

An Analysis of Data Handling Techniques in Zimbabwe

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Edward Kurwakumire
Midlands State University, Zimbabwe



Nyaradzo Chaminama
NAVTEQ B.V. Nederland

Presentation Outline

- Introduction
- Cadastral Surveys in Zimbabwe
- Data Acquisition Technologies in Zimbabwe
- Land Survey Data Processing
- Land Survey Data Lodgement
- Modern Data Acquisition Techniques
- Discussion
- Conclusions
- Recommendations

Introduction

- Data Handling technologies
 - Technologies (instrumentation) and methods
 - Capture, processing and lodgement of land survey data
- Historical Spatial Data Acquisition
 - Land Survey is among the oldest professions
 - Cadastral surveys employed in ancient Egypt to relocate boundaries long the Nile
 - Construction of the Great Pyramid at GIZA (2700 BC)
 - Evolution in instrumentation and techniques of capturing land survey data (from stretching plane

Cadastral Surveys in Zimbabwe

Land Tenure in Zimbabwe

- Zimbabwe presents land tenure in the following categories (Paradzayi, 2007):
- Freehold (Urban areas – survey is a pre-requisite)
- Leasehold (e.g. in resettlement areas – 99 yr leases)
- State Land
- Communal (Usufruct, group rights, access rights)
- Unalienated land

...Cadastral Surveys in Zimbabwe

The Cadastre in Zimbabwe

- The cadastre in Zimbabwe is incomplete
- All land in urban areas has been surveyed
- New land allocations are surveyed prior to development as a by-law
- However, the cadastral survey process is slow because of the technology in use and accuracy requirements (quality control takes 34% of project time – Chimhamhiwa and Lemmen (2001))
- This is particularly in communal areas (70% population)
- Most resettlement areas also have not been surveyed

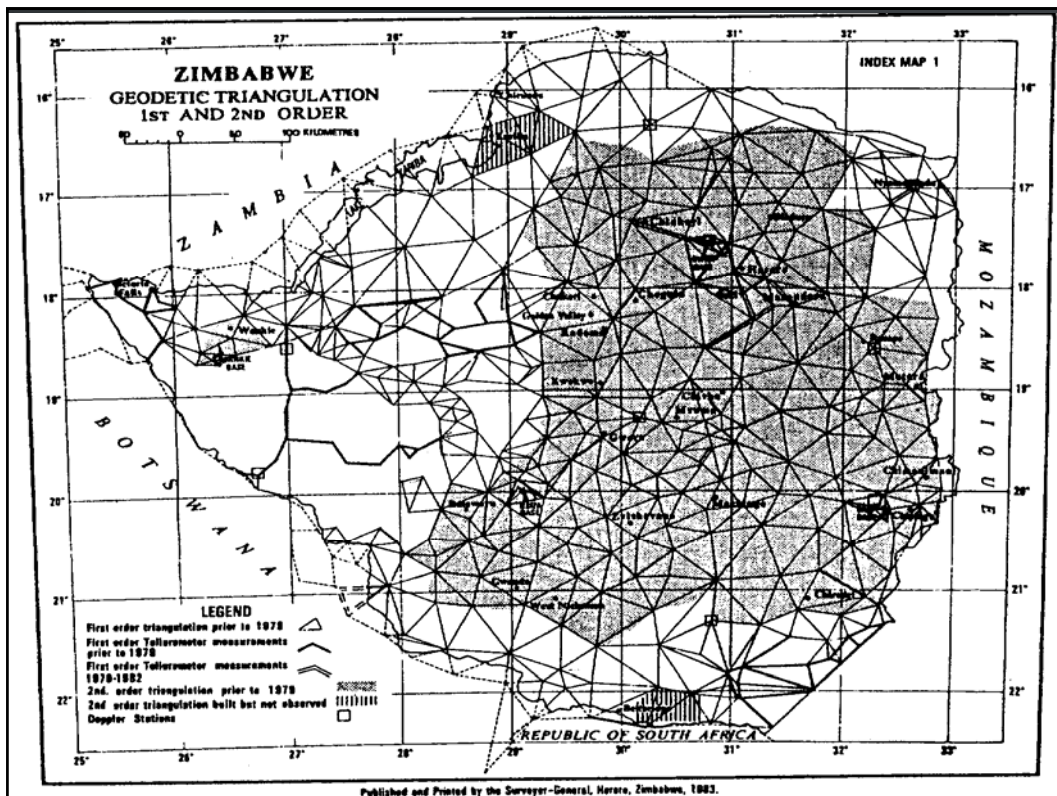
...Cadastral Surveys in Zimbabwe

The Control Network in Zimbabwe:

