URBANIZATION AND URBAN HEAT ISLAND ANALYSIS OF LAGOS, NIGERIA: USING REMOTE SENSING AND GIS ANALYSIS TO DETERMINE URBAN HEAT AND DISEASE OUTBREAK

Lagos has surpassed it carrying capacity and is now an overcrowded city. Despite this, individuals from rural areas continue to flock to Lagos in search of improved survival opportunities (Shelter Right Initiative, 1997; Folarin, 2007). To address the escalation of diseases, growing cases in Lagos State, and the urban heat island effect, health authorities, urban planners, and the community must come together. A comprehensive approach to these concerns can effectively enhance disease prevention and advance overall urban health.

The connection between disease outbreaks, elevated case counts in Lagos State, Nigeria, and the urban heat island effect is intricate and impacted by numerous variables. The primary culprits behind the urban heat island effect are human pursuits and a scarcity of greenery, which can intensify disease transmission in heavily populated metropolitan regions like Lagos. This can ultimately lead to the propagation of illnesses such as dengue fever and malaria. Among the significant vector-borne illnesses that are most susceptible to changes in environmental conditions, are malaria, schistosomiasis, and dengue infection included (Martens 1998; Martens et al. 1999; Rogers and Randolph 2000), although a considerable range of infectious diseases, including cholera (Pascual et al. 2002), lymphatic filariasis (Sattenspiel 2000), and tick-borne encephalitis (Randolph and Rogers 2000) may also be encountered, with potentially profound consequences for human health.

Malaria transmission is currently restricted to regions with warmer climates. However, the emergence of anthropogenic global warming and climate change has the potential to expand the geographic area for malaria transmission. This is because the Plasmodium malaria parasite and Anopheles mosquito vector are highly dependent on temperature for their life cycles. Furthermore, the habitats of immature Anopheles are heavily influenced by local hydrodynamics and rainfall. (Eikenberry et al., 2018). Lagos is prone to mosquito-borne diseases such as malaria due to its tropical climate and breeding grounds for mosquitoes.

The urban heat island effect exacerbates the conditions that are favorable for mosquito breeding and habitat expansion. Warmer urban areas are also a cause of concern for the spread of dengue fever through the Aedes mosquito vector. Various environmental factors, such as temperature, humidity, rainfall, and wind speed, can impact the incidence of malaria by affecting mosquito and parasite life cycles or human, vector, and parasite behavior. Research conducted by Gubler et al. (2001) and Koenraadt et al. (2004) shows that malaria, one of the deadliest diseases in human history, claims the lives of approximately half a million people each year, with the majority being children under the age of five who reside in tropical Africa.

According to a publication **"Mathematical modeling of Climate Change and malaria transmission dynamics: a historical review"** (Eikenberry et al., 2018) establishes a clear link between temperature and the rising incidences of malaria. Another publication **"Modeling the effects of weather and climate change on malaria transmission"** (Paul and Edwin 2010) also establishes a clear link between temperature and malaria incidence.

To address this issue, a multi-faceted approach is required, including effective mosquito control measures, incorporation of green spaces into urban planning, and improved sanitation and waste management to reduce disease transmission. Public health campaigns focused on disease prevention, especially during high temperatures, are essential in mitigating the situation.

