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A System for Managing Green Infrastructure Data: A Pathway to Sustainable Urban Development

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Abstract: This paper investigated the implementation of a client/server system, (EnviroView) for management of green infrastructure to facilitate the development of a sustainable urban areas in Enugu State, Nigeria. The aim is to provide simple digital systems for environmental data gathering, grouping, and visualization. EnviroView will bring about a smart city planning and management in line with the Sustainable Development Goal 11 (SDG 11) on Sustainable Cities and Communities. The research adopted a case study approach in the collection of stakeholder responses using structured questionnaires from urban planners, City officials, and community members. The EnviroView system works well in capturing real time ecological data, maintaining data accuracy providing easy data access and visualization. The general feedback from user groups attested to the usefulness of the system in assisting sustainable urban policies. The research demonstrated that EnviroView if implemented shall advance the data-driven sustainability of cities and provides a stepping stone for innovative environmental management of urban areas, especially, in emerging economies, thus making contribution towards the realization of SDG 11.

Keywords: Green Infrastructure, Web-Based Client/Server System, Sustainable Urban Development, Ecological Data Management, SDG 11 (Sustainable Cities and Communities).

I. Introduction

The trend of urbanization has become an iconic global pattern in the 21st century, as more than half of the world population is currently living in cities (Xing Quan Zhang, 2016). Although cities are the centers of economic development and innovation, the fast-paced urban development is commonly accompanied by negative effects on environmental degradation, poor infrastructure, and diminished living standards (Sukanya & Tantia, 2023). Here, green infrastructure in the form of parks, green roofs, urban forests, wetlands, and sustainable drainage systems has cropped up as a crucial intervention to encourage urban resilience, better air and water quality, and livability (Ashinze et al., 2024). Green infrastructure is essential in reducing the negative consequences of urbanization by providing both ecological, social and economic value (Gidiagba et al., 2024). Yet, the efficient planning, monitoring, and management of green infrastructure in cities need to have access to robust, current data.

Data relating to urban ecology; such as coverage of the green space, air quality, water systems, and biodiversity are often disjointed, outdated, or cannot be accessed by the key stakeholders (Klimanova et al., 2021). Lack of integrated data systems also presents a barrier to evidence-based decision making and restricts the capability of city planners, environmental managers, and policymakers to formulate sustainable solutions (Darma, 2023). The intensity of this challenge is notably high in developing areas such as Enugu State, Nigeria, where urbanization is advancing fast but the technical and institutional infrastructure to support collection of ecological data is undeveloped (Amechi, 2024). To fill this gap, this work proposes a potentially scalable web-based technology to manage green infrastructure information. Such systems enable real-time environmental data to be harvested, processed, stored and shared by a centralized system accessible over the internet.

Using such client-server architecture system, users (clients) and data repositories (servers) interact in a smooth manner, and can access regularly updated environmental data together (Sinha, 2018). The adoption of this method does not only enhanced transparency and stakeholders' involvement, but it also boosts the capacity of the decision-makers in coming with strategies that facilitate urban sustainable development. Hence this paper presents a research on the use internet based client/server application, for ecological infrastructure information management in the state of Enugu.

EnviroView is a combination of data captured by environmental sensors and community observations into a single system that provides visual investigation, trend tracking, and planning solutions (Wong & Kerkez, 2016). The study assesses the performance of the system, accuracy of data and satisfaction of its users to conclude on how the system helps in achieving Sustainable Development Goal 11 (SDG 11) - Sustainable Cities and communities.

Enugu State make an ideal case study because of the current increase in urbanization and the rising need of sustainable urban planning designs. Unplanned settlement, loss of green cover, and environmental pollution are some of the issues affecting the city and are challenges that undermine the lives of people living in the city. Enugu has the opportunity to introduce a data-driven ecological resources control by implementing this technological platform the EnviroView, for other cities in Nigeria to adopt. The research fits the SDG 11 that promotes the role of inclusive, safe, resilient, and sustainable cities. This study emphasizes the transformative power of digital technology in urban governance. Through the evaluation of its usability to manage green

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infrastructure in a more efficient way, the study advances the debate on smart and sustainable cities in Africa and advances the global agenda around environmental sustainability and climate resilience.

