# GEOSPATIAL EVALUATION OF CLIMATE CHANGE-INDUCED OCEAN WARMING/SEA LEVEL RISE AND ITS IMPACTS ON THE COASTLAND OF SOUTHWEST NIGERIA

BY

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# INTRODUCTION Cont.

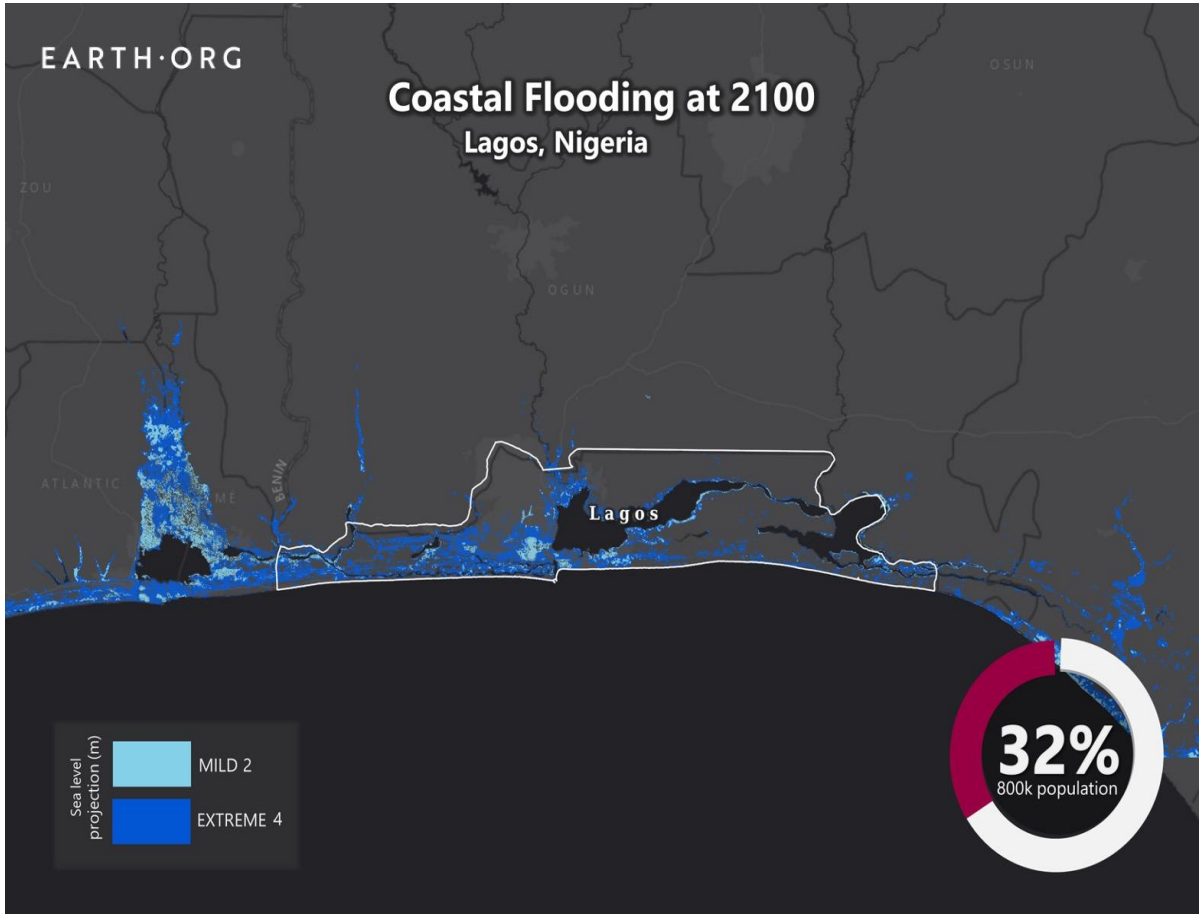
- The consequences of climate change on ocean level in coastal cities are

  **Shoreline erosion and degradation.** Rising sea levels allow waves to penetrate further inland, even during calm conditions, increasing the potential for erosion.

  **Saltwater intrusion.** Saltwater can reach further into coastal groundwater sources as sea level rises, increasing the salinity of freshwater used for drinking and agriculture.

