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**Research Article**

# Traffic of Fleets at Urban Nodes within the City Of Bamenda; a Handicap to Sustainable Transportation

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**Abstract:** The high rate of urbanization experienced in developing countries pose a great challenge to transport development in most cities. The study examined traffic congestion problems and their causes at road intersections in Bamenda, Cameroon. Secondary data was obtained from both published and unpublished materials, libraries and internet sources and primary data from field photographs, administration of questionnaires to a sampled population of 220 respondents. The data was analyzed by the use of quantitative and qualitative methods including SPSS and the output presented in the form of graphs, charts and tables. The analysis of data collected revealed that spatio-temporal variations exist in traffic flows and delays at specific intersections. Also poor town planning, poor driving habits, absence of traffic control mechanisms, lack of parking space, road side trading and hawking, were found to be the greatest causes of delays at the road intersections in the city. Based on this, the study therefore recommends that, trading activities and poorly parked vehicles and attitudes of road users be strictly prohibited especially at road intersections to reduce traffic congestion and delays within the city.

**Keywords:** Bamenda, road, traffic congestion, urban nodes, vehicle.

## INTRODUCTION

Globally, 55% of people live in urban areas, a proportion that is expected to increase to 68% by 2050 (UN DESA, 2018). Projections show that urbanization, the gradual shift in residence of the population could add another 2.5 billion people to urban areas by 2050, with close to 90% of this increase taking place in Asia and Africa, according to the 2018 Revision of World Urbanization Prospects produced by the Population Division of the UN Department of Economic and Social Affairs. The high rate of urbanization experienced in developing countries poses great and frequent challenges to transport development in most cities which causes traffic congestion in the city with movement of people and goods from one place to another and especially at cross roads (Ogunbodede, 2004). A study of the changing morphology of many Cameroonian cities gives an insight into the evolution of traffic congestion at road intersections within the city resulting in massive delays, increased fuel consumption and financial losses. Urban nodes are attractive for business because of accessibility and market (population) but not sustainable in Bamenda. Due to the poorly planned road networks and haphazard land use, a common outcome is the presence of small critical areas, which are common growth poles for congestion. Consequently, poor traffic management around these spots potentially results in traffic jams. Previous studies on road transport problems have focused on Road infrastructure and their effect on traffic (Fogwe *et al.*, 2015) and determinants of traffic congestion (Njimanted, 2013). However, traffic at urban nodes received little attention. The aim of this study is to analyse vehicular traffic at unban nodes within the city of Bamenda.

### Location of the Study Area

The study covers the three Sub-Divisional councils, which make up the Bamenda Municipality. Bamenda town is located between latitude $5^0$ 56" and $5^0$ 58" North of the equator and longitude $10.09^0$ and $10.11^0$ East of the Greenwich Meridian (Neba, 2000). Figure 1. The Municipality is bounded to the North by Bafut, to the West by Tubah, to the South by Santa and to the East by Bali (Figure 1). It lies at an altitude of

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1430m above sea level with a surface area of 3125ha (Neba, 2000).

