ROAD ACCIDENT: A THREAT TOWARDS NATION'S PEACE AND PROSPERITY

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ABSTRACT

Road accident is an unfortunate event that creates ecological imbalance and social disaster. More than a collision, it is a situation that leaves behind distress, sorrow & sufferings. Therefore, identification of the causes of road accidents become highly essential for adopting necessary preventive measures against this critical event. The damage created by road accidents is to a large extent unrepairable and therefore needs attention to eradicate this continuously increasing trend of awful epidemic. The objective of this research paper is to highlight & focus on the causes resulting in road accidents in the North-Eastern region of India by collecting data from various sources. Though we have concentrated on causes of road accidents, the paper to follow will highlight on some possible remedies for lessening/eliminating road accidents of the region specific in nature.

1 INTRODUCTION

North-Eastern region of India consists of 8 States viz. Assam, Manipur, Meghalaya, Mizoram, Arunachal Pradesh, Nagaland, Tripura & Sikkim. At present the North-Eastern States of India are mainly suffering from poor infrastructure regarding transportation & connectivity problems. Connectivity through rail & air mode is restricted only to selected places of this region. Therefore, roads are the only means for travelling to various places and they act as the veins and arteries for the flow & movement of people, goods & other consumables, supporting the business activities in this region. Each state of this region is dependent on the other for its business activities, which highlights the need for good durable & sustainable roads in the North-Eastern region of India.

Silchar acts as a business hub supporting many states of the North Eastern region. To analyse the problem better a survey was conducted at Silchar, Assam to identify the major ones among the various causes resulting in road accidents in the North-Eastern region. Also, the paper will help to project the rate of growth in the vehicle population in the last decade (2000-2010) in the various states of North-East India and the statistics of the road accidents in those states during that period.

A Truck Loaded with Logs Rammed into the School Bus at Saw Mer, Upper Shillong (Meghalaya) on 15th June, 2012
(Ref. The Shilong Times 16th June, 2012)

Table 1 State-wise Comparison of Road Accidents at North-Eastern Region of India in 2008 & 2009

Sl. No.	State	Road Accidents in 2008	Road Accidents in 2009	% Growth
1	Assam	4262	4585	7.57
2	Tripura	767	865	12.77
3	Manipur	502	578	15.13
4	Meghalaya	191	314	64.39
5	Mizoram	87	125	43.67
6	Nagaland	126	47	-62.69

Source: NCRB data bank

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Road accident rate in India is among the highest in the world, with at least 1,34,000 killed each year on the road. Road fatalities are an "epidemic" and will become the world's fifth biggest killer by 2030. North-Eastern region of India is an ecologically sensitive place but lacks the necessary facilities and infrastructure regarding road transportation, ultimately resulting in the critical event- road accidents, creating a major problem for the common people of this region.

2 METHODOLOGY

Initially, for the identification of problem (i.e. causes of road accidents in North-East India), the need for a survey was realised for collection of primary data. The survey was conducted at Silchar, Assam. To conduct the survey, a questionnaire of likert-scale type was prepared and then the target group was selected to conduct the survey. The response of the target group (total respondents: 40 nos) was collected during the survey and was thoroughly observed & studied for further analysis.

3 DATA COLLECTION

3.1 Primary Data (Through Survey)

Primary data is collected from the survey conducted at Silchar, Assam. A questionnaire (likert-scale type) is used to conduct the survey. The target group for this survey consists of various officials from State/ Central Govt. organizations, traffic dept. officials, motor vehicle association, service engineers from vehicle dealers, surveyor & loss assessor from various insurance companies etc. from the locality. The questionnaire was prepared on the various factors causing road accidents in the North-Eastern region of India. The various factors are:

1. Unskilled drivers.
2. Drunken drivers.
3. Improper Traffic Management System (proper marking on road & bumps).
4. Non-compliance & lack of awareness regarding traffic rules.
5. Poor road condition.
6. Unfit vehicles.
7. Negligence & careless attitude of pedestrians.
8. High vehicle density.
9. Over-loaded vehicles.
10. Limited Road Network.
11. Fog & rainy weather condition.

The response from the target group is represented in the histogram as follows:

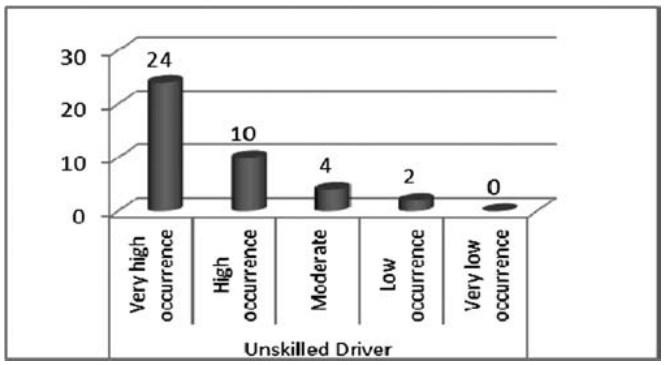


Fig. 1 Response of Target Group Regarding 'Unskilled Driver 'as a Cause for Road Accidents

