SOCIAL AND ECONOMIC BENEFITS DUE TO NOIDA, GREATER NOIDA METRO

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Abstract- The growing demand for public transport in mega cities has serious effects on urban ecosystems, especially due to increased atmospheric pollution and changes in land use patterns. An ecologically sustainable urban transport system could be obtained by an appropriate mix of alternative modes of transport resulting in the use of environment friendly fuels and land use patterns. The introduction of CNG in certain vehicles and switching of some portion of the transport demand to the Metro rail have resulted in a significant reduction in air pollution, time saving to passengers, reduction in accidents, reduction in traffic congestion and fuel saving. There are incremental benefits and costs to a number of economic agents: government, private transporters, passengers, general public and unskilled labour. The social cost-benefit analysis of Noida-Greater Noida Metro done in this report tries to measure all these benefits and costs across 22 stations, covering a total distance of ~30 kms from Noida to Greater Noida. Estimates of the social benefits and cost of the project are obtained using the recently estimated shadow prices of investment, foreign exchange and unskilled labour as well as the social time preference rate for the Indian economy for a study commissioned by the Planning Commission, Government of India and done at the Institute of Economic Growth.

Keywords— Ecosystem, cost-benefit analysis, CNG, social benefits, economic benefits.

I.   INTRODUCTION

Delhi, the capital city of India, is one of the quickest developing urban areas on the planet with a populace of 13 million as revealed in the Census of India Report for the year 2000. As of not long ago, it was maybe the main city of its size on the planet depending on the whole on streets as the sole method of mass transport. The aggregate length of the street arrange in Delhi has expanded from an insignificant 652 km in 1981 to 1122 km in 2001 and it is required to develop to 1340 km in the year 2021. This expansion in street length isn't at standard with the remarkable development in the quantity of vehicles on these streets in Delhi. The aggregate figure of enrolled private and government transports, the fundamental methods for open transport, is 41,872 out of 1990 and it is relied upon to increment to 81,603 continuously 2011. The quantity of individual engine vehicles has expanded from 5.4 lakhs in 1981 to 30 lakhs in 1998 and is anticipated to go up to 35 lakhs by 2011 [6]. With continuous flat development of the city, the normal trek length of transports has gone up to 13 km and the expanded blockage on streets has made the comparing venture time of around 60 minutes. Delhi has now turned into the fourth most dirtied city on the planet, with vehicles contributing in excess of 66% of the aggregate air contamination. In this specific circumstance, the choice of the Government of India to build up a mass transport framework for Delhi giving elective methods of transport to the travellers was generally fitting.

The Noida-Greater Noida metro framework is proposed to be developed with an expected expense of Rs. 4801.00crore with focal charges and land cost. The length of the metro framework and gauge cost at April-2014 value level without focal charges is put in table beneath:

The evaluated expense at April - 2014 value level incorporates a measure of Rs.75 Crore as one-time charges of security individual towards expense of weapons, blockades and hand held and entryway indicator have not considered FIRR count.

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TABLE NO. : 1

ESTIMATED COST WITH AND WITHOUT TAXES

Name of Corridor	Distance (Kms)	Estimated cost without taxes (Rs/Crore)	Estimated cost with Central taxes & land cost (Rs/Crore)
Noida-Greater Noida Metro	29.707	4290.00	4801.00

A. COSTS

Investment Cost

To calculate the Financial Internal Rate of Return (FIRR), the consummation fee with focal expenses have been determined by taking heightening detail @7.5% PA. It has been commonplace that UP kingdom Government will solve the nearby duties or repay the equivalent and give the land really worth Rs. 339.00 crore free of expense.

