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GIS Analysis of Potential Crime Locations in University Neighborhood: A Case Study of College of Medicine, Idi-Araba, Lagos, Nigeria

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Abstract

Crimes are pervasive with potentials to disrupt community's socio-economic activities and academics learning. The College of Medicine University of Lagos (CMUL) Idi-Araba campus neighborhood is predominantly slum both in physical and social characteristics thus vulnerable to criminal activities. Mapping the distribution of human activities and other geographic features that are potential crime's locations (PCLs) around the university environment have not been given extensive attention. This study uses Geographic Information Science (GIS) to identify PCLs within and around the CMUL neighborhood. Intensive field campaign through Global Positioning System (GPS) deployment was carried out and collected data were processed and analyzed using buffer tool in ArcMap 10.8 GIS environment. Classification and ranking of human activities and other spatial features as PCLs were based on neighborhood characteristics influencing crime while the proximity of law enforcement agency was carried out at 500, 1000 and 1,500 meters' buffers to the CMUL. Results show that five of the nine very high PCLs including motor parks and bus stops are within the 500m to the CMUL while fifteen (15) of the forty-two (42) high PCLs such as beer sale shops, banks, and motels are within 500m buffer. Only one of three police stations within study area is a divisional headquarters while the other two are police posts. The current situation may embolden determined criminals to perpetrate activities at the detriment of academic learning. It is recommended that surveillance be mounted at the high PCLs and regular patrol of security agents within the study area should be put in place.

Keywords: Potential Crime Locations (PCLs), Proximity Analysis (GIS), Neighborhood characteristics, CMUL

Analyse SIG des lieux de criminalité potentiels dans le quartier universitaire: une étude de cas du Collège de médecine, Idi-Araba, Lagos, Nigéria

Resume

Les crimes sont omniprésents et peuvent perturber les activités socio-économiques de la communauté et l'apprentissage scolaire. Le quartier du campus Idi-Araba du Collège de médecine de l'Université de Lagos (CMUL) est principalement un bidonville à la fois dans ses caractéristiques physiques et sociales, donc vulnérable aux activités criminelles. La cartographie de la répartition des activités humaines et d'autres caractéristiques géographiques qui sont des emplacements potentiels de criminalité (PCL) autour de l'environnement universitaire n'a pas fait l'objet d'une attention particulière. Cette étude utilise la science de l'information géographique (SIG) pour identifier les PCL à l'intérieur et autour du quartier CMUL. Une campagne intensive sur le terrain par le biais du déploiement du système de positionnement global (GPS) a été menée et les données collectées ont été traitées et analysées à l'aide de l'outil tampon dans l'environnement SIG ArcMap 10.8. La classification et le classement des activités humaines et d'autres caractéristiques spatiales en tant que LCP étaient basés sur les caractéristiques du quartier influençant la criminalité, tandis que la proximité des organismes d'application de la loi était effectuée à 500, 1000 et 1 500 mètres de tampons de la CMUL. Les résultats montrent que cinq des neuf PCL très élevés, y compris les parcs automobiles et les arrêts d'autobus, se trouvent à moins de 500 m de la CMUL, tandis que quinze (15) des quarante-deux (42) PCL élevées telles que les magasins de vente de bière, les banques et les motels se trouvent à moins de 500 m de zone tampon. Un seul des trois postes de police situés dans la zone d'étude est un quartier général divisionnaire, tandis que les deux autres sont des postes de police. La situation actuelle peut encourager les criminels déterminés à perpétrer des activités au détriment de l'apprentissage scolaire. Il est recommandé d'installer une surveillance aux LCP élevées et de mettre en place une patrouille régulière des agents de sécurité dans la zone d'étude.

Mots-clés : Lieux de criminalité potentielle (LCP), Analyse de proximité (SIG), Caractéristiques du quartier, CMUL

Introduction

Crime is sporadic, and proper understanding of its potential spatial occurrence and patterns can contribute to making cities and indeed campus communities safe and peaceful. Although, it is not an emerging issue (Aksoy, 2017), it has become particularly pervasive in cosmopolitan areas. Crime has always been a society menace and it is pervasive and does not discriminate based on geographical boundaries or space (Okpuwie, Akinyede, Tohozin, and Toko, 2021). It is particularly detrimental which could be a source of major distraction in a university neighboruhood. Academic activities of both students and faculty could be severely affected if they fall victims of crime in their immediate learning environment (Brantingham and Brantingham, 1995). In this regard, Spencer (2001) opined that crime mapping supports many operational forms including tactical, investigative, strategic policing, crime reduction activity, but it has not been well researched. The existence of crime has been noted to be as old as the creation of man (Fajemirokun, Adewale,Oyewusi, and Maiyegun, 2006).

