SANSA Earth Observation Offerings

Naledzani Mudau
Acting Chief Sector and Business Developer
GISSA: Eastern Cape AGM 2024

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Science and Innovation
REPUBLIC OF SOUTH AFRICA

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SOUTH AFRICAN NATIONAL
SPACE AGENCY

Act No. 36, SOUTH AFRICAN NATIONAL SPACE AGENCY ACT, 2008

To provide for the promotion and use of space and co-operation in space-related activities, foster research in space science, advance scientific engineering through human capital, support the creation of an environment conducive to industrial development in space technologies within the framework of national government policy, and for that purpose to establish the South African National Space Agency; to provide for the objects and functions of the South African National Space Agency and for the manner in which it must be managed and governed; and to provide for matters connected therewith.

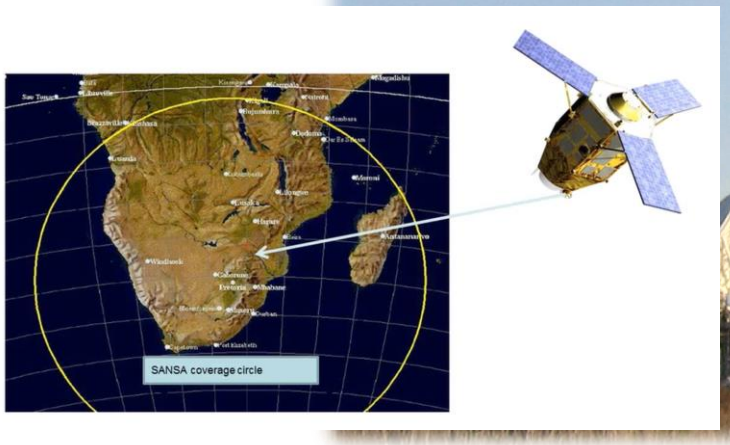
Functions of Agency 5. (1) The Agency must—

(d) acquire, assimilate and disseminate space satellite imagery for any organ of state

Sources of Satellite Data for South Africa

Data received at SANSA Ground Receiving Station (Space Operations)

Ingested, archived and catalogued by SANSA Earth Observation ground segments



Currently directly receiving

Landsat 8,9 CBERS 04, 4A, MODIS; Aqua and Terra

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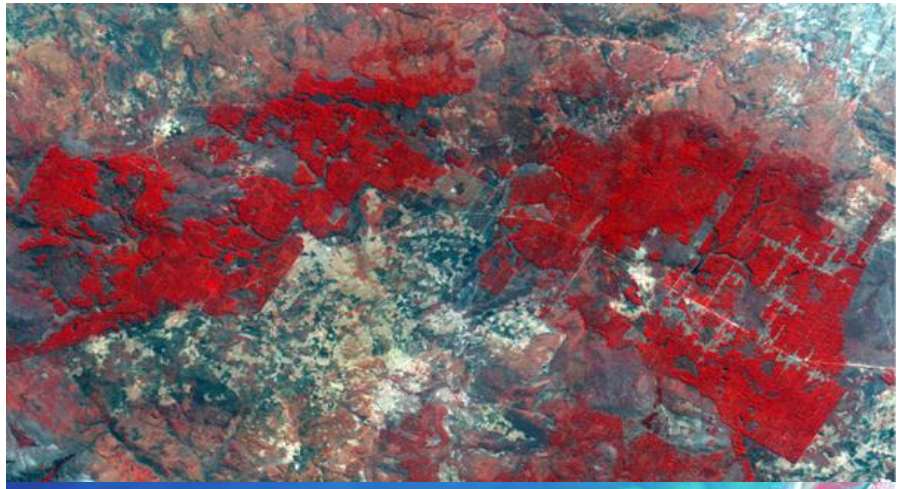
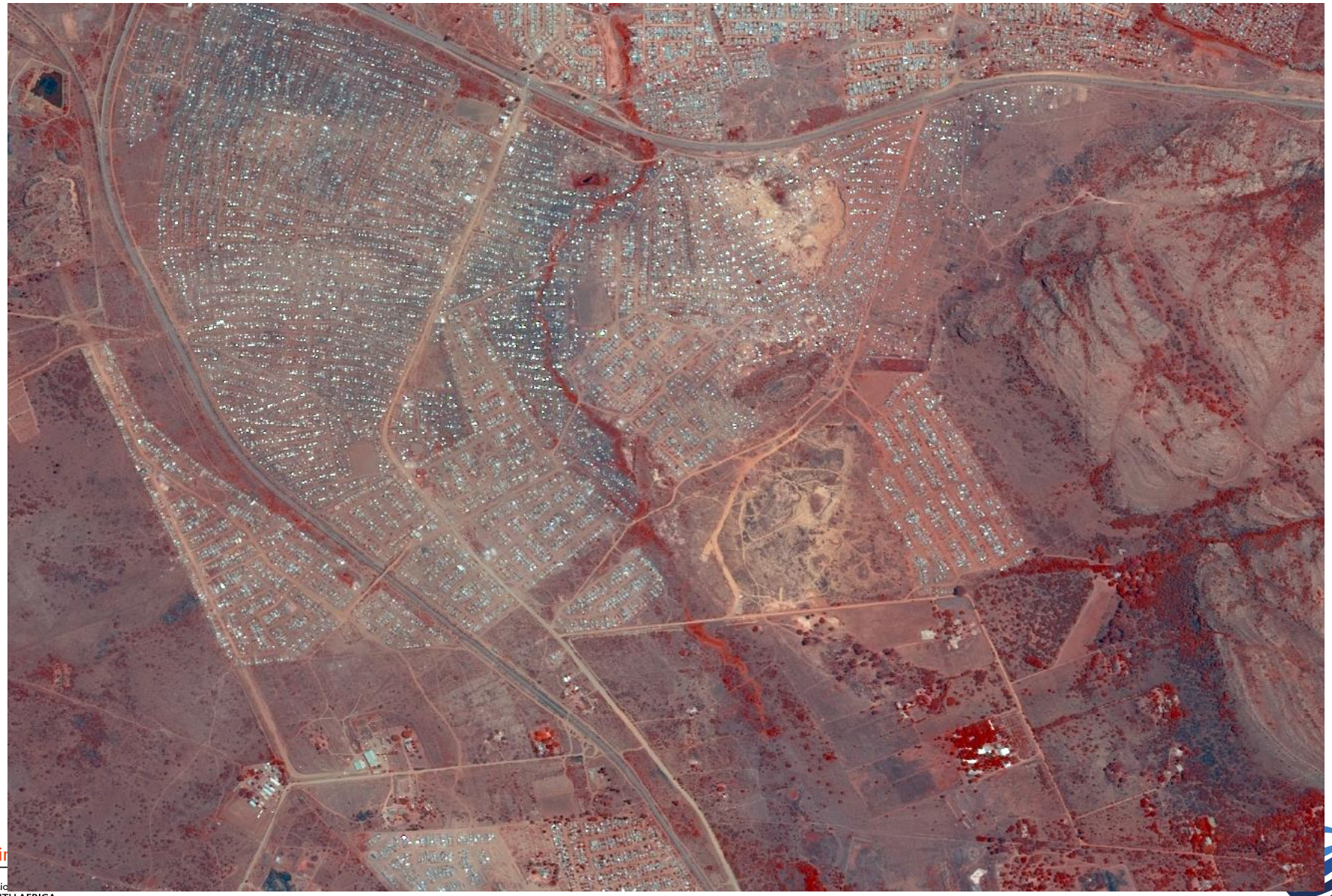
CBERS 4A

Wide width Panchromatic Multi-spectral camera (WPM)

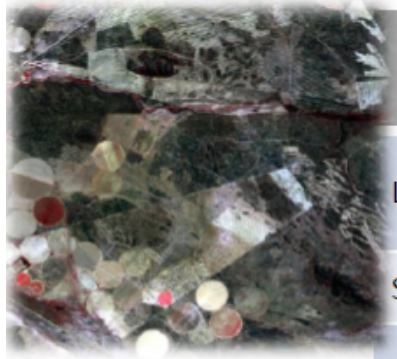
Pan 2m , MS: 8m

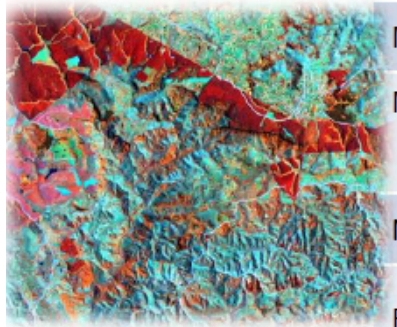
	Total	Level 0	Level 1A	Level 2B
Tasking plans	55			
Number of images	1381	59	684	638





More in the EODC Archive

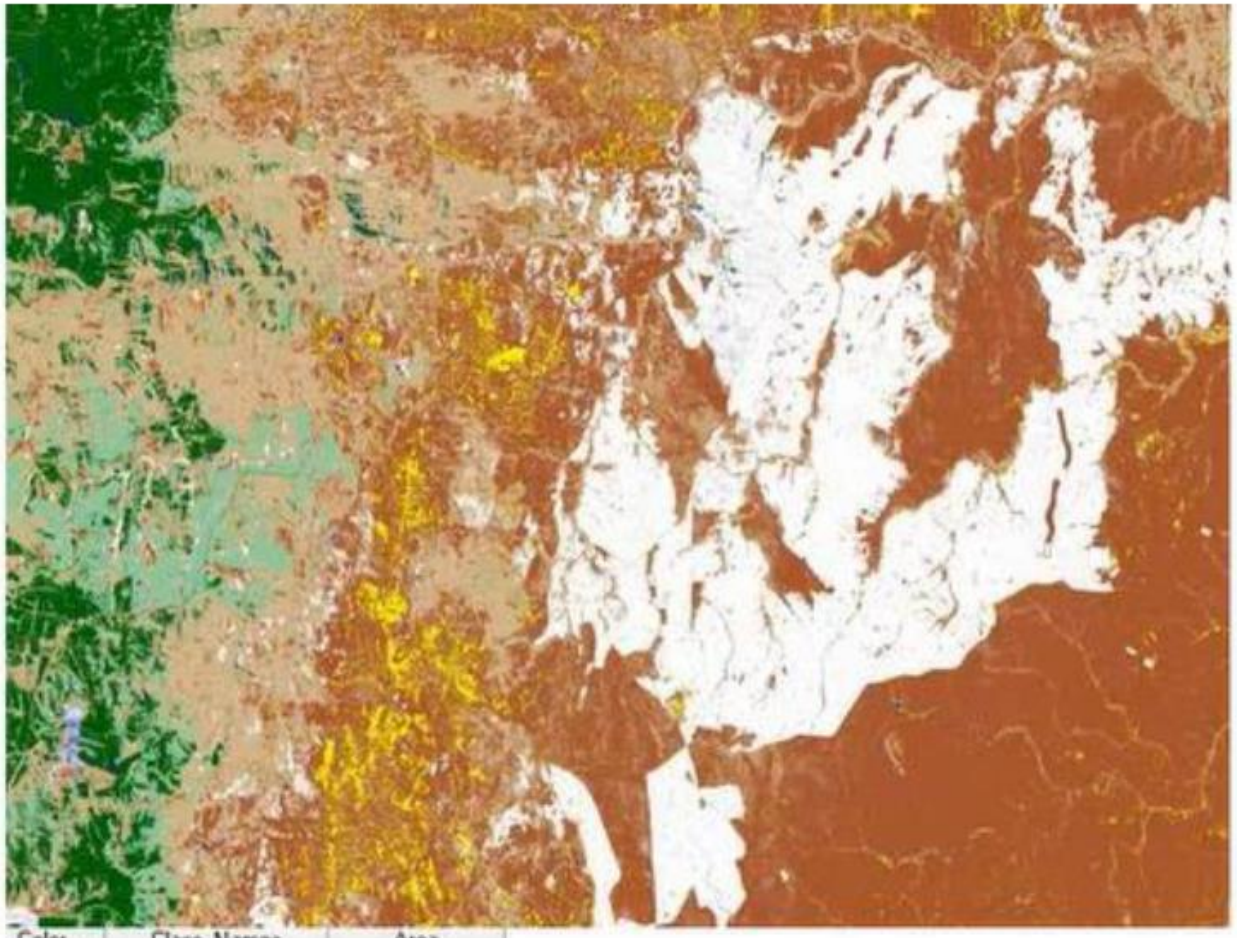




Sensor	Spatial Resolution	Coverage	Date of Acquisition
Landsat: MSS,TM, ETM, 7,8	15m-60m	Southern Africa	1972 - current day
SPOT 2, 4,5,6,7	1.5m-20m	Southern Africa	1994 - current day
CBERS 2B, CBERS 4A &4B	20m	SADC except, Mauritius, DRC, Madagascar and Seychelles	2008 -2009
SAC-C	175m	SADC except, Mauritius, DRC, Madagascar and Seychelles	2008 - 2009
MISR	275m, 1.1km	Africa	2003 - current day
MODIS, AQUA & TERRA	250m,500m, 1km	Africa	2000 - current day
NOAA AVHRR	1.1km	Africa	1984 - current day
ERS-1	30m	Africa	1994 to 2009
MERIS	300m	Africa	2002 to 2010
SumbandilaSat	6.25m	Global	2000 to 2011

