

# Urban Growth And Its Challenges In Kano Metropolis Cases Of CO And NO<sub>2</sub>

Hashim Abdullahi, Gobi Krishna Sinniah, Ho Chin Siong,

**Abstract:** The aim of the study is to assess the air pollutants emission with reference to carbon monoxides and Nitrogen Oxides with the view to make urban and regional planning recommendation towards low carbon society. Primary data was gathered from field with the aid of gas sensing device (Gas Sensor By Crown Cone) Outdoor carbon monoxides and Nitrogen Oxides was sensed in four (4) selected local government authorities namely Kano Municipal, Fagge, Nasarawa and Tarauni based on the land uses interactions and 4 major road intersections (junctions) in each local government reading stations was sensed each in a specific days. Monday and Fridays was selected as the busiest day. Friday was used for Kano Municipal and Nassarawa while Fagee and Tarauni Monday was employed the. The study also utilized secondary data obtained from available sources of majorly related journals. The result was tabulated for comparison. The result depict that the study unveiled that, Tarauni local government has the highest average value of carbon monoxides of 21Ppm. The study also indicates that on the other hand, Tarauni local government demonstrates the highest records of Nitrogen Oxides (NO<sub>2</sub>). This is due to its high volume of traffic. Nassarawa and Fagge local governments relatively portrays very close records of sensed carbon monoxides with 16Ppm and 15Ppm. The result further indicates that Kano Municipal local government maintain the least records of both Carbon monoxides and Nitrogen Oxides of 13Ppm and 00.4. This is due to the facts, the traditional city has less vehicular movements because of its connectivity challenges with the walled city. This therefore affects its rate of emission. Urban planning towards Low carbon society is to strongly recommend so as to safe guard the environment in sustainable manner. This could be achieved through in-depth study of environmental implications of urban growth within the study area.

**Keywords:** Kano Metropolis, Urban Growth, Gas Sensing, CO and NO<sub>2</sub>, Low Carbon Society

## 1. INTRODUCTION

Climate change ambiguity, infrastructural long-term usage and exorbitant prices of energy sum up of the needs for low carbon society (Low Carbon Energy System) in the world particularly in the United Kingdom [1]. Additionally, [2] carbon mitigation gains more attention as a vehicle for attending sustainable development since Kyoto treaty. Integration of land use planning [3]. United Kingdom government set strong policies aside to mitigates carbon emission by 80 % by 2050 when slightly compare with 1990 mission Housing industry in UK has peculiar resilience to SDPT which brings about joining code for Sustainable homes with low carbon. The code for sustainable Homes (Housing) has nine areas of concentration which include; Energy /carbon, pollution, water, health and wellbeing, materials, management, runs off, ecology and solid waste. Few builders in UK acquired same technologies while others depend on one or more than one technologies [4]. Nigeria has abundant reserve of natural gas and it is ranked as the 7<sup>th</sup> nation blessed with natural gas deposit. However, the gas is flaring, this flaring posed high environmental challenges because of its high contribution to greenhouse emission [5]. Low Carbon Development (LCD) covers major variation in the context of technology, values, policies and institutions [6]... The techniques gain more strength as a market innovative tools. Policies required radical rules and skills acquisition [7]. Scottish Environmental Protection (SEPA) policy depicts its intention with regard to climate change delivery plan that worked towards achieving expected

target of mitigating Green House emission [8]. Policies related to energy –efficacy play roles in the sector and technical innovation were postulated designs for energy saving building and energy saving materials. Life cycle inventory was collected using 4 house developed and constructed houses with dimensions 1.3 by 1.3 by 2.5. The modelled used different building techniques as: House 1 made up of modified Tromber, House 2 is made of block concrete, House 3 is made of clay, and house 4 is from auto clave concrete [9]. Back casting is not a fresh mitigation technique [10] [11]. Zero energy principles, energy efficiency [13], Carbon inventory [14]. [15] Comment that there will be significant raise in the PV power supply globally where the supply will dramatically change from 1,000 MW within year 2000 to 140,000 by the year 2030.

