Evidence-Based Spatial Planning through Drone-Derived Geospatial Intelligence in South Africa

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SUMMARY

The National Department of Land Reform and Rural Development (DLRRD) has launched a Drone Programme aimed at transforming service delivery and spatial planning through near-real-time geospatial intelligence. Compliant with South African Civil Aviation Authority (SACAA) regulations, the Programme leverages multirotor and VTOL (Vertical Take-Off and Landing) fixed-wing drone technology. These drones are equipped with advanced sensor payloads, including RGB, Oblique and Multispectral sensors to collect high-resolution data. This data is used to produce geospatial products such as ortho-mosaics, 3D meshes, point clouds, contours, Digital Terrain Models (DTMs), and Digital Surface Models (DSMs). These products support evidence-based planning and accelerate interventions across rural and urban landscapes. They provide insights into land use, infrastructure, and environmental conditions.

This paper provides an overview of the Programme's establishment and operational framework. It outlines the workflow, which includes aerial surveys, sensor-based data acquisition utilizing a RGB payload, and subsequent processing and analysis using Geographic Information Systems (GIS) and Geospatial Artificial Intelligence (GeoAI) techniques. Through case studies from informal settlements and small towns, the paper illustrates how drone-derived datasets can inform targeted interventions and improve planning for decision-making. It demonstrates how high-resolution imagery and 3D models deliver insights that enable dynamic spatial analysis and foster a data-driven approach to spatial planning.

The Drone Programme exemplifies how innovative geospatial technologies can revolutionize spatial planning in South Africa. By combining near-real-time remote sensing with advanced analytics, it promotes responsive, inclusive, and sustainable development strategies. The significance of this work lies in its potential to scale across regions, offering a replicable model for

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other government departments and agencies seeking to modernize service delivery through geospatial intelligence.

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