In Nigeria, crimes are often limited to major urban centers including Lagos city (Amelika and Chukwuma, 2005). It is becoming endemic with an increasing rate (Olowu, 2002) and often carried out sophisticatedly. These crimes range from kidnapping, banditry, armed robbery, murder, internet scam, killing for rituals, etc. Lagos is among the top ten (10) states in Nigeria with high crime rates (Oguntunde et al., 2018; Fajemirokun et al., 2006). In 2017, Lagos State was leading other states in Nigeria with over fifty thousand reported crime cases (Varrelia, 2021). These crime rate in the urban areas including Lagos was attributed to various factors such as increase in urban population, economic disparity, unemployment, socio-political conditions, social disorganization, etc. (Mazlan, 2012; Murray et al., 2001).

In addition, crime rate can also be attributed to lack of continuous manning of crime prone and potential crime locations, ineffective community policing on activities that could breed crimes, and inconclusive investigation and/or prosecution of criminal cases. Rate of crimes vary among the twenty Local Government Areas (LGAs) of Lagos State. Some areas in Lagos such as Oshodi, Mushin, Agege are notorious for crime activities. High incidence of robbery, assault and pocket-picking, burglary, public peace disturbance, theft, store breaking and car theft have been observed in Mushin area (Agbabiaka, Daramola, and Adesanya, 2021; Balaji, Nagarathinam, Vinothkanna, and Soundarraj, 2016); which include Idi-Oro Idi-Araba (the location of CMUL). The CMUL is surrounded mostly by slum communities. The presence of these slum communities could be responsible for crime activities around the citadel of learning. It has been observed that most of the criminals in urban area live in slum (Balaji et al., 2016). Alemika and Chukwuma (2005) observed that Mushin LGA is among the leading areas in Lagos State with high rate of murder, theft of properties from car, robbery, sexual assault, and extortion.

Crime mapping related studies dates to the eighteenth century (Keith, 1999). It is not a new activity, but one which is attracting increasing attention and leveraging development in the information and communication technology era. Geographic Information System (GIS) adopts several sciences and technological innovations to understand, map, and analyse spatial phenomenon such as crimes at a given time. Crime mapping, therefore, is gaining popularity among security agencies who make use of GIS to detect and mitigate crimes (Phiri, Lubobya and Phiri, 2020; Richard and Carolyn, 2001). Development in information technology and mapping of crime prone features and human activities have been identified as good steps at curbing criminal activities. This paper therefore aims at the GIS analysis of potential crime locations in a University Neighborhood using University of Lagos College of Medicine, Idi-Araba, Lagos, Nigeria as a case study.

Literature Review

Vasiliev (1996) and Wang (2012) noted that the concept of locational identity of crime events should be of great priority in crime study unlike time which was opined that it is difficult to measure. According to Spencer (2001) geographic feature of crime is essential for mapping crime events since it must have happened somewhere in space and time. The concept of space when compared to the temporal dimension has been embraced and explored in crime mapping as reiterated by Keith (1999). Some geographic features are crime originators while certain other human activities particularly in urban areas attract crimes (Brantingham and Brantingham, 1995). Tobler's law of geography stated that everything is related and closer features are more related. This could also be true of crime locations and human activities that generate crimes. Crimes are perpetrated at certain places where motivated criminals perceived opportunities such as hotels, markets, and bars (Brantingham and Brantingham, 1995). Potential crime sites are determined by the antecedents of where crimes have been reported. Burglary is a possibility due to the nature of the housing neighborhood (Brintingham, 1995) and offenders carry out specific criminal actions at locations where they have reliable knowledge (CurtisHam, Bernasco, Medvedev, Polaschek, 2020). A crime location features could therefore be a choice location for future crime point elsewhere.

Studies on crime including the works of Njoku, (2021); Enas (2018), Balaji et al., (2016), and Yongmei, (2005) have focused mainly on where crimes had occurred. Enas (2018) further stressed the spatio-temporal nature of crime in relation to neighborhood address. In most cases, approach to crimes mapping studies have been on where crimes have occurred commonly referred to as hot spots. It has been noted by Richard and Carolyn (2001) that criminals shift from crime hot spots to establish bases somewhere with similar geographic locational characteristics as the hot spots. Curbing crimes should therefore include holistic approach including identifying the possible locations of occurrence based on precedents. Consequently, identifying potential locations where crimes could be perpetrated offer preventive measures to curbing crimes rather

than the reactive approach. Hence, this study focuses on this missing link.

