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Urban Road Transport Infrastructure Planning and Development Implications on Socio-Economic Growth in the City of Douala, Cameroon

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Abstract: - Cities are the major contributors to socio-economic growth with easy access to amenities which stem through road transport infrastructure development. This study was conducted to assess urban road transport infrastructure planning and examine development implications on socio-economic growth in the City of Douala. A descriptive research design was used with primary and secondary data collected and analyzed using descriptive and inferential statistical techniques. Results revealed that, transport infrastructure in Douala have been structured through urban development planning policy which influences surface spatial expansion of socio-economic activities. The planning policies have contributed to the rapid expansion and growth through the initiations of master plan, land use plan and sector plan. Infrastructural development on road transport depicts a physical expansion and construction of road networks which influences the socio-economic growth of the study area. Stakeholders' actions on construction, reconstruction and rehabilitation, investments and maintenance of road infrastructure have helped to curb down some transportation challenges and creates easy access to facilities within different sectors of the study area. However, road transport infrastructure which is well-developed boasts socio-economic activities and growth. The state of road transport network, its diversity and characteristic features is defined by its prevalence within different areas in Douala. Contrarily, other transport infrastructures which are not functioning appropriately due to lapses in physical planning possess enormous implications on transportation in the study area. The conclusion drawn was that the manner in which urban planning policies are implemented determines the level of development in road transport infrastructure and socio-economic growth of Douala. The study recommends an effective application of planning policies to be integrated by implicating all the actors of urban managers and transportation planners for improved growth in the study area.

Keywords:- *Urban, Road Transport, Infrastructure, Planning, Development, Douala.*

I. INTRODUCTION

Estimates held that half of humanity lives in cities and by 2030, some 60 per cent of the world's people will be urban dwellers as the developing world cities gain an average of 5 million residents every month (Egbenchong, 2022). Faced with this upsurge, there is a need for harmony among the spatial, social and environmental aspects of the urban centers and their inhabitants. Rapid and uncontrolled urbanization is archetypical of urban centers of both developed and developing world. Transportation network systems are the means by which mobility is enhanced. Appropriate transportation systems contribute to building a human-friendly city, designed for people to live in and overcome social differences within cities of the world (UN-Habitat, 2016).

According to the World Bank (2018), the implementation of the urbanization process in Africa has unfortunately led to unproductive dynamics observed within cities. Accessibility and connectivity depend on transport supply in terms of frequency and quality of road network. In Africa, the inner centers of most cities are under constant dynamics in infrastructural set-up such as paved roads, bridges, industries, markets, schools, hospitals and recreation. Constant movements are also observed in areas with main road axes which are usually densely congested (Njimanted et al., 2014). The physical and demographic features of Sub-Saharan cities have influenced the expansion of road transport infrastructure planning and development. This has led to the rapid population increase from urbanization and industrialization. The fast-developing nature of these cities has led to urban land use dynamics with expansion on road transport development (Fogwe and Ntumngia, 2015).

The city of Douala is the economic capital and industrial nerve of Cameroon, which harbors about 80% of the country's industries (SITRASS, 2004). Douala has evolved through a dual colonial process whose imprints are reflected in its present layout and land use with the transport sector. Due to the persistent dichotomy of comparatively improper planning and high level of urban economics, the spatial, economic, political and social impact of transport infrastructure is a

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challenge to sustainable urban transport development in the city of Douala. In view of the Douala Urban Plan, the city has over the decades grown from an uninhabited area to today's highly urbanized and built-up area with its own system of transport. The development of Douala is not homogenous in its planning and infrastructural growth (CUD, 2015). Thus, urban transport planning and development is critical to Douala City's way of life and economic vitality.

II. STUDY AREA AND RESEARCH METHODS

Douala is the economic capital of Cameroon and the most populated city with a total of 3,727,221 inhabitants (Egbenchong and Nformi, 2024). The city of Douala determines a lot about the growth and development of Cameroon. Due to its position as a seaport town, Douala has attracted many manufacturing firms producing for domestic consumption and exportation. The demand for transportation services is a sequel to the day-to-day demand for critical economic services. Labour services are required daily to power the various sectors; business ideas are shared on face-to-face business interaction and goods and services are also required to be delivered on a just-in-time basis. All of these utilities put together depend on road transport services, especially a port city. This explains the fact of road transport efficiency affecting the socio-economic growth. It is in this light that the Industrial Free Trade Zones of Bonaberi, Bassa and Ndizengué were established. Douala is located between longitude 9o42' and 10o75' E and latitude 3o2' and 4o2'N. It is the inland extension of the Cameroon estuary at the Gulf of Guinea, constituted of the low coastal plain (Figure 1).

