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PROBLEMS OF ROAD AND TRAFFIC MANAGEMENT IN THE AUTONOMOUS DISTRICT OF GRAND LOMÉ

Summary. Grand Lomé, Togo's metropolis and capital city, is experiencing an urban explosion that is creating enormous road and traffic management challenges. Mobility is increasingly marked by heavy congestion, traffic congestion caused by businesses, and illegal parking on the roads, aggravating road safety challenges. This research project aims to analyze the influence of poor road management on the mobility of the population of Grand Lomé. The methodological approach involved drawing up an inventory of the road network through observation and interviews with the stakeholders and road users. The results reveal a lack of appropriate road layout on the one hand and poor management of traffic flow, the absence of parking areas, and poor enforcement on the other. The road network is substandard. The main roads do not have sidewalks or crosswalks. Most of the sidewalks that do exist on some new roads are narrow and illegally occupied by businesses, preventing non-motorized transport users from benefiting from them. Bicycle paths are virtually non-existent on new lanes, which highlights the lane configuration problem. In order to ensure sustainable mobility in cities like Lomé, it is essential to optimize the road network and traffic conditions.

1. INTRODUCTION

Urbanization, which is a universal and irreversible phenomenon, has been humanity's most striking contemporary development since the second half of the 20th century. Worldwide, cities have undergone spectacular development, particularly in South and in sub-Saharan Africa [1]. Indeed, never before has the world undergone such a process of high-speed urbanization. As [2] pointed out, cities, whether small, medium, or large, continue to grow slowly in the Western world and rapidly in Latin America and, especially, in African and Asian countries. In fact, Africa remains the least urbanized continent in the world (41% versus 52%), but it is also where urbanization and urban growth rates have been accelerating over the last 50 years. The highest are at 4% or 5% per annum [3]. Access to mobility and the improvement of traffic conditions in urban areas are major global issues today at the heart of sustainable development policies. In this context, cities worldwide are facing similar challenges, requiring a reevaluation of infrastructure and adaptation to the diverse needs of the population.

At the heart of this global phenomenon are the multiple challenges facing cities and public authorities across the continent, particularly in sub-Saharan Africa. These challenges mainly concern the population, the economy, urban governance and management, as well as the environment. Urban governance and transport systems are deficient. The rapid urbanization of the continent, whose urban population is set to double by 2050, is considerably increasing travel needs [4]. This growth is all the more problematic in that transport infrastructures are often inadequate or unsuitable. According to [5],

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the urban sector accounts for at least 50% of gross national product in most developing countries and over 70% in others. Cities in developing countries often devote 15% to 25% of their annual expenditures, if not more, to transport systems [6]. Households generally spend between 8% and 16% of their income on transport, but this percentage can be over 25% among the poorest households in metropolises [7]. Transport fulfills a vital function in cities, which, in most developing countries, are the essential engine of national economic growth, helping to alleviate poverty [8]. However, the deterioration of public transport systems in many cities undermines the economic and environmental wellbeing of cities, as well as the quality of life of the poorest segments of the population. In fact, mediocre road networks hamper growth. From a social point of view, transport can either enable or hinder access to jobs and the health, education, and social services essential to the well-being of people with low incomes [9]. For poor urban populations, lack of access is one of the main factors of social exclusion [6]. Therefore, urban transport strategies can play a part in the fight against poverty both through its impact on the urban economy and, consequently, on economic growth, as well as through its direct impact on the daily needs of the most disadvantaged. Therefore, urban mobility is becoming one of the main social and economic challenges facing African cities [10]. The growing need to move people and goods cannot be met by infrastructure development alone due to severe political, economic, and environmental constraints [4]. Therefore, it is essential to improve the management of existing infrastructures, and strategic planning must be accompanied by, or even give way to, truly operational planning. In general, no planning policy seems sufficiently tried and tested to manage the urban challenges facing African countries [5]. In addition to traditional road transport, roads are increasingly becoming a shared space for alternative modes of transport (bicycles, pedestrians, exclusive right-of-way transport, etc.). Road space itself must concede part of its right-of-way to other modes of mobility [7]. Only by considering other modes of transport can we guarantee efficient, effective mobility in the cities of the south. Road Safety is an increasingly important issue in this sector, both for operators and users. It affects infrastructure maintenance and design, as well as the safety of staff and users [6].

Grand Lomé, Togo's metropolis and capital city, is a fast-growing area comprising two prefectures and 13 communes, and it is experiencing an urban explosion that is creating enormous challenges for urban road management [11]. Due to its demographic weight, the autonomous district of Grand Lomé concentrates most of the country's political, economic, and administrative life. This has an impact on the mobility of city dwellers. Daily mobility within Grand Lomé is increasingly marked by heavy congestion, which worsens during rush hours. There is a lack of development and management of the road network, poor management of traffic flows, a lack of parking areas, and poor enforcement of rules, all of which increase road insecurity in Grand Lomé [12]. This is the motivation behind this study, which explores how the layout of the road network influences mobility in Grand Lomé. This research aims to contribute to sustainable management of the road network and traffic on the various roads in Grand Lomé in order to avoid traffic congestion and facilitate accessibility for all modes of transport while avoiding road insecurity.

2. METHODOLOGY

This research is based on two main sources of data collection. These are primary data collected in the field and secondary data collected from mobility stakeholders in Grand Lomé. Primary data collection took place in January 2024.

