Climate Change and Water Supply: Case of Akoko Northeast, Southwest, Nigeria

Being the Contributed Talk on Water Resources in Developing Countries: Planning and Management in a Climate Change Scenario

Presented by

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Introduction

- Water is one of the most important necessities of life. Its quantity, quality, development and management contribute to its sustainability

- Both surface and groundwater are develop for single or multi purpose (domestic, agriculture or industrial)

- Water from natural sources e.g. ponds, streams, springs and river are more available and accessible to semi-urban and rural dwellers in Nigeria

- Climate change is becoming more threatening to the totality of human existence.

- Globally, evidences from paleo-climatology indicated that, during the Ice ages (about 2.5million to 10,000years ago) global temperature was about 5^0C (Awake 2008).

- Different time and spatial scales studies on annual rainfall distribution and temperature variability has shown that these variables have substantial impact on water supply.

- Precipitation data in recent time examination has indicate a run of dry years for the sub Sahara region dating back to the 1940s (Bryson, 1973; Lamb, 1985; Adeyemi 2000 and Adejuwon, 2004).

- Higher temperature will reduce relative humidity, and increase the sink strength of the atmosphere

- Higher temperature will not only reduce water supply, it will as well increase water demand

- Nigeria annual rainfall ranges between 400mm in northeastern parts and 4000mm in the coastal area

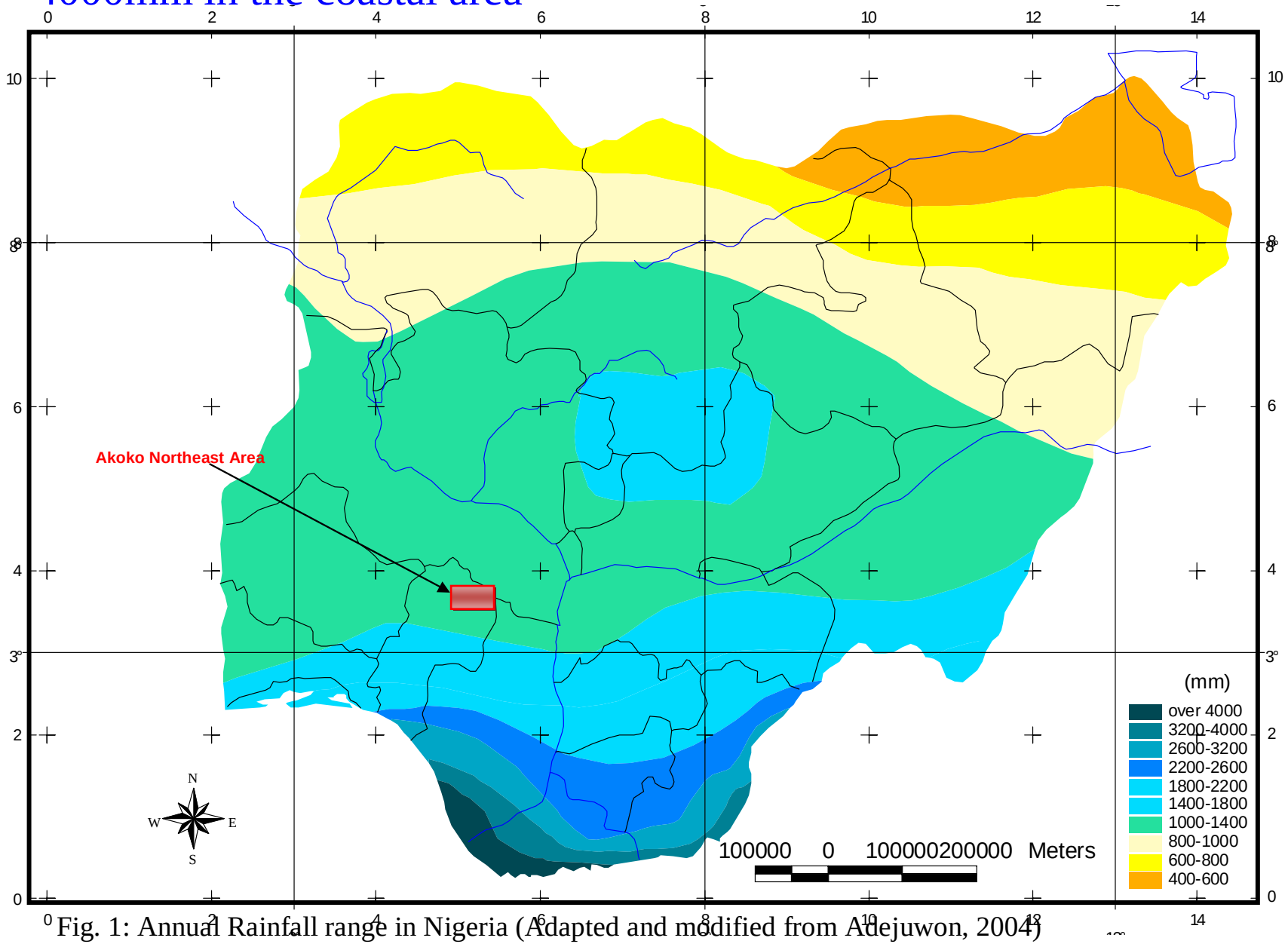


Fig. 1: Annual Rainfall range in Nigeria (Adapted and modified from Adejuwon, 2004)

- The south mean maximum temperature is between 30°C and 32°C while the north is between 36°C and 38°C. South mean minimum temperature is between 20°C and 22°C in the south and less than 13°C in the north.

