

# **Dynamics and Outcomes of Accidents along the Triangle of Death in Cameroon**

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## **Abstract**

Road safety is an issue of preoccupation in several developing countries including Cameroon where the rate of road accidents per 100,000 inhabitants is 32.6% with human lives and property lost on daily basis. The loss of human lives and property damage present potential socio-economic challenges, particularly in terms of nation-building and development needs. The upsurge of road accidents in Cameroon has raised worrying concerns about road safety and sustainable transportation from the government and other development actors involved in tackling the problem. This paper draws on field data and studies conducted in Cameroon to assess the dynamics and outcomes of accidents along National Road N<sup>o</sup>3 (NR), National Road N<sup>o</sup> 4, and National Road N<sup>o</sup> 5 in Cameroon. The methodology used primary and secondary sources of data on transportation studies in Cameroon, Africa and the world. Primary sources also involved the employment of questionnaires and field survey used to ascertain the realities along the roads. The results revealed that the states of the roads are deplorable owing to ill traffic engineering and road maintenance amongst others. The findings evince that 70% of the road accidents in Cameroon occur along National road 3, 4 and 5, with 50% registered along the Douala-Yaounde road axis. Also, these accidents manifest as head-on collisions, rear-end collisions, sideswipes, roll-overs and multiple-collisions, involving death of road users and a wide range of property damaged. With regard to death, 2029 lives have been lost with 305 (15%), 707 (35%) and 1017 (50%) recorded along NR5, NR 4 and NR 3 respectively. The toll on injuries is also alarming as over 5524 people have been injured, leading to the appellation “The Triangle of Death”. The study further reveals that given the occurrence of road accidents and the reactive, mistimed policies, redressing the thorny situation is challenging for Cameroon.

**Keywords:** Dynamics, Outcomes, Road Transport, Transportation Safety, the Triangle of Death, Cameroon

## **1. Introduction**

If energy forms are the earth's heart, transport networks are its arteries [4]. Road transport is the most widely used mode of transport especially in developing countries. Despite this key role, road safety remains a pressing issue particularly in developing countries where road accidents have become a public health problem. According to the [16], road accidents ranked as the 11<sup>th</sup> leading cause of death and accounted for 2.1% of all deaths globally. Road traffic crashes injure or disable between 20 million and 50 million people a year [16]. These figures were predicted to rise by 65% if preventive measures are not effectively put in place [11]. In Africa, nearly 59 000 people died from road accidents in 1990 and these deaths were estimated to reach 144 000 by 2020 [6], giving a 144% rise. It was also anticipated that a sudden increase in the number of vehicles per inhabitant would cause 80% rise in injury mortality between 2000 and 2020 [11]. 93% of the world's fatalities on roads occur in low- and middle-income countries, even though these countries have approximately 60% of the world's vehicles [15]. The most affected victims of road accidents include pedestrians and passengers [1]. It is estimated that every year, road traffic crashes cost US\$65 billion in low-income and middle-income countries, exceeding the total amount received in development assistance [16]. Without sustained action, road accidents are predicted to become the 7<sup>th</sup> leading cause of death by 2030 [18]. The rate of road accidents in Sub-Saharan Africa was 2.8% slightly above the global rate, 2.6% [3]. The situation in Cameroon is not different as road accidents have been frequent with wider implications on development and families. According to [8], between 2002 and 2009, about 88717 corporal accidents, involving 15000 deaths with 2791 cases of material loss were recorded along the first category of roads (National Roads) in Cameroon. In 2015, 3229 road accidents were recorded, involving 1288 deaths and 4326 people injured. According to [17], 16,583 road accidents resulting in 1,000 deaths each year are recorded in Cameroon. Apart from deaths and injuries recorded, the monetary cost of road accidents in Cameroon was estimated at 100 billion CFAF, equivalent to 1% of her Gross Domestic Product (GDP) per year [8]. This paper principally seeks to investigate the states of National Road 3, National Road 4 and National Road 5 referred to as the Triangle of Death. The paper also finds out the states of vehicles and road users behaviour to provide options in redressing the carnage along the national roads.

