



# Cartography M.Sc.

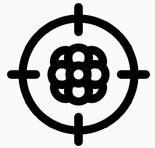
## Reviewing the Status of National Spatial Data Infrastructure: A case study in Southern Africa countries

John Ogunbiyi

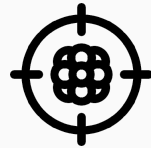
- Motivation and Problem Statement
- Research Objectives
- Research Questions
- Country's SDI Profile
- Adopted Methodology
- Results
- Answers to Research Questions
- Conclusion and Recommendation

- The implementation of NSDI has been slow in developing countries, particularly in **Southern Africa countries** (Mwange et al., 2018).
- Africa continent still lacks the **knowledge and technical skills** to develop and **promote spatial data capacity** (Maphale 2021).
- Thus, this study reviewed the **status and technological trends** of SDI developments within five Southern Africa countries (South Africa, Botswana, Zimbabwe, Tanzania and Malawi).

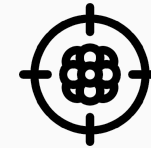
# Research Objectives



**R01:** Assess the status of SDI development in the selected countries.



**R02:** Identified key players and constraints related to SDI development in the selected countries.



**R03:** Implementation of a free open-source tool (Geodjango) to support NSDI platform

The research questions for this study includes;



**RQ1:** What are the challenges influencing SDI implementation in the selected countries?



**RQ2:** Who are the actors responsible for coordinating SDI activities and how have they collaborated?



**RQ3:** How can SDI implementation be effectively managed in the selected countries?

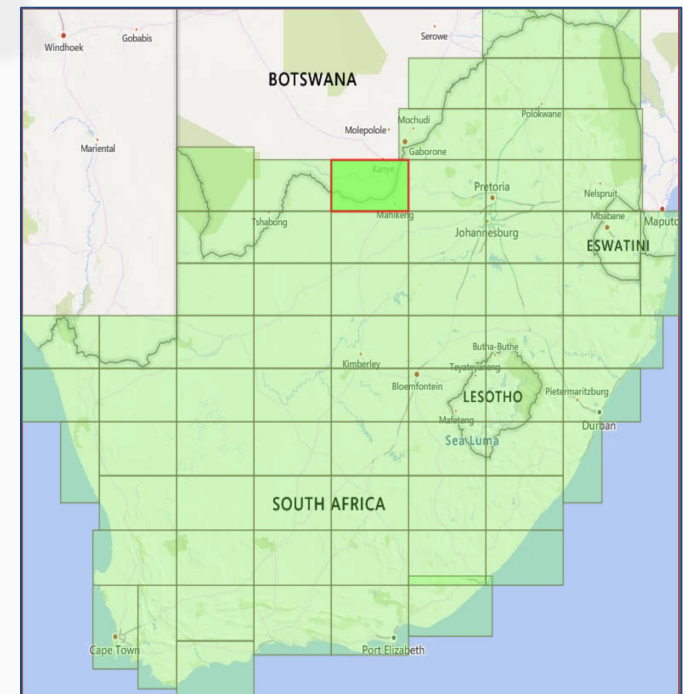
## Brief Introduction

South Africa has a land mass of approximately 1,221,037 square kilometers and an estimated total population of 59.9 million (UN Data, 2021).

**Status:** Implementation of SASDI is still ongoing with endorsement of dataset and pricing custodianship policies.

## FINDINGS ON SDI ACTIVITIES IN SOUTH AFRICA

- Implementation of Data Custodianship (Feb, 2019)
- Review on Spatial Data Infrastructure Act, 54 (2003) workshop (Dec, 2019)
- Map design and styling of National land cover classes (July, 2020)

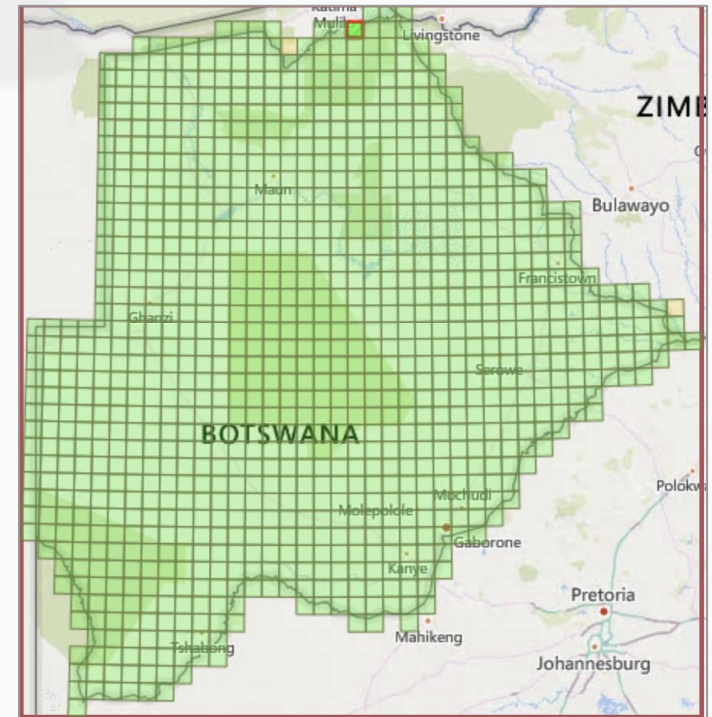


Source: <https://shop.geospatial.com/>

Botswana has a total area of 582,730 square kilometers and a population of 2.2 million people (UN Data, 2021).

## FINDINGS ON SDI ACTIVITIES IN BOTSWANA

- Digital Information policy approved by the cabinet (March 2015)
- Implementation of GIS cluster and land information initiatives (Nov, 2014)
- Collaboration with ESRI South Africa to improve data integration and sharing (Nov, 2014)
- Development of major NSDI components (Nov, 2014)



Source: <https://shop.geospatial.com/>

## Brief Introduction

Malawi has a land area of nearly 119,000 square kilometers with an estimated population of 17.2 million (UN Data, 2021).

**Status:** At the national level, there are ongoing efforts to promote SDI activities among relevant organizations

## FINDINGS ON SDI ACTIVITIES IN Malawi

- In 2015, a three-day workshop was held to present the GIS and atlas database
- Establishment of National Spatial Data Centre (2008)



Source: <https://shop.geospatial.com/>



## Brief Introduction

Tanzania covers a total area of 885,800 square kilometers with an estimated population of 61.4 million (UN Data, 2021).

**Status:** Tanzania is still struggling to develop a spatial data infrastructure. There are still ongoing institutional arrangements to support the development of a formal SDI.

## FINDINGS ON SDI ACTIVITIES IN Tanzania

- Integrating land information system (March, 2012)
- Establishment of Geodetic network (Nov, 2015)
- Implementation of mapping software and equipment (Nov, 2015)



Source: <https://shop.geospatial.com/>

## Brief Introduction

Zimbabwe covers a total area of 390,757 square kilometers with an estimated population of 15 million (UN Data, 2021).

**Status:** SDI implementation process is still at the early stages. There is no formal SDI activities in Zimbabwe apart from the country reports (UNECA).

