DEVELOPMENT AND IMPLEMENTATION OF A WEB-BASED GEOSPATIAL DATABASE FOR CONTROL AND MANAGEMENT OF DRUG ABUSE PREVALENCE IN ANAMBRA STATE

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Abstract
Drug abuse is becoming a serious threat in our society. Within the last decade, the involvement of Nigerian youths in drug related offences is becoming worrisome. Studies conducted by the National Drug Law Enforcement Agency (NDLEA) revealed that youths of both sex and between the ages of 13-35 years constitute the high-risk group for drug abuse in our society. Secondary school pupils are not left out, as some of them now indulge in drug abuse. Hence this study is aimed at creating a geospatial database and mapping of these drug-abuse hotspots and agencies involved so as to reduce or curb the drug-abuse incidents within the State. GIS has been identified as a veritable tool in tracking, monitoring and evaluating the occurrence and rate of drug-abuse in various streets and towns in Anambra State. Coordinates of the respective drug-abuse hotspots were captured with the use of a Garmin 760CS handheld GPS, these coordinates where later inputted in a GIS, ArcGIS 10.5 software and was used to map these hideouts. Also, several analyses like network analysis, buffering, time-distance analysis, cluster analysis and kernel density analysis were done in order to monitor the hotspots and cold-spots so as to depict the rate of occurrence in different towns. The results of these analyses show that Onitsha, Awka, Agulu, Nkpor and Nnewi posses the greater rate of occurrence due to the influence of the pressures due business districts and institutions which tends to bring so many youths together and this tends to increase the rate of illicit drug-abuse. The distance-time response analysis was done to identify the distance and time of response from several law enforcement agencies to the respective drug-abuse hideouts. Absence of a yearly occurrence record was serious trait through the period of the research work. It is recommended that pattern analysis, site suitability and positioning analysis should be done in future researches in order to track the rate of prevalence and as well map new prescribed sites for these law enforcement agencies outpost.

Keywords: Drug abuse, Geospatial database, GIS, Management

Introduction

The issue of drug abuse among our youths is becoming a serious concern in our society. A study by the Nigerian Drug Law Enforcement Agency (NDLEA) shows that 15-20 percent of drug addicts are females while males constitute about 50-55 percent, all comprising of traders, students, unskilled workers and the unemployed.

Anambra state is one of the states in Nigeria with the highest number of youths. Onitsha, with some of other major cities in the state such Nnewi and Awka is notorious for drug-related offences. Some of these cities are characterized by slums, which act as breeding ground for the drug abuse. Frequent arrest and release of the offenders have not reduced the number of drug abuse offenders. Efforts by the NDLEA and other security agencies have not yielded the desired results in controlling drug abuse.

Geospatial technology offers a very important and veritable tool to map and model the prevalence of drug abuse and assist in control and management. Geographic Information System (GIS), a system for capturing, storing,

querying, analyzing and displaying geographically referenced data, offers itself as an effective tool for modeling, mapping and monitoring of prevalence of drug abuse. GIS can enable us to monitor the activities of drug addicts so as to know where, when, what and who needed drug abuse assisted programs.

Drug abuse has contributed to the numerous problems we are having in our society. Anambra state is not an exception. Many youths engage in various evil activities such as robbery, rape, thuggery because of their involvement in drugs. Some of the causes of accidents on our highways are related to drugs.

One of the factors militating against eradication of drug abuse in our society is that the

NDLEA and other security agencies do not have enough data to scientifically map and model the numerous factors that contribute to drug abuse. This research seeks to develop and implement a geospatial database for control and management of drug abuse prevalence in Anambra State.

Anambra state is one of the States in southeastern Nigeria. It is located between Latitude 6˚20'N and 7˚00'N and Longitude 6˚33'E and 7˚00'E. It is bounded by Delta State to the west, Imo State to the south, Enugu State to the east, and Kogi State to the North, with its capital in Awka. The State has an area of 4,593kmsq (1870sq mi), and have an approximated population of 4.1million according to 2006 national census (National Population Commission, 2006). The Indigenous ethnic groups in Anambra State are the Igbo (98% of population) and a small population of Igala (2% of the population), who live mainly in the north-western part of the state. Economy of Anambra state is solely on farming and business. The study area is located in the tropical rain forest zone with a derived savannah. It has a tropical savannah climate with its humidity at its peak between the month of March to November.