Crimes impede development, discourage investment, economic prosperity, increase the cost of transactions, and destabilize society (Okpuvwie et al., 2021; Fajemirokun et al., 2006). It could also create fears that could impede effective academic learning in a university neighborhood (Balogun,Okeke, and Chukwukere, 2014). Consequently, cognizance of PCL would go a long way at reducing crimes while it will also guide security agents on surveillances. The PCL is very germane to curbing or reducing crime drastically because criminals tend to shift operational bases known to the public and security operatives. Hence, this study aimed at identifying PCL around a university neighborhood and the proximity of police station to these PCL. The PCL concept relies mainly on neighborhood spatial characteristics and activities that could crimes. Having knowledge of where crime is likely to occur could serve two major purposes: it may alert the populace and secondly, it may guide operational activities in mapping out operations and responding to eventuality by security personnel. The knowledge of potential crime location would serve as early warning system to both the public and security personnel.

Study Area

The College of Medicine University of Lagos (CMUL) is located along Ishaga Road at Idi-Araba neighborhood (Figure1) and it occupies a land area of about 40.11 Hectares. The total land area includes the Lagos State University Teaching Hospital (LUTH). The CMUL is located between Latitude 6^0 $30^{'}$ 55.08" and 6^0 $31^{'}$ 19.42" North of the Equator, and Longitude 3^0 $21^{'}$4.83" and 3^0 $21^{'}$ 34.96" East of Greenwich Meridian. The study area environment (Idi-Araba) is a disorganized urban area where crimes could easily be committed. To capture PCLs around the CMUL, the study area was defined by Longitude 3^0 $20^{'}$ 39.09" to 3^0 $21^{'}$ 56.96" East of Greenwich Meridian and Latitude 6^0 $30^{'}$ 36.50" and 6^0 $31^{'}$ 41.1" North of the Equator. This geographical boundary captured the neighboring community to the school and Idi-Araba neighborhood. Idi-Araba community is a subset of Mushin Local Government Area (LGA) of Lagos State (Figure 1). The Mushin LGA comprises of industrial, residential, commercial and transport activities. Major hubs of commercial activities can be found at Idi-Oro, Olosha, Ojuwoye, Ladipo, among others. In addition, the entire span of the major road (Agege motor road) that pass-through Mushin towards Oshodi direction is a major hub for commercial activities. Meanwhile, Mushin is also assumed in some quarters to be the breeding ground of social miscreants and irritants. The social miscreant and irritant activities are often violent in nature and are usually involved in thuggery, smoking, drinking, cultism, among others. These activities, therefore, often encourage crimes within the neighborhood of CMUL. The Campus is located at Idi-Araba which is predominantly a slum community both in physical and social characteristics. The community is characterized by informal activities including roadside petty trading, scrap iron sorting and buying centers, roadside begging, plank shops/kiosks, self-

provided basic social services including education, sanitation, water and security.

In addition to Idi-Araba, the CMUL has other neighboring communities. These include communities purposively selected based on their proximity to the study area which include Mushin, Idi-Oro, Olosha, Obele, Lawanson, Empire, and Ojuelegba. The location distribution of the neighboring communities is shown in the Figure 1. Administratively, Olosha, Idi-Araba, Idi-Oro, and Mushin are within the Mushin LGA while Obele, Lawanson, and Ojuelegba fall within Surulere LGA of Lagos State.

