INVESTIGATING SAHELIAN DUSTSTORM (2000-2020) AND ITS IMPACT ON THE ENVIRONMENT AND BIOMASS IN NIGERIA

Taiwo Olatunji Qudus*, Ojonigu Ati, Gajere EN, Benibo Irene, Taye Alegbe, Caleb Gajere

United Nations/Austria Symposium on
Space Science and Technology Applications

INTRODUCTION

- Dust is one of the most abundant aerosol type in the atmosphere
- Dust Storms are common meteorological hazards in arid and semi arid regions of Nigeria
- Dust Storms normally occurs when strong wind lifts large amounts of sanddust from bare dry soils into the atmosphere.
- Study has shown over the years that Dust Storms has serious impact on climate, human health and the environment.

AIM AND OBJECTIVES

The aim of the project is to investigate and analyse Sahelian Dust in Nigeria (2000-2020) and its impact on the environment and biomass using Remote Sensing Satellite Technology with the following objectives;

- To determined the Dry Dust Haze in Nigeria within 2000 -2020
- To assess the desert storm impacts on the climate and immediate environment.
- To assess the desert storm impacts on human health and activities
- To assess the security and spatial dimension the extreme dust storm in the region
- To ascertain the health implications of the extreme dust storm in the North Eastern Nigeria

STATEMENT OF THE PROBLEM

❖Dust storm affects not only the regional but also the global climate system, human respiratory tracts and cloud microphysical properties.

❖Dust particle is a potential hazard to human health when it enters the blood streams causing cardiovascular disorders amongst others.

❖It contributed to poor visibility conditions during aircraft landing and taking off and can also damage engines.

❖ Furthermore, key discussions were adopted during the UNCCD COP 14 held in New Delhi in order to mitigate negative impacts of Sand and Dust Storm SDS.

❖In recent times, studies have shown that Dust Storm can be a carrier of Covid 19 Virus.

THE STUDY AREA

- The field work was carried out in North Eastern part of Nigeria, Jigawa State
- It is located between latitudes 11.00˚N to 13.00˚N and longitudes 8.00˚E to 10.15˚E.
- It share borders with Kano and Katsina states to the west.
- It also share borders with Bauchi and Yobe states to the east and northeast respectively.
- To the north, it shares an international border with Zinder Region in The Republic of Niger.

THE STUDY AREA

- The State has a total land area of approximately 22,410 sqkm
- Its topography is dominated by undulating land with Sand Dunes
- The major river basins are the Hadejia, Kafin Hausa and Iggi river basins
- Hadejia – Kafin Hausa River traverses from west and empties into Lake Chad
- The average annual temperature for state is 36° and
- The average annual rainfall is about 196mm

