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PROFESSIONAL MASTERS IN TOWN PLANNING, MANAGEMENT AND URBAN DEVELOPMENT (URAMDEUR)

CONTRIBUTION TO EASE TRAFFIC CONGESTION ALONG THE OLEMBE-NKOMETOU 1, SEGMENT OF NATIONAL ROAD N° 4 IN YAOUNDE

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DEDICATION

This work is dedicated to my late Dad and my lovely Mother

LATE PA TEMBE JACOB ABEN

(He inspired my interest in Learning and Schooling)

AND

MADAM ANNA MBAYI TEMBE

(She taught me humility)

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ABSTRACT

Road traffic congestion has been frequent in the study matrix over the years (2004 till present). As a result, the study matrix has been referred to as 'A Stretch of Road Where Traffic Congestion Never Ends'. It is for this reason that this study is carried out to verify the manifestation, causes, impacts and measures put in place to reduce traffic congestion along the Olembe-Nkometou 1 stretch of road. In clear terms, the main objectives are to (i) to propose a strategy whereby commuters plying this stretch of road can gain time and catch up with their commitments. (ii) What are the causes of traffic congestion along this segment of road. (iii) Examine how the uncontrolled extension of Yaoundé brings about traffic congestion along this road. (iv) Show how administrative bottlenecks hinder urban development in Yaoundé. (v) Propose strategy to decongest traffic congestion along the Olembe-Nkometou 1, segment of road.

To carry out this work on contribution to ease traffic congestion along the Olembe-Nkometou 1, segment of the National road N°: 4, three hypotheses were set. To verify the hypotheses, data was obtained from primary and secondary sources. The study adopted a mixed method approach that is qualitative and quantitative, using several data collection methods: questionnaires administration, interviews with key informants and observations. Primary sources include interviews, fieldworks, field survey, taking of photographs, GPS collection points and participant observation and simple random sampling approaches were adopted targeting one hundred and ninety respondents (commuters or individuals). Secondary data was also gotten from the internet, libraries, newspapers, magazines, Presidential Decree, legal law texts and audio visual sources. The data collected was processed and analyzed using required statistical tools which gave the following results.The main determinants or driving forces of road traffic congestion on that stretch of road were poor waste management, the narrowness of the road, road deterioration and the presence of mixed vehicles and pedestrians..

The study has proposed some strategies and recommendations to the local authorities, respective delegations and developers in a bid to ease road traffic congestion along the Olembe-Nkometou 1, stretch of road. Finally, the study suggests that further study be undertaken to decongest traffic congestion from Nkometou 1- Obala roundabout, stretch of road in the years ahead else it will become another nightmare to commuters.

Key words: Road traffic congestion, vulnerability, prevention, National road N°: 4, Cameroon

RESUME

Le sujet des embouteillages routiers a été fréquent dans la matrice d'étude au fil des années (de 2004 à ce jour). En conséquence, la matrice d'étude a été appelée « Un tronçon de route où les embouteillages ne finissent jamais ». C'est pour cette raison que cette étude est réalisée afin de vérifier la manifestation, les causes, les impacts et les mesures mises en place pour réduire cette congestion routière dans la zone d'étude. En clair, les principaux objectifs sont de (i) proposer une stratégie permettant aux navetteurs empruntant ce tronçon de route de gagner du temps et de rattraper leurs engagements. (ii) Quelles sont les causes de la congestion routiere sur ce trancon de route.iii) Examiner comment l'extension incontrôlée de Yaoundé entraîne des embouteillages le long de cette route. (iv) Montrer comment les goulots d'étranglement administratifs freinent le développement urbain à Yaoundé. (v) Stratégie proposée pour réduire les embouteillages le long du tronçon de route Olembe-Nkometou 1.

Pour réaliser ces travaux de contribution à la décongestion du trafic le long du tronçon Olembe-Nkometou 1, tronçon de la route Nationale N°4, trois hypothèses ont été émises. Pour vérifier les hypothèses, des données ont été obtenues à partir de sources primaires et secondaires. L'étude a adopté une approche mixte, qualitative et quantitative, utilisant plusieurs méthodes de collecte de données et de recherche : administration de questionnaires, entretiens avec des informateurs clés et observations. Les sources primaires comprennent les entretiens, les travaux sur le terrain, les enquêtes sur le terrain, la prise de photographies, les points des collecte GPS et l'observation participante. Des approches d'échantillonnage aléatoire simples ont été adoptées ciblant cent quatre-vingt-dix personnes interrogées (navetteurs ou individus). Des données secondaires ont également été obtenues à partir d'Internet, de bibliothèques, de journaux, de magazines, de décrets présidentiels, de textes de loi et de sources audiovisuelles. Les données collectées ont été traitées et analysées à l'aide des outils statistiques requis qui ont donné les résultats suivants. Les principaux déterminants ou forces motrices de la congestion routière sur ce tronçon de route étaient la mauvaise gestion des déchets, l'étroitesse de la route, la détérioration de la route et la présence à la fois de véhicules et de piétons.

L'étude a proposé quelques stratégies et recommandations aux autorités locales, aux délégations respectives et aux promoteurs afin de réduire la congestion du trafic routier le long du tronçon Olembe-Nkometou 1. Enfin, l'étude suggère que des études plus approfondies soient entreprises pour décongestionner les embouteillages du Rond-Point Nkometou 1-Obala, tronçon de route des années à venir, sinon cela deviendra un autre cauchemar pour les navetteurs.

Mots clés: Congestion routière, Vulnérabilité, Prévention, Route nationale N°4, Cameroun

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LIST OF ABBREVIATIONS AND ACRONYMS

ADT - Average Daily Traffic

BB - Asphalt Concrete

BRT - Bus Rapid Transit

UMPT - Urban Mass Public Transport

BUCREP – Central Bureau of Population Studies

CBD - Central Business District

CDS - A City Development Strategy

CDS - Strategic spatial planning and a city development strategy

CTD - Decentralized Territorial Communities

CUY - Yaounde city council

COS - Land Occupancy Coefficient

GIFU - Urban Land Initiative Group

COPIL - Technical Steering Committee

DFs - Displaced Families

DPU - Urban Planning Document

ESIA - Environmental and Social Impact Assessment

ERA - Environment - Research – Action

FALSH - Faculty of Arts, Letters and Social Sciences

FCFA - Franc of the African Financial Community

GIS - Geographic Information System

GPS - Global Position Systems

HYSACAM - Hygiene and Sanitation Company in Cameroon

ICT - Information and Communication Technology

IDP - Internally Displaced Persons

KM - kilometres

MINEPAT - Ministry of Economy, Planning and Regional Development

MINHDU - Ministry of Housing and Urban Development

MINMAP - Ministry of Public Contracts

MINT - Ministry of Transport

MINTP - Regional Delegation of the Ministry of Public Work

MINEE - Ministry of Energy and Water Resources

MINDCAF - The ministry of State Property and Land Tenure

NGO - Non-Governmental Organization

NR4 - National Road Number 4

NWR - North West Region

ONUC - National Order of Urban Planners of Cameroon

PAPs - Project Affected Persons

PAFs - Project Affected Families

CDP - Municipal Development Plan

UMP - Urban Master Plan

PK - Kilometer point

POS - Land Use Plan

PS - Sector Plan

PSU - Summary Urban Plan

PDU - Urban Master Plan.

PTL - Partial truckland

PS - Sector Plan

PSU- Summary Urban Plan

RTI - Road Transport Infrastructure

SPS - Standard Positioning Service

SSP - Strategic Spatial Planning

SWM - Solid Waste Management

SPAFs - Significantly Project Affected Families

SDAU- Master Plan for Development and Urban Planning

STECY S.A - Company of Transport and Collective Equipment of Yaoundé.

SOTUC - Cameroon Urban Transport Company

UN - United Nations

UNECE - United Nation Economic Commission for Europe

URAMDEUR - Town Planning and Urban Development.

UY1 - University of Yaoundé 1

VRD - Roads and Various Networks

VG - Vulnerable Groups

WR - Western Region

% - Percentage

CHAPTER 1

GENERAL INTRODUCTION.

1.1 Context of the study

The transport system of any country is crucial to the effective functioning of its socio-ecomonic activities. It provides mobility and access, critical to all the activities in cities. In other words, the vibrancy of socio-economic activities in cities depends largely on the level of functionality of the transport infrastructure and services. Theoretically and empirically, the geographical location of a city influences the pattern of its transport systems. For instance, a city located along the coast-line is bound to benefit from the environmentally-sustainable potential of water transport for the transportation of its goods and people. On the other hand, cities located in the hinterland stand to enjoy the ultimate benefits offered by land modes such as roads, rail and pipeline. The integration of pipeline and road modes with the water mode in any geographical location helps cities to grow in her economy as well as develop a vibrant social life over time and space. Thus the combination of different types of transport modes in regional as well as cities' economy is inevitable. This is as a result of the derived nature of transport. It is required for the purpose and not for its sake. For example transport is deirianded for various reasons amonst these are health, academic, production and social activities (Webber, 2000).

It is unfortunate that many transport systems are beginning to threaten the very livability of the cities they serve. This is is occurring even in cities where car ownership is still very low, because they are ill-equipped to handle rapidly increasing private-vehicle traffic. The resulting traffic congestion has a direct effect on economic growth, not to mention safety, noise and air pollution. The problems are particularly acute in the developing world's largest cities. Swollen population and high density of vehicles of all types translate into major congestion, long travel time, exposure to air pollution and high accident fatality (World Bank, 1999) and IEA, 2002).

In an assessment of global urban transportation externalities by the World Bank (1999) Traffic congestion constitutes about 54.5 percent of all noticeable urban transport externalities. Ineffectual public transport system, air and noise pollution are responsible for about 54.8 percent and 59.4 percent level of urban nuisance respectively. When this transportation related problems are projected in the future in the report, traffic congestion will be worse, rising to 61.3 percent, while public transportation and air pollution related problems are expected to be 60 percent each in most cities of the world.

The demand for transport especially in cities of developing countries has been on an increase following the rapid socio-economic growth and development of these countries. For instance, the rate of motor vehicle ownership and use is growing faster than population in many places, with the vehicle ownership growth rate rising to 13 to 20 percent per year. The average distance travelled per vehicle is also increasing except for the largest and most congested cities. This growth often exceeds the rate of growth and maintenance of road infrastructure and road complementary facilities. The overall effect is the congestion problems experienced daily in these cities with the consequent negative impact on productivity (World Bank 2001).

The United Nations centre for Human Settlements (UNCH8, 1998) asserted that travel speed is decreasing and the travel environment for pedestrains and people-powred vehicles are deteriorating in developing countries. For instance, of the sxteen developing cities with populations of more than 4 million reported in the UNCHS Global Indicators Database in 1998, five cities namely Bucharest, Jakarta, Kinshasa, Yaounde and Manila experience average one way journey to work times of one and a quarter hours or more.

Traffic congestion, according to Hook (1980), constrained the growth of Gross Domestic Product (GPD). Hook expatiated that in some large cities such as Sao Paulo, Mexico city, and Manila, traffic congestion has continued to impact negatively on the cities economic environment. The city of Yaounde equally falls into this category, where the unpredictability of transit time impacts negatively on business and other related socio-economic activities, despite the fact that all these motorization is still at a relatively low level in most developing countries. In Yaounde there are 100 cars per thousand populations as against the more developed countries with about 400 cars per thousand populations (WBCSD 2004).

The challenges posed by traffic congestion along the Olembe - Nkometou 1, stretch of road as in other cities are enormous. For example, road traffic congestion along the Olembe - Nkometou 1, stretch of road has wosen as the urban economy grows, population and personal income increase and sub-urban environment sprawls. These factors are partly responsible for the increase in car vehicular traffic, which further aggravates the flow of traffic on this existing road in the study matrix. It is imperative that enduring and practicable solutions are preferred, with a view to unclogging traffic on Olembe-Nkometou 1 stretch of road.

1.2. Statement of the research problem

Road traffic congestion is a headache and a burning problem for public and private institutions; and the inhabitants plying the Olembe-Nkometou 1, stretch of road. Driving through this 15km stretch of road is something many of the inhabitants will like to avoid these days. For example, from Bafoussam to Obala is about 4 hours drive, with a road length of about 300km. While from Nkometou 1 - Olembe which has a road length of about 15km, one can take more than 2 hours drive to cover this 15km stretch of road during rush hour. So if nothing is done, the situation will get worst in the nearest future.

Congestion along this stretch of road is associated with an increase in vehicle queues and poor accessibility to work and homes, especially in the morning and evening hours. Serious traffic congestion is observable between 7:00 a.m. to 11:00 a.m. (the time that most workers go to their workplaces, children go to school and transporters are busy fighting for passengers), and the hours between 04:00 and 08:00 p. m. when worker, students and business people are returning home. Based on these facts, it is true that the majority of workers and people in general report very late in their work stations, such as offices, markets, schools and hospitals. This means that some may report on time, although very tired and stressed, and others may not. Others face the problem of a few hours of sleep due to early awakening and late sleep, wasted time in queues, overtime work and a few hours to rest at home after work. This nightmare on the National Road N°4 has been causing people a lot of concern. It is posing formidable challenges to state governments, Local government councils, researchers and particularly the city residents along this segment of road.

The National Road number 4, which passes through Olembe- Nkometou 1 is plagued by a number of road infrastructure problems with major ones being potholes, faulty designs, and poor maintenance culture, among others. All of these have significantly reduced the ability of the road to perform their functions. It is possible to blame the fast increase of these problems on the geometric urban growth of Yaounde which is not proportionate to the rate of provision of the road infrastructures. These problems often leads to road traffic congestion which may results to the loss of time and petrol, economic activities slow down, Vehicles break down. They have also made it difficult, expensive and more odious to move farm produce from suburbs to the city of Yaounde, which leads to manhour time, high cost of goods, and services and hence slows urban development. It is against this background that this study asssess the implications, causes and the solutions to road traffic congestion along this road corridor.

In general, transportation on this stretch of road is chaotic, inefficient, unreliable and dangerous. The Congestion on this Olembe -Nkometou 1 stretch of road is mainly due to bad roads,

unregulated abusive use of road, and insufficient traffic regulation at junctions as well as poor road infrastructures condition. It negatively affects society, especially the urban poor, through loss of productivity, inhibiting human development and reducing the quality of life. It is said that all these complications and problems that most employees and people who ply this stretch of road encounter in varying degrees and circumstances are directly associated with the congestion of existing road traffic.

Also, the creation of secondary roads along that study matrix will help to reduce the traffic congestion on that stretch of road. The search for an enduring solution to the traffic problems will necessarily commence with thorough investigation that will unveil the factors responsible for such problems. This is what this study intends to do with particular reference on the Olembe-Nkometou 1, segment of National Road N^{o}4 in Yaounde.

1.3. Research Questions

General research question: Can traffic congestion be blamed on the general increase of vehicles in Yaoundé in particular and in Cameroon in general?

Specific research questions:

Specific research questions.

- To what extent can we qualify traffic to be congested along the Olembe-Nkometou 1 segment of National Road No: 4 in Yaounde?
- Does traffic congestion along this segment of road depend on the uncontrolled extension of Yaounde?
- Could it be that administrative bottlenecks hinder construction works in rendering traffic fluidity in Yaounde?
- Could comparative studies of scenarios linked to alleviating traffic congestion along the Olembe- Nkometou 1, stretch of road lead to a solution?

1.4. Location of the study area and justification.

Geographically, the Olembe-Nkometou 1 segment of the National road No: 4 is located between Longitudes $11^{0}31^{1}46^{11}$E and $11^{0}32^{1}56^{11}$E and between Latitudes $3^{0}57^{1}10^{11}$N and $4^{0}3^{1}10^{11}$N of the equator.

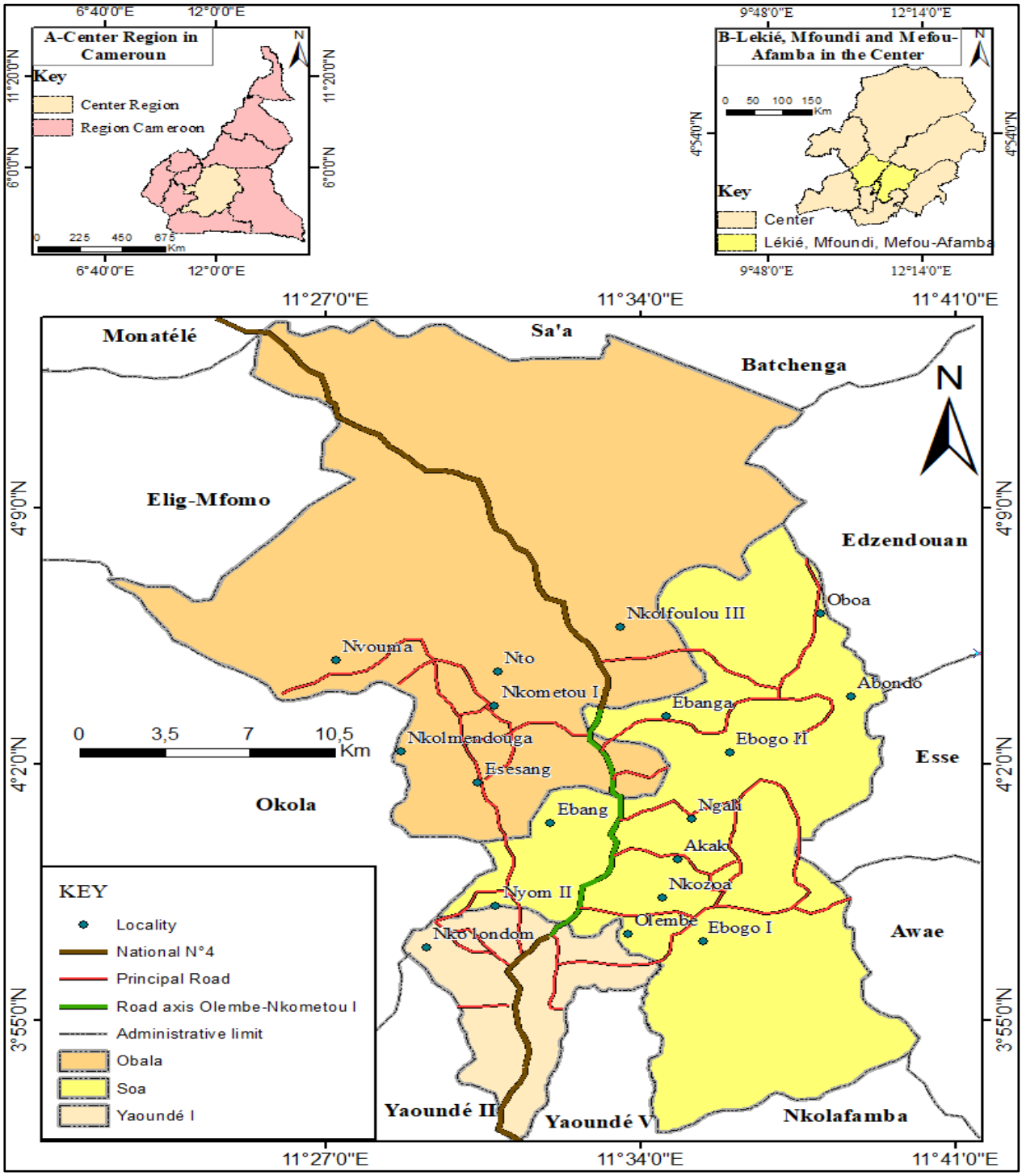


Figure 1: Location of the Olembe-Nkometou 1 stretch of road in Yaounde.

Source: Shapefile INC, 2020 Cameroon

This segment of National road covers a distance of about 15km, cutting across suburban areas in the city of Yaounde. It cuts across two sub-divisional councils, which make up the Yaounde Municipality. The highest traffic congestion on this National road N°: 4 is found along the Olembe-Nkometou 1 road axis. The study covers two council areas, which are Yaounde 1 council and Yaounde 2 council...

Yaounde is a city and part of Mfoundi, as well as the capital city of Cameroon. It is situated in the very central part of the country and also on a hilly forested plateau between the Nijong and Sanaga River in the South-Central part of the country. Latitudinally, Yaounde is located approximately between latitude $3^0\,50^1\,38.8284^{11}$ North of the equator and between longitude $11^0\,30^1\,4.8456^{11}$ East of the Greenwich meridian. The city has grown as an administrative service and commercial centre and the communication hub for roads, rail and air transport. It lies in the centre region of the nation at an elevation of about 750 meters (2500) above sea level.

1.4.1. Justication of study

This part of the work brings out the scientific interest and significance of the study

In the late1980s and 1990s, traffic congestion characterized the Emana stretch of road. The city expands to the bridge before Messassi. This traffic problem was a serious headache until in the 2000s, this stretch of road was enlarged to Olembe. The problem today has shifted from the end of the expanded road at Olembe to Nkometou 1. So this 15km stretch of road is a nightmare to many who ply this road. In a nutshell, it is due to the nightmare on this segment of road that caught my attention. This is in relation to the expanding city which is rapid and rendering it difficult for development to follow the rhythm of population growth and city expansion.

In literature, corridor expansion is seens as a practical solution to the ubiquity of road traffic congestion along the Olembe-Nkometou 1, stretch of road. but construction of new secondary roads and the expansion of old ones by excessive administrations in Yaoude has never ameliorated the problem, rather traffic congestion has been getting worst as population and vehicular volume in Yaounde continue to grow by the day.

This 15km stretch of road is busy, with lots of traffic there and a mixture of different types of vehicle plying the road**.** It is also important because it enable goods to enter Yaounde and therefore have a direct impact on the viability of trade.

The Olembe-Nkometou 1, segment of road is a great exit that passes or goes through the North West Region, Western Region, and Eastern Region. This exit is highly loaded with vehicles and a greater portion of that stretch of road is narrow. Consequently, when any part of a road is narrow, it strings the traffic going up or coming down. This is the case at the Nkometou 1 market at Nkometou, which is the main entrance into the interurban transport from the West, North West and East Region.

Traffic planning and management is important and essential, especially in urban centres as life relies more on vehicular movement (road transportation) for various daily activities. On daily basis people go to work, school, shopping etc, creating scrambling for the right-of-way among all road users. Often creates what is referred to as "traffic conflict" (traffic bottlenecks or crashes). Therefore, traffic planning and management is required to resolve traffic conflicts in order to ensure free flow of traffic and safe motoring. The growing concerns for urban traffic problems inYaounde has encouraged the researcher propose basic road management strategies and policies to solve these problems. This research work was to show the researcher's contribution to ease traffic congestion along the Olembe-Nkometou 1 segment of National road N^{o}: 4 in Yaounde and how it will affect the economy development of Yaounde.

The result of this work may help the ministry of transport and the ministry of public works on how to improve on the road network in the area under study. This work will help them make projections on the volume of traffic flow in the study area in order to provide sustainable road infrastructure.

This work may serve as a working document to the ministry of territorial administration and decentralization, department of civil protection on how to ameliorate policies on civil protection in Cameroon.

Road safety authorities planning and evaluating road safety measures will use the data obtained in this study. The health authorities in the study area and the ministry of public health of Cameroon will use the data for planning health care delivery. The findings will also help on how to ameliorate emergency services during road traffic congestion in the study area.

1.5. Significance of the study.

- It is expected that the study will provide new data about urban transport system problem, road traffic congestion to be precise, in the most populous city in Cameroon. Nevertheless, it is possible to replicate some of the findings of this study in solving similar problems in other cities across Cameroon
- It is looked forward that the study might act as a catalyst in getting every stakeholder involved in urban transport planning in Cameroon Also, the segmented nature of transport institutions in Yaounde, which does not permit a seamless operating environment as revealed in this study, hopefully will compel the authority to find a way of networking necessary agencies involved in traffic planning and management in Yaounde, with a view to ameliorating road traffic congestion and other transportation problems.
- It is due that the study will provide or act as a guide to city authority in deploying the

sequence of sustainable urban transport planning processes; and choose from the array of sustainable policy options recommended in this study. It will enlighten the road users and city planners, to see the need for internalization of transport cost, as a way of developing alternative sustainable means of transport in Yaounde. It is expected that the study will provide further guide to relevant public authorities in determining traffic management investment priorities in the capital city of Yaounde. It will sensitizes the authority to embrace 'predict and prevent', and repudiate 'predict and provide' solutions to road traffic congestion in Yaounde. Again, it is expected that the study might act as additional source of new literature for future research on the road traffic congestion phenomenon. It is expected that the study might channel a sustainable course for urban transport planning and development in Yaounde, other Cameroon cities as well as other cities in developing countries.

- Again, it is anticipated that the study might be important to the Municipality of Yaounde on the occasions of building more roads in the expansion of the town.
- Further, it is awaited that the study might be important to the Government in the developmental project on how to achieve economic development in the region.
- Also, it is hope-for that the study might be important to the institution itself for library purpose as a lee way for further research
- It is scheduled that the study might serve as a working tool as regards proposing valuable suggestions in enhancing road transport in order to minimize road traffic congestion which will go a long way in enhancing community life.
- It is counted on that the study on traffic congestion might be useful to stakeholders in Cameroon to understand how much Cameroon has lost from the frequent road traffic congestion in the study area.
- In addition, it is expected that the study will provide the results which will set a pace to understand the causes of the frequent road traffic congestion in the study matrix. The daily, monthly and seasonal variations in traffic congestion would be reviewed, thereby helping traffic agents to plan for efficient road traffic congestion controls.
- Furthermore, it is predicted that the study might bring out the factors that stand as obstacles to the effectiveness of road safety measures in the study area.
- Finally, it is forecast that the study might be useful to future researchers who want to understand more about the need for road safety in every economy. The recommendations provided if considered are going to benefit the public at large on how to curb road traffic congestion in the study area.

1.6. Objectives of the study.

Time is money, the general objective of this study is to propose a strategy whereby commuters plying this stretch of road can gain time and catch up with their commitments.

Specific Objectives:

- What are the causes of traffic congestion along the Olembe-Nkometou 1, segment of road?
- Examine how the uncontrolled extension of Yaounde brings about traffic congestion along this road?
- Show how administrative bottlenects hinder urban development in Yaounde?.
- Propose strategy to decongest traffic congestion along the Olembe-Nkometou 1 segment of road**.**

1.7. Research hypotheses.

1) The maintenance of the width of the road along this segment until today is at the origin of traffic congestion.

2) If the development programmes were well executed, we could not talk about traffic congestion along the Olembe- Nkometou 1, stretch of road.

3) Traffic congestion along the Olembe- Nkometou 1, stretch of road largely results from unclear administrative roles in urban development.

4) Road widening can be brought in or adopted to address the traffic congestion issue along the Olembe-Nkometou 1 stretch of road.

ORGANISATION OF THE WORK

	RESEARCH QUESTIONS	RESEARCH OBJECTIVES	RESEARCH HYPOTHESES
MAIN	Can this traffic congestion be blamed on the general increase of vehicles in Yaoundé in particular and in Cameroon in general?	To propose a strategy whereby commuters plying this stretch of road can gain time and catch up with their commitments	?
SPECIFIC 1	To what extent can we qualify traffic to be congested along the Olembe-Nkometou 1, segment of National Road No: 4 in yaounde	Demonstrate the extent to which traffic congestion is experience along the Olembe-Nkometou 1, segment of road.	The maintenance of the width of the road along this segment until today is at the origin of traffic congestion.
SPECIFIC 2	Does traffic congestion along this segment of road depend on the uncontrolled extension of Yaoundé?	Examine how the uncontrolled extension of Yaounde brings about traffic congestion along this road.	If the development programmes were well executed, we could not talk about traffic congestion along the Olembe- Nkometou 1, stretch of road.
SPECIFIC 3	Could it be that administrative bottlenecks hinder construction works in rendering traffic fluidity in Yaoundé?	Prove how administrative bottlenects hinder urban development in Yaounde.	Traffic congestion along the Olembe-Nkometou 1, stretch of road largely results from unclear administrative roles in urban development.
SPECIFIC 4	Could comparative studies of scenarios linked to alleviating traffic congestion along the Olembe Nkometou 1 stretch of road leads to a solution	Propose strategy to decongest traffic along the Olembe-Nkometou 1 segment of road**.**	?

Source: Tembe E. T., 2023.

1.8. Research methodology

1.8.0. Introduction

To achieve the specific objectives and hypotheses of this study, the following methodology was established. The research methodology is divided into data collection that involves the different sources of data, collection procedures and their techniques of analysis.

1.8.1: Data collection

1.8.1.1: The consultation of secondary sources of information

Literature was consulted for the realization of this research work. These included textbooks, masters dissertations, articles, brochures, topographic maps, aerial photographs and satellite images. Some of these sources were either consulted on the spot in the resource centres or borrowed out. These amongst others included libraries like the main libraries of the state universities and especially those of the Geography Department. Data from secondary sources are those obtained during the literature review. They were collected in various documentations centers; library of the Faculty of Arts, Letters and Human Sciences (FALSH), library of the Geography Department of the University of Yaoundé 1, library of the Ecole Normale Supérieure (ENS), various documentation centers provided information necessary for the development of this work. Amongst others, we can cite the Institute of Research for Development and State Structures such as the library of the Ministry of Scientific and Innovation. We also had access to documentations (activity reports, studies, and minutes) of the municipality of the district of Yaoundé 1. All my reading was oriented towards urban infrastructural development, especially towards urban transport system. This research has benefited from the advantages of the internet. We have used several search engines such as; cyber geo, memoire online, Microsoft Encarta, Google scholar, Notre-planete.info, vertigo, Wikipedia. The information drawn from these documentations and from the internet made it possible to better define our theme. They provided us with information that allowed us to define our subject, to delimit our study area, to establish the literature review, to define the different concepts and to develop diagnosis and solutions to ease traffic congestion along the Olembe-Nkometou 1, stretch of road found in the municipality of Yaoundé 1 and Soa. To ensure a smooth execution of this stage of the study, the researcher received the following documents fom the individuals and other departments:

- The Council Development Plan of the city of Yaounde;
- The letter of introduction to the administrative services;
- The typical cross-section of the Yaounde - Nsimalen highway;
- The detailed technical report of the technical studies for the rehabilitation of the Yaounde - Nsimalen highway

To complete this data, the researcher collected documents from the Ministry of Housing and Urban Development (MINHDU), Ministry of Transport (MINT), Regional Delegation of the Ministry of Public Work (MINTP), the Yaoundé city council, the municipalities of Yaoundé 1, and Soa, local authorities and NGOs which were analysed in order to extract useful information for this

research work. The researcher then proceeded to a critical analysis of the information, at the end of which the rsearcher identified the available data and the data to be supplemented by field visits.

1.8.2. Primary data source

The collection of primary data was based on a number of parameters. These included self-administered questionnaires, in-depth personal interviews, inspection (observation), field measurements and reconnaissance surveys. They were considered most appropriate as data collection instruments for this study due to the advantages derived from these approaches. The questionnaires ensured that questions posed on the respondents were uniformly phrased, thus permitting objective comparison of results while interviews gave the respondents opportunity to express views more expansively than would be possible with a closed-ended questionnaires.The questionaires targeted on obtaining information on (i) the causes of road traffic congestion along the Olembe-Nkometou 1, segment of road, (ii) examine how the uncontrolled extension of Yaounde brings about traffic congestion along this road, (iii) to show how administrative bottlenecks hinder urban development in Yaounde, (iv) sustainable strategies for suitable road traffic congestion. Moreover, the interviews permitted explanation of issues in the questionnaires by the researcher in areas where some respondents may not be fully knowledgeable. The intention was to frame questions in the form of a questionnaire combined with personal interviews to clarify information where required by the respondents. Inspection and field measurements permitted the verification of some facts given by the respondents and interviewees.The interview done were centered on obtaining information on (a) their understanding on road transport infrastructure planning, investment, construction and maintence in Yaounde, (b) to obtained ideas on the application of planning documents and the different type and functions of urban planning document in Yaounde, (c) how people have been occupying land and how land is being transacted in the study area (d) what planning strategies can be done to ease road traffic congestion along the Olembe-Nkometou 1, stretch of road

90 questionnaires (See Appendix 1) was designed to supply empirical data on the general perception, attitudes, experiences or opinions of commuters on road traffic congestion and 190 questionnaires were administered in the study area. Questionnaires were used to collect quantitative and/ or qualitative information on the subject matter. Quantitative information was gotten from my respondents (individuals) who were commuters like: Taxi men, bike riders, Truck drivers, private cars owners, passengers and road vendors who go along this route regularly. Questionnaires were also administered to residents in the study area. The following proportion of questionnaires was administered to the following respondents: Bike riders 30, Taxi men 30, Truck drivers 10,

passengers 25, Road vendors 45, Residents 15 and private cars owners 15. All the questionnaire papers administered are still in my keeping. The different time period of the day was used to administer the questionnaires depending on the busy schedule of the respondents. For example, taxi men, truck drivers, passengers and private car owners I talked with during the peak of the congestion period in the early hours of the morning from 7 am till 11: am. While bike riders, road vendors I talked with from 12:00 noon till 2:30 pm when traffic is less congested on that stretch of road and the respondents were not busy compared to the early hours of the morning. Lastly, residents I talked with only during the weekend due to their busy schedule during the week days. While qualitative information was gotten through interviewing the administrative authorities and the chiefs in the study area. The choosing of the respondents is in direct relationship to the said problem. Here questionnaires were divided into four sections. The first section focused on the identification of the respondents concerning age, sex, marital status and level of education etc. The second, third and fourth section raised questions to collect data used to verify the research hypothesis stated in this work. Questionnaires were administered using the random sampling techniques. The techniques were used because the fixed number of commuters could not be determined. Questionnaires made use of both opened and closed-ended questions. The open- ended questions were necessary to measure attitude and opinion on the factors of road traffic and safety measures put in place.

Questionnaires were prepared and to the zone in this study area (Appendix 1). The questionnaires contained a combination of closed and open-ended question. The open-ended questions permitted respondents to give detailed answers in cases where their experiences could not be articulated into few options. The questionnaires consisting of questions that covered the background of respondents, what dictates the choice of the roads frequent used. Other questions covered their views on the ugly situation, causes, and the impacts (how it affects them) of traffic congestion, and how it affects them plus questions about the application of planning documents. Lastly questions suggesting the sustainable strategies for a suitable road traffic congestion was raised in the questionnaire.

The researcher also designed an original interview guide with 14 open ended semi structured questions (Appendix 2) using qualitative methods covering the research topic. A focused person -to-person interviewing was done with Transport operators in the Ministry of Town planning and urban Development (MINHDU), Ministry of Transport (MINT), the Yaoundé city council, the municipalities of Yaoundé 1, and Soa, local authorities and NGOs. Here the researcher wanted to know about the application of planning documents from the administrative authorities. Interviews were conducted to gain complete and detailed insights into participants' perspectives, opinions, and

understanding of the subject being investigated (Turner, 2010). The chiefs of the quarters in the study area were also contacted to know how land is being transacted or how people have been occupying land in that study area.

The questionnaire and interview guides were approved by the research supervisors who have knowledge, experience, and understanding of road traffic management.

Further, some information on the state and types of Road Transport Infrastructures was gotten through field Inspection and measurement of these infrastructures. Inspection was used instead of monitoring for infrastructures like culverts because the time for the research could not permit monitoring techniques. This concerns daily observation to prove that there is traffic congestion along that stretch of road in the study matrix. Direct observation permitted the researcher to become more familiar and to be more acquainted with the area of study. With this method, several trips were carried out in the study area in order to have a better knowledge of the terrain and delimitation of the study area. It is during this observation that we witnessed the functioning of the different periods of traffic congestion, to see that in the space of 500m, how many vehicles are standing there, to estimate the time a vehicle will spend on one spot, and to know what fuel does a steam car use, the quantity of petrol or diesel a vehicle will lost if it steam for an hour). Apart from this, photographs were taken to demonstrate the causes of traffic congestion, GPS points, measurements of the dimension of the road, traffic flow investigation was carried out and the placement of road vendors. In the course of the field visit, the opportunity to have important and serious discussions with the quarter head or chiefs from the various villages in the study area was made possible. It equally permitted the mastery of the study area and its physical constraints so as to facilitate the administration of the questionnaires and understanding planning constraints. It is through this direct observation that this researcher could carry out a good diagnosis of the problem.

1.8.2.1: Data Collection procedures

Field surveys to identify the determinants and the impact of road traffic congestion in the study matrix were carried out during field visits. This assessment was done using the inspection and field measurement technique. Traffic along major road like “entre Ministre Nkozoa Street” was observed to notice the difference in rate of flow of traffic during peak hours and other hours of the day. Information on the state of the road was obtained primarily through inspection and field measuring tape; the sizes of potholes were recorded to determine the intensity of the degradation. Photographs were taken on the field to show evidence of some causes of road traffic congestion, and the ugly situation during rush hours in the study area, GPS points were obtained during field trips in the study area to indicate where possible locations of secondary roads could be created from

the National road No: 4 in the study matrix. The interview guide prepared also carried a section on the impact of traffic congestion. Data was also gotten from questionnaires administered and interviews conducted with some experts to spoke their minds about the state of road traffic congestion on the Olembe-Nkometou 1, stretch of road. Whilst, secondary data sources were gotten from both published and unpublished thesis articles, journals, papers, reports, textbooks and from the World Wide Web. Information from other secondary sources was used to add more strength on the primary data.

Mainly primary data was used though some secondary data too was necessary to examine how the uncontrolled extension of Yaoundé brings about traffic congestion along this road. The application of planning documents was gotten through primary sources of data, by interviewing the administrative authorities concern. The map of the municipality of Yaoundé 1 and Soa for 2023 was updated to include new neighborhoods which have emerged recently when field observations was done. Whilst secondary data sources on the application of planning documents were obtained from legal law documents on how this document is being drawn and the functions of these documents. Population data was obtained from the National office for statistics using the secondary data sources. Since the world is moving from an analog to a digital world, the maps were used to calculate the population of the municipality of Yaounde 1 and Soa for the period under review with three time frames (2000, 2010 and 2023).

Mainly primary data was used to obtain information from the stakeholders concerned in urban development. To know how administrative bottlenecks hinder urban development in Yaoundé, the role of the various stakeholders was gotten both from primary and secondary data sources. Primary source of data was obtained through interview with the delegate for Land Tenure and State Property and other administrative authorities on how their functions in their different sectors are conflicting. Field work shows that after several months and even years after, most projects have not kick-off; some of the foundation stones are nowhere to be found or covered with grass. Observaions on the field indicates that in towns especially those in the urban areas like Yaounde, it is common to see roadsides undergo several mutations within a short space of time. Whilst secondary data sources were gotten from Presidential Decree documents, to know how administrative bottlenecks hinder urban development in Yaounde. The role of the various stakeholders is stated in the Presidential Decree documents. Every day we read in newspapers, hear from radio and television how sumptuous occasions have been organized to announce the availability of funds and rapid take-off or execution of projects in the nooks and crannies of the

country. Most of the projects were idenified from documents in the various ministries and their level of execution.

Primary and secondary data sources were employed to suggest strategies and a plan to ease traffic congestion along the Olembe-Nkometou 1, segment of road. Recommendations of the studies were made based on data obtained and analyzed for objectives one and two. Interview questions concerning strategies for sustainable RTI system were posed to the expert. Other adaptive measures were suggested based on findings. Whilst secondary data sources were also used to find out measures which could be put in place as adaptive measures and also to pose some measures that were found to have been successful in other areas and regions of the world.

1.8.2.2: Limitations of the Study

The most obvious limitation of the study was getting the respondents to answer the questionnaires. This was particular in the study area. So many participants were afraid to give information. They were however convinced that the information was for academic purposes and that their identity is not considered. In some cases, the researcher even had to give them tips.

The lack of reliable population data for Yaoundé 1 and Soa municipalities was also a limitation to this study. The population data available was from last population census in Cameroon which took place in 2010. However, 13 years is so much time and so many factors which were not envisaged at the time have probably altered the pattern of population growth in Yaounde 1 and Soa municipalities.

The reluctance of some populations to provide the information requested by the researcher for collecting the necessary expropriation data on the ground. To overcome this, the researcher had to provide drinks and tips to some people along the right of way who will be affected directly or indirectly by the road project.

Moreover, after completing the interpretation of the findings, the researcher discovered that the data collected was short of some aspects which inhibited the ability to conduct a thorough analysis of the result. For example, the environment impacts of urban growth on road transport infrastructure were not included on the questionnaires. Therefore, in rating the most threatening impacts, this was not considered. Future studies therefore may consider this aspect.

