

STUDY OF SMART CITY PILOT ROAD, NASHIK

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Abstract : Study of Smart city pilot road, Nashik is to provide practical information about why road widening is required, its importance and comparative study between existing roads and widen road. The main purpose of this road is to provide good quality strengthen and widen road to users. It helps to minimize traffic intensity, reduced idle time and make road more feasible. This information is beneficial for the development of transportation in city. It improves the serviceability to the public such as utility duct, bus shelter with E-toilet, smart poles, street furniture, LED lights etc. strengthening and widening of road can improve traffic safety and capacity.

Keywords – Pilot, Smart, Intensity, VOC, Idle.

1. INTRODUCTION

The city is the main base of human civilization and it is the technological and mind crystallization of human. The study of urban growth reflects that the growth of urban population is growing rapidly. In the past, the changes in urban growth were slow and the possibilities, variety of tools, and technology and also the interests were limited and the system of common and popular culture didn't served well and their product was a city with 6 harmonious and sustainable appearance. Rapid population growth and its focus in cities all over the world will effect on the majority of human's prospect of living in cities .The crises of this rapid growth are poverty, environmental degradation, lack of urban services, the fall of existing infrastructure, lack of access to land and shelter. Urban planning of twentieth century ended when this plan is not only positive but it has supplied an unseemly figure of city against urban environment and it has threatened social integration and biological structures by using of the culture of technology and it will have no result except the instability and imbalance in natural, social, economic and physical infrastructure.

Traffic intensity is a measure of number of vehicles in specified period of time which shows the density of traffic. Traffic intensity distributes the vehicles with their categories. Traffic intensity is also essential for development of road traffic safety. Idle time is helps to analyze the traffic intensity. From this, we came to know the relation that as traffic intensity is directly proportional to idle time if proper functioning and convenience in road is provided. This study examines the existing traffic situation for a road stretch before and after the construction. The study of pilot road shows some factors which impacts on the environment and we studied these impacts to overcome the effects on environment. The existing pilot road has reduced the vehicles operating cost as compared to previous road.

2. METHODOLOGY

2.1 GENERAL

Traffic congestion leads to long and unpredictable commute times, environmental pollution and fuel waste. These negative effects are more acute in developing countries like India, where infrastructure growth is slow because of cost and bureaucratic issues. Intelligent traffic management and better access to traffic information for commuters can help alleviate congestion issues to a certain extent.

2.2 TRAFFIC VOLUME COUNT

Traffic Data Collection is basic requirements for transport planning. Traffic Data forms an integral part of national economics and such knowledge is essential in drawing up a rational transport policy for movement of passengers and goods by both government and the private sectors. Traffic Volume Count is counting of number of vehicles passing through a road over a period of time. It is usually expressed in terms of Passenger Car Unit (PCU) and measured to calculate Level of Service of the road and related attributes like congestion, carrying capacity, V/C Ratio, identification of peak hour or extended peak hour etc.

2.2 METHODS OF DOING TRAFFIC COUNT

Traffic Volume Count can be done by various methods depending upon various factors like manpower available, budget, technology/instrument available, magnitude of traffic data required or to be collected which will then determine quality and type of vehicle classification to be adopted. Traffic counting falls in two main categories, namely: manual count and automatic count. Traffic data collection forms the integral part of traffic volume study as it provides the raw data and includes primary survey. The various types and methods used to collect traffic data not only provide a good and valuable coverage of the required traffic information. Different methods of traffic volume count are as mentioned below,

1. Hourly patterns - In this pattern we count number of vehicle passing per hour at a specific junction. It is one of the effective ways to note traffic intensity with respect to time variations. We observed that traffic intensity is more in peak hours. It is easy to calculate traffic intensity as compared to other patterns like daily, monthly & yearly.

The method we followed is:-

2. Manual count method - Manual count is the most common method to count the traffic volume. In this method group of people involves to record the number of vehicles passing on the road. This method of data collection is done by man power. We count no of vehicle by eye observation the total no of vehicle or classifying them according to type of vehicle.

2.3 TRAFFIC INTENSITY

Traffic intensity is a measure of number of vehicles in a specified period of time which shows the density of traffic. Traffic intensity distributes the vehicles with their categories. Traffic intensity is done by doing survey of the road. Traffic intensity is also essential for development of measures to improve road traffic safety, while its forecasting on the roads is an integral part of the process of designing road facilities outside populated localities.