## **2. Methodology**

The methodology employed for this study contained a research design, data collection and method of data analysis. The descriptive research design comprised questionnaire administration to collect opinions of stakeholders on dynamics of the roads, outcomes of accidents and effectiveness of management strategies. Data for this study were generated from primary and secondary sources. Data on dynamics of the roads and traffic flow were collected from the Ministry of Public Works of Cameroon whereas the Ministry of Transport, hospitals and National Gendarmerie posts, found along the roads and collecting data in compliance with the set modalities, provided data on the causes and outcomes of accidents. The sample size of drivers and passengers was derived from registers at public transport agencies and companies, resident population from population census report and government official at the Ministry of Public Works (Department of Road Works) and the Ministry of Transport (Department of Road Transport). With the use of the random sampling technique, 450 questionnaires were administered to the targeted population, comprising road users and administrative authorities. 108 questionnaires were distributed to drivers of public transport agencies (24%), truck drivers (20%), resident population along the roads (22%), passengers (9%) and government officials (25%). Field survey was used during which opinions were gathered on realities along the roads. Works on road transport in Cameroon and other countries were also consulted for literature. Data collected was processed using the Statistical Package for Social Science 17.0 (SPSS). Descriptive statistical analyses were done using Microsoft excel, and ArcGIS for mapping. The approach of the U.S. Department of Transportation [4] was used to realise road segment exposure to accidents along the Triangle of Death in Cameroon.

### 3. Results

#### 3.1 Dynamics of National Roads along the Triangle of Death

Traffic engineering and transportation planning are primary to achieve safe and efficient movement of people, goods and services. Wide lanes, quality speed bumps, standard sidewalks, crosswalks, markings and road signs amongst others are indispensable for transit. Defining future policies, goals, investments and spatial planning designs are proactive measures to prepare for future needs to move people and goods. Traffic engineering and transportation planning have beneficial outcomes, whereas their poor conception and implementation bring dramatic outcomes on road safety. This section examines the states of the roads along the Triangle of Death.

#### The Douala-Yaounde National Road 3

The Yaounde-Douala National Road (243km) is the most busy and dangerous along The Triangle of Death in Cameroon. Constructed during the period of German colonial rule from 1982 to 1985 [14], it has a dense traffic characterized with the movement of people of all walks of life and the flow of timber, dangerous products and containers amongst others. Unfortunately, the Douala-Yaounde National Road was poorly conceived and current management strategies are neither sufficient to secure lives nor put the flow of goods and services under effective control. The ancient road is narrow and shows several other defects along the stretches presented on table 1.

Table 1: Segments and State of National Road 3

Segment	Road Stretch	Distance (km)	State of the Road
1	Douala-Edea	66	Narrow lane, heterogeneous and degraded speed bumps
2	Edea-Pouma	48	Narrow lane and Sharp bends
3	Pouma-Boumnyebel	38	Narrow lane and Sharp bends
4	Boumnyebel-Mbankomo	75	Narrow lane, steep hills and sharp bends
5	Mbankomo-Yaounde	15	Narrow lane and High traffic congestion

