

National Space Research and Development Agency

Assessment of Environmental Sensitivity to Desertification in Katsina State, Nigeria

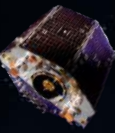
By:

James Godstime







**National Space Research & Development Agency
(NASRDA), Airport Road, Abuja, Nigeria**

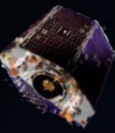
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Technologies for Disaster Risk Reduction - "Building Resilience
through Integrated Applications" 23-25 October 2017, Beijing,
China

24th of October 2017

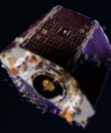


PRESENTATION OUTLINE

-  Introduction.
-  Study Area.
-  Method.
-  Results.
-  Analysis of Results
-  Conclusion.

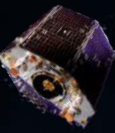


- Target 15.3 of the SDGs states as follows: “By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world”.
- If this is achieved, then the risks associated with land degradation disasters will be greatly reduced.
- Land degradation and Desertification (LDD) are critical issues facing most states in northern Nigeria, with severe consequences for national food security.
- Desertification phenomenon has been reported in northern Nigeria since the 1920s.
- The impact was more pronounced during the famine of 1971 to 1973.



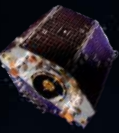
Why is the problem of desertification significant?

- It is significant because it has affected the socio-economic wellbeing of Nigerians, particularly in the north:
 1. It has caused the displacement of numerous farming and nomadic population.
 2. Herdsmen constantly seek for new grazing fields due to the desert encroachment and has resulted in the migration of herdsmen to the southern parts of the country for grazing.
 3. This migration is responsible for the deadly clashes between the cattle herdsmen and farmers.
 4. The unemployment created by desertification is also partly responsible for the Boko Haram insurgency in the country.

