FEASIBILITY STUDY OF METRO RAIL PROJECT IN NAGPUR CITY

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ABSTRACT

The growing demand for public transport in cities has serious effects on urban ecosystems, especially due to the increased atmospheric pollution and changes in land use patterns. An appropriate mix of alternative modes of transport resulting in the use of environmentally friendly fuels and land use patterns can be obtained by an ecologically sustainable urban transport system. Transport, because of its pervasive nature, occupies a central position in the fabric of modern urbanized society. In most of the countries, this has been a story of evolutionary change with new transport development replacing the old transport system in response to perceived socio economic needs of the people. Implementation of such modern transport system of Metro Rail facility to NAGPUR city is the ultimate aim of this project.

Keywords: Feasibility Study, Metro, Public Transportation, Traffic Scenario.

I INTRODUCTION

As cities grow in size, the number of vehicular trips on road system goes up. This necessitates a pragmatic policy shift to discourage private modes and encourage public transport once the level of traffic along any travel corridor in one direction exceeds 8000 persons per hour. Introduction of a rail based (MRTS) Mass Rapid Transit System is called for. Mass Rapid Transit Systems are capital intensive. It has been noticed that in developed countries, planning for mass transit system starts when city population size exceeds 1 million; the system is in position by the time the city population is 2 to 3 million and once the population exceeds 4 million or so, planned extensions to the Mass Rapid Transit Systems is vigorously taken up. The main interpretation that usually follows the term feasibility is one of the following: the case in which an alternative option, a strategy plan, a design or a different location is provide economically preferable; the case in which an alternative option is deemed appropriate in social or environmental terms and the case in which probable construction and operation of a project can be financially viable as well as manageable. A feasibility study is a multi-dimensional set of actions which aims to analyze and evaluate a project in order to determine if its construction is feasible. Such a study refers to the assessment of results which

concern the economic forecast in relation to other important factors, such as socio-economic efficiency and environmental impact. The defining point of a feasibility study is the necessary information that leads decision makers to decide if the proposed option or project should be implemented. Its necessity in project development is considered significant, as the identification of errors in this stage contributes to better performance of the project. Thus, the success of a project is determined by the assumptions that are set during the feasibility study process. Metro provides number benefits: reduction in air pollution, time saving to passengers, reduction in accidents, reduction in traffic congestion and fuel savings. There are incremental benefits and costs to a number of economic agents: government, private transporters, passengers, general public and unskilled labor. In some cases, a project is not profitable in economic terms; however, its feasibility is attributed to serve another purpose.

II. DATA COLLECTION PROCEDURE

2.1 Terminal Study

To check the feasibility of metro rail we have to check the magnitude of passenger at different terminal in the city, on the basis of this data we get the rough idea about how much passenger may use Metro. Bus and Rail Terminal station were surveyed mainly to understand the magnitude of passenger. There are 3 railway stations and 7 bus terminals in Nagpur city. So there are 113324 incoming passenger at different terminal of Nagpur city and 119643 number of passenger use that terminal as outgoing passenger. From this data we can found that which terminal is used mostly by the passenger (incoming + outgoing). However the Nagpur main railway Station, Ajani rail station may be considered as an extended part of Nagpur Rail Station and main bus station is mostly used by commuters. So the provision of Metro station nearer to that terminal is feasible. From this data graph is plotted for better understanding of this study.

Table 1.1 Terminal study

Terminal Name	Incoming Passenger	Outgoing Passenger	Total
Nagpur Main Railway Station	32862	32757	65619
Ajni Railway Station	2263	5850	8113
Itwari Railway Staion	5502	9001	14503
Buildi Bus stand	8360	102036	18566
Ganeshpeth Bus stand	32130	32282	64412
Ravi Nagar Bus Stand	9803	8973	18776
Chattrapati Square	3720	7494	11214
Gandhibagh Bus Stand	1755	1368	3123

Indora Bus Stand	3395	2777	6172
More Bhavan Bus Stand	10580	6482	17062
MP Bus Stand	2954	2453	5407
	113324	**119643**	**232967**