The methodology used in this research is based on a literature review to examine the various theories governing the analysis of issues relating to road and traffic management and the analysis of field realities through interviews with stakeholders. Theses, dissertations, reviews, and articles, along with general and specific works by transport authorities, transport operators, and transport unions, were consulted on-site and online. The interviews consisted of a series of pointed, objective questions to the heads of the various socio-collective structures set up along the main roads in Grand Lomé. The other, more important target group for these interviews comprised pedestrians, cyclists, local residents, drivers of motorized modes of transport (motorcycle and car drivers), and promoters of economic activities along the main roads in Grand Lomé. The interviews provided key information on road and traffic

management in Grand Lomé. Overall, a sample of 450 respondents was selected, consisting of 150 pedestrians, 100 motorcyclists, 80 motorists, 70 merchants, and 50 managers or transportation infrastructure officials. This diversity in the sample allowed for a comprehensive understanding of traffic dynamics and road network management in Grand Lomé. The number of respondents ensured the representativeness of the various user profiles and stakeholders involved in road management. Traffic counts on the main roads were carried out over three days, from February 5–7, 2024, from 5:30 a.m. to 6:00 p.m. in both directions. The main objective of this approach was to analyze the dynamics of movement, identify congestion points, and provide reliable data for better infrastructure and mobility planning. This count provided information on the modal share of road traffic and gave an idea of the extent of traffic jams on Lomé's roads. The information collected in the field was processed on the computer using Sphinx and Excel. This software was used to create graphs and statistical tables to analyze and interpret various phenomena. Maps were produced using Arc GIS mapping software to make the locations and networks easier to read.

3. RESULTS

3.1. Urban dynamics of the Grand Lomé

3.1.1. From demographic explosion to urban macrocephaly

Grand Lomé, located on the coast of the Gulf of Guinea on the Atlantic Ocean, lies between 1°05'00" and 1°20'00" East longitude and between 6°05'00" and 6°22'00" North latitude. Lomé, the capital city of Togo, now extends beyond the boundaries of the commune. The immediate outskirts of the commune used to belong to villages that have now been absorbed by the capital city. Today, the Lomé conurbation is made up of the communes of the Gulf prefecture and those of the Agoè-Nyivé prefecture, which are grouped in the Autonomous District of Grand Lomé as represented in Fig. 1.

Three factors explain the urban growth of Lomé and African cities: 1) natural growth, 2) absorption of peripheral areas or villages, also known as in situ urbanization, a phenomenon also observed in Asia, and 3) migration. This growth was very slow from the 1940s onwards due to the low population growth rate and the lack of interest most Togolese had in urban areas, as they were more attached to rural areas, the only likely outlet for wealth production. However, following Togo's independence in 1960 and the awakening of the Togolese elite, freedom drove many rural dwellers to urban centers, which offered more opportunities [13]. This catalyzed urban growth in Lomé, Togo's capital city, which boasted a certain number of basic infrastructures for training and public services, which provided opportunities for development and emancipation. Since then, urban growth has progressed until the symbolic threshold of 2,000,000 people was passed according to the latest population and housing census (RGPH) in 2022. Fig. 2 shows the demographic evolution of the city of Lomé from the 1920s to the present.

In 1921, three years after the German defeat and Togo's passage under French trusteeship, Lomé's population was estimated at 6,444, and it rose to 32,000 by 1940. At independence, Lomé had a population of 85,000. As can be seen from the graph, it was from this period onwards that the population growth curve began to rise after having progressed almost linearly since 1921. Between 1960 and 1970, the city of Lomé more than doubled its population, with an annual growth rate of 7.9% [13]. This exponential growth curve has continued to the present day, with growth rates declining but remaining high and above the national average [14]. From 188,876 in 1970, Lomé's population doubled again to 379,499 according to the 1981 census, with a growth rate of 6.1% [13].

