Improvement of area accuracy in general boundary areas in Kenya: Case study of Juja – Kiambu County

by

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Presenter: Ogechi O. Bernard
The Preliminary Index Diagram

- Refers to a demarcation map prepared from enlarged, marked and un-rectified aerial photo graphs used together with adjudication record to register rights and interests on Adjudicated land areas.

- Trust land in Kenya constitutes about 70% of registered land, also known as “Adjudication Area”. Land registration in these areas is done using the PIDs. About 50% of land registration on these areas has been completed while 20% is yet to be done.

- The responsibility of producing the PIDs lies with the department of Survey of Kenya and collaborates with the department of Adjudication and Lands in the process of the registration of individual titles to land.
Problem Statement

- Currently the PIDs are produced from enlarged, marked and un-rectified aerial photographs.

- They contain distortions to parcel area which more than often is a source of land disputes especially resolving the gap between the documented and the actual parcel area.
The PID making process

1. Aerial photography
2. Area photo 1:12,500
3. Enlarged photo 1:2,500
(4) Enlarged photo marking at the field

(5) Marked, enlarged aerial photo

(6) Tracing parcel details onto durafilm

(7) Area measurement with plannimeter
(8) Manual generation of area list

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Ground Surveying Process

(1) Datum Plans & Recce

(2) Traverses & Boundary Picking

(3) Area computations
Linear measurements
Angular measurements
OBJECTIVES

1. To make comparisons between parcel area obtained through aerial photography and that obtained through ground survey.

2. To investigate the effect of changes in acreage, slope and elevation on PID area accuracy.

3. To develop a procedure for the improvement of PID area accuracy.
The area of study is Juja situated about 36 km North East of Nairobi city;

The area covers about 64km² within coordinates S 1° 02' 40" - S 1° 07' 20" and E 37° 05' 04" - E 37° 04' 50".
METHODOLOGY

AERIAL PHOTOGRAPHY
- unrectified Aerial photos
- photo enlargement and boundary marking
- Tracing of parcel boundaries and attribute entry
- PID from Aerial Photos and Area list

GROUND SURVEY
- Survey plans, Topo maps
- Reconnaissance
- Actual ground survey: Traverses, observation & Recording.
- Parcel area Computation, linear & Angular measurements.

Spatial analysis:
- Overlays, Comparisons
### RESULTS

#### Comparison

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(a) Effect of acreage on area accuracy

**RESULTS**

\[ y = 3.2 \times 10^{-7}x^3 - 0.00027x^2 + 0.14x - 0.82 \]
(b) Slope distance

Effect of slope distance on area accuracy

![Graph showing the effect of slope distance on area accuracy. The graph plots area differences (Ha) against slope distance (m). There is a red line indicating aerial photo PID.]
(c) Elevation

Effect of elevation on area accuracy

Aerial differences (Ha) vs. Elevation (m)

- Aerial photo PID
Correction factor

Application of correction factor \( y = 3.2 \times 10^{-7}x^3 - 0.00027x^2 + 0.14x - 0.82 \)

- **Current PID**: Red line
- **Improved PID**: Blue line

RMS = 2.95 from 14.63
CONCLUSIONS AND RECOMMENDATIONS

• There are significant variations between PID areas and Ground survey areas.
• The RMS of variations between PID areas and Ground surveyed areas ± 14.63 Ha.
• The application of generated correction factor \( y = 3.2 \times 10^{-7}x^3 - 0.00027x^2 + 0.14x - 0.82 \) (where \( x = \) acreage) reduces the current PID area error to RMS ± 2.95 from ± 14.63 (80%).
• In the absence of resources to implement other better methods e.g. satellite imagery technique, the correction equation obtained out of aerial photo technique can be used to easily obtain more correct parcel acreage.

• We shall consider effects of slope and elevation in our future studies.
THANK YOU ALL

Questions and Comments !!!