

Systematic Analysis of the Efficacy and Effectiveness and Flaws of the National Highways in Meeting Traffic Demands

Aluru Harish Babu

Harish21051991@gmail.com

MVR College of Engineering and Technology

Abstract:

The National Highways are very important as even though these comprise less than 2 percent of the road network but are carrying about 40 percent of the total road traffic. Road transport has emerged as the dominant mode in India's transportation sector. Easy availability, adaptability to individual needs and cost savings are some of the factors which go in favor of road transport. Road transport also acts as a feeder service to railway, shipping and air traffic. Industrialization of the country has induced a traffic growth of 8 to 10 percent per year on many sections of National Highways and this growth trend is expected to continue for years to come.

This paper deals with the scholastic analysis of the National Highways and checking whether the design, construction and maintenance of the National Highways are implemented according to the specifications prescribed by the Indian Road Congress. This paper aims to examine whether standard procedures like observing data from traffic surveys, estimating future traffic demands and selecting the best possible alternative among several options etc are followed. This paper also aims to analyze the causes for accidents on National Highways and attempts to provide solutions for the reduction of such accidents.

This paper also attempts to analyze the results of the National Highways, recognizing any serious misjudgments, suggesting new proposals for difficulties being encountered. To ensure the practicality of the thesis, I have chosen to conduct all the necessary surveys and studies on selected areas of NH65 and NH30. Thorough research and examination of National Highways is important to ensure that the very purpose of building them is achieved and that the process followed is scientific and fair.

Keywords: National Highways, NHAI, Volume Count, Spot Speed Study, Causes for Accidents.

INTRODUCTION

The National Highways are the principal highways moving across the length and breadth of the nation, joining important harbors, big commercial and tourism hubs, state capitals, and so on. National Highways in the country are represented as NH and then the highway number comes after it. These highways are again categorized on the basis of the girth of motorway of the road. Usually, for a single lane, the breadth of the lane is 3.75 meters. At the same time, for National Highways with many lanes, the breadth of every lane is 3.5 meters.

The National Highways network of India is a network of highways that is managed and maintained by agencies of the government of India. These highways measured over 100,087 km as of June 2016,

including over 1,000 km of limited-access expressways. Out of 100,087 km of National Highways 26,200 plus km are at least four-laned with the remaining 50,000 km two-laned. The National Highways form the economic backbone of the country and have often facilitated development along their routes, and many new towns have sprung up along major highways. India government has set itself a target of construct and upgrade 30km of highway per day from 2017 and all new construction will be using cement concrete instead of bitumen.

The National Highways Authority of India (NHAI) is the nodal agency responsible for building, upgrading and maintaining most of the national highways network. It operates under The Ministry of Road Transport and Highways. The National Highways Development project (NHDP) is a major effort to expand and upgrade the network of highways. NHAI often uses a public-private partnership model for highway development, maintenance and toll-collection.

The National Highways are intended to facilitate medium and long distance inter-city passenger and freight traffic across the country. The State Highways are supposed to carry the traffic along major centers within the State. Other District Roads and Village Roads provide villages accessibility to meet their social needs as also the means to transport agriculture produce from village to nearby markets. Major District Roads provide the secondary function of linkage between main roads and rural roads.

Volume Count

One of the fundamental measures of traffic on a road system is the volume of traffic using the road in a given interval of time. It is also termed as Flow and it is expressed in vehicles per hour or vehicles per day. Volume counts are therefore indicators of the need to improve the transport facilities and are an invaluable tool in the hands of a transport planner. They enable him to draw up schemes for improvement of roads based on a system of relative priorities.

There are two types of volume counts namely Levels of Measurement of Flow and Short Term and Long Term Counts.

The three common levels of measurement of flow are:

1. Average annual flow, expressed in vehicles per year.
2. Annual Average Daily Flow (AADT) expressed in vehicles per day.
3. Hourly flow, expressed in vehicles per hour.

