

Does the Greater Port Harcourt Master Plan 2008 meet Aspirations for Liveable City?

By

Precious N. Ede, Opuenebo B. Owei and Chimbiko Iche Akarolo

In 2007 the government of Rivers State, Nigeria contracted a South African firm to produce a master plan for a new city called Greater Port Harcourt to be situated in the outskirts of the old city. The Greater Port Harcourt Master Plan 2008 is here examined in the context of current thinking as to whether it has credentials that meet aspirations for modern liveable cities. The new city plan assumes that Port Harcourt will continue to grow at its current rate so there is need to respond pro-actively to the reality of meeting cogent challenges. The infrastructure to be provided must be sustainable, that is, there should be continuity of effective service delivery by operators, by way of renewal, upgrading and expansion to cope with the city growth. Provision of services will be private sector driven, while government is politically ready to amend laws, regulations and policies to create an enabling environment for private sector to thrive in driving the development initiatives. The plan provides a long-term vision for the city based on sustainability: social, economic and political equity. Sustainability is hinged on continual improvement based on accountability, transparency and good governance. The master plan aims at a development that positively encourages the creation of a mixed community of 350,000 housing units, initially. The energy infrastructure utilizes the natural resources in the region such as natural gas for powering turbines and providing domestic fuel, with a little solar power. Open spaces, sports and recreational grounds are integral part of the plan. Governance is exercised by an independent agency whose administrative and emolument structure are different from that of government. We can only wait for the new city to take off and the lofty ideas expressed in the master plan to be implemented before we draw the right conclusions.

Key words: Greater Port Harcourt Master Plan, liveable cities.

1.0 Introduction

Port Harcourt, the capital city of Rivers State, Nigeria is situated on the coast of the Atlantic Ocean's Gulf of Guinea. The City is located approximately 20km inland on the Bonny River, as the coastline is a delta of rivers producing endless marshlands and mangroves that are unsuitable for development. The marshes form part of the Niger Delta, which is the largest river delta in the world. Port Harcourt is one of Nigeria's main port cities and has two commercial harbours and several private harbours. Port Harcourt, situated in the south-south political region of Nigeria is the fourth largest city in the country after Lagos, Kano and Ibadan. Unlike most cities in Nigeria, Port Harcourt is an international hub for petro-business, thus a perceived potential not only for growth and expansion, but possessing a resource base unequalled in the West African region. The extreme congestion, high building and population densities, un-serviced areas, insufficient and decaying utilities contrast sharply with the expectation of residents and government's vision, hence, in late 2007 the new government that took over the reign of power in Rivers State Nigeria made the retrofitting of the old city and the development of a new city a priority. The new city is called the Greater Port Harcourt and the design project was awarded to a South African firm in November, 2007.

This paper examines the new city plan from the perspective of its sustainable. Sustainability implies an action that can be maintained over a period of defined time. It is about meeting basic needs in order to sustain human life, and about making responsible choices and decisions in an attempt to adhere to and acknowledge the intricate connections between actions and effects with relation to the environment, economic growth and the growing society. Sustainable development is generally understood as an integrative and holistic

process of maintaining and managing the dynamic balance between the needs and demands of people for societal aspects such as equity, prosperity and quality of life, and what is ecologically possible. Over time the definitive nature of the idea of sustainable development has changed. From the relatively simplistic idea of meeting basic needs, to the current, of meeting the entire hierarchy of human needs, to provide an acceptable quality of life for all. Sustainable cities can accommodate growth and change well, whilst simultaneously being improved by these processes. This implies that development is managed in an integrated manner with relation to social, economic and environmental requirements. A sustainable city is much more than green practices and environmental conservation - it is a holistic concept pertaining to the creation of a place that provides adequate shelter, innovative economic opportunities and safety in terms of cultural freedom, resource conservation and development management. Sustainable cities are liveable; they are attractive to their users and residents. If cities are attractive to live in and work in, they will inevitably also become attractive for business life, investment and tourism. Sustainable cities emphasise a quality communal lifestyle, a sense of place and create a liveable urban environment.

1.1 Study Objectives

This study was anchored under two major lines of inquiry that revolve around the new plan's suitability and sustainability. The primary objective of the study is to review the Greater Port Harcourt Master Plan with a view to evaluate the sustainable attributes that were included in the plan. The study will use the information provided in the plan to determine the potential ecological footprint of the New City on the plan area and discuss the adequacy of what the planners have proposed to mitigate them.