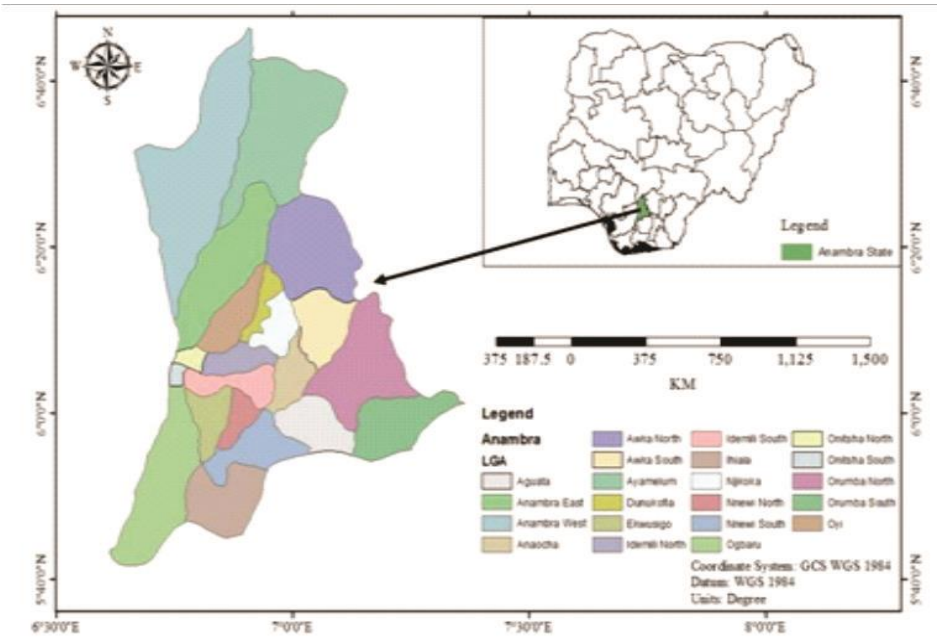


Fig 1.1: Map of Anambra State showing its position in Nigeria

Primary Data: the primary data that was used for this study includes:

I. Areas of concentration of drug abuse in the State.
ii. Types of drugs abused and concentration points (Pharmacy professionals will be needed here).
iii. Percentage (%) of population involved

Secondary Data: the secondary data that was used includes:

I. 0.25cm Aerial Photograph of the entire State
ii. Political maps of State and Local Government Areas with boundaries
iii. Utility maps- includes road networks, urban planimetric maps
iv. Population Data
v. Location of Health facilities, Rehabilitation and Education centers etc.
vi. Location of Law Enforcement offices.

The primary data was obtained from field visit and questionnaires. The political maps of the state and local government, utility maps were obtained from the Survey Department of the Ministry of Lands, Survey and Town Planning Awka. The 0.25cm spatial resolution aerial photograph (2015) was obtained from the Awka Capital Territory Development Authority (ACTDA). The population data was obtained from National Population Commission (NPC) Awka. Professionals in Pharmacy and officials of NDLEA assisted in providing information concerning most frequently abused drugs and characteristics and spread of such drugs. Drug abuse locations were obtained through an oral interview of officials of NDLEA office Awka, since there was no documented list of the hotspots as of then. The coordinates of these hotspots provided were obtained using handheld GPS during field visit to those locations.