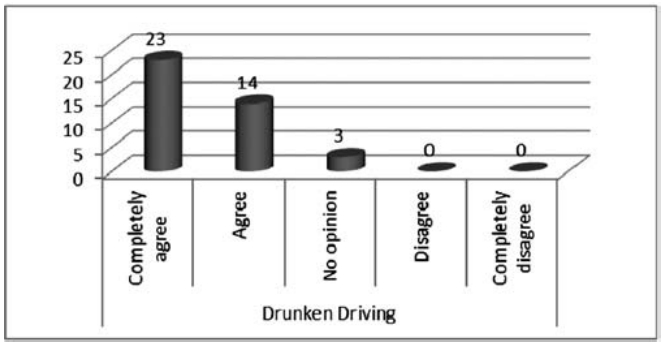


Fig. 2 Response of Target Group Regarding 'Drunken Driver 'as a Cause for Road Accidents

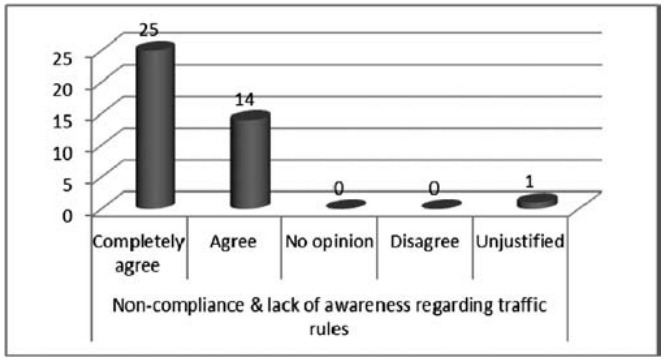


Fig. 3 Response of Target Group Regarding 'Non-Compliance & Lack of Awareness Regarding Traffic Rules 'as a Cause for Road Accidents

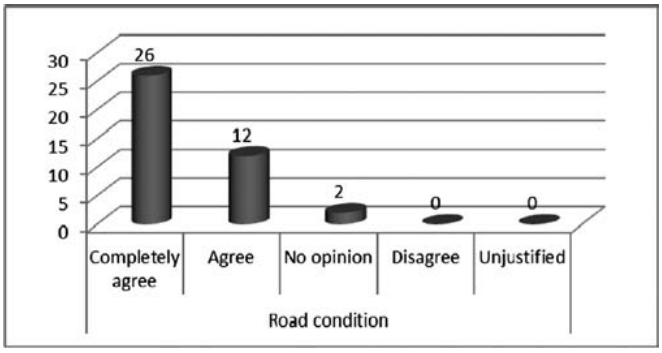


Fig. 4 Response of Target Group Regarding 'Road Condition 'as a Cause for Road Accidents

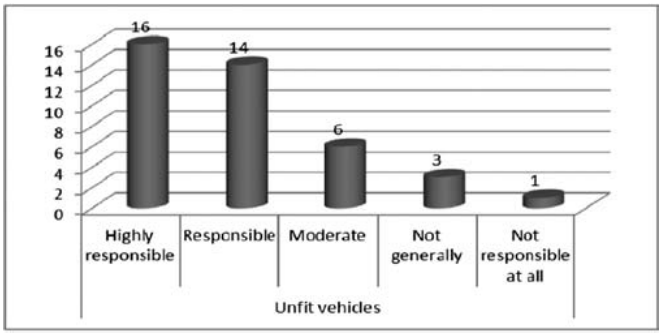


Fig. 5 Response of Target Group Regarding 'Unfit Vehicles'as a Cause for Road Accidents

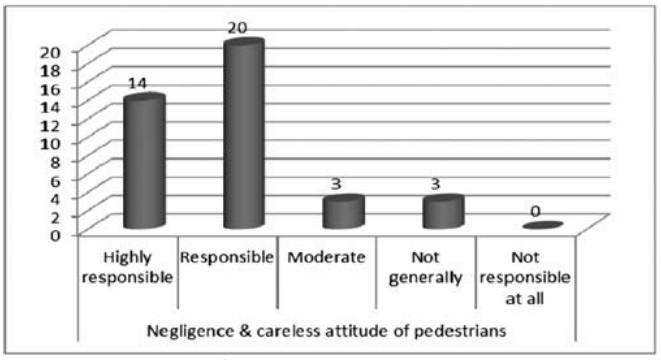


Fig. 6 Response of Target Group Regarding 'Negligence & Careless Attitude of Pedestrians' as a Cause for Road Accidents

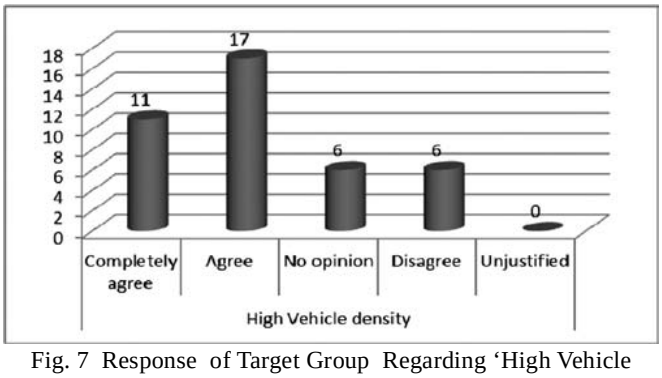


Fig. 7 Response of Target Group Regarding 'High Vehicle Density 'as a Cause for Road Accidents