  **Permanent inundation.** Many low-lying coastal land areas are expected to be gradually submerged by rising sea levels.

- South Western Nigeria is characterized with low-lying coastal areas

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These human activities are:

- Deforestation
- Industrialization
- fossil fuel burning from automobile use
- draining of wetlands
- Mining activities
- Waste disposal
- Population

# GLOBAL WARMING IN AFRICA

- Africa contributes to 1/3 of total global greenhouse gases emission making her the smallest contributor globally
- Nigeria emits one of the most greenhouse gasses in all of Africa because of flaring of proceeds and unwanted natural gas by multinational companies
- According to the International Energy Agency (IEA) the total greenhouse gas emissions from Nigeria ranks second in all of Africa at 49 million tons. (IEA, 2019)

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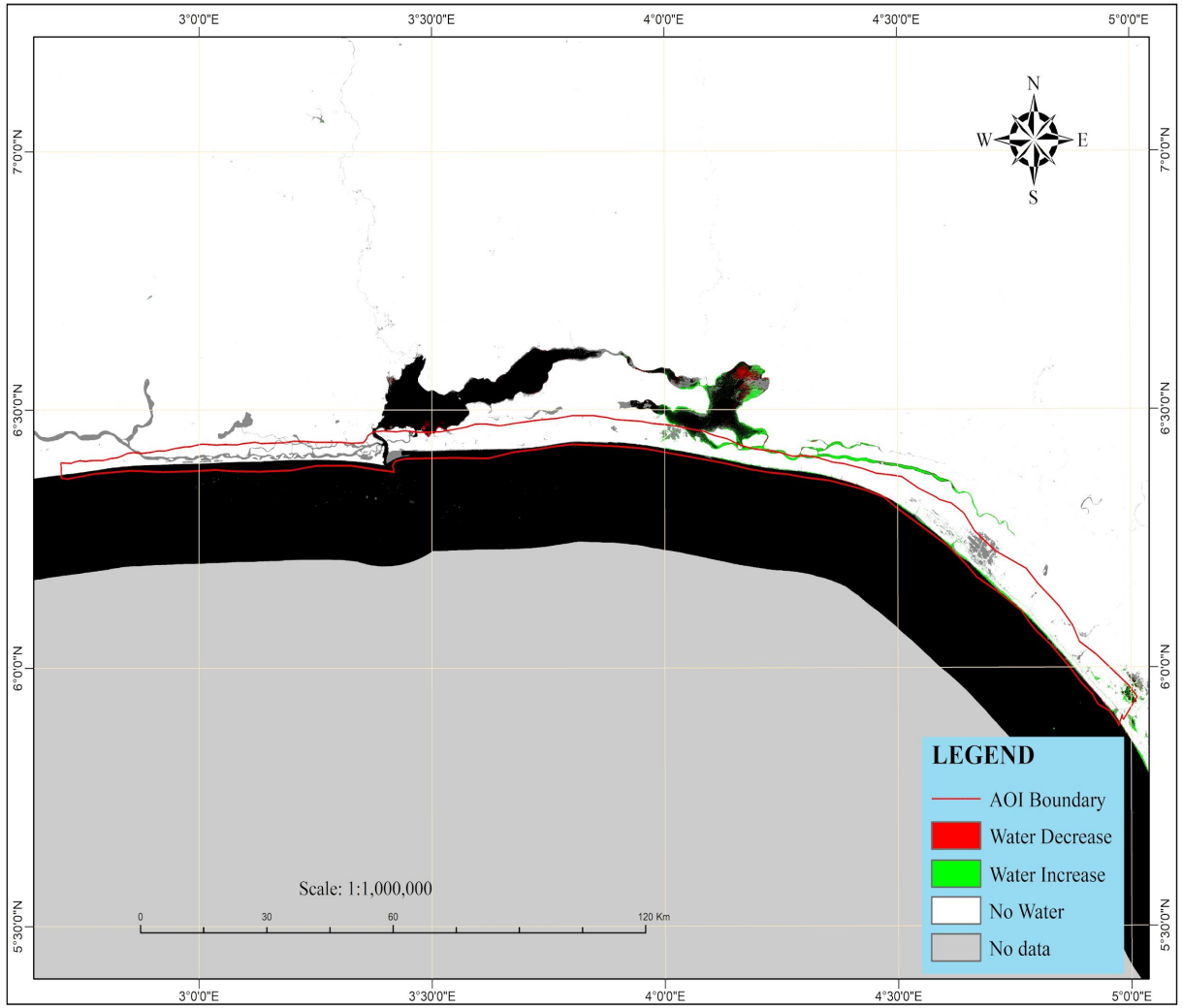
# AIM OF RESEARCH

- This study sought to map the areas that are likely to be affected by the constant sea-level rise using Geospatial Techniques.