The methodological flow chart is shown in figure 4.1 below

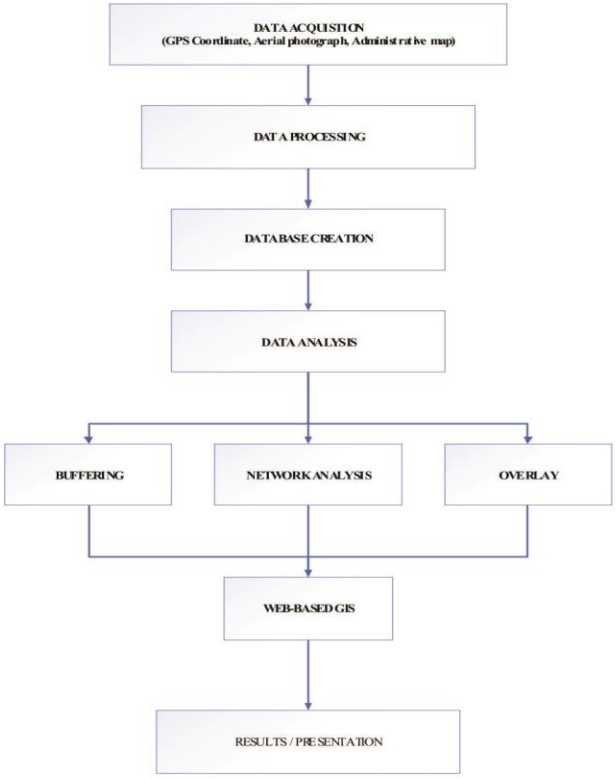


Fig: 2.1: Flowchart for Production of the methodology

Data Processing and Database creation

The analogue maps were scanned using AO Scanner. The scanned maps were georeferenced, digitized and integrated with the very high resolution aerial photograph.

The sample questionnaire was designed based on some selected persons likely to abuse drugs and types of drugs in common use such as Injected Drug Users (IDUs), Men having sex with men (MSM), Male sexual workers (MSW) and Female sexual workers (FSW). The possible location where drug abusers are located were categorized into Brothel, Street, Home-based, Bar/Night club/Casino-based, Hotel/lodge, massage parlour, Hostel/campus based, trailer (truck) stop, Escort (call girls/mobile) and others. These categories are the Spot category. Also, venue listing and profiling was conducted. The objective was to identify and characterize the key venues and locales where people meet new drug partners as well as describe the emotional behaviours and networking patterns at key venues and locales. The following was categorized under venue: Bars, Night clubs, Hotel, lodge, commercial parks, campus, under bridge/open space, cinema, shopping malls, mechanic village, beauty salons, internet café point and kill/fish joint, brothel, street and others. The list of hot spot identified in that zone + the venue list for that zone = the master list of venues to be profiled. The venues listed on the master list were visited. On the second visit, the venues were validated to ensure that they are still active.

At the stage, the geographic positions of the venues were obtained using handheld GPS. Also, other attribute values that may have contributed to the Spot being used as well as a spatial attribute of the Spot were obtained.

The questionnaire sample was used to create the database. The geographic locations of the validated Spots were plotted into the digitized map/ aerial photograph of the zone. Also, the location of health facilities, rehabilitation, police stations, NDLEA offices and Agents and education centers were plotted on the map. Their attribute data were added and several queries were performed using the database created.

Spatial Database System Implementation and Analyses

Several queries were performed to test the effectiveness of the database. Also, network analysis, buffering and clustering were carried out. Such queries include:

I. Query showing the geographic location of the target person "Drug abusers" as well as its attribute.

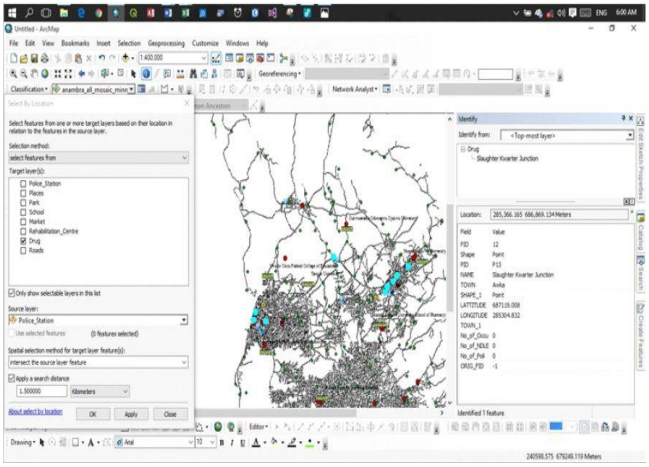


Fig: 3.1: Sample query analysis in Arcmap showing drug-abuse locations that is within the distance of 1.5km to police stations

The sample query result shows the location of drug abusers within a distance of 1.5km from police stations.

i. Query showing the maximum number of drug addicts that visit a particular spot/town.

This analysis was carried out to known the location with highest number of occurrence of drug abuse within the study area using clustering analysis. Fig 3.2 Shows the classification model for the cluster of drug abuse.