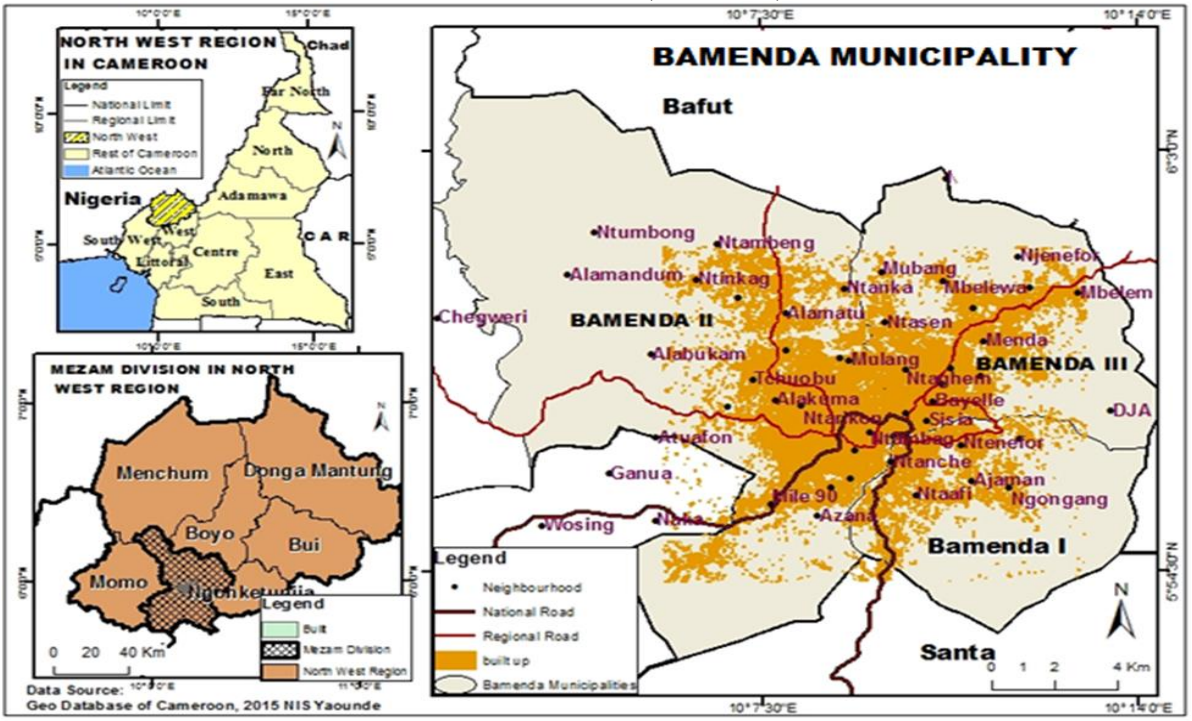


**Figure 1. Location of the study area in Mezam Division of the North West Region of Cameroon**

## METHODS AND TECHNIQUES

The methodology involved the collection and treatment of primary and secondary data for quantitative and qualitative analyses. Secondary data was obtained from both published and unpublished materials, libraries and internet sources and primary data from field photographs, administration of questionnaires to a sampled population of 220 respondents. Direct personal interviews were made with stakeholders of urban traffic such as the Regional Delegation of Transport, Regional Directorate of Roads, Delegation of Public Works as well as the Department of Traffic at the Bamenda City Council. The data was analyzed by the use of quantitative and qualitative methods including SPSS and the output presented in the form of graphs, charts and tables.

## PRESENTATION OF RESULTS AND INTERPRETATION

### 1. Characteristics of Urban Nodes

Based on the road transport system of Bamenda, four intersections were selected which comprised of 4-legged and 3-legged road junctions chosen from different locations on major roads in Bamenda (Fig 2 and 3). The intersections serve as links to major routes, which connect different types of land use activities in the study area.