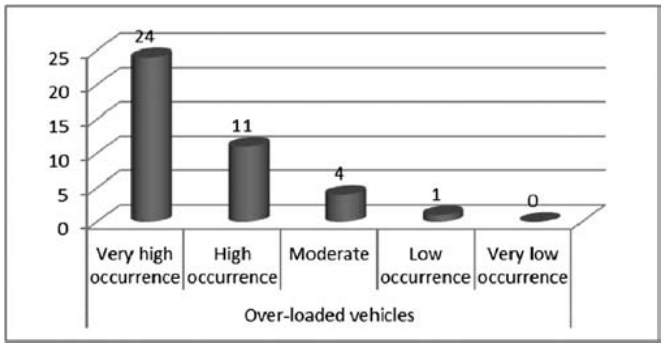


Fig. 8 Response of Target Group Regarding 'Over-Loaded Vehicles 'as a Cause for Road Accidents

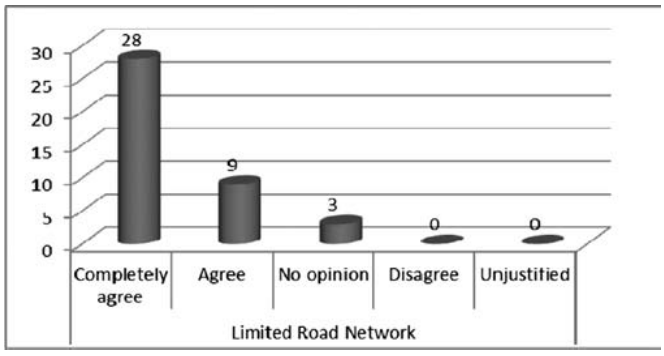


Fig. 9 Response of Target Group Regarding 'Limited Road Network' as a Cause for Road Accidents

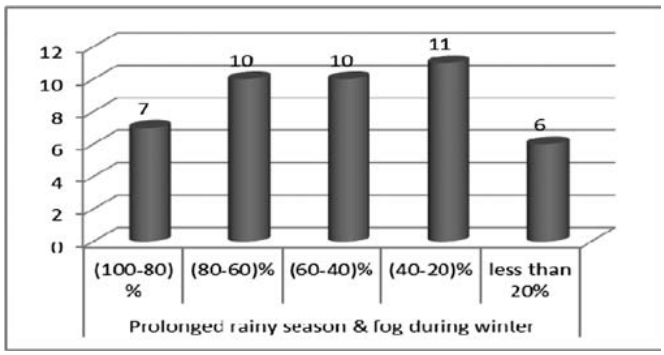


Fig. 10 Response of Target Group Regarding 'Weather Condition' as a Cause for Road Accidents

3.2 Analysis of Primary Data: After observing the response from the survey it is understood that all the above mentioned factors are responsible to a large extent for the occurrence of road accidents in the North-Eastern region of India. But among these various factors, few factors are commonly responsible for road accidents in this region (for e.g. drunken driving), while some other factors are specifically responsible for road accidents in certain states of this region. This research paper will highlight the alarming

factors/causes resulting in road accidents in North-East India.

Secondary Data:

(Source: National Crime Records Bureau (NCRB) data bank, Ministry of Home Affairs)

Assam :

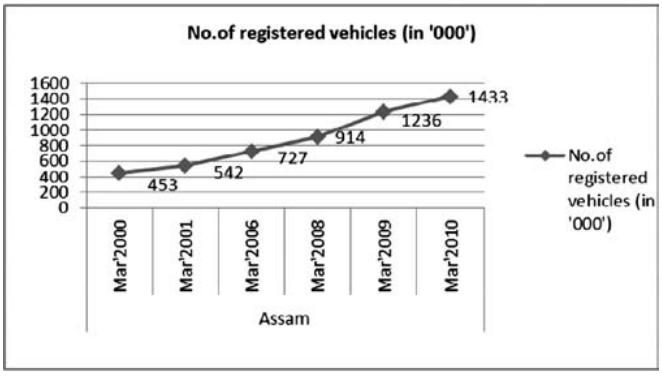


Fig. 11 Growth in the Vehicle Population of Assam (2000-2010)

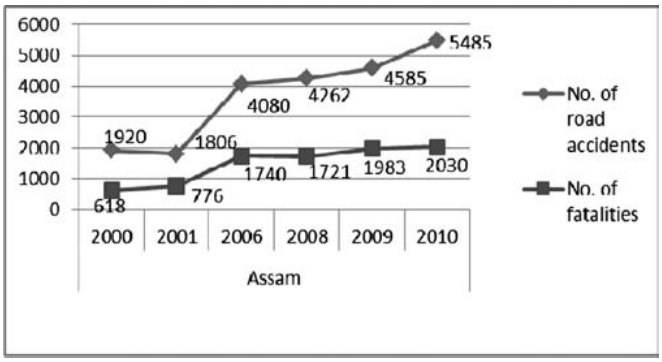


Fig. 12 Linear Growth in the no. of Road Accidents & Fatalities at Assam (2000-2009)

3.3 Analysis of Secondary Data

(for States of Assam, Tripura & Manipur):

With reference to Figs. No. 11&12, in case of Assam, the vehicle population is too high and has grown linearly at a substantial high rate during the last decade (2000-2010). The high growth in the vehicle population has also resulted in large number of road accidents. With the increase in the number of road accidents (year-wise) the number of fatalities has also increased in the roads of Assam, making the situation highly critical and alarming.