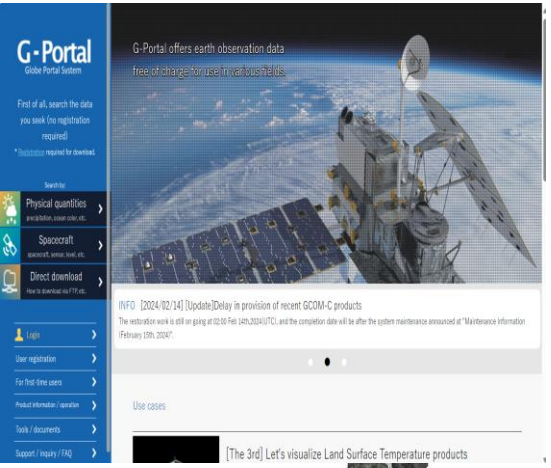
Post fire assessment

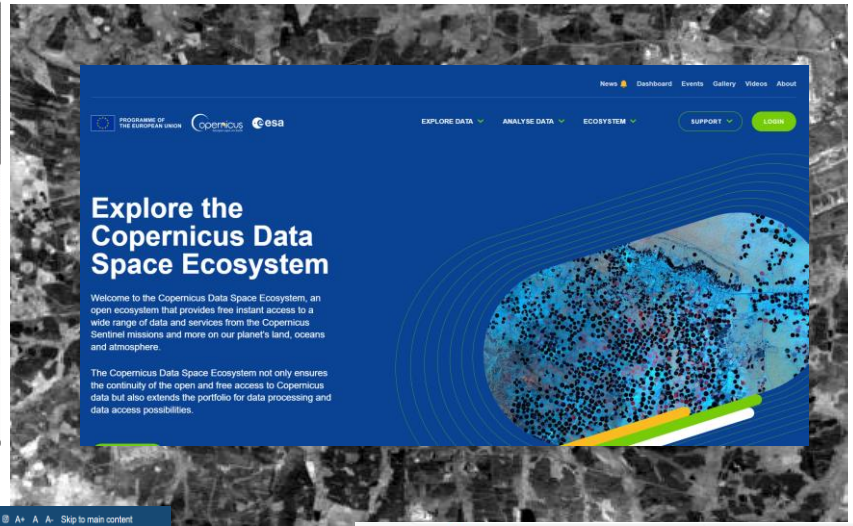
SumbandilaSat image

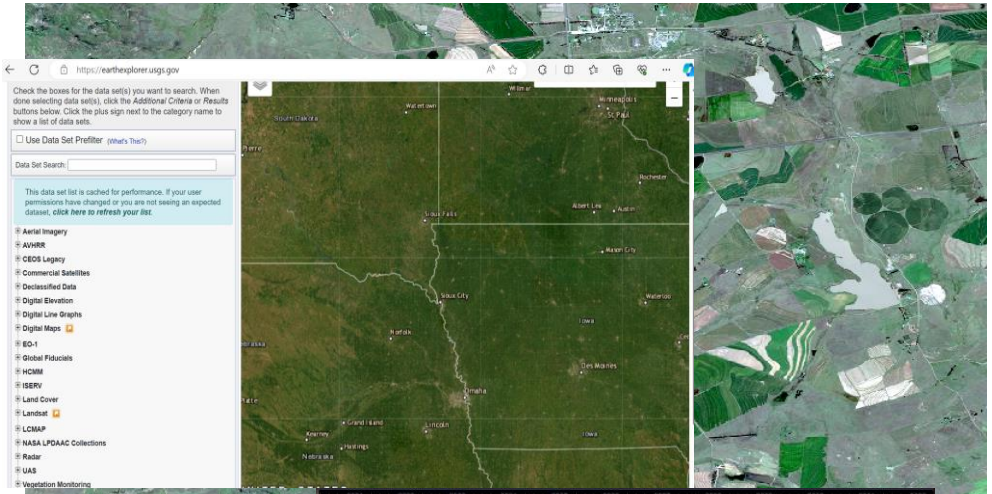


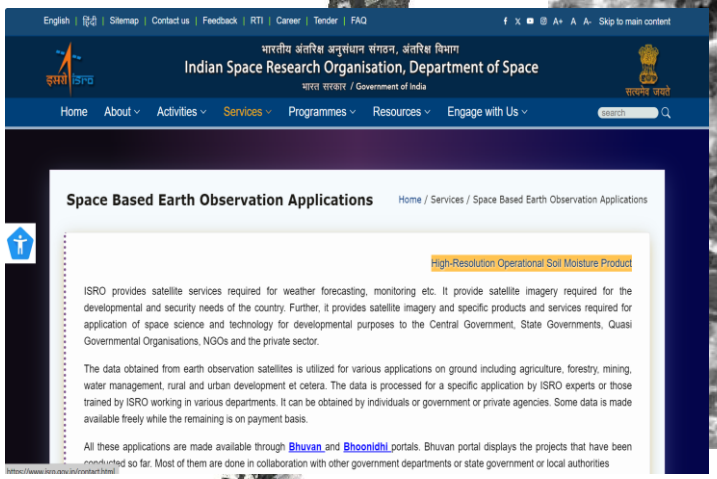
Color	Class_Names	Area
	Agric	5330.13
	c_bveld	55225.5
	Fire	29032.3
	Forestry	9696.07
	ı_bveld	31857.9
	Unclassified	0.6804
	Urban	4369.98
	Water	252.573

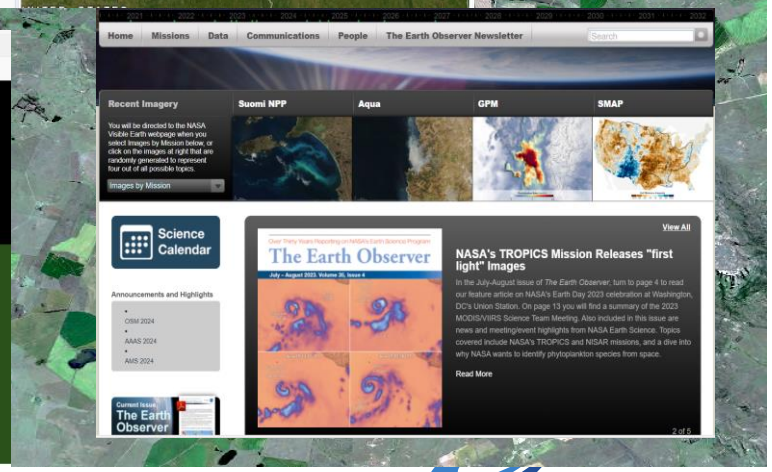
Open Access Data











MS to Hyperspectral

Systematic coverage – targeted

Optical SAR

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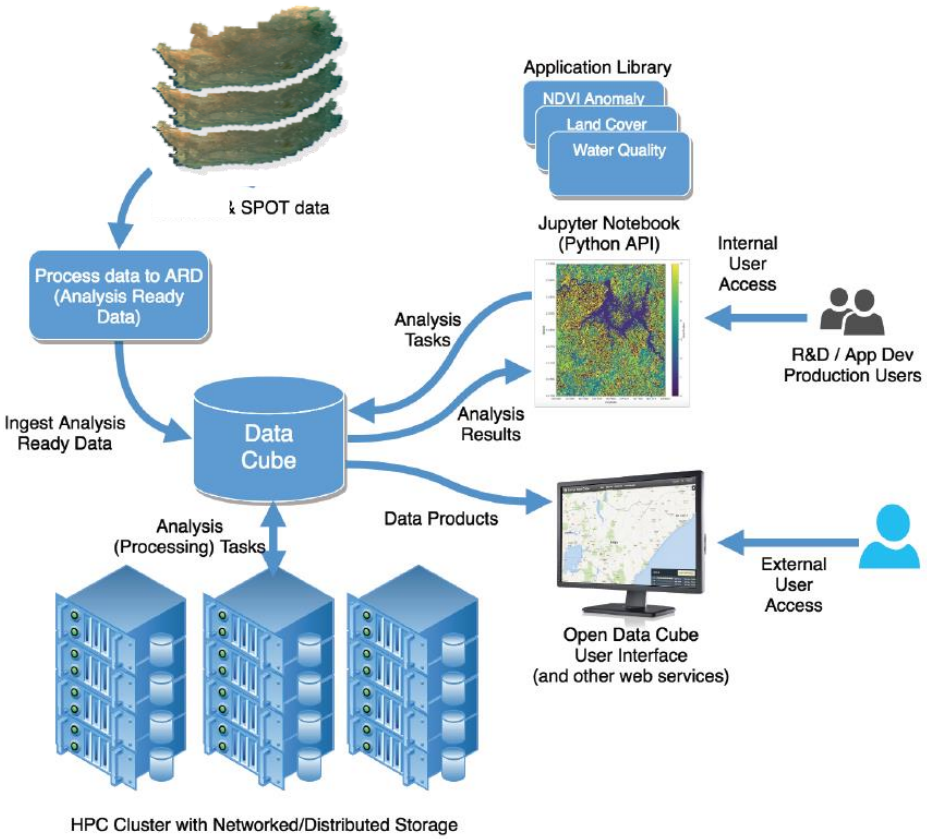
Ocean, land-atmosphere

Specific Needs	Earth Observation									
	Spatial Resolution Required									
	<50cm	50cm – 1m	1m – 2.5m	2.5m – 5m	5m – 10m	10m – 20m	20m – 30m	>30m	Temporal Frequency	Geographic Area
Environmental and geospatial monitoring	•	•	•	•	•	•	•	•	Annual	National
Ocean, coastal and marine management	•	•	•	•	•	•	•	•	Annual	SADC
Land management	•	•	•	•					Seasonal	National
Rural development and urban planning	•	•	•	•					Annual	National
Topographic mapping	•	•	•	•	•	•	•	•	Annual	National
Hydrological monitoring	•	•	•	•	•	•	•		Twice per annum	National
Climate change mitigation and adaptation	•	•	•	•	•	•			Daily	SADC
Meteorological monitoring								•	Daily	SADC
Disaster monitoring and relief	•	•	•	•	•	•	•	•	Daily when required	SADC
Hazard forecasting and early warning					•	•	•	•	Twice per annum	SADC
Cross-border risks	•	•	•	•					Daily when required	National
Disease surveillance and health risk	•	•	•	•	•	•	•	•	Twice per annum	National
Asset monitoring	•	•	•	•					Daily when required	National
Regulatory enforcement	•	•	•						Daily when required	National
Defence, peacekeeping and treaty monitoring	•	•	•	•					High turnaround time	Africa
Tourism and recreation	•	•	•	•	•	•	•		Annual	National
Communication									Continuous	SADC
Space science and exploration										National
Space technology transfer and spin-offs	•	•	•	•	•	•	•	•		National
Development of the space industry	•	•	•	•	•	•	•	•		National

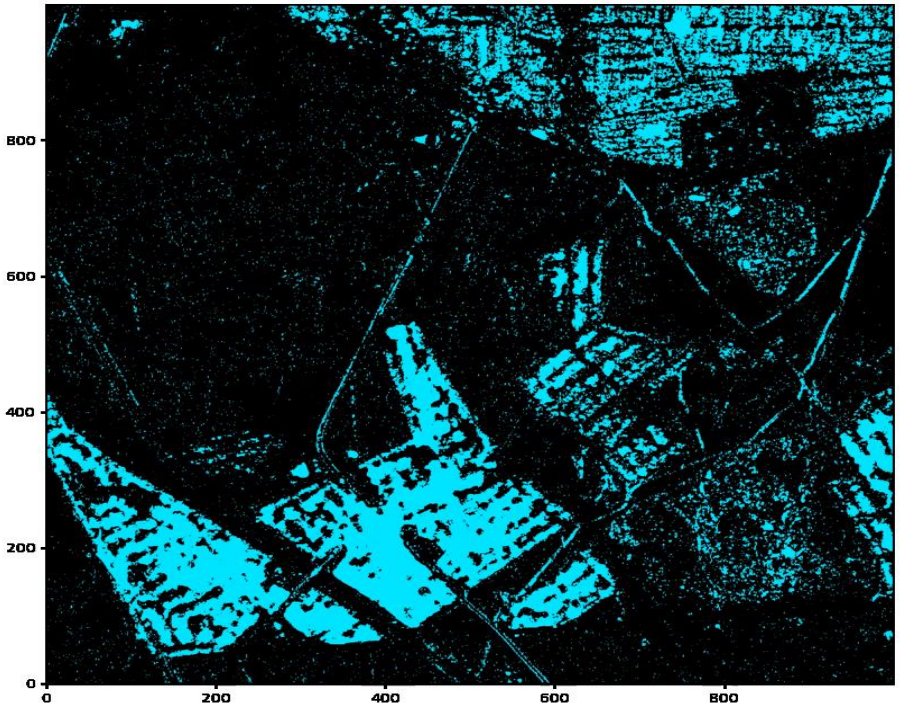
South African Datacube

- High spatial resolution data cube
- SPOT 5,6 & 7: 2006 – 2017
- Open to government, research and academia
- Access by private through a partnership framework
- Products free for non-commercial use



Use-case: Urban Change Detection

- **We used SPOT 6 & 7 datasets to examine the change in urban extent between a baseline period and a more recent period.**
- **Location of urban growth between the two periods is highlighted on a map**



Platform - Digital Earth South Africa (sansa.org.za)