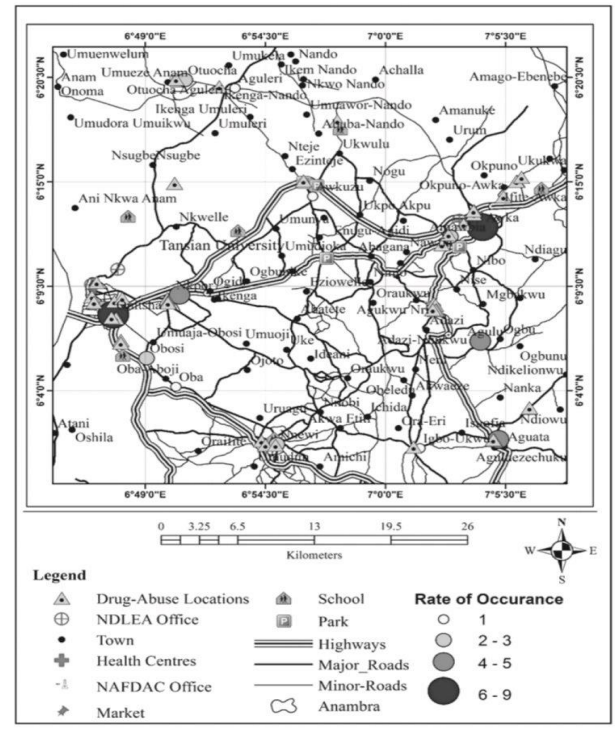


Fig: 3.2: classification model for cluster rate.

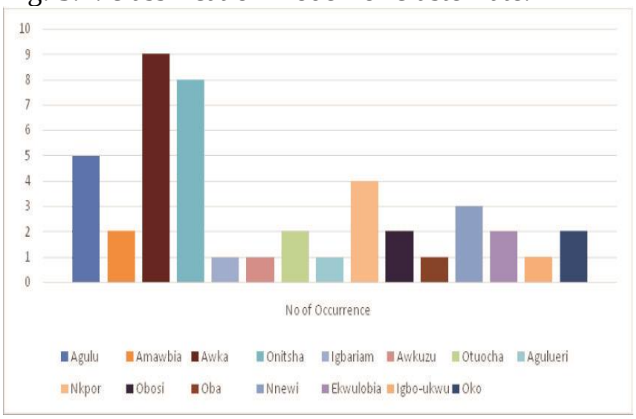


Fig. 3.3: Bar chart showing the rate of occurrence of drug-abuse within the towns of the State.

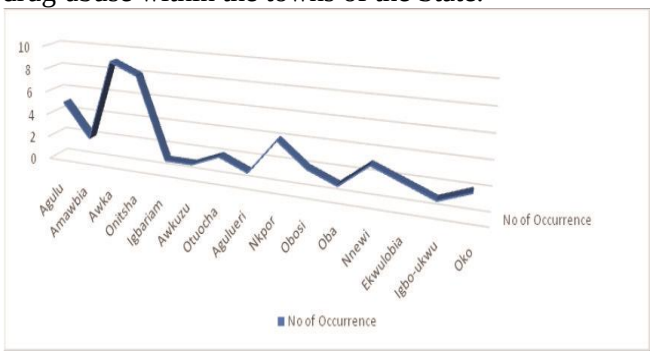


Fig. 3.4: Graph showing the rate of occurrence of drug-abuse within the towns of the State.

The result of the query presented in figure 3.2 and 3.3 shows at a glance the rate of occurrence of drug abuse locations in the Study area. It can be seen that Awka and Onitsha has the highest number of drug abuse locations while places like Oba, Otuocha, Igbo-ukwu etc. has the lowest rate of occurrence.

This was further analyzed to know if there is a relationship between presence of law enforcement agencies (NDLEA and Police) and the location of the hot spots. The result is presented in figure 3.4.

