



Sustainable Environment and the built Space: Integrating Ecology, Planning and Human Well-being

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**THE CONTRIBUTION OF URBAN GREEN INFRASTRUCTURE TO MENTAL HEALTH AND
SOCIAL WELL-BEING IN SOUTHERN CITIES OF NIGERIA: FROM CONCRETE TO
COGNITION**

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Abstract

Rapid urbanization in Southern Nigeria has resulted in the widespread development of infrastructure, population increase and land use, which have changed the urban landscape. The positive economic changes have been accompanied by the loss of urban green infrastructure including parks and urban forest, wetlands, community gardens and public open spaces. Although the contribution of greenery in contributing to mental health and social well-being has become clear, information on the impact of urban green infrastructure in the context of Southern Nigerian cities is still limited. This paper discusses a systematic review of literature on the link between urban green infrastructure, mental health and social well-being in cities in the South of Nigeria. Peer-reviewed journal articles, government publications, conference proceedings and institutional publications have been reviewed between 2010 and 2025 using thematic analysis. The study has confirmed the impact of urban green spaces in the reduction of stress, emotional recovery, cognitive functions, social cohesion and quality of life. Green infrastructure also helps to lower levels of environmental stressors like noise pollution, overcrowding, air pollution and urban heat – which are becoming increasingly ubiquitous in fast-growing cities. However, the research shows that these issues persist, such as inadequate urban planning, unchecked growth of cities, inadequate environmental governance: and unequal access to recreational space. The review also highlights the lack of research to empirically determine the mental health benefits of buildings' GREEN. The review also noted that there is a huge lack of empirical studies on the mental health benefit and how this is impacted by green infrastructure in Southern Nigeria. The paper suggests that implementing green infrastructure in urban development processes, strengthening environmental policies and ensuring access to green spaces that is equitable are key actions for sustainable and healthy cities. The study contributes to the key debate on sustainable cities by making the general case that green infrastructure is an important aspect of the future cities of Nigeria for public health and social well-being. The findings from this research will be applicable in urban green infrastructure, mental health, social wellbeing, sustainable cities, southern Nigeria, urban planning and environmental health.

Keywords: Environmental Health; Mental Health; Social Well-being; Southern Nigeria; Sustainable Urban Development; Urban Green Infrastructure

1. INTRODUCTION

Global urbanisation is now an important feature of modern development. More than 56 per cent of all people in the world are already living in urban areas, and this is expected to rise considerably by 2050, according to the United Nations. Urbanization has provided unprecedented opportunities for economic development in developing countries and has at the same time brought with it environmental, social and public health problems. Nigeria is having one of the most rapid urbanisation rates in Africa. In the last 30 years, there has been phenomenal expansion of cities in the south of Nigeria, including Owerri, Port Harcourt, Benin City, Uyo, Calabar and Warri. This expansion has come with a rise in the demand for housing, transportation infrastructure, commercial development and public services. A significant amount of natural landscapes and green areas, as a result, have been lost and transformed into built-up areas.

The need to mitigate the environmental and social impacts of rapid urbanization is now more pressing than ever before, and Urban Green Infrastructure (UGI) is one of the strategies that can help meet this challenge. The urban green infrastructure is a network of natural or semi-natural areas, such as parks, urban forests, wetlands, green corridors, community gardens, recreational grounds and other vegetated space with ecological and social roles in urban areas. In addition to environmental advantages, recent studies have more and more identified how green infrastructure can also help to improve mental health and social well-being. A range of positive associations between access to green space and psychological stress, emotional wellbeing, cognitive function, social cohesion and wellbeing have been found. Healthier urban populations are linked to opportunities for relaxation, exercise, recreation, and opportunities for interactions with neighbors and others in green places.

Although these benefits have been found at a global level, urban green infrastructure (UGI) in many cities in the south of Nigeria has not yet been developed or adequately protected. Planning decisions are made in cities with a focus on economic development and infrastructural growth, which may be at the cost of environmental sustainability. The ability of green infrastructure to support mental health and social well-being is therefore seldom recognised.

This study consequently examines the interlinkage between urban green infrastructure, mental health and social well being in the backdrop of the cities of the south in Nigeria. It aims to gather current research, identify issues and develop policy recommendations for the implementation of green infrastructure in urban development plans.

The urbanisation process of Southern Nigeria is examined in terms of the following trends:

Some of the fastest growing urban centres in Nigeria are in Southern Nigeria. Increased population, rural to urban migration, industrialisation and economic diversification have been the drivers of urban growth in the region. Port Harcourt and other cities have grown into big industrial centres while Owerri, Uyo and Calabar have seen significant growth from administrative, educational and commercial activities.

These cities have generally grown without any overall planning framework. Forests have been cleared for housing developments, wetlands have been converted for development, and public open spaces have been gained by commercial development. This gives rise to urban spaces that are more dense, have higher traffic volumes, are more polluted and have less parkland.

These changes have broader implications than environmental issues. Loss of natural landscapes has a negative impact on residents' physical and psychological health and wellbeing, providing less opportunity for recreation, social interaction and stress recovery. The above developments underscore the importance of sustainable urban planning approaches where green infrastructure is seen as an important asset in the urban resilience process.

1.3 Concept of Urban Green Infrastructure

The term Urban Green Infrastructure (UGI) is used to describe a network of interconnected natural and designed green spaces that provides environmental, economic and social benefits within urban areas. The concept for the green infrastructure highlights the connectivity and multifunctionality of the green spaces as opposed to isolated ones. Key components include Urban parks, Urban forests, Street trees, Green roofs, Green walls, Wetlands, Riparian corridors, Community gardens, Recreational open spaces

All of these factors help to promote biodiversity, climate control, stormwater management, air quality, and beautification. Most importantly, they develop places that foster human health and well-being.

1.4: Social and Mental Well-being in Urban Environments

Mental health refers to a person's psychological well-being, allowing them to fulfill their potentials, manage their everyday lives, be productive and contribute to the community. Social well-being is about the relationship, engagement, inclusion and belonging in the community. Many people living in urban areas are subject to a number of stressors such as Noise pollution, Air pollution, Traffic congestion, Overcrowding, Heat stress, Social isolation.

Evidence from environmental psychology indicates that there are many such stressors associated with the built environment that can be reduced by being in natural places. Green spaces allow for relaxation, reduce anxiety, encourage physical activity and allow social interactions. Urban green infrastructure is therefore increasingly seen as a public health resource (not a resource for the environment).

2.0 PROBLEM STATEMENT

The urban green infrastructure of the cities of Southern Nigeria has been decreasing over time as a consequence of urbanization. Roads, buildings, shopping centers and residential developments are replacing natural ecosystems more and more. Consequently, there are few opportunities for residents to access green spaces that can provide opportunities for psychological recovery and social engagement. Inadequate recreational facilities, poor environmental planning and poor implementation of development control regulations are some of the problems that many cities in the South of Nigeria have. Lack of accessible parks and green space adds to environmental risk factors such as noise, heat, pollution and crowding.

While there are several extensive international literature on the role of GIs on mental health, there are still limited studies in the Nigerian context. As a result, there is insufficient evidence to support funding of green infrastructure as an intervention to improve health outcomes.