Urban Change

Jan 2016 to July 2017

Data Acquisition Initiatives

Acquisition of high spatial resolution satellite imagery

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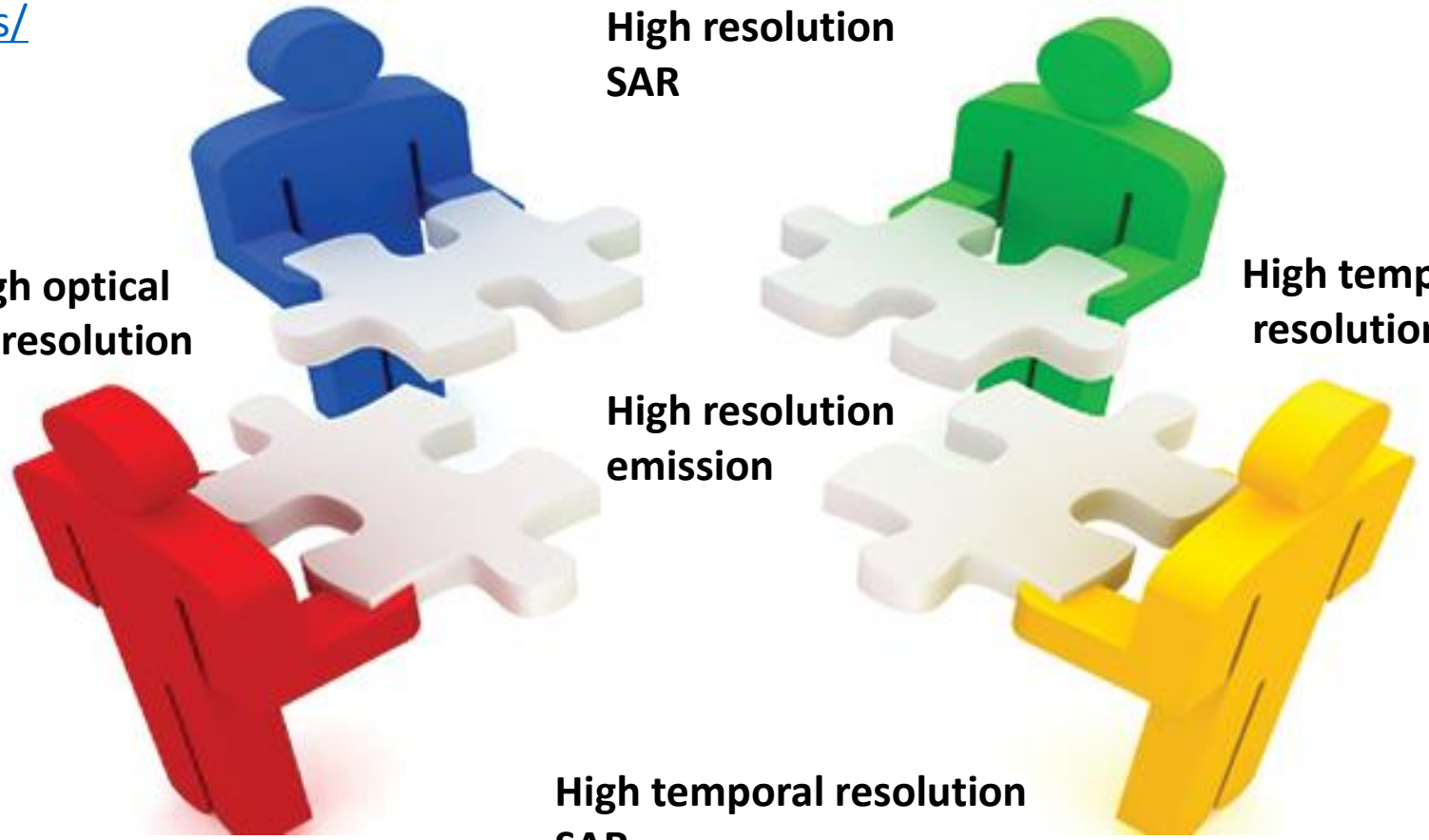
Acquisition of high…. resolution data

https://www.etenders.gov.za/Home/opportunities?id=1
https://www.sansa.org.za/tenders/



Acquisition of SAR

NATIONAL OCIMS

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Fisheries and Aquaculture Support

A satellite remote-sensing product showing where algal blooms are occurring.

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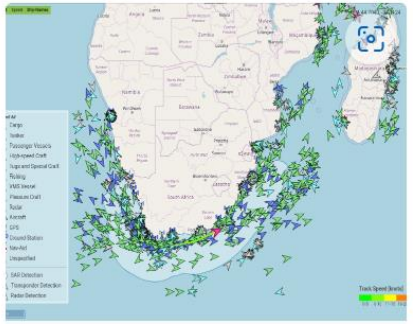
Coastal Operations at Sea

Use of ocean models and sea state parameters.

Launch >



Integrated Vessel Tracking

This tool is access controlled. Please contact us if you would like to discuss further.

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Using earth observations (EO) to determine water quality

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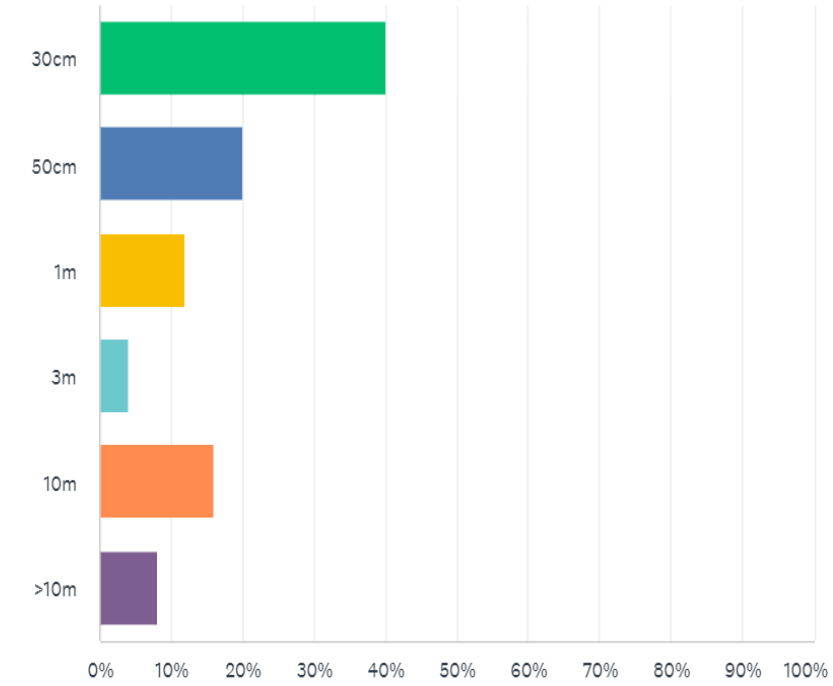
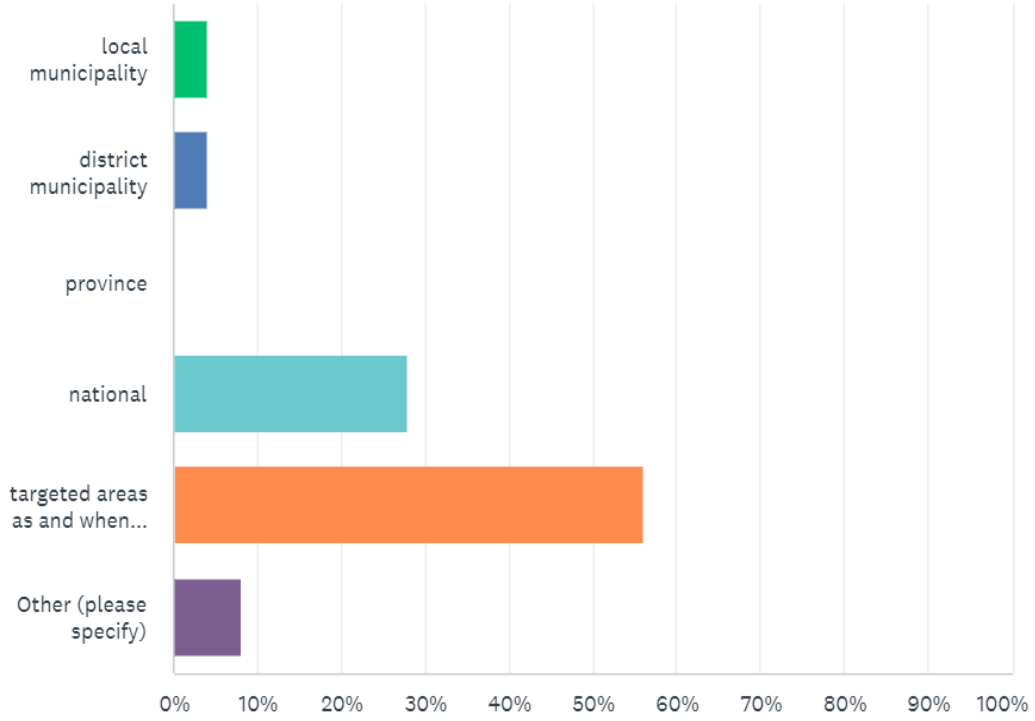
User requirements
https://www.surveymonkey.com/r/C8LVKKX

What is the spatial resolution of the satellite imagery do you require?