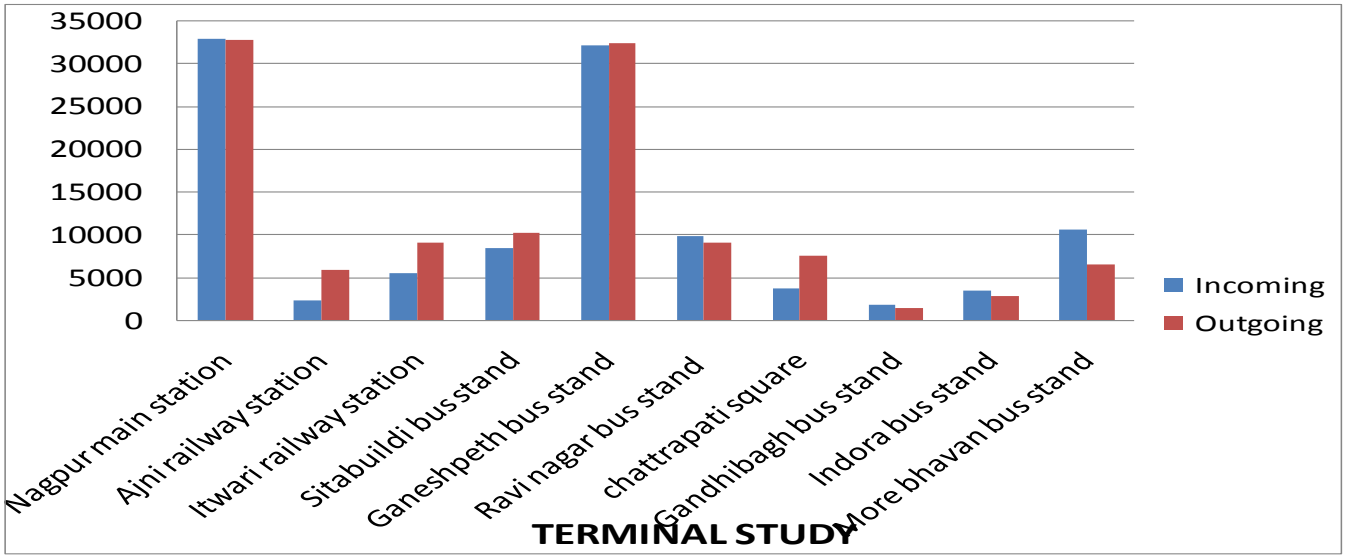

Fig 1.1 Terminal Studies

2.2 Terminal Passenger Interview

There are 8 main stops in Nagpur city which is use daily by most of passenger for travel purpose. 240 passengers were interviewed at 8 main bus stands for knowing their travel characteristic. While most of the passenger i.e. 55.3% of passenger use city bus for access and dispersed to. Other than city bus there is large number of passenger i.e. 24.6% of passenger use Auto Rickshaw from various terminal of city.

Table 1.2 Terminal passenger interview

Modes	Passenger in percentage
Two Wheeler	9.1%
Auto Rickshaw	24.6%
Car	2.6%
Taxi	1.1%
Mini Bus	0.9%
City Bus	55.3%
Cycle Rickshaw	0.3%

Cycle	0.2%
Train	3.6%
Walk	2.3%
Total	100%

2.3 Interview of Workers and Workplace

Workplace survey was conducted in Nagpur city to know the concentration and type of workplaces and workers socio-economic conditions. In all 60 thousand work places were intercepted where1.94 lakh people are working. For a population of 24 lakhs, assuming 30% are workers, total workers are about 8 lakhs. In this manner, about 25%workers were recorded during the survey. This survey was aimed mainly to identify main work centers within the city. In Nagpur 85% of work places are shopping and hospitality business. This survey has depicted the status of retail type employments and not the status of basic type employments such as employments in Government Offices and railways. As far as location of work place is concerned, 50% employment is concentrated in DHANTOLI, COTTON MARKET, ZERO MILE, SITABULDI areas which are within the core area of the city. Another 30% employment is in MANAKPUR, MAHAL, LAWCOLLEGE, BHANDARA ROAD, MANEWADA, FORT, GANESHPETH, SADAR and LAKDAGANJ areas. There are also a few isolated places such as INDORA, KHAMLA,ITWARI and KALMANA where work places exist. This is an important finding for identifying work trip attraction zones for trip distribution purpose.

