NAMIBIA SPATIAL DATA INFRASTRUCTURE (NSDI)
IN SUPPORT OF NATIONAL DEVELOPMENT PLANNING

Africa Thematic Conference:

Managing a statistical organization in times of change

08 October 2019

Pretoria

OUTLINE

1. NAMIBIA STATISTICS AGENCY

2. NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)

3. NAMIBIA USE CASES OF SPATIAL INFORMATION

4. CENSUS MAPPING

5. IMPLEMENTATION CHALLENGES

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Namibia in context

NSDI
when fully developed will provide standardised and accurate spatial planning data and basic land statistics for the country

1. **Communal Land (35%)**
2. **Freehold Land (42%)**
3. **State Land (23%)**
4. **Plus Oceanography & Marine 513 015 km2**
   - The sea consists of both the territorial waters (23 541 km2) and Exclusive Economic Zone (48 474 km2).
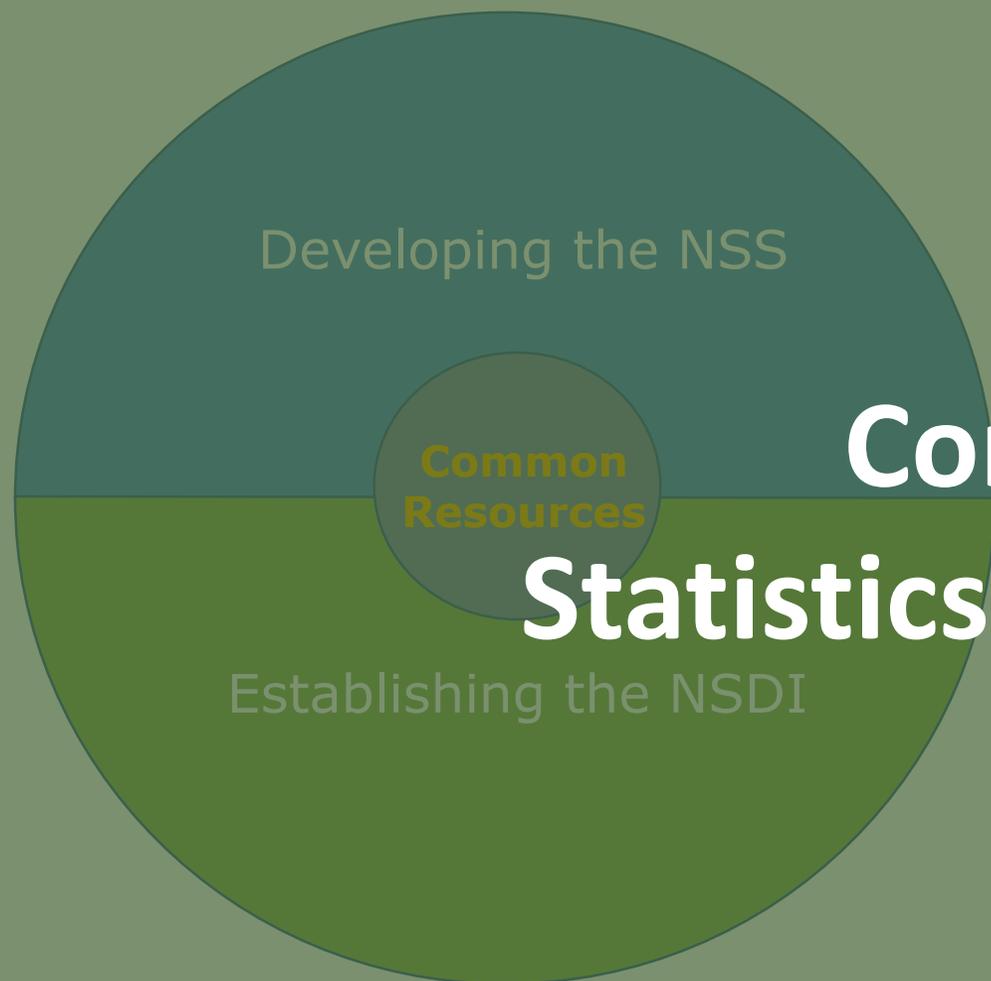   - Population = 2.4 Million

Exclusive Economic Zone
Territorial waters
National Boundaries

Namibia

NAMIBIA STATISTICS AGENCY

Developing the NSS

Common Resources

Establishing the NSDI

Combining Statistics with Location

Statistics Act, No. 9 of 2011

NSA one organisation two responsibilities

NSDI developed in consultation with the **Ministry of Land Reform**

NATIONAL SPATIAL DATA INFRASTRUCTURE (NSDI)

NSDI INSTITUTIONAL FRAMEWORK CONT….

	Target	On Board
National SDI	+-25 OMA's	15 OMA's
Regional SDI	14 Regional Councils	MURD
Local SDI	57 Local Authorities	MURD, ALAN, NALAO

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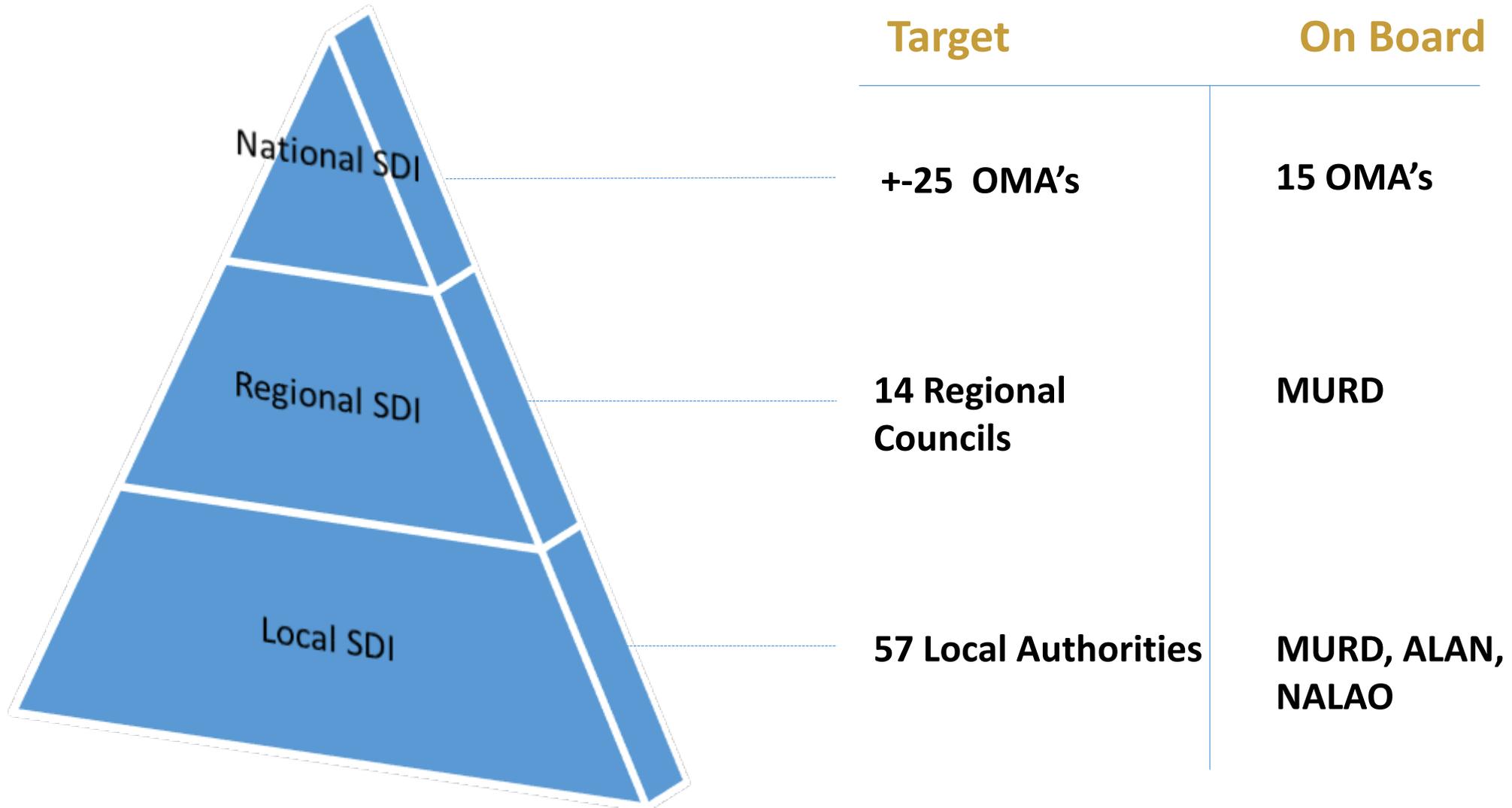
NSDI GOVERNANCE STRUCTURE

