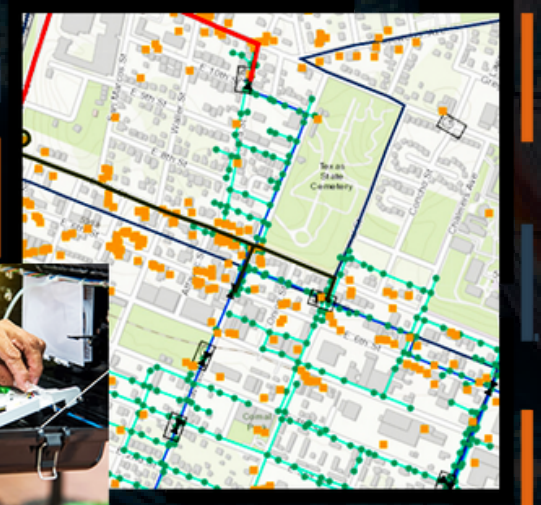
FINULENT SOLUTIONS

AIGeoGraph

Read Inside

- The Challenge
- AI+ GIS
- Applications
- Data & Cloud Integration



The challenge the telecom industry faces as it seeks to accelerate towards ubiquitous 5G is that operators are experiencing **unforeseen obstacles** that will shape the industry. It requires denser infrastructure because of the use of higher frequency bands, the complexities within urban areas create challenges when it comes to planning, and the longer the time to deploy the network, the longer the time to revenue, which can cost billions. By integrating **Artificial Intelligence (AI)** and **Geographic Information Systems (GIS)**, operators can use an integrated, data-oriented, and precision-based approach to 5G deployment.

THE CHALLENGE:

Density & Complexity of 5G Networks

To begin with, the scope of sites needed for 5G coverage in dense urban environments is **tenfold that of 4G** due to the limits of the **millimetre-wave spectrum**. According to the **2024 Ericsson Mobility Report**, it estimates that by the end of 2025, there will be more than 1.6 billion subscriptions for 5G networks, an indication that the telecom operators need to accelerate the growth of 5G, along with ensuring quality and sustainability.

AI+GIS: A STRATEGIC ENABLER

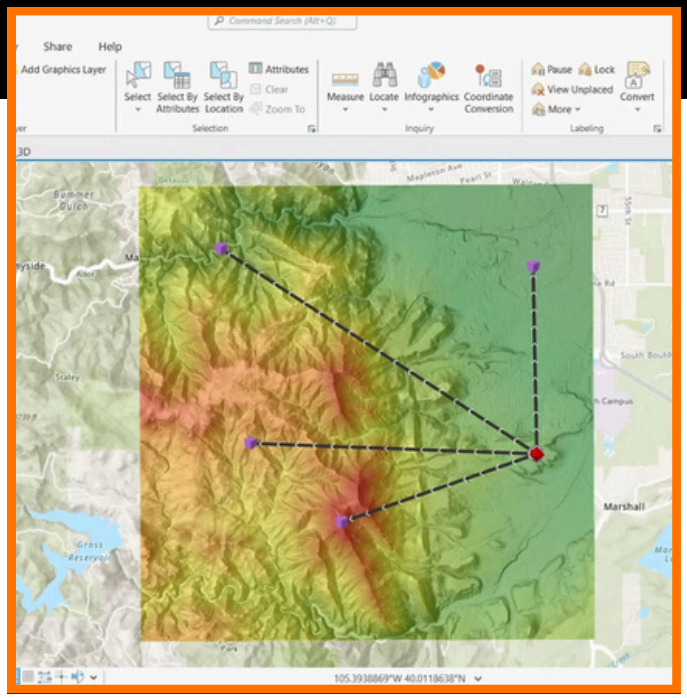
Site Location Optimisation

AI algorithms can evaluate multi-layer GIS data (topography, population density, traffic patterns, building heights, vegetation, and existing network assets) to provide recommended sites for small cell and macro tower placement.

One example is **Telefonica Germany**, using AI+GIS in Munich to plan new sites, **reducing planning time by 30%** by automating the review of 3D city models, population movement heatmaps, and obstruction data.

