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MEASUREMENTS OF CARBON MONOXIDE CONCENTRATIONS AND THE MEASUREMENTS OF CARBON MONOXIDE POLLUTION IN MINNA, NIGER (GIS) MEASUREMENT OF A UNIQUE GEOGRAPH OF A UNIQUE GEOGRA

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Abstract
Air pollution arising from the release of toxic gases during the process of combustion is Air pollution arising from the release of coal-powered in most households because the use of coal-powered and wood-commonly encountered; the use of petrol- and diesel- powered generators. commonly encountered in most house roll and diesel- powered and wood fire hearths is widespread; the use of petrol- and diesel- powered generators is also fire hearths is widespread, the disc of proceedings is also becoming very popular. This study was undertaken in order to determine the trend of becoming very popular. This study was undertaken in order to determine the trend of becoming very popular. becoming very popular. This study the becoming very popular. This study the trend of carbon monoxide concentrations in Minna, Niger State. Data acquisition procedure was carbon monoxide meter, and about 6000 households. carbon monoxide concentrations in the monoxide meter, and about 6000 households were facilitated by the use of the carbon monoxide meter, and about 6000 households were representation of the carbon will facilitated by the use of the carbon were visited for this exercise. The data acquisition procedure was basically a house-to-house visited for this exercise. The data acquisition procedure was basically a house-to-house visited for this exercise. exercise whence the GPS unit and the CO meter were employed to gather geo-referenced data and CO pollution level data. The north-south axis of Minna from Maikunkele to Chanchaga and the east-west axis from Maitumbi to Kpakungu were covered in this Chanchaga and the east west and interest occupied for this investigation showed investigation. All of the stations of carbon monoxide explains a showed investigation. All of the stations of carbon monoxide, explaining the green insignificant levels of ambient concentrations of carbon monoxide, explaining the green dotted colour coding on the result maps. The major neighbourhoods of Minna township like Chanchaga, Maitumbi, Minna Central, Bosso, and Tunga have high green dot densities because of the high residence density of those areas. The insignificant values of carbon monoxide observed for this work is due to the fact the nearly all of the sources surveyed were outdoor sources that encourage rapid dispersion of the CO gas into the atmosphere. By use of the Geographical Information System (GIS) platform, a carbon dioxide pollution layer for Minna has been created, a novelty in itself. The final pollution map is a perfect guide to the overall CO pollution trend of Minna.

Environmental pollution, geo-referencing, GIS, pollution map **Keywords:**

Introduction

There is no doubt that air pollution arising principally from the release of toxic

gases during the process of combustion is commonly encountered in most households. As a way out of the economic crunch, householders have now resorted to the use of coal-powered and wood-fire hearths thereby exposing families to pollution when these hearths are in use. Also the use of petrol- and diesel- powered generators by householders to generate their own electricity is a major source of air pollution. It is with this fact in mind that this project was undertaken in order to determine the trend of carbon monoxide concentration in Minna, Niger State.

Carbon monoxide (chemical formula CO) is a colourless, odourless, tasteless, yet highly toxic gas. Its molecules consist of one carbon atom and one oxygen atom, connected by a covalent double bond and a dative covalent bond. It is the simplest oxocarbon, and can be viewed as the anhydride of formic acid (CH_2O_2) . Carbon monoxide is produced from the partial oxidation of carbon containing compound; it forms in preference to the more usual carbon dioxide (CO_2) when there is a reduced availability of oxygen, such as when operating a stove or an internal combustion engine in an enclosed space. Carbon monoxide has significant fuel value, burning in air with a characteristic blue flame, producing carbon dioxide. Despite its serious toxicity, it was once widely used (as the main component of coal gas) for domestic lighting, cooking and heating, and in the production of nickel. Carbon monoxide still plays a major role in modern technology, in industrial processes such as iron smelting and as a precursor to myriad products (www.carbon monoxide emission.com).

Environmental pollution is the disruption of the natural equilibrium between the living species and their natural environment. The degradation of the environment has resulted in increase in diseases, reduction of the average life spans and growth in infant mortality rates. Civilization appears to have gone berserk and the future of planet earth has never been in greater jeopardy than it is today (www.wikipedia.com).

Sources of carbon monoxide are numerous and prevalent in everyday life. In its natural state, carbon monoxide will usually dissipate quickly over a large area without posing any significant threat to human health. However, non-natural carbon monoxide emissions produced as a result of incomplete burning of carbon-containing fuels, including coal, wood, charcoal, natural gas, and fuel oil, are harmful to the body. The three main areas of carbon monoxide emissions are residential, industrial, and in the field of transportation.