Methods available for Traffic Counts are:

1. Manual Methods
2. Combination of Manual and Mechanical Methods
3. Automatic Devices
4. Moving Observer Method
5. Photographic Methods

Among the methods mentioned above, we have selected Manual method for traffic volume study conducted on the selected study area on National Highways 30 and 65. After conducting the volume count study for 10 days, the observed data is averaged per day and the data is given below.

Volume Count Data for NH30:

Hour of Count	Bikes	Buses	Cars/Jeeps	Trucks	LCVs	MAVs	Auto	Tractor	Tractor+ Trailor
08:00 to 09:00	96	27	20	13	10	10	43	3	3
09:00 to 10:00	116	11	21	25	14	14	47	1	5
10:00 to 11:00	163	12	47	25	8	13	42	2	4
11:00 to 12:00	166	11	58	30	6	11	36	1	3
12:00 to 01:00	171	17	38	16	3	3	39	0	4
01:00 to 02:00	149	12	39	28	7	9	20	2	1
02:00 to 03:00	100	11	25	9	4	10	19	1	2
03:00 to 04:00	101	13	46	16	5	11	36	3	3
04:00 to 05:00	154	24	48	16	4	7	55	1	4
05:00 to 06:00	167	16	87	28	4	11	38	5	3
06:00 to 07:00	160	20	67	29	3	9	27	2	2
07:00 to 08:00	102	12	32	27	6	10	45	3	4

Volume Count Data for NH65:

Hour of Count	Bikes	Buses	Cars/Jeeps	Trucks	LCVs	MAVs	Autos	Tractor	Tractor+ Trailor
08:00 to 09:00	432	74	90	42	40	53	204	5	6
09:00 to 10:00	522	30	95	81	56	74	223	2	10
10:00 to 11:00	734	33	212	81	32	68	200	4	8
11:00 to 12:00	747	30	261	98	24	58	171	2	6
12:00 to 01:00	770	47	171	52	12	16	185	0	8
01:00 to 02:00	671	33	176	91	28	47	95	4	2
02:00 to 03:00	450	30	113	29	16	53	90	2	4
03:00 to 04:00	455	36	207	52	20	58	171	5	6
04:00 to 05:00	693	66	216	52	16	37	261	2	8
05:00 to 06:00	752	44	392	91	16	58	181	9	6
06:00 to 07:00	720	55	302	94	12	47	128	4	4
07:00 to 08:00	459	33	144	88	24	53	214	5	8

Above mentioned data is converted to PCUs using the equivalent factor values of vehicles as per

IRC 64-1990 and is observed that the maximum and minimum PCUs on NH30 are 417 and 215 respectively. And the maximum and minimum PCUs on NH65 are 1679.5 and 888.5 respectively.

Capacity of a two-lane highway is 1700 passenger cars per hour (pc/h) for each direction of travel.

According to the above data on NH65, the highest pc/h is around 1680 which is nearly equal to 1700. Hence, the traffic expectations from the NH65 are met by the actual traffic. Similarly, as per data on NH30, the highest pc/h is around 417. Hence, the traffic expectations from NH30 are very higher than the actual traffic.

Spot Speed Study

Spot speed is the instantaneous speed of a vehicle at a specified location. Spot speed studies are used to determine the speed distribution of a traffic stream at a specific location. The data gathered in spot speed studies are used to determine vehicle speed percentiles, which are useful in making many speed-related decisions.

Speed measurements are need for a number of purposes given below:

- For determining the problems of congestion on roads.
- For analysing the causes of accidents.
- For before-and-after studies of road improvement schemes it is necessary to have spot speed study data.
- For regulation and control of traffic.

Basic Mean Speed of Vehicles on Two Lane Two Way Highways

Si.No	Vehicle Type	Basic Desired Mean Speed (KMPH)	Standard Deviation (KMPH)	Coefficient of Variation
1	New Technology Car	91.8	12.66	0.14
2	Old Technology Car	68	10.39	0.15
3	Bus	75.3	9.59	0.13
4	Heavy Truck	63.3	8.34	0.13
5	LCV	69.6	8.69	0.12
6	Motorized Two Wheeler	56.5	7.77	0.14

Based on the survey conducted at G. Konduru and Ramachandrapuram on NH30, it was noted that the speed of the vehicles at some particular spots is lower than the Basic Mean Speed of Vehicles in India in Two Lane Highways.