2.3.1 METHODOLOGY TO CALCULATE TRAFFIC INTENSITY

1. Traffic intensity of pilot road is calculated by the hourly pattern and manually counted.
2. There are three junctions on pilot road that is Trimbak naka, CBS and Ashok stambh.
3. Traffic intensity is calculated by observing the vehicles at each individual junction on signal. From this, we calculated passed vehicles on that road.
4. Also we observed the vehicles which divert their direction toward another link road.
5. Simply, we observed the directions of vehicles which pass from pilot to another link road.
6. Traffic intensity is calculated at each junction by the two group members at each.
7. Like this, we calculated the Traffic intensity from morning to evening.

2.4 ENVIRONMENTAL IMPACT

Roads can have both positive and negative influences on people and the environment. On the positive side roads provide the opportunity of mobility and transport for people and goods. On the negative side roads occupy land resources and form barriers to animals. They can also cause adverse impacts on natural water resources and discharge areas. The three most damaging effects of road construction and management are noise, dust and vibrations. Noise mainly occurs during road construction phases but it can also occur to a lesser degree during maintenance operations. Dust is created during the construction of gravel roads and unbound aggregate layers. Excess dust production can be treated by means such as watering, the use of alternative materials, and by using dust binders near houses. Vibration can be caused by uneven road surfaces and can pose significant impacts and problems to houses close to the source.

2.4.1 NOISE POLLUTION

Noise is defined as a sound that is undesirable to the listener. The level of the disturbance caused by sound will depend on its extent and intensity, and on the sensitivity of the persons affected. Traffic intensity is increased due to the flexibility and widening of road, so more the traffic intensity, more will be the noise pollution. Noise disturbances may cause irritation as well as agitation and stress to livestock. The existing pilot road is now more traffic intensity so the chances of noise pollution increase. But due to less congestion of traffic, horn sounds become less and noise pollution can be controlled.

2.4.2 AIR POLLUTION

Air pollution is the emission of toxic air from the vehicles and any other components which is harmful for the environment. The existing pilot road increased the traffic intensity due to the flexibility and widening of road. But the new existing pilot road has less idle time and time travel of vehicle so the air pollution is reduced.

2.5 ENVIRONMENTAL IMPACT OF CONCRETE AND ASPHALT PAVEMENT

The assessment is based on the estimation of service life of road pavements and the environmental burdens caused by their production, use and disposal. Also taken into account is the influence of the pavement on fuel consumption by traffic, noise, lighting requirements and dust formation. Concrete is rigid and flexible so the time travel of vehicle is reduced and controlled the pollutions. Concrete pavements also reduce the fuel consumption. It also reduced the idle time of traffic due to less time travel of vehicles. Consequently, environmental profile of concrete pavement also significantly depends on the depth of the concrete layer the environmental burdens from paving and maintenance are rather low compared with those caused by production processes of high strength concrete.

2.6 FUEL CONSUMPTION

On the new existing road, due to flexibility and widening of road, the vehicle time travel is reduced. Less time travel of vehicle has advantage to save the fuel. This type of road is very eco-friendly in nature. It creates more fuel consumption which is beneficial to the vehicles. Fuel consumption is the main objective of vehicle owner so this road completes this objective. Fuel consumption helps to reduce pollution in the environment.

2.7 VISIBILITY

Road lighting is a significant impact on road traffic comfort and safety. All participants of the traffic, vehicle drivers, cyclists and pedestrians alike have benefits from vision conditions that facilitated the completion of visual tasks. The entire road along with background is well visible at all times. This is possible due to the widening of existing road. This parameter fulfills the objective of work. Visibility is eco-friendly in nature.

2.8 TRAFFIC CONGESTION

Traffic congestion is the major obstruction in the transportation. At some places, due to narrow carriage way, vehicle is not able to pass road in less time and so the traffic congestion produced. But at new existing road, due to widening and flexibility, vehicle passes in less time and reduce the traffic congestion. Less traffic congestion affects greatly on environment. Less traffic congestion reduces pollution and makes surrounding eco-friendly.