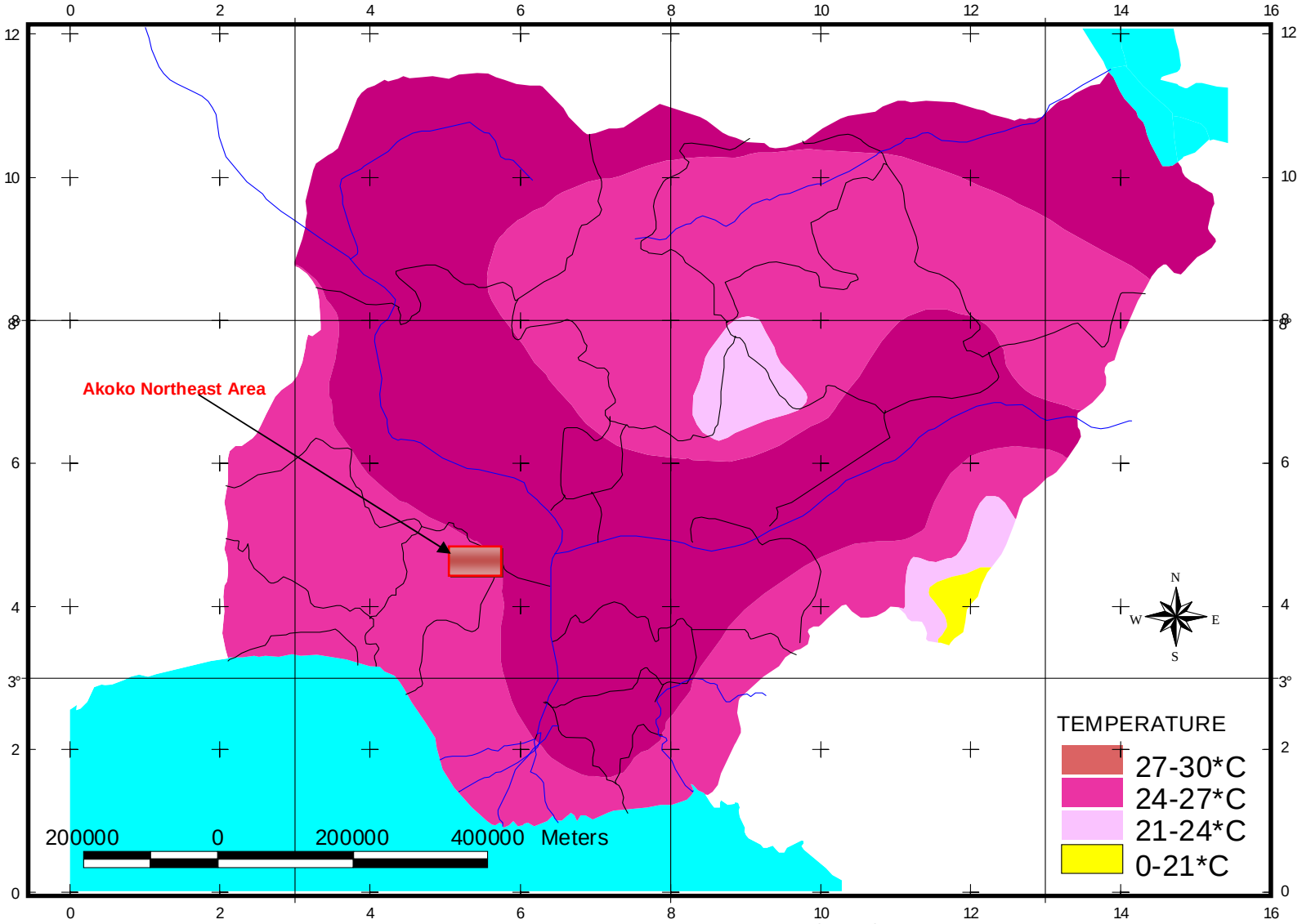


Fig. 2: Annual Temperature range in Nigeria (Adapted and modified from Adejuwon, 2004)

