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GEOSPATIAL EVALUATION OF SURVEILLANCE FACILITIES IN RIVERS STATE UNIVERSITY MAIN CAMPUS, PORT HARCOURT, NIGERIA

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Abstract

Adequate surveillance infrastructure is essential for ensuring safety and security within university campuses, particularly in fast-growing and densely populated environments like Rivers State University Main Campus, Port Harcourt. Despite the university's expansion in student population and infrastructure, the development and spatial optimization of surveillance facilities such as streetlights and CCTV systems have not kept pace. Several areas remain poorly lit or completely dark at night, posing serious security risks. The lack of a coordinated geospatial database further hinders effective planning, monitoring, and maintenance of these facilities, increasing vulnerability to crime and reducing the effectiveness of existing security measures. This study aimed to evaluate the geospatial location of surveillance facilities within the university's main campus. The objectives were to identify and classify the existing surveillance infrastructure, develop a geospatial database, analyze proximity to major campus hubs, and produce spatial and hotspot maps of surveillance coverage. Field data were collected using GPS receiver to map features such as solar lights, electric lights, CCTV cameras, and security units. The data were analyzed using GIS techniques to determine spatial distribution patterns and identify gaps in surveillance coverage. Findings revealed a total of 981 surveillance features, with solar-powered lights accounting for 786 units (80.1%), indicating a strong reliance on renewable energy. CCTV cameras made up only 4.5% of the total, highlighting a significant deficiency in visual monitoring. Security units constituted just 2.1%. Buffer analysis around selected hubs such as the PG Hostel, Central Library, and Faculty of Engineering showed disparities in infrastructure coverage relative to spatial extent and functional significance. Some areas, notably residential zones, had higher surveillance concentration, while key academic hubs had fewer and sometimes non-functional facilities. In conclusion, the study established that although progress have been made in deploying lighting infrastructure, the surveillance system remains uneven and under-optimized. It is recommended that the university expand CCTV coverage, improve maintenance, integrate facilities into a centralized GIS-based management system, and conduct regular spatial audits. These actions would enhance security, ensure efficient resource allocation, and promote a safer campus environment.

KEYWORDS: *Surveillance facilities, GIS & Remote Sensing, CCTV, Street lighting, RSU, Campus security*

1. Introduction

The rapid advancement of urban infrastructure, into smart systems has become a key feature of modern cities. This shift is driven by the increasing need for safety, sustainability, and efficiency. One major aspect of this transformation is the integration of surveillance technologies especially Closed-Circuit Television (CCTV) systems, security units and street lighting into public spaces (Thomas, Kebiru, Friday & Fidelis, 2019).

As cities and campuses evolve into more complex and dynamic spaces, the deployment of intelligent systems such as security units, CCTV and street lighting has become indispensable in fostering secure and functional environments. In particular, higher institutions like Rivers State University, located in the active city of Port Harcourt, is increasingly relying on these facilities to enhance campus security and

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nighttime visibility, promote energy efficiency, and improve the overall quality of life for their academic communities (Ashby, 2017).

One of the major features of modern urban management is the integration of surveillance systems into public infrastructure (Socha & Kogut, 2020). Surveillance refers to the systematic observation of people, places, or activities, typically for the purpose of information gathering, safety, and control. In urban settings, this involves the use of personnel or stations such as security posts or unit that ensures safety and respond to incidents and also the use of technological tools to monitor environments and ensure security. Technological tools such as CCTV and smart street light technologies which are now widely adopted for real-time video monitoring of public spaces and improving visibility at night. The application of surveillance systems which help deter criminal activities and supports camera effectiveness offering a valuable solution for real-time surveillance and post-incident investigation (Socha & Kogut, 2020).

CCTV were originally intended for monitoring critical infrastructure and large public gatherings, but CCTV installations have expanded their applications to housing estates, campuses, financial institutions, shopping centers, and car parks (Enoch, Juliana, Nelson, Francis, Seth, Dominic & Gabriel, 2022). CCTV systems today are not merely passive video-capturing devices but they have evolved into intelligent systems capable of incident analysis through the integration of computer vision and image processing. These setups can detect, classify, and track target objects in real-time, thereby, enhancing security responses and helping prevent future occurrences of criminal activities (Enoch et al. 2022). Beyond recording events, CCTV systems are increasingly deployed to actively analyze incidents, detect threats, and support law enforcement through intelligent data interpretation. The proper design and positioning of CCTV cameras are therefore crucial to achieving the intended surveillance outcomes (Thomas et al, 2019).