2.0 Methodology

A research is controlled by the nature of the inquiry. The research problem, the type of data required, the resources available, and the accessibility to the sources of data are also similarly affected. Data types are essential to research because they influence the validity of the conclusions drawn. The data types in this study are predominantly secondary of both qualitative and quantitative forms. When a project is brought under focus for academic discourse, the effort takes the form of a case study. Case studies as an approach is common to both the physical and the social sciences so long as the researcher confines his scrutiny of it to dissecting the case, the analysis describes and grades the system that is studied. Description is qualitative, while grading that uses objective criteria are quantitative. Creswell (1998) states that a case study is an exploration of a "bounded system" or a case (or multiple cases) over time through detailed, in-depth data involving multiple sources of information rich in context. This bounded system is bounded by time and place, and it is the case being studied-a program, an event an activity or individuals. The context of the case involves situating the case within the setting, which may be a physical setting or the social, historical, and or economic setting for the case. This implies a detailed examination or study of a particular setting, place or a subject matter. This case study evaluates the Greater Port Harcourt Master Plan 2008 as to its provisions for sustainability and liveability. Additional evaluation was made to ascertain the environmental sustainability using CO₂ per capita and carbon foot printing of the plan area.

3.0 Greater Port Harcourt Urban Planning Framework

Nigeria is a federation of 36 states and Port Harcourt is the capital of Rivers State. The hierarchy of government is distributed between tiers with a very powerful federal government, the constituting states and local government areas (LGAs). Planning derives from this structure because the federal government plans at the supra and regional level, that gives rise to agencies that cut across many states or the country as a whole. The River Basins are outcome of this position and national cities like Lagos and Abuja are considered

spheres were the national government contribute significantly. States concentrate on sub-regional plans and local plans, by this arrangement, all other cities in Nigeria besides Lagos and Abuja predominantly fall under state planning regulations. There is also good planning authority exercised at the LGAs, but it is limited by lack resources to plan with and general dereliction at that level of government in Nigeria. Urban Planning in Port Harcourt is essentially through the instruments of the state government because it straddles several LGAs. There are also federal planning influences in places where it has acquired large interests. Onne Town and its environs which constitute one of the strands of the Greater Port Harcourt Master had a separate master plan drawn up by the federal government since 1980 (see Federal Ministry of Housing and Environment,1981). How that plan will comingle with Greater Port Harcourt Master plan is not clear because the authors of the New Master Plan did not indicate its existence. The relationships of the various planning authorities in Nigeria are illustrated in Figure 1.

Port Harcourt was formally established in 1912 under British rule. The city was planned and land use controls were established, as per the British system of town and country planning, to manage the urban composition and its growth. City planning entailed the establishment of a central business district that for the most part housed commercial and institutional uses, surrounded by homogenous residential areas and suburbs. Provision was made for open spaces and parks, little of which still remain today, but, which together with the tree-lined arterial routes, earned Port Harcourt the status of Garden City. In time Port Harcourt grew into a major city, accommodating roughly 195 000 people by the 1960s. Then came independence and 30 years of military rule, which brought with it serious instability. During this time there was no regard for planning and formal development, and nearly all established planning procedures, systems and structures were abandoned. However, it was also in this time that petroleum was discovered, which despite volatile governance resulted in major population influx into the city which continues to this day.