NSDI Patron(s)
(Minister(s) in Charge of NSDI) → Minister of Economic Planning in consultation with Minister of Land Reform

Proposals ↑ ↓ Policies, Decisions

National Executive Council → Committee for Spatial Data including decisions from the NSA Board

Proposals ↑ ↓ Policies, Decisions

NSDI Secretariat → Department of GIS & NSDI Coordination (Technical)
Department of Legal Affairs (Administrative)

Proposals ↑ ↓ Policies, Decisions

NSDI Inter-Agency SEC → NSDI Inter-Agency Steering Executive Sub-Committe (SEC)

↑ ↓

Standards WG | **Capital Building WG** | **Policy & Legal Affairs WG** | **Communication WG** → Working Groups

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NSDI SIGNED PARTNERSHIP AGREEMENTS

1. Ministry of Mines and Energy
2. Ministry of Land Reform
3. Ministry of Urban and Rural Development
4. Ministry of Environment and Tourism
5. Ministry of Agriculture, Water and Forestry
6. Ministry of Industrialization, Trade and SME Development
7. Ministry of Education, Art and Culture
8. Nampower

9. Namwater
10. Telecom
11. Roads Authority
12. MTC
13. Erongo Red
14. Cenored
15. NSA
16. NPC
17. NUST, UNAM (by Virtue of Mandate)

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NSDI PARTNERSHIPS STILL TO BE ENGAGED

1. Office of the Prime Minister (OPM) - reviewing MoU
2. Ministry of Health and Social Services - reviewing MoU
3. Ministry of Defense
4. Ministry of Safety and Security
5. Ministry of Works and Transport
6. Namibia Civil Aviation Authority
7. ALAN, NALAO
8. 14 x Regional Councils
9. Nored
10. Ministry of Fisheries and Marine Resources

SPATIAL DATA INFRASTRUCTURE CONCEPT

Geoportal

Application

USERS

Policy & Legal Framework

Data sharing mechanisms

Standards

Cooperation

Metadata

Competence

Spatial data services

PRODUCERS

Spatial data
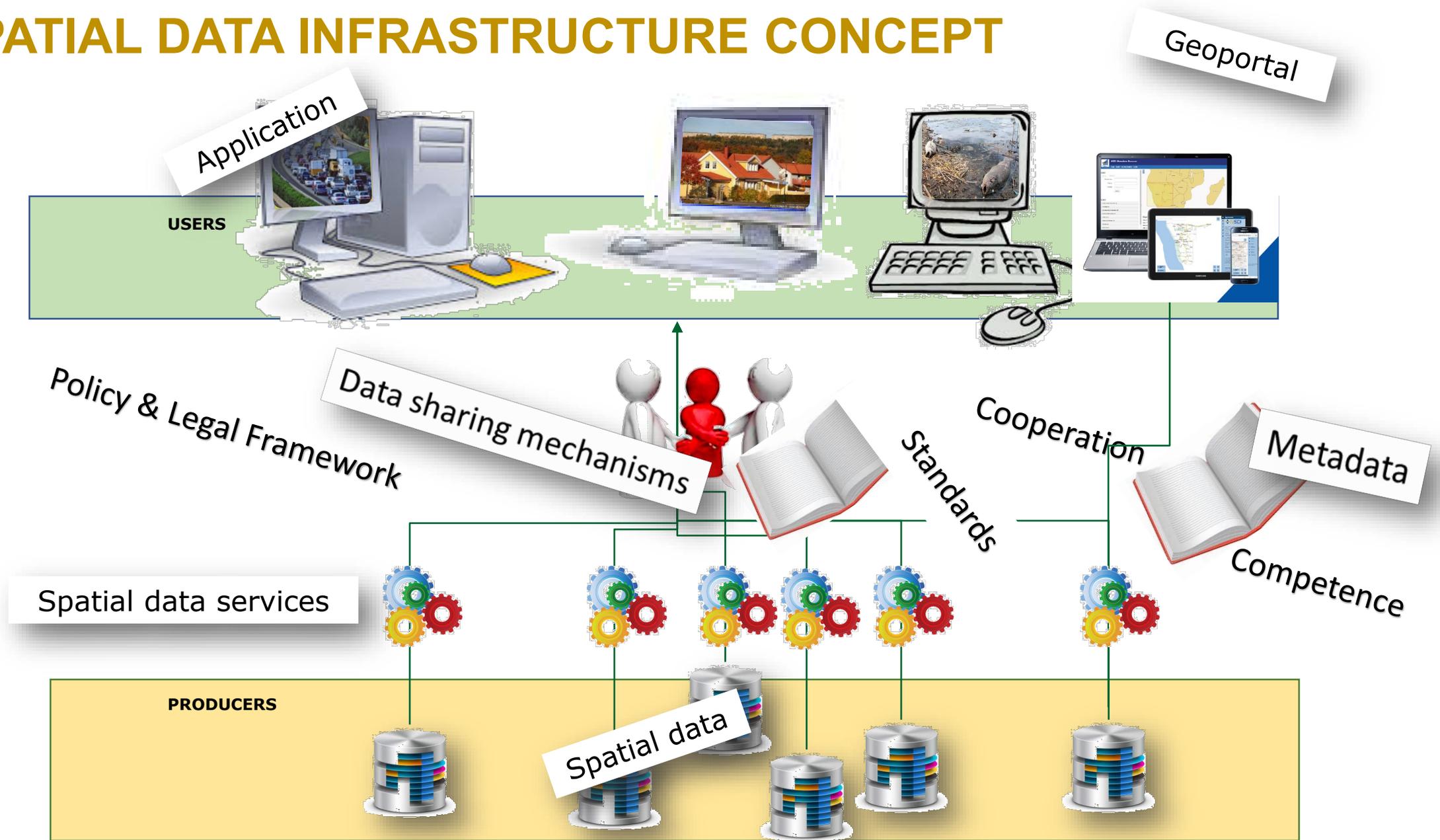
What strategy is Namibia implementing NSDI?