This gap in knowledge hinders the ability to create evidence-based policies that can enable good living conditions and sustainable urban development.

3.0 AIM AND OBJECTIVES

3.1 Aim of the Study

To investigate the role of urban green infrastructure on mental health and social well being of Southern Nigerian Cities and suggest how green infrastructure can be incorporated into sustainable urban development.

3.2 Objectives

The study seeks to:

1. Discuss urban green infrastructure concept and elements.
2. Explore the links between urban green infrastructure and mental wellbeing.
3. Evaluate the relationship of green space to social health.
4. Enumerate causes of reduction of 'green infrastructure' in the cities of the South of Nigeria.
5. Assess planning and policy issues and opportunities for green infrastructure.
6. Suggest measures for making better use of and developing urban green areas.

4.0 METHODOLOGY

4.1 Research Design

This study used systematic literature review (SLR) method to review the relationship between mental health, social well-being and urban green infrastructure in cities of Southern Nigeria. A systematic review was deemed suitable as it would allow the identification, evaluation and synthesis of existing knowledge from several studies in a transparent, replicable way. The approach enabled for an in-depth assessment of empirical evidence and theory on the role of green infrastructure for public health effects and social welfare in fast urbanizing contexts.

The review centered on scholarly articles and grey literature on urban green spaces, environmental health, mental health, social cohesion and sustainable urban development in Nigeria and its likenesses in the developing world.

4.2 Literature Search Strategy

Major academic databases and institutional repositories were searched for a comprehensive literature search. This was carried out from January to March 2026. These databases were used: Google Scholar, Scopus, Web of Science, ScienceDirect, SpringerLink, JSTOR, PubMed, African Journal of Pharmacy and Pharmacology (AJP). The literature search included articles published between the years 2010-2025. Eligible studies were obtained using the keywords and Boolean operators. Some of the search phrases that were used were: “Urban Green Infrastructure” AND “Mental Health”, “Green Spaces” AND “Social Well-being”, Urban Parks” AND “Psychological Restoration”, “Urbanization” AND “Environmental Health”, “Public Open Spaces” AND “Community Cohesion”.

Selected papers were also chosen from reference lists, to look for other relevant publications. Inclusion/exclusion criteria were set to assure the review's quality and relevance.

Inclusion Criteria

The studies were included if they:

1. Were published between 2010 and 2025.
2. Analyzed urban green infrastructure, green spaces, parks, urban forests, wetlands, gardens or any related environmental facet.
3. Explored mental health, psychological well-being, social well being, community interaction or quality of life outcomes.

4. They were peer-reviewed journal articles, conference papers, government reports or institutional publications.
5. Specific to Nigeria, Sub-Saharan or any other developing country setting with its comparable urban environments.
6. Were published in English.

Exclusion Criteria

Research was excluded if it had characteristics of:

1. Reduced to the level of conservation of biodiversity only, not considering the human well-being.
2. only looked at rural areas.
3. Not was opinion articles, editorials, newspaper reports or non-academic publications were missing empirical or theoretical rigor.
4. These were duplicated for each database.
5. Lacked details of methodology or full text was not available.

These criteria helped to ensure inclusion of only relevant and credible sources in the review. A consistent framework for data extraction was used for the selected studies to extract relevant information. The information that was extracted were:

- i. Author(s) and the year published.
- ii. Study location
- iii. Research objectives
- iv. Methodological approach
- v. Type of green infrastructure studied/analyzed

The following results are based on mental health outcomes reported:

- i. A score for social well-being outcomes has been reported.
- ii. A summary of the key findings and recommendations.

Thematic analysis were used to analyse collected data. This included coding and categorising common ideas, patterns and themes around the role of urban green infrastructure in enhancing mental health and social well-being. The analysis resulted in major thematic areas such as psychological restoration, the reduction of stress, cognitive functioning, social cohesion, environmental quality improvement, challenges in urban planning and policy implications.

The results were then synthesized and interpreted to reveal gaps in existing knowledge, gaps in research, and future research directions for planning urban green infrastructure and for mental health research in Southern Nigeria.

5.0 URBANISATION AND GREEN INFRASTRUCTURE IN SOUTHERN NIGERIA

The town of Oyo in southern Nigeria is home to the city's green infrastructure. The city of Oyo in southern Nigeria is home to the city's Green Infrastructure.

5.1 Urban Growth Trends

Over the last 30 years, there has been unprecedented urbanization growth in Southern Nigeria as a result of population growth, migration from rural areas to urban areas, job opportunities, industrialization, and infrastructural development. In addition to significant spatial expansion, the natural landscapes in Owerri, Port Harcourt, Benin City, Uyo, Calabar and Warri have been transformed into residential, commercial, industrial and transportation infrastructures. Nigeria's national demographic dynamics shows that urbanization rates, while not as high as those in some countries, continue to rise at a higher rate than the global average, thus intensifying the pressure on urban land resources and the public infrastructure. Increased infrastructural development such as roads, houses, shopping centres and manufacturing units has skewed urban development in the southern part of Nigeria. These factors have helped stimulate economic development and increased access to services, but they have also led to an increase in the alteration of vegetated areas to built-up environments. Land-use changes have also increased due to the development of peri-urban settlements around major cities. The development of peri-urban settlements around major cities has also added to the land-use changes. Ecological systems are becoming broken up and environmental quality is decreasing as agricultural lands, wetlands, urban forests and open green spaces are increasingly being replaced by concrete structures. As a result, some southern cities in Nigeria today are experiencing issues of environmental degradation, urban heat is accumulation, air pollution, flood and loss of public recreational areas.

5.2 Status Urban Green Infrastructure

Southern Nigeria urban green infrastructure includes parks, urban forests, wetlands, street trees, community garden, green belts, recreation fields, riparian vegetation and institutional landscapes. Many cities traditionally had significant green assets that helped them achieve environmental sustainability, biodiversity protection and the health and welfare of their citizens. But, the status of the green infrastructure in most cities of the South Nigeria is one of decline, fragmentation and poor management. Either there are not enough public parks, or they are poorly maintained, or not all citizens have access to them. The urban forests, wetlands and the like have shrunk as a result of land reclamation, infrastructure construction, and unchecked urban sprawl.

In the cities like Port Harcourt and Warri, industrial activities and urban development have drastically affected the natural ecosystems, while the rapidly growing cities like Owerri and Uyo have seen natural ecosystems converted to residential and commercial activities. The state and private bodies have made some attempts to set up recreational parks or beautification works, but they are still insufficient in the face of urban development. This is made even more difficult by the unequal distribution of green spaces. There is a disparity between high-income and low-income communities with regards to access to landscaped areas and recreational facilities. This imbalance also means that vulnerable groups have less opportunity to get mental rest and recreation, and the social interaction they need, while also contributing to environmental injustice.

5.3 Reasons for Green Infrastructure decline.

The loss of urban green infrastructure in Southern Nigeria is attributed to a number of inter-related factors.

Rapid Urban Expansion

Uncontrolled urban growth is one of the main contributors. Cities grow in response to population growth, and green space is seen as space that can be used to provide housing, commercial development and transportation. This has resulted in extensive urban forest, wetland and park encroachment.