Line-of-Sight Analysis

GIS provides 3D mapping that is critical for high-frequency 5G due to the need for direct **line-of-sight (LoS)** to maintain signal quality. Using AI models to simulate beam propagation while calculating **Fresnel zones** across GIS layers allows for the identification of potential obstacles such as high-rise buildings or trees.



A field study by **AT&T in Chicago** demonstrated that using AI+GIS-based LoS modelling reduced blocked beam events by **22%** and therefore improved coverage reliability.

Capacity & Demand Forecasting

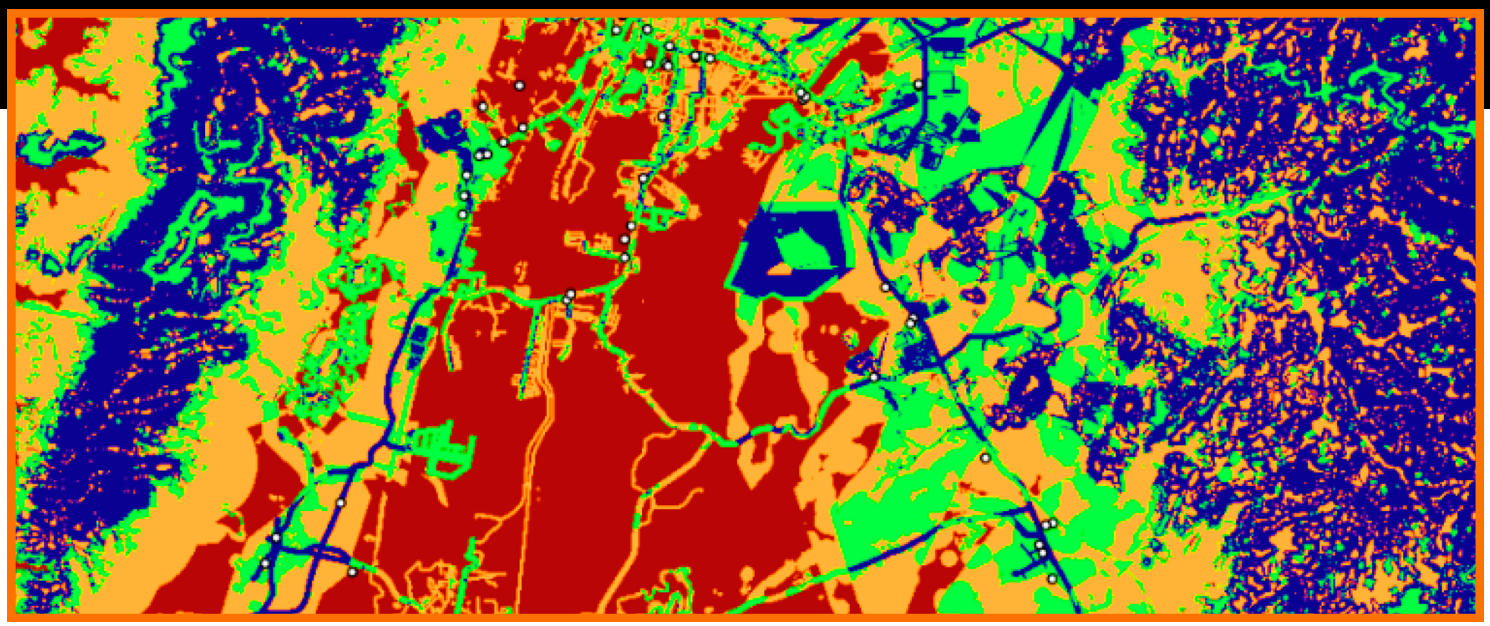
Machines trained with **geographic information systems (GIS)** tagged mobile usage data can forecast **spatiotemporal traffic patterns.** By using GIS data to know where businesses, stadiums, transit hub locations, and particular events are located seasonally, the AI forecasting for peak demand would be accurately determined, where there will be a spike in demand for bandwidth.

Verizon uses AI+GIS to forecast peak demand around **Super Bowl LV**, where they identified Tampa, Florida, as a potential hotspot and programmed temporary microcells into peak demand zones, and capacity increased by 80% compared to no AI rates of demand.