Also this research was based on self- reported data with potential sources of bias like; a selective memory (respondents remembering or not remembering or not remembering experiences or events that occurred at some point in the past); telescoping (respondents may recall events that occurred at

one time as if they occurred at another time); attribution (some respondents may turn to attribute positive events and outcomes to their own sector but attribute negative events and outcomes to another sectors); and, exaggeration (some respondents tend to embellish events as more significant than is actually suggested from other data). However, the respondents were cautioned to try as much as possible to give adequate information.

1.8.3: Data processing and analyses

Three types of data processing and analyzing techniques were used processing of remotely- sensed data (iconographic data), statistical and processing of text.

1.8.3:1: Processing of remotely-sensed data

Data processing was done with software such as Arc GIS for drawing of map of the study area. Arc GIS and Google Earth Image 2023 was used in the drawing of the topographical map which shows the relief pattern of the study area. Photos exploited in the text were collected using a digital camera and a telephone. These photos were edited with Microsoft ware office publisher 2013 for easy interpretation. The GPS points were gotten or obtained through "my GPS Coordinates app" on the researcher's telephone. Google Earth image 2023 was used to locate the principal road and the creation of the new secondary roads in the study matrix.

1.8.3.2: Statistical

The statistical knowledge helps the researcher for collecting, analyzing and interpreting data. The statistics the researcher obtained help answer questions about a survey conducted on **"**Traffic Flow Investigation along the Olembe-Nkometou 1, stretch of National Road N^{o}: 4".

1.8.3.3: Processing of data

Data for this work was sorted out manually from questionnaires. Questionnaires provided quantitative data that was analyzed using Microsoft Excel 2010. Statistical data from secondary sources was also processed using this program for integration in the text. Data from interview was processed using a specific technique "content analysis". By this method, the researcher assembled the information from interviewees on a paper and established correspondences between interviewees' opinion. Through this technique, the researcher did qualitative explanations to complement quantitative analyses.

1.8.4: Qualitative Analysis of Commercial vehicles Operators Perception of Road Traffic Congestion along the Olembe-Nkometou 1 road axis

Table 1 shows the Commercial vehicles Operators Assessment of Road Traffic Congestion along the Olembe-Nkometou 1 road axis from four points of view, namely Road Traffic Congestion Conceptualization, Infrastructural Factor, Financial and Policy Implications of Road Traffic Congestion along the Olembe-Nkometou 1 road axis. The probable future increase in traffic congestion along the Olembe-Nkometou 1 road axis is predicted duing the fieldwork by the researcher.

Table 1: Qualitative Analysis of Commercial vehicles Operators Assessment of Road Traffic Congestion along the Olembe-Nkometou 1 road axis

Indicators	Comments	Views on the Future
Road Traffic Congestion Conceptualization	It is a significant problem of free flow of vehicular traffic in a big city like Yaounde. For example, in the two decades following independence, Cameroon was quite prosperous as the number of vehicle ownerships increased astronomically	Respondents believe that the worst day, as far as congestion is concerned is not here yet. The expectation is that with economic improvement and population growth rate vehicle ownership will increase and so will congestion level on Yaounde roads.
Infrastructural Factor	The road network along the Oembe-Nkometou 1 road axis is still not adequate relative to the number of vehicles plying them. Hence, the increasing trend of traffic congestion everywhere in Yaounde. In addition, despite the increasing numbers of vehicles, provision of traffic lights is inadequate for effective traffic control. Also, the roads in most cases are plague by pot-holes, rough surfacing, lack of sidewalks, disorderly parking and cycle paths and poor drainage. These usually impact adversely on the flow of traffic along the Olembe-Nkometou 1 road corridor. As a result of poor rainwater drainage, flooding during the rainy seasons aggravates road traffic congestion on this National road No: 4.	They are of the opinion that Yaounde authority should open-up metropolitan Yaounde by constructing additional road networks. Also, they agreed that the existing National roads N^{o}: 4 should be regularly fixed, so as to reduce the level of traffic congestion caused by flooding, rough surfacing(cracks), ack of signaling and marking, ack of sidewalks and cycle paths, and disorderly parking and pot-holes.

Financial Implications	The negative social impacts of road traffic congestion along the Olembe-Nkometou 1 National road No: 4 includes :Travel cost, mobility lateness, Man-hour toss, Heath changes, Pressure on road in infrastructure, Travel cost and Global warning. All these put together would eventually create health hazards for the people and the urban environment. Road traffic congestion along the Oembe-Nkometou 1 road axis does not make public transport operation attractive to operatives and investors alike. Noticeably, the profitability of the business is being depleted by regular high cost of vehicles maintenance, excessive fuel consumption and delay (i.e. man-hour lost in traffic).	They expect that adverse effect of traffic congestion along the Olembe-Nkometou 1 National road is bound to increase if measures, such as provision of more roads are not put in place. Also, the traffic management agency needs to be supported by the government, through provision of operational facilities, so as to improve traffic management operations along this road corridor. They are of the opinion that, government should improve on the quality of existing road infrastructures such as road surface, drainage, traffic light, so as to minimize occurrence of road traffic congestion on this road corridor
Policy Issues	The Yaounde Traffic Management Agency (YIMA) seems capable of taming road traffic congestion along this National road No: 4 in Yaounde. But lack of co-ordination among about six agencies responsible for road traffic management in Yaounde, sometimes beclouds the focus of YTMA and leads to inefficient traffic management in Yaounde. For example, there are cases of quarreling between YIMA officials and the Police, as well as agents of National Union of Road Transport Workers (NURTW). The lack of synergy among these, agencies often affects the efficiency of traffic management in Yaounde	The government needs to establish a centralized clearing house for traffic management in Yaounde, such that this centralized agency will coordinate traffic management activities in Yaounde, determine investment in road transport infrastructure supply and maintenance and ensure strict enforcement of traffic rules and regulations across the metropolitan area.

Source: Researcher`s Field work, 2023

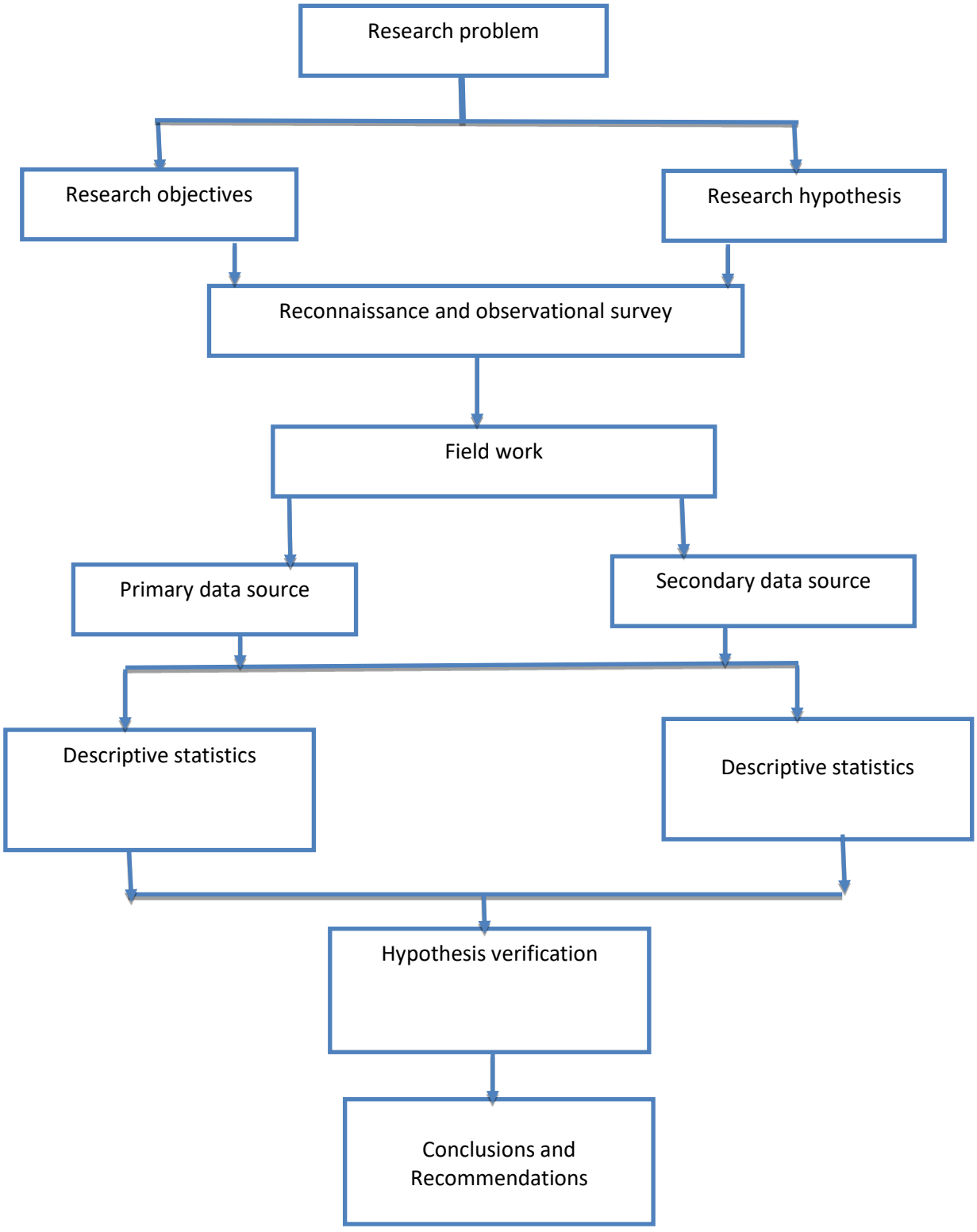


Figure 2 : Summary of Reseach Methodology

Source: Tembe E. T., 2023

1.9.0: LITERATURE REVIEW AND THEORITICAL FRAMEWORK

1.9.0: Introduction

This chapter outlines the theoretical framework that guides the study, and contains a review of relevant works so far conducted in urban transport congestion in Metropolitan Yaounde and other parts of the world.

This Chapter is organized into three parts:

1. Theoritical Framework of road traffic congestion.
2. Literature Review
3. Conclusion

1.9.0 Theoretical Framework

Theoritical issues relate to the basic theories and that help to elucidate the problem being examine in this thesis. They are examined in turn as follows.

1.9.1 "Predict and Provide", "Predict and Prevent"

The theory of "predict and provide", "predict and prevent" as postulated by Goodwin (1997) is synonymous with the problem of urban traffic management. According to Goodwin (1997) the axiom was: first we forecast how much traffic there will be, and then we build enough road space' to accommodate it. This axiom resulted in a rapid, huge, expansion of road capacity, and produced the national network of motorways in England. It is a process of meeting the demand by supply of additional road infrastructures.

The axiom' also resulted in some things that we now mostly, have come to realize were a grievous mistake, like the destruction of the heart of some of city centres to make room for urban motorways. This however, served as the basis for 1989 national road traffic forecasts, called "Roads to Prosperity". This was the time government in UK devised a road programme intended to "meet the demand". However, the flaw of this programme was its inability to keep pace with traffic growth. In practice Goodwin (1997) affirmatively stated that "Predict and provide" actually meant, inevitably, "Predict - and - under provide", and a strategy with road building at its heart would not deliver improvements in travel conditions. This is called the New Realism.

The main flaw in this programmed anywhere in the world is that it has never kept pace with traffic growth, in case of Yaounde, the Government is concluding plan on a Yaounde Outer Ring Road. New road attracts new set of traffic; in other words, it induces new form of traffic at completion.

New roads have never been, and can never be the solution to traffic jam in the city. It is like loosing your belt to solve the problem of obesity.

Again, the total collapse of this theory in the UK opened the way to recognizing that the volume of traffic is - in part - the result of policy, and is therefore subject to some degree of choice. This conclusively brings researchers in transport policy and planning to two propositions. One, that it will be difficult to match the supply of road capacity to the forecast demand for it. And, two that demand is not an inexorable, external, given: it is subject to influence.

These, consequently warranted the change from 'self-fulfilling forecasts[5] to 'self-defeating forecasts[5]. Predict - and - provide according to Goodwin consequently, became 'predict - and-prevent. He explained further that this was the reason - not just a change in fashion or shortage of funds - why during the 1990s 'demand management[5] has become part of the transport policy of every political party in UK.

This theory educate the commuters and road users how switching route or choosing among alternative route can help solve the traffic congestion problem along the Olembe-Nkometou 1, stretch of road in the study matrix. These theories espouse the features and characteristics of this phenomenon along the Olembe-Nkometou 1 stretch of road.

1.9.2: Traffic Equilibrium Theory

The Predict and Provide theory as stated above informed the following two basic clarifications on how road traffic congestion influenced the immediate environment of the congested urban routes. Also, it shows as well the aspiration of the authority to expand and construct new roads as one of the perceived proper ways of curtailing spatial expansion of road traffic congestion in an urban environment. For instance, there is a sort of general misconception among Yaoundé commuters that congestion routes can be avoided, thus save time and money, by choosing alternative routes. But, they are unaware of the principle of Network Equilibrium, according to Florian (1999) that stated suppose that between two points there are two highways, one of which is broad enough to accommodate without crowding all the traffic which may care to use it, but is poorly graded and surfaced; while the other is a much better road, but narrow and quite limited in capacity, if a large number of trucks the two highways and are free to choose either of the two routes, they will tend to distribute themselves between the roads in such proportions to the cost per unit of transportation, or effective returns per unit of investment, will be the same for every truck on both routes. As more trucks use the narrow and better road, congestion develops until at a certain point it becomes equally profitable to use the broader but poorer highway.'

Florian added that Wardrop opined categorically that two principles formalize this notion of equilibrium. His first principle stated that 'the journey times in all routes actually used are equal and less than those which would be experienced by a single vehicle on any unused route'. Under certain assumptions, another interpretation of this principle is that the routes actually used are the shortest in time (or cost) under the prevailing traffic conditions and their perception by the travelers. Wardrop's first principle of route choice, which is identical to the notion postulated by Florian, became accepted as a sound and simple behavioral principle to describe the spreading of trips over alternative routes due to congested conditions. The traffic flows that satisfy this principle are usually referred to as 'user optimal' flows, since each user chooses the route that is perceived to be the best. On the other hand, the 'system optimal' is characterized by Wardrop's second principle.

According to Florian (1999), the first mathematical model of network equilibrium was formulated by Beckmann, McGuire and Winsten in 1956. The contribution Florian added was the starting point for intense research and the application of this route choice model. The integration of network equilibrium models in the field of transportation planning began in the 1970s and became more common as the algorithms used to solve various model variations were embedded in use-friendly software packages. Urban and regional partners could then attain easy access to these models without the need to have extensive mathematical programming background. One of such software package is EMME/2, which is used by more than 700 organizations in countries of five continents.

It was Wardrop, nearly half a century ago, who provided this theoretical core of modern transport modeling practice in suggesting the drivers choose among alternative routes for the same journey by picking the route which consumes the minimum journey time. If too many choose the most direct route, it becomes congested and less attractive. There is, then, an incentive for drivers to use an initially rejected longer route. Adjustments continue until equilibrium is reached when no individual can make a further improvement as a result of any individual choice. When this obtains all routes used between any origin and destination have the same journey time, any other possible route being slower, and not used. Again, Wardrop stated in Forian, 1999, that under equilibrium conditions traffic arrange itself in congested networks in such a way that no individual trip maker can reduce his path costs by switching routes.

If all trip makers perceive costs in the same way (no stochastic effects) under equilibrium conditions, traffic arranges itself in congested networks such that all routes between O-D pair have equal and minimum cost while all unused routes have greater or equal costs. However, it is easy to see that if these conditions did not hold, at least some drivers would be able to reduce their costs by switching to other routes. The above theories in relation to the menace of the problem of road traffic

congestion in an urban setting necessitates a better understanding of the phenomenon as conceptualized in literature.

This theory teaches us that traffic congestion problem along the Olembe-Nkometou 1, stretch of road can only be solve using better transport policy methods. However, that additional road infrastructure is not a solution to traffic congestion in Yaounde for example. This theory helps the researcher to establish the inconsistency in traffic management policy in Yaounde.

1.10. Literature Review

1.10.1: The historical antecedent of Road Traffic Congestion in cities

According to Mumford (1961), road traffic congestion preceded automobile technology that came into existence early in the 19th century. This assertion is further corroborated by Wachs (2002), thus: "as soon as the increase of population created a demand for wheeled traffic in Rome, the congestion became intolerable. The effect of this, of course, was to create such a noise at night, with wood or iron-shod cartwheels rumbling over the stone paving blocks, that the racket tormented sleep: at a much later date, it drove the poet Juvenal into insomnia. Just as motor car congestion now affects small towns as well as big ones... And, Julius Caesar's First Acts, on seizing power was to ban wheeled traffic from the centre of Rome during the day. In a century and a half, traffic congestion had gone from bad to worse globally",

Also Wachs (2002), added that Charles II of England issued a famous edict in 1660 to ban standing carriages, wagons, and horse from the streets of Westminster and London, because they were excessive and were creating a public nuisance. He ordered that they be required to wait for their passengers off the main thoroughfares to enable the traffic to flow more freely on the boulevards.

1.10.2. The Characteristics and dimension of Road Traffic Congestion in cities

Driving through the city of Yaoundé is something many of the inhabitants will like to avoid these days Most of the principal roads eading to the centre of the town are exceptional busy due to heavy traffic

Whether you go by foot, motor bike or by car no matter the means of transport, the situation is the same, no way to circulate. More and more vehicles and less developed roads even the police authorities have trouble getting through Yaoundé lately, people spend more than 2 hours on site just to get into the city of yaounde or to more from one neighborhood to the other. From the researcher's investigations, the researcher noted that the problem comes first from the lack of roads and the existing ones are in poor conditions, poor urbanization and road maintenance work currently going

on in some parts of the city. The asphalting of roads carried out by the public authorities to private partners in charge of public works are done with lightness or without much control from specialized services (LABOGENIE). For example, the road of "Nkolmesseng" a district in Yaounde which had already been asphalted twice is impracticable at present. We also noted the incivism of citizens due to non-compliance with the Rousseau-code, the glut of used cars, corruption just to name these are the main reasons for traffic jams which is a determining factor for delay, economic loses and even loss of lives because even emergency ambulances at times are unable to circulate.

All over most Cameroon cities, particularly Yaounde "large numbers of vehicles are seen crawling along the roads. Although these cities, have fewer vehicles than many of the developed environments, they suffer far greater congestion problems especially during the peak hour period. The World Bank policy study on urban transport noted that "in Yaounde, average vehicle travels at about half the speed of its counterpart in London and Frankfurt and this indicates that, a large amount of time and energy are (sic) often wasted" Ikya, (1993).

Road traffic congestion, according to Ubogu (1980) is evident in many industrial cities such as New York, Chicago, Tokyo, New Delhi and Lagos, Thus in the last six years, according to Ubogu (1980), metropolitan Yaounde has been experiencing acute traffic congestion as a result of a phenomenal growth in vehicle ownership relative to the growth of road space. Because of this, the share of road space per vehicle had been declining over the years irrespective of the Government's massive road expansion programme. The worsening of traffic situation in Yaounde had continuously affected the social and economic life of the city.

Alao, (1984), worried about the chaotic traffic congestion level in metropolitan Yaounde, rhetorically queried thus: "is urban congestion inevitable, given the characteristic of urban technology? If so, how can we conceptualize and compute the optimum level of congestion in an urban setting?"

Mabogunje's (1981) perception of the dimension of road traffic congestion in Yaounde is that by world standard, Yaounde, the largest of our metropolitan centres, with its huge population is relatively small, however, its traffic problems are greater than those of cities many times its size. The traffic situation is already making Yaounde almost an unhabitable city, apart from gradually raising its level of air pollution. Likewise, Adalemo (1981), and Olukoju (2003) explicitly portrayed the transportation related problems of Metropolitan Yaounde, of which road traffic congestion is one, as an enigma as Yaounde emerged as a commercial and transportation centre.

To a general overview of road traffic congestion in Cameroon, Ogunsanya (2002) stated “traffic A congestion is another transportation problem of Cameroon cities. He added that “the chaotic situation is observable in virtually all the streets of metropolitan Yaounde, Douala, Bafoussam, Kousseri, Garoua, Buea, Bamenda, which depict rising levels of traffic congestion”.

Egbeoluwa (2001), appraising the chaotic scenario of road traffic congestion in metropolitan Yaounde, stated that it is a well-known fact that the existing transportation facilities in the metropolitan area are inadequate. For instance, the waiting time and the travel time have become intolerable, as a result of road traffic congestion over *time* and space.

Afolabi Ojo (1981) stated that the chronic problems of traffic flow which have bedeviled many poorly planned cities such as Yaounde is one of the experiences that cannot be adequately described in words. The traffic jams and accidents constitute the real cankerworm of the city of Yaounde. The traffic problem of the city has been estimated to be perhaps three or four times more severe and frustrating than those of a similar sized city in other parts of the world. Ojo finally added that the future fate of Yaounde hangs in the balance, depending on how its traffic problems would be resolved.

Also, a significant urban transportation problem identified by Badejo (1990) is road traffic congestion. Badejo stated “no where are problems of Cameroon's urbanization and urban development visible than in Yaounde. Here urban problems range from unemployment to traffic congestion and environmental deterioration” The Public authorities should therefore oversee the execution of road works according to the specification required from the company in charge, limit the importation of old cars and have a better urbanization plan not only in Yaounde but also in the towns of Douala, Bafoussam, Kousseri, Garoua, Buea, Bamenda

1.10.3. Road Traffic Congestion Causal Factors in Metropolitan cities.

Ogunsanya (2002) and Oduola (1981) explained that most urban congestion problems are caused by the sub-optimal manner in which the roads are used. Roadside and on-road parking, roadside trading and total disregard of traffic regulation by road users are significant human contributions to the traffic problem. Again, in a study carried out by Transpo Consults (1976), about 55.5 per cent of the total parking accounts for 66.4 per cent of causes of road traffic congestion in Yaounde. Ogunsanya (1984) equally observed that illegal parking alone accounts for 30 per cent of the cause of delays along streets in Yaounde.

Again, there are social problems of traffic control, traffic discipline and the observance of traffic laws and regulations. There is no other town in Cameroon where the tempo of life is as high as in

Yaounde. People in Yaounde hurry excessively, forgetting one basic fact of transportation - that movement takes time. The generally low standard of traffic discipline on the part of the Yaounde motoring population is worsened by appalling low standard of traffic control; and sometimes complete absence of control at strategic 4-way intersections where it is mostly needed.

Yaounde, according to Onakomaiya (1981), has only a small fraction of the numbers of cars in such cities as New York, Chicago or London, but traffic moves smoothly and steadily in these cities simply because drivers obey traffic signals and take their turns in the queue. The law-breaking drivers in these cities are tracked down and brought to justice by the alert, efficient and honest mobile patrol police who are always on the move in the cities, where nobody is above the law. Metropolitan Yaounde can still escape the complications of its chaotic traffic situation, if the authorities are prepared to work out solutions, by involving all the organs concerned with traffic and transportation problems.

Additionally, MRT Consults (1976) lucidly presented the ugly trend of traffic congestion in metropolitan Yaounde. For instance, the general traffic scene in Yaounde is one of endless queues of vehicles moving at speeds approaching 30 km/h on some sections of the radial approaches, particularly in the central business district of the city, at speeds amounting to approximately only 5km/h. For a journey made within the confines of Yaounder center on any week day approximately 60% of the trip time is spent in a stationary position, and stop/start conditions prevail for long periods of the day. Consequently, “serious traffic congestion in the city is generally experienced over a period of approximately 14 hours...” (MRT Consult,1976). Ironically, this horrible trend persists across metropolitan Yaounde even up till today.

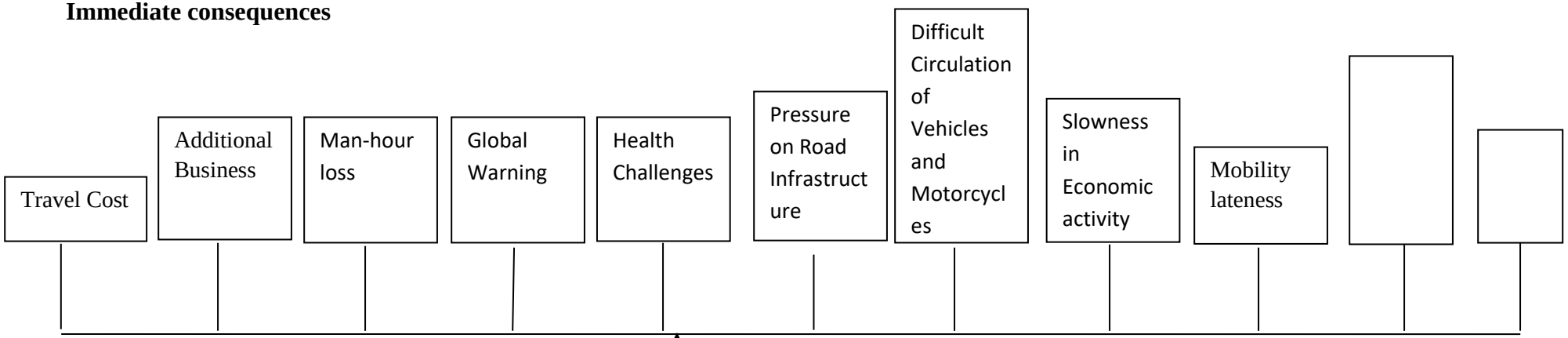
CONCLUSION

The body of knowledge on the concept of road traffic congestion, presented in this chapter from local and global points of view, is broader and diverse in nature. The prevalence of road traffic congestion and its attendant effects in metropolitan Yaounde are established in literature. Interestingly, Webber (2000) convincingly argued that, there are no immediate solutions to the problem of road traffic congestion in cities. But traffic congestion and its attendant effects are one of those prices the urban dwellers have to pay for the abundant opportunities cities offer them. Also, most of the popular solutions to traffic congestion such as road expansion and the construction of new roads are regarded in literature as travel induced solutions, which do not solve the problem of traffic congestion in cities. Rather, they encourage new forms of traffic which consequently increase traffic volume and congestion on the newly expanded and/or constructed roads. The

noticeable gaps in literature, as far as road traffic congestion in Yaounde is concerned include lack of previous studies on the spatial pattern of traffic bottlenecks in Yaounde; the health implication of congestion on commuters as well as the relevance of the multi-agency approach in traffic management in Yaounde; the contributions of pedestrians, and urban logistics and supply chain activities to road traffic congestion in metropolitan Yaounde. It also helps in determining the gaps in literature, such that the study could contribute to the existing body of knowledge in road traffic congestion. Finally, it acts as the guiding benchmark for the identification of appropriate sustainable solutions to the problem of road traffic congestion in the study area.

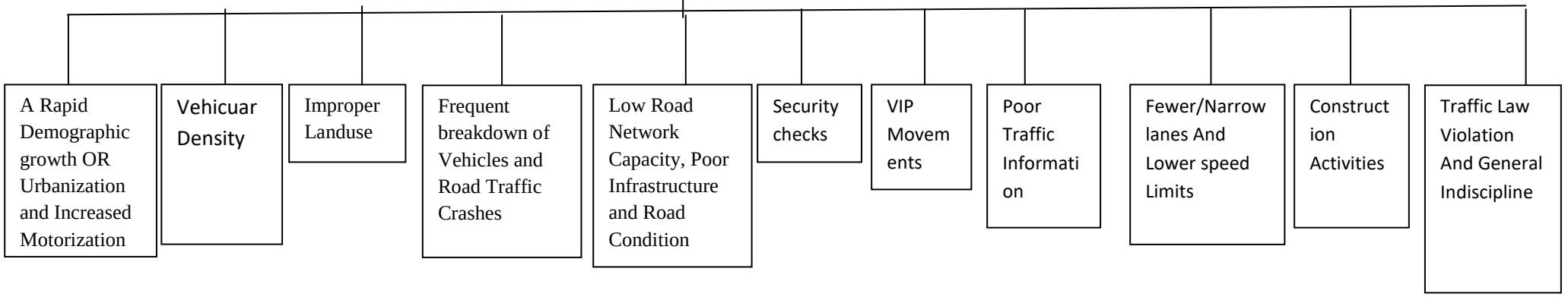
Table 2: Establishment of the problem tree or problem table

Immediate consequences



Central problem → TRAFFIC CONGESTION ALONG THE OLEMBE–NKOMETOU 1 ROAD AXIS

Causes



Source: Tembe E. T., 2023

CHAPTER 2

DETERMINANTS OF TRAFFIC CONGESTION ALONG THE OLEMB-NKOMETOU 1 STRETCH OF ROAD.

2.0 Introduction

The purpose of this chapter is to identify the determinants of traffic congestion along the Olembe-Nkometou 1 stretch of road so as to recommend a suitable strategy. Specifically this chapter investigates the extent to which poor Waste Management, narrowness of the road, Road deterioration and exponential population growth among other factors influence traffic congestion on the Olembe-Nkometou 1 road axis and the most efficient approach that can be adopted in order to tackle the problem. Each of these factors will be critically examined below that follows. The over all objective of this chapter is to verify hypothesis one which states that the maintenance of the width of the road along this segment until today is at the origin of traffic congestion.

This chapter is sub-divided into the following sub-headings, namely:

- The ugly situation of traffic congestion along the Olembe-Nkometou 1 stretch of road.
- What are the causes of traffic congestion along the Olembe-Nkometou 1, stretch of road.
- Impact on this type of congestion on the commuters.
- Conclusion.

2.1. The ugly situation of traffic congestion along the Olembe-Nkometou 1 stretch of road

Driving along the Olembe-Nkometou 1, stretch of road is something many of the inhabitants will like to avoid these days. This stretch of road is a nightmare to the commuters, and road users. That 15km stretch of the National road leading to the centre of the town is exceptionally busy due to heavy traffic. Whether you go by foot, motor bike or by car no matter the means of transport, the situation is the same and circulation is difficult. More and more vehicles and less developed roads, even the police authorities, emergency ambulances have trouble getting through this stretch of road lately. They are three Regions that enter into Yaoundé through this stretch of road. These regions are the North West Region, Western Region, and Eastern region use this road as a gateway into Yaounde. All over Yaounde, particularly Olembe-Nkometou 1, stretch of road ‘large numbers of mixed vehicles are seen crawling along the road in the study matrix. The stretch of road in the study matrix has been experiencing acute traffic congestion as a result of phenomenal growth in personal vehicle ownership relative to the growth of road space. People spend more than 2 hours on this stretch of road in the study matrix just to get to the centre of the city, Yaoundé. The traffic congestion constitutes the real cankerworm along the Olembe-Nkometou 1, stretch of road. The

traffic problem along this stretch of road has been estimated to be perhaps three or four times more severe and frustrating than those of similar parts of the city of Yaoundé. The researcher lucidly presented the ugly trend of traffic congestion along the Olembe-Nkometou 1, stretch of road in photos 1 and 2 below.

Photos 1 & 2: Rush hour period along the Olembe-Nkomtou 1, road axis

Source: Tembe E. T., 2023

2.2. Determinants to traffic congestion.

The country's road network, which accounts for 85 percent of transport in the country, suffers among other problems from poor waste management, narrowness of the road, road deterioration, the presence of mixed vehicles and pedestrains.

2.2.1. Poor Waste Management

The mountain heaps or dumps and waste along this Olembe-Nkometou 1, stretch of road is becoming an assault and causes serious traffic congestion. The study area is overwhelmed by uncollected waste. Along the road or in street corners or market, Yaounde inhabitants are now getting use to piles of heaps of waste abandoned for long.

According to the researcher, the garbage which has invaded their street is affecting circulation on that 15km stretch of road. The researcher observed that a lot of people prefer throwing their dirt's on the street despite the presence of a trash can. The existing road is already narrow and is further being narrow due to the different solid wastes found on the streets, gutters and water bodies on that stretch of road and no place to escape from garbage disposal along this stretch of road. This stretch

of road stings, because residents dump trash on sidewalks and roadway carelessly. Waste is spotted here and there along this stretch of road. Low collection coverage and irregular collection services has been a major problem faced by the household for years.

2.2.2 Exponential Population Growth

Another factor is that we are experiencing an exponential population growth. The impact of this increase in population is greatly felt in the management of waste and plastic along that road corridor. An increase in population on that stretch of road is synonymous to an increase in the waste production management. This has given rise to the question of plastic management on that stretch of road with different stake holders playing an active role. Over the last three decades, the exponential population growth, coupled with increase commercial activities have increase waste generation on that stretch of road. Lack of proper collection and disposal of this waste pose a threat on traffic, human and the environment at large. In Yaoundé, as in most Sub-Saharan cities, massive population growth and urbanization are driving an exponential increase in the production of household waste. However, the country has managed to develop a waste management system that could provide a model for its west and central Africa neighbours. The Cameroon way is based on a strong political will and a concession arrangement with a private local company, HYSACAM. Hysacam (a French acronym meaning hygiene and sanitation company in Cameroon) was founded in 1969 and is the country's number one private waste management contractor. The activities of this organization can be regrouped into four categories: sensitization in a move to create awareness and provoke a change of the mentality of the population; collection and removal of household wastes which calls for the creation of waste collection points and routine emptying of waste containers around homes and quarters; sweeping of streets and markets; and the transportation and processing of wastes at discharge sites. In order to carry out this work effectively, HYSACAM has employed a workforce of about 1500 workers and about 100 trucks transporting household waste in the country. This enables HYSACAM to remove and transport approximately 700 tons of waste daily, (Derrick Ngoran & Xiong Zhi, 2013). The removal of wastes and the cleanliness of Yaoundé, is the affair and responsibility of three partners, including the State (City Councils), the public and HYSACAM (Hygiene and sanitation company in Cameroon), the service provider. HYSACAM's mission is limited to the removal, transportation, and processing of household wastes from homes, streets, and markets only. Cleaning of industrial wastes, scrap iron, is not its duty. This is same for gutters, drains, and streams. Hence the inhabitants are advised to have garbage cans/bins in their homes and not throw waste materials at the roadsides or in gutters. Any garbage that is not from household is the concern of the City Councils. A European Union survey on habitat in Cameroon revealed that

there is an average of seven persons per home in Yaoundé and that most homes are without waste or garbage cans and that each person produced at least 600 g of waste daily. This is far above the 1500 tons which the company that until now have been charged with the responsibility of collecting and managing it. Meaning that, about 1000 tons is stockpiled daily, mostly as a result of the population's behaviour towards the respect of hygiene and sanitation norms. The law provides for sanctions, but HYSACAM's mission is limited to the provision of services not to sanction defaulters.

Photos 3 & 4: Poor waste disposal causes traffic congestion along the Olembe-Nkometou 1; stretch of road

Source: Tembe E. T., 2023

Is advisable that waste should be transported at night but with us here waste is transported during the day. That is why we are witnessing pollution of all its kinds in Yaoundé these days. Also having a monopoly company like Hysacam is disadvantageous. It will be advisable to have more than one company responsible for this waste disposal along this study area. This can be a solution of this pile of heap along this roadside which causes traffic congestion. Also, Municipal authorities should revise the text governing waste collection and management in Cameroon. Further, a recent interview granted by the researcher to the general manager of the hygine and sanitation company (Hysacam) Dr. Jean Pierre Ymele, affirmed the impact of waste is hugs and he said “we need to act now and is time we start thinking of recycling”. It maybe the time today to start encouraging all the families and we start knowing how to sort out waste at home. Moreover, while waiting for a

solution from the government, various organizations and environmentalist have made it a responsibility to continue sensitizing the population on proper waste disposal in Yaounde.

2.2.3. The narrowness of the road

When the lanes are few, the capacity of the road is small or reduced and the inability of the road to adequately accommodate the vehicular volume will result in congestion. It is an issue of battling with low resources; hence new modern and expansive roads cannot be accommodated in the budgets of the government while they also find it difficult to secure international financing for such projects. When the lanes are few, the capacity of the road is small or reduced and the inability of the carriage way to adequately accommodate the vehicular volume will result in congestion as it is happening on the Olembe-Nkometou 1 stretch of road. Same goes for situations where the lanes are narrow. Olembe-Nkometou 1 stretch of road has low capacity and needs to be expanded. When the capacity is low, there will be many vehicles competing for a little space, hence traffic congestion.

Photos 5 & 6: Narrowness of the road in the study matrix

Source: Tembe E. T., 2023

Thus, the volume of traffic flow in the study area is becoming more than available road network. The available road infrastructure remains relatively inadequate, measuring less than 7m in width. It is indispensable that these roads should be increased, restructured and rehabilitated especially where there are potholes. Along the Olembe-Nkometou 1 road, special attention and care should be given to the stretch from Olembe- Nkometou 1, stretch of road. According to the conducted survey, a large majority of the private car owners, for example, 92.5%, felt that the vehicular traffic delays during peak periods along the Olembe-Nkometou 1 stretch of road was/is terrible and a total waste of otherwise very productive hours. That the time one takes from the point 'of origin to destination is exceptionally too long. Majority of these respondents also indicated that the road network carrying capacity was inadequate.

2.2.4 Road deterioration

The Olembe- Nkometou 1, stretch of road is in a poor stage with potholes and ditches eating up road sections in almost every neigbourhoods in the study matrix. From entre ministe in Nkozoa to Akak is the worst section of the road. The traffic delay from Olembe-Nkometou 1, stretch of road is cause by bad roads. Car owners complain of increase cost in repairing their cars due to the bad roads which leads to frequent car break down. Smoothly tar roads and drainage are loosely absent in most part of the Olembe-Nkometou 1, stretch of road which makes it difficult to ply these days. It takes task to move from this part of town in a cab to reach your destination on time. There are potholes everywhere and people faced difficulties boarding a taxi. It is a major problem for those who want to get to their place of work earlier. Driving through each day is a problem for students and workers alike to go figure out. Many spend long hours and arrive late at work, this is not normal.

Keeping roads in good condition is the most cost-effective way to save roads along the Olembe-Nkometou 1 stretch of road. The accurate prediction of rutting development is an essential element for the efficient management of pavements systems. Okikbo (2012) refers to road deterioration (defects) as the visible evidence of an undesirable condition in the pavement affecting serviceability, structural condition or appearance. He also indicates that the definition of "road deterioration" includes any part of a road, highway, or construction site that does not meet the regulations for a safe road. In addition to that; in his paper on road defects, he indicates that the defects that most often cause injuries to people or damage to vehicles include: inadequate road shoulders, lanes that are uneven, pavement that is uneven, improperly marked signs, malfunctioning stop lights, construction negligence, and municipal negligence.

While going through the segment of road in the study area, the researcher noted the presences of quagmires at the main low points along the project segment (major potholes and /or complete deterioration of the roadway that have become points of rainwater stagnation. Other types of deterioration observed on asphalt section includes: large cracks, clogged, gutters in places, gullies in the road in places, peeling off of the road, crazing, subsidence, etc.

From field work, some defects which were noticeable on the stretch of road in the study area as shown in photos 7 to 11 were cracks, potholes, rutting, raveling and edge breaks.

Cracks: During field observations, map cracks and block could be seen on some sections of the road. Photo 7 below shows cracks observed along the NR4 close to the vehicle testing centre in

Nkozoa. These cracks are lighter in some areas indicating the beginning, but however, more intense in some areas showing that they have actually existed for some time. The divisional delegate of Public works in an interview briefed that these cracks are associated with the aging and deterioration of the surface bituminous layer due to shrinking and hardening of the bituminous binder and that they are in general not load related. However, the pressure mounted by heavy traffic that comes with urban growth in Yaoundé increases the cracks leading to the formation of potholes and even more dangerous defect

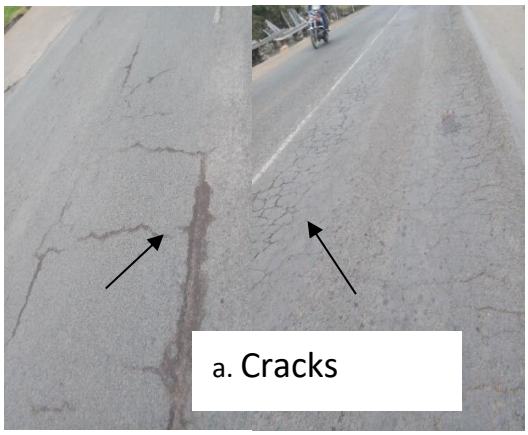


Photo 7: cracks: Defects on RTI along the Olembe-Nkometou 1, stretch of road.