Problem Statement

The high rate of urbanization that Enugu State is experiencing (likewise most cities in the developing world), has contributed towards deterioration of the environment, leading to poor quality of air, disappearance of green areas, and resource scarcity (water). Although green infrastructure is of paramount importance in assuring urban sustainability, little is known about collection, management, and use of ecological data to plan as well as policy making. Current systems are more or less broken, outdated, or not available to important stakeholders. This reduces the capacity of the urban planners and city officials to make informed decisions that promote sustainable development. There is also a lack of a comprehensive integrated platform for monitoring and reporting on environmental data in real-time that enhances the process of attaining the Sustainable Development Goal 11. Thus, a strong technological approach to the effective collection, storage, visualization, and access of data is urgently required, to enhance city planning and environmental in Nigeria.

II. Literature Review

Concepts of green infrastructure in urban planning

Green infrastructure is a well-calculated network of natural and semi-natural locations, which do not only present a scope of environmental, economic and other socially beneficial impacts in cities but also present a high level of various benefits to those (Monteiro, Ferreira & Antunes, 2020). In contrast, to the traditional grey infrastructure (the road surface, the system of drainage pipes, and the constructions), green infrastructure focuses on ensuring the incorporation of natural processes into the city development process in order to enlarge the scope of ecosystem services and advance the quality of life conditions of inhabitants. Green infrastructure is an essential instrument in the facilitation of urban planning towards sustainability, climatic resilience, and even biodiversity (Adegun et al., 2021). In essence, green infrastructure entails elements like parks, the urban forest, green rooftops, street trees, wetlands, riparian buffer, bioswales, and the community gardens. These factors assist in the management of storm water, alleviating the effects of urban heat islands, enhance the quality of air and water as well as provides conducive habitat to wildlife. They can also provide recreational as well as aesthetic benefits, which attribute to the well-being of the people (Wang et al., 2024). Green infrastructure plays the role of making more livable and resilient cities in the environment of urban planning. It facilitates urban forms that are dense and efficient with the connection of nature to the man-made environment. Green infrastructure helps planners to regulate such problems of an urban environment like flooding, air pollution, and green-space deficiency (Ashinze et al., 2024). It is usually incorporated into land utilization rules, zoning requirements, and environmental laws to make sure that organic resource are conserved and improved along with increasing the city. The idea of green infrastructure is of a special concern since it coincides with the targets of goal SDG 11 that puts an emphasis on building inclusive, safe, resilient, and sustainable cities. The web-based system such as the EnviroView assists in the green infrastructure planning, monitoring, and management by supplying an accurate and real-time data to facilitate informed decision (Kufeoglu, 2022). Green infrastructure also gives a sustainable urban development solution especially in cities with high rates of urbanization where the environment is usually degraded. Utilization of green components in city design has the potential of achieving good ecological balance, facilitating climate adaptation, and guaranteeing a healthy living environment to future generation.

