

## **Infrastructural Development in Ondo States' Coastal Communities: Implications for the SDGs**

<sup>1</sup>Ibrahim AdemolaAdeniran, <sup>2</sup>Kolade Victor Otokiti and <sup>3</sup>Helen AbidemiFaturoti

<sup>1</sup>The Hong Kong Polytechnic University, Hong Kong, China

[Adeniran.ibrahim@connect.PolyU.hk](mailto:Adeniran.ibrahim@connect.PolyU.hk)

<sup>2</sup>Faculty of Spatial Sciences (Islands and Sustainability), University of Groningen, the Netherlands

[K.otokiti@students.rug.nl](mailto:K.otokiti@students.rug.nl)

<sup>3</sup>Department of Urban and Regional Planning, University of Ibadan, Nigeria

[faturotiellenah@gmail.com](mailto:faturotiellenah@gmail.com)

## ABSTRACT

This study examines the state of infrastructure development in coastal communities of Ondo State, Nigeria, and its impact on living standards. Coastal communities are known for their natural beauty and resources, and the coast of Ondo State is no exception. However, the lack of sufficient infrastructure has become a detrimental factor hindering the development of this region and impeding the achievement of multiple Sustainable Development Goals (SDGs). To assess the state of infrastructure development, two communities located within a 5km buffer from the Ondo state coastline were selected as the study's focus. A quantitative approach was employed, and a sample size of 329 household heads was selected. Primary data was collected through questionnaires and housing grading sheets, and descriptive and inferential statistics were used for data analysis. The findings of the study paint a concerning picture of poor infrastructure development in the coastal communities of Ondo State. The results reveal that 97% of the respondents practice unimproved methods of solid waste management, such as dumping refuse into the sea or vacant land within the community. Additionally, 69.61% of the respondents rely on unimproved sources for faecal waste management. The sampled housing units exhibited very poor conditions, with 64.74% of them falling into this category. Despite being connected to the national grid, there is a lack of electricity supply in these communities. Furthermore, nearly half of the population does not have access to pipe-borne water. Recognizing the critical role of infrastructure in achieving sustainable development, it is evident that addressing these deficiencies is essential for progress towards several SDGs. The SDGs most affected by the poor infrastructure development in these coastal communities include SDG 1: No Poverty, SDG 4: Quality Education, SDG 3: Good Health and Well-being, SDG 11: Sustainable Cities and Communities, SDG 6: Clean Water and Sanitation, SDG 14: Life Below Water, SDG 7: Affordable and Clean Energy, SDG 9: Industry, Innovation, and Infrastructure, and SDG 13: Climate Action. Based on the study findings, several recommendations were made to address the infrastructural challenges in these communities including, Public-Private Partnerships (PPPs) to mobilize additional resources and expertise for infrastructure development, community empowerment and integrated planning approach.

Keywords: Coastal communities, Infrastructure, Ondo State, Nigeria

## **1 Introduction**

Infrastructure in the context of this study refers to a comprehensive network of interconnected systems that facilitate the delivery of essential services such as energy, water supply, waste management, transportation, and telecommunications (Thacker et al., 2019). While infrastructure is specifically encompassed within Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure), its impact extends far beyond this particular goal (World Bank, 2012; Department for International Development, 2013), exerting its influence on all 17 Sustainable Development Goals (SDGs), either through direct or indirect means, impacting 121 out of the 169 targets (72%) (Thacker et al., 2019). Thus, infrastructure development is widely recognised as a key driver of sustainable development, with its impact extending across economic, social, and environmental domains (Castells-Quintana, 2017; Sun and Cui, 2018). Unsurprisingly, Hassan (2017) and Cui and Sun (2019) contend that poor infrastructure development may hamper social development, and impose adverse effects on the standard of living, quality of life, economic stability, and productivity.

