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Environmental Problems due to Joka- B.B.D. Bag Metro Railway Project Along Behala -Taratala Route in the City of Kolkata, West Bengal

Alpana Ray¹ and Sudip Roy^{2*}

Abstract : *The construction of new metro railway project or the expansion of the existing metro system invites environmental problems in densely populated areas. The metro system after construction and commissioning will definitely reduce the pollution level and will be highly convenient and Low Carbon mode of Public Transport. But the construction stage aggravates different environmental problems as it passes through densely populated and high vehicular traffic areas. Joka-B.B.Bag Metro Project inaugurated in September 2010 through Behala Taratala areas which are 18.72 k.m. long is creating some environmental problems both to the environment and the people. The delay of constructional activities has led to many environmental problems which led to Diamond Harbour road very narrow, accident-prone and polluted. This paper deals with all the aspects of minimizing the negative environmental effects in planning and implementation of metro projects in highly polluted areas especially when the pollution level of certain elements are above the acceptance level. The paper throws light on the management system which will be helpful for any future project.*

Keywords : *Metro Railway, Behala-Taratala, Kolkata, Environmental Problems*

Introduction

Metro Rails are mass rapid transit system which is totally separated from other modes of the transport system in an urban area. It is characterized by their high capacity to carry passengers i.e. 50,000 to 65,000 per hour on an average at an average speed 20-35 km/hr and very high-frequency operation and also promoting Low Carbon Transport in cities (Teewari, 2014). Though it is 20-30 times costlier than Bus Transit system among the policymakers, there has been a growing interest to build Metro railways to address the expanding population of the cities. In addition to this, it is perceived to have higher comfort levels, speed and efficiency than any other transport (Mohan, 2000) and play an important role in reducing air pollution and road traffic congestion and accidents.

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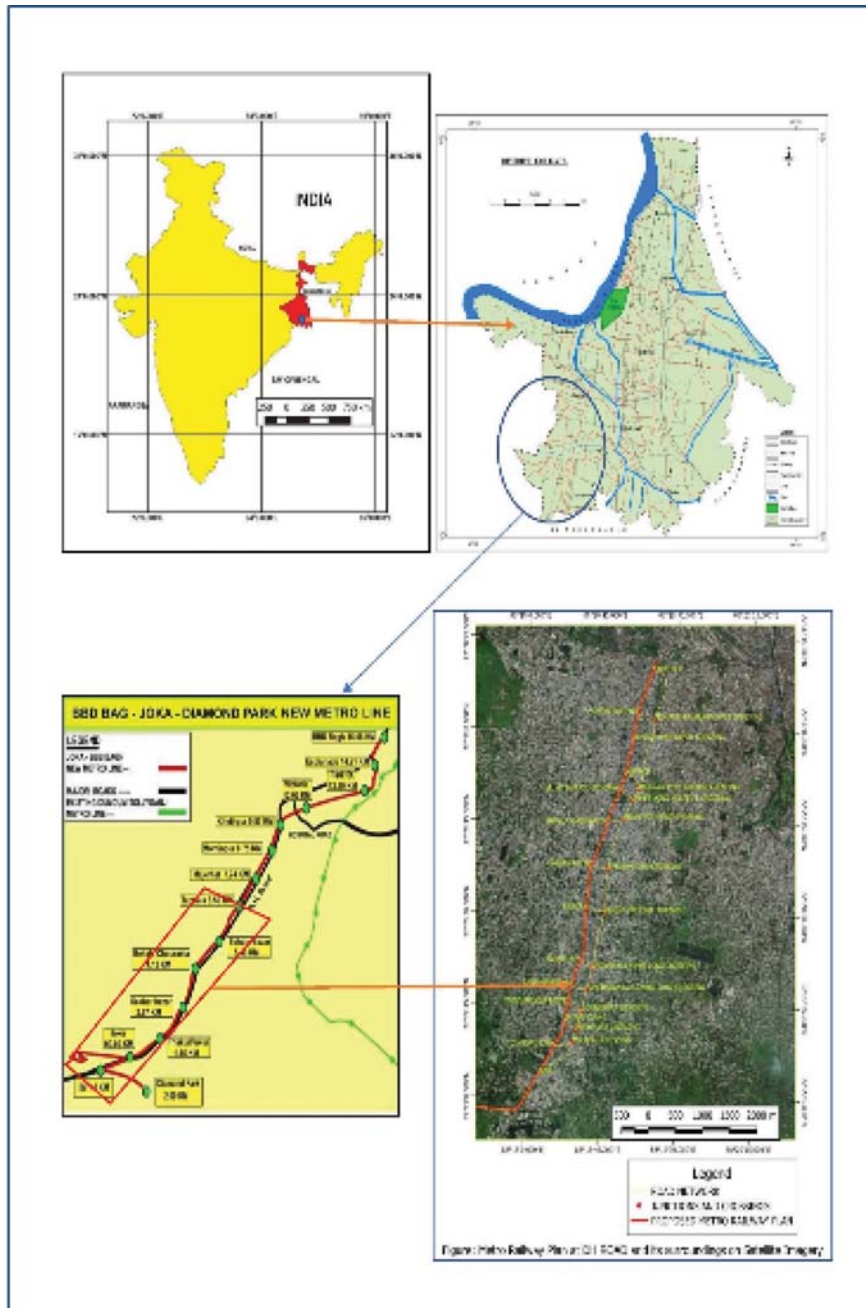