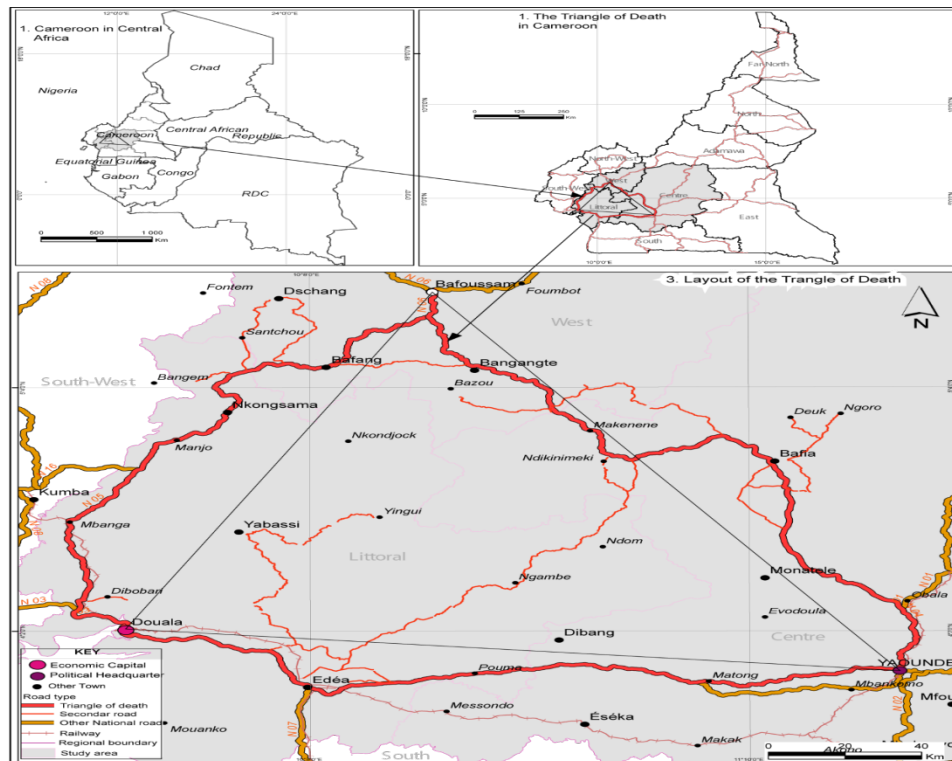


Fig.1: Layout of the Triangle of Death

Fig.1 presents the layout of the Triangle of Death. For the most part, the roads are narrow and sinuous especially the Yaounde-Bafoussam and Douala-Bafoussam road axes. The Douala-Yaounde road axis is also referred to as the Douala-Bangui corridor connecting Douala the economic hub of Cameroon and Bangui the political capital of Central African Republic. Despite the invaluable contribution of this road to the development of Cameroon, most lanes are merely 7meters wide with sharp, bushy bends with reduced visibility. These risks factors lead to high exposure to accidents especially along the Yaounde-Nomayos and Yaounde-Obala segments (Table 2).

Table 2: Road Segments with High Exposure Rate

National road	Segment	Length (km)	Traffic	Exposure rate
National Road 5	Douala-Bekoko	19.45	11341	1.59
National Road 4	Bandjoun-Bafoussam	12.050	6305	1.43
National Road 3	Yaounde-Nomayos	13	5579	1.17
National Road 3	Yaounde-Obala	32.435	6198	0.52
National Road 5	Nkongsamba-Melong	20	3281	0.44

### The Yaounde-Bafoussam National road 4

The Yaounde-Bafoussam National Road covers a distance of 295km with some segments constructed during the colonial era. Conceived during colonial administration and current attentions below expectation, the poor state of the road has raised worrying concerns about traffic engineering, management, road safety and sustainable transportation. The road has several faults as presented on table 3.

Table 3: Segments and State of National Road 4

Segment	Road Stretch	Distance (km)	State of the Road
1	Yaounde-Obala	32.435	Narrow lane and lack of sidewalks
2	Obala-Ebebda	39.450	Narrow lane, Degraded speed bumps and road signs
3	Ebebda-Bafia	45.200	Narrow lane, potholes and degraded speed bumps
4	Bafia-Bangangte	121.750	Narrow lane, potholes and abandoned road signs
5	Bangangte-Bandjoun	33.500	Narrow lane, potholes and steep slopes
6	Bandjoun-Bafoussam	12.050	Narrow lane, sharp bends and absence of sidewalks

### The Douala-Bafoussam National road 5

The first segment of the Douala-Bafoussam National Road (253km) was constructed during the French colonial rule in Cameroon. During the colonial rule from 1916 to 1945, the construction and completion of the road paid little attention to road safety. Currently, the road is obsolete and cannot meet up with the existing traffic. The state of the road is presented on table 4.

Table 4: Segments of National Road 5 and State of the Road

Segment	Road Stretch	Distance (km)	State of the Road
1	Douala-Bekoko	19.45	Narrow lane, potholes and absence of sidewalks
2	Bekoko-Loum	80.63	Narrow lane, potholes, poor road signs, sharp bends sidewalks
3	Loum-Nkongsamba	39.50	Narrow lane, potholes and poor road signs,
4	Nkongsamba-Melong	20	Narrow lane and pothole
5	Melong-Bafang	26	Narrow lane, numerous potholes, sharp bends and steep slopes
6	Bafang-Bandjoun	48	Narrow lane, steep slopes, sharp bends and abandoned road signs
7	Bandjoun-Bafoussam	12.050	Narrow lane and absence of sidewalks

Table 1, Table 3 and Table 4 reveal the different risks ranging from potholes, absence of road signs, sharp bends, steep slopes, poorly constructed and degraded speed bumps to lack of sidewalks. Other factors include high traffic, movement along the roads, abusive parking and violation of speed limits. Apart from these problems, table 5 illustrates the nature of speed bumps along the Triangle of Death.

Table 5: Speed Bumps along the Triangle of Death

Road axis	Number of speed bumps	Speed bumps without markings		Speed bumps with markings		Degraded speed bumps		Total %
		No	(%)	No	(%)	No	(%)	
Yaounde-Bafoussam	78	23	29.5	31	39.7	24	30.8	100
Douala-Bafoussam	171	45	26.3	87	50.9	39	22.8	100
Douala-Yaounde	75	16	21.3	26	34.7	33	44	100
<b>Total</b>	<b>324</b>	<b>84</b>	<b>26</b>	<b>144</b>	<b>44.4</b>	<b>96</b>	<b>29.6</b>	<b>100</b>