Adapted from part of Victoria's Spatial Information Management Framework, Second Edition, 2009

	Thematic Information	Information Access	
	Data Collection Calendar	Awareness	
Competence	Framework Information	Privacy, Pricing & Licensing	
Governance	Data Quality	Metadata	E-Services
Custodianship	Spatial Data Inventory	Awareness	Technology & Applications
1. INSTITUTIONAL ARRANGEMENTS	2. MECHANISMS FOR CREATING & MAINTAINING SPATIAL INFORMATION	3. MECHANISMS FOR MAKING SPATIAL INFORMATION ACCESSBLE & USABLE	4. STRATEGIC DEVELOPMENT OF TECHNOLOGY & APPLICATIONS

FUNDING REQUIREMENTS

NAMIBIA NATIONAL SPATIAL DATA INFRASTRUCTURE

NSDI TECHNICAL IMPLEMENTATION ARCHITECTURE
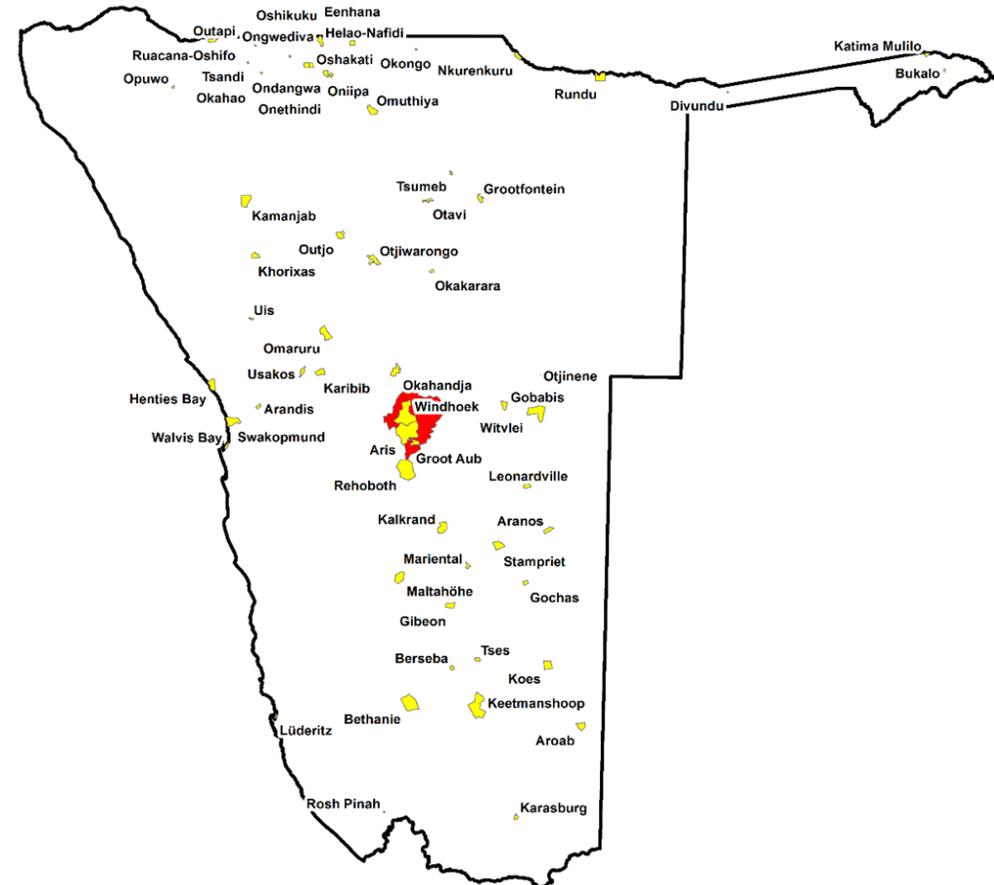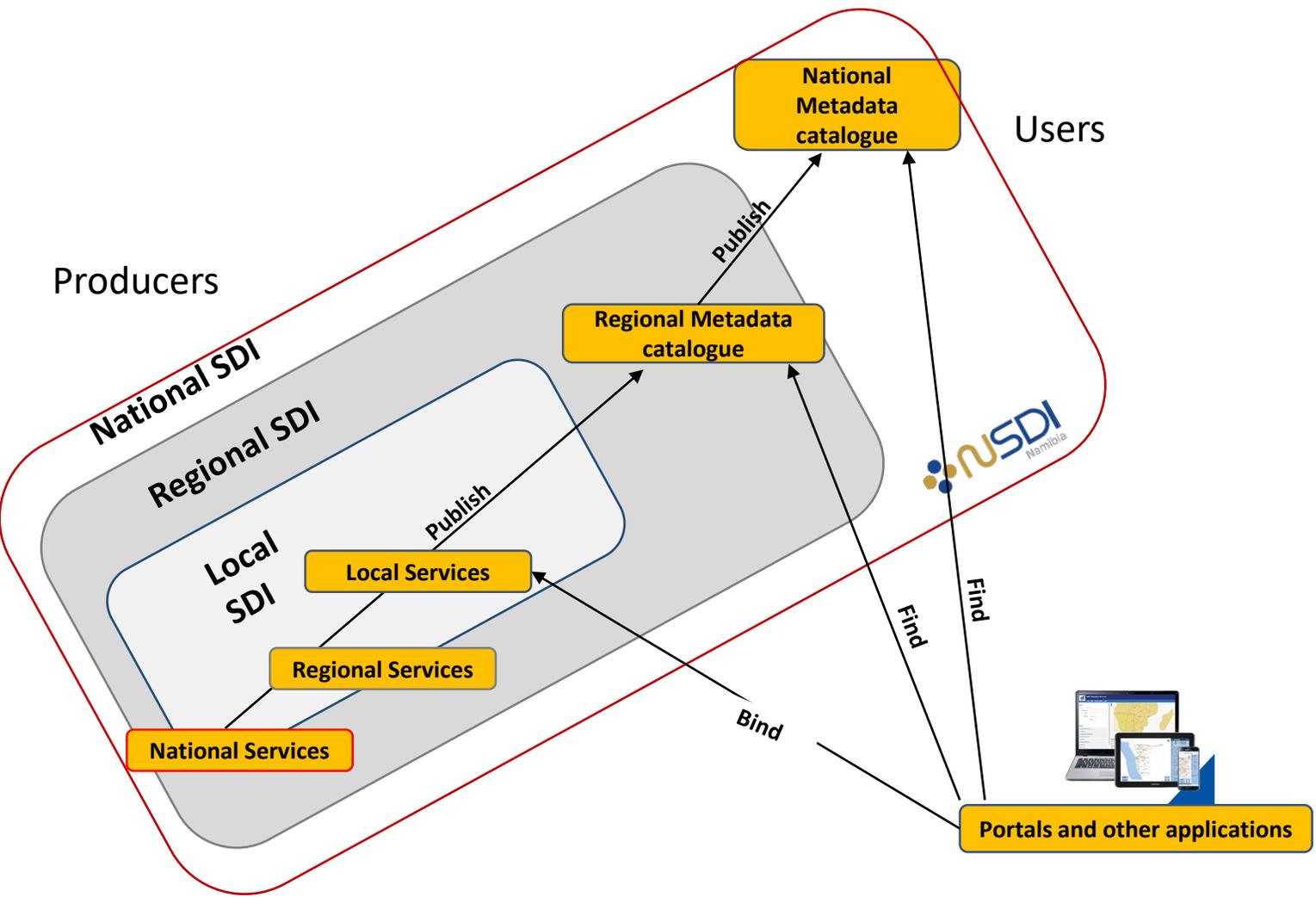
Medium to long term : E-Governance enabled access to National Development Information
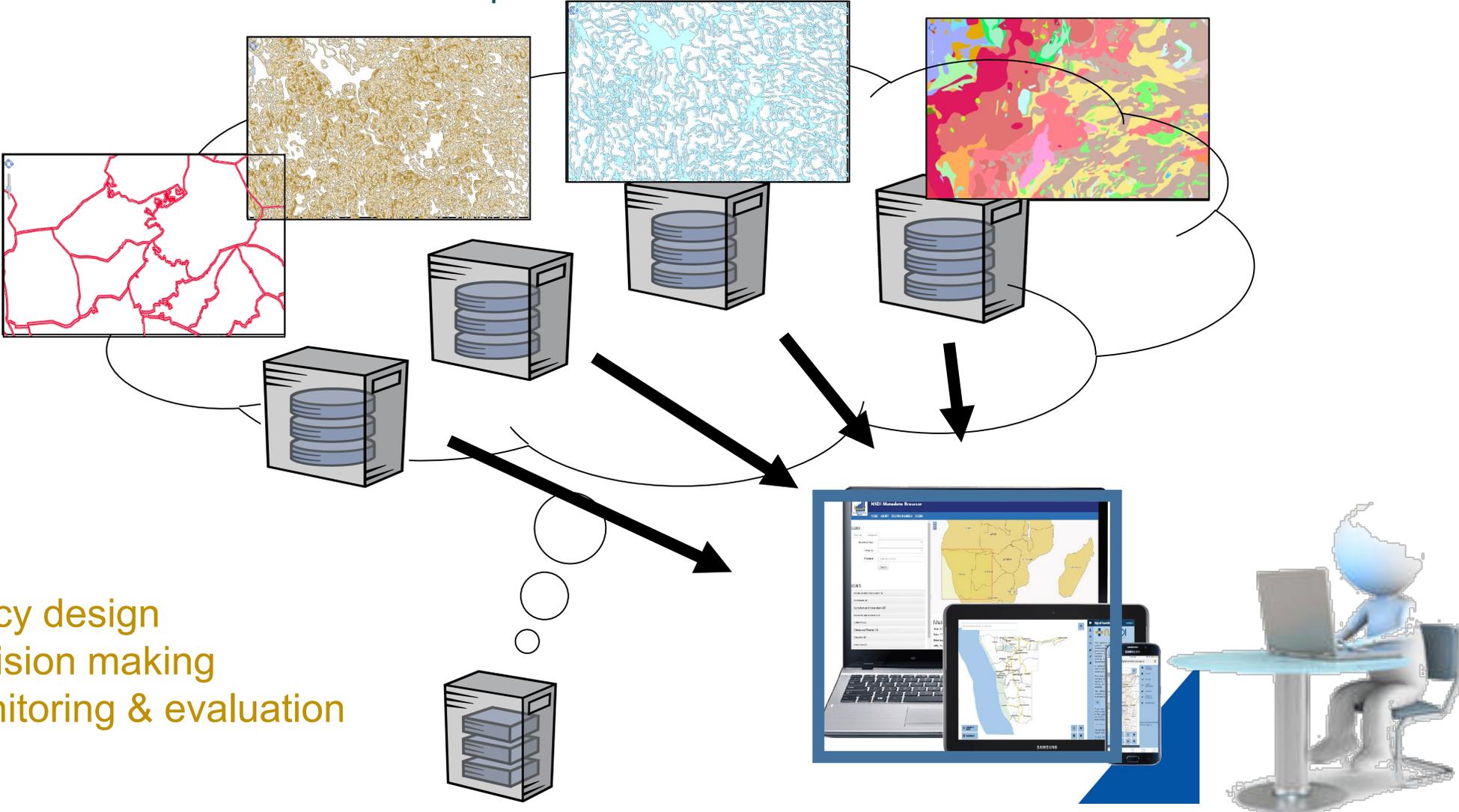
- ✓ Better policy design
- ✓ Better decision making
- ✓ Better monitoring & evaluation