Carbon monoxide concentration is measured in parts per million (ppm), a standard measurement unit in which zero is the lowest level on the scale. Typical concentrations are given below:

- 0.1ppm natural background atmosphere level
- 0.5 to 5ppm average background level in homes
- . 5 to 15ppm levels near properly adjusted gas stoves in homes
- 5,000ppm chimney of a home wood fire
- 7,000ppm undiluted warm car exhaust without catalytic converter

The natural background atmosphere level is 0.1ppm (parts per million) which is very convenient to life in the environment. The average carbon monoxide levels in homes without gas stoves vary from 0.5 to 5ppm (parts per million). Levels near properly

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Inhaled carbon monoxide will rapidly declared on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending on the amount of CO inhaled its ability to carry oxygen throughout the body. Depending the local control of the local its ability to carry oxygen throughout the body. Depending the local control of the local c ability to carry only effects caused by this gas something. There are a poisoning significant harmful effects caused by this gas something. There are a poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. There are a number of carbon monoxide can poison or kill an individual with little warning. significant natural signif Carbon monoxide carbon monoxide carbon monoxide poison. Recently, studies have vary depending on the amount of exposure to the actual poison. Recently, studies have symptoms that are supposed to the amount of exposure to the descriptions that are supposed to the amount of exposure to the descriptions that the amount of exposure to the descriptions that the amount of exposure to the descriptions are supposed to the description are supposed to residual effects on our bodies.

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residual effects on our bodies and colorless it is not always evident when it has Because carbon monoxide is odorless and colorless it is not always evident when it has Because carbon monoxide is odorless and colorless it is not always evident when it has because carbon monoxide is odorless and colorless it is not always evident when it has because carbon monoxide is odorless. Because carbon monoxide is odolless and do who have a mild to moderate problem it has become a problem in the home. Often people who have a mild to moderate problem will become a problem in the home. They might feel a little better will become a problem in the home. Often people become a problem in the home. They might feel a little better will find they feel sick while they spend time at home. They might feel a little better outside find they feel sick will have re-occurring symptoms shortly after returning home. find they feel sick while they spend time as symptoms shortly after returning home. If the family have re-occurring bouts with flu-like symptoms while in the fresh air but will have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family have re-occurring bouts with flu-like symptoms while it is a fitter family while it is a fi in the fresh air but will have re-occurring bouts with flu-like symptoms while fuel other members of the family have re-occurring bouts with flu-like symptoms while fuel other members are being used it may be time to have the house checked other members of the family nave to declar be time to have the house checked by a burning appliances are being used it may be time to have the house checked by a burning appliances are being used to have burning appliances are being used to have burning appliances are being used to have into your home to check your appliances a professional. Besides having a professional come into your home to check your appliances a professional. professional. Besides having a professional constant watch over the levels of carbon monoxide detector can be used to keep a constant watch over the levels of carbon monoxide in the home throughout the year. e in the home throughout the year.

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Persily (1996) has studied early persily (1996) has studied early measurements of carbon monoxide buildings. He noted that studies involving measurements of carbon monoxide buildings have been concerned chiefly with single and the studies involving measurements of carbon monoxide buildings. buildings. He noted that studies involved been concerned chiefly with single-family concentrations in residential buildings have been concerned chiefly with single-family concentrations in residential buildings residences in which personal exposure residences. These studies include CO concentrations associated with various residences. These studies include CO concentrations associated with various activities monitors were used to determine CO concentrations associated with various activities monitors were used to determine co contents and micro environments. There have also been a number of indoor air quality surveys of and micro environments. There have also been a number of indoor pollutants were and micro environments. There have also be large numbers of residential buildings in which multiple indoor pollutants were sampled, large numbers of residential buildings in which multiple indoor pollutants were sampled, large numbers of residential buildings in the large numbers of resid location in each building, they provide information on indoor levels and the sources associated with indoor CO. A limited number of studies have involved multi-point sampling of CO. Finally, there have been a number of investigations of the factors that impact CO concentrations and the spatial and temporal variation in these concentrations. While not all of the studies indicate where and at what height the CO concentration was measured, this information is provided when it is available.

There have been a number of studies designed to determine the levels of human exposure to CO. These studies have included personal monitoring studies in which Journal Of Science, Technology, Mathematics And Education (Jostmed) Volume 7(3), August 2011

occupants wore personal exposure monitors for 24 hours or more and recorded their occupants word and locations in diaries (Akland et al., 1985; Nagda and Koontz, 1985). These activities are provided information on CO over activities and recorded information on CO exposure as a function of activity and micro environment, such as parking garages, motor vehicles, outdoors, and residential buildings. Some studies have focused on CO exposure in buildings, and in some cases on exposure in specific locations within buildings. One of these studies focused on men with exposure in specific disease, in which they wore personal CO monitors that recorded one minute average CO concentrations (Colome et al., 1992). The study participants also minute average of their activities, locations and symptoms. In addition to information on health symptoms, the results of this study included information on CO exposure as a function of occupant activity and location. The highest personal exposures were associated with driving automobiles and using small gasoline appliances for lawn care or cutting wood, and CO concentrations are reported for a number of indoor spaces including residential buildings by room type, e.g. kitchen, living room, and bedroom. In residential buildings, mean one-minute CO exposures ranged from 4mg/m³ to 4.6mg/m³ (3.5ppm and 4.0ppm) in family rooms, kitchens, dining rooms and living rooms, from 2.4mg/m³ to 3.4mg/m³ (2.1ppm and 3.0ppm) in bedrooms, bathrooms and laundry rooms, and 4.5mg/m³ (3.9ppm) in garages or enclosed carports. However, maximum concentrations were above 100mg/m³ (87ppm) in family rooms, kitchens and garages/carports.