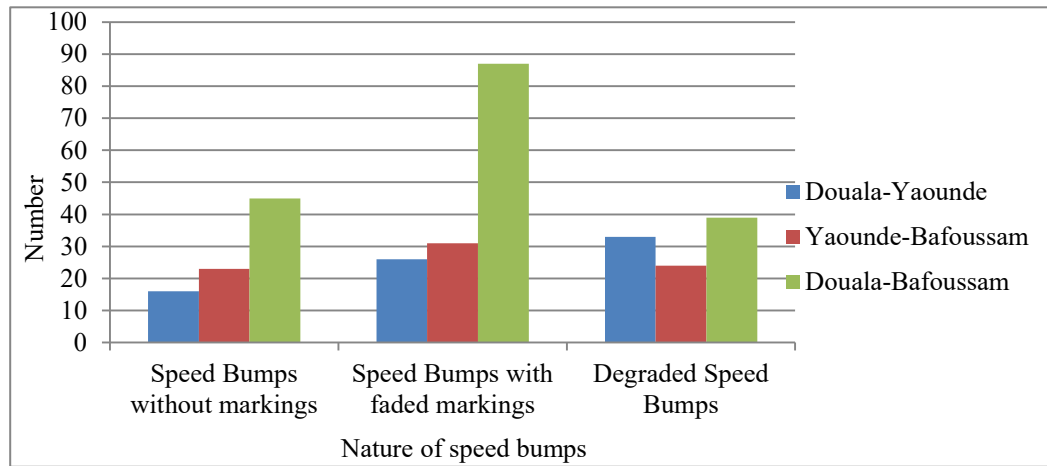


Fig. 2: The nature of Speed Bumps along the Triangle of Death

Apart from the afore-mentioned defects associated with speed bumps, most stretches of the roads (95%) where speed limit is 90-110km/h lack medians to reduce vehicle contact, and emergency stop points. Stretches with pedestrians and speed limit is 40-60km/h lack sidewalks and bus stops. Agglomerations have speed limit (30-40km/h), but they lack sidewalks and pedestrian refuge islands.

### 3.2 Road Users and States of Vehicles

The need to improve on living standards leads to awkward behaviours along the roads. Drivers plying the roads are known for overload, excessive speed, reckless overtaking and abusive parking. In addition, drivers have been caught in possession of illegal driver licenses and other documents. Roadside vendors cross the roads along dangerous stretches. Most vehicles on the national roads are of low quality. Between 2007 and 2014, 611484 used-vehicles were imported. Of this number, 286.099 were more than 10 years old with 325,385 less than 10 years. Within this period, 144203 vehicles of more than 20 years were shipped into Cameroon. The poor quality vehicles have to be checked in compliance with the existing laws which are ineffectively enforced. Some drivers have ghost road worthiness certificates as the laws are not effectively enforced. Other road worthiness certificates were obtained through bribery and corruption. Consequently, vehicles suffer from brake failure and tyre puncture amongst others. The risks factors associated with the states of the roads, states of vehicles and activities of road users have led to despicable road accidents with far-reaching impact on families. The outcomes of road accidents along the Triangle of Deaths are presented in the following section.

### 3.3 Outcomes of Road Accidents along the Triangle of Death

Road accidents are linked to the states of the roads. The deplorable states of the roads in combination with other factors presented on table 1, table 3 and table 4 result in frequent road accidents which manifest as head-on collision, rear-end collision, multiple collision, run-off, roll-over and sideswipe (Fig. 3).