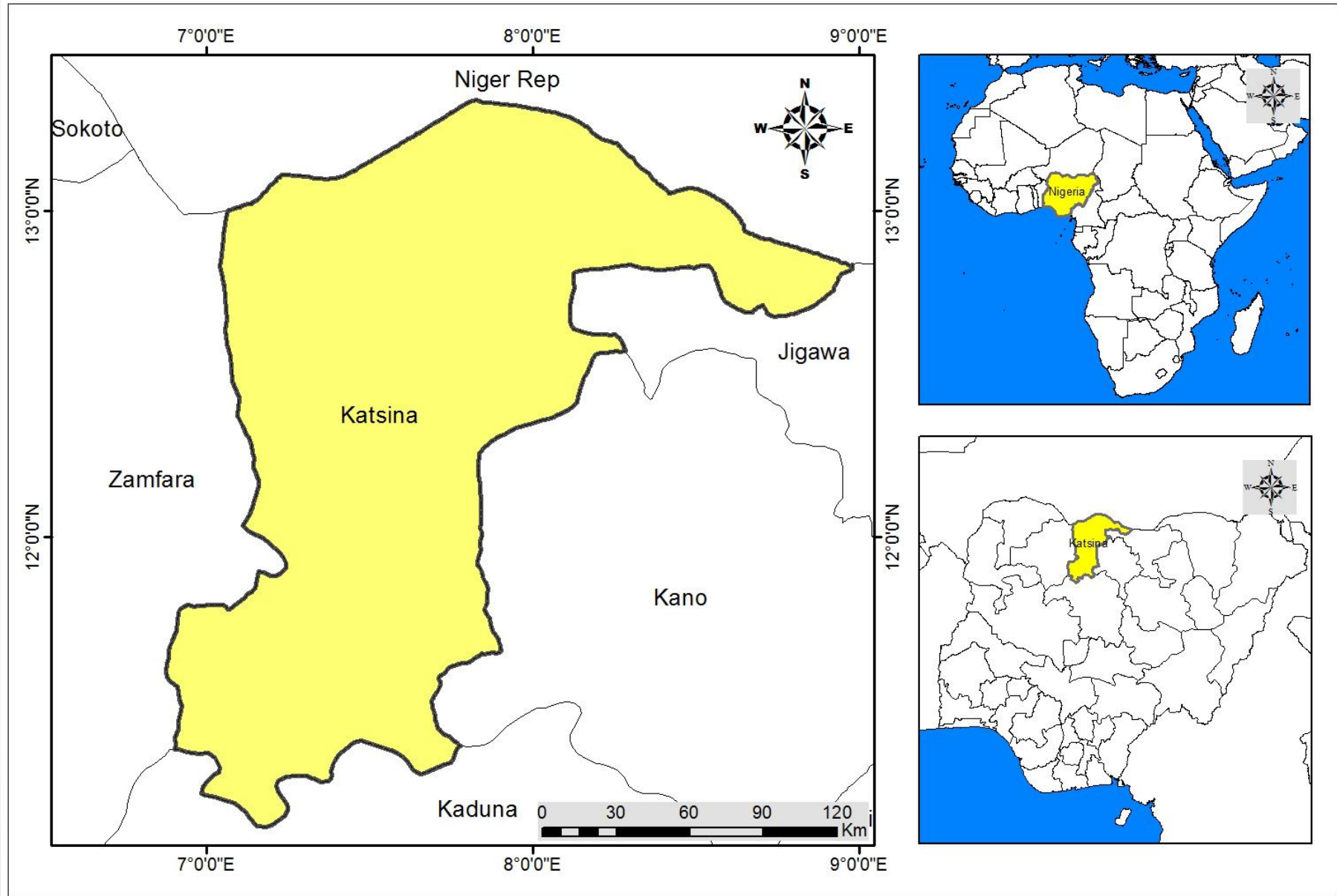


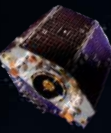
5. The agro-economy of Nigeria is dependent on rainfall and hence affected by fluctuating weather.

- In an effort to tackle the challenge of desertification, Nigeria signed the convention of the United Nations to Combat Desertification on 30 October 1994.
- This study focuses on the assessment of environmental sensitivity to desertification in Katsina state.
- The outcome will assist policy makers in the type of policy prescription that will be deployed to achieve land degradation neutrality.

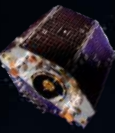


Study Area





- The MEDALUS (Mediterranean Desertification And Land Use) approach was developed by the European Commission and aims at assessing environmental sensitivity to desertification.
- The areas sensitive to desertification are identified by the combination of 5 quality indicators:
 - Soil Quality Index (SQI),
 - Climate Quality Index (CQI),
 - Vegetation Quality Index (VQI),
 - Water Quality Index (WQI), and
 - Land Management Index (LMI).



$$\text{ESDI} = (\text{SQI} * \text{CQI} * \text{VQI} * \text{WQI} * \text{MQI})^{1/5}$$

$$\text{ESDI\#} = (\text{SQI} * \text{CQI} * \text{VQI})^{1/3}$$

Where:

ESDI: Environmental Sensitivity to Desertification Index

SQI: Soil Quality Index

CQI: Climate Quality Index

VQI: Vegetation Quality Index

WQI: Water Quality Index

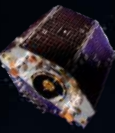
MQI: Management Quality Index

$$\text{SQI} = (\text{Soil Texture} * \text{Soil Depth} * \text{Slope})^{1/3}$$

$$\text{CQI} = (\text{Total annual precipitation} * \text{aridity index} * \text{slope})^{1/3}$$

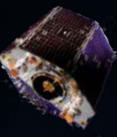
VQI =

$$[\text{fire risk} * \text{erosion protection} * \text{drought resistance} * \text{vegetation cover}]^{1/4}$$