It is regular that the development paintings to be finished on 30.09.2017 with Revenue Opening Date (ROD) as 01.10.2017. The combination completing fees well movement of ventures independently is put in Table beneath:

TABLE NO.2

COMPLETION COST WITH AND WITHOUT TAXES

Financial Year	Completion cost at April 2014 price level (with Central Taxes & land cost)	Total completion cost (with Central Taxes & Duties & land cost)
2014-15	559.00	559.00
2015-16	1229.00	1313.00
2016-17	1452.00	1660.00
2017-18	892.00	1108.00
2018-19	699.00	893.00
Total	**4801.00**	**5533.00**

In spite of the fact that the development is relied upon to get over by 31st December 2017, the income overflow up to March 2019 by virtue of instalment typically required to be made to the different temporary workers up to that period required by legally binding provisions.

The expense of place where there is Rs. 339.00 crore incorporated into the above consummation cost will be sans given of expense by the Greater Noida Authority (UP Government).

II.   LITERATURE REVIEW

The writing audit incorporates the data from web, codes, unified works done in the office and data gathered through books, diaries and so on. These data help to comprehend parts of money saving advantage investigation and in what manner would this be able to be actualized for any task. Diverse distributed and unpublished works have been alluded for drawing out this work. Concentrate distinctive articles gives a far-reaching information in regards to the subject. The prime focal point of the writing audit is to outline and combine the thoughts and contentions put somewhere around others in their work. The concise dialog of all references is as per the following [1]:

•   Feasibility exam elements show off research, specialised plausibility, speculation value.

•   Environment Feasibility-Objective of EIA, examination systems.

•   Socio-economic plausibility using Cost Benefit Analysis.

•   Use of cash saving benefits investigation processes to evaluate the monetary and social factors of interest and drawbacks to the network.

•   Use of NPV as a method for determination of a venture to assess its subjective appeal.

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COST BENEFIT ANALYSIS OF BUILDING CONSTRUCTION

- Evaluate foundation of a development building challenge by using the gadget of cash saving benefit examination [2].

- All types of building ventures have exam in which unmistakable and immaterial blessings are accounted. The decision of rebate rate importantly affects the research.

- The estimation of existence of the undertaking has important reflections on the aftereffect of the research.

- Use of NPV is closed as fairly better approach for cash saving advantage research. Estimation of a huge range of fees.

- This think about gives the strategies to count number of a wide range of fee related with a building challenge.

- It orchestrates the social advantages and adjustments over these immaterial aberrant views to charges for the upliftment of most people.

The workshop [3] indicates how the system of CB investigation utilizes the accessible assets in a most beneficial way empowering their utilization perspective of society on the loose. It additionally alludes to:

- Use of money saving advantages investigation methods to assess the financial and social favourable circumstances and disservices to the network.

- Use of NPV as a strategy for determination of an undertaking to assess its subjective appeal.

In this book SCBA [4] has been examined as far as its need, the contrast among financial and social examination. Distinctive standard modes that are pursued universally were talked about in stages. UNIDO approach and L-M approach are the two, talked about with their similitudes and contrasts. Distinctive terms which come into picture in different phases of the investigation have additionally been out like-social wage, change rate, book keeping rate, rate of return, effect of sparing, rate of security and so forth.

The paper [5] examines approximately the fundamental idea approximately SCBA. It tells about goals and quantity of doing a SCBA. It additionally tells about the importance of SCBA adore it diminishes the market unhappiness by giving the hazard to make earlier strides and manipulate the marketplace unhappiness or unhappiness of an challenge publish-consummation. It likewise allows in know-how humans in general top class higher and helps understanding the idea of by way of and big sparing and task and its effect on the majority. SBCA goes about as a proof of social obligations with the aid of making sure movement and redistribution of income among distinctive instructions of most people. This paper moreover tells about the estimation of-blessings and charges. Summing the whole discourse, Social money saving advantage examination alludes to situations where the undertaking has an expansive effect crosswise over society and, all matters taken into consideration, is usually finished by the legislature. It tries to assess the software of an challenge to society in well known. Monetary or social assessment of task offers a response to the difficulty of evaluating ventures in a social placing. Social assessment is an adjustment of the money related evaluation. While in cash related evaluation, the centre is restricted to budgetary blessings and charges straightforwardly collecting to most people basic are taken into consideration. Along these strains the thoughts of advantages and costs applied in monetary evaluation are extra substantial than the concept one's applied in budgetary assessment. Social money saving advantages research gives a outstanding shape of monetary and social evaluation. It allows in achieving a standard development in an economic system and might help settle on picks in an effort to expand paintings, speculations, sparing and usage, consequently, enhancing the monetary sports in a financial system.