A relatively recent study focused specifically on the factors that affect indoor CO levels in residential buildings (Colome et al., 1994; Wilson et al., 1993; Wilson et al., 1995). In this study, 48-h and 8-h average CO concentrations were monitored in about 300 homes in California and were related to a number of variables including the concentrations of other pollutants, house characteristics, ventilation rates, appliance type, and occupant activities. Statistical analyses were performed to determine the relationship between indoor CO concentrations and these variables. Of the 277 homes for which CO was reported, 13 had 8-h average concentrations above 10mg/m³ (9ppm), and one house had a 1-h average of about 40mg/m³ (35ppm). These two values correspond to the EPA ambient air quality standard. The findings of this study include that indoor CO levels are correlated with outdoor levels, and that high indoor CO is associated with cigarette smoking, gas fuel for cooking, wall furnaces and smaller houses. Some high levels were also associated with using gas ranges for heating and with attached garages.

There have been a number of studies in which CO concentrations were measured in residential buildings, some of which have addressed the impact of specific sources on indoor CO concentrations. In a study in manufactured houses less than 10 years old, CO exposure was monitored at a single location in each house during potable kerosene heater operation (Williams et al., 1992). The sampling locations were about 0.5m (1.6ft) above the floor and about 2m to 4m (7ft to 13ft) from the heaters. The measurement showed that three of the eight houses studied had 8-h average concentrations above or near 10mg/m³ (9ppm), the EPA 8-h ambient air quality standard. Seven of the houses had significant increases in indoor CO levels during heater operation, and one routinely had levels of 34mg/m³ to 57mg/m³ (30ppm to 50ppm) for prolonged periods.

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In a study of ventilation and made in a two- story, four-unit buildings, parker (1986) measured CO in three apartments in a two- story, four-unit buildings. Carbon measured in the main living areas of each apartment apartment. (1986) measured CO in three apartment in the main living areas of each apartment, are dioxide concentrations were measured in the measured CO concentrations were all 1 may and outside doors. The measured CO concentrations were all 1 may and outside doors. dioxide concentrations were measured. The measured CO concentrations were all 1 mg/mi from windows and outside doors. The measured smoking, in which case they were all 1 mg/mi from windows and outside doors. The significant from windows are significant from the significant from th (0.9ppm) or less except when there was a significant of the strength of the st about 5mg/m³ (4ppm). Another study of an about 5mg/m³ (4ppm) in several multi-family buildings in Canada, ranging from four to twenty-one stories, included to multi-family buildings in Canada, ranging from four to twenty-one stories, included to multi-family buildings in Canada, ranging a multi-family below 5mg/m³ (4ppm) (Gulay et al., page 200 cm) and control of the measurements. The measured levels may be measurements. The measurements al.,1993). Levels above 5mg/m³ (4ppm), up to 13mg/m³ (11ppm), appeared to be al.,1993). Levels above 5mg/m³ (4ppm), up to 13mg/m³ (11ppm), appeared to be al.,1993). Levels above Sing/in (1997). Levels above Sing/in (1997). The report on this study did not include associated with underground parking garages. The report on this study did not include associated with underground parking states as the sampling duration and location. These much detail on the measurements, such as the sampling duration and location. These much detail on the measurements, and occupational standards, which are to ambient and occupational standards, which are to ambient and occupational standards. generally low compared to ambient and occupational standards, which are based on generally low compared to simple decircumstances and in a relatively small averages over several hours. However, under some circumstances and in a relatively small averages over several hours. number of buildings, these average values and short-term peak values can be significantly above the values in these standards.

Objectives of Study

The principal objectives of this project work are as follows:

- To help prepare the framework for a carbon monoxide pollution database for (i) Minna; this project will be the substratum upon which subsequent studies would be laid.
- To help build the nucleus for an environmental awareness advocacy programme (ii) to be funded and executed by the Niger State Government.