FINAL RESULT

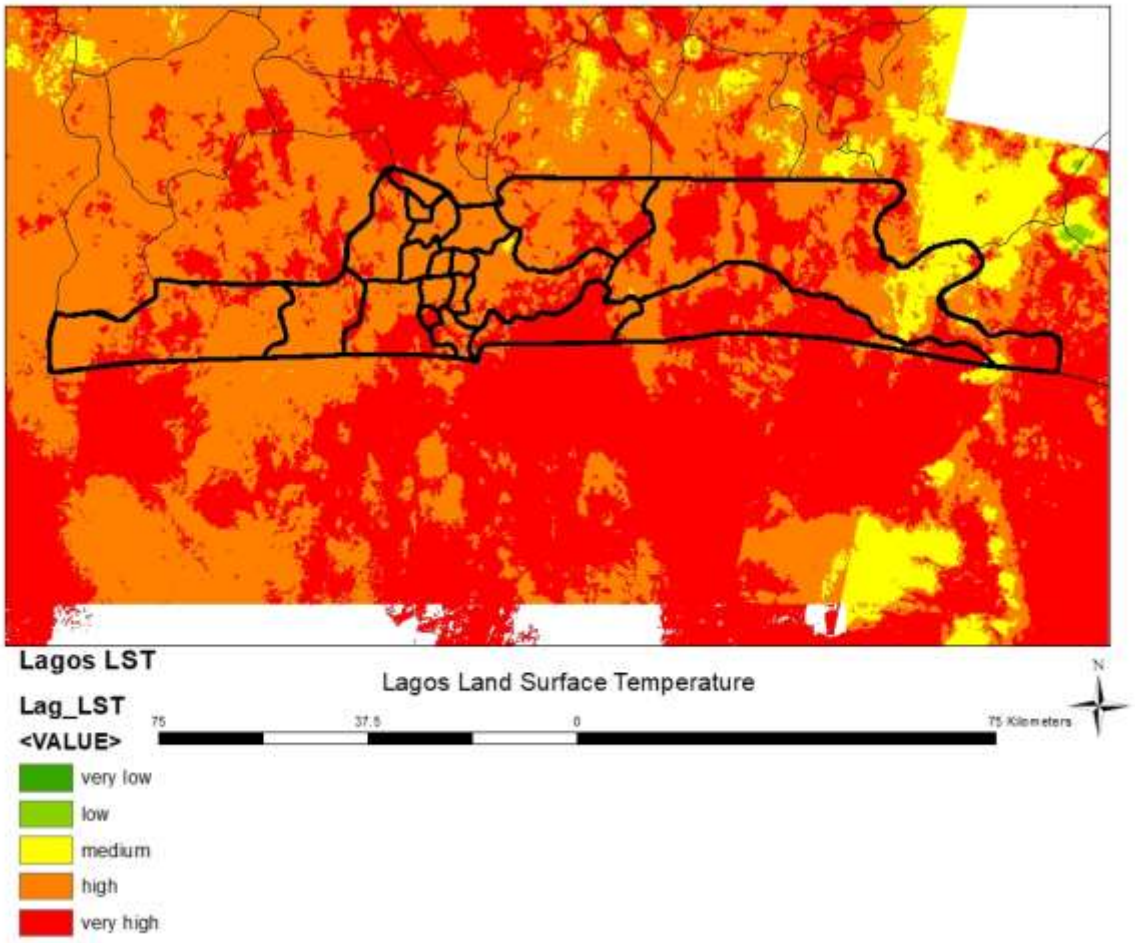

Figure 1: Showing land surface temperature of Lagos, Nigeria.

The figure above shows the urban heat line drawn by digitizing the area of Lagos using polyline on the land surface temperature layer, and the legend shows the varying temperature levels. The land surface temperature analysis was done by obtaining raster images (C2 L2 LandSat 8/9 OLI/TIRS band 10) from earth explorer, and I used the mosaic to new raster tools to merge the raster images together, and with the use of raster calculator the merged raster images was used to get the land surface temperature (LST) using the multiplicative factor (0.00341802) and additive factor (149) to get the LST in kelvin and the covert to degree Celsius, 273.15 was subtracted. Below are the raster images downloaded