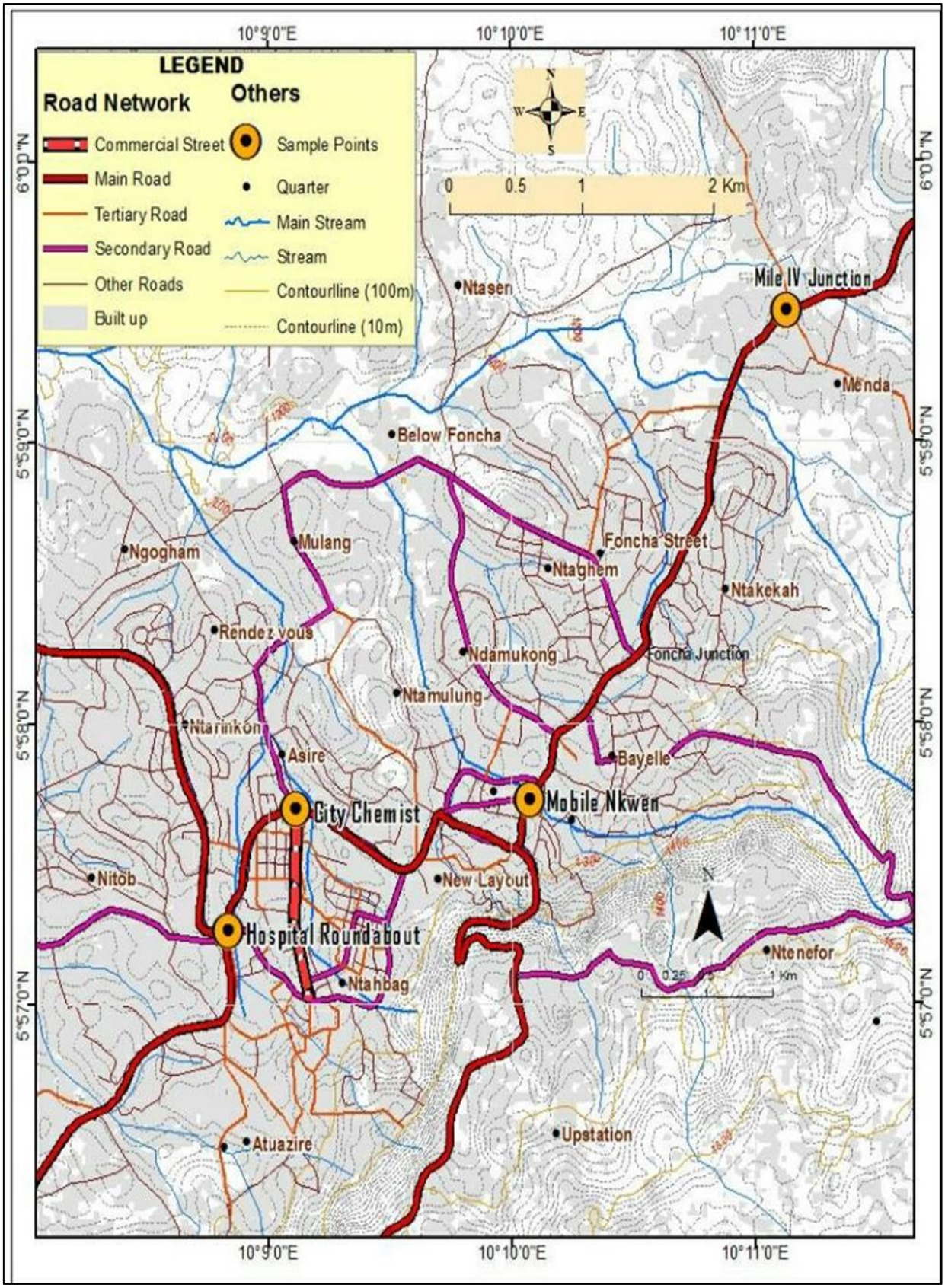


**Figure: 2. The current road Tranasport network of Bamenda**
**Source: Fieldwork 2017**

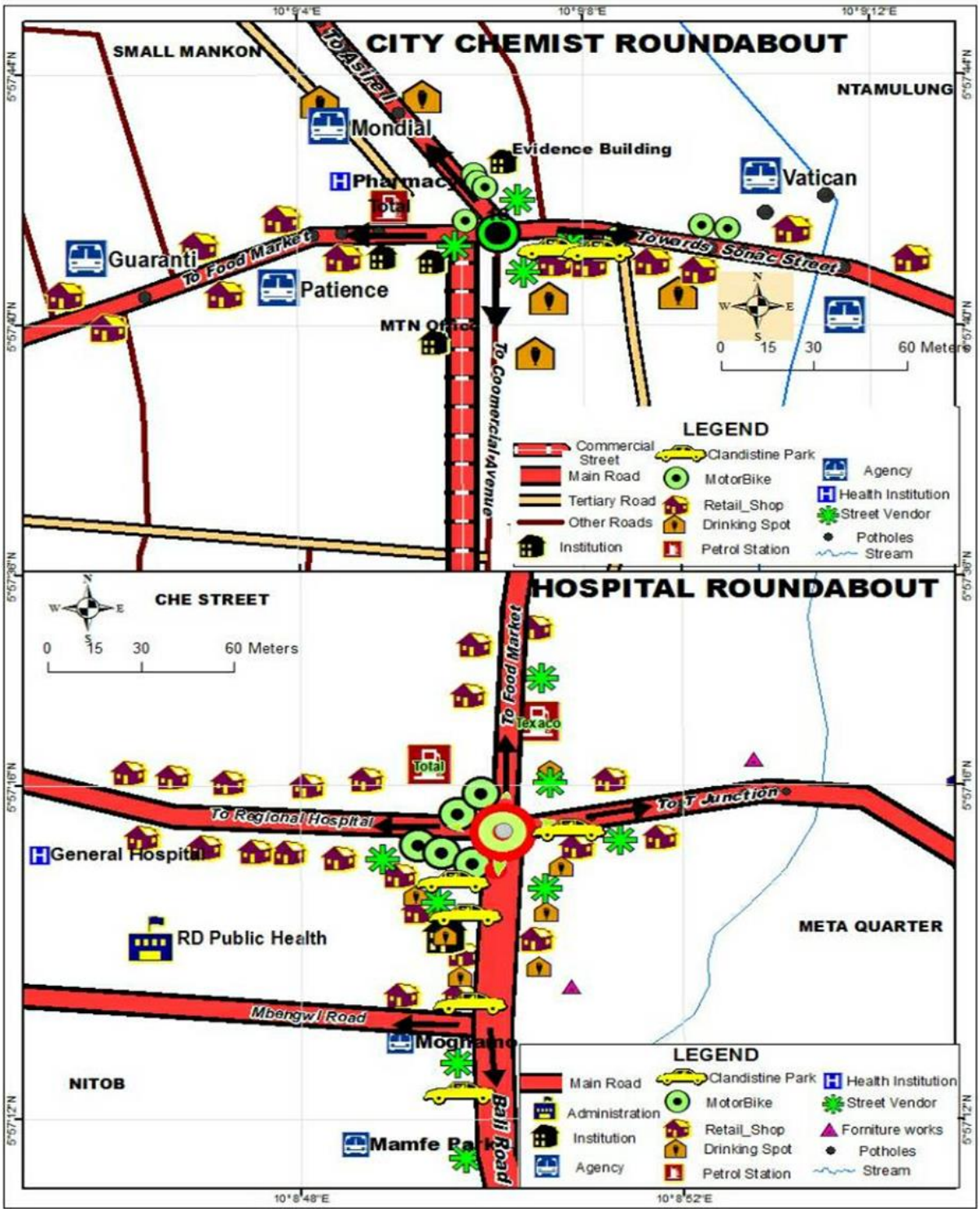


**Figure: 3. A sketch of the City Chemist and Hospital Roundabouts**
**Source: Fieldwork 2017**

Common to all the junctions is the presence of roadside hawkers and traders, and the location of retail shops along the intersecting roads. These result in roadside obstructions and parking problems from customers who patronize the products thereby impeding the free movements of vehicles as shown on Figure 3.


**Figure 4: Encroachment of retail activities into main road junction of City Chemist, Hospital Roundabout and Mobile Nkwen**
**Source: Fieldwork 2017**

As far as encroachment into roads by activities was concerned as (Fig 4), the average was 3 m, with the highest at Mobile Nkwen (4 m) while it was the same (3 m) at the other three roundabouts.

## 2. TRAFFIC CONTROL AT MAJOR JUNCTIONS

Through field observation at the studied junctions, it was discovered that there is no traffic light at all junctions, lanes and roundabouts are not properly demarcated with white lines while only Hospital Roundabout and Mile Four junctions had one and two policemen respectively controlling traffic.

### 2.1 Observed Attitude and Behavior of Drivers

The attitude and behavior of drivers were also observed at each of the studied junctions and presented in Table 1. This observation was done during the morning peak from 7am-8am and evening peak from 6am-7am.

