



science
& technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

Application of GIS to Fast Track Planning and Monitoring of Development Agenda

The Use of Satellite Imagery for Human
Settlement Mapping and Monitoring

13 – 17 August 2018

11 SUSTAINABLE CITIES
AND COMMUNITIES



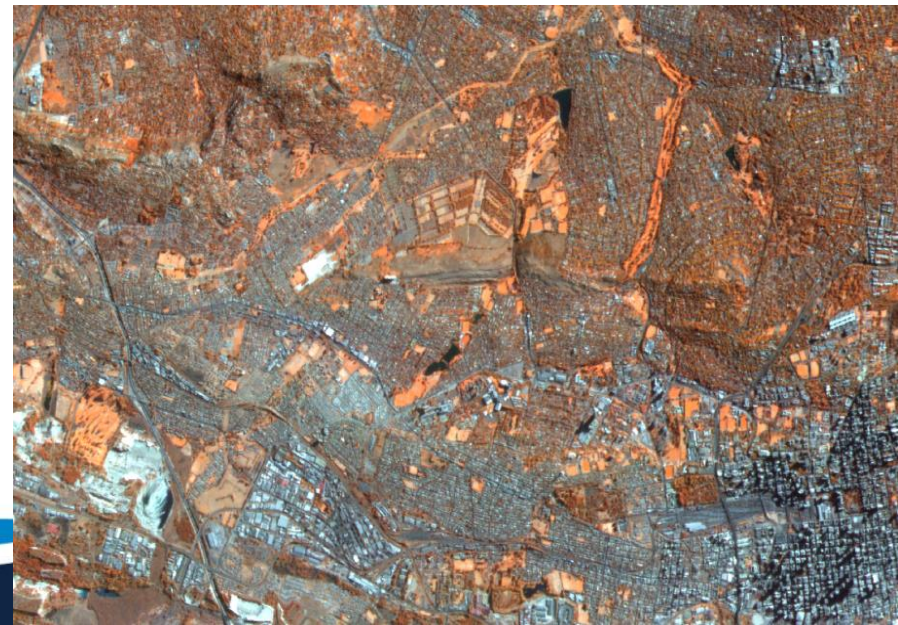
Introduction

Human settlement development:

- Environmental management
 - Natural resources management
 - Urban planning/rural development
 - Disaster management
 - Policy formulation and implementation
 - Infrastructure planning and monitoring
 - Development planning and monitoring
 - Population estimation
 - Land use management
 - Service delivery and monitoring
 - GIS map updating
- 

Why satellite remote sensing


- Satellite remote sensing technology provides:
 - a synoptic view of human activities and natural environment over a larger area
 - temporal mapping (frequency: ability to capture the same area at different time interval)
 - at up 50cm spatial resolution (detail information can be extracted – higher scale mapping)
 - provision of evidence for informed decision-making
 - accurate and consistent source of information
 - short term to long term monitoring




International trends on human settlement mapping

- GEO, Global urban Observation and Information
 - Defence Meteorological Satellite Programme
 - Modis Land Cover Products
 - Urban Environmental Monitoring,
 - Mega cities/Euro-cities
 - Global Urban Observatory
 - Global Human Settlement Layer
 - FAO land cover (Africa)
 - etc.
- 

South Africa Human settlement initiatives

- Eskom's SPOT Building Count (SBC)
 - DWA villages
 - Land cover land use, national, provincial, local municipality,
 - Dept. Human Settlement products
 - Municipal data
 - STATSSA Dwelling frame
 - etc.
- 

Why SANSA?

- Custodian/Access to data and technology
 - Mandate to support users
 - Development of user-driven products
 - Development of methodologies
 - Create awareness and promote the use of satellite remote sensing products
- 

Earth Observation data for human settlement mapping

Active

- Modis – free to all
- Landsat 7/8 – free to all
- SPOT 5/6 – (SPOT 5 -2006-2013, SPOT 6 – 2013- ...)- free to government users
- Pleiades – not free
- WorldView/GeoEye – not free