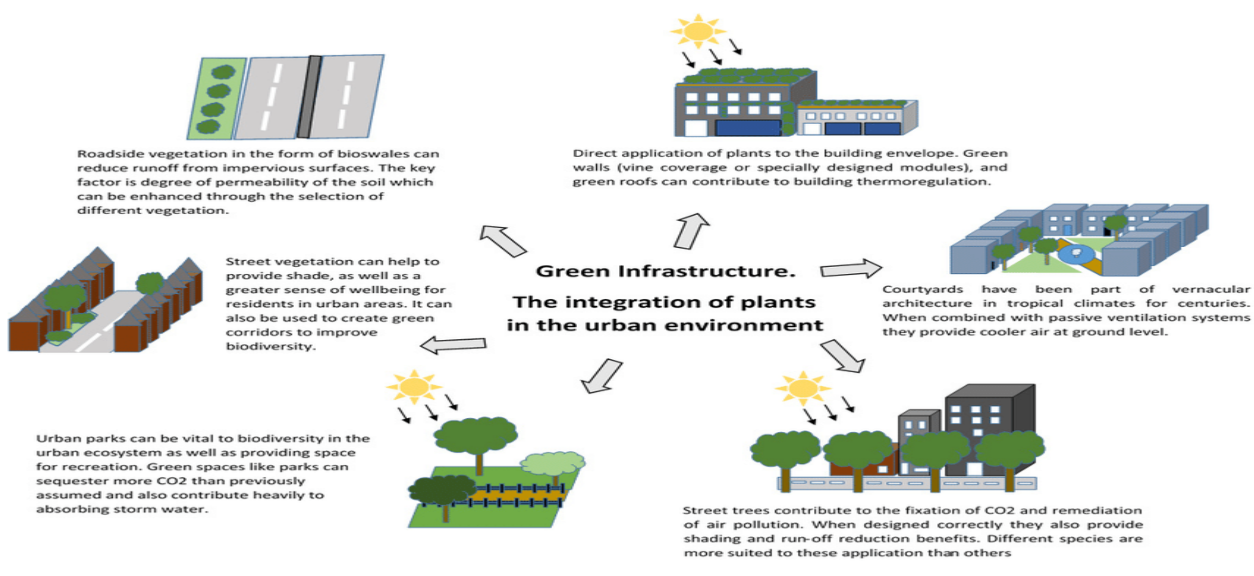

Figure 1: **U**rban green infrastructure with potential contributions **(**Wootton-Beard et al., 2016**).**

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Technologies for ecological data management

Ecological data management involves the systematic collection, processing, analysis, storage, and visualization of environmental information to support decision-making, conservation, and sustainable urban development (Maurya & Kumar, 2024). With the growing complexity of ecological systems and urban challenges, a variety of advanced technologies is now used to enhance the accuracy, accessibility, and utility of ecological data.

Geographic Information Systems (GIS): GIS is one of the most popular technologies in ecological data management. It allows locational, spatial analysis, and visualization of the environmental landscape Maps, Land covers, green spaces, water bodies, and pollution sources (Maurya & Kumar, 2024). GIS enables planners and researchers to map ecological resources, to watch them over time and to know what areas are priorities to conserve or develop. GIS also facilitates scenario modelling and assists city planners to determine the possible implication of alternative land-use decisions.

Remote Sensing: Is the process of collecting information concerning the surface of the earth through the satellite images, drones, and aerial photography. This tech is especially useful in the sphere of tracking the changes in a large-scale environment, like deforestation, urban sprawl, vegetation health, as well as water conditions (Jiao, 2024). Combined with GIS, remote sensing provides great opportunities to conduct ecological assessment in real time.

Internet of Things (IoT) and Environmental Sensors: The IoT devices and sensors are important in collecting real-time data about the quality of air, temperature, and humidity, soil moisture, noise levels, as well as water conditions. The specified sensors may be dispersed throughout the cities and connected to the centralized platforms to monitor them on a nonstop basis. In a system as EnviroView, IoT sensors will give in-time data that can be used to quickly address environmental concerns by the urban managers (Biancha, 2024).

Web-Based Client/Server Systems: Integrations of the various sources of data can be done on one useful system using Web-based platforms. The architecture of these systems is client-server with the information processed, stored and shared by the server to the client. This will enable live access to ecological data, analysis tools and dashboards to stakeholders, which advances practices in cities planning, government and in society. It alsp increases transparency, cooperation and databased decision-making (Omotayo & Efuntade, 2023).

Big Data Analytics: As sensor, satellite and survey data siturate the environment, big data analytics tools are leveraged to find patterns, trends, and correlations. These accelerators aid in forecasting environmental risks, work with resource exploitation, and assess green infrastructure initiatives performance.

Cloud Computing: Cloud-based systems have scalable storage and processing capability on ecological information. They allow tele-access, collaboration in real-time, and combination of various types of data. Machine-learning applications in ecological modeling and forecasting are also done due to the support of cloud computing (Merseedi & Zeebaree, 2024).

Mobile Applications and Crowdsourcing Tools: With mobile apps, citizens get a chance to send ecological data through reporting pollution, planting trees, and water problems. Crowdsourcing websites promote citizen engagement and promote high-quality data collected on the ground that could be missed by the institutional sources (Luna et al., 2028).