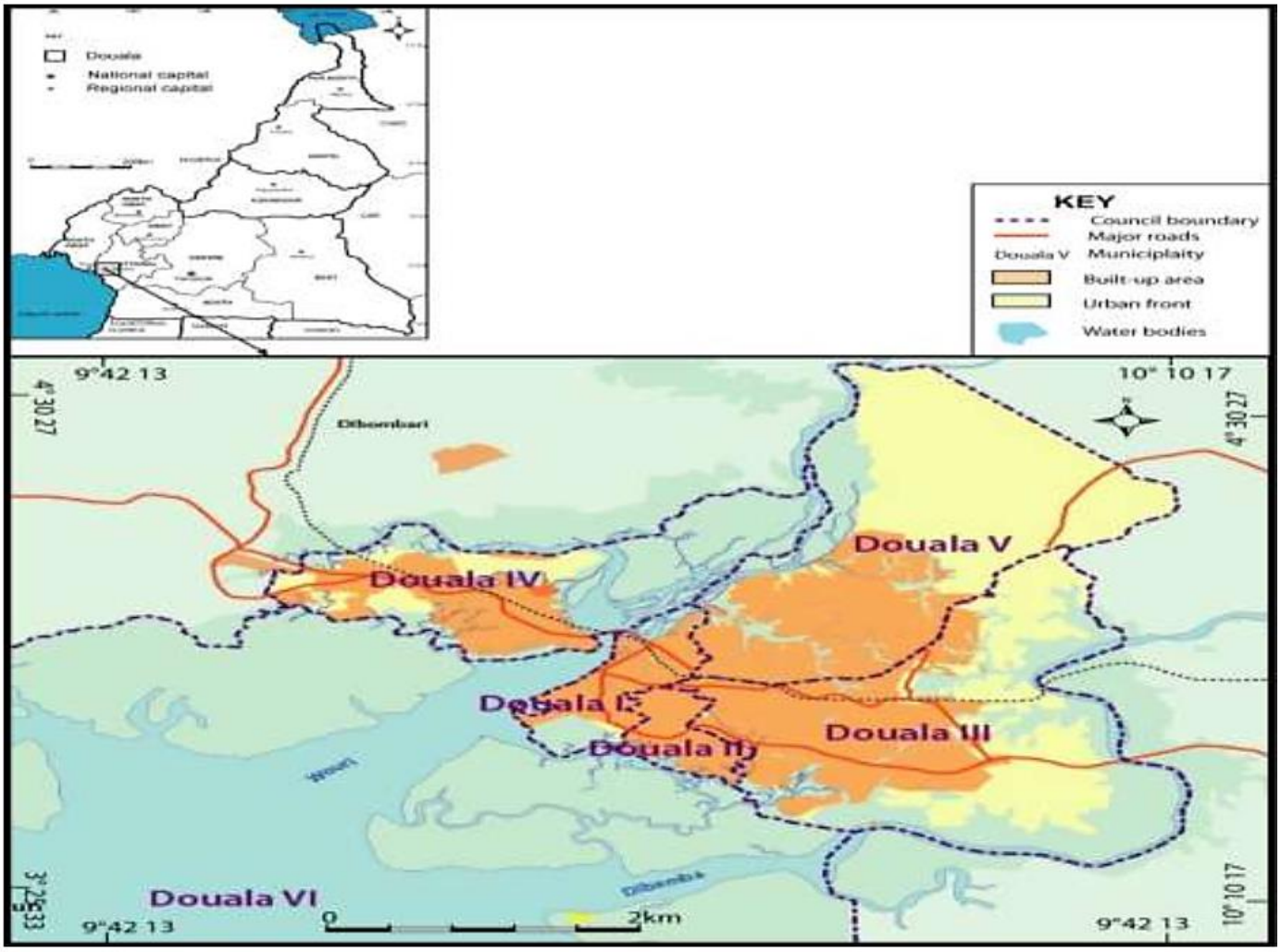

Fig 1: Location of the Study Area
Source: Fieldwork, 2023

A combination of primary and secondary data was used in this study. Primary data were gotten from questionnaires of 100 inhabitants within the city which were purposively sampled. Field observations and on-the-spot appraisals provided data on the planning design of the transportation network in Douala and pictures taken to express the state of the city at present. This observation permitted a visual evaluation on the current state of road network visa-vi transport infrastructure development and implications of these facilities to socio-economic growth. Available data required also provided an opportunity for an approximate appreciation of the complexity of the study area. This was complemented by secondary data and interviews with Douala City Council (CUD) authorities. Information

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gotten from the Council enabled the acquisition of data on the development and implementation of Master Plans in the study area. The data collected was treated using Excel and SPSS software and inferential statistical techniques presented on maps and tables. Cameroonian town planning policies on land use and infrastructure permitted the explanation of norms. Such norms brought out the gaps that have led to inappropriate planning implementations and implications on road transportation in the city of Douala.

III. RESULTS AND DISCUSSIONS

The results obtained through field studies revealed an expansion on urban road transport with planning implications and development which influenced and contributes to the socio-economic growth of the study area. This implies that, in most areas where roads have been constructed, reconstructed and rehabilitated experienced a physical expansion and an extension of other economic activities and urban services. Similarly, with the expansion of such areas development in other sectors becomes very easy to initiate. Development in road infrastructures contributes to socio-economic growth by influencing the growth of development sectors and improving the living conditions of the population.

A. Planning Urban Transport Infrastructure Development in Douala

The conception, organisation and construction of an urban transportation network are achieved through planning policies that respects texts and norms of the area. Urban planning in Cameroon and their execution has promoted transport development in the city of Douala. The urban planning policies are backed up with good Laws and regulations on urban development. Planning in Douala is practiced under the Town planning Law of 2004. Thus, the actions of public policies of urban planning and land use are the upstream of the processes of urban road transport development in the study area. The implementation of these policies is initiated by stakeholders of urban development which have contributed to the quality and quantity of infrastructural disparity that characterise road network in the study area. These stakeholders are in charge of planning, implementation, development and management of the road transport infrastructure in Douala. The policies have contributed to the rapid expansion and growth of transport development through the initiations of the Master Plan, Land Use Plan and Sector Plan (figure 2)

PDS (Summary of Land use Plan), PS (Sector Plan), PDL (Local Master Plan) and PDU (Urban Master Plan).

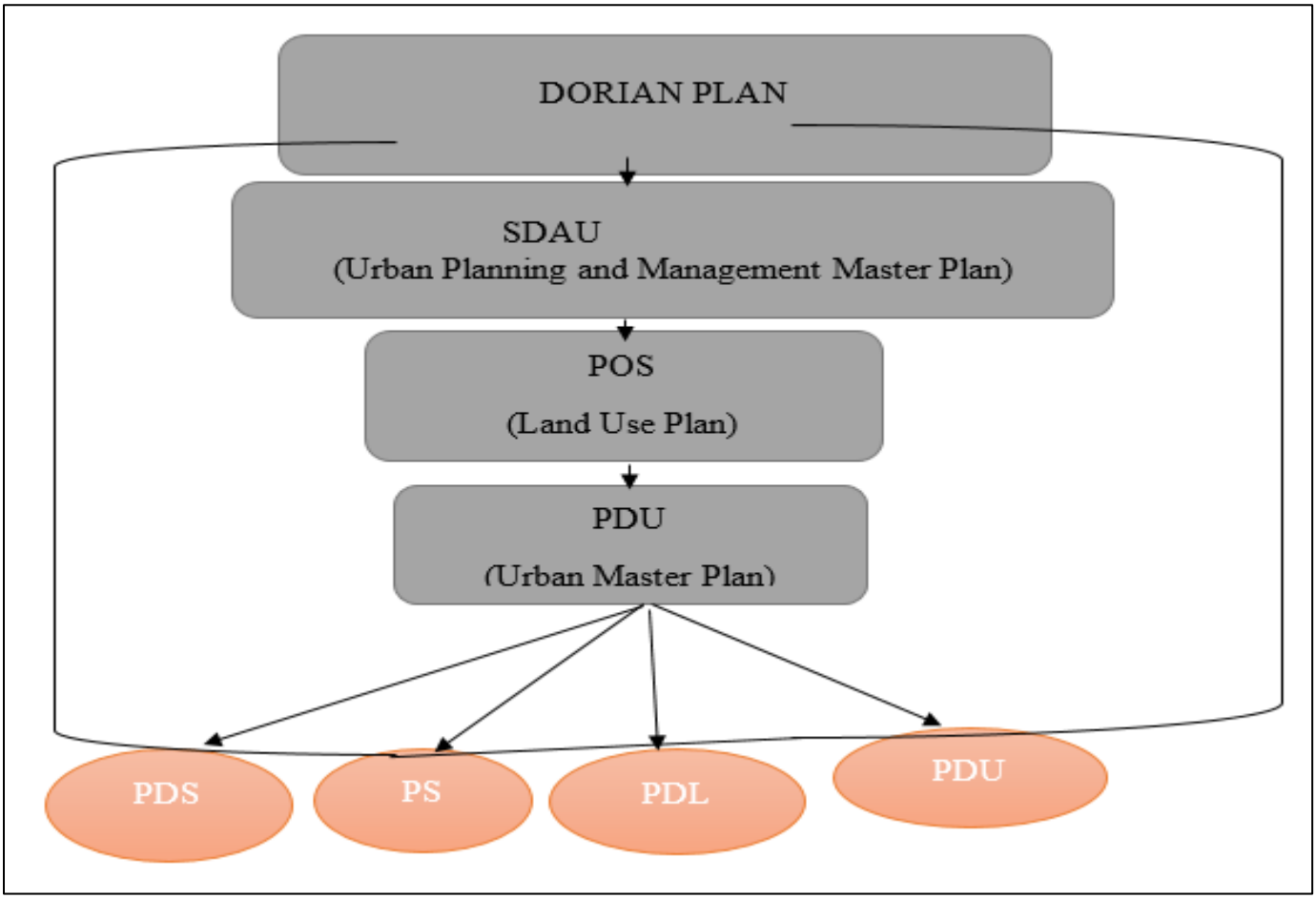

Fig 2: Stages from 1922-2004 of the Urban Planning Development in Douala
Source: CUD 2015 and field survey, 2023

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These plans however came after settlements have been established and the process of its implantation faced resistance from the already established plans. In this light, the Douala City Council in 2012 produced another Master Plan for the city known as Horizon 2025 Master Plan of Douala. The urban planning development plans mark the space transcription on the construction and rehabilitation of road transport infrastructure. In Douala, urban managers like the Douala City Council had engaged in the construction and rehabilitation of street lights along the major roads and junctions. The initiatives in this domain are; the installation of electric wires underground, changing of deteriorated equipment and the installation of street lamps along the major roads which cost about 27 billion FCFA (CUD, 2015). In this framework, public lighting has improved with the installation of solar panels, especially along Boulevards of Ahmadou Ahidjo, Boulevards of Reunification, to help strengthen the safety of main road axes during night hours. The electricity company ENEO ameliorates the lighting system with the implantation of new electricity poles and emergency interventions. The solar panels and electric lamps for street lighting within some streets in Douala are seen on (Figure3).