Cost Savings from Automated Route Planning

ITo deploy 5G services, the trenching costs associated with fibre backhaul routes can range from **$27 - $50 per foot**. Artificial intelligence + GIS capability can provide the least-cost paths along existing duct networks, finding a route without unnecessary obstacles (e.g., rivers, railways), or the complexities of permits, possible to traverse or avoid altogether, minimising issues that typically can arise when planning a route.

BT Group, in the UK, identified t**otal cost savings of £4 million** via GIS-optimised fiber routes in London during their 5G fiber expansion, achieving further savings via reduced historical excavation lengths that resulted in almost no digging by following existing, but unused, duct routes

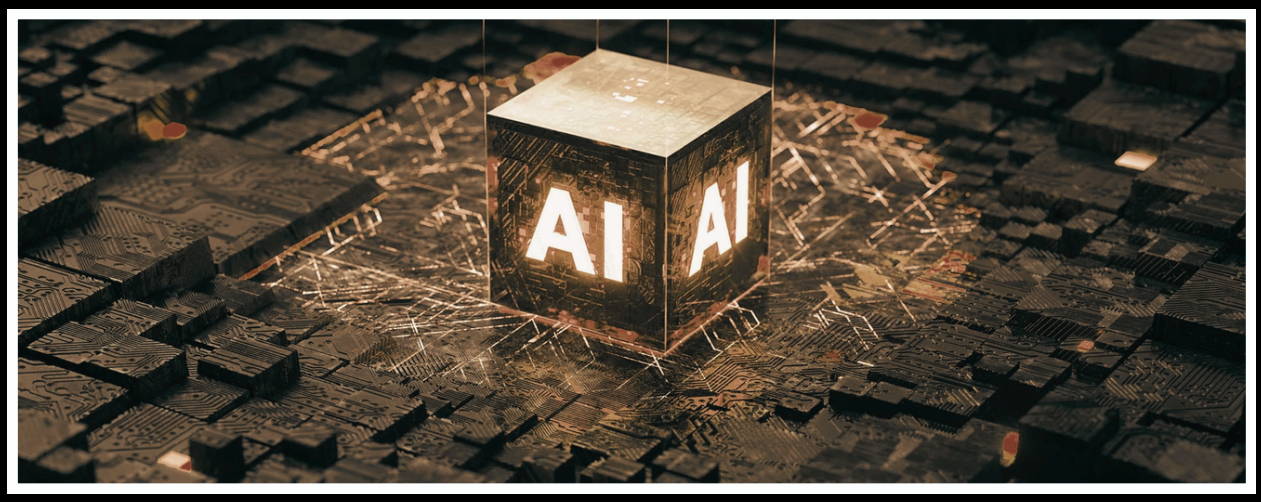


Regulatory Compliance & Environmental Impact

GIS layers map out sets of environmental limitations, such as wetlands and protected areas or sites of heritage. The AI tells which of many available design solutions is the least invasive to the environment. This indicates to the authorities that you are complying with their expectations, which can expedite the approval of permits.

For instance, **T-Mobile Netherlands' AI + GIS system** used during its last rollout found **78 possible zoning violations**, allowing it to launch services quicker and remove some of the risk of having zoning limitations assessed.

Applications



Rakuten Mobile, Japan - Fully Virtualised 5G with AI+GIS

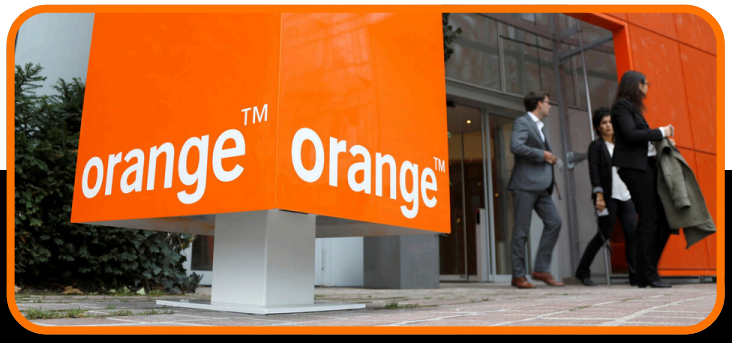
Rakuten developed the **world's first cloud-native mobile network**, using AI combined with GIS to automate locating small cells in Tokyo's dense urban environment. They were able to feed GIS data into AI models that had been trained on foot traffic, building shadowing, and mobility patterns and **reduced deployment time by 40%** compared to traditional practices. The deployment covered more than 96% of the Tokyo metropolitan area i**n less than two years.**