Similar, trend regarding the vehicle population and road accidents can also be seen in the States of Tripura & Manipur (ref. to Figs. No. 13, 14, 15 & 16). Compared to the vehicle population the road accidents occurring in Tripura is quite high, ultimately resulting in the increase in the number of fatalities (ref. to Fig. No. 4).

In case of Manipur, the vehicle population too grew at a linear rate, but some fluctuations can be seen in the number of road accidents and fatalities during the last decade (2000-2009) (ref. to Figs. No. 15 & 16). It is suggested to take appropriate measures & road safety initiatives to keep the road accident rate on the decreasing trend.

Tripura :

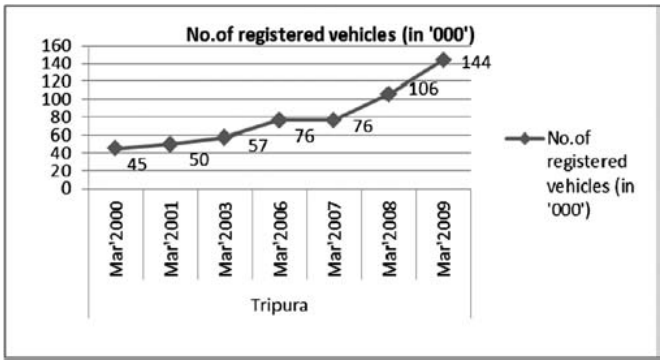


Fig. 13 Growth in the Vehicle Population of Tripura (2000-2009)

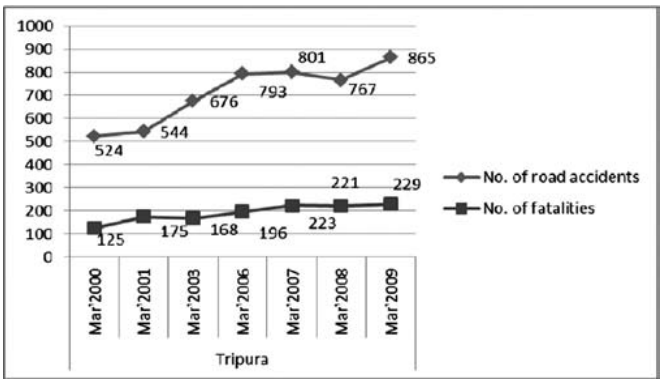


Fig. 14 Linear Growth in the no. of Road Accidents & Fatalities at Tripura (2000-2009)

Manipur :

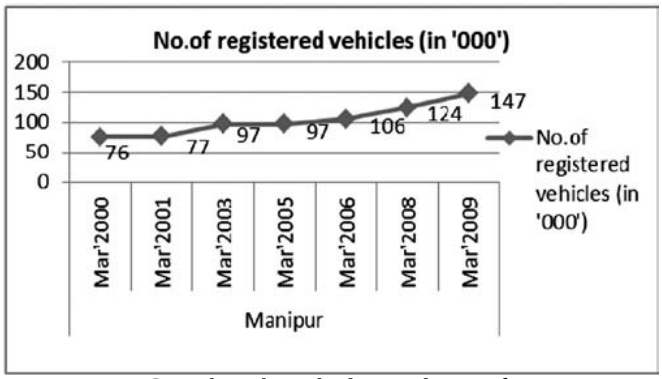


Fig. 15 Growth in the Vehicle Population of Manipur (2000-2009)

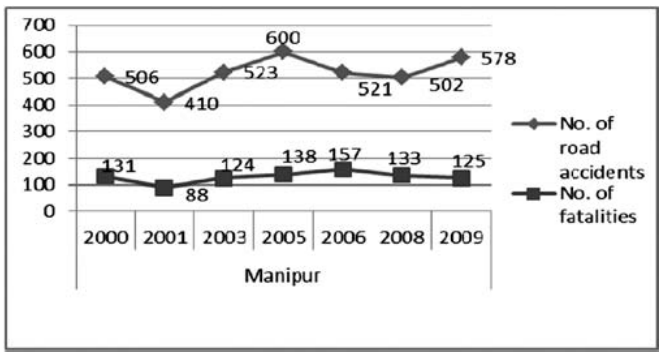


Fig. 16 Graphical Representation of the no. of Road Accidents & Fatalities at Manipur (2000-2009)

3.4 Analysis of Secondary Data

(for States of Meghalaya, Mizoram & Nagaland):

In these 3 states (Meghalaya, Mizoram, Nagaland) the number of road accidents occurred during the last decade (2000-2009) is comparatively less than those of Assam, Tripura & Manipur. With reference to Figs No. 17 & 18, it is observed and understood that the vehicle population at Meghalaya grew continuously. But the number of road accidents increased substantially during 2003, 2005 & 2009 (Source: NCRB data bank). Continuous attention & road safety initiatives are required to minimize the number of road accidents each year.