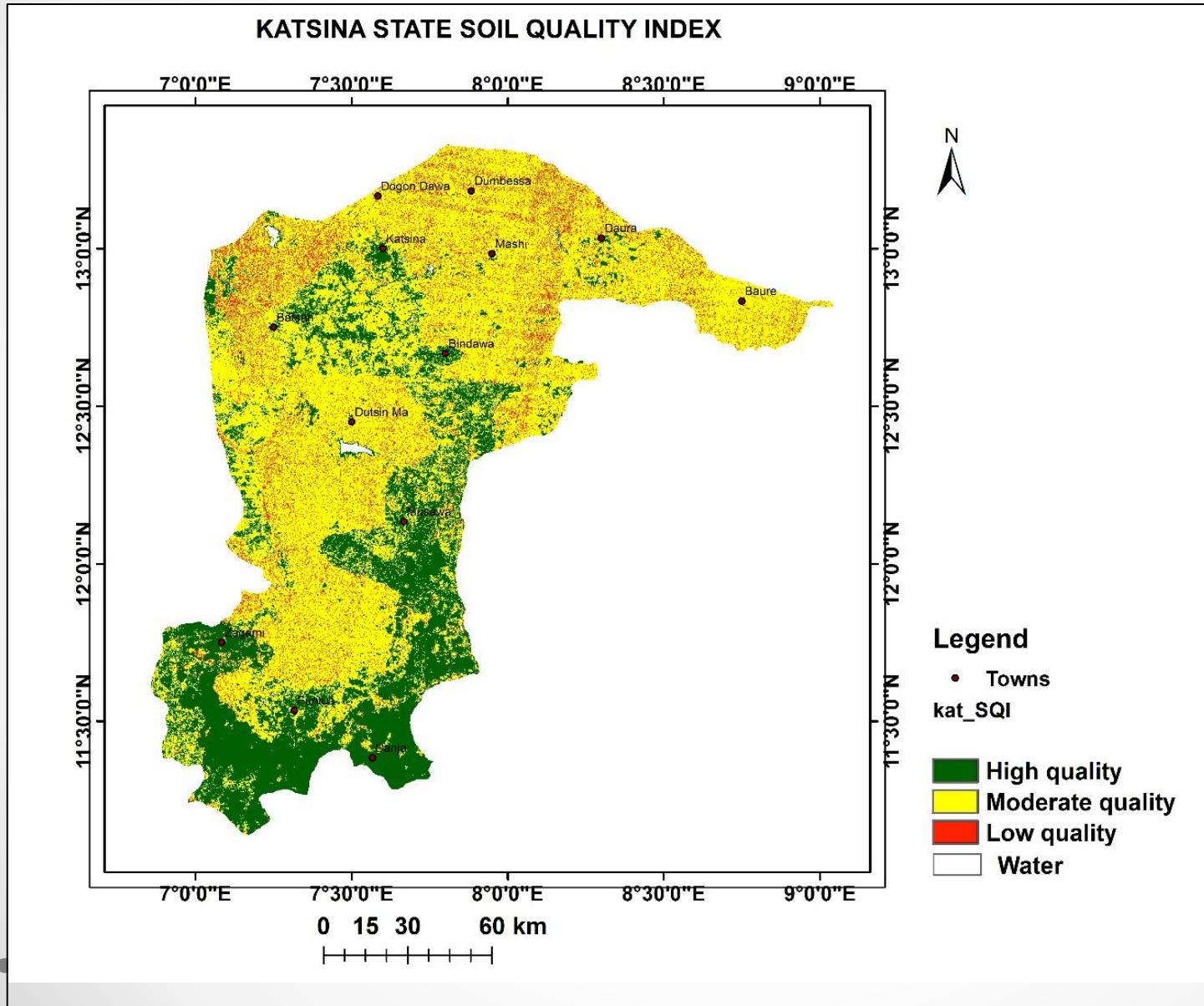
Datasets: Freely Available

Data	Format	Source
Soil grid data	Raster	The International Soil Reference and Information Centre (ISRIC) (www.isric.org/content/african-soilgrids-t250m-geotiffs)
Standard soil depth	150m Raster	The International Soil Reference and Information Centre (ISRIC) (www.isric.org/content/african-soilgrids-t250m-geotiffs)
DEM	30m ASTER	Earth Explorer website (https://earthexplorer.usgs.gov)
Precipitation dataset	2.5 degrees	version-2 global precipitation climatology project (GPCP)
Annual Mean Temperature	Degree celsius	Giovanni NASA (http://giovanni.gsfc.nasa.gov/giovanni/)
Landsat 8 satellite image		Earth Explorer (http://earthexplorer.usgs.gov/)