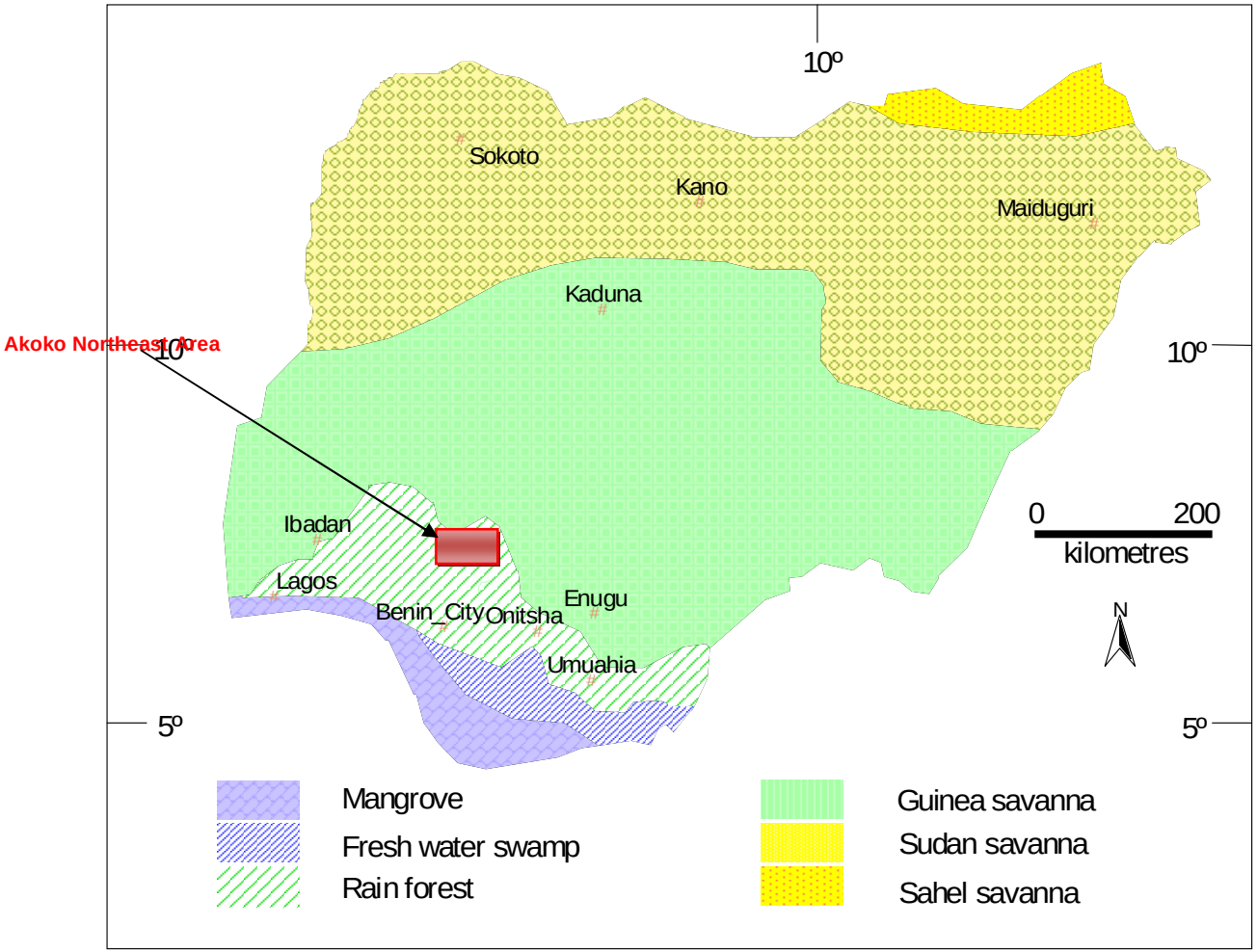
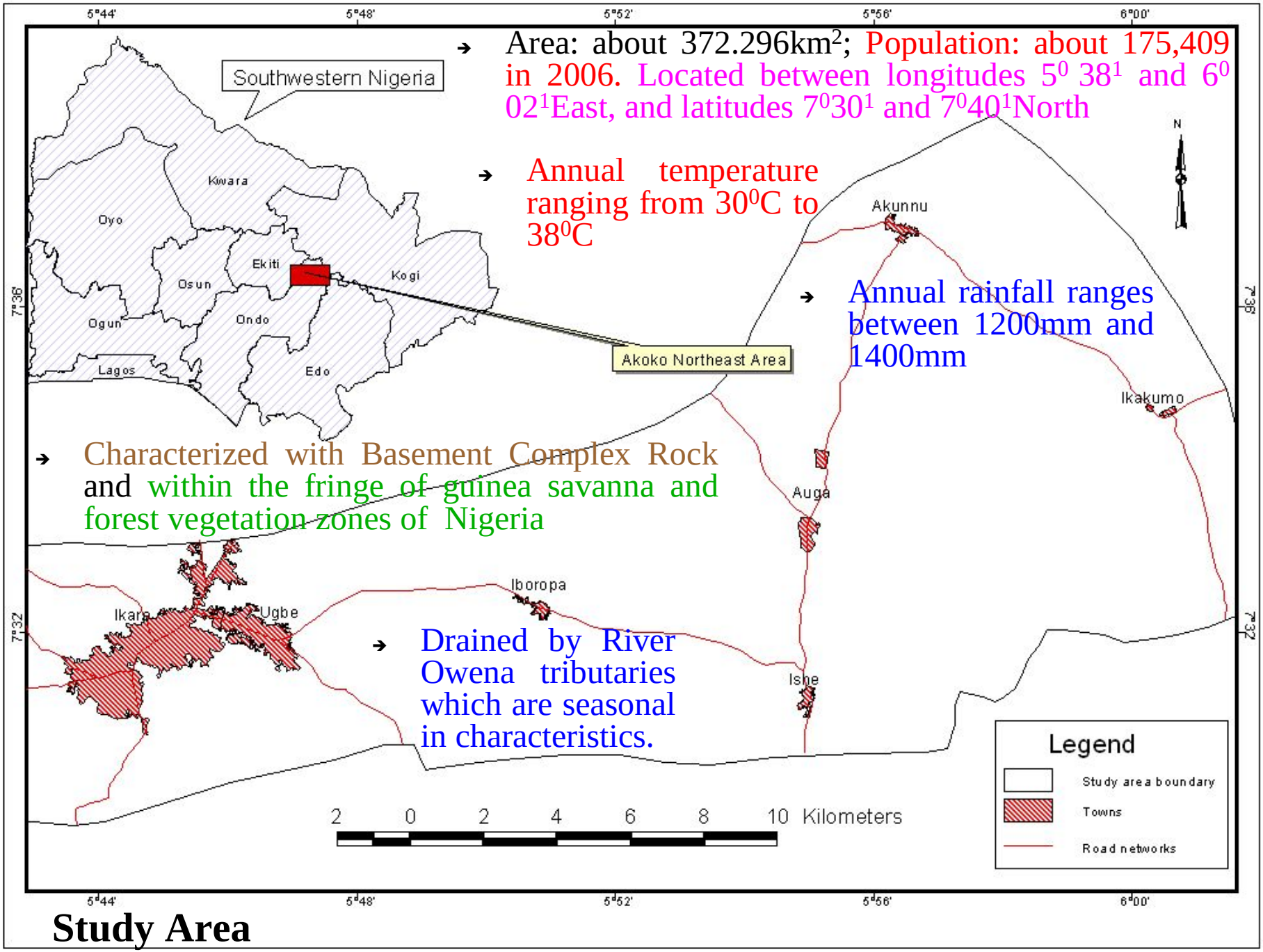