Moreover, Socha and Kogut, (2020) and Thomas et al. (2019) observed that the increasing threat of public space crime and terrorism has compelled governments and institutions to adopt CCTV surveillance as a proactive strategy. Police and security services now rely on these systems for real-time monitoring of traffic, public areas, and critical facilities, which enables them to respond promptly to emergencies. Ashby (2017) confirmed that even in the absence of eyewitnesses, CCTV footage has proven to be instrumental in solving criminal cases. CCTV systems transmit images from cameras to central control rooms, where they are monitored, stored, and analyzed. They are designed to deter crime by increasing the perceived risk of apprehension, and to foster a sense of safety within the monitored areas (Kirui, Muiya, Ochieng, & Waithaka, 2023). In line with the United Nations Sustainable Development Goals (SDGs), this study aligns directly with SDG 4: Quality Education, particularly target 4.a, which emphasizes the need to "build and upgrade education facilities that are child, disability, and gender sensitive and provide safe, non-violent, inclusive, and effective learning environments for all."

The aim of the study is to evaluate the geospatial location of surveillance facilities in Rivers State University Main Campus, Port Harcourt, Nigeria using geospatial techniques.

1.2 Objectives of the Study

The specific objectives of the study are to:

1. Identify the existing surveillance facilities within Rivers State University Main Campus
2. Develop a geospatial database of surveillance facilities within the study area
3. Analyze the proximity of surveillance facilities from different hubs within the study area
4. Produce a spatial distribution map of surveillance infrastructure within the study area
5. Produce a hotspot map that shows the coverage of functional surveillance facilities

1.3 Study area

Rivers State University (RSU), Port Harcourt, is located within the Diobu area of Port Harcourt, precisely at Mile III, in the Port Harcourt City Local Government Area of Rivers State. The University have five campuses: the Nkpolu-Oroworukwo Campus (Main Campus), Emohua Campus, Etche Campus, Ahoada Campus, and Sakpenwa Campus. The present study is restricted to the Nkpolu-Oroworukwo Main Campus, located in Port Harcourt City Local Government Area (PHALGA), Rivers State. Geographically, the Nkpolu-Oroworukwo Campus lies between latitude 04°47'12.85" and 04°48'25.49" North of the equator and longitude 006°58'26.72" and 006°59'15.50" East of the Greenwich Meridian, covering an approximate land area of 178 hectares (Ayobami, 2024). The University occupies a strategic urban position and serves as one of the largest academic communities in the Niger Delta region. As of 2017, the institution had an estimated population of about 3,000 non-academic staff and civil force personnel, and approximately 22,400 students, making a total of about 25,400 individuals within the main campus environment. This figure does not include dependents such as staff children, lecturers' families, or residents who earn their livelihood from commercial activities within and around the campus environment (Didia & Weje, 2020).

Rivers State University lies within a lowland area, with an average elevation of less than 20 metres above sea level. The region is characterized by sedimentary formations, while some sections of the campus retain their natural vegetation, especially the less-developed slum areas. The vegetation cover consists of raffia palms, light rainforest vegetation, home gardens, and ornamental trees. All of which thrive due to the high rainfall recorded in and around the campus (Didia & Weje, 2020). The soil profile is dominated by sandy and sandy loam textures that are often highly leached, underlain by an impervious pan layer. These soil conditions are further influenced by constant construction activities across the university campus (Ayobami, 2024).

Topographically, Rivers State University lies within a lowland area, with an average elevation of less than 20 metres above sea level. The region is characterized by sedimentary

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formations, while some sections of the campus retain their natural vegetation, especially the less-developed slum areas.

Structurally, the University is divided into two major campuses—old site and new site— with several other specialized areas such as the Agric site, Faculty of Law site, Staff Quarters (old and new), ISS section, the Arena, the Staff Club near the Amphi-Theatres, and the commercial area. Accommodation facilities include several hostels such as Hostels H, D, and others that serve the large student population (Ayobami, 2024; Didia & Weje, 2020).