In case of Mizoram (with ref. to Figs. No. 19 & 20) linear growth is observed regarding the vehicle population during 2000-2009. The number of road accidents at Mizoram increased marginally from 2000 to 2003, then for few consecutive years the number of road accidents decreased, but increased suddenly during 2008 & 2009.

Meghalaya :

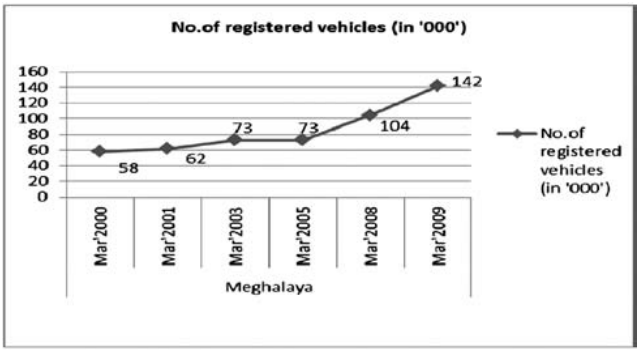


Fig. 17 Growth in the Vehicle Population of Meghalaya (2000-2009)

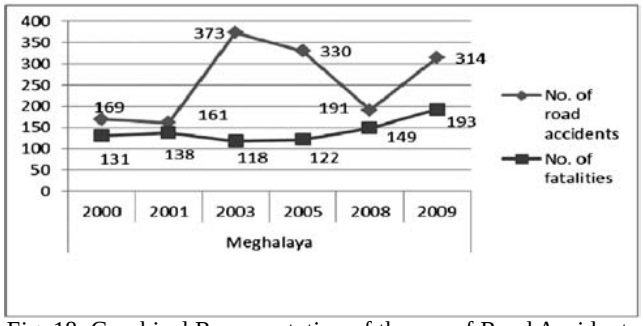


Fig. 18 Graphical Representation of the no. of Road Accidents & Fatalities at Meghalaya (2000-2009)

Mizoram :

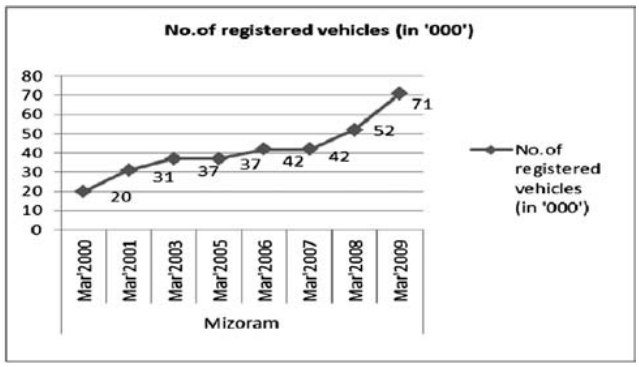


Fig. 19 Growth in the Vehicle Population of Mizoram (2000-2009)

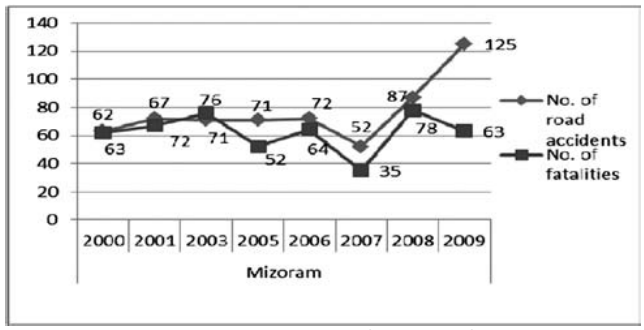


Fig. 20 Graphical Representation of the no. of Road Accidents & Fatalities at Mizoram (2000-2009)

Nagaland :

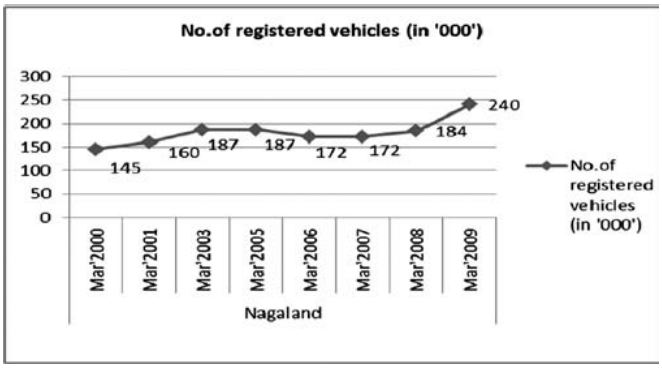


Fig. 21 Growth in the Vehicle Population of Nagaland (2000-2009)

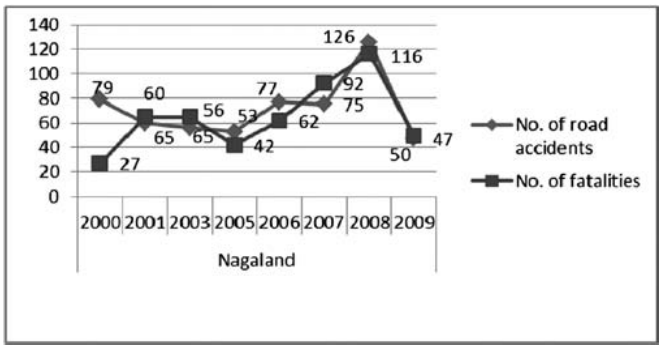


Fig. 22 Graphical Representation of the no. of Road Accidents & Fatalities at Nagaland (2000-2009)

Nagaland, though being one of the smallest states of the North-Eastern region (area: 16,579 km^2), records the second highest vehicle population (ref. to Fig. No. 21) of the North-Eastern region (in terms of number of vehicles registered). Compared to the vehicle population, the number of road accidents and fatalities occurred at Nagaland during the last decade (2000-2009) is marginal.