### 1.1 LITERATURE REVIEW

United Nation Environmental Programme's Sustainable Building and Climate Change Initiative Common Carbon Metric (UNEP-SBCI CCM ) usage in Malaysia is quietly viable , though it has shortfalls, but using UNEP – SBCI'S as a carbon metric is relatively better when the results of the two was compered[16]. Additionally, low carbon was first utilized in 2003 by the British government white paper , since then other countries took up the idea like Japan works toward low carbon society. Its technology paved ways for policies making nationally and locally to resolve climate change challenges. In the transition of five years plan in China, total carbon per unit GDP dropped significantly, on the other hand carbon emission per capita slightly change Cities are the major contributor to challenging climate change issues. Cities amount of to 80% of carbon emission in the context of the world at large, therefore cities are responsible for climate change processes Cities in this generation are directed by trends of globe, processes , networking and existing institutions but urban governance has less influence regarding the cities [17]. Construction organisations has been an under-utilised practice, especially in Nigeria. Hence, it is this gap of identifying these skilled workers that is the primary stimulus for this research.

- Hashim Abdullahi, is Currently a PhD student in Urban and Regional Planning ,Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Malaysia [hashimabdullahi46@yahoo.com](mailto:hashimabdullahi46@yahoo.com)
- Gobi Krishna Sinniah, Department of Urban and Regional Planning, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310 UTM Johor Bahru, Malaysia
- Ho Chin Siong,UTM Low carbon Asia Research Center, UTM, 81310 UTM Johor Bahru, Malaysia [ho@utm.my](mailto:ho@utm.my)

### 1.3 Buildings and Low Carbon Effects of Population Growth Together With Urbanization in Cities

Architectural buildings (housing) generates 40 % emission through related activities like construction and renovation processes and heating and lighting [18]. In UK up to 27% are emitted from housing and 5 % is sum up to the total emission from buildings but recorded 10% carbon emission is directly linked with manufacturing sector. [19], global warming mitigation starts in the community, minimizing emission starts by individuals within their houses, this saves the environment as well as saves resources (money). Housing industry (Building) can play a vital role in mitigating carbon emission and new governance for low carbon society needs transformation and development [20]. Rapid population growth which led to dramatic increase in the solid waste generation posed serious environmental challenges which call for effective environmental friendly approach in its problems solving [21]. Greenhouse emission posed great environmental challenge that create the needs for providing substitute solutions [22]. Challenges of climate change has the following developmental stages: from technology to learning, innovation and from international to collaborations. Power Sector together with related firms generate power through the use of (a) Oil (b) Coal (c) Gas (4) Nuclear (5) Wind (f) Hydropower (6) Coal with CCS (7) Gas with CCS (8) Coal with CCS (9) Biomass with CCS [23]. Cities and its buildings are essentially responsible for the climate change It utilizes 70% of energy and exactly carbon emission. Socio-economic stability of urban cities areas solely depend on its adequacy, availability of its affordable housing [24].

### 1.2 Theoretical syntheses of carbon society models, policies and principles

These forms the contents of Policies, Acts and other related environmental challenges issues. [25], the research conducted used the following dependent variables; Oil price, coal price, gas price, temperature, availability, stock price, commodity, corporate risk premium, carbon price, carbon off set price and overall location. Passive House Planning Package (PHPP) is an energy software principally used to determined energy performance [26]. Data was collected through web-based survey and econometrics approach [27]. The work utilized socio-technical building performance in developing eco-housing in UK [28]. Climate change and carbon Models calculations [29], European Union in its consideration developed a Cap-Trade Scheme in reaction to the general obligation of Kyoto Protocols [30]. European Union Carbon Emission Trading Scheme (EUETS) is the most functionally largest across the Globe. It allows and permits industries to acquire trade permits (permission) on market financial bases. Industries that go beyond its permissible level have to purchase and acquire new additional permission in the design market. While, those that under-utilized their desirable and allowable permits level can sale its excess and this is governed by statistical. Furthermore, [31] explained that battery storage is a new technology and it is treated as a very effective medium of minimizing the intermittency of electricity generated by solar PV system. [32] classified green roof into two major categories (a) Intensive green roof (b) Extensive green roof. The classification is based on the determinant factors as its demand and stratification. The total of 80% of the perimeter of the roof is cover by vegetation while the remaining 20% is mainly used as pathways for maintenance