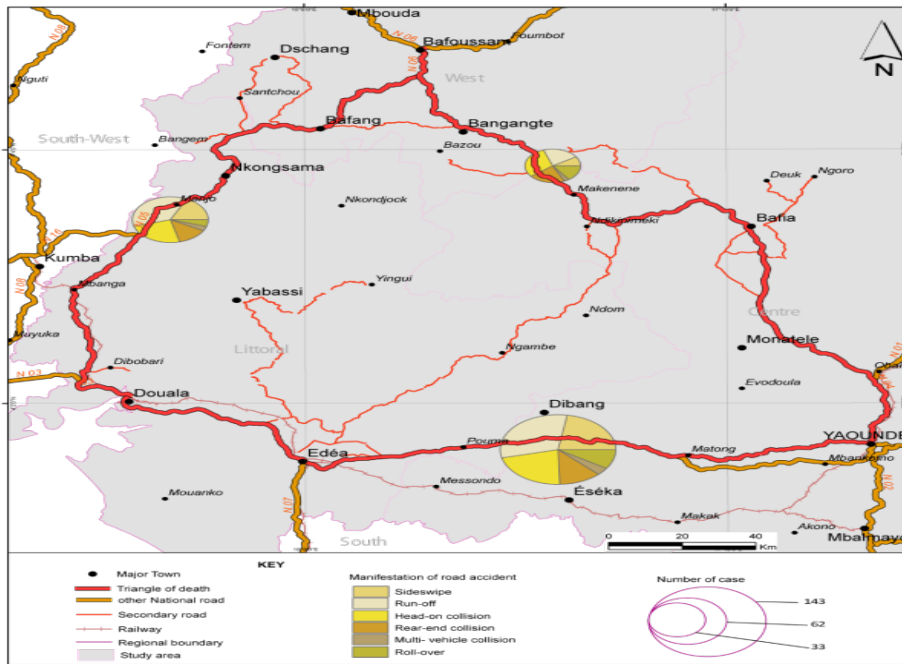


Fig. 3: Manifestation of Road Accidents along the Triangle of Death

From 2016 to 2020, 85 head-on collisions were recorded because the roads have insufficient medians or road divides to reduce vehicle contact, sideswipe (49), run-off (74), rear-end collision (34), multi- vehicle collision (8) and roll-over (24). More accidents are recorded at black spots along the Triangle of Death. Black spots refer to areas of frequent and prominent road accidents (Fig. 4).

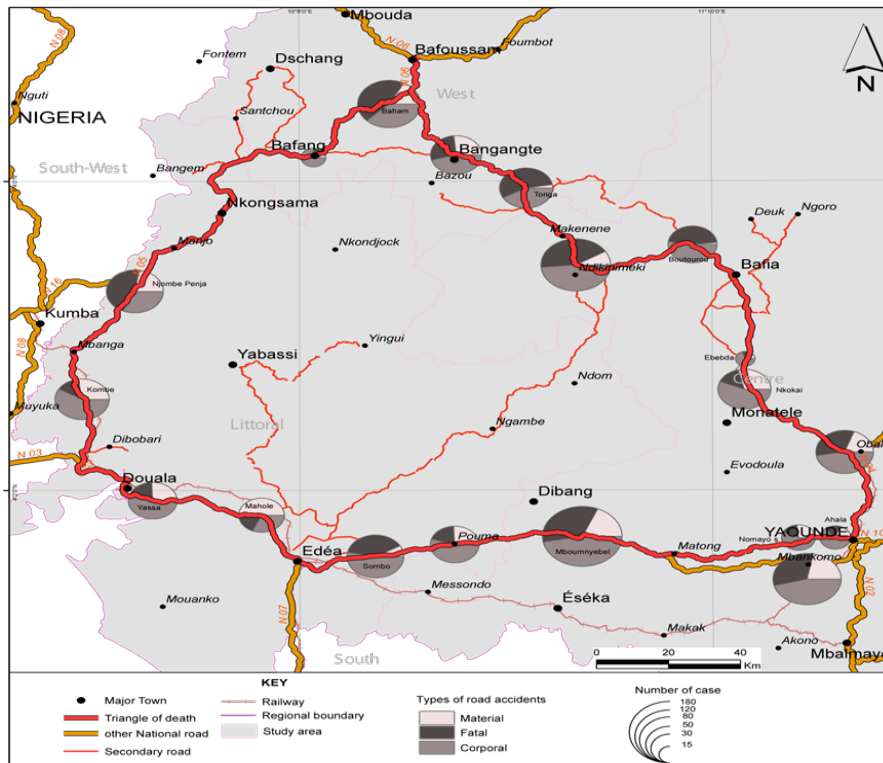


Fig. 4: Black Spots along the Triangle of Death

Fig. 4 illustrates areas of frequent and outstanding road accidents along the Triangle of Death. Black spots along the Douala-Yaounde road axis include Mahole, Mbankomo, Pouma, Boumnyebel, Sombo, Nomayos and Matomb. Boumnyebel is the most deadly locality along this road, recording fatal, corporal and material accidents. On one hand, a fatal accident involves several deaths with many people seriously injured. On the other hand, a corporal accident implicates a victim and a car. Material accidents comprise destruction of goods.