III.   METHODOLOGY

A.   ESTIMATION OF CASH FLOW

About each choice is identifying with money streams. The money streams demonstrate how much cash will be gotten and spent amid every time of choice execution. This data fills in as a reason for a quantitative evaluation. Net money streams are determined by deducting money outpourings from money inflows.

Net income estimation equation:

Net income = Cash inflows – Cash outpourings

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Where cash inflows surpass money surges, a internet income is certain, where they were given degree of cash is underneath the burned via one, a net income is terrible. Net money streams are determined on a every year motive for the entire time of utilization of the choice being stated. Where the execution time of a preference is shorter than four years, the figuring out of month to month money streams is becoming.

B.   DISCOUNTING

A conventional view is that in the more inaccessible future expenses or advantage are brought about or inferred the less important to us they are as a great many people would incline toward getting a benefit of a similar volume and quality now yet not following at least two years. Besides, as indicated by the incentive for cash rule, a Rupee got following a year does not have indistinguishable incentive from a Rupee is worth today as a Rupee got today can be contributed and in excess of one Rupee got following a year. Individual financial estimations mirror these inclinations. As a rule money streams happen in various periods [2]. Along these lines, future inflows or future surges ought to be limited. Markdown factor limiting – implies altering the future incentive for the present time frame. The present estimation of future money is dictated by utilizing a markdown factor, i.e. the number which makes the future inflows and surges equivalent to the present inflows and outpourings where,

Markdown factor (f) = $1/(1+r)^n$ (r – Discount rate; n – Year)

A markdown rate utilized for the appraisal of an open choice is referred as a social rebate rate. In the appraisal of long-haul choices, the choice of a rebate rate is basic: an activity which is by all accounts great applying a low markdown rate might be terrible at a higher rebate rate.

C.   INTERNAL RATE OF RETURN

Another imperative pointer of choice evaluation, in view of the time estimation of cash rule, is the inward rate of return (IRR). The inward rate of return (IRR) marker is especially helpful if the assurance of the correct markdown rate is troublesome. IRR is a rebate rate at the nearness of which the present estimations of expected instalments (surges) are equivalent to the present estimations of expected inflows, i.e. the NPV of all net money streams produced by a choice is equivalent to a zero. At the end of the day, the NPV pointer depicts the relative conceivable dimension of instalments (surges). Estimation of the IRR pointer can be determined consequently applying the proper money related elements of information handling programming (e.g. Microsoft Excel). The IRR marker, similar to the NPV pointer, can be utilized for the examination of a few elective choices: by expecting that the various components are indistinguishable the choice with the most noteworthy IRR would be considered as the best. In any case, it is vital that the IRR standard does not permit the separation of various choices: for example, if the IRR is the main foundation of the correlation of options, the choice whose NPV is one thousand Rupee and IRR is 25 % will be more alluring than the choice with the NPV of 1 million Rupee, and the IRR – 20 %. Accordingly, the proposal is to investigate the NPV and IRR markers in the meantime in picking the choice.

D.   BENEFIT-COST RATIO

The remainder of the talked about choice evaluation criteria is the advantage cost proportion (B/C proportion). It is the proportion of net money inflow to the net money out stream.

On the off chance that the estimation of the B/C proportion is higher than one, a choice is viewed as adequate as the advantage created by it (quantified by the present estimation of the aggregate net inflows) is higher than the brought about costs (estimated at the present estimation of the aggregate net surges) [7]. The higher is the estimation of the B/C proportion the higher is the estimation of the option being referred to.