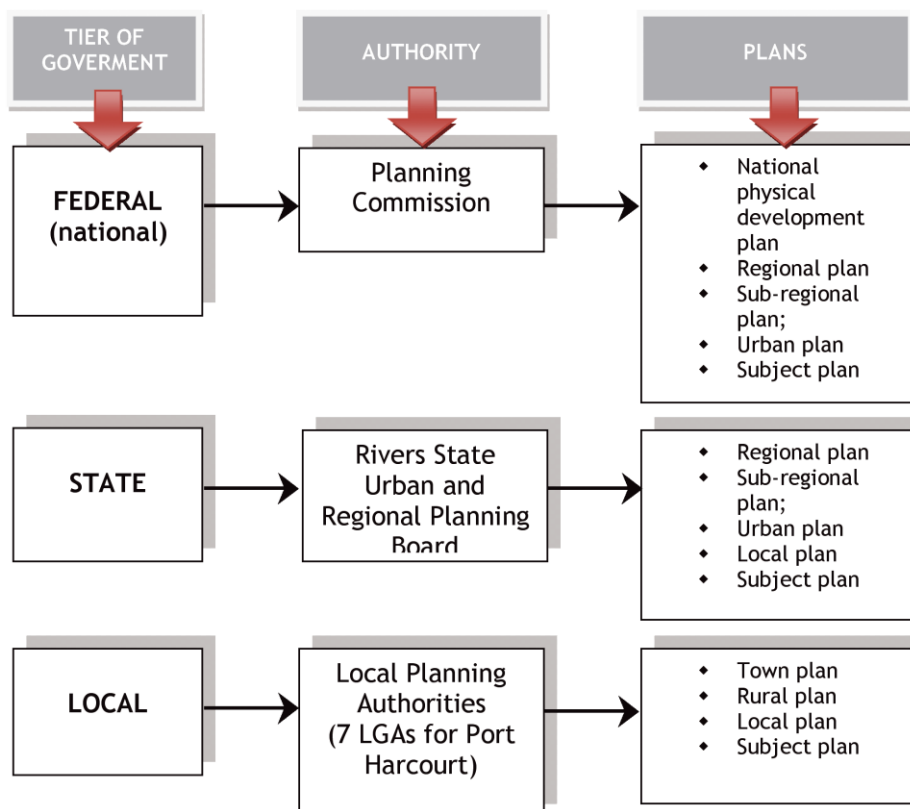


Figure 1: Planning Hierarchy in Nigeria (Source Greater Port Harcourt Master Plan, 2008)

The planning philosophy of the firm engaged for Greater Port Harcourt adopted a blend of principles, which come from 19th Century Garden City planning and 20th Century New Urbanism and Sustainability. They argued that the principles of Garden City in England of the 19th century and the Urbanism of 20th century are workable synthesis for the regeneration of Port Harcourt. It appears that from inception up to about 40 years ago Port Harcourt was a well-developed and well-managed port city that boasted good infrastructure and service delivery, low densities, well kept open spaces and parks, a formal CBD and a well-defined institutional precinct. The City had status and was visually attractive to the extent that it was known as the Garden City of Nigeria, but it is arguable whether such an appellation still fits its present state. The ways some urban features disconnect are apparent for Port Harcourt, so it is a generally held opinion of a need to reinstate values that can uphold the former status, create good and healthy living environment, and achieve sustainability and plan for the future. The objective of the Urban Design Framework is to create a new and exciting urban environment where citizens feel safe, their lifestyle is uplifted and investments are protected through the application of known urban design principles.

The territory of Rivers State of Nigeria where the city of Port Harcourt is situated comprises 23 LGAs, while the City of Port Harcourt, i.e. Greater Port Harcourt, extends over 8 of them, these 8 LGAs are: Port Harcourt LGA, the most southern LGA; Oyigbo, Eleme, Okrika and Ogu-Bolo LGAs situated to the east and south of the CBD; Obio/Akpor directly to the north of Port Harcourt LGA; Ikwerre LGA to the north-west of Obio/Akpor LGA; and Etche LGA to the north-east which includes the Otamiri-Etche River. Greater Port Harcourt does not completely encase all eight areas. In most instances, only sections or fractions of the LGAs form part of the urban agglomeration which is known as Greater Port Harcourt. The expanded City covers an area of approximately 1900sq. km (see Figure 2) and houses over 2 million people, who by and large live in conditions of informal shelters and high densities. Large portions within will remain undeveloped due to a number of factors such as natural and physical constraints (like excessively ponded places), retention of existing settlements in the outskirts of the old city, large infrastructure like, the refinery-petrochemical complexes, airports, etc. Limited habitat space, poor town planning and urban management, and lack of a flood and erosion policy and or its implementation, have resulted in many structures being built within flood prone areas, while other structures have been built in storm water discharge areas. The consequence is that very many houses are located in unsafe areas, which is of great concern. Flooding in the city is a common occurrence; a minor rainfall event causes major flooding problems around the city. It should be noted that flooding is not caused by the overflow of rivers and creeks, but by rain falling on the impervious surface of the urban terrain. The Master Plan proposes a storm water master plan to manage flooding in the city using rivers as primary drainage channels.

The actual land area left to accommodate the New City is approximately 40 000ha. The Greater Port Harcourt Master Plan projecting at its inception in 2008 from a population of 1 884 570 at a growth rate of 2,84% until 2020 produces a total population for Greater Port Harcourt of 2 637 285 people. This means that in addition to de-densifying the city and providing space for it, the city has to make provision for an additional 700 000 people by 2020. For progressive intervals the projected population growth of the city is as follows:

- 2015: 2,2 million
- 2020: 2,6 million
- 2025: 3 million
- 2030: 3,4 million

Further calculations also suggest that at a delivery of 7 000 residential units per annum, it will take 50 years to develop the full 350 000 units which constitute the New City.