Lack of effective urban planning and enforcement.

There are planning regulations, but there is a lack of enforcement in many urban centres. Development is often permitted without proper consideration of environmental sustainability and protection of G.I. Environmental sustainability and protection of G.I. is often not considered during development approval. In some instances, political/economic pressures have led to re-purpose of “designed” recreational areas.

Population Growth and Housing Demand.

The growing urban population has created huge demand for housing and urban services. Implementing the above-mentioned strategies often means that developers will prioritise financial returns by utilising the maximum land area possible, thus reducing and/or removing green space from urban development.

Inadequate Environmental Governance

Poor institutional capacity, inadequate resources and governance issues have hindered good environmental management. Local governments do not generally have a holistic plan for green infrastructure planning, maintenance and monitoring.

The pressure that arises from the economy and business climate.

Commercialisation of urban land leads to conversion of green space for profits. Wetlands, open spaces and urban forests are often perceived as unused land resources, and are therefore subject to development pressures.

Public Awareness Deficit

The awareness of the environmental, social and mental health benefits of Green Infrastructure is low. Consequently, there can be limited interest in protecting green space, which provides less incentive for government to act on the public agenda to support environmental outcomes.

The combined effect of these has led to a gradual decline in the green infrastructure of the Southern Nigeria cities. Unless this trend of reduction in urban greenspaces is reversed, it could further compound environmental issues and risk the ability to deliver urban mental health, social cohesion and resilience benefits.

6.0 URBAN GREEN INFRASTRUCTURE AND MENTAL HEALTH

In the last 20 years, the relationship between urban green infrastructure (UGI) and mental health has become a growing focus of research and study. Green infrastructure in the form of parks, urban forests, community gardens, green corridors, wetlands, recreational open spaces, and other areas offer environmental and aesthetic advantages, but they also offer other benefits. It is an essential resource for mental replenishment, emotional health, thinking and socialization.

Many urban dwellers in rapidly urbanizing cities are constantly subjected to environmental stressors like traffic congestion, overcrowding, noise pollution, air pollution and lack of recreational activities. Increased stress, anxiety, depression and mental health issues have been associated with these conditions. The Urban Green Infrastructure can provide such a natural solution, by creating restorative spaces which benefit the mind and enhance quality of life.

Recent studies indicate that green spaces have the potential to alleviate psychological distress, improve cognitive functioning, improve emotional and mental reactions to stress and promote healthier urban

communities. The importance of studying the mental health benefits of green infrastructure is growing as urban expansion in cities of the south of Nigeria continues to diminish natural landscapes in such cities.

This section is about reducing stress and restoring the mind. This section is about the reduction of stress and psychological restoration.

Urban green infrastructure is often cited to be able to reduce stress and promote psychological restoration. The Stress Reduction Theory (SRT) suggests that the natural environment elicits positive emotional responses, and physiological relaxation. Green spaces offer a possibility to people to get out of the pressures of city life and relax from mental strain. Spending time in parks, gardens and environments with trees has been shown to decrease cortisol levels, BP and improve mood. Earlier it was reported that visual exposure to nature is also linked to less tension, anger and anxiety. Just a few minutes of exposure to green spaces can have a positive effect on health and well-being.

In urban centers of the South, the urbanization and its stress have heightened the exposure of city dwellers to stressors. Green infrastructure can provide a healing urban resource that allows for relaxation, recreation, meditation and social engagement. Public parks, waterfronts and urban forests can then be a significant factor in helping to restore the mind and alleviate stress-related ailments.

The practice duration and recovery time will depend on how much cognitive performance and attention recovery is being sought.

Urban green infrastructure is very effective in supporting cognitive functions and attention restoration. According to the Attention Restoration Theory (ART) people benefit from recovery from fatigue in their directed attention system when their sensory systems are presented with natural environments rather than environments with high levels of mental stimulation. The Attention Restoration Theory (ART) proposes that natural environments provide recovery from fatigue in the directed attention system, which is fatigued by sustained mental effort and/or mental stimulation from complex urban environments.

When the brain is overwhelmed, it can recover by being in nature, as it has certain qualities of fascination, compatibility, and escape. Research has shown that people who spend time in green spaces have improved attention, memory, problem-solving and cognitive functions. Access to green environments are especially beneficial to children, students and working adults. Studies have found that schools and workplaces that are close to green spaces have been linked to better academic achievement, increased productivity and better mental concentration. Combining green spaces with built infrastructure in urban areas, especially in Southern Nigeria, where urban sprawl is more likely to be prioritizing built infrastructure over green space, incorporating green spaces into residential areas, schools and workplaces could improve cognitive function and promote better urban living. Such interventions may be especially useful to students and professionals who are at risk of high mental workload and environmental stress.

6.1 Stress reduction and psychological restoration

The psychological benefit of urban green infrastructure is among the most well-documented benefits and is of growing interest. Stress Reduction Theory (SRT) suggests that nature environments can lead to positive emotional responses and physiological relaxation. Green spaces offer people the chance to get out of the hectic urban environment and to recover from mental fatigue. Studies show that spending time in a park, garden or tree-lined area can help to lower cortisol levels, decrease blood pressure and enhance mood. Studies also show that adults exposed to natural landscapes experience less tension, anger and anxiety. Just a few minutes will make a difference in improving psychological well-being.

In the South, urbanisation and its associated environmental pressures have created a greater exposure to stressors for urban dwellers. Green infrastructure can contribute to the therapeutic aspects of the urban landscape by providing recreation, relaxation, meditation and social interaction areas. Public parks,

waterfronts and urban forests can then have a meaningful impact on mental rejuvenation, and the alleviation of stress associated with health impacts.

6.2 Recovery from cognitive performance and attention.

Urban green infrastructure plays an important role in cognition and restoration of attention. Based on the A.R.T. (Attention Restoration Theory), natural environments can promote restoration from directed attention fatigue that occurs as a result of using the mind for long periods and in complex urban environments. Natural settings have qualities of fascination, synergy and the sense of escape, which enable the brain to recharge from over-stimulation. Research has shown that people who spend time in green spaces benefit from higher focus, better memory, problem-solving skills and cognitive performance. Access to green spaces is especially beneficial for children, students and working adults. It has been proven that schools and workplaces in close proximity to a green space have a positive link to better academic achievement, increased productivity and increased mental concentration.

Within urban environments in Southern Nigeria where built infrastructure is seen as more important than natural spaces, the inclusion of greenspaces in sustainable urban development within residential environments, schools, and workplaces could improve cognitive performance and lead to a healthier urban environment. These interventions may be especially advantageous for students and professionals who have a high mental workload and environmental stress.

6.3 Emotional well-being and resilience is a focus area

Urban green infrastructure has a critical importance to support emotional well-being and to enhance psychological resilience. Green environments offer opportunities for recreation, social interaction, physical activity and contact with nature, which all help to foster positive emotional experiences.

People who have easy access to green space tend to be happier, more satisfied with their lives and more satisfied with their subjective wellbeing. Nature helps to relax, alleviate emotional fatigue and offers moments to reflect and recharge from the day's events. Physical activity is also linked with better mental health which is provided by green spaces.