Fig 3(a): Installed Solar Panels on Poles in Akwa Fig 3(b): A Well-Lit Street in Ndokotti
Fig 3: Streets Equipped with Lighting Devices in the City of Douala
Source: Field Survey, 2023

Installation of solar panels and street lamps has improved on the state of security in the study area. The lighting of main streets in some parts of Douala is restored to ensure the safety of users. This also represents an improvement for the wellbeing of inhabitants who feel more safe and secured at night.The rehabilitation of street lights along main road axes especially within the city centre, for example quarters such as Akwa, around Tunnel Ndokotti and other areas like Bonanjo, Rond-point Deido, Wouri Bridge, Bonassama and Nouvelle Route in Bonaberi have improved in terms of security at night. Both vehicles and pedestrians move freely and benefit from road safety in these areas. Improvement on road transport network in Douala has been the priority of the City Council and other development agencies.

B. Urban Transport Infrastructure Development in Douala

The changes taking place in the domain of road infrastructure in the study area portray the physical expansion of the area. The inner center (Douala I), benefits from a better-structured road network than all of the other subdivisions of the area. This is partly explained by the fact that it accommodates most of the administrative area (Ministries, Regional and Divisional offices, consulates, City Council amongst others) and large shopping hub. In the past years, several works have improved the road network and facilitated traffic in this part of the city. There have been constructions and emergency rehabilitation of transport means in Douala. To that effect, the area has benefited from the creation installation of fuel stations, micro-enterprises and other commercial activities. The construction of the road leading to Village neighborhood and the Douala airport depicts a physical expansion and has brought socio-economic development and growth. The creation of a new neighborhood (New Town Aeroport) was a result of the presence of the constructed road. One of the roads that was constructed by MINDUH is the Douala Eastern Boulevard. The construction of this urban Boulevard (that is the road leading to Village), has a site location at the eastern entrance, with a 2 x 3 lanes (2 x 3 x 9=54km), 04 roundabouts, 2 underpasses and overpasses. This road was constructed between 2008 and 2009, with the broadening of the eastern access way which cost about 1700.000.000 FCFA (MINDUH, 2009). A view of this road can be seen on figure 4.

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Fig 4: Partial View of the Road Leading to Douala Airport and 'Village' Neighborhood
Source: Field Survey, 2023

The construction of a two-way road transport network in Douala is one of the implemented plans which have contributed to socio-economic development by improving the factors of growth of economies and improving the living conditions of the population and access to multiple services. Generally, the city of Douala covers approximately 20,220 km2, or 4.3% of the total area of the Littoral region and represents 4.5% of the study area (Egbenchong, 2022). Overall, the road network extends over a length of 1,800 kilometers, of which around 500 kilometers are paved, and for which 150 kilometers constitute the structuring network (CUD, 2009). Most of the dense road networks in the study area are located in Douala 1 since it surrounds the city center and host major economic and administrative services. The first action of restructuring the Bonanjo and the extension of the Akwa areas are the works of the Germans; they traced the first major axes and made Bonanjo the administrative head, an embryonic road network. Some roads benefited from more extensive maintenance by the Douala City Council such as the Boulevards of; Ahmadou Ahidjo, Boulevard du General Leclerc, Boulevard de la liberté which are renovated and rehabilitated.

All intersections linking the main road axes within the different areas of Douala I to Douala V have been constructed and rehabilitated. Most road intersections are rehabilitated by the Douala City Council with the assistance of the Ministry of Urban development and Housing (MINDUH). Among other works, the following road junctions have been improved in the study area as presented in table 1.

Table 1: Constructed and Rehabilitated Road Junctions in the City of Douala

Road Junction	Main Neighbourhood	Distance (metres)
Fokou Roundabout	Bonaberi	100
Rond point	Deido	3600
Roundabout Place Leclerc	Ndokoti	6300
Boulevard Besseke	Joss bridge	2000
Pont Joss	Place Leclerc	1200
Boulevard Leclerc	Dakar	1800
Port Boulevard	Dakar	800
Boulevard Japoma	Japoma	2600
Boulevard of reunification	Bonanjo	2600
Yabassi-Ndokoti Roundabout	Camp Yabassi – Ndokoti	3850
PK 10 - PK 14 Roundabout	PK 10 - PK 14	4050
Ndokoti – Japoma Roundabout	Ndokoti – Japoma	5950

Source: CUD 2019 and Field Work 2023

These are well-marked road junctions that facilitate movements of people, goods and the parking of vehicles. The good conditions of these roads testifies to the daily efforts made by the Douala City Council not only to facilitate the movement of goods and people but also to participate in the beautification and development of the city. Findings revealed that the construction of a flyover in Bonaberi linking the Ancienne and Nouvel route is a major achievement on road transport development in the city of Douala (figure 5).

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Fig 5: Partial View of the Fly-Over at Sodiko in Bonaberi
Source: Field Survey, 2023

The broadening of the main road in Bonaberi (Ancienne and Nouvelle Route) linking the Wouri Bridge is 40km with 3 roundabouts and a fly-over. The construction and rehabilitation of this road equally stretched from the second Wouri Bridge from Rondpoint Diedo towards the Douala Airport. The reconstruction of this road was between 2009 and 2012 with a cost of 1.850.000.000 FCFA (CUD, 2015). The road that was plagued with pot holes was totally rehabilitated from Bonassama (Ancienne Route) and Nouvelle Route to Rail. This road was degraded with only two lanes initially and often congested was transformed into a four-lane road at Sodiko in the Bonaberi neighborhood. This has helped to improve movement and circulation of socioeconomic activities. The construction of these roads has greatly transformed and significantly increased road infrastructure in the study area. The estimated cost provided by the authorities referred to actual costs based on expenses on similar road rehabilitation projects within the city of Douala. The investment cost of 24.198.374.448 FCFA is more than the annual maintenance cost in construction and maintenance of 4.799.968.691 FCFA for major road axes (CUD, 2019). A summary of estimated cost of investments and maintenance of major roads in the study area are presented on table 2.

Table 2: Investment and Maintenance Costs of Major Roads in Douala

Municipality	Main Road Length	Investment Cost (CFAF)	(%)	Annual Maintenance Cost (CFAF)	(%)
Douala 1	6.505	10.509.679.081	30.1	4.432.150,615	40.0
Douala 2	2.100	1.435.421.012	10.9	134.737	10.0
Douala 3	3.210	3.357.746.238	16.1	22,935,385	10.0
Douala 4	4.342	4.624.733278	18.5	302.945.454	19.0
Douala 5	5.320	4.270.794.839	24.0	41.802.500	21.0
Total	21.477	24.198.374.448	100	4.799.968.691	100

Source: CUD 2019 and Field Work 2023

A strategic road infrastructure which was demanded by Cameroonian economic operators, the second Wouri Bridge was constructed. This new bridge allows better traffic flow from Bonaberi, which accommodates an industrial zone, the CBD and the Autonomous Port of Douala (Figure 6).

