PIONEERING DIGITAL MAPPING:

K&A's Smart Solutions for Oman's Urban Landbank

INTRODUCTION

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Urban planning and land management are undergoing a digital transformation driven by Artificial Intelligence (AI), Geographic Information Systems (GIS), aerial surveying, and automation innovations. These technologies reshape how cities and governments collect and analyze data, improving decision-making and optimizing infrastructure planning.

Khatib & Alami (K&A) has been at the forefront of this transformation, pioneering a fully digital approach to large-scale land mapping. This case study explores how K&A leveraged cutting-edge technology to deliver the Oman Urban Landbank Project, demonstrating the impact of AI-driven automation in geospatial analysis.

THE CHALLENGE

DIGITIZING LARGE-SCALE LAND MAPPING

The Dhofar Governorate in Oman required a digital land database covering 760 km², mapping buildings, roads, fences, and utilities. The goal was to assist the Ministry of Housing and Urban Planning (MoHUP) in making proper land plans and generating accurate site plans and deeds.

However, several challenges made this project particularly complex:

1 Rugged terrain and social constraints made traditional field surveys impractical.

2 Large project scope covering an extensive 760 km² area.

3 Strict two-year deadline, requiring an efficient and automated solution.

4 High-accuracy requirements, with land features needing precision within 10 cm.

To meet these challenges, K&A designed an AI-powered aerial surveying solution that eliminated the need for manual fieldwork, dramatically reducing project timelines and costs.
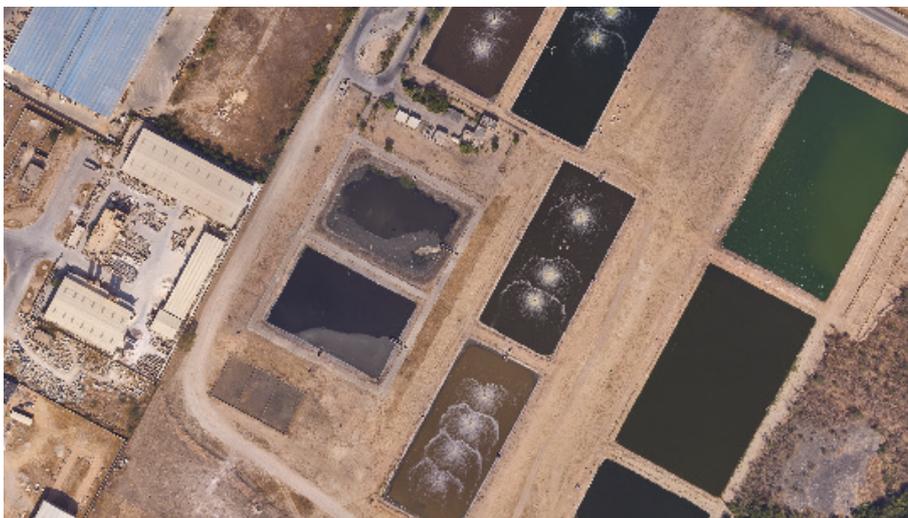
The project area: **760 km²**

Project completed in: **16 months**

Human intervention: **10 staff**

SOLUTION

A DIGITAL-FIRST APPROACH TO PROJECT DELIVERY

For this project, K&A devised an innovative solution involving an aerial survey using aircraft and Artificial Intelligence to detect footprints and roads.

K&A developed a fully automated land detection system combining aerial surveying, AI-based classification, and GIS mapping. The methodology included:

Aerial Survey & LiDAR Data Capture

Accurate and high-resolution data collection was essential for achieving precise land mapping results. To accomplish this, K&A leveraged state-of-the-art aerial imaging and LiDAR technology, ensuring that the entire project area was efficiently covered within a short timeframe.