Source: Tembe E. T., 2023

Potholes: Bowl-shaped holes of various sizes were observed along the Olembe-Nkometou 1, notably Akak-Nkometou 1 as seen on photo 8. These potholes are secondary forms of deterioration developing from cracks. In some cases, patches could be seen on the road giving way back to potholes especially around Akak. The formation of potholes on roads is linked with the amount of traffic that road is carrying. So many potholes occur on the road along the Olembe- Nkometou 1, partly because rapid urbanisation subdues the road structure under traffic higher than its designed bearing capacity.

Photo 8 illustrations on how potholes on the road produced pre-congestion conditions, which grow to full congestion and even hyper congestion because of the constant inflow of road users. From Olembe to Nkometou 1, the road is horrible. This stretch is characterized by large potholes. Most vehicles ended up in these poles after it rains with water covering the deep craters. Traffic congestion, break downs of vehicles and bikes are multiplied as they have to cross along at stretch of road. Locals and road users say only fishes are lacking to make it a fish point. The poor quality

rehabilitation works on this road makes potholes on the road frequent. From field observation, one could witness the reality the vehicles, bikes faced on a daily bases especially when it rains.

Photo 8: Large potholes at Akak 11 which has widen over time & a deplorable nature of the road especially during rainy season

Source: Tembe E. T., 2023

Rutting: This was noticeable through longitudinal surface depression in the wheel path. This type of deterioration was observed to be caused by compaction or shear deformation of the pavement layers through traffic loading. This deformation was particularly noticeable along the National road NR4 between entry minister Nkozoa and Lac Nkozoa checkpoint as seen in photo 9. This occurrence of rutting on the high was passing through Nkozoa can be linked to heavy trucks which transport sand from river Sanaga to Olembe and also trucks that transport goods to and from the Olembe area (Photo 9)

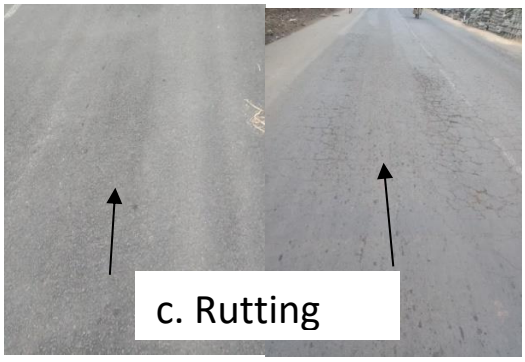


Photo 9: rutting: **Defects on RTI along the Olembe-Nkometou 1, stretch of road.**

Source: Tembe E. T., 2023

Ravelling: Along lycee Nkozoa – Entry Ministe junction Nkozoa (Photo 10), a section of the road could be observed where the aggregate particles are dislodged and some of the alphalt binder is removed. This situation is caused by the abrasive action of traffic as this road is constantly subjected under heavy traffic although the original quality of the road also counts a lot. (Photo 10)

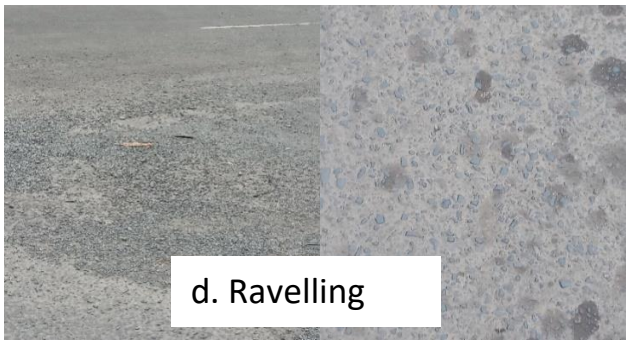


Photo 10: ravelling: **Defects on RTI along the Olembe-Nkometou 1, stretch of road.**

Source: Tembe E. T., 2023

Edge break: Along some of the roads in the study area, the breaking away of surfacing at the edges of the pavement can be noticed. This is caused by poor unpaved shoulder maintenance. This is particularly noticeable along the road linking Akak to Nkozoa (Photo 11).

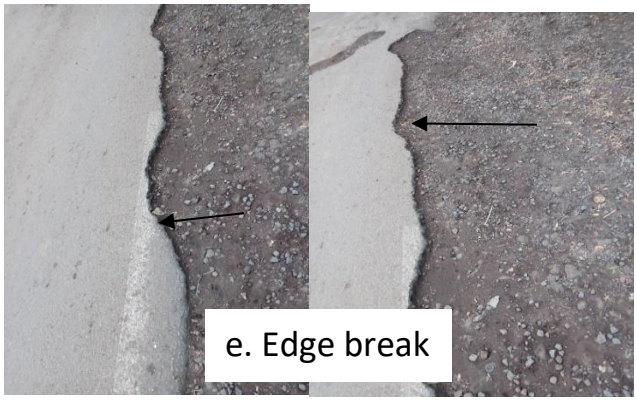


Photo 11: edge break: Defects on RTI along the Olembe-Nkometou 1, stretch of road.

Source: Tembe E. T., 2023

The perspective of respondents on the level of deterioration of road transport infrastructure is shown on figure 4 below.

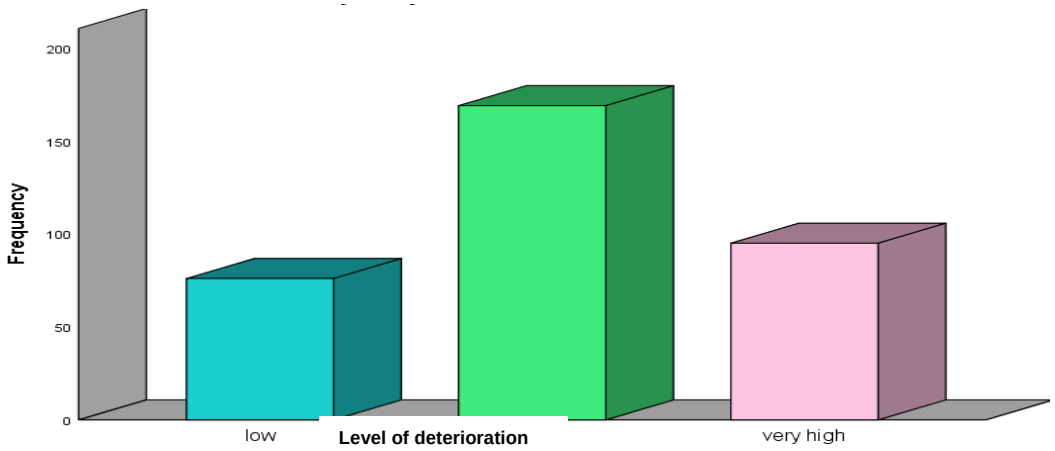


Figure 3: Level of Deterioration of Road Transport Infrastructure along the Olembe-Nkometou 1, stretch of road

Analysis shown on figure 4 reveals that concerning the level of deterioration of road transport infrastructures, 76 respondents (22.4%) of the respondents said the level of road deterioration is low, 95 respondents (27.9%) of the respondents affirmed that it is very high. However, 169 respondents representing 49.7% of the respondents were of the opinion that the level of road deterioration along the Olembe-Nkometou 1, stretch of road is high. (Figure 4)

2.2.5: The presence of mixed vehicles and pedestrians along the Olembe-Nkometou 1, stretch of road

The Olembe-Nkometou roads axis is full of traffic congestion. These vehicles include private cars, taxis's, motor taxis, logistic vehicles, inter-urban buses and heavy duty vehicles operating on different schedules**.** The frequent movement of these vehicles causes traffic congestion on the study matrix. Traffic congestions are frequent during different periods of the day, months and seasons especially on the Olembe –Nkometou 1 road axis making travelling on the road very uncomfortable (boring).

Peri-urban mobility has become the most visible and disordered sector within Yaounde town due to lack of planning and high rate of population growth that does not match with the available transport infrastructures and facilities in place. Thus illegal parks are seen almost everywhere in town with disastrous effects which falls in line with the work of González, (2017). The dynamism of the peri-urban transport system in Yaounde can be understood through the major mode of transportation like motorcycle, taxi, regular and mini bus (cargo bus), and clandestine taxi. Regular and cargo buses are the major modes of transportation which influences peri-urban dynamism that mainly ply on structural road that leaves from the Central business district (central town) through the periphery to the rural area. The outcomes of about 190 questionnaires administered in major departures, arrivals,

markets and others public areas within Olembe-Nkometou 1 peri-urban shows that; more than 32% of peri-urban inhabitants used cargo bus as a major mode of transportation from the periphery into the CBD, 25.64% used auto bus a well organised transport system, 22.44% used motorcycle which remained the most risky and speedy mode of transportation, 15.87% depends on urban taxi and the 4.01% on clandestine taxi as shown in figure 5.

Photo 12: Diverse modes of peri-urban transport along the Olembe-Nkometou 1 stretch of road.

Source: Tembe E. T., 2023

The dynamics and diversified nature of the Yaounde peri-urban transport network has brought about inhabitant's or user's preference in choosing among the various modes of transport. This is generally based on security, speediness and comfort just to name a few.

The fact that regular and cargo buses link the Yaounde CBD and its periphery is due to its vast network of about 20 loading points, tarred road, cheaper rate (200-250F CFA), speedy and it collective nature (10-30 passengers). Figure 6 shows the determinant role played by major roads which trespass the peri-urban milieu that favour the movement of Yaounde peri-urban dwellers thus enhancing urban dynamism.

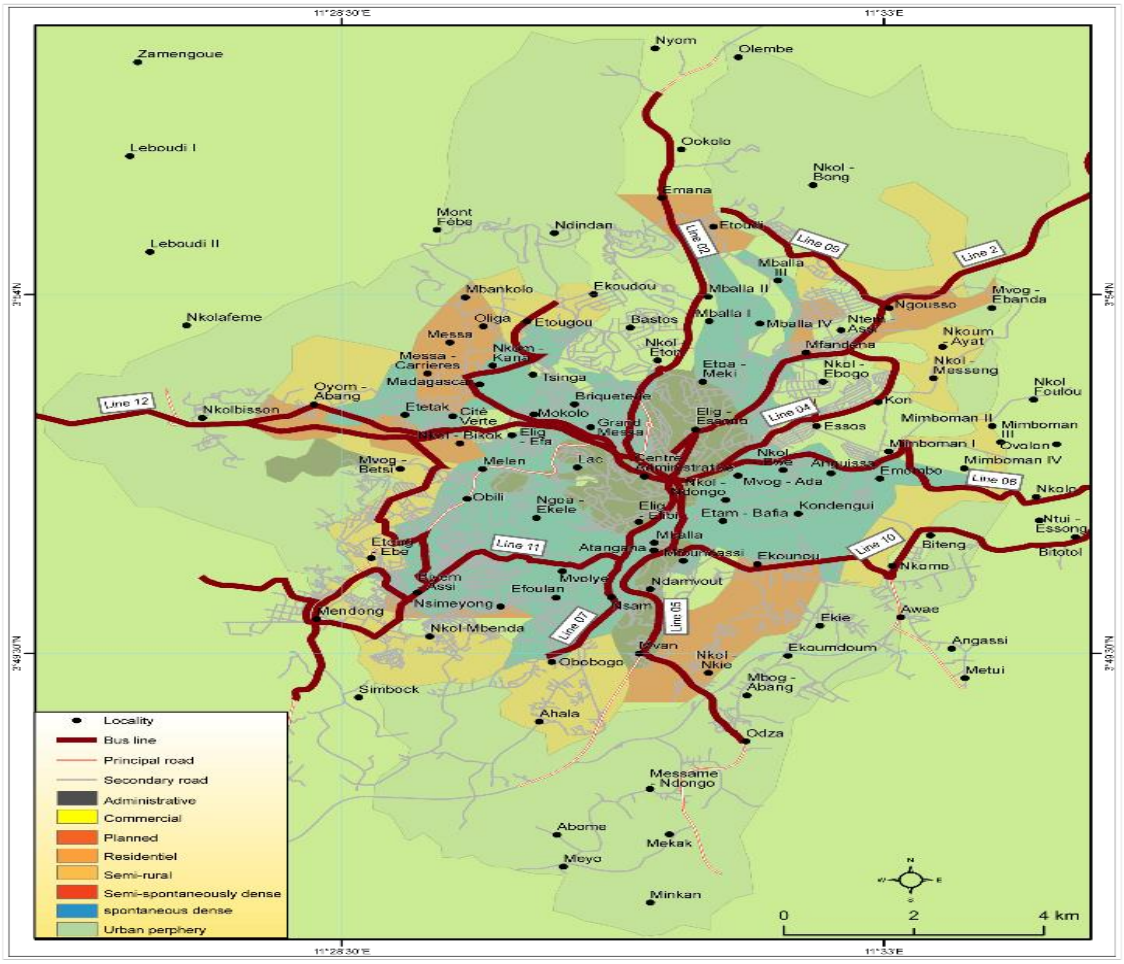


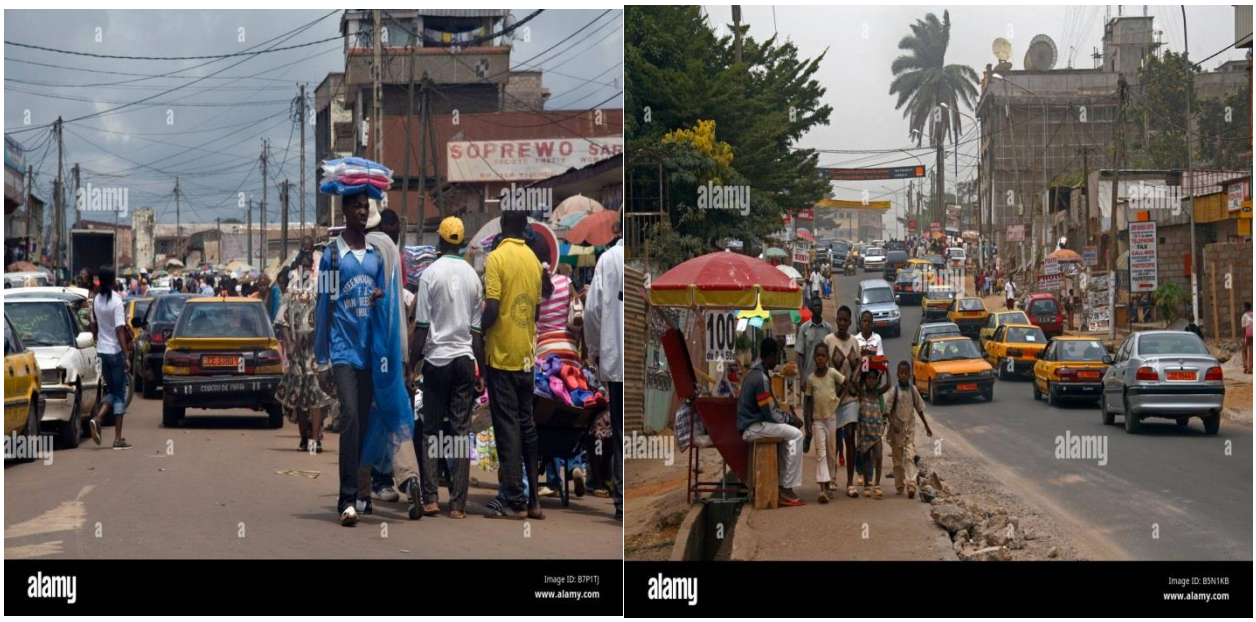
Figure 4: The dynamism of peri-urban transport in Yaounde

Source: Urban diagnostic transportation plan of Yaounde (2022) and Google earth satellite image (2023) Existing mobility and transport services

The transport system in Yaoundé, while being relatively fluid, is accident prone, congestion-prone system, uncomfortable, polluting, and expensive for the population. In or within the city, there are about 8 million of trips travelled every day, from which one third are short distance trips travelled by walking or by moto-taxis. For longer trips, taxis, motorbikes, and cars are the main modes of transport within the city. Official bus service and informal minibuses currently only play a minor role. Neba (2000).

2.2.5.1 Walking:

4 million trips travelled every day by pedestrians in Yaounde and walking is one of the main modes of transport along the Olembe-.Nkometou 1, stretch of road. However, the lack of sidewalk, pedestrian crossing, and the narrowness of the road combined with a chaotic traffic poses a threat to pedestrians' safety, and they are particularly exposed to traffic accidents along the Olembe-Nkometou 1, stretch of road.



Photos 13 & 14: Busy street scene with pedestrians and road vendors in the study matrix

Source: Alamy images

2.2.5.2 Taxi service:

Taxis are the oldest regulated mode of urban transport in the city of Yaounde: they are 5-seater vehicles painted yellow and displaying a number on the front doors. The taxi fleet is dilapidated, most of the vehicles are second-hand, imported from Europe and were first put into circulation at least ten years ago. Maintaining these vehicles is therefore expensive because of their obsolescence, while their lifespan will hardly exceed five years.

Photo 15: Taxis ply the 15km stretch of road in the study matrix

Source: Tembe E. T., 2023

Less than 5% of vehicles are taxis, but they have a 38% share of the modal split by distance. They transport all categories of the population, and with an average occupation rate of 3 passengers, they are the main motorized mode of transport causing traffic congestion along the Olembe-Nkometou 1 stretch of road. Taxis, even used collectively, are relatively expensive: for one passenger out of four, taxi fares only represent over 15% of their household income.

2.2.4.3 Motor-taxis

Motor-traxi is particularly present in the outlying districts. Their flexibility and agility allow them to use roads that are impracticable for other vehicles, due to the poor state of the pavement or the narrowness of the road. Motor-taxis, often operated informally by very young drivers, are notably resistant to any regulation, which is nevertheless necessary to address the safety issues associated with this mode of transport.

Motor-taxi has become familiar in the landscape of some of the most important African cities, Lagos, Cotonou, Lome, Kigali. In Cameroon, the motorcycle taxi activity was born in the 1990s, resulting from the conjunction of several crises, economic crises, with the decline in the purchasing power of transport uses on the one hand and unemployment and layoffs in services and public companies which have led to finings original sources of income on the one hand. Governments have repeatedly attempted to regulate the activity. Decree no 2008/3447/pm of December 31, 2008 sets the current framework for the operation of motorcycles for consideration in Cameroon.

Photos 16 & 17: Nkozoa: one of the numerous quarters served principally by motor cycle transport in Yaounde.

Source: Tembe E. T., 2023

2.2.4.4 Private cars

Cars are handicapped by the state of the road network and only 10% of trips are made by private cars. The car ownership rate, which is highly dependent on household income, is nevertheless increasing along with the standard of living. Firstly, the reason or explanation behind the strong preference for using private cars in the study matrix is the aspect of status. In Cameroon, the automobile is still considered not only a means of transport, but also an indication of its owner's status in society. A person driving a BMW will be considered as superior to one driving a Suzuki, while a person who arrives at the office by car rather than bus is seen as someone who has moved up in the world. The prestige attached to being a car owner is a strong factor in the volume of traffic along that stretch of road in the study matrix. In addition to these reasons related with the social structure and cultural characteristics, the following considerations are also important in the study matrix.

1) The poor quality of the mini buses compared with the aspirations of car owners
2) The fact that the mini buses are very crowded at rush hours

3) The feeling of insecurity caused by the dangerious way some mini bus drivers operate their vehicles.
4) The real or assumed possibility of being a victim of delinquents on board mini bus transport vehicles.

The preference for travelling by private car becomes a problem at rush hours, when there is a concentration of journeys for reasons of work or study. Not even serious delays in journeys are enough to cause people to stop using their cars. If they had to choose between reaching their destination slowly by private car on congested roads and arriving a little more quickly by mini bus transport, it is by no means certain that many commuters in the study matrix would opt for the former alternative. Having a car to go to a shopping centre, visit friends or relations in distant parts of town, or travel outside the city is one of the fruits of economic development, and its costs are generally internalized to a large extent by car owners, since these journeys are made at times of low congestion. Using the car every day to go to the office or the city centre generates high external costs in terms of congestion and pollution and does considerable harm to society. However, securing a better balance between the ownership and use of private cars is therefore one of the main challenges to be faced today in the Yaounde transport sector.

PRIVATE CAR-OWNERSHIP RESPONSE AFTER A SURVEY CONDUCTED BY THE RESEARCHER IN THE STUDY MATRIX.

In overall the private car-owners claimed that they owned their vehicles for personal and family safety in terms of transportation. They indicated that the current mini bus transport means in Yaounde were unsafe, unreliable, and too congested for one to ride in, especially for the school children. 85% owned only one vehicle and the other 15% owned motor cycles and clandestine taxi. The average daily distance covered here was found to be between 10 and 31 kilometers. It should be noted here that part of the daily distance covered includes distances covered looking for parking and detours from vehicular traffic congestions along otherwise, direct routes to destination.

The percentages were as follows:

Distance Daily covered: i) 0 to 5 kilometres 4.0%, ii) 6 to 10 kilometres 28.5%, iii) 11 to 20 kilometres 41.0%, iv) 21 to 30 kilometres 19.5%, V) 31 kilometres and over 7.0%, = Total: 100.0%.

Private car owners also claimed that they waste much of their valuable time on the road due to vehicular traffgic congestions. Some of them claimed that the waste up to 60 minutes or more on the Olembe-Nkometou 1, stretch of road daily. This means they have to start their trips to work early in order to make it to work on time; this defeats the purpose of owing private means of

transportation for convenience when mobility is considered. The term “time wasted” is used here to earn the total time taken from the place of origin to destination during peak periods less the time normally taken during off-peak periods or with normal traffic flow. The findings here were as follows:

Peak Period Time Wasted: i) 0 to 15 minutes 12.0%, ii) 16 to 30 minutes 31.0%, iii) 31 to 45 minutes 37.5%, iv) 46 to 60 minutes 17.5%, V) 61 minutes and over 2.0%. = Total: 100.0%

The fuel consumption increases with increasing distances and the idling of engines due to vehicular traffic congestions. 31 % of the private car owners spend less than 5.000 FRS cfa per day on fuel consumption, while 37% spend between 6.000 FRS cfa and 10.000 FRS per day. The other 32 percent of the private car owners spend over 10.000FRS cfa per day on fuel consumption.

2.2.4.5: Logistic vehicles

This is simply the movement of goods from one location to the other in or within the city. Vehicles transporting goods like drinks, transpotation of food stuff, transportation of livestock and animals, transportation of Gas bottles and fuels etc. also ply the Olembe – Nkometou 1, stretch of road. Although there are multiple solutions to get logistics delivered, trucking has always stood the test of time. The trucking industry was able to offer companies efficient, reliable, and cost-saving solutions for delivery along the Olembe-Nkometou 1, stretch of road.

Photo 18 & 19: Logistic vehicles plying the the road in he study area area.

Source: Tembe E. T., 2023

2.2.4.6: Heavy duty trucks

Traffic is more and denser on that stretch of road due the quarry companies found in the study matrix. The researcher recorded more than 50 tippers along that stretch of road daily, transporting sand, gravel and wood planks. The presence of quarry companies like Razel with her heavy duty trippers, trailers causes too much traffic congestion along that stretch of road in the study matrix

Photos 20 & 21: Heavy duty trucks and trailers plying the road in the study area

Source: Tembe E. T., 2023.

2.2.5.7: Inter-urban vehicles

The presence of heavy inter-urban buses that ply this stretch of road also causes traffic congestion. Amongst the categories of buses on these National roads, are 70 seater buses own by traveling companies like Moghamo Express, Vatican Express, NsoBoys Express, Amour Mezam company, International line voyages, Tresor voyages, Binam voyages and Real Express are frequent. These inter urban transport buses transport passengers and goods daily along this stretch of road from Yaoundé to Bafousam, Dschang, and Bamenda and vice versa. Also, on the same note, inter urban buses transport goods and passengers from Yaoundé via Nganga Eboko to Bertoua.

Photos 22 & 23: Shows the inter-urban buses that ply the Olembe-Nkometou 1 stretch of road

Source: Tembe E. T., 2023

2.2.5.8: Minibuses

Informal minibuses are of lesser importance in comparison to other African cities. In Yaoundé, they are mainly used for transport between the centre and the periphery, following fixed routes and departing from bus stations. If we strictly adhere to the regulations, minibuses, with a capacity varying between 10 and 20 seats, are not authorized for urban transport. The license granted to taxi gives the right to operate an urban transport vehicle within a maximum of 10 seats, including that of the driver. The minibuses have loading points and fixed lines serving distant neighborhoods from the center. For remote areas with different access, they are practically the only means of motorized transport. The license granted to minibuses by the services of the ministry of transport authorizes the use of the vehicle on inter-urban routes. However, it does not specify the link and can be granted in any city regardless of the vehicles future services. Faced with the shortcomings of the urban

transport supply, operators have taken advantage of this loophole in the regulations and the permissiveness of the controls to establish themselves firmly in the remote peripheral services.

Photo 24 : Minibus loading point at central town [opposite Sonel central] that transport passengers along the study matrix and other peripheral areas within the city

Source: Tembe E. T., 2023

Photo 25: Minibus with baggage and passengers plying the road in the study matrix

Source: Alamy images

2.2.6: Commercial activities.

The poor nature of the Olembe-Nkometou 1 stretch of road limits the volume of economic activities and thereby limiting the scope of economic activities. This usually results in induce travel as the nature of the road drives traffic flow to already congested road. This increases the traffic flow on this stretch and makes the stretch always congested especially as it has a lot of business centers which use part of the road as a car park as well as extension of their shopping centers to the road, making the road always congested.

2.2.6.1: Roadside Vendors

Selling at roadsides and control points has been a major cause of traffic congestion in the study matrix. Selling along this stretch of National road number 4 is common in small and medium-sized

communities found in the study matrix. This road-oriented business activity is taking advantage of the opportunities offered by traffic. Roadside sellers carry commercial items in trucks, wheelbarrows, bicycles, motorbikes and practice head-portage as they sell along the roadside to passengers. During this trade, hawkers cross the road without looking and some cross where on-comng vehicles can not see them. These manifestations have been the cause of traffic congestion among roadside sellers in the study area. During holidays, students and pupils dominate in trading along this road. Selling along this road is common at the Nkoumetou 1 market, and at the police check point at Nkoumetou 1.

Various reasons account for why people sell along this study area of the National Road Number 4. An interview conducted by the researcher with a groundnut dealer reveals that from her profit, she sends her son to school and ploughs back profit. Another interview granted to a banana seller along Nkometou 1 market in July 2023 yielded a similar result "As a farmer, I have been trading along this road since 2010, my children generate revenue from the sale of my produce…..'. Therefore, people sell along this road to send their children to school amongst others. This is similar to the situation observed in the Sorsogon community in the Philippine. The Sorsogon people were land tenants who sought to improve on their low incomes by selling along highways. In Matara, landholdings were small and farmers resorted to selling along highways to make earns meet.

Roadside vendors occupying sidewalks pose havoc to the free movement of persons and vehicles along that stretch of road. This makes the road on the study area and encourages disorder despite efforts made by local councilors to free sidewalks from encroachments, road vendors still prove stubborn as a result of this bad habit. Some of these vendors are Internally Displaced Persons who were starting a new life after having escaped from security crisis in the North and South West Region and they do not know where to run to this time. Roadside vendors are continuously ticking around because buyers are there. Efforts from officials of the Yaounde 1 council and Soa municipality to comment on plans to ease traffic in the study area proved filter despite several attempts.

Street vendors and market traders are an integral part of urban economies around the world, offering easy access to a wide range of affordable goods and services in public spaces. They sell everything from fresh vegetables to prepared foods, from building materials to garments and crafts, and from consumer electronics to auto repairs to haircuts. In cities in Cameroon and squares bustle with women and men selling everything from fresh fruits and vegetables to cell phone covers to colorful fabrics and clothing. These street vendors and market traders bring every day goods to residents at

affordable prices in place convenient to them; at transport hubs, pear office parks and outside at residential clusters. But as cities grow, land values escalate, and public space become more contexted and privalized, street vendors are being pushed out. Petit traders and motor bikes riders have occupied the roadway causing consisting vexing traffic. Many city dwellers are even the more indicant at the fact that little or nothing is done to stop the situation.

Here in the study matrix, vendors and commercial motorbikes riders makes the rules while traders have abandoned markets for road pavements. Bikes have made the junction their parking lots and the polulation is bearing the consequences of this disorder. The market at Nkometou 1, has to be constructed to ease things on that stretch of road in the study matrix. When it is rush hours cars moving to-and-fro can hardly find their way. Vendors insist the incomplete nature of the market at Nkomtou 1, leaves them with no option than to sell along the roadside. Especially as officials of the soa council wouldn't comment on any plans to fix the Nkometou 1 market. This situation has been going on for years and does not seens to end any time soon.

Photos 26 & 27: Road vendors are struggling to sell their foodstuff s to the bus passengers around the Nkometou 1 market in the study area

Source: Alamy images

2.2.6.2: Market along the road.

Urban agglomeration results in competing land use such as motorbikes and car parks, markets or other commercial activities. This is the case with the Nkometou 1 market as settlers agglomerate around Nkometou 1 market and this has introduced competing land uses such as motorbike stop, competing with the road as this activity extends to the road and causing recurrent traffic congestion at the Nkometou 1 market area. This increases the traffic flow on this stretch and makes the stretch

always congested especially as it has a lot of business centres which use part of the road as a car park as well as extension of their shopping centres to the road making the road always congested. The absence of proper town planning, which would have made provisions for a proper motorbike and car park, wood planks shop, sand sale points and transportation. The absence of these facilities has force users to set up their business activities on the road thereby causing recurrent traffic congestion at this point. See photos 24 & 25 below.

Photos 28 & 29: Market erxtension induce driving behaviour and Traffic Congestion at the Nkometou 1 market area.

Source: Alamy images

2.2.5.6.3: The presence of shops along the road.

Rapid urbanization without proper land use planning especially in the location of certain specialized activities such as concentration of workplaces in some areas, residential and recreational facilities in some other areas and often far from each other results in crisscrossing movements compounding traffic problems. Most often, traffic impact assessments are not carried out before facilities are located on this stretch of road. The problem is more severe during the peak hours as most people resume and close from work respectively in the morning and evenings at the same time. Inappropriate sitting of certain facilities such as wood planks shops and sand sale area on the Olembe-Nkometou 1 stretch of road also constitute major traffic nuisances.

Photos 30 & 31: Shows shops lineup along the Olembe-Nkometou 1, stretch of road

Source: Tembe E. T., 2023

Conclusively, the predominant illegal human activities of the roads such as uncheck street trading, loading and off- loading of trucks and passenger vehicles, uncontrolled pedestrian crossing will further narrow down the road space, particularly at major land uses like commercial centres. Notable examples are found in Entry Ministe', Nkozoa as shown in photo 27 & 28. The identified land uses problems along this corridors, reconfirmed one of the Babatola (2000) findings that the relative concentration of commercial activites in Yaounde is responsible for the usual traffic congestion on some road arteries connecting the suburbs with the city. Also, most public facilities such as banks, shopping malls and petrol stations are, for ease of access to them, located at road junctions. They are so located for ease of patronage but the influx of vehicles to these places and the non-provision of motorbike parks often create traffic bottle neck. Motorbike parks, especially 'tipper parks' for articulated vehicles are illegally located on this stretch of road, causing traffic congestion at such points. On the Olembe-Nkometou 1, we have such parks at Nkozoa, Akak and Nkometou 1. These areas are known points of traffic obstructions on the road. Akak is also notorious for tipper parks' induced traffic congestion along the study matrix. In some instances too, markets are also located along the road. During researcher's field work, it was observed that there was an improperly located local market along major highways in Nkometou 1. The buying and selling on the road slows down traffic and exposes a lot of the traders and their patrons to injuries and deaths through road traffic crashes that further compound traffic situation when they occur. The absence of proper town planning, which would have made provisions for a proper motorbike park,

shops, sand sale points, wood planks shops, market , has forced users to set up their business activities on the roads there by causing recurrent traffic congestion at this point.

2.3. Impact on this type of congestion on the commuters

Traffic congestion has a tremendous impact on the life of people. It is one of the most serious problems olang the Olembe-Nkometou 1, stretch of road that people have to deal with in daily life. Since most of the people have to deal with on a daily basis, they may get psychologically affected. It also negatively affects work, education and personal life of people and finally to the progress of the country. Some of the major problems that arise due to high traffic along the Olembe-Nkometou 1, stretch of road are as follows;

- Being stuck in traffic for long hour's results in unproductive time. The time sitting idle and getting late to your appointment causes frustration and anger in a person. Commuters and other road users spend more than 2 hours on this stretch of road in the study matrix just to get to the centre of the city, Yaounde. Unproductive time is the major disadvantage of traffic congestion on this stretch of road in the study matrix.
- Increase in pollution level due to wastage of fuels when the vehicles are stuck in traffic congestion in the study area. Stopping and accelerating the car leads to an unnecessary release of carbon dioxide. Also, the value of the vehicle depreciates due to frequent acceleration and braking. The frequent breaking and accelerating the vehicles in traffic congestion burns more fuel and brings about more smoke along the Olembe-Nkometou I, stretch of road.
- Noise pollution increase due to extra honking and too much traffic along that stretch of road in the study matrix. These long traffic congestions on the road can harm the mind. Also, traffic congestion can also have a negative impact on the mind of a person. The traffic congestion and constant blowing of horns create excessive noise pollution along the Olembe-Nkometou 1, segment of road..
- Emergency vehicles like fire brigade and ambulance get stuck up in traffic congestion that causes a delay in reaching their location in the study matrix.
- People can get late for their important meetings and to cover up the time, sometimes drvers drive fast and cause accidents. The chances of accidents and damages increase due to tight spacing between the vehicles on that stretch of road in the study matrix..
- It increases stress and frustration among motorists and passengers. Commuters and other road users faced nightmare along the Olembe-Nkometou 1, stretch of road especially during rush hours. .

- Businesses nowadays in Yaounde provide home delivery services. Such time bond businesses are strongly affected by the traffic congestion along the Olembe-Nkometou 1, stretch of road.
- Road rage is the absurd reaction of commuters that is very common during traffic congestion especially along the Olembe-Nkometou 1, stretch of road. People often use bad language and drive aggressively that can lead to accidents.
- Traffic congestion makes the march of life slow and unsteady. Men and women going to their place of work are at once halted. They do not reach their office in time. The children are delayed to reach the school. The patients do not get medical aid in time. They have to stop on the way. Sometimes, there is traffic congestion for hours together. The small babies in the laps of their mother cry for milk, but they do not get it. These are typical emples of what commuters and road users faced on daily basis on the aolembe-Nkometou 1. Stretch of road..
- Traffic congestion in the modern age reflects an ugly mark on the beautiful face of the city. They are the negation of progress. In this age of' science and technology, such congestion cannot be favored by anybody. They are a denial of the cultural growth of a city. So the Government has to do all it can to decongest traffic on the Olembe-Nkometou 1, stretch of road.

2.4. Result

Here, we shall examine daily, monthly and seasonal variations in traffic congestion in the study area.

2.4.1. Congested periods of the day.

Traffic flow investigation.

Understanding fieldwork on traffic flow entails investing or finding out changes in traffic volume over time and the pattern of movement of goods and persons between settlements over time. It is achieved through counting (one of the enquiry skills).

The significance of traffic flow investigation lies in the fact that it helps in (i) the planning of new roads to solve problems of congestion on some roads, (ii) to relocate certain urban functions like market and parks and any activity which requires high accessibility, (iii) also it act as a determinants of traffic congestion on the Olembe-Nkometou 1 stretch of road.

Daily Variations.

Traffic congestion in the study area varies from Monday to Sunday. The frequency of traffic congestion in the study matrix is higher on Fridays, Saturdays and Sundays. During these days, traffic flow is very high and risk of traffic congestion.

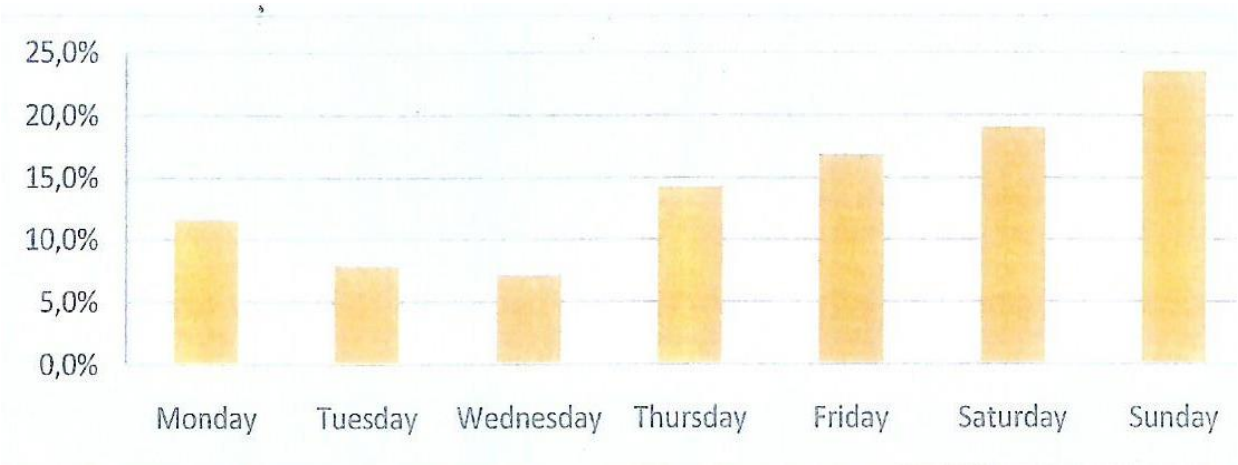


Figure 5: Frequency of traffic flow by days of the week in the study marix.

Source: Fieldwork, 2023

Fridays, Saturdays and Sundays fall within weekends. On these days, many people travel using the National road N^{o}.4. People travel to their villages for funerals as typical of the Bamileke. People on return often result to traffic congestion along that stretch of road.

Period of the day.

Having statistically analyzed traffic congestion along the Olembe - Nkometou 1, stretch of road in the study marix, found that congestion occurs mostly on the road between the hours of 7 a.m.-11 a.m. in the morning and 4 p.m.-8 p.m. in the evening with its highest peak experienced at Akak-Nkozoa. This location is a critical congestion area where a network of road is very narrow. This was proven after a traffic flow investigation along the Olembe-Nkometou 1, segment of the National road No; 4, Yaounde was carried out.

Traffic flow investigation

Understanding fieldwork on traffic flow entails investigation or finding out changes in traffic volume over time and the pattern of movement of goods and persons between settlements over time. It is achieved through counting

The significance of traffic flow investigation lies in the fact that it helps in (i) the planning of new roads to solve problems of traffic congestion on some roads, (ii) to relocate certain urban functions like markets and parks and any activities which requires high accessibility.

Pedestrian and traffic counts are two significant examples of this enquiry skill. Start by brainstorming on where and how the traffic flow will be investigated. Appropriate methods for recording the counts should be discussed including the layout of recording sheets, instructions and the necessary information required identifying the sheet following the count (i.e. time, date, location and name of recorder).

EXAMPLE OF A TRAFFIC FLOW INVESTIGATION ALONG THE OLEMBE – NKOUMETOU 1 SEGMENT OF NATIONAL ROAD N^{O}: 4, YAOUNDE DONE BY THE RESEARCHER

This investigation was coordinated and solely carried out by the Researcher.