- Control is in form of:
- Trigonometrical Beacons (Primary, Secondary and Quaternary)
- Town Survey Marks
- Official Control Points
- Height Benchmarks
- There is a sufficient nationwide coverage for national mapping

Monumentation:

- 12 mm iron pegs in concrete



Data Acquisition Technologies in Zimbabwe

- Surveys by Total Station (90% of boundary Surveys)
- Theodolite – EDM Combo (Control & boundary surveys)
- Theodolite and Tape (Running lines and simple beacon searches)
- GPS use is not regularised
- Aerial photographs are out of date
- As a result, the majority of maps (topographical) are out of date
- The new generation of surveyors are attempting to



Survey by Total Station

Land Survey Data Processing

- 4 major software packages employed by surveyors
 - SURPAC (Least Squares Based)
 - AutoCAD
 - Microstation
 - Vcad
- Software employed for performing calculations and generating diagrams
- SURPAC employs the Gaussian Coordinate System (Zero degrees South Orientation)
- All computations and diagrams need to be printed in compiling the survey record

Land Survey Data Lodgement

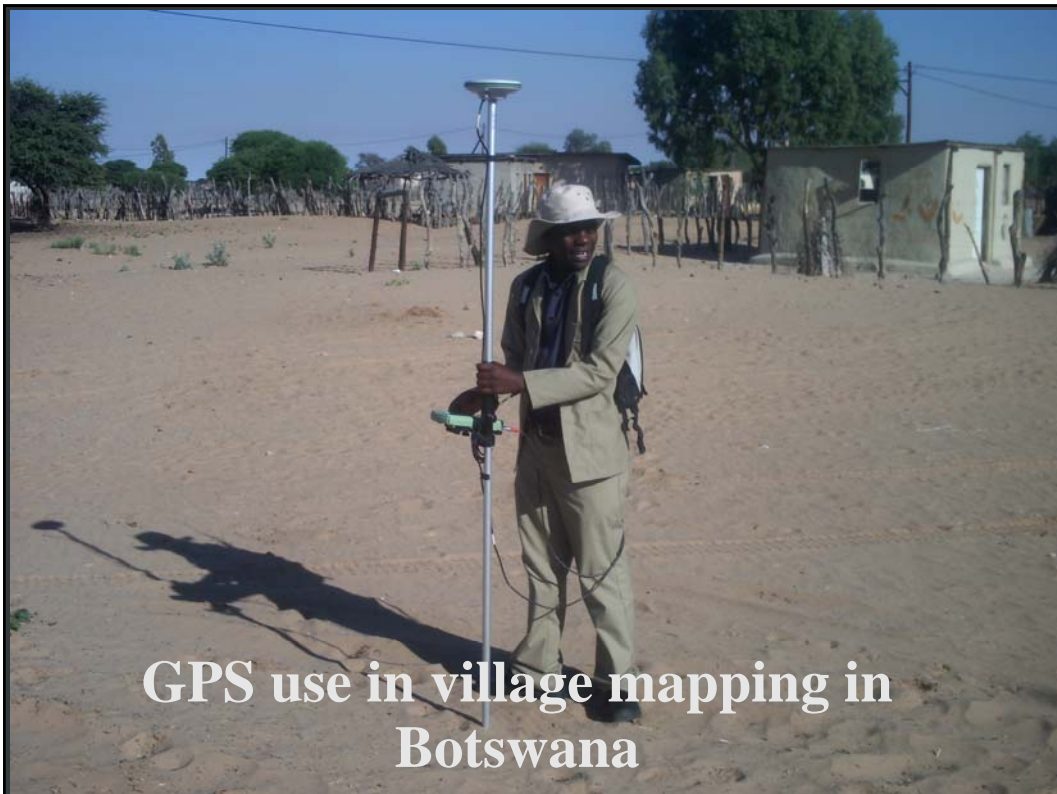
- A survey records in required for examination by the Surveyor General
 - Paper Field Book
 - Coordinate List
 - Calculation Sheets
 - Coordinate List
 - Working Plan
 - General Plan
- Survey records need to be physically submitted
- No electronic submission