**Table 1: Attitude and behavior of drivers on the Road**

| Attitude and behavior of drivers | Major junction | | | |
|---|---|---|---|---|
| | Hospital round about | Mobile Nkwen | City Chemist Roundabout | Mile 4 Junction |
| Horning constantly (>5 seconds) | Rarely | Often | Often | Often |
| Looking worried and anxious | Rarely | Often | Rarely | Often |
| Shouting and quarreling with other road users | Rarely | Rarely | Often | Rarely |
| Accidents | Not at all | Not at all | Not at all | Yes |

**Source: Fieldwork, 2017**

Drivers in general, often horn as it was the case at three junctions out of the four. They are often looking worried and anxious at Mobile Nkwen and Mile 4 Junction while this attitude though not absent was rare at Hospital Roundabout and City Chemist roundabout. They often shout and quarrel only at City Chemist roundabout. No accident was recorded except at Mile 4 junction.

## 3. Pattern and Components of Traffic Flow

Table 2 show the average traffic volumes in vehicles per hour at the studied junctions for both morning and afternoon peaks.

**Table 2: Volume and Composition of Traffic at Selected Intersections**

| Junctions | Volume of traffic | Motor Bikes | Taxis | Private cars | Buses | Trucks/ trailers | Others | Total |
|---|---|---|---|---|---|---|---|---|
| Hospital round about | Morning Peak 7-8 AM | 4395 | 644 | 711 | 26 | 56 | 87 | 5919 |
| | Evening Peak 5-6 PM | 3663 | 533 | 508 | 11 | 54 | 72 | 4841 |
| | Total | 8058 | 1177 | 1219 | 37 | 110 | 159 | 10760 |
| Mobile Nkwen | Morning Peak 7-8 AM | 2215 | 601 | 300 | 59 | 37 | 41 | 3253 |
| | Evening Peak 5-6 PM | 1690 | 540 | 344 | 43 | 32 | 34 | 2683 |
| | Total | 3905 | 1141 | 644 | 102 | 69 | 75 | 5936 |
| City Chemist Roundabout | Morning Peak 7-8 AM | 3498 | 743 | 474 | 36 | 43 | 42 | 4836 |
| | Evening Peak 5-6 PM | 3035 | 654 | 623 | 24 | 27 | 23 | 4386 |
| | Total | 6533 | 1397 | 1097 | 60 | 70 | 65 | 9222 |
| Mile 4 Junction | Morning Peak 7-8 AM | 1417 | 558 | 500 | 107 | 25 | 14 | 2621 |
| | Evening Peak 5-6 PM | 1198 | 550 | 460 | 41 | 38 | 14 | 2302 |
| | Total | 2615 | 1108 | 960 | 148 | 64 | 28 | 4923 |
| Average | Morning Peak 7-8 AM | 10631 | 637 | 496 | 57 | 41 | 46 | 4157 |
| | Evening Peak 5-6 PM | 2397 | 569 | 484 | 30 | 39 | 36 | 3553 |
| | Total | 5278 | 1206 | 980 | 87 | 78 | 82 | 7710 |

**Source: Fieldwork, November 2017**

Hospital Roundabout recorded the highest density of traffic with 10760 vehicles and motorbikes cumulatively at Morning Peak from 7-8 AM and Evening Peak from 5-6 PM, followed by City Chemist Roundabout (9,222), Mobile Nkwen (5,936) and Mile 4 Junction (2,302). The junctions were relatively busy, 4,157 vehicles and motorbikes during morning peak (7-8 AM), 3,553 during evening peak (5-6 PM) while the total was 7,710 bikes and vehicles over these two periods.

## 4. NATURE OF TRAFFIC CONGESTION AT INTERSECTIONS

### 4.1 Passengers and Drivers' Assessment of the Nature of Traffic Congestion

Both categories of respondents were asked to assess the nature of traffic congestion at intersections as illustrated in Table 3. Of the 50 passengers, 33 described the nature of traffic as recurrent while 17 considered it as occasional. On the side of the drivers, 40 considered the traffic as recurrent and 10 others considered it as occasional. Thus, the majority of both drivers and passengers considered the nature of traffic congestion at road intersections more of recurrent than occasional.