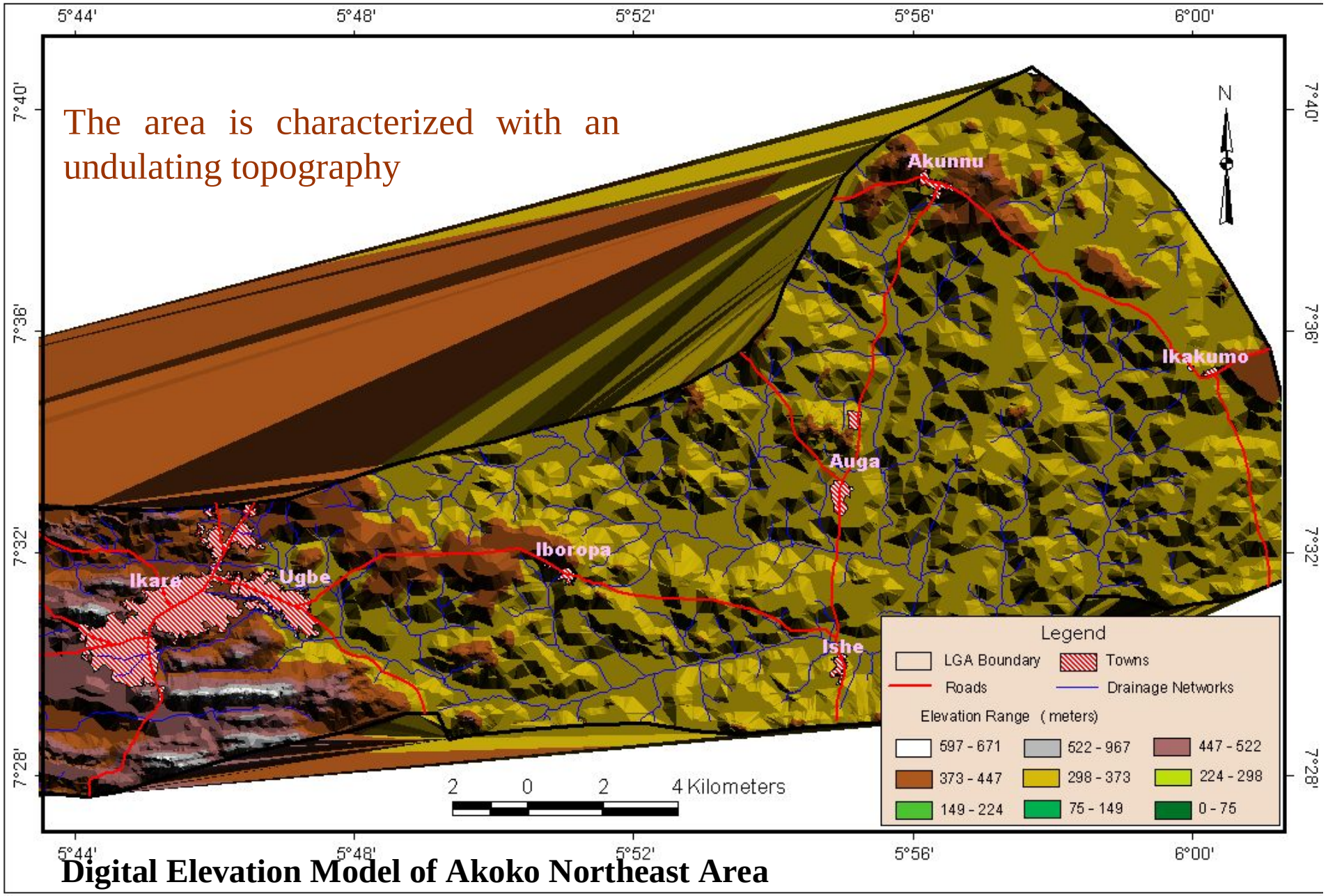