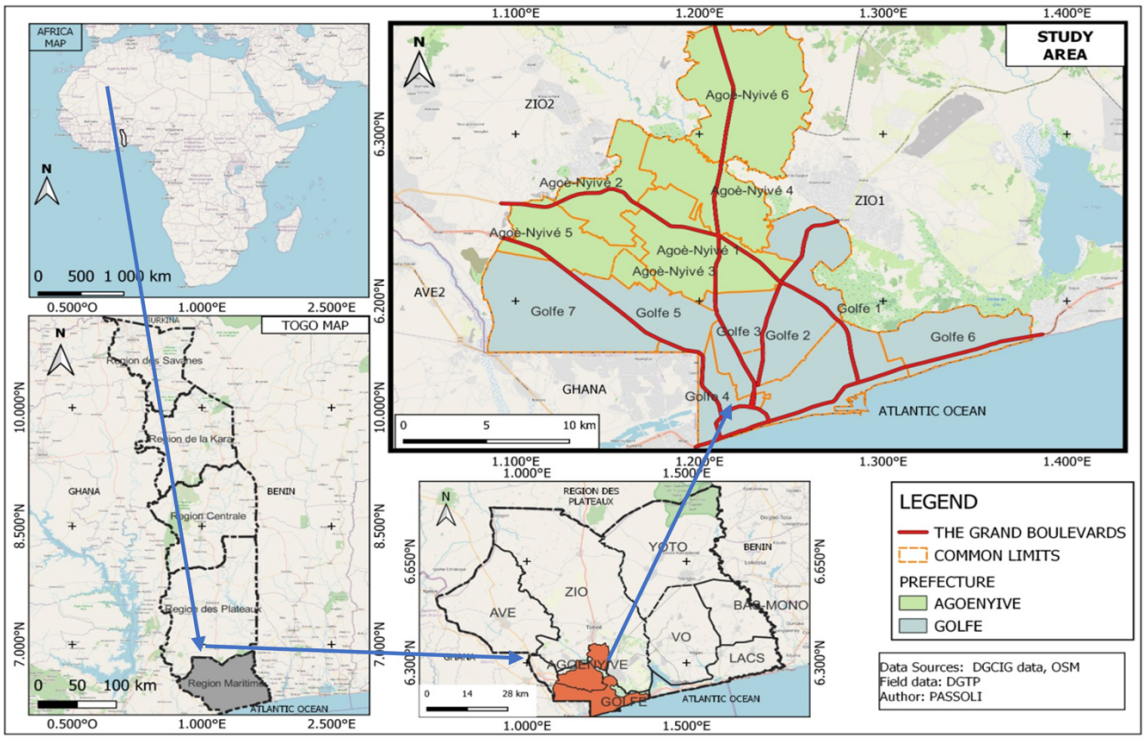

Fig. 1. Location of the Lomé urban area. Source : [30]

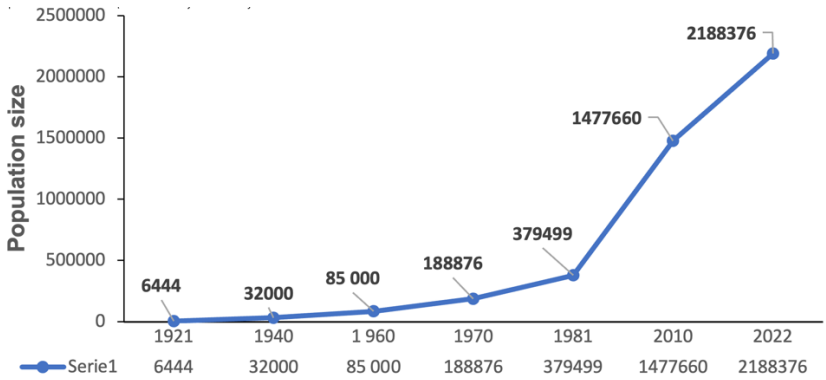

Fig. 2. Demographic evolution curve. Source: [13]

By 2010, the capital of Lomé had almost quadrupled its population, with an annual growth rate of 4.1%, taking the city's population past the 1 million mark (1,477,660 inhabitants). Between 2010 and 2022, the Lomé metropolitan area passed the 2 million inhabitant mark. From 1,477,660 inhabitants in 2010, Grand Lomé had a total population of 2,188,376 at the last population census. Though the population growth rate was down (3.3%), it was still high compared with the national average, as mentioned above [13]. Administrative reclassifications, the rural exodus, natural increase and surplus migration ensured these very high growth rates. This situation further widened disparities between cities and the country's regions [14].

The other main feature of Togolese urbanization is the stark contrast between Lomé, the national metropolis, and a cluster of small towns, which it crushes with all its weight both by its demographic size and its multiple urban functions (political and economic capital). The ratio between the largest city and the second largest is noteworthy: from five in 1970, it reached seven in 1980, and 14 today [15]. Fig. 3 below shows the difference in growth between Lomé and three other major cities in Togo.

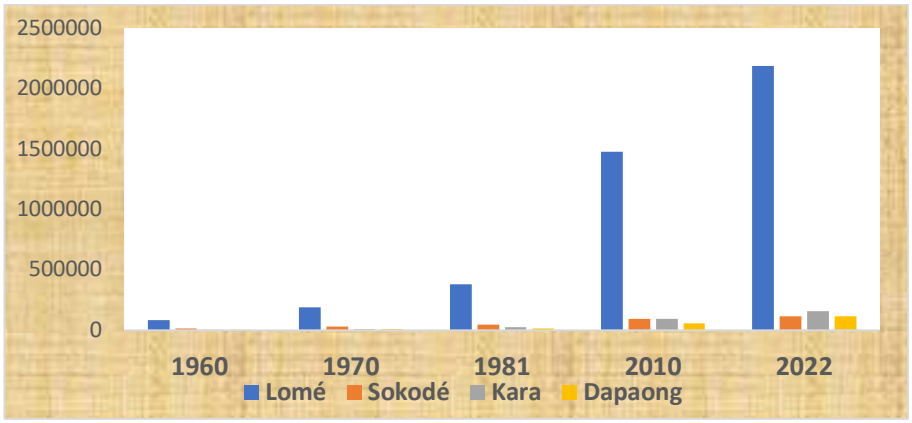

Fig. 3. Comparison of population growth in Lome and Togo's three next-largest cities. Sources: [13]

The graph shows the overwhelming position of Lomé in Togo's overall urban fabric. From independence to the present, Lomé's urban explosion has been unprecedented. Moreover, the hyper-concentration of economic, political, and socio-cultural power has favored the growth of Lomé to the detriment of the country's other cities. The result is an urban macrocephaly that is among the largest in Africa. The rest of the country will continue to have low populations. The exponential growth of Lomé will lead to an uncontrolled and disproportionate spatial expansion.

3.1.2. Grand Lomé, a city undergoing rapid spatial expansion

Lomé's development is taking place horizontally, reflecting an astonishing spatial dynamism. Fig. 4. below shows the spatial evolution of the city of Lomé.

The map shows that the urban perimeter grew from 1,000 hectares in 1959 to 6,076 hectares in 1981. Fifteen years later, Lomé tripled its surface area. The city covered an area of 18,800 hectares in 1996 and 28,800 hectares in 2010 [14]. Today, the Lomé conurbation encompasses all the communes of Agoè-Nyivé and is estimated to cover 37,528 hectares or 375.28 km^2. One of the reasons for such continuous growth is the size of the housing estates (600 m^2). In the capital, built-up areas occupy 43.9% of the total surface area, while undeveloped areas and reserves still make up 55.38% of Lomé's land area. A land use analysis also shows that Lomé is not an industrial city, with only 3.3% of its land devoted to industrial activities [13].