Archive

- SPOT 2-4
 - Landsat 2-7
 - CBERS
 - SAC-C
 - SumbandilaSat.....
- 

Satellite imagery for human settlement mapping

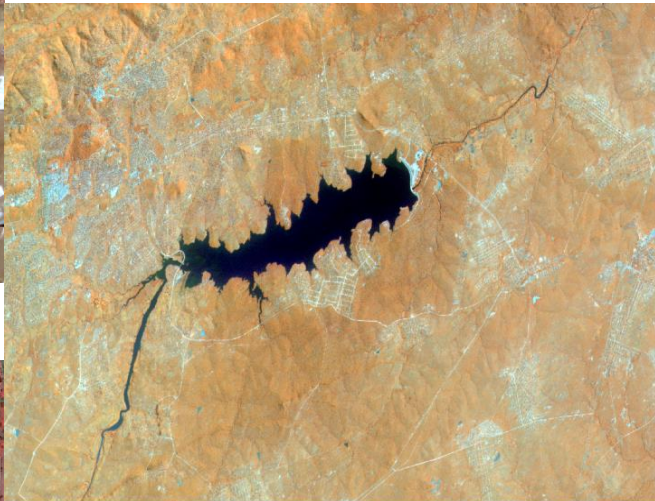
Landsat 30m



SPOT 6- 1.5m



SumbandilaSat 6.25m



SPOT 5 – 2.5m



Pleiades 50cm



Level of detail required = sensor to use

Built-up
Non-Built-up

Applications

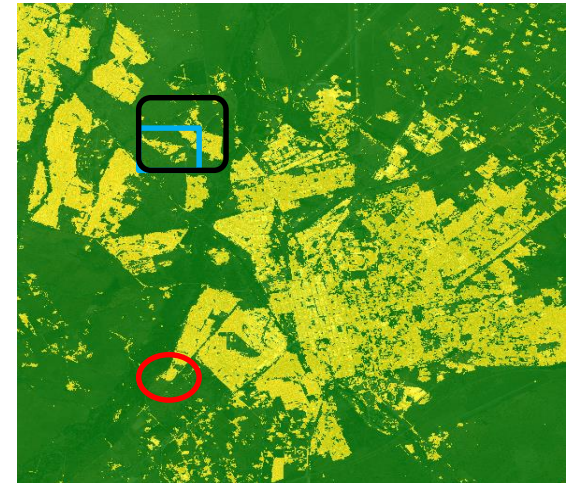
Urban growth assessment
2006



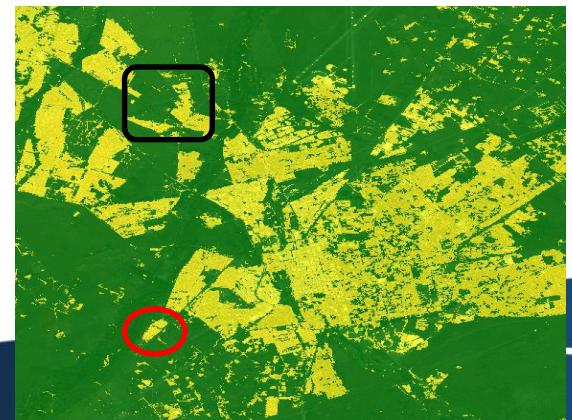
2009



2012



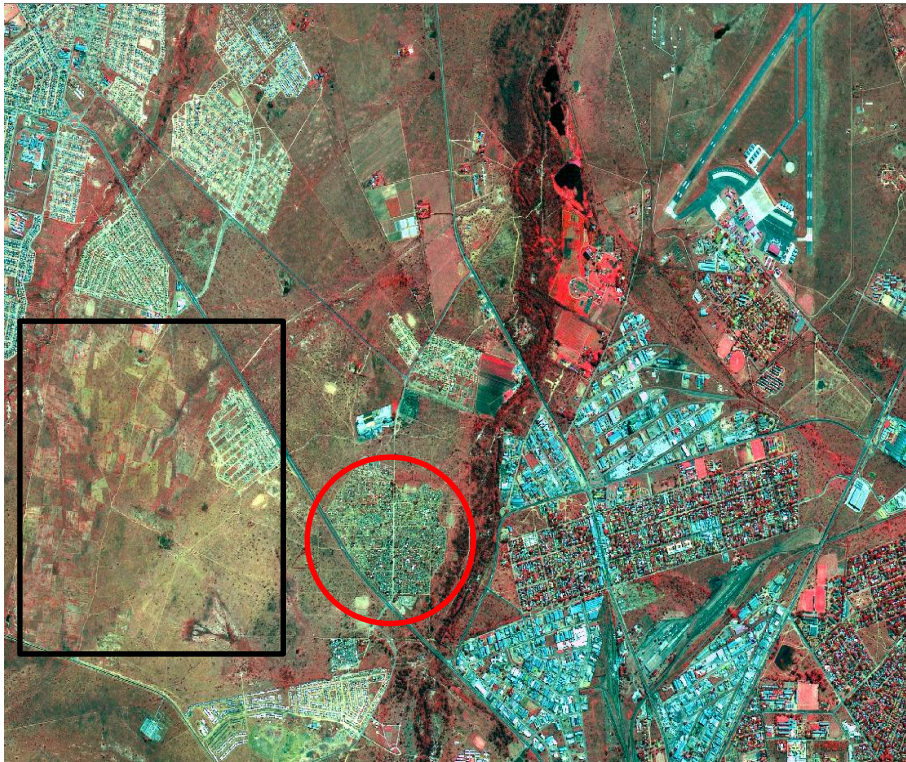
2013



- Impact of the growth on the infrastructure /services/development plans?
- Causes of the growth?
- Impact on the environment?
- Disaster management system?
- Demarcation boundaries