The data collected from the survey conducted at Silchar (Assam) is represented in a tabular format (Table-2). The factors/causes of road accidents are rated on a likert scale questionnaire by giving rating from 1 to 5, (explained at the bottom of Table-2). The average of each of the causes of road accidents in the North-Eastern region of India is calculated to identify & understand the final result/ output of the survey. The higher the average value the more responsible the factor is for the occurrence of road accidents in this region. Therefore, on this basis, among the ten factors (mentioned in Table-2), the top five factors highly responsible for road accidents in this region, chronologically are- 1. Limited Road Network, 2. Road Condition, 3 Non-compliance & lack of awareness regarding traffic rules, 4. Drunken Driving & 5. Over-loaded vehicles.

Table 2 Data Collection Through Survey

Sl. No.	Unskilled Driver	Drunken Driver	Non-Compliance of Traffic Rules	Road Condition	Unfit Vehicles	Negligence & Careless Attitude of Pedestrians	High Vehicle Density	Over-Loaded Vehicles	Limited Road Network	Weather Condition
1	4	5	4	4	5	4	3	4	4	3
2	3	4	4	5	3	4	3	3	3	3
3	5	5	5	5	4	4	4	5	5	2
4	5	5	5	5	5	4	4	5	5	3
5	5	4	5	4	2	4	4	5	4	3
6	3	4	5	5	2	5	2	5	5	1
7	5	5	4	4	4	4	2	3	4	2
8	5	5	5	5	4	3	2	3	4	2
9	2	4	5	4	4	4	4	2	3	2
10	5	5	5	5	3	2	3	4	4	1
11	3	5	5	5	3	4	4	5	5	2

Table 2 Contd ...

Sl. No.	Unskilled Driver	Drunken Driver	Non-Compliance of Traffic Rules	Road Condition	Unfit Vehicles	Negligence & Careless Attitude of Pedestrians	High Vehicle Density	Over-Loaded Vehicles	Limited Road Network	Weather Condition
12	5	5	4	5	5	4	4	4	5	5
13	5	5	4	5	5	4	4	5	5	3
14	5	5	5	3	5	5	3	4	4	2
15	5	5	5	5	3	5	4	5	5	3
16	5	4	4	4	4	2	2	4	5	5
17	5	4	5	5	4	4	4	4	5	3
18	5	4	4	4	4	3	4	4	4	2
19	3	3	4	4	5	4	5	4	5	4
20	4	4	5	5	4	2	5	5	5	2
21	4	4	4	5	5	5	5	5	5	5
22	5	5	5	4	4	4	3	3	5	2
23	5	5	5	4	5	5	5	5	5	5
24	3	4	5	5	5	4	3	5	5	1
25	2	4	1	5	1	5	2	5	5	1
26	4	5	5	5	4	5	5	5	5	2
27	5	5	5	5	5	5	4	5	4	4
28	5	5	5	5	5	5	4	5	5	4
29	5	3	4	5	3	5	5	5	5	4
30	5	5	5	5	5	4	5	5	5	1
31	5	5	5	5	4	5	5	5	5	5
32	4	4	4	4	4	4	4	4	4	2
33	4	4	5	5	4	5	5	5	5	4
34	4	5	5	5	5	5	2	5	5	3
35	4	4	4	3	2	4	4	4	5	1
36	5	5	5	5	5	4	5	5	5	4
37	5	5	4	4	4	4	4	5	3	3
38	4	5	4	4	3	3	4	4	5	4
39	5	5	5	5	5	4	4	5	5	5
40	5	4	5	5	5	5	5	5	5	3
Avg:	4.375	4.525	4.55	4.6	4.025	4.125	3.825	4.45	4.625	2.9

5-Completely Agree, 4-Agree, 3-No opinion, 2-Disagree, 1-Completely disagree

Or, 5-Highly responsible, 4-Responsible, 3-Moderate, 2-Not generally, 1-Not responsible at all