IV.   SOCIAL BENFITS

A.   SAVINGS IN FUEL CONSUMPTION

There are reserve funds in fuel utilization (comprehensive of both CNG and oil) because of the preoccupation of a piece of the street activity to Metro and lessened clog to vehicles as yet working on the streets. There is a between fuel substitution of oil and CNG to power that could result in investment funds of remote trade and a decrease of air contamination [5]. Customs (1995a) have utilized the accompanying equation which is additionally utilized in an examination by the Central Road Research Institute (CRRI) for evaluating the fuel reserve funds by leftover vehicles because of the lessened clog on Delhi streets after Metro.

$$F_c = A (1/V_c - 1/V_d) + B (V_c^2 - V_d^2)$$

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Where,

F_c = savings in fuel consumption (cc/km) due to decongestion,

V_c = speed of vehicles in a congested situation,

V_d = speed of vehicles in a decongested situation,

A = 1675.52 for cars and 3904.6445 for buses,

B = 0.0133 for cars and 0.0207 for buses

The evaluations of funds in fuel utilization for vehicles and transports determined by utilizing the above equation are 28.73cc/km and 91.19cc/km, separately

Fuel funds emerging out of the Metro could result in the reserve funds of outside trade for the Indian economy given that a vast extent of local interest for oil-based commodities in India has been met out of imports. An ongoing report on speculation arranging in India gives a gauge of the shadow cost of outside trade, which is 10 percent higher than the market swapping scale. Given that there are Rs. 16610 million worth of fuel reserve funds from the Metro in the year 2011-12 esteemed at market costs or by the dollars spent on the imports of powers esteemed at the market conversion standard, the social estimation of fills spared at the shadow cost of outside trade is evaluated as Rs. 18271 million.

B. SAVINGS IN PASSENGER TIME

The investment funds of movement time of travellers going by the Metro rather than by street are determined as the result of the quantity of travelers voyaged day by day and the time saved money on the normal traveler. On account of leftover traveler activity on street, RITES has assessed the everyday efficient by the travelers because of decongestion utilizing the accompanying equation:

$$T = (D/S_c) - (D/S_d)$$

Where,

T: Time saving on average daily run

D: Daily run of vehicles (in km)

S_C: Average speed in congested situation (without Metro).

S_d: Average speed in decongested situation (with Metro)

C. SAVINGS IN VEHICULAR OPERATING COST

Because of the decongestion impact Annual vehicle working expense is considerably diminished because of the higher speed of vehicles and therefore lesser hours on street. It is evaluated as the result of the leftover movement; time saved money by and large leads per vehicle every year and the vehicle working expense every hour.

D. REDUCTION IN AIR POLLUTION

Fewer vehicles and the decongestion for the residual traffic on Delhi roads due to Metro could lead to reduced air pollution. The distance saved due to decongested is estimated by multiplying the time saved with the speed of a vehicle in a decongested situation. An estimate of the pollution reduction by a vehicle in this context could be obtained by multiplying the distance saved by the relevant emission coefficient for different pollutants for each category of vehicle.

TABLE NO: 3

VEHICLE EMISSION 2011-2021(CPCB) AND COST IN RUPEES

Vehicle	CO	HC	NOX	PM	CO	CO2
BUS	3.72	0.16	6.53	0.24	3.72	787.72
2W-2 STROKE	1.4	1.32	0.08	0.05	1.4	24.99
2W-4 STROKE	1.4	0.7	0.3	0.05	1.4	28.58
MINI BUS	2.48	0.83	8.26	0.58	2.48	358.98
4W-SMALL	1.39	0.15	0.12	0.02	1.39	139.51

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E. *SAVINGS IN CAPITAL AND OPERATING COST OF DIVERTED VEHICLES*

Reduction in the capital and operating cost of vehicles due to the introduction of the MRTS is given by the product of the diverted traffic stream, the annual and the VOC/V-km