Preparation

After choosing the topic for investigation, the following preparations were made:

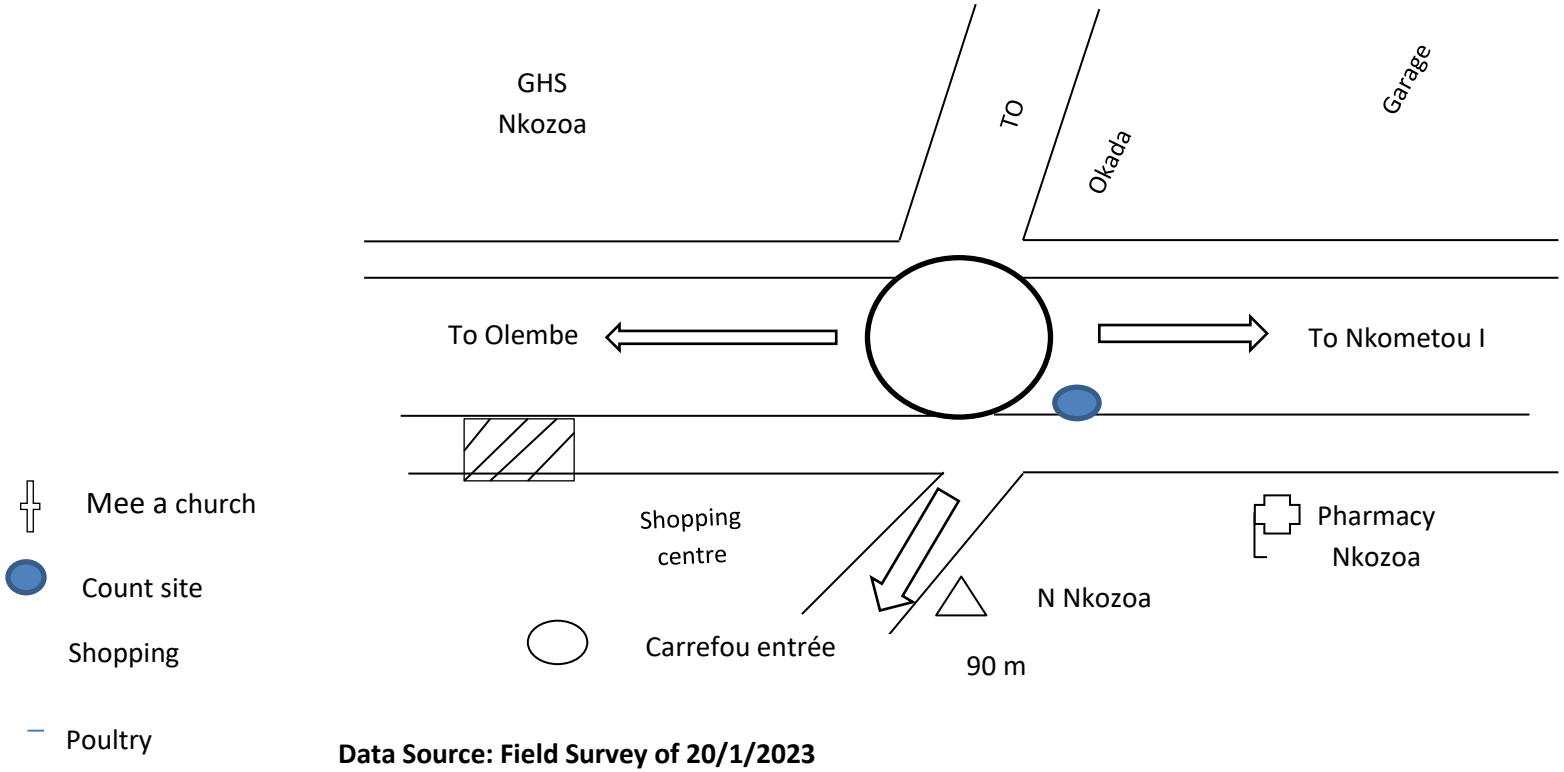
- The objective of the field work exercise was conceived.
- The hypothesis was formulated and after deciding on the type of data needed. The researcher proceeded to get the material required to collect the data such as GPS receiver, stop watch, whistle, a phone etc.
- A traffic flow recorded sheet was designed before going out for the field work exercise.
- Feasibility studies were made at the site where the count was to be done
- A base map of the city of Yaoundé was collected from the National Institute of Cartography, Yaoundé to locate and choose an appropriate site for the field research.

Location of site

According to the reading of the GPS received, the site of the investigation is located at latitude $3^{0}57^{1}58^{11}$N and longitude $11^{0}32^{1}29^{11}$E, along the Olembe-Nkometou1 road axis in the Soa Sub Division in the Centre Region, Department of Mefou and Afamba as seen on the sketch map below:

Location of Traffic flow count site along the Olembe-Nkometou 1 road axis

SKETCH MAP



Data Source: Field Survey of 20/1/2023

Figure 6 : Location of traffic flow count site along the Olembe-Nkometou I road axis

Precisely carrefour Nkozoa (Entry Ministe) was the base location for the traffic fow counts. It is located at an altitude of 747m yd a…s. To the north of the site is the Nkozoa lake, lycee Bilingue NKozoa and Phamacie Nkozoa. To the west is the Akam Bilingual Academy and to the East is the centre de soins Ambuatoire betta heath

Problem: How does the volume of traffic vary between Olembe and Nkometou1?

Objective: To investigate changes in traffic volume from morning (8am) to 11am along the Olembe-Nkometou 1 road axis

Hypothesis: The investigation was carried out on the assumption that traffic volume decreases with the passage of time

Type of data needed: To test the hypothesis, the researcher needed data on a number of vehicles at the top of each hour.

Type of material/Equipments Needed: A tally chat to record the count, a watch to determine the start and end of count times, a stop watch to determine the duration of the counting process (30 minute each), a whistle to signal the start and end of each count phase.

Method of Data Collection:

Sampling was used where a specific site was chosen where the count was to be conducted.

The researcher was in charge of counting incoming cars and outgoing cars.

The different types of vehicles were observed, identified and counted. In effect, the researcher had the challenge of identifying the type of cars and the researcher was to record using a stroke under the corresponding type of vehicles. To facilitate the count, stroke were grouped in five (Tallying)

The watch was used to identify the start and the times of each counting phase, which lasted for 30 minute

Data Processing:

All the type of vehicles were summed at the top of each hour and the overall total of a vehicles for each hour

Table 3: The table shows recording traffic count over time.

Table for recording traffic count over time Location of count: ……. Kind of road: tarred road ……un tarred road …….. Date …….Time…….. Vehicles travelling towards ……. From ……..							
	Private cars	Township Taxi	Buses	Pick-ups And vans	Trucks	Motor cycle	Total
730 -8am							
830-9am							

930-10am							
1030-11am							
1130-12							
Total							

Data Presentation:

Table 4: The incoming and out going cars within a given period of time along the stretch of road

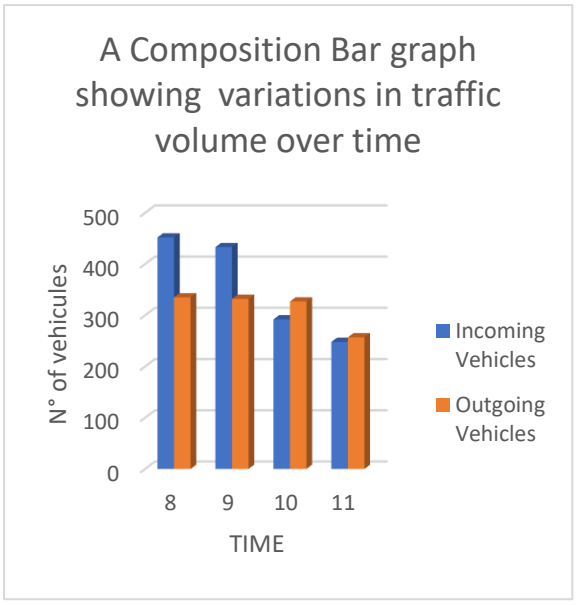
Incoming vehicles

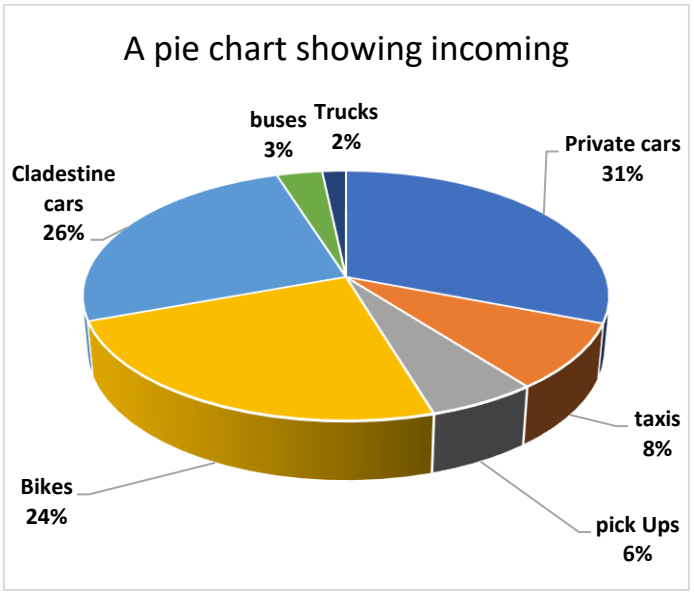
Time	Private cars	Taxis	pick Ups	Bikes	Cladestine cars	Buses	Trucks	Total
08:00	100	29	17	163	123	14	6	452
09:00	128	38	21	98	129	12	7	433
10:00	106	28	22	48	64	15	9	292
11:00	106	28	23	34	50	5	2	248
Total	440	123	83	343	366	46	24	1425

Outgoing vehicles

Time	Private cars	taxis	pick Ups	Bikes	Cladestine cars	buses	Trucks	Total
08:00	85	28	15	71	110	22	4	335
09:00	97	18	20	88	92	7	10	332
10:00	98	30	18	59	100	11	11	327
11:00	74	32	11	49	79	5	7	257
Total	354	108	64	267	381	45	32	1251

Source: Fieldwork (2024)





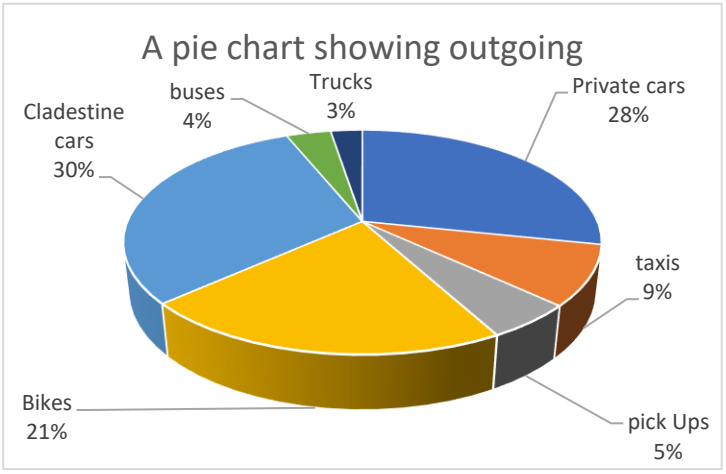


Figure 7: A Composition Bar graph showing variations in traffic volume over time

Figure 8: A pie chart showing incoming vehicles

Figure 9: A pie chart showing outgoing vehicles

Data Source: Field Survey of 20/1/2024

The information received on each type of vehicles was summed and represented on a bar graph above. From the above graph, the following result emerged;

Generally speaking, traffic volume reduces with time both for incoming and outgoing vehicles (from 8.am to 11.am. Though both incoming and outgoing vehicles reduces with time, there were more vehicles moving towards the city center. For instance, at 8.am, we had 452 incoming and 335 outgoing vehicles. Also, towards the end that is 11am; we had 275 incoming and 257 outgoing vehicles.

In a nutshell, traffic volume decreases with time. This confirmed the idea that was in mind before the field work exercise was carried out.

2.5.2. Monthly Variations.

Traffic flow and traffic congestion in the study area vary by months of the year. The peak traffic flow and road traffic congestion are recorded from September to December. Traffic flow and traffic congestion are also high in January, May and August in the study matrix.

Traffic congestion are high in these months for a number of reasons. In January, people are returning to their various towns and villages after Christmas feast. The months of May-June, August-September, November and December are months of high mobility. Students going back to schools and several people travelling for end of year festivity (Christmas and New Year). These months experience peaks of traffic flow along these roads. Consequently, traffic congestions are very frequent. An interview granted to the Commissioner of the Nkozoa police station (2023) confirms to the findings.

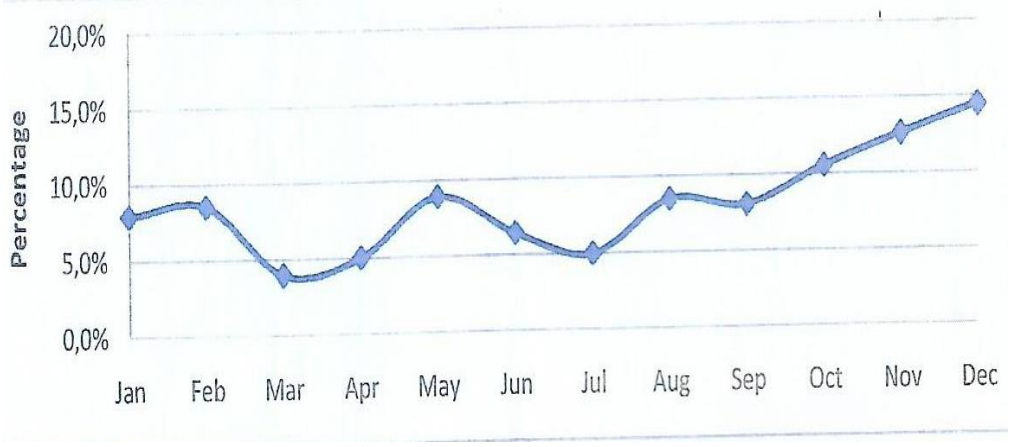


Figure 10: Traffic flow per months of the year.

Source: Fieldwork, 2023

2.5.3. Seasonal variations.

The frequency of traffic congestion in the study area varies by seasons. There are two main seasons in Cameroon; dry and rainy seasons. Traffic congestion is higher during the rainy season than in the dry season. The months of June, July, August and September correspond to the rainy season in the study area. During these months, the roads are wet and slippery, fog reduces visibility. Thus, increasing the risk of traffic congestion. An interview with the commissioner of the Nkozoa police

station (2023), corresponds to this findings. During the rainy season, traffic control in the study area is intensified especially in September as traffic congestion is frequent.

People move along the Bafoussam-Yaounde National road N^{o}: 4 for several reasons. Generally, people move between these towns for education, health, business, visits, administrative and others. Field work investigations show that people move between Bafoussam and Yaounde mainly for administrative reasons.

Conclusion:

This chapter demonstrates that traffic congestion in the northern section of Yaoundé result from multifactorial challenges, such as rapid population growth, gaps in road infrastructure, and traffic management issues etc. The importance of Geographic Information Systems in identifying and highlighting the underlying causes of this congestion can be emphacised while providing an ideal framework for proposing decision-making tools (map) relating to integrated solutions for improving urban mobility. Thus, traffic congestion is a serious issue along the Olembe-Nkometou 1, stretch of road that causes several problems for commuters on day to day basis. So traffic problem is one of the major problems that need serious attention on that stretch of road. It is a real issue of concern in the lives of those who ply that stretch of road on day to day basis. It consumes so much of their time and energy unnecessarily and is not preferred by anyone. Measures also need to be taken to control population growth which is a major cause of increasing number of vehicles on that stretch of road in the study matrix. Also, serious measures need to be taken to control traffic and promote the use of public transport. Development of public transport network at economic rates is essential. Traffic safety rules by traffic police is a must and should be effectively implemented for the safety of the commuters. People should drive more responsibly, use public transport and opt for car pool whenever possible. The effectiveness of such measures also depends on the people of Yaoundé and proper imposition of laws. Hence we all can work in this way to solve the big threat of the current time.

CHAPTER 3

POOR TOWN PLANNING AS A DETERMINANT TO TRAFFIC CONGESTION IN THE NORTH OF YAOUNDE

3.0 Introduction

The overall aim of development planning is to enable us understand the strategic measurable goals that a person, organization or community plans to meet within a certain amount of time.. The urban development plan works to address housing, economic development, and environmental sustainability issues. The ultimate goal of urban planning is to create livable, healthy, and thriving communities that meet the needs of all residents, now and in the future. This chapter is in attempt to verify hypothesis two which states that if the development programmes were well executed, we could not talk about traffic congestion along the Olembe-Nkometou 1, stretch of road.

In view of the foregoing, this chapter is organized into five parts as follows:

- Examine the urban development plans that exist for Yaoundé
- Gaps in urban development plans (poor orientation of these programmes that leads to the expansion of Yaoundé).
- Reasons for these programs not well executed.
- To what extent have these programmes being executed that cause's traffic congestion?
- Conclusion

3.1. Examine the urban development plans that exist for Yaoundé

Established at the initiative of a public body, the purpose of urban planning documents is to specify the rules affecting the allocation and occupation of land (mostly for buildings). They are enforceable on public or private persons. In Cameroon, urban planning documents determine the conditions that make it possible to organize space, plan travel needs, preserve agricultural activities, protect forest areas, cultural heritage, natural or urban sites and landscapes., to prevent natural risks and technological risks, as well as pollution and nuisances of all kinds. These documents, of which the Land Use Plan (POS) is a part, must allow sufficient planning of building spaces for economic and general interest activities, as well as for the satisfaction of present and future housing needs and public facilities. As such, the decentralization laws and the powers transferred allow communities to define the specific rules that will apply to their territory, through the development of urban planning documents. Urban planning documents replace the general rules of urban planning defined by law No. 2004/003 of April 21, 2004 governing urban planning. In Cameroon, all municipalities and district municipalities should have a land use plan, the provisions of which must be compatible with the guidelines of the Urban Master Plan (PDU) if there is one (Article 38 of the same law).

3.1.1. Urban master plan

The Urban Master Plan is a document that sets the guidelines; fundamental development of an urban territory, the general destination of soils and the equipment programming. The graphic documents of the Town Planning Master Plan are drawn up on a scale between 1/20,000th and 1/25,000th. The Urban Master Plan is drawn up for the Urban Communities and for groupings of municipalities whose development requires action concerted. The initiative to draw up an Urban Master Plan belongs to the Mayor of the municipality or a group of municipalities concerned. The Urban Master Plan is prescribed by order of the Minister responsible for urban planning or the Minister in charge of urban issues as the case may be, under the conditions set by regulatory route. It is carried out under the authority of the Mayor of the Urban Community. The studies of the Town Planning Master Plan are monitored by a technical committee of management, the composition and operation of which are fixed by decree. The Urban Master Plan is approved by order of the Prefect of the department concerned, or by joint order of the Prefects of the departments concerned. Consular chambers and natural park management bodies and regional are consulted when establishing a Master Plan. The reports produced by these bodies are taken into account and possibly; appended to urban planning documents. Local user associations are consulted, at their request, to the development or revision of an Urban Master Plan.

Urban Planning Document (DPU) make it possible to rationalize the use of space, control travel needs, preserve agricultural activities, protect forest areas, cultural heritage, natural or urban sites and landscapes, to prevent natural risks and technological risks, as well as pollution and nuisances of all kinds. These DPU, including the PDU, must make it possible to provide enough building space for the deployment of economic activities and activities of general interest, as well as for the satisfaction of present and future needs in terms of housing and public facilities. As such, the laws on decentralization and urban planning allow communities to define the specific rules that will apply to their territories, through the development of SPS. In particular, law no. 2004/003 of April 21, 2004 governing Urban Planning in Cameroon, prescribes the development of DPU to determine the conditions of use and control of urban space in a municipality. According to its articles 32 and 33, the PDU fixes the fundamental orientations of the development of an urban territory, the general destination of the grounds and the programming of the equipment. It is developed for urban communities and for groups of municipalities whose development requires concerted action. Alongside the latter, there is decree no 2008/0736/pm of 23 April 20008 setting the procedures for drawing up and revising DPUs which prescribes in its article 29 that the procedure for revising a DPU takes place at the end of the period of validity.

3.1.1.1. Reminders of the procedure for preparing the PDU.

Like any planning document, the procedure for formalizing and developing the Yaoundé urban master plan for 2035 (PDUY-h2035) follows a formal process.

PDU DEVELOPMENT STEPS

The development of the PDU in Cameroon follows the following steps;

- The initiative for the PDU development process belongs to the mayor and , if necessary, to the minister responsible for urban planning;
- Prescription; the PDU is prescribed by order of the minister in charge of urban planning.
- The simultaneous realization and publicity of the studies; the studies of development of the PDU just like those of the other DPU are led by the mayor. These studies are on the part of the latter, the subject of sufficient publicity, by all available means, including public enquiry, to allow all public and private bodies, populations organized in local associations of users and urban land initiative groups (GIFU) in the area studied, to contribute to the development of the said document. The monitoring of the development of the PDU is ensure by a technical steering committee (COPIL) composed of the mayor (president) or his representative, the representative of the minister responsible for territorial planning (rapporteur) and members who are;

- One (1) representative of the minister in charge of domins;
- One (1) representative of the minister in charge of the cadastre.
- One (1) representative of the minister in charge of urban planning.
- One (1) representative of the minister responsible for the environment;
- Three (3) representatives of the commune(s) concerned;
- One (1) representative of the national order of urban planners of Cameroon;
- One (1) representative of the national order of architects of Cameroon;
- One (1) representative of the national order of surveyors of Cameroon;
- One (1) representative of the national order of civil engineers of Cameroon;
- One (1) representative of local population associations

The president can invite any other person to take part in the work of the COPIL, because of his competence on the questions to be examined. An order from the prefect of the department concerned establishes the composition of the said committee. The COPIL cannot have more than 25 members. It meets when convened by the chairman in order to examine and approve the documents submitted to it. The operating costs of the said committee are charged to the budget of the initiator of the project. The committee is dissolved upon approval of the PDU.

- The public planning survey; the populations organized in local user associations and the GIFUs are consulted, all questions concerning urban planning forecasts;
- The public planning inquiry takes place when the initiator of the DPU considers that the state of progress of the related project is significant enough to be submitted to it. It publishes at its own expense, in at least one national newspaper, a public inquiry runs for a period of thirty (30) days from the date of publication of the notice.
- The opinion of the local technical town planning services;
- The deliberation of the Municipal Council;
- Transmission of the project to the competent authority for approval; after deliberation by the Municipal Council approving the project, the complete file of the PDU is transmitted to the competent approval authority (the prefect of Mfoundi in the case of Yaoundé) . The latter has a period of sixty (60) days, from the date of its discharge, to approve it officially or to express its reservations. After this period, the document is deemed approved;
- The composition of the PDU file.

3.1.1.2. Composition of the PDU

According to article 2 (paragraph 2) of decree N°2008/073/PM of April 23, 2008 fixing the methods of elaboration and revision of the DPU, the file of the PDU, like any other DPU in Cameroon, consists of documents following;

- A supporting report, which makes an analytical synthesis of the situation on the geographical, natural, environmental, urban, economic, demographic, financial, and institutional levels. It mainly proposes a spatio-temporal programming of the equipment, a structuring of the territory and its functioning;
- Graphic documents, which present in a synthetic way the inventory of fixtures of the infrastructures, the equipment, the urban fabric and the urban morphology. In the form of a development proposal, the urban structure, the general destination of the land, the extension zones, the location of the main activities, equipment and viable networks;
- An urban planning regulations which establishes a field of application and makes the spatial distribution of the development zones (urban and activity zone, rural zone, natural zone, etc.) with the general conditions of use or land use. For each sector or zone, the regulations also deal with the types of prohibited occupation or use of the ground, accessibility and access to roads and various networks, the size of the building plots, the maximum possibilities of using the ground (Land Occupancy Coefficient (COS) and Ground Coverage Coefficient (CES), the height of constructions, the rules for setting up a property and the separating limits between properties;

- Any annexes

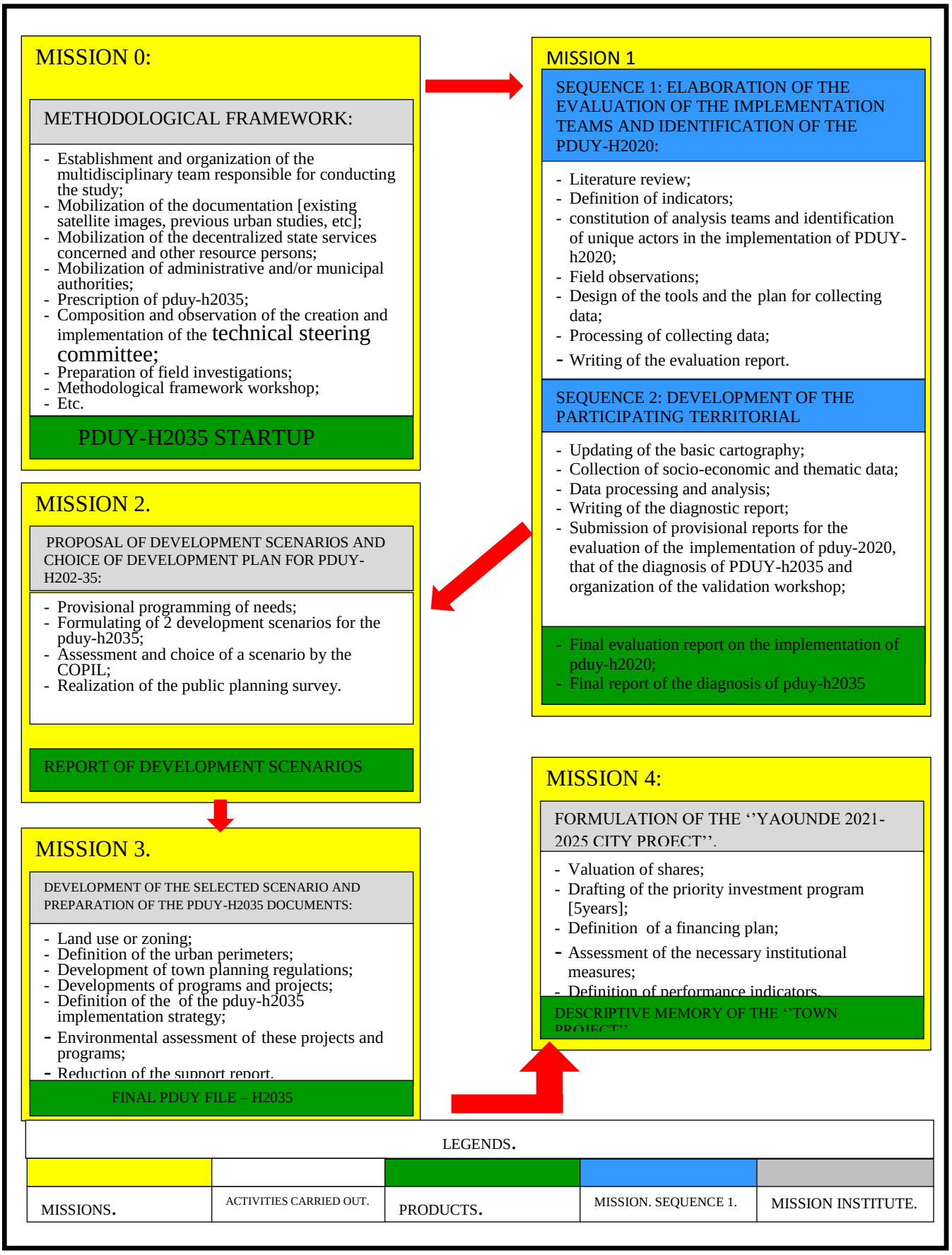


Figure 11 : Block diagram of the PDUY-h2035 development methodology

Source: G2 Design / ETS Integral, 2021

3.1.2 The land use plan

The land use plan is a document that sets land use and the rules which govern it for the medium term (10 to 15 years). It defines the perimeter of each of the assigned areas and enacts, for each of them, the rules, restrictions and easements specific land uses. The graphic documents of the land use plan are drawn up on a scale between 1/5,000th and 1/10,000th. All urban centres, all urban municipality and urban district munipality must have a land use plan. The provisions of the land use plan must be compatible with the guidelines of the urban master plan, if there is one. The initiative to draw up a land use plan belongs to the Mayor or if necessary, to the Minister in charge of Town Planning or to the Minister in charge of urban as the case may be, under the conditions set by regulation. It is prescribed by Prefectural Decree and drawn up under the authority of the Mayor. Work to draw up the Land Use Plan is monitored by a committee steering technique chaired by the mayor, whose composition and methods of operation are set by order of the minister responsible for Urban Planning or the minister in charge of urban issues as the case maybe. Under the conditions sets by regulations, this committee monitors the work to ensure compliance with the regulations, the rules of the act and the options selected. The Land Use Plan is approved by Prefectural Order after deliberations by the Municipal Council and opinion of the Local Town Planning department for those in charge of urban as the case maybe under the conditions set by regulations

Defines land use and the rules governing it for a period of 10-15 years, aim to control the urban planning of the territory. Its objective is to control the Town Planning of the territory, organizes the future of the territory and is enforceable against third parties. The POS organizes the urban fabric by defining the destination of buildings and densities. It locates the locations reserved for the construction of equipment and protects the natural and agricultural areas. It delimits urban areas taking into account in particular the agronomic value of the soil and the existence of land areas producing quality food stuffs higher or with special equipment. It fixes for each zone or part of the zone, depending in particular on the capacity of the collective facilities that exist or are in the process of being realization, and the nature of the constructions to be built. It sets one or more occupancy coefficients for the soils, which possibly determine for each type of construction the density of the construction admitted. The POS delimits the areas or part of the areas in which the on-site construction or development of existing buildings may be for urban planning or architectural reasons. He can be imposed or authorized with a density at most equal to that which was initially built. The POS specifies the layout and characteristics of the traffic lanes to be maintained, modified or create. It delineates the districts, streets, monuments, sites and sectors to be protected or enhance for aesthetic, historical or ecological reasons. It delimits the sectors in which the issuance

of the building permit may be subject to demolition of all or part of the existing buildings on the land, where the location of the construction is considered. The POS sets the locations reserved for public roads and structures, installations of general interest, as well as green spaces. It locates in urban areas, cultivate land at protect and inconstructible regardless of the equipment that serves them. It defines the rules concerning the rights to locate constructions, their destinations, the natures, their external aspects, their size and the layout of their surroundings. It suggests the limits of urban perimeter.

Thus, the Land Use Plan (POS) is a reference document used to issue Town Planning Acts. It makes it possible to control future installations and thus to consider:

- Control the types of occupation to promote urban diversity or, on the contrary, prohibit inappropriate activities and types of housing in certain neighborhoods (polluting industries, large warehouses, etc.);
- Regulate forms and methods of construction for a harmonious urban landscape (footprint, setback, height, etc.);
- Create easements for planned future developments, nature reserves, risk areas;
- Boost the attractiveness of certain neighborhoods through the development of public spaces and socio-collective facilities.
- According to article 37 of this law, the POS fixes land use and the rules governing it for the medium term. It defines the perimeter of each zones of allocation and enacts, for each of them, the rules, restrictions and particular easements of land use.

3.1.2.1. Composition of the POS

According to article 2 (paragraph 2) of decree No 2008/073/PM of 23 April 2008 setting the terms for the development and revision of urban planning documents, the POS is made up of the following documents;

- A supporting report, which analyzes the existing situation on the demographic, urban, economic, financial and institutional levels and which establishes a prospective of the structuring elements of the territory and its functioning allowing to arrive at the adopted development plan and its justification. The development prospects of the territory concerned are established and taking into account its relations with the surrounding territories.
- Graphic documents, which analytically illustrate the inventory of infrastructure, equipment, morphology and urban fabric. And in the form of a development

proposal, the urban structure, the general destination of the land, the extension zones, the location of the main activities, equipment and viable networks;

- A regulation which establishes a field of application and makes the spatial distribution of the development plan (urban or activity area, rural area, natural area, etc.) with the general conditions of use or occupation of the land. Also for each sector or zone, the regulations deal with the types of prohibited occupation or use of the ground, the accessibility and access to roads and various networks, the size of building plots, the maximum possibilities of using the ground (COS and CES), the height of constructions; the rules for setting up a property and the dividing lines between properties;
- Additional documents.

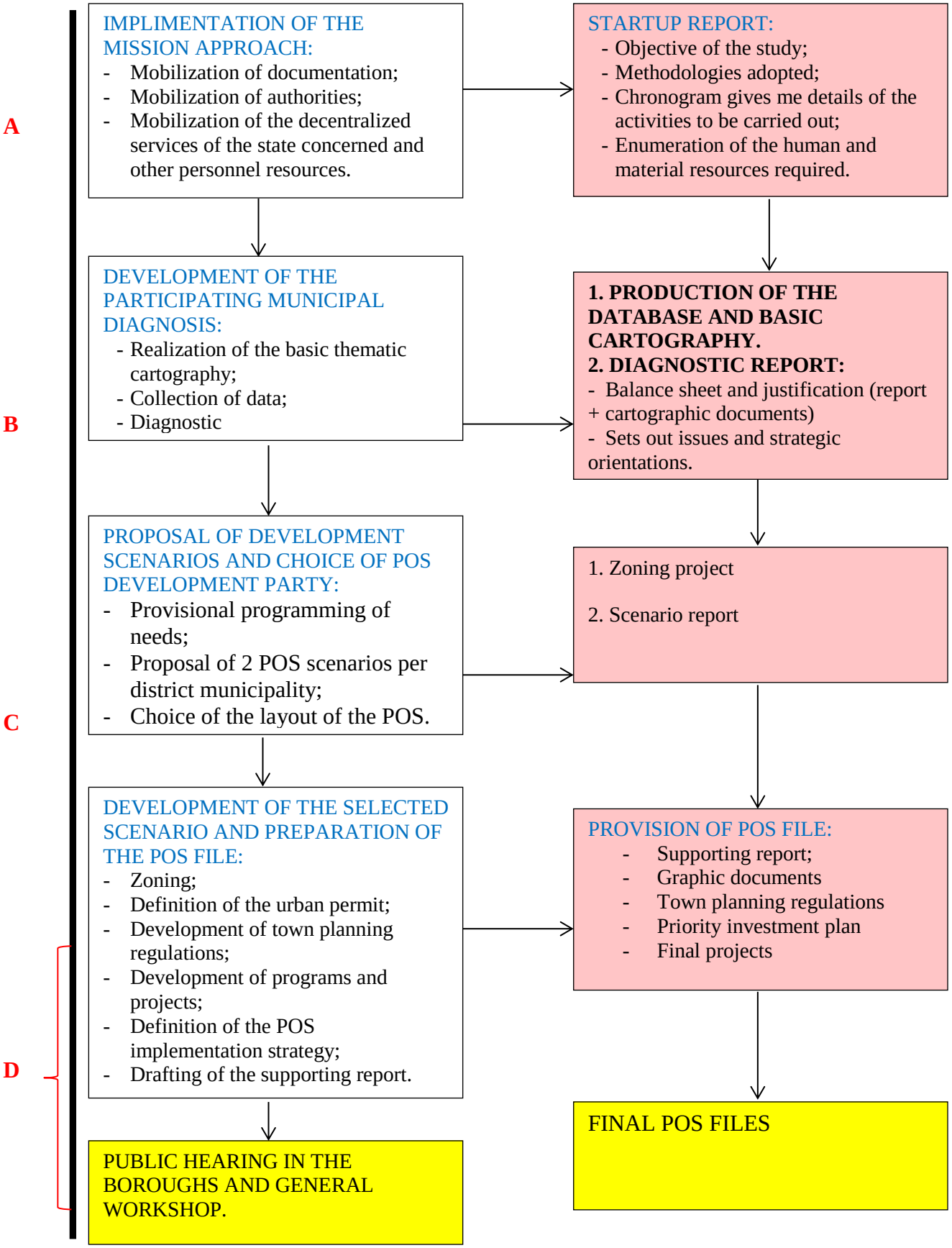


Figure 12: Synoptic diagram of the progress of the Yaoundé POS development study

Source: G2 Conception International – June 2020.
Urban community of Yaoundé

3.1.3. The Sector Plan

The sector plan is a document which, for part of the agglomeration, specifies the details of the organization and technical methods of land use, the equipment and reserved spaces, and the technical and financial characteristics of various infrastructure works. The graphic documents of the sector plan are drawn up at a scale comprised between 1/500th and 1/1000th. The sector plan is drawn up for a part of a locality covered by a plan of land use. The provisions of the sector plan must be compatible with the orientations of the land use plan and in accordance with the latter; he must take into account the necessary coherence of the whole agglomeration. The regulations of the sector plan enact, in detail, the prescriptions relating to easements, location, access, layout and appearance of buildings in the area concerned. The initiative of drawing a sector plan belongs to the mayor. It is prescribed by municipal degree, after deliberation of the municipal council and opinion of the local services of town planning or those in charge of urban issues as the case may be, under conditions fixed by regulations. The sector plan is drawn up under the authority of the mayor and in accordance with the provisions of article 31. It is approved by municipal degree and in accordance with article 30.

It is a document which specifies in detail for a part of the agglomeration (an island), the organization and technical methods of land use on the plot, the equipment and the reserved spaces and the technical and financial characteristics of the various works and infrastructure. It is an infra-territorial 'pre-operational' document. It must determine the particular modes of land use, the final layout of both the main and secondary roads, excluding roads intended only to serve buildings at the interior of the island. He determines the places reserved for public roads and services, installations of general interest, to green or wooden spaces, the rules and easements of consecutive constructions. The characters of the places, their vocation, their proposed function in relation to the urbanized whole (size of constructions, prospects, right-of-way and easement in the vicinity, fenced areas). It determines the particular measurement relating to certain islands said to be of an evolving nature (frame home). The modalities of renovation or restructuring of the blocks, determines a plan of various networks, the order of urgency of the operations provided for in the plan.

3.1.4. Summary Urban Plan

While waiting to adopt a land use plan, the municipalities have the possibility of drawing up a simplified planning document called Summary Plan of Town Planning. The Summary Urban Plan is a document that determines land use and defines the parameters of each of the assigned areas. It enact summarily for each among them, the roles, restrictions and special landuse easement. The graphic document of the Summary Urban Plan is drawn up on a scale between 1/5,000th and

1/10,000th. The provisions of the summary urban plan must be compactable with the orientation of the urban master plan, if there is one. The initiative for drawing up a Summary Urban Plan belongs to the Mayor.

3.2 Gaps in urban development plans in Cameroon

Urban planning in Yaounde and Cameroon in general is enshrined with good laws and regulations. The challenge lies on inadequate implementation of these Town Planning Laws and insufficient competence of personnel. Urban planning in Yaounde is practiced under the Town Planning Law No 2004/003 of April 2004. This law stipulates that the main document guiding development is the Master Plan and the Land Use Plan. These two documents are not adequately put to use in Yaounde.

3.2.1. Obsolete master plan

The Master Plan is a document which lays down the basic guidelines for developing a given urban area, the general use assigned to land and the schedule for the provision of amenities. The August 1982 Master Plan, though outdated, is the only document available, even though it was never implemented. Unfortunately, nothing has been done till date to update and make it a working tool in town planning practice. Theoretically, all these institutions are enshrined with good laws and regulations. But the challenge lies in inadequate implementation of these town planning laws. Even the putting in place of a Master Plan which is a document that lays down the basic guidelines for developing a given urban area has not helped things.

3.2.2. Insufficient implementation of land use plan

The land use plan, which is a document drawn up to define the allocation of land and the rules governing such allocation in the medium term defines the area of each of the allocated land and spells out the rules and special land use restrictions. Field studies indicate that this document is poorly put in use in Yaounde.The poor implementation of this significant document makes it problematic for satisfactory urban planning to be accomplished in Yaounde. 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 Yaounde. The only document that is put to function to a certain degree by urban planners in Yaounde is the Sector Plan. The Sector Plan, just like the name, deals only with sections of the town. It gives detailed specifications for the organization, technical terms and conditions of land use equipment, reserved areas and the technical and financial characteristics of the various infrastructure works. The Yaounde City Council admitted to the fact that it has implemented some Sector and Layout plans. Examples of such plans are the built up areas of Olembe and Emana which are about 62 km by road away from the Yaounde city center.

Unfortunately the Master Plan which is supposed to determine the compatibility of this sector plans with other land uses and to ensure uniformity of the town is outdated and was never respected in the first place. The noncompliance to these vital documents makes it difficult for proper town planning to be practiced. Henceforth, land uses have favoured sprawl forms, without considering their compatibility with the ecosystem.

3.2.3. Impact on master plan.

The main planning tool used by the Yaoundé City Council is the Master plan, contained into the Master Plan for Development and Urban Planning (SDAU) conceived in the ’80. The document states almost all the aspects of land use, land possession, although from a 1974 law, all the land belongs to the State. The limits of this tool is that, as it tries to translate government policies into spatial form, the appropriation and the context do not really match with the aspirations of the populations. Moreover, even before its real implementation, the *SDAU* is already out of norms because of the fast growing population that implies a new land redistribution zoning scheme.

To better cope with the key issues of Yaoundé, it would be better to do a combination of the Strategic spatial planning and a city development strategy (CDS). In fact, because the Strategic spatial planning can shape a desired future direction of urban development, it would help withdraw the negative effects of self-organization that prevails in Yaoundé with the failure of correction tentative. This can help taking into account the rapid changes the City is undergoing due to global forces. Moreover, this SSP can help define visions and strategies to improve city competitiveness.

One of the main problems of Yaoundé is the lack of appropriation of the City objectives by city dwellers because of the insufficiency of the decision-making process. The population does not at all feel concerned with the changes brought to their day-to-day living conditions. By putting in place a collective vision and strategy among stakeholders (government, community, private sector), the CDS will provide a broad framework for local decision making and involve participatory planning processes and partnerships. In this way, the decentralization process actually in Cameroon will be very useful for the implementation of effective local government institutions and leadership, committed to creating such a participatory process necessary to the putting on of this CDS.