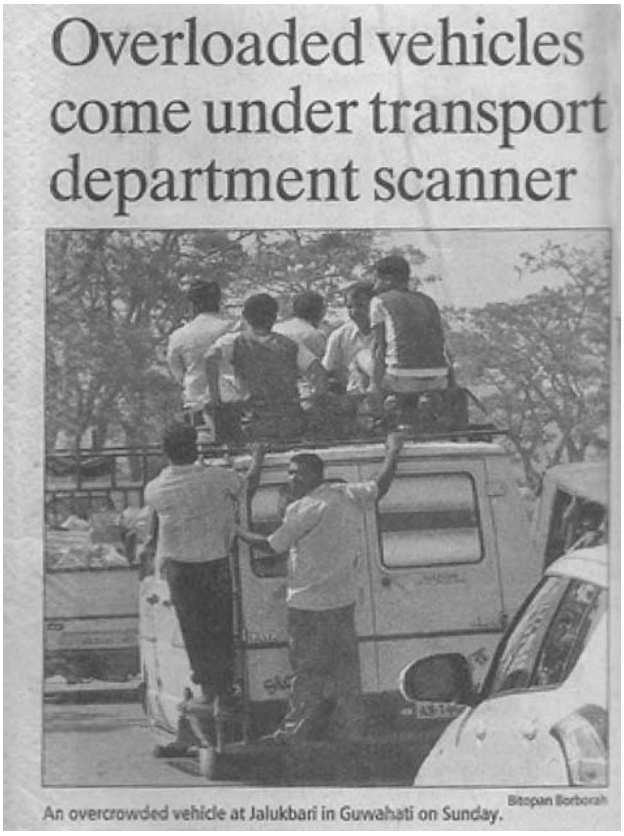
Table 3 Correlation Matrix

	Unskilled Driver	Drunken Driver	Non-compliance & lack of awareness regarding traffic rules	Road Condition	Unfit vehicles	Negligence of pedestrians	High vehicle density	Over-loaded vehicles	Limited road network	Weather condition
Unskilled Driver	1									
Drunken Driver	0.4358	1								
Non-compliance & lack of awareness regarding traffic rules	0.3720	0.3115	1							
Road Condition	0.0000	0.1016	0.1622	1						
Unfit vehicles	0.3711	0.3050	0.4058	0.0993	1					
Negligence of pedestrians	-0.0964	0.0188	0.0100	0.1527	0.0823	1				
High vehicles density	0.1875	-0.1410	0.2660	0.1376	0.2945	0.2046	1			
Over-loaded vehicles	0.1917	0.0848	0.0918	0.4548	0.0796	0.3744	0.3941	1		
Limited road network	0.1195	-0.0085	0.0681	0.3458	0.0924	0.1855	0.2578	0.5608	1	
Weather condition	0.3417	0.0363	0.0580	0.1138	0.4162	0.1738	0.3778	0.1970	0.2047	1

The data from the Table-2 is further used to prepare the correlation matrix by the application of data analysis tool in MS excel. A correlation is a single number that describes the degree of relationship between two variables. By using the correlation matrix, correlation among two factors can be established. Coefficients having higher value (close to one) will establish high correlation among the corresponding two factors. With reference to Table-3, considering coefficients whose value is more than 0.5, it is observed that only four coefficients have value higher than 0.5. Hence their corresponding two factors are highly correlated. Those factors are:

1. Limited road network vs Over-loaded vehicles (correlation coeff. 0.5608)
2. Over-loaded vehicles vs Road condition (cor. coeff 0.4548)
3. Drunken Driving vs Unskilled Drivers (correlation coeff. 0.4358)
4. Weather Condition vs Unfit vehicles (cor. coeff. 0.4162)
5. Unfit vehicles vs Non-compliance & lack of awareness regarding traffic rules (cor. coeff. 0.4058)

The above mentioned two factors (no. 1 & 2) are highly correlated and in many situations are combinedly responsible for occurrence of road accidents in the North-Eastern region of India.


Overloaded vehicles come under transport department scanner

An overcrowded vehicle at Jalukbari in Guwahati on Sunday. Bitopan Borborah

Photo from Assam Times News Paper (Assam), Dated 13th Aug'2010

Haflong-Silchar road in dilapidated condition

13 August, 2010, Anup Biswas

Haflong-Silchar road

Photo From Seven Sisters Post Newspaper (Assam), Dated 7th May' 2012

Data Analysis of Table-4 (shown in Annexure-I):

From Table-2, for each factor/variable the average of four consecutive numbers are calculated. For normalisation, those values are then divided by 5 and then by 10 (since 5 is the maximum value of Table-2 and by taking average of four consecutive numbers, 10 values are obtained for each factor/ variable). Also for each factor/variable the maximum value is obtained from the correlation matrix (Table-3). Then for calculating the weightage for each factor/variable, the summation of the product of those normalised values (from Table-4) and the maximum value of the correlation coefficient of those respective factors/ variables is done, which is shown as follows:-

Calculation of weightage from normalised data:

[Wi] = [Normalised survey data] [Max. value of correln coeff. for respective factors]

W_1 = (0.085 x 0.4358) + (0.095 x 0.3115) + (0.09 x 0.4058) + (0.095 x 0.4548) + (0.085 x 0.4162) + (0.08 x 0.3744) + (0.07 x 0.3941) + (0.085 x 0.5608) + (0.085 x 0.3458) + (0.055 x 0.3778) = **0.332**

W_2 = (0.09 x 0.4358) + (0.09 x 0.3115) + (0.095 x 0.4058) + (0.09 x 0.4548) + (0.06 x 0.4162) + (0.08 x 0.3744) + (0.05 x 0.3941) + (0.08 x 0.5608) + (0.085 x 0.3458) + (0.04 x 0.3778) = **0.305**

and so on..