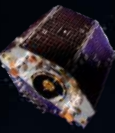


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Results

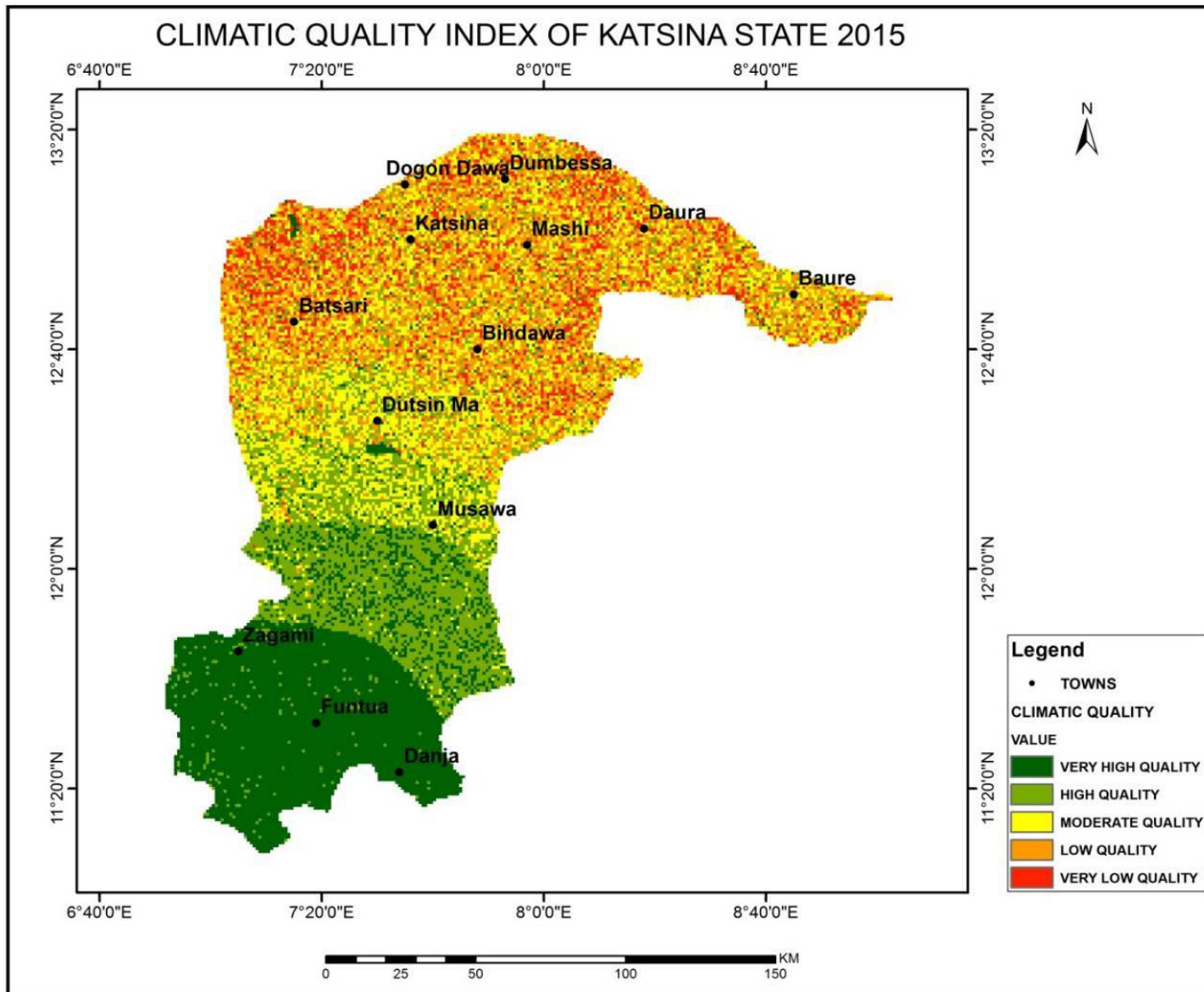