The University also operates vital social and infrastructural facilities that support academic and non-academic activities. These include a private healthcare retainership scheme that provides medical services for staff and students, as well as a permanent water supply system managed by the Department of Works. Initially, water was distributed using mini tankers to hostels, classrooms, and laboratories. However, in recent years, this has been significantly improved with the drilling of boreholes and reticulation of water systems to nearly all buildings across the University, thereby making the water board of the Department of Works fully functional (Ayobami, 2024; Didia & Weje, 2020).

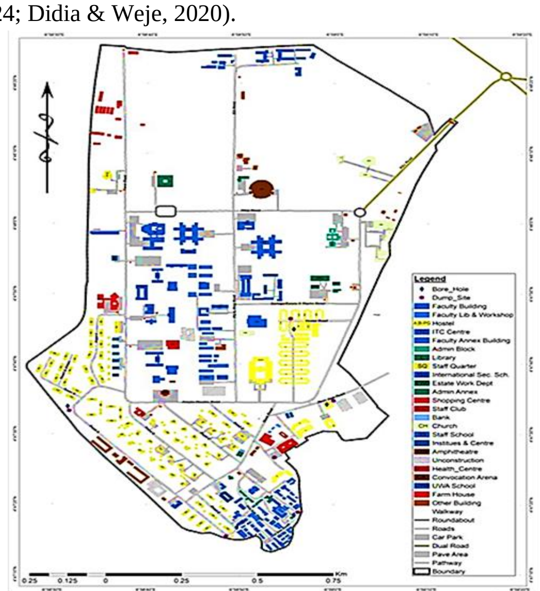

Figure 1: Map of Rivers State University Main Campus
Source: (Didia & Weje, 2020)

2. Literature Review

Yu-Sheng, Shih-Hsiung, Guan-Sheng, Chu-Sing, Yueh-Min, and Ting-Wei (2016) conducted a study titled "An Implementation of High Efficient Smart Street Light Management System for Smart City**"** in China. The study aimed to propose a high-efficiency system for the configuration, deployment, and management of smart street lighting as part of a broader smart City infrastructure. The key objective was to integrate streetlights and sensors into a data collection interface capable of supporting scalable, flexible, and secure data management and transmission. The methodology involved the use of container-based virtualization to deploy edge computing devices comprising micro-controllers, sensors, and IP cameras. These devices collected real-time environmental data and enabled live streaming of images. The system incorporated NoSQL and in-memory databases for flexible data handling and adopted asymmetric encryption and SSH tunneling for secure data transmission. Furthermore, token-based legitimacy validation was applied to ensure secure interconnection among services. A simulation of street lighting was designed to assess the real-time performance of the proposed system, and the feasibility of deploying multiple virtualized services on edge computing devices was validated. The result of the study demonstrated high efficiency and security in data management, with fast deployment, low latency, and high through input being achieved. The system was shown to support flexible data storage and efficient processing of massive smart city data, thereby offering substantial commercial potential.

Hailu, Mohammed, and Merid (2021) conducted a study titled "Crime Hotspot Analysis and Mapping using Geospatial Technology in Dessie City, Ethiopia." The aim of the study was to utilize geospatial techniques to analyze and map the spatial distribution and clustering of crime incidents within the city, with the objective of identifying high-risk and low-risk areas for informed security planning. The methodology involved the use of semi-variogram modeling and spatial autocorrelation analysis using Moran's I statistic to detect spatial patterns in crime distribution. Crime data were analyzed across various neighbourhoods in Dessie City to reveal statistically significant clustering patterns. Neighbourhoods such as Hote, Arada, and Segno were identified as crime hotspots, evidenced by high Z-scores ranging from 0.037 to 4.608, indicating statistically significant concentrations of crime incidents. In contrast, neighbourhoods such as Menafesha and Bounbouwha displayed low negative Z-scores (from -3.231 to -0.116), highlighting them as cold spots or areas with lower crime prevalence. The spatial pattern of crime was further confirmed by a Moran's I index of 0.027492 and a Z-score of 3.297616, indicating significant positive spatial autocorrelation.