TABLE NO 4

VEHICLE OPERATING COST IN RUPEES

Per Vehicle KM	BUS	4-Wh (Large)	4-Wh (Small)	2-Wh (MC)	2-Wh SC)	3-Wh (Auto)	Mini Bus
Maintenance Cost	3.94	3.31	2.01	0.57	0.72	2.25	2.75
Capital Cost	2.40	2.40	2.67	1.20	0.18	0.16	1.72
Total VOC	6.98	6.58	3.54	0.82	0.96	3.27	4.92

V.   ECONOMIC BENEFITS

Benefits in term of money value are estimated directly from the project passenger km saved for the horizon years (2016, 2021, 2026, 2031 and 2041) and values for other years are interpolated on the basis of the projected traffic. Market values are used for calculating cost and then appropriate economic factors are applied. For fuel cost 7%, for vehicle operating cost (VOC) 2% and for values of each benefit components are estimated and thus benefit stream is obtained. Benefits are mainly due to passengers who will be shifted to metro but vehicles on road will also get some benefit due to less congestion. Benefit shares of different components of the entire project period (2013-2043) is presented in table which shows that benefits are mainly from saving of travel time cost (76%), VOC(10%) and fuel cost (9.5%). Environmental Benefit from emission reduction, accident reduction and infrastructure maintenance cost (all together) is 4.35%.

TABLE NO 5

COST/BENEFIT COMPONENTS DUE TO METRO

S. No.	Cost/Benefit Components	Economic Factors
1	Construction Cost	85%
2	Maintenance Cost	85%
3	Annual time cost saved by metro passengers	90%
4	Annual fuel cost saved by metro passengers	80%
5	Annual vehicle operating cost saved by metro passengers	80%
6	Emission saving cost	100%
7	Accident cost	100%
8	Annual time cost saved by road passengers	90%
9	Annual fuel cost saved by road passengers	80%
10	Annual infrastructure maintenance cost	80%

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VI.   CONCLUSIONS

The metro connection from 'NOIDA Sector 52 to Greater NOIDA Depot Station is ~30 kms in length with 22 stations, fully elevated for the entire stretch. This is a light metro with a capacity of about 30,000 PHPDT, proposed to be operated by 4 coach trains with an ultimate headway of 2.5 minutes. The present-day cost of the project is Rs. 4290 Cr. without taxes and duties. The project cost, including taxes and duties, will be Rs. 5533 Cr. A project of this size and magnitude can be easily completed within a period of three and a half years from the date of the 'go ahead' signal. The line passes through largely undeveloped, uninhabited areas for almost 75% of its length. The possibility of these areas getting developed within the project period is remote. Therefore, on completion and in the initial years the ridership is expected to be very low- of the order 1.04 lakh commuters per day. With this scenario and with the Financial Rate of Return being very low, there's no possibility of a private operator coming forward to take up this project on BOT (Build Operate and Transfer) basis. Even if extensive lands are offered for property development along the route in the form of sweeteners, still it is unlikely that investors will come forward to take up this project on BOT basis due to slump in the real estate market. In the same way a Public Private Participation route (PPP) is also ruled out as the financials of the project will not attract any private investor.

REFERENCES

[1] Santanu Sadhukhan, *Feasibility Study of Residential/Commercial and Infrastructure Project Seminar,* Dec.2006.

[2] Bimal Kumar, *Cost Benefit Analysis Of Building Construction Project Seminar,* May 1985

[3] Application Of Operational Research In Project Management Project Seminar: - By Md Fasih Quasim, 2006

[4] Prasanna Chandra, *Projects Planning, Analysis, Financing, Implementation And Review.* 5th Edition, Tata McGraw Hill, New Delhi. 2014

[5] Dr. Punita Soni A Conceptual Paper On Social Cost Benefit Analysis, International Journal of Contemporary Practices, vol2, issue 1, 2017

[6] Government of India, Planning Commission Economic Survey (2005).

[7] Construction Project Management, Theory and Practice, Kumar Neeraj Jha (2011).