To ensure that all the needs of the project are met three levels of progressive planning from a metropolitan level down to a neighbourhood level were instituted. The greater metropolitan area comprises the old city and its immediate hinterland. The task of the firm of planners is to provide a strategic planning document that contains development proposals instant on the immediate growth and for its expansion in an integrative manner. The various project disciplines were conceived in a realistic platform whose goals are attainable. A simple phasing in project timeline prioritises activities for implementation assign incremental, but steady improvement of the old city, while pursuing the development of the new city. Inputs to the process by several disciplines are collated to create a holistic set of principles that fed into the plan. Although the New City plans to accommodate approximately 350 000 households, the first phase for instance is a mixed use zone for 20,000 units and its implementation is on-going. The framework identified a suitable area with suitable qualities for those uses that best promote the design philosophy. The planning framework for the first phase incorporated broad assessment for bulk service implementation, urban design and landscaping guidelines that will be incorporated into detailed township plans.

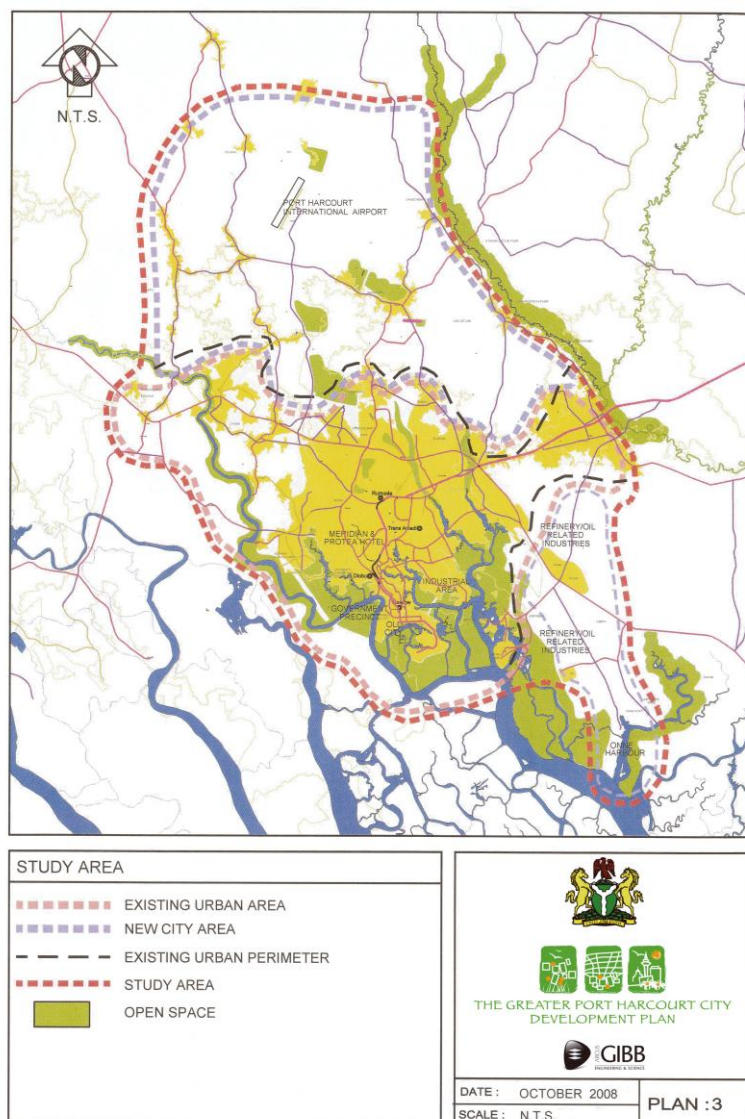


Figure 2: Greater Port Harcourt Plan Area

3.1 Land Use and Service Delivery Standards

The new city spatial and land use plan aims to develop a coherent development framework that integrates the various disciplines into a comprehensive plan for the City; provide a directive for other technical disciplines, to define the way forward and ensure that all disciplines work towards achieving the same outcome; and create a tool for government in terms of which urban growth and development can and should be managed to reinstate the garden city of decades before, which will be a well governed and thriving world-class city. In this regard the spatial and land use planning component of the project is critical, as it comprehensively connects all the aspects to create a feasible and practical solution. Spatial planning integrates the different project components to provide a plan that gives form to the future City of Greater Port Harcourt.