Parking

One of the problem created by road traffic is parking. Not only do vehicles require street space to move about, but also do they require space to park where the occupants can be loaded and unloaded. It is roughly estimated that out of 8760 hours in a year, the car runs on an average for only 400 hours,

leaving 8360 hours when it is parked. With the growing population of motor vehicles, the problem of parking has assumed serious proportions. A systematic study of the parking characteristics and demand and regulatory measures that are possible for controlling parking is of great help to a traffic engineer as well as town planner.

Parking and its influence on accidents:

Parking of vehicles is one of the major contributors to accidents. Accidents can occur in the following ways.

1. Parking and unparking manoeuvres can cause accidents to pedestrians, cyclists or to other motorists.
2. Opening of car doors on parking can suddenly cause a cyclist or a motorist to be involved in an accident.
3. Pedestrians can appear from between parked vehicles or in front of a parked vehicle, unnoticed by a speeding vehicle.
4. Parking generally reduces the street space and increases the congestion, there by indirectly causing accidents.

"No matter what others suffer, my needs should be fulfilled" is the way the society today thinks. The way people think of Roads as Parking Areas and park their vehicles on both sides of the road is grossly irresponsible. Rural and Urban areas competing with each other in this aspect. But the thought that parking like this might result in other person's suffering never crosses one's mind. This negligence not only causes accident, but also might prove fatal.

Acceleration and Deceleration Lanes:

Acceleration/deceleration lanes are also known as speed-change lanes or auxiliary lanes, provide drivers with an opportunity to speed up or slow down in a space not used by high-speed through traffic. On freeways and some major streets, the speed change can be substantial and cause stop-and-go traffic and a higher number of collisions for the main vehicle flow. Incorporating speed change lanes into the roadway design can mitigate these issues.

Deceleration lanes allow traffic exiting a major street to slow down to a safer speed to make a left or right turn at an intersection without affecting the main flow of traffic. Dedicated acceleration lanes allow cars that are joining the main road to speed up to match the flow of traffic.

Auxiliary lanes are another form of acceleration/deceleration lanes. These lanes continue a freeway entrance ramp into an additional freeway lane; this becomes an "exit only" lane at the next downstream exit. Using auxiliary lanes reduces the interference of exiting and entering traffic on the main lanes. The proper use of acceleration/deceleration lanes increases the average speed on freeways and major streets, reduces the delays on ramps, and increases safety by reducing the number of conflicts between slow speed and higher speed vehicles.

Accident Free Road Transportation in Andhra Pradesh

This evokes happiness and courage in mind when we hear it. But is it really possible? Every year, around 12.50 Lakhs of people die in road accidents around the world. And another 2 to 5 Crores of people are injured in various degrees. The majority of the casualties in these accidents are youth. Every step in the direction of accident free transportation is equally significant. Likewise, every minute reason for the cause of every accident is critical.

Causes of road accidents

Road accident is most unwanted thing to happen to a road user, though they happen quite often. The most unfortunate thing is that we don't learn from our mistakes on road. Most of the road users are quite well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes. Main cause of accidents and crashes are due to human errors. We are elaborating some of the common behaviour of humans which results in accident.

Minute Negligence - Irreparable Damages

Traffic signals, Speed Breakers, Footpaths, Lane Crossings, and Barricades etc have become a part of the modern transport system. Because of these systematic measures we were able to design an accident-less transport system. It isn't a difficult task for the NHAI to provide these facilities on National Highways in India. Not providing these measures at the right time in a right place might seem like a minute negligence or flaw. But the damage or loss people have to suffer due to that minute negligence is Irreparable at times. The loss might even be in the form of lives sometimes.