Applications

Urban growth assessment using SPOT 5



Polokwane 2006



Polokwane 2013

Applications

Human settlement development

2007



2012



Midrand

Applications

Human settlement development



2007



2010



2013

Applications

Urban land cover using SPOT 6



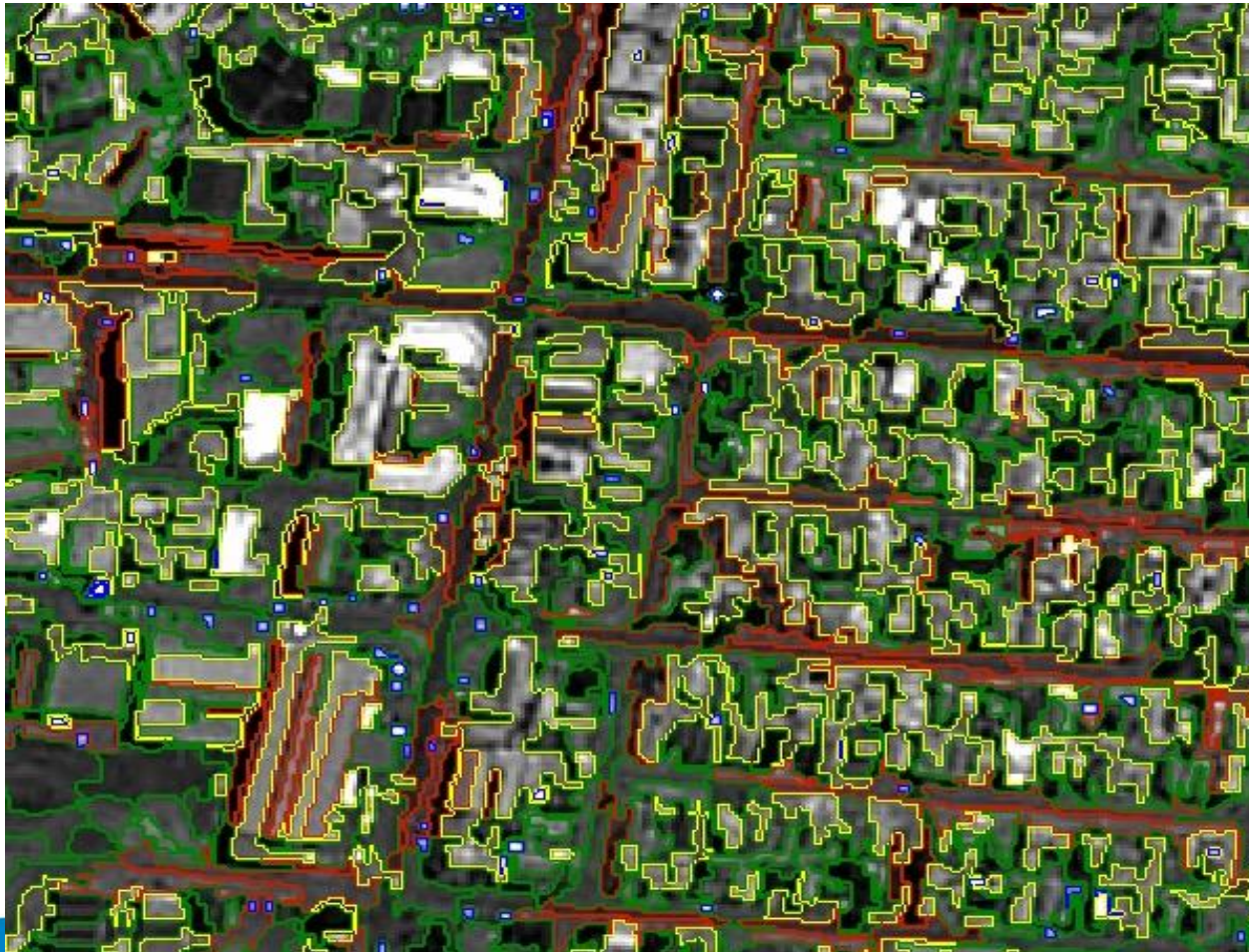
Witbank, Mpumalanga



- classes
- grassland
- impervious
- iron roof
- other roofs
- trees

Human settlements products

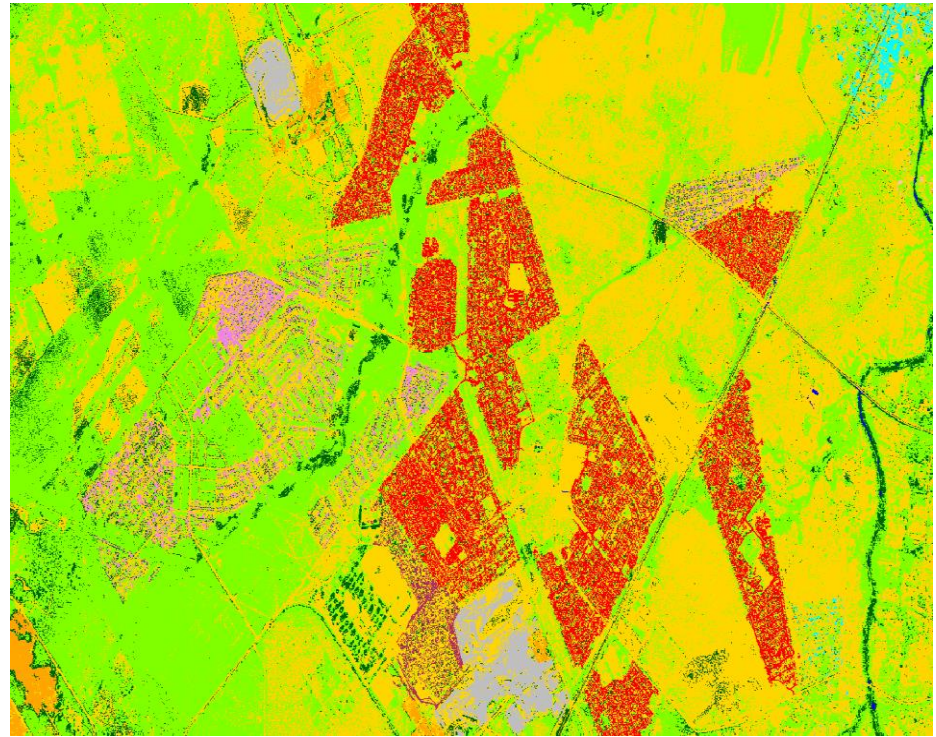
Urban land cover/use using SPOT 6



Cars
Vegetation/open
Built-up
Roads

Applications

Human settlement types classification



Applications

- Informal settlement monitoring
 - Growth



After a year



Applications of satellite remote sensing

Informal settlement monitoring

- Decline



Applications

Environmental condition assessment



Wetlands?

- Informal settlement upgrade Prioritization
- Disaster management plans?