Therefore,

1. Limited road network (Weightage, W_9 = 0.358)
2. Over-loaded vehicles (Weightage, W_8 = 0.356)
3. Weather condition (Weightage, W_{10} = 0.355)
4. Negligence & careless attitude of pedestrians (Weightage, W_6 = 0.351)
5. High vehicle density (Weightage, W_7 = 0.345)
6. Road condition (Weightage, W_4 = 0.341)
7. Unskilled Driver (Weightage, W_1 = 0.332)
8. Unfit vehicles (Weightage, W_5 = 0.33)
9. Non-compliance & lack of awareness regarding traffic rules (Weightage, W_3 = 0.317)
10. Drunken Driving (Weightage, W_2 = 0.305)

Factors with higher value of weightage are more responsible for the occurrence of road accidents in the North-Eastern region of India (i.e. limited road network, over-loaded vehicles, weather condition and so on).

The general objective function of road accidents can be related with the identified factor (higher the weightage value, higher is the contribution towards road accidents) as,

Road Accident (y) = $\sum_{i=1}^{10} W_i x_i$, i = no. of factors

(Chance cause or probability)

Where,

x_1 = unskilled driver

x_2 = drunken driver

x_3 = Non-compliance & lack of awareness regarding traffic rules

x_4 = Road condition

x_5 = Unfit vehicles

x_6 = Negligence & careless attitude of pedestrians

x_7 = High vehicle density

x_8 = Over-loaded vehicles

x_9 = Limited road network

x_{10} = Weather condition

The data for the various factors/variables are obtained from the survey (in Table-2) conducted at Silchar (Assam) is specific for the North-Eastern region of India. Therefore, the above mentioned equation of road accident is also specific for this region.

5 CONCLUSION & RECOMMENDATION:

As shown in Table-2, 'limited road network' appears to be the most significant factor resulting in road accidents in the North-Eastern region of India, followed by 'road condition', 'non-compliance & lack of awareness with respect to traffic rules', 'drunken driving' and 'over-loaded vehicles'. But apart from these individual causes responsible for occurrence of road accidents in this region, it is more essential to find out a correlation between two factors/causes mainly resulting in road accidents in this region. From Table-3 (considering correlation between two factors), 'limited road network' vs 'over-loaded vehicles' shows the maximum correlation coefficient (i.e. 0.5608), followed by 'over-loaded vehicles' vs 'road condition' (correlation coefficient 0.4548), which means that those combinations result in maximum road accidents and also those respective factors need immediate and serious attention. Therefore, it is recommended that running of over-loaded vehicles on the poor & limited roads of North-East India is very risky & has higher probability of road accidents.

But, based on the response from the target group during this survey & the correlation matrix (Table-3), the correlation coefficient between 'drunken driving' vs 'unskilled drivers' is obtained (i.e. 0.4358), which means that the target group perceives that the chance of occurrence of road accidents with this combination is very less and therefore the correlation coefficient is also relatively less (i.e. 0.4358). Similar conclusion can also be drawn for the remaining correlations (between two factors) with lesser correlation coefficients (mentioned in Table-3). Moreover, it is also recommended that the drivers of this region should be properly trained and educated to change their basic mentality & behaviour and also to make them aware while driving on the road.

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Annexure-I

Table 4 Matrix for Calculation of Weightage for Various Factors

Variables	1	2	3	4	5	6	7	8	9	10	Correlation coeff. (max. value)
Unskilled Driver	0.085	0.095	0.09	0.095	0.085	0.08	0.07	0.085	0.085	0.055	0.4358
Drunken Driver	0.09	0.09	0.095	0.09	0.06	0.08	0.05	0.08	0.085	0.04	0.3115
Non-compliance & lack of awareness regarding traffic rules	0.075	0.095	0.095	0.095	0.075	0.07	0.075	0.075	0.085	0.05	0.4058
Road Condition	0.1	0.095	0.09	0.085	0.085	0.08	0.065	0.09	0.095	0.065	0.4548
Unfit vehicles	0.085	0.075	0.09	0.09	0.085	0.065	0.09	0.085	0.095	0.055	0.4162
Negligence & careless attitude of pedestrians	0.085	0.09	0.095	0.09	0.095	0.09	0.08	0.09	0.1	0.065	0.3744
High vehicle density	0.08	0.095	0.08	0.1	0.075	0.1	0.075	0.1	0.095	0.055	0.3941
Over-loaded vehicles	0.095	0.085	0.09	0.095	0.08	0.09	0.095	0.095	0.095	0.06	0.5608
Limited road network	0.085	0.09	0.095	0.09	0.08	0.09	0.08	0.095	0.1	0.08	0.3458
Weather condition	0.095	0.095	0.09	0.09	0.085	0.08	0.085	0.095	0.09	0.075	0.3778

OBITUARY

The Indian Roads Congress express their profound sorrow on the sad demise of Dr. Vijay Trimbak Ganpule resident of F. No.101 & 101-A, Laxmikant Apt-A, Shree Hanuman Chs., Opp. Kakad Ind. Estate, Off. T.H. Kataria Marg, Sitaram Keer Marg, Mumbai on 14th March 2013. He was an active member of the Indian Roads Congress.

May his soul rest in peace.

The Indian Roads Congress express their profound sorrow on the sad demise of Shri M. Amirthalingam, Joint Chief Engineer (Highways) & Officer on Special Duty (Retd.), 21, Gopal Pillaiyar Koil Street, Thiruvannamalai (Tamil Nadu). He was an active member of the Indian Roads Congress.

May his soul rest in peace.