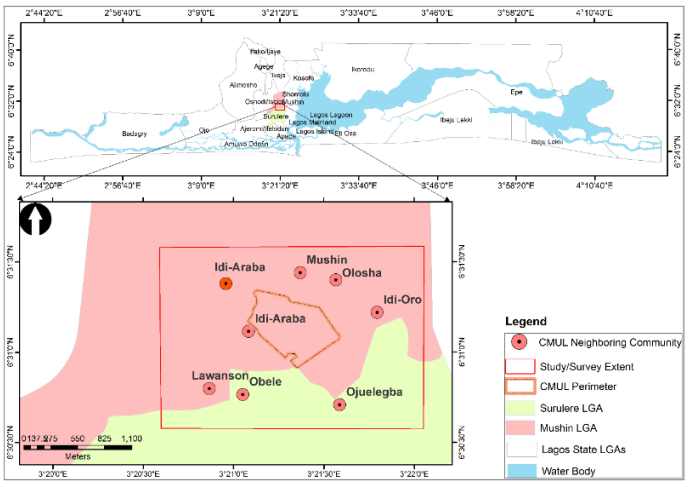


Figure 1: Study area

Materials and Methods

The base map of the study area in vectors/shapefiles formats were sourced from the Laboratory for Remote Sensing and Geographic Information System (GIS), Department of Geography, University of Lagos. The base maps include features such as road networks and their names, administrative boundaries (State, Local Government, and Wards maps), and layout of CMUL, Idi-Araba Campus. In addition, to understand the spatial distribution of PCLs in a university neighborhood, a high-resolution QuickBird satellite imagery was utilized for detailed analysis and mapping of land uses. This was sourced from the archival spatial data (base map) resources in ArcMap 10.8 GIS environment (Earthstar Geographics/ Maxar). The satellite imagery was already auto rectified in the GIS software and data extraction of features was carried out on the imagery through on-screen digitization. The various GIS steps and operations carried out on the acquired data are shown in Figure 2. It includes distant measurement and data manipulation such as repositioning of spatial data on the base map.

Potential crime locations are therefore regarded as geographic spaces where crimes could easily/possibly be carried out by motivated offenders. It could be a landmark such as unoccupied or abandoned places in urban areas. Landmarks (natural and human activities) within the study area were categorized and coded in GIS environment for basic query operation based on activities that could generate crimes. The identified features were therefore categorized and ranked into seven PCLs (Table 1) based on susceptibility and possibility of crime occurrence. Rather than focusing on individuals that are criminally minded, it has been suggested that target areas prone to risks of crimes in community should be the focus (UNODC, 2010).

Table 1: Classification of Landmarks based on PCL vulnerability

Landmarks	Code/ Rank	Remarks
Parks (Commercial Motorcycle and Bus stop1)	7	Very high
Open Beer sale shops and Motels	6	High
Smoking/youth gathering/betting shops	5	Moderately high
Banks/ATM Spots	4	Low
Uncompleted/Abandoned Building/Viewing Center/mechanic workshop	3	Moderately low
Scrap Iron Sorting sites	2	Very low
Others (schools, church, pharmacy, hospitals, mosques)	1	Unlikely

Source: Created from the UNODC 2010 Handbook on the crime prevention guidelines

The analysis relies mainly on field data collection which includes obtaining coordinates and photos of features of interest. To carry out comprehensive and effective neighborhood profiling and mapping, various points of interest (POIs)/ landmarks within the study area extent were captured through hand-held Garmin 72H series Geographic Positioning System (GPS) with a fine (5 meters) locational accuracy. This was carried out from street-to-street for effective community profiling. This was helpful in identifying PCLs in the neighborhood. These features were then mapped and analyzed using buffer geo-processing tool in GIS environment. Table 2 shows some of the POIs considered as crime enabling activities within and around the CMUL. Similarly, perceived crimes ranged from theft from cars, store breaking, public peace disturbance to murder. Locational identity (coordinates) of these features were imported on the base maps for visual/graphic display and analysis. Furthermore, attribute table was created for each point features for basic queries and analysis in GIS environment. Distances of these community midpoint to the center of the CMUL range from 554 meters to 1,140 meters. The CMUL is sandwiched between these communities, meanwhile, a citadel of learning of this status should ideally be situated in a secluded area.

Table 2: Community profile and Crime Clustering activities

Community	Main Human Activity	Types of Crimes	Crime Generators	Proximity to the CMUL (meters)
Idi-Araba	Education/Health	Theft from cars, robbery, pocket-picking, & burglary	Carpark/Bus parks, and presence of financial banks, & bear sale shops	554
Idi-Oro	Commercial	Assault and pocket-picking	Operation of commercial buses	714
Mushin	Commercial/ Transportation	Murder, robbery, public peace disturbance, & store breaking	Commercial bus operators, bear sale shops,	603
Olosha	Commercial	Public peace disturbance, Smoking of prohibited substances and public disturbance	Gangsters, unfenced mechanic workshops, bear sale shops &uncompleted buildings	706
Lawanson	Residential/ Commercial	Assault and pocket-picking	Gangsters & bear sale shops	1140
Obele	Residential/ Commercial	Smoking of prohibited substances	Gangsters & bear sale shops	856
Ojuelegba	Commercial	Pocket-picking, Assault, Smoking of prohibited substances and public disturbance,	Commercial bus operators & bear sale shops	870

Source: Authors

Based on hypothesized distance decay principle (Balaji et al, 2016); criminals commit crimes at short distances from their place of abode, consequently the study covers about two kilometers radius of the CUML. Proximity (buffer) analysis was carried on the PCLs and police stations in relation to the CMUL. Buffer analysis principle is based on parametric x equation of a circle of radius at center *C*. The implicit Cartesian plane Euclidian buffer is expressed in equation (1) as:

$$(x - x_0)^2 + (y - y_0)^2 = r^2 \ldots\ldots (1)$$

Where: x and y are the coordinates of the spatial feature center and r is the radius.