GAZETTED NATIONAL FUNDAMENTAL GEOSPATIAL DATA THEMES

Level III (13)

| Education | Health | Environment & Conservation | Tourism | Agriculture & Aquaculture | Hydrology & Inland Water | Climate & Weather |

| Demography | Business & Economy | Society, Culture & Heritage | Disaster Risk Management | Oceanography & Marine | Utilities |

Level II(4)

| Geoscientific | Land cover | Imagery | Elevation |

Coordinate Reference Systems

Geographic Grids

Level I(5)

| Addresses | Cadastral | Geographic Names | Admin Boundaries | Transport Networks |

22 x Main Fundamental Data Themes

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NATIONAL AND GLOBAL DATA INTEGRATION STRATEGY

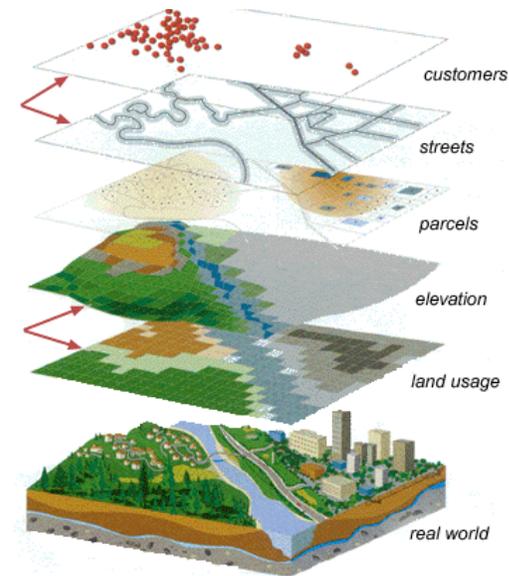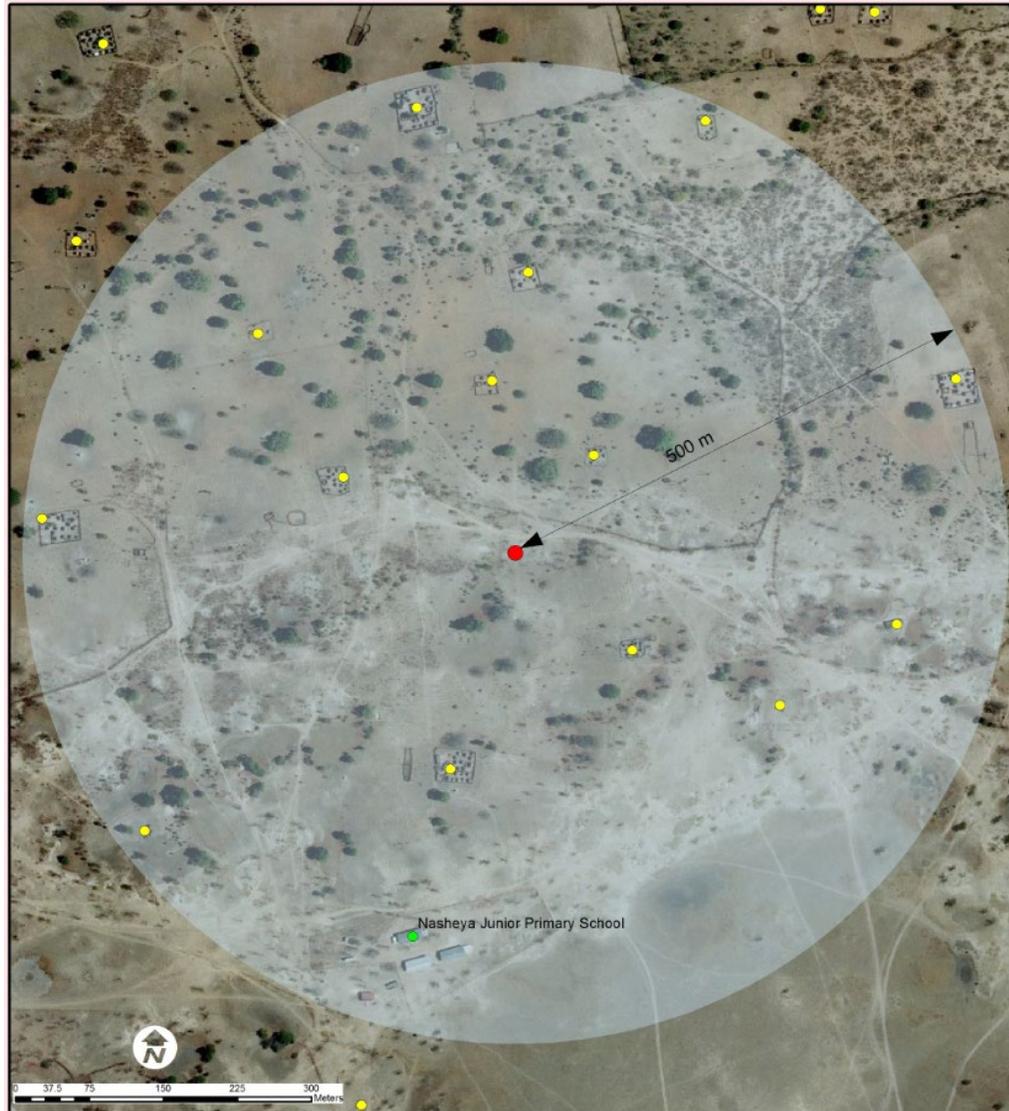Towards a National Development Information Infrastructure…

SNAMIBIA USE CASES OF SPATIAL INFORMATION

❖This is a list of all structures in the country with a geographic or spatial reference

❖A dot represents a homestead in rural areas and dwelling structure in urban.

