

# GPS APPLICATIONS FOR GIS PURPOSES IN SWAZILAND

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# Where is Swaziland?



# About Swaziland

- One of the few remaining absolute monarchies
- Shares 75% borders with South Africa and 25% with Mozambique in the East
- Population of 1 Million people
- 17 636 Square Kilometres

# Surveyor General's Department

- To provide a high standard of advice to government departments and others on all surveying and mapping matters.
- To fulfill efficiently all statutory requirements to supervise and control surveys of land for registration purposes.
- To provide surveying services to the Government of Swaziland to effectively support the development and management of its land.

# Surveyor General's Department

- To maintain and make available accurate and up-to-date mapping services to meet the needs of the nation.
- To maintain the survey control framework of Swaziland, which underpins the development of the nation.
- To educate customers, landowners and the general public about the activity of the Surveyor General's Department.

# GPS APPLICATIONS FOR GIS PURPOSES IN SWAZILAND

- Swaziland is a small land-locked country in Southern Africa. Like other countries in the SADC region, the country is rapidly developing and the need for state-of-the-art technology cannot be over-emphasized. GIS (Geographic Information Systems) is one of the fastest growing industries in the country for presentation and analysis of geo-spatial information. As an integral part of this technology, Global Navigation Satellite Systems are of prime importance in collecting spatially referenced data. Global Positioning System (GPS), being the most popular, has found its way into activities you would never have imagined before.

# GPS APPLICATIONS FOR GIS PURPOSES IN SWAZILAND

- Mapping
  - Cadastral Surveys
  - Map Revision
  - Thematic Mapping
  - Malaria ITN Program (Case study)
- Disease Surveillance
- Environmental Monitoring
- Physical Planning

# MAPPING

- Cadastral Surveys
  - Land Tenure – Challenge
    - Swazi Nation Land 60%
    - Title Deed Land 30%
    - Other 10%
  - Huge demand for land conversion



# CADASTRAL SURVEYS

- Acquire high precision GPS equipment
- Revisit Trig Network
- Capture WGS 84 coordinates for Trig Network

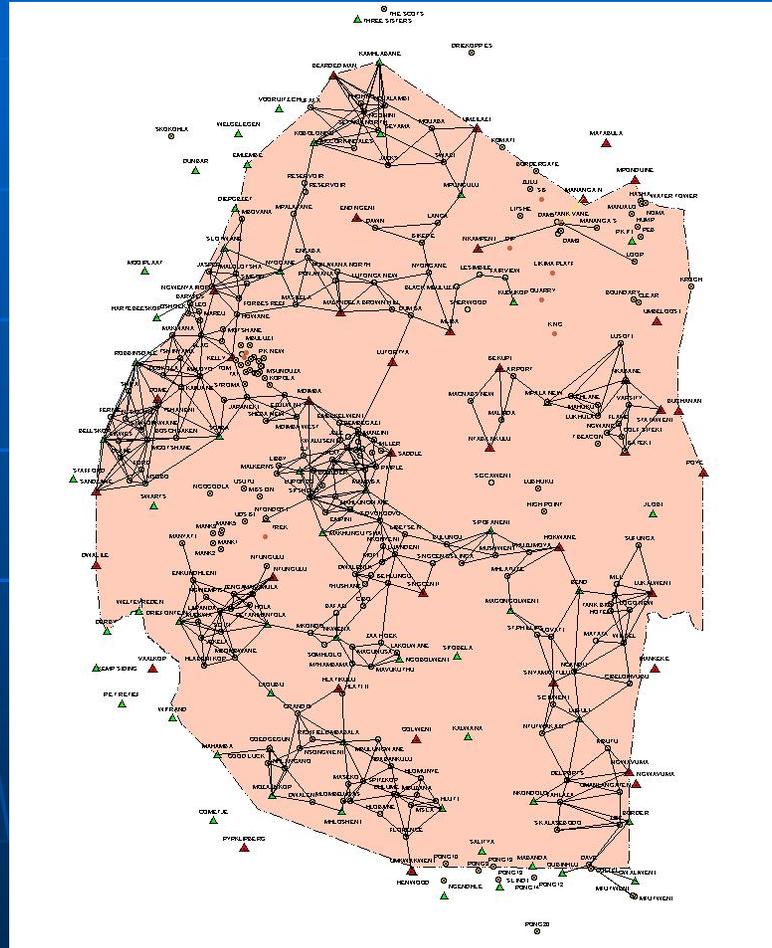
# CADASTRAL SURVEYS



# CADASTRAL SURVEYS



# CADASTRAL SURVEYS



# MAP REVISION

- Photogrammetry
  - Aerial Photography (GPS Control)
  - Photo Control
  - Aerial Triangulation
  - Mapping

# MAP REVISION



# THEMATIC MAPPING

- Specialized mapping of certain activities in the country is from time to time be required. This could include thematic mapping such as Poverty mapping, HIV/AIDS and Disability Mapping, just to mention a few.

# THEMATIC MAPPING

- The country is facing a serious problem when it comes to poverty and HIV/AIDS.
- Over 60% of the population of 1 million lives below the poverty line and the HIV infection rate is over 40%.
- If you want to eliminate these problems, it is essential to have proper statistics about the situation in the country.

# THEMATIC MAPPING

- You need to answer questions like:
  - Who needs help?
  - Where are they situated?
  - Are they accessible? Etc.
- GIS comes in very handy in such situation to be able to answer these questions.