Table 1: Land Use Budget and Services Delivery Standard

CATEGORY	LAND USE	STANDARD	AREA REQUIRED
EDUCATION	Crèche	1/3 300 persons	0.15 ha
	Primary school	1/5 500 persons	2 ha
	Secondary school	1/16 500 persons	3 ha
	College	1/30 000 persons	9 ha
	University	on demand	To be determined
HEALTH	Clinic	1/10 000 persons	0.4 ha
	Day hospital	1/100 000 persons	1 ha
	Government hospital	1/150 000 persons	1 ha
SAFETY	Police station	1/33 000 persons	0.9 ha
	Prison	1/160 000 persons	12 ha
	Fire station	1/150 000 persons	1.2 ha
COMMUNITY	Minor library	1/20 000 persons	0.01 ha
	Major library	1/80 000 persons	0.9 ha
	Post office	1/16 500 persons	0.15 ha
	Minor community hall	1/20 000 persons	0.15 ha
	Major community hall	1/70 000 persons	0.75 ha
	Old age home	1/20 000 persons	0.75 ha
	Church	1/3 300 persons	0.16 ha
Cemetery	on demand		
RECREATION	Neighbourhood park	1/5 000 persons	0.25 ha
	Suburban park	1/18 000 persons	1 ha
	District park	1/70 000 persons	3 ha
	Regional park	1/140 000 persons	6 ha
	Public open space	1/10 000 persons	0.5 ha
	Children's playground	1/1 000 persons	0.03 ha
SPORT	Suburban sports field	1/18 000 persons	0.65 ha
	City sports stadium	1/950 000 persons	20 ha
COMMERCIAL	Conner shop	1/3 300 persons	0.07 ha
	Neighbourhood shopping centre	1/10 000 persons	0.05 ha
	Suburban shopping centre	1/40 000 persons	4 ha
	District shopping centre	1/160 000 persons	16 ha
	Regional shopping centre	1/500 000 persons	35 ha
	CBD	1/1 million persons	600 ha

(Source: Greater Port Harcourt Master Plan, 2008)

Standards for service delivery were compiled based on international best practices, which have been slightly adjusted to Port Harcourt's unique circumstances. The proportional space to be set aside for service standards for the various social service categories is presented in Table 1. Because existing detailed delivery quantities are not available, the standards could not be used to calculate existing delivery backlog. However, these standards were very relevant in estimating service provision for the New City, which form part of the Master Plan for Port Harcourt.

4.0 Sustainability Credentials

4.1 Economic Sustainability

The key elements that drive the economy of Rivers State where Greater Port Harcourt is are agriculture and petroleum. Previously an array of manufacturing industries like tyre, ceramic, enamel, wrought iron, confectionaries, office equipment food processing (e.g. RIVOC and RISONPALM) and aluminium sheet production existed. Heavy industries included several cement works, fertilizer, petrochemicals and petroleum refineries. Those industries that were based on import substitution declined in the 1980s and '90s following years of structural adjustment programs prescribed by international lending institutions coupled with chronic public power shortages, so they were closed down. The petroleum based industries which were all owned by the Federal Government were mismanaged and some are being revived currently through sale to foreign private investors. The petrochemical complex is for this reason poised to diversify and double its output. Rivers State accounts for about 40% of Nigeria's onshore crude oil output, which is astounding. In turn, agriculture and fishing are the main source of employment. While a lot of the agriculture is on a self-sustaining basis, efforts are being made to revive agriculture and restore it to its glory days when Nigeria was a main exporter of agricultural produce.

While oil is a major sector, the economic analysis reveals that non-oil sectors such as agriculture, solid minerals mining, construction, tourism, and cultural and entertainment services, have the potential for high growth. The drivers for growth in these sectors are telecommunications, general commerce, manufacturing, agriculture and tertiary services. The vast numbers of people in Port Harcourt are employed in the informal sector and their activities are not easily accountable; therefore there is need to have them formalised. The other bottlenecks to economic sustainable are addressing the infrastructure gap by restoring full public power supply for instance, return to a diversified industrial base with downstream spinoffs, and infuse safety and security. These proposals will create employment, alleviate poverty and promote tourism. Government has taken up the challenge by investing in education beginning with the primary level, relaxing barriers to investment, facilitating innovation and training in all sectors, including information technology, virtual economy, private and government services. The police in Nigeria is an exclusive domain of the federal government, but it is well known that the Rivers State government fund, equip and train force members posted to the state, sometimes abroad. Added to these, the plan area is witnessing massive infrastructure facelift. The Master Plan further recommends greater investment in human resources, improved performance of the public sector, institutional capacity building, better micro-economic management, spreading wealth to lift people out of poverty and sustained growth.