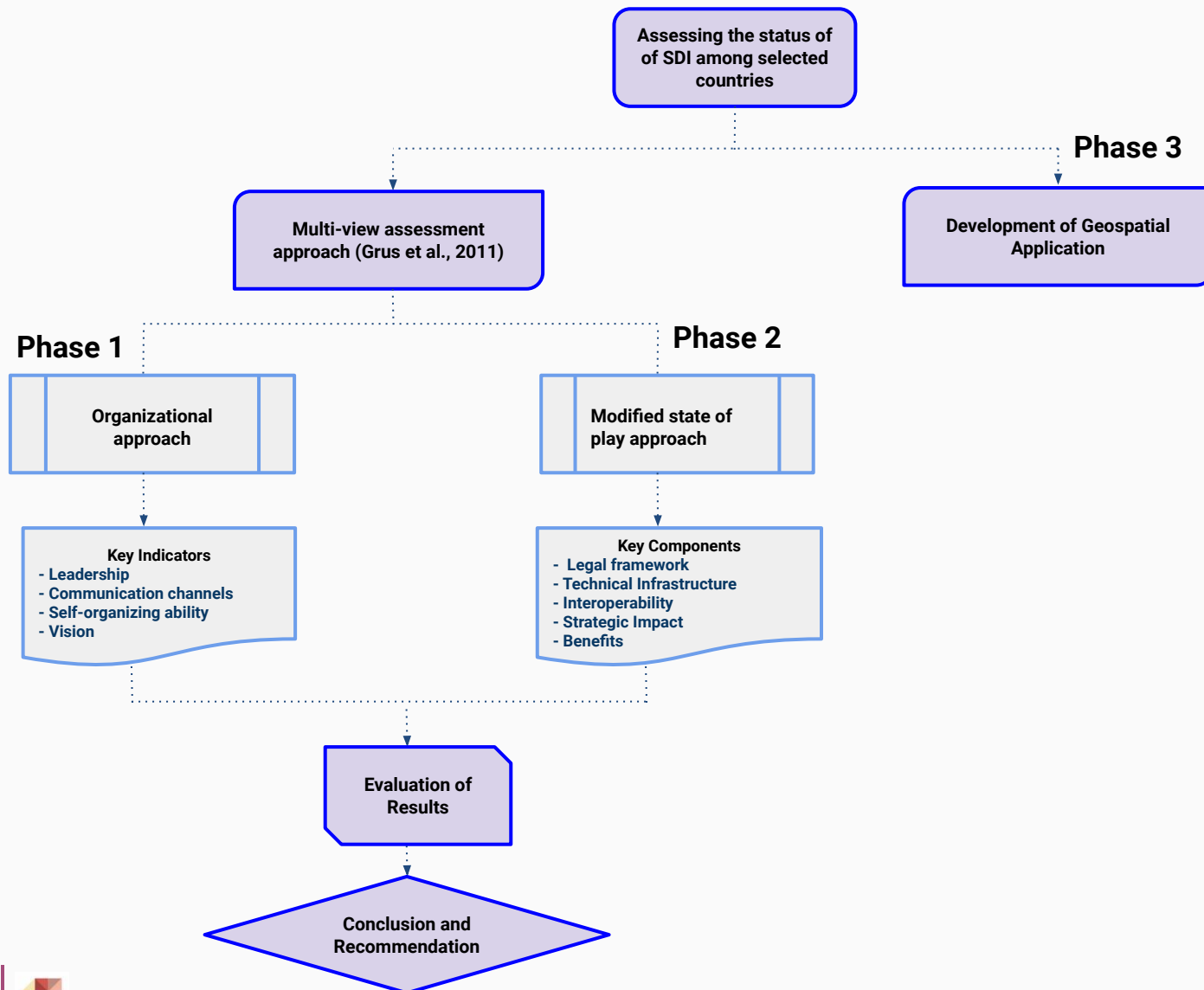
## FINDINGS ON SDI ACTIVITIES IN Zimbabwe

- Production of topographic base maps and other thematic maps (March, 2014)
- Maintenance of National geodetic control network (March, 2014)
- Implementation of Zimbabwe geospatial tool (July, 2015)