- With objectives to evaluate the magnitude of its impact on the land-use and land cover phenomena along various coastland sectors of Lagos, Ogun and Ondo states

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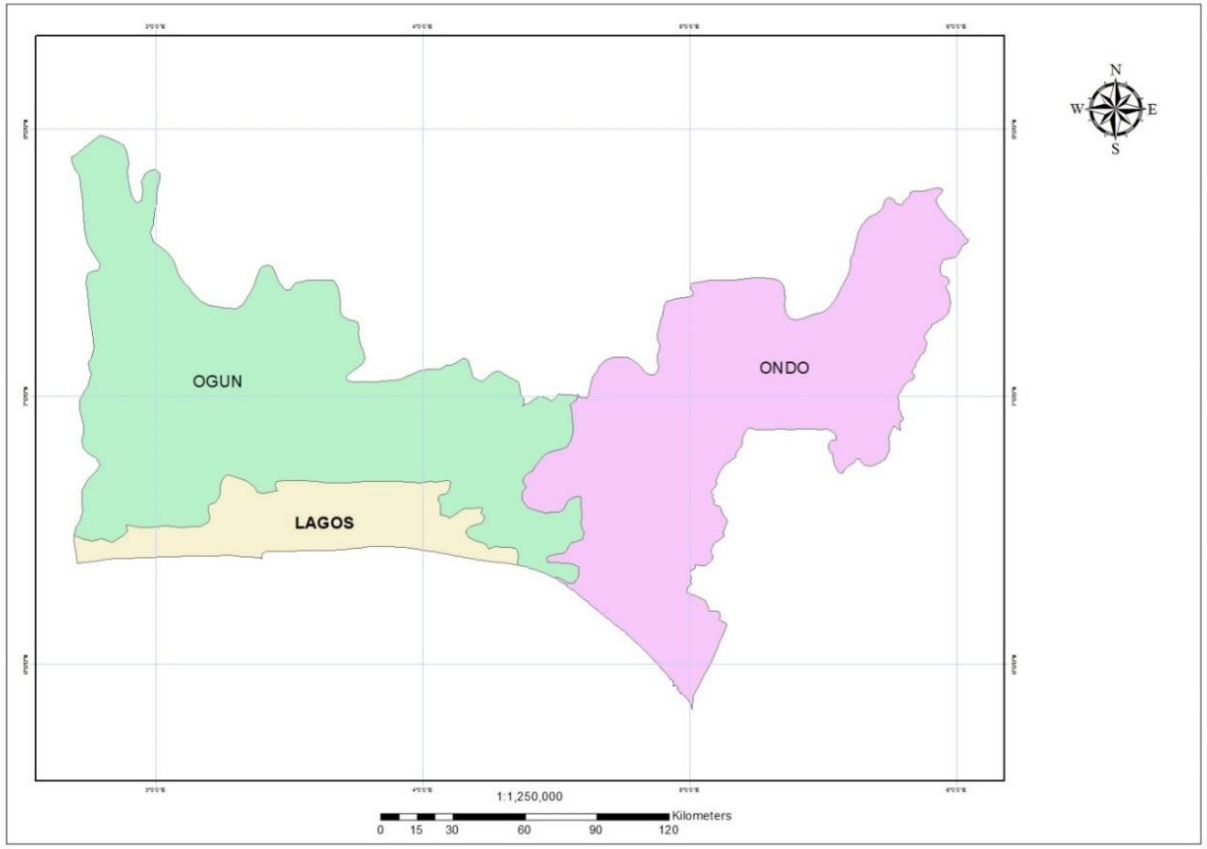
# STUDY AREA

- The South-West Nigeria lies between longitudes (2° 39' 28.7" - 6° 6' 25.2") and latitudes (6° 17' 38.3" 9° 16' 1.2").
- The study area comprises three states of Lagos, Ogun and Ondo with an area extent of 37,985.81 square kilometer
- It is mostly low lying flat area with the apex of the altitude being 1053 meters.
- The region has the busiest commercial activities in the country.
- Projected population of the study area as at year 2022 is 34,326,835 people. (NPC, 2022)

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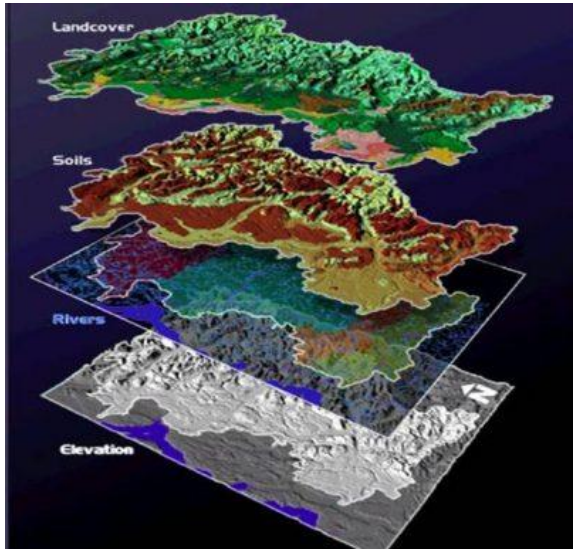
# DATA