NAMIBIAN EXAMPLE : THE POWER OF KNOWING THE "WHERE"...

Nasheya Junior Primary School

- MME'S 2010 Rural Electrification Master Plan is based on identifying communities without access to the national power grid.

- To determine which communities are assigned a higher priority, consider all structures within a 500m radius of a planned transformer point.

- Communities with schools or other government structures are assigned higher priority ratings than those containing only homesteads.

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PROPOSED ELECTRICITY NETWORK EXTENSION – YEAR 1 TO 20
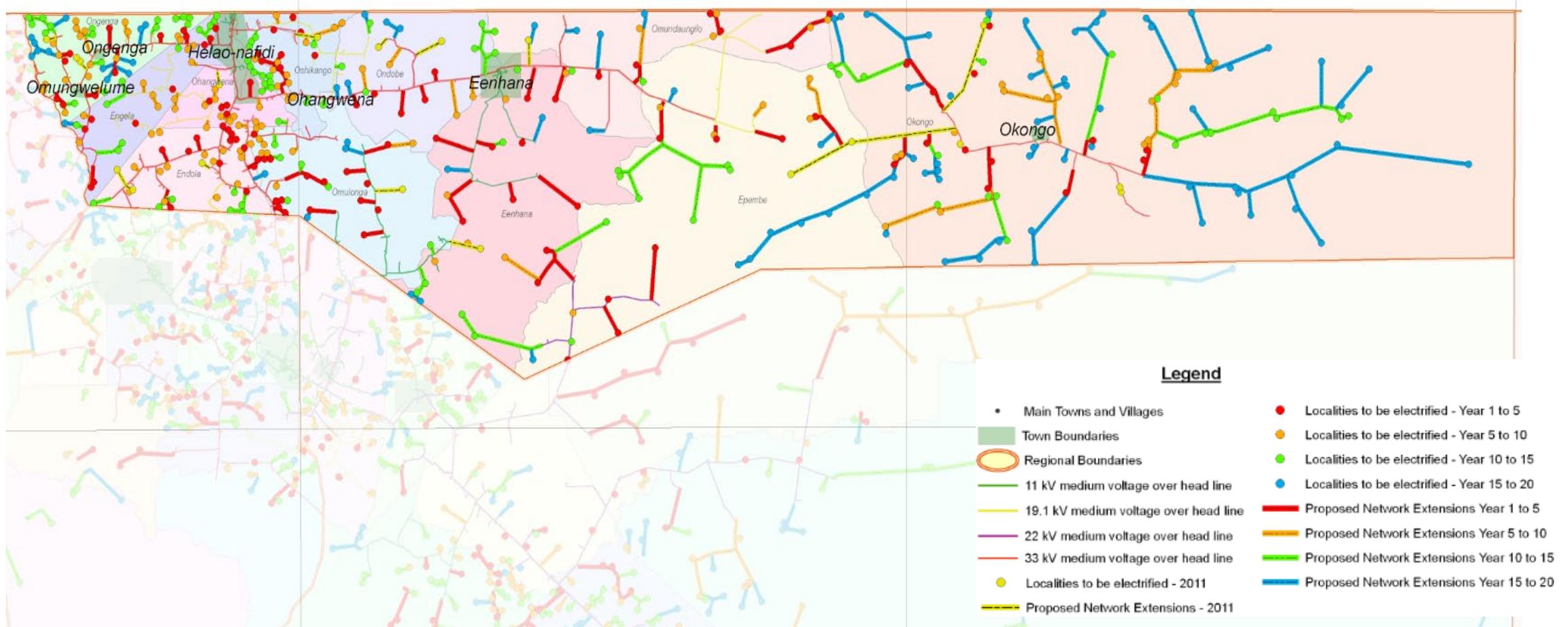
Source: Ministry of Mines & Energy - Rural Electricity Distribution
Master Plan 2010 Update

Mobile Network Planning 2010

Red = Household not owning cell phones

Green = Households owning cell phones

Total Dwelling Units: 5729

Total Dwelling Units: 27408

Total Dwelling Units: 5262

Omauni

Ohangwena

Nkurenkuru (Kahenge)

Kapako

Rundu

Kayengona

Muroro-Mashari

Mabushe

Kamagoro

Kavango West

Oshikoto

Kavango East

Mururani-Gate

Otjozondjupa

Tsumeb
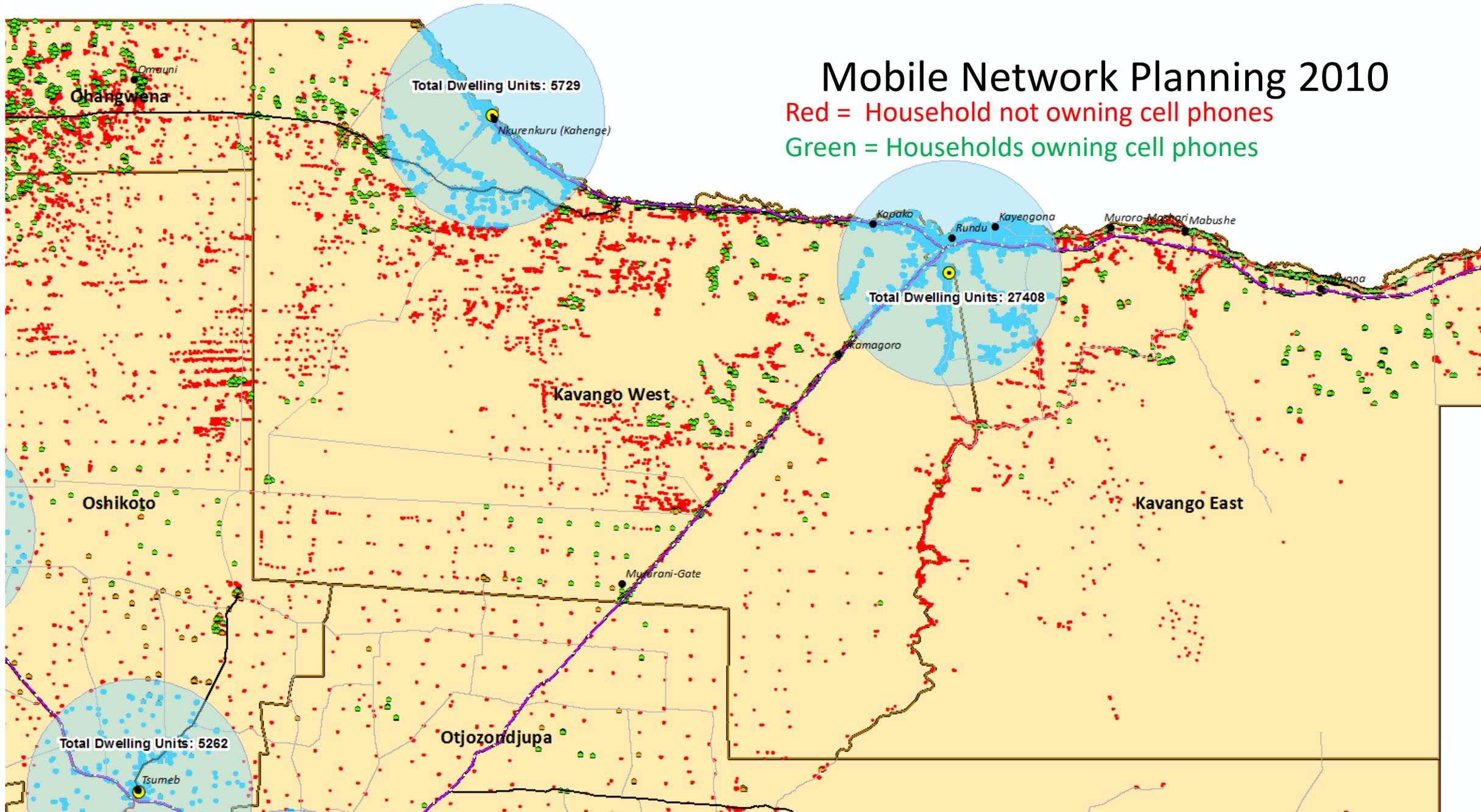
Development Statistics - Road Network Growth