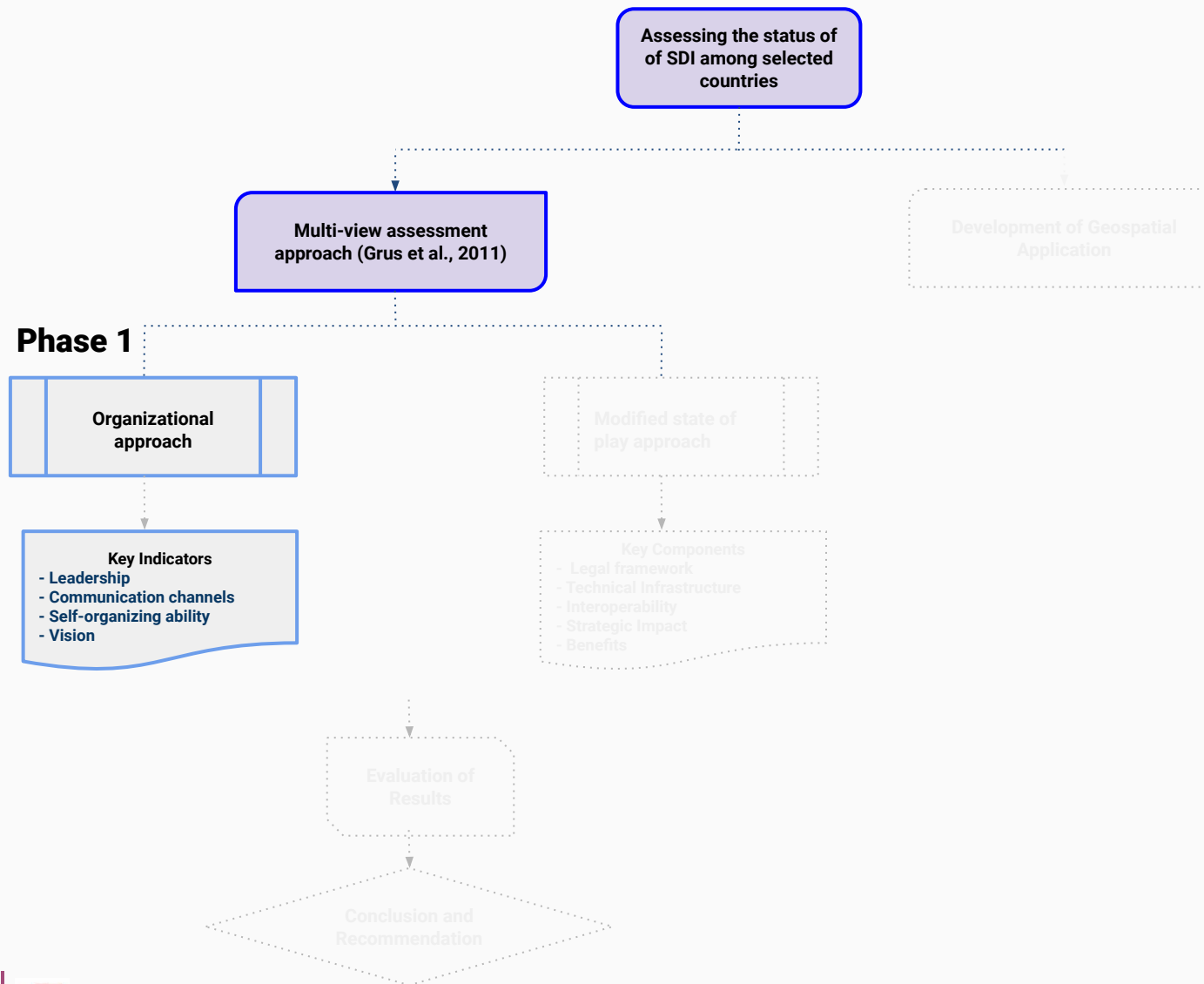


Source: <https://shop.geospatial.com/>

# Adopted Methodology

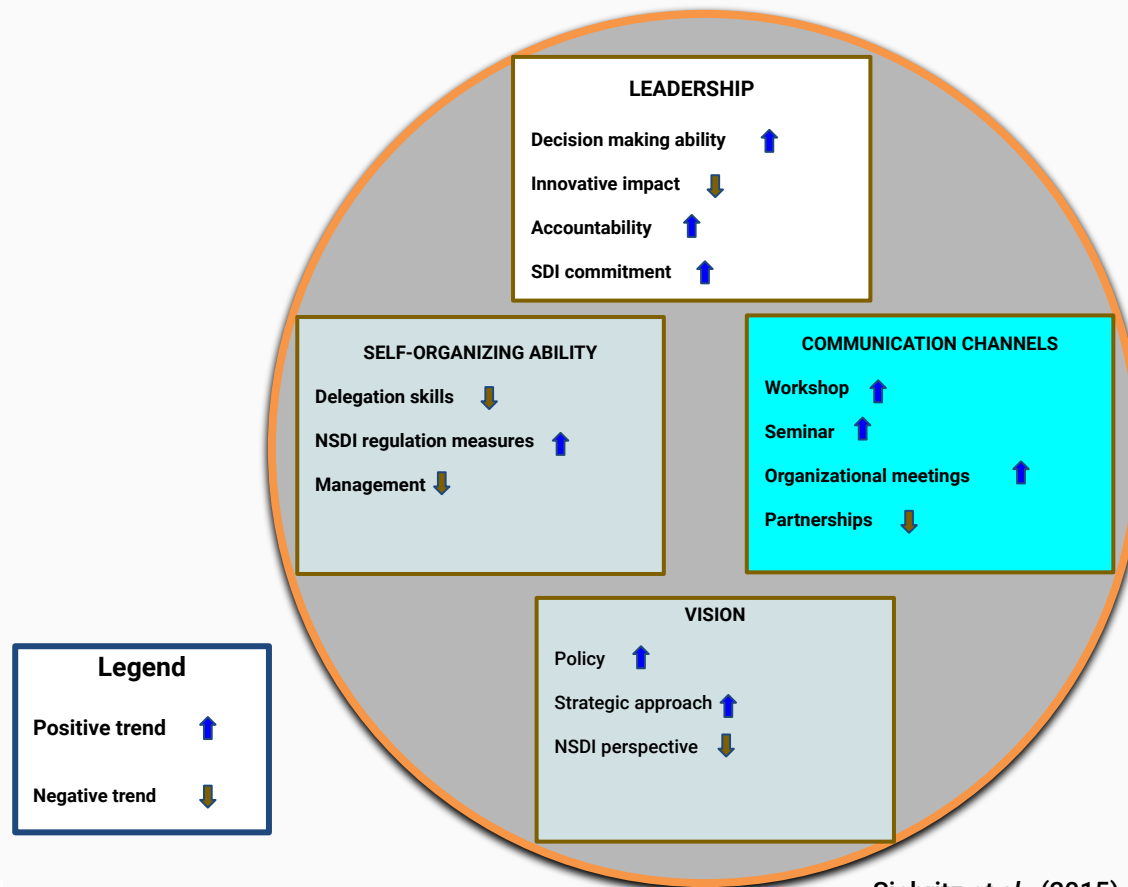


# Organizational Approach



## ❏ South Africa

South Africa has consistently improved NSDI activities. Trends in the evaluation of the organizational structure include;

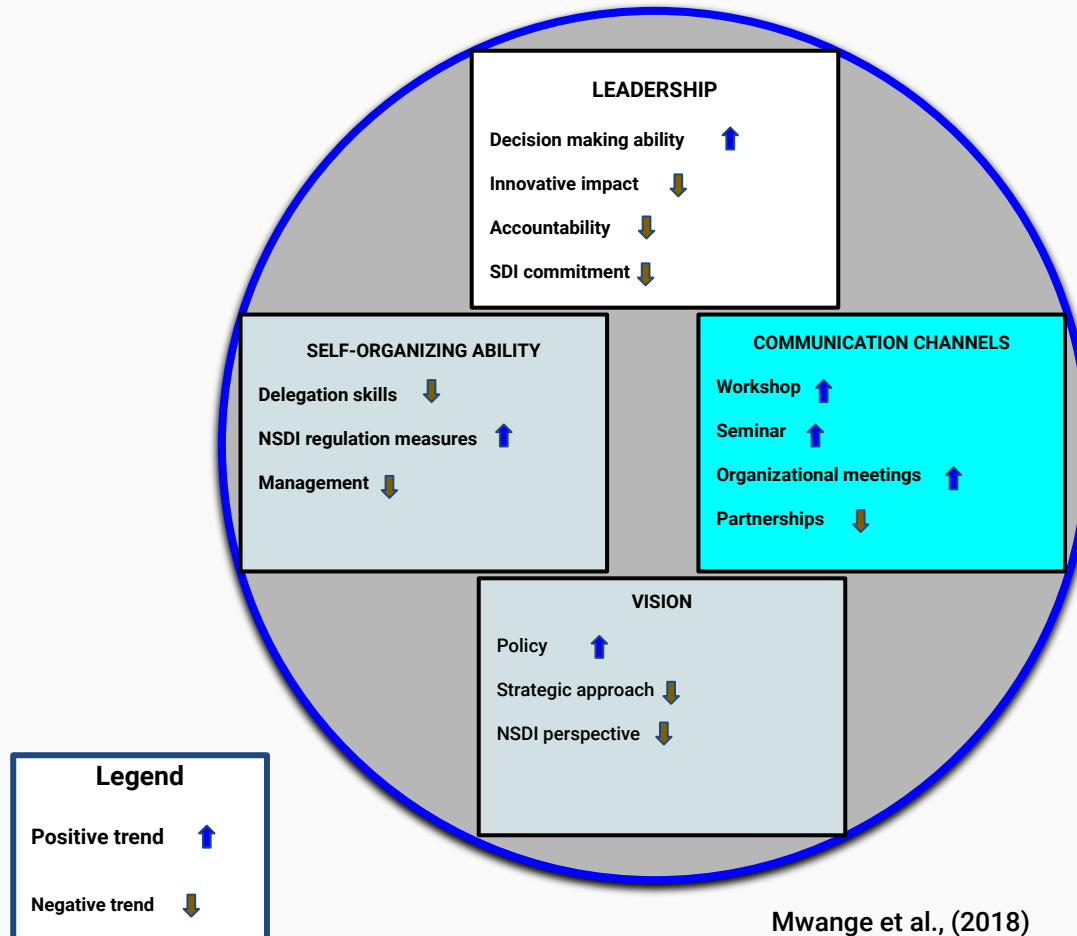


## Organizational Approach Assessments



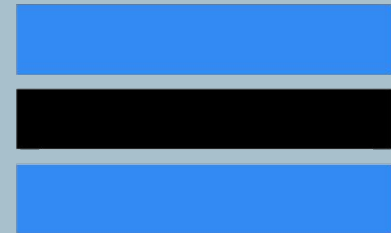
Siebritz et al., (2015)

Organizational assessment results for Botswana Spatial Data Infrastructure includes;



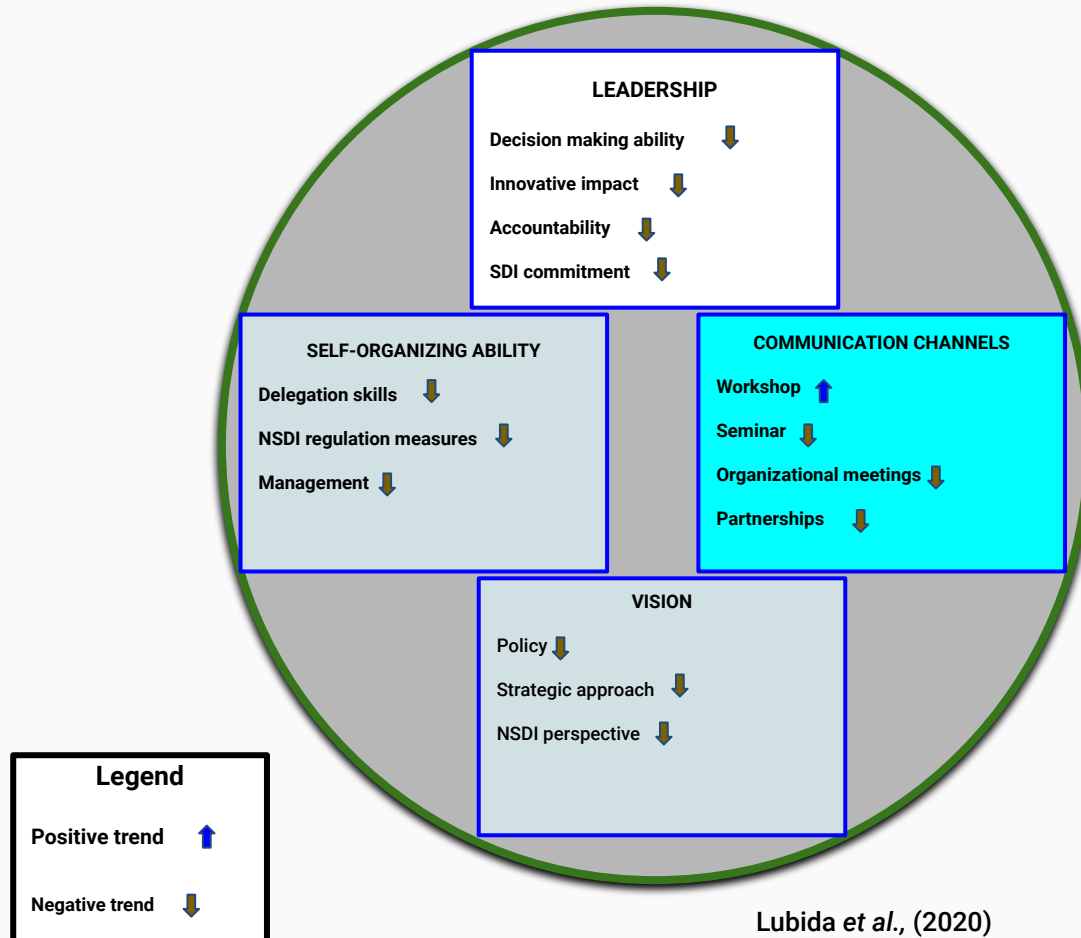
Mwange et al., (2018)