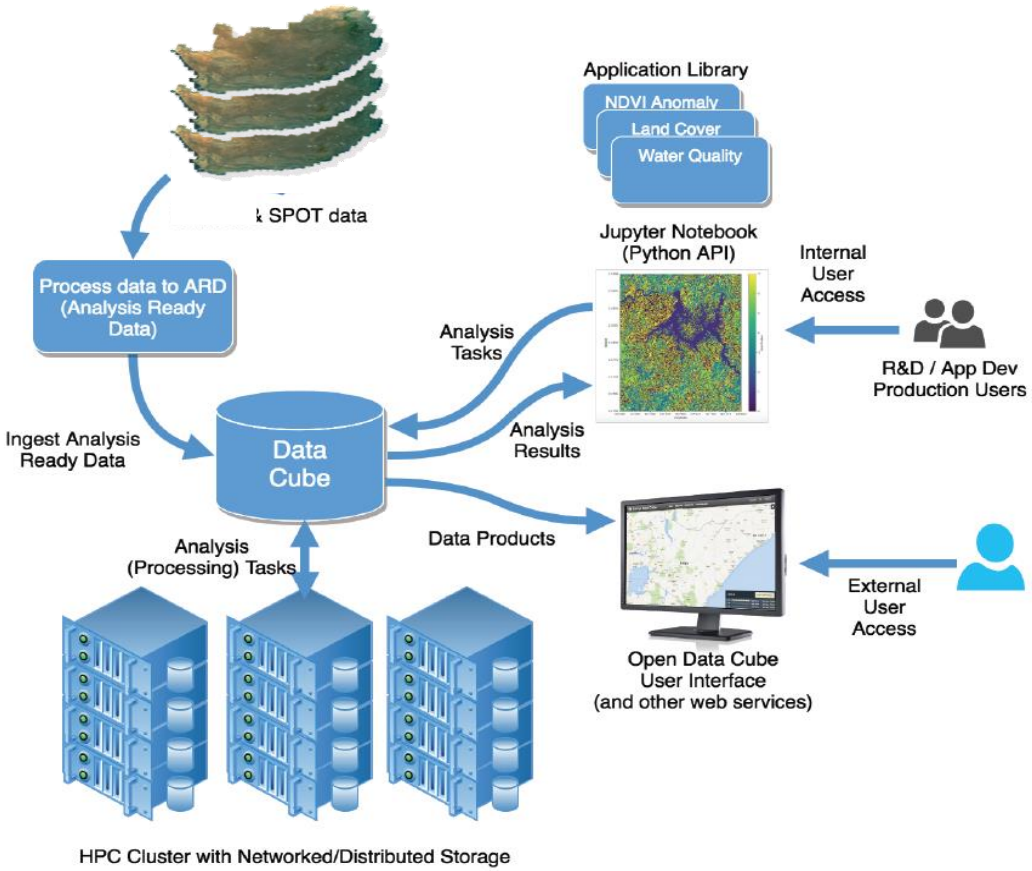
Answered: 25 Skipped: 0





Access to satellite imagery through partnerships

Infrastructure Expansion: +Data Cubes



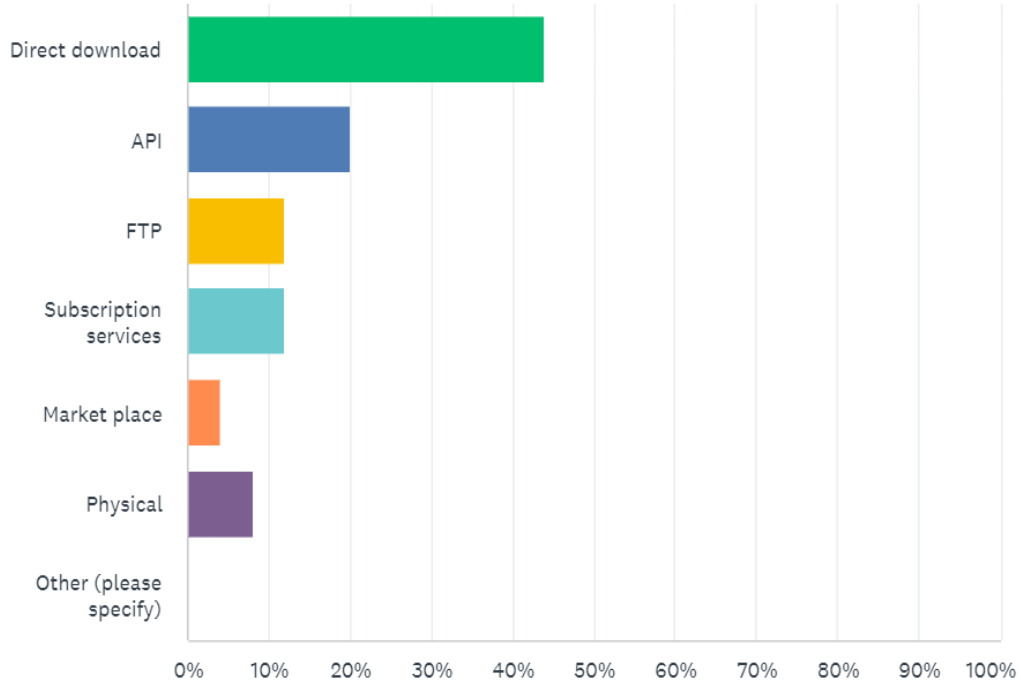
SPOT 6 7

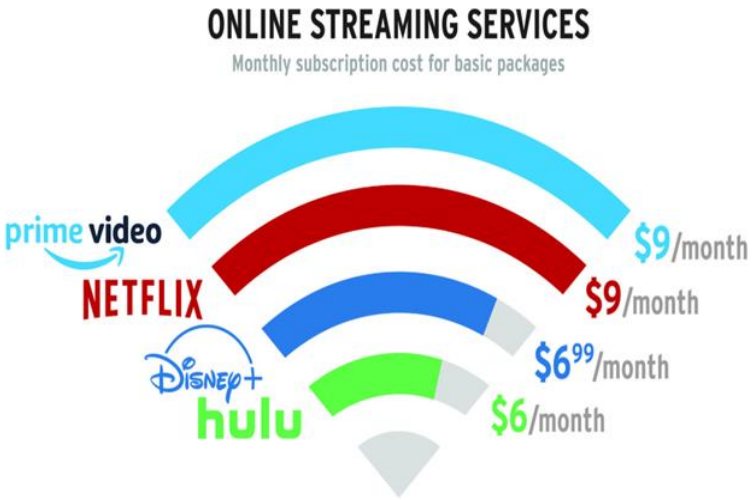
SPOT 5

CBERS

Landsat

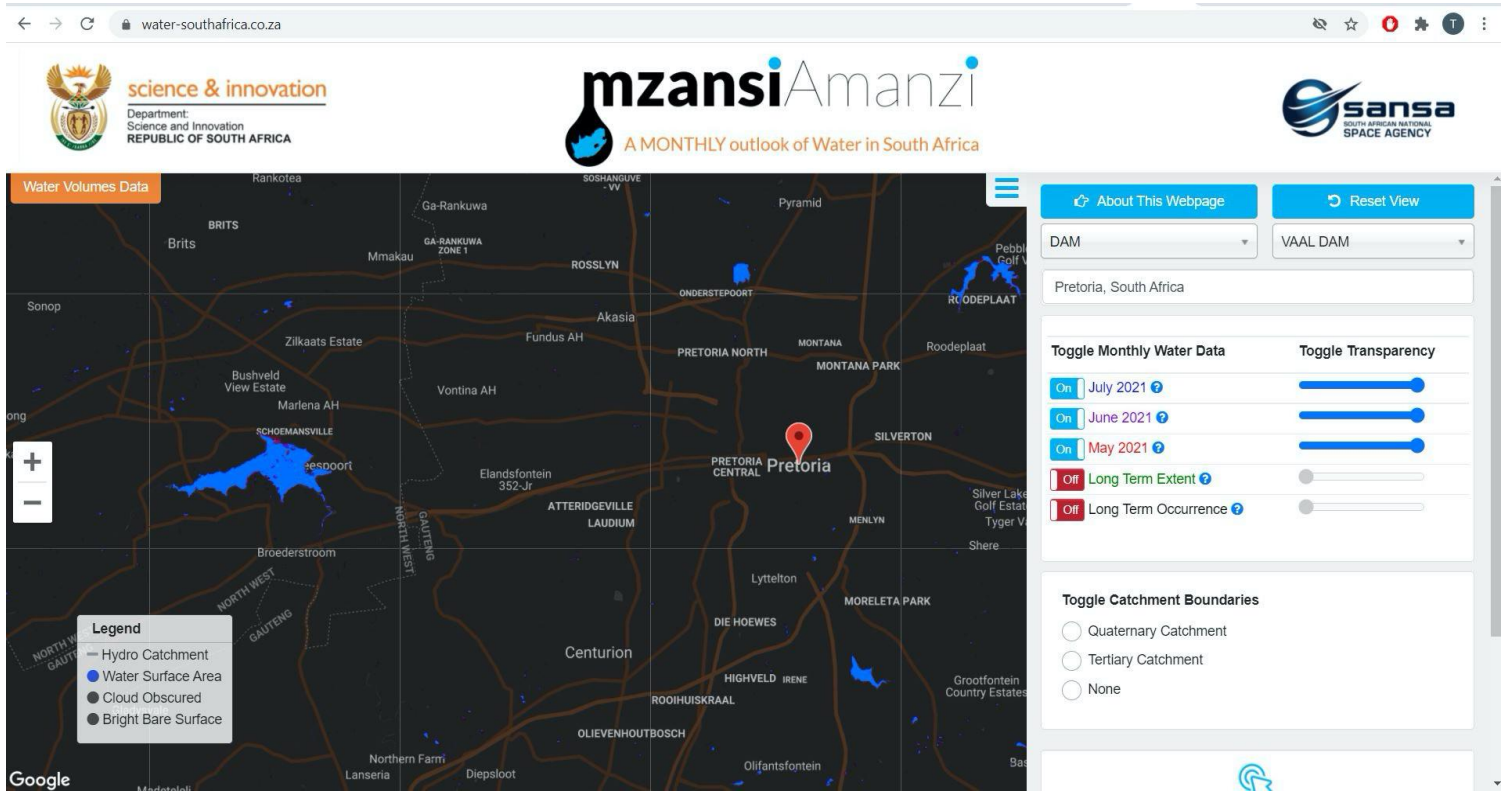
Data dissemination



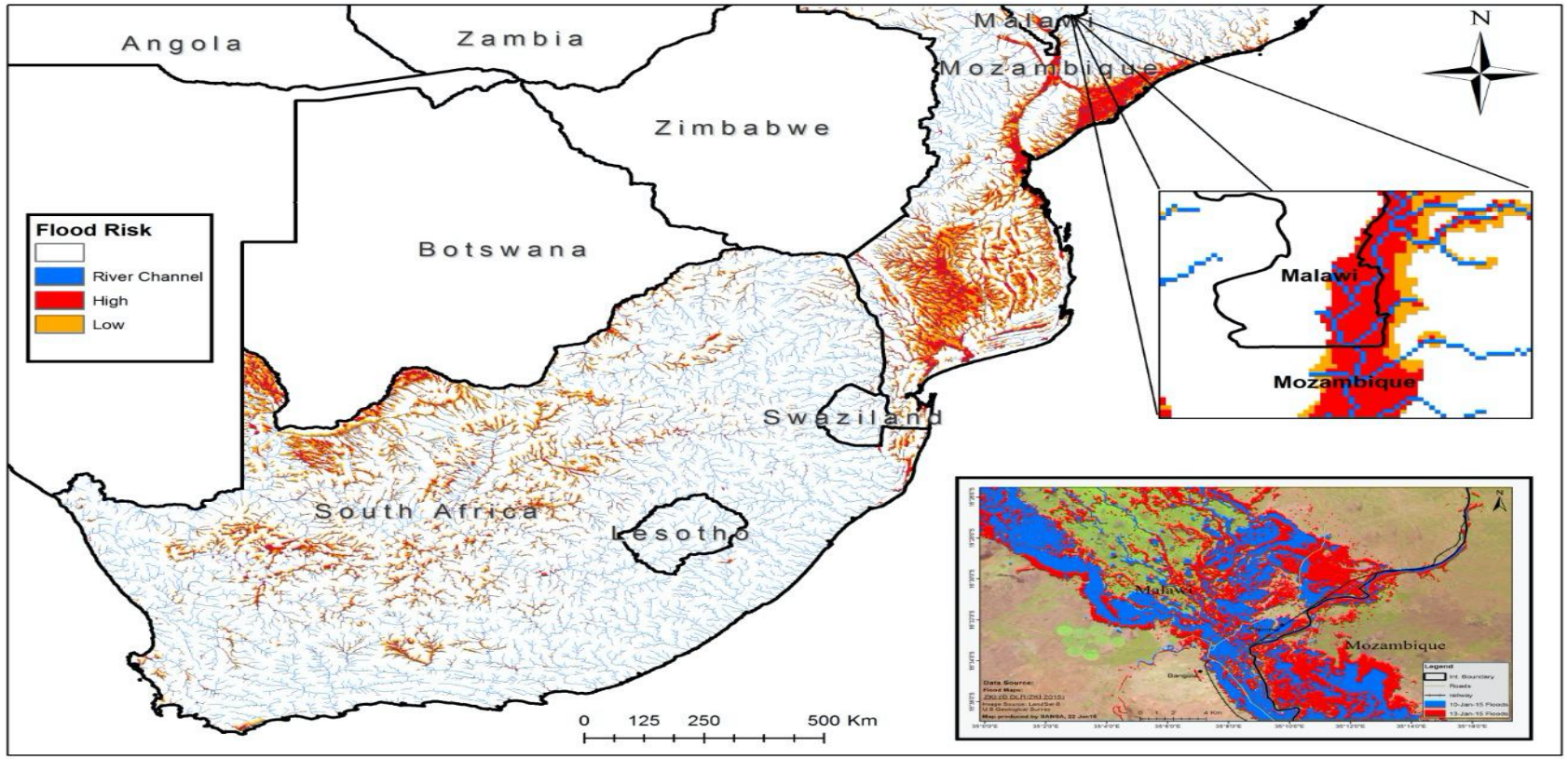


Thematic areas

Water Quantity Information Service

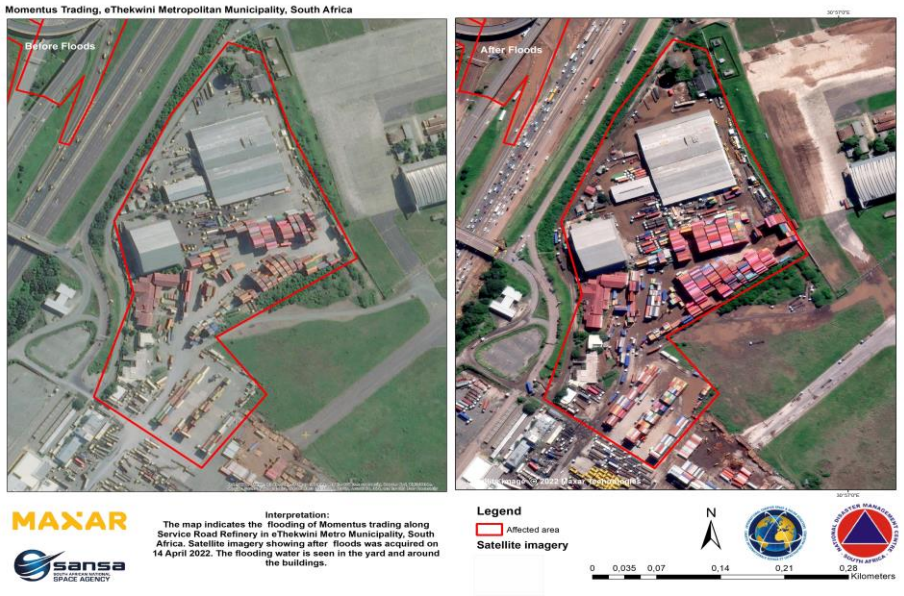


Flood Risk Mapping

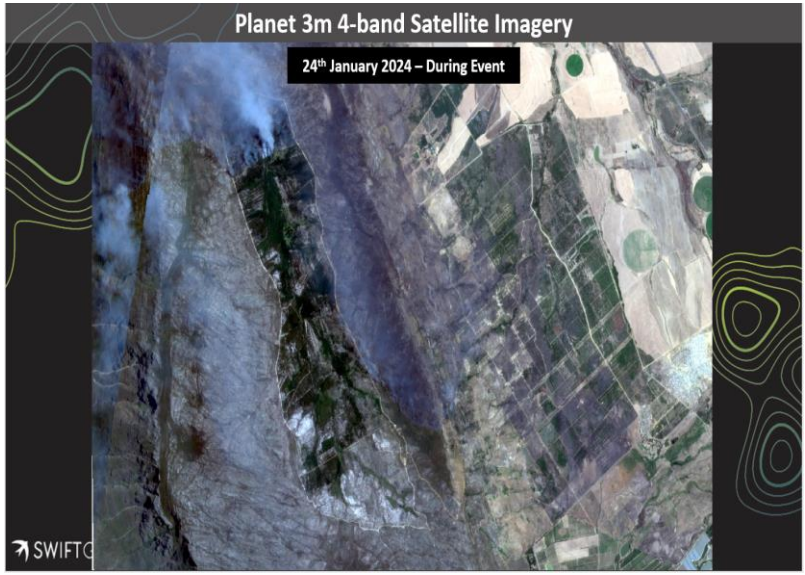


Satellite data to support disasters

The International Charter Space and Major Disasters



SANSA Led Image Acquisition



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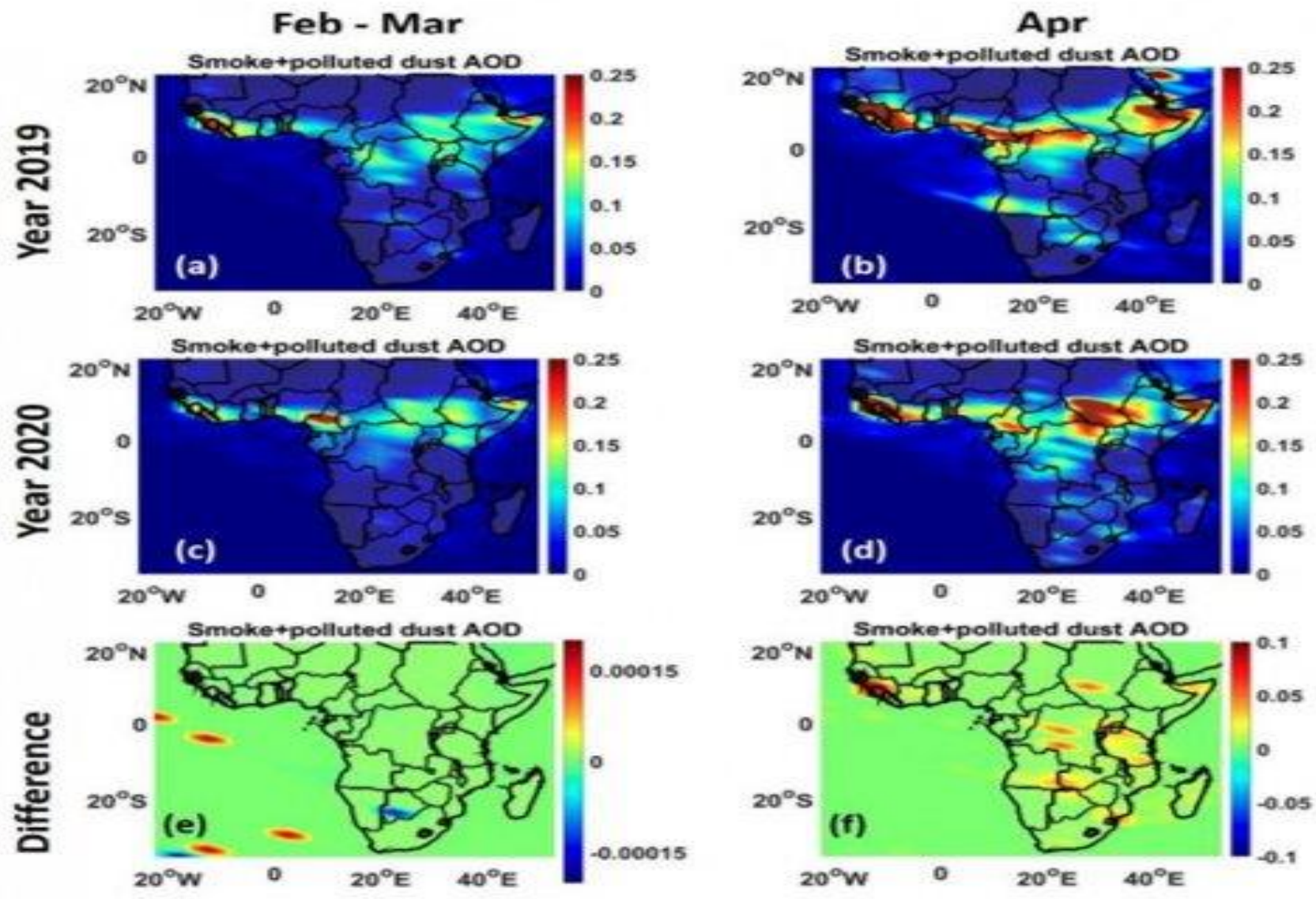
Air Quality



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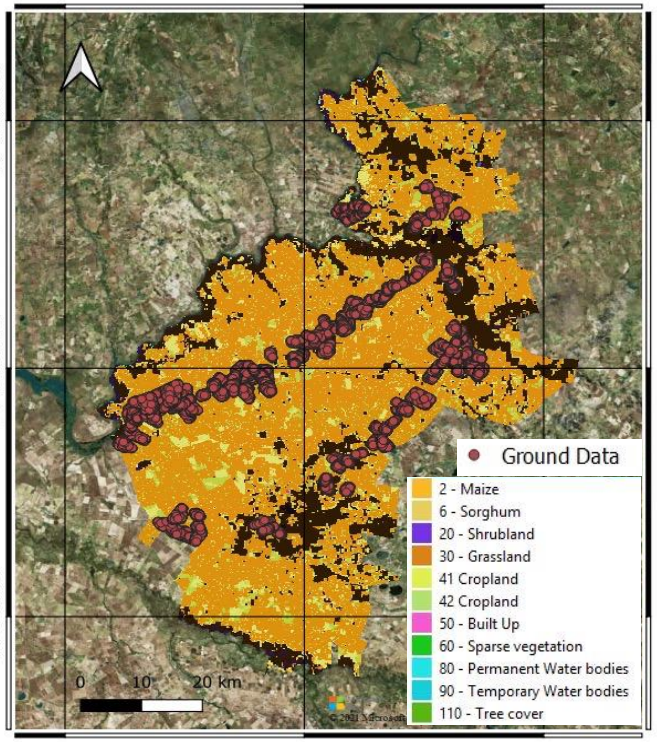
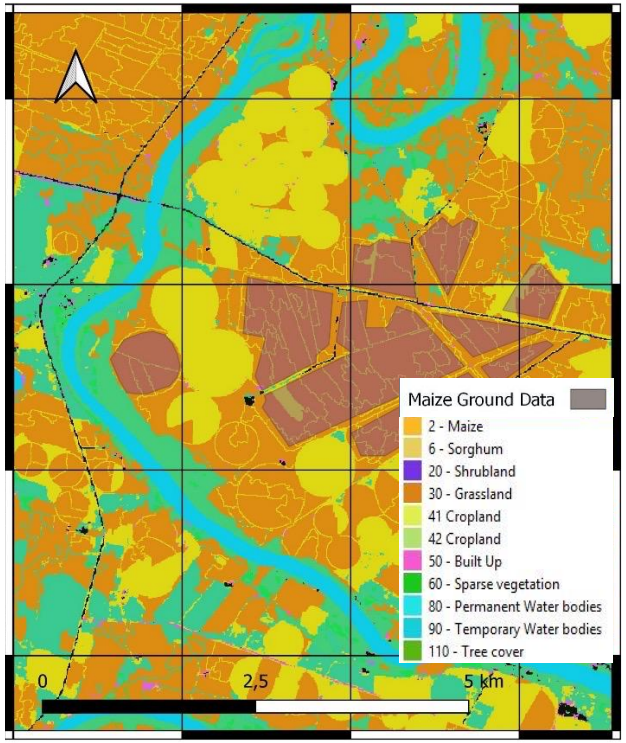
Crop type mapping