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Fig 6: Partial View of the Second Constructed Wouri Bridge in Douala
Source: Field Survey, 2023

The road infrastructure comprised two bridges with a length of 850 meters, firstly a road bridge with 5 lanes, and secondly a rail bridge with two tracks. This project which cost over 141.6 billion CFCA in 2018 was financed by the AFD (French Development Agency), the World Bank and a Chinese joint venture. The reconstruction of the first bridge and construction of the second bridge in Wouri initiated additional developments that opened up Rond-Point Deido.

C. Road Transport Network in the City of Douala

Road transport has become the dominant land transportation system in Cameroon. This is the dominant means of transport served by the population of Douala. The various types of means used such as cars, motorbikes, buses and trucks are heavily dependent on road tracks in the study area. Urban road transport possesses significant advantages over rail in the city of Douala. The road network is not evenly distributed within the sub-divisions of Douala I, II, III, IV and Douala V due to disparities in road infrastructure. The roads are concentrated in some areas than others. For example, in Douala I within the neighborhoods of Bonanjo, Akwa, Bonapriso, Deido and Bali, there is a high concentration of road network in both main and minor streets (Figure 7).

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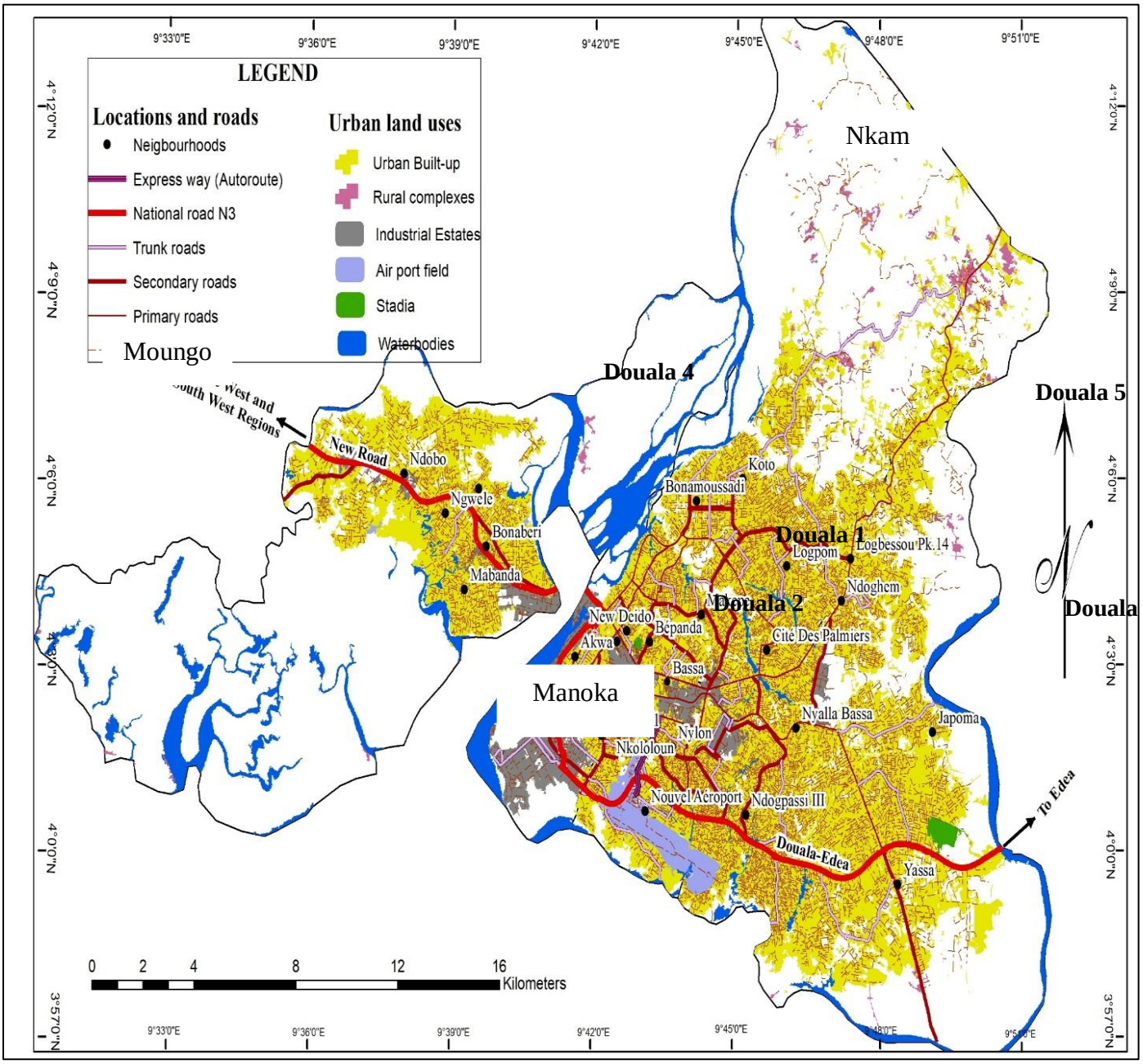

Fig 7: Spatial Pattern and Diversity of Road Transport Network in Douala
Source: Map Realised from the use of Open Street Maps 2022 and Field Survey 2023

According to figure 2, Douala has a high density of road network. The road types depict express ways (high ways), National road (N3), Trunk road, primary and secondary roads (main/minor streets) and feeder road. Meanwhile, in New Bell which is the headquarter of Douala II, only the main streets are accessible. Similarly, in Bonaberi which consists of Douala IV, only the primary road seems to be highly accessible in addition to one secondary road, the Manbanda road with the constant circulation of buses, taxis and motorbikes. The spatial pattern of road network in Douala V, results from the rehabilitation of areas which were villages that have been transformed into urban agglomerations. Thus, higher road densities in the area under study correspond with densely populated areas. The areas of high densities are the inner parts of the localities in Douala, while the areas of low densities are the peripheries. These areas of high road densities are closer to the highways and main streets and their density decreases with increasing distances towards the highways. The disparity in the spatial pattern of the road transport network in the city of Douala is influenced by the urban land use of the physical milieu resulting in a multiplicity of transport system on the landscape. The roads in Douala are classified according to their importance from 1, 2, 3 and 4th categories (CUD, 2009). Links of the first category (footpath) are created and maintained by the local population since they serve mainly households. Meanwhile links of the 2nd, 3rd and 4th categories (minor, main streets and highways) are created and maintained by the municipal and planning authorities of the city. The diverse characteristic features of road transport network are presented on table 3.

