International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 9 Issue 8 ǁ 2021 ǁ PP. 07-11

Social cost benefit analysis of Pune Metro

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Abstract - *The growing population of megacities demands an increase in public transport. There are severe effects on urban ecosystems, primarily due to the increased air pollution and land-use patterns. Metro will help in reducing traffic as well as reduced air pollution. The introduction of CNG in specific vehicles and switching off some portion of the transport demand to the metro rail have significantly reduced atmospheric pollution in Pune. The Pune Metro provides multiple 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 several economic agents: government, private transporters, passengers, general public and unskilled labour. This paper's social cost-benefit analysis of Pune metro is trying to find social costs and social benefits of METRO for Pune city.*

Date of Submission: 14-08-2021 Date of acceptance: 29-08-2021

I. INTRODUCTION

Pune is the 2nd largest city of Maharashtra after Mumbai. It is the ninth most populated city in India, with a population of 6.772 million in 2018. The city is also considered the cultural capital of Maharashtra because of its religious and historical places situated in various part of the town. Pune city is well known as the„Oxford of the East‟ due to its educational, research and development institutions. It has become a major educational hub in recent decades. There has been tremendous pressure on the public transportation system since ever the industrial and residential development pace accelerated almost a decade ago. The roads in the city which cater to various kinds of vehicles handle huge peak hour traffic, which amounts to roughly 10,000 peak hour peak direction traffic (PHPDT). The total number of registered vehicles is about 40 lakh as per the Pune Regional Transport Office. Compared with 2017, the number of four-wheelers registered increased from 5.89 lakh to 6.45 lakh in 2018, and the number of registered two-wheelers shot up from 24.97 lakh to 27.03 lakh now. Being a densely populated area and ever-growing traffic needs cannot be met by a road-based transport system. To control such a high density of traffic, increased air pollution, and the number of road accidents, an emergent need to develop an alternate mode of transport in Pune. For the planning and construction of the Metro project, the Pune Municipal Corporation (PMC) approached Delhi Metro Rail. Corporation (DMRC) prepared the Detailed Project Report (DPR); the draft submitted to the PMC in August 2008. and the final in 2010.

1.1 Overview of MRTS

Overview of Pune metro			
PARAMETERS	L1	L2	L3
Length (Km)	16.59	14.66	23.33
Route	PCMC - swargate	Vanaz - Ramwadi	Hinjewadi to civil court
No. of Station UG	5	0	0
No. of Station Elevtd	9	16	23

Table 1 *OVERVIEW OF PUNE METRO*

This study proposes the social cost-benefit analysis of the Pune metro. The Pune Metro provides several benefits. It decreases the travel time of people using the road and metro, road accidents and air pollution in Pune.

II. LITERATURE REVIEW

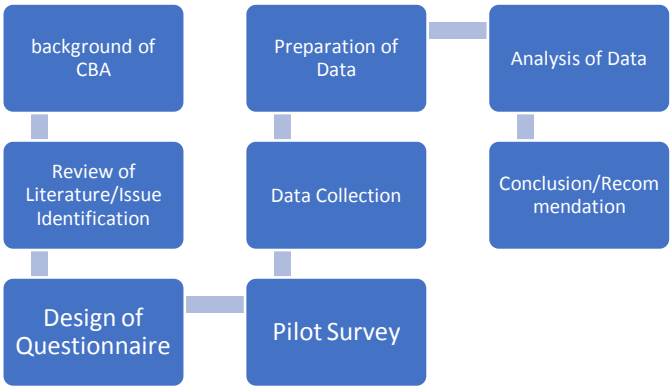
According to Chatterjee, S., Kishore K. Dhavala and M. N. Murty [2], A Social cost benefit analysis, also known as economic analysis, is a decision-making strategy which helps in assessing the impact of investment business projects on the society as a complete. It is an organised and cohesive mechanism to contemplate the impact of development projects on society. The objective of analysing the social cost benefit is to weight the heterogeneous impact of your development project on societal elements such as pollution, real

estate, legal prospects, health, environment etc. As a result of the analysis, the project decision maker can precisely elucidate the social welfare impact of the project.

According to Murty, M. N. and B. N. Goldar[7,]The impact of social cost-benefit analysis can be positive or negative. The positive impact is called as a social benefit and the negative impact is termed as a social cost. SCBA is different from CBA in the sense that it has an extensive view because it tries to study the social values of the entire society rather than taking into account the profitability of individuals who are a section of the society.