## Organizational Approach Assessments



## ❏ Tanzania

The organizational assessment results for Tanzania Spatial Data Infrastructure includes;

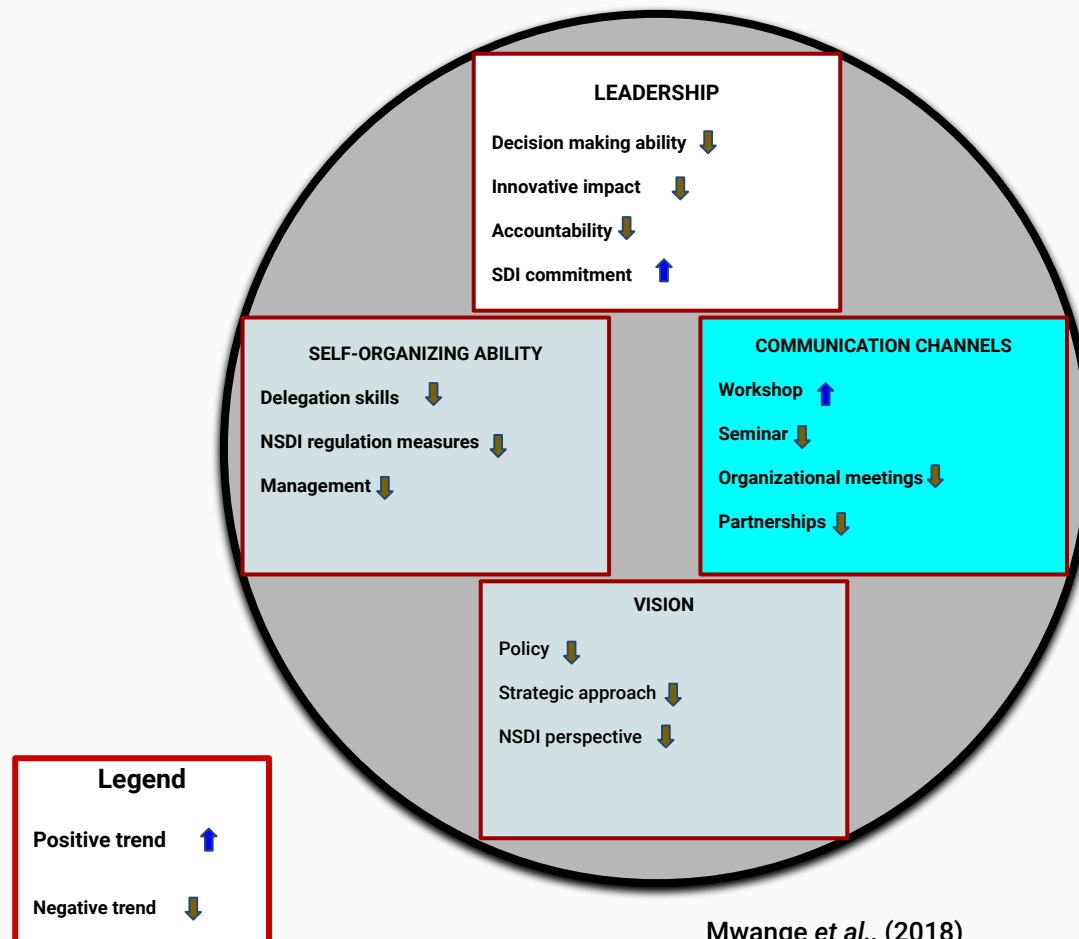


Lubida et al., (2020)

## Organizational Approach Assessments



The organizational assessment results for Malawi Spatial Data Infrastructure includes;



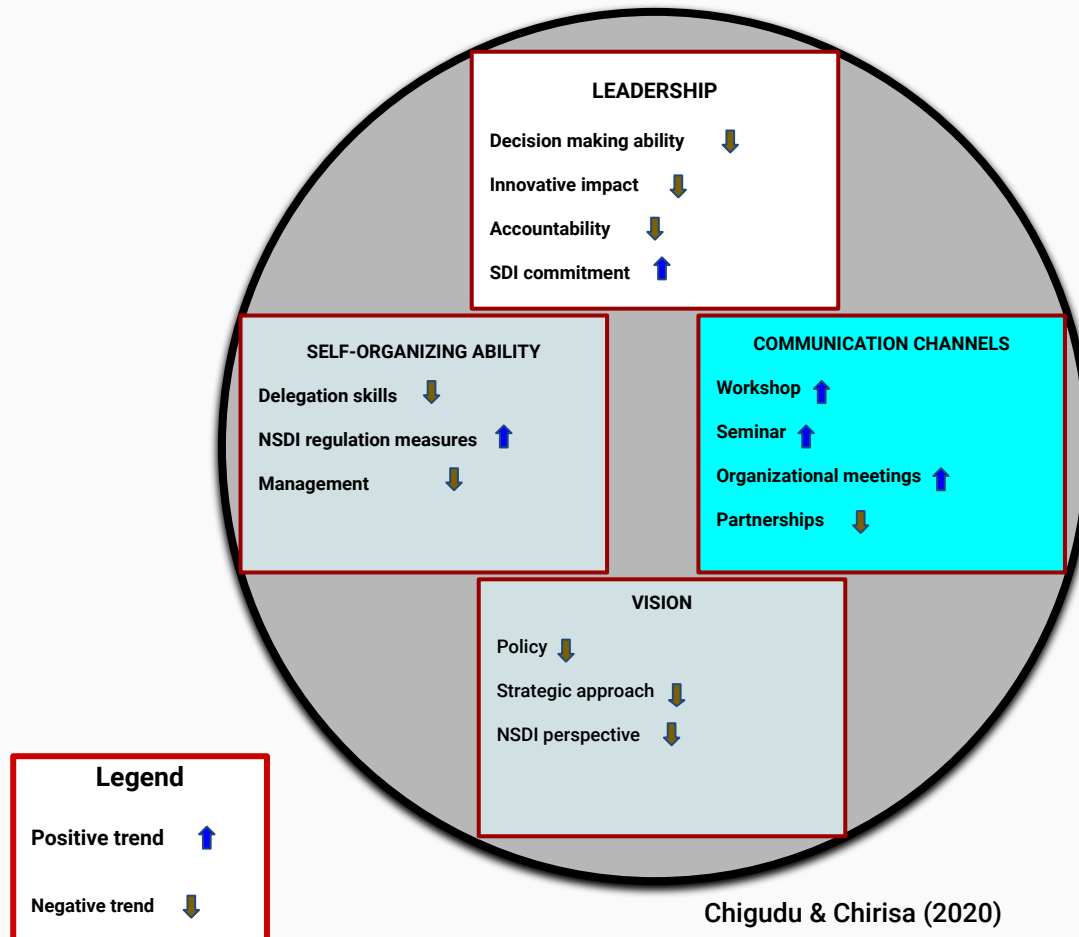
Mwange *et al.*, (2018)