S/N	Names of Hotspots	Town	Distance	Time
1	Central School, Adabebe	Amawbia	**4.28963KM**	**6.434mins**
2	Community Primary School	Amawbia	**2.59803KM**	**3.897mins**
3	Oringo Lodge, Enu-Ifite off Gauze Pharmacy	Awka	**4.87472KM**	**6.989mins**
4	Five Deckings Lodge, Ifite	Awka	**6.90302KM**	**9.262mins**
5	Dubia Lodge, Ifite	Awka	**6.82835KM**	**9.173mins**
6	Divine Lodge Junction, Ifite	Awka	**7.44954KM**	**9.918mins**
7	Elite Lodge, behind God is Good Motors	Awka	**1.53633KM**	**2.305mins**
8	Slaughter Quarter Junction	Awka	**0.86251KM**	**1.294mins**
9	Abakaliki Street	Awka	**1.75578KM**	**2.634mins**
10	Kofi night club	Awka	**1.75578KM**	**2.634mins**
11	Sylvason Lodge, Eziumenwa	Agulu	**9.58786KM**	**14.00mins**
12	Choomy Place, Eziumenwa	Agulu	**9.91985KM**	**14.50mins**
13	Bakery Lodge, Apapa	Agulu	**10.2922KM**	**15.06mins**
14	Las Vegas, Apapa	Agulu	**10.3869KM**	**15.20mins**
15	Jeoking Lodge, Ezinano	Agulu	**10.3869KM**	**15.20mins**

Table 1.1: Table showing the response time from NDLEA office Udoka estate Awka to drug- abuse hotspots within 10km radius.

Buffering was carried out in order to know the hotspots within a given radius to NDLEA office, Police stations, Rehabilitation center and Psychiatric hospital. This was done with Arcmap 10.5 and different radii were employed as shown in Figure 3.6.

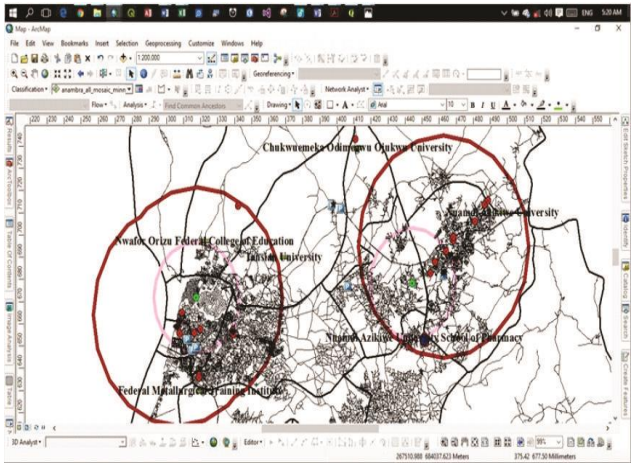


Fig: 3.6: Part of Buffering result showing, NDLEA offices and Health centers at different radii.

Figure 3.6 tries to depict the locations of law enforcement agencies offices at different radius with the attribute of the location involved. It can also be seen from figure 3.6, that the drug abuse location is represented with red colour while the law enforcement agencies offices were represented as green colour. The presence of higher institutions such as Nnamdi Azikiwe University and Chukwuemeka Odumegwu Ojukwu University largely contribute to high rate of drug abuse as can be seen in figure 3.6.

Kernel density analysis was used to model the distribution of drug abuse with the study area. The result of the analysis shows the towns with the highest number of occurrence of drug abuse as can be seen in figure 3.7.