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  Row: 056

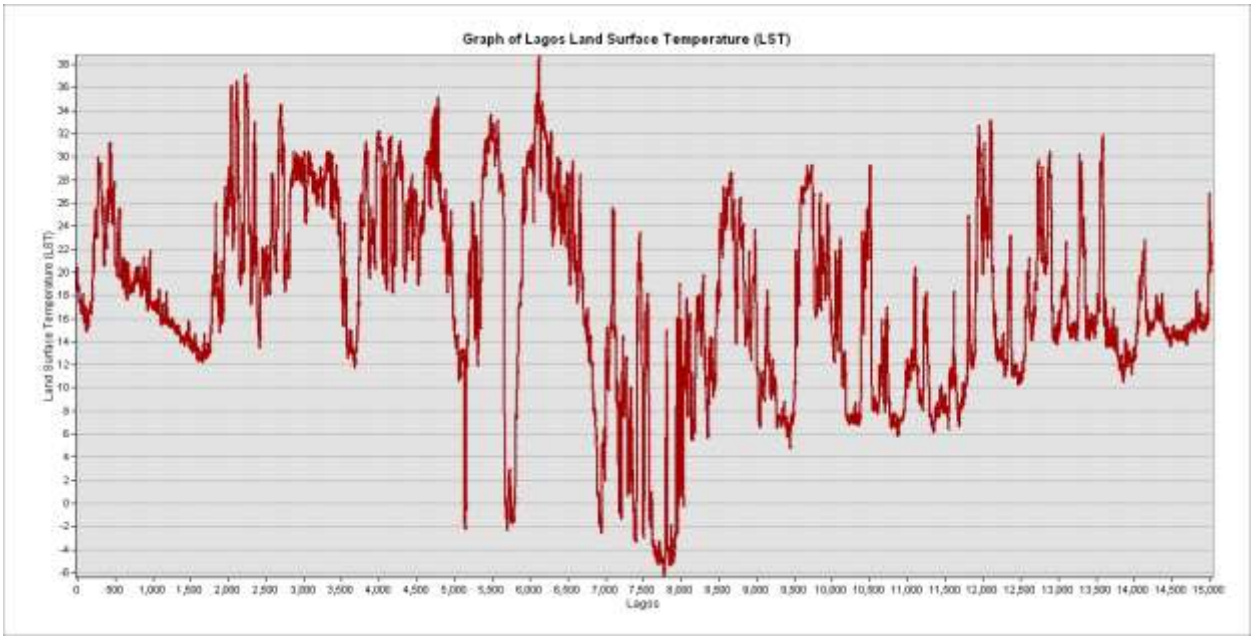

Figure 2: Showing the Lagos, Nigeria Urban Heat Island Analysis graph.

The figure above shows the urban heat island analysis graph of Lagos State, Nigeria, which was gotten by the stack profile tool, the digitized area of Lagos State, Nigeria, and the land surface temperature of gotten. The temperature in the graph was above 38^0c as seen in the graph.

CONCLUSION

The relationship between urbanization, the urban heat island effect, and disease outbreaks in Lagos, Nigeria, is a complex and interconnected challenge that demands attention and comprehensive action. Lagos, being an overcrowded city and a magnet for rural-to-urban migration, faces a multitude of issues that include the surge in disease cases and the urban heat island phenomenon. Addressing these intertwined concerns requires a concerted effort from health authorities, urban planners, and the community to enhance disease prevention and overall urban health. The urban heat island effect in Lagos is primarily driven by human activities and a lack of green spaces. This phenomenon exacerbates disease transmission, particularly vector-borne diseases like malaria, schistosomiasis, and dengue infection. These diseases are highly susceptible to changes in environmental conditions, and elevated temperatures associated with urban heat islands can create favorable conditions for their transmission.

Malaria, a major public health concern in Lagos due to its tropical climate, is significantly influenced by temperature and local hydrodynamics. The urban heat island effect amplifies these conditions, making the city more prone to mosquito-borne diseases. Dengue fever, another mosquito-borne illness, is also a growing concern in warmer urban areas. To combat this issue, a multi-faceted approach is imperative. It should encompass effective mosquito control measures, the integration of green spaces in urban planning, and improved sanitation and waste management to reduce disease transmission. Public health campaigns, especially during high-temperature periods, play a critical role in disease prevention.

The analysis of land surface temperature in Lagos reveals the extent of the urban heat island effect, with temperatures exceeding 38°C in some areas. This underscores the urgency of implementing measures to mitigate the impact of urban heat islands and, in turn, reduce the risk of disease outbreaks in the city. The complex interplay between urbanization, urban heat islands, and disease occurrence in Lagos necessitates a holistic and interdisciplinary approach to safeguard the health and well-being of the city's inhabitants. It is essential that urban planning and public health efforts work in tandem to create a more sustainable and healthier urban environment for the people of Lagos.

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