Artificial Intelligent (AI). Artificial Intelligence allows sophisticated process of massive ecological data obtained by sensors, satellite imagery, and community contributions. Using machine learning, one can detect the patterns in the quality of air, vegetation coverage and water levels, and model predictive analytics to intervene successfully early in environmental degradation. Green infrastructure classification and monitoring can also be performed with AI by performing image recognition to increase the pace at which such data is collected and minimise damage caused by human error (Miller et al., 2025). AI in EnviroView could drive dashboards, which create real-time insight, thus enabling urban planners to act in advance of the ecological changes.

Blockchain Technology: Blockchain offers secure, decentralized solution to store as well as share ecological information. Transparency and traceability are ensured in each transaction or any data input recorded in a tamper-proof ledger. It is especially helpful in checking up on environmental reports, watching over whether the urban sustainability policies are followed, and building trust among the parties (Dong et al., 2023). In EnviroView, the blockchain sensor data can be authenticated, land use changes can be traced, participatory governance can be facilitated by allowing community members to add and approve data entries without any shadow of doubt.

The potential of web-based client/server systems

The use of web-based client/server systems has great potentials in changing the way, which the urban green infrastructure is managed particularly, in developing regions such as Enugu State, Nigeria. Such systems are aimed to allow smooth collaboration of a client (user interface) and a centralized server (data processing and storage hub) via the internet (Adegun et al., 2021). Such systems in the scope of this study offer a convenient, scalable, and efficient tool to gather, store, analyse and visualise ecological data in real-time.

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Among the key benefits of web-based, client/server systems, central data management can be listed (Stogia et al., 2024). The data on the environment, air quality, green space distribution, water management indicators, etc., can be collected and integrated into a single platform and shared to; IoT sensors, mobile devices, satellite imagery, and others. Such integration decreases the data fragmentation, strengthens data consistency, and makes sure that every interested party has the same actualized data (Buelvas et al., 2023). Secondly, real time access and collaboration is another important gain.

Accessibility of the platform by urban planners, environmental managers, policymakers, as well as by the community members, is made possible through a web interface, allowing full availability of the platform in any location at any time. This enhances effective decision-making, which is informed and timely, and in the dynamic urban environments where the environmental conditions can change within a short period. It is also possible to store on the system interactive visualizations, which can be used to simplify the interpretation of complex ecological data and dashboards (Costa et al., 2024). In addition, such systems are scalable and flexible. As the urban environment changes and the data increase, the web-based platforms can easily expand in terms of data sources, users, and functionality without too much of influencing the infrastructure. This will make them future-resistant, and they can achieve long-term sustainability objectives (Anbalagan, 2024). The knowledge that the state of Enugu, where urban pressure is rising, and the traditional environment monitoring infrastructure is limited, web-based client/server system, such as EnviroView may offer the highest improvement in the ability of city officials to plan and manage green infrastructure. Such systems allow enhancing access to valid and up-to-date environmental information, thus enable evidence-based policies, public participation, and directly lead to the achievement of Sustainable Development Goal 11 - Sustainable Cities and Communities. On the whole, the possible of web-based client/server systems in the studies is their capability to bring updating eco-data management and the collaboration among the stakeholders and sustainable urban development with the help of innovative technology.