However, this equation has been incorporated into GIS as a spatial model. The study area was used as input for point feature to carry out the buffer analysis in the GIS environment. Buffer tool was used to create distance value of varying sizes around the CMUL. This was to examine the proximity of PCLs and police stations that fall within each buffer ring.

The study employs buffer rings/zones of 500m, 1,000m, and 1,500m around the CMUL. Each zone was used to clip out the number of PCLs that fall within it and were cartographically mapped accordingly. Furthermore, attributes table of PCLs that fall within each buffer zone was exported to Microsoft excel for proper arrangement and presentation.

The same process (buffer zones) was used for the proximity analysis of police stations in relation to the CMUL. In addition to this road (route) distances from the CMUL to all the police stations within the buffered zone were identified, clipped, calculated and mapped. The study mythological flow chart is shown in Figure 2.

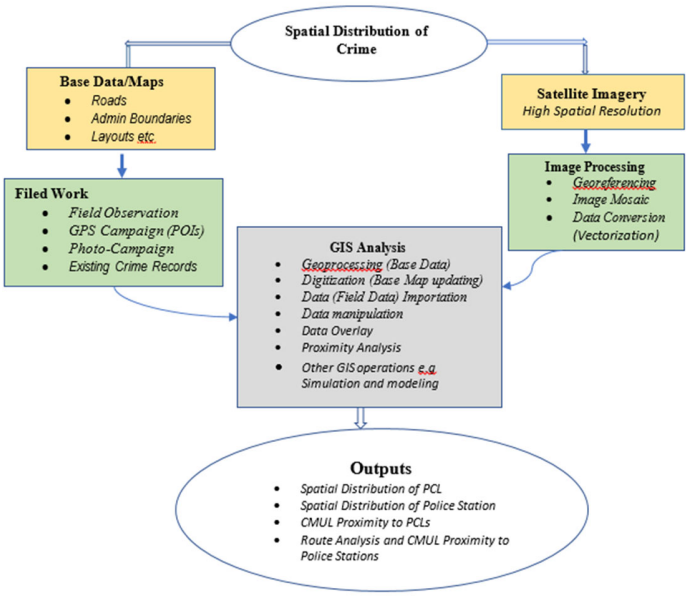


Figure *2*: Study Methodology and Workflow

RESULTS AND DISCUSSION

Point of Interests (POIs)

As shown in Table 3, a total number of 314 POIs were identified within the study area extent. These landmarks range from public facilities (such as schools, health facilities, markets and commercial bus stops), corporate organizations (such as banks, filling stations, hospitals, shopping malls, schools, and hospitalities), religious (mostly Churches and Mosques), and privately owned properties/facilities including open bar, sport betting outfits, canteens among others. Meanwhile, there are other unclassified landmarks that do not fall into any of these four categories; they are

unapproved Okada (motorcycle) parks, traditional palaces, smoking/gang spots, major road junction/intersection etc. Attributes of these landmarks including their coordinates and street addresses (as contained in the GIS environment) are shown in the Figure 3. These landmarks are skewed towards the Idi-Araba and Mushin communities. These two settlements which are located at the northern part of the study area are the closet to the CMUL (Figure 3). As shown in Table 2, 43.63% and 23.25% of the identified POIs were concentrated at Mushin and Idi-Araba communities respectively. Of the identified features within the Mushin community, 19.77% and 16.06% were sport/local betting kiosks/shops and beer sale shops (bars) respectively. Other dominant features are schools (mostly privately owned), religious buildings, and drugs store. Most of these features are located on adjoining streets to the CMUL.

Table 3: Concentration of features in selected communities

Sn	Community	Number of POI	Per cent	Remarks
1	Mushin	137	43.63	Mostly on Onifade, Martins & Cardoso Streets
2	Idi-Araba	73	23.25	CMUL inclusive
3	Oloosha	23	7.32	Mostly on Shoremekun & Labinjo Street
4	Idi-Oro	59	18.79	Mostly on Akodu, Owokoniran, and Adegboyega Streets
5	Ojuelegba	8	2.55	Mostly on Mabo and Atunrase street
6	Obele	6	1.91	Mostly on Obele and Lawani Streets
7	Lawanson	8	2.55	Mostly on Itire road
	Total	314	100	