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Methodology

Co-ordinate Identification: Whilst it would have been inconvenient doing full-scale

to house identification in the traditional manner have Co-ordinate Identification in the traditional manner because a significant portion of house-to-nouse identification for this project over a significant portion of a ordinate identification for this project over a constitution of the project over a constitution of the project over a constitution for this project over a Minna town still remain and street identifiers are conspicuously missing, co-ordinate identification for this project exercise was facilitated by the use of missing, co-oldinated by the use of hand-held Global Positioning System (GPS) units. A GPS unit measures the geographical hand-neid Global, Control of a place in terms of its longitude and latitude in units of degrees, location (and seconds. The operation of this device is done in open spaces, away from minutes and high tension cables which as a long tude on open spaces, away from minutes and second high tension cables which could be sources of interference of the trees, tall buildings, and high tension cables which could be sources of interference of the trees, tall buildings, to satellites in space. As soon as the device is switched on, signals are signals transmitted on, signals are sent from the device to a special network of geostationary satellites. When at least three or four of these satellites are located, the location or elevation of any point on the surface or roul of the earth could be fixed within an acceptable margin of error. A typical GPS device is shown in Fig.1.

Fig. 1. Typical GPS device

Field Equipment: The carbon monoxide gas meter was the core sampling equipment employed in the course of this project work. It is used to determine the ambient level of carbon monoxide concentration in the atmosphere. The sampling equipment is a potable handheld device which is easily carried around and used both indoors and outdoors, and measures the gas in a unit of parts per million (ppm). The device is powered by the use of two dry cell batteries; the power button is used to switch it on which later the screen is displayed with the manufacture brand name then the menu. When asked to display the reading the entre button is pushed and the reading is displayed which initially fluctuates until a steady value is gotten. A typical Carbon monoxide gas meter device is shown in Fig.2.

Fig. 2. Typical carbon monoxide gas meter device

Fig. 2. Typical carbon monoxide gas meter device

The data acquisition procedure was basically and the CO meter were employed together togethe Fig. 2. Typical carbon morione: The data acquisition procedure was basically a house exercise whence the GPS unit and the CO meter were employed together to Data Collection Process

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pataset of Study: About 6000 households studied in conformance with this study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. The dataset collected from the field are usually presented in conformance with the study. 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The Information System (GIS) protocol in terms of single static source representing a produced in the Geographic static source with the Geographic static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representing a produced in terms of single static source representations on the graphic static source representation in the static source representation i dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) protocol in terms of single dataset collected from GIS) pr Information System (Carpon Information System (Carpon Information System Carpon Information System (Carpon Information System (Carpon Information System Carpon Information System (Carpon Information System Carpon Information System (Carpon Information System (Carp shape, their numerical sources of carbon monoxide values, and the presence of described value). An abridged form a comparison of the measured values with the threshold value). An abridged form of the state of the carbon monoxide (determined to the carbon monoxide) and the presence of described value of the carbon monoxide (determined to the carbon monoxide). An abridged form of the carbon monoxide value of the carbon monoxide (determined to the carbon monoxide) and the presence of described value of the carbon monoxide values, and the presence of described value of the carbon monoxide value of the carbon monoxide value of the carbon monoxide (determined to the carbon monoxide). An abridged form of the carbon monoxide value of

Table 1: Abridged Form of Dataset of Study

					Pollution		
	**	Coord	inates	Location	Sources	Power Rating	CO
Shape	ID	9.6406	6.5292	Okada Road	Charcoal Hearth	3	Value Ro
Point	1	9.6407	6.5295	Okada Road	Charcoal Hearth		2 About
Point	2	9.6394	6.5292	Okada Road	Firewood Hearth		2 Absent
Point	3	9.6389	6.5299	Okada Road	Firewood Hearth		3 Absent
Point	4	9.6388	6.5299	Okada Road	Generator		3 Absent
Point	5	9.6385	6.5299	Okada Road	Generator		2 Absent
Point	6	9.6384	6.5300	Okada Road	Generator	2.0kw/220v/50Hz	3 Absent
Point	7	9,6385	6.5302	Okada Road	Generator	1.5kw/220v/50Hz	3 Absent
Point	8	9.6377	6,5303	Okada Road	Firewood Hearth	7 - 2 - 3 OHZ	1 Absent
Point	9	9.6375	6.5303	Okada Road	Generator	7.5kw/220v/50Hz	3 Absent
		9.03/3	0,5505			2500/20HZ	2 Absent
Point	10	9.6371	6.5305	Okada Road	Firewood Hearth		
Point	11	9.6366	6.5307	Okada Road	Generator	2.0kw/220v/50Hz	3 Absent
Point	12	9.6362	6.5308	Okada Road	Firewood Hearth		3 Absen
Point	13	9.6361	6.5309	Okada Road	Charcoal Hearth		2 Abser
Point	14	9.6361	6.5309	Okada Road	Milling Machine	1200w/220v/50H	0.5 Abser
Point	15	9.6362	6.5309	Okada Road	Generator	z 2.0kw/220v/50Hz	3 Abser
Point	16	9.6492	6.5229	Okada Road	Generator	2.0kw/220v/50Hz	3 Abse
Point Point	17	9.6492	6.5230	Okada Road	Generator	2.0kw/220v/50Hz	3 Abse