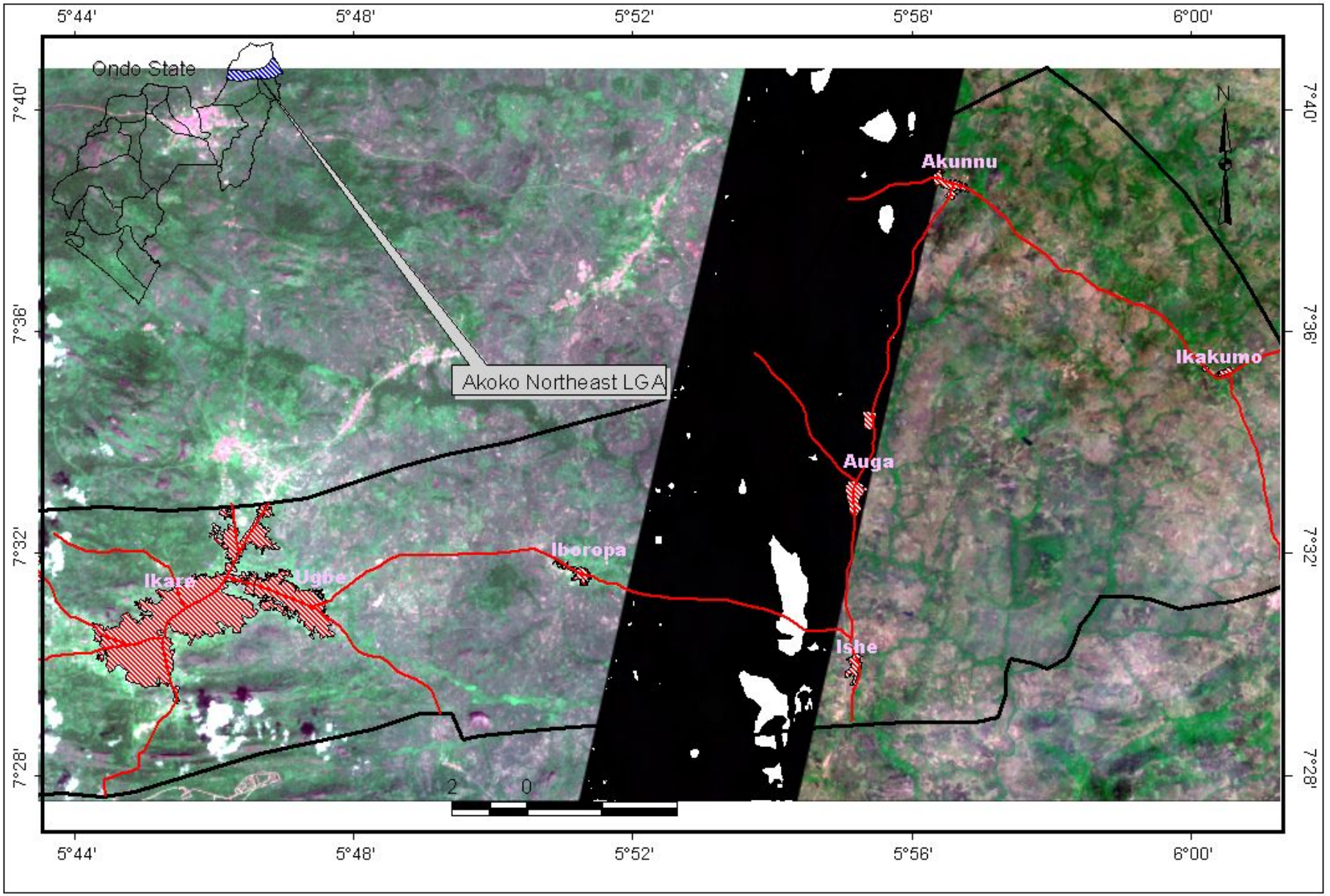
Figure 3 : Vegetation of Nigeria


5°44'
5°48'
5°52'
5°56'
6°00'
7°36'
7°32'
Southwestern Nigeria
Kwara
Oyo
Ekiti
Kogi
Osun
Ogun
Ondo
Lagos
Edo
Akoko Northeast Area
Akunnu
Ikakumo
Auga
Iboropa
Ikare
Ugbe
Ishe
N
Area: about 372.296km²; Population: about 175,409 in 2006. Located between longitudes 5⁰ 38¹ and 6⁰ 02¹East, and latitudes 7⁰30¹ and 7⁰40¹North
Annual temperature ranging from 30⁰C to 38⁰C
Annual rainfall ranges between 1200mm and 1400mm
Characterized with Basement Complex Rock and within the fringe of guinea savanna and forest vegetation zones of Nigeria
Drained by River Owena tributaries which are seasonal in characteristics.
2 0 2 4 6 8 10 Kilometers
Legend
Study area boundary
Towns
Road networks

Study Area



Digital Elevation Model of Akoko Northeast Area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7°28'
Ondo State
Akoko Northeast LGA
N
Akunnu
Ikakumo
Auga
Iboropa
Ugbe
Ikare
Ishe
2
0

Some of the ponds using for drinking and domestic purposes

- 75% population of the area depends on surface water sources especially ponds to meet up with their daily domestic water need.

Methodology

- *Types of Data:*

  Monthly rainfall, relative humidity and temperature received over Akoko Northeast Area between 1984 and 2008.

- *Method of Data Analysis:*

  - Trend analysis was employed which shows both positive and negative dispersion and/or disparity from the long-term mean.

  - Climatic and water index was also employed in order to estimate deviation from the long-term mean of the climatic and water variables