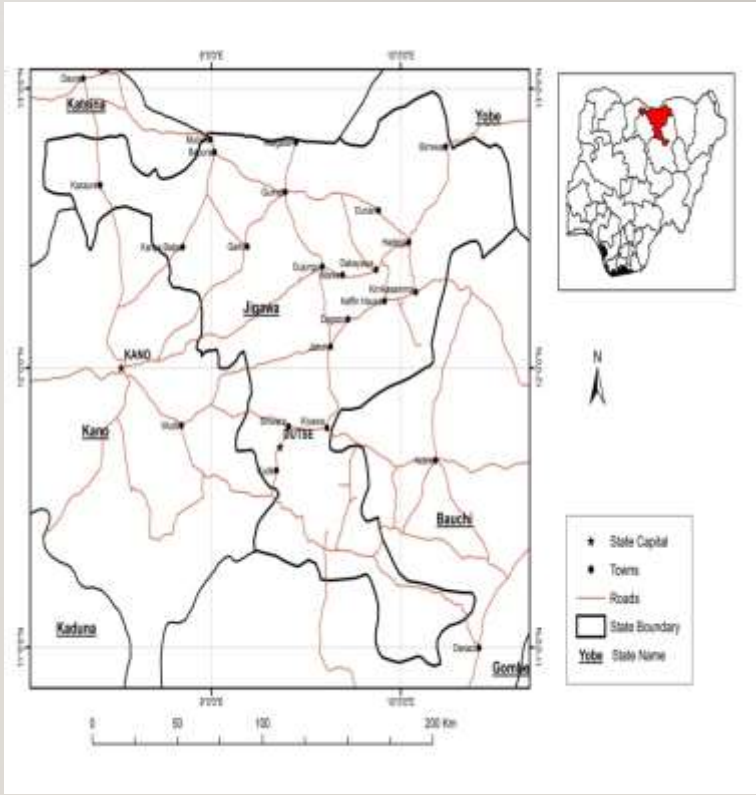
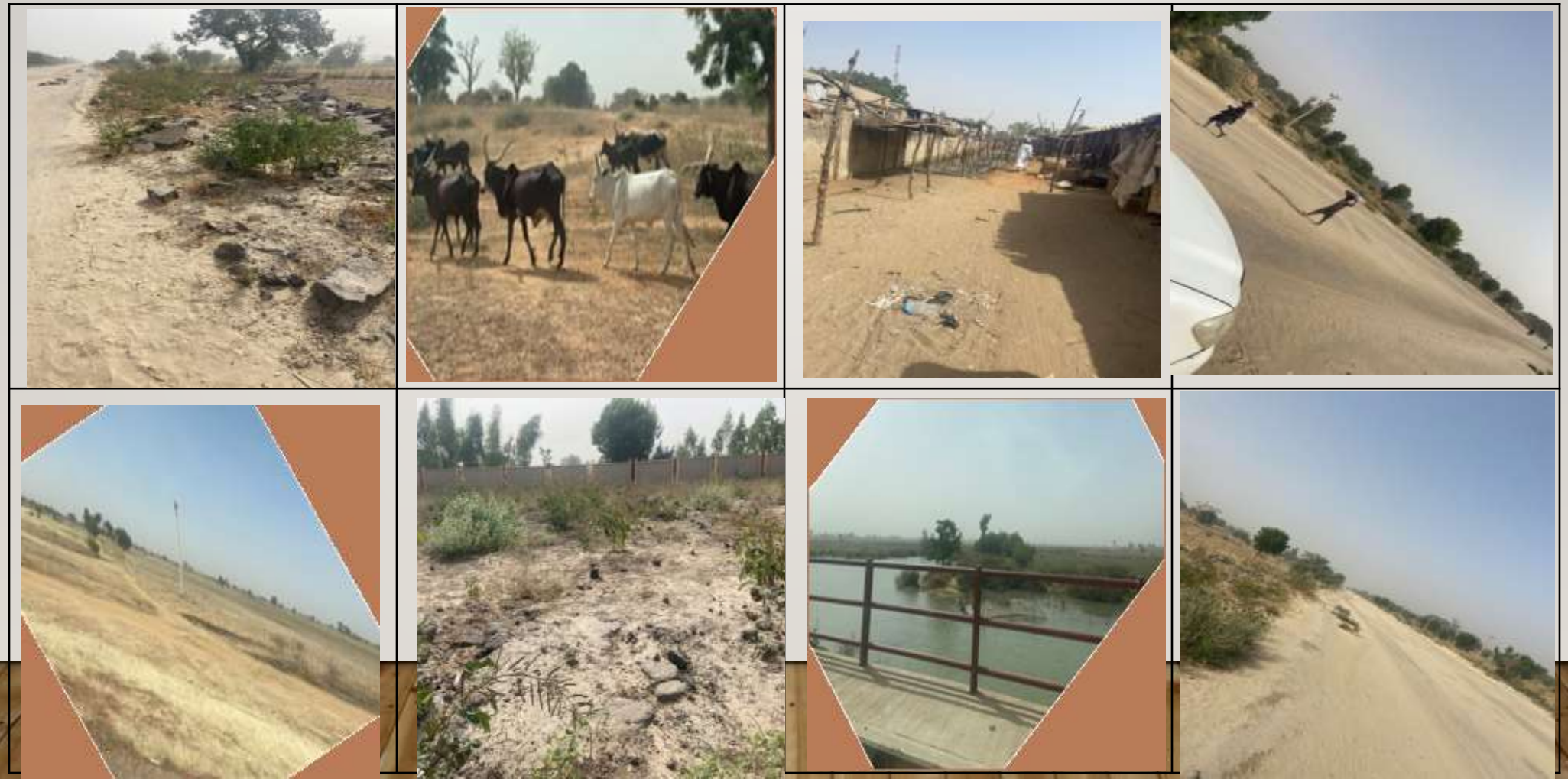