4.2 Energy Use Options

The energy options in use in Port Harcourt are electricity largely generated from gas turbines of which the Rivers State government has heavily invested in to complement the weak supply from the federal government owned monopoly called Power Holding Company. Port Harcourt enjoys long hours of sunshine as a tropical city and solar technology was once extensively used in street lighting. The immediate region of Port Harcourt also referred to as

“Greater Port Harcourt” in Whitman (1982) bears the largest cluster of petroleum production platforms in Nigeria. Despite this level of energy endowment in the region the use of fuel wood for cooking and candles for lighting is widespread. Natural gas reserves is greater than crude oil in the balance of Nigeria’s petroleum resources, yet gas supply to households and industry is limited as gas distribution infrastructure is constrained and supply obligations are undefined. One of the major constraints to power generation and other utilization of gas in Nigeria is that although gas tariff is low, the refineries are not supplying quality gas or are supplying on unreliable schedules.

A number of independent power producers’ licences (IPPs) have been granted by the Nigerian Electricity Regulatory Commission (NERC) to various authorities, including the Rivers State Government. Due to current supply shortages, a fair amount of household and commercial electricity is self-generated. There are several oil refineries and larger industries which also generate their own electricity. The World Bank estimates that only 41% of Nigeria is electrified. The Rivers State government has a transmission network at 132kV. The distribution of electricity is done by way of 33kV networks and 33/11kV injection substations, 11kV distribution networks and low voltage networks to end users. There are serious power generation, transmission and distribution shortfalls in Port Harcourt. The analysis revealed that the city has a current electricity supply of 200MW, although the actual demand is estimated at 803MW. Due to the serious shortfall the city experiences frequent power outages as supply is “epileptic”. Consequently, many formal businesses have their own generators to meet their demand for uninterrupted supply. It is projected that the electricity demand by 2020 will be in the region of 1.93GW, which indicates that there will be a very severe and escalating shortfall in the medium term future.

4.3 Efficient and Sustainable Transportation

Roads and to a significantly lower extent, water are the sole means of transportation in Port Harcourt. The roads are affected by unprotected reserves, uncontrolled land use changes, unplanned urban expansion, which combine to produce easily flooded motorways, large sections of potholes and severe traffic congestions. Public transport occurs mainly on an informal, unmanaged basis, currently rendered by private vehicles, minibus taxis and busses. Seventy thousand motorcycles hitherto December 2008 provided the bulk of intra city transport. The plan recommended a gradual phase out of motor cycle use for public transportation; government chose outright ban due to immediate security threats. There are two airports and two harbours in the plan area, but there are many constraints to their effective utilization, especially the poor conditions of the access roads, their operational facilities beg for improvement and patronage is variable as a response to unreliable services. Rail-based public transport or any other rail based mass transit system (such as light rail or bus rapid transit) is non-existent. On transportation the plan concludes that existing system of transport functions but does not function optimally for a city the size of Port Harcourt. It proposes to improve road infrastructure by introducing a revised road hierarchy, which classifies roads into five categories with applicable design standards. What is most lacking in the transport system of Port Harcourt is a form of mass transit. The plan therefore analysed various options including heavy rail, light rail, monorail, bus rapid transport (BRT) and underground metro. It settled for BRT citing cost and technological simplicity. This will be supported by a road based freight as well as pipelines for liquids. There is an existing 22km of heavy rail track in the plan area, which it was suggested should not be revived in the short or medium term. Because of the derelict state of rail systems in Nigeria, revival should rather be part of a national infrastructure plan.

4.4 Spatial Processes, Land Use and Availability

The structure of the city has been influenced by two primary elements, these being the natural features and the primary roads. These elements have broadly defined the city as it exists at the moment. The natural features of Port Harcourt are the rivers and tributaries, and

their associated wetlands and marshes, which meander around the city and through the urban milieu. These areas are inaccessible for settlement and so have remained visible, shaping the urban form. Thus, the city has developed on available dry land, although residential infill has pushed the boundaries of development to the edge of the impenetrable areas and has informally reclaimed parts of the wetlands. The City is bound on its south, west and north-east by major water courses. These rivers define the urban growth pattern and are re-directing growth towards areas that are more accessible and buildable. The second most important structuring element has been the roads. The network of arterial roads has played an important role in creating and shaping urban form. We have learnt that transportation planning is an important part of overall city planning which needs to be considered in the closest possible relationship to land use planning. For experience has shown transport is indeed the maker and breaker of cities. It exists in an intimate symbiotic relationship with urban form: the development of the city affects the transportation choices that are available, but in turn the transportation system will affect the city's future development. In designing the street and its land uses, the Plan considers the preservation of the human scale. The design guidelines ensure that street level design promotes continuous, vibrant and desirable experiences. Street facades and the ground floors of buildings are the primary interface between the public and the private realm, and must be carefully planned, as they make or break the public realm that affect pedestrians' urban experience.