2.9 IDLE TIME

Idle time is the time of traffic with the started engine. Idle time is helps to analyse the traffic intensity. From this, we come to know the relation that as traffic intensity is directly proportional to idle time if proper functioning and convenience in road is provided. If the traffic intensity is more, the idle time is also more .It means that the idle time is depends on the traffic intensity. It is beneficial to common people. It can also reduce the consumption of fuel and will be beneficial to all.

2.9.1 IDLE TIME CALCULATION

Idle time is calculated for a specific vehicle such that Bike, Bus, Car, Auto.

2.9.2 FORMULAE

$T_{std} = \text{Distance}/\text{Speed}$.

$\text{Idle} = T_{act} - T_{std}$

Idle time calculation depends on the type of vehicle, traffic intensity, road condition, vehicle speed, etc. Distance is common for all vehicles and speed varies with traffic intensity.

2.9.3 Data Collection

Table Number 1. Data collection table

Serial Number	Vehicles	Distance (m)	Speed (kmph)	Actual time (min)(T act)
1	Bike	1200	40	4.17
2	Bus	1200	25	8
3	Car	1200	45	3.8
4	Auto	1200	30	5

A) Bike:

Given:

$D = 1.2\text{Km} = 1200\text{m}$,

Maximum speed is calculated by tracking the bike by Geo-tracker.

Max Speed = 40kmph = 11.11mps,

Bike is feasible to pass through enough traffic in less time. Therefore, we get

$T_{act} = 4.17$ minutes.

Where, T_{act} = Actual time of vehicle covered by app

Standard time is time which shows the standard time for particular distance with a maximum speed. Therefore,

$T_{std} = 1200/11.11 = 108.01\text{sec} = 1.8$ minutes.

B) Bus:

Given:

$$D = 1.2\text{Km} = 1200\text{m},$$

Bus is a public transport vehicle so it has limitations for speed. It has less speed than other vehicles. Therefore,

$$\text{Max Speed} = 25\text{kmph} = 6.94\text{mps},$$

Bus is large area vehicle and takes stop at their stop stations and also very difficult to pass it through traffic. So it requires more time to reach destination point. Therefore,

$$\text{Tact} = 8 \text{ minutes.}$$

Where, Tact = Actual time of vehicle covered by app

Standard time is time which shows the standard time for particular distance with a maximum speed. Therefore,

$$T_{\text{std}} = 1200/6.94 = 172.91\text{sec} = 2.88 \text{ minutes.}$$

Where, Tstd = calculated standard time of vehicle at a particular distance

$$\text{Idle time} = 8 - 2.88 = 5.12 \text{ minutes.}$$

C) Car:

Given:

$$D = 1.2\text{Km} = 1200\text{m},$$

Car travels with maximum speed than other vehicles. Therefore,

$$\text{Max Speed} = 45\text{kmph} = 12.5\text{mps},$$

Car reaches their destination with maximum speed so it requires less time. Therefore,

$$\text{Tact} = 3.8 \text{ minutes.}$$

Where, Tact = Actual time of vehicle covered by app

Standard time is time which shows the standard time for particular distance with a maximum speed. Therefore,

$$T_{\text{std}} = 1200/12.5 = 96\text{sec} = 1.6 \text{ minutes.}$$

Where, Tstd = calculated standard time of vehicle at a particular distance

$$\text{Idle time} = 3.8 - 1.6 = 2.2 \text{ minutes.}$$

D) Auto:

Given:

$$D = 1.2\text{Km} = 1200\text{m},$$

Auto has the same function of bus but it has more speed than bus. Therefore,

$$\text{Max Speed} = 30\text{kmph} = 8.33\text{mps},$$

Auto passes with more speed. So it has enough time consumable. Therefore,

$$\text{Tact} = 5 \text{ minutes.}$$

Where, Tact = Actual time of vehicle covered by app

Standard time is time which shows the standard time for particular distance with a maximum speed. Therefore,

$$T_{\text{std}} = 1200/12.5 = 96\text{sec} = 1.6 \text{ minutes.}$$

Where, Tstd = calculated standard time of vehicle at a particular distance

$$\text{Idle time} = 5 - 2.4 = 2.6 \text{ minutes.}$$

2.9.4 OUTPUT

Table Number 2. Result table

Serial Number	Vehicles	Idle time (min)
1	Bike	2.37
2	Bus	5.12
3	Car	2.2
4	Auto	2.6