Figure 1: Administrative Map Jigawa State and its environs

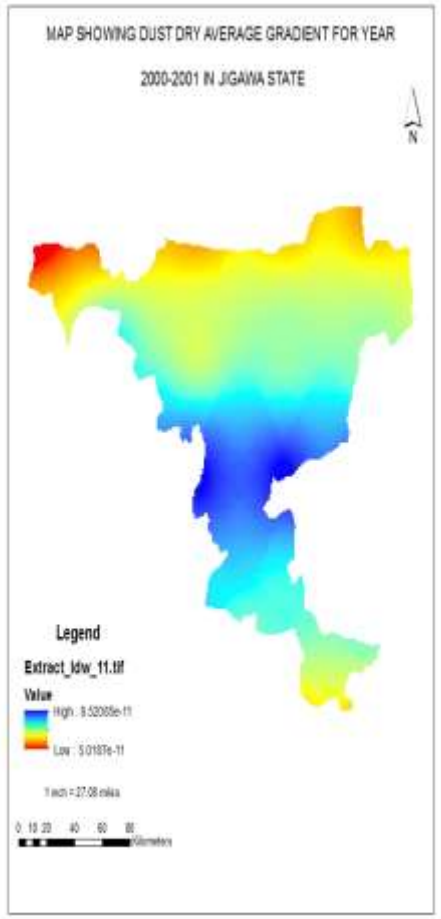
MATERIALS AND METHODS

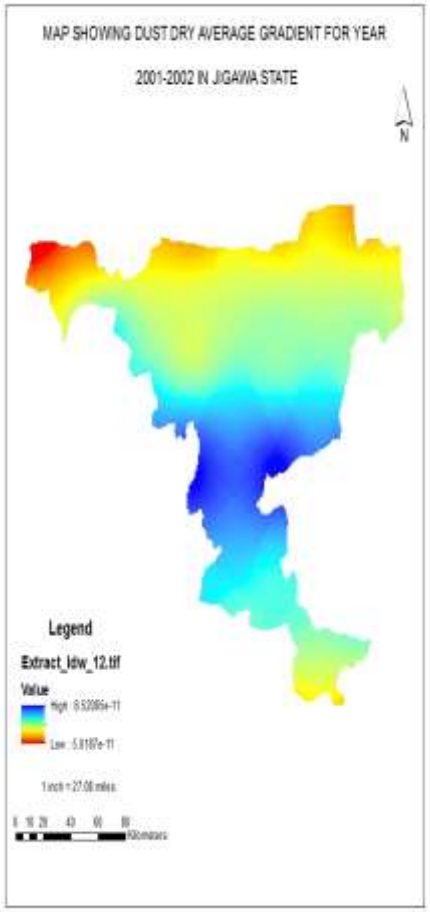
- Primary data obtained from fieldwork in Jigawa state, Nigeria.
- Readings taken includes air temperature, relative humidity, atmospheric pressure, wind speed, UV index, cloud cover and visibility.
- Data from the Giovanni platform were sampled over a 20 year period from 2000-2020.
- Visibility for Dry Dust Haze (DDH) occurrence indicating visibility >1,000 m was used following that which was adopted by Anuforum AC, [2007], and are also similar to that used by Goudie et al. [2006] and Engelstaedter et al. [2006].
- Output was subjected to graphical analysis in order to show the spatial variation of dust occurrence over the study area.