III. ALIGNMENT OF METRO RAIL

3.1 Traffic Volume Count

To understand traffic characteristic in terms of vehicular, passenger and PCU, 40 traffic count stations were identified. These count stations were so chosen as to cove major inter-zonal traffic movements within the city. These were located on major arterial roads some of which will be eventually used as path of proposed metro alignment. Some locations were fixed as screen line points and some were as outer cordon points. Outer cordon points are for checking external trips which enters and exists the city. Passenger occupancy survey was to visually estimate hoe many passengers were travelling in a bus, car, auto or scooter. These were done on sample basis (in every 15 minute interval) as counting of passengers in every vehicle (especially bus) was not possible.

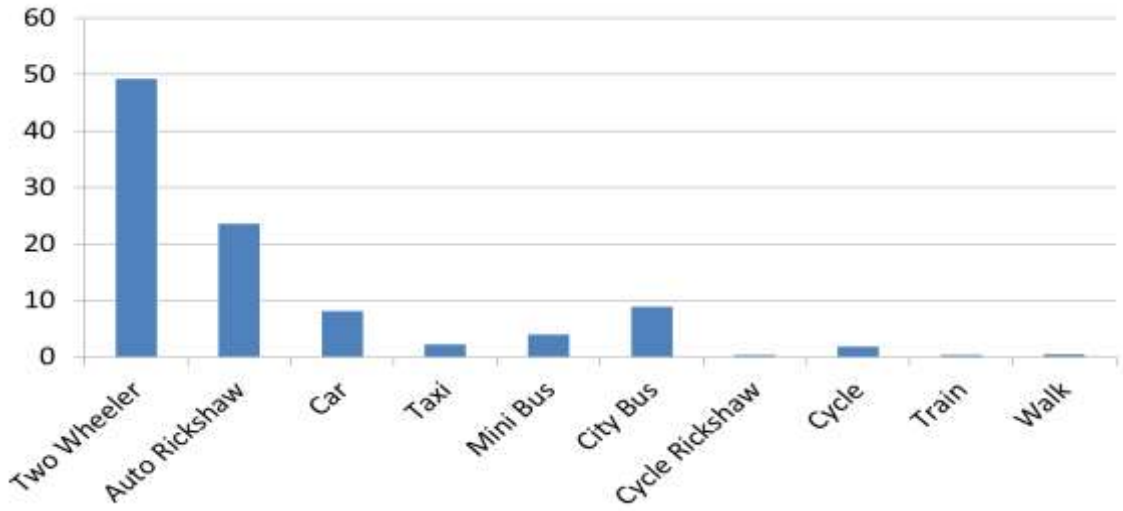

Fig 1.2 Traffic Compositions

Proposed Rail Alignment

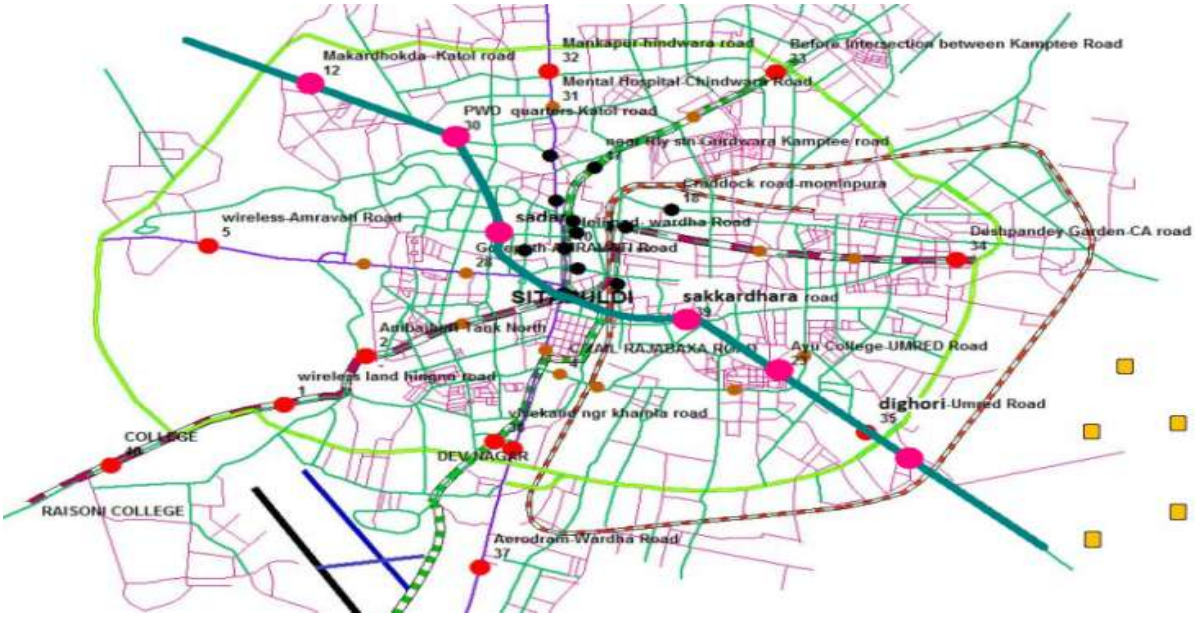

Fig 1.3 Metro Alignments

From the above map light green and dark pink lines refers to the most Feasible route which is already implemented. Dark green line shows that this route will be feasible in next one decade according to growing traffic on this route.

PHASES:-

Phase-1: Automotive sq. at kamptee road – via Sitabuildi-

Airport- Mihan (20km)

Phase-2: Prajapatinagar/ Wardhamannagar- via sitabuildi-

Hingna (22km)

Phase-3: Proposed Route-Katol road to Umrer road (22km)

3.2 Study of Alignment

From the above TVC survey we studied the vehicular and passenger traffic of 40 different points in the city. This survey can be calculated by manually or by the instrument. From this above table we sort out some points on the basis of maximum vehicular and passenger density. If we join that points we get 3 three different phases of Nagpur Metro Rail. This phases are passing through the important area of Nagpur with sitabuildis the central and interchanging station. From this survey we can sort out that area or that route where the vehicular traffic cross the road feasibility limit means 8000PHPDT. Road base system is feasible up to 8000 PHPDT, above this limit mass rapid transit system is to be provided. There are 25 points which are used by maximum number of passenger and vehicles. Traffic densities of that important point are given below.

IV COST AND ECONOMY

4.1 Cost Comparison

Table 1.3 Sanctioned metro project

PARTICULARS	BANGALORE	HYDREBAD	NAGPUR
Length	33 KM	71.6 KM	38.2 KM (APPOX)