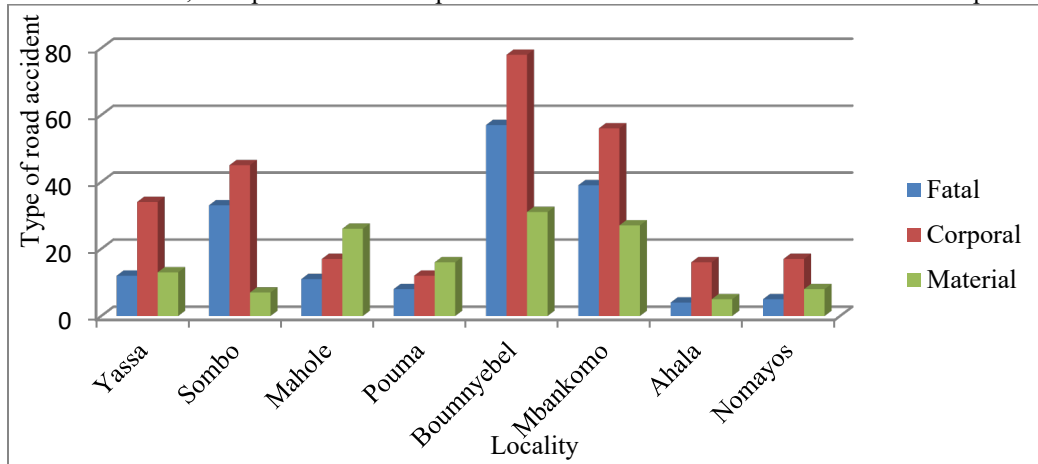


Fig. 5: Hazardous Spots along the Douala-Yaounde road

Boumnyebel is the locality where private cars, buses of public transport agencies and trucks belonging to brewery companies have been ravaged in road accidents. Along the Yaounde-Bafoussam National Road 4, black spots include Ndikinimenki (Fig. 6), Tonga, Obala, Boutourou, Bangangte, Ebebda and Nkokai.



Fig. 6: (a) A fatal road accident along a narrow lane at Ndikinimeki a black spot and security agents on the scene, (b) more than 35 deaths (V) deposited along the road, onlookers (O). Over 26 passengers were seriously injured, 27/12/2020



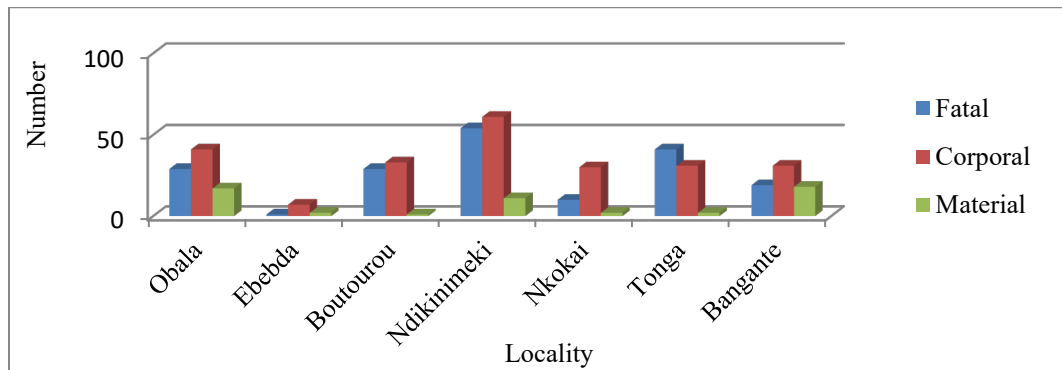


Fig 7: Black Spots along the Yaounde-Bafoussam National Road

Njombe, Pendja, Kombe, Loum, Mbanga and Baham are black spots along the Douala-Bafoussam National Road 5 (Fig. 8). These localities have witnessed fatal road accidents involving extensive material damage with serious injuries inflicted on passengers. Some of the road accidents have led to press release from government officials, describing the nature of the carnage. For instance, in 2018, 11 people died at Kombe with 15 people injured in a fatal road accident. In 2019, another fatal road accident involving 21 deaths with 16 people seriously injured occurred at Baham.