Gideon, Benard, Duncan, and Stephen (2023) conducted a study titled "Impact of CCTV on Police Operations Outcomes in Nairobi City County, Kenya." The aim of the study was to examine the impact of CCTV systems on key police operational outcomes, including crime reduction, response times, road safety, officer safety, and cost reduction in Nairobi City County, Kenya. The study was guided by rational choice theory and routine activity theory, employing a convergent mixed-method design that combined both a cross-sectional survey and a phenomenological approach. Participants included 403 police officers from the CCTV command centre and various police stations across Nairobi, selected using cluster and purposive sampling techniques. The study used questionnaires, key informant interviews, and focus group discussions for data collection. Quantitative data were analyzed using binary logistic regression, while qualitative data underwent thematic analysis. The study found that CCTV had a significant positive impact on crime reduction, road safety, officer safety, and cost reduction. However, response times showed minimal improvement, which was attributed to limited CCTV coverage and coordination challenges between police officers. The study recommended expanding the

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coverage of the CCTV system, improving collaboration among officers, and publicizing the system's successes to maximize its effectiveness.

Kirui, Muiya, Ochieng, and Waithaka (2023) conducted a study titled "The Moderating Effect of CCTV Policies on the Relationship between CCTV use and Police Operational Outcomes." The aim of the study was to investigate whether CCTV policies moderate the relationship between the use of CCTV systems and the operational outcomes of the police in Nairobi City County, Kenya.

The study was informed by rational choice theory and routine activity theory, and it employed both a cross-sectional and phenomenological design. The study participants were police officers working at the CCTV command centre and police stations within Nairobi County, sampled using cluster and purposive sampling techniques. Data collection tools included a questionnaire, key informant interview guide, and a focus group guide. The study found that CCTV policies significantly influenced the use of CCTV systems. However, the policies had a statistically insignificant effect on moderating the relationship between CCTV use and police operational outcomes ($b = 0.001$, 95% CI [-0.410, 0.408], $p = 0.996$). The study concluded that while CCTV policies influence the adoption of CCTV technology, they do not significantly moderate the outcomes of police operations. It recommended that CCTV policies be published, regularly reviewed, and that police officers be sensitized about the policies to ensure their effective use.

However, several authors were mentioned in the literature review but Kirui et al (2023) and Gideon et al., (2023) focused on policy analysis and operational outcomes of CCTV systems, whereas the current study is centered on the spatial mapping and analysis of CCTV facilities and their proximity to infrastructure. Both studies address the effectiveness of CCTV but from different perspectives, one policy-oriented, and the other focused on spatial distribution and infrastructure coverage.

3. Materials and Method

This study adopted a quantitative research approach, which was consistent with the positivism research philosophy. Global Positioning System (GPS) and Geospatial Information System (GIS) technique was integrated to achieve the objectives of the study. Instrument used in course of this research work is shown in table 1.

Table 1: Software and Hardware Selection

S/N	Software	Hardware
1.	QGIS	Laptop
2.	Microsoft Word	Phone camera
3.	Microsoft Excel	Printer
4.	Google earth	Field Book
5.	Notepad	Garmin 76csx GPS receiver (handheld)

Source: Author's Field Work, 2024

3.1 Data Acquisition:

Primary Data Sources: This involved Field Survey where a comprehensive field survey was conducted across the Rivers State University Main Campus using a Global Positioning System (GPS) device to acquire the coordinate of surveillance facilities within the study area. In addition to location data, attributes such as type of surveillance facility, operational status (functional or non-functional), were also noted.

3.1.1 The Principle of GPS Technique

The techniques of GPS was utilized to determine the spatial locations (coordinates) of various Surveillance facilities within the study area. This was done by the use of a handheld GPS receiver as stated by Kavanagh & Mastin, (2014), enables the precise determination of a receiver's location by calculating distances from satellites. These distances, known as ranges, were measured from the satellite to the receiver using timing and signal data. GPS operates similarly to the process of resection used in traditional ground surveying, where distances and angles are observed from an unknown point to known control points (Ghilani & Wolf, 2015),

The Handheld GPS Receiver utilized GPS point positioning mode which measures the code pseudo ranges to determine the position of the observer instantaneously as long as four or more satellites are visible at the receiver. This technique relied on measuring range distances between satellites and receivers. A range distance was the distance between two objects. In this case, GPS signals travel at approximately the speed of light, and the range distance was calculated based on the travel time of the signal from the satellite to the receiver (Bolstad, 2016) using the formula:

$$\mathbf{R = c \times t} \qquad 1$$

Where,

R is range from Satellite in space to receiver on the Earth's surface,

c is on light in space and

t is time takes for signal to reach the receiver from satellite.