Total Cost (cr)	6395	16000 (APPROX)	8680
Per km Cost (cr)	192	224	227

4.2 Project Estimate

While preparing the capital cost estimates, various items have generally been grouped under three major heads on the basis of (i) route km length of alignment, (ii) number of units of that item, and (iii) item being an independent entity. All items related with alignment, whether elevated or at grade or underground construction, permanent way,

traction, signaling &telecommunication, whether in main lines or in maintenance depot, have been estimated at rate per route km basis. The construction cost of each phase is calculated by multiplying the phase distance with per KM construction cost. The cost required for each phase is given in table below.

Table 1.4 Metro phases

Phase no	Name of phase	Distance (KMs)	Estimated cost (cr)
1	Automotive sq. at kamptee to Mihan	19.66	4463
2	Wadhaman nagar to Hingna	18.56	4213
3	PROPOSED ROUTE:Katol road to Umrer road	20	4540
	TOTAL	58.22	13216

4.3 ECONOMIC ANALYSIS

The benefit stream that has been evaluated and quantified includes:

1) Capital and operating cost of carrying the total volume of passenger traffic by existing bus system and private vehicles in case metro project is not taken up.
2) Savings in operating costs of all buses and other vehicles due to de-congestion including those that would continue to use the existing transport network even after the metro is introduced.
3) Savings in time of commuters using the metro over the existing transport modes because of faster speed of metro.
4) Savings on account of prevention of accidents and pollution with introduction of metro.
5) Savings in fuel consumption on account of less number of vehicles on road and congestion effect with introduction of metro are included in those of vehicle operating cost.

V CONCLUSION

The population of Nagpur had already exceeded 35 lakhs and in 2021 it will cross 50 lakhs. We can say that, at the time of2016 PHPDT of this route will exceed the limit of 8000PHPDT, so mass rapid transit system is necessary. As per TVC survey the studied phases are feasible and the phase 3 will be after a decade. The revenue generated within 3 years will be equal to total cost of project (9408 crore) when 13% of the population will use metro rail. It is the fast mode of transportation with maximum carrying capacity in less time. So we can conclude that Metro Rail will be feasible in Nagpur by 2016.

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