Soil Quality Index

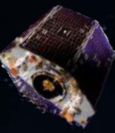


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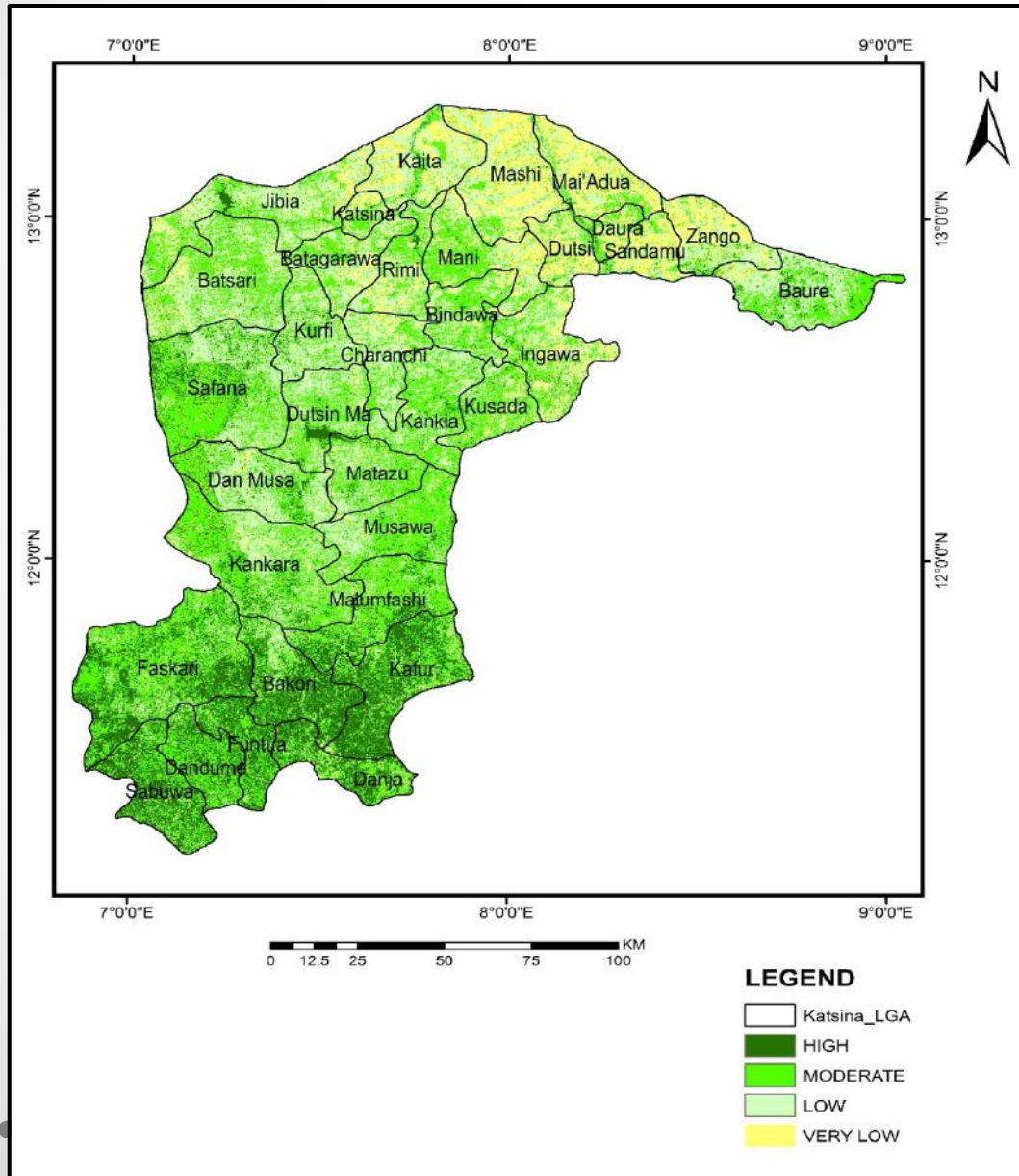
Results