Nigeria faces a pressing need for the prompt renovation or replacement of its existing infrastructure systems (Jaiyesimi, 2016). Nigeria's infrastructure deficit stands as a substantial barrier to the nation's aspiration of positioning itself among the world's top twenty economies (Bolomope et al., 2020). The study of Deinne (2021) suggests that the infrastructure deficit in Nigeria is not evenly distributed, with coastal communities experiencing a more pronounced and acute problem. In many of these regions, modern transportation and communication infrastructure are inaccessible, and there is a complete lack of power infrastructure (Cinner et al., 2018). The unique geographic characteristics of Nigeria's coastal communities contribute to the intensified infrastructure deficit, further exacerbating social and economic disparities. Furthermore, coastal areas are susceptible to several natural disasters, such as coastal flooding, sea-level rise, and sea intrusion (Adeniran and Otokiti, 2019), considerably worsening the region's infrastructural issues (San-Liang and Yuanzhi, 2018).

Against the aforementioned context, this research aims to examine the infrastructural challenges faced by the coastal communities in Ondo State, Nigeria, and explore the implications of these challenges on the attainment of SDGs.

### **The Study Area**

Ilaje Local Government is the largest Local Government in Ondo State (Figure 1) in terms of landmass, and it has a shoreline covering about 75 km (Popoola, 2014). Crude oil, the mainstay of the Nigerian economy, is being explored and exploited in the Local Government area, likewise, Bitumen, for which exploitation will soon begin (TheNation, 2019). The occupational activities of the Ilajes include fishing, canoe making, lumbering net making, mat making, launch building, farming, and trading (Onuoha, 2008).

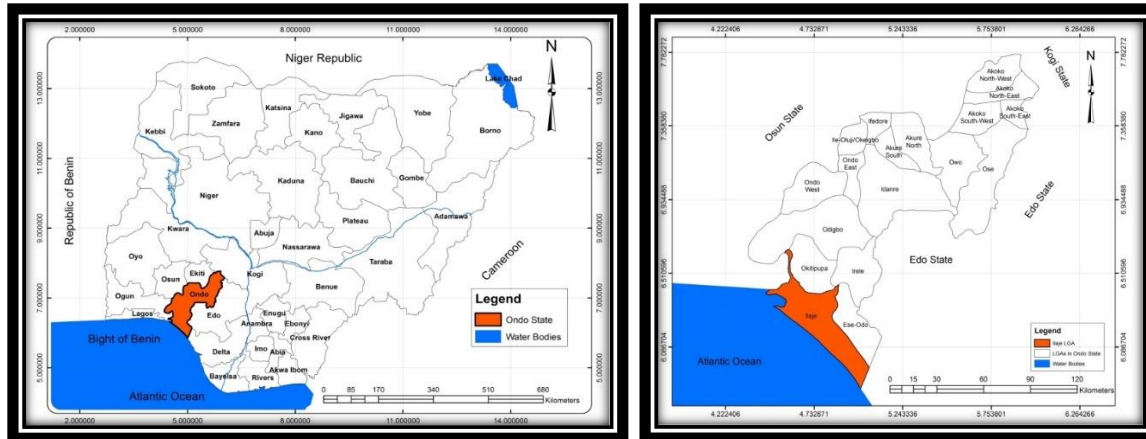


Figure 1: Ilaje LGA in its regional settings

Source: Nigeria Administrative Data (2019)

## 2 Methodology

For this study, a survey research approach was employed to gather data. Given the homogeneous nature of the communities along the coast in terms of their socioeconomic characteristics, building type, and building arrangement (Olalekan and Wahab, 2018), two communities situated within a 5 km distance from the coastline of Ondo State were randomly selected as the study locations. These communities include Aiyetoro and Idi Agba. The primary data was collected using structured questionnaires and a housing grading sheet. Furthermore, observations were conducted during a field visit to the study areas. The collected data underwent processing and analysis using descriptive and inferential statistics, and the results were presented in the form of tables and charts for clear visualisation.

The projected population figures for the two communities, Aiyetoro and Idi Agba, in 2019 were obtained by applying the average growth rate of 3.2% from the 1991 population census (NPC, 2006). To determine the sample population for the study, the total population of the communities was divided by 5, considering the average household size in Ondo State estimated by the National Population Commission (NPC) as 5 (Ondo State Bureau of Statistics, 2012). This yielded the number of household heads in both communities, which served as the sampling frame for the study. In line with the study of Popoola et al. (2019), a sample size of 5% was randomly chosen from each community for the purpose of this study. This sampling ratio is deemed feasible for survey research, particularly when dealing with populations that exhibit homogeneous characteristics and have a relatively low sampling frame (Agbola and Olatubara, 2007). Consequently, a total of 266 household heads were selected from Aiyetoro, while 63 household heads were selected from Idiagba, representing 5% of the total sampling frame in each of these communities (Table 1).