As indicated above, this uncontrolled urbanization of Lomé has stimulated a horizontal evolution of the city of Lomé, which is spreading out over an uncontrolled dimension of the periphery of the old city as it is known. In the 1980s and early 1990s, Lomé's perimeter expanded dramatically due to the rural exodus/immigration that strongly influenced the city's demographic growth rate, anarchic peripheral urbanization, and low housing density. Another reason is the saturation of downtown areas, which is driving the growth of the urban population, especially in the city's outskirts. Unfortunately, the outlying areas are the least endowed in terms of facilities, jobs, and, above all, transport infrastructure, while the population has to move around daily.

3.2. An unfavorable infrastructure offer

Transport is a key geographical element that enhances economic activity. As [16] states, "urban roads are an integral part of transport systems, insofar as the existence of infrastructure is a prerequisite for the circulation of all forms of vehicles." Traffic in Lomé is a real problem, with few access roads to some neighborhoods and the deterioration of almost all paved urban roads. The level of road infrastructure is one of the reasons that residents cannot get around comfortably and that traffic jams persist during rush hours on certain roads. As a result, the city's road network is not keeping pace with its growth.

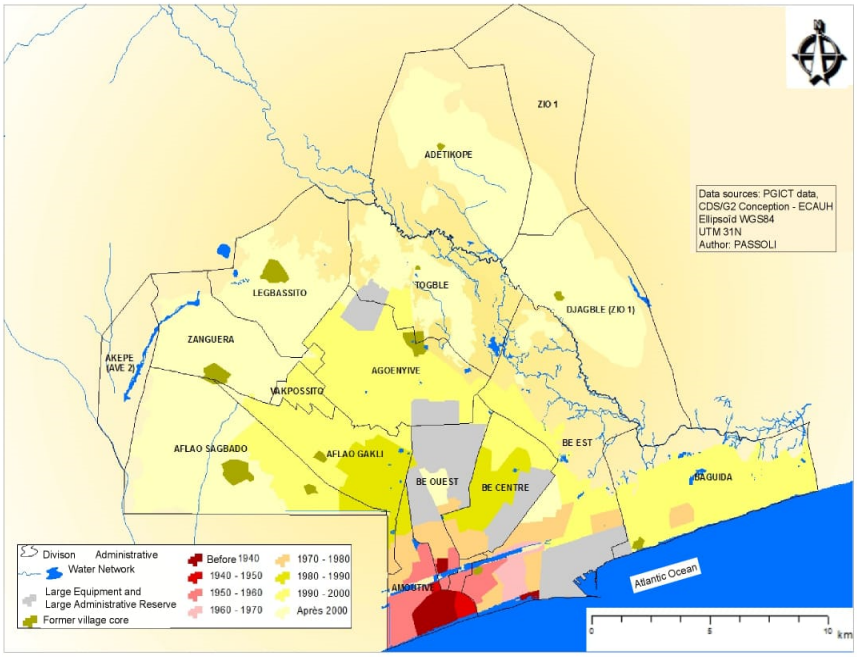

Fig. 4. Spatial evolution of the city of Lomé from independence to the present day. Source: [35]

3.2.1. A well-structured but insufficiently developed road network

As a support and vector for development, the road network plays a vital role in a country's economic life. In Grand Lomé, it is represented by narrow streets and a high proportion of unmade dirt roads. The few asphalted and paved roads are limited to the city center within the circular boulevard and the main center/periphery links. The rest of the network is poorly developed and in very poor condition. Table 1 below shows the type and condition of roads in Grand Lomé.

Table 1

Type and condition of roads in Grand Lomé. Source: [36]

Type	**Condition**			
	Good (m)	**Fair (m)**	**Bad**	**Total**
Asphalt roadway	124,723	53,233	844	178, 800
Paved roadway	4,900	7,300	0	12,200
Dirt roadway	3,918	62,696	717,868	784,482
Total	**133,541**	**123,229**	**718,712**	**975,482**

Generally speaking, the level of urban services in Lomé is low. Out of a network of 975,482 m in Lomé, 19.6% (191,000 m) is paved (178,800 m) or cobbled (12,200 m), and 80.4% (784,482 m) is made up of dirt streets, often with no facilities. The rainwater drainage network comprises open and covered gutters totaling around one hundred km in length, covering only 13% of all road categories combined, or 48% of paved roads. The very embryonic primary wastewater network barely exceeds 3,900 mL [13].

The structure of Lomé's road network comprises:

- a circular urban boulevard around the historic town center of Amoutivé
- radial roads converging from the residential outskirts towards the employment center, which accommodates commuter flows along the city's expansion axes
- a main transverse axis linking these penetrating roads from the port to the Ghanaian border
- a secondary inter-neighborhood network, mainly linking the main roads, but often insufficiently sized to handle the flows required
- a vast tertiary network of local services, mainly unpaved and built up spontaneously

This structuring of Grand Lomé's road network shows a good hierarchical structure, allowing us to distinguish:

- a primary paved network, often with a dividing island and two to three lanes in each direction, which tend to be radial and converge on Lomé's hypercenter and the ring road
- a secondary network that structures inter-neighborhood links
- a tertiary and local network made up mainly of unpaved roads.