ourne		_				3.00,2011		
Point	18	9.6491	6.5231	Okada Road	Generator	1.5kw/220v/50Hz	1	Absent
	19	9.6490	6.5232	Okada Road	Firewood Hearth	•	3	Absent
Point	20	9.6489	6.5233	Okada Road	Charcoal Hearth		2	Absent
Point	21	9.6488	6.5233	Okada Road	Firewood Hearth		3	Absent
Point	22	9.6488	6.5235	Okada Road	Stove		3.5	Absent
Point		9.6486	6.5236	Okada Road	Firewood Hearth		3	Absent
Point		9.6485	6.5238	Okada Road	Milling Machine	1200w/220v/50hz	0.5	Absent
Point	24	9.6478	6.5244	Okada Road	Generator	1.5kw/220v/50Hz	1	Absent
Point	25	9.6477	6.5245	Okada Road	Generator	1.5kw/220v/50Hz	1	Absent
Point	26	9.6476	6.5246	Okada Road	Firewood Hearth		3	Absent
Point	27			Okada Road				
Point	28	9.6475			Charcoal Hearth		3	Absent
Point	29	9.6472	6.5243	Okada Road	Firewood Hearth		3	Absent
Point	30	9.6469	6.5241	Okada Road	Charcoal Hearth		3	Absent
Point	31	9.6468	6.5238	Okada Road	Firewood Hearth		3	Absent
Point	32	9.6472	6.5249	Okada Road	Generator	2.0kw/220v/50Hz	3	Absent
Point	33	9.6467	6.5252	Okada Road	Generator	2.0kw/220v/50Hz	3	Absent
Point	34	9.6466	6.5253	Okada Road	Generator	2.0kw/220v/50Hz	2	Absent

	_	9.6464	6.5254	Okada Road	Firewood Hearth		
	35			to Boad	Stove		3 Absent
Point	+	9.6459	6.5251	Okada Road	3.67.5		35
point	36	-	6.5249	Okada Road	Stove		3.5 Absent
1	37	9.6459	6.5243				3.5 Absent
Point	101	9.6460	6.5245	Okada Road	Generator	11.5kw/220v/50H	
	38	9.010			Congrator	2.01 (0.0	1 Absent
Point	+	9.6461	6.5242	Okada Road	Generator	2.0kw/220v/50Hz	
point	39		6.5236	Okada Road	Generator	2.0kw/220v/50Hz	3 Absent
	40	9.6458	6.5250	Ones		, V 30HZ	3 Absent
Point	+	9.6457	6.5235	Okada Road	Generator	2.0kw/220v/50Hz	
Point	41						3 Absent
1000	42	9.6478	6.5891	Mypa Road	Generator	7.5kw/220v/50Hz	
Point	172	0.6470	6.5293	Mypa Road	Generator	2.0kw/220v/50Hz	2 Absent
D. int	43	9.6479	0.5255	(1)	i .	2.3KW/220V/3UHz	3 Absent
Point	+	9.6507	6.5334	Mypa Road	Generator	2.0kw/220v/50Hz	
Point	44						3 Absent
	45	9.6509	6.5334	Mypa Road	Generator	2.0kw/220v/50Hz	3 Absent
Point	10	9.6482	6.5302	Mypa Road	Generator	7 5km/220 (5-	0301
Point	46	3.0402	0.5502	,,,pa	Scherator .	7.5kw/220v/50Hz	2 Absent
	47	9.6487	6.5309	Mypa Road	Firewood Hearth		-
Point	71						3 Absent
Point	48	9.6488	6.5309	Mypa Road	Generator	7.5kw/220v/50Hz	2 Absent
Point		9.6509	6.5335	Mypa Road	Motor audes		
Point	49		5.5555	, iypu Kodu	Motor cycles		3 Absent
	50	9.6479	6.5295	Mypa Road	Generator	11.5kw/220v/50H	3 Absent
Point	50					Z	J AUSEN
Point	51	9.6479	6.5293	Mypa Road	Firewood Hearth		3 Absent
Point	50	9.6492	6 5214				
	52	3.0732	6.5314	Mypa Road	Motor cycles		2 Absent