This technique was useful in spatially locating surveillance facilities within the study area by obtaining the coordinates of various surveillance facilities using handheld GPS receiver within Rivers State University main campus.

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3.1.2 Secondary Data Sources

Secondary data were collected from open-source data (repository) simply means no restriction in the usage of such type of data, therefore, it implied free access to the data type (Bolstad, 2016) and table 2 showed the data types.

Table 2: Open source data

S/N	Open Source Data	Significance	Data Types
1	Google Earth	Charting of Coordinates	Imagery, raster
2	Google Labels	Ground features identification/names	Vector
3	OpenStreetMap	Highly detailed GIS data with different levels of accuracy and completeness	Vector data such as buildings, roads, vegetation and waterways

Source: (Author's Fieldwork, 2025)

OpenStreetMap was used to extract roads, buildings, land use, and other relevant features within Port Harcourt metropolis with detailed and up-to-date geographical information. However, field observations were necessary to ensure accuracy and to validate the points of interest that was imported to QGIS and superimposed on the OSM. The integration of OSM and field observation enhanced Google Earth Satellite Imagery and Label of earth features.

3.2 Data Processing

The processing of the data was carried out on QGIS 3.28 software utilizing the following steps or procedures:

3.2.1 Creation of Shapefile

The shapefile of Surveillance facilities was created and saved coordinates of various Surveillance facilities as CSV (Comma Seperated Value, delimited text), file extension through Microsoft Excel, and was later imported to QGIS environment/software through the layer tool, and further exported as a shapefile.

3.2.2 Validation of Coordinate Points

The coordinate acquired were charted or validated on QGIS to ascertain if the position of the various Surveillance facilities falls within the confines of the study area and this was achieved by launching Google earth satellite imagery as a layer in QGIS and importing the coordinates of the Surveillance facilities as shown in figure 3. This was done to ascertain that obtained coordinates during data acquisition were in-situ or falls within the study area.

3.2.3 Utilization of Open-Source Data

In this research work, after importing the shape file of the Surveillance facilities to QGIS environment as a layer, an open-source data known as Open Street Map (OSM) was used to show the roads leading to the various Surveillance facilities as shown in figure 2 and other necessary features needed for the map, where some vector operations were also performed.

3.3.4 Creation of the Database

The imported data containing the coordinates of the various Surveillance facilities along with the attributes were converted to a shapefile. A shapefile is a widely used geospatial vector data format for geographic information system (GIS) software. It was developed by ESRI, a leading provider of GIS software. A shapefile stored geometric and attribute data for geographic features and was composed of multiple files with specific extensions.

3.5 Map production

QGIS software was used to produce the maps. The coordinates and attributes of various Surveillance facilities that were saved in Microsoft excel as a CSV (Comma Separated Value) file were imported to QGIS as a delimited text and OSM was also launched to validate the point. The different layers that have been imported were modified and different point colours were selected for each of the layers and to further enhance the data usage, the layers were exported to a shapefile format. After getting the shapefile from the CSV data as explained earlier, the shapefile was imported to QGIS under the print layout, the points were imported and the OSM on the map canvas were added then other map elements were updated accordingly and a suitable scale was selected and the map was exported to PDF (Portable Document Format).

3.6 Data Analysis

3.6.1 The principle of Data Analysis

The principle of data analysis adopted for this research work aligned with the quantitative research approach. Quantitative research data analysis is in two methods which are descriptive and inferential statistical analysis. Descriptive statistics focused on describing the visible characteristics of a dataset meanwhile inferential statistics focused on making predictions or generalizations about a larger data based on a sample. This research work, therefore, aligned with the descriptive statistical analysis for quantitative or numerical data.

3.6.2 Proximity Analysis

200m buffering operation was carried out by dividing Rivers State University (RSU) main campus into four zones with each zones having a major hub which were the origins of the 200m radius searching. The major hubs include Entrepreneurship Development Centre (EDC), Central Library, Faculty of Engineering, and Post Graduate (PG) Hostel.