- Example of crop fields sampled (red points) during the 2021 campaign in Free State province, superimposed to the crop type map computed by using Sentinel-2 images.



Crop type Map: Detail

Bothaville (2021), Free State, South Africa
Land cover and Crop type Map

forestry, fisheries & the environment
science & innovation
water & sanitation
South African Weather Service
ARC • LNR
SA-EU STRATEGIC PARTNERSHIP THE DIALOGUE FACILITY
Deutscher Wetterdienst
EUMETSAT
AfriCultuReS
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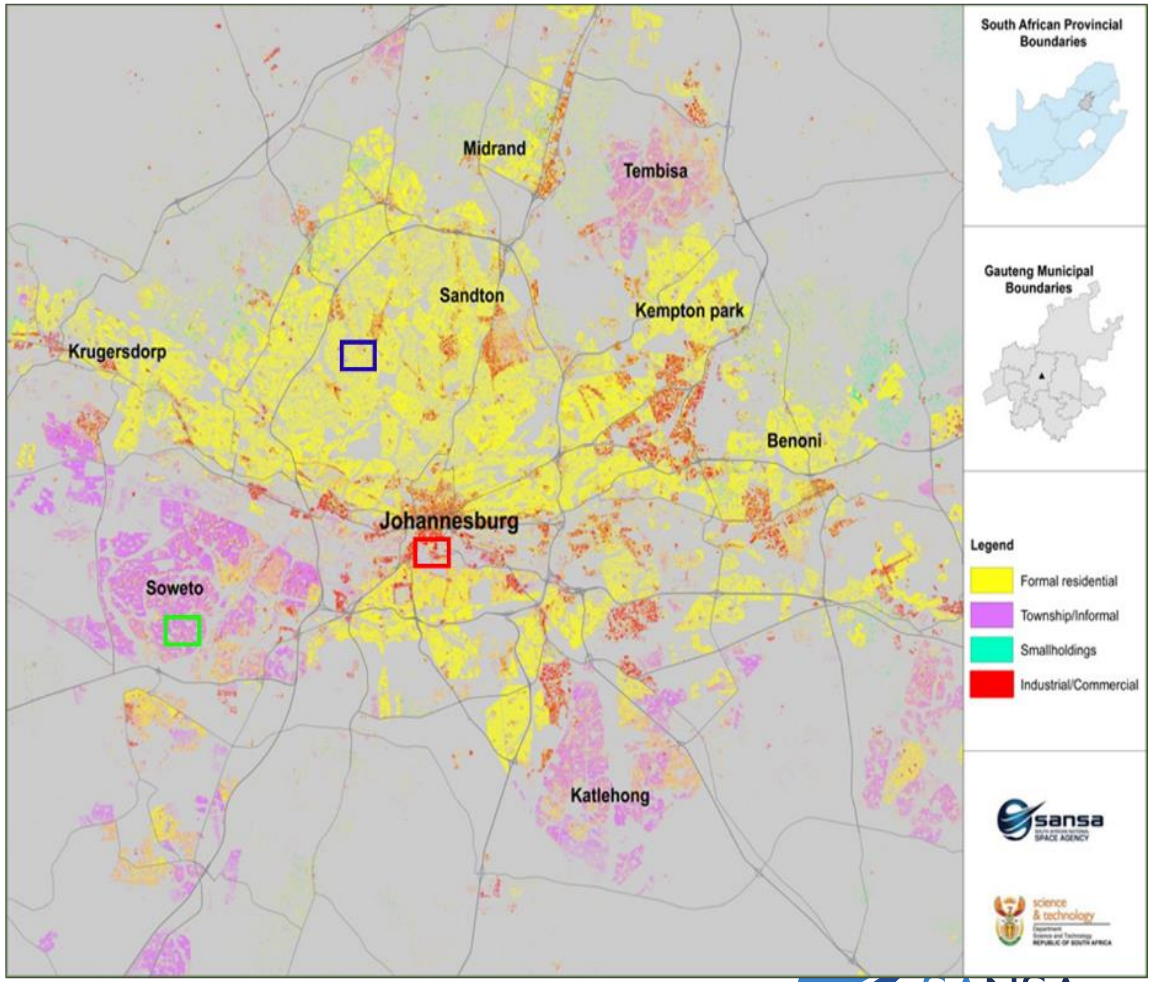
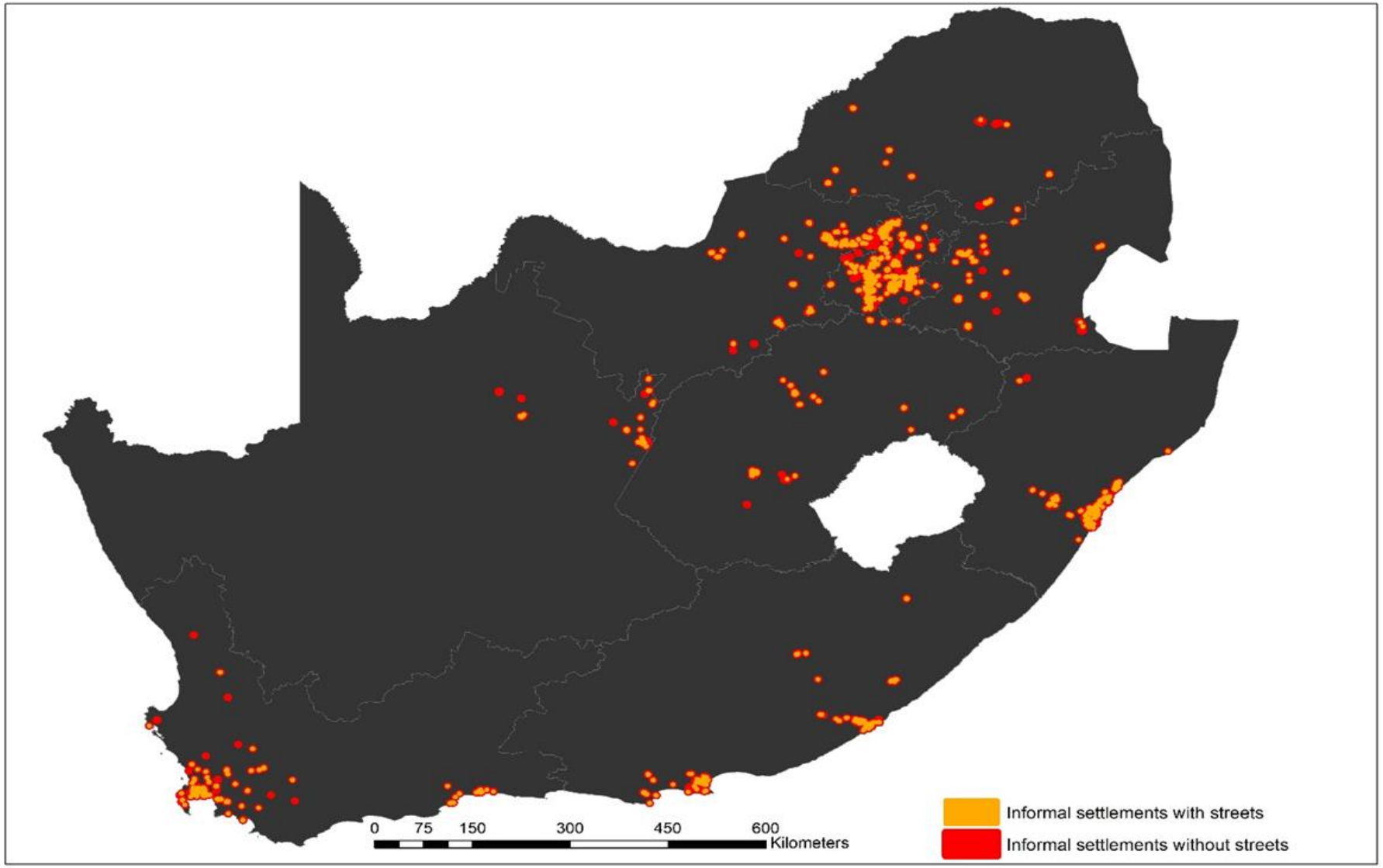
Understanding of the status of human settlements

- ✓ Higher urbanization rates are expected to take place in developing countries
- ✓ Increased land for habitation
- ✓ Human settlements indicate where people live, socialize and work
- ✓ Population is not always up-to-date
- ✓ High spatial resolution imagery provides the data to map and monitor settlements
- ✓ Human settlement give an indication of standard of living
- ✓ Base during planning of services