	1990	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011-2013	2013-2015	2015-2017	2017/2018
Bitumen	4572	5477	5477	5477	5477	5477	5548	5810	6199	6387	6664	7165	7568	7892.7	8259.4
Earth road	11467	12245	12245	12245	12245	12245	12255	11967	10684	12734	11460	11541	13022	13315.6	13359.9
Gravel road	25550	24296	24296	24296	24296	24296	24361	24273	24944	24744	25710	25921	25604	26046.5	25889.3
Salt road	226	220	220	220	220	220	210	210	273	272	288	304	304	299.9	189.3
Proclaimed road	0	745	745	745	745	745	1452	1675	2328	1250	1524	1446	1829	1320.6	1201.9

PROMOTING REAL TO NEAR REAL-TIME DATA
Flooding in Eastern Kavango in 2012, the dots represent homesteads

- Flood Vulnerability Assessment

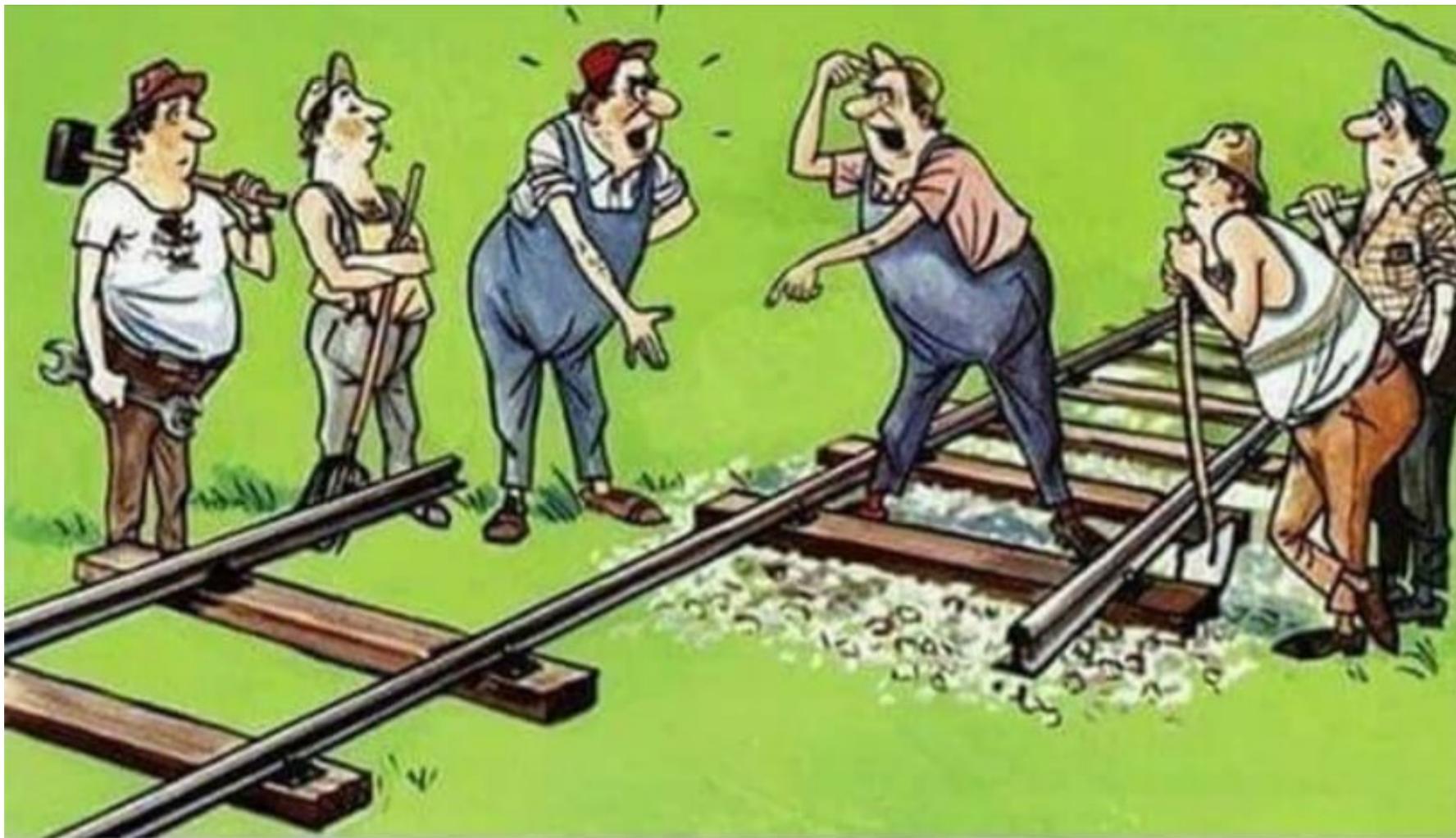|		
Water Flow	1030 m³/s	596.866 km²
Water Flow	600 m³/s	459.836 km²
Water Flow	100 m³/s	196.748 km²
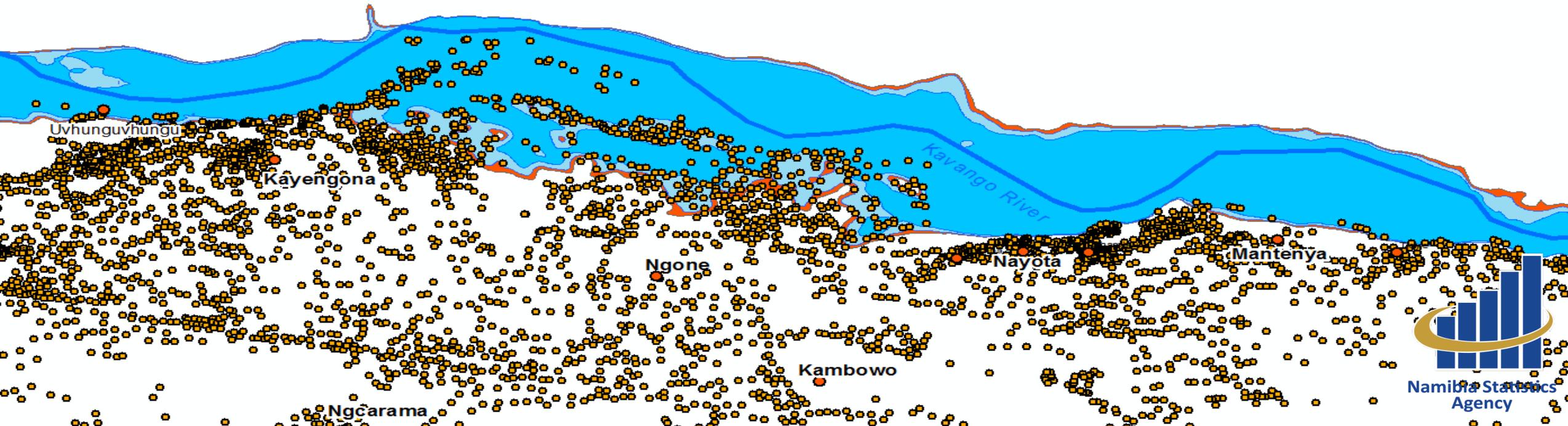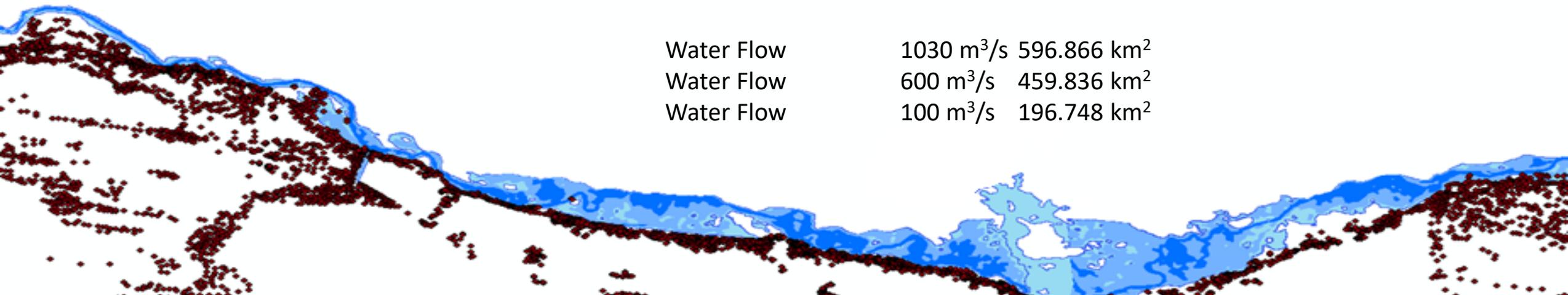
Risks of livestock production loss due to bush encroachment in 2015
High bush cover reduces grass growth and decreases livestock production