## Organizational Approach Assessments





Organizational Assessment of Zimbabwe Spatial Data Infrastructure includes;



## Organizational Approach Assessments



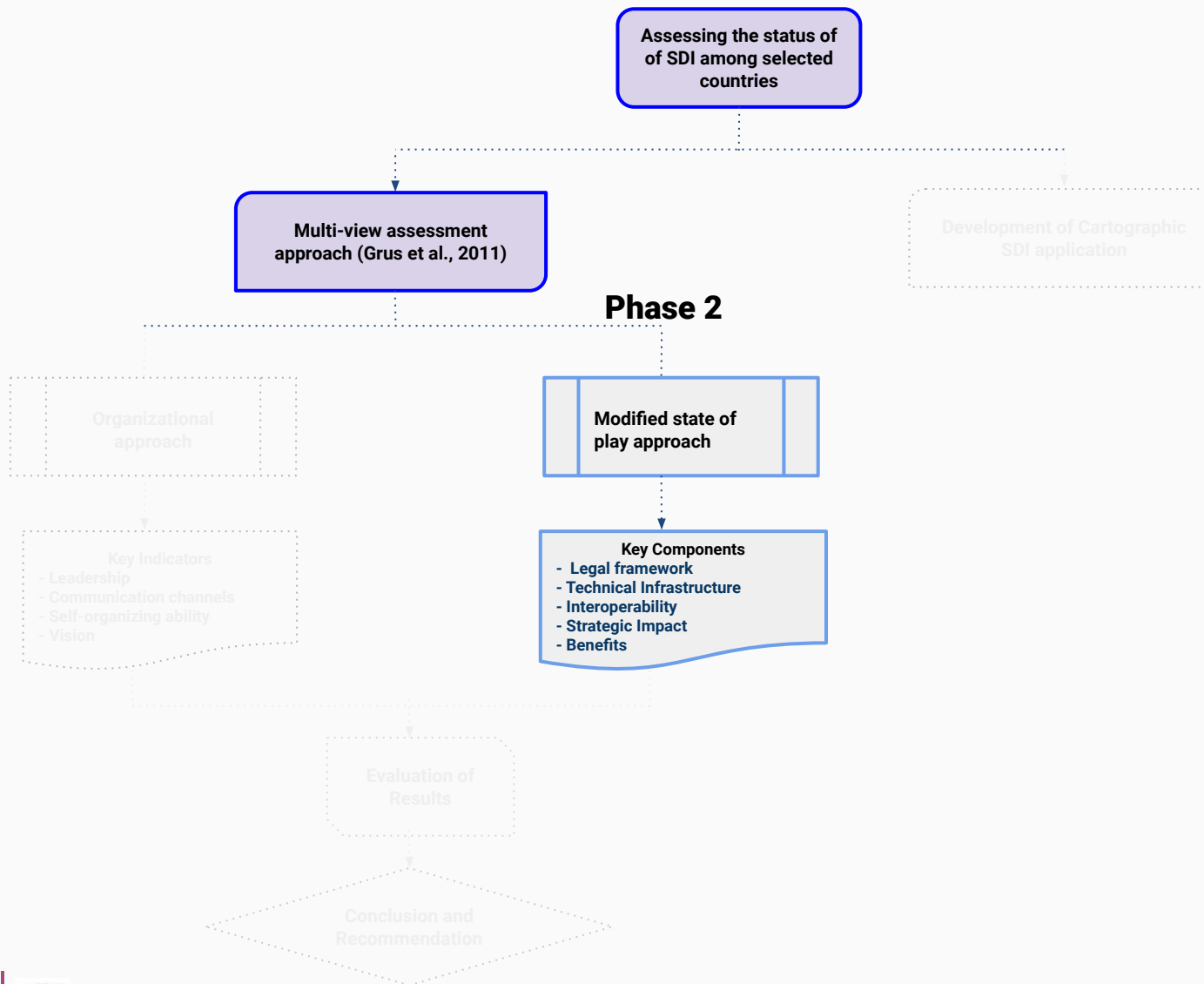
## Successful implementation of NSDI development includes;

- **Leadership:** effective leadership can be achieved by prioritizing the SDI action plan through short-, medium-, and long-term interventions.
- **Vision:** the vision for a national spatial data infrastructure should remain clear, sustainable, and transparent to relevant stakeholders
- **Self-organizing Ability:** national organizations should be actively involved in the legal and policy structures to create an effective system for managing NSDI and its usage
- **Communication Channels:** improvement in digital communication and collaboration among stakeholders to reduce data duplication.

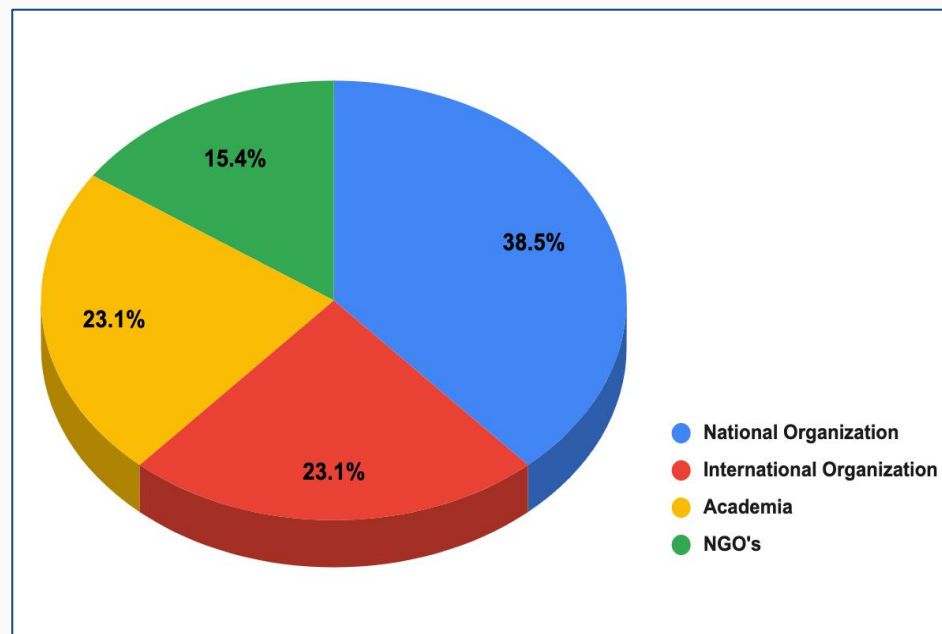
The implementation of NSDI activities and continental action plans recommendations based on the UN-GGIM meeting (2020) includes:

- The commitment of African countries to participate in UN-GGIM meetings and regional SDI summits.
- Identify alternative means of communication by adopting electronic communication channels among member states.