Also, nature exposure has been shown to increase resilience through assisting people to manage stress, hardship, and nature's challenges. Groups of trees and plants in community gardens, neighborhood parks and recreation green spaces promote social interaction and networks of support, which help with emotional stability and community health.

Green infrastructure can play an important part in enhancing emotional resilience and a general quality of life in rapidly growing Southern Nigerian cities, where challenges to psychological health can arise from economic pressures and environment.

6.4 Depression/Anxiety Reduction - Green Infrastructure

Depression and anxiety are two of the most prevalent mental disorders in the world in cities. The benefits of access to green infrastructure are increasingly recognized and there is evidence that it contributes to the reduction of prevalence and severity of these conditions.

Regularly using green spaces offers a chance for physical activity, social interaction and contact with environments that can be healing, which are all connected to anxiety and depression. People who live in areas with more trees tend to have a better mental health than people living in more urban areas.

Research has consistently been linked with contact with nature and decreased symptoms of depression, better emotional control, and lower anxiety levels. Green spaces can also help to alleviate the sense of isolation that can sometimes occur in society, by providing opportunities for interaction and recreation among residents.

Empirical studies, however, specifically investigating these relationships in Southern Nigeria are scarce but the existing evidence from similar urban settings indicates that the conservation and enhancement of urban green infrastructure may play an important role in the promotion of mental health. Access to parks, urban forests and community green spaces can thus be an effective public health initiative to help tackle the increasing mental health burden from urbanisation.

Urban green infrastructure, as a whole, should be seen as an environmental asset and not just part of the environmental system, but also and importantly as part of the urban mental health system. Incorporating greenery in urban planning and development policies will not only enhance psychological health, but also increase community resilience and help to make Southern Nigeria's cities healthier and more sustainable.

7.0 URBAN GREEN INFRASTRUCTURE AND SOCIAL WELL-BEING

Urban green infrastructure plays a vital role in the social wellbeing, providing space for social interaction, recreation, community involvement and inclusiveness. In addition to ecological and mental health improvements, green infrastructure is an important social asset that helps improve the quality of life in the city and creates robust and resilient communities. Social well-being involves the nature of relationships between people and between people and groups, the extent to which communities are involved, social support networks, a sense of belonging and engagement. Green spaces like urban forests, community gardens, parks, recreational fields, and public open spaces are locations in urban settings where people can meet together, connect and foster community bonds. The process of rapid urbanization is still taking place in the cities of the South with the resultant growth in population and the decline in public space, which has limited opportunities for people to meet and connect with each other, thus lowering community cohesion. Urban green infrastructure (UGI) has emerged as an increasing priority as an instrument to support social wellbeing and to build more inclusive and livable cities.

7.1 Social Cohesion and Community Interaction.

The ability to promote social cohesion and social interaction is one of the most significant social benefits of urban green infrastructure. Green spaces offer a neutral and accessible space where people of all social, cultural and economic statuses can meet, interact and engage in a common activity. Neighbourhood green spaces, public parks, community gardens and recreational centres are also places where residents meet together, and promote social networking and interpersonal relationships. These kinds of interactions can help to foster trust, cooperation, and support within the community, strengthening social capital. Studies have indicated that green space in neighborhoods with well-maintained spaces have greater civic involvement and community bonding. Green spaces promote informal social interactions, family activities, cultural events and community festivities, fostering a sense of belonging and collective identity.

Preserving and developing green infrastructure can help mitigate social fragmentation and foster better community relationships in urban cities in Southern Nigeria that have tended to marginalize communal spaces by urban expansion. These areas are especially significant in multicultural towns or cities where the intersection of social and economic life depends on opportunities for social integration in order to ensure peaceful coexistence and community development. For students to enjoy recreation and physical activity in a safe and healthy environment. UGI offers fundamental opportunities for recreation and physical activity, which are both important to social well-being and public health. Parks, a sports field, greenways, walking trails and open spaces provide a variety of recreational opportunities, such as walking, jogging, cycling, sports, relaxation and outdoor gatherings.

Engaging in recreation activities helps people become physically fit, lowers stress and increases overall satisfaction with life. In the community context, recreational green space can trigger social interaction by fostering opportunities for people to get together for sport and recreation, and to enjoy cultural events. Safe and well-maintained recreational facilities continue to be a challenge in many cities in the South of Nigeria.

With the continuing growth in urban population, the need for readily available recreational areas is rising. Urban green infrastructure can then contribute to the enhancement of the quality of life of the inhabitants by offering safe places to relax, socialize and exercise.

Moreover, recreational green space can help to mitigate health inequalities by providing low cost physical activity opportunities to people of all socio-economic status. This is especially relevant in developing urban settings, where there is a reduced availability of private recreational lands.

7.3 Community identity and sense of place

Urban green infrastructure plays a role in the creation of place and strong community identity. The natural and landscape features of an area can also come to play a role in the culture and social scene as a defining element of residents' perception of their community. A sense of place is an emotional connection that people feel to a place as a result of events, memories, culture and relationships to it. The attachment is reinforced by the provision of green spaces that offer pleasant and significant spaces to relate to nature and one's neighbors.

Community parks, urban forests, botanical gardens and waterfront green spaces have the potential to be symbols of local identity and pride. These are used as spaces for cultural festivals, religious services, social gatherings, and community celebrations, furthering common values and traditions. A local community's sense of identity and identity of place can be reinforced through the preservation of green infrastructure in Southern Nigeria, where many cities have unique characteristics of their local ecology and culture. The important role green spaces play in protecting the environment, and also in protecting important cultural and social resources which helps people feel a sense of belonging in the city, can be protected.

7.4 Public Safety and Social Inclusion

When well designed, managed and maintained, urban green infrastructure can also help to improve public safety and promote social inclusion. The right design of green areas encourages frequent usage and enhances community monitoring, while making people feel uncomfortable in using them in ways that could be considered antisocial. The idea of "eyes on the street" implies that places for informal social surveillance and perceptions of safety are places that are used by people. Well-maintained, accessible, and well-lit parks and recreational facilities can increase the public's confidence in using public space and engage in community activities.

Social inclusion is another advantage of green infrastructure through shared space open to all social groups, by age, gender, economic status and ability. Intergenerational green space encourages interaction between different age-groups and can minimize social isolation for children, older people and those with disabilities. There are still major disparities in access to quality public spaces in many cities in the South of Nigeria. Low income areas may have restricted access to recreational areas and green space. Therefore, opening up opportunities to access urban green spaces can play a role in progressing social justice, social integration and quality of life.

In general, urban green infrastructure contributes to the social dimension of the city in various aspects, such as social cohesion, recreation, community identity, public safety and social inclusion. Investment in accessible and sustainable green infrastructure will be important as Southern Nigerian cities keep growing to create healthier, connected and resilient cities.