Table 1: Sampling Frame

Community	1991 population	2019 projection	Sampling Population	Sample Size
Aiyetoro	14,521	26,560	5,312	266

<b>Idi agba</b>	3,465	6,338	1,268	63
<b>Total</b>	17,986	32,898	6,580	329

Source: NPC, 1991

### 3 RESULTS AND DISCUSSION OF FINDINGS

#### 4.1 The state of infrastructure development

##### *Transportation*

Insufficient transportation infrastructure within a community poses a significant barrier to the movement of people, goods, and services, which may have detrimental effects on the community's development. Based on the data presented in Table 2, the findings reveal that a significant proportion of the sampled respondents (44.07%) reported that their houses were accessible by water, utilising canoes, speed boats, or other water vehicles based on the capacity of their households. Additionally, 31.00% of the households relied on wooden walkways, while 24.93% relied on concrete walkways for accessing their homes. The use of water vehicles and walkways as primary means of accessing housing indicates a lack of proper road infrastructure and limited accessibility to the communities. This may hinder various aspects of daily life, including access to education (SDG 4), healthcare services (SDG 3), employment opportunities, and social amenities. For instance, water transportation can be costly, time-consuming, and prone to weather conditions, limiting mobility and economic opportunities for community members. Moreover, the reliance on wooden and concrete walkways may indicate potential safety risks and limited convenience, especially during adverse weather conditions or emergencies. The isolation of the coastal communities from mainland settlements further exacerbates the challenges related to accessibility and infrastructure development.

Generally, the reliance on water vehicles highlights the need for sustainable maritime transportation to protect the marine ecosystem (SDG 14), reduce pollution, and ensure the sustainable use of marine resources, fostering sustainable communities (SDG 11). This is particularly crucial as the marine resources serve as a source of livelihood for a substantial portion of the community's population.

Table 2: Transport Facility providing access within the community

	<b>Frequency</b>	<b>Percentage (%)</b>
Water	145	44.07
Paved walkway	82	24.93
Wooden walkway	102	31.00
<b>Total</b>	<b>329</b>	<b>100</b>

Source: Authors' Fieldwork, 2019

##### *Housing*

Housing serves not only as a basic need for shelter, security, and privacy but also plays a vital role in community development by providing opportunities for economic activities and job creation. The evaluation of housing infrastructure conditions was conducted utilising a housing grading sheet, which indicated that a substantial portion of the sampled housing units in the communities exhibited very poor conditions (64.74%) (Table 3). Conversely, only a small percentage of the

housing units were found to be in very good condition (1.82%). The high prevalence of housing units in very poor conditions indicates inadequate living conditions and substandard housing quality for a large proportion of the community members.

Living in substandard housing may have adverse effects on the physical and mental health of individuals and families. It may lead to increased risks of respiratory diseases, poor sanitation, overcrowding, and lack of privacy. Moreover, inadequate housing conditions may perpetuate a cycle of poverty and social exclusion, as individuals and families struggle to access better opportunities and improve their socioeconomic status. Therefore, improving housing infrastructure not only enhances the living conditions and quality of life for community members but also contributes to the achievement of several Sustainable Development Goals. These include SDG 11 (Sustainable Cities and Communities), which emphasises the need for inclusive, safe, resilient, and sustainable human settlements, as well as SDG 3 (Good Health and Well-being) and SDG 1 (No Poverty), as access to adequate housing is closely linked to improved health outcomes and poverty reduction.

Table 3: Housing condition in the study area

	<b>Frequency</b>	<b>Percentage (%)</b>
Very Good	6	1.82
Good	26	7.90
Fair	15	4.56
Poor	69	21.00
Very Poor	213	64.74
<b>Total</b>	<b>329</b>	<b>100</b>

Source: Authors' Fieldwork, 2019

### ***Water and Sanitation***

The recognition of the Human Right to Water and Sanitation by the United Nations General Assembly in 2010 marked its significance in ensuring access to clean water and sanitation for all individuals (United Nations, 2010). However, Nigeria continues to face challenges in providing improved water and sanitation facilities, resulting in high rates of illness and death among children under five. The lack of access to safe drinking water and inadequate sanitation conditions increases the vulnerability of communities to water-borne diseases, with over 70,000 children under five affected each year.

