TOWARDS DEVELOPMENT OF NATIONAL HUMAN SETTLEMENT LAYER

The launch of 2013 SANSA SPOT 5 National Mosaic, The Innovation Hub, Pretoria
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Introduction

Why are researchers and scientists studying human settlements?

- Human settlements affect various aspects of planning and management
  - Environmental /natural resources management, urban planning/rural development, disaster management, policy formulation and implementation, infrastructure development, population estimation, land use management, service delivery....

Satellite remote sensing

- Advancement in remote sensing technology: spatial, spectral and temporal resolutions
  - Map the location of human settlements
    - Monitoring of human settlement developments
    - Accurate and independent evidence of the status of human settlements
    - Extraction of data/information for sustainable human settlement planning
South African human settlement developments

- The proportion of people living in urban areas increased from 52% in 1990 to 62% in 2011
- Everyone has the right to have access to adequate housing- Constitution of the Republic of South Africa
- Implementation of government priorities rely on current human settlement information

- Challenges
  - Housing backlog
  - Access to basic services
  - Informal settlement development
  - Rapid urbanisation

- Impact of human settlement developments
  - Infrastructure : water, electricity, social services
  - Encroachment on the agricultural land and protected areas
International initiatives on human settlement mapping and monitoring using remote sensing:

- GEO, Global urban Observation and Information, Modis Land Cover Products, Urban Environmental Monitoring, Mega cities/Euro-cities, Global Urban Observatory, Global Human Settlement Layer, FAO land cover (Africa)
- available at global or regional scale

In South Africa:
- Eskom’s SPOT Building Count (SBC), DWA villages, Land cover land use, Dept. Human Settlement products, STATSSA Dwelling frame
- Development of these data sets is time consuming and resources extensive
  - Some of these data sets are outdated
SA-National Human Settlement Layer

- Development of semi to automatic methodologies for human settlement extraction using SPOT imagery
  - Increase the frequency of updated information on human settlements
  - Increase the use of the data
  - Improve decision making

- SPOT 5
- Training data

Morphological Textural Radiance/reflectance

Built-up mask

SPOT 5 image

Built-up mask
2012 National Human Settlement Layer

- 2012 built-up mask
  - Resampled to 5m resolution
Built-up mask - Gauteng
2012 Built-up mask

Kimberly

Thohoyandou and surrounding villages

Umthatha and surrounding villages

Durban

Bloemfontein

Cape Town
Characterisation of built-up structures

Original SPOT 5 image

Classification building structures

- Land use management
- Demand of service
- Integrated planning
Building density from national human settlement layer

Building density maps
- Population
- Demand of service
- Disaster management
Encroachment of human settlements into agricultural land

2006 SPOT image, 2008 Agricultural Field Boundaries
GIS update and planning of service

- GIS update
- Demarcation
- Enumeration areas
- Villages
- Educational/health facilities
- Demand analysis
- Master planning
- Integrated planning
Activities on the national human settlement layer

- Methodology improvement
  - SANSA – JRC partnership
  - Global Human Settlement Layer (GHSL)
  - GEO Global Urban Observation and Information task
- Quality assurance
- Value adding products as per user requirements
- Change detection using archive SPOT 5
- New products using SPOT 6 and other sensors

- Case studies on human settlements
Informal settlement change detection

- SANSA and NDHS
- 2006-2011 change detection
  - Using SPOT 5 imagery
  - Location and extent (area)
  - 45 priority municipalities
- Results
  - 2006 = 1,602, 2011 = 1,793 (see graph)
  - 2006 = 182,687 Km², 2011 = 205,762 Km²
- Trends
  - Informal settlement decline (A)
  - Expansion of informal settlement (B)
  - No change (C)
  - New informal settlement development (D)
Urban growth assessment

Polokwane 2006

Polokwane 2013

Urbanization rate? Causes?

- Future plans
  - Reduce the negative impact
Low cost housing mapping

- Extraction of LCH units

- Tracking of government’s investments
- Living condition assessment
- Improve reporting
## Benefits of human settlement data

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<th>Organisation/Departments</th>
<th>Applications</th>
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<tr>
<td>National Department of Human settlement, provincial, district -local</td>
<td>Informal settlement upgrade planning and monitoring, low cost housing verification/progress assessment</td>
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<tr>
<td>Eskom</td>
<td>Electrification planning and load forecasting</td>
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<td>Municipalities</td>
<td>Spatial planning and infrastructure development</td>
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<td>Statistics South Africa</td>
<td>Population estimate and census planning</td>
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<td>Independent Electoral Commission</td>
<td>Voting districts mapping/update</td>
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<td>Housing Development Agency</td>
<td>Habitable land assessment</td>
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<td>Department of Performance Monitoring and Evaluation</td>
<td>Performance monitoring of publicly funded projects/tracking government’s investments in infrastructure projects</td>
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<td>Municipal Demarcation Board</td>
<td>National demarcation boundaries update</td>
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<td>Rand Water</td>
<td>Infrastructure monitoring and planning</td>
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<td>Rural Development and Land Reform</td>
<td>Cartographic map update, land management</td>
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<td>Department of Environment Affairs</td>
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<td>Department of Agriculture</td>
<td>Human settlement encroachment into agricultural land</td>
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<tr>
<td>Provincial Government Dept.</td>
<td>Informal settlement upgrade planning and monitoring, low cost housing mapping, etc</td>
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Legislative mandates

- SPLUMA
- Conservation of Agricultural Resources Act
- Environmental Management : Biodiversity Act
- Millennium Development Goals
- National Development Plan
THANK YOU