- Informal settlement assessment between 2006 and 2011

Applications

Mixed housing development project

2012



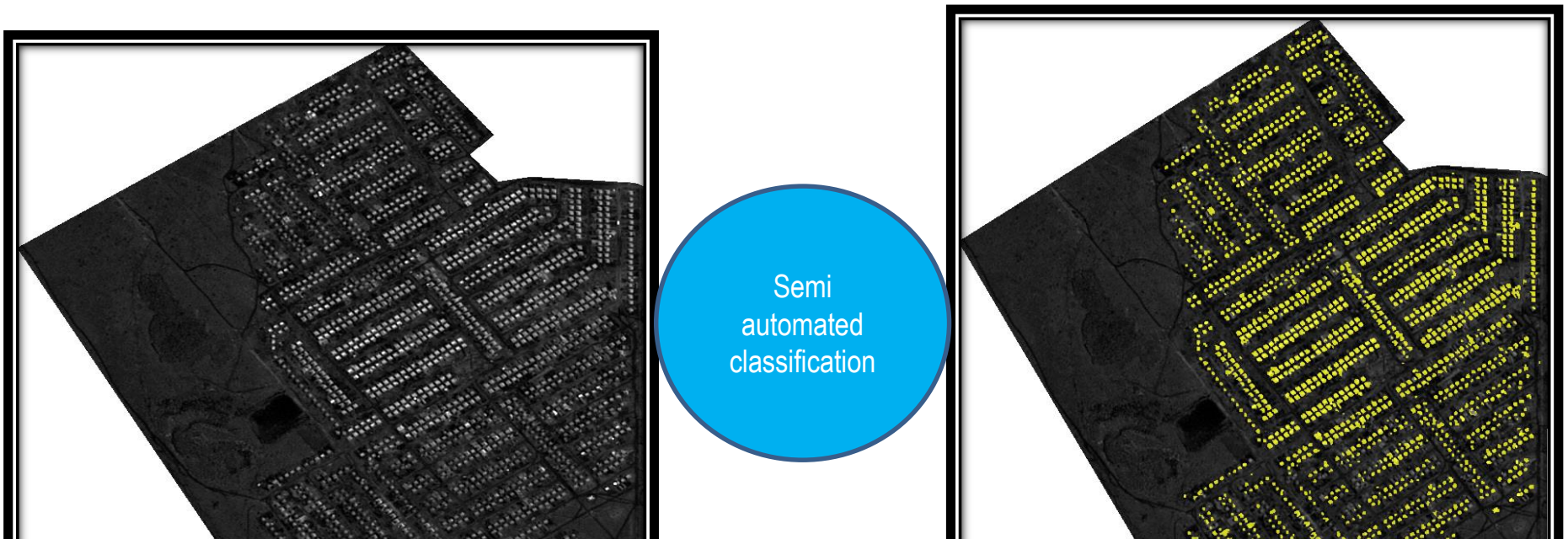
2013



New school

Applications

- LCH verification
- Building count
- Population estimation



Project number	Project name	Municipality name	No of Subsidies	Houses completed as	Outstanding units as reported	SANSA mapped	Foundations mapped	Waiplates mapped	Top Structure Budget	Subsidy Quantum	SANSA results in Rands	Variance on Top Structure
B04040005	BA BOTHITHONG	Joe Morolong	400	400	0	400	0	0			R 0	R 0
B04010001	BA GA MAIDI WARD 13	Mafikeng	371	368	3	42	0	0	R 5 014 200	R 23 100	R 970 200	R 4 044 000
B04030003	BA GA PHETLHU RURAL	Ga-Segonyana	300	300	0	281	0	0		R 23 100	R 6 491 100	-R 6 491 100
B04010002	BA GA PHUDUHUCWANA	Greater Taung	360	1	359	45	0	0	R 4 704 885	R 23 100	R 1 039 500	R 3 665 385
B04030006	BA-GA-MOTLHWARE	Ga-Segonyana	500	498	2	499	5	0	R 13 598 641	R 31 929	R 15 932 571	-R 2 333 930
B04120001	BOITUMELONG EXT 4	Lekwa-Teemane	500	317	183	613	99	31	R 10 301 176	R 20 300	R 12 443 900	-R 2 142 724
B05060006	CHRISTIANA	Lekwa-Teemane	450	416	34	790	138	78	R 10 382 286	R 31 929	R 25 223 910	-R 14 841 624
B04100001	DITHAKWANENG RURAL	Naledi	625	614	11	233	105	38			R 0	R 0
B04040012	GANYESA RURAL HOUSING	Kagisano/Molopo	600	590	10	518	76	0			R 0	R 0
B04040008	HEUNING RURAL SUBSIDY	Joe Morolong	500	0	500	0	0	0			R 0	R 0
B08030001	KAGISANO RURAL TSEGE	Kagisano/Molopo	340	340	0	0	0	0			R 0	R 0

Applications

Infrastructure development monitoring

- Mixed housing development

Tarred road

Structures with roofs

Wall plates-structures

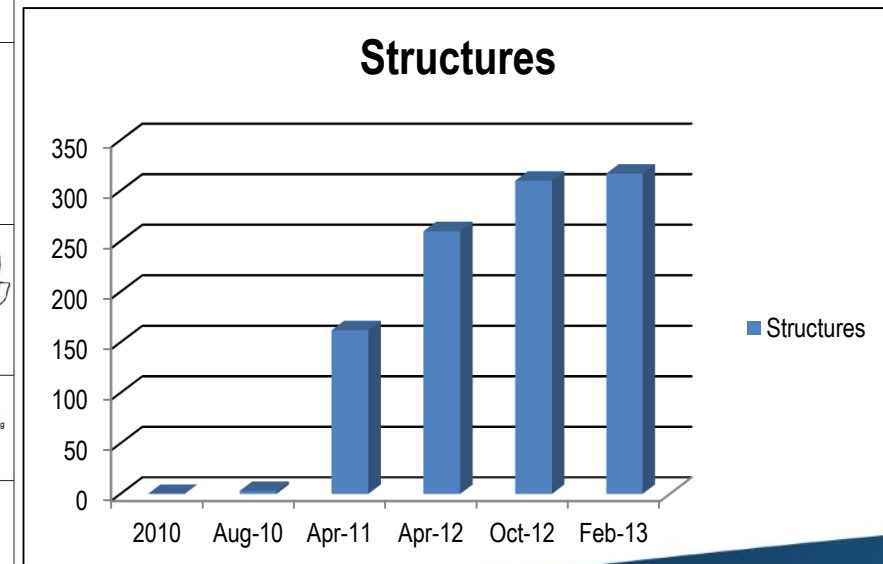
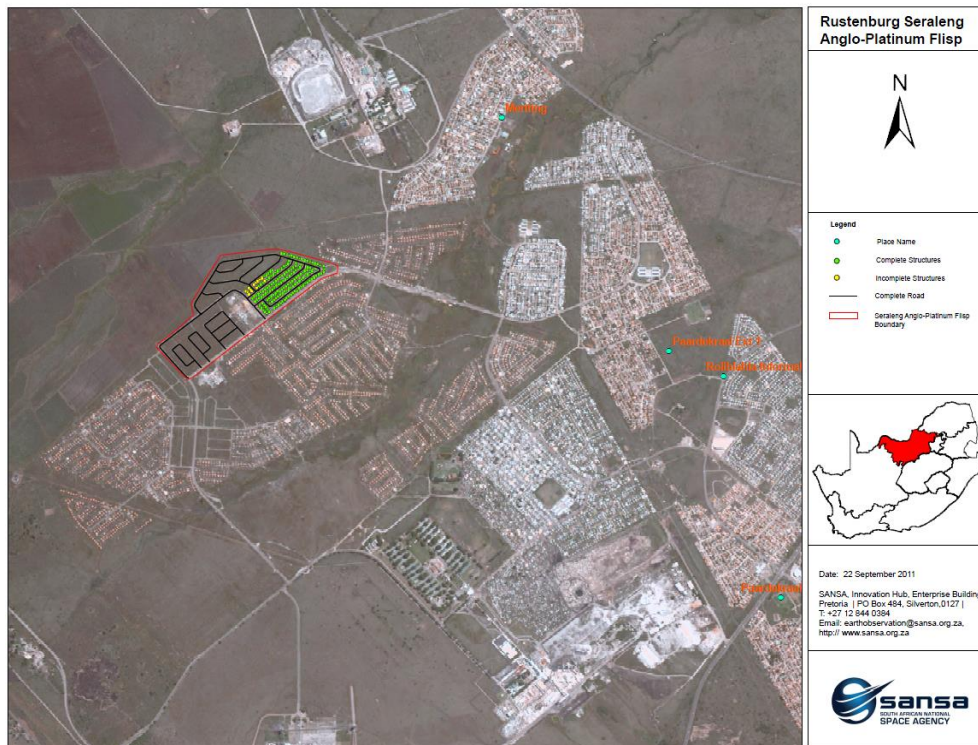
Gravel