Analysis of the survey data, presented in Table 4, indicates that both improved and unimproved water sources are being used in the communities. The findings from the study reveal a concerning situation regarding access to piped bore water in the community, with nearly half of the population being unserved. The respondents reported relying on unimproved water sources, such as the sea/lagoon (23.71%) and river (25.83%) for their water needs. Access to safe and clean water is a fundamental human right and is crucial for maintaining good health and preventing waterborne diseases. The reliance on unimproved water sources poses serious risks to the health and sanitation of the community members, particularly children and vulnerable populations.

The lack of access to piped bore water indicates a gap in infrastructure development and service provision. It highlights the need for urgent interventions and investments in water supply infrastructure to ensure reliable and safe water access for all community members. Addressing this issue is not only essential for fulfilling the basic needs of the population but also for achieving several Sustainable Development Goals, including SDG 6 (Clean Water and Sanitation), SDG 3 (Good Health and Well-being), and SDG 11 (Sustainable Cities and Communities).

Table 4: Source of water accessible in the study area

	Frequency	Percentage (%)
<b>Sea/Lagoon</b>	78	23.71
<b>Tap</b>	166	50.46
<b>River</b>	85	25.83
<b>Total</b>	<b>329</b>	<b>100</b>

Source: Authors' Fieldwork, 2019

### **Sanitation**

Effective management of faecal and solid waste poses a significant challenge in coastal communities due to their unique location characteristics. The field survey results indicate that a majority of the residents (69.61%) in the study area rely on unimproved sources for faecal waste management. This includes practices such as open defecation into the sea or lagoon, as well as the use of hanging latrines with superstructures within households (Figure 2). Unimproved faecal waste management may contribute to environmental degradation and pose a serious risk to public health. For instance, improper disposal of human waste may contaminate water sources, leading to the spread of waterborne diseases such as cholera, typhoid, and diarrhoea, jeopardising the health and well-being of community members (SDG 3), particularly vulnerable groups such as children and the elderly. Additionally, when human waste is not adequately managed and treated, it may result in the contamination of rivers and other natural resources. This pollution can have adverse effects on ecosystems, aquatic life, and biodiversity.



Figure 2: a) Pit Latrine b) Septic Tank of flush toilet

Source: Authors' fieldwork, 2019

The findings from the survey (Table 5) indicate that the majority of respondents (97%) in the study area practised unimproved methods of solid waste management, such as dumping refuse into the sea or vacant land within the community. However, a small percentage (3%) of respondents were aware of the risks associated with unimproved waste disposal and employed improved solid waste management techniques. These individuals stored their waste in covered receptacles and

transported it to designated pick-up points on the mainland, where waste management agencies could collect it.

Addressing the issue of open defecation and unimproved means of solid waste management in the coastal communities is essential for achieving multiple SDGs, particularly SDG 6: Clean Water and Sanitation, SDG 3: Good Health and Well-being and SDG 14: Life Below Water

Table 5: Waste management in the study area.

	<b>Faecal waste</b>	<b>Solid waste</b>
<b>Improved</b>	100(30.39%)	10(3.0%)
<b>Unimproved</b>	229(69.61%)	319(97.0%)
<b>Total</b>	329(100.0%)	329(100.0%)

Source: Authors' Fieldwork, 2019

### ***Electricity***

Power infrastructure plays a crucial role in driving economic activities and development within communities (ESI Africa, 2018). However, the two coastal communities examined in the survey have experienced a lack of electricity supply, despite being connected to the national grid. As a result, residents have resorted to alternative sources of power. According to the survey results, 39.21% of the sampled households rely on generators as their primary power source, while 26.75% utilise solar inverters (Table 6). Unfortunately, 34.04% of households cannot afford any alternative power sources, leaving them without access to electricity. Addressing the electricity shortage and improving power infrastructure in these coastal communities is essential for achieving many SDGs, particularly SDG 7: Affordable and Clean Energy, SDG 9: Industry, Innovation, and Infrastructure, SDG 13: Climate Action and SDG 11: Sustainable Cities and Communities. For instance, the high percentage of households relying on generators as their primary power source and those without access to electricity indicate a lack of access to affordable and reliable electricity. Furthermore, inadequate power infrastructure and limited access to electricity may hinder industrial development and innovation within the communities. Reliance on generators as a primary power source contributes to increased greenhouse gas emissions and environmental pollution. Transitioning towards cleaner and renewable energy sources, such as solar power, aligns with SDG 13 and may promote climate action. It may also be argued that access to reliable and sustainable energy is crucial for creating sustainable and resilient cities and communities. The lack of electricity access negatively may impact the quality of life, limit opportunities for economic activities, and hinder social development within the communities.