purposes. Cyprus building was assessed base on the existing typology of the present housing stock. In the United States on the other hand, green roof energy performance was determined using alternatives methods. [33], on the contrary, housing (building) sector had established models, theories, policies, principles and techniques postulated and developed by professionals primarily with regards to planning, designing built environment for the purpose of sustainable development to be achieved. The challenges or predicaments are further subdivided into (a) Challenges in BEA process software (b) Challenges in data transition from BIM to BEM software [34]. [35] Zero carbon building is an integral mechanism of mitigating related carbon emission within buildings. The research dwells deeply in developing theoretical boundaries model for ZCB. Literature studied so far revealed tremendous effort is being made towards low carbon society across the World as a whole. However, the study also depicts less effort is made in the subject matter in African Nations towards the development of carbon society particularly in Nigerian Housing Sector. This may be as a result of weak interest of the government together with lack of experts in the field. Low level of technology may have significant role in this issue together with lack of public awareness. Carbon emission and contribution globally of African continent is not known, this is because researches conducted in African are not sufficient. The continent is experiencing dramatic raise in population growth, land degradation and deforestation.

## 2.0 STUDY AREA

Kano Metropolis is geographically located within Latitudes  $12^{\circ} 25' N$  to  $12^{\circ} 40' N$  and Longitude  $8^{\circ} 35' E$  to  $8^{\circ} 45' E$ . It is the most developing and urbanizing cities and commercial center of the Northern Nigeria. It has annual growth rate of 3% with population of (3.5 million, 2010) projected to (4.3 million 2018). It is highly crowded with 1000 people per Square kilometer ( $KM^2$ ) and its climate is wet and dry base on Koppen's classifications [36], [37], [38], [39] stated that the traditional fortified Kano establishment reflected 10<sup>th</sup> Century and it served as the major and prominent Trans-Sahara routes for trades. Kano city is more than 1000 years and started within Dala Hill [40]. In addition, it is the Commercial center of 19 Northern states of Nigerian. Kano Metropolis is the most commercialized and industrialized metropolis in the Northern Nigeria that attract influx of migrants from and outside the region.

## 3.0 AIM

The aim of the study is to assess the air pollutants emission with reference to carbon monoxides and Nitrogen Oxides with the view to make urban and regional planning recommendation towards low carbon society.

## 4.0 MATERIAL AND METHODOLOGY

Primary data was gathered from field with the aid of gas sensing device (Gas Sensor by Crown Cone) Outdoor carbon monoxides and Nitrogen Oxides was sensed in four (4) selected local government authorities namely Kano Municipal, Fagee, Nasarawo and Tarauni based on the land uses interactions and 4 major road intersections (junctions) in each local government reading stations was sensed each in a specific days. Monday and Fridays was selected as the busiest day. Friday was used for Kano Municipal and Nassarawo while Fagee and Tarauni Monday was employed

the. The study also utilized secondary data obtained from available sources of majorly related journals. The result was tabulated for comparison. Carbon monoxides (CO) and Nitrogen oxides (NO<sub>2</sub>) was considered because both are directly linked with roads traffic and combustion of fossil fuel and related activities.



Figure 1: showing carbon sensing device by Crown Cone

## 5.0 RESULTS AND DISCURSION

Table 1 Portraying Air Quality Index (Carbon Monoxide (CO) and Nitrogen dioxide (NO<sub>2</sub>) Sensing) In Kano metropolis date:

Monday/06/2019

Location: Kano MC (Rimi Market Junction)			Location: Fagge (Kantin Kwari Junction)			Location: Nasarawa (Kwama Nasarawa Junction)			Location: Tarauni (Dangi Junction)		
Sensing Time	CO	NO <sub>2</sub>	Sensing Time	CO	NO <sub>2</sub>	Sensing Time	CO	NO <sub>2</sub>	Sensing Time	CO	NO <sub>2</sub>
8:00AM	09	00.4	8:00AM	11	00.4	8:00AM	09	00.5	8:00AM	009	00.5
12:00AM	09	00.3	12:00AM	09	00.5	12:00AM	08	00.4	12:00AM	020	00.6
2:00PM	15	00.3	2:00PM	19	00.5	2:00PM	19	00.3	2:00PM	026	00.4
4:00PM	19	00.4	4:00PM	25	00.6	4:00PM	23	00.4	4:00PM	028	00.7
Average	13	00.4	Average	16	00.5	Average	15	00.4	Average	21	00.6

Source: Field Survey,2019

The study unveiled that, Tarauni local government has the highest average value of carbon monoxides of 21Ppm. This is lightly closely doubled the average value of Kano Municipal local government. The local government is characterized with carbon emission related activities. The study also indicates that on the other hand, Tarauni local government demonstrates the highest records of Nitrogen Oxides (NO<sub>2</sub>). This is due to its high volume of traffic. Nassarawa and Fagge local governments relatively portrays very close records of sensed carbon monoxides with 16Ppm and 15Ppm. Additionally, Nitrogen Oxides records of the two local government maintain closely records with 00.5 For Fagge

local government while 00.4 is for Nassarawo local government. The result further indicates that Kano Municipal local government maintain the least records of both Carbon monoxides and Nitrogen Oxides of 13Ppm and 00.4. This is due to the facts, the traditional city has less vehicular movements because of its connectivity challenges with the walled city. This therefore affects its rate of emission.