The land use composition in Port Harcourt is quite intricate due to the lack of land use management, which led to uncontrolled and uninhibited land use changes throughout the city. The result is an intricate mix of uses, which is difficult to untangle. There are no homogenous areas, as all areas reveal a complete mix of uses. While mixing land uses is not the inherent problem, it is the lack of control and management that is the problem. Thus, it is desirable to control and manage the mixing of uses to ensure the establishment of safe and healthy living conditions and the creation of efficient and effective urban form.



Figure 3: Plan View of New Development Precinct (Source Greater Port Harcourt Master Plan, 2008)

There is a need to de-densify the middle to low income areas where infill development has been most noticeable, and to remove squatters from areas which are unsafe or unhealthy for living. Given that most of the population live in either of these two conditions, the task of urban restructuring is immense and will therefore take many years to achieve. Land availability is influenced by land ownership. In Nigeria land ownership falls into four main categories:

- Land owned by government;
- Public land;

- Family and individually owned land; and
- Communally owned land.

Theoretically the 1978 Land Use Act vested rights on all urban lands in the Governor of the State, which affectively means that the Planning Authority can acquire land at will. In practice this is not that straightforward as landowners do not always cooperate with government. Regardless of ownership issues, land availability in Port Harcourt is also affected by the natural conditions of the land. A huge area of land is unsuitable for development, being marshy, subject to frequent flooding and having unsuitable soils or other constraints. Such areas cause urban fragmentation, but if they are well planned and defined as an open space network to protect the environmentally sensitive areas, the spaces could add value to the city. There is a need to relocate those residents that live in unsafe areas to well-planned and fully serviced residential areas. Housing typology would include some free-standing units, but should for the most part provide row-housing or 3 storey walk-ups designed around courtyards. Cost of housing is high in Port Harcourt and affordability of housing will be a factor.

4.5 Waste Management

Waste management in the city is of a very poor standard and is characterised by indiscriminate dumping of waste. It is estimated that 2 000 tonnes of domestic waste is generated daily, of which only 15% ends up in waste sites. This uncontrolled dumping has led to:

- Blockages of storm water drains;
- Surface and groundwater pollution;
- Health impacts; and
- Environmental degradation.

The waste stream is mixed and includes high organic content, glass, aluminium, paper, wood, plastic, grease, oil, scrap metals, industrial waste, medical waste, polythene bags, etc. Waste originates from a range of sources including households, industries, businesses, hospitals, clinics, markets, abattoirs, etc. The Nigerian Constitution delegates the function and provision of waste management to local government. However, the current local government lacks trained personnel, infrastructure and budgets to meet its statutory obligations. Thus, municipal solid waste is collected, transported and disposed of by an agency, known as the Rivers State Environmental Sanitation Authority. In turn, industrial and commercial waste is collected, treated and disposed of by private contractors. Treatment technologies include land filling, recycling, incineration and thermal desorption. There is no engineered landfill site in the City; the New City plan has proposed two.

Although a thriving informal recycling industry exists in the backstreets of Port Harcourt, most waste recovery takes place at the waste dumps. Recycling of different types of plastics, glass, metals and tyres occur yet most recyclables are transferred out of the State for further processing in other States. A revised system of waste management must be adopted, which by focusing on waste prevention and minimisation, recycling and re-use through material, recovery, treatment; and disposal of waste in a safe manner. In addition, existing impacted areas, such as waterways and informal dumping areas must be rehabilitated to reinstate the natural environment.

4.6 Water and Sanitation Services

The topographic and flooding conditions in Port Harcourt have hampered any implementation of formal waterborne sewerage networks, which are totally lacking. Consequently, sewerage infrastructure is mainly provided by septic tanks, pit latrines, jetty toilets and direct flushing into the rivers. While these mechanisms are not ideal in an urban environment such as Port Harcourt, the situation is worsened by the fact that the prevailing infrastructure operates far over capacity. Sanitation or the lack of it is a major concern. The poor state of sanitation has a direct impact on the natural environment. The disposal of human excreta in rivers has a direct impact on the quality of the water, biodiversity and animal and plant life. Raw sewage kills off critical water bodies which take years to recover. Given the dependence that people have on the river, this is life-threatening. People bathe

and fish in the rivers, exposing themselves to dangerous bacteria in the excrement. Almost all drinking water in the city is obtained from underground sources (boreholes). Current sanitation practices directly threaten this source of drinking water as uncontrolled sanitation leads to seepage into the soil and consequent contamination of ground water. Present statistics reveal that an alarming 80% of reported diseases originate from water contamination.