Table 6: Distribution of Household power sources in the study area

	<b>Frequency</b>	<b>Percentage</b>
<b>Generator</b>	129	39.21
<b>Inverter</b>	88	26.75
<b>No Access</b>	112	34.04
<b>Total</b>	329	100.0



Source: Authors' Fieldwork, 2019

### **Information and Communication Technology (ICT)**

ICT has emerged as a vital component of economic infrastructure in coastal communities, alongside transportation and utilities such as water, gas, and electricity. It is considered an essential need that drives regional economic development and provides diverse opportunities for social and economic growth.

The provision of internet services in the coastal communities exhibits a moderate level of satisfaction, as indicated by the reported uninterrupted access to fast internet on mobile phones by 65.23% of respondents (Figure 3). However, a considerable proportion of the population still faces limited (11.57%) or no access to internet facilities (23.2%). This disparity in digital connectivity raises concerns regarding the potential exclusion of some individuals from valuable educational resources and online opportunities. Such exclusion may impede their ability to acquire new skills, access educational materials, and participate in digital learning platforms, thereby hindering their overall educational and socio-economic development. Addressing this digital divide and improving internet accessibility in these communities becomes imperative to foster equal access to educational, entrepreneurial, and technological advancements, thereby promoting inclusive and sustainable development.

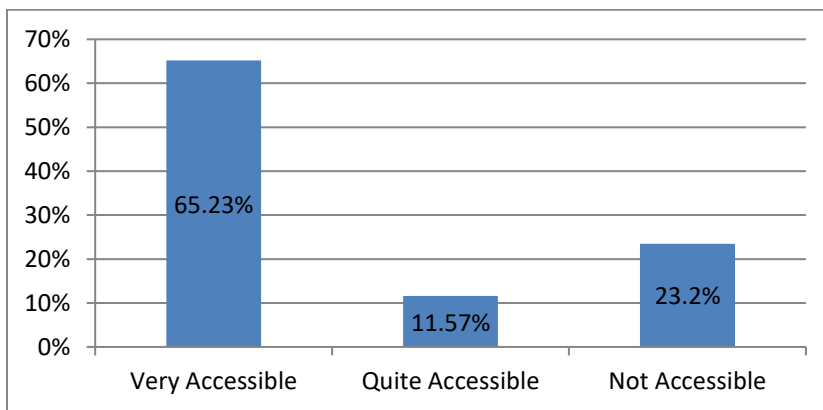


Figure 3: Accessibility of internet facility

Source: Authors' Fieldwork, 2019

The availability of communication facilities, such as television and radio stations, plays a crucial role in facilitating the dissemination of information. However, it was observed during the site visit that there is no television station established within the coastal communities. Nevertheless, the communities do have access to local television stations, including OSRC (Ondo State Radio-visual Corporation), NTA (Nigeria Television Authority), and cable TV channels such as StarTimes, GoTV, and DSTV. Nonetheless, a significant proportion of respondents (44.8%) reported not having access to television services (Table 7). In comparison, 32.2% and 23% of respondents reported having access to cable TV and local TV stations, respectively. Without access to local television stations, the residents may have limited access to diverse sources of information and media content. This may hinder their ability to stay informed about important local and global issues, participate in public discourse, and make well-informed decisions. Furthermore, access to educational programs and resources through television can be limited, depriving community members, particularly students, of valuable learning opportunities.