However, primary links are inadequate, especially crossroads between main roads, which generate heavy traffic on the secondary network, whose type (surface, width, facilities at intersections) is not always appropriate. Investment in road infrastructure has been concentrated on the core network, and it already guarantees efficient national and sub-regional exchanges and serves the conurbation as a whole. Fig. 5 below shows the structure of the Grand Lomé road network.

3.2.2. Crossroads less in tune with traffic control logic

Junctions are road intersections or connection points in a road network. When they are poorly dimensioned and laid out, their operation becomes restrictive and complex. Inadequate management of these transport infrastructures can lead to congestion and reduced road safety. Of the 157 crossroads identified in Grand Lomé, 30 are intersections of national and primary roads, and 82 are intersections of national or primary roads and tertiary roads. There are few secondary roads, and they do not always connect primary and tertiary roads. Tertiary roads are directly linked to primary roads.

Around 10 traffic light junctions have been set up on the main bypass to connect various primary roads. These include the Kégué and Agoè grade-separated overpasses, which have almost identical characteristics. These two major junctions connect the Jean Paul II and Eyadema Boulevards. Figs. 6 and 7 below show these two intersections.

Each intersection is controlled by a graded overpass. There are a few traffic lights to regulate traffic flow and allow vehicles leaving the main bypass to merge into the traffic flow. There are on-ramps to the Community of West African States (ECOWAS) road from Eyadema and Jean Paul II boulevards. There are illuminated signs at each junction to manage the insertion of ECOWAS vehicles into the traffic on these boulevards. The road markings have been obliterated, making vehicle positioning at junctions complex. The slip road is correctly marked on the ground on the main bypass, and vertical signs at junctions are respected. Numerous signs have been installed to indicate directions or prohibitions. Crosswalks are not marked on the ground. There are no medians separating the traffic lanes. In the absence of these markings, pedestrians cross wherever they can. All categories of vehicles can use the crossing, except vehicles over 5.5 m high, which cannot pass under these structures. Traffic on the ECOWAS is free-flowing, as the road is a freeway with no obstacles. Meanwhile, traffic is limited at the boulevard level due to traffic light junctions, anarchic commercial activities along the lanes, and the use of lanes dedicated to motorized vehicles by pedestrians or cyclists. The configuration of the crossroads presents a danger when exiting the intersection towards the north of Lomé. Vehicles arrive from the right without respecting a certain priority rule.

3.2.3. A well-shared but congested and poorly used roadway

According to field results, traffic on main roads, such as boulevards Gnassingbé, 13 Janvier, 30 Août, Jean Paul II, and Mono, is dominated by two-wheelers, which account for 47% of road traffic. Shared cabs and private cars come in second with 35% of the means of travel. Active modes of transport—in particular, walking and cycling—come third and fourth, representing 7% and 5% of trips, respectively. Finally, the numbers of tricycles and buses are the smallest, accounting for 4% and 2%, respectively, of all means of transport counted during the morning rush hour (Fig. 8).

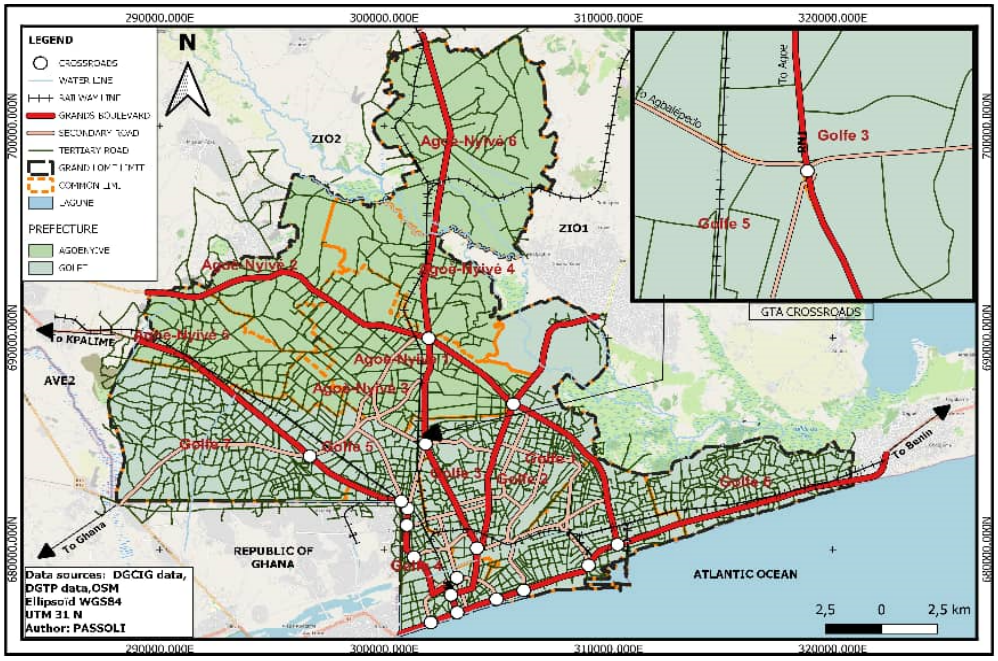

Fig. 5. Road network structure of Grand Lomé. Source: [37]

Fig. 6. Overpass of Agoe

Fig. 7. Overpass of Kegue

Traffic on the roads of Grand Lomé is very dense. The city's main roads draw all traffic from the northern suburbs to the city center. The high traffic density is due to the ever-increasing motorization of the population, a large portion of which lives a long way from the city center. On almost all of Grand Lomé's road network, space is shared between different modes of transport. Automobiles and heavy trucks occupy the central space of the roadway, with a law prohibiting the circulation of heavy vehicles in the city center during rush hours.