Fig. 1 : Location the Study Area

Thus the Planning Commission has recommended rail transit project under twelfth Five Year Plan for Indian Cities with population exceeds 2 million and cities with a population in excess of 3 million to construct the Metro rails (Planning Commission, 2011). After the completion of the Metro Project, it will certainly reduce the pollution level and convenient mode of public transport but also aggravates different problems mainly waterlogging, pollution, traffic congestion during the construction stage. As metro alignment passes through very densely populated areas so the construction phases aggravate different problems.

Behala is very densely populated area located in the southwestern flank of Kolkata city (Figure:1) and is very vulnerable interms of different problems like traffic congestion, a waterlogging problem during monsoon months, and high level of air pollution and noise pollution. Behala is one of the best oldest residential areas and also known as an important industrial area of the city with total inhabitants 5,26,460 (Census 2011) in the ward between 115,116, 118....132(Figure:2).

Behala comprises one of the largest suburban agglomerations of the city of Kolkata. It consists of many small localities like Parnasree Pally, Taratola, Sahapur, Behala tram depot, Manton, Chowrasta (Barisha), Shakherbazar, Silpara, Kadamtola, and BehalaThakurpukur. The huge growth of population, especially since the early eighties, resulted in the area being on the radar of the daily wage earners, common populace and educated classes. Due to this enormous an unplanned growth, the traffic is by a large dependent on the arterial Diamond Harbour Road in spite of the availability of the parallel James Long Sarani (commonly known as Bypass or Rail line since the old and now defunct Kalighat-Falta Railway ran here) as an option. But after the construction of the Taratala fly over a large portion of the traffic flows through James long Sarani to avoid traffic congestion causing the development of other areas of Behala.