2.9.5 COMPARISON OF IDLE TIME OF OLD AND NEW ROAD OF BIKE

Table Number 3. Idle time comparison

Idle time		Time Duration
New	Old	
1.29	1.57	6 to 8
2.13	2.37	10 to 12
1.74	2.1	2 to 4
3.08	3.52	6 to 8

2.9.5 GRAPHICAL REPRESENTATION OF IDLE TIME OF BIKE

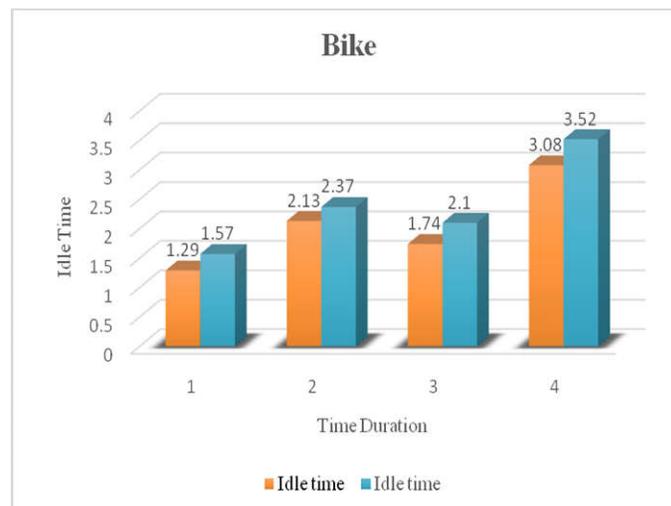


Figure Number 1. Idle time comparison

This graphical representation represents comparative study of old and new traffic data. This representation shows that the new pilot road has less idle time than the old road. This happens due to the widening and proper traffic management. From the observations we concluded that as the traffic intensity increases, the idle time of vehicles reduces. Decade to decade traffic and number of vehicles increases but due to new services and convenience in road vehicle gets passed over road easily and idle time gets reduce. On the pilot road, the idle time decreases due to smooth and smart work of road.

As we got the relation that as traffic intensity is directly proportional to idle time if proper functioning and convenience in road is provided. So we get to know that as compared to old road new road reduces idle time. It is beneficial to common people. It can also reduce the consumption of fuel and will be beneficial to all.

2.10 VEHICLE OPERATING COST

Vehicle operating cost is integral part of the economic benefit estimation in the economic evaluation in feasibility studies of highway projects. It is expected that improved road conditions or reduction in congestion due to construction of a new road or upgrading of an existing road will reduce the vehicle operating cost of the affected road users. Operating cost of a vehicle type is a function of several variables including road condition, travel speed, road geometry and many more parameters.

2.10.1 VOC STUDY OF PILOT ROAD

1. As the new constructed road has smooth surface so it reduces the wear on tires of vehicle and decrease maintenance cost.
2. Given road has absence of curvature, so it reduces wear on the vehicle's tires leads to decrease in operating costs.
3. Due to widening, less traffic congestion occurs and vehicles increase their speed, so as to decrease in operating cost.
4. Speed is not constant so with the change in speed, the operating costs also increases.
5. Due to widening of road, vehicles consumes less fuel with constant speed.

3. CONCLUSION

The concept of smart road city road is modern, have good facilities, features and services. It fulfills all the objectives and purposes and makes operating and use of road smooth. From general point of view, the road is durable having great strength, solves traffic problems effectively. From the above study, we conclude that the road is able to solve traffic problem. Due to smooth and wide surface, vehicle passes smoothly. As road is made up of concrete, it gives great strength but do not compromise with environment. The road gives good visibility, reduces excess pollution and hence, it is environment friendly. Due to smooth surface, idle time is reduced which is again a positive point and with that vehicle operating cost is also less. So citizens prefer this road. By considering all the points, the road is profitable, provide good services in less cost, feasible for all and have more strength. This existing road is also beneficial to the society. It provides various facilities to the public. It gives systematic management to the transportation. This project provided facilities like, bus stop, E-toilet, footpath, etc. It provided the better and safe pathway to the pedestrians. This project also controls the accidents with providing safety on the road. The main problem on this road is reduced that is the parking of vehicles. Due to widening of road, the parking issues are solved. This project area covered with CCTV cameras for emergency issues. Overall, this research is beneficial in all point of view of development.

4. REFERENCES

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