## 6.0 FINDINGS

The field survey unveiled that residents of Kano Metropolis 4 out of every 10 residents own personal generator for power supply for domestic purpose such as cooling, heating and for powering electric appliances such as hand phones, laptops and related. This is because of insufficient power supply by the national grid in the metropolis. This result thousands of generator to be on simultaneously thereby generating air pollution. The study also portrayed that generators supply power to commercial and services related light industries such as Services industries as Banks Food processing industries, Commercial and Privates Vehicles, Welder work shop industries. The study also showed that shopping malls and Markets to some extent rely on the personal standby generator for Cooling purpose (Fans, Refrigerators and Cell phones and related charging. Building Constructions on the other hand as the metropolis is experience urban expansion contribute greatly in polluting air quality in the metropolis. Heavy industrial construction machines used both for road constructions and buildings aided air pollution. Vehicular movement within the study area also play vital role in the air pollution promotion Motor. Heavy vehicular movement especially densely commercial zones. Commercial tricycles riders dominate the entire major roads contribute significant in the air pollutant emission Cycles. Heavy Industries and Plants operating with the industrial lay-outs also responsibly contribute to the air pollutions within the study area.

## 7.0 CONCLUSION

Literature studied so far revealed tremendous effort is being made towards low carbon society across the World as a whole. However, the study also depicts less effort is made in the subject matter in African Nations towards the development of carbon society. Reasons for this big gap is unknown. This call for strong recommendations of research should be carry out on this issue particularly in Nigerian Residential Housing sector specifically in Kano Metropolis. The literature unveiled the potentials of housing sectors both energy utilization, carbon emission together with possibilities of mitigating measures in-terms of energy usage changing behavior, utilization of green building technology, clean energy implementations, environmental friendly building materials and government regulations through effective development control, zoning regulation. Housing sectors particularly dominates high energy consumption and consequentially, the sector play vital role in the carbon emission as stated in the literature. The research showed less efforts of African nations with regards to the low carbon society development in the context of residential housing carbon emission and mitigation measures. This was the pivotal motivational factor that encouraged the researcher's interest. This will also serves as a turning point for providing solution to the African environmental challenges while promoting low carbon society development together with supporting sustainable development particularly in Nigerian densely populated area



like Kano Metropolis. The study aims at synthesizing literatures with regards to contribution of housing sector towards low carbon society development with the view to gain knowledge for further studies. These are summary of way forwards, suggestions, and predictions with regards to low carbon society development through housing sectors from the literature studied. This shows an overview of the housing sector's contribution towards low carbon society development. Housing sector across the globe consume high energy with relatively high emission. This is because housing accommodate greater percentage of sociological and psychological activities in all ramifications. For examples, sleeping, cooking, indoors recreational, trading (petty trading) and some houses are used as work spaces and offices as well. All the required high energy supply and utilization (carbon emission). Yet, housing as revealed by scholars can effectively be used as a tool for implementing low carbon society plans. On the other hand, scholars unveiled the potentialities of housing sector in mitigating carbon emission. These challenges can be tackled through cut down of resilience of fossil fuel, low energy passive building, smart grids, tri generation district heating and cooling system, wind farming, solar arrays, small scale hydrocarbon plants and closed looped system. Central government is to regulate guide lines, institutional frame work and policy, Local authority's management system establishment. Furthermore, Partnership between central government and city government in formulating management system, Co-ordination of policies, Development of low carbon development plan. Comments on the issues of professional skills are essentials for low energy construction [41]. Brundtland Commission report on sustainable development of 1987 captured numerous initiation reference to education for the changing of people psychology towards sustainability [42]. In addition for the change to take place in the context of social practice, these elements are essentials; Know-how and contained habit Institutionalized knowledge, Engagement and Technologies available. Carbon emission and contribution globally of African continent is not known, this is because researches conducted are but very few. The continent is experiencing dramatic raise in population growth, land degradation and deforestation

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