III. METHODOLOGY

The data collection for the study involved two stages. The primary data was gathered through a questionnaire survey targeted at some contractors, clients, and consultants in construction projects in Pune and some of the local tradesmens and businesses. The secondary data were obtained from the literature. Using this approach, some of the causes that are helpful in analyzing the social and economic impact of Real estate sector will be identified. A questionnaire is then developed to assess the perceptions of clients, consultants, and contractors, locals on the relative importance of causes and effects of factors in the Pune construction industry.



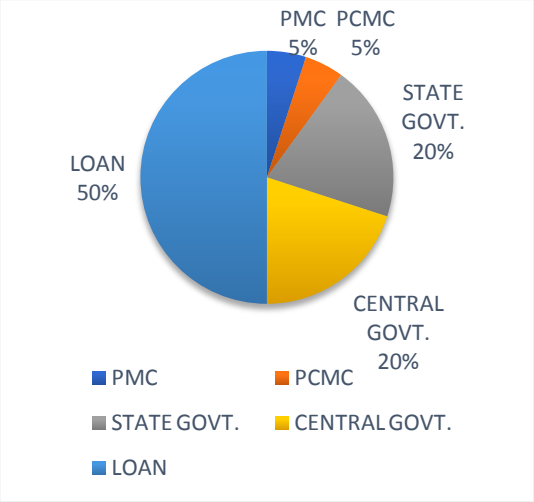
IV. FINANCIAL COSTS AND BENEFITS OF THE METRO

It is imperative to look at the monetary possibility of PUNE MERO before really taking up its financial evaluation. The monetary assessment of an undertaking requires the examination of its yearly incomes of income and expenses, considering it as a business association working with the goal of augmenting private benefits. The monetary capital expense of PM addresses the time stream of venture made by it during its lifetime. the line is estimated to cost ₹8,313 crores. The speculation uses made by the task in one of the years during its lifetime establishes the acquisition of capital products, cost of procurement of land and instalments made to talented and incompetent work and material contributions for project development. The activity and upkeep cost of the undertaking comprises the yearly use brought about on energy, material contributions for support and instalments made to gifted and untalented work.

Table - 2 MODE OF FINANACE

MODE OF FINANCE	
Line 1 & Line 2	**Rs in Crore**
PMC (5%)	576.10
PCMC (5%)	576.10
State Government (20%)	2,304.40
Central Government (20%)	2,304.40

Table 2MODE OF FINANCE



The primary source of income of the MRTS system is the fare collection by travellers. However, with higher fares, the ridership is expected to decline given that the willingness of passengers to travel by Metro depends on the value they place on time savings, frequency and safety of service, comfort and ease of travel, capacity to pay. The revenue collected by DM every year during its lifetime consists of revenue from the passenger traffic diverted from the road to the Metro and the revenue from serving part of the growing passenger demand in Pune.

ESTIMATED PASSENGER VOLUME

LINE 1				
Year	**2011**	**2018**	**2021**	**2031**
Daily Ridership	480860	516855	532281	613442
Passengers km	2787096	4651692	4258248	4294094

Table 3VOLUME OF PASSENGER ESTIMATED FOR LINE 1

LINE 2				
Year	**2011**	**2018**	**2021**	**2031**
Daily Ridership	289813	421123	477399	592168
Passengers km	2787096	2105616	2386995	2960840

Table 4 VOLUME OF PASSENGER ESTIMATED FOR LINE 2

V. IDENTIFICATION OF ECONOMIC BENEFITS AND COSTS OF METRO

Classification of economic benefits and costs of the Delhi Metro requires the identification of the changes brought out by it in the transport sector of the economy. Most importantly, the Pune metro contributes to the diversion of a very high proportion of current passenger traffic from the road to Metro and serves as part of the growing passenger traffic demand in Pune. As an outcome, there will be a decrease in the number of buses, passenger cars and other vehicles carrying passengers on Delhi roads with the introduction of the Metro. Travelling time on the passengers on the road will be reduced due to reduced congestion and obviously also for those travelling by Metro. Air pollution will decrease in Pune because of the use of electricity instead of petrol and diesel and reduced crowding on the roads. There will also be a decrease in the number of accidents on the roads.

Investment in the Metro could result in fewer government investments in the development of roads, govt busses. There will be reductions in motor vehicles' operation and maintenance charges to both the government and the private sector. There could be cost savings to passenger car owners in terms of capital cost and operation and maintenance costs of cars if they switch over from road to Metro for travel in Delhi. The farebox revenue collections by Metro will be at the cost of the revenue, accruing earlier to private and the government bus operators and hence constitutes a loss in income.