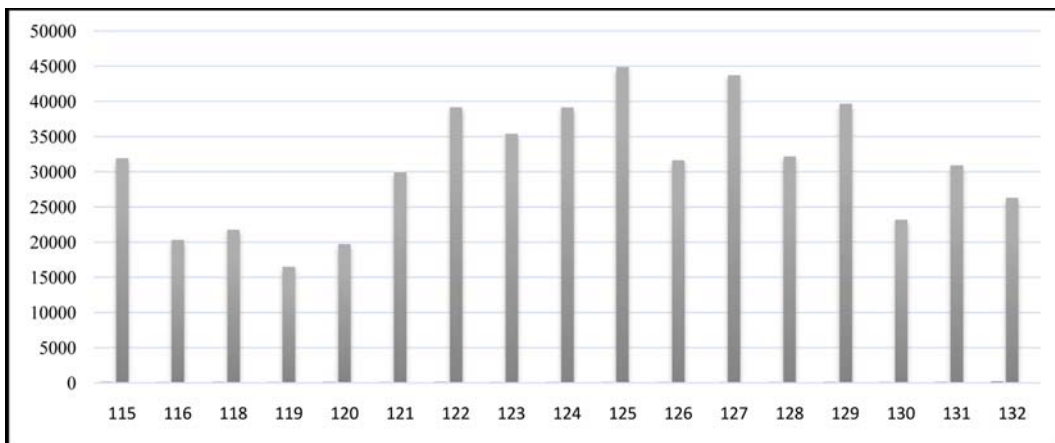


Fig. 2 : Population in Behala (Wards 115- 132), 2011

A tram line used to run through the centre of Diamond Harbour road from Joka to Behala tram depot till around 2005 and the service on this stretch has been withdrawn due to the elevated metro railway construction on the Diamond Harbour Road which will run from Joka to BBD Bag metro rail project in presence of Central Finance Minister and Governor of West Bengal in Sept 2010. The 18.72 km long Joka to BBD Bag metro got stalled because of an issue leaving Diamond Harbour road narrow accident-prone and extremely polluted.

The study area i.e from Thakurpukur to Taratola (6.5 km) the progress of the project has been quite steady with Railway Vikash Nigam Limited (RVNL) but the construction of metro rail in the thakurpukur to taratola region is creating some problems both to the environment and to the people. The delay in the construction of the Joka – BBD Bag metro railway on Diamond Harbour road has led to many physical and socio-economic problems to leaving Diamond Harbour road narrow accident prone and polluted. The stations proposed in the section are as follows (Table 1).

Table:1 Proposed Stations from Joka to B.B.D Bag

Name of station	KM (Approx.)	Remarks
Joka	0.000	New Station
Thakurpukur	1.455	New Station
Sakher Bazar	2.670	New Station
BehalaChowrasta	4.130	New Station
Behala Bazar	5.460	New Station
Taratola	6.500	New Station
Majerhat	7.740	New Station
Mominpur	8.755	New Station
Khidirpur	9.870	New Station
Victoria	12.025	New Station
Park Street	13.290	New Station
Esplanade	14.215	New Station
BBD Bag	15.075	New Station

Source: Metro Railway, Kolkata

The study area i.e from thakurpukur to taratola (6.5 km) the progress of the project has Extension project for Rs. 294.49 Cr of BBD Bag – Joka new Metro line to IIM and Diamond Park for 2 km has been sanctioned in the Budget of 2012-13. The work has been given to RVNL. The station's proposed stations are as follows (Table:2)

Table:2 Proposed Extended Stations from Joka to Diamond Park

Name of station	KM (Approx.)	Remarks
Joka	0.00	New Station
IIM	1.00	New Station
Diamond Park	2.00	New Station

Source: Metro Railway, Kolkata

Objective and Methodology

To have a proper idea about the environmental problems due to Metro railway construction in the study area includes the following objectives

- To evaluate the problems of Traffic congestion due to construction activities in the study area.
- To analyse the different issues and concerns which are related to air pollution in the study area.
- To identify the problems of water logging in the study area and to find out the affected areas in and around the proposed metro route.
- To suggest possible solutions to avoid such problems in the study area.

This study is basically descriptive in nature and based on secondary and primary information. Both qualitative and quantitative methods have been applied to this research. The present research work is based on the application of modern as well as a conventional methodology with intensive fieldwork. The analytical part of the research is based on the compilation of various secondary data and also an analysis of primary data from field visits to fulfil the objective. Secondary data obtained from Metro Railway office, Behala Municipality offices, archival sources, downloaded information through websites, and the suggestions and recommendations made by the interviewing the common people who are sufferer to analysis the research problems. A structured questionnaire based on an interview was conducted to study the research problems in and around the area. The nature of the present research work is explorative and the whole work has been done by descriptive as well as analytical methods.