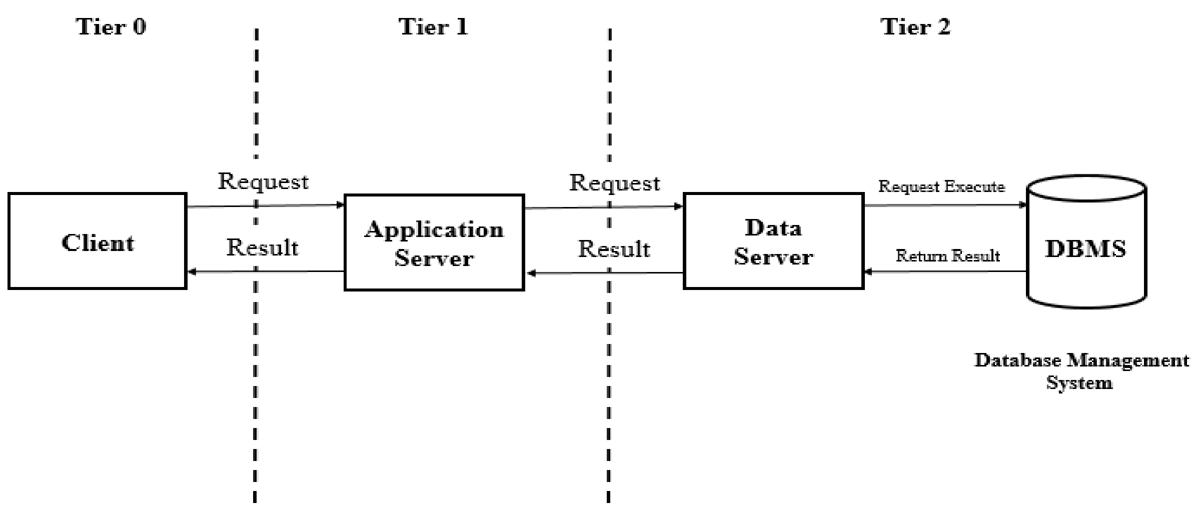

Figure 2: Client-Server Architecture (Dr. Huidae Cho, 2024).

Sustainable Development Goal 11 and Its Targets

The sustainable development goal 11 (SDG 11) represents one of the 17 goals put up by the United Nations under the 2030 Agenda of Sustainable Development. It is dedicated to the inclusion of cities and human settlements in the protected aspect and resilience and sustainability (United Nations, 2023). With the growing population of the world people focusing more on urbanization, the SDG 11 aims at relating the significance of better urban planning, infrastructure, and management of the environment in terms of providing a better living standard to all the people with special consideration to the vulnerable.

Goal Statement:

“Make cities and human settlements inclusive, safe, resilient and sustainable.”

SDG 11 plays a crucial role to check the problems of high urbanization, which comprise congestion, pollution, unsuitable living conditions, poor infrastructure, and access to basic amenities. It focuses on holistic approach to city developments where the balance is achieved between social inclusion, protection of the environment and economic growth.

Key Targets of SDG 11 Relevant to This Study Include:

Target 11.1: Access to proper moderate, safe and cheap housing and basic services. The target is related to the issue of urban slums and poor housing because it increases infrastructure to expand the standard living in rapidly developing cities (Shulla & Kőszeghy, 2021).

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Target 11.3*:* Inclusive and sustainable urbanization, and ability to plan and manage human settlements, participatory, integrated and sustainable. The focus of this study is based on this target, as it instills the significance of data-driven tools of urban planning, such as web-based systems of green infrastructure management (Haou et al., 2025).

Target 11.6*:* Make cities better environmentally by reducing air quality and other factors of poor municipal waste management. The example of environmental monitoring systems is also pertinent to this target as it allows enhancing urban ecosystems and mitigating pollution as the hallmarks of the EnviroView project (James, 2024).

Target 11.7: Offer equality of access to safe, inclusive and accessible, green and public space, especially women and children, older persons and persons with disabilities. The well-being of the urban green space is a fundamental aim of this research, and noticeably coincides with the movement towards just and sustainable community spaces ((United Nations, 2023).

Target 11.B*:* Adopt combined policies and strategies in inclusion, efficient utilization of resources, mitigation and adaptation to climatic change, and disaster resistance. This encourages the application of cutting-edge planning tools, such as client/server technologies over the web that help in reinforcing the resilience of cities and climate adaptation (Allaran ne et al., 2024).

III. Methodology

This study adopts a **case study research design**, focusing on Enugu State, Nigeria, as a representative urban environment experiencing rapid growth and environmental challenges. A case study approach would enable a thorough analysis to find out how a web-based client/server system EnviroView could facilitate green infrastructure management and promote sustainable urban development.