- Landsat7 ETM$^{+}$ image of 2010 and
- Sentinel-2 image of 2020
- Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) GDEM V3

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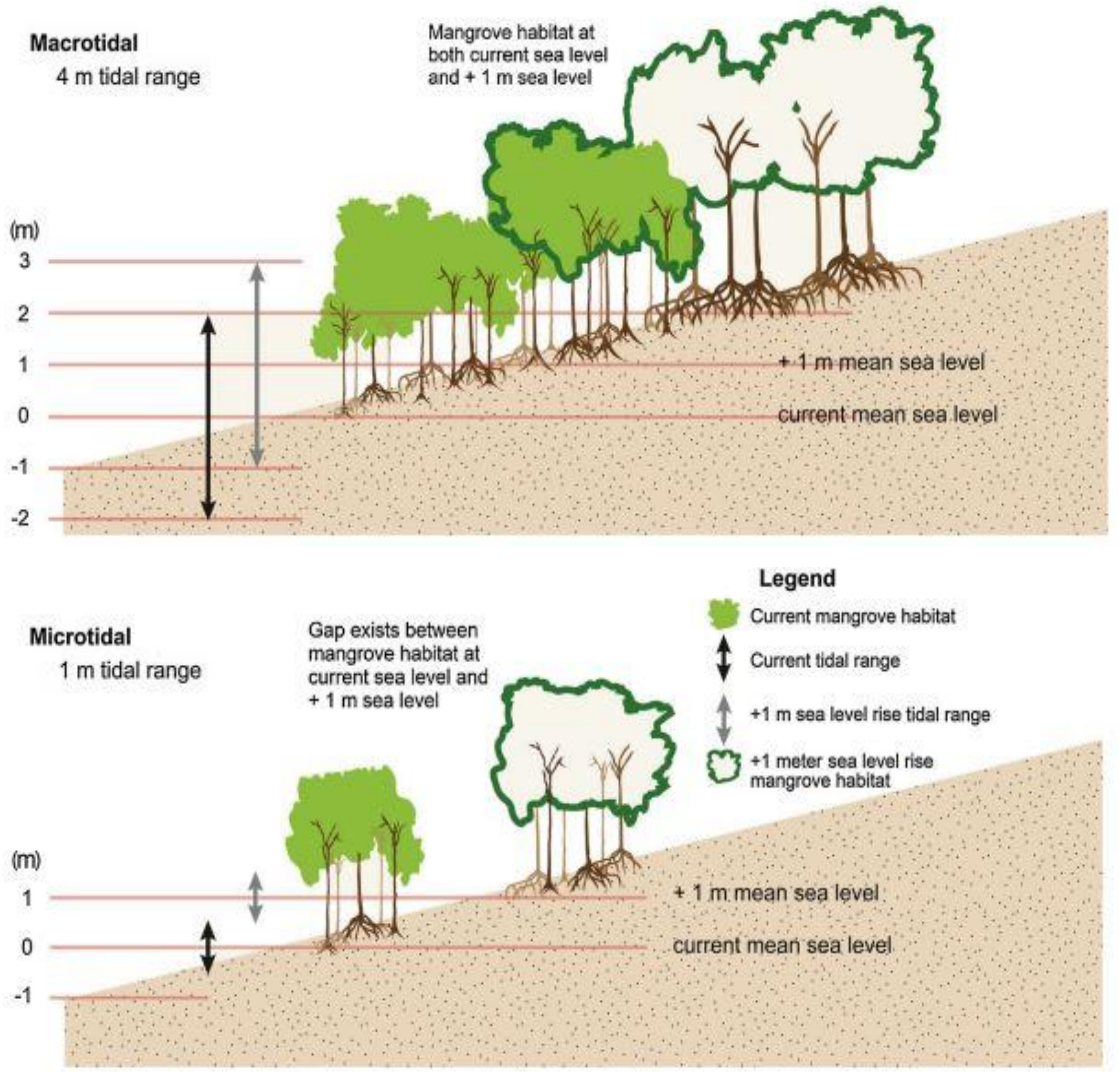
# METHODOLOGY

- The land-use and land cover features along the coastlines was interpreted from the data
- Topography of the area was generated by interpolating the (Digital Elevation Model) DEM to 4m elevation at 1.0 m interval
- The area statistics on the various features within 1.0m, 2.0m and 3.0m of 2010 against 2020 were compared
- This represents the future low-tide limit (in the event of 1.0 m (3.28 ft)  rise of sea level)
- Image Classification was done using the Google Earth Engine (GEE) and the Geostatistical Analysis was done using the ArcGIS Pro Software.