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Table 3: Characteristic Features of Road Transport Network in Douala

Road Category	Road Type	Nature of Roads	Place of Prevalence and Areas Served	Means of Transporting Goods and People
1	Footpaths	Un-graded	- Within living quarters - Link up households	Bicycles, Motorbike, sidewalkPedestrians and head loads
2	Minor streets	Graded and untarred	- Link up neighbourhoods - Link up streets	Bicycles, Motorbike and sidewalkPedestrians
3	Main Streets	Graded, partially-tarred and tarred	-Link up neighbourhood, Markets and areas beyond.	Taxi, bus, truck, motorbike, bicycle and sidewalkPedestrians
4	Highways	Graded, and tarred	Link up industrial, residential commercial zones/peripheries	Taxi, bus, truck, motorbike, bicycle and sidewalkPedestrians

Source. Field survey, 2023

D. Implications of Road Transport Development to the Socio-Economic Growth of Douala

The road transport network is a common tool used for urban development in the study area. It is one of the determinants in the evolution of the urban fabric. It has become one of the major elements of territorial attractiveness. This is because it facilitates the building of a conducive environment and improved standard of living. Therefore, the changes taking place within the road network of Douala affect the socio-economic growth of the area such as; improved neighbourhoods, living conditions and the fight against poverty, industrial and commercial developments. Road transport is an explanatory factor for social growth in the study area. When the road transport network is efficient, it provides social opportunities and benefits that result in positive multiplier effects. Social benefits of road transport development are presented on figure 8.

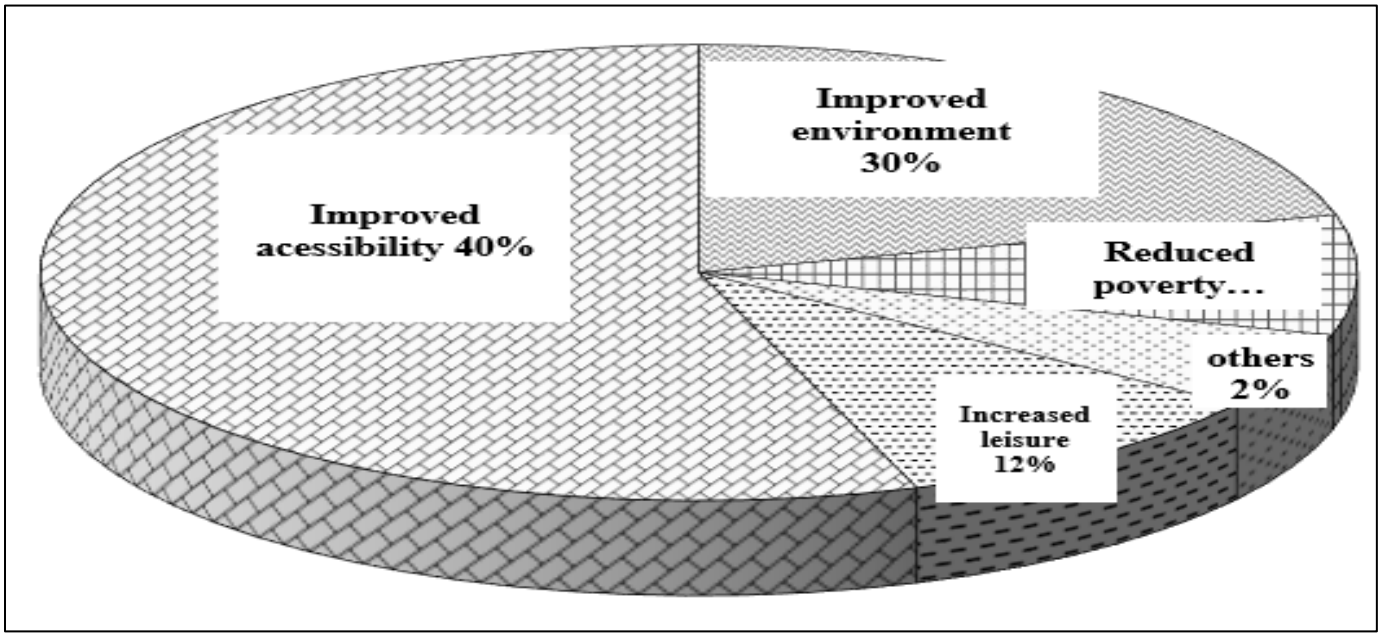

Fig 8: Social Benefits of Road Transport Development in Douala
Source: Field Survey, 2023

Improvement of accessibility in the City of Douala is a social benefit through road transport development. More opportunities arise within the study area as road transport infrastructures satisfy mobility needs of the population. This is by ensuring access to social facilities, markets and other resources. In Douala 1 area, there is access through major road arteries to leisure sites like the Douala art museum, maritime museum in Bonanjo, Bonanjo parc, fun center at Bonapriso and parcours vita at Akwa north. The study outlines that a good and efficient road network is of paramount importance for the population of Douala. There is equally improved access to supper-markets like Santa Lucia in Bonaberi and Bonamussadi, easy access to hotels such as royal palace in ancienne route, hotel Belavie Bonaberi.

Health access inequalities have steadily decreased through the years in Douala. Today, more and more people can easily reach medical care. Development of road transport network has increase the opportunity to use medical services, resulting in increased network to health care through the provision of fast interventions in the study area. The population of Douala benefits from road access to main public health centers like the Douala general hospital, Laquintinie hospital, Bonassama district hospital, Cite de palmiers and Deido district hospitals amongst others.

Improvement of the environment in Douala is evidence from the development of road transport network. The objective of every development project is to improve urban management and access to infrastructure especially for poor

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or un-favoured neighborhoods. The effects of human activities on the environment are more and more being considered as the new battlefront in the city of Douala. Road transport development has contributed enormously to poverty reduction in Douala. On one hand, road transport development contributes to poverty reduction through its indirect impact on economic growth, while on the other hand there is direct impact on the personal welfare of the poor. Generally, local access roads in poor neighborhoods make only a modest contribution to national income growth, whereas they are likely to have a direct and significant impact on the daily life of the poor. On the other hand, inter-city transport is of strategic importance to an area's economy, but it is likely to have only indirect impact in relieving poverty. Wouri Division has benefited from debt relief under the Heavily Indebted Poor Countries (HIPC) Initiative, the Multilateral Debt Relief Initiative (MDRI), and additional bilateral debt relief (C2D) initiatives. The HIPC and C2D initiatives in the study area have impact on road infrastructure and urban development. This is achieved through the government's commitment of allocating resources made available from Debt relief to priority expenditures in the fight against poverty as outlined in the Poverty Reduction Strategy Paper (PRSP).

However, high-density road transport infrastructure and highly connected networks are commonly associated with high levels of economic development. Road transport plays an important role in the economic development of the study area. As the economy of Douala is experiencing development on transport networks, there is a shift of functions within different sectors. These sectors rely on different means of road transport and capabilities. One of the contributing factors of road transport development to the economic growth of Douala is improvement on storm water drainage. All road drainage systems affected by the road transport network projects are improved or redesigned to avoid all floods, and improve the current environmental situation. A drainage system and disclavement was carried out by the Douala City Council and other development organisations such as the UNDP. This organisation worked on "Improving connectivity and living environment within inner-city connectivity and integration of poor neighborhoods and Sanitation". Drainage systems financed by the project included those in Douala III estimated at 3.409 km and Douala 5 estimated at 4.013 km. The economic benefits of road transport development in Douala are seen on figure 9.