EnviroView is a user-specific web based ecological data management platform, which uses a client/server model. The client provides an intuitive web interface to the user whereas the server performs functions of data storage, processing and management. The system implements essential functions including the gathering of data about the environment (e.g., green space coverage, air, and water quality) and access to the data in real-time (sensors and community input) and engaging visualization tools, i.e. maps and dashboards.

The **study area**, Enugu State, was selected due to its urbanization trends, ecological pressures, and need for smart urban solutions. **Data collection methods** included structured **questionnaires** distributed to stakeholders to assess usability, satisfaction, and system impact, alongside **performance metrics** (system speed, uptime, data accuracy) collected from EnviroView's backend logs Participants includes urban planners, city officials, and community members selected using a purposive sampling that aimed at representing major stakeholders in urban planning and environmental management.

A quantitative data analysis approach was employed. The survey responses were analyzed using descriptive statistics to measuring user satisfaction and system usefulness, while performance metrics were measured to determine the technical stability and efficacy of EnviroView. This approach provided evidence-based insights into the system's contribution to achieving SDG 11.

IV. Results

Research Question 1

How effective is the EnviroView web-based client/server system in collecting and managing green infrastructure data in Enugu State?

Table 1: EnviroView Web-based Client/Server System

S/N	Statement	Mean (x)	Standard Deviation (S.D)	Agreement (%)	Remark
1.	The EnviroView system effectively collects real-time data on green infrastructure.	4.25	0.68	85%	Highly Effective
2.	The data captured by EnviroView is reliable and accurate for planning purposes.	4.10	0.73	82%	Effective
3.	EnviroView integrates data from multiple sources (sensors, reports) efficiently.	3.90	0.85	78%	Moderate Effective
4.	The platform allows easy access and retrieval of green infrastructure data.	4.30	0.60	88%	Highly Effective
5.	The system improves the organization and storage of environmental information.	4.00	0.80	80%	Effective

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Table 1 shows that the respondents are generally of view that the EnviroView system is useful in the gathering and management of green infrastructure data within Enugu State. The collection of data in real-time recorded a high mean of 4.25 which implies that users strongly trust the data collection method; data reliability was also recorded to have a positive mean of 4.10. Data accessibility was scored the highest with 4.30, which indicated that the platform was highly accessible and user friendly to the users. The effectiveness of data organization and storage had a mean of 4.00, which means that there is a margin of improvement. The core underlying long-term goals together with the data integration got the lowest mean of 3.90, thus, showing that even though the user understood that data integration is useful, some of these users had difficulties with integrating information that was given by numerous sources. The general mean score of 4.11, along with significant percentages of agreement (varying between 78 and 88 percent) and comparatively small standard deviations indicate an overall high and rather consistent positive attitude towards the system. Based on the identified need of better data integration, the research results justify the conclusion that EnviroView is a useful instrument of using ecological data, which can lead to sustainable urban planning and realization of SDG 11 in Enugu State.

Research 2

To what extent does the EnviroView system enhance real-time access and visualization of ecological data for urban planning and decision-making?

Table 2: EnviroView System **enhance real-time access**

S/N	Statement	Mean (x)	Standard Deviation (S.D)	Agreement (%)	Remark
1.	EnviroView provides timely access to ecological data required for urban planning.	4.20	0.65	86%	Highly Effective
2.	The system supports real-time updates that help in monitoring environmental changes.	4.05	0.70	81%	Effective
3.	Visualization tools (maps, graphs, dashboards) on EnviroView are easy to understand and use.	3.95	0.78	79%	Moderate Effective
4.	EnviroView enhances the speed and quality of urban planning decisions through real-time data.	4.15	0.62	83%	Effective
5.	The platform helps stakeholders identify ecological trends and make data-driven decisions.	4.00	0.75	80%	Effective