Problems Associated with Metro Rail Construction Activities

Traffic Congestion

With increasing traffic demand, coupled with an increasing number of vehicles on road, the problems related to traffic congestion, road accidents, environmental pollution have increased magnificently over in the last few years. One of the most accepted methods of improving traffic congestion in the cities has been to improve efficient Public transport system (Bhutani et al., 2016). So the objective to build the Joka – BBD Bag metro is to reduce the traffic pressure on DH Road,

a national highway NH-117 and also on Behala- Thakurpukur area. But the construction of a metro line from Joka to Majherhat is under many disputes from the beginning of the project (July 2011). The deadline is being delayed due to availing permission from the defence authorities and also due to the land issue problem. The completion schedule (Joka–Taratala) was postponed from early 2014 to 2015-16 and now it is postponed to June 2018.

A flank of Diamond Harbour Road, the major thoroughfare in Behala has been blocked several places – Pathakpara, Silpara, Behala-Chowrasta and Thakurpukur because of metro construction and work on a waterline. The traffic comprising heavy lorries, buses, autos and cars from both directions move along the single lane. Snarls and chaos are natural outcomes. The cars and bikes and some superfast deluxe buses try to steer clear of these traps by taking James Long Sarani turning the road into a second choke pot. The overload triggers massive traffic congestion during peak hours. The loose stone chips mounds of sand and muck from the construction site spill on the road. The stretches near Thakurpukur, Kadamtola and Behala-chowrasta are particularly hazardous.

The overloaded tracks often speed along the road at well over the speed limit of 60km/hr with little regard for traffic rules and fellow motorists. They take sharp turns and switch lanes suddenly. The stretch between Pathakpara in front of Orient day school and Behala bus stand number 14, opposite silpara basketball courts are always lined with buses, cars and trucks. This is a no parking zone. The D.H Road is a national highway (N.H 117) and always reveals a good percentage of traffic flow during peak time. Though it is congested nowadays due to the constructions of Joka-BB Bag metro link.

The primary survey also reveals the fact that autorickshaw, private buses follow the D.H Road most and the bikes, cycles, rickshaws and public buses prefer James Long Sarani. There are some bus stands which are not usable due to the diversions the road space is being reduced. The lack of traffic management near the diversion area is another problem resulting in accidents. The road diversion has increased the flow of vehicles through James Long Sarani leading to traffic congestion in James Long Sarani and lack of traffic police here has increased the speeding of two-wheeler leading to accidents, thus the road diversions and lack of management is the main problem. The bad and deteriorating condition of D.H Road has decreased the accessibility and thus increased the accessibility in James Long Sarani leading to congestion here. The reasons behind James Long Sarani congestion are a bad condition of D.H Road (NH-117) is road diversion road space is narrowed in D.H Road due to the building of metro stations traffic congestion on D.H Road has increased the flow of vehicles through James Long Sarani. The main problem faced by the people living near James Long Sarani is traffic congestion and accident.

Temporal accessibility analyses along DH Road and its adjacent James Long Sarani showing the decreasing level of accessibilities along with most important settlement pockets of South Kolkata. Shimble Index method has been used for this purpose (Figure:3). Shimble Index is the addition of the lowest number of arcs in between a particular station and adjacent stations or nodes in a topological map and the lowest number reflects the highest accessibility condition and the highest number reflects the lowest accessibility condition. The very high accessible areas are from