Housing foundation



Applications

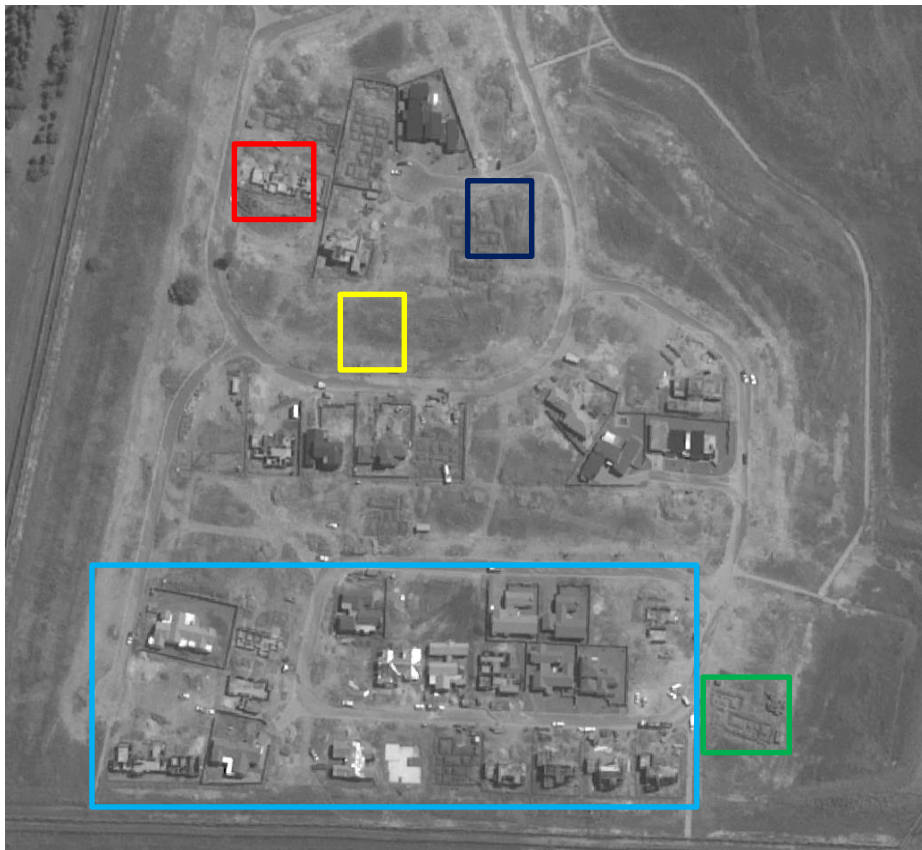
- Reporting



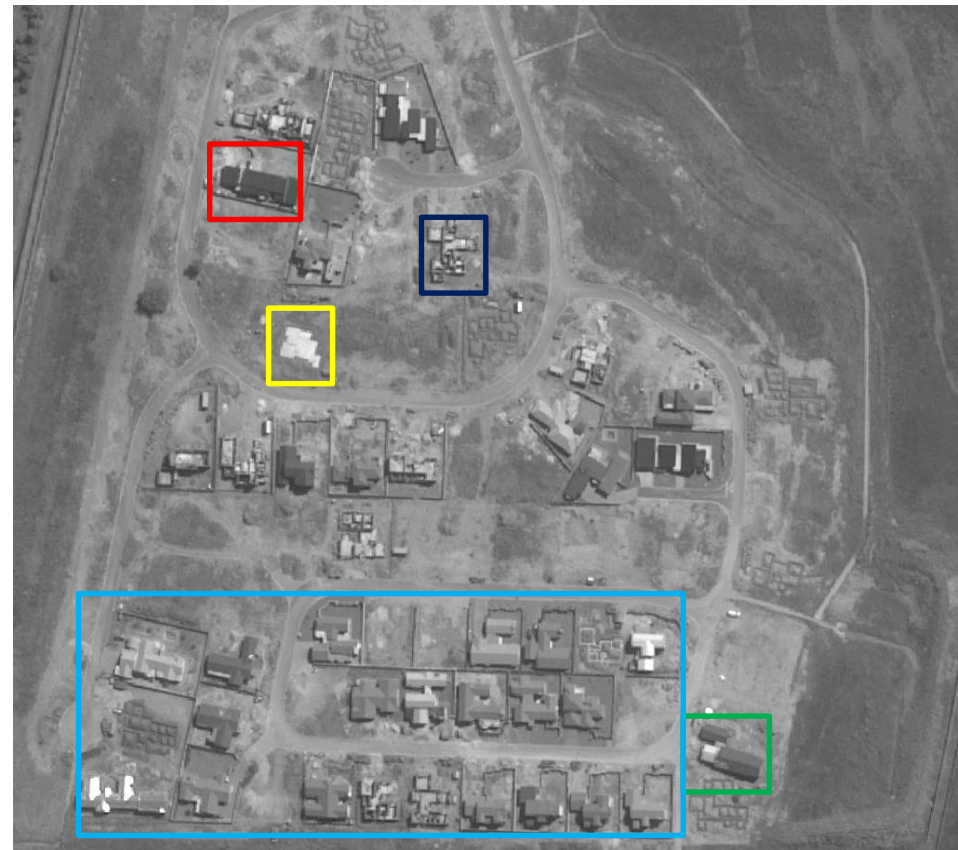
Satellite imagery applications

Housing development

Feb 2014



March 2014



Impact of these rapid development on infrastructure/services?

Human settlement products

Impact of these rapid development on infrastructure/services?



Feb 2014



March 2014

Informal settlement upgrade



upgrade



Access to services?
Development of backyard shack



More backyard
shacks?

More informal
Settlements?