The table 2 shows a positive result of the effectiveness of the EnviroView system in increasing the real-time access and visualization of ecological data in urban planning and decision-making in the Enugu State. The respondents evaluated the system highly in terms of their ability to get timely data with a mean rating of 4.20 and 86 percent confidence to the respondents in the ability of real-time performance by the system. Tracking environmental changes in real-time were also rated highly with the mean of 4.05 and 81 percent of agreement with the results showing that there was satisfaction with the dynamism of data within the system. Although the visualizations tools were rated slightly lower, (mean of 3.95 and 79 percent of agreement), the results indicate moderate usefulness with some aspects of improvement such as clarity and usability of the interface. The overall effect of the system on speed and quality of planning decisions was supported with 4.15 mean and 83 per cent agreement and the aid the system rendered in finding data-driven decision-making was supported with 4.00 mean and 80 per cent agreement. The reliability of 4.07 as the overall average mean and agreement level of between 79 percent and 86 percent show that it is a positive perception. The consistency in user response is high as the standard deviations are low. To conclude, the EnviroView tool may be regarded as an excellent method of urban ecological planning, which is effective in terms of data access and visualization, however, additional improvements in visual presentation capabilities can powerfully increase its effectiveness.

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Research Question 3

What is the level of satisfaction and perceived impact of the EnviroView system among urban planners, city officials, and community members in promoting sustainable urban development (SDG 11)?

Table 3: **Satisfaction and perceived impact of the EnviroView System**

S/N	Statement	Mean (x)	Standard Deviation (S.D)	Agreement (%)	Remark
1.	I am satisfied with how EnviroView supports planning for green and sustainable urban spaces.	4.10	0.70	82%	Effective
2.	EnviroView promotes collaboration among stakeholders toward achieving SDG 11.	4.00	0.75	80%	Effective
3.	The system has increased my awareness and engagement in environmental sustainability efforts.	3.85	0.80	76%	Moderate Effective
4.	I believe EnviroView positively influences policy-making for sustainable cities and communities.	4.05	0.72	81%	Effective
5.	I am satisfied with the role of EnviroView in driving sustainable development in Enugu State.	4.20	0.65	85%	Highly Effective

Table 3 presents an overall positive attitude toward the EnviroView system among community members, urban planners and city officials with regards to facilitating sustainable development across urban environment and pursuing goals of SDG 11. The most-rated one, with an average mark 4.20 and 85 percent unanimous, points to the general satisfaction with the activity of EnviroView in promoting sustainability in Enugu State. They also valued the system on its support to green and sustainable urban planning with a mean of 4.10 as well as 82 percent agreement indicating that it is reliable in its planning processes. In the same way, the assumption that EnviroView is a positive factor in policy-making received the average of 4.05 and 81% approval, denoting that users can observe real effects in government and decision-making. The enhancement of cooperation among stakeholders to achieve SDG 11 was positively rated with the mean of 4.00 and 80 percent agree as well, further asserting the usefulness of the system in establishing cooperative planning. The mean score of 3.85 of the statement on raising awareness and involvement in environmental sustainability is still a moderate successful effect, although a bit lower than the previous score, which was 86% agreement. Each value of standard deviation is less than 0.80, which indicates uniformity of responses by users. Comprehensively, the mean of the five items is 4.04, which validates the fact that the EnviroView system is regarded as a helpful and efficient instrument in boosting urban sustainability initiatives and stakeholder participation in Enugu State. Such findings confirm the relevance and perceived impact of the system to the SDG 11 using real-time data, collaboration, and informed decision-making.

V. Discussion

This paper examined the importance of using a web-based client/server system, EnviroView, in the management of green infrastructure data in support of sustainable urban development at Enugu State as regards Sustainable Development Goal 11 (SDG 11) Sustainable Cities and Communities. The results of the analyses establish the vivid image of the effectiveness and usability as well as the perceived impact of the system on the urban planners, the city officials and the community members who are the key stakeholders. The first research question was answered as revealed that EnviroView was of great effectiveness in the areas of gathering and management green infrastructure data by the respondents. The high average scores and proportions of agreement between indicators linked with real-time data collection, data reliability and accessibility imply that the system supports a high performance in the capture and organization of the data about the ecology. Reliability of these findings is also provided by the consistencies in responses, which is manifested through the low values of standard deviation. Nonetheless, a little lower score in data integration leads to the idea that it is possible to improve. The reason would be the difficulty in providing a coordination of heterogeneous data (sources) or heterogeneous networks of sensors, which are prevalent in multi-ethnic urban ecosystems. The second research question was concerned with the real time access and visualization. Here too, results were very much satisfactory especially with respect to updating data on timely basis and facile accesses. The visualization tools had an average score and this could indicate that the intended users would have to either improve on their user interface or have more training on the use of the visualization tools. The outputs are also vital since to make effective decisions under fast-changing conditions in an urban environment, real-time visualization is required. The third research question identified the level of general