# Modified State of Play Approach (Results)

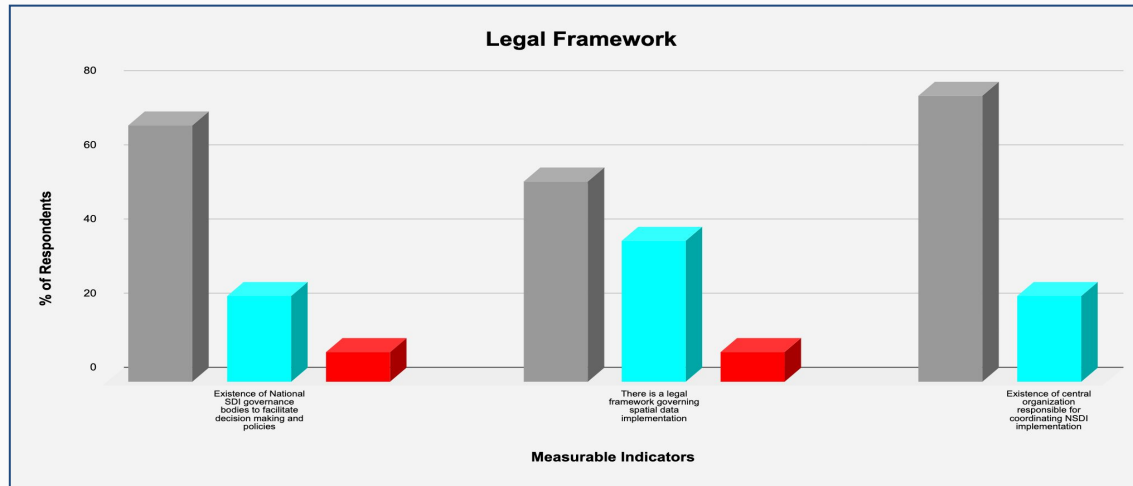


## ❑ The sample size distribution of respondents :

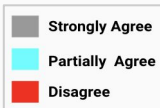


# Modified State of Play Approach Results

## Legal framework

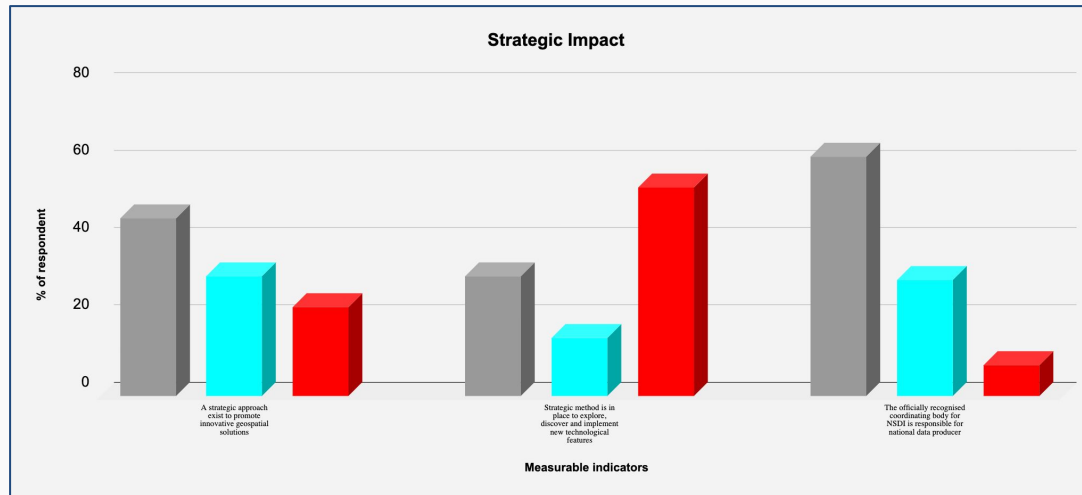


	Existence of NSDI Governance bodies	Presence of Legal framework governing SDI activities	Coordination of NSDI implementation
Strongly Agree	69%	54%	77%
Partially Agree	23%	38%	23%
Disagree	8%	8%	

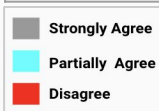


# Modified State of Play Approach Results

## Strategic Impact

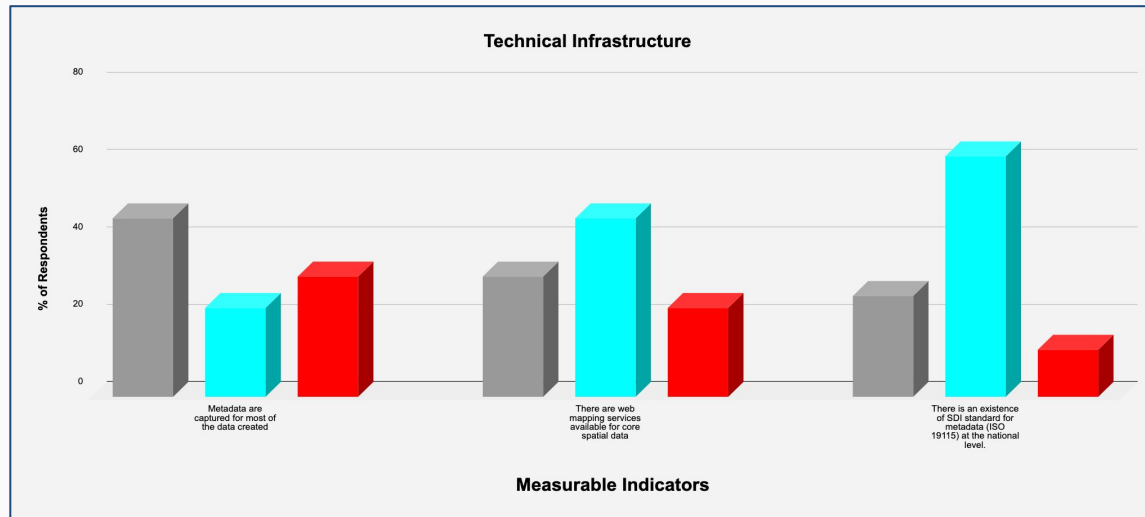


	Strategic Approach exist to promote SDI	Existence of strategic method to Implement technological features	Existence of NSDI coordinating body to promote National data production
Strongly Agree	46%	31%	62%
Partially Agree	31%	15%	30%
Disagree	23%	54%	8%

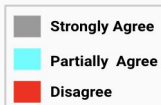


# Modified State of Play Approach Results

## Technical Infrastructure



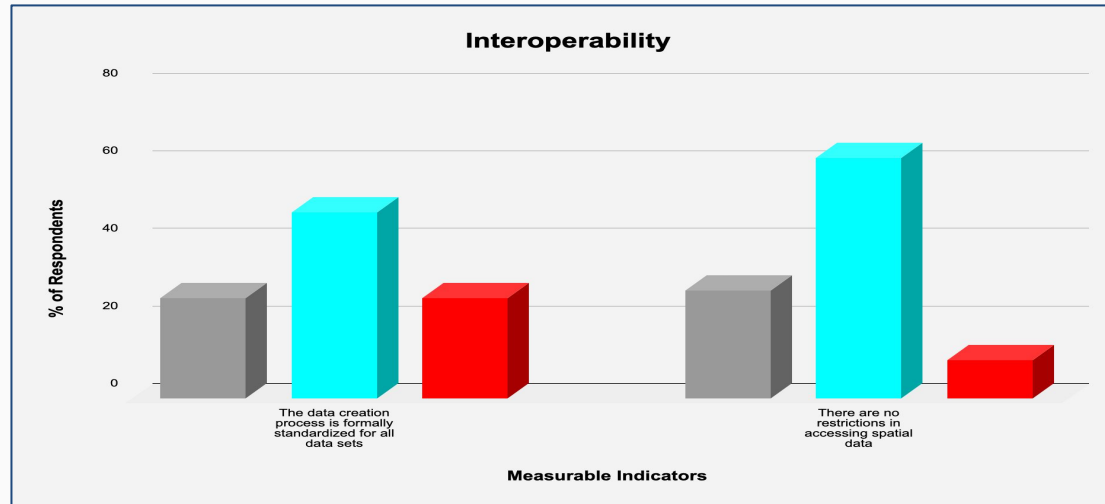
	Metadata are captured for most of the data created	Web mapping services are available for core spatial data	Existence of SDI standard for metadata at the National level
Strongly Agree	46%	31%	26%
Partially Agree	23%	46%	62%
Disagree	31%	23%	12%