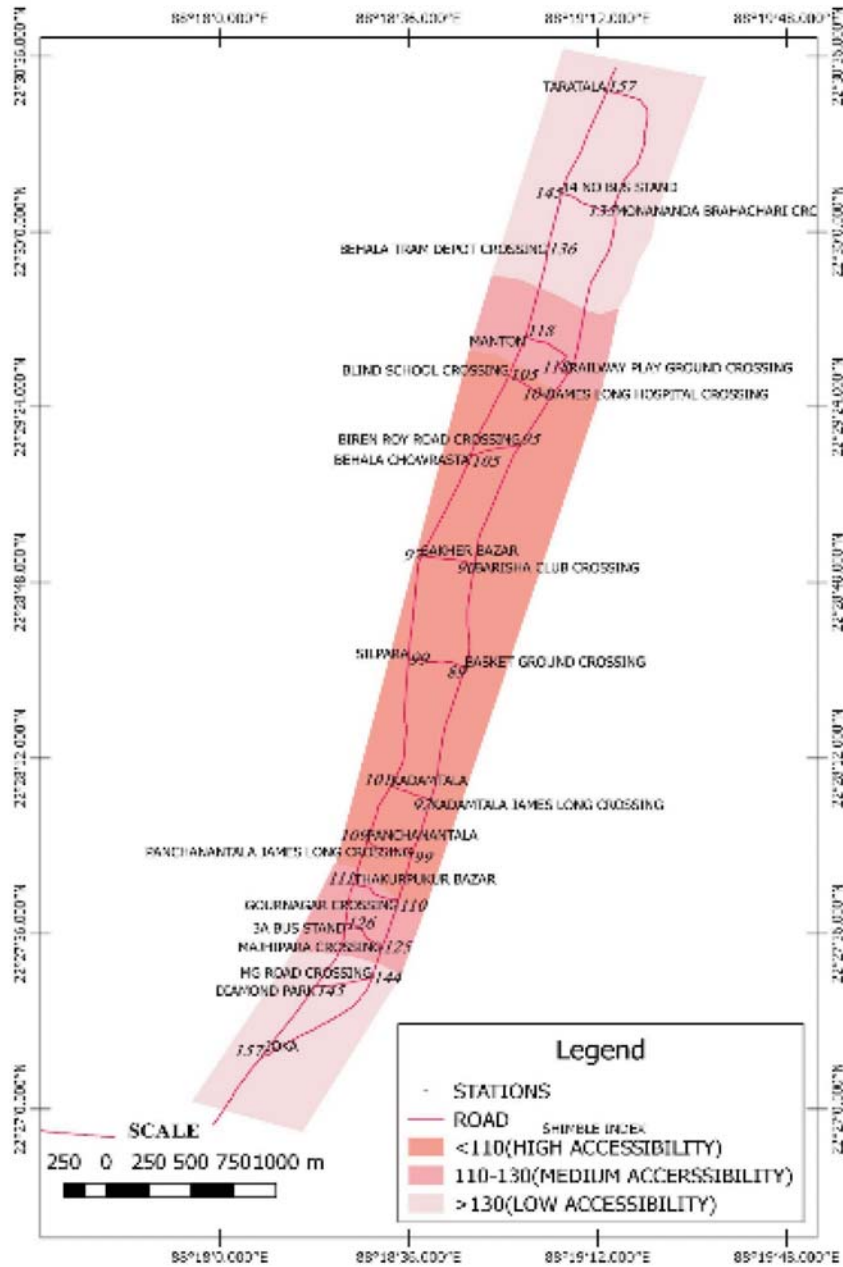


Fig. 3 : Accessibility Map prepared by calculating SHIMBLE INDEX (Shortest Path Matrix) showing level of accessibility along Joka to Taratala (D H Road)

Sakherbazar to Thakurpukur and Behala Chowrasta to Manton is the most accessible area as D.H. Road is connected by the James Long Sarani by several linking roads. These are totally affected along the route for road diversion during the metro railway construction and the high accessible areas of the map have become moderately and less accessible (Figure:4). The shimble index values are increasing near about 20 which indicates that all the vehicles have to be diverted through James Long Sarani by several linking roads.

