery, Drones Data, Reports, Maps, Mine Planning, Mine Operations etc.
- Information does not have a spatial component leading to delays in decision-making.
- Impact on decision, planning and execution.
- Data error gets compounded with many mining sites.

Solution

Esri's ArcGIS Enterprise was deployed on-premises within the organization's service-oriented architecture. ArcGIS Enterprise is a foundational software system for GIS, powering mapping and visualization, analytics, and data management. It is the backbone for running the Esri suite of applications and custom applications. ArcGIS Enterprise is tightly integrated with ArcGIS Desktop and ArcGIS Pro for mapping and authoring and seamlessly connects with ArcGIS Online to share content between systems.
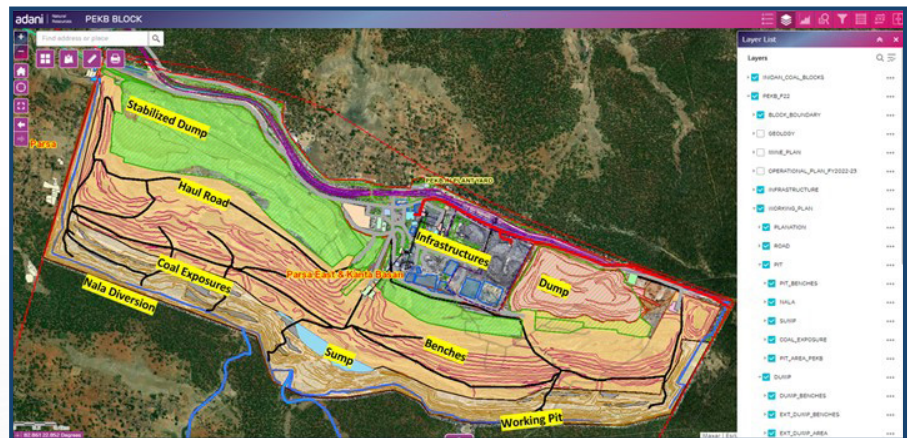

Integrated GIS Database

Adani deployed the following solutions to build a comprehensive GIS database and integrated network.

1. **ArcGIS Desktop:** Helped in the digitization of mining-related information to prepare the GIS database.
2. **ArcGIS Enterprises:** Managing a huge volume of GIS database to create organized, user-friendly WebGIS Application (both in 2D & 3D).
3. **ArcGIS Image Server:** Hosting a huge volume of drone database captured monthly for each project.
4. **Operational Dashboard:** Capturing and monitoring real time production details of mining projects, tracking budgeted verses actual production targets as well as land details with compensation status.

Benefits

GIS applications increased project efficiency, enhanced decision-making capability, dynamic planning of activities, and monitoring of mining projects. A single platform with access to multiple spatial and non-spatial databases related to mining projects helped stakeholders interact and collaborate with sharing and updating information. Some of the examples are listed below:
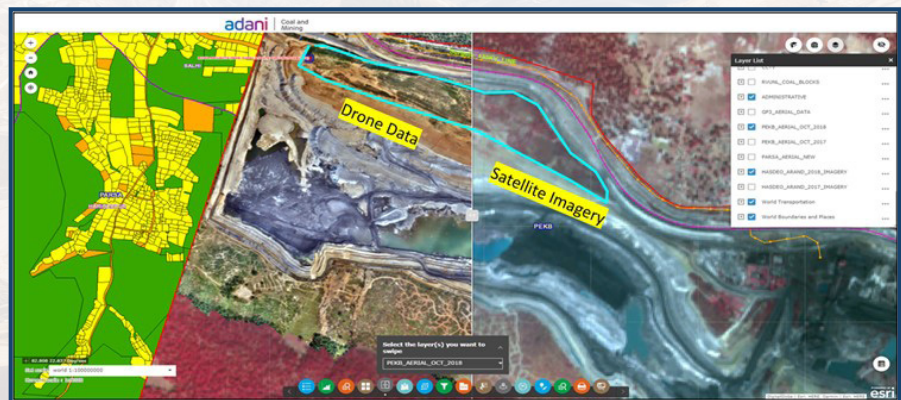