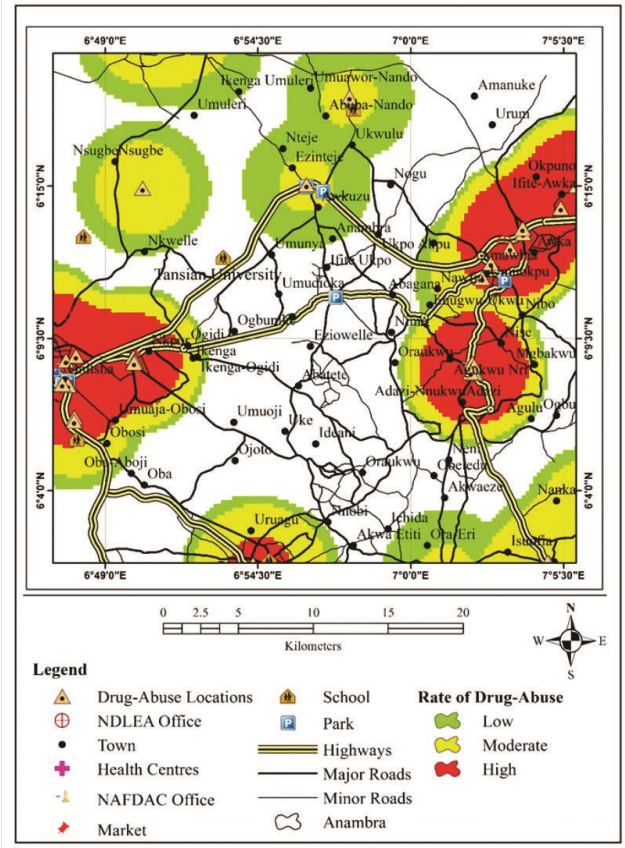


Fig: 3.7: Rate of distribution of drug abuse in the State

It can be seen from figure 3.7, that the legend contains attributes which include drug abuse location, NDLEA office, Health Centers, market, school, park, roads, Rates of Drug Abuse. The Low, moderate and high rate of drug abuse was represented with green, yellow and red color respectively. The towns the fell within the low rate shows that it has low rate of drug abuse while those that fell under high rates means that such towns have high rate of abuse. This can aid in decision making especially in the location of law enforcement agencies in the State.

QGIS plugin (qgis2web) python language was used for the web-based implementation of the database. The sample window of the design and implementation as it appears in Google chrome is shown in figure 3.8 and 3.9 respectively.