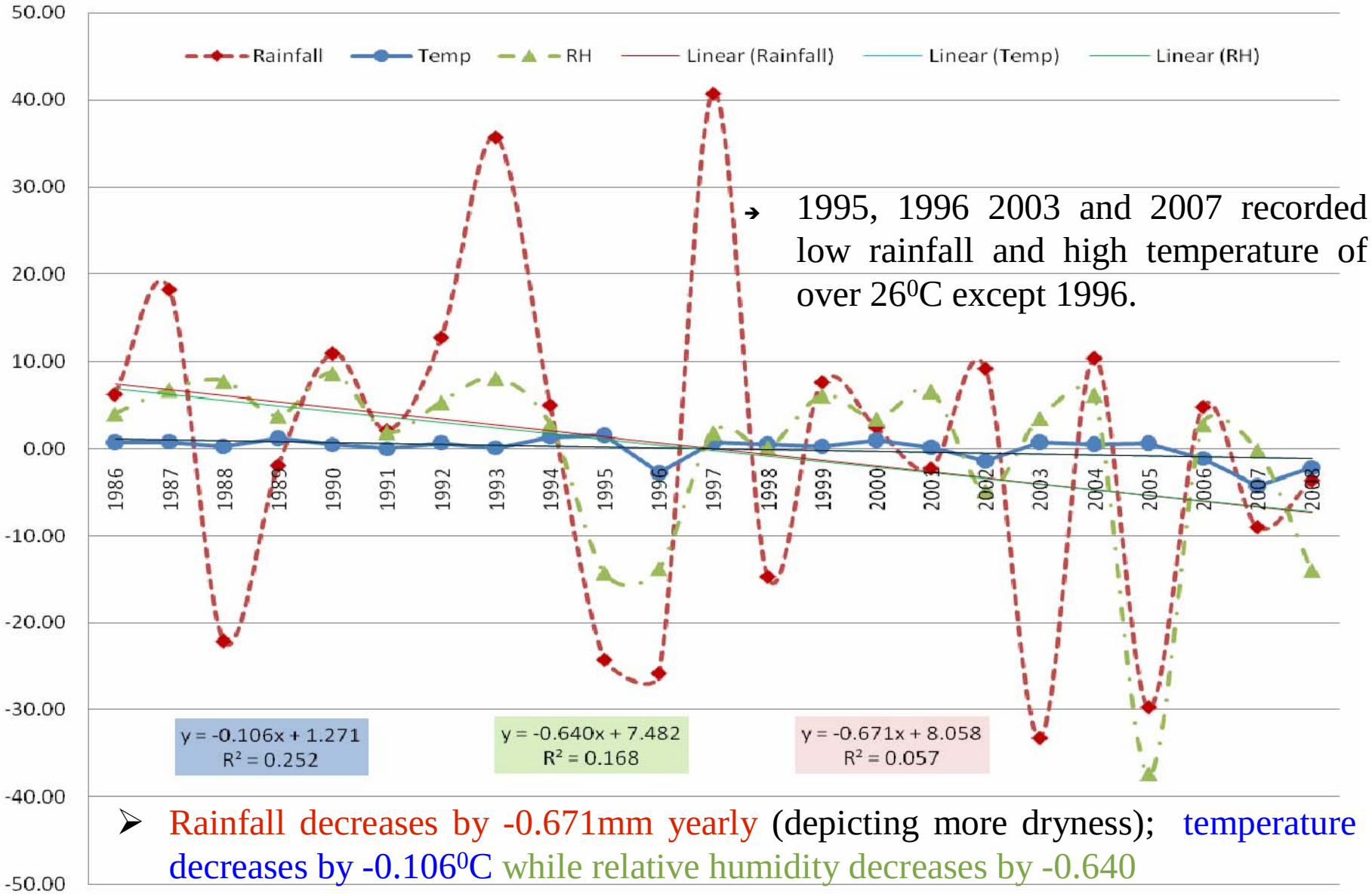
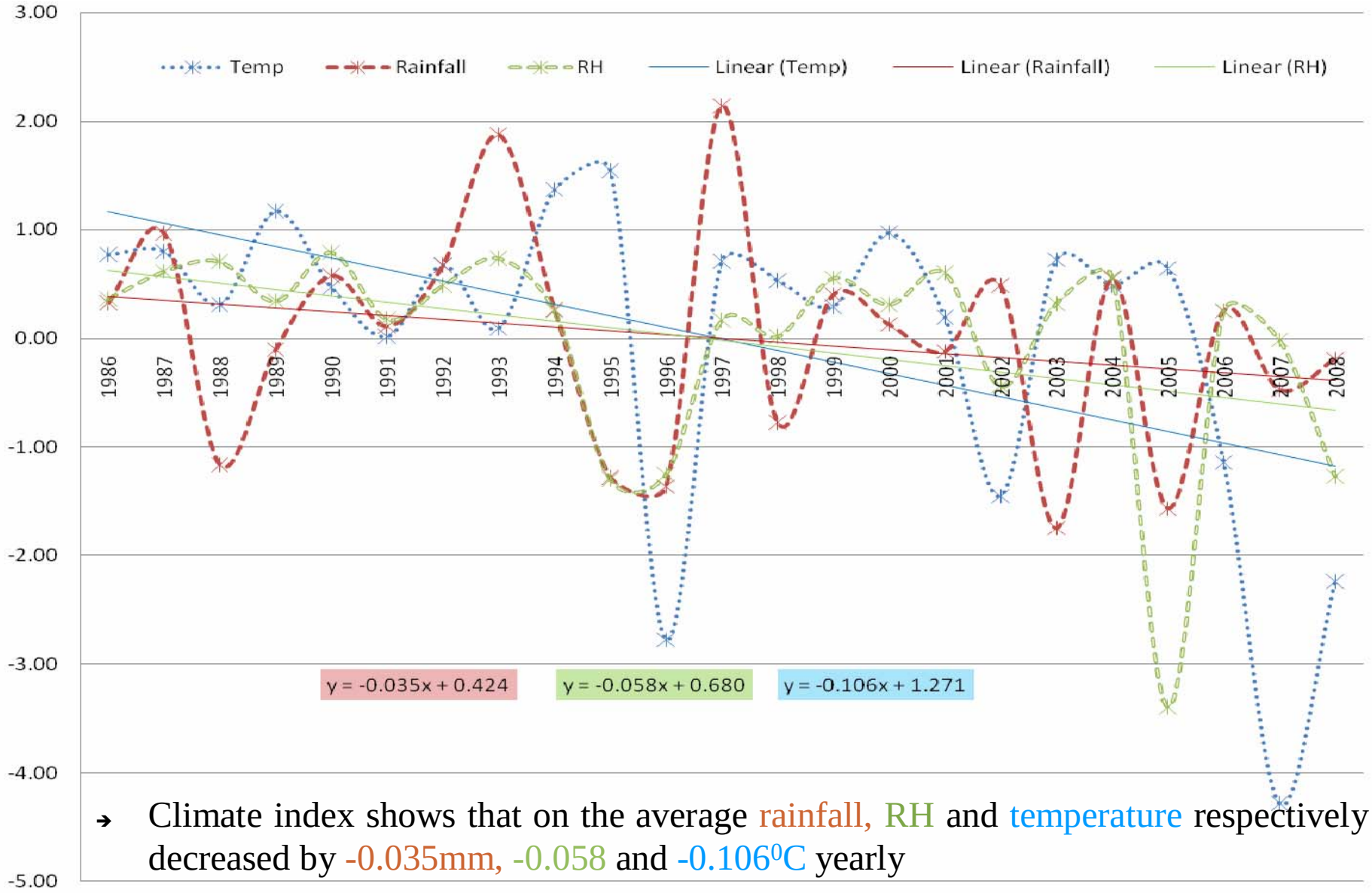