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satisfaction and perceived influence of the system on the idea of developing the sustainable urban development. The seekers showed a lot of satisfaction and they shared the responsibility of making EnviroView also being involved in building collaboration, information and sound policy-making. Such reactions attest the wider role that the system plays in the society other than technical features. The system especially appealed to the users due to how it integrates the process of urban planning with the concept of sustainability to promote SDG 11 by means of improved environmental surveillance and collaboration among communities. The core strength of EnviroView according to this investigation is the architecture, which is based on sound client/server with the possibility to collect process and retrieve data in real time. The web-based design of the system makes it available to as many users as possible irrespective of where they are; especially in those developing countries such as Enugu State. Besides, the capacity of the system to present visual and contemporary data makes it possible to understand the changes in the state of the environment and evaluate the effectiveness of green infrastructure work as well. Nonetheless, the system has its potential but there are the areas, which can be improved. The option to integrate the data and add visualization interface should be enhanced to allow variety of datasets and their ease of use. They will also require constant training and involvement of the stakeholders to ensure peak adoption and successful usage especially to the community members who are not so tech-savvy. This paper illustrates that, EnviroView possesses the capacity to be used in the management of ecological information in the city and sustainable city planning. It can be adopted in the state of Enugu and can be used as a scalable and replicable model in other cities across the emerging economies. EnviroView helps to bring together the environment and decision-maker at an international level, thereby facilitating the achievement of the SDG 11 because it leads to resilient, inclusive, and sustainable cities and human settlements.

VI. Conclusion

This study has demonstrated that EnviroView a web-based, client/server platform can bridge the long-standing gap between fragmented ecological data and the evidence-based decisions required for Sustainable Development Goal 11 (SDG 11). By reliably collecting, storing and visualising real-time metrics on air quality, green-space distribution and water management, the system has earned high marks from planners, officials and community members for data accuracy, accessibility and decision support. Translating these findings into actionable progress calls for a coordinated policy and implementation agenda. First, EnviroView should be formally integrated into the workflows of the Enugu State Ministry of Environment and Urban Development, serving as the authoritative ecological data repository and a mandatory reference point for environmental-impact assessments, building-permit reviews and other regulatory processes that demand up-to-date sustainability indicators. Second, an “Open Eco-Data” framework should be enacted to require non-proprietary data standards, publicly accessible dashboards and blockchain-secured audit trails, thereby enhancing transparency, civic oversight and trust in environmental governance. Third, national and local capital budgets should require a regular investment in the IoT sensor coverage like air-quality nodes, soil-moisture probes and capacitance meter flow into informal settlements and peri-urban areas but in accordance with international operating standards (e.g., OGC and ISO 19115) to enable EnviroView to interact directly with present GIS tools and promote smart city applications in the future. Fourth, there must be a long-term capacity-building initiative: the annual training of the planners, IT specialists, and volunteers in the community should emphasize the data interpretation and scenario modelling with follow-ups in the area of citizen science that would reward residents who provide geo-tagged observations therefore enriching data sets and creating a sense of co-ownership. Lastly, better emergency-response times or increases in green-space coverage must be explicitly embedded as key performance indicators into the budget-performance scorecards that the state should introduce, and the state must commission independent auditors to periodically review the system uptimes, as well as the effectiveness of integration and usability of its interfaces, so that improvements are continually informed by feedback. Combining EnviroView technical capabilities with effective regulation, open-data and participatory mechanisms and governance, Enugu State can become transformational rather than just pilot, providing demonstrable examples to be shared with other governments, with sub-national structures seeking face their future in the cities, as inclusive, resilient, and environmentally responsible places.

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