# THEMATIC MAPPING

- In order to present the spatial distribution of this information then it is essential to link this information to its position in space or a coordinate system.
- GPS becomes an obvious solution
- Thematic mapping presents the situation graphically

# MALARIA ITN PROJECT

- 30% of the population is at risk of infection by malaria
- The disease is more prevalent in the Lubombo region
- The program implements a number of interventions at community level
- Resources are decreasing every year as a result of a number reasons including HIV/AIDS
- Proper planning, monitoring and evaluation is very critical
- Locally/Chieftdom based planning is essential

# MALARIA ITN PROJECT

- To determine the coverage of Insecticide Treated Nets (ITN) by pregnant women and < 5 years children
- Determine the proportion of population sleeping in sprayed house
- Determine the proportion of the population with access to potable water supply and proper sanitation
- Determine the proportion of homesteads with a rural health motivator
- Determine proportion of homesteads with traditional practitioners
- Determine the distribution of structures by type of wall surface

# MALARIA ITN PROJECT

Data Collector ..... Date ...../...../ 2004  
 Chief ..... Homestead Number .....  
 District..... Inkhundla .....  
 Locality.....

Turn GPS ON

Turn GPS ON

Turn GPS ON

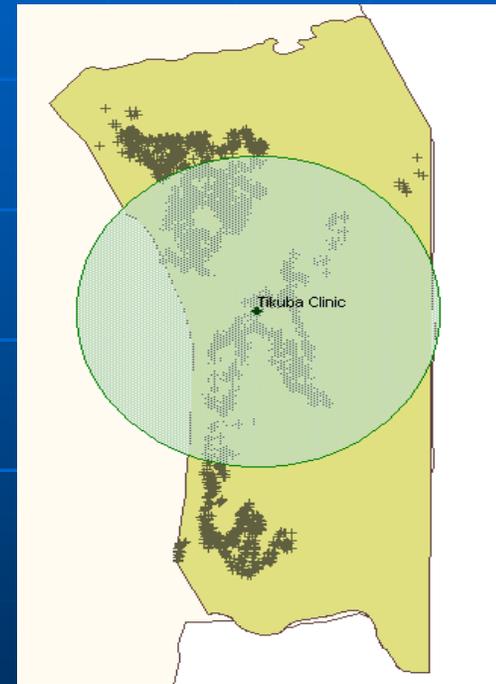
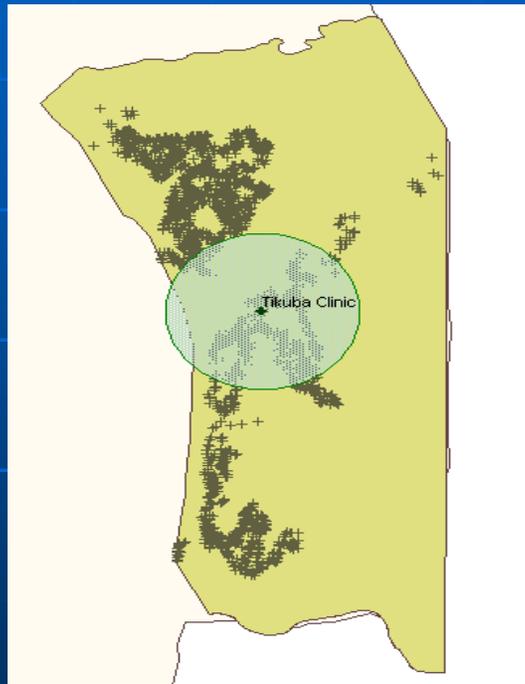
1	Name of Homestead Head					M	F	Chief	Child
2	Types and numbers of rooms		Total			Brick			
3	Painted	Mud		Other					
4	Number of People		Total	< 5 yrs	Pregnant				
5	Number of toilets		WC	Simple	VIP	None			
6	Source of Water		Spring	Dam		Well			
7	Piped	River		Other source					
8	Clinic used			Hospital used					
9	Number of <u>bednets</u>		Used in high season		Yes	No			
10	<u>Bednets</u> used by		Pregnant	< 5 yrs	5-15 yrs				
11	Name of your RHM						None		
12	Does a RHM live here?	Y/N	Name						
13	Does a traditional practitioner live here?	Y/N	Name						
14	Latitude E		Longitude S						
15	How many People sleep in Sprayed Houses?								

Please turn GPS OFF

Please turn GPS OFF

Please turn GPS OFF

# MALARIA ITN PROJECT



# MALARIA ITN PROJECT

## ■ RESULTS

- Only one clinic serving a big community
- 70% of population still consulted traditional practitioners (behavioral change essential)
- By the time they get to hospitals its too late
- Traditional practitioners offering a better service by their spread in the community
- ITN coverage >70%

# OTHER ACTIVITIES

- DISEASE SURVEILLANCE
  - Ministry of Agriculture
  - Ministry of Health
- ENVIRONMENTAL MONITORING
  - Industrial Waste management
  - Monitoring of protected areas and species
- PHYSICAL PLANNING
  - Prevention of informal settlements
  - Provision of land for development

# CHALLENGES

- NEED FOR REALTIME GPS
  - Provides real time position
  - Quick to locate features
  - Coordinates are in local system
  - Very high accuracy meets requirements of legislation

# CHALLENGES

- Size of the country. 17363 square kilometers
- Long.  $27^{\circ} 20' E$  and  $32^{\circ} 10' E$
- Lat.  $25^{\circ} 40' S$  and  $27^{\circ} 20' S$
- This means that if you use geographical coordinates then you will be dealing with decimals of a degree in most cases.

# CHALLENGES

- Ideal system is then the local Cartesian coordinate system.
- Current system has a lot of inherent problems
  - Projects maps upside down on digital mapping software.
- Plan to convert out maps to WGS 84 coordinate system

**THANK YOU  
FOR YOUR ATTENTION**