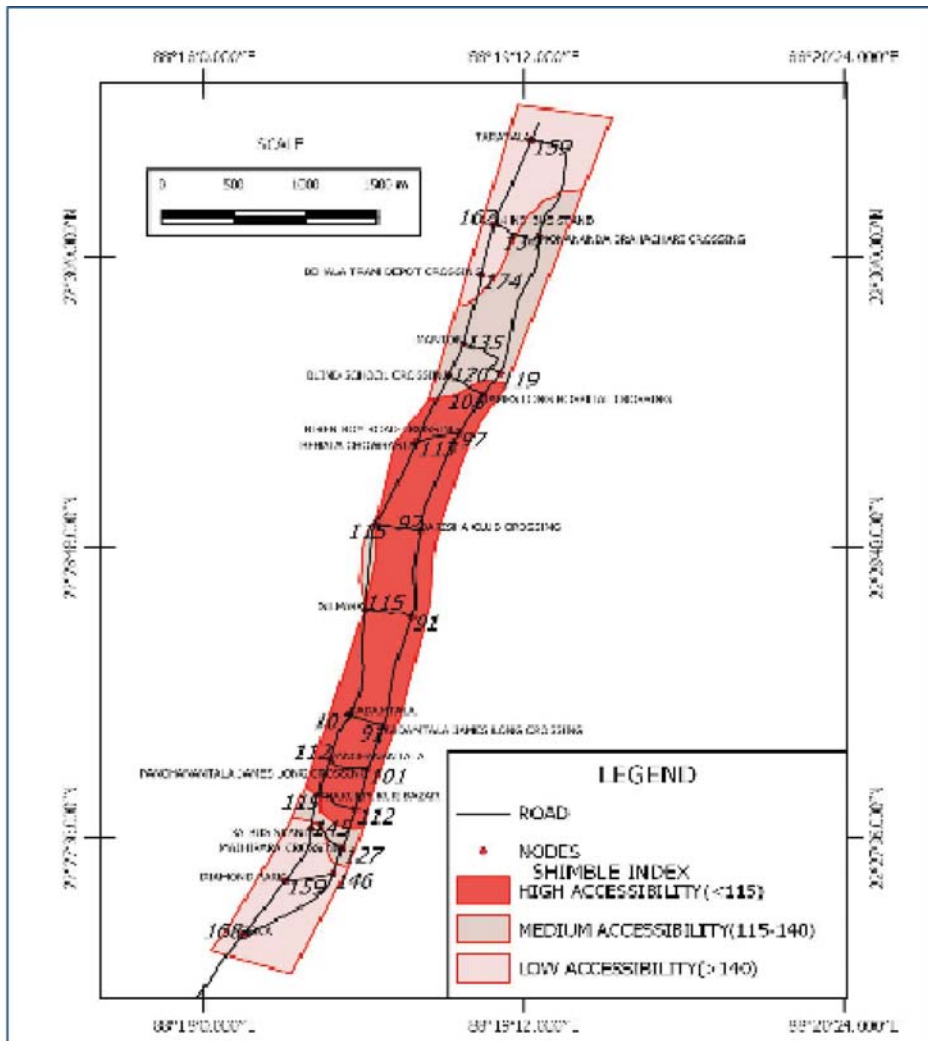


Fig. 4 : Accessibility Map prepared by calculating SHIMBLE INDEX (Shortest Path Matrix) showing the decrease level of accessibility along Joka to Taratala (D H Road) at the time of road diversion at Silpara to Sakher Bazar

Air Pollution

Air pollution has become a very serious issue in the study area in recent times due to metro rail construction activities, and the quality of air is turning out to be very poor and causing many health issues among the public. With the increase in the number of vehicles on roads, construction activities and industrialisation are some of the reasons that have led to pollution (Verma, 2003). To meet up with the population pressure, more infrastructural facilities are needed and thus increase the pollution level. To solve the problem of inadequate infrastructural facilities, city planners plan to construct metro rails to relieve traffic congestion on the road and consequent reduction in pollution level (Kumar, 2003). Metro rail construction activities in Behala–Taratala area aggravate the air pollution in the environment. Trash burning is carried on a regular basis. There are huge dump-yards where huge quantities of trash are being burned regularly, causing pollution in the air. Moreover, construction activities also create dust like cement, wood trash etc which also results in air pollution.

The Air Quality Index (AQI), in Kolkata, showed 409 in Nov'2018 and 415 in Dec'2018, which is considered as "Poor". The city residents breathe 5 times of bad air and around 71% of people suffer from respiratory diseases. Pollution levels rise rapidly in winter due to the low speed of wind and damp weather. Kolkata, as usual, has damp weather and the dust particles get trapped easily. PM_{2.5} is not available during all the seasons but it increases at the start of winter even the Air Quality index rises above 300/400 during the winter season. The pollution and bad air quality is at peak during night time and early in the morning. Most of the people suffering from respiratory diseases are non-smoking people. The existing level of pollution like Suspended Particulate Matter