8.0 MENTAL HEALTH IMPACTS OF THE ENVIRONMENT

The benefits of urban green infrastructure are numerous and directly and indirectly affect mental health and wellbeing. The psychological benefits of green spaces are all too frequently seen as recreational and natural exposure, but their environmental impacts are also significant and vital to the health of the city. Green

infrastructure can help to reduce environmental stressors that impact the mental well-being by improving air quality, reducing urban heat, noise pollution, and increasing climate resilience. Air pollution, heat, flood and noise pollution are some of the environmental problems that are in the rapidly urbanizing Southern Nigerian cities. The psychological distress, anxiety, decreased quality of life, and public health issues are associated with these conditions. The urban green infrastructure is a natural and cost-effective solution to tackle these issues and also to improve the mental health of the people.

8.1 Air Quality Improvement

Air pollution continues to be one of the greatest environmental health problems facing cities. Many cities in the South of Nigeria suffer from low air quality as a result of rapid industrialization, growing number of road transport vehicles, open burning of waste and construction activities. Polluted air has been linked to respiratory diseases, cardiovascular diseases, cognitive impairment, mental health problems (anxiety and depression). Urban green infrastructure (UGI) is an important solution to air pollution, as it filters the air of pollutants and generates oxygen through photosynthesis. Trees, shrubs and other plant life, trap particulates, bind toxic gases like carbon dioxide, nitrogen oxides and sulphur dioxide, and enhance air quality in urban areas. Better air quality has a positive impact on mental health, through improvements to physical stress and well-being. Research has indicated that those residing in greener neighborhoods tend to have less psychological distress, and improved self-reported health status. Urban green infrastructure provides healthier environments, which helps to maintain cognitive function, emotional balance and improve quality of life, by limiting exposure to environmental pollutants. Urban forestry and green corridors, if appropriately developed, could play a major role in improving the environment and promoting mental health in urban areas of Nigeria like Port Harcourt, where the presence of industries and vehicles have a high impact on air quality.

8.2 Urban Heat Island Mitigation

The Urban Heat Island (UHI) effect is the phenomenon that occurs when urban areas are warmer than their rural surroundings because of the heat-trapping attributes of buildings, roads, and other heat-absorbing surfaces. This has been exacerbated by rapid urbanization, as well as the reduction in the amount of vegetation, in many Nigerian cities. High temperatures make people physically uncomfortable, disturb their sleep, decrease their productivity and cause psychological stress. Excessive heat exposure has also been associated with mental health issues such as irritability, aggression, anxiety and other mental health issues.

The shading and evapotranspiration processes play a role in the reduction of the Urban Heat Island effect provided by the Urban Green Infrastructure. Vegetation: Trees, parks, green roofs and vegetated open spaces lower surface temperatures and enhance the urban microclimate by absorbing less heat than concrete and asphalt surfaces. According to a study, urban areas with large trees and green spaces are found to be significantly cooler than high-density urban areas. The cooler environments help to make outdoor environments more comfortable, increase physical activity and promote social interaction, which are all beneficial to mental health.

Growing urban forests in the southern Nigerian cities could be an effective way of enhancing thermal comfort and lowering psychological stress in the context of high temperature experienced throughout the year.

8.3 Noise Reduction

Noise pollution is a developing issue in urban areas and is often caused by road transportation, business or industrial noise, construction works and dense residential development. Excessive noise exposure is linked to stress, sleep disturbances, decreased concentration, cardiovascular issues and mental fatigue. The urban green infrastructure acts as a natural barrier to noise pollution. Vegetated barriers, such as trees, shrubs and hedges, absorb, deflect and scatter sound waves, which will help to lower background noise. Green spaces also offer less noisy surroundings where people can relax and psychologically renew themselves.

Research has demonstrated the positive effects of access to natural quiet environments on reducing stress, improving mood, and improving cognitive functioning. Parks and urban forests provide a sanctuary from the sensory overload that can be experienced in highly urbanized environments, and provide a place to recover from mental fatigue and emotional stress. Green belts and vegetative buffers can be placed strategically within urban environments of the South to help manage the environment and promote mental wellness in cities with growing traffic congestion and business activity.

8.4 Climate adaptation and resilience

The impacts of climate change on urban sustainability and public health are very significant. Many areas in Southern Nigeria experience more flooding, extreme weather events, higher temperatures and environmental degradation. Climate change-related hazards have the potential to have a negative impact on mental well-being and wellbeing, by leading to heightened stress, uncertainty, displacement and vulnerability. Urban green infrastructure plays its part in climate adaptation and resilience as part of ways cities can adapt and recover from environmental shocks. Wetlands, urban forestry, green corridors, permeable green spaces contribute to stormwater management, flood control, biodiversity and ecosystem stability.

Psychological impacts of climate resilience are tremendous. Some communities have ready-made green infrastructure which can be more resilient to disturbances and can lessen the climate-related anxiety and promote a sense of security in these communities. Green spaces also offer opportunities for social support, recreation and community engagement both during and after environmental events. Cities like Port Harcourt, Calabar and Warri, which face the threat of flooding and coastal environmental hazards, can benefit both the environment and public health by incorporating green infrastructure as part of urban planning. Such investments can enhance mental health in the long-term by making cities safer, healthier, and more resilient, while also benefiting ecological resilience.

In summary, the environmental services provided by urban green infrastructure are much wider than ecological conservation. Green infrastructure helps to reduce environmental stressors such as air pollution, urban heat, noise pollution and increases climate resilience, all of which have a negative impact on mental health. Therefore, it should be considered an invaluable part of the sustainable urban development and health policy in Southern Nigeria.

9.0 CASE STUDIES FROM SOUTHERN NIGERIAN CITIES

The experiences of southern cities are highlighted in these case studies. These case studies focus on the experiences of southern cities. In order to appreciate the contribution to the mental health and social wellbeing of urban green infrastructure, it is imperative to analyze selected cities in Southern Nigeria. The degree of urbanization, environmental transformation and GID in these cities have been different. The case studies underline both opportunities and challenges that are relevant to the preservation of urban green spaces in the context of fast urbanization.

9.1 Owerri

The city of Owerri, the capital of Imo State, is one of the most growing cities in South-Eastern part of Nigeria. The city is famous for its greenery and relatively good urban atmosphere, but has experienced considerable physical change over time as its population, commerce and real estate development has grown. Loss of green infrastructure due to the rapid rate of development of residential and commercial uses of open space, farmland and vegetated areas. The former recreational areas have become more and more transformed to accommodate hotels, shopping malls and housing projects. This means that the residents have less chance to use the outdoors for recreation and contact with nature.

However, there are a number of green spaces that have been preserved within educational environments, Government buildings and private developments. These spaces offer a place for rest or socialization and for psychological renewal. But deliberate urban planning policies that encourage the preservation and growth of green infrastructure are needed to help promote residents' mental health and social well-being.

9.2 Port Harcourt

The capital of Rivers State is Port Harcourt which is a leading industrial and commercial center in the Niger Delta area. The city has been undergoing rapid urbanisation primarily due to the oil and gas production, population growth and economic development. Industrialization has had a considerable effect on the natural environment, including reclamation of land, deforestation, loss of wetlands and air pollution. Soot pollution, traffic congestion, flooding and lessen green cover have been a concern in public health and quality of life due to environmental issues.