**Table 3: Nature of traffic congestion at the three intersections**

| Occurrence of traffic congestion | Passengers | Drivers |
|---|---|---|
| Recurrent (Frequently occurring) | 33 | 40 |
| Occasional | 17 | 10 |
| Total | 50 | 50 |

**Source: Fieldwork, 2017**

### 4.2 Respondents Perception of Traffic Peak

The assessment was based on interviews conducted with drivers and passengers. Traffic congestion around road intersections does not occur every day nor throughout the day, but during specific periods or times of the day (Ogunbodede, 2004). Hence, respondents were asked to indicate which periods of the day they encounter traffic build ups around junctions. It was generally perceived by drivers and passengers that traffic is high in the morning and in the evening (Figure 4).

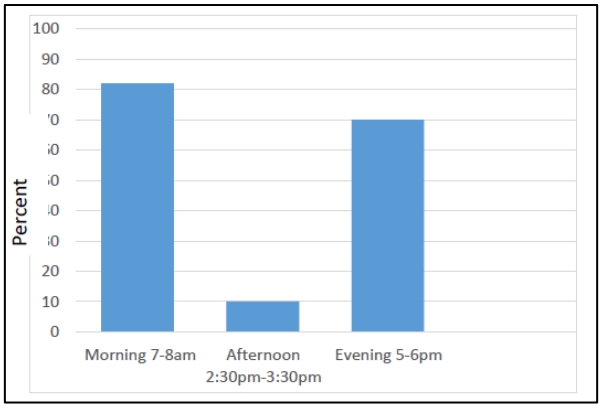


**Figure 5: Respondents Perception of Traffic Peak**
**Source: Fieldwork, 2017**

Majority of the respondents noted that traffic is high in both the morning 82% and evening periods 70% (Figure 5). Most of the explanations they gave to support their position were that during these periods, the number of cars on the road are many because people go to work during the same period in the morning (7:30-8:30am). Others also blamed it on the poor roads coupled with the fact that many people also return from work at the same time. The result is in line with what the officials said. They acknowledged that the traffic is worse in the morning and evening than in the afternoon and night from 9pm.

Furthermore, 10% of the respondents also opined that the congestion usually occurs during the late afternoon (2-3pm). This stems from the fact that, many business activities peak during late afternoons and some workers and school children begin their journey back home. Through personal observation, it was revealed that many traders conducted their businesses by the roadside to catch a glimpse of people who are returning home so as to sell their goods. Commercial vehicle operators tended to cash in on this by stopping at unapproved places in order to pick and drop commuters who patronize such trading spaces. This was prevalent around the Veterinary Junction especially when students from P C H S, G B H S Bamenda and G B H S Down Town were returning home. This pedestrian/trading attitude results in traffic congestion on the affected intersections as most of the sidewalks and shoulders of the roads are invaded by traders and commercial vehicles.

### 4.3 Appraisal of Daily Traffic at Study Sites

Often, traffic congestion seems to be very high and unbearable on particular days while in others, the reverse is the case. As indicated in Figure 6, the majority of drivers and passengers consider Saturdays, Fridays and Tuesdays as days of high traffic congestion