Table 7: Access to Television service

<b>TV facilities</b>	<b>Frequency</b>	<b>Percentage</b>
Cabled TV	106	32.3
Local TV	76	23.0
No Access	147	44.7
<b>Total</b>	<b>329</b>	<b>100.0</b>

Source: Authors' fieldwork, 2019

## **Conclusion and Recommendations**

This study assesses the state of infrastructural development in the coastal communities of Ondo State and examines its implications for the achievement of Sustainable Development Goals (SDGs). The study reveals that insufficient infrastructure in Ondo state coastal communities is becoming a significant obstacle to their development, and imposes several implications for poverty reduction, education, well-being and healthcare, water and sanitation, marine protection, energy accessibility, industrial development, and climate change mitigation. Thus, addressing infrastructure deficiencies in the communities is crucial for the achievement of several SDGs, including SDG 1: No Poverty, SDG 4: Quality Education, SDG 3: Good Health and Well-being, SDG 11: Sustainable Cities and Communities, SDG 6: Clean Water and Sanitation, SDG 14: Life Below Water, SDG 7: Affordable and Clean Energy, SDG 9: Industry, Innovation, and Infrastructure, and SDG 13: Climate Action.

Based on these findings, the following recommendations are relevant to the Ondo State Oil Producing Areas Development Commission (OSOPADEC), a government agency established by the Laws of Ondo State CAP. 106 in 2001 to intervene in the development of the oil-producing and impacted areas of Ondo state:

1. **Strengthen Infrastructure Investment:** OSOPADEC should prioritize infrastructure development projects in the oil-producing areas of Ondo state. This includes improving transportation networks, housing infrastructure, water and sanitation facilities, proper waste management systems, electricity access, and information and communication technology (ICT) infrastructure. Emphasis must be placed on infrastructure solutions that minimize environmental impact, promote climate resilience, and optimize resource utilization. This includes integrating renewable energy sources, promoting green building practices, and implementing sustainable waste management systems.
2. **Promote Public-Private Partnerships:** OSOPADEC should actively seek partnerships with private entities to leverage additional resources and expertise for infrastructure projects. Collaborating with private sector organizations can bring in new technologies, funding opportunities, and efficient management practices. This may help expedite infrastructure development initiatives and ensure their long-term sustainability.
3. **Encourage Renewable Energy Solutions:** OSOPADEC should explore and promote the adoption of renewable energy sources, such as solar power, in the communities. Investing in renewable energy infrastructure will not only provide access to clean and reliable electricity but also contribute to mitigating climate change and reducing dependence on fossil fuels. This aligns with SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).
4. **Support Community Empowerment and Capacity Building:** OSOPADEC should invest in community empowerment programs and capacity-building initiatives to ensure the sustainable utilisation and maintenance of infrastructure facilities. This includes providing training and education opportunities for community members, fostering local entrepreneurship, and promoting community participation in infrastructure planning and

decision-making processes. Empowered and engaged communities are more likely to take ownership of infrastructure projects, leading to their long-term success.

5. **Monitor and Evaluate Infrastructure Projects:** OSOPADEC should establish a robust monitoring and evaluation system to assess the impact and effectiveness of infrastructure projects. This will help identify areas for improvement, ensure accountability, and inform future decision-making processes. Regular monitoring and evaluation will enable OSOPADEC to track progress, address any challenges or gaps, and make data-driven decisions to enhance infrastructure development outcomes.
6. **Integrated Planning:** OSOPADEC should adopt an integrated planning approach that considers the interdependencies between different infrastructure sectors. This will ensure coordinated and holistic development, promoting synergy and maximizing the benefits of infrastructure investments.