Change Detection

1. Contiguous acquisition and tracking of land in areas of interest demarcated by mine planners designated to certain activities like mining, dumping, or infrastructure areas. Similarly, mine planners continuously upgrade the working plan for every consecutive month/year on the basis of land availability.
2. Infrastructure planning in mining areas is not flexible as it must be in a non-mineralized zone. GIS applications integrate geological model databases, surface features, and existing mining features to suggest suitable infrastructure areas.
3. Monitoring large mining landscapes from drone data and tracking land reclamation details, vegetation planning, vegetation health growth, and mining operations as per DGMS safety guidelines like bench height, slope, haul road gradients, etc.
4. Exploration planning in undulated topography and tracking exploration progress through GIS dashboards and analytics.
5. Monitoring of safety and environmental parameters in the mining area.
6. Effective evacuation and logistics planning.
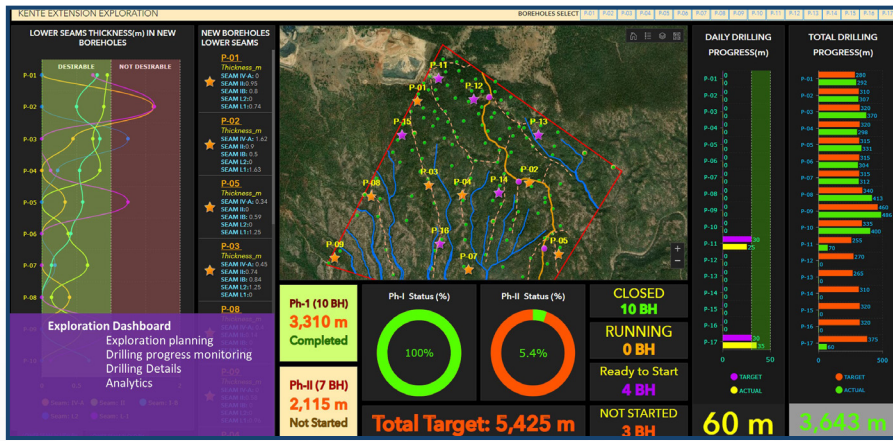
Exploration Dashboard
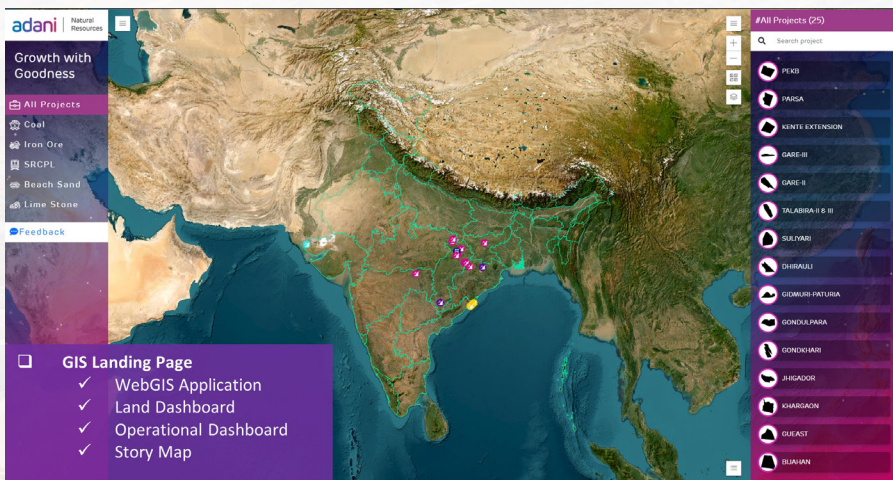
WebGIS Application

Esri's solution has provided a single platform to host, visualize, analyze, track integrated mining related information, thereby increasing effective mining related decision-making process, collaboration with stakeholders and monitoring of mining benchmarks/projects. The GIS platform has become the foundation for our digital transformation projects in mining, thereby opening windows to creative solutions, resolving challenges, ensuring safety standards, and increasing ROI of mining projects.

- Abinash Majhi, Associate General Manager, Adani Enterprises Limited