Source: Authors

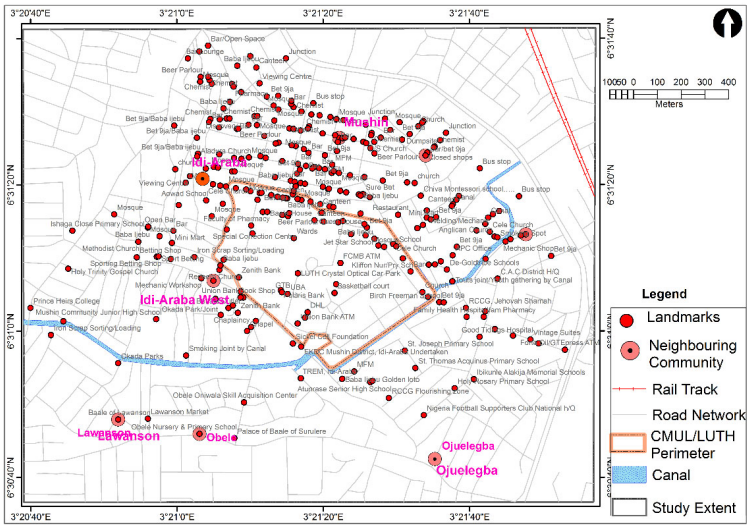


Figure 3: Distribution of POIs within CMUL and Neighborhoods

Potential Crime Location (PCL) around the CMUL

Of the identified POIs, features that are potential crime generators and crime attractive were further sieved based susceptibility rank shown in Table 2. The PCLs were discussed thematically based on their vulnerabilities and proximity to the CMUL. As shown in Table 3, vulnerable places within the study area include open bear parlors, uncompleted/abandoned structures, unauthorized motorcycle parks, smoking joints, commercial motor parks, sales of outlawed substance, etc. A university neighborhood is expected to be safe and free of activities that attract crimes so as to meet up the sustainable development goal (SDG 4) target. The SDG goal 4 target advocates a safe and non-violent learning environment for all (Ellen Boeren, 2019).

Table 3: Ranking of PCLs in the CMUL

Landmarks/PCLs	Buffer Zone/Features				
	500m	1,000m	1,500m	Total	Remarks
Parks (Commercial Motorcycle and Bus stops)	5	4	-	9	Very high
Open Beer Sale Shops and Motels	15	24	3	42	High
Canal bridge/betting shops	20	27	1	48	Moderately high
Banks/ATM Spots	10	1	1	12	Low
Uncompleted/Abandoned Building/Viewing Center/mechanic workshop/market	3	15	-	18	Moderately low
Filling station//Mini Marts etc	14	20	3	37	Very low
Schools, church, pharmacy, hospitals, mosques) etc	41	94	5	140	Unlikely

Source: Authors

The result of the analysis showed that some features are ranked as very high PCLs within the study area which include but not limited to motorcycle parks and commercial bus stops. These are locations were associated with several crimes such as public peace disturbances, gang/cultist clashes, smoking of prohibited substances, stealing, etc. In addition, a canal bridge crossing at about 200 meters to the CMUL gate falls within this zone and has been linked with several nefarious activities. Of the identified nine very high PCLs, five are within 500m radius to the CMUL while four are within 1km radius (Figure 4).

Similarly, the features ranked as high PCLs in the study area include beer selling outlets and motels. Sales of beer and other alcoholic drinks is rampant and grossly unregulated around Idi-Araba community and environs. The proliferation of retail beer sale shops of fifteen (15) and twenty-four (24) within 500m and 1km radius respectively around a university neighborhood should be a worrisome situation. A relationship has been established between concentration of beer (liquor) shops and crime (Richard and Carolyn, 2001). The result of the analysis revealed that about 42 beer/liquor retail outlets were identified within 1.5km to the CMUL (Figure 4).