## References

- Adeniran, Ibrahim, and Kolade Victor, Otokiti. "Characterization of climate change manifestation in Nigeria coastal community." *Climate Change* 5, no. 20 (2019): 235-244.
- Agbola, Tunde., and Charles, Olatubara. "Private Sector Driven Housing in Nigeria: Issues, Constraints, Challenges and Prospects." Timothy Olugbenga Nubi, Modupe Moronke Omirin & Akintade Samuel Afolayan eds. *Private Sector Driven Housing Delivery. Issues, Challenges and Prospects*: Lagos, Department of Estate Management, University of Lagos (2007).
- Bolomope, Muhammed Temitayo, Kwasi Gyau Baffour Awuah, Abdul-Rasheed Amidu, and Olga Filippova. "The challenges of access to local finance for PPP infrastructure project delivery in Nigeria." *Journal of Financial Management of property and Construction* 26, no. 1 (2021): 63-86.
- Castells-Quintana, David. "Malthus living in a slum: Urban concentration, infrastructure and economic growth." *Journal of Urban Economics* 98 (2017): 158-173.
- Cinner, Joshua E., W. Neil Adger, Edward H. Allison, Michele L. Barnes, Katrina Brown, Philippa J. Cohen, Stefan Gelcich et al. "Building adaptive capacity to climate change in tropical coastal communities." *Nature Climate Change* 8, no. 2 (2018): 117-123.
- Deinne, Clement Ebizimor. "Inequalities in access to infrastructural amenities and sustainable development in Delta State, Nigeria." *Ghana Journal of Geography* 13, no. 2 (2021).
- Department for International Development. *Connecting People, Creating Wealth: Infrastructure for Economic Development and Poverty Reduction* (2013).  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/243802/130918\\_Infrastructure\\_Position\\_Paper\\_FNL.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/243802/130918_Infrastructure_Position_Paper_FNL.pdf)
- ESI Africa. Energy infrastructure an important factor in the IRP draft (2018, September 12). Retrieved November 27, 2019, from African Power and Energy Elite: <https://www.esi-africa.com/industry-sectors/business-and-markets/energy-infrastructure-an-important-factor-in-the-irp-draft/>
- Gaal, Hassan Osman, and N. A. Afrah. "Lack of Infrastructure: The Impact on Economic Development as a case of Benadir region and Hir-shabelle, Somalia." *Developing Country Studies* 7, no. 1 (2017).
- Jaiyesimi, Rotimi. "The challenge of implementing the sustainable development goals in Africa: The way forward." *African journal of reproductive health* 20, no. 3 (2016): 13-18.
- National Population Commission. "population census of the Federal Republic of Nigeria." Census Report. National Population Commission, Abuja (2006).
- National Population Commission. "population census of the Federal Republic of Nigeria." Census Report. National Population Commission, Abuja (1991).
- Olaoye, Olalekan Jacob, and Wahab Gbenga Ojebiyi. "Marine fisheries in Nigeria: A review." *Marine ecology-Biotic and abiotic interactions* (2018).
- Ondo State Bureau of Statistics. *Report of integrated household survey in Ondo State 2011*. Akure: Ondo State Bureau of Statistics (2012).
- Onuoha, Freedom. *Oil Exploration Environmental Degradation and Climate Change: Assessing the Vulnerability of the Niger Delta Environment to Natural Disaster*. The Conference

Proceedings of the International Conference on the Nigeria State, Oil Industry and the Niger Delta (pp. 1025-1041). Akure: Platex Press. (2008).

Popoola, Olusola. "Vulnerability of Nigerian Coast to Inundation Consequent on Sea Level Rise." *Journal of Engineering and Environmental Studies* 5, no. 1 (2014).

Popoola, O. O., A. E. Olajuyigbe, and O. E. Rowland. "Assessment of the Implications of Biodiversity Change in the Coastal Areas of Ondo State, Nigeria." *Journal of Sustainable Technology* 10, no. 1 (2019).

San Liang, X., and Yuanzhi Zhang. *Coastal Environment, Disaster, and Infrastructure*. Tianjin. United Kingdom: IntechOpen. (2018).

Sun, Yu, and Yin Cui. "Evaluating the coordinated development of economic, social and environmental benefits of urban public transportation infrastructure: Case study of four Chinese autonomous municipalities." *Transport Policy* 66 (2018): 116-126.

Thacker, S., Adshead, D., Fay, M., Hallegatte, S., Harvey, M., Meller, H., O'Regan, N., Rozenberg, J., Watkins, G. and Hall, J.W., 2019. Infrastructure for sustainable development. *Nature Sustainability*, 2(4), pp.324-331.

The Nation. Ondo bitumen first exploitation begins this year (2019, February 1). Retrieved June 11, 2019, from <https://www.citypopulation.de/php/nigeria-admin.php?adm1id=NGA029>

United Nations. General Assembly (2010, August 3). Retrieved November 17, 2019, from <https://undocs.org/A/RES/64/292>

World Bank. *Inclusive Green Growth : The Pathway to Sustainable Development*. Washington, DC (2012). <http://hdl.handle.net/10986/6058>