	53	9.6465	6.5266	Mypa Road	Firewood Hearth		3	Absen
Point								
Polite	54	9.6469	6.5264	Mypa Road	Charcoal Hearth		2	Absen
Point								
	55	9.6469	6.5271	Mypa Road	Generator	2.0kw/220v/50Hz	2	Absen
Point	56	9.6467	6.5265	Mypa Road	Charcoal Hearth		1	Absen
Point	57	9.6472	6.5269	Mypa Road	Charcoal Hearth		3	Absen
Point	58	9.6468	6.5264	Mypa Road	Generator	1.5kw/220v/50Hz	3	Absen
Point	50	3.0100	5.5207	11-11-11-11-11-11-11-11-11-11-11-11-11-	7	2.38472204730112	-	,
Politic	59	9.6473	6.5266	Mypa Road	Firewood Hearth		3	Absen
Point	60	9.6471	6.5271	Mypa Road	Generator		2	Absen
Deint	60	9.04/1	0.5271	riypa Koda	GCHEIRIO		-	Abscri
Point	61	9.6472	6.5261	Mypa Road	Charcoal Hearth	2.0kw/220v/50Hz	3	Absen
Point	62	9.6474	6.5290	Mypa Road	Generator		2	Absen
Point	02			E.E.				
10	63	9.6474	6.5266	Mypa Road	Generator	2.0kw/220v/50Hz	3	Absen
Point	64	9.6475	6.5268	Mypa Road	Stove		3.5	Absen
Point								
	65	9.6474	6.5267	Mypa Road	Generator	7.5kw/220v/50Hz	2	Absen
Point	66	9.6419	6.5264	Mypa Road	Generator	7.5kw/220v/50Hz	2	Absen
Point	67	9.6418	6.5266	Mypa Road	Charcoal Hearth		2	Absen
Point								
	68	9.6417	6.5272	Mypa Road	Stove		3.5	Abser
Point	69	9.6419	6.5267	Mypa Road	Stove		3.5	Abser

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	_	120	6.5267	Mypa Road	Firewood Hearth		
	70	9.6420	0.32		Chave		3 Absent
Point	71	9.6421	6.5267	Mypa Road	Stove	,	3.5 Absent
point			6.5268	Mypa Road	Generator	2.0kw/220v/50Hz	
	72	9.6424	0.5200		Standardh Hoarth		3 Absent
Point	73	9.6425	6.5268	Mypa Road	Charcoal Hearth		2 Absent
point		0.127	6.5268	Mypa Road	Firewood Hearth		
	74	9.6427	0.3200		Complete Com	2.004/220 /52	3 Absent
Point	75	9.6428	6.5268	Mypa Road	Generator	2.0kw/220v/50Hz	3 Absent
Point	_	9.6431	6.5268	Mypa Road	Firewood Hearth		
point	76	9.0431			Firewood Hearth		3 Absent
Politic	77	9.6432	6.5268	Mypa Road	Firewood ficardi	•	3 Absent
Point	77	9.6435	6.5269	Mypa Road	Charcoal Hearth		2 Absent
Point	11	5.0		Bood	Firewood Hearth		
	78	9.6438	6.5269	Mypa Road	THEWOOD TREATER		3 Absent
Point	79	9.6438	6.5270	Mypa Road	Firewood Hearth		3 Absent
Point	10			M Bood	Firewood Hearth		
	80	9.6429	6.5277	Mypa Road	THEWOOD TIES. ST		3 Absent
Point	81	9.6417	6.5285	Okada Road	Diesel Engine	14.kw/220v/50Hz	1 Absent
Point			1 5200	Okada Road	Firewood Hearth		
Dist	82	9.6414	6.5288	Okada Road	THE WOOd Treater		3 Absent
Point	83	9.6411	6.5289	Okada Road	Generator	2.0kw/220v/50Hz	3 Absent
Point			4 5077	Muna	Firewood Hearth		3 41
Deint	84	9.6476	6.5277	Mypa Junction	THEWOOD TREATER		3 Absent
Point	85	9.6472	6.5278	Мура	Charcoal Hearth		,2 Absent
Point				Junction	G	1 Flour/220 //FOLL-	1 11
Point	86	9.6496	6.5219	Мура	Generator	1.5kw/220v/50Hz	1 Absent

	87	9.6471		Junction Mypa	Charcoal Hearth		2 Absent
Point	88	9.6483	6.5303	unction. Mypa	Charcoal Hearth		2 Absent
Point	. 89	9.6502	6.5326	Junction Mypa	Firewood Hearth		3 Absent
Point	90	9.6476	6.5276	unction Mypa	Generator		3 Absent
Point	91	9.6494	6.5314	unction Mypa	Stove		3.5 Absent
Point	92	9.6413	6.5336	unction Mypa	Stove		3.5 Absent
Point	93	9.6475	6.5278	unction Mypa	Charcoal Hearth		2 Absent
Point	94	9.6476	6.5271	unction Mypa Road	Generator	2.0kw/220v/50Hz	3 Absent
Point	95	9.6477	6.526	5 Mypa Road	Charcoal Hearth		2 Absent
Poin	t 96	9.6473	6.526	1 Mypa Road	Generator	2.0kw/220v/50Hz	3 Absent
Poin	97	9.647	2 6.526	Mypa Road	Firewood Hearth		3 Absent
Poir	nt 98	9.645	8 6.527	73 Mypa Road	Charcoal Hearth		2 Absent