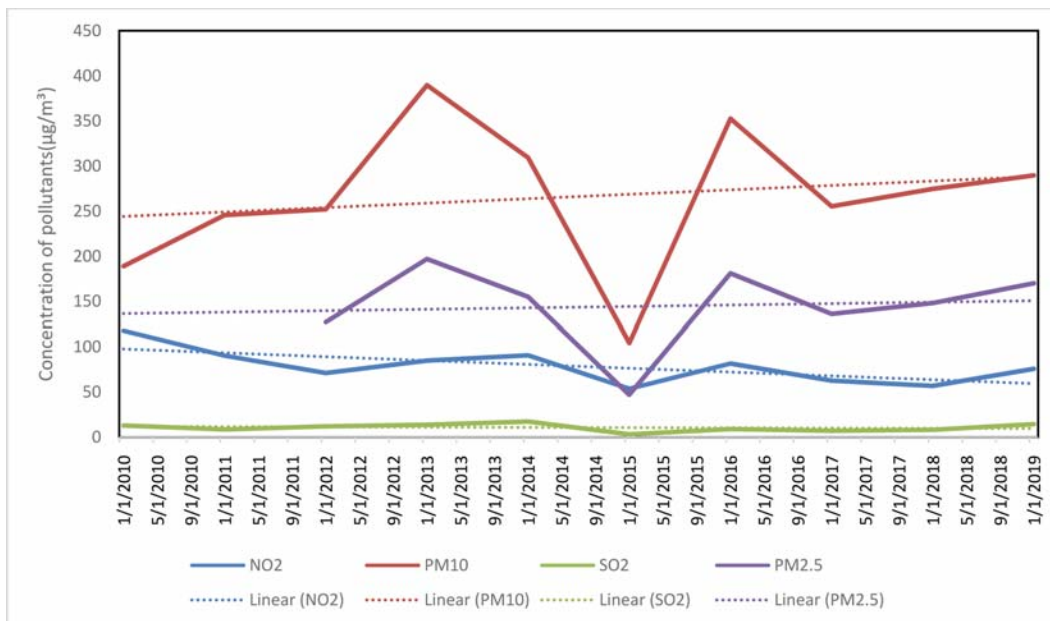


Fig. 5 : Temporal Concentration of pollutants(µg/m³) at Chowrasta

(SPM), CO_2 , SO_2 , NO_2 are either already on the higher side or above the acceptable level causing serious health problems. The Figure:5 shows that before the construction activities in the year 2010 PM_{10} was $189 \mu\text{g}/\text{m}^3$ which was quite low but 2013-2019 it is increasing at a faster rate and it is also true for $\text{PM}_{2.5}$. Metro construction activities have aggravated air pollution level in Behala Chowrasta area. Air quality index has also increased from 159 in 2010 to 338 in 2019.

Any rise in pollution level beyond the prescribed limit has a serious impact on the health of people (Goel et al. 2014). Air pollution leads to many health hazards making it difficult for people to breathe and survive in a clean environment. According to experts and doctors, Kolkata should also take measures same as in Delhi to deal with air pollution or it will lead to serious health issues among the public. More deaths due to lung cancer and heart attacks are the major concern in the present era. The most affected are the school going and college going students, who fall prey for asthma. People who are on roads for long periods such as dwellers, hawkers, drivers of public transport are at more risk than anyone, as they inhale more of these harmful gasses. People are at high risk of respiratory disorders and other disorders due to rising air pollution. People also suffer from irritation in eyes, sneezing, cough, allergies and body rashes.

Waterlogging

The heavy shower always caused water logging in many pockets of Behala Thakurpukur region. The main reason for waterlogging on D.H Road is improper drainage system, low terrain, increase of built-up areas and lack of management. The construction of the metro link has increased the water logging condition even in the light spell of rain as the construction materials are choking the drainage system. The underlying surface has changed due to the construction of pillars for the metro flyover, water is getting logged on the low areas which are also logging in the potholes created by the lorries (heavy vehicles i.e more than six wheels) carrying construction materials. Thus waterlogging is another problem on D.H Road which has been increased due to the building of metro link. Narrow road space due to encroachment by street hawkers, unauthorized shops under Metro flyover, illegal settlements and choking off the drainage due to the dumping of construction materials are the reasons for waterlogging problem in the study area. The areas like Behala Tram Depot, Behala- Chowrasta, Sakherbazar, Silpara, Thakurpukur are all waterlogging prone areas due to Metro Railway construction (Figure: 6).