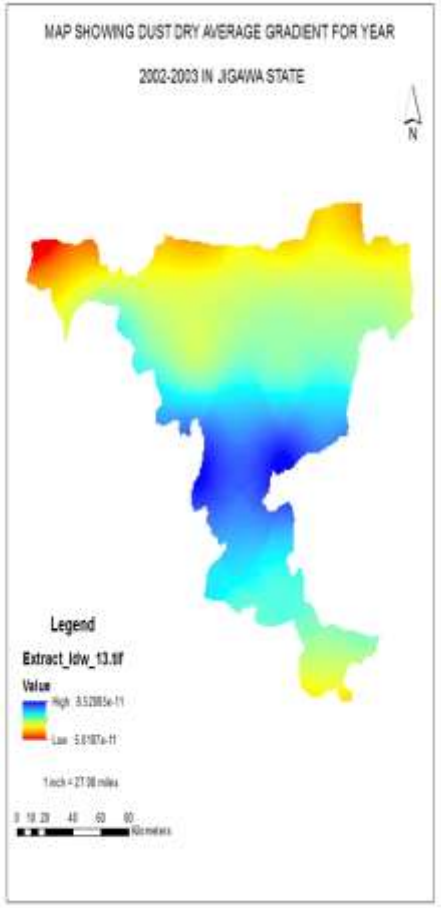
SCENES FROM FIELD WORK

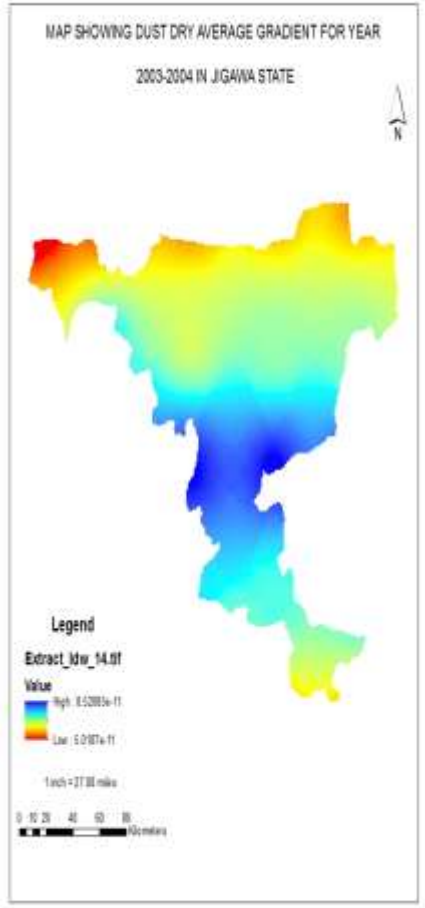


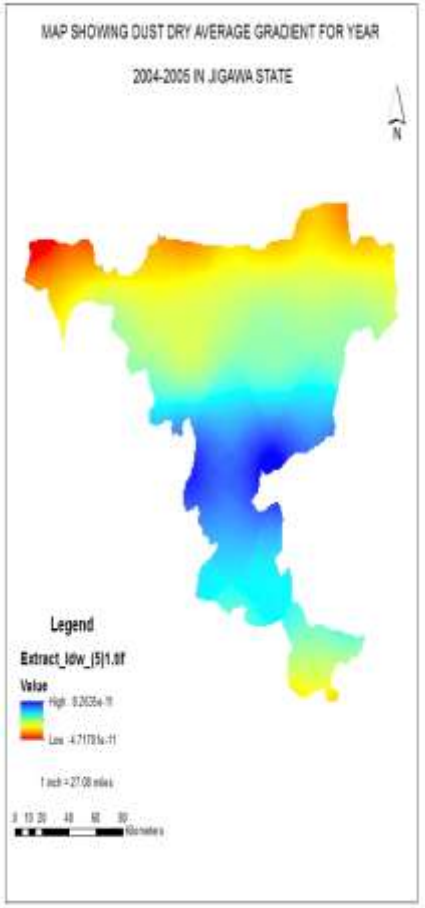
RESULTS: SPATIAL DISTRIBUTION OF DRY DUST HAZE OCCURRENCE (2000 – 2005)