3.3 Reasons for this programmes not well executed.

3.3.1. Misuse of urban planning tools.

Urban planning tools are processes put in place to realize the provisions of the different planning guidelines. In order to ensure adequate implementation of urban planning guideline, tools, such as building permits, town planning certificate, and development control are used. The town planning certificate is a document which provides information on the rules governing town planning and administrative rights applicable to a piece of land. This certificate is awarded by the mayor of the relevant council upon technical recommendation of the local urban planning service. For this certificate to be awarded, field inspection is usually carried out by the technical team to determine whether the land use of that area differs from what the developer intends to build. After confirming this, the developer further applies and obtains a building permit, which is an administrative instrument authorizing a building to be put up after ensuring that it complies with building standards and the town planning regulations? Technical and field studies are carried out by the Regional Delegations of Land tenure and State Property, Surveys, Urban Development, Health and finally the City Council who may or may not issue the building permit. The problem here lies in the fact that adequate studies by the technical staff before issuing these permits are not carried out. As a result, town planning certificates and building permits are issued to developers in risk-prone areas. Field studies indicate that some developers in Damas and Mbankolo neighbourhood which are vulnerable to landslides and floods have been granted building permits. Again, many of the buildings that collapse in the Mbankolo neighbourhood had not been marked for demolition. Authorities in Yaounde are not doing enough to demolish houses in high-risk zones susceptible to floods and landslides, considering the fact that mudslide during the rainy season are frequent in Yaounde, a hilly city where sometimes precarious dwellers are built.

3.3.2. Inadequate qualified staff

Another puncture resides with inadequate qualified staff in the city council. The Yaounde City Council cannot effectively carry out development because of inadequate and mismanagement of funds. As a result, they cannot employ enough qualified staff in the town planning section of the City Council. The technical office that is in charge of urban planning is manned by few surveyors, assisted by untrained field workers. This has led to the poor implementation of town planning rules and regulations. For example, development control, which is a tool to regulate and control development, has various stages of applications and the final of them all is demolition. If the City Council had carried this out properly, they would have demolished all the houses constructed in

risk-prone zones. This, however, would invoke a social problem. Under the circumstances, it is better to prohibit the springing up of settlements at such risk-prone sites as the social factor will come into play once the houses have been built.

3.3.3. Insufficient exertion of functions

The Delegation of Urban Development and Housing is not doing much in coordinating and advising the City Council. The only activity in which they are very active is the studying of application files for the issuing of planning certificates and building permits. Therefore, the main function of the Delegation of Urban Development and Housing is more about signing and approval of documents. Field visits, for instance, are aimed mostly at identifying the owner of the plot and the boundaries. These field visits are equally aimed at issuing town planning certificates and building permits. Very little is being done in the domain of environmental studies in order to determine which site is suitable for a particular land use. This can be seen in the non-respect of the outdated Yaounde Master Plan. Urban officials and the existence of a law in Cameroon that prohibites construction on land unsuitable for habitation, people continue to build houses on slope marshland and other harzadous areas. This is common in Yaounde where houses sprask up ever day on high risk zones and it may appear that municipal and other authorities are inactive. City dwellers are not sensitized about prohibited zones each time there is the demand for a building permit. Unfortunately recacitrants who build in prohibited zones are not purnished. In some prohibited areas, houses are demolished but rapid urbansation, lack of resources, and other socio-political constraint makes the task of municipal authorities challenging. Reducing the rate of construction on land unsuitable for habitation might appear difficult but as some experts puts it the synegy of action among the different institution groups and civil society may be profitable

3.3.4. Land ownership problems

Like other African countries, Cameroon suffers a profound right-to-land dualism between traditional and modern rights.There is an overlap between land use rights, customary rights and modern rights established by State law. With regards to tradition, the notion of individual land ownership does not exist. Instead, the traditional “owners” are considered managers of the land, and the land itself is considered communal or to a particular ethnic group. Nevertheless, traditional land rights and land occupation are not even throughout the nation. In fact, there are many different traditional land practices as a consequence of earlier intermingling of people from different areas of the country. The notion of allogène (immigrant or outsider in the community) is very strong in land matters and the ceding of traditional land to an allogène is a very long and challenging process. For

example, Biyem-Assi in Yaounde is occupied by allogènes (the Anglophones, who migrated from the North West and South West region of the country).

According to the Law, land without formal property titles belongs to the State even though the traditional occupants claim it for themselves because of their traditional rights. This condition validates the complexities involved in land use and land ownership conflicts; these complexities continue to be the main problems in land legalization since upgrading. In 1974, Cameroon adopted laws which provided a framework for the transformation of traditional into modern tenure rights, along with state management of the undeveloped lands. Based on these regulations, land is divided into three categories as below: Registered land belonging to the State. Registered private land (with a title deed 3).“Domaine National” (former traditional lands which are neither private nor belong to the State). However, the limited implementation capacities of the Ministry of Urban Development and Housing (MINHDU) have not allowed for effective enforcement of these laws. Only a small number of urban properties have ever been registered. A deed is any legal instrument in writing which passes, or affirms or confirms something which passes, an interest, right, or property and that is signed, attested, delivered, and in some jurisdictions sealed. S.D. Ngoran, X. Xue / Journal of Urban Management 4 (2015) 53–7264 plot production by the State is very limited, and the new unplanned urban developments have spread to the peri-urban area without rules and without official rights. There is an active market in untitled or illegally titled plots; this also is in part because of the absence of an updated cadastral.

Thus, Land in Yaoundé is under growing pressure for many reasons – powerful commercial interests, changing climate conditions and shifting demographic flows including mass migration and increasing population density. The rights of rural communities and indigenous people to access and use land for farming and grazing have been eroded – primarily due to failure to recognize customary land tenure rights, land use conflict and lack of effective local governance. The country`s land legislation is indeed outdated and not compactable with customary laws and local realities. To resolve these challenges, since the 1980s both government and nongovernmental organizations have trialed several initiatives. These have had mixed results, reflecting gaps in the legal framework. This briefing assesses these initiatives, and draws out recommendations to guide the current land reform process and ensure the rights of all are protected. From my findings and research, I can personally concludes that, despite the lessons and opportunities for intervention advanced, land tenure insecurity and land conflicts in Yaoundé could only be overcome, if the present structures and institutions of land management are modernized and restructured by stakeholders to benefit the majority. Land tenure security protects people against arbitrary forced eviction, harassment and

other threats. However, it is clear that there is no single land issue in the city of Yaoundé, but many different issues that may be linked in various ways. In the city of Yaoundé, policy instrument that affect resource use, potential and conflicts are numerous and highly varied. They include legislation, executive rules and regulations, financial instruments, public projects and programmed, environmental policy, and policy related to health and demographics. It therefore makes sense to adapt the use of instruments to the different causes of land tenure insecurity. The following instruments like inequality, institutional insecurity, outside encroachment, undermining of common property and internal conflicts are some of the causes of land tenure insecurity in the city of Yaoundé, Cameroon.

3.3.5. The high infux of population into Yaounde

Yaoundé, the capital city of Cameroon is situated at the Centre region. Yaounde's 2023 population is now estimated at 4,509,287. In 1950, the population of Yaounde was 31,644**.** Yaounde has grown tremendously in the last year, which represents a 3.98% annual change. These population estimates and projections come from the latest revision of the UN World Urbanization Prospects. These estimates represent the urban agglomeration of Yaounde, which typically includes Yaounde's population in addition to adjacent suburban areas.

Like in many other sub-Saharan cities, the urbanization of Yaoundé is a relatively new phenomenon, linked to the colonial administration. This historic fact has particularly shaped the land use for, the birth of the city was done out of any land planning management or system. The population of Yaounde has greatly evolved over the past decades up till the time when it became a real primate city in the Centre region. In the year 2000, the city had a total population of 1,538,192 inhabitants while Mbalmayo, the second town in the rank had only 61,788 inhabitants. The rest of the region has several small subordinate towns. This certainly emphasizes the primacy of Yaounde. The agglomeration of Yaounde originated from a Military Post under the German Administration in 1888 (Mougoue, 1984). A trend of the growth of the population can be traced from 1933 to 2012 (figure 15). At independence in 1960, the town was little more than a large agglomeration of 100,000 inhabitants. Between 1976 and 1987, it registered an urban growth rate of 6.86% as the administrative capital. In this way, the town has grown into a metropolis.

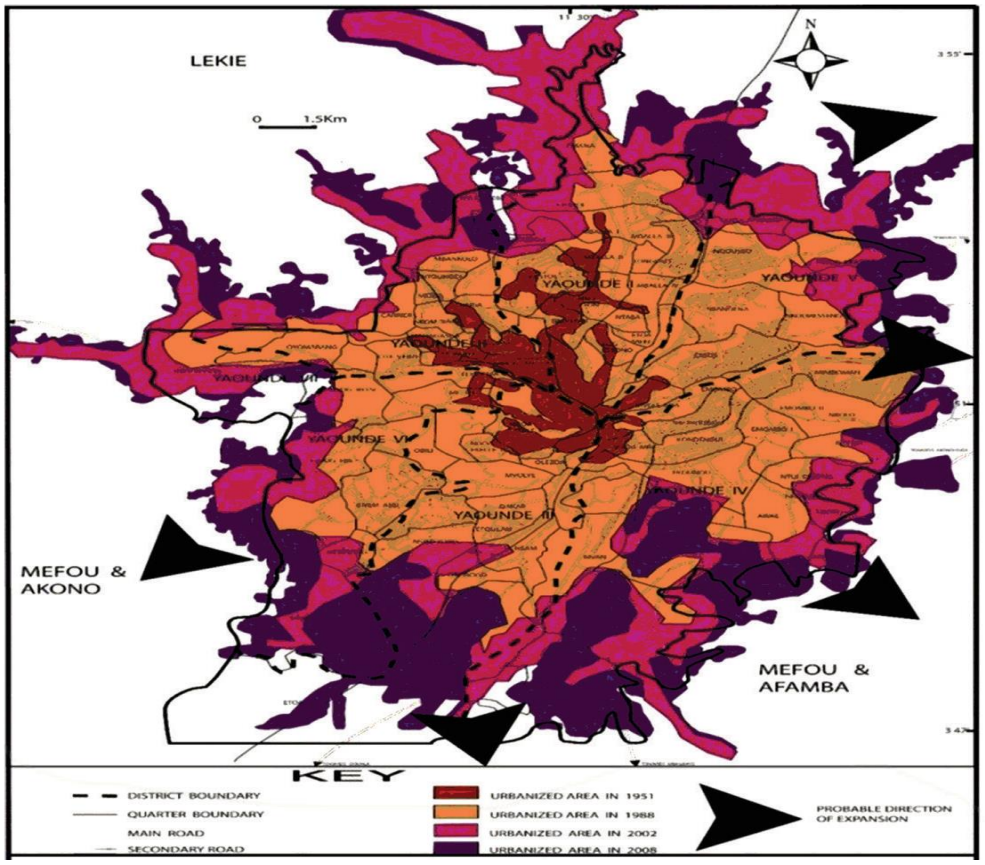


Figure 13: The spatial extext of urban space over the years

(Sources: Tchindjangetal., 2005; Mani, 2008; VaxelaireManuel 2010; Nkwemoh, 2011; Tchindjang, 2012)

A digital processing of satellite images and aerial photographs in the 80's till present date have permitted to establish with certainty that the sprawling tendency of Yaounde is far from ever coming to an end. It can however be said that a threshold is being reached when judging from the administrative point of view. The Yaounde metropolis is already overlapping the Mfoundi Division.

Indeed, Yaoundé, the political capital of Cameroon, is a city of about 4,509287 inhabitants which has experienced strong growth over the last three decades [more than 5 percent per year], a growth which has resulted in high occupancy of spaces. The radius of the city of Yaoundé increased from 3.5 km in the 1960s (Moussima, 2011) to more than 8 km in 1980 (Assako, 2011). In 2007, the city extended over more than 30 km on its North-South axis and over 17 km on its East-West axis (PDU Yaoundé horizon, 2020). Today, it overflows its official limits and spreads over the surrounding rural space. This phenomenon leads to many impacts, the most important of which undoubtedly concern the spontaneous, anarchic and unsustainable habitat of land and buildings. Additionally, there is an obvious incompatibility of land use due to poor location of activities, and poor allocation of space.

The immediate consequences of this spontaneous, anarchic and unsustainable occupation of land and buildings are;

• Land insecurity due to the fact that several boundaries and several land forms and vocations will be modified during redevelopment operations;

• Degradation of the natural environment through construction in vulnerable and at-risk areas, destruction of terrestrial and forest ecosystems, water and air pollution;

• The weakness of the local economy which leads to poverty, lower incomes, instability of local financial resources and public revenues;

• The degradation of socio-cultural resources, a source of organized crime, juvenile delinquency, instability and social inequalities.

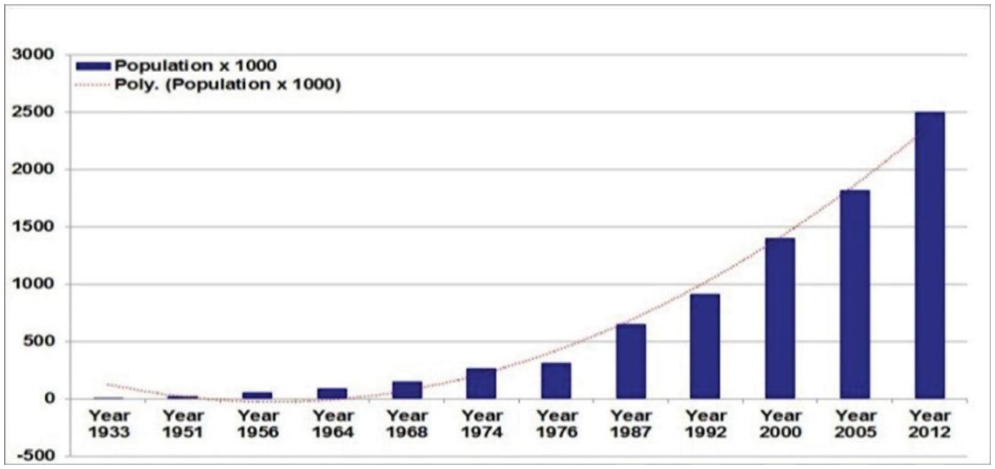


Figure 14: Populaion Evolution of the Yaounde metropolis.

(Source: BUCREP, 2010, Tchindjang, 2012).

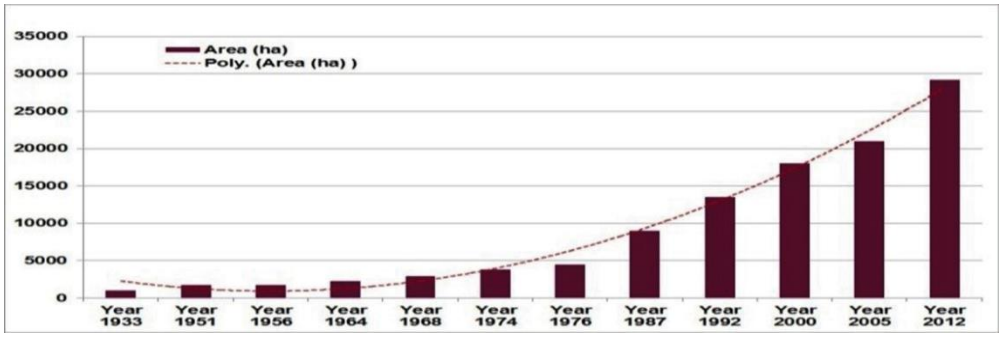


Figure 15: The expansion of Yaounde town from 1933-2012

Source: Augea international-iris conseil-arcauplan in sdau and pdl of Yaounde, 2001; Tchindjang et al., 2005; tchindjang 2012.

The spatial growth is as a result of gallopjng population of Yaounde.The urban network of the centre Region has Yaoundé as the hub. It is equally the result of the efforts of municipal authorities who are out to dislodge urban dwellers and reorganize chaotic areas in the city core. The massive expropriation of settlers and business men within the city centre is the reason behind the movement of the population to the outskirts to produce spontaneous settlement or squatters. The last rapid growth from the 80's till date has been exacerbated by some actors or stakeholder like MAETUR, SIC, MINDUH, the municipal fund for investment and equipment (Feicom), and Credit Foncier. The overall situation of rapid urban growth and spatial expansion is quite similar to those related to the growth of cities in other counties in Africa (Gleave 1992; BopdaetaL. 2008; Fombe and Balgah, 2010) and elsewhere (Boserup, 1965).

Conclusively, the above findings and discussions have permitted some succinct conclusions. First, that there has been a rapid increase of the population in the metropolis. This supposes an eminent impending demographic pressure. Secondly, there has been an unparallel urban sprawl or expansion. Thirdly there has been and increase in corporation for land for agriculture, culture in and around the Yaoundé metropolis to feed the increased number of hungry mouths.

3.4. To what extent have these programmes been executed that caused traffic congestion?

Three years before the end of the implementation of the Urban Master Plan which was to make it modern and functional by 2020, the political capital is becoming more distressing every day. It is a new failure that the city of Yaoundé runs within three years. After the disappointment of the strategic vision defined in 1982 for the development of the capital of Cameroon, a new development plan sets a new course of modernization until 2020. With the aim of providing the city of Seven Hills with appropriate infrastructure likely to improve people's living conditions. Some three years from the deadline, Yaoundé continues to suffocate in all segments of urban life, starting with the means of communication. No major roads to avoid the heart of the city are open. Circulating in Yaoundé today without the bypasses of the city center defined 35 years ago has become an obstacle course. According to the Urban Master Plan, the eastern bypass was to lead to the construction of a 2×3 lane road. It was to be used for the construction of a corridor linking the heavy Douala axis and the Obala road. Another 2×2 lane western bypass was hoped to face the urban extension in the southern part from Mbalmayo and Nsimalen for intersections towards the future service center of Afanoyoa, in the rural part of the district of Yaoundé 3rd. Unfortunately none of this has come to light.

Regarding urban infrastructures, the main issue in Yaoundé is the insufficiency of urban transport system. This cause's huge traffic congestion as population urges from and to the periphery. Unfortunately, Yaoundé does not have a real efficient transport system, despite the efforts of the City council.

Again, expectations of new mode of transport in the capital city was high.Similarly, from the secondary center of Mendong in the 6th district, two variants were retained. First, the link with the old road to Douala along the Mefou to limit urbanization within the current perimeter. The second variant offers a direct link with the Nkolbisson pole with a crossing at the heavy West/East axis for a later extension towards the Okola road where an East bypass interchange is announced. In this system, it should be noted that work on the Nsimalen-Yaoundé highway began in 2014. In the absence of such road infrastructure, it is difficult to imagine a modern transport system for goods and people. With the disappearance of the company "Le Bus" following the Sotuc, the hope of public transport now rests on the Yaoundé transport and collective equipment company (Stecy) which started operating in February 2017 but died a natural dead. This revival will not be able to meet the expectations of a city in extension. Especially since in the Urban Master Plan, to go from the North to the South of the city of Yaoundé, an option of mixed use of the railway is envisaged on the Soa and Mbankomo route via stations at Nkozoa and Binguela. For the East-West axis, the option of a reinforced route on its own site with the possibility of choosing between the tramway on wheels or another form is still awaited.

Furthermore, a need for 362 housing units in the city was inevitable. The city of Yaoundé is still waiting for its intercity tram-coaches with polar stations in Ahala, Mimboman, Messa and Olembé. The same is true for the Tram and Camrail option, which has Djoungolo in the city center as its major center with direct connections to Mbalngong, a locality on the edge of the municipality of Yaoundé 6 and that of Yaoundé 3 and which serves Mbankomo, the expected economic zone on the outskirts of Yaoundé. But the Tram and Camrail equipment could also extend to Etoudi in the municipality of Yaoundé 1er. The other big equation to solve is that of housing. Between 2002 and 2020, the Yaoundé Urban Master Plan provides for the construction of 362 housing units. That is a minimum of 857 dwellings per year, including 20 in the Yaoundé Urban Community, at the rate of 159% social housing, i.e. 14 dwellings per year and 219% for home ownership. These estimates are based on projected demography by 80 of more than 11 million inhabitants in the Yaoundé Urban Community. In housing supply strategies, the Yaoundé Urban Master Plan encourages the establishment of six main municipalities in the Hinterland, notably in Mfou, Nkolafamba, Soa, Obala, Okola and Mbankomo. All of this otherwise laudable planning is being outdated before it

has even been implemented. The continuous extension of the political capital and increased urbanization imposes a catch-up with public services. Yaoundé suffocates a little more each day, due to the unavailability of drinking water and regular power cuts, due to the saturation of the urban road system. The capital will soon be an open-air prison, if reality continues to evolve three times faster than public policies.

CONCLUSION:

Finally even though the urban land use of Yaounde was not well planned at the beginning, the city still has the opportunity to transform itself into a modern city. This can be done through the adoption of modern landuse tools adapted to the socio-cultural, economic, natural and institutional environment and realities. Referring to Asian cities that have begun to move toward more dynamic planning tools to better deal with future change, Yaounde can move away from blueprint planning toward strategic planning, with an emphasis on critical issues and prioritizing infrastructure investments, which are the key issues for shaping urban growth. The conclusions of the effort portray that urban sprawl in Yaounde is caused by outdated Master plan and many others.

CHAPTER 4

CONFLICTING ADMINISTRATIVE ROLES IN URBAN DEVELOPMENT AS A STIMULANT TO TRAFFIC CONGESTION IN YAOUNDE.

4.0. Introduction

The main objective of this chapter is to verify hypothesis three which states that traffic congestion along the Olembe-Nkometou 1, stretch of road largely results from unclear administrative roles in urban development. Urban development is the outcome of social, economic and political developments that lead to urban concentration and growth of large cities, changes in land use and transformation from rural to metropolitan pattern of organization and governance. Various stakeholders got involved with this urban development process in an urban area or city.

This chapter is thus sub-divided into three parts namely:

- Various stakeholders involved in urban development in Cameroon and their roles.
- How conflicting are these stakeholders that hinder urban development.
- Conclusion

4.1. Stakeholders involved in urban development in Cameroon and their roles.

4.1.1. The role of the ministry of public works (MINTP).

The Head of State, Paul Biya, has reorganized the functioning of the Ministry of Public Works, allowing it to efficiently pilot infrastructure projects needed to catapult the economy to emergence by 2035.

The new organigramme contained in a Presidential decree of September 13, 2013 creates a department of infrastructure, which is supposed to partner with other structures in the construction of rail, ports (sea and air), energy, as well as environmental projects.

Another new department born out of the presidential decree is that of technical studies. Placed under a Director General, the department will serve as a reference point in matters of technical studies of projects. It is also to follow up the quality and cost as well as deadline of public works infrastructure in the country.

This Ministry is placed under the authority of a minister of Public Works. The minister of Public Works is responsible for the supervision and control of infrastructure, construction technique and public buildings, as well as heritage maintenance and protect national highway. As such, it is responsible for;

- The development of the policy of construction, maintenance, infrastructure upkeep, public buildings and roads.
- To carry out all necessary studies adaptation to local ecosystems of these infrastructures in connection with the ministry responsible for research scientific, research or teaching and any other organization competent;
- Ensure the promotion of infrastructures, public buildings and roads in conjunction with the ministry of economic, planning and territory planning;
- Control of the execution of the works of construction and infrastructure and public buildings in accordance to established standards;
- To contribute to the construction and road maintenance, including urban roads, in connection with ministerial departments organizations competent
- Monitoring the activities of organizations engineering professionals. Civil and public works engineers.
- Training of public personnel in construction, in liaison with the departments ministries concerned.
- (3) he exercises technical supervision over :

a) The National School of Public Works (ENSTP);
b) The National Engineering Equipment Civil Park (MATGENIE);
c) The National Civil Engineering Laboratory (LABOGENIA)
d) The Road Fund.

4.1.2. HYSACAM (Hygienne et Salubrité du Cameroun)

HYSACAM (a French acronym meaning hygiene and health in Cameroon) was founded in 1969 and is the country's number one private waste management contractor. The activities of this organization can be regrouped into four categories: sensitization in a move to create awareness and provoke a change of the mentality of the population; collection and removal of household wastes which calls for the creation of waste collection points and routine emptying of waste containers around homes and quarters; sweeping of streets and markets; and the transportation and processing of wastes at discharge sites. In order to carry out this work effectively, HYSACAM has employed a workforce of about 1500 workers and about 100 trucks transporting household waste. This enables Hygiene and Sanitation Company to remove and transport approximately 800 t of waste daily, in Yaoundé (Derrick Ngoran & XiongZhi, 2013). The removal of wastes and the cleanliness of the city of Yaoundé is the affair and responsibility of three partners, including the State (City Councils), the public and the hygiene and sanitation company, the service provider. HYSACAM's mission is

limited to the removal, transportation, and processing of household wastes from homes, streets, and markets only. Cleaning of industrial wastes, scrap iron, etc., is not its duty. This is same for gutters, drains, and streams. Hence the inhabitants are advised to have garbage cans/bins in their homes and not throw waste materials at the roadsides or in gutters. Any garbage that is not from household is the concern of the City Councils. A European Union survey on habitat in Cameroon revealed that there is an average of seven persons per home in Yaounde and that most homes are without waste or garbage cans and that each person produced at least 600 g of waste daily. Inferring that with an estimated population of about 4.5 million inhabitants of the City of Yaounde, nearly 1200 tons of waste are produced daily. HYSACAM succeeds in transporting about 800 tons daily in Yaoundé, meaning that about 400 tons is stockpiled daily, mostly as a result of the population's behaviour towards the respect of hygiene and sanitation norms. The law provides for sanctions, but HYSACAM's mission is limited to the provision of services not to sanction defaulters.

4.1.3. Para-statals

AE-SONEL (Société Nationale d'Electricité) and SENEC (Société Nationale des Eaux de Cameroun) are responsible for urban services. Cameroon National Water Corporation (la Société Nationale des Eaux du Cameroun, SNEC), were reassigned to the state-owned company, Camwater. Camwater has a concession with the government for service delivery in urban and peri-urban zones, which it delegates to a consortium led by the Moroccan public utility, the Office National de l' Eau Potable (ONEP). In 2008, the ONEP/Delta Holding Ingema Consortium began production, transportation, and supply of drinking water through the newly established local private company, Camerounaise des Eaux (CDE). Camwater is responsible for infrastructure development and for financing investment in the water sector (Marin, Loening, & Drozdz, 2010.

4.1.4. The role of the Yaounde city council.

The CUY created by decree no. 87/1365 of September 25, 1987, the urban community of Yaounde (CUY), covers the seven (07) district municipalities that make up the city of Yaounde. It is placed under the authority of a city mayor appointed by presidential decree, assisted by four (4) Assistant Delegates appointed by presidential decree. City Council is made up of the Mayors of the seven district municipalities and representatives appointed to the municipal councils of the district municipalities

The staff of the CUY is around 600 people. The urban community of Yaounde is organized as follows: 1) The Cabinet is composed of the private secretariat, the Public Relations department, Management Control; 2) The Secretary General is placed under the authority of a Secretary

General; 3) The technical departments which include: The Architecture Department, the Environment and Hygiene Department, the Garage Department, the Parks and Gardens Department, the Town Planning Department, the even, the Urban Development Unit; 4) The Municipal Racette responsible for carrying out revenue and expenditure operations of the Urban Community is composed of: the Recovery Brigade, the Expenditure Control and Management Accounts Department, the Accounting and Cash Department.

The Yaounde City Council deals with the organization and functioning of the services of the urban community of Yaounde. The urban community of Yaounde is competent for any action relating to intercommunity, major works and structuring projects.

As such, it has exclusive jurisdiction over;

a) Enhancement of tourist sites
b) The cleaning of national, regional and departmental roads as well as community public spaces;
c) Monitoring and control of industrial waste management
d) The development of community action plans for the environment, particularly in the fight against pollution and nuisances, protection of green spaces;
e) The creation, maintenance and management of green spaces, parks and community gardens;
f) The constitution of land reserves of community interest.
g) The collection, removal and treatment of household waste
h) The creation and development of urban public space.
i) Urban planning, plans and master plans for concerted development, urban renewal and land consolidation. To this end, the town hall of the city of Yaounde gives its opinion on the draft regional land use plan before its approval;
j) Participate in the organization and management of urban public transport;
k) Development operations of community interest;
l) The issuance of town planning certificates, subdivision permits, building permits, building and demolition permits;
m) The creation, development, maintenance, operation, management of primary and secondary roads, their outbuildings and their equipment, including public lighting, signage, rainwater, drainage, safety equipment and engineering structures;
n) The coordination of urban networks for the distribution of energy, drinking water, telecommunications and all those involved in the public community road domain; the creation, development, maintenance, operation and management of sanitation, waste water and rain water facilities.

o) Traffic and urban travel plans for the entire road network;
p) The addressing and naming of streets, squares and public buildings;
q) The creation of industrial activity zones;
r) The creation, maintenance and management of public cemeteries.

4.1.4.1. Institutional and financial capacity of the CUY: a gap remains between mandate and resources

The Urban Community of Yaoundé is the transport organising authority, both legally and in practice. However, in spite of notable capacities, the CUY does not currently have the institutional means nor the adequate human resources to perform some of the essential tasks assigned to it by law, including the following: (i) the organization and management of public transport, (ii) the traffic and parking management, and (iii) continuous monitoring of performance the urban transport system and the quality of service provided to citizens. As the majority of the city will develop outside the administrative boundaries of the CUY by 2035, the municipal authorities, i.e. the CUY and the peripheral municipalities will have to develop together an integrated organisation for public transport and define a structuring infrastructure network and priority multimodal investment plans on the scale of the future large conurbation. In total, financial resources allocated to the construction and maintenance of roads, nearly 40 M€ per year, are in line with expectations based on the economic status of the city and country. However, the CUY has an insufficient share of these resources in perspective of its mandate. The national level compensates financially with its much greater resources and the support of international donors, but coordination is insufficient between the city and the ministries responsible for urban development and public works.

4.1.5. The role of the Ministry of Housing and Urban Development (MINHDU)

At the end of Degree No. 2012/384 of 14 September 2012 on its organization, the Ministry of Housing and Urban Development is responsible for the development and implementation of the Government's housing policy and urban development. The ministry of Housing and Urban Development shall be under the authority of a minister.

In this capacity, he is responsible for;

a) In the area of housing:

- The development and implementation of a housing improvement plan, in both urban and rural areas;
- the implementation of the social housing policy;
- Monitoring the application of habitat standards.

b) In the field of urban development:

- drawing up and monitoring the implementation of town planning and restructuring strategies in relation to the Administrations concerned;
- the development and implementation of integrated social development strategies in different urban areas;
- the development and implementation of urban infrastructure management strategies in conjunction with the Ministry of Public Works;
- the development and implementation of traffic improvement strategies in major urban centers with the Ministries and the Decentralized territorial Communities concerned;
- the beautification of urban centers in conjunction with the Ministries and the Decentralized Territorial Communities concerned;
- planning and control of urban development;
- monitoring the development of master plans for Urbanization projects in conjunction with the Decentralized Territorial Communities;
- Monitoring the application of sanitation and drainage standards.
- Monitoring compliance with standards for hygiene and sanitation, removal and / or treatment of household waste;
- Liaison with the international organizations concerned with the development of large cities in relation with the Ministry of External Relations.
- He follows the activities of the orders corresponding to the professions of architect, urban planner and surveyor.

It works in close collaboration with the Decentralized territorial Communities and supervises the Societe Immobiliere du Cameroon (SIC), the projects and organizations involved in urban planning and housing. He is responsible for the development and implementation of the Government's housing policy (urban and rural housing improvement plan, social housing, and standards) and urban development (planning and development strategies). urban restructuring, urban development, urban infrastructure management, urban traffic master plans, beautification, urbanization projects, application of sanitation and drainage standards, hygiene and sanitation, removal and garbage treatment, etc.). He is in charge of the SIC (Société Immobilière du Cameroun).

The Ministry of Housing and Urban Development (Cameroon) is made up of the following Departments:

- The department of the Secretariat General
- The department of Studies, Planning and Cooperation division.

- The department of urban social development division
- The department of Housing and Real Estate Development
- The department of General administration
- The Department of Architecture and Housing Standards
- The Urban Operation Department.

4.1.6. The role of local population in urban development.

The population has to corporate and collaborates to know how to carry out any project in any area. Although predominantly concerned with the planning of settlements and communities, urban planners are also responsible for planning the efficient transportation of goods, resources, people and waste; the distribution of basic necessities such as water and electricity; a sense of inclusion and opportunity for people. All projects in urban space are developed through the collaboration of different people and organisations such as municipalities, housing corporations, developers, city inhabitants and designers. Public or local population participation is a process where each contributor gains a better understanding of both the issue(s) and how other participants see the issue(s). It is an opportunity for participants to share their facts, experiences, knowledge, ideas, preferences, hopes, fears, opinions, and values.

Community participation can be loosely defined as the involvement of people in a community in projects to solve their own problems. People cannot be forced to 'participate' in projects which affect their lives but should be given the opportunity where possible. In a general sense, local population participation is important in development planning as the local population themselves benefit from greater access to and involvement in efforts to promote national development. They can assume more positive attitudes, learn and develop new skills and take on more responsibility for development initiatives. Public involvement brings more information to the decision, including scientific or technical knowledge, knowledge about the context where decisions are implemented, history and personalities. More information can make the difference between a good and poor decision. All citizens have had the opportunity to share their opinions and sentiment, encourages engagement and democratic participation. Environmental issues are best handled with the participation of all concerned citizens, at the relevant level. At the national level, each individual shall have access to information concerning the environment that is held by public authorities and the opportunity to participate in decision making process.

The importance of community engagement is that our community will trust you more. You will make better decisions and do a better job of addressing all the issues. Your community will be more satisfied with your organization's performance. The community will be more likely to accept your

recommendations. Public participation concerns the preparation, modification, or review of plans or programs relating to the environment. Public participation has been characterised as an instrument of prevention, as it contributes to the democratic control of decision-making in environmental matters. In the participatory development of the organic sector five elements appear to play a key role: ownership, heterogeneity, sharing knowledge and experience, value driven and a system approach. Local people's participation is necessary while formulating a development plan for a place in the following ways; i) it helps to fulfill public will and desire. ii) Support is obtained for work from local people. iii) It helps in maximum utilization of means and resources. iv) Less chance of corruption.

Some of the internal and external factors that impede public engagement as follows:

- A major internal challenge in public participation is inadequate financial resources and human resources, Lack of skilled facilitator, Low efficiency, Not interested in participation and Language barrier.

A successful community engagement will include: increased and strategic communications, strategic engagement with community based organizations, increased outreach to community colleges and transfer students, enhanced partnerships with pre-college programs including camps and competitions, outreach to churches and faith based organizations. The five pillars for successful local population engagement in an urban development work includes: Think, Initiate, Engage, Review and Shift. Local leaders can use this framework for the entire planning process. This framework streamlines public engagement efforts. Local population participation in community development works on the principle that everyone should take equal responsibility and participate in development projects. Be it evaluation, participation, provision, or direction, members of all levels should make a valuable contribution. For a local population to achieve Community Activation, your overall strategy should be centered on the top three types of participation: Functional Participation, Interactive Participation, and Self-Mobilization.

In a general sense, people themselves benefit from greater access to and involvement in efforts to promote national development. They can assume more positive attitudes, learn and develop new skills and take on more responsibility for development initiatives. The benefits of local population participation in any urban development project includes; feeling in control, having a sense of dignity, feeling connected to others in the community, developing relationships, increased independence, increased self-awareness, greater levels of physical activity and increased self-esteem. The population has to corporate and collaborates to know how to carry out any project.

4.2. How conflicting are these stakeholders that hinder urban development.

There is conflict in most of the functions performed by the various stakeholders. An interview with the delegate for Land Tenure and State Property indicates that they issue land titles to landowners in areas earmarked by the City Council as risk-prone areas. There is, therefore, conflict in function between the City Council on the other hand which does not encourage human settlement in these areas and the Department of Land Tenure and State Property. Lately, Government have levied sanctions on some member in the Ministry of State Property, survey and Land Tenure on those who have issued irregular land titles to some individuals in the Mbankolo neighborhood in Yaounde

At the ministerial level, the responsibilities of the ministries and the decentralized local authorities overlap and are not plainly defined. The State continuous to exercise tutelage over local authorities and financial autonomy is far from being reached. The principle of centralized finances compounded by the continuous financial problems of the State has had negative impacts on municipal functions. In 1987, the urban local authorities of Yaoundé were created. Yaoundé have elected municipal councilors, but executive commands are exercised by central government representatives who preside over the council (Delegues du Government).

In the past four decades several governments across the globe especially Cameroon have been doing all they can to make sure urban towns are safe places to live. They have made urban planning a cardinal issue for urban dwellers, government institutions and professionals. It is no secret that towns in Cameroon suffer from socio-economic and environmental problems and need the putting in place of adequate measures to avoid disorder that results from the inadequate enforcement of its plan, non-respect of building codes, poverty and limited houses with potable water, business conflicts, inadequate health facilities and increasing crime wave. Furher, the government is not doing enough to alert or synsithized the people to respect construction norms. Since water sweeps away everything that it meets and it has no direction. So the population has to be synsithize or be prudence not to build on water channels, to stay out of gutters, landslide prone zones and Marshy areas.

The expansion of urban areas is a common and historical phenomenon in Cameroon. Nowadays poorly planned urban expansion has led to several problems. This situation is further compounded by the short-sightedness of some decision-makers to address the preponderant issues adequately. In the case of Cameroon, there are varying actors involved in the process of urban planning. The ministry of stat property and land tenure (MINDCAF) has authority over all land, but many of its objectives are largely focused on state land. The ministry of Economy, Planning and Regional

Development (MINEPAT) is responsible for the development and implementation of the country's economic policy and the ministry of energy and water resources (MINEE) primary responsibility is to develop, implement and evaluate policies concerning water resources and its exploitation. Theoretically, all these institutions are enshrined with good laws and regulations. But the challenge lies in inadequate implementation of these town planning laws.

Because of the prevailing cacophony, there is lack of coordination between the different actors. Every day we read in newspapers, hear from radio and television how sumptuous occasions have been organized to announce the availability of funds and rapid take-off or execution of projects in the nooks and crannies of the country. But several months and even years after, the projects have not kick-off, some of the foundation stones are nowhere to be found or covered with grass. At the level of the ministries documents show that the level of execution of the projects is increasing. By the end of the budgetary year, the final documents indicate that the project has been completed or witnessed an 80 percent execution. These things happen until the minister in charge becomes vigilant and announce the cancellation of such fake deals for the masks to take off.

In towns especially those in the urban areas, it is common to see roadsides undergo several mutations within a short space of time. In the morning, digging is done by this or that company or a group of hard-to-be identified individuals lying pipes with the aim of supplying water to the different residential areas. A few days after they complete the process, another company or individuals are seen on the same site, digging the same roadsides with the aim of laying other cables. The same scenario applies to those involved in the supply of electricity to residential areas. The problem here is not the digging of roadsides but the lack of coordination among the stakeholders and the abandoning of the site after digging. Apart from the roadsides, potholes sprout here and there, making driving extremely difficult for the inhabitants. Because not only vehicle owners run the risk of being involved in accidents, commuters also find it difficult to carry out their daily chores. In some cases, water pipes are destroyed; telephone and electricity cables are damaged rendering communication virtually impossible. What is funny is that none of the stakeholders take responsibility. While those responsible in road construction accuse the energy supply company for being behind their delay to complete certain works, the water supply company attributes the lack of water in homes to the destruction of its pipe by the road construction company

Another area of conflict is on road maintenance and construction which has become a national problem. We have about 5 departments in charge of roads in Cameroon. They include the following: Urban development, Public Works, Municipal Councils, City Councils, and Regional Assembly. They all are given the budget to maintain roads. Here there is that conflict of who does

what and at the end of the day nobody does anything. Each stakeholder always says the road project is not within their competency and at the end of the day nobody does anything. For instance, in Bamenda on Friday, November 3rd, 2023, I personally saw gravel placed on the stretch of road from Vertinary junction to Ayaba being carried away because the city mayor came and made an attempt that he want to tar or rehabilitate the road but the delegate of Public Works says no this road is a national road, is not within your competence. So you see there is always that misplaced priority. You don't know what to do at what time and where. This is a similar situation in other parts of the country and it has become a national problem. The ministry of Decentralization and Local Development gives to each of the 10 city councils in Cameroon CFA 285 million every year and gives to subdivisions and councils CFA 100 million. We also have some competence by the ministry of Public Works that gives CFA 27 million to each council around the country for road maintenance and some other things. With all these money, roads are not rehabilitated properly in the country due to conflict of who does what? In Bamenda where I come from, two authorities are conflicting every 3 months on the maintenance of a stretch of road from Nkem junction-Ayaba. The Regional Delegate does maintenance work on this stretch of road from Nkem junction-Ayaba, after 3 months the city council comes in and does the same. So there is that conflict in functions of who does what and where in the road maintenance and construction sector in Cameroon and at the end of the day nobody does anything.