Three waste water treatment plants are proposed; the two situated at Eagle Island and Trans Amadi is quick response projects to service the old city, they will be fed through septic tank truck haulage. Phase 1 of the New City will be serviced by a piped sewage and the treatment plant will be at Ogbogoro with bulk outfall sewer and rising mains. It will take some time for the conversion to the new system to take place and hence a phased approach will have to be adopted whereby minor and the most critical conversions will be dealt with first. For instance, jetty and direct flush latrines must be converted to septic tanks as a matter of urgency to halt uncontrolled disposal of raw sewage into the rivers and consequent environmental degradation.

4.7 Retrofitting of the Old City and Integration

The Old City is a key component of Greater Port Harcourt and must be an integral part of the city's development process. There is no sense in ignoring the existing city and planning only for the new, as the old must be uplifted, renewed and revived in support of the new. The central part of the Old City calls for strategic renewal and redevelopment. Since it is impossible and impractical to totally rebuild the Old City, it is proposed that only strategic and meaningful areas are focused on to initiate the redevelopment process. The principles of the process are to create strong linkages from the CBD to the various surrounding anchors, including the waterfront, the harbour and government precinct; to reinstate legibility;

5.0 The Carbon Footprint of the Plan Area

There are no records of carbon dioxide (CO₂) emission for Port Harcourt. Estimates for Nigeria as a whole from various sources will be used to compute the carbon foot print of the New City. According to a web source (CO₂ Scorecard, 2009), Nigeria released 100.16 million metric tons of CO₂ in the year 2008, and is ranked 41 out of 216 countries. With per capita CO₂ emissions of .6849 metric tons per year, it is in the bottom quartile globally. Its CO₂ intensity (kg per unit GDP 2005 PPP \$) is 0.45, which is higher than the average of 0.27 for its income group – the Low income countries. Regarding the trend, the total CO₂ emissions have decreased by -3.20% during 2007-08. Over the previous five years, the total CO₂ emissions worsened by 7.97%, and over the last decade the total CO₂ emissions has gone up by 12.85%. The total net power generation for Nigeria in 2007 was 21.92 million Mwh. Power supply from conventional thermal sources accounted for 71.07% of the total. In comparison, renewable sources including hydroelectricity contributed 28.93% of the total. Nigeria's economy has been growing on an annual average of about 6% in recent years. In 2010 GDP growth rate was 8.4% even after factoring inflation (Index Omundi, 2011). Based on the analysis and a steady economic growth rate of 6%, metropolitan Port Harcourt, with or without the new city is projected to have its CO per capita doubled in less than ten years.

Table 2: Per Capita CO₂Emission in Port Harcourt

Year	Population of Greater Port Harcourt	Per capita CO ₂ emission
2008	1,9 million	0.6849
2015	2,2 million	1.0326
2020	2,6 million	1.3816
2025	3 million	1.7614
2030	3,4 million	2.3704

The analysis is plausible because the short and long term energy scenarios for Port Harcourt are based on the exploitation and utilization of natural gas for power generation and other forms of petroleum products for industrial and domestic uses.

6.0 Conclusions

The New City plan provides for virtually all that will be required to make the city of Port Harcourt sustainable and liveable. Mass transit is one of the missing links in the sustainability profile of the old city. The new plan provides for a BRT, but what is being implemented is a monorail system, which is one of the earliest distortions of the plan. The plan has provisions for the management of certain places where a federal plan already exist, like in Onne, the second largest port in Nigeria and a logistics centre to the petroleum industry in the West African Offshores where there will be Federal and State overlapping authority. It is wise to use rivers as natural drainage for the City because the flooding problem of the City is not their overflow, but the inadequacy of artificial drainages. The facelift proposed for the old city will be timely and it serves to integrate existing settlements within the plan area into the Master Plan. Poor waste management and sanitation practices intrudes on a city's liveability, the plan has various proposals to tackle it as well. Alternative energy uses can be seen around Port Harcourt in the areas of street lighting, for instance, however the Plan relies on fossil fuel to drive energy needs. This enhances the long term growth in the carbon foot print of the City and it is a major sustainability issue.

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