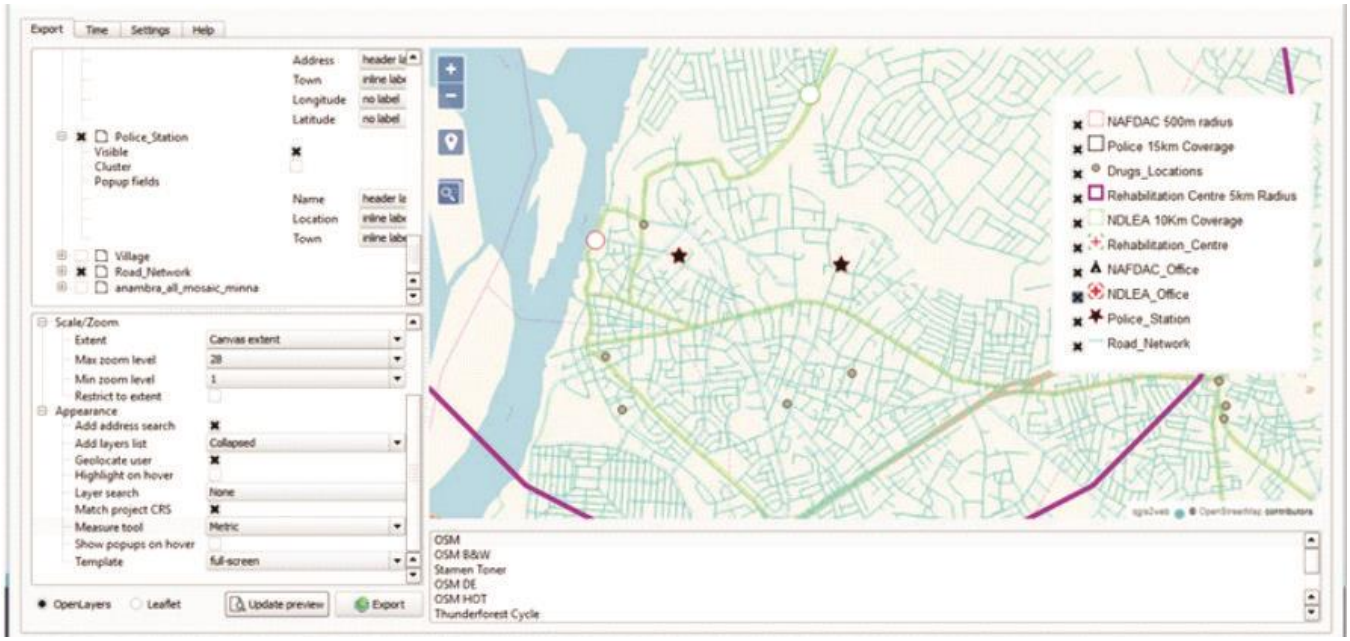


Fig: 3.8: Sample window of the design

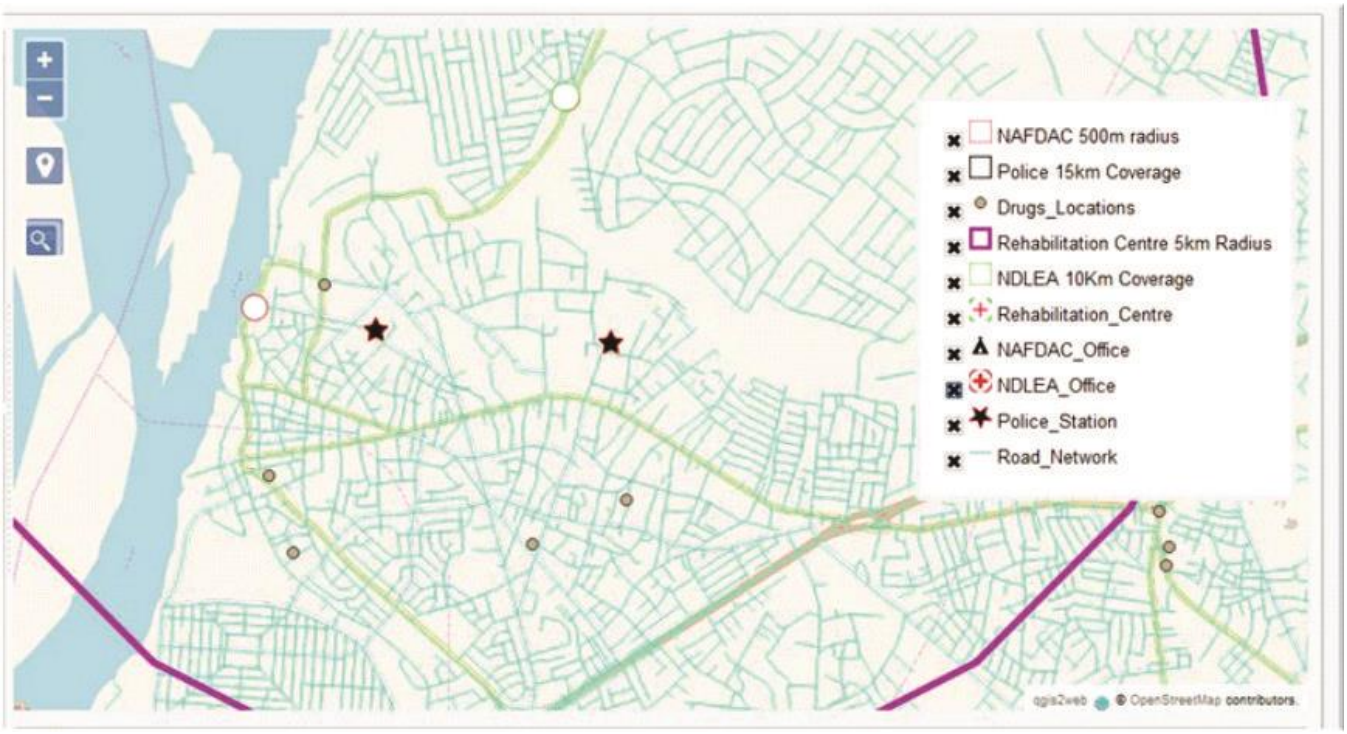


Fig. 3.9: Web-based guide for drug abuse hotspots and other forces as it appears in Google chrome.

Conclusion

This study has demonstrated the effectiveness of GIS in developing and implementing web-based database. The result of the study shows that Awka and Onitsha has the highest number of drug abuse locations while places like Oba, otuocha, Igboukwu has the lowest rate of occurrence.

The study also established a relationship between presence of law enforcement agencies (NDLEA and Police) and the location of the drug abuse hot spots.

Based on the findings of this study, the following are recommended:

i. The NDLEA should intensify effort in creating awareness on the effects of drug abuse.

ii. More presence of law enforcement agencies should be established especially around the higher Institutions and motor parks.

iii. Drug abuse trend prediction should be carried out using logistic regression analysis. This analysis will help to determine the likely number of drug addicts in the future using the available data, the trend of spread geographically and the cost in terms of human resources. This was not carried out in this study because of lack of periodic data.