Port Harcourt has a number of institutional green spaces, waterfront spaces and recreational parks but access to these spaces is not uniform in all neighbourhoods. Green infrastructure is important to help reduce environmental stressors through improved air quality, heat mitigation and recreation and social space. The city's experience has shown the value of incorporating the concept of environmental sustainability in urban development plans. Investing in an expanded urban forestry program and safeguarding existing wetlands can make a major contribution to enhancing environmental quality and mental health.

9.3 Benin City

Benin City is the capital of Edo State, and it is a city with a rich history and a high rate of urbanization. Urban growth has been growing in the city with the development of roads, housing, commercial establishments, and infrastructures. In the past Benin City was famous for its rich vegetation and ecology. But the gradual decrease in green space and natural habitats has been caused by urban expansion. The city's green infrastructure network is impacted by encroachment on open spaces and lack of maintenance of public recreation facilities. Despite this, there are some urban park, institutional landscape and tree-lined corridors remaining in Benin City that will benefit environmental quality and residents' welfare. These areas provide recreational opportunities, socialization opportunities, and opportunities for emotional respite.

Investing in the enhancement of green infrastructure planning and maintenance can help the city's ability to tackle environmental issues, support social cohesion and public health.

9.4 Uyo

The capital of Akwa Ibom State is Uyo, which is known as one of the most aesthetically planned cities in Nigeria. The city has made considerable investments in beautification, landscaping, road infrastructure and public spaces which have helped improve the city's reputation as a clean and organized urban centre.

City urban development includes greened medians, tree-lined boulevards, recreational parks and clean public spaces; all these contribute to the environmental quality and urban aesthetics. The green features can enhance the health of residents, providing a place to play, relax and socialize.

The city of Uyo exemplifies the ability to integrate green infrastructure in a rapidly urbanising city through strategic planning, as compared to many other urban or urbanising cities in Nigeria. Yet, rising population and urban growth are future challenges which demand proactive policies to ensure the maintenance of green assets. The city of Uyo is a good example of how green infrastructure can be integrated into the city while at the same time promoting mental health and social well-being.

9.5 Calabar

The Cross River State capital of Calabar is known for its environmental consciousness, tourism attractiveness, and urban beautification. Environmental management and green development programs are

always given importance in the city. The city has many parks, gardens, tree-lined streets and recreational areas, adding to its unique character. These green spaces are often used annually for cultural events and tourism, and their cultural and social value is often strengthened through these activities. Green infrastructure in Calabar promotes the conservation of biodiversity, climate regulation, recreation and social engagement. Public open space is a resource that affords residents opportunities to be physically active, relax and interact with others, all of which can positively impact mental health.

But, in the context of ongoing urban expansion and mounting development pressures, ongoing dedication to green space preservation and environmental planning is needed. The experience of Calabar is about the good that could be achieved by embedding environmental care into urban governance.

9.6 Warri

Warri, a major industrial and commercial centre in Delta State, is a significant town in the Niger Delta region. The city, like Port Harcourt, has also faced significant environmental challenges from industrialization, oil-related activities, and rapid urbanization. Loss of wetlands, mangrove ecosystems and open spaces historically provided ecological and recreational value, which has been lost due to urban development. Flooding, pollution, traffic congestion and poor public space have caused an impact on the quality of life for residents.

However, there is scope for the creation and enhancement of green infrastructure in the form of wetlands and urban green spaces as well as community-led environmental projects. These interventions may help to enhance the environment, mental health, social interaction and urban resilience. The Warri case serves as a prime example of the importance of weighing the economic benefits of development against the environmental threats it poses, in order to maintain the health and overall wellbeing of the public and community.

10.0 CLIMATE CHANGE IMPACTS ON, AND OPPORTUNITIES FOR, GREEN INFRASTRUCTURE DEVELOPMENT

However, urban green infrastructure in Southern Nigeria cities is hindered by various challenges even though it has been considered as an important solution in addressing environmental, social and mental health challenges. Many urban centres have experienced a reduction and underuse of green spaces as a result of rapid urbanization, poor institutional capacity, insufficient funding and socio-economic disparities. The findings in this review of case studies show that some cities have tried to incorporate green infrastructure in their urban development, but there are still many obstacles that stand in the way of the respective projects. These challenges must be addressed if sustainable urban development is to be achieved and the value of green infrastructure in terms of mental health and social well-being is to be maximised.

10.1 Weak Urban Planning Frameworks

Weakness in urban planning framework and implementation mechanisms is one of the most important challenges facing the implementation of green infrastructure in Southern Nigeria. Regulations and development control policies are in place but there is a lack of consistent and effective enforcement. Housing and commercial development and transportation facilities are given preferential treatment over environmental sustainability in many urban development projects. As a result, there is a high likelihood that open spaces and recreation lands are increasingly being lost to other uses without comprehensive environmental evaluations.

In addition, in many cities, the urban master plans are either obsolete or not well designed and not well executed for sustainable land-use development. Lack of clear green city policies has led to disorganized and uncoordinated development. The lack of parks, urban forests, green corridors and recreational facilities are

also part of the weak planning frameworks. Consequently, there are many cities that do not have a comprehensive system of green spaces to support environmental quality, social interaction and psychological well-being.

Thus, enhancing planning regulation and integrating green infrastructure needs into urban development policies are key to the sustainable development of cities.

10.2 Rapid Urban Expansion

Urbanization is one of the most apparent challenges to green infrastructure in Southern Nigerian cities. Urban land resources have been heavily stressed by population growth, urban migration and the demand for housing and development. With the expansion of cities, vegetated land, wetlands, agriculture and open spaces are often substituted with residential settlements, shopping centers, road networks, and industrial sites. This has led to a substantial loss of green space and an ecological fragmentation.

The geographical extent and rate of urban expansion may outpace planning agencies' ability to manage development. For this reason, however, environmental issues are often neglected in the name of economic and infrastructural requirements. The growth of informal settlements further exacerbates the situation, with the lack of planned development typically resulting in the absence of parks and recreational facilities, or conservation areas. Continued loss of urban green infrastructure could further contribute to environmental degradation and to the lack of psychological restoration and social interaction opportunities.

10.3 Inadequate Environmental Governance

Good environmental governance structures, policy clarity and institutional coordination are essential for effective development of green infrastructure. But the governance of the environment in several cities in the South of Nigeria is fraught with a lot of issues.

The environmental management agencies are frequently understaffed, under-equipped, under-funded and have overlapping responsibilities. These limitations diminish their capacity to enforce environmental laws and policies and to pursue long-term green infrastructure initiatives. Environmental programmes are also affected by political change or priorities for development. Proposals for the establishment or maintenance of green space could be abandoned, neglected or superseded by shorter-term development goals.

Also, in many urban areas, there is limited public involvement in environmental decision-making. There are very few effective stakeholder engagement processes that enhance community ownership of green infrastructure projects and bolster conservation efforts. Strengthen institutions, integrate policy and involve stakeholders in sustainable green infrastructure management is the key to improving environmental governance.

10.4 Funding Constraints

Another significant challenge for urban green infrastructure development and maintenance is financial constraints. This involves significant investment in planning, land procurement, building, planting and ongoing maintenance for parks and urban forests, recreation facilities and green corridors. Many cities in the South of Nigeria have a tendency to spend their government budgets on infrastructure projects that are vital to the community, including roads, water and sewer systems, medical care, schools, and housing. As a result, green infrastructure initiatives often do not receive funding prioritization, even when they offer environmental and public health benefits that last over the long-term.