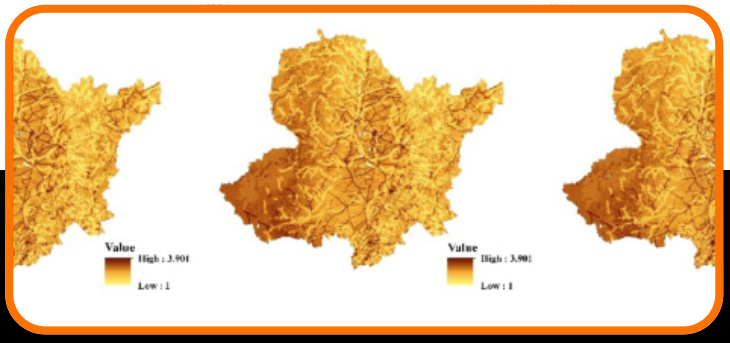
Deutsche Telekom, Germany - AI+GIS for Rural 5G Expansion

Deutsche Telekom faced the **challenge of locating new mobile towers** in rural Bavaria that typically had a sparse population. They employed GIS-based land-use datasets to develop AI models that predicted subscriber growth while considering wild land-use patterns to make smart strategic decisions on tower placements. **The deployment averages 30%** fewer towers to meet planning coverage goals while resulting in a reduction of capital expenditure by tens of millions of dollars.

Orange, France - Minimising Environmental Effect with AI+GIS

Orange layers GIS with protected habitats and historic monument and uses AI to suggest the placement of sites which **reduce ecological or heritage conflicts.** This allowed them to reduce **environmental permitting rejection rates by 50%** and **average permitting time by 3 months** in the Provence-Alpes





Swisscom, Switzerland - Improving Fiber Backhaul Planning with AI+GIS

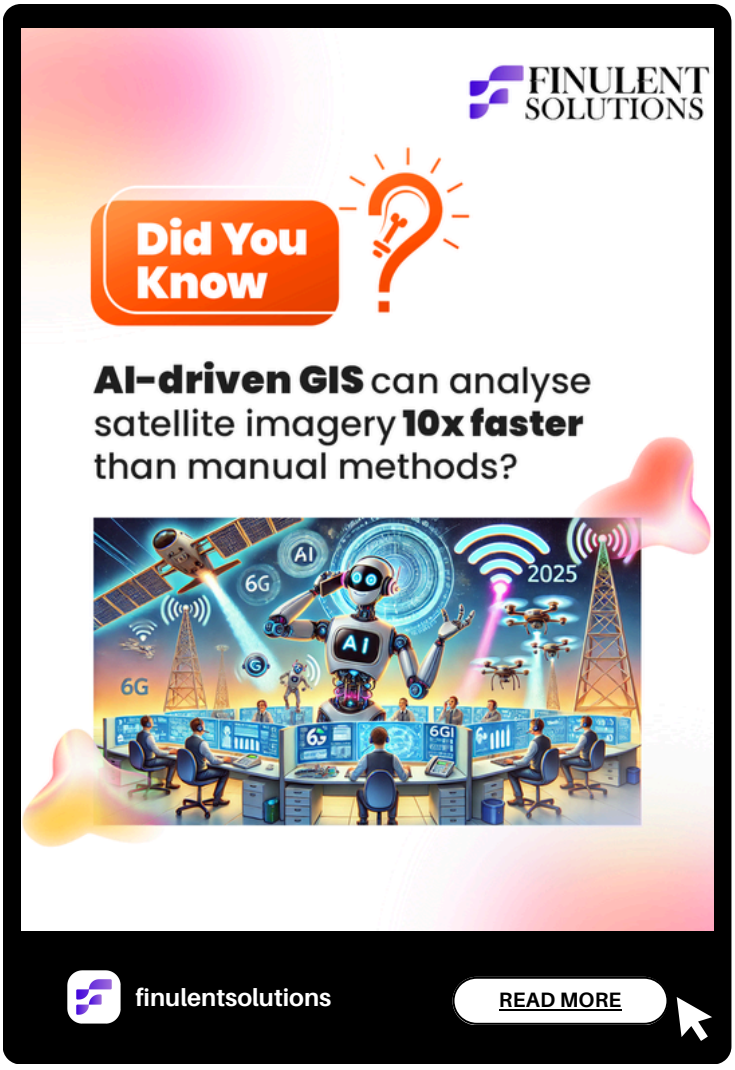
Using AI+GIS in Zurich, Swisscom planned fiber hotspots to support 5G small cells by **analysing all underground layer infrastructure**, costs to disrupt traffic, and the city's vision. Overall, this reduced the lengths of fiber **trenching required to 28%** of the average distance to complete and an estimate of **CHF 6 million** in deployment costs.