high risk

low risk

farms
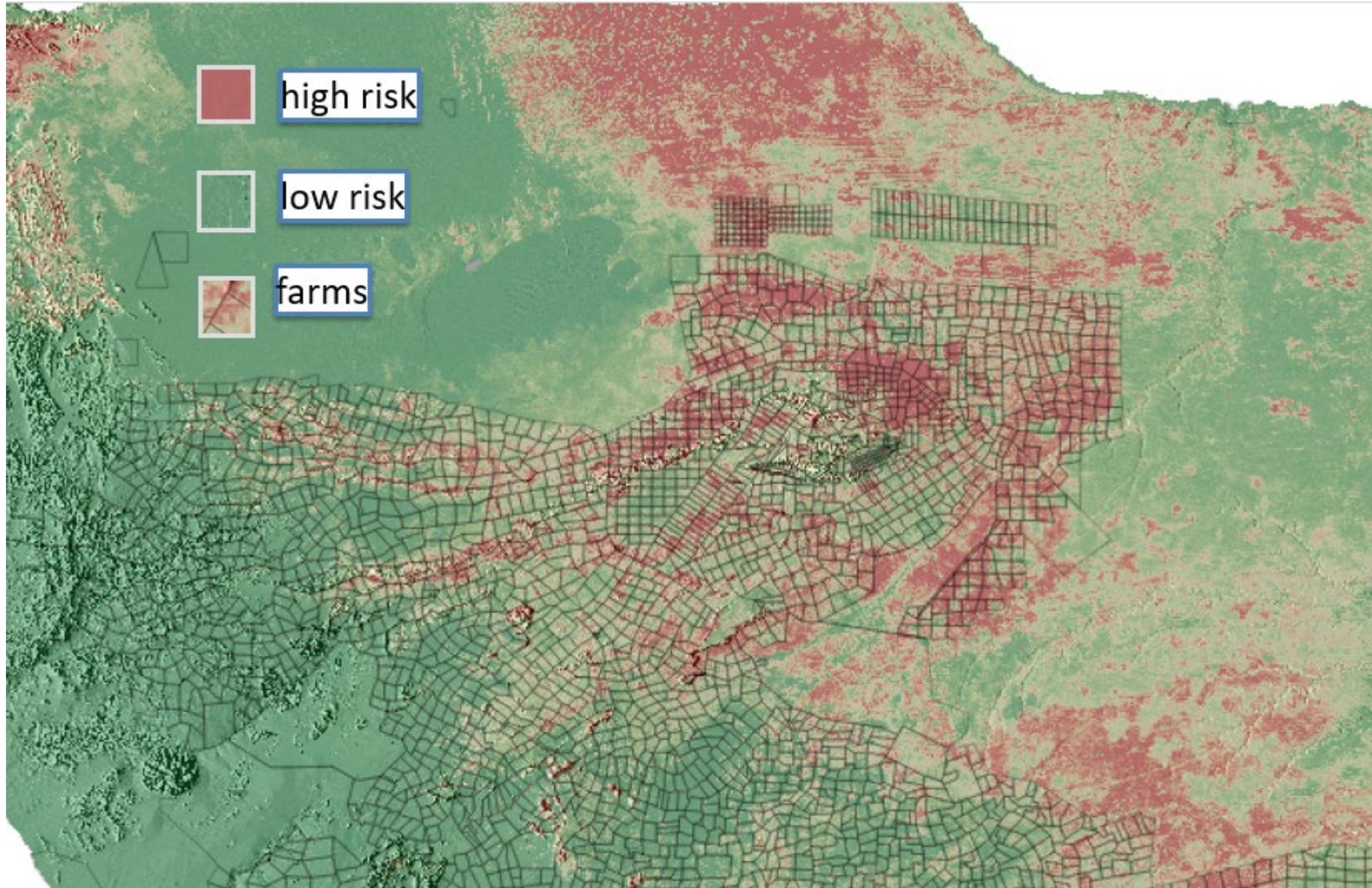
UNCOORDINATED DEVELOPMENT PLANNING

CENSUS UNDERTAKINGS IN NAMIBIA

1. NSA tasked by the **Statistics Act, 2011** to conduct a **PHC every 10 years** & UN Recommendations

2. Census undertaken: 1991, 2001, 2011 (next PHC in 2021)

3. Provide demographic and socio-economic statistical information on population and its living quarters

4. Provide data for small geographic areas & population groups for each and every citizen

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CENSUS METHODOLOGY & OUTPUTS

1. 1st PHC to be **paperless** in Namibia

2. Use of CAPI technology to collect data

3. Use of **modern satellite imagery** to conduct the pre-enumeration census mapping and location demarcation.

4. Statistics will be linked to **spatial locations** good for development planning at all levels

5. Outputs: Master Sampling & Dwelling Unit Frames; Population Projections; Business Register; Data for M&E of NDPS, HHP, SDGs, Agenda 2063

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HIGH RESOLUTION SATELLITE IMAGES

- Images from Digital Globe
- Contribution
  - NSA
  - MURD
  - UNFPA
- Government wide license

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NATIONAL LAND CONFERENCE RESOLUTIONS: URBAN LAND REFORM THEMATIC AREA =➡URBAN LAND DELIVERY

Goreagab

Input – Generic

Satellite Imagery
- Open Source Landsat, Sentinel, etc. – Spectral bands
- High Resolution Optical Imagery

Use Case: Housing Detection
- Optical High- Resolution Satellite Imagery from DigitalGlobe in WMS format/download possible
- Optical Aerial Photographs
- ArcGIS, QGIS

Application – Generic

- Add-on / Script / GUI to ArcGIS or QGIS for machine learning on Spectral Bands and/ or RGB
- Input parameters: Shape, Patterns, Size, Colours, spectrum, etc.
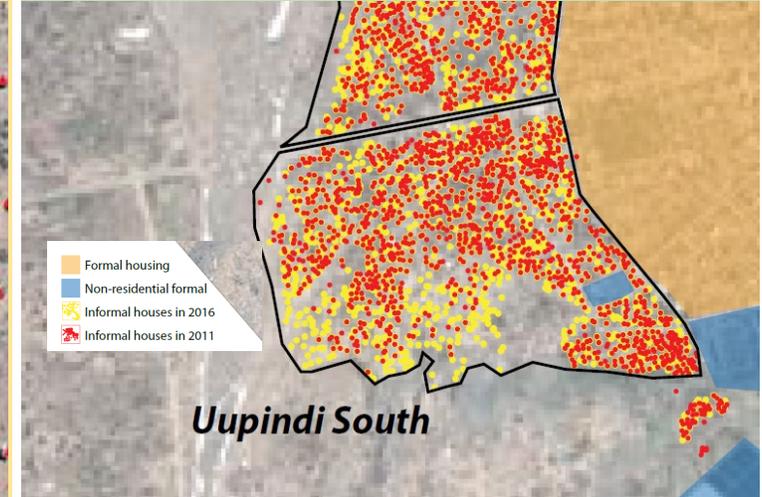- Sample Area to teach classes and patterns