Two-wheelers, whether motorized or not, often use side bike lanes or ride on the edges of general traffic lanes. Tricycles are too wide to use cycle lanes, so they join general traffic. They are slower than cars and stop frequently, causing delays. On some stretches of road, such as the "Golf - GTA" section on Boulevard Eyadéma and the "Attikoumé - Lomégan" section on Avenue de la Chance, there are few sidewalks, and those that do exist are frequently cluttered with commercial units. Pedestrian crossings are marked but unsafe due to the absence of speed bumps or raised crossings. So, although in theory, the sharing of space is fairly well defined, the frequent occupation of the roadway by informal businesses, illegal parking, etc., generates numerous conflicts of use, poor traffic flow, and a high accident rate between modes (Fig. 9).

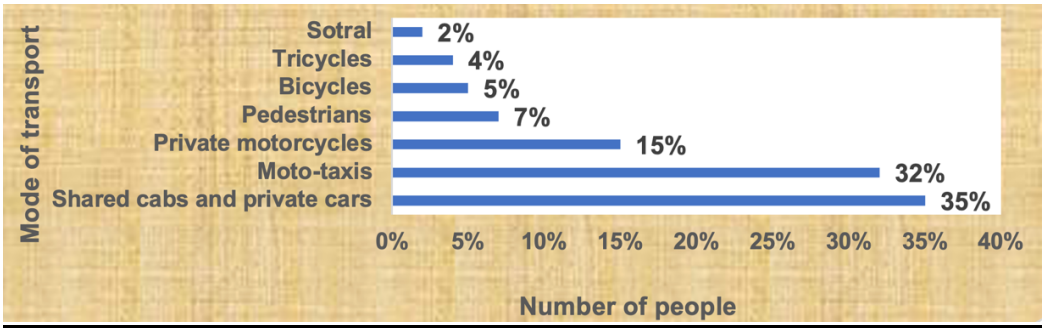

Fig. 8. Modal split on the main roads in Grand Lomé (%)

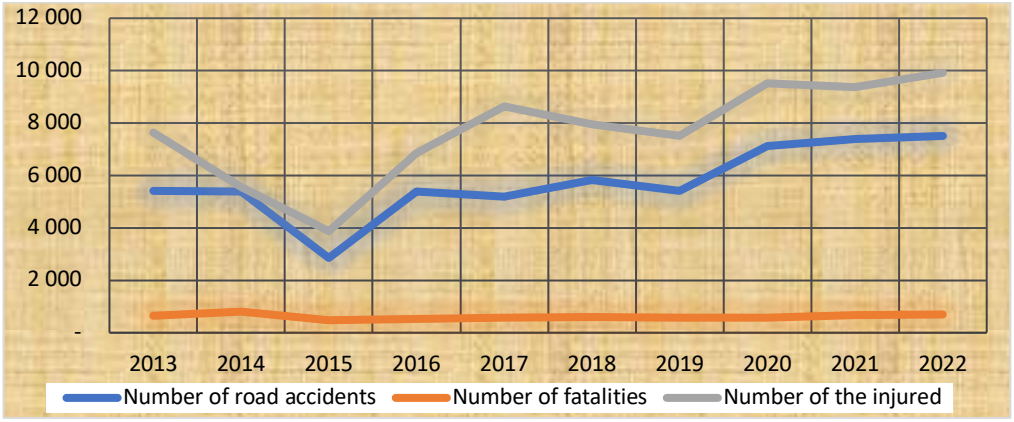

Fig. 9. Road accidents in Grand Lomé

Trends in the numbers of accidents and injuries in recent years show a steady increase of almost 9% per year. Accident statistics are alarming, as the number of accidents rose from 5,401 in 2015 to 7,507 in 2022, including 683 deaths and almost 9,918 injuries, with motorcycle cabs accounting for 63% of all accidents (Fig. 10).

Pedestrians make up the second largest category of road accident victims, accounting for 18% of fatalities. Among the accidents recorded over the last three years, the national roads in the Grand Lomé are particularly accident-prone, with 35% of accidents recorded on the RN1, 7% on the Grand Bypass, and 5% on the RN5. These accidents have both human and financial impacts since they represent around 5% of the country's GDP [17]. It should be noted that in less than half a year, the compulsory wearing of helmets for both driver and passenger on two wheels has been successfully enforced. Future accident data should enable us to measure the impact of this measure on the accident fatality rate.

Artisanal parking penalizes the movement of the population of Grand Lomé. There is no official parking lot. Instead, parking is organized in public spaces. Some people organize and supervise parking for a fee, either in open spaces in the urban fabric or, more often, on the road. This type of parking is organized in double lines or on sidewalks at points of attraction such as stores. Sometimes, private individuals organize parking on their property. However, the organization of parking on the roadway generates traffic problems such as congestion, conflicts of use on sidewalks, the transfer of two-wheelers onto the main roadway, and low visibility at pedestrian crossings. According to the law on decentralization, parking is the responsibility of the communes, but this issue has not yet been addressed at the communal level (Fig. 11).