Fig. 4: Variability in the mean of Rainfall, Temperature and Relative humidity in Akoko Northeast Area



➔ Climate index shows that on the average rainfall, RH and temperature respectively decreased by -0.035mm, -0.058 and -0.106^{0}C yearly

Fig. 5: Climatic Index of Rainfall, Temperature and Relative humidity in Akoko Northeast Area

Observations

- Presently the area is experiencing the influence of savanna grassland ecological impacts.

- The area extent of Awara water supply scheme dam in the study area has reduced by 5% while the designed capacity (volume) reduced from 1,800,000 litres daily to about 1,250,000 litres daily.

Observations Cont'd

- The trend of potable water supply decreases from 48.4litres/head/day in 1958 to 3.59litres/head/day in 2007 as a result of drastically decreasing in actual water supply in 1996.

- Yearly, potential water demand increases with 1.086cubic litres/day whereas actual water supply increases by 0.255cubic litres/day (Fig. 6).

- The sudden reduction in actual potable water supply in 1996 could be attributed to increase in temperature in 1995 and its continuous trends between 1997 and 2005 (Fig. 5)

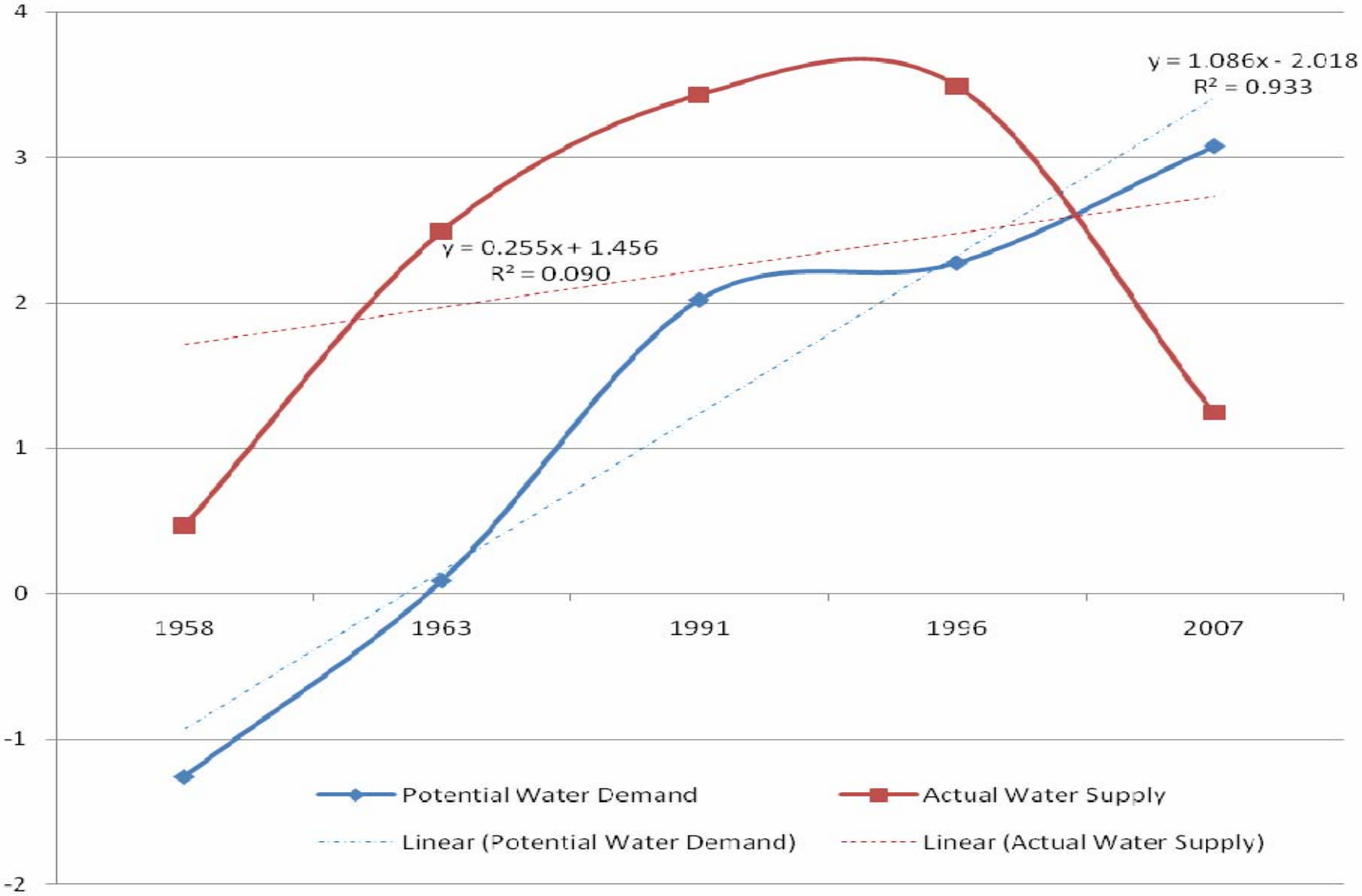


Fig. 6: Water index of Potential Water Demand and Actual water supply in Akoko Northeast Area

Possible Implication

- Most of the major ponds in the area have shrink by about 17.5% between 1958 and 2008 threatening more water scarcity in the nearest future.