Again, the appointment of individuals into duty post or positions into the government service which are not in their field of studies brings about inefficiency in their performance at their jobsite and hinders urban development. Since ministerial positions in the country are political, most Government officials lack the necessary skills and know-how to run their ministries. For eample, the Minister Delegate at the Presidency incharge of Supreme State Audit Control was in Bamenda lately to educate mayors on the money given to them by the state for urban development. When state authority starts going out to educate mayors, it means verications will follow soon. Further, nowaday Yaounde has 8 worst Mayors for over a decade in the 8 municipalities that make up Yaounde. Our roads in Yaounde are dishearthening and the various Mayors in Yaounde who are responsible for repairing/fixing a particular stretch of road in the city are conflicting. Since there is no clear cut boundary between the various municipalities in Yaounde, most areas bordering two municipalities in the city of Yaounde are often left unfix because both Mayors will end-up complaining that it is not within their municipality to fix that stretch of road. Other Mayors in Yaounde have been shifting blames on the City Mayor for lack of repairs works on a particular stretch of road in the city. The conflict within the Mayors in the 8 municipalities of Yaounde tends to hinder urban development in a metropolitan city like Yaounde.

CONCLUSION:

Finally even though the urban land use of Yaounde was not well planned at the beginning, the city still has the opportunity to transform itself into a modern city. This can be done through the adoption of modern landuse tools adapted to the socio-cultural, economic, natural and institutional environment and realities. Referring to Asian cities that have begun to move toward more dynamic planning tools to better deal with future change, Yaounde can move away from blueprint planning toward strategic planning, with an emphasis on critical issues and prioritizing infrastructure investments, which are the key issues for shaping urban growth. The Yaounde City Mayor most go to work soonest and launch a campaign on urban disorder, urban mobility projects on the 7 council areas or sub divisions of the Mfoudi to make Yaounde a capital city of world class standard.

CHAPTER 5

PROPOSED STRATEGY TO EASE TRAFFIC CONGESTION ALONG THE OLEMBE-NKOMETOU 1, SEGMENT OF NATIONAL ROAD Nº: 04

5.0 Introduction

This chapter is the concluding part of this study which focuses on or outlines the policy implications of the study, and proffers diverse cost-effective and pragmatic measures for alleviating the problem of traffic congestion along the Olembe-Nkometou 1, segment of road in particular and Yaounde in general.

The enormous causes of Traffic congestion in major cities in the world have compelled evolving workable strategies which of course include huge deployment of technology to address the situation. There should be "home grown strategies" to tackle the unique situations presented in every city. This does not for-close sharing of experiences among city administrators to broaden their exposure as they get some of the borrowed experiences domesticated. Yaounde has had a lot of strategies tested with some jettisoned and others working to improve the livability of the megacity which is fast growing. New strategies must emerge to tackle or mitigate the ever present traffic congestion along the Olembe-Nkomtou 1, segment of road. It is hoped that the solutions proffered or the policies or road management strategies proposed will assist smooth committing on our major road corridor from Olembe-Nkometou 1 road axis and in making the city of Yaoundé and it peri-urban areas a better place to live in.

As already pointed out earlier in this study, there appears to be no singular accepted universal solution to the problem of road traffic congestion, than mobility management. Therefore, this study recommends an array of mobility management strategies that are capable of reducing the volume of vehicular traffic in the study area. The proposed strategy is thus sub-divided into two: Scenarios studied and Proposed Basic Traffic Management Strategies. Also the recommendations are thus sub-divided into two, Viz: Short Term and Long Term strategies.

The chapter is arranged in sections as follow:

- Scenarios Studied
- Proposed basic traffic management strategies that can be applied;
- Short term recommendations;
- Long term recommendations;
- General conclusion.

5.1. Scenarios Studied

It is time to make Yaounde great again. Yaounde of today is more than 4.5 million people, with more garbage, more road users and all our roads are old. A situation further compounded by piles of garbage which is not cleared regularly enough, given that stretch of road in the study matrix a ghost slow image. I think we should have more practical situations more quickly on the immediate clearing of the stagnating piles of garbage around the Olembe-Nkomtou 1, stretch of road. Conerning the problem of garbage, it is necessary to go down to the local councils to see what they can do and how they can be of help by removing the waste along the road.

When traffic congestion is properly managed, traffic will flow steadily, delay will be reduced, and more vehicles will use the road facility. More importantly, when traffic is managed with appropriate measures, especially at traffic nodes, conflicts are eliminated. Every vehicle will have a safe passage. Most traffic infrastructure contend with traffic volume that is more than its design capacity, example of which is the road inter-change. Appropriate traffic management measure must be put in place to ensure that such facility adequately handles the traffic to avoid a chaotic situation or delay. Safety of road users is an important goal of traffic management on which other considerations depend. Transport Planners as well as traffic engineers' gives priority to this goal over and above others.

5.1.1. Scenario 1 - Proper municipal solid wastes collection

Piles of waste over flowing garbage bins are still very visible in many neighborhoods in the nation capital. The State or Government should enforce new strategies which prohibit littering of municipal solid waste along road sides causing road traffic congestion and polluting many neighborhood areas. As a proposed strategy, the following steps shall be taken by the municipal authorities.

- ✓ **Organizing house-to-house collection of municipal solid wastes:**

Through any of the methods, for example community bin collection (central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing of musical vehicle (without exceeding permissible noise levels), Planning a systematic way and united effort for collection of waste from poverty areas or localities including hotels, restaurants, office complexes and commercial areas. Bio-medical wastes and industrial wastes shall not be combined with municipal solid wastes and such wastes should follow the rules separately specified for the purpose. Horticultural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in

accordance with the State laws. Stray animals such as dogs and cats shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State laws. The municipal authority shall notify waste collection schedule in neighborhoods.

- ✓ **Segregation of municipal solid wastes:**

Segregation materials should be done by municipal authority by promote recycling and reused waste by create or organized an awareness programs and campaign. The municipal authority shall take in charge phased programs to ensure community participates in waste segregation programmed. For this purpose, the municipal authorities shall arrange regular meetings at quarterly intervals with representatives of local resident welfare associations and non-governmental organizations.

- ✓ **Storage of municipal solid wastes**:

Municipal authorities shall establish and maintain storage facilities in such a manner as they do not create unhygienic and in sanitary conditions around it. There is some example criteria shall be taken to establishing and maintaining storage facilities.

The quantities of waste generation should be counted in order to create enough storage facilities in a given area and the population densities. Furthermore, a storage facility shall be so placed that it is accessible to user. Storage facilities to be set up by municipal authorities or any other agency shall be so designed that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user- friendly.

- ✓ **Transportation of municipal solid wastes:**

Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment preventing their scattering and unpleasant smell. The following storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing.

- ✓ **Processing of municipal solid wastes**:

To minimize burden on landfill the municipal authorities shall adopt suitable technology or combination techniques to process the municipal solid waste. The biodegradable wastes shall be processed by composting, vermin composting, anaerobic digestion or any other appropriate bio-logical processing for stabilization of solid waste. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorization.

- ✓ While waiting for a solution, various organizations dealing with environmental issues have made it a responsibility to continue sensitizing the population on proper waste disposal.
- ✓ Some experts think the final solution can come from the revision of the actual legislation. Also municipal authorities should revise the text governing waste collection and management in Cameroon is the way forward. The researcher suggests the competency should be divided between the city Mayor and the sub divisional Mayors.
- ✓ Abandon household waste along the roadside helps to destroy the existing tar on the road. When dirt gets decay on the tar, the tar is destroyed. So the municipal authorities and Hysacam Company should carry or clear the dirt found on roadside on daily basis to avoid the distraction of the tar.
- ✓ Besides, waste should be transported in the night to avoid traffic congestion during day-time collection. This will reduce the amount of air pollution that the populations will inhault during collection. Also during collection the Hysacam trunks block the road for several minutes, haulting traffic until the truck is done with loading and takes off before traffic can start flowing again. As a solution, in most countries that the researcher has visited, waste is being transported at night to avoid traffic congestion but with us here waste is transported during the day. That is why we talk about pollution and traffic congestion of all its kinds in Yaoundé during the day.
- ✓ Also, having a monopoly company like Hysacam is disadvantageous. It will be advisable to have more than one company responsible for this waste management disposal along this study area rather than having a monopoly. This can be a solution of these piles of heaps along this roadside which causes traffic congestion.
- ✓ Furthermore a recent interview granted by the researcher to the general manager of the Hygiene and sanitation company Hysacam Dr. Jean Pierre Ymele, affirmed the impact of waste is huge and he said ‘’we need to act now… is time we start thinking of recycling. It maybe the time today to start encouraging all the families and we start knowing how to sort out waste at home’’.
- ✓ Moreover, while waiting for a solution from the Government, various organizations and environmentalist have made it a responsibility to continue sensitizing the population on proper waste disposal.

In a nutshell, the following suggestions below would be helpful in improving SWM system along the Olembe-Nkometou 1, stretch of road and other similar stretch of road within the city.

- ➢ People have to respect the waste management norms
- ➢ The mayor of the Yaounde city council most create more waste disposal sites to take over

from the current site in Nkomfulou which will soon be saturated.

- Open waste storage sites and other unhygienic street bins should not be allowed.
- The placement of waste receptacles should be correct.
- Door to door collection of waste must be made mandatory that will help to minimum waste on roads and streets across the city.
- Alternative and better options for proper waste disposal method must be adopted regularly based on the needs and situation of the area,
- There must be total ban on stray animals who wander on the roads which include cows, bulls, dogs, goats, etc. and these animals must be regularly trapped without any political or community influence. It will solve many of the problems associated with waste disposal.
- Proper maintenance of vehicles and other equipments used for waste disposal.
- Government should adopt 4R's (Reduce, Reuse, Recycle and Resource Recovery) principle.
- Government should increase the number of composting and energy generation plant.

Thus, despite all efforts being made by the local municipality within their limited resources, the solid waste management situation in the municipality of Soa and Yaoundé 1 is still not adequate. The waste is being dumped on low lying or open areas along the roadside and in the outskirts of the city without engineering and scientific methods. This situation of solid waste management disposal along roadsides can be compared with other segments of roads within Yaoundé of similar size. Management of municipal solid waste in the Yaoundé city is far from satisfactory. There are problems in the solid waste management practices prevailing in the study area at every level, such as collection, transportation, processing and disposal. It should be noted that mismanagement of solid waste is a matter of serious concern for public health and environment.

5.1.2. Scenario 2 - Road degredation remedies

About mobility in Yaounde is in a state of disrepair and it needs emergency works. The socio economic wellbeing of the population of Yaounde is therefore at stake. Our degrading state of the roads in Yaounde is clearly envisage or visible to everyone. Potholes have eaten up portions of the road right into the center of the town. The degrading urban road network in Yaounde need an emergency maintainance works. It is imperative to improve the state of the roads following what happens during rush hours on this stretch of road from Olembe-Nkometou 1. The key members of government and mayors' incharge of road maintenance have to immediately address the situation with practical and sustainable solutions. It is part of the functions of the local authorities to maintain our roads, so the government should provide them with the necessary means available.

Some of the solutions envisage to turn around the situation on the Olembe-Nkometou 1, stretch of road as far as road maintenance is concern include the use of local materials. Since the CTD programme was launch, many roads have been built with rural compact concrete and this technology don't use imported product. Low cost approach can be implemented as part of a solution to our roads. Further, many roads can be done by PTL as a solution too. The ministry of public works should advice the council mayors that no road construction works happens in the rainy seasons due to heavy rains. So many road contracts are expected to take off in November when the challenge of the rains will be over and the treatment of potholes along the road is inevitable or unavoidable. Further, the 15 percent of the national budget allocated to councils in line with decentralization should be ceded to them by the government to facilitate road construction works by the council mayors. Further, the various councils should be building equipment pole for life repairs on city roads.

Of all the factors that degrade the road, water is undoubtedly the most important and should be treated with importance. It is true there are categories of road tarring and this is done for a period of time. Majority of roads are always dimension within a period of time and after that time, we suppose the materials most have expired and need restoration. And the best way to restore is either picking up the tarring, granding it and reusing or patching the potholes and running another layer on the pavement for it sustainability. So there is nothing which is done without a time frame. Time frame here meaning that how long shall this road last because you may dimension it with a low traffic that is lesser and years later the road taffic increases like just what is happenng along the Olembe-Nkomteou 1, stretch of road at this point in time. Now the weight on the road will certainly have to way out the road in a shorter time. And to restore it, you need now to retreat it and do punctual treatment if there are potholes, then you run another layer of tar on it, even if it is just 2 or 3 cm maximum, that will be an ever lasting solution given to that stretch of road or pavement. Which means we are not only using old materials but new ones are added which makes it good and long lasting. The following factors below should be taken into consideration to avoid damages on the pavement

- **The quality of the platform**

The ground that constitutes the platform must be as stable as possible in the limit of water content variation. Also soils subject to swelling and large withdrawals should be avoided.

- **The quality of the materials used**

The materials used in the body of pavement must meet the requirements in the specifications loads. For a surface dressing for example, the aggregates must comply with the values limits set for particles size, hardness, cleanliness and shape.

- **The quality of implementation of materials**

The life of a pavement will be shortened in the following cases; insufficient compact, segregation of asphalt or gravel, crushed, dosages of binder not respected application temperatures too low, improper use of borrowings, implementation in rainy weather, etc.

- **Road design**

Design errors can cause the premature ruin of the road. We can cite: under sizing, a bad out of water, poor design of ditches, pavements of bathtubs, insufficient damage, etc.

- **Traffic**

The movement of people, vehicles from one place to another is called traffic. Movement of vehicles on roads is generally called as road traffic. After water, traffic is one of the most aggressive factors for the road. It causes the polishing of the aggregates of the layer of rolling; inter granular friction in the body pavement (fine production), the appearance of longitudinal cracks and transverse in the wearing course, and the formation of ruts at certain points.

- **Prolong solid waste damages the tar**

Abandon household waste along the roadside helps to destroy the existing tar on the road. When dirt gets decay on the tar, the tar is destroyed. So the City Mayor and Hysacam Company should carry or clear the dirt found on roadside on daily basis to avoid the distruction of the tar.

5.1.3. Scenario 3 – Road Widening Study

Assessment of gaps in road infrastructure.

- Insufficient Road Capacity: A detailed assessment of the current capacity of the northern penetrating road reveals insufficiencies in relation to the growing demand for travel.

- Lack of Transportation Alternatives: The absence of alternative routes and efficient public transportation options contribute to increased dependence on the northbound highway and on individual vehicles, worsening congestion.

The map below presents the state of the road network along the northern penetrating route to Yaoundé that needs to be widened.

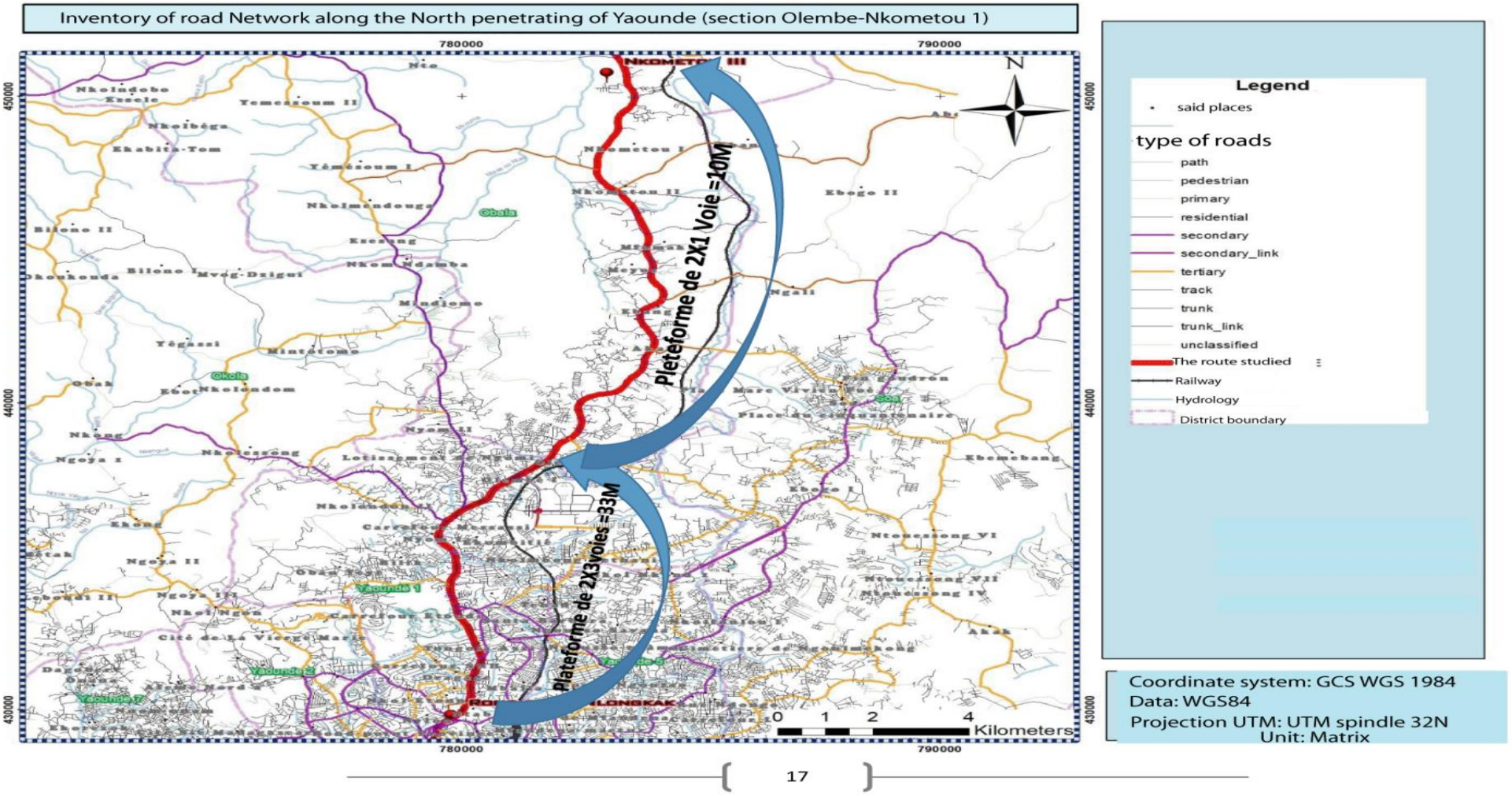


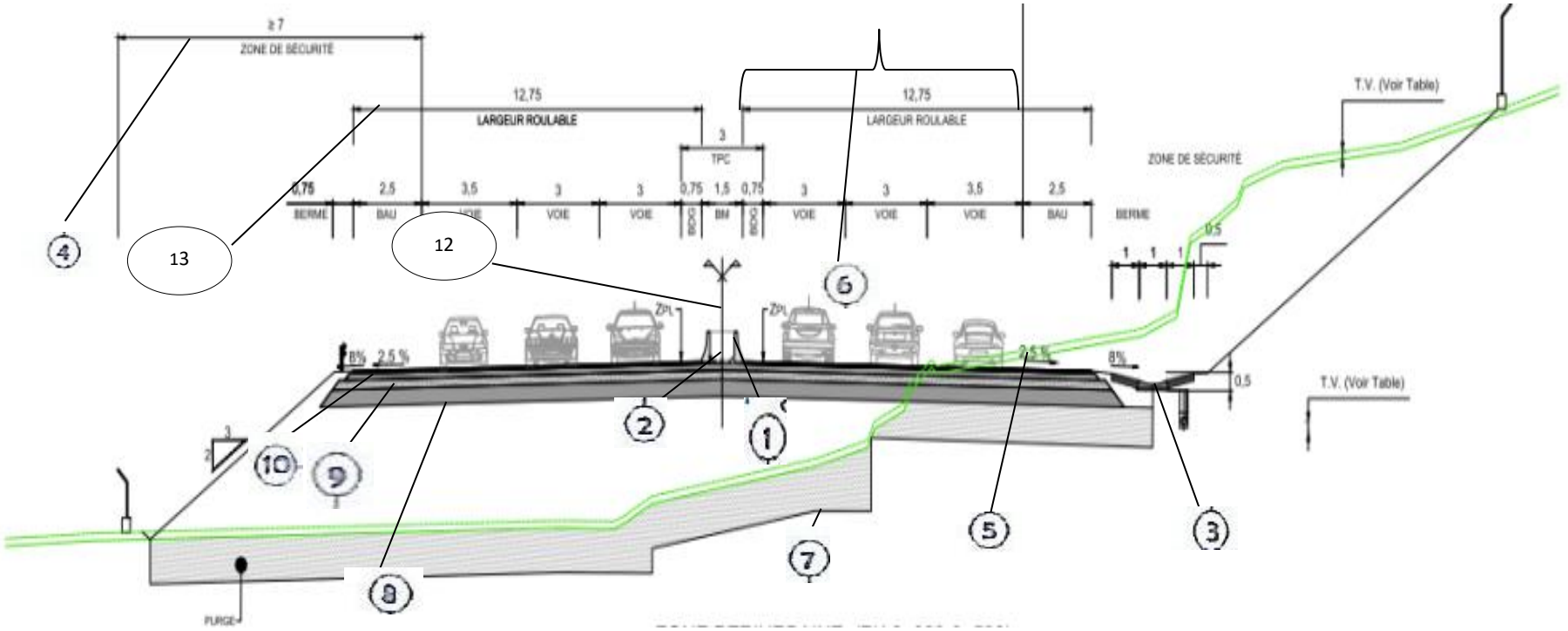
Figure 16: State of the road network along the northern penetrating route to Yaoundé.

Source: Field Survey of 20/1/2023

Since this is a state –maintained road and is a major road that connects to the capital city and other towns in the country, the widening or enlargement of this narrow road is inevitable to reduce traffic congestion along this stretch of road. The first solution will be to enlarge this road to have 3 X 2 lane road. That means 3 lane in each direction and there are only 2 sides. This expressway or auto route will have different road dimensions; 3 meters, 3 meters and 3.5 meters respectively and with different speed limit. This Auto route is meant for vehicles only not pedestrians. Here, tunnels will be built underground and bridges built above the expressway for pedestrians crossing to the opposite side of the road. The speed of this Auto route goes progressively from one lane to the other. This stretch of road will be called an expressway due to the speed permitted on this road. The cross section shows how the V and the U gutters will be formed. The V gutter shows that not enough water is coming there while the U gutter shows that too much water is being collected there. . In short, the cross section bellow shows that the area where the road will be constructed has a mix profile and in an area with mix profile, the gutters are position differently. The kerbs on the cross section show how cars are avoided from crossing from one side to another in the opposition directions. The Kerbs has length of 0.75 meters on both sides and protect vehicles from driving into opposite lane. The kerbs demarcate road or the lanes in opposite directions. It is done in this way so that people should not cross into opposite directions carelesslly to cause accidents. In-between the opposite kerbs is a space called the median or central tail plane. The median is technically reserved to habour or recieved networks like water, electricity, camtel net box, drainage pipes, utilities, water pipes, telephone cables, energy cables and surveillance cameras etc through it or are installed. Normally the assessment of the displacement of the various networks takes into account its constituent elements and its magnitude. It will be done in collaboration with the various dealers after rhe production of the layout and cross-sections, followed by a joint visit with the dealers. Careful examination shows that the road has 4 layers. Understanding the different layers, with their different names and compositions in terms of aggregate and construction is a neccesity. The cross section below shows that the road surface has a composition of 4 layers. These are:

- Surface course or wearing course
- Base course
- Sub-base course
- Sub grade or roadbed

The width composition used for the study is as shown below. The drawing below is for a 3 x 2 lane road designed on the stretch of road from Olembe-Nkometou 1 on the National road N^{o}: 4



① Kerbs

②Median

③ V- gutter

④ Safety barrier

⑤ Slope percentage

⑥Traveled lane

⑦ Natural earth

⑧Sub-gradeor roadbed

⑨ Sub-grade course

⑩ Base course

⑪ Surface wearing course

⑫ Lighting pole

⑬ Shoulder

SOURCE: Louis Berger.
Autoroute Y'de-Nsimalen. 2017.
OLembe (PK 0) + to Nkometou 1 PK 15

SCALE: 1/100cm

Figure 17: Cross section of a 3 x 2 lane of road to be constructed along the Olembe-Nkometou 1 stretch of road.

Sections	Coded	Linear (km)	Right of way (m)	Status	Action to be taken	Cost of works (FCFA)
National road N°4	RN4	15	60	Good condition, section New station – BOCOM, narrow for the traffic weight	Enlargement and building a 3x2 lanes and TPC	63.000.000.000
Total		15				63,000,000,000

Table 5: Development of Primary road

Source: Tembe's Design, 2023.

The following table below sets out the actions on the Olembe-Nkometou 1 road planned as part of this study. The work to be done consists of widening the section starting from the Olembe-Nkometou 1.road corridor.

The technical characteristics of the Olembe-Nkometou 1 road planned to be enlarged and maintained are as follows;

The typical cross-section on a 60.0 m right-of-way with a bicycle path is as follows:

- 3 X 2 lanes of 3.5 m each
- Sidewalks: 2.50 m wide on both sides (including covered gutter)
- Public lighting,
- Sanitation: concrete U gutters
- Pavement structure: asphalt concrete wearing course 5cm of bituminous concrete, base course of 20cm of gravel bitumen, foundation layer of 15 cm of Crushed gravel 0/31.5,
- Emergency Lane (BAU): 3.00m wide on both sides
- Reservation of networks: 1.50 m wide on both sides
- Central reservation: 2.00 m wide

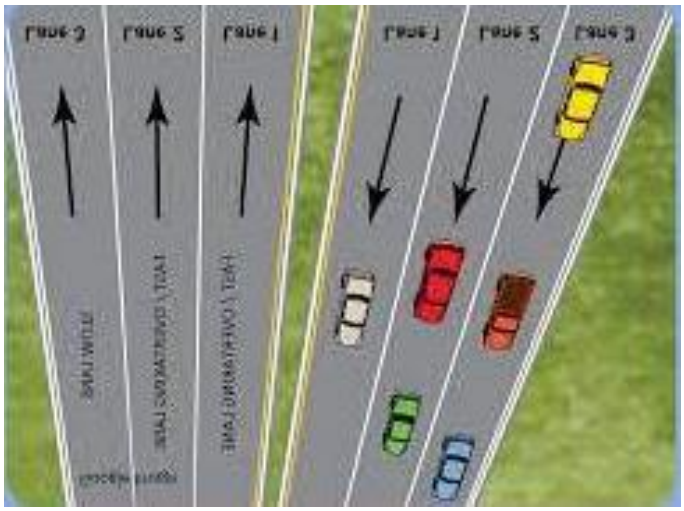


Figure 18: 6 lane roads.

Source: Tembe E. T., 2023

Photo 32 : Example: Yaounde- Nsimalem highway

Source: Tembe E. T., 2023

5.1.3.1. Conditions for calculating construction cost and the cost price for the expansion of the 15km Olembe-Nkometou 1 road axis.

In this study, the document outlining the cost estimation for the Olembe-Nkometou 1, segment of road has been obtained, describing the costs for the superstructure, substructure, foundation structure, tax and design and construction supervision. Concerning the rough construction cost for this study, the unit cost of each work item will be determined by reference to this document and the rough volume will be calculated to ascertain the rough construction cost. So the expansion of the Olembe-Nkometou 1, road axis will cost CFA 63 billion. Since the Olembe-Nkometou 1 road axis is part of the NR N°: 4 and is a State-Maintained road. So the enlargement or expansion of this 15km stretch of road will obviously be the responsibility of the Government to provide the CFA 63 billion or the funds.

For those who are familiar with road construction, constructing 1km lane of road will cost 500 million -700 million francs cfa for a constructable road not maintenance. That is for a road that you are building it from scratch. So the 15km stretch of road from Olembe-Nkometou 1 will be enlarged to have a 3 X 2 lane road. That means 3 lanes in each direction and there are only 2 sides. So the total kilometer of road to be enlarged is about 90km. So 90km multiple by CFA 700 million which is equal to CFA 63 billion. So the total cost for the construction of the 90km stretch of an auto road with a 3 x 2 lane road will be 63 billion frans cfa, which has to be financed by the state.

5.1.3.2. Other facilities that need to be added or installed on the Olembe – Nkometou 1 highway.

- About 4 – 6 crossovers should be constructed to keep the pedestrian and population safe;
- Gates most be constructed to stop stray animals from getting in to the highay;
- Video surveillance cameras should be install to check over–speeding vehicles;
- Zebra crossings should be drawn to ease movement of pedestains.

These amendments would increase the amount estimated for the construction of this first phase which already moved from F CFA 63 billion to F CFA 70 billion..

5.1.3.3. Analysis of traffic management problems.

1 - Inadequate Traffic Control Systems: The effectiveness of traffic management systems traffic, including traffic lights, traffic signs and coordination of intersections, are among other factors aggravating traffic congestion on the penetrating North of Yaoundé. It is presented on the map in Figure 21 on the next page, the inventory of the most common important intersections and areas of traffic congestion by various economic activities. These intersections are differentiated into two categories (crossroads with traffic lights and intersections without traffic lights). This distinction is made through a symbiology based on two visual variables: (Circle and color). The color of the label texts is made variable to characterize the frequency of traffic jams at each intersection:

• Red: Congested intersection even outside peak hours;

• Orange: Carrefour congested especially during rush hours;

• Green: crossroads rarely congested

The map on the next page, shows traffic management problems can be fixed along the study matrix.

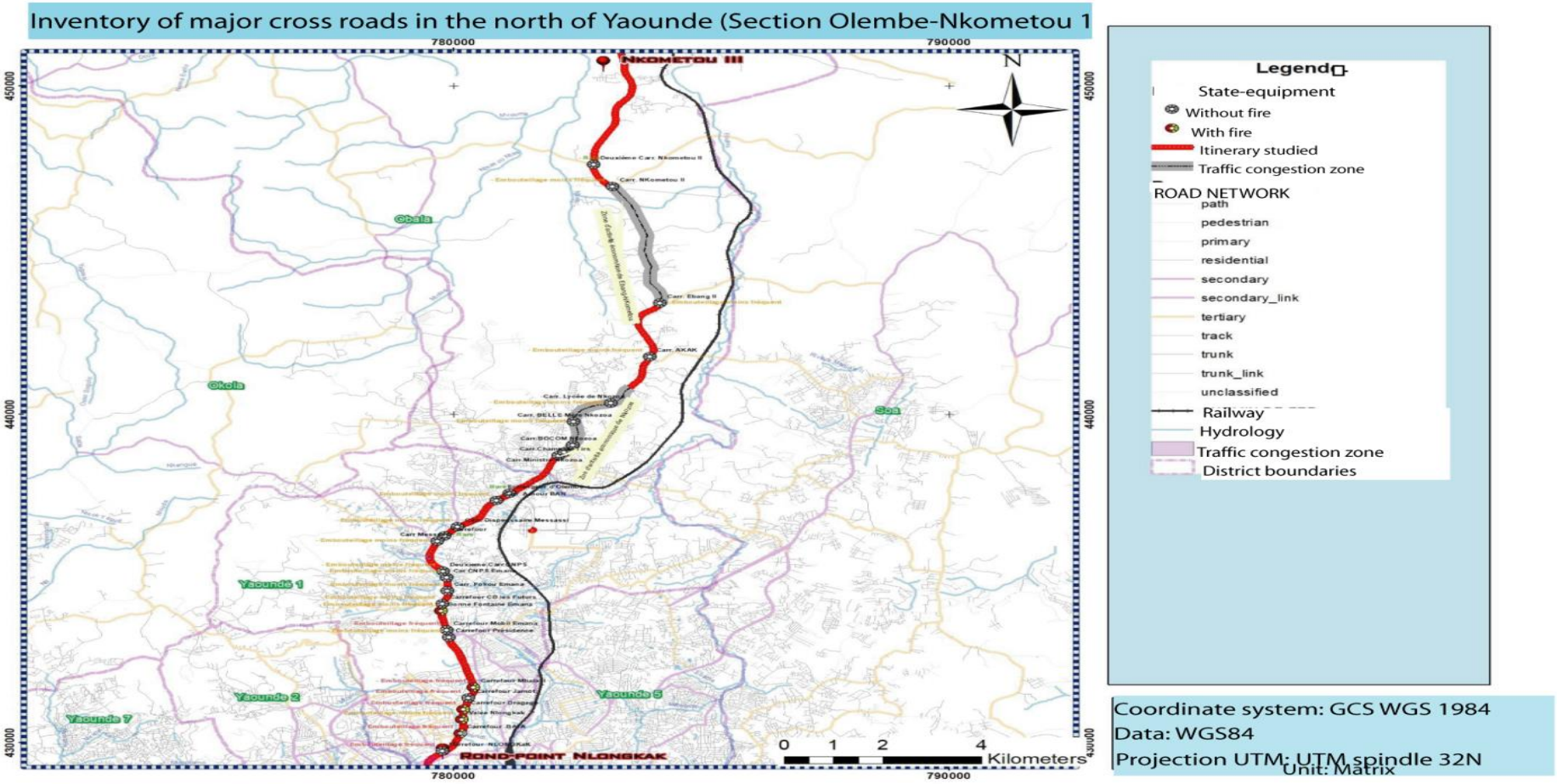


Figure 7: Etat des lieux de carrefours majeurs

Figure 19: Traffic management problems can be fixed along the study matrix.

Data Source: Field Survey of 20/1/2023

5.1.3.4. SUMMARY EXPROPRIATION STUDY

This part deals with the expropriations of people who will be affected by the construction project of the 15 km stretch of road from Olembe-Nkometou 1. An expropriation report that accompanies this study file, was carried out at the request of the University of Yaounde 1. This project is designed by the researcher, a master student in the University of Yaounde 1.

5.1.3.4.1. Purpose of the Expropriation Study

The objectives of this dossier are:

- Provide the Contracting Authority with the information necessary for a good knowledge of the properties located within the project area.
- Carry out a preliminary estimate of the cost of expropriations and various indemnities likely to be borne by the Contracting Authority
- Facilitate the implementation of the administrative procedure for expropriation in the public interest.

Following the expropriation procedure inforce in Cameroon, and in order to limit the damage that could be caused to the populations owning the property around the project right-of-way, the expropriation strip was defined by the Client at (30 x 2=60) m to minimize the social damage that the project could cause.

This report defines the development of the populations affected by the project on this 30 m right-of-way. The types of assets that will be affected are as follows:

- Buildings used as dwellings, mostly made of permanent materials
- Buildings or shads used for businesses
- A few crops and shade trees
- Bare grounds
- Dealer Networks
- Etc

- Accelerated Urbanization: Rapid urbanization leads to densification of areas residential and commercial areas along the road axis, intensifying travel daily.

The map below shows the relief pattern of the study area. (Nature of the terrain). The terrain shows that the study mtrix has both low land and little rocky hilly areas.

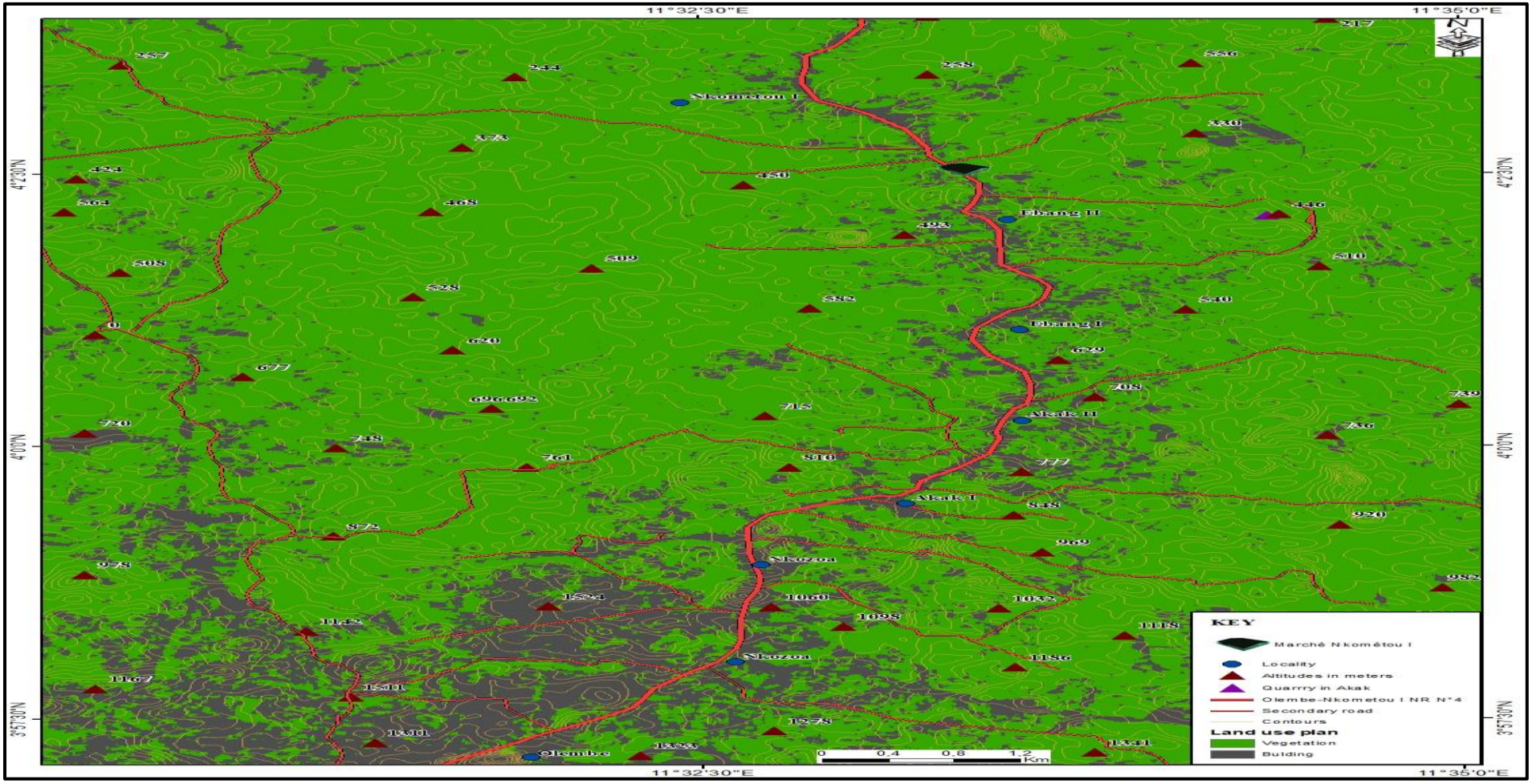


Figure 20: The relief pattern of the study area. (Nature of the terrain).

Data sources:
-Field investigation
-Digitization on satellite image
- Arc GIS and Google Earth Image 2023

From the map above, one can get a good sence of what the terrain in the study matrix looks like. The contour line on the map helps us to visualize the shape of the terrain. For example, as the contour lines form a circle it shows a peak. When the contour lines are pact together, it shows that the elevation is changing a lot and the terrain is quite steep there. As the contour lines spread out it means the terrain is changing quite slowly, narrow or gradual steep. Lastly, one can pick out terrain features by looking at the contour indexes on the above map. Whilst the above map legend is like the users guide where the various contour lines, colour symbols are defined. It is worth noting that understanding the level of detail of the above map is heavy when planning a road.

The map below shows the state of land use along the penetrating route North of Yaoundé.