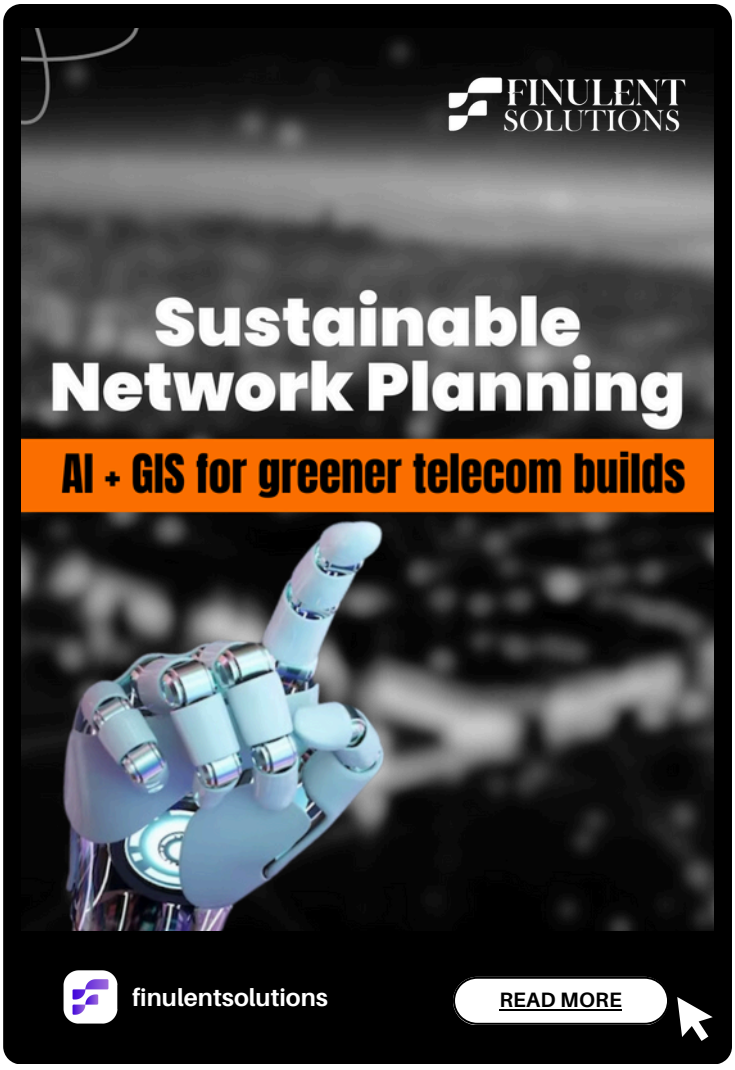
Data & Cloud Integration

Modern solutions such as **Esri ArcGIS** with AI Toolkits, integrated into **Cloud Service Platforms from AWS and Azure**, enable edge applications to real-time update apps such as construction activity and traffic flow, and new zoning regulations, enabling operators to better navigate change in rapidly dynamic urban environments without redesigning the manual planning

AI and GIS are not just a luxury, it's becoming a necessity in delivering a low-cost, efficient and future-proofed 5G network. With operators demanding **a 5G nationwide coverage rollou**t in the next couple of years, AI and GIS will allow operators to plan, deploy and maintain high-quality service with little adverse environmental effect other than providing high-speed connectivity.

FINUSHOTS





Follow Us : Finulent Solutions | finulentsolutions | Finulent Solutions

Contact Us : US: +1 860 880 1115 | UK: +44 7961627865 | India: +91 9867650526