- Continuous decrease in rainfall will also result to consistent reduction in surface (ponds) volume since low water will be retain in catchment. Also more water will be evaporated.

- The area is now experiencing more thermal discomfort depicting more water for body metabolism.

- About 75% of ponds will go to extinct in the nearest future while potable water supply will further decreases from 3.59litres/head/day in 2007 to an estimate value of about 2.00litres/head/day in 2027.

Conclusion and Suggestions

- The solutions to the climate change threatening on water supply sources lies in the hand of governments, individuals, and businesses by adopting various options for increasing water supply scheme capacity and reducing greenhouse gas emissions. This can be achieved in developing countries by;

  - ✓develop highly efficient water supply scheme, and encouragement of community water development and management.
  - ✓Human resources development (training),
  - ✓Free and easy access to meteorological data to enhance accurate planning.
  - ✓Global law that will address coal and oil pollution, and protect and restoring threatened forests should be established and enforce.

Conclusion and Suggestions Cont'd

- With the nature and complexity of global change coupled with rapidly increasing population, the consequences are many and in most cases deleterious to human and its environment.

- Nevertheless, changes may be self-reinforcing with human being to cope within or may be self-canceling.

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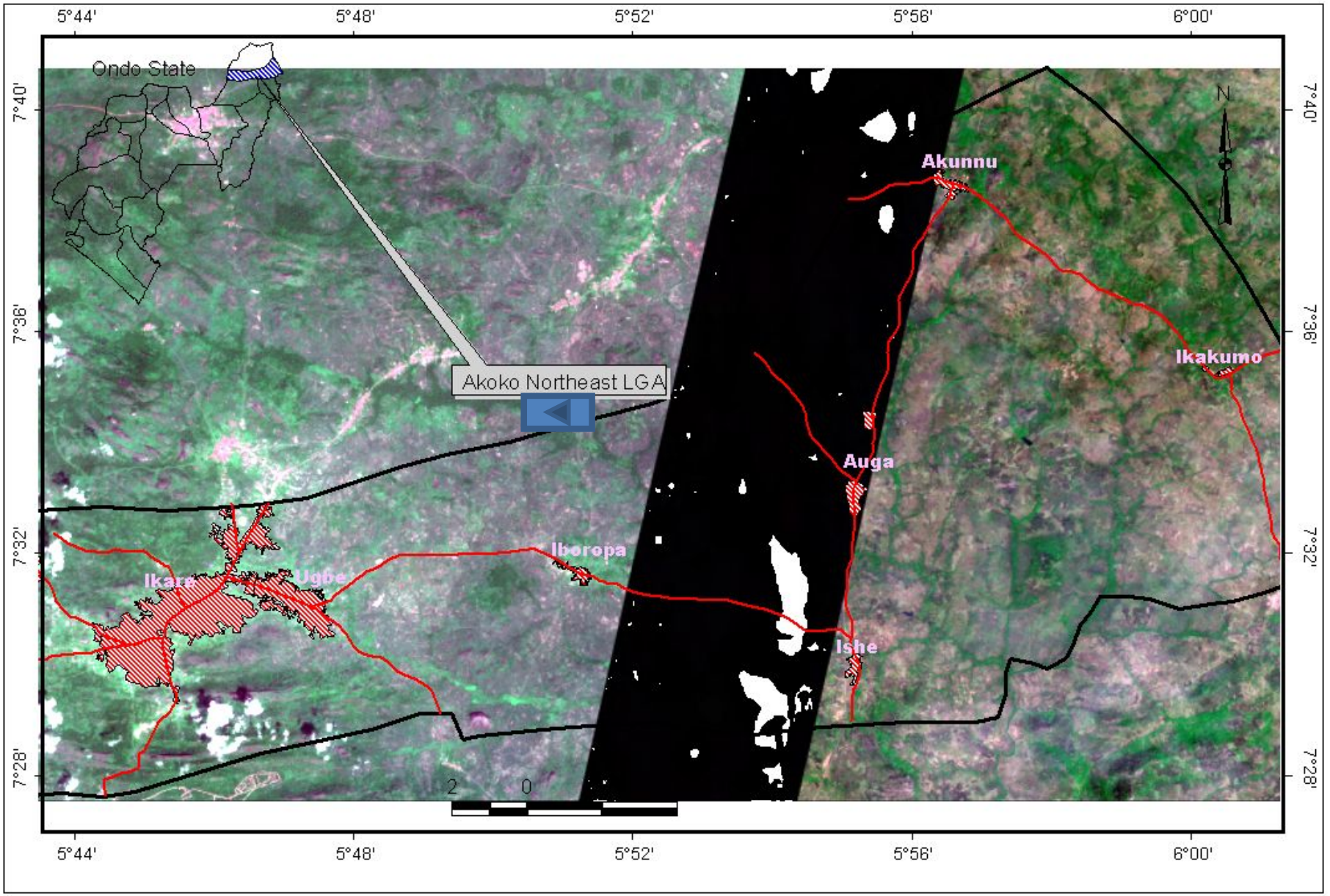
Thanks for Listening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