The news of the loss of a life in a road accident in a town or district or country remains just as a news item in a newspaper which people don't even read. But the amount of grief caused by the same loss of life of a person in a life can only be known to and experienced by the family of that person. And also, if the loss is caused by the negligence or mistake of another person, the family's grief cannot be expressed in words.

Vijayawada is one of the major cities connected by National Highway Number 65. As it became the capital of Andhra Pradesh after the bifurcation, the significance of the highway and the traffic flow increased multi fold. And because the Bus Station, Railway Station, and Police Control Room are situated in close proximity to each other, both vehicle flow and pedestrian traffic remain competitive throughout the day. And National Highways Authority of India failed to provide footpaths for pedestrians in this congested locality. And because of this absence of footpath in this area, I lost my sister in a road accident. 9 months after I lost my sister, the Highway Authority provided the footpath. If they provided the same footpath 9 months ago, so many lives would've been saved including that of my sister. We are paying a huge penalty for that small negligence of the National Highways Authority of India.

Sign Boards

Whatever the level of the transport system may be, be it national or international, sign boards play an important and special role in it. Whether they are indicating the destination or warning about dangerous curves ahead or directing the speed limit, sign boards have a lot of significance in any transport system.

All this is just one side of the coin.

If we look at the other side, to decide whether the sign boards are beneficial or not they have to pass certain conditions. They are:

1. Where the driver is observing the sign boards?
2. Will he follow them, if he observed?
3. Did he actually observe and followed the sign boards?

Only if you answer these questions in the affirmative, the sign boards are said to have fulfilled their purpose. Even if the vehicle driver has these indicators at appropriate places and can use them, one can't say that the sign boards are actually very useful.

There are so many sign boards like accident prone zone, dangerous curve ahead, speed limit 40 kilometers per hour etc. But still the accident rate couldn't be decreased to 50 percent, let alone zero percent. If we take last year's data into consideration, only 5% of the deaths in accidents could be decreased in the Andhra Pradesh State. That means 95% of the accidents still cause deaths. Where does the problem lie? If you examine deeply, the problem appears more in the implementation than in the system. Anyone who neglects the caution boards and drive recklessly are suffering and causing accidents. In order to prevent these accidents or to make sign boards 100% useful, sign boards with sophisticated new technology should be introduced. That system is "Sign Boards with Sensor system".

Drunk Driving

"Drunk driving is dangerous". We see this warning everywhere in our daily life. We hear this in many situations too. But to what extent is this in practice? Can a person addicted to alcohol de-addict himself? Consumption of alcohol to celebrate any occasion is common. But when mixed with driving it turns celebration into a misfortune. Alcohol reduces concentration. It decreases reaction time of a human body. Limbs take more to react to the instructions of brain. It hampers vision due to dizziness. Alcohol dampens fear and incites humans to take risks. All these factors while driving cause accidents and many a times it proves fatal. For every increase of 0.05 blood alcohol concentration, the risk of accident doubles. Apart from alcohol many drugs, medicines also affect the skills and concentration necessary for driving.

Lane Crossings

Lane crossings are provided to switch from main lane to opposite lane using U turn in Four Lane Two Way Highways. But providing Lane Crossings without providing Acceleration/deceleration lanes results in vehicles using these lane crossings become a sudden obstacle for the vehicles in main lane. Because it's a National Highway, 4 wheeler drivers think that the route would be clear and maintain a quick pace generally. If there are lane crossing sign posts, these drivers will drive carefully. But those signposts which indicate lane crossings are rare on National Highways. For example, there are 7 Lane Crossings in Ibrahimpatnam – Kanchikacherla region on NH65. 7 Lane Crossings in a span of just

18kms results in 4 wheelers having to reduce their speed many times. But despite having 7 Lane Crossings, we don't find a single sign board indicating any of those.



To prevent collision of vehicles coming in from Lane Crossing and vehicles travelling on main lane, barricades are being erected. By which NHAI is creating a situation where vehicles have no other option but to reduce the speed in that particular place. Even after spending so much money, time, and effort and converting Two lane Two way highways to Four Lane Two Way Highways, if free traffic flow is not possible, are the methods implemented by NHAI beneficial?