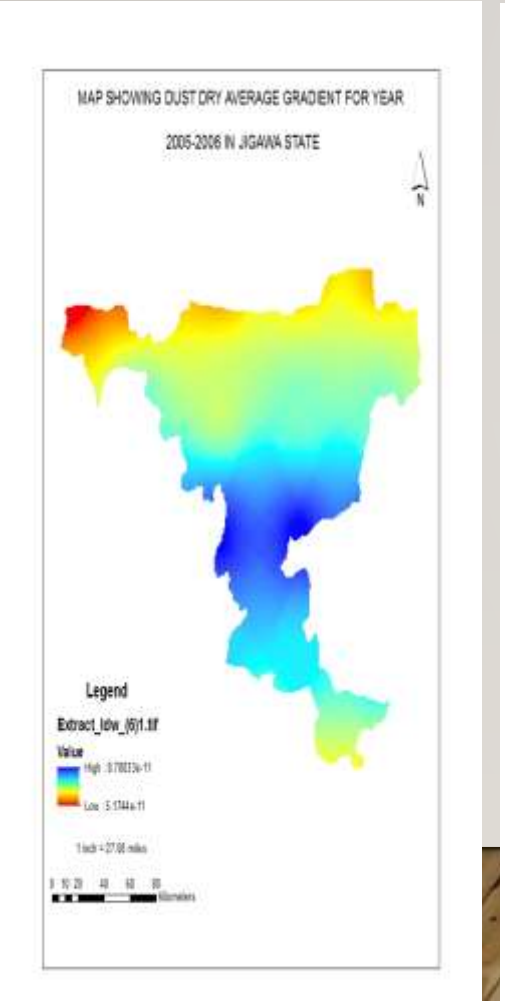


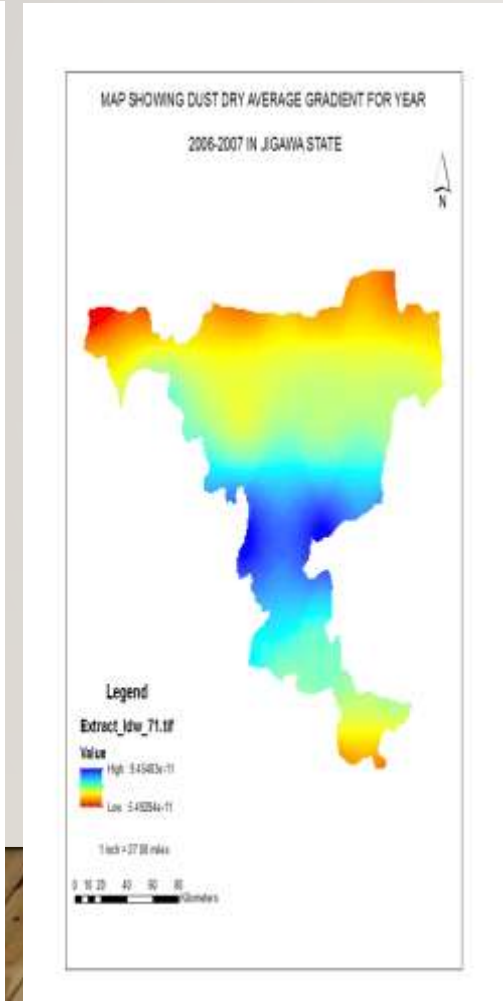


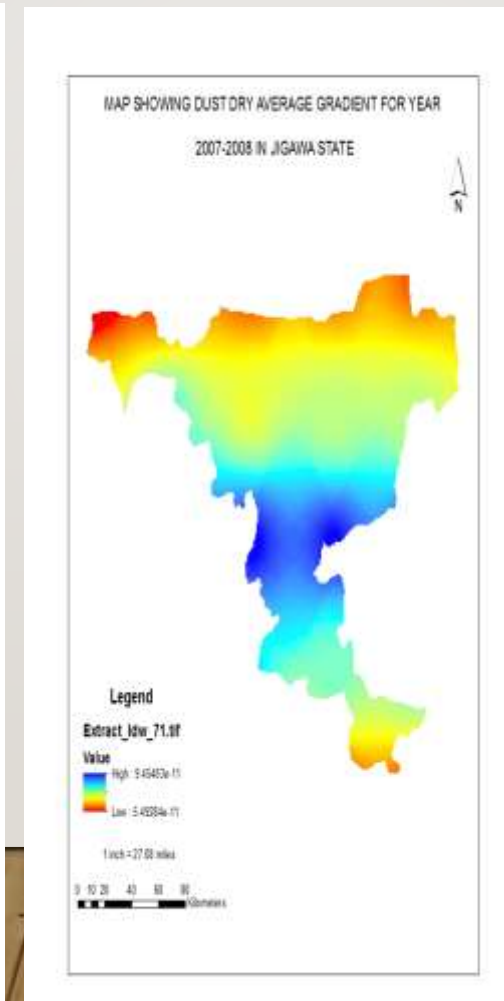


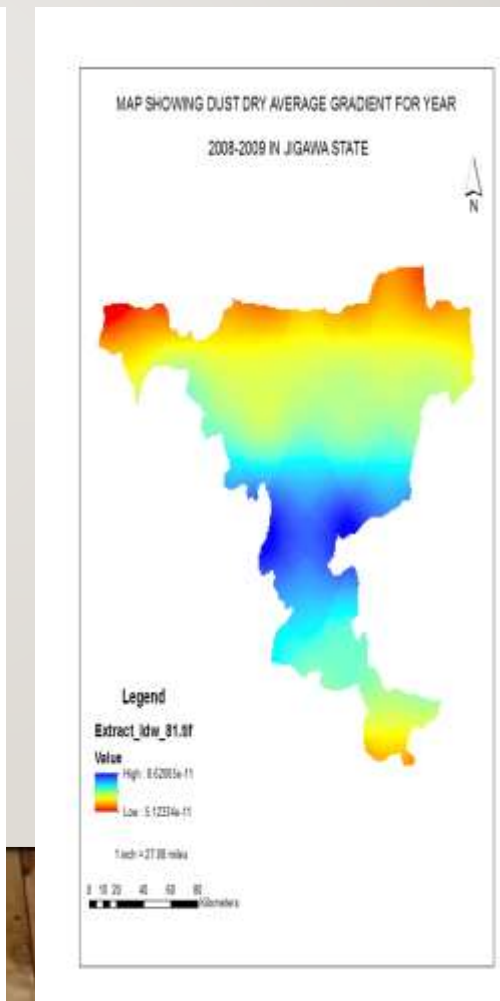


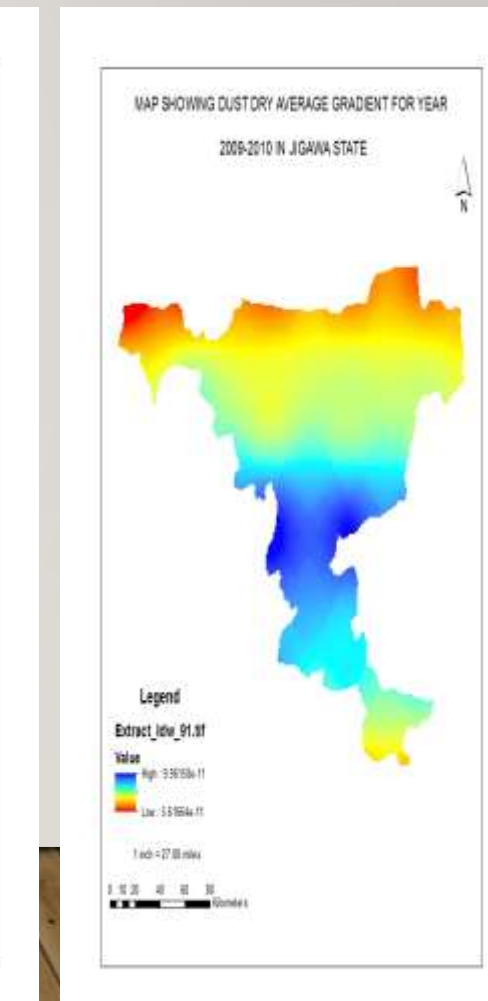
RESULTS: SPATIAL DISTRIBUTION OF DRY DUST HAZE OCCURRENCE (2006 – 2010)