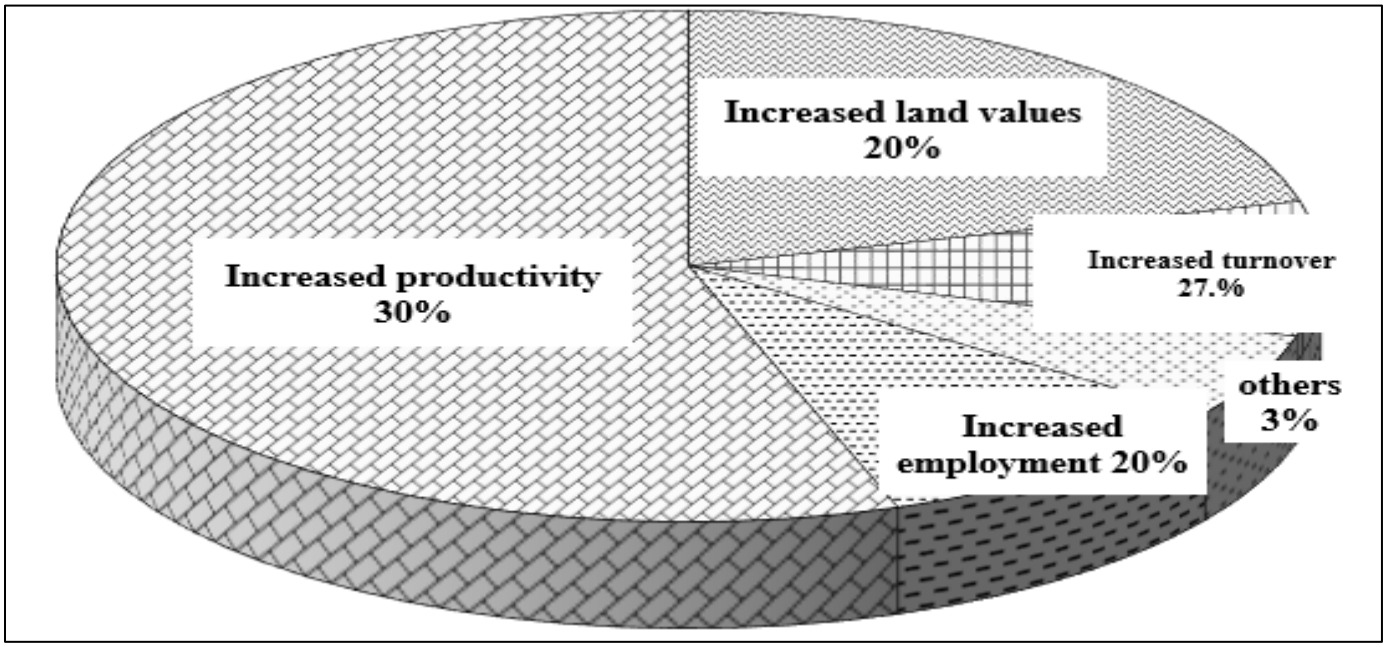

Fig 9: Economic Benefits of Road Transport Development in Douala
Source: Field survey, 2023

The battle for access to land and housing is a fundamental aspect of gentrification which is influenced by accessibility in road transport networks of the study area. In addition, the constant rise in the price of rent does not encourage the most disadvantaged to move closer to the central business districts of Douala. The changes in the rental price for example in Akwa, Bonanjo, Bonaberi and New Bell from 1980 till the present date are partly explained by the heavy demand to which the inner center of Douala is subjected. Land values increase with improved road networks within these localities. It is noted that in the past thirty years, the rental price has practically quadrupled especially in Akwa and Bonanjo and this situation is not likely to favour and encourage the urban poor to live within the inner centres. Hence, the exclusion of this group of people towards the outlying areas (periphery). Only wealthy families can afford the luxury of renting within these areas.

Development on road transport in Douala has influenced the growth and expansion of industrial, commercial and other sectors. In the study area, Akwa, Bonanjo, Bassa and Bonaberi neighbourhoods to name a few, are good examples within Douala I, Douala III and Douala IV. For example, Bonaberi, just like Akwa which is the top

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or leading commercial and industrial centers derive this advantage due to the improvement in the development of road infrastructure. This is equally due to their proximity to the ports which has led to the development of industrial and commercial activities. The characteristics of these areas have made them very famous and densely populated in Douala. The well-built-up road infrastructure within these neighbourhoods is a pool to several commercial activities which together, contribute to the economic development of the said areas. Akwa for example, which makes up part of the CBD presents a landscape marked by the presence of many enterprises, luxurious hotels, shops and offices. Bonaberi and Bassa are marked with high industrial, commercial and financial institutions amongst others.

The road transport development has greatly contributed to shaping Douala's economy by enabling the emergence of modern supply chain management. It remains today a key element for the source of state revenue since it represents one of the largest items in national budgets. In 2004, SITRASS released a report on vehicle taxation in Douala which indicated that vehicle-related taxes represented up to 10.2% of the total fiscal income of state revenue. Different areas where the economy benefits turnover are through motor vehicle tax revenue, driving license fees taxes, tolls, customs duties, insurance taxes and service stations. This has encouraged the growth of fuel companies; SCDP, TEXACO, BOCOM, Total, Afrique Gas, Africa Petroleum and a host of others in Wouri. Thus, the road transport sector is a very substantial source of jobs in the study area. Statistics show a gross distortion between taxes collected and funds re-invested back into the road sector. Most at the time taxation raised from road services is higher than the amounts spent by the authorities on investments in road infrastructure. However, the distribution of socio-economic activities such as industrial hubs, markets, sport complexes, airport, urban greens and agricultural lands along road arteries in the study area (figure 10)