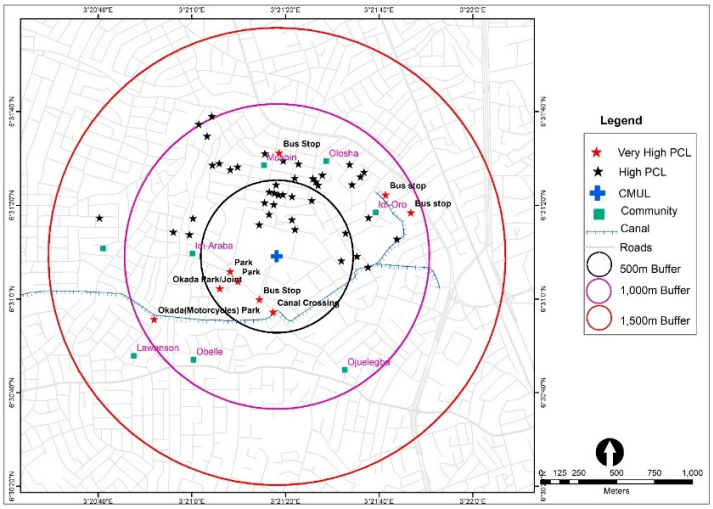


Figure 4: Distribution/Location of Very high and High PCLs to CMUL

Likewise, the moderately high PCLs are found in places dominated by crimes in the northern section of the CMUL. As shown in the Table 3, these zones are notable for betting shops, smoking joints, and gang enclaves. The concentration of these PCLs is within the 500m and 1000m to the university neighborhood. These PCLs, particularly the betting shops, can be found almost on every street within the area which could trigger crimes especially among young people who are engaging in these betting. (Figure 5). In addition, the smoking joints and gang enclaves constitutes an avenue where crimes could either occur or be planned. A total of

forty-eight moderately high PCLs were identified within the study area extent.

Some areas in the neighborhood of CMUL are ranked as low PCLs which include commercial banks, microfinance banks, and automated teller machine (ATM) locations because of availability of security measures to reduce crimes. These measures include close circuit television (CCTV), presence of men of the Nigerian Police Force, and private security personnel. Moreover, most of the identified banks and ATMs are within the premises of the CMUL (Figure 5). Of the twelve identified low PCLs, ten are within the 500m buffer to the CMUL while one each is located within other buffer zones.

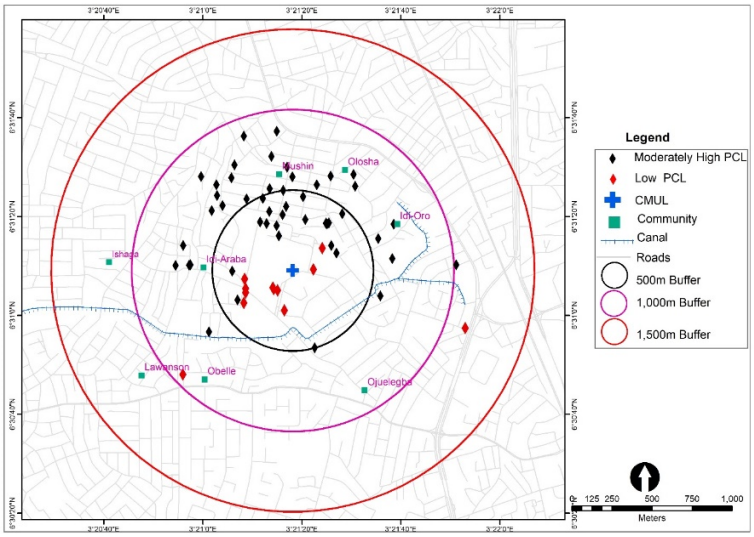


Figure 5: Distribution of Moderately High and Low PCLs

Locations and activities ranked as moderately low PCLs are uncompleted/abandoned buildings, sport view centers, mechanic workshops, and markets. These locations particularly the abandoned/uncompleted buildings have been hideouts for criminals where raping, smoking of banned substances, and drinking of liquor that aid criminals in carrying out heinous activities. As shown in Figure 6, the moderately low PCLs are common within 1km to the CMUL campus while only three are within 500m radius. Similarly, very low PCLs are so considered because there are little chances of crime activities taking place at these locations. The very low PCLs include fuel station, mini marts, iron scrap sorting sites, etc. Of the identified 37 locational activities (Table 2), twelve (12) are within the 500 meters' radius to the CMUL while 19 and 7 are 1000 and 1500 meters respectively (Figure 6).

Meanwhile, location activities where crimes are unlikely to occur dominate the study area (Figure 6). The number of identified unlikely potential crime locations in this category is 140 and this represents about 45% of the total number of the POIs. Activities considered to be unlikely PCLs are mostly churches, mosques, schools (mostly private elementary and secondary schools), pharmaceutical shops, etc. where crime are typically low. Of the total of unlikely PCLs, 41, 94, and 5 are found within 500m, 1,000m, and 1,500m respectively to the CMUL (Table 2).