Another constraint on maintenance activities is limited financial resources. Many of the public parks and recreational facilities are poorly maintained, poorly secured, deteriorating and have degraded environments. These make them less appealing and useful for recreation and socializing. Public-private partnerships, corporate social responsibility, environmental trust funds, and community-based financing can be considered as options to enhance green infrastructure investment and sustainability.

10.5 Unequal Access to Green Spaces

Green infrastructure inequity continues to be a social and environmental issue. There are socio-economic, residential and urban development pattern influences on the access to quality green space. Wealthier residential areas have improved landscaping, private gardens, recreation facilities and access to public parks. Low-income communities tend to have restricted access to safe and well-maintained green spaces, in contrast.

This inequity can lead to environmental injustice and exclude vulnerable communities from mental health and recreational and social benefits of green infrastructure. Access to inclusive public spaces can have a disproportionate impact on children, older people, women and people with disabilities. If access is differential, this can also contribute to the overall social inequality, as the lack of opportunities for recreation, physical activity, community interaction or psychological restoration can stem from an unequal access. In this context, the goal of scaling up green infrastructure should be to create a fair distribution of the amenity to provide access to benefits across the urban population.

The design of inclusive and accessible green spaces is critical for ensuring social health, addressing inequities in health and building sustainable cities.

11.0 RESEARCH GAPS AND FUTURE RESEARCH DIRECTIONS

The literature on urban green infrastructure has been expanding and is highlighting its role in promoting environmental sustainability, mental health and social well-being. But a survey of the available literature indicates that knowledge gaps exist, especially in relation to the cities in the South of Nigeria. Although the psychological and social effects of green spaces on human beings have been well documented in international studies, the evidence in Nigeria is still sparse and scattered. Existing research tends to be focused on the environmental management, urban planning, biodiversity protection and climate adaptation aspects of green infrastructure, but the psychological impacts of green infrastructure are not widely studied. In addition, methodological shortcomings, lack of adequate spatial analyses, and inadequate policy integration have limited the ability to have a holistic view of the impact of green infrastructure on human well-being in fast urbanizing cities in Nigeria.

Solving these research gaps is crucial for producing context-specific evidence which can be used to support sustainable urban planning, public health interventions and environmental policy.

11.1 Lack of Empirical Mental Health Studies

This gap was one of the major ones identified in the literature, as there is a lack of empirical studies that look at direct association of urban green infrastructure and the effect it has on the mental health outcomes of Southern Nigeria. There are several studies that have been conducted internationally which have shown the positive benefits of green space on stress reduction, emotional well-being, cognitive function and psychological restoration, however, not many studies have been done in the Nigerian context. Existing Nigerian studies are mainly centred on the conservation and protection of the environment, urban growth and development or ecosystem services, and psychologic/mental health indicators are either neglected or insufficiently accounted for. Lacking from this understanding is the knowledge of the impact of exposure to parks, urban forest, wetlands and recreational green space on mental health among urban residents.

Future research should use quantitative and mixed method studies to explore mental health benefits of green infrastructure. Research can focus on individual population groups and their experience of stress, anxiety, depression, emotional well-being, life satisfaction, and quality of life. This would help support the policy integration of green infrastructure into public health and urban planning policies.

11.2 Limited Longitudinal Research

There's another critical area that is not investigated and addressed in longitudinal studies, which is the long-term impact of green infrastructure on mental and social health. Existing research mostly uses cross-sectional designs which only capture cross-sectional relationships.

While cross-sectional studies are good at capturing associations, they fall short of capturing mental health outcome changes over a long period of time. Thus, it is hard to predict long-term effects of green infrastructure interventions on people and communities. Longitudinal studies could be useful in understanding the long-term effects of continuous exposure to a green environment on psychological wellbeing, resilience, social cohesion and health. Such research could also evaluate the efficacy of the new parks established, urban greening, and environmental restoration efforts.

Long term monitoring and repeated evaluation should be, therefore, included in future investigations to gain a deeper insight into the dynamic relationship between UGi and human well-being. In order to understand the spatial and geographic dimensions of social issues, there is a need for GIS and spatial analysis studies.

It also underscores the great dearth of Geographic Information System (GIS) and spatial analysis research addressing the urban green infrastructure of cities in the South of Nigeria. The distribution, accessibility, connectivity, and quality of green spaces in urban areas have been assessed using GIS technologies. GIS-based studies have been conducted to investigate spatial inequalities in access to green space and their linkages to mental health and social well-being in many developed countries. There are few similar studies conducted in Nigeria, and therefore, there is limited evidence of the spatial nature for urban planning and policy development.

There is a need for further research using GIS, remote sensing, satellite imagery and spatial modelling to create a map of urban green infrastructure and to assess accessibility of the green infrastructure across the different socio-economic groups. These analyses would help pinpoint communities that are not being served by green space and inform evidence-based decision making on equitable distribution of green space. GIS-based research can also help evaluate green infrastructure loss stemming from urban sprawl and to offer key input to sustainable urban development planning.

11.4 Policy-Oriented Research Needs

Another missing link in the literature is the scarcity of policy-oriented research which takes science-based solutions into practice and into planning and governance. While many studies recognise the value of green infrastructure, the policy prescriptions are generally abstract and do not address the contexts of cities in the south of Nigeria. Research is needed to address the effectiveness of current environmental policies, urban planning policies and green infrastructure programs. These analyses should include an evaluation of institutional capacity, governance issues, stakeholder engagement processes, and financing mechanisms that impact green infrastructure implementation.

Policy oriented research should be continued to investigate new ways of integrating green infrastructure in urban development plans, climate adaptation strategy, housing policies and public health programmes. Successful cases from other developing countries could be used as lessons to be learned by Nigeria's policy makers. A tighter integration of academic research and the policy-making process will be key in making science a relevant and effective input to sustainable urban development and public health.

12.0 POLICY IMPLICATIONS AND RECOMMENDATIONS

The results of this review show urban green infrastructure goes beyond simply being an environmental amenity, it is an integral part of sustainable urban development, public health promotion and social well-being. The evidence shows that the benefits of green spaces are linked to reduced stress, cognitive

restoration, emotional well-being, social cohesion, environmental quality and climate resilience. But these benefits are at risk because green infrastructure is decreasing in Southern Nigerian cities. Solutions to these challenges must be a combination of integrated, proactive, and innovative strategies, with a strong emphasis on green infrastructure as a key urban asset, across the disciplines of policy, urban planning, environmental agencies, and public health, along with community stakeholders. The following policy implications and recommendations are proposed to improve the development, accessibility and sustainability of the urban green infrastructure in Southern Nigeria.

12.1 Green Infrastructure planning process integration.

The inclusion of green infrastructure elements in urban planning processes and development policies is a key criterion for sustainable urban development. The goal of green infrastructure is to be part of the urban infrastructure, not an added decorative element. Parks, the urban forest, green corridors, wetlands, recreational facilities and public open spaces should be specified in urban master plans. Planning rules must provide for a minimum green space criteria for residential, commercial, institutional and industrial development.