Lack of Foot Over Bridges:

Absence of Foot Over Bridges forces the pedestrians to cross the road at random places and this leads to accidents. Foot Over Bridges should be erected on National Highways passing through Residential Communities. In order to provide Accident Free Transportation System in Andhra Pradesh, Foot Over Bridges are a must. All the National Highways in Andhra Pradesh pass through Residential Communities. For example, take NH 65. In a span of 18 kms, it passes through 8 villages namely Ibrahimpatnam, Jupudi, Kilesapuram, Mulapadu, Kethanakonda, Donabanda, Paritala, and Kanchikacherla. Take NH30. In a span of 25 kms, it passes through 8 villages namely Ibrahimpatnam, Kondapalli, Chevuturu, G. Konduru, Mylavaram, Chandragudem, Ramachandrapuram, and Cheemalapadu. Likewise, many National Highways pass through villages. For daily needs and necessities, public use the road very frequently. In these circumstances, if a person is caught unawares for a moment while crossing the road, the ensuing loss could be irreparable. This problem is much more evident at nights. There are many situations where people fail to estimate the distance from a vehicle by judging its headlights and suffer accidents. Also, pedestrian traffic on these National Highways affects the free flow of traffic. Despite being expensive, erection of Foot Over Bridges is very helpful in overcoming these problems. It helps in ensuring free flow of traffic and also for safe pedestrian passage.

Two Way Two Lane Highways

Driving in two lane two way highway has become an equivalent to driving a vehicle being prepared for an accident. No vehicle is going below the speed limit prescribed for it. Everyone is travelling at a far

more speed than allowed, be it two wheelers or three wheelers or four wheelers or heavy vehicles. When a vehicle comes suddenly across, they are not able to control the speed of the vehicle and hence suffering accidents. These accidents can be reduced if vehicular movement is restricted in the opposite direction.

Over Confidence in Road Geometric Design

Necessary precautions should be taken while Geometric Design of Roads is done in places where dangerous curves are identified so that even if the drivers are not alert the accidents can be minimised. Because changes can be made any number of times during the design phase, but once the designs are implemented and accidents take place, one can do nothing but face the losses. Also if lives 40 odd people depend on a bus driver and if he is being negligent and causes an accident, the fault lies with the road designer too. Hence such dangerous curves should be identified in the site investigation stage itself and necessary precautions should be taken in Road Geometric Design.



For example, a private travels bus fell off the cliff while trying to evade a motorcycle on the National Highway at Jethwa village in Motihari District in Bihar and 20 people died. Also, a school bus fell off the cliff on Noorpur - Chamba Highway at Gurchal village in Dharmashala District in Himachal Pradesh and 30 people lost their lives. And 27 of them are kids below 12 years of age.

Conclusion

National Highways have become the most important part of the road transport system in India. Lion's share of the traffic is being borne by National Highways. Due to the globalization and population explosion, the traffic has grown multifold on the National Highways. Hence an extensive and analytical study of the usage and effectiveness of the National Highways is necessary. Hence the present study is intended to analyze the efficacy and effectiveness of National Highways. It also aims to identify the potential causes for accidents and attempts to suggest remedies or solutions.

The present study analyses the design, construction, and usage of the National Highways. For this process, National Highway 65 and National Highway 30 are chosen as sample. A stretch of 18 kilometers on NH 65 and a stretch of 25 kilometers on NH 30 were analyzed in several phases. These were chosen because Amaravathi has been made the new capital of bifurcated Andhra Pradesh. Because of the mobilization of the bureaucrats from Hyderabad and also increasing number of constructions and daily traffic, the National Highways have become congested.

The study analyzed and examined the difference between the design capacity of the National Highways and actual vehicle traffic using traffic volume count analysis. The study identified that the actual vehicles speed in some spots is lower than the basic mean speed using spot speed study.

The present study emphasizes on the causes of accidents irrespective of their chance and quantum. Because any accident caused by any reason can be fatal, the present study leaves nothing out.

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