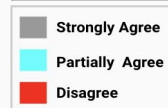


# Modified State of Play Approach Results

## Interoperability

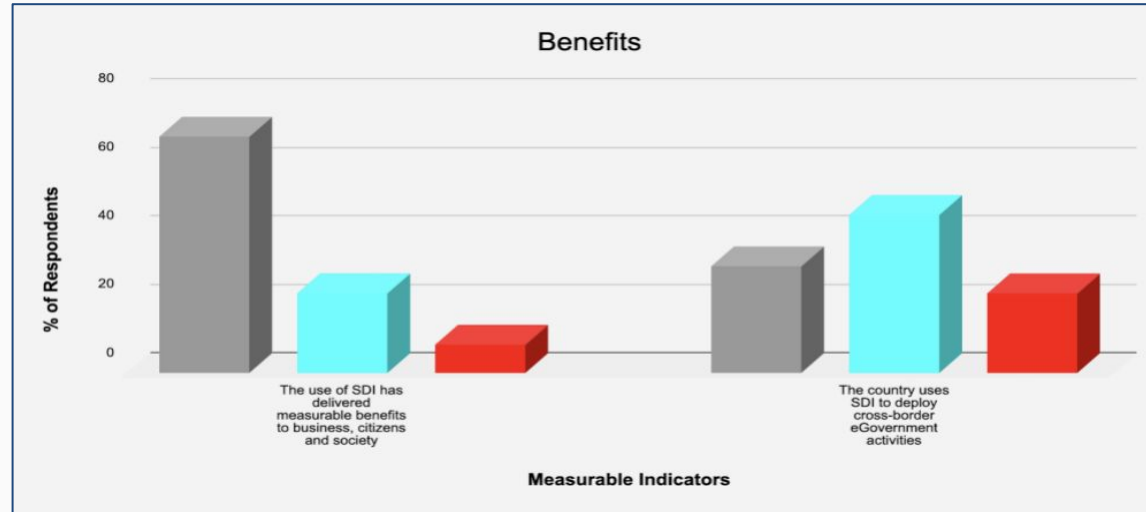


	The data creation process is formally standardized for all the data sets	There are no restrictions in accessing spatial data
Strongly Agree	26%	28%
Partially Agree	48%	62%
Disagree	26%	10%