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# RESULTS AND DISCUSSION

- Based on the recent estimates on possible sea-level rise of about 1.0 m to 1.5 m (Milne et al. 2009) at an average value of 2.5 m (*Kakani et al., 2011*)

- the minimum estimated rise for the study is taken at 1.0m to compute its possible impact on the existing land use/land cover along the South Western coastlines of Nigeria.

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# RESULTS
# STATISTICS

## Table 1.1: Affected LULC due to 1M Flood Rise

| Landuse | 2010 Area ($Km^2$) | Percentage (%) | 2020 Area ($Km^2$) | Percentage (%) |
|---|---|---|---|---|
| **Agricultural Land** | 6.62 | 24.5 | 2.94 | 8 |
| **Bare Surface** | 0.04 | 0.1 | 0.76 | 2 |
| **Built-up** | 2.22 | 8.2 | 4.71 | 13 |
| **Forest** | 18.15 | 67.2 | 27.41 | 77 |
| **Total** | **27.03** | **100** | **35.82** | **100** |

## Table 1.2: Affected LULC due to 2M Flood Rise

| Landuse | 2010 Area ($Km^2$) | Percentage (%) | 2020 Area ($Km^2$) | Percentage (%) |
|---|---|---|---|---|
| **Agricultural Land** | 37.31 | 23.94 | 19.26 | 8 |
| **Bare Surface** | 0.48 | 0.31 | 6.34 | 3 |
| **Built-up** | 16.63 | 10.67 | 29.24 | 13 |
| **Forest** | 101.45 | 65.09 | 171.85 | 76 |
| **Total** | **155.87** | **100** | **226.69** | **100** |

## Table 1.3: Affected LULC due to 3M Flood Rise

| Landuse | 2010 Area (Km2) | Percentage (%) | 2020 Area (Km2) | Percentage (%) |
|---|---|---|---|---|
| **Agricultural Land** | 78.66 | 24.07 | 38.41 | 9 |
| **Bare Surface** | 0.89 | 0.27 | 8.15 | 2 |
| **Built-up** | 34.64 | 10.60 | 61.20 | 15 |
| **Forest** | 212.59 | 65.06 | 310.34 | 74 |
| **Total** | **326.78** | **100** | **418.10** | **100** |

# RESULTS AND DISCUSSION

- The land-use/land cover map prepared using Landsat 7 and Sentinel-2 images from 2010 and 2020, overlaid with elevation data generated from ASTER GDEM V3 indicated that agriculture and forest are the major land use activity in the zone followed by built-Up.

# RESULTS AND DISCUSSION

- If the sea level rises by 1.0m based on recent findings indicated that an area of about 27.03 $km^2$ for the year 2010 and 35.82 $km^2$ for the year 2020 would be submerged.

- Furthermore, an area of about 155.87 $km^2$ for the year 2010 and 226.69 $km^2$ for the year 2020 lying between the present tide line 2.0m and

- an area of 326.78 $km^2$ for year 2010 and 418.10 $km^2$ for year 2020 at tide line 3.0m will be submerged respectively (See Table 1.1, Table 1.2 and Table 1.3).

- Therefore, in summary a total area of 326.78$km^2$ in the year 2010 and 418.10$km^2$ in the year 2020 would be submerged within the 1,579 $km^2$.

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# CONCLUSION

Satellites facilitates historic, incessant, and planetary data that are crucial for evaluating the changes of shorelines. The study revealed that the looming sea-level rise would seriously damage the agricultural activities and build-Up in the coastlines areas of south western Nigeria, especially in the Island area of Lagos state which is considered as the economy hub.

# RECOMMENDATION

- Policies that help in reduction of greenhouse gases emissions should be formulated and properly policed
- Establishment of Green Belt and Coastal Zone Protection to protect wetlands, estuaries and prevent salt water from mixing with fresh water.
- Climate smart structures should be recommended in coastal areas.
- Enforcement of property management which will forestall encroachment into floodplains.
- Public enlightenment on sustainable waste management and indiscriminate waste dumping in drainages

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# THANK YOU FOR LISTENING

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