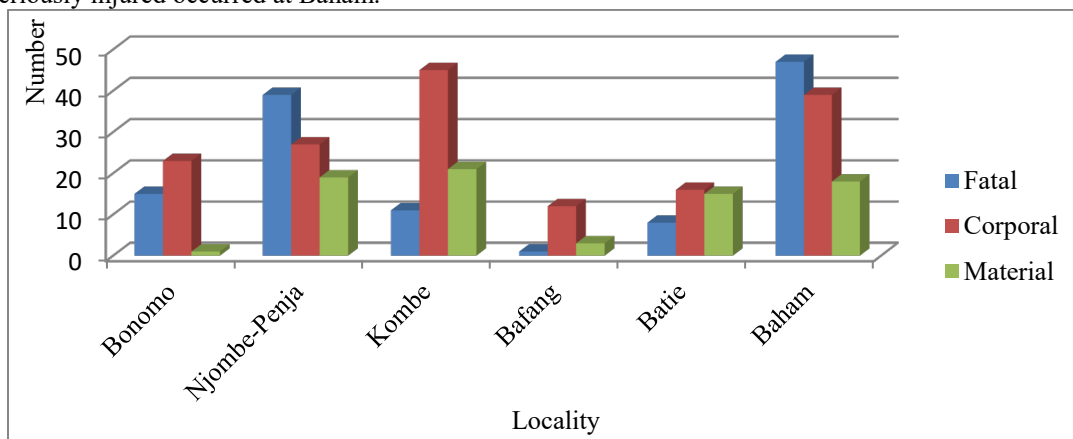


Fig 8: Black Spots along the Bafoussam-Douala National Road

These scenes of the scenarios inflicting pain, hardship and despair on families are scary and rescue teams are nowhere to be found. Dead victims lay in pools of blood and survivors urgently in need of medical attention are trapped in vehicle wreckages. Rescue teams are known for late arrival [10]. Death and injury tolls recorded during the period 2004-2018 are alarming (Fig. 9).

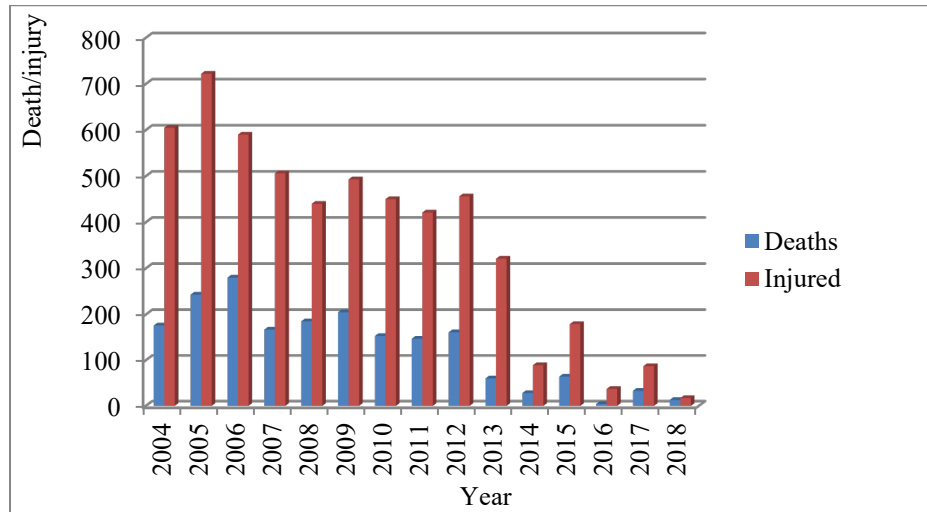


Fig. 9: Deaths and Injuries along the Triangle of Death

The tolls were high within the period 2004-2012 when the states of the roads were extremely deplorable and enforcement of road safety policies was quite reactive. Currently, road accidents have reduced, but the rate is far higher than figures recorded in other countries in Africa and Developed Countries. Accidents remain a thorny problem especially along the Douala-Yaounde road axis evinced on table 6.

Table 6: Deaths and Injuries along the Triangle of Death

Deaths			Injuries		
Road axis	Number	%	Road axis	Number	%
Douala-Bafoussam	305	15	Douala-Bafoussam	1064	19.3
Bafoussam-Yaounde	707	35	Bafoussam-Yaounde	3226	58.4
Douala-Yaounde	1017	50	Douala-Yaounde	1234	22.3
<b>Total</b>	<b>2029</b>	<b>100</b>	<b>Total</b>	<b>5524</b>	<b>100</b>

Table 6 shows that more deaths (50%) are recorded along the Douala-Yaounde road axis. This figure (50%) indicates a drop as compared to (70%) recorded in the previous years. The reduction results from repressive measures and sensitization campaigns which are more reactive than proactive. Also, it is noticed that the Bafoussam-Yaounde road seems to have recorded more injuries than the Douala-Yaounde road axis which is the most dangerous and has the highest death and injury tolls. The toll on injury along the Douala-Yaounde road axis was underreported. Different categories of people suffer from accidents along the national roads (Fig. 10).