Journal Of Science, Technology, Mathematics Ana Luncus of Carbon Mon Creation of a Unique GIS Layer of Carbon Monoxide Pollution

concept of GIS: A Geographical Information System also known as GIS is a competent of GIS: A Geographical Information System and analyse the features present that take place on it. It doesn't really matter who the condesested when the events that take place a multinational conglomerate **Concept of GIS:** A Geographical Information of an analyse the features present of the sused to digitally reproduce and analyse the features present of the sused to digitally reproduce and analyse the features present of the concept of the features present of the sused system which is used to digitally reproduce and analyse the features present of the features pre concept of GIS: A Geographic digitally reproduce and the really matter whether the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally referenced and the events that take place on it. It doesn't really matter whether the based system which is used to digitally referenced and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the really matter whether the based system which is used to digitally reproduce and the really matter whether the based system which is used to digitally reproduce and the really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter whether the based system which is used to digitally reproduce and the events that take place on it. It doesn't really matter that the events is a supplier to digitally reproduce and the events are the events and the events are the events and the events are the events a concept of which is used that take place of the conglomerate, based system which is used the events that take place of the conglomerate, based system which is used the events that take place of the conglomerate whether whether the based system which is used the place of the conglomerate, a government of sustaining the events that take place of the conglomerate whether the conglomerate, a government of sustaining the congraphically referenced and organisation is a suther the place of the conglomerate, a government of local authority, two very important facts stand out:

The conglomerate is a small business, a multinational conglomerate, a government of local authority, two very important facts stand out:

The conglomerate is a small business, a multinational conglomerate, a government of local authority, two very important facts stand out:

The conglomerate is a small business of the part of the conglomerate is a small business of the conglomerate is a organisation is a Silial basiness, two very important facts stand out: department or local authority, two very important facts stand out: nent or local authority, two ton, and a stand out:

A lot of the information will be geographically referenced and a lot of the information one has, the harder it becomes the standard out:

(a)

(b)

The more information of all information in circulation possesses them.

Bearing in mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information in circulation possesses are mind that up to 70% of all information. them.

Bearing in mind that up to 7070 or an architecturation possesses and the search of geography, it is now clear that GIS must be incorporated to be any other to be a common denominator of geographical information. Unlike any other to be a common denominator of geographical information. Unlike any other to be a common denominator of geographical information. Unlike any other to be a common denominator of geography, it is now clear that GIS must be incorporated to be a common denominator of geography, it is now clear that GIS must be incorporated to be a common denominator of geography, it is now clear that GIS must be incorporated to be a common denominator of geography. Bearing III III of geography, It is not a line of the control of the common denominator of geographical information. Unlike any other to help in decision-making based upon geographical the concept of location. GIS is a common decision handling tool, GIS can understand the concept of location. GIS is a common decision handling tool, GIS can understand displaying geographical the concept of location. common denominated upon geographical the concept of location. GIS is a computer information handling tool, GIS can understand the concept of location. GIS is a computer information handling tool, manipulating and displaying geographically references to their location). Also the CIS references to the concept of location of the concept of location of the concept of location of the concept of location. in decision-making tool, GIS can understand displaying geographically referenced information handling tool, GIS can understand displaying geographically referenced information handling tool, GIS can understand displaying geographically referenced information handling tool, GIS can understand displaying geographically referenced information handling tool, GIS can understand displaying geographically referenced information handling tool, GIS can understand displaying geographically referenced information handling tool, GIS is a computer of the computer o information harding information harding manipulating information harding manipulating information. Also the GIS technology information (i.e. data identified closely to their location). Also the GIS technology information (i.e. data identified operations such as query and statistical analysis with the common database operations benefits offered by maps. system capable of data identified closely to an adversarial statistical analysis technology information (i.e. data identified closely to a query and statistical analysis technology information (i.e. data identified closely to a query and statistical analysis with the integrates common database operation analysis benefits offered by maps. Practitioners with the contraction and geographic analysis personal and the data that go in the contraction of information (i.e. analysis operations such as a state of the state of integrates common and geographic analysis of the unique visualization and geographic visualization and geographic visualization and geographic visualization and geographic vi regard the total GIS as including operating to easily calculate emergency responsiveness in A GIS would allow emergency planning to easily calculate emergency responsiveness in the event of a natural disaster.