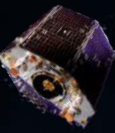
Climatic Quality Index



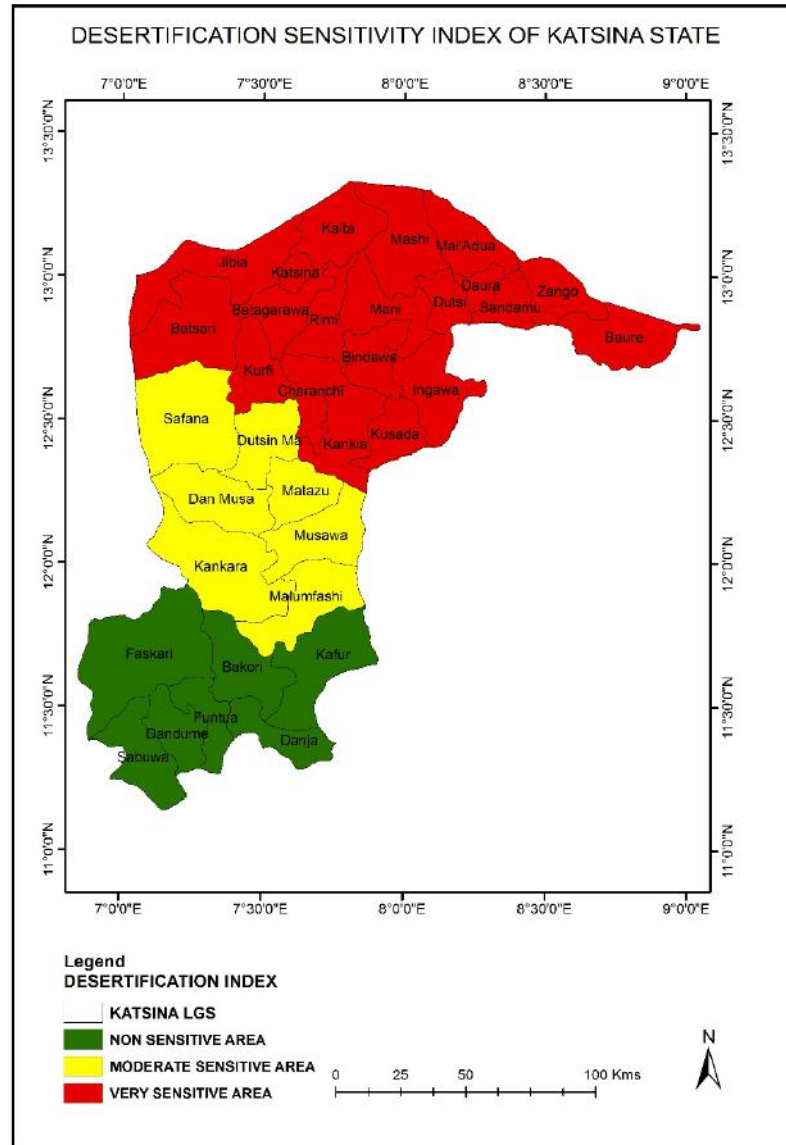
Results



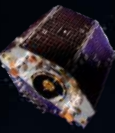
Vegetation Quality Index



Desertification Sensitivity Index



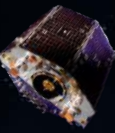
- Very Sensitive Area
- Moderately Sensitive Area
- Non Sensitive Area



Desertification Sensitivity Index-Very Sensitive Area

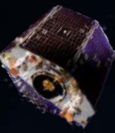
- The very sensitive area is prevalent in the Northern part of the State-with highest risk of desert conditions.
- This area covers 917,873 hectares, i.e. over 38% of the total land area of Katsina State.
- This area falls within the Sahel zone and soil is generally sandy and of low fertility.
- The area has patches of brush, grasses, and stunted trees.
- About 3.5 Million people are at risk of desertification.





Desertification Sensitivity Index- Moderate Sensitivity

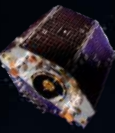
- This is the transition zone and thus have mixture of the characteristics of both the very sensitive and non-sensitive areas.
- Mixed cropping is practiced in this area.
- It covers an area of 814,291.57 hectares, that is, about 34% of the total land area of Katsina State



Desertification Sensitivity Index-Non-Sensitivity

- The Southern part of the state is the least affected by desertification conditions, and is referred to as the non-sensitive area.
- The non-sensitive area covers an area of 663,628.05 hectares, i.e. about 28% of the total land area of Katsina State.
- Sugarcane, rice and yam are mostly planted in this area.
- The area is more vegetated compared with the other parts of the state.
- The non-sensitive area has the smallest land mass. This means that about 72% of the total land area of Katsina State is under the threat of desertification.





- The Environmental Sensitivity to Desertification is a rapid method of assessing the vulnerability of an areas to desert conditions.
- The variation in the sensitive areas to desertification within the state as shown in the ESDI is as a result of the following factors:
 - Agro-ecological zones,
 - The interaction and interplay of climate,
 - Soil types, and
 - Vegetation.
- Based on the findings of this study, policy prescription can be deployed appropriately, depending on the degree of sensitivity to desert conditions.
- Today, the same policy prescription is generally deployed to address the challenge of desertification in Katsina State.



Thank You

