Digital Land Survey using Drone Technology and Qgis in Andhra Pradesh

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***Abstract*—This study presents an overview of the Resurvey Project implemented in Andhra Pradesh, focusing on the adoption of modern geospatial technologies to improve the accuracy and transparency of land records. The project utilizes high-resolution drone imagery, GPS-based measurements, CORS network support, and QGIS software to create precise digital parcel maps and update traditional land documentation systems.**

The abstract highlights the background and need for resurvey, the methodologies followed, data-matching and verification procedures, major findings, challenges encountered, and recommendations for future enhancements. The initiative is closely aligned with the PM SVAMITVA Yojana, a national program aimed at granting rural households legal ownership rights through the issuance of secure property cards. By reducing boundary disputes, modernizing land records, and improving governance efficiency, the project significantly benefits rural communities and supports credit access and development planning.

The objective of this work is to demonstrate a scalable and technology-driven workflow using QGIS and other geospatial tools to strengthen digital land management and promote transparency in land administration across Andhra Pradesh.

***Index Terms*—Abstract, Introduction, Literature Review, Objective, Methodology, Data Collection, Case Study, Findings & Discussions, Problems Faced, Comparison with Other States, Conclusion, Reference.**

I. INTRODUCTION

Land is a vital resource in rural India, forming the basis for agricultural activity, property ownership, revenue collection, and legal rights. The accuracy of land records is therefore essential for transparent governance and dispute resolution. Traditional surveying practices in India were largely manual, slow, and often inaccurate, which frequently resulted in boundary conflicts, uncertainty in ownership, and ineffective land administration.

To overcome these long-standing challenges, the Government of Andhra Pradesh has initiated an advanced Resurvey Project, adopting modern geospatial technologies such as high-resolution drone imaging, GPS-based field measurements, CORS positioning systems, and QGIS mapping software. These technologies enable the creation of precise digital parcel boundaries and updated land records. Landowners actively participate in the verification of boundaries, ensuring transparency and confidence in the data.

This resurvey initiative aligns with the PM SVAMITVA (Survey of Villages and Mapping with Improvised Technology in Village Areas) Yojana, a national program that aims to provide rural household owners with legal property rights through the issuance of property cards. Andhra Pradesh has emerged as one of the leading states in successfully implementing the scheme due to strong administrative mechanisms, public involvement, and technology-driven planning. The project has significantly reduced land disputes, improved record accessibility, and enabled villagers to use their land documents for loans, credit, and development purposes.

This report documents the methodology, workflow, and implementation challenges of the resurvey project, with a special case study on Nadipudi village

in Penugonda Mandal. It explains the data acquisition process using drone imagery, boundary measurement, digitization in QGIS, integration with existing land records, and final map validation. The study highlights how a standardized and replicable geospatial workflow can improve land management accuracy and strengthen digital governance.

II. LITERATURE REVIEW

Earlier land surveys in Andhra Pradesh were carried out during the British period using chain and compass methods. The data was recorded in Field Measurement Books (FMBs) and village maps, which over time became damaged, outdated, and inconsistent with the real field situation. According to reports from the Revenue Department, inaccuracies in these maps caused numerous land ownership disputes and administrative inefficiencies. Nearly 60–70% of rural civil cases in Andhra Pradesh were related to boundary disputes or unclear land ownership. This background created the need for a scientific and technology-based re-survey to replace the old, manual system. Land records in Andhra Pradesh were historically managed using manual and paper-based systems, many of which were over a century old. These outdated methods led to overlapping boundaries, ownership disputes, and delays in registration and development planning. Recognizing these challenges, the state government launched a comprehensive resurvey program to digitally remap all land parcels, ensuring error-free and transparent land ownership.

III. OBJECTIVES

The primary objectives of Andhra Pradesh's Resurvey Project are:

i. Digitize Land Records: Replace outdated, manual cadastral records with precise digital maps.
ii. Ensure Accuracy: Minimize measurement errors using drones and GPS technology.
iii. Enhance Transparency: Allow citizens to access their land records online, reducing the scope for corruption.
iv. Empower Governance: Support local authorities in planning, taxation, and dispute resolution.
v. Reduce Conflicts: Ensure clear boundaries and verified ownership to prevent land disputes.
vi. Integrate PM SVAMITVA: Provide legal ownership certificates to rural households, supporting financial inclusion and empowerment.

IV. METHODOLOGY

Resurvey – List of Phases

Phase I – The Pre Drone Flying Phase
Phase II – Drone Flying & Image Processing
Phase III – Ground Truthing & Record Preparation
Phase IV – Ground Validation & Record Updation
Phase V – Boundary Disputes & Appeals
Phase VI – Final Records & Notification

Data Collection Analysis

Spatial Data: Drone images, satellite imagery, vector shapefiles.
Attribute Data: Ownership details, plot number, land use classification.
Data Analysis in QGIS: Overlay of old and new maps for boundary change detection Accuracy checks using control points Automated report generation.
Map symbology for easy identification of parcel types
The QGIS platform enabled seamless integration of spatial and non-spatial data, allowing easy visualization, editing, and storage of land records. The use of open-source plugins further enhanced functionality such as labelling, printing layouts, and quality checks.

Problems Faced During Resurvey

1. Resistance from Landowners: Initial skepticism about the digital survey and fear of increased taxation.
2. Technical Challenges: GPS failures in dense areas and drone restrictions due to weather.
3. Historical Record Discrepancies: Missing or inconsistent old maps.
4. Training Needs: Surveyors initially required additional guidance on QGIS and drone use.

Solutions: Awareness campaigns, repeated GPS measurements, cross-verification, and staff supervision.

V. CONCLUSION

Andhra Pradesh was the first Indian state to implement a full statewide resurvey using drones, GNSS, and QGIS, under a dedicated state scheme. Other states like Maharashtra and Haryana did pilot versions or used different GIS tools, but not at this scale and depth. Andhra Pradesh's resurvey sets a benchmark in India, showing that open-source tools can achieve large-scale results.

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