Digitisation of Analogue Map of Study Area

Digitisation is a simplification process that converts all spatial data to a point (e.g. a polygon formed by a closed, complex line (e.g. a late) Digitisation is a simplification product by a closed, complex line (e.g., a lake), or a well), a line (e.g., a stream), a polygon formed by a closed, complex line (e.g., a lake), or a well), a line (e.g., a stream) a polygon formed by a closed, complex line (e.g., a lake), or a well), a line (e.g., a stream) a polygon formed by a closed, complex line (e.g., a lake), or a well). a well), a line (e.g., a stream), a polygon a well), a line (e.g., a stream), a polygon a well), a line (e.g., a lake), or a grid cell. Digitisation reduces all spatial entities to these simple forms because they were a grid cell. Digitisation reduces all speaking a grid cell. Digitisation reduces a grid cell. Digit easy to store in the computer. A GIS de la condities or entities as human map users do. For example, we cannot enter the entity "lake" into a GIS. Rather, as human map users do a coordinates for the lake's shoreline as a polygon. as human map users up. For example, as human map users up. For example, we entered the spatial data coordinates for the lake's shoreline as a polygon. Later, the we entered the spatial data coordinate the GIS database and will be associated with the attributes of the lake will be entered into the GIS database and will be associated with the polygon. Following the digitization of map features, the user completes the compilation polygon. Following the digital features to their respective attributes, and by cleaning up and phase by relating all spatial features to their respective attributes, and by cleaning up and correcting errors introduced as a result of the data conversion process. The end results of compilation was a set of digital files, each accurately representing all of the spatial and attribute data of interest contained on the original map manuscripts. These digital files contained geographic coordinates for spatial objects (points, lines, polygons, and cells) that represent mapped features. Although we conceptualize the GIS as a set of registered map layers, the GIS actually stores these data at a much more primitive level. The digitised map of the study area on ArcView3.3 is shown in Fig.3.



Fig.3. Digitised map of study area

Creation of a Database and Carbon Monoxide Pollution Layer Map ArcView3.3 Platform

The conventional database contains rows and columns, geographical coordinates of the locations of noise, sources of noise, rating, noise level, and pollution status (see Table 1). This same dataset on the ArcView3.3 is shown in Fig.4.

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Fig.4. Database of study area on ArcView3.3

The database was inputted and hot-linked to the spatial data (map and coordinate). Colour coding was specified whence red dots indicate presence of pollution and green dots points indicate insignificant pollution levels. The resultof the process of hot-linking the database and the digitised map on ArcView3.3 to produce the pollution status map is shown in shown in Fig.5.



Fig.5. Result of hot-linking the database and the digitised map on ArcView3.3 to produce the pollution status map

Presentation of Carbon Monoxide Emission Layer Map

The COemission layer map for Minna is shown in Fig. 6.

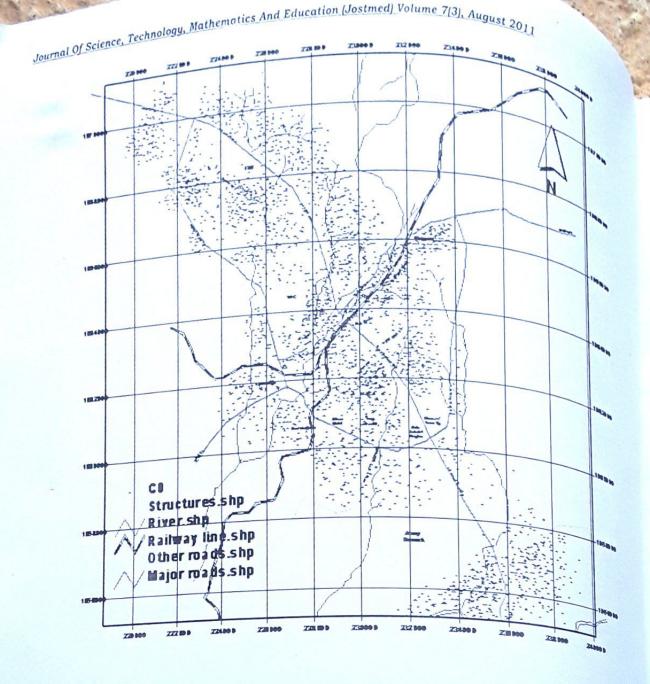


Fig.6. The Carbon monoxide emission layer map for Minna

Results and Conclusion

All of the stations of interest occupied for this project work show insignificant level of ambient concentration of carbon monoxide, explaining for the green dotted colour coding. However, from Fig.6 we see that the major neighbourhoods of Minna township like Chanchaga, Maitumbi, Minna Central, Bosso, and Tunga have high green dot densities because of the high residence density of those areas. It also observed that the green dots are spread over the central region of Minna territory corresponding to residency patterns.

The insignificant values of carbon monoxide observed for this work is due to the fact the nearly all of the sources surveyed were outdoor sources that encourage rapid dispersion of the CO gas in the atmosphere. Nevertheless, the final pollution map is a perfect guide to the overall air pollution trend of Minna.

Recommendation

In spite of the fact that CO pollution is absent in all the household surveyed in Minna, the study group members recommend that public health awareness campaign should nevertheless be initiated to better educate the populace on the hazards of over-exposure to combustion products.

The result of this study is actually futuristic in its outlook, thus it is strongly recommended that a GIS host platform for Minna be created so that the interactive nature of the carbon monoxide pollution map of Fig.6 can be fully exploited.

It is also recommended that novelty studies of this kind be replicated in the major towns and cities of Nigeria.

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