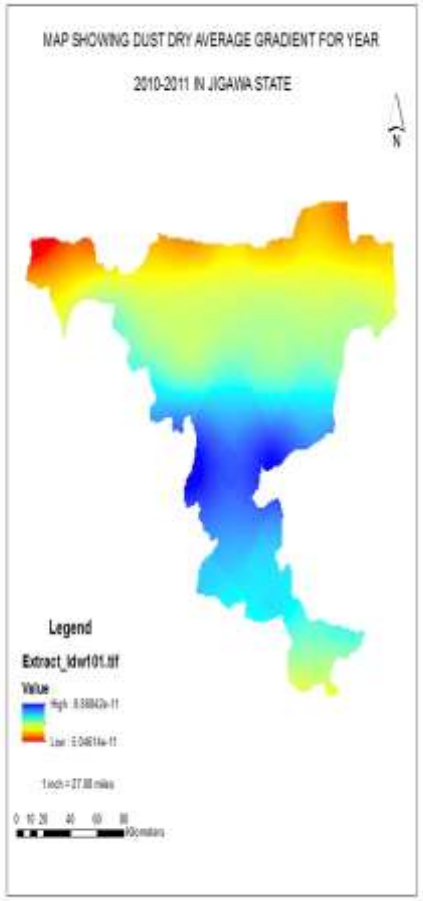


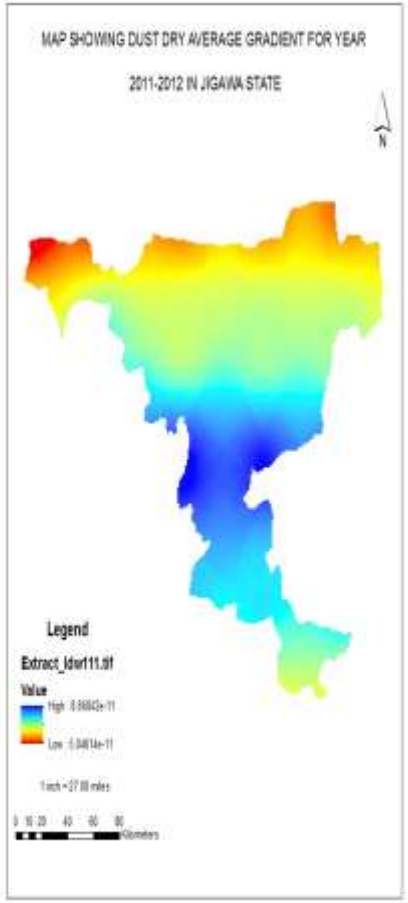


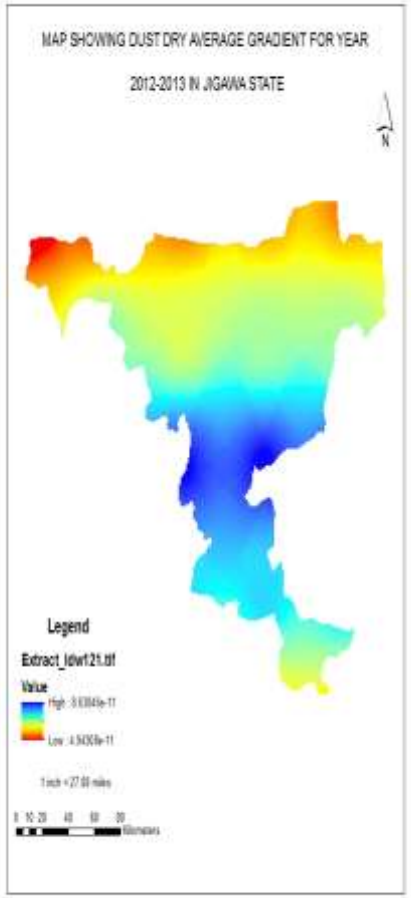


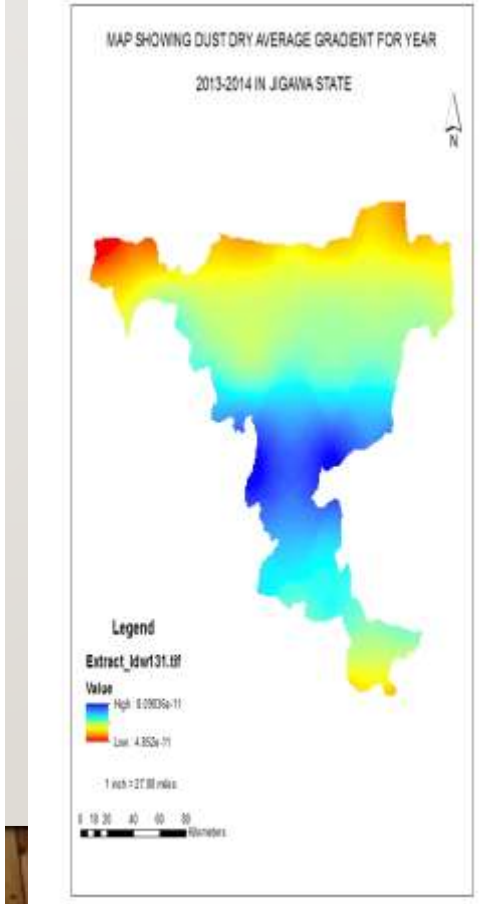


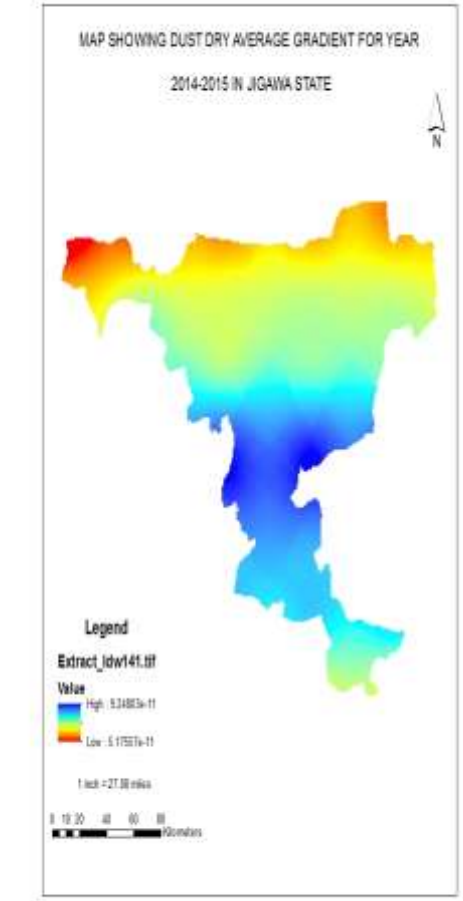
RESULTS: SPATIAL DISTRIBUTION OF DRY DUST HAZE OCCURRENCE (2011 – 2015)