Impact of the
current services



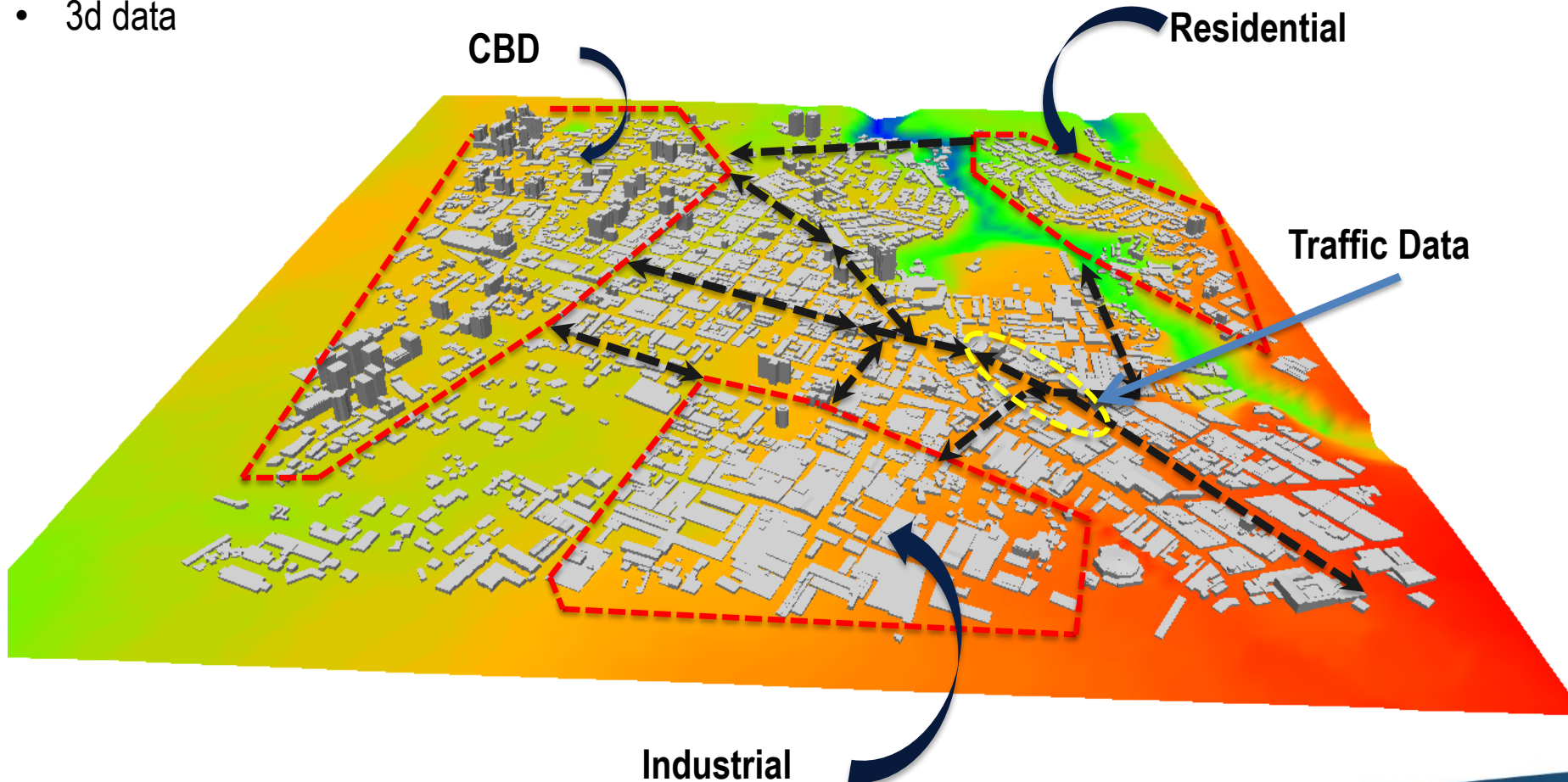
GIS database/map update



- Cadastral
- Roads
- Point of interest
- Schools
- Health
- Sports
- Buildings....
- etc.