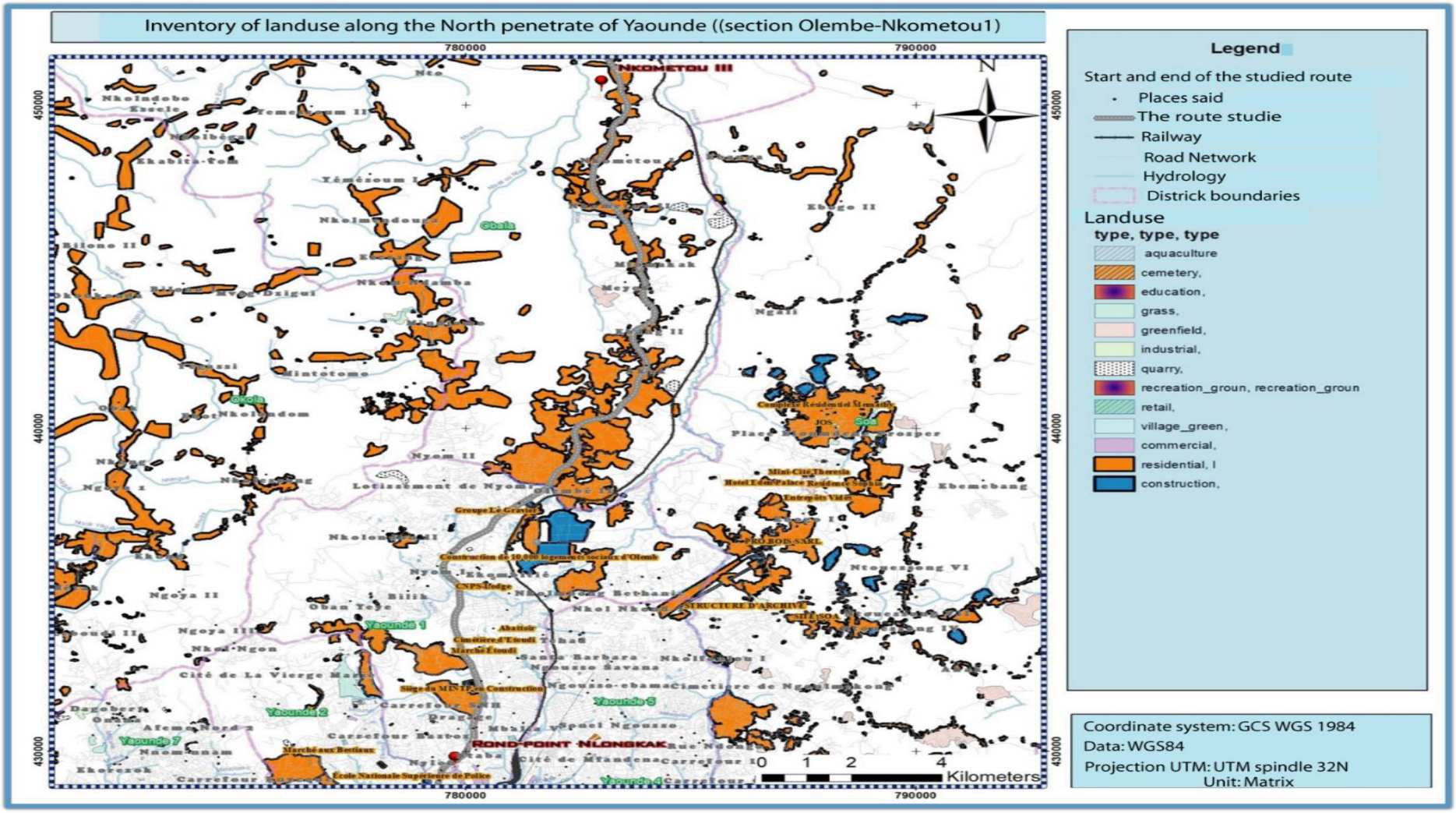


Figure 21 : The landuse map of the the study matrix.

Data Source: Field Survey of 20/1/2023

The land use map shows how man has in his ways help to modify the natural environment and in some cases adapted his ways of life to the natural environment in the study matrix. This he does by the way he uses the land. From the land use map, there are various ways in which man uses the land in the study matrix. The building of settlement, farming, quarry, residential sits, commercial sites, Greenfield, industrial etc are some of the major land use types that are shown on the land use map in the study matrix. From the map legend, each land use type has its own symbols that are used to represent it. For example build-up areas for human settlement can easily be recognized on the map. It may be necessary to suggest that the major high way have influenced the distribution pattern of settlements in the study matrix. Further, other factors have also influenced the distribution pattern of each of the land use activities found in the study matrix.

Considering the fixed rights-of-way, the results of expropriations are as follows.

For individual constructions, they consist of hard, semi-hard, plank and fence houses. The total cost of their compensation according to the different components of the project is distributed as follows:

5.1.3.4.2. Expropriation of immovable property

It should be noted that the cost of these constructions has been assessed on the basis of replacement value. It takes into account the pice of building materials in today's market. The majority of the affected buildings are made of permanent materials with tin roofs. Those who will be impacted will have to be compensated to allow the effected populations to rebuild them elsewhere. There could therefore be the problem of land acquisition. The psychological disturbance of the people concerned will there be major.

5.1.3.4.3. Expropriation of crops

For crops, compensation is calculated on the basis of the scale of Decree No. 2003/418 PM of 25 February 2003 setting the tariff of compensation to be awarded to owners who are victims of destruction of cultivated crops and trees for reasons of pubic utility. Since we are in a peri-urban area, the majority of the crops surveyed are shade trees. The amount calculated on the basis of the current assessment of on-site cultivation amounts to 5,615,500 (five million six hundred and fifteen thousand five hunded) FCFA;

5.1.3.4.4. Expropriation of bare land

As of bare land, a few people have indicated their formal rights to the land (existence of land title) while walking through the neighbourhoods through which the project passes, but the majority have not presented it. Several have come out in favour of a Collective Land Title and others say they are

in the process of being established. The total cost of their compensation according to the different components is as follows:

In addition, we would like to see all riparian accesses destroyed during the work restored. The cost of this work is not included in this evaluation report as the restoration of these accesses is included in the overall cost of the work. Similarly, a set of community support measures will be recommended in the Environmental and Social Management Plan in order to compensate for the various damages caused to the population as a result of these expropriations. These include the development of intersections, garbage bin receptacles, taxi shelter, speed bumps, and the development of waterfront access.

It should be noted that the cost of network relocations is part of the technical component and will not be included here. All you have to do is ask the concessionaries for the various installation plans for their networks and possibly their proposals for the costs of travel to constitute the Report on the Identification Studies of the networks to be moved, which is part of the contractual documents of this project.

In the end, the quantified assessment of the expropriations in the context of the construction of the 15 km long Olembe-Nkometou 1 segment of road is estimated at F CFA 64 billion (Sixty four billion) CFA francs. This will include both construction and assessment of the expropriation cost.

The proposed approach for the continuation of the payments of the indemnities consists of publishing the extended DUP to all the parties concerned, materializing on the ground the rights of way and landmarks of the project, in order to quickly carry out a final cencus before the start of the work, to commit and NGO whose aim will be to raise awareness among the populations with a view to a better use of the compensation received, and to provide them with a framework for the appeal procedures in the event of a dispute.

The expansion of this 15km stretch of existing road will destroy people’s properties greatly and will require compensation from the Government. Table 1 below, indicates the type of assets or use that will be affected during implementation of the Olembe-Nkometou 1 project. The magnitude of impact of assets that must be relocated with or without relocation of PAPs is also indicated.

The table below was obtained during the researcher's fieldwork 2023.

Table 6: Project Impacted Assets and Magnitude of Impact

Affected Category	No. of Assets	Summary of Impact/Loss
Residential structure	70	Permanent loss of structure/Loss of accommodation/Displaced person needs to relocate - physical relocation/ others can relocate on the same plot
Commercial structure	120	These are structures that the owner combines both residence and commercial activities such commercial activities include residential tenants and shops
Permanent crops and trees	7	These include shelter and food trees and different maturity level. Temporary loss of food sources and/or income or profit while re-establishing farming activities
Loss of Business owned by individuals (renting or owners of the structures	115	Mainly retail shops and residential tenants
Loss of Business	7	These are go downs and small factories
Loss of Business 1 Fuel filling station located along the Olembe-Nkometou 1 corridor	1	Fuel filling station located along the Olembe-Nkometou 1 corridor
Loss of Business that is undertaken at the local council open space	22	These include brick making, food venders, a small garage
Annexed Structures	6	These are structures that impacts do not affect the main structures i.e security fence and therefore PAP will not be relocated these include fence
Graves	10	The graves are located infront of houses of relatives and relatives in the area indicate that due to limited space some have buried more than one person on an area demarcated as one grave
Public/Community structures	3	One Akak office, One church and Two community halls (owned by an individual PAP)
Public/Community land	1	Land by the local council that is currently used by petty business.
Loss of services	2	A PAP with a bore hole that is currently serving water to about 200 families and a primary school across the Olembe-Nkometou 1 road.
Public/community assets	1	An alter owned by the Roman Catholic Church
TOTAL	364	There are PAPs with more than one asset mainly graves

Source: Tembe E. T., 2023

Note: This does not include utilities and trees along the corridor

Further, the proposed project will require relocation or damaging of utilities and other infrastructures. These include water, traffic lights, and electricity or telecommunication infrastructures, Petrol stations which will amount to about CFA 10 million. Any damage or relocation will require compensation from the project developer to be paid to the institution that

owns the utility that include eneo, camwater, petrolex petrol station, neptune oil petrol station, bocom petrol station, green oil petrol station, blessing gas oil petrol station, total energies petrol station, galaxy petrol station. This should be done on a timely manner to avoid inconveniences to the users of the infrastructures.

Table 7: Compensation Procedures and Necessary Time Period

Duration	Resident compensation procedures
1.0 month	1) After the decision to implement the project, the CCE, comprising relevant ministries and director of the Mfoundi branch is set, with the Mfoundi governor as the chair.
1.0 month	2) CCE decides the border of project site.
3.0 months	3) CCE conducts a population census and understands the number of residents subject to resettlement.
3.0 months	4) The cutoff date is decided after census completion.
-	5) CCE organizes a public hearing for residents subject to resettlement and explains the project overview and its needs. The public hearing is repeated until residents agree on the project implementation. (Time required for 5 differs by project.) 6) CCE conducts a census of residents subject to resettlement, conducts their property and land survey, calculates the amount of compensation and prepares a survey report.
10 days	7) CCE reviews the survey report to examine whether its contents (calculation of amount of compensation, resettlement plan and census survey results) are in line with the provisions.
10 days	8) When the report is determined as problematic as a result of the review, the survey is repeated and the report is revised.
10 days	9) When it is decided that there is no problem, the report is submitted to the Ministry of Finance.
10 days	10) The Ministry of Finance checks the contents of the survey report.
-	11) The Ministry of Finance prepares an ordinance based on the survey report. It specifies the decision of project site and compensation.
-	12) The ordinance is confirmed and signed by the President or Prime Minister. (Time required for 11 and 12 differs by project.) -【Procedures of grievance handling system】
-	13) Accept petitions and complaints from residents subject to resettlement.
-	14) Petitions and complaints are submitted to CCE and the contents are reviewed for handling.
	15) A lawsuit is filed when residents do not agree to 14 above.
-	16) Compensation is paid after handling of all complaints is confirmed
	17) Compensation begins. (Time required for 13 to 15 differs by project.)

Source: Cameroon Law on Compensation for Public Works Projects.

Cameroon legislation provides valuation of properties at market values for land, houses and structures affected by a project. However, since the road project is to be funded by government, the government policies and guidelines on compensation and issues are to be followed. The creation of the new Auto road in the study matrix will cost about CFA 70 billion.

For the proposed Olembe-Nkometou 1 Project the following groups are entitled to compensation and/or assistance under the project:

•Project Affected Persons (PAPs)

- These include people and households regardless of their ownership status as squatters etc. that will face their livelihoods adversely affected and/or lose their right or title on land, house, habitat, water resource or any asset possessed, due to the project implementation.

•Project Affected Families (PAFs)

All members of a project affected household residing under one roof and operating as a single economic unit, who are adversely affected by the project or any of its components.

•Significantly Project Affected Families (SPAFs)

–The affected families who lose all of their land and residences because of the project intervention.

•Displaced Family

–Any tenure or interest holder on a property and his/her family members, who on account of acquisition of the property for the project purpose becomes a displaced person.

•Squatters

–People who have occupied land for purpose of their livelihoods violating the law and are not entitled to compensation for lost land under this policy. But if displaced they are entitled to resettlement assistance.

•Vulnerable groups

–Distinct groups of social and economically distressed people who might suffer disproportionately from the effects of displacement. These may be ethnic minority, women and child -headed households, impoverished youth, the most poor (based on the poverty line), and the disabled and elderly.

- Others unintentionally impact

These are people or families or even property owners suffering unintentional and temporary damage to their land and property during construction due to unforeseen actions or simply by accidents such as damage to nearby utilities, crops, structures or infrastructure caused by movement of machines and other construction activities. Whenever an unintentional impact occurs, during construction; the property should be compensated as per the entitlement matrix in this RAP (Resettlement Action Plan). This will be the responsibility of the Developer in collaboration with the contractor and therefore these items should be included in the contract to the project contractor.

Thus, to compensate the PAPs for their lost assets, the Project has one options for payment. **Cash payments will be** Calculated and paid to compensate for land, assets, or to cover allowances such as disturbance, accommodation, transportation, loss of profit. For this particular project all individual PAPs have opted for cash compensation.

5.1.4: Scenario 4 – New Secondary Roads study in the study matrix.

Another strategic measure to curb traffic congestion along the Olembe-Nkometou 1, road axis is the construction of secondary roads in the study matrix. The secondary road will provide the connection between the Olembe-Nkometou 1, stretch of road. It will ensure the large mesh of the urban space of Olembé, Nkozoa, Nkometou 1 and other suburbs. These routes give direct access to the various evolving urban areas. It plays the role of penetrating or passing to the various neighbourhoods in the study matrix while contributing to their structuring and their accessibility. The secondary roads meet to serve the large groups of islands (mesh).

The Google Earth map below shows possible locations where the various secondary roads will be created along the National Road Number 4 in the study matrix, with their verious GPS points.

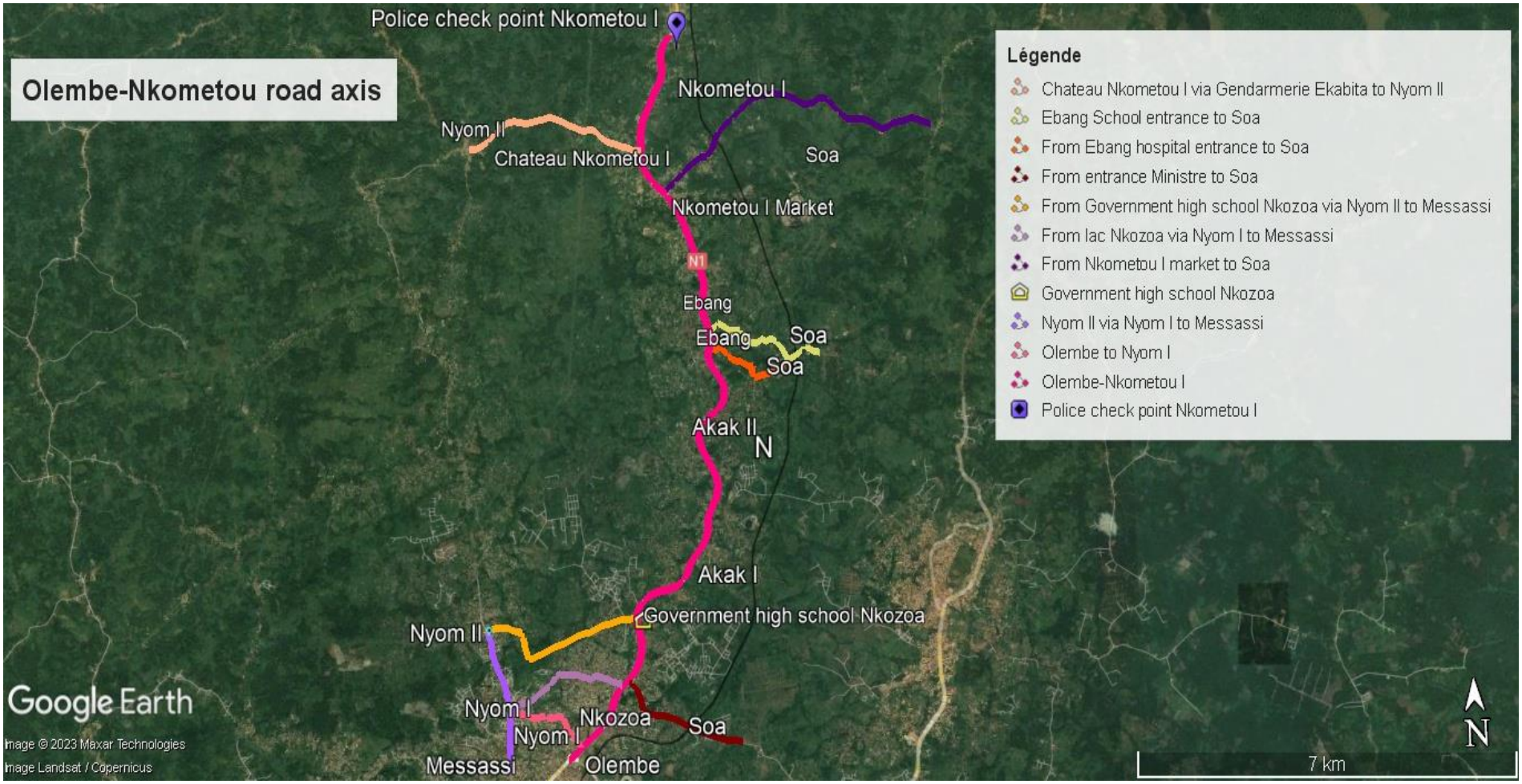


Figure 22: Possible locations with their GPS points where new secondary roads can be created in the study matrix.

Figure 23: Portion 1: Possible locations of the new scondary roads that can be created from Olembe-Nkozoa road axis.

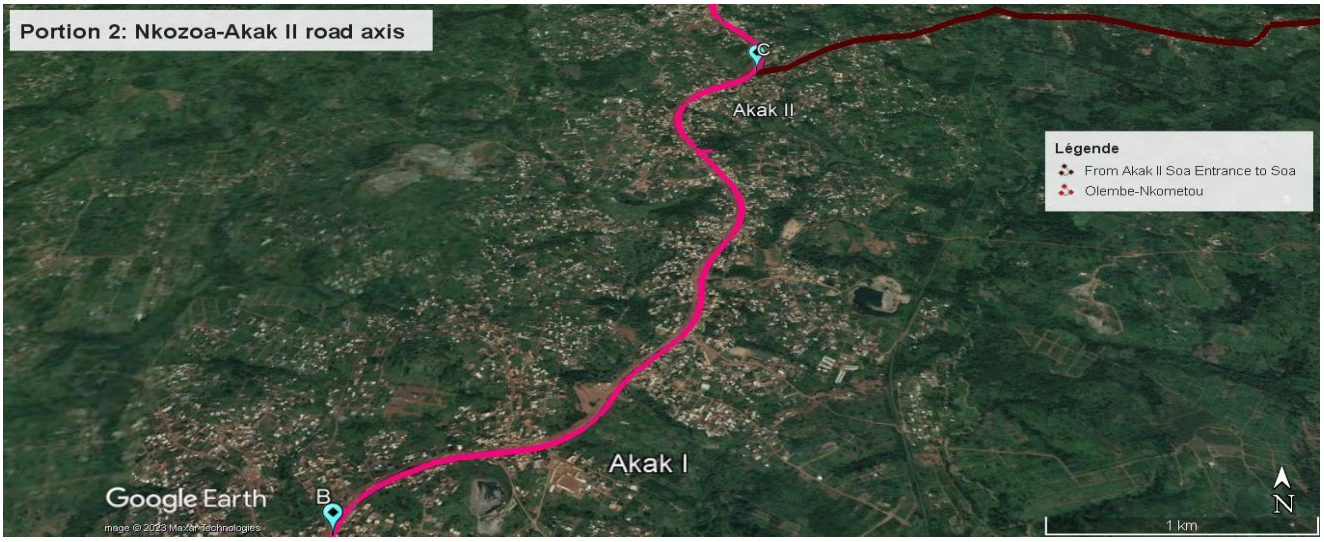


Figure 24: Portion 2: Possible locations of new secondary road that can be created from Nkozoa –Akak

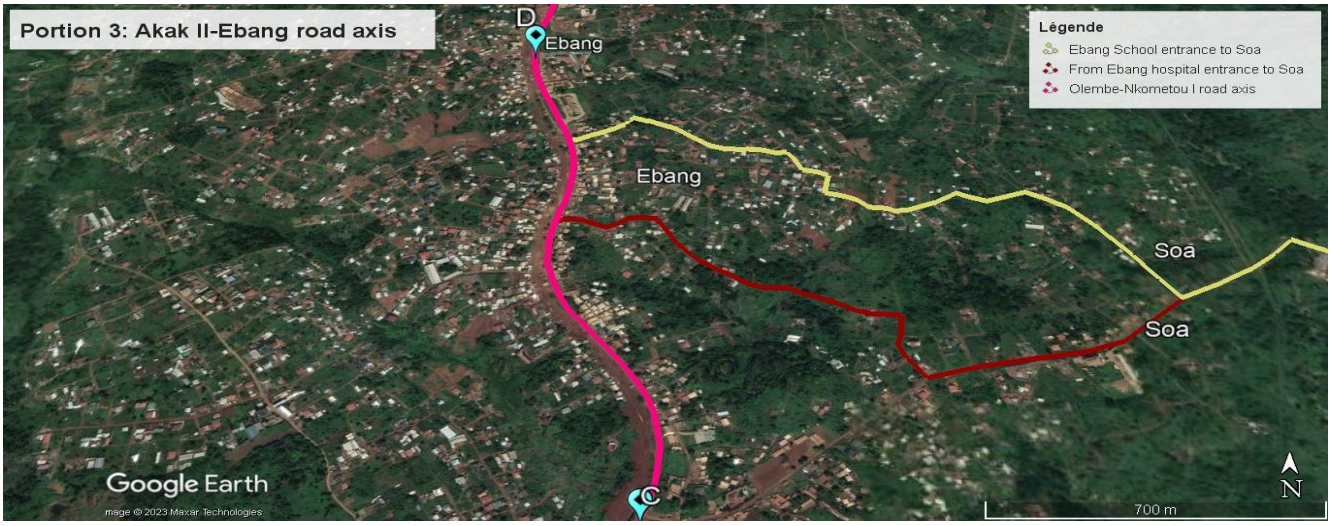


Figure 25: Portion 3: Possible locations of new secondary roads that can be created from Akak 11- Ebang road axis

Figure 24, 25, 26 & 27,

Data sources:

-Field investigation

-Digitization on satellite image

- Google Earth Image 2023

- **Date: June 2023**

Produced by:

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Town Planner / Uramdeur Graduate

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5.1.4.1. The cross section of a secondary road

The cross section above shows a 2 x 2 lane road planned for the study matrix. The roads will have a pedestrian path in each side and there are trees on both sides. This is an example of our normal road in Cameroon that has a pedestrian path. With a secondary road in the study matrix, two kerbs are joining together, so no media or central tail plain spaces exist. This is an example of our normal simply roads here in Cameroon with norms. The proposed secondary roads will have a normal dimension of 3.5m per lane. The cross section below shows that the road surface of the area is not flat but it has a gentle slop. So here, with the construction of a new secondary road in the study matrix, the cost price for 1km lane of road will cost F CFA 700 million.

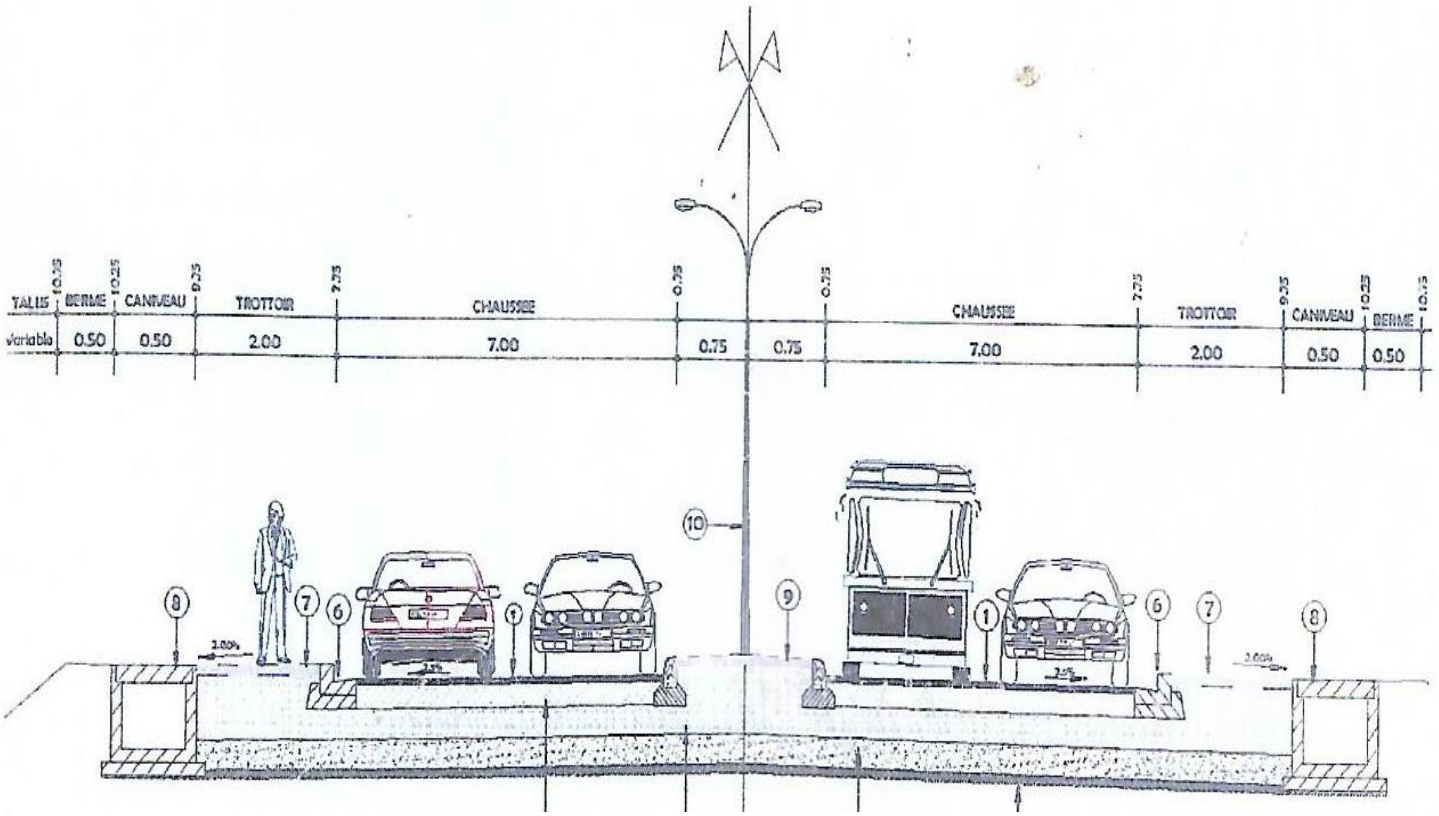

Figure 26 : The cross section design of the new Secondary roads project in the study matrix

Source: Tembe's Design 2023
SCALE: 1/ 100cm

① Bituminous concrete

② Surface course or

③ Base

④ Sub- base

⑤ Traverse lane border edge

⑥ Sub- grade or road

⑦ Sidewalk (paving)

⑧ U- gutter

⑨ Median

⑩ Double bracket floor lamp

However, traditional road surfaces of a secondary road in the study matrix will suffer degradation, deformation, the cracks, tears, lifts, unclassified damage, and roadway dependencies over time from both traffic and environmental factors like: The quality of the platform, the quality of the materials, the quality of implementation, and road design which will need their restoration. The estimated lifespan of road construction and maintenance projects varies from nation to country, but on average, one may anticipate that the project will provide service for many decades, with significant rehabilitation work being carried out around every 10 years.

The figure below shows a 2 x 2 lane road crossing the various neighborhoods. The 2 x2 lane road is tentative and may become a 3 x 2 lane road if traffic demand increases in the future.

The following table sets out the actions on the secondary roads planned as part of this study in the study matrix.

Table 8: Development of secondary roads

Sections	Linear (km)	Right of way (M)	Status	Action and lead	Cost of work (fcfa)	Observations
From Chateau Nkometou 1 to Nyom 11	17 x 4 = 68	40	Bad condition	Pending	47.600.000.000	Project still to be approve & validated
From Nkometou 1 market to Soa	15 x 4 = 60		Bad condition	Pending	42.000.000.000	Project still to be approve & validated
From Entrée ecole Ebang to Soa.	12 x 4 = 48		Bad condition	Pending	33.600.000.000	Project still to be approve & validated
From entrée L'hopitale Ebang to Soa	17 x 4 = 68		Bad condition	Pending	47.600.000.000	Project still to be approve & validated
From Gov't high school Nkozoa to Nyom 11	18 x 4 = 72		Bad condition	Pending	50.400.000.000	Project still to be approve & validated
From entrée ministe' Nkozoa to Soa	12 x 4 = 48		Bad condition	Pending	33.600.000.000	Project still to be approve & validated
From Entrée shan de Tire Nkozoa to Nyom 1	17 x 4 = 68		Bad condition	Pending	47.600.000.000	Project still to be approve & validated
Entrée Brazzaries Olembe to Nyom 1	11 x 4 = 44		Bad condition	Pending	30.800.000.000	Project still to be approve & validated
Total	476				336,000,000,000	

Source: Tembe's Design, 2023

The technical characteristics of the secondary road planned to be built and maintained are the following;

- ✓ Right of way: 40 m
- ✓ Medium traffic class: T3,
- ✓ roadway: 2 X 2 lanes of 3.5 m,
- ✓ Separation: Central reservation
- ✓ Sidewalks: 2x2.0 m,

- ✓ Public lighting,
- ✓ Sanitation: concrete gutters
- ✓ Pavement structure: asphalt concrete wearing course, base course of 20cm, and foundation layer of 20 cm.

  Here with the construction of a new secondary road in the study matrix, the cost price for 1km lane of road will cost F CFA 700 million

5.1.4.2 The Final roadmap of the study area

The Final roadmap of the study area on the next page shows how traffic congestion can be ease along the Olembe-Nkometou 1, segment of National road n°: 4 in Yaounde. In a pragmatic and operational manner, the map below highlghts the decongestion solution to be implemented following three time periods: Short, medium and long terms

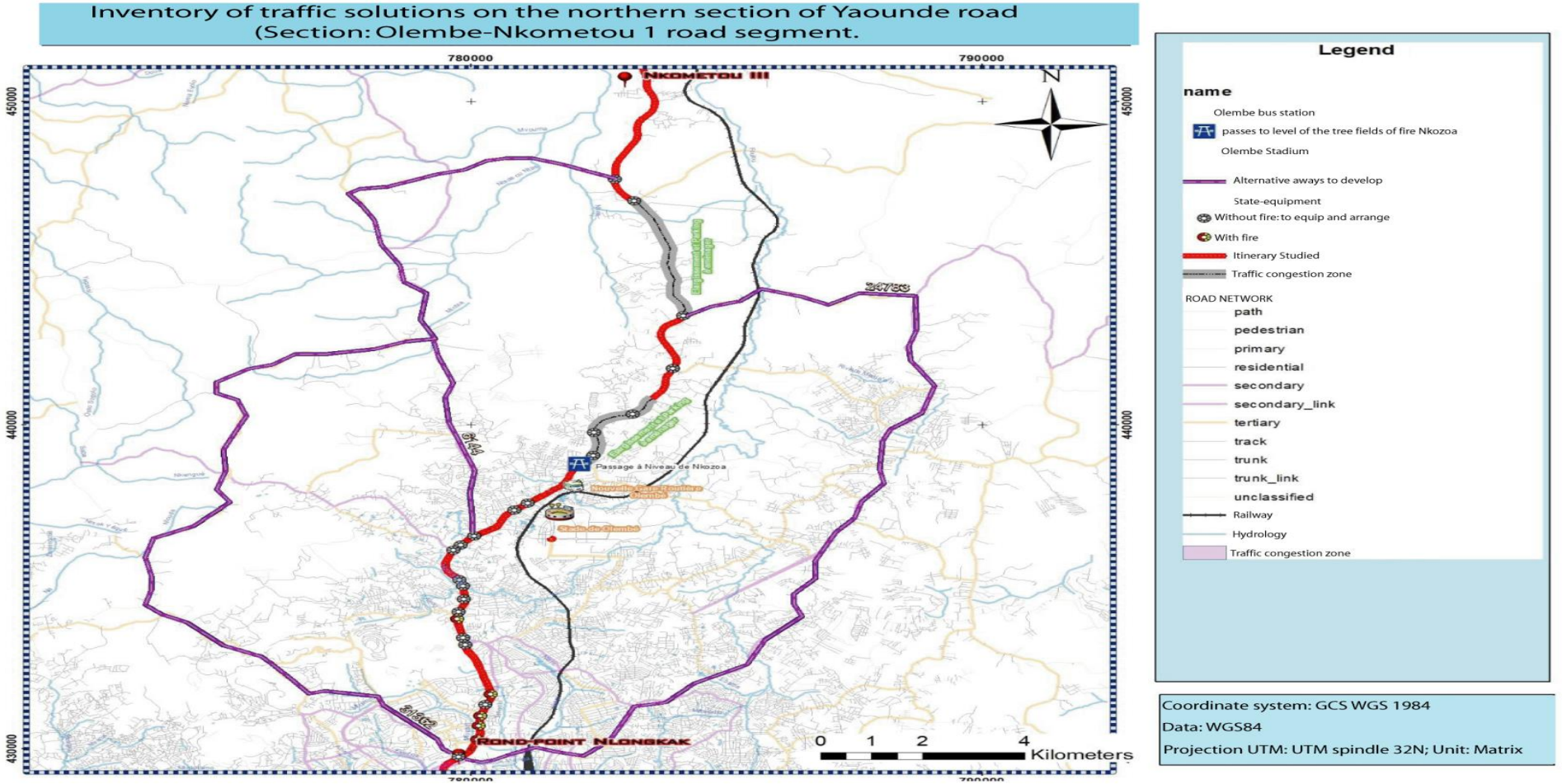

Figure 27: The Final roadmap of the study area after the road study.

Data Source: Field Survey of 20/1/2023

5.1.4.3: Comparison criteria:

For those who are familiar with road construction, since roads are of different categories or not the same, so the cost price of any road differs. The description of the road and what you have put on the road will determine the cost price of that road. So the cost price of any road will depend on the investment on that particular road. And what you have put on the road will depend on your objectives of the road. So in terms of time, no specific time period can be given for the construction of any type of road network because it all depends on the resources available. Meanwhile, in terms of cost, the secondary road is the most expensive. The principal road with a 3 x 2 lane is the cheapest in terms of construction or widening compared to the secondary road axes.

Table 9: **Results of Comparison**.

Transport modes	Implementation Cost	Implementation Time
Principal road (90 km)	70 Billion Francs cfa	-Days
Secondary roads (476 km)	336 Billion Francs cfa	- Days

Source: Tembe E. T., 2023

5.1.4.3. Comparative Conclusion

In the analysis that has been done, the result shows that constructing secondary roads is more expensive than expanding the existing segment of the NR4. The estimated budget or cost of constructing a 90 km of a principal road with 3 x 2 lanes will cost F CFA 70 billion while 476km of secondary road construction with 2 x 2 lanes with an estimated budget of F CFA 336 billion. Thus, the difference in costs is due to the unequal volume of work and the quantity of materials to be used.

CONCLUSION

At the end of the preliminary design studies, the importance of carrying out this project no longer needs to be demonstructed. In addition to the fact that these developments will improve the conditions for the mobility of people and goods, they will also contribute to improving the socio-political climate of the entire region. These developments will also allow the city of Yaounde, the capital of the Central region, to stand out fom other cities in the region. After the exploitation of the data collected in the field, fom the Yaounde PDU, the researcher carried out the studies while proposing the development plans which led us to present the cost elaborated above. The rest of the

studies will alow us to better develop the project in its most subtle details as well as its various equipment/street furniture, in order to have detailed cost estimates for the work.

N.B: For all these work packages, the alternative solution (wih Bituminous Concrete coating plus Interlocking pavers in roundabouts) is recommended. The researcher also recommends the construction of the solar-powered public lighting network.

5.1.5. Scenario 5 - Proposed Basic Traffic Management Strategies.

The core principle underlying the strategies in traffic management rests on Education, Engineering, Enforcement and Evaluation but what is clear is that these basic four highlighted below are the ingredients from which the or any additions derive their support. It is in this context that the first four are seen as the prime factors and will help as a solution to the traffic congestion along the Olembe -Nkometou 1, segment of road.

5.1.5.1. Education

Road Traffic education is the first strategy in effective traffic management. It is the process of integrating every individual into the motoring public. A well-educated road user is a safety conscious person who is fully aware of his/her role and responsibility on the road.

Road traffic education includes:

- Training and licensing of drivers and riders;
- Enlightenment and reorientation of road users;
- Mass mobilisation for safety measures;
- Traffic information system;
- Public participation in policy formulation and implementation.

In traffic management, education is not for its own sake but for the purpose of public compliance to safety rules and regulations as well as for smooth enforcement of traffic regulations. An investment in traffic education will in turn yield results in terms of compliance, and orderliness that will in turn lead to economic returns in time saving (man-hour conservation) and safety of lives and property, bound to have multiplier effect on productivity and income.

Research has shown that compliance with traffic rules and regulation is very high where traffic management policy and physical measures are understood by the road user. Passman et al (2001), Falade (2005), Adeniji (2006) and Khan et al (2008) indicate public education and awareness campaign as a veritable tool for compliance to safety measures. It is in this wise that they advised

that legislation and enforcement alone cannot bring the required reduction in road crashes. It is therefore clear that enforcement without education cannot bring about total compliance, especially in this part of the world where the society is becoming lawless, people doing whatever they feel without consideration for others. Safety is not seen as a norm accepted only when enforcement agencies are present. It then means that to achieve total compliance, the UN standard of an officer to 50 meters of road length needs to be adopted. This is almost a tall dream. Resources to achieve this are grossly inadequate. So people cannot be policed closely. The viable option is to moderate road users' behaviour. Road traffic education therefore has to be a major programme to raise road users' consciousness about the rules and regulations guiding the use of the road with a view to ensuring safety of all road users.

5.1.5.2. Engineering

Roads are engineering structure on which vehicular traffic ply. An effective and efficient traffic management agency must pay attention to this strategy as it involves the development of safer road infrastructures. Deliberate attention must be focused on assessment of safety planning in the design, construction and operation of roads. It includes road pavement markings, installation of signage and signals, intersection design, road landscaping, railing, barrier and other calming devices that can be used to reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized street users (Lockwood, 1997).

Traffic management is in the purview of traffic engineers who are trained in the use of engineering elements to direct and redirect traffic. They design and construct roads with adequate consideration for engineering standards and specifications. On the other hand, the Town Planners' responsibility is to prepare layout of road network with adequate consideration for land uses that such network will serve. Their expertise includes the use of landscape element to coordinate people's movement and regulate physical development that may impede accessibility and mobility, nonetheless, the role of traffic engineers and town Planners cannot be over looked.

Traffic management agencies must develop capacity in these areas having the relevant experts in their employ in order to have a good synergy with the aforementioned government departments to be able to coordinate road traffic system effectively.

5.1.5.3. Enforcement

This is a process of policing the entire traffic system with a view to arresting and punishing violators of traffic rules and regulations. The enforcement duty has overwhelming concern while the

other strategies are left unexploited. Enforcement involves the enactment of traffic legislations, penalties such as fines, and establishment of different mechanism for the enforcement.

Legislation and enforcement are two sides of a coin. While legislation spells out offences that can be committed, enforcement ensures punishment for contravention. Where there is no legislation there is nothing to enforce. Hence, appropriate legislation is necessary. It must be capable of creating deterrence but requires adequate publicity in order to make every road user aware of it.

Abuse and “selective” enforcement have been two major problems in road traffic management. Just as political interference and trade union agitation also neutralise the effectiveness of enforcement. Sad enough, revenue generated from fines and penalties are yardsticks used in measuring the performance of most of the traffic stakeholders as opposed to the improvement recorded in safety of road users on the highway.

5.1.5.4. Evaluation

Evaluation is central to all strategies. It is a process of reviewing the policies, plans and programmes set to achieve traffic management objectives. Once there are goals for plans and programmes to achieve, periodic review of performance is needed to give a feedback on how the system is faring.