- High-resolution aerial imaging using aircraft equipped with LiDAR sensors captured detailed topographical and structural data.
- Optimized flight planning allowed the team to cover the entire 760 km² area in just 9 days, reducing project duration significantly.
- Precise ground control points (GCPs) were established to ensure geo-referenced accuracy, minimizing errors in land mapping.
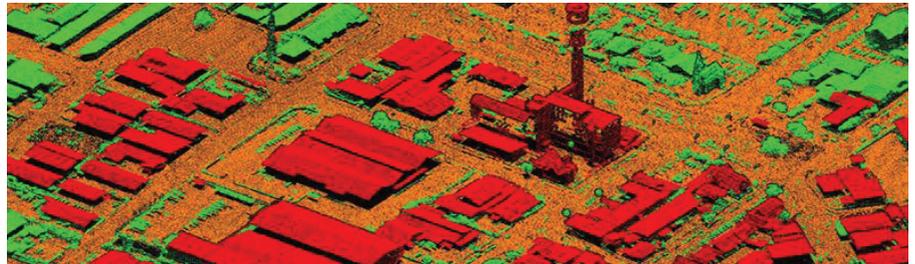
AI-Driven Land Detection & Mapping

Processing vast amounts of aerial data manually would have been time-intensive and prone to errors. By integrating AI and deep learning models, K&A streamlined the data analysis process, ensuring high accuracy with minimal human intervention.

- Five deep learning models were deployed to analyze aerial imagery and low-density point cloud data, automatically identifying land features.
- AI detected over 10,000 buildings and 13,000 fences with an impressive 10 cm precision, surpassing industry standards.
- Automation minimized human intervention, with the entire process requiring only 10 staff (2 full-time), significantly reducing labor costs.
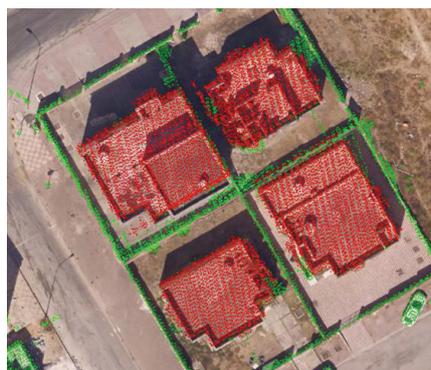
GIS Database Creation

Once the AI-driven analysis was complete, the extracted land features were integrated into a comprehensive GIS database, ensuring that urban planners had a reliable, digital foundation for future development projects.

- AI-extracted land features were seamlessly incorporated into a centralized GIS database, enabling real-time access and analysis.
- The final geo-referenced landbank provided a digital blueprint for future planning and policy-making, ensuring data-driven decision-making for land development initiatives.

By combining AI, aerial imaging, and GIS, K&A transformed the project into a highly efficient, data-driven process.

RESULTS & KEY TAKEAWAYS

Through digital innovation, K&A successfully delivered the Oman Urban Landbank Project, achieving the following results:

- **TIME SAVINGS:** The project was completed in 16 months instead of the 7-9 years required for traditional field surveys.

- **COST REDUCTION:** Automated AI and GIS workflows reduced costs by over 90%

- **UNMATCHED ACCURACY:** 10 cm precision in footprint detection, exceeding the original target.

- **ENVIRONMENTAL & SOCIAL IMPACT:** Eliminated the need for intrusive fieldwork while optimizing land use planning.

- **SCALABILITY:** The success led to a new, larger-scale project covering seven times the initial area.

CONCLUSION

REDEFINING DIGITAL LAND MAPPING

By integrating AI, GIS, and aerial surveying, K&A has set a new benchmark for efficiency, accuracy, and scalability in land mapping projects. The Oman Urban Landbank Project demonstrates how digital transformation can drive cost-effective, sustainable urban planning solutions.

As cities and governments seek faster, smarter land management solutions, AI-powered geospatial technologies will play an increasingly critical role. K&A continues to lead this transformation, delivering projects that shape the future of urban development.