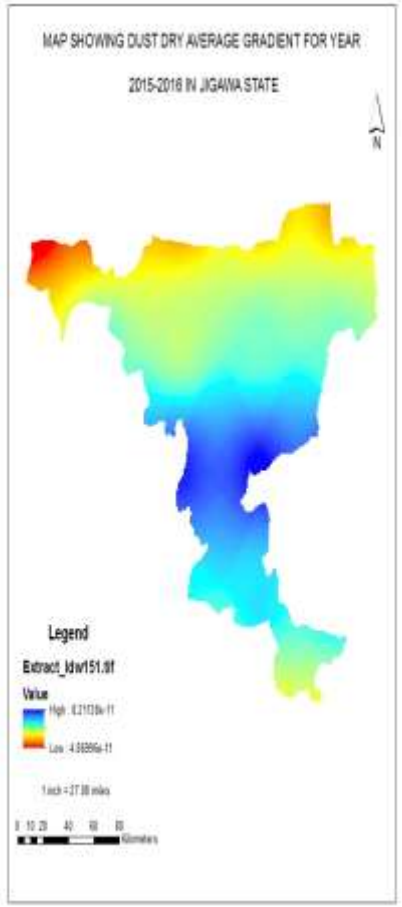


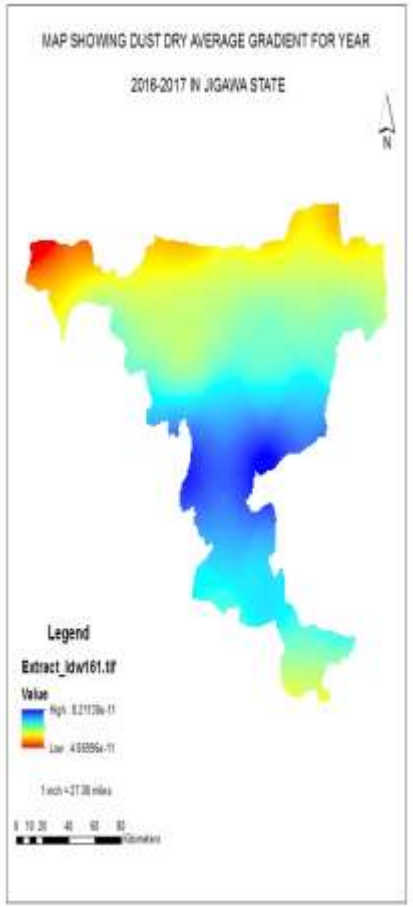


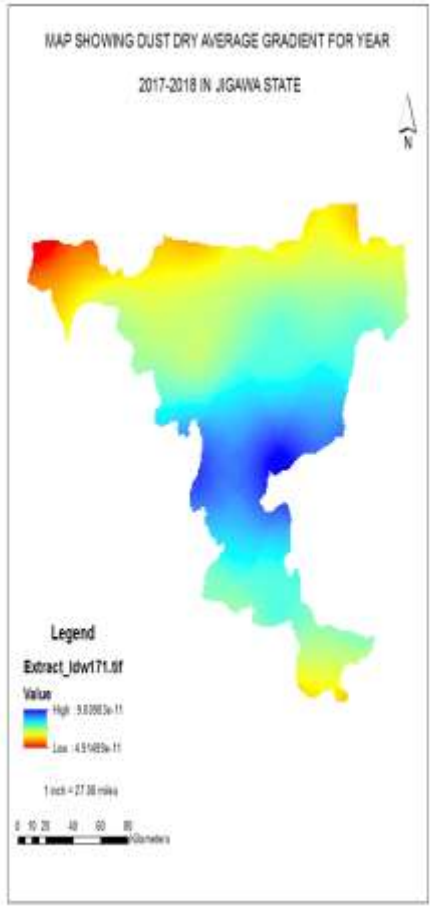


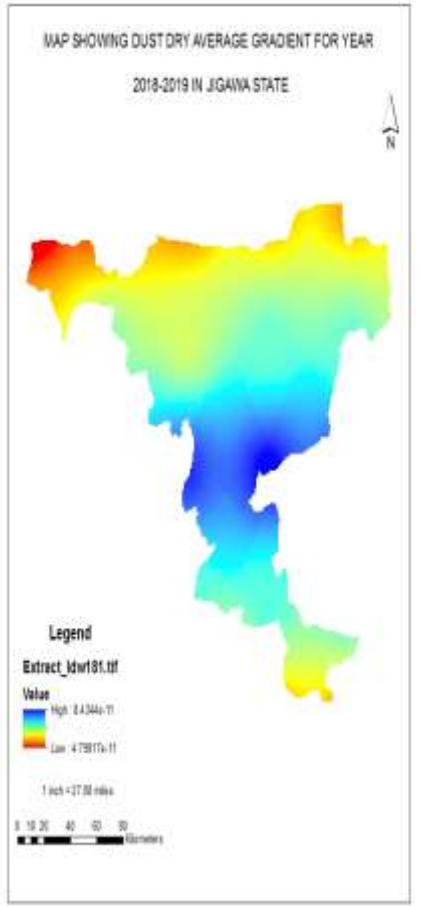


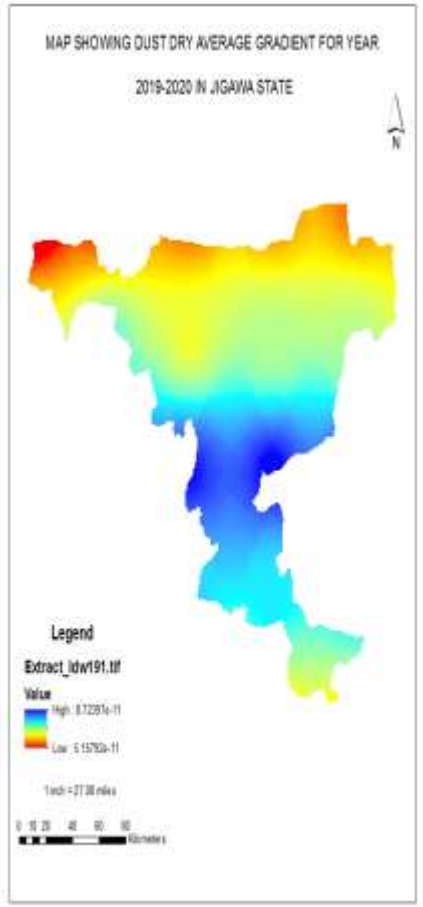
RESULTS: SPATIAL DISTRIBUTION OF DRY DUST HAZE OCCURRENCE (2016 – 2020)











ANALYSIS

- For the first decade, figures shows the Dry Dust Haze (DDH) highest occurrences for dust storms were seen majorly over the towns of Kazaure, Mutum, Babura and Maigatari.

- The towns of Siyawa and Kiyawa has the least number of DDH occurrences as observed over Jigawa State.

- The least number of DDH days were also recorded in the town of Jahon throughout the study period.

- The town of Kazaure records the highest number of DDH conditions throughout this period

- In the second decade, the average frequency of occurrence of DDH days reduced generally when compared with the first decade

ANALYSIS

- In the year 2006 to 2010, the frequency of DDH days range increases Northeast of the state
- During the two decades DDH peaked in the year 2009 to 2010 for which 2005 to 2006 has the lowest number of DDH
- Generally, the frequency of dust occurrence days decreases southwards
- This can be attributed to the non proximity of this area to the Saharan dust source region
- Hence, the atmosphere is therefore richer in dust concentration in the north than in the south.

ENVIRONMENTAL IMPACT ANALYSIS

- Furthermore, concentration of dust in the atmosphere decreases as the distance from the source region by the force of gravity as the speed of the wind reduces further southward.

- This was also explained by Goudie AS et al. [2006], which stated that the particle size and rate of deposition of Saharan dust decrease with increasing distance from the sources.