There should also be a landscape sensitive approach to planning by local planning authorities to prevent the loss of ecologically valuable areas due to unregulated development. Environmental Impact Assessments (EIAs) need to be improved to incorporate the protection and improvement of green infrastructure into urban projects. Additionally, planners should encourage the use of new and creative green infrastructure practices, like green roofs, green walls, urban agriculture, and sustainable drainage solutions, wherever feasible to optimize environmental and health benefits in urban areas with high population density.

12.2 Strengthening Environmental Policies

Appropriate environmental policies and governance structures are needed to preserve existing green infrastructure and to enable future development. Federal and state and local governments should bolster environmental laws to combat the increasing dangers of urban sprawl and environmental degradation. Legally protect urban parks, wetlands, forests and other sensitive areas. The enforcement of rules and regulations should be strengthened to avoid the encroachment of green spaces for residential, commercial and industrial developments.

Environmental agencies should have sufficient resources and funding to oversee green infrastructure resources, to enforce regulations, and to coordinate urban environmental management activities. There should also be greater cooperation between inter-agency planning authorities, environmental agencies, public health institutions and local governments.

Furthermore, the role of green infrastructure in climate adaptation, disaster risk reduction and public health policies should be included in government policies. This integration would make sure that environmental sustainability and human well-being are both taken into consideration.

12.3 Community Participation and Stewardship

Active community engagement and local stewardship is essential for sustainable green infrastructure management. Urban green spaces are very likely to be the most frequent users and beneficiaries of urban green spaces, which makes their involvement a key to their long term sustainability and effectiveness. Community involvement should be promoted during the planning, design, construction and operation of green infrastructure projects. The incorporation of participatory planning techniques in the process can also yield insights to local needs, enhance project acceptance, and build local ownership.

Public awareness should be developed through campaigns to promote green infrastructure to communities and its benefits to the environment, social, and mental health. Environmental education and conservation practices can be promoted through the efforts of schools, community organizations, religious groups, and

civil society groups. Likewise, community-based programs such as neighbourhood tree planting, park maintenance programmes, urban gardening projects and environmental volunteer groups should be supported. The activities are not only improving the green infrastructure, but they are also increasing social cohesion and civic responsibility.

12.4 Equity of distribution of green spaces.

Ensuring equitable access to green infrastructure is essential for promoting social justice, public health, and inclusive urban development. Overall, the review shows that the distribution of quality green space is not equal, and the income and socio-economic groups with fewer resources often have many less recreation and environmental amenities. Policies must give attention to the needs for green spaces in under-served and environmentally disadvantaged areas. Accessibility goals should be set to ensure all residents have easy access to parks and recreation facilities, regardless of income, age, gender or physical ability.

Children and economically disadvantaged groups, older adults and people with disabilities are particularly vulnerable populations and should be considered. Green spaces should be designed inclusively to meet the needs of all users. Green space provision gaps and inequity in provision can be identified using Geographic Information Systems (GIS) and spatial planning tools which can assist policy makers in providing equitable distribution across urban areas. These can help to mitigate environmental inequalities and improve opportunities for mental restoration, recreation and social interaction.

13.0 CONCLUSION

Urban green infrastructure has become an essential element of sustainable urban development and has been recognized as providing environmental, social and psychological benefits. This review focused on the role of urban green infrastructure in mental health and social well-being in cities of the South of Nigeria, namely Owerri, Port Harcourt, Benin City, Uyo, Calabar and Warri. The study was a review of literature that examined the relationships between green space, mental health outcomes, social cohesion and environmental sustainability in the context of rapid urbanization.

The results show that urban green infrastructure has a significant impact on reducing stress, psychological recovery, cognition, emotional well-being, and resilience. The availability of parks, urban forests, community gardens, wetlands, and other green spaces offers avenues for relaxation, recreation, social interaction, and a connection to nature, which are important for enhancing mental health and quality of life. Moreover, green infrastructure is beneficial to social health by providing the benefits of improved social cohesion, sense of place, physical activity and social inclusion. In addition to the psychological and social advantages, urban green infrastructure can help mitigate urban heat island effects, offer advantages in air quality and noise reduction, and enhance the resilience of urban areas against climate change. These environmental functions are indirectly related to mental health by reducing exposure to urban stressors and thereby improving the quality of living.

The review also identifies major challenges that are impacting green infrastructure development in Southern Nigerian cities, however. Lack of urban planning, lack of environmental governance, unequal access to green spaces, lack of financing, and rapid urban expansion remain challenges to the sustainability of urban ecosystems. The study also pointed out some of the gaps in the literature, such as the paucity of empirical studies on mental health, short duration of longitudinal studies conducted, inadequate GIS-based studies, and absence of policy-oriented studies in the context of Nigeria. The case studies illustrate the extent of commitment to green infrastructure development in cities of the South of Nigeria. Cities like Uyo and Calabar have come a long way in incorporating green spaces into urban development while others still face hard environmental pressures due to uncontrolled urban development and land-use changes. These experiences highlight the importance of more strategic and coordinated ways of managing the environment in cities.

The study calls for the incorporation of green infrastructure in urban planning policies, enhancement of environmental governance, more community engagement in environmental stewardship, and equitable access to green spaces. These are necessary to ensure that the mental health, social and environmental impacts of green infrastructure are maximized. Finally, it is important to note that the value of urban green infrastructure cannot be limited to just its role as a design element; it must be considered a core element of a healthy and sustainable city. Investment in green infrastructure will be relied upon more and more as cities in the South continue to grow, to support people's mental health, build social cohesion, improve environmental quality, and create resilient urban communities. Sustainable urban development in Nigeria will not only rely on the development of physical infrastructure, but also on the maintenance and development of green infrastructure that will help benefit the human and the environments.

A paradigm shift in urban planning and development is needed to move from “concrete to cognition”, and to recognise the role of green infrastructure as a key pathway to healthier, more inclusive and sustainable cities for current and future generations.

14.0 RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed:

1. *Integrate Green Infrastructure into Urban Planning Policies:* Urban green infrastructure should be incorporated as a mandatory component of city master plans, zoning regulations, and development control frameworks to ensure the preservation and expansion of green spaces.
2. *Strengthen Environmental Governance and Enforcement:* Government agencies at federal, state, and local levels should enhance the enforcement of environmental regulations to prevent the indiscriminate conversion of parks, wetlands, and other green areas into built-up developments.
3. *Increase Investment in Urban Green Spaces:* Public authorities should allocate adequate funding for the creation, maintenance, and rehabilitation of parks, urban forests, recreational facilities, and community green spaces. Public-private partnerships should also be encouraged to support green infrastructure projects.
4. *Promote Equitable Access to Green Infrastructure:* Efforts should be made to ensure that green spaces are fairly distributed across all neighborhoods, particularly in low-income and underserved communities, to reduce environmental inequalities and improve social inclusion.
5. *Encourage Community Participation and Stewardship:* Local communities should be actively involved in the planning, management, and maintenance of green infrastructure through tree-planting programs, environmental awareness campaigns, and community-based conservation initiatives.

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