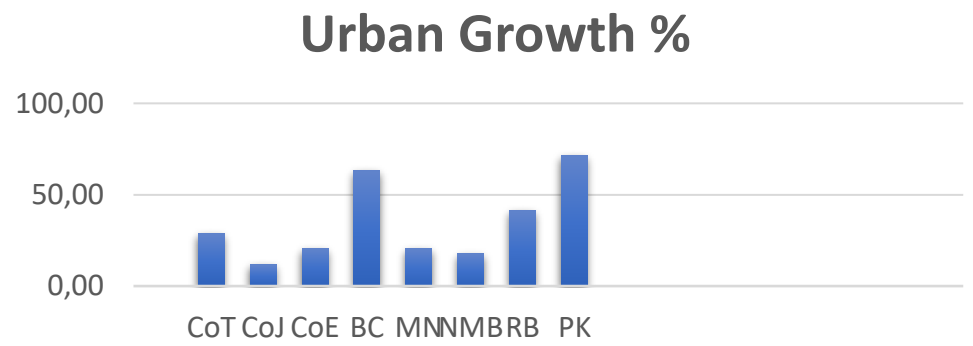



0 75 150 300 450 600
Kilometers
Informal settlements with streets
Informal settlements without streets

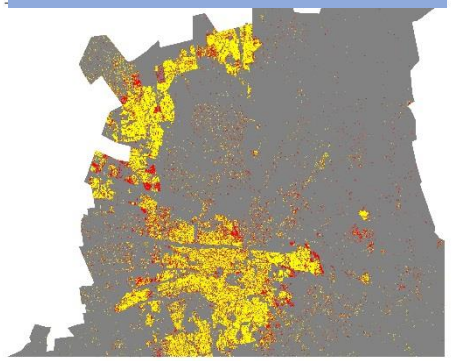
2007 -2014 urban growth

Need to assess urban growth

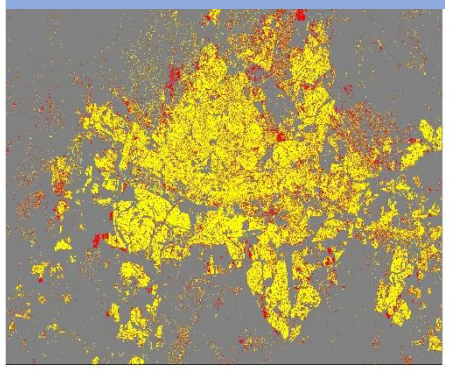
- ✓ Secondary cities experienced higher expansion than major cities



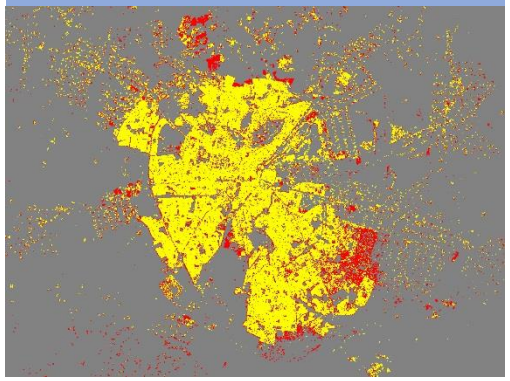
Tshwane



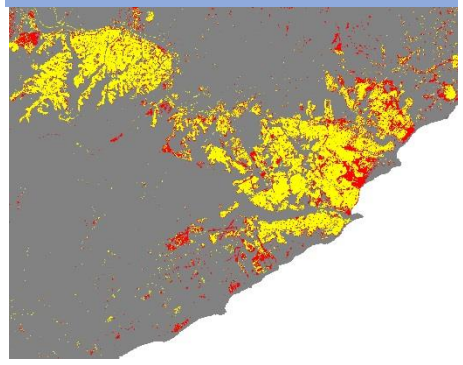
G. Johannesburg MA



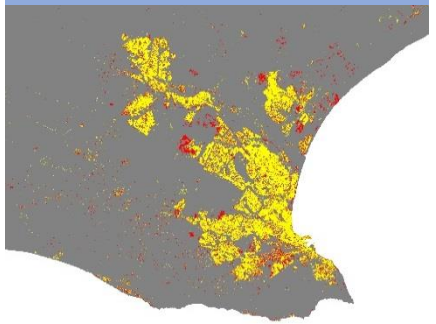
Mangaung



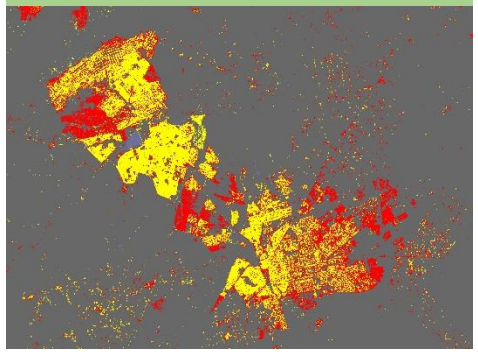
Buffalo city



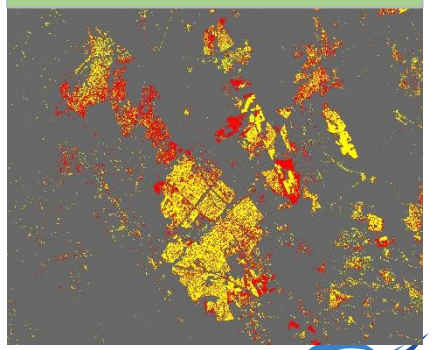
Nelson Mandela Bay



Polokwane



Rustenburg



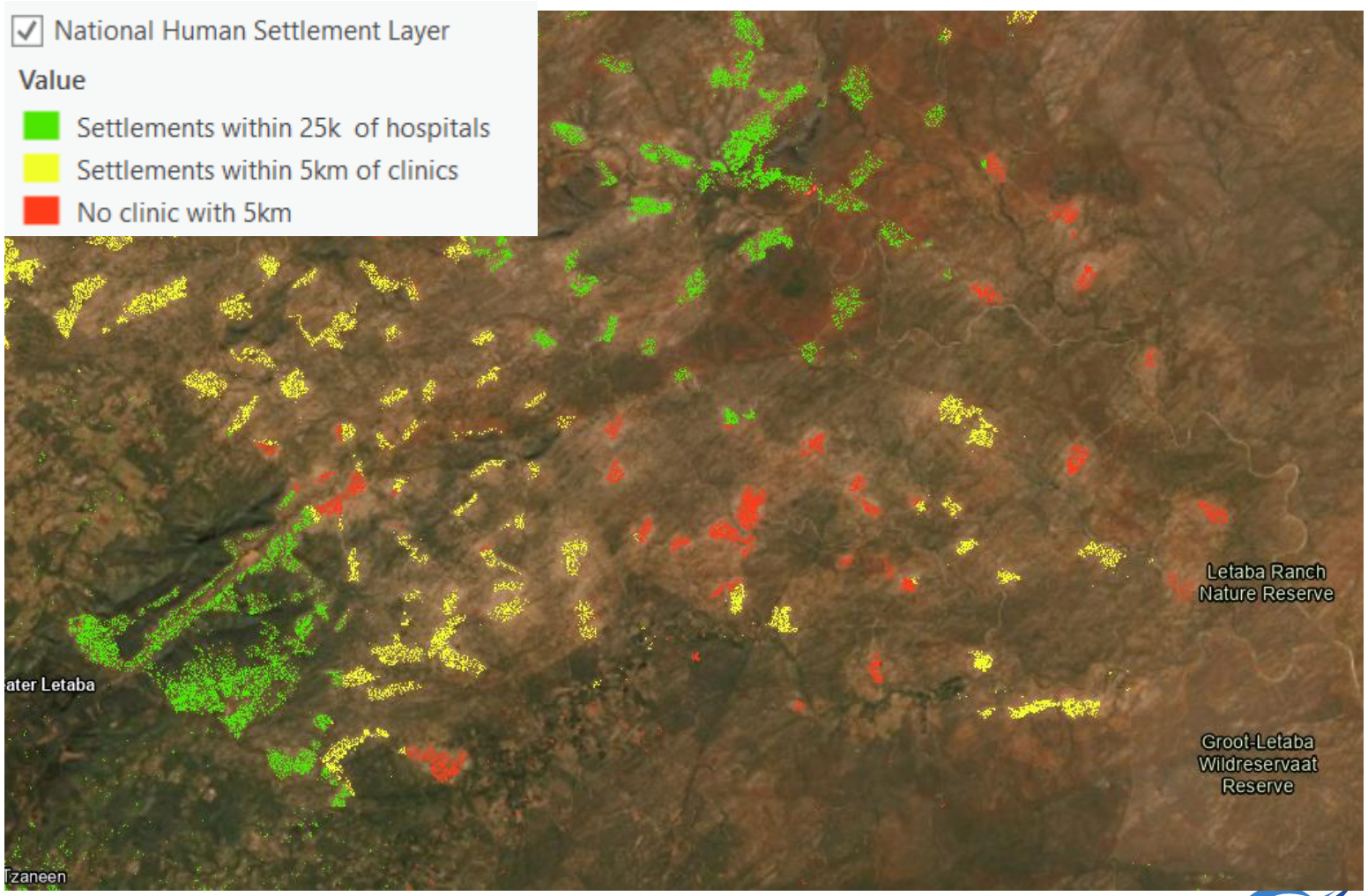
Mapping informal settlements

- ✓ Over 1 billion people live in slums
- ✓ Urbanization: increased development of informal settlements/slums
- ✓ Illegal, lack access to services, vulnerable to natural and man-made disasters
- ✓ May lead to environmental degradation

Connectivity/accessibility of
the settlements

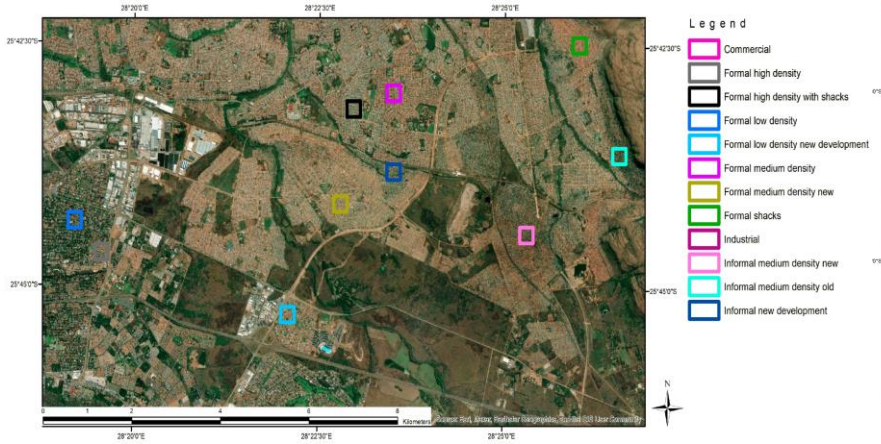
Assessment of areas that require services

- ✓ Health services should be 5km from the settlements
- ✓ Identification of areas that are far from the services
- ✓ Accessibility to be assessed using road network
- ✓ Identification of suitable sites

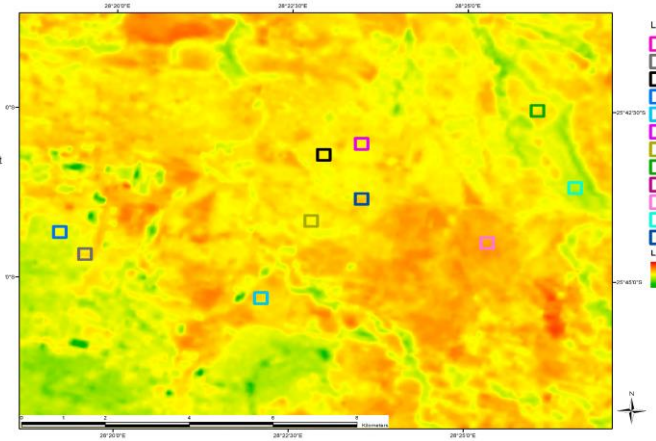


Understanding environmental conditions of human settlements

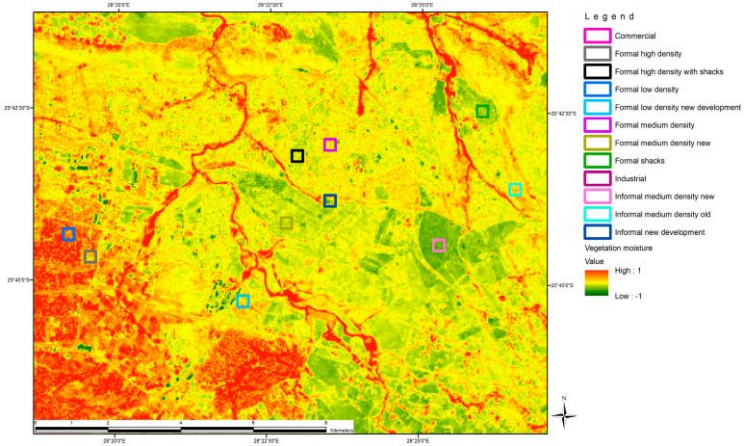
- ✓ Earth observation products: Land Surface Temperature(LST),Urban Heat Island, Vegetation Moisture, Air Quality, Humidity, Bareness
- ✓ Environmental conditions indices: Remote Sensing Ecological Index*(RSEI); Settlement Surface Ecological Index**; Heat Vulnerability Index



Mamelodi, City of Tshwane



Land Surface Temperature



Vegetation moisture

*Yue, H.; Liu, Y.; Li, Y.; Lu, Y. Eco-Environmental Quality Assessment in China's 35 Major Cities Based On Remote Sensing Ecological Index. IEEE Access 2019, 7, 51295–51311.