Conclusions and Recommendations

The unplanned growth of the Behala area in the absence of a proper master plan is the main problem that is leading to the degradation of this virgin environment from the beginning.

The primary survey in the Behala Thakurpukur area reveals that the problems of waterlogging, road diversions unauthorized shops bad condition of road and traffic footpath problems etc have increased due to the constructions of the metro project in this area. The lack of management and unplanned growth and development in this area is the main reason for the above problems.

The infrastructure projects play an important role in the development of a nation and these are also accompanied by significant environmental and social impacts during its construction phase of



Plate 1 & 2: Water logging at D H Road in the rainy season.



Plate 3: Road diversion at Silpara



Plate 4: Excavation at DH Road for Metro construction



Plate 5: Dumping of construction material at DH Road.



Plate 6: Dumping of construction material at footpath and blocking of footpath near Thakurpukur

the project (Kumar, 2003). Metro railways construction activities in densely populated and polluted areas invite different environmental, social and other related critical issues which need to be studied and addressed carefully so that this mega-infrastructure will be socially and environmentally acceptable. Metro rail projects take many years to get operational so that environmental management can be suitably used to ensure that they are environmentally sustainable and socially acceptable (Karthik, 2018).

Though the environmental impact of the metro projects is assessed and necessary mitigation is already planned but overall comprehensive planning is usually lacking which results in an increase in pollution level and other environmental problems. So it is necessary for the metro planners to take into account all the possible environmental problems and plan remedial measures accordingly.

At different locations of Metro rail construction where the pollution level has exceeded the permitted level or is on the higher side in the study area, construction activity needs to be scrutinized to protect the environment. The type of material used plays an important role in deteriorating the environment. The use of 'precast' concrete structural members, high capacity cranes, battery operated trucks will provide a big relief from adverse environmental impact (Kumar, 2003).

A proper master plan is to be chalked out to get rid of these problems. The drainage outlet should be cleaned to check pollution and spread of diseases and reduction in waterlogging. The hawkers should be removed to some place through management so that they can earn their livelihood & also the problems caused by their presence on D.H Road can be reduced. The temporary settlements should be checked by the contracted company related to the project. The condition of D.H Road should be improved as it is a national highway, proper traffic management is required and more traffic police are needed there.

The road diversions should be properly done and the increase of traffic police in the diversion area also in James Long Sarani is needed. The proper disposal of solid waste should be done by the metro railway authority. The checking of the pollution level should be done especially near the hospital area and near the educational institutions. To materialize all the suggestive measures to upgrade environmental and socio-economic conditions of the area. A strict and regular administrative vigilance is the need of the hour. Development is good but the development should be environment-friendly i.e. not harming the environment and for this proper plan must be chalked out by the developmental committees. A proper master plan should be taken as that the environment and the common people affected by the construction of the metro link.

Recent studies show that an increase in pollution level due to the metro railway for short duration in polluted areas of the study area has an extremely adverse effect on the health of the people. Adequate consideration of environmental aspects is to be given in all aspects of planning and construction of the metro project to match with the special circumstances that prevail in highly polluted and populated cities. By proper planning and execution, the adverse effect on highly polluted and populated zones of the city can be minimised so that health hazards are minimised.

Such planning acted upon effectively will also should the public opinion in favour of increased public cooperation and goodwill.

A more personal approach is required for people whose living conditions are getting directly affected due to the metro construction mainly vibration in their building, movement of a large number of trucks, temporary blocking off their pathway, etc. Engineers and their representative along with Public Relation Personnel should take responsibility to meet directly with such persons and keep them informed about the steps being taken to ensure safety and environment.

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