4. 0 Results and Discussions

Identification of Surveillance Facilities

The study identified a total of 981 surveillance facilities of various categories within Rivers State University main campus as shown in Table 3

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Table 3: Description of the Identified Surveillance Facilities within Rivers State University

S/N	Category of Surveillance Facilities	Number of Surveillance Facilities	Description
1.	Solar Light	786	Uses solar panel/energy
2.	Electric Light	114	Uses electric current from NEPA or generator
3.	Electric Pole	10	Streetlight installed on electric poles
4.	Building Light	6	Streetlight installed on buildings
5.	CCTV	44	Closed Circuit Television
6.	Security Unit	21	Security buildings and personnels
Total		**981**	

Source: (Author, 2025)

Geospatial Database of Surveillance Facilities

Table 4: An Excerpt of the Geospatial Database of Streetlight Surveillance Facilities within Rivers State University

S/N	Streetlight Type	Eastings (m)	Northings (m)	Status	Location	Description
1	Electric Light	276383.629	530151.937	Functional	Back Gate	Not Motion sensitive
2	Solar Light	276369.353	530139.628	Functional	Back Gate	Not Motion sensitive
3	Solar Light	276378.746	530126.696	Functional	Back Gate	Not Motion sensitive
4	Solar Light	276379.632	530113.605	Functional	Back Gate	Not Motion sensitive
5	Solar Light	276395.473	530091.990	Functional	Back Gate	Not Motion sensitive
6	Solar Light	276413.621	530100.601	Functional	Back Gate	Not Motion sensitive
7	Solar Light	276395.777	530132.729	Functional	Back Gate	Not Motion sensitive
8	Solar Light	276388.058	530148.974	Functional	Back Gate	Not Motion sensitive
9	Solar Light	276425.674	530174.672	Functional	Back Gate	Not Motion sensitive
10	Solar Light	276352.494	530127.141	Functional	Back Gate	Not Motion sensitive
11	Electric Light	276343.789	530124.771	Functional	Back Gate	Not Motion sensitive
12	Building Light	276340.829	530124.595	Functional	Back Gate	Not Motion sensitive
13	Solar Light	276331.748	530117.986	Functional	Back Gate	Not Motion sensitive
14	Solar Light	276332.308	530119.459	Functional	Back Gate	Not Motion sensitive
15	Electric Light	276293.256	530108.697	Functional	Back Gate	Not Motion sensitive
16	Solar Light	276293.256	530108.697	Functional	Back Gate	Not Motion sensitive
17	Solar Light	276286.551	530092.495	Functional	PG Hall of Residence	Not Motion sensitive
18	Solar Light	276293.693	530068.878	Functional	PG Hall of Residence	Not Motion sensitive
19	Solar Light	276296.989	530057.623	Functional	PG Hall of Residence	Not Motion sensitive
20	Solar Light	276311.054	530061.084	Functional	PG Hall of Residence	Not Motion sensitive

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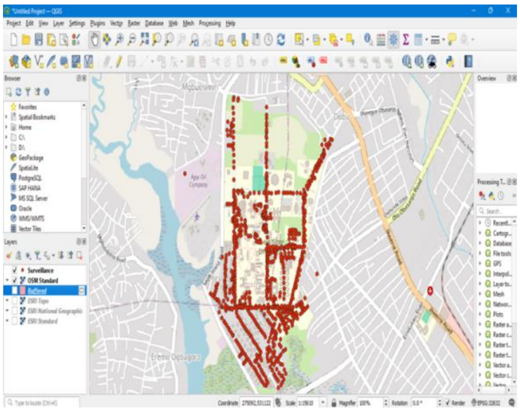

Figure 2: Spatial Distribution of Surveillance Facilities using the OSM layer in QGIS
Source: (Author, 2025)

Proximity Analysis of Surveillance Facilities

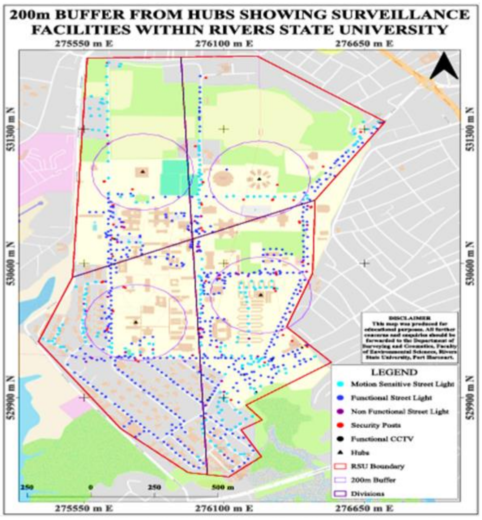

Figure 3: 200m Buffer Analysis of Surveillance Facilities in Rivers State University