The Pune public will gain substantially with the introduction of the Metro service. It saves travel time due to a reduction of congestion on the roads and lower travel time of the Metro. Pune will have health and environmental benefits because of reduced pollution. Land and house property owners gain from the increased valuation of house property prices due to the Metro. The Metro has the effect of increasing the income of the Pune. The Metro provides employment benefits to unskilled labour, especially during its construction period.

ECONOMIC BENEFITS OF METRO

- Reduction in the number of vehicles on road
- Savings in Foreign Exchange due to reduced Fuel Consumption
- Reduction in Pollution
- Savings in Time for all passengers using Metro and Roads
- Savings in Accidents
- Savings in Vehicle Operating Cost (VOC) due to decongestion for residual traffic
- Savings in Capital and Operating cost of diverted vehicles
- Savings in the cost of Road Infrastructure
- Savings in fuel consumption
- Reduction in air pollution
- Savings in passenger time

VI. ECONOMIC EVALUATION OF METRO

Two approaches are used for the analysis. One method maintains that there is a sub-optimal level of savings in the Indian economy. Therefore the social time preference rate is lower than the rate of return on investment, and there is a social premium on investment. This approach is similar to the standard UNIDO method (Dasgupta, Sen and Marglin, 1972) for investment project evaluation. Another approach assumes that the level of savings in the Indian economy is optimal. There are no distortions in the capital market so that the rate of return on investment or the market rate of interest could be taken as the social time preference rate. Both the approaches recognize that distortions still exist in the markets for unskilled labour and foreign exchange so that their market prices are different from the shadow prices. However, in the case of unskilled labour, its shadow price consists of the direct and indirect opportunity cost of unskilled labour employment on investment projects in the first approach while it constitutes only the direct opportunity cost in the case of the second approach. The immediate opportunity cost includes the marginal productivity of unskilled labour in the alternative employment, say in agriculture while the indirect opportunity cost is due to the social value of loss in savings or investment due to labour employment. A recent study commissioned by the Planning Commission, Government of India (Murty and Goldar, 2006) has obtained estimates of the social time preference rate and the rate of return on investment for the Indian economy as 8 and 10 percent, respectively. It has also made the estimates of 36 percent and 10 percent social premium on investment and foreign exchange, respectively. It provides an assessment of the marginal productivity of unskilled labour in agriculture as Rs. 48 per day and an estimate of the shadow wage rate consisting of the direct and indirect cost of unskilled labour employment as Rs. 60 for the Indian economy. This study also provides some estimates of the income distributional weights pertaining to payments of people belonging to different income groups in the Indian economy. These estimates of national parameters for the investment project evaluation in India are used to the economic assessment of the Metro.

The economic agents affected by having the Metro operational in Delhi could be identified as government, passengers, general public, private transporters and unskilled labour. As explained in Section III, these agents get incremental benefits and incur total costs due to Metro.

The Government gets farebox revenues, revenues from property development and advertisements and tax revenue on the goods and services bought for the investments and operation and maintenance of the Metro while it suffers revenue losses due to the displaced public buses. It incurs the investment and operation and maintenance cost of the Metro while it saves the expense on road infrastructure and the capital and operating cost of displaced public buses.

The Private transporters lose the revenue from displaced private buses but at the same time save on their capital and operating costs.

The Unskilled labour employed on the construction and maintenance of Metro gain to the extent of the difference between the project wage rate and the wage rate in an alternative employment in India. Murty and Goldar (2006) provide an estimate of the marginal productivity of unskilled labour in agriculture as Rs. 48 while on the average, the industrial wage for unskilled labour in India is Rs. 120 per day at 2004-05 prices.

The General public outlining the Indian society receives the benefits of social premium on investment and foreign exchange and the environmental services of reduced pollution due to the Metro.There could be incremental benefits or losses of savings due to the Metro in the Indian economy depending upon the propensity to save of different agents affected by the project.

VII. CONCLUSIONS

Social cost-benefit analysis is the tool to find the effect of the project considering society. Pune metro will reduce Air pollution and will improve the living environment for people.
Fuel cost will be reduced for public transport.

Time and traffic will be less on the road.
Pune Metro will benefit society as the social cost of the project is low and temporary, comparing benefits are more and long-lasting.

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