Data Storage



Modern Data Acquisition Techniques

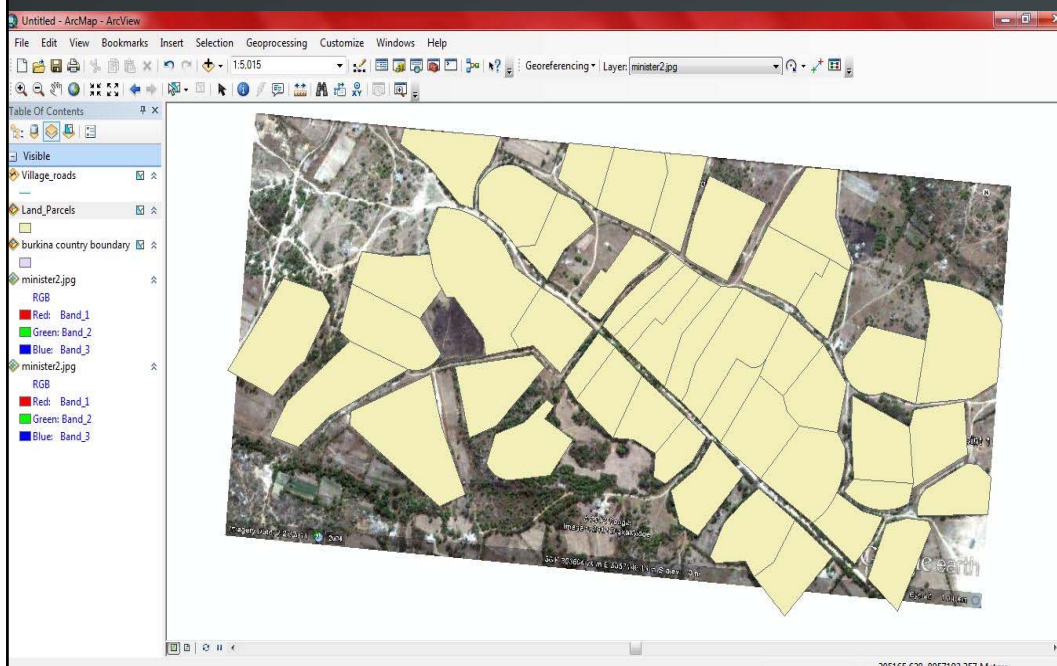
- GPS (RTK)
- Close Range Photogrammetry
- High Resolution Satellite Imagery
 - Quickbird (GSD = 0.62m) Topan *et al* (2006)
 - Worldview 1 (GSD = 50cm)
 - IKONOS (1m resolution)



Discussion

- High accuracy are impeding the use of relatively low cost mapping technologies
- Need for flexibility with the land surveying regulations for Zimbabwe
- Consideration of general boundaries for surveys
- Need for a balance between accuracy and total survey costs
- This is crucial for having a complete cadastral layer
- This serves as the basis of the land administration system

Domboshava Communal Lands, Zimbabwe (pilot project)



Conclusions

- The surveying fraternity in Zimbabwe needs to embrace ICT
- This results in greater efficiency and flexibility in executing fieldwork and processing field data
- Low cost mapping solutions should be considered for tourist maps, communal land and even part of high value land.

Optimum Technology Utilisation



Recommendations

- General Boundaries
- GPS Surveys for Cadastral Work (Need for updating the survey regulations)
- Boundary surveys using satellite imagery (*Current work is on communal lands*)
- Utilising Open Source Software
- Web based lodgement and Access of land survey data (*Current Study for the development of the web portal*)
- Continuous updating of Surveying and Geomatics curriculum in training institutions to incorporate

The End

Thank You