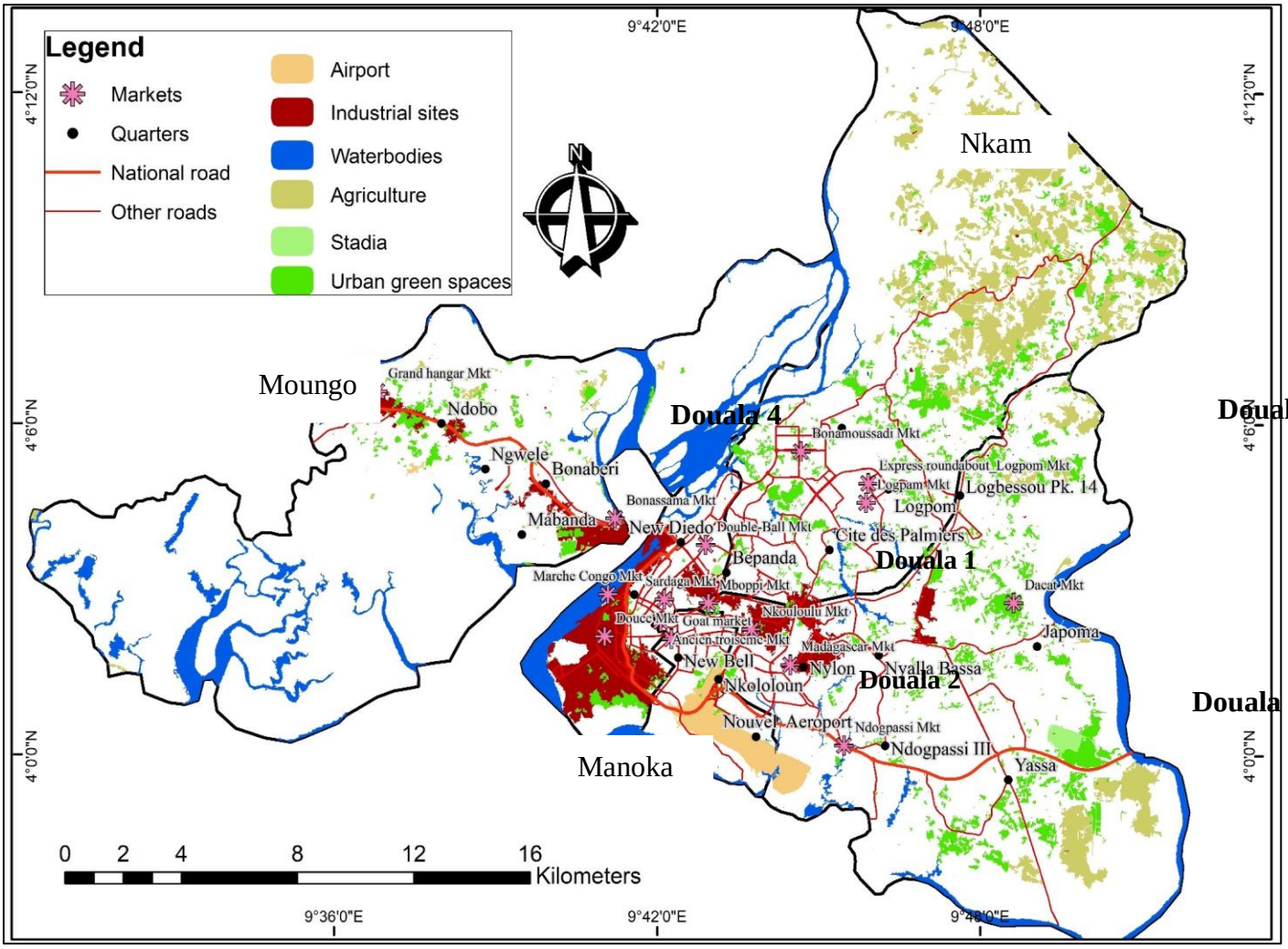

Fig 10: Spatial Distribution of Socio-Economic Activities along Road Arteries in Douala
Source: Sentinel-2 (ESA, 2022) and fieldwork, 2023

The reconstruction of the Douala air and sea ports, the creation of the New Town Aeroport neighborhood, the construction of a new sport complex at Japoma and extended farm lands for agricultural purposes are all linked to a well-stretched road networks (National road and other main streets) within these areas.

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E. Implications of Urban Planning Policy Implementation on Transportation in the City of Douala

Findings depict a certain dimension on urban road transport planning and development in Douala. The study reveals a broad road transport network, though city dwellers still face difficulties in access to transport and adequate road infrastructure to ease the flow of economic activities. This is because some of the roads are still unpaved due to lapses in planning and inappropriate implementation of urban plans. The state of road network in Douala is presented on table 4.

Table 4: The State of Road Transport Network in Douala

Road Surface State			Road State			
Area	**Surface Area in km**	**Surface Area in Percentage**	**Unpaved Road Length in km**	**Paved Road Length in km**	**Total Length in km**	**Overall Percentage**
Douala 1	6044	43	291	5549	28856	38
Douala 2	2044	9	8233	937	9170	7
Douala 3	3044	11	4047	1000	5040	9
Douala 4	4044	16	23938	4918	6570	12
Douala 5	5044	21	23605	702	24307	32
Total	20220	100	65372	7848	73950	100

Source: MINT 2019 and Field Survey, 2023

In the study area, out of the 20220 km of classified roads, 28 856 km of road (Douala 1) are defined as priority network on which the state of the area is committed to concentrating the resources allocated to the road sector. This is because most of the commercial and administrative activities are being performed within the area of Akwa and Bonanjo. Meanwhile, other areas of Douala 2, 3, 4 and 5 harbors mostly industrial and commercial sectors. However, challenges faced in urban planning by the authorities is partly due to the effect of rapid population growth, inadequate implementation of the town planning laws amongst other factors. Even though, urban planning in Cameroon and Douala in particular is enshrined with good rules and regulations. There is poor implementation of the land use plans which makes it problematic for satisfactory urban planning and transport infrastructure development to be accomplished in Douala. The result therefore, is the haphazard allocation of land uses without taking into account their compatibility with the environment and other land uses, and the safety of the city dwellers. For instance, the residential land uses of Bonassama, Venice, New Deido, Mabanda, Ndobo, Bonaberi, Bonambape, and Akwa Nord expose the settlers to sea intrusion and flood hazards especially during the rainy season. The state of some secondary roads within neighbourhoods during the raining season is revealed on figure 11.

Fig 11(a): A Street at Bonaberi Occupied by Pool of Water

Fig 11(b): Flash Flood at Bonamoussadi that has Innundated the Highway

Fig 11: Flash Floods and Stagnant Pools within Some Streets of Neighbourhoods
Source: Field Survey, 2023

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During the rainy season when the conditions become different from the dry season, motor vehicles cannot access most secondary roads leading to the quarters. The diversity in the transport system in Douala decreases the degree of accessibility in the study area. Most of the affected transport infrastructure from observation revealed that water is the main factor that accounts for the degradation. This surface water is in the form of floods or inundations. Findings revealed that parts of the study area which is composed of wetlands are the most famous flooding zones. Frequent floods are recorded every year especially between the period of July and September. The constant presence of water provokes hydraulic disturbances that affect the lifespan of the roads and deteriorates the environment (Fogwe and Ntumngia, 2015). Thus, negatively influencing the accessibility of the population found within such neighbourhoods in the city of Douala.

Traffic and congestion is an economic challenge to urban road transportation and this is partly with an increased population yearly. The quest to satisfy daily demand by the population has caused the inhabitants of Douala to use multiple systems of urban transportation leading to road accidents. Drivers and pedestrians mostly operate in contravention of road transport regulations. There is high level of unhealthy and un-sustained competition from bus, car and motorcycle transport means giving rise to accidents and traffic jams. Most of the main and minor streets in the study area are not in a good state and hinders the free flow of vehicles and pedestrians. The growing influx and competition between different transportation means has led to the non-respect of highway signals and road accidents in Douala. The search for better means of living by the population influenced street vendors, which render transportation very difficult. The traffic situation in some main roads of Douala is seen on figure 12.

Non functionality of Traffic Lights in Ndokoti (morning)

Fig 12(a): Deplorable Nature of Roads at New Bell
Traffic Congestion by users in Ndokoti (Evening)

Fig 12(b): Potholes Widen Over Time in Mabanda
Fig 12: Traffic Congestion Incidents During Morning/Evening Hours at Ndokoti
Source: Field Survey, 2023

These images of non-functionality of traffic control lights at Tunnel Ndokotti and traffic congestion by road users at Ndokoti roundabout give a clear view of the economic challenges faced in the domain of road transportation in the study area. This implies uneasy access to movement along highways. The population had varied opinion in appreciation of streets with respect to the state of the road network in Douala. Neighborhoods of Bonanjo, Akwa, Bonapriso, Bali, Deido and Bonassama of the study area were graded by the population with good road network. Results indicates that most streets have either poor or very poor roads especially those from Douala 2 (New Bell), Douala 4 (Mabanda) amongst others as shown on figure 13.

Fig 13(a): Deplorable Nature of Roads at New Bell

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Fig 13(b): Potholes Widen Over Time in Mabanda
Fig 13: The State of Roads in Some Neighbourhoods in the city of Douala
Field Survey, 2023

The poor nature of the road at New Bell drives traffic flow towards Akwa Street. This increases the traffic flow on this stretch and makes the stretch always congested especially as it has a lot of commercial activities. It depicts the pre-congestion conditions as a result of potholes from poorly paved segments of the road. This road serves as a major feeder road between "Marche Central" and "Marche Congo" which are major shopping hub in the study area. Meanwhile photo in Manbanda depict the poor nature of the paved roads and inadequate maintenance. Large potholes grow wider and deeper making motorcycles the most reliable means of transport in this area.