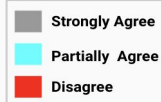


# Modified State of Play Approach Results

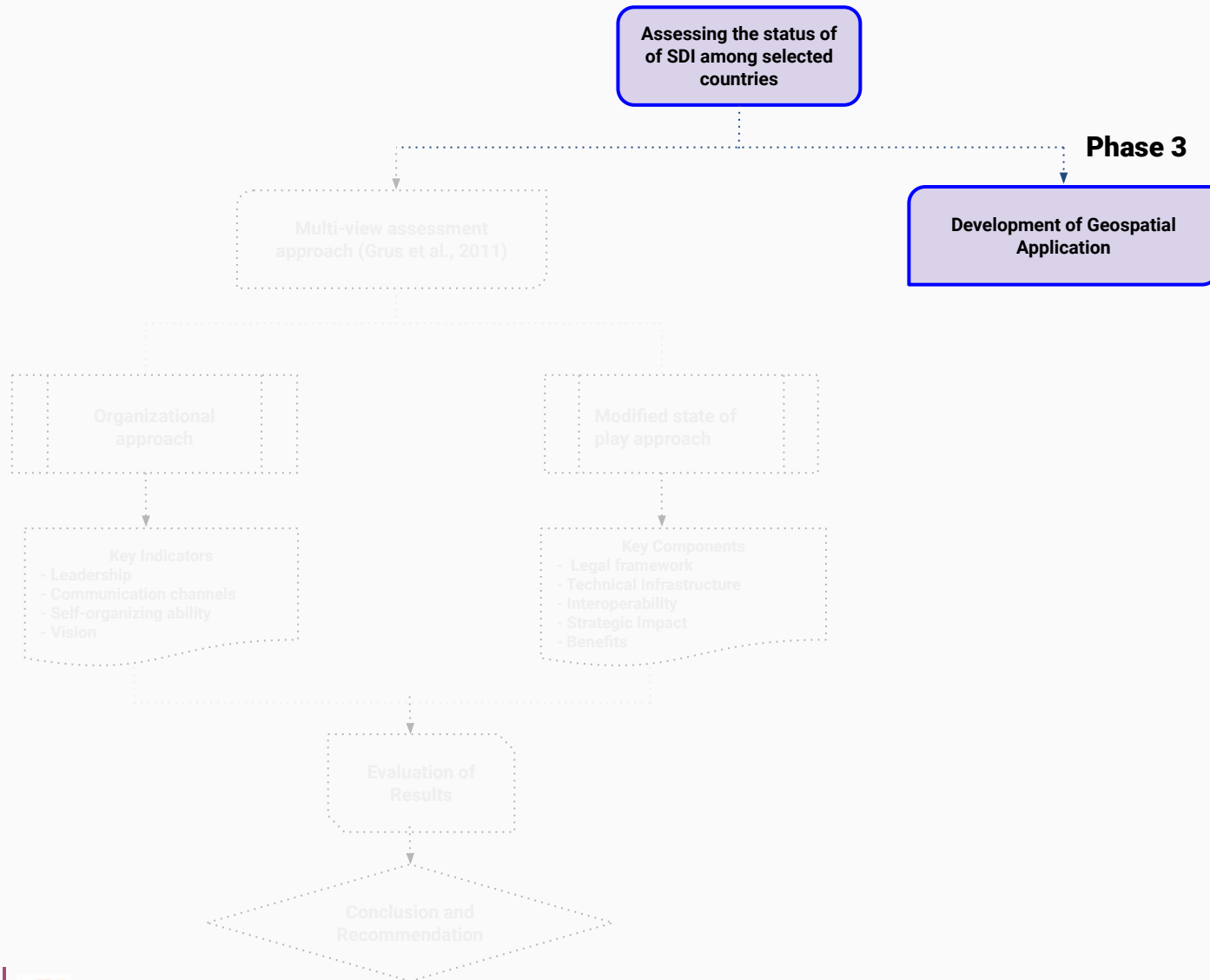
## Benefits

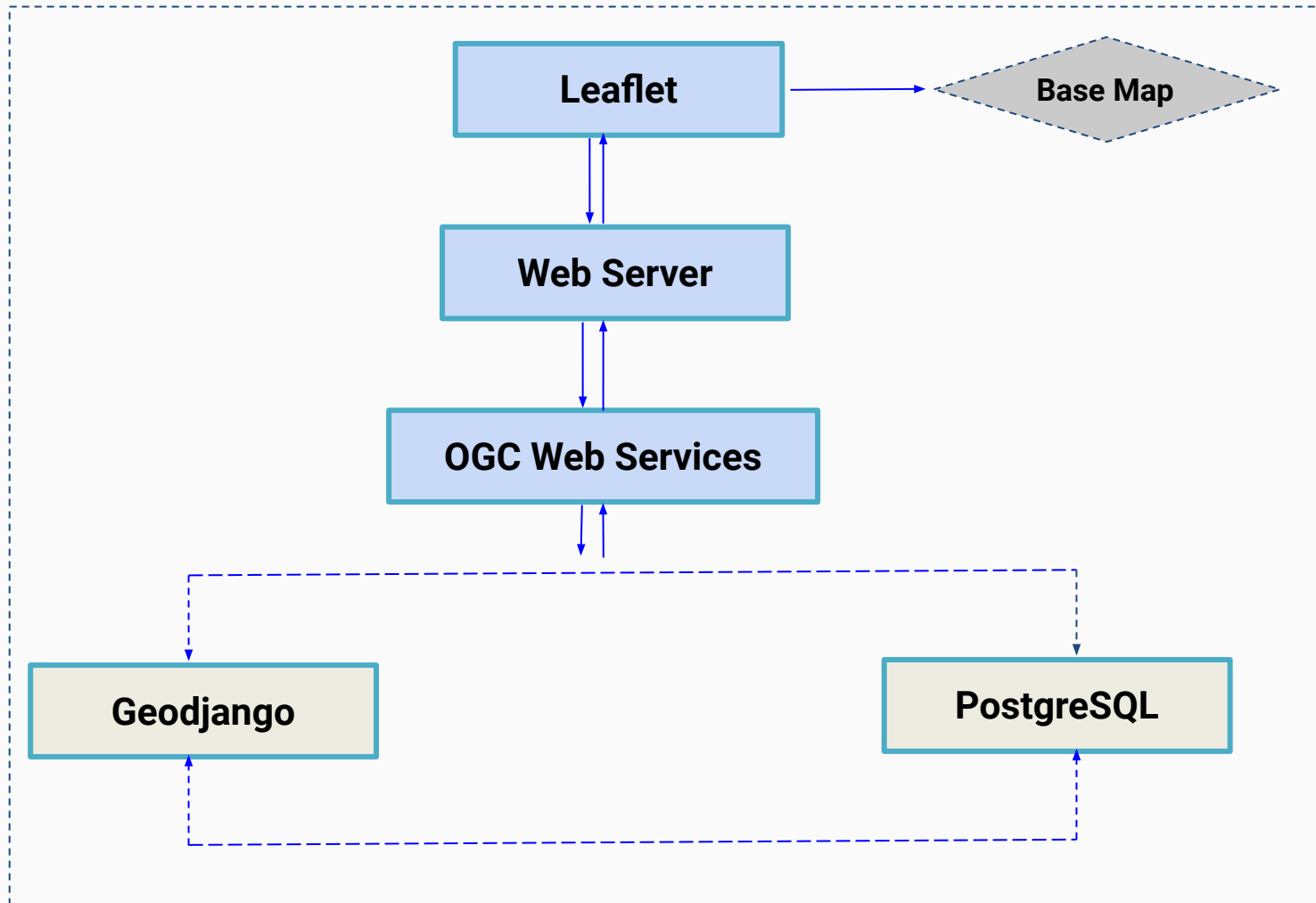


	The use of SDI has delivered measurable benefits to business, citizens and society	The country uses SDI to deploy cross-border eGovernment activities
Strongly Agree	69%	31%
Partially Agree	23%	46%
Disagree	8%	23%

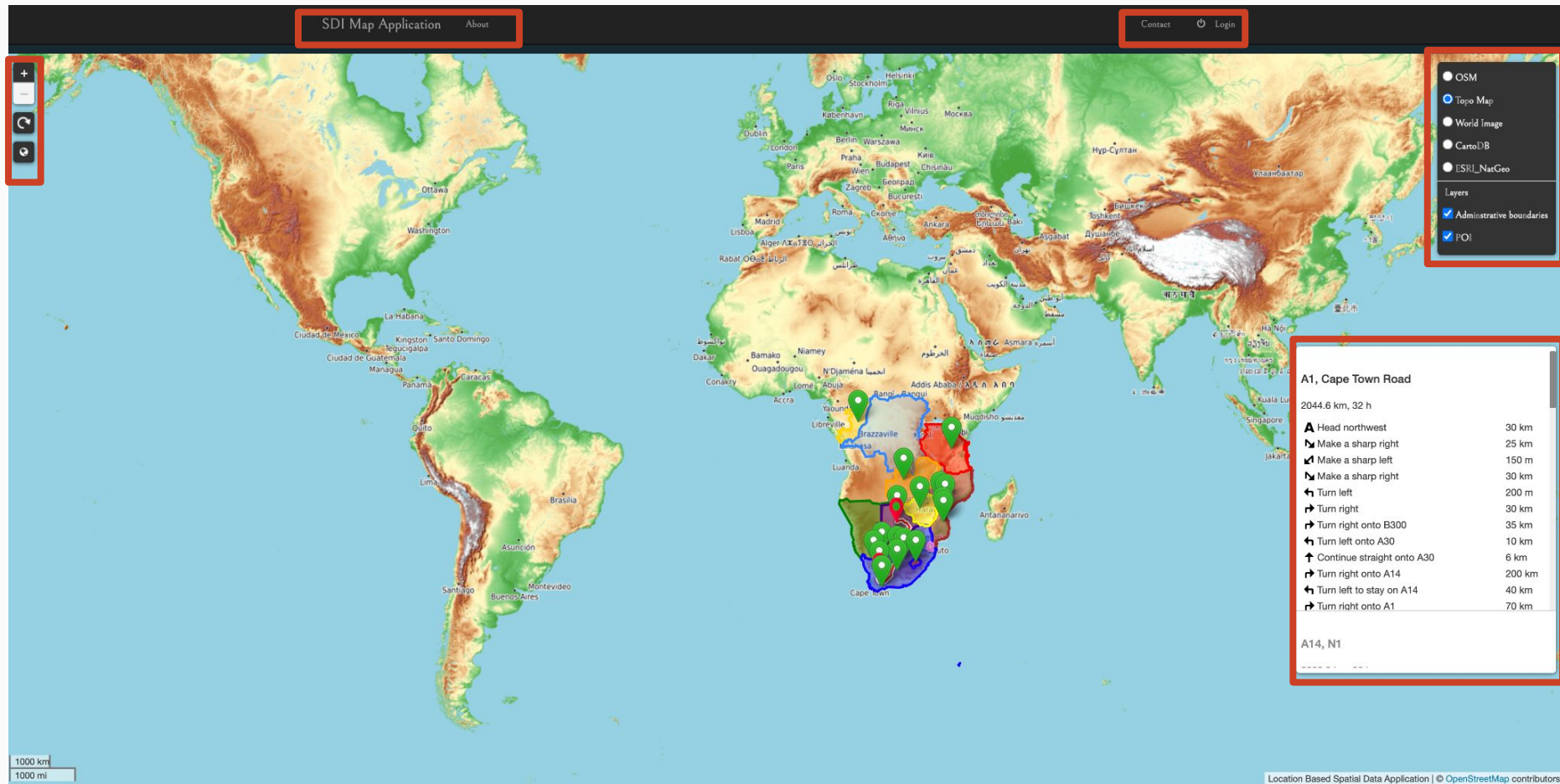


# Development of Geospatial Web-based Application





# Development of Cartographic SDI APP



# Development of Cartographic SDI APP



## SDI administration

WELCOME, **JOHNJAY** / [VIEW SITE](#) / [CHANGE PASSWORD](#) / [LOG OUT](#)

### SDI administration

#### AUTHENTICATION AND AUTHORIZATION

Groups	<a href="#">+ Add</a>	<a href="#">Change</a>
Users	<a href="#">+ Add</a>	<a href="#">Change</a>

#### REPORTER

ADMO_NAME	<a href="#">+ Add</a>	<a href="#">Change</a>
Features	<a href="#">+ Add</a>	<a href="#">Change</a>

#### Recent actions

##### My actions

- + Features object (17)  
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<https://geoapplication91.herokuapp.com/>



## **RQ1: What are the challenges influencing SDI implementation in the selected countries?**

Implementation of SDI has been underachieved in the selected countries due to some identified limitations;

- Lack of fundamental datasets (metadata geoportals and SDI standard)
- Poor organizational mandate
- Insufficient funding
- Poor National security and privacy issues



**RQ2:** Who are the actors responsible for coordinating SDI activities and how have they collaborated?

## Countries SDI Actors;

- **South Africa:** Dept of Rural Development and Land Reform (DRDLR)
- **Botswana:** Department of Survey and Mapping
- **Malawi:** Department of Surveying, Malawi (DoS)
- **Tanzania:** Ministry of Lands, Housing and Human Settlement Development
- **Zimbabwe:** Ministry of Lands and Rural Settlement

There are limited interactions/partnerships between the stakeholders. To achieve a similar objective, activities to consider includes:

- Cross-departmental workshops
- Introducing Seminar events
- SDI Partnerships

**RQ3:** Among the selected countries, how can SDI implementation be managed successfully?

SDI implementation can be achieved successfully through;

- Provision of adequate funding
- Regional policy formulation
- Advancement in SDI Research and Innovation
- Incorporating fundamental datasets and metadata within relevant organizations.

**This research work highlights the key assessment findings which includes:**

- **Spatial Data Infrastructure in Southern Africa countries has struggled to produce tangible result.**
- **Constraints affecting the development of SDI include: lack of technical infrastructure, fundamental data sets, strategic impacts and interoperability.**
- **The results of the Modified State of Play approach indicate that SDI key components and measurable indicators are underutilized.**

The research study recommends that more attention should be given to the following aspect of NSDI in the selected countries:

- Redefining geospatial resource metadata, policy and its provenance within the selected countries.
- Increasing the visibility of spatial data infrastructure on the web and developing a national framework to access open public data (geospatial datasets)

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