**Mudau, N.; Mhangara, P. Assessment of the Ecological Condition of Informal Settlements Using the Settlement Surface Ecological Index. Land 2023, 12, 1622. https://doi.org/10.3390/land12081622

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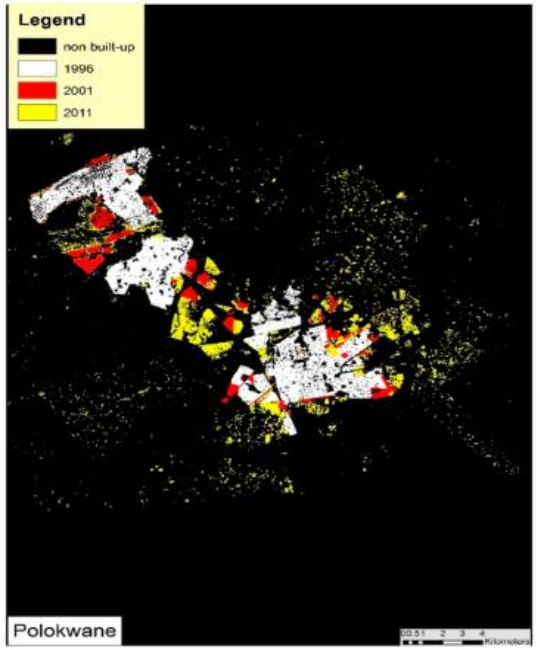
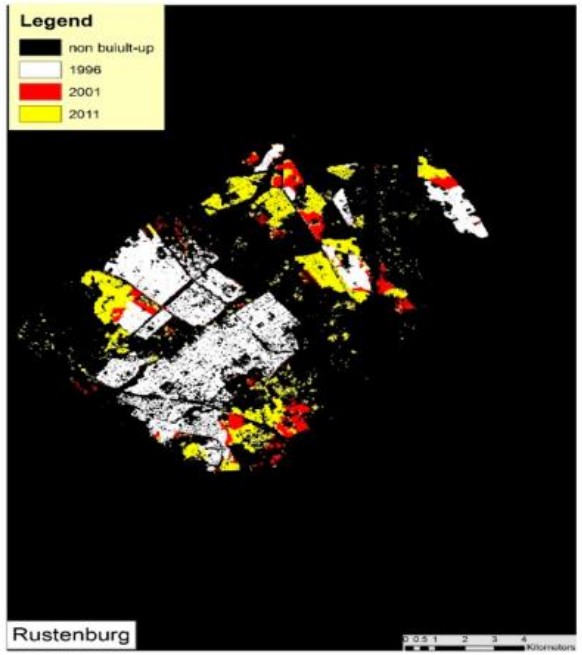
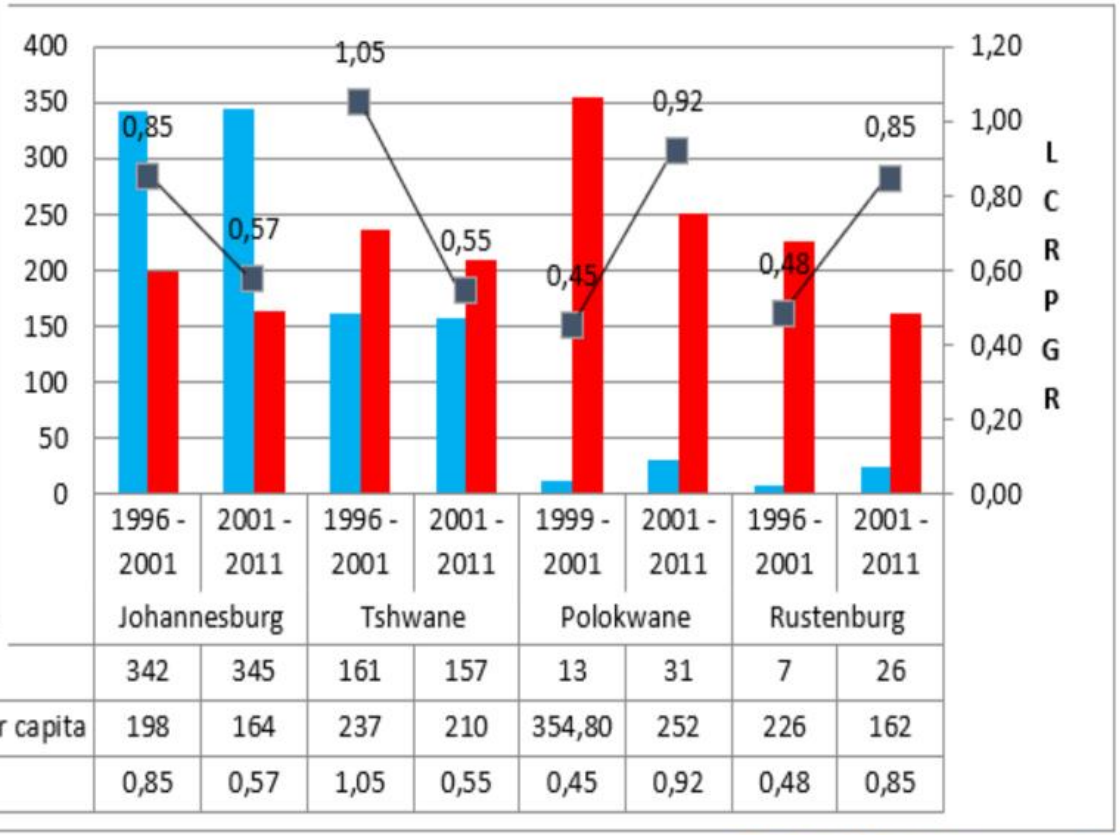
SGD 11.3.1 reporting

Ratio of Land Consumption Rate to Population Growth Rate (LCRPGR)







	Johannesburg		Tshwane		Polokwane		Rustenburg	
Total land consumed	342	345	161	157	13	31	7	26
Land consumption per capita	198	164	237	210	354,80	252	226	162
LCRPGR	0,85	0,57	1,05	0,55	0,45	0,92	0,48	0,85

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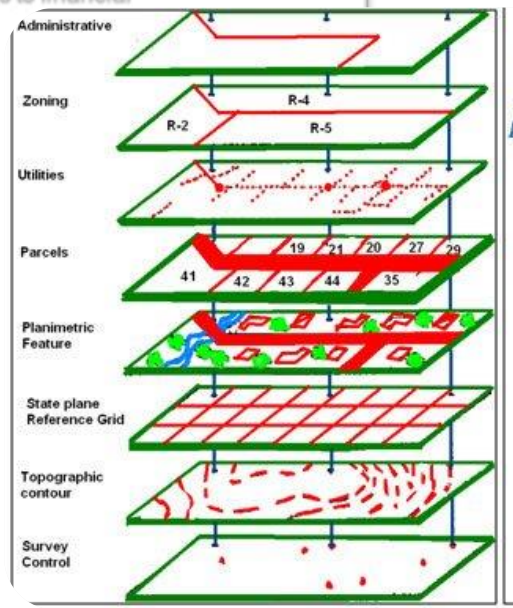
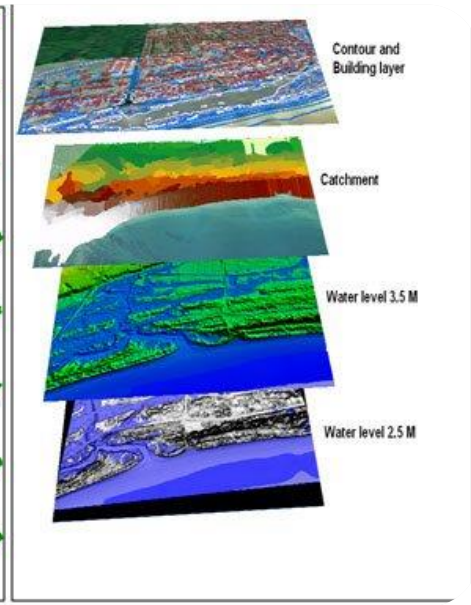
Available Tools

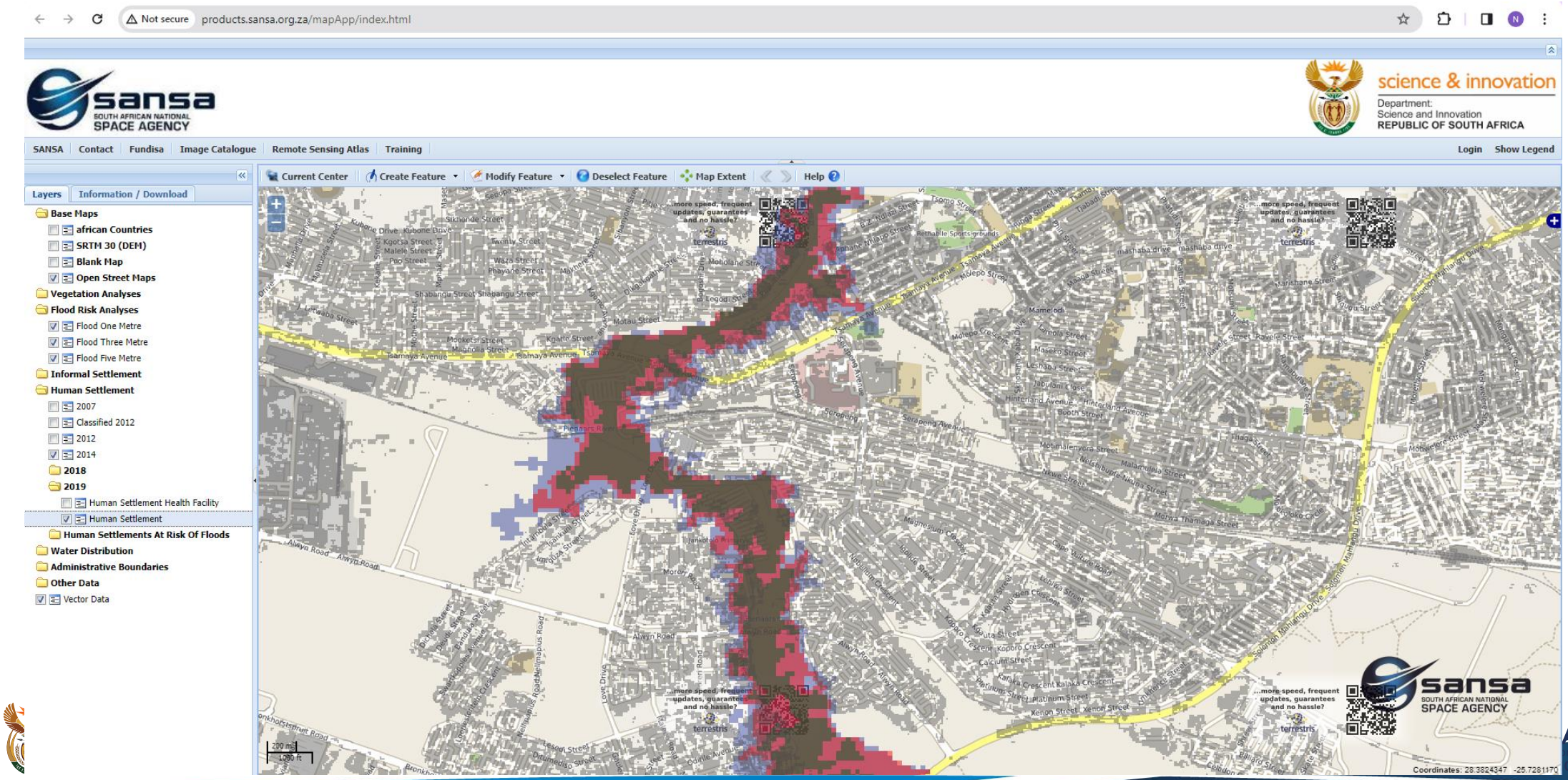
Decision Support Tool focus





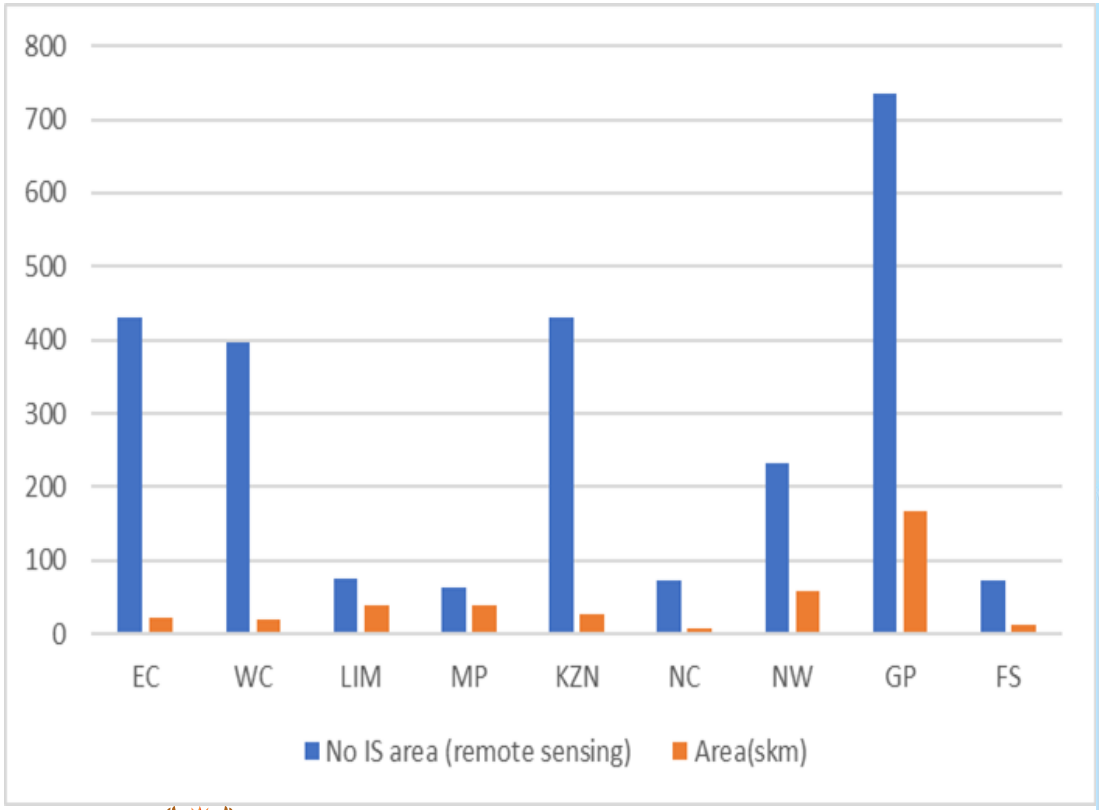
https://www.ezitech.africa/services-municipal.html

