



FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting
Our World,
Conquering
New Frontiers

**Hybrid pre-vectorization approaches
to produce accurate, precise maps
to scale up boundary demarcation
for property rights delivery:**

**Case study in Zambia's Systematic Land
Titling Project**

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Integrated & Integrative Outcomes

- ★ Overcome resistance, inertia in planning & development
- ★ Eliminate constraints to doing business, accessing financing, facilitating trade
- ★ Improve efficiency of labor, product markets, by demonstrating technological readiness
- ★ Mapping land rights address need for sensitive, innovative approaches (e.g., customary lands)

Zambia

- One of Africa's least densely populated countries, Zambia is "land abundant"
- Only 14% of land available for agriculture has been used
- Mining: critical "fulcrum" for growing economy
 - 13% of GDP, 70% of Zambia's foreign earnings
 - North-Western province: epicenter of copper industry
 - Two mines (Kalumbila and Solwezi) produce nearly 2/3 of Zambia's annual production of 720,000 tons



- ❑ MLG replicates Fit for Purpose Land Administration guidelines (World Bank & International Federation of Surveyors (FIG))
- ❑ Zambia's Land Survey Act: land verified and secured for CTs must be "mapped using orthorectified imagery captured using drones or aircrafts"

Hybrid Approach

- Spatial resolution precision down to 5-10 centimeters
- Uses machine learning for analyzing, detecting boundaries where fences, walls make automated boundary detection possible
- Hybrid process with boots on the ground, survey-grade global navigation satellite system (GNSS) in Zambia, simultaneous use of drones to capture spatial data

Value of Hybrid Approach

- GIS technology magnifies objectives for accuracy, verified and secured certificate access, cost-efficiency
- Generate essential cadastral layers identifying land boundaries, building footprints elevations, etc.
- Plans for zoning, commercial areas, services areas, valuation algorithms
- Dispute resolution: processes leading to land titling bring latent disputes to surface



- Easements, construction permits management, validate topographical rules for planning new settlements
- Mining, agricultural sectors: land use categorization, soil identification, measure of deforestation
- Sustainable agricultural industrialization, supporting food security without compromising ecosystem

Copperbelt Province

- 6% of global copper reserves: geological surveys in Zambia: significant opportunity to find viable deposits of copper
- Mapping produces data so investors don't need to resort to speculation, given uncertainty is typically reflected in price they are willing to negotiate for securing exploration licenses
- GIS & mapping: data foundations for economic transformation, scales of efficiency" enhanced infrastructure, macroeconomic stimulus and stability are improved

Direct Benefits

- Transparent access to data to increase the public participation rate and eliminate redundancies
- Streamlined property registrations and transfers
- Documented land valuations and enhanced land wealth
- Secured land inheritance
- Empowerment for communities & citizens

Indirect Benefits

- Mapping, digitization of processes unlock capital for personal investment, access to credit, tenure security,
- Open channels of revenue to build wealth
- Encourage FDI opportunities
- Use data roadmaps to plan for economic stimulus
- Encourage real estate investment
- Explore, develop natural, mineral resources industries