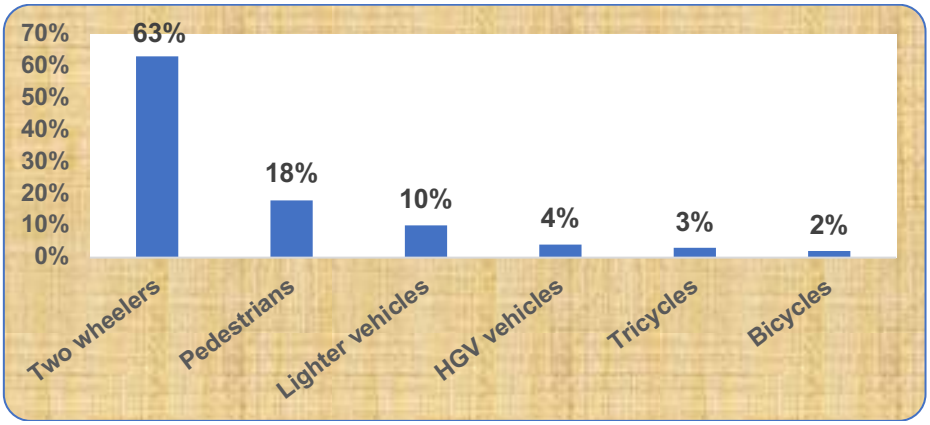

Fig. 10. Breakdown of accidents by mode of transport

Fig. 11. Vehicle stations and unauthorized parking along the roads

Converting pockets of informal parking into official parking represents a major opportunity to easily improve road use conditions (traffic flow, sharing of public space, safety) and offer strong revenue potential. However, the implementation of the plan requires the involvement of the police.

4. DISCUSSION

The definition of urban roads reflects their multiple functions and fundamental role in public space [18]. Mangin [19] considers that urban roads serve as a space for traffic circulation and multiple social practices. Thus, roads combine functions linked to movement and traffic (traffic, fluidity, road safety) with those relating to the city's living environment and social activities [18]. It should be noted, however, that the original function of roads was to ensure a certain number of collective functions (access to private spaces, circulation of people and goods, places for activities and exchanges, etc.) [20]. The development of motorized traffic is what overturned the traditional uses of the street to the point where the circulatory function now plays a dominant, even exclusive role [20]. Several studies carried out in the 1970s demonstrated the intimate link between these two functions. [21] drew up a diagram of the relationship between the level of road traffic and social relations in a given road space. In his view, the denser the traffic on a street, the less likely it is that residents will be able to travel and interact with each other across the street space. On the other hand, the less traffic there is on a street, the more opportunities there are for residents to "inhabit" the street (i.e., make it their own, improvise routes, negotiate exchanges, or meet their neighbors. The traffic threshold beyond which the relationship between residents and the street deteriorates is estimated at 2,000 vehicles a day. Once this threshold is exceeded, the impact of traffic is not limited to the physiological inconveniences caused by noise, pollution, and vibrations, and it extends to the social relations and psyche of residents [21].

The prominence of the circulatory function in road space affects more than the social relationships of local residents. It is also a source of urban congestion, pollution, and the degradation of quality of life. For [22], congestion is not caused by automobiles. The term originated in the 19th century to

describe the state of cities. A walled city was too full. It had too many things, too many activities, and too many people. Therefore, congestion was initially a problem of storage before becoming a problem of flow. According to the author, the automobile was presented at its inception as the panacea for the problem of urban congestion. However, the massification of the automobile during the 20th century gave rise to another problem: traffic congestion. The remedy for urban congestion became, and in turn, created another problem. The automobile has also profoundly altered how cities are used and how they function. A complete dissociation between living and working areas is now possible. Indeed, the automobile seems to abolish distance, encouraging urban sprawl and growth [20]. Although traffic congestion caused by automobiles is still a topical problem without an adequate solution, it was considered a subject of reflection by researchers and technicians from a very early stage. In his report entitled "De la circulation en ville" (On traffic in the city), [23] takes a different view of urban space, questioning the place of the vehicle in it. He sees urban space as a living space, not just a traffic area. He developed the concept of "environmental zones" in which people can live, work, shop, and walk without being hindered by car traffic. These zones are not closed to traffic. However, their road network is designed so that only local traffic enters them, while through traffic is redirected to the ring roads. According to [24], the difficulty of getting around in African metropolises is a fact. This situation is largely due to the invasion of minibuses and motorcycles, which have managed to replace failing public bus transport. According to the same authors, minibuses currently account for almost 50% of all motorized traffic on some routes. Their proliferation is the cause of heavy congestion, particularly at rush hours. However, the authors go further, detailing the causes of traffic dysfunction in these cities. On the one hand, "poor management of traffic flow, lack of parking facilities and poor enforcement of rules"; on the other hand, "the road network is substandard. The network's low capacity, lack of emergency lanes and service roads, deteriorating road surfaces and minimal street lighting" are cited as factors responsible for road congestion. As a result, "traffic jams in major African cities owe much more to the chronic inadequacy of the road network and the disorganization of informal public transport than to the size of the private vehicle fleet" [25].