One thing is central here that is, the importance of appropriate record keeping and information gathering mechanism in the organisation. An evidence-based judgement cannot be made if there are no data to assess value, evaluate and measure how a plan or programme has succeeded.

Public participation in the evaluation process is highly recommended. Given the background that traffic management is a social service, people's involvement in periodic assessment, policy formulation and implementation are therefore necessary ingredients for an effective traffic management strategy.

5.1.6. Recommendations

As already pointed out earlier in this study, there appears to be no singular accepted universal solution to the problem of road traffic congestion, than mobility management. Therefore, this study recommends an array of mobility management strategies that are capable of reducing the volume of vehicular traffic in the study area. The recommendations are thus sub-divided into two, viz: Short Term and Long Term strategies.

5.1.6.1. Short Term Strategies

1**. Development of traffic restraint zones along the Olembe -Nkometou 1, stretch of road**.

This study has as one of its findings, the problem of mobility management in the study matrix. The poor mobility management is thus responsible for the situation whereby any type of vehicles is allowed along that 15km stretch of road. For instance, at peak hours commuters and truck traffic compete for the road space.

This prevailing situation is responsible for the snail-like speed of vehicles at peak periods. However there is a need for a policy change in traffic management in Yaoundé; that will internalized the cost of transportation along the Olembe-Nkometou 1, stretch of road at a given time of the day. The only way by which congestion cost can be internalized in the study area is through development of traffic restraint zones in the study matrix, whereby public transit system will have precedence over car traffic. As a result, it is hereby recommended that the Yaounde authority should restraint vehicular traffic along the 15km stretch of road in the study matrix.

Photos 33 & 34: All categories of vehicles found on this 15 km stretch of road in the study matrix

Source: Tembe E. T., 2023

The purpose of the traffic restraint policy measure is to ensure that certain categories of vehicles are restrained from the Olembe-Nkometou 1, segment of road at peak periods between 6.30a.m.till 11 a.m and between 4pm till 8pm. However, only vehicles that are on emergency duties such as Fire fighters, Police/ Military Official vehicles, inter-urban buses, taxi's, mini buses would be allowed to

enter the study matrix during the traffic restrain period. However, vehicle owners who may prefer entering the zones with their vehicles within the traffic restraint period would be made to pay toll. The amount to be paid shall be fixed by the authority and the stakeholders.

It is expected that toll along this segment of road, from any part of the country should be higher *than the toll* vehicles will pay for any other part along national road number 4. This core area along the Olembe-Nkometou 1, stretch of road, generates more traffic and activities other segment of the National road No: 4. The vehicles restraint policy measure, if well planned and managed, will help develop the culture of public transport utilization among commuters, and consequently free the road from traffic congestion.

Therefore, for the traffic restraint measures to be efficient and functional, there should be provision for complementary facilities, such as park and ride facilities, like car park facilities, bicycle and motorcycle parking facilities. It is believed that commuters should be able to park safely and securely their cars, bicycles and motorcycles, and complete their journey to the designated CBDs by public transport in the city centre, in a place near the mass transit stations,

Again, another complementary infrastructure that will be required for the traffic restraint measure to work perfectly is the Freight Distribution Centres (FDC]. For instance, if trailers and trucks are barred along the Olembe-Nkometou 1, segment of road at a particular time of the day, goods meant for distribution by these vehicles can be handled by smaller vehicles, for distribution within a closer range of the freight distribution centres.

2. Introduction of truck tolling along the Olembe-Nkometou 1 stretch of road.

Trucks and trailers are observed wandering at peak periods along the Olembe-Nkometou 1, segment of road, to the detriment of other more important vehicles that provide emergency services such as ambulances, fire fighters, police, school bus to mention a few. However, restricting movement of trucks and trailers at peak periods would help ameliorate traffic congestion along the study matrix. For, according to Webber (2000) as a result of the non-linear nature of traffic congestion, adding or removing only a small fraction of all travelers can make an enormous difference in traffic flow. This is a prominent traffic management strategy that will help free this road corridor and reduce traffic congestion. In the course of this study, it was observed that truck and trailer traffic are prominent along this major road corridor such as Olembe-Nkometou 1 national road at peak periods. Therefore, such a policy is capable of withdrawing more than 30% of traffic along the Olembe-Nkometou, stretch of road at peak periods, if properly applied by the traffic management officials. On the contrary, if trucks and trailers must move around at peak periods, the operators

must be made to pay toll, especially to enter the traffic restraint zones.

Photos 35 & 36: shows how Trucks and trailers are seen wandering at peak periods along the Olembe-Nkometou 1, stretch of road

Source: Tembe E. T., 2023

Jones (2007) emphasizing the universality of tolling as a countermeasure against traffic congestion stated that ‘'all over the world we see heightened interest in creating new toll facilities, in road pricing and in open road tolling. For instance, in the last few years, four separate concessionaries have come together in Santiago, Chile, to create a fully integrated, electronic open road tolling system in an urban setting. Also, in Austria, the government- owned Motorway Company known as ASFINAG recently created a fully electronic free-flow truck charging system that covers the entire country's motorway network”.

Furthermore, Jones (2007) added that “in Germany, the Transport Ministry, using a different technological solution, has created a national truck tolling network under the auspices of Toll collect. In India, the National Highways Authority is in the process of 'four-Ianing' more than 24,000km of interurban highways on the Golden Quadrilateral and converting these roads to toll roads. Again, during the summer Olympic Games in 2008 in china, thousands of miles of new motorways were built, many of them tolled, to support the mobility of its people and a rapidly growing economy”.

Tolling is also perceived as a better way of internalizing the external costs of transportation, of which traffic congestion is a major problem. Hence, Jones (2007) asserted that tolling is as a result

of “the increasing demand for new sources of highway funding to promote mobility and reduce congestion...” Again, in a report by the German Ministry for Economic Cooperation and Development (2003) it is emphasized that “external costs caused by the transport sector should be borne by the users of transport services (this is the polluter – pays principle). Only then is a rational and responsible development of transport systems and behaviour possible. Transport demand Management can play a vital role in this respect by steering transport demand by means of laws and regulations, financial incentives (taxes and subsidies for transport services), and cooperative practices (e,g, Public-Private Partnership). However, the most important aspects of the transport external costs are accidents, traffic congestion and enhanced noise pollution.

5.1.6.2. Long-term strategies

1. **City Bicycle Promotion**.

The poor mobility management in Yaoundé, whereby more than 90 per cent of every movement is road based, and road infrastructural provision is largely for movement of vehicular traffic, aggravates the traffic congestion crisis along the major corridors of metropolitan Yaoundé, For instance, the share of bicycle in road infrastructure provision and usage as observed in Metropolitan Yaoundé amounts to zero percent of total road infrastructure provision. The planning vacuum created by this great omission necessitated the need for every travel demand along the Olembe-Nkometou 1 stretch of road, being met by automobile, hence the consequent increase in road traffic externalities such as traffic congestion, air and noise pollution, accidents and so on.

However, in other cities of the world where bicycle usage is accorded all the necessary attention it deserves and is conscientiously promoted, it has been able to take charge of a reasonable proportion of the demand for travels in these cities (see photo 36). For instance, according to a report by the German Ministry of Economic Cooperation and Development (2003) it is stated that “cities in developing countries are generally heavily dependent on both public and non-motorized transport. Walking and riding by bike account for more than 50 per cent of all daily trips in many Asian cities, reaching between 60 and 90 per cent in selected Chinese cities. In India and Pakistan, for example, between 10 and 30 per cent of all intraurban trips were by bicycles during the 1990s”.However, in the course of road infrastructure provision for bicycle usage in these cities, the report added that “the opportunities for using the two viable alternatives to cars, that is non-motorized and public transport exist, but they are often being overlooked or not considered due to a series of misconceptions”.

Photo 37: Park and ride facility located near Tram Station in Dresden, Germany

Source: Authors' Collections

Interestingly, the topography of the study matrix or environment is suitable for cycling as can be seen from the topographical map (see figure 22). Yaounde is characterized by low floor terrain and not hilly, which is suitable for cycling. Also the close proximity to each other of some of the land use categories in Metropolitan Yaoundé is an added advantage for bicycle usage and promotion in Yaoundé, This mode of transport, if well developed and promoted by Yaoundé authority in collaboration with international and local environment friendly Non- Governmental Organizations, and international donor agencies, is capable of technically removing from the road between 30-50 per cent of the current car traffic. Typical examples of cities where this approach has helped tremendously are Amsterdam, Holland; Copenhagen, Denmark; Dresden, Germany as well as cities in Colombia.

Ghana is currently developing a city bicycle network in her major city - Accra. Therefore, a city network of bicycle path is needed to be developed in Yaounde. This can be achieved if the city authority in collaboration with private stakeholders would develop a master plan for comprehensive bicycle path infrastructure development in Yaounde. It is achievable within 2-5 years. The study area of this work would provide the ideal corridors for the take-off of this sustainable urban transport project.

2. Introduction of Uniform School bus in Metropolitan Yaoundé

One of the prominent aspects of the travel pattern of an average middle class person in Yaoundé is transportation of child to school, on their way to work in the mornings. Since, the authority does not have full control over the choice of schools by parents for their children, hence somebody living in the Southern part of the city would prefer enrolling his or her child in a school of his choice in the Northern part of the city, and vice versa. The traffic generation implication of this is usually conflicting early morning mass movement of people in different directions of the city.

This unnecessarily extended travel pattern of parents (from home to school, and from school to office), complicates traffic management and control in Yaoundé. For instance, traffic around most schools is usually heavy and difficult to control, as a result of parent parking for child to disembark in the morning and embark in the afternoon.

These trips will not be necessary, if the city authority in its mobility management programme would recognize this type of traffic, and tactically remove it, by providing a uniform public school bus system. This is an ideal traffic management scheme that is capable of rearranging the travel pattern of most parents. At the planning stage of this scheme every stakeholder must be duly represented, more importantly schools and parents.

Government may as well encourage car pooling and car sharing, among parents living in the same neighborhood, such one car instead of two or three from a neighborhood will need to take the children of two or three families to school at a time. Government should encourage this traffic management approach through radio and television jingles, print media advertisement, as well as through collaboration between government agencies in the transport and education sectors.

Again, in the nearest future, government may need to discontinue completely the idea of public school bus, once efficient and adequate mass transit system is put in place in Yaoundé. For instance, as part of the mobility management strategies in most cities in Germany school bus is not encouraged, not even for the toddlers. Rather, parents are encouraged to leave their children at a designated point, within a walking distance from their home, where a teacher of the school will walk the children to the nearest bus stop or tram station. Typical example of this concept 'is found in the city of Dresden.

3. Towards Transit Oriented Development (TOD) in Yaounde

Urban sprawling needs to be discouraged in Yaoundé. Rather the authority should support and encourage property developers to develop skyscraper estates across the city that will have capacity to accommodate work zones, residential, commercial, educational, health, and financial land use (photo 37). This is in line with the architectural concept of design, density and diversity (3Ds). The cities of Curitiba, Brazil and Bogota in Colombia developed along this new urbanism ideology. This approach has been able to reduce reasonably the travel distance as well as the need to travel in most cities of the world. Skyscrapers are alright, but the only reservation for its deployment in the study area is the erratic nature of power supply.

Photo 38: High Rise Residential Buildings in Yaounde, Cameroon.

Source: Tembe E. T., 2023

Hence the report of the German Ministry of Economic Cooperation and Development (2003) on Transport and Mobility succinctly stated that "in the mid-and long-term, solving traffic problems in many cities can only be achieved through improved and combined settlement and land-use management, by adhering to the short-distance principle, i.e. by locating housing and work in close proximity to one another, freight distribution point to Industrial and commercial zones"

In addition, linking these skyscrapers together with mass transit options like Bus Rapid Transit (BRT), Tramway, monorail, Light rail, will further enhance the mobility management potential of the city. The direction of this development should tilt towards the expanded urban fringe of Metropolitan Yaounde, such as Olembe, Nkozoa, Ebang and Nkometou 1.

Other recommendations also include the following:

i. Rechannelisation of creeks and lagoon in Yaounde using public and private investment initiatives will equally go a long way at relieving the existing road of excess "weight" over time and space.

ii. The correlation between the Yaoundé population-growing trend and travel demand, informs the need for a more scientific approach in traffic control and management. Hence, the need for deployment of various categories of Intelligent Transport System (JTS), particularly centralized Traffic Control System (CTCS) aided with Close Circuit Television (CCTV) will help in accomplishing real time traffic information, control and management in metropolitan Yaoundé.
Since land use abuse is identified as a major contributing factor to road traffic congestion in most developing countries, this work recommends that future urban transport plan should emphasize Transit Oriented Development (TOD) along side capital investment in all urban transport projects in metropolitan Yaounde.

iii. There should be exclusive investment in integrated urban transport system whereby the concept of multi-modlism would be fully developed. For example, the expansion of the rail corridor farther into the the western and eastern parts of the city will help to reduced to a reasonable extent the travel demand on the road.

iv. Since land use abuse is identified as a major contributing factors to road traffic congestion in most developing countries, this work recommends that future urban transport plan should emphasize Transit Oriented Development (TOD) alongside capital investment in all urban transport projects in Yaoundé.

5.1.7: Suggestion for Future Academic Works.

5.1.7.1: Further Road Widening.

Eventhough my project ends at the toll gate (police check point) at Nkometou 1, the researcher is proposing that in the near future the road should be extended righ to Oballa roundabout to solve future road traffic congestion problem on that National road No: 4. The widening of the stretch of road from Nkomeou 1- Obala roundabout is a necessity else that particular stretch of road will become another nigh mare to the commuters. Widening the wide of that stretch of road from Oballa-Nkometou 1, will help resolve future road traffic congestion problem once and for all on that stretch of road. The government should be thinking of spending more by trying to widening that stretch of road so that it should have about 3x2 lane road. That means on each side of the road we need to have about 3 lanes in each direction and there are only 2 sides. This stretch of road is a great exit that passes or goes through the East Region, North West Region and the West Region. So it's a big exit and that portion of road need to have many lane of traffic.

5.1.7.2. Bus Rapid Transit

The newest sustainable urban transport option that is being tested and proved worthwhile today is the concept of Bus Rapid Transit (BRT). Yaounde authority should encourage private initiative to invest in development of BRT corridors across Yaounde. Importantly the major expressway should be redesigned to accommodate BRT infrastructure, and thus give priority to public transport. Bus rapid transit (BRT) systems consist of large buses that run on dedicated lanes and stop at well-defined stations, and include a technology that enables passengers to pay before boarding.

Photos 39 & 40: BRT buses 70 passengers' capacity comprising 42 sitting and 28 standing.

Source: Alamy images

5.1.7.3. Urban Mass Public Transport

Urban Mass Public Transport in Cameroon has so far proven futile after several tryers of Public bus transportation especially in the capital city of Yaoundé. The researcher thinks Urban Mass Public Transport should be re-launch if well toiled itinerary like Obobogo to Olembe that cuts across through the city of Yaoundé. The author also thinks, the Fast Link Urban Train project by the Yaoundé City Council should be accelerated. Mass Urban Transport in the Capital City like Yaoundé with more than 4.5 million inhabitants call for Planning, adequate studies to identify the different poles of influx. The city is not well planned and without a good plan is difficult to know exactly where traffic generates and where you have to transfer and (to) commute this traffic to another place in town. At the Yaoundé Urban Council, studies are well advanced on the Rapid Transit Buses for public transportation. The author suggests that a Rapid Transit Buses in the same line from Olembe to Ahala should be carried out. But since 2016 Yaoundé is known only for inter-urban transport buses that the author believes could be very productive to both parties, i.e., the public and the private sector concern to uplift the challenges. Further talks with STECY the operator on the blockages should be carried out. STECY complained that out of 10 buses put on the road, 5 are grounded by evening due to very bad roads. However, STECY is still ready to put urban buses at the disposal of the population in the city of Yaoundé. For one thing, since SOTUC succeeded in Yaoundé in the 90s, meaning if well studied, planned and applied, Urban Public Transport by Mass could be well effective in Yaoundé.

Photos 41 & 42: Stecy SA, circulation of new transport buses in Yaoundé in the 90s and the current Stecy SA buses are blue in colour

Source: Alamy images

Photos 43 & 44: Shows how the sitting and standing positions were designed in Stecy SA buses in Yaounde in the 90s.

Source: Skynesher images

5.1.7.4. Road pricing.

Road pricing is a mechanism put in place in most developed countries' cities to fight the menace of road traffic congestion. It is process whereby fees are charged by cities authorities for utilization of given corridor (mostly congested corridor) by private car at peak period. This approach has been adopted to discourage the exclusive dependence of urban dweller on private cars. This is because of the immense contribution of cars to road traffic congestion in most cities.

A most recent successful experience in this regard in the 'London Congestion Charged' which has helped in slashing considerably the congestion rate on inner city corridors in London. Another example is the case of the City of Stockholm, Sweden. Although it is still being experimental on it has impacted positively on accessibility problem in the inner Stockholm corridor.

Mechanism for the adoption of this sustainable opinion against road traffic congestion in Yaoundé is equally researchable considering the worsening trend of road traffic congestion on Yaoundé road.

5.1.8: Summary of study

Road traffic congestion is a global phenomenon, which adversely affects cities in both developed and developing countries alike. The aggravation of the phenomenon (traffic congestion) over the years necessitates a scientific enquiry into the dimensions of the problem on the geo-political and socio-economic setting along the Olembe-Nkometou 1, segment of National Road N^{o}: 4 in Yaoundé, being one of the busiest road in the country.

The existing global body of knowledge on road traffic congestion, recognizes the prevalence of this phenomenon (road traffic congestion), as a social problem which has both positive and negative impacts on cities well being. Hence, various concepts and theories have been developed in pursuit of the desire to counteract its negative impacts on the city. For example, down's 'predict and provide', predict and prevent'; Traffic Equilibrium Theory to mention a few. These theories espouse the features and characteristics of this phenomenon in the city.

Also, the review of literature on the phenomenon reveals an interesting characteristic of the problem; the realization that there is no permanent solution to the problem. Rather, according to webber (2000), congestion and its attendant effects in cities, are the price people have to pay for the variety of opportunities cities have to offer their inhabitants. Notwithstanding, the negative effects of congestion in cities, as revealed in the literature, can be minimized through land use and transport planning integration, application of Information and Communication Technology (ICT), prioritization of public transit system among others.

The study was able to explain the characteristics and dimensions of road traffic congestion in the study area, through a combination of qualitative and quantitative research methods. For instance, the human factors that contribute to traffic congestion, such as perception, attitudinal and behavioral factors, institutional analysis, which cannot be adequately captured, using quantitative research method/approach, were explained through qualitative research methods.

Consequently, this study has been able to establish some facts about the features and characteristic of road traffic congestion along the Olembe-Nkometou 1 stretch of road. For instance, Yaoundé commuters considered the health implications of time spent in traffic congestion as grievous. They perceived that it is often responsible for all kinds' ailments such as stress, fatigue, headache, feverish condition and tiredness. As a result, commuters in the study matrix adopt series of coping strategies. Detouring is a popular coping strategy. Unpopular secondary roads in the study matrix are often used by commuters

Additionally, this study examines the various urban development plans that exist in Yaoundé and their loopholes. The study tries to find out the reasons why these programmes were not well executed and how traffic congestion is resulting from the poor implementations of these programs.

This study has been able to establish that there is inconsistency in traffic management policy in Yaounde. The city has been experiencing policy somersaults over the years. The total lack of coordination among institutions responsible for road transport development does not allow for the integration of the urban transport policy and institutions in Yaounde. Currently, there is no clear cut

route(s) for operational feedback among these institutions. Rather responsibility is duplicated and overlapped. This consequently amounts to a waste of public funds.

Furthermore, the activities of street traders, touts, and shops along the road gravely affect the flow of traffic along the Olembe-Nkometou 1, stretch of road. (See photos 22, 23, 24, 25, 26 & 27). These evidently reveal the weakness in traffic law enforcement in Yaoundé. It also emphasizes that road infrastructure, which is expected to be a public space, are being violated and misused by road users along the stretch of road in the study matrix. Hence, the increasing rate of traffic bottlenecks and congestion, which is everyday experience by road users along the Olembe-Nkometou 1 stretch of road.

The study investigate the extent to which poor waste management, infrastructure, and the presence of mix vehicles and commercial activities, and others are a great challenge to effective traffic management along the Olembe-Nkometou 1, stretch of road**.** (See photo 3, 4, 5 and 6).

However, the car growth trend needs to be curtailed in Younde. Otherwise, under a business as usual (BAU) scenario, as personal income of individuals increases, the economy of the city improves and population continues to grow, definitely the demands for travel is expected to rise. Therefore, if provision is not made for integrated public mass transit development in Yaounde, more commuters will opt for personalized means of transport through acquisition of private cars. The consequent implication of this is heavy traffic congestion on the road.

GENERAL CONCLUSION

This study has been able to establish that road traffic congestion is a global phenomenon. It is neither a peculiar problem of developed nor that of developing countries. Again, road traffic congestion in Yaoundé, as confirmed by past studies, seems to have defied every countermeasure. This is also an evidence of the global characteristics of traffic congestion, which made Webber (2000) to agree that there is no permanent solution(s) to traffic congestion. And, that if road expansion and construction could be the solution to traffic congestion, roads in cities such as Los Angeles, USA and London, UK are supposed not to be congested. Road traffic congestion; as confirmed in the literature is one of the prices city dwellers are bound to pay for variety of opportunities cities have to offer. It was further stated in the literature that traffic congestion, is a tested yardstick of determining the socio- economic vibrancy of a city. For instance, the heavier the level of traffic congestion in a city, the heavier the level of socio-economic activities. As a result, the positive part of traffic congestion is that it is an evidence of economic vibrancy, competitiveness as well as creativity of a city.

This problem or topic happens to be a worry that is plaguing the whole of circulation in Yaounde. Even though, the State has recognized this particular problem on this stretch of road and they are doing something gigantic about it. The State has impact on one measure which is the “by-pass” that is going to link Yaounde South, Yaounde North. The “by-pass” will appear on Yaounde-Douala axis, then another one that has to pass to Soa and come into Yaounde. Even though every day we read in newspapers, hear from radio and television how sumptuous occasions have been organized to announce the availability of funds and rapid take-off or execution of projects in the nooks and crannies of the country. But several months and even years after, the projects have not kick-off, some of the foundation stones are nowhere to be found or covered with grass. At the level of the ministries documents show that the level of execution of the projects is increasing. By the end of the budgetary year, the final documents indicate that the project has been completed or witnessed an 80 percent execution. These things happen until the minister in charge becomes vigilant and announce the cancellation of such fake deals for the masks to take off. Due to such fake deals and lack of trust from the state, the researcher sees the necessity for this particular stretch of road to be widen, so as to absorb the traffic or decongest the traffic at Nkometou and to enable people catch up with work in due time. Also, those vehicles coming into Yaounde still gives room for that stretch of road to be widen and that is what this thesis is all about. And in course of widening it, people along the right of way will be affected directly or indirectly by losing their properties. This will obviously entail some compensation especially of those things that were realized with authorization from the council.

Thus, a global phenomenon like road traffic congestion requires a global solution as already suggested in this study. Therefore, stakeholders in Metropolitan Yaoundé need to think globally and act locally, by domesticating some of the world tested countermeasures already mentioned in this work. Inasmuch as, man has a limited control over traffic congestion, unless he would not want economic activities to grow in his neighborhood, people along the Olembe-Nkometou 1 road corridor should learn to live with traffic congestion, while they apply conscientiously the world acclaimed mobility management strategies, rather than looking forward to the day, when the phenomenon would disappear from the streets of Yaoundé.

Consequently, authorities should unbundle urban transport development such that each mode (rail and road), will be allowed to play its complementary role. Also, unbundling transport development in Yaounde will usher in public/private partnering, towards funding of environmentally-friendly infrastructures and services like tramways, mono-rail, and low floor public bus services. Thus, it will reduce cost-effectively the number of personal means of transportation through cars, and consequently road traffic congestion.

The above listed remedies are guarantees that traffic congestion in Yaounde would subside, if government and every stakeholder will show sincere commitment and political will required to make these remedies work in Yaounde. This is in the light of the observation of Lomax (2003) in an assessment of the efficacy of remedies offered in the Texas Urban Mobility Study, in which he stated that “congestion is worsening, no doubt about that, but it would be a much greater problem, if not for these and other remedies”. Therefore, in a ‘do- nothing’ scenario, Yaounde should expect the worst of traffic congestion, as personal income and economy improved.

Just as the Doctors’ decisions are accepted in matters regarding health, even though the medicine may be bitter or the needle painful, so should the decisions of the author or researcher to ease traffic congestion along the Olembe-Nkometou 1, stretch of road be given the prime consideration. Also, all hands therefore must be put in hands to achieve the above listed recommendations by the researcher.

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APPENDICES

Appendix 1: Questionnaires for respondents

Department of Geography

University of Yaounde 1

Dear respondent,

I am a professional Master's of Science student in Town planning and urban development in the Department of Geography, in the University of Yaoundé 1 carrying out a research on "Contribution to ease traffic contribution along the Olembe-Nkometou 1, stretch of road". I therefore solicit for your cooperation to respond to the following questions by ticking [ ] at the appropriate item and where necessary, you fill in the blank spaces. All information given will be treated confidentially as the research work is only for academic purpose.

Thank you.

Tembe Ernest Temban.

SECTION A - General Information

1. Gender; a) Male [ ] b) Female [ ]
2. Type of respondents
   a) Taxi men [ ] b) bike riders [ ] c) truck drivers [ ] d) passengers [ ] e) road vendors [ ]
3. Age : a) < 20 [ ] b) 20-24 [ ] c) 25-29 [ ] d) 30-34 [ ] e) 35-39 [ ] f) 40-44 [ ] g) 45-49 h) 50-54 [ ] i) 55-59 [ ] j) 60 > [ ]
4. Educational Status:
   a) FSLC [ ] b) O/Level [ ] c) A/Level [ ] d) First degree [ ] e) Masters/PHD [ ] f) No education [ ]
5. Place of residence in Yaoundé (district/neighborhood) _____
6. Marital status:
   a) Single [ ] b) Married [ ] c) Divorced [ ] d) Widow/ Widower [ ]
7. Occupation
   a) Farmer [ ] b) Civil Servant [ ] c) Student [ ] d) transporter [ ] e) business [ ]
   f) Others [ ]

8. How often do you travel (by road)?

a) Often [ ] b) very often [ ] c) rarely [ ] d) never [ ]

9. What dictates the choice of the roads you are frequently?

a) State of the road infrastructure [ ] b) type of road infrastructures present [ ] c) the population of the area [ ]

SECTION B: Demonstrate the extent to which traffic congestion is experienced along the Olembe-Nkometou 1, segment of road.

Causes of road traffic congestion

42 Do you ply this stretch of National road No 4? Yes ☐ No ☐

43 What type of Vehicles do you see along this road axis? Buses ☐ Private cars ☐ Trucks ☐ Vehicles ☐ Pedestrians ☐ Motorbikes ☐ Bicycles ☐

44. What are the 3 major causes of traffic congestion along this stretch of National road No: 4?

_____

45 According to you, who are the real causes of this traffic congestion? Driver ☐ Government ☐ Passengers ☐ Local population ☐ others ☐

46 At what periods is traffic congestion frequent along this stretch of National road No: 4?

a) **Period of the day:** Morning ☐ Afternoon ☐ Evening ☐

b) **Period of the week:** Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday ☐

c) **Period of the year**: January ☐ February ☐ March ☐ April ☐ May ☐ June ☐ July ☐ August ☐ September ☐ October ☐ November ☐ December ☐

Impacts of traffic congestion

52 Have you been affected by traffic congestion Yes ☐ No ☐

a. Property Yes ☐ No ☐

b. Your child Yes ☐ No ☐ if yes

name.....

c. Your friend Yes ☐ No ☐ if yes name.....

d. Your relative Yes ☐ No ☐ if yes name.....

e. Parents Yes ☐ No ☐ if yes name.....

53. What are the impacts of road traffic congestion along the Olembe-Nkometou 1, stretch of road?

54. Who are the commuters on that Olembe-Nkometou 1, stretch of road?

55. What are the different type of vehicles that ply the Olembe-Nkometou 1, stretch of road daily**?**

Policy and Social Issues

56. If road pricing is introduced along the Olembe-Nkometou 1 roads as a car owner, which of the following option would you prefer, to avoid paying toll?

Car pool □ Taxis ☐ Buses □ Van pool ☐

57. Does road traffic hold-up influence the time you wake up and get ready for work?

Yes ☐ **No** ☐

58. If yes, to avoid hold-up on your way to work, what time do you normally leave home.

4.00-5.00 ☐ 5.00-6.00am □ 6.00-7.00am ☐

7.00-8.00am □ 8.00-9.00am □

59. What time would you reach office if you leave earlier as stated above?

60. What is the state of traffic hold-up in your usual route at morning and evening period?

61. What time is the most terrible time one can travel on your route and encounter traffic

hold-up?

62. From your experience what are the major causes of this traffic hold up?

Bad road ☐ Pedestrian crossing ☐ Breakdown vehicles

Traffic wardens ☐ Others ☐

Preventive Measures

63. Have measures been put in place to curb this road traffic congestion? Yes [ ] No [ ]

64. What measures have been put in place to mitigate the problem? a) Road widening [ ]

b) Traffic control [ ] c) Rehabilitation works [ ] others [ ]

65. How efficient are these measures? Successful Yes [ ] No [ ]

66. If no, why? Bribery and corruption [ ] embezzlement [ ] Mismanagement [ ] disobedience [ ] others specify _____

67. What are the future plans of the government for this stretch of road? _____

SECTION C: Examine how the uncontrolled extension of Yaoundé brings about traffic congestion along this road.

68. Where specifically do you work? _____

69. In which region in Cameroon do you work? a) Yaoundé [ ] b) Douala [ ] c) Others [ ]

70. What position do you hold in your office? a) Council staff b) City Mayor [ ] c) Mayor [ ]

d) Minister [ ] e) village Chief [ ]

71. How many Urban Development plans exist in your city? a) 1 [ ] b) 2 [ ] c) 3 [ ] d) 4 [ ]

72. Name the various Urban Development plans that exist in your city? _____

73. When was each of these urban development plans created? _____

74. Which legal law number created each of these urban development plans? _____

75. What is the composition of each of these urban development plans? _____

76. What are the functions of each of the urban development pans? _____

77. What are the procedures for preparing each of the urban development plans? _____

78. How is land being transacted in the study area? _____

79. What are some of the reasons for these programs not well executed? _____

80. How has the execution of these programs been able to cause traffic congestion along the Olembe-Nkometou 1, stretch of road? _____

SECTION D: Prove how administrative bottlenecks hinder urban development in Yaoundé.

81. Where do you work? _____

82. What position do you hold in your office? a) Director [ ] b) Sub-Director [ ] c) Assistant sub-Director [ ] d) [staff [ ] e) Minister [ ]

83. How long have you work in that position? a) Few months [ ] b) 1 – 3 years c) 4 – 6 years

d) 7^{+} [ ]

84. When were your sector created and which presidential decree created your sector

_____

85. What are the functions of your sector? _____

86. Does the administrative fu nctions in your sector conflict with those of other sectors? a) Yes [ ]

b) No [ ]

87. If yes, why and how do they conflict with those of other sector?

_____

88. And in which area do they conflict? _____

89. Can the conflicting functions be resolved? a) Yes [ ] b) No [ ]

SECTION E: Sustainable strategies for a suitable road traffic congestion.

90. What do you suggest can be done by the central government, the city council and/ or individuals to ease traffic congestion along the Olembe-Nkometou 1, stretch of road?

_____

_____

_____

_____

_____

Big thanks for understanding!

Appendix 2: Interview guide

Appendix 2: Interview for respondents

Dear respondent,

I am a professional Master of science (M.Sc) student of the Department of Geography, in the University of Yaounde 1 carrying out a research on "Contribution to ease traffic congestion along the Olembe-Nkometou 1, segment of National road No: 4". I therefore solicit for your cooperation to respond to the following questions. All questions given will be treated confidentially as the research work is only for academic purpose.

Thank you.

Tembe Ernest Temban

Contribution to Ease Traffic Congestion

Date of interview:

Place:

Time:

Interviewer:

Position of Interviewee:

Questions

1. Describe your understanding of traffic congestion along the Olembe-Nkometou 1, stretch of road.
2. Describe your understanding of road transport infrastructure planning, investment, construction and maintenance in Yaoundé.
3. How does urban growth relate to road transport infrastructure investment along the Olembe-Nkometou 1, stretch of road?
4. What are the planning linkages between urban growth and the need for road construction?
5. Describe your understanding about the application of planning documents?
6. What are the different types and functions of urban planning document used in Yaounde?
7. Reasons for these urban planning programs not well executed.
8. What are the gaps in these urban development plans?
9. To what extent has these programs been executed that causes traffic congestion
10. How have people been occupying land in your area and how is land transacted in your area?
11. Who are the various stakeholders involved in urban development in Yaoundé?
12. What are the functions of your sector as a stakeholder in urban development in Cameroon?
13. How conflicting are these stakeholders that hinder urban development in Yaoundé.
14. What are the planning strategies which can lead to ease road traffic congestion along the Olembe-Nkometou 1, stretch of road

Big thanks for understanding!

Appendix 3: Research attestation

REPUBLIQUE DU CAMEROUN
PAIX-TRAVAIL-PATRIE
****
UNIVERSITÉ DE YAOUNDÉ I.
****
FACULTE DES ARTS, LETTRES ET DES SCIENCES HUMAINES
****
DEPARTEMENT DE GEOGRAPHIE
****

REPUBLIC OF CAMEROUN
PEACE-WORK-FATHERLAND
****
THE UNIVERSITY OF YAOUNDE I.
****
FACULTY OF ARTS, LETTERS AND SOCIAL SCIENCES
****
DEPARTMENT OF GEOGRAPHY

Master Professionnel Urbanisme, Aménagement et Développement Urbains

ATTESTATION DE RECHERCHE

Je soussigné, **Pr. PAUL TCHAWA**

Chef du Département de Géographie, atteste que

Monsieur: **TEMBE ERNEST TEMBAN**

Matricule: **21N965**

Est inscrit(e) au cycle de: **MASTER II PROFESSIONNEL**

Spécialité: **MASTER PROFESSIONNEL EN URBANISME, AMENAGEMENT ET DEVELOPPEMENT URBAINS**

Et prepare une thèse sur le sujet: **CONTRIBUTION TO DECONGEST TRAFFIC JAM ALONG THE OLEMBE – NKOMETOU 1 SEGMENT OF NATIONAL ROAD No. 4 IN YAOUNDE.**

A cet égard, je prie toutes les personnes ressources et tous les organismes sollicités de lui réserver un bon accueil et de lui apporter toute l'aide nécessaire a la réussite de cette recherche dont la contribution a l'appui au développement ne fait pas de doute.

19 OCT 2022

Fait à Yaoundé le .....

LE CHEF DE DEPARTEMENT

Clement Anguh Nkwemoh
Associate Professor (M.C)
University of Yaoundé I

Appendix 4: Academic intership attestation from MINHDU

REPUBLIQUE DU CAMEROUN
Paix - Travail - Patrie

MINISTERE DE L'HABITAT ET
DU DEVELOPPEMENT URBAIN

SECRETARIAT GENERAL

DIRECTION DES AFFAIRES GENERALES

SOUS-DIRECTION DES PERSONNELS,
DE LA SOLDE ET DES PENSIONS

SERVICE DU PERSONNEL

REPUBLIC OF CAMEROON
Peace – Work – Fatherland

MINISTRY OF HOUSING
AND URBAN DEVELOPMENT

SECRETARIAT GENERAL

DEPARTMENT OF GENERAL AFFAIRS

SUB-DEPARTMENT OF PERSONNEL,
SALARIES AND PENSION

PERSONAL SERVICE

N° 00307/AFSA/MINHDU/SG/DAG/SDPSP/SP/BPNF

Yaoundé, le 17 AVR 2023

ATTESTATION DE FIN DE STAGE ACADEMIQUE

Le Ministre de l'Habitat et du Développement Urbain soussigné, atteste que Monsieur **TEMBE Ernest TEMBAN,** étudiant en Urbanisme, Aménagement et Développement Urbain (URAMDEUR), a effectué un stage académique de quatre (04) mois respectivement dans quatre (04) directions (DOU ; DDSU ; DHSPI et DEPC) du Ministère de l'Habitat et du Développement Urbain, pendant la période allant du 26 août au 30 décembre 2022.

En foi de quoi la présente attestation est établie et délivrée à l'intéressé pour servir et valoir ce que de droit.

AMPLIATIONS :
-MINHDU/SG/DAG/SDPSP/SP
-INTERESSE/DOSSIER
-CHRONO/ARCHIVES.

LE MINISTRE

Ingénieur née Ketcha Célestine

Appendix 5: Academic Intership approval from MINTP

REPUBLIQUE DU CAMEROUN

Paix-Travail-Patrie

MINISTERE DES TRAVAUX PUBLICS

SECRETARIAT GENERAL

CELLULE DE LA FORMATION
.....
NNA

REPUBLIC OF CAMEROON

Peace- Work-Fatherland

MINISTRY OF PUBLIC WORKS

SECRETARIAT GENERAL

TRAINING UNIT
.....

MINISTERE DES TRAVAUX PUBLICS
CELLULE DES PROJETS ROUTIERS A FINANCEMENT CONJOINTS
Le 20 NOV 2023
COURRIER ARRIVEE
Enregistre S/N°

---9529

N°_____/C/MINTP/SG/CELFOR/NNA

Yaoundé le 15 NOV 2023

CHRONOGRAMME DE STAGES ACADEMIQUES OU PROFESSIONNELS PHASE N°18

Les étudiants dont les noms suivent sont retenus pour effectuer un stage académique ou professionnel au Ministère des Travaux-Publics. Il s'agit de :

N°	NOMS	FILIERE	ECOLE	STRUCTURE D'ACCUEIL	PERIODE DE STAGE
1	TCHINDA Jiresse	Génie Civil	ENSTP/Yaoundé	DIR	30 octobre 2023 au 30 janvier 2024
2	MOKORO Victory FOMUWILD	Génie Civil	ENSTP/Yaoundé	Direction des Investissements Routiers	30 octobre 2023 au 30 janvier 2024
3	TANGIRI Michael NDZEDZENYUY	Génie Civil	ENSTP/Yaoundé	Direction des Investissements Routiers	30 octobre 2023 au 30 janvier 2024
4	KOTEKOTE FOURZEN Jacques RAYMOND	Topographie/Cadastre	ENSTP/Yaoundé	Direction de la Construction	30 octobre au 30 novembre 2023
5	MANGA NGABA Germaine Gwladys	Master Contentieux International	IRIC	Division de la Coopération et du Partenariat	30 Octobre 30 décembre 2023
6	SEIDOU NDE BILLY	Environnement	ENSTP/Yaoundé	Cellule de l'Environnement et de la Protection des Infrastructures	30 octobre 2023 au 30 janvier 2024
7	DOUMTSOP Ronald	Communication	USTE/Yaoundé	Cellule de la Communication	22 oct au 22 décembre 2023
8	EGOUA BEKOLO Pharel	Génie Civil	ENSTP /Yaoundé	Direction de la Construction	30 octobre 2023 au 30 janvier 2024
9	TEMBE Ernest TEMBAN	Urbanisme/aménagement et développement Urbain	Université Yaoundé I	Cellule des Projets Routiers a Financement Conjoint	30 oct 2023 au 30 janvier 2024
10	ABENA MAROUSSIA Darila	Finance International	SUP de CO/Yaoundé	Direction des Affaires Générales	30 oct 2023 au 30 janvier 2024
11	ASMAOU YASMINE ALIOUM	Génie Civil	. ENSTP/Yaoundé	Direction de la Construction	30 oct 2023 au 30 janvier 2024
12	SAMIRA MAMBO KARI	Relation internationale	Université de Yaoundé I	Division de la Coopération et Partenariat	30 oct 2023 au 30 janvier 2024
13	AWA BELLO	Licence en Lettres modernes	Université de Yaoundé I	Direction de l'Entretien et de la Protection du Patrimoine Routiers	30 oct 2023 au 30 janvier 2024janvier 2024
14	SILINOU DJILLE Armand	Génie Civil	ENSTP/Yaoundé	Direction de la Construction	30 oct 2023 au 30 janvier 2024

20.11.2023

Exécution

LE MINISTRE

Emmanuel NGANOU D.