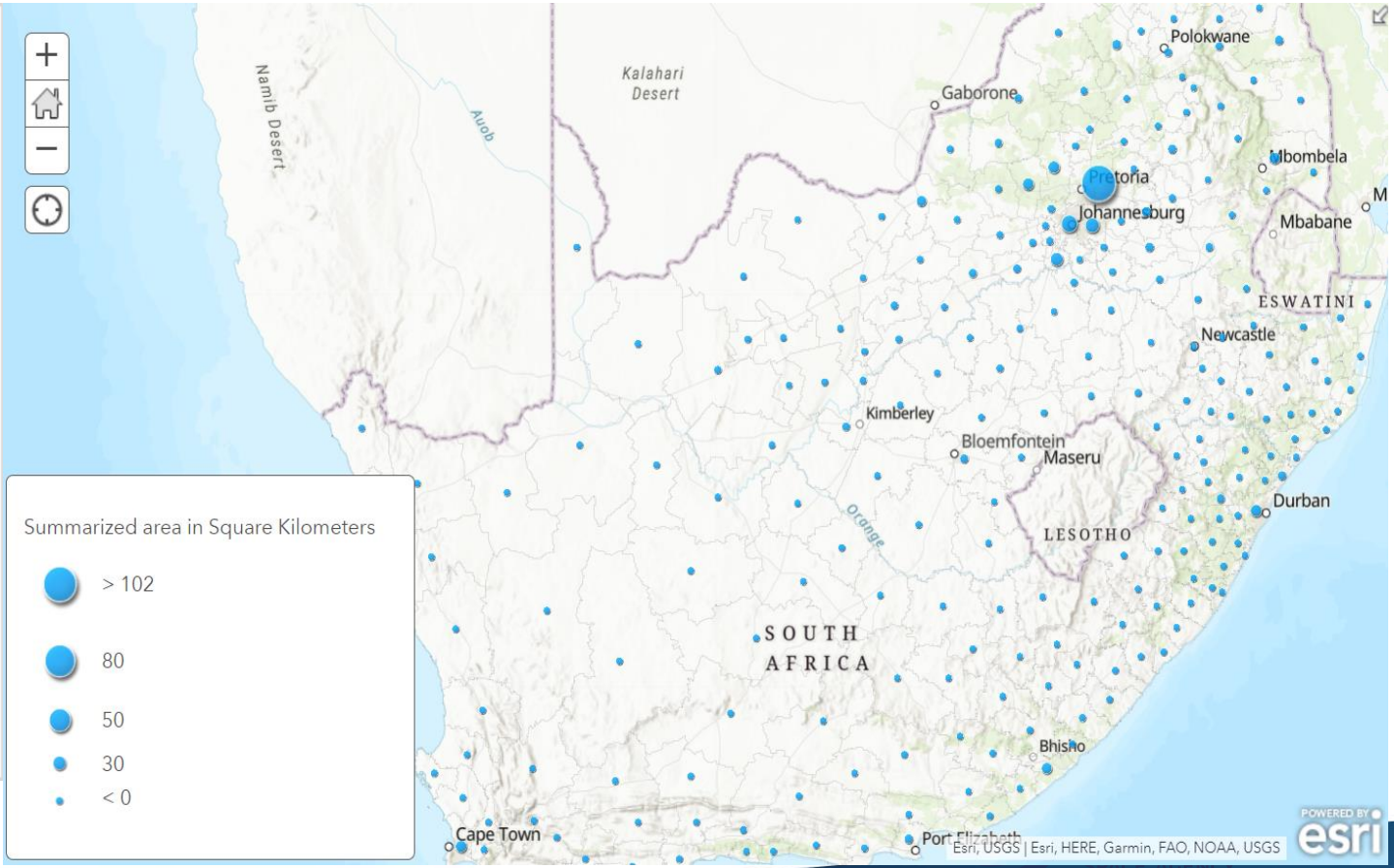
Decision support tool



Dashboards: Informal settlements (quantity and area)

Informal settlement: not included in disaster management; no waste collection; vulnerable to disaster





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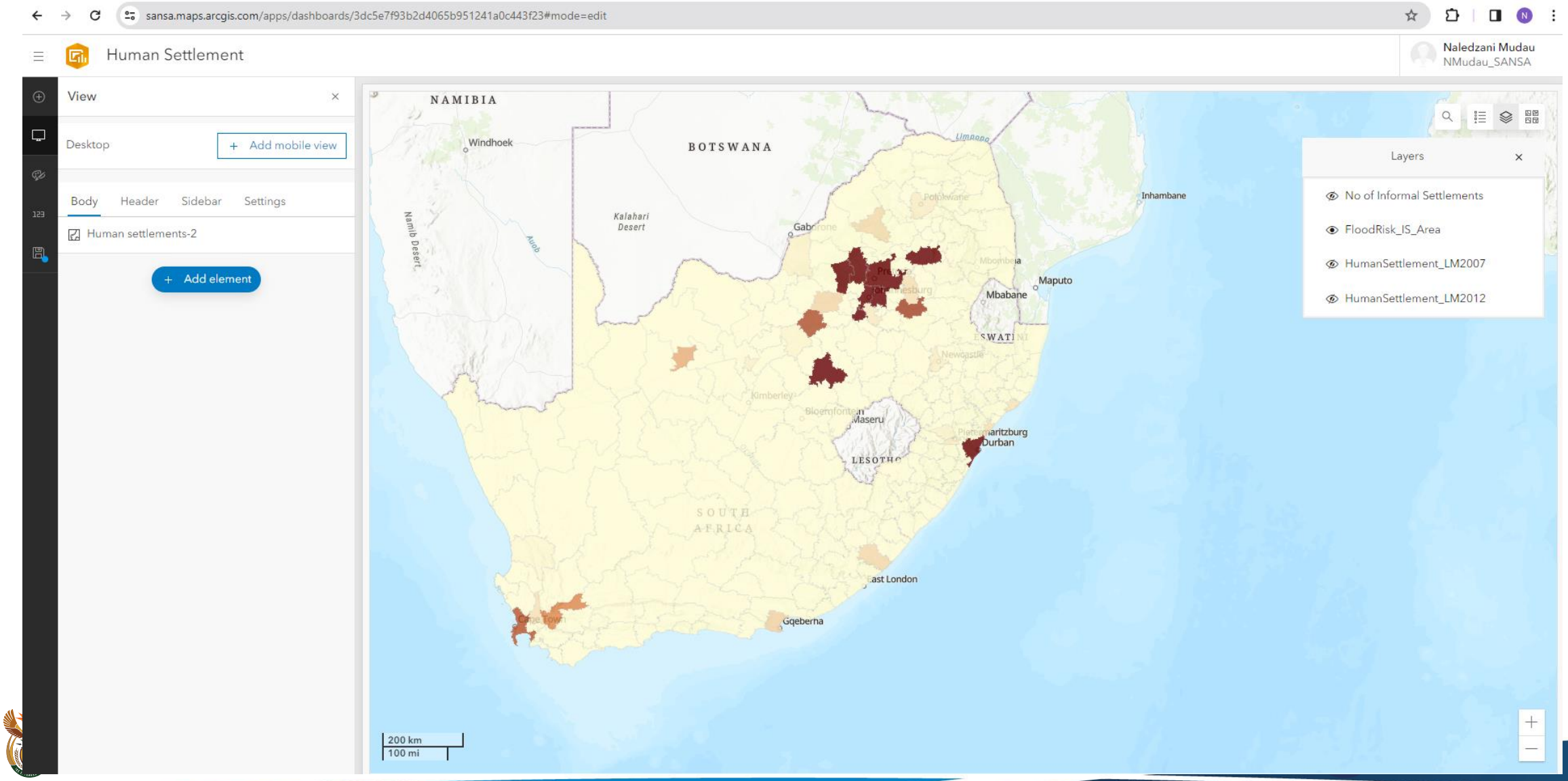
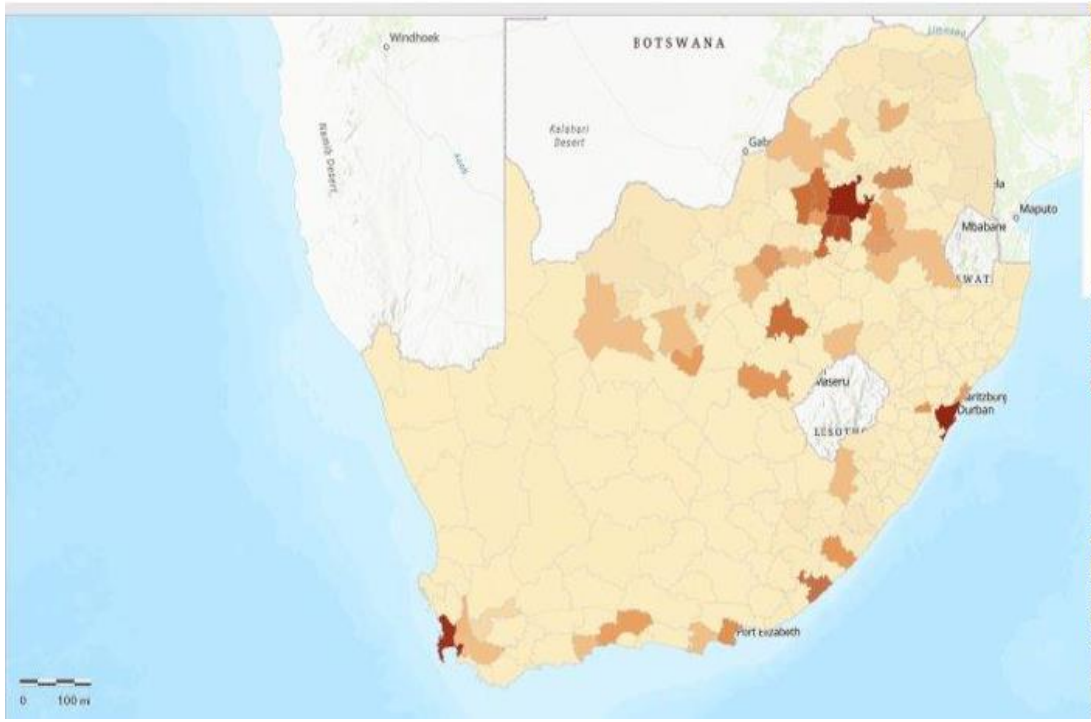

sansa.maps.arcgis.com/apps/dashboards/3dc5e7f93b2d4065b951241a0c443f23#mode=edit
Human Settlement
Naledzani Mudau
NMudau_SANSA
View
Desktop
+ Add mobile view
Body
Header
Sidebar
Settings
Human settlements-2
+ Add element
NAMIBIA
BOTSWANA
Windhoek
Kalahari Desert
Namib Desert
Gaborone
Inhambane
Maputo
Mbabane
SWATI
Kimberley
Maseru
LESOTHO
Durban
SOUTH AFRICA
Gqeberha
Layers
No of Informal Settlements
FloodRisk_IS_Area
HumanSettlement_LM2007
HumanSettlement_LM2012
200 km
100 mi

Capacity Building

Supporting the implementation of the DDM and other government priorities

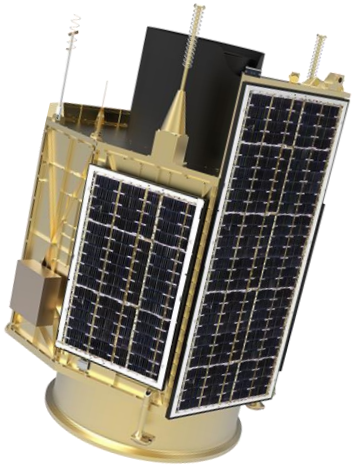


Science advancement

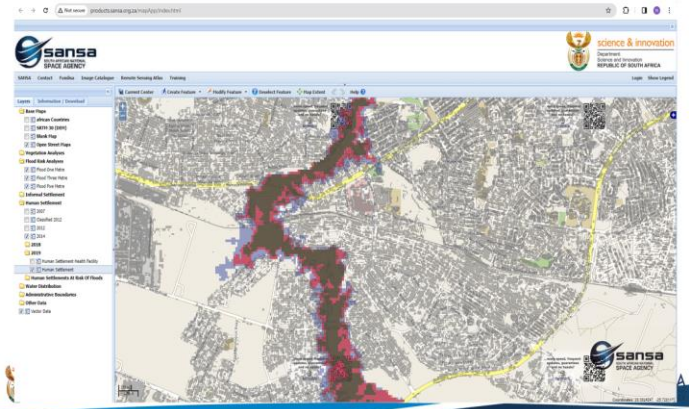
Bursaries

Internships

Space Infrastructure Hub



Decision support tool



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Upcoming trainings

Introduction to Earth Observation and geospatial technology for decision making

11-13 March

Harnessing space technological applications in sustainable urban development through Julia programming language

07-10 May

Ndi a livhuwa

Thank you

NMudau@sansa.org.za
www.sansa.org.za