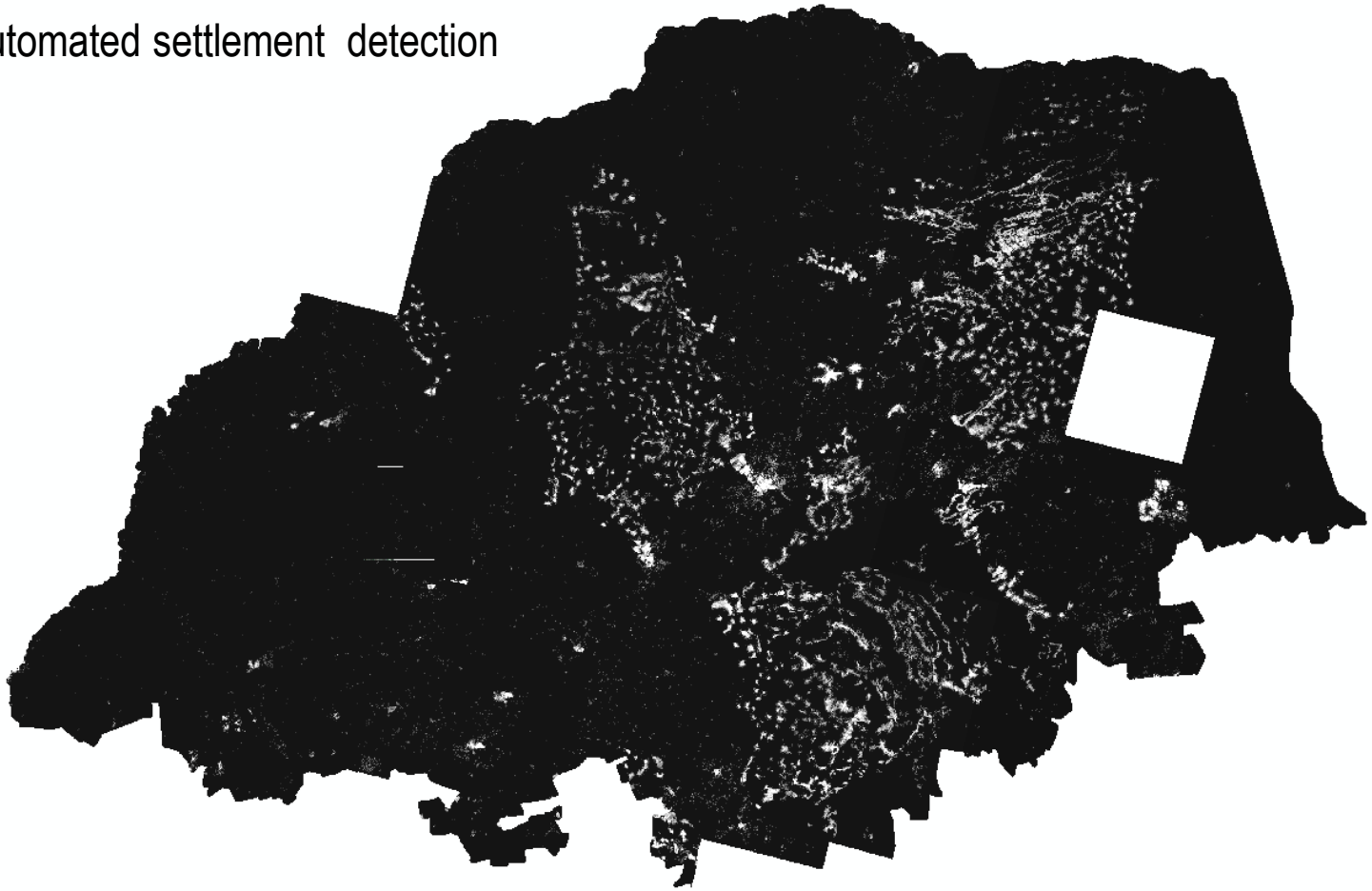
Detailed mapping

- 3d data

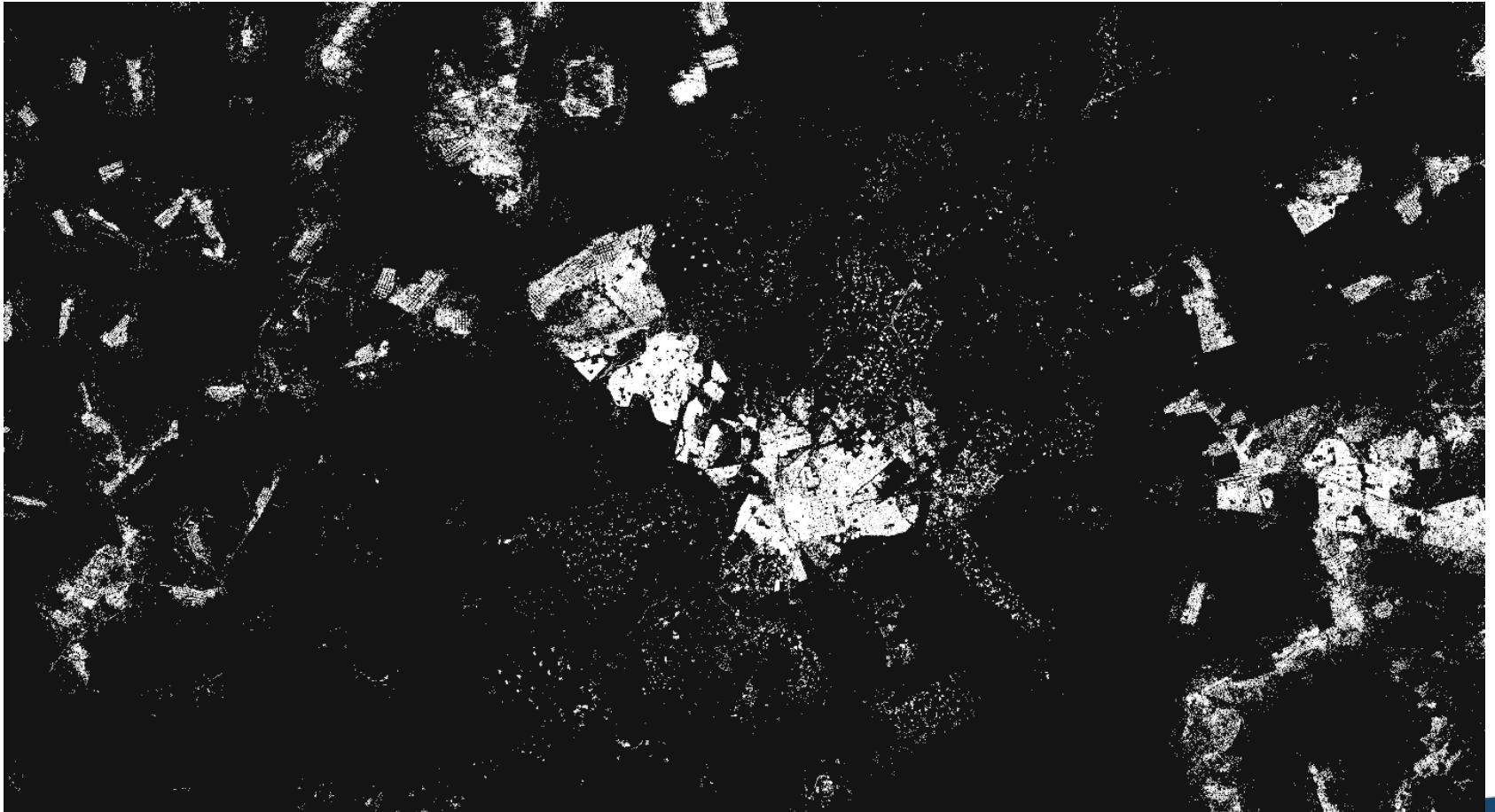


Provincial – national human settlement map

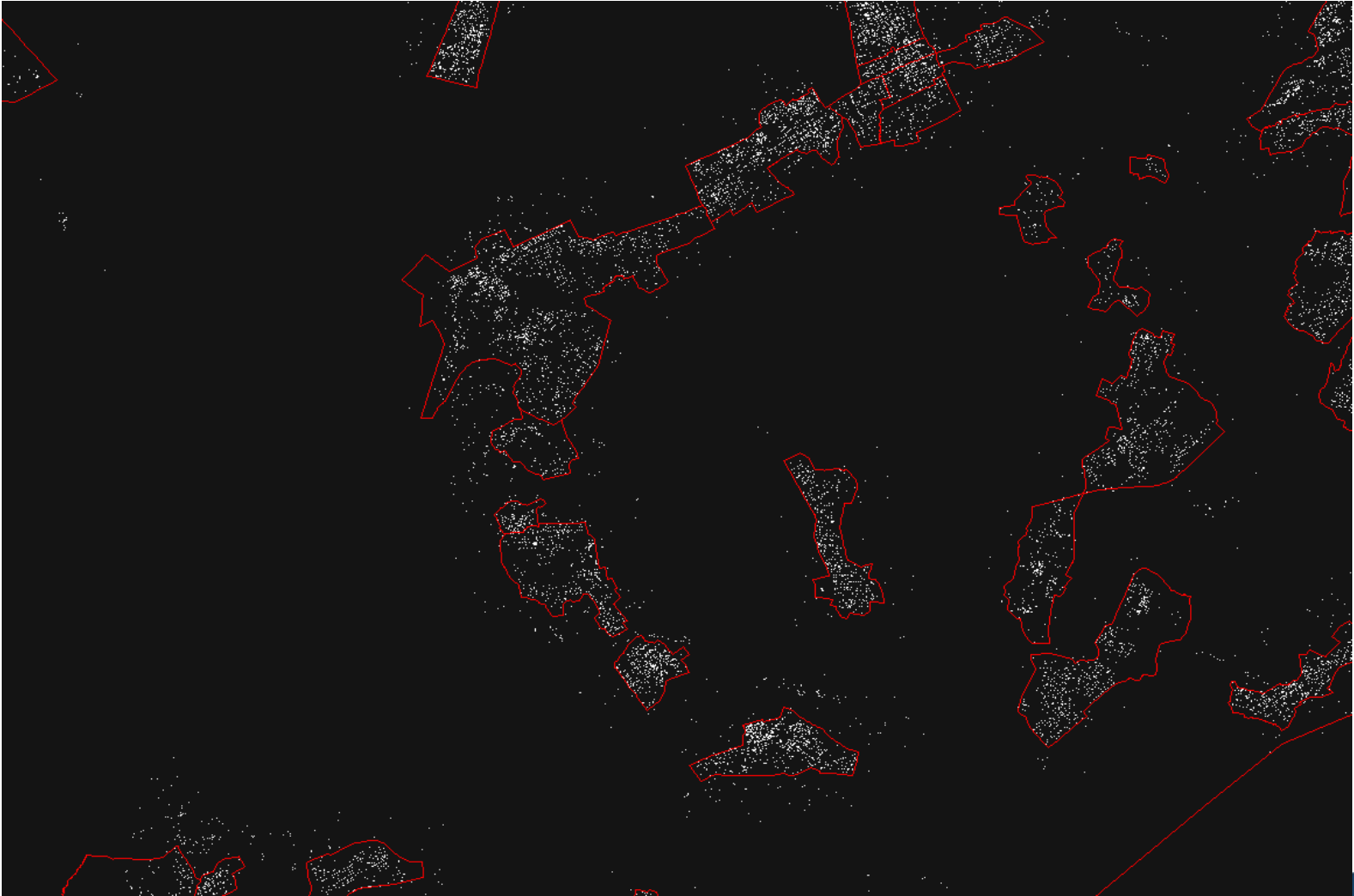
- Semi –automated settlement detection



Provincial – national human settlement map

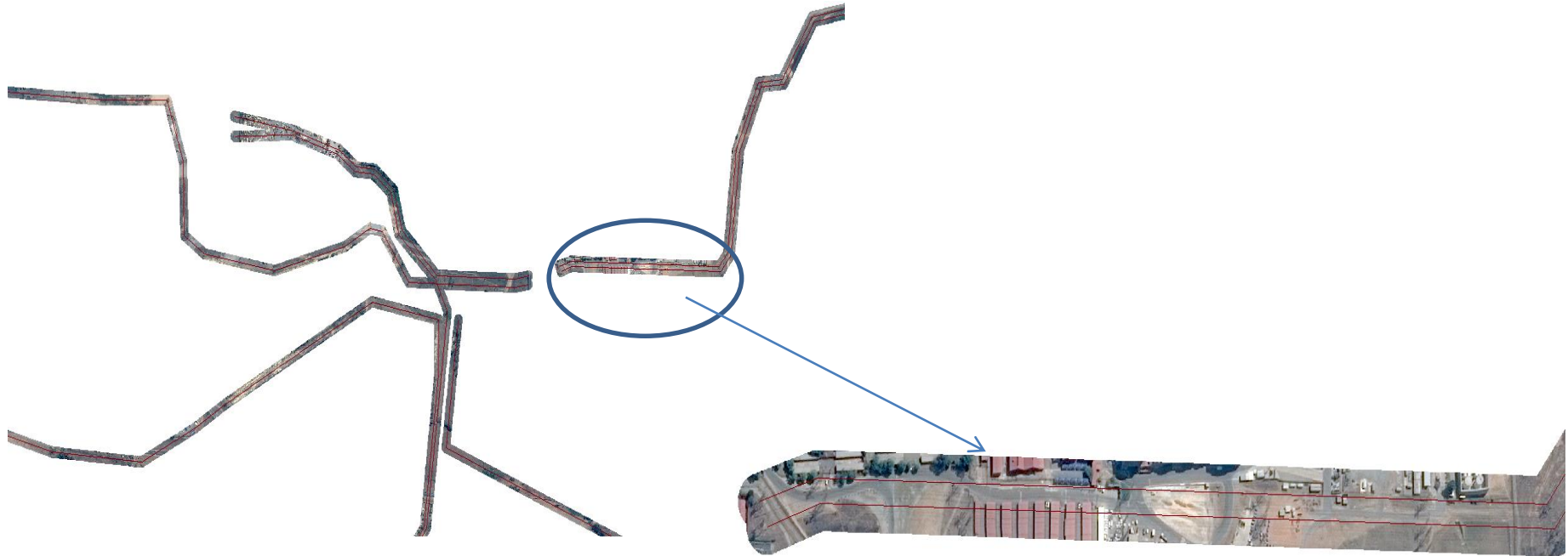