IV. CONCLUSION AND RECOMMENDATIONS

Investigations affirm that urban road transport infrastructure development of Douala depends on the appropriate implementation of development plans and planning policies. The extent of execution of urban plans directly influences the development of transportation networks. Urban transport development planning is one of the principal challenges of the 21st Century in many areas of developing countries such as Cameroon and the city of Douala in particular. The transport development situation in Douala is problematic in as much as the last Urban Development Master Plan dates back to 1982 and the development of transport infrastructure plan would appear to depend on the adoption of a new Master Plan, for which the process is already well behind schedule. Development of a strategy of this sort is complicated by the absence of local structures to ensure coordination, either between institutional actors, making it possible to address their multiplicity with development operators. This challenge is a result of rapid population growth and an increase in-migration. In this regard, the rapid urban population growth is a crucial factor contributing to unplanned and uncontrolled urban expansion. There are overwhelming shreds of evidence to show that Douala depends on transport for efficiency. The urban residents must be on the move constantly in order to make urban activities and functions among others and this movement is allowed by a transport mechanism. Overall, despite the diversity and complementary nature of roads in Douala, their surface expansion contributes to the physical and socio-economic growth of the area. The asphalt roads have experienced serious improvement in livelihood. The urban transport sector is a major source of unskilled jobs in Douala. This rapid analysis of the supply of urban transport in the study area reveals a sector undergoing substantial change. In this regard, the recommendations proposed are:

- The City Council and planning authorities should take into cognisance the element of time in devising any transport development strategy for a large city like Douala. There is a necessity for the urban development authorities to regulate projects in time and space through a more comprehensive and purposeful decentralisation policy of transportation.
- There should be an effective application of planning policies integrated by implicating all the actors of urban managers and transportation planners for improved socio-economic growth; with a system of urban zoning to regulate specific locations/sites (market entrances, offices, educational premises and motor parks) for easy identification, expansion of the transportation network and control of the more stable trading activities along road arteries in the city of Douala.

REFERENCES

[1]. Andersson M. (2019). Urban Expansion and Public Transport: Implications for DevelopmentInclusive.https://www.ide.go.jp/library/English/Publish/Download/c/pdf/23_05.pdf. https://doi.org/10.1108/14777831211204921.
[2]. CUD. (2010). Local Agenda 21 of the city of Douala 96p.
[3]. CUD. (2015) urban master plan of Douala in horizon 2025. 240p.
[4]. CUD. (2019). Development strategy of the Douala Metropolis, Douala city council (CUD). 147p.
[5]. Egbenchong, R.E. (2022). Urban Development Implications on mobility in Wouri Division, the Littoral Region of Cameroon. An Unpublished Ph.D Thesis, Department of Geography and Planning, University of Bamenda.
[6]. Egbenchong R.E. and Nformi Beatrice Maluh. (2024) Urban recreational green spaces dynamics and implications in the Bonaberi neighbourhood of Douala IV Municipality, Cameroon.World Journal of Advanced Research and Reviews; WJARR 2024, 23(02), 1008-1019.
[7]. Fogwe, Z. N. and Ntumngia L., N. (2015). Road infrastructural development and traffic patterns in Bamenda - a Cameroonian medium city. Journal of Progressive Research in Social Sciences (JPRSS) ISSN: 2395-6283.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24SEP1492

[8]. Farzaneh, M. (2011). Urban Development Planning, regeneration and public participation: A comparison between UK and Iran, Newcastle University, United Kingdom. 71(2), 147-162. https://doi.org/10.4236/jep.2011.25069
[9]. Kamath, L. & Deekshit, P. (2014) Planning as Practice? Governing Conjunctures and Informal Urbanisation in Solapur Town. Economic & Political Weekly. XLIX (22), pp. 72–81.
[10]. Law No 2004/003 of 21st April 2004. To regulate town planning in Cameroon. Mahendra, A. (2018). Urban transport in the developing countries: Balancing accessibility with aspiration. Expert Group meeting on ―special needs and challenges in developing countries for achieving sustainable transport‖. UN-DESA, New York, May 10, 2016.
[11]. MINDUH, Ministry of Housing and Urban Development Department, 2015. http://www.livablecommunities.gov/
[12]. MINDUH. (2001). Regional studies on the development of Douala, urbanism, 130p.
[13]. MINDUH. (2014). collection of texts relating to town planning and housing, November, 2014
[14]. MINDUH. (2014). Recuiel De Textes Reltifs A L'urbanisme ET L'habitat, Novembre, 2014. 278p.
[15]. MINT (2015). Urban Transport development Project in the City of Douala. Understanding the Influence of development on Commuting. MINT and CUD September 2015, 128p
[16]. MINT. (2019). Urban development project in Douala, Feasibility study for the establishment of road network. République of Cameroon, 125p.
[17]. Njimanted, G. F., Mbohjim & Mobit, O. (2014). Determinants of Traffic Congestion in the Metropolis of Douala, Cameroon: An integrated approach in Journal of the Cameroon Academy of Sciences Vol. 11 No. 2 & 3 (2013/14), p 211216.
[18]. Oliver, P. (2014). The issue of implementation of town planning documents in Cameroon towards new dynamism in the issuance of town planning instrument 7p.
[19]. O.S.E.E.D. (2015): industrial companies in Douala, interim progress report n° 1, Collection "Entreprises & Territory", Nov., CUD, pp. 11/16 Report: Development Strategy for the City of Douala and its Metropolitan Area. December 2015.
[20]. Papacostas, C.S. & Prevedouros, P.D. (2000) Transportation Engineering and Planning (3rd Edition). [online]. Prentice Hall. [Accessed 21 April 2024] Paris,https://dx.doi.org/10.1787/2ce4b893-en.
[21]. Porter, G. (2008) Transport planning in sub-Saharan Africa II: putting gender into mobility and transport planning in Africa [online]. Progress in Development Studies. 8 (3), pp. 281–289. [Accessed 21 September 2024].
[22]. Rodrigue, J-P. (2017). Urban land use and transportation. In: the Geography of transport systems, 4th edition, New York, Routledge, 440 pages.
[23]. Rodrique, J-P., Comtois, C., & Slack B. (2012).The geography of transport system. New Routledge, Taylor and Francis Group, London and New York, 432 pages.
[24]. SITRASS, International Solidarity on Transport and Research in Sub-Saharan Africa (2004b) Poverty and Urban Mobility in Douala', report for World Bank, SITRASS, Lyon, September.
[25]. UITP - International Association of Public Transport (2010), Public Transport in Sub-Saharan Africa: Major trends and case studies. Trans-Africa Consortium, Brussel. UCL Policy Briefing– October 2022.
[26]. UN-HABITAT (2016). A City that Plans: Reinventing Urban Planning. In World cities report, Noirobi, Kenya. http://wcr.unhabitat.org/main-report/
[27]. URBAN PLAN. (2009). Development strategies in the city of Douala and it Metropole CUD, study report, 2009, 87p.
[28]. World Bank, (2018). Douala Urban Mobility Project (P167795). Project Information Document/Integrated Safeguards Data Sheet (PID/ISDS). Concept Stage/Updated: 25-Oct-2018/Report No; PIDISDSC25288. http://documents1.worldbank.org.> (Accessed June 7th 2024).
[29]. WSAPL-MoUD & WSA-MoUD (2008) Final report: Study on traffic and transportation policies and strategies in urban areas in India. New Delhi: Wilbur Smith Associates for the Ministry of Urban Development, Government of India, New Delhi.