According to [18], while the authors mentioned above have focused on the technical aspects that are intrinsic to the infrastructures themselves, others have pointed to the behavior of local residents as being an additional cause of traffic and congestion problems. [1] describes the problem as not new to African cities. The occupation of public spaces in Lomé, as is the case in otherAfrican cities, stems from the multiple socio-economic crises of the 1980s that followed structural adjustment policies in many African countries. This occupation is also the result of an increasingly informal economy that is developing in anywhere that is likely to aid its growth. This phenomenon, which is spreading throughout the city, is becoming more pronounced, particularly on the crossroads and sidewalks of major urban thoroughfares and shopping areas. Sidewalk activities range from handicrafts to informal trade and religious practices. These spaces are also occupied by motorcycle cabs. According to [26], motorcycle cabs play an essential role in urban transport and the structuring of public space in Lomé. Born of "the socio-political and economic crisis that the country went through in the 1990s", this activity (the mototaxi) has always supported Lomé's transport system in the face of the failure of institutional transport. "The proliferation of motorcycle cabs has led to a certain reorganization of urban space, with parking areas multiplying everywhere, clogging up markets and streets. Thus, crossroads, streets and their surroundings, and the vicinity of markets and commercial establishments are all territories favored by these mototaxis, diverting them from their primary function [18]. While worsening poverty for most of the urban population justifies this situation of anarchic occupation, it is not without consequences. According to [1], the first consequence is linked to traffic difficulties for motorists, pedestrians, and all those who use the street. Sidewalk occupation forces pedestrians to encroach on the roadway traditionally reserved for motorists. This has made rush-hour traffic very dangerous, and the safety of users is not guaranteed. The occupation of public spaces is also a source of pollution in all its forms. The author concludes that "all those who illegally occupy the streets produce large quantities of commercial and artisanal waste, made up of all sorts of garbage, plastic bags, paper packaging, cardboard and tin cans, which litter the sidewalks and roadways at the end of the day." For [27], the general observation on urban mobility shows that bicycles are used less in Lomé for reasons of insecurity, a lack of facilities, and difficulty of cohabitation with motorized vehicles, which are more numerous on the roads.

The objective of ensuring sustainable mobility in a conurbation like Lomé involves optimizing roads and traffic conditions. For [24], the improvement of urban transport in African cities will depend on setting up a structure to coordinate measures aimed at infrastructure development, traffic management, service quality, and network development. In practical terms, these cities must "repair their pavements, improve their traffic management practices and ensure the economic viability of large-vehicle services through cost recovery using either fareboxes or predictable subsidies." [29 and 28] and [18] recommend the development of subsidiary structures to address all these shortcomings in road network development. According to the authors, public authorities should plan for the design of gutters, cycle paths, footpaths, or sidewalks around sections and footbridges when developing roads. They continue their analysis by citing the need to install speed bumps or speed limit signs, improve lighting, traffic lights, and signage, and ensure the rigorous presence of law enforcement at every intersection to reduce speeding and accidents [30]. [28] and [18] suggest redesigning lanes and, especially, junctions to adapt them to soft-mode users. This should involve "horizontal development, which would consist of building after the traffic lights, extensions of cycle paths and crosswalks with clearly visible markings on the pavement, and vertical development, which would consist in installing directional signs and prohibition signs for other users in order to make them safer." As for the problem of anarchic occupation, he agrees with the authorities' recommendation to clear the site but advises that this should be done by mutual agreement with the illegal occupants. For [27], in the dynamic of a sustainable city, a bicycle-friendly road system can be a response to resilient mobility in Lomé. [31] advocates strengthening Sotral's capacity and integrating it with other modes of transport. To this end, he proposes improving the road conditions of Lines 1 and 3 of the network and creating bus lanes there.

An international study on inclusive mobility conducted in 2015 highlights that accessible mobility policies are based on varied designs adapted to local contexts. It showcases successful initiatives in countries such as Canada, Denmark, Japan, and the United Kingdom, which have implemented innovative solutions to improve public transport accessibility, particularly for people in precarious situations and seniors [32]. Furthermore, the special report of the European Court of Auditors on sustainable urban mobility, published in 2020, shows that sustainable urban mobility is one of the main challenges cities in the European Union face. Sustainable urban mobility is closely related to economic growth and the reduction of environmental pollution [33]. Additionally, a study published in 2024 in *Nature Cities* reveals significant disparities in the average time required to access basic services on foot in different global cities. For example, in Barcelona, this time is nine minutes on average, while in Atlanta, it is as high as 50 minutes. This study highlights the importance of urban planning to ensure equitable access to essential services [34].

5. CONCLUSIONS AND OUTLOOK

This research aimed to contribute to the sustainable management of roads and traffic on the various routes of Grand Lomé to avoid traffic congestion and facilitate accessibility for all modes of transport while avoiding road insecurity. To achieve this, it was first necessary to carry out an analytical study focusing on three points: an analysis of the level of traffic carried by the various roads, the quality of supply, and the level of demand for transport on these roads.

The study revealed several dysfunctions in terms of layout and mobility practices. Crossroads are poorly configured, as is the road network. Parking is uncontrolled due to a lack of regulation. Horizontal and vertical signage is inadequate. Pedestrian spaces are occupied by various types of shops and stalls. All these dysfunctions lead to congestion and traffic accidents, particularly during rush hour. Pedestrians are the most exposed to the risk of traffic accidents. Pedestrian crossing management has not been considered in the organization of intersections. As a result, pedestrians have no specific traffic lights to ensure their safety. Therefore, it is important to review the crossing of central medians (e.g., by lowering the curbs) and the ascent to the sidewalk to ensure the safety of people with reduced mobility.

The safety of pedestrians and users of motorized two-wheelers (the main victims of road accidents) must be improved by building new or improving existing sustainable transport infrastructures—in particular, footpaths and cycle lanes—and by supervising those involved in small-scale transport.

Improving existing transport infrastructures is imperative to better organize and plan maintenance and secure financing. Such improvements will help ensure proper execution by more clearly defining responsibilities in this area and will improve the road network—most notably, the capacity of the secondary network (roads and intersections) and signposting. The construction of bike lanes and sidewalks to provide space has long been expected by users of active modes of transportation. The physical separation between the roadway and the bicycle lane will prevent motorized traffic from encroaching at any time on these structures dedicated to users of soft modes of transportation.

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