- In addition, local injection of dust particles as a result of anthropogenic activities such as agricultural activities which generally increase the dust over the zone.

- It was also observed that the frequency of occurrence of DDH days increases southward of the state

- This could be attributed to the predominance of fine dust particles and lower wind speed towards the south of Jigawa State.

ENVIRONMENTAL IMPACT ANALYSIS

Further analysis of the Storm Dust content indicated that it contains the following;

- **Alternaira** –is a fungus that causes Agricultural spoilages and respiratory disorders in humans.

- **Aspergillus**- is a bacteria which causes cystic fibrosis of asthma induced by inhaling dust and also through exposed cuts on the body.

- **Clostridium** – is of algal origin found in humans, animals and in the soil which causes tetanus related infections and food poisoning.

- **Escherichia** – bacteria that infects humans by oral ingestion through food or polluted water

CONCLUSION

- For Nigeria, it could be seen that throughout the study period, the average number of Dry Dust Haze days and frequency increases within the state

- The impact of the content of the dust storm be it on surfaces in or outside in the open, in or on animals or soil, water or otherwise has a lot of health implications

- Recent installations of Early Warning and Detection Systems by the Federal Government of Nigeria in order to mitigate the impacts of dust storm in the aviation industry is laudable and should be sustained

RECOMMENDATIONS

- The Federal Government of Nigeria should partner with the United Nations Convention to Combat Desertification UNCCD on the management of the risk of Sand and Dust storms SDS

- The North East Development Commission should as a matter of urgency to restore human dignity in the affected areas

THANK YOU