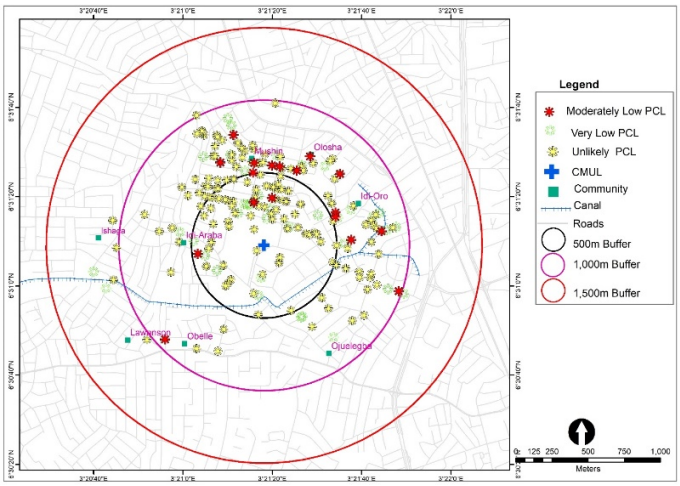


Figure 6: Distribution of Moderately Low, Low, and Unlikely PCLs

Proximity of CMUL to Police Stations

Rapid response to crimes should be timely whenever and wherever they occur. In most places including Nigeria, police are the empowered institution to respond to any criminal activities and to bring situations under control. Police responses' time rate to crime locations particularly in and around university neighborhood depends on their proximity to police stations, among other factors. The analysis of the proximity of the CMUL to police stations was carried out at 500m, 1000m and 1500m radius. The results showed that there is a police post/ station each within buffer zones to the CMUL (Figure 7). A police post (which usually has a few numbers of personnel and logistics) is located within CMUL campus while Alakara Police Station is located at Idi-Oro community (northeast to the CMUL) and Lawanson Position Station is located at southwestern region to the CMUL campus. Meanwhile, out of the three police stations identified within the study area, it is only the Alakara Police Station that is a division police headquarters.

Table 4: Police Station Proximity to the CMUL

Buffer	Number/ Quantity	Police Station	Address	Coordinates	
				Long.(X)	Lat.(Y)
500m	1	CMUL Police Post	CMUL Campus, Idi-Araba	3.354131	6.517107
1000m	1	Alakara Police Station	Agege Motor Road, Idi-Oro	3.363694	6.521735
1500m	1	Lawanson Police Station	Anjorin Str. Lawanson	3.346563	6.509634

Source: Authors

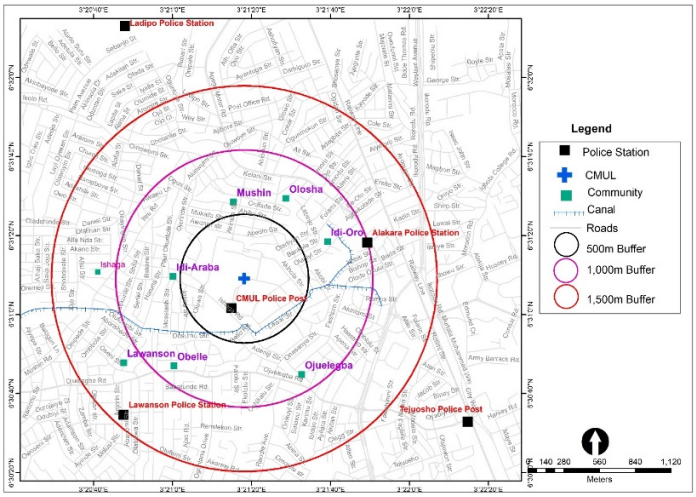


Fig.7: Proximity of Police Station to CMUL

Conclusion and Recommendations

The paper has used GIS to examine the proximity of PCLs within and around the CMUL, Idi-Araba campus. Buffer analysis was used to identify location of human activities and geographic features at 500m, 100m, and 1500m around the CMUL. PCLs were ranked as very high, high, moderate, low, and very low depending on their tendency to generate crimes with respect to their proximity to CMUL. Total number of very high and high PCLs identified are 9 and 42 respectively. Of the very high PCLs, 5 are located within the 500 meters around the University; similarly, 15 of the high PCL features are also located within 500m. Generally, no regular pattern of PCLs was noticed based on spatial(buffer) distance to the school. Police post(station) are located within every 500m distance to the CMUL. Nonetheless, the security agent regular patrol, strategic monitoring, and surveillance of PCLs which should serve as deterrents to criminal minded individuals is an issue yet to be investigated. The spatial

distribution of human activities in the study area have profiled crime generators which can be useful for the effective planning of land uses. The GIS generated maps can also become a resourceful tool for surveillance, crime prevention and rapid response in the study area (Puleno Kennao, Deepak Lal, and Lav Kesharwani, 2018).

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