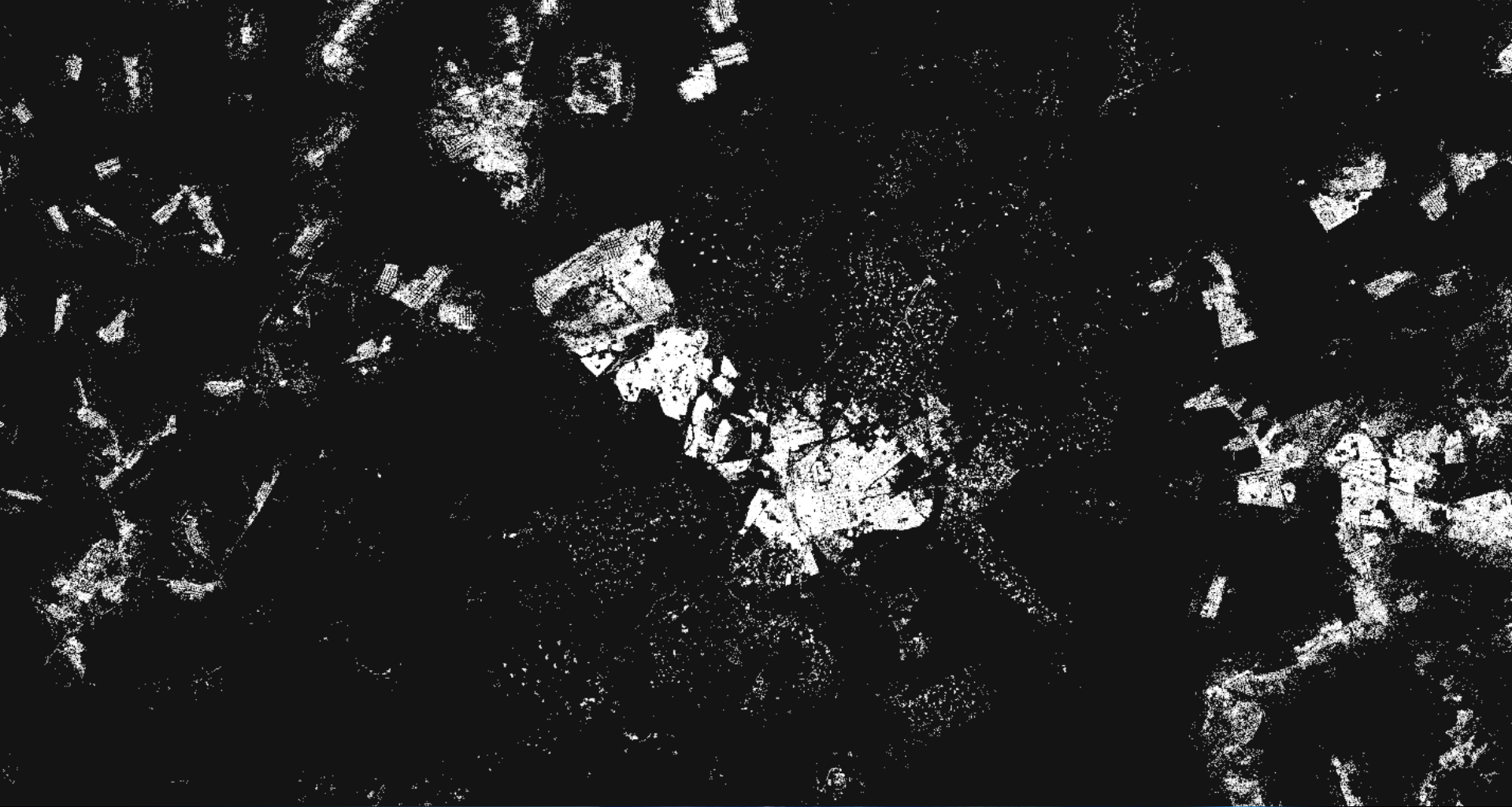
Applications of Provincial –National human settlement layer



Other applications

- Acquisition of high resolution imagery areas of interest
- Change detection report encroachment of settlements on private/ protected land





Thank you
Ndi a livhuwa