Spatial Distribution Map of Surveillance Facilities

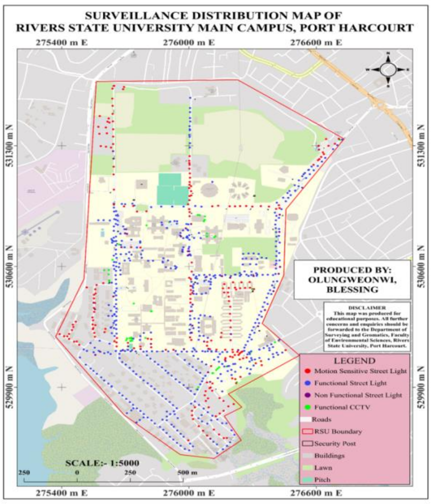

Figure 4: Spatial Distribution Map of Surveillance Facilities within Rivers State University

Hotspot Map of Surveillance Facilities

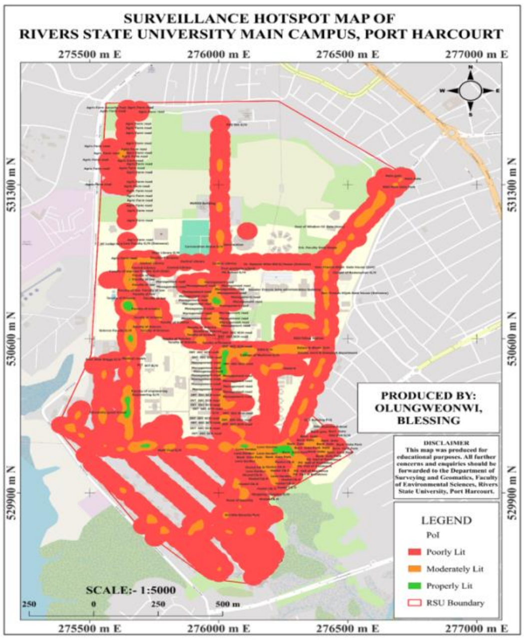

Figure 5: Hotspot Map of Surveillance Facilities within Rivers State University

5. Findings and Discussion

The identification and classification of surveillance facilities within Rivers State University Main Campus revealed a total of 981 surveillance-related features, as presented in Table 3. These facilities were categorized into six types: solar lights, electric lights, electric poles with lighting, building-mounted lights, CCTV cameras, and security units. These lights brighten the environment within and around the campus. Students who normally have night classes or preparatory classes for examination walk freely without any fear of danger or intimidation because of the lighting system. It also helps the lectures who stay in the campus for better visibility and enjoy the campus life, and security consciousness. Table 4 provides the spatial coordinates and functionality of the surveillance facilities obtained during data acquisition, which form the basis for mapping and analysis. The cartographic system tells what is here and there for virtual representation of earth's feature within the University system. More so, buffer analysis of surveillance facilities around selected major hubs within Rivers State University revealed varying degrees of infrastructural coverage which indicated that the residential zones had better lighting coverage compared to academic areas. However, considering the corridor of the University, the hotspot map revealed clusters of surveillance facilities showing areas that are poorly lit, moderately lit and well lit.

6. Conclusion

The geospatial assessment of surveillance infrastructure within Rivers State University Main Campus has provided a comprehensive insight into the spatial distribution, typology, and functional status of existing security facilities. The results revealed that the University has made commendable progress in deploying lighting infrastructure, particularly solar-powered lights, which accounted for over 80% of the total surveillance elements identified. This heavy reliance on solar

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energy demonstrates an environmentally sustainable and cost-effective response to the challenges posed by irregular power supply from the national grid. However, the evaluation also exposed notable deficiencies that undermine the overall effectiveness and integration of the surveillance framework. The significantly low number of CCTV installations, comprising only 4.5% of all surveillance features, reflects a limited capacity for real-time visual monitoring and forensic review, leaving considerable portions of the campus vulnerable to blind spots.

7. Recommendations

Based on the findings of the study, the following recommendations are made:

1. Improve Maintenance and Functionality of Existing Infrastructure,
2. Integrate Surveillance Infrastructure into a Centralized Geospatial System and
3. Deploy more security units in underserved areas

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