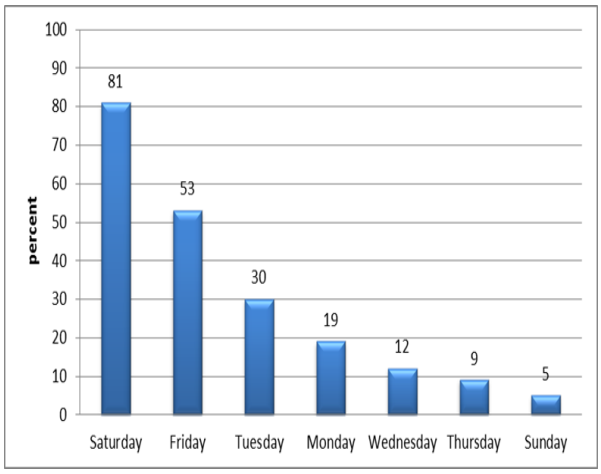


**Figure 6: Days of the week perceived for heavy traffic by respondents**
**Source: Fieldwork, 2017**

Saturdays are perceived as the most exposed to traffic congestion representing 81%, followed by Fridays 53%, then Tuesdays 30% for the top three. Majority of the respondents stated that before the start of the political crisis hitting the NW and the SW regions of Cameroon, the highest traffic congestion were experienced on Mondays. But due to the crisis, a large majority of the population now respect Mondays as "ghost town", with most business premises and offices closed, children not going to school, thereby leading to no traffic congestion for Mondays.

### 4.4 Frequency in Traffic Obstruction As Perceived By Drivers and Passengers

Assessing how often passengers and drivers get stuck in traffic, three main scales (Likert) of measurement were used, namely, very frequently, frequently, and seldom (Table 4).

**Table 4: Frequency of being trapped in traffic as perceived by drivers and passengers**

| Frequency | Response | |
|---|---|---|
| | N | Percent |
| Very frequent | 18 | 18.0 |
| Frequent | 75 | 75.0 |
| Seldom | 7 | 7.0 |
| Total | 100 | |

**Source: Fieldwork, 2017**

Majority of the respondents (75%) indicated that they get stuck in traffic frequently, and only 18% indicated that they get stuck very frequently. The least were the respondents for seldom with 7%.

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## 5. Causes of Traffic Congestions at Major Junctions in Bamenda Municipality

The main objective of this study was to examine the causes of traffic congestion at major road junctions within the municipality. The research sought to use the responses to identify the various causes of traffic congestion and the multiple responses (Fig 7).

From the perspective of the traders, drivers and passengers, the majority (92.5%) pointed poor town planning as the main cause of traffic congestion. This was closely followed by road side hawking and trading activities (82.2%), poor driving habits (79.5%), poor/no traffic control (78.8%), lack/poor parking habits and narrowness of road (63.1%).

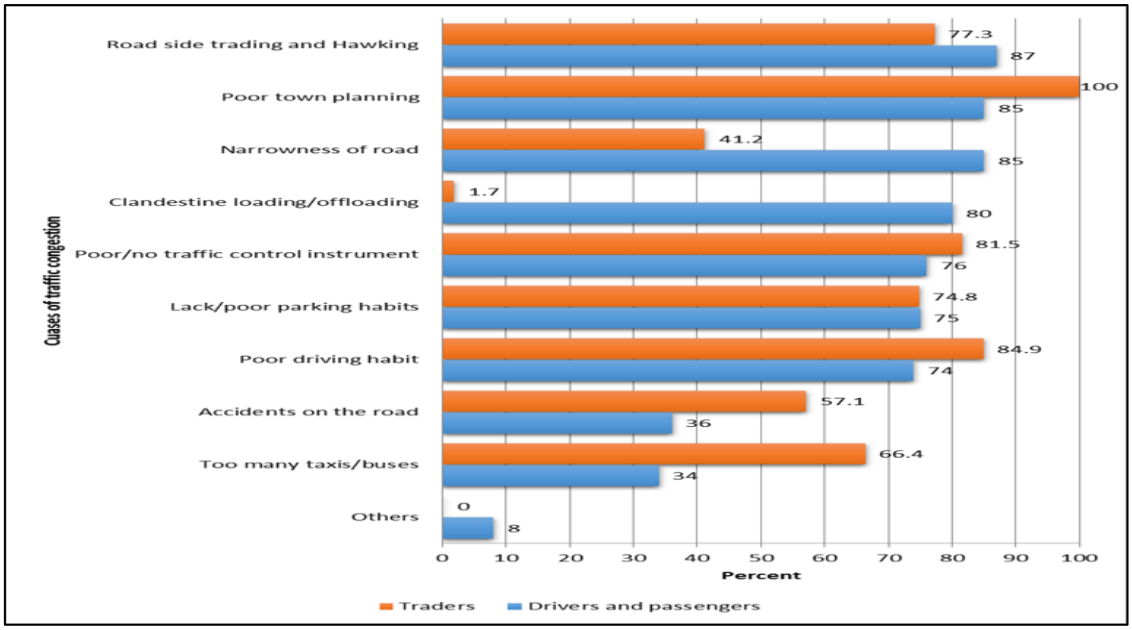


**Figure 7: Causes of traffic congestions at major junctions in Bamenda municipality as perceived by drivers, passengers, and traders**
**Source: Fieldwork, 2017**