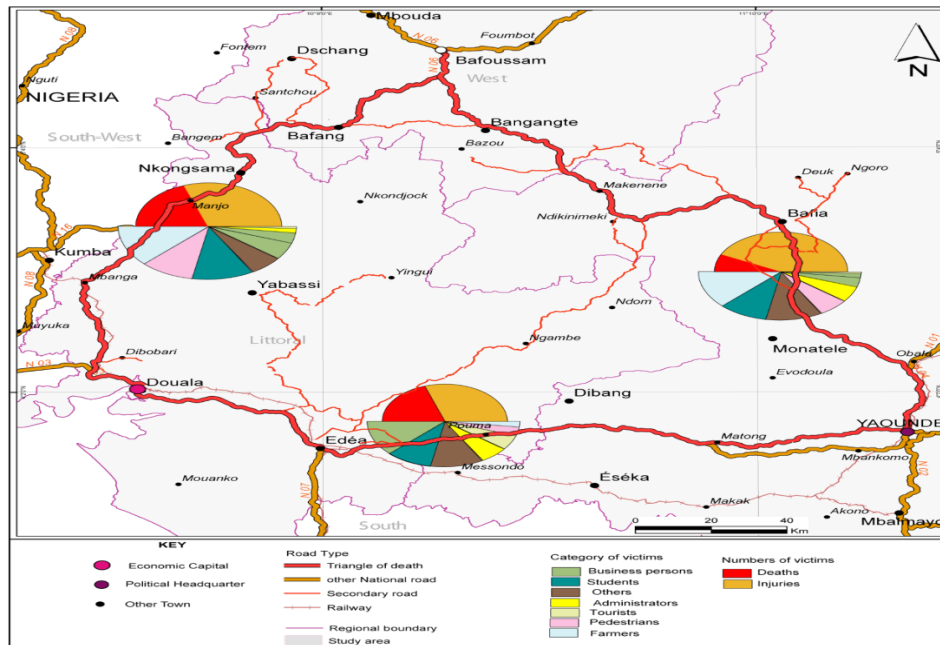


Fig 10: Victims of Accidents along the Triangle of Death

In 2021, road accidents implicated 43 businesspersons, administrators (31), tourists (13), students (31) and farmers (5) along the Douala-Yaounde National road. In the same year, businesspersons (26), administrators (3), tourists (1), students (18) and farmers (25) were involved in accidents along National Road 4 with businesspersons (17), administrators (3), students (15) and farmers (12) registered along the Douala-Bafoussam National Roads.

#### 4. Discussion

Road transport is a key driver of socio-economic growth and development as it can propel the economy if sustainably managed. Road transport can also be a setback if loosely managed as the case is apparent in Developing Countries. Cameroon sustaining a high rate of road accidents (32.6%) per 100,000 inhabitants, the deaths and injuries recorded along the Triangle of Death in Cameroon have wider implications on families. Some victims of road accidents lack access to medical check-up on account of poverty. Other outcomes of road accidents include wanton material damage. Cameroon lost 498,000 million CFAF which could be used for the construction of 830km national road between the year 2015 and 2020 with 166km every year for reactive policies towards road accidents. One kilometre (1km) highway cost Cameroon 3.5 billion CFAF in 2015, about 2,905 billion CFAF enough to construct 140km highway with 28km every year was lost in the management of road accidents during the same period. The current states of the roads do not befit their status as national roads linking regional headquarters such as Yaounde and Douala, the political and economic headquarters of Cameroon respectively. The Triangle of Death especially National Road 3 remains a threat to public health in Cameroon. The causes of the road accidents are rather attributed to road users. As if that is not enough, structural measures such as rehabilitation works, repair works, clearing sharp bends, installing road signs, renewing horizontal road markings and renovating tollgates with little attention given to widening the roads, constructing road divides, constructing modern roads and developing alternative modes of transport amongst others are not sufficient to curb road accidents. Also, sustainable road transport ought to heed roadside facilities to make it friendly for road users with disabilities and those in vulnerable situations.

#### Conclusion

Road users are rather accused of being the root cause of accidents along the national roads. The results of this paper reveal that the ill states of the roads sustain the frequent accidents along the Triangle of Death. The roads were poorly conceived, road signs and speed bumps are below standards, rehabilitation and maintenance works are irregular. The vehicles plying the roads are in poor states as a result of irregular maintenance. These road accidents constituting a public health problem are also caused by road users specifically drivers through recklessness as they struggle to augment their low salaries with overload and excessive speed amongst others. The

Douala-Yaounde National Road is the most dangerous axis. National Road 3, National Road 4 and National Road 5 which make up the Triangle of Death contribute more than 50% to accidents in Cameroon. The fatalities and injuries are setbacks for socio-economic growth and development. Measures put in place to redress this despicable situation are reactive and mistimed. The frequent road accidents have laid bare the failings of the strategies aimed at redressing the situation. The national roads need to be modernised and new technologies integrated to monitor the existing traffic. In addition, construction of modern roads, development of other modes, road safety campaigns and effective enforcement of laws will curb the situation along the Triangle of Death in Cameroon.

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