PID	Name of Drug-Abuse Locations	TOWN	SHAPE	EASTINGS	NORTHINGS	No of Occurrence	No of NDLEA Office	No of Police Stations
P1	Sylvason Lodge, Eziumenwa	Agulu	Point	679462.73	282767.109	5	0	1
P2	Choomy Place, Eziumenwa	Agulu	Point	679265.92	282898.562	2	0	1
P3	Bakery Lodge, Apapa	Agulu	Point	678810.999	282977.953	5	0	1
P4	Las Vegas, Apapa	Agulu	Point	678766.37	282894.301	3	0	1
P5	Jeoking Lodge, Ezinano	Agulu	Point	678836.693	282660.394	3	0	1
P6	Central School, Adabebe	Amawbia	Point	685124.623	283457.487	2	0	3
P7	Community Primary School	Amawbia	Point	686113.955	284020.778	2	1	3
P8	Oringo Lodge, Enu-Ifite off Gauze Pharmacy	Awka	Point	689772.93	288675.103	1	1	1
P9	Five Deckings Lodge, Ifite	Awka	Point	691254.414	289836.854	9	1	1
P10	Dubai Lodge, Ifite	Awka	Point	691264.457	289778.421	8	1	1
P11	Divine Lodge Junction, Ifite	Awka	Point	691661.715	290211.193	9	1	1
P12	Elite Lodge, behind God is Good Motors	Awka	Point	688090.052	286172.826	5	1	1
P13	Slaughter Quarter Junction	Awka	Point	687119.008	285304.832	6	1	1
P14	Abakaliki Street	Awka	Point	688408.689	286203.589	8	1	1
P15	Kofi night club	Awka	Point	688404.588	286135.856	9	1	1
P16	Bishop Crowther Memorial School Trans-Nkisi	Awka	Point	681580.839	254279.32	5	1	1
P17	Nimek Plaza, Main Market (EmekaOffor Plaza)	Onitsha	Point	680209.557	253873.108	9	2	3
P18	Bida Road (Bunk)	Onitsha	Point	679664.376	254052.092	5	2	3
P19	Metropolitan Secondary School	Onitsha	Point	679727.289	255762.508	8	2	3

P20	Ime Obi Field	Onitsha	Point	680037.382	256432.17	7	2	3
P21	Aba Park, Upper Iweka	Onitsha	Point	678146.798	255942.161	7	2	3
P22	Uwa-Mgbede, Upper Iweka	Onitsha	Point	678089.581	255892.551	9	2	3
P23	Lagos Park, Upper Iweka	Onitsha	Point	678167.766	255517.272	5	0	3
P24	Owerri Park, Upper Iweka	Onitsha	Point	674893.782	225903.607	5	0	3
P25	Igbariam Campus	Igbariam	Point	697204.233	274674.273	2	0	3
P26	Awkuzu Motor Park	Awkuzu	Point	691378.294	271793.366	2	0	0
P27	Otuocha Waterside Market	Otuocha	Point	691193.621	260910.798	1	0	0
P28	Otuocha Waterside Market Parks	Otuocha	Point	701278.845	261058.479	4	0	0
P29	Aguleri Roundabout (Timber)	Aguleri	Point	700547.228	264708.257	4	0	0
P30	Nkpor Junction	Nkpor	Point	679957.725	260242.108	5	0	0
P31	Nkpor Park	Nkpor	Point	679706.628	260308.882	4	0	0
P32	Nkpor Park	Nkpor	Point	679648.585	260345.833	3	0	0
P33	Nkpor Park	Nkpor	Point	679575.627	260290.757	6	0	0
P34	MgbukaObosi	Obosi	Point	675953.834	256311.826	2	0	0
P35	MgbukaObosi	Obosi	Point	675697.818	256289.584	2	0	0
P36	PDP Secretariat, Old road	Oba	Point	630399.171	225896.553	1	0	0
P37	White House Nnewi	Nnewi	Point	666134.603	268135.34	3	0	0
P38	Slaughter Nnewi	Nnewi	Point	665750.235	268484.031	3	0	0
P39	100 Foot Road Nnewi	Nnewi	Point	665727.457	269329.117	2	0	0
P40	Ekwulobia Roundabout Park	Ekwulobia	Point	666121.543	287836.538	2	0	0
P41	Ekwulobia Roundabout Park	Ekwulobia	Point	666181.652	287723.582	2	0	0
P42	Igbo-ukwu Market	Igbo-ukwu	Point	665497.739	281003.26	1	0	0
P43	Oko Campus Road	Oko	Point	669226.151	290766.673	2	0	0
P44	Oko Campus Road	Oko	Point	669279.126	290799.725	2	0	0

Table 1.2: Attribute Table of Drug Abuse Hotspots within Anambra State

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