The other causes of traffic congestion according to the traders, passengers and drivers is the proliferation of streets with taxi/ buses (50.2%), clandestine loading and offloading (40.9%) as seen on Figure 8 and others (8%) pointed to accidents on the road.


**Figure 8: Clandestine Loading and Offloading Causing Traffic**
**Source: Fieldwork, 2017**

**6. Research Hypothesis: The Concentration Of Informal Markets And Clandestine Loading At Major Nodes Create Traffic Problems In Bamenda.**

It was statistically obvious increased number of informal markets exacerbates traffic congestion given the positive sign of the correlation coefficient which is above 0.5 and P-value <0.05 (R=0.541; P=0.042). The hypothesis here stated is then accepted (Table 6).

**Table 6: Relationship between the growth in the number informal activities and traffic congestion at urban nodes within the city of Bamenda**

| | Spearman's rho | Perceived dynamic of traffic within the municipality over the past three years |
|---|---|---|
| Perceived dynamic of the number of informal markets within the municipality over the past three years | Correlation Coefficient | .541 |
| | Sig. (2-tailed) | .042 |
| | N | 100 |

**Source: Fieldwork, 2018.**

## DISCUSSIONS

Traffic congestion problems are manifesting in many of the major urban centres in Cameroon. They are indeed becoming a menace to free flow of traffic in these cities especially along cross roads. Hospital Roundabout, City Chemist Roundabout, Mobile Nkwen and Mile IV junctions were identified as major urban nodes in Bamenda which experience high levels of congestion.

These problems are caused by high traffic density with an average of 2209 per junction over the two peak period (Morning Peak 7-8 AM and Evening Peak 5-6 PM), the encroachment of informal activities around crossroads and poor driving habits which exacerbates congestion. This supports Olagunju's (2015) who stated that, indiscipline is a major factor of traffic crises in our cities and on our roads.

Drivers and passengers perceived negative effect of traffic congestion at intersections more than traders. However, all to an average extent perceived negative effect on health, ranging from cardiovascular diseases, asthma, lung cancer and diabetes. Drivers and passengers emphasized on additional time they take to reach their destinations, which is mostly 21-30 minutes 50.0%, and cumulatively, 79% of them estimates 21 minutes or more.

It was suggested that drivers should learn to obey traffic regulations, avoid wrong parking and slowing down for people to buy things especially around junctions. The general public should use only designated areas for crossing the road, avoid stopping and boarding vehicles at wrong places, avoid trading or hawking along the road to reduce traffic. Oyeyemi (2015) believes that enforcing traffic laws strictly without fear or favor will enhance the livability of our cities.

## CONCLUSION

The encroachment of informal activities around crossroads and poor driving habits are the main causes of traffic congestion which adds to potholes, too many vehicles on the road, no traffic control mechanisms, narrow roads, clandestine loading and offloading and road accidents worsening the situation. Traffic congestion is greater around Hospital roundabout, City chemist roundabout, Mobile Nkwen and Mile Four junction with negative effects as time wastage, lateness to work and appointments, stress and pollution. All of these tend to affect the social and economic wellbeing of the people.

Intersection improvement designs should be undertaken at almost all junctions most especially around Hospital Roundabout, City Chemist Roundabout and Mobile Nkwen Junction to reduce delays and queues. Off-street parking should be provided. Also, road-side hawking and trading and all forms of commercial activities should be strictly restricted up to a distance of 30 metres from the intersections. Introducing high-capacity buses to work alongside taxis and motorcycles will reduce the number of vehicles on the road and consequently a drop in congestion.

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