Use Case: Housing Detection
- Teaching of Formal/ permanent structures,
- Teaching of informal structures (zinc roof, thatching (grass) roof and tents)
- Teaching of other Built Up Structures
- Methodology with proof of concept and given accuracy/ confidence in other use cases

Output – Generic

- Classes (shapefiles) based on defined parameters. (e.g land cover maps)
- Object Database for detected units

Use Case: Housing Detection
- Countrywide Database of Housing Units (Attributes & Location)
- Countrywide Classes of Built Up Structures
- Countrywide Change Detection (future)

Formal housing
Non-residential formal
Informal houses in 2016
Informal houses in 2011

Uupindi South

Image source: Beat Weber and John Mendelsohn (2017)

EXAMPLE OF WHAT WILL BE CAPTURED AND CREATED DURING CENSUS MAPPING

MAIN Id	Name
0	Unknown
1	Vacant
4	Dwelling Unit
5	Special Dwelling Unit
6	Commercial Structure
7	Educational Facility (excluding Hostel)
8	Health Facility (excluding overnight stay)
9	Recreational Facility (excluding overnight stay)
10	Heritage Site
11	Public Structure
12	Religious Place
13	Transport Node
14	Industrial Structure
15	Agricultural Facility
17	Observation Structure
18	Power Station
19	Waste Site
20	Water Supply Point
21	Treatment Plant
22	Telecommunications Tower
23	Reservoir
24	Headmen/Traditional Leader/Chief's House
99	Other, specify

DWELLING UNIT VARIABLES			
1	Detached House	4 N	A formal, permanent dwelling typically for one family that does not form part of a block of flats
2	Semi-detached house/Town house	4 N	a Semi-detached House, a Duet, a Townhouse, a Cluster Home
3	Apartment/flat	4 N	A set of rooms used as a residence.
4	Guest Flat	4 N	NULL
5	Part commercial/Industrial	4 N	NULL
6	Mobile home (caravan, tent)	4 N	A vehicle or vessel equipped for living in. The dwelling is either self-powered or towed. This includes a Caravan, a Trailer Home, a Portable Hut, a Tent, and a Houseboat.
7	Single quarters	4 N	NULL
8	Traditional Dwelling	4 N	A typically rural dwelling constructed by plastering a wooden framework with a mixture of mud and manure.
9	Impoverished Unit (shack)	4 N	An informal dwelling constructed from metal sheeting, boards, zinc and other material.
10	Holiday home	4 N	NULL
11	Under construction	4 N	NULL
12	Other Dwelling, specify	4 N	NULL

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COMMERCIAL STRUCTURE VARIABLES

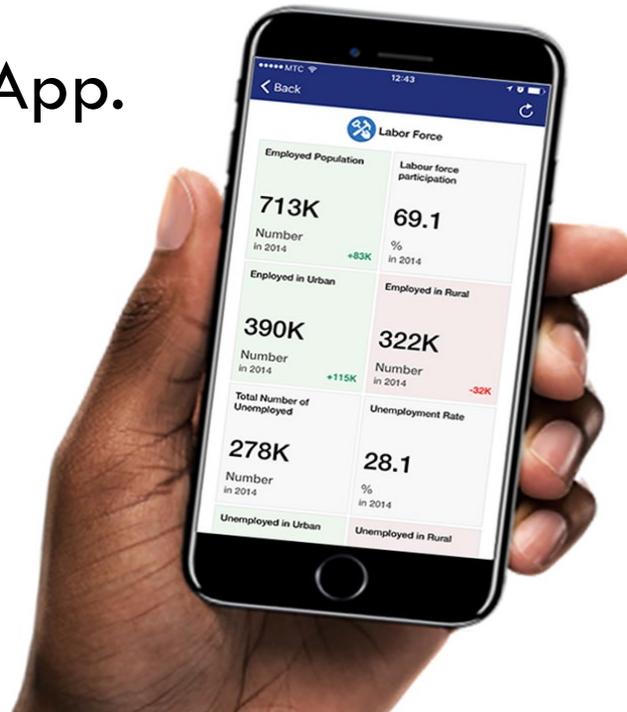|	
Office Block	A large building containing business offices.
Office	A room or building used as a place of business.
Shopping Centre	An area or complex of shops, with associated facilities. This includes a Shopping Complex and a Shopping Mall.
Market	A venue where people can gather to buy and sell goods. This includes a Flea Market, a Craft Market and an Agricultural Market.
Retail Outlet	A room or building used for retailing goods and services. This includes a Shop, a Supermarket, a Hypermarket, a Spaza Shop, Greengrocer, Butcher and Café.
Food and beverage outlet	A retail outlet selling food and beverage largely for consumption on the premises or for immediate consumption elsewhere. This includes a Restaurant, a Food Court, a Coffee Shop, a Shebeen, a Beer hall, a Pub and a Bar.

IMPLEMENTATION CHALLENGES

1. Concluding NSDI memoranda of understanding taking too long

2. More discussions regarding the linkages of the NSDI Policy, Statistics Act and other laws relating to spatial data

3. Geospatialist Job Level not recognised on the government post structure

4. National Capacity – the capacity to properly formalize the NSDI is lacking countrywide

5. Poor data management practices in OMAs (high risk of data loss/corruption, poor land statistics)

6. Ongoing duplication in data collection, wastage of government resources despite established coordination framework

7. Inadequate ICT Infrastructure

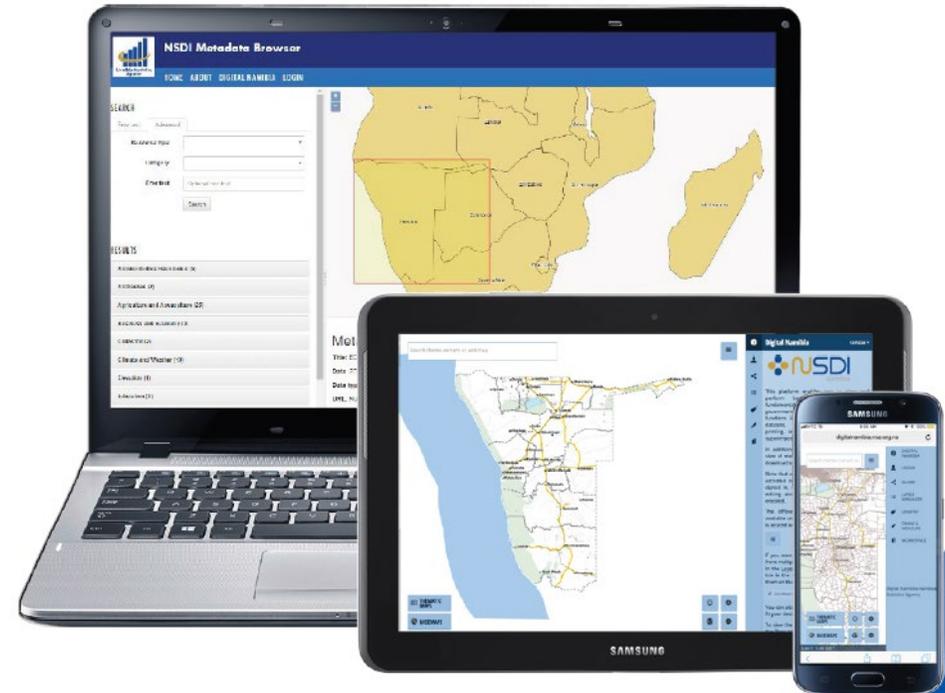8. Staffing at the NSDI Secretariat (NSA)

9. Lack of Funding

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Thank You

1. NSA Mobile Application

Download the NS App